APR1400
DESIGN CONTROL DOCUMENT TIER 2

CHAPTER 3
DESIGN OF STRUCTURES, SYSTEMS, COMPONENTS, AND EQUIPMENT

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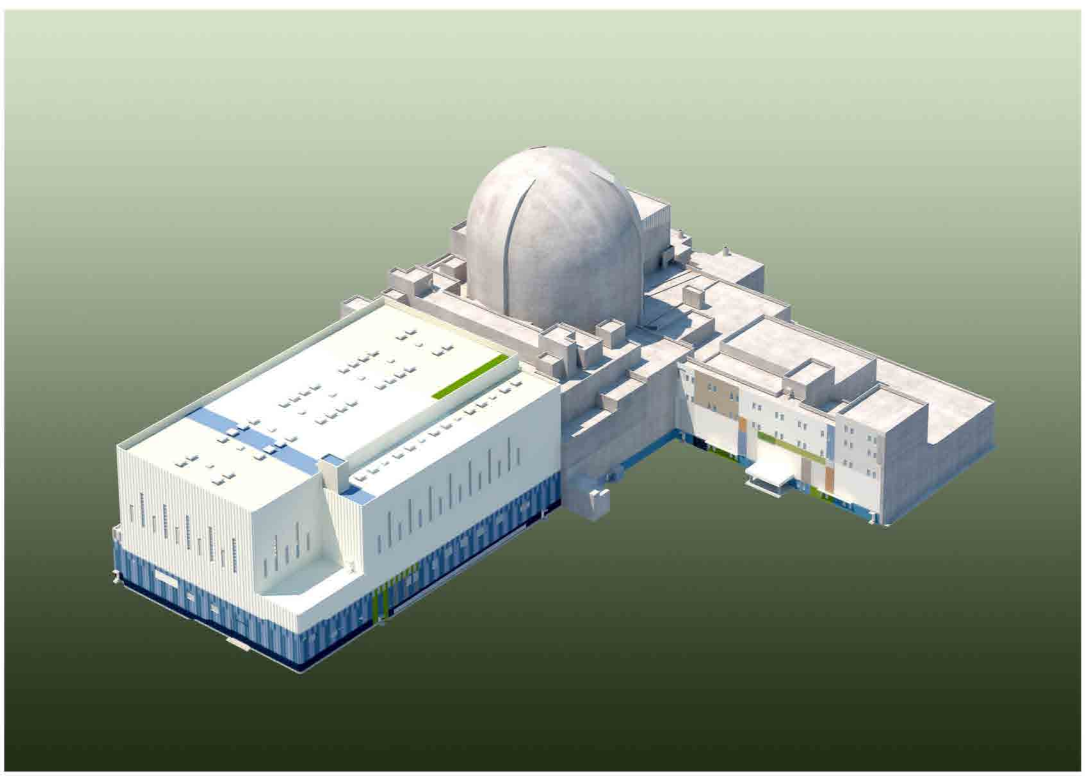

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KOREA HYDRO & NUCLEAR POWER CO., LTD

CHAPTER 3 – DESIGN OF STRUCTURES, SYSTEMS, COMPONENTS, AND EQUIPMENT

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ACRONYM AND ABBREVIATION LIST

AAC	alternate alternating current
AB	auxiliary building
AC	alternating current
ACI	American Concrete Institute
ACU	air cleaning unit
AFW	auxiliary feedwater
AFWS	auxiliary feedwater system
AFWST	auxiliary feedwater storage tank
AHU	air handling unit
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANS	American Nuclear Society
ANSI	American National Standards Institute
AOO	anticipated operational occurrence
APC	1) auxiliary process cabinet 2) auxiliary protective cabinet
APR	Advanced Power Reactor
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing And Materials
ATWS	anticipated transient without scram
BAST	boric acid storage tank
BLPB	branch line pipe break
BOP	balance of plant
BRL	Ballistic Research Laboratory
CCS	component control system
CCW	component cooling water
CCW HX	component cooling water heat exchanger
CCWPH	component cooling water pump house

CCWS	component cooling water system
CEA	control element assembly
CEAC	CEA calculator
CEDM	control element drive mechanism
CFR	Code of Federal Regulations
CIAS	containment isolation actuation signal
CIV	containment isolation valve
COL	combined license
COLA	combined license application
CPC	core protection calculator
CPCS	core protection calculator system
CPCSC	core protection calculator system cabinet
CR	control room
CS	1) containment spray 2) core support
CSB	core support barrel
CSDRS	certified seismic design response spectra
CSS	containment spray system
CVAP	comprehensive vibration assessment program
CVCS	chemical and volume control system
CWS	circulating water system
DAC	design acceptance criteria
DBE	design basis event
DBFL	design basis flooding level
DBPB	design basis pipe break
DCD	Design Control Document
DFL	dynamic fluid loads
DFOT	diesel fuel oil tank
DGA	diesel generator area
DIF	dynamic impact factor
DLF	dynamic load factor

DN	nominal diameter
DNBR	departure from nucleate boiling ratio
DPS	diverse protection system
DRCS	digital rod control system
DVI	direct vessel injection
EAB	exclusion area boundary
ECCS	emergency core cooling system
ECCSC	ESF component control system cabinet
EDG	emergency diesel generator
EDGB	emergency diesel generator building
ENFMS	ex-core neutron flux monitoring system
EPRI	Electric Power Research Institute
ESA	extension shaft assembly
ESF	engineered safety features
ESF-CCS	engineered safety feature – component control system
ESFAS	engineered safety features actuation system
ESR	electro-hydraulic spring return
ESWB	essential service water building
ESWS	essential service water system
FEM	finite element model
FHA	fuel handling area
FIV	flow induced vibration
FTC	fuel temperature coefficient
FW	feed water
FWLB	feedwater line break
FWLB	feedwater line break
FWPB	feedwater pipe break
GDC	general design criteria (of 10 CFR Part 50, Appendix A)
GL	Generic Letter
GMRS	ground motion response spectra
GTAW	gas tungsten arc weld

GWMS	gaseous waste management system
HELB	high-energy line break
HIS	Hydraulic Institute Standard
HJTC	heated junction thermocouple
HRHF	hard rock high frequency
HSB	hot standby
HSD	hot shutdown
HT	high temperature
HVAC	heating, ventilation, and air conditioning
HVT	holdup volume tank
HX	heat exchanger
I&C	instrumentation and control
IBA	inner barrel assembly
ICI	in-core instrumentation
ID	inner diameter
IEEE	Institute of Electrical and Electronics Engineers
IHA	integrated head assembly
IPS	information processing system
IRWST	in-containment refueling water storage tank
ISI	inservice inspection
ISM	independent support motion
ISRS	in-structure response spectra
IST	Inservice Testing
ITAAC	inspections, tests, analyses, and acceptance criteria
ITP	interface and test processor
J-R	J-Resistance
JOG	Joint Owner Group
LBB	leak before break
LC	1) lock close 2) loop controller
LCO	limiting conditions for operation

LO	lock open
LOCA	loss of coolant accident
LOF	left-out-force
LOOP	loss of offsite power
LPD	local power density
LPZ	low population zone
LSS	lower support structure
LSSS	limiting safety system setting
LT	low temperature
LTOP	low temperature overpressure protection
LWR	light water reactor
MCC	motor control center
MCL	main coolant loop
MCR	main control room
MFS	main feedwater system
MMIS	man-machine interface system
MOV	motor-operated valve
MS	main steam
MSADV	main stem atmospheric dump valve
MSE	main steam enclosure
MSIS	main steam isolation signal
MSIV	main steam isolation valve
MSLB	main steam line break
MSS	main steam system
MSSV	main steam safety valve
MSV	main steam valve
MSVH	main steam valve house
MTC	moderator temperature coefficient
MTP	maintenance and test panel
NDRC	National Defense Research Council
NDTT	nil ductility transition temperature

NI	nuclear island
NNS	non-nuclear safety
NO	normal operation
NOP	normal operating procedure
NPP	nuclear power plant
NPSH	net positive suction head
NPSHA	net positive suction head available
NPSHR	net positive suction head required
NR	narrow range
NRC	United States Nuclear Regulatory Commission
NS	non-seismic
NSSS	nuclear steam supply system
NUREG	U.S. Nuclear Regulatory Commission Regulation
OBE	operating basis earthquake
OD	outside diameter
P&ID	piping and instrumentation diagram
PAMI	post-accident monitoring instrumentation
PED	piping evaluation diagram
PGA	peak ground acceleration
PIV	pressure isolation valve
PMF	probable maximum flood
PMP	probable maximum precipitation
POSRV	pilot operated safety relief valve
POV	power-operated valve
PPS	plant protection system
PPSC	plant protection system cabinet
PS	outside primary shield and inside secondary shield
PSD	power spectra density
PSR	pneumatic spring return
PSW	primary shield wall
PWR	pressurized water reactor

PZR	pressurizer
RAP	reliability assurance program
RC	reactor coolant
RCB	reactor containment building
RCGVS	reactor coolant gas vent system
RCL	reactor coolant loop
RCP	reactor coolant pump
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RDT	reactor drain tank
RHR	residual heat removal
RPS	reactor protection system
RRS	required response spectra
RSPT	reed switch position transmitter
RSR	remote shutdown room
RTD	resistance temperature detector
RT_{NDT}	reference temperature for nil-ductility transition
RTSS	reactor trip switchgear system
RV	reactor vessel
RVI	reactor vessel internals
SAFDL	specified acceptable fuel design limit
SAM	seismic anchor movement motion
SC	1) shutdown cooling 2) safety console
SCP	shutdown cooling pump
SCS	shutdown cooling system
SDCHX	shutdown cooling heat exchanger
SECY	office of the secretary of the commission
SFP	spent fuel pool
SG	steam generator
SGBS	steam generator blowdown system

SGTR	steam generator tube rupture
SI	safety injection
SIF	stress intensification factor
SIP	safety injection pump
SIS	safety injection system
SIT	1) safety injection tank 2) structural integrity test
SLB	steam line break
SMAW	shielded metal arc weld
SOV	solenoid-operated valve
SQSDS	seismic qualification summary data sheet
SRI	Stanford Research Institute
SRP	Standard Review Plan
SRSS	square root of the sum of the squares
SRV	safety relief valve
SS	outside secondary shield
SSC	structures, systems, and components
SSE	safe shutdown earthquake
SSI	soil structure interaction
SSW	secondary shield wall
T/C	reactor inlet temperature, T(cold)
T/H	reactor outlet temperature, T(hot)
TEDE	total effective dose equivalent
TGB	turbine generator building
TIV	temperature isolation valve
TLOFW	total loss of feedwater
UGS	upper guide structure
UHS	ultimate heat sink
UPC	ultimate pressure capacity
URS	uniform response spectrum
USH	uniform support motion

VCT	volume control tank
WR	wide range
ZPA	zero period acceleration

CHAPTER 3 – DESIGN OF STRUCTURES, SYSTEMS, COMPONENTS, AND EQUIPMENT

3.1 Conformance with Nuclear Regulatory Commission General Design Criteria

3.1.1 Criterion 1 – Quality Standards and Records

"Structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. Where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy, and sufficiency and shall be supplemented or modified as necessary to assure a quality product in keeping with the required safety function. A quality assurance program shall be established and implemented in order to provide adequate assurance that these structures, systems, and components will satisfactorily perform their safety functions. Appropriate records of the design, fabrication, erection, and testing of structures, systems, and components important to safety shall be maintained by or under the control of the nuclear power unit licensee throughout the life of the unit."

Response:

The structures, systems, and components (SSCs) described in the Design Control Document (DCD) are classified according to their importance to safety, including the prevention and mitigation of accidents using the classification system described in ANSI/ANS 51.1 (Reference 1). Each component is given a safety class designation. The codes, standards, and quality control applicable to each component and safety class designation are identified in Section 3.2. The design and fabrication of SSCs conform with 10 CFR 50.55a (Reference 2) as applicable. The quality assurance program conforms with the requirements of 10 CFR Part 50, Appendix B (Reference 3), and is addressed in Section 17.5. Chapter 14 describes the initial tests and operations that are conducted on installed equipment to provide reasonable assurance that the performance of the equipment is commensurate with the importance of the safety function.

The design, fabrication, and quality programs for components not included in the American National Standards Institute (ANSI) classification system are governed by industry codes appropriate to the application. Additional details are described in the relevant DCD sections.

3.1.2 Criterion 2 – Design Bases for Protection Against Natural Phenomena

"Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The design bases for these structures, systems, and components shall reflect: (1) Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena and (3) the importance of the safety functions to be performed."

Response:

The SSCs important to safety are designed to accommodate, without loss of capability, the effects of the design basis natural phenomena along with appropriate combinations of normal and accident conditions, as described in this chapter. Additional design information is provided in the sections that describe the individual SSCs.

3.1.3 Criterion 3 – Fire Protection

"Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and control room. Fire detection and fighting systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems, and components important to safety. Firefighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems, and components."

Response:

The pressure boundary components and structures and the attendant auxiliary systems in the APR1400 design scope are designed to minimize the probability and effects of fires and explosions. High-grade noncombustible and fire-resistant materials are used for components located in the containment, components of engineered safety feature systems, and throughout the plant wherever practical. The fire protection system is described in Subsection 9.5.1.

3.1.4 Criterion 4 – Environmental and Dynamic Effects Design Bases

"Structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. These structures, systems, and components shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit. However, dynamic effects associated with postulated pipe ruptures in nuclear power units may be excluded from the design basis when analyses reviewed and approved by the Commission demonstrate that the probability of fluid system piping rupture is extremely low under conditions consistent with the design basis for the piping."

Response:

SSCs important to safety are designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including a LOCA as described in Section 3.11.

Where appropriate, design bases include design requirements that provide reasonable assurance that SSCs are appropriately protected against dynamic effects such as missiles, pipe whipping, fluid discharges that could result from equipment failures, postulated accidents, and events and conditions outside the nuclear power plant.

The design concept of leak-before-break (LBB) is applied to the reactor coolant piping including surge line, safety injection, and shutdown cooling piping inside containment. The LBB concept eliminates the dynamic effects of postulated pipe ruptures from the design basis and is carried out in accordance with SRP 3.6.3 (Reference 4) and NUREG-1061 (Reference 5), Volume 3. The applications of LBB provisions are described in Subsection 3.6.3.

3.1.5 Criterion 5 – Sharing of Structures, Systems, and Components

"Structures, systems, and components important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units."

Response:

SSCs that perform safety-related functions are not shared between two units because the APR1400 is a single-unit plant.

3.1.6 Criterion 10 – Reactor Design

"The reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences."

Response:

Specified acceptable fuel design limits (SAFDLs) are described in Subsection 4.4.1. Operation within the limiting conditions for operation (LCOs) specified by the Technical Specifications keeps the reactor fuel within the SAFDLs for normal operation, including anticipated operational occurrences (AOOs).

The plant is designed so that operation within the LCOs and limiting safety system settings (LSSSs) prescribed in the Technical Specifications results in confidence that SAFDLs are not exceeded as a result of an AOO. Operator action, aided by control systems and monitored by plant instrumentation, maintains the plant within LCO limits during normal operation.

Additional information is provided in the following sections:

a. Section 4.2, Fuel System Design

b. Chapter 5, Reactor Coolant System and Connecting Systems

c. Subsection 5.4.7, Shutdown Cooling System

d. Section 7.2, Reactor Trip System

e. Chapter 15, Transient and Accident Analyses

f. Chapter 16, Technical Specifications

3.1.7 Criterion 11 – Reactor Inherent Protection

"The reactor core and associated coolant systems shall be designed so that in the power operating range the net effect of the prompt inherent nuclear feedback characteristics tends to compensate for a rapid increase in reactivity."

Response:

In the power operating range, the combined response of the fuel temperature coefficient (FTC), moderator temperature coefficient (MTC), moderator void coefficient, and moderator pressure coefficient to an increase in reactor power is a decrease in reactivity (i.e., the inherent nuclear feedback characteristics are not positive).

The reactivity coefficients for this reactor are described in Subsection 4.3.1.4.

3.1.8 Criterion 12 – Suppression of Reactor Power Oscillations

"The reactor core and associated coolant, control, and protection systems shall be designed to assure that power oscillations which can result in conditions exceeding specified acceptable fuel design limits are not possible or can be reliably and readily detected and suppressed."

Response:

Total reactor power oscillations of the fundamental mode stability is provided by the negative power coefficient of reactivity (GDC 11, Subsection 3.1.7) and the coolant temperature program maintained by regulating rods. Power level is continuously monitored by neutron flux detectors (Chapter 7).

Power distribution oscillations are detected by neutron flux detectors. Axial mode oscillations are suppressed by means of part-strength or full-strength neutron absorber rods. All other modes of oscillation are expected to be convergent. Monitoring and protective requirements imposed by GDC 10 and 20 are described in Subsections 3.1.6 and 3.1.16 and Chapter 4.

3.1.9 Criterion 13 – Instrumentation and Control

"Instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges."

Response:

Instrumentation is provided to monitor significant process variables that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary (RCPB), and their associated systems. Controls are provided to maintain these variables within the limits prescribed for safe operation. Instrumentation and control for the containment and its associated systems are described in Chapters 6 through 12. The principal process variables to be monitored and controlled are:

a. Neutron flux level (reactor power)

b. Control element assembly (CEA) positions

c. Neutron flux distribution (at various axial positions)

d. Reactor coolant temperature and pressure

e. Reactor coolant pump (RCP) speed

f. Pressurizer (PZR) level

g. Steam generator (SG) level and pressure

The departure from nucleate boiling ratio (DNBR) margin and local power density (LPD) margin (kW/cm) are also monitored.

The plant protection system (PPS) consists of the reactor protection system (RPS) and engineered safety features actuation system (ESFAS). The RPS is designed to monitor nuclear steam supply system (NSSS) operating conditions and initiate reliable and rapid reactor shutdown if monitored variables or combinations of monitored variables deviate from the permissible operating range to a degree that a safety limit may be reached. The ESFAS is designed to monitor plant variables and to actuate ESF systems during a design basis event (DBE).

The following systems and equipment are provided to monitor and maintain control over the fission process during transient and steady-state periods over the life of the core:

a. Redundant channels of ex-core nuclear instrumentation as the primary means of monitoring the fission process for protection, control, and low power operation

b. Redundant and diverse CEA position-indicating systems

c. Manual and automatic control of reactor power by means of CEAs

d. Manual regulation of boron concentration in the reactor coolant

e. A boronometer to determine boron concentration in the reactor coolant by neutron absorption as a backup to routine sampling and analysis

f. In-core instrumentation, provided to supplement information on core power distribution and enable calibration of ex-core flux detectors

The non-nuclear instrumentation measures temperatures, pressures, flows, and levels in the reactor coolant, main steam, and auxiliary systems and is used to maintain these variables within the prescribed limits. The instrumentation and control (I&C) systems are described in Chapter 7. The boronometer is described in Subsections 7.7.1.1 and 9.3.4.2. The process radiation monitor is described in Subsection 9.3.4.2.

When a variable is to be monitored during and after a DBE, in addition to normal operation, the event analysis results are used to provide reasonable assurance that the instruments provided cover the range anticipated for the event conditions.

3.1.10 Criterion 14 – Reactor Coolant Pressure Boundary

"The reactor coolant pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture."

Response:

The RCPB is defined in accordance with 10 CFR 50.2 and ANSI/ANS 51.1, as described in the response to GDC 55, Subsection 3.1.48.

Reactor coolant system (RCS) components are designed to meet the requirements of ASME Section III. To establish operating pressure and temperature limitations during startup and shutdown of the RCS, the fracture toughness rules defined in ASME Section III are followed. Quality control, inspection, and testing are performed as required by ASME Section III and allowable reactor pressure-temperature operations are specified to provide reasonable assurance of the integrity of the RCS.

The RCPB is designed to accommodate the system pressures and temperatures attained under all expected modes of unit operation, including anticipated transients, and maintain the stresses within applicable limits.

Piping and equipment pressure parts of the RCPB are assembled and erected by welding unless applicable codes permit flanged or screwed joints. Welding procedures that produce welds of complete fusion and free of unacceptable defects are followed. All welding procedures, welders, and welding machine operators are qualified in accordance with the requirements of ASME Section IX for the materials to be welded. Qualification records, including the results of the procedure and performance qualification tests and identification symbols assigned to each welder, are maintained.

The pressure boundary has provisions for in-service inspection in accordance with ASME Section XI to provide reasonable assurance of the continuance of the structural and leak-tight integrity of the boundary, as described in the response to GDC 32, Subsection 3.1.28. For the reactor vessel, a material surveillance program conforming to the requirements of 10 CFR Part 50, Appendix H, is provided.

3.1.11 Criterion 15 – Reactor Coolant System Design

"The reactor coolant system and associated auxiliary, control, and protection systems shall be designed with sufficient margin to assure that the design conditions of the reactor coolant pressure boundary are not exceeded during any condition of normal operation, including anticipated operational occurrences."

Response:

The design criteria and bases for the RCPB are described in the response to GDC 14.

The operating conditions for normal steady-state and transient plant operations are established conservatively. Normal operating limits are selected so that an adequate margin exists between normal operating limits and design limits. The plant control systems are designed to provide reasonable assurance that plant variables are maintained well within established operating limits. The plant transient response characteristics and pressure and temperature distributions during normal operations are considered in the design as well as the accuracy and response of the instruments and controls. These design techniques provide reasonable assurance that a satisfactory margin is maintained between normal operating conditions, including design transients, and design limits for the RCPB.

Plant control systems function to minimize the deviations from normal operating limits in the event of AOOs. When the control system is inadequate or fails to respond upon demand, the plant protection system starts functioning to mitigate the consequences of such events.

The plant protection system functions to mitigate the consequences in the event of accidents. Analyses show that design limits for the RCPB are not exceeded in the event of any ANSI/ANS 51.1 conditions.

3.1.12 Criterion 16 – Containment Design

"Reactor containment and associated systems shall be provided to establish an essentially leak-tight barrier against the uncontrolled release of radioactivity to the environment and to assure that the containment design conditions important to safety are not exceeded for as long as postulated accident conditions require."

Response:

The containment design incorporates a post-tensioned concrete containment with a steel liner to enclose the nuclear steam supply system completely. The containment system is designed to protect the public from the consequences of a LOCA, based on the equivalent energy release of a postulated break of reactor coolant piping up to and including a double-ended break of the largest reactor coolant pipe.

The containment building and the associated engineered safety feature systems are designed to safely withstand all internal and external environmental conditions that may reasonably be expected to occur during the life of the plant, including both short- and long-term effects of a LOCA.

The design criteria and methods of analysis for the containment structure are described in Subsections 3.8.1 and 3.8.2. The leak-tightness of the containment system and short- and long-term performance following a LOCA are described in Section 6.2.

3.1.13 Criterion 17 – Electrical Power Systems

"An onsite electric power system and an offsite electric power system shall be provided to permit functioning of structures, systems, and components important to safety. The safety function for each system (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents.

The onsite electric power supplies, including the batteries, and the onsite electric distribution system, shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure.

Electric power from the transmission network to the onsite electric distribution system shall be supplied by two physically independent circuits (not necessarily on separate rights of way) designed and located so as to minimize to the extent practical the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. A switchyard common to both circuits is acceptable. Each of these circuits shall be designed to be available in sufficient time following a loss of all onsite alternating current power supplies and the other offsite electric power circuit, to assure that specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded. One of these circuits shall be designed to be available within a few seconds following a loss-of-coolant accident to assure that core cooling, containment integrity, and other vital safety functions are maintained.

Provisions shall be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies."

Response:

The APR1400 design is provided with an onsite electric power system and an offsite electric power system to permit functioning of SSCs important to safety in conformance with the requirements of this GDC, as described in Chapter 8.

The onsite electric power system consists of separate, redundant, and independent distribution systems and dedicated power supplies with sufficient capacity, capability, and testability to perform associated safety functions assuming a single failure.

The offsite electric power is supplied to the plant from the transmission network by at least two independent circuits through the site-specific switchyard. Each circuit is immediately available and has sufficient capacity and capability to perform the associated safety function.

Provisions are made to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit.

3.1.14 Criterion 18 – Inspection and Testing of Electrical Power Systems

"Electric power systems important to safety shall be designed to permit appropriate periodic inspection and testing of important areas and features, such as wiring, insulation, connections, and switchboards, to assess the continuity of the systems and the condition of their components. The systems shall be designed with a capability to test periodically (1) the operability and functional performance of the components of the systems, such as onsite power sources, relays, switches, and buses, and (2) the operability of the systems as a whole and, under conditions as close to design as practical, the full operation sequence that brings the systems into operation, including operation of applicable portions of the protection system, and the transfer of power among the nuclear power unit, the offsite power system, and the onsite power system."

Response:

Electrical power systems important to safety are designed to permit appropriate periodic inspection and testing of important areas and features, such as wiring, insulation, connections, and switchboards, to assess the continuity of the systems and to detect deterioration, if any, of their components. Capability is provided to periodically test the operability and functional performance of the system components. The diesel generator sets are started and loaded periodically on a routine basis, and relays, switches, and buses are inspected and tested for operation and availability.

Transfer from normal to emergency sources of power is performed to check system operability and the full operational sequence that brings the systems into operation.

Further information is provided in Subsections 8.3.1 and 8.3.2 and in Chapter 16.

3.1.15 Criterion 19 – Control Room

"A control room shall be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions, including loss of coolant accidents. Adequate radiation protection shall be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 5 rem whole body, or its equivalent to any part of the body, for the duration of the accident. Equipment at appropriate locations outside the control room shall be provided (1) with a design capability for prompt hot shutdown of the reactor, including necessary instrumentation and controls to maintain the unit in a safe condition during hot shutdown, and (2) with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures.

Applicants for and holders of construction permits and operating licenses under this part who apply on or after January 10, 1997, applicants for design approvals or certifications under part 52 of this chapter who apply on or after January 10, 1997, applicants for and holders of combined licenses or manufacturing licenses under part 52 of this chapter who do not reference a standard design approval or certification, or holders of operating licenses using an alternative source term under § 50.67, shall meet the requirements of this criterion, except that with regard to control room access and occupancy, adequate radiation protection shall be provided to ensure that radiation exposures shall not exceed 0.05 Sv (5 rem) total effective dose equivalent (TEDE) as defined in § 50.2 for the duration of the accident."

Response:

All control and monitoring equipment necessary to operate or shut the unit down and maintain safe control of the facility is located in the main control room (MCR).

The design of the MCR permits safe occupancy during abnormal conditions. The use of non-combustible and fire-retardant materials in the construction of the MCR, the limitation of combustible supplies, the location of firefighting equipment, and the continuous presence of a trained operator minimize the possibility that the MCR will become uninhabitable. Radiation exposure levels following design basis accidents are maintained below allowable levels by proper design of shielding and ventilation. The MCR ventilation system is designed to allow access to occupancy of the MCR under accident conditions without personnel receiving radiation exposures in excess of 0.05 Sv (5 rem) TEDE during the accident. Fission product removal is performed by the MCR heating, ventilation and air conditioning (HVAC) system to remove iodine and particle matter, thereby minimizing the dose that could result from the accident. Radiation detectors and alarms are provided. MCR habitability features are described in Section 6.4. Emergency lighting is described in Subsection 9.5.3.

If the MCR is inaccessible, alternate local controls and instruments are available for equipment required to establish and maintain a hot standby condition, as well as cold shutdown. Hot and cold shutdown capability is addressed in Section 7.4 for the systems required for safe shutdown. The MCR is described in Subsection 7.7.1.2. Human factors issues are addressed in Chapter 18.

Radiation protection for the plant's control facilities is addressed in Section 6.4 and Chapter 2.

3.1.16 Criterion 20 – Protection System Functions

"The protection system shall be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and (2) to sense accident conditions and to initiate the operation of systems and components important to safety."

Response:

A plant protection system (PPS), consisting of a reactor protection system (RPS) and an engineered safety features actuation system (ESFAS), is provided. The RPS automatically initiates a reactor trip when any of the monitored process variables reaches a trip setpoint. The ESFAS automatically actuates engineered safety feature (ESF) systems and their support systems when any of the monitored process variables reaches a predetermined setpoint.

The trip setpoints of the RPS are selected to provide reasonable assurance that DBEs that are expected to occur once or more during the life of the nuclear generating station do not cause violation of SAFDLs. The reactor trips also help the ESF systems in mitigating the consequences of DBEs that are expected to occur once during the life of several plants as well as arbitrary combinations of unplanned events and degraded systems that are never expected to occur, to within acceptable limits.

Reactor trip is accomplished by de-energizing the control element drive mechanism (CEDM) coils through the interruption of the CEDM power supply either automatically or manually. The CEDM power supply is a pair of full-capacity motor-generator sets. The path to the CEDMs is interrupted by opening the reactor trip switchgear. With the CEDM coils de-energized, the CEAs are released to drop into the core by gravity, rapidly inserting negative reactivity to shut the reactor down. The CEDMs are addressed in Subsection 3.9.4 and specific reactor trips are addressed in Section 7.2.

The ESF systems are actuated to minimize the effects of incidents that could occur. Controls are provided for manual actuation of the ESF system. The ESF systems are addressed in Chapter 6. The process variables that automatically actuate the ESF system and the logic for the ESFAS are addressed in Section 7.3.

The SAFDLs on linear heat rate and DNBR are intended to enforce the principal thermal-hydraulic design bases given in Subsection 4.4.1 (i.e., the avoidance of thermally induced fuel damage during normal steady-state operations and AOOs).

3.1.17 Criterion 21 – Protection System Reliability and Testability

"The protection system shall be designed for high functional reliability and inservice testability commensurate with the safety functions to be performed. Redundancy and independence designed into the protection system shall be sufficient to assure that (1) no single failure results in loss of the protection function and (2) removal from service of any component or channel does not result in loss of the required minimum redundancy unless the acceptable reliability of operation of the protection system can be otherwise demonstrated. The protection system shall be designed to permit periodic testing of its functioning when the reactor is in operation, including a capability to test channels independently to determine failures and losses of redundancy that may have occurred."

Response:

The protection system is designed to conform with the requirements of IEEE Std. 603-1991 (Reference 6) and other standards, as noted in Subsection 7.1.2. No credible single failure will result in a loss of the protection function. The protection channels are independent with respect to wire routing, sensor mounting, and supply of power.

Each channel of the protection system, including the sensors up to the reactor trip switchgear system (RTSS) and ESFAS actuation devices, is capable of being checked during reactor operation. Process sensors of each channel in the protection systems are checked by comparison of the redundant process sensor values using the discrete indications and alarms in the MCR, as described in Subsection 7.7.1.2.

To minimize an inadvertent actuation of an ESF system or an inadvertent reactor trip, the protection systems use a coincidence of two-out-of-four logic to operate. The channel being testing is bypassed so the protection system converts to a two-out-of-three logic. This allows periodic testing and the operation of various protective functions without a loss of the protection function.

3.1.18 Criterion 22 – Protection System Independence

"The protection system shall be designed to assure that the effects of natural phenomena, and of normal operating, maintenance, testing, and postulated accident conditions on redundant channels do not result in loss of the protection function, or shall be demonstrated to be acceptable on some other defined basis. Design techniques, such as functional diversity or diversity in component design and principles of operation, shall be used to the extent practical to prevent loss of the protection function."

Response:

The protection systems conform with the independence requirements of IEEE Std. 603-1991. Four independent measurement channels, complete with sensors, sensor power supplies, signal conditioning units, and bistable trip functions, are provided for each protective parameter monitored by the protection systems, except for the CEA position sensors that are two-fold redundant. The measurement channels are provided with a high degree of independence by separate connection of the channel sensors to the process systems. Refer to Chapter 7 for a more detailed description of the protection systems.

Power to the protection system channels is provided by independent vital bus power supply systems. The power supply systems are described in Subsection 8.3.2.

Functional diversity is incorporated into the system design to prevent a loss of the protective function. When an RPS trip function is required, it is frequently backed up by other trip functions. The ESFAS actuation signals are used to actuate two or four independent ESF trains.

The diverse protection system augments reactor trip and auxiliary feedwater system (AFWS) actuation by using separate and diverse non-Class 1E trip logic from that used by the plant protection system.

The design goals are accomplished without excessive complexity by using only four channels for each parameter. This allows for testing and maintenance of a channel without reducing the system to a single channel for trip, which would make the system susceptible to spurious trip or actuation signals.

Environmental and seismic qualifications are also performed using type tests, specific equipment tests, appropriate analyses, or prior operating experience. Further information is provided in Sections 3.10 and 3.11.

3.1.19 Criterion 23 – Protection System Failure Modes

"The protection system shall be designed to fail into a safe state or into a state demonstrated to be acceptable on some other defined basis if conditions such as disconnection of the system, loss of energy (e.g., electric power, instrument air), or postulated adverse environments (e.g., extreme heat or cold, fire, pressure, steam, water, radiation) are experienced."

Response:

The plant protection system trip channels are designed to fail into a safe state or into a state established as acceptable in the event of loss of power supply. A failure is assumed to occur in only one channel (i.e., a single failure). This channel can be placed into bypass, which places the RPS/ESFAS local coincidence logic into a two-out-of-three configuration. Refer to Sections 7.2 and 7.3 for information on the failure modes and effects analysis.

A loss of power to CEDM coils would cause the CEAs to insert into the core. Redundancy, channel independence, and separation are incorporated into the protection system design to minimize the possibility of the loss of a protective function. The loss of offsite power would cause the standby diesel electric generators to start and energize the ESF trains with actuation signals present.

3.1.20 Criterion 24 – Separation of Protection and Control Systems

"The protection system shall be separated from control systems to the extent that failure of any single control system component or channel, or failure or removal from service of any single protection system component or channel which is common to the control and protection systems leaves intact a system satisfying all reliability, redundancy, and independence requirements of the protection system. Interconnection of the protection and control systems shall be limited so as to assure that safety is not significantly impaired."

Response:

Protection system components and control system components are electrically and functionally isolated from each other. Further details are provided in Sections 7.2, 7.3, and 7.7.

Isolation devices provide reasonable assurance that when protection signals are used by non-safety systems and non-safety signals are used by safety systems, credible single failures in the non-safety system do not degrade the performance of the safety system. In addition to the electrical and physical isolation, functional isolation between non-safety systems and safety systems is provided. The functional isolation is provided by priority logic in the safety systems or by signal selector logic in the non-safety systems. The priority logic provides reasonable assurance that safety actuation signals, both automatic and manual (system level and component level), override all control signals from the non-safety systems. Signal selection logic in the control system prevents erroneous control actions due to single sensor failures. Eliminating these erroneous control actions prevents challenges to the protection system while it is degraded due to the same sensor failure.

The adequacy of the system isolation capability has been verified by testing under conditions of postulated credible faults. The failure of any single control system component or channel, or the failure or removal from service of any single protection system component or channel, which is common to the control and protection system, leaves intact a system that satisfies the requirements of the protection system.

3.1.21 Criterion 25 – Protection System Requirements for Reactivity Control Malfunctions

"The protection system shall be designed to assure that specified acceptable fuel design limits are not exceeded for any single malfunction of the reactivity control systems, such as accidental withdrawal (not ejection or dropout) of control rods."

Response:

Shutdown of the reactor is accomplished by the opening of the reactor trip switchgear system (RTSS) circuit breakers, which interrupts power to the CEDM coils. Actuation of the circuit breakers is independent of any existing control signals.

The protection systems are designed such that SAFDLs are not exceeded for any single malfunction of the reactivity control systems, including the withdrawal of a single full- or part-strength CEA. Analyses of possible reactivity control system malfunctions are described in Chapter 15.

3.1.22 Criterion 26 – Reactivity Control System Redundancy and Capability

"Two independent reactivity control systems of different design principles shall be provided. One of the systems shall use control rods, preferably including a positive means for inserting the rods, and shall be capable of reliably controlling reactivity changes to assure that under conditions of normal operation, including anticipated operational occurrences, and with appropriate margin for malfunctions such as stuck rods, specified acceptable fuel design limits are not exceeded. The second reactivity control system shall be capable of reliably controlling the rate of reactivity changes resulting from planned, normal power changes (including xenon burnout) to assure acceptable fuel design limits are not exceeded. One of the systems shall be capable of holding the reactor core subcritical under cold conditions."

Response:

Two independent reactivity control systems of different design principles are provided. The first system, using CEAs, includes a passive means (gravity) for inserting CEAs and is capable of reliably controlling reactivity changes to provide reasonable assurance that under conditions of normal operation, including AOOs, SAFDLs are not exceeded. The CEAs can be mechanically driven into the core.

The appropriate margin for stuck rods is provided by assuming in the analyses of AOOs that the highest-worth CEA does not fall into the core.

The second system, using neutron-absorbing soluble boron, is capable of reliably compensating for the rate of reactivity changes resulting from planned normal power changes (including xenon burnup) such that SAFDLs are not exceeded. This system is capable of holding the reactor subcritical under cold conditions.

Either system is able to insert negative reactivity at a rate sufficient to prevent exceeding SAFDLs as the result of a power change (i.e., positive reactivity added by xenon burnup).

3.1.23 Criterion 27 – Combined Reactivity Control Systems Capability

"The reactivity control systems shall be designed to have a combined capability, in conjunction with poison addition by the emergency core cooling system, of reliably controlling reactivity changes to assure that under postulated accident conditions and with appropriate margin for stuck rods the capability to cool the core is maintained."

Response:

Dissolved boron addition capability provided by the safety injection system (SIS) (Chapter 6) in conjunction with the CEAs is such that under postulated accident conditions (Chapter 15), even with the CEA of highest worth stuck out of the core, adequate reactivity control is available to maintain short- and long-term core cooling.

3.1.24 Criterion 28 – Reactivity Limits

"The reactivity control systems shall be designed with appropriate limits on the potential amount and rate of reactivity increase to assure that the effects of postulated reactivity accidents can neither (1) result in damage to the reactor coolant pressure boundary greater than limited local yielding nor (2) sufficiently disturb the core, its support structures or other reactor pressure vessel internals to impair significantly the capability to cool the core. These postulated reactivity accidents shall include consideration of rod ejection (unless prevented by positive means), rod dropout, steam line rupture, changes in reactor coolant temperature and pressure, and cold water addition."

Response:

The bases for CEA design include providing reasonable assurance that the reactivity worth of any one CEA is not greater than a preselected maximum value. The CEAs are divided into two sets, a shutdown set and a regulating set, further subdivided into groups as necessary. Administrative procedures and interlocks provide reasonable assurance that only one group is withdrawn at a time, and that regulating groups are withdrawn only after shutdown groups are fully withdrawn. The regulating groups are programmed to move in sequence and within limits that prevent the rate of reactivity addition and the worth of individual CEAs from exceeding limiting values.

The maximum rate of reactivity addition that can be produced by the chemical and volume control system (CVCS) is too low to induce pressure forces significant enough to rupture the RCPB or disturb the reactor vessel internals.

The RCPB (Chapter 5) and reactor internals (Chapter 4) are designed to appropriate codes (e.g., the response to Criterion 14) and accommodate the static and dynamic loads associated with an inadvertent, sudden release of energy such as that resulting from a CEA ejection or steam line break (Chapter 15) without rupture and with limited deformation so that core cooling capability is not impaired.

3.1.25 Criterion 29 – Protection Against Anticipated Operational Occurrences

"The protection and reactivity control systems shall be designed to assure an extremely high probability of accomplishing their safety functions in the event of anticipated operational occurrences."

Response:

Plant events, designated in ANSI/ANS 51.1, have been carefully considered in the design of the protection and reactivity control systems. Redundancy, independence, and testability have been considered in the design. These considerations, coupled with careful component selection, overall system testing, and adherence to detailed quality assurance requirements, provide reasonable assurance that protection and reactivity control systems will accomplish their safety functions in the event of AOOs.

Refer to Chapter 7 for detailed descriptions of the protection systems and Chapter 17 for description of design quality assurance. DBE analysis is addressed in Chapter 15.

3.1.26 Criterion 30 – Quality of Reactor Coolant Pressure Boundary

"Components which are part of the reactor coolant pressure boundary shall be designed, fabricated, erected, and tested to the highest quality standards practical. Means shall be provided for detecting and, to the extent practical, identifying the location of the source of reactor coolant leakage."

Response:

RCPB components are designed, fabricated, erected, and tested in accordance with ASME Section III. All components are classified safety Class 1 or 2 in accordance with ANSI/ANS 51.1 and undergo all quality assurance measures that are appropriate for the respective classification.

Means are provided for identifying the source of reactor coolant leakage, which includes detection of leakage to systems connected to the RCPB as well as leakage from the boundary into the containment.

Instrumentation is provided to indicate and record makeup flow rates to the primary water system. This instrumentation permits detection of both suddenly occurring and gradually increasing leaks. Leakage detection methods are described in Subsection 5.2.5.1.

3.1.27 Criterion 31 – Fracture Prevention of Reactor Coolant Pressure Boundary

"The reactor coolant pressure boundary shall be designed with sufficient margin to assure that when stressed under operating, maintenance, testing, and postulated accident conditions (1) the boundary behaves in a nonbrittle manner and (2) the probability of rapidly propagating fracture is minimized. The design shall reflect consideration of service temperatures and other conditions of the boundary material under operating, maintenance, testing, and postulated accident conditions and the uncertainties in determining (1) material properties, (2) the effects of irradiation on material properties, (3) residual, steady state and transient stresses, and (4) size of flaws."

Response:

All the RCPB components are designed and constructed in accordance with ASME Section III and conform with test and inspection requirements of these codes. The test and inspection requirements provide reasonable assurance that flaw sizes are limited so that the probability of failure by rapid propagation is extremely remote. Particular emphasis is placed on the quality control applied to the reactor vessel, on which tests and inspections exceeding ASME Code requirements are performed. The tests and inspections performed on the reactor vessel are described in Subsection 5.3.1.3.

Carbon and low-alloy steel materials that form part of the RCPB are tested in accordance with fracture toughness requirements for materials in ASME Section III. Nonductile failure prevention is reasonably assured by adhering to the relevant sections of the ASME Code.

Excessive embrittlement of the reactor vessel material due to neutron irradiation is prevented by providing an annulus of coolant water between the reactor core and the vessel. In addition, to minimize the effects of irradiation on material toughness properties of core beltline materials, restrictions on upper limits for residual elements that directly influence the reference temperature for nil-ductility transition (RT_{NDT}) shift are required by design specification. Specifically, upper limits are placed on copper, nickel, phosphorous, sulfur, and vanadium.

The maximum integrated fast neutron exposure of the reactor vessel wall opposite the midplane of the core is less than 9.5×10^{19} n/cm^2. This value assumes a 60-year design life and a 93 percent plant capacity factor. The maximum expected increase in transition temperature for vessel weld materials is approximately 31.4 °C (56.6 °F) provided that weld metal is conservatively assumed to be exposed to the peak value of neutron fluence, 9.5×10^{19} n/cm^2. Actual locations of welds are outside the active core region. The actual change in material toughness properties due to irradiation is verified periodically during plant lifetime by a material surveillance program. Based on the initial RT_{NDT} of archive pressure vessel beltline material, which is –23.3 °C (–10 °F) or less, operating restrictions are applied as necessary to limit vessel stresses.

The thermal stresses induced by the injection of cold water into the vessel following a LOCA have been examined. Analyses have shown that there is no gross yielding across the vessel wall when using the minimum specified yield strength in ASME Section III.

3.1.28 Criterion 32 – Inspection of Reactor Coolant Pressure Boundary

"Components which are part of the reactor coolant pressure boundary shall be designed to permit (1) periodic inspection and testing of important areas and features to assess their structural and leaktight integrity, and (2) an appropriate material surveillance program for the reactor pressure vessel."

Response:

Provisions have been made in the design for inspection, testing, and surveillance of the RCS boundary as required by ASME Section XI. The system designer recommends a reactor vessel surveillance program to the owner. The reactor vessel surveillance program provided to the owner conforms with 10 CFR Part 50, Appendix H. Sample pieces taken from the same material used in fabrication of the reactor vessel are installed between the core and the vessel inside wall. These samples are removed and tested by the owner at intervals during vessel life to provide an indication of the extent of the neutron embrittlement of the vessel wall. Charpy tests are performed on the samples to develop a Charpy transition curve. By comparing this curve with the Charpy curve and drop weight test results for specimens taken at the beginning of the vessel life, the change of RT_{NDT} is determined and operating procedures adjusted as required. Further details are provided in Chapter 5.

3.1.29 Criterion 33 – Reactor Coolant Makeup

"A system to supply reactor coolant makeup for protection against small breaks in the reactor coolant pressure boundary shall be provided. The system safety function shall be to assure that specified acceptable fuel design limits are not exceeded as a result of reactor coolant loss due to leakage from the reactor coolant pressure boundary and rupture of small piping or other small components which are part of the boundary. The system shall be designed to assure that for onsite electric power system operation (assuming offsite power is not available) and for offsite electric power system operation (assuming onsite power is not available) the system safety function can be accomplished using the piping, pumps, and valves used to maintain coolant inventory during normal reactor operation."

Response:

Reactor coolant makeup during normal operation is provided by the CVCS. The two charging pumps can be powered from either onsite or offsite power sources. The system is described in Subsection 9.3.4. The CVCS has the capability of replacing the flow loss to the containment due to leaks in small reactor coolant lines such as instrument and sample lines. These lines have 5.56 mm (7/32 in.) diameter by 25.4 mm (1 in.) long flow-restricting devices to limit loss of RCS coolant due to postulated pipe breaks in RCS piping.

The CVCS is not required to perform any safety-related function, such as accident mitigation or safe shutdown. This does not, however, compromise the defense-in-depth provided by the system as the normal means of maintaining RCS inventory and primary water chemistry. The CVCS is essential to day-to-day plant operations and has been provided with a high degree of reliability and redundancy, and is designed in accordance with accepted industry standards and quality assurance commensurate with its importance to plant operation. Design criteria, including ASME Code classification assignments, are in accordance with ANSI/ANS 51.1, which requires that portions of the CVCS in the RCPB, all portions that provide reasonable assurance of containment isolation and reactor coolant normal makeup, have a rigorous safety classification in accordance with the functional performance requirements.

3.1.30 Criterion 34 – Residual Heat Removal

"A system to remove residual heat shall be provided. The system safety function shall be to transfer fission product decay heat and other residual heat from the reactor core at a rate such that specified acceptable fuel design limits and the design conditions of the reactor coolant pressure boundary are not exceeded.

Suitable redundancy in components and features, and suitable interconnections, leak detection, and isolation capabilities shall be provided to assure that for onsite electric power system operation (assuming offsite power is not available) and for offsite electric power system operation (assuming onsite power is not available) the system safety function can be accomplished, assuming a single failure."

Response:

Residual heat removal capability is provided by the shutdown cooling system (SCS) for reactor coolant temperature and pressure less than 176.7 °C (350 °F) and 31.6 kg/cm^{2}A (450 psia). For temperatures greater than 176.7 °C (350 °F), this function is provided by the SGs. The AFWS provides a dedicated, independent, safety-related means of supplying feedwater (FW) to the SGs for removal of heat and prevention of reactor core uncovery. The design incorporates sufficient redundancy, interconnections, leak detection, and isolation capability to provide reasonable assurance that the residual heat removal function can be accomplished, assuming a single active failure. Within appropriate design limits, either system can remove fission product decay heat at a rate that SAFDLs and the design conditions of the RCPB are not exceeded.

The SCS and SG auxiliaries are designed to operate from offsite or from onsite power sources.

Further description of the SCS is provided in Subsection 5.4.7, and further description of the steam and power conversion system is provided in Chapter 10.

3.1.31 Criterion 35 – Emergency Core Cooling

"A system to provide abundant emergency core cooling shall be provided. The system safety function shall be to transfer heat from the reactor core following any loss of reactor coolant at a rate such that (1) fuel and clad damage that could interfere with continued effective core cooling is prevented and (2) clad metal-water reaction is limited to negligible amounts.

Suitable redundancy in components and features, and suitable interconnections, leak detection, isolation, and containment capabilities shall be provided to assure that for onsite electric power system operation (assuming offsite power is not available) and for offsite electric power system operation (assuming onsite power is not available) the system safety function can be accomplished, assuming a single failure."

Response:

Emergency core cooling is provided by the SIS as described in Section 6.3. The system is designed to provide cooling water to limit peak clad temperature to less than 1,204 °C (2,200 °F), to remove heat at a rate sufficient to maintain the fuel in a coolable geometry and to provide reasonable assurance that zirconium-water reaction is limited to a negligible amount (less than 1 percent) following a LOCA, including breaks in the pipe in the reactor coolant pressure boundary up to and including a break size equivalent to the double-ended rupture of the largest pipe in the RCS. Performance of the emergency core cooling system (ECCS) has been analyzed using the evaluation models complying with the requirements of 10 CFR 50.46(a)(1), and performance has been verified adequate to meet the criteria prescribed in 10 CFR 50.46(b).

The system design includes provisions to provide reasonable assurance that the required safety functions are accomplished with either onsite or offsite electrical power, assuming a single failure of any component which is qualified as described below.

The single failure considered may be limited to an active failure(1) during the short-term cooling phase of safety injection or an active or limited-leakage passive failure(2) during the long-term cooling phase of safety injection.

Although the SIS is designed to accommodate a limited leakage passive failure during the long-term cooling phase, it does not accommodate arbitrary large-leakage passive failures, such as the complete double-ended severance of piping, which are extremely low probability events.

3.1.32 Criterion 36 – Inspection of Emergency Core Cooling System

"The emergency core cooling system shall be designed to permit appropriate periodic inspection of important components, such as spray rings in the reactor pressure vessel, water injection nozzles, and piping, to assure the integrity and capability of the system."

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(1) An active failure is a malfunction, excluding passive failure, of a component that relies on mechanical movement to complete its intended function upon demand. Examples of active failures include the failure of a valve to move to its correct position, or the failure of a pump, fan, or diesel generator to start. Spurious action of a powered component originating within the actuation system or its supporting systems shall be regarded as an active failure, unless specific design features or operating restrictions preclude such spurious action.

(2) A passive failure is a failure of a component to maintain its structural integrity or the blockage of a process flow path. Blockage of a process flow path could occur, for example, due to separation of a valve disc from its stem. Refer to Subsection 6.3.2.5.4 for a description of a limited-leakage passive failure of the SIS.

Response:

The SIS is designed to facilitate access to all critical components. All pumps, heat exchangers, valves, and piping external to the containment structure are readily accessible for periodic inspection to provide reasonable assurance of system leak-tight integrity. Valves, piping, and tanks inside the containment may be inspected for leak-tightness during plant shutdowns for refueling and maintenance.

Reactor vessel internal structures, reactor coolant piping, and water injection nozzles are designed to permit visual inspection for wear due to erosion, corrosion, or vibration and nondestructive inspection techniques where applicable and desirable.

Descriptions of the inspection program are provided in Chapters 5, 6, and 16.

3.1.33 Criterion 37 – Testing of Emergency Core Cooling System

"The emergency core cooling system shall be designed to permit appropriate periodic pressure and functional testing to assure (1) the structural and leaktight integrity of its components, (2) the operability and performance of the active components of the system, and (3) the operability of the system as a whole and, under conditions as close to design as practical, the performance of the full operational sequence that brings the system into operation, including operation of applicable portions of the protection system, the transfer between normal and emergency power sources, and the operation of the associated cooling water system."

Response:

The SIS is provided with testing capability to demonstrate system and component operability. Testing can be conducted during normal plant operation with the test facilities arranged not to interfere with the performance of the systems or with the initiation of control circuits, as described in Section 6.3 and Chapter 14. During in-service testing, testing is performed to confirm that the SI pump return line to the in-containment refueling water storage tank (IRWST) allows each SI pump to be operated at rated flow.

3.1.34 Criterion 38 – Containment Heat Removal

"A system to remove heat from the reactor containment shall be provided. The system safety function shall be to reduce rapidly, consistent with the functioning of other associated systems, the containment pressure and temperature following any loss-of-coolant accident and maintain them at acceptably low levels.

Suitable redundancy in components and features, and suitable interconnections, leak detection, isolation, and containment capabilities shall be provided to assure that for onsite electric power system operation (assuming offsite power is not available) and for offsite electric power system operation (assuming onsite power is not available) the system safety function can be accomplished, assuming a single failure."

Response:

The containment spray system (CSS) consists of two independent divisions. Each division consists of a containment spray pump, a containment spray heat exchanger, a containment spray pump miniflow heat exchanger, a containment spray header, and associated piping and valves. The heat removal capacity of each division is sufficient to keep the containment pressure and temperature below design conditions for any break size in the RCS piping up to and including a double-ended break of the largest reactor coolant pipe, with an unobstructed discharge from both ends.

The CSS takes suction borated water from the IRWST, which is located in the containment. Borated water is sprayed downward by the CSS from the upper regions of the containment to cool the containment atmosphere. The removed heat is transferred by the component cooling water via the CSS heat exchangers to the ultimate heat sink (UHS).

Suitable redundancy in components and features is designed into the CSS to maintain the pressure and temperature conditions below containment design conditions even in the event of a single failure including the loss of onsite or offsite electrical power.

The CSS is supplied from separate Class 1E buses and receives electrical power from electrically independent and redundant emergency power supply systems as well as offsite power supplies.

The CSS is described further in Subsections 6.2.2 and 6.5.2. Electrical power supplies are described further in Subsections 8.2 and 8.3.

3.1.35 Criterion 39 – Inspection of Containment Heat Removal System

"The containment heat removal system shall be designed to permit appropriate periodic inspection of important components, such as the torus, sumps, spray nozzles, and piping to assure the integrity and capability of the system."

Response:

Inspections of the CSS are conducted to confirm the integrity and capability and provide reasonable assurance of the system. All essential equipment of the CSS is located outside the containment, except for spray headers, nozzles, containment sump, IRWST, and associated piping. These components include two containment spray pumps, two containment spray pump miniflow heat exchangers, two containment spray heat exchangers, and independent containment spray headers.

The detailed arrangement and layout of system piping, pumps, heat exchangers, and valves provide the separation, availability, and accessibility required for periodic inspection. Nozzle inspection capability is provided as well.

The CSS is described further in Subsections 6.2.2 and 6.5.2.

3.1.36 Criterion 40 – Testing of Containment Heat Removal System

"The containment heat removal system shall be designed to permit appropriate periodic pressure and functional testing to assure (1) the structural and leaktight integrity of its components, (2) the operability and performance of the active components of the system, and (3) the operability of the system as a whole, and under conditions as close to the design as practical the performance of the full operational sequence that brings the system into operation, including operation of applicable portions of the protection system, the transfer between normal and emergency power sources, and the operation of the associated cooling water system."

Response:

The containment heat removal system is arranged so that components can be tested periodically for operability. The operational tests are performed to verify the proper operation of CSS and include the calibration of instrumentation, verification of adequate pump performance, verification of the operability of all associated valves, and verification that the spray headers and spray nozzles are free of obstructions. Testing can be conducted during normal plant operation with the system configured to not interfere with the performance of the initiation of control circuits, as described in Subsection 6.2.2.

All components of the CSS are hydrostatically tested in the manufacturer's shop. A hydrostatic test is performed in the field to verify the leaktightness of the system.

The performance testing of containment spray pumps is conducted at some time other than refueling. The pumps are aligned to take suction from and return flow to the IRWST. Flow and head are recorded by the installed instrumentation.

Actuator-operated valves can be tested from the control room and operation verified by observing control room indication.

The valves on the inlets and outlets of the containment spray pumps can be tested to provide reasonable assurance that the valves operate properly.

3.1.37 Criterion 41 – Containment Atmosphere Cleanup

"Systems to control fission products, hydrogen, oxygen, and other substances which may be released into the reactor containment shall be provided as necessary to reduce, consistent with the functioning of other associated systems, the concentration and quality of fission products released to the environment following postulated accidents, and to control the concentration of hydrogen or oxygen and other substances in the containment atmosphere following postulated accidents to assure that containment integrity is maintained.

Each system shall have suitable redundancy in components and features, and suitable interconnections, leak detection, isolation, and containment capabilities to assure that for onsite electric power system operation (assuming offsite power is not available) and for offsite electric power system operation (assuming onsite power is not available) its safety function can be accomplished, assuming a single failure."

Response:

The CSS and containment hydrogen control system are provided to control fission products, hydrogen, oxygen, and other substances that may be released into the containment. The CSS is an automatically actuated ESF system that provides heat removal and fission product removal following a LOCA. The fission products are removed to reduce activity at the site boundary by the CSS and the post-accident pH of the sprayed fluid is controlled by using trisodium phosphate (TSP). The CSS consists of two independent divisions that are supplied power from separate Class 1E buses and has sufficient redundancy to perform its safety functions. The CSS is designed so that a single failure coincident with a loss of offsite power does not prevent performance of the safety function.

Passive autocatalytic recombiners (PARs), which have 200 percent of required capacity, are located in containment and preclude hydrogen concentration buildup to detonable levels.

The systems are described in detail in Subsections 6.2.5 and 6.5.2.

3.1.38 Criterion 42 – Inspection of Containment Atmosphere Cleanup Systems

"The containment atmosphere cleanup systems shall be designed to permit appropriate periodic inspection of important components, such as filter frames, ducts, and piping to assure the integrity and capability of the systems."

Response:

The containment atmosphere cleanup systems are designed and located so that they can be inspected periodically as required. Inspection of the CSS function relative to iodine removal is treated as described in GDC 39.

All major active components of the containment atmosphere cleanup systems are located outside containment and are readily accessible for periodic inspection.

The inspection and surveillance program for the containment hydrogen control system is described further in Subsection 6.2.5.

3.1.39 Criterion 43 – Testing of Containment Atmosphere Cleanup Systems

"The containment atmosphere cleanup systems shall be designed to permit appropriate periodic pressure and functional testing to assure (1) the structural and leaktight integrity of its components, (2) the operability and performance of the active components of the systems such as fans, filters, dampers, pumps, and valves and (3) the operability of the systems as a whole and, under conditions as close to design as practical, the performance of the full operational sequence that brings the systems into operation, including operation of applicable portions of the protection system, the transfer between normal and emergency power sources, and the operation of associated systems."

Response:

Testing of the CSS is conducted to provide reasonable assurance of structural and leaktight integrity and operability and performance in accordance with GDC 40. In addition, performance testing is conducted on CSS components. These tests are normally conducted while the plant is operating. System design includes provisions to prevent accidental containment spray during component testing. The test for the CSS is described further in Subsections 6.2.2 and 6.5.2

The containment hydrogen control system is designed to permit periodic testing for confirming the continued operability. Testing may be conducted during normal plant operation or shutdown. The test for the containment hydrogen control system is described in Subsection 6.2.5 for details.

3.1.40 Criterion 44 – Cooling Water

"A system to transfer heat from structures, systems, and components important to safety, to an ultimate heat sink shall be provided. The system safety function shall be to transfer the combined heat load of these structures, systems, and components under normal operating and accident conditions.

Suitable redundancy in components and features, and suitable interconnections, leak detection, and isolation capabilities shall be provided to assure that for onsite electric power system operation (assuming offsite power is not available) and for offsite electric power system operation (assuming onsite power is not available) the system safety function can be accomplished, assuming a single failure."

Response:

The cooling water systems, which function to remove the combined heat load from safety-related systems and components under normal operating and accident conditions, are the component cooling water system (CCWS) and the essential service water system (ESWS). The CCWS is a closed-loop system that removes heat from nuclear safety-related and potentially radioactive systems. The ESWS removes heat from the CCWS and transfers it to the environment through the UHS.

Suitable redundancy, systems interconnection, leak detection, and isolation capabilities are incorporated into the design of these systems to provide reasonable assurance of the required safety function, assuming a single failure with available onsite or offsite power.

The CCWS and the ESWS are described in Subsections 9.2.2 and 9.2.1, respectively.

3.1.41 Criterion 45 – Inspection of Cooling Water System

"The cooling water system shall be designed to permit appropriate periodic inspection of important components, such as heat exchangers and piping, to assure the integrity and capability of the system."

Response:

Components of these systems are located in accessible areas with the exception of any underground piping for the ESWS. These components have suitable manholes, handholes, inspection ports, or other appropriate design and layout features to allow periodic inspection. The integrity of any underground piping is demonstrated during normal power operation as well as by pressure and functional tests. The inspection and testing requirements for the CCWS and the ESWS are described in Subsections 9.2.2 and 9.2.1, respectively.

3.1.42 Criterion 46 – Testing of Cooling Water System

"The cooling water system shall be designed to permit appropriate periodic pressure and functional testing to assure (1) the structural and leaktight integrity of its components, (2) the operability and the performance of the active components of the system, and (3) the operability of the system as a whole and, under conditions as close to design as practical, the performance of the full operational sequence that brings the system into operation for reactor shutdown and for loss-of-coolant accidents, including operation of applicable portions of the protection system and the transfer between normal and emergency power sources."

Response:

The design provides for periodic testing of the cooling water systems for operability and functional performance.

The manufacturer is required to conduct performance tests of the components. An initial system flow test demonstrates proper functioning of the system. Thereafter, periodic tests provide reasonable assurance that components are functioning properly.

Cooling water system valves can be connected to the preferred power source at any time during reactor operation to demonstrate operability. The system is operated normally, thereby demonstrating operability. Remotely operated valves are exercised and actuation circuits are tested. Automatic actuation circuitry, valves, and pump breakers can also be checked when integrated system tests are performed during a planned cooldown of the RCS. Provisions have been made to permit periodic leakage tests to verify the continued leak-tight integrity of the systems. The inspection and testing requirements for the CCWS and the ESWS are provided in Subsections 9.2.2 and 9.2.1, respectively.

3.1.43 Criterion 50 – Containment Design Basis

"The reactor containment structure, including access openings, penetrations, and the containment heat removal system shall be designed so that the containment structure and its internal compartments can accommodate, without exceeding the design leakage rate and with sufficient margin, the calculated pressure and temperature conditions resulting from any loss-of-coolant accident. This margin shall reflect consideration of (1) the effects of potential energy sources which have not been included in the determination of the peak conditions, such as energy in steam generators and as required by § 50.44 energy from metal-water and other chemical reactions that may result from degradation but not total failure of emergency core cooling functioning, (2) the limited experience and experimental data available for defining accident phenomena and containment responses, and (3) the conservatism of the calculational model and input parameters."

Response:

The containment structure, including access openings and penetrations, is designed to accommodate, without exceeding the design leak rate, the transient peak pressure and temperature associated with a LOCA up to and including a double-ended rupture of the largest reactor coolant pipe.

The containment structure and ESF systems have been evaluated for various combinations of energy release. The analysis accounts for system thermal and chemical energy, and for nuclear decay heat. The SIS is designed such that no single active failure could result in significant metal-water reaction, as described in Subsection 6.2.1.

The containment heat removal system is described in Subsection 6.2.2. Further information is provided in Subsections 3.8.1 and 3.8.2.

3.1.44 Criterion 51 – Fracture Prevention of Containment Pressure Boundary

"The reactor containment boundary shall be designed with sufficient margin to assure that under operating, maintenance, testing, and postulated accident conditions (1) its ferritic materials behave in a nonbrittle manner and (2) the probability of rapidly propagating fracture is minimized. The design shall reflect consideration of service temperatures and other conditions of the containment boundary material during operation, maintenance, testing, and postulated accident conditions, and the uncertainties in determining (1) material properties, (2) residual, steady state, and transient stresses, and (3) size of flaws."

Response:

The containment's ferrite materials are selected to provide reasonable assurance that their temperature under normal operating and testing conditions is at least 16.7 °C (30 °F) above the nil-ductility transition temperature (NDTT). Detailed stress analyses of the containment liner anchors are conducted under normal and postulated accident conditions.

Further details regarding ferrite materials used in the containment and associated design requirements are described in Subsections 3.8.1, 3.8.2, and 6.1.1.

3.1.45 Criterion 52 – Capability for Containment Leakage Rate Testing

"The reactor containment and other equipment which may be subjected to containment test conditions shall be designed so that periodic integrated leakage rate testing can be conducted at containment design pressure."

Response:

Criterion 52 is complied with the plant design. The provision for testing in conformance with this criterion and the provisions for conformance with 10 CFR Part 50, Appendix J, are described in Subsection 6.2.6.1. Containment design relative to test pressure is described in Subsection 3.8.1.3.

3.1.46 Criterion 53 – Provisions for Containment Testing and Inspection

"The reactor containment shall be designed to permit (1) appropriate periodic inspection of all important areas, such as penetrations, (2) an appropriate surveillance program, and (3) periodic testing at containment design pressure of the leaktightness of penetrations which have resilient seals and expansion bellows."

Response:

The containment design permits access to penetrations and other important areas for implementation of the surveillance program described in Chapter 16. Penetrations with resilient seals and bellows are visually inspected and pressure tested periodically for leak-tightness according to the Technical Specifications. Leakage rate testing is described in Subsection 6.2.6.

3.1.47 Criterion 54 – Piping Systems Penetrating Containment

"Piping systems penetrating primary reactor containment shall be provided with leak detection, isolation, and containment capabilities having redundancy, reliability, and performance capabilities which reflect the importance to safety of isolating these piping systems. Such piping systems shall be designed with a capability to test periodically the operability of the isolation valves and associated apparatus and to determine if valve leakage is within acceptable limits."

Response:

Piping systems that penetrate containment are designed to provide the required isolation and testing capabilities. These piping systems are provided with test connections to allow periodic leak detection tests to provide reasonable assurance that the leakage is within the acceptable limits of 10 CFR Part 50, Appendix J, and Chapter 16.

The ESFAS circuitry provides the means for testing isolation valve operability.

The fuel transfer tube is not classified as a fluid system penetration. The blind flange and the portion of the transfer tube inside the containment are an extension of the containment boundary. The blind flange isolates the transfer tube at all times, except when the reactor is shut down for refueling. This assembly is a penetration in the same sense as the equipment hatches and personnel locks.

Subsection 6.2.4 addresses penetration design. Additional information is given in the responses to GDC 55, 56, and 57 (Subsections 3.1.48 through 3.1.50).

3.1.48 Criterion 55 – Reactor Coolant Pressure Boundary Penetrating Containment

"Each line that is part of the reactor coolant pressure boundary and that penetrates primary reactor containment shall be provided with containment isolation valves as follows, unless it can be demonstrated that the containment isolation provisions for a specific class of lines, such as instrument lines, are acceptable on some other defined basis:

a. One locked closed isolation valve inside and one locked closed isolation valve outside containment.

b. One automatic isolation valve inside and one locked closed isolation valve outside containment.

c. One locked closed isolation valve inside and one automatic isolation valve outside containment. A simple check valve may not be used as the automatic isolation valve outside containment.

d. One automatic isolation valve inside and one automatic isolation valve outside containment. A simple check valve may not be used as the automatic isolation valve outside containment.

Isolation valves outside containment shall be located as close to containment as practical and upon loss of actuating power, automatic isolation valves shall be designed to take the position that provides greater safety.

Other appropriate requirements to minimize the probability or consequences of an accidental rupture of these lines or of lines connected to them shall be provided as necessary to assure adequate safety. Determination of the appropriateness of these requirements, such as higher quality in design, fabrication, and testing, additional provisions for inservice inspection, protection against more severe natural phenomena, and additional isolation valves and containment, shall include consideration of the population density, use characteristics, and physical characteristics of the site environs."

Response:

All RCPB lines penetrating containment meet the isolation criteria of GDC 55 using the following basis for specific lines in addition to those noted above:

a. Safety injection lines, as shown in Figure 6.3.2-1, are used to mitigate the consequences of accidents and therefore do not receive an automatic closure signal and are not locked closed.

b. When in shutdown cooling mode, the shutdown cooling system is an extension of the RCPB and is isolated from the environment by two isolation valves in series.

c. The charging and seal injection lines shown in Figure 9.3.4-1 have automatic valves outside containment that do not receive a closure signal (CIAS) because it is desirable to maintain charging and seal injection flow as long as the charging pumps are in operation.

d. Special cases are described in Subsection 6.2.4.

3.1.49 Criterion 56 – Primary Containment Isolation

"Each line that connects directly to the containment atmosphere and penetrates primary reactor containment shall be provided with containment isolation valves as follows, unless it can be demonstrated that the containment isolation provisions for a specific class of lines, such as instrument lines, are acceptable on some other defined basis:

a. One locked closed isolation valve inside and one locked closed isolation valve outside containment.

b. One automatic isolation valve inside and one locked closed isolation valve outside containment.

c. One locked-closed isolation valve inside and one automatic isolation valve outside containment. A simple check valve may not be used as the automatic isolation valve outside containment.

d. One automatic isolation valve inside and one automatic isolation valve outside containment. A simple check valve may not be used as the automatic isolation valve outside containment.

Isolation valves outside containment shall be located as close to the containment as practical and upon loss of actuating power, automatic isolation valves shall be designed to take the position that provides greater safety."

Response:

Fluid systems conform with the requirements of GDC 56 with the following exceptions:

a. Lines that connect directly to the containment atmosphere and are used for mitigating the effects of accidents are connected to a closed piping system outside containment, which is isolated from the environment in accordance with the requirements of GDC 55.

b. In addition, the capability for remote double isolation at the containment boundary is provided in accordance with GDC 56.

c. Special cases are described in Subsection 6.2.4.

3.1.50 Criterion 57 – Closed System Isolation Valves

"Each line that penetrates primary reactor containment and is neither part of the reactor coolant pressure boundary nor connected directly to the containment atmosphere shall have at least one containment isolation valve which shall be either automatic, or locked closed, or capable of remote manual operation. This valve shall be outside containment and located as close to the containment as practical. A simple check valve may not be used as the automatic isolation valve."

Response:

The system conforms with the requirements of GDC 57 as described in Subsection 6.2.4.

3.1.51 Criterion 60 – Control of Releases of Radioactive Material to the Environment

"The nuclear power unit design shall include means to control suitably the release of radioactive materials in gaseous and liquid effluents and to handle radioactive solid wastes produced during normal reactor operation, including anticipated operational occurrences. Sufficient holdup capacity shall be provided for retention of gaseous and liquid effluents containing radioactive materials, particularly where unfavorable site environmental conditions can be expected to impose unusual operational limitations upon the release of such effluents to the environment."

Response:

The sources and expected quantities of radioactive materials produced during normal reactor operation, including AOOs, are presented in Chapter 11. The radioactive waste systems to suitably control the release of these materials in gaseous and liquid effluents and handle radioactive solid wastes are described in Sections 11.2 through 11.4.

3.1.52 Criterion 61 – Fuel Storage and Handling and Radioactivity Control

"The fuel storage and handling, radioactive waste, and other systems which may contain radioactivity shall be designed to assure adequate safety under normal and postulated accident conditions. These systems shall be designed (1) with a capability to permit appropriate periodic inspection and testing of components important to safety, (2) with suitable shielding for radiation protection, (3) with appropriate containment, confinement, and filtering systems, (4) with a residual heat removal capability having reliability and testability that reflects the importance to safety of decay heat and other residual heat removal, and (5) to prevent significant reduction in fuel storage coolant inventory under accident conditions."

Response:

The spent fuel cooling and cleanup system, fuel handling system, building ventilation systems for radiation control areas, and radioactive waste management systems are designed to provide reasonable assurance of adequate safety under normal and postulated accident conditions.

Structures, systems, and components are designed and located so that appropriate periodic inspection and testing can be performed.

Information on shielding is provided in Section 12.3. Radiation monitoring is described in Section 11.5 and Subsection 12.3.4.

The individual components that contain radioactivity are located in confined areas and ventilated through appropriate filtering systems. Information on radioactive waste management systems is provided in Chapter 11.

The spent fuel pool cooling and cleanup system provides cooling to remove residual heat from the fuel stored in the spent fuel pool. The system is designed with redundant and testable features to provide reasonable assurance of continuous heat removal. The spent fuel pool cooling and cleanup system is described in Subsection 9.1.3.

The spent fuel pool is designed in accordance with seismic Category I requirements so that no postulated accident can cause excessive loss of coolant inventory.

3.1.53 Criterion 62 – Prevention of Criticality in Fuel Storage and Handling

"Criticality in the fuel storage and handling system shall be prevented by physical systems or processes, preferably by use of geometrically safe configurations."

Response:

The restraints and interlocks provided for safe handling and storage of new and spent fuel are described in Section 9.1.

The fuel handling area is laid out to preclude the spent fuel shipping cask from traversing the spent fuel storage pool.

The design of fuel storage racks provides reasonable assurance of an effective multiplication factor (K_{eff}). For new fuel storage racks, K_{eff} is less than 0.95 with full density unborated water and less than 0.98 with optimum moderating condition. For spent fuel storage racks, K_{eff} is less than 0.95 with partial credit for soluble boron and less than 1.0 with full density unborated water.

Criticality in the fuel storage area is prevented by the physical separation of fuel assemblies, the fixed neutron absorber attached on the spent fuel rack wall, and the presence of borated water in the fuel storage pool.

3.1.54 Criterion 63 – Monitoring Fuel and Waste Storage

"Appropriate systems shall be provided in fuel storage and radioactive waste systems and associated handling areas (1) to detect conditions that may result in loss of residual heat removal capability and excessive radiation levels and (2) to initiate appropriate safety actions."

Response:

Instrumentation is provided to monitor the spent fuel pool (SFP) water level and water temperature continuously, and their indications and annunciations are provided in the main control room (MCR). Two redundant safety-related fuel handling area radiation monitors are provided to monitor SFP area radioactivity continuously, and their indications and annunciations are provided in the MCR. In case of an inadvertent release of radioactivity, the area radiation monitor generates local and MCR alarms and an ESFAS fuel handling area emergency ventilation actuation signal as required for the appropriate safety actions. Information on the ESFAS is provided in Section 7.3 and information on the fuel storage area radiation monitoring system is provided in Subsection 9.4.2.

3.1.55 Criterion 64 – Monitoring Radioactivity Releases

"Means shall be provided for monitoring the reactor containment atmosphere, spaces containing components for recirculation of loss-of-coolant accident fluids, effluent discharge paths, and the plant environs for radioactivity that may be released from normal operations, including anticipated operational occurrences, and from postulated accidents."

Response

The reactor containment atmosphere is continuously sampled and monitored for any radioactivity that is released from normal operations (including AOOs) by a continuous air monitoring system located outside the containment. A separate system is provided to enable collection and analysis of grab samples of the containment atmosphere during normal operations and accident conditions. Area monitors such as high-range ion chambers are located inside the containment to measure radiation levels from normal and accident conditions.

Gamma and beta scintillators are located outside the containment for containment air monitoring.

Spaces containing components for recirculation of LOCA fluids and areas contiguous to the containment structure are monitored for airborne radioactivity by systems that sample and monitor the air exhausted from the associated areas. The systems consist of continuous air monitors, duct radiation monitors, and air samplers to enable the collection of samples of exhaust air for laboratory analysis during normal and accident conditions.

Effluent discharge paths and plant environs from the facility are continuously monitored for radioactivity during normal operations with continuous air and liquid monitoring systems. Sampling provisions are included to allow sample collection for analysis during normal operations and accident conditions. Extended-range noble gas monitors are provided to allow for continuous monitoring during accident conditions. The systems provided for monitoring radioactive releases from the facility are described in Sections 11.5 and 12.3.

3.1.56 Combined License Information

No COL information is required with regard to Section 3.1.

3.1.57 References

1. ANSI/ANS 51.1-1983, "American National Standard Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plant," American Nuclear Society, 1983.

2. 10 CFR 50.55a, "Codes and Standards," U.S. Nuclear Regulatory Commission.

3. 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants," U.S. Nuclear Regulatory Commission.

4. NUREG-0800, Standard Review Plan, Section 3.6.3, "Leak-Before-Break Evaluation Procedures," Rev. 1, U.S. Nuclear Regulatory Commission, March 2007.

5. NUREG-1061, "Evaluation of Potential for Pipe Breaks," Volume 3, U.S. Nuclear Regulatory Commission, November 1984.

6. IEEE Std. 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 1991.

3.2 Classification of Structures, Systems, and Components

The APR1400 structures, systems, and components (SSCs) are classified according to nuclear safety classification, quality groups, seismic category, 10 CFR Part 50, Appendix B, quality assurance program, and codes and standards.

Safety-related SSCs are defined in 10 CFR 50.2 as SSCs that are relied on to remain functional during and following design basis events to ensure the following:

a. The integrity of the reactor coolant pressure boundary

b. The capability to shut down the reactor and maintain it in a safe shutdown condition; or

c. The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the applicable guideline exposures in 10 CFR 50.34(a)(1) or 10 CFR 100.11

The APR1400 SSCs that perform the above safety functions are classified as safety-related. The safety-related SSCs meet the quality assurance requirements of Appendix B of 10 CFR Part 50. SSCs that do not perform the above safety functions are classified as non-safety-related, and the requirements of 10 CFR Part 50, Appendix B, are not applied to these SSCs.

However, APR1400 SSCs that are important to safety but are not safety-related are additionally classified so that they are designed to the appropriate quality standards. The augmented quality assurance requirements for these SSCs, which are described in Chapter 17, are commensurate with the importance of their safety functions. The areas where these augmented quality controls are applied to SSCs important to safety are anticipated transient without scram (ATWS), station blackout, fire protection, seismic Category II SSCs, and risk-significant non-safety-related SSCs determined by the design reliability assurance program, which is described in Section 17.4.

This section provides the methodology that is used to classify APR1400 SSCs. Seismic classifications are described in Subsection 3.2.1, and quality group classifications are described in Subsection 3.2.2. The safety classifications are described in Subsection 3.2.3.

3.2.1 Seismic Classification

General Design Criterion (GDC) 2 (Reference 1) requires, in part, that nuclear power plant SSCs important to safety be designed to withstand the effects of earthquakes without loss of capability to perform their safety function. Plant features, including foundations and supports, that are designed to remain functional in the event of a safe shutdown earthquake (SSE) or surface deformation are designed as seismic Category I. These plant features are the features that are necessary to provide reasonable assurance of (1) the integrity of the reactor coolant pressure boundary (RCPB), (2) the capability to shut down the reactor and maintain it in a safe shutdown condition, or (3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guideline exposures of 10 CFR 50.34(a)(1) and 10 CFR 52.79 or 10 CFR 100.11 (Reference 2).

The earthquake for which these plant features are designed is defined as the SSE in 10 CFR Part 100, Appendix A (Reference 3), and 10 CFR Part 50, Appendix S (Reference 4). The SSE is based on an evaluation of the maximum earthquake potential and produces the maximum vibratory ground motion for which SSCs important to safety are designed to remain functional.

The seismic classification used in APR1400 complies with the seismic criteria stated in NRC RG 1.29 to meet the requirements of both GDC 2 and 10 CFR Part 50, Appendix S.

Radioactive waste management SSCs comply with the seismic design criteria specified in NRC RG 1.143 (Reference 6). Radioactive waste management SSCs are designed to meet the design basis loads including natural phenomena and internal/external man-induced hazard design criteria in accordance with NRC RG 1.143. Designing and constructing radioactive waste management SSCs to meet the requirements of GDC 61 and the guidance on seismic design and classification in NRC RG 1.143 provide reasonable assurance that SSCs that contain radioactivity are properly classified and that radiation exposure as a result of a seismic event will be as low as is reasonably achievable (ALARA). The radwaste safety classification is described in Table 3.2-1.

Instrument sensing lines and their supports are designed in accordance with the seismic design criteria of NRC RG 1.151 (Reference 7). Compliance with Positions C.2 and C.3 of NRC RG 1.151 provides reasonable assurance that the instrument sensing lines used to actuate or monitor safety-related systems are appropriately classified and will be capable of withstanding the effects of the SSE.

Fire protection systems are designed in accordance with the seismic design criteria of NRC RG 1.189 (Reference 8). Compliance with Positions 3.2.1, 6.1.1.2, and 7.1 of NRC RG 1.189 provides reasonable assurance that the SSCs important to safety that are required to function during an SSE are properly classified as seismic Category I, will function during such events, and will provide reasonable assurance that the safety functions can be performed.

Seismic categories are designated as seismic Category I, II, or III.

The seismic categories of SSCs are listed in Table 3.2-1. The COL applicant is to identify the seismic classification of site-specific SSCs that are to be designed to withstand the effects of the SSE (COL 3.2(1)).

The seismic category portions of SSCs are indicated by the class breaks shown on the flow diagrams for the appropriate systems described in this DCD. Seismic Category I requirements extend to the first seismic anchor beyond the interface of the classification change. Supports for piping and components have the same seismic classifications as the piping and components that are supported.

Seismic Category I, II, and III SSCs are defined as follows:

a. Seismic Category I

SSCs that are important to safety and designed to remain functional in the event of an SSE are designated as seismic Category I.

The selection of seismic Category I SSCs is in accordance with the definition above and the guidance provided by NRC RG 1.29 (Reference 5). Seismic Category I components have a designated safety class in accordance with ANSI/ANS 51.1 (Reference 9; see Subsection 3.2.3). All components in Safety Classes 1, 2, and 3 are seismic Category I. The portions of SSCs that form an interface between seismic Category I and seismic Category II/III features are designed to seismic Category I requirements in accordance with Regulatory Position C.3 of NRC RG 1.29 (Reference 5). Seismic Category I design requirements extend to the first seismic anchor (restraint) beyond the defined boundaries.

Portions of some non-safety-related systems (e.g., fire protection system) are classified as seismic Category I to conform with NRC RG 1.189.

Seismic Category I SSCs are designed to remain functional and within the applicable stress and deformation limits (elastic range of material properties) when subjected to the effects of the vibratory motion of the operating basis earthquake (OBE) in combination with normal operation loads. This design is based on the design for SSE loads where an OBE is defined as one third of the SSE, as described in Subsection 3.7.1. Seismic Category I structures are protected from interaction with adjacent non-seismic structures, as described in Subsection 3.7.2.8. The seismic classifications of platforms and miscellaneous steel located in seismic Category I application are described in Subsection 3.8.3.

Seismic Category I SSCs meet the pertinent QA requirements of 10 CFR Part 50, Appendix B (Reference 10). The criteria used for the design of seismic Category I SSCs are described in Section 3.7.

b. Seismic Category II

Seismic Category II applies to SSCs which do not perform safety-related function, and whose continued function is not required, but whose structural failure could reduce the functioning of a seismic Category I SSC to an unacceptable safety level or could result in incapacitating injury to occupants of the control room.

Seismic Category II SSCs are designed to preclude a gross structural failure resulting from an SSE that could degrade the ability of an adjacent safety-related SSC to function to an unacceptable level or result in incapacitating injuries to personnel in the main control room (MCR).

Seismic Category II SSCs meet the augmented quality assurance requirements for non-safety-related SSCs as described in Section 17.5.

c. Seismic Category III

All SSCs not covered by seismic Category I or II are classified as seismic Category III and are designed in accordance with industry codes and standards as applicable for their design function.

3.2.2 System Quality Group Classification

GDC 1 of 10 CFR Part 50 Appendix A (Reference 1) requires that nuclear power plant systems and components important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed. Fluid systems and pressure-retaining components are part of the RCPB and other fluid systems that are important to safety. Such systems (1) prevent or mitigate the consequences of accidents and malfunctions originating in the RCPB, (2) permit shutdown of the reactor and maintain it in a safe shutdown condition, and (3) retain radioactive material.

NRC RG 1.26 (Reference 11) is the principal document that is used to identify, on a functional basis, the components of systems that are important to safety and that are in Quality Groups A, B, C, and D, which are defined below. ASME Section III, or Safety Class 1, components that are part of the RCPB are identified in 10 CFR 50.55a (Reference 12).

Systems and components are assigned to quality groups in accordance with the quality group classification system (NRC Quality Groups A, B, C or D) defined in NRC RG 1.26 (Reference 11), which was established for water-steam-containing components important to safety. Two other quality groups, E and G, are defined, in addition to those designated in NRC RG 1.26, to indicate the governing design codes for the components that are not covered under NRC Quality Groups A, B, C, or D.

The quality group classifications and codes and standards for mechanical and fluid systems and components are listed in Table 3.2-1 and are shown on the applicable flow diagrams. The flow diagrams identify the classification boundaries of interconnecting piping and valves, as well as the interfaces between the safety-related and non-safety-related portions of each system. The COL applicant is to identify the quality group classification of site-specific systems and components and their applicable codes and standards (COL 3.2(2)).

Quality Groups A through E and G are defined below.

Quality Group A

Quality Group A applies to the components that are part of the reactor coolant pressure boundary (RCPB), except for the portions that are included in Quality Group B below. This exclusion applies to components whose failure would not prevent the reactor from being shut down and cooled down in an orderly fashion with normal makeup and components that are or can be isolated from the reactor coolant system by two valves in series (with automatic closure of open valves).

Quality Group A water-, steam-, and radioactive-waste-containing components are designed to meet the requirements for Class 1 components in ASME Section III, Division I, NB.

Quality Group B

Quality Group B applies to water- and steam-containing components that support the systems or portions of systems listed in the regulatory position C.1 of NRC RG 1.26.

These systems or portions of systems are as follows:

a. Portions of the RCPB that are excluded from Quality Group A

b. Systems or portions of systems important to safety that are designed for the (i) emergency core cooling, (ii) post-accident containment heat removal, or (iii) post-accident fission product removal

c. Systems or portions of systems important to safety that are designed for (i) reactor shutdown or (ii) residual heat removal

d. Portions of the steam and feedwater systems of pressurized-water reactors extending from and including the secondary side of steam generators up to and including the outermost containment isolation valves, and connected piping up to and including the first valve (including a safety or relief valve) that is either normally closed or capable of automatic closure during all modes of normal reactor operation

e. Systems or portions of systems that are connected to the reactor coolant pressure boundary and are not capable of being isolated from the boundary during all modes of normal reactor operation by two valves, each of which is either normally closed or capable of automatic closure

Quality Group B water- and steam-containing components are designed to meet the requirements for Class 2 components in ASME Section III, Division I, NC and NG.

Quality Group C

Quality Group C applies to water-, steam-, and radioactive-waste-containing components that are not part of the reactor coolant pressure boundary or included in Quality Group B but part of the following:

a. Cooling water and auxiliary feedwater systems or portions of those systems important to safety that are designed for emergency core cooling, post-accident containment heat removal, post-accident containment atmosphere cleanup, or residual heat removal from the reactor and from the spent fuel storage pool

b. Cooling water and seal water systems or portions of those systems important to safety that are designed for the functioning of components and systems important to safety

c. Systems or portions of systems that are connected to the reactor coolant pressure boundary and are capable of being isolated from that boundary during all modes of normal reactor operation by two valves, each of which is either normally closed or capable of automatic closure

d. Systems, other than radioactive waste management systems, not covered by the above item a. through item c. that contain or may contain radioactive material and whose postulated failure would result in conservatively calculated potential offsite doses that exceed 0.5 rem to the whole body or its equivalent to any part of the body; only single component failures need be assumed for those systems located in Seismic Category I structures, and no credit should be taken for automatic isolation from other components in the system or for treatment of released material, unless the isolation or treatment capability is designed to the appropriate seismic and quality group standards and can withstand loss of offsite power and a single failure of an active component.

Quality Group C pressure retaining components are designed to meet the requirements for Class 3 components in ASME Section III, Division I, ND.

Quality Group D

Quality Group D applies to non-safety-related systems and components that are not covered under Quality Group A, B, or C and that are designed to ASME B31.1 (Reference 13) code criteria or other codes and standards listed in Table 1 of NRC RG 1.26. Quality Group D may include parts or portions of systems that contain or may contain radioactive material.

The radwaste management system and steam generator blowdown system (SGBS), which contain or may contain radioactive materials, are designed in accordance with applicable codes and standards, QA requirements, and guidance provided in NRC RG 1.143.

Quality Group E

Quality Group E pertains to non-safety-related fluid systems and components that are designed to codes other than ASME B31.1 code criteria and codes and standards listed in NRC RG 1.26.

Quality Group G

Quality Group G pertains to safety-related fluid systems and components that are designed to codes and standards other than those listed for Quality Group A, B and C in Table 1 of NRC RG 1.26.

3.2.3 Safety Class

Fluid system components important to safety are classified in accordance with ANSI/ANS 51.1 (Reference 9). Safety Class 1, 2, 3, and non-nuclear safety (NNS) of ANSI/ANS 51.1 are equivalent, on a functional basis, to Quality Groups A, B, C, D of NRC RG 1.26. The criteria establish safety classes that are used as a guide to the selection of codes, standards, and quality assurance provisions for the design and construction of the components. The safety class designations are also used as a guide to the fluid system components that are classified as seismic Category I and II (see Subsection 3.2.1).

The safety classification in ANSI/ANS 51.1 is summarized as follows:

a. Safety Class 1

   Safety Class 1 (SC-1) applies to pressure-retaining portions and supports of mechanical equipment that form part of the RCPB whose failure could cause a loss of reactor coolant in excess of the reactor coolant normal makeup capability and whose requirements are within the scope of the ASME Section III.

b. Safety Class 2

Safety Class 2 (SC-2) applies to pressure-retaining portions and supports of primary containment and other mechanical equipment, whose requirements are within the scope of the ASME Section III, which are not assigned to SC-1 but are relied on to accomplish the following safety functions:

1) Provide fission product barriers or primary containment radioactive material holdup or isolation

2) Provide emergency heat removal for the primary containment atmosphere to an intermediate heat sink, or emergency removal of radioactive material from the primary containment atmosphere (e.g., containment spray)

3) Introduce emergency negative reactivity to make the reactor subcritical (e.g., boron injection system), or restrict the addition of positive reactivity via pressure boundary equipment

4) Provide reasonable assurance of emergency core cooling where the equipment provides coolant directly to the core (e.g., residual heat removal, emergency core cooling)

5) Provide or maintain sufficient reactor coolant inventory for emergency core cooling

c. Safety Class 3

Safety Class 3 (SC-3) applies to equipment not included in SC-1 or SC-2 that is designed and relied on to accomplish the following safety functions:

1) Provide the functions defined in SC-2 where equipment, or portions thereof, is not within the scope of ASME Section III

2) Except for the primary containment boundary extension function, provide reasonable assurance of hydrogen concentration control of the primary containment atmosphere to acceptable limits

3) Remove radioactive material from the atmosphere of confined space outside primary containment (e.g., MCR, fuel building) containing SC-1, SC-2, or SC-3 equipment

4) Introduce negative reactivity to achieve or maintain subcritical reactor conditions (e.g., boron makeup)

5) Provide or maintain sufficient reactor coolant inventory for core cooling (e.g., reactor coolant normal makeup system)

6) Maintain geometry within the reactor to provide reasonable assurance of core reactivity control or core cooling capability (e.g., core support structures)

7) Structurally load-bear or protect SC-1, SC-2, or SC-3 equipment

8) Provide radiation shielding for the MCR or offsite personnel

9) Provide reasonable assurance of required cooling for liquid-cooled stored fuel (e.g., SFP and cooling system)

10) Provide reasonable assurance of nuclear safety functions provided by SC-1, SC-2, or SC-3 equipment (e.g., provide heat removal for SC-1, SC-2, or SC-3 heat exchangers, provide lubrication of SC-1, SC-2, or SC-3 pumps, provide fuel oil to emergency diesel engine)

11) Provide actuation or motive power for SC-1, SC-2, or SC-3 equipment

12) Provide information or controls to provide reasonable assurance of capability for manual or automatic actuation of nuclear safety functions required of SC-1, SC-2, or SC-3 equipment

13) Supply or process signals or supply power required for SC-1, SC-2, or SC-3 equipment to perform its required nuclear safety functions

14) Provide a manual or automatic interlock function to provide reasonable assurance that the proper performance of nuclear safety functions required of SC-1, SC-2, and SC-3 equipment is maintained

15) Provide an acceptable environment for SC-1, SC-2, or SC-3 equipment and operating personnel

d. Non-nuclear safety

Non-nuclear safety (NNS) applies to equipment or structures that are not included in SC-1, SC-2, or SC-3. These items are not relied on to perform a nuclear safety function.

All pressure-containing components in SC-1, SC-2, and SC-3 are designed, manufactured, and tested in accordance with the requirements of ASME Section III Code Class 1, 2, and 3, respectively. Components designated as NNS are designed and constructed with appropriate consideration of the intended service using applicable industry codes and standards. Table 3.2-2 shows the interrelationship and/or correspondence between the classifications.

The electrical equipment in SC-3 is in accordance with IEEE Std. 308 (Reference 14), IEEE Std. 603 (Reference 15), and applicable IEEE standards. The structures in SC-2 and SC-3 are in accordance with ASME Section III, Division 1, MC (Reference 16); ASME Section III, Division 2, CC (Reference 17); ACI-349 (Reference 18); and ANSI/AISC N690 (Reference 19).

The safety classification system is also used to identify the components that fall under the requirements of 10 CFR Part 50, Appendix B (Reference 10). Components in safety Classes 1, 2, and 3 are designed and manufactured under a rigorous quality assurance program reflecting the requirements of 10 CFR Part 50, Appendix B, and are designated as such in Table 3.2-1 in the column labeled 10 CFR Part 50, Appendix B. Components that do not serve a safety-related function are not subject to the quality assurance requirements of 10 CFR Part 50, Appendix B, and are designated as such in Table 3.2-1 in the column labeled 10 CFR Part 50, Appendix B.

Supports for piping and components have the same classification as the component or piping supported. Supports for APR1400 Quality Group A, B, and C mechanical components and piping are constructed to ASME Section III, Subsection NF requirements. The principal construction code for supports for non-safety-related components and piping is the same as that for the supported component or piping.

The safety classification systems described above meet the intent of NRC RG 1.26 and the requirements of 10 CFR 50.55a.

3.2.4 Classification Listings

Table 3.2-1 provides component classifications as defined in Subsections 3.2.1 through 3.2.3. Table 3.2-1 also provides the quality assurance requirements of 10 CFR Part 50, Appendix B, and the applicable codes and standards.

3.2.5 Combined License Information

COL 3.2(1) The COL applicant is to identify the seismic classification of site-specific SSCs that should be designed to withstand the effects of the SSE.

COL 3.2(2) The COL applicant is to identify the quality group classification of site-specific systems and components and their applicable codes and standards.

COL 3.2(3) The COL applicant is to provide the classification of structures, systems, and components for turbine generator building drain system.

3.2.6 References

1. 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," U.S. Nuclear Regulatory Commission.

2. 10 CFR 100.11, "Determination of Exclusion Area, Low Population Zone, and Population Center Distance," U.S. Nuclear Regulatory Commission.

3. 10 CFR Part 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants," U.S. Nuclear Regulatory Commission.

4. 10 CFR Part 50, Appendix S, "Earthquake Engineering Criteria for Nuclear Power Plants," U.S. Nuclear Regulatory Commission.

5. Regulatory Guide 1.29, "Seismic Design Classification," Rev. 4, U.S. Nuclear Regulatory Commission, March 2007.

6. Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants," Rev. 2, U.S. Nuclear Regulatory Commission, November 2001.

7. Regulatory Guide 1.151, "Instrument Sensing Lines," Rev. 1, U.S. Nuclear Regulatory Commission, July 2010.

8. Regulatory Guide 1.189, "Fire Protection for Nuclear Power Plants," Rev. 2, U.S. Nuclear Regulatory Commission, October 2009.

9. ANSI/ANS 51.1-1983, "Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants," American Nuclear Society, 1983.

10. 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," U.S. Nuclear Regulatory Commission.

11. Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," Rev. 4, U.S. Nuclear Regulatory Commission, March 2007.

12. 10 CFR Part 50, Section 50.55a, "Codes and Standards," U.S. Nuclear Regulatory Commission.

13. ASME B31.1, "Power Piping," The American Society of Mechanical Engineers, 2010.

14. IEEE Std. 308-2001, "IEEE Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers , 2001.

15. IEEE Std. 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 1991.

16. ASME Section III, Division 1, Subsection NE, "Class MC Components," The American Society of Mechanical Engineers, the 2007 Edition with the 2008 Addenda.

17. ASME Section III, Division 2, Subsection CC "Concrete Containments," American Society of Mechanical Engineers, the 2001 Edition with the 2003 Addenda.

18. ACI 349-1997, "Code Requirements for Nuclear Safety Related Concrete Structures," American Concrete Institute, 1997.

19. ANSI/AISC N690-1994, "Specification for the Design, Fabrication and Erection of Steel Safety-Related Structures for Nuclear Facilities," American Institute of Steel Construction, 1994.

Table 3.2-1 (1 of 86)

Classification of Structures, Systems, and Components[(1)]

SSC Identification	Location[(2)]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[(3)]	Seismic Category	Remarks
I. Major Structures							
1. Containment Building (including mechanical and electrical penetrations)		SC-2	B	ASME Section III NE-2007 with 2008 addenda, ASME Section III CC-2001 with 2003 Addenda	Yes	I	
2. Containment Building Internal Structures (including radiation shield and pipe whip restraints)		SC-3	N/A	ACI 349-1997, ANSI/AISC N690-1994 incl. Supp. 2 (2004)	Yes	I	
3. Auxiliary Building (including TSC)		SC-3	N/A	ACI 349-1997, ANSI/AISC N690-1994 incl. Supp. 2 (2004)	Yes	I	(4)
4. Turbine Generator Building		NNS	N/A	ACI 318-2008 AISC 360-2005	A	II	(3)(d)
5. Compound Building		NNS	N/A	ACI 349-1997, ANSI/ AISC N690-1994 incl. Supp. 2 (2004)	A	II	(3)(d), (4)
6. Emergency Diesel Generator Building		SC-3	N/A	ACI 349-1997, ANSI/AISC N690-1994 incl. Supp. 2 (2004)	Yes	I	
7. Alternate Alternating Current Gas Turbine Generator Building		NNS	N/A	ACI 318-2008	A	II	(3)(d)
8. Essential Service Water Building		SC-3	N/A	ACI 349-1997, ANSI/AISC N690-1994 incl. supp. 2(2004)	Yes	I	

Table 3.2-1 (2 of 86)

SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
9. Component Cooling Water Heat Exchanger Building		SC-3	N/A	ACI 349-1997, ANSI/AISC N690-1994 incl. supp. 2(2004)	Yes	I	
10. Component Cooling Water Piping Tunnel		SC-3	N/A	ACI 349-1997, ANSI/AISC N690-1994 incl. supp. 2(2004)	Yes	I	
II. Systems and Components							
1. AC – Auxiliary Process Cabinet							
a. APC A/B/C/D	AB	SC-3	N/A	IEEE Std. 603-1991, IEEE Std. 323-2003, IEEE Std. 344-2004	Yes	I	
b. APC N1/N2	AB	NNS	N/A	N/A	A	III	
2. AF – Auxiliary Feedwater							
a. Auxiliary feedwater pumps							
1) Pumps	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
b. Auxiliary feedwater pump suction piping and valves from auxiliary feedwater suction manual valves (AFW-V1001 A/B, AFW-V1002 A/B)	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
c. Auxiliary feedwater pump discharge piping and valves up to and including emergency cooling water injection line manual valve (AFW-V2102 A/B) but excluding auxiliary feedwater isolation valves (AFW-V043 ~ 046)	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	

Table 3.2-1 (3 of 86)

SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
d. Auxiliary feedwater pump discharge piping from auxiliary feedwater isolation valves (AFW-V043 ~ 046) up to feedwater connection	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
e. Auxiliary feedwater pump recirculation piping and valves up to and including auxiliary feedwater recirculation isolation valves (AFW-V1011 A/B, AFW V1013 A/B)	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
f. Emergency cooling water injection line excluding manual valves (AFWV2102 A/B)	AB	NNS	D	ASME B31.1-2010	A	I	(3)(d)
g. Non-safety-related piping/equipment in safety-related areas	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
h. Other non-safety-related piping/equipment in non-safety-related areas	AB	NNS	D	ASME B31.1-2010	N/A	III	
3. AN – Alarm							
a. Qualified indication and alarm-non-safety (QIAS-N) alarm	AB	NNS	N/A	N/A	A	I	(N-9)
b. Information processing system (IPS) alarm	AB	NNS	N/A	N/A	A	II	(3)(d)
4. AS – Auxiliary Steam							
a. Containment isolation valves and associated piping	AB, RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
b. Non-safety-related piping and components in safety-related areas	AB, RCB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
c. Others	TGB, CB	NNS	D	ASME B31.1-2010	N/A	III	

Table 3.2-1 (4 of 86)

SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
5. AT – Auxiliary Feedwater Pump Turbine							
a. Auxiliary feedwater pump turbines	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
b. Steam admission/exhaust/ preheating lines and valves	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
c. Non-safety-related piping/component in safety-related areas	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
d. Others	TGB	NNS	D	ASME B31.1-2010	N/A	III	
6. AX – Auxiliary Feedwater Storage and Transfer							
a. Auxiliary feedwater storage tank	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
b. Auxiliary feedwater makeup piping up to and including auxiliary feedwater storage tank inlet manual valves (AX-V1605, AX-V1606)	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
c. Auxiliary feedwater makeup piping from auxiliary feedwater storage tank inlet manual valves (AX-V1605, AX-V1606) up to and including auxiliary feedwater storage tank makeup check valve (AX-V1600)	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d), (3)(e)

Table 3.2-1 (5 of 86)

SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
d. Auxiliary feedwater pump suction piping and valves including emergency cooling water injection line manual valves (AX-2679A/B) from auxiliary feedwater storage tanks up to and excluding auxiliary feedwater suction manual valves (AFW-V1001 A/B, AFW-V1002 A/B)	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
e. Component cooling water / essential chilled water makeup piping up to and including component cooling water / essential chilled water makeup pump supply valves (AX-V1607, AX-V1608)	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
f. Auxiliary feedwater storage tank sampling piping up to and including auxiliary feedwater storage tank grab sample test valves (AX-V2642, AX-V2644)	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
g. Auxiliary feedwater storage tank overflow piping	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
h. Auxiliary feedwater storage tank drain piping from auxiliary feedwater storage tank drain valves (AX-V2641, AX-V2643) to condensate polishing area sump in safety-related area	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
i. Auxiliary feedwater storage tank drain piping up to condensate polishing area sump in non-safety-related area	TGB	NNS	D	ASME B31.1-2010	N/A	III	

Table 3.2-1 (6 of 86)

SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
j. Auxiliary feedwater storage tank cross connection line up to and including AFWST connection manual valves (AX-V1621, AX-V1622)	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
k. Auxiliary feedwater storage tank cross connection line between and excluding AFWST connection manual valves (AX-V1621, AX-V1622)	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
l. Non-safety backup supply line up to and including AFW pump suction manual valves (AX-V1623, AX-V1624)	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
m. Non-safety backup supply line from AFW pump suction manual valves (AX-V1623, AX-V1624) up to and including raw water supply valve (AX-V1208) and condensate storage tank water supply valve (AX-V1627)	AB	NNS	D	ASME B31.1-2010	A	I	(3)(d)
o. Emergency cooling water injection line excluding manual valve (AX-V2679A/B, AX-V2780A/B)	AB	NNS	D	ASME B31.1-2010	A	I	(3)(d)
7. BI – Bypass and Inoperable Status Indication							
a. Control logic and indication device		NNS	N/A	IEEE Std. 603-1991	A	II	(3)(d), (8)
8. CA – Condenser Vacuum							
a. Containment isolation valves and associated piping	AB, RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	

Table 3.2-1 (7 of 86)

SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
b. Non-safety-related piping and components in safety-related areas	AB, RCB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
c. Condenser vacuum pumps, booster fan and other components	TGB	NNS	D	ASME B31.1-2010 HEI Standards-2006 ASME AG-1-2009	N/A	III	
9. CC – CCW							
a. CCW heat exchangers	CCWHXB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
b. CCW pumps	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
c. CCW makeup pumps	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
d. CCW surge tanks	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
e. Chemical addition tank	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d)
f. Component cooling water supply and return piping and valves excluding the following 1) through 9) below:	AB, CCWHXB, EDGB, Yard	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
1) Containment penetration piping of RCP cooler supply line between and including the valves, CC-231 and CC-1099 in the division I	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	

Table 3.2-1 (8 of 86)

SSC Identification	Location[(2)]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[(3)]	Seismic Category	Remarks
2) Containment penetration piping of RCP cooler return line between and including the valves, CC-249, CC-250, and CC-1100 in the division I	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
3) RCP cooler supply and return piping between the valves, CC-1099, CC-249, and CC-1100 in the division I	RCB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
4) Non-essential supply and return piping between the valve CC-145 and CC-147 in the division I excluding the following 5) through 7) below:	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
5) Containment penetration piping of letdown heat exchanger supply line between and including the valves CC-296, CC-297, and CC-1685 in the division I	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
6) Containment penetration piping of letdown heat exchanger return line between and including the valve CC-301, CC-302, and CC-1686 in the division I	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
7) Letdown heat exchanger supply and return piping between the valves, CC-297, CC-301, CC-1685, and CC-1686 in the division I	RCB	NNS	D	ASME B31.1-2010	A	II	(3)(d)

Table 3.2-1 (9 of 86)

SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
8) Non-essential supply and return piping between the valve CC-146 and CC-148 in the auxiliary building of the division II	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
9) Non-essential supply and return piping in the compound building of the division II	CPB	NNS	D	ASME B31.1-2010	N/A	III	
10. CD – Condensate							
a. Piping in auxiliary bldg.	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
b. Condenser, condensate pumps, tanks, valves, strainers	TGB	NNS	D	ASME B31.1-2010	N/A	III	
c. Deaerator storage tank	TGB	NNS	D	ASME Section VIII - 2007 with 2008 addenda	N/A	III	
d. Feedwater Heaters	TGB	NNS	D	ASME Section VIII - 2007 with 2008 addenda	N/A	III	
e. Other piping	TGB	NNS	D	ASME B31.1-2010	N/A	III	
11. CE – Control Element Assembly Drive							
a. Control element drive mechanism	RCB	SC-1	A	ASME Section III NB - 2007 with 2008 addenda	Yes	I	
1) Pressure housing assembly	RCB	SC-1	A	ASME Section III NB - 2007 with 2008 addenda	Yes	I	
2) Motor assembly	RCB	SC-2	B	N/A	Yes	I	(N-10)
3) Extension shaft assembly	RCB	SC-2	B	N/A	Yes	I	(N-10)
b. Reactor trip switchgear	RCB	SC-3	N/A	IEEE Std. 603-1991	Yes	I	
c. CEDM motor generator set	AB	NNS	N/A	N/A	N/A	III	

Table 3.2-1 (10 of 86)

SSC Identification	Location[2]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[3]	Seismic Category	Remarks
12. CI – Containment							
a. Mechanical penetration		SC-2	B	ASME Section III NC - 2007 with 2008 addenda	Yes	I	
b. Electrical penetration	RCB	SC-2	N/A	IEEE Std. 317-1983 IEEE Std. 323-2003 IEEE Std. 344-2004	Yes	I	
13. CM – Containment Monitoring							
a. Containment Isolation	RCB	SC-2	B	IEEE Std. 323-2003 IEEE Std. 344-2004	Yes	I	
b. Safety-related sample tubing and valves	RCB/AB	SC-2	B	IEEE Std. 323-2003 IEEE Std. 344-2004	Yes	I	
c. Other safety-related equipment	RCB/AB	SC-3	G	IEEE Std. 323-2003 IEEE Std. 344-2004	Yes	I	
d. Non-safety-related equipment	AB	NNS	D	N/A	A	II	(3)(d)
14. CN – Soft Control							
a. Safety soft control (ESCM)	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 379-2000 IEEE Std. 603-1991 IEEE Std. 7-4.3.2-2003	Yes	I	
b. Non-safety soft control (IFPD)	AB	NNS	N/A	N/A	A	II	(3)(d)

Table 3.2-1 (11 of 86)

SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
15. CP – Condensate Polishing							
a. Condensate polishing package							
1) Vessels	TGB	NNS	D	ASME Section VIII-2007 with 2008 addenda	N/A	III	
2) Piping and valves	TGB	NNS	D	ASME B31.1-2010	N/A	III	
16. CQ – Communication							
a. Equipment in safety-related areas							
1) Telephone, paging phone in MCR	AB	NNS	N/A	N/A	A	II	(3)(d)
2) Evacuation alarm board in MCR	AB	NNS	N/A	N/A	A	II	(3)(d)
3) Paging phone full booth	AB	NNS	N/A	N/A	A	II	(3)(d)
4) Other equipment	ALL	NNS	N/A	N/A	A	II	(3)(d)
b. Others	ALL	NNS	N/A	N/A	N/A	III	
17. CR – Core Protection Calculation System							
a. CPC (core protection calculator)	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 338-1987 IEEE Std. 344-2004 IEEE Std. 379-2000 IEEE Std. 383-2003 IEEE Std. 603-1991 IEEE Std. 7-4.3.2-2003	Yes	I	
b. CEAC (control element assembly calculator)	AB	SC-3	N/A		Yes	I	
c. CPP (CEA position processor)	AB	SC-3	N/A		Yes	I	
d. OM (operator's module)	AB	SC-3	N/A		Yes	I	
e. I/O simulator	AB	NNS	N/A	N/A	N/A	III	
18. CS – Containment Spray							
a. Containment spray pumps	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	

Table 3.2-1 (12 of 86)

SSC Identification	Location[2]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[3]	Seismic Category	Remarks
b. Containment spray heat exchangers							
1) Tube side	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
2) Shell side	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
c. Containment spray miniflow heat exchangers							
1) Tube side	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
2) Shell side	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
d. Spray nozzles (including ECSBS spray nozzles)	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
e. CSS piping and valves from CSS suction line to containment penetration, ECSBS piping and valve from V1013 to containment penetration	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
f. CSS piping and valves from containment penetration to CSS spray nozzles, ECSBS piping and valve from containment penetration to ECSBS spray nozzles	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
g. ECSBS piping and valves from external siamese hose connection to V1013 (excluding V1013)	AB	NNS	D	ASME B31.1-2010	A	I	(3)(b)
h. CSS refueling pool piping to V1011 (excluding V1011)	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
19. CT – Condensate Storage and Transfer							
a. Condensate storage tanks with associated components, and valves	TGB	NNS	D	ASME Section VIII-2007 with 2008 addenda/ ASME B31.1-2010 / API 620-2008	N/A	III	
b. Non-safety-related piping in safety-related area	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
20. CV – Chemical and Volume Control							
a. Regenerative heat exchanger	RCB	SC-2/SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
b. Letdown heat exchanger (tube/shell)	RCB	SC-2/ SC-3	B/C	ASME Section III NC/ND-2007 with 2008 addenda	Yes	I	(N-1)
c. Charging pump miniflow heat exchanger	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
d. Purification ion exchangers	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d)
e. Deborating ion exchanger	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d)
f. Volume control tank	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
g. Chemical addition system	AB	NNS	D	ANSI/HI-2010 except ANSI/HI Std 1.3-2009 /API 650-2007	N/A	III	
h. Boric acid batching tank	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	N/A	III	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
i. Charging pumps / charging pump motors	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
j. Auxiliary charging pump	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
k. Auxiliary charging pump suction stabilizer/pulsation dampener	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
l. Boric acid makeup pumps	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
m. Reactor makeup water pumps	AB	NNS	D	ASME B31.1-2010 / HI Std	N/A	III	
n. Boric acid concentrator							
1) Process unit	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	N/A	III	
2) I&C assembly	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	N/A	III	
o. Preholdup ion exchanger	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d)
p. Boric acid condensate ion exchanger	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	N/A	III	
q. Reactor drain pumps	AB	NNS	D	ANSI/HI-2010 except ANSI/HI Std 1.3-2009	A	II	(3)(d)
r. Holdup pumps	AB	NNS	D	ANSI/HI-2010 except ANSI/HI Std 1.3-2009	N/A	III	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
s. 1) Reactor drain tank	RCB	NNS	D	ASME Section VIII-2007 with 2008 addenda	N/A	III	
2) Reactor drain tank support	RCB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d)
t. Holdup tank	Yard	NNS	D	API-650-2007 with 2008 addendum	N/A	III	
u. Equipment drain tank	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d)
v. Boric acid storage tank	Yard	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
w. Reactor makeup water tank	Yard	NNS	D	API-620-2008 with 2009, 2010 addendum	N/A	III	
x. Gas stripper							
1) Process unit	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d)
2) I&C assembly	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	N/A	III	
y. Purification filters	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
aa. Reactor drain filters	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d)
ab. Seal injection filters	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	

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SSC Identification	Location[2]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[3]	Seismic Category	Remarks
ac. Reactor makeup water filter	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	N/A	III	
ad. Boric acid filter	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
ae. Letdown strainer	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d)
af. Preholdup strainer	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d)
ag. Boric acid condensate ion exchanger strainer	AB	NNS	D	ASME B31.1-2010 /B16.34-2009	N/A	III	
ah. Boric acid batching strainer	AB	NNS	D	ASME B31.1-2010 /B16.34-2009	N/A	III	
ai. Boric acid batching eductor	AB	NNS	D	ASME B16.5-2009	N/A	III	
aj. Letdown orifices	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
ak. Charging restricting orifices	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
al. Piping and Valves							
1) Within RCPB	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
2) Letdown, charging, seal injection, and aux. spray piping and valves							
(a) Inside containment	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
(b) Letdown piping and valves from CV-523 outlet to CV-520 outlet	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
(c) Letdown piping and valves from CV-520 outlet to CV-415 inlet	AB	NNS	D	ASME B31.1-2010 /B16.34-2009	A	II	(3)(d)
					N/A	III	CV-870/894/895/896 and associated branch lines
(d) Letdown piping and valves from CV-415 inlet to VCT inlet	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	

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SSC Identification	Location[2]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[3]	Seismic Category	Remarks
(e) RCP CBO piping and valves from CV-505 outlet to VCT inlet	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
(f) RCP seal injection piping and valves form seal injection tee to CV-255 inlet	AB, RCB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
(g) Charging piping and valves from VCT outlet to CV-524 inlet	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
3) Containment isolation	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
4) Reactor water drain collection							
(a) Inside containment (reactor drain tank)	RCB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
(b) Outside containment (equipment drain tank, reactor drain pump suction and discharge to holdup tank)	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
5) Boric acid recovery system (holdup tank to boric acid storage tank and reactor makeup water tank)	Yard	NNS	D	ASME B31.1-2010	A N/A	II III	(3)(d), CV-686/127: Seismic Cat. II

Table 3.2-1 (19 of 86)

SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
6) Boric acid supply (BAST to VCT/charging pump suction)	Yard, AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
7) Reactor makeup water supply (RMWT to CV-186 inlet)	Yard, AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
8) BAMP to IRWST isolation valve CV-553	AB, RCB	NNS	D	ASME B16.34 - 2009	A	II	(3)(d)
9) BABT to BAST isolation valve CV-126	AB	NNS	D	ASME B16.34 - 2009	N/A	III	
21. CW – Circulating Water							
a. [[CW pumps]]	CWPH	NNS	D	HI Standards – 2010	N/A	III	
b. Butterfly valves	TGB, CWPH	NNS	D	AWWA C504-2010	N/A	III	
c. Condenser tube cleaning system components	TGB	NNS	D	ASME B31.1-2010	N/A	III	
d. Circulating water pump lube water booster pumps	CWPH	NNS	D	HI Standards-2010	N/A	III	
e. [[Makeup pumps]]	Yard	NNS	D	HI Standards-2010	N/A	III	
f. [[Blowdown pumps]]	Yard	NNS	D	HI Standards-2010	N/A	III	
g. [[Cooling towers (including cooling tower fans)]]	Yard	NNS	D	ASME PTC 23-2003	N/A	III	
h. Piping and valves	TGB, CWPH, Yard	NNS	D	ASME B31.1-2010	N/A	III	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
22. CY – Information Processing							
a. IFPD in safe shutdown area	AB	NNS	N/A	N/A	A	II	(3)(d)
b. IFPD in non-safe shutdown area	CPB/EOF	NNS	N/A	N/A	N/A	III	
c. Information processing device server and related equipment	AB	NNS	N/A	N/A	N/A	III	
d. Computer room engineering workstation	AB	NNS	N/A	N/A	N/A	III	
e. I&C equipment room engineering workstation	AB	NNS	N/A	N/A	A	II	(3)(d)
f. Radwaste control room engineering workstation	CPB	NNS	N/A	N/A	N/A	III	
22a. DA - Alternate AC Gas Turbine Generator System							
a. Gas turbine generator package including auxiliary subsystem	AAC GTGB	NNS	E	Manufacturer's standard	A	III	(3)(b), (3)(e)
b. AAC diesel fuel oil tanks and day tanks	AAC GTGB	NNS	D	ASME Section VIII-2007 with 2008 addenda/API-650-2007 with 2008 addenda	A	III	(3)(b), (3)(e)
c. AAC diesel fuel oil transfer pump	AAC GTGB	NNS	D	HEI Standards-2010	A	III	(3)(b), (3)(e)
d. Non-safety-related piping and valves located at indoor	AAC GTGB	NNS	D	ASME B31.1-2010	A	III	(3)(b), (3)(e)
e. Non-safety-related piping and valves located at outdoor	YARD	NNS	D	ASME B31.1-2010	N/A	III	

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SSC Identification	Location[(2)]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[(3)]	Seismic Category	Remarks
23. DC – DC Distribution							
a. DC equipment necessary for safety-related function							
1) Safety-related battery chargers	AB	SC-3	N/A	IEEE Std. 308-2001 IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 420-2001 IEEE Std. 450-2010	Yes	I	
2) Safety-related batteries	AB	SC-3	N/A	IEEE Std. 308-2001 IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 420-2001 IEEE Std. 450-2010	Yes	I	
3) Safety-related DC control centers	AB	SC-3	N/A	IEEE Std. 308-2001 IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 420-2001 IEEE Std. 450-2010	Yes	I	
b. Non-safety-related DC equipment in safety-related areas							
1) Non-safety-related battery chargers	AB	NNS	N/A	N/A	A	II	(3)(d)
2) Non-safety-related batteries	AB	NNS	N/A	N/A	A	II	(3)(d)
3) Non-safety-related DC control centers (MC01M, MC01N)	AB	NNS	N/A	N/A	A	II	(3)(d), (3)(e)
c. DC equipment in AAC GTG building							
1) Non-safety-related battery chargers	AAC GTGB	NNS	N/A	N/A	A	III	(3)(b)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
2) Non-safety-related batteries	AAC GTGB	NNS	N/A	N/A	A	III	(3)(b)
3) Non-safety-related DC control centers	AAC GTGB	NNS	N/A	N/A	A	III	(3)(b)
d. Others							
1) Non-safety-related battery chargers	TGB, CPB	NNS	N/A	N/A	N/A	III	
2) Non-safety-related batteries	TGB, CPB	NNS	N/A	N/A	N/A	III	
3) Non-safety-related DC control centers	TGB, CPB	NNS	N/A	N/A	N/A	III	
24. DE – Radioactive Drain							
a. Exposed piping and components in safety-related areas	AB	NNS	D	ASME B31.1 - 2010 HI Standards - 2010	A	II	(3)(d)
b. Embedded piping and components necessary for flood protection in safety-related areas	AB	NNS	D	ASME B31.1 - 2010 HI Standards - 2010	A	II	(3)(d)
c. Piping and components necessary for flood protection in non-safety-related areas	AB	NNS	D	ASME B31.1 - 2010 HI Standards - 2010	A	II	(3)(d)
d. Containment isolation valves and associated piping	RCB, AB	SC-2	B	ASME Section III NC - 2007 with 2008 addenda	Yes	I	
e. Flood alarm loops of ESF pump rooms and elevation 55 ft 0 in of each quadrant wall	AB	SC-3	C	ASME Section III ND - 2007 with 2008 addenda	Yes	I	
f. Reactor containment bldg. drain sump pump	RCB	NNS	D	HI Standards - 2010	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
g. ICI cavity sump pump	RCB	NNS	D	HI Standards - 2010	A	II	(3)(d)
h. Aux. bldg. floor drain sump pump	AB	NNS	D	HI Standards - 2010	A	II	(3)(d)
i. Aux. bldg. equipment drain sump pump	AB	NNS	D	HI Standards - 2010	A	II	(3)(d)
j. Safety injection pump room sump pump	AB	NNS	D	HI Standards - 2010	A	II	(3)(d)
k. Shutdown cooling pump room sump pump	AB	NNS	D	HI Standards - 2010	A	II	(3)(d)
l. Containment spray pump room sump pump	AB	NNS	D	HI Standards - 2010	A	II	(3)(d)
m. Aux. bldg. chemical drain sump pump	AB	NNS	D	HI Standards - 2010	A	II	(3)(d)
n. Compound bldg. normal sump pump	CPB	NNS	D	HI Standards - 2010	N/A	III	
o. Spent resin long term storage tank room sump pump	CPB	NNS	D	HI Standards - 2010	N/A	III	
p. Compound bldg. chemical drain sump pump	CPB	NNS	D	HI Standards - 2010	N/A	III	
q. RLS drain sump pump	CPB	NNS	D	HI Standards - 2010	N/A	III	
25. DG – Emergency Diesel Generator							
a. Fuel oil feed pumps	AB, EDGB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
b. Air receivers	AB, EDGB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
c. Heat exchangers	AB, EDGB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
d. Expansion tanks	AB, EDGB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
e. Combustion air intake duct work	AB, EDGB	SC-3	G	ASME AG-1 - 2009	Yes	I	
f. Engine, engine-mounted components, and generator	AB, EDGB	SC-3	G	IEEE Std. 387-1995	Yes	I	
g. Starting air compressors, air dryer package, lube oil separator, lube oil/preheating water heat exchanger, HT water electric heater, preheating HT water pump, prelube oil pump and other non-safety-related equipment	AB, EDGB	NNS	D	ASME Section VIII-2007 with 2008 addenda ASME B31.1-2010	A	II	(3)(d)
h. Non-safety-related piping and equipment located at outdoor	AB, EDGB	NNS	D	ASME B31.1-2010	N/A	III	
i. Exhaust piping	AB, EDGB	SC-3	G	ASME B31.1-2010	Yes	I	
26. DI – Display							
a. QIAS-N display	AB	NNS	N/A	N/A	A	I	(N-9)
b. IFPD in safe shutdown area	AB	NNS	N/A	N/A	A	II	(3)(d)
c. IFPD in non-safe shutdown area	CPB, EOF	NNS	N/A	N/A	N/A	III	
27. DO – Diesel Fuel Oil Transfer							
a. Diesel fuel oil storage tanks	AB, EDGB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
b. Diesel fuel oil transfer pumps	AB, EDGB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
c. Diesel fuel oil day tanks	AB, EDGB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
d. Other safety-related components and piping	AB, EDGB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
e. Non-safety-related components and piping in safety-related areas	AB, EDGB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
f. Others	AB, EDGB	NNS	D	N/A	N/A	III	
28. DP – Diverse Protection System (DPS)							(14)
a. DPS Cabinet	AB	NNS	N/A	IEEE Std. 384-1992, IEEE Std. 344-2004	A	II	(3)(a) (3)(d)
b. DPS-OM	AB	NNS	N/A	IEEE Std. 384-1992, IEEE Std. 344-2004	A	II	(3)(a) (3)(d)
29. ED – Non-radioactive equipment vent and drain							
a. Non-safety-related components and piping in safety-related areas	AB, CCWHXB, CPB, ESWB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
b. Flood protection embedded components and piping in safety-related areas	AB, CCWHXB, CPB, ESWB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
c. Flood protection components and piping in non-safety-related areas	TGB, FPWTB, CWPH	NNS	D	ASME B31.1-2010	A	II	(3)(d)
d. Others		NNS	D	ASME B31.1-2010	N/A	III	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
30. EF – Engineered Safety Feature Actuation System	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 379-2000 IEEE Std. 603-1991 IEEE Std. 7-4.3.2-2003	Yes	I	
31. EM – Seismic Monitoring	AB, RCB, CPB, CCWHXB	NNS	N/A	IEEE Std. 344-2004	A	I	(9)
32. ER – Emergency Response Facility							
a. TSC Console	AB	NNS	N/A	N/A	A	II	(3)(d), (5)
b. Panels and displays in EOF	Outside of plant	NNS	N/A	N/A	N/A	III	
33. ET – Auxiliary Transformer							
a. Standby aux. transformers	Yard	NNS	N/A	N/A	A	III	(3)(e)
b. Unit aux. transformers	Yard	NNS	N/A	N/A	A	III	(3)(e)
34. FC – Spent Fuel Pool Cooling and Cleanup							(10)
a. Spent fuel pool cooling heat exchangers	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
b. Spent fuel pool cooling pumps	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
c. Spent fuel pool cleanup pumps	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d)
d. Spent fuel pool cleanup filters	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
e. Spent fuel pool cleanup demineralizers	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d)
f. Spent fuel pool demineralizer filters	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d)
g. Valves and piping of cooling loop	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
h. Valves and piping of makeup water supply line and boric acid makeup line from V1208, V1210, V2001 and V2002 to cooling loop	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
i. Valves and piping of cleanup loop and connected line excluding the following j through m below:	AB, RCB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
j. Valves and piping of boric acid makeup line from but excluding V2034 to cleanup loop	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
k. Valves and piping of IRWST return line from but excluding V1217 to cleanup loop	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
l. Valves and piping of containment isolation line including V1142, V1143, V1144, V1145	AB , RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
m. V2034 and V1217	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
n. Valves and piping of spent fuel pool demineralized water makeup line	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
o. Valves and piping of spent fuel pool external makeup and spray lines	AB	NNS	D	ASME B31.1-2010	A	I	(3)(b)
35. FD – Fire Detection and Alarm							
a. Fire control panels in safety-related areas	AB	NNS	N/A	NFPA 72-2013, NFPA 70-2008	A	II	(3)(c)(d)
b. Fire detector	ALL	NNS	N/A	NFPA 72-2013, NFPA 70-2008	N/A	III	
c. Notification and control equipment	ALL	NNS	N/A	NFPA 72-2013, NFPA 70-2008	N/A	III	
36. FH – Fuel Handling and Transfer							
a. New fuel storage racks	AB	NNS	N/A	ASME Section III NF – 2007 with 2008 Addenda	Yes	I	
b. Spent fuel storage racks	AB	NNS	N/A	ASME Section III NF – 2007 with 2008 Addenda	Yes	I	
c. Refueling machine	RCB	NNS	D	N/A	A	II	(3)(d)
d. Spent fuel handling machine	AB	NNS	D	N/A	A	II	(3)(d)
e. New fuel elevator	AB	NNS	D	N/A	A	II	(3)(d)
f. Fuel transfer system							
1) Transfer carriage	RCB, AB	NNS	D	N/A	A	II	(3)(d)
2) Upender	RCB, AB	NNS	D	N/A	A	II	(3)(d)
3) Hydraulic power unit	RCB, AB	NNS	D	N/A	A	II	(3)(d)
g. New fuel handling tool	AB	NNS	D	N/A	N/A	III	
h. Spent fuel handling tool	AB	NNS	D	N/A	N/A	III	
i. Fuel transfer tube valve and stand	AB	NNS	D	N/A	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
j. Fuel transfer tube	RCB, AB	NNS	D	N/A	A	II	(3)(d)
k. Refueling machine bridge rails and spent fuel handling machine bridge rails	RCB, AB	NNS	D	N/A	A	II	(3)(d)
l. CEA elevator	RCB	NNS	D	N/A	A	II	(3)(d)
m. CEA cutter	RCB	NNS	D	N/A	N/A	III	
n. CEA change platform	RCB	NNS	D	N/A	A	II	(3)(d)
o. Upper guide structure lifting rig	RCB	NNS	D	ASME Section III NF - 2007 with 2008 addenda	A	II	(3)(d)
p. Core barrel lifting rig	RCB	NNS	D	ASME Section III NF - 2007 with 2008 addenda	A	II	(3)(d)
q. Underwater television	RCB, AB	NNS	N/A	N/A	N/A	III	
r. Refueling pool seal	RCB	NNS	D	N/A	A	I	
s. In-core instrumentation cutter	RCB	NNS	D	N/A	N/A	III	
t. Gripper operating tool	RCB	NNS	D	N/A	N/A	III	
u. CEA handling tool	RCB	NNS	D	N/A	N/A	III	
v. Refueling supervisory console	RCB	NNS	D	N/A	N/A	III	
w. Refueling simulator	AB	NNS	D	N/A	N/A	III	
x. ICI guide tube	RCB	SC-1	A	ASME Section III NB - 2007 with 2008 addenda	Yes	I	
aa. ICI guide tube support	RCB	SC-1	A	ASME Section III NF - 2007 with 2008 addenda	Yes	I	
ab. ICI insertion and removal tool	RCB	NNS	D	N/A	N/A	III	
ac. ICI sealing housing	RCB	SC-1	A	ASME Section III NB - 2007 with 2008 addenda	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
ad. ICI seal table	RCB	SC-1	A	ASME Section III NF - 2007 with 2008 addenda	Yes	I	
ae. ICI holding frame	RCB	NNS	D	N/A	N/A	III	
af. Double blind flange	RCB	SC-2	B	ASME Section III NE - 2007 with 2008 addenda	Yes	I	
37. FI – Fixed In-core Detector Amplifier System (FIDAS)							
a. Cabinet	AB, RCB	NNS	N/A	N/A	A	II	(3)(d) (N-9)
38. FP – Fire Protection							(12)
a. Containment isolation	AB, RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	YES	I	
b. Seismic Category I fire protection subsystem							
1) Subsystem Components							
(a) Seismic Category I fire pumps	AB	NNS	D	NFPA 20-2013	A	I	(3)(c)
(b) Seismic Category I fire water tanks	AB	NNS	D	AWWA D-100-2005 NFPA 22 - 2013	A	I	(3)(c)
(c) Others	AB	NNS	E	Applicable UL/NFPA	A	I	(3)(c)
2) Subsystem fire protection piping	AB	NNS	D	ASME B31.1-2010	A	I	(3)(c)
3) Subsystem fire protection piping	AB	NNS	E	NFPA 13-2013	A	I	(3)(c)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
c. Normal fire protection subsystem in safety-related areas							
1) Subsystem Components							
(a) Fire control panel	ALL	NNS	N/A	UL/NFPA 20-2013	A	II	(3)(d)
(b) Fire hydrant	Yard	NNS	E	NFPA 24-2013	A	II	(3)(d)
(c) Extinguisher	ALL	NNS	E	NFPA 10 -2013	A	II	(3)(d)
(d) Others	ALL	NNS	E	Applicable UL/NFPA	A	II	(3)(d)
2) Subsystem fire protection piping	ALL	NNS	D	ASME B31.1-2010	A	II	(3)(d)
3) Subsystem fire protection piping	ALL	NNS	E	NFPA 13-2013	A	II	(3)(d)
4) Clean Agent Suppression Subsystem in Control Room	AB	NNS	E	Applicable UL/NFPA	A	II	(3)(e)
5) Fire Suppression Subsystem in Switchgear Room	AB	NNS	E	Applicable UL/NFPA	A	II	(3)(e)
d. Normal fire protection subsystem in non-safety-related areas							
1) Subsystem components							
(a) Main fire pumps and jockey pump	FPWTB	NNS	E	NFPA 20-2013	N/A	III	
(b) Freshwater storage tanks	Yard	NNS	E	AWWA D-100-2005 NFPA 22-2013	N/A	III	
(c) Fire control panel	FPWTB	NNS	N/A	UL/NFPA 20-2013	N/A	III	
(d) Fire hydrant	Yard	NNS	E	NFPA 24-2013	N/A	III	
(e) Extinguisher	ALL	NNS	E	NFPA 10-2013	N/A	III	
(f) Others	ALL	NNS	E	Applicable UL/NFPA	N/A	III	
2) Subsystem fire protection piping	ALL	NNS	D	ASME B31.1-2010	N/A	III	
3) Subsystem fire protection piping	ALL	NNS	E	NFPA 13-2013	N/A	III	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
39. FW – Feedwater							
a. From the SG up to and including the MSVH penetration anchor	RCB, MSVH	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
b. Other piping	TGB	NNS	D	ASME B31.1-2010	N/A	III	
c. Feedwater pumps	TGB	NNS	D	HI Standards - 2010	N/A	III	
d. Feedwater booster pumps	TGB	NNS	D	HI Standards - 2010	N/A	III	
e. Startup feedwater pump	TGB	NNS	D	HI Standards - 2010	A	III	(3)(e)
f. Startup feedwater pump discharge check valve, discharge stop check valve, and suction valve	TGB	NNS	D	ASME B31.1-2010	A	III	(3)(e)
g. Startup feedwater pump discharge isolation valve	TGB	NNS	D	ASME B31.1-2010	A	III	(3)(e)
h. Feedwater heaters	TGB	NNS	D	ASME Section VIII – 2007 with 2008 addenda	N/A	III	
i. Other components	TGB	NNS	D	ASME Section VIII - 2007 with 2008 addenda	N/A	III	
40. GD – Grounding							
a. Grounding conductor	ALL	NNS	N/A	IEEE Std. 80-2000 IEEE Std. 665-1995	N/A	III	
b. Lightning protection equipment	ALL	NNS	N/A	IEEE Std. 80-2000 IEEE Std. 665-1995	N/A	III	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B (3)	Seismic Category	Remarks
41. GP – Cathodic Protection							
a. Panels in safety-related areas	ESWB, CCWHXB	NNS	N/A	NACE SP 0169-2007 NACE SP 048-2008	A	II	(3)(d)
b. Others							
1) Anode	ALL	NNS	N/A	NACE SP 0169-2007 NACE SP 048-2008	N/A	III	
2) Reference electrode	ALL	NNS	N/A	NACE SP 0169-2007 NACE SP 048-2008	N/A	III	
3) Panels in other areas	ALL	NNS	N/A	N/A	N/A	III	
42. GW – Gaseous Radwaste							
a. Containment isolation	RCB, AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
b. Piping and components containing radioactive material	CPB	NNS	D	ASME Section VIII - 2007 ASME B31.3 - 2010	Note (4)	Note (4)	
c. Piping and components not related to radioactive material	CPB	NNS	D	N/A	N/A	III	Not containing radioactive material
d. Header drain tank	CPB	NNS	D	ASME Section VIII – 2007	Note (4)	Note (4)	
e. Charcoal guard bed	CPB	NNS	D	ASME Section VIII – 2007	Note (4)	Note (4)	
f. Charcoal delay bed	CPB	NNS	D	ASME Section VIII – 2007	Note (4)	Note (4)	
g. HEPA filter	CPB	NNS	D	ASME Section VIII – 2007	Note (4)	Note (4)	
h. Waste gas dryer	CPB	NNS	D	ASME Section VIII – 2007	Note (4)	Note (4)	

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SSC Identification	Location[2]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[3]	Seismic Category	Remarks
43. HC – Hoist Crane (All except Fuel Handling and Transfer System)							
a. Reactor containment building polar crane	RCB	NNS	N/A	N/A	A	II	(3)(d), (11), (13)
b. Fuel handling area overhead crane	AB	NNS	N/A	N/A	A	II	(3)(d), (11)
c. Cranes and/or hoists in safety-related areas	AB, CPB	NNS	N/A	N/A	A	II	(3)(d), (11)
d. Others	AB, CPB	NNS	N/A	N/A	N/A	III	
44. HD – Heater Drain							
a. Feedwater heater drain control valves	TGB	NNS	D	ASME B31.1-2010	N/A	III	
b. Others	TGB	NNS	D	N/A	N/A	III	
45. HG – Containment Hydrogen Control							
a. Passive autocatalytic recombiners (PARs)	RCB	NNS	E	Manufacturer standard	A	I	(3)(e)
b. Hydrogen ignitors	RCB	NNS	N/A	Manufacturer standard	A	I	(3)(e)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
46. HT – Heat Tracing							
a. Equipment in safety-related areas							
1) Heat tracing panel	AB	NNS	N/A	IEEE Std. 622-1987, IEEE Std. 515-2004, IEEE Std. 622A-1984, IEEE Std. 622B-1988	A	II	(3)(d)
2) Distribution transformer	AB	NNS	N/A	N/A	A	II	(3)(d)
b. Others	TGB, CPB, Yard	NNS	N/A	IEEE Std. 622-1987, IEEE Std. 515-2004, IEEE Std. 622A-1984, IEEE Std. 622B-1988	N/A	III	
47. IA – Instrument Air							
a. Containment isolation valves and associated piping	AB, RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
b. Non-safety-related piping and equipment in safety-related areas	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
c. Air compressor and auxiliaries	TGB	NNS	D	ANSI/ISA S7.3-1975(R1981)	N/A	III	
d. Piping in non-safety-related areas	TGB	NNS	D	N/A	N/A	III	
e. Others	TGB	NNS	D	N/A	N/A	III	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
48. IC – In-core Monitoring							
a. In-core instrument	RCB	SC-1	A	IEEE Std. 323-2003 IEEE Std. 344-2004	Yes	I	Seal plug only
b. Cabling and cable tray system from seal table to pool-wall junction panel	RCB, AB	SC-3	C	IEEE Std. 323-2003 IEEE Std. 344-2004	Yes	I	
c. Cables and cable tray system from pool wall junction panel to containment penetration	RCB, AB	SC-3	N/A	IEEE Std. 383-2003	Yes	I	
d. Cables and cable tray system from containment penetration to FIDAS cabinet	RCB, AB	NNS	N/A	IEEE Std. 386-1992	Yes	II	(3)(d)
e. Cables and cable tray system from containment penetration to QIAS-P cabinet	RCB, AB	SC-3	N/A	IEEE Std. 383-2003	Yes	I	
49. IP – Instrument and Control Power							
a. Safety-related inverters, regulating transformers, automatic transfer switches, manual transfer switches, and 120V AC distribution panels	AB	SC-3	N/A	IEEE Std. 308-2001 IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 420-2001	Yes	I	
b. Non-safety-related inverters, regulating transformers, automatic transfer switches, manual transfer switches, and 120V AC distribution panels	AB	NNS	N/A	N/A	A	II	(3)(d)
c. Non-safety-related UPS	AAC GTGB	NNS	N/A	N/A	A	III	(3)(b)
d. Non-safety-related UPS	AB	NNS	N/A	N/A	A	II	(3)(d)
e. Non-safety-related UPS	CPB	NNS	N/A	N/A	N/A	III	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
50. IS – Security							
a. Equipment in Safety-Related Areas	AB, CCWHXB, ESWB, EDGB	NNS	N/A	10 CFR 73.55-2010 IEEE Std. 692-2010	A	II	(3)(d), (6)
b. Others	ALL	NNS	N/A	N/A	N/A	III	(6)
51. IW – In-Containment Refueling Water Storage							
a. In-containment refueling water storage tanks	RCB	SC-3	G	ACI 349-1997, ASME Section III CC-2001 with 2003 Addenda	Yes	I	
b. Holdup volume tank	RCB	SC-3	G	ACI 349-1997, ASME Section III CC-2001 with 2003 Addenda	Yes	I	
c. Trisodium phosphate baskets	RCB	SC-3	N/A	AISC N690-1994&2004 (Supplement No.2)	Yes	I	
d. IRWST sump strainers	RCB	SC-3	G	AISC N690-1994&2004 (Supplement No.2)	Yes	I	
e. Swing panels	RCB	SC-3	G	ASME AG-1-2009	Yes	I	
f. In-containment refueling water storage tank spillway	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
g. Holdup volume tank flooding lines including the power operated valves V001 and 002 (MOV)	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
h. Reactor cavity flooding lines including the power operated valves V003 and 004 (MOV)	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
i. IRWST pressure/temperature instrument penetration piping including isolation valves	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
j. IRWST level instrument penetration piping including isolation valves	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
k. HVT level instrument penetration piping including isolation valves	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
l. Reactor cavity level instrument penetration piping including isolation valves	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
m. Containment penetration piping of CVCS BAMP suction line upstream including isolation and relief valves	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
n. High volume purge and reactor cavity flooding piping including isolation valves	RCB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
52. LD – Leak Detection							
a. Level instruments to monitor the flood level at ESF pump compartment and floor of each quadrant	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004	Yes	I	
b. Containment air radiation monitors	RCB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004	Yes	I	(16)
c. Others in safe shutdown area	RCB, AB	NNS	N/A	N/A	A	II	(3)(d), (16)
d. Others in non-safe shutdown area	AB	NNS	N/A	N/A	N/A	III	(16)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B (3)	Seismic Category	Remarks
53. LL – Lighting							
a. Equipment in safety-related area							
1) Lighting fixture	RCB, AB, CCWHXB, ESWB, EDGB	NNS	N/A	NFPA 101-2012	A	II	(3)(d)
2) Lighting transformer	RCB, AB, CCWHXB, ESWB, EDGB	NNS	N/A	NFPA 101-2012	A	II	(3)(d)
3) Lighting distribution panel	RCB, AB, CCWHXB, ESWB, EDGB	NNS	N/A	NFPA 101-2012	A	II	(3)(d)
b. Equipment in other areas	ALL	NNS	N/A	N/A	N/A	III	
54. LP – Large Display Panel	AB	NNS	N/A	N/A	A	II	(3)(d)
55. MP – Main Power							
a. Protective relays for generator and transformer	AB	NNS	N/A	N/A	A	II	(3)(d)
b. Main transformer and isolated phase bus	TGB Yard	NNS	N/A	N/A	A	III	(3)(e)
c. Generator excitation system, generator circuit breaker, and related protection facility	TGB Yard	NNS	N/A	N/A	N/A	III	
d. Others	TGB	NNS	N/A	N/A	N/A	III	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
56. MS – Main Steam							
a. Piping and components from SG up to and including the MSVH penetration anchor wall	RCB, MSVH	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
b. Piping and components from outlet of MSADVs and MSSVs	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
c. Piping inside main steam pipe enclosure	MS Pipe Enclosure	NNS	D	ASME B31.1-2010	A	II	(3)(d)
d. Components inside turbine generator building from outside main steam pipe enclosure	TGB	NNS	D	ASME B31.1-2010	N/A	III	
e. Other piping	TGB	NNS	D	ASME B31.1-2010	N/A	III	
57. NB – 4.16 kV Non-Class 1E Power							
a. 4.16 kV switchgear (SW01M) in aux. building	AB	NNS	N/A	N/A	A	II	(3)(d), (3)(e)
b. 4.16 kV switchgears (SW02M, SW02N) in TG building	TGB	NNS	N/A	N/A	N/A	III	
c. 4.16 kV switchgear (SW03N) in AAC GTG building	AAC GTGB	NNS	N/A	N/A	A	III	(3)(b), (3)(e)
d. 4.16 kV switchgear (SW01N) in aux. building	AB	NNS	N/A	N/A	A	II	(3)(d)
58. NC – NSSS process control							
a. Feedwater control signal processing and processor	AB	NNS	N/A	N/A	A	II	(3)(d)
b. Steam bypass control signal processing and processor	AB	NNS	N/A	N/A	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
c. PZR level control signal processing and processor	AB	NNS	N/A	N/A	A	II	(3)(d)
d. PZR pressure control signal processing and processor	AB	NNS	N/A	N/A	A	II	(3)(d)
e. PZR heater proportional power controller	AB	NNS	N/A	N/A	N/A	III	
f. CVCS – signal processing and processor	AB	NNS	N/A	N/A	A	II	(3)(d)
g. Boron dilution alarm system – signal conditional and processing electronics	AB	NNS	N/A	N/A	A	II	(3)(d)
59. NG – 480V Non-1E Load Center							
a. 480V non-1E load centers and transformers in safety-related areas	AB	NNS	N/A	N/A	A	II	(3)(d)
b. 480V non-1E load center and transformer in AAC GTG building	AAC GTGB	NNS	N/A	N/A	A	III	(3)(b)
c. 480V non-1E load centers (LC05N, LC10M) and transformers (TR05N, TR10M) in TG building	TGB	NNS	N/A	N/A	A	III	(3)(e)
d. 480V non-1E load centers and transformers in other areas	TGB CPB CW Pump House	NNS	N/A	N/A	N/A	III	

Table 3.2-1 (42 of 86)

SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
60. NH – 480V non-1E MCC and low voltage							
a. 480V MCCs, 120/208V distribution panels, and XFMRs in safety-related areas	AB	NNS	N/A	N/A	A	II	(3)(d)
b. 480V MCC (MC03M), 120/208V distribution panel, and XFMR in Aux. Building	AB	NNS	N/A	N/A	A	III	(3)(e)
c. 480V MCC (MC20N), 120/208V distribution panel, and XFMR in TG building	TGB	NNS	N/A	N/A	A	III	(3)(e)
d. 480V MCCs, 120/208V distribution panels, and XFMRs in AAC GTG building	AAC GTGB	NNS	N/A	N/A	A	III	(3)(b)
e. 480V MCCs, 120/208V distribution panels, and XFMRs in other areas	TGB CPB CW Pump House	NNS	N/A	N/A	N/A	III	
61. NI – NSSS Integrity Monitoring							
a. Alarm unit cabinet (AUC) and field components	RCB, AB	NNS	N/A	IEEE Std. 344-2004 IEEE Std. 383-2003	A	II	(3)(d)
b. Analysis computer console (ACC)	AB	NNS	N/A	N/A	N/A	III	
c. Acoustic leak monitoring (ALMS)	RCB, AB	NNS	N/A	N/A	A	II	(3)(d)
d. Internal vibration monitoring (IVMS)	RCB, AB	NNS	N/A	ASME OM-S/G Part 5-2007	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
e. Loose parts monitoring (LPMS)	RCB, AB	NNS	N/A	ASME OM-S/G Part 12-2007	A	II	(3)(d)
f. RCP vibration monitoring (RCPVMS)	RCB, AB	NNS	N/A	ASME OM-S/G Part 14-2007	A	II	(3)(d)
62. NP – 13.8 kV Non-1E Power							
a. 13.8 kV switchgear (SW02N) in TG building	TGB	NNS	N/A	N/A	A	III	(3)(e)
b. 13.8 kV switchgear (SW02M) in TG building	TGB	NNS	N/A	N/A	N/A	III	
c. 13.8 kV switchgears in aux. building	AB	NNS	N/A	N/A	A	II	(3)(d)
63. NR – Ex-core Neutron Flux Monitoring							
a. Startup/control channel	RCB, AB	NNS	N/A	N/A	A	II	(3)(d)
b. Safety channel	RCB, AB	SC-3	N/A	IEEE Std. 603-1991 IEEE Std. 323-2003 IEEE Std. 344-2004	Yes	I	
64. PD – Diverse Indication System (DIS)							
a. DIS cabinet	AB	NNS	N/A	IEEE Std. 344-2004 IEEE Std. 384-1992	A	II	(3)(d)
b. DIS display (FPD) & switch	AB	NNS	N/A	IEEE Std. 344-2004	A	II	(3)(d)
65. PE – Engineered Safety Features-Component Control							
a. Safety-related component control cabinets and field-mounted instruments							
1) Group controller cabinet and related instruments	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 379-2000 IEEE Std. 603-1991 IEEE Std. 7-4.3.2-2003	Yes	I	

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SSC Identification	Location[2]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[3]	Seismic Category	Remarks
2) Field loop controller cabinet	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 379-2000 IEEE Std. 603-1991 IEEE Std. 7-4.3.2-2003	Yes	I	
3) Safety soft control (ESCM)	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 379-2000 IEEE Std. 603-1991 IEEE Std. 7-4.3.2-2003	Yes	I	
b. Safety-Related Instrument Sensing Line							
1) Safety-Related Instrument Sensing Line for SC-1	RCB, AB	SC-2	A	ANSI/ISA-S67.02.01	Yes	I	
2) Safety-Related Instrument Sensing Line for SC-2	RCB, AB	SC-2	B				
3) Safety-Related Instrument Sensing Line for SC-3	RCB, AB, Yard, CCWHXB, ESWB, CWPH	SC-3	C				
66. PF – 4.16 kV Class 1E Power							
a. 4.16 kV switchgear	AB	SC-3	N/A	IEEE Std. 308-2001, IEEE Std. 323-2003, IEEE Std. 344-2004, IEEE Std. 420-2001	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
67. PG – 480V Class 1E Load Center							
a. 480V LCs and LC XFMRs	AB	SC-3	N/A	IEEE Std. 308-2001, IEEE Std. 323-2003, IEEE Std. 344-2004, IEEE Std. 420-2001	Yes	I	
68. PH – 480V Class 1E MCC and Low Voltage							
a. 480V MCCs, 120/208V distribution panels, and XFMRs	AB ESWB EDGB	SC-3	N/A	IEEE Std. 308-2001, IEEE Std. 323-2003, IEEE Std. 344-2004, IEEE Std. 420-2001	Yes	I	
69. PM – MCR							
a. Operator console (RO, TO, EO, SS, STA)							
1) Frame	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 420-2013 IEEE Std. 603-1991	Yes	I	
2) IFPD	AB	NNS	N/A	N/A	A	II	(3)(d)
3) ESCM	AB	SC-3	N/A	IEEE Std. 603-1991 IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 420-2013	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
4) Non-1E switch	AB	NNS	N/A	N/A	A	II	(3)(d)
5) QIAS-N FPD	AB	NNS	N/A	N/A	A	I	(N-9)
b. Meeting room Workstation							
1) IFPD	AB	NNS	N/A	N/A	A	II	(3)(d)
c. Safety Console							
1) Frame	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 379-2000 IEEE Std. 420-2013 IEEE Std. 603-1991	Yes	I	
2) Class 1E switch	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 379-2000 IEEE Std. 420-2013 IEEE Std. 603-1991	Yes	I	
3) Non-1E switch	AB	NNS	N/A	N/A	A	II	(3)(d)
4) Mini LDP (including QIAS-N)	AB	NNS	N/A	N/A	A	I	(N-9)
5) Operator module	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 379-2000 IEEE Std. 420-2013 IEEE Std. 603-1991 IEEE Std. 7-4.3.2-2003	Yes	I	

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SSC Identification	Location[2]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[3]	Seismic Category	Remarks
6) QIAS-P FPD	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 379-2000 IEEE Std. 383-2003 IEEE Std. 497-2002 IEEE Std. 603-1991 IEEE Std. 7-4.3.2-2003	Yes	I	
7) Diverse Indication System FPD	AB	NNS	N/A	N/A	A	II	(3)(d)
8) Mark-VI FPD	AB	NNS	N/A	N/A	A	II	(3)(d)
9) ESCM	AB	SC-3	N/A	IEEE Std. 603-1991 IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 420-2013	Yes	I	
70. PN – NSSS Process Instrumentation							
a. Safety-related	RCB, AB	SC-3	N/A	IEEE Std. 603-1991 IEEE Std. 323-2003 IEEE Std. 344-2004	Yes	I	
b. Non-safety-related	RCB, AB	NNS	N/A	N/A	A	II/III	(3)(d)
71. PO – Process Component Control							
a. Non-safety-related component control cabinet and local installation component							
1) Process group controller cabinet and related components	AB, TB	NNS	N/A	IEEE Std. 383-2003 [17] IEEE Std. 420-2001[17] IEEE Std. 7-4.3.2-2003[17]	A	II	(3)(d)
2) Reliability related process loop controller cabinet and related components	TB	NNS	N/A	IEEE Std. 383-2003[17] IEEE Std. 420-2001[17] IEEE Std. 7-4.3.2-2003[17]	A	II	(3)(d), (3)(e)

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SSC Identification	Location[2]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[3]	Seismic Category	Remarks
3) Other process loop controller cabinet and related components	AB, CPB, TB, FPWTB, CWPH, AAC GTGB, SWYD	NNS	N/A	IEEE Std. 383-2003 [17] IEEE Std. 420-2001[17] IEEE Std. 7-4.3.2-2003[17]	A	II	(3)(d)
b. Non-safety-instrument sensing lines							
1) Non-safety instrument sensing line in safety-related area	AB, RCB, TGB, CPB, ACC GTGB, ESWB, CWPH, CCWHXB, Yard	NNS	D	N/A	A	II	(3)(d)
2) Reliability related non-safety instrument sensing line in non-safety-related area	AB, TGB, CPB FPWTB, RCB CWPH, Yard	NNS	D	N/A	A	III	(3)(e)
3) Other non-safety instrument sensing line in non-safety-related area	AB, TGB, CCWHXB, RCB, CPB, CWPH, FPWTB, ESWB, AAC GTGB, Yard	NNS	D	N/A	N/A	III	

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SSC Identification	Location[2]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[3]	Seismic Category	Remarks
72. PP – Post-Accident Monitoring							
a. Instrumentation for Type A, B, and C variables	RCB, AB	SC-3	N/A	IEEE Std. 497-2002	Yes	I	(7)
b. Instrumentation for Type D variables	RCB, AB, CCWHXB EDGB	SC-3	N/A	IEEE Std. 497-2002	Yes	I	(7)
c. Instrumentation for Type E variables	AB, CPB, TGB	NNS	N/A	IEEE Std. 497-2002	A	II	(3)(d), (7)
d. Instrumentation for Type E variables	Yard	NNS	N/A	IEEE Std. 497-2002	N/A	III	(7)
73. PR – Radiation Monitoring							
a. NSSS RMS							
1) PRMS – sampler/detector unit	RCB, AB	NNS	N/A	N/A	A	II	(3)(d)
2) PRMS – signal conditional and processing electronics	RCB, AB	NNS	N/A	N/A	A	III	
3) WRBS – sampler/detector unit	RCB, AB	NNS	N/A	N/A	A	II	(3)(d)
4) WRBS – signal conditional and processing electronics	RCB, AB	NNS	N/A	N/A	A	III	
5) GSERMS – sampler/detector unit	RCB, AB	NNS	N/A	N/A	A	II	(3)(d)
6) GSERMS – signal conditional and processing electronics	RCB, AB	NNS	N/A	N/A	A	III	
b. BOP RMS							
1) Safety-related equipment	AB	SC-3	G	IEEE Std. 497-2002 IEEE Std. 603-1991	Yes	I	

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SSC Identification	Location[(2)]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[(3)]	Seismic Category	Remarks
2) Non-safety-related equipment in safety-related areas and TSC	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
3) Equipment in non-safety-related areas required to ensure radioactivity releases are within limits	TGB, CPB	NNS	D	ASME B31.1-2010	N/A	III	
4) Containment isolation	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
5) Others	CCWH XB, FPWTB	NNS	D	ASME B31.1-2010	N/A	III	
74. PS – Process Sampling							
a. Steam generator sample lines located in the reactor containment building including containment isolation	RCB, AB, CPB	SC-2	B	ANSI/ISA-S67.02.01	Yes	I	
b. Non-safety-related sample lines in the safety-related areas	AB	NNS	D	N/A	A	II	(3)(d)
c. Equipment contacting with radioactive sample in non-safety-related areas	CPB	NNS	D	N/A	N/A	III	
d. Analyzer and instrumentation equipment	AB, CPB, TGB	NNS	N/A	N/A	N/A	III	
e. Others	AB, TGB	NNS	D	N/A	N/A	III	
75. PW – Power Control System							
a. Reactor regulating system – signal conditional and processing electronics	AB	NNS	N/A	N/A	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
b. Digital rod control system – signal conditional and processing electronics	AB	NNS	N/A	N/A	A	II	(3)(d)
c. Digital rod control system power control electronics	AB	NNS	N/A	N/A	N/A	III	
d. Reactor power cutback system – signal conditional and processing electronics	AB	NNS	N/A	N/A	A	II	(3)(d)
e. DRCS remote I/O cabinet	AB	NNS	N/A	N/A	N/A	I	(N-9)
76. PX – Primary Sampling							
a. RCS hot leg sample to but excluding line CIV inside Containment	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
b. RCS hot leg sample line from but excluding CIV outside Containment to post-accident primary sample cooler rack	AB	NNS	D	ASME B31.1-2010	A	I	
c. RCS PZR surge sample line to but excluding CIV inside containment	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
d. RCS PZR Steam Space Sample Line to but excluding CIV inside Containment	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
e. SI pumps miniflow sample line isolation valves	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
f. CS pump miniflow sample line isolation valves	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
g. SC pump miniflow sample line isolation valves	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
h. SI tank sample line to but excluding CIV inside containment	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
i. Containment air sample line to but excluding CIV inside containment	RCB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
j. Containment air sample return line from but excluding CIV inside containment	RCB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
k. PASS sample return line from but excluding CIV inside containment	RCB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
l. CVCS purification filter and ion exchanger common outlet sample line isolation valves	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
m. Sampling return line to VCT from but including VCT isolation valves	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
n. VCT off-gas sample line to but including VCT isolation valve	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
o. Containment isolation valves and associated piping	RCB, AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
p. Remaining sample and return line in aux. building	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
q. Remaining sample and return line in compound building	CPB	NNS	D	ASME B31.1-2010	N/A	III	
r. Normal primary sample cooler rack	CPB	NNS	D	ASME B31.1-2010	N/A	III	
s. Normal primary sample sink	CPB	NNS	D	ASME B31.1-2010	N/A	III	
t. Post-accident primary sample cooler rack	AB	NNS	D	ASME B31.1-2010	N/A	III	
u. Post-accident primary sample sink	AB	NNS	D	ASME B31.1-2010	N/A	III	
v. Primary off-gas sample pump	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
77. QN – Qualified Indication and Alarm – Non-Safety (QIAS-N)							
a. QIAS-N display device (QIAS-N FPD, mini-LDP and SODP)	AB	NNS	N/A	IEEE Std. 384-1992	A	I	(N-9)
b. QIAS-N processing device and related equipment	AB	NNS	N/A	IEEE Std. 384-1992	A	I	(N-9)
78. QP – Qualified Indication and Alarm – P(QIAS-P)							
a. QIAS-P display		SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 379-2000 IEEE Std. 383-2003 IEEE Std. 497-2002 IEEE Std. 603-1991 IEEE Std. 7-4.3.2-2003	Yes	I	
b. QIAS-P processing controller (including ICCMS)		SC-3	N/A		Yes	I	(7)
c. HJTC instrumentation flange assembly		SC-1	A		Yes	I	
d. Heated junction thermocouple probe assembly		SC-1/ SC-3	A/C		Yes	I	SC-1: Seal plug

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
79. RC – Reactor Coolant							
a. Reactor vessel	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
b. SG (primary/secondary)	RCB	SC-1/ SC-2	A/B	ASME Section III NB-2007 with 2008 addenda ASME Section III NC-2007 with 2008 addenda	Yes	I	(N-1)
c. PZR	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
d. RCP (RCPB Components)	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	(N-3, 4)
e. POSRV							(N-8)
1) Main valves	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
2) Spring-loaded pilot valves	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
3) Double motor-operated pilot valves	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
4) Motor-operated isolation valves	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
5) Manual isolation valves	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
f. Sparger	RCB	SC-3	C	ASME Section III ND	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
g. Piping							
1) Reactor coolant piping	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
2) Pressurizer surge line piping	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
3) Pressurizer spray line piping	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
4) Upstream of flow-restricting devices	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	(N-5)
5) Downstream of flow-restricting devices	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	(N-6)
6) POSRV discharge piping upstream of 3-way valves	RCB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
7) POSRV discharge piping downstream of 3-way valves	RCB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
h. Integrated head assembly							
1) IHA seismic support system	RCB	SC-1	A	ASME Section III, NF - 2007 with 2008 addenda	Yes	I	
2) RCGVS flange support	RCB	SC-1	A	ASME Section III, NF - 2007 with 2008 addenda	Yes	I	
3) Main columns and cooling shroud shells	RCB	SC-3	C	ASME Section III, NF - 2007 with 2008 addenda	Yes	I	
4) Upper air plenum	RCB	NNS	D	ASME Section III, NF - 2007 with 2008 addenda	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
i. Core support structures and Internal Structures	RCB	SC-3	B	ASME Section III NG-2007 with 2008 addenda	Yes	I	(N-2)
j. Valves							
1) Pressurizer spray control valves	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
2) Pressurizer spray isolation valves	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
3) Downstream of flow restricting devices	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
4) 3-way valves of POSRV discharge piping	RCB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
k. Discharge piping vacuum breaker	RCB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
l. RCP lube oil collection tank	RCB	NNS	D	ASME Section VIII-2007 with 2008 addenda	N/A	II	(3)(d)
80. RG – Reactor Coolant Gas Vent							
a. Pressurizer gas vent piping upstream of and including the vent isolation valves V412 and 413	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
b. Reactor vessel upper head gas vent piping upstream of and including the vent isolation valves V416 and 417	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
c. RCGVS gas vent piping from downstream of the vent isolation valves V412,413,416, and 417 to and including the vent isolation valves V418,419, and 420	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
d. RCGVS gas vent piping from downstream of the vent isolation valves V418 to RDT	RCB	NNS	D	ASME B 31.1-2010	A	II	(3)(d)
e. RCGVS gas vent piping from downstream of the vent isolation valves V419, 420 to the IRWST anchor wall	RCB	NNS	D	ASME B 31.1-2010	A	II	(3)(d)
f. RCGVS gas vent piping from downstream of the IRWST anchor wall to the end point of RCGVS sparger	RCB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
81. RP – Reactor Protective							
a. PPS (plant protection system)	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 603-1991 IEEE Std. 7-4.3.2-2003, ASME NQA-1-2008 IEC 61000-4-2-1992	Yes	I	
b. MTP (maintenance test panel)	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 603-1991 IEEE Std. 7-4.3.2-2003, ASME NQA-1-2008 IEC 61000-4-2-1992	Yes	I	
c. ITP (integrated test processor)	AB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 603-1991 IEEE Std. 7-4.3.2-2003, ASME NQA-1-2008 IEC 61000-4-2-1992	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
82. RS – Remote Shutdown Room							
a. Frame	AB	SC-3	N/A	IEEE Std. 603-1991 IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 420-2013	Yes	I	
b. IFPD	AB	NNS	N/A	N/A	A	II	(3)(d)
c. ESCM	AB	SC-3	N/A	IEEE Std. 603-1991 IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 420-2013	Yes	I	
d. Shutdown overview display panel (SODP)	AB	NNS	N/A	N/A	A	I	(N-9)
e. Class 1E switch	AB	SC-3	N/A	IEEE Std. 603-1991 IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 420-2013	Yes	I	
f. Non-Class 1E switch	AB	NNS	N/A	N/A	A	II	(3)(d)
83. RW – Radwaste Control Room	CB	NNS	N/A	N/A	N/A	III	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
84. SA – Service Air							
a. Containment isolation valves and associated piping	AB, CPB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
b. Non-safety-related piping and equipment in safety-related areas	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
c. Air compressor and auxiliaries	TGB	NNS	D	N/A	N/A	III	
d. Piping in non-safety-related areas	TGB	NNS	D	ASME B31.1-2010	N/A	III	
e. Others	TGB	NNS	D	N/A	N/A	III	
85. SC – Shutdown Cooling							
a. Shutdown cooling pumps	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
b. Shutdown cooling heat exchanger (tube/shell)	AB	SC-2/ SC-3	B/C	ASME Section III NC/ND-2007 with 2008 addenda	Yes	I	(N-1)
c. Shutdown cooling pump mini-flow heat exchanger (tube/shell)	AB	SC-2/ SC-3	B/C	ASME Section III NC/ND-2007 with 2008 addenda	Yes	I	(N-1)
d. Piping and Valves							
1) SCS suction piping and valves on the RCS side from RCS hot leg up to including SI-653, 654	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
2) SC piping and valves from downstream of SI-653, 654 to the connecting point to SIS in the downstream of SI-601/600	RCB, AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
3) Piping and valves on the IRWST cooling line from downstream of SI-688, 693 to SI-300, 301 (up to and including SI-391)	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
4) External reactor vessel cooling fill line downstream of and excluding SI-391	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
5) Piping and valves on the SCS filling line from and including SI-708, 709 to upstream of SI-106	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
6) Radioactive drain system connection piping	RCB, AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
7) All relief valves discharge piping	RCB, AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
86. SD – SG Blowdown							
a. Valves and piping from SG up to the anchor wall of the blowdown flash tank room, including containment isolation valves	RCB, AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
b. Blowdown flash tank	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d), (4)
c. Regenerative heat exchanger	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d), (4)
d. Mixed bed demineralizer	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d), (4)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
e. Valves and piping from the anchor wall of the blowdown flash tank room to the point (V050) where discharged into the condensate	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d), (4)
f. Valves and piping from the points (V1045, 050) where discharged into the condensate, and the wastewater treatment system to the auxiliary building wall.	AB	NNS	D	ASME B31.1-2010	N/A	III	
g. Valves and piping from the blowdown flash tank to MSVH	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d), (4)
h. Valves and piping at the downstream MSVH	AB, TGB	NNS	D	ASME B31.1-2010	N/A	III	
i. Valves and piping except (e), (f), (g), and (h) within auxiliary building	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d), (4)
j. Valves and piping from the point (V050), where discharged into the condensate, to the liquid radwaste system	CPB	NNS	D	ASME B31.1-2010	N/A	III	(4)
k. Equipment and piping within the compound building and turbine building	CPB, TGB	NNS	D	ASME B31.1-2010	N/A	III	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
l. Wet lay-up recirculation pump	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d), (4)
m. Valves and piping from wet lay-up subsystem within containment or auxiliary building except the containment penetration area and pressure boundaries.	RCB, AB	NNS	D	ASME B31.1-2010	N/A	II	(3)(d), (4)
n. Valves and piping of the containment penetration area and SG pressure boundaries	RCB, AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
o. Steam generator blowdown prefilters and postfilter		NNS	D	ASME Section VIII-2007 with 2008 addenda	A	II	(3)(d), (4)
87. SI – Safety Injection							
a. Safety injection pumps	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
b. Safety injection tanks	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
c. Safety injection filling tank	AB	NNS	D	ASME Section VIII-2007 with 2008 addenda	N/A	III	
d. Piping and valves							
1) SIP miniflow line (from SIP orifice or SI-218, 219, 254, 255 to IRWST)	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
2) SI piping and valves from IRWST to upstream of and excluding the check valves SI-543, 541, 542, 540 and SI-523, 533	RCB, AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
3) SI piping and valves between the DVI nozzle and including the check valves SI-543, 541, 542, 540, SIT check valve SI-245, 225, 235, 215, and SI-648, 628, 638, 618	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
4) Hot leg injection piping downstream of and including SI-523, 533 and SI-322, SI-332 to the piping connected to the SCS suction line.	RCB	SC-1	A	ASME Section III NB-2007 with 2008 addenda	Yes	I	
5) Piping and valves on the SIT filling and drain line from and including SI-290 to up to and including SI-661 and up to and excluding SI-322, SI-332, SI-245, 225, 235, 215, SI-648, 628, 638, 618. Piping between the valves SI-290 and SI-293 is not included.	RCB, AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
6) SIT filling piping between the valves SI-290 and SI-293 (excluding SI-290 and SI-293)	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	

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SSC Identification	Location[2]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[3]	Seismic Category	Remarks
7) SIT nitrogen supply piping up to and including valves SI-642, 622, 632, 612, 649, 629, 639, 619	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
8) Piping and valves on the SIT atmosphere vent line up to and including valves SI-643, 623, 633, 613, 608, 606, 607, 605	RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
9) Piping and valves on the SIS filling line from and including SI-700, 714, 701, 715 to the piping downstream of SI-476, 435, 478, 447	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
10) Piping and valves on the SIS filling line from SIFT to up to and including SI-722 and up to and excluding SI-700, 714, 701, 715 and SI-708, 709	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
11) SIFT vent line	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
12) Radioactive drain system connection piping	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
13) All relief valves discharge piping	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
88. SS – RCP Shaft Speed Sensing							
a. Safety-related components	RCB	SC-3	N/A	IEEE Std. 323-2003 IEEE Std. 344-2004 IEEE Std. 383-2003	Yes	I	
b. Non-safety-related components	RCB	NNS	N/A	N/A	A	II	(3)(d)
89. SX – Essential Service Water							
a. Essential service water pumps	ESWB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
b. Essential service water debris filters	CCWHXB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
c. ESW piping and valves excluding the following 1) through 3) below:	CCWHXB/ ESWB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
1) ESW blowdown piping excluding the isolation valve SX-1063, SX1065 in the division I, and SX-1064, SX-1066 in the division II	ESWB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
2) Radiation monitoring piping excluding the isolation valve SX-2071, SX-2073 in the division I, and SX-2072, SX-2074 in the division II	CCWHXB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
3)Backwash discharge piping excluding the isolation valve SX-3102 and SX-3104	CCWHXB	NNS	D	ASME B31.1-2010	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
90. SY – Switchyard							
a. GIS and panels	Switch Yard	NNS	N/A	N/A	N/A	III	
b. EMS RTU, fault recorder	Switch Yard	NNS	N/A	N/A	N/A	III	
91. TA – Main Turbine and Auxiliary	TGB	NNS	D	ASME B31.1-2010	N/A	III	
92. TV – Closed Circuit Television							
a. Equipment in safety-related areas	RCB, AB, CCWHXB	NNS	N/A	N/A	A	II	(3)(d)
b. Others	AB	NNS	N/A	N/A	N/A	III	
93. VB – Compound Building HVAC							
a. Air handling units (AHUs) and associated components	CPB	NNS	E	ASME AG-1-2009	N/A	III	
b. Air cleaning units (ACUs) and associated components	CPB	NNS	E	ASME AG-1-2009 ASME N509-2002	N/A	III	(15)
c. Cubicle coolers and associated components	CPB	NNS	E	ASME AG-1-2009	N/A	III	
d. Packaged air conditioning units	CPB	NNS	E	ASME AG-1-2009	N/A	III	
e. Fans and motors	CPB	NNS	E	ASME AG-1-2009	N/A	III	
f. Dampers	CPB	NNS	E	ASME AG-1-2009	N/A	III	
g. Ductwork	CPB	NNS	E	ASME AG-1-2009	N/A	III	
h. Electric duct heaters	CPB	NNS	E	ASME AG-1-2009	N/A	III	
i. Humidifier	CPB	NNS	E	ASME AG-1-2009	N/A	III	

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SSC Identification	Location[(2)]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[(3)]	Seismic Category	Remarks
94. VC – Control Room HVAC							
a. Control room supply and return air subsystem							
1) AHUs and associated components excluding cooling coils	AB	SC-3	G	ASME AG-1-2009	Yes	I	
2) AHU cooling coils	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
3) Dampers	AB	SC-3	G	ASME AG-1-2009	Yes	I	
4) Humidifiers	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
5) Ductwork	AB	SC-3	G	ASME AG-1-2009	Yes	I	
b. Emergency makeup air cleaning subsystem							
1) ACUs and associated components	AB	SC-3	G	ASME AG-1-2009 ASME N509-2002	Yes	I	
2) Dampers	AB	SC-3	G	ASME AG-1-2009	Yes	I	
3) Ductwork	AB	SC-3	G	ASME AG-1-2009	Yes	I	
c. Exhaust air subsystem	AB						
1) Fan and motor	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
2) Isolation dampers (Y0027 & Y0028), tornado damper (Y1102), and exhaust ductwork between the isolation dampers (Y0027 & Y0028) and exhaust ductwork of the tornado damper (Y1102) outlet	AB	SC-3	G	ASME AG-1-2009	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
3) Exhaust ductwork excluding exhaust ductwork between the isolation dampers (Y0027 & Y0028) and exhaust ductwork of the tornado damper (Y1102) outlet	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
d. Computer room air conditioning subsystem							
1) Packaged air conditioning units	AB	NNS	E	ASME AG-1-2009	N/A	III	
2) Dampers	AB	NNS	E	ASME AG-1-2009	N/A	III	
3) Ductwork	AB	NNS	E	ASME AG-1-2009	N/A	III	
e. Smoke removal subsystem							
1) Fan and motor	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
2) Isolation dampers (Y0029 & Y0030), tornado damper (Y1103), and smoke removal ductwork between the isolation dampers (Y0029 & Y0030) and smoke removal ductwork of the tornado damper (Y1103) outlet	AB	SC-3	G	ASME AG-1-2009	Yes	I	
3) Smoke removal ductwork excluding smoke removal ductwork between the isolation dampers (Y0029 & Y0030) and smoke removal ductwork of the tornado damper (Y1103) outlet	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
95. VD – EDG Area HVAC							
a. EDG room emergency HVAC subsystem							
1) Cubicle coolers and associated components excluding cooling coils	EDGB	SC-3	G	ASME AG-1-2009	Yes	I	
2) Cubicle cooler cooling coils	EDGB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
3) Dampers	EDGB	SC-3	G	ASME AG-1-2009	Yes	I	
4) Ductwork	EDGB	SC-3	G	ASME AG-1-2009	Yes	I	
b. EDG room normal HVAC subsystem							
1) AHUs and associated components excluding cooling coils	EDGB	SC-3	G	ASME AG-1-2009	Yes	I	
2) AHU cooling coils	EDGB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
3) Fans and motors	EDGB	SC-3	G	ASME AG-1-2009	Yes	I	
4) Dampers	EDGB	SC-3	G	ASME AG-1-2009	Yes	I	
5) Ductwork	EDGB	SC-3	G	ASME AG-1-2009	Yes	I	
6) Electric duct heaters	EDGB	SC-3	G	ASME AG-1-2009	Yes	I	
c. Diesel fuel oil storage tank room HVAC subsystem							
1) Fans and motors	EDGB	SC-3	G	ASME AG-1-2009	Yes	I	
2) Dampers	EDGB	SC-3	G	ASME AG-1-2009	Yes	I	
3) Ductwork	EDGB	SC-3	G	ASME AG-1-2009	Yes	I	
4) Electric duct heaters	EDGB	SC-3	G	ASME AG-1-2009	Yes	I	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
96. VE – Electrical and I&C equipment areas HVAC							
a. Electrical and I&C equipment areas HVAC subsystem							
1) Safety-related cubicle coolers and associated components excluding cooling coils	AB	SC-3	G	ASME AG-1-2009	Yes	I	
2) Safety-related cubicle cooler cooling coils	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
3) Non-safety-related cubicle coolers and associated components	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
4) Safety-related electric duct heaters	AB	SC-3	G	ASME AG-1-2009	Yes	I	
5) Non-safety-related electric duct heaters	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
6) Humidifiers	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
7) Dampers	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
8) Ductwork	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
b. CEDM M/G set room HVAC subsystem							
1) AHU and associated components	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
2) Electric duct heaters	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
3) Humidifiers	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
4) Dampers	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
5) Ductwork	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
c. Class 1E battery room HVAC subsystem							
1) Fans and motors	AB	SC-3	G	ASME AG-1-2009	Yes	I	
2) Dampers	AB	SC-3	G	ASME AG-1-2009	Yes	I	
3) Electric duct heaters	AB	SC-3	G	ASME AG-1-2009	Yes	I	
4) Ductwork	AB	SC-3	G	ASME AG-1-2009	Yes	I	
d. Non-Class 1E battery room exhaust subsystem							
1) Fans and motors	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
2) Dampers	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
3) Electric duct heaters	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
4) Ductwork	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
e. Remote shutdown room HVAC subsystem							
1) Fans and motors	AB	SC-3	G	ASME AG-1-2009	Yes	I	
2) Safety-related cubicle coolers and associated components excluding cooling coils	AB	SC-3	G	ASME AG-1-2009	Yes	I	
3) Safety-related cubicle cooler cooling coils	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
4) Electric duct heaters	AB	SC-3	G	ASME AG-1-2009	Yes	I	
5) Humidifiers	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
6) Dampers	AB	SC-3	G	ASME AG-1-2009	Yes	I	
7) Ductwork	AB	SC-3	G	ASME AG-1-2009	Yes	I	

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SSC Identification	Location[(2)]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[(3)]	Seismic Category	Remarks
f. Remote control console room HVAC subsystem							
1) Packaged air conditioning unit	AB	NNS	E	ASME AG-1-2009	N/A	III	
97. VF – Fuel Handling Area HVAC							
a. Normal HVAC subsystem							
1) AHU and associated components	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
2) ACU and associated components	AB	NNS	E	ASME AG-1-2009 ASME N509-2002	A	II	(3)(d), (15)
3) Isolation dampers Y0001A & Y0002B, tornado damper Y1202A, and ductwork from outside intake to Y002B	AB	SC-3	G	ASME AG-1-2009	Yes	I	
4) Isolation dampers Y003A & Y0004B, tornado dampers Y1201A & Y1201B, and ductwork from Y0003A to exhaust duct termination	AB	SC-3	G	ASME AG-1-2009	Yes	I	
5) Dampers excluding tornado dampers Y1201A, Y1201B, and Y1202A, and isolation dampers Y0001A, Y0002B,Y003A, and Y0004B	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
6) Ductwork excluding ductwork from outside intake to Y002B and ductwork from Y0003A to exhaust duct termination	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)

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SSC Identification	Location[(2)]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[(3)]	Seismic Category	Remarks
b. Emergency HVAC Subsystem							
1) ACUs and associated components	AB	SC-3	G	ASME AG-1-2009 ASME N509-2002	Yes	I	
2) Safety-related cubicle coolers and associated components excluding cooling coils	AB	SC-3	G	ASME AG-1-2009	Yes	I	
3) Safety-related cubicle cooler cooling coils	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
4) Dampers	AB	SC-3	G	ASME AG-1-2009	Yes	I	
5) Ductwork	AB	SC-3	G	ASME AG-1-2009	Yes	I	
98. VK – Auxiliary Building Controlled Area HVAC							
a. HELB area HVAC subsystem							
1) AHU and associated components	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
2) ACU and associated components	AB	NNS	E	ASME AG-1-2009 ASME N509-2002	A	II	(3)(d), (15)
3) Cubicle coolers and associated components	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
4) Dampers	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
5) Ductwork	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)

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SSC Identification	Location[2]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[3]	Seismic Category	Remarks
b. Aux. building controlled area I/II HVAC subsystem							
1) AHUs and associated components	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
2) Normal ACUs and associated components	AB	NNS	E	ASME AG-1-2009 ASME N509-2002	A	II	(3)(d), (15)
3) Emergency ACUs and associated components	AB	SC-3	G	ASME AG-1-2009 ASME N509-2002	Yes	I	
4) Dampers and ductwork associated with emergency ACUs	AB	SC-3	G	ASME AG-1-2009	Yes	I	
5) Isolation dampers, tornado dampers Y1401A & Y1402B, and ductwork between and including Y0017A & Y0019B, Y0018A & Y0020B, Y0021A & Y0023B, Y0022A & Y0024B	AB	SC-3	G	ASME AG-1-2009	Yes	I	
6) Dampers and ductwork associated with AHUs and normal ACUs excluding isolation dampers, tornado dampers Y1401A & Y1402B, and ductwork between and including Y0017A & Y0019B, Y0018A & Y0020B, Y0021A & Y0023B, Y0022A & Y0024B	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
7) Safety-related cubicle coolers and associated components excluding cooling coils	AB	SC-3	G	ASME AG-1-2009	Yes	I	
8) Safety-related cubicle cooler cooling coils	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
9) Non-safety-related cubicle coolers and associated components	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)

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SSC Identification	Location[2]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[3]	Seismic Category	Remarks
99. VO – Auxiliary Building Clean Area HVAC							
a. Auxiliary building clean area I/II HVAC subsystem							
1) AHUs and components	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
2) Fans and motors	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
3) Safety-related cubicle coolers and associated components excluding cooling coils	AB	SC-3	G	ASME AG-1-2009	Yes	I	
4) Safety-related cubicle cooler cooling coils	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
5) Non-safety-related cubicle coolers and associated components	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
6) Dampers	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
7) Ductwork	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
b. Main steam valve room HVAC subsystem							
1) AHUs and associated components	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
2) Dampers	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
3) Ductwork	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
c. Main steam enclosure HVAC subsystem	AB						
1) Fans and motors	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
2) Dampers	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
3) Ductwork	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
d. Auxiliary building smoke removal HVAC subsystem							
1) Fans and motors	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
2) Dampers	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
3) Ductwork	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
100. VP – Reactor Containment Building HVAC							
a. RCFC and associated components	RCB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
b. AHU and associated components	RCB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
c. Fans and motors	RCB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
d. Dampers	RCB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
e. Ductwork	RCB	NNS	E	ASME AG-1-2009	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
101. VQ – Reactor Containment Purge							
a. Containment isolation portions (including isolation damper and piping)	AB, RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
b. ACUs and associated components	AB	NNS	E	ASME AG-1-2009 ASME N509-2002	A	II	(3)(d) , (15)
c. AHU and associated components	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
d. Fans and motors	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
e. Dampers	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
f. Ductwork	AB	NNS	E	ASME AG-1-2009	A	II	(3)(d)
102. VT – Turbine Building HVAC							
a. AHUs and associated components	TGB	NNS	E	ASME AG-1-2009	N/A	III	
b. Fans and motors	TGB	NNS	E	ASME AG-1-2009	N/A	III	
c. Cubicle coolers and associated components	TGB	NNS	E	ASME AG-1-2009	N/A	III	
d. Electric duct heaters	TGB	NNS	E	ASME AG-1-2009	N/A	III	
e. Packaged air conditioning units and components	TGB	NNS	E	ASME AG-1-2009	N/A	III	
f. Dampers	TGB	NNS	E	ASME AG-1-2009	N/A	III	
g. Ductwork	TGB	NNS	E	ASME AG-1-2009	N/A	III	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
103. WH – Turbine Generator Building Open Cooling Water	TGB	NNS	D	ASME B31.1-2010	N/A	III	
104. WD – Domestic Water							
a. Hydropneumatic tank	FPWTB	NNS	D	ASME Section VIII-2007 with 2008 addenda	N/A	III	
b. Domestic water pumps	FPWTB	NNS	D	HI Standards-2010	N/A	III	
c. Non-safety-related components and piping in safety-related areas	AB, CCWHXB, ESWB	NNS	D	ASME Section VIII-2007 with 2008 addenda ASME B31.1-2010	A	II	(3)(d)
105. WI – Plant Chilled Water							
a. Central chilled water subsystem							
1) Containment penetration portions (including isolation valves and piping)	AB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
2) Chillers	AB	NNS	E	ASME Section VIII-2010 ASME AG-1-2009	A	II	(3)(d)
3) Pumps	AB	NNS	D	HI Standards-2010	A	II	(3)(d)
4) Compression tank	AB	NNS	D	ASME Section VIII-2010	A	II	(3)(d)

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
5) Air separator	AB	NNS	D	ASME Section VIII-2010	A	II	(3)(d)
6) Chemical additive tank	AB	NNS	D	ASME Section VIII-2010	A	II	(3)(d)
7) Control valves	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
8) Manual valves	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
9) Piping and accessories	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
b. Compound building chilled water subsystem							
1) Chillers	CPB	NNS	E	ASME Section VIII-2010 ASME AG-1-2009	N/A	III	
2) Pumps	CPB	NNS	D	HI Standards-2010	N/A	III	
3) Compression tank	CPB	NNS	D	ASME Section VIII-2010	N/A	III	
4) Air separator	CPB	NNS	D	ASME Section VIII-2010	N/A	III	
5) Chemical additive tank	CPB	NNS	D	ASME Section VIII-2010	N/A	III	
6) Control valves	CPB	NNS	D	ASME B31.1-2010	N/A	III	
7) Manual valves	CPB	NNS	D	ASME B31.1-2010	N/A	III	
8) Piping	CPB	NNS	D	ASME B31.1-2010	N/A	III	
106. WM – Demineralized Water Makeup							
a. Containment isolation valves and associated piping	AB, RCB	SC-2	B	ASME Section III NC-2007 with 2008 addenda	Yes	I	
b. Non-safety-related components and piping in safety-related areas	AB, RCB	NNS	D	ASME B31.1-2010	A	II	(3)(d) (3)(e)
c. Demineralized water storage tank	Yard	NNS	D	API 650-2007	N/A	III	

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SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
d. Demineralized water transfer pumps	FPWTB	NNS	D	HI Standards-2010	N/A	III	
e. WM-V1201A, V1205A, V1220	Yard, FPWTB, UCT	NNS	D	ASME B31.1-2010	A	III	(3)(e)
f, Other components and piping in water treatment building	FPWTB	NNS	D	ASME Section VIII-2007 with 2008 addenda ASME B31.1-2010	N/A	III	
107. WO – Essential Chilled Water							
a. Chillers	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
b. Pumps	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
c. Compression tanks and air separators	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
d. Control valves	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
e. Manual valves	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
f. Piping	AB	SC-3	C	ASME Section III ND-2007 with 2008 addenda	Yes	I	
g. Chemical additive tanks	AB	NNS	D	ASME Section VIII-2010	A	II	(3)(d)
h. Refrigerant exhaust piping	AB	NNS	D	ASME Section VIII-2010	A	II	(3)(d)
i. Demineralized water makeup control valves	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)

Table 3.2-1 (81 of 86)

SSC Identification	Location(2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
j. Demineralized water makeup manual valve	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
k. Nitrogen makeup control valves	AB	NNS	D	ASME B31.1-2010	A	II	(3)(d)
108. WT – Turbine Generator Building Closed Cooling Water							
a. Pumps	TGB	NNS	D	HI Standards-2010	A	III	(3)(e)
b. Surge tank	TGB	NNS	D	ASME Section VIII-2007 with 2008 Addenda	A	III	(3)(e)
c. Heat exchangers, and chemical addition tank	TGB	NNS	D	ASME Section VIII-2007 with 2008 Addenda	N/A	III	
d. Valves and associated piping	TGB	NNS	D	ASME B31.1-2010	N/A	III	
109. WV – Liquid Radwaste							
a. Piping and components in safety-related areas	AB	NNS	D	ASME B31.1 - 2010	A	II	(3)(d)
b. Piping and valve containing radioactive materials	CPB	NNS	D	ASME B31.3 - 2010	Note (4)	Note (4)	
c. Floor drain tank	CPB	NNS	D	API650 - 2007	Note (4)	Note (4)	
d. Equipment waste tank	CPB	NNS	D	API650 – 2007	Note (4)	Note (4)	
e. Chemical waste tank	CPB	NNS	D	API650 – 2007	Note (4)	Note (4)	
f. Monitor tank	CPB	NNS	D	API650 – 2007	Note (4)	Note (4)	

Table 3.2-1 (82 of 86)

SSC Identification	Location[(2)]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B[(3)]	Seismic Category	Remarks
g. Acid storage tank	CPB	NNS	D	API650 – 2007	N/A	III	Not containing radioactive material
h. Acid batch tank	CPB	NNS	D	API650 – 2007	N/A	III	Not containing radioactive material
i. Caustic storage tank	CPB	NNS	D	API650 – 2007	N/A	III	Not containing radioactive material
j. Seal water storage tank	CPB	NNS	D	API650 – 2007	Note (4)	Note (4)	
k. Caustic batch tank	CPB	NNS	D	API650 – 2007	N/A	III	Not containing radioactive material
l. Chemical additive tank	CPB	NNS	D	API650 – 2007	N/A	III	Not containing radioactive material
m. Floor drain pump	CPB	NNS	D	API610 - 2010	Note (4)	Note (4)	
n. Equipment waste pump	CPB	NNS	D	API610 - 2010	Note (4)	Note (4)	
o. Chemical waste pump	CPB	NNS	D	API610 - 2010	Note (4)	Note (4)	
p. Monitor tank pump	CPB	NNS	D	API610 - 2010	Note (4)	Note (4)	
q. Seal water pump	CPB	NNS	D	API610 - 2010	Note (4)	Note (4)	
r. Acid batch pump	CPB	NNS	D	API610 - 2010	N/A	III	Not containing radioactive material

Table 3.2-1 (83 of 86)

SSC Identification	Location[2]	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B [3]	Seismic Category	Remarks
s. Caustic batch pump	CPB	NNS	D	API610 - 2010	N/A	III	Not containing radioactive material
t. Chemical additive pump	CPB	NNS	D	API610 - 2010	N/A	III	Not containing radioactive material
u. LRS seal water heat exchanger	CPB	NNS	D	ASME Section VIII - 2007 TEMA – 2007	Note (4)	Note (4)	
v. RO package	CPB	NNS	D	ASME Section VIII – 2007	Note (4)	Note (4)	
110. WX – Solid Radwaste							
a. Piping and components in safety-related areas	AB	NNS	D	ASME B31.1 - 2010 ASME Section VIII – 2007	A	II	(3)(d)
b. Solid waste compactor	CPB	NNS	D	N/A	N/A	III	
c. Piping and components containing radioactive material	AB, CPB	NNS	D	ASME B31.3 - 2010 ASME Section VIII - 2007 API-650 – 2007	Note (4)	Note (4)	
d. Low-activity spent resin tank	CPB	NNS	D	ASME Section VIII - 2007	Note (4)	Note (4)	
e. Spent resin long term storage tank	CPB	NNS	D	API650 – 2007	Note (4)	Note (4)	
f. New resin tank	AB	NNS	D	ASME Section VIII – 2007	A	II	(3)(d)
111. WY – Detergent Waste							
a. Detergent waste tank	CPB	NNS	D	API650 – 2007	Note (4)	Note (4)	
b. Detergent waste tank pump	CPB	NNS	D	API610 – 2010	Note (4)	Note (4)	

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SSC Identification	Location (2)	Safety Class	Quality Group	Codes and Standards	10 CFR 50, App. B(3)	Seismic Category	Remarks
c. Detergent waste filter	CPB	NNS	D	ASME Section VIII - 2007	Note (4)	Note (4)	
d. Piping and valves containing radioactive material	CPB	NNS	D	ASME B31.3-2010	Note (4)	Note (4)	
112. DT - Turbine Generator Building Drain The COL applicant is to provide the classification of structures, systems, and components for turbine generator building drain system (COL 3.2(3)).							

(1) As used in this document, the term safety-related area applies to those areas containing equipment or structures required for safe shutdown (including accident mitigation).

(2) Locations are defined below:

RCB = Reactor Containment Building
CPB = Compound Building
CCWHXB = Component Cooling Water Heat Exchanger Building
CWPH=Circulating Water Pump House
MSVH = Main Steam Valve House
EOF = Emergency Operation Facility
AAC GTGB = Alternate Alternating Current Gas Turbine Generator Building
SWYD = Switchyard
AB = Auxiliary Building
TGB = Turbine Generator Building
ESWB = Essential Service Water Building
FPWTB = Fire Pump & Water/Wastewater Treatment Building
FHA = Fuel Handling Area
EDGB = Emergency Diesel Generator Building
ALL = All areas

(3) Legend:

- Yes – Compliance with the requirements of 10 CFR Part 50, Appendix B, is required.
- A – Augmented quality assurance requirements of Appendix B to 10 CFR Part 50, is applied. Augmented quality controls are applied to the following areas:
  - (a) ATWS (Anticipated Transient without Scram)
  - (b) Station Blackout
  - (c) Fire Protection
  - (d) Seismic Category II SSCs, external injection provision to cope with severe accident
  - (e) Risk significant non-safety-related SSCs determined by design RAP
- N/A – The requirements of 10 CFR Part 50, Appendix B, are not required.

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(4) Designed in accordance with NRC RG 1.143. The radwaste facilities, including the structures, systems, and components, are designed to meet the design basis loads, including the natural phenomena and internal and/or external man-induced hazards design criteria, in accordance with NRC RG 1.143.

- The radwaste safety classifications for the radioactive waste management systems: LWMS, GWMS, SWMS, and the SGBD systems and components, are presented in Sections 11.2, 11.3, 11.4, and 10.4.8, respectively.
- The radwaste safety classification for the compound building and the auxiliary building, in which the radioactive waste management systems (LWMS, GWMS, and SWMS) and the components for the SGBD system are housed respectively, is RW-IIa in accordance with the guidance in NRC RG 1.143.

(5) Designed based on guidance contained in NRC NUREG-0696 and NUREG-0737, Supplement 1.

(6) Security system requirements per 10 CFR Part 73.

(7) NRC RG 1.97 endorses IEEE Std. 497 as an acceptable method for providing instrumentation to monitor variables for accident conditions, subject to the 5 NRC positions. Instrumentation meets qualification and quality requirements of NRC RG 1.97 and IEEE Std. 497.

(8) Guidance per NUREG-0718 and NRC RG 1.47.

(9) Earthquake monitoring is per NRC RG 1.12.

(10) Design guidance per NRC RG 1.13.

(11) Design guidance per NRC RG 1.13, NUREG-0554, and NUREG-0612.

(12) Design guidance per NRC RG 1.189.

(13) The entire crane, including the bridge and trolley, is designed and constructed in accordance with NRC RG 1.29.

(14) Non-safety-related diverse protection system per 10 CFR 50.62 and GL 85-06.

(15) Non-safety-related ACUs and components, including fan/motor and associated isolation dampers, are designed and constructed per NRC RG 1.140.

(16) Design guidance per NRC RG 1.45.

(17) These codes and standards are applied to requirements of interface design.

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NSSS Notes:

(N-1) Two safety classes are used for heat exchangers to distinguish primary and secondary sides where they are different.

(N-2) All of the reactor internals are classified as seismic Category I.

(N-3) The reactor coolant pump (RCP) auxiliaries are not required to be classified as seismic Category I because 1) continuous operation of the pumps is not required during or following an SSE and 2) sufficient time is available (i.e., >30 minutes) for the operator to stop the RCPs before loss of the RCP auxiliaries would cause any damage to the RCPs (see CENPD-201-A).

(N-4) Only those structural portions of the RCPs that comprise the RCPB and, therefore, support the safety function of the integrity of the RCPB must be categorized as Safety Class 1.

(N-5) Safety classes of piping within the RCPB (as defined in 10 CFR 50) are selected in accordance with the ANSI/ANS 51.1 criteria. Safety Classes 1, 2, 3 and Non-Nuclear Safety of ANSI/ANS 51.1 are equivalent to Quality Groups A, B, C, and D of NRC RG 1.26, respectively.

(N-6) Flow-restricting orifices are provided in the nozzles for the RCS sampling lines, the pressurizer (PZR) level and pressure instruments, the RCP differential pressure instrument lines, the common SI header pressure instrument lines, the RCP seal pressure instrument lines, the charging line differential pressure instrument line, and the SI hot leg injection pressure instrument lines to limit flow in the event of a downstream break of a nozzle. The orifice size, 5.55 mm (7/32 in.) diameter × 25.4 mm (1 in.) long, precludes exceeding fuel design limits while using minimum makeup rates. This permits orderly shutdown in the event of a downstream break in accordance with 10 CFR Part 50, Appendix A, GDC 33. A reduction may therefore be made in the classification of downstream lines of the orifice.

(N-7) All containment isolation valves (and their operators) within NSSS scope of supply including manual valves, check valves, and relief valves, which also serve as isolation valves, are subject to the pertinent requirements of the Quality Assurance Program.

(N-8) The POSRVs are used for overpressure protection and rapid depressurization function.

(N-9) The "Associated Circuits" are defined, in accordance with IEEE Std. 384, as equipment, components, or systems the functions of which are Non-Nuclear Safety (NNS) and electrically Non-Class 1E, though their failures or abnormal states can affect the Class 1E equipment, components, or systems due to the effects of less than the minimum separation or the absence of electrical isolation from the Class 1E equipment, components, or systems. Consequently, the equipment, components, or systems, which are defined as "Associated Circuits" although they are functionally Non-Nuclear Safety, are subject to the qualification requirements placed on Class 1E equipment, components, or systems.

(N-10) Codes and standards are not specified because CEDM motor assembly and extension shaft assembly are neither pressure boundary components nor electric component. Safety function of those components is limited to scramability.

Table 3.2-2

Classification System Relationship

Quality Group	Safety Class	Seismic Category
A	SC-1	I
B	SC-2	I
C, G	SC-3	I
D, E	NNS	I [(1)] II III

(1) Seismic Category I items that are not safety-related but are required by regulatory requirements to be designed for seismic loads are Quality Group D or E (e.g., portions of fire protection system).

3.3 Wind and Tornado Loadings

All seismic Category I and II structures, systems, and components (SSCs), except those not exposed to wind, are designed for wind and tornado/hurricane loadings.

3.3.1 Wind Loadings

The design wind loadings on the surfaces of seismic Category I and II SSCs subject to wind are determined in accordance with ASCE/SEI 7-05 (Reference 1).

Load combinations including wind loads are discussed in Section 3.8.

3.3.1.1 Design Wind Velocity and Recurrence Interval

The 50-year 3-second wind gust speed of 64.8 m/s (145 mph) corresponds to the wind speed at 10 m (33 ft) above ground for exposure Category C (open terrain), as defined in Section 6.5.6.3 of ASCE/SEI 7-05 (Reference 1). A recurrence interval of the design wind speed is 50 years with a 0.02 annual probability of being exceeded.

The design wind speed specified for the APR1400 standard plant covers most of the contiguous United States based on the basic wind speed map provided in Figure 6-1 of ASCE/SEI 7-05 (Reference 1).

The COL applicant is to demonstrate that the site-specific design wind speed is bounded by the design wind speed of 64.8 m/s (145 mph) (COL 3.3(1)).

3.3.1.2 Determination of Applied Forces

Wind pressure on the surfaces of the seismic Category I and II SSCs is determined in accordance with Equation (6-15) of ASCE/SEI 7-05 (Reference 1). The wind directionality factor (K_d), velocity pressure exposure coefficient (K_z), and topographic factor (K_{zt}) are defined in SRP 3.3.1 and conform with the provisions of SRP 3.3.1. For seismic Category I and II SSCs, an importance factor (I) of 1.15 is used in order to be compatible with the recurrence interval of 100 years. Exposure category D is applied in determining wind loads regardless of the site location.

Wind forces on the surfaces of seismic Category I and II structures, which are classified as enclosed or partially enclosed structures, are determined in accordance with the equation (6-17) of ASCE/SEI 7-05 (Reference 1).

All non-safety-related facilities subject to winds are designed using the same design wind speed and methodology applied to seismic Category I SSCs except the load combinations. A wind-loading-caused full or partial failure of seismic Category II SSCs adjacent to seismic Category I SSCs does not affect the ability of the seismic Category I SSCs to perform their intended safety functions. Otherwise, the seismic Category I SSCs are designed to maintain their integrity from the failure of seismic Category II SSCs.

The COL applicant is to demonstrate that the site-specific seismic Category II structures adjacent to the seismic Category I structures are designed to meet the provisions described above (COL 3.3(2)).

3.3.2 Tornado Loadings

The APR1400 standard and site-specific plant is designed to protect SSCs listed in the Appendix to NRC Regulatory Guide (RG) 1.117 (Reference 2) from tornadoes and hurricanes. All seismic Category I and II SSCs subject to tornado and hurricane winds are designed to meet the acceptance criteria described in Section 3.8.

3.3.2.1 Applicable Design Parameters

As provided in Table 2.0-1, the design basis tornado parameters are the same as those of Region I and categorized in NRC RG 1.76 (Reference 3). The annual probability of exceedance of the design basis tornado described above is 10^{-7}, and the corresponding recurrence interval is approximately 10 million years.

The maximum wind speed of design basis hurricane is 116 m/s (260 mph) from the wind speed contour maps for hurricane-prone regions of the contiguous United States presented in NRC RG 1.221 (Reference 4). The annual probability of exceedance of the design basis hurricane is 10^{-7}. The wind speed is nominal 3-second peak gust at a height of 10 m (33 ft) in flat open terrain.

The seismic Category I and II SSCs subject to extreme winds such as the design basis tornado or design basis hurricane are designed individually for the postulated extreme winds enveloping both the design basis tornado and design basis hurricane in terms of straight winds and wind-borne missiles. The pressure drop effects due only to the design basis tornado are combined with the design basis hurricane loadings, as described in Subsection 3.3.2.2.4.

The COL applicant is to perform an analysis if the site-specific wind and tornado/hurricane characteristics are not bounded by the site parameter postulated for the certified design (COL 3.3(3)).

3.3.2.2 Determination of Forces on Structures

The forces on seismic Category I and II SSCs due to the postulated extreme winds are obtained using methods outlined in Subsection 3.3.1.2. The missile barriers of the seismic Category I structures are designed based on the missiles listed in Table 3.5-2. The design method of missile barriers is presented in Subsection 3.5.3. The pressure drop effects due to the design basis tornado are determined using the guidance provided by Simiu and Scanlan (Reference 5). The loading combinations associated with the postulated extreme wind loadings are described in Tables 3.8-2, 3.8-7A, and 3.8-7B.

3.3.2.2.1 Hurricane Velocity Forces

Velocity forces due to the postulated extreme winds are determined using the approach described in Subsection 3.3.1.2 in conjunction with an importance factor (I) of 1.15 in accordance with SRP 3.3.2.

3.3.2.2.2 Hurricane Missile Effects

The missile barriers of seismic Category I structures are designed in accordance with the missile spectrum identified in Table 3.5-2. The missile barriers are designed to prevent the penetration, perforation, and withstand scabbing effects due to the hurricane missiles, as described in Subsection 3.5.3.

3.3.2.2.3 Tornado Pressure Drops

Pressure drop effects during the design basis tornado are evaluated based on the enclosure category of seismic Category I and II SSCs, as applicable. Vented or partially enclosed and enclosed buildings are designed to withstand the pressure drop while pressure drop effects are not considered in the interior of unvented structures.

3.3.2.2.4 Combined Extreme Wind Effects

The loading combinations of the individual extreme wind loading components are in accordance with SRP 3.3.2. The total extreme wind load W_t used in the load combinations described in Section 3.8 is determined for the combined effects using the following relationships:

$W_t = W_w$

$W_t = W_p$

$W_t = W_m$

$W_t = W_w + 0.5\ W_p$

$W_t = W_w + W_m$

$W_t = W_w + 0.5\ W_p + W_m$

Where:

W_t = total extreme wind load

W_w = load from hurricane wind effect

W_p = load from tornado atmospheric pressure change effect

W_m = load from hurricane missile impact effect

Pressure drop effects due only to the design basis tornado are combined with the design basis hurricane loadings.

3.3.2.3 Effect of Failure of Structures or Components Not Designed for Extreme Wind Loads

Failure of any SSCs not designed for postulated extreme wind loads does not affect the capability of safety-related SSCs to perform their intended safety functions.

The non-safety-related SSCs not designed for extreme wind loads are evaluated and designed using one of the following methods:

a. Designing the SSCs adjacent to seismic Category I SSCs to wind, and tornado/hurricane loadings

b. Investigating the effect of adjacent structural failure on seismic Category I SSCs to provide reasonable assurance that the ability of the seismic Category I SSCs to perform their intended safety functions is not impacted or affected

c. Designing and providing a structural barrier to protect seismic Category I SSCs from adjacent structural failure

The COL applicant is to provide reasonable assurance that site-specific structures and components not designed for the extreme wind loads do not impact either the function or integrity of adjacent seismic Category I SSCs (COL 3.3(4)).

3.3.3 Combined License Information

COL 3.3(1) The COL applicant is to demonstrate that the site-specific design wind speed is bounded by the design wind speed of 64.8 m/s (145 mph).

COL 3.3(2) The COL applicant is to demonstrate that the site-specific seismic Category II structures adjacent to the seismic Category I structures are designed to meet the provisions described in Subsection 3.3.1.2.

COL 3.3(3) The COL applicant is to perform an analysis if the site-specific wind and tornado/hurricane characteristics are not bounded by the site parameter postulated for the certified design.

COL 3.3(4) The COL applicant is to provide reasonable assurance that site-specific structures and components not designed for the extreme wind loads do not impact either the function or integrity of adjacent seismic Category I SSCs.

3.3.4 References

1. ASCE/SEI 7-05, "Minimum Design Loads for Buildings and Other Structures," American Society of Civil Engineers/Structural Engineering Institute, 2006.

2. Regulatory Guide 1.117, "Tornado Design Classification," Rev. 1, U.S. Nuclear Regulatory Commission, April 1978.

3. Regulatory Guide 1.76, "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants," Rev. 1, U.S. Nuclear Regulatory Commission, March 2007.

4. Regulatory Guide 1.221, "Design-Basis Hurricane and Hurricane Missiles for Nuclear Power Plants," U.S Nuclear Regulatory Commission, October 2011.

5. E. Simiu and R. H. Scanlan, "Wind Effects on Structures: Fundamentals and Applications to Design," John Wiley & Sons, Inc., New York, 3rd Edition, 1996.

3.4 Water Level (Flood) Design

All seismic Category I structures, systems, and components (SSCs) are designed to withstand the effects of flooding due to natural phenomena or onsite equipment failures without loss of the capability to perform their safety-related functions.

The potential causes of external flooding include probable maximum precipitation, potential dam failures, and high groundwater and outdoor tank failures, and extreme sea waves such as storm surges, seiches, tsunamis, high tides, etc., as described in Section 2.4.

This analysis includes a site description and elevations of safety-related structures and equipment; evaluations of penetrations in seismic Category I structures; and the effects of flooding due to postulated pipe failures, inadvertent operation of fire protection systems, and failures of non-seismic and non-high-wind (including tornado and hurricane) protected tanks, vessels, and piping.

3.4.1 Flood Protection and Evaluation

3.4.1.1 Design Bases

The design basis flood level at the reactor site will be determined in accordance with NRC RG 1.59 (Reference 1) and ANSI/ANS 2.8 (Reference 2). Because the design basis flood level of the APR1400 standard design is at least 0.3 m (1 ft) below the plant grade as specified in Table 2.0-1, all safety-related SSCs located on the dry site as defined in NRC RG 1.102 (Reference 3) are protected from an external flood event.

The COL applicant is to provide the site-specific design of plant grading and drainage (COL 3.4(1)).

The COL applicant is to provide site-specific information on protection measures for the design basis flood, such levees, seawalls, flood walls, revetments or breakwaters or site bulkheads pursuant to NRC RG 1.102 as described in Subsection 2.4.10 (COL 3.4(2)).

All seismic Category I structures are designed to withstand the static and dynamic forces due to the maximum groundwater level, which is 0.61 m (2 ft) below the plant grade as provided in Table 2.0-1.

3.4.1.2 Flood Protection from External Sources

The flood protection measures for seismic Category I SSCs are designed in accordance with NRC RG 1.102 (Reference 3).

Seismic Category I structures identified in Table 3.2-1 are designed for flood protection. Seismic Category I structures are designed to protect safety-related equipment from flooding by incorporating the following safeguards into their construction:

a. No exterior access openings are lower than 0.41 m (1 ft 4 in.) above plant grade (yard grade) elevation.

b. The finished yard grade adjacent to the safety-related structures is maintained at least 0.41 m (1 ft 4 in.) below the ground floor elevation, except where ramps or steps are provided for access.

c. Waterstops are used in all horizontal and vertical construction joints in all exterior walls up to flood-level elevation.

d. Water seals are provided for all penetrations in exterior walls up to flood-level elevation. The water seals are designed for the static pressure of water at the flood elevation. Water seals in safety-related structures are designed to maintain integrity in the event of an SSE.

e. All below-grade exterior walls and basemats of seismic Category I structures are thickened by more than or equal to 0.6 m (2 ft) to protect against water seepage, as required in SRP 14.3.2.

Penetrations below the external flood level in the external walls of the auxiliary building include component cooling water, radwaste, and diesel fuel oil system piping and cable penetrations. Additional penetrations may be identified when layouts are finalized for systems such as sewage, demineralized water, station air, and security. All penetrations are sealed on the inside of the penetration to eliminate the potential of flooding through the penetration. The penetration seals are periodically inspected to ensure their functionality.

3.4.1.3 Flood Protection from Internal Sources

The APR1400 arrangement provides physical separation of redundant safety-related SSCs. The flood protection mechanisms related to minimizing the consequences of internal flooding include the following:

a. Structural enclosures or barrier walls

b. Drainage systems

c. Emergency sump

d. Internal curbs or ramps

e. Watertight doors

The APR1400 minimizes penetrations through enclosures or barrier walls below the flood level. Enclosures and barrier walls below the flood level are sealed to maintain watertightness. Barrier walls, floors, and penetrations are designed to withstand the maximum anticipated hydrodynamic loads associated with a pipe failure, as described in Section 3.6.

Divisional and quadrant separation by flood barriers with watertightness is provided for internal flood protection. Each quadrant is protected against propagation of internal flood event from one quadrant to any other.

The floor drainage systems are separated by quadrants with no common drain lines between the quadrants. Floors are gently sloped to allow for good drainage to the quadrant sumps. The functional capability of equipment and floor drainage system is maintained because the piping of the drainage system is designed as seismic Category II and embedded into the concrete of seismic Category I structures such as reactor containment building and auxiliary building.

The COL applicant is to establish procedures and programmatic controls to ensure the availability of the floor drainage (COL 3.4(3)).

The vertical and horizontal Emergency Overflow Lines (EOLs) are used to provide flow paths for the draining of flooded water, in addition to floor drains, as one of the flood mitigation measures. EOLs are the embedded pipes that connect rooms. EOLs are seismically designed as seismic Category II. The sizes of the EOLs are determined based on the combination of available number of floor drains and required flow area needed to support drainage of the flooded water volume.

The lowest spaces of each building are designed as an emergency sump to keep flood water within the building where a flooding event could occur. The emergency sump is large enough to accommodate the volume of limiting flooding source.

Additionally, curbs or ramps and sealed penetrations function as flood barriers. Safety-related equipment and components are located at higher elevations so flooding events do not affect them.

Watertight doors are used for internal flood protection. Watertight doors are specified to withstand the static pressure from the maximum flood elevation as determined in the flooding analysis. Sensor signals of sensors to indicate the status of open and close of the watertight doors are provided to the main control room. The COL applicant is to periodically inspect watertight doors and the penetration seals to ensure their functionality (COL 3.4(4)).

The areas of concern in APR1400 are as follows:

a. Reactor containment building

   The reactor containment building systems to be protected from flooding are the reactor coolant system (RCS), safety injection system (SIS), reactor coolant gas vent system (RCGVS), feedwater system (FWS), auxiliary feedwater system (AFWS), shutdown cooling system (SCS), component cooling water system (CCWS), and main steam system (MSS). The components to be protected from flooding are the valves and electric instrumentation of these systems.

b. Auxiliary building

   The auxiliary building systems to be protected from flooding are the SIS, shutdown cooling system (SCS), chemical and volume control system (CVCS), containment spray system (CSS), auxiliary feedwater system (AFWS), and component cooling water system (CCWS). The components to be protected from flooding are the motor-driven pumps, valves, electrical equipment and instruments, Class 1E electric/instrumentation components, and cubicle coolers in the relevant system.

c. Emergency diesel generator building

The systems in the emergency diesel generator building to be protected from flooding are Class 1E emergency diesel generator system, and the emergency diesel generator fuel oil storage and transfer system. The components to be protected from flooding are diesel generator, diesel fuel oil transfer pump, and exhaust fan.

d. Site-specific safety structures

The COL applicant is to provide flooding analysis with flood protection and mitigation features from internal flooding for the CCW Heat Exchanger Building and ESW Building (COL 3.4(5)).

Tables 3.4-1 and 3.4-2 provide the locations of safety-related SSCs and a comparison of the maximum internal flood elevation in the vicinity of the components. Figures 3.4-1 through 3.4-7 provide the locations of watertight doors and flood barriers in the auxiliary building.

3.4.1.4 Evaluation of External Flooding

External flooding is evaluated based on flooding sources such as natural phenomena and the failure of onsite tanks or large buried pipes. The failure of non-safety-related onsite tanks such as condensate storage facilities (CSF) could result in a potential flood source. However, onsite tanks are located in the tank yard that is an adequate distance from safety-related structures, and watertight doors are installed at the exterior entrances located on the ground level of safety-related structures to prevent inflow of external flooding. Therefore, a non-safety-related tank failure does not result in adverse effects to safety-related SSCs. The maximum water level and flow velocity of an individual flood event are determined to estimate flood loads on seismic Category I structures and the watertightness of the structures during an external flood event. Seismic Category I structures are designed for the design basis flood level and the maximum groundwater level defined in Table 2.0-1.

The COL applicant is to provide the site-specific flooding hazards from engineered features, such as water tank collapsing, water piping breaking, etc. (COL 3.4(6)).

The COL applicant is to confirm that the potential site-specific external flooding events are bounded by design basis flood values or otherwise demonstrate that the design is acceptable (COL 3.4(7)).

No permanent dewatering systems are necessary to maintain safe and acceptable groundwater levels.

The COL applicant is to provide the site-specific dewatering system if the plant is built below the design basis flood level (COL 3.4(8)).

3.4.1.5 Evaluation of Internal Flooding

The internal flooding analysis demonstrates that plant nuclear safety functions are protected from the effects of internal flooding that are the result of a postulated failure or operation of the plant fire protection system. The safety-related SSCs included in Table 3.2-1 are protected against an internal flood. Potential flooding sources are as follows:

a. High- and moderate-energy piping failures

b. Full-circumferential ruptures in non-seismic moderate-energy piping

c. Postulated failures of non-seismic and non-tornado/hurricane-protected tanks and vessels

d. Pump mechanical seal failures

e. Operation of the fire protection system

Criteria and assumptions described in Subsection 3.6.2 are used for the internal flooding analysis. Subsection 3.6.2 provides the criteria used to define break and crack locations and configurations for high- and moderate-energy piping failures.

For flooding analysis, the single worst-case piping rupture for non-seismically analyzed piping is assumed for each analyzed area. Also, only one break at a time is postulated for non-seismic Category I or II piping as the result of a seismic event in the internal flooding analysis. All piping inside the reactor containment building and auxiliary building are seismically designed. Therefore, no breaks are postulated during a seismic event in these buildings. The discharge volume through the ruptured area is calculated in accordance with the formula given in ANSI/ANS 56.10, Section 3 (Reference 4). The released steam flow rate is conservatively assumed to be completely condensed to result in a higher flood level.

The discharge flow rate from a high-energy line break is obtained by one of the following critical flow correlations.

a. Moody model for two-phase mixture and saturated steam conditions

b. Henry-Fauske model for subcooled liquid

A LOCA that results in the largest discharge volume to the reactor containment is assumed as a flooding source in the flooding analysis of reactor containment building. The flood level of the reactor containment building is determined by dividing the accumulated volume by the total floodable area at El. 100 ft 0 in. For conservatism, the entire released volume is taken to accumulate at El. 100 ft of containment with no drainage to the HVT at a lower elevation before recirculation mode, although fluid flow to the lower elevation will actually be established when broken flow arrives at the openings to the lower elevation.

In the long term cooling period, during recirculation mode with containment spray from IRWST, the inflow of water onto El. 100 ft of containment consists of ECCS (SI and CS) injection flow from the IRWST with an outflow to the HVT and discharging back into the IRWST through spillways. The outflow to the IRWST through spillways is determined by using the general equation for pressure drop, Darcy's formula.

Fire hose stations that could reach the area or zone where a fire occurs are contributed to internal flooding sources when a fire occurs. The discharge flow rate from fire hose stations is assumed to be 0.044 m^3/s (700 gpm).

The lowest level of the auxiliary building is designed to function as an emergency sump to collect flooding sources when a flood event occurs. The flood level of the emergency sump is determined by dividing the maximum volume of flooding sources by the floodable area of the emergency sump. The flood level, except for the lowest elevation, is determined based on the level established by the difference between the inflow rate of the postulated flooding source and the outflow rate through drains or openings in steady-state condition.

Fluid flow rates through stairwells, floor openings, and under door gaps are determined in accordance with the formulae given in ANSI 56.11 (Reference 5). The fluid flow rate through a stairwell or a floor opening is calculated using equation 5.2-1, and the flow rate under a door is calculated using equation 5.2-3 in Reference 5. It is assumed that the total inventory of the IRWST and SI tanks are spilled out. The total water volume in the IRWST is considered as a limiting flood source in auxiliary building only as a result of a pipe rupture. No credit is taken for operation of sump pumps to mitigate the flooding consequences.

The internal flooding analysis is performed on a floor-by-floor and room-by-room basis.

Flooding analysis consists of the following steps:

a. Identification of safety-related SSCs

b. Identification of potential flooding sources

c. Determination of flow rates and flood levels

d. Risk assessment for components affected by a flood event

e. Determination of the need for protection and mitigation measures

3.4.1.5.1 Reactor Containment Building

The APR1400 is designed to accommodate the effects of, and to be compatible with, the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including LOCAs.

The reactor containment building is not designed to provide divisional separation but it allows flooding sources to flow to the lowest level of the building i.e., containment annulus area at El. 100 ft 0 in. through the floor openings and stairwells.

a. Water at El. 156 ft 0 in. flows to the lower elevation through four reactor containment fan cooler duct openings, two stairwells, and four safety injection tank openings.

b. Water at El. 136 ft 6 in. flows to the lower elevation through the grating on this floor. Water in the pressurizer cavity flows to the containment annulus area through the wire mesh door.

c. Water at El. 114 ft 0 in. flows to the lower elevation through the grating on this floor. Water in each valve room flows to the containment annulus area through the wire mesh door.

d. Water collected at El. 100 ft 0 in. flows to the holdup volume tank through the floor opening and then to the IRWST through the spillway. Water in the letdown heat exchanger room and reactor drain tank room flows to the containment annulus area through the wire mesh door.

The worst-case flooding event is a LOCA in reactor containment building because it results in maximum flood water volume to the reactor containment building as a flooding source. The water volume of bounding case is 109,197 ft^3 which is summation of total discharged water volume from a LOCA (19,482 ft^3) and the recirculation mode with IRWST water volume (89,715 ft^3). There are flooding sources inside the reactor containment building such as reactor coolant system, main feedwater, auxiliary feedwater, component cooling water, fire protection and chemical and volume control systems.

The flooding source of an AF tank does not gravity discharge into the reactor containment building since the location of the piping is higher than the top level of the AF Tank.

The discharged water volume from the FW system during the isolation time by safety-related main feedwater isolation valve and the volume of AF makeup flow to steam generator are less than the volume of water from a LOCA in recirculation mode. For the FW line break evaluation, the transient water level is evaluated using a time history approach to determine the flood height and takes a credit of the flow path from the floor opening at El. 100 ft of RCB. Based on the sensitivity analysis, the flood level resulting from a postulated FW line break remains below El. 102 ft.

The water volume of FP system is isolated with flood protection measures including operator action. It has sufficient time for operators to identify and isolate the fire protection system in a flooding event. Non-seismically designed pipes are excluded as flood sources because all piping inside the reactor containment building is seismically designed. Operator action is credited for identification and isolation of flood sources that could result in larger volumes to containment than a worst case LOCA.

Discharged water first fills up the volume below elevation El. 100 ft 0 in. and then spreads the volume above the grade level of the reactor containment building. Water released by a

LOCA is collected in the IRWST through the spillways between HVT and IRWST. It then flows back to the reactor coolant system or is sprayed into the containment and recirculated.

The total discharged volume of a LOCA is 551.67 m^3 (19,482 ft^3) which consists of volume for reactor coolant system and four safety injection tanks described in Table 6.2.1-20 and Table 6.2.1-21. The net floodable volume under El. 100 ft 0 in., including volume of air space of IRWST 753 m^3 (26,592 ft^3), holdup volume tank 242.3 m^3 (8,557 ft^3), and normal sump 6.7 m^3 (237 ft^3) is 1,002 m^3 (35,385 ft^3). The total discharged water volume due to LOCA is smaller than the total floodable volume.

The flood level of the bottom area of the reactor containment building with total water volume of LOCA is determined to be 0.61 m (2 ft) from the El. 100 ft 0 in. The maximum containment flood level is determined by dividing total LOCA volume by floodable area 11,215 ft^2 of El. 100 ft. For LOCA evaluation, the analysis conservatively assumes that the break volume is discharged to containment with no loss of volume through the floor openings at El. 100 ft of the RCB prior to recirculation. The resulting containment flood level has been determined to be an additional 0.61 m (2 ft) to El. 102 ft. In the long term period with the containment water level at El. 102 ft, the outflow into the IRWST through two 24 inch spillways is greater than the inflow from SI and CS pumps into containment. The flood height decreases during the recirculation period, and, therefore, the flood water level remains less than the determined level of 0.61 m (2 ft) established before recirculation period. It envelops all flood levels throughout the entire containment area at El. 100 ft 0 in. The flood levels in the separately compartmentalized areas located above the bottom and annulus area are independently determined by taking account of flows in and out of these areas. The maximum flood level of containment does not affect safety-related equipment. There are no submerged SSCs required for safe shutdown. Table 3.4-1 provides a list and the locations of SSCs inside the reactor containment building that require flood protection. These SSCs are located above the maximum internal flood level.

3.4.1.5.2 Auxiliary Building

The auxiliary building is designed to provide physical separation to prevent spreading of fluids to the areas housing safety-related equipment and components.

Elevation 55 ft 0 in

The primary means of flood protection is the divisional or quadrant walls, which serve as flood barriers between redundant trains of safe shutdown systems and components. Flood barriers provide separation between the quadrants, while maintaining equipment removal capability.

On the divisional wall, penetrations are sealed and no doors are provided up to El. 64 ft 0 in., which is the potential flood level from the bottom elevation. The heights of the divisional walls at El. 55 ft 0 in. are 13 ft (El. 68 ft 0 in.) as shown in Figures 1.2-11 and 1.2-12. The divisional walls are sufficiently high to contain total water volume in the affected quadrant. Watertight doors are provided between the quadrants to prevent potential flooding sources from spreading to adjacent quadrants.

The equipment to be protected at El. 55 ft 0 in. includes SI pumps, SC/CS pumps, heat exchangers, and CCW pumps. In each quadrant, the SI pump rooms, SC/CS pump rooms, and CCW pump rooms are separated by a flood barrier.

The following potential flooding sources are considered:

a. A postulated pipe failure is considered in only one area of the quadrant. During normal operation, a 0.25 m (10 in.) pipe crack in the SIS suction line from the IRWST is considered a potential flooding source.

b. There is no break in non-seismic moderate-energy piping because piping in the auxiliary building is designed as seismic Category I or II.

c. Firefighting equipment represents internal flooding sources from at least the nearest two fire hose stations that could reach the fire zone. The discharge rate for firefighting equipment is assumed to be 0.044 m^3/s (700 gpm).

The worst case of flooding in the auxiliary building is the water source in the IRWST. The total water volume of the IRWST is 2,540 m^3 (89,715 ft^3) and the floodable area in the four quadrants (A, B, C, and D) is 1,168 m^2 (12,577 ft^2), 1,176 m^2 (12,664 ft^2), 1,232 m^2 (13,263 ft^2), and 1,232 m^2 (13,263 ft^2), respectively.

Based on these values, the maximum water level is 2.74 m (9 ft) with some margin. The released water volume is contained within the affected quadrant.

<u>Elevation 78 ft 0 in</u>

Flood water above El. 78 ft 0 in. drains to the lower elevation through the floor drain, stairwells, and openings. To avoid flooding adjacent quadrants, a curb or ramp is installed at each quadrant intersection. The emergency diesel generator is separated by distance and flood barriers. Radiation-control areas are also separated by flood barriers. A watertight door is provided to prevent spreading of flooding water through the potential flow path from the boric acid storage tank (BAST) tunnel to the auxiliary building.

The equipment to be protected from flooding at El. 78 ft 0 in includes motor-driven AF pumps, turbine-driven AF pumps, Class 1E switchgear, essential chiller, and related electrical equipment. The turbine-driven AF pump and motor-driven AF pump are separated by a quadrant flood barrier.

The following potential flooding sources are considered:

a. A postulated pipe failure of a moderate-energy line is considered.

b. A high-energy line break event is not considered because there is no piping break in this area.

c. A break in non-seismic moderate-energy piping break is not considered because piping in the auxiliary building is designed as seismic Category I or II.

d. Firefighting equipment represents internal flooding sources from at least the nearest two fire hose stations that could reach the fire zone. The discharge rate for firefighting equipment is assumed to be 0.044 m^3/s (700 gpm).

The worst-case flooding scenario is a postulated pipe failure of a 0.10 m (4 in.) AF moderate-energy line in normal operation, during which flood water would drain to lower elevations through the drain system and openings. The potential flood level at this elevation is assumed as 0.15 m (6 in.).

AF pumps are located above the potential internal flood levels. Pressure door protection is provided for the turbine-driven auxiliary feedwater pump room to further protect these pumps and the adjacent motor-driven pumps from the impact of pipe ruptures. Electrical equipment is installed above the flood level so that flooding events do not affect this equipment. Therefore, AF pumps and electrical equipment are not flooded.

Elevation 100 ft 0 in

Flood water above El. 100 ft 0 in. drains to the lower elevation through floor drains, stairwells, and openings. To avoid flooding adjacent quadrants, a curb or ramp is installed at each quadrant intersection. The emergency diesel generator is separated by distance and protected by flood barriers. The radiation control area is also separated by flood barriers. Watertight doors are installed to prevent spreading of flood water through the potential flow path from the compound building to the auxiliary building.

The equipment to be protected from flooding at El. 100 ft 0 in includes the 480V Class 1E motor control center, electrical equipment, and related cubicle coolers.

The following potential flooding sources are considered:

a. Postulated pipe failure of a moderate-energy line is considered.

b. A high-energy line break event is not considered because there is no piping break in this area.

c. There is no break of non-seismic moderate-energy piping because piping in auxiliary building is designed as seismic Category I or II.

d. The total water inventory of the volume control tank is considered a flooding source at quadrant A.

e. Firefighting equipment represents internal flooding sources from at least the nearest two fire hose stations that could reach the fire zone. The discharge rate for firefighting equipment is assumed to be 0.044 m^3/s (700 gpm).

Based on flooding sources, the worst-case flooding scenario is postulated failure of a 0.36 m (14 in.) component cooling line in the general access area, during which flood water would drain to lower elevations through the drain system and openings. The potential flood level at this elevation is assumed as 0.15 m (6 in.).

The safety-related equipment and components are elevated above the flood level so that flooding events do not affect components. Therefore, the electrical equipment and related cubicle cooler are not flooded.

<u>Elevation 120 ft 0 in</u>

Flood water above El. 120 ft 0 in. drains to the lower elevation through floor drains, stairwells, and openings. To avoid flooding adjacent quadrants, a curb or ramp is installed at each quadrant intersection. The emergency diesel generator is separated by distance and protected by flood barriers. The radiation control area is also separated by flood barriers.

The equipment to be protected from flooding at El. 120 ft 0 in includes the Class 1E motor control center, related cubicle coolers, safety injection containment isolation valves, and AF modulating valves.

The following potential flooding sources are considered:

a. A postulated pipe failure of a moderate-energy line is considered.

b. A high-energy line break is considered for the 0.10 m (4 in.) steam generator blowdown system line.

c. There is no break of non-seismic moderate-energy piping because piping in the auxiliary building is designed as seismic Category I or II.

d. Firefighting equipment represents internal flooding sources from at least the nearest two fire hose stations that could reach the fire zone. The discharge rate for firefighting equipment is assumed to be 0.044 m^3/s (700 gpm).

Based on flooding sources, the worst-case flooding scenario is the HELB of a 0.10 m (4 in.) steam generator blowdown system line. The floor drains are conservatively assumed to be clogged due to debris resulting from dynamic forces in the high-energy line break areas. The flood relief opening is installed toward the outside to remove flood water. A watertight door is installed to protect against spreading flood water to adjacent areas in the steam generator blowdown regenerator heat exchanger room.

In other areas except the SGBD regenerator heat exchanger room, the 0.10 m (4 in.) fire protection system line is considered a flooding source. The flood water is drained to lower elevations through the drain system and openings. The potential flood level at this elevation is assumed as 0.15 m (6 in.).

Safety-related equipment and components are elevated above flood level. Therefore, the Class 1E motor control center, cubicle coolers, and valves are not flooded.

<u>Elevation 137 ft 6 in</u>

Flood water above El. 137 ft 6 in. drains to the lower elevation through floor drains, stairwells, and openings. To avoid flooding adjacent quadrants, a curb or ramp is installed at each quadrant intersection. The remote shutdown room and reactor trip switchgear room are protected by flood barriers.

The equipment to be protected from flooding at El. 137 ft 6 in. includes Class 1E motor control center, switchgear, remote shutdown panel, main feedwater isolation valves, and main steam safety valves.

The following potential flooding sources are considered:

a. A postulated pipe failure of moderate-energy line is considered.

b. A high-energy line break is considered in the main steam enclosure and main steam valve room.

c. There is no break of non-seismic moderate-energy piping because piping in the auxiliary building is designed as seismic Category I or II.

d. Firefighting equipment represents internal flooding sources from at least the nearest two fire hose stations that could reach the fire zone. The discharge rate for firefighting equipment is assumed to be 0.044 m^3/s (700 gpm). The malfunction of sprinklers is also considered a potential flooding source.

A rupture of a feedwater system line is the worst case of flooding for the main steam valve room. The cross-section area of the break is based on 0.09 m^2 (1.0 ft^2), as defined in Standard Review Plan, Branch Technical Position 3-3 (Reference 6). In addition, a main feedwater pump is assumed to operate at the maximum flow rate. The floor drains are conservatively assumed to be clogged due to debris resulting from dynamic forces in the high-energy line break areas. An emergency flood relief path is installed to drain out at each room. The potential flood level is 1.82 m (6 ft) above El. 137 ft 6 in. and the safety valves are located above the flood level, so these valves are not flooded.

In other areas except the main steam valve room, the fire suppression system is considered a flooding source. The flood water is drained to lower elevations through the drain system and openings. The potential flood level at this elevation is assumed as 0.15 m (6 in.).

The safety-related equipment and components are elevated above the flood level. Therefore, the Class 1E motor control center, switchgear, and remote shutdown panel are not flooded.

Elevation 156 ft 0 in

Flood water above El. 156 ft 0 in drains to the lower elevation through the floor drain and stairwells.

The equipment to be protected from flooding at El. 156 ft 0 in includes I&C equipment, cubicle coolers, and the console in main control room. The main control room area is protected from flooding in that no water lines are routed above or through the control room or computer room. Water lines routed to HVAC air handling units around the control room are contained in rooms with curbs that preclude the potential for water leakage from entering the control room or computer room. The MCR is also protected from the flooding sources outside the main control room with curbs and steel hole panel installed at the entrance of the MCR.

The following potential flooding sources are considered:

a. A postulated pipe failure of a moderate-energy line is considered.

b. A high-energy line break is not considered because there is no piping break in this area.

c. There is no break of non-seismic moderate-energy piping because piping in the auxiliary building is designed as seismic Category I or II.

d. Firefighting equipment represents internal flooding sources from at least the nearest two fire hose stations that could reach the fire zone. The discharge rate is for firefighting equipment is assumed to be 0.044 m^3/s (700 gpm).

Based on flooding sources, the worst-case flooding scenario is rupture of a 0.10 m (4 in.) fire protection system line in a corridor. The flood water is drained to lower elevations through the drain system and openings. The potential flood level at this elevation is assumed as 0.61 m (2 ft) from the bottom El. 156 ft 0 in.

The safety-related equipment and components are elevated above El. 158 ft 0 in, so the I&C equipment, cubicle cooler, and consoles in the MCR are not flooded.

Elevation 174 ft 0 in

Flood water above El. 174 ft 0 in drains to the lower elevation through floor drains, stairwells, and openings. The EDG normal exhaust fan room is separated by distance and protected by flood barriers.

The equipment to be protected from flooding at El. 174 ft 0 in includes the control room supply air handling unit and EDG room normal supply air handling unit.

The following potential flooding sources are considered:

a. A postulated pipe failure of a moderate-energy line is considered.

b. A high-energy line break event is not considered because there is no piping break in this area.

c. There is no break of non-seismic moderate-energy piping because most of the piping in the auxiliary building is designed as seismic Category I or II.

d. Firefighting equipment represents internal flooding sources from at least the nearest two fire hose stations that could reach the fire zone. The discharge rate is for firefighting equipment is assumed to be 0.044 m^3/s (700 gpm).

Based on flooding sources, the worst-case flooding scenario is rupture of a 0.10 m (4 in.) fire protection system line in the general access area. The flood water is drained to lower elevations through the drain system and openings. The potential flood level at this elevation is assumed as 0.15 m (6 in.) from the bottom El. 174 ft 0 in.

The safety-related equipment and components are located above the flood level. Therefore, the control room supply AHUs, control room emergency makeup ACUs, and EDG room normal supply AHUs are not flooded.

3.4.1.5.3 Emergency Diesel Generator Building

The emergency diesel generator building is separated by distance from other buildings and divisionally separated by flood barriers. Emergency diesel generators (EDGs) are separated by distance and flood barriers so that an internal flooding event does not affect both EDGs simultaneously.

3.4.2 Analysis Procedures

Flood loads due to the design basis flood level and maximum groundwater level are estimated using the applicable codes and standards, as described in Section 3.8. Seismic Category I structures are designed to withstand flood loads and to remain watertight during the design basis flood event. The loads and load combinations provided in Section 3.8 take into consideration the static and dynamic loadings on seismic Category I structures including hydrostatic loading due to the design basis flood and/or the groundwater conditions specified in Table 2.0-1.

The COL applicant is to describe the basis for the Probable Maximum Flood (PMF) to determine the maximum site-specific ground water elevation above the grade that may occur from tsunami or hurricane sources (COL 3.4(9)).

The COL applicant is to identify any site-specific physical models that could be used to predict prototype performance of hydraulic structures and systems (COL 3.4(10)).

3.4.3 Combined License Information

COL 3.4(1) The COL applicant is to provide the site-specific design of plant grading and drainage.

COL 3.4(2) The COL applicant is to provide site-specific information on protection measures for the design basis flood, such levees, seawalls, flood walls, revetments or breakwaters or site bulkheads pursuant to NRC RG 1.102 as required in Subsection 2.4.10.

COL 3.4(3) The COL applicant is to establish procedures and programmatic controls to ensure the availability of the floor drainage.

COL 3.4(4) The COL applicant is to periodically inspect watertight doors and the penetration seals to ensure their functionality.

COL 3.4(5) The COL applicant is to provide flooding analysis with flood protection and mitigation features from internal flooding for the CCW Heat Exchanger Building and ESW Building.

COL 3.4(6) The COL applicant is to provide the site-specific flooding hazards from engineered features, such as water tank collapsing, water piping breaking, etc.

COL 3.4(7) The COL applicant is to confirm that the potential site-specific external flooding events are bounded by design basis flood values or otherwise demonstrate that the design is acceptable.

COL 3.4(8) The COL applicant is to provide the site-specific dewatering system if the plant is built below the design basis flood level.

COL 3.4(9) The COL applicant is to describe the basis for the Probable Maximum Flood (PMF) to determine the maximum site-specific ground water elevation above the grade that may occur from tsunami or hurricane sources.

COL 3.4(10) The COL applicant is to identify any site-specific physical models that could be used to predict prototype performance of hydraulic structures and systems.

3.4.4 References

1. Regulatory Guide 1.59, "Design Basis Floods for Nuclear Power Plants," Rev. 2, U.S. Nuclear Regulatory Commission, August 1977.

2. ANSI/ANS 2.8-1992, "Determining Design Basis Flooding at Power Reactor Sites," American Nuclear Society, 1992.

3. Regulatory Guide 1.102, "Flood Protection for Nuclear Power Plants," Rev. 1, Nuclear Regulatory Commission," September 1976.

4. ANSI/ANS 56.10-1987, "Subcompartment Pressure and Temperature Transient Analysis in Light Water Reactors," American Nuclear Society, 1987.

5. ANSI/ANS 56.11-1988, "Design Criteria for Protection against the Effects of Compartment Flooding in Light Water Reactor Plants," American Nuclear Society, 1988.

6. NUREG-0800, Standard Review Plan, BTP 3-3, "Protection against Postulated Piping Failures in Fluid Systems Outside Containment," Rev. 3, U.S. Nuclear Regulatory Commission, March 2007.

Table 3.4-1 (1 of 58)

Reactor Containment Building Components Protected From Internal Flooding

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
1	731-J-RW-0001A	ENFMS CH A DETECTOR ASSEMBLY	078C01	RCB	78'-0"	Below (1)	0.61 (2.0)
2	731-J-RW-0001B	ENFMS CH B DETECTOR ASSEMBLY	078C01	RCB	78'-0"	Below (1)	0.61 (2.0)
3	731-J-RW-0001C	ENFMS CH C DETECTOR ASSEMBLY	078C01	RCB	78'-0"	Below (1)	0.61 (2.0)
4	731-J-RW-0001D	ENFMS CH D DETECTOR ASSEMBLY	078C01	RCB	78'-0"	Below (1)	0.61 (2.0)
5	763-J-TE-0039A	REACTOR CAVITY TEMP	078C01	RCB	78'-0"	Below (1)	0.61 (2.0)
6	447-V-0001	REACTOR CAVITY FLOODING ISO VALVE	080C01	RCB	80'-0"	Below (1)	0.61 (2.0)
7	447-V-0002	REACTOR CAVITY FLOODING ISO VALVE	080C01	RCB	80'-0"	below (1)	0.61 (2.0)
8	447-V-0003	REACTOR CAVITY FLOODING ISO VALVE	080C01	RCB	80'-0"	below (1)	0.61 (2.0)
9	447-V-0004	REACTOR CAVITY FLOODING ISO VALVE	080C01	RCB	80'-0"	below (1)	0.61 (2.0)
10	447-V-1001	REACTOR CAVITY FLOODING BLOCK VALVE	080C01	RCB	80'-0"	below (1)	0.61 (2.0)
11	447-V-1002	REACTOR CAVITY FLOODING BLOCK VALVE	080C01	RCB	80'-0"	below (1)	0.61 (2.0)
12	447-M-TK02	HOLDUP VOLUME TANK (HVT)	080C01	RCB	80'-0"	below (1)	0.61 (2.0)
13	431-M-SZ01	POSRV SPARGER1	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
14	431-M-SZ02	POSRV SPARGER2	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
15	431-M-SZ03	POSRV SPARGER3	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
16	431-M-SZ04	POSRV SPARGER4	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
17	431-M-SZ05	POSRV SPARGER5	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
18	431-M-SZ06	POSRV SPARGER6	081C01	RCB	81'-0"	below (1)	0.61 (2.0)

Table 3.4-1 (2 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
19	431-M-SZ07	POSRV SPARGER7	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
20	431-M-SZ08	POSRV SPARGER8	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
21	431-M-SZ09	POSRV SPARGER9	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
22	431-M-SZ10	POSRV SPARGER10	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
23	431-M-SZ11	POSRV SPARGER11	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
24	431-M-SZ12	POSRV SPARGER12	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
25	433-M-SZ01	RCGVS SPARGER1	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
26	447-M-ST01A	IRWST SUMP STRAINER	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
27	447-M-ST01B	IRWST SUMP STRAINER	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
28	447-M-ST01C	IRWST SUMP STRAINER	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
29	447-M-ST01D	IRWST SUMP STRAINER	081C01	RCB	81'-0"	below (1)	0.61 (2.0)
30	443-M-HR04A	PAR	100C01	RCB	100'-0"	above	0.61 (2.0)
31	443-M-HR04B	PAR	100C01	RCB	100'-0"	above	0.61 (2.0)
32	443-M-HR09A	PAR	100C01	RCB	100'-0"	above	0.61 (2.0)
33	443-M-HR09B	PAR	100C01	RCB	100'-0"	above	0.61 (2.0)
34	443-M-HR10A	PAR	100C01	RCB	100'-0"	above	0.61 (2.0)
35	443-M-HR10B	PAR	100C01	RCB	100'-0"	above	0.61 (2.0)
36	447-M-SP01A	SWING PANEL	100C01	RCB	100'-0"	above	0.61 (2.0)
37	447-M-SP01B	SWING PANEL	100C01	RCB	100'-0"	above	0.61 (2.0)
38	447-M-SP01C	SWING PANEL	100C01	RCB	100'-0"	above	0.61 (2.0)
39	447-M-SP01D	SWING PANEL	100C01	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (3 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
40	447-M-SP02A	SWING PANEL	100C01	RCB	100'-0"	above	0.61 (2.0)
41	447-M-SP02B	SWING PANEL	100C01	RCB	100'-0"	above	0.61 (2.0)
42	447-M-SP02C	SWING PANEL	100C01	RCB	100'-0"	above	0.61 (2.0)
43	447-M-SP02D	SWING PANEL	100C01	RCB	100'-0"	above	0.61 (2.0)
44	447-M-SP03A	SWING PANEL	100C01	RCB	100'-0"	above	0.61 (2.0)
45	447-M-SP03B	SWING PANEL	100C01	RCB	100'-0"	above	0.61 (2.0)
46	447-M-SP03C	SWING PANEL	100C01	RCB	100'-0"	above	0.61 (2.0)
47	447-M-SP03D	SWING PANEL	100C01	RCB	100'-0"	above	0.61 (2.0)
48	441-V-0100	SCP 01A to IRWST Return Line CHK VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
49	441-V-0101	SCP 01B to IRWST Return Line CHK VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
50	441-V-0113	SIS Line4 to DVI Nozzle 1B CHK VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
51	441-V-0133	SIS Line3 to DVI Nozzle 2A CHK VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
52	441-V-0179	RCS Loop1 to SCP 01A LTOP VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
53	441-V-0189	RCS Loop2 to SCP 01B LTOP VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
54	441-V-0391	Reactor Cavity ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
55	441-V-0393	Reactor Cavity ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
56	441-V-0395	IRWST Return Line ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
57	441-V-0450	Reactor Cavity Line Relief VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
58	441-V-0506	SIP 02C to Hot Leg INJ LN PT-390 RT VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
59	441-V-0523	SIP 02C to Hot Leg INJ LN CHK VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (4 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
60	441-V-0533	SIP 02D to Hot Leg INJ LN CHK VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
61	441-V-0653	RCS Loop1 to SCP 01A Suct ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
62	441-V-0654	RCS Loop2 to SCP 01B Suct ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
63	441-V-0913	SIS Line4 to DVI Nozzle 1B Test Conn VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
64	441-V-0914	SIS Line4 to DVI Nozzle 1B Test Conn VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
65	441-V-0933	SIS Line3 to DVI Nozzle 2A Test Conn VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
66	441-V-0934	SIS Line3 to DVI Nozzle 2A Test Conn VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
67	441-V-0957	SIP 02C to Hot Leg INJ Loop1 LN ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
68	441-V-0958	SIP 02D to Hot Leg INJ LN ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
69	441-V-0959	IRWST Inlet ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
70	441-V-0961	Hot Leg INJ Loop1 Vent VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
71	441-V-0962	Hot Leg INJ Loop1 Vent VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
72	441-V-0963	Hot Leg INJ Loop1 Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
73	441-V-0964	Hot Leg INJ Loop1 Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
74	441-V-0965	S/D Cooling Loop1 Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
75	441-V-0967	S/D Cooling Loop1 Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
76	441-V-0968	S/D Cooling Loop1 Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
77	441-V-0971	Hot Leg INJ Loop2 Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
78	441-V-0972	Hot Leg INJ Loop2 Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
79	441-V-0973	Hot Leg INJ Loop2 Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (5 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
80	441-V-0974	Hot Leg INJ Loop2 Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
81	441-V-0975	S/D Cooling Loop2 Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
82	441-V-0977	S/D Cooling Loop2 Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
83	441-V-0978	S/D Cooling Loop2 Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
84	441-V-2507	SCP 01A RETURN LINE SPEC TEST V/V	100C01	RCB	100'-0"	above	0.61 (2.0)
85	441-V-2508	SCP 01B RETURN LINE SPEC TEST V/V	100C01	RCB	100'-0"	above	0.61 (2.0)
86	441-V-2733	SCP 01A RETURN LINE SPEC TEST V/V	100C01	RCB	100'-0"	above	0.61 (2.0)
87	441-V-2734	SCP 01B RETURN LINE SPEC TEST V/V	100C01	RCB	100'-0"	above	0.61 (2.0)
88	441-V-2812	Safety Line 4 to DV Nozzle 1B Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
89	441-V-2813	Safety Line 4 to DV Nozzle 1B Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
90	441-V-2818	Safety INJ Line3 to DV Nozzle 2A Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
91	441-V-2819	Safety INJ Line3 to DV Nozzle 2A Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
92	441-V-2822	Shutdown Cooling Loop1 Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
93	441-V-2823	Shutdown Cooling Loop1 Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
94	441-V-2838	S/D COOLING LOOP1 TEST VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
95	442-V-1007	CS Hx 01A Outlet CHK VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
96	442-V-1008	CS Hx 01B Outlet CHK VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
97	442-V-2007	CS Hx 01A Outlet Pr Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
98	442-V-2008	CS Hx 01B Outlet Pr Test VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
99	443-V-0001	POST ACCIDENT H_2 PURGE CONTAINMENT ISOLATION VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (6 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
100	447-V-2008	IRWST Pr TRANSMITTER ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
101	447-V-2009	IRWST Pr TRANSMITTER ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
102	451-V-0189	IRWST M/U Line CHK VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
103	451-V-0444	Letdown Heat Exchanger Vent VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
104	451-V-0445	LHX Vent VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
105	451-V-0560	RDT Effluent Containment ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
106	451-V-0747	Charging Line CHK VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
107	451-V-0748	Charging Line Test Connection ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
108	451-V-0751	Regenerative Heat Exchanger Inlet ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
109	455-V-1077	Wet Lay Up Recir PP A Suction ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
110	455-V-1078	Wet Lay Up Recir PP B Suction ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
111	455-V-1079	Wet Lay Up Recir PP A Suction ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
112	455-V-1080	Wet Lay Up Recir PP B Suction ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
113	455-V-1105	Wet L/U Recir PP A Suct ISO B/P CHK VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
114	455-V-1106	Wet L/U Recir PP B Suct ISO B/P CHK VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
115	455-V-1133	Wet L/U Recir PP A Suct ISO VALVE(inside)	100C01	RCB	100'-0"	above	0.61 (2.0)
116	455-V-1134	Wet L/U Recir PP B Suct ISO VALVE(inside)	100C01	RCB	100'-0"	above	0.61 (2.0)
117	463-V-1142	SFP CLEANUP P/P B SUCT LN PENE ISO V/V	100C01	RCB	100'-0"	above	0.61 (2.0)
118	481-V-0005	RCB Sump to LRS FLR DRN TK LN ISO(RCB)	100C01	RCB	100'-0"	above	0.61 (2.0)
119	491-V-0001	RCS HOTLEG LOOP1 SAMPLE CIV	100C01	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (7 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
120	491-V-2001	RCS H/L LOOP-1 SMPL LN TEST CONN V/V(INSIDE CTMT)	100C01	RCB	100'-0"	above	0.61 (2.0)
121	491-V-2016	RCS H/L LOOP-1 SMPL LN PR TEST CONN V/V(INSIDE CTMT)	100C01	RCB	100'-0"	above	0.61 (2.0)
122	763-V-1021	H2 ANZR/MON(TRN A) INLET ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
123	763-V-1022	H2 ANZR/MON(TRN B) INLET ISO VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
124	763-V-1023	H2 ANZR/MON(TRN A) INLET LN TEST VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
125	763-V-1024	H2 ANZR/MON(TRN B) INLET LN TEST VALVE	100C01	RCB	100'-0"	above	0.61 (2.0)
126	447-M-TK01	INCONTAINMENT REFUELING WATER STORAGE TANK (IRWST)	100C01	RCB	100'-0"	above	0.61 (2.0)
127	431-J-PT-0190A	RCS PRESS. (COLD LEG - PUMP DISCHARGE)	100C01	RCB	100'-0"	above	0.61 (2.0)
128	431-J-PT-0190B	RCS PRESS. (COLD LEG - PUMP DISCHARGE)	100C01	RCB	100'-0"	above	0.61 (2.0)
129	447-J-PT-0390A	IRWST TK01 PRESSURE 1	100C01	RCB	100'-0"	above	0.61 (2.0)
130	447-J-PT-0391B	IRWST TK01 PRESSURE 2	100C01	RCB	100'-0"	above	0.61 (2.0)
131	447-J-TE-0390A01	IRWST TEMP 1	100C01	RCB	100'-0"	above	0.61 (2.0)
132	447-J-TE-0390A02	IRWST TEMP 1	100C01	RCB	100'-0"	above	0.61 (2.0)
133	447-J-TE-0390A03	IRWST TEMP 1	100C01	RCB	100'-0"	above	0.61 (2.0)
134	447-J-TE-0391B01	IRWST TEMP 2	100C01	RCB	100'-0"	above	0.61 (2.0)
135	447-J-TE-0391B02	IRWST TEMP 2	100C01	RCB	100'-0"	above	0.61 (2.0)
136	447-J-TE-0391B03	IRWST TEMP 2	100C01	RCB	100'-0"	above	0.61 (2.0)
137	447-J-TE-0392A01	IRWST TEMP 3	100C01	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (8 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
138	447-J-TE-0392A02	IRWST TEMP 3	100C01	RCB	100'-0"	above	0.61 (2.0)
139	447-J-TE-0392A03	IRWST TEMP 3	100C01	RCB	100'-0"	above	0.61 (2.0)
140	763-J-LE-0027A	CNMT WATER LEVEL CH.A	100C01	RCB	100'-0"	above	0.61 (2.0)
141	763-J-LE-0028B	CNMT WATER LEVEL CH.B	100C01	RCB	100'-0"	above	0.61 (2.0)
142	431-V-0225	Loop-2 LT-115, LGS-001 Root VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
143	431-V-0232	Loop-1B DRN to RDT ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
144	431-V-0234	Loop-1A DRN to RDT ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
145	431-V-0257	RCP 01B DP PDT-120/160 Root VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
146	431-V-0267	Loop-2 LT-115, LGS-001 Root VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
147	431-V-0277	S/G 01 DP PDT-115A Root VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
148	431-V-0292	Loop-1B Hot-Cold DP PDT-132 Root VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
149	431-V-0293	Loop-1B Hot-Cold DP PDT-132 Root VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
150	431-V-0294	Loop-1A Hot-Cold DP PDT-131 Root VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
151	431-V-0332	Loop-1B DRN to RDT ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
152	431-V-0334	Loop-1A DRN to RDT ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
153	431-V-0340	Mid Loop-1 LT-105 Root VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
154	431-V-0341	Mid Loop-1 LT-105 Root VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
155	431-V-0344	RCP 01A Seal WTR BLD Off to VCT ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
156	431-V-0345	RCP 01B Seal WTR BLD Off to VCT ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
157	431-V-0380	RCP 01A S-WTR BLD Off LN PT-153 Root VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (9 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
158	431-V-0430	RCP 01A Seal WTR BLD Off → VCT ISO MOV	100C02A	RCB	100'-0"	above	0.61 (2.0)
159	431-V-0431	RCP 01B Seal WTR BLD Off → VCT ISO MOV	100C02A	RCB	100'-0"	above	0.61 (2.0)
160	431-V-0446	RCP 01A Seal WTR HP CLR Inlet ISO MOV	100C02A	RCB	100'-0"	above	0.61 (2.0)
161	431-V-0447	RCP 01B Seal WTR HP CLR Inlet ISO MOV	100C02A	RCB	100'-0"	above	0.61 (2.0)
162	431-V-0450	RCP 01A Seal WTR HP CLR Inlet ISO MOV	100C02A	RCB	100'-0"	above	0.61 (2.0)
163	431-V-0451	RCP 01B Seal WTR HP CLR Inlet ISO MOV	100C02A	RCB	100'-0"	above	0.61 (2.0)
164	431-V-0700	RCP 01A Jet PP 03A Disch to RDT ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
165	431-V-0701	RCP 01B Jet PP 03B Disch to RDT ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
166	431-V-0737	RCP 01B Seal CLR 03B Inlet PT-161 RT VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
167	431-V-0868	RCP 01A Jet PP 03A Disch to RDT ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
168	431-V-0869	RCP 01B Jet PP 03B Disch to RDT ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
169	431-V-2028	RCP 01B DP PDT-120/160 DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
170	431-V-2030	RCP 01B DP PDT-120/160 DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
171	431-V-2032	RCP 01B DP PDT-120/160 DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
172	431-V-2034	RCP 01B DP PDT-120/160 DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
173	431-V-2036	RCP 01B DP PDT-120/160 Vent VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
174	431-V-2038	RCP 01B DP PDT-120/160 Vent VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
175	431-V-2052	S/G 01 DP PDT-115A Vent VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
176	431-V-2054	S/G 01 DP PDT-115A Vent VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
177	431-V-2056	S/G 01 DP PDT-115D DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (10 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
178	431-V-2058	S/G 01 DP PDT-115D DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
179	431-V-2060	S/G 01 DP PDT-115C DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
180	431-V-2062	S/G 01 DP PDT-115C DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
181	431-V-2064	S/G 01 DP PDT-115B DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
182	431-V-2066	S/G 01 DP PDT-115B DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
183	431-V-2068	Loop-1B Hot-Cold DP PDT-132 DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
184	431-V-2070	Loop-1B Hot-Cold DP PDT-132 DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
185	431-V-2072	RCP 01A DP PDT-110/150 DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
186	431-V-2074	RCP 01A DP PDT-110/150 DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
187	431-V-2080	RCP 01A DP PDT-110/150 DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
188	431-V-2082	RCP 01A DP PDT-110/150 DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
189	431-V-2083	Mid Loop-1 LT-105 DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
190	431-V-2084	Mid Loop-1 LT-105 DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
191	431-V-2089	Mid Loop-1 LT-105 Vent VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
192	431-V-2090	Mid Loop-1 LT-105 Vent VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
193	431-V-2096	RCP 01A Seal WTR BLD Off to VCT Vent VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
194	431-V-2097	RCP 01A Seal WTR BLD Off to VCT Vent VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
195	431-V-2098	RCP 01A Seal WTR BLD Off to VCT DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
196	431-V-2101	RCP 01B Seal WTR BLD Off to VCT DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
197	431-V-2102	RCP 01B Seal WTR BLD Off to VCT DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (11 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
198	441-V-0217	SIT 01D Outlet to DVI Nozzle 1B CHK VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
199	441-V-0247	SIT 01A Outlet to DVI Nozzle 1A CHK VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
200	441-V-0469	RCS Loop1 to SCP 01A Suct Relief VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
201	441-V-0473	SIT to IRWST Relief VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
202	441-V-0522	SIP 02C to Hot Leg INJ LN CHK VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
203	441-V-0540	SIS Line4 to DVI Nozzle 1B CHK VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
204	441-V-0618	SIT 01D CHK VALVE Leakage LN ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
205	441-V-0648	SIT 01A CHK VALVE Leakage LN ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
206	441-V-0651	RCS Loop1 to SCP 01A Suct ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
207	441-V-0661	SIT to RDT ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
208	441-V-0670	SIT DRN Line ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
209	441-V-2826	RDT Inlet DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
210	441-V-2827	RDT Inlet DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
211	441-V-2834	SIT 01A Outlet to RDT DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
212	441-V-2835	SIT 01A Outlet to RDT DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
213	441-V-2916	SAFETY INJ LINE 4 TO DV NOZZLE 1B TEST VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
214	441-V-2917	SAFETY INJ LINE 4 TO DV NOZZLE 1B TEST VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
215	451-V-0433	Charging Line CHK VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
216	451-V-0515	Letdown ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (12 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
217	451-V-0516	Letdown ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
218	451-V-0787	Seal Injection CHK VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
219	451-V-0788	Seal Injection ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
220	451-V-0802	Seal INJ CHK VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
221	451-V-0803	Seal INJ ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
222	451-V-0848	Seal INJ Test Connection ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
223	451-V-0849	Seal INJ Test Connection ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
224	451-V-0866	Seal INJ CHK VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
225	451-V-0867	Seal INJ CHK VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
226	451-V-2099	Boric Acid Filter Bypass LN Vent VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
227	451-V-2220	CHG LN to RC Loop 1A VNT VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
228	451-V-2221	CHG LN to RC Loop 1A VNT VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
229	455-V-0001	S/G-1 H/L BLOWDOWN ISOLATION VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
230	455-V-0003	S/G-1 C/L BLOWDOWN ISOLATION VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
231	455-V-1001	S/G-1 H/L Blow Down ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
232	455-V-1003	S/G-1 C/L Blow Down ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
233	455-V-1161	S/G-1 N2 Supply ISO VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
234	455-V-2733	S/G-1 C/L Blow Down DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
235	455-V-2735	S/G-1 C/L Blow Down DRN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
236	455-V-2815	S/G-1 H/L Flushing Connection VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
237	455-V-2817	S/G-1 C/L Flushing Connection VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (13 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
238	521-V-1211	STEAM GENERATOR 1 VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
239	521-V-2061	STEAM GENERATOR 1 FT 1A LN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
240	521-V-2062	STEAM GENERATOR 1 FT 1A LN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
241	521-V-2063	STEAM GENERATOR 1 FT 1B LN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
242	521-V-2064	STEAM GENERATOR 1 FT 1B LN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
243	521-V-2301	STEAM GENERATOR 1 FT 1A LN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
244	521-V-2302	STEAM GENERATOR 1 FT 1A LN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
245	521-V-2403	STEAM GENERATOR 1 FT 1B LN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
246	521-V-2404	STEAM GENERATOR 1 FT 1B LN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
247	521-V-2411	STEAM GENERATOR 1 LN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
248	521-V-2412	STEAM GENERATOR 1 LN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
249	521-V-2415	STEAM GENERATOR 1 LN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
250	521-V-2416	STEAM GENERATOR 1 LN VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
251	541-V-1036	S/G 1 E/C CHK VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
252	541-V-1037	S/G 1 E/C CHK VALVE	100C02A	RCB	100'-0"	above	0.61 (2.0)
253	431-M-OR15A	FLOW ORIFICE	100C02A	RCB	100'-0"	above	0.61 (2.0)
254	431-M-OR15B	FLOW ORIFICE	100C02A	RCB	100'-0"	above	0.61 (2.0)
255	441-M-OR09A	RESTRICTION ORIFICE	100C02A	RCB	100'-0"	above	0.61 (2.0)
256	441-M-OR09D	RESTRICTION ORIFICE	100C02A	RCB	100'-0"	above	0.61 (2.0)
257	441-M-OR10A	Flow Orifice for Equipment	100C02A	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (14 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
258	441-M-OR22	FLOW ORIFICE FOR EQUIPMENT	100C02A	RCB	100'-0"	above	0.61 (2.0)
259	441-M-OR24A	RESTRICTION ORIFICE	100C02A	RCB	100'-0"	above	0.61 (2.0)
260	431-J-PY-0190A	RCP 1A (PP01A) DISCH. PRESSURE	100C02A	RCB	100'-0"	above	0.61 (2.0)
261	431-J-PY-0190B	RCP 2B (PP02B) DISCH. PRESSURE	100C02A	RCB	100'-0"	above	0.61 (2.0)
262	431-J-SE-0113A	RCP 1A (PP01A) SPEED	100C02A	RCB	100'-0"	above	0.61 (2.0)
263	431-J-SE-0113B	RCP 1A (PP01A) SPEED	100C02A	RCB	100'-0"	above	0.61 (2.0)
264	431-J-SE-0113C	RCP 1A (PP01A) SPEED	100C02A	RCB	100'-0"	above	0.61 (2.0)
265	431-J-SE-0113D	RCP 1A (PP01A) SPEED	100C02A	RCB	100'-0"	above	0.61 (2.0)
266	431-J-SE-0123A	RCP 1B (PP01B) SPEED	100C02A	RCB	100'-0"	above	0.61 (2.0)
267	431-J-SE-0123B	RCP 1B (PP01B) SPEED	100C02A	RCB	100'-0"	above	0.61 (2.0)
268	431-J-SE-0123C	RCP 1B (PP01B) SPEED	100C02A	RCB	100'-0"	above	0.61 (2.0)
269	431-J-SE-0123D	RCP 1B (PP01B) SPEED	100C02A	RCB	100'-0"	above	0.61 (2.0)
270	431-J-TE-0112A	HOT LEG TEMP. LOOP NO.1 - PROTECTIVE(NR)	100C02A	RCB	100'-0"	above	0.61 (2.0)
271	431-J-TE-0112B	HOT LEG TEMP. LOOP NO.1 - PROTECTIVE(NR)	100C02A	RCB	100'-0"	above	0.61 (2.0)
272	431-J-TE-0112C	HOT LEG TEMP. LOOP NO.1 - PROTECTIVE(NR)	100C02A	RCB	100'-0"	above	0.61 (2.0)
273	431-J-TE-0112D	HOT LEG TEMP. LOOP NO.1 - PROTECTIVE(NR)	100C02A	RCB	100'-0"	above	0.61 (2.0)
274	431-J-TE-0122A	COLD LEG TEMP. LOOP NO.1 - PROTECTIVE(NR)	100C02A	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (15 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
275	431-J-TE-0122B	COLD LEG TEMP. LOOP NO.1 - PROTECTIVE(NR)	100C02A	RCB	100'-0"	above	0.61 (2.0)
276	431-J-TE-0122C	COLD LEG TEMP. LOOP NO.1 - PROTECTIVE(NR)	100C02A	RCB	100'-0"	above	0.61 (2.0)
277	431-J-TE-0122D	COLD LEG TEMP. LOOP NO.1 - PROTECTIVE(NR)	100C02A	RCB	100'-0"	above	0.61 (2.0)
278	431-J-TE-0132A	HOT LEG TEMP. LOOP NO.1 - PROTECTIVE(WR)	100C02A	RCB	100'-0"	above	0.61 (2.0)
279	431-J-TE-0132B	HOT LEG TEMP. LOOP NO.1 - PROTECTIVE(WR)	100C02A	RCB	100'-0"	above	0.61 (2.0)
280	431-J-TE-0142A	COLD LEG TEMP. LOOP NO.1 - PROTECTIVE(WR)	100C02A	RCB	100'-0"	above	0.61 (2.0)
281	431-J-TE-0142B	COLD LEG TEMP. LOOP NO.1 - PROTECTIVE(WR)	100C02A	RCB	100'-0"	above	0.61 (2.0)
282	431-J-TEW-0112A	HOT LEG TEMP FROM REACTOR TO SG1	100C02A	RCB	100'-0"	above	0.61 (2.0)
283	431-J-TEW-0112B	HOT LEG TEMP FROM REACTOR TO SG1	100C02A	RCB	100'-0"	above	0.61 (2.0)
284	431-J-TEW-0112C	HOT LEG TEMP FROM REACTOR TO SG1	100C02A	RCB	100'-0"	above	0.61 (2.0)
285	431-J-TEW-0112D	HOT LEG TEMP FROM REACTOR TO SG1	100C02A	RCB	100'-0"	above	0.61 (2.0)
286	431-J-TEW-0122A	LOOP 1A COLD LEG	100C02A	RCB	100'-0"	above	0.61 (2.0)
287	431-J-TEW-0122B	LOOP 1B COLD LEG	100C02A	RCB	100'-0"	above	0.61 (2.0)
288	431-J-TEW-0122C	LOOP 1A COLD LEG	100C02A	RCB	100'-0"	above	0.61 (2.0)
289	431-J-TEW-0122D	LOOP 1B COLD LEG	100C02A	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (16 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
290	521-J-FE-1011	SG 1 STEAM FLOW	100C02A	RCB	100'-0"	above	0.61 (2.0)
291	521-J-FE-1012	SG 1 STEAM FLOW	100C02A	RCB	100'-0"	above	0.61 (2.0)
292	763-J-TE-0032A	STM GEN 1 RM TEMP	100C02A	RCB	100'-0"	above	0.61 (2.0)
293	431-V-0210	PZR Sample ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
294	431-V-0211	RX VSL Flange Leak-off DRN to RDT ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
295	431-V-0214	Loop-2 LT-116, LGS-002 Root VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
296	431-V-0215	Loop-2 DRN to RDT ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
297	431-V-0216	Loop-2 DRN to RDT ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
298	431-V-0217	RX VSL Flange Leak-off LN PT-118 Root VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
299	431-V-0218	Loop-2 LT-116, LGS-002 Root VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
300	431-V-0226	Loop-2 LT-115/116 S/G Root VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
301	431-V-0233	Loop-2A DRN to RDT ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
302	431-V-0235	Loop-2B DRN to RDT ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
303	431-V-0244	PZR Spray Line CHK VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
304	431-V-0252	RCP 02B DP PDT-140/180 Root VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
305	431-V-0281	S/G 02 DP PDT-125C Root VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
306	431-V-0285	S/G 02 DP PDT-125A Root VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
307	431-V-0297	Loop-2A Hot-Cold DP PDT-133 Root VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
308	431-V-0298	Loop-2B Hot-Cold DP PDT-134 Root VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
309	431-V-0299	Loop-2B Hot-Cold DP PDT-134 Root VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (17 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
310	431-V-0333	Loop-2A DRN to RDT ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
311	431-V-0335	Loop-2B DRN to RDT ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
312	431-V-0342	Mid Loop-2 LT-106 Root VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
313	431-V-0343	Mid Loop-2 LT-106 Root VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
314	431-V-0346	RCP 02A Seal WTR BLD Off to VCT ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
315	431-V-0347	RCP 02B Seal WTR BLD Off to VCT ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
316	431-V-0358	Loop-2 LGS-001/002 S/G Root VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
317	431-V-0382	RCP 02A S-WTR BLD Off LN PT-173 Root VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
318	431-V-0403	RX VSL Flange Leak-off DRN → RDT ISO SOV	100C02B	RCB	100'-0"	above	0.61 (2.0)
319	431-V-0432	RCP 02A Seal WTR BLD Off → VCT ISO MOV	100C02B	RCB	100'-0"	above	0.61 (2.0)
320	431-V-0433	RCP 02B Seal WTR BLD Off → VCT ISO MOV	100C02B	RCB	100'-0"	above	0.61 (2.0)
321	431-V-0448	RCP 02A Seal WTR HP CLR Inlet ISO MOV	100C02B	RCB	100'-0"	above	0.61 (2.0)
322	431-V-0449	RCP 02B Seal WTR HP CLR Inlet ISO MOV	100C02B	RCB	100'-0"	above	0.61 (2.0)
323	431-V-0452	RCP 02A Seal WTR HP CLR Inlet ISO MOV	100C02B	RCB	100'-0"	above	0.61 (2.0)
324	431-V-0453	RCP 02B Seal WTR HP CLR Inlet ISO MOV	100C02B	RCB	100'-0"	above	0.61 (2.0)
325	431-V-0702	RCP 02A Jet PP 04A Disch to RDT ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
326	431-V-0703	RCP 02B Jet PP 04B Disch to RDT ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
327	431-V-0870	RCP 02A Jet PP 04A Disch to RDT ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
328	431-V-0871	RCP 02B Jet PP 04B Disch to RDT ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
329	431-V-2023	RCP 02A Disch to Spray Line DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (18 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
330	431-V-2024	RCP 02B Disch to Spray Line DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
331	431-V-2025	RCP 02A Disch to Spray Line DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
332	431-V-2026	RCP 02B Disch to Spray Line DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
333	431-V-2027	RCP 02A DP PDT-130/170 DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
334	431-V-2029	RCP 02A DP PDT-130/170 DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
335	431-V-2031	RCP 02A DP PDT-130/170 DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
336	431-V-2033	RCP 02A DP PDT-130/170 DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
337	431-V-2043	S/G 02 DP PDT-125C Vent VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
338	431-V-2045	S/G 02 DP PDT-125C Vent VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
339	431-V-2051	S/G 02 DP PDT-125A Vent VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
340	431-V-2053	S/G 02 DP PDT-125A Vent VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
341	431-V-2055	S/G 02 DP PDT-125B DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
342	431-V-2057	S/G 02 DP PDT-125B DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
343	431-V-2059	S/G 02 DP PDT-125C DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
344	431-V-2061	S/G 02 DP PDT-125C DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
345	431-V-2063	S/G 02 DP PDT-125D DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
346	431-V-2065	S/G 02 DP PDT-125D DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
347	431-V-2067	Loop-2B Hot-Cold DP PDT-134 DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
348	431-V-2069	Loop-2B Hot-Cold DP PDT-134 DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
349	431-V-2071	RCP 02B DP PDT-140/180 DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (19 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
350	431-V-2073	RCP 02B DP PDT-140/180 DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
351	431-V-2075	RCP 02B DP PDT-140/180 Vent VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
352	431-V-2077	RCP 02B DP PDT-140/180 Vent VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
353	431-V-2079	RCP 02B DP PDT-140/180 DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
354	431-V-2081	RCP 02B DP PDT-140/180 DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
355	431-V-2091	RX VSL Flange Leak-off PT-118 Vent VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
356	431-V-2092	RX VSL Flange Leak-off PT-118 Vent VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
357	431-V-2093	Mid Loop-2 LT-106 DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
358	431-V-2094	Mid Loop-2 LT-106 DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
359	431-V-2103	RCP 02B Seal WTR BLD Off to VCT Vent VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
360	431-V-2104	RCP 02B Seal WTR BLD Off to VCT Vent VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
361	431-V-2105	RCP 02A Seal WTR BLD Off to VCT DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
362	431-V-2106	RCP 02A Seal WTR BLD Off to VCT DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
363	431-V-2107	RCP 02B Seal WTR BLD Off to VCT DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
364	431-V-2108	RCP 02B Seal WTR BLD Off to VCT DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
365	431-V-2110	Primary Sampling Line DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
366	431-V-2111	Primary Sampling Line DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
367	433-V-0414	RX VESSEL GAS VENT ISO V/V	100C02B	RCB	100'-0"	above	0.61 (2.0)
368	433-V-0415	RX VESSEL GAS VENT ISO V/V	100C02B	RCB	100'-0"	above	0.61 (2.0)
369	433-V-0416	RX VESSEL GAS VENT ISO V/V	100C02B	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (20 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
370	433-V-0417	RX VESSEL GAS VENT ISO V/V	100C02B	RCB	100'-0"	above	0.61 (2.0)
371	433-V-0418	GAS VENT TO RDT	100C02B	RCB	100'-0"	above	0.61 (2.0)
372	433-V-0419	GAS VENT TO IRWST	100C02B	RCB	100'-0"	above	0.61 (2.0)
373	433-V-0420	GAS VENT TO IRWST	100C02B	RCB	100'-0"	above	0.61 (2.0)
374	433-V-2001	VENT LINE PT-106 ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
375	433-V-2002	PZR DISCH LINE VENT VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
376	433-V-2003	PZR DISCH LINE VENT VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
377	441-V-0169	RCS Loop2 to SCP 01B Suct Relief VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
378	441-V-0227	SIT 01B Outlet to DVI Nozzle 2B CHK VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
379	441-V-0237	SIT 01C Outlet to DVI Nozzle 2A CHK VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
380	441-V-0516	SIP 02D to Hot Leg INJ LN PT-391 RT VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
381	441-V-0532	SIP 02D to Hot Leg INJ LN CHK VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
382	441-V-0542	SIS Line3 to DVI Nozzle 2A CHK VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
383	441-V-0628	SIT 01B CHK VALVE Leakage LN ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
384	441-V-0638	SIT 01C CHK VALVE Leakage LN ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
385	441-V-0652	RCS Loop2 to SCP 01B Suct ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
386	441-V-2816	Shutdown Cooling Loop2 Test VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
387	441-V-2817	Shutdown Cooling Loop2 Test VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
388	441-V-2836	SIT 01B Outlet to Hot Leg INJ Loop2 VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
389	441-V-2837	SIT 01B Outlet to Hot Leg INJ Loop2 VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (21 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
390	441-V-2912	Safety Line 4 to DV Nozzle 1B DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
391	441-V-2913	Safety Line 4 to DV Nozzle 1B DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
392	441-V-2914	SAFETY INJ LINE 3 TO DV NOZZLE 2A TEST VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
393	441-V-2915	SAFETY INJ LINE 3 TO DV NOZZLE 2A TEST VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
394	451-V-0807	Seal INJ CHK VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
395	451-V-0808	Seal INJ ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
396	451-V-0812	Seal INJ CHK VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
397	451-V-0813	Seal INJ ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
398	451-V-0859	Seal INJ Test Connection ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
399	451-V-0860	Seal INJ Test Connection ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
400	451-V-0868	Seal INJ CHK VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
401	451-V-0869	Seal INJ CHK VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
402	451-V-2003	Reg. HX HE01 Tube Side Outlet DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
403	451-V-2023	Reg. HX HE01 Tube Side Outlet DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
404	451-V-2287	SC Hx 1&2 to L/D Hx HE02 DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
405	451-V-2288	SC Hx 1&2 to L/D Hx HE02 DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
406	451-V-2298	RCP 02B Seal Injection LN Vent VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
407	451-V-2299	RCP 02B Seal Injection LN Vent VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (22 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
408	455-V-0002	S/G-2 H/L BLOWDOWN ISOLATION VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
409	455-V-0004	S/G-2 C/L BLOWDOWN ISOLATION VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
410	455-V-1002	S/G-2 H/L Blow Down ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
411	455-V-1004	S/G-2 C/L Blow Down ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
412	455-V-1162	S/G-2 N2 Supply ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
413	455-V-2734	S/G-2 C/L Blow Down DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
414	455-V-2736	S/G-2 C/L Blow Down DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
415	455-V-2816	S/G-2 H/L Flushing Connection VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
416	455-V-2818	S/G-2 C/L Flushing Connection VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
417	521-V-1216	STEAM GENERATOR 2 VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
418	521-V-2065	STEAM GENERATOR 1 FT 1C LN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
419	521-V-2066	STEAM GENERATOR 1 FT 1C LN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
420	521-V-2067	STEAM GENERATOR 1 FT 1D LN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
421	521-V-2068	STEAM GENERATOR 1 FT 1D LN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
422	521-V-2405	STEAM GENERATOR 1 FT 1C LN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
423	521-V-2406	STEAM GENERATOR 1 FT 1C LN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
424	521-V-2407	STEAM GENERATOR 1 FT 1D LN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
425	521-V-2408	STEAM GENERATOR 1 FT 1D LN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
426	521-V-2413	STEAM GENERATOR 2 LN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
427	521-V-2414	STEAM GENERATOR 2 LN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (23 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
428	521-V-2417	STEAM GENERATOR 2 LN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
429	521-V-2418	STEAM GENERATOR 2 LN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
430	541-V-2079	S/G 2 LT 8B ISO VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
431	791-V-2047	S/G#1 DOWNCOMER SIDE LN DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
432	791-V-2049	S/G#1 DOWNCOMER SIDE LN DRN VALVE	100C02B	RCB	100'-0"	above	0.61 (2.0)
433	431-M-OR16A	FLOW ORIFICE	100C02B	RCB	100'-0"	above	0.61 (2.0)
434	431-M-OR16B	FLOW ORIFICE	100C02B	RCB	100'-0"	above	0.61 (2.0)
435	441-M-OR09B	RESTRICTION ORIFICE	100C02B	RCB	100'-0"	above	0.61 (2.0)
436	441-M-OR09C	RESTRICTION ORIFICE	100C02B	RCB	100'-0"	above	0.61 (2.0)
437	441-M-OR10B	Flow Orifice for Equipment	100C02B	RCB	100'-0"	above	0.61 (2.0)
438	441-M-OR12B	Flow Orifice for Equipment	100C02B	RCB	100'-0"	above	0.61 (2.0)
439	431-J-SE-0133A	RCP 2A (PP02A) SPEED	100C02B	RCB	100'-0"	above	0.61 (2.0)
440	431-J-SE-0133B	RCP 2A (PP02A) SPEED	100C02B	RCB	100'-0"	above	0.61 (2.0)
441	431-J-SE-0133C	RCP 2A (PP02A) SPEED	100C02B	RCB	100'-0"	above	0.61 (2.0)
442	431-J-SE-0133D	RCP 2A (PP02A) SPEED	100C02B	RCB	100'-0"	above	0.61 (2.0)
443	431-J-SE-0143A	RCP 2B (PP02B) SPEED	100C02B	RCB	100'-0"	above	0.61 (2.0)
444	431-J-SE-0143B	RCP 2B (PP02B) SPEED	100C02B	RCB	100'-0"	above	0.61 (2.0)
445	431-J-SE-0143C	RCP 2B (PP02B) SPEED	100C02B	RCB	100'-0"	above	0.61 (2.0)
446	431-J-SE-0143D	RCP 2B (PP02B) SPEED	100C02B	RCB	100'-0"	above	0.61 (2.0)
447	431-J-TE-0113A	HOT LEG TEMP. LOOP NO.2 - PROTECTIVE(NR)	100C02B	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (24 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
448	431-J-TE-0113B	HOT LEG TEMP. LOOP NO.2 - PROTECTIVE(NR)	100C02B	RCB	100'-0"	above	0.61 (2.0)
449	431-J-TE-0113C	HOT LEG TEMP. LOOP NO.2 - PROTECTIVE(NR)	100C02B	RCB	100'-0"	above	0.61 (2.0)
450	431-J-TE-0113D	HOT LEG TEMP. LOOP NO.2 - PROTECTIVE(NR)	100C02B	RCB	100'-0"	above	0.61 (2.0)
451	431-J-TE-0123A	COLD LEG TEMP. LOOP NO.2 - PROTECTIVE(NR)	100C02B	RCB	100'-0"	above	0.61 (2.0)
452	431-J-TE-0123B	COLD LEG TEMP. LOOP NO.2 - PROTECTIVE(NR)	100C02B	RCB	100'-0"	above	0.61 (2.0)
453	431-J-TE-0123C	COLD LEG TEMP. LOOP NO.2 - PROTECTIVE(NR)	100C02B	RCB	100'-0"	above	0.61 (2.0)
454	431-J-TE-0123D	COLD LEG TEMP. LOOP NO.2 - PROTECTIVE(NR)	100C02B	RCB	100'-0"	above	0.61 (2.0)
455	431-J-TE-0133A	HOT LEG TEMP. LOOP NO.2 - PROTECTIVE(WR)	100C02B	RCB	100'-0"	above	0.61 (2.0)
456	431-J-TE-0133B	HOT LEG TEMP. LOOP NO.2 - PROTECTIVE(WR)	100C02B	RCB	100'-0"	above	0.61 (2.0)
457	431-J-TE-0143A	COLD LEG TEMP. LOOP NO.2 - PROTECTIVE(WR)	100C02B	RCB	100'-0"	above	0.61 (2.0)
458	431-J-TE-0143B	COLD LEG TEMP. LOOP NO.2 - PROTECTIVE(WR)	100C02B	RCB	100'-0"	above	0.61 (2.0)
459	431-J-TEW-0113A	HOT LEG TEMP FROM REACTOR TO SG2	100C02B	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (25 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
460	431-J-TEW-0113B	HOT LEG TEMP FROM REACTOR TO SG2	100C02B	RCB	100'-0"	above	0.61 (2.0)
461	431-J-TEW-0113C	HOT LEG TEMP FROM REACTOR TO SG2	100C02B	RCB	100'-0"	above	0.61 (2.0)
462	431-J-TEW-0113D	HOT LEG TEMP FROM REACTOR TO SG2	100C02B	RCB	100'-0"	above	0.61 (2.0)
463	431-J-TEW-0123A	LOOP 2A COLD LEG	100C02B	RCB	100'-0"	above	0.61 (2.0)
464	431-J-TEW-0123B	LOOP 2B COLD LEG	100C02B	RCB	100'-0"	above	0.61 (2.0)
465	431-J-TEW-0123C	LOOP 2A COLD LEG	100C02B	RCB	100'-0"	above	0.61 (2.0)
466	431-J-TEW-0123D	LOOP 2B COLD LEG	100C02B	RCB	100'-0"	above	0.61 (2.0)
467	451-J-TW-0214	REGENERATIVE SHELL SIDE HX INLET TEMP	100C02B	RCB	100'-0"	above	0.61 (2.0)
468	521-J-FE-1021	SG 2 STEAM FLOW	100C02B	RCB	100'-0"	above	0.61 (2.0)
469	521-J-FE-1022	SG 2 STEAM FLOW	100C02B	RCB	100'-0"	above	0.61 (2.0)
470	763-J-TE-0034B	STM GEN 2 RM TEMP	100C02B	RCB	100'-0"	above	0.61 (2.0)
471	433-V-1421	RCGVS VACUUM BREAKER VALVE	100C04	RCB	100'-0"	above	0.61 (2.0)
472	451-V-0388	Letdown Orifice ISO VALVE	100C04	RCB	100'-0"	above	0.61 (2.0)
473	451-V-2006	L/D Hx HE02 DRN VALVE	100C04	RCB	100'-0"	above	0.61 (2.0)
474	451-V-2007	L/D Hx HE02 DRN VALVE	100C04	RCB	100'-0"	above	0.61 (2.0)
475	451-V-2258	Letdown Hx Inlet Pr Test Conn VALVE	100C04	RCB	100'-0"	above	0.61 (2.0)
476	451-V-2259	Letdown Hx Inlet Pr Test Conn VALVE	100C04	RCB	100'-0"	above	0.61 (2.0)
477	451-V-2260	Letdown Hx Outlet Pr Test Conn VALVE	100C04	RCB	100'-0"	above	0.61 (2.0)
478	451-V-2261	Letdown Hx Outlet Pr Test Conn VALVE	100C04	RCB	100'-0"	above	0.61 (2.0)
479	451-M-HE02	LETDOWN HEAT EXCHANGER	100C04	RCB	100'-0"	above	0.61 (2.0)

Table 3.4-1 (26 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
480	431-V-0213	Loop-1 Primary Sample ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
481	431-V-0248	RCP 01A DP PDT-110/150 Root VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
482	431-V-0249	RCP 01A DP PDT-110/150 Root VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
483	431-V-0256	RCP 01B DP PDT-120/160 Root VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
484	431-V-0270	S/G 01 DP PDT-115D Root VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
485	431-V-0271	S/G 01 DP PDT-115D Root VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
486	431-V-0272	S/G 01 DP PDT-115C Root VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
487	431-V-0273	S/G 01 DP PDT-115C Root VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
488	431-V-0274	S/G 01 DP PDT-115B Root VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
489	431-V-0275	S/G 01 DP PDT-115B Root VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
490	431-V-0276	S/G 01 DP PDT-115A Root VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
491	431-V-0295	Loop-1A Hot-Cold DP PDT-131 Root VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
492	431-V-0350	S/G 01 C/L DRN to RDT ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
493	431-V-0351	S/G 01 C/L DRN to RDT ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
494	431-V-0352	S/G 01 H/L DRN to RDT ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
495	431-V-0353	S/G 01 H/L DRN to RDT ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
496	431-V-0381	RCP 01B S-WTR BLD Off LN PT-163 Root VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
497	431-V-0706	RCP 01A Casing Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
498	431-V-0707	RCP 01B Casing Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
499	431-V-0712	RCP 01A Casing Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)

Table 3.4-1 (27 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
500	431-V-0713	RCP 01B Casing Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
501	431-V-0724	RCP 01A Seal CLR 05A Inlet PT-152 RT VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
502	431-V-0725	RCP 01B Seal CLR 05B Inlet PT-162 RT VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
503	431-V-0736	RCP 01A Seal CLR 03A Inlet PT-151 RT VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
504	431-V-0752	RCP 01A Seal Housing DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
505	431-V-0753	RCP 01B Seal Housing DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
506	431-V-2019	Hot Leg Injection Loop 1 Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
507	431-V-2021	Hot Leg Injection Loop 1 Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
508	431-V-2040	S/G 01 DP PDT-115D Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
509	431-V-2042	S/G 01 DP PDT-115D Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
510	431-V-2044	S/G 01 DP PDT-115C Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
511	431-V-2046	S/G 01 DP PDT-115C Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
512	431-V-2048	S/G 01 DP PDT-115B Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
513	431-V-2050	S/G 01 DP PDT-115B Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
514	431-V-2076	RCP 01A DP PDT-110/150 Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
515	431-V-2078	RCP 01A DP PDT-110/150 Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
516	431-V-2099	RCP 01A Seal WTR BLD Off to VCT DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
517	441-V-0143	SIS Line1 to DVI Nozzle 1A CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
518	441-V-0216	SIT 01D Outlet Pr PT-319 RT VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
519	441-V-0246	SIT 01A Outlet Pr PT-349 RT VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)

Table 3.4-1 (28 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
520	441-V-0322	Hot leg INJ1 to IRWST ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
521	441-V-0474	SIP 02B/02D to SIT Fill LN Relief VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
522	441-V-0543	SIS Line1 to DVI Nozzle 1A CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
523	441-V-0682	SIP 02B/02D to IRWST ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
524	441-V-0943	SIS Line1 to DVI Nozzle 1A Test Conn VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
525	441-V-0944	SIS Line1 to DVI Nozzle 1A Test Conn VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
526	441-V-2105	SIP to RDT Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
527	441-V-2106	SIP to RDT Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
528	441-V-2115	Safety INJ to RDT Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
529	441-V-2116	Safety INJ to RDT Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
530	441-V-2601	SIT 01A to DV Nozzle 1A Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
531	441-V-2602	SIT 01A to DV Nozzle 1A Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
532	441-V-2723	DVI INJECTION 1B DRAIN V/V	114C01A	RCB	114'-0"	above	0.25(0.83)
533	441-V-2724	DVI INJECTION 1B DRAIN V/V	114C01A	RCB	114'-0"	above	0.25(0.83)
534	441-V-2820	Safety INJ Line1 to DV Nozzle 1A Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
535	441-V-2821	Safety INJ Line1 to DV Nozzle 1A Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
536	441-V-2824	Hot Leg INJ Loop1 to RDT Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
537	441-V-2825	Hot Leg INJ Loop1 to RDT Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
538	441-V-2832	RDT Inlet Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
539	441-V-2833	RDT Inlet Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)

Table 3.4-1 (29 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
540	442-V-1014	ECSBS Nozzles LN CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
541	442-V-2037	ECSBS Nozzles LN Pre Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
542	451-V-0241	Seal Injection Flow CTRL VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
543	451-V-0242	Seal Injection Flow CTRL VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
544	451-V-0417	Seal INJ Line Test Connection ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
545	451-V-0494	RSSH to RDH CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
546	451-V-0506	RCP Controlled BLD off CNMT ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
547	451-V-0740	RCP Bleed Off Test Connection ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
548	451-V-0789	Seal Injection Flow indicator ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
549	451-V-0800	Seal INJ Flow indicator ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
550	451-V-0804	Seal INJ Flow indicator ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
551	451-V-0805	Seal INJ Flow indicator ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
552	451-V-0833	Seal INJ Test Connection ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
553	451-V-0835	Seal INJ Containment ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
554	451-V-0853	Letdown Line Test Connection ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
555	451-V-1010	Reg. HX HE01 Tube Side INLT Pr Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
556	451-V-1011	Reg. HX HE01 Tube Side INLT Pr Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
557	451-V-1027	RCPs Bleed Off LN ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
558	451-V-2001	Reg. HX HE01 Shell Side DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
559	451-V-2002	Reg. HX HE01 Tube Side Inlet DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)

Table 3.4-1 (30 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
560	451-V-2019	Reg. HX HE01 Tube Side Inlet DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
561	451-V-2215	RCP Seal Injection LN VNT VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
562	451-V-2216	RCP Seal Injection LN VNT VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
563	451-V-2222	RCP Seal Injection LN VNT VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
564	451-V-2223	RCP Seal Injection LN VNT VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
565	451-V-2226	RCP 01A Seal Injection LN DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
566	451-V-2227	RCP 01A Seal Injection LN DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
567	451-V-2228	RCP 01B Seal Injection LN DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
568	451-V-2229	RCP 01B Seal Injection LN DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
569	451-V-2234	RCP 01B Seal Injection LN DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
570	451-V-2235	RCP 01B Seal Injection LN DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
571	451-V-2240	RCP 01B Seal Injection LN Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
572	451-V-2241	RCP 01B Seal Injection LN Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
573	451-V-2242	RCP 1A Bleed Off HDR DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
574	451-V-2243	RCP 1A Bleed Off HDR DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
575	451-V-2264	Reg. HX HE01 Outlet Pr Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
576	451-V-2265	Reg. HX HE01 Outlet Pr Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
577	451-V-2330	RCP Bleed Off HDR Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
578	451-V-2331	RCP Bleed Off HDR Vent VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
579	451-V-2332	RCP Bleed Off HDR DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)

Table 3.4-1 (31 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
580	451-V-2333	RCP Bleed Off HDR DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
581	455-V-1115	Wet Lay Up Recir PP A Disch CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
582	455-V-2965	S/G-1 H/L Process Sampling ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
583	455-V-2967	S/G-1 C/L Process Sampling ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
584	461-V-0249	RCP CLNG RETURN CNMT ISOL VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
585	461-V-0297	LETDWN HX SUPPLY CNMT ISOL VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
586	461-V-0301	LETDWN HX RETURN CNMT ISOL VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
587	461-V-1099	CCW Quadrant A to RCP Common LN CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
588	461-V-1100	RCP Return Pr Release Line CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
589	461-V-1685	L/D HE Inlet ISO VALVE 297 Bypass CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
590	461-V-1686	L/D HE Outlet Line Pr Release CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
591	461-V-2662	Letdown HE02 Inlet Line Pr Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
592	461-V-2667	Letdown HE02 Outlet Line Pr Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
593	461-V-2802	RCP Common Supply Line Pr Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
594	461-V-2807	RCP Common Return Line Pr Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
595	471-V-0001	GAS SURGE HDR INSIDE CTMT ISO V/V	114C01A	RCB	114'-0"	above	0.25(0.83)
596	491-V-0021	SI TANKS SAMPLE CIV	114C01A	RCB	114'-0"	above	0.25(0.83)
597	491-V-0041	CTMT AIR SMPL LN ISOL. V/V(INSIDE CTMT)	114C01A	RCB	114'-0"	above	0.25(0.83)

Table 3.4-1 (32 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
598	491-V-1005	SMPL RTN LN ISOL. V/V(INSIDE CTMT) TO HVT	114C01A	RCB	114'-0"	above	0.25(0.83)
599	491-V-1020	CTMT AIR SMPL RTN LN ISOL. V/V(INSIDE CTMT)	114C01A	RCB	114'-0"	above	0.25(0.83)
600	491-V-2011	POST-ACC. SMPL RTN LN PRESS. TEST V/V	114C01A	RCB	114'-0"	above	0.25(0.83)
601	491-V-2012	CTMT AIR SMPL LN PRESS. TEST V/V	114C01A	RCB	114'-0"	above	0.25(0.83)
602	491-V-2014	CTMT AIR SMPL RTN LN PRESS. TEST V/V	114C01A	RCB	114'-0"	above	0.25(0.83)
603	541-V-2122	S/G 1 2ry DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
604	541-V-2123	S/G 1 2ry DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
605	541-V-2182	S/G 1 2ry DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
606	541-V-2183	S/G 1 2ry DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
607	542-V-1007A	AFWP 02A Disch ISO CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
608	542-V-1008A	AFWP 01A Disch ISO CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
609	542-V-2009A	AFWP 01A Disch Line DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
610	542-V-2010A	AFWP 01A Disch Line DRN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
611	594-V-1401	RCB SA Supply HDR CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
612	594-V-2402	RCB SA Supply Special Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
613	596-V-1601	RCB IA ISO CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
614	596-V-2602	PC-145 RCB In Special Test VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
615	632-V-0014	REACTOR CNMT BLDG CHILLED WTR SUPPLY SIDE PENETRATION RELIEF VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)

Table 3.4-1 (33 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
616	632-V-0015	RCB CNTR CHLD WTR RTN ISO VALVE(RCB)	114C01A	RCB	114'-0"	above	0.25(0.83)
617	632-V-1043	RCB CNTR CHLD WTR RTN ISO VALVE(AB)	114C01A	RCB	114'-0"	above	0.25(0.83)
618	632-V-2067	RCB C.C WTR Supply LLRT T.C VALVE(RCB)	114C01A	RCB	114'-0"	above	0.25(0.83)
619	669-V-1016	HI Pr N2 Supply HDR to SIT/RDT CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
620	669-V-2005	HI Pr N2 Sply to SIT/RDT LN Test Conn VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
621	761-V-0431	CMNT AIR RE/RT-039A INLET ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
622	761-V-1433	CMNT AIR RE/RT-039A OUTLET CHK VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
623	761-V-2051	RE/RT-039 OUTLET SPECIAL TEST CONN VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
624	763-V-0001	H2 ANZR/MON(TRN A) INLET ISO(RCB INSIDE)	114C01A	RCB	114'-0"	above	0.25(0.83)
625	763-V-0011	H2 ANZR/MON(TRN A) INLET ISO(RCB INSIDE)	114C01A	RCB	114'-0"	above	0.25(0.83)
626	763-V-0023	H2 ANZR/MON(TRN A) INLET ISO(RCB INSIDE)	114C01A	RCB	114'-0"	above	0.25(0.83)
627	763-V-1013	H2 ANZR/MON(TRN A) OUTLET ISO VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
628	791-V-2043	SGBD#1 C/L SIDE LN VENT VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
629	791-V-2045	SGBD#1 C/L SIDE LN VENT VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
630	791-V-2055	S/G#1 B/D H/L SIDE LN VENT VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
631	791-V-2057	S/G#1 B/D H/L SIDE LN VENT VALVE	114C01A	RCB	114'-0"	above	0.25(0.83)
632	441-M-OR11	Flow Orifice for Equipment	114C01A	RCB	114'-0"	above	0.25(0.83)

Table 3.4-1 (34 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
633	441-M-OR23	FLOW ORIFICE FOR EQUIPMENT	114C01A	RCB	114'-0"	above	0.25(0.83)
634	442-M-OR06A	RESTRICTION ORIFICE	114C01A	RCB	114'-0"	above	0.25(0.83)
635	542-M-OR03A	CAVITATING VENTURI A	114C01A	RCB	114'-0"	above	0.25(0.83)
636	431-V-0286	POSRV-200/201 Leakage DRN to RDT VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
637	431-V-0287	POSRV-202/203 Leakage DRN to RDT VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
638	431-V-1401	POSRV DISCHARGE VACUUM RELIEF VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
639	431-V-1401N	POSRV DISCHARGE VACUUM RELIEF VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
640	431-V-1402	POSRV DISCHARGE VACUUM RELIEF VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
641	431-V-1402N	POSRV DISCHARGE VACUUM RELIEF VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
642	431-V-1403	POSRV DISCHARGE VACUUM RELIEF VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
643	431-V-1403N	POSRV DISCHARGE VACUUM RELIEF VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
644	431-V-1404	POSRV DISCHARGE VACUUM RELIEF VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
645	431-V-1404N	POSRV DISCHARGE VACUUM RELIEF VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
646	441-V-0123	SIS Line2 to DVI Nozzle 2B CHK VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
647	441-V-0332	Hot leg INJ2 to IRWST ISO VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
648	441-V-0541	SIS Line2 to DVI Nozzle 2B CHK VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
649	441-V-0923	SIS Line2 to DVI Nozzle 2B Test Conn VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
650	441-V-0924	SIS Line2 to DVI Nozzle 2B Test Conn VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
651	441-V-2814	Safety Line 2 to DV Nozzle 2B Test VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
652	441-V-2815	Safety Line 2 to DV Nozzle 2B Test VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)

Table 3.4-1 (35 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
653	451-V-0199	RCP CBO Relief VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
654	451-V-0243	Seal Injection Flow CTRL VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
655	451-V-0244	Seal Injection Flow CTRL VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
656	451-V-0300	RCP CBO Pr Indicator ISO VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
657	451-V-0363	Shutdown Purification Line CHK VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
658	451-V-0406	CHG Line Back Pr Diff. Pr Indi. ISO VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
659	451-V-0507	RCP CBO Relief ISO VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
660	451-V-0522	Letdown Containment ISO VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
661	451-V-0809	Seal INJ Flow indicator ISO VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
662	451-V-0810	Seal INJ Flow indicator ISO VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
663	451-V-0814	Seal INJ Flow indicator ISO VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
664	451-V-0815	Seal INJ Flow indicator ISO VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
665	451-V-0850	Letdown Line Test Connection ISO VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
666	451-V-0852	Letdown Orifice Test Connection ISO VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
667	451-V-0880	Shutdown PURIF Line ISO VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
668	451-V-0891	Shutdown Purif Line Test Conn ISO VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
669	451-V-2224	RCP Seal Injection LN VNT VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
670	451-V-2225	RCP Seal Injection LN VNT VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
671	451-V-2230	RCP 02A Seal Injection LN DRN VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
672	451-V-2231	RCP 02A Seal Injection LN DRN VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
673	451-V-2232	RCP 02B Seal Injection LN DRN VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)

Table 3.4-1 (36 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
674	451-V-2233	RCP 02B Seal Injection LN DRN VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
675	451-V-2244	RCP 2B Bleed Off HDR DRN VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
676	451-V-2245	RCP 2B Bleed Off HDR DRN VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
677	451-V-2246	RCP 2A Bleed Off HDR VNT VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
678	451-V-2247	RCP 2A Bleed Off HDR VNT VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
679	451-V-2307	L/D Hx Outlet Vent VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
680	451-V-2308	L/D Hx Outlet Vent VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
681	455-V-1116	Wet Lay Up Recir PP B Disch CHK VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
682	463-V-1145	SFP CLEANUP DMZR OUTLET HDR PENE CHK V/V	114C01B	RCB	114'-0"	above	0.25(0.83)
683	491-V-0003	PZR SURGE LINE SAMPLE CIV	114C01B	RCB	114'-0"	above	0.25(0.83)
684	491-V-0005	PZR STEAM SPACE SAMPLE CIV	114C01B	RCB	114'-0"	above	0.25(0.83)
685	491-V-2003	PZR SURGE SMPL LN TEST CONN V/V(INSIDE CTMT)	114C01B	RCB	114'-0"	above	0.25(0.83)
686	491-V-2005	PZR STM SPACE SMPL LN TEST CONN V/V(INSIDE CTMT)	114C01B	RCB	114'-0"	above	0.25(0.83)
687	491-V-2018	PZR SURGE SMPL LN PR TEST CONN V/V(INSIDE CTMT)	114C01B	RCB	114'-0"	above	0.25(0.83)
688	491-V-2020	PZR STM SPACE SMPL LN TEST CONN V/V(INSIDE CTMT)	114C01B	RCB	114'-0"	above	0.25(0.83)
689	491-V-2460	PZR SURGE LINE VENT V/V	114C01B	RCB	114'-0"	above	0.25(0.83)

Table 3.4-1 (37 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
690	491-V-2461	PZR SURGE LINE VENT V/V	114C01B	RCB	114'-0"	above	0.25(0.83)
691	491-V-2462	PZR SURGE LINE DRAIN V/V	114C01B	RCB	114'-0"	above	0.25(0.83)
692	491-V-2463	PZR SURGE LINE DRAIN V/V	114C01B	RCB	114'-0"	above	0.25(0.83)
693	491-V-2464	PZR SURGE LINE DRAIN V/V	114C01B	RCB	114'-0"	above	0.25(0.83)
694	491-V-2465	PZR SURGE LINE DRAIN V/V	114C01B	RCB	114'-0"	above	0.25(0.83)
695	491-V-2466	PZR STEAM SPACE DRAIN V/V	114C01B	RCB	114'-0"	above	0.25(0.83)
696	491-V-2467	PZR STEAM SPACE DRAIN V/V	114C01B	RCB	114'-0"	above	0.25(0.83)
697	535-V-1023	BSTR Fan Disch LN CHK VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
698	535-V-2057	CNMT BLDG Normal Sump Inlet Pr Test VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
699	542-V-1007B	AFWP 02B Disch ISO CHK VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
700	542-V-1008B	AFWP 01B Disch ISO CHK VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
701	542-V-2009B	AFWP 01B Disch Line DRN VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
702	542-V-2010B	AFWP 01B Disch Line DRN VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
703	582-V-1752	RCB M/U HDR DEMI WTR CHK VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
704	691-V-1440	RCB Indoor Fire Hydrant CHK VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
705	691-V-1444	RCB Indoor Fire Hydrant Special Test VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
706	763-V-0002	H2 ANZR/MON(TRN B) INLET ISO(RCB INSIDE)	114C01B	RCB	114'-0"	above	0.25(0.83)
707	763-V-0012	H2 ANZR/MON(TRN B) INLET ISO(RCB INSIDE)	114C01B	RCB	114'-0"	above	0.25(0.83)

Table 3.4-1 (38 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
708	763-V-0024	H2 ANZR/MON(TRN B) INLET ISO(RCB INSIDE)	114C01B	RCB	114'-0"	above	0.25(0.83)
709	763-V-1014	H2 ANZR/MON(TRN B) OUTLET ISO VALVE	114C01B	RCB	114'-0"	above	0.25(0.83)
710	441-M-OR24B	FLOW ORIFICE FOR EQUIPMENT	114C01B	RCB	114'-0"	above	0.25(0.83)
711	442-M-OR06B	RESTRICTION ORIFICE	114C01B	RCB	114'-0"	above	0.25(0.83)
712	542-M-OR03B	CAVITATING VENTURI B	114C01B	RCB	114'-0"	above	0.25(0.83)
713	431-V-0228	PZR LT-110A Root VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
714	431-V-0229	PZR LT-103C/110B Root VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
715	431-V-0253	RCP 02B DP PDT-140/180 Root VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
716	431-V-0260	RCP 02A DP PDT-130/170 Root VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
717	431-V-0261	RCP 02A DP PDT-130/170 Root VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
718	431-V-0278	S/G 02 DP PDT-125D Root VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
719	431-V-0279	S/G 02 DP PDT-125D Root VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
720	431-V-0280	S/G 02 DP PDT-125C Root VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
721	431-V-0282	S/G 02 DP PDT-125B Root VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
722	431-V-0283	S/G 02 DP PDT-125B Root VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
723	431-V-0284	S/G 02 DP PDT-125A Root VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
724	431-V-0296	Loop-2A Hot-Cold DP PDT-133 Root VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
725	431-V-0354	S/G 02 H/L DRN to RDT ISO VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
726	431-V-0355	S/G 02 H/L DRN to RDT ISO VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
727	431-V-0356	S/G 02 C/L DRN to RDT ISO VALVE	114C02	RCB	114'-0"	above	0.15(0.5)

Table 3.4-1 (39 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
728	431-V-0357	S/G 02 C/L DRN to RDT ISO VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
729	431-V-0383	RCP 02B S-WTR BLD Off LN PT-183 Root VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
730	431-V-0708	RCP 02A Casing Vent VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
731	431-V-0709	RCP 02B Casing Vent VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
732	431-V-0714	RCP 02A Casing Vent VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
733	431-V-0715	RCP 02B Casing Vent VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
734	431-V-0726	RCP 02A Seal CLR 06A Inlet PT-172 RT VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
735	431-V-0727	RCP 02B Seal CLR 06B Inlet PT-182 RT VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
736	431-V-0738	RCP 02A Seal CLR 04A Inlet PT-171 RT VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
737	431-V-0739	RCP 02B Seal CLR 04B Inlet PT-181 RT VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
738	431-V-0754	RCP 02A Seal Housing DRN VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
739	431-V-0755	RCP 02B Seal Housing DRN VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
740	431-V-2020	Hot Leg Injection Loop 2 Vent VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
741	431-V-2022	Hot Leg Injection Loop 2 Vent VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
742	431-V-2035	RCP 02A DP PDT-130/170 Vent VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
743	431-V-2037	RCP 02A DP PDT-130/170 Vent VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
744	431-V-2039	S/G 02 DP PDT-125D Vent VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
745	431-V-2041	S/G 02 DP PDT-125D Vent VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
746	431-V-2047	S/G 02 DP PDT-125B Vent VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
747	431-V-2049	S/G 02 DP PDT-125B Vent VALVE	114C02	RCB	114'-0"	above	0.15(0.5)

Table 3.4-1 (40 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
748	441-V-0226	SIT 01B Outlet Pr PT-329 RT VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
749	441-V-0236	SIT 01C Outlet Pr PT-339 RT VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
750	441-V-2603	SIT 01B to DV Nozzle 2B Vent VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
751	441-V-2604	SIT 01B to DV Nozzle 2B Vent VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
752	441-V-2721	DVI INJECTION 2A DRAIN V/V	114C02	RCB	114'-0"	above	0.15(0.5)
753	441-V-2722	DVI INJECTION 2A DRAIN V/V	114C02	RCB	114'-0"	above	0.15(0.5)
754	451-V-2004	Reg. HX HE01 Shell Side DRN VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
755	451-V-2005	Reg. HX Shell Side to RX DRN HDR ISO VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
756	451-V-2236	RCP 02B Seal Injection LN DRN VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
757	451-V-2237	RCP 02B Seal Injection LN DRN VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
758	451-V-2262	Reg. HX HE01 Inlet Pr Test VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
759	451-V-2263	Reg. HX HE01 Inlet Pr Test VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
760	455-V-2966	S/G-2 H/L Process Sampling ISO VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
761	455-V-2968	S/G-2 C/L Process Sampling ISO VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
762	541-V-2124	S/G 2 2ry DRN VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
763	541-V-2125	S/G 2 2ry DRN VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
764	541-V-2180	S/G 2 2ry DRN VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
765	541-V-2181	S/G 2 2ry DRN VALVE	114C02	RCB	114'-0"	above	0.15(0.5)
766	451-V-0110X	Letdown Orifice 1 ISO VALVE	115C02	RCB	115'-0"	above	0.38(1.25)
767	451-V-0110Y	Letdown Orifice 2 ISO VALVE	115C02	RCB	115'-0"	above	0.38(1.25)

Table 3.4-1 (41 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
768	451-V-0110Z	Letdown Orifice 3 ISO VALVE	115C02	RCB	115'-0"	above	0.38(1.25)
769	451-V-0200	Letdown Orifice Bypass Flow Cntrl VALVE	115C02	RCB	115'-0"	above	0.38(1.25)
770	451-V-0202	Letdown Orifice Bypass ISO VALVE	115C02	RCB	115'-0"	above	0.38(1.25)
771	451-V-0396	LHX ISO VALVE	115C02	RCB	115'-0"	above	0.38(1.25)
772	451-V-0851	Letdown Orifice Test Connection ISO VALVE	115C02	RCB	115'-0"	above	0.38(1.25)
773	541-V-1043	S/G 2 E/C CHK VALVE	115C02	RCB	115'-0"	above	0.38(1.25)
774	541-V-1044	S/G 2 E/C CHK VALVE	115C02	RCB	115'-0"	above	0.38(1.25)
775	451-M-OR01A	Flow Orifice for Equipment	115C02	RCB	115'-0"	above	0.38(1.25)
776	451-M-OR01B	Flow Orifice for Equipment	115C02	RCB	115'-0"	above	0.38(1.25)
777	451-M-OR01B-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	115C02	RCB	115'-0"	above	0.38(1.25)
778	451-M-OR01C	Flow Orifice for Equipment	115C02	RCB	115'-0"	above	0.38(1.25)
779	451-M-OR01C-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	115C02	RCB	115'-0"	above	0.38(1.25)
780	451-M-OR02A	Flow Orifice for Equipment	115C02	RCB	115'-0"	above	0.38(1.25)
781	451-M-OR02B	Flow Orifice for Equipment	115C02	RCB	115'-0"	above	0.38(1.25)
782	451-M-OR02B-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	115C02	RCB	115'-0"	above	0.38(1.25)
783	451-M-OR02C	Flow Orifice for Equipment	115C02	RCB	115'-0"	above	0.38(1.25)
784	451-M-OR02C-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	115C02	RCB	115'-0"	above	0.38(1.25)
785	451-M-OR03A	FLOW ORIFICE FOR EQUIPMENT	115C02	RCB	115'-0"	above	0.38(1.25)

Table 3.4-1 (42 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
786	451-M-OR03B	FLOW ORIFICE FOR EQUIPMENT	115C02	RCB	115'-0"	above	0.38(1.25)
787	451-M-OR03B-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	115C02	RCB	115'-0"	above	0.38(1.25)
788	451-M-OR03C	FLOW ORIFICE FOR EQUIPMENT	115C02	RCB	115'-0"	above	0.38(1.25)
789	451-M-OR03C-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	115C02	RCB	115'-0"	above	0.38(1.25)
790	431-V-0100F	PZR Spray Line CTRL SOV	115C03	RCB	115'-0"	above	0.76(2.5)
791	431-V-0237	PZR Spray CTRL V100F Bypass VALVE	115C03	RCB	115'-0"	above	0.76(2.5)
792	431-V-0241	Loop-2A PZR Spray ISO VALVE	115C03	RCB	115'-0"	above	0.76(2.5)
793	431-V-0442	Loop-2A PZR Spray ISO MOV	115C03	RCB	115'-0"	above	0.76(2.5)
794	451-V-0240	Charging Line Back Pr CTRL VALVE	115C03	RCB	115'-0"	above	0.76(2.5)
795	451-V-0405	CHG Line Back Pr Diff. Pr Indi. ISO VALVE	115C03	RCB	115'-0"	above	0.76(2.5)
796	451-V-0434	CHG Line Spring Loaded CHK VALVE ISO VALVE	115C03	RCB	115'-0"	above	0.76(2.5)
797	451-V-0435	Charging Line Spring Loaded CHK VALVE	115C03	RCB	115'-0"	above	0.76(2.5)
798	451-V-2285	CHG LN to RC Loop 1A DRN VALVE	115C03	RCB	115'-0"	above	0.76(2.5)
799	451-V-2286	CHG LN to RC Loop 1A DRN VALVE	115C03	RCB	115'-0"	above	0.76(2.5)
800	431-V-0100E	PZR Spray Line CTRL SOV	115C04	RCB	115'-0"	above	0.76(2.5)
801	431-V-0236	PZR Spray CTRL V100E Bypass VALVE	115C04	RCB	115'-0"	above	0.76(2.5)
802	431-V-0240	Loop-2B PZR Spray ISO VALVE	115C04	RCB	115'-0"	above	0.76(2.5)
803	431-V-0443	Loop-2B PZR Spray ISO MOV	115C04	RCB	115'-0"	above	0.76(2.5)
804	431-V-F508	GLOBE VLAVE	115C04	RCB	115'-0"	above	0.76(2.5)

Table 3.4-1 (43 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
805	451-V-0203	Pressurizer Auxiliary Spray VALVE	115C04	RCB	115'-0"	above	0.76(2.5)
806	451-V-0431	Pressurizer Auxiliary Spray CHK VALVE	115C04	RCB	115'-0"	above	0.76(2.5)
807	451-M-OR23	Flow Orifice for Equipment	115C04	RCB	115'-0"	above	0.76(2.5)
808	451-M-OR23-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	115C04	RCB	115'-0"	above	0.76(2.5)
809	451-V-0302	RGHX Relief VALVE	128C01	RCB	128'-0"	above	0.25(0.83)
810	451-V-1012	Reg. HX HE01 Tube Side OTLT Pr Test VALVE	128C01	RCB	128'-0"	above	0.25(0.83)
811	451-V-1013	Reg. HX HE01 Tube Side OTLT Pr Test VALVE	128C01	RCB	128'-0"	above	0.25(0.83)
812	451-V-2256	Reg. HX HE01 Tube Side Outlet DRN VALVE	128C01	RCB	128'-0"	above	0.25(0.83)
813	451-V-2257	Reg. HX HE01 Tube Side Outlet DRN VALVE	128C01	RCB	128'-0"	above	0.25(0.83)
814	541-V-2078	S/G 1 LT 9A ISO VALVE	128C01	RCB	128'-0"	above	0.25(0.83)
815	541-V-2082	S/G 1 LT 7A ISO VALVE	128C01	RCB	128'-0"	above	0.25(0.83)
816	541-V-2090	S/G 1 LT 8A Lower ISO VALVE	128C01	RCB	128'-0"	above	0.25(0.83)
817	541-V-2094	S/G 1 LT 10A ISO VALVE	128C01	RCB	128'-0"	above	0.25(0.83)
818	451-M-HE01	REGENERATIVE HEAT EXCHANGER	128C01	RCB	128'-0"	above	0.25(0.83)
819	451-J-TEW-0221	REGEN. HX HE01 LETDOWN OUTLET TEMP	128C01	RCB	128'-0"	above	0.25(0.83)
820	451-J-TW-0022	REGENERATIVE HX INLET TEMP	128C01	RCB	128'-0"	above	0.25(0.83)
821	441-V-0210	SIT 01D to IRWST ISO VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
822	441-V-0213	SIT 01D Wide Range LVL LT-311D RT VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
823	441-V-0214	SIT 01D to PRI Sample SYS ISO VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
824	441-V-0215	SIT 01D Outlet CHK VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
825	441-V-0240	SIT 01A to IRWST ISO VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)

Table 3.4-1 (44 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
826	441-V-0243	SIT 01A Wide Range LVL LT-341A RT VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
827	441-V-0244	SIT 01A to PRI Sample SYS ISO VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
828	441-V-0245	SIT 01A Outlet CHK VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
829	441-V-0611	SIT 01D Fill & DRN ISO VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
830	441-V-0614	SIT 01D Outlet ISO VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
831	441-V-0641	SIT 01A Fill & DRN ISO VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
832	441-V-0644	SIT 01A Outlet ISO VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
833	441-V-2022	SIT 01A Outlet LN Vent VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
834	441-V-2023	SIT 01D Outlet LN Vent VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
835	441-V-2026	DVI INJECTION 1A TEST CONN V/V	136C01A	RCB	136'-0"	above	0.64(2.1)
836	441-V-2027	DVI INJECTION 1B TEST CONN V/V	136C01A	RCB	136'-0"	above	0.64(2.1)
837	441-V-2032	SIT 01A Outlet LN Vent VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
838	441-V-2033	SIT 01D Outlet LN Vent VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
839	441-V-2036	DVI INJECTION 1A TEST CONN V/V	136C01A	RCB	136'-0"	above	0.64(2.1)
840	441-V-2037	DVI INJECTION 1B TEST CONN V/V	136C01A	RCB	136'-0"	above	0.64(2.1)
841	441-V-F510	GLOBE VLAVE	136C01A	RCB	136'-0"	above	0.64(2.1)
842	455-V-1117	Wet Lay Up Recir PP A Disch ISO VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
843	455-V-1119	Wet Lay Up Recir PP A Disch ISO VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
844	491-V-0022	SI TANK 1A SAMPLE VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
845	491-V-0025	SI TANK 1D SAMPLE VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)

Table 3.4-1 (45 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
846	541-V-1040	S/G 1 D/C CHK VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
847	571-V-1017	CNMT Aux STM Supply ISO VALVE (CNMT Inside)	136C01A	RCB	136'-0"	above	0.64(2.1)
848	571-V-2150	CNMT AS Supply Line DRN VALVE (CNMT Inside)	136C01A	RCB	136'-0"	above	0.64(2.1)
849	791-V-1094	S/G#1 DOWNCOMER SIDE SAMPLE ISO VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
850	791-V-2051	S/G#1 DOWNCOMER SIDE LN VENT VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
851	791-V-2053	S/G#1 DOWNCOMER SIDE LN VENT VALVE	136C01A	RCB	136'-0"	above	0.64(2.1)
852	441-M-OR12A	RESTRICTION ORIFICE	136C01A	RCB	136'-0"	above	0.64(2.1)
853	441-M-OR12D	RESTRICTION ORIFICE	136C01A	RCB	136'-0"	above	0.64(2.1)
854	441-M-TK01A	SAFETY INJECTION TANK 1	136C01A	RCB	136'-0"	above	0.64(2.1)
855	441-M-TK01D	SAFETY INJECTION TANK 4	136C01A	RCB	136'-0"	above	0.64(2.1)
856	442-M-OR05A	RESTRICTION ORIFICE	136C01A	RCB	136'-0"	above	0.64(2.1)
857	443-M-HR01A	PAR	136C01A	RCB	136'-0"	above	0.64(2.1)
858	443-M-HR02A	PAR	136C01A	RCB	136'-0"	above	0.64(2.1)
859	431-J-ST-0113A	RCP 1A (PP01A) SPEED	136C01A	RCB	136'-0"	above	0.64(2.1)
860	431-J-ST-0113B	RCP 1A (PP01A) SPEED	136C01A	RCB	136'-0"	above	0.64(2.1)
861	431-J-ST-0113C	RCP 1A (PP01A) SPEED	136C01A	RCB	136'-0"	above	0.64(2.1)
862	431-J-ST-0113D	RCP 1A (PP01A) SPEED	136C01A	RCB	136'-0"	above	0.64(2.1)
863	431-J-ST-0123A	RCP 1B (PP01B) SPEED	136C01A	RCB	136'-0"	above	0.64(2.1)

Table 3.4-1 (46 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
864	431-J-ST-0123B	RCP 1B (PP01B) SPEED	136C01A	RCB	136'-0"	above	0.64(2.1)
865	431-J-ST-0123C	RCP 1B (PP01B) SPEED	136C01A	RCB	136'-0"	above	0.64(2.1)
866	431-J-ST-0123D	RCP 1B (PP01B) SPEED	136C01A	RCB	136'-0"	above	0.64(2.1)
867	441-J-LT-0311D	SIT 4 TK01D LEVEL (WIDE)	136C01A	RCB	136'-0"	above	0.64(2.1)
868	441-J-LT-0341A	SIT 1 TK01A LEVEL (WIDE)	136C01A	RCB	136'-0"	above	0.64(2.1)
869	461-J-FE-0247	RCP 1A MTR CLR OUTLET	136C01A	RCB	136'-0"	above	0.64(2.1)
870	461-J-FE-0248	RCP 1B MTR CLR OUTLET	136C01A	RCB	136'-0"	above	0.64(2.1)
871	461-J-FT-0247A	RCP PP01A CLG FLOW	136C01A	RCB	136'-0"	above	0.64(2.1)
872	461-J-FT-0247B	RCP PP01A CLG FLOW	136C01A	RCB	136'-0"	above	0.64(2.1)
873	461-J-FT-0248A	RCP PP01B CLG FLOW	136C01A	RCB	136'-0"	above	0.64(2.1)
874	461-J-FT-0248B	RCP PP01B CLG FLOW	136C01A	RCB	136'-0"	above	0.64(2.1)
875	541-J-LT-1114A	SG 1 CHANNEL A NAR RANGE LEVEL	136C01A	RCB	136'-0"	above	0.64(2.1)
876	541-J-LT-1114B	SG 1 CHANNEL B NAR RANGE LEVEL	136C01A	RCB	136'-0"	above	0.64(2.1)
877	541-J-LT-1114C	SG 1 CHANNEL C NAR RANGE LEVEL	136C01A	RCB	136'-0"	above	0.64(2.1)
878	541-J-LT-1114D	SG 1 CHANNEL D NAR RANGE LEVEL	136C01A	RCB	136'-0"	above	0.64(2.1)
879	763-J-TE-0047A	ANULUS 3RD QUAD TEMP BELOW OPERATING LVL	136C01A	RCB	136'-0"	above	0.64(2.1)
880	763-J-TE-0048B	ANULUS 4TH QUAD TEMP BELOW OPERATING LVL	136C01A	RCB	136'-0"	above	0.64(2.1)

Table 3.4-1 (47 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
881	441-V-0220	SIT 01B to IRWST ISO VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
882	441-V-0223	SIT 01B Wide Range LVL LT-321B RT VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
883	441-V-0224	SIT 01B to PRI Sample SYS ISO VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
884	441-V-0225	SIT 01B Outlet CHK VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
885	441-V-0230	SIT 01C to IRWST ISO VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
886	441-V-0233	SIT 01C Wide Range LVL LT-331C RT VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
887	441-V-0234	SIT 01C to PRI Sample SYS ISO VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
888	441-V-0235	SIT 01C Outlet CHK VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
889	441-V-0621	SIT 01B Fill & DRN ISO VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
890	441-V-0624	SIT 01B Outlet ISO VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
891	441-V-0631	SIT 01C Fill & DRN ISO VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
892	441-V-0634	SIT 01C Outlet ISO VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
893	441-V-2021	SIT 01C Outlet LN Vent VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
894	441-V-2024	SIT 01B Outlet LN Vent VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
895	441-V-2025	DVI INJECTION 2A TEST CONN V/V	136C01B	RCB	136'-0"	above	0.64(2.1)
896	441-V-2028	DVI INJECTION 2B TEST CONN V/V	136C01B	RCB	136'-0"	above	0.64(2.1)
897	441-V-2031	SIT 01C Outlet LN Vent VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
898	441-V-2034	SIT 01B Outlet LN Vent VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
899	441-V-2035	DVI INJECTION 2A TEST CONN V/V	136C01B	RCB	136'-0"	above	0.64(2.1)
900	441-V-2038	DVI INJECTION 2B TEST CONN V/V	136C01B	RCB	136'-0"	above	0.64(2.1)

Table 3.4-1 (48 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
901	441-V-F509	GLOBE VLAVE	136C01B	RCB	136'-0"	above	0.64(2.1)
902	455-V-1118	Wet Lay Up Recir PP B Disch ISO VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
903	455-V-1120	Wet Lay Up Recir PP B Disch ISO VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
904	491-V-0023	SI TANK 1B SAMPLE VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
905	541-V-1047	S/G 2 D/C CHK VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
906	791-V-2052	S/G#2 DOWNCOMER SIDE LN VENT VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
907	791-V-2054	S/G#2 DOWNCOMER SIDE LN VENT VALVE	136C01B	RCB	136'-0"	above	0.64(2.1)
908	441-M-OR12C	Flow Orifice for Equipment	136C01B	RCB	136'-0"	above	0.64(2.1)
909	441-M-TK01B	SAFETY INJECTION TANK 2	136C01B	RCB	136'-0"	above	0.64(2.1)
910	441-M-TK01C	SAFETY INJECTION TANK 3	136C01B	RCB	136'-0"	above	0.64(2.1)
911	442-M-OR05B	RESTRICTION ORIFICE	136C01B	RCB	136'-0"	above	0.64(2.1)
912	443-M-HR01B	PAR	136C01B	RCB	136'-0"	above	0.64(2.1)
913	443-M-HR02B	PAR	136C01B	RCB	136'-0"	above	0.64(2.1)
914	431-J-PT-0101B	PZR PRESS. PROTECTIVE (NR)	136C01B	RCB	136'-0"	above	0.64(2.1)
915	431-J-PT-0101D	PZR PRESS. PROTECTIVE (NR)	136C01B	RCB	136'-0"	above	0.64(2.1)
916	431-J-PT-0102B	PZR PRESS. PROTECTIVE (WR)	136C01B	RCB	136'-0"	above	0.64(2.1)
917	431-J-PT-0102D	PZR PRESS. PROTECTIVE (WR)	136C01B	RCB	136'-0"	above	0.64(2.1)
918	431-J-PT-0104B	PZR PRESS. RESTRICTED RANGE	136C01B	RCB	136'-0"	above	0.64(2.1)
919	431-J-PT-0106D	PZR PRESS. RESTRICTED RANGE	136C01B	RCB	136'-0"	above	0.64(2.1)
920	431-J-ST-0133A	RCP 2A (PP02A) SPEED	136C01B	RCB	136'-0"	above	0.64(2.1)

Table 3.4-1 (49 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
921	431-J-ST-0133B	RCP 2A (PP02A) SPEED	136C01B	RCB	136'-0"	above	0.64(2.1)
922	431-J-ST-0133C	RCP 2A (PP02A) SPEED	136C01B	RCB	136'-0"	above	0.64(2.1)
923	431-J-ST-0133D	RCP 2A (PP02A) SPEED	136C01B	RCB	136'-0"	above	0.64(2.1)
924	431-J-ST-0143A	RCP 2B (PP02B) SPEED	136C01B	RCB	136'-0"	above	0.64(2.1)
925	431-J-ST-0143B	RCP 2B (PP02B) SPEED	136C01B	RCB	136'-0"	above	0.64(2.1)
926	431-J-ST-0143C	RCP 2B (PP02B) SPEED	136C01B	RCB	136'-0"	above	0.64(2.1)
927	431-J-ST-0143D	RCP 2B (PP02B) SPEED	136C01B	RCB	136'-0"	above	0.64(2.1)
928	441-J-LT-0321B	SIT 2 TK01B LEVEL (WIDE)	136C01B	RCB	136'-0"	above	0.64(2.1)
929	441-J-LT-0331C	SIT 3 TK01C LEVEL (WIDE)	136C01B	RCB	136'-0"	above	0.64(2.1)
930	461-J-FE-0245	RCP 2B PUMP CLR OUTLET	136C01B	RCB	136'-0"	above	0.64(2.1)
931	461-J-FE-0246	RCP 2A MTR CLR OUTLET	136C01B	RCB	136'-0"	above	0.64(2.1)
932	461-J-FT-0245A	RCP PP02B CLG FLOW	136C01B	RCB	136'-0"	above	0.64(2.1)
933	461-J-FT-0245B	RCP PP02B CLG FLOW	136C01B	RCB	136'-0"	above	0.64(2.1)
934	461-J-FT-0246A	RCP PP02A CLG FLOW	136C01B	RCB	136'-0"	above	0.64(2.1)
935	461-J-FT-0246B	RCP PP02A CLG FLOW	136C01B	RCB	136'-0"	above	0.64(2.1)
936	541-J-LT-1124A	SG 2 CHANNEL A NAR RANGE LEVEL	136C01B	RCB	136'-0"	above	0.64(2.1)
937	541-J-LT-1124B	SG 2 CHANNEL B NAR RANGE LEVEL	136C01B	RCB	136'-0"	above	0.64(2.1)
938	541-J-LT-1124C	SG 2 CHANNEL C NAR RANGE LEVEL	136C01B	RCB	136'-0"	above	0.64(2.1)
939	541-J-LT-1124D	SG 2 CHANNEL D NAR RANGE LEVEL	136C01B	RCB	136'-0"	above	0.64(2.1)

Table 3.4-1 (50 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
940	763-J-TE-0045A	ANULUS 1ST QUAD TEMP BELOW OPERATING LVL	136C01B	RCB	136'-0"	above	0.64(2.1)
941	763-J-TE-0046B	ANULUS 2ND QUAD TEMP BELOW OPERATING LVL	136C01B	RCB	136'-0"	above	0.64(2.1)
942	431-V-0120	POSRV-200 SLPV-300 ISO MOV	136C02	RCB	136'-0"	above	0.51(1.7)
943	431-V-0121	POSRV-200 SLPV-301 ISO MOV	136C02	RCB	136'-0"	above	0.51(1.7)
944	431-V-0122	POSRV-201 SLPV-302 ISO MOV	136C02	RCB	136'-0"	above	0.51(1.7)
945	431-V-0123	POSRV-201 SLPV-303 ISO MOV	136C02	RCB	136'-0"	above	0.51(1.7)
946	431-V-0124	POSRV-202 SLPV-304 ISO MOV	136C02	RCB	136'-0"	above	0.51(1.7)
947	431-V-0125	POSRV-202 SLPV-305 ISO MOV	136C02	RCB	136'-0"	above	0.51(1.7)
948	431-V-0126	POSRV-203 SLPV-306 ISO MOV	136C02	RCB	136'-0"	above	0.51(1.7)
949	431-V-0127	POSRV-203 SLPV-307 ISO MOV	136C02	RCB	136'-0"	above	0.51(1.7)
950	431-V-0130	POSRV-200 Double Motor Operated Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
951	431-V-0131	POSRV-200 Double Motor Operated Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
952	431-V-0132	POSRV-201 Double Motor Operated Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
953	431-V-0133	POSRV-201 Double Motor Operated Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
954	431-V-0134	POSRV-202 Double Motor Operated Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
955	431-V-0135	POSRV-202 Double Motor Operated Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
956	431-V-0136	POSRV-203 Double Motor Operated Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
957	431-V-0137	POSRV-203 Double Motor Operated Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)

Table 3.4-1 (51 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
958	431-V-0200	POSRV Main VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
959	431-V-0201	POSRV Main VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
960	431-V-0202	POSRV Main VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
961	431-V-0203	POSRV Main VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
962	431-V-0300	POSRV-200 Spring Loaded Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
963	431-V-0301	POSRV-200 Spring Loaded Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
964	431-V-0302	POSRV-201 Spring Loaded Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
965	431-V-0303	POSRV-201 Spring Loaded Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
966	431-V-0304	POSRV-202 Spring Loaded Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
967	431-V-0305	POSRV-202 Spring Loaded Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
968	431-V-0306	POSRV-203 Spring Loaded Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
969	431-V-0307	POSRV-203 Spring Loaded Pilot VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
970	431-V-0310	POSRV-200 SLPV-300 Manual ISO VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
971	431-V-0311	POSRV-200 SLPV-301 Manual ISO VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
972	431-V-0312	POSRV-201 SLPV-302 Manual ISO VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
973	431-V-0313	POSRV-201 SLPV-303 Manual ISO VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
974	431-V-0314	POSRV-202 SLPV-304 Manual ISO VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
975	431-V-0315	POSRV-202 SLPV-305 Manual ISO VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
976	431-V-0316	POSRV-203 SLPV-306 Manual ISO VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
977	431-V-0317	POSRV-203 SLPV-307 Manual ISO VALVE	136C02	RCB	136'-0"	above	0.51(1.7)

Table 3.4-1 (52 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
978	431-V-0385	POSRV-200/201 Disch to Atmos MOV	136C02	RCB	136'-0"	above	0.51(1.7)
979	431-V-0386	POSRV-202/203 Disch to Atmos MOV	136C02	RCB	136'-0"	above	0.51(1.7)
980	491-V-0024	SI TANK 1C SAMPLE VALVE	136C02	RCB	136'-0"	above	0.51(1.7)
981	491-V-2007	SIT SMPL LN TEST CONN V/V (INSIDE CTMT)	136C02	RCB	136'-0"	above	0.51(1.7)
982	763-J-TE-0033A	PRESSURIZER RM TEMP	136C02	RCB	136'-0"	above	0.51(1.7)
983	431-V-0204	PZR PT-101C/102C/105C Root VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
984	431-V-0205	PZR PT-101D/102D/106D Root VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
985	431-V-0206	PZR PT-101A/102A/103A Root VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
986	431-V-0207	PZR PT-101B/102B/104B Root VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
987	431-V-0208	PZR PT-100X/199X, LT-110A Root VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
988	431-V-0209	PZR LT-103C Root VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
989	431-V-0227	PZR PT-100Y/199Y, LT-110B Root VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
990	431-V-0238	PZR STM Space Sample ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
991	431-V-2300	PZR STM Space ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
992	433-V-0410	PZR GAS VENT ISO V/V	156C01	RCB	156'-0"	above	0.15(0.5)
993	433-V-0411	PZR GAS VENT ISO V/V	156C01	RCB	156'-0"	above	0.15(0.5)
994	433-V-0412	PZR GAS VENT ISO V/V	156C01	RCB	156'-0"	above	0.15(0.5)
995	433-V-0413	PZR GAS VENT ISO V/V	156C01	RCB	156'-0"	above	0.15(0.5)
996	441-V-0112	SIT 01D Atmos Vent ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)

Table 3.4-1 (53 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
997	441-V-0117	SIT 01D N_2 PR WIDE RANGE PT-311D RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
998	441-V-0118	SIT 01D Atmos Vent ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
999	441-V-0119	SIT 01D N_2 PR NR PT-313 RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1000	441-V-0122	SIT 01B Atmos Vent ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1001	441-V-0127	SIT 01B N_2 PR WIDE RANGE PT-321B RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1002	441-V-0128	SIT 01B Atmos Vent ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1003	441-V-0129	SIT 01B N_2 PR NR PT-323 RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1004	441-V-0132	SIT 01C Atmos Vent ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1005	441-V-0137	SIT 01C N_2 PR WIDE RANGE PT-331C RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1006	441-V-0138	SIT 01C Atmos Vent ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1007	441-V-0139	SIT 01C N_2 PR NR PT-333 RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1008	441-V-0142	SIT 01A Atmos Vent ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1009	441-V-0147	SIT 01A N_2 PR WIDE RANGE PT-341A RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1010	441-V-0148	SIT 01A Atmos Vent ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1011	441-V-0149	SIT 01A N_2 PR NR PT-343 RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1012	441-V-0211	SIT 01D Relief VALVE	156C01	RCB	156'-0"	above	0.15(0.5)

Table 3.4-1 (54 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
1013	441-V-0212	SIT 01D Wide Range LVL LT-311D RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1014	441-V-0221	SIT 01B Relief VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1015	441-V-0222	SIT 01B Wide Range LVL LT-321B RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1016	441-V-0228	SIT 01D NR LVL LT-312/313 RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1017	441-V-0229	SIT 01D NR LVL LT-312/313 RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1018	441-V-0231	SIT 01C Relief VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1019	441-V-0232	SIT 01C Wide Range LVL LT-331C RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1020	441-V-0238	SIT 01B NR LVL LT-322/323 RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1021	441-V-0239	SIT 01B NR LVL LT-322/323 RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1022	441-V-0241	SIT 01A Relief VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1023	441-V-0242	SIT 01A Wide Range LVL LT-341A RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1024	441-V-0248	SIT 01C NR LVL LT-332/333 RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1025	441-V-0249	SIT 01C NR LVL LT-332/333 RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1026	441-V-0258	SIT 01A NR LVL LT-342/343 RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1027	441-V-0259	SIT 01A NR LVL LT-342/343 RT VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1028	441-V-0605	SIT 01D Atmos Vent Sol VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1029	441-V-0606	SIT 01B Atmos Vent Sol VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1030	441-V-0607	SIT 01C Atmos Vent Sol VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1031	441-V-0608	SIT 01A Atmos Vent Sol VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1032	441-V-0612	SIT 01D N_2 Supply VALVE	156C01	RCB	156'-0"	above	0.15(0.5)

Table 3.4-1 (55 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
1033	441-V-0613	SIT 01D Atmos Vent Sol VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1034	441-V-0619	SIT 01D N_2 Supply VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1035	441-V-0622	SIT 01B N_2 Supply VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1036	441-V-0623	SIT 01B Atmos Vent Sol VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1037	441-V-0629	SIT 01B N_2 Supply VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1038	441-V-0632	SIT 01C N_2 Supply VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1039	441-V-0633	SIT 01C Atmos Vent Sol VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1040	441-V-0639	SIT 01C N_2 Supply VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1041	441-V-0642	SIT 01A N_2 Supply VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1042	441-V-0643	SIT 01A Atmos Vent Sol VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1043	441-V-0649	SIT 01A N_2 Supply VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1044	441-V-1001	SIT 01D N_2 Supply LN CHK VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1045	441-V-1002	SIT 01B N_2 Supply LN CHK VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1046	441-V-1003	SIT 01C N_2 Supply LN CHK VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1047	441-V-1004	SIT 01A N_2 Supply LN CHK VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1048	541-V-2072	S/G 1 LIT 7A Upper ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1049	541-V-2073	S/G 2 LT 10B Upper ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1050	541-V-2074	S/G 1 LT 9A Upper ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)

Table 3.4-1 (56 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
1051	541-V-2075	S/G 2 LT 8B Upper ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1052	541-V-2076	S/G 1 LT 9A Lower ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1053	541-V-2077	S/G 2 LT 8B Lower ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1054	541-V-2080	S/G 1 LT 7A Lower ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1055	541-V-2081	S/G 2 LT 10B Lower ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1056	541-V-2084	S/G 1 LT 10A ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1057	541-V-2085	S/G 2 LT 7B Upper ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1058	541-V-2086	S/G 1 LT 8A Upper ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1059	541-V-2087	S/G 2 LT 9B Upper ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1060	541-V-2088	S/G 1 LT 8A Lower ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1061	541-V-2089	S/G 2 LT 9B Lower ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1062	541-V-2092	S/G 1 LT 10A Lower ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1063	541-V-2093	S/G 2 LT 7B Lower ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1064	612-V-0012	HV Purge AHU to R/F&Pool Supply VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1065	612-V-0013	R/F&Pool to HV Purge EXH ACU ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1066	612-V-0032	LV Purge Sply Fan to R/F&Pool Sply VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1067	612-V-0033	R/F & Pool to LV Purge ACU02 ISO VALVE	156C01	RCB	156'-0"	above	0.15(0.5)
1068	442-M-OR02A	RESTRICTION ORIFICE	156C01	RCB	156'-0"	above	0.15(0.5)
1069	442-M-OR02B	RESTRICTION ORIFICE	156C01	RCB	156'-0"	above	0.15(0.5)

Table 3.4-1 (57 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
1070	442-M-OR03A	RESTRICTION ORIFICE	156C01	RCB	156'-0"	above	0.15(0.5)
1071	442-M-OR03B	RESTRICTION ORIFICE	156C01	RCB	156'-0"	above	0.15(0.5)
1072	442-M-OR04A	RESTRICTION ORIFICE	156C01	RCB	156'-0"	above	0.15(0.5)
1073	442-M-OR04B	RESTRICTION ORIFICE	156C01	RCB	156'-0"	above	0.15(0.5)
1074	442-M-OR09	RESTRICTION ORIFICE	156C01	RCB	156'-0"	above	0.15(0.5)
1075	443-M-HR03A	PAR	156C01	RCB	156'-0"	above	0.15(0.5)
1076	443-M-HR03B	PAR	156C01	RCB	156'-0"	above	0.15(0.5)
1077	431-J-PT-0101A	PZR PRESS. PROTECTIVE (NR)	156C01	RCB	156'-0"	above	0.15(0.5)
1078	431-J-PT-0101C	PZR PRESS. PROTECTIVE (NR)	156C01	RCB	156'-0"	above	0.15(0.5)
1079	431-J-PT-0102A	PZR PRESS. PROTECTIVE (WR)	156C01	RCB	156'-0"	above	0.15(0.5)
1080	431-J-PT-0102C	PZR PRESS. PROTECTIVE (WR)	156C01	RCB	156'-0"	above	0.15(0.5)
1081	431-J-PT-0103A	PZR PRESS. RESTRICTED RANGE	156C01	RCB	156'-0"	above	0.15(0.5)
1082	431-J-PT-0105C	PZR PRESS. RESTRICTED RANGE	156C01	RCB	156'-0"	above	0.15(0.5)
1083	441-J-PT-0311D	SIT TANK 4 TK-01D PRESSURE (WIDE)	156C01	RCB	156'-0"	above	0.15(0.5)
1084	441-J-PT-0321B	SIT TANK 2 TK-01B PRESSURE (WIDE)	156C01	RCB	156'-0"	above	0.15(0.5)
1085	441-J-PT-0331C	SIT TANK 3 TK-01C PRESSURE (WIDE)	156C01	RCB	156'-0"	above	0.15(0.5)
1086	441-J-PT-0341A	SIT TANK 1 TK-01A PRESSURE (WIDE)	156C01	RCB	156'-0"	above	0.15(0.5)
1087	521-J-PT-1013A	S/G 1 PRESSURE CH A	156C01	RCB	156'-0"	above	0.15(0.5)
1088	521-J-PT-1013B	S/G 1 PRESSURE CH B	156C01	RCB	156'-0"	above	0.15(0.5)
1089	521-J-PT-1013C	S/G 1 PRESSURE CH C	156C01	RCB	156'-0"	above	0.15(0.5)

Table 3.4-1 (58 of 58)

Item No.	Equipment No	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Height above Floor m(ft)
1090	521-J-PT-1013D	S/G 1 PRESSURE CH D	156C01	RCB	156'-0"	above	0.15(0.5)
1091	521-J-PT-1023A	S/G 2 PRESSURE CH A	156C01	RCB	156'-0"	above	0.15(0.5)
1092	521-J-PT-1023B	S/G 2 PRESSURE CH B	156C01	RCB	156'-0"	above	0.15(0.5)
1093	521-J-PT-1023C	S/G 2 PRESSURE CH C	156C01	RCB	156'-0"	above	0.15(0.5)
1094	521-J-PT-1023D	S/G 2 PRESSURE CH D	156C01	RCB	156'-0"	above	0.15(0.5)
1095	761-J-RE-0231A	CNMT OPERATING AREA MONITOR	156C01	RCB	156'-0"	above	0.15(0.5)
1096	761-J-RE-0232B	CNMT OPERATING AREA MONITOR	156C01	RCB	156'-0"	above	0.15(0.5)
1097	761-J-RE-0233A	CNMT UPPER OPERATING AREA MONITOR	156C01	RCB	156'-0"	above	0.15(0.5)
1098	761-J-RE-0234B	CNMT UPPER OPERATING AREA MONITOR	156C01	RCB	156'-0"	above	0.15(0.5)
1099	763-J-TE-0031A	CNMT. DOME TEMP	156C01	RCB	156'-0"	above	0.15(0.5)
1100	763-J-TE-0035A	CNMT 1ST QUAD TEMP (ABOVE OPERATING LVL)	156C01	RCB	156'-0"	above	0.15(0.5)
1101	763-J-TE-0036B	CNMT 2ND QUAD TEMP (ABOVE OPERATING LVL)	156C01	RCB	156'-0"	above	0.15(0.5)
1102	763-J-TE-0037A	CNMT 3RD QUAD TEMP (ABOVE OPERATING LVL)	156C01	RCB	156'-0"	above	0.15(0.5)
1103	763-J-TE-0038B	CNMT 4TH QUAD TEMP (ABOVE OPERATING LVL)	156C01	RCB	156'-0"	above	0.15(0.5)

(1) These components are not required to be protected against internal flooding because they are not failed due to submergence or the loss of their functions does not impact on safe shutdown.

Table 3.4-2 (1 of 281)

Auxiliary Building Components Protected from Internal Flooding

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1	442-M-HE02A	CS MINIFLOW HX 1	050A01C	Auxiliary	50'-0"	(1)	64'-0"	N/A	6" EOL (1)
2	442-M-OR01A	RESTRICTION ORIFICE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
3	442-M-PP01A	CONTAINMENT SPRAY PUMP 1	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
4	606-M-HV10A	CS PUMP & MINIFLOW HEAT EXCHANGER RM	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
5	442-J-TW-0081	CS MINI FLOW HX 1 INLET TEMP	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
6	442-J-TW-0083	CS MINI FLOW HX 1 OUTLET TEMP	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
7	461-J-TEW-0119	CS PUMP MINI FLOW HX OUTLET TEMP	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
8	461-J-TW-0117	CS PUMP MINI FLOW HX 1 OUTLET	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
9	481-J-LE-0097C	CS PUMP ROOM "A" FLOODING LEVEL	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
10	606-J-TE-0207C	CS PP & MINIFLOW HX RM TEMP	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
11	633-J-TW-0205	COOLING COIL VK-CW10A OUTLET	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
12	633-J-TW-0207	COOLING COIL VK-CW10A INLET	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
13	442-V-1001	CSP 01A Disch CHK VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
14	442-V-1003	CS Hx 01A Inlet ISO VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
15	442-V-1015	CSP 01A Mini-flow HX01A ILT ISO VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
16	442-V-1017	CSP 01A Mini-flow HX01A Outlet ISO VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
17	442-V-1019	CS Mini-Flow Hx 01A LN to Pri SMPL ISO	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
18	442-V-1021	CS MINI-FLOW HX HE02A THERMAL RELIEF VALVE TO EDT	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
19	442-V-2001	CSP 01A Suct STR PI-013 Root VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
20	442-V-2003	CSP 01A Suct STR PI-015 Root VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
21	442-V-2009	PI-051 Root VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
22	442-V-2011	PI-071 Root VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
23	442-V-2015	CSP 01A Vent VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
24	442-V-2017	CSP 01A Vent VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
25	442-V-2019	CS Mini-Flow Hx 01A DRN VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
26	442-V-2021	CSP 01A DRN VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
27	442-V-2039	CSP 01A Suct LN DRN VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
28	442-V-2041	CSMH 02A Disch Vent VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
29	442-V-2043	CSMH 02A Inlet Vent VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
30	442-V-2053	IRWST RTN LN Vent VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		

Table 3.4-2 (2 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
31	442-V-2061	CSMH 02A Outlet Spec Test VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
32	442-V-2063	CSMH 02A Inlet Spec Test VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
33	442-V-2069	CS Hx 01A Inlet DRN VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
34	451-V-2327	BAMP 1&2 Mini-Flow LN to BAST VNT VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
35	461-V-1241	CS PP Mini-Flow HE02A Inlet ISO VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
36	461-V-1243	CS PP Mini-Flow HE02A Outlet ISO VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
37	461-V-1247	CNMT SPRAY PUMP MINI-FLOW HX 1 SHELL SIDE RELIEF VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
38	461-V-2123	Quadrant C Supply Line DRN VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
39	461-V-2127	CS PP Mini-Flow HE02A Outlet LN Vent VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
40	461-V-2231	CS PP Mini-Flow HE02A Inlet Pr Test VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
41	461-V-2234	CS PP Mini-Flow HE02A Outlet Pr Test VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
42	461-V-2463	CS PP Mini-Flow HE02A OTLT FT-10G RT VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
43	461-V-2464	CS PP Mini-Flow HE02A OTLT FT-10G RT VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
44	491-V-0026	CS PUMP 1 MINIFLOW LINE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
45	633-V-1153A	CS PP(C)&M/F HX RM C-CLR Outlet VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
46	633-V-1154A	CS PP(C)&M/F HX RM C-CLR Inlet throt VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
47	633-V-2153A	CSPP(C)&M/F HX C-CLR Outlet PZR Test VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
48	633-V-2154A	CSPP(C)&M/F HX C-CLR Inlet PZR Test VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
49	633-V-2181A	CS PP(C)&M/F HX C-CLR Outlet DRN VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
50	633-V-2182A	CS PP(C)&M/F HX C-CLR Inlet Vent VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
51	633-V-2183A	CS PP(C)&M/F HX C-CLR Inlet DRN VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
52	633-V-2253A	CSPP&MinFlo Hx RM HV10A ECW OTLT Vent VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
53	633-V-2254A	CSPP&MinFlo Hx RM HV10A ECW Inlet DRN VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
54	633-V-2353A	HV10A ECW Outlet Test Conn VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
55	633-V-2354A	HV10A ECW Inlet Test Conn VALVE	050A01C	Auxiliary	50'-0"	(1)	64'-0"		

Table 3.4-2 (3 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
56	606-Y-VK-1504A	FIRE DAMPER	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
57	606-Y-VK-1523A	FIRE DAMPER	050A01C	Auxiliary	50'-0"	(1)	64'-0"		
58	442-M-HE02B	CS MINIFLOW HX 2	050A01D	Auxiliary	50'-0"	(1)	64'-0"	N/A	8" EOL (1)
59	442-M-OR01B	RESTRICTION ORIFICE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
60	442-M-PP01B	CONTAINMENT SPRAY PUMP 2	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
61	606-M-HV10B	CS PUMP & MINIFLOW HEAT EXCHANGER RM	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
62	442-J-TW-0082	CS MINI FLOW HX 2 INLET TEMP	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
63	442-J-TW-0084	CS MINI FLOW HX 2 OUTLET TEMP	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
64	461-J-TEW-0120	CS PUMP MINI FLOW HX OUTLET TEMP	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
65	461-J-TW-0118	CS PUMP MINI FLOW HX 2 OUTLET	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
66	481-J-LE-0098D	CS PUMP ROOM "B" FLOODING LEVEL	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
67	606-J-TE-0208D	CS PP & MINIFLOW HX RM TEMP	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
68	633-J-TW-0206	COOLING COIL VK-CW10B OUTLET	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
69	633-J-TW-0208	COOLING COIL VK-CW10B INLET	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
70	442-V-1002	CSP 01B Disch CHK VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
71	442-V-1004	CS Hx 01B Inlet ISO VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
72	442-V-1016	CSP 01B Minflow HX01B ILT ISO VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
73	442-V-1018	CSP 01B Minflow HX01B Outlet ISO VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
74	442-V-1020	CS Mini-Flow Hx 02B LN to Pri SMPL ISO	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
75	442-V-1022	CS MINI-FLOW HX HE02B THERMAL RELIEF VALVE TO EDT	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
76	442-V-2002	CSP 01B Suct STR PI-014 Root VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
77	442-V-2004	CSP 01B Suct STR PI-016 Root VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
78	442-V-2010	PI-061 Root VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
79	442-V-2012	PI-081 Root VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
80	442-V-2013	CS Mini-Flow HX 01A Vent VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
81	442-V-2014	CS Mini-Flow HX 02B Vent VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
82	442-V-2020	CS Mini-Flow Hx 01B DRN VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
83	442-V-2022	CSP 01B DRN VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
84	442-V-2038	CSP 01B Suct LN DRN VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
85	442-V-2040	CSMH 02B Disch Vent VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
86	442-V-2042	CSMH 02B Inlet Vent VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
87	442-V-2052	IRWST RTN LN Vent VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
88	442-V-2060	CSMH 02B Outlet Spec Test VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
89	442-V-2062	CSMH 02B Inlet Spec Test VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
90	442-V-2068	CS Hx 02B Inlet DRN VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		

Table 3.4-2 (4 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
91	461-V-1242	CS PP Mini-Flow HE02B Inlet ISO VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
92	461-V-1244	CS PP Mini-Flow HE02B Outlet ISO VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
93	461-V-1248	CNMT SPRAY PUMP MINI-FLOW HX 2 SHELL SIDE RELIEF VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
94	461-V-2124	Quadrant D Supply Line DRN VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
95	461-V-2128	CS PP Mini-Flow HE02B Outlet LN Vent VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
96	461-V-2236	CS PP Mini-Flow HE02B Inlet Pr Test VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
97	461-V-2239	CS PP Mini-Flow HE02B Outlet Pr Test VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
98	461-V-2465	CS PP Mini-Flow HE02B OTLT FT-10H RT VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
99	461-V-2466	CS PP Mini-Flow HE02B OTLT FT-10H RT VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
100	461-V-3003	CCW M/U PP03A Disch Line FT-2A Root VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
101	491-V-0027	CS PUMP2 MINIFLOW LINE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
102	633-V-1153B	CS PP(D)&M/F HX RM C-CLR Outlet VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
103	633-V-1154B	CS PP(D)&M/F HX RM C-CLR Inlet throt VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
104	633-V-2153B	CSPP(D)&M/F HX C-CLR Outlet PZR Test VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
105	633-V-2154B	CSPP(D)&M/F HX C-CLR Inlet PZR Test VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
106	633-V-2181B	CS PP(D)&M/F HX C-CLR Outlet DRN VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
107	633-V-2182B	CS PP(D)&M/F HX C-CLR Inlet Vent VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
108	633-V-2183B	CS PP(D)&M/F HX C-CLR Inlet DRN VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
109	633-V-2253B	CSPP&MinFlo Hx RM HV10B ECW OTLT Vent VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
110	633-V-2254B	CSPP&MinFLOHxRM HV10B ECW Inlet DRN VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
111	633-V-2353B	HV10B ECW Outlet Test Conn VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
112	633-V-2354B	HV10B ECW Inlet Test Conn VALVE	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
113	606-Y-VK-1040B	MANUAL DAMPER	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
114	606-Y-VK-1523B	FIRE DAMPER	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
115	606-Y-VK-1526A	FIRE DAMPER	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
116	606-Y-VK-1526B	FIRE DAMPER	050A01D	Auxiliary	50'-0"	(1)	64'-0"		

Table 3.4-2 (5 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
117	606-Y-VK-1529B	FIRE DAMPER	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
118	606-Y-VK-1574B	FIRE DAMPER	050A01D	Auxiliary	50'-0"	(1)	64'-0"		
119	441-M-OR01C	Flow Orifice for Equipment	050A02C	Auxiliary	50'-0"	(1)	64'-0"	N/A	6" EOL (1)
120	441-M-OR07A	Flow Orifice for Equipment	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
121	441-M-OR07A-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
122	441-M-OR08C	Flow Orifice for Equipment	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
123	441-M-OR08C-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
124	441-M-OR20C	Flow Orifice for Equipment	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
125	441-M-PP02C	SAFETY INJECTION PUMP 3	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
126	606-M-HV11A	SI PUMP RM CUBICLE COOLER	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
127	481-J-LE-0091C	SI PUMP ROOM "C" FLOODING LEVEL	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
128	606-J-TE-0209C	SI PP ROOM TEMP	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
129	633-J-TW-0213	COOLING COIL VK-CW12A OUTLET	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
130	633-J-TW-0215	COOLING COIL VK-CW12A INLET	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
131	441-V-0130	SIP 02C Suction ISO VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
132	441-V-0254	SIP 02C Disch to IRWST Flow Orif B/P VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
133	441-V-0412	SIP 02C Disch Mini-Flow ISO VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
134	441-V-0433	SIP 02C Disch PT-306 RT VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
135	441-V-0434	SIP 02C Disch CHK VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
136	441-V-0435	SIP 02C Disch ISO VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
137	441-V-0451	SIP 02C Disch Mini-Flow CHK VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
138	441-V-0483	SIP 02C Suction PI-2303 RT VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
139	441-V-0550	SIP 02C Suction Pr Test VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
140	441-V-0604	SIP 02C to Hot Leg INJ Loop1 LN ISO VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
141	441-V-0706	SIS FILL CHECK VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
142	441-V-2201	SIP 02C Disch Line DRN VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
143	441-V-2302	SIP 02C Disch Line DRN VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
144	441-V-2303	SIP 02C Disch Line DRN VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
145	441-V-2402	SIP 02C Disch Line DRN VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
146	441-V-2403	SIP 02C Disch Line DRN VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
147	441-V-2778	SI/SC Mini-Flow Line DRN VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
148	441-V-2779	SI/SC Mini-Flow Line DRN VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
149	441-V-2780	Hot Leg INJ Loop1 DRN VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
150	441-V-2781	Hot Leg INJ Loop1 DRN VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
151	442-V-2045	SDCHX 1 Inlet LN DRN VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		

Table 3.4-2 (6 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
152	442-V-2047	SDCHX 1 Inlet LN Vent VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
153	633-V-1157A	SI PP(C) RM C-CLR Outlet VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
154	633-V-1158A	SI PP(C) RM C-CLR Inlet throt VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
155	633-V-2157A	SI PP(C) RM C-CLR Outlet PZR Test VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
156	633-V-2158A	SI PP(C) RM C-CLR Inlet PZR Test VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
157	633-V-2184A	SI PP(C) RM C-CLR Outlet DRN VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
158	633-V-2185A	SI PP(C) RM C-CLR Inlet Vent VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
159	633-V-2186A	SI PP(C) RM C-CLR Inlet DRN VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
160	633-V-2257A	SI PP RM HV 11A ECW Outlet Vent VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
161	633-V-2258A	SI PP RM HV 11A ECW Inlet DRN VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
162	633-V-2357A	SI PP RM HV11A ECW Outlet Test Conn VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
163	633-V-2358A	SI PP RM HV11A ECW Inlet Test Conn VALVE	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
164	606-Y-VK-1525A	FIRE DAMPER	050A02C	Auxiliary	50'-0"	(1)	64'-0"		
165	441-M-OR01D	Flow Orifice for Equipment	050A02D	Auxiliary	50'-0"	(1)	64'-0"	N/A	8" EOL (1)
166	441-M-OR07B	Flow Orifice for Equipment	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
167	441-M-OR07B-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
168	441-M-OR08D	Flow Orifice for Equipment	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
169	441-M-OR08D-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
170	441-M-OR20D	FLOW ORIFICE FOR EQUIPMENT	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
171	441-M-PP02D	SAFETY INJECTION PUMP 4	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
172	606-M-HV11B	SI PUMP RM CUBICLE COOLER	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
173	481-J-LE-0092D	SI PUMP ROOM "D" FLOODING LEVEL	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
174	633-J-TW-0214	COOLING COIL VK-CW12B OUTLET	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
175	633-J-TW-0216	COOLING COIL VK-CW12B INLET	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
176	441-V-0131	SIP 02D Suction ISO VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
177	441-V-0255	SIP 02D Disch to IRWST Flow Orif B/P VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
178	441-V-0413	SIP 02D Disch Mini-Flow ISO VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
179	441-V-0446	SIP 02D Disch CHK VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
180	441-V-0447	SIP 02D Disch ISO VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
181	441-V-0448	SIP 02D Disch Mini-Flow CHK VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
182	441-V-0484	SIP 02D Suction PI-2304 RT VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
183	441-V-0555	SIP 02D Suction Pr Test VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
184	441-V-0609	SIP 02D to Hot Leg INJ Loop2 LN ISO VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		

Table 3.4-2 (7 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
185	441-V-0707	SIS FILL CHECK VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
186	441-V-2203	SIP 02D Disch Line DRN VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
187	441-V-2306	SIP 02D Disch Line DRN VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
188	441-V-2307	SIP 02D Disch Line DRN VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
189	441-V-2406	SIP 02D Disch Line DRN VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
190	441-V-2407	SIP 02D Disch Line DRN VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
191	441-V-2793	SI/SC Mini-Flow Line DRN VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
192	441-V-2794	SI/SC Mini-Flow Line DRN VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
193	441-V-2795	Hot Leg INJ Loop2 DRN VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
194	441-V-2796	Hot Leg INJ Loop2 DRN VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
195	441-V-F542	GLOBE VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
196	442-V-2044	SDCHX 2 Inlet LN DRN VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
197	442-V-2046	SDCHX 2 Inlet LN Vent VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
198	633-V-1157B	SI PP(D) RM C-CLR Outlet VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
199	633-V-1158B	SI PP(D) RM C-CLR Inlet throt VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
200	633-V-2157B	SI PP(D) RM C-CLR Outlet PZR Test VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
201	633-V-2158B	SI PP(D) RM C-CLR Inlet PZR Test VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
202	633-V-2184B	SI PP(D) RM C-CLR Outlet DRN VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
203	633-V-2185B	SI PP(D) RM C-CLR Inlet Vent VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
204	633-V-2186B	SI PP(D) RM C-CLR Inlet DRN VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
205	633-V-2257B	SI PP RM HV 11B ECW Outlet Vent VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
206	633-V-2258B	SI PP RM HV 11B ECW Inlet DRN VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
207	633-V-2357B	SI PP RM HV11B ECW Outlet Test Conn VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
208	633-V-2358B	SI PP RM HV11B ECW Inlet Test Conn VALVE	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
209	606-Y-VK-1043B	MANUAL DAMPER	050A02D	Auxiliary	50'-0"	(1)	64'-0"		
210	441-M-OR01A	Flow Orifice for Equipment	050A03A	Auxiliary	50'-0"	(1)	64'-0"	N/A	6" EOL (1)
211	441-M-OR08A	Flow Orifice for Equipment	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
212	441-M-OR08A-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
213	441-M-OR20A	FLOW ORIFICE FOR EQUIPMENT	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
214	441-M-PP02A	SAFETY INJECTION PUMP 1	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
215	606-M-HV12A	SI PUMP RM CUBICLE COOLER	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
216	441-J-HS-0041A03	SHUTDOWN COOLING PUMP 2A	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
217	481-J-LE-0079A	SI PUMP ROOM "A" FLOODING LEVEL	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
218	606-J-TE-0211A	SI PP ROOM TEMP	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
219	633-J-TW-0209	COOLING COIL VK-CW11A OUTLET	050A03A	Auxiliary	50'-0"	(1)	64'-0"		

Table 3.4-2 (8 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
220	633-J-TW-0211	COOLING COIL VK-CW11A INLET	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
221	441-V-0218	SIP 02A Disch to IRWST Flow Orif B/P VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
222	441-V-0341	SCP 01A/CSP 01A Disch Cross Connect VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
223	441-V-0404	SIP 02A Disch CHK VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
224	441-V-0410	SIP 02A Disch Mini-Flow ISO VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
225	441-V-0416	SIP 02A Disch PT-308 RT VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
226	441-V-0424	SIP 02A Disch Mini-Flow CHK VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
227	441-V-0470	SIP 02A Suction ISO VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
228	441-V-0476	SIP 02A Disch ISO VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
229	441-V-0481	SIP 02A Suction PI-2301 RT VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
230	441-V-0552	SIP 02A Suction Pr Test VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
231	441-V-0704	SIS FILL CHECK VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
232	441-V-2200	SIP 02A Disch Line DRN VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
233	441-V-2300	SIP 02A Disch Line DRN VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
234	441-V-2301	SIP 02A Disch Line DRN VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
235	441-V-2400	SIP 02A Disch Line DRN VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
236	441-V-2401	SIP 02A Disch Line DRN VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
237	441-V-2768	SIP 02A Outlet DRN VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
238	441-V-2769	SIP 02A Outlet DRN VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
239	441-V-2772	SIP 02A Disch to SI 1 Line Vent VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
240	441-V-2773	SIP 02A Disch to SI 1 Line Vent VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
241	441-V-2776	Containment Spray HX DRN VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
242	633-V-1155A	SI PP(A) RM C-CLR Outlet VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
243	633-V-1156A	SI PP(A) RM C-CLR Inlet throt VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
244	633-V-2155A	SI PP(A) RM C-CLR Outlet PZR Test VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
245	633-V-2156A	SI PP(A) RM C-CLR Inlet PZR Test VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
246	633-V-2191A	SI PP(A) RM C-CLR Outlet Vent VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
247	633-V-2192A	SI PP(A) RM C-CLR Inlet Vent VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
248	633-V-2255A	PP RM HV12A ECW Outlet Vent VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
249	633-V-2256A	PP RM HV12A ECW Inlet DRN VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
250	633-V-2355A	PP RM HV12A ECW Outlet FLO Test Conn VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
251	633-V-2356A	PP RM HV12A ECW Inlet FLO Test Conn VALVE	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
252	606-Y-VK-1048A	MANUAL DAMPER	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
253	606-Y-VK-1049A	MANUAL DAMPER	050A03A	Auxiliary	50'-0"	(1)	64'-0"		

Table 3.4-2 (9 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
254	606-Y-VK-1522A	FIRE DAMPER	050A03A	Auxiliary	50'-0"	(1)	64'-0"		
255	441-M-OR01B	Flow Orifice for Equipment	050A03B	Auxiliary	50'-0"	(1)	64'-0"	N/A	8" EOF (1)
256	441-M-OR08B	Flow Orifice for Equipment	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
257	441-M-OR08B-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
258	441-M-OR20B	RESTRICTION ORIFICE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
259	441-M-PP02B	SAFETY INJECTION PUMP 2	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
260	606-M-HV12B	SI PUMP RM CUBICLE COOLER	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
261	441-J-HS-0042B03	SHUTDOWN COOLING PUMP 2B	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
262	481-J-LE-0080B	SI PUMP ROOM "B" FLOODING LEVEL	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
263	606-J-TE-0212B	SI PP ROOM TEMP	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
264	633-J-TW-0210	COOLING COIL VK-CW11B OUTLET	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
265	633-J-TW-0212	COOLING COIL VK-CW11B INLET	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
266	441-V-0219	SIP 02B Disch to IRWST Flow Orif B/P VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
267	441-V-0343	SCP 01B/CSP 01B Disch Cross Connect VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
268	441-V-0402	SIP 02B Suction ISO VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
269	441-V-0405	SIP 02B Disch CHK VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
270	441-V-0408	SIP 02B Disch PT-309 RT VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
271	441-V-0409	SIP 02B Disch Relief VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
272	441-V-0411	SIP 02B Disch Mini-Flow ISO VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
273	441-V-0426	SIP 02B Disch Mini-Flow CHK VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
274	441-V-0436	SIP 02D Disch PT-307 RT VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
275	441-V-0478	SIP 02B Disch ISO VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
276	441-V-0482	SIP 02B Suction PI-2302 RT VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
277	441-V-0553	SIP 02B Suction Pr Test VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
278	441-V-0705	SIS FILL CHECK VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
279	441-V-2202	SIP 02B Disch Line DRN VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
280	441-V-2304	SIP 02B Disch Line DRN VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
281	441-V-2305	SIP 02B Disch Line DRN VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
282	441-V-2404	SIP 02B Disch Line DRN VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
283	441-V-2405	SIP 02B Disch Line DRN VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
284	441-V-2750	SIP 02B DISCH LINE VENT VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
285	441-V-2752	SIP 02B DISCH LINE VENT VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
286	441-V-2784	SIP 02B Disch DRN VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
287	441-V-2785	SIP 02B Disch DRN VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
288	441-V-2788	SIP 02B Disch to SI 2 Line Vent VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		

Table 3.4-2 (10 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
289	441-V-2789	SIP 02B Disch to SI 2 Line Vent VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
290	441-V-2791	SC HX01B Suct DRN VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
291	441-V-F541	GLOBE VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
292	633-V-1155B	SI PP(B) RM C-CLR Outlet VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
293	633-V-2155B	SI PP(B) RM C-CLR Outlet PZR Test VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
294	633-V-2191B	SI PP(B) RM C-CLR Outlet Vent VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
295	633-V-2192B	SI PP(B) RM C-CLR Inlet Vent VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
296	633-V-2255B	PP RM HV12B ECW Outlet Vent VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
297	633-V-2355B	PP RM HV12B ECW Outlet FLO Test Conn VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
298	633-V-2356B	PP RM HV12B ECW Inlet FLO Test Conn VALVE	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
299	606-Y-VK-1048B	MANUAL DAMPER	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
300	606-Y-VK-1527B	FIRE DAMPER	050A03B	Auxiliary	50'-0"	(1)	64'-0"		
301	441-M-HE02A	SCP MINIFLOW HX 1	050A04A	Auxiliary	50'-0"	(1)	64'-0"	N/A	6" EOL (1)
302	441-M-OR02A	Flow Orifice for Equipment	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
303	441-M-OR03A	Flow Orifice for Equipment	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
304	441-M-OR03A-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
305	441-M-OR17A	RESTRICTION ORIFICE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
306	441-M-OR17A-DU	RESTRUCTION ORIFICE(DUMMY)	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
307	441-M-PP01A	SHUTDOWN COOLING PUMP 1	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
308	606-M-HV16A	SC PUMP & MINIFLOW HEAT EXCHANGER RM CUBICLE COOLER	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
309	441-J-AX-0342B	SC PUMP 1 MINIFLOW LINE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
310	441-J-TE-0300A	SDC HX NO.1 INLET & OUTLET TEMP.	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
311	441-J-TEW-0300A	SHUTDOWN COOLING HX (HE01A) INLET TEMP	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
312	441-J-TW-0310	S/D MINI FLOW HX HE02A INLET TEMP	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
313	441-J-TW-0312	S/D MINI FLOW HX HE02A OUTLET TEMP	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
314	461-J-TEW-0371	SHUTDOWN CLNG MINI FLOW HX TEMP	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
315	461-J-TW-0369	SHUTDOWN COOLING MINI FLOW HX INLET	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
316	481-J-LE-0085A	SC PUMP ROOM "A" FLOODING LEVEL	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
317	606-J-TE-0219A	SC PP & MINIFLOW HX RM TEMP	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
318	633-J-TW-0229	COOLING COIL VK-CW16A OUTLET	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
319	633-J-TW-0231	COOLING COIL VK-CW16A INLET	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
320	441-V-0106	SCP 01A Suction ISO VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		

Table 3.4-2 (11 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
321	441-V-0108	SCP 01A Suction PT-300 ISO VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
322	441-V-0196	SCP 01A Disch PT-302 RT VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
323	441-V-0252	SCP 01A Disch to PRI Sample SYS ISO VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
324	441-V-0265	SCP 01A to SCP Mini-Flow Hx 1 ISO VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
325	441-V-0485	SCP 01A Suction PI-2305 RT VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
326	441-V-0568	SCP 01A Disch CHK VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
327	441-V-0570	SCP Mini-Flow Hx 02A Vent VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
328	441-V-0576	SCP Mini-Flow Hx 02A Vent VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
329	441-V-0578	SCP 01A Disch ISO VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
330	441-V-0712	Cask Loading Pit to SCS LN Fill CHK VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
331	441-V-2002	Shutdown Cooling Line Loop1 Vent VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
332	441-V-2501	SCP 01A Disch Line DRN VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
333	441-V-2503	SCP 01A Disch Line DRN VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
334	441-V-2504	SCP 01B Disch Line DRN VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
335	441-V-2505	SCP 01A Disch Line DRN VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
336	441-V-2506	SCP 01B Disch Line DRN VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
337	441-V-2515	Mini-Flow HX 02A Suct Line Vent VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
338	441-V-2517	Mini-Flow HX 02A Disch Line Vent VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
339	441-V-2605	SCP MINFLOW VENT VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
340	441-V-2606	SCP MINFLOW VENT VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
341	441-V-2741	SCP 01A SUCTION DRAIN VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
342	461-V-1541	SC PP Mini-Flow HE02A Inlet ISO VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
343	461-V-1543	SC PP Mini-Flow HE02A Outlet Throt VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
344	461-V-1547	SHUTDOWN COOLING MINI-FLOW HX 1 SHELL SIDE RELIEF VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
345	461-V-2138	SC PP Mini-Flow HE02A Inlet LN Vent VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
346	461-V-2139	SC PP Mini-Flow HE02A Outlet LN Vent VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
347	461-V-2531	SC PP Mini-Flow HE02A Inlet Pr Test VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
348	461-V-2534	SC PP Mini-Flow HE02A Outlet Pr Test VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
349	461-V-2585	SC PP Mini-Flow HE02A OTLT FT-10Z RT VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
350	461-V-2586	SC PP Mini-Flow HE02A OTLT FT-10Z RT VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		

Table 3.4-2 (12 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
351	491-V-0016	SC PUMP 1 MINIFLOW SAMPLE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
352	633-V-1165A	SC PP(A)&M/F HX RM C-CLR Outlet VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
353	633-V-1166A	SC PP(A)&M/F HX RM C-CLR Inlet throt VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
354	633-V-2165A	SCPP(A)&M/F HX C-CLR Outlet PZR Test VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
355	633-V-2166A	SCPP(A)&M/F HX C-CLR Inlet PZR Test VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
356	633-V-2196A	CSPP&MinFLOHxRM HV16A ECW Outlet DRN VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
357	633-V-2197A	CSPP&MinFLOHxRM HV16A ECW Inlet Vent VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
358	633-V-2198A	CSPP&MinFLOHxRM HV16A ECW Inlet DRN VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
359	633-V-2265A	CSPP&MinFLOHxRM HV16A ECW OutletVent VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
360	633-V-2266A	CSPP&MinFLOHxRM HV16A ECW Inlet DRN VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
361	633-V-2365A	HV16A ECW Outlet FLO Test Conn VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
362	633-V-2366A	HV16A ECW Inlet FLO Test Conn VALVE	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
363	606-Y-VK-1046A	MANUAL DAMPER	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
364	606-Y-VK-1502A	FIRE DAMPER	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
365	606-Y-VK-1507A	FIRE DAMPER	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
366	606-Y-VK-1520A	FIRE DAMPER	050A04A	Auxiliary	50'-0"	(1)	64'-0"		
367	441-M-HE02B	SCP MINIFLOW HX 2	050A04B	Auxiliary	50'-0"	(1)	64'-0"	N/A	6" EOL (1)
368	441-M-OR02B	Flow Orifice for Equipment	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
369	441-M-OR03B	Flow Orifice for Equipment	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
370	441-M-OR03B-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
371	441-M-OR17B	RESTRICTION ORIFICE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
372	441-M-OR17B-DU	RESTRUCTION ORIFICE(DUMMY)	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
373	441-M-PP01B	SHUTDOWN COOLING PUMP 2	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
374	606-M-HV16B	SC PUMP & MINIFLOW HEAT EXCHANGER RM CUBICLE COOLER	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
375	441-J-AX-0313C	SC PUMP 2 MINIFLOW LINE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		

Table 3.4-2 (13 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
376	441-J-TE-0303B	SDC HX NO.2 INLET & OUTLET TEMP.	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
377	441-J-TEW-0303B	SHUTDOWN COOLING HX (HE01B) INLET TEMP	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
378	441-J-TW-0311	S/D MINI FLOW HX HE02B INLET TEMP	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
379	441-J-TW-0313	CS MINI FLOW HX HE02B OUTLET TEMP	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
380	461-J-TEW-0372	SHUTDOWN CLNG MINI FLOW HX TEMP	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
381	461-J-TW-0370	SHUTDOWN COOLING MINI FLOW HX INLET	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
382	481-J-LE-0086B	SC PUMP ROOM "B" FLOODING LEVEL	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
383	606-J-TE-0220B	SC PP & MINIFLOW HX RM TEMP	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
384	633-J-TW-0230	COOLING COIL VK-CW16B OUTLET	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
385	633-J-TW-0232	COOLING COIL VK-CW16B INLET	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
386	441-V-0107	SCP 01B Suction ISO VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
387	441-V-0109	SCP 01B Suction PT-301 ISO VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
388	441-V-0197	SCP 01B Disch PT-305 RT VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
389	441-V-0253	SCP 01B Disch to PRI Sample SYS ISO VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
390	441-V-0269	SCP 01B to SCP Mini-Flow Hx 2 ISO VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
391	441-V-0486	SCP 01B Suction PI-2305 RT VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
392	441-V-0569	SCP 01B Disch CHK VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
393	441-V-0571	SCP Mini-Flow Hx 02B Vent VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
394	441-V-0577	SCP Mini-Flow Hx 02B Vent VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
395	441-V-0579	SCP 01B Disch ISO VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
396	441-V-0713	Cask Loading Pit to SCS LN Fill CHK VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
397	441-V-2006	Shutdown Cooling Line Loop2 Vent VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
398	441-V-2502	SCP 01B Disch Line DRN VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
399	441-V-2516	Mini-Flow HX 02B Suct Line Vent VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
400	441-V-2518	Mini-Flow HX 02B Disch Line Vent VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
401	441-V-2607	SCP MINFLOW VENT VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
402	441-V-2608	SCP MINFLOW VENT VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
403	441-V-2742	SCP 01B SUCTION DRAIN VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
404	461-V-1542	SC PP Mini-Flow HE02B Inlet ISO VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
405	461-V-1544	SC PP Mini-Flow HE02B Outlet Throt VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
406	461-V-1548	SHUTDOWN COOLING MINI-FLOW HX 2 SHELL SIDE RELIEF VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		
407	461-V-2140	SC PP Mini-Flow HE02B Outlet LN Vent VALVE	050A04B	Auxiliary	50'-0"	[1]	64'-0"		

Table 3.4-2 (14 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
408	461-V-2536	SC PP Mini-Flow HE02B Inlet Pr Test VALVE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
409	461-V-2539	SC PP Mini-Flow HE02B Outlet Pr Test VALVE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
410	461-V-2587	SC PP Mini-Flow HE02B OTLT FT-10AA RT VALVE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
411	461-V-2588	SC PP Mini-Flow HE02B OTLT FT-10AA RT VALVE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
412	491-V-0017	SC PUMP 2 MINIFLOW SAMPLE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
413	633-V-1165B	SC PP(B)&M/F HX RM C-CLR Outlet VALVE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
414	633-V-2165B	SCPP(B)&M/F HX C-CLR Outlet PZR Test VALVE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
415	633-V-2166B	SCPP(B)&M/F HX C-CLR Inlet PZR Test VALVE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
416	633-V-2196B	CSPP&MinFLOHxRM HV16B ECW Outlet DRN VALVE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
417	633-V-2197B	CSPP&MinFLOHxRM HV16B ECW Inlet Vent VALVE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
418	633-V-2198B	CSPP&MinFLOHxRM HV16B ECW Inlet DRN VALVE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
419	633-V-2265B	CSPP&MinFLOHxRM HV16B ECW OutletVent VALVE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
420	633-V-2266B	CSPP&MinFLOHxRM HV16B ECW Inlet DRN VALVE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
421	633-V-2365B	HV16B ECW Outlet FLO Test Conn VALVE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
422	633-V-2366B	HV16B ECW Inlet FLO Test Conn VALVE	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
423	606-Y-VK-1062B	MANUAL DAMPER	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
424	606-Y-VK-1520B	FIRE DAMPER	050A04B	Auxiliary	50'-0"	(1)	64'-0"		
425	442-M-HE01A	CONTAINMENT SPRAY HEAT EXCHANGER 1	055A01C	Auxiliary	55'-0"	(1)	64'-0"	N/A	8" EOL (1)
426	606-M-HV15A	CS HEATER EXCHANGER RM CUBICLE COOLER	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
427	442-J-FE-0338	CNMT SPRAY HX HE01A OUTLET FLOW	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
428	442-J-TE-0071C	CONT. SPRAY HE01A OUTLET	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
429	442-J-TEW-0071	CONTAINMENT SPRAY HX(HE01A) OUTLET	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
430	461-J-TW-0099	CS HX 1 INLET TEMP	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
431	461-J-TW-0101	CS HX 1 OUTLET TEMP	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
432	606-J-TE-0217C	CS HX RM TEMP	055A01C	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (15 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
433	633-J-TW-0225	COOLING COIL VK-CW15A OUTLET	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
434	633-J-TW-0227	COOLING COIL VK-CW15A INLET	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
435	442-V-1005	CNMT SPRAY HX HE01A THERMAL RELIEF VALVE TO EDT	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
436	442-V-2027	CS Hx 01A DRN VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
437	442-V-2029	CSP 01A Disch FT-4A Root VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
438	442-V-2031	CSP 01A Disch FT-4A Root VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
439	442-V-2051	CS HX 01A Outlet LN Vent VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
440	442-V-2065	CS HX 01A Inlet Spec Test VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
441	442-V-2067	CS HX 01A Outlet Spec Test VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
442	461-V-0097	CNMT SPRAY HX 01A INLET ISO.VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
443	461-V-1211	CS HX 01A OUTLET ISO VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
444	461-V-1213	CNMT Spray HE01A Inlet 097 VALVE Equal VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
445	461-V-1215	CNMT SPRAY HX 1 SHELL SIDE RELIEF VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
446	461-V-2121	Quadrant C Supply Line Vent VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
447	461-V-2125	CS HE01A Outlet Line Vent VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
448	461-V-2201	CS HE01A Inlet Pr Test VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
449	461-V-2204	CS HE01A Outlet Pr Test VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
450	633-V-1163A	CW15A CS HX RM C-CLR Outlet VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
451	633-V-1164A	CW15A CS HX RM C-CLR Inlet throt VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
452	633-V-2163A	CW15A CS HX RM C-CLR Outlet PZR Test VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
453	633-V-2179A	CW15A CS HX RM C-CLR Outlet DRN VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
454	633-V-2263A	CSPP&MinFLOHxRM HV15A ECW OutletVent VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
455	633-V-2264A	CSPP&MinFLOHxRM HV15A ECW InletDRN VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
456	633-V-2363A	HV15A ECW Outlet FLO Test Conn VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
457	633-V-2364A	HV15A ECW Inlet FLO Test Conn VALVE	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
458	606-Y-VK-1503A	FIRE DAMPER	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
459	606-Y-VK-1518A	FIRE DAMPER	055A01C	Auxiliary	55'-0"	(1)	64'-0"		
460	442-M-HE01B	CONTAINMENT SPRAY HEAT EXCHANGER 2	055A01D	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)

Table 3.4-2 (16 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
461	606-M-HV15B	CS HEATER EXCHANGER RM CUBICLE COOLER	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
462	442-J-FE-0348	CNMT SPRAY HX HE01B OUTLET FLOW	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
463	442-J-TE-0072D	CONT. SPRAY HE01B OUTLET	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
464	442-J-TEW-0072	CONTAINMENT SPRAY HX(HE01B) OUTLET	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
465	461-J-TW-0100	CS HX 2 INLET TEMP	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
466	461-J-TW-0102	CS HX 2 OUTLET TEMP	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
467	606-J-TE-0218D	CS HX RM TEMP	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
468	633-J-TW-0226	COOLING COIL VK-CW15B OUTLET	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
469	633-J-TW-0228	COOLING COIL VK-CW15B INLET	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
470	442-V-1006	CNMT SPRAY HX HE01B THERMAL RELIEF VALVE TO EDT	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
471	442-V-2028	CS Hx 01B DRN VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
472	442-V-2030	CSP 01B Disch FT-4B Root VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
473	442-V-2032	CSP 01B Disch FT-4B Root VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
474	442-V-2048	CS HX 01B Inlet LN Vent VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
475	442-V-2064	CS HX 01B Inlet Spec Test VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
476	442-V-2066	CS HX 01B Outlet Spec Test VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
477	461-V-0098	CNMT SPRAY HX 01A INLET ISO.VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
478	461-V-1212	CS HX 01B OUTLET ISO VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
479	461-V-1214	CNMT Spray HE01B Inlet 098 VALVE Equal VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
480	461-V-1216	CNMT SPRAY HX 2 SHELL SIDE RELIEF VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
481	461-V-2122	Quadrant D Supply Line Vent VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
482	461-V-2126	CS HE01B Outlet Line Vent VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
483	461-V-2205	CS HE01B Inlet Pr Test VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
484	461-V-2206	CS HE01B Outlet Pr Test VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
485	633-V-1163B	CW15B CS HX RM C-CLR Outlet VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
486	633-V-1164B	CW15B CS HX RM C-CLR Inlet throt VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
487	633-V-2163B	CW15B CS HX RM C-CLR Outlet PZR Test VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
488	633-V-2164B	CW15B CS HX RM C-CLR Inlet PZR Test VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
489	633-V-2179B	CW15B CS HX RM C-CLR Outlet DRN VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (17 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
490	633-V-2263B	CSPP&MinFLOHxRM HV15B ECW OutletVent VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
491	633-V-2264B	CSPP&MinFLOHxRM HV15B ECW InletDRN VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
492	633-V-2363B	HV15B ECW Outlet FLO Test Conn VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
493	633-V-2364B	HV15B ECW Inlet FLO Test Conn VALVE	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
494	606-Y-VK-1518B	FIRE DAMPER	055A01D	Auxiliary	55'-0"	(1)	64'-0"		
495	461-M-PP01A	COMPONENT COOLING WATER PUMP 1A	055A02A	Auxiliary	55'-0"	(1)	64'-0"	N/A	8" EOL (1)
496	606-M-HV13A	CCW PUMP RM CUBICLE COOLER	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
497	461-J-FE-0047	CCW PUMP 01A DISCH FLOW	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
498	461-J-FE-0049M	CCW PUMP 02A DISCH FLOW	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
499	461-J-FT-0047A	CCW PUMP PP01A DISCH FLOW	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
500	606-J-TE-0213A	CCW PP ROOM TEMP	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
501	633-J-TW-0217	COOLING COIL VK-CW13A OUTLET	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
502	633-J-TW-0219	COOLING COIL VK-CW13A INLET	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
503	461-V-1001	CCW PP01A Disch CHK VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
504	461-V-1007	CCW PP PP01A DISCH ISO VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
505	461-V-1121	CCW PP PP01A SUCH ISO VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
506	461-V-2001	CCW PP01A Disch PI-041 Root VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
507	461-V-2033	CCW PP01A Casing Vent VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
508	461-V-2034	CCW PP01B Casing Vent VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
509	461-V-2035	CCW PP02A Casing Vent VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
510	461-V-2036	CCW PP02B Casing Vent VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
511	461-V-2041	CCW PP01A Suct PI-017 Root VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
512	461-V-2047	CCW PP01A Suction Line Pr Test VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
513	461-V-2091	CCW PP01A Suction Line DRN VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
514	461-V-2385	CCW PP01A Disch Line DRN VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
515	461-V-3008	CCW PP02A Disch Line FT-5C Root VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
516	462-V-1001	ESWP 01A DISCH CHECK VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
517	633-V-1159A	CCW PP(A) RM C-CLR Outlet VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
518	633-V-1160A	CCW PP(A) RM C-CLR Inlet throt VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
519	633-V-2159A	CCW PP(A) RM C-CLR Outlet PZR Test VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
520	633-V-2160A	CCW PP(A) RM C-CLR Inlet PZR Test VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
521	633-V-2193A	CCW PP(A) RM C-CLR Outlet DRN VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
522	633-V-2194A	CCW PP(A) RM C-CLR Inlet Vent VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
523	633-V-2195A	CCW PP RM HV 13A ECW Inlet DRN VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (18 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
524	633-V-2259A	CCW PP RM HV 13A ECW Outlet Vent VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
525	633-V-2260A	CCW PP RM HV 13A ECW Inlet DRN VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
526	633-V-2359A	CCW PP RM HV13A ECW Outlet Test Conn VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
527	633-V-2360A	CCW PP RM HV13A ECW Inlet Test Conn VALVE	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
528	606-Y-VK-1028A	MANUAL DAMPER	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
529	606-Y-VK-1030A	MANUAL DAMPER	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
530	606-Y-VK-1031A	MANUAL DAMPER	055A02A	Auxiliary	55'-0"	(1)	64'-0"		
531	461-M-PP01B	COMPONENT COOLING WATER PUMP 1B	055A02B	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
532	606-M-HV13B	CCW PUMP RM CUBICLE COOLER	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
533	461-J-FE-0048	CCW PUMP 01B DISCH FLOW	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
534	461-J-FE-0050M	CCW PUMP 02B DISCH FLOW	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
535	606-J-TE-0214B	CCW PP ROOM TEMP	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
536	633-J-TW-0218	COOLING COIL VK-CW13B OUTLET	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
537	633-J-TW-0220	COOLING COIL VK-CW13B INLET	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
538	441-V-0166	SI Hot Leg INJ Line2 Relief VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
539	461-V-1002	CCW PP01B Disch CHK VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
540	461-V-1008	CCW PP PP01B DISCH ISO VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
541	461-V-1122	CCW PP PP01B SUCH ISO VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
542	461-V-2002	CCW PP01B Disch PI-042 Root VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
543	461-V-2042	CCW PP01B Suct PI-018 Root VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
544	461-V-2048	CCW PP01B Suction Line Pr Test VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
545	461-V-2092	CCW PP01B Suction Line DRN VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
546	461-V-2386	CCW PP01B Disch Line DRN VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
547	462-V-1002	ESWP 01B DISCH CHECK VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
548	633-V-1159B	CCW PP(B) RM C-CLR Outlet VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
549	633-V-1160B	CCW PP(B) RM C-CLR Inlet throt VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
550	633-V-2159B	CCW PP(B) RM C-CLR Outlet PZR Test VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
551	633-V-2160B	CCW PP(B) RM C-CLR Inlet PZR Test VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
552	633-V-2193B	CCW PP(B) RM C-CLR Outlet DRN VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
553	633-V-2194B	CCW PP(B) RM C-CLR Inlet Vent VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
554	633-V-2195B	CCW PP RM HV 13B ECW Inlet DRN VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
555	633-V-2259B	CCW PP RM HV 13B ECW Outlet Vent VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (19 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
556	633-V-2260B	CCW PP RM HV 13B ECW Inlet DRN VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
557	633-V-2359B	CCW PP RM HV13B ECW Outlet Test Conn VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
558	633-V-2360B	CCW PP RM HV13B ECW Inlet Test Conn VALVE	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
559	606-Y-VK-1028B	MANUAL DAMPER	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
560	606-Y-VK-1031B	MANUAL DAMPER	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
561	606-Y-VK-1515B	FIRE DAMPER	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
562	606-Y-VK-1516B	FIRE DAMPER	055A02B	Auxiliary	55'-0"	(1)	64'-0"		
563	461-M-PP02A	COMPONENT COOLING WATER PUMP 2A	055A02C	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
564	606-M-HV14A	CCW PUMP RM CUBICLE COOLER	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
565	461-J-FE-0047M	CCW PUMP 01A DISCH FLOW	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
566	461-J-FE-0049	CCW PUMP 02A DISCH FLOW	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
567	461-J-FT-0049C	CCW PUMP PP02A DISCH FLOW	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
568	461-J-PT-0053C	CCW PMP PP01A/PP02A COMMON DISCH HDR PR	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
569	606-J-TE-0215C	CCW PP ROOM TEMP	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
570	633-J-TW-0221	COOLING COIL VK-CW14A OUTLET	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
571	633-J-TW-0223	COOLING COIL VK-CW14A INLET	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
572	447-V-0010	IRWST LT-391A Upper TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
573	447-V-0011	IRWST LT-391A Lower TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
574	447-V-0014	HVT WIDE RANGE LT-395A Upper TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
575	447-V-0015	HVT WIDE RANGE LT-395A Lower TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
576	447-V-0018	REACTOR CAVITY LT-397A Upper TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
577	447-V-0019	REACTOR CAVITY LT-397A Lower TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
578	447-V-2002	IRWST LT-391A Upper TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
579	447-V-2003	IRWST LT-391A Lower TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
580	447-V-2006	HVT WIDE RANGE LT-395A Upper TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
581	447-V-2007	HVT WIDE RANGE LT-395A Lower TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (20 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
582	447-V-2010	REACTOR CAVITY LT-397A Upper TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
583	447-V-2011	REACTOR CAVITY LT-397A Lower TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
584	447-V-2020	IRWST LT-391A Upper TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
585	447-V-2021	IRWST LT-391A Lower TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
586	447-V-2024	HVT WIDE RANGE LT-395A Upper TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
587	447-V-2025	HVT WIDE RANGE LT-395A Lower TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
588	447-V-2028	REACTOR CAVITY LT-397A Upper TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
589	447-V-2029	REACTOR CAVITY LT-397A Lower TAP ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
590	447-V-2036	IRWST LT-391A Upper TAP Pr Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
591	447-V-2037	IRWST LT-391A Upper TAP Pr Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
592	447-V-2038	IRWST LT-391A Lower TAP Pr Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
593	447-V-2039	IRWST LT-391A Lower TAP Pr Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
594	447-V-2044	HVT WR LT-395A Upper TAP Pr Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
595	447-V-2045	HVT WR LT-395A Upper TAP Pr Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
596	447-V-2046	HVT WR LT-395A Lower TAP Pr Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
597	447-V-2047	HVT WR LT-395A Lower TAP Pr Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
598	447-V-2052	RX CAVITY LT-397A Upper TAP Pr Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
599	447-V-2053	RX CAVITY LT-397A Upper TAP Pr Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
600	447-V-2054	RX CAVITY LT-397A Lower TAP Pr Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
601	447-V-2055	RX CAVITY LT-397A Lower TAP Pr Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
602	447-V-F539	GLOBE VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
603	447-V-F540	GLOBE VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
604	461-V-1003	CCW PP02A Disch CHK VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
605	461-V-1009	CCW PP PP02A DISCH ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (21 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
606	461-V-1013	CCW TRN A PP DISCH HDR ISO	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
607	461-V-1113	CCW PP TRN A Disch to CAT A Inlet ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
608	461-V-1119	CCW Train A Chemical Injection ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
609	461-V-1123	CCW PP PP02A SUCH ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
610	461-V-1207	CCW Train A to Radiation MON SYS ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
611	461-V-1209	RE/RT-111 to CCW Train A ISO VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
612	461-V-2003	CCW PP02A Disch PI-043 Root VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
613	461-V-2019	CCW TRN A PP Disch HDR PT-4A Root VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
614	461-V-2043	CCW PP02A Suct PI-019 Root VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
615	461-V-2049	CCW PP02A Suction Line Pr Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
616	461-V-2093	CCW PP02A Suction Line DRN VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
617	461-V-2097	CCW PP Train A Disch HDR Vent VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
618	461-V-2387	CCW PP02A Disch Line DRN VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
619	461-V-2401	RE/RT-111 Return Line Vent VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
620	461-V-2403	CCW Train A Chemical Injection Vent VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
621	461-V-2405	RE/RT-111 Return Line DRN VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
622	461-V-2407	CCW Train A Chemical Injection DRN VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
623	462-V-1003	ESWP 02A DISCH CHECK VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
624	633-V-1017B	ECW ChEM ADD TK-03B Outlet VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
625	633-V-1161A	CCW PP(C) RM C-CLR Outlet VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
626	633-V-1162A	CCW PP(C) RM C-CLR Inlet throt VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
627	633-V-2161A	CCW PP(C) RM C-CLR Outlet PZR Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
628	633-V-2162A	CCW PP(C) RM C-CLR Inlet PZR Test VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
629	633-V-2180A	CCW PP(C) RM C-CLR Outlet DRN VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
630	633-V-2261A	CCW PP RM HV 14A ECW Outlet Vent VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
631	633-V-2262A	CCW PP RM HV 14A ECW Inlet DRN VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
632	633-V-2361A	CCW PP RM HV14A ECW Outlet Test Conn VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
633	633-V-2362A	CCW PP RM HV14A ECW Inlet Test Conn VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
634	633-V-2451A	CCW PP RM CW14A Outlet DRN VALVE	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
635	606-Y-VK-1027A	MANUAL DAMPER	055A02C	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (22 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
636	606-Y-VK-1035A	MANUAL DAMPER	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
637	606-Y-VK-1505A	FIRE DAMPER	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
638	606-Y-VK-1537A	FIRE DAMPER	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
639	606-Y-VK-1538A	FIRE DAMPER	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
640	606-Y-VK-1572A	FIRE DAMPER	055A02C	Auxiliary	55'-0"	(1)	64'-0"		
641	461-M-PP02B	COMPONENT COOLING WATER PUMP 2B	055A02D	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
642	606-M-HV14B	CCW PUMP RM CUBICLE COOLER	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
643	461-J-FE-0048M	CCW PUMP 01B DISCH FLOW	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
644	461-J-FE-0050	CCW PUMP 02B DISCH FLOW	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
645	461-J-FT-0048B	CCW PUMP PP01B DISCH FLOW	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
646	461-J-FT-0050D	CCW PUMP PP02B DISCH FLOW	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
647	461-J-PT-0054D	CCW PMP PP01B/PP02B COMMON DISCH HDR PR	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
648	606-J-TE-0210D	SI PP ROOM TEMP	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
649	606-J-TE-0216D	CCW PP ROOM TEMP	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
650	633-J-TW-0222	COOLING COIL VK-CW14B OUTLET	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
651	633-J-TW-0224	COOLING COIL VK-CW14B INLET	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
652	461-V-1004	CCW PP02B Disch CHK VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
653	461-V-1010	CCW PP PP02B DISCH ISO VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
654	461-V-1014	CCW TRN B PP DISCH HDR ISO	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
655	461-V-1114	CCW PP TRN B Disch to CAT B Inlet ISO VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
656	461-V-1120	CCW Train B Chemical Injection ISO VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
657	461-V-1124	CCW PP PP02B SUCH ISO VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
658	461-V-1208	CCW Train B to Radiation MON SYS ISO VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
659	461-V-1210	RE/RT-112 to CCW Train B ISO VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
660	461-V-2004	CCW PP02B Disch PI-044 Root VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
661	461-V-2020	CCW TRN B PP Disch HDR PT-4B Root VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
662	461-V-2044	CCW PP02B Suct PI-020 Root VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
663	461-V-2050	CCW PP02B Suction Line Pr Test VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
664	461-V-2094	CCW PP02B Suction Line DRN VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
665	461-V-2098	CCW PP Train B Disch HDR Vent VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
666	461-V-2388	CCW PP02B Disch Line DRN VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
667	461-V-2402	RE/RT-112 Return Line Vent VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
668	461-V-2404	CCW Train B Chemical Injection Vent VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
669	461-V-2406	RE/RT-112 Return Line DRN VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (23 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
670	461-V-2408	CCW Train B Chemical Injection DRN VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
671	462-V-1004	ESWP 02B DISCH CHECK VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
672	633-V-1161B	CCW PP(D) RM C-CLR Outlet VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
673	633-V-1162B	CCW PP(D) RM C-CLR Inlet throt VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
674	633-V-2161B	CCW PP(D) RM C-CLR Outlet PZR Test VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
675	633-V-2162B	CCW PP(D) RM C-CLR Inlet PZR Test VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
676	633-V-2180B	CCW PP(D) RM C-CLR Outlet DRN VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
677	633-V-2261B	CCW PP RM HV 14B ECW Outlet Vent VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
678	633-V-2262B	CCW PP RM HV 14B ECW Inlet DRN VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
679	633-V-2361B	CCW PP RM HV14B ECW Outlet Test Conn VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
680	633-V-2362B	CCW PP RM HV14B ECW Inlet Test Conn VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
681	633-V-2447B	CCW PP RM CW14B Outlet DRN VALVE	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
682	606-Y-VK-1026B	MANUAL DAMPER	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
683	606-Y-VK-1027B	MANUAL DAMPER	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
684	606-Y-VK-1030B	MANUAL DAMPER	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
685	606-Y-VK-1525B	FIRE DAMPER	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
686	606-Y-VK-1533B	FIRE DAMPER	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
687	606-Y-VK-1535B	FIRE DAMPER	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
688	606-Y-VK-1536B	FIRE DAMPER	055A02D	Auxiliary	55'-0"	(1)	64'-0"		
689	591-M-HE01A	LUBE OIL /PREHEATING WATER H/EX	055A03C	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
690	591-M-PP01A	PREHEATING HT WATER PUMP	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
691	591-M-ZM03A	OVERSPEED AIR RACK	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
692	591-M-ZM03B	OVERSPEED AIR RACK	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
693	442-J-ZY-0005C01	IRWST RTN CTRL VALVE005 POSITION(TRAIN C)	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
694	481-J-LE-0052C	FLOOR DRAIN SUMP(QUAD.C) FLOODING LEVEL	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
695	481-J-LIT-0052C	FLOOR DRAIN SUMP(QUAD.C) FLOODING LEVEL	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
696	442-V-2023	CS Hx 01A Vent VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
697	442-V-2024	CS Hx 01B Vent VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
698	461-V-2133	CCW TRN A to EDG Line DRN VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
699	461-V-2202	Containment Spray HE01A Vent VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (24 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
700	461-V-2203	Containment Spray HE01A DRN VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
701	461-V-2207	Containment Spray HE01B Vent VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
702	461-V-2208	Containment Spray HE01B DRN VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
703	461-V-2232	CS PP Mini-Flow HE02A Vent VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
704	461-V-2233	CS PP Mini-Flow HE02A DRN VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
705	461-V-2237	CS PP Mini-Flow HE02B Vent VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
706	461-V-2238	CS PP Mini-Flow HE02B DRN VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
707	461-V-2502	Shutdown Cooling HE01A Vent VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
708	461-V-2503	Shutdown Cooling HE01A DRN VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
709	461-V-2507	Shutdown Cooling HE01B Vent VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
710	461-V-2508	Shutdown Cooling HE01B DRN VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
711	461-V-2532	SC PP Mini-Flow HE02A Vent VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
712	461-V-2533	SC PP Mini-Flow HE02A DRN VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
713	461-V-2537	SC PP Mini-Flow HE02B Vent VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
714	461-V-2538	SC PP Mini-Flow HE02B DRN VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
715	591-V-4039B	D/G B Air RCVR TK41B OTLT Regulating VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
716	591-V-4040B	D/G B Air RCVR TK40B OTLT Regulating VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
717	591-V-4042B	D/G B Air RCVR TK40B/41B CMN ISO VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
718	591-V-4043B	D/G B Air RCVR TK40B/41B CMN CHK VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
719	591-V-4048B	D/G B Starting Air RCVR TK40B Outlet VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
720	591-V-4049B	D/G B Starting Air RCVR TK41B Outlet VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
721	591-V-4308B	D/G B Air RCVR TK40B → CMN HDR CHK VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
722	591-V-4309B	D/G B Air RCVR TK41B → CMN HDR CHK VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
723	591-V-4312B	DG B START Air RCVR TK 40A41A CMN CHK VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
724	591-V-4314B	DG B START Air RCVR TK 40A41A CMN ISO VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
725	591-V-4317B	D/G B OVRSP Air RCVR TK PI-3086B RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (25 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
726	591-V-5323B	D/G B OVRSP Air RCVR TK PI-3086B RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
727	591-V-5324B	D/G B OVRSP Air RCVR TK42B PS-3587 RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
728	591-V-5409B	D/G B Fuel Oil ENG INLT Pr PT-3536 RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
729	591-V-5418A	D/G A Pre-HTG HT WTR PP Disch PI RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
730	591-V-5420B	D/G B Air RCVR TK40B Pr PI-3176B RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
731	591-V-5421B	D/G B Air RCVR TK40B Pr PS-3580 RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
732	591-V-5422B	D/G B Air RCVR TK40B Pr PS-3578 RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
733	591-V-5424B	D/G B Air RCVR TK40B Pr PI-3176B RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
734	591-V-5425B	D/G B Air RCVR TK40B Pr PS-3182B RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
735	591-V-5426B	D/G B Air RCVR TK41B Pr PS-3183B RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
736	591-V-5429B	D/G B Air RCVR TK41B Pr PS-3581 RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
737	591-V-5430B	D/G B Air RCVR TK41B Pr PS-3579 RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
738	591-V-5431B	D/G B Air RCVR TK41B Pr PI-3177B RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
739	591-V-5433B	D/G B Air COMP ZM04B Disch PT-3584 RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
740	591-V-5436B	D/G B Air COMP ZM05B Disch PT-3585 RT VALVE	055A03C	Auxiliary	55'-0"	(1)	64'-0"		
741	442-J-ZY-0006D01	IRWST RTN CTRL VALVE006 POSITION(TRAIN D)	055A03D	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
742	481-J-LE-0053D	FLOOR DRAIN SUMP(QUAD.D) FLOODING LEVEL	055A03D	Auxiliary	55'-0"	(1)	64'-0"		
743	481-J-LIT-0053D	FLOOR DRAIN SUMP(QUAD.D) FLOODING LEVEL	055A03D	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (26 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
744	591-V-5420A	D/G A Air RCVR TK40A Pr PI-3176A RT VALVE	055A03D	Auxiliary	55'-0"	(1)	64'-0"		
745	591-V-5421A	D/G A Air RCVR TK40A Pr PS-3180 RT VALVE	055A03D	Auxiliary	55'-0"	(1)	64'-0"		
746	591-V-5425A	D/G A Air RCVR TK40A Pr PS-3182A RT VALVE	055A03D	Auxiliary	55'-0"	(1)	64'-0"		
747	591-V-5428A	D/G A Air RCVR TK41A Pr PI-3177A RT VALVE	055A03D	Auxiliary	55'-0"	(1)	64'-0"		
748	442-J-FT-0338C	CNMT SPRAY HX HE01A OUTLET FLOW	055A07C	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
749	442-J-HS-0017C03	CONTAINMENT SPRAY PUMPS PP01A CTRL	055A07C	Auxiliary	55'-0"	(1)	64'-0"		
750	481-J-LIT-0097C	CS PUMP ROOM "A" FLOODING LEVEL	055A07C	Auxiliary	55'-0"	(1)	64'-0"		
751	606-Y-VK-1033A	MANUAL DAMPER	055A07C	Auxiliary	55'-0"	(1)	64'-0"		
752	606-Y-VK-1034A	MANUAL DAMPER	055A07C	Auxiliary	55'-0"	(1)	64'-0"		
753	606-Y-VK-1037A	MANUAL DAMPER	055A07C	Auxiliary	55'-0"	(1)	64'-0"		
754	606-Y-VK-1515A	FIRE DAMPER	055A07C	Auxiliary	55'-0"	(1)	64'-0"		
755	606-Y-VK-1516A	FIRE DAMPER	055A07C	Auxiliary	55'-0"	(1)	64'-0"		
756	606-Y-VK-1519A	FIRE DAMPER	055A07C	Auxiliary	55'-0"	(1)	64'-0"		
757	606-Y-VK-1536A	FIRE DAMPER	055A07C	Auxiliary	55'-0"	(1)	64'-0"		
758	442-J-FT-0348D	CNMT SPRAY HX HE01B OUTLET FLOW	055A07D	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
759	442-J-HS-0018D03	CONTAINMENT SPRAY PUMPS PP02A CTRL	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
760	481-J-LIT-0098D	CS PUMP ROOM "B" FLOODING LEVEL	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
761	442-V-2050	CS HX 01B Outlet LN Vent VALVE	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
762	461-V-0144	TRN B NON-SAFETY LOAD SUPPLY ISO	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
763	461-V-0146	TRN B NON-SAFETY LOAD SUPPLY ISO	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
764	461-V-0148	TRN B NON-SAFETY LOAD RETURN ISO	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
765	461-V-0150	TRN B NON-SAFETY LOAD RETURN ISO	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
766	461-V-1020	CCW QUADRANTA D COMMON HDR	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
767	461-V-2130	CS HE01B/HE02B Outlet Line DRN VALVE	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
768	461-V-2226	CCW TRN B to EDG Line Vent VALVE	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
769	461-V-2453	CS HE01B Outlet FT-10B Root VALVE	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
770	461-V-2454	CS HE01B Outlet FT-10B Root VALVE	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
771	606-Y-VK-1033B	MANUAL DAMPER	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
772	606-Y-VK-1034B	MANUAL DAMPER	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
773	606-Y-VK-1570B	FIRE DAMPER	055A07D	Auxiliary	55'-0"	(1)	64'-0"		
774	606-Y-VK-1006A	MANUAL DAMPER	055A08C	Auxiliary	55'-0"	(1)	64'-0"		
775	606-Y-VK-1080B	MANUAL DAMPER	055A08D	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (27 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
776	481-J-LE-0054A	CCW SUMP(QUAD.A) FLOODING LEVEL	055A12A	Auxiliary	55'-0"	(1)	64'-0"		
777	481-J-LIS-0054A	CCW SUMP(QUAD.A) FLOODING LEVEL	055A12A	Auxiliary	55'-0"	(1)	64'-0"		
778	481-J-LE-0055B	CCW SUMP(QUAD.B) FLOODING LEVEL	055A12B	Auxiliary	55'-0"	(1)	64'-0"		
779	606-Y-VK-1069B	MANUAL DAMPER	055A12B	Auxiliary	55'-0"	(1)	64'-0"		
780	606-Y-VK-1116B	MANUAL DAMPER	055A12B	Auxiliary	55'-0"	(1)	64'-0"		
781	481-J-LE-0056C	CCW SUMP(QUAD.C) FLOODING LEVEL	055A12C	Auxiliary	55'-0"	(1)	64'-0"		
782	606-Y-VK-1036A	MANUAL DAMPER	055A12C	Auxiliary	55'-0"	(1)	64'-0"		
783	481-J-LE-0057D	CCW SUMP(QUAD.D) FLOODING LEVEL	055A12D	Auxiliary	55'-0"	(1)	64'-0"		
784	461-V-2135	CCW TRN B to EDG Line DRN VALVE	055A12D	Auxiliary	55'-0"	(1)	64'-0"		
785	606-Y-VK-1036B	MANUAL DAMPER	055A12D	Auxiliary	55'-0"	(1)	64'-0"		
786	441-V-0102	IRWST Disch to SCP 01A Pr Test VALVE	055A14C	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	-
787	441-V-0157	CSP 01A Suction CHK VALVE	055A14C	Auxiliary	55'-0"	(1)	64'-0"		
788	441-V-0308	IRWST to SIP 02C/CSP 01A ISO VALVE	055A14C	Auxiliary	55'-0"	(1)	64'-0"		
789	441-V-0340	SCP 01A/CSP 01A Suct Cross Connect VALVE	055A14C	Auxiliary	55'-0"	(1)	64'-0"		
790	441-V-0347	CSP 01A Suction ISO VALVE	055A14C	Auxiliary	55'-0"	(1)	64'-0"		
791	441-V-0439	SIP 02C Disch Relief VALVE	055A14C	Auxiliary	55'-0"	(1)	64'-0"		
792	442-V-0005	CS TRN-A IRWST RTN FLOW CONTRL VALVE	055A14C	Auxiliary	55'-0"	(1)	64'-0"		
793	442-V-1023	IRWST RETURN LINE THERMAL RELIEF VALVE TO EDT	055A14C	Auxiliary	55'-0"	(1)	64'-0"		
794	442-V-2057	IRWST RTN LN DRN VALVE	055A14C	Auxiliary	55'-0"	(1)	64'-0"		
795	442-V-2059	CS HX 01A Outlet LN DRN VALVE	055A14C	Auxiliary	55'-0"	(1)	64'-0"		
796	606-Y-VK-1039A	MANUAL DAMPER	055A14C	Auxiliary	55'-0"	(1)	64'-0"		
797	606-Y-VK-1041A	MANUAL DAMPER	055A14C	Auxiliary	55'-0"	(1)	64'-0"		
798	606-Y-VK-1524A	FIRE DAMPER	055A14C	Auxiliary	55'-0"	(1)	64'-0"		
799	441-V-0103	IRWST Disch to SCP 01B Pr Test VALVE	055A14D	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	-
800	441-V-0158	CSP 01B Suction CHK VALVE	055A14D	Auxiliary	55'-0"	(1)	64'-0"		
801	441-V-0309	IRWST to SIP 02D/CSP 01B ISO VALVE	055A14D	Auxiliary	55'-0"	(1)	64'-0"		
802	441-V-0342	SCP 01B/CSP 01B Suct Cross Connect VALVE	055A14D	Auxiliary	55'-0"	(1)	64'-0"		
803	441-V-0348	CSP 01B Suction ISO VALVE	055A14D	Auxiliary	55'-0"	(1)	64'-0"		
804	441-V-0449	SIP 02D Disch Relief VALVE	055A14D	Auxiliary	55'-0"	(1)	64'-0"		
805	442-V-0006	CS TRN-B IRWST RTN FLOW CONTRL VALVE	055A14D	Auxiliary	55'-0"	(1)	64'-0"		
806	442-V-1024	IRWST RETURN LINE THERMAL RELIEF VALVE TO EDT	055A14D	Auxiliary	55'-0"	(1)	64'-0"		
807	442-V-2056	IRWST RTN LN DRN VALVE	055A14D	Auxiliary	55'-0"	(1)	64'-0"		
808	442-V-2058	CS HX 01B Outlet LN DRN VALVE	055A14D	Auxiliary	55'-0"	(1)	64'-0"		
809	606-Y-VK-1039B	MANUAL DAMPER	055A14D	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (28 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
810	606-Y-VK-1061B	MANUAL DAMPER	055A14D	Auxiliary	55'-0"	(1)	64'-0"		
811	606-Y-VK-1524B	FIRE DAMPER	055A14D	Auxiliary	55'-0"	(1)	64'-0"		
812	441-V-2702	SI HOT LET-1 SPEC TEST VENT VALVE	055A18A	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	-
813	441-V-2703	SI HOT LET-1 SPEC TEST VENT VALVE	055A18A	Auxiliary	55'-0"	(1)	64'-0"		
814	441-V-2749	SIP 02A DISCH LINE VENT VALVE	055A18A	Auxiliary	55'-0"	(1)	64'-0"		
815	441-V-2751	SIP 02A DISCH LINE VENT VALVE	055A18A	Auxiliary	55'-0"	(1)	64'-0"		
816	441-V-2770	SI/SC Mini-Flow Line DRN VALVE	055A18A	Auxiliary	55'-0"	(1)	64'-0"		
817	441-V-2771	SI/SC Mini-Flow Line DRN VALVE	055A18A	Auxiliary	55'-0"	(1)	64'-0"		
818	441-V-2774	SIP 02A Disch to SI 1 Line Vent VALVE	055A18A	Auxiliary	55'-0"	(1)	64'-0"		
819	441-V-2775	SIP 02A Disch to SI 1 Line Vent VALVE	055A18A	Auxiliary	55'-0"	(1)	64'-0"		
820	441-V-2797	Hot Leg INJ Loop1 DRN VALVE	055A18A	Auxiliary	55'-0"	(1)	64'-0"		
821	441-V-2798	Hot Leg INJ Loop1 DRN VALVE	055A18A	Auxiliary	55'-0"	(1)	64'-0"		
822	441-V-2808	SI/SC Mini-Flow Line Vent VALVE	055A18A	Auxiliary	55'-0"	(1)	64'-0"		
823	441-V-2809	SI/SC Mini-Flow Line Vent VALVE	055A18A	Auxiliary	55'-0"	(1)	64'-0"		
824	606-Y-VK-1509A	FIRE DAMPER	055A18A	Auxiliary	55'-0"	(1)	64'-0"		
825	441-V-2712	SI HOT LET-2 SPEC TEST VENT VALVE	055A18B	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	-
826	441-V-2713	SI HOT LET-2 SPEC TEST VENT VALVE	055A18B	Auxiliary	55'-0"	(1)	64'-0"		
827	441-V-2786	SI/SC Mini-Flow Line DRN VALVE	055A18B	Auxiliary	55'-0"	(1)	64'-0"		
828	441-V-2787	SI/SC Mini-Flow Line DRN VALVE	055A18B	Auxiliary	55'-0"	(1)	64'-0"		
829	441-V-2805	SIP 02B Disch to SI 2 Line Vent VALVE	055A18B	Auxiliary	55'-0"	(1)	64'-0"		
830	441-V-2806	SIP 02B Disch to SI 2 Line Vent VALVE	055A18B	Auxiliary	55'-0"	(1)	64'-0"		
831	441-V-2810	SI/SC Mini-Flow Line Vent VALVE	055A18B	Auxiliary	55'-0"	(1)	64'-0"		
832	441-V-2811	SI/SC Mini-Flow Line Vent VALVE	055A18B	Auxiliary	55'-0"	(1)	64'-0"		
833	606-Y-VK-1049B	MANUAL DAMPER	055A18B	Auxiliary	55'-0"	(1)	64'-0"		
834	606-Y-VK-1521B	FIRE DAMPER	055A18B	Auxiliary	55'-0"	(1)	64'-0"		
835	441-J-FT-0302A	SI SHUTDOWN CLG PUMP PP02A DISCHARGE FLOW	055A19A	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
836	441-J-ZY-0310A01	SDCHX 1 OUTLET FLOW CONTROL VALVE - 310	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
837	441-J-ZY-0312A01	SDCHX 1 BYPASS FLOW CTRL VALVE - 312	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
838	481-J-LE-0050A	FLOOR DRAIN SUMP(QUAD.A) FLOODING LEVEL	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
839	481-J-LIT-0050A	FLOOR DRAIN SUMP(QUAD.A) FLOODING LEVEL	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
840	481-J-LIT-0079A	SI PUMP ROOM "A" FLOODING LEVEL	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
841	481-J-LIT-0085A	SC PUMP ROOM "A" FLOODING LEVEL	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
842	481-J-LIT-0091C	SI PUMP ROOM "C" FLOODING LEVEL	055A19A	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (29 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
843	606-J-PDT-0033A	GNRL ACCS AREA 55-A19A DIFF PRESS	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
844	461-V-2136	SC HE01A Outlet Line Vent VALVE	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
845	461-V-2143	CCW Quadrant A Return Line DRN VALVE	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
846	633-V-2434A	CCW PP RM HV 13A ECW Outlet DRN VALVE	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
847	633-V-2435A	CCW PP RM HV 13A ECW Outlet Vent VALVE	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
848	633-V-2436A	CCW PP RM HV 13A ECW Outlet DRN VALVE	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
849	633-V-2437A	CCW PP RM HV 13A ECW Inlet DRN VALVE	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
850	633-V-2438A	CCW PP RM HV 13A ECW Inlet Vent VALVE	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
851	633-V-2439A	CCW PP RM HV 13A ECW Inlet DRN VALVE	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
852	606-Y-VK-1043A	MANUAL DAMPER	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
853	606-Y-VK-1045A	MANUAL DAMPER	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
854	606-Y-VK-1126A	MANUAL DAMPER	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
855	606-Y-VK-1127A	MANUAL DAMPER	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
856	606-Y-VK-1506A	FIRE DAMPER	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
857	606-Y-VK-1517A	FIRE DAMPER	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
858	606-Y-VK-1528A	FIRE DAMPER	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
859	606-Y-VK-1573A	FIRE DAMPER	055A19A	Auxiliary	55'-0"	(1)	64'-0"		
860	441-J-FT-0305B	SI SHUTDOWN CLG PUMP PP02B DISCHARGE FLOW	055A19B	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
861	441-J-ZY-0311B01	SDCHX 2 OUTLET FLOW CONTROL VALVE - 311	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
862	441-J-ZY-0313B01	SDCHX 2 BYPASS FLOW CTRL VALVE - 313	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
863	441-J-ZY-0315B01	SCS TEST RETURN ISO VALVE - 315	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
864	447-J-LT-0390B	IRWST TK01 LEVEL 1	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
865	447-J-LT-0394B	HOLDUP VOL TK TK02 LEVEL(WIDE)	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
866	447-J-LT-0398B	REACTOR CAVITY LEVEL 2(WIDE)	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
867	447-J-PT-0402B	IRWST TK01 LEVEL 1 PRESSURE 1 (ACCIDENT)	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
868	447-J-PT-0404B	HVT TK02 WIDE LEVEL 1 PRESSURE 1 (ACCIDENT)	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
869	447-J-PT-0406B	REACTOR CAVITY LEVEL 2 PRESSURE 1 (ACCIDENT)	055A19B	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (30 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
870	481-J-LE-0051B	FLOOR DRAIN SUMP(QUAD.B) FLOODING LEVEL	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
871	481-J-LIT-0051B	FLOOR DRAIN SUMP(QUAD.B) FLOODING LEVEL	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
872	481-J-LIT-0080B	SI PUMP ROOM "B" FLOODING LEVEL	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
873	481-J-LIT-0086B	SC PUMP ROOM "B" FLOODING LEVEL	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
874	481-J-LIT-0092D	SI PUMP ROOM "D" FLOODING LEVEL	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
875	606-J-PDT-0034B	GNRL ACCS AREA 55-A19B DIFF PRESS	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
876	461-V-2749	Quadrant B Supply Line DRN VALVE	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
877	461-V-2752	Quadrant B Return Line DRN VALVE	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
878	633-V-1156B	SI PP(B) RM C-CLR Inlet throt VALVE	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
879	633-V-2156B	SI PP(B) RM C-CLR Inlet PZR Test VALVE	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
880	633-V-2431B	ECW Supply LN DRN VALVE	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
881	633-V-2432B	C-1E MCC01A RM HV06B ECW Inlet Vent VALVE	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
882	633-V-2433B	C-1E MCC01A RM HV06B ECW Outlet Vent VALVE	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
883	633-V-2434B	CCW PP RM HV 13B ECW Outlet DRN VALVE	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
884	633-V-2435B	CCW PP RM HV 13B ECW Outlet DRN VALVE	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
885	633-V-2436B	CCW PP RM HV 13B ECW Outlet DRN VALVE	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
886	606-Y-VK-1004B	MANUAL DAMPER	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
887	606-Y-VK-1045B	MANUAL DAMPER	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
888	606-Y-VK-1093B	MANUAL DAMPER	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
889	606-Y-VK-1506B	FIRE DAMPER	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
890	606-Y-VK-1507B	FIRE DAMPER	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
891	606-Y-VK-1508B	FIRE DAMPER	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
892	606-Y-VK-1509B	FIRE DAMPER	055A19B	Auxiliary	55'-0"	(1)	64'-0"		
893	606-Y-VK-1050A	MANUAL DAMPER	055A20A	Auxiliary	55'-0"	(1)	64'-0"		
894	606-Y-VK-1539A	FIRE DAMPER	055A20A	Auxiliary	55'-0"	(1)	64'-0"		
895	606-Y-VK-1065B	MANUAL DAMPER	055A20B	Auxiliary	55'-0"	(1)	64'-0"		
896	606-Y-VK-1512B	FIRE DAMPER	055A20B	Auxiliary	55'-0"	(1)	64'-0"		
897	441-M-OR04A	Flow Orifice for Equipment	055A21A	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
898	441-M-OR04A-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
899	441-M-OR05A	FLOW ORIFICE FOR EQUIPMENT	055A21A	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (31 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
900	441-M-OR05A-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
901	442-M-OR08A	RESTRICTION ORIFICE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
902	441-J-TE-0301A	SDC HX NO.1 INLET & OUTLET TEMP.	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
903	441-J-TEW-0301A	SHUTDOWN COOLING HX (HE01A) OUTLET TEMP	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
904	441-V-0159	SCP 01A Suction CHK VALVE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
905	441-V-0187	SCS Test Return Line Relief VALVE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
906	441-V-0207	IRWST OTLT to SCP 01A/SIP 02A Pr Test VALVE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
907	441-V-0289	SDC Hx 01A to IRWST Line Relief VALVE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
908	441-V-0304	IRWST to SCP 01A/SIP 02A ISO VALVE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
909	441-V-0314	SCS Train1 Test Return LN ISO VALVE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
910	441-V-0344	SCP 01A Suction ISO VALVE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
911	441-V-0421	Shutdown Purification ISO VALVE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
912	441-V-0466	SDC Hx 01A Outlet Relief VALVE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
913	441-V-0688	SCS Train1 Test Return LN ISO VALVE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
914	441-V-2753	SCP 01A RETURN LINE DRAIN VALVE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
915	442-V-0007	CS TRN-A IRWST RTN ISO VALVE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
916	442-V-1011	IRWST RTN to Refueling Pooling LN ISO VALVE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
917	442-V-2055	IRWST RTN LN DRN VALVE	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
918	606-Y-VK-1052A	MANUAL DAMPER	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
919	606-Y-VK-1081A	MANUAL DAMPER	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
920	606-Y-VK-1085A	MANUAL DAMPER	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
921	606-Y-VK-1529A	FIRE DAMPER	055A21A	Auxiliary	55'-0"	(1)	64'-0"		
922	441-M-OR04B	Flow Orifice for Equipment	055A21B	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
923	441-M-OR04B-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
924	441-M-OR05B	RESTRICTION ORIFICE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
925	441-M-OR05B-DU	RESTRUCTION ORIFICE(DUMMY)	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
926	442-M-OR08B	RESTRICTION ORIFICE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
927	441-J-AX-0306C	SC PUMP 2 MINIFLOW LINE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
928	441-J-TE-0304B	SDC HX NO.2 INLET & OUTLET TEMP.	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
929	441-J-TEW-0304B	SHUTDOWN COOLING HX (HE01B) OUTLET TEMP	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
930	441-V-0160	SCP 01B Suction CHK VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
931	441-V-0188	SCS Test Return Line Relief VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (32 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
932	441-V-0208	IRWST OTLT to SCP 01B/SIP 02B Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
933	441-V-0286	SIP 02D Disch to IRWST Line Relief VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
934	441-V-0287	SDC Hx 01B to IRWST Line Relief VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
935	441-V-0305	IRWST to SCP 01B/SIP 02B ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
936	441-V-0315	SCS Train2 Test Return LN ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
937	441-V-0346	SCP 01B Suction ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
938	441-V-0420	Shutdown Purification ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
939	441-V-0427	SIP Mini-Flow Header Sample ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
940	441-V-0467	SDC Hx 01B Outlet Relief VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
941	441-V-0693	SCS Train2 Test Return LN ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
942	441-V-2754	SCP 01B RETURN LINE DRAIN VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
943	441-V-2801	Hot Leg INJ Loop2 DRN VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
944	441-V-2802	Hot Leg INJ Loop2 DRN VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
945	442-V-0008	CS TRN-B IRWST RTN ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
946	442-V-1012	IRWST RTN to Refueling Pooling LN ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
947	442-V-2054	IRWST RTN LN DRN VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
948	447-V-0012	HVT WIDE RANGE LT-394B Upper TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
949	447-V-0013	HVT WIDE RANGE LT-394B Lower TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
950	447-V-0016	HVT NR LT-396 Upper TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
951	447-V-0017	HVT NR LT-396 Lower TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
952	447-V-0020	REACTOR CAVITY LT-398B Upper TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
953	447-V-0021	REACTOR CAVITY LT-398B Lower TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
954	447-V-0022	IRWST LT-390B Upper TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
955	447-V-0023	IRWST LT-390B Lower TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
956	447-V-2000	IRWST LT-390B Upper TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
957	447-V-2001	IRWST LT-390B Lower TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
958	447-V-2004	HVT WIDE RANGE LT-394B Upper TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
959	447-V-2005	HVT WIDE RANGE LT-394B Lower TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (33 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
960	447-V-2012	REACTOR CAVITY LT-398B Upper TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
961	447-V-2015	REACTOR CAVITY LT-398B Lower TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
962	447-V-2016	HVT NR LT-396 Upper TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
963	447-V-2017	HVT NR LT-396 Lower TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
964	447-V-2018	IRWST LT-390B Upper TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
965	447-V-2019	IRWST LT-390B Lower TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
966	447-V-2022	HVT WIDE RANGE LT-394B Upper TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
967	447-V-2023	HVT WIDE RANGE LT-394B Lower TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
968	447-V-2026	HVT NR LT-396 Upper TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
969	447-V-2027	HVT NR LT-396 Lower TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
970	447-V-2030	REACTOR CAVITY LT-398B Upper TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
971	447-V-2031	REACTOR CAVITY LT-398B Lower TAP ISO VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
972	447-V-2032	IRWST LT-390B Upper TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
973	447-V-2033	IRWST LT-390B Upper TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
974	447-V-2034	IRWST LT-390B Lower TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
975	447-V-2035	IRWST LT-390B Lower TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
976	447-V-2040	HVT WR LT-394B Upper TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
977	447-V-2041	HVT WR LT-394B Upper TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
978	447-V-2042	HVT WR LT-394B Lower TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
979	447-V-2043	HVT WR LT-394B Lower TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
980	447-V-2048	HVT NR LT-396 Upper TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
981	447-V-2049	HVT NR LT-396 Upper TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
982	447-V-2050	HVT NR LT-396 Lower TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
983	447-V-2051	HVT NR LT-396 Lower TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
984	447-V-2056	RX CAVITY LT-398B Upper TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (34 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
985	447-V-2057	RX CAVITY LT-398B Upper TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
986	447-V-2058	RX CAVITY LT-398B Lower TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
987	447-V-2059	RX CAVITY LT-398B Lower TAP Pr Test VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
988	447-V-F551	GLOBE VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
989	491-V-0009	SI PUMP 2&4 MINI FLOW SAMPLE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
990	633-V-1166B	SC PP(B)&M/F HX RM C-CLR Inlet throt VALVE	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
991	606-Y-VK-1052B	MANUAL DAMPER	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
992	606-Y-VK-1063B	MANUAL DAMPER	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
993	606-Y-VK-1121B	MANUAL DAMPER	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
994	606-Y-VK-1504B	FIRE DAMPER	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
995	606-Y-VK-1530B	FIRE DAMPER	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
996	606-Y-VK-1534B	FIRE DAMPER	055A21B	Auxiliary	55'-0"	(1)	64'-0"		
997	447-V-0005	BAMP Suct CNMT ISO VALVE	055A22A	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
998	447-V-0006	BAMP Suct CNMT ISO VALVE	055A22A	Auxiliary	55'-0"	(1)	64'-0"		
999	447-V-1003	BAMP Suct LN Pr(THERMAL) Relief VALVE	055A22A	Auxiliary	55'-0"	(1)	64'-0"		
1000	451-V-0508	RCP CBO Diversion VALVE	055A22A	Auxiliary	55'-0"	(1)	64'-0"		
1001	451-V-0653	RCP CBO Diversion Line CHK VALVE	055A22A	Auxiliary	55'-0"	(1)	64'-0"		
1002	451-V-2073	Purif FLT 1 Inlet DRN VALVE	055A22A	Auxiliary	55'-0"	(1)	64'-0"		
1003	451-V-2343	V508 Disch to CHG PP Mini-Flow HX DRN VALVE	055A22A	Auxiliary	55'-0"	(1)	64'-0"		
1004	606-Y-VK-1531A	FIRE DAMPER	055A22A	Auxiliary	55'-0"	(1)	64'-0"		
1005	451-V-2095	CHR PP 01B Disch Vent VALVE	055A22B	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
1006	451-V-2096	CHR PP 01B Disch Vent VALVE	055A22B	Auxiliary	55'-0"	(1)	64'-0"		
1007	451-V-2250	AUX CHR PP to CHR LN VNT VALVE	055A22B	Auxiliary	55'-0"	(1)	64'-0"		
1008	451-V-2251	AUX CHR PP to CHR LN VNT VALVE	055A22B	Auxiliary	55'-0"	(1)	64'-0"		
1009	451-V-2311	CHG PP 01B Seal Vent VALVE	055A22B	Auxiliary	55'-0"	(1)	64'-0"		
1010	451-V-2320	CHG PP 01B Mini-Flow LN Vent VALVE	055A22B	Auxiliary	55'-0"	(1)	64'-0"		
1011	451-V-2321	CHG PP 01B Mini-Flow LN Vent VALVE	055A22B	Auxiliary	55'-0"	(1)	64'-0"		
1012	441-M-HE01A	SHUTDOWN COOLING HEAT EXCHANGER 1	055A30A	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
1013	441-M-OR18A	RESTRICTION ORIFICE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1014	441-M-OR18A-DU	RESTRUCTION ORIFICE(DUMMY)	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1015	606-M-HV17A	SC HEATER EXCHANGER RM CUBICLE COOLER	055A30A	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (35 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1016	441-J-FE-0302A	SC PUMP NO.1 FLOW RATE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1017	441-J-HS-0310A03	SDCHX DISCHARGE ISO. AND THROTTLE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1018	441-J-HS-0312A03	SDCHX BYPASS FLOW CONTROL	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1019	441-J-TE-0302A	SDC HX NO.1 OUTLET TEMP.	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1020	441-J-TEW-0302A	SHUTDOWN COOLING HX 1 (HE01A) OUTLET TEMP	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1021	461-J-TEW-0077	SHUTDOWN CLNG HX A OUTLET TEMP	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1022	461-J-TW-0353	SHUTDOWN COOLING HX 1 INLET TEMP	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1023	606-J-TE-0221A	SC HX RM TEMP	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1024	633-J-TW-0233	COOLING COIL VK-CW17A OUTLET	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1025	633-J-TW-0235	COOLING COIL VK-CW17A INLET	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1026	441-V-0170	Shutdown Cooling Hx 01A Vent VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1027	441-V-0172	Shutdown Cooling Hx 01A DRN VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1028	441-V-0310	SDC Hx 01A Outlet Flow CTRL VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1029	441-V-0312	SDC Hx 01A Bypass Flow CTRL VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1030	441-V-0422	SDC Hx 01A HDR Relief VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1031	441-V-0490	SDC Hx 01A Outlet FT-302A RT VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1032	441-V-0492	SDC Hx 01A Outlet FT-302A RT VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1033	441-V-2519	SC HX 01A Suct Line Vent VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1034	441-V-2521	SC HX 01A Disch Line Vent VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1035	441-V-2743	SCP 01A SUCTION VENT VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1036	441-V-2745	SCP 01A DISCH DRAIN VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1037	441-V-2747	SCP 01A DISCH VENT VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1038	461-V-0351	SC HX 01A INLET ISO. VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1039	461-V-1017	CCW QUADRANTA A COMMON HDR	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1040	461-V-1511	SC HX 01A OUTLET ISO VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1041	461-V-1513	SC HE01A Inlet V351 Equal VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1042	461-V-1515	SHUTDOWN COOLING HX A SHELL SIDE PRESSURE(THERMAL) RELIEF VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1043	461-V-2083	CCW Train A Supply HDR Pr Test VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1044	461-V-2501	SC HE01A Inlet Pr Test VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1045	461-V-2504	SC HE01A Outlet Pr Test VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1046	461-V-2581	Shutdown Cooling HE01A OTLT FT-10T RT VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1047	461-V-2582	Shutdown Cooling HE01A OTLT FT-10T RT VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1048	461-V-2747	Quadrant A Supply Line Vent VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1049	633-V-1167A	CW17A SC HX RM C-CLR Outlet VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (36 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1050	633-V-1168A	CW17A SC HX RM C-CLR Inlet throt VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1051	633-V-2167A	CW17A SC HX RM C-CLR Outlet PZR Test VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1052	633-V-2168A	CW17A SC HX RM C-CLR Inlet PZR Test VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1053	633-V-2190A	CW17A SC HX RM C-CLR Inlet Vent VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1054	633-V-2267A	SC Hx RM HV17A ECW Outlet Vent VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1055	633-V-2268A	SC Hx RM HV17A ECW Inlet DRN VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1056	633-V-2367A	SC Hx RM HV17A ECW Outlet Test Conn VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1057	633-V-2368A	SC Hx RM HV17A ECW Inlet Test Conn VALVE	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1058	606-Y-VK-1571A	FIRE DAMPER	055A30A	Auxiliary	55'-0"	(1)	64'-0"		
1059	441-M-HE01B	SHUTDOWN COOLING HEAT EXCHANGER 2	055A30B	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
1060	441-M-OR18B	FLOW ORIFICE FOR EQUIPMENT	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1061	441-M-OR18B-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1062	606-M-HV17B	SC HEATER EXCHANGER RM CUBICLE COOLER	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1063	441-J-FE-0305B	SDCHX NO.2 OUTLET TEMP.	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1064	441-J-HS-0311B03	SDCHX DISCHARGE ISO. AND THROTTLE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1065	441-J-HS-0313B03	SDCHX BYPASS FLOW CONTROL	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1066	441-J-TE-0305B	SDC HX NO.2 OUTLET TEMP.	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1067	441-J-TEW-0305B	SHUTDOWN COOLING HX 2 (HE02A) OUTLET TEMP	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1068	461-J-TEW-0078	SHUTDOWN CLNG HX B OUTLET TEMP	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1069	461-J-TW-0354	SHUTDOWN COOLING HX 2 INLET TEMP	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1070	606-J-TE-0222B	SC HX RM TEMP	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1071	633-J-TW-0234	COOLING COIL VK-CW17B OUTLET	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1072	633-J-TW-0236	COOLING COIL VK-CW17B INLET	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1073	441-V-0180	Shutdown Cooling Hx 01B Vent VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1074	441-V-0182	Shutdown Cooling Hx 01B DRN VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1075	441-V-0311	SDC Hx 01B Outlet Flow CTRL VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1076	441-V-0313	SDC Hx 01B Bypass Flow CTRL VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1077	441-V-0423	SDC Hx 01B HDR Relief VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1078	441-V-0491	SDC Hx 01B Outlet FT-305B RT VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1079	441-V-0493	SDC Hx 01B Outlet FT-305B RT VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (37 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1080	441-V-2520	SC HX 01B Suct Line Vent VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1081	441-V-2522	SC HX 01B Disch Line Vent VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1082	441-V-2744	SCP 01B SUCTION VENT VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1083	441-V-2746	SCP 01B DISCH DRAIN VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1084	441-V-2748	SCP 01B DISCH VENT VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1085	441-V-2908	Safety INJ Line 2 Vent VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1086	441-V-2909	Safety INJ Line 2 Vent VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1087	441-V-2911	Cask Loading Pit Outlet Vent VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1088	461-V-0352	SC HX 01B INLET ISO. VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1089	461-V-1018	CCW QUADRANTA B COMMON HDR	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1090	461-V-1512	SC HX 01B OUTLET ISO VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1091	461-V-1514	SC HE01B Inlet V352 Equal VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1092	461-V-1516	SHUTDOWN COOLING HX B SHELL SIDE PRESSURE(THERMAL) RELIEF VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1093	461-V-2084	CCW Train B Supply HDR Pr Test VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1094	461-V-2137	SC HE01B Outlet Line Vent VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1095	461-V-2506	SC HE01B Inlet Pr Test VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1096	461-V-2509	SC HE01B Outlet Pr Test VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1097	461-V-2583	Shutdown Cooling HE01B OTLT FT-10U RT VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1098	461-V-2584	Shutdown Cooling HE01B OTLT FT-10U RT VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1099	461-V-2748	Quadrant B Supply Line Vent VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1100	633-V-1167B	CW17B SC HX RM C-CLR Outlet VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1101	633-V-1168B	CW17B SC HX RM C-CLR Inlet throt VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1102	633-V-2167B	CW17B SC HX RM C-CLR Outlet PZR Test VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1103	633-V-2168B	CW17B SC HX RM C-CLR Inlet PZR Test VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1104	633-V-2190B	CW17B SC HX RM C-CLR Inlet Vent VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1105	633-V-2256B	PP RM HV12B ECW Inlet DRN VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1106	633-V-2267B	SC Hx RM HV17B ECW Outlet Vent VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1107	633-V-2268B	SC Hx RM HV17B ECW Inlet DRN VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1108	633-V-2367B	SC Hx RM HV17B ECW Outlet Test Conn VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1109	633-V-2368B	SC Hx RM HV17B ECW Inlet Test Conn VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1110	633-V-2448B	SC HX RM CW17B Outlet DRN VALVE	055A30B	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (38 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1111	606-Y-VK-1019B	MANUAL DAMPER	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1112	606-Y-VK-1054B	MANUAL DAMPER	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1113	606-Y-VK-1107B	MANUAL DAMPER	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1114	606-Y-VK-1513B	FIRE DAMPER	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1115	606-Y-VK-1514B	FIRE DAMPER	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1116	606-Y-VK-1568B	FIRE DAMPER	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1117	606-Y-VK-1569B	FIRE DAMPER	055A30B	Auxiliary	55'-0"	(1)	64'-0"		
1118	606-Y-VK-1068B	MANUAL DAMPER	055A31B	Auxiliary	55'-0"	(1)	64'-0"		
1119	606-Y-VK-1113B	MANUAL DAMPER	055A31B	Auxiliary	55'-0"	(1)	64'-0"		
1120	606-Y-VK-1057A	MANUAL DAMPER	055A33A	Auxiliary	55'-0"	(1)	64'-0"		
1121	606-Y-VK-1059A	MANUAL DAMPER	055A33A	Auxiliary	55'-0"	(1)	64'-0"		
1122	606-Y-VK-1061A	MANUAL DAMPER	055A33A	Auxiliary	55'-0"	(1)	64'-0"		
1123	606-Y-VK-1575A	FIRE DAMPER	055A33A	Auxiliary	55'-0"	(1)	64'-0"		
1124	441-V-0700	SIS FILL ISO VALVE	055A34A	Auxiliary	55'-0"	(1)	64'-0"		
1125	441-V-0702	SIS FILL ISO VALVE	055A34A	Auxiliary	55'-0"	(1)	64'-0"		
1126	441-V-0708	SCS FILL ISO VALVE	055A34A	Auxiliary	55'-0"	(1)	64'-0"		
1127	441-V-0710	SCS FILL ISO VALVE	055A34A	Auxiliary	55'-0"	(1)	64'-0"		
1128	441-V-2900	SI LINE 1 & 3 FILL LINE TEST CONN VALVE	055A34A	Auxiliary	55'-0"	(1)	64'-0"		
1129	441-V-2901	SI LINE 1 & 3 FILL LINE TEST CONN VALVE	055A34A	Auxiliary	55'-0"	(1)	64'-0"		
1130	441-V-2902	Safety INJ Line 1 Vent VALVE	055A34A	Auxiliary	55'-0"	(1)	64'-0"		
1131	441-V-2903	Safety INJ Line 1 Vent VALVE	055A34A	Auxiliary	55'-0"	(1)	64'-0"		
1132	441-V-2904	SC LOOP 1 FILL LINE TEST CONN VALVE	055A34A	Auxiliary	55'-0"	(1)	64'-0"		
1133	441-V-2905	Cask Loading Pit Outlet Vent VALVE	055A34A	Auxiliary	55'-0"	(1)	64'-0"		
1134	441-V-0701	SIS FILL ISO VALVE	055A34B	Auxiliary	55'-0"	(1)	64'-0"		
1135	441-V-0703	SIS FILL ISO VALVE	055A34B	Auxiliary	55'-0"	(1)	64'-0"		
1136	441-V-0709	SCS FILL ISO VALVE	055A34B	Auxiliary	55'-0"	(1)	64'-0"		
1137	441-V-0711	SCS FILL ISO VALVE	055A34B	Auxiliary	55'-0"	(1)	64'-0"		
1138	441-V-2906	SI LINE 2 & 4 FILL LINE TEST CONN VALVE	055A34B	Auxiliary	55'-0"	(1)	64'-0"		
1139	441-V-2907	SI LINE 2 & 4 FILL LINE TEST CONN VALVE	055A34B	Auxiliary	55'-0"	(1)	64'-0"		
1140	441-V-2910	SC LOOP 2 FILL LINE TEST CONN VALVE	055A34B	Auxiliary	55'-0"	(1)	64'-0"		
1141	441-J-ZY-0314A01	SCS TEST RETURN ISO VALVE - 314	055A35A	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	-
1142	447-J-LT-0391A	IRWST TK01 LEVEL 2	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1143	447-J-LT-0395A	HOLDUP VOL TK TK02 LEVEL(WIDE)	055A35A	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (39 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1144	447-J-LT-0397A	REACTOR CAVITY LEVEL 1(WIDE)	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1145	447-J-PT-0401A	IRWST TK01 LEVEL 2 PRESSURE 1 (ACCIDENT)	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1146	447-J-PT-0403A	HVT TK02 WIDE LEVEL 2 PRESSURE 1 (ACCIDENT)	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1147	447-J-PT-0405A	REACTOR CAVITY LEVEL 1 PRESSURE 1 (ACCIDENT)	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1148	451-J-FT-0212B	CHARGING LINE FLOW	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1149	451-J-PT-0212A	CV CHARGING LINE PRESS	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1150	451-V-0131	BA Filter Diff. Pr Indicator ISO VALVE	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1151	451-V-0436	CHG PP Suct Line Pr Indicator ISO VALVE	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1152	633-V-2440A	CHG PP RM HV18A ECW Inlet Vent VALVE	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1153	633-V-2442A	CHG PP RM HV18A ECW Inlet DRN VALVE	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1154	606-Y-VK-1055A	MANUAL DAMPER	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1155	606-Y-VK-1058A	MANUAL DAMPER	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1156	606-Y-VK-1066A	MANUAL DAMPER	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1157	606-Y-VK-1071A	MANUAL DAMPER	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1158	606-Y-VK-1088A	MANUAL DAMPER	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1159	606-Y-VK-1092A	MANUAL DAMPER	055A35A	Auxiliary	55'-0"	(1)	64'-0"		
1160	606-Y-VK-1007A	MANUAL DAMPER	055A38A	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	-
1161	606-Y-VK-1067A	MANUAL DAMPER	055A38A	Auxiliary	55'-0"	(1)	64'-0"		
1162	606-Y-VK-1072A	MANUAL DAMPER	055A38A	Auxiliary	55'-0"	(1)	64'-0"		
1163	606-Y-VK-1073A	MANUAL DAMPER	055A38A	Auxiliary	55'-0"	(1)	64'-0"		
1164	451-M-PP01A	CHARGING PUMP 1	055A39A	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	-
1165	451-J-PS-0216A	CHARGING PUMP SUCTION	055A39A	Auxiliary	55'-0"	(1)	64'-0"		
1166	451-V-0364	PRM & Boronometer ISO VALVE	055A39A	Auxiliary	55'-0"	(1)	64'-0"		
1167	451-V-0413	PRM Bypass VALVE	055A39A	Auxiliary	55'-0"	(1)	64'-0"		
1168	451-V-0421	Boronometer Flow Indicator ISO VALVE	055A39A	Auxiliary	55'-0"	(1)	64'-0"		
1169	451-V-0422	PRM Flow Indicator ISO VALVE	055A39A	Auxiliary	55'-0"	(1)	64'-0"		
1170	451-V-0449	PRM & Boronometer CHK VALVE	055A39A	Auxiliary	55'-0"	(1)	64'-0"		
1171	451-V-0521	PRM AND Boronometer Bypass VALVE	055A39A	Auxiliary	55'-0"	(1)	64'-0"		
1172	606-Y-VK-1069A	MANUAL DAMPER	055A39A	Auxiliary	55'-0"	(1)	64'-0"		
1173	606-Y-VK-1075A	MANUAL DAMPER	055A39A	Auxiliary	55'-0"	(1)	64'-0"		
1174	606-M-HV18A	CHARGING PUMP RM CUBICLE COOLER	055A42A	Auxiliary	55'-0"	(1)	64'-0"	4" FD (1)	
1175	606-J-TE-0201A	CHARGING PUMP ROOM TEMP	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1176	633-J-TW-0181	COOLING COIL VE-CW10A OUTLET	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1177	633-J-TW-0183	COOLING COIL VE-CW10A INLET	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1178	451-V-0125	Charging Line Relief VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (40 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1179	451-V-0316	CHG PP Suction ISO VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1180	451-V-0317	CHG PP Suction to DRDH ISO VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1181	451-V-0437	CHG PP Pr Switch ISO VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1182	451-V-0659	CHEM Addition ISO VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1183	451-V-0742	Changing PP Test Connection ISO VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1184	451-V-1035	CHR PP 01A Suct PI-025 Root VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1185	451-V-1037	CHR PP 01A Disch PI-029 Root VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1186	451-V-1039	CHR PP 01A Disch PI-029 Root VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1187	451-V-1058	CHR PP 01A Suct Pr Test VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1188	451-V-2093	CHR PP 01A Disch Vent VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1189	451-V-2094	CHR PP 01A Disch Vent VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1190	451-V-2111	CHG PP 01A Casing DRN VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1191	451-V-2113	CHG PP 01A Casing DRN VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1192	451-V-2162	CHG PP 01A Suct Flushing Conn VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1193	451-V-2173	CHG PP 01A Casing DRN VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1194	451-V-2175	CHG PP 01A Casing DRN VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1195	451-V-2177	CHG PP 01A Disch Head DRN DRN VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1196	451-V-2179	CHG PP 01A Disch Head DRN DRN VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1197	451-V-F507	GLOBE VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1198	451-V-F552	GLOBE VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1199	451-V-F554	GLOBE VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1200	451-V-F556	GLOBE VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1201	451-V-F558	GLOBE VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1202	451-V-F560	GLOBE VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1203	451-V-F562	GLOBE VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1204	633-V-1141A	CW18A CHG PP RM C-CLR Outlet VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1205	633-V-1142A	CW18A CHG PP RM C-CLR Inlet throt VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1206	633-V-2141A	CW18A CHG PP RM C-CLR Outlet PZR Test VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1207	633-V-2142A	CW18A CHG PP RM C-CLR Inlet PZR Test VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1208	633-V-2199A	CHG PP RM HV18A ECW Inlet Vent VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1209	633-V-2200A	CHG PP RM HV18B ECW Outlet DRN VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1210	633-V-2241A	CHG PP RM HV18A ECW Outlet Vent VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1211	633-V-2242A	CHG PP RM HV18A ECW Inlet DRN VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (41 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1212	633-V-2341A	CHG PP RM HV18A ECW Outlet Test Conn VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1213	633-V-2342A	CHG PP RM HV18A ECW Inlet Test Conn VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1214	633-V-2441A	CHG PP RM HV18A ECW Outlet DRN VALVE	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1215	606-Y-VK-1084A	MANUAL DAMPER	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1216	606-Y-VK-1540A	FIRE DAMPER	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1217	606-Y-VK-1541A	FIRE DAMPER	055A42A	Auxiliary	55'-0"	(1)	64'-0"		
1218	451-M-HE04	CHARGING PUMP MINI-FLOW HEAT EXCHANGER	055A43A	Auxiliary	55'-0"	(1)	64'-0"		
1219	451-J-TW-0028	CHARGING PUMP MINIFLOW HX OUTLET TEMP	055A43A	Auxiliary	55'-0"	(1)	64'-0"		
1220	451-V-0311	MFHX Inlet ISO VALVE	055A43A	Auxiliary	55'-0"	(1)	64'-0"		
1221	451-V-0325	MFHX Relief VALVE	055A43A	Auxiliary	55'-0"	(1)	64'-0"		
1222	451-V-0333	MFHX Outlet ISO VALVE	055A43A	Auxiliary	55'-0"	(1)	64'-0"		
1223	451-V-0342	CHG PP Balancing Leakoff CHK VALVE	055A43A	Auxiliary	55'-0"	(1)	64'-0"		
1224	451-V-0710	MFHX Vent ISO VALVE	055A43A	Auxiliary	55'-0"	(1)	64'-0"		
1225	451-V-2052	CHG PP Mini-Flow Hx Tube Side DRN VALVE	055A43A	Auxiliary	55'-0"	(1)	64'-0"		
1226	451-V-2058	CHG PP Mini-Flow Hx T Side INLT Pr Test	055A43A	Auxiliary	55'-0"	(1)	64'-0"		
1227	451-V-2059	CHG PP Mini-Flow Hx T Side OTLT Pr Test	055A43A	Auxiliary	55'-0"	(1)	64'-0"		
1228	451-V-2312	CHG PP 01A Seal Vent VALVE	055A43A	Auxiliary	55'-0"	(1)	64'-0"		
1229	606-Y-VK-1076A	MANUAL DAMPER	055A43A	Auxiliary	55'-0"	(1)	64'-0"		
1230	606-Y-VK-1082A	MANUAL DAMPER	055A43A	Auxiliary	55'-0"	(1)	64'-0"		
1231	606-Y-VK-1086A	MANUAL DAMPER	055A44A	Auxiliary	55'-0"	(1)	64'-0"		
1232	606-Y-VK-1087A	MANUAL DAMPER	055A44A	Auxiliary	55'-0"	(1)	64'-0"		
1233	606-Y-VK-1089A	MANUAL DAMPER	055A44A	Auxiliary	55'-0"	(1)	64'-0"		
1234	606-Y-VK-1093A	MANUAL DAMPER	055A44A	Auxiliary	55'-0"	(1)	64'-0"		
1235	451-V-0190	BAST Gravity Feed CHK VALVE	055A45A	Auxiliary	55'-0"	(1)	64'-0"	4" FD (1)	8" EOL (1)
1236	451-V-0425	Charging Line Pr Indicator ISO VALVE	055A45A	Auxiliary	55'-0"	(1)	64'-0"		
1237	451-V-2252	AUX CHR PP to CHR LN DRN VALVE	055A45A	Auxiliary	55'-0"	(1)	64'-0"		
1238	451-V-2253	AUX CHR PP to CHR LN DRN VALVE	055A45A	Auxiliary	55'-0"	(1)	64'-0"		
1239	451-V-2254	AUX CHR PP to CHR LN VNT VALVE	055A45A	Auxiliary	55'-0"	(1)	64'-0"		
1240	451-V-2255	AUX CHR PP to CHR LN VNT VALVE	055A45A	Auxiliary	55'-0"	(1)	64'-0"		
1241	451-V-2305	RCP Seal INJ Filter Outlet DRN VALVE	055A45A	Auxiliary	55'-0"	(1)	64'-0"		
1242	451-V-2306	RCP Seal INJ Filter Outlet DRN VALVE	055A45A	Auxiliary	55'-0"	(1)	64'-0"		
1243	491-V-0063	VCT GAS SAMPLE VALVE	055A47B	Auxiliary	55'-0"	(1)	64'-0"	4" FD (1)	-

Table 3.4-2 (42 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1244	606-Y-VK-1066B	MANUAL DAMPER	055A47B	Auxiliary	55'-0"	(1)	64'-0"		
1245	606-Y-VK-1101B	MANUAL DAMPER	055A47B	Auxiliary	55'-0"	(1)	64'-0"		
1246	606-Y-VK-1110B	MANUAL DAMPER	055A47B	Auxiliary	55'-0"	(1)	64'-0"		
1247	606-Y-VK-1112B	MANUAL DAMPER	055A48B	Auxiliary	55'-0"	(1)	64'-0"	4" FD (1)	-
1248	606-Y-VK-1051B	MANUAL DAMPER	055A49B	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	-
1249	606-Y-VK-1053B	MANUAL DAMPER	055A49B	Auxiliary	55'-0"	(1)	64'-0"		
1250	606-Y-VK-1055B	MANUAL DAMPER	055A49B	Auxiliary	55'-0"	(1)	64'-0"		
1251	606-Y-VK-1100B	MANUAL DAMPER	055A49B	Auxiliary	55'-0"	(1)	64'-0"		
1252	606-Y-VK-1111B	MANUAL DAMPER	055A49B	Auxiliary	55'-0"	(1)	64'-0"		
1253	606-Y-VK-1114B	MANUAL DAMPER	055A49B	Auxiliary	55'-0"	(1)	64'-0"		
1254	606-Y-VK-1550B	FIRE DAMPER	055A49B	Auxiliary	55'-0"	(1)	64'-0"		
1255	481-J-LIS-0055B	CCW SUMP(QUAD.B) FLOODING LEVEL	055A50B	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	-
1256	463-V-2706	SI/SC FILL ISO VALVE(FROM BAMP)	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1257	633-V-2241B	CHG PP RM HV18B ECW Outlet Vent VALVE	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1258	633-V-2243B	Aux. CHG PP RM HV21B ECW Outlet Vent VALVE	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1259	633-V-2437B	CCW PP RM HV 13B ECW Inlet DRN VALVE	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1260	606-Y-VK-1020B	MANUAL DAMPER	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1261	606-Y-VK-1021B	MANUAL DAMPER	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1262	606-Y-VK-1023B	MANUAL DAMPER	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1263	606-Y-VK-1029B	MANUAL DAMPER	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1264	606-Y-VK-1072B	MANUAL DAMPER	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1265	606-Y-VK-1119B	MANUAL DAMPER	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1266	606-Y-VK-1120B	MANUAL DAMPER	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1267	606-Y-VK-1537B	FIRE DAMPER	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1268	606-Y-VK-1540B	FIRE DAMPER	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1269	606-Y-VK-1541B	FIRE DAMPER	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1270	606-Y-VK-1543B	FIRE DAMPER	055A50B	Auxiliary	55'-0"	(1)	64'-0"		
1271	606-Y-VK-1025B	MANUAL DAMPER	055A51B	Auxiliary	55'-0"	(1)	64'-0"	4" FD (1)	-
1272	606-Y-VK-1102B	MANUAL DAMPER	055A51B	Auxiliary	55'-0"	(1)	64'-0"		
1273	606-Y-VK-1067B	MANUAL DAMPER	055A52B	Auxiliary	55'-0"	(1)	64'-0"		
1274	606-Y-VK-1103B	MANUAL DAMPER	055A52B	Auxiliary	55'-0"	(1)	64'-0"		
1275	606-Y-VK-1104B	MANUAL DAMPER	055A52B	Auxiliary	55'-0"	(1)	64'-0"		
1276	606-Y-VK-1118B	MANUAL DAMPER	055A52B	Auxiliary	55'-0"	(1)	64'-0"		
1277	606-Y-VK-1123B	MANUAL DAMPER	055A53B	Auxiliary	55'-0"	(1)	64'-0"		
1278	451-M-PD01	SUITION STABILIZER	055A54B	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	-
1279	451-M-PP03	AUXILIARY CHARGING PUMP	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1280	451-M-SD01	SUITION STABILIZER	055A54B	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (43 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1281	606-M-HV21B	AUX.CHARGING PUMP RM CUBICLE COOLER	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1282	451-J-PS-0218A	AUX. CHARGING PUMP SUCTION LINE PRESSURE SWITCH	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1283	451-J-PS-0218B	AUX. CHARGING PUMP SUCTION LINE PRESSURE SWITCH	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1284	606-J-TE-0224B	AUX. CHARGING PUMP RM TEMP	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1285	633-J-TW-0186	COOLING COIL VK-CW21B OUTLET	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1286	633-J-TW-0188	COOLING COIL VK-CW21B OUTLET	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1287	451-V-0324	ACP Relief VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1288	451-V-0336	Aux CHG PP Disch to DRDH ISO VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1289	451-V-0439	Aux CHG PP Pr Switch ISO VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1290	451-V-0743	Aux CHG PP Test Connection ISO VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1291	451-V-1041	Aux. CHR PP Suct PI-027 Root VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1292	451-V-1042	Aux. CHR PP Disch PI-031 Root VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1293	451-V-1043	Aux. CHR PP Disch PI-031 Root VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1294	451-V-1060	Aux. CHR PP Suct Pr Test VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1295	451-V-1062	Aux CHG PP Suct Stabilizer Vent VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1296	451-V-1063	Aux CHG PP Suct Stabilizer DRN VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1297	451-V-1095	Aux CHG PP 03 to Sump DRN VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1298	451-V-2272	AUX CHG PP Suct Flushing Conn VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1299	633-V-1143B	CW21B AUX CHG PP RM C-CLR Outlet VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1300	633-V-1144B	CW21B AUX CHG PP RM C-CLR Inlet thro VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1301	633-V-2143B	AUX CHG PP RM C-CLR Outlet PZR Test VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1302	633-V-2144B	AUX CHG PP RM C-CLR Inlet PZR Test VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1303	633-V-2244B	Aux. CHG PP RM HV21B ECW Inlet DRN VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1304	633-V-2343B	Aux CHG PP RM HV21B ECW OTLT TestConn VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1305	633-V-2344B	Aux CHG PP RM HV21B ECW INLT TestConn VALVE	055A54B	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (44 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1306	606-Y-VK-1064B	MANUAL DAMPER	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1307	606-Y-VK-1545B	FIRE DAMPER	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1308	606-Y-VK-1546B	FIRE DAMPER	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1309	606-Y-VK-1548B	FIRE DAMPER	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1310	606-Y-VK-1549B	FIRE DAMPER	055A54B	Auxiliary	55'-0"	(1)	64'-0"		
1311	451-M-PP01B	CHARGING PUMP 2	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1312	606-M-HV18B	CHARGING PUMP RM CUBICLE COOLER	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1313	451-J-PS-0217B	CHARGING PUMP SUCTION	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1314	606-J-TE-0202B	CHARGING PUMP ROOM TEMP	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1315	633-J-TW-0182	COOLING COIL VE-CW10B OUTLET	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1316	633-J-TW-0184	COOLING COIL VE-CW10B INLET	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1317	451-V-0320	CHG PP Suction to DRDH ISO VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1318	451-V-0438	CHG PP Pr Switch ISO VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1319	451-V-0741	Changing PP Test Connection ISO VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1320	451-V-1036	CHR PP 01B Suct PI-026 Root VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1321	451-V-1038	CHR PP 01B Disch PI-030 Root VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1322	451-V-1040	CHR PP 01B Disch PI-030 Root VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1323	451-V-1059	CHR PP 01B Suct Pr Test VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1324	451-V-1096	PDP DRAIN VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1325	451-V-1097	PDP DRAIN VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1326	451-V-2112	CHG PP 01B Casing DRN VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1327	451-V-2114	CHG PP 01B Casing DRN VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1328	451-V-2160	CHG PP 01B Suct Flushing Conn VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1329	451-V-2174	CHG PP 01B Casing DRN VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1330	451-V-2176	CHG PP 01B Casing DRN VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1331	451-V-2178	CHG PP 01B Disch Head DRN DRN VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1332	451-V-2180	CHG PP 01B Disch Head DRN DRN VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1333	451-V-2238	CHG PP 01B Disch DRN VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1334	451-V-2239	CHG PP 01B Disch DRN VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1335	451-V-F553	GLOBE VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1336	451-V-F555	GLOBE VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1337	451-V-F557	GLOBE VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1338	451-V-F559	GLOBE VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1339	451-V-F561	GLOBE VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1340	451-V-F563	GLOBE VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1341	633-V-1141B	CW18B CHG PP RM C-CLR Outlet VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1342	633-V-1142B	CW18B CHG PP RM C-CLR Inlet throt VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (45 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1343	633-V-2141B	CW18B CHG PP RM C-CLR Outlet PZR Test VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1344	633-V-2142B	CW18B CHG PP RM C-CLR Inlet PZR Test VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1345	633-V-2242B	CHG PP RM HV18B ECW Inlet DRN VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1346	633-V-2341B	CHG PP RM HV18B ECW Outlet Test Conn VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1347	633-V-2342B	CHG PP RM HV18B ECW Inlet Test Conn VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1348	633-V-2449B	CHG PP RM CW18B Inlet Vent VALVE	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1349	606-Y-VK-1544B	FIRE DAMPER	055A55B	Auxiliary	55'-0"	(1)	64'-0"		
1350	451-M-OR04A	FLOW ORIFICE FOR EQUIPMENT	055A56A	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
1351	451-M-OR04B	FLOW ORIFICE FOR EQUIPMENT	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1352	451-M-OR05A	FLOW ORIFICE FOR EQUIPMENT	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1353	451-M-OR05B	FLOW ORIFICE FOR EQUIPMENT	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1354	451-M-OR05B-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1355	451-M-OR07A	Flow Orifice for Equipment	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1356	451-M-OR07B	Flow Orifice for Equipment	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1357	451-J-FE-0212B	CHARGING LINE FLOW	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1358	451-J-LY-0212X	CHARGING FLOW CONTROL	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1359	451-J-LY-0212Y	CHARGING FLOW CONTROL	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1360	451-V-0165	BAF Diff. Pr Indicator ISO VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1361	451-V-0212P	Charging CTRL VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1362	451-V-0212Q	Charging CTRL VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1363	451-V-0308	CHG PP to MFHX CHK VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1364	451-V-0328	CHG PP Disch CHK VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1365	451-V-0339	CHG PP Disch ISO VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1366	451-V-0427	Charging Flow Indicator ISO VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1367	451-V-0428	Charging Flow Indicator ISO VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1368	451-V-0575	Charging Flow Flow Restricting VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1369	451-V-0576	Charging Flow Restricting VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1370	451-V-0577	Charging Flow Restricting VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1371	451-V-0713	Charging CTRL VALVE ISO VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1372	451-V-0714	Charging CTRL VALVE ISO VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1373	451-V-0715	Charging CTRL VALVE ISO VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1374	451-V-0716	Charging CTRL VALVE ISO VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1375	451-V-0796	Charging to MFHX ISO VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (46 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1376	451-V-2066	CHR LN to RC Loop 1A VNT VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1377	451-V-2067	CHR LN to RC Loop 1A VNT VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1378	451-V-2068	CHR LN to RC Loop 1A DRN VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1379	451-V-2069	CHR LN to RC Loop 1A DRN VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1380	451-V-2070	CHR LN to RC Loop 1A DRN VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1381	451-V-2071	CHR LN to RC Loop 1A DRN VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1382	451-V-2322	CHG PP 01A Mini-Flow LN DRN VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1383	451-V-2323	CHG PP 01A Mini-Flow LN DRN VALVE	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1384	606-Y-VK-1077A	MANUAL DAMPER	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1385	606-Y-VK-1083A	MANUAL DAMPER	055A56A	Auxiliary	55'-0"	(1)	64'-0"		
1386	451-M-OR06A	Flow Orifice for Equipment	055A56B	Auxiliary	55'-0"	(1)	64'-0"	6" FD (1)	8" EOL (1)
1387	451-M-OR06B	Flow Orifice for Equipment	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1388	451-V-0307	CHG PP to MFHX CHK VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1389	451-V-0314	Hydrostatic Test Connection ISO VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1390	451-V-0319	CHG PP Suction ISO VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1391	451-V-0322	ACP Suction ISO VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1392	451-V-0323	Aux CHG PP Suct to DRDR ISO VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1393	451-V-0331	CHG PP Disch CHK VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1394	451-V-0334	Aux CHG PP Disch CHK VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1395	451-V-0335	Aux CHG PP Disch ISO VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1396	451-V-0337	CHG PP Disch ISO VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1397	451-V-0343	CHG PP Balancing Leakoff CHK VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1398	451-V-0642	Hydrostatic Test Connection ISO VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1399	451-V-0744	Charging Line Test Connection ISO VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1400	451-V-0797	Charging to MFHX ISO VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1401	451-V-2274	AUX CHG PP Disch Vent VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1402	451-V-2275	AUX CHG PP Disch Vent VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1403	451-V-2294	AUX CHG PP Disch DRN VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1404	451-V-2295	AUX CHG PP Disch DRN VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1405	451-V-2313	CHG PP 01B Seal DRN VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1406	451-V-2328	CHG PP 01B Mini-Flow LN DRN VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1407	451-V-2329	CHG PP 01B Mini-Flow LN DRN VALVE	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1408	606-Y-VK-1539B	FIRE DAMPER	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1409	606-Y-VK-1547B	FIRE DAMPER	055A56B	Auxiliary	55'-0"	(1)	64'-0"		
1410	595-M-ST02A	DUPLEX STRAINER	055A57C	Auxiliary	55'-0"	(1)	64'-0"	6" FD (2)	8" EOL (1)
1411	481-J-LIS-0056C	CCW SUMP(QUAD.C) FLOODING LEVEL	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1412	595-J-LT-0001A	DIESEL FUEL OIL STORAGE TANK "A" TK01A	055A57C	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (47 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1413	442-V-2016	CSP 01B Vent VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1414	442-V-2018	CSP 01B Vent VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1415	442-V-2049	CS HX 01A Inlet LN Vent VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1416	461-V-0143	TRN A NON-SAFETY LOAD SUPPLY ISO	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1417	461-V-0145	TRN A NON-SAFETY LOAD SUPPLY ISO	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1418	461-V-0147	TRN A NON-SAFETY LOAD RETURN ISO	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1419	461-V-0149	TRN A NON-SAFETY LOAD RETURN ISO	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1420	461-V-1019	CCW QUADRANTA C COMMON HDR	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1421	461-V-1039	CROSS TIE RETURN HEADER ISO. VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1422	461-V-2065	CCW PP TRN A Suct HDR Grab SMPL Test VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1423	461-V-2081	CCW PP Train A Disch HDR Pr Test VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1424	461-V-2129	CS HE01A/HE02A Outlet Line DRN VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1425	461-V-2221	CCW TRN A to EDG Line Vent VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1426	461-V-2451	CS HE01A Outlet FT-10A Root VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1427	461-V-2452	CS HE01A Outlet FT-10A Root VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1428	595-V-1005A	F.O XFR PP 01A Disch CHK VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1429	595-V-1006A	F.O XFR PP 01A Disch VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1430	595-V-1007A	F.O XFR PP 02A Disch CHK VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1431	595-V-1008A	F.O XFR PP 02A Disch VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1432	595-V-1015A	F.O XFR PP 01A/02A Disch CMN LN ISO VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1433	595-V-2008A	F.O XFR PP A Disch PI-017 Root VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1434	595-V-2009A	F.O XFR PP C Disch PI-015 Root VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1435	595-V-2011A	F.O A Train DISH PIS-019 Root VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1436	595-V-2030A	F.O XFR PP DISH DRN VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1437	595-V-2501A	F.O XFR PP Train A Disch Flow Test VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1438	595-V-2502A	F.O XFR PP Train A Disch Flow Test VALVE	055A57C	Auxiliary	55'-0"	(1)	64'-0"		
1439	481-J-LIS-0057D	CCW SUMP(QUAD.D) FLOODING LEVEL	055A57D	Auxiliary	55'-0"	(1)	64'-0"	6" FD (2)	8" EOL (1)
1440	595-J-LT-0002B	DIESEL FUEL OIL STORAGE TANK "B" TK01B	055A57D	Auxiliary	55'-0"	(1)	64'-0"		
1441	461-V-1040	CROSS TIE RETURN HEADER ISO. VALVE	055A57D	Auxiliary	55'-0"	(1)	64'-0"		
1442	461-V-2066	CCW PP TRN B Suct HDR Grab SMPL Test VALVE	055A57D	Auxiliary	55'-0"	(1)	64'-0"		
1443	461-V-2082	CCW PP Train B Disch HDR Pr Test VALVE	055A57D	Auxiliary	55'-0"	(1)	64'-0"		
1444	461-V-2085	CCW PP Suction Common Line Pr Test VALVE	055A57D	Auxiliary	55'-0"	(1)	64'-0"		

Table 3.4-2 (48 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1445	606-Y-VK-1032B	MANUAL DAMPER	055A57D	Auxiliary	55'-0"	(1)	64'-0"		
1446	606-Y-VK-1532B	FIRE DAMPER	055A57D	Auxiliary	55'-0"	(1)	64'-0"		
1447	451-V-2097	Boric Acid Filter Outlet DRN VALVE	055A58A	Auxiliary	55'-0"	(1)	64'-0"		
1448	451-V-2098	Boric Acid Filter Inlet DRN VALVE	055A58A	Auxiliary	55'-0"	(1)	64'-0"		
1449	606-Y-VK-1010A	MANUAL DAMPER	055A59A	Auxiliary	55'-0"	(1)	64'-0"		
1450	606-Y-VK-1074A	MANUAL DAMPER	055A59A	Auxiliary	55'-0"	(1)	64'-0"		
1451	595-M-PP01A	DIESEL FUEL OIL TRANSFER PUMP	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1452	595-M-PP02A	DIESEL FUEL OIL TRANSFER PUMP	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1453	595-M-TK01A	DIESEL FUEL OIL STORAGE TANK "A"	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1454	602-E-BS02A	DIESEL FEUL OIL STORAGE TANK ROOM EDH LOCAL CONTROL BOX	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1455	602-M-AH05A	DIESEL FUEL OIL STORAGE TANK ROOM SUPPLY FAN	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1456	602-M-AH06A	DIESEL FUEL OIL STORAGE TANK ROOM EXHAUST FAN	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1457	602-M-HC02A	DIESEL FUEL OIL STORAGE TANK ROOM ELECTRIC DUCT HEATER	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1458	595-J-TEW-0003	DIESEL FUEL OIL STOR. TK TK01A TEMP	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1459	602-J-FS-3043C	EDG AREA I DIESEL FUEL OIL STOR TK RM	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1460	602-J-TE-3029C	EDG AREA I DIESEL FUEL OIL STOR TK RM	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1461	602-J-TE-3039C	EDG AREA I DIESEL FUEL OIL STOR TK RM	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1462	602-J-TE-3041C	EDG AREA I DIESEL FUEL OIL STOR TK RM	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1463	602-J-TS-3039C	EDG AREA I DIESEL FUEL OIL STOR TK RM PRI. OVER TEMP	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1464	602-J-TS-3041C	EDG AREA I DIESEL FUEL OIL STOR TK RM SEC. OVER TEMP	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1465	595-V-1002A	F.O STRG TK 01A Outlet VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1466	595-V-1003A	F.O XFR PP 01A Suct VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1467	595-V-1004A	F.O XFR PP 02A Suct VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1468	595-V-1009A	F.O TRN A Duplex Basket STR02A Inlet VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1469	595-V-1010A	F.O TRN A Duplex Basket STR02A Outlet VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		

Table 3.4-2 (49 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1470	595-V-2001A	F.O STRG TK 01A DRN VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1471	595-V-2005A	F.O STRG TK A LTI-001 Root VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1472	595-V-2006A	F.O XFR PP A Suct PI-007 Root VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1473	595-V-2007A	F.O XFR PP C Suct PI-005 Root VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1474	595-V-2012A	F.O TRN A Duplex Basket STR02A B/P VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1475	595-V-2013A	F.O XFR PP Suct STR PDIS-021 RT VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1476	595-V-2014A	F.O XFR PP Suct STR PDIS-021 RT VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1477	595-V-2015A	F.O STRG TK01A Overflow ISO VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1478	595-V-2020A	F.O STRG TK 01A LTI-001A Root VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1479	595-V-2021A	F.O STRG TK 01A LTI-001A Root VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1480	595-V-2026A	TK 01A to XFR PP A Train Pr. Test VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1481	595-V-2027A	TK 02A to F.O STRG TK 01A RTN ISO VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1482	595-V-2028A	XFR PP 02A Suct DRN VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1483	595-V-2029A	XFR PP 01A Suct DRN VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1484	595-V-2040A	F.O STRG TK 01A to XFR PP DRN VALVE	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1485	602-Y-VD-1043A	MANUAL DAMPER	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1486	602-Y-VD-1046A	MANUAL DAMPER	065A01C	Auxiliary	65'-0"	(1)	78'-0"		
1487	595-M-PP01B	DIESEL FUEL OIL TRANSFER PUMP	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1488	595-M-PP02B	DIESEL FUEL OIL TRANSFER PUMP	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1489	595-M-ST02B	DUPLEX STRAINER	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1490	595-M-TK01B	DIESEL FUEL OIL STORAGE TANK "B"	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1491	602-E-BS02B	DIESEL FUEL OIL STORAGE TANK ROOM EDH LOCAL CONTROL BOX	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1492	602-M-AH05B	DIESEL FUEL OIL STORAGE TANK ROOM SUPPLY FAN	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1493	602-M-AH06B	DIESEL FUEL OIL STORAGE TANK ROOM EXHAUST FAN	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1494	602-M-HC02B	DIESEL FUEL OIL STORAGE TANK ROOM ELECTRIC DUCT HEATER	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1495	595-J-TEW-0004	DIESEL FUEL OIL STOR. TK TK01B TEMP	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1496	602-J-FS-3044D	EDG AREA II DIESEL FUEL OIL STOR TK RM	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1497	602-J-TE-3030D	EDG AREA II DIESEL FUEL OIL STOR TK RM	065A01D	Auxiliary	65'-0"	(1)	78'-0"		

Table 3.4-2 (50 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1498	602-J-TE-3040D	EDG AREA II DIESEL FUEL OIL STOR TK RM	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1499	602-J-TE-3042D	EDG AREA II DIESEL FUEL OIL STOR TK RM	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1500	602-J-TS-3040D	EDG AREA II DIESEL FUEL OIL STOR TK RM PRI. OVER TEMP	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1501	602-J-TS-3042D	EDG AREA II DIESEL FUEL OIL STOR TK RM SEC. OVER TEMP	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1502	595-V-1001B	F.O STRG TK 01B F.O Fill VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1503	595-V-1002B	F.O STRG TK 01B Outlet VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1504	595-V-1003B	F.O XFR PP 01B Suct VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1505	595-V-1004B	F.O XFR PP 02B Suct VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1506	595-V-1005B	F.O XFR PP 01B Disch CHK VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1507	595-V-1006B	F.O XFR PP 01B Disch VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1508	595-V-1007B	F.O XFR PP 02B Disch CHK VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1509	595-V-1008B	F.O XFR PP 02B Disch VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1510	595-V-1009B	F.O TRN A Duplex Basket STR02B Inlet VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1511	595-V-1010B	F.O TRN A Duplex Basket STR02B Outlet VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1512	595-V-1015B	F.O XFR PP 01B/02B Disch CMN LN ISO VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1513	595-V-2001B	F.O STRG TK 01B DRN VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1514	595-V-2005B	F.O STRG TK B LTI-001 Root VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1515	595-V-2006B	F.O XFR PP B Suct PI-008 Root VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1516	595-V-2007B	F.O XFR PP D Suct PI-006 Root VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1517	595-V-2008B	F.O XFR PP B Disch PI-018 Root VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1518	595-V-2009B	F.O XFR PP D Disch PI-016 Root VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1519	595-V-2011B	F.O A Train DISH PIS-020 Root VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1520	595-V-2012B	F.O TRN A Duplex Basket STR02B B/P VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1521	595-V-2013B	F.O XFR PP Suct STR PDIS-022 RT VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1522	595-V-2014B	F.O XFR PP Suct STR PDIS-022 RT VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1523	595-V-2015B	F.O STRG TK01B Overflow ISO VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1524	595-V-2020B	F.O STRG TK 01B LT-001B Root VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1525	595-V-2021B	F.O STRG TK 01B LI-001B Root VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1526	595-V-2026B	TK 01B to XFR PP B Train Pr. Test VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		

Table 3.4-2 (51 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1527	595-V-2027B	TK 02B to F.O STRG TK 01B RTN ISO VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1528	595-V-2028B	XFR PP 02B Suct DRN VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1529	595-V-2029B	XFR PP 01B Suct DRN VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1530	595-V-2030B	F.O XFR PP DISH DRN VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1531	595-V-2040B	F.O STRG TK 01B to XFR PP DRN VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1532	595-V-2501B	F.O XFR PP Train B Disch Flow Test VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1533	595-V-2502B	F.O XFR PP Train B Disch Flow Test VALVE	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1534	602-Y-VD-1043B	MANUAL DAMPER	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1535	602-Y-VD-1046B	MANUAL DAMPER	065A01D	Auxiliary	65'-0"	(1)	78'-0"		
1536	606-Y-VK-1020A	MANUAL DAMPER	068A01A	Auxiliary	68'-0"	above	68'-6"	4" FD (2)	-
1537	763-J-PT-0351A	NARROW RANGE PRESS. (CH "A")	068A05A	Auxiliary	68'-0"	above	68'-6"	4" FD (1)	-
1538	763-J-PT-0352A	WIDE RANGE PRESS. (CH "A")	068A05A	Auxiliary	68'-0"	above	68'-6"		
1539	763-J-PT-0353A	EXTENDED WIDE RANGE PRESS. (CH "A")	068A05A	Auxiliary	68'-0"	above	68'-6"		
1540	606-Y-VK-1014A	MANUAL DAMPER	068A05A	Auxiliary	68'-0"	above	68'-6"		
1541	606-Y-VK-1512A	FIRE DAMPER	068A05A	Auxiliary	68'-0"	above	68'-6"		
1542	451-V-2074	Purif. FLT 1 Inlet VNT VALVE	068A07A	Auxiliary	68'-0"	above	68'-6"	4" FD (2)	-
1543	451-V-2103	BAST Outlet to CHR PPs Vent VALVE	068A07A	Auxiliary	68'-0"	above	68'-6"		
1544	451-V-2267	RCP Seal Injection HDR LN Vent VALVE	068A07A	Auxiliary	68'-0"	above	68'-6"		
1545	451-V-2268	RCP Seal Injection HDR LN Vent VALVE	068A07A	Auxiliary	68'-0"	above	68'-6"		
1546	451-V-2303	RCP Seal INJ Filter Outlet Vent VALVE	068A07A	Auxiliary	68'-0"	above	68'-6"		
1547	451-V-2304	RCP Seal INJ Filter Outlet Vent VALVE	068A07A	Auxiliary	68'-0"	above	68'-6"		
1548	451-V-2101	BAMP Outlet to BAST DRN VALVE	068A08B	Auxiliary	68'-0"	above	68'-6"	6" FD (2)	-
1549	451-V-2104	BAST Outlet to CHR PPs DRN VALVE	068A08B	Auxiliary	68'-0"	above	68'-6"		
1550	451-V-2105	Makeup WTR LN to BAMP Suct DRN VALVE	068A08B	Auxiliary	68'-0"	above	68'-6"		
1551	451-V-2108	BAMP Suct DRN VALVE	068A08B	Auxiliary	68'-0"	above	68'-6"		
1552	491-V-0053	SAMPLE RETURN VALVE TO HVT	068A08B	Auxiliary	68'-0"	above	68'-6"		
1553	491-V-1025	POST-ACCIDENT SMPL RTN LN ISO. VALVE TO VCT	068A08B	Auxiliary	68'-0"	above	68'-6"		
1554	606-Y-VK-1510B	FIRE DAMPER	068A08B	Auxiliary	68'-0"	above	68'-6"		
1555	606-Y-VK-1511B	FIRE DAMPER	068A08B	Auxiliary	68'-0"	above	68'-6"		
1556	451-J-FE-0202	LETDOWN LINE FLOW	068A10A	Auxiliary	68'-0"	above	68'-6"	4" FD (1)	8" EOL (1)
1557	451-V-0204	PRM Flow CTRL VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1558	451-V-0351	Letdown Flow Indicator ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1559	451-V-0353	Sampling Line ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1560	451-V-0355	Purification Filter Bypass VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1561	451-V-0356	Purif Filter Diff. Pr Indicator ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		

Table 3.4-2 (52 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1562	451-V-0357	Purif Filter Diff. Pr Indicator ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1563	451-V-0358	Purification Filter ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1564	451-V-0359	Purification Filter Vent VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1565	451-V-0360	Purification Filter ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1566	451-V-0361	Purification Filter to DRDH ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1567	451-V-0366	Purification Filter Vent VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1568	451-V-0367	PRM Flow CTRL VALVE ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1569	451-V-0368	PRM Flow CTRL VALVE ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1570	451-V-0373	Purification Filter ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1571	451-V-0375	Purification Filter to DRDH ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1572	451-V-0376	Purification Filter ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1573	451-V-0415	Ion Exchanger ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1574	451-V-0420	IX Effluent Sampling Line ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1575	451-V-0423	PRM Spring Loaded CHK VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1576	451-V-0424	PRM Bypass VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1577	451-V-0426	Letdown Sampling Line ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1578	451-V-0520	PURIF AND DIX Bypass VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1579	451-V-0816	Seal INJ Filter ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1580	451-V-0818	Seal INJ Filter ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1581	451-V-0819	Seal INJ Filter ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1582	451-V-0821	Seal INJ Filter ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1583	451-V-0822	Seal INJ to DRDH ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1584	451-V-0823	Seal INJ to DRDH ISO VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1585	451-V-0825	Seal INJ Filter Diff. Pr Indication ISO	068A10A	Auxiliary	68'-0"	above	68'-6"		
1586	451-V-0826	Seal INJ Filter Diff. Pr Indication ISO	068A10A	Auxiliary	68'-0"	above	68'-6"		
1587	451-V-0844	Seal INJ Filter Vent VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1588	451-V-0845	Seal INJ Filter Vent VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1589	451-V-1034	L/D Purif Ex Flow CTRL VALVE Inlet DRN VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1590	451-V-1056	L/D Purif Ex Flow CTRL VALVE Outlet DRN VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1591	451-V-1105	RCP Seal INJ Filter to Recyc DRN HDR VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1592	451-V-1106	RCP Seal INJ Filter-Recyc DRN HDR VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1593	451-V-1107	RCP Seal INJ Filter-Recyc DRN HDR VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1594	451-V-1108	RCP Seal INJ Filter→Recyc DRN HDR VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1595	451-V-2072	Purif FLT 2 Outlet DRN VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		

Table 3.4-2 (53 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1596	451-V-2081	Purif FLT 1 to RDH DRN VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1597	451-V-2082	Purif FLT 2 to RDH DRN VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1598	451-V-2269	PURIF IX/DIX Bypass LN to VCT DRN VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1599	451-V-2318	PRM & Boronometer LN VNT VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1600	451-V-2319	PRM & Boronometer LN VNT VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1601	491-V-0012	CVCS PUR FILTER INLET SAMPLE VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1602	491-V-0013	CVCS PUR FILTER OUTLET SAMP. VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1603	491-V-0014	CVCS DEBOR. IX OUTLET SAMP.VALVE	068A10A	Auxiliary	68'-0"	above	68'-6"		
1604	606-Y-VK-1016A	MANUAL DAMPER	068A10A	Auxiliary	68'-0"	above	68'-6"		
1605	491-V-0034	SAMPLE RETURN VALVE TO VCT	068A11A	Auxiliary	68'-0"	above	68'-6"	4" FD (1)	-
1606	595-V-2101A	F.O TRN A Duplex Basket STR02A DRN VALVE	068A11A	Auxiliary	68'-0"	above	68'-6"		
1607	595-V-2101B	F.O TRN B Duplex Basket STR02B DRN VALVE	068A11A	Auxiliary	68'-0"	above	68'-6"		
1608	595-V-2102A	F.O TRN A Duplex Basket STR02A DRN VALVE	068A11A	Auxiliary	68'-0"	above	68'-6"		
1609	595-V-2102B	F.O TRN B Duplex Basket STR02B DRN VALVE	068A11A	Auxiliary	68'-0"	above	68'-6"		
1610	451-V-0132	BA Filter Vent VALVE	068A12A	Auxiliary	68'-0"	above	68'-6"	6" FD (1)	-
1611	451-V-0134	BAMP Disch to DRDH ISO VALVE	068A12A	Auxiliary	68'-0"	above	68'-6"		
1612	451-V-0161	Boric Acid Filter ISO VALVE	068A12A	Auxiliary	68'-0"	above	68'-6"		
1613	451-V-0164	Boric Acid Filter Bypass VALVE	068A12A	Auxiliary	68'-0"	above	68'-6"		
1614	451-V-0166	Boric Acid Filter ISO VALVE	068A12A	Auxiliary	68'-0"	above	68'-6"		
1615	451-V-0176	Boric Acid Sampling Line ISO VALVE	068A12A	Auxiliary	68'-0"	above	68'-6"		
1616	451-V-0648	Boric Acid Sampling Line ISO VALVE	068A12A	Auxiliary	68'-0"	above	68'-6"		
1617	451-V-2083	Boric Acid Filter DRN VALVE	068A12A	Auxiliary	68'-0"	above	68'-6"		
1618	451-M-FT01	PURIFICATION FILTER 1	077A06A	Auxiliary	77'-0"	above	77'-6"	4" FD (1)	-
1619	451-V-0344	Letdown Pr Indicator ISO VALVE	077A06A	Auxiliary	77'-0"	above	77'-6"		
1620	451-M-FT02	PURIFICATION FILTER 2	077A08A	Auxiliary	77'-0"	above	77'-6"	4" FD (1)	-
1621	451-M-FT03	SEAL INJECTION FILTER	077A10A	Auxiliary	77'-0"	above	77'-6"	4" FD (1)	-
1622	451-M-FT04	SEAL INJECTION FILTER	077A12A	Auxiliary	77'-0"	above	77'-6"	4" FD (1)	-
1623	451-M-FT07	BORIC ACID FILTER	077A14A	Auxiliary	77'-0"	above	77'-6"	4" FD (1)	-
1624	603-M-HV01A	CUBICLE COOLER	078A02C	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
1625	745-J-LX03C	LOOP CONTROLLER CABINET (CH. CE)	078A02C	Auxiliary	78'-0"	above	78'-6"		
1626	823-E-SW02A	CLASS 1E AB 4.16KV SWGR 02A	078A02C	Auxiliary	78'-0"	above	78'-6"		
1627	442-J-FY-0338C02	CONTAINMENT SPRAY HX HE01A FLOW	078A02C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (54 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1628	442-J-FY-0338C03	CONTAINMENT SPRAY HX HE01A FLOW	078A02C	Auxiliary	78'-0"	above	78'-6"		
1629	442-J-TY-0071C	CONTAINMENT SPRAY HX(HE01A) OUTLET	078A02C	Auxiliary	78'-0"	above	78'-6"		
1630	442-J-ZY-0005C02	IRWST RTN CTRL VALVE005 POSITION(TRAIN C)	078A02C	Auxiliary	78'-0"	above	78'-6"		
1631	461-J-FS-0049C	CCW PUMP PP02A DISCH. FLOW	078A02C	Auxiliary	78'-0"	above	78'-6"		
1632	461-J-FY-0049C01	CCW PUMP PP02A DISCH. FLOW	078A02C	Auxiliary	78'-0"	above	78'-6"		
1633	461-J-FY-0049C02	CCW PUMP PP02A DISCH. FLOW	078A02C	Auxiliary	78'-0"	above	78'-6"		
1634	461-J-LS-0009C01	CCW SURGE TK TK01A LEVEL	078A02C	Auxiliary	78'-0"	above	78'-6"		
1635	461-J-LS-0009C02	CCW SURGE TK TK01A LEVEL	078A02C	Auxiliary	78'-0"	above	78'-6"		
1636	461-J-LS-0009C03	CCW SURGE TK TK01A LEVEL	078A02C	Auxiliary	78'-0"	above	78'-6"		
1637	461-J-LS-0009C04	CCW SURGE TK TK01A LEVEL	078A02C	Auxiliary	78'-0"	above	78'-6"		
1638	461-J-LS-0009C05	CCW SURGE TK TK01A LEVEL	078A02C	Auxiliary	78'-0"	above	78'-6"		
1639	461-J-LS-0009C06	CCW SURGE TK TK01A LEVEL	078A02C	Auxiliary	78'-0"	above	78'-6"		
1640	461-J-LS-0011C01	CCW SURGE TK TK01A LEVEL	078A02C	Auxiliary	78'-0"	above	78'-6"		
1641	461-J-LS-0011C02	CCW SURGE TK TK01A LEVEL	078A02C	Auxiliary	78'-0"	above	78'-6"		
1642	461-J-LS-0011C03	CCW SURGE TK TK01A LEVEL	078A02C	Auxiliary	78'-0"	above	78'-6"		
1643	461-J-LS-0011C04	CCW SURGE TK TK01A LEVEL	078A02C	Auxiliary	78'-0"	above	78'-6"		
1644	461-J-LY-0009C01	CCW SURGE TK TK01A LEVEL	078A02C	Auxiliary	78'-0"	above	78'-6"		
1645	461-J-LY-0011C	CCW SURGE TK TK01A LEVEL	078A02C	Auxiliary	78'-0"	above	78'-6"		
1646	461-J-PS-0053C	TRAIN A PUMP COMMON DISCHARGE HEADER PRESSURE	078A02C	Auxiliary	78'-0"	above	78'-6"		
1647	461-J-PY-0053C	TRAIN A PUMP COMMON DISCHARGE HEADER PRESSURE	078A02C	Auxiliary	78'-0"	above	78'-6"		
1648	462-J-PS-0039C	ESW PUMP PP02A DISCH PRESS	078A02C	Auxiliary	78'-0"	above	78'-6"		
1649	462-J-PY-0039C	ESW PUMP PP02A DISCH PRESS	078A02C	Auxiliary	78'-0"	above	78'-6"		
1650	603-J-TE-0101C	CLASS 1E SWGR 02A RM TEMP.	078A02C	Auxiliary	78'-0"	above	78'-6"		
1651	633-J-TW-0105	COOLING COIL VE-CW01A OUTLET	078A02C	Auxiliary	78'-0"	above	78'-6"		
1652	633-J-TW-0107	COOLING COIL VE-CW01A INLET	078A02C	Auxiliary	78'-0"	above	78'-6"		
1653	633-V-1103A	C-1E SWGR 02A RM C-CLR Outlet VALVE	078A02C	Auxiliary	78'-0"	above	78'-6"		
1654	633-V-1104A	C-1E SWGR 02A RM C-CLR Inlet throt VALVE	078A02C	Auxiliary	78'-0"	above	78'-6"		
1655	633-V-2103A	C-1E SWGR 02A C-CLR Outlet PZR Test VALVE	078A02C	Auxiliary	78'-0"	above	78'-6"		
1656	633-V-2104A	C-1E SWGR 02A C-CLR Inlet PZR Test VALVE	078A02C	Auxiliary	78'-0"	above	78'-6"		
1657	633-V-2178A	C-1E SWGR 02A C-CLR Outlet DRN VALVE	078A02C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (55 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1658	633-V-2203A	C-1E SWGR02ARM HV01A ECW Outlet Vent VALVE	078A02C	Auxiliary	78'-0"	above	78'-6"		
1659	633-V-2204A	C-1E SWGR02ARM HV01A ECW Inlet DRN VALVE	078A02C	Auxiliary	78'-0"	above	78'-6"		
1660	633-V-2303A	SWGR02A HV01A ECW Outlet Test Conn VALVE	078A02C	Auxiliary	78'-0"	above	78'-6"		
1661	633-V-2304A	SWGR02A HV01A ECW Inlet Test Conn VALVE	078A02C	Auxiliary	78'-0"	above	78'-6"		
1662	603-Y-VE-1566A	FIRE DAMPER	078A02C	Auxiliary	78'-0"	above	78'-6"		
1663	603-M-HV01B	CUBICLE COOLER	078A02D	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
1664	745-J-LX03D	LOOP CONTROLLER CABINET (CH. DE)	078A02D	Auxiliary	78'-0"	above	78'-6"		
1665	823-E-SW02B	CLASS 1E AB 4.16KV SWGR 02B	078A02D	Auxiliary	78'-0"	above	78'-6"		
1666	461-J-FY-0050D01	CCW PUMP PP02B DISCH. FLOW	078A02D	Auxiliary	78'-0"	above	78'-6"		
1667	461-J-FY-0050D02	CCW PUMP PP02B DISCH. FLOW	078A02D	Auxiliary	78'-0"	above	78'-6"		
1668	461-J-LS-0010D01	CCW SURGE TK TK01B LEVEL	078A02D	Auxiliary	78'-0"	above	78'-6"		
1669	461-J-LS-0010D02	CCW SURGE TK TK01B LEVEL	078A02D	Auxiliary	78'-0"	above	78'-6"		
1670	461-J-LS-0010D03	CCW SURGE TK TK01B LEVEL	078A02D	Auxiliary	78'-0"	above	78'-6"		
1671	461-J-LS-0010D04	CCW SURGE TK TK01B LEVEL	078A02D	Auxiliary	78'-0"	above	78'-6"		
1672	461-J-LS-0010D05	CCW SURGE TK TK01B LEVEL	078A02D	Auxiliary	78'-0"	above	78'-6"		
1673	461-J-LS-0010D06	CCW SURGE TK TK01B LEVEL	078A02D	Auxiliary	78'-0"	above	78'-6"		
1674	461-J-LS-0012D01	CCW SURGE TK TK01B LEVEL	078A02D	Auxiliary	78'-0"	above	78'-6"		
1675	461-J-LS-0012D02	CCW SURGE TK TK01B LEVEL	078A02D	Auxiliary	78'-0"	above	78'-6"		
1676	461-J-LS-0012D03	CCW SURGE TK TK01B LEVEL	078A02D	Auxiliary	78'-0"	above	78'-6"		
1677	461-J-LS-0012D04	CCW SURGE TK TK01B LEVEL	078A02D	Auxiliary	78'-0"	above	78'-6"		
1678	461-J-LY-0010D01	CCW SURGE TK TK01B LEVEL	078A02D	Auxiliary	78'-0"	above	78'-6"		
1679	461-J-LY-0012D	CCW SURGE TK TK01B LEVEL	078A02D	Auxiliary	78'-0"	above	78'-6"		
1680	461-J-PS-0054D	TRAIN B PUMP COMMON DISCHARGE HEADER PRESSURE	078A02D	Auxiliary	78'-0"	above	78'-6"		
1681	461-J-PY-0054D	TRAIN B PUMP COMMON DISCHARGE HEADER PRESSURE	078A02D	Auxiliary	78'-0"	above	78'-6"		
1682	462-J-PS-0040D	ESW PUMP PP02B DISCH PRESS	078A02D	Auxiliary	78'-0"	above	78'-6"		
1683	462-J-PY-0040D	ESW PUMP PP02B DISCH PRESS	078A02D	Auxiliary	78'-0"	above	78'-6"		
1684	603-J-TE-0102D	CLASS 1E SWGR 02B RM TEMP.	078A02D	Auxiliary	78'-0"	above	78'-6"		
1685	633-J-TW-0106	COOLING COIL VE-CW01B OUTLET	078A02D	Auxiliary	78'-0"	above	78'-6"		
1686	633-J-TW-0108	COOLING COIL VE-CW01B INLET	078A02D	Auxiliary	78'-0"	above	78'-6"		
1687	823-J-HS-0314B02	LOCAL CONTROL STATION	078A02D	Auxiliary	78'-0"	above	78'-6"		
1688	823-J-HS-0314B03	LOCAL CONTROL STATION	078A02D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (56 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1689	633-V-1103B	C-1E SWGR 02B RM C-CLR Outlet VALVE	078A02D	Auxiliary	78'-0"	above	78'-6"		
1690	633-V-1104B	C-1E SWGR 02B RM C-CLR Inlet throt VALVE	078A02D	Auxiliary	78'-0"	above	78'-6"		
1691	633-V-2103B	C-1E SWGR 02B C-CLR Outlet PZR Test VALVE	078A02D	Auxiliary	78'-0"	above	78'-6"		
1692	633-V-2104B	C-1E SWGR 02B C-CLR Inlet PZR Test VALVE	078A02D	Auxiliary	78'-0"	above	78'-6"		
1693	633-V-2178B	C-1E SWGR 02B C-CLR Outlet DRN VALVE	078A02D	Auxiliary	78'-0"	above	78'-6"		
1694	633-V-2203B	C-1E SWGR02BRM HV01A ECW Outlet Vent VALVE	078A02D	Auxiliary	78'-0"	above	78'-6"		
1695	633-V-2204B	C-1E SWGR02BRM HV01A ECW Inlet DRN VALVE	078A02D	Auxiliary	78'-0"	above	78'-6"		
1696	633-V-2303B	SWGR02B HV01B ECW Outlet Test Conn VALVE	078A02D	Auxiliary	78'-0"	above	78'-6"		
1697	633-V-2304B	SWGR02B HV01B ECW Inlet Test Conn VALVE	078A02D	Auxiliary	78'-0"	above	78'-6"		
1698	603-Y-VE-1566B	FIRE DAMPER	078A02D	Auxiliary	78'-0"	above	78'-6"		
1699	603-M-HV02A	CUBICLE COOLER	078A03C	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
1700	745-J-LX01C	LOOP CONTROLLER CABINET (CH. CE)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1701	745-J-LX02C	LOOP CONTROLLER CABINET (CH. CE)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1702	825-E-LC02A	UNIT 3 480V 1E LC 02A	078A03C	Auxiliary	78'-0"	above	78'-6"		
1703	827-E-MC02A	UNIT 3 480V 1E MCC 02A	078A03C	Auxiliary	78'-0"	above	78'-6"		
1704	827-E-MC04A	UNIT 3 480V 1E MCC 04A	078A03C	Auxiliary	78'-0"	above	78'-6"		
1705	441-J-FY-0331C01	SAFETY INJECTION LINE 3 FLOW	078A03C	Auxiliary	78'-0"	above	78'-6"		
1706	441-J-FY-0331C02	SAFETY INJECTION LINE 3 FLOW	078A03C	Auxiliary	78'-0"	above	78'-6"		
1707	441-J-FY-0390C01	HOT LEG INJECTION LOOP 1 FLOW	078A03C	Auxiliary	78'-0"	above	78'-6"		
1708	441-J-FY-0390C02	HOT LEG INJECTION LOOP 1 FLOW	078A03C	Auxiliary	78'-0"	above	78'-6"		
1709	441-J-ZY-0636C02	SI LINE 3 ISO VALVE - 636	078A03C	Auxiliary	78'-0"	above	78'-6"		
1710	527-J-LS-0003C01	SG 1 LINE TO AF PUMP TURB. TA01A	078A03C	Auxiliary	78'-0"	above	78'-6"		
1711	527-J-LS-0003C02	SG 1 LINE TO AF PUMP TURB. TA01A	078A03C	Auxiliary	78'-0"	above	78'-6"		
1712	527-J-LS-0003C03	SG 1 LINE TO AF PUMP TURB. TA01A	078A03C	Auxiliary	78'-0"	above	78'-6"		
1713	527-J-LY-0003C	SG 1 LINE TO AF PUMP TURB. TA01A	078A03C	Auxiliary	78'-0"	above	78'-6"		
1714	527-J-PY-0011C	SG 1 LINE TO AF PUMP TURB. TA01A	078A03C	Auxiliary	78'-0"	above	78'-6"		
1715	527-J-PY-0013C	SG 1 LINE TO AF PUMP TURB. TA01A	078A03C	Auxiliary	78'-0"	above	78'-6"		
1716	527-J-SY-3035C	AF PUMP TURBINE A (TA01A) SPEED	078A03C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (57 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1717	603-J-HS-0101C	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH01A	078A03C	Auxiliary	78'-0"	above	78'-6"		
1718	603-J-HS-0103C	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH02A	078A03C	Auxiliary	78'-0"	above	78'-6"		
1719	603-J-HS-0107C	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH04A	078A03C	Auxiliary	78'-0"	above	78'-6"		
1720	603-J-TC-3201C	CHANNEL-A,C BATTERY RM (078-A06C,A07C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1721	603-J-TC-3231C	I&C EQUIP. RM (157-A19C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1722	603-J-TE-0103C	CLASS 1E LOAD CTR 02A RM TEMP.	078A03C	Auxiliary	78'-0"	above	78'-6"		
1723	603-J-TS-0101C01	CLASS-1E SWGR 02A RM (078-A02C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1724	603-J-TS-0101C02	CLASS-1E SWGR 02A RM (078-A02C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1725	603-J-TS-0101C03	CLASS-1E SWGR 02A RM (078-A02C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1726	603-J-TS-0103C01	CLASS-1E LOADCENTER 02A RM (078-A03C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1727	603-J-TS-0103C02	CLASS-1E LOADCENTER 02A RM (078-A03C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1728	603-J-TS-0103C03	CLASS-1E LOADCENTER 02A RM (078-A03C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1729	603-J-TS-0107C01	CH.C DC&IP EQUIP. RM (078-A05C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1730	603-J-TS-0107C02	CH.C DC&IP EQUIP. RM (078-A05C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1731	603-J-TS-0107C03	CH.C DC&IP EQUIP. RM (078-A05C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1732	603-J-TS-3201C01	CHANNEL-A,C BATTERY RM HI(078-A06C,A07C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1733	603-J-TS-3201C02	CHANNEL-A,C BATTERY RM LO(078-A06C,A07C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1734	603-J-TS-3231C01	I&C EQUIP. RM HI(157-A19C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1735	603-J-TS-3231C02	I&C EQUIP. RM LO(157-A19C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1736	603-J-TY-0101C	CLASS-1E SWGR 02A RM (078-A02C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1737	603-J-TY-0103C	CLASS-1E LOADCENTER 02A RM (078-A03C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1738	603-J-TY-0107C	CH.C DC&IP EQUIP. RM (078-A05C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1739	603-J-TY-3201C01	CHANNEL-A,C BATTERY RM IN-BFR(078-A06C,A07C)	078A03C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (58 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1740	603-J-TY-3201C02	CHANNEL-A,C BATTERY RM OUT-BFR(078-A06C,A07C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1741	603-J-TY-3231C01	I&C EQUIP. RM IN-BFR(157-A19C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1742	603-J-TY-3231C02	I&C EQUIP. RM OUT-BFR(157-A19C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1743	606-J-FC-0047C	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A AIR FLOW	078A03C	Auxiliary	78'-0"	above	78'-6"		
1744	606-J-FS-0047C01	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A AIR FLOW	078A03C	Auxiliary	78'-0"	above	78'-6"		
1745	606-J-FS-0047C02	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A AIR FLOW	078A03C	Auxiliary	78'-0"	above	78'-6"		
1746	606-J-FY-0047C01	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A AIR FLOW	078A03C	Auxiliary	78'-0"	above	78'-6"		
1747	606-J-FY-0047C02	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A AIR FLOW	078A03C	Auxiliary	78'-0"	above	78'-6"		
1748	606-J-TS-0207C01	CS PP & MINIFLOW HX RM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1749	606-J-TS-0207C02	CS PP & MINIFLOW HX RM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1750	606-J-TS-0207C03	CS PP & MINIFLOW HX RM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1751	606-J-TS-0209C01	SI PP ROOM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1752	606-J-TS-0209C02	SI PP ROOM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1753	606-J-TS-0209C03	SI PP ROOM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1754	606-J-TS-0215C01	CCW PP ROOM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1755	606-J-TS-0215C02	CCW PP ROOM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1756	606-J-TS-0215C03	CCW PP ROOM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1757	606-J-TS-0217C01	CS HX RM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1758	606-J-TS-0217C02	CS HX RM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1759	606-J-TS-0217C03	CS HX RM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1760	606-J-TY-0207C	CS PP & MINIFLOW HX RM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1761	606-J-TY-0209C	SI PP ROOM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1762	606-J-TY-0215C	CCW PP ROOM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1763	606-J-TY-0217C	CS HX RM TEMP	078A03C	Auxiliary	78'-0"	above	78'-6"		
1764	607-J-TS-0083C01	ESSENTIAL CHILLER RM (078-A12C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1765	607-J-TS-0083C02	ESSENTIAL CHILLER RM (078-A12C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1766	607-J-TS-0083C03	ESSENTIAL CHILLER RM (078-A12C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1767	607-J-TY-0083C	ESSENTIAL CHILLER RM (078-A12C)	078A03C	Auxiliary	78'-0"	above	78'-6"		
1768	633-J-TW-0109	COOLING COIL VE-CW02A OUTLET	078A03C	Auxiliary	78'-0"	above	78'-6"		
1769	633-J-TW-0111	COOLING COIL VE-CW02A INLET	078A03C	Auxiliary	78'-0"	above	78'-6"		
1770	633-V-1105A	C-1E L/C 02A RM C-CLR Outlet VALVE	078A03C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (59 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1771	633-V-1106A	C-1E L/C 02A RM C-CLR Inlet throt VALVE	078A03C	Auxiliary	78'-0"	above	78'-6"		
1772	633-V-2105A	C-1E L/C 02A C-CLR Outlet PZR Test VALVE	078A03C	Auxiliary	78'-0"	above	78'-6"		
1773	633-V-2106A	C-1E L/C 02A C-CLR Inlet PZR Test VALVE	078A03C	Auxiliary	78'-0"	above	78'-6"		
1774	633-V-2176A	C-1E L/C 02A C-CLR Outlet DRN VALVE	078A03C	Auxiliary	78'-0"	above	78'-6"		
1775	633-V-2205A	C-1E LC02A RM HV02A ECW Outlet Vent VALVE	078A03C	Auxiliary	78'-0"	above	78'-6"		
1776	633-V-2206A	C-1E LC02A RM HV02A ECW Inlet DRN VALVE	078A03C	Auxiliary	78'-0"	above	78'-6"		
1777	633-V-2305A	LC02ARM HV02A ECW Outlet Test Conn VALVE	078A03C	Auxiliary	78'-0"	above	78'-6"		
1778	633-V-2306A	LC02ARM HV02A ECW Inlet Test Conn VALVE	078A03C	Auxiliary	78'-0"	above	78'-6"		
1779	633-V-2430A	ECW RTN LN Vent VALVE	078A03C	Auxiliary	78'-0"	above	78'-6"		
1780	633-V-2431A	ECW Supply LN Vent VALVE	078A03C	Auxiliary	78'-0"	above	78'-6"		
1781	603-Y-VE-1563A	FIRE DAMPER	078A03C	Auxiliary	78'-0"	above	78'-6"		
1782	603-M-HV02B	CUBICLE COOLER	078A03D	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
1783	745-J-LX01D	LOOP CONTROLLER CABINET (CH. DE)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1784	745-J-LX02D	LOOP CONTROLLER CABINET (CH. DE)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1785	825-E-LC02B	UNIT 3 480V 1E LC 02B	078A03D	Auxiliary	78'-0"	above	78'-6"		
1786	827-E-MC02B	UNIT 3 480V 1E MCC 02B	078A03D	Auxiliary	78'-0"	above	78'-6"		
1787	827-E-MC04B	UNIT 3 480V 1E MCC 04B	078A03D	Auxiliary	78'-0"	above	78'-6"		
1788	441-J-FY-0311D01	SAFETY INJECTION LINE 4 FLOW	078A03D	Auxiliary	78'-0"	above	78'-6"		
1789	441-J-FY-0311D02	SAFETY INJECTION LINE 4 FLOW	078A03D	Auxiliary	78'-0"	above	78'-6"		
1790	441-J-FY-0391D01	HOT LEG INJECTION LOOP 2 FLOW	078A03D	Auxiliary	78'-0"	above	78'-6"		
1791	441-J-FY-0391D02	HOT LEG INJECTION LOOP 2 FLOW	078A03D	Auxiliary	78'-0"	above	78'-6"		
1792	441-J-LY-0311D	SIT 4 (TK01D) LEVEL (WIDE RANGE)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1793	441-J-PY-0311D	SI TANK 4 (TK01D) PRESS(WIDE RANGE)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1794	441-J-ZY-0331D02	HOT LEG INJECTION VALVE - 331	078A03D	Auxiliary	78'-0"	above	78'-6"		
1795	441-J-ZY-0616D02	SI LINE 4 ISO VALVE - 616	078A03D	Auxiliary	78'-0"	above	78'-6"		
1796	442-J-FY-0348D01	CONTAINMENT SPRAY HX HE01B FLOW	078A03D	Auxiliary	78'-0"	above	78'-6"		
1797	442-J-FY-0348D02	CONTAINMENT SPRAY HX HE01B FLOW	078A03D	Auxiliary	78'-0"	above	78'-6"		
1798	442-J-TY-0072D	CONTAINMENT SPRAY HX(HE01B) OUTLET	078A03D	Auxiliary	78'-0"	above	78'-6"		
1799	442-J-ZY-0006D02	IRWST RTN CTRL VALVE006 POSITION(TRAIN D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1800	527-J-LS-0004D01	SG 2 LINE TO AF PUMP TURB. TA01B	078A03D	Auxiliary	78'-0"	above	78'-6"		
1801	527-J-LS-0004D02	SG 2 LINE TO AF PUMP TURB. TA01B	078A03D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (60 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1802	527-J-LS-0004D03	SG 2 LINE TO AF PUMP TURB. TA01B	078A03D	Auxiliary	78'-0"	above	78'-6"		
1803	527-J-LY-0004D	SG 2 LINE TO AF PUMP TURB. TA01B	078A03D	Auxiliary	78'-0"	above	78'-6"		
1804	527-J-PY-0012D	SG 2 LINE TO AF PUMP TURB. TA01B	078A03D	Auxiliary	78'-0"	above	78'-6"		
1805	527-J-PY-0014D	SG 2 LINE TO AF PUMP TURB. TA01B	078A03D	Auxiliary	78'-0"	above	78'-6"		
1806	527-J-SY-3036D	AF PUMP TURBINE B (TA01B) SPEED	078A03D	Auxiliary	78'-0"	above	78'-6"		
1807	603-J-HS-0102D	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH01B	078A03D	Auxiliary	78'-0"	above	78'-6"		
1808	603-J-HS-0104D	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH02B	078A03D	Auxiliary	78'-0"	above	78'-6"		
1809	603-J-HS-0108D	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH04B	078A03D	Auxiliary	78'-0"	above	78'-6"		
1810	603-J-TC-3202D	CHANNEL-B,D BATTERY RM (078-A06D,A07D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1811	603-J-TE-0104D	CLASS 1E LOAD CTR 02B RM TEMP.	078A03D	Auxiliary	78'-0"	above	78'-6"		
1812	603-J-TS-0102D01	CLASS-1E SWGR 02B RM (078-A02D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1813	603-J-TS-0102D02	CLASS-1E SWGR 02B RM (078-A02D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1814	603-J-TS-0102D03	CLASS-1E SWGR 02B RM (078-A02D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1815	603-J-TS-0104D01	CLASS-1E LOADCENTER 02B RM (078-A03D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1816	603-J-TS-0104D02	CLASS-1E LOADCENTER 02B RM (078-A03D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1817	603-J-TS-0104D03	CLASS-1E LOADCENTER 02B RM (078-A03D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1818	603-J-TS-0108D01	CH.D DC&IP EQUIP. RM (078-A05D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1819	603-J-TS-0108D02	CH.D DC&IP EQUIP. RM (078-A05D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1820	603-J-TS-0108D03	CH.D DC&IP EQUIP. RM (078-A05D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1821	603-J-TS-0118D01	ELECT. PENETRATION (D) RM CC (120-A09D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1822	603-J-TS-0118D02	ELECT. PENETRATION (D) RM CC (120-A09D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1823	603-J-TS-0118D03	ELECT. PENETRATION (D) RM CC (120-A09D)	078A03D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (61 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1824	603-J-TS-3202D01	CHANNEL-B,D BATTERY RM HI (078-A06D,A07D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1825	603-J-TS-3202D02	CHANNEL-B,D BATTERY RM LO(078-A06D,A07D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1826	603-J-TY-0102D	CLASS-1E SWGR 02B RM (078-A02D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1827	603-J-TY-0104D	CLASS-1E LOADCENTER 02B RM (078-A03D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1828	603-J-TY-0108D	CH.D DC&IP EQUIP. RM (078-A05D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1829	603-J-TY-0118D	ELECT. PENETRATION (D) RM CC (120-A09D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1830	603-J-TY-3202D01	CHANNEL-B,D BATTERY RM IN-BFR(078-A06D,A07D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1831	603-J-TY-3202D02	CHANNEL-B,D BATTERY RM OUT-BFR(078-A06D,A07D)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1832	606-J-FC-0048D	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B AIR FLOW	078A03D	Auxiliary	78'-0"	above	78'-6"		
1833	606-J-FS-0048D01	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B AIR FLOW	078A03D	Auxiliary	78'-0"	above	78'-6"		
1834	606-J-FS-0048D02	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B AIR FLOW	078A03D	Auxiliary	78'-0"	above	78'-6"		
1835	606-J-FY-0048D01	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B AIR FLOW	078A03D	Auxiliary	78'-0"	above	78'-6"		
1836	606-J-FY-0048D02	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B AIR FLOW	078A03D	Auxiliary	78'-0"	above	78'-6"		
1837	606-J-TS-0208D01	CS PP & MINIFLOW HX RM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1838	606-J-TS-0208D02	CS PP & MINIFLOW HX RM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1839	606-J-TS-0208D03	CS PP & MINIFLOW HX RM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1840	606-J-TS-0210D01	SI PP ROOM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1841	606-J-TS-0210D02	SI PP ROOM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1842	606-J-TS-0210D03	SI PP ROOM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1843	606-J-TS-0216D01	CCW PP ROOM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1844	606-J-TS-0216D02	CCW PP ROOM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1845	606-J-TS-0216D03	CCW PP ROOM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1846	606-J-TS-0218D01	CS HX RM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1847	606-J-TS-0218D02	CS HX RM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1848	606-J-TS-0218D03	CS HX RM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1849	606-J-TY-0208D	CS PP & MINIFLOW HX RM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (62 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1850	606-J-TY-0210D	SI PP ROOM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1851	606-J-TY-0216D	CCW PP ROOM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1852	606-J-TY-0218D	CS HX RM TEMP	078A03D	Auxiliary	78'-0"	above	78'-6"		
1853	607-J-TS-0084D01	ESSENTIAL CHILLER RM (078-A12C)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1854	607-J-TS-0084D02	ESSENTIAL CHILLER RM (078-A12C)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1855	607-J-TS-0084D03	ESSENTIAL CHILLER RM (078-A12C)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1856	607-J-TY-0084D	ESSENTIAL CHILLER RM (078-A12C)	078A03D	Auxiliary	78'-0"	above	78'-6"		
1857	633-J-TW-0110	COOLING COIL VE-CW02B OUTLET	078A03D	Auxiliary	78'-0"	above	78'-6"		
1858	633-J-TW-0112	COOLING COIL VE-CW02B INLET	078A03D	Auxiliary	78'-0"	above	78'-6"		
1859	633-V-1105B	C-1E L/C 02B RM C-CLR Outlet VALVE	078A03D	Auxiliary	78'-0"	above	78'-6"		
1860	633-V-1106B	C-1E L/C 02B RM C-CLR Inlet throt VALVE	078A03D	Auxiliary	78'-0"	above	78'-6"		
1861	633-V-2105B	C-1E L/C 02B C-CLR Outlet PZR Test VALVE	078A03D	Auxiliary	78'-0"	above	78'-6"		
1862	633-V-2106B	C-1E L/C 02B C-CLR Inlet PZR Test VALVE	078A03D	Auxiliary	78'-0"	above	78'-6"		
1863	633-V-2176B	C-1E L/C 02B C-CLR Outlet DRN VALVE	078A03D	Auxiliary	78'-0"	above	78'-6"		
1864	633-V-2205B	C-1E LC02B RM HV02A ECW Outlet Vent VALVE	078A03D	Auxiliary	78'-0"	above	78'-6"		
1865	633-V-2206B	C-1E LC02B RM HV02A ECW Inlet DRN VALVE	078A03D	Auxiliary	78'-0"	above	78'-6"		
1866	633-V-2305B	LC02BRM HV02B ECW Outlet Test Conn VALVE	078A03D	Auxiliary	78'-0"	above	78'-6"		
1867	633-V-2306B	LC02BRM HV02B ECW Inlet Test Conn VALVE	078A03D	Auxiliary	78'-0"	above	78'-6"		
1868	633-V-2385B	C-1E LC02AA RM HV02B ECW Inlet Vent VALVE	078A03D	Auxiliary	78'-0"	above	78'-6"		
1869	633-V-2428B	ECW Supply LN Vent VALVE	078A03D	Auxiliary	78'-0"	above	78'-6"		
1870	633-V-2429B	ECW RTN LN Vent VALVE	078A03D	Auxiliary	78'-0"	above	78'-6"		
1871	633-V-2430B	ECW RTN LN DRN VALVE	078A03D	Auxiliary	78'-0"	above	78'-6"		
1872	603-Y-VE-1563B	FIRE DAMPER	078A03D	Auxiliary	78'-0"	above	78'-6"		
1873	431-E-IN01A	UNIT 3 1E INVERTER IN01A	078A04C	Auxiliary	78'-0"	above	78'-6"	4" FD (2)	-
1874	603-M-HV03A	CUBICLE COOLER	078A04C	Auxiliary	78'-0"	above	78'-6"		
1875	841-E-BC01A	UNIT 3 1E BATTERY CHARGER BC01A	078A04C	Auxiliary	78'-0"	above	78'-6"		
1876	841-E-DP01A	125V DC DISTR. PNL	078A04C	Auxiliary	78'-0"	above	78'-6"		
1877	841-E-MC01A	UNIT 3 1E DC CONTROL CENTER MC01A	078A04C	Auxiliary	78'-0"	above	78'-6"		
1878	842-E-TR01A	UNIT 3 1E REGULATING TR. TR01A	078A04C	Auxiliary	78'-0"	above	78'-6"		
1879	603-J-TE-0105A	CH A DC & IP EQUIP RM TEMP.	078A04C	Auxiliary	78'-0"	above	78'-6"		
1880	633-J-TW-0113	COOLING COIL VE-CW03A OUTLET	078A04C	Auxiliary	78'-0"	above	78'-6"		
1881	633-J-TW-0115	COOLING COIL VE-CW03A INLET	078A04C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (63 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1882	633-V-1107A	ChA DC&IP EQUIP RM C-CLR Outlet VALVE	078A04C	Auxiliary	78'-0"	above	78'-6"		
1883	633-V-1108A	ChA DC&IP EQUIP RM C-CLR Inlet throt VALVE	078A04C	Auxiliary	78'-0"	above	78'-6"		
1884	633-V-2107A	ChA DC&IP EQUIP C-CLR Outlet PZR Test VALVE	078A04C	Auxiliary	78'-0"	above	78'-6"		
1885	633-V-2108A	ChA DC&IP EQUIP C-CLR Inlet PZR Test VALVE	078A04C	Auxiliary	78'-0"	above	78'-6"		
1886	633-V-2175A	ChA DC&IP EQUIP RM C-CLR Outlet DRN VALVE	078A04C	Auxiliary	78'-0"	above	78'-6"		
1887	633-V-2207A	ChA DC&IP EQUIP RM HV03AECW OTLT Vent VALVE	078A04C	Auxiliary	78'-0"	above	78'-6"		
1888	633-V-2208A	ChA DC&IP EQUIP RM HV03AECW InletDRN VALVE	078A04C	Auxiliary	78'-0"	above	78'-6"		
1889	633-V-2307A	ChA EQUIP RM HV03A ECW Outlet TestConnVALVE	078A04C	Auxiliary	78'-0"	above	78'-6"		
1890	633-V-2308A	ChA EQUIP RM HV03A ECW Inlet TestConnVALVE	078A04C	Auxiliary	78'-0"	above	78'-6"		
1891	633-V-2381A	ChA EQUIP RM HV03A ECW Inlet Vent VALVE	078A04C	Auxiliary	78'-0"	above	78'-6"		
1892	633-V-2382A	ChA EQUIP RM HV03A ECW Inlet DRN VALVE	078A04C	Auxiliary	78'-0"	above	78'-6"		
1893	603-Y-VE-1051A	MANUAL DAMPER	078A04C	Auxiliary	78'-0"	above	78'-6"		
1894	603-Y-VE-1052A	MANUAL DAMPER	078A04C	Auxiliary	78'-0"	above	78'-6"		
1895	603-Y-VE-1540A	FIRE DAMPER	078A04C	Auxiliary	78'-0"	above	78'-6"		
1896	603-Y-VE-1560A	FIRE DAMPER	078A04C	Auxiliary	78'-0"	above	78'-6"		
1897	431-E-IN01B	UNIT 3 1E INVERTER IN01B	078A04D	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
1898	603-M-HV03B	CUBICLE COOLER	078A04D	Auxiliary	78'-0"	above	78'-6"		
1899	841-E-BC01B	UNIT 3 1E BATTERY CHARGER BC01B	078A04D	Auxiliary	78'-0"	above	78'-6"		
1900	841-E-DP01B	125V DC DISTR. PNL	078A04D	Auxiliary	78'-0"	above	78'-6"		
1901	841-E-MC01B	UNIT 3 1E DC CONTROL CENTER MC01B	078A04D	Auxiliary	78'-0"	above	78'-6"		
1902	842-E-TR01B	UNIT 3 1E REGULATING TR. TR01B	078A04D	Auxiliary	78'-0"	above	78'-6"		
1903	603-J-TE-0106B	CH B DC & IP EQUIP RM TEMP.	078A04D	Auxiliary	78'-0"	above	78'-6"		
1904	633-J-TW-0114	COOLING COIL VE-CW03B OUTLET	078A04D	Auxiliary	78'-0"	above	78'-6"		
1905	633-J-TW-0116	COOLING COIL VE-CW03B INLET	078A04D	Auxiliary	78'-0"	above	78'-6"		
1906	633-V-1107B	ChB DC&IP EQUIP RM C-CLR Outlet VALVE	078A04D	Auxiliary	78'-0"	above	78'-6"		
1907	633-V-1108B	ChB DC&IP EQUIP RM C-CLR Inlet throt VALVE	078A04D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (64 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1908	633-V-2107B	ChB DC&IP EQUIP C-CLR Outlet PZR Test VALVE	078A04D	Auxiliary	78'-0"	above	78'-6"		
1909	633-V-2108B	ChB DC&IP EQUIP C-CLR Inlet PZR Test VALVE	078A04D	Auxiliary	78'-0"	above	78'-6"		
1910	633-V-2175B	CHB DC&IP EQUIP RM C-CLR Outlet DRN VALVE	078A04D	Auxiliary	78'-0"	above	78'-6"		
1911	633-V-2207B	ChA DC&IP EQUIP RM HV03BECW OTLT Vent VALVE	078A04D	Auxiliary	78'-0"	above	78'-6"		
1912	633-V-2208B	ChA DC&IP EQUIP RM HV03BECW InletDRN VALVE	078A04D	Auxiliary	78'-0"	above	78'-6"		
1913	633-V-2307B	ChA EQUIP RM HV03B ECW Outlet TestConnVALVE	078A04D	Auxiliary	78'-0"	above	78'-6"		
1914	633-V-2308B	ChA EQUIP RM HV03B ECW Inlet TestConnVALVE	078A04D	Auxiliary	78'-0"	above	78'-6"		
1915	633-V-2381B	ChA EQUIP RM HV03B ECW Inlet Vent VALVE	078A04D	Auxiliary	78'-0"	above	78'-6"		
1916	633-V-2382B	ChA EQUIP RM HV03B ECW Inlet DRN VALVE	078A04D	Auxiliary	78'-0"	above	78'-6"		
1917	603-Y-VE-1051B	MANUAL DAMPER	078A04D	Auxiliary	78'-0"	above	78'-6"		
1918	603-Y-VE-1052B	MANUAL DAMPER	078A04D	Auxiliary	78'-0"	above	78'-6"		
1919	603-Y-VE-1540B	FIRE DAMPER	078A04D	Auxiliary	78'-0"	above	78'-6"		
1920	603-Y-VE-1560B	FIRE DAMPER	078A04D	Auxiliary	78'-0"	above	78'-6"		
1921	431-E-IN01C	UNIT 3 1E INVERTER IN01C	078A05C	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
1922	603-M-HV04A	CUBICLE COOLER	078A05C	Auxiliary	78'-0"	above	78'-6"		
1923	841-E-BC01C	UNIT 3 1E BATTERY CHARGER BC01C	078A05C	Auxiliary	78'-0"	above	78'-6"		
1924	841-E-MC01C	UNIT 3 1E DC CONTROL CENTER MC01C	078A05C	Auxiliary	78'-0"	above	78'-6"		
1925	842-E-TR01C	UNIT 3 1E REGULATING TR. TR01C	078A05C	Auxiliary	78'-0"	above	78'-6"		
1926	603-J-TE-0107C	CH C DC & IP EQUIP RM TEMP.	078A05C	Auxiliary	78'-0"	above	78'-6"		
1927	633-J-TW-0117	COOLING COIL VE-CW04A OUTLET	078A05C	Auxiliary	78'-0"	above	78'-6"		
1928	633-J-TW-0119	COOLING COIL VE-CW04A INLET	078A05C	Auxiliary	78'-0"	above	78'-6"		
1929	633-V-1109A	ChC DC&IP EQUIP RM C-CLR Outlet VALVE	078A05C	Auxiliary	78'-0"	above	78'-6"		
1930	633-V-1110A	ChC DC&IP EQUIP RM C-CLR Inlet throt VALVE	078A05C	Auxiliary	78'-0"	above	78'-6"		
1931	633-V-2109A	ChC DC&IP EQUIP C-CLR Outlet PZR Test VALVE	078A05C	Auxiliary	78'-0"	above	78'-6"		
1932	633-V-2110A	ChC DC&IP EQUIP C-CLR Inlet PZR Test VALVE	078A05C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (65 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1933	633-V-2177A	ChC DC&IP EQUIP RM C-CLR Outlet DRN VALVE	078A05C	Auxiliary	78'-0"	above	78'-6"		
1934	633-V-2209A	ChC DC&IP EQUIP RM HV04AECW OTLT Vent VALVE	078A05C	Auxiliary	78'-0"	above	78'-6"		
1935	633-V-2210A	ChC DC&IPEQUIP RM HV04AECW InletDRN VALVE	078A05C	Auxiliary	78'-0"	above	78'-6"		
1936	633-V-2309A	ChC EQUIP RM HV04A ECW Outlet TestConnVALVE	078A05C	Auxiliary	78'-0"	above	78'-6"		
1937	633-V-2310A	ChC EQUIP RM HV04A ECW Inlet TestConnVALVE	078A05C	Auxiliary	78'-0"	above	78'-6"		
1938	633-V-2383A	ChC EQUIP RM HV04A ECW Inlet Vent VALVE	078A05C	Auxiliary	78'-0"	above	78'-6"		
1939	633-V-2384A	ChC EQUIP RM HV04A ECW Inlet DRN VALVE	078A05C	Auxiliary	78'-0"	above	78'-6"		
1940	603-Y-VE-1070A	MANUAL DAMPER	078A05C	Auxiliary	78'-0"	above	78'-6"		
1941	603-Y-VE-1071A	MANUAL DAMPER	078A05C	Auxiliary	78'-0"	above	78'-6"		
1942	603-Y-VE-1558A	FIRE DAMPER	078A05C	Auxiliary	78'-0"	above	78'-6"		
1943	431-E-IN01D	UNIT 3 1E INVERTER IN01D	078A05D	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
1944	603-M-HV04B	CUBICLE COOLER	078A05D	Auxiliary	78'-0"	above	78'-6"		
1945	841-E-BC01D	UNIT 3 1E BATTERY CHARGER BC01D	078A05D	Auxiliary	78'-0"	above	78'-6"		
1946	841-E-MC01D	UNIT 3 1E DC CONTROL CENTER MC01D	078A05D	Auxiliary	78'-0"	above	78'-6"		
1947	842-E-TR01D	UNIT 3 1E REGULATING TR. TR01D	078A05D	Auxiliary	78'-0"	above	78'-6"		
1948	603-J-TE-0108D	CH D DC & IP EQUIP RM TEMP.	078A05D	Auxiliary	78'-0"	above	78'-6"		
1949	633-J-TW-0118	COOLING COIL VE-CW04B OUTLET	078A05D	Auxiliary	78'-0"	above	78'-6"		
1950	633-J-TW-0120	COOLING COIL VE-CW04B INLET	078A05D	Auxiliary	78'-0"	above	78'-6"		
1951	633-V-1109B	ChD DC&IP EQUIP RM C-CLR Outlet VALVE	078A05D	Auxiliary	78'-0"	above	78'-6"		
1952	633-V-1110B	ChD DC&IP EQUIP RM C-CLR Inlet throt VALVE	078A05D	Auxiliary	78'-0"	above	78'-6"		
1953	633-V-2109B	ChD DC&IP EQUIP C-CLR Outlet PZR Test VALVE	078A05D	Auxiliary	78'-0"	above	78'-6"		
1954	633-V-2110B	ChD DC&IP EQUIP C-CLR Inlet PZR Test VALVE	078A05D	Auxiliary	78'-0"	above	78'-6"		
1955	633-V-2177B	ChD DC&IP EQUIP RM C-CLR Outlet DRN VALVE	078A05D	Auxiliary	78'-0"	above	78'-6"		
1956	633-V-2209B	ChC DC&IPEQUIP RM HV04BECW OutletVent VALVE	078A05D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (66 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1957	633-V-2210B	ChC DC&IPEQUIP RM HV04BECW InletDRN VALVE	078A05D	Auxiliary	78'-0"	above	78'-6"		
1958	633-V-2309B	ChC EQUIP RM HV04B ECW Outlet TestConnVALVE	078A05D	Auxiliary	78'-0"	above	78'-6"		
1959	633-V-2310B	ChC EQUIP RM HV04B ECW Inlet TestConnVALVE	078A05D	Auxiliary	78'-0"	above	78'-6"		
1960	633-V-2383B	ChC EQUIP RM HV04B ECW Inlet Vent VALVE	078A05D	Auxiliary	78'-0"	above	78'-6"		
1961	633-V-2384B	ChC EQUIP RM HV04B ECW Inlet DRN VALVE	078A05D	Auxiliary	78'-0"	above	78'-6"		
1962	603-Y-VE-1070B	MANUAL DAMPER	078A05D	Auxiliary	78'-0"	above	78'-6"		
1963	603-Y-VE-1071B	MANUAL DAMPER	078A05D	Auxiliary	78'-0"	above	78'-6"		
1964	603-Y-VE-1558B	FIRE DAMPER	078A05D	Auxiliary	78'-0"	above	78'-6"		
1965	841-E-BT01A	UNIT 3 125VDC 1E BATTERY BT01A	078A06C	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
1966	603-Y-VE-1047A	MANUAL DAMPER	078A06C	Auxiliary	78'-0"	above	78'-6"		
1967	603-Y-VE-1048A	MANUAL DAMPER	078A06C	Auxiliary	78'-0"	above	78'-6"		
1968	603-Y-VE-1049A	MANUAL DAMPER	078A06C	Auxiliary	78'-0"	above	78'-6"		
1969	603-Y-VE-1050A	MANUAL DAMPER	078A06C	Auxiliary	78'-0"	above	78'-6"		
1970	603-Y-VE-1541A	FIRE DAMPER	078A06C	Auxiliary	78'-0"	above	78'-6"		
1971	603-Y-VE-1543A	FIRE DAMPER	078A06C	Auxiliary	78'-0"	above	78'-6"		
1972	603-Y-VE-1555A	FIRE DAMPER	078A06C	Auxiliary	78'-0"	above	78'-6"		
1973	603-Y-VE-1677A	FIRE DAMPER	078A06C	Auxiliary	78'-0"	above	78'-6"		
1974	841-E-BT01B	UNIT 3 125VDC 1E BATTERY BT01B	078A06D	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
1975	603-Y-VE-1047B	MANUAL DAMPER	078A06D	Auxiliary	78'-0"	above	78'-6"		
1976	603-Y-VE-1048B	MANUAL DAMPER	078A06D	Auxiliary	78'-0"	above	78'-6"		
1977	603-Y-VE-1049B	MANUAL DAMPER	078A06D	Auxiliary	78'-0"	above	78'-6"		
1978	603-Y-VE-1050B	MANUAL DAMPER	078A06D	Auxiliary	78'-0"	above	78'-6"		
1979	603-Y-VE-1541B	FIRE DAMPER	078A06D	Auxiliary	78'-0"	above	78'-6"		
1980	603-Y-VE-1543B	FIRE DAMPER	078A06D	Auxiliary	78'-0"	above	78'-6"		
1981	603-Y-VE-1555B	FIRE DAMPER	078A06D	Auxiliary	78'-0"	above	78'-6"		
1982	603-Y-VE-1677B	FIRE DAMPER	078A06D	Auxiliary	78'-0"	above	78'-6"		
1983	603-E-BS01A	BATTERY RM EDH LOCAL CONTROL BOX	078A07C	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
1984	603-M-HC01A	BATTERY RM ELECT. DUCT HEATER	078A07C	Auxiliary	78'-0"	above	78'-6"		
1985	841-E-BT01C	UNIT 3 125VDC 1E BATTERY BT01C	078A07C	Auxiliary	78'-0"	above	78'-6"		
1986	841-E-BT01C-C1	UNIT 3 125VDC 1E BATTERY BT01C-C1	078A07C	Auxiliary	78'-0"	above	78'-6"		
1987	603-J-FS-3401C	CHANNEL-A,C BATTERY RM (078-A06C,A07C)	078A07C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (67 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
1988	603-J-TE-3101C	CHANNEL-A,C BATTERY RM (078-A06C,A07C)	078A07C	Auxiliary	78'-0"	above	78'-6"		
1989	603-J-TE-3201C	CHANNEL-A,C BATTERY RM (078-A06C,A07C)	078A07C	Auxiliary	78'-0"	above	78'-6"		
1990	603-J-TE-3301C	CHANNEL-A,C BATTERY RM (078-A06C,A07C)	078A07C	Auxiliary	78'-0"	above	78'-6"		
1991	603-J-TS-3101C	CHANNEL-A,C BATTERY RM HI-HI (078-A06C,A07C)	078A07C	Auxiliary	78'-0"	above	78'-6"		
1992	603-J-TS-3301C	CHANNEL-A,C BATTERY RM HI(078-A06C,A07C)	078A07C	Auxiliary	78'-0"	above	78'-6"		
1993	603-Y-VE-1065A	MANUAL DAMPER	078A07C	Auxiliary	78'-0"	above	78'-6"		
1994	603-Y-VE-1066A	MANUAL DAMPER	078A07C	Auxiliary	78'-0"	above	78'-6"		
1995	603-Y-VE-1067A	MANUAL DAMPER	078A07C	Auxiliary	78'-0"	above	78'-6"		
1996	603-Y-VE-1068A	MANUAL DAMPER	078A07C	Auxiliary	78'-0"	above	78'-6"		
1997	603-Y-VE-1557A	FIRE DAMPER	078A07C	Auxiliary	78'-0"	above	78'-6"		
1998	603-Y-VE-1679A	FIRE DAMPER	078A07C	Auxiliary	78'-0"	above	78'-6"		
1999	603-E-BS01B	BATTERY RM EDH LOCAL CONTROL BOX	078A07D	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
2000	603-M-HC01B	BATTERY RM ELECT. DUCT HEATER	078A07D	Auxiliary	78'-0"	above	78'-6"		
2001	841-E-BT01D	UNIT 3 125VDC 1E BATTERY BT01D	078A07D	Auxiliary	78'-0"	above	78'-6"		
2002	841-E-BT01D-D1	UNIT 3 125VDC 1E BATTERY BT01D-D1	078A07D	Auxiliary	78'-0"	above	78'-6"		
2003	603-J-FS-3402D	CHANNEL-B,D BATTERY RM (078-A06D,A07D)	078A07D	Auxiliary	78'-0"	above	78'-6"		
2004	603-J-TE-3102D	CHANNEL-B,D BATTERY RM (078-A06D,A07D)	078A07D	Auxiliary	78'-0"	above	78'-6"		
2005	603-J-TE-3202D	CHANNEL-B,D BATTERY RM (078-A06D,A07D)	078A07D	Auxiliary	78'-0"	above	78'-6"		
2006	603-J-TE-3302D	CHANNEL-B,D BATTERY RM (078-A06D,A07D)	078A07D	Auxiliary	78'-0"	above	78'-6"		
2007	603-J-TS-3102D	CHANNEL-B,D BATTERY RM HI-HI(078-A06D,A07D)	078A07D	Auxiliary	78'-0"	above	78'-6"		
2008	603-J-TS-3302D	CHANNEL-B,D BATTERY RM HI(078-A06D,A07D)	078A07D	Auxiliary	78'-0"	above	78'-6"		
2009	603-Y-VE-1065B	MANUAL DAMPER	078A07D	Auxiliary	78'-0"	above	78'-6"		
2010	603-Y-VE-1066B	MANUAL DAMPER	078A07D	Auxiliary	78'-0"	above	78'-6"		
2011	603-Y-VE-1067B	MANUAL DAMPER	078A07D	Auxiliary	78'-0"	above	78'-6"		
2012	603-Y-VE-1068B	MANUAL DAMPER	078A07D	Auxiliary	78'-0"	above	78'-6"		
2013	603-Y-VE-1557B	FIRE DAMPER	078A07D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (68 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2014	603-Y-VE-1679B	FIRE DAMPER	078A07D	Auxiliary	78'-0"	above	78'-6"		
2015	603-Y-VE-1501A	FIRE DAMPER	078A09C	Auxiliary	78'-0"	above	78'-6"		
2016	603-Y-VE-1501B	FIRE DAMPER	078A09D	Auxiliary	78'-0"	above	78'-6"		
2017	603-Y-VE-1583B	FIRE DAMPER	078A09D	Auxiliary	78'-0"	above	78'-6"		
2018	603-M-AH20A	CLASS 1E BATTERY RM SUPPLY FAN	078A10C	Auxiliary	78'-0"	above	78'-6"	4" FD (4)	10" EOL (1)
2019	543-J-LI-0006B02	AUX. FEEDWATER STOR. TANK A LEVEL	078A10C	Auxiliary	78'-0"	above	78'-6"		
2020	543-J-LT-0006B	AUX FW STOR TANK "A" TK01A LEVEL	078A10C	Auxiliary	78'-0"	above	78'-6"		
2021	633-V-2427A	ECW RTN LN Vent VALVE	078A10C	Auxiliary	78'-0"	above	78'-6"		
2022	633-V-2428A	ECW Supply LN DRN VALVE	078A10C	Auxiliary	78'-0"	above	78'-6"		
2023	633-V-2429A	ECW RTN LN DRN VALVE	078A10C	Auxiliary	78'-0"	above	78'-6"		
2024	633-V-2469A	ECW Supply LN Vent VALVE	078A10C	Auxiliary	78'-0"	above	78'-6"		
2025	603-Y-VE-1569A	FIRE DAMPER	078A10C	Auxiliary	78'-0"	above	78'-6"		
2026	603-M-AH20B	CLASS 1E BATTERY RM SUPPLY FAN	078A10D	Auxiliary	78'-0"	above	78'-6"	4" FD (4)	10" EOL (1)
2027	543-J-LI-0005A02	AUX. FEEDWATER STOR. TANK B LEVEL	078A10D	Auxiliary	78'-0"	above	78'-6"		
2028	543-J-LT-0005A	AUX FW STOR TANK "B" TK01B LEVEL	078A10D	Auxiliary	78'-0"	above	78'-6"		
2029	461-V-2132	Essential CHLR CNDSR 02B Outlet Vent VALVE	078A10D	Auxiliary	78'-0"	above	78'-6"		
2030	633-V-2427B	ECW RTN LN Vent VALVE	078A10D	Auxiliary	78'-0"	above	78'-6"		
2031	603-Y-VE-1569B	FIRE DAMPER	078A10D	Auxiliary	78'-0"	above	78'-6"		
2032	603-M-AH21A	CLASS 1E BATTERY ROOM EXHAUST FAN	078A11C	Auxiliary	78'-0"	above	78'-6"	6" FD (1)	-
2033	607-M-HV31A	CUBICLE COOLER	078A11C	Auxiliary	78'-0"	above	78'-6"		
2034	633-J-LP01A	ESSENTIAL CHILLED WATER SYS (WO) CONTROL PANEL	078A11C	Auxiliary	78'-0"	above	78'-6"		
2035	633-J-LP02A	UU ESSENTIAL CHILLER CONTROLS	078A11C	Auxiliary	78'-0"	above	78'-6"		
2036	633-J-LP03A	UU ESSENTIAL CHILLER CONTROLS	078A11C	Auxiliary	78'-0"	above	78'-6"		
2037	633-M-CH01A	ESSENTIAL CHILLER	078A11C	Auxiliary	78'-0"	above	78'-6"		
2038	633-M-PP01A	ESSENTIAL CHILLED WATER PUMP	078A11C	Auxiliary	78'-0"	above	78'-6"		
2039	461-J-PY-3250A	CHLR CONDENSER PRES.MODULATE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2040	461-J-TEW-0385	ESW CHILLER 1A OUTLET TEMP	078A11C	Auxiliary	78'-0"	above	78'-6"		
2041	461-J-TW-0381	ESW CHILLER 1A INLET	078A11C	Auxiliary	78'-0"	above	78'-6"		
2042	607-J-TE-0081A	ESSENTIAL CHILLER ROOM	078A11C	Auxiliary	78'-0"	above	78'-6"		
2043	607-J-TI-0081A	ESSENTIAL CHILLER RM (078-A11C)	078A11C	Auxiliary	78'-0"	above	78'-6"		
2044	633-J-FE-0017	ESSENTIAL CHILLER CH01A INLET FLOW	078A11C	Auxiliary	78'-0"	above	78'-6"		
2045	633-J-FE-0017M	ESSENTIAL CHILLER CH01A INLET FLOW	078A11C	Auxiliary	78'-0"	above	78'-6"		
2046	633-J-HS-0009A03	ESSENTIAL CHILLED WATER PUMP PP01A HAND SWITCH	078A11C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (69 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2047	633-J-HS-0009A04	ESSENTIAL CHILLED WATER PUMP PP01A HAND SWITCH	078A11C	Auxiliary	78'-0"	above	78'-6"		
2048	633-J-HS-3009A01	ESSENTIAL CHILLER CH01A HAND SWITCH	078A11C	Auxiliary	78'-0"	above	78'-6"		
2049	633-J-HS-3009A02	ESSENTIAL CHILLER CH01A HAND SWITCH	078A11C	Auxiliary	78'-0"	above	78'-6"		
2050	633-J-HS-3009A03	ESSENTIAL CHILLER CH01A HAND SWITCH	078A11C	Auxiliary	78'-0"	above	78'-6"		
2051	633-J-HS-3011C01	ESSENTIAL CHILLER CH02A HAND SWITCH	078A11C	Auxiliary	78'-0"	above	78'-6"		
2052	633-J-HS-3011C02	ESSENTIAL CHILLER CH02A HAND SWITCH	078A11C	Auxiliary	78'-0"	above	78'-6"		
2053	633-J-HS-3011C03	ESSENTIAL CHILLER CH02A HAND SWITCH	078A11C	Auxiliary	78'-0"	above	78'-6"		
2054	633-J-LI-0001A	ESSEN CHLD WTR COMR TANK TK01A LEVEL	078A11C	Auxiliary	78'-0"	above	78'-6"		
2055	633-J-LS-0001A01	ESSEN CHLD WTR COMR TANK TK01A LEVEL	078A11C	Auxiliary	78'-0"	above	78'-6"		
2056	633-J-LS-0001A02	ESSEN CHLD WTR COMR TANK TK01A LEVEL	078A11C	Auxiliary	78'-0"	above	78'-6"		
2057	633-J-LS-0001A03	ESSEN CHLD WTR COMR TANK TK01A LEVEL	078A11C	Auxiliary	78'-0"	above	78'-6"		
2058	633-J-LS-0001A04	ESSEN CHLD WTR COMR TANK TK01A LEVEL	078A11C	Auxiliary	78'-0"	above	78'-6"		
2059	633-J-LY-0001A01	COMPRESSION TANK TK01A LEVEL	078A11C	Auxiliary	78'-0"	above	78'-6"		
2060	633-J-LY-0001A02	COMPRESSION TANK TK01A LEVEL	078A11C	Auxiliary	78'-0"	above	78'-6"		
2061	633-J-LY-0001A03	COMPRESSION TANK TK01A LEVEL	078A11C	Auxiliary	78'-0"	above	78'-6"		
2062	633-J-LY-0001A04	COMPRESSION TANK TK01A LEVEL	078A11C	Auxiliary	78'-0"	above	78'-6"		
2063	633-J-LY-0001A05	COMPRESSION TANK TK01A LEVEL	078A11C	Auxiliary	78'-0"	above	78'-6"		
2064	633-J-PIC-3250A	ESSENTIAL CHILLER CH01A CONDENSER PRESSURE INDICATING CONTROLLER	078A11C	Auxiliary	78'-0"	above	78'-6"		
2065	633-J-TEW-0021	ESSENTIAL CHILLER CH01A INLET	078A11C	Auxiliary	78'-0"	above	78'-6"		
2066	633-J-TEW-0025	ESSENTIAL CHILLER CH01A OUTLET	078A11C	Auxiliary	78'-0"	above	78'-6"		
2067	633-J-TW-0193	COOLING COIL VO-CW31A OUTLET	078A11C	Auxiliary	78'-0"	above	78'-6"		
2068	633-J-TW-0195	COOLING COIL VO-CW31A INLET	078A11C	Auxiliary	78'-0"	above	78'-6"		
2069	461-V-0383	ESSEN CHLR CNDSR 1A OUTLET ISO VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (70 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2070	461-V-0901	ESSENTIAL CHILLER CONDENSER 1A OUTLET CONTROL VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2071	461-V-1561	ESSEN CHLR CNDSR 1A INLET ISO VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2072	461-V-1563	ESSEN CHLR CNDSR 1A OUTLET ISO VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2073	461-V-1565	ESSEN CHLR CNDSR 01A Bypass VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2074	461-V-1567	ESSEN CHLR CNDSR 01A Outlet VALVE Equal VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2075	461-V-1569	ESSENTIAL CHILLER 1A CCW RETURN LINE PRESSURE(THERMAL) RELIEF VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2076	461-V-2471	ESSEN CHLR CNDSR 02A Outlet FT-10N RT VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2077	461-V-2472	ESSEN CHLR CNDSR 02A Outlet FT-10N RT VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2078	461-V-2551	ESSEN CHLR CNDSR 01A Inlet Pr Test VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2079	461-V-2552	ESSEN CHLR CNDSR 01A Outlet LN DRN VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2080	461-V-2553	ESSEN CHLR CNDSR 01A Outlet Pr Test VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2081	461-V-2589	ESSEN CHLR CNDSR 1A Outlet FT-10AD RT VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2082	461-V-2590	ESSEN CHLR CNDSR 1A Outlet FT-10AD RT VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2083	461-V-2901	ESSEN CHLR CNDSR 01A Outlet Line Vent VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2084	633-V-1009A	CHLD WTR PUMP PP01A SUCTION	078A11C	Auxiliary	78'-0"	above	78'-6"		
2085	633-V-1010A	ECW PP-01A Disch CHK VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2086	633-V-1012A	ECW PP-01A Disch Throt VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2087	633-V-1019A	ESSEN. CHILLER CH01A INLET	078A11C	Auxiliary	78'-0"	above	78'-6"		
2088	633-V-1020A	ESSEN. CHILLER CH01A OUTLET	078A11C	Auxiliary	78'-0"	above	78'-6"		
2089	633-V-1027A	ESSEN. CHILLER CH01A/B TIE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2090	633-V-1028A	ESSEN. CHILLER CH01A/B TIE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2091	633-V-1147A	CW31A ESSE CHLR RM C-CLR Outlet VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2092	633-V-1148A	CW31A ESSE CHLR RM C-CLR Inlet throt VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (71 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2093	633-V-2007A	ECW PP-01A Suct PI-005 RT VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2094	633-V-2008A	ECW PP-01A Disch PI-013 RT VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2095	633-V-2017A	ESSE CHLR-01A Evap Inlet PI-029 RT VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2096	633-V-2018A	ESSE CHLR-01A Evap Outlet PI-033 RT VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2097	633-V-2147A	CW31AESSE CHLR C-CLR Outlet PZR Test VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2098	633-V-2148A	CW31AESSE CHLR C-CLR Inlet PZR Test VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2099	633-V-2173A	CW31A ESSE CHLR C-CLR Outlet DRN VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2100	633-V-2247A	Ess. CHLR RM HV31A ECW Outlet Vent VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2101	633-V-2248A	Ess. CHLR RM HV31A ECW Inlet DRN VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2102	633-V-2347A	Ess CHLRRM HV31A ECW Outlet TestConn VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2103	633-V-2348A	Ess CHLRRM HV31A ECW Inlet TestConn VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2104	633-V-2403A	ECW PP-01A Suct Pr Test Conn VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2105	633-V-2404A	ECW PP-01A Suct DRN VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2106	633-V-2405A	ECW PP-01A Disch Vent VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2107	633-V-2406A	ECW PP-01A Disch DRN VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2108	633-V-2407A	ECW PP-01A Disch Vent VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2109	633-V-2408A	Esse ChIR-01A Evap Inlet DRN VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2110	633-V-2418A	ECW Supply FLO CTL VALVE Inlet DRN VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2111	633-V-5003	CHLR Ch02A EVAP Inlet FI-019 RT VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2112	633-V-5004	CHLR Ch02A EVAP Inlet FI-019 RT VALVE	078A11C	Auxiliary	78'-0"	above	78'-6"		
2113	603-Y-VE-1570A	FIRE DAMPER	078A11C	Auxiliary	78'-0"	above	78'-6"		
2114	603-M-AH21B	CLASS 1E BATTERY ROOM EXHAUST FAN	078A11D	Auxiliary	78'-0"	above	78'-6"	6" FD (1)	-
2115	607-M-HV31B	CUBICLE COOLER	078A11D	Auxiliary	78'-0"	above	78'-6"		
2116	633-J-LP01B	ESSENTIAL CHILLED WATER SYS (WO) CONTROL PANEL	078A11D	Auxiliary	78'-0"	above	78'-6"		
2117	633-J-LP02B	UU ESSENTIAL CHILLER CONTROLS	078A11D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (72 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2118	633-J-LP03B	UU ESSENTIAL CHILLER CONTROLS	078A11D	Auxiliary	78'-0"	above	78'-6"		
2119	633-M-CH01B	ESSENTIAL CHILLER	078A11D	Auxiliary	78'-0"	above	78'-6"		
2120	633-M-PP01B	ESSENTIAL CHILLED WATER PUMP	078A11D	Auxiliary	78'-0"	above	78'-6"		
2121	461-J-PY-3350B	CHLR CONDENSER PRES.MODULATE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2122	461-J-TEW-0386	ESW CHILLER 1B OUTLET TEMP	078A11D	Auxiliary	78'-0"	above	78'-6"		
2123	461-J-TW-0382	ESW CHILLER 1B INLET	078A11D	Auxiliary	78'-0"	above	78'-6"		
2124	607-J-TE-0082B	ESSENTIAL CHILLER ROOM	078A11D	Auxiliary	78'-0"	above	78'-6"		
2125	607-J-TI-0082B	ESSENTIAL CHILLER RM (078-A11D)	078A11D	Auxiliary	78'-0"	above	78'-6"		
2126	633-J-FE-0018	ESSENTIAL CHILLER CH01B INLET FLOW	078A11D	Auxiliary	78'-0"	above	78'-6"		
2127	633-J-FE-0018M	ESSENTIAL CHILLER CH01B INLET FLOW	078A11D	Auxiliary	78'-0"	above	78'-6"		
2128	633-J-HS-0010B03	ESSENTIAL CHILLED WATER PUMP PP01B HAND SWITCH	078A11D	Auxiliary	78'-0"	above	78'-6"		
2129	633-J-HS-0010B04	ESSENTIAL CHILLED WATER PUMP PP01B HAND SWITCH	078A11D	Auxiliary	78'-0"	above	78'-6"		
2130	633-J-HS-3010B01	UU CHILLER CONTROL CH01B HAND SWITCH	078A11D	Auxiliary	78'-0"	above	78'-6"		
2131	633-J-HS-3010B02	UU CHILLER CONTROL CH01B HAND SWITCH	078A11D	Auxiliary	78'-0"	above	78'-6"		
2132	633-J-HS-3010B03	UU CHILLER CONTROL CH01B HAND SWITCH	078A11D	Auxiliary	78'-0"	above	78'-6"		
2133	633-J-HS-3012D01	UU CHILLER CONTROL CH02B HAND SWITCH	078A11D	Auxiliary	78'-0"	above	78'-6"		
2134	633-J-HS-3012D02	UU CHILLER CONTROL CH02B HAND SWITCH	078A11D	Auxiliary	78'-0"	above	78'-6"		
2135	633-J-HS-3012D03	UU CHILLER CONTROL CH02B HAND SWITCH	078A11D	Auxiliary	78'-0"	above	78'-6"		
2136	633-J-LI-0002B	ESSEN CHLD WTR COMR TANK TK01B LEVEL	078A11D	Auxiliary	78'-0"	above	78'-6"		
2137	633-J-LS-0002B01	ESSEN CHLD WTR COMR TANK TK01B LEVEL	078A11D	Auxiliary	78'-0"	above	78'-6"		
2138	633-J-LS-0002B02	ESSEN CHLD WTR COMR TANK TK01B LEVEL	078A11D	Auxiliary	78'-0"	above	78'-6"		
2139	633-J-LS-0002B03	ESSEN CHLD WTR COMR TANK TK01B LEVEL	078A11D	Auxiliary	78'-0"	above	78'-6"		
2140	633-J-LS-0002B04	ESSEN CHLD WTR COMR TANK TK01B LEVEL	078A11D	Auxiliary	78'-0"	above	78'-6"		
2141	633-J-LY-0002B01	COMPRESSION TANK TK01B LEVEL	078A11D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (73 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2142	633-J-LY-0002B02	COMPRESSION TANK TK01B LEVEL	078A11D	Auxiliary	78'-0"	above	78'-6"		
2143	633-J-LY-0002B03	COMPRESSION TANK TK01B LEVEL	078A11D	Auxiliary	78'-0"	above	78'-6"		
2144	633-J-LY-0002B04	COMPRESSION TANK TK01B LEVEL	078A11D	Auxiliary	78'-0"	above	78'-6"		
2145	633-J-LY-0002B05	COMPRESSION TANK TK01B LEVEL	078A11D	Auxiliary	78'-0"	above	78'-6"		
2146	633-J-PIC-3350B	ESSENTIAL CHILLER CH01B CONDENSER PRESSURE INDICATING CONTROLLER	078A11D	Auxiliary	78'-0"	above	78'-6"		
2147	633-J-TEW-0022	ESSENTIAL CHILLER CH01B INLET	078A11D	Auxiliary	78'-0"	above	78'-6"		
2148	633-J-TEW-0026	ESSENTIAL CHILLER CH01B OUTLET	078A11D	Auxiliary	78'-0"	above	78'-6"		
2149	633-J-TW-0194	COOLING COIL VO-CW31B OUTLET	078A11D	Auxiliary	78'-0"	above	78'-6"		
2150	633-J-TW-0196	COOLING COIL VO-CW31B INLET	078A11D	Auxiliary	78'-0"	above	78'-6"		
2151	461-V-0384	ESSEN CHLR CNDSR 1B OUTLET ISO VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2152	461-V-0902	ESSENTIAL CHILLER CONDENSER 1B OUTLET CONTROL VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2153	461-V-1562	ESSEN CHLR CNDSR 1B INLET ISO VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2154	461-V-1564	ESSEN CHLR CNDSR 1B OUTLET ISO VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2155	461-V-1566	ESSEN CHLR CNDSR 01B Bypass VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2156	461-V-1568	ESSEN CHLR CNDSR 01B Outlet VALVE Equal VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2157	461-V-1570	ESSENTIAL CHILLER 1B CCW RETURN LINE PRESSURE(THERMAL) RELIEF VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2158	461-V-2142	ESSEN CHLR CNDSR 01B Outlet LN Vent VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2159	461-V-2556	ESSEN CHLR CNDSR 01B Inlet Pr Test VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2160	461-V-2557	ESSEN CHLR CNDSR 01B Outlet LN DRN VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2161	461-V-2558	ESSEN CHLR CNDSR 01B Outlet Pr Test VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2162	461-V-2591	ESSEN CHLR CNDSR 1B Outlet FT-10AE RT VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2163	461-V-2592	ESSEN CHLR CNDSR 1B Outlet FT-10AE RT VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2164	633-V-1009B	CHLD WTR PUMP PP01B SUCTION	078A11D	Auxiliary	78'-0"	above	78'-6"		
2165	633-V-1010B	ECW PP-01B Disch CHK VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (74 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2166	633-V-1012B	ECW PP-01B Disch Throt VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2167	633-V-1019B	ESSEN. CHILLER CH01B INLET	078A11D	Auxiliary	78'-0"	above	78'-6"		
2168	633-V-1020B	ESSEN. CHILLER CH01B OUTLET	078A11D	Auxiliary	78'-0"	above	78'-6"		
2169	633-V-1027B	ESSEN. CHILLER CH02A/B TIE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2170	633-V-1028B	ESSEN. CHILLER CH02A/B TIE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2171	633-V-1147B	CW31B ESSE CHLR RM C-CLR Outlet VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2172	633-V-1148B	CW31B ESSE CHLR RM C-CLR Inlet throt VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2173	633-V-2007B	ECW PP-01B Suct PI-006 RT VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2174	633-V-2008B	ECW PP-01B Disch PI-014 RT VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2175	633-V-2017B	ESSE CHLR-01B Evap Inlet PI-030 RT VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2176	633-V-2018B	ESSE CHLR-01B Evap Outlet PI-034 RT VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2177	633-V-2147B	CW31BESSE CHLR C-CLR Outlet PZR Test VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2178	633-V-2148B	CW31BESSE CHLR C-CLR Inlet PZR Test VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2179	633-V-2173B	CW31B ESSE CHLR C-CLR Outlet DRN VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2180	633-V-2247B	Ess. CHLR RM HV31B ECW Outlet Vent VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2181	633-V-2248B	Ess. CHLR RM HV31B ECW Inlet DRN VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2182	633-V-2294B	CSPP&MinFLOHxRM HV10B ECW InletVent VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2183	633-V-2347B	Ess CHLRRM HV31B ECW Outlet TestConn VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2184	633-V-2348B	Ess CHLRRM HV31B ECW Inlet TestConn VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2185	633-V-2403B	ECW PP-01B Suct Pr Test Conn VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2186	633-V-2404B	ECW PP-01B Suct DRN VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2187	633-V-2405B	ECW PP-01B Disch Vent VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2188	633-V-2406B	ECW PP-01B Disch DRN VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2189	633-V-2407B	ECW PP-01B Disch Vent VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2190	633-V-2408B	Esse ChIR-01B Evap Inlet DRN VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2191	633-V-2415B	ECW PP-02B Disch DRN VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (75 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2192	633-V-2416B	ECW PP-02B Disch Vent VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2193	633-V-2417B	Esse ChIR-02B Evap Inlet DRN VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2194	633-V-2418B	ECW Supply FLO CTL VALVE Inlet DRN VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2195	633-V-5007	CHLR Ch01A EVAP Inlet FI-018 RT VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2196	633-V-5008	CHLR Ch01A EVAP Inlet FI-018 RT VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2197	633-V-5009	CHLR Ch02A EVAP Inlet FI-020 RT VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2198	633-V-5010	CHLR Ch02A EVAP Inlet FI-020 RT VALVE	078A11D	Auxiliary	78'-0"	above	78'-6"		
2199	607-M-HV32A	CUBICLE COOLER	078A12C	Auxiliary	78'-0"	above	78'-6"	6" FD (1)	-
2200	633-J-LP01C	ESSENTIAL CHILLED WATER SYS (WO) CONTROL PANEL	078A12C	Auxiliary	78'-0"	above	78'-6"		
2201	633-M-CH02A	ESSENTIAL CHILLER	078A12C	Auxiliary	78'-0"	above	78'-6"		
2202	633-M-PP02A	ESSENTIAL CHILLED WATER PUMP	078A12C	Auxiliary	78'-0"	above	78'-6"		
2203	633-M-TK02A	ESSENTIAL CHILLED WATER AIR SEPARATOR	078A12C	Auxiliary	78'-0"	above	78'-6"		
2204	461-J-PY-3450C	CHLR CONDENSER PRES.MODULATE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2205	461-J-TEW-0133	ESW CHILLER 2A OUTLET TEMP	078A12C	Auxiliary	78'-0"	above	78'-6"		
2206	461-J-TW-0129	ESSENTIAL WATER CHILLER 2A INLET	078A12C	Auxiliary	78'-0"	above	78'-6"		
2207	607-J-TE-0083C	ESSENTIAL CHILLER ROOM	078A12C	Auxiliary	78'-0"	above	78'-6"		
2208	607-J-TI-0083C	ESSENTIAL CHILLER RM (078-A12C)	078A12C	Auxiliary	78'-0"	above	78'-6"		
2209	607-J-TI-0084D	ESSENTIAL CHILLER RM (078-A12C)	078A12C	Auxiliary	78'-0"	above	78'-6"		
2210	633-J-FE-0019	ESSENTIAL CHILLER CH02A INLET FLOW	078A12C	Auxiliary	78'-0"	above	78'-6"		
2211	633-J-FE-0019M	ESSENTIAL CHILLER CH02A INLET FLOW	078A12C	Auxiliary	78'-0"	above	78'-6"		
2212	633-J-HS-0011C03	ESSENTIAL CHILLED WATER PUMP PP02A HAND SWITCH	078A12C	Auxiliary	78'-0"	above	78'-6"		
2213	633-J-HS-0011C04	ESSENTIAL CHILLED WATER PUMP PP02A HAND SWITCH	078A12C	Auxiliary	78'-0"	above	78'-6"		
2214	633-J-LI-0003C01	COMPRESSION TANK TK01A LEVEL	078A12C	Auxiliary	78'-0"	above	78'-6"		
2215	633-J-LS-0003C01	COMPRESSION TANK TK01A LEVEL	078A12C	Auxiliary	78'-0"	above	78'-6"		
2216	633-J-LS-0003C03	COMPRESSION TANK TK01A LEVEL	078A12C	Auxiliary	78'-0"	above	78'-6"		
2217	633-J-LS-0003C04	COMPRESSION TANK TK01A LEVEL	078A12C	Auxiliary	78'-0"	above	78'-6"		
2218	633-J-LY-0003C01	COMPRESSION TANK TK01A LEVEL	078A12C	Auxiliary	78'-0"	above	78'-6"		
2219	633-J-LY-0003C03	COMPRESSION TANK TK01A LEVEL	078A12C	Auxiliary	78'-0"	above	78'-6"		
2220	633-J-LY-0003C04	COMPRESSION TANK TK01A LEVEL	078A12C	Auxiliary	78'-0"	above	78'-6"		
2221	633-J-LY-0003C05	COMPRESSION TANK TK01A LEVEL	078A12C	Auxiliary	78'-0"	above	78'-6"		
2222	633-J-LY-0003C06	COMPRESSION TANK TK01A LEVEL	078A12C	Auxiliary	78'-0"	above	78'-6"		
2223	633-J-LY-0003C07	COMPRESSION TANK TK01A LEVEL	078A12C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (76 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2224	633-J-PIC-3450C	ESSENTIAL CHILLER CH02A CONDENSER PRESSURE INDICATING CONTROLLER	078A12C	Auxiliary	78'-0"	above	78'-6"		
2225	633-J-TEW-0023	ESSENTIAL CHILLER CH02A INLET	078A12C	Auxiliary	78'-0"	above	78'-6"		
2226	633-J-TEW-0027	ESSENTIAL CHILLER CH02A OUTLET	078A12C	Auxiliary	78'-0"	above	78'-6"		
2227	633-J-TW-0197	COOLING COIL VO-CW32A OUTLET	078A12C	Auxiliary	78'-0"	above	78'-6"		
2228	633-J-TW-0199	COOLING COIL VO-CW32A INLET	078A12C	Auxiliary	78'-0"	above	78'-6"		
2229	461-V-0131	ESSEN CHLR CNDSR 2A OUTLET ISO VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2230	461-V-0905	ESSENTIAL CHILLER CONDENSER 2A OUTLET CONTROL VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2231	461-V-1261	ESSEN CHLR CNDSR 2A INLET ISO VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2232	461-V-1263	ESSEN CHLR CNDSR 2A OUTLET ISO VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2233	461-V-1265	ESSEN CHLR CNDSR 2A Bypass VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2234	461-V-1267	ESSEN CHLR CNDSR 2A Outlet VALVE Bypass VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2235	461-V-1269	ESSENTIAL CHILLER 2A CCW RETURN LINE PRESSURE(THERMAL) RELIEF VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2236	461-V-2251	ESSEN CHLR CNDSR 02A Inlet Pr Test VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2237	461-V-2252	Essential CHLR CNDSR 02A DRN VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2238	461-V-2253	ESSEN CHLR CNDSR 02A Outlet Pr Test VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2239	461-V-2744	Quadrant C Supply Line Vent VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2240	461-V-2745	ESSEN CHLR CNDSR 02A Outlet Line Vent VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2241	633-V-1002C	ECW Comp TK01A→Air Sep TK-02A ISO VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2242	633-V-1008A	ECW AIR SEP TK02A INLET	078A12C	Auxiliary	78'-0"	above	78'-6"		
2243	633-V-1013A	CHLD WTR PUMP PP02A SUCTION	078A12C	Auxiliary	78'-0"	above	78'-6"		
2244	633-V-1014A	ECW PP-02A Disch CHK VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2245	633-V-1016A	ECW PP-02A Disch Throt VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2246	633-V-1017A	ECW ChEM ADD TK-03A Outlet VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2247	633-V-1018A	ECW ChEM ADD TK-03A Inlet VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2248	633-V-1023A	ESSEN. CHILLER CH02A INLET	078A12C	Auxiliary	78'-0"	above	78'-6"		
2249	633-V-1024A	ESSEN. CHILLER CH02A OUTLET	078A12C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (77 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2250	633-V-1025A	ESSEN. CHILLER CH01A INLET	078A12C	Auxiliary	78'-0"	above	78'-6"		
2251	633-V-1149A	CW32A ESSE CHLR RM C-CLR Outlet VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2252	633-V-1150A	CW32A ESSE CHLR RM C-CLR Inlet throt VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2253	633-V-2010A	ECW PP-02A Suct PI-007 RT VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2254	633-V-2011A	ECW PP-02A Disch PI-015 RT VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2255	633-V-2021A	ESSE CHLR-02A Evap Inlet PI-031 RT VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2256	633-V-2022A	ESSE CHLR-02A Evap Outlet PI-035 RT VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2257	633-V-2149A	CW32AESSE CHLR C-CLR Outlet PZR Test VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2258	633-V-2150A	CW32AESSE CHLR C-CLR Inlet PZR Test VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2259	633-V-2174A	CW32A ESSE CHLR C-CLR Outlet DRN VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2260	633-V-2249A	Ess. CHLR RM HV32A ECW Outlet Vent VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2261	633-V-2250A	Ess. CHLR RM HV32A ECW Inlet DRN VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2262	633-V-2349A	Ess CHLRRM HV32A ECW Outlet TestConn VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2263	633-V-2350A	Ess CHLRRM HV32A ECW Inlet TestConn VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2264	633-V-2411A	ECW Comp TK-02A DRN VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2265	633-V-2412A	ECW PP-02A Suct Pr Test Conn VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2266	633-V-2413A	ECW PP-02A Suct DRN VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2267	633-V-2414A	ECW PP-02A Disch Vent VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2268	633-V-2415A	ECW PP-02A Disch DRN VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2269	633-V-2416A	ECW PP-02A Disch Vent VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2270	633-V-2417A	Esse ChIR-02A Evap Inlet DRN VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2271	633-V-2424A	ECW CHEM Add TK-03A Outlet Vent VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2272	633-V-2425A	ECW Ch02A Disch Vent VALVE	078A12C	Auxiliary	78'-0"	above	78'-6"		
2273	607-M-HV32B	CUBICLE COOLER	078A12D	Auxiliary	78'-0"	above	78'-6"	6" FD (1)	-
2274	633-J-LP01D	ESSENTIAL CHILLED WATER SYS (WO) CONTROL PANEL	078A12D	Auxiliary	78'-0"	above	78'-6"		
2275	633-M-CH02B	ESSENTIAL CHILLER	078A12D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (78 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2276	633-M-PP02B	ESSENTIAL CHILLED WATER PUMP	078A12D	Auxiliary	78'-0"	above	78'-6"		
2277	633-M-TK02B	ESSENTIAL CHILLED WATER AIR SEPARATOR	078A12D	Auxiliary	78'-0"	above	78'-6"		
2278	461-J-PY-3550D	CHLR CONDENSER PRES.MODULATE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2279	461-J-TEW-0134	ESW CHILLER 2A OUTLET TEMP	078A12D	Auxiliary	78'-0"	above	78'-6"		
2280	461-J-TW-0130	ESSENTIAL WATER CHILLER 2B INLET	078A12D	Auxiliary	78'-0"	above	78'-6"		
2281	607-J-TE-0084D	ESSENTIAL CHILLER ROOM	078A12D	Auxiliary	78'-0"	above	78'-6"		
2282	633-J-FE-0020	ESSENTIAL CHILLER CH02B INLET FLOW	078A12D	Auxiliary	78'-0"	above	78'-6"		
2283	633-J-FE-0020M	ESSENTIAL CHILLER CH02B INLET FLOW	078A12D	Auxiliary	78'-0"	above	78'-6"		
2284	633-J-HS-0012D03	ESSENTIAL CHILLED WATER PUMP PP02B HAND SWITCH	078A12D	Auxiliary	78'-0"	above	78'-6"		
2285	633-J-HS-0012D04	ESSENTIAL CHILLED WATER PUMP PP02B HAND SWITCH	078A12D	Auxiliary	78'-0"	above	78'-6"		
2286	633-J-LI-0004D01	COMPRESSION TANK TK01B LEVEL	078A12D	Auxiliary	78'-0"	above	78'-6"		
2287	633-J-LS-0004D01	COMPRESSION TANK TK01B LEVEL	078A12D	Auxiliary	78'-0"	above	78'-6"		
2288	633-J-LS-0004D03	COMPRESSION TANK TK01B LEVEL	078A12D	Auxiliary	78'-0"	above	78'-6"		
2289	633-J-LS-0004D04	COMPRESSION TANK TK01B LEVEL	078A12D	Auxiliary	78'-0"	above	78'-6"		
2290	633-J-LY-0004D01	COMPRESSION TANK TK01B LEVEL	078A12D	Auxiliary	78'-0"	above	78'-6"		
2291	633-J-LY-0004D03	COMPRESSION TANK TK01B LEVEL	078A12D	Auxiliary	78'-0"	above	78'-6"		
2292	633-J-LY-0004D04	COMPRESSION TANK TK01B LEVEL	078A12D	Auxiliary	78'-0"	above	78'-6"		
2293	633-J-LY-0004D05	COMPRESSION TANK TK01B LEVEL	078A12D	Auxiliary	78'-0"	above	78'-6"		
2294	633-J-LY-0004D06	COMPRESSION TANK TK01B LEVEL	078A12D	Auxiliary	78'-0"	above	78'-6"		
2295	633-J-LY-0004D07	COMPRESSION TANK TK01B LEVEL	078A12D	Auxiliary	78'-0"	above	78'-6"		
2296	633-J-PIC-3550D	ESSENTIAL CHILLER CH02B CONDENSER PRESSURE INDICATING CONTROLLER	078A12D	Auxiliary	78'-0"	above	78'-6"		
2297	633-J-TEW-0024	ESSENTIAL CHILLER CH02B INLET	078A12D	Auxiliary	78'-0"	above	78'-6"		
2298	633-J-TEW-0028	ESSENTIAL CHILLER CH02B OUTLET	078A12D	Auxiliary	78'-0"	above	78'-6"		
2299	633-J-TW-0198	COOLING COIL VO-CW32B OUTLET	078A12D	Auxiliary	78'-0"	above	78'-6"		
2300	633-J-TW-0200	COOLING COIL VO-CW32B INLET	078A12D	Auxiliary	78'-0"	above	78'-6"		
2301	461-V-0132	ESSEN CHLR CNDSR 2B OUTLET ISO VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2302	461-V-0906	ESSENTIAL CHILLER CONDENSER 2B OUTLET CONTROL VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2303	461-V-1262	ESSEN CHLR CNDSR 2B INLET ISO VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2304	461-V-1264	ESSEN CHLR CNDSR 2B OUTLET ISO VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2305	461-V-1266	ESSEN CHLR CNDSR 2B Bypass VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (79 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2306	461-V-1268	ESSEN CHLR CNDSR 2B Outlet VALVE Bypass VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2307	461-V-1270	ESSENTIAL CHILLER 2B CCW RETURN LINE PRESSURE(THERMAL) RELIEF VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2308	461-V-2131	Essential CHLR CNDSR 02B Inlet Vent VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2309	461-V-2256	ESSEN CHLR CNDSR 02B Inlet Pr Test VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2310	461-V-2257	Essential CHLR CNDSR 02B DRN VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2311	461-V-2258	ESSEN CHLR CNDSR 02B Outlet Pr Test VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2312	461-V-2473	ESSEN CHLR CNDSR 02B Outlet FT-10O RT VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2313	461-V-2474	ESSEN CHLR CNDSR 02B Outlet FT-10O RT VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2314	633-V-1002D	ECW Comp TK01B→Air Sep TK-02B ISO VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2315	633-V-1008B	ECW AIR SEP TK02B INLET	078A12D	Auxiliary	78'-0"	above	78'-6"		
2316	633-V-1013B	CHLD WTR PUMP PP02B SUCTION	078A12D	Auxiliary	78'-0"	above	78'-6"		
2317	633-V-1014B	ECW PP-02B Disch CHK VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2318	633-V-1016B	ECW PP-02B Disch Throt VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2319	633-V-1018B	ECW ChEM ADD TK-03B Inlet VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2320	633-V-1023B	ESSEN. CHILLER CH02B INLET	078A12D	Auxiliary	78'-0"	above	78'-6"		
2321	633-V-1024B	ESSEN. CHILLER CH02B OUTLET	078A12D	Auxiliary	78'-0"	above	78'-6"		
2322	633-V-1025B	ESSEN. CHILLER CH01B INLET	078A12D	Auxiliary	78'-0"	above	78'-6"		
2323	633-V-1149B	CW32B ESSE CHLR RM C-CLR Outlet VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2324	633-V-1150B	CW32B ESSE CHLR RM C-CLR Inlet throt VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2325	633-V-2010B	ECW PP-02B Suct PI-008 RT VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2326	633-V-2011B	ECW PP-02B Disch PI-016 RT VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2327	633-V-2021B	ESSE CHLR-02B Evap Inlet PI-032 RT VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2328	633-V-2022B	ESSE CHLR-02B Evap Outlet PI-036 RT VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2329	633-V-2149B	CW32BESSE CHLR C-CLR Outlet PZR Test VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (80 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2330	633-V-2150B	CW32BESSE CHLR C-CLR Inlet PZR Test VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2331	633-V-2174B	CW32B ESSE CHLR C-CLR Outlet DRN VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2332	633-V-2249B	Ess. CHLR RM HV32B ECW Outlet Vent VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2333	633-V-2250B	Ess. CHLR RM HV32B ECW Inlet DRN VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2334	633-V-2349B	Ess CHLRRM HV32B ECW Outlet TestConn VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2335	633-V-2350B	Ess CHLRRM HV32B ECW Inlet TestConn VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2336	633-V-2411B	ECW Comp TK-02B DRN VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2337	633-V-2412B	ECW PP-02B Suct Pr Test Conn VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2338	633-V-2413B	ECW PP-02B Suct DRN VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2339	633-V-2414B	ECW PP-02B Disch Vent VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2340	633-V-2424B	ECW CHEM Add TK-03B Outlet Vent VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2341	633-V-2425B	ECW Ch02B Disch Vent VALVE	078A12D	Auxiliary	78'-0"	above	78'-6"		
2342	527-J-LP01C	AF PUMP TURBINE TA01A CONTROL PANEL	078A15C	Auxiliary	78'-0"	above	78'-6"	6" FD (1)	-
2343	527-M-EE71A	STEAM EJECTOR	078A15C	Auxiliary	78'-0"	above	78'-6"		
2344	527-M-OR01A	RESTRICTION ORIFICE A	078A15C	Auxiliary	78'-0"	above	78'-6"		
2345	527-M-OR71A	RESTRICTION ORIFICE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2346	527-M-OR72A	RESTRICTION ORIFICE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2347	527-M-OR73A	RESTRICTION ORIFICE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2348	527-M-TP71A	Trap	078A15C	Auxiliary	78'-0"	above	78'-6"		
2349	542-M-OR01A	MINI. FLOW RESTRICTION ORIFICE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2350	542-M-PP01A	AUXILIARY FEEDWATER PUMP C (TURBINE DRIVEN)	078A15C	Auxiliary	78'-0"	above	78'-6"		
2351	527-J-HS-3017C04	AF PUMP TURBINE TA01A CONTROL PANEL LP01C HAND SWITCH	078A15C	Auxiliary	78'-0"	above	78'-6"		
2352	527-J-HS-3017C05	AF PUMP TURBINE TA01A CONTROL PANEL LP01C HAND SWITCH	078A15C	Auxiliary	78'-0"	above	78'-6"		
2353	527-J-HS-3017C06	AF PUMP TURBINE TA01A CONTROL PANEL LP01C HAND SWITCH	078A15C	Auxiliary	78'-0"	above	78'-6"		
2354	527-J-HS-3017C07	AF PUMP TURBINE TA01A CONTROL PANEL LP01C HAND SWITCH	078A15C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (81 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2355	527-J-HS-3018D04	AF PUMP TURBINE TA01B CONTROL PANEL LP01D HAND SWITCH	078A15C	Auxiliary	78'-0"	above	78'-6"		
2356	527-J-HS-3018D05	AF PUMP TURBINE TA01B CONTROL PANEL LP01D HAND SWITCH	078A15C	Auxiliary	78'-0"	above	78'-6"		
2357	527-J-HS-3018D06	AF PUMP TURBINE TA01B CONTROL PANEL LP01D HAND SWITCH	078A15C	Auxiliary	78'-0"	above	78'-6"		
2358	527-J-HS-3018D07	AF PUMP TURBINE TA01B CONTROL PANEL LP01D HAND SWITCH	078A15C	Auxiliary	78'-0"	above	78'-6"		
2359	527-J-HS-3021C	AF PUMP TURBINE TA01A CONTROL PANEL LP01C HAND SWITCH	078A15C	Auxiliary	78'-0"	above	78'-6"		
2360	527-J-HS-3021D	AF PUMP TURBINE TA01B CONTROL PANEL LP01D HAND SWITCH	078A15C	Auxiliary	78'-0"	above	78'-6"		
2361	527-J-HS-3022C	AF PUMP TURBINE TA01A CONTROL PANEL LP01C HAND SWITCH	078A15C	Auxiliary	78'-0"	above	78'-6"		
2362	527-J-HS-3022D	AF PUMP TURBINE TA01B CONTROL PANEL LP01D HAND SWITCH	078A15C	Auxiliary	78'-0"	above	78'-6"		
2363	527-J-LT-0003C	MS LINE DRIP LEG LEVEL TO AF PMP TBN TA01A	078A15C	Auxiliary	78'-0"	above	78'-6"		
2364	527-J-PT-0011C	MAIN STEAM LINE PRESSURE TO AFP TBN TA01A	078A15C	Auxiliary	78'-0"	above	78'-6"		
2365	527-J-PT-0013C	MAIN STEAM LINE PRESSURE TO AFP TBN TA01A	078A15C	Auxiliary	78'-0"	above	78'-6"		
2366	527-J-SI-3035C02	AF PUMP TURBINE A (TA01A) SPEED	078A15C	Auxiliary	78'-0"	above	78'-6"		
2367	527-J-SI-3036D02	AF PUMP TURBINE B (TA01B) SPEED	078A15C	Auxiliary	78'-0"	above	78'-6"		
2368	527-J-SIS-3035C	AF PUMP TURBINE A (TA01A) SPEED	078A15C	Auxiliary	78'-0"	above	78'-6"		
2369	527-J-SIS-3036D	AF PUMP TURBINE B (TA01B) SPEED	078A15C	Auxiliary	78'-0"	above	78'-6"		
2370	527-J-ST-3035C	AF PUMP TURBINE A (TA01A) SPEED	078A15C	Auxiliary	78'-0"	above	78'-6"		
2371	527-J-ST-3036D	AF PUMP TURBINE B (TA01B) SPEED	078A15C	Auxiliary	78'-0"	above	78'-6"		
2372	527-J-ZS-0009C	AF PUMP TURBINE STEAM ISOATION VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2373	542-J-FE-0049	AF FLOW TO S/G 2	078A15C	Auxiliary	78'-0"	above	78'-6"		
2374	542-J-FT-0049C	AF PMP PP01A DSCH FLOW TO SG 1	078A15C	Auxiliary	78'-0"	above	78'-6"		
2375	542-J-PT-0007C	AF PUMP PP01A SUCTION PRESSURE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2376	542-J-PT-0025C	AF PUMP PP01A DISCH PRESSURE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2377	542-J-TEW-0029	AF PUMP 01A DISCH. HDR	078A15C	Auxiliary	78'-0"	above	78'-6"		
2378	542-J-TEW-0033	AF PUMP 01A DISCH. HDR	078A15C	Auxiliary	78'-0"	above	78'-6"		
2379	542-J-ZS-1016	AF V1016 NOT FULLY CLOSED	078A15C	Auxiliary	78'-0"	above	78'-6"		
2380	542-J-ZTC-0036B	AF PP01A DISCH. FLOW TO SG 1	078A15C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (82 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2381	543-J-ZS-1621	AX V1621 NOT FULLY CLOSED	078A15C	Auxiliary	78'-0"	above	78'-6"		
2382	527-V-0007	AFPT STEAM DRIP LEG LEVEL CONTROL VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2383	527-V-0009	AF TURBINE STEAM ISOATION VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2384	527-V-1020A	S/G-1 Main STM→AFWP TBN A CHK VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2385	527-V-1021A	Aux STM→AFWP TBN A ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2386	527-V-1022A	Aux STM→AFWP TBN A CHK VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2387	527-V-1023A	AFWP TBN A DRN Pot LCV-007 B/P VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2388	527-V-1024A	AFWP TBN A DRN Pot LCV-007 B/P VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2389	527-V-1025A	AFWP TBN A DRN Pot LCV-007 Inlet ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2390	527-V-1026A	AFWP TBN A DRN Pot LCV007 Outlet ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2391	527-V-1027A	AFWP TBN A STM EXH LN DRN VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2392	527-V-2010A	S/G-1 MS→AFWP TBN A PIT 2C RT VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2393	527-V-2011A	S/G-1 MS→AFWP TBN A PT-011 RT VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2394	527-V-2012A	AFWP TBN A STM HDR LT-003 RT VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2395	527-V-2013A	AFWP TBN A STM HDR LT-003 RT VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2396	527-V-2016A	AFWP TBN A STM HDR DRN Pot CLN Out VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2397	527-V-2017A	AFWP TBN A STM HDR DRN Pot CLN Out VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2398	527-V-2018A	AFWP TBN A DRN Pot LCV-007 Inlet DRN VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2399	527-V-2019A	AFWP TBN A DRN Pot LCV-007 Inlet DRN VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2400	527-V-2044A	S/G-1 Main STM→AFWP TBN A Vent VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2401	527-V-2045A	S/G-1 Main STM→AFWP TBN A Vent VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2402	527-V-3007	PRESSURE REGULATING VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2403	527-V-3008	PRESSURE REGULATING VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2404	527-V-3009	TRIP AND THROTTLE VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2405	527-V-3010	TRIP AND THROTTLE VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2406	527-V-3011	GOVERNOR VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2407	527-V-3012	GOVERNOR VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (83 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2408	527-V-4020A	AFWP TBN A TT VALVE INITIAL STM DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2409	527-V-4020B	AFWP TBN B TT VALVE INITIAL STM DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2410	527-V-4021A	AFWP TBN A TT VALVE INITIAL STM DRNISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2411	527-V-4021B	AFWP TBN B TT VALVE INITIAL STM DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2412	527-V-4022A	AFWP TBN A GOV VALVE Outlet DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2413	527-V-4022B	AFWP TBN B GOV VALVE Outlet DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2414	527-V-4023A	AFWP TBN A GOV VALVE Outlet DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2415	527-V-4023B	AFWP TBN B GOV VALVE Outlet DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2416	527-V-4024A	AFWP TBN A GOV VALVE DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2417	527-V-4025A	AFWP TBN A GOV VALVE DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2418	527-V-4025B	AFWP TBN B GOV VALVE DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2419	527-V-4026A	AFWP TBN A CASING DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2420	527-V-4026B	AFWP TBN B CASING DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2421	527-V-4027A	AFWP TBN A CASING DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2422	527-V-4027B	AFWP TBN B CASING DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2423	527-V-4028A	AFWP TBN A CASING DRN B/P VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2424	527-V-4029A	AFWP TBN A STM EJEC→R DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2425	527-V-4029B	AFWP TBN B STM EJEC→R DRN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2426	527-V-5001	AFWP TBN A PRV Inlet Pr PI-3105 ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2427	527-V-5002	AFWP TBN B PRV Inlet Pr PI-3106 ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2428	527-V-5005	AFWP TBN A GOV Outlet PrN PI3107 ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2429	542-V-0036	AUX. FW MODULATING VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (84 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2430	542-V-1002A	AFWP 01A Suction VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2431	542-V-1004A	AFWP 01A Disch CHK VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2432	542-V-1006A	AFWP 01A Disch ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2433	542-V-1013A	AFWP 01A Recir ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2434	542-V-1014A	AFWP 01A Recir CHK VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2435	542-V-1016	TURBINE-DRIVEN AF PUMP FLOW TEST VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2436	542-V-1023A	CHEM INJ to AFWP 01A Disch LN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2437	542-V-1024A	CHEM INJ to AFWP 01A Disch LN CHK VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2438	542-V-2002A	AFWP 01A Suction Pr Test VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2439	542-V-2004A	AFWP 01A Suction Pr Test VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2440	542-V-2050A	AFWP 01A Suction Pr PT-007C RT VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2441	542-V-2054A	AFWP 01A Disch Pr PT-025C RT VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2442	542-V-2057A	AFWP 01A Disch Flow LN FT-049C RT VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2443	542-V-2058A	AFWP 01A Disch Flow LN FT-049C RT VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2444	542-V-2065A	AFWP 01A Recir Flow LN FT-014 RT VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2445	542-V-2066A	AFWP 01A Recir Flow LN FT-014 RT VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2446	542-V-2084A	AFWP 01A Disch Line DRN VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2447	542-V-2085A	AFWP 01A Disch Line DRN VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2448	542-V-2086A	AFWP 01A Recir Line DRN VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2449	542-V-2087A	AFWP 01A Recir Line DRN VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2450	542-V-2090A	AFWP 01A Disch Line Vent VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2451	542-V-2091A	AFWP 01A Disch Line Vent VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2452	542-V-2092A	AFWP 01A Disch Line Vent VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2453	542-V-2093A	AFWP 01A Disch Line Vent VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2454	542-V-2094A	AFWP 01A Disch Line Vent VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2455	542-V-2095A	AFWP 01A Disch Line Vent VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2456	542-V-2098A	AFWP 01A Emergency CLG WTR INJ LN CHK VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2457	542-V-2099A	AFWP 01A Emergency CLG WTR INJ LN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2458	542-V-2099B	AFWP 01B Emergency CLG WTR INJ LN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (85 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2459	542-V-2100A	AFWP 01A EMERGENCY CLG WTR INJ LN DRAIN VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2460	542-V-2101A	AFWP 01A EMERGENCY CLG WTR INJ LN DRAIN VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2461	543-V-1616	TBN AF PP Recir→AF STRG TK A Inlet VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2462	543-V-1621	AF STRG TK A & B Conn LN VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2463	543-V-1645	TRN A AUX FW PP(TBN) RECYC Pr test VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2464	543-V-1649	TRN A AUX FW PP(TBN) RECYC Pr test VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2465	543-V-2653	AUX FW STRG TK A,B CMN LN DRN VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2466	543-V-2678	AUX FW STRG TK A EMERGENCY CLG WTR INJ LN CHK VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2467	543-V-2679	AUX FW STRG TK A EMERGENCY CLG WTR INJ LN ISO VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2468	543-V-2685	AUX FW STRG TK A EMERGENCY CLG WTR INJ LN DRN VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2469	543-V-2687	AUX FW STRG TK A EMERGENCY CLG WTR INJ LN DRN VALVE	078A15C	Auxiliary	78'-0"	above	78'-6"		
2470	603-Y-VE-1571A	FIRE DAMPER	078A15C	Auxiliary	78'-0"	above	78'-6"		
2471	527-J-LP01D	AF PUMP TURBINE TA01B CONTROL PANEL	078A15D	Auxiliary	78'-0"	above	78'-6"	6" FD (1)	-
2472	527-M-EE71B	STEAM EJECTOR	078A15D	Auxiliary	78'-0"	above	78'-6"		
2473	527-M-OR01B	RESTRICTION ORIFICE B	078A15D	Auxiliary	78'-0"	above	78'-6"		
2474	527-M-OR71B	RESTRICTION ORIFICE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2475	527-M-OR72B	RESTRICTION ORIFICE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2476	527-M-OR73B	RESTRICTION ORIFICE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2477	527-M-TA01A	AF PUMP TURBINE A	078A15D	Auxiliary	78'-0"	above	78'-6"		
2478	527-M-TA01B	AF PUMP TURBINE B	078A15D	Auxiliary	78'-0"	above	78'-6"		
2479	527-M-TP71B	Trap	078A15D	Auxiliary	78'-0"	above	78'-6"		
2480	527-M-TP72A	Trap	078A15D	Auxiliary	78'-0"	above	78'-6"		
2481	527-M-TP72B	Trap	078A15D	Auxiliary	78'-0"	above	78'-6"		
2482	542-M-OR01B	MINI. FLOW RESTRICTION ORIFICE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2483	542-M-PP01B	AUXILIARY FEEDWATER PUMP D (TURBINE DRIVEN)	078A15D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (86 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2484	527-J-LT-0004D	MS LINE DRIP LEG LEVEL TO AF PMP TBN TA01B	078A15D	Auxiliary	78'-0"	above	78'-6"		
2485	527-J-PI-3105	AF PUMP TURBINE A TA01A	078A15D	Auxiliary	78'-0"	above	78'-6"		
2486	527-J-PI-3106	AF PUMP TURBINE A TA01B	078A15D	Auxiliary	78'-0"	above	78'-6"		
2487	527-J-PI-3107	AF PUMP TURBINE A TA01A	078A15D	Auxiliary	78'-0"	above	78'-6"		
2488	527-J-PI-3108	AF PUMP TURBINE A TA01B	078A15D	Auxiliary	78'-0"	above	78'-6"		
2489	527-J-PI-3109	AF PUMP TURBINE A TA01A	078A15D	Auxiliary	78'-0"	above	78'-6"		
2490	527-J-PI-3110	AF PUMP TURBINE A TA01B	078A15D	Auxiliary	78'-0"	above	78'-6"		
2491	527-J-PT-0012D	MAIN STEAM LINE PRESSURE TO AFP TBN TA01B	078A15D	Auxiliary	78'-0"	above	78'-6"		
2492	527-J-PT-0014D	MAIN STEAM LINE PRESSURE TO AFP TBN TA01B	078A15D	Auxiliary	78'-0"	above	78'-6"		
2493	527-J-SE-3035C	AF PUMP TURBINE A (TA01A) SPEED	078A15D	Auxiliary	78'-0"	above	78'-6"		
2494	527-J-SE-3036D	AF PUMP TURBINE B (TA01B) SPEED	078A15D	Auxiliary	78'-0"	above	78'-6"		
2495	527-J-SE-3045C	AF PUMP TURBINE A (TA01A) SPEED	078A15D	Auxiliary	78'-0"	above	78'-6"		
2496	527-J-SE-3046D	AF PUMP TURBINE B (TA01B) SPEED	078A15D	Auxiliary	78'-0"	above	78'-6"		
2497	527-J-ZS-0010D	AF PUMP TURBINE STEAM ISOATION VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2498	542-J-FE-0050	AF FLOW TO S/G 2	078A15D	Auxiliary	78'-0"	above	78'-6"		
2499	542-J-FT-0050D	AF PMP PP01B DSCH FLOW TO SG 2	078A15D	Auxiliary	78'-0"	above	78'-6"		
2500	542-J-PT-0008D	AF PUMP PP01B SUCTION PRESSURE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2501	542-J-PT-0026D	AF PUMP PP01B DISCH PRESSURE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2502	542-J-TEW-0030	AF PUMP 01B DISCH. HDR	078A15D	Auxiliary	78'-0"	above	78'-6"		
2503	542-J-TEW-0034	AF PUMP 01B DISCH. HDR	078A15D	Auxiliary	78'-0"	above	78'-6"		
2504	542-J-ZS-1017	AF V1017 NOT FULLY CLOSED	078A15D	Auxiliary	78'-0"	above	78'-6"		
2505	542-J-ZTC-0037A	AF PP01B DISCH. FLOW TO SG 2	078A15D	Auxiliary	78'-0"	above	78'-6"		
2506	543-J-ZS-1622	AX V1622 NOT FULLY CLOSED	078A15D	Auxiliary	78'-0"	above	78'-6"		
2507	527-V-0008	AFPT STEAM DRIP LEG LEVEL CONTROL VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2508	527-V-0010	AF TURBINE STEAM ISOATION VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2509	527-V-1020B	S/G-2 Main STM→AFWP TBN B CHK VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2510	527-V-1021B	Aux STM→AFWP TBN B ISO VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2511	527-V-1022B	Aux STM→AFWP TBN B CHK VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2512	527-V-1023B	AFWP TBN B DRN Pot LCV-008 B/P VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2513	527-V-1024B	AFWP TBN B DRN Pot LCV-008 B/P VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2514	527-V-1025B	AFWP TBN B DRN Pot LCV-008 Inlet ISO VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (87 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2515	527-V-1026B	AFWP TBN B DRN Pot LCV008 Outlet ISO VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2516	527-V-1027B	AFWP TBN B STM EXH LN DRN VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2517	527-V-2010B	S/G-2 MS→AFWP TBN B PIT 2D RT VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2518	527-V-2011B	S/G-2 MS→AFWP TBN B PT-012 RT VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2519	527-V-2012B	AFWP TBN B STM HDR LT-004 RT VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2520	527-V-2013B	AFWP TBN B STM HDR LT-004 RT VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2521	527-V-2016B	AFWP TBN B STM HDR DRN Pot CLN Out VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2522	527-V-2017B	AFWP TBN B STM HDR DRN Pot CLN Out VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2523	527-V-2018B	AFWP TBN B DRN Pot LCV-008 Inlet DRN VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2524	527-V-2019B	AFWP TBN B DRN Pot LCV-008 Inlet DRN VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2525	527-V-2044B	S/G-2 Main STM→AFWP TBN B Vent VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2526	527-V-2045B	S/G-2 Main STM→AFWP TBN B Vent VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2527	527-V-3015	AFWP TBN A EXT LN Safety Relief VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2528	527-V-3016	AFWP TBN B EXT LN Safety Relief VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2529	527-V-4024B	AFWP TBN B GOV VALVE DRN ISO VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2530	527-V-4028B	AFWP TBN B CASING DRN B/P VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2531	527-V-4040A	AFWP TBN A GLAND WTR COLLN TK DRN VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2532	527-V-4040B	AFWP TBN B GLAND WTR COLLN TK DRN VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2533	527-V-5003	AFWP TBN A EXT Pr PI-3109 ISO VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2534	527-V-5004	AFWP TBN A EXT Pr PI-3110 ISO VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2535	527-V-5006	AFWP TBN B GOV Outlet PrN PI3108 ISO VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2536	542-V-0037	AUX. FW MODULATING VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2537	542-V-1002B	AFWP 01B Suction VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2538	542-V-1004B	AFWP 01B Disch CHK VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2539	542-V-1006B	AFWP 01B Disch ISO VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2540	542-V-1013B	AFWP 01B Recir ISO VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2541	542-V-1014B	AFWP 01B Recir CHK VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (88 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2542	542-V-1017	TURBINE-DRIVEN AF PUMP FLOW TEST VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2543	542-V-1021B	CHEM INJ to AFWP 01B Disch LN ISO VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2544	542-V-1022B	CHEM INJ to AFWP 01B Disch LN CHK VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2545	542-V-2002B	AFWP 01B Suction Pr Test VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2546	542-V-2004B	AFWP 01B Suction Pr Test VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2547	542-V-2050B	AFWP 01B Suction Pr PT-008D RT VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2548	542-V-2054B	AFWP 01B Disch Pr PT-026D RT VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2549	542-V-2057B	AFWP 01B Disch Flow LN FT-050D RT VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2550	542-V-2058B	AFWP 01B Disch Flow LN FT-050D RT VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2551	542-V-2065B	AFWP 01B Recir Flow LN FT-015 RT VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2552	542-V-2066B	AFWP 01B Recir Flow LN FT-015 RT VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2553	542-V-2084B	AFWP 01B Disch Line DRN VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2554	542-V-2085B	AFWP 01B Disch Line DRN VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2555	542-V-2086B	AFWP 01B Recir Line DRN VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2556	542-V-2087B	AFWP 01B Recir Line DRN VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2557	542-V-2090B	AFWP 01B Disch Line Vent VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2558	542-V-2091B	AFWP 01B Disch Line Vent VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2559	542-V-2092B	AFWP 01B Disch Line Vent VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2560	542-V-2093B	AFWP 01B Disch Line Vent VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2561	542-V-2098B	AFWP 01B Emergency CLG WTR INJ LN CHK VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2562	542-V-2101B	AFWP 01B EMERGENCY CLG WTR INJ LN DRAIN VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2563	542-V-2109B	AFWP 01B EMERGENCY CLG WTR INJ LN DRAIN VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2564	543-V-1617	TBN AF PP Recir→AF STRG TK B Inlet VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2565	543-V-1622	AF STRG TK A & B Conn LN VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2566	543-V-1646	TRN B AUX FW PP(TBN) RECYC Pr test VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2567	543-V-1650	TRN B AUX FW PP(TBN) RECYC Pr test VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (89 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2568	543-V-2669	AUX FW STRG TK CMN LN DRN Globe VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2569	543-V-2680	AUX FW STRG TK B EMERGENCY CLG WTR INJ LN CHK VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2570	543-V-2681	AUX FW STRG TK B EMERGENCY CLG WTR INJ LN ISO VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2571	543-V-2686	AUX FW STRG TK B EMERGENCY CLG WTR INJ LN DRN VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2572	543-V-2688	AUX FW STRG TK B EMERGENCY CLG WTR INJ LN DRN VALVE	078A15D	Auxiliary	78'-0"	above	78'-6"		
2573	603-Y-VE-1570B	FIRE DAMPER	078A15D	Auxiliary	78'-0"	above	78'-6"		
2574	603-Y-VE-1571B	FIRE DAMPER	078A15D	Auxiliary	78'-0"	above	78'-6"		
2575	543-J-LI-0003A02	AUX. FEEDWATER STOR. TANK A LEVEL	078A19A	Auxiliary	78'-0"	above	78'-6"	4" FD (3)	10" EOL (1)
2576	543-J-LT-0003A	AUX FW STOR TANK "A" TK01A LEVEL	078A19A	Auxiliary	78'-0"	above	78'-6"		
2577	461-V-2101	Essential CHLR CNDSR 01A Inlet Vent VALVE	078A19A	Auxiliary	78'-0"	above	78'-6"		
2578	543-J-LI-0004B02	AUX. FEEDWATER STOR. TANK B LEVEL	078A19B	Auxiliary	78'-0"	above	78'-6"	4" FD (2)	-
2579	543-J-LT-0004B	AUX FW STOR TANK "B" TK01B LEVEL	078A19B	Auxiliary	78'-0"	above	78'-6"		
2580	461-V-2141	ESSEN CHLR CNDSR 01B Inlet LN Vent VALVE	078A19B	Auxiliary	78'-0"	above	78'-6"		
2581	542-M-OR02A	MINI. FLOW RESTRICTION ORIFICE	078A20A	Auxiliary	78'-0"	above	78'-6"	6" FD (1)	-
2582	542-M-PP02A	AUXILIARY FEEDWATER PUMP A (MOTOR DRIVEN)	078A20A	Auxiliary	78'-0"	above	78'-6"		
2583	607-M-HV33A	CUBICLE COOLER	078A20A	Auxiliary	78'-0"	above	78'-6"		
2584	542-J-FE-0047	AF FLOW TO S/G 1	078A20A	Auxiliary	78'-0"	above	78'-6"		
2585	542-J-FT-0047A	AF PMP PP02A DSCH FLOW TO SG 1	078A20A	Auxiliary	78'-0"	above	78'-6"		
2586	542-J-PT-0005A	AF PUMP PP02A SUCTION PRESSURE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2587	542-J-PT-0023A	AF PUMP PP02A DISCH PRESSURE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2588	542-J-TEW-0027	AF PUMP 2A DISCH. HDR	078A20A	Auxiliary	78'-0"	above	78'-6"		
2589	542-J-TEW-0031	AF PUMP 2A DISCH, HDR	078A20A	Auxiliary	78'-0"	above	78'-6"		
2590	542-J-ZS-1015	AF V1015 NOT FULLY CLOSED	078A20A	Auxiliary	78'-0"	above	78'-6"		
2591	542-J-ZTC-0035A	AF PP02A DISCH. FLOW TO SG 1	078A20A	Auxiliary	78'-0"	above	78'-6"		
2592	543-J-ZS-1601	AX V1601 NOT FULLY OPEN	078A20A	Auxiliary	78'-0"	above	78'-6"		
2593	543-J-ZS-1623	AX V1623 NOT FULLY CLOSED	078A20A	Auxiliary	78'-0"	above	78'-6"		
2594	607-J-TE-0085A	MD AFW PUMP ROOM TEMP	078A20A	Auxiliary	78'-0"	above	78'-6"		
2595	607-J-TI-0085A	MDA FW PUMP RM (078-A20A)	078A20A	Auxiliary	78'-0"	above	78'-6"		
2596	633-J-TW-0241	COOLING COIL VO-CW33A OUTLET	078A20A	Auxiliary	78'-0"	above	78'-6"		
2597	633-J-TW-0243	COOLING COIL VO-CW33A INLET	078A20A	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (90 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2598	542-V-0035	AUX. FW MODULATING VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2599	542-V-1001A	AFWP 02A Suction VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2600	542-V-1003A	AFWP 02A Disch CHK VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2601	542-V-1005A	AFWP 02A Disch ISO VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2602	542-V-1011A	AFWP 02A Recir ISO VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2603	542-V-1012A	AFWP 02A Recir CHK VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2604	542-V-1015	MOTOR-DRIVEN AF PUMP FLOW TEST VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2605	542-V-1021A	CHEM INJ to AFWP 02A Disch LN ISO VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2606	542-V-1022A	CHEM INJ to AFWP 02A Disch LN CHK VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2607	542-V-2001A	AFWP 02A Suction Pr Test VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2608	542-V-2003A	AFWP 02A Suction Pr Test VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2609	542-V-2049A	AFWP 02A Suction Pr PT-005A RT VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2610	542-V-2053A	AFWP 02A Disch Pr PT-023A RT VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2611	542-V-2055A	AFWP 02A Disch Flow LN FT-047A RT VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2612	542-V-2056A	AFWP 02A Disch Flow LN FT-047A RT VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2613	542-V-2063A	AFWP 02A Recir Flow LN FT-013 RT VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2614	542-V-2064A	AFWP 02A Recir Flow LN FT-013 RT VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2615	542-V-2072A	AFWP 02A Disch Line Vent VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2616	542-V-2073A	AFWP 02A Disch Line Vent VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2617	542-V-2074A	AFWP 02A Disch Line DRN VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2618	542-V-2075A	AFWP 02A Disch Line DRN VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2619	542-V-2078A	AFWP 02A Recir Line DRN VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2620	542-V-2079A	AFWP 02A Recir Line DRN VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2621	542-V-2096A	AFWP 01A Disch Line DRN VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2622	542-V-2097A	AFWP 01A Disch Line DRN VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2623	543-V-1601	AF STRG TK A→TRN A AF PP Supply VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2624	543-V-1603	MTR AF PP Recir→AF STRG TK A Inlet VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2625	543-V-1623	CST→Train A AUX FW PP Suct GATE VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2626	543-V-1643	TRN A AUX FW PP(MTR) RECYC Pr test VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (91 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2627	543-V-1647	TRN A AUX FW PP(MTR) RECYC Pr test VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2628	543-V-2641	AUX FW STRG TK A→AFWST B LN Glove VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2629	543-V-2645	AUX FW STRG TK A EQUIP DRN VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2630	543-V-2652	AUX FW STRG TK A DRN LN Globe VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2631	543-V-2656	AUX FW STRG TK A→TRN A DRN LN Globe VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2632	543-V-2661	AUX FW STRG TK A HVAC Vent LN VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2633	543-V-2665	AUX FW STRG TK A HVAC Vent Test VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2634	633-V-1171A	M/D AFP RM(A) C-CLR Outlet VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2635	633-V-1172A	M/D AFP RM(A) C-CLR Inlet throt VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2636	633-V-2171A	M/D AFP RM(A) C-CLR Outlet PZR Test VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2637	633-V-2172A	M/D AFP RM(A) C-CLR Inlet PZR Test VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2638	633-V-2271A	MDP RM HV33A ECW Outlet Vent VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2639	633-V-2272A	MDP RM HV33A ECW Inlet DRN VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2640	633-V-2295A	MDP RM HV33A ECW Outlet DRN VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2641	633-V-2371A	MDP RM HV33A ECW Outlet Test Conn VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2642	633-V-2372A	MDP RM HV33A ECW Inlet Test Conn VALVE	078A20A	Auxiliary	78'-0"	above	78'-6"		
2643	542-M-OR02B	MINI. FLOW RESTRICTION ORIFICE	078A20B	Auxiliary	78'-0"	above	78'-6"	4" FD (2)	-
2644	542-M-PP02B	AUXILIARY FEEDWATER PUMP B (MOTOR DRIVEN)	078A20B	Auxiliary	78'-0"	above	78'-6"		
2645	607-M-HV33B	CUBICLE COOLER	078A20B	Auxiliary	78'-0"	above	78'-6"		
2646	542-J-FE-0048	AF FLOW TO S/G 1	078A20B	Auxiliary	78'-0"	above	78'-6"		
2647	542-J-FT-0048B	AF PMP PP02B DSCH FLOW TO SG 2	078A20B	Auxiliary	78'-0"	above	78'-6"		
2648	542-J-PT-0006B	AF PUMP PP02B SUCTION PRESSURE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2649	542-J-PT-0024B	AF PUMP PP02B DISCH PRESSURE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2650	542-J-TEW-0028	AF PUMP 2B DISCH. HDR	078A20B	Auxiliary	78'-0"	above	78'-6"		
2651	542-J-TEW-0032	AF PUMP 2B DISCH, HDR	078A20B	Auxiliary	78'-0"	above	78'-6"		
2652	542-J-ZS-1018	AF V1018 NOT FULLY CLOSED	078A20B	Auxiliary	78'-0"	above	78'-6"		
2653	542-J-ZTC-0038B	AF PP02B DISCH. FLOW TO SG 2	078A20B	Auxiliary	78'-0"	above	78'-6"		
2654	543-J-ZS-1602	AX V1602 NOT FULLY OPEN	078A20B	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (92 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2655	543-J-ZS-1624	AX V1624 NOT FULLY CLOSED	078A20B	Auxiliary	78'-0"	above	78'-6"		
2656	607-J-TE-0086B	MD AFW PUMP ROOM TEMP	078A20B	Auxiliary	78'-0"	above	78'-6"		
2657	607-J-TI-0086B	MDA FW PUMP RM (078-A20B)	078A20B	Auxiliary	78'-0"	above	78'-6"		
2658	633-J-TW-0242	COOLING COIL VO-CW33B OUTLET	078A20B	Auxiliary	78'-0"	above	78'-6"		
2659	633-J-TW-0244	COOLING COIL VO-CW33B INLET	078A20B	Auxiliary	78'-0"	above	78'-6"		
2660	455-V-1136	Wet L/U Recir PP B Suct ISO VALVE(outside)	078A20B	Auxiliary	78'-0"	above	78'-6"		
2661	542-V-0038	AUX. FW MODULATING VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2662	542-V-1001B	AFWP 02B Suction VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2663	542-V-1003B	AFWP 02B Disch CHK VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2664	542-V-1005B	AFWP 02B Disch ISO VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2665	542-V-1011B	AFWP 02B Recir ISO VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2666	542-V-1012B	AFWP 02B Recir CHK VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2667	542-V-1018	MOTOR-DRIVEN AF PUMP FLOW TEST VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2668	542-V-1023B	CHEM INJ to AFWP 02B Disch LN ISO VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2669	542-V-1024B	CHEM INJ to AFWP 02B Disch LN CHK VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2670	542-V-2001B	AFWP 02B Suction Pr Test VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2671	542-V-2003B	AFWP 02B Suction Pr Test VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2672	542-V-2049B	AFWP 02B Suction Pr PT-006B RT VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2673	542-V-2053B	AFWP 02B Disch Pr PT-024B RT VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2674	542-V-2055B	AFWP 02B Disch Flow LN FT-048B RT VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2675	542-V-2056B	AFWP 02B Disch Flow LN FT-048B RT VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2676	542-V-2063B	AFWP 02B Recir Flow LN FT-016 RT VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2677	542-V-2064B	AFWP 02B Recir Flow LN FT-016 RT VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2678	542-V-2072B	AFWP 02B Disch Line Vent VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2679	542-V-2073B	AFWP 02B Disch Line Vent VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2680	542-V-2074B	AFWP 02B Disch Line DRN VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2681	542-V-2075B	AFWP 02B Disch Line DRN VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2682	542-V-2078B	AFWP 02B Recir Line DRN VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2683	542-V-2079B	AFWP 02B Recir Line DRN VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2684	543-V-1602	AF STRG TK B→TRN B AF PP Supply VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2685	543-V-1604	MTR AF PP Recir→AF STRG TK B Inlet VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (93 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2686	543-V-1624	CST→Train B AUX FW PP Suct GATE VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2687	543-V-1644	TRN B AUX FW PP(MTR) RECYC Pr test VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2688	543-V-1648	TRN B AUX FW PP(MTR) RECYC Pr test VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2689	543-V-2643	AUX FW STRG TK B→CNDSR POL Area LN VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2690	543-V-2646	AUX FW STRG TK B EQUIP DRN VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2691	543-V-2654	AUX FW STRG TK B→TRN B DRN LN Globe VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2692	543-V-2659	AUX FW STRG TK B→TRN B DRN LN Globe VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2693	543-V-2664	AUX FW STRG TK B HVAC Vent Test VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2694	543-V-2666	AUX FW STRG TK B HVAC Vent Test VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2695	633-V-1171B	M/D AFP RM(B) C-CLR Outlet VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2696	633-V-1172B	M/D AFP RM(B) C-CLR Inlet throt VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2697	633-V-2171B	M/D AFP RM(B) C-CLR Outlet PZR Test VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2698	633-V-2172B	M/D AFP RM(B) C-CLR Inlet PZR Test VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2699	633-V-2271B	MDP RM HV33B ECW Outlet Vent VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2700	633-V-2272B	MDP RM HV33B ECW Inlet DRN VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2701	633-V-2371B	MDP RM HV33B ECW Outlet Test Conn VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2702	633-V-2372B	MDP RM HV33B ECW Inlet Test Conn VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2703	633-V-2451B	MDAFW PP RM CW33B Outlet DRN VALVE	078A20B	Auxiliary	78'-0"	above	78'-6"		
2704	441-J-AX-0344B	SI PUMPS 1 & 3 MINIFLOW LINE	078A21A	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
2705	441-V-0465	SIP MINIFLOW SAMPLE VALVE	078A21A	Auxiliary	78'-0"	above	78'-6"		
2706	441-V-0468	SIP 02C to Hot Leg INJ LN Relief VALVE	078A21A	Auxiliary	78'-0"	above	78'-6"		
2707	491-V-0008	SI PUMP 1&3 MINI FLOW SAMPLE	078A21A	Auxiliary	78'-0"	above	78'-6"		
2708	606-Y-VK-1514A	FIRE DAMPER	078A21A	Auxiliary	78'-0"	above	78'-6"		
2709	441-V-0290	SIP 02B/02D to SIT Fill & EDT LN ISO VALVE	078A21B	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	10" EOL (1)
2710	441-V-0292	SIT Fill & EDT LN Relief VALVE	078A21B	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (94 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2711	441-V-0294	SIT Fill & EDT LN Grab SMPL Test Conn VALVE	078A21B	Auxiliary	78'-0"	above	78'-6"		
2712	441-V-0295	SIT Fill & EDT LN Grab SMPL Test Conn VALVE	078A21B	Auxiliary	78'-0"	above	78'-6"		
2713	606-Y-VK-1517B	FIRE DAMPER	078A21B	Auxiliary	78'-0"	above	78'-6"		
2714	603-M-HV05A	CUBICLE COOLER	078A22A	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
2715	745-J-LX01A	LOOP CONTROLLER CABINET (CH. AE)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2716	745-J-LX02A	LOOP CONTROLLER CABINET (CH. AE)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2717	745-J-LX03A	LOOP CONTROLLER CABINET (CH. AE)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2718	745-J-LX04A	LOOP CONTROLLER CABINET (CH. AE)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2719	745-J-LX06A	LOOP CONTROLLER CABINET (CH. AE)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2720	441-J-FS-0302A01	SI SHUTDOWN CLG PUMP PP01A DISCHARGE FLOW LOW	078A22A	Auxiliary	78'-0"	above	78'-6"		
2721	441-J-FS-0302A02	SI SHUTDOWN CLG PUMP PP01A DISCHARGE FLOW LO-LO	078A22A	Auxiliary	78'-0"	above	78'-6"		
2722	441-J-FS-0302A03	SI SHUTDOWN CLG PUMP PP01A DISCHARGE FLOW HI	078A22A	Auxiliary	78'-0"	above	78'-6"		
2723	441-J-FY-0302A01	SHUTDOWN COOLING PUMP 1 DISCH	078A22A	Auxiliary	78'-0"	above	78'-6"		
2724	441-J-FY-0302A02	SHUTDOWN COOLING PUMP 1 DISCH	078A22A	Auxiliary	78'-0"	above	78'-6"		
2725	441-J-TS-0300A	SHUTDOWN COOLING HX(HE01A) INLET TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2726	441-J-TS-0301A	SHUTDOWN COOLING HX(HE01A) OUTLET TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2727	441-J-TY-0300A01	SHUTDOWN COOLING HX(HE01A) INLET TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2728	441-J-TY-0301A01	SHUTDOWN COOLING HX(HE01A) OUTLET TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2729	441-J-TY-0302A	SHUTDOWN COOLING HX 1 (HE01A) OUTLET TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2730	441-J-ZY-0310A02	SDCHX 1 OUTLET FLOW CONTROL VALVE - 310	078A22A	Auxiliary	78'-0"	above	78'-6"		
2731	441-J-ZY-0312A02	SDCHX 1 BYPASS FLOW CTRL VALVE - 312	078A22A	Auxiliary	78'-0"	above	78'-6"		
2732	441-J-ZY-0314A02	SCS TEST RETURN ISO VALVE - 314	078A22A	Auxiliary	78'-0"	above	78'-6"		
2733	447-J-LS-0401A01	IRWST TANK LEVEL2	078A22A	Auxiliary	78'-0"	above	78'-6"		
2734	447-J-LS-0401A02	IRWST TANK LEVEL2	078A22A	Auxiliary	78'-0"	above	78'-6"		
2735	447-J-LS-0401A03	IRWST TANK LEVEL2	078A22A	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (95 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2736	447-J-LS-0402B01	IRWST TANK LEVEL1	078A22A	Auxiliary	78'-0"	above	78'-6"		
2737	447-J-LS-0402B02	IRWST TANK LEVEL1	078A22A	Auxiliary	78'-0"	above	78'-6"		
2738	447-J-LS-0402B03	IRWST TANK LEVEL1	078A22A	Auxiliary	78'-0"	above	78'-6"		
2739	447-J-LY-0395A	HOLDUP VOL TK TK02 LEVEL(WIDE)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2740	447-J-LY-0397A	REACTOR CAVITY LEVEL 1(WIDE)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2741	447-J-LY-0401A02	IRWST TANK LEVEL2	078A22A	Auxiliary	78'-0"	above	78'-6"		
2742	447-J-LY-0403A	HOLD UP VOLUME TANK WIDE RANGE LEVEL2	078A22A	Auxiliary	78'-0"	above	78'-6"		
2743	447-J-LY-0405A	REACTOR CAVITY LEVEL1	078A22A	Auxiliary	78'-0"	above	78'-6"		
2744	447-J-PY-0390A02	IRWST TANK PRESSURE 1	078A22A	Auxiliary	78'-0"	above	78'-6"		
2745	447-J-PY-0401A01	IRWST TK01 LEVEL 2 PRESSURE 1 (ACCIDENT)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2746	447-J-PY-0403A	HVT TK02 WIDE LEVEL 2 PRESSURE 1 (ACCIDENT)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2747	447-J-PY-0405A	REACTOR CAVITY LEVEL 1 PRESSURE 1 (ACCIDENT)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2748	447-J-PY-0411A01	IRWST TK01 LEVEL 2 PRESSURE 2 (ACCIDENT)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2749	447-J-PY-0412B01	IRWST TK01 LEVEL 1 PRESSURE 2 (ACCIDENT)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2750	447-J-PY-0417A	HVT & RC LEVEL 2 PRESSURE 2 (ACCIDENT)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2751	447-J-TY-0390A01	IRWST TANK TEMP 1	078A22A	Auxiliary	78'-0"	above	78'-6"		
2752	447-J-TY-0390A02	IRWST TANK TEMP 1	078A22A	Auxiliary	78'-0"	above	78'-6"		
2753	447-J-TY-0390A03	IRWST TANK TEMP 1	078A22A	Auxiliary	78'-0"	above	78'-6"		
2754	447-J-TY-0392A01	IRWST TANK TEMP 3	078A22A	Auxiliary	78'-0"	above	78'-6"		
2755	447-J-TY-0392A02	IRWST TANK TEMP 3	078A22A	Auxiliary	78'-0"	above	78'-6"		
2756	447-J-TY-0392A03	IRWST TANK TEMP 3	078A22A	Auxiliary	78'-0"	above	78'-6"		
2757	451-J-PS-0212A	CV CHARGING LINE PRESS	078A22A	Auxiliary	78'-0"	above	78'-6"		
2758	451-J-PY-0212A	CV CHARGING LINE PRESS	078A22A	Auxiliary	78'-0"	above	78'-6"		
2759	461-J-FS-0047A	CCW PUMP PP01A DISCH. FLOW	078A22A	Auxiliary	78'-0"	above	78'-6"		
2760	461-J-FY-0047A01	CCW PUMP PP01A DISCH. FLOW	078A22A	Auxiliary	78'-0"	above	78'-6"		
2761	461-J-FY-0047A02	CCW PUMP PP01A DISCH. FLOW	078A22A	Auxiliary	78'-0"	above	78'-6"		
2762	463-J-LS-0001A01	SPENT FUEL POOL LEVEL (TRAIN A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2763	463-J-LS-0001A02	SPENT FUEL POOL LEVEL (TRAIN A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2764	463-J-LS-0001A03	SPENT FUEL POOL LEVEL (TRAIN A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2765	463-J-LS-0001A04	SPENT FUEL POOL LEVEL (TRAIN A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2766	463-J-LS-0001A05	SPENT FUEL POOL LEVEL (TRAIN A)	078A22A	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (96 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2767	463-J-LY-0001A01	SPENT FUEL POOL LEVEL (TRAIN A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2768	463-J-TS-0007A	SFP RETURN TEMPERATURE	078A22A	Auxiliary	78'-0"	above	78'-6"		
2769	463-J-TY-0007A01	SFP RETURN TEMPERATURE	078A22A	Auxiliary	78'-0"	above	78'-6"		
2770	481-J-LS-0050A	FLOOR DRAIN SUMP (QUAD.A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2771	481-J-LS-0079A	SI PUMP A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2772	481-J-LS-0085A	SC PUMP A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2773	481-J-LY-0050A	FLOOR DRAIN SUMP (QUAD.A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2774	481-J-LY-0079A02	SI PUMP A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2775	481-J-LY-0085A	SC PUMP A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2776	542-J-FY-0047A01	AF PMP PP02A DSCH FLOW TO SG 1	078A22A	Auxiliary	78'-0"	above	78'-6"		
2777	542-J-FY-0047A02	AF PMP PP02B DSCH FLOW TO SG 2	078A22A	Auxiliary	78'-0"	above	78'-6"		
2778	542-J-LC-0035A	AF PP02A DISCH. FLOW TO SG 1	078A22A	Auxiliary	78'-0"	above	78'-6"		
2779	542-J-LC-0037A	AF PP01B DISCH. FLOW TO SG 2	078A22A	Auxiliary	78'-0"	above	78'-6"		
2780	542-J-LY-0035A	AF PP02A DISCH. FLOW TO SG 1	078A22A	Auxiliary	78'-0"	above	78'-6"		
2781	542-J-LY-0037A	AF PP01B DISCH. FLOW TO SG 2	078A22A	Auxiliary	78'-0"	above	78'-6"		
2782	542-J-PS-0005A01	AFP PP02A SUCTION PRESS	078A22A	Auxiliary	78'-0"	above	78'-6"		
2783	542-J-PS-0005A02	AFP PP02A SUCTION PRESS	078A22A	Auxiliary	78'-0"	above	78'-6"		
2784	542-J-PS-0023A	AFP PP02A DISCH. PRESS	078A22A	Auxiliary	78'-0"	above	78'-6"		
2785	542-J-PY-0005A	AFP PP02A SUCTION PRESS	078A22A	Auxiliary	78'-0"	above	78'-6"		
2786	542-J-PY-0023A	AFP PP02A DISCH. PRESS	078A22A	Auxiliary	78'-0"	above	78'-6"		
2787	542-J-TS-0053A	SG 1 AF LINE	078A22A	Auxiliary	78'-0"	above	78'-6"		
2788	542-J-TY-0053A	SG 1 AF LINE	078A22A	Auxiliary	78'-0"	above	78'-6"		
2789	542-J-ZY-0035A	AF PP02A DISCH. FLOW TO SG 1	078A22A	Auxiliary	78'-0"	above	78'-6"		
2790	542-J-ZY-0037A	AF PP01B DISCH. FLOW TO SG 2	078A22A	Auxiliary	78'-0"	above	78'-6"		
2791	543-J-LS-0003A01	AFW SOTRAGE TANK A LEVEL	078A22A	Auxiliary	78'-0"	above	78'-6"		
2792	543-J-LS-0003A02	AFW SOTRAGE TANK A LEVEL	078A22A	Auxiliary	78'-0"	above	78'-6"		
2793	543-J-LS-0003A03	AFW SOTRAGE TANK A LEVEL	078A22A	Auxiliary	78'-0"	above	78'-6"		
2794	543-J-LS-0003A04	AFW SOTRAGE TANK A LEVEL	078A22A	Auxiliary	78'-0"	above	78'-6"		
2795	543-J-LS-0003A05	AFW SOTRAGE TANK A LEVEL	078A22A	Auxiliary	78'-0"	above	78'-6"		
2796	543-J-LS-0003A06	AFW SOTRAGE TANK A LEVEL	078A22A	Auxiliary	78'-0"	above	78'-6"		
2797	543-J-LS-0003A07	AFW SOTRAGE TANK A LEVEL	078A22A	Auxiliary	78'-0"	above	78'-6"		
2798	543-J-LS-0003A08	AFW SOTRAGE TANK A LEVEL	078A22A	Auxiliary	78'-0"	above	78'-6"		
2799	543-J-LY-0003A01	AFW SOTRAGE TANK A LEVEL	078A22A	Auxiliary	78'-0"	above	78'-6"		
2800	543-J-LY-0003A02	AFW SOTRAGE TANK A LEVEL	078A22A	Auxiliary	78'-0"	above	78'-6"		
2801	543-J-LY-0005A01	AFW SOTRAGE TANK B LEVEL	078A22A	Auxiliary	78'-0"	above	78'-6"		
2802	543-J-LY-0005A02	AFW SOTRAGE TANK B LEVEL	078A22A	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (97 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2803	603-J-HS-0105A	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH03A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2804	603-J-TE-0109A	MUX A RM TEMP.	078A22A	Auxiliary	78'-0"	above	78'-6"		
2805	603-J-TS-0105A01	CH.A DC&IP EQUIP. RM (078-A04C)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2806	603-J-TS-0105A02	CH.A DC&IP EQUIP. RM (078-A04C)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2807	603-J-TS-0105A03	CH.A DC&IP EQUIP. RM (078-A04C)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2808	603-J-TS-0109A01	MUX A RM (078-A22A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2809	603-J-TS-0109A02	MUX A RM (078-A22A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2810	603-J-TS-0109A03	MUX A RM (078-A22A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2811	603-J-TS-0111A01	CLASS-1E MCC 01A RM (078-A24A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2812	603-J-TS-0111A02	CLASS-1E MCC 01A RM (078-A24A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2813	603-J-TS-0111A03	CLASS-1E MCC 01A RM (078-A24A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2814	603-J-TS-0113A01	CLASS-1E SWITCHGEAR 01A RM CC (078-A25A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2815	603-J-TS-0113A02	CLASS-1E SWITCHGEAR 01A RM CC (078-A25A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2816	603-J-TS-0113A03	CLASS-1E SWITCHGEAR 01A RM CC (078-A25A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2817	603-J-TY-0105A	CH.A DC&IP EQUIP. RM (078-A04C)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2818	603-J-TY-0109A	MUX A RM (078-A22A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2819	603-J-TY-0111A	CLASS-1E MCC 01A RM (078-A24A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2820	603-J-TY-0113A	CLASS-1E SWITCHGEAR 01A RM CC (078-A25A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2821	606-J-FC-0045A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A AIR FLOW	078A22A	Auxiliary	78'-0"	above	78'-6"		
2822	606-J-FS-0009A	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A AIR FLOW	078A22A	Auxiliary	78'-0"	above	78'-6"		
2823	606-J-FS-0045A01	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A AIR FLOW	078A22A	Auxiliary	78'-0"	above	78'-6"		
2824	606-J-FS-0045A02	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A AIR FLOW	078A22A	Auxiliary	78'-0"	above	78'-6"		
2825	606-J-FY-0009A	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A AIR FLOW	078A22A	Auxiliary	78'-0"	above	78'-6"		
2826	606-J-FY-0045A01	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A AIR FLOW	078A22A	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (98 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2827	606-J-FY-0045A02	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A AIR FLOW	078A22A	Auxiliary	78'-0"	above	78'-6"		
2828	606-J-PDS-0033A01	GENERAL ACCESS AREA (055-A19A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2829	606-J-PDS-0033A02	GENERAL ACCESS AREA (055-A19A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2830	606-J-PDY-0033A	GENERAL ACCESS AREA (055-A19A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2831	606-J-TC-3007A	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2832	606-J-TS-0201A01	CHARGING PUMP ROOM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2833	606-J-TS-0201A02	CHARGING PUMP ROOM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2834	606-J-TS-0201A03	CHARGING PUMP ROOM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2835	606-J-TS-0211A01	SI PP ROOM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2836	606-J-TS-0211A02	SI PP ROOM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2837	606-J-TS-0211A03	SI PP ROOM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2838	606-J-TS-0213A01	CCW PP ROOM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2839	606-J-TS-0213A02	CCW PP ROOM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2840	606-J-TS-0213A03	CCW PP ROOM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2841	606-J-TS-0219A01	SC PP & MINIFLOW HX RM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2842	606-J-TS-0219A02	SC PP & MINIFLOW HX RM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2843	606-J-TS-0219A03	SC PP & MINIFLOW HX RM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2844	606-J-TS-0221A01	SC HX RM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2845	606-J-TS-0221A02	SC HX RM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2846	606-J-TS-0221A03	SC HX RM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2847	606-J-TS-3007A	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2848	606-J-TS-3023A01	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A HEATING COIL HC01A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2849	606-J-TS-3023A02	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A HEATING COIL HC01A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2850	606-J-TS-3054A01	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A HEATING COIL HC02A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2851	606-J-TS-3054A02	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A HEATING COIL HC02A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2852	606-J-TS-3054C01	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A HEATING COIL HC02A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2853	606-J-TS-3054C02	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A HEATING COIL HC02A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2854	606-J-TY-0201A	CHARGING PUMP ROOM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (99 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2855	606-J-TY-0211A	SI PP ROOM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2856	606-J-TY-0213A	CCW PP ROOM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2857	606-J-TY-0219A	SC PP & MINIFLOW HX RM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2858	606-J-TY-0221A	SC HX RM TEMP	078A22A	Auxiliary	78'-0"	above	78'-6"		
2859	606-J-TY-3007A01	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2860	606-J-TY-3007A02	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2861	606-J-TY-3021A01	CONTROLLED AREA I EXH. ACU AU01A INLET	078A22A	Auxiliary	78'-0"	above	78'-6"		
2862	606-J-TY-3023A01	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A HEATING COIL HC01A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2863	606-J-TY-3033A01	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A CARBON ADSBR FT04A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2864	606-J-TY-3051A01	CONTROLLED AREA I EXH. ACU AU02A INLET	078A22A	Auxiliary	78'-0"	above	78'-6"		
2865	606-J-TY-3064A01	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A CARBONADSBR FT09A	078A22A	Auxiliary	78'-0"	above	78'-6"		
2866	607-J-TS-0081A01	ESSENTIAL CHILLER RM (078-A11C)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2867	607-J-TS-0081A02	ESSENTIAL CHILLER RM (078-A11C)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2868	607-J-TS-0081A03	ESSENTIAL CHILLER RM (078-A11C)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2869	607-J-TS-0085A01	MDA FW PUMP RM (078-A20A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2870	607-J-TS-0085A02	MDA FW PUMP RM (078-A20A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2871	607-J-TS-0085A03	MDA FW PUMP RM (078-A20A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2872	607-J-TY-0081A	ESSENTIAL CHILLER RM (078-A11C)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2873	607-J-TY-0085A	MDA FW PUMP RM (078-A20A)	078A22A	Auxiliary	78'-0"	above	78'-6"		
2874	633-J-TW-0121	COOLING COIL VE-CW05A OUTLET	078A22A	Auxiliary	78'-0"	above	78'-6"		
2875	633-J-TW-0123	COOLING COIL VE-CW05A INLET	078A22A	Auxiliary	78'-0"	above	78'-6"		
2876	633-V-1111A	MUX A RM C-CLR Outlet VALVE	078A22A	Auxiliary	78'-0"	above	78'-6"		
2877	633-V-1112A	MUX A RM C-CLR Inlet throt VALVE	078A22A	Auxiliary	78'-0"	above	78'-6"		
2878	633-V-2111A	MUX A RM C-CLR Outlet PZR Test VALVE	078A22A	Auxiliary	78'-0"	above	78'-6"		
2879	633-V-2112A	MUX A RM C-CLR Inlet PZR Test VALVE	078A22A	Auxiliary	78'-0"	above	78'-6"		
2880	633-V-2188A	MUX A RM C-CLR Outlet DRN VALVE	078A22A	Auxiliary	78'-0"	above	78'-6"		
2881	633-V-2211A	MUX A RM HV05A ECW Outlet Vent VALVE	078A22A	Auxiliary	78'-0"	above	78'-6"		
2882	633-V-2212A	MUX A RM HV05A ECW Inlet DRN VALVE	078A22A	Auxiliary	78'-0"	above	78'-6"		
2883	633-V-2311A	MUX A RM HV05A ECW Outlet Test Conn VALVE	078A22A	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (100 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2884	633-V-2312A	MUX A RM HV05A ECW Inlet Test Conn VALVE	078A22A	Auxiliary	78'-0"	above	78'-6"		
2885	603-M-HV05B	CUBICLE COOLER	078A22B	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
2886	745-J-LX01B	LOOP CONTROLLER CABINET (CH. BE)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2887	745-J-LX02B	LOOP CONTROLLER CABINET (CH. BE)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2888	745-J-LX03B	LOOP CONTROLLER CABINET (CH. BE)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2889	745-J-LX04B	LOOP CONTROLLER CABINET (CH. BE)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2890	745-J-LX06B	LOOP CONTROLLER CABINET (CH. BE)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2891	441-J-FS-0305B01	SI SHUTDOWN CLG PUMP PP01B DISCHARGE FLOW LOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2892	441-J-FS-0305B02	SI SHUTDOWN CLG PUMP PP01B DISCHARGE FLOW LO-LO	078A22B	Auxiliary	78'-0"	above	78'-6"		
2893	441-J-FS-0305B03	SI SHUTDOWN CLG PUMP PP01B DISCHARGE FLOW HI	078A22B	Auxiliary	78'-0"	above	78'-6"		
2894	441-J-FY-0305B01	SHUTDOWN COOLING PUMP 2 DISCH	078A22B	Auxiliary	78'-0"	above	78'-6"		
2895	441-J-FY-0305B02	SHUTDOWN COOLING PUMP 2 DISCH	078A22B	Auxiliary	78'-0"	above	78'-6"		
2896	441-J-TS-0303B	SHUTDOWN COOLING HX(HE01B) INLET TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
2897	441-J-TS-0304B	SHUTDOWN COOLING HX(HE01B) OUTLET TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
2898	441-J-TY-0303B01	SHUTDOWN COOLING HX(HE01B) INLET TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
2899	441-J-TY-0304B01	SHUTDOWN COOLING HX(HE01B) OUTLET TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
2900	441-J-TY-0305B	SHUTDOWN COOLING HX 2 (HE02A) OUTLET TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
2901	441-J-ZY-0311B02	SDCHX 2 OUTLET FLOW CONTROL VALVE - 311	078A22B	Auxiliary	78'-0"	above	78'-6"		
2902	441-J-ZY-0313B02	SDCHX 2 BYPASS FLOW CTRL VALVE - 313	078A22B	Auxiliary	78'-0"	above	78'-6"		
2903	441-J-ZY-0315B02	SCS TEST RETURN ISO VALVE - 315	078A22B	Auxiliary	78'-0"	above	78'-6"		
2904	447-J-LS-0390B01	IRWST TK01 LEVEL 1	078A22B	Auxiliary	78'-0"	above	78'-6"		
2905	447-J-LS-0390B02	IRWST TK01 LEVEL 1	078A22B	Auxiliary	78'-0"	above	78'-6"		
2906	447-J-LS-0390B03	IRWST TK01 LEVEL 1	078A22B	Auxiliary	78'-0"	above	78'-6"		
2907	447-J-LS-0391A01	IRWST TK01 LEVEL 2	078A22B	Auxiliary	78'-0"	above	78'-6"		
2908	447-J-LS-0391A02	IRWST TK01 LEVEL 2	078A22B	Auxiliary	78'-0"	above	78'-6"		
2909	447-J-LS-0391A03	IRWST TK01 LEVEL 2	078A22B	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (101 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2910	447-J-LY-0390B02	IRWST TK01 LEVEL 1	078A22B	Auxiliary	78'-0"	above	78'-6"		
2911	447-J-LY-0391A02	IRWST TANK LEVEL 2	078A22B	Auxiliary	78'-0"	above	78'-6"		
2912	447-J-LY-0394B	HOLDUP VOL TK TK02 LEVEL(WIDE)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2913	447-J-LY-0398B	REACTOR CAVITY LEVEL 2(WIDE)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2914	447-J-LY-0402B02	IRWST TANK LEVEL1	078A22B	Auxiliary	78'-0"	above	78'-6"		
2915	447-J-LY-0404B	HOLD UP VOLUME TANK WIDE RANGE LEVEL2	078A22B	Auxiliary	78'-0"	above	78'-6"		
2916	447-J-LY-0406B	REACTOR CAVITY LEVEL2	078A22B	Auxiliary	78'-0"	above	78'-6"		
2917	447-J-PY-0391B02	IRWST TANK PRESSURE 2	078A22B	Auxiliary	78'-0"	above	78'-6"		
2918	447-J-PY-0402B01	IRWST TK01 LEVEL 1 PRESSURE 1 (ACCIDENT)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2919	447-J-PY-0404B	HVT TK02 WIDE LEVEL 1 PRESSURE 1 (ACCIDENT)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2920	447-J-PY-0406B	REACTOR CAVITY LEVEL2	078A22B	Auxiliary	78'-0"	above	78'-6"		
2921	447-J-PY-0411A02	IRWST TK01 LEVEL 2 PRESSURE 2 (ACCIDENT)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2922	447-J-PY-0412B02	IRWST TK01 LEVEL 1 PRESSURE 2 (ACCIDENT)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2923	447-J-PY-0418B	HVT & RC LEVEL 1 PRESSURE 2 (ACCIDENT)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2924	447-J-TY-0391B01	IRWST TANK TEMP 2	078A22B	Auxiliary	78'-0"	above	78'-6"		
2925	447-J-TY-0391B02	IRWST TANK TEMP 2	078A22B	Auxiliary	78'-0"	above	78'-6"		
2926	447-J-TY-0391B03	IRWST TANK TEMP 2	078A22B	Auxiliary	78'-0"	above	78'-6"		
2927	451-J-FS-0212B01	CHARGING LINE FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2928	451-J-FS-0212B02	CHARGING LINE FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2929	451-J-FS-0212B03	CHARGING LINE FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2930	451-J-FS-0212B04	CHARGING LINE FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2931	451-J-FS-0212B05	CHARGING LINE FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2932	451-J-FY-0212B02	CHARGING LINE FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2933	451-J-FY-0212B03	CHARGING LINE FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2934	461-J-FS-0048B	CCW PUMP PP01B DISCH. FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2935	461-J-FS-0245B	RCP 2B CLNG FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2936	461-J-FS-0246B	RCP 2A CLNG FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2937	461-J-FS-0247B	RCP 1A CLNG FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2938	461-J-FS-0248B	RCP 1B CLNG FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2939	461-J-FY-0048B01	CCW PUMP PP01B DISCH. FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2940	461-J-FY-0048B02	CCW PUMP PP01B DISCH. FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (102 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2941	461-J-FY-0245B01	RCP 2B CLNG FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2942	461-J-FY-0245B02	RCP 2B CLNG FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2943	461-J-FY-0246B01	RCP 2A CLNG FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2944	461-J-FY-0246B02	RCP 2A CLNG FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2945	461-J-FY-0247B01	RCP 1A CLNG FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2946	461-J-FY-0247B02	RCP 1A CLNG FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2947	461-J-FY-0248B01	RCP 1B CLNG FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2948	461-J-FY-0248B02	RCP 1B CLNG FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
2949	463-J-LS-0002B01	SPENT FUEL POOL LEVEL (TRAIN B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2950	463-J-LS-0002B02	SPENT FUEL POOL LEVEL (TRAIN B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2951	463-J-LS-0002B03	SPENT FUEL POOL LEVEL (TRAIN B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2952	463-J-LS-0002B04	SPENT FUEL POOL LEVEL (TRAIN B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2953	463-J-LS-0002B05	SPENT FUEL POOL LEVEL (TRAIN B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2954	463-J-LY-0002B01	SPENT FUEL POOL LEVEL (TRAIN B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2955	463-J-TS-0008B	SFP RETURN TEMPERATURE	078A22B	Auxiliary	78'-0"	above	78'-6"		
2956	463-J-TY-0008B01	SFP RETURN TEMPERATURE	078A22B	Auxiliary	78'-0"	above	78'-6"		
2957	481-J-LS-0051B	FLOOR DRAIN SUMP (QUAD.B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2958	481-J-LS-0080B	SI PUMP B	078A22B	Auxiliary	78'-0"	above	78'-6"		
2959	481-J-LS-0086B	SC PUMP B	078A22B	Auxiliary	78'-0"	above	78'-6"		
2960	481-J-LY-0051B	FLOOR DRAIN SUMP (QUAD.B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2961	481-J-LY-0080B	SI PUMP B	078A22B	Auxiliary	78'-0"	above	78'-6"		
2962	481-J-LY-0086B	SC PUMP B	078A22B	Auxiliary	78'-0"	above	78'-6"		
2963	542-J-FY-0048B01	AF PMP PP01B DSCH FLOW TO SG 1	078A22B	Auxiliary	78'-0"	above	78'-6"		
2964	542-J-FY-0048B02	AF PMP PP02B DSCH FLOW TO SG 2	078A22B	Auxiliary	78'-0"	above	78'-6"		
2965	542-J-LC-0036B	AF PP01A DISCH. FLOW TO SG 1	078A22B	Auxiliary	78'-0"	above	78'-6"		
2966	542-J-LC-0038B	AF PP02B DISCH. FLOW TO SG 2	078A22B	Auxiliary	78'-0"	above	78'-6"		
2967	542-J-LY-0036B	AF PP01A DISCH. FLOW TO SG 1	078A22B	Auxiliary	78'-0"	above	78'-6"		
2968	542-J-LY-0038B	AF PP02B DISCH. FLOW TO SG 2	078A22B	Auxiliary	78'-0"	above	78'-6"		
2969	542-J-PS-0006B01	AFP PP02B SUCTION PRESS	078A22B	Auxiliary	78'-0"	above	78'-6"		
2970	542-J-PS-0006B02	AFP PP02B SUCTION PRESS	078A22B	Auxiliary	78'-0"	above	78'-6"		
2971	542-J-PS-0024B	AFP PP02B DISCH. PRESS	078A22B	Auxiliary	78'-0"	above	78'-6"		
2972	542-J-PY-0006B	AFP PP02B SUCTION PRESS	078A22B	Auxiliary	78'-0"	above	78'-6"		
2973	542-J-PY-0024B	AFP PP02B DISCH. PRESS	078A22B	Auxiliary	78'-0"	above	78'-6"		
2974	542-J-TS-0054B	SG 2 AF LINE	078A22B	Auxiliary	78'-0"	above	78'-6"		
2975	542-J-TY-0054B	SG 2 AF LINE	078A22B	Auxiliary	78'-0"	above	78'-6"		
2976	542-J-ZY-0036B	AF PP01A DISCH. FLOW TO SG 1	078A22B	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (103 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
2977	542-J-ZY-0038B	AF PP02B DISCH. FLOW TO SG 2	078A22B	Auxiliary	78'-0"	above	78'-6"		
2978	603-J-HS-0106B	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH03B	078A22B	Auxiliary	78'-0"	above	78'-6"		
2979	603-J-HS-0110B	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH05B	078A22B	Auxiliary	78'-0"	above	78'-6"		
2980	603-J-HS-0112B	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH06B	078A22B	Auxiliary	78'-0"	above	78'-6"		
2981	603-J-HS-0114B	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH07B	078A22B	Auxiliary	78'-0"	above	78'-6"		
2982	603-J-TE-0110B	MUX B RM TEMP.	078A22B	Auxiliary	78'-0"	above	78'-6"		
2983	603-J-TS-0106B01	CH.B DC&IP EQUIP. RM (078-A04D)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2984	603-J-TS-0106B02	CH.B DC&IP EQUIP. RM (078-A04D)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2985	603-J-TS-0106B03	CH.B DC&IP EQUIP. RM (078-A04D)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2986	603-J-TS-0110B01	MUX B RM (078-A22B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2987	603-J-TS-0110B02	MUX B RM (078-A22B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2988	603-J-TS-0110B03	MUX B RM (078-A22B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2989	603-J-TS-0112B01	CLASS-1E MCC 01B RM (078-A24B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2990	603-J-TS-0112B02	CLASS-1E MCC 01B RM (078-A24B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2991	603-J-TS-0112B03	CLASS-1E MCC 01B RM (078-A24B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2992	603-J-TS-0114B01	CLASS-1E SWGR 01B RM (078-A25B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2993	603-J-TS-0114B02	CLASS-1E SWGR 01B RM (078-A25B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2994	603-J-TS-0114B03	CLASS-1E SWGR 01B RM (078-A25B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2995	603-J-TY-0106B	CH.B DC&IP EQUIP. RM (078-A04D)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2996	603-J-TY-0110B	MUX B RM (078-A22B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2997	603-J-TY-0112B	CLASS-1E MCC 01B RM (078-A24B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2998	603-J-TY-0114B	CLASS-1E SWGR 01B RM (078-A25B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
2999	606-J-FC-0046B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B AIR FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
3000	606-J-FS-0010B	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B AIR FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
3001	606-J-FS-0046B01	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B AIR FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (104 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3002	606-J-FS-0046B02	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B AIR FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
3003	606-J-FY-0010B	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B AIR FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
3004	606-J-FY-0046B01	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B AIR FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
3005	606-J-FY-0046B02	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B AIR FLOW	078A22B	Auxiliary	78'-0"	above	78'-6"		
3006	606-J-TS-0202B01	CHARGING PUMP ROOM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3007	606-J-TS-0202B02	CHARGING PUMP ROOM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3008	606-J-TS-0202B03	CHARGING PUMP ROOM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3009	606-J-TS-0212B01	SI PP ROOM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3010	606-J-TS-0212B02	SI PP ROOM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3011	606-J-TS-0212B03	SI PP ROOM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3012	606-J-TS-0214B01	CCW PP ROOM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3013	606-J-TS-0214B02	CCW PP ROOM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3014	606-J-TS-0214B03	CCW PP ROOM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3015	606-J-TS-0220B01	SC PP & MINIFLOW HX RM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3016	606-J-TS-0220B02	SC PP & MINIFLOW HX RM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3017	606-J-TS-0220B03	SC PP & MINIFLOW HX RM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3018	606-J-TS-0222B01	SC HX RM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3019	606-J-TS-0222B02	SC HX RM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3020	606-J-TS-0222B03	SC HX RM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3021	606-J-TS-0224B01	AUX. CHARGING PUMP RM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3022	606-J-TS-0224B02	AUX. CHARGING PUMP RM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3023	606-J-TS-0224B03	AUX. CHARGING PUMP RM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3024	606-J-TS-3008B	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B	078A22B	Auxiliary	78'-0"	above	78'-6"		
3025	606-J-TS-3024B01	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B HEATING COIL HC01B	078A22B	Auxiliary	78'-0"	above	78'-6"		
3026	606-J-TS-3024B02	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B HEATING COIL HC01B	078A22B	Auxiliary	78'-0"	above	78'-6"		
3027	606-J-TS-3053B01	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B HEATING COIL HC02B	078A22B	Auxiliary	78'-0"	above	78'-6"		
3028	606-J-TS-3053B02	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B HEATING COIL HC02B	078A22B	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (105 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3029	606-J-TS-3053D01	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B HEATING COIL HC02B	078A22B	Auxiliary	78'-0"	above	78'-6"		
3030	606-J-TS-3053D02	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B HEATING COIL HC02B	078A22B	Auxiliary	78'-0"	above	78'-6"		
3031	606-J-TY-0202B	CHARGING PUMP ROOM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3032	606-J-TY-0212B	SI PP ROOM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3033	606-J-TY-0214B	CCW PP ROOM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3034	606-J-TY-0220B	SC PP & MINIFLOW HX RM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3035	606-J-TY-0222B	SC HX RM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3036	606-J-TY-0224B	AUX. CHARGING PUMP RM TEMP	078A22B	Auxiliary	78'-0"	above	78'-6"		
3037	606-J-TY-3008B01	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B	078A22B	Auxiliary	78'-0"	above	78'-6"		
3038	606-J-TY-3008B02	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B	078A22B	Auxiliary	78'-0"	above	78'-6"		
3039	606-J-TY-3022B01	CONTROLLED AREA II EXH. ACU AU01B INLET	078A22B	Auxiliary	78'-0"	above	78'-6"		
3040	606-J-TY-3024B01	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B HEATING COIL HC01B	078A22B	Auxiliary	78'-0"	above	78'-6"		
3041	606-J-TY-3034B01	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A CARBON ADSBR FT04A	078A22B	Auxiliary	78'-0"	above	78'-6"		
3042	606-J-TY-3052B01	CONTROLLED AREA II EXH. ACU AU02B INLET	078A22B	Auxiliary	78'-0"	above	78'-6"		
3043	606-J-TY-3053B01	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B HEATING COIL HC02B	078A22B	Auxiliary	78'-0"	above	78'-6"		
3044	606-J-TY-3054A01	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A HEATING COIL HC02A	078A22B	Auxiliary	78'-0"	above	78'-6"		
3045	606-J-TY-3063B01	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B CARBONADSBR FT09B	078A22B	Auxiliary	78'-0"	above	78'-6"		
3046	607-J-TS-0082B01	ESSENTIAL CHILLER RM (078-A11D)	078A22B	Auxiliary	78'-0"	above	78'-6"		
3047	607-J-TS-0082B02	ESSENTIAL CHILLER RM (078-A11D)	078A22B	Auxiliary	78'-0"	above	78'-6"		
3048	607-J-TS-0082B03	ESSENTIAL CHILLER RM (078-A11D)	078A22B	Auxiliary	78'-0"	above	78'-6"		
3049	607-J-TS-0086B01	MDA FW PUMP RM (078-A20B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
3050	607-J-TS-0086B02	MDA FW PUMP RM (078-A20B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
3051	607-J-TS-0086B03	MDA FW PUMP RM (078-A20B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
3052	607-J-TY-0082B	ESSENTIAL CHILLER RM (078-A11D)	078A22B	Auxiliary	78'-0"	above	78'-6"		
3053	607-J-TY-0086B	MDA FW PUMP RM (078-A20B)	078A22B	Auxiliary	78'-0"	above	78'-6"		
3054	633-J-TW-0122	COOLING COIL VE-CW05B OUTLET	078A22B	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (106 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3055	633-J-TW-0124	COOLING COIL VE-CW05B INLET	078A22B	Auxiliary	78'-0"	above	78'-6"		
3056	633-V-1111B	MUX B RM C-CLR Outlet VALVE	078A22B	Auxiliary	78'-0"	above	78'-6"		
3057	633-V-1112B	MUX B RM C-CLR Inlet throt VALVE	078A22B	Auxiliary	78'-0"	above	78'-6"		
3058	633-V-2111B	MUX B RM C-CLR Outlet PZR Test VALVE	078A22B	Auxiliary	78'-0"	above	78'-6"		
3059	633-V-2112B	MUX B RM C-CLR Inlet PZR Test VALVE	078A22B	Auxiliary	78'-0"	above	78'-6"		
3060	633-V-2188B	MUX B RM C-CLR Outlet DRN VALVE	078A22B	Auxiliary	78'-0"	above	78'-6"		
3061	633-V-2211B	MUX A RM HV05B ECW Outlet Vent VALVE	078A22B	Auxiliary	78'-0"	above	78'-6"		
3062	633-V-2212B	MUX A RM HV05B ECW Inlet DRN VALVE	078A22B	Auxiliary	78'-0"	above	78'-6"		
3063	633-V-2311B	MUX A RM HV05B ECW Outlet Test Conn VALVE	078A22B	Auxiliary	78'-0"	above	78'-6"		
3064	633-V-2312B	MUX A RM HV05B ECW Inlet Test Conn VALVE	078A22B	Auxiliary	78'-0"	above	78'-6"		
3065	603-M-HV06A	CUBICLE COOLER	078A24A	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3066	827-E-MC01A	UNIT 3 480V 1E MCC 01A	078A24A	Auxiliary	78'-0"	above	78'-6"		
3067	603-J-TE-0111A	CLASS 1E MCC 01A RM TEMP.	078A24A	Auxiliary	78'-0"	above	78'-6"		
3068	633-J-TW-0125	COOLING COIL VE-CW06A OUTLET	078A24A	Auxiliary	78'-0"	above	78'-6"		
3069	633-J-TW-0127	COOLING COIL VE-CW06A INLET	078A24A	Auxiliary	78'-0"	above	78'-6"		
3070	633-V-1113A	C-1E MCC 01A RM C-CLR Outlet VALVE	078A24A	Auxiliary	78'-0"	above	78'-6"		
3071	633-V-1114A	C-1E MCC 01A RM C-CLR Inlet throt VALVE	078A24A	Auxiliary	78'-0"	above	78'-6"		
3072	633-V-2113A	C-1E MCC01A RM C-CLR Outlet PZR Test VALVE	078A24A	Auxiliary	78'-0"	above	78'-6"		
3073	633-V-2114A	C-1E MCC01A RM C-CLR Inlet PZR Test VALVE	078A24A	Auxiliary	78'-0"	above	78'-6"		
3074	633-V-2164A	CW15A CS HX RM C-CLR Inlet PZR Test VALVE	078A24A	Auxiliary	78'-0"	above	78'-6"		
3075	633-V-2187A	C-1E MCC 01A RM C-CLR Outlet DRN VALVE	078A24A	Auxiliary	78'-0"	above	78'-6"		
3076	633-V-2213A	C-1E MCC01A RM HV06A ECW Outlet Vent VALVE	078A24A	Auxiliary	78'-0"	above	78'-6"		
3077	633-V-2214A	C-1E MCC01A RM HV06A ECW Inlet DRN VALVE	078A24A	Auxiliary	78'-0"	above	78'-6"		
3078	633-V-2313A	MCC01A RM HV06A ECW Outlet Test Conn VALVE	078A24A	Auxiliary	78'-0"	above	78'-6"		
3079	633-V-2314A	MCC01A RM HV06A ECW Inlet Test Conn VALVE	078A24A	Auxiliary	78'-0"	above	78'-6"		
3080	633-V-2432A	C-1E MCC01A RM HV06A ECW Inlet Vent VALVE	078A24A	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (107 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3081	633-V-2433A	C-1E MCC01A RM HV06A ECW Outlet Vent VALVE	078A24A	Auxiliary	78'-0"	above	78'-6"		
3082	633-V-2452A	C-1E MCC 01A RM CW06A Outlet DRN VALVE	078A24A	Auxiliary	78'-0"	above	78'-6"		
3083	603-M-HV06B	CUBICLE COOLER	078A24B	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3084	827-E-MC01B	UNIT 3 480V 1E MCC 01B	078A24B	Auxiliary	78'-0"	above	78'-6"		
3085	603-J-TE-0112B	CLASS 1E MCC 01B RM TEMP.	078A24B	Auxiliary	78'-0"	above	78'-6"		
3086	633-J-TW-0126	COOLING COIL VE-CW06B OUTLET	078A24B	Auxiliary	78'-0"	above	78'-6"		
3087	633-J-TW-0128	COOLING COIL VE-CW06B INLET	078A24B	Auxiliary	78'-0"	above	78'-6"		
3088	633-V-1113B	C-1E MCC 01B RM C-CLR Outlet VALVE	078A24B	Auxiliary	78'-0"	above	78'-6"		
3089	633-V-1114B	C-1E MCC 01B RM C-CLR Inlet throt VALVE	078A24B	Auxiliary	78'-0"	above	78'-6"		
3090	633-V-2113B	C-1E MCC01B RM C-CLR Outlet PZR Test VALVE	078A24B	Auxiliary	78'-0"	above	78'-6"		
3091	633-V-2114B	C-1E MCC01B RM C-CLR Inlet PZR Test VALVE	078A24B	Auxiliary	78'-0"	above	78'-6"		
3092	633-V-2187B	C-1E MCC 01B RM C-CLR Outlet DRN VALVE	078A24B	Auxiliary	78'-0"	above	78'-6"		
3093	633-V-2213B	C-1E MCC01A RM HV06B ECW Outlet Vent VALVE	078A24B	Auxiliary	78'-0"	above	78'-6"		
3094	633-V-2214B	C-1E MCC01A RM HV06B ECW Inlet DRN VALVE	078A24B	Auxiliary	78'-0"	above	78'-6"		
3095	633-V-2313B	MCC01B RM HV06B ECW Outlet Test Conn VALVE	078A24B	Auxiliary	78'-0"	above	78'-6"		
3096	633-V-2314B	MCC01B RM HV06B ECW Inlet Test Conn VALVE	078A24B	Auxiliary	78'-0"	above	78'-6"		
3097	633-V-2450B	C-1E MCC 01B RM CW06B Outlet DRN VALVE	078A24B	Auxiliary	78'-0"	above	78'-6"		
3098	603-M-HV07A	CUBICLE COOLER	078A25A	Auxiliary	78'-0"	above	78'-6"	6" FD (1)	-
3099	823-E-SW01A	CLASS 1E AB 4.16KV SWGR 01A	078A25A	Auxiliary	78'-0"	above	78'-6"		
3100	825-E-LC01A	UNIT 3 480V 1E LC 01A	078A25A	Auxiliary	78'-0"	above	78'-6"		
3101	603-J-TE-0113A	CLASS 1E SWGR 01A RM TEMP.	078A25A	Auxiliary	78'-0"	above	78'-6"		
3102	633-J-TW-0129	COOLING COIL VE-CW07A OUTLET	078A25A	Auxiliary	78'-0"	above	78'-6"		
3103	633-J-TW-0131	COOLING COIL VE-CW07A INLET	078A25A	Auxiliary	78'-0"	above	78'-6"		
3104	633-V-1115A	C-1E SWGR 01A RM C-CLR Outlet VALVE	078A25A	Auxiliary	78'-0"	above	78'-6"		
3105	633-V-1116A	C-1E SWGR 01A RM C-CLR Inlet throt VALVE	078A25A	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (108 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3106	633-V-2115A	C-1E SWGR 01A C-CLR Outlet PZR Test VALVE	078A25A	Auxiliary	78'-0"	above	78'-6"		
3107	633-V-2116A	C-1E SWGR 01A C-CLR Inlet PZR Test VALVE	078A25A	Auxiliary	78'-0"	above	78'-6"		
3108	633-V-2189A	C-1E SWGR 01A RM C-CLR DRN VALVE	078A25A	Auxiliary	78'-0"	above	78'-6"		
3109	633-V-2215A	C-1E SWGR01ARM HV07A ECW Outlet Vent VALVE	078A25A	Auxiliary	78'-0"	above	78'-6"		
3110	633-V-2216A	C-1E SWGR01ARM HV07A ECW Inlet DRN VALVE	078A25A	Auxiliary	78'-0"	above	78'-6"		
3111	633-V-2315A	SWGR01A RM HV07A ECW Outlet TestConnVALVE	078A25A	Auxiliary	78'-0"	above	78'-6"		
3112	633-V-2316A	SWGR01A RM HV07A ECW Inlet Test Conn VALVE	078A25A	Auxiliary	78'-0"	above	78'-6"		
3113	603-M-HV07B	CUBICLE COOLER	078A25B	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3114	606-E-SQ01	LOCAL STARTER	078A25B	Auxiliary	78'-0"	above	78'-6"		
3115	823-E-SW01B	CLASS 1E AB 4.16KV SWGR 01B	078A25B	Auxiliary	78'-0"	above	78'-6"		
3116	825-E-LC01B	UNIT 3 480V 1E LC 01B	078A25B	Auxiliary	78'-0"	above	78'-6"		
3117	825-E-LC02	UNIT 3 SWING 480V 1E LC 02	078A25B	Auxiliary	78'-0"	above	78'-6"		
3118	603-J-TE-0114B	CLASS 1E SWGR 01B RM TEMP.	078A25B	Auxiliary	78'-0"	above	78'-6"		
3119	633-J-TW-0130	COOLING COIL VE-CW07B OUTLET	078A25B	Auxiliary	78'-0"	above	78'-6"		
3120	633-J-TW-0132	COOLING COIL VE-CW07B INLET	078A25B	Auxiliary	78'-0"	above	78'-6"		
3121	823-J-HS-0312B02	LOCAL CONTROL STATION	078A25B	Auxiliary	78'-0"	above	78'-6"		
3122	823-J-HS-0312B03	LOCAL CONTROL STATION	078A25B	Auxiliary	78'-0"	above	78'-6"		
3123	633-V-1115B	C-1E SWGR 01B RM C-CLR Outlet VALVE	078A25B	Auxiliary	78'-0"	above	78'-6"		
3124	633-V-1116B	C-1E SWGR 01B RM C-CLR Inlet throt VALVE	078A25B	Auxiliary	78'-0"	above	78'-6"		
3125	633-V-2115B	C-1E SWGR 01B C-CLR Outlet PZR Test VALVE	078A25B	Auxiliary	78'-0"	above	78'-6"		
3126	633-V-2116B	C-1E SWGR 01B C-CLR Inlet PZR Test VALVE	078A25B	Auxiliary	78'-0"	above	78'-6"		
3127	633-V-2189B	C-1E SWGR 01B RM C-CLR DRN VALVE	078A25B	Auxiliary	78'-0"	above	78'-6"		
3128	633-V-2215B	C-1E SWGR01BRM HV07B ECW Outlet Vent VALVE	078A25B	Auxiliary	78'-0"	above	78'-6"		
3129	633-V-2216B	C-1E SWGR01BRM HV07B ECW Inlet DRN VALVE	078A25B	Auxiliary	78'-0"	above	78'-6"		
3130	633-V-2315B	SWGR01B RM HV07B ECW Outlet TestConnVALVE	078A25B	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (109 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3131	633-V-2316B	SWGR01B RM HV07B ECW Inlet Test Conn VALVE	078A25B	Auxiliary	78'-0"	above	78'-6"		
3132	461-M-PP03A	CCW MAKEUP PUMP A	078A29C	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3133	461-V-1301	CCW M/U PP03A Suction ISO VALVE	078A29C	Auxiliary	78'-0"	above	78'-6"		
3134	461-V-1303	CCW M/U PP03A Disch CHK VALVE	078A29C	Auxiliary	78'-0"	above	78'-6"		
3135	461-V-1305	CCWMP DISCH. ISOATION VALVE	078A29C	Auxiliary	78'-0"	above	78'-6"		
3136	461-V-1321	CCW M/U PP03A Recir Line Throttle VALVE	078A29C	Auxiliary	78'-0"	above	78'-6"		
3137	461-V-1323	CCW M/U PP03A Recir Line ISO VALVE	078A29C	Auxiliary	78'-0"	above	78'-6"		
3138	461-V-1325	CCW M/U PP03A Recir Line CHK VALVE	078A29C	Auxiliary	78'-0"	above	78'-6"		
3139	461-V-2007	CCW M/U PP03A Recir LN FI-031 Root VALVE	078A29C	Auxiliary	78'-0"	above	78'-6"		
3140	461-V-2009	CCW M/U PP03A Recir LN FI-031 Root VALVE	078A29C	Auxiliary	78'-0"	above	78'-6"		
3141	461-V-2011	CCW M/U PP03A Suct STR Inlet Pr Test VALVE	078A29C	Auxiliary	78'-0"	above	78'-6"		
3142	461-V-2013	CCW M/U PP03A Suct STR Outlet Pr Test VALVE	078A29C	Auxiliary	78'-0"	above	78'-6"		
3143	461-V-2015	CCW M/U PP03A Disch PI-035 Root VALVE	078A29C	Auxiliary	78'-0"	above	78'-6"		
3144	461-V-2111	CCW M/U PP03A Suction Line DRN VALVE	078A29C	Auxiliary	78'-0"	above	78'-6"		
3145	461-V-2113	CCW M/U PP03A Disch Line Vent VALVE	078A29C	Auxiliary	78'-0"	above	78'-6"		
3146	461-V-2740	CCW M/U PP03A Disch Line DRN VALVE	078A29C	Auxiliary	78'-0"	above	78'-6"		
3147	461-M-PP03B	CCW MAKEUP PUMP B	078A29D	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3148	461-V-1302	CCW M/U PP03B Suction ISO VALVE	078A29D	Auxiliary	78'-0"	above	78'-6"		
3149	461-V-1304	CCW M/U PP03B Disch CHK VALVE	078A29D	Auxiliary	78'-0"	above	78'-6"		
3150	461-V-1306	CCWMP DISCH. ISOATION VALVE	078A29D	Auxiliary	78'-0"	above	78'-6"		
3151	461-V-1322	CCW M/U PP03B Recir Line Throttle VALVE	078A29D	Auxiliary	78'-0"	above	78'-6"		
3152	461-V-1324	CCW M/U PP03B Recir Line ISO VALVE	078A29D	Auxiliary	78'-0"	above	78'-6"		
3153	461-V-1326	CCW M/U PP03B Recir Line CHK VALVE	078A29D	Auxiliary	78'-0"	above	78'-6"		
3154	461-V-2008	CCW M/U PP03B Recir LN FI-032 Root VALVE	078A29D	Auxiliary	78'-0"	above	78'-6"		
3155	461-V-2010	CCW M/U PP03B Recir LN FI-032 Root VALVE	078A29D	Auxiliary	78'-0"	above	78'-6"		
3156	461-V-2012	CCW M/U PP03B Suct STR Inlet Pr Test VALVE	078A29D	Auxiliary	78'-0"	above	78'-6"		
3157	461-V-2014	CCW M/U PP03B Suct STR Outlet Pr Test VALVE	078A29D	Auxiliary	78'-0"	above	78'-6"		
3158	461-V-2016	CCW M/U PP03B Disch PI-036 Root VALVE	078A29D	Auxiliary	78'-0"	above	78'-6"		
3159	461-V-2112	CCW M/U PP03B Suction Line DRN VALVE	078A29D	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (110 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3160	461-V-2114	CCW M/U PP03B Disch Line Vent VALVE	078A29D	Auxiliary	78'-0"	above	78'-6"		
3161	461-V-2743	CCW M/U PP03B Disch Line DRN VALVE	078A29D	Auxiliary	78'-0"	above	78'-6"		
3162	606-J-PDT-0035A	GNRL ACCS AREA 078-A31A DIFF PRESS	078A31A	Auxiliary	78'-0"	above	78'-6"	4" FD (2), 6" FD (1)	10" EOL (1)
3163	461-V-1041	CCW HX 1A OUTLET BYPASS VALVE	078A31A	Auxiliary	78'-0"	above	78'-6"		
3164	461-V-1042	CCW HX 1B OUTLET BYPASS VALVE	078A31A	Auxiliary	78'-0"	above	78'-6"		
3165	606-Y-VK-1004A	MANUAL DAMPER	078A31A	Auxiliary	78'-0"	above	78'-6"		
3166	606-Y-VK-1005A	MANUAL DAMPER	078A31A	Auxiliary	78'-0"	above	78'-6"		
3167	606-Y-VK-1011A	MANUAL DAMPER	078A31A	Auxiliary	78'-0"	above	78'-6"		
3168	606-Y-VK-1012A	MANUAL DAMPER	078A31A	Auxiliary	78'-0"	above	78'-6"		
3169	606-Y-VK-1013A	MANUAL DAMPER	078A31A	Auxiliary	78'-0"	above	78'-6"		
3170	606-Y-VK-1015A	MANUAL DAMPER	078A31A	Auxiliary	78'-0"	above	78'-6"		
3171	606-Y-VK-1124A	MANUAL DAMPER	078A31A	Auxiliary	78'-0"	above	78'-6"		
3172	606-Y-VK-1511A	FIRE DAMPER	078A31A	Auxiliary	78'-0"	above	78'-6"		
3173	606-Y-VK-1513A	FIRE DAMPER	078A31A	Auxiliary	78'-0"	above	78'-6"		
3174	606-Y-VK-1533A	FIRE DAMPER	078A31A	Auxiliary	78'-0"	above	78'-6"		
3175	606-Y-VK-1534A	FIRE DAMPER	078A31A	Auxiliary	78'-0"	above	78'-6"		
3176	606-Y-VK-1590A	FIRE DAMPER	078A31A	Auxiliary	78'-0"	above	78'-6"		
3177	606-Y-VK-1591A	FIRE DAMPER	078A31A	Auxiliary	78'-0"	above	78'-6"		
3178	606-Y-VK-1024A	MANUAL DAMPER	078A35A	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3179	606-Y-VK-1019A	MANUAL DAMPER	078A36A	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3180	451-V-2266	PURIF FLT Outlet to PURIF. IX VNT VALVE	078A37A	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3181	606-Y-VK-1023A	MANUAL DAMPER	078A37A	Auxiliary	78'-0"	above	78'-6"		
3182	463-V-2034	BAMP TO SFP CLEANUP P/P SUCT CONN VALVE	078A38A	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3183	606-Y-VK-1003A	MANUAL DAMPER	078A38A	Auxiliary	78'-0"	above	78'-6"		
3184	606-Y-VK-1025A	MANUAL DAMPER	078A38A	Auxiliary	78'-0"	above	78'-6"		
3185	606-Y-VK-1038A	MANUAL DAMPER	078A39A	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3186	606-Y-VK-1046B	MANUAL DAMPER	078A39A	Auxiliary	78'-0"	above	78'-6"		
3187	606-Y-VK-1003B	MANUAL DAMPER	078A41B	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3188	606-Y-VK-1099B	MANUAL DAMPER	078A41B	Auxiliary	78'-0"	above	78'-6"		
3189	606-Y-VK-1580B	FIRE DAMPER	078A41B	Auxiliary	78'-0"	above	78'-6"		
3190	461-V-2595	SFP Cooling HE02B Outlet FT-7B Root VALVE	078A43B	Auxiliary	78'-0"	above	78'-6"	4" FD (2)	-
3191	461-V-2596	SFP Cooling HE02B Outlet FT-7B Root VALVE	078A43B	Auxiliary	78'-0"	above	78'-6"		
3192	606-J-PDT-0036B	GNRL ACCS AREA 078-A44B DIFF PRESS	078A44B	Auxiliary	78'-0"	above	78'-6"	4" FD (2)	10" EOL (1)
3193	606-Y-VK-1011B	MANUAL DAMPER	078A44B	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (111 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3194	606-Y-VK-1015B	MANUAL DAMPER	078A44B	Auxiliary	78'-0"	above	78'-6"		
3195	606-Y-VK-1071B	MANUAL DAMPER	078A44B	Auxiliary	78'-0"	above	78'-6"		
3196	606-Y-VK-1092B	MANUAL DAMPER	078A44B	Auxiliary	78'-0"	above	78'-6"		
3197	606-Y-VK-1519B	FIRE DAMPER	078A44B	Auxiliary	78'-0"	above	78'-6"		
3198	606-Y-VK-1590B	FIRE DAMPER	078A44B	Auxiliary	78'-0"	above	78'-6"		
3199	606-Y-VK-1591B	FIRE DAMPER	078A44B	Auxiliary	78'-0"	above	78'-6"		
3200	606-Y-VK-1579B	FIRE DAMPER	078A47B	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3201	606-Y-VK-1097B	MANUAL DAMPER	078A48B	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3202	606-Y-VK-1522B	FIRE DAMPER	078A48B	Auxiliary	78'-0"	above	78'-6"		
3203	606-Y-VK-1058B	MANUAL DAMPER	078A49B	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3204	606-Y-VK-1007B	MANUAL DAMPER	078A50B	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3205	606-Y-VK-1057B	MANUAL DAMPER	078A50B	Auxiliary	78'-0"	above	78'-6"		
3206	606-Y-VK-1059B	MANUAL DAMPER	078A50B	Auxiliary	78'-0"	above	78'-6"		
3207	606-Y-VK-1576B	FIRE DAMPER	078A50B	Auxiliary	78'-0"	above	78'-6"		
3208	606-Y-VK-1578B	FIRE DAMPER	078A50B	Auxiliary	78'-0"	above	78'-6"		
3209	451-M-OR14	Flow Orifice for Equipment	078A51B	Auxiliary	78'-0"	above	78'-6"	4" FD (1)	-
3210	451-M-OR14-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	078A51B	Auxiliary	78'-0"	above	78'-6"		
3211	451-M-PP05	BORIC ACID MAKEUP PUMP 1	078A51B	Auxiliary	78'-0"	above	78'-6"		
3212	451-M-PP06	BORIC ACID MAKEUP PUMP 2	078A51B	Auxiliary	78'-0"	above	78'-6"		
3213	451-V-0130	BAMP Recir ISO VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3214	451-V-0143	BAMP Suction ISO VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3215	451-V-0145	BAMP Suction ISO VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3216	451-V-0146	BAMP Pr Indicator ISO VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3217	451-V-0147	BAMP Pr Indicator ISO VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3218	451-V-0152	BAMP Disch ISO VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3219	451-V-0153	BAMP Disch ISO VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3220	451-V-0154	BAMP Disch CHK VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3221	451-V-0155	BAMP Disch CHK VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3222	451-V-0157	BORIC ACID to IRWST TIE Line ISO VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3223	451-V-0192	BAMP Recir ISO VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3224	451-V-0753	BAMP to PCPS ISO VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3225	451-V-0856	BAMP Suction Flush Conn VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3226	451-V-1044	BAMP 1 Suct PI-1044 Root VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3227	451-V-1045	BAMP 2 Suct PI-1045 Root VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3228	451-V-1228	BAMP 1 Suct STR ST23 Inlet Pr Test VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3229	451-V-1229	BAMP 2 Suct STR ST24 Inlet Pr Test VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		

Table 3.4-2 (112 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3230	451-V-2045	BAMP 1 Casing DRN VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3231	451-V-2046	BAMP 2 Casing DRN VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3232	451-V-2107	BAMP 1 Suct Vent VALVE	078A51B	Auxiliary	78'-0"	above	78'-6"		
3233	451-V-F568	VENT	078A51B	Auxiliary	78'-0"	above	78'-6"		
3234	451-V-F569	DRAIN	078A51B	Auxiliary	78'-0"	above	78'-6"		
3235	606-Y-VK-1005B	MANUAL DAMPER	078A51B	Auxiliary	78'-0"	above	78'-6"		
3236	606-Y-VK-1006B	MANUAL DAMPER	078A51B	Auxiliary	78'-0"	above	78'-6"		
3237	606-Y-VK-1577B	FIRE DAMPER	078A51B	Auxiliary	78'-0"	above	78'-6"		
3238	591-M-EJ02A	Expansion Joint for Equipment	100A01C	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	-
3239	591-M-EJ03A	Expansion Joint for Equipment	100A01C	Auxiliary	100'-0"	above	100'-6"		
3240	591-M-SL01A	SILENCER	100A01C	Auxiliary	100'-0"	above	100'-6"		
3241	591-M-SL03A	SILENCER	100A01C	Auxiliary	100'-0"	above	100'-6"		
3242	455-V-1135	Wet L/U Recir PP A Suct ISO VALVE(outside)	100A01C	Auxiliary	100'-0"	above	100'-6"		
3243	591-V-5502A	D/G A Crankcase Gas Pr PS-3060A RT VALVE	100A01C	Auxiliary	100'-0"	above	100'-6"		
3244	591-V-5503A	D/G A L.O ENG Inlet Pr PS-3047A RT VALVE	100A01C	Auxiliary	100'-0"	above	100'-6"		
3245	591-V-5504A	D/G A L.O ENG Inlet Pr PS-3046A RT VALVE	100A01C	Auxiliary	100'-0"	above	100'-6"		
3246	591-V-5505A	D/G A L.O ENG Inlet Pr PT-3048 RT VALVE	100A01C	Auxiliary	100'-0"	above	100'-6"		
3247	591-V-5506A	D/G A L.O ENG Inlet Pr PS-3041A RT VALVE	100A01C	Auxiliary	100'-0"	above	100'-6"		
3248	591-V-5507A	D/G A L.O ENG Inlet Pr PS-3042A RT VALVE	100A01C	Auxiliary	100'-0"	above	100'-6"		
3249	591-M-EJ02B	Expansion Joint for Equipment	100A01D	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	-
3250	591-M-EJ03B	Expansion Joint for Equipment	100A01D	Auxiliary	100'-0"	above	100'-6"		
3251	591-M-SL01B	SILENCER	100A01D	Auxiliary	100'-0"	above	100'-6"		
3252	591-M-SL03B	SILENCER	100A01D	Auxiliary	100'-0"	above	100'-6"		
3253	461-V-2741	CCW M/U PP03B Disch Line Vent VALVE	100A01D	Auxiliary	100'-0"	above	100'-6"		
3254	461-V-2742	CCW M/U PP03B Disch Line DRN VALVE	100A01D	Auxiliary	100'-0"	above	100'-6"		
3255	591-J-LP01A	LOCAL CONTROL PANEL	100A02C	Auxiliary	100'-0"	above	100'-6"	-	
3256	602-E-BS01A	D/G CONTROL ROOM EDH LOCAL CONTROL BOX	100A02C	Auxiliary	100'-0"	above	100'-6"		
3257	602-M-HC01A	D/G CONTROL ROOM ELECTRIC DUCT HEATER	100A02C	Auxiliary	100'-0"	above	100'-6"		
3258	827-E-MC08A	UNIT 3 480V 1E MCC 08A	100A02C	Auxiliary	100'-0"	above	100'-6"		
3259	591-J-HS-3011A	FUEL OIL FEED PUMP PP22A	100A02C	Auxiliary	100'-0"	above	100'-6"		
3260	591-J-HS-3012A	PRELUBE OIL PUMP PP33A	100A02C	Auxiliary	100'-0"	above	100'-6"		
3261	591-J-HS-3013A	PREHEATING HT WATER PUMP PP01A	100A02C	Auxiliary	100'-0"	above	100'-6"		
3262	595-J-HS-3011A	DIESEL FUEL OIL TRANSFER PUMP CONTROL SWITCH	100A02C	Auxiliary	100'-0"	above	100'-6"		
3263	595-J-HS-3013A	DIESEL FUEL OIL TRANSFER PUMP PP02A	100A02C	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (113 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3264	595-J-LI-0001A	DIESEL FUEL OIL STORAGE TANK "A" TK01A	100A02C	Auxiliary	100'-0"	above	100'-6"		
3265	595-J-LS-0001A	DIESEL FUEL OIL STORAGE TANK "A" TK01A	100A02C	Auxiliary	100'-0"	above	100'-6"		
3266	595-J-LS-0001N01	DIESEL FUEL OIL STORAGE TANK "A" TK01A	100A02C	Auxiliary	100'-0"	above	100'-6"		
3267	595-J-LS-0001N02	DIESEL FUEL OIL STORAGE TANK "A" TK01A	100A02C	Auxiliary	100'-0"	above	100'-6"		
3268	595-J-LS-0001N03	DIESEL FUEL OIL STORAGE TANK "A" TK01A	100A02C	Auxiliary	100'-0"	above	100'-6"		
3269	595-J-LY-0001	DIESEL FUEL OIL STORAGE TANK "A" TK01A	100A02C	Auxiliary	100'-0"	above	100'-6"		
3270	595-J-LY-0001A01	DIESEL FUEL OIL STORAGE TANK "A" TK01A	100A02C	Auxiliary	100'-0"	above	100'-6"		
3271	595-J-LY-0001A02	DIESEL FUEL OIL STORAGE TANK "A" TK01A	100A02C	Auxiliary	100'-0"	above	100'-6"		
3272	602-J-FS-3049C	EDG AREA I D/G CTRL RM	100A02C	Auxiliary	100'-0"	above	100'-6"		
3273	602-J-TE-3037C	EDG AREA I D/G CTRL RM	100A02C	Auxiliary	100'-0"	above	100'-6"		
3274	602-J-TE-3045C	EDG AREA I D/G CTRL RM	100A02C	Auxiliary	100'-0"	above	100'-6"		
3275	602-J-TE-3047C	EDG AREA I D/G CTRL RM	100A02C	Auxiliary	100'-0"	above	100'-6"		
3276	602-J-TS-3045C	EDG AREA I D/G CTRL RM PRI. OVER TEMP	100A02C	Auxiliary	100'-0"	above	100'-6"		
3277	602-J-TS-3047C	EDG AREA I D/G CTRL RM SEC. OVER TEMP	100A02C	Auxiliary	100'-0"	above	100'-6"		
3278	591-V-5220A	D/G A Pre-HTG HT WTR PP 01A Suct DRN VALVE	100A02C	Auxiliary	100'-0"	above	100'-6"		
3279	591-V-5286A	D/G A Pre-L.O PP 33A Disch LN Vent VALVE	100A02C	Auxiliary	100'-0"	above	100'-6"		
3280	602-Y-VD-1039A	MANUAL DAMPER	100A02C	Auxiliary	100'-0"	above	100'-6"		
3281	602-Y-VD-1524A	FIRE DAMPER	100A02C	Auxiliary	100'-0"	above	100'-6"		
3282	591-E-DP01A	EDG DIV. A EXCITATION CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"	-	
3283	591-E-DP01B	EDG DIV. B EXCITATION CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3284	591-E-DP02A	EDG DIV. A PHASE/POTENTIAL CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3285	591-E-DP02B	EDG DIV. B PHASE/POTENTIAL CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3286	591-E-DP03A	EDG DIV. A NEUTRAL CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3287	591-E-DP03B	EDG DIV. B NEUTRAL CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3288	591-E-DP04A	EDG DIV. A NEUTRAL GROUNDING CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (114 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3289	591-E-DP04B	EDG DIV. B NEUTRAL GROUNDING CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3290	591-E-DP05A	EDG DIV. A CONNECTION CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3291	591-E-DP05B	EDG DIV. B CONNECTION CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3292	591-E-DP06A	EDG DIV. A CONNECTION CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3293	591-E-DP06B	EDG DIV. B CONNECTION CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3294	591-E-DP07A	EDG DIV. A PROTECTION CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3295	591-E-DP07B	EDG DIV. B PROTECTION CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3296	591-E-DP08A	EDG DIV. A SPEED CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3297	591-E-DP08B	EDG DIV. B SPEED CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3298	591-E-DP09A	EDG DIV. A RELAYING CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3299	591-E-DP09B	EDG DIV. B RELAYING CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3300	591-E-DP10A	EDG DIV. A RELAYING CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3301	591-E-DP10B	EDG DIV. B RELAYING CUBICLE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3302	591-J-LP01B	LOCAL CONTROL PANEL	100A02D	Auxiliary	100'-0"	above	100'-6"		
3303	602-E-BS01B	D/G CONTROL ROOM EDH LOCAL CONTROL BOX	100A02D	Auxiliary	100'-0"	above	100'-6"		
3304	602-M-HC01B	D/G CONTROL ROOM ELECTRIC DUCT HEATER	100A02D	Auxiliary	100'-0"	above	100'-6"		
3305	827-E-MC08B	UNIT 3 480V 1E MCC 08B	100A02D	Auxiliary	100'-0"	above	100'-6"		
3306	591-J-HS-3011B	FUEL OIL FEED PUMP PP22B	100A02D	Auxiliary	100'-0"	above	100'-6"		
3307	591-J-HS-3012B	PRELUBE OIL PUMP PP33B	100A02D	Auxiliary	100'-0"	above	100'-6"		
3308	591-J-HS-3013B	PREHEATING HT WATER PUMP PP01B	100A02D	Auxiliary	100'-0"	above	100'-6"		
3309	595-J-HS-3012B	DIESEL FUEL OIL TRANSFER PUMP CONTROL SWITCH	100A02D	Auxiliary	100'-0"	above	100'-6"		
3310	595-J-HS-3014B	DIESEL FUEL OIL TRANSFER PUMP PP02B	100A02D	Auxiliary	100'-0"	above	100'-6"		
3311	595-J-LI-0002B	DIESEL FUEL OIL STORAGE TANK "B" TK01B	100A02D	Auxiliary	100'-0"	above	100'-6"		
3312	595-J-LS-0002B	DIESEL FUEL OIL STORAGE TANK "B" TK01B	100A02D	Auxiliary	100'-0"	above	100'-6"		
3313	595-J-LS-0002N01	DIESEL FUEL OIL STORAGE TANK "B" TK01B	100A02D	Auxiliary	100'-0"	above	100'-6"		
3314	595-J-LS-0002N02	DIESEL FUEL OIL STORAGE TANK "B" TK01B	100A02D	Auxiliary	100'-0"	above	100'-6"		
3315	595-J-LS-0002N03	DIESEL FUEL OIL STORAGE TANK "B" TK01B	100A02D	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (115 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3316	595-J-LY-0002	DIESEL FUEL OIL STORAGE TANK "B" TK01B	100A02D	Auxiliary	100'-0"	above	100'-6"		
3317	595-J-LY-0002B01	DIESEL FUEL OIL STORAGE TANK "B" TK01B	100A02D	Auxiliary	100'-0"	above	100'-6"		
3318	595-J-LY-0002B02	DIESEL FUEL OIL STORAGE TANK "B" TK01B	100A02D	Auxiliary	100'-0"	above	100'-6"		
3319	602-J-FS-3050D	EDG AREA II D/G CTRL RM	100A02D	Auxiliary	100'-0"	above	100'-6"		
3320	602-J-TE-3038D	EDG AREA II D/G CTRL RM	100A02D	Auxiliary	100'-0"	above	100'-6"		
3321	602-J-TE-3046D	EDG AREA II D/G CTRL RM	100A02D	Auxiliary	100'-0"	above	100'-6"		
3322	602-J-TE-3048D	EDG AREA II D/G CTRL RM	100A02D	Auxiliary	100'-0"	above	100'-6"		
3323	602-J-TS-3046D	EDG AREA II D/G CTRL RM PRI. OVER TEMP	100A02D	Auxiliary	100'-0"	above	100'-6"		
3324	602-J-TS-3048D	EDG AREA II D/G CTRL RM SEC. OVER TEMP	100A02D	Auxiliary	100'-0"	above	100'-6"		
3325	591-V-5286B	D/G B Pre-L.O PP 33B Disch LN Vent VALVE	100A02D	Auxiliary	100'-0"	above	100'-6"		
3326	602-Y-VD-1039B	MANUAL DAMPER	100A02D	Auxiliary	100'-0"	above	100'-6"		
3327	591-J-LP02A	ENGINE PANEL	100A03C	Auxiliary	100'-0"	above	100'-6"	6" FD (1)	-
3328	591-M-DG01A	DIESEL ENGINE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3329	591-M-EJ01A	Expansion Joint for Equipment	100A03C	Auxiliary	100'-0"	above	100'-6"		
3330	591-M-FT50B	Filter	100A03C	Auxiliary	100'-0"	above	100'-6"		
3331	591-M-HE02A	CC/LT WATER HX HE02A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3332	591-M-HE03A	HT/CC WATER HX HE03A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3333	591-M-HE30A	LUBE OIL/LT WATER HX. HE30A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3334	591-M-OR01A	Flow Orifice for Equipment	100A03C	Auxiliary	100'-0"	above	100'-6"		
3335	591-M-OR05A	Flow Orifice for Equipment	100A03C	Auxiliary	100'-0"	above	100'-6"		
3336	591-M-OR06A	Flow Orifice for Equipment	100A03C	Auxiliary	100'-0"	above	100'-6"		
3337	591-M-OR07A	RESTRICTION ORIFICE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3338	591-M-OR08A	Flow Orifice for Equipment	100A03C	Auxiliary	100'-0"	above	100'-6"		
3339	591-M-OR11A	Flow Orifice for Equipment	100A03C	Auxiliary	100'-0"	above	100'-6"		
3340	591-M-OR12A	RESTRICTION ORIFICE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3341	591-M-OR16A	RESTRICTION ORIFICE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3342	591-M-OR18A	RESTRICTION ORIFICE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3343	591-M-OR20A	Flow Orifice for Equipment	100A03C	Auxiliary	100'-0"	above	100'-6"		
3344	591-M-OR30A	ORIFICE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3345	591-M-OR31A	ORIFICE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3346	591-M-OR33A	RESTRICTION ORIFICE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3347	591-M-OR34A	RESTRICTION ORIFICE	100A03C	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (116 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3348	591-M-OR35A	RESTRICTION ORIFICE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3349	591-M-OR36A	RESTRICTION ORIFICE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3350	591-M-PP22A	FUEL OIL FEED PUMP	100A03C	Auxiliary	100'-0"	above	100'-6"		
3351	591-M-PP33A	PRELUBE OIL PUMP	100A03C	Auxiliary	100'-0"	above	100'-6"		
3352	591-M-ST01A	Y TYPE STRAINER	100A03C	Auxiliary	100'-0"	above	100'-6"		
3353	591-M-ST02A	Y TYPE STRAINER	100A03C	Auxiliary	100'-0"	above	100'-6"		
3354	591-M-TK40A	STARTING AIR RECEIVER	100A03C	Auxiliary	100'-0"	above	100'-6"		
3355	591-M-TK41A	STARTING AIR RECEIVER	100A03C	Auxiliary	100'-0"	above	100'-6"		
3356	591-M-TK42A	OVER SPEED AIR RECEIVER	100A03C	Auxiliary	100'-0"	above	100'-6"		
3357	595-M-TK02A	DIESEL FUEL OIL DAY TANK "A"	100A03C	Auxiliary	100'-0"	above	100'-6"		
3358	602-E-BS03A	TANK RM. EDH LOCAL CONTROL BOX	100A03C	Auxiliary	100'-0"	above	100'-6"		
3359	602-M-HC03A	TANK RM. ELECTRIC DUCT HEATER	100A03C	Auxiliary	100'-0"	above	100'-6"		
3360	591-J-PI-3086A	OVER SPEED AIR RECEIVER TK42A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3361	591-J-PI-3142A	LUBE OIL /PREHEATING WATER H/EX HE01A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3362	591-J-PI-3176A	STARTING AIR RECEIVER TK40A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3363	591-J-PI-3177A	STARTING AIR RECEIVER TK41A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3364	591-J-PS-3008A	PREHEATING WATER PUMP OUTLET PRESSURE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3365	591-J-PS-3035A	FUEL OIL PUMP OUTLET PRESSURE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3366	591-J-PS-3041A	LUBE OIL SUMP (R2) PRESSURE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3367	591-J-PS-3042A	LUBE OIL SUMP (R1) PRESSURE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3368	591-J-PS-3046A	LUBE OIL SUMP (D) PRESSURE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3369	591-J-PS-3047A	LUBE OIL SUMP (C) PRESSURE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3370	591-J-PS-3060A	LUBE OIL SUMP (S1) PRESSURE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3371	591-J-PS-3182A	STARTING AIR RECEIVER TK40A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3372	591-J-PS-3183A	STARTING AIR RECEIVER TK41A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3373	591-J-PT-3007A	ENGINE INLET HT WATER PRESSURE MEASUREMENT L(222)	100A03C	Auxiliary	100'-0"	above	100'-6"		
3374	591-J-PT-3110A	LT WATER PUMP DISCHARE (L232)	100A03C	Auxiliary	100'-0"	above	100'-6"		
3375	591-J-TEW-3002A	PREHEATING HT WATER PUMP PP01	100A03C	Auxiliary	100'-0"	above	100'-6"		
3376	591-J-TEW-3004A	HT WATER PUMP SUCTION	100A03C	Auxiliary	100'-0"	above	100'-6"		
3377	591-J-TEW-3010A	LT WATER PUMP DISCHARE (L232)	100A03C	Auxiliary	100'-0"	above	100'-6"		
3378	591-J-TEW-3016A	AIR COOLER LT WATER INLET (L233), (L236)	100A03C	Auxiliary	100'-0"	above	100'-6"		
3379	591-J-TEW-3016B	AIR COOLER LT WATER INLET (L233), (L236)	100A03C	Auxiliary	100'-0"	above	100'-6"		
3380	591-J-TEW-3042A	LUBE OIL ENGINE INLET (L104)	100A03C	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (117 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3381	591-J-TEW-3044A	LUBE OIL ENGINE INLET (L104)	100A03C	Auxiliary	100'-0"	above	100'-6"		
3382	591-J-TEW-3045A	LUBE OIL ENGINE INLET (L104)	100A03C	Auxiliary	100'-0"	above	100'-6"		
3383	591-J-TEW-3109A	LUBE OIL /PREHEATING WATER H/EX HE01A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3384	591-J-TEW-3113A	AIR COOLER LT WATER OUTLET (L234)	100A03C	Auxiliary	100'-0"	above	100'-6"		
3385	591-J-TEW-3114A	AIR COOLER LT WATER OUTLET (L235)	100A03C	Auxiliary	100'-0"	above	100'-6"		
3386	591-J-TI-3109A	LUBE OIL /PREHEATING WATER H/EX HE01A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3387	591-J-TI-3113A	AIR COOLER LT WATER OUTLET (L234)	100A03C	Auxiliary	100'-0"	above	100'-6"		
3388	591-J-TI-3114A	AIR COOLER LT WATER OUTLET (L235)	100A03C	Auxiliary	100'-0"	above	100'-6"		
3389	591-J-TT-3002A	PREHEATING HT WATER PUMP PP01A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3390	591-J-TT-3044A	LUBE OIL ENGINE INLET (L104)	100A03C	Auxiliary	100'-0"	above	100'-6"		
3391	591-J-TT-3045A	LUBE OIL ENGINE INLET (L104)	100A03C	Auxiliary	100'-0"	above	100'-6"		
3392	595-J-LI-3025A	DISEL FUEL OIL DAY TANK TK02A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3393	595-J-LS-3025A01	DISEL FUEL OIL DAY TANK TK02A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3394	595-J-LS-3025A02	DISEL FUEL OIL DAY TANK TK02A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3395	595-J-LS-3025A03	DISEL FUEL OIL DAY TANK TK02A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3396	595-J-LS-3025A04	DISEL FUEL OIL DAY TANK TK02A	100A03C	Auxiliary	100'-0"	above	100'-6"		
3397	602-J-FS-3051C	D/G FUEL OIL & LT & HT WTR TK RM AREA I	100A03C	Auxiliary	100'-0"	above	100'-6"		
3398	602-J-TE-0013C	EDG AREA I EMRG D/G RM TEMP.	100A03C	Auxiliary	100'-0"	above	100'-6"		
3399	602-J-TE-0015C	EDG AREA I EMRG D/G RM TEMP.	100A03C	Auxiliary	100'-0"	above	100'-6"		
3400	602-J-TE-3051C	D/G FUEL OIL & LT & HT WTR TK RM AREA I	100A03C	Auxiliary	100'-0"	above	100'-6"		
3401	602-J-TE-3053C	D/G FUEL OIL & LT & HT WTR TK RM AREA I	100A03C	Auxiliary	100'-0"	above	100'-6"		
3402	602-J-TS-3051C	D/G FUEL OIL & LT & HT WTR TK RM AREA I PRI. OVER TEMP	100A03C	Auxiliary	100'-0"	above	100'-6"		
3403	602-J-TS-3053C	D/G FUEL OIL & LT & HT WTR TK RM AREA I SEC. OVER TEMP	100A03C	Auxiliary	100'-0"	above	100'-6"		
3404	461-V-0181	DG A HX INLET ISO VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3405	461-V-1281	DG. A HX OUTLET ISO. VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3406	591-V-3023A	D/G A Starting Air RCVR TK40A Relief VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3407	591-V-3031A	D/G A Starting Air RCVR TK41A Relief VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3408	591-V-3037A	D/G A F.O Outlet OR20A B/P Regulating VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (118 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3409	591-V-3054A	D/G A Pre Lube Oil PP 33A Relief VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3410	591-V-3059A	D/G A Lube Oil Pr Regulating VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3411	591-V-3098A	D/G A Starting Air RCVR TK41A DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3412	591-V-3099A	D/G A Starting Air RCVR TK40A DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3413	591-V-3114A	D/G A L.O Engine Inlet Temp CTRL VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3414	591-V-3217A	D/G A HT WTR Engine Outlet Temp CTRL VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3415	591-V-3250A	D/G A LT WTR PP Suction Temp CTRL VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3416	591-V-3353A	D/G A Fuel Oil Feed PP 22A Relief VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3417	591-V-4022A	D/G A Air Compressor ZM04A Outlet CHK VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3418	591-V-4030A	D/G A Air Compressor ZM05A Outlet CHK VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3419	591-V-4039A	D/G A Air RCVR TK41A OTLT Regulating VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3420	591-V-4040A	D/G A Air RCVR TK40A OTLT Regulating VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3421	591-V-4042A	D/G A Air RCVR TK40A/41A CMN ISO VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3422	591-V-4043A	D/G A Air RCVR TK40A/41A CMN CHK VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3423	591-V-4048A	D/G A Starting Air RCVR TK40A Outlet VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3424	591-V-4049A	D/G A Starting Air RCVR TK41A Outlet VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3425	591-V-4109A	D/G A Pre-L.O Engine Inlet CHK VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3426	591-V-4110A	D/G A Pre-L.O PP 33A Suction VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3427	591-V-4111A	L.O/Pre-HTG WTR HX 01A L.O Outlet CHK VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3428	591-V-4112A	L.O/Pre-HTG WTR HX 01A L.O Outlet ISO VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3429	591-V-4140A	D/G A Lube Oil PP Disch CHK VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3430	591-V-4210A	D/G A Pre-L.O PP 33A Disch VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3431	591-V-4212A	D/G A HT WTR PP Suction Line CHK VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (119 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3432	591-V-4213A	D/G A Pre-HTG HT WTR ENG Inlet LN ISO VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3433	591-V-4214A	D/G A Pre-HTG HT WTR ENG Inlet LN CHK VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3434	591-V-4219A	D/G A Pre-HTG HT WTR PP 01A Suct VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3435	591-V-4223A	D/G A HT WTR Elec. HTR HT01A Inlet VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3436	591-V-4224A	D/G A HT WTR Elec. HTR HT01A Outlet VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3437	591-V-4242A	D/G A LT WTR PP Disch LN CHK VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3438	591-V-4308A	D/G A Air RCVR TK40A → CMN HDR CHK VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3439	591-V-4309A	D/G A Air RCVR TK41A → CMN HDR CHK VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3440	591-V-4312A	DG A START Air RCVR TK 40A41A CMN CHK VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3441	591-V-4314A	DG A START Air RCVR TK 40A41A CMN ISO VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3442	591-V-4315A	D/G A OVRSP Air RCVR TK42A Inlet ISO VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3443	591-V-4316A	D/G A OVRSP Air RCVR TK42A Inlet CHK VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3444	591-V-4317A	D/G A OVRSP Air RCVR TK PI-3086A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3445	591-V-4319A	D/G A Fuel Oil Feed PP 22A Disch CHK VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3446	591-V-4320A	D/G A Fuel Oil Feed PP 22A Disch VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3447	591-V-4324A	D/G A Fuel Oil Feed PP 22A Suction VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3448	591-V-4405A	D/G A Fuel Oil Feed PP 22A Suction VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3449	591-V-4415A	D/G A Fuel Oil PP Suction VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3450	591-V-4416A	D/G A Fuel Oil PP Suction VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3451	591-V-4421A	D/G A Fuel Oil ENG INLT Pr PT-3136 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3452	591-V-5024A	D/G A Starting Air RCVR TK40A DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3453	591-V-5032A	D/G A Starting Air RCVR TK41A DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (120 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3454	591-V-5033A	D/G A Starting Air RCVR TK40A DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3455	591-V-5034A	D/G A Starting Air RCVR TK41A DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3456	591-V-5043A	D/G A Over Speed Air RCVR TK42A DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3457	591-V-5105A	D/G A L.O PP Disch Line ED VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3458	591-V-5245A	D/G A Air Cooler LT WTR Inlet LN DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3459	591-V-5251A	D/G A LT WTR PP Disch LN DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3460	591-V-5280A	D/G A F.O Feed PP 22A Suct LN DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3461	591-V-5282A	D/G A Fuel Oil PP Suction Line DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3462	591-V-5283A	D/G A HT/CC HX HT WTR Inlet LN Vent VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3463	591-V-5285A	L.O/Pre-HTG WTR HX 01A WTR Outlet DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3464	591-V-5287A	D/G A L.O Pr Regulating VALVE Outlet DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3465	591-V-5288A	D/G A L.O PP Disch Line DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3466	591-V-5289A	L.O/LT WTR HX 30A L.O Inlet LN DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3467	591-V-5290A	D/G A LT WTR PP Suction Line DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3468	591-V-5292A	D/G A F.O Feed PP 22A Disch LN DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3469	591-V-5293A	D/G A HT WTR ENG Outlet Line DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3470	591-V-5294A	D/G A CC/LT HX LT WTR Inlet LN Vent VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3471	591-V-5295A	D/G A CC/LT HX LT WTR Outlet LN DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3472	591-V-5296A	D/G A F.O Engine Outlet Line DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3473	591-V-5297A	D/G A F.O Engine Outlet Line DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3474	591-V-5305A	D/G A HT WTR PP Suction Line DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3475	591-V-5307A	D/G A HT WTR Engine Outlet LN Vent VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3476	591-V-5308A	D/G A Pre-HTG HT WTR ENG INLT LN Vent VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (121 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3477	591-V-5312A	D/G A Pre-L.O PP 33A Suction LN DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3478	591-V-5313A	D/G A Pre-L.O PP 33A Disch LN DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3479	591-V-5316A	D/G A L.O PP Disch Line Vent VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3480	591-V-5318A	D/G A L.O Engine Inlet Line Vent VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3481	591-V-5320A	D/G A L.O/LT WTR HX L.O Outlet LN DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3482	591-V-5321A	D/G A LT WTR PP Disch LN Vent VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3483	591-V-5322A	D/G A OVRSP Air RCVR TK42A Relief VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3484	591-V-5323A	D/G A OVRSP Air RCVR TK PI-3086A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3485	591-V-5324A	D/G A OVRSP Air RCVR TK42A PS-3087 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3486	591-V-5325A	D/G A CC/LT WTR HX 02A CCW OTLT Vent VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3487	591-V-5331A	D/G A LT WTR PP Disch Pr PT-3110A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3488	591-V-5333A	D/G A Air Cooler LT WTR Outlet LN DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3489	591-V-5334A	D/G A LT WTR PP Disch→Air CLR LN Vent VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3490	591-V-5342A	D/G A Pre-HTG HT WTR ENG Inlet LN DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3491	591-V-5403A	LUBE OIL PUMP FEEDING INLET LN DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3492	591-V-5406A	D/G A L.O Engine Inlet LN PI-3142A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3493	591-V-5409A	D/G A Fuel Oil ENG INLT Pr PT-3136 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3494	591-V-5410A	D/G A HT WTR HTR 01A OTLT PS-3008A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3495	591-V-5422A	D/G A Air RCVR TK40A Pr PS-3178 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3496	591-V-5424A	D/G A Air RCVR TK40A Pr PI-3176A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3497	591-V-5426A	D/G A Air RCVR TK41A Pr PS-3183A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (122 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3498	591-V-5429A	D/G A Air RCVR TK41A Pr PS-3181 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3499	591-V-5430A	D/G A Air RCVR TK41A Pr PS-3179 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3500	591-V-5431A	D/G A Air RCVR TK41A Pr PI-3177A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3501	591-V-5432A	D/G A Air COMP ZM04A Disch PT-3184 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3502	591-V-5433A	D/G A Air COMP ZM04A Disch PT-3184 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3503	591-V-5435A	D/G A Air COMP ZM05A Disch PT-3185 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3504	591-V-5436A	D/G A Air COMP ZM05A Disch PT-3185 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3505	591-V-5440A	D/G A HT WTR ENG Inlet Pr PT-3007A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3506	591-V-5450A	D/G A F.O Feed PP Disch PS-3035A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3507	591-V-5451A	D/G A F.O Feed PP Disch PS-3035A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3508	591-V-5508A	D/G A L.O ENG Inlet Pr PT-3040 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3509	591-V-5517A	D/G A L.O Engine Inlet LN PI-3142A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3510	591-V-5518A	D/G A Pre-HTG HT WTR PP Disch PI RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3511	591-V-5530A	D/G A HT WTR ENG Inlet Pr PT-3007A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3512	591-V-5531A	D/G A LT WTR PP Disch Pr PT-3110A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3513	591-V-5541A	D/G A L.O ENG Inlet Pr PT-3048 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3514	591-V-5542A	D/G A L.O ENG Inlet Pr PS-3041A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3515	591-V-5543A	D/G A Crankcase Gas Pr PS-3060A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3516	591-V-5544A	D/G A L.O ENG Inlet Pr PS-3047A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3517	591-V-5545A	D/G A L.O ENG Inlet Pr PS-3046A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3518	591-V-5546A	D/G A L.O ENG Inlet Pr PS-3042A RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3519	591-V-5547A	D/G A L.O ENG Inlet Pr PT-3040 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3520	591-V-6100B	D/G B Silencer 01B FT50B PDIS-3521 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (123 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3521	591-V-6101B	D/G B Silencer 01B FT50B PDIS-3521 RT VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3522	595-V-4011A	F.O XFR PP A Train to TK 02A Supply VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3523	595-V-5031A	F.O Day TK 02A Inlet LN Pr Test VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3524	595-V-5103A	F.O Day TK 02A DRN VALVE	100A03C	Auxiliary	100'-0"	above	100'-6"		
3525	602-Y-VD-1004A	MANUAL DAMPER	100A03C	Auxiliary	100'-0"	above	100'-6"		
3526	602-Y-VD-1005A	MANUAL DAMPER	100A03C	Auxiliary	100'-0"	above	100'-6"		
3527	602-Y-VD-1040A	MANUAL DAMPER	100A03C	Auxiliary	100'-0"	above	100'-6"		
3528	602-Y-VD-1054A	MANUAL DAMPER	100A03C	Auxiliary	100'-0"	above	100'-6"		
3529	602-Y-VD-1506A	FIRE DAMPER	100A03C	Auxiliary	100'-0"	above	100'-6"		
3530	602-Y-VD-1519A	FIRE DAMPER	100A03C	Auxiliary	100'-0"	above	100'-6"		
3531	602-Y-VD-1527A	FIRE DAMPER	100A03C	Auxiliary	100'-0"	above	100'-6"		
3532	591-J-LP02B	ENGINE PANEL	100A03D	Auxiliary	100'-0"	above	100'-6"	6" FD (1)	-
3533	591-M-DG01B	DIESEL ENGINE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3534	591-M-EJ01B	Expansion Joint for Equipment	100A03D	Auxiliary	100'-0"	above	100'-6"		
3535	591-M-HE01B	LUBE OIL /PREHEATING WATER H/EX	100A03D	Auxiliary	100'-0"	above	100'-6"		
3536	591-M-HE02B	CC/LT WATER HX HE02B	100A03D	Auxiliary	100'-0"	above	100'-6"		
3537	591-M-HE03B	HT/CC WATER HX HE03B	100A03D	Auxiliary	100'-0"	above	100'-6"		
3538	591-M-HE30B	LUBE OIL /LT WATER HX. HE30B	100A03D	Auxiliary	100'-0"	above	100'-6"		
3539	591-M-OR01B	Flow Orifice for Equipment	100A03D	Auxiliary	100'-0"	above	100'-6"		
3540	591-M-OR02B	Flow Orifice for Equipment	100A03D	Auxiliary	100'-0"	above	100'-6"		
3541	591-M-OR03B	Flow Orifice for Equipment	100A03D	Auxiliary	100'-0"	above	100'-6"		
3542	591-M-OR05B	Flow Orifice for Equipment	100A03D	Auxiliary	100'-0"	above	100'-6"		
3543	591-M-OR06B	Flow Orifice for Equipment	100A03D	Auxiliary	100'-0"	above	100'-6"		
3544	591-M-OR07B	RESTRICTION ORIFICE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3545	591-M-OR08B	Flow Orifice for Equipment	100A03D	Auxiliary	100'-0"	above	100'-6"		
3546	591-M-OR11B	Flow Orifice for Equipment	100A03D	Auxiliary	100'-0"	above	100'-6"		
3547	591-M-OR12B	RESTRICTION ORIFICE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3548	591-M-OR16B	RESTRICTION ORIFICE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3549	591-M-OR18B	RESTRICTION ORIFICE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3550	591-M-OR20B	Flow Orifice for Equipment	100A03D	Auxiliary	100'-0"	above	100'-6"		
3551	591-M-OR30B	ORIFICE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3552	591-M-OR31B	ORIFICE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3553	591-M-OR33B	RESTRICTION ORIFICE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3554	591-M-OR34B	RESTRICTION ORIFICE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3555	591-M-OR35B	RESTRICTION ORIFICE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3556	591-M-OR36B	RESTRICTION ORIFICE	100A03D	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (124 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3557	591-M-PP01B	PREHEATING HT WATER PUMP	100A03D	Auxiliary	100'-0"	above	100'-6"		
3558	591-M-PP22B	FUEL OIL FEED PUMP	100A03D	Auxiliary	100'-0"	above	100'-6"		
3559	591-M-PP33B	PRELUBE OIL PUMP	100A03D	Auxiliary	100'-0"	above	100'-6"		
3560	591-M-ST01B	Y TYPE STRAINER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3561	591-M-ST02B	Y TYPE STRAINER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3562	591-M-TK40B	STARTING AIR RECEIVER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3563	591-M-TK41B	STARTING AIR RECEIVER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3564	591-M-TK42B	OVER SPEED AIR RECEIVER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3565	602-E-BS03B	TANK RM.EDH LOCAL CONTROL BOX	100A03D	Auxiliary	100'-0"	above	100'-6"		
3566	602-M-HC03B	TANK RM. ELECTRIC DUCT HEATER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3567	591-J-PI-3086B	OVER SPEED AIR RECEIVER TK42B	100A03D	Auxiliary	100'-0"	above	100'-6"		
3568	591-J-PI-3142B	LUBE OIL /PREHEATING WATER H/EX HE01B	100A03D	Auxiliary	100'-0"	above	100'-6"		
3569	591-J-PI-3176B	STARTING AIR RECEIVER TK40B	100A03D	Auxiliary	100'-0"	above	100'-6"		
3570	591-J-PI-3177B	STARTING AIR RECEIVER TK41B	100A03D	Auxiliary	100'-0"	above	100'-6"		
3571	591-J-PS-3008B	PREHEATING WATER PUMP OUTLET PRESSURE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3572	591-J-PS-3035B	FUEL OIL PUMP OUTLET PRESSURE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3573	591-J-PS-3041B	LUBE OIL SUMP (R2) PRESSURE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3574	591-J-PS-3042B	LUBE OIL SUMP (R1) PRESSURE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3575	591-J-PS-3046B	LUBE OIL SUMP (D) PRESSURE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3576	591-J-PS-3047B	LUBE OIL SUMP (C) PRESSURE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3577	591-J-PS-3060B	LUBE OIL SUMP (S1) PRESSURE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3578	591-J-PS-3182B	STARTING AIR RECEIVER TK40B	100A03D	Auxiliary	100'-0"	above	100'-6"		
3579	591-J-PS-3183B	STARTING AIR RECEIVER TK41B	100A03D	Auxiliary	100'-0"	above	100'-6"		
3580	591-J-PT-3007B	ENGINE INLET HT WATER PRESSURE MEASUREMENT L(222)	100A03D	Auxiliary	100'-0"	above	100'-6"		
3581	591-J-PT-3110B	LT WATER PUMP DISCHARE (L232)	100A03D	Auxiliary	100'-0"	above	100'-6"		
3582	591-J-TEW-3002B	PREHEATING HT WATER PUMPPP01	100A03D	Auxiliary	100'-0"	above	100'-6"		
3583	591-J-TEW-3004B	HT WATER PUMP SUCTION (L201)	100A03D	Auxiliary	100'-0"	above	100'-6"		
3584	591-J-TEW-3010B	LT WATER PUMP DISCHARE (L232)	100A03D	Auxiliary	100'-0"	above	100'-6"		
3585	591-J-TEW-3042B	LUBE OIL ENGINE INLET (L104)	100A03D	Auxiliary	100'-0"	above	100'-6"		
3586	591-J-TEW-3044B	LUBE OIL ENGINE INLET (L104)	100A03D	Auxiliary	100'-0"	above	100'-6"		
3587	591-J-TEW-3045B	LUBE OIL ENGINE INLET (L104)	100A03D	Auxiliary	100'-0"	above	100'-6"		
3588	591-J-TEW-3109B	LUBE OIL /PREHEATING WATER H/EX HE01B	100A03D	Auxiliary	100'-0"	above	100'-6"		
3589	591-J-TEW-3113B	AIR COOLER LT WATER OUTLET (L234)	100A03D	Auxiliary	100'-0"	above	100'-6"		
3590	591-J-TEW-3114B	AIR COOLER LT WATER OUTLET (L235)	100A03D	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (125 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3591	591-J-TEW-3516B	AIR COOLER LT WATER INLET (L233), (L236)	100A03D	Auxiliary	100'-0"	above	100'-6"		
3592	591-J-TI-3109B	LUBE OIL /PREHEATING WATER H/EX HE01B	100A03D	Auxiliary	100'-0"	above	100'-6"		
3593	591-J-TI-3113B	AIR COOLER LT WATER OUTLET (L234)	100A03D	Auxiliary	100'-0"	above	100'-6"		
3594	591-J-TI-3114B	AIR COOLER LT WATER OUTLET (L235)	100A03D	Auxiliary	100'-0"	above	100'-6"		
3595	591-J-TT-3002B	PREHEATING HT WATER PUMP PP01B	100A03D	Auxiliary	100'-0"	above	100'-6"		
3596	591-J-TT-3044B	LUBE OIL ENGINE INLET (L104)	100A03D	Auxiliary	100'-0"	above	100'-6"		
3597	591-J-TT-3045B	LUBE OIL ENGINE INLET (L104)	100A03D	Auxiliary	100'-0"	above	100'-6"		
3598	602-J-FS-3052D	D/G FUEL OIL & LT & HT WTR TK RM AREA II	100A03D	Auxiliary	100'-0"	above	100'-6"		
3599	602-J-TE-0014D	EDG AREA II EMRG D/G RM TEMP.	100A03D	Auxiliary	100'-0"	above	100'-6"		
3600	602-J-TE-0016D	EDG AREA II EMRG D/G RM TEMP.	100A03D	Auxiliary	100'-0"	above	100'-6"		
3601	602-J-TE-3052D	D/G FUEL OIL & LT & HT WTR TK RM AREA II	100A03D	Auxiliary	100'-0"	above	100'-6"		
3602	602-J-TE-3054D	D/G FUEL OIL & LT & HT WTR TK RM AREA II	100A03D	Auxiliary	100'-0"	above	100'-6"		
3603	602-J-TS-3052D	D/G FUEL OIL & LT & HT WTR TK RM AREA II PRI. OVER TEMP	100A03D	Auxiliary	100'-0"	above	100'-6"		
3604	602-J-TS-3054D	D/G FUEL OIL & LT & HT WTR TK RM AREA II SEC. OVER TEMP	100A03D	Auxiliary	100'-0"	above	100'-6"		
3605	461-V-0182	DG B HX INLET ISO VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3606	461-V-1282	DG. B HX OUTLET ISO. VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3607	591-V-3023B	D/G B Starting Air RCVR TK40B Relief VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3608	591-V-3031B	D/G B Starting Air RCVR TK41B Relief VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3609	591-V-3037B	D/G B F.O Outlet OR20B B/P Regulating VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3610	591-V-3054B	D/G B Pre Lube Oil PP 33B Relief VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3611	591-V-3059B	D/G B Lube Oil Pr Regulating VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3612	591-V-3098B	D/G B Starting Air RCVR TK41B DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3613	591-V-3099B	D/G B Starting Air RCVR TK40B DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3614	591-V-3114B	D/G B L.O Engine Inlet Temp CTRL VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3615	591-V-3217B	D/G B HT WTR Engine Outlet Temp CTRL VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (126 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3616	591-V-3250B	D/G B LT WTR PP Suction Temp CTRL VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3617	591-V-3353B	D/G B Fuel Oil Feed PP 22B Relief VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3618	591-V-4022B	D/G B Air Compressor ZM04B Outlet CHK VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3619	591-V-4030B	D/G B Air Compressor ZM05B Outlet CHK VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3620	591-V-4109B	D/G B Pre-L.O Engine Inlet CHK VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3621	591-V-4110B	D/G B Pre-L.O PP 33B Suction VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3622	591-V-4111B	L.O/Pre-HTG WTR HX 01B L.O Outlet CHK VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3623	591-V-4112B	L.O/Pre-HTG WTR HX 01B L.O Outlet ISO VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3624	591-V-4140B	D/G B Lube Oil PP Disch CHK VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3625	591-V-4210B	D/G B Pre-L.O PP 33B Disch VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3626	591-V-4212B	D/G B HT WTR PP Suction Line CHK VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3627	591-V-4213B	D/G B Pre-HTG HT WTR ENG Inlet LN ISO VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3628	591-V-4214B	D/G B Pre-HTG HT WTR ENG Inlet LN CHK VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3629	591-V-4219B	D/G B Pre-HTG HT WTR PP 01B Suct VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3630	591-V-4223B	D/G B HT WTR Elec. HTR HT01B Inlet VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3631	591-V-4224B	D/G B HT WTR Elec. HTR HT01B Outlet VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3632	591-V-4242B	D/G B LT WTR PP Disch LN CHK VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3633	591-V-4315B	D/G B OVRSP Air RCVR TK42B Inlet ISO VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3634	591-V-4316B	D/G B OVRSP Air RCVR TK42B Inlet CHK VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3635	591-V-4319B	D/G B Fuel Oil Feed PP 22B Disch CHK VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3636	591-V-4320B	D/G B Fuel Oil Feed PP 22B Disch VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3637	591-V-4324B	D/G B Fuel Oil Feed PP 22B Suction VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3638	591-V-4405B	D/G B Fuel Oil Feed PP 22B Suction VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3639	591-V-4415B	D/G B Fuel Oil PP Suction VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3640	591-V-4416B	D/G B Fuel Oil PP Suction VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (127 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3641	591-V-4421B	D/G B Fuel Oil ENG INLT Pr PT-3536 RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3642	591-V-5024B	D/G B Starting Air RCVR TK40B DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3643	591-V-5032B	D/G B Starting Air RCVR TK41B DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3644	591-V-5033B	D/G B Starting Air RCVR TK40B DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3645	591-V-5034B	D/G B Starting Air RCVR TK41B DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3646	591-V-5043B	D/G B Over Speed Air RCVR TK42B DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3647	591-V-5105B	D/G B L.O PP Disch Line ED VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3648	591-V-5220B	D/G B Pre-HTG HT WTR PP 01B Suct DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3649	591-V-5245B	D/G B Air Cooler LT WTR Inlet LN DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3650	591-V-5251B	D/G B LT WTR PP Disch LN DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3651	591-V-5280B	D/G B F.O Feed PP 22B Suct LN DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3652	591-V-5282B	D/G B Fuel Oil PP Suction Line DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3653	591-V-5283B	D/G B HT/CC HX HT WTR Inlet LN Vent VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3654	591-V-5285B	L.O/Pre-HTG WTR HX 01B WTR Outlet DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3655	591-V-5287B	D/G B L.O Pr Regulating VALVE Outlet DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3656	591-V-5288B	D/G B L.O PP Disch Line DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3657	591-V-5289B	L.O/LT WTR HX 30B L.O Inlet LN DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3658	591-V-5290B	D/G B LT WTR PP Suction Line DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3659	591-V-5292B	D/G B F.O Feed PP 22B Disch LN DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3660	591-V-5293B	D/G B HT WTR ENG Outlet Line DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3661	591-V-5294B	D/G B CC/LT HX LT WTR Inlet LN Vent VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3662	591-V-5295B	D/G B CC/LT HX LT WTR Outlet LN DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (128 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3663	591-V-5296B	D/G B F.O Engine Outlet Line DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3664	591-V-5297B	D/G B F.O Engine Outlet Line DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3665	591-V-5305B	D/G B HT WTR PP Suction Line DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3666	591-V-5307B	D/G B HT WTR Engine Outlet LN Vent VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3667	591-V-5308B	D/G B Pre-HTG HT WTR ENG INLT LN Vent VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3668	591-V-5312B	D/G B Pre-L.O PP 33B Suction LN DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3669	591-V-5313B	D/G B Pre-L.O PP 33B Disch LN DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3670	591-V-5316B	D/G B L.O PP Disch Line Vent VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3671	591-V-5318B	D/G B L.O Engine Inlet Line Vent VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3672	591-V-5320B	D/G B L.O/LT WTR HX L.O Outlet LN DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3673	591-V-5321B	D/G B LT WTR PP Disch LN Vent VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3674	591-V-5322B	D/G B OVRSP Air RCVR TK42B Relief VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3675	591-V-5325B	D/G B CC/LT WTR HX 02B CCW OTLT Vent VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3676	591-V-5331B	D/G B LT WTR PP Disch Pr PT-3110B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3677	591-V-5333B	D/G B Air Cooler LT WTR Outlet LN DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3678	591-V-5334B	D/G B LT WTR PP Disch→Air CLR LN Vent VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3679	591-V-5341B	LUBE OIL PUMP FEEDING INLET LN VENT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3680	591-V-5342B	D/G B Pre-HTG HT WTR ENG Inlet LN DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3681	591-V-5343B	LUBE OIL PUMP FEEDING INLET LN VENT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3682	591-V-5403B	LUBE OIL PUMP FEEDING INLET LN DRN VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3683	591-V-5406B	D/G B L.O Engine Inlet LN PI-3142B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3684	591-V-5411B	D/G B HT WTR EXP TK01B LI/LS HDR RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (129 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3685	591-V-5412B	D/G B HT WTR EXP TK01B LI/LS HDR RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3686	591-V-5418B	D/G B Pre-HTG HT WTR PP Disch PI RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3687	591-V-5432B	D/G B Air COMP ZM04B Disch PT-3584 RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3688	591-V-5435B	D/G B Air COMP ZM05B Disch PT-3585 RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3689	591-V-5440B	D/G B HT WTR ENG Inlet Pr PT-3007B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3690	591-V-5450B	D/G B F.O Feed PP Disch PS-3035B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3691	591-V-5502B	D/G B Crankcase Gas Pr PS-3060B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3692	591-V-5503B	D/G B L.O ENG Inlet Pr PS-3047B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3693	591-V-5504B	D/G B L.O ENG Inlet Pr PS-3046B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3694	591-V-5505B	D/G B L.O ENG Inlet Pr PT-3548 RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3695	591-V-5506B	D/G B L.O ENG Inlet Pr PS-3041B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3696	591-V-5507B	D/G B L.O ENG Inlet Pr PS-3042B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3697	591-V-5508B	D/G B L.O ENG Inlet Pr PT-3540 RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3698	591-V-5510B	D/G B HT WTR HTR 01B OTLT PS-3008B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3699	591-V-5517B	D/G B L.O Engine Inlet LN PI-3142B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3700	591-V-5518B	D/G B Pre-HTG HT WTR PP Disch PI RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3701	591-V-5530B	D/G B HT WTR ENG Inlet Pr PT-3007B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3702	591-V-5531B	D/G B LT WTR PP Disch Pr PT-3110B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3703	591-V-5541B	D/G B L.O ENG Inlet Pr PT-3548 RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3704	591-V-5542B	D/G B L.O ENG Inlet Pr PS-3041B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3705	591-V-5543B	D/G B Crankcase Gas Pr PS-3060B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3706	591-V-5544B	D/G B L.O ENG Inlet Pr PS-3047B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3707	591-V-5545B	D/G B L.O ENG Inlet Pr PS-3046B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3708	591-V-5546B	D/G B L.O ENG Inlet Pr PS-3042B RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3709	591-V-5547B	D/G B L.O ENG Inlet Pr PT-3540 RT VALVE	100A03D	Auxiliary	100'-0"	above	100'-6"		
3710	602-Y-VD-1004B	MANUAL DAMPER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3711	602-Y-VD-1005B	MANUAL DAMPER	100A03D	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (130 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3712	602-Y-VD-1040B	MANUAL DAMPER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3713	602-Y-VD-1054B	MANUAL DAMPER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3714	602-Y-VD-1506B	FIRE DAMPER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3715	602-Y-VD-1519B	FIRE DAMPER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3716	602-Y-VD-1520B	FIRE DAMPER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3717	602-Y-VD-1521B	FIRE DAMPER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3718	602-Y-VD-1524B	FIRE DAMPER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3719	602-Y-VD-1527B	FIRE DAMPER	100A03D	Auxiliary	100'-0"	above	100'-6"		
3720	602-Y-VD-1523A	FIRE DAMPER	100A04C	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	-
3721	461-V-2479	EDG to CCW Train A Line FT-10R Root VALVE	100A06C	Auxiliary	100'-0"	above	100'-6"	6" FD (2)	10" EOL (1)
3722	461-V-2480	EDG to CCW Train A Line FT-10R Root VALVE	100A06C	Auxiliary	100'-0"	above	100'-6"		
3723	543-V-2606	AUX FW STRG TK A→LTI2 INST RT VALVE	100A06C	Auxiliary	100'-0"	above	100'-6"		
3724	543-V-2642	AUX FW STRG TK A Grab Sample Test VALVE	100A06C	Auxiliary	100'-0"	above	100'-6"		
3725	461-V-2481	EDG to CCW Train B Line FT-10S Root VALVE	100A06D	Auxiliary	100'-0"	above	100'-6"	6" FD (2)	10" EOL (1)
3726	461-V-2482	EDG to CCW Train B Line FT-10S Root VALVE	100A06D	Auxiliary	100'-0"	above	100'-6"		
3727	543-V-2608	AUX FW STRG TK B→LTI3 INST RT VALVE	100A06D	Auxiliary	100'-0"	above	100'-6"		
3728	543-V-2644	AUX FW STRG TK B GRAB Sample Test VALVE	100A06D	Auxiliary	100'-0"	above	100'-6"		
3729	543-M-TK01A	AUXILIARY FEEDWATER STORAGE TANK A	100A07C	Auxiliary	100'-0"	above	100'-6"	-	
3730	441-J-FT-0331C	SI & LINE 3 FLOW	100A08C	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	-
3731	441-J-ZY-0636C01	SI LINE 3 ISO VALVE - 636	100A08C	Auxiliary	100'-0"	above	100'-6"		
3732	441-J-FT-0311D	SI & LINE 4 FLOW	100A08D	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	-
3733	441-J-ZY-0616D01	SI LINE 4 ISO VALVE - 616	100A08D	Auxiliary	100'-0"	above	100'-6"		
3734	543-J-TEW-0001	AFWST TK A TEMP	100A10A	Auxiliary	100'-0"	above	100'-6"	6" FD (1)	10" EOL (1)
3735	543-V-2605	AUX FW STRG TK A→LTI2 INST RT VALVE	100A10A	Auxiliary	100'-0"	above	100'-6"		
3736	543-J-TEW-0002	AFWST TK B TEMP	100A10B	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	10" EOL (1)
3737	543-V-2607	AUX FW STRG TK B→LTI3 INST RT VALVE	100A10B	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (131 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3738	606-M-HV19A	MECHANICAL PENETRATION RM CUBICLE COOLER	100A13A	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	
3739	441-J-FE-0390C	SIP HOT LEG INJECTION HEADER NO.1 FLOW	100A13A	Auxiliary	100'-0"	above	100'-6"		
3740	441-J-HS-0655A03	SCS SUCTION LINE ISOATION	100A13A	Auxiliary	100'-0"	above	100'-6"		
3741	441-J-HS-0691A02	SCS WARMUP LINE FOLW CONTROL	100A13A	Auxiliary	100'-0"	above	100'-6"		
3742	606-J-TE-0223A	MECH. PENETRATION RM TEMP	100A13A	Auxiliary	100'-0"	above	100'-6"		
3743	441-V-0285	SIP 02C Disch to IRWST Line Relief VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3744	441-V-0300	SDC Hx 01A to IRWST Return Line ISO VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3745	441-V-0302	SI Combined Mini-Flow Line ISO VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3746	441-V-0321	SIP 02C to Hot Leg INJ Loop1 LN ISO VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3747	441-V-0417	SIP 02A Disch Relief VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3748	441-V-0525	SIP 02C to Hot Leg INJ LN FT-390C RT VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3749	441-V-0526	SIP 02C to Hot Leg INJ LN FT-390C RT VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3750	441-V-0655	RCS Loop1 to SCP 01A Suct ISO VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3751	441-V-0691	SCS Train1 Warmup Line Flow CTRL VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3752	441-V-0801	EXTERNAL EMERGENCY INJECTION LINE CHK VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3753	441-V-0803	EXTERNAL EMERGENCY INJECTION LINE ISO VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3754	441-V-0805	EXTERNAL EMERGENCY INJECTION LINE ISO VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3755	441-V-0807	EXTERNAL EMERGENCY INJECTION LINE ISO VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3756	441-V-2312	SCS TRN Test Connection VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3757	441-V-2313	SCS TRN Test Connection VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3758	441-V-2509	SCP 01A RETURN LINE SPEC TEST VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3759	441-V-2511	SCP 01A Return Line Spec Test VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3760	441-V-2513	SI/SC MINFLOW LINE SPEC TEST VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3761	441-V-2704	RCS LOOP-1 TO SCP 01A SUCT LN SPEC TEST VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3762	441-V-2731	SCP 01A RETURN LINE SPEC TEST VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3763	441-V-2735	SI/SC MINFLOW LINE SPEC TEST VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3764	441-V-2755	SCP 01A RETURN LINE DRAIN VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3765	441-V-2762	SI Hot Let-1 Spec Test Vent VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (132 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3766	441-V-2764	SI Hot Let-1 Spec Test Vent VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3767	441-V-2765	SCP 01A Return Line Spec Test VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3768	441-V-2766	SI/SC Mini-Flow Line Vent VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3769	441-V-2767	SI/SC Mini-Flow Line Vent VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3770	441-V-2830	SI/SC Injection 1 Line DRN VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3771	441-V-2831	SI/SC Injection 1 Line DRN VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3772	443-V-0003	POST ACCIDENT H_2 PURGE CONTAINMENT ISOATION VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3773	443-V-2002	H2 Purge LN Pr Test Vent VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3774	451-V-0113	VCT Level Indicator ISO VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3775	451-V-0114	VCT Level Indicator ISO VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3776	451-V-0193	VCT Level Indicator ISO VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3777	451-V-0194	VCT Level Indicator ISO VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3778	451-V-0509	IRWST M/U Line Cont. ISO VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3779	451-V-0898	IRWST M/U Line Test Connection ISO VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3780	481-V-0006	RCB Sump to LRS FLR DRN TK LN ISO VALVE(AB)	100A13A	Auxiliary	100'-0"	above	100'-6"		
3781	491-V-0002	RCS HOTLEG LOOP1 SAMPLE CIV	100A13A	Auxiliary	100'-0"	above	100'-6"		
3782	612-V-2012	ILRT/SIT Air Conn LLRT Conn VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3783	612-V-2024	ILRT/SIT Air Connection VALVE	100A13A	Auxiliary	100'-0"	above	100'-6"		
3784	606-Y-VK-1150A	MANUAL DAMPER	100A13A	Auxiliary	100'-0"	above	100'-6"		
3785	606-Y-VK-1153A	MANUAL DAMPER	100A13A	Auxiliary	100'-0"	above	100'-6"		
3786	606-Y-VK-1558A	FIRE DAMPER	100A13A	Auxiliary	100'-0"	above	100'-6"		
3787	606-M-HV19B	MECHANICAL PENETRATION RM CUBICLE COOLER	100A13B	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	10" EOL (1)
3788	441-J-FE-0391D	SIP HOT LEG INJECTION HEADER NO.2 FLOW	100A13B	Auxiliary	100'-0"	above	100'-6"		
3789	441-J-HS-0656B03	SCS SUCTION LINE ISOATION	100A13B	Auxiliary	100'-0"	above	100'-6"		
3790	441-J-HS-0690B02	SCS WARMUP LINE FOLW CONTROL	100A13B	Auxiliary	100'-0"	above	100'-6"		
3791	451-J-ZL-0362	SHUTDOWN COOLING HEAT EXCHANGER 1	100A13B	Auxiliary	100'-0"	above	100'-6"		
3792	606-J-TE-0228B	MECH. PENET. ROOM TEMP	100A13B	Auxiliary	100'-0"	above	100'-6"		
3793	633-J-TW-0202	COOLING COIL VK-CW12B OUTLET	100A13B	Auxiliary	100'-0"	above	100'-6"		
3794	633-J-TW-0204	COOLING COIL VK-CW12B INLET	100A13B	Auxiliary	100'-0"	above	100'-6"		
3795	441-V-0301	SDC Hx 01B to IRWST Return Line ISO VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3796	441-V-0303	SI Combined Mini-Flow Line ISO VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3797	441-V-0331	SIP 02D to Hot Leg INJ LN ISO VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (133 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3798	441-V-0535	SIP 02D to Hot Leg INJ LN FT-391D RT VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3799	441-V-0536	SIP 02D to Hot Leg INJ LN FT-391D RT VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3800	441-V-0656	RCS Loop2 to SCP 01B Suct ISO VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3801	441-V-0690	SCS Train2 Warmup Line Flow CTRL VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3802	441-V-2510	SCP 01B RETURN LINE SPEC TEST VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3803	441-V-2512	SCP 01B Return Line Spec Test VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3804	441-V-2514	SI/SC MINFLOW LINE SPEC TEST VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3805	441-V-2714	RCS LOOP-2 TO SCP 01B SUCT LN SPEC TEST VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3806	441-V-2732	SCP 01B RETURN LINE SPEC TEST VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3807	441-V-2736	SI/SC MINFLOW LINE SPEC TEST VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3808	441-V-2756	SCP 01B RETURN LINE DRAIN VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3809	441-V-2761	SI Hot Let-2 Spec Test Vent VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3810	441-V-2763	SI Hot Let-2 Spec Test Vent VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3811	441-V-2782	SI/SC Mini-Flow Line Vent VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3812	441-V-2783	SI/SC Mini-Flow Line Vent VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3813	441-V-2807	SCP 01B Return Line Spec Test VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3814	441-V-2828	SI/SC Injection 2 Line DRN VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3815	441-V-2829	SI/SC Injection 2 Line DRN VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3816	451-V-0362	Shutdown Purification Line ISO VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3817	451-V-0416	CHG Line Test Connection ISO VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3818	451-V-0524	Charging Line ISO VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3819	451-V-0854	Charging Line Test Connection ISO VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3820	451-V-0892	Shutdown Purif Line Test Conn ISO VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3821	451-V-0893	Shutdown Purif Line Test Conn ISO VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3822	451-V-2064	CHG LN to RC Loop 1A DRN VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3823	451-V-2065	CHG LN to RC Loop 1A DRN VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3824	451-V-2349	SC Hx 1&2 to L/D Hx HE02 DRN VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3825	463-V-1143	SFP CLEANUP P/P B SUCT LN PENE ISO VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3826	633-V-1151B	CW19B MECH. PENET RM C-CLR Outlet VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3827	633-V-1152B	CW19B MECH. PENET RM C-CLR Inlet thro VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3828	633-V-2151B	MECH.PENET(19B) C-CLR Outlet PZR Test VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (134 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3829	633-V-2152B	MECH. PENET(19B) C-CLR Inlet PZR Test VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3830	633-V-2251B	MECH. PENET RM HV19B ECW Outlet Vent VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3831	633-V-2252B	MECH. PENET RM HV19B ECW Inlet DRN VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3832	633-V-2291B	MECH. PENET RM HV19B ECW Outlet DRN VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3833	633-V-2351B	ME PEN RM HV19B ECW Outlet Test Conn VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3834	633-V-2352B	ME PEN RM HV19B ECW Inlet Test Conn VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3835	763-V-0010	H2 ANZR/MON(TRN B) OTLT ISO(RCB OUTSIDE)	100A13B	Auxiliary	100'-0"	above	100'-6"		
3836	763-V-0014	H2 ANZR/MON(TRN B) INLT ISO(RCB OUTSIDE)	100A13B	Auxiliary	100'-0"	above	100'-6"		
3837	763-V-0020	CH D CNMT PR PT-351D,352D RT VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3838	763-V-1008	H2 ANZR/MON(TRN B) OUTLET LN DRN VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3839	763-V-1012	H2 ANZR/MON(TRN B) OUTLET LN DRN VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3840	763-V-1018	H2 ANZR/MON(TRN B) INLT LN DRN & TEST VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3841	763-V-1020	H2 ANZR/MON(TRN B) INLT LN DRN & TEST VALVE	100A13B	Auxiliary	100'-0"	above	100'-6"		
3842	606-Y-VK-1180B	MANUAL DAMPER	100A13B	Auxiliary	100'-0"	above	100'-6"		
3843	606-Y-VK-1560B	FIRE DAMPER	100A13B	Auxiliary	100'-0"	above	100'-6"		
3844	606-Y-VK-1158A	MANUAL DAMPER	100A14A	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	-
3845	606-Y-VK-1556A	FIRE DAMPER	100A14A	Auxiliary	100'-0"	above	100'-6"		
3846	441-M-OR06C	Flow Orifice for Equipment	100A16C	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	10" EOL (1)
3847	441-M-OR06C-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	100A16C	Auxiliary	100'-0"	above	100'-6"		
3848	441-J-FE-0331C	SIP DVI 2A FLOW RATE	100A16C	Auxiliary	100'-0"	above	100'-6"		
3849	442-J-HS-0001C	CONTAINMENT SPRAY HEADER BLOCK VALVES V001 CTRL	100A16C	Auxiliary	100'-0"	above	100'-6"		
3850	441-V-0125	SI Line3 FT-331C RT VALVE	100A16C	Auxiliary	100'-0"	above	100'-6"		
3851	441-V-0126	SI Line3 FT-331C RT VALVE	100A16C	Auxiliary	100'-0"	above	100'-6"		
3852	441-V-0636	SIS Line3 to DVI Nozzle 2A ISO VALVE	100A16C	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (135 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3853	441-V-0931	SIS Line3 to DVI Nozzle 2A Test Conn VALVE	100A16C	Auxiliary	100'-0"	above	100'-6"		
3854	441-V-0932	SIS Line3 to DVI Nozzle 2A Test Conn VALVE	100A16C	Auxiliary	100'-0"	above	100'-6"		
3855	442-V-0001	CS TRN-A CNMT BLOCK VALVE	100A16C	Auxiliary	100'-0"	above	100'-6"		
3856	442-V-0003	CS TRN-A CNMT ISO VALVE	100A16C	Auxiliary	100'-0"	above	100'-6"		
3857	442-V-2005	CS Hx 01A Outlet Pr Test VALVE	100A16C	Auxiliary	100'-0"	above	100'-6"		
3858	442-V-2033	CS Hx 01A Outlet Spec Test Vent VALVE	100A16C	Auxiliary	100'-0"	above	100'-6"		
3859	791-V-0031	S/G#1 H/L SIDE B/D SAMPLE ISO VALVE	100A16C	Auxiliary	100'-0"	above	100'-6"		
3860	791-V-0033	S/G#1 DOWNCOMER SIDE SAMPLE ISO VALVE	100A16C	Auxiliary	100'-0"	above	100'-6"		
3861	791-V-0035	S/G#1 C/L SIDE B/D SAMPLE ISO VALVE	100A16C	Auxiliary	100'-0"	above	100'-6"		
3862	791-V-0257	S/G#1 H/L→PRI SMPL & CLR RACK ISO VALVE	100A16C	Auxiliary	100'-0"	above	100'-6"		
3863	791-V-2001	SGBD#1 C/L SIDE GRAB SMPL TEST ISO VALVE	100A16C	Auxiliary	100'-0"	above	100'-6"		
3864	606-Y-VK-1601A	FIRE DAMPER	100A16C	Auxiliary	100'-0"	above	100'-6"		
3865	441-M-OR06D	Flow Orifice for Equipment	100A16D	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	10" EOL (1)
3866	441-M-OR06D-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	100A16D	Auxiliary	100'-0"	above	100'-6"		
3867	441-J-FE-0311D	SIP DVI 1B FLOW RATE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3868	441-V-0115	SI Line4 FT-311D RT VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3869	441-V-0116	SI Line4 FT-311D RT VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3870	441-V-0616	SIS Line4 to DVI Nozzle 1B ISO VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3871	441-V-0911	SIS Line4 to DVI Nozzle 1B Test Conn VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3872	441-V-0912	SIS Line4 to DVI Nozzle 1B Test Conn VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3873	442-V-0002	CS TRN-B CNMT BLOCK VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3874	442-V-0004	CS TRN-B CNMT ISO VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3875	442-V-2006	CS Hx 01B Outlet Pr Test VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3876	442-V-2034	CS Hx 01B Outlet Spec Test Vent VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3877	451-V-0561	RDT Effluent Containment ISO VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3878	791-V-0032	S/G#2 H/L SIDE B/D SAMPLE ISO VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3879	791-V-0034	S/G#2 DOWNCOMER SIDE SAMPLE ISO VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3880	791-V-0036	S/G#2 C/L SIDE B/D SAMPLE ISO VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3881	791-V-0258	S/G#2 H/L→PRI SMPL & CLR RACK ISO VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3882	791-V-2003	SGBD#2 C/L SIDE GRAB SMPL TEST ISO VALVE	100A16D	Auxiliary	100'-0"	above	100'-6"		
3883	606-Y-VK-1601B	FIRE DAMPER	100A16D	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (136 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3884	491-J-JZ-0002A	RCS HOTLEG LOOP1 SAMPLE CIV CCU	100A18A	Auxiliary	100'-0"	above	100'-6"		
3885	606-Y-VK-1561B	FIRE DAMPER	100A18B	Auxiliary	100'-0"	above	100'-6"		
3886	602-Y-VD-1520A	FIRE DAMPER	100A19C	Auxiliary	100'-0"	above	100'-6"		
3887	602-Y-VD-1521A	FIRE DAMPER	100A19C	Auxiliary	100'-0"	above	100'-6"		
3888	441-E-SQ02C	UNIT 3 1E 125V DC LOCAL STARTER SQ02C	100A20A	Auxiliary	100'-0"	above	100'-6"	6" FD (1)	-
3889	606-J-PDT-0027A	GNRL ACCS AREA 100-A20A DIFF PRESS	100A20A	Auxiliary	100'-0"	above	100'-6"		
3890	633-J-TW-0191	COOLING COIL VF-CW02A INLET	100A20A	Auxiliary	100'-0"	above	100'-6"		
3891	633-J-TW-0201	COOLING COIL VK-CW12A OUTLET	100A20A	Auxiliary	100'-0"	above	100'-6"		
3892	633-J-TW-0203	COOLING COIL VK-CW12A INLET	100A20A	Auxiliary	100'-0"	above	100'-6"		
3893	451-V-0116	VCT Sampling Line ISO VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3894	451-V-F570	VENT VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3895	461-V-1573	SFP Cooling HE02A Inlet V389 Equal VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3896	461-V-2751	SFP Cooling HE02A Outlet Line Vent VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3897	461-V-2902	SFP Cooling HE02A Inlet Line Vent VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3898	633-V-1145A	CW02A SFP CLG HX C-CLR Outlet VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3899	633-V-1146A	CW02A SFP CLG HX C-CLR Inlet throt VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3900	633-V-1151A	CW19A MECH. PENET RM C-CLR Outlet VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3901	633-V-1152A	CW19A MECH. PENET RM C-CLR Inlet thro VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3902	633-V-2145A	SFP CLGHX(02A) C-CLR Outlet PZR Test VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3903	633-V-2146A	SFP CLG HX(02A) C-CLR Inlet PZR Test VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3904	633-V-2151A	MECH.PENET(19A) C-CLR Outlet PZR Test VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3905	633-V-2152A	MECH. PENET(19A) C-CLR Inlet PZR Test VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3906	633-V-2245A	SFP CLG Hx Rm HV 02A ECW Outlet Vent VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3907	633-V-2246A	SFP CLG Hx Rm HV 02A ECW Inlet DRN VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3908	633-V-2251A	MECH. PENET RM HV19A ECW Outlet Vent VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3909	633-V-2252A	MECH. PENET RM HV19A ECW Inlet DRN VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (137 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3910	633-V-2290A	SFP CLGHxRm HV02A ECW Inlet TestConn VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3911	633-V-2291A	MECH. PENET RM HV19A ECW Outlet DRN VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3912	633-V-2345A	SFPCLGHxRm HV02A ECW Outlet TestConn VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3913	633-V-2346A	SFPCLGHxRm HV02A ECW Inlet TestConn VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3914	633-V-2351A	ME PEN RM HV19A ECW Outlet Test Conn VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3915	633-V-2352A	ME PEN RM HV19A ECW Inlet Test Conn VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3916	761-V-2054A	CMNT AIR RE/RT-039A INLET VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3917	761-V-2054B	CMNT AIR RE/RT-039A INLET VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3918	761-V-2055A	CMNT AIR RE/RT-039A OUTLET VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3919	761-V-F606	GATE VALVE	100A20A	Auxiliary	100'-0"	above	100'-6"		
3920	606-Y-VK-1164A	MANUAL DAMPER	100A20A	Auxiliary	100'-0"	above	100'-6"		
3921	606-Y-VK-1565A	FIRE DAMPER	100A20A	Auxiliary	100'-0"	above	100'-6"		
3922	606-Y-VK-1582A	FIRE DAMPER	100A20A	Auxiliary	100'-0"	above	100'-6"		
3923	606-Y-VK-1584A	FIRE DAMPER	100A20A	Auxiliary	100'-0"	above	100'-6"		
3924	606-Y-VK-1130A	MANUAL DAMPER	100A21A	Auxiliary	100'-0"	above	100'-6"	6" FD (1)	-
3925	606-Y-VK-1146A	MANUAL DAMPER	100A21A	Auxiliary	100'-0"	above	100'-6"		
3926	606-Y-VK-1148A	MANUAL DAMPER	100A21A	Auxiliary	100'-0"	above	100'-6"		
3927	606-Y-VK-1165A	MANUAL DAMPER	100A21A	Auxiliary	100'-0"	above	100'-6"		
3928	441-J-FT-0390C	HOT LET INJECTION LOOP 1	100A22A	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	10" EOL (1)
3929	441-J-ZY-0321C01	HOT LEG INJECTION VALVE - 321	100A22A	Auxiliary	100'-0"	above	100'-6"		
3930	441-J-ZY-0691A01	SCS WARMUP LINE ISO VALVE - 691	100A22A	Auxiliary	100'-0"	above	100'-6"		
3931	761-J-RE-0039A	CNMT AIR	100A22A	Auxiliary	100'-0"	above	100'-6"		
3932	761-J-RE-0040A	CONTAINMENT AIR	100A22A	Auxiliary	100'-0"	above	100'-6"		
3933	761-J-RT-0039A	CONTAINMENT AIR PART RAD. HI	100A22A	Auxiliary	100'-0"	above	100'-6"		
3934	761-J-RT-0039A01	CONTAINMENT AIR PART RAD. HI	100A22A	Auxiliary	100'-0"	above	100'-6"		
3935	761-J-RT-0040A	CONTAINMENT AIR PART RAD. HI	100A22A	Auxiliary	100'-0"	above	100'-6"		
3936	761-J-RT-0040A01	CONTAINMENT AIR PART RAD. HI	100A22A	Auxiliary	100'-0"	above	100'-6"		
3937	763-J-PT-0351D	NARROW RANGE PRESS. (CH "D")	100A22A	Auxiliary	100'-0"	above	100'-6"		
3938	763-J-PT-0352D	WIDE RANGE PRESS. (CH "D")	100A22A	Auxiliary	100'-0"	above	100'-6"		
3939	761-V-2055B	CMNT AIR RE/RT-039A OUTLET VALVE	100A22A	Auxiliary	100'-0"	above	100'-6"		
3940	604-Y-VF-1506	FIRE DAMPER	100A22A	Auxiliary	100'-0"	above	100'-6"		
3941	606-Y-VK-1097A	MANUAL DAMPER	100A22A	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (138 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3942	606-Y-VK-1123A	MANUAL DAMPER	100A22A	Auxiliary	100'-0"	above	100'-6"		
3943	606-Y-VK-1132A	MANUAL DAMPER	100A22A	Auxiliary	100'-0"	above	100'-6"		
3944	606-Y-VK-1136A	MANUAL DAMPER	100A22A	Auxiliary	100'-0"	above	100'-6"		
3945	606-Y-VK-1138A	MANUAL DAMPER	100A22A	Auxiliary	100'-0"	above	100'-6"		
3946	606-Y-VK-1139A	MANUAL DAMPER	100A22A	Auxiliary	100'-0"	above	100'-6"		
3947	606-Y-VK-1147A	MANUAL DAMPER	100A22A	Auxiliary	100'-0"	above	100'-6"		
3948	606-Y-VK-1557A	FIRE DAMPER	100A22A	Auxiliary	100'-0"	above	100'-6"		
3949	606-Y-VK-1559A	FIRE DAMPER	100A22A	Auxiliary	100'-0"	above	100'-6"		
3950	606-Y-VK-1560A	FIRE DAMPER	100A22A	Auxiliary	100'-0"	above	100'-6"		
3951	606-Y-VK-1561A	FIRE DAMPER	100A22A	Auxiliary	100'-0"	above	100'-6"		
3952	606-Y-VK-1581A	FIRE DAMPER	100A22A	Auxiliary	100'-0"	above	100'-6"		
3953	606-M-HV01A	AUX.BLDG CONTROLLED AREA I SUPPLY AHU	100A23A	Auxiliary	100'-0"	above	100'-6"	6" FD (1)	-
3954	606-J-FE-0009A	AUX BLDG CONTROLLED AREA I SUP AIR FLOW	100A23A	Auxiliary	100'-0"	above	100'-6"		
3955	606-J-FS-3201A	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A	100A23A	Auxiliary	100'-0"	above	100'-6"		
3956	606-J-FT-0009A	AUX BLDG CONTROLLED AREA I SUP AIR FLOW	100A23A	Auxiliary	100'-0"	above	100'-6"		
3957	606-J-TE-3007A	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A	100A23A	Auxiliary	100'-0"	above	100'-6"		
3958	606-J-TE-3203A	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A	100A23A	Auxiliary	100'-0"	above	100'-6"		
3959	606-J-TE-3265A	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A	100A23A	Auxiliary	100'-0"	above	100'-6"		
3960	606-J-TS-3203A	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A	100A23A	Auxiliary	100'-0"	above	100'-6"		
3961	606-J-TS-3265A	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A	100A23A	Auxiliary	100'-0"	above	100'-6"		
3962	606-Y-VK-1008A	MANUAL DAMPER	100A23A	Auxiliary	100'-0"	above	100'-6"		
3963	606-Y-VK-1009A	MANUAL DAMPER	100A23A	Auxiliary	100'-0"	above	100'-6"		
3964	606-Y-VK-1156A	MANUAL DAMPER	100A23A	Auxiliary	100'-0"	above	100'-6"		
3965	606-Y-VK-1166A	MANUAL DAMPER	100A23A	Auxiliary	100'-0"	above	100'-6"		
3966	606-Y-VK-1221A	MANUAL DAMPER	100A23A	Auxiliary	100'-0"	above	100'-6"		
3967	606-Y-VK-1501A	FIRE DAMPER	100A23A	Auxiliary	100'-0"	above	100'-6"		
3968	606-Y-VK-1552A	FIRE DAMPER	100A23A	Auxiliary	100'-0"	above	100'-6"		
3969	606-Y-VK-1553A	FIRE DAMPER	100A23A	Auxiliary	100'-0"	above	100'-6"		
3970	606-Y-VK-1563A	FIRE DAMPER	100A23A	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (139 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
3971	463-M-HE02A	SFP COOLING HEAT EXCHANGER A	100A24A	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	-
3972	463-M-PP01A	SFP COOLING PUMP A	100A24A	Auxiliary	100'-0"	above	100'-6"		
3973	604-M-HV02A	SFP COOLING HX ROOM CUBICLE COOLER	100A24A	Auxiliary	100'-0"	above	100'-6"		
3974	461-J-TEW-0393	SPENT FUEL POOL HX 2A TEMP	100A24A	Auxiliary	100'-0"	above	100'-6"		
3975	461-J-TW-0391	SPENT FUEL POOL HX INLET	100A24A	Auxiliary	100'-0"	above	100'-6"		
3976	463-J-FE-0005	SFP CLNG HX01A OUTLET FLOW	100A24A	Auxiliary	100'-0"	above	100'-6"		
3977	463-J-FE-0005M	SFP CLNG HX01A OUTLET FLOW	100A24A	Auxiliary	100'-0"	above	100'-6"		
3978	463-J-TE-0007A	SFP CLNG HX(02A) OUTLET TEMP	100A24A	Auxiliary	100'-0"	above	100'-6"		
3979	463-J-TEW-0007	SFP COOLING HX02A OUTLET TEMP	100A24A	Auxiliary	100'-0"	above	100'-6"		
3980	463-J-TW-0013	SFP CLNG HX 02A INLET TEMP	100A24A	Auxiliary	100'-0"	above	100'-6"		
3981	604-J-TE-0027A	SFP HX. RM TEMP.	100A24A	Auxiliary	100'-0"	above	100'-6"		
3982	633-J-TW-0189	COOLING COIL VF-CW02A OUTLET	100A24A	Auxiliary	100'-0"	above	100'-6"		
3983	451-V-0649	BABE Supply VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3984	461-V-0389	SFP CLNG HX 02A INLET ISO VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3985	461-V-1571	SFP CLNG HX 02A OUTLET ISO VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3986	461-V-1575	SPENT FUEL POOL COOLING HX A COLD SIDE RELIEF VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3987	461-V-2561	SFP Cooling HE02A Inlet Pr Test VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3988	461-V-2562	SFP Cooling HE02A Outlet Line Vent VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3989	461-V-2563	SFP Cooling HE02A Inlet Line DRN VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3990	461-V-2564	SFP Cooling HE02A Outlet Pr Test VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3991	461-V-2750	SFP Cooling HE02A Outlet Line DRN VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3992	463-V-1003	SFP CLG P/P 01A SUCT VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3993	463-V-1005	SFP CLG P/P 01A DISCH CHK VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3994	463-V-1007	SFP CLG P/P 01A DISCH VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3995	463-V-1009	SFP CLG HX 01A INLET VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3996	463-V-1011	SFP CLG HX 01A OUTLET VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3997	463-V-1013	SFP COOLING HX A HE01A HOT SIDE PRESSURE THERMAL RELIEF VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3998	463-V-1208	AUX.FWST TO BAMP SUCT ISO VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
3999	463-V-1209	AUX.FWST TO BAMP SUCT CHK VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
4000	463-V-1210	AUX.FWST TO BAMP SUCT ISO VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
4001	463-V-1211	AUX.FWST TO BAMP SUCT CHK VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
4002	463-V-2001	BAMP TO SFP TRN-B CONN VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
4003	463-V-2002	BAMP TO SFP TRN-A CONN VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (140 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4004	463-V-2005	SFP CLG P/P 01A SUCT PR TEST CONN VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
4005	463-V-2007	SFP CLG P/P 01A SUCT PI-037 ROOT VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
4006	463-V-2009	SFP CLG HX 01A VENT VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
4007	463-V-2011	SFP CLG HX 01A DRN VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
4008	463-V-2018	SFP CLG HX 01A OUTLET PR TEST CONN VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
4009	463-V-2019	SFP CLG HX 01A INLET PR TEST CONN VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
4010	463-V-2103	SFP CLG P/P 01A DISCH PIS-011 ROOT VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
4011	463-V-2400	SFP Cooling PP A Disch LN Vent VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
4012	463-V-2427	SFP Cooling PP A Suction Line DRN VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
4013	463-V-2429	SFP Cooling HX A Inlet Line DRN VALVE	100A24A	Auxiliary	100'-0"	above	100'-6"		
4014	604-Y-VF-0009A	CONTROL DAMPER	100A24A	Auxiliary	100'-0"	above	100'-6"		
4015	604-Y-VF-0010B	CONTROL DAMPER	100A24A	Auxiliary	100'-0"	above	100'-6"		
4016	451-M-TK01	VOLUME CONTROL TANK	100A25A	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	-
4017	451-V-2088	VCT Inlet LN from Purif IX Vent VALVE	100A25A	Auxiliary	100'-0"	above	100'-6"		
4018	606-Y-VK-1140A	MANUAL DAMPER	100A25A	Auxiliary	100'-0"	above	100'-6"		
4019	606-Y-VK-1154A	MANUAL DAMPER	100A25A	Auxiliary	100'-0"	above	100'-6"		
4020	606-Y-VK-1562A	FIRE DAMPER	100A25A	Auxiliary	100'-0"	above	100'-6"		
4021	451-V-0115	VCT Relief VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	-
4022	451-V-0117	VCT to DRDH ISO VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"		
4023	451-V-0118	VCT CHK VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"		
4024	451-V-0174	Boric Acid M/U Cross Connection ISO VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"		
4025	451-V-0177	BAMP to CHG PP CHK VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"		
4026	451-V-0179	VCT Makeup Bypass CHK VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"		
4027	451-V-0197	Sampling Line CHK VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"		
4028	451-V-0330	BAMP Line to HT ISO VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"		
4029	451-V-0501	VCT Disch ISO VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"		
4030	451-V-0504	VCT Disch ISO VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"		
4031	451-V-0510	BAMP Recir VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"		
4032	451-V-0514	Direct Boration VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"		
4033	451-V-1084	Purif IX to VCT Inlet LN P-Trap DRN VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"		
4034	451-V-1086	Gas STRIP to VCT Inlet LN P-Trap DRN VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"		
4035	451-V-2090	VCT Outlet Vent VALVE	100A26A	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (141 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4036	606-Y-VK-1141A	MANUAL DAMPER	100A26A	Auxiliary	100'-0"	above	100'-6"		
4037	606-Y-VK-1155A	MANUAL DAMPER	100A26A	Auxiliary	100'-0"	above	100'-6"		
4038	606-Y-VK-1183B	MANUAL DAMPER	100A27B	Auxiliary	100'-0"	above	100'-6"		
4039	606-Y-VK-1564A	FIRE DAMPER	100A27B	Auxiliary	100'-0"	above	100'-6"		
4040	606-Y-VK-1564B	FIRE DAMPER	100A27B	Auxiliary	100'-0"	above	100'-6"		
4041	463-V-2402	SFP CLG PP A/B Disch Cross LN Vent VALVE	100A29B	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	-
4042	606-Y-VK-1184B	MANUAL DAMPER	100A30B	Auxiliary	100'-0"	above	100'-6"	6" FD (1)	-
4043	606-Y-VK-1556B	FIRE DAMPER	100A30B	Auxiliary	100'-0"	above	100'-6"		
4044	606-Y-VK-1562B	FIRE DAMPER	100A30B	Auxiliary	100'-0"	above	100'-6"		
4045	463-M-HE02B	SFP COOLING HEAT EXCHANGER B	100A32B	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	-
4046	463-M-PP01B	SFP COOLING PUMP B	100A32B	Auxiliary	100'-0"	above	100'-6"		
4047	604-M-HV02B	SFP COOLING HX ROOM CUBICLE COOLER	100A32B	Auxiliary	100'-0"	above	100'-6"		
4048	461-J-TEW-0394	SPENT FUEL POOL HX 2B TEMP	100A32B	Auxiliary	100'-0"	above	100'-6"		
4049	461-J-TW-0392	SPENT FUEL POOL HX INLET	100A32B	Auxiliary	100'-0"	above	100'-6"		
4050	463-J-FE-0006	SFP CLNG HX01B OUTLET FLOW	100A32B	Auxiliary	100'-0"	above	100'-6"		
4051	463-J-FE-0006M	SFP CLNG HX01B OUTLET FLOW	100A32B	Auxiliary	100'-0"	above	100'-6"		
4052	463-J-TE-0008B	SFP CLNG HX(02B) OUTLET TEMP	100A32B	Auxiliary	100'-0"	above	100'-6"		
4053	463-J-TEW-0008	SFP COOLING HX02B OUTLET TEMP	100A32B	Auxiliary	100'-0"	above	100'-6"		
4054	463-J-TW-0014	SFP CLNG HX 02B INLET TEMP	100A32B	Auxiliary	100'-0"	above	100'-6"		
4055	604-J-TE-0028B	SFP HX. RM TEMP.	100A32B	Auxiliary	100'-0"	above	100'-6"		
4056	633-J-TW-0190	COOLING COIL VF-CW02B OUTLET	100A32B	Auxiliary	100'-0"	above	100'-6"		
4057	633-J-TW-0192	COOLING COIL VF-CW02B INLET	100A32B	Auxiliary	100'-0"	above	100'-6"		
4058	461-V-0390	SFP CLNG HX 02B INLET ISO VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4059	461-V-1572	SFP CLNG HX 02B OUTLET ISO VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4060	461-V-1574	SFP Cooling HE02B Inlet V390 Equal VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4061	461-V-1576	SPENT FUEL POOL COOLING HX B COLD SIDE RELIEF VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4062	461-V-2566	SFP Cooling HE02B Inlet Pr Test VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4063	461-V-2567	SFP Cooling HE02B Outlet Line Vent VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4064	461-V-2568	SFP Cooling HE02B Inlet Line DRN VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4065	461-V-2569	SFP Cooling HE02B Outlet Pr Test VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4066	463-V-1001	SFP CLG P/P 01A/01B SUCT CROSS-TIE VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4067	463-V-1004	SFP CLG P/P 01B SUCT VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4068	463-V-1006	SFP CLG P/P 01B DISCH CHK VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4069	463-V-1008	SFP CLG P/P 01B DISCH VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4070	463-V-1010	SFP CLG HX 01B INLET VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (142 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4071	463-V-1012	SFP CLG HX 01B OUTLET VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4072	463-V-1014	SFP COOLING HX B HE01B HOT SIDE PRESSURE THERMAL RELIEF VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4073	463-V-1150	SFP CLG P/P A/B DISCH CROSS-TIE VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4074	463-V-2006	SFP CLG P/P 01B SUCT PR TEST CONN VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4075	463-V-2008	SFP CLG P/P 01B SUCT PI-038 ROOT VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4076	463-V-2010	SFP CLG HX 01B VENT VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4077	463-V-2012	SFP CLG HX 01B DRN VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4078	463-V-2028	SFP CLG HX 01B OUTLET PR TEST CONN VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4079	463-V-2029	SFP CLG HX 01B INLET PR TEST CONN VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4080	463-V-2104	SFP CLG P/P 01B DISCH PIS-012 ROOT VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4081	463-V-2226	SFP CLG HX 01A OUTLET LN FIS-005 ROOT VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4082	463-V-2227	SFP CLG HX 01A OUTLET LN FIS-005 ROOT VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4083	463-V-2228	SFP CLG HX 01B OUTLET LN FIS-006 ROOT VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4084	463-V-2229	SFP CLG HX 01B OUTLET LN FIS-006 ROOT VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4085	463-V-2401	SFP Cooling PP B Disch LN Vent VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4086	463-V-2417	SFP Cooling PP B Disch LN DRN VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4087	463-V-2428	SFP Cooling PP B Suction Line DRN VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4088	633-V-1145B	CW02B SFP CLG HX C-CLR Outlet VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4089	633-V-1146B	CW02B SFP CLG HX C-CLR Inlet throt VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4090	633-V-2145B	SFP CLGHX(02B) C-CLR Outlet PZR Test VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4091	633-V-2146B	SFP CLG HX(02B) C-CLR Inlet PZR Test VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4092	633-V-2246B	SFP CLG Hx Rm HV 02B ECW Inlet DRN VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4093	633-V-2345B	SFPCLGHxRm HV02B ECW Outlet TestConn VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (143 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4094	633-V-2346B	SFPCLGHxRm HV02B ECW Inlet TestConn VALVE	100A32B	Auxiliary	100'-0"	above	100'-6"		
4095	604-J-PDT-0073A	LOADING & UNLOADING AREA DIFF PRESS	100A35B	Auxiliary	100'-0"	above	100'-6"	4" FD (2)	-
4096	604-J-PDT-0074B	LOADING & UNLOADING AREA DIFF PRESS	100A35B	Auxiliary	100'-0"	above	100'-6"		
4097	604-Y-VF-0001A	CONTROL DAMPER	100A36B	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	-
4098	604-Y-VF-0002B	CONTROL DAMPER	100A36B	Auxiliary	100'-0"	above	100'-6"		
4099	441-E-SQ02D	UNIT 3 1E 125V DC LOCAL STARTER SQ02D	100A37B	Auxiliary	100'-0"	above	100'-6"	4" FD (1)	10" EOL (1)
4100	441-J-FT-0391D	HOT LET INJECTION LOOP 2	100A37B	Auxiliary	100'-0"	above	100'-6"		
4101	441-J-ZY-0303B01	SI PUMP LINE ISO VALVE-303	100A37B	Auxiliary	100'-0"	above	100'-6"		
4102	441-J-ZY-0331D01	HOT LEG INJECTION VALVE - 331	100A37B	Auxiliary	100'-0"	above	100'-6"		
4103	441-J-ZY-0690B01	SCS WARMUP LINE ISO VALVE - 690	100A37B	Auxiliary	100'-0"	above	100'-6"		
4104	606-J-PDT-0026B	GNRL ACCS AREA 100-A37B DIFF PRESS	100A37B	Auxiliary	100'-0"	above	100'-6"		
4105	761-V-F607	GATE VALVE	100A37B	Auxiliary	100'-0"	above	100'-6"		
4106	606-Y-VK-1169B	MANUAL DAMPER	100A37B	Auxiliary	100'-0"	above	100'-6"		
4107	606-Y-VK-1181B	MANUAL DAMPER	100A37B	Auxiliary	100'-0"	above	100'-6"		
4108	606-Y-VK-1182B	MANUAL DAMPER	100A37B	Auxiliary	100'-0"	above	100'-6"		
4109	606-Y-VK-1198B	MANUAL DAMPER	100A37B	Auxiliary	100'-0"	above	100'-6"		
4110	606-Y-VK-1222B	MANUAL DAMPER	100A37B	Auxiliary	100'-0"	above	100'-6"		
4111	606-Y-VK-1565B	FIRE DAMPER	100A37B	Auxiliary	100'-0"	above	100'-6"		
4112	606-Y-VK-1566B	FIRE DAMPER	100A37B	Auxiliary	100'-0"	above	100'-6"		
4113	461-V-2593	SFP Cooling HE02A Outlet FT-7A Root VALVE	100A38A	Auxiliary	100'-0"	above	100'-6"	6" FD (1)	-
4114	461-V-2594	SFP Cooling HE02A Outlet FT-7A Root VALVE	100A38A	Auxiliary	100'-0"	above	100'-6"		
4115	604-Y-VF-0003A	CONTROL DAMPER	100A38A	Auxiliary	100'-0"	above	100'-6"		
4116	604-Y-VF-0004B	CONTROL DAMPER	100A38A	Auxiliary	100'-0"	above	100'-6"		
4117	604-Y-VF-1505	FIRE DAMPER	100A38A	Auxiliary	100'-0"	above	100'-6"		
4118	595-V-1001A	F.O STRG TK 01A F.O Fill VALVE	100A43C	Auxiliary	100'-0"	above	100'-6"		
4119	595-V-2010A	Emergency F.O Supply ISO VALVE	100A43C	Auxiliary	100'-0"	above	100'-6"		
4120	602-Y-VD-1509A	FIRE DAMPER	100A43C	Auxiliary	100'-0"	above	100'-6"		
4121	602-Y-VD-1517A	FIRE DAMPER	100A43C	Auxiliary	100'-0"	above	100'-6"		
4122	595-V-2010B	Emergency F.O Supply ISO VALVE	100A43D	Auxiliary	100'-0"	above	100'-6"		
4123	602-Y-VD-1509B	FIRE DAMPER	100A43D	Auxiliary	100'-0"	above	100'-6"		
4124	602-Y-VD-1517B	FIRE DAMPER	100A43D	Auxiliary	100'-0"	above	100'-6"		

Table 3.4-2 (144 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4125	441-V-2758	SI/SC INJECTION 1 LINE VENT VALVE	117A01A	Auxiliary	117'-0"	above	120'-0"	4" FD (1)	-
4126	441-V-2760	SI/SC INJECTION 1 LINE VENT VALVE	117A01A	Auxiliary	117'-0"	above	120'-0"		
4127	455-V-2801	Wet L/U Recir PP A Disch Pr Test Conn VALVE	117A01A	Auxiliary	117'-0"	above	120'-0"		
4128	471-V-2002	GAS SURGE HDR LN TEST CONN VALVE (OUTSIDE CTMT)	117A01A	Auxiliary	117'-0"	above	120'-0"		
4129	763-V-1019	H2 ANZR/MON(TRN A) INLT LN DRN & TEST VALVE	117A01A	Auxiliary	117'-0"	above	120'-0"		
4130	606-Y-VK-1135A	MANUAL DAMPER	117A01A	Auxiliary	117'-0"	above	120'-0"		
4131	606-Y-VK-1151A	MANUAL DAMPER	117A01A	Auxiliary	117'-0"	above	120'-0"		
4132	461-V-1283	CCW Train A to EDG A V181 Bypass VALVE	120A01C	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	-
4133	461-V-2134	CCW TRN A to EDG Line Vent VALVE	120A01C	Auxiliary	120'-0"	above	120'-6"		
4134	461-V-2211	CCW TRN A to EDG Line DRN VALVE	120A01C	Auxiliary	120'-0"	above	120'-6"		
4135	461-V-2271	CCW Train A to EDG Line Pr Test VALVE	120A01C	Auxiliary	120'-0"	above	120'-6"		
4136	461-V-2272	EDG to CCW Train A Line Pr Test VALVE	120A01C	Auxiliary	120'-0"	above	120'-6"		
4137	543-V-1605	AF STRG TK A Inlet VALVE	120A01C	Auxiliary	120'-0"	above	120'-6"		
4138	461-V-2216	CCW TRN B to EDG Line DRN VALVE	120A01D	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	-
4139	461-V-2277	EDG to CCW Train B Line Pr Test VALVE	120A01D	Auxiliary	120'-0"	above	120'-6"		
4140	461-V-2746	CCW Train B to EDG Line Vent VALVE	120A01D	Auxiliary	120'-0"	above	120'-6"		
4141	543-V-1606	AF STRG TK B Inlet VALVE	120A01D	Auxiliary	120'-0"	above	120'-6"		
4142	602-Y-VD-1003A	MANUAL DAMPER	120A02C	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	-
4143	602-Y-VD-1503A	FIRE DAMPER	120A02C	Auxiliary	120'-0"	above	120'-6"		
4144	602-Y-VD-1522A	FIRE DAMPER	120A02C	Auxiliary	120'-0"	above	120'-6"		
4145	602-Y-VD-1002B	MANUAL DAMPER	120A02D	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	-
4146	602-Y-VD-1003B	MANUAL DAMPER	120A02D	Auxiliary	120'-0"	above	120'-6"		
4147	602-Y-VD-1503B	FIRE DAMPER	120A02D	Auxiliary	120'-0"	above	120'-6"		
4148	602-Y-VD-1522B	FIRE DAMPER	120A02D	Auxiliary	120'-0"	above	120'-6"		
4149	602-M-AH07A	FUEL OIL AND LUBE OIL TANK RM. EXH. FAN	120A03C	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	-
4150	595-V-4013A	Day TK 02A to F.O TK 01A RTN ISO VALVE	120A03C	Auxiliary	120'-0"	above	120'-6"		
4151	595-V-4019A	Day TK 02A to F.O TK 01A XFR ISO VALVE	120A03C	Auxiliary	120'-0"	above	120'-6"		
4152	595-V-4034A	Day TK 02A to EDG A Engine Oil Supply VALVE	120A03C	Auxiliary	120'-0"	above	120'-6"		
4153	595-V-4101A	Day TK 02A to EDG A Engine Oil Supply VALVE	120A03C	Auxiliary	120'-0"	above	120'-6"		
4154	595-V-4102A	TK 02A to EDG A F.O Feed PP Supply VALVE	120A03C	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (145 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4155	595-V-5032A	TK 02A to F.O TK 01A RTN LN Pr Test VALVE	120A03C	Auxiliary	120'-0"	above	120'-6"		
4156	595-V-5033B	TK 02B to EDG B ENG Sply LN Pr. Test VALVE	120A03C	Auxiliary	120'-0"	above	120'-6"		
4157	595-V-5101A	F.O Day TK 02A LIS-02A Root ISO VALVE	120A03C	Auxiliary	120'-0"	above	120'-6"		
4158	595-V-5102A	F.O Day TK 02A LIS-02A Root ISO VALVE	120A03C	Auxiliary	120'-0"	above	120'-6"		
4159	602-Y-VD-1001A	MANUAL DAMPER	120A03C	Auxiliary	120'-0"	above	120'-6"		
4160	602-Y-VD-1002A	MANUAL DAMPER	120A03C	Auxiliary	120'-0"	above	120'-6"		
4161	602-Y-VD-1052A	MANUAL DAMPER	120A03C	Auxiliary	120'-0"	above	120'-6"		
4162	602-Y-VD-1518A	FIRE DAMPER	120A03C	Auxiliary	120'-0"	above	120'-6"		
4163	595-M-TK02B	DIESEL FUEL OIL DAY TANK "B"	120A03D	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	-
4164	602-M-AH07B	FUEL OIL AND LUBE OIL TANK RM. EXH. FAN	120A03D	Auxiliary	120'-0"	above	120'-6"		
4165	595-J-LI-3026B	DISEL FUEL OIL DAY TANK TK02B	120A03D	Auxiliary	120'-0"	above	120'-6"		
4166	595-J-LS-3026B01	DISEL FUEL OIL DAY TANK TK02B	120A03D	Auxiliary	120'-0"	above	120'-6"		
4167	595-J-LS-3026B02	DISEL FUEL OIL DAY TANK TK02B	120A03D	Auxiliary	120'-0"	above	120'-6"		
4168	595-J-LS-3026B03	DISEL FUEL OIL DAY TANK TK02B	120A03D	Auxiliary	120'-0"	above	120'-6"		
4169	595-J-LS-3026B04	DISEL FUEL OIL DAY TANK TK02B	120A03D	Auxiliary	120'-0"	above	120'-6"		
4170	595-V-4011B	F.O XFR PP A Train to TK 02B Supply VALVE	120A03D	Auxiliary	120'-0"	above	120'-6"		
4171	595-V-4013B	Day TK 02B to F.O TK 01B XFR ISO VALVE	120A03D	Auxiliary	120'-0"	above	120'-6"		
4172	595-V-4019B	Day TK 02B to F.O TK 01B XFR ISO VALVE	120A03D	Auxiliary	120'-0"	above	120'-6"		
4173	595-V-4034B	Day TK 02B to EDG B Engine Oil Supply VALVE	120A03D	Auxiliary	120'-0"	above	120'-6"		
4174	595-V-4101B	Day TK 02B to EDG B Engine Oil Supply VALVE	120A03D	Auxiliary	120'-0"	above	120'-6"		
4175	595-V-4102B	TK 02B to EDG B F.O Feed PP Supply VALVE	120A03D	Auxiliary	120'-0"	above	120'-6"		
4176	595-V-5031B	F.O Day TK 02B Inlet LN Pr Test VALVE	120A03D	Auxiliary	120'-0"	above	120'-6"		
4177	595-V-5032B	TK 02B to F.O TK 01B RTN LN Pr Test VALVE	120A03D	Auxiliary	120'-0"	above	120'-6"		
4178	595-V-5033A	TK 02A to EDG A ENG Sply LN Pr. Test VALVE	120A03D	Auxiliary	120'-0"	above	120'-6"		
4179	595-V-5101B	F.O Day TK 02B LIS-02B Root ISO VALVE	120A03D	Auxiliary	120'-0"	above	120'-6"		
4180	595-V-5102B	F.O Day TK 02B LIS-02B Root ISO VALVE	120A03D	Auxiliary	120'-0"	above	120'-6"		
4181	595-V-5103B	F.O Day TK 02B DRN VALVE	120A03D	Auxiliary	120'-0"	above	120'-6"		
4182	602-Y-VD-1001B	MANUAL DAMPER	120A03D	Auxiliary	120'-0"	above	120'-6"		
4183	602-Y-VD-1052B	MANUAL DAMPER	120A03D	Auxiliary	120'-0"	above	120'-6"		
4184	602-Y-VD-1501B	FIRE DAMPER	120A03D	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (146 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4185	602-Y-VD-1518B	FIRE DAMPER	120A03D	Auxiliary	120'-0"	above	120'-6"		
4186	591-M-OR02A	Flow Orifice for Equipment	120A04C	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	-
4187	591-M-OR03A	Flow Orifice for Equipment	120A04C	Auxiliary	120'-0"	above	120'-6"		
4188	591-M-OR04A	Flow Orifice for Equipment	120A04C	Auxiliary	120'-0"	above	120'-6"		
4189	591-M-OR10A	Flow Orifice for Equipment	120A04C	Auxiliary	120'-0"	above	120'-6"		
4190	591-M-OR17A	Flow Orifice for Equipment	120A04C	Auxiliary	120'-0"	above	120'-6"		
4191	591-M-TK01A	HT WATER EXPANSION TANK	120A04C	Auxiliary	120'-0"	above	120'-6"		
4192	591-M-TK10A	LT WATER EXPANSION TANK	120A04C	Auxiliary	120'-0"	above	120'-6"		
4193	461-J-TEW-0185	EMERGENCY D/G OUTLET TEMP	120A04C	Auxiliary	120'-0"	above	120'-6"		
4194	461-J-TEW-0187	EMERGENCY D/G OUTLET TEMP	120A04C	Auxiliary	120'-0"	above	120'-6"		
4195	461-J-TW-0183	EMERGENCY D/G INLET TEMP	120A04C	Auxiliary	120'-0"	above	120'-6"		
4196	591-J-LI-3001A	HT WATER EXPANSION TANK TK01A	120A04C	Auxiliary	120'-0"	above	120'-6"		
4197	591-J-LI-3010A	LT WATER EXPANSION TANK TK10A	120A04C	Auxiliary	120'-0"	above	120'-6"		
4198	591-J-LS-3001A01	HT WATER EXPANSION TANK LEVEL LO	120A04C	Auxiliary	120'-0"	above	120'-6"		
4199	591-J-LS-3001A02	HT WATER EXPANSION TANK LEVEL HI	120A04C	Auxiliary	120'-0"	above	120'-6"		
4200	591-J-LS-3010A01	LT WATER EXPANSION TANK LEVEL LO	120A04C	Auxiliary	120'-0"	above	120'-6"		
4201	591-J-LS-3010A02	LT WATER EXPANSION TANK LEVEL HI	120A04C	Auxiliary	120'-0"	above	120'-6"		
4202	591-J-PI-3124A	DIESEL ENGINE DG01A FUEL OIL ENGINE INLET (L302)	120A04C	Auxiliary	120'-0"	above	120'-6"		
4203	591-J-TEW-3005A	HT WATER OUTLET (L210)	120A04C	Auxiliary	120'-0"	above	120'-6"		
4204	591-J-TEW-3006A	HT WATER OUTLET (L209), (L210)	120A04C	Auxiliary	120'-0"	above	120'-6"		
4205	591-J-TEW-3007A	HT WATER OUTLET (L209), (L210)	120A04C	Auxiliary	120'-0"	above	120'-6"		
4206	591-J-TEW-3011A	HT/CC WATER HX HE03A	120A04C	Auxiliary	120'-0"	above	120'-6"		
4207	591-J-TEW-3112A	CC/LT WATER HX HE02A	120A04C	Auxiliary	120'-0"	above	120'-6"		
4208	591-J-TI-3011A	HT/CC WATER HX HE03A	120A04C	Auxiliary	120'-0"	above	120'-6"		
4209	591-J-TI-3112A	CC/LT WATER HX HE02A	120A04C	Auxiliary	120'-0"	above	120'-6"		
4210	591-J-TT-3006A	HT WATER OUTLET (L209), (L210)	120A04C	Auxiliary	120'-0"	above	120'-6"		
4211	591-J-TT-3007A	HT WATER OUTLET (L209), (L210)	120A04C	Auxiliary	120'-0"	above	120'-6"		
4212	602-J-TE-3059C	D/G FUEL OIL & LT & HT WTR TK RM AREA I	120A04C	Auxiliary	120'-0"	above	120'-6"		
4213	591-V-3035A	D/G A F.O RECIR Pr Regulating VALVE	120A04C	Auxiliary	120'-0"	above	120'-6"		
4214	591-V-4404A	D/G A HT WTR Expansion TK01A ED ISO VALVE	120A04C	Auxiliary	120'-0"	above	120'-6"		
4215	591-V-4440A	D/G A LT WTR Expansion TK10A ED ISO VALVE	120A04C	Auxiliary	120'-0"	above	120'-6"		
4216	591-V-5271A	D/G A HT WTR Elec. HTR HT01A INLT Vent	120A04C	Auxiliary	120'-0"	above	120'-6"		
4217	591-V-5272A	D/G A HT WTR Elec. HTR HT01A OTLT Vent	120A04C	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (147 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4218	591-V-5302A	D/G A F.O Feed PP→Day TK PI-3124A RT VALVE	120A04C	Auxiliary	120'-0"	above	120'-6"		
4219	591-V-5411A	D/G A HT WTR EXP TK01A LI/LS HDR RT VALVE	120A04C	Auxiliary	120'-0"	above	120'-6"		
4220	591-V-5412A	D/G A HT WTR EXP TK01A LI/LS HDR RT VALVE	120A04C	Auxiliary	120'-0"	above	120'-6"		
4221	591-V-5423A	D/G A F.O Feed PP→Day TK PI-3124A RT VALVE	120A04C	Auxiliary	120'-0"	above	120'-6"		
4222	591-V-5441A	D/G A LT WTR EXP TK10A LI-3010A RT VALVE	120A04C	Auxiliary	120'-0"	above	120'-6"		
4223	591-V-5443A	D/G A LT WTR EXP TK10A LI-3010A RT VALVE	120A04C	Auxiliary	120'-0"	above	120'-6"		
4224	591-V-5510A	D/G A HT WTR HTR 01A OTLT PS-3008A RT VALVE	120A04C	Auxiliary	120'-0"	above	120'-6"		
4225	602-Y-VD-1048A	MANUAL DAMPER	120A04C	Auxiliary	120'-0"	above	120'-6"		
4226	602-Y-VD-1049A	MANUAL DAMPER	120A04C	Auxiliary	120'-0"	above	120'-6"		
4227	602-Y-VD-1051A	MANUAL DAMPER	120A04C	Auxiliary	120'-0"	above	120'-6"		
4228	602-Y-VD-1501A	FIRE DAMPER	120A04C	Auxiliary	120'-0"	above	120'-6"		
4229	591-M-OR04B	Flow Orifice for Equipment	120A04D	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	-
4230	591-M-OR10B	Flow Orifice for Equipment	120A04D	Auxiliary	120'-0"	above	120'-6"		
4231	591-M-OR17B	Flow Orifice for Equipment	120A04D	Auxiliary	120'-0"	above	120'-6"		
4232	591-M-TK01B	HT WATER EXPANSION TANK	120A04D	Auxiliary	120'-0"	above	120'-6"		
4233	591-M-TK10B	LT WATER EXPANSION TANK	120A04D	Auxiliary	120'-0"	above	120'-6"		
4234	461-J-TEW-0186	EMERGENCY D/G OUTLET TEMP	120A04D	Auxiliary	120'-0"	above	120'-6"		
4235	461-J-TEW-0188	EMERGENCY D/G OUTLET TEMP	120A04D	Auxiliary	120'-0"	above	120'-6"		
4236	461-J-TW-0184	EMERGENCY D/G INLET TEMP	120A04D	Auxiliary	120'-0"	above	120'-6"		
4237	591-J-LI-3001B	HT WATER EXPANSION TANK TK01B	120A04D	Auxiliary	120'-0"	above	120'-6"		
4238	591-J-LI-3010B	LT WATER EXPANSION TANK TK10B	120A04D	Auxiliary	120'-0"	above	120'-6"		
4239	591-J-LS-3001B01	HT WATER EXPANSION TANK LEVEL LO	120A04D	Auxiliary	120'-0"	above	120'-6"		
4240	591-J-LS-3001B02	HT WATER EXPANSION TANK LEVEL HI	120A04D	Auxiliary	120'-0"	above	120'-6"		
4241	591-J-LS-3010B01	LT WATER EXPANSION TANK LEVEL LO	120A04D	Auxiliary	120'-0"	above	120'-6"		
4242	591-J-LS-3010B02	LT WATER EXPANSION TANK LEVEL HI	120A04D	Auxiliary	120'-0"	above	120'-6"		
4243	591-J-PI-3124B	DIESEL ENGINE DG01B FUEL OIL ENGINE INLET (L302)	120A04D	Auxiliary	120'-0"	above	120'-6"		
4244	591-J-TEW-3005B	HT WATER OUTLET DIESEL ENGINE DG01B	120A04D	Auxiliary	120'-0"	above	120'-6"		
4245	591-J-TEW-3006B	HT/CC WATER HX HE03B	120A04D	Auxiliary	120'-0"	above	120'-6"		
4246	591-J-TEW-3007B	HT/CC WATER HX HE03B	120A04D	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (148 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4247	591-J-TEW-3011B	HT/CC WATER HX HE03B	120A04D	Auxiliary	120'-0"	above	120'-6"		
4248	591-J-TEW-3112B	CC/LT WATER HX HE02B	120A04D	Auxiliary	120'-0"	above	120'-6"		
4249	591-J-TI-3011B	HT/CC WATER HX HE03B	120A04D	Auxiliary	120'-0"	above	120'-6"		
4250	591-J-TI-3112B	CC/LT WATER HX HE02B	120A04D	Auxiliary	120'-0"	above	120'-6"		
4251	591-J-TT-3006B	HT/CC WATER HX HE03B	120A04D	Auxiliary	120'-0"	above	120'-6"		
4252	591-J-TT-3007B	HT/CC WATER HX HE03B	120A04D	Auxiliary	120'-0"	above	120'-6"		
4253	602-J-TE-3050D	D/G FUEL OIL & LT & HT WTR TK RM AREA II	120A04D	Auxiliary	120'-0"	above	120'-6"		
4254	591-V-3035B	D/G B F.O RECIR Pr Regulating VALVE	120A04D	Auxiliary	120'-0"	above	120'-6"		
4255	591-V-4404B	D/G B HT WTR Expansion TK01B ED ISO VALVE	120A04D	Auxiliary	120'-0"	above	120'-6"		
4256	591-V-4440B	D/G B LT WTR Expansion TK10B ED ISO VALVE	120A04D	Auxiliary	120'-0"	above	120'-6"		
4257	591-V-5271B	D/G B HT WTR Elec. HTR HT01B INLT Vent	120A04D	Auxiliary	120'-0"	above	120'-6"		
4258	591-V-5272B	D/G B HT WTR Elec. HTR HT01B OTLT Vent	120A04D	Auxiliary	120'-0"	above	120'-6"		
4259	591-V-5302B	D/G B F.O Feed PP→Day TK PI-3124B RT VALVE	120A04D	Auxiliary	120'-0"	above	120'-6"		
4260	591-V-5410B	D/G B HT WTR HTR 01B OTLT PS-3008B RT VALVE	120A04D	Auxiliary	120'-0"	above	120'-6"		
4261	591-V-5423B	D/G B F.O Feed PP→Day TK PI-3124B RT VALVE	120A04D	Auxiliary	120'-0"	above	120'-6"		
4262	591-V-5428B	D/G B Air RCVR TK41B Pr PI-3177B RT VALVE	120A04D	Auxiliary	120'-0"	above	120'-6"		
4263	591-V-5441B	D/G B LT WTR EXP TK10B LI-3010B RT VALVE	120A04D	Auxiliary	120'-0"	above	120'-6"		
4264	591-V-5443B	D/G B LT WTR EXP TK10B LI-3010B RT VALVE	120A04D	Auxiliary	120'-0"	above	120'-6"		
4265	591-V-5451B	D/G B F.O Feed PP Disch PS-3035B RT VALVE	120A04D	Auxiliary	120'-0"	above	120'-6"		
4266	602-Y-VD-1048B	MANUAL DAMPER	120A04D	Auxiliary	120'-0"	above	120'-6"		
4267	602-Y-VD-1049B	MANUAL DAMPER	120A04D	Auxiliary	120'-0"	above	120'-6"		
4268	602-Y-VD-1051B	MANUAL DAMPER	120A04D	Auxiliary	120'-0"	above	120'-6"		
4269	602-Y-VD-1523B	FIRE DAMPER	120A04D	Auxiliary	120'-0"	above	120'-6"		
4270	441-V-2800	Safety INJ Line3 to DV Nozzle 2A Vent VALVE	120A05C	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	-
4271	441-V-2799	Safety INJ Line3 to DV Nozzle 2A Vent VALVE	120A06C	Auxiliary	120'-0"	above	120'-6"	4" FD (2)	-
4272	461-V-0231	RCP CLNG SUPPLY CNMT ISO VALVE	120A06C	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (149 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4273	461-V-0250	RCP CLNG RETURN CNMT ISO VALVE	120A06C	Auxiliary	120'-0"	above	120'-6"		
4274	461-V-1070	RCP CLNG CNMT ISO BLKVALVE	120A06C	Auxiliary	120'-0"	above	120'-6"		
4275	461-V-1085	RCP CLNG CNMT ISO BLKVALVE	120A06C	Auxiliary	120'-0"	above	120'-6"		
4276	461-V-2801	RCP Common Supply Line Test Vent VALVE	120A06C	Auxiliary	120'-0"	above	120'-6"		
4277	461-V-2806	RCP Common Return Line Test Vent VALVE	120A06C	Auxiliary	120'-0"	above	120'-6"		
4278	542-V-0043	AFWP 02A Disch LN AFW ISO MOV	120A06C	Auxiliary	120'-0"	above	120'-6"		
4279	542-V-0044	AFWP 01A Disch LN AFW ISO MOV	120A06C	Auxiliary	120'-0"	above	120'-6"		
4280	594-V-0001	CNMT ISOATION VALVE (SERVICE AIR)	120A06C	Auxiliary	120'-0"	above	120'-6"		
4281	596-V-0020	CNMT ISOATION VALVE (INSTRUMENT AIR)	120A06C	Auxiliary	120'-0"	above	120'-6"		
4282	612-V-2016	ILRT/SIT Verification Test Conn VALVE	120A06C	Auxiliary	120'-0"	above	120'-6"		
4283	612-V-2017	ILRT/SIT Verification Test Conn LLRT VALVE	120A06C	Auxiliary	120'-0"	above	120'-6"		
4284	632-V-0012	RCB CNTR CHLD WTR RTN ISO VALVE(AB)	120A06C	Auxiliary	120'-0"	above	120'-6"		
4285	632-V-0013	RCB CNTR CHLD WTR Supply ISO VALVE(AB)	120A06C	Auxiliary	120'-0"	above	120'-6"		
4286	669-V-0004	HP N2 SUPPLY CONTROL VALVE THROUGH CNMT PENETRATION	120A06C	Auxiliary	120'-0"	above	120'-6"		
4287	441-V-2803	Safety INJ Line 4 Vent VALVE	120A06D	Auxiliary	120'-0"	above	120'-6"	4" FD (2)	-
4288	441-V-2804	Safety INJ Line 4 Vent VALVE	120A06D	Auxiliary	120'-0"	above	120'-6"		
4289	461-V-1284	CCW Train B to EDG B V182 Bypass VALVE	120A06D	Auxiliary	120'-0"	above	120'-6"		
4290	461-V-2276	CCW Train B to EDG Line Pr Test VALVE	120A06D	Auxiliary	120'-0"	above	120'-6"		
4291	542-V-0045	AFWP 01B Disch LN AFW ISO MOV	120A06D	Auxiliary	120'-0"	above	120'-6"		
4292	542-V-0046	AFWP 02B Disch LN AFW ISO MOV	120A06D	Auxiliary	120'-0"	above	120'-6"		
4293	582-V-1685	RCB Makeup DEMI WTR HDR Vent VALVE	120A06D	Auxiliary	120'-0"	above	120'-6"		
4294	582-V-1751	RCB M/U HDR DEMI WTR Supply VALVE	120A06D	Auxiliary	120'-0"	above	120'-6"		
4295	582-V-2752	RCB M/U DEMI WTR Special Test Conn VALVE	120A06D	Auxiliary	120'-0"	above	120'-6"		
4296	691-V-0030	REACTOR CNMT BLDG FIRE WATER STANDPIPE SYSTEM CNMT ISOATION VALVE	120A06D	Auxiliary	120'-0"	above	120'-6"		
4297	603-Y-VE-1596B	FIRE DAMPER	120A06D	Auxiliary	120'-0"	above	120'-6"		
4298	543-V-2602	AUX FW STRG TK A→LTI2 INST RT VALVE	120A07C	Auxiliary	120'-0"	above	120'-6"	4" FD (2), 6" FD (2)	10" EOL (1)
4299	543-V-2660	MAKEUP WTR HVAC Vent Test VALVE	120A07C	Auxiliary	120'-0"	above	120'-6"		
4300	543-V-2672	DE WTR M/U SYS→AUX FW STRG TK A VentVALVE	120A07C	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (150 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4301	543-V-2675	DE WTR M/U SYS→AUX FW STRG TK A DRN VALVE	120A07C	Auxiliary	120'-0"	above	120'-6"		
4302	633-V-2450A	Elec. PENET RM CW09A Outlet DRN VALVE	120A07C	Auxiliary	120'-0"	above	120'-6"		
4303	543-M-TK01B	AUXILIARY FEEDWATER STORAGE TANK B	120A07D	Auxiliary	120'-0"	above	120'-6"	4" FD (2), 6" FD (2)	10" EOL (1)
4304	543-V-2604	AUX FW STRG TK B→LTI3 INST RT VALVE	120A07D	Auxiliary	120'-0"	above	120'-6"		
4305	543-V-2671	DE WTR M/U SYS→AUX FW STRG TK B VentVALVE	120A07D	Auxiliary	120'-0"	above	120'-6"		
4306	431-E-SQ01C	LOCAL STARTER	120A09C	Auxiliary	120'-0"	above	120'-6"	4" FD (2)	-
4307	431-E-SQ02C	LOCAL STARTER	120A09C	Auxiliary	120'-0"	above	120'-6"		
4308	431-E-SQ03C	LOCAL STARTER	120A09C	Auxiliary	120'-0"	above	120'-6"		
4309	431-J-LP01C	POSRV MASTER CONTROL CABINET (PMCC)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4310	441-E-SQ01C	LOCAL STARTER	120A09C	Auxiliary	120'-0"	above	120'-6"		
4311	441-W-001A	FUSE TERMINAL BOX	120A09C	Auxiliary	120'-0"	above	120'-6"		
4312	441-W-001C	FUSE TERMINAL BOX	120A09C	Auxiliary	120'-0"	above	120'-6"		
4313	447-E-SQ01C	LOCAL STARTER	120A09C	Auxiliary	120'-0"	above	120'-6"		
4314	447-E-SQ02C	LOCAL STARTER	120A09C	Auxiliary	120'-0"	above	120'-6"		
4315	542-E-SQ01C	UNIT 3 1E 125V DC LOCAL STARTER SQ01C	120A09C	Auxiliary	120'-0"	above	120'-6"		
4316	603-M-HV09A	CUBICLE COOLER	120A09C	Auxiliary	120'-0"	above	120'-6"		
4317	839-E-EA22M-J1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	120A09C	Auxiliary	120'-0"	above	120'-6"		
4318	839-E-EA23M-D1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	120A09C	Auxiliary	120'-0"	above	120'-6"		
4319	839-E-EA24M-D2	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	120A09C	Auxiliary	120'-0"	above	120'-6"		
4320	839-E-EA27C-E1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-C	120A09C	Auxiliary	120'-0"	above	120'-6"		
4321	839-E-EA28C-K1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-C	120A09C	Auxiliary	120'-0"	above	120'-6"		
4322	839-E-EA29M-T1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	120A09C	Auxiliary	120'-0"	above	120'-6"		
4323	839-E-EA30M-T2	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	120A09C	Auxiliary	120'-0"	above	120'-6"		
4324	839-E-EA31M-E1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	120A09C	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (151 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4325	839-E-EA32M-E2	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	120A09C	Auxiliary	120'-0"	above	120'-6"		
4326	839-E-EA33M-E3	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	120A09C	Auxiliary	120'-0"	above	120'-6"		
4327	839-E-EA34M-E4	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	120A09C	Auxiliary	120'-0"	above	120'-6"		
4328	431-J-HS-0121C02	PZR POSRV MOTOR OPERATED ISOATION VALVE V121	120A09C	Auxiliary	120'-0"	above	120'-6"		
4329	431-J-HS-0123C02	PZR POSRV MOTOR OPERATED ISOATION VALVE V123	120A09C	Auxiliary	120'-0"	above	120'-6"		
4330	441-J-HS-0634C02	SIT ISOATION	120A09C	Auxiliary	120'-0"	above	120'-6"		
4331	441-J-HS-0653C03	SCS SUCTION LINE ISOATION	120A09C	Auxiliary	120'-0"	above	120'-6"		
4332	603-J-TE-0117C	ELEC. PENETRATION RM(C) TEMP	120A09C	Auxiliary	120'-0"	above	120'-6"		
4333	633-J-TW-0137	COOLING COIL VE-CW09A OUTLET	120A09C	Auxiliary	120'-0"	above	120'-6"		
4334	633-J-TW-0139	COOLING COIL VE-CW09A INLET	120A09C	Auxiliary	120'-0"	above	120'-6"		
4335	669-J-PI-3120N01	PRESSURE INDICATOR (EPA NO. 31M-E1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4336	669-J-PI-3121N01	PRESSURE INDICATOR (EPA NO. 34M-E4)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4337	669-J-PI-3122N01	PRESSURE INDICATOR (EPA NO. 24M-D2)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4338	669-J-PI-3123N01	PRESSURE INDICATOR (EPA NO. 32M-E2)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4339	669-J-PI-3124N01	PRESSURE INDICATOR (EPA NO. 23M-D1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4340	669-J-PI-3125N01	PRESSURE INDICATOR (EPA NO. 33M-E3)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4341	669-J-PI-3127N01	PRESSURE INDICATOR (EPA NO. 22M-J1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4342	669-J-PI-3128N01	PRESSURE INDICATOR (EPA NO. 30M-T2)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4343	669-J-PI-3129N01	PRESSURE INDICATOR (EPA NO. 29M-T1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4344	669-J-PI-3130N01	PRESSURE INDICATOR (EPA NO. 27C-E1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4345	669-J-PI-3131N01	PRESSURE INDICATOR (EPA NO. 28C-K1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4346	669-J-PS-3120	PRESSURE SWITCH (EPA NO. 31M-E1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4347	669-J-PS-3121	PRESSURE SWITCH (EPA NO. 34M-E4)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4348	669-J-PS-3122	PRESSURE SWITCH (EPA NO. 24M-D2)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4349	669-J-PS-3123	PRESSURE SWITCH (EPA NO. 32M-E2)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4350	669-J-PS-3124	PRESSURE SWITCH (EPA NO. 23M-D1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4351	669-J-PS-3125	PRESSURE SWITCH (EPA NO. 33M-E3)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4352	669-J-PS-3127	PRESSURE SWITCH (EPA NO. 22M-J1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4353	669-J-PS-3128	PRESSURE SWITCH (EPA NO. 30M-T2)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4354	669-J-PS-3129	PRESSURE SWITCH (EPA NO. 29M-T1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4355	669-J-PS-3130	PRESSURE SWITCH (EPA NO. 27C-E1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4356	669-J-PS-3131	PRESSURE SWITCH (EPA NO. 28C-K1)	120A09C	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (152 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4357	839-J-TE-3120	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.31M-E2)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4358	839-J-TE-3121	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.34M-E4)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4359	839-J-TE-3122	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.24M-D2)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4360	839-J-TE-3123	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.32M-E2)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4361	839-J-TE-3124	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.23M-D1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4362	839-J-TE-3125	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.33M-E3)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4363	839-J-TE-3127	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.22M-J1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4364	839-J-TE-3130C	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.27C-E1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4365	839-J-TE-3131C	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.28C-K1)	120A09C	Auxiliary	120'-0"	above	120'-6"		
4366	633-V-1119A	Elec. PENET RM(C) C-CLR Outlet VALVE	120A09C	Auxiliary	120'-0"	above	120'-6"		
4367	633-V-1120A	Elec. PENET RM(C) C-CLR Inlet throt VALVE	120A09C	Auxiliary	120'-0"	above	120'-6"		
4368	633-V-2119A	Elec. PENET(C) C-CLR Outlet PZR Test VALVE	120A09C	Auxiliary	120'-0"	above	120'-6"		
4369	633-V-2120A	Elec. PENET(C) C-CLR Inlet PZR Test VALVE	120A09C	Auxiliary	120'-0"	above	120'-6"		
4370	633-V-2219A	ELECT PENET RM HV09A ECW Outlet Vent VALVE	120A09C	Auxiliary	120'-0"	above	120'-6"		
4371	633-V-2220A	ELECT PENET RM HV09A ECW Inlet DRN VALVE	120A09C	Auxiliary	120'-0"	above	120'-6"		
4372	633-V-2285A	ELECT PENET RM HV09A ECW Outlet DRN VALVE	120A09C	Auxiliary	120'-0"	above	120'-6"		
4373	633-V-2319A	ELE PEN RM HV09A ECW Outlet TestConn VALVE	120A09C	Auxiliary	120'-0"	above	120'-6"		
4374	633-V-2320A	ELE PEN RM HV09A ECW Inlet Test Conn VALVE	120A09C	Auxiliary	120'-0"	above	120'-6"		
4375	633-V-2447A	Elec. PENET RM CW09A Outlet Vent VALVE	120A09C	Auxiliary	120'-0"	above	120'-6"		
4376	633-V-2448A	Elec. PENET RM CW09A Inlet Vent VALVE	120A09C	Auxiliary	120'-0"	above	120'-6"		
4377	633-V-2449A	Elec. PENET RM CW09A Inlet DRN VALVE	120A09C	Auxiliary	120'-0"	above	120'-6"		
4378	431-E-SQ01D	LOCAL STARTER	120A09D	Auxiliary	120'-0"	above	120'-6"	4" FD (2)	10" EOL (1)

Table 3.4-2 (153 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4379	431-E-SQ02D	LOCAL STARTER	120A09D	Auxiliary	120'-0"	above	120'-6"		
4380	431-E-SQ03D	LOCAL STARTER	120A09D	Auxiliary	120'-0"	above	120'-6"		
4381	431-J-LP01D	POSRV MASTER CONTROL CABINET (PMCC)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4382	441-E-SQ01D	LOCAL STARTER	120A09D	Auxiliary	120'-0"	above	120'-6"		
4383	441-W-002B	FUSE TERMINAL BOX	120A09D	Auxiliary	120'-0"	above	120'-6"		
4384	447-E-SQ01D	LOCAL STARTER	120A09D	Auxiliary	120'-0"	above	120'-6"		
4385	447-E-SQ02D	LOCAL STARTER	120A09D	Auxiliary	120'-0"	above	120'-6"		
4386	542-E-SQ01D	UNIT 3 1E 125V DC LOCAL STARTER SQ01D	120A09D	Auxiliary	120'-0"	above	120'-6"		
4387	603-M-HV09B	CUBICLE COOLER	120A09D	Auxiliary	120'-0"	above	120'-6"		
4388	839-E-EA22N-S1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	120A09D	Auxiliary	120'-0"	above	120'-6"		
4389	839-E-EA23N-J1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	120A09D	Auxiliary	120'-0"	above	120'-6"		
4390	839-E-EA24N-D1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	120A09D	Auxiliary	120'-0"	above	120'-6"		
4391	839-E-EA27D-E1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-D	120A09D	Auxiliary	120'-0"	above	120'-6"		
4392	839-E-EA28D-K1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-D	120A09D	Auxiliary	120'-0"	above	120'-6"		
4393	839-E-EA29N-T1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	120A09D	Auxiliary	120'-0"	above	120'-6"		
4394	839-E-EA30N-T2	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	120A09D	Auxiliary	120'-0"	above	120'-6"		
4395	839-E-EA31N-E1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	120A09D	Auxiliary	120'-0"	above	120'-6"		
4396	839-E-EA32N-E2	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	120A09D	Auxiliary	120'-0"	above	120'-6"		
4397	839-E-EA33N-E3	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	120A09D	Auxiliary	120'-0"	above	120'-6"		
4398	839-E-EA34N-E4	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	120A09D	Auxiliary	120'-0"	above	120'-6"		
4399	431-J-HS-0125D02	PZR POSRV MOTOR OPERATED ISOATION VALVE V125	120A09D	Auxiliary	120'-0"	above	120'-6"		
4400	431-J-HS-0127D02	PZR POSRV MOTOR OPERATED ISOATION VALVE V127	120A09D	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (154 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4401	433-J-JZ-0413D	PZR GAS VENT CCU	120A09D	Auxiliary	120'-0"	above	120'-6"		
4402	433-J-JZ-0417D	RX VESSEL GAS VENT CCU	120A09D	Auxiliary	120'-0"	above	120'-6"		
4403	441-J-HS-0614D02	SIT ISOATION	120A09D	Auxiliary	120'-0"	above	120'-6"		
4404	441-J-HS-0654D03	SCS SUCTION LINE ISOATION	120A09D	Auxiliary	120'-0"	above	120'-6"		
4405	603-J-TE-0118D	ELEC. PENETRATION RM(D) TEMP	120A09D	Auxiliary	120'-0"	above	120'-6"		
4406	633-J-TW-0138	COOLING COIL VE-CW09B OUTLET	120A09D	Auxiliary	120'-0"	above	120'-6"		
4407	633-J-TW-0140	COOLING COIL VE-CW09B INLET	120A09D	Auxiliary	120'-0"	above	120'-6"		
4408	669-J-PI-3158N01	PRESSURE INDICATOR (EPA NO. 31N-E1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4409	669-J-PI-3159N01	PRESSURE INDICATOR (EPA NO. 34N-E4)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4410	669-J-PI-3160N01	PRESSURE INDICATOR (EPA NO. 24N-D1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4411	669-J-PI-3161N01	PRESSURE INDICATOR (EPA NO. 32N-E2)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4412	669-J-PI-3162N01	PRESSURE INDICATOR (EPA NO. 23N-J1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4413	669-J-PI-3163N01	PRESSURE INDICATOR (EPA NO. 33N-E3)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4414	669-J-PI-3165N01	PRESSURE INDICATOR (EPA NO. 30N-T2)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4415	669-J-PI-3166N01	PRESSURE INDICATOR (EPA NO. 22N-S1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4416	669-J-PI-3167N01	PRESSURE INDICATOR (EPA NO. 29N-T1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4417	669-J-PI-3168N01	PRESSURE INDICATOR (EPA NO. 27D-E1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4418	669-J-PI-3169N01	PRESSURE INDICATOR (EPA NO. 28D-K1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4419	669-J-PS-3158	PRESSURE SWITCH (EPA NO. 31N-E1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4420	669-J-PS-3159	PRESSURE SWITCH (EPA NO. 34N-E4)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4421	669-J-PS-3160	PRESSURE SWITCH (EPA NO. 24N-D1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4422	669-J-PS-3161	PRESSURE SWITCH (EPA NO. 32N-E2)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4423	669-J-PS-3162	PRESSURE SWITCH (EPA NO. 23N-J1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4424	669-J-PS-3163	PRESSURE SWITCH (EPA NO. 33N-E3)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4425	669-J-PS-3165	PRESSURE SWITCH (EPA NO. 30N-T2)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4426	669-J-PS-3166	PRESSURE SWITCH (EPA NO. 22N-S1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4427	669-J-PS-3167	PRESSURE SWITCH (EPA NO. 29N-T1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4428	669-J-PS-3168	PRESSURE SWITCH (EPA NO. 27D-E1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4429	669-J-PS-3169	PRESSURE SWITCH (EPA NO. 28D-K1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4430	839-J-TE-3158	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.31N-E1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4431	839-J-TE-3159	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.34N-E4)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4432	839-J-TE-3160	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.24N-D1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4433	839-J-TE-3161	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.32N-E2)	120A09D	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (155 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4434	839-J-TE-3162	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.23N-J1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4435	839-J-TE-3163	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.33N-E3)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4436	839-J-TE-3168D	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.27D-E1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4437	839-J-TE-3169D	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.28D-K1)	120A09D	Auxiliary	120'-0"	above	120'-6"		
4438	612-V-2014	ILRT/SIT Pr Connection ISO VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4439	612-V-2015	ILRT/SIT Pr Conn LLRT Conn VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4440	633-V-1119B	Elec. PENET RM(D) C-CLR Outlet VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4441	633-V-1120B	Elec. PENET RM(D) C-CLR Inlet throt VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4442	633-V-2119B	Elec. PENET(D) C-CLR Outlet PZR Test VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4443	633-V-2120B	Elec. PENET(D) C-CLR Inlet PZR Test VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4444	633-V-2219B	ELECT PENET RM HV09B ECW Outlet Vent VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4445	633-V-2220B	ELECT PENET RM HV09B ECW Inlet DRN VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4446	633-V-2285B	ELECT PENET RM HV09B ECW Outlet DRN VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4447	633-V-2319B	ELE PEN RM HV09B ECW Outlet TestConn VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4448	633-V-2320B	ELE PEN RM HV09B ECW Inlet Test Conn VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4449	633-V-2443B	I&C EQUIP RM HV16B ECW Outlet Vent VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4450	633-V-2444B	I&C EQUIP RM HV16B ECW Inlet Vent VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4451	633-V-2445B	I&C EQUIP RM CW09B Inlet DRN VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4452	633-V-2446B	I&C EQUIP RM CW09B Outlet DRN VALVE	120A09D	Auxiliary	120'-0"	above	120'-6"		
4453	633-M-PP03A	ESSENTIAL CHILLED WATER MAKEUP PUMP	120A10C	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	-
4454	543-V-1607	CCW/ECW TRN A M/U PP Supply VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4455	633-V-1003A	ECW COMP TK-01A DE WTR M/U LN CHK VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4456	633-V-1005A	AFST → ECW M/U PP-03A Suct ISO VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (156 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4457	633-V-1011A	ECW M/U PP-03A Disch CHK VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4458	633-V-1015A	ECW M/U PP-03A Disch ISO VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4459	633-V-1021A	ECW COMP TK-01A AF M/U LN Throt VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4460	633-V-1022A	ECW COMP TK-01A AF M/U LN CHK VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4461	633-V-1032A	ECW COMP TK-01A DEMI WTR M/U LN CHK VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4462	633-V-2015A	ECW M/U PP-03A Suct PI-247 RT VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4463	633-V-2016A	ECW M/U PP-03A Disch PI-251 RT VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4464	633-V-2293A	ECW PP-03ADisch DRN VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4465	633-V-2373A	Comp TK01A De WTR M/U LN Fl-373 RT VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4466	633-V-2374A	Comp TK01A De WTR M/U LN Fl-373 RT VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4467	633-V-2409A	ECW PP-03A Suct DRN VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4468	633-V-2410A	ECW PP-03A Disch Vent VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4469	633-V-3001	CH01A EVAPORATOR SAFETY RELIEF VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4470	633-V-5001	CHLR Ch01A EVAP Inlet FI-017 RT VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4471	633-V-5002	CHLR Ch01A EVAP Inlet FI-017 RT VALVE	120A10C	Auxiliary	120'-0"	above	120'-6"		
4472	633-M-PP03B	ESSENTIAL CHILLED WATER MAKEUP PUMP	120A10D	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	-
4473	543-V-1608	CCW/ECW TRN B M/U PP Supply VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		
4474	633-V-1003B	ECW COMP TK-01B DE WTR M/U LN CHK VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		
4475	633-V-1005B	AFST → ECW M/U PP-03B Suct ISO VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		
4476	633-V-1011B	ECW M/U PP-03B Disch CHK VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		
4477	633-V-1015B	ECW M/U PP-03B Disch ISO VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		
4478	633-V-1021B	ECW COMP TK-01B AF M/U LN Throt VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		
4479	633-V-1022B	ECW COMP TK-01B AF M/U LN CHK VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		
4480	633-V-1032B	ECW COMP TK-01B DEMI WTR M/U LN CHK VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		
4481	633-V-2015B	ECW M/U PP-03B Suct PI-248 RT VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		
4482	633-V-2016B	ECW M/U PP-03B Disch PI-252 RT VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		
4483	633-V-2293B	ECW PP-03ADisch DRN VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (157 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4484	633-V-2373B	Comp TK01B De WTR M/U LN Fl-374 RT VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		
4485	633-V-2374B	Comp TK01B De WTR M/U LN Fl-374 RT VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		
4486	633-V-2409B	ECW PP-03B Suct DRN VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		
4487	633-V-2410B	ECW PP-03B Disch Vent VALVE	120A10D	Auxiliary	120'-0"	above	120'-6"		
4488	543-V-2601	AUX FW STRG TK A→LTI2 INST RT VALVE	120A11A	Auxiliary	120'-0"	above	120'-6"	6" FD (1)	10" EOL (1)
4489	543-V-2603	AUX FW STRG TK B→LTI3 INST RT VALVE	120A11B	Auxiliary	120'-0"	above	120'-6"	4" FD (2)	10" EOL (1)
4490	603-M-HV14B	CUBICLE COOLER	120A15B	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	-
4491	745-J-LX07B	LOOP CONTROLLER CABINET (CH. BE)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4492	745-J-LX08B	LOOP CONTROLLER CABINET (CH. BE)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4493	827-E-MC05B	UNIT 3 480V 1E MCC 05B	120A15B	Auxiliary	120'-0"	above	120'-6"		
4494	431-J-PS-0104B01	PZR PRESSURE	120A15B	Auxiliary	120'-0"	above	120'-6"		
4495	431-J-PS-0104B02	PZR PRESSURE	120A15B	Auxiliary	120'-0"	above	120'-6"		
4496	431-J-PS-0104B03	PZR PRESSURE	120A15B	Auxiliary	120'-0"	above	120'-6"		
4497	431-J-PS-0104B04	PZR PRESSURE	120A15B	Auxiliary	120'-0"	above	120'-6"		
4498	431-J-PS-0104B05	PZR PRESSURE	120A15B	Auxiliary	120'-0"	above	120'-6"		
4499	431-J-PY-0104B	PZR PRESSURE	120A15B	Auxiliary	120'-0"	above	120'-6"		
4500	441-J-FT-0321B	SI & LINE 2 FLOW	120A15B	Auxiliary	120'-0"	above	120'-6"		
4501	441-J-FY-0321B02	SAFETY INJECTION LINE 2 FLOW	120A15B	Auxiliary	120'-0"	above	120'-6"		
4502	441-J-FY-0321B03	SAFETY INJECTION LINE 2 FLOW	120A15B	Auxiliary	120'-0"	above	120'-6"		
4503	441-J-ZY-0303B02	SI PUMP LINE ISO VALVE-303	120A15B	Auxiliary	120'-0"	above	120'-6"		
4504	441-J-ZY-0600B01	SCS DVI ISO VALVE - 600	120A15B	Auxiliary	120'-0"	above	120'-6"		
4505	441-J-ZY-0602B01	SI LINE 2 LOW FLOW CTRL BYPASS VALVE - 602	120A15B	Auxiliary	120'-0"	above	120'-6"		
4506	441-J-ZY-0626B01	SI LINE 2 ISO VALVE - 626	120A15B	Auxiliary	120'-0"	above	120'-6"		
4507	441-J-ZY-0690B02	SCS WARMUP LINE ISO VALVE - 690	120A15B	Auxiliary	120'-0"	above	120'-6"		
4508	447-J-PT-0412B	IRWST TK01 LEVEL 1 PRESSURE 2 (ACCIDENT)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4509	447-J-PT-0418B	HVT & RC LEVEL 1 PRESSURE 2 (ACCIDENT)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4510	491-J-JZ-0004B	PZR SURGE LINE SAMPLE CIV CCU	120A15B	Auxiliary	120'-0"	above	120'-6"		
4511	491-J-JZ-0006B	PZR STEAM SPACE SAMPLE CIV CCU	120A15B	Auxiliary	120'-0"	above	120'-6"		
4512	543-J-LS-0004B01	AFW SOTRAGE TANK B LEVEL	120A15B	Auxiliary	120'-0"	above	120'-6"		
4513	543-J-LS-0004B02	AFW SOTRAGE TANK B LEVEL	120A15B	Auxiliary	120'-0"	above	120'-6"		
4514	543-J-LS-0004B03	AFW SOTRAGE TANK B LEVEL	120A15B	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (158 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4515	543-J-LS-0004B04	AFW SOTRAGE TANK B LEVEL	120A15B	Auxiliary	120'-0"	above	120'-6"		
4516	543-J-LS-0004B05	AFW SOTRAGE TANK B LEVEL	120A15B	Auxiliary	120'-0"	above	120'-6"		
4517	543-J-LS-0004B06	AFW SOTRAGE TANK B LEVEL	120A15B	Auxiliary	120'-0"	above	120'-6"		
4518	543-J-LS-0004B07	AFW SOTRAGE TANK B LEVEL	120A15B	Auxiliary	120'-0"	above	120'-6"		
4519	543-J-LS-0004B08	AFW SOTRAGE TANK B LEVEL	120A15B	Auxiliary	120'-0"	above	120'-6"		
4520	543-J-LY-0004B01	AFW SOTRAGE TANK B LEVEL	120A15B	Auxiliary	120'-0"	above	120'-6"		
4521	543-J-LY-0004B02	AFW SOTRAGE TANK B LEVEL	120A15B	Auxiliary	120'-0"	above	120'-6"		
4522	543-J-LY-0006B01	AFW SOTRAGE TANK A LEVEL	120A15B	Auxiliary	120'-0"	above	120'-6"		
4523	543-J-LY-0006B02	AFW SOTRAGE TANK A LEVEL	120A15B	Auxiliary	120'-0"	above	120'-6"		
4524	603-J-TE-0128B	CLASS 1E MCC 05B RM TEMP.	120A15B	Auxiliary	120'-0"	above	120'-6"		
4525	604-J-FC-0034B	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B EXH. AIR FLOW	120A15B	Auxiliary	120'-0"	above	120'-6"		
4526	604-J-FS-0034B01	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B EXH. AIR FLOW	120A15B	Auxiliary	120'-0"	above	120'-6"		
4527	604-J-FS-0034B02	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B EXH. AIR FLOW	120A15B	Auxiliary	120'-0"	above	120'-6"		
4528	604-J-FY-0034B01	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B EXH. AIR FLOW	120A15B	Auxiliary	120'-0"	above	120'-6"		
4529	604-J-FY-0034B02	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B EXH. AIR FLOW	120A15B	Auxiliary	120'-0"	above	120'-6"		
4530	604-J-FY-0034B03	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B EXH. AIR FLOW	120A15B	Auxiliary	120'-0"	above	120'-6"		
4531	604-J-FY-0034B04	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B EXH. AIR FLOW	120A15B	Auxiliary	120'-0"	above	120'-6"		
4532	604-J-PDS-0074B01	LOADING & UNLOADING AREA DIFF. PRESSURE (CHANNEL B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4533	604-J-PDS-0074B02	LOADING & UNLOADING AREA DIFF. PRESSURE (CHANNEL B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4534	604-J-PDS-0076B01	NEW FUEL STORAGE AREA (CHANNEL B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4535	604-J-PDS-0076B02	NEW FUEL STORAGE AREA (CHANNEL B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4536	604-J-PDY-0074B	LOADING & UNLOADING AREA DIFF. PRESSURE (CHANNEL B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4537	604-J-PDY-0076B	NEW FUEL STORAGE AREA (CHANNEL B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4538	604-J-TS-0028B01	SFPC HX ROOM (100A32B) TEMP	120A15B	Auxiliary	120'-0"	above	120'-6"		
4539	604-J-TS-0028B02	SFPC HX ROOM (100A32B) TEMP	120A15B	Auxiliary	120'-0"	above	120'-6"		
4540	604-J-TS-0028B03	SFPC HX ROOM (100A32B) TEMP	120A15B	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (159 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4541	604-J-TS-3044B01	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B HTG COIL HC02B	120A15B	Auxiliary	120'-0"	above	120'-6"		
4542	604-J-TY-0028B	SFPC HX ROOM (100A32B) TEMP	120A15B	Auxiliary	120'-0"	above	120'-6"		
4543	604-J-TY-3032B01	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B INLET	120A15B	Auxiliary	120'-0"	above	120'-6"		
4544	604-J-TY-3044B01	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B HTG COIL HC02B	120A15B	Auxiliary	120'-0"	above	120'-6"		
4545	604-J-TY-3046B01	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B CARBON ADSR FT07B	120A15B	Auxiliary	120'-0"	above	120'-6"		
4546	606-J-PDS-0026B01	GENERAL ACCESS AREA (100-A37B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4547	606-J-PDS-0026B02	GENERAL ACCESS AREA (100-A37B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4548	606-J-PDS-0028B01	GENERAL ACCESS AREA (120-A31A)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4549	606-J-PDS-0028B02	GENERAL ACCESS AREA (120-A31A)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4550	606-J-PDS-0034B01	GENERAL ACCESS AREA (055-A19B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4551	606-J-PDS-0034B02	GENERAL ACCESS AREA (055-A19B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4552	606-J-PDS-0036B01	GENERAL ACCESS AREA (078-A44B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4553	606-J-PDS-0036B02	GENERAL ACCESS AREA (078-A44B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4554	606-J-PDY-0026B	GENERAL ACCESS AREA (100-A37B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4555	606-J-PDY-0028B	GENERAL ACCESS AREA (120-A31A)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4556	606-J-PDY-0034B	GENERAL ACCESS AREA (055-A19B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4557	606-J-PDY-0036B	GENERAL ACCESS AREA (078-A44B)	120A15B	Auxiliary	120'-0"	above	120'-6"		
4558	606-J-TS-0204B01	MECH. PENET. ROOM TEMP	120A15B	Auxiliary	120'-0"	above	120'-6"		
4559	606-J-TS-0204B02	MECH. PENET. ROOM TEMP	120A15B	Auxiliary	120'-0"	above	120'-6"		
4560	606-J-TS-0204B03	MECH. PENET. ROOM TEMP	120A15B	Auxiliary	120'-0"	above	120'-6"		
4561	606-J-TY-0204B	MECH. PENET. ROOM TEMP	120A15B	Auxiliary	120'-0"	above	120'-6"		
4562	633-J-TW-0158	COOLING COIL VE-CW14B OUTLET	120A15B	Auxiliary	120'-0"	above	120'-6"		
4563	633-J-TW-0160	COOLING COIL VE-CW14B INLET	120A15B	Auxiliary	120'-0"	above	120'-6"		
4564	763-J-PT-0351B	NARROW RANGE PRESS. (CH "B")	120A15B	Auxiliary	120'-0"	above	120'-6"		
4565	763-J-PT-0352B	WIDE RANGE PRESS. (CH "B")	120A15B	Auxiliary	120'-0"	above	120'-6"		
4566	763-J-PT-0353B	EXTENDED WIDE RANGE PRESS. (CH "B")	120A15B	Auxiliary	120'-0"	above	120'-6"		
4567	633-V-1129B	C-1E MCC 05B RM C-CLR Outlet VALVE	120A15B	Auxiliary	120'-0"	above	120'-6"		
4568	633-V-1130B	C-1E MCC 05B RM C-CLR Inlet throt VALVE	120A15B	Auxiliary	120'-0"	above	120'-6"		
4569	633-V-2129B	C-1E MCC05B RM C-CLR Outlet PZR Test VALVE	120A15B	Auxiliary	120'-0"	above	120'-6"		
4570	633-V-2130B	C-1E MCC05B RM C-CLR Inlet PZR Test VALVE	120A15B	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (160 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4571	633-V-2229B	C-1E MCC 05A RM HV14B ECW OutletVent VALVE	120A15B	Auxiliary	120'-0"	above	120'-6"		
4572	633-V-2230B	C-1E MCC 05A RM HV14B ECW InletDRN VALVE	120A15B	Auxiliary	120'-0"	above	120'-6"		
4573	633-V-2292B	C-1E MCC 05A RM HV14B ECW Outlet DRN VALVE	120A15B	Auxiliary	120'-0"	above	120'-6"		
4574	633-V-2329B	MCC05A RM HV14B ECW Outlet Test Conn VALVE	120A15B	Auxiliary	120'-0"	above	120'-6"		
4575	633-V-2330B	MCC05A RM HV14B ECW Inlet Test Conn VALVE	120A15B	Auxiliary	120'-0"	above	120'-6"		
4576	441-M-OR06A	Flow Orifice for Equipment	120A16A	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	10" EOL (1)
4577	441-M-OR06A-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	120A16A	Auxiliary	120'-0"	above	120'-6"		
4578	606-M-HV20A	MECHANICAL PENETRATION RM CUBICLE COOLER	120A16A	Auxiliary	120'-0"	above	120'-6"		
4579	441-J-FE-0341A	SIP DVI 1A FLOW RATE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4580	441-J-HS-0601A03	SCS DVI ISOATION	120A16A	Auxiliary	120'-0"	above	120'-6"		
4581	606-J-TE-0205A	MECH. PENET. ROOM TEMP	120A16A	Auxiliary	120'-0"	above	120'-6"		
4582	633-J-TW-0237	COOLING COIL VK-CW20A OUTLET	120A16A	Auxiliary	120'-0"	above	120'-6"		
4583	633-J-TW-0239	COOLING COIL VK-CW20A INLET	120A16A	Auxiliary	120'-0"	above	120'-6"		
4584	761-J-ZL-0432	RE/RT-039A, 040B MONITOR SAMPLE CONTAINMENT ISOATION VALVES V432 CTRL SW	120A16A	Auxiliary	120'-0"	above	120'-6"		
4585	761-J-ZL-0434	RE/RT-039A, 040B MONITOR SAMPLE CONTAINMENT ISOATION VALVES V432 CTRL SW	120A16A	Auxiliary	120'-0"	above	120'-6"		
4586	441-V-0145	3-SI-OR06A TAP BLOCK VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4587	441-V-0146	3-SI-OR06A TAP BLOCK VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4588	441-V-0175	SI LINE1 FT-341A RT VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4589	441-V-0176	SI LINE1 FT-341A RT VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4590	441-V-0178	SIS Line1 to DVI Nozzle 1A CHK VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4591	441-V-0293	SIP 02B/02D to SIT Fill & EDT LN ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4592	441-V-0461	SCS TRAIN1 RELIEF VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4593	441-V-0601	SCS Train1 ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4594	441-V-0603	SIS Line1 to DVI Nozzle 1A Flo CTRL VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4595	441-V-0646	SIS Line1 to DVI Nozzle 1A ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4596	441-V-0941	SIS Line1 to DVI Nozzle 1A Test Conn VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (161 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4597	441-V-0942	SIS Line1 to DVI Nozzle 1A Test Conn VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4598	441-V-2107	SIP to SIT Vent VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4599	441-V-2108	SIP to SIT Vent VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4600	442-V-1013	ECSBS ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4601	442-V-2036	ECSBS Nozzles LN Pre Test & Vent VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4602	451-V-0198	RCP CBO ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4603	451-V-0255	Seal Injection CNMT ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4604	451-V-0301	RCP CBO Line Test Connection ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4605	451-V-0505	RCP Controlled BLD off CNMT ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4606	451-V-0580	RSSH to RDH ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4607	451-V-0646	RCP CBO Line CHK VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4608	451-V-0666	RSSH to RDH Test Connection ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4609	451-V-0834	Seal INJ Test Connection ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4610	451-V-2355	RCP Bleed Off LN VNT VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4611	451-V-2356	RCP Bleed Off LN VNT VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4612	455-V-1113	Wet Lay Up Recir PP A Disch ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4613	461-V-0296	LETDWN HX SUPPLY CNMT ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4614	461-V-0302	LETDWN HX RETURN CNMT ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4615	471-V-0002	GAS SURGE HDR OUTSIDE CTMT ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4616	491-V-0020	SI TANKS SAMPLE CIV	120A16A	Auxiliary	120'-0"	above	120'-6"		
4617	491-V-0042	CTMT AIR SMPL LN ISO. VALVE(OUTSIDE CTMT)	120A16A	Auxiliary	120'-0"	above	120'-6"		
4618	491-V-0043	CTMT AIR SMPL RTN LN ISO. VALVE(OUTSIDE CTMT)	120A16A	Auxiliary	120'-0"	above	120'-6"		
4619	633-V-1169A	CW20A MECH. PENET C-CLR Outlet VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4620	633-V-1170A	CW20A MECH. PENET C-CLR Inlet throt VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4621	633-V-2169A	MECH.PENET(20A) C-CLR Outlet PZR Test VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4622	633-V-2170A	MECH. PENET(20A) C-CLR Inlet PZR Test VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4623	633-V-2269A	MECH. PENET RM HV20A ECW Outlet Vent VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4624	633-V-2270A	MECH. PENET RM HV20A ECW Inlet DRN VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (162 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4625	633-V-2289A	MECH. PENET RM HV20A ECW Outlet DRN VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4626	633-V-2369A	ME PEN RM HV20A ECW Outlet Test Conn VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4627	633-V-2370A	ME PEN RM HV20A ECW Inlet Test Conn VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4628	633-V-2476A	MECH. PENET RM CW20A Outlet DRN VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4629	633-V-2477A	MECH. PENET RM CW20A Outlet Vent VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4630	633-V-2478A	MECH. PENET RM CW20A Inlet Vent VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4631	761-V-0432	CMNT AIR RE/RT-039A INLET ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4632	761-V-0434	CMNT AIR RE/RT-039A OUTLET ISO VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4633	761-V-2052	RE/RT-039 INLET SPECIAL TEST CONN VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4634	761-V-2053	RE/RT-039 OUTLET SPECIAL TEST CONN VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4635	763-V-0003	H2 ANZR/MON(TRN A) INLT ISO(RCB OUTSIDE)	120A16A	Auxiliary	120'-0"	above	120'-6"		
4636	763-V-0009	H2 ANZR/MON(TRN A) OTLT ISO(RCB OUTSIDE)	120A16A	Auxiliary	120'-0"	above	120'-6"		
4637	763-V-0013	H2 ANZR/MON(TRN A) INLT ISO(RCB OUTSIDE)	120A16A	Auxiliary	120'-0"	above	120'-6"		
4638	763-V-0017	CH A CNMT PR PT-351A,352A,353A RT VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4639	763-V-0019	CH C CNMT PR PT-351C,352C RT VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4640	763-V-0021	DPS CNMT PR PT-350X RT VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4641	763-V-1005	H2 ANZR/MON(TRN A) INLET LN DRN VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4642	763-V-1007	H2 ANZR/MON(TRN A) OUTLET LN DRN VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4643	763-V-1009	H2 ANZR/MON(TRN A) INLET LN DRN VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4644	763-V-1011	H2 ANZR/MON(TRN A) OUTLET LN DRN VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (163 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4645	763-V-1017	H2 ANZR/MON(TRN A) INLT LN DRN & TEST VALVE	120A16A	Auxiliary	120'-0"	above	120'-6"		
4646	606-Y-VK-1149A	MANUAL DAMPER	120A16A	Auxiliary	120'-0"	above	120'-6"		
4647	606-Y-VK-1554A	FIRE DAMPER	120A16A	Auxiliary	120'-0"	above	120'-6"		
4648	606-Y-VK-1592A	FIRE DAMPER	120A16A	Auxiliary	120'-0"	above	120'-6"		
4649	441-M-OR06B	FLOW ORIFICE FOR EQUIPMENT	120A16B	Auxiliary	120'-0"	above	120'-6"	4" FD (2)	-
4650	441-M-OR06B-DU	FLOW ORIFICE FOR EQUIPMENT(DUMMY)	120A16B	Auxiliary	120'-0"	above	120'-6"		
4651	606-M-HV20B	MECHANICAL PENETRATION RM CUBICLE COOLER	120A16B	Auxiliary	120'-0"	above	120'-6"		
4652	441-J-FE-0321B	SIP DVI 2B FLOW RATE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4653	441-J-HS-0600B03	SCS DVI ISOATION	120A16B	Auxiliary	120'-0"	above	120'-6"		
4654	606-J-TE-0204B	MECH. PENET. ROOM TEMP	120A16B	Auxiliary	120'-0"	above	120'-6"		
4655	633-J-TW-0238	COOLING COIL VK-CW20B OUTLET	120A16B	Auxiliary	120'-0"	above	120'-6"		
4656	633-J-TW-0240	COOLING COIL VK-CW20B INLET	120A16B	Auxiliary	120'-0"	above	120'-6"		
4657	441-V-0135	3-SI-OR06B TAP BLOCK VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4658	441-V-0136	3-SI-OR06B TAP BLOCK VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4659	441-V-0155	SI Line2 FT-321B RT VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4660	441-V-0156	SI Line2 FT-321B RT VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4661	441-V-0168	SIS Line2 to DVI Nozzle 2B CHK VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4662	441-V-0462	SCS TRAIN2 RELIEF VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4663	441-V-0600	SCS Train2 ISO VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4664	441-V-0602	SIS Line2 to DVI Nozzle 2B Flo CTRL VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4665	441-V-0626	SIS Line2 to DVI Nozzle 2B ISO VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4666	441-V-0921	SIS Line2 to DVI Nozzle 2B Test Conn VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4667	441-V-0922	SIS Line2 to DVI Nozzle 2B Test Conn VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4668	441-V-2757	SI/SC INJECTION 2 LINE VENT VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4669	441-V-2759	SI/SC INJECTION 2 LINE VENT VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4670	451-V-0201P	Letdown CTRL VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4671	451-V-0201Q	Letdown CTRL VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4672	451-V-0340	Shutdown Purification Line ISO VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4673	451-V-0341	Shutdown Purification Line CHK VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4674	451-V-0346	Letdown Pr Indicator ISO VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4675	451-V-0347	Letdown CTRL VALVE ISO VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4676	451-V-0348	Letdown CTRL VALVE ISO VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4677	451-V-0349	Letdown CTRL VALVE ISO VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4678	451-V-0350	Letdown CTRL VALVE ISO VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4679	451-V-0352	Letdown Pr Indicator ISO VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (164 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4680	451-V-0354	Letdown Relief VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4681	451-V-0523	Letdown Containment ISO VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4682	451-V-0855	Letdown Line Test Connection ISO VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4683	451-V-0871	SHUTDOWN PURIFICATION LINE TEST CONNECTION VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4684	455-V-1114	Wet Lay Up Recir PP B Disch ISO VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4685	455-V-2802	Wet L/U Recir PP B Disch Pr Test Conn VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4686	463-V-1144	SFP CLEANUP DMZR OUTLET HDR PENE ISO VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4687	463-V-1217	IRWST RTN LN ISO VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4688	463-V-2249	PENE-240 CTMT OUTSIDE PR TEST CONN VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4689	491-V-0004	PZR SURGE LINE SAMPLE CIV	120A16B	Auxiliary	120'-0"	above	120'-6"		
4690	491-V-0006	PZR STEAM SPACE SAMPLE CIV	120A16B	Auxiliary	120'-0"	above	120'-6"		
4691	633-V-1169B	CW20B MECH. PENET C-CLR Outlet VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4692	633-V-1170B	CW20B MECH. PENET C-CLR Inlet throt VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4693	633-V-2169B	MECH.PENET(20B) C-CLR Outlet PZR Test VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4694	633-V-2170B	MECH. PENET(20B) C-CLR Inlet PZR Test VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4695	633-V-2269B	MECH. PENET RM HV20B ECW Outlet Vent VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4696	633-V-2270B	MECH. PENET RM HV20B ECW Inlet DRN VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4697	633-V-2289B	MECH. PENET RM HV20B ECW Outlet DRN VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4698	633-V-2369B	ME PEN RM HV20B ECW Outlet Test Conn VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4699	633-V-2370B	ME PEN RM HV20B ECW Inlet Test Conn VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4700	763-V-0004	H2 ANZR/MON(TRN B) INLT ISO(RCB OUTSIDE)	120A16B	Auxiliary	120'-0"	above	120'-6"		
4701	763-V-0018	CH B CNMT PR PT-351B,352B,353B RT VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4702	763-V-0022	DPS CNMT PR PT-350Y RT VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (165 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4703	763-V-1006	H2 ANZR/MON(TRN B) INLET LN DRN VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4704	763-V-1010	H2 ANZR/MON(TRN B) INLET LN DRN VALVE	120A16B	Auxiliary	120'-0"	above	120'-6"		
4705	606-Y-VK-1179B	MANUAL DAMPER	120A16B	Auxiliary	120'-0"	above	120'-6"		
4706	606-Y-VK-1592B	FIRE DAMPER	120A16B	Auxiliary	120'-0"	above	120'-6"		
4707	763-J-LP01A	CNMT POST-LOCA H2 ANALYZER CABINET	120A20A	Auxiliary	120'-0"	above	120'-6"	4" FD (4)	10" EOL (1)
4708	441-J-FT-0341A	SI & LINE 1 FLOW	120A20A	Auxiliary	120'-0"	above	120'-6"		
4709	441-J-ZY-0601A01	SCS DVI ISO VALVE - 601	120A20A	Auxiliary	120'-0"	above	120'-6"		
4710	441-J-ZY-0603A01	SI LINE 1 LOW FLOW CTRL BYPASS VALVE - 603	120A20A	Auxiliary	120'-0"	above	120'-6"		
4711	441-J-ZY-0646A01	SI LINE 1 ISO VALVE - 646	120A20A	Auxiliary	120'-0"	above	120'-6"		
4712	447-J-PT-0411A	IRWST TK01 LEVEL 2 PRESSURE 2 (ACCIDENT)	120A20A	Auxiliary	120'-0"	above	120'-6"		
4713	447-J-PT-0417A	HVT & RC LEVEL 2 PRESSURE 2 (ACCIDENT)	120A20A	Auxiliary	120'-0"	above	120'-6"		
4714	604-J-FT-0033A	EMRG EXH ACU AU02A DNSTRM FLOW	120A20A	Auxiliary	120'-0"	above	120'-6"		
4715	606-J-FT-0045A	AUX. BLDG CTRLD AREA I EXH. ACU AU01A AIR FLOW	120A20A	Auxiliary	120'-0"	above	120'-6"		
4716	606-J-FT-0047C	AUX. BLDG CTRLD AREA I EXH. ACU AU02A AIR FLOW	120A20A	Auxiliary	120'-0"	above	120'-6"		
4717	606-J-PDT-0025A	GNRL ACCS AREA 120-A20A DIFF PRESS	120A20A	Auxiliary	120'-0"	above	120'-6"		
4718	763-J-AE-0005A	CNMT H2 CONCENT.(CH.A)	120A20A	Auxiliary	120'-0"	above	120'-6"		
4719	763-J-AE-0006A	IRWST H2 CONCENT.(CH.A)	120A20A	Auxiliary	120'-0"	above	120'-6"		
4720	763-J-PT-0351C	NARROW RANGE PRESS. (CH "C")	120A20A	Auxiliary	120'-0"	above	120'-6"		
4721	763-J-PT-0352C	WIDE RANGE PRESS. (CH "C")	120A20A	Auxiliary	120'-0"	above	120'-6"		
4722	763-J-TC-3101A	TEMPERATURE CONTROLLER FOR HEAT TRACE AT CNMT TRAIN A	120A20A	Auxiliary	120'-0"	above	120'-6"		
4723	763-J-TC-3103A	TEMPERATURE CONTROLLER FOR HEAT TRACE AT IRWST TRAIN A	120A20A	Auxiliary	120'-0"	above	120'-6"		
4724	633-V-2479A	MECH. PENET RM CW20A Inlet DRN VALVE	120A20A	Auxiliary	120'-0"	above	120'-6"		
4725	604-Y-VF-1508B	FIRE DAMPER	120A20A	Auxiliary	120'-0"	above	120'-6"		
4726	606-Y-VK-1125A	MANUAL DAMPER	120A20A	Auxiliary	120'-0"	above	120'-6"		
4727	606-Y-VK-1131A	MANUAL DAMPER	120A20A	Auxiliary	120'-0"	above	120'-6"		
4728	606-Y-VK-1566A	FIRE DAMPER	120A20A	Auxiliary	120'-0"	above	120'-6"		
4729	606-Y-VK-1567A	FIRE DAMPER	120A20A	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (166 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4730	606-M-AU01A	AUX.BLDG CONTROLLED AREA I EXHAUST ACU	120A21A	Auxiliary	120'-0"	above	120'-6"	4" FD (3)	-
4731	606-M-AU02A	AUX.BLDG CONTROLLED AREA I EXHAUST ACU	120A21A	Auxiliary	120'-0"	above	120'-6"		
4732	606-J-FE-0045A	AUX. BLDG CTRLD AREA I EXH. ACU AU01A AIR FLOW	120A21A	Auxiliary	120'-0"	above	120'-6"		
4733	606-J-FE-0047C	AUX. BLDG CTRLD AREA I EXH. ACU AU02A AIR FLOW	120A21A	Auxiliary	120'-0"	above	120'-6"		
4734	606-J-FS-3221A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A HEATING COIL HC01A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4735	606-J-FS-3228A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A HEATING COIL HC02A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4736	606-J-TE-3021A	CONTROLLED AREA I EXH. ACU AU01A INLET	120A21A	Auxiliary	120'-0"	above	120'-6"		
4737	606-J-TE-3023A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A HEATING COIL HC01A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4738	606-J-TE-3033A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A CARBON ADSBR FT04A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4739	606-J-TE-3051A	CONTROLLED AREA I EXH. ACU AU02A INLET	120A21A	Auxiliary	120'-0"	above	120'-6"		
4740	606-J-TE-3223A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A HEATING COIL HC01A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4741	606-J-TE-3230A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A HEATING COIL HC02A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4742	606-J-TE-3233A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A CARBON ADSBR FT04A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4743	606-J-TE-3264A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A CARBONADSBR FT09A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4744	606-J-TE-3271A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A HEATING COIL HC01A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4745	606-J-TE-3273A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A CARBON ADSBR FT04A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4746	606-J-TE-3276A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A HEATING COIL HC02A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4747	606-J-TE-3278A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A CARBONADSBR FT09A	120A21A	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (167 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4748	606-J-TI-3022B	CONTROLLED AREA II EXH. ACU AU01B INLET	120A21A	Auxiliary	120'-0"	above	120'-6"		
4749	606-J-TI-3024B	AUX. BLDG CONTROLLED EXH. AREA II AU01B HEATING COIL HC01B	120A21A	Auxiliary	120'-0"	above	120'-6"		
4750	606-J-TI-3034B	AUX. BLDG CONTROLLED EXH. AREA II AU01B CARBON ADSBR FT04B	120A21A	Auxiliary	120'-0"	above	120'-6"		
4751	606-J-TI-3052B	CONTROLLED AREA II EXH. ACU AU02B INLET	120A21A	Auxiliary	120'-0"	above	120'-6"		
4752	606-J-TI-3053B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B HEATING COIL HC02B	120A21A	Auxiliary	120'-0"	above	120'-6"		
4753	606-J-TI-3063B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B CARBONADSBR FT09B	120A21A	Auxiliary	120'-0"	above	120'-6"		
4754	606-J-TS-3223A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A HEATING COIL HC01A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4755	606-J-TS-3230A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A HEATING COIL HC02A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4756	606-J-TS-3233A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A CARBON ADSBR FT04A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4757	606-J-TS-3264A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A CARBON ADSBR FT09A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4758	606-J-TS-3271A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A HEATING COIL HC01A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4759	606-J-TS-3273A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A CARBON ADSBR FT04A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4760	606-J-TS-3276A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A HEATING COIL HC02A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4761	606-J-TS-3278A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A CARBON ADSBR FT09A	120A21A	Auxiliary	120'-0"	above	120'-6"		
4762	606-J-ZL-0024B	AUX. BLDG. CONTROLLED AREA EXH. ACU ELECT. HEATING COILS HC01B	120A21A	Auxiliary	120'-0"	above	120'-6"		
4763	606-J-ZL-0053B	AUX. BLDG. CONTROLLED AREA EXH. ACU ELECT. HEATING COILS HC02B	120A21A	Auxiliary	120'-0"	above	120'-6"		
4764	606-J-ZL-0053D	AUX. BLDG. CONTROLLED AREA EXH. ACU ELECT. HEATING COILS HC02B	120A21A	Auxiliary	120'-0"	above	120'-6"		
4765	606-V-1001A	AB CTRLD Area Ⅰ EXH AU01A Fire WTR ISO VALVE	120A21A	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (168 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4766	606-V-1002A	AB CTRLD Area Ⅰ EXH AU01A Fire WTR ISO VALVE	120A21A	Auxiliary	120'-0"	above	120'-6"		
4767	606-V-1003A	AB CTRLD Area Ⅰ EXH AU02A Fire WTR ISO VALVE	120A21A	Auxiliary	120'-0"	above	120'-6"		
4768	606-V-1004A	AB CTRLD Area Ⅰ EXH AU02A Fire WTR ISO VALVE	120A21A	Auxiliary	120'-0"	above	120'-6"		
4769	606-V-2001A	AB CTRLD Area Ⅰ EXH AU01A Fire WTR DRN VALVE	120A21A	Auxiliary	120'-0"	above	120'-6"		
4770	606-V-2002A	AB CTRLD Area Ⅰ EXH AU01A Fire WTR DRN VALVE	120A21A	Auxiliary	120'-0"	above	120'-6"		
4771	606-V-2003A	AB CTRLD Area Ⅰ EXH AU02A Fire WTR DRN VALVE	120A21A	Auxiliary	120'-0"	above	120'-6"		
4772	606-V-2004A	AB CTRLD Area Ⅰ EXH AU02A Fire WTR DRN VALVE	120A21A	Auxiliary	120'-0"	above	120'-6"		
4773	606-V-2009A	AB CTRLD Area Ⅰ EXH AU01A Fire WTR Vent	120A21A	Auxiliary	120'-0"	above	120'-6"		
4774	606-V-2010A	AB CTRLD Area Ⅰ EXH AU02A Fire WTR Vent	120A21A	Auxiliary	120'-0"	above	120'-6"		
4775	606-V-2013A	AB CTRLD Area Ⅰ EXH AU01A Fire WTR DRN VALVE	120A21A	Auxiliary	120'-0"	above	120'-6"		
4776	606-V-2014A	AB CTRLD Area Ⅰ EXH AU02A Fire WTR DRN VALVE	120A21A	Auxiliary	120'-0"	above	120'-6"		
4777	606-Y-VK-0001A	CONTROL DAMPER	120A21A	Auxiliary	120'-0"	above	120'-6"		
4778	606-Y-VK-0002A	CONTROL DAMPER	120A21A	Auxiliary	120'-0"	above	120'-6"		
4779	606-Y-VK-0003A	CONTROL DAMPER	120A21A	Auxiliary	120'-0"	above	120'-6"		
4780	606-Y-VK-1001A	MANUAL DAMPER	120A21A	Auxiliary	120'-0"	above	120'-6"		
4781	606-Y-VK-1002A	MANUAL DAMPER	120A21A	Auxiliary	120'-0"	above	120'-6"		
4782	606-Y-VK-1133A	MANUAL DAMPER	120A21A	Auxiliary	120'-0"	above	120'-6"		
4783	606-Y-VK-1134A	MANUAL DAMPER	120A21A	Auxiliary	120'-0"	above	120'-6"		
4784	606-Y-VK-1143A	MANUAL DAMPER	120A21A	Auxiliary	120'-0"	above	120'-6"		
4785	606-Y-VK-1144A	MANUAL DAMPER	120A21A	Auxiliary	120'-0"	above	120'-6"		
4786	606-Y-VK-1145A	MANUAL DAMPER	120A21A	Auxiliary	120'-0"	above	120'-6"		
4787	606-Y-VK-1301A	MANUAL DAMPER	120A21A	Auxiliary	120'-0"	above	120'-6"		
4788	606-Y-VK-1302A	MANUAL DAMPER	120A21A	Auxiliary	120'-0"	above	120'-6"		
4789	606-Y-VK-1583A	FIRE DAMPER	120A21A	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (169 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4790	606-Y-VK-1585A	FIRE DAMPER	120A21A	Auxiliary	120'-0"	above	120'-6"		
4791	433-J-JZ-0412C	PZR GAS VENT CCU	120A22C	Auxiliary	120'-0"	above	120'-6"	-	
4792	433-J-JZ-0416C	RX VESSEL GAS VENT CCU	120A22C	Auxiliary	120'-0"	above	120'-6"		
4793	451-V-0101	Letdown to VCT CHK VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	-
4794	451-V-0103	VCT Pr Indicator ISO VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4795	451-V-0104	VCT Vent to GWMS	120A23A	Auxiliary	120'-0"	above	120'-6"		
4796	451-V-0112	VCT Gas Supply Line CHK VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4797	451-V-0139	GAS Stripper to VCT CHK VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4798	451-V-0184	RMW Line to VCT CHK VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4799	451-V-0185	Sampling Line ISO VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4800	451-V-0188	VCT Makeup Line CHK VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4801	451-V-0210Y	Boric Acid M/U CTRL VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4802	451-V-0500	VCT Inlet Diversion VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4803	451-V-0512	VCT M/U Supply ISO VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4804	451-V-0513	VCT Vent VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4805	451-V-0527	VCT M/U Bypass VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4806	451-V-0645	VCT Gas Supply Line ISO VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4807	451-V-0668	BAM Line to VCT CHK VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4808	451-V-2087	Gas STRIP to VCT Inlet LN P-Trap Vent VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4809	451-V-2089	VCT from/to BAMP Vent VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4810	451-V-2091	VCT Inlet from RMWP & BAMP Vent VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4811	451-V-2217	PURIF IX to VCT Inlet LN P-Trap Vent VALVE	120A23A	Auxiliary	120'-0"	above	120'-6"		
4812	606-Y-VK-1152A	MANUAL DAMPER	120A23A	Auxiliary	120'-0"	above	120'-6"		
4813	604-M-AU02A	FUEL HANDLING AREA EMERGENCY EXHAUST ACU	120A24A	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	-
4814	604-J-FE-0033A	EMRG EXH ACU AU02A DNSTRM FLOW	120A24A	Auxiliary	120'-0"	above	120'-6"		
4815	604-J-FS-3201A	FUEL HANDLING AREA I EMRG. EXH. ACU AU01A HTG COIL HC02A	120A24A	Auxiliary	120'-0"	above	120'-6"		
4816	604-J-TE-3031A	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A INLET	120A24A	Auxiliary	120'-0"	above	120'-6"		
4817	604-J-TE-3043A	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A HTG COIL HC02A	120A24A	Auxiliary	120'-0"	above	120'-6"		
4818	604-J-TE-3045A	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A CARBON ADSR FT07A	120A24A	Auxiliary	120'-0"	above	120'-6"		
4819	604-J-TE-3202A	FUEL HANDLING AREA I EMRG. EXH. ACU AU01A HTG COIL HC02A	120A24A	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (170 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4820	604-J-TE-3203A	FUEL HANDLING AREA I EMRG. EXH. ACU AU01A HTG COIL HC02A	120A24A	Auxiliary	120'-0"	above	120'-6"		
4821	604-J-TE-3204A	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A CARBON ADSR FT07A	120A24A	Auxiliary	120'-0"	above	120'-6"		
4822	604-J-TE-3205A	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A CARBON ADSR FT07A	120A24A	Auxiliary	120'-0"	above	120'-6"		
4823	604-J-TS-3202A	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A HTG COIL HC02A	120A24A	Auxiliary	120'-0"	above	120'-6"		
4824	604-J-TS-3203A	FUEL HANDLING AREA I EMRG. EXH. ACU AU01A HTG COIL HC02A	120A24A	Auxiliary	120'-0"	above	120'-6"		
4825	604-J-TS-3204A	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A CARBON ADSR FT07A	120A24A	Auxiliary	120'-0"	above	120'-6"		
4826	604-J-TS-3205A	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A CARBON ADSR FT07A	120A24A	Auxiliary	120'-0"	above	120'-6"		
4827	604-V-1001A	FH Area EMERG EXH AU02A Fire WTR ISO VALVE	120A24A	Auxiliary	120'-0"	above	120'-6"		
4828	604-V-1002A	FH Area EMERG EXH AU02A Fire WTR ISO VALVE	120A24A	Auxiliary	120'-0"	above	120'-6"		
4829	604-V-1003A	FH Area EMERG EXH AU02A Fire WTR Vent VALVE	120A24A	Auxiliary	120'-0"	above	120'-6"		
4830	604-V-2001A	FH Area EMERG EXH AU02A Fire WTR DRN VALVE	120A24A	Auxiliary	120'-0"	above	120'-6"		
4831	604-V-2002A	FH Area EMERG EXH AU02A Fire WTR DRN VALVE	120A24A	Auxiliary	120'-0"	above	120'-6"		
4832	604-V-2003A	FH Area EMERG EXH AU02A Fire WTR DRN VALVE	120A24A	Auxiliary	120'-0"	above	120'-6"		
4833	604-Y-VF-0005A	CONTROL DAMPER	120A24A	Auxiliary	120'-0"	above	120'-6"		
4834	604-Y-VF-0007A	CONTROL DAMPER	120A24A	Auxiliary	120'-0"	above	120'-6"		
4835	604-Y-VF-1007A	MANUAL DAMPER	120A24A	Auxiliary	120'-0"	above	120'-6"		
4836	604-Y-VF-1533B	FIRE DAMPER	120A24A	Auxiliary	120'-0"	above	120'-6"		
4837	606-M-AU01B	AUX.BLDG CONTROLLED AREA II EXHAUST ACU	120A29B	Auxiliary	120'-0"	above	120'-6"	4" FD (2)	-
4838	606-M-AU02B	AUX.BLDG CONTROLLED AREA II EXHAUST ACU	120A29B	Auxiliary	120'-0"	above	120'-6"		
4839	606-J-FE-0046B	AUX. BLDG CTRLD AREA II EXH. ACU AU01B AIR FLOW	120A29B	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (171 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4840	606-J-FS-3222B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B HEATING COIL HC01B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4841	606-J-FS-3227B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B HEATING COIL HC02B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4842	606-J-TE-3022B	CONTROLLED AREA II EXH. ACU AU01B INLET	120A29B	Auxiliary	120'-0"	above	120'-6"		
4843	606-J-TE-3024B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B HEATING COIL HC01B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4844	606-J-TE-3034B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B CARBON ADSBR FT04B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4845	606-J-TE-3052B	CONTROLLED AREA II EXH. ACU AU02B INLET	120A29B	Auxiliary	120'-0"	above	120'-6"		
4846	606-J-TE-3053B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B HEATING COIL HC02B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4847	606-J-TE-3054A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A HEATING COIL HC02A	120A29B	Auxiliary	120'-0"	above	120'-6"		
4848	606-J-TE-3063B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B CARBONADSBR FT09B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4849	606-J-TE-3064A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A CARBONADSBR FT09A	120A29B	Auxiliary	120'-0"	above	120'-6"		
4850	606-J-TE-3224B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B HEATING COIL HC01B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4851	606-J-TE-3229B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B HEATING COIL HC02B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4852	606-J-TE-3234B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B CARBON ADSBR FT04B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4853	606-J-TE-3263B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B CARBONADSBR FT09B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4854	606-J-TE-3272B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B HEATING COIL HC01B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4855	606-J-TE-3274B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B CARBON ADSBR FT04B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4856	606-J-TE-3275B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B HEATING COIL HC02B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4857	606-J-TE-3277B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B CARBONADSBR FT09B	120A29B	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (172 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4858	606-J-TI-3021A	CONTROLLED AREA I EXH. ACU AU01A INLET	120A29B	Auxiliary	120'-0"	above	120'-6"		
4859	606-J-TI-3023A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A HEATING COIL HC01A	120A29B	Auxiliary	120'-0"	above	120'-6"		
4860	606-J-TI-3033A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A CARBON ADSBR FT04A	120A29B	Auxiliary	120'-0"	above	120'-6"		
4861	606-J-TI-3051A	CONTROLLED AREA I EXH. ACU AU02A INLET	120A29B	Auxiliary	120'-0"	above	120'-6"		
4862	606-J-TI-3054A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A HEATING COIL HC02A	120A29B	Auxiliary	120'-0"	above	120'-6"		
4863	606-J-TI-3064A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A CARBONADSBR FT09A	120A29B	Auxiliary	120'-0"	above	120'-6"		
4864	606-J-TS-3224B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B HEATING COIL HC01B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4865	606-J-TS-3229B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B HEATING COIL HC02B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4866	606-J-TS-3234B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B CARBON ADSBR FT04B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4867	606-J-TS-3263B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B CARBON ADSBR FT09B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4868	606-J-TS-3272B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B HEATING COIL HC01B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4869	606-J-TS-3274B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B CARBON ADSBR FT04B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4870	606-J-TS-3275B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B HEATING COIL HC02B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4871	606-J-TS-3277B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B CARBON ADSBR FT09B	120A29B	Auxiliary	120'-0"	above	120'-6"		
4872	606-J-ZL-0023A	AUX. BLDG. CONTROLLED AREA EXH. ACU ELECT. HEATING COILS HC01A	120A29B	Auxiliary	120'-0"	above	120'-6"		
4873	606-J-ZL-0054A	AUX. BLDG. CONTROLLED AREA EXH. ACU ELECT. HEATING COILS HC02A	120A29B	Auxiliary	120'-0"	above	120'-6"		
4874	606-J-ZL-0054C	AUX. BLDG. CONTROLLED AREA EXH. ACU ELECT. HEATING COILS HC02A	120A29B	Auxiliary	120'-0"	above	120'-6"		
4875	606-V-1001B	AB CTRLD Area II EXH AU01B Fire WTR ISO VALVE	120A29B	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (173 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4876	606-V-1002B	AB CTRLD Area Ⅱ EXH AU01B Fire WTR ISO VALVE	120A29B	Auxiliary	120'-0"	above	120'-6"		
4877	606-V-1003B	AB CTRLD Area Ⅱ EXH AU02B Fire WTR ISO VALVE	120A29B	Auxiliary	120'-0"	above	120'-6"		
4878	606-V-1004B	AB CTRLD Area Ⅱ EXH AU02B Fire WTR ISO VALVE	120A29B	Auxiliary	120'-0"	above	120'-6"		
4879	606-V-2001B	AB CTRLD Area Ⅱ EXH AU01B Fire WTR DRN VALVE	120A29B	Auxiliary	120'-0"	above	120'-6"		
4880	606-V-2002B	AB CTRLD Area Ⅱ EXH AU01B Fire WTR DRN VALVE	120A29B	Auxiliary	120'-0"	above	120'-6"		
4881	606-V-2003B	AB CTRLD Area Ⅱ EXH AU02B Fire WTR DRN VALVE	120A29B	Auxiliary	120'-0"	above	120'-6"		
4882	606-V-2004B	AB CTRLD Area Ⅱ EXH AU02B Fire WTR DRN VALVE	120A29B	Auxiliary	120'-0"	above	120'-6"		
4883	606-V-2009B	AB CTRLD Area Ⅱ EXH AU01B Fire WTR Vent	120A29B	Auxiliary	120'-0"	above	120'-6"		
4884	606-V-2010B	AB CTRLD Area Ⅱ EXH AU02B Fire WTR Vent	120A29B	Auxiliary	120'-0"	above	120'-6"		
4885	606-V-2013B	AB CTRLD AREA Ⅱ EXH AU01B FIRE WTR DRN VALVE	120A29B	Auxiliary	120'-0"	above	120'-6"		
4886	606-V-2014B	AB CTRLD AREA Ⅱ EXH AU02B FIRE WTR DRN VALVE	120A29B	Auxiliary	120'-0"	above	120'-6"		
4887	606-Y-VK-0001B	CONTROL DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		
4888	606-Y-VK-0002B	CONTROL DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		
4889	606-Y-VK-0003B	CONTROL DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		
4890	606-Y-VK-0004B	CONTROL DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		
4891	606-Y-VK-1001B	MANUAL DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		
4892	606-Y-VK-1002B	MANUAL DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		
4893	606-Y-VK-1176B	MANUAL DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		
4894	606-Y-VK-1177B	MANUAL DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		
4895	606-Y-VK-1178B	MANUAL DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		
4896	606-Y-VK-1197B	MANUAL DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		
4897	606-Y-VK-1301B	MANUAL DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		
4898	606-Y-VK-1558B	FIRE DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		
4899	606-Y-VK-1559B	FIRE DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		

Table 3.4-2 (174 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4900	606-Y-VK-1586B	FIRE DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		
4901	606-Y-VK-1588B	FIRE DAMPER	120A29B	Auxiliary	120'-0"	above	120'-6"		
4902	763-J-LP01B	CNMT POST-LOCA H2 ANALYZER CABINET	120A31B	Auxiliary	120'-0"	above	120'-6"	4" FD (1)	10" EOL (1)
4903	606-J-FT-0046B	AUX. BLDG CTRLD AREA II EXH. ACU AU01B AIR FLOW	120A31B	Auxiliary	120'-0"	above	120'-6"		
4904	606-J-PDT-0028B	GNRL ACCS AREA 120-A31B DIFF PRESS	120A31B	Auxiliary	120'-0"	above	120'-6"		
4905	763-J-AE-0007B	CNMT H2 CONCENT.(CH.B)	120A31B	Auxiliary	120'-0"	above	120'-6"		
4906	763-J-AE-0008B	IRWST H2 CONCENT.(CH.B)	120A31B	Auxiliary	120'-0"	above	120'-6"		
4907	763-J-TC-3102B	TEMPERATURE CONTROLLER FOR HEAT TRACE AT CNMT TRAIN B	120A31B	Auxiliary	120'-0"	above	120'-6"		
4908	763-J-TC-3104B	TEMPERATURE CONTROLLER FOR HEAT TRACE AT IRWST TRAIN B	120A31B	Auxiliary	120'-0"	above	120'-6"		
4909	763-V-1001	H2 ANZR/MON(TRN A) INLET ISO VALVE	120A31B	Auxiliary	120'-0"	above	120'-6"		
4910	763-V-1002	H2 ANZR/MON(TRN B) INLET ISO VALVE	120A31B	Auxiliary	120'-0"	above	120'-6"		
4911	763-V-1003	H2 ANZR/MON(TRN A) OUTLET ISO VALVE	120A31B	Auxiliary	120'-0"	above	120'-6"		
4912	763-V-1004	H2 ANZR/MON(TRN B) OUTLET ISO VALVE	120A31B	Auxiliary	120'-0"	above	120'-6"		
4913	763-V-1015	H2 ANZR/MON(TRN A) INLET ISO VALVE	120A31B	Auxiliary	120'-0"	above	120'-6"		
4914	763-V-1016	H2 ANZR/MON(TRN B) INLET ISO VALVE	120A31B	Auxiliary	120'-0"	above	120'-6"		
4915	606-Y-VK-1162B	MANUAL DAMPER	120A31B	Auxiliary	120'-0"	above	120'-6"		
4916	606-Y-VK-1195B	MANUAL DAMPER	120A31B	Auxiliary	120'-0"	above	120'-6"		
4917	606-Y-VK-1551B	FIRE DAMPER	120A31B	Auxiliary	120'-0"	above	120'-6"		
4918	606-Y-VK-1557B	FIRE DAMPER	120A31B	Auxiliary	120'-0"	above	120'-6"		
4919	606-Y-VK-1589B	FIRE DAMPER	120A31B	Auxiliary	120'-0"	above	120'-6"		
4920	602-M-AH01A	EMERGENCY D/G ROOM NORMAL SUPPLY FAN	123A01C	Auxiliary	123'-0"	above	123'-6"		
4921	602-Y-VD-1510A	FIRE DAMPER	123A01C	Auxiliary	123'-0"	above	123'-6"		
4922	602-M-AH01B	EMERGENCY D/G ROOM NORMAL SUPPLY FAN	123A01D	Auxiliary	123'-0"	above	123'-6"		
4923	602-Y-VD-1510B	FIRE DAMPER	123A01D	Auxiliary	123'-0"	above	123'-6"		
4924	591-M-EJ04A	Expansion Joint for Equipment	127A01C	Auxiliary	127'-0"	above	127'-6"		
4925	591-M-EJ05A	Expansion Joint for Equipment	127A01C	Auxiliary	127'-0"	above	127'-6"		
4926	602-Y-VD-1507A	FIRE DAMPER	127A01C	Auxiliary	127'-0"	above	127'-6"		
4927	591-M-EJ04B	Expansion Joint for Equipment	127A01D	Auxiliary	127'-0"	above	127'-6"		
4928	591-M-EJ05B	Expansion Joint for Equipment	127A01D	Auxiliary	127'-0"	above	127'-6"		
4929	602-Y-VD-1526A	FIRE DAMPER	137A01C	Auxiliary	137'-6"	above	138'-0"	6" FD (1)	-

Table 3.4-2 (175 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4930	602-Y-VD-1528A	FIRE DAMPER	137A01C	Auxiliary	137'-6"	above	138'-0"		
4931	602-Y-VD-1526B	FIRE DAMPER	137A01D	Auxiliary	137'-6"	above	138'-0"	6" FD (1)	10" EOL (1)
4932	602-Y-VD-1528B	FIRE DAMPER	137A01D	Auxiliary	137'-6"	above	138'-0"		
4933	541-V-2133	S/G 1 E/C HDR Vent VALVE	137A02C	Auxiliary	137'-0"	above	138'-0"	4" FD (1)	-
4934	541-V-2135	S/G 1 D/C HDR Vent VALVE	137A02C	Auxiliary	137'-0"	above	138'-0"		
4935	541-V-2161	S/G 1 D/C HDR Vent VALVE ISO VALVE	137A02C	Auxiliary	137'-0"	above	138'-0"		
4936	541-V-2163	S/G 1 E/C HDR Vent VALVE	137A02C	Auxiliary	137'-0"	above	138'-0"		
4937	603-J-FE-0140C	RSC RM EXHAUST FAN AH23A DNST FLOW	137A03D	Auxiliary	137'-0"	above	138'-0"	4" FD (1)	-
4938	603-J-FE-0141D	RSC RM EXHAUST FAN AH23B DNST FLOW	137A03D	Auxiliary	137'-0"	above	138'-0"		
4939	603-J-FT-0141D	RSP RM EXHAUST FAN AH23B DNST FLOW	137A03D	Auxiliary	137'-0"	above	138'-0"		
4940	633-J-TW-0173	COOLING COIL VE-CW18A OUTLET	137A03D	Auxiliary	137'-0"	above	138'-0"		
4941	633-J-TW-0175	COOLING COIL VE-CW18A INLET	137A03D	Auxiliary	137'-0"	above	138'-0"		
4942	633-V-1137A	CW18A RSP RM C-CLR Outlet VALVE	137A03D	Auxiliary	137'-0"	above	138'-0"		
4943	633-V-1138A	CW18A RSP RM C-CLR Inlet throt VALVE	137A03D	Auxiliary	137'-0"	above	138'-0"		
4944	633-V-2137A	CW18A RSP RM C-CLR Outlet PZR Test VALVE	137A03D	Auxiliary	137'-0"	above	138'-0"		
4945	633-V-2138A	CW18A RSP RM C-CLR Inlet PZR Test VALVE	137A03D	Auxiliary	137'-0"	above	138'-0"		
4946	633-V-2237A	RSP RM HV18A ECW Outlet Vent VALVE	137A03D	Auxiliary	137'-0"	above	138'-0"		
4947	633-V-2238A	RSP RM HV18A ECW Inlet DRN VALVE	137A03D	Auxiliary	137'-0"	above	138'-0"		
4948	633-V-2296A	RSP RM HV18A ECW Outlet DRN VALVE	137A03D	Auxiliary	137'-0"	above	138'-0"		
4949	633-V-2337A	RSP RM HV18A ECW Outlet Test Conn VALVE	137A03D	Auxiliary	137'-0"	above	138'-0"		
4950	633-V-2338A	RSP RM HV18A ECW Inlet Test Conn VALVE	137A03D	Auxiliary	137'-0"	above	138'-0"		
4951	633-V-2462A	RSP RM CW18A Outlet Vent VALVE	137A03D	Auxiliary	137'-0"	above	138'-0"		
4952	633-V-2465A	RSP RM CW18A Inlet Vent VALVE	137A03D	Auxiliary	137'-0"	above	138'-0"		
4953	633-V-2466A	RSP RM CW18A Inlet DRN VALVE	137A03D	Auxiliary	137'-0"	above	138'-0"		
4954	603-Y-VE-1589B	FIRE DAMPER	137A03D	Auxiliary	137'-6"	above	138'-0"		
4955	603-Y-VE-1592B	FIRE DAMPER	137A05D	Auxiliary	137'-6"	above	138'-0"		
4956	754-J-RU01	REMOTE SHUTDOWN CONSOLE (RSC) (FRAME)	137A06D	Auxiliary	137'-0"	above	138'-0"		
4957	603-J-FE-0142C	RSC RM CC HV18A DNSTRM FLOW	137A06D	Auxiliary	137'-0"	above	138'-0"		
4958	603-J-FE-0143D	RSC RM AH18B DNSTRM FLOW	137A06D	Auxiliary	137'-0"	above	138'-0"		
4959	603-J-TE-0135C	RSP RM TEMP.	137A06D	Auxiliary	137'-0"	above	138'-0"		

Table 3.4-2 (176 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4960	603-J-TE-0136D	RSR RM TEMP.	137A06D	Auxiliary	137'-0"	above	138'-0"		
4961	603-J-TE-3205C	REMOTE SHUTDOWN RM (137-A40D)	137A06D	Auxiliary	137'-0"	above	138'-0"		
4962	603-J-TE-3206D	REMOTE SHUTDOWN RM (137-A40D)	137A06D	Auxiliary	137'-0"	above	138'-0"		
4963	603-Y-VE-1255A	MANUAL DAMPER	137A06D	Auxiliary	137'-6"	above	138'-0"		
4964	603-Y-VE-1255B	MANUAL DAMPER	137A06D	Auxiliary	137'-6"	above	138'-0"		
4965	603-Y-VE-1256B	MANUAL DAMPER	137A06D	Auxiliary	137'-6"	above	138'-0"		
4966	603-Y-VE-1257A	MANUAL DAMPER	137A06D	Auxiliary	137'-6"	above	138'-0"		
4967	603-Y-VE-1257B	MANUAL DAMPER	137A06D	Auxiliary	137'-6"	above	138'-0"		
4968	603-Y-VE-1586B	FIRE DAMPER	137A06D	Auxiliary	137'-6"	above	138'-0"		
4969	603-Y-VE-1587A	FIRE DAMPER	137A06D	Auxiliary	137'-6"	above	138'-0"		
4970	603-Y-VE-1741A	FIRE DAMPER	137A06D	Auxiliary	137'-6"	above	138'-0"		
4971	603-Y-VE-1741B	FIRE DAMPER	137A06D	Auxiliary	137'-6"	above	138'-0"		
4972	633-J-TW-0174	COOLING COIL VE-CW18B OUTLET	137A09D	Auxiliary	137'-0"	above	138'-0"	4" FD (1), 6" FD (1)	10" EOL (1)
4973	633-J-TW-0176	COOLING COIL VE-CW18B INTLET	137A09D	Auxiliary	137'-0"	above	138'-0"		
4974	633-V-1137B	CW18B RSP RM C-CLR Outlet VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4975	633-V-1138B	CW18B RSP RM C-CLR Inlet throt VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4976	633-V-2137B	CW18B RSP RM C-CLR Outlet PZR Test VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4977	633-V-2138B	CW18B RSP RM C-CLR Inlet PZR Test VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4978	633-V-2237B	RSP RM HV18B ECW Outlet Vent VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4979	633-V-2238B	RSP RM HV18B ECW Inlet DRN VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4980	633-V-2245B	SFP CLG Hx Rm HV 02B ECW Outlet Vent VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4981	633-V-2337B	RSP RM HV18B ECW Outlet Test Conn VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4982	633-V-2338B	RSP RM HV18B ECW Inlet Test Conn VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4983	633-V-2439B	CCW PP RM HV 13B ECW Inlet Vent VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4984	633-V-2440B	CHG PP RM HV18B ECW Inlet Vent VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4985	633-V-2441B	CHG PP RM HV18B ECW Outlet DRN VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4986	633-V-2442B	CHG PP RM HV18B ECW Inlet DRN VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4987	633-V-2453A	RSP RM CW18A Inlet Vent VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4988	633-V-2454A	RSP RM CW18A Inlet DRN VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4989	633-V-2455A	RSP RM CW18A Inlet Vent VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4990	633-V-2456A	RSP RM CW18A Inlet DRN VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4991	633-V-2457A	RSP RM CW18A Inlet Vent VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		

Table 3.4-2 (177 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
4992	633-V-2458A	RSP RM CW18A Outlet Vent VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4993	633-V-2459A	RSP RM CW18A Outlet DRN VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4994	633-V-2460A	RSP RM CW18A Outlet Vent VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4995	633-V-2461A	RSP RM CW18A Outlet DRN VALVE	137A09D	Auxiliary	137'-0"	above	138'-0"		
4996	603-Y-VE-1584B	FIRE DAMPER	137A09D	Auxiliary	137'-6"	above	138'-0"		
4997	603-Y-VE-1590B	FIRE DAMPER	137A09D	Auxiliary	137'-6"	above	138'-0"		
4998	603-M-HV10A	CUBICLE COOLER	137A10C	Auxiliary	137'-6"	above	138'-0"	4" FD (2)	-
4999	745-J-LX04C	LOOP CONTROLLER CABINET (CH. CE)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5000	745-J-LX05C	LOOP CONTROLLER CABINET (CH. CE)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5001	827-E-MC06A	UNIT 3 480V 1E MCC 06A	137A10C	Auxiliary	137'-6"	above	138'-0"		
5002	431-J-LY-0103C	PZR LEVEL	137A10C	Auxiliary	137'-6"	above	138'-0"		
5003	431-J-PS-0105C	PZR PRESSURE	137A10C	Auxiliary	137'-6"	above	138'-0"		
5004	431-J-PY-0105C	PZR PRESSURE	137A10C	Auxiliary	137'-6"	above	138'-0"		
5005	441-J-LY-0331C	SIT 3 (TK01C) LEVEL (WIDE RANGE)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5006	441-J-PY-0331C	SI TANK 3 (TK01C) PRESS(WIDE RANGE)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5007	441-J-ZY-0321C02	HOT LEG INJECTION VALVE - 321	137A10C	Auxiliary	137'-6"	above	138'-0"		
5008	481-J-LS-0052C	FLOOR DRAIN SUMP (QUAD.C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5009	481-J-LS-0091C	SI PUMP C	137A10C	Auxiliary	137'-6"	above	138'-0"		
5010	481-J-LS-0097C	CS PUMP A	137A10C	Auxiliary	137'-6"	above	138'-0"		
5011	481-J-LY-0052C	FLOOR DRAIN SUMP (QUAD.C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5012	481-J-LY-0091C	SI PUMP C	137A10C	Auxiliary	137'-6"	above	138'-0"		
5013	481-J-LY-0097C	CS PUMP A	137A10C	Auxiliary	137'-6"	above	138'-0"		
5014	542-J-FY-0049C01	AF PMP PP02A DSCH FLOW TO SG 1	137A10C	Auxiliary	137'-6"	above	138'-0"		
5015	542-J-FY-0049C02	AF PMP PP02B DSCH FLOW TO SG 2	137A10C	Auxiliary	137'-6"	above	138'-0"		
5016	542-J-PS-0007C01	AFP PP01A SUCTION PRESS	137A10C	Auxiliary	137'-6"	above	138'-0"		
5017	542-J-PS-0007C02	AFP PP01A SUCTION PRESS	137A10C	Auxiliary	137'-6"	above	138'-0"		
5018	542-J-PS-0025C	AFP PP01A DISCH. PRESS	137A10C	Auxiliary	137'-6"	above	138'-0"		
5019	542-J-PY-0007C	AFP PP01A SUCTION PRESS	137A10C	Auxiliary	137'-6"	above	138'-0"		
5020	542-J-PY-0025C	AFP PP01A DISCH. PRESS	137A10C	Auxiliary	137'-6"	above	138'-0"		
5021	602-J-TC-3029C	EDG AREA I DIESEL FUEL OIL STOR TK RM	137A10C	Auxiliary	137'-6"	above	138'-0"		
5022	602-J-TC-3037C	EDG AREA I D/G CTRL RM	137A10C	Auxiliary	137'-6"	above	138'-0"		
5023	602-J-TC-3059C	D/G FUEL OIL & LT & HT WTR TK RM AREA I	137A10C	Auxiliary	137'-6"	above	138'-0"		
5024	602-J-TS-0013C01	EDG AREA Ⅰ EMRG D/G RM TEMP FAN AH03A SATRT	137A10C	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (178 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5025	602-J-TS-0013C02	EDG AREA Ⅰ EMRG D/G RM TEMP FAN AH03A STOP	137A10C	Auxiliary	137'-6"	above	138'-0"		
5026	602-J-TS-0015C01	EDG AREA Ⅰ EMRG D/G RM TEMP FAN AH04A SATRT	137A10C	Auxiliary	137'-6"	above	138'-0"		
5027	602-J-TS-0015C02	EDG AREA Ⅰ EMRG D/G RM TEMP FAN AH04A STOP	137A10C	Auxiliary	137'-6"	above	138'-0"		
5028	602-J-TS-3029C01	EDG AREA Ⅰ DIESEL FUEL OIL STOR TK RM	137A10C	Auxiliary	137'-6"	above	138'-0"		
5029	602-J-TS-3029C02	EDG AREA Ⅰ DIESEL FUEL OIL STOR TK RM	137A10C	Auxiliary	137'-6"	above	138'-0"		
5030	602-J-TS-3037C01	EDG AREA Ⅰ D/G CTRL RM	137A10C	Auxiliary	137'-6"	above	138'-0"		
5031	602-J-TS-3037C02	EDG AREA Ⅰ D/G CTRL RM	137A10C	Auxiliary	137'-6"	above	138'-0"		
5032	602-J-TS-3059C01	D/G FUEL OIL & LT & HT WTR TK RM AREA I	137A10C	Auxiliary	137'-6"	above	138'-0"		
5033	602-J-TS-3059C02	D/G FUEL OIL & LT & HT WTR TK RM AREA I	137A10C	Auxiliary	137'-6"	above	138'-0"		
5034	602-J-TY-0013C	EDG AREA I EMRG D/G RM TEMP	137A10C	Auxiliary	137'-6"	above	138'-0"		
5035	602-J-TY-0015C	EDG AREA I EMRG D/G RM TEMP	137A10C	Auxiliary	137'-6"	above	138'-0"		
5036	602-J-TY-3029C01	EDG AREA Ⅰ DIESEL FUEL OIL STOR TK RM IN-BFR	137A10C	Auxiliary	137'-6"	above	138'-0"		
5037	602-J-TY-3029C02	EDG AREA Ⅰ DIESEL FUEL OIL STOR TK RM OUT-BFR	137A10C	Auxiliary	137'-6"	above	138'-0"		
5038	602-J-TY-3037C01	EMRG D/G AREA I D/G CONTROL RM(100-A02C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5039	602-J-TY-3037C02	EMRG D/G AREA I D/G CONTROL RM(100-A02C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5040	602-J-TY-3059C01	D/G FUEL OIL & LT & HT WTR TK RM AREA Ⅰ IN-BFR	137A10C	Auxiliary	137'-6"	above	138'-0"		
5041	602-J-TY-3059C02	D/G FUEL OIL & LT & HT WTR TK RM AREA Ⅰ OUT-BFR	137A10C	Auxiliary	137'-6"	above	138'-0"		
5042	603-J-FS-0138C	RSP RM SUPPLY FAN AH22A AIR FLOW	137A10C	Auxiliary	137'-6"	above	138'-0"		
5043	603-J-FS-0140C	RSP RM EXHAUST FAN AH23A AIR FLOW	137A10C	Auxiliary	137'-6"	above	138'-0"		
5044	603-J-FS-0142C	RSP RM AH18A RETURN AIR FLOW	137A10C	Auxiliary	137'-6"	above	138'-0"		
5045	603-J-FY-0138C	RSP RM SUPPLY FAN AH22A AIR FLOW	137A10C	Auxiliary	137'-6"	above	138'-0"		
5046	603-J-FY-0140C	RSP RM EXHAUST FAN AH23A AIR FLOW	137A10C	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (179 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5047	603-J-FY-0142C	RSP RM AH18A RETURN AIR FLOW	137A10C	Auxiliary	137'-6"	above	138'-0"		
5048	603-J-HS-0109A	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH05A	137A10C	Auxiliary	137'-6"	above	138'-0"		
5049	603-J-HS-0111A	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH06A	137A10C	Auxiliary	137'-6"	above	138'-0"		
5050	603-J-HS-0113A	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH07A	137A10C	Auxiliary	137'-6"	above	138'-0"		
5051	603-J-HS-0117C	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH09A	137A10C	Auxiliary	137'-6"	above	138'-0"		
5052	603-J-HS-0119C	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH10A	137A10C	Auxiliary	137'-6"	above	138'-0"		
5053	603-J-HS-0121C	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH11A	137A10C	Auxiliary	137'-6"	above	138'-0"		
5054	603-J-TC-3205C	REMOTE SHUTDOWN RM (137-A40D)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5055	603-J-TE-0119C	CLASS 1E MCC 06A RM TEMP.	137A10C	Auxiliary	137'-6"	above	138'-0"		
5056	603-J-TS-0117C01	ELECT. PENETRATION RM CC (120-A09C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5057	603-J-TS-0117C02	ELECT. PENETRATION RM CC (120-A09C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5058	603-J-TS-0117C03	ELECT. PENETRATION RM CC (120-A09C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5059	603-J-TS-0119C01	CLASS-1E MCC 06A RM (137-A10C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5060	603-J-TS-0119C02	CLASS-1E MCC 06A RM (137-A10C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5061	603-J-TS-0119C03	CLASS-1E MCC 06A RM (137-A10C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5062	603-J-TS-0121C01	ELECT. PENETRATION RM (C) (137-A11C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5063	603-J-TS-0121C02	ELECT. PENETRATION RM (C) (137-A11C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5064	603-J-TS-0121C03	ELECT. PENETRATION RM (C) (137-A11C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5065	603-J-TS-0135C01	RSP RM (137-A40D)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5066	603-J-TS-0135C02	RSP RM (137-A40D)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5067	603-J-TS-0135C03	RSP RM (137-A40D)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5068	603-J-TS-3205C01	REMOTE SHUTDOWN RM HI(137-A40D)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5069	603-J-TS-3205C02	REMOTE SHUTDOWN RM LO(137-A40D)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5070	603-J-TY-0117C	ELECT. PENETRATION RM CC (120-A09C)	137A10C	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (180 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5071	603-J-TY-0119C	CLASS-1E MCC 06A RM (137-A10C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5072	603-J-TY-0121C	ELECT. PENETRATION RM (C) (137-A11C)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5073	603-J-TY-0135C	RSP RM (137-A40D)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5074	603-J-TY-3205C01	REMOTE SHUTDOWN RM IN-BFR(137-A40D)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5075	603-J-TY-3205C02	REMOTE SHUTDOWN RM OUT-BFR(137-A40D)	137A10C	Auxiliary	137'-6"	above	138'-0"		
5076	633-J-TW-0141	COOLING COIL VE-CW10A OUTLET	137A10C	Auxiliary	137'-6"	above	138'-0"		
5077	633-J-TW-0143	COOLING COIL VE-CW10A INLET	137A10C	Auxiliary	137'-6"	above	138'-0"		
5078	839-J-TS-3130C	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 27C TEMP.	137A10C	Auxiliary	137'-6"	above	138'-0"		
5079	839-J-TS-3131C	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 28C TEMP.	137A10C	Auxiliary	137'-6"	above	138'-0"		
5080	839-J-TY-3130C	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 27C TEMP.	137A10C	Auxiliary	137'-6"	above	138'-0"		
5081	839-J-TY-3131C	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 28C TEMP.	137A10C	Auxiliary	137'-6"	above	138'-0"		
5082	633-V-1121A	C-1E MCC 06A RM C-CLR Outlet VALVE	137A10C	Auxiliary	137'-6"	above	138'-0"		
5083	633-V-1122A	C-1E MCC 06A RM C-CLR Inlet throt VALVE	137A10C	Auxiliary	137'-6"	above	138'-0"		
5084	633-V-2121A	C-1E MCC06A RM C-CLR Outlet PZR Test VALVE	137A10C	Auxiliary	137'-6"	above	138'-0"		
5085	633-V-2122A	C-1E MCC06A RM C-CLR Inlet PZR Test VALVE	137A10C	Auxiliary	137'-6"	above	138'-0"		
5086	633-V-2221A	C-1E MCC06A RM HV10A ECW Outlet Vent VALVE	137A10C	Auxiliary	137'-6"	above	138'-0"		
5087	633-V-2222A	C-1E MCC06A RM HV10A ECW Inlet DRN VALVE	137A10C	Auxiliary	137'-6"	above	138'-0"		
5088	633-V-2284A	C-1E MCC 06A RM HV10A ECW Outlet DRN VALVE	137A10C	Auxiliary	137'-6"	above	138'-0"		
5089	633-V-2321A	MCC06A RM HV10A ECW Outlet Test Conn VALVE	137A10C	Auxiliary	137'-6"	above	138'-0"		
5090	633-V-2322A	MCC06A RM HV10A ECW Inlet Test Conn VALVE	137A10C	Auxiliary	137'-6"	above	138'-0"		
5091	603-M-HV10B	CUBICLE COOLER	137A10D	Auxiliary	137'-6"	above	138'-0"	4" FD (2)	-
5092	745-J-LX04D	LOOP CONTROLLER CABINET (CH. DE)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5093	745-J-LX05D	LOOP CONTROLLER CABINET (CH. DE)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5094	827-E-MC06B	UNIT 3 480V 1E MCC 06B	137A10D	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (181 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5095	431-J-PS-0106D	PZR PRESSURE	137A10D	Auxiliary	137'-6"	above	138'-0"		
5096	431-J-PY-0106D	PZR PRESSURE	137A10D	Auxiliary	137'-6"	above	138'-0"		
5097	461-J-FS-0050D	CCW PUMP PP02B DISCH. FLOW	137A10D	Auxiliary	137'-6"	above	138'-0"		
5098	481-J-LS-0053D	FLOOR DRAIN SUMP (QUAD.D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5099	481-J-LS-0092D	SI PUMP D	137A10D	Auxiliary	137'-6"	above	138'-0"		
5100	481-J-LS-0098D	CS PUMP B	137A10D	Auxiliary	137'-6"	above	138'-0"		
5101	481-J-LY-0053D	FLOOR DRAIN SUMP (QUAD.D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5102	481-J-LY-0092D	SI PUMP D	137A10D	Auxiliary	137'-6"	above	138'-0"		
5103	481-J-LY-0098D	CS PUMP B	137A10D	Auxiliary	137'-6"	above	138'-0"		
5104	542-J-FY-0050D01	AF PMP PP01B DSCH FLOW TO SG 1	137A10D	Auxiliary	137'-6"	above	138'-0"		
5105	542-J-FY-0050D02	AF PMP PP02B DSCH FLOW TO SG 2	137A10D	Auxiliary	137'-6"	above	138'-0"		
5106	542-J-PS-0008D01	AFP PP01B SUCTION PRESS	137A10D	Auxiliary	137'-6"	above	138'-0"		
5107	542-J-PS-0008D02	AFP PP01B SUCTION PRESS	137A10D	Auxiliary	137'-6"	above	138'-0"		
5108	542-J-PS-0026D	AFP PP01B DISCH. PRESS	137A10D	Auxiliary	137'-6"	above	138'-0"		
5109	542-J-PY-0008D	AFP PP01B SUCTION PRESS	137A10D	Auxiliary	137'-6"	above	138'-0"		
5110	542-J-PY-0026D	AFP PP01B DISCH. PRESS	137A10D	Auxiliary	137'-6"	above	138'-0"		
5111	602-J-TC-3030D	EDG AREA II DIESEL FUEL OIL STOR TK RM	137A10D	Auxiliary	137'-6"	above	138'-0"		
5112	602-J-TC-3038D	EDG AREA II D/G CTRL RM	137A10D	Auxiliary	137'-6"	above	138'-0"		
5113	602-J-TC-3050D	D/G FUEL OIL & LT & HT WTR TK RM AREA II	137A10D	Auxiliary	137'-6"	above	138'-0"		
5114	602-J-TS-0014D01	EDG AREA Ⅱ EMRG D/G RM TEMP FAN AH03B SATRT	137A10D	Auxiliary	137'-6"	above	138'-0"		
5115	602-J-TS-0014D02	EDG AREA Ⅱ EMRG D/G RM TEMP FAN AH03B STOP	137A10D	Auxiliary	137'-6"	above	138'-0"		
5116	602-J-TS-0016D01	EDG AREA Ⅱ EMRG D/G RM TEMP FAN AH04B SATRT	137A10D	Auxiliary	137'-6"	above	138'-0"		
5117	602-J-TS-0016D02	EDG AREA Ⅱ EMRG D/G RM TEMP FAN AH04B STOP	137A10D	Auxiliary	137'-6"	above	138'-0"		
5118	602-J-TS-3030D01	EDG AREA Ⅱ DIESEL FUEL OIL STOR TK RM	137A10D	Auxiliary	137'-6"	above	138'-0"		
5119	602-J-TS-3030D02	EDG AREA Ⅱ DIESEL FUEL OIL STOR TK RM	137A10D	Auxiliary	137'-6"	above	138'-0"		
5120	602-J-TS-3038D01	EDG AREA Ⅱ D/G CTRL RM	137A10D	Auxiliary	137'-6"	above	138'-0"		
5121	602-J-TS-3038D02	EDG AREA Ⅱ D/G CTRL RM	137A10D	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (182 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5122	602-J-TS-3050D01	D/G FUEL OIL & LT & HT WTR TK RM AREA Ⅱ	137A10D	Auxiliary	137'-6"	above	138'-0"		
5123	602-J-TS-3050D02	D/G FUEL OIL & LT & HT WTR TK RM AREA Ⅱ	137A10D	Auxiliary	137'-6"	above	138'-0"		
5124	602-J-TY-0014D	EDG AREA II EMRG D/G RM TEMP	137A10D	Auxiliary	137'-6"	above	138'-0"		
5125	602-J-TY-0016D	EDG AREA II EMRG D/G RM TEMP	137A10D	Auxiliary	137'-6"	above	138'-0"		
5126	602-J-TY-3030D01	EDG AREA Ⅱ DIESEL FUEL OIL STOR TK RM IN-BFR	137A10D	Auxiliary	137'-6"	above	138'-0"		
5127	602-J-TY-3030D02	EDG AREA Ⅱ DIESEL FUEL OIL STOR TK RM OUT-BFR	137A10D	Auxiliary	137'-6"	above	138'-0"		
5128	602-J-TY-3038D01	EDG AREA Ⅱ D/G CTRL RM IN-BFR	137A10D	Auxiliary	137'-6"	above	138'-0"		
5129	602-J-TY-3038D02	EDG AREA Ⅱ D/G CTRL RM OUT-BFR	137A10D	Auxiliary	137'-6"	above	138'-0"		
5130	602-J-TY-3050D01	D/G FUEL OIL & LT & HT WTR TK RM AREA Ⅱ IN-BFR	137A10D	Auxiliary	137'-6"	above	138'-0"		
5131	602-J-TY-3050D02	D/G FUEL OIL & LT & HT WTR TK RM AREA Ⅱ OUT-BFR	137A10D	Auxiliary	137'-6"	above	138'-0"		
5132	603-J-FS-0139D	RSP RM SUPPLY FAN AH22B AIR FLOW	137A10D	Auxiliary	137'-6"	above	138'-0"		
5133	603-J-FS-0141D	RSP RM EXHAUST FAN AH23B AIR FLOW	137A10D	Auxiliary	137'-6"	above	138'-0"		
5134	603-J-FS-0143D	RSP RM AH18B RETURN AIR FLOW	137A10D	Auxiliary	137'-6"	above	138'-0"		
5135	603-J-FY-0139D	RSP RM SUPPLY FAN AH22B AIR FLOW	137A10D	Auxiliary	137'-6"	above	138'-0"		
5136	603-J-FY-0141D	RSP RM EXHAUST FAN AH23B AIR FLOW	137A10D	Auxiliary	137'-6"	above	138'-0"		
5137	603-J-FY-0143D	RSP RM AH18B RETURN AIR FLOW	137A10D	Auxiliary	137'-6"	above	138'-0"		
5138	603-J-HS-0118D	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH09B	137A10D	Auxiliary	137'-6"	above	138'-0"		
5139	603-J-HS-0120D	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH10B	137A10D	Auxiliary	137'-6"	above	138'-0"		
5140	603-J-HS-0122D	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH11B	137A10D	Auxiliary	137'-6"	above	138'-0"		
5141	603-J-TC-3206D	REMOTE SHUTDOWN RM (137-A40D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5142	603-J-TE-0120D	CLASS 1E MCC 06B RM TEMP.	137A10D	Auxiliary	137'-6"	above	138'-0"		
5143	603-J-TS-0120D01	CLASS-1E MCC 06B RM (137-A10D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5144	603-J-TS-0120D02	CLASS-1E MCC 06B RM (137-A10D)	137A10D	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (183 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5145	603-J-TS-0120D03	CLASS-1E MCC 06B RM (137-A10D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5146	603-J-TS-0122D01	ELECT. PENETRATION (D) RM (137-A11D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5147	603-J-TS-0122D02	ELECT. PENETRATION (D) RM (137-A11D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5148	603-J-TS-0122D03	ELECT. PENETRATION (D) RM (137-A11D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5149	603-J-TS-0136D01	RSP RM (137-A04D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5150	603-J-TS-0136D02	RSP RM (137-A04D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5151	603-J-TS-0136D03	RSP RM (137-A04D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5152	603-J-TS-3206D01	REMOTE SHUTDOWN RM HI(137-A40D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5153	603-J-TS-3206D02	REMOTE SHUTDOWN RM LO(137-A40D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5154	603-J-TY-0120D	CLASS-1E MCC 06B RM (137-A10D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5155	603-J-TY-0122D	ELECT. PENETRATION (D) RM (137-A11D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5156	603-J-TY-0136D	RSP RM (137-A06D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5157	603-J-TY-3206D01	REMOTE SHUTDOWN RM IN-BFR(137-A40D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5158	603-J-TY-3206D02	REMOTE SHUTDOWN RM OUT-BFR(137-A40D)	137A10D	Auxiliary	137'-6"	above	138'-0"		
5159	633-J-TW-0142	COOLING COIL VE-CW10B OUTLET	137A10D	Auxiliary	137'-6"	above	138'-0"		
5160	633-J-TW-0144	COOLING COIL VE-CW10B INLET	137A10D	Auxiliary	137'-6"	above	138'-0"		
5161	839-J-TS-3168D	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 27D TEMP.	137A10D	Auxiliary	137'-6"	above	138'-0"		
5162	839-J-TS-3169D	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 28D TEMP.	137A10D	Auxiliary	137'-6"	above	138'-0"		
5163	839-J-TY-3168D	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 27D TEMP.	137A10D	Auxiliary	137'-6"	above	138'-0"		
5164	839-J-TY-3169D	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 28D TEMP.	137A10D	Auxiliary	137'-6"	above	138'-0"		
5165	633-V-1121B	C-1E MCC 06B RM C-CLR Outlet VALVE	137A10D	Auxiliary	137'-6"	above	138'-0"		
5166	633-V-1122B	C-1E MCC 06B RM C-CLR Inlet throt VALVE	137A10D	Auxiliary	137'-6"	above	138'-0"		
5167	633-V-2121B	C-1E MCC06B RM C-CLR Outlet PZR Test VALVE	137A10D	Auxiliary	137'-6"	above	138'-0"		
5168	633-V-2122B	C-1E MCC06B RM C-CLR Inlet PZR Test VALVE	137A10D	Auxiliary	137'-6"	above	138'-0"		
5169	633-V-2221B	C-1E MCC06B RM HV10B ECW Outlet Vent VALVE	137A10D	Auxiliary	137'-6"	above	138'-0"		
5170	633-V-2222B	C-1E MCC06B RM HV10B ECW Inlet DRN VALVE	137A10D	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (184 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5171	633-V-2284B	C-1E MCC 06A RM HV10B ECW Outlet DRN VALVE	137A10D	Auxiliary	137'-6"	above	138'-0"		
5172	633-V-2321B	MCC06A RM HV10B ECW Outlet Test Conn VALVE	137A10D	Auxiliary	137'-6"	above	138'-0"		
5173	633-V-2322B	MCC06A RM HV10B ECW Inlet Test Conn VALVE	137A10D	Auxiliary	137'-6"	above	138'-0"		
5174	441-W-002A	FUSE TERMINAL BOX	137A11C	Auxiliary	137'-6"	above	138'-0"	4" FD (2)	10" EOL (1)
5175	441-W-002C	FUSE TERMINAL BOX	137A11C	Auxiliary	137'-6"	above	138'-0"		
5176	603-M-HV11A	CUBICLE COOLER	137A11C	Auxiliary	137'-6"	above	138'-0"		
5177	839-E-EA09C-X1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-C	137A11C	Auxiliary	137'-6"	above	138'-0"		
5178	839-E-EA11M-J1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	137A11C	Auxiliary	137'-6"	above	138'-0"		
5179	839-E-EA12M-D1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	137A11C	Auxiliary	137'-6"	above	138'-0"		
5180	839-E-EA13M-D2	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	137A11C	Auxiliary	137'-6"	above	138'-0"		
5181	839-E-EA14C-X2	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-C	137A11C	Auxiliary	137'-6"	above	138'-0"		
5182	839-E-EA15C-Y1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-C	137A11C	Auxiliary	137'-6"	above	138'-0"		
5183	839-E-EA16M-T1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	137A11C	Auxiliary	137'-6"	above	138'-0"		
5184	839-E-EA17M-T2	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	137A11C	Auxiliary	137'-6"	above	138'-0"		
5185	839-E-EA18M-T3	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	137A11C	Auxiliary	137'-6"	above	138'-0"		
5186	839-E-EA19M-E1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	137A11C	Auxiliary	137'-6"	above	138'-0"		
5187	839-E-EA20M-E2	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	137A11C	Auxiliary	137'-6"	above	138'-0"		
5188	839-E-EA21M-00	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	137A11C	Auxiliary	137'-6"	above	138'-0"		
5189	839-E-EA25M-A1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	137A11C	Auxiliary	137'-6"	above	138'-0"		
5190	839-E-EA26M-A2	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.I	137A11C	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (185 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5191	603-J-TE-0121C	ELECT. PENETRATION TEMP.	137A11C	Auxiliary	137'-6"	above	138'-0"		
5192	633-J-TW-0145	COOLING COIL VE-CW11A OUTLET	137A11C	Auxiliary	137'-6"	above	138'-0"		
5193	633-J-TW-0147	COOLING COIL VE-CW11A INLET	137A11C	Auxiliary	137'-6"	above	138'-0"		
5194	669-J-PI-3133N01	PRESSURE INDICATOR (EPA NO. 26M-A2)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5195	669-J-PI-3134N01	PRESSURE INDICATOR (EPA NO. 20M-E2)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5196	669-J-PI-3135N01	PRESSURE INDICATOR (EPA NO. 25M-A1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5197	669-J-PI-3136N01	PRESSURE INDICATOR (EPA NO. 12M-D1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5198	669-J-PI-3137N01	PRESSURE INDICATOR (EPA NO. 13M-D2)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5199	669-J-PI-3138N01	PRESSURE INDICATOR (EPA NO. 19M-E1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5200	669-J-PI-3139N01	PRESSURE INDICATOR (EPA NO. 11M-J1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5201	669-J-PI-3140N01	PRESSURE INDICATOR (EPA NO. 17M-T2)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5202	669-J-PI-3142N01	PRESSURE INDICATOR (EPA NO. 18M-T3)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5203	669-J-PI-3143N01	PRESSURE INDICATOR (EPA NO. 16M-T1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5204	669-J-PI-3144N01	PRESSURE INDICATOR (EPA NO. 21M-00)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5205	669-J-PI-3145N01	PRESSURE INDICATOR (EPA NO. 15C-Y1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5206	669-J-PI-3146N01	PRESSURE INDICATOR (EPA NO. 09C-X1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5207	669-J-PI-3147N01	PRESSURE INDICATOR (EPA NO. 14C-X2)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5208	669-J-PS-3133	PRESSURE SWITCH (EPA NO. 26M-A2)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5209	669-J-PS-3134	PRESSURE SWITCH (EPA NO. 20M-E2)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5210	669-J-PS-3135	PRESSURE SWITCH (EPA NO. 25M-A1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5211	669-J-PS-3136	PRESSURE SWITCH (EPA NO. 12M-D1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5212	669-J-PS-3137	PRESSURE SWITCH (EPA NO. 13M-D2)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5213	669-J-PS-3138	PRESSURE SWITCH (EPA NO. 19M-E1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5214	669-J-PS-3139	PRESSURE SWITCH (EPA NO. 11M-J1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5215	669-J-PS-3140	PRESSURE SWITCH (EPA NO. 17M-T2)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5216	669-J-PS-3142	PRESSURE SWITCH (EPA NO. 18M-T3)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5217	669-J-PS-3143	PRESSURE SWITCH (EPA NO. 16M-T1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5218	669-J-PS-3144	PRESSURE SWITCH (EPA NO. 21M-00)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5219	669-J-PS-3145	PRESSURE SWITCH (EPA NO. 15C-Y1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5220	669-J-PS-3146	PRESSURE SWITCH (EPA NO. 09C-X1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5221	669-J-PS-3147	PRESSURE SWITCH (EPA NO. 14C-X2)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5222	839-J-TE-3133	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.26M-A2)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5223	839-J-TE-3134	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.20M-E2)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5224	839-J-TE-3135	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.25M-A1)	137A11C	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (186 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5225	839-J-TE-3136	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.12M-D1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5226	839-J-TE-3137	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.13M-D2)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5227	839-J-TE-3138	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.19M-E1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5228	839-J-TE-3139	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.11M-J1)	137A11C	Auxiliary	137'-6"	above	138'-0"		
5229	633-V-1123A	Elec. PENET RM(C) C-CLR Outlet VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5230	633-V-1124A	Elec. PENET RM(C) C-CLR Inlet throt VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5231	633-V-2123A	Elec. PENET(C) C-CLR Outlet PZR Test VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5232	633-V-2124A	Elec. PENET(C) C-CLR Inlet PZR Test VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5233	633-V-2223A	ELECT PENET RM HV11A ECW Outlet Vent VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5234	633-V-2224A	ELECT PENET RM HV11A ECW Inlet DRN VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5235	633-V-2283A	ELECT PENET RM HV11A ECW Outlet DRN VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5236	633-V-2323A	ELE PEN RM HV11A ECW Outlet TestConn VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5237	633-V-2324A	ELE PEN RM HV11A ECW Inlet TestConn VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5238	633-V-3011	CH01B COMPRESSOR SAFETY RELIEF VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5239	633-V-3012	CH01B COMPRESSOR SAFETY RELIEF VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5240	633-V-3013	CH02B COMPRESSOR SAFETY RELIEF VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5241	633-V-3014	CH02B COMPRESSOR SAFETY RELIEF VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5242	633-V-5011	PIC3350 ISOATION VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5243	633-V-5012	PIC3550 ISOATION VALVE	137A11C	Auxiliary	137'-6"	above	138'-0"		
5244	441-W-001B	FUSE TERMINAL BOX	137A11D	Auxiliary	137'-6"	above	138'-0"	4" FD (2)	10" EOL (1)
5245	441-W-001D	FUSE TERMINAL BOX	137A11D	Auxiliary	137'-6"	above	138'-0"		
5246	441-W-002D	FUSE TERMINAL BOX	137A11D	Auxiliary	137'-6"	above	138'-0"		
5247	603-M-HV11B	CUBICLE COOLER	137A11D	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (187 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5248	839-E-EA09D-X1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-D	137A11D	Auxiliary	137'-6"	above	138'-0"		
5249	839-E-EA11N-J1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	137A11D	Auxiliary	137'-6"	above	138'-0"		
5250	839-E-EA12N-D1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	137A11D	Auxiliary	137'-6"	above	138'-0"		
5251	839-E-EA13N-D2	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	137A11D	Auxiliary	137'-6"	above	138'-0"		
5252	839-E-EA14D-X2	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-D	137A11D	Auxiliary	137'-6"	above	138'-0"		
5253	839-E-EA15D-Y1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-D	137A11D	Auxiliary	137'-6"	above	138'-0"		
5254	839-E-EA16N-T1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	137A11D	Auxiliary	137'-6"	above	138'-0"		
5255	839-E-EA17N-T2	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	137A11D	Auxiliary	137'-6"	above	138'-0"		
5256	839-E-EA18N-T3	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	137A11D	Auxiliary	137'-6"	above	138'-0"		
5257	839-E-EA19N-E1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	137A11D	Auxiliary	137'-6"	above	138'-0"		
5258	839-E-EA20N-E2	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	137A11D	Auxiliary	137'-6"	above	138'-0"		
5259	839-E-EA21N-00	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	137A11D	Auxiliary	137'-6"	above	138'-0"		
5260	839-E-EA25N-A1	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	137A11D	Auxiliary	137'-6"	above	138'-0"		
5261	839-E-EA26N-A2	ELECTRICAL PENETRATION ASSEMBLY - NON CLASS 1E DIV.II	137A11D	Auxiliary	137'-6"	above	138'-0"		
5262	603-J-TE-0122D	ELECT. PENETRATION TEMP.	137A11D	Auxiliary	137'-6"	above	138'-0"		
5263	633-J-TW-0146	COOLING COIL VE-CW11B OUTLET	137A11D	Auxiliary	137'-6"	above	138'-0"		
5264	633-J-TW-0148	COOLING COIL VE-CW11B INLET	137A11D	Auxiliary	137'-6"	above	138'-0"		
5265	669-J-PI-3171N01	PRESSURE INDICATOR (EPA NO. 26N-A2)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5266	669-J-PI-3172N01	PRESSURE INDICATOR (EPA NO. 20N-E2)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5267	669-J-PI-3173N01	PRESSURE INDICATOR (EPA NO. 25N-A1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5268	669-J-PI-3174N01	PRESSURE INDICATOR (EPA NO. 12N-D1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5269	669-J-PI-3175N01	PRESSURE INDICATOR (EPA NO. 13N-D2)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5270	669-J-PI-3176N01	PRESSURE INDICATOR (EPA NO. 19N-E1)	137A11D	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (188 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5271	669-J-PI-3177N01	PRESSURE INDICATOR (EPA NO. 11N-J1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5272	669-J-PI-3178N01	PRESSURE INDICATOR (EPA NO. 17N-T2)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5273	669-J-PI-3180N01	PRESSURE INDICATOR (EPA NO. 18N-T3)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5274	669-J-PI-3181N01	PRESSURE INDICATOR (EPA NO. 16N-T1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5275	669-J-PI-3182N01	PRESSURE INDICATOR (EPA NO. 21N-00)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5276	669-J-PI-3183N01	PRESSURE INDICATOR (EPA NO. 15D-Y1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5277	669-J-PI-3184N01	PRESSURE INDICATOR (EPA NO. 09D-X1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5278	669-J-PI-3185N01	PRESSURE INDICATOR (EPA NO. 14D-X2)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5279	669-J-PS-3171	PRESSURE SWITCH (EPA NO. 26N-A2)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5280	669-J-PS-3172	PRESSURE SWITCH (EPA NO. 20N-E2)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5281	669-J-PS-3173	PRESSURE SWITCH (EPA NO. 25N-A1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5282	669-J-PS-3174	PRESSURE SWITCH (EPA NO. 12N-D1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5283	669-J-PS-3175	PRESSURE SWITCH (EPA NO. 13N-D2)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5284	669-J-PS-3176	PRESSURE SWITCH (EPA NO. 19N-E1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5285	669-J-PS-3177	PRESSURE SWITCH (EPA NO. 11N-J1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5286	669-J-PS-3178	PRESSURE SWITCH (EPA NO. 17N-T2)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5287	669-J-PS-3180	PRESSURE SWITCH (EPA NO. 18N-T3)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5288	669-J-PS-3181	PRESSURE SWITCH (EPA NO. 16N-T1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5289	669-J-PS-3182	PRESSURE SWITCH (EPA NO. 21N-00)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5290	669-J-PS-3183	PRESSURE SWITCH (EPA NO. 15D-Y1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5291	669-J-PS-3184	PRESSURE SWITCH (EPA NO. 09D-X1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5292	669-J-PS-3185	PRESSURE SWITCH (EPA NO. 14D-X2)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5293	839-J-TE-3171	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.26N-A2)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5294	839-J-TE-3172	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.20N-E2)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5295	839-J-TE-3173	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.25N-A1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5296	839-J-TE-3174	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.12N-D1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5297	839-J-TE-3175	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.13N-D2)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5298	839-J-TE-3176	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.19N-E1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5299	839-J-TE-3177	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.11N-J1)	137A11D	Auxiliary	137'-6"	above	138'-0"		
5300	633-V-1123B	Elec. PENET RM(D) C-CLR Outlet VALVE	137A11D	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (189 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5301	633-V-1124B	Elec. PENET RM(D) C-CLR Inlet throt VALVE	137A11D	Auxiliary	137'-6"	above	138'-0"		
5302	633-V-2123B	Elec. PENET(D) C-CLR Outlet PZR Test VALVE	137A11D	Auxiliary	137'-6"	above	138'-0"		
5303	633-V-2124B	Elec. PENET(D) C-CLR Inlet PZR Test VALVE	137A11D	Auxiliary	137'-6"	above	138'-0"		
5304	633-V-2223B	ELECT PENET RM HV11B ECW Outlet Vent VALVE	137A11D	Auxiliary	137'-6"	above	138'-0"		
5305	633-V-2224B	ELECT PENET RM HV11B ECW Inlet DRN VALVE	137A11D	Auxiliary	137'-6"	above	138'-0"		
5306	633-V-2283B	ELECT PENET RM HV11B ECW Outlet DRN VALVE	137A11D	Auxiliary	137'-6"	above	138'-0"		
5307	633-V-2323B	ELE PEN RM HV11B ECW Outlet TestConn VALVE	137A11D	Auxiliary	137'-6"	above	138'-0"		
5308	633-V-2324B	ELE PEN RM HV11B ECW Inlet TestConn VALVE	137A11D	Auxiliary	137'-6"	above	138'-0"		
5309	603-Y-VE-1628B	FIRE DAMPER	137A11D	Auxiliary	137'-6"	above	138'-0"		
5310	603-M-HV15A	CUBICLE COOLER	137A15A	Auxiliary	137'-6"	above	138'-0"	4" FD (1)	-
5311	827-E-MC07A	UNIT 3 480V 1E MCC 07A	137A15A	Auxiliary	137'-6"	above	138'-0"		
5312	603-J-TE-0129A	CLASS 1E MCC 07A RM TEMP.	137A15A	Auxiliary	137'-6"	above	138'-0"		
5313	633-J-TW-0161	COOLING COIL VE-CW15A OUTLET	137A15A	Auxiliary	137'-6"	above	138'-0"		
5314	633-J-TW-0163	COOLING COIL VE-CW15A INLET	137A15A	Auxiliary	137'-6"	above	138'-0"		
5315	633-V-1131A	C-1E MCC 07A RM C-CLR Outlet VALVE	137A15A	Auxiliary	137'-6"	above	138'-0"		
5316	633-V-1132A	C-1E MCC 07A RM C-CLR Inlet throt VALVE	137A15A	Auxiliary	137'-6"	above	138'-0"		
5317	633-V-2131A	C-1E MCC07A RM C-CLR Outlet PZR Test VALVE	137A15A	Auxiliary	137'-6"	above	138'-0"		
5318	633-V-2132A	C-1E MCC07A RM C-CLR Inlet PZR Test VALVE	137A15A	Auxiliary	137'-6"	above	138'-0"		
5319	633-V-2231A	C-1E MCC 07A RM HV15A ECW OutletVent VALVE	137A15A	Auxiliary	137'-6"	above	138'-0"		
5320	633-V-2232A	C-1E MCC 07A RM HV15A ECW Inlet DRN VALVE	137A15A	Auxiliary	137'-6"	above	138'-0"		
5321	633-V-2286A	C-1E MCC 07A RM HV15A ECW Outlet DRN VALVE	137A15A	Auxiliary	137'-6"	above	138'-0"		
5322	633-V-2331A	MCC07A RM HV15A ECW Outlet Test Conn VALVE	137A15A	Auxiliary	137'-6"	above	138'-0"		
5323	633-V-2332A	MCC07A RM HV15A ECW Inlet Test Conn VALVE	137A15A	Auxiliary	137'-6"	above	138'-0"		
5324	633-V-2467A	C-1E MCC 07A RM Inlet Vent VALVE	137A15A	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (190 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5325	633-V-2468A	C-1E MCC 07A RM Inlet DRN VALVE	137A15A	Auxiliary	137'-6"	above	138'-0"		
5326	603-M-HV15B	CUBICLE COOLER	137A15B	Auxiliary	137'-6"	above	138'-0"	4" FD (1)	-
5327	745-J-LX09B	LOOP CONTROLLER CABINET (CH. BE)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5328	745-J-LX10B	LOOP CONTROLLER CABINET (CH. BE)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5329	827-E-MC07B	UNIT 3 480V 1E MCC 07B	137A15B	Auxiliary	137'-6"	above	138'-0"		
5330	441-J-LY-0321B	SIT 2 (TK01B) LEVEL (WIDE RANGE)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5331	441-J-PY-0321B	SI TANK 2 (TK01B) PRESS(WIDE RANGE)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5332	603-J-HS-0124B	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH12B	137A15B	Auxiliary	137'-6"	above	138'-0"		
5333	603-J-HS-0126B	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH13B	137A15B	Auxiliary	137'-6"	above	138'-0"		
5334	603-J-HS-0128B	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH14B	137A15B	Auxiliary	137'-6"	above	138'-0"		
5335	603-J-HS-0130B	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH15B	137A15B	Auxiliary	137'-6"	above	138'-0"		
5336	603-J-HS-0132B	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH16B	137A15B	Auxiliary	137'-6"	above	138'-0"		
5337	603-J-TE-0130B	CLASS 1E MCC 07B RM TEMP.	137A15B	Auxiliary	137'-6"	above	138'-0"		
5338	603-J-TS-0124B01	PENETRATION MUX B RM (137-A17B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5339	603-J-TS-0124B02	PENETRATION MUX B RM (137-A17B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5340	603-J-TS-0124B03	PENETRATION MUX B RM (137-A17B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5341	603-J-TS-0126B01	ELECT. PENETRATION (B) RM CC (137-A18B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5342	603-J-TS-0126B02	ELECT. PENETRATION (B) RM CC (137-A18B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5343	603-J-TS-0126B03	ELECT. PENETRATION (B) RM CC (137-A18B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5344	603-J-TS-0128B01	CLASS-1E MCC 05B RM (120-A15B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5345	603-J-TS-0128B02	CLASS-1E MCC 05B RM (120-A15B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5346	603-J-TS-0128B03	CLASS-1E MCC 05B RM (120-A15B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5347	603-J-TS-0130B01	CLASS-1E MCC 07B RM (137-A15B)	137A15B	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (191 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5348	603-J-TS-0130B02	CLASS-1E MCC 07B RM (137-A15B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5349	603-J-TS-0130B03	CLASS-1E MCC 07B RM (137-A15B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5350	603-J-TS-0132B01	I&C EQUIP. RM (B) (157-A01D)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5351	603-J-TS-0132B02	I&C EQUIP. RM (B) (157-A01D)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5352	603-J-TS-0132B03	I&C EQUIP. RM (B) (157-A01D)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5353	603-J-TY-0124B	PENETRATION MUX B RM (137-A17B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5354	603-J-TY-0126B	ELECT. PENETRATION (B) RM CC (137-A18B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5355	603-J-TY-0128B	CLASS-1E MCC 05B RM (120-A15B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5356	603-J-TY-0130B	CLASS-1E MCC 07B RM (137-A15B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5357	603-J-TY-0132B	I&C EQUIP. RM (B) (157-A01D)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5358	633-J-TW-0162	COOLING COIL VE-CW15B OUTLET	137A15B	Auxiliary	137'-6"	above	138'-0"		
5359	633-J-TW-0164	COOLING COIL VE-CW15B INLET	137A15B	Auxiliary	137'-6"	above	138'-0"		
5360	763-J-AS-0007B01	CNMT H2 CONCENT.(CH.B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5361	763-J-AS-0007B02	CNMT H2 CONCENT.(CH.B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5362	763-J-AS-0008B01	IRWST H2 CONCENT.(CH.B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5363	763-J-AS-0008B02	IRWST H2 CONCENT.(CH.B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5364	763-J-AY-0007B02	CNMT H2 CONCENT.(CH.B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5365	763-J-AY-0008B02	IRWST H2 CONCENT.(CH.B)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5366	763-J-LY-0028B02	CNMT WATER LEVEL CH.B	137A15B	Auxiliary	137'-6"	above	138'-0"		
5367	763-J-TY-0034B	SG 2 RM TEMP.	137A15B	Auxiliary	137'-6"	above	138'-0"		
5368	763-J-TY-0036B	CNMT 2ND QUAD TEMP. (ABOVE OPERATING LVL)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5369	763-J-TY-0038B	CNMT 4TH QUAD TEMP. (ABOVE OPERATING LVL)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5370	763-J-TY-0046B	ANULUS 2ND QUAD TEMP. (BELOW OPERATING LVL)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5371	763-J-TY-0048B	ANULUS 4TH QUAD TEMP. (BELOW OPERATING LVL)	137A15B	Auxiliary	137'-6"	above	138'-0"		
5372	839-J-TS-3187B	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 08B TEMP.	137A15B	Auxiliary	137'-6"	above	138'-0"		
5373	839-J-TS-3188B	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 03B TEMP.	137A15B	Auxiliary	137'-6"	above	138'-0"		
5374	839-J-TS-3190B	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 07B TEMP.	137A15B	Auxiliary	137'-6"	above	138'-0"		
5375	839-J-TY-3187B	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 08B TEMP.	137A15B	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (192 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5376	839-J-TY-3188B	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 03B TEMP.	137A15B	Auxiliary	137'-6"	above	138'-0"		
5377	839-J-TY-3190B	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 07B TEMP.	137A15B	Auxiliary	137'-6"	above	138'-0"		
5378	633-V-1131B	C-1E MCC 07B RM C-CLR Outlet VALVE	137A15B	Auxiliary	137'-6"	above	138'-0"		
5379	633-V-2131B	C-1E MCC07B RM C-CLR Outlet PZR Test VALVE	137A15B	Auxiliary	137'-6"	above	138'-0"		
5380	633-V-2231B	C-1E MCC 07A RM HV15B ECW OutletVent VALVE	137A15B	Auxiliary	137'-6"	above	138'-0"		
5381	633-V-2286B	C-1E MCC 07A RM HV15B ECW Outlet DRN VALVE	137A15B	Auxiliary	137'-6"	above	138'-0"		
5382	633-V-2331B	MCC07A RM HV15B ECW Outlet Test Conn VALVE	137A15B	Auxiliary	137'-6"	above	138'-0"		
5383	633-V-2332B	MCC07A RM HV15B ECW Inlet Test Conn VALVE	137A15B	Auxiliary	137'-6"	above	138'-0"		
5384	606-Y-VK-1142A	MANUAL DAMPER	137A16A	Auxiliary	137'-6"	above	138'-0"	4" FD (1)	-
5385	603-M-HV12A	CUBICLE COOLER	137A17A	Auxiliary	137'-6"	above	138'-0"	4" FD (1)	10" EOL (1)
5386	745-J-LX05A	LOOP CONTROLLER CABINET (CH. AE)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5387	745-J-LX07A	LOOP CONTROLLER CABINET (CH. AE)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5388	745-J-LX08A	LOOP CONTROLLER CABINET (CH. AE)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5389	745-J-LX09A	LOOP CONTROLLER CABINET (CH. AE)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5390	745-J-LX10A	LOOP CONTROLLER CABINET (CH. AE)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5391	745-J-LX11A	LOOP CONTROLLER CABINET (CH. AE)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5392	745-J-LX12A	LOOP CONTROLLER CABINET (CH. AE)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5393	763-J-LP02A	CNMT POST-LOCA H2 MONITOR CABINET	137A17A	Auxiliary	137'-6"	above	138'-0"		
5394	431-J-PS-0103A01	PZR PRESSURE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5395	431-J-PS-0103A02	PZR PRESSURE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5396	431-J-PS-0103A03	PZR PRESSURE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5397	431-J-PS-0103A04	PZR PRESSURE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5398	431-J-PS-0103A05	PZR PRESSURE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5399	431-J-PY-0103A	PZR PRESSURE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5400	441-J-FY-0341A02	SAFETY INJECTION LINE 1 FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5401	441-J-FY-0341A03	SAFETY INJECTION LINE 1 FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5402	441-J-LY-0341A	SIT 1 (TK01A) LEVEL (WIDE RANGE)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5403	441-J-PY-0341A02	SI TANK 1 (TK01A) PRESS(WIDE RANGE)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5404	441-J-ZY-0601A02	SCS DVI ISO VALVE - 601	137A17A	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (193 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5405	441-J-ZY-0603A02	SI LINE 1 LOW FLOW CTRL BYPASS VALVE - 603	137A17A	Auxiliary	137'-6"	above	138'-0"		
5406	441-J-ZY-0646A02	SI LINE 1 ISO VALVE - 646	137A17A	Auxiliary	137'-6"	above	138'-0"		
5407	441-J-ZY-0691A02	SCS WARMUP LINE ISO VALVE - 691	137A17A	Auxiliary	137'-6"	above	138'-0"		
5408	461-J-FS-0245A01	RCP 2B CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5409	461-J-FS-0245A02	RCP 2B CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5410	461-J-FS-0245A03	RCP 2B CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5411	461-J-FS-0246A01	RCP 2A CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5412	461-J-FS-0246A02	RCP 2A CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5413	461-J-FS-0246A03	RCP 2A CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5414	461-J-FS-0247A01	RCP 1A CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5415	461-J-FS-0247A02	RCP 1A CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5416	461-J-FS-0247A03	RCP 1A CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5417	461-J-FS-0248A01	RCP 1B CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5418	461-J-FS-0248A02	RCP 1B CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5419	461-J-FS-0248A03	RCP 1B CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5420	461-J-FY-0071A01	CCW HX. OUTLET(TRAN A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5421	461-J-FY-0071A02	CCW HX. OUTLET(TRAN A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5422	461-J-FY-0245A01	RCP 2B CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5423	461-J-FY-0245A02	RCP 2B CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5424	461-J-FY-0246A01	RCP 2A CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5425	461-J-FY-0246A02	RCP 2A CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5426	461-J-FY-0247A01	RCP 1A CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5427	461-J-FY-0247A02	RCP 1A CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5428	461-J-FY-0248A01	RCP 1B CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5429	461-J-FY-0248A02	RCP 1B CLNG FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5430	461-J-TS-0069A01	COMBINED CCW HX OUTLET (TRN A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5431	461-J-TS-0069A02	COMBINED CCW HX OUTLET (TRN A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5432	461-J-TY-0069A	COMBINED CCW HX OUTLET (TRN A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5433	461-J-ZY-0021A02	CCW HX HE01A OUTLET VALVE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5434	461-J-ZY-0023A02	CCW HX HE02A OUTLET VALVE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5435	461-J-ZY-0025A02	CCW HX HE03A OUTLET VALVE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5436	461-J-ZY-0027A02	CCW HX BYPASS ISO VALVE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5437	462-J-FS-0049A	ESW PUMP PP01A,PP02A DISCH	137A17A	Auxiliary	137'-6"	above	138'-0"		
5438	462-J-FY-0049A01	ESW PUMP PP01A,PP02A DISCH	137A17A	Auxiliary	137'-6"	above	138'-0"		
5439	462-J-FY-0049A02	ESW PUMP PP01A,PP02A DISCH	137A17A	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (194 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5440	462-J-PS-0035A	ESW PUMP PP01A DISCH PRESS	137A17A	Auxiliary	137'-6"	above	138'-0"		
5441	462-J-PY-0035A	ESW PUMP PP01A DISCH PRESS	137A17A	Auxiliary	137'-6"	above	138'-0"		
5442	462-J-ZY-0067A02	ESW DISCH. VALVE 067	137A17A	Auxiliary	137'-6"	above	138'-0"		
5443	521-J-HC-0102A	SG 1 MSADV (102)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5444	521-J-HC-0103A	SG 2 MSADV (103)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5445	521-J-HY-0102A02	MSADV (102)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5446	521-J-HY-0103A02	MSADV (103)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5447	521-J-ZY-0102A	SG 1 PORV (102)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5448	521-J-ZY-0103A	SG 1 PORV (103)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5449	553-J-LY-3051A	ESW TRAV. SCRN TS09A	137A17A	Auxiliary	137'-6"	above	138'-0"		
5450	603-J-HS-0123A	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH12A	137A17A	Auxiliary	137'-6"	above	138'-0"		
5451	603-J-HS-0125A	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH13A	137A17A	Auxiliary	137'-6"	above	138'-0"		
5452	603-J-HS-0127A	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH14A	137A17A	Auxiliary	137'-6"	above	138'-0"		
5453	603-J-HS-0129A	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH15A	137A17A	Auxiliary	137'-6"	above	138'-0"		
5454	603-J-HS-0131A	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH16A	137A17A	Auxiliary	137'-6"	above	138'-0"		
5455	603-J-TE-0123A	PENETRATION MUX A RM TEMP.	137A17A	Auxiliary	137'-6"	above	138'-0"		
5456	603-J-TS-0123A01	PENETRATION MUX A RM (137-A17A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5457	603-J-TS-0123A02	PENETRATION MUX A RM (137-A17A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5458	603-J-TS-0123A03	PENETRATION MUX A RM (137-A17A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5459	603-J-TS-0125A01	ELECT. PENETRATION RM (A) CC (137-A18A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5460	603-J-TS-0125A02	ELECT. PENETRATION RM (A) CC (137-A18A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5461	603-J-TS-0125A03	ELECT. PENETRATION RM (A) CC (137-A18A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5462	603-J-TS-0127A01	CLASS-1E MCC 05A RM (137-A23A)	137A17A	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (195 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5463	603-J-TS-0127A02	CLASS-1E MCC 05A RM (137-A23A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5464	603-J-TS-0127A03	CLASS-1E MCC 05A RM (137-A23A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5465	603-J-TS-0129A01	CLASS-1E MCC 07A RM (137-A15A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5466	603-J-TS-0129A02	CLASS-1E MCC 07A RM (137-A15A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5467	603-J-TS-0129A03	CLASS-1E MCC 07A RM (137-A15A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5468	603-J-TS-0131A01	I&C EQUIP. RM (A) (157-A01C)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5469	603-J-TS-0131A02	I&C EQUIP. RM (A) (157-A01C)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5470	603-J-TS-0131A03	I&C EQUIP. RM (A) (157-A01C)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5471	603-J-TY-0123A	PENETRATION MUX A RM (137-A17A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5472	603-J-TY-0125A	ELECT. PENETRATION RM (A) CC (137-A18A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5473	603-J-TY-0127A	CLASS-1E MCC 05A RM (137-A23A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5474	603-J-TY-0129A	CLASS-1E MCC 07A RM (137-A15A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5475	603-J-TY-0131A	I&C EQUIP. RM (A) (157-A01C)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5476	604-J-FC-0033A	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A EXH. AIR FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5477	604-J-FS-0033A01	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A EXH. AIR FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5478	604-J-FS-0033A02	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A EXH. AIR FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5479	604-J-FY-0033A01	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A EXH. AIR FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5480	604-J-FY-0033A02	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A EXH. AIR FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5481	604-J-FY-0033A03	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A EXH. AIR FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5482	604-J-FY-0033A04	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A EXH. AIR FLOW	137A17A	Auxiliary	137'-6"	above	138'-0"		
5483	604-J-PDS-0073A01	LOADING & UNLOADING AREA DIFF. PRESSURE (CHANNEL A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5484	604-J-PDS-0073A02	LOADING & UNLOADING AREA DIFF. PRESSURE (CHANNEL A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5485	604-J-PDS-0075A01	NEW FUEL STORAGE AREA (CHANNEL A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5486	604-J-PDS-0075A02	NEW FUEL STORAGE AREA (CHANNEL A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5487	604-J-PDY-0073A	LOADING & UNLOADING AREA DIFF. PRESSURE (CHANNEL A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5488	604-J-PDY-0075A	NEW FUEL STORAGE AREA (CHANNEL A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5489	604-J-TS-0027A01	SFPC HX ROOM (100-A24A) TEMP	137A17A	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (196 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5490	604-J-TS-0027A02	SFPC HX ROOM (100-A24A) TEMP	137A17A	Auxiliary	137'-6"	above	138'-0"		
5491	604-J-TS-0027A03	SFPC HX ROOM (100-A24A) TEMP	137A17A	Auxiliary	137'-6"	above	138'-0"		
5492	604-J-TS-3043A01	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A HTG COIL HC02A	137A17A	Auxiliary	137'-6"	above	138'-0"		
5493	604-J-TY-0027A	SFPC HX ROOM (100-A24A) TEMP	137A17A	Auxiliary	137'-6"	above	138'-0"		
5494	604-J-TY-3031A01	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A INLET	137A17A	Auxiliary	137'-6"	above	138'-0"		
5495	604-J-TY-3043A01	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A HTG COIL HC02A	137A17A	Auxiliary	137'-6"	above	138'-0"		
5496	604-J-TY-3045A01	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A CARBON ADSR FT07A	137A17A	Auxiliary	137'-6"	above	138'-0"		
5497	605-J-TS-0003A01	CCW HEAT EXCHANGER ROOM TEMP (100-D01)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5498	605-J-TS-0003A02	CCW HEAT EXCHANGER ROOM TEMP (100-D01)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5499	605-J-TS-0055A01	ESW HVAC ROOM TEMP (090-K01)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5500	605-J-TS-0055A02	ESW HVAC ROOM TEMP (090-K01)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5501	605-J-TY-0003A	CCW HEAT EXCHANGER ROOM TEMP (100-D01)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5502	605-J-TY-0055A	ESW HVAC ROOM TEMP (090-K01)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5503	606-J-PDS-0025A01	GENERAL ACCESS AREA (120-A20A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5504	606-J-PDS-0025A02	GENERAL ACCESS AREA (120-A20A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5505	606-J-PDS-0027A01	GENERAL ACCESS AREA (100-A20A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5506	606-J-PDS-0027A02	GENERAL ACCESS AREA (100-A20A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5507	606-J-PDS-0035A01	GENERAL ACCESS AREA (078-A31A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5508	606-J-PDS-0035A02	GENERAL ACCESS AREA (078-A31A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5509	606-J-PDY-0025A	GENERAL ACCESS AREA (120-A20A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5510	606-J-PDY-0027A	GENERAL ACCESS AREA (100-A20A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5511	606-J-PDY-0035A	GENERAL ACCESS AREA (078-A31A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5512	606-J-TS-0205A01	MECH. PENET. ROOM TEMP	137A17A	Auxiliary	137'-6"	above	138'-0"		
5513	606-J-TS-0205A02	MECH. PENET. ROOM TEMP	137A17A	Auxiliary	137'-6"	above	138'-0"		
5514	606-J-TS-0205A03	MECH. PENET. ROOM TEMP	137A17A	Auxiliary	137'-6"	above	138'-0"		
5515	606-J-TS-0223A01	MECH. PENETRATION RM TEMP	137A17A	Auxiliary	137'-6"	above	138'-0"		
5516	606-J-TS-0223A02	MECH. PENETRATION RM TEMP	137A17A	Auxiliary	137'-6"	above	138'-0"		
5517	606-J-TS-0223A03	MECH. PENETRATION RM TEMP	137A17A	Auxiliary	137'-6"	above	138'-0"		
5518	606-J-TY-0205A	MECH. PENET. ROOM TEMP	137A17A	Auxiliary	137'-6"	above	138'-0"		
5519	606-J-TY-0223A	MECH. PENETRATION RM TEMP	137A17A	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (197 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5520	633-J-TW-0149	COOLING COIL VE-CW12A OUTLET	137A17A	Auxiliary	137'-6"	above	138'-0"		
5521	633-J-TW-0151	COOLING COIL VE-CW12A INLET	137A17A	Auxiliary	137'-6"	above	138'-0"		
5522	761-J-RS-0075A	MCR AIR INTAKE RADIATION SWITCH	137A17A	Auxiliary	137'-6"	above	138'-0"		
5523	761-J-RY-0071A03	MCR AIR INTAKE RADIATION TRAIN A	137A17A	Auxiliary	137'-6"	above	138'-0"		
5524	761-J-RY-0072B03	MCR AIR INTAKE RADIATION TRAIN B	137A17A	Auxiliary	137'-6"	above	138'-0"		
5525	761-J-RY-0073A03	MCR AIR INTAKE RADIATION TRAIN A	137A17A	Auxiliary	137'-6"	above	138'-0"		
5526	761-J-RY-0074B03	MCR AIR INTAKE RADIATION TRAIN B	137A17A	Auxiliary	137'-6"	above	138'-0"		
5527	761-J-RY-0075A	MCR AIR INTAKE RADIATION	137A17A	Auxiliary	137'-6"	above	138'-0"		
5528	763-J-AS-0005A01	CNMT H2 CONCENT.(CH.A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5529	763-J-AS-0005A02	CNMT H2 CONCENT.(CH.A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5530	763-J-AS-0006A01	IRWST H2 CONCENT.(CH.A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5531	763-J-AS-0006A02	IRWST H2 CONCENT.(CH.A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5532	763-J-AT-0005A	CNMT H2 CONCENT.(CH.A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5533	763-J-AT-0006A	IRWST H2 CONCENT.(CH.A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5534	763-J-AY-0005A01	CNMT H2 CONCENT.(CH.A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5535	763-J-AY-0005A02	CNMT H2 CONCENT.(CH.A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5536	763-J-AY-0006A01	IRWST H2 CONCENT.(CH.A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5537	763-J-AY-0006A02	IRWST H2 CONCENT.(CH.A)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5538	763-J-LY-0027A02	CNMT WATER LEVEL CH.A	137A17A	Auxiliary	137'-6"	above	138'-0"		
5539	763-J-TY-0031A02	CNMT DOME TEMP.	137A17A	Auxiliary	137'-6"	above	138'-0"		
5540	763-J-TY-0032A	SG 1 RM TEMP.	137A17A	Auxiliary	137'-6"	above	138'-0"		
5541	763-J-TY-0033A	PRESSURIZER RM TEMP.	137A17A	Auxiliary	137'-6"	above	138'-0"		
5542	763-J-TY-0035A	CNMT 1ST QUAD TEMP. (ABOVE OPERATING LVL)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5543	763-J-TY-0037A	CNMT 3RD QUAD TEMP. (ABOVE OPERATING LVL)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5544	763-J-TY-0039A	REACTOR CAVITY TEMP.	137A17A	Auxiliary	137'-6"	above	138'-0"		
5545	763-J-TY-0045A	ANULUS 1ST QUAD TEMP. (BELOW OPERATING LVL)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5546	763-J-TY-0047A	ANULUS 3RD QUAD TEMP. (BELOW OPERATING LVL)	137A17A	Auxiliary	137'-6"	above	138'-0"		
5547	839-J-TS-3149A	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 08A TEMP.	137A17A	Auxiliary	137'-6"	above	138'-0"		
5548	839-J-TS-3150A	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 03A TEMP.	137A17A	Auxiliary	137'-6"	above	138'-0"		
5549	839-J-TS-3152A	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 07A TEMP.	137A17A	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (198 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5550	839-J-TY-3149A	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 08A TEMP.	137A17A	Auxiliary	137'-6"	above	138'-0"		
5551	839-J-TY-3150A	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 03A TEMP.	137A17A	Auxiliary	137'-6"	above	138'-0"		
5552	839-J-TY-3152A	ELECTRICAL PENETRATION ASSEMBLIES EQ. NO. 07A TEMP.	137A17A	Auxiliary	137'-6"	above	138'-0"		
5553	633-V-1125A	PENET MUX A RM C-CLR Outlet VALVE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5554	633-V-1126A	PENET MUX A RM C-CLR Inlet throt VALVE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5555	633-V-2125A	PENET MUX A RM C-CLR Outlet PZR Test VALVE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5556	633-V-2126A	PENET MUX A RM C-CLR Inlet PZR Test VALVE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5557	633-V-2225A	PENET MUX A RM HV12A ECW Outlet Vent VALVE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5558	633-V-2226A	PENET MUX A RM HV12A ECW Inlet DRN VALVE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5559	633-V-2288A	PENET MUX A RM HV12A ECW Outlet DRN VALVE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5560	633-V-2325A	MUX A RM HV12A ECW Outlet Test Conn VALVE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5561	633-V-2326A	MUX A RM HV12A ECW Inlet Test Conn VALVE	137A17A	Auxiliary	137'-6"	above	138'-0"		
5562	603-M-HV12B	CUBICLE COOLER	137A17B	Auxiliary	137'-6"	above	138'-0"	4" FD (1)	-
5563	745-J-LX05B	LOOP CONTROLLER CABINET (CH. BE)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5564	745-J-LX11B	LOOP CONTROLLER CABINET (CH. BE)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5565	745-J-LX12B	LOOP CONTROLLER CABINET (CH. BE)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5566	745-J-LX13B	LOOP CONTROLLER CABINET (CH. BE)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5567	763-J-LP02B	CNMT POST-LOCA H2 MONITOR CABINET	137A17B	Auxiliary	137'-6"	above	138'-0"		
5568	433-J-JZ-0411B	PZR GAS VENT CCU	137A17B	Auxiliary	137'-6"	above	138'-0"		
5569	433-J-JZ-0415B	RX VESSEL GAS VENT CCU	137A17B	Auxiliary	137'-6"	above	138'-0"		
5570	433-J-JZ-0419B	GAS VENT TO IRWST CCU	137A17B	Auxiliary	137'-6"	above	138'-0"		
5571	441-J-ZY-0600B02	SCS DVI ISO VALVE - 600	137A17B	Auxiliary	137'-6"	above	138'-0"		
5572	441-J-ZY-0602B02	SI LINE 2 LOW FLOW CTRL BYPASS VALVE - 602	137A17B	Auxiliary	137'-6"	above	138'-0"		
5573	441-J-ZY-0626B02	SI LINE 2 ISO VALVE - 626	137A17B	Auxiliary	137'-6"	above	138'-0"		
5574	461-J-FY-0072B01	CCW HX. OUTLET(TRAN B)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5575	461-J-FY-0072B02	CCW HX. OUTLET(TRAN B)	137A17B	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (199 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5576	461-J-TS-0070B01	COMBINED CCW HX OUTLET (TRN B)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5577	461-J-TS-0070B02	COMBINED CCW HX OUTLET (TRN B)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5578	461-J-TY-0070B	COMBINED CCW HX OUTLET (TRN B)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5579	461-J-ZY-0022B02	CCW HX HE01B OUTLET VALVE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5580	461-J-ZY-0024B02	CCW HX HE02B OUTLET VALVE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5581	461-J-ZY-0026B02	CCW HX HE03B OUTLET VALVE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5582	461-J-ZY-0028B02	CCW HX BYPASS ISO VALVE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5583	462-J-FS-0050B	ESW PUMP PP01B,PP02B DISCH	137A17B	Auxiliary	137'-6"	above	138'-0"		
5584	462-J-FY-0050B01	ESW PUMP PP01B,PP02B DISCH	137A17B	Auxiliary	137'-6"	above	138'-0"		
5585	462-J-FY-0050B02	ESW PUMP PP01B,PP02B DISCH	137A17B	Auxiliary	137'-6"	above	138'-0"		
5586	462-J-PS-0036B	ESW PUMP PP01B DISCH PRESS	137A17B	Auxiliary	137'-6"	above	138'-0"		
5587	462-J-PY-0036B	ESW PUMP PP01B DISCH PRESS	137A17B	Auxiliary	137'-6"	above	138'-0"		
5588	462-J-ZY-0068B02	ESW DISCH. VALVE 068	137A17B	Auxiliary	137'-6"	above	138'-0"		
5589	463-J-TS-0003B	SFP TEMPERATURE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5590	463-J-TY-0003B01	SFP TEMPERATURE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5591	491-J-JZ-0001B	RCS HOTLEG LOOP1 SAMPLE CIV CCU	137A17B	Auxiliary	137'-6"	above	138'-0"		
5592	521-J-HC-0101B	SG 1 MSADV (101)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5593	521-J-HC-0104B	SG 2 MSADV (104)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5594	521-J-HY-0101B02	MSADV (101)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5595	521-J-HY-0104B02	MSADV (104)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5596	521-J-ZY-0101B	SG 1 PORV (101)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5597	521-J-ZY-0104B	SG 1 PORV (104)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5598	553-J-LY-3052B	ESW TRAV. SCRN TS09B	137A17B	Auxiliary	137'-6"	above	138'-0"		
5599	603-J-TE-0124B	PENETRATION MUX B RM TEMP.	137A17B	Auxiliary	137'-6"	above	138'-0"		
5600	605-J-TS-0004B01	CCW HEAT EXCHANGER ROOM TEMP (100-D02)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5601	605-J-TS-0004B02	CCW HEAT EXCHANGER ROOM TEMP (100-D02)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5602	605-J-TS-0056B01	ESW HVAC ROOM TEMP (090-K02)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5603	605-J-TS-0056B02	ESW HVAC ROOM TEMP (090-K02)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5604	605-J-TY-0004B	CCW HEAT EXCHANGER ROOM TEMP (100-D02)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5605	605-J-TY-0056B	ESW HVAC ROOM TEMP (090-K02)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5606	606-J-PDS-0030B01	GENERAL ACCESS AREA (137-A29B)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5607	606-J-PDS-0030B02	GENERAL ACCESS AREA (137-A29B)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5608	606-J-PDS-0032B01	GENERAL ACCESS AREA (156-A05B)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5609	606-J-PDS-0032B02	GENERAL ACCESS AREA (156-A05B)	137A17B	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (200 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5610	606-J-PDY-0030B	GENERAL ACCESS AREA (137-A29B)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5611	606-J-PDY-0032B	GENERAL ACCESS AREA (156-A05B)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5612	606-J-TS-0228B01	MECH. PENET. ROOM TEMP	137A17B	Auxiliary	137'-6"	above	138'-0"		
5613	606-J-TS-0228B02	MECH. PENET. ROOM TEMP	137A17B	Auxiliary	137'-6"	above	138'-0"		
5614	606-J-TS-0228B03	MECH. PENET. ROOM TEMP	137A17B	Auxiliary	137'-6"	above	138'-0"		
5615	606-J-TY-0228B	MECH. PENET. ROOM TEMP	137A17B	Auxiliary	137'-6"	above	138'-0"		
5616	633-J-TW-0150	COOLING COIL VE-CW12B OUTLET	137A17B	Auxiliary	137'-6"	above	138'-0"		
5617	633-J-TW-0152	COOLING COIL VE-CW12B INLET	137A17B	Auxiliary	137'-6"	above	138'-0"		
5618	761-J-RS-0076B	MCR AIR INTAKE RADIATION SWITCH	137A17B	Auxiliary	137'-6"	above	138'-0"		
5619	761-J-RT-0232B	OPETRATING AREA TRN B RAD. HI	137A17B	Auxiliary	137'-6"	above	138'-0"		
5620	761-J-RT-0234B	UPPER OPERATING AREA RAD. HI	137A17B	Auxiliary	137'-6"	above	138'-0"		
5621	761-J-RY-0076B	MCR AIR INTAKE RADIATION	137A17B	Auxiliary	137'-6"	above	138'-0"		
5622	761-J-RY-0232B	CNMT OPERATING AREA MONITOR	137A17B	Auxiliary	137'-6"	above	138'-0"		
5623	761-J-RY-0234B	CNMT UPPER OPERATING AREA MONITOR	137A17B	Auxiliary	137'-6"	above	138'-0"		
5624	763-J-AT-0007B	CNMT H2 CONCENT.(CH.B)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5625	763-J-AT-0008B	IRWST H2 CONCENT.(CH.B)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5626	763-J-AY-0007B01	CNMT H2 CONCENT.(CH.B)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5627	763-J-AY-0008B01	IRWST H2 CONCENT.(CH.B)	137A17B	Auxiliary	137'-6"	above	138'-0"		
5628	763-J-LT-0028B	CNMT WATER LEVEL CH.B	137A17B	Auxiliary	137'-6"	above	138'-0"		
5629	633-V-1125B	PENET MUX B RM C-CLR Outlet VALVE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5630	633-V-1126B	PENET MUX B RM C-CLR Inlet throt VALVE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5631	633-V-2125B	PENET MUX B RM C-CLR Outlet PZR Test VALVE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5632	633-V-2126B	PENET MUX B RM C-CLR Inlet PZR Test VALVE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5633	633-V-2225B	PENET MUX A RM HV12B ECW Outlet Vent VALVE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5634	633-V-2226B	PENET MUX A RM HV12B ECW Inlet DRN VALVE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5635	633-V-2288B	PENET MUX A RM HV12B ECW Outlet DRN VALVE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5636	633-V-2325B	MUX A RM HV12B ECW Outlet Test Conn VALVE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5637	633-V-2326B	MUX A RM HV12B ECW Inlet Test Conn VALVE	137A17B	Auxiliary	137'-6"	above	138'-0"		
5638	431-E-SQ01A	LOCAL STARTER	137A18A	Auxiliary	137'-6"	above	138'-0"	4" FD (1)	10" EOL (1)

Table 3.4-2 (201 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5639	431-E-SQ02A	LOCAL STARTER	137A18A	Auxiliary	137'-6"	above	138'-0"		
5640	431-J-LP01A	POSRV MASTER CONTROL CABINET (PMCC)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5641	603-M-HV13A	CUBICLE COOLER	137A18A	Auxiliary	137'-6"	above	138'-0"		
5642	839-E-EA01A-X1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-A	137A18A	Auxiliary	137'-6"	above	138'-0"		
5643	839-E-EA02A-X2	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-A	137A18A	Auxiliary	137'-6"	above	138'-0"		
5644	839-E-EA03A-J1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-A	137A18A	Auxiliary	137'-6"	above	138'-0"		
5645	839-E-EA04A-00	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-A	137A18A	Auxiliary	137'-6"	above	138'-0"		
5646	839-E-EA05A-Y1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-A	137A18A	Auxiliary	137'-6"	above	138'-0"		
5647	839-E-EA06A-T1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-A	137A18A	Auxiliary	137'-6"	above	138'-0"		
5648	839-E-EA07A-K1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-A	137A18A	Auxiliary	137'-6"	above	138'-0"		
5649	839-E-EA08A-D1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-A	137A18A	Auxiliary	137'-6"	above	138'-0"		
5650	431-J-HS-0120A02	PZR POSRV MOTOR OPERATED ISOATION VALVE V120	137A18A	Auxiliary	137'-6"	above	138'-0"		
5651	431-J-HS-0122A02	PZR POSRV MOTOR OPERATED ISOATION VALVE V122	137A18A	Auxiliary	137'-6"	above	138'-0"		
5652	431-J-HS-0130A03	PZR POSRV MOTOR OPERATED PILOT VALVE V130	137A18A	Auxiliary	137'-6"	above	138'-0"		
5653	431-J-HS-0132A03	PZR POSRV MOTOR OPERATED PILOT VALVE V132	137A18A	Auxiliary	137'-6"	above	138'-0"		
5654	433-J-JZ-0410A	PZR GAS VENT CCU	137A18A	Auxiliary	137'-6"	above	138'-0"		
5655	433-J-JZ-0414A	RX VESSEL GAS VENT CCU	137A18A	Auxiliary	137'-6"	above	138'-0"		
5656	433-J-JZ-0420A	GAS VENT TO IRWST CCU	137A18A	Auxiliary	137'-6"	above	138'-0"		
5657	441-J-HS-0391A02	ERVC INJECTION ISO.	137A18A	Auxiliary	137'-6"	above	138'-0"		
5658	441-J-HS-0393A02	ERVC INJECTION ISO.	137A18A	Auxiliary	137'-6"	above	138'-0"		
5659	441-J-HS-0395A02	IRWST RETURN LINE ISO.	137A18A	Auxiliary	137'-6"	above	138'-0"		
5660	441-J-HS-0644A02	SIT ISOATION	137A18A	Auxiliary	137'-6"	above	138'-0"		
5661	441-J-HS-0651A03	SCS SUCTION LINE ISOATION	137A18A	Auxiliary	137'-6"	above	138'-0"		
5662	441-J-HS-0652B03	SCS SUCTION LINE ISOATION	137A18A	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (202 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5663	491-J-JZ-0003A	PZR SURGE LINE SAMPLE CIV CCU	137A18A	Auxiliary	137'-6"	above	138'-0"		
5664	491-J-JZ-0005A	PZR STEAM SPACE SAMPLE CIV CCU	137A18A	Auxiliary	137'-6"	above	138'-0"		
5665	603-J-TE-0125A	ELECT. PENETRATION A RM TEMP.	137A18A	Auxiliary	137'-6"	above	138'-0"		
5666	633-J-TW-0153	COOLING COIL VE-CW13A OUTLET	137A18A	Auxiliary	137'-6"	above	138'-0"		
5667	633-J-TW-0155	COOLING COIL VE-CW13A INLET	137A18A	Auxiliary	137'-6"	above	138'-0"		
5668	669-J-PI-3149N01	PRESSURE INDICATOR (EPA NO. 08A-D1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5669	669-J-PI-3150N01	PRESSURE INDICATOR (EPA NO. 03A-J1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5670	669-J-PI-3151N01	PRESSURE INDICATOR (EPA NO. 04A-00)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5671	669-J-PI-3152N01	PRESSURE INDICATOR (EPA NO. 07A-K1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5672	669-J-PI-3153N01	PRESSURE INDICATOR (EPA NO. 02A-X2)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5673	669-J-PI-3154N01	PRESSURE INDICATOR (EPA NO. 05A-Y1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5674	669-J-PI-3155N01	PRESSURE INDICATOR (EPA NO. 01A-X1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5675	669-J-PI-3156N01	PRESSURE INDICATOR (EPA NO. 06A-T1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5676	669-J-PS-3149	PRESSURE SWITCH (EPA NO. 08A-D1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5677	669-J-PS-3150	PRESSURE SWITCH (EPA NO. 03A-J1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5678	669-J-PS-3151	PRESSURE SWITCH (EPA NO. 04A-00)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5679	669-J-PS-3152	PRESSURE SWITCH (EPA NO. 07A-K1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5680	669-J-PS-3153	PRESSURE SWITCH (EPA NO. 02A-X2)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5681	669-J-PS-3154	PRESSURE SWITCH (EPA NO. 05A-Y1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5682	669-J-PS-3155	PRESSURE SWITCH (EPA NO. 01A-X1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5683	669-J-PS-3156	PRESSURE SWITCH (EPA NO. 06A-T1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5684	839-J-TE-3149A	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.08A-D1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5685	839-J-TE-3150A	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.03A-J1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5686	839-J-TE-3152A	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.07A-K1)	137A18A	Auxiliary	137'-6"	above	138'-0"		
5687	633-V-1127A	Elec. PENET RM(A) C-CLR Outlet VALVE	137A18A	Auxiliary	137'-6"	above	138'-0"		
5688	633-V-1128A	Elec. PENET RM(A) C-CLR Inlet throt VALVE	137A18A	Auxiliary	137'-6"	above	138'-0"		
5689	633-V-2127A	Elec. PENET(A) C-CLR Outlet PZR Test VALVE	137A18A	Auxiliary	137'-6"	above	138'-0"		
5690	633-V-2128A	Elec. PENET(A) C-CLR Inlet PZR Test VALVE	137A18A	Auxiliary	137'-6"	above	138'-0"		
5691	633-V-2227A	ELECT PENET RM HV13A ECW Outlet Vent VALVE	137A18A	Auxiliary	137'-6"	above	138'-0"		
5692	633-V-2228A	ELECT PENET RM HV13A ECW Inlet DRN VALVE	137A18A	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (203 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5693	633-V-2287A	ELECT PENET RM HV13A ECW Outlet DRN VALVE	137A18A	Auxiliary	137'-6"	above	138'-0"		
5694	633-V-2327A	ELE PEN RM HV13A ECW Outlet TestConn VALVE	137A18A	Auxiliary	137'-6"	above	138'-0"		
5695	633-V-2328A	ELE PEN RM HV13A ECW Inlet TestConn VALVE	137A18A	Auxiliary	137'-6"	above	138'-0"		
5696	431-E-SQ01B	LOCAL STARTER	137A18B	Auxiliary	137'-6"	above	138'-0"	4" FD (1)	-
5697	431-E-SQ02B	LOCAL STARTER	137A18B	Auxiliary	137'-6"	above	138'-0"		
5698	431-J-LP01B	POSRV MASTER CONTROL CABINET (PMCC)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5699	451-E-SQ01B	LOCAL STARTER	137A18B	Auxiliary	137'-6"	above	138'-0"		
5700	603-M-HV13B	CUBICLE COOLER	137A18B	Auxiliary	137'-6"	above	138'-0"		
5701	839-E-EA01B-X1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-B	137A18B	Auxiliary	137'-6"	above	138'-0"		
5702	839-E-EA02B-X2	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-B	137A18B	Auxiliary	137'-6"	above	138'-0"		
5703	839-E-EA03B-J1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-B	137A18B	Auxiliary	137'-6"	above	138'-0"		
5704	839-E-EA04B-00	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-B	137A18B	Auxiliary	137'-6"	above	138'-0"		
5705	839-E-EA05B-Y1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-B	137A18B	Auxiliary	137'-6"	above	138'-0"		
5706	839-E-EA06B-T1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-B	137A18B	Auxiliary	137'-6"	above	138'-0"		
5707	839-E-EA07B-K1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-B	137A18B	Auxiliary	137'-6"	above	138'-0"		
5708	839-E-EA08B-D1	ELECTRICAL PENETRATION ASSEMBLY - CLASS 1E CHANNEL-B	137A18B	Auxiliary	137'-6"	above	138'-0"		
5709	431-J-HS-0124B02	PZR POSRV MOTOR OPERATED ISOATION VALVE V124	137A18B	Auxiliary	137'-6"	above	138'-0"		
5710	431-J-HS-0126B02	PZR POSRV MOTOR OPERATED ISOATION VALVE V126	137A18B	Auxiliary	137'-6"	above	138'-0"		
5711	431-J-HS-0134B03	PZR POSRV MOTOR OPERATED PILOT VALVE V134	137A18B	Auxiliary	137'-6"	above	138'-0"		
5712	431-J-HS-0136B03	PZR POSRV MOTOR OPERATED PILOT VALVE V136	137A18B	Auxiliary	137'-6"	above	138'-0"		
5713	441-J-HS-0624B02	SIT ISOATION	137A18B	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (204 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5714	603-J-TE-0126B	ELECT. PENETRATION B RM TEMP.	137A18B	Auxiliary	137'-6"	above	138'-0"		
5715	633-J-TW-0154	COOLING COIL VE-CW13B OUTLET	137A18B	Auxiliary	137'-6"	above	138'-0"		
5716	633-J-TW-0156	COOLING COIL VE-CW13B INLET	137A18B	Auxiliary	137'-6"	above	138'-0"		
5717	669-J-PI-3187N01	PRESSURE INDICATOR (EPA NO. 08B-D1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5718	669-J-PI-3188N01	PRESSURE INDICATOR (EPA NO. 03B-J1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5719	669-J-PI-3189N01	PRESSURE INDICATOR (EPA NO. 04B-00)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5720	669-J-PI-3190N01	PRESSURE INDICATOR (EPA NO. 07B-K1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5721	669-J-PI-3191N01	PRESSURE INDICATOR (EPA NO. 02B-X2)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5722	669-J-PI-3192N01	PRESSURE INDICATOR (EPA NO. 05B-Y1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5723	669-J-PI-3193N01	PRESSURE INDICATOR (EPA NO. 01B-X1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5724	669-J-PI-3194N01	PRESSURE INDICATOR (EPA NO. 06B-T1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5725	669-J-PS-3187	PRESSURE SWITCH (EPA NO. 08B-D1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5726	669-J-PS-3188	PRESSURE SWITCH (EPA NO. 03B-J1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5727	669-J-PS-3189	PRESSURE SWITCH (EPA NO. 04B-00)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5728	669-J-PS-3190	PRESSURE SWITCH (EPA NO. 07B-K1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5729	669-J-PS-3191	PRESSURE SWITCH (EPA NO. 02B-X2)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5730	669-J-PS-3192	PRESSURE SWITCH (EPA NO. 05B-Y1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5731	669-J-PS-3193	PRESSURE SWITCH (EPA NO. 01B-X1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5732	669-J-PS-3194	PRESSURE SWITCH (EPA NO. 06B-T1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5733	839-J-TE-3187B	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.08B-D1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5734	839-J-TE-3188B	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.03B-J1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5735	839-J-TE-3190B	TEMPERATURE MONITORING THERMOCOUPLE (EPA NO.07B-K1)	137A18B	Auxiliary	137'-6"	above	138'-0"		
5736	633-V-1127B	Elec. PENET RM(B) C-CLR Outlet VALVE	137A18B	Auxiliary	137'-6"	above	138'-0"		
5737	633-V-1128B	Elec. PENET RM(B) C-CLR Inlet throt VALVE	137A18B	Auxiliary	137'-6"	above	138'-0"		
5738	633-V-1132B	C-1E MCC 07B RM C-CLR Inlet throt VALVE	137A18B	Auxiliary	137'-6"	above	138'-0"		
5739	633-V-2127B	Elec. PENET(B) C-CLR Outlet PZR Test VALVE	137A18B	Auxiliary	137'-6"	above	138'-0"		
5740	633-V-2128B	Elec. PENET(B) C-CLR Inlet PZR Test VALVE	137A18B	Auxiliary	137'-6"	above	138'-0"		
5741	633-V-2132B	C-1E MCC07B RM C-CLR Inlet PZR Test VALVE	137A18B	Auxiliary	137'-6"	above	138'-0"		
5742	633-V-2227B	ELECT PENET RM HV13B ECW Outlet Vent VALVE	137A18B	Auxiliary	137'-6"	above	138'-0"		
5743	633-V-2228B	ELECT PENET RM HV13B ECW Inlet DRN VALVE	137A18B	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (205 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5744	633-V-2232B	C-1E MCC 07A RM HV15B ECW Inlet DRN VALVE	137A18B	Auxiliary	137'-6"	above	138'-0"		
5745	633-V-2287B	ELECT PENET RM HV13B ECW Outlet DRN VALVE	137A18B	Auxiliary	137'-6"	above	138'-0"		
5746	633-V-2327B	ELE PEN RM HV13B ECW Outlet TestConn VALVE	137A18B	Auxiliary	137'-6"	above	138'-0"		
5747	633-V-2328B	ELE PEN RM HV13B ECW Inlet TestConn VALVE	137A18B	Auxiliary	137'-6"	above	138'-0"		
5748	761-J-RT-0231A	OPETRATING AREA TRN A RAD. HI	137A20A	Auxiliary	137'-6"	above	138'-0"	6" FD (2)	10" EOL (1)
5749	761-J-RT-0233A	UPPER OPERATING AREA RAD. HI	137A20A	Auxiliary	137'-6"	above	138'-0"		
5750	761-J-RY-0231A	CNMT OPERATING AREA MONITOR	137A20A	Auxiliary	137'-6"	above	138'-0"		
5751	761-J-RY-0233A	CNMT UPPER OPERATING AREA MONITOR	137A20A	Auxiliary	137'-6"	above	138'-0"		
5752	763-J-LT-0027A	CNMT WATER LEVEL CH.A	137A20A	Auxiliary	137'-6"	above	138'-0"		
5753	633-V-2464A	C-1E MCC 05A RM CW14A Inlet DRN VALVE	137A20A	Auxiliary	137'-6"	above	138'-0"		
5754	633-V-2463A	C-1E MCC 05A RM CW14A Outlet DRN VALVE	137A22A	Auxiliary	137'-6"	above	138'-0"	6" FD (1)	-
5755	603-M-HV14A	CUBICLE COOLER	137A23A	Auxiliary	137'-6"	above	138'-0"	4" FD (1)	-
5756	827-E-MC05A	UNIT 3 480V 1E MCC 05A	137A23A	Auxiliary	137'-6"	above	138'-0"		
5757	603-J-TE-0127A	CLASS 1E MCC 05A RM TEMP.	137A23A	Auxiliary	137'-6"	above	138'-0"		
5758	633-J-TW-0157	COOLING COIL VE-CW14A OUTLET	137A23A	Auxiliary	137'-6"	above	138'-0"		
5759	633-J-TW-0159	COOLING COIL VE-CW14A INLET	137A23A	Auxiliary	137'-6"	above	138'-0"		
5760	633-V-1129A	C-1E MCC 05A RM C-CLR Outlet VALVE	137A23A	Auxiliary	137'-6"	above	138'-0"		
5761	633-V-1130A	C-1E MCC 05A RM C-CLR Inlet throt VALVE	137A23A	Auxiliary	137'-6"	above	138'-0"		
5762	633-V-2129A	C-1E MCC05A RM C-CLR Outlet PZR Test VALVE	137A23A	Auxiliary	137'-6"	above	138'-0"		
5763	633-V-2130A	C-1E MCC05A RM C-CLR Inlet PZR Test VALVE	137A23A	Auxiliary	137'-6"	above	138'-0"		
5764	633-V-2229A	C-1E MCC 05A RM HV14A ECW OutletVent VALVE	137A23A	Auxiliary	137'-6"	above	138'-0"		
5765	633-V-2230A	C-1E MCC 05A RM HV14A ECW InletDRN VALVE	137A23A	Auxiliary	137'-6"	above	138'-0"		
5766	633-V-2329A	MCC05A RM HV14A ECW Outlet Test Conn VALVE	137A23A	Auxiliary	137'-6"	above	138'-0"		
5767	633-V-2330A	MCC05A RM HV14A ECW Inlet Test Conn VALVE	137A23A	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (206 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5768	633-V-2480A	C-1E MCC 05A RM CW14A Inlet Vent VALVE	137A23A	Auxiliary	137'-6"	above	138'-0"		
5769	604-M-AU02B	FUEL HANDLING AREA EMERGENCY EXHAUST ACU	137A25A	Auxiliary	137'-6"	above	138'-0"	4" FD (1)	-
5770	604-J-FE-0034B	EMRG EXH ACU AU02B DNSTRM FLOW	137A25A	Auxiliary	137'-6"	above	138'-0"		
5771	604-J-FS-3202B	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B HTG COIL HC02B	137A25A	Auxiliary	137'-6"	above	138'-0"		
5772	604-J-FT-0034B	EMRG EXH ACU AU02B DNSTRM FLOW	137A25A	Auxiliary	137'-6"	above	138'-0"		
5773	604-J-TE-3032B	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B INLET	137A25A	Auxiliary	137'-6"	above	138'-0"		
5774	604-J-TE-3044B	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B HTG COIL HC02B	137A25A	Auxiliary	137'-6"	above	138'-0"		
5775	604-J-TE-3046B	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B CARBON ADSR FT07B	137A25A	Auxiliary	137'-6"	above	138'-0"		
5776	604-J-TE-3206B	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B HTG COIL HC02B	137A25A	Auxiliary	137'-6"	above	138'-0"		
5777	604-J-TE-3207B	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B HTG COIL HC02B	137A25A	Auxiliary	137'-6"	above	138'-0"		
5778	604-J-TE-3208B	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B CARBON ADSR FT07B	137A25A	Auxiliary	137'-6"	above	138'-0"		
5779	604-J-TE-3209B	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B CARBON ADSR FT07B	137A25A	Auxiliary	137'-6"	above	138'-0"		
5780	604-J-TI-3046	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B CARBON ADSR FT07B	137A25A	Auxiliary	137'-6"	above	138'-0"		
5781	604-J-TS-3206B	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B HTG COIL HC02B	137A25A	Auxiliary	137'-6"	above	138'-0"		
5782	604-J-TS-3207B	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B HTG COIL HC02B	137A25A	Auxiliary	137'-6"	above	138'-0"		
5783	604-J-TS-3208B	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B CARBON ADSR FT07B	137A25A	Auxiliary	137'-6"	above	138'-0"		
5784	604-J-TS-3209B	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B CARBON ADSR FT07B	137A25A	Auxiliary	137'-6"	above	138'-0"		
5785	604-V-1001B	FH Area EMERG EXH AU02B Fire WTR ISO VALVE	137A25A	Auxiliary	137'-6"	above	138'-0"		
5786	604-V-1002B	FH Area EMERG EXH AU02B Fire WTR ISO VALVE	137A25A	Auxiliary	137'-6"	above	138'-0"		
5787	604-V-1003B	FH Area EMERG EXH AU02B Fire WTR Vent VALVE	137A25A	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (207 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5788	604-V-2001B	FH Area EMERG EXH AU02B Fire WTR DRN VALVE	137A25A	Auxiliary	137'-6"	above	138'-0"		
5789	604-V-2002B	FH Area EMERG EXH AU02B Fire WTR DRN VALVE	137A25A	Auxiliary	137'-6"	above	138'-0"		
5790	604-V-2003B	FH Area EMERG EXH AU02B Fire WTR DRN VALVE	137A25A	Auxiliary	137'-6"	above	138'-0"		
5791	604-Y-VF-0006B	CONTROL DAMPER	137A25A	Auxiliary	137'-6"	above	138'-0"		
5792	604-Y-VF-0008B	CONTROL DAMPER	137A25A	Auxiliary	137'-6"	above	138'-0"		
5793	604-Y-VF-1007B	MANUAL DAMPER	137A25A	Auxiliary	137'-6"	above	138'-0"		
5794	604-Y-VF-1508A	FIRE DAMPER	137A25A	Auxiliary	137'-6"	above	138'-0"		
5795	604-Y-VF-1509A	FIRE DAMPER	137A25A	Auxiliary	137'-6"	above	138'-0"		
5796	604-Y-VF-1509B	FIRE DAMPER	137A25A	Auxiliary	137'-6"	above	138'-0"		
5797	604-Y-VF-1513A	FIRE DAMPER	137A25A	Auxiliary	137'-6"	above	138'-0"		
5798	606-Y-VK-1171B	MANUAL DAMPER	137A27B	Auxiliary	137'-6"	above	138'-0"	4" FD (1)	-
5799	606-M-HV01B	AUX.BLDG CONTROLLED AREA II SUPPLY AHU	137A28B	Auxiliary	137'-6"	above	138'-0"	4" FD (1), 6" FD (1)	-
5800	606-J-FE-0048D	AUX. BLDG CTRLD AREA II EXH. ACU AU02B AIR FLOW	137A28B	Auxiliary	137'-6"	above	138'-0"		
5801	606-J-FS-3202B	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B	137A28B	Auxiliary	137'-6"	above	138'-0"		
5802	606-J-FT-0048D	AUX. BLDG CTRLD AREA II EXH. ACU AU02B AIR FLOW	137A28B	Auxiliary	137'-6"	above	138'-0"		
5803	606-J-TC-3008B	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B	137A28B	Auxiliary	137'-6"	above	138'-0"		
5804	606-J-TE-3008B	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B	137A28B	Auxiliary	137'-6"	above	138'-0"		
5805	606-J-TE-3204B	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B	137A28B	Auxiliary	137'-6"	above	138'-0"		
5806	606-J-TE-3267B	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B	137A28B	Auxiliary	137'-6"	above	138'-0"		
5807	606-J-TS-3204B	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B	137A28B	Auxiliary	137'-6"	above	138'-0"		
5808	606-J-TS-3267B	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B	137A28B	Auxiliary	137'-6"	above	138'-0"		
5809	606-Y-VK-1008B	MANUAL DAMPER	137A28B	Auxiliary	137'-6"	above	138'-0"		
5810	606-Y-VK-1009B	MANUAL DAMPER	137A28B	Auxiliary	137'-6"	above	138'-0"		
5811	606-Y-VK-1584B	FIRE DAMPER	137A28B	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (208 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5812	606-M-AH08B	EXHAUST ACU(AU01B) BOOSTER FAN	137A29B	Auxiliary	137'-6"	above	138'-0"	4" FD (2)	10" EOL (1)
5813	606-M-AH09B	EXHAUST ACU(AU02B) BOOSTER FAN	137A29B	Auxiliary	137'-6"	above	138'-0"		
5814	606-J-FE-0010B	AUX BLDG CONTROLLED AREA II SUP AIR FLOW	137A29B	Auxiliary	137'-6"	above	138'-0"		
5815	606-J-FT-0010B	AUX BLDG CONTROLLED AREA II SUP AIR FLOW	137A29B	Auxiliary	137'-6"	above	138'-0"		
5816	606-J-PDT-0030B	GNRL ACCS AREA 137-A29B DIFF PRESS	137A29B	Auxiliary	137'-6"	above	138'-0"		
5817	633-V-2460B	ECW Supply LN Vent VALVE	137A29B	Auxiliary	137'-6"	above	138'-0"		
5818	633-V-2461B	ECW RTN LN Vent VALVE	137A29B	Auxiliary	137'-6"	above	138'-0"		
5819	604-Y-VF-1518A	FIRE DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5820	606-Y-VK-1161B	MANUAL DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5821	606-Y-VK-1168B	MANUAL DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5822	606-Y-VK-1172B	MANUAL DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5823	606-Y-VK-1173B	MANUAL DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5824	606-Y-VK-1191B	MANUAL DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5825	606-Y-VK-1192B	MANUAL DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5826	606-Y-VK-1193B	MANUAL DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5827	606-Y-VK-1194B	MANUAL DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5828	606-Y-VK-1221B	MANUAL DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5829	606-Y-VK-1302B	MANUAL DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5830	606-Y-VK-1553B	FIRE DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5831	606-Y-VK-1582B	FIRE DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5832	606-Y-VK-1583B	FIRE DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5833	606-Y-VK-1587B	FIRE DAMPER	137A29B	Auxiliary	137'-6"	above	138'-0"		
5834	606-Y-VK-1170B	MANUAL DAMPER	137A31B	Auxiliary	137'-6"	above	138'-0"		
5835	521-M-FL10	FLEXIBLE HOSE	137A31C	Auxiliary	137'-6"	above	143'-6"		Emergency Flood Relief Path
5836	521-M-OR01	RESTRICTION ORIFICE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5837	521-J-PI-3041	AFW PUMP TBN STM SUPPLY VALVE ACCUMULATOR PRESSURE INDICATOR	137A31C	Auxiliary	137'-6"	above	143'-6"		
5838	521-J-PI-3042	AFW PUMP TBN STM SUPPLY VALVE ACCUMULATOR PRESSURE INDICATOR	137A31C	Auxiliary	137'-6"	above	143'-6"		
5839	521-J-PS-3041	AFW PUMP TBN STM SUPPLY VALVE ACCUMULATOR PRESSURE SWITCH	137A31C	Auxiliary	137'-6"	above	143'-6"		
5840	521-J-PS-3042	AFW PUMP TBN STM SUPPLY VALVE ACCUMULATOR PRESSURE SWITCH	137A31C	Auxiliary	137'-6"	above	143'-6"		

Table 3.4-2 (209 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5841	521-J-TEW-0001	STM GEN. 1 MAIN STM TEMP	137A31C	Auxiliary	137'-6"	above	143'-6"		
5842	521-J-TEW-0002	STM GEN. 1 MAIN STM TEMP	137A31C	Auxiliary	137'-6"	above	143'-6"		
5843	521-J-ZS-0110B	AFW PUMP TBN STM SUPPLY VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5844	521-J-ZT-0101B	S/G 1 MS ATM DUMP VALVE POSITION CONTROL	137A31C	Auxiliary	137'-6"	above	143'-6"		
5845	521-J-ZT-0102A	S/G 1 MS ATM DUMP VALVE POSITION CONTROL	137A31C	Auxiliary	137'-6"	above	143'-6"		
5846	521-V-0011	S/G-1 MS ISO VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5847	521-V-0012	S/G-1 MS ISO VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5848	521-V-0015	MAIN STEAM ISO.VALVE BYPASS VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5849	521-V-0016	MAIN STEAM ISO.VALVE BYPASS VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5850	521-V-0019	S/G-1 MSIV 011 B/P STM CTRL VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5851	521-V-0020	S/G-1 MSIV 012 B/P STM CTRL VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5852	521-V-0101	MAIN STEAM ATMOSPHERIC DUMP VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5853	521-V-0102	MAIN STEAM ATMOSPHERIC DUMP VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5854	521-V-0105	S/G-1 MSADV 101 INLET ISO VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5855	521-V-0106	S/G-1 MSADV 102 INLET ISO VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5856	521-V-0110	AF TURBINE STEAM SUPPLY VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5857	521-V-0112	AF TURBINE WARMUP VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5858	521-V-1021	S/G-1 MSIV 012 TO MS HDR LN PRTEST RT VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5859	521-V-1022	S/G-1 MSIV 012 TO MS HDR LN PRTEST RT VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5860	521-V-1030	N2 SUPPLY TO S/G-1 MS LN ISO VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5861	521-V-1042	S/G1 MSIV 011 TO MS HDR LN PR TEST RT VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5862	521-V-1043	S/G1 MSIV 011 TO MS HDR LN PR TEST RT VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5863	521-V-1151	AFW PP TURBINE "A" LN ISO VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5864	521-V-1153	AFW PP TBN WARMUP LN ISO VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5865	521-V-1257	NITROGEN SUPPLY LN ISO VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5866	521-V-1301	MAIN STEAM SAFETY VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5867	521-V-1302	MAIN STEAM SAFETY VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5868	521-V-1303	MAIN STEAM SAFETY VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5869	521-V-1304	MAIN STEAM SAFETY VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		

Table 3.4-2 (210 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5870	521-V-1305	MAIN STEAM SAFETY VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5871	521-V-1306	MAIN STEAM SAFETY VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5872	521-V-1307	MAIN STEAM SAFETY VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5873	521-V-1308	MAIN STEAM SAFETY VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5874	521-V-1309	MAIN STEAM SAFETY VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5875	521-V-1310	MAIN STEAM SAFETY VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5876	521-V-2081	FLOOR DRAIN AUX. BLDG LN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5877	521-V-2082	FLOOR DRAIN AUX. BLDG LN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5878	521-V-2083	FLOOR DRAIN AUX. BLDG LN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5879	521-V-2084	FLOOR DRAIN AUX. BLDG LN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5880	521-V-2151	MAIN STEAM DRAIN HEADER LN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5881	521-V-2152	MAIN STEAM DRAIN HEADER LN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5882	521-V-2153	MAIN STEAM DRAIN HEADER LN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5883	521-V-2154	MAIN STEAM DRAIN HEADER LN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5884	521-V-2208	FLOOR DRAIN AUX. BLDG LN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5885	521-V-2209	FLOOR DRAIN AUX. BLDG LN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5886	521-V-2212	FLOOR DRAIN AUX. BLDG LN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5887	521-V-2213	FLOOR DRAIN AUX. BLDG LN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5888	521-V-4001	AUX FW PP TURBINE "A" CHK VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5889	521-V-4002	AUX FW PP TURBINE "A" CHK VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5890	541-V-0121	ECONOMIZER MAIN FEEDWATER ISOATION VALVES	137A31C	Auxiliary	137'-6"	above	143'-6"		
5891	541-V-0122	ECONOMIZER MAIN FEEDWATER ISOATION VALVES	137A31C	Auxiliary	137'-6"	above	143'-6"		
5892	541-V-0131	DOWNCOMMER MAIN FEEDWATER ISOATION VALVES	137A31C	Auxiliary	137'-6"	above	143'-6"		
5893	541-V-0132	DOWNCOMMER MAIN FEEDWATER ISOATION VALVES	137A31C	Auxiliary	137'-6"	above	143'-6"		
5894	541-V-0138	FEEDWATER CHEMICAL INJECTION VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5895	541-V-1035	S/G 1 E/C HDR CHK VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5896	541-V-1039	S/G 1 D/C HDR CHK VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5897	541-V-1050	SG 1 Feed WTR CHEM INJ CHK VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5898	541-V-1051	SG 1 Feed WTR CHEM INJ ISO VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5899	541-V-2110	S/G 1 D/C HDR Spec Test VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5900	541-V-2111	S/G 1 D/C HDR Spec Test VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5901	541-V-2112	S/G 1 E/C HDR Spec Test VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		

Table 3.4-2 (211 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5902	541-V-2113	S/G 1 E/C HDR Spec Test VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5903	541-V-2118	S/G 1 E/C HDR Vent VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5904	541-V-2134	S/G 1 E/C HDR DRN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5905	541-V-2136	S/G 1 D/C HDR DRN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5906	541-V-2153	S/G 1 D/C HDR Spec Test VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5907	541-V-2154	S/G 1 D/C HDR Spec Test VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5908	541-V-2155	S/G 1 E/C HDR Spec Test VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5909	541-V-2156	S/G 1 E/C HDR Spec Test VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5910	541-V-2162	S/G 1 D/C HDR DRN VALVE ISO VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5911	541-V-2164	S/G 1 E/C HDR DRN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5912	541-V-2169	S/G 1 E/C HDR Vent VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5913	541-V-2171	SG 1 FEED WTR CHEM INJ VENT VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5914	541-V-2172	SG 1 FEED WTR CHEM INJ VENT VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5915	541-V-2437	S/G 1 D/C HDR MFIV 131 Body DRN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5916	541-V-2438	S/G 1 D/C HDR MFIV 131 Body DRN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5917	541-V-2441	S/G 1 E/C HDR MFIV 132 Body DRN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5918	541-V-2442	S/G 1 E/C HDR MFIV 132 Body DRN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5919	541-V-2468	S/G 1 D/C HDR MFIV 121 Body DRN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5920	541-V-2469	S/G 1 D/C HDR MFIV 121 Body DRN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5921	541-V-2472	S/G 1 E/C HDR MFIV 122 Body DRN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5922	541-V-2473	S/G 1 E/C HDR MFIV 122 Body DRN VALVE	137A31C	Auxiliary	137'-6"	above	143'-6"		
5923	571-V-1016	CNMT Aux STM Supply ISO VALVE(CNMT Outside)	137A31C	Auxiliary	137'-6"	above	143'-6"		
5924	521-M-FL09	FLEXIBLE HOSE	137A31D	Auxiliary	137'-6"	above	143'-6"		Emergency Flood Relief Path
5925	521-M-OR02	Flow Orifice for Equipment	137A31D	Auxiliary	137'-6"	above	143'-6"		
5926	521-J-TEW-0003	STM GEN. 2 MAIN STM TEMP	137A31D	Auxiliary	137'-6"	above	143'-6"		
5927	521-J-TEW-0004	STM GEN. 2 MAIN STM TEMP	137A31D	Auxiliary	137'-6"	above	143'-6"		
5928	521-J-ZS-0109A	AUX. FWP.TBN STEAM SUPPLY VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5929	521-J-ZT-0103A	S/G 2 MS ATM DUMP VALVE POSITION CONTROL	137A31D	Auxiliary	137'-6"	above	143'-6"		
5930	521-J-ZT-0104B	S/G 2 MS ATM DUMP VALVE POSITION CONTROL	137A31D	Auxiliary	137'-6"	above	143'-6"		
5931	521-V-0013	S/G-2 MS ISO VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5932	521-V-0014	S/G-2 MS ISO VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5933	521-V-0017	MAIN STEAM ISO.VALVE BYPASS VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		

Table 3.4-2 (212 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5934	521-V-0018	MAIN STEAM ISO.VALVE BYPASS VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5935	521-V-0021	S/G-2 MSIV 013 B/P STM CTRL VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5936	521-V-0022	S/G-2 MSIV 014 B/P STM CTRL VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5937	521-V-0090	MAIN STEAM DRIP LEG ISOATION VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5938	521-V-0091	MAIN STEAM DRIP LEG ISOATION VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5939	521-V-0092	MAIN STEAM DRIP LEG ISOATION VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5940	521-V-0093	MAIN STEAM DRIP LEG ISOATION VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5941	521-V-0103	MAIN STEAM ATMOSPHERIC DUMP VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5942	521-V-0104	MAIN STEAM ATMOSPHERIC DUMP VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5943	521-V-0107	S/G-2 MSADV 103 INLET ISO VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5944	521-V-0108	S/G-2 MSADV 104 INLET ISO VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5945	521-V-0109	AF TURBINE STEAM SUPPLY VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5946	521-V-0111	AF TURBINE WARMUP VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5947	521-V-1051	N2 SUPPLY TO S/G-2 MS LN ISO VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5948	521-V-1064	S/G-2 MSIV 014 TO MS HDR LN PRTEST RT VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5949	521-V-1065	S/G-2 MSIV 014 TO MS HDR LN PRTEST RT VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5950	521-V-1073	N2 SUPPLY TO S/G-2 MS LN ISO VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5951	521-V-1085	S/G-2 MSIV 013 TO MS HDR LN PRTEST RT VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5952	521-V-1086	S/G-2 MSIV 013 TO MS HDR LN PRTEST RT VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5953	521-V-1152	AFW PP TURBINE "B" LN ISO VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5954	521-V-1154	AFW PP TBN WARMUP LN ISO VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5955	521-V-1311	MAIN STEAM SAFETY VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5956	521-V-1312	MAIN STEAM SAFETY VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5957	521-V-1313	MAIN STEAM SAFETY VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5958	521-V-1314	MAIN STEAM SAFETY VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5959	521-V-1315	MAIN STEAM SAFETY VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5960	521-V-1316	MAIN STEAM SAFETY VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5961	521-V-1317	MAIN STEAM SAFETY VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5962	521-V-1318	MAIN STEAM SAFETY VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5963	521-V-1319	MAIN STEAM SAFETY VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5964	521-V-1320	MAIN STEAM SAFETY VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		

Table 3.4-2 (213 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5965	521-V-1510	MAIN STEAM DRAIN HEADER ISO VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5966	521-V-1511	MAIN STEAM DRAIN HEADER ISO VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5967	521-V-1512	MAIN STEAM DRAIN HEADER ISO VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5968	521-V-1513	MAIN STEAM DRAIN HEADER ISO VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5969	521-V-2085	FLOOR DRAIN AUX. BLDG LN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5970	521-V-2086	FLOOR DRAIN AUX. BLDG LN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5971	521-V-2087	FLOOR DRAIN AUX. BLDG LN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5972	521-V-2088	FLOOR DRAIN AUX. BLDG LN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5973	521-V-2155	MAIN STEAM DRAIN HEADER LN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5974	521-V-2156	MAIN STEAM DRAIN HEADER LN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5975	521-V-2157	MAIN STEAM DRAIN HEADER LN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5976	521-V-2158	MAIN STEAM DRAIN HEADER LN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5977	521-V-2216	FLOOR DRAIN AUX. BLDG LN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5978	521-V-2217	FLOOR DRAIN AUX. BLDG LN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5979	521-V-2220	FLOOR DRAIN AUX. BLDG LN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5980	521-V-2221	FLOOR DRAIN AUX. BLDG LN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5981	521-V-4010	AUX FW PP TURBINE "B" CHK VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5982	521-V-4011	AUX FW PP TURBINE "B" CHK VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5983	535-V-0013	BSTR Fan Disch ISO VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5984	541-V-0123	ECONOMIZER MAIN FEEDWATER ISOATION VALVES	137A31D	Auxiliary	137'-6"	above	143'-6"		
5985	541-V-0124	ECONOMIZER MAIN FEEDWATER ISOATION VALVES	137A31D	Auxiliary	137'-6"	above	143'-6"		
5986	541-V-0133	DOWNCOMMER MAIN FEEDWATER ISOATION VALVES	137A31D	Auxiliary	137'-6"	above	143'-6"		
5987	541-V-0134	DOWNCOMMER MAIN FEEDWATER ISOATION VALVES	137A31D	Auxiliary	137'-6"	above	143'-6"		
5988	541-V-0139	FEEDWATER CHEMICAL INJECTION VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5989	541-V-1042	S/G 2 E/C HDR CHK VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5990	541-V-1046	S/G 2 D/C HDR CHK VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5991	541-V-1052	SG 2 Feed WTR CHEM INJ CHK VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5992	541-V-1053	SG 2 Feed WTR CHEM INJ ISO VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5993	541-V-2114	S/G 2 D/C HDR Spec Test VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5994	541-V-2115	S/G 2 D/C HDR Spec Test VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5995	541-V-2116	S/G 2 E/C HDR Spec Test VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5996	541-V-2117	S/G 2 E/C HDR Spec Test VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		

Table 3.4-2 (214 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
5997	541-V-2119	S/G 2 E/C HDR Vent VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5998	541-V-2137	S/G 2 E/C HDR Vent VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
5999	541-V-2138	S/G 2 E/C HDR DRN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6000	541-V-2139	S/G 2 D/C HDR Vent VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6001	541-V-2140	S/G 2 D/C HDR DRN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6002	541-V-2157	S/G 2 D/C HDR Spec Test VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6003	541-V-2158	S/G 2 D/C HDR Spec Test VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6004	541-V-2159	S/G 2 E/C HDR Spec Test VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6005	541-V-2160	S/G 2 E/C HDR Spec Test VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6006	541-V-2165	S/G 2 D/C HDR Vent VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6007	541-V-2166	S/G 2 D/C HDR DRN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6008	541-V-2167	S/G 2 E/C HDR Vent VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6009	541-V-2168	S/G 2 E/C HDR DRN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6010	541-V-2170	S/G 2 E/C HDR Vent VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6011	541-V-2173	SG 2 FEED WTR CHEM INJ VENT VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6012	541-V-2174	SG 2 FEED WTR CHEM INJ VENT VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6013	541-V-2445	S/G 2 D/C HDR MFIV 133 Body DRN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6014	541-V-2446	S/G 2 D/C HDR MFIV 133 Body DRN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6015	541-V-2449	S/G 2 D/C HDR MFIV 134 Body DRN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6016	541-V-2465	S/G 2 D/C HDR MFIV 134 Body DRN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6017	541-V-2466	S/G 2 D/C HDR MFIV 124 Body DRN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6018	541-V-2476	S/G 2 D/C HDR MFIV 123 Body DRN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6019	541-V-2477	S/G 2 D/C HDR MFIV 123 Body DRN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6020	541-V-2478	S/G 2 D/C HDR MFIV 124 Body DRN VALVE	137A31D	Auxiliary	137'-6"	above	143'-6"		
6021	603-E-BS03A	RSP RM. EDH LOCAL CONTROL BOX	137A40D	Auxiliary	137'-6"	above	138'-0"	6" FD (1)	-
6022	603-E-BS03B	RSP RM. EDH LOCAL CONTROL BOX	137A40D	Auxiliary	137'-6"	above	138'-0"		
6023	603-M-AH22A	RSP ROOM SUPPLY FAN	137A40D	Auxiliary	137'-6"	above	138'-0"		
6024	603-M-AH22B	RSP ROOM SUPPLY FAN	137A40D	Auxiliary	137'-6"	above	138'-0"		
6025	603-M-AH23A	RSP ROOM EXHAUST FAN	137A40D	Auxiliary	137'-6"	above	138'-0"		
6026	603-M-AH23B	RSP ROOM EXHAUST FAN	137A40D	Auxiliary	137'-6"	above	138'-0"		
6027	603-M-HC03A	RSP RM ELECT. DUCT HEATER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6028	603-M-HC03B	RSP RM ELECT. DUCT HEATER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6029	603-M-HV18A	CUBICLE COOLER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6030	603-M-HV18B	CUBICLE COOLER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6031	603-J-FE-0138C	RSC RM SUPPLY FAN AH22A DNSTRM FLOW	137A40D	Auxiliary	137'-6"	above	138'-0"		

Table 3.4-2 (215 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6032	603-J-FE-0139D	RSC RM SUPPLY FAN AH22B DNST FLOW	137A40D	Auxiliary	137'-6"	above	138'-0"		
6033	603-J-FS-3405C	REMOTE SHUTDOWN RM (137-A40D)	137A40D	Auxiliary	137'-6"	above	138'-0"		
6034	603-J-FS-3406D	REMOTE SHUTDOWN RM (137-A40D)	137A40D	Auxiliary	137'-6"	above	138'-0"		
6035	603-J-FT-0138C	RSP RM SUPPLY FAN AH22A DNSTRM FLOW	137A40D	Auxiliary	137'-6"	above	138'-0"		
6036	603-J-FT-0139D	RSP RM SUPPLY FAN AH22B DNST FLOW	137A40D	Auxiliary	137'-6"	above	138'-0"		
6037	603-J-FT-0140C	RSP RM EXHAUST FAN AH23A DNST FLOW	137A40D	Auxiliary	137'-6"	above	138'-0"		
6038	603-J-FT-0142C	RSP RM CC HV18A DNSTRM FLOW	137A40D	Auxiliary	137'-6"	above	138'-0"		
6039	603-J-FT-0143D	RSP RM AH18B DNSTRM FLOW	137A40D	Auxiliary	137'-6"	above	138'-0"		
6040	603-J-TE-3105C	REMOTE SHUTDOWN RM (137-A40D)	137A40D	Auxiliary	137'-6"	above	138'-0"		
6041	603-J-TE-3106D	REMOTE SHUTDOWN RM (137-A40D)	137A40D	Auxiliary	137'-6"	above	138'-0"		
6042	603-J-TE-3305C	REMOTE SHUTDOWN RM (137-A40D)	137A40D	Auxiliary	137'-6"	above	138'-0"		
6043	603-J-TE-3306D	REMOTE SHUTDOWN RM (137-A40D)	137A40D	Auxiliary	137'-6"	above	138'-0"		
6044	603-J-TS-3105C	REMOTE SHUTDOWN RM HI-HI(137-A40D)	137A40D	Auxiliary	137'-6"	above	138'-0"		
6045	603-J-TS-3106D	REMOTE SHUTDOWN RM HI-HI(137-A40D)	137A40D	Auxiliary	137'-6"	above	138'-0"		
6046	603-J-TS-3305C	REMOTE SHUTDOWN RM HI(137-A40D)	137A40D	Auxiliary	137'-6"	above	138'-0"		
6047	603-J-TS-3306D	REMOTE SHUTDOWN RM HI(137-A40D)	137A40D	Auxiliary	137'-6"	above	138'-0"		
6048	603-Y-VE-1094B	MANUAL DAMPER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6049	603-Y-VE-1095A	MANUAL DAMPER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6050	603-Y-VE-1095B	MANUAL DAMPER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6051	603-Y-VE-1251A	MANUAL DAMPER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6052	603-Y-VE-1251B	MANUAL DAMPER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6053	603-Y-VE-1252A	MANUAL DAMPER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6054	603-Y-VE-1252B	MANUAL DAMPER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6055	603-Y-VE-1253A	MANUAL DAMPER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6056	603-Y-VE-1253B	MANUAL DAMPER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6057	603-Y-VE-1254A	MANUAL DAMPER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6058	603-Y-VE-1254B	MANUAL DAMPER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6059	603-Y-VE-1588B	FIRE DAMPER	137A40D	Auxiliary	137'-6"	above	138'-0"		
6060	606-Y-VK-1226B	MANUAL DAMPER	156A01B	Auxiliary	156'-0"	above	156'-6"	4" FD (1)	-
6061	606-Y-VK-1227B	MANUAL DAMPER	156A01B	Auxiliary	156'-0"	above	156'-6"		
6062	606-Y-VK-1600B	FIRE DAMPER	156A01B	Auxiliary	156'-0"	above	156'-6"		
6063	606-Y-VK-1164B	MANUAL DAMPER	156A02B	Auxiliary	156'-0"	above	156'-6"	4" FD (1)	-
6064	606-Y-VK-1599B	FIRE DAMPER	156A02B	Auxiliary	156'-0"	above	156'-6"		
6065	606-Y-VK-1160B	MANUAL DAMPER	156A04B	Auxiliary	156'-0"	above	156'-6"	4" FD (1)	-
6066	606-Y-VK-1187B	MANUAL DAMPER	156A04B	Auxiliary	156'-0"	above	156'-6"		

Table 3.4-2 (216 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6067	606-Y-VK-1224B	MANUAL DAMPER	156A04B	Auxiliary	156'-0"	above	156'-6"		
6068	606-J-PDT-0032B	GNRL ACCS AREA 156-A05B DIFF PRESS	156A05B	Auxiliary	156'-0"	above	156'-6"	4" FD (1)	-
6069	606-Y-VK-1165B	MANUAL DAMPER	156A05B	Auxiliary	156'-0"	above	156'-6"		
6070	606-Y-VK-1166B	MANUAL DAMPER	156A05B	Auxiliary	156'-0"	above	156'-6"		
6071	606-Y-VK-1189B	MANUAL DAMPER	156A05B	Auxiliary	156'-0"	above	156'-6"		
6072	606-Y-VK-1190B	MANUAL DAMPER	156A05B	Auxiliary	156'-0"	above	156'-6"		
6073	606-Y-VK-1223B	MANUAL DAMPER	156A05B	Auxiliary	156'-0"	above	156'-6"		
6074	606-Y-VK-1554B	FIRE DAMPER	156A05B	Auxiliary	156'-0"	above	156'-6"		
6075	606-Y-VK-1555B	FIRE DAMPER	156A05B	Auxiliary	156'-0"	above	156'-6"		
6076	606-Y-VK-1593B	FIRE DAMPER	156A05B	Auxiliary	156'-0"	above	156'-6"		
6077	606-Y-VK-1594B	FIRE DAMPER	156A05B	Auxiliary	156'-0"	above	156'-6"		
6078	463-J-LE-0001A	SPENT FUEL POOL LEVEL (TRAIN A)	156A08B	Auxiliary	156'-0"	above	156'-6"	4" FD (3)	-
6079	463-J-LE-0002B	SPENT FUEL POOL LEVEL (TRAIN B)	156A08B	Auxiliary	156'-0"	above	156'-6"		
6080	463-J-LIT-0001A	SPENT FUEL POOL LEVEL (TRAIN A)	156A08B	Auxiliary	156'-0"	above	156'-6"		
6081	463-J-LIT-0002B	SPENT FUEL POOL LEVEL (TRAIN B)	156A08B	Auxiliary	156'-0"	above	156'-6"		
6082	463-J-TE-0003B	SFP TEMP	156A08B	Auxiliary	156'-0"	above	156'-6"		
6083	604-J-PDT-0075A	NEW FUEL CONTAINER LAYDOWN & INSPECTION AREA (CHANNEL A)	156A08B	Auxiliary	156'-0"	above	156'-6"		
6084	604-J-PDT-0076B	NEW FUEL CONTAINER LAYDOWN & INSPECTION AREA (CHANNEL B)	156A08B	Auxiliary	156'-0"	above	156'-6"		
6085	761-J-RE-0241A	SPENT FUEL POOL AREA MONITOR	156A08B	Auxiliary	156'-0"	above	156'-6"		
6086	761-J-RE-0242B	SPENT FUEL POOL AREA MONITOR	156A08B	Auxiliary	156'-0"	above	156'-6"		
6087	761-J-RT-0241A	SPENT FUEL POOL TRN A RAD. HI	156A08B	Auxiliary	156'-0"	above	156'-6"		
6088	761-J-RT-0242B	SPENT FUEL POOL TRN B RAD. HI	156A08B	Auxiliary	156'-0"	above	156'-6"		
6089	604-Y-VF-1011B	MANUAL DAMPER	156A08B	Auxiliary	156'-0"	above	156'-6"		
6090	455-V-2021	S/G-1 Blow Down Line Vent VALVE	156A15B	Auxiliary	156'-0"	above	156'-6"		
6091	455-V-2022	S/G-2 Blow Down Line Vent VALVE	156A15B	Auxiliary	156'-0"	above	156'-6"		
6092	455-V-2023	S/G-1 Blow Down Line Vent VALVE	156A15B	Auxiliary	156'-0"	above	156'-6"		
6093	455-V-2024	S/G-2 Blow Down Line Vent VALVE	156A15B	Auxiliary	156'-0"	above	156'-6"		
6094	455-V-2809	SGBD #1 LN Outside CNMT Pr Test Conn VALVE	156A15B	Auxiliary	156'-0"	above	156'-6"		
6095	455-V-2810	SGBD #2 LN Outside CNMT Pr Test Conn VALVE	156A15B	Auxiliary	156'-0"	above	156'-6"		
6096	455-V-2811	SGBD #1 LN Outside CNMT Pr Test Conn VALVE	156A15B	Auxiliary	156'-0"	above	156'-6"		
6097	455-V-2812	SGBD #2 LN Outside CNMT Pr Test Conn VALVE	156A15B	Auxiliary	156'-0"	above	156'-6"		

Table 3.4-2 (217 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6098	455-V-2813	S/G-1 Blow Down LN Special Test Conn VALVE	156A15B	Auxiliary	156'-0"	above	156'-6"		
6099	455-V-2814	S/G-2 Blow Down LN Special Test CONN VALVE	156A15B	Auxiliary	156'-0"	above	156'-6"		
6100	455-V-2993	S/G-1 Blow Down LN Special Test Conn VALVE	156A15B	Auxiliary	156'-0"	above	156'-6"		
6101	455-V-2994	S/G-2 Blow Down LN Special Test Conn VALVE	156A15B	Auxiliary	156'-0"	above	156'-6"		
6102	603-M-HV16A	CUBICLE COOLER	157A01C	Auxiliary	156'-0"	above	158'-0"	4" FD (1)	-
6103	752-J-PA03A	ESF-CCS GROUP CONTROLLER CABINET (CH. AE)	157A01C	Auxiliary	156'-0"	above	158'-0"		
6104	752-J-PA04A	ITP/MTP CABINET (CH.AE)	157A01C	Auxiliary	156'-0"	above	158'-0"		
6105	752-J-PA14A	PPS CABINET CH.A-1	157A01C	Auxiliary	156'-0"	above	158'-0"		
6106	752-J-PA14C	PPS CABINET CH.C-1	157A01C	Auxiliary	156'-0"	above	158'-0"		
6107	752-J-PA15A	CPC CABINET CH.A	157A01C	Auxiliary	156'-0"	above	158'-0"		
6108	752-J-PA16A	QIAS-P CABINET CH.A	157A01C	Auxiliary	156'-0"	above	158'-0"		
6109	752-J-PA18A	APC CABINET CH.A	157A01C	Auxiliary	156'-0"	above	158'-0"		
6110	752-J-PA47A	BOP RMS CABINET (SRDC)	157A01C	Auxiliary	156'-0"	above	158'-0"		
6111	752-J-PA48A	ENFMS CABINET CH.A	157A01C	Auxiliary	156'-0"	above	158'-0"		
6112	752-J-PA48C	ENFMS CABINET CH.C	157A01C	Auxiliary	156'-0"	above	158'-0"		
6113	431-J-LY-0110A	PZR LEVEL	157A01C	Auxiliary	156'-0"	above	158'-0"		
6114	431-J-LY-0110B	PZR LEVEL	157A01C	Auxiliary	156'-0"	above	158'-0"		
6115	431-J-PDY-0115A	STM GEN. NO. 1 DIFF. PRESS. (PRIMARY SIDE)	157A01C	Auxiliary	156'-0"	above	158'-0"		
6116	431-J-PDY-0115C	STM GEN. NO. 1 DIFF. PRESS. (PRIMARY SIDE)	157A01C	Auxiliary	156'-0"	above	158'-0"		
6117	431-J-PDY-0125A	STM GEN. NO. 2 DIFF. PRESS. (PRIMARY SIDE)	157A01C	Auxiliary	156'-0"	above	158'-0"		
6118	431-J-PDY-0125C	STM GEN. NO. 2 DIFF. PRESS. (PRIMARY SIDE)	157A01C	Auxiliary	156'-0"	above	158'-0"		
6119	431-J-PY-0101A01	PZR PRESSURE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6120	431-J-PY-0101A02	PZR PRESSURE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6121	431-J-PY-0101A03	PZR PRESSURE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6122	431-J-PY-0101C03	PZR PRESSURE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6123	431-J-PY-0102A01	PZR PRESSURE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6124	431-J-PY-0102A02	PZR PRESSURE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6125	431-J-PY-0102C	PZR PRESSURE	157A01C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (218 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6126	431-J-SY-0113A01	RCP 1A (PP01A) SPEED	157A01C	Auxiliary	156'-0"	above	158'-0"		
6127	431-J-SY-0113A02	RCP 1A (PP01A) SPEED	157A01C	Auxiliary	156'-0"	above	158'-0"		
6128	431-J-SY-0123A01	RCP 1B (PP01B) SPEED	157A01C	Auxiliary	156'-0"	above	158'-0"		
6129	431-J-SY-0123A02	RCP 1B (PP01B) SPEED	157A01C	Auxiliary	156'-0"	above	158'-0"		
6130	431-J-SY-0133A01	RCP 2A (PP02A) SPEED	157A01C	Auxiliary	156'-0"	above	158'-0"		
6131	431-J-SY-0133A02	RCP 2A (PP02A) SPEED	157A01C	Auxiliary	156'-0"	above	158'-0"		
6132	431-J-SY-0143A01	RCP 2B (PP02B) SPEED	157A01C	Auxiliary	156'-0"	above	158'-0"		
6133	431-J-SY-0143A02	RCP 2B (PP02B) SPEED	157A01C	Auxiliary	156'-0"	above	158'-0"		
6134	431-J-TY-0112A	HOT LEG TEMP FROM REACTOR TO SG1	157A01C	Auxiliary	156'-0"	above	158'-0"		
6135	431-J-TY-0113A	HOT LEG TEMP TO SG2	157A01C	Auxiliary	156'-0"	above	158'-0"		
6136	431-J-TY-0122A	LOOP 1A COLD LEG TEMP	157A01C	Auxiliary	156'-0"	above	158'-0"		
6137	431-J-TY-0123A	LOOP 2A COLD LEG TEMP	157A01C	Auxiliary	156'-0"	above	158'-0"		
6138	431-J-TY-0132A	HOT LEG TEMP FROM REACTOR TO SG1	157A01C	Auxiliary	156'-0"	above	158'-0"		
6139	431-J-TY-0133A	HOT LEG TEMP TO SG2	157A01C	Auxiliary	156'-0"	above	158'-0"		
6140	431-J-TY-0142A	LOOP 1A COLD LEG TEMP	157A01C	Auxiliary	156'-0"	above	158'-0"		
6141	431-J-TY-0143A	LOOP 2A COLD LEG TEMP	157A01C	Auxiliary	156'-0"	above	158'-0"		
6142	441-J-FY-0341A01	SAFETY INJECTION LINE 1 FLOW	157A01C	Auxiliary	156'-0"	above	158'-0"		
6143	441-J-PY-0341A01	SI TANK 1 (TK01A) PRESS(WIDE RANGE)	157A01C	Auxiliary	156'-0"	above	158'-0"		
6144	447-J-LY-0391A01	IRWST TANK LEVEL 2	157A01C	Auxiliary	156'-0"	above	158'-0"		
6145	447-J-TY-0390A04	IRWST TANK TEMP 1	157A01C	Auxiliary	156'-0"	above	158'-0"		
6146	481-J-LY-0079A01	SI PUMP A	157A01C	Auxiliary	156'-0"	above	158'-0"		
6147	521-J-PY-1013A	S/G 1 PRESSURE CH A	157A01C	Auxiliary	156'-0"	above	158'-0"		
6148	521-J-PY-1023A	S/G 2 PRESSURE CH A	157A01C	Auxiliary	156'-0"	above	158'-0"		
6149	542-J-FY-0047A03	AF FLOW TO SG 1	157A01C	Auxiliary	156'-0"	above	158'-0"		
6150	543-J-LY-0003A03	AFWST A TK01A LVL	157A01C	Auxiliary	156'-0"	above	158'-0"		
6151	543-J-LY-0005A03	AFWST B TK01B LVL	157A01C	Auxiliary	156'-0"	above	158'-0"		
6152	603-J-TE-0131A	I & C EQUIP RM A TEMP.	157A01C	Auxiliary	156'-0"	above	158'-0"		
6153	633-J-TW-0165	COOLING COIL VE-CW16A OUTLET	157A01C	Auxiliary	156'-0"	above	158'-0"		
6154	633-J-TW-0167	COOLING COIL VE-CW16A INLET	157A01C	Auxiliary	156'-0"	above	158'-0"		
6155	761-J-RR-0071A	MCR AIR INTAKE A	157A01C	Auxiliary	156'-0"	above	158'-0"		
6156	761-J-RR-0073A	MCR AIR INTAKE A	157A01C	Auxiliary	156'-0"	above	158'-0"		
6157	761-J-RR-0231A	CNMT OPERATING AREA	157A01C	Auxiliary	156'-0"	above	158'-0"		
6158	761-J-RR-0233A	CNMT OPERATING AREA	157A01C	Auxiliary	156'-0"	above	158'-0"		
6159	761-J-RR-0241A	SPENT FUEL POOL AREA	157A01C	Auxiliary	156'-0"	above	158'-0"		
6160	763-J-AY-0005A03	CNMT H2 CONCENT.(CH.A)	157A01C	Auxiliary	156'-0"	above	158'-0"		
6161	763-J-AY-0006A03	IRWST H2 CONCENT.(CH.A)	157A01C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (219 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6162	763-J-LY-0027A01	CNMT WATER LEVEL CH.A	157A01C	Auxiliary	156'-0"	above	158'-0"		
6163	763-J-PY-0351A	NARROW RANGE PRESS. (CH "A")	157A01C	Auxiliary	156'-0"	above	158'-0"		
6164	763-J-PY-0351C	NARROW RANGE PRESS. (CH "C")	157A01C	Auxiliary	156'-0"	above	158'-0"		
6165	763-J-PY-0352A	WIDE RANGE PRESS. (CH "A")	157A01C	Auxiliary	156'-0"	above	158'-0"		
6166	763-J-PY-0352C	WIDE RANGE PRESS. (CH "C")	157A01C	Auxiliary	156'-0"	above	158'-0"		
6167	763-J-PY-0353A01	EXTENDED WIDE RANGE PRESS. (CH "A")	157A01C	Auxiliary	156'-0"	above	158'-0"		
6168	763-J-PY-0353A02	EXTENDED WIDE RANGE PRESS. (CH "A")	157A01C	Auxiliary	156'-0"	above	158'-0"		
6169	763-J-TY-0031A01	CNMT DOME TEMP.	157A01C	Auxiliary	156'-0"	above	158'-0"		
6170	633-V-1133A	I&C EQUIP RM(A) C-CLR Outlet VALVE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6171	633-V-1134A	I&C EQUIP RM(A) C-CLR Inlet throt VALVE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6172	633-V-2133A	I&C EQUIP RM(A) C-CLR Outlet PZR Test VALVE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6173	633-V-2134A	I&C EQUIP RM(A) C-CLR Inlet PZR Test VALVE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6174	633-V-2233A	I&C EQUIP RM HV16A ECW Outlet Vent VALVE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6175	633-V-2234A	I&C EQUIP RM HV16A ECW Inlet DRN VALVE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6176	633-V-2282A	I&C EQUIP RM HV16A ECW Outlet DRN VALVE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6177	633-V-2333A	I&CEQUIP RM HV16A ECW Outlet TestConn VALVE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6178	633-V-2334A	I&CEQUIP RM HV16A ECW Inlet TestConn VALVE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6179	633-V-2443A	I&C EQUIP RM HV16A ECW Outlet Vent VALVE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6180	633-V-2444A	I&C EQUIP RM HV16A ECW Inlet Vent VALVE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6181	633-V-2472A	I&C EQUIP RM CW16A Inlet Vent VALVE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6182	633-V-2473A	I&C EQUIP RM CW16A Inlet DRN VALVE	157A01C	Auxiliary	156'-0"	above	158'-0"		
6183	602-Y-VD-1525A	FIRE DAMPER	157A01C	Auxiliary	156'-0"	above	158'-0"		
6184	602-Y-VD-1529A	FIRE DAMPER	157A01C	Auxiliary	156'-0"	above	158'-0"		
6185	603-Y-VE-1178A	MANUAL DAMPER	157A01C	Auxiliary	156'-0"	above	158'-0"		
6186	603-Y-VE-1259A	MANUAL DAMPER	157A01C	Auxiliary	156'-0"	above	158'-0"		
6187	603-Y-VE-1676A	FIRE DAMPER	157A01C	Auxiliary	156'-0"	above	158'-0"		
6188	603-M-HV16B	CUBICLE COOLER	157A01D	Auxiliary	156'-0"	above	158'-0"	4" FD (1)	-

Table 3.4-2 (220 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6189	752-J-PA03B	ESF-CCS GROUP CONTROLLER CABINET (CH. BE)	157A01D	Auxiliary	156'-0"	above	158'-0"		
6190	752-J-PA04B	ITP/MTP CABINET (CH.BE)	157A01D	Auxiliary	156'-0"	above	158'-0"		
6191	752-J-PA14B	PPS CABINET CH.B-1	157A01D	Auxiliary	156'-0"	above	158'-0"		
6192	752-J-PA14D	PPS CABINET CH.D-1	157A01D	Auxiliary	156'-0"	above	158'-0"		
6193	752-J-PA15B	CPC CABINET CH.B	157A01D	Auxiliary	156'-0"	above	158'-0"		
6194	752-J-PA16B	QIAS-P CABINET CH.B	157A01D	Auxiliary	156'-0"	above	158'-0"		
6195	752-J-PA18B	APC CABINET CH.B	157A01D	Auxiliary	156'-0"	above	158'-0"		
6196	752-J-PA47B	BOP RMS CABINET (SRDC)	157A01D	Auxiliary	156'-0"	above	158'-0"		
6197	752-J-PA48B	ENFMS CABINET CH.B	157A01D	Auxiliary	156'-0"	above	158'-0"		
6198	752-J-PA48D	ENFMS CABINET CH.D	157A01D	Auxiliary	156'-0"	above	158'-0"		
6199	431-J-PDY-0115B	STM GEN. NO. 1 DIFF. PRESS. (PRIMARY SIDE)	157A01D	Auxiliary	156'-0"	above	158'-0"		
6200	431-J-PDY-0115D	STM GEN. NO. 1 DIFF. PRESS. (PRIMARY SIDE)	157A01D	Auxiliary	156'-0"	above	158'-0"		
6201	431-J-PDY-0125B	STM GEN. NO. 2 DIFF. PRESS. (PRIMARY SIDE)	157A01D	Auxiliary	156'-0"	above	158'-0"		
6202	431-J-PDY-0125D	STM GEN. NO. 2 DIFF. PRESS. (PRIMARY SIDE)	157A01D	Auxiliary	156'-0"	above	158'-0"		
6203	431-J-PY-0101B01	PZR PRESSURE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6204	431-J-PY-0101B02	PZR PRESSURE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6205	431-J-PY-0101B03	PZR PRESSURE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6206	431-J-PY-0101D03	PZR PRESSURE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6207	431-J-PY-0102B	PZR PRESSURE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6208	431-J-PY-0102D	PZR PRESSURE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6209	431-J-SY-0113B01	RCP 1A (PP01A) SPEED	157A01D	Auxiliary	156'-0"	above	158'-0"		
6210	431-J-SY-0113B02	RCP 1A (PP01A) SPEED	157A01D	Auxiliary	156'-0"	above	158'-0"		
6211	431-J-SY-0123B01	RCP 1B (PP01B) SPEED	157A01D	Auxiliary	156'-0"	above	158'-0"		
6212	431-J-SY-0123B02	RCP 1B (PP01B) SPEED	157A01D	Auxiliary	156'-0"	above	158'-0"		
6213	431-J-SY-0133B01	RCP 2A (PP02A) SPEED	157A01D	Auxiliary	156'-0"	above	158'-0"		
6214	431-J-SY-0133B02	RCP 2A (PP02A) SPEED	157A01D	Auxiliary	156'-0"	above	158'-0"		
6215	431-J-SY-0143B01	RCP 2B (PP02B) SPEED	157A01D	Auxiliary	156'-0"	above	158'-0"		
6216	431-J-SY-0143B02	RCP 2B (PP02B) SPEED	157A01D	Auxiliary	156'-0"	above	158'-0"		
6217	431-J-TY-0112B	HOT LEG TEMP FROM REACTOR TO SG1	157A01D	Auxiliary	156'-0"	above	158'-0"		
6218	431-J-TY-0113B	HOT LEG TEMP TO SG2	157A01D	Auxiliary	156'-0"	above	158'-0"		
6219	431-J-TY-0122B	LOOP 1B COLD LEG TEMP	157A01D	Auxiliary	156'-0"	above	158'-0"		
6220	431-J-TY-0123B	LOOP 2B COLD LEG TEMP	157A01D	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (221 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6221	431-J-TY-0132B	HOT LEG TEMP FROM REACTOR TO SG1	157A01D	Auxiliary	156'-0"	above	158'-0"		
6222	431-J-TY-0133B	HOT LEG TEMP TO SG2	157A01D	Auxiliary	156'-0"	above	158'-0"		
6223	431-J-TY-0142B	LOOP 1B COLD LEG TEMP	157A01D	Auxiliary	156'-0"	above	158'-0"		
6224	431-J-TY-0143B	LOOP 2B COLD LEG TEMP	157A01D	Auxiliary	156'-0"	above	158'-0"		
6225	441-J-FY-0321B01	SAFETY INJECTION LINE 2 FLOW	157A01D	Auxiliary	156'-0"	above	158'-0"		
6226	451-J-FY-0212B01	CHARGING LINE FLOW	157A01D	Auxiliary	156'-0"	above	158'-0"		
6227	542-J-FY-0048B03	AF FLOW TO SG 2	157A01D	Auxiliary	156'-0"	above	158'-0"		
6228	603-J-TE-0132B	I & C EQUIP RM B TEMP.	157A01D	Auxiliary	156'-0"	above	158'-0"		
6229	633-J-TW-0166	COOLING COIL VE-CW16B OUTLET	157A01D	Auxiliary	156'-0"	above	158'-0"		
6230	633-J-TW-0168	COOLING COIL VE-CW16B INLET	157A01D	Auxiliary	156'-0"	above	158'-0"		
6231	761-J-RR-0072B	MCR AIR INTAKE B	157A01D	Auxiliary	156'-0"	above	158'-0"		
6232	761-J-RR-0074B	MCR AIR INTAKE B	157A01D	Auxiliary	156'-0"	above	158'-0"		
6233	761-J-RR-0232B	CNMT OPERATING AREA	157A01D	Auxiliary	156'-0"	above	158'-0"		
6234	761-J-RR-0234B	CNMT OPERATING AREA	157A01D	Auxiliary	156'-0"	above	158'-0"		
6235	761-J-RR-0242B	SPENT FUEL POOL AREA	157A01D	Auxiliary	156'-0"	above	158'-0"		
6236	763-J-PY-0351B	NARROW RANGE PRESS. (CH "B")	157A01D	Auxiliary	156'-0"	above	158'-0"		
6237	763-J-PY-0351D	NARROW RANGE PRESS. (CH "D")	157A01D	Auxiliary	156'-0"	above	158'-0"		
6238	763-J-PY-0352B	WIDE RANGE PRESS. (CH "B")	157A01D	Auxiliary	156'-0"	above	158'-0"		
6239	763-J-PY-0352D	WIDE RANGE PRESS. (CH "D")	157A01D	Auxiliary	156'-0"	above	158'-0"		
6240	763-J-PY-0353B	EXTENDED WIDE RANGE PRESS. (CH "B")	157A01D	Auxiliary	156'-0"	above	158'-0"		
6241	633-V-1133B	I&C EQUIP RM(B) C-CLR Outlet VALVE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6242	633-V-1134B	I&C EQUIP RM(B) C-CLR Inlet throt VALVE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6243	633-V-2133B	I&C EQUIP RM(B) C-CLR Outlet PZR Test VALVE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6244	633-V-2134B	I&C EQUIP RM(B) C-CLR Inlet PZR Test VALVE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6245	633-V-2233B	I&C EQUIP RM HV16B ECW Outlet Vent VALVE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6246	633-V-2234B	I&C EQUIP RM HV16B ECW Inlet DRN VALVE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6247	633-V-2282B	I&C EQUIP RM HV16B ECW Outlet DRN VALVE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6248	633-V-2333B	I&CEQUIP RM HV16B ECW Outlet TestConn VALVE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6249	633-V-2334B	I&CEQUIP RM HV16B ECW Inlet TestConn VALVE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6250	633-V-2452B	I&C EQUIP RM CW16B Outlet Vent VALVE	157A01D	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (222 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6251	633-V-2453B	I&C EQUIP RM CW16B Inlet Vent VALVE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6252	633-V-2456B	I&C EQUIP RM CW16B Inlet Vent VALVE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6253	633-V-2457B	I&C EQUIP RM CW16B Inlet DRN VALVE	157A01D	Auxiliary	156'-0"	above	158'-0"		
6254	602-Y-VD-1525B	FIRE DAMPER	157A01D	Auxiliary	156'-0"	above	158'-0"		
6255	602-Y-VD-1529B	FIRE DAMPER	157A01D	Auxiliary	156'-0"	above	158'-0"		
6256	603-Y-VE-1178B	MANUAL DAMPER	157A01D	Auxiliary	156'-0"	above	158'-0"		
6257	603-Y-VE-1259B	MANUAL DAMPER	157A01D	Auxiliary	156'-0"	above	158'-0"		
6258	603-Y-VE-1676B	FIRE DAMPER	157A01D	Auxiliary	156'-0"	above	158'-0"		
6259	603-Y-VE-1680B	FIRE DAMPER	157A01D	Auxiliary	156'-0"	above	158'-0"		
6260	601-J-PDT-0149C	TSC OFFICE ENVELPOE PRESSURE-CH.A	157A02C	Auxiliary	156'-0"	above	158'-0"	4" FD (1)	-
6261	601-J-PDT-0150D	TSC OFFICE ENVELPOE PRESSURE-CH.B	157A02C	Auxiliary	156'-0"	above	158'-0"		
6262	601-Y-VC-1035	MANUAL DAMPER	157A02C	Auxiliary	156'-0"	above	158'-0"		
6263	601-Y-VC-1508	FIRE DAMPER	157A02C	Auxiliary	156'-0"	above	158'-0"		
6264	601-Y-VC-1520	FIRE DAMPER	157A02C	Auxiliary	156'-0"	above	158'-0"		
6265	601-Y-VC-1566	FIRE DAMPER	157A02C	Auxiliary	156'-0"	above	158'-0"		
6266	601-Y-VC-1042	MANUAL DAMPER	157A03C	Auxiliary	156'-0"	above	158'-0"		
6267	601-Y-VC-1020	MANUAL DAMPER	157A04C	Auxiliary	156'-0"	above	158'-0"		
6268	601-Y-VC-1049	MANUAL DAMPER	157A04C	Auxiliary	156'-0"	above	158'-0"		
6269	601-Y-VC-1021	MANUAL DAMPER	157A05C	Auxiliary	156'-0"	above	158'-0"		
6270	431-J-HS-0130A02	PZR POSRV MOTOR OPERATED PILOT VALVE V130	157A06D	Auxiliary	156'-0"	above	158'-0"		
6271	431-J-HS-0131C02	PZR POSRV MOTOR OPERATED PILOT VALVE V131	157A06D	Auxiliary	156'-0"	above	158'-0"		
6272	431-J-HS-0132A02	PZR POSRV MOTOR OPERATED PILOT VALVE V132	157A06D	Auxiliary	156'-0"	above	158'-0"		
6273	431-J-HS-0133C02	PZR POSRV MOTOR OPERATED PILOT VALVE V133	157A06D	Auxiliary	156'-0"	above	158'-0"		
6274	431-J-HS-0134B02	PZR POSRV MOTOR OPERATED PILOT VALVE V134	157A06D	Auxiliary	156'-0"	above	158'-0"		
6275	431-J-HS-0135D02	PZR POSRV MOTOR OPERATED PILOT VALVE V135	157A06D	Auxiliary	156'-0"	above	158'-0"		
6276	431-J-HS-0136B02	PZR POSRV MOTOR OPERATED PILOT VALVE V136	157A06D	Auxiliary	156'-0"	above	158'-0"		
6277	431-J-HS-0137D02	PZR POSRV MOTOR OPERATED PILOT VALVE V137	157A06D	Auxiliary	156'-0"	above	158'-0"		
6278	433-J-HS-0410A02	REACTOR CLNT GAS PZR VENT ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (223 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6279	433-J-HS-0411B02	REACTOR CLNT GAS PZR VENT ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6280	433-J-HS-0412C02	REACTOR CLNT GAS PZR VENT ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6281	433-J-HS-0413D02	REACTOR CLNT GAS PZR VENT ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6282	433-J-HS-0414A02	REACTOR HEAD VENT ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6283	433-J-HS-0415B02	REACTOR HEAD VENT ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6284	433-J-HS-0416C02	REACTOR HEAD VENT ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6285	433-J-HS-0417D02	REACTOR HEAD VENT ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6286	433-J-HS-0419B02	REACTOR CLNT GAS VENT TO ATM ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6287	433-J-HS-0420A02	REACTOR CLNT GAS VENT TO RDT ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6288	441-J-HS-0034B02	SAFETY INJECTION PUMP PP01B	157A06D	Auxiliary	156'-0"	above	158'-0"		
6289	441-J-HS-0036D02	SAFETY INJECTION PUMP PP01D	157A06D	Auxiliary	156'-0"	above	158'-0"		
6290	441-J-HS-0042B02	SHUTDOWN COOLING PUMP 2B	157A06D	Auxiliary	156'-0"	above	158'-0"		
6291	441-J-HS-0311B02	SDCHX DISCHARGE ISO. AND THROTTLE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6292	441-J-HS-0313B02	SDCHX BYPASS FLOW CONTROL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6293	441-J-HS-0321C02	SI HOT INJECTION	157A06D	Auxiliary	156'-0"	above	158'-0"		
6294	441-J-HS-0331D02	SI HOT INJECTION	157A06D	Auxiliary	156'-0"	above	158'-0"		
6295	441-J-HS-0342D02	CS PUMP/SC PUMP SUCTION CROSS CONNECT	157A06D	Auxiliary	156'-0"	above	158'-0"		
6296	441-J-HS-0343B02	CS PUMP/SC PUMP DSCH. CROSS CONNECT	157A06D	Auxiliary	156'-0"	above	158'-0"		
6297	441-J-HS-0600B02	SDC DVI 2B ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6298	441-J-HS-0601A02	SDC DVI 1A ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6299	441-J-HS-0609D02	SIP HOT LEG INJ ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6300	441-J-HS-0616D02	SI LINE ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6301	441-J-HS-0626B02	SI LINE ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6302	441-J-HS-0636C02	SI LINE ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6303	441-J-HS-0646A02	SI LINE ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6304	441-J-HS-0651A02	SDC SUCTION LINE ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6305	441-J-HS-0652B02	SDC SUCTION LINE ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6306	441-J-HS-0653C02	SDC SUCTION LINE ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6307	441-J-HS-0654D02	SDC SUCTION LINE ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6308	441-J-HS-0655A02	SDC SUCTION LINE ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (224 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6309	441-J-HS-0656B02	SDC SUCTION LINE ISO VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6310	442-J-HS-0003C02	CONTAINMENT SPRAY HEADER ISO VALVE V003 CTRL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6311	442-J-HS-0004D02	CONTAINMENT SPRAY HEADER ISO VALVE V004 CTRL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6312	442-J-HS-0017C02	CONTAINMENT SPRAY PUMP PP01A CTRL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6313	442-J-HS-0018D02	CONTAINMENT SPRAY PUMPS PP02A CTRL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6314	451-J-HS-0001A02	CHARGING PUMPS PP01A & PP01B	157A06D	Auxiliary	156'-0"	above	158'-0"		
6315	451-J-HS-0002B02	CHARGING PUMPS PP01A & PP01B	157A06D	Auxiliary	156'-0"	above	158'-0"		
6316	451-J-HS-0003A02	AUXILIARY CHARGING PUMP PP03 HAND SWITCH	157A06D	Auxiliary	156'-0"	above	158'-0"		
6317	451-J-HS-0003B02	AUXILIARY CHARGING PIMP PP03	157A06D	Auxiliary	156'-0"	above	158'-0"		
6318	451-J-HS-0203B02	PZR AUX SPRAY VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6319	451-J-HS-0501A02	VOLUME CONTROL TANK DISCHARGE ISO	157A06D	Auxiliary	156'-0"	above	158'-0"		
6320	451-J-HS-0504B02	VOLUME CONTROL TANK DISCHARGE ISO	157A06D	Auxiliary	156'-0"	above	158'-0"		
6321	451-J-HS-0534B02	BAST GRAVITY	157A06D	Auxiliary	156'-0"	above	158'-0"		
6322	451-J-HS-0536A02	BAST GRAVITY	157A06D	Auxiliary	156'-0"	above	158'-0"		
6323	461-J-HS-0001A02	CCW PUMP PP01A CTRL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6324	461-J-HS-0001B02	CCW PUMP PP01B CTRL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6325	461-J-HS-0002C02	CCW PUMP PP02A CTRL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6326	461-J-HS-0002D02	CCW PUMP PP02B CTRL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6327	461-J-HS-0351A02	SHUTDOWN COOLING HX A & B INLET ISO VALVE V351 CTRL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6328	461-J-HS-0352B02	SHUTDOWN COOLING HX A & B INLET ISO VALVE V352 CTRL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6329	462-J-HS-0001A02	ESW PUMP PP01A CONTROL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6330	462-J-HS-0002B02	ESW PUMP PP01B CONTROL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6331	462-J-HS-0003C02	ESW PUMP PP02A CONTROL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6332	462-J-HS-0004D02	ESW PUMP PP02B CONTROL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6333	521-J-HIK-0101B02	SG 1 MSADV (101)	157A06D	Auxiliary	156'-0"	above	158'-0"		
6334	521-J-HIK-0102A02	SG 1 MSADV (102)	157A06D	Auxiliary	156'-0"	above	158'-0"		
6335	521-J-HIK-0103A02	SG 2 MSADV (103)	157A06D	Auxiliary	156'-0"	above	158'-0"		
6336	521-J-HIK-0104B02	SG 2 MSADV (104)	157A06D	Auxiliary	156'-0"	above	158'-0"		
6337	521-J-HS-0101B02	MSADV (101) CTRL SW	157A06D	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (225 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6338	521-J-HS-0101D02	MSADV (101) CTRL SW	157A06D	Auxiliary	156'-0"	above	158'-0"		
6339	521-J-HS-0102A02	MSADV (102) CTRL SW	157A06D	Auxiliary	156'-0"	above	158'-0"		
6340	521-J-HS-0102C02	MSADV (102) CTRL SW	157A06D	Auxiliary	156'-0"	above	158'-0"		
6341	521-J-HS-0103A02	MSADV (103) CTRL SW	157A06D	Auxiliary	156'-0"	above	158'-0"		
6342	521-J-HS-0103C02	MSADV (103) CTRL SW	157A06D	Auxiliary	156'-0"	above	158'-0"		
6343	521-J-HS-0104B02	MSADV (104) CTRL SW	157A06D	Auxiliary	156'-0"	above	158'-0"		
6344	521-J-HS-0104D02	MSADV (104) CTRL SW	157A06D	Auxiliary	156'-0"	above	158'-0"		
6345	521-J-HS-0109A02	AUX. FWP.TBN STEAM SUPPLY VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6346	521-J-HS-0110B02	AFW PUMP TBN STM SUPPLY VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6347	527-J-HS-0009C02	STEAM SUPPLY ISOATION VALVE SOFT CONTROL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6348	527-J-HS-0010D02	STEAM SUPPLY ISOATION VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6349	527-J-HS-0017C02	AF PUMP TBN TA01A CONTROL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6350	527-J-HS-0018D02	AF PUMP TBN TA01B CONTROL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6351	542-J-HIK-0035A	AF PP02A DSCH FLOW TO SG 1	157A06D	Auxiliary	156'-0"	above	158'-0"		
6352	542-J-HIK-0038B	AF PP02B DSCH FLOW TO SG 2	157A06D	Auxiliary	156'-0"	above	158'-0"		
6353	542-J-HS-0002A02	AF MOTOR DRIVEN PUMP PP02A CONTROL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6354	542-J-HS-0002B02	AF MOTOR DRIVEN PUMP PP02B CONTROL	157A06D	Auxiliary	156'-0"	above	158'-0"		
6355	542-J-HS-0035A02	AF MODULATING VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6356	542-J-HS-0035A03	SD/DC TO DMA TRANSFER SW	157A06D	Auxiliary	156'-0"	above	158'-0"		
6357	542-J-HS-0036B02	AF MODULATING VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6358	542-J-HS-0037A02	AF MODULATING VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6359	542-J-HS-0038B02	AF MODULATING VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6360	542-J-HS-0038B03	SC/DC TO DMA TRANSFER SW	157A06D	Auxiliary	156'-0"	above	158'-0"		
6361	542-J-HS-0043A02	AF ISOATION VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6362	542-J-HS-0044C02	AF ISOATION VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6363	542-J-HS-0045D02	AF ISOATION VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6364	542-J-HS-0046B02	AF ISOATION VALVE	157A06D	Auxiliary	156'-0"	above	158'-0"		
6365	542-J-HY-0035A	AF PP02A DISCH. FLOW TO SG 1	157A06D	Auxiliary	156'-0"	above	158'-0"		
6366	542-J-HY-0038B	AF PP02B DISCH. FLOW TO SG 2	157A06D	Auxiliary	156'-0"	above	158'-0"		
6367	542-J-LIK-0035A02	AF PP02A DISCH. FLOW TO SG 1	157A06D	Auxiliary	156'-0"	above	158'-0"		
6368	542-J-LIK-0036B02	AF PP01A DISCH. FLOW TO SG 1	157A06D	Auxiliary	156'-0"	above	158'-0"		
6369	542-J-LIK-0037A02	AF PP01B DISCH. FLOW TO SG 2	157A06D	Auxiliary	156'-0"	above	158'-0"		
6370	542-J-LIK-0038B02	AF PP02B DISCH. FLOW TO SG 2	157A06D	Auxiliary	156'-0"	above	158'-0"		
6371	591-J-HS-0105C03	EDG EMERGENCY STOP(DC)	157A06D	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (226 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6372	591-J-HS-0105C04	EDG EMERGENCY START(DC)	157A06D	Auxiliary	156'-0"	above	158'-0"		
6373	591-J-HS-0205D03	EDG EMERGENCY STOP (DC)	157A06D	Auxiliary	156'-0"	above	158'-0"		
6374	591-J-HS-0205D04	EDG EMERGENCY START (DC)	157A06D	Auxiliary	156'-0"	above	158'-0"		
6375	601-J-HS-0001C02	CTRL RM SUPPLY AHU FANS AH01A	157A06D	Auxiliary	156'-0"	above	158'-0"		
6376	601-J-HS-0002D02	CTRL RM SUPPLY AHU FANS AH01B	157A06D	Auxiliary	156'-0"	above	158'-0"		
6377	601-J-HS-0005C02	CTRL RM EMRG MAKEUP ACU FANS AH02A	157A06D	Auxiliary	156'-0"	above	158'-0"		
6378	601-J-HS-0006D02	CTRL RM EMRG MAKEUP ACU FANS AH02B	157A06D	Auxiliary	156'-0"	above	158'-0"		
6379	633-J-HS-0009A02	ESSENTIAL CHILLED WATER PUMP PP01A HAND SWITCH	157A06D	Auxiliary	156'-0"	above	158'-0"		
6380	633-J-HS-0010B02	ESSENTIAL CHILLED WATER PUMP PP01B HAND SWITCH	157A06D	Auxiliary	156'-0"	above	158'-0"		
6381	633-J-HS-0011C02	ESSENTIAL CHILLED WATER PUMP PP02A HAND SWITCH	157A06D	Auxiliary	156'-0"	above	158'-0"		
6382	633-J-HS-0012D02	ESSENTIAL CHILLED WATER PUMP PP02B HAND SWITCH	157A06D	Auxiliary	156'-0"	above	158'-0"		
6383	633-J-ZL-0009A	ENSSENTIAL CHILLER CH01A COMP MOTOR	157A06D	Auxiliary	156'-0"	above	158'-0"		
6384	633-J-ZL-0011C	ENSSENTIAL CHILLER CH02A COMP MOTOR	157A06D	Auxiliary	156'-0"	above	158'-0"		
6385	601-Y-VC-1548	SMOKE DAMPER	157A06D	Auxiliary	156'-0"	above	158'-0"		
6386	601-Y-VC-1560	FIRE DAMPER	157A06D	Auxiliary	156'-0"	above	158'-0"		
6387	601-Y-VC-1039	MANUAL DAMPER	157A07C	Auxiliary	156'-0"	above	158'-0"		
6388	601-Y-VC-1040	MANUAL DAMPER	157A07C	Auxiliary	156'-0"	above	158'-0"		
6389	601-Y-VC-1547	SMOKE DAMPER	157A08D	Auxiliary	156'-0"	above	158'-0"		
6390	601-Y-VC-1558	FIRE DAMPER	157A08D	Auxiliary	156'-0"	above	158'-0"		
6391	601-Y-VC-1017	MANUAL DAMPER	157A09C	Auxiliary	156'-0"	above	158'-0"	4" FD (1)	-
6392	601-Y-VC-1018	MANUAL DAMPER	157A09C	Auxiliary	156'-0"	above	158'-0"		
6393	601-Y-VC-1031	MANUAL DAMPER	157A09C	Auxiliary	156'-0"	above	158'-0"		
6394	601-Y-VC-1032	MANUAL DAMPER	157A09C	Auxiliary	156'-0"	above	158'-0"		
6395	601-Y-VC-1036	MANUAL DAMPER	157A09C	Auxiliary	156'-0"	above	158'-0"		
6396	601-Y-VC-1518	FIRE DAMPER	157A09C	Auxiliary	156'-0"	above	158'-0"		
6397	601-Y-VC-1519	FIRE DAMPER	157A09C	Auxiliary	156'-0"	above	158'-0"		
6398	601-Y-VC-1060	MANUAL DAMPER	157A10C	Auxiliary	156'-0"	above	158'-0"		
6399	601-Y-VC-1025	MANUAL DAMPER	157A11D	Auxiliary	156'-0"	above	158'-0"		
6400	601-Y-VC-1026	MANUAL DAMPER	157A11D	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (227 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6401	751-J-PM01	RO CONSOLE (FRAME)	157A12C	Auxiliary	156'-0"	above	158'-0"	4" FD (2)	-
6402	751-J-PM02	TO/EO CONSOLE (FRAME)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6403	751-J-PM03	SS CONSOLE (FRAME)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6404	751-J-PM04	STA CONSOLE (FRAME)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6405	751-J-PM05	SAFETY CONSOLE (FRAME)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6406	431-J-HS-0120A01	PZR POSRV MOTOR OPERATED ISOATION VALVE V120	157A12C	Auxiliary	156'-0"	above	158'-0"		
6407	431-J-HS-0121C01	PZR POSRV MOTOR OPERATED ISOATION VALVE V121	157A12C	Auxiliary	156'-0"	above	158'-0"		
6408	431-J-HS-0122A01	PZR POSRV MOTOR OPERATED ISOATION VALVE V122	157A12C	Auxiliary	156'-0"	above	158'-0"		
6409	431-J-HS-0123C01	PZR POSRV MOTOR OPERATED ISOATION VALVE V123	157A12C	Auxiliary	156'-0"	above	158'-0"		
6410	431-J-HS-0124B01	PZR POSRV MOTOR OPERATED ISOATION VALVE V124	157A12C	Auxiliary	156'-0"	above	158'-0"		
6411	431-J-HS-0125D01	PZR POSRV MOTOR OPERATED ISOATION VALVE V125	157A12C	Auxiliary	156'-0"	above	158'-0"		
6412	431-J-HS-0126B01	PZR POSRV MOTOR OPERATED ISOATION VALVE V126	157A12C	Auxiliary	156'-0"	above	158'-0"		
6413	431-J-HS-0127D01	PZR POSRV MOTOR OPERATED ISOATION VALVE V127	157A12C	Auxiliary	156'-0"	above	158'-0"		
6414	431-J-HS-0130A01	PZR POSRV MOTOR OPERATED PILOT VALVE V130	157A12C	Auxiliary	156'-0"	above	158'-0"		
6415	431-J-HS-0131C01	PZR POSRV MOTOR OPERATED PILOT VALVE V131	157A12C	Auxiliary	156'-0"	above	158'-0"		
6416	431-J-HS-0132A01	PZR POSRV MOTOR OPERATED PILOT VALVE V132	157A12C	Auxiliary	156'-0"	above	158'-0"		
6417	431-J-HS-0133C01	PZR POSRV MOTOR OPERATED PILOT VALVE V133	157A12C	Auxiliary	156'-0"	above	158'-0"		
6418	431-J-HS-0134B01	PZR POSRV MOTOR OPERATED PILOT VALVE V134	157A12C	Auxiliary	156'-0"	above	158'-0"		
6419	431-J-HS-0135D01	PZR POSRV MOTOR OPERATED PILOT VALVE V135	157A12C	Auxiliary	156'-0"	above	158'-0"		
6420	431-J-HS-0136B01	PZR POSRV MOTOR OPERATED PILOT VALVE V136	157A12C	Auxiliary	156'-0"	above	158'-0"		
6421	431-J-HS-0137D01	PZR POSRV MOTOR OPERATED PILOT VALVE V137	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (228 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6422	431-J-HS-0385C	POSRV BRANCH OFF VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6423	431-J-HS-0386D	POSRV BRANCH OFF VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6424	431-J-LR-0110A	PZR LEVEL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6425	431-J-LR-0110B	PZR LEVEL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6426	431-J-ZL-0200A	POSRV V200	157A12C	Auxiliary	156'-0"	above	158'-0"		
6427	431-J-ZL-0201C	POSRV V201	157A12C	Auxiliary	156'-0"	above	158'-0"		
6428	431-J-ZL-0202B	POSRV V202	157A12C	Auxiliary	156'-0"	above	158'-0"		
6429	431-J-ZL-0203D	POSRV V203	157A12C	Auxiliary	156'-0"	above	158'-0"		
6430	431-J-ZL-0300A	POSRV V200 ISO. VALVE V300	157A12C	Auxiliary	156'-0"	above	158'-0"		
6431	431-J-ZL-0301C	POSRV V200 ISO. VALVE V301	157A12C	Auxiliary	156'-0"	above	158'-0"		
6432	431-J-ZL-0302A	POSRV V201 ISO. VALVE V302	157A12C	Auxiliary	156'-0"	above	158'-0"		
6433	431-J-ZL-0303C	POSRV V201 ISO. VALVE V303	157A12C	Auxiliary	156'-0"	above	158'-0"		
6434	431-J-ZL-0304B	POSRV V202 ISO. VALVE V304	157A12C	Auxiliary	156'-0"	above	158'-0"		
6435	431-J-ZL-0305D	POSRV V202 ISO. VALVE V305	157A12C	Auxiliary	156'-0"	above	158'-0"		
6436	431-J-ZL-0306B	POSRV V203 ISO. VALVE V306	157A12C	Auxiliary	156'-0"	above	158'-0"		
6437	431-J-ZL-0307D	POSRV V203 ISO. VALVE V307	157A12C	Auxiliary	156'-0"	above	158'-0"		
6438	431-J-ZL-0310A	POSRV V200 ISO. VALVE V300	157A12C	Auxiliary	156'-0"	above	158'-0"		
6439	431-J-ZL-0311C	POSRV V200 ISO. VALVE V301	157A12C	Auxiliary	156'-0"	above	158'-0"		
6440	431-J-ZL-0312A	POSRV V201 ISO. VALVE V302	157A12C	Auxiliary	156'-0"	above	158'-0"		
6441	431-J-ZL-0313C	POSRV V201 ISO. VALVE V303	157A12C	Auxiliary	156'-0"	above	158'-0"		
6442	431-J-ZL-0314B	POSRV V202 ISO. VALVE V304	157A12C	Auxiliary	156'-0"	above	158'-0"		
6443	431-J-ZL-0315D	POSRV V202 ISO. VALVE V305	157A12C	Auxiliary	156'-0"	above	158'-0"		
6444	431-J-ZL-0316B	POSRV V203 ISO. VALVE V306	157A12C	Auxiliary	156'-0"	above	158'-0"		
6445	431-J-ZL-0317D	POSRV V203 ISO. VALVE V307	157A12C	Auxiliary	156'-0"	above	158'-0"		
6446	433-J-HS-0410A01	REACTOR CLNT GAS PZR VENT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6447	433-J-HS-0411B01	REACTOR CLNT GAS PZR VENT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6448	433-J-HS-0412C01	REACTOR CLNT GAS PZR VENT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6449	433-J-HS-0413D01	REACTOR CLNT GAS PZR VENT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6450	433-J-HS-0414A01	REACTOR HEAD VENT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6451	433-J-HS-0415B01	REACTOR HEAD VENT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6452	433-J-HS-0416C01	REACTOR HEAD VENT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6453	433-J-HS-0417D01	REACTOR HEAD VENT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (229 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6454	433-J-HS-0419B01	REACTOR CLNT GAS VENT TO ATM ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6455	433-J-HS-0420A01	REACTOR CLNT GAS VENT TO RDT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6456	441-J-FI-0302A	SCP FLOW RATE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6457	441-J-FI-0305B	SCP FLOW RATE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6458	441-J-FI-0311D	SCP DVI FLOW RATE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6459	441-J-FI-0321B	SCP DVI FLOW RATE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6460	441-J-FI-0331C	SCP DVI FLOW RATE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6461	441-J-FI-0341A	SCP DVI FLOW RATE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6462	441-J-FI-0390C	SI HOT LEG INJECTION FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6463	441-J-FI-0391D	SI HOT LEG INJECTION FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6464	441-J-HS-0033A01	SAFETY INJECTION PUMP PP01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6465	441-J-HS-0033A02	SAFETY INJECTION PUMP PP01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6466	441-J-HS-0034B01	SAFETY INJECTION PUMP PP01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6467	441-J-HS-0035C01	SAFETY INJECTION PUMP PP01C	157A12C	Auxiliary	156'-0"	above	158'-0"		
6468	441-J-HS-0035C02	SAFETY INJECTION PUMP PP01C	157A12C	Auxiliary	156'-0"	above	158'-0"		
6469	441-J-HS-0036D01	SAFETY INJECTION PUMP PP01D	157A12C	Auxiliary	156'-0"	above	158'-0"		
6470	441-J-HS-0041A01	SHUTDOWN COOLING PUMP 2A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6471	441-J-HS-0041A02	SHUTDOWN COOLING PUMP 2A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6472	441-J-HS-0042B01	SHUTDOWN COOLING PUMP 2B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6473	441-J-HS-0300A	IRWS RETURN LINE ISOATION	157A12C	Auxiliary	156'-0"	above	158'-0"		
6474	441-J-HS-0301B	IRWS RETURN LINE ISOATION	157A12C	Auxiliary	156'-0"	above	158'-0"		
6475	441-J-HS-0302A	SI PUMP LINE ISO. VALVE TO IRWST	157A12C	Auxiliary	156'-0"	above	158'-0"		
6476	441-J-HS-0303B	SI PUMP LINE ISO. VALVE TO IRWST	157A12C	Auxiliary	156'-0"	above	158'-0"		
6477	441-J-HS-0304A	IRWST ISOATION	157A12C	Auxiliary	156'-0"	above	158'-0"		
6478	441-J-HS-0305B	IRWST ISOATION	157A12C	Auxiliary	156'-0"	above	158'-0"		
6479	441-J-HS-0308C	IRWST ISOATION	157A12C	Auxiliary	156'-0"	above	158'-0"		
6480	441-J-HS-0309D	SIT FILL AND DRAIN	157A12C	Auxiliary	156'-0"	above	158'-0"		
6481	441-J-HS-0310A01	SDCHX DISCHARGE ISO. AND THROTTLE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6482	441-J-HS-0310A02	SDCHX DISCHARGE ISO. AND THROTTLE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6483	441-J-HS-0311B01	SDCHX DISCHARGE ISO. AND THROTTLE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6484	441-J-HS-0312A01	SDCHX BYPASS FLOW CONTROL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6485	441-J-HS-0312A02	SDCHX BYPASS FLOW CONTROL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6486	441-J-HS-0313B01	SDCHX BYPASS FLOW CONTROL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6487	441-J-HS-0314A	SCS TEST RETURN ISOATION	157A12C	Auxiliary	156'-0"	above	158'-0"		
6488	441-J-HS-0315B	SCS WARMUP LINE FOLW CONTROL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6489	441-J-HS-0321C01	SI HOT INJECTION	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (230 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6490	441-J-HS-0322C	HOT LEG CHECK VALVE LEAKAGE ISO	157A12C	Auxiliary	156'-0"	above	158'-0"		
6491	441-J-HS-0331D01	SI HOT INJECTION	157A12C	Auxiliary	156'-0"	above	158'-0"		
6492	441-J-HS-0332D	HOT LEG CHECK VALVE LEAKAGE ISO	157A12C	Auxiliary	156'-0"	above	158'-0"		
6493	441-J-HS-0340C01	CS PUMP/SC PUMP SUCTION CROSS CONNECT	157A12C	Auxiliary	156'-0"	above	158'-0"		
6494	441-J-HS-0340C02	CS PUMP/SC PUMP SUCTION CROSS CONNECT	157A12C	Auxiliary	156'-0"	above	158'-0"		
6495	441-J-HS-0341A01	CS PUMP/SC PUMP DISCH. CROSS CONNECT	157A12C	Auxiliary	156'-0"	above	158'-0"		
6496	441-J-HS-0341A02	CS PUMP/SC PUMP DISCH. CROSS CONNECT	157A12C	Auxiliary	156'-0"	above	158'-0"		
6497	441-J-HS-0342D01	CS PUMP/SC PUMP SUCTION CROSS CONNECT	157A12C	Auxiliary	156'-0"	above	158'-0"		
6498	441-J-HS-0343B01	CS PUMP/SC PUMP DSCH. CROSS CONNECT	157A12C	Auxiliary	156'-0"	above	158'-0"		
6499	441-J-HS-0344A	SI PUMP/SC PUMP SUCTION CROSS CONNECTION	157A12C	Auxiliary	156'-0"	above	158'-0"		
6500	441-J-HS-0346B	SI PUMP/SC PUMP SUCTION CROSS CONNECTION	157A12C	Auxiliary	156'-0"	above	158'-0"		
6501	441-J-HS-0347C	IRWST ISOATION	157A12C	Auxiliary	156'-0"	above	158'-0"		
6502	441-J-HS-0348D	SAFETY INJECTION TANK FILL LINE ISO.	157A12C	Auxiliary	156'-0"	above	158'-0"		
6503	441-J-HS-0391A01	ERVC INJECTION ISO. VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6504	441-J-HS-0393A01	ERVC INJECTION ISO. VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6505	441-J-HS-0395A01	IRWST RETURN LINE ISO.	157A12C	Auxiliary	156'-0"	above	158'-0"		
6506	441-J-HS-0600B01	SDC DVI 2B ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6507	441-J-HS-0601A01	SDC DVI 1A ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6508	441-J-HS-0602B	SI LOW FLOW CONTROL BYPASS	157A12C	Auxiliary	156'-0"	above	158'-0"		
6509	441-J-HS-0603A	SI LOW FLOW CONTROL BYPASS	157A12C	Auxiliary	156'-0"	above	158'-0"		
6510	441-J-HS-0604C01	SIP HOT LEG INJ ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6511	441-J-HS-0604C02	SIP HOT LEG INJ ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6512	441-J-HS-0605C	SAFETY INJECTION TANK ATMOSPERIC VENT	157A12C	Auxiliary	156'-0"	above	158'-0"		
6513	441-J-HS-0606A	SAFETY INJECTION TANK ATMOSPERIC VENT	157A12C	Auxiliary	156'-0"	above	158'-0"		
6514	441-J-HS-0607C	SAFETY INJECTION TANK ATMOSPERIC VENT	157A12C	Auxiliary	156'-0"	above	158'-0"		
6515	441-J-HS-0608A	SAFETY INJECTION TANK ATMOSPERIC VENT	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (231 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6516	441-J-HS-0609D01	SIP HOT LEG INJ ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6517	441-J-HS-0611D	SIT FILL AND DRAIN	157A12C	Auxiliary	156'-0"	above	158'-0"		
6518	441-J-HS-0612D	SAFETY INJECTION TANK NITROGEN SUPPLY	157A12C	Auxiliary	156'-0"	above	158'-0"		
6519	441-J-HS-0613D	SAFETY INJECTION TANK ATMOSPERIC VENT	157A12C	Auxiliary	156'-0"	above	158'-0"		
6520	441-J-HS-0614D01	SIT ISOATION	157A12C	Auxiliary	156'-0"	above	158'-0"		
6521	441-J-HS-0616D01	SI LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6522	441-J-HS-0618D	CHECK VALVE LEAKAGE LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6523	441-J-HS-0619C	SAFETY INJECTION TANK NITROGEN SUPPLY	157A12C	Auxiliary	156'-0"	above	158'-0"		
6524	441-J-HS-0621B	SIT FILL AND DRAIN	157A12C	Auxiliary	156'-0"	above	158'-0"		
6525	441-J-HS-0622B	SAFETY INJECTION TANK NITROGEN SUPPLY	157A12C	Auxiliary	156'-0"	above	158'-0"		
6526	441-J-HS-0623B	SAFETY INJECTION TANK ATMOSPERIC VENT	157A12C	Auxiliary	156'-0"	above	158'-0"		
6527	441-J-HS-0624B01	SIT ISOATION	157A12C	Auxiliary	156'-0"	above	158'-0"		
6528	441-J-HS-0626B01	SI LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6529	441-J-HS-0628B	CHECK VALVE LEAKAGE LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6530	441-J-HS-0629A	SAFETY INJECTION TANK NITROGEN SUPPLY	157A12C	Auxiliary	156'-0"	above	158'-0"		
6531	441-J-HS-0631C	SIT FILL AND DRAIN	157A12C	Auxiliary	156'-0"	above	158'-0"		
6532	441-J-HS-0632C	SAFETY INJECTION TANK NITROGEN SUPPLY	157A12C	Auxiliary	156'-0"	above	158'-0"		
6533	441-J-HS-0633D	SAFTY INJECTION TANK ATMOSPERIC VENT	157A12C	Auxiliary	156'-0"	above	158'-0"		
6534	441-J-HS-0634C01	SIT ISOATION	157A12C	Auxiliary	156'-0"	above	158'-0"		
6535	441-J-HS-0636C01	SI LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6536	441-J-HS-0638C	CHECK VALVE LEAKAGE LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6537	441-J-HS-0639D	SAFETY INJECTION TANK NITROGEN SUPPLY	157A12C	Auxiliary	156'-0"	above	158'-0"		
6538	441-J-HS-0641A	SIT FILL AND DRAIN	157A12C	Auxiliary	156'-0"	above	158'-0"		
6539	441-J-HS-0642B	SAFETY INJECTION TANK NITROGEN SUPPLY	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (232 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6540	441-J-HS-0643B	SAFETY INJECTION TANK ATMOSPERIC VENT	157A12C	Auxiliary	156'-0"	above	158'-0"		
6541	441-J-HS-0644A01	SIT ISOATION	157A12C	Auxiliary	156'-0"	above	158'-0"		
6542	441-J-HS-0646A01	SI LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6543	441-J-HS-0648A	CHECK VALVE LEAKAGE LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6544	441-J-HS-0649A	SAFETY INJECTION TANK NITROGEN SUPPLY	157A12C	Auxiliary	156'-0"	above	158'-0"		
6545	441-J-HS-0651A01	SCS SUCTION LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6546	441-J-HS-0652B01	SCS SUCTION LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6547	441-J-HS-0653C01	SCS SUCTION LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6548	441-J-HS-0654D01	SCS SUCTION LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6549	441-J-HS-0655A01	SDC SUCTION LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6550	441-J-HS-0656B01	SDC SUCTION LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6551	441-J-HS-0682B	SIT FILL LINE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6552	441-J-HS-0688A	SCS TEST RETURN ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6553	441-J-HS-0690B01	SCS WARMUP LINE FOLW CONTROL VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6554	441-J-HS-0691A01	SCS WARMUP LINE FOLW CONTROL VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6555	441-J-HS-0693B	SCS TEST RETURN ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6556	442-J-HS-0002D	CONTAINMENT SPRAY HEADER BLOCK VALVES V002 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6557	442-J-HS-0003C01	CONTAINMENT SPRAY HEADER ISO VALVE V003 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6558	442-J-HS-0004D01	CONTAINMENT SPRAY HEADER ISO VALVE V004 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6559	442-J-HS-0005C	IRWST RTN LINE CTRL VALVES V005 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6560	442-J-HS-0006D	IRWST RTN LINE CTRL VALVES V006 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6561	442-J-HS-0007A	IRWST RTN BLOCK VALVES V007 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6562	442-J-HS-0008B	IRWST RTN BLOCK VALVES V008 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6563	442-J-HS-0017C01	CONTAINMENT SPRAY PUMP PP01A CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6564	442-J-HS-0018D01	CONTAINMENT SPRAY PUMP PP02A CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6565	442-J-ZI-0005C	IRWST RTN CTRL VALVE005 POSITION(TRAIN C)	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (233 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6566	442-J-ZI-0006D	IRWST RTN CTRL VALVE006 POSITION(TRAIN D)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6567	443-J-HS-0001B	CNMT HYDROGEN CONTROL CNMT ISO VALVE V001	157A12C	Auxiliary	156'-0"	above	158'-0"		
6568	443-J-HS-0003A	CNMT HYDROGEN CONTROL CNMT ISO VALVE V003	157A12C	Auxiliary	156'-0"	above	158'-0"		
6569	447-J-HS-0001C	REACTOR CAVITY FLOODING ISO. VALVE V001 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6570	447-J-HS-0002D	REACTOR CAVITY FLOODING ISO. VALVE V002 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6571	447-J-HS-0003C	REACTOR CAVITY FLOODING ISO. VALVE V003 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6572	447-J-HS-0004D	REACTOR CAVITY FLOODING ISO. VALVE V004 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6573	447-J-HS-0005A	BORIC ACID MAKE-UP PUMP ISO. VALVE V005 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6574	447-J-HS-0006B	BORIC ACID MAKE-UP PUMP ISO. VALVE V006 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6575	447-J-HS-0007C	REACTOR CAVITY FLOODING ISO. VALVE V003 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6576	447-J-HS-0008D	REACTOR CAVITY FLOODING ISO. VALVE V004 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6577	447-J-HS-0010A	LEVEL INSTRUMENT ISOATION VALVE V010 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6578	447-J-HS-0011A	LEVEL INSTRUMENT ISOATION VALVE V011 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6579	447-J-HS-0012B	LEVEL INSTRUMENT ISOATION VALVE V012 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6580	447-J-HS-0013B	LEVEL INSTRUMENT ISOATION VALVE V013 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6581	447-J-HS-0014A	LEVEL INSTRUMENT ISOATION VALVE V014 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6582	447-J-HS-0015A	LEVEL INSTRUMENT ISOATION VALVE V015 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6583	447-J-HS-0016B	LEVEL INSTRUMENT ISOATION VALVE V016 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6584	447-J-HS-0017B	LEVEL INSTRUMENT ISOATION VALVE V017 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (234 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6585	447-J-HS-0018A	LEVEL INSTRUMENT ISOATION VALVE V018 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6586	447-J-HS-0019A	LEVEL INSTRUMENT ISOATION VALVE V019 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6587	447-J-HS-0020B	LEVEL INSTRUMENT ISOATION VALVE V020 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6588	447-J-HS-0021B	LEVEL INSTRUMENT ISOATION VALVE V021 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6589	447-J-HS-0022B	LEVEL INSTRUMENT ISOATION VALVE V022 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6590	447-J-HS-0023B	LEVEL INSTRUMENT ISOATION VALVE V023 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6591	447-J-LI-0401A	IRWST TK01 LEVEL 2	157A12C	Auxiliary	156'-0"	above	158'-0"		
6592	447-J-LI-0402B	IRWST TK01 LEVEL 1	157A12C	Auxiliary	156'-0"	above	158'-0"		
6593	447-J-LI-0403A	HOLD UP VOLUME TANK WIDE RANGE LEVEL2	157A12C	Auxiliary	156'-0"	above	158'-0"		
6594	447-J-LI-0404B	HOLD UP VOLUME TANK WIDE RANGE LEVEL1	157A12C	Auxiliary	156'-0"	above	158'-0"		
6595	447-J-LI-0405A	REACTOR CAVITY LEVEL 1(WIDE)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6596	447-J-LI-0406B	REACTOR CAVITY LEVEL 2(WIDE)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6597	447-J-LR-0390B	IRWST TK01 LEVEL 1	157A12C	Auxiliary	156'-0"	above	158'-0"		
6598	447-J-LR-0391A	IRWST TK01 LEVEL 2	157A12C	Auxiliary	156'-0"	above	158'-0"		
6599	447-J-LR-0401A	IRWST TK01 LEVEL 2	157A12C	Auxiliary	156'-0"	above	158'-0"		
6600	447-J-LR-0402B	IRWST TK01 LEVEL 1	157A12C	Auxiliary	156'-0"	above	158'-0"		
6601	451-J-HS-0001A01	CHARGING PUMPS PP01A & PP01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6602	451-J-HS-0002B01	CHARGING PUMPS PP01A & PP01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6603	451-J-HS-0003A01	AUXILIARY CHARGING PUMP PP03 HAND SWITCH	157A12C	Auxiliary	156'-0"	above	158'-0"		
6604	451-J-HS-0003B01	AUXILIARY CHARGING PIMP PP03	157A12C	Auxiliary	156'-0"	above	158'-0"		
6605	451-J-HS-0203B01	PZR AUX SPRAY VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6606	451-J-HS-0255A	SEAL INJECTION CNMT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6607	451-J-HS-0501A01	VOLUME CONTROL TANK DISCHARGE ISO	157A12C	Auxiliary	156'-0"	above	158'-0"		
6608	451-J-HS-0504B01	VOLUME CONTROL TANK DISCHARGE ISO	157A12C	Auxiliary	156'-0"	above	158'-0"		
6609	451-J-HS-0505B	RCP CONTROLLED CNMT ISO	157A12C	Auxiliary	156'-0"	above	158'-0"		
6610	451-J-HS-0506A	RCP CONTROLLED CNMT ISO	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (235 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6611	451-J-HS-0507B	RCP CONTROLLED BLEEDOFF HEADER ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6612	451-J-HS-0509A	IRWST MAKEUP LINE CONTAINMENT ISO	157A12C	Auxiliary	156'-0"	above	158'-0"		
6613	451-J-HS-0515B	LETDOWN INSIDE CNMT ISO	157A12C	Auxiliary	156'-0"	above	158'-0"		
6614	451-J-HS-0516A	LETDOWN INSIDE CNMT ISO	157A12C	Auxiliary	156'-0"	above	158'-0"		
6615	451-J-HS-0522A	LETDOWN CONTAINMENT ISO	157A12C	Auxiliary	156'-0"	above	158'-0"		
6616	451-J-HS-0523B	LETDOWN OUTSIDE CNMT ISO	157A12C	Auxiliary	156'-0"	above	158'-0"		
6617	451-J-HS-0524B	CHARGINGNLINE CONTAINMENT ISO	157A12C	Auxiliary	156'-0"	above	158'-0"		
6618	451-J-HS-0534B01	BAST GRAVITY	157A12C	Auxiliary	156'-0"	above	158'-0"		
6619	451-J-HS-0536A01	BAST GRAVITY	157A12C	Auxiliary	156'-0"	above	158'-0"		
6620	451-J-HS-0560A	REACTOR DRAIN TANK DISCHARGE LINE CONTAINMENT ISO.	157A12C	Auxiliary	156'-0"	above	158'-0"		
6621	451-J-HS-0561B	REACTOR DRAIN TANK DSCH LINE CNMT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6622	451-J-HS-0576B	CHARGING FLOW RESTRICTING	157A12C	Auxiliary	156'-0"	above	158'-0"		
6623	451-J-HS-0577A	CHARGING FLOW RESTRICTING	157A12C	Auxiliary	156'-0"	above	158'-0"		
6624	451-J-HS-0580A	RSSH TO RDH CNMT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6625	455-J-HS-0005A	STEAM GENERATOR BLOWDOWN CNMT ISO. VALVES V005 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6626	455-J-HS-0006B	STEAM GENERATOR BLOWDOWN CNMT ISO. VALVES V006 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6627	455-J-HS-0007A	STEAM GENERATOR BLOWDOWN CNMT ISO. VALVES V007 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6628	455-J-HS-0008B	STEAM GENERATOR BLOWDOWN CNMT ISO. VALVES V008 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6629	461-J-FI-0047A	CCW PUMP PP01A DISCH. FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6630	461-J-FI-0048B	CCW PUMP PP01B DISCH. FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6631	461-J-FI-0049C	CCW PUMP PP02A DISCH. FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6632	461-J-FI-0050D	CCW PUMP PP02B DISCH. FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6633	461-J-FI-0071A	CCW HX. OUTLET(TRAN A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6634	461-J-FI-0072B	CCW HX. OUTLET(TRAN B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6635	461-J-FI-0245A	RCP 2B CLNG FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6636	461-J-FI-0246A	RCP 2A CLNG FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6637	461-J-FI-0247A	RCP 1A CLNG FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6638	461-J-FI-0248A	RCP 1B CLNG FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6639	461-J-HS-0001A01	CCW PUMP PP01A CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6640	461-J-HS-0001B01	CCW PUMP PP01B CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6641	461-J-HS-0002C01	CCW PUMP PP02A CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (236 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6642	461-J-HS-0002D01	CCW PUMP PP02B CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6643	461-J-HS-0003C	CCW SURGE TANK MAKEUP PUMP PP03A CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6644	461-J-HS-0003D	CCW SURGE TANK MAKEUP PUMP PP03B CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6645	461-J-HS-0011C	CCW SURGE TANK DEMI-WATER MAKEUP VALVE V011 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6646	461-J-HS-0012D	CCW SURGE TANK DEMI-WATER MAKEUP VALVE V012 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6647	461-J-HS-0013C	CCW SURGE TANK SUMP WATER MAKEUP VALVE V013 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6648	461-J-HS-0014D	CCW SURGE TANK SUMP WATER MAKEUP VALVE V014 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6649	461-J-HS-0021A	CCW TRN. A & B HX OUTLET ISOATION VALVE V021 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6650	461-J-HS-0022B	CCW TRN. A & B HX OUTLET ISOATION VALVE V022 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6651	461-J-HS-0023A	CCW TRN. A & B HX OUTLET ISOATION VALVE V023 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6652	461-J-HS-0024B	CCW TRN. A & B HX OUTLET ISOATION VALVE V024 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6653	461-J-HS-0025A	CCW TRN. A & B HX OUTLET ISOATION VALVE V025 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6654	461-J-HS-0026B	CCW TRN. A & B HX OUTLET ISOATION VALVE V026 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6655	461-J-HS-0027A	CCW TRN. A & B HX BYPASS LINE ISOATION VALVE V027 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6656	461-J-HS-0028B	CCW TRN. A & B HX BYPASS LINE ISOATION VALVE V028 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6657	461-J-HS-0097C	CNMT. SPRAY HX A/B INLET ISOATION VALVE V097 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6658	461-J-HS-0098D	CNMT. SPRAY HX A/B INLET ISOATION VALVE V098 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6659	461-J-HS-0131C	ESSENTIAL CHILLER CONDENSERS OUTLET ISOATION VALVES V131 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6660	461-J-HS-0132D	ESSENTIAL CHILLER CONDENSERS OUTLET ISOATION VALVES V132 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (237 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6661	461-J-HS-0143A	CCW TRN A NON-SAFETY HEADER INLET & OUTLET ISO. VALVES V143 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6662	461-J-HS-0144B	CCW TRN B NON-SAFETY HEADER INLET & OUTLET ISOATION VALVES V144 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6663	461-J-HS-0145C	CCW TRN A NON-SAFETY HEADER INLET & OUTLET ISO. VALVES V145 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6664	461-J-HS-0146D	CCW TRN B NON-SAFETY HEADER INLET & OUTLET ISOATION VALVES V146 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6665	461-J-HS-0147C	CCW TRN A NON-SAFETY HEADER INLET & OUTLET ISO. VALVES V147 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6666	461-J-HS-0148D	CCW TRN B NON-SAFETY HEADER INLET & OUTLET ISOATION VALVES V148 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6667	461-J-HS-0149A	CCW TRN A NON-SAFETY HEADER INLET & OUTLET ISO. VALVES V149 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6668	461-J-HS-0150B	CCW TRN B NON-SAFETY HEADER INLET & OUTLET ISOATION VALVES V150 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6669	461-J-HS-0181C	DG A&B INLET ISOATION VALVES V181 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6670	461-J-HS-0182D	DG A&B INLET ISOATION VALVES V182 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6671	461-J-HS-0231C	RCP COOLER CCW CNMT. ISOATION VALVES V231 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6672	461-J-HS-0249D	RCP COOLER CCW CNMT. ISOATION VALVES V249 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6673	461-J-HS-0250C	RCP COOLER CCW CNMT. ISOATION VALVES V250 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6674	461-J-HS-0296A	LETDOWN HX INLET & OUTLET ISOATION VALVES V296 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6675	461-J-HS-0297B	LETDOWN HX INLET & OUTLET ISOATION VALVES V297 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6676	461-J-HS-0301B	LETDOWN HX INLET & OUTLET ISOATION VALVES V301 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6677	461-J-HS-0302A	LETDOWN HX INLET & OUTLET ISOATION VALVES V302 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6678	461-J-HS-0351A01	SHUTDOWN COOLING HX A & B INLET ISO VALVE V351 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (238 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6679	461-J-HS-0352B01	SHUTDOWN COOLING HX A & B INLET ISO VALVE V352 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6680	461-J-HS-0383A	ESSENTIAL CHILLER CONDENSERS OUTLET ISO VALVE V383 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6681	461-J-HS-0384B	ESSENTIAL CHILLER CONDENSERS OUTLET ISO VALVE V384 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6682	461-J-HS-0389A	SFP COOLING HX ISO VALVE V389 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6683	461-J-HS-0390B	SFP COOLING HX ISO VALVE V390 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6684	461-J-HS-1037A	CROSS CONNECTION LINE ISOATION VALVES V1037 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6685	461-J-HS-1038B	CROSS CONNECTION LINE ISOATION VALVES V1038 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6686	461-J-HS-1039C	CROSS CONNECTION LINE ISOATION VALVES V1039 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6687	461-J-HS-1040D	CROSS CONNECTION LINE ISOATION VALVES V1040 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6688	461-J-LI-0011C	CCW SURGE TK TK01A LEVEL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6689	461-J-LI-0012D	CCW SURGE TK TK01B LEVEL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6690	461-J-PI-0053C	TRAIN A PUMP COMMON DISCHARGE HEADER PRESSURE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6691	461-J-PI-0054D	TRAIN B PUMP COMMON DISCHARGE HEADER PRESSURE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6692	461-J-TI-0069A	COMBINED CCW HX OUTLET (TRN A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6693	461-J-TI-0070B	COMBINED CCW HX OUTLET (TRN B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6694	462-J-FI-0049A	ESW PUMP PP01A,PP02A DISCH	157A12C	Auxiliary	156'-0"	above	158'-0"		
6695	462-J-FI-0050B	ESW PUMP PP01B,PP02B DISCH	157A12C	Auxiliary	156'-0"	above	158'-0"		
6696	462-J-HS-0001A01	ESW PUMP PP01A CONTROL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6697	462-J-HS-0002B01	ESW PUMP PP01B CONTROL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6698	462-J-HS-0003C01	ESW PUMP PP02A CONTROL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6699	462-J-HS-0004D01	ESW PUMP PP02B CONTROL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6700	462-J-HS-0045A	ESW PUMP PP01A ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6701	462-J-HS-0046B	ESW PUMP PP01B ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6702	462-J-HS-0047C	ESW PUMP PP02A ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6703	462-J-HS-0048D	ESW PUMP PP02B ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6704	462-J-HS-0067A	CCW HX COMMON OUTLET	157A12C	Auxiliary	156'-0"	above	158'-0"		
6705	462-J-HS-0068B	CCW HX COMMON OUTLET	157A12C	Auxiliary	156'-0"	above	158'-0"		
6706	462-J-PI-0035A	ESW PUMP PP01A DISCH PRESS	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (239 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6707	462-J-PI-0036B	ESW PUMP PP01B DISCH PRESS	157A12C	Auxiliary	156'-0"	above	158'-0"		
6708	462-J-PI-0039C	ESW PUMP PP02A DISCH PRESS	157A12C	Auxiliary	156'-0"	above	158'-0"		
6709	462-J-PI-0040D	ESW PUMP PP02B DISCH PRESS	157A12C	Auxiliary	156'-0"	above	158'-0"		
6710	463-J-HS-0001A	SFP COOLING PUMP A PP01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6711	463-J-HS-0001B	SFP COOLING PUMP B PP01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6712	463-J-LI-0001A	SPENT FUEL POOL LEVEL (TRAIN A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6713	463-J-LI-0002B	SPENT FUEL POOL LEVEL (TRAIN B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6714	471-J-HS-0001A	CVCS REACTOR DRAIN TANK	157A12C	Auxiliary	156'-0"	above	158'-0"		
6715	471-J-HS-0002B	CVCS REACTOR DRAIN TANK	157A12C	Auxiliary	156'-0"	above	158'-0"		
6716	481-J-HS-0005B	LRS FLOOR DRAIN TANK	157A12C	Auxiliary	156'-0"	above	158'-0"		
6717	481-J-HS-0006A	LRS FLOOR DRAIN TANK	157A12C	Auxiliary	156'-0"	above	158'-0"		
6718	491-J-HS-0001B	PRIMARY SAMPLING CONTAINMENT ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6719	491-J-HS-0002A	PRIMARY SAMPLING CONTAINMENT ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6720	491-J-HS-0003A	PRIMARY SAMPLING CONTAINMENT ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6721	491-J-HS-0004B	PRIMARY SAMPLING CONTAINMENT ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6722	491-J-HS-0005A	PRIMARY SAMPLING CONTAINMENT ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6723	491-J-HS-0006B	PRIMARY SAMPLING CONTAINMENT ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6724	491-J-HS-0020A	PRIMARY SAMPLING CONTAINMENT ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6725	491-J-HS-0021B	PRIMARY SAMPLING CONTAINMENT ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6726	491-J-HS-0041B	CONTAINMENT ISOATION VALVES	157A12C	Auxiliary	156'-0"	above	158'-0"		
6727	491-J-HS-0042A	CONTAINMENT ISOATION VALVES	157A12C	Auxiliary	156'-0"	above	158'-0"		
6728	491-J-HS-0043B	CONTAINMENT ISOATION VALVES	157A12C	Auxiliary	156'-0"	above	158'-0"		
6729	491-J-HS-0053A	PRIMARY SAMPLING CONTAINMENT ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6730	521-J-HIK-0101B01	SG 1 MSADV (101)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6731	521-J-HIK-0102A01	SG 1 MSADV (102)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6732	521-J-HIK-0103A01	SG 2 MSADV (103)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6733	521-J-HIK-0104B01	SG 2 MSADV (104)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6734	521-J-HS-0011A	MAIN STEAM ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (240 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6735	521-J-HS-0011B	MAIN STEAM ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6736	521-J-HS-0012A	MAIN STEAM ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6737	521-J-HS-0012B	MAIN STEAM ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6738	521-J-HS-0013A	MAIN STEAM ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6739	521-J-HS-0013B	MAIN STEAM ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6740	521-J-HS-0014A	MAIN STEAM ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6741	521-J-HS-0014B	MAIN STEAM ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6742	521-J-HS-0015A	MAIN STEAM ISOATION VALVE BYPASS VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6743	521-J-HS-0015B	MAIN STEAM ISOATION VALVE BYPASS VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6744	521-J-HS-0016A	MAIN STEAM ISOATION VALVE BYPASS VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6745	521-J-HS-0016B	MAIN STEAM ISOATION VALVE BYPASS VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6746	521-J-HS-0017A	MAIN STEAM ISOATION VALVE BYPASS VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6747	521-J-HS-0017B	MAIN STEAM ISOATION VALVE BYPASS VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6748	521-J-HS-0018A	MAIN STEAM ISOATION VALVE BYPASS VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6749	521-J-HS-0018B	MAIN STEAM ISOATION VALVE BYPASS VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6750	521-J-HS-0090A	MAIN STEAM DRIP LEG ISOALTION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6751	521-J-HS-0090B	MAIN STEAM DRIP LEG ISOALTION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6752	521-J-HS-0091A	MAIN STEAM DRIP LEG ISOALTION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6753	521-J-HS-0091B	MAIN STEAM DRIP LEG ISOALTION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6754	521-J-HS-0092A	MAIN STEAM DRIP LEG ISOALTION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6755	521-J-HS-0092B	MAIN STEAM DRIP LEG ISOALTION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6756	521-J-HS-0093A	MAIN STEAM DRIP LEG ISOALTION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (241 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6757	521-J-HS-0093B	MAIN STEAM DRIP LEG ISOALTION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6758	521-J-HS-0101B01	MSADV (101) CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6759	521-J-HS-0101D01	MSADV (101) CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6760	521-J-HS-0102A01	MSADV (102) CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6761	521-J-HS-0102C01	MSADV (102) CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6762	521-J-HS-0103A01	MSADV (103) CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6763	521-J-HS-0103C01	MSADV (103) CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6764	521-J-HS-0104B01	MSADV (104) CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6765	521-J-HS-0104D01	MSADV (104) CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6766	521-J-HS-0105A	ATMOSPHERIC DUMP ISOATION VALVES	157A12C	Auxiliary	156'-0"	above	158'-0"		
6767	521-J-HS-0106B	ATMOSPHERIC DUMP ISOATION VALVES	157A12C	Auxiliary	156'-0"	above	158'-0"		
6768	521-J-HS-0107B	ATMOSPHERIC DUMP ISOATION VALVES	157A12C	Auxiliary	156'-0"	above	158'-0"		
6769	521-J-HS-0108A	ATMOSPHERIC DUMP ISOATION VALVES	157A12C	Auxiliary	156'-0"	above	158'-0"		
6770	521-J-HS-0109A01	AUX. FWP.TBN STEAM SUPPLY VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6771	521-J-HS-0110B01	AUX. FWP.TBN STEAM SUPPLY VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6772	521-J-HS-0111A	AUX. FWP. TBN WARM-UP VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6773	521-J-HS-0112B	AUX. FWP. TBN WARM-UP VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6774	521-J-ZI-0101B	SG 1 PORV(101)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6775	521-J-ZI-0102A	SG 1 PORV(102)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6776	521-J-ZI-0103A	SG 1 PORV(103)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6777	521-J-ZI-0104B	SG 1 PORV(104)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6778	521-J-ZL-0011A	MAIN STEAM ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6779	521-J-ZL-0012A	MAIN STEAM ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6780	521-J-ZL-0013A	MAIN STEAM ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6781	521-J-ZL-0014A	MAIN STEAM ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6782	521-J-ZL-0015A	MAIN STEAM ISOATION VALVE BYPASS VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6783	521-J-ZL-0016A	MAIN STEAM ISOATION VALVE BYPASS VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6784	521-J-ZL-0017A	MAIN STEAM ISOATION VALVE BYPASS VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6785	521-J-ZL-0018A	MAIN STEAM ISOATION VALVE BYPASS VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6786	521-J-ZL-0101B	MSADV (101) CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6787	521-J-ZL-0102A	MSADV (102) CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6788	521-J-ZL-0103A	MSADV (103) CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (242 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6789	521-J-ZL-0104B	MSADV (104) CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6790	527-J-HS-0007C	DRAIN VALVE FOR AUX. FW PUMP TURBINE STEAM LINE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6791	527-J-HS-0008D	DRAIN VALVE FOR AUX. FW PUMP TURBINE STEAM LINE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6792	527-J-HS-0009C01	STEAM SUPPLY ISOATION VALVE SOFT CONTROL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6793	527-J-HS-0010D01	STEAM SUPPLY ISOATION VALVE SOFT CONTROL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6794	527-J-HS-0017C01	AUX. FW PUMP TURBINE CONTROLS	157A12C	Auxiliary	156'-0"	above	158'-0"		
6795	527-J-HS-0017C03	AUX. FW PUMP TURBINE CONTROLS	157A12C	Auxiliary	156'-0"	above	158'-0"		
6796	527-J-HS-0018D01	AUX. FW PUMP TURBINE CONTROLS	157A12C	Auxiliary	156'-0"	above	158'-0"		
6797	527-J-HS-0018D03	AUX. FW PUMP TURBINE CONTROLS	157A12C	Auxiliary	156'-0"	above	158'-0"		
6798	541-J-HS-0121A	SG 1 ECONOMIZER FW ISO VALVE (CH.A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6799	541-J-HS-0122B	SG 1 ECONOMIZER FW ISO VALVE (CH.B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6800	541-J-HS-0123A	SG 2 ECONOMIZER FW ISO VALVE (CH.A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6801	541-J-HS-0124B	SG 2 ECONOMIZER FW ISO VALVE (CH.B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6802	541-J-HS-0131A	SG 1 DOWNCOMMER FW ISO VALVE (CH. A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6803	541-J-HS-0132B	SG 1 DOWNCOMMER FW ISO VALVE (CH. B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6804	541-J-HS-0133A	SG 2 DOWNCOMMER FW ISO VALVE (CH. A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6805	541-J-HS-0134B	SG 2 DOWNCOMMER FW ISO VALVE (CH. B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6806	541-J-HS-0138A	CHEMICAL INJECTION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6807	541-J-HS-0139B	CHEMICAL INJECTION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6808	542-J-HS-0002A01	AUX. FEED WATER PUMPS (MOTOR DRIVEN)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6809	542-J-HS-0002B01	AUX. FEED WATER PUMPS (MOTOR DRIVEN)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6810	542-J-HS-0035A01	AUX. FW MODULATING VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6811	542-J-HS-0036B01	AUX. FW MODULATING VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6812	542-J-HS-0037A01	AUX. FW MODULATING VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6813	542-J-HS-0038B01	AUX. FW MODULATING VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6814	542-J-HS-0043A01	AUX. FW MODULATING VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6815	542-J-HS-0044C01	AUX. FW MODULATING VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (243 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6816	542-J-HS-0045D01	AUX. FW MODULATING VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6817	542-J-HS-0046B01	AUX. FW MODULATING VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6818	542-J-LIK-0035A01	AF PP02A DISCH. FLOW TO SG 1	157A12C	Auxiliary	156'-0"	above	158'-0"		
6819	542-J-LIK-0036B01	AF PP01A DISCH. FLOW TO SG 1	157A12C	Auxiliary	156'-0"	above	158'-0"		
6820	542-J-LIK-0037A01	AF PP01B DISCH. FLOW TO SG 2	157A12C	Auxiliary	156'-0"	above	158'-0"		
6821	542-J-LIK-0038B01	AF PP02B DISCH. FLOW TO SG 2	157A12C	Auxiliary	156'-0"	above	158'-0"		
6822	543-J-LR-0003A	AFW SOTRAGE TANK A LEVEL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6823	543-J-LR-0004B	AFW SOTRAGE TANK B LEVEL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6824	591-J-HS-0105C01	EDG EMERGENCY STOP(SC)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6825	591-J-HS-0105C02	EDG EMERGENCY START(SC)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6826	591-J-HS-0106C	RAISE/LOWER (GOVERNOR SPEED/LOAD) (SC)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6827	591-J-HS-0107C	RAISE/LOWER (VOLTAGE ADJUST) (SC)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6828	591-J-HS-0205D01	EDG EMERGENCY STOP (SC)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6829	591-J-HS-0205D02	EDG EMERGENCY START (SC)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6830	591-J-HS-0206D	EDG(DG01B) RAISE/LOWER(GOVERMOR SPEED/LOAD) (SC)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6831	591-J-HS-0207D	EDG(DG01B) RAISE/LOWER (VOLTAGE ADJUST) (SC)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6832	594-J-HS-0001A	CNMT ISOATION VALVE V001 CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6833	596-J-HS-0020A	CONTAINMENT ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
6834	601-J-FI-0051C	CTRL RM OUTSIDE AIR SUPPLY FLOW - CHANNEL A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6835	601-J-FI-0052D	CTRL RM OUTSIDE AIR SUPPLY FLOW - CHANNEL B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6836	601-J-FI-0053C	CTRL RM OUTSIDE AIR SUPPLY FLOW TO ACU AU 01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6837	601-J-FI-0054D	CTRL RM OUTSIDE AIR SUPPLY FLOW TO ACU AU 01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6838	601-J-FI-0055C	CTRL RM AREA RETURN AIR FLOW-CHANNEL A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6839	601-J-FI-0056D	CTRL RM AREA RETURN AIR FLOW-CHANNEL B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6840	601-J-FIK-0021C	CTRL RM SUPPLY AHU HV 01A AIR FLOW CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6841	601-J-FIK-0022D	CTRL RM SUPPLY AHU HV 01B AIR FLOW CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (244 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6842	601-J-FIK-0023C	CTRL RM EMRG MAKEUP ACU AU01A AIR FLOW CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6843	601-J-FIK-0024D	CTRL RM EMRG MAKEUP ACU AU01B AIR FLOW CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6844	601-J-HS-0001C01	CTRL RM SUPPLY AHU FANS AH01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6845	601-J-HS-0002D01	CTRL RM SUPPLY AHU FANS AH01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6846	601-J-HS-0003C	SUPPLY AHU ELEC. HEATING COILS HC01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6847	601-J-HS-0004D	SUPPLY AHU ELEC. HEATING COILS HC01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6848	601-J-HS-0005C01	CTRL RM EMRG MAKEUP ACU FANS AH02A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6849	601-J-HS-0006D01	CTRL RM EMRG MAKEUP ACU FANS AH02B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6850	601-J-HS-0011C	OUTSIDE AIR INTAKE ISO. DAMPERS Y0011A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6851	601-J-HS-0011D	OUTSIDE AIR INTAKE ISO. DAMPERS Y0011B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6852	601-J-HS-0012C	OUTSIDE AIR INTAKE ISO. DAMPERS Y0012A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6853	601-J-HS-0012D	OUTSIDE AIR INTAKE ISO. DAMPERS Y0012B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6854	601-J-HS-0013C	CTRL RM SUPPLY AHU ISO. DAMPERS Y0013A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6855	601-J-HS-0014D	CTRL RM SUPPLY AHU ISO. DAMPERS Y0014B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6856	601-J-HS-0015C	CTRL RM SUPPLY AHU ISO. DAMPERS Y0015C	157A12C	Auxiliary	156'-0"	above	158'-0"		
6857	601-J-HS-0016D	CTRL RM SUPPLY AHU ISO. DAMPERS Y0016D	157A12C	Auxiliary	156'-0"	above	158'-0"		
6858	601-J-HS-0017C	CTRL RM EMRG MAKEUP ACU ISO. DAMPERS Y0017A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6859	601-J-HS-0018D	CTRL RM EMRG MAKEUP ACU ISO. DAMPERS Y0018B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6860	601-J-HS-0019C	CTRL RM RTN AIR ISO. DAMPERS Y0019A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6861	601-J-HS-0020D	CTRL RM RTN AIR ISO. DAMPERS Y0020D	157A12C	Auxiliary	156'-0"	above	158'-0"		
6862	601-J-HS-0027C	KITCHEN AND TOILET EXH. AIR ISO. DAMPERS Y0027	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (245 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6863	601-J-HS-0028D	KITCHEN AND TOILET EXH. AIR ISO. DAMPERS Y0028	157A12C	Auxiliary	156'-0"	above	158'-0"		
6864	601-J-HS-0029C	CONTROL ROOM AREA SMOKE REMOVAL ISO DAMPER Y0029A CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6865	601-J-HS-0030D	CONTROL ROOM AREA SMOKE REMOVAL ISO DAMPER Y0030B CTRL	157A12C	Auxiliary	156'-0"	above	158'-0"		
6866	601-J-HS-0219C	CTRL RM SUPPLY AHU ISO. DAMPERS CLOSE(Y0013A, Y0015A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6867	601-J-HS-0220D	CTRL RM SUPPLY AHU ISO. DAMPERS CLOSE(Y0014B, Y0016B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6868	601-J-PDI-0147C	MCR ENVELOPE PRESSURE-CHANNEL A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6869	601-J-PDI-0148D	MCR ENVELOPE PRESSURE-CHANNEL B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6870	601-J-PDI-0149C	TSC OFFICE ENVELPOE PRESSURE-CH.A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6871	601-J-PDI-0150D	TSC OFFICE ENVELPOE PRESSURE-CH.B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6872	601-J-PDI-0151C	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6873	601-J-PDI-0152D	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6874	601-J-PDI-0153C	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6875	601-J-PDI-0154D	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6876	601-J-PDT-0147C	MCR ENVELOPE PRESSURE-CHANNEL A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6877	601-J-PDT-0148D	MCR ENVELOPE PRESSURE-CHANNEL B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6878	601-J-TE-3049C	CTRL RM SUPPLY AHU HV 01A TEMP MCR	157A12C	Auxiliary	156'-0"	above	158'-0"		
6879	601-J-TE-3050D	CTRL RM SUPPLY AHU HV 01B TEMP MCR	157A12C	Auxiliary	156'-0"	above	158'-0"		
6880	601-J-TI-3001C	CTRL RM SUPPLY AHU HV 01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6881	601-J-TI-3002D	CTRL RM SUPPLY AHU HV 01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6882	601-J-TI-3011C	CTRL RM EMRG MAKEUP ACU AU01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6883	601-J-TI-3012D	CTRL RM EMRG MAKEUP ACU AU01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6884	601-J-TI-3043C	CTRL RM EMRG MAKEUP ACU AU 01A ELEC. HTG COIL HC 08A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6885	601-J-TI-3044D	CTRL RM EMRG MAKEUP ACU AU 01B ELEC. HTG COIL HC 08B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6886	601-J-TI-3045C	CTRL RM EMRG MAKEUP ACU AU 01A CARBON ADSR FT 02A	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (246 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6887	601-J-TI-3046D	CTRL RM EMRG MAKEUP ACU AU 01B CARBON ADSR FT 02B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6888	601-J-TI-3047C	CTRL RM SUPPLY AHU HV 01A TEMP ELEC. HTG COIL HC 01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6889	601-J-TI-3048D	CTRL RM SUPPLY AHU HV 01B TEMP ELEC. HTG COIL HC 01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6890	601-J-TI-3049C	CTRL RM SUPPLY AHU HV 01A TEMP MCR	157A12C	Auxiliary	156'-0"	above	158'-0"		
6891	601-J-TI-3050D	CTRL RM SUPPLY AHU HV 01B TEMP MCR	157A12C	Auxiliary	156'-0"	above	158'-0"		
6892	601-J-TIK-3047C	CTRL RM SUPPLY AHU HV 01A TEMP ELEC. HTG COIL HC 01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6893	601-J-TIK-3048D	CTRL RM SUPPLY AHU HV 01B TEMP ELEC. HTG COIL HC 01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6894	601-J-TIK-3049C	CTRL RM SUPPLY AHU HV 01A TEMP MCR	157A12C	Auxiliary	156'-0"	above	158'-0"		
6895	601-J-TIK-3050D	CTRL RM SUPPLY AHU HV 01B TEMP MCR	157A12C	Auxiliary	156'-0"	above	158'-0"		
6896	601-J-ZL-0021C	SUPPLY AHU DOWNSTREAM FLOW CTRL DAMPERS Y0021A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6897	601-J-ZL-0022D	SUPPLY AHU DOWNSTREAM FLOW CTRL DAMPERS Y0022B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6898	601-J-ZL-0023C	EMRG MAKEUP ACU DOWNSTREAM FLOW CTRL DAMPERS Y0023A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6899	601-J-ZL-0024D	EMRG MAKEUP ACU DOWNSTREAM FLOW CTRL DAMPERS Y0024B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6900	601-J-ZL-0065C	EMRG MAKEUP ACU ELEC. HTC HC08A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6901	601-J-ZL-0066D	EMRG MAKEUP ACU ELEC. HTC HC08B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6902	602-J-HS-0005C	EDG RM NORMAL SUPPLY FAN AH01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6903	602-J-HS-0006D	EDG RM NORMAL SUPPLY FAN AH01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6904	602-J-HS-0011C	EDG RM EMRG EXHAUST FAN AH03A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6905	602-J-HS-0012D	EDG RM EMRG EXHAUST FAN AH03B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6906	602-J-HS-0019C	EDG RM EMRG EXHAUST FAN AH04A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6907	602-J-HS-0020D	EDG RM EMRG EXHAUST FAN AH04B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6908	602-J-HS-0027C	DIESEL FUEL OIL STORAGE TANK RM SUPPLY FAN AH05A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6909	602-J-HS-0028D	DIESEL FUEL OIL STORAGE TANK RM SUPPLY FAN AH05B	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (247 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6910	602-J-HS-0029C	D/G CTRL RM ELEC. DUCT HEATER HC02A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6911	602-J-HS-0030D	D/G CTRL RM ELEC. DUCT HEATER HC02B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6912	602-J-HS-0037C	D/G CTRL RM ELEC. DUCT HEATER HC01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6913	602-J-HS-0038D	D/G CTRL RM ELEC. DUCT HEATER HC01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6914	602-J-HS-0039C	D/G CTRL RM ELEC. DUCT HEATER HC03A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6915	602-J-HS-0040D	D/G CTRL RM ELEC. DUCT HEATER HC03B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6916	602-J-TI-0013C	EDG AREA Ⅰ EMRG D/G RM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
6917	602-J-TI-0014D	EDG AREA Ⅱ EMRG D/G RM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
6918	602-J-TI-0015C	EDG AREA Ⅰ EMRG D/G RM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
6919	602-J-TI-0016D	EDG AREA Ⅱ EMRG D/G RM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
6920	602-J-TI-3029C	EDG AREA Ⅰ DIESEL FUEL OIL STOR TK RM	157A12C	Auxiliary	156'-0"	above	158'-0"		
6921	602-J-TI-3030D	EDG AREA Ⅱ DIESEL FUEL OIL STOR TK RM	157A12C	Auxiliary	156'-0"	above	158'-0"		
6922	602-J-TI-3037C	EDG AREA Ⅰ D/G CTRL RM	157A12C	Auxiliary	156'-0"	above	158'-0"		
6923	602-J-TI-3038D	EDG AREA Ⅱ D/G CTRL RM	157A12C	Auxiliary	156'-0"	above	158'-0"		
6924	602-J-TI-3050D	D/G FUEL OIL & LT & HT WTR TK RM AREA Ⅱ	157A12C	Auxiliary	156'-0"	above	158'-0"		
6925	602-J-TI-3059C	D/G FUEL OIL & LT & HT WTR TK RM AREA Ⅰ	157A12C	Auxiliary	156'-0"	above	158'-0"		
6926	602-J-TIK-3029C	EDG AREA Ⅰ DIESEL FUEL OIL STOR TK RM	157A12C	Auxiliary	156'-0"	above	158'-0"		
6927	602-J-TIK-3030D	EDG AREA Ⅱ DIESEL FUEL OIL STOR TK RM	157A12C	Auxiliary	156'-0"	above	158'-0"		
6928	602-J-TIK-3037C	EDG AREA Ⅰ D/G CTRL RM	157A12C	Auxiliary	156'-0"	above	158'-0"		
6929	602-J-TIK-3038D	EDG AREA Ⅱ D/G CTRL RM	157A12C	Auxiliary	156'-0"	above	158'-0"		
6930	602-J-TIK-3050D	D/G FUEL OIL & LT & HT WTR TK RM AREA Ⅱ	157A12C	Auxiliary	156'-0"	above	158'-0"		
6931	602-J-TIK-3059C	D/G FUEL OIL & LT & HT WTR TK RM AREA Ⅰ	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (248 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6932	602-J-ZL-0001C	EDG RM NORMAL SUPPLY FAN AH07A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6933	602-J-ZL-0001D	EDG RM NORMAL SUPPLY FAN AH07B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6934	602-J-ZL-0002C	EDG RM NORMAL SUPPLY FAN AH02A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6935	602-J-ZL-0002D	EDG RM NORMAL SUPPLY FAN AH02B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6936	602-J-ZL-0029C	DIESEL FUEL OIL STORAGE TANK RM SUPPLY FAN AH06A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6937	602-J-ZL-0029D	DIESEL FUEL OIL STORAGE TANK RM SUPPLY FAN AH06B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6938	603-J-FI-0138C	RSP RM SUPPLY FAN AH22A AIR FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6939	603-J-FI-0139D	RSP RM SUPPLY FAN AH22B AIR FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6940	603-J-FI-0140C	RSP RM EXHAUST FAN AH23A AIR FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6941	603-J-FI-0141D	RSP RM EXHAUST FAN AH23B AIR FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6942	603-J-FI-0142C	RSP RM AH18A RETURN AIR FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6943	603-J-FI-0143D	RSP RM AH18B RETURN AIR FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6944	603-J-HS-0001C	BATTERY RM SUPPLY & EXH. FANS AH20A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6945	603-J-HS-0002D	BATTERY RM SUPPLY & EXH. FANS AH20B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6946	603-J-HS-0005C	REMOTE SHUTDOWN RM SUPPLY & EXH FAN AH22A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6947	603-J-HS-0006C	REMOTE SHUTDOWN RM SUPPLY & EXH FAN AH23A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6948	603-J-HS-0006D	REMOTE SHUTDOWN RM SUPPLY & EXH FAN AH23B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6949	603-J-HS-0007C	SUPPLY & EXH FAN AH25A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6950	603-J-HS-0007D	SUPPLY & EXH FAN AH25B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6951	603-J-HS-0135C	REMOTE SHUTDOWN RM SAFETY-RELATED CC FAN AH18A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6952	603-J-HS-0136D	REMOTE SHUTDOWN RM SAFETY-RELATED CC FAN AH18B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6953	603-J-HS-0201C	BATTERY RM ELECT. DUCT HEATER HC01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6954	603-J-HS-0203D	BATTERY RM AND I&C EQUIP. RM ELEC. DUCT HEATERS HC01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6955	603-J-HS-0206C	REMOTE SHUTDOWN RM ELEC. DUCT HEATER 03A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6956	603-J-HS-0206D	REMOTE SHUTDOWN RM ELEC. DUCT HEATER 03B	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (249 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6957	603-J-HS-0207C	BATTERY RM AND I&C EQUIP. RM ELEC. DUCT HEATERS HC04A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6958	603-J-HS-0207D	BATTERY RM AND I&C EQUIP. RM ELEC. DUCT HEATERS HC04B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6959	603-J-TI-0101C	CLASS-1E SWGR 02A RM (078-A02C)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6960	603-J-TI-0102D	CLASS-1E SWGR 02B RM (078-A02D)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6961	603-J-TI-0103C	CLASS-1E LOADCENTER 02A RM (078-A03C)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6962	603-J-TI-0104D	CLASS-1E LOADCENTER 02B RM (078-A03D)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6963	603-J-TI-0105A	CH.A DC&IP EQUIP. RM (078-A04C)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6964	603-J-TI-0106B	CH.B DC&IP EQUIP. RM (078-A04D)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6965	603-J-TI-0107C	CH.C DC&IP EQUIP. RM (078-A05C)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6966	603-J-TI-0108D	CH.D DC&IP EQUIP. RM (078-A05D)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6967	603-J-TI-0109A	MUX A RM (078-A22A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6968	603-J-TI-0110B	MUX B RM (078-A22B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6969	603-J-TI-0111A	CLASS-1E MCC 01A RM (078-A24A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6970	603-J-TI-0112B	CLASS-1E MCC 01B RM (078-A24B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6971	603-J-TI-0113A	CLASS-1E SWITCHGEAR 01A RM CC (078-A25A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6972	603-J-TI-0114B	CLASS-1E SWGR 01B RM (078-A25B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6973	603-J-TI-0117C	ELECT. PENETRATION RM CC (120-A09C)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6974	603-J-TI-0118D	ELECT. PENETRATION (D) RM CC (120-A09D)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6975	603-J-TI-0119C	CLASS-1E MCC 06A RM (137-A10C)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6976	603-J-TI-0120D	CLASS-1E MCC 06B RM (137-A10D)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6977	603-J-TI-0121C	ELECT. PENETRATION RM (C) (137-A11C)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6978	603-J-TI-0122D	ELECT. PENETRATION (D) RM (137-A11D)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6979	603-J-TI-0123A	PENETRATION MUX A RM (137-A17A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6980	603-J-TI-0124B	PENETRATION MUX B RM (137-A17B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6981	603-J-TI-0125A	ELECT. PENETRATION RM (A) CC (137-A18A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6982	603-J-TI-0126B	ELECT. PENETRATION (B) RM CC (137-A18B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6983	603-J-TI-0127A	CLASS-1E MCC 05A RM (137-A23A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6984	603-J-TI-0128B	CLASS-1E MCC 05B RM (120-A15B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6985	603-J-TI-0129A	CLASS-1E MCC 07A RM (137-A15A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6986	603-J-TI-0130B	CLASS-1E MCC 07B RM (137-A15B)	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (250 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
6987	603-J-TI-0131A	I&C EQUIP. RM (A) (157-A01C)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6988	603-J-TI-0132B	I&C EQUIP. RM (B) (157-A01D)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6989	603-J-TI-0133C	I&C EQUIP. RM (C) (157-A19C)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6990	603-J-TI-0134D	I&C EQUIP. RM (D) (157-A19D)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6991	603-J-TI-0135C	RSP RM (137-A40D)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6992	603-J-TI-0136D	RSP RM (137-A04D)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6993	603-J-TI-3232D	I&C EQUIP. RM (157-A19D)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6994	603-J-TIK-3232D	I&C EQUIP. RM (157-A19D)	157A12C	Auxiliary	156'-0"	above	158'-0"		
6995	604-J-FIK-0033A	FUEL HANDLING AREA I EMRG. EXH. ACU AU02A EXH. AIR FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6996	604-J-FIK-0034B	FUEL HANDLING AREA II EMRG. EXH. ACU AU02B EXH. AIR FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
6997	604-J-HS-0001A	OUTSIDE AIR ISO. DAMPERS Y0001A	157A12C	Auxiliary	156'-0"	above	158'-0"		
6998	604-J-HS-0002B	OUTSIDE AIR ISO. DAMPERS Y0002B	157A12C	Auxiliary	156'-0"	above	158'-0"		
6999	604-J-HS-0003A	NORMAL EXH. ISOATION DAMPERS Y0003A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7000	604-J-HS-0004B	NORMAL EXH. ISOATION DAMPERS Y0004B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7001	604-J-HS-0009A	OUTSIDE AIR ISO. DAMPERS Y0009A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7002	604-J-HS-0010B	OUTSIDE AIR ISO. DAMPERS Y0010B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7003	604-J-HS-0021A	EMERGENCY EXH. ACU FANS AH02A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7004	604-J-HS-0022B	EMERGENCY EXH. ACU FANS AH02B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7005	604-J-HS-0027A	CUBICLE COOLER FAN AH04A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7006	604-J-HS-0028B	CUBICLE COOLER FAN AH04B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7007	604-J-PDI-0073A	LOADING & UNLOADING AREA DIFF. PRESSURE (CHANNEL A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7008	604-J-PDI-0074B	LOADING & UNLOADING AREA DIFF. PRESSURE (CHANNEL B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7009	604-J-PDI-0075A	NEW FUEL STORAGE AREA (CHANNEL A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7010	604-J-PDI-0076B	NEW FUEL STORAGE AREA (CHANNEL B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7011	604-J-TI-0027A	SFPC HX ROOM (100-A24A) TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7012	604-J-TI-0028B	SFPC HX ROOM (100A32B) TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7013	604-J-ZL-0005A	EMRG. EXH. ACU INLET ISO. DAMPERS Y0005A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7014	604-J-ZL-0006B	EMRG. EXH. ACU INLET ISO. DAMPERS Y00068	157A12C	Auxiliary	156'-0"	above	158'-0"		
7015	604-J-ZL-0009A	EMER. EXH. ACU ELECT. HEATING COILS HC02A	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (251 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7016	604-J-ZL-0033A	EMER. EXH. AIR FLOW CTRL DAMPERS Y0007A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7017	604-J-ZL-0034B	EMER. EXH. AIR FLOW CTRL DAMPERS Y0008B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7018	604-J-ZL-0058B	EMER. EXH. ACU ELECT. HEATING COILS HC02B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7019	605-J-HS-0001A	CCW HEAT EXCHANGER RM SUPPLY FANS AH03A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7020	605-J-HS-0002B	CCW HEAT EXCHANGER RM SUPPLY FANS AH03A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7021	605-J-HS-0051A	ESW PUMP RM SUPPLY FANS AH01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7022	605-J-HS-0052B	ESW PUMP RM SUPPLY FANS AH01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7023	605-J-HS-0053A	ESW PUMP RM SUPPLY FANS AH02A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7024	605-J-HS-0054B	ESW PUMP RM SUPPLY FANS AH02B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7025	605-J-TI-0003A	CCW HEAT EXCHANGER ROOM TEMP (100-D01)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7026	605-J-TI-0004B	CCW HEAT EXCHANGER ROOM TEMP (100-D02)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7027	605-J-TI-0055A	ESW HVAC ROOM TEMP (090-K01)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7028	605-J-TI-0056B	ESW HVAC ROOM TEMP (090-K02)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7029	606-J-FI-0009A	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A AIR FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7030	606-J-FI-0010B	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B AIR FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7031	606-J-FIK-0045A	AUX. BLDG CONTROLLED AREA I EXH. ACU AU01A AIR FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7032	606-J-FIK-0046B	AUX. BLDG CONTROLLED AREA II EXH. ACU AU01B AIR FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7033	606-J-FIK-0047C	AUX. BLDG CONTROLLED AREA I EXH. ACU AU02A AIR FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7034	606-J-FIK-0048D	AUX. BLDG CONTROLLED AREA II EXH. ACU AU02B AIR FLOW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7035	606-J-HS-0001A	AUX. BLDG. CONTROLLES AREA EXH. ACU ISO. DAMPERS AND FANS AH01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7036	606-J-HS-0002B	AUX. BLDG. CONTROLLES AREA EXH. ACU ISO. DAMPERS AND FANS AH01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7037	606-J-HS-0003A	AUX. BLDG. CONTROLLES AREA EXH. ACU ISO. DAMPERS AND FANS AH02A	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (252 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7038	606-J-HS-0004B	AUX. BLDG. CONTROLLES AREA EXH. ACU ISO. DAMPERS AND FANS AH02B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7039	606-J-HS-0005A	AUX.BLDG. CONTROLLED AREA SUPPLY AHU FANS AH03A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7040	606-J-HS-0006B	AUX.BLDG. CONTROLLED AREA SUPPLY AHU FANS AH03B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7041	606-J-HS-0007A	AUX. BLDG. CONTROLLED AREA AHU ELEC. HEATING COILS/EDH HC07A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7042	606-J-HS-0008	AUX. BLDG. CONTROLLED AREA AHU ELEC. HEATING COILS/EDH HC07B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7043	606-J-HS-0008B	AUX. BLDG. CONTROLLED AREA AHU ELEC. HEATING COILS/EDH HC07B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7044	606-J-HS-0009A	AUX.BLDG. CONTROLLED AREA SUPPLY AHU FANS AH04A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7045	606-J-HS-0010B	AUX.BLDG. CONTROLLED AREA SUPPLY AHU FANS AH04B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7046	606-J-HS-0011B	AUX. BLDG. CONTROLLES AREA EXH. ACU AU01B BOOSTER FAN	157A12C	Auxiliary	156'-0"	above	158'-0"		
7047	606-J-HS-0012B	AUX. BLDG. CONTROLLES AREA EXH. ACU AU02B BOOSTER FAN	157A12C	Auxiliary	156'-0"	above	158'-0"		
7048	606-J-PDI-0025A	GENERAL ACCESS AREA (120-A20A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7049	606-J-PDI-0026B	GENERAL ACCESS AREA (100-A37B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7050	606-J-PDI-0027A	GENERAL ACCESS AREA (100-A20A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7051	606-J-PDI-0028B	GENERAL ACCESS AREA (120-A31A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7052	606-J-PDI-0030B	GENERAL ACCESS AREA (137-A29B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7053	606-J-PDI-0032B	GENERAL ACCESS AREA (156-A05B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7054	606-J-PDI-0033A	GENERAL ACCESS AREA (055-A19A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7055	606-J-PDI-0034B	GENERAL ACCESS AREA (055-A19B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7056	606-J-PDI-0035A	GENERAL ACCESS AREA (078-A31A)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7057	606-J-PDI-0036B	GENERAL ACCESS AREA (078-A44B)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7058	606-J-TI-0201A	CHARGING PUMP ROOM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7059	606-J-TI-0202B	CHARGING PUMP ROOM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7060	606-J-TI-0204B	MECH. PENET. ROOM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7061	606-J-TI-0205A	MECH. PENET. ROOM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7062	606-J-TI-0207C	CS PP & MINIFLOW HX RM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7063	606-J-TI-0208D	CS PP & MINIFLOW HX RM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7064	606-J-TI-0209C	SI PP ROOM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (253 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7065	606-J-TI-0210D	SI PP ROOM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7066	606-J-TI-0211A	SI PP ROOM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7067	606-J-TI-0212B	SI PP ROOM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7068	606-J-TI-0213A	CCW PP ROOM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7069	606-J-TI-0214B	CCW PP ROOM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7070	606-J-TI-0215C	CCW PP ROOM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7071	606-J-TI-0216D	CCW PP ROOM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7072	606-J-TI-0217C	CS HX RM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7073	606-J-TI-0218D	CS HX RM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7074	606-J-TI-0219A	SC PP & MINIFLOW HX RM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7075	606-J-TI-0220B	SC PP & MINIFLOW HX RM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7076	606-J-TI-0221A	SC HX RM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7077	606-J-TI-0222B	SC HX RM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7078	606-J-TI-0223A	MECH. PENETRATION RM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7079	606-J-TI-0224B	AUX. CHARGING PUMP RM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7080	606-J-TI-0228B	MECH. PENET. ROOM TEMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7081	606-J-TI-3007A	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7082	606-J-TI-3008B	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7083	606-J-TIK-3007A	AUX. BLDG CONTROLLED AREA I SUPPLY AHU HV01A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7084	606-J-TIK-3008B	AUX. BLDG CONTROLLED AREA II SUPPLY AHU HV01B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7085	606-J-ZL-0049A	AUX. BLDG. CONTROLLED AREA EXH. ACU FLOW CTRL DAMPERS Y0001A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7086	606-J-ZL-0050B	AUX. BLDG. CONTROLLED AREA EXH. ACU FLOW CTRL DAMPERS Y0001B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7087	606-J-ZL-0111A	AUX. BLDG. CONTROLLES AREA EXH. ACU ISO. DAMPERS AND FANS Y0002A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7088	606-J-ZL-0112B	AUX. BLDG. CONTROLLES AREA EXH. ACU ISO. DAMPERS AND FANS Y0002A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7089	606-J-ZL-0113B	AUX. BLDG. CONTROLLES AREA EXH. ACU ISO. DAMPERS AND FANS Y0003B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7090	606-J-ZL-0113D	AUX. BLDG. CONTROLLES AREA EXH. ACU ISO. DAMPERS AND FANS Y0003B	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (254 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7091	606-J-ZL-0114A	AUX. BLDG. CONTROLLES AREA EXH. ACU ISO. DAMPERS AND FANS Y0003A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7092	606-J-ZL-0114C	AUX. BLDG. CONTROLLES AREA EXH. ACU ISO. DAMPERS AND FANS Y0003A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7093	607-J-HS-0081A	SAFETY-RELATED CUBICLE COOLER FANS AH31A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7094	607-J-HS-0082B	SAFETY-RELATED CUBICLE COOLER FANS AH31B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7095	607-J-HS-0083C	SAFETY-RELATED CUBICLE COOLER FANS AH32A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7096	607-J-HS-0084D	SAFETY-RELATED CUBICLE COOLER FANS AH32B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7097	607-J-HS-0085A	SAFETY-RELATED CUBICLE COOLER FANS AH33A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7098	607-J-HS-0086B	SAFETY-RELATED CUBICLE COOLER FANS AH33B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7099	612-J-HS-0011B	HIGH VOLUME PURGE CONTAINMENT ISO. VALVES V011	157A12C	Auxiliary	156'-0"	above	158'-0"		
7100	612-J-HS-0012A	HIGH VOLUME PURGE CONTAINMENT ISO. VALVES V012	157A12C	Auxiliary	156'-0"	above	158'-0"		
7101	612-J-HS-0013A	HIGH VOLUME PURGE CONTAINMENT ISO. VALVES V013	157A12C	Auxiliary	156'-0"	above	158'-0"		
7102	612-J-HS-0014B	HIGH VOLUME PURGE CONTAINMENT ISO. VALVES V014	157A12C	Auxiliary	156'-0"	above	158'-0"		
7103	612-J-HS-0031B	LOW VOLUME PURGE CNMT ISO. VALVES V031	157A12C	Auxiliary	156'-0"	above	158'-0"		
7104	612-J-HS-0032A	LOW VOLUME PURGE CNMT ISO. VALVES V032	157A12C	Auxiliary	156'-0"	above	158'-0"		
7105	612-J-HS-0033A	LOW VOLUME PURGE CNMT ISO. VALVES V033	157A12C	Auxiliary	156'-0"	above	158'-0"		
7106	612-J-HS-0034B	LOW VOLUME PURGE CNMT ISO. VALVES V034	157A12C	Auxiliary	156'-0"	above	158'-0"		
7107	632-J-HS-0012A	CENTRAL CHILLED WATER ISO. VALVES (CNMT. OUTSIDE)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7108	632-J-HS-0013A	CENTRAL CHILLED WATER ISO. VALVES (CNMT. OUTSIDE)	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (255 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7109	632-J-HS-0015A	CENTRAL CHILLED WATER ISO. VALVES (CNMT. INSIDE)	157A12C	Auxiliary	156'-0"	above	158'-0"		
7110	633-J-HS-0009A01	ESSENTIAL CHILLED WATER PUMPS AND CHILLERS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7111	633-J-HS-0010B01	ESSENTIAL CHILLED WATER PUMPS AND CHILLERS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7112	633-J-HS-0011C01	ESSENTIAL CHILLED WATER PUMPS AND CHILLERS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7113	633-J-HS-0012D01	ESSENTIAL CHILLED WATER PUMPS AND CHILLERS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7114	633-J-HS-0249C	ESSENTIAL CHILLED WATER MAKEUP PUMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7115	633-J-HS-0250D	ESSENTIAL CHILLED WATER MAKEUP PUMP	157A12C	Auxiliary	156'-0"	above	158'-0"		
7116	633-J-ZL-0010B	ESSENTIAL CHILLER CH01B COMP MOTOR	157A12C	Auxiliary	156'-0"	above	158'-0"		
7117	633-J-ZL-0012D	ESSENTIAL CHILLER CH02B COMP MOTOR	157A12C	Auxiliary	156'-0"	above	158'-0"		
7118	669-J-HS-0004A	HIGH PRESS N2 SUPPLY ISOATION VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
7119	691-J-HS-0030A	CNMT BLDG FIRE PROTECTION DISCH. VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
7120	711-J-HS-0100A	RX TRIP CH A MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7121	711-J-HS-0100B	RX TRIP CH C MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7122	711-J-HS-0100C	RX TRIP CH B MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7123	711-J-HS-0100D	RX TRIP CH D MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7124	711-J-HS-0101A	HIGH LOG POWER BYPASS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7125	711-J-HS-0101B	HIGH LOG POWER BYPASS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7126	711-J-HS-0101C	HIGH LOG POWER BYPASS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7127	711-J-HS-0101D	HIGH LOG POWER BYPASS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7128	711-J-HS-0102A	LPD/DNBR BYPASS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7129	711-J-HS-0102B	LPD/DNBR BYPASS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7130	711-J-HS-0102C	LPD/DNBR BYPASS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7131	711-J-HS-0102D	LPD/DNBR BYPASS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7132	711-J-HS-0103A	Lo PZR PRESS BYPASS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7133	711-J-HS-0103B	Lo PZR PRESS BYPASS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7134	711-J-HS-0103C	Lo PZR PRESS BYPASS	157A12C	Auxiliary	156'-0"	above	158'-0"		
7135	711-J-HS-0103D	Lo PZR PRESS BYPASS	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (256 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7136	711-J-HS-0105A	Lo PZR PRESS SETPOINT RESET	157A12C	Auxiliary	156'-0"	above	158'-0"		
7137	711-J-HS-0105B	Lo PZR PRESS SETPOINT RESET	157A12C	Auxiliary	156'-0"	above	158'-0"		
7138	711-J-HS-0105C	Lo PZR PRESS SETPOINT RESET	157A12C	Auxiliary	156'-0"	above	158'-0"		
7139	711-J-HS-0105D	Lo PZR PRESS SETPOINT RESET	157A12C	Auxiliary	156'-0"	above	158'-0"		
7140	711-J-HS-0106A	Lo SG PRESS SETPOINT RESET	157A12C	Auxiliary	156'-0"	above	158'-0"		
7141	711-J-HS-0106B	Lo SG PRESS SETPOINT RESET	157A12C	Auxiliary	156'-0"	above	158'-0"		
7142	711-J-HS-0106C	Lo SG PRESS SETPOINT RESET	157A12C	Auxiliary	156'-0"	above	158'-0"		
7143	711-J-HS-0106D	Lo SG PRESS SETPOINT RESET	157A12C	Auxiliary	156'-0"	above	158'-0"		
7144	712-J-HS-0071A01	CREVAS CH A MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7145	712-J-HS-0072B01	CREVAS CH B MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7146	712-J-HS-0101A	CSAS CH A MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7147	712-J-HS-0101B	CSAS CH B MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7148	712-J-HS-0101C	CSAS CH C MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7149	712-J-HS-0101D	CSAS CH D MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7150	712-J-HS-0102A	SIAS CH A MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7151	712-J-HS-0102B	SIAS CH B MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7152	712-J-HS-0102C	SIAS CH C MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7153	712-J-HS-0102D	SIAS CH D MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7154	712-J-HS-0104A	CIAS CH A MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7155	712-J-HS-0104B	CIAS CH B MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7156	712-J-HS-0104C	CIAS CH C MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7157	712-J-HS-0104D	CIAS CH D MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7158	712-J-HS-0105A	MSIS CH A MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7159	712-J-HS-0105B	MSIS CH B MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7160	712-J-HS-0105C	MSIS CH C MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7161	712-J-HS-0105D	MSIS CH D MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7162	712-J-HS-0106A	AFAS-1 CH A MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7163	712-J-HS-0106B	AFAS-1 CH B MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7164	712-J-HS-0106C	AFAS-1 CH C MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7165	712-J-HS-0106D	AFAS-1 CH D MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7166	712-J-HS-0107A	AFAS-2 CH A MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7167	712-J-HS-0107B	AFAS-2 CH B MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7168	712-J-HS-0107C	AFAS-2 CH C MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7169	712-J-HS-0107D	AFAS-2 CH D MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7170	712-J-HS-0231A01	CPIAS CH A MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7171	712-J-HS-0232B01	CPIAS CH.B MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (257 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7172	712-J-HS-0241A01	FHEVAS CH A MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7173	712-J-HS-0242B01	FHEVAS CH B MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7174	751-J-HS-0091	ESCM 1 CH A CONFIRM SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7175	751-J-HS-0092	ESCM 2 CH B CONFIRM SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7176	751-J-HS-0093	ESCM 3 CH C CONFIRM SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7177	751-J-HS-0094	ESCM 4 CH D CONFIRM SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7178	751-J-HS-0096	ESCM 2 CH A CONFIRM SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7179	751-J-HS-0097	ESCM 3 CH B CONFIRM SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7180	751-J-HS-0098	ESCM 4 CH C CONFIRM SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7181	751-J-HS-0099	ESCM 5 CH D CONFIRM SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7182	751-J-UC-0021	CPC/PPS OM 1 CTRL SCREEN	157A12C	Auxiliary	156'-0"	above	158'-0"		
7183	751-J-UC-0022	CPC/PPS OM 2 CTRL SCREEN	157A12C	Auxiliary	156'-0"	above	158'-0"		
7184	751-J-UC-0023	CPC/PPS OM 3 CTRL SCREEN	157A12C	Auxiliary	156'-0"	above	158'-0"		
7185	751-J-UC-0024	CPC/PPS OM 4 CTRL SCREEN	157A12C	Auxiliary	156'-0"	above	158'-0"		
7186	751-J-UC-0025	ESCM 1	157A12C	Auxiliary	156'-0"	above	158'-0"		
7187	751-J-UC-0026	ESCM 2	157A12C	Auxiliary	156'-0"	above	158'-0"		
7188	751-J-UI-0039	QIAS-P FPD 1	157A12C	Auxiliary	156'-0"	above	158'-0"		
7189	751-J-UI-0040	QIAS-P FPD 2	157A12C	Auxiliary	156'-0"	above	158'-0"		
7190	761-J-HS-0431A	RE/RT-039A, 040B MONITOR SAMPLE CONTAINMENT ISOATION VALVES V431 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7191	761-J-HS-0432B	RE/RT-039A, 040B MONITOR SAMPLE CONTAINMENT ISOATION VALVES V432 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7192	761-J-HS-0434B	RE/RT-039A, 040B MONITOR SAMPLE CONTAINMENT ISOATION VALVES V432 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7193	761-J-RI-0039A	CNMT AIR	157A12C	Auxiliary	156'-0"	above	158'-0"		
7194	761-J-RI-0040A	RECATOR CONTAINMENT BLDG. CONTAINMENT AIR	157A12C	Auxiliary	156'-0"	above	158'-0"		
7195	761-J-RI-0071A	MCR AIR INTAKE RADIATION TRAIN A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7196	761-J-RI-0072B	MCR AIR INTAKE RADIATION TRAIN B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7197	761-J-RI-0073A	MCR AIR INTAKE RADIATION TRAIN A	157A12C	Auxiliary	156'-0"	above	158'-0"		
7198	761-J-RI-0074B	MCR AIR INTAKE RADIATION TRAIN B	157A12C	Auxiliary	156'-0"	above	158'-0"		
7199	761-J-RI-0231A	CNMT OPERATING AREA MONITOR	157A12C	Auxiliary	156'-0"	above	158'-0"		
7200	761-J-RI-0232B	CNMT OPERATING AREA MONITOR	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (258 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7201	761-J-RI-0233A	CNMT UPPER OPERATING AREA MONITOR	157A12C	Auxiliary	156'-0"	above	158'-0"		
7202	761-J-RI-0234B	CNMT UPPER OPERATING AREA MONITOR	157A12C	Auxiliary	156'-0"	above	158'-0"		
7203	761-J-RI-0241A	SPENT FUEL POOL AREA	157A12C	Auxiliary	156'-0"	above	158'-0"		
7204	761-J-RI-0242B	SPENT FUEL POOL AREA	157A12C	Auxiliary	156'-0"	above	158'-0"		
7205	761-J-RR-0039A	CNMT AIR	157A12C	Auxiliary	156'-0"	above	158'-0"		
7206	761-J-RR-0040A	RECATOR CONTAINMENT BLDG. CONTAINMENT AIR	157A12C	Auxiliary	156'-0"	above	158'-0"		
7207	763-J-HS-0001A	H2 MONITOR CNMT ISOATION VALVES V001 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7208	763-J-HS-0002B	H2 MONITOR CNMT ISOATION VALVES V002 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7209	763-J-HS-0003A	H2 MONITOR CNMT ISOATION VALVES V003 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7210	763-J-HS-0004B	H2 MONITOR CNMT ISOATION VALVES V004 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7211	763-J-HS-0009A	H2 MONITOR CNMT ISOATION VALVES V009 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7212	763-J-HS-0010B	H2 MONITOR CNMT ISOATION VALVES V010 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7213	763-J-HS-0011A	H2 MONITOR CNMT ISOATION VALVES V011 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7214	763-J-HS-0012B	H2 MONITOR CNMT ISOATION VALVES V012 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7215	763-J-HS-0013A	H2 MONITOR CNMT ISOATION VALVES V013 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7216	763-J-HS-0014B	H2 MONITOR CNMT ISOATION VALVES V014 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7217	763-J-HS-0017A	CNMT PRESS ISOATION VALVES V017 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7218	763-J-HS-0018B	CNMT PRESS ISOATION VALVES V018 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7219	763-J-HS-0019C	CNMT PRESS ISOATION VALVES V019 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7220	763-J-HS-0020D	CNMT PRESS ISOATION VALVES V020 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (259 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7221	763-J-HS-0021A	CNMT PRESS ISOATION VALVES V021 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7222	763-J-HS-0022B	CNMT PRESS ISOATION VALVES V022 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7223	763-J-HS-0023A	H2 MONITOR CNMT ISOATION VALVES V023 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7224	763-J-HS-0024B	H2 MONITOR CNMT ISOATION VALVES V024 CTRL SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7225	791-J-HS-0031A	SG 1 PROCESS SAMP. ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
7226	791-J-HS-0032B	SG 1&2 PROCESS SAMPLING CNMT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
7227	791-J-HS-0033A	SG 1 PROCESS SAMP. ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
7228	791-J-HS-0034B	SG 1&2 PROCESS SAMPLING CNMT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
7229	791-J-HS-0035A	SG 1 PROCESS SAMP. ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
7230	791-J-HS-0036B	SG 1&2 PROCESS SAMPLING CNMT ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
7231	791-J-HS-0257A	SG 1 PRIMARY SAMPLE ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
7232	791-J-HS-0258B	SG 1&2 PRIMARY SAMPLING ISO VALVE	157A12C	Auxiliary	156'-0"	above	158'-0"		
7233	799-J-HS-0101A	DMA SIAS-A MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7234	799-J-HS-0101C	DMA SIAS-C MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7235	799-J-HS-0102A	DMA CSAS-A MANUALACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7236	799-J-HS-0102C	DMA CSAS-C MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7237	799-J-HS-0103A	DMA AFAS-1 MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7238	799-J-HS-0103B	DMA AFAS-2 MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7239	799-J-HS-0104A	DMA MSIS-1A MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7240	799-J-HS-0105A	DMA MSIS-1B MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7241	799-J-HS-0106A	DMA MSIS-2A MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7242	799-J-HS-0107A	DMA MSIS-2B MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7243	799-J-HS-0108A	DMA CIAS-A MANUAL ACT	157A12C	Auxiliary	156'-0"	above	158'-0"		
7244	799-J-HS-0109A	DMA ENABLE SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7245	799-J-HS-0111A	CPC CH A ENABLE SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7246	799-J-HS-0111B	CPC CH B ENABLE SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7247	799-J-HS-0111C	CPC CH C ENABLE SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7248	799-J-HS-0111D	CPC CH D ENABLE SW	157A12C	Auxiliary	156'-0"	above	158'-0"		
7249	823-J-HS-0301A02	1E BUS SW01A NORMAL FEED PCB	157A12C	Auxiliary	156'-0"	above	158'-0"		
7250	823-J-HS-0302B02	1E BUS SW01B NORMAL FEED PCB	157A12C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (260 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7251	823-J-HS-0303A02	1E BUS SW02A NORMAL FEED PCB	157A12C	Auxiliary	156'-0"	above	158'-0"		
7252	823-J-HS-0304B02	1E BUS SW02B NORMAL FEED PCB	157A12C	Auxiliary	156'-0"	above	158'-0"		
7253	823-J-HS-0305A02	1E BUS SW01A ALT FEED PCB	157A12C	Auxiliary	156'-0"	above	158'-0"		
7254	823-J-HS-0306B02	1E BUS SW01B ALT FEED PCB	157A12C	Auxiliary	156'-0"	above	158'-0"		
7255	823-J-HS-0307A02	1E BUS SW02A ALT FEED PCB	157A12C	Auxiliary	156'-0"	above	158'-0"		
7256	823-J-HS-0308B02	1E BUS SW02B ALT FEED PCB	157A12C	Auxiliary	156'-0"	above	158'-0"		
7257	823-J-HS-0315A02	1E BUS SW01A DG SUP PCB	157A12C	Auxiliary	156'-0"	above	158'-0"		
7258	823-J-HS-0316B02	1E BUS SW01B DG SUP PCB	157A12C	Auxiliary	156'-0"	above	158'-0"		
7259	823-J-HS-0317A02	1E BUS SW02A DG SUP PCB	157A12C	Auxiliary	156'-0"	above	158'-0"		
7260	823-J-HS-0318B02	1E BUS SW02B DG SUP PCB	157A12C	Auxiliary	156'-0"	above	158'-0"		
7261	823-J-HS-0319A02	1E BUS SW01A TIE PCB TO AAC	157A12C	Auxiliary	156'-0"	above	158'-0"		
7262	823-J-HS-0320B02	1E BUS SW01B TIE PCB TO AAC	157A12C	Auxiliary	156'-0"	above	158'-0"		
7263	823-J-HS-0321A02	1E BUS SW02A TIE PCB TO AAC	157A12C	Auxiliary	156'-0"	above	158'-0"		
7264	823-J-HS-0322B02	1E BUS SW02B TIE PCB TO AAC	157A12C	Auxiliary	156'-0"	above	158'-0"		
7265	601-Y-VC-1041	MANUAL DAMPER	157A12C	Auxiliary	156'-0"	above	158'-0"		
7266	601-Y-VC-1047	MANUAL DAMPER	157A12C	Auxiliary	156'-0"	above	158'-0"		
7267	601-Y-VC-1048	MANUAL DAMPER	157A12C	Auxiliary	156'-0"	above	158'-0"		
7268	601-Y-VC-1063	MANUAL DAMPER	157A12C	Auxiliary	156'-0"	above	158'-0"		
7269	601-Y-VC-1521	FIRE DAMPER	157A12C	Auxiliary	156'-0"	above	158'-0"		
7270	633-V-2445A	I&C EQUIP RM HV16A ECW Inlet DRN VALVE	157A13C	Auxiliary	156'-0"	above	158'-0"	4" FD (1)	-
7271	633-V-2446A	I&C EQUIP RM CW16A Outlet DRN VALVE	157A13C	Auxiliary	156'-0"	above	158'-0"		
7272	633-V-2470A	I&C EQUIP RM CW17A Outlet Vent VALVE	157A13C	Auxiliary	156'-0"	above	158'-0"		
7273	633-V-2471A	I&C EQUIP RM CW17A Inlet Vent VALVE	157A13C	Auxiliary	156'-0"	above	158'-0"		
7274	601-Y-VC-1531	FIRE DAMPER	157A13D	Auxiliary	156'-0"	above	158'-0"		
7275	601-Y-VC-1056	MANUAL DAMPER	157A15D	Auxiliary	156'-0"	above	158'-0"		
7276	601-Y-VC-1061	MANUAL DAMPER	157A15D	Auxiliary	156'-0"	above	158'-0"		
7277	603-Y-VE-1680A	FIRE DAMPER	157A16C	Auxiliary	156'-0"	above	158'-0"	4" FD (1)	-
7278	603-Y-VE-1675B	FIRE DAMPER	157A16D	Auxiliary	156'-0"	above	158'-0"	4" FD (2)	-
7279	601-Y-VC-1054	MANUAL DAMPER	157A17C	Auxiliary	156'-0"	above	158'-0"	4" FD (1)	-
7280	601-Y-VC-1509	FIRE DAMPER	157A17C	Auxiliary	156'-0"	above	158'-0"		
7281	601-Y-VC-1511	FIRE DAMPER	157A17C	Auxiliary	156'-0"	above	158'-0"		
7282	601-Y-VC-1514	FIRE DAMPER	157A17C	Auxiliary	156'-0"	above	158'-0"		
7283	601-Y-VC-1517	FIRE DAMPER	157A17C	Auxiliary	156'-0"	above	158'-0"		
7284	601-Y-VC-1561	FIRE DAMPER	157A17C	Auxiliary	156'-0"	above	158'-0"		
7285	601-Y-VC-1565	FIRE DAMPER	157A17C	Auxiliary	156'-0"	above	158'-0"		
7286	603-M-HV17A	CUBICLE COOLER	157A19C	Auxiliary	156'-0"	above	158'-0"	4" FD (1)	-

Table 3.4-2 (261 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7287	752-J-PA03C	ESF-CCS GROUP CONTROLLER CABINET (CH. CE)	157A19C	Auxiliary	156'-0"	above	158'-0"		
7288	752-J-PA04C	ITP/MTP CABINET (CH.CE)	157A19C	Auxiliary	156'-0"	above	158'-0"		
7289	752-J-PA06C	LOOP CONTROLLER CABINET (CH. CE)	157A19C	Auxiliary	156'-0"	above	158'-0"		
7290	752-J-PA15C	CPC CABINET CH.C	157A19C	Auxiliary	156'-0"	above	158'-0"		
7291	752-J-PA18C	APC CABINET CH.C	157A19C	Auxiliary	156'-0"	above	158'-0"		
7292	752-J-PA29C	DRCS MUX CABINET (CH.CE)	157A19C	Auxiliary	156'-0"	above	158'-0"		
7293	431-J-PY-0101C01	PZR PRESSURE	157A19C	Auxiliary	156'-0"	above	158'-0"		
7294	431-J-PY-0101C02	PZR PRESSURE	157A19C	Auxiliary	156'-0"	above	158'-0"		
7295	431-J-SY-0113C01	RCP 1A (PP01A) SPEED	157A19C	Auxiliary	156'-0"	above	158'-0"		
7296	431-J-SY-0113C02	RCP 1A (PP01A) SPEED	157A19C	Auxiliary	156'-0"	above	158'-0"		
7297	431-J-SY-0123C01	RCP 1B (PP01B) SPEED	157A19C	Auxiliary	156'-0"	above	158'-0"		
7298	431-J-SY-0123C02	RCP 1B (PP01B) SPEED	157A19C	Auxiliary	156'-0"	above	158'-0"		
7299	431-J-SY-0133C01	RCP 2A (PP02A) SPEED	157A19C	Auxiliary	156'-0"	above	158'-0"		
7300	431-J-SY-0133C02	RCP 2A (PP02A) SPEED	157A19C	Auxiliary	156'-0"	above	158'-0"		
7301	431-J-SY-0143C01	RCP 2B (PP02B) SPEED	157A19C	Auxiliary	156'-0"	above	158'-0"		
7302	431-J-SY-0143C02	RCP 2B (PP02B) SPEED	157A19C	Auxiliary	156'-0"	above	158'-0"		
7303	431-J-TY-0112C	HOT LEG TEMP FROM REACTOR TO SG1	157A19C	Auxiliary	156'-0"	above	158'-0"		
7304	431-J-TY-0113C	HOT LEG TEMP TO SG2	157A19C	Auxiliary	156'-0"	above	158'-0"		
7305	431-J-TY-0122C	LOOP 1A COLD LEG TEMP	157A19C	Auxiliary	156'-0"	above	158'-0"		
7306	431-J-TY-0123C	LOOP 2A COLD LEG TEMP	157A19C	Auxiliary	156'-0"	above	158'-0"		
7307	442-J-FY-0338C01	CONTAINMENT SPRAY HX HE01A FLOW	157A19C	Auxiliary	156'-0"	above	158'-0"		
7308	601-J-FC-0021C	CTRL RM SUPPLY AHU HV 01A AIR FLOW CTRL	157A19C	Auxiliary	156'-0"	above	158'-0"		
7309	601-J-FS-0021C01	CTRL RM SUPPLY AHU HV 01A AIR FLOW CTRL	157A19C	Auxiliary	156'-0"	above	158'-0"		
7310	601-J-FS-0021C02	CTRL RM SUPPLY AHU HV 01A AIR FLOW CTRL	157A19C	Auxiliary	156'-0"	above	158'-0"		
7311	601-J-FS-0023C01	CTRL RM EMRG MAKEUP ACU AU01A AIR FLOW CTRL	157A19C	Auxiliary	156'-0"	above	158'-0"		
7312	601-J-FS-0023C02	CTRL RM EMRG MAKEUP ACU AU01A AIR FLOW CTRL	157A19C	Auxiliary	156'-0"	above	158'-0"		
7313	601-J-FS-0055C01	CTRL RM AREA RETURN AIR FLOW-CHANNEL A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7314	601-J-FS-0055C02	CTRL RM AREA RETURN AIR FLOW-CHANNEL A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7315	601-J-FY-0021C01	CTRL RM SUPPLY AHU HV 01A AIR FLOW CTRL	157A19C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (262 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7316	601-J-FY-0021C02	CTRL RM SUPPLY AHU HV 01A AIR FLOW CTRL	157A19C	Auxiliary	156'-0"	above	158'-0"		
7317	601-J-FY-0023C	CONTROL ROOM EMRG. MAKEUP ACU AU01A AIR FLOW CTRL	157A19C	Auxiliary	156'-0"	above	158'-0"		
7318	601-J-FY-0051C	CTRL RM OUTSIDE AIR SUPPLY FLOW - CHANNEL A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7319	601-J-FY-0053C	CTRL RM OUTSIDE AIR SUPPLY FLOW TO ACU AU 01A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7320	601-J-FY-0055C	CTRL RM AREA RETURN AIR FLOW-CHANNEL A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7321	601-J-PDS-0147C	MCR ENVELOPE PRESSURE-CHANNEL A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7322	601-J-PDS-0149C	TSC OFFICE ENVELPOE PRESSURE-CH.A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7323	601-J-PDS-0151C	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7324	601-J-PDS-0153C	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7325	601-J-PDY-0147C	MCR ENVELOPE PRESSURE-CHANNEL A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7326	601-J-PDY-0149C	TSC OFFICE ENVELPOE PRESSURE-CH.A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7327	601-J-PDY-0151C	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7328	601-J-PDY-0153C	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7329	601-J-TC-3047C	CTRL RM SUPPLY AHU HV 01A TEMP ELEC. HTG COIL HC 01A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7330	601-J-TC-3049C	CTRL RM SUPPLY AHU HV 01A TEMP MCR	157A19C	Auxiliary	156'-0"	above	158'-0"		
7331	601-J-TS-3043C01	CTRL RM EMRG MAKEUP ACU AU 01A ELEC. HTG COIL HC 08A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7332	601-J-TS-3043C02	CTRL RM EMRG MAKEUP ACU AU 01A ELEC. HTG COIL HC 08A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7333	601-J-TS-3047C	CTRL RM SUPPLY AHU HV 01A TEMP ELEC. HTG COIL HC 01A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7334	601-J-TS-3049C	CTRL RM SUPPLY AHU HV 01A TEMP MCR	157A19C	Auxiliary	156'-0"	above	158'-0"		
7335	601-J-TY-3001C	CTRL RM SUPPLY AHU HV 01A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7336	601-J-TY-3043C01	CTRL RM EMRG MAKEUP ACU AU 01A ELEC. HTG COIL HC 08A	157A19C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (263 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7337	601-J-TY-3045C01	CTRL RM EMRG MAKEUP ACU AU 01A CARBON ADSR FT 02A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7338	601-J-TY-3047C01	CTRL RM SUPPLY AHU HV 01A TEMP ELEC. HTG COIL HC 01A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7339	601-J-TY-3047C02	CTRL RM SUPPLY AHU HV 01A TEMP ELEC. HTG COIL HC 01A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7340	601-J-TY-3049C01	CTRL RM SUPPLY AHU HV 01A TEMP MCR	157A19C	Auxiliary	156'-0"	above	158'-0"		
7341	601-J-TY-3049C02	CTRL RM SUPPLY AHU HV 01A TEMP MCR	157A19C	Auxiliary	156'-0"	above	158'-0"		
7342	603-J-HS-0133C	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH17A	157A19C	Auxiliary	156'-0"	above	158'-0"		
7343	603-J-TE-0133C	I & C EQUIP RM C TEMP.	157A19C	Auxiliary	156'-0"	above	158'-0"		
7344	603-J-TE-3231C	I&C EQUIP. RM (157-A19C)	157A19C	Auxiliary	156'-0"	above	158'-0"		
7345	603-J-TS-0133C01	I&C EQUIP. RM (C) (157-A19C)	157A19C	Auxiliary	156'-0"	above	158'-0"		
7346	603-J-TS-0133C02	I&C EQUIP. RM (C) (157-A19C)	157A19C	Auxiliary	156'-0"	above	158'-0"		
7347	603-J-TS-0133C03	I&C EQUIP. RM (C) (157-A19C)	157A19C	Auxiliary	156'-0"	above	158'-0"		
7348	603-J-TY-0133C	I&C EQUIP. RM (C) (157-A19C)	157A19C	Auxiliary	156'-0"	above	158'-0"		
7349	633-J-TW-0169	COOLING COIL VE-CW17A OUTLET	157A19C	Auxiliary	156'-0"	above	158'-0"		
7350	633-J-TW-0171	COOLING COIL VE-CW17A INLET	157A19C	Auxiliary	156'-0"	above	158'-0"		
7351	633-V-1135A	I&C EQUIP RM(C) C-CLR Outlet VALVE	157A19C	Auxiliary	156'-0"	above	158'-0"		
7352	633-V-1136A	I&C EQUIP RM(C) C-CLR Inlet throt VALVE	157A19C	Auxiliary	156'-0"	above	158'-0"		
7353	633-V-2135A	I&C EQUIP RM(C) C-CLR Outlet PZR Test VALVE	157A19C	Auxiliary	156'-0"	above	158'-0"		
7354	633-V-2136A	I&C EQUIP RM(C) C-CLR Inlet PZR Test VALVE	157A19C	Auxiliary	156'-0"	above	158'-0"		
7355	633-V-2235A	I&C EQUIP RM HV17A ECW Outlet Vent VALVE	157A19C	Auxiliary	156'-0"	above	158'-0"		
7356	633-V-2236A	I&C EQUIP RM HV17A ECW Inlet DRN VALVE	157A19C	Auxiliary	156'-0"	above	158'-0"		
7357	633-V-2281A	I&C EQUIP RM HV17A ECW Outlet DRN VALVE	157A19C	Auxiliary	156'-0"	above	158'-0"		
7358	633-V-2335A	I&CEQUIP RM HV17A ECW Outlet TestConn VALVE	157A19C	Auxiliary	156'-0"	above	158'-0"		
7359	633-V-2336A	I&CEQUIP RM HV17A ECW Inlet TestConn VALVE	157A19C	Auxiliary	156'-0"	above	158'-0"		
7360	633-V-2474A	I&C EQUIP RM CW17A Inlet Vent VALVE	157A19C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (264 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7361	633-V-2475A	I&C EQUIP RM CW17A Inlet DRN VALVE	157A19C	Auxiliary	156'-0"	above	158'-0"		
7362	603-Y-VE-1176A	MANUAL DAMPER	157A19C	Auxiliary	156'-0"	above	158'-0"		
7363	603-Y-VE-1177A	MANUAL DAMPER	157A19C	Auxiliary	156'-0"	above	158'-0"		
7364	603-Y-VE-1179A	MANUAL DAMPER	157A19C	Auxiliary	156'-0"	above	158'-0"		
7365	603-Y-VE-1258A	MANUAL DAMPER	157A19C	Auxiliary	156'-0"	above	158'-0"		
7366	603-Y-VE-1556A	FIRE DAMPER	157A19C	Auxiliary	156'-0"	above	158'-0"		
7367	603-Y-VE-1675A	FIRE DAMPER	157A19C	Auxiliary	156'-0"	above	158'-0"		
7368	603-Y-VE-1678A	FIRE DAMPER	157A19C	Auxiliary	156'-0"	above	158'-0"		
7369	603-M-HV17B	CUBICLE COOLER	157A19D	Auxiliary	156'-0"	above	158'-0"	4" FD (1)	-
7370	752-J-PA03D	ESF-CCS GROUP CONTROLLER CABINET (CH. DE)	157A19D	Auxiliary	156'-0"	above	158'-0"		
7371	752-J-PA04D	ITP/MTP CABINET (CH.DE)	157A19D	Auxiliary	156'-0"	above	158'-0"		
7372	752-J-PA06D	LOOP CONTROLLER CABINET (CH. DE)	157A19D	Auxiliary	156'-0"	above	158'-0"		
7373	752-J-PA15D	CPC CABINET CH.D	157A19D	Auxiliary	156'-0"	above	158'-0"		
7374	752-J-PA18D	APC CABINET CH.D	157A19D	Auxiliary	156'-0"	above	158'-0"		
7375	752-J-PA29D	DRCS MUX CABINET (CH.DE)	157A19D	Auxiliary	156'-0"	above	158'-0"		
7376	431-J-PY-0101D01	PZR PRESSURE	157A19D	Auxiliary	156'-0"	above	158'-0"		
7377	431-J-PY-0101D02	PZR PRESSURE	157A19D	Auxiliary	156'-0"	above	158'-0"		
7378	431-J-SY-0113D01	RCP 1A (PP01A) SPEED	157A19D	Auxiliary	156'-0"	above	158'-0"		
7379	431-J-SY-0113D02	RCP 1A (PP01A) SPEED	157A19D	Auxiliary	156'-0"	above	158'-0"		
7380	431-J-SY-0123D01	RCP 1B (PP01B) SPEED	157A19D	Auxiliary	156'-0"	above	158'-0"		
7381	431-J-SY-0123D02	RCP 1B (PP01B) SPEED	157A19D	Auxiliary	156'-0"	above	158'-0"		
7382	431-J-SY-0133D01	RCP 2A (PP02A) SPEED	157A19D	Auxiliary	156'-0"	above	158'-0"		
7383	431-J-SY-0133D02	RCP 2A (PP02A) SPEED	157A19D	Auxiliary	156'-0"	above	158'-0"		
7384	431-J-SY-0143D01	RCP 2B (PP02B) SPEED	157A19D	Auxiliary	156'-0"	above	158'-0"		
7385	431-J-SY-0143D02	RCP 2B (PP02B) SPEED	157A19D	Auxiliary	156'-0"	above	158'-0"		
7386	431-J-TY-0112D	HOT LEG TEMP FROM REACTOR TO SG1	157A19D	Auxiliary	156'-0"	above	158'-0"		
7387	431-J-TY-0113D	HOT LEG TEMP TO SG2	157A19D	Auxiliary	156'-0"	above	158'-0"		
7388	431-J-TY-0122D	LOOP 1B COLD LEG TEMP	157A19D	Auxiliary	156'-0"	above	158'-0"		
7389	431-J-TY-0123D	LOOP 2B COLD LEG TEMP	157A19D	Auxiliary	156'-0"	above	158'-0"		
7390	601-J-FC-0022D	CTRL RM SUPPLY AHU HV 01B AIR FLOW CTRL	157A19D	Auxiliary	156'-0"	above	158'-0"		
7391	601-J-FC-0023C	CTRL RM EMRG MAKEUP ACU AU 01A AIR FLOW CTRL	157A19D	Auxiliary	156'-0"	above	158'-0"		
7392	601-J-FC-0024D	CTRL RM EMRG MAKEUP ACU AU01B AIR FLOW CTRL	157A19D	Auxiliary	156'-0"	above	158'-0"		
7393	601-J-FS-0022D01	CTRL RM SUPPLY AHU HV 01B AIR FLOW CTRL	157A19D	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (265 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7394	601-J-FS-0022D02	CTRL RM SUPPLY AHU HV 01B AIR FLOW CTRL	157A19D	Auxiliary	156'-0"	above	158'-0"		
7395	601-J-FS-0024D01	CTRL RM EMRG MAKEUP ACU AU01B AIR FLOW CTRL	157A19D	Auxiliary	156'-0"	above	158'-0"		
7396	601-J-FS-0024D02	CTRL RM EMRG MAKEUP ACU AU01B AIR FLOW CTRL	157A19D	Auxiliary	156'-0"	above	158'-0"		
7397	601-J-FS-0056D01	CTRL RM AREA RETURN AIR FLOW-CHANNEL B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7398	601-J-FS-0056D02	CTRL RM AREA RETURN AIR FLOW-CHANNEL B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7399	601-J-FY-0022D01	CTRL RM SUPPLY AHU HV 01B AIR FLOW CTRL	157A19D	Auxiliary	156'-0"	above	158'-0"		
7400	601-J-FY-0022D02	CTRL RM SUPPLY AHU HV 01B AIR FLOW CTRL	157A19D	Auxiliary	156'-0"	above	158'-0"		
7401	601-J-FY-0023C02	CTRL RM EMRG MAKEUP ACU AU01A AIR FLOW CTRL	157A19D	Auxiliary	156'-0"	above	158'-0"		
7402	601-J-FY-0024D	CONTROL ROOM EMRG. MAKEUP ACU AU01B AIR FLOW CTRL	157A19D	Auxiliary	156'-0"	above	158'-0"		
7403	601-J-FY-0024D02	CTRL RM EMRG MAKEUP ACU AU01B AIR FLOW CTRL	157A19D	Auxiliary	156'-0"	above	158'-0"		
7404	601-J-FY-0052D	CTRL RM OUTSIDE AIR SUPPLY FLOW - CHANNEL B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7405	601-J-FY-0054D	CTRL RM OUTSIDE AIR SUPPLY FLOW TO ACU AU 01B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7406	601-J-FY-0056D	CTRL RM AREA RETURN AIR FLOW-CHANNEL B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7407	601-J-PDS-0148D	MCR ENVELOPE PRESSURE-CHANNEL B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7408	601-J-PDS-0150D	TSC OFFICE ENVELPOE PRESSURE-CH.B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7409	601-J-PDS-0152D	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7410	601-J-PDS-0154D	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7411	601-J-PDY-0148D	MCR ENVELOPE PRESSURE-CHANNEL B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7412	601-J-PDY-0150D	TSC OFFICE ENVELPOE PRESSURE-CH.B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7413	601-J-PDY-0152D	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7414	601-J-PDY-0154D	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.B	157A19D	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (266 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7415	601-J-TC-3048D	CTRL RM SUPPLY AHU HV 01B TEMP ELEC. HTG COIL HC 01B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7416	601-J-TC-3050D	CTRL RM SUPPLY AHU HV 01B TEMP MCR	157A19D	Auxiliary	156'-0"	above	158'-0"		
7417	601-J-TS-3044D01	CTRL RM EMRG MAKEUP ACU AU 01B ELEC. HTG COIL HC 08B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7418	601-J-TS-3044D02	CTRL RM EMRG MAKEUP ACU AU 01B ELEC. HTG COIL HC 08B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7419	601-J-TS-3048D	CTRL RM SUPPLY AHU HV 01B TEMP ELEC. HTG COIL HC 01B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7420	601-J-TS-3050D	CTRL RM SUPPLY AHU HV 01B TEMP MCR	157A19D	Auxiliary	156'-0"	above	158'-0"		
7421	601-J-TY-3002D	CTRL RM SUPPLY AHU HV 01B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7422	601-J-TY-3044D01	CTRL RM EMRG MAKEUP ACU AU 01B ELEC. HTG COIL HC 08B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7423	601-J-TY-3046D01	CTRL RM EMRG MAKEUP ACU AU 01B CARBON ADSR FT 02B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7424	601-J-TY-3048D01	CTRL RM SUPPLY AHU HV 01B TEMP ELEC. HTG COIL HC 01B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7425	601-J-TY-3048D02	CTRL RM SUPPLY AHU HV 01B TEMP ELEC. HTG COIL HC 01B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7426	601-J-TY-3050D01	CTRL RM SUPPLY AHU HV 01B TEMP MCR	157A19D	Auxiliary	156'-0"	above	158'-0"		
7427	601-J-TY-3050D02	CTRL RM SUPPLY AHU HV 01B TEMP MCR	157A19D	Auxiliary	156'-0"	above	158'-0"		
7428	603-J-HS-0134D	ELECT. AND I&C EQUIP. AREAS Ⅰ&Ⅱ SAFETY-RELATED CUBICLE COOLER FANS AH17B	157A19D	Auxiliary	156'-0"	above	158'-0"		
7429	603-J-TC-3232D	I&C EQUIP. RM (157-A19D)	157A19D	Auxiliary	156'-0"	above	158'-0"		
7430	603-J-TE-0134D	I & C EQUIP RM D TEMP.	157A19D	Auxiliary	156'-0"	above	158'-0"		
7431	603-J-TE-3232D	I&C EQUIP. RM (157-A19D)	157A19D	Auxiliary	156'-0"	above	158'-0"		
7432	603-J-TS-0134D01	I&C EQUIP. RM (D) (157-A19D)	157A19D	Auxiliary	156'-0"	above	158'-0"		
7433	603-J-TS-0134D02	I&C EQUIP. RM (D) (157-A19D)	157A19D	Auxiliary	156'-0"	above	158'-0"		
7434	603-J-TS-0134D03	I&C EQUIP. RM (D) (157-A19D)	157A19D	Auxiliary	156'-0"	above	158'-0"		
7435	603-J-TS-3232D01	I&C EQUIP. RM HI(157-A19D)	157A19D	Auxiliary	156'-0"	above	158'-0"		
7436	603-J-TS-3232D02	I&C EQUIP. RM LO(157-A19D)	157A19D	Auxiliary	156'-0"	above	158'-0"		
7437	603-J-TY-0134D	I&C EQUIP. RM (D) (157-A19D)	157A19D	Auxiliary	156'-0"	above	158'-0"		
7438	603-J-TY-3232D01	I&C EQUIP. RM IN-BFR(157-A19D)	157A19D	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (267 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7439	603-J-TY-3232D02	I&C EQUIP. RM OUT-BFR(157-A19D)	157A19D	Auxiliary	156'-0"	above	158'-0"		
7440	633-J-TW-0170	COOLING COIL VE-CW17B OUTLET	157A19D	Auxiliary	156'-0"	above	158'-0"		
7441	633-J-TW-0172	COOLING COIL VE-CW17B INLET	157A19D	Auxiliary	156'-0"	above	158'-0"		
7442	633-V-1135B	I&C EQUIP RM(D) C-CLR Outlet VALVE	157A19D	Auxiliary	156'-0"	above	158'-0"		
7443	633-V-1136B	I&C EQUIP RM(D) C-CLR Inlet throt VALVE	157A19D	Auxiliary	156'-0"	above	158'-0"		
7444	633-V-2135B	I&C EQUIP RM(D) C-CLR Outlet PZR Test VALVE	157A19D	Auxiliary	156'-0"	above	158'-0"		
7445	633-V-2136B	I&C EQUIP RM(D) C-CLR Inlet PZR Test VALVE	157A19D	Auxiliary	156'-0"	above	158'-0"		
7446	633-V-2235B	I&C EQUIP RM HV17B ECW Outlet Vent VALVE	157A19D	Auxiliary	156'-0"	above	158'-0"		
7447	633-V-2236B	I&C EQUIP RM HV17B ECW Inlet DRN VALVE	157A19D	Auxiliary	156'-0"	above	158'-0"		
7448	633-V-2281B	I&C EQUIP RM HV17B ECW Outlet DRN VALVE	157A19D	Auxiliary	156'-0"	above	158'-0"		
7449	633-V-2335B	I&CEQUIP RM HV17B ECW Outlet TestConn VALVE	157A19D	Auxiliary	156'-0"	above	158'-0"		
7450	633-V-2336B	I&CEQUIP RM HV17B ECW Inlet TestConn VALVE	157A19D	Auxiliary	156'-0"	above	158'-0"		
7451	633-V-2458B	I&C EQUIP RM CW17B Inlet Vent VALVE	157A19D	Auxiliary	156'-0"	above	158'-0"		
7452	633-V-2459B	I&C EQUIP RM CW17B Inlet DRN VALVE	157A19D	Auxiliary	156'-0"	above	158'-0"		
7453	603-Y-VE-1176B	MANUAL DAMPER	157A19D	Auxiliary	156'-0"	above	158'-0"		
7454	603-Y-VE-1177B	MANUAL DAMPER	157A19D	Auxiliary	156'-0"	above	158'-0"		
7455	603-Y-VE-1258B	MANUAL DAMPER	157A19D	Auxiliary	156'-0"	above	158'-0"		
7456	603-Y-VE-1542B	FIRE DAMPER	157A19D	Auxiliary	156'-0"	above	158'-0"		
7457	603-Y-VE-1556B	FIRE DAMPER	157A19D	Auxiliary	156'-0"	above	158'-0"		
7458	603-Y-VE-1678B	FIRE DAMPER	157A19D	Auxiliary	156'-0"	above	158'-0"		
7459	603-E-BS04A	I&C EQUIP. RM. EDH LOCAL CONTROL BOX	157A20C	Auxiliary	156'-0"	above	158'-0"	4" FD (1)	-
7460	603-M-AH25A	I&C EQUIP. RM SUPPLY FAN	157A20C	Auxiliary	156'-0"	above	158'-0"		
7461	603-M-HC04A	I&C EQUIP.RM ELECT DUCT HEATER	157A20C	Auxiliary	156'-0"	above	158'-0"		
7462	603-J-FS-3431C	I&C EQUIP. RM (157-A19C)	157A20C	Auxiliary	156'-0"	above	158'-0"		
7463	603-J-TE-3131C	I&C EQUIP. RM SEC. OVER TEMP(157-A19C)	157A20C	Auxiliary	156'-0"	above	158'-0"		
7464	603-J-TE-3331C	I&C EQUIP. RM PRI. OVER TEMP(157-A19C)	157A20C	Auxiliary	156'-0"	above	158'-0"		
7465	603-J-TS-3131C	I&C EQUIP. RM HI-HI(157-A19C)	157A20C	Auxiliary	156'-0"	above	158'-0"		
7466	603-J-TS-3331C	I&C EQUIP. RM HI(157-A19C)	157A20C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (268 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7467	603-Y-VE-1180A	MANUAL DAMPER	157A20C	Auxiliary	156'-0"	above	158'-0"		
7468	603-Y-VE-1181A	MANUAL DAMPER	157A20C	Auxiliary	156'-0"	above	158'-0"		
7469	603-Y-VE-1542A	FIRE DAMPER	157A20C	Auxiliary	156'-0"	above	158'-0"		
7470	603-E-BS04B	I&C EQUIP. RM EDH LOCAL CONTROL BOX	157A20D	Auxiliary	156'-0"	above	158'-0"	4" FD (1)	-
7471	603-M-AH25B	I&C EQUIP. RM SUPPLY FAN	157A20D	Auxiliary	156'-0"	above	158'-0"		
7472	603-M-HC04B	I&C EQUIP.RM ELECT DUCT HEATER	157A20D	Auxiliary	156'-0"	above	158'-0"		
7473	603-J-FS-3432D	I&C EQUIP. RM (157-A19D)	157A20D	Auxiliary	156'-0"	above	158'-0"		
7474	603-J-TE-3132D	I&C EQUIP. RM SEC. OVER TEMP(157-A19D)	157A20D	Auxiliary	156'-0"	above	158'-0"		
7475	603-J-TE-3332D	I&C EQUIP. RM PRI. OVER TEMP(157-A19D)	157A20D	Auxiliary	156'-0"	above	158'-0"		
7476	603-J-TS-3132D	I&C EQUIP. RM HI-HI(157-A19D)	157A20D	Auxiliary	156'-0"	above	158'-0"		
7477	603-J-TS-3332D	I&C EQUIP. RM HI(157-A19D)	157A20D	Auxiliary	156'-0"	above	158'-0"		
7478	603-Y-VE-1179B	MANUAL DAMPER	157A20D	Auxiliary	156'-0"	above	158'-0"		
7479	603-Y-VE-1180B	MANUAL DAMPER	157A20D	Auxiliary	156'-0"	above	158'-0"		
7480	603-Y-VE-1181B	MANUAL DAMPER	157A20D	Auxiliary	156'-0"	above	158'-0"		
7481	601-Y-VC-1029	MANUAL DAMPER	157A21D	Auxiliary	156'-0"	above	158'-0"		
7482	601-Y-VC-1030	MANUAL DAMPER	157A21D	Auxiliary	156'-0"	above	158'-0"		
7483	601-Y-VC-1515	FIRE DAMPER	157A21D	Auxiliary	156'-0"	above	158'-0"		
7484	601-Y-VC-1580	FIRE DAMPER	157A21D	Auxiliary	156'-0"	above	158'-0"		
7485	601-Y-VC-1027	MANUAL DAMPER	157A23D	Auxiliary	156'-0"	above	158'-0"		
7486	601-Y-VC-1028	MANUAL DAMPER	157A23D	Auxiliary	156'-0"	above	158'-0"		
7487	601-Y-VC-1513	FIRE DAMPER	157A23D	Auxiliary	156'-0"	above	158'-0"		
7488	601-Y-VC-1581	FIRE DAMPER	157A23D	Auxiliary	156'-0"	above	158'-0"		
7489	601-Y-VC-1582	FIRE DAMPER	157A23D	Auxiliary	156'-0"	above	158'-0"		
7490	601-Y-VC-1066	MANUAL DAMPER	157A24C	Auxiliary	156'-0"	above	158'-0"		
7491	601-Y-VC-1033	MANUAL DAMPER	157A25C	Auxiliary	156'-0"	above	158'-0"		
7492	601-Y-VC-1034	MANUAL DAMPER	157A25C	Auxiliary	156'-0"	above	158'-0"		
7493	601-Y-VC-1055	MANUAL DAMPER	157A25C	Auxiliary	156'-0"	above	158'-0"		
7494	601-Y-VC-1522	FIRE DAMPER	157A25C	Auxiliary	156'-0"	above	158'-0"		
7495	455-V-0005	S/G-1 BLOWDOWN CONTAINMENT ISOATION VAVLE	157A27C	Auxiliary	156'-0"	above	158'-0"		
7496	455-V-0006	S/G-2 BLOWDOWN CONTAINMENT ISOATION VAVLE	157A27C	Auxiliary	156'-0"	above	158'-0"		
7497	455-V-0007	S/G-1 BLOWDOWN CONTAINMENT ISOATION VAVLE	157A27C	Auxiliary	156'-0"	above	158'-0"		

Table 3.4-2 (269 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7498	455-V-0008	S/G-2 BLOWDOWN CONTAINMENT ISOATION VAVLE	157A27C	Auxiliary	156'-0"	above	158'-0"		
7499	602-M-AH02A	EMERGENCY D/G ROOM NORMAL EXHAUST FAN	174A01C	Auxiliary	174'-0"	above	174'-6"	4" FD (1)	-
7500	602-M-AH03A	EMERGENCY D/G ROOM EMERGENCY EXHAUST FAN	174A01C	Auxiliary	174'-0"	above	174'-6"		
7501	602-M-AH04A	EMERGENCY D/G ROOM EMERGENCY EXHAUST FAN	174A01C	Auxiliary	174'-0"	above	174'-6"		
7502	602-Y-VD-1008A	MANUAL DAMPER	174A01C	Auxiliary	174'-0"	above	174'-6"		
7503	602-Y-VD-1010A	MANUAL DAMPER	174A01C	Auxiliary	174'-0"	above	174'-6"		
7504	602-Y-VD-1044A	MANUAL DAMPER	174A01C	Auxiliary	174'-0"	above	174'-6"		
7505	602-Y-VD-1045A	MANUAL DAMPER	174A01C	Auxiliary	174'-0"	above	174'-6"		
7506	602-Y-VD-1050A	MANUAL DAMPER	174A01C	Auxiliary	174'-0"	above	174'-6"		
7507	602-Y-VD-1053A	MANUAL DAMPER	174A01C	Auxiliary	174'-0"	above	174'-6"		
7508	602-Y-VD-1508A	FIRE DAMPER	174A01C	Auxiliary	174'-0"	above	174'-6"		
7509	602-M-AH02B	EMERGENCY D/G ROOM NORMAL EXHAUST FAN	174A01D	Auxiliary	174'-0"	above	174'-6"	4" FD (1)	-
7510	602-M-AH03B	EMERGENCY D/G ROOM EMERGENCY EXHAUST FAN	174A01D	Auxiliary	174'-0"	above	174'-6"		
7511	602-M-AH04B	EMERGENCY D/G ROOM EMERGENCY EXHAUST FAN	174A01D	Auxiliary	174'-0"	above	174'-6"		
7512	602-Y-VD-1008B	MANUAL DAMPER	174A01D	Auxiliary	174'-0"	above	174'-6"		
7513	602-Y-VD-1010B	MANUAL DAMPER	174A01D	Auxiliary	174'-0"	above	174'-6"		
7514	602-Y-VD-1044B	MANUAL DAMPER	174A01D	Auxiliary	174'-0"	above	174'-6"		
7515	602-Y-VD-1045B	MANUAL DAMPER	174A01D	Auxiliary	174'-0"	above	174'-6"		
7516	602-Y-VD-1050B	MANUAL DAMPER	174A01D	Auxiliary	174'-0"	above	174'-6"		
7517	602-Y-VD-1053B	MANUAL DAMPER	174A01D	Auxiliary	174'-0"	above	174'-6"		
7518	602-Y-VD-1507B	FIRE DAMPER	174A01D	Auxiliary	174'-0"	above	174'-6"		
7519	602-Y-VD-1508B	FIRE DAMPER	174A01D	Auxiliary	174'-0"	above	174'-6"		
7520	633-M-TK01A	ESSENTIAL CHILLED WATER COMPRESSION TANK	174A02C	Auxiliary	174'-0"	above	174'-6"	4" FD (1)	-
7521	633-J-LI-0003C02	COMPRESSION TANK TK01A LEVEL	174A02C	Auxiliary	174'-0"	above	174'-6"		
7522	633-J-LT-0001A	COMPRESSION TANK TK01A LEVEL	174A02C	Auxiliary	174'-0"	above	174'-6"		
7523	633-J-LT-0003C	COMPRESSION TANK TK01A LEVEL	174A02C	Auxiliary	174'-0"	above	174'-6"		
7524	633-V-1001A	ESSENTIAL CHILLED WATER COMPRESSION TANK TK01A SAFETY RELIEF VALVE	174A02C	Auxiliary	174'-0"	above	174'-6"		

Table 3.4-2 (270 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7525	633-V-1031A	ECW COMP TK-01A N2 Supply LN CHK VALVE	174A02C	Auxiliary	174'-0"	above	174'-6"		
7526	633-V-2002A	ECW COMP TK-01A LTIS-1A Upper RT VALVE	174A02C	Auxiliary	174'-0"	above	174'-6"		
7527	633-V-2005A	ECW COMP TK-01A PI-003 RT VALVE	174A02C	Auxiliary	174'-0"	above	174'-6"		
7528	633-V-2401A	ECW Comp TK-01A Vent VALVE	174A02C	Auxiliary	174'-0"	above	174'-6"		
7529	633-V-2402A	ECW Comp TK-01A DRN VALVE	174A02C	Auxiliary	174'-0"	above	174'-6"		
7530	633-M-TK01B	ESSENTIAL CHILLED WATER COMPRESSION TANK	174A02D	Auxiliary	174'-0"	above	174'-6"	4" FD (1)	-
7531	633-J-LI-0004D02	COMPRESSION TANK TK01B LEVEL	174A02D	Auxiliary	174'-0"	above	174'-6"		
7532	633-J-LT-0002B	COMPRESSION TANK TK01B LEVEL	174A02D	Auxiliary	174'-0"	above	174'-6"		
7533	633-J-LT-0004D	COMPRESSION TANK TK01B LEVEL	174A02D	Auxiliary	174'-0"	above	174'-6"		
7534	633-V-1001B	ESSENTIAL CHILLED WATER COMPRESSION TANK TK01B SAFETY RELIEF VALVE	174A02D	Auxiliary	174'-0"	above	174'-6"		
7535	633-V-1031B	ECW COMP TK-01B N2 Supply LN CHK VALVE	174A02D	Auxiliary	174'-0"	above	174'-6"		
7536	633-V-2005B	ECW COMP TK-01B PI-004 RT VALVE	174A02D	Auxiliary	174'-0"	above	174'-6"		
7537	633-V-2401B	ECW Comp TK-01B Vent VALVE	174A02D	Auxiliary	174'-0"	above	174'-6"		
7538	633-V-2402B	ECW Comp TK-01B DRN VALVE	174A02D	Auxiliary	174'-0"	above	174'-6"		
7539	461-M-TK01A	COMPONENT COOLING WATER SURGE TANK A	174A03C	Auxiliary	174'-0"	above	174'-6"	4" FD (1)	-
7540	461-J-FE-0003	CCW SURGE TANK 01A MAKEUP	174A03C	Auxiliary	174'-0"	above	174'-6"		
7541	461-J-FE-0003M	CCW SURGE TANK 01A MAKEUP	174A03C	Auxiliary	174'-0"	above	174'-6"		
7542	461-J-LT-0009C	CCW SURGE TANK TK01A LEVEL	174A03C	Auxiliary	174'-0"	above	174'-6"		
7543	461-J-LT-0011C	CCW SURGE TANK TK01A LEVEL	174A03C	Auxiliary	174'-0"	above	174'-6"		
7544	461-V-0011	CCW Surge TK01A M/U ISO VALVE	174A03C	Auxiliary	174'-0"	above	174'-6"		
7545	461-V-0013	CCW Sump to CCW Surge TK01A M/U ISO VALVE	174A03C	Auxiliary	174'-0"	above	174'-6"		
7546	461-V-1107	CCW SURGE TANK TK01A VACUUM RELIEF VALVE	174A03C	Auxiliary	174'-0"	above	174'-6"		
7547	461-V-1109	N2 Supply to CCW Surge TK01A CHK VALVE	174A03C	Auxiliary	174'-0"	above	174'-6"		
7548	461-V-1111	CCW SURGE TANK TK01A PRESSURE RELIEF VALVE	174A03C	Auxiliary	174'-0"	above	174'-6"		
7549	461-V-1127	CCW SURGE TANK DISCH HDR ISO	174A03C	Auxiliary	174'-0"	above	174'-6"		
7550	461-V-1311	CCW Surge TK01A M/U V011 Inlet ISO VALVE	174A03C	Auxiliary	174'-0"	above	174'-6"		

Table 3.4-2 (271 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7551	461-V-1313	CCW Surge TK01A M/U V011 Outlet ISO VALVE	174A03C	Auxiliary	174'-0"	above	174'-6"		
7552	461-V-1315	MOV BYPASS LINE ISOATION VALVE.	174A03C	Auxiliary	174'-0"	above	174'-6"		
7553	461-V-1327	N2 Supply to CCW Surge TK01A ISO VALVE	174A03C	Auxiliary	174'-0"	above	174'-6"		
7554	461-V-1331	CCW Sump to Surge TK01A CHK VALVE	174A03C	Auxiliary	174'-0"	above	174'-6"		
7555	461-V-1333	CCW SUMP MAKEUP ISO VALVE	174A03C	Auxiliary	174'-0"	above	174'-6"		
7556	461-V-2061	CCW Surge TK01A DRN VALVE	174A03C	Auxiliary	174'-0"	above	174'-6"		
7557	461-V-2106	CCW SURGE TANK SUPPLY VENT VALVE	174A03C	Auxiliary	174'-0"	above	174'-6"		
7558	461-V-2377	CCW Surge TK01A Vent VALVE	174A03C	Auxiliary	174'-0"	above	174'-6"		
7559	461-V-3002	CCW M/U PP03A Disch Line FT-2A Root VALVE	174A03C	Auxiliary	174'-0"	above	174'-6"		
7560	461-M-TK01B	COMPONENT COOLING WATER SURGE TANK B	174A03D	Auxiliary	174'-0"	above	174'-6"	4" FD (1)	-
7561	461-J-FE-0004	CCW SURGE TANK 01B MAKEUP	174A03D	Auxiliary	174'-0"	above	174'-6"		
7562	461-J-FE-0004M	CCW SURGE TANK 01B MAKEUP	174A03D	Auxiliary	174'-0"	above	174'-6"		
7563	461-J-LT-0010D	CCW SURGE TANK TK01B LEVEL	174A03D	Auxiliary	174'-0"	above	174'-6"		
7564	461-J-LT-0012D	CCW SURGE TANK TK01B LEVEL	174A03D	Auxiliary	174'-0"	above	174'-6"		
7565	461-V-0012	CCW Surge TK01B M/U ISO VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		
7566	461-V-0014	CCW Sump to CCW Surge TK01B M/U ISO VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		
7567	461-V-1108	CCW SURGE TANK TK01B VACUUM RELIEF VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		
7568	461-V-1110	N2 Supply to CCW Surge TK01B CHK VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		
7569	461-V-1112	CCW SURGE TANK TK01B PRESSURE RELIEF VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		
7570	461-V-1128	CCW SURGE TANK DISCH HDR ISO	174A03D	Auxiliary	174'-0"	above	174'-6"		
7571	461-V-1312	CCW Surge TK01B M/U V012 Inlet ISO VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		
7572	461-V-1314	CCW Surge TK01B M/U V012 Outlet ISO VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		
7573	461-V-1316	MOV BYPASS LINE ISOATION VALVE.	174A03D	Auxiliary	174'-0"	above	174'-6"		
7574	461-V-1328	N2 Supply to CCW Surge TK01B ISO VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		
7575	461-V-1332	CCW Sump to Surge TK01B CHK VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		
7576	461-V-1334	CCW SUMP MAKEUP ISO VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		
7577	461-V-2062	CCW Surge TK01B DRN VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		
7578	461-V-2107	CCW SURGE TANK SUPPLY VENT VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		
7579	461-V-2378	CCW Surge TK01B Vent VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		

Table 3.4-2 (272 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7580	461-V-3004	CCW M/U PP03B Disch Line FT-2B Root VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		
7581	461-V-3005	CCW M/U PP03B Disch Line FT-2B Root VALVE	174A03D	Auxiliary	174'-0"	above	174'-6"		
7582	601-Y-VC-1554A	FIRE DAMPER	174A04C	Auxiliary	174'-0"	above	174'-6"		
7583	601-Y-VC-1554B	FIRE DAMPER	174A04D	Auxiliary	174'-0"	above	174'-6"		
7584	601-J-FT-0051C	CTRL RM OUTSIDE AIR SUPPLY FLOW DIV. I	174A05C	Auxiliary	174'-0"	above	174'-6"	4" FD (1)	-
7585	601-Y-VC-1567A	FIRE DAMPER	174A05C	Auxiliary	174'-0"	above	174'-6"		
7586	601-Y-VC-0012B	CONTROL DAMPER	174A05D	Auxiliary	174'-0"	above	174'-6"		
7587	601-Y-VC-1567B	FIRE DAMPER	174A05D	Auxiliary	174'-0"	above	174'-6"		
7588	601-J-FE-0051C	CTRL RM OUTSIDE AIR SUPPLY FLOW DIV. I	174A06C	Auxiliary	174'-0"	above	174'-6"		
7589	601-Y-VC-0011A	CONTROL DAMPER	174A06C	Auxiliary	174'-0"	above	174'-6"		
7590	461-M-OR01A	RESTRICTION ORIFICE	174A12C	Auxiliary	174'-0"	above	174'-6"	4" FD (2), 6" FD (1)	-
7591	601-J-FE-0055C	CTRL RM AREA RETURN AIR FLOW-CHANNEL A	174A12C	Auxiliary	174'-0"	above	174'-6"		
7592	601-J-FT-0055C	CTRL RM AREA RETURN AIR FLOW-CHANNEL A	174A12C	Auxiliary	174'-0"	above	174'-6"		
7593	761-J-RE-0071A	MCR AIR INTAKE A	174A12C	Auxiliary	174'-0"	above	174'-6"		
7594	761-J-RE-0072B	MCR AIR INTAKE B	174A12C	Auxiliary	174'-0"	above	174'-6"		
7595	761-J-RY-0071A	MCR AIR INTAKE A	174A12C	Auxiliary	174'-0"	above	174'-6"		
7596	761-J-RY-0072B	MCR AIR INTAKE B	174A12C	Auxiliary	174'-0"	above	174'-6"		
7597	461-V-1169	CCW PP Train A Recir Throttle VALVE	174A12C	Auxiliary	174'-0"	above	174'-6"		
7598	461-V-1309	CCW M/U PP03A Disch CHK VALVE	174A12C	Auxiliary	174'-0"	above	174'-6"		
7599	461-V-1317	Demi WTR M/U to Surge TK01A CHK VALVE	174A12C	Auxiliary	174'-0"	above	174'-6"		
7600	461-V-1319	Demi WTR M/U to Surge TK01A CHK VALVE	174A12C	Auxiliary	174'-0"	above	174'-6"		
7601	461-V-2115	CCW M/U PP03A Disch Line DRN VALVE	174A12C	Auxiliary	174'-0"	above	174'-6"		
7602	461-V-2116	CCW M/U PP03B Disch Line DRN VALVE	174A12C	Auxiliary	174'-0"	above	174'-6"		
7603	601-Y-VC-0011B	CONTROL DAMPER	174A12C	Auxiliary	174'-0"	above	174'-6"		
7604	601-Y-VC-0027	CONTROL DAMPER	174A12C	Auxiliary	174'-0"	above	174'-6"		
7605	601-Y-VC-0028	CONTROL DAMPER	174A12C	Auxiliary	174'-0"	above	174'-6"		
7606	601-Y-VC-1002A	MANUAL DAMPER	174A12C	Auxiliary	174'-0"	above	174'-6"		
7607	601-Y-VC-1502A	FIRE DAMPER	174A12C	Auxiliary	174'-0"	above	174'-6"		
7608	601-Y-VC-1505	SMOKE DAMPER	174A12C	Auxiliary	174'-0"	above	174'-6"		

Table 3.4-2 (273 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7609	601-Y-VC-1537A	FIRE DAMPER	174A12C	Auxiliary	174'-0"	above	174'-6"		
7610	601-Y-VC-1538A	FIRE DAMPER	174A12C	Auxiliary	174'-0"	above	174'-6"		
7611	601-Y-VC-1539A	FIRE DAMPER	174A12C	Auxiliary	174'-0"	above	174'-6"		
7612	601-Y-VC-1568A	FIRE DAMPER	174A12C	Auxiliary	174'-0"	above	174'-6"		
7613	601-Y-VC-1575	FIRE DAMPER	174A12C	Auxiliary	174'-0"	above	174'-6"		
7614	461-M-OR01B	RESTRICTION ORIFICE	174A12D	Auxiliary	174'-0"	above	174'-6"	4" FD (2), 6" FD (1)	-
7615	601-J-FE-0052D	CTRL RM OUTSIDE AIR SUPPLY FLOW DIV. II	174A12D	Auxiliary	174'-0"	above	174'-6"		
7616	601-J-FE-0056D	CTRL RM AREA RETURN AIR FLOW-CHANNEL B	174A12D	Auxiliary	174'-0"	above	174'-6"		
7617	601-J-FT-0052D	CTRL RM OUTSIDE AIR SUPPLY FLOW DIV. II	174A12D	Auxiliary	174'-0"	above	174'-6"		
7618	601-J-FT-0056D	CTRL RM AREA RETURN AIR FLOW-CHANNEL B	174A12D	Auxiliary	174'-0"	above	174'-6"		
7619	761-J-RE-0073A	MCR AIR INTAKE A	174A12D	Auxiliary	174'-0"	above	174'-6"		
7620	761-J-RE-0074B	MCR AIR INTAKE B	174A12D	Auxiliary	174'-0"	above	174'-6"		
7621	761-J-RY-0073A	MCR AIR INTAKE A	174A12D	Auxiliary	174'-0"	above	174'-6"		
7622	761-J-RY-0074B	MCR AIR INTAKE B	174A12D	Auxiliary	174'-0"	above	174'-6"		
7623	461-V-1170	CCW PP Train B Recir Throttle VALVE	174A12D	Auxiliary	174'-0"	above	174'-6"		
7624	461-V-1310	CCW M/U PP03B Disch CHK VALVE	174A12D	Auxiliary	174'-0"	above	174'-6"		
7625	461-V-1318	Demi WTR M/U to Surge TK01B CHK VALVE	174A12D	Auxiliary	174'-0"	above	174'-6"		
7626	461-V-1320	Demi WTR M/U to Surge TK01B CHK VALVE	174A12D	Auxiliary	174'-0"	above	174'-6"		
7627	461-V-2063	CCW Surge TK01A Outlet Grab SMPL Test VALVE	174A12D	Auxiliary	174'-0"	above	174'-6"		
7628	461-V-2064	CCW Surge TK01B Outlet Grab SMPL Test VALVE	174A12D	Auxiliary	174'-0"	above	174'-6"		
7629	601-Y-VC-0012A	MANUAL DAMPER	174A12D	Auxiliary	174'-0"	above	174'-6"		
7630	601-Y-VC-1002B	MANUAL DAMPER	174A12D	Auxiliary	174'-0"	above	174'-6"		
7631	601-Y-VC-1502B	FIRE DAMPER	174A12D	Auxiliary	174'-0"	above	174'-6"		
7632	601-Y-VC-1504	SMOKE DAMPER	174A12D	Auxiliary	174'-0"	above	174'-6"		
7633	601-Y-VC-1516	FIRE DAMPER	174A12D	Auxiliary	174'-0"	above	174'-6"		
7634	601-Y-VC-1536	FIRE DAMPER	174A12D	Auxiliary	174'-0"	above	174'-6"		
7635	601-Y-VC-1537B	FIRE DAMPER	174A12D	Auxiliary	174'-0"	above	174'-6"		
7636	601-Y-VC-1538B	FIRE DAMPER	174A12D	Auxiliary	174'-0"	above	174'-6"		
7637	601-Y-VC-1539B	FIRE DAMPER	174A12D	Auxiliary	174'-0"	above	174'-6"		
7638	601-Y-VC-1541	FIRE DAMPER	174A12D	Auxiliary	174'-0"	above	174'-6"		
7639	601-Y-VC-1568B	FIRE DAMPER	174A12D	Auxiliary	174'-0"	above	174'-6"		

Table 3.4-2 (274 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7640	601-Y-VC-1576	FIRE DAMPER	174A12D	Auxiliary	174'-0"	above	174'-6"		
7641	601-Y-VC-0029A	MANUAL DAMPER	174A13C	Auxiliary	174'-0"	above	174'-6"	6" FD (1)	
7642	601-Y-VC-0030B	MANUAL DAMPER	174A13C	Auxiliary	174'-0"	above	174'-6"		
7643	603-Y-VE-1742A	FIRE DAMPER	174A13C	Auxiliary	174'-0"	above	174'-6"		
7644	603-Y-VE-1743A	FIRE DAMPER	174A13C	Auxiliary	174'-0"	above	174'-6"		
7645	603-Y-VE-1742B	FIRE DAMPER	174A13D	Auxiliary	174'-0"	above	174'-6"	4" FD (1)	-
7646	603-Y-VE-1743B	FIRE DAMPER	174A13D	Auxiliary	174'-0"	above	174'-6"		
7647	601-M-AU01A	CONTROL ROOM EMERGENCY MAKEUP ACU	174A14C	Auxiliary	174'-0"	above	174'-6"	4" FD (1), 6" FD (1)	-
7648	601-M-HV01A	CONTROL ROOM SUPPLY AHU	174A14C	Auxiliary	174'-0"	above	174'-6"		
7649	601-M-SL01A	SILENCER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7650	601-M-SL02A	SILENCER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7651	601-J-FE-0021C	CTRL RM SUPPLY AHU HV 01A AIR FLOW CTRL	174A14C	Auxiliary	174'-0"	above	174'-6"		
7652	601-J-FE-0023C	CTRL RM EMRG MAKEUP ACU AU01A AIR FLOW CTRL	174A14C	Auxiliary	174'-0"	above	174'-6"		
7653	601-J-FE-0053C	CTRL RM OUTSIDE AIR SUPPLY FLOW TO ACU AU 01A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7654	601-J-FS-3201	CTRL RM SUPPLY AHU HV 01A TEMP ELEC. HTG COIL HC 01A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7655	601-J-FS-3211	CTRL RM EMRG MAKEUP ACU AU 01A ELEC. HTG COIL HC 08A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7656	601-J-FT-0021C	CTRL RM SUPPLY AHU HV 01A AIR FLOW CTRL	174A14C	Auxiliary	174'-0"	above	174'-6"		
7657	601-J-FT-0023C	CTRL RM EMRG MAKEUP ACU AU01A AIR FLOW CTRL	174A14C	Auxiliary	174'-0"	above	174'-6"		
7658	601-J-FT-0053C	CTRL RM OUTSIDE AIR SUPPLY FLOW TO ACU AU 01A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7659	601-J-PDT-0151C	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7660	601-J-PDT-0152D	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.B	174A14C	Auxiliary	174'-0"	above	174'-6"		
7661	601-J-TE-3001C	CTRL RM SUPPLY AHU HV01A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7662	601-J-TE-3011C	CTRL RM EMRG MAKEUP ACU AU01A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7663	601-J-TE-3043C	CTRL RM EMRG MAKEUP ACU AU01A ELEC. HTG COIL HC 08A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7664	601-J-TE-3045C	CTRL RM EMRG MAKEUP ACU AU01A CARBON ADSR FT 02A	174A14C	Auxiliary	174'-0"	above	174'-6"		

Table 3.4-2 (275 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7665	601-J-TE-3047C	CTRL RM SUPPLY AHU HV 01A TEMP ELEC. HTG COIL HC 01A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7666	601-J-TE-3203C	CTRL RM SUPPLY AHU HV 01A TEMP ELEC. HTG COIL HC 01A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7667	601-J-TE-3213C	CTRL RM EMRG MAKEUP ACU AU 01A ELEC. HTG COIL HC 08A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7668	601-J-TE-3215C	CTRL RM EMRG MAKEUP ACU AU 01A CARBON ADSR FT 02A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7669	601-J-TE-3217C	CTRL RM EMRG MAKEUP ACU AU 01A ELEC. HTG COIL HC 08A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7670	601-J-TE-3219C	CTRL RM EMRG MAKEUP ACU AU 01A CARBON ADSR FT 02A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7671	601-J-TE-3221C	CTRL RM SUPPLY AHU HV 01A TEMP ELEC. HTG COIL HC 01A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7672	601-J-TS-3203C	CTRL RM SUPPLY AHU HV 01A TEMP ELEC. HTG COIL HC 01A PRI. OVER TEMP	174A14C	Auxiliary	174'-0"	above	174'-6"		
7673	601-J-TS-3213C	CTRL RM EMRG MAKEUP ACU AU 01A ELEC. HTG COIL HC 08A PRI. OVER TEMP	174A14C	Auxiliary	174'-0"	above	174'-6"		
7674	601-J-TS-3215C	CTRL RM EMRG MAKEUP ACU AU 01A CARBON ADSR FT 02A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7675	601-J-TS-3217C	CTRL RM EMRG MAKEUP ACU AU 01A ELEC. HTG COIL HC 08A SEC. OVER TEMP	174A14C	Auxiliary	174'-0"	above	174'-6"		
7676	601-J-TS-3219C	CTRL RM EMRG MAKEUP ACU AU 01A CARBON ADSR FT 02A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7677	601-J-TS-3221C	CTRL RM SUPPLY AHU HV 01A TEMP ELEC. HTG COIL HC 01A SEC. OVER TEMP	174A14C	Auxiliary	174'-0"	above	174'-6"		
7678	601-J-TY-3011C01	CTRL RM EMRG MAKEUP ACU AU01A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7679	633-J-TW-0101	COOLING COIL VC-CW01A OUTLET	174A14C	Auxiliary	174'-0"	above	174'-6"		
7680	633-J-TW-0103	COOLING COIL VC-CW01A INLET	174A14C	Auxiliary	174'-0"	above	174'-6"		
7681	633-J-TY-0906C	CONTROL ROOM SUPPLY AHU COOLING COIL 9-601 CW01A (El. 174'-0") 3-WAY VALVE TEMP	174A14C	Auxiliary	174'-0"	above	174'-6"		
7682	761-J-RT-0071A	MCR AIR INTAKE TRN A1 RAD. HI	174A14C	Auxiliary	174'-0"	above	174'-6"		
7683	761-J-RT-0072B	MCR AIR INTAKE TRN B1 RAD. HI	174A14C	Auxiliary	174'-0"	above	174'-6"		
7684	601-V-2001A	MCR EMERG M/U ACU AU01A Fire WTR DRN VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		

Table 3.4-2 (276 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7685	601-V-2002A	MCR EMERG M/U ACU AU01A Fire WTR DRN VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7686	601-V-2010A	MCR EMERG M/U ACU AU01A Fire WTR ISO VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7687	601-V-2011A	MCR EMERG M/U ACU AU01A Fire WTR ISO VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7688	601-V-2012A	MCR EMERG M/U ACU AU01A Fire WTR Vent VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7689	601-V-2012B	MCR EMERG M/U ACU AU01B Fire WTR Vent VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7690	601-V-2013A	MCR EMERG M/U ACU AU01A Fire WTR DRN VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7691	633-V-0906A	CHILLED WATER CONTROL VALVE FOR COOLING COIL 601-CW01A	174A14C	Auxiliary	174'-0"	above	174'-6"		
7692	633-V-1069A	CTRL RM Supply AHU-01A B/P VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7693	633-V-1101A	CTRL RM Supply AHU-01A Outlet VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7694	633-V-1102A	CTRL RM Supply AHU-01A Inlet throt VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7695	633-V-2101A	CTRL RM Supply AHU-A Outlet PZR Test VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7696	633-V-2102A	CTRL RM Supply AHU-A Inlet PZR Test VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7697	633-V-2201A	CTRL RM HV01A ECW Outlet Vent VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7698	633-V-2202A	CTRL RM HV01A ECW Inlet DRN VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7699	633-V-2301A	CTRLRM HV01A ECW Outlet FLO TestConn VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7700	633-V-2302A	CTRLRM HV01A ECW Inlet FLO TestConn VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7701	633-V-2481A	CTRL RM HV01A ECW OUTLET DRN VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7702	633-V-2482A	CTRL RM SUPPLY RM CW01A OUTLET DRN VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7703	633-V-2483A	CTRL RM SUPPLY RM CW01A INLET DRN VALVE	174A14C	Auxiliary	174'-0"	above	174'-6"		
7704	601-Y-VC-0013A	CONTROL DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7705	601-Y-VC-0015A	CONTROL DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7706	601-Y-VC-0017A	CONTROL DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7707	601-Y-VC-0019A	CONTROL DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		

Table 3.4-2 (277 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7708	601-Y-VC-0021A	MANUAL DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7709	601-Y-VC-0023A	CONTROL DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7710	601-Y-VC-1001A	MANUAL DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7711	601-Y-VC-1005A	MANUAL DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7712	601-Y-VC-1007A	MANUAL DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7713	601-Y-VC-1011	MANUAL DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7714	601-Y-VC-1016	MANUAL DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7715	601-Y-VC-1062A	MANUAL DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7716	601-Y-VC-1503A	FIRE DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7717	601-Y-VC-1540A	FIRE DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7718	601-Y-VC-1545A	SMOKE DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7719	601-Y-VC-1545B	SMOKE DAMPER	174A14C	Auxiliary	174'-0"	above	174'-6"		
7720	601-M-AU01B	CONTROL ROOM EMERGENCY MAKEUP ACU	174A14D	Auxiliary	174'-0"	above	174'-6"	4" FD (1), 6" FD (1)	-
7721	601-M-HV01B	CONTROL ROOM SUPPLY AHU	174A14D	Auxiliary	174'-0"	above	174'-6"		
7722	601-M-SL01B	SILENCER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7723	601-M-SL02B	SILENCER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7724	601-J-FE-0022D	CTRL RM SUPPLY AHU HV 01B AIR FLOW CTRL	174A14D	Auxiliary	174'-0"	above	174'-6"		
7725	601-J-FE-0024D	CTRL RM EMRG MAKEUP ACU AU01B AIR FLOW CTRL	174A14D	Auxiliary	174'-0"	above	174'-6"		
7726	601-J-FE-0054D	CTRL RM OUTSIDE AIR SUPPLY FLOW TO ACU AU 01B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7727	601-J-FS-3202	CTRL RM SUPPLY AHU HV 01B TEMP ELEC. HTG COIL HC 01B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7728	601-J-FS-3212	CTRL RM EMRG MAKEUP ACU AU 01B ELEC. HTG COIL HC 08B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7729	601-J-FT-0022D	CTRL RM SUPPLY AHU HV 01B AIR FLOW CTRL	174A14D	Auxiliary	174'-0"	above	174'-6"		
7730	601-J-FT-0024D	CTRL RM EMRG MAKEUP ACU AU01B AIR FLOW CTRL	174A14D	Auxiliary	174'-0"	above	174'-6"		
7731	601-J-FT-0054D	CTRL RM OUTSIDE AIR SUPPLY FLOW TO ACU AU 01B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7732	601-J-PDT-0153C	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.A	174A14D	Auxiliary	174'-0"	above	174'-6"		
7733	601-J-PDT-0154D	CTRL RM AREA SUP. ACU & AHU RM ENVELOPE PRESSURE - CH.B	174A14D	Auxiliary	174'-0"	above	174'-6"		

Table 3.4-2 (278 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7734	601-J-TE-3002D	CTRL RM SUPPLY AHU HV01B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7735	601-J-TE-3012D	CTRL RM EMRG MAKEUP ACU AU01B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7736	601-J-TE-3044D	CTRL RM EMRG MAKEUP ACU AU01B ELEC. HTG COIL HC 08B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7737	601-J-TE-3046D	CTRL RM EMRG MAKEUP ACU AU01B CARBON ADSR FT 02B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7738	601-J-TE-3048D	CTRL RM SUPPLY AHU HV 01B TEMP ELEC. HTG COIL HC 01B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7739	601-J-TE-3204D	CTRL RM SUPPLY AHU HV 01B TEMP ELEC. HTG COIL HC 01B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7740	601-J-TE-3214D	CTRL RM EMRG MAKEUP ACU AU 01B ELEC. HTG COIL HC 08B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7741	601-J-TE-3216D	CTRL RM EMRG MAKEUP ACU AU 01B CARBON ADSR FT 02B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7742	601-J-TE-3218D	CTRL RM EMRG MAKEUP ACU AU 01B ELEC. HTG COIL HC 08B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7743	601-J-TE-3220D	CTRL RM EMRG MAKEUP ACU AU 01B CARBON ADSR FT 02B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7744	601-J-TE-3222D	CTRL RM SUPPLY AHU HV 01B TEMP ELEC. HTG COIL HC 01B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7745	601-J-TS-3204D	CTRL RM SUPPLY AHU HV 01B TEMP ELEC. HTG COIL HC 01B PRI. OVER TEMP	174A14D	Auxiliary	174'-0"	above	174'-6"		
7746	601-J-TS-3214D	CTRL RM EMRG MAKEUP ACU AU 01B ELEC. HTG COIL HC 08B PRI. OVER TEMP	174A14D	Auxiliary	174'-0"	above	174'-6"		
7747	601-J-TS-3216D	CTRL RM EMRG MAKEUP ACU AU 01B CARBON ADSR FT 02B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7748	601-J-TS-3218D	CTRL RM EMRG MAKEUP ACU AU 01B ELEC. HTG COIL HC 08B SEC. OVER TEMP	174A14D	Auxiliary	174'-0"	above	174'-6"		
7749	601-J-TS-3220D	CTRL RM EMRG MAKEUP ACU AU 01B CARBON ADSR FT 02B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7750	601-J-TS-3222D	CTRL RM SUPPLY AHU HV 01B TEMP ELEC. HTG COIL HC 01B SEC. OVER TEMP	174A14D	Auxiliary	174'-0"	above	174'-6"		
7751	601-J-TY-3012D01	CTRL RM EMRG MAKEUP ACU AU01B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7752	633-J-TW-0102	COOLING COIL VC-CW01B OUTLET	174A14D	Auxiliary	174'-0"	above	174'-6"		
7753	633-J-TW-0104	COOLING COIL VC-CW01B INLET	174A14D	Auxiliary	174'-0"	above	174'-6"		
7754	633-J-TY-0906D	CONTROL ROOM SUPPLY AHU COOLING COIL 9-601 CW01B (El. 174'-0") 3-WAY VALVE TEMP.	174A14D	Auxiliary	174'-0"	above	174'-6"		

Table 3.4-2 (279 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7755	761-J-RT-0073A	MCR AIR INTAKE TRN A2 RAD. HI	174A14D	Auxiliary	174'-0"	above	174'-6"		
7756	761-J-RT-0074B	MCR AIR INTAKE TRN B2 RAD. HI	174A14D	Auxiliary	174'-0"	above	174'-6"		
7757	461-V-2054	CCW Surge TK01A LT-1A Root VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7758	461-V-2056	CCW Surge TK01B LT-1B Root VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7759	461-V-2058	CCW Surge TK01A LTI-3A Root VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7760	461-V-2060	CCW Surge TK01B LTI-3B Root VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7761	601-V-2001B	MCR EMERG M/U ACU AU01B Fire WTR DRN VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7762	601-V-2002B	MCR EMERG M/U ACU AU01B Fire WTR DRN VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7763	601-V-2010B	MCR EMERG M/U ACU AU01B Fire WTR ISO VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7764	601-V-2011B	MCR EMERG M/U ACU AU01B Fire WTR ISO VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7765	601-V-2013B	MCR EMERG M/U ACU AU01B Fire WTR DRN VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7766	633-V-0906B	CHILLED WATER CONTROL VALVE FOR COOLING COIL 601-CW01B	174A14D	Auxiliary	174'-0"	above	174'-6"		
7767	633-V-1069B	CTRL RM Supply AHU-01B B/P VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7768	633-V-1101B	CTRL RM Supply AHU-01B Outlet VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7769	633-V-1102B	CTRL RM Supply AHU-01B Inlet throt VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7770	633-V-2002B	ECW COMP TK-01B LTIS-1C Upper RT VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7771	633-V-2002C	ECW COMP TK-01A LTIS-1B Upper RT VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7772	633-V-2002D	ECW COMP TK-01B LTIS-1D Upper RT VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7773	633-V-2003A	ECW COMP TK-01A LTIS-1A Lower RT VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7774	633-V-2003B	ECW COMP TK-01B LTIS-1C Lower RT VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7775	633-V-2003C	ECW COMP TK-01A LTIS-1B Lower RT VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7776	633-V-2003D	ECW COMP TK-01B LTIS-1D Lower RT VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7777	633-V-2101B	CTRL RM Supply AHU-B Outlet PZR Test VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		

Table 3.4-2 (280 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7778	633-V-2102B	CTRL RM Supply AHU-B Inlet PZR Test VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7779	633-V-2201B	CTRL RM HV01B ECW Outlet Vent VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7780	633-V-2202B	CTRL RM HV01B ECW Inlet DRN VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7781	633-V-2301B	CTRLRM HV01B ECW Outlet FLO TestConn VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7782	633-V-2302B	CTRLRM HV01B ECW Inlet FLO TestConn VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7783	633-V-2462B	CTRL RM Supply RM CW01B Outlet DRN VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7784	633-V-2463B	CTRL RM SUPPLY RM CW01B OUTLET DRN VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7785	633-V-2464B	CTRL RM SUPPLY RM CW01B INLET DRN VALVE	174A14D	Auxiliary	174'-0"	above	174'-6"		
7786	601-Y-VC-0014B	CONTROL DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7787	601-Y-VC-0016B	CONTROL DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7788	601-Y-VC-0018B	CONTROL DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7789	601-Y-VC-0020B	CONTROL DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7790	601-Y-VC-0022B	MANUAL DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7791	601-Y-VC-0024B	CONTROL DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7792	601-Y-VC-1001B	MANUAL DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7793	601-Y-VC-1006B	MANUAL DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7794	601-Y-VC-1008B	MANUAL DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7795	601-Y-VC-1013	MANUAL DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7796	601-Y-VC-1015	MANUAL DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7797	601-Y-VC-1062B	MANUAL DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7798	601-Y-VC-1503B	FIRE DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7799	601-Y-VC-1540B	FIRE DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7800	601-Y-VC-1552	FIRE DAMPER	174A14D	Auxiliary	174'-0"	above	174'-6"		
7801	606-Y-VK-1167B	MANUAL DAMPER	174A15B	Auxiliary	174'-0"	above	174'-6"	4" FD (2)	-
7802	606-Y-VK-1186B	MANUAL DAMPER	174A15B	Auxiliary	174'-0"	above	174'-6"		
7803	606-Y-VK-1597B	FIRE DAMPER	174A15B	Auxiliary	174'-0"	above	174'-6"		
7804	606-Y-VK-1598B	FIRE DAMPER	174A15B	Auxiliary	174'-0"	above	174'-6"		
7805	612-V-0011	HV Purge AHU to R/F&Pool Supply VALVE	174A16B	Auxiliary	174'-0"	above	174'-6"	4" FD (1)	-
7806	612-V-0014	R/F&Pool to HV Purge EXH ACU ISO VALVE	174A16B	Auxiliary	174'-0"	above	174'-6"		
7807	612-V-0031	LV Purge Sply Fan to R/F&Pool Sply VALVE	174A16B	Auxiliary	174'-0"	above	174'-6"		
7808	612-V-0034	R/F & Pool to LV Purge ACU02 ISO VALVE	174A16B	Auxiliary	174'-0"	above	174'-6"		

Table 3.4-2 (281 of 281)

Item No.	Equipment No.	Equipment Description	Location	Building	Floor Elevation	SSC Level Relative to Flood Height	Flood Elevation	Flood Drain [inch(EA)]	Emergency Overflow Line [inch(EA)]
7809	612-V-2001	LV Purge Supply Fan to R/F&Pool LLRT VALVE	174A16B	Auxiliary	174'-0"	above	174'-6"		
7810	612-V-2002	R/F & Pool to LV Purge ACU LLRT Conn VALVE	174A16B	Auxiliary	174'-0"	above	174'-6"		
7811	612-V-2003	HV Purge AHU to R/F&Pool LLRT Conn VALVE	174A16B	Auxiliary	174'-0"	above	174'-6"		
7812	612-V-2004	R/F & Pool to HV Purge EXH ACU LLRT VALVE	174A16B	Auxiliary	174'-0"	above	174'-6"		
7813	606-Y-VK-1163B	MANUAL DAMPER	174A16B	Auxiliary	174'-0"	above	174'-6"		
7814	606-Y-VK-1188B	MANUAL DAMPER	174A16B	Auxiliary	174'-0"	above	174'-6"		
7815	606-Y-VK-1595B	FIRE DAMPER	174A16B	Auxiliary	174'-0"	above	174'-6"		
7816	606-Y-VK-1596B	FIRE DAMPER	174A16B	Auxiliary	174'-0"	above	174'-6"		
7817	606-Y-VK-1185B	MANUAL DAMPER	174A17B	Auxiliary	174'-0"	above	174'-6"		
7818	521-J-HY-0101B01	MSADV (101)	174A23C	Auxiliary	174'-0"	above	174'-6"		
7819	521-J-HY-0102A01	MSADV (102)	174A23C	Auxiliary	174'-0"	above	174'-6"		
7820	521-J-HY-0103A01	MSADV (103)	174A23D	Auxiliary	174'-0"	above	174'-6"		
7821	521-J-HY-0104B01	MSADV (104)	174A23D	Auxiliary	174'-0"	above	174'-6"		
7822	461-V-2053	CCW Surge TK01A LT-1A Root VALVE	195A02D	Auxiliary	195'-0"	above	195'-6"	4" FD (1)	-
7823	461-V-2055	CCW Surge TK01B LT-1B Root VALVE	195A02D	Auxiliary	195'-0"	above	195'-6"		
7824	461-V-2057	CCW Surge TK01A LTI-3A Root VALVE	195A02D	Auxiliary	195'-0"	above	195'-6"		
7825	461-V-2059	CCW Surge TK01B LTI-3B Root VALVE	195A02D	Auxiliary	195'-0"	above	195'-6"		

(1) These components are protected by flood barrier against internal flooding. And these components are not required to be protected from flooding sources due to redundancy of other trains/components.

Security-Related Information - Withhold Under 10 CFR 2.390

Figure 3.4-1 Location of Watertight Doors and Flood Barrier Plan View Elevation 55′-0″

Security-Related Information - Withhold Under 10 CFR 2.390

Figure 3.4-2   Location of Watertight Doors and Flood Barrier Plan View Elevation 78′-0″

Security-Related Information - Withhold Under 10 CFR 2.390

Figure 3.4-3 Location of Watertight Doors and Flood Barrier Plan View Elevation 100′-0″

Security-Related Information - Withhold Under 10 CFR 2.390

Figure 3.4-4   Location of Watertight Doors and Flood Barrier Plan View Elevation 120′-0″

Security-Related Information - Withhold Under 10 CFR 2.390

Figure 3.4-5 Location of Watertight Doors and Flood Barrier Plan View Elevation 137′-6″

Security-Related Information - Withhold Under 10 CFR 2.390

Figure 3.4-6 Location of Watertight Doors and Flood Barrier Plan View Elevation 156′-0″

Security-Related Information - Withhold Under 10 CFR 2.390

Figure 3.4-7   Location of Watertight Doors and Flood Barrier Plan View Elevation 174′-0″

3.5 Missile Protection

In accordance with 10 CFR Part 50, Appendix A, GDC 2 and 4 (Reference 1), essential structures, systems, and components (SSCs) important to safety are required to be protected from internal and external missiles.

Missile protection is provided for SSCs important to safety so that internal and external missiles do not cause the release of significant amounts of radioactivity or prevent the safe shutdown of the reactor considering a single failure.

The protection of SSCs important to safety is accomplished by one or more of the following:

a. Minimizing the sources of missiles by equipment design features that prevent missile generation

b. Orienting or physically separating potential missile sources away from safety-related equipment and components

c. Containing the potential missiles through the use of protective shields or barriers near the missile source or safety-related facility and equipment

d. Hardening of safety-related equipment and components to withstand missile impact when such impacts cannot be reasonably avoided by the methods listed above

Table 3.2-1 is the list of SSCs. Essential SSCs outside reactor containment building to be protected from externally generated missiles are provided in Table 3.5-4. SSCs located inside the seismic Category I containment building are protected from missiles outside reactor containment building by thick concrete walls and are therefore omitted. General arrangement drawings showing locations of the SSCs are given in Section 1.2.

3.5.1 Missile Selection and Description

For equipment with energy sources capable of generating a missile, the selection is based on the application of a single failure criterion to the retention features of the component. Where sufficient redundancy of retention features is provided to a component, then no missile impact is postulated due to a single failure of a retention feature of that component.

The types of missiles considered in the design of safety-related SSCs are categorized as follows, based on their origin:

a. Internally generated missiles (outside the containment)

b. Internally generated missiles (inside the containment)

c. Turbine missiles

d. Natural phenomena missiles

e. Site proximity missiles (except aircraft)

f. Aircraft hazards

The criteria for each type of missiles are described below. An evaluation is performed to verify that missiles do not adversely affect the safety functions of safety-related SSCs.

3.5.1.1 Internally Generated Missiles (Outside the Containment)

The criteria used for protection from internally generated missiles outside the containment are generally consistent with the NRC guidelines in Standard Review Plan (SRP) 3.5.1.1 (Reference 2).

Barriers or retention features in structures other than containment are designed in accordance with the design procedure described in Subsection 3.5.3. The following procedures are used to achieve conformance with design criteria for protection against missiles that are generated by the failure of pressurized or rotating components outside the containment.

a. Classifying missiles based on their source

b. Classifying equipment and components that require protection from missiles, based on the design criteria described in Section 3.5

c. Following the procedures listed below to protect equipment and components from failure

   1) Identifying features of missiles generated by the failure of rotating components (e.g., motor-driven pumps, fans), pressurized components (e.g.,

reactor vessel closure head stud and nut), or gravitational missiles (e.g., falling objects resulting from a nonseismically designed SSC during a seismic event)

2) Determining the effects of the identified missiles on equipment and components (design structures between the missiles and protected equipment to withstand the missile impact if the structures are in the trajectory path)

3) Relocating equipment and missile generation source in relation to postulated missile trajectories to protect equipment from being impacted by a missile

4) Installing barriers or retention features, to protect equipment and components from impact by a missile.

Internally generated missiles can be generated from two types of equipment: rotating components and pressurized components. Rotating components include turbine wheels, fans, and pumps. Pressurized components include valve stems, valve bonnets, bolted connections on pressure vessels, and instrument wells.

Missiles generated by postulated failures of rotating components are selected and evaluated based on the following conditions:

a. All rotating components that are operated during normal operating plant conditions are capable of generating missiles.

b. The energy of potential missiles generated from rotating components is based on a 120 percent overspeed condition as a minimum.

c. The missile is postulated to occur only if the energy of the missile is sufficient to perforate the equipment's protective housing.

Missiles generated by postulated failures of pressurized components are selected and evaluated based on the following conditions:

a. Pressurized components in the systems whose maximum operating pressure exceeds 19.3 kg/cm^2 (275 psig) are assumed to be missile generation sources.

b. Connecting portions installed on piping or components are assumed to be missile generation sources. Connecting portions include thermowells, pressure gauges, and lines for vents, drains, and testing.

c. A connecting portion may be eliminated as a missile generation source if it is welded and its design strength is stronger than base mental.

d. Valves with bolted bonnets are most commonly used valve type such as gate, check or globe valves in high energy piping. The body and bolted bonnet of these valves constructed with ASME Section III or ASME B16.34 are unlikely to become missile sources due to the limitation of stresses in the bonnet-to-body bolting material by rules set forth in ASME Code. Even if a bonnet-to-body bolt failure were to occur, the likelihood of all bolts experiencing a simultaneous complete failure is very remote. The widespread use of valves with bolted bonnet in nuclear industry and the low historical incidence of complete valve bonnet failures demonstrate that the valves with bolted bonnets type need not be considered as credible missile sources.

e. Pressure seal bonnet type valves are also constructed in accordance with ASME Section III or ASME B16.34. The valve bonnets are prevented from becoming missiles by the retaining ring. If retaining ring were to fail in shear, then the yoke would capture the bonnet or at least significantly reduce its energy. Because of the combination of these design features bonnet ejection incident is highly improbable, and hence bonnets are not considered missile sources.

f. The design feature of threaded valve stem with face hardened backseats prevents the ejection of stems. The stems are prevented from becoming credible missiles. And the stems having valve actuators are additionally restrained by the valve actuators.

g. Nuts, bolts, nut-and-bolt combinations, and nut-and-stud combinations need not be considered as credible missile sources because it has not enough energy to eject a missile.

h. Non-ASME pressurized vessels with an operating pressure greater than 19.3 kg/cm^2 (275 psig) are considered missile generation sources. ASME vessels are not considered missile generation sources because they are designed, fabricated, examined, and tested in accordance with ASME Section III.

i. Non-ASME valves in piping systems with an operating pressure greater than 19.3 kg/cm^2 (275 psig) are considered missile generation sources.

j. An industrial pressure bottle containing highly pressurized gas is considered a missile generation source except when the bottle is designed with overpressure protection and is located in a separate room to control the effect of an explosion.

Internally generated missiles (outside the containment) from rotating and pressurized components are not considered credible in accordance with the criteria described above.

Missiles falling from heavy load transfers by crane and missiles from dropped SSCs designed to non-seismic category outside the containment are considered gravity-based missiles. The design conforms with SRP 9.1.5 (Reference 3) and NUREG-0612 (Reference 4) for falling heavy loads from equipment or component transfers, and the design provides reasonable assurance that the effect of heavy load drops during transfers by a crane is eliminated by blocking the path above the systems and components that are necessary to achieve a safe shutdown or accident. The drop of nonseismically designed SSCs outside the containment could affect safety-related systems. Therefore, they are designed to seismic Category II to protect the safety-related systems from the impact of dropped objects.

The COL applicant is to provide the procedure for heavy load transfer to strictly limit the transfer route inside and outside containment during plant maintenance and repair periods (COL 3.5(1)).

3.5.1.1.1 Potential Missiles from Rotating Component (Outside Containment)

If the probability of missile generation P_1 is maintained less than 10^{-7} per year, missile is not considered statistically significant. If the probability of occurrence is greater than 10^{-7} per year, the probability of impact on a significant target is determined. If the product of these two probabilities is less than 10^{-7} per year, the missile is not considered statistically significant.

All rotating components such as pumps and motors are considered rotating missile generation sources outside containment. However, there is no postulated missile because P_1 is less than 10^{-7} per year for the following reasons.

a. Pump motors are an induction type that have relatively slow running speeds and are not prone to overspeed. These motors are pretested at full running speed by the motor vendor prior to installation.

b. The motor stator serves as a natural container of rotor missiles if any are generated.

c. Safety-related pumps have relatively low suction pressures and are not driven to overspeed due to a pipe break in their discharge lines. In addition, the induction motor would act as a brake to prevent pump overspeed.

d. Industry pumps are designed to prevent the penetration of pump casings from impeller pieces under overspeed conditions through vendor demonstration that the supplied pump casing is adequate to retain postulated fragments.

The turbine building, which contacts with the seismic Category I auxiliary building, is designed as seismic Category II. The turbine building does not contain safety-related systems or components and does not require design for protection from rotating and pressurized components that become missiles.

The turbine, the object with the largest kinetic energy in the turbine building, is considered a missile generation source. Turbine missiles are described in Subsection 3.5.1.3. The main feedwater pump, the object with the second largest kinetic energy outside containment, is considered to be a generation source for a missile that flies toward the auxiliary building, even though the main feedwater pump is designed such that the inside fragment cannot perforate the casing. By assuming penetration of its casing by a fragment, the results provide reasonable assurance that missiles from the main feedwater pump would not perforate the external wall of the auxiliary building. Considering that missiles that are generated from rotating components near the auxiliary building have rotors that are oriented toward the auxiliary building, reasonable assurance of the protection of safety-related systems and components inside the auxiliary building is provided.

3.5.1.1.2 Potential Missiles from Pressurized Components (Outside Containment)

If the probability of missile generation P_1 is maintained less than 10^{-7} per year, the missile is not considered statistically significant. If the probability of occurrence is greater than 10^{-7} per year, the probability of impact on a significant target is determined. If the product of these two probabilities is less than 10^{-7} per year, the missile is not considered statistically significant.

Valves are considered potential missiles from pressurized components outside containment. However, no postulated missiles are generated by valves because P_1 is less than 10^{-7} per year for one or more of the following reasons:

a. All valve stems are provided with a backseat or shoulder larger than the valve bonnet opening.

b. Motor-operated and manual valve stems are restrained by stem threads.

c. Operators on motor, hydraulic, and pneumatic operated valves prevent stem ejection.

d. Pneumatic-operated diaphragms and safety valve stems are restrained by the actuator casing.

3.5.1.2 Internally Generated Missiles (Inside Containment)

The criteria used for protection of internally generated missiles inside the containment are generally consistent with the guidelines in SRP 3.5.1.2 (Reference 5).

Structures inside the containment, including the secondary shield wall, refueling pool wall, structural beams, and floor slabs, serve as missile shields for equipment, including the reactor coolant loop, that must be protected from missiles. These structures protect the reactor coolant pressure boundary (RCPB), containment liner plate, containment penetration, main steam line, main feedwater line, direct vessel injection line, and steam generator, including the instrument connection of steam side, blowdown line, and drain line from the missile. Engineered safety features, except for some portions of piping for direct vessel injection following a LOCA, are located outside the secondary shield wall to minimize the effects from missiles generated by the RCPB.

The protective shield is installed above the control element drive mechanism to protect the control rod drive mechanism and reactor vessel and SSCs required for safe shutdown from internally generated missiles and a missile from the control element drive mechanism breakaway.

The protective features (such as structural concrete walls, structural steel beams, or floor slabs) inside the containment are provided to protect the containment liner plate, isolation system, and the main steam system related to the steam generator from missiles caused by the main steam and main feedwater line breaks, and to prevent the malfunction of other systems or equipment.

The secondary shield wall between the containment wall and refueling pool wall serves as a shield to protect the reactor coolant system, including the steam generator, from missiles generated inside the containment annulus area. The secondary shield wall also serves as a shield to protect safe-shutdown equipment, such as the safety injection tank, from missiles generated by the RCPB.

Missiles falling from heavy load transfers by crane and missiles from dropped SSCs designed to non-seismic category inside the containment are considered gravity-caused missiles. Designs for other lifts comply only with SRP 9.1.5 and NUREG-0612 for falling heavy loads from equipment or component transfers, and the design provides reasonable assurance that the effect of heavy load drops during transfers by crane is eliminated by blocking the path above the systems and components that are necessary to achieve a safe shutdown or protect against an accident. The drop of nonseismically designed SSCs in the containment could affect safety-related systems. Therefore, they are designed to seismic Category II to protect the safety-related systems from the impact of dropped objects.

The COL applicant is to provide the procedure for heavy load transfer to strictly limit the transfer route inside and outside containment during plant maintenance and repair period (COL 3.5(1)).

The COL applicant is to provide the procedures which ensure that equipment required during maintenance, should be removed from containment prior to operation, moved to a location where it is not a potential hazard to SSC important to safety, or seismically restrained (COL 3.5(2)).

3.5.1.2.1 Potential Missiles from Rotating Components (Inside Containment)

If the probability of missile generation P_1 is maintained less than 10^{-7} per year, the missile is not considered statistically significant. If the probability of occurrence is greater than 10^{-7} per year, the probability of impact on a significant target is determined. If the product of these two probabilities is less than 10^{-7} per year, the missile is not considered statistically significant.

Rotating components inside the containment building are reactor coolant pumps, heating, ventilation and air conditioning (HVAC) equipment, and pump impellers. However, they are not postulated missile sources, because P_1 is less than 10^{-7} per year for the reasons described in Subsection 3.5.1.1.1.

3.5.1.2.2 Potential Missiles from Pressurized Components (Inside Containment)

Table 3.5-1 lists the postulated missiles and their weight, shape, dimensions, and impact energy. Major pretensioned studs and nuts, instruments, and the control rod drive mechanism missiles are included. Items that are excluded because of redundant retention features are valve stems, valve bonnets, and pressurized cover plates.

Credible missiles resulting from failures of pressurized components are selected based on the same conditions as listed in Subsection 3.5.1.1.

Potential missiles might be generated from pressurized components installed in the high-energy piping system. Most of the valves installed on a high-energy line designed, constructed, and tested in accordance with ASME B16.34 with Class 900 are excluded as a missile source from pressurized components. Valves installed on auxiliary steam systems are also excluded as a missile source because the operating pressure is below 19.3 kg/cm^2 (275 psig).

3.5.1.3 Turbine Missiles

Although the auxiliary system associated with the turbine is non-safety-related, missiles generated by turbine failure can adversely affect the integrity of essential SSCs as defined in Regulatory Guide 1.115 (Reference 13) Appendix A. Table 3.5-4 lists the essential SSCs outside the reactor building that are evaluated to provide reasonable assurance that they are adequately protected from potential turbine missiles. None of the essential SSCs listed are within the low-trajectory missile strike zone.

3.5.1.3.1 Geometry

The turbine generator is composed of one high-pressure and three low-pressure turbines. As shown in Figure 3.5-1, the turbine shaft is placed in a line with the containment and auxiliary building. The figure shows that the turbine generator is placed with favorable orientation so that all essential the SSCs are excluded from the low-trajectory turbine missile strike zone, as defined by Regulatory Guide 1.115, and are concentrated in an area bounded by lines inclined at 25 degrees to the turbine wheel planes and passing through the end wheels of the low-pressure stages. The arrangement is selected to meet Regulatory

Guide 1.115 approach C.2.a. An assessment of the orientation of the turbine generator of this and other unit(s) at multi-unit sites for the probability of missile generation using the evaluation in Subsection 3.5.1.3.2 shall verify essential SSCs are outside the low-trajectory turbine missile strike zone.

3.5.1.3.2 Evaluation

Essential SSCs are designed to be protected from potential turbine missiles. The design criteria for the protection of essential SSCs are described in Section 3.5.

The probability of unacceptable damage resulting from failure of a single turbine (P_4) is calculated by multiplying all items ($P_1 \times P_2 \times P_3$) below.

a. Probability of turbine failure resulting in the ejection of turbine disc (or internal structure) fragments through the turbine casing (P_1)

b. Probability of ejected missiles perforating intervening barriers and striking essential SSCs (P_2)

c. Probability of essential SSCs that are struck failing to perform their safety functions (P_3)

Thus, the total damage probability per year (P) of each unit resulting from turbine failure in site is calculated as follows.

$$P = P_4 = P_1 \times P_2 \times P_3$$

Where P_1, P_2, and P_3 are as defined above, P_3 is assumed to be 1.0 (i.e., if struck, an SSC is assumed to fail), and P_4 is the probability of unacceptable damage to safety-related SSCs in target unit.

As described in SRP 3.5.1.3 (Reference 6), on the basis of simple estimates for a variety of plant layouts, the strike and damage probability product (P_2 x P_3) can be reasonably assumed to fall within a range that depends on the gross features of turbine generator orientation.

For favorably oriented turbine generators, the product of P_2 and P_3 tends to be in the range of 10^{-4} to 10^{-3} per year per plant.

An estimate of 10^{-3} per year for a favorable orientation is conservatively assumed.

Favorable turbine generator placement and orientation, combined with the design and fabrication processes, the redundant and fail-safe turbine control system, maintenance and inspection programs as described in Section 10.2, and overspeed protection systems, provide an acceptably small probability of turbine missiles causing damage to essential SSCs, P_4.

The probability of turbine missile generation P_1 shall be verified by ITAAC to be less than 1×10^{-5} per year for a favorable orientation to demonstrate that the probability of failure of essential SSCs from turbine missile P_4 is less than 1×10^{-7} per year.

In addition, ITAAC shall provide verification that the as-built turbine material properties, turbine rotor and blade designs, pre-service inspection and testing results and in-service testing and inspection requirements meet the requirements defined in the turbine missile probability analysis.

The COL applicant is to perform an assessment of the orientation of the turbine generator of this and other unit(s) at multi-unit sites for the probability of missile generation using the evaluation of Subsection 3.5.1.3.2 to verify that essential SSCs are outside the low-trajectory turbine missile strike zone (COL 3.5(3)).

3.5.1.4 Missiles Generated by Tornadoes and Extreme Winds

Safety-related SSCs of the APR1400 are protected against the impact generated by tornado or hurricane missiles. The protection measures consist of seismic Category I structures, shields, and barriers to withstand the effects of missile impact generated by a tornado or hurricane. The protection provides reasonable assurance of conformance with 10 CFR Part 50, Appendix A, GDC 2 and 4 and 10 CFR 52.47(b)(1) (Reference 7).

Procedures are followed to predict local damage of the impacted area and the response of seismic Category I structures, shields and barriers, or portions thereof, to the missile impact generated by a tornado or hurricane. The procedure for determining local damage includes an estimation of the depth of penetration and, in the case of concrete barriers, the potential for generation of secondary missiles by spalling or scabbing.

Procedures for overall response include assumptions on acceptable ductility ratios where elasto-plastic behavior is relied upon and methods for estimation of forces, moments, and shears induced in the barrier by the impact force of the missile.

Design basis missile spectra for tornadoes and their maximum horizontal speeds (vertical speeds are 67 percent of horizontal speeds) are determined based on the Region I spectrum, which is defined in Table 2 of NRC RG 1.76 (Reference 8). Design basis missile spectra for hurricanes are determined based on Table 1 of NRC RG 1.221 (Reference 9). The design basis missile velocities for hurricanes correspond to the hurricane windspeed of 116 m/s (260 mph) in Table 2 of NRC RG 1.221. The selected missile types are listed below, and the specified dimensions, mass, and velocity of each missile are defined in Table 3.5-2.

a. Pipe – Rigid missile that tests penetration

b. Automobile – Massive high-kinetic-energy missile that deforms on impact

c. Solid steel sphere – Small rigid missile of sufficient size to pass through any opening in protective barriers

Exterior walls and roof slabs of seismic Category I structures are required to function as missile barriers. The design of missile barriers provides reasonable assurance that the structure will not collapse under the missile load and the barrier will not be penetrated.

The COL applicant is to evaluate site-specific hazards induced by external events that may produce more energetic missiles than tornado or hurricane missiles, and provide reasonable assurance that the seismic Category I structures are designed to withstand these loads (COL 3.5(4)).

The COL applicant is to confirm that automobile missiles cannot be generated within a 0.5 mile radius of safety-related SSCs that would lead to impact higher than 10.06 m (33 ft) above plant grade (COL 3.5(5)).

The COL applicant is to identify applicable tornado missile spectra and associate velocities for the compound building, and to evaluate the missile protection provided by the building (COL 3.5(6)).

3.5.1.5 Site Proximity Missiles (Except Aircraft)

The COL applicant is to evaluate the potential for site proximity explosions and missiles due to train explosions (including rocket effects), truck explosions, ship or barge explosions, industrial facilities, pipeline explosions, or military facilities (COL 3.5(7)). If the total probability of explosion is greater than an order of magnitude of 10^{-7} per year, a missile description, including size, shape, weight, energy, material properties, and trajectory, will be specified. A description of the missile effects on the SSCs will be developed and addressed, if necessary.

3.5.1.6 Aircraft Hazards

The COL applicant is to provide justification for the site-specific aircraft hazard and an aircraft hazard analysis in accordance with the requirements of NRC RG 1.206 (Reference 10) (COL 3.5(8)).

3.5.2 Structures, Systems, and Components to be Protected from Externally Generated Missiles

All safety-related SSCs required to safely shut the reactor down and maintain it in a safe condition are housed in seismic Category I structures. Seismic Category I structures are designed as tornado/hurricane resistant (see Subsection 3.5.1.4) and other external missile resistant.

Structures used to protect safety-related SSCs meet the requirements of NRC RGs 1.13 (Reference 11), 1.27 (Reference 12), 1.115 (Reference 13), and 1.117 (Reference 14).

Essential SSCs protected against missile impact are listed in Table 3.5-4. SSCs inside containment are protected by the thick seismic Category I concrete walls of the reactor building and are not listed.

Openings and penetrations through the exterior walls and roofs of seismic Category I structures and the location of equipment in the vicinity of such openings are arranged so that a missile passing through the opening would not prevent the safe shutdown of the plant and would not result in an offsite release of nuclides exceeding 25% of the limits defined in 10 CFR Part 100 (Reference 15). Otherwise, structural barriers composed of enclosures, missiles-resistant doors and covers, and physical protection features are designed to resist tornado and hurricane missiles in accordance with the design procedures described in

Subsection 3.5.3. Tornado and hurricane missiles are not postulated to strike more than once at a target location. Because of the robustness of the exterior wall, all seismic Category I structures are capable of withstanding the impact of each identified missile.

The COL applicant is to provide reasonable assurance that site-specific structures and components not designed for missile loads will not prevent safety-related SSCs from performing their safety function (COL 3.5(9)).

3.5.3 Barrier Design Procedures

Missile barriers, whether steel or concrete, are designed with sufficient strength and thickness to prevent local damage including perforation, spalling and scabbing, and overall damage. The procedures by which structures and barriers are designed to perform this function are presented in this subsection.

There are no composite sections designed as missile barrier in APR1400. Containment liner plate is not designed as missile barriers nor composite sections.

3.5.3.1 Evaluation of Local Structural Effects

The prediction of local damage in the immediate vicinity of an affected area depends on the basic material of construction of the barrier itself. Corresponding procedures are described below.

3.5.3.1.1 Concrete Barriers

Local damage prediction for concrete structures includes the estimation of the depth of missile penetration and an assessment of whether secondary missiles could be generated by spalling. Design criteria for concrete barriers are consistent with the National Defense Research Council (NDRC), "A Review of Procedures for the Analysis and Design of Concrete Structures to Resist Missile Impact Effects" (Reference 16). The modified NDRC formula is used to estimate the missile penetration depth, and barrier thickness to prevent perforation, spalling, and scabbing effects. The design thicknesses of missile barriers are 20 percent greater than the threshold values for the phenomenon being prevented. The design thicknesses also satisfy the minimum acceptable barrier thickness requirements for local damage prediction against tornado-generated missiles as well as hurricane-generated missiles. The minimum barrier thicknesses for local damage due to tornado- and hurricane-generated missiles are provided in Table 3.5-3. The equations used to evaluate local structural effects are described as follows.

3.5.3.1.1.1 Penetration

The depth of missile penetration, x, is calculated using the modified NDRC formulas:

$$x=KNW_m\left(\frac{v_o}{1{,}000d}\right)^{1.80}+d,\ \text{for}\ \frac{x}{d}>2.0,$$

$$x=\sqrt{4KNW_m d\left(\frac{v_o}{1{,}000d}\right)^{1.80}},\ \text{for}\ \frac{x}{d}>2.0$$

Where:

x = penetration depth (inch)

K = concrete penetrability factor, based on experimental data

= $\frac{180}{\sqrt{f'_c}}$, (with f'_c in psi)

N = missile shape factor and is taken as follows:

= 0.72 for flat-nosed bodies

= 0.84 for blunt-nosed bodies

= 1.00 for spherical end

= 1.14 for very sharp nose

W_m = missile weight (lb)

V_o = missile impact velocity (ft/sec)

d = effective missile diameter ; for non-solid cylindrical missiles or solid missiles with non-circular cross section, d is the diameter of an equivalent solid cylindrical shaped missile with the same contact surface area as the actual missile (inch)

3.5.3.1.1.2 Perforation

The thickness, t_p, required to prevent perforation is calculated by the modified NDRC formulas:

$$t_p = \left[3.19\left(\frac{X}{d_e}\right) - 0.178\left(\frac{X}{d_e}\right)^2\right] d_e, \qquad for\ \frac{X}{d_e} \leq 1.35$$

$$t_p = \left[1.32 + 1.24\left(\frac{X}{d_e}\right)\right] d_e, \qquad for\ 1.35 \leq \frac{X}{d_e} \leq 13.5$$

Where:

t_p = barrier thickness to prevent perforation (inch)

x = penetration depth (inch)

d_e = diameter of a solid bar with the same contact area as the pipe, effective missile diameter for solid missile (inch)

3.5.3.1.1.3 Scabbing

The thickness t_s, required to preclude scabbing is calculated by the modified NDRC formulas:

$$\frac{t_s}{d_e} = \left[7.91\left(\frac{x}{d_e}\right) - 5.06\left(\frac{x}{d_e}\right)^2\right], \quad for\ \frac{x}{d_e} \leq 0.65$$

$$\frac{t_s}{d_e} = 2.12 + 1.36\left(\frac{x}{d_e}\right), \quad for\ 0.65 \leq \frac{x}{d_e} \leq 11.75$$

Where:

t_s = barrier thickness to prevent scabbing (inch)

χ = penetration depth (inch)

d_e = diameter of a solid bar with the same contact area as the pipe, effective missile diameter for solid missile (inch)

3.5.3.1.2 Steel Barriers

Steel barriers are not used in the APR1400 design to protect the safety-related equipment or systems from missile impact.

3.5.3.2 Overall Damage Prediction

Overall evaluation of structures/barriers under impact or impulsive loads is focused on providing reasonable assurance that the structures or barriers will not collapse and have excessive deformations to affect the function of safe shutdown equipment. For the evaluation of overall response of reinforced concrete barriers under impact and impulse loads, nonlinear and elasto-plastic response of structures is used.

Evaluations of the overall damage due to missile impact are performed by either considering missile impact in the elastic range of the structural element with other loadings applied and accounting for rebound effects of the impact, or by assuming that the inelastic capacity of the structural element resists missile impact loads. Inelastic impact analyses are performed by assuming that the full elastic capacity of the structural element is used to accommodate other loading conditions, and that the missile impact loads are accommodated in-elastically based on the ductility of the structural element. Code requirements for ductility shall be satisfied for the structural response evaluations under the missile impact.

Excessive deformation is limited by the allowable ductility ratios, which is defined as the ratio of maximum displacement to the yield displacement of structural element, where the maximum displacement will not result in the loss and damage of structural elements and components. The ductility limits for concrete structures or barriers for various loading categories are defined in Table 3.5-5 which is based on NRC RG 1.142 (Reference 18).

3.5.4 Combined License Information

COL 3.5(1) The COL applicant is to provide the procedure for heavy load transfer to strictly limit the transfer route inside and outside containment during plant maintenance and repair periods.

COL 3.5(2) The COL applicant is to provide the procedures which ensure that equipment required during maintenance, should be removed from containment prior to operation, moved to a location where it is not a potential hazard to SSC important to safety, or seismically restrained.

COL 3.5(3) The COL applicant is to perform an assessment of the orientation of the turbine generator of this and other unit(s) at multi-unit sites for the probability of missile generation using the evaluation of Subsection 3.5.1.3.2 to verify that essential SSCs are outside the low-trajectory turbine missile strike zone.

COL 3.5(4) The COL applicant is to evaluate site-specific hazards induced by external events that may produce more energetic missiles than tornado or hurricane missiles, and provide reasonable assurance that the seismic Category I structures are designed to withstand these loads.

COL 3.5(5) The COL applicant is to confirm that automobile missiles cannot be generated within a 0.5 mile radius of safety-related SSCs that would lead to impact higher than 10.06 m (33 ft) above plant grade.

COL 3.5(6) The COL applicant is to identify applicable tornado missile spectra and associate velocities for the compound building, and to evaluate the missile protection provided by the building.

COL 3.5(7) The COL applicant is to evaluate the potential for site proximity explosions and missiles due to train explosions (including rocket effects), truck explosions, ship or barge explosions, industrial facilities, pipeline explosions, or military facilities.

COL 3.5(8) The COL applicant is to provide justification for the site-specific aircraft hazard and an aircraft hazard analysis in accordance with the requirements of NRC RG 1.206.

COL 3.5(9) The COL applicant is to provide reasonable assurance that site-specific structures and components not designed for missile loads will not prevent safety-related SSCs from performing their safety function.

3.5.5 References

1. 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities,” U.S. Nuclear Regulatory Commission.

2. NUREG-0800, Standard Review Plan, Section 3.5.1.1, “Internally Generated Missiles (Outside Containment),” Rev. 3, U.S. Nuclear Regulatory Commission, March 2007.
3. NUREG-0800, Standard Review Plan, Section 9.1.5, “Overhead Heavy Load Handling Systems,” Rev. 1, U.S. Nuclear Regulatory Commission, March 2007.
4. NUREG-0612, “Control of Heavy load at Nuclear Power Plant: Resolution of Generic Technical Activity A-36,” U.S. Nuclear Regulatory Commission, July 2007.
5. NUREG-0800, Standard Review Plan, Section 3.5.1.2 “Internally Generated Missiles (Inside Containment),” Rev. 3, U.S. Nuclear Regulatory Commission, March 2007.
6. NUREG-0800, Standard Review Plan, Section 3.5.1.3, “Turbine Missiles,” Rev. 3, U.S. Nuclear Regulatory Commission, March 2007.
7. 10 CFR Part 52 “License, Certifications, and Approvals for Nuclear Power Plant,” U.S. Nuclear Regulatory Commission.
8. Regulatory Guide 1.76, “Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants,” Rev. 3, U.S. Nuclear Regulatory Commission, February 2007.
9. Regulatory Guide 1.221, “Design-Basis Hurricane and Hurricane Missiles for Nuclear Power Plants,” U.S. Nuclear Regulatory Commission, October 2011.
10. Regulatory Guide 1.206, “Combined License Applications for Nuclear Power Plants,” U.S. Nuclear Regulatory Commission, June 2007.
11. Regulatory Guide 1.13, “Spent Fuel Storage Facility Design Basis,” Rev. 2, U.S. Nuclear Regulatory Commission, March 2007.
12. Regulatory Guide 1.27, “Ultimate Heat Sink,” Rev. 2, U.S. Nuclear Regulatory Commission, January 1976.
13. Regulatory Guide 1.115, “Protection Against Low-Trajectory Turbine Missiles,” Rev. 2, U.S. Nuclear Regulatory Commission, January 2012.
14. Regulatory Guide 1.117, “Tornado Design Classification,” Rev. 1, U.S. Nuclear Regulatory Commission, April 1978.
15. 10 CFR Part 100 “Reactor Site Criteria,” U.S. Nuclear Regulatory Commission.

16. R. P. Kennedy, "A Review of Procedures for the Analysis and Design of Concrete Structures to Resist Missile Impact Effects," Nuclear Engineering and Design, Volume 37, Number 2, 183-203, 1976.

17. Russell, C.R., "Reactor Safeguards," MacMillan, 1962.

18. Regulatory Guide 1.142, "Safety-Related Concrete Structures for Nuclear Power Plants (Other Than Reactor Vessels and Containments)," Rev. 2, U.S. Nuclear Regulatory Commission, November 2001.

Table 3.5-1 (1 of 2)

Kinetic Energy of Potential Missiles[(1)]

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Table 3.5-1 (2 of 2)

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Table 3.5-2

Design Basis Missiles

Wind	Missile Type	Dimensions	Mass kg (lb)	Max. Horizontal Strike Velocity m/sec (ft/s)
Design Basis Tornado (1)	Schedule 40 Pipe	Φ 0.168 m × 4.58 m long (Φ 6.625 in × 15 ft long)	130 (287)	41 (135)
	Automobile	5 m × 2 m × 1.3 m (16.4 ft × 6.6 ft × 4.3ft)	1,810 (4,000)	41 (135)
	Solid Steel Sphere	Φ 2.54 cm (Φ 1 in.)	0.0669 (0.147)	8 (26)
Design Basis Hurricane (2)	Schedule 40 Pipe	Φ 0.168 m × 4.58 m long (Φ 6.625 in × 15 ft long)	130 (287)	64.5 (212)
	Automobile	5 m × 2 m × 1.3 m (16.4 ft × 6.6 ft × 4.3 ft)	1,810 (4,000)	80.2 (263)
	Solid Steel Sphere	Φ 2.54 cm (Φ 1 in.)	0.0669 (0.147)	57.3 (188)

(1) The missile velocities in vertical direction are 67 percent of horizontal missile velocities. The automobile missile is considered to impact at all altitudes less than 10.06 m (33 ft) above all grade levels within 0.8 km (0.5 mi) of the plant structures.

(2) Missiles are based on the maximum wind velocity at elevation 10.06 m (33 ft) above ground. The design basis vertical missile velocity for all missiles is 26 m/s (58 mph).

Table 3.5-3

Minimum Acceptable Barrier Thickness Requirements for Local Damage Prediction against Missiles Generated by Natural Phenomena

Concrete Strength kg/cm^2 (psi)	Wall Thickness cm (in.)	Roof Thickness cm (in.)
350 (5,000)	51.1 (20.2)	43.7 (12.7)
420 (6,000)	50.3 (19.4)	42.5 (12.4)

Table 3.5-4 (1 of 2)

Essential Systems and Components Outside Reactor Containment Building to Be Protected from Externally Generated Missiles

Protected Components	Missile Barrier
Chemical and Volume Control System Charging pump mini-flow heat exchanger Volume control tank Charging pump (auxiliary charging pump) Boric acid storage tank Safety-related pipes and valves	Auxiliary Building The BAST located in Yard is designed to withstand externally generated missiles.
Class 1E electric systems, including on-site safety-related portions of the Emergency Diesel Generator System necessary to provide emergency electric power to the other systems identified in this table.	Auxiliary Building and EDG Building
Spent Fuel Pool Cooling and Cleanup System Spent Fuel Pool Heat Exchanger Spent Fuel Pool Cooling Pump Safety-related Pipes and Valves	Auxiliary Building
Main Steam System MSIVs and pipe between MSIVs and containment	Auxiliary Building
Shutdown Cooling System Shutdown Cooling Pump and Heat Exchanger Safety-related Pipes and Valves	Auxiliary Building
Essential Service Water System Essential Service Water Pump Safety-related Pipes and Valves	ESW Building
Control Room HVAC System AHU, ACU Control, Isolation and Smoke Damper	Auxiliary Building

Table 3.5-4 (2 of 2)

Protected Components	Missile Barrier
Component Cooling Water System Component Cooling Water Heat Exchanger Component Cooling Water Pump Component Cooling Water Makeup Pump Safety-related Pipes and Valves	Component Cooling Water Heat Exchanger Building and Auxiliary Building
Auxiliary Feedwater System Auxiliary Feedwater Pump Auxiliary Feedwater Storage Tank Safety-related Pipes and Valves	Auxiliary Building
Liquid Waste Management System Floor drain tank Equipment waste tank RW-IIa component in R/O package (Refer to Table 11.2-6)	Compound Building
Gaseous Waste Management System Header drain tank Charcoal guard bed Charcoal delay bed HEPA filter Waste gas dryer	Compound Building
Solid Waste Management System Low-activity spent resin tank Spent resin long-term storage tank Concentrate treatment system	Compound Building

Table 3.5-5 (1 of 2)

Allowable ductility Ratios

<table>
<tr><th>Component</th><th>Loading Categories</th><th>Ductility Ratio</th><th>Remarks</th></tr>
<tr><td rowspan="5">Reinforced Concrete</td><td>Concrete structure subjected to pressure pulse caused by compartment pressurization or external explosion load</td><td>1.0 for a structure as a whole
3.0 for a localized area</td><td>Except the case for axial compression + flexure</td></tr>
<tr><td>Flexure (beam, wall, and slabs)</td><td>Ductility Ratio:
$\frac{0.05}{\rho - \rho'} \leq 10$
Rotational Capacity, γ_θ:
$\gamma_\theta < 0.0065\frac{d}{c} < 0.07\,rad$</td><td>ρ: tension reinforcement. ratio
ρ′:compression reinforcement Ratio
c: distance from compression face to the neutral axis at ultimate strength
d: distance from compression face to the tensile reinforcement
- For flexure to control the design, the load capacity of a structural element in shear shall be at least 20% greater than the load capacity in flexure, otherwise, the ductility ratios given in shear or axial compression + flexure shall be used.</td></tr>
<tr><td colspan="3">Shear (Beams, wall, and slab) carried by</td></tr>
<tr><td>concrete alone</td><td>1.0</td><td></td></tr>
<tr><td>concrete + stirrups or bent bars</td><td>1.3</td><td></td></tr>
</table>

Table 3.5-5 (2 of 2)

Component	Loading Categories	Ductility Ratio	Remarks
Reinforced Concrete (continued)	Axial Compression + Flexure (beam-column, walls, and slabs)		
	When compression load $>0.1f'_c A_g$ or $1/3F_{bc}$	1.0	F_{bc}: Force which would produce balanced condition
	When compression load $\leq 0.1f'_c A_g$ or $1/3F_{bc}$	Follow remarks	Ductility ratio for flexure is used
	Combined compression + Flexure	Follow remarks	Ductility ratio is calculated linearly between 1.0 (Compression controls) and ductility ratio for flexure (Flexure controls)

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Figure 3.5-1 Turbine Missile Strike Zone

3.6 Protection against Dynamic Effects Associated with the Postulated Rupture of Piping

According to 10 CFR Part 50, Appendix A, GDC 4 (Reference 1), essential structures, systems, and components (SSCs) important to safety are required to be protected from postulated piping failures. The effects of postulated piping failures include dynamic and environmental effects. Dynamic effects include pipe whipping, jet impingement, subcompartment pressurization, and fluid system decompression. Environmental effects include but are not limited to spray wetting, temperature, humidity, radiological consequences, and localized flooding.

Section 3.6 describes the design bases and design measures that are used to provide reasonable assurance that the safe shutdown capability, containment integrity, and offsite dose consequence are maintained for postulated piping failures inside and outside the containment. The postulated piping failures considered in this section include circumferential breaks, longitudinal breaks, and cracks.

The criteria used to evaluate the effects of postulated piping failures are generally consistent with NRC guidelines including those in Standard Review Plans 3.6.1, 3.6.2, and 3.6.3 (References 2, 3, and 4), and Branch Technical Positions 3-3 and 3-4 (References 5 and 6).

Subsection 3.6.1 identifies the high-energy and moderate-energy piping system and provides design bases and measures to protect essential SSCs from the effect of postulated piping failures and to verify integrity and operability.

Subsection 3.6.2 describes the criteria used to define locations and configurations of pipe rupture, and analytical methods to define forcing functions.

Subsection 3.6.3 describes the leak-before-break (LBB) analysis for all designated piping systems where application of LBB methodology is justifiable based on regulatory criteria. LBB analysis is used to eliminate from the structural design bases the dynamic effects of double-ended guillotine breaks and equivalent longitudinal breaks for an applicable piping system. However, environmental effects resulting from non-mechanistic piping failures are still applicable, as described above.

3.6.1 Plant Design for Protection against Postulated Piping Failures in Fluid Systems Inside and Outside the Containment

Protection against postulated fluid system piping failures is provided to the extent that the following criteria are met:

a. The minimum performance capabilities of the engineered safety systems are not reduced below those required to protect against the postulated break.

b. The ability to shut down the reactor and mitigate the consequences of the postulated piping failure.

c. Containment integrity is maintained if the postulated piping failure is a loss-of-coolant accident (LOCA).

d. Resultant radiological doses are below the guideline values of 10 CFR Part 100 (Reference 7).

3.6.1.1 Design Basis

Protection of essential equipment is achieved primarily by separation of redundant safe shutdown systems and by separation of high-energy pipelines from safe shutdown systems, which are required to be functional following specific pipe rupture events. This redundancy and separation result in a design that requires very few special protective features (such as pipe whip restraints and jet shields) to provide reasonable assurance of safe shutdown capability following a postulated high-energy line break (HELB).

Most systems and components outside the containment required for safe plant shutdown are located in the auxiliary building. The auxiliary building is divided by a structural wall that serves as a barrier between redundant trains of safe shutdown systems and components. Each half of the auxiliary building is compartmentalized to separate redundant safe shutdown components to the extent practical. High-energy piping systems located in the auxiliary building, which are not required to be functional for safe shutdown, are routed primarily in designated pipe tunnels or in the main steam valve houses (MSVHs) to provide separation from safe shutdown systems and components.

Systems and components inside the containment, which are required to be functional for safe plant shutdown, are protected from postulated pipe failure dynamic effects primarily by separation and barriers. The secondary shield wall serves as a barrier between the reactor coolant loops and the containment liner. The steam generators (SGs) and pressurizer (PZR) are also enclosed in cavities that provide separation.

The systems that are required for safe shutdown or to support safe shutdown for a given pipe failure are described in Section 3.2 and listed in Table 3.2-1. High-energy and moderate-energy pipe failure locations are postulated as described in Subsection 3.6.2. A list of high- and moderate-energy fluid systems is provided in Table 3.6-1. Each postulated rupture location is evaluated for effect on safe shutdown systems and components required following the specific pipe failure event.

3.6.1.1.1 High-Energy Piping Systems

A high-energy pipe failure is postulated in branches or piping runs that are larger than 2.54 cm (1 in.) nominal diameter and operate with high-energy fluid during normal plant conditions.

Included in this category are fluid systems or portions of fluid systems that, during normal plant conditions, are either in operation or maintained pressurized under conditions where either or both of the following are met:

a. Maximum operating temperature exceeds 93.3 °C (200 °F)

b. Maximum operating pressure exceeds 19.3 kg/cm^2 (275 psig)

In analyzing the effects of a high-energy pipe failure, the consequences of pipe whip, jet impingement, blast effects, flooding, subcompartment pressurization, and environmental conditions are considered.

3.6.1.1.2 Moderate-Energy Piping Systems

A moderate-energy pipe failure is postulated in branches or piping runs that are larger than 2.54 cm (1 in.) nominal diameter and operate with moderate-energy fluid during normal plant conditions.

Fluid piping systems that qualify as high energy for only short operational periods are considered moderate-energy systems if the fraction of the time that the system operates within the pressure-temperature conditions specified for high-energy fluid systems is less than 2 percent of the total time the system operates.

Included in this category are fluid systems or portions of fluid systems that, during normal plant conditions, are either in operation or maintained pressurized (above atmospheric pressure) under conditions where both of the following are met:

a. Maximum operating temperature is 93.3 °C (200 °F) or less

b. Maximum operating pressure is 19.3 kg/cm^2 (275 psig) or less

In analyzing the effects of a moderate-energy pipe failure, the consequences of flooding and environmental conditions are considered.

3.6.1.1.3 Failure Modes and Effects Analysis

An evaluation of postulated pipe break events is performed to identify the safety-related systems and components that provide protective actions required to mitigate, to acceptable limits, the consequences of the postulated pipe break event.

If the separation inherent in the plant design is shown to provide reasonable assurance of the functional capability of the safety systems required following a postulated pipe break event, no additional protective measures are required for that event. When necessary, additional protective measures are incorporated into the design to provide reasonable assurance of the functional capability of safety systems that are required following a postulated pipe break event.

The following criteria are used in the failure modes and effects analysis to establish the integrity of systems and components necessary for safe reactor shutdown and maintenance of the shutdown condition:

a. Offsite power is assumed to be unavailable if an automatic turbine generator trip or automatic reactor trip is a direct consequence of a postulated piping failure.

b. In addition to the postulated pipe failure and its accompanying effects, a single active component failure is assumed in the systems required to mitigate the consequences of the postulated piping failure except as noted in item d below.

c. Each high-energy or moderate-energy fluid system pipe failure is considered separately as a single postulated initiating event occurring during normal plant conditions.

d. Where a postulated piping failure is assumed in one of two redundant trains of a system that is required to operate during normal plant conditions as well as to shut down the reactor, single failures that prevent the functioning of the other train or trains of that system are not assumed, provided the system is (1) designed to seismic Category I standards, (2) powered from offsite and onsite sources, and (3) designed, constructed, operated, and inspected to quality assurance, testing, and in-service inspection standards appropriate for nuclear safety systems.

e. All available systems and components, including non-seismic Category I and those actuated by operator actions, may be used to mitigate the consequences of a postulated piping failure. In judging the availability of such systems and components, account is taken of the postulated failure and its direct consequences, such as unit trip and loss of offsite power, and of the assumed single active component failure and its direct consequences.

f. For a postulated pipe failure, the escape of steam, water, and heat from structures enclosing the high-energy fluid containing piping does not preclude:

    1) Accessibility to surrounding areas important to the safe control of reactor operations

    2) Habitability of the main control room (MCR)

3.6.1.2 Safety Evaluation

By means of design features such as separation, barriers, pipe whip restraints and jet shields, all of which are described below, the effects of a pipe break would not damage essential systems to the extent that the design function is impaired or the necessary component operability is affected.

Typical measures used for protecting the essential SSCs are described below.

3.6.1.2.1 Protection Measures

The design to protect essential SSCs from the effect of postulated break is basically achieved by separation, physical barriers, or piping restraint protection.

3.6.1.2.1.1 Separation

The plant arrangement provides separation to the extent practical between redundant safety systems in order to prevent loss of safety function as a result of hazards different from those for which the system is required to function, as well as for the specific event for which the system is required to be functional. Separation between redundant safety systems and associated auxiliary supporting features is the basic protective measure.

In general, layout of the facility followed a multistep process to provide reasonable assurance of adequate separation.

a. Safety-related systems are located away from most high-energy piping.

b. Redundant safety systems and subsystems are located in separate compartments.

c. As necessary, components are enclosed to maintain the redundancy required for the systems that must function as a consequence of piping failure events.

3.6.1.2.1.2 Barriers and Shields

Protection requirements are met through the protection afforded by the walls, floors, and columns in many cases. Where adequate protection does not exist due to separation, additional barriers, deflectors, or shields are provided as necessary to meet the functional protection requirements. Where compartments, barriers, and structures are required to provide the necessary protection, they are designed to withstand the effects of the postulated failure concurrent with an earthquake event.

Structures separating a high-energy line from an essential component are designed to withstand the consequences of a pipe break including associated pipe whip, jet impingement and subcompartment pressurization.

Structures separating a high-energy line from an essential component are designed to withstand the consequences of pipe break in high-energy line that produces the greatest effect at the structure.

3.6.1.2.1.3 Piping Restraints

Where adequate protection does not exist due to separation, barriers, or shields, piping restraints are provided as necessary to meet the functional protection requirements.

Restraints are not provided when it can be shown that the postulated pipe breaks would not cause unacceptable damage to essential systems or components.

The design criteria for pipe whip restraints are given in Subsection 3.6.2.4.

3.6.1.2.2 Specific Protection Consideration

The design criteria define acceptable types of isolation for safety-related elements and for high-energy lines from similar elements of the redundant train. Separation is accomplished by:

a. Routing the redundant trains through separate compartments

b. Physically separating the redundant trains by a specified minimum distance

c. Separating the redundant trains by structural barriers

The design criteria provide reasonable assurance that a postulated failure of a high-energy line or a safety-related element cannot take more than one safety-related train out of service. The failure of a component or subsystem of one train may cause failure of another portion of the same train; for example, a Division II high-energy pipe may cause failure of a Division II component electrical tray but not failure of any Division I component. The capability to safely shut down the plant under such a failure would therefore not be affected. Subsection 1.2.14.2 describes the detailed divisional separation of the auxiliary building.

Given the separation criteria above and the pipe break criteria in Subsection 3.6.2.1, the effects of high-energy pipe breaks are not analyzed where it is determined that all essential SSCs are sufficiently physically remote from a postulated break in that piping run.

The potential effects of flooding as a consequence of high- or moderate-energy pipe failure through-wall cracks (as defined in Subsection 3.6.2.1), are evaluated to provide reasonable assurance that the operability of safety-related equipment required for safe shutdown is not impaired. An analysis of the potential effects of flooding is described in Section 3.4.

Subcompartment pressurization analysis is performed to determine pressure loadings on building structures. Environmental pressure and temperature analysis defines pressure and temperature conditions for qualification of mechanical and electrical equipment. The pressure transients and environmental conditions for specified subcompartments are calculated using the code, and the results are reflected in the design of the subcompartments and venting paths. The subcompartment pressurization analysis is described in Subsection 6.2.1.2.

The potential environmental effects of steam on essential systems are described in Section 3.11. In general, because of the protective measures of redundancy and separation between systems and trains, the consequential effect of the transport of steam is not sufficient to impair the ability of the essential system to shut down the plant or mitigate the consequences of the given accident of interest.

There are no high-energy lines in the vicinity of the control room. As such, there are no effects on the habitability of the MCR by pipe break either from pipe whip, jet impingement, or transport of steam. Refer to Section 6.4 for a description of control room habitability systems.

3.6.1.3 Postulated Failures Associated with Site-Specific Piping

The COL applicant is to identify the site-specific safety-related SSCs that are located near high-energy and moderate-energy piping systems and are susceptible to consequences of high- and moderate-energy piping failures (COL 3.6(1)). The COL applicant is to provide a list of site-specific high-energy piping systems including layout drawings and protection features and the failure modes and effects analysis for safe shutdown due to the postulated HELB (COL 3.6(2)).

3.6.2 Determination of Break Locations and Dynamic Effects Associated with the Postulated Rupture of Piping

This section describes the design bases for locating breaks and cracks in piping inside and outside containment, the procedure used to define the thrust at the break location, the jet impingement loading criteria, and the dynamic response models.

3.6.2.1 Criteria Used to Define Rupture Locations and Configurations

3.6.2.1.1 General Requirements

Postulated pipe ruptures are considered in all plant piping systems and the associated potential for damage to required systems and components is evaluated on the basis of the energy in the system. System piping is classified as high-energy or moderate-energy, and postulated ruptures are classified as circumferential breaks, longitudinal breaks, or through-wall cracks. Each postulated rupture is considered separately as a single postulated initiating event.

For each postulated circumferential and longitudinal break, an evaluation is made of the effects of pipe whip, jet impingement, blast effects, subcompartment pressurization, environmental conditions, and flooding. For piping systems where LBB is applied (Subsection 3.6.3), dynamic effects of pipe breaks are not considered. If required to demonstrate safe plant shutdown, an internal fluid system load evaluation is performed on the effects of fluid forces on components within or bounding the fluid system.

For each postulated through-wall crack, an evaluation is made of the effects of environmental conditions and flooding. The effects of pipe breaks and/or through-wall cracks are included in the environmental qualification of safety-related electrical and mechanical equipment. Environmental qualification of safety-related equipment is described in Section 3.11. The evaluation of the required systems and components demonstrates that the protection requirements of Subsection 3.6.1 are met.

The pipe break analysis is considered for postulated high-energy and moderate-energy line failure. Considering the following information, the plant can be shut down safely and maintained in cold safe shutdown when postulated pipe failure occurs. A graded approach is taken to the scope of piping system as described in DCD Tier 2 subsection 14.3.2.3. The results are summarized in the pipe rupture analysis report (Reference 24).

a. Dynamic effect analysis from high-energy line break

   1) Identification of break and crack locations in high-energy and moderate-energy piping

   2) Scope of dynamic effect analysis (Class 1 piping inside containment and piping connected NSSS component.)

   3) Identification of terminal end break and intermediate break (result of stress analysis including fatigue analysis according to BTP 3-4)

   4) High-energy line markup P&ID and break point dimensional isometric drawing

   5) Essential target and dynamic load from pipe break and protection features

6) Summary of subcompartment pressure and temperature analysis for a 1 ft^2 break on the main steam and main feed lines, within the pipe break exclusion zone.

b. Environmental analysis of the high-energy and moderate-energy piping systems to protect safety-related system from flooding and other adverse environmental effects.

3.6.2.1.2 Postulated Rupture Descriptions

a. Circumferential break

A circumferential break is assumed to result in pipe severance with full separation of the two severed pipe ends unless the extent of separation is limited by consideration of physical means. The break plane area is assumed to be perpendicular to the longitudinal axis of the pipe and is assumed to be the cross-sectional flow area of the pipe at the break location. The break flow area, discharge coefficient, and discharge correlation are substantiated analytically.

b. Longitudinal break

A longitudinal break is assumed to result in a split of the pipe wall along the pipe longitudinal axis but without severance. The break plane area is assumed to be parallel to the longitudinal axis of the pipe and equal to the cross-sectional flow area of the pipe at the break location. The break is assumed to be circular in shape or elliptical (2D × D/2) with its long axis parallel to the longitudinal axis of the pipe where D is the effective inner diameter of the pipe. The discharge coefficient and any other values used for the area or shape associated with a longitudinal break are substantiated analytically.

c. Leakage crack

A leakage crack is assumed to be a crack through the pipe wall where the size of the crack and corresponding flow rate are determined by analysis and a leak detection system, as described in Subsection 3.6.3.

d. Through-wall crack

A through-wall crack is assumed to be a circular orifice through the pipe wall of cross-sectional flow area equal to the product of half of the inside pipe diameter and half of the pipe wall thickness.

3.6.2.1.3 Leak-Before-Break Applied Piping

An LBB evaluation has been performed for the reactor coolant system (RCS) main loop piping, surge line, shutdown cooling, and safety injection lines inside containment, which eliminates the dynamic effects of pipe break from the design basis. The evaluation is performed using the guidelines of NUREG-1061 (Reference 8), Vol. 3, and SRP 3.6.3, as described in Subsection 3.6.3.

3.6.2.1.4 Piping Not Applied to Leak-Before-Break

This section applies to all high- and moderate-energy piping other than that whose dynamic effects due to pipe breaks are eliminated from the design basis by LBB evaluation, as identified in Subsection 3.6.2.1.3.

3.6.2.1.4.1 Postulated Rupture Locations

3.6.2.1.4.1.1 Break Locations for High-Energy Fluid System Piping in Areas Other than Containment Penetration

Both circumferential and longitudinal breaks of high-energy piping systems are postulated to occur, but not concurrently, considering the following exceptions:

a. Circumferential breaks are not postulated in piping runs of a nominal diameter equal to or less than 2.54 cm (1 in.).

b. Longitudinal breaks are not postulated in piping runs of a nominal diameter less than 10.16 cm (4 in.).

c. Longitudinal breaks are not postulated at terminal ends.

The postulated pipe break locations are determined in accordance with BTP 3-4, Part B, item A(iv). All pipes are identified and considered for the selection of break locations.

A terminal end is defined as an extremity of a piping run that connects to structures, components, or pipe anchor that acts as a rigid constraint to piping motion and thermal expansion. Branch lines connected to main piping run are considered as terminal end in accordance with BTP 3-4.

ASME Section III (Reference 9), Class 1 Piping

With the exceptions of the portions of piping identified in Subsection 3.6.2.1.3, breaks in ASME Section III, Class 1 piping are postulated at the following locations in each piping and branch run:

a. At terminal end

b. At intermediate locations where U exceeds 0.1 or S from Equation (10) plus Equation (12) or (13) exceeds 2.4 S_m

Where, as defined in ASME Section III, Division 1, NB-3653:

S = primary-plus-secondary stress-intensity range under the combination of loadings for which either Level A or Level B service limits have been specified, as calculated from Equations (10), (12), and (13)

S_m = allowable stress-intensity value

U = cumulative usage factor

As a result of piping reanalysis due to differences between the design configuration and the as-built configuration, the highest stress or cumulative usage factor locations may be shifted. However, the initially determined intermediate break locations need not be changed unless one of the following conditions exists:

a. The dynamic effects from the new (as-built) intermediate break locations are not mitigated by the original pipe whip restraints and jet shields.

b. A change is required in pipe parameters such as major differences in pipe size, wall thickness, and routing.

ASME Section III, Class 2, Class 3, or Seismically Analyzed ASME B31.1 (Reference 10) Piping

With the exceptions of the portions of piping identified in Subsection 3.6.2.1.3, breaks in ASME Section III, Class 2&3 piping are postulated at the following locations in each piping and branch run:

a. At terminal end

b. At intermediate locations selected by one of the following criteria:

   1) At each pipe fitting (e.g., elbow, tee, cross, flange, nonstandard fitting), welded attachment, and valve or where the piping contains no fittings, welded attachments, or valves at one location at each extreme of the piping adjacent to the protective structure.

   2) At intermediate locations where the stress S exceeds 0.8 (X + Y)

      Where, as defined in ASME Section III, Division 1, NC/ND-3653

      S = stresses under the combination of loadings for which either level A or level B stress limits have been specified, as calculated from the sum of Equations (9) and (10)

      X = Equation (9) service level B allowable stress

      Y = Equation (10) allowable stress

As a result of piping reanalysis due to differences between the design configuration and the as-built configuration, the highest stress locations may be shifted; however, the initially determined intermediate break locations may be used unless a redesign of the piping resulting in a change in pipe parameters (diameter, wall thickness, routing) is required, or the dynamic effects from the new (as-built) intermediate break locations are not mitigated by the original pipe whip restraints and jet shields.

Non-Seismically Analyzed ASME B31.1 Piping

Safety class systems and piping are seismically analyzed. Most non-safety systems and piping are required to be non-seismically analyzed. Therefore, rules are isolation and separation in order to avoid impact to safety-related systems from non-safety-related piping failure effects caused by an earthquake. In cases where it is not possible or practical to isolate the seismic piping, adjacent non-seismic piping is analyzed according to seismic Category II criteria.

For non-seismic piping attached to seismic piping, the dynamic effects of the non-seismic piping are simulated in the modeling of the seismic piping. The attached non-seismic piping up to the analyzed/unanalyzed boundary is designed not to cause a failure of the seismic piping during a seismic event as described in Subsection 3.12.3.7.

Breaks are postulated at the following locations in each non-safety-related, ASME B31.1 piping network that is not seismically analyzed.

a. At terminal ends of the pressurized portions of the network

b. At each intermediate location of potential high stress or fatigue, such as pipe fittings, valves, flanges, and welded-on attachments

3.6.2.1.4.1.2 Crack Locations

Through-wall Cracks

Through-wall cracks are postulated in all high-energy and moderate-energy piping systems having a nominal diameter greater than 2.54 cm (1 in.), except that through-wall cracks are not postulated at locations where:

a. For Class 1 piping, the calculated value of stress range by equation (10) in ASME Section III, Division 1, NB-3653 is less than 1.2 S_m.

b. For Class 2, Class 3, or seismically analyzed ASME B31.1 piping, the calculated stress by the sum of equations(9) and (10) in NC/ND-3653 is less than 0.4 times the sum of the stress limits given in NC/ND-3653.

c. For the containment penetration area, the requirements of Subsection 3.6.2.1.4.1.3 are satisfied.

d. For moderate-energy piping near high-energy piping where a break in high-energy piping is postulated that results in more limiting environmental conditions, the through-wall crack in the moderate-energy piping is not postulated.

e. Through-wall cracks, instead of breaks, are postulated for the piping classified as moderate energy as defined in subsection 3.6.1.1.2 due to its short operational period in the high-energy condition.

Leakage Cracks

A leakage crack is postulated in place of a circumferential break, longitudinal break, or through-wall crack if justified by an analysis performed on the pipeline in accordance with the requirements described in Subsection 3.6.3.

3.6.2.1.4.1.3 Fluid System Piping in Containment Penetration Areas

3.6.2.1.4.1.3.1 High-Energy Piping

ASME Section III, Class 2 piping is used in containment penetration areas. Breaks or cracks are not postulated in those portions of piping between the containment wall and the inboard or outboard isolation valves, because they are designed with beak exclusion by meeting the design criteria of the ASME Section III, NE-1120 and the following additional requirements:

a. The following design stress and fatigue limits are not exceeded:

   1) The maximum stress as calculated by the sum of Equations (9) and (10) in NC-3653, ASME Section III, considering those loads and conditions thereof for which level A and level B stress limits have been specified in the system's Design Specification (i.e., sustained loads, occasional loads, and thermal expansion), excluding earthquake loads, does not exceed 0.8 (1.8 S_h + S_A). The S_h and S_A are allowable stresses at maximum (hot) temperature and allowable stress range for thermal expansion, respectively, as defined in NC-3600 of ASME Section III.

   2) The maximum stress, as calculated by Equation (9) in NC-3653, ASME Section III, under the loadings resulting from a postulated piping failure of fluid system piping beyond these portions of piping, does not exceed the lesser of 2.25 S_h and 1.8 $S_{y.}$

   3) Primary loads include those that are deflection limited by whip restraints. The exceptions permitted in BTP 3-4, Part B, Item A (ii)(1)(c) may also be applied provided that when the piping between the outboard isolation valve

and the restraint is constructed in accordance with Power Piping Code ANSI B31.1 (see ASB 3-1 B.2.c.[4]), the piping is either of seamless construction with full radiography of all circumferential welds, or all longitudinal and circumferential welds are fully radiographed.

b. Welded attachments for pipe supports or other purposes to these portions of piping are avoided except where detailed stress analyses or tests are performed to demonstrate conformance with the limits of Item a above.

c. The number of circumferential and longitudinal piping welds and branch connections is minimized. Specific access provisions are made to permit in-service volumetric examination of the longitudinal and circumferential welds.

d. The length of these portions of piping is reduced to the minimum length practical.

e. The design of pipe anchors or restraints (e.g., connections to containment penetrations, pipe whip restraints) does not require welding directly to the outer surface of the piping (e.g., flued integrally forged pipe fittings may be used) except where such welds are 100 percent volumetrically examinable in service and a detailed stress analysis is performed to demonstrate conformance with the limits in Item 1 above.

f. A 100 percent volumetric in-service examination of all pipe welds is conducted during each inspection interval as defined in IWA-2400, ASME Section XI (Reference 11).

Since guard pipes are not used, the guard pipe design requirements addressed in BTP 3-4, Part B, Item A(ii)(6) are excluded from the additional requirements. Pipe break exclusion design expands to the auxiliary building wall anchor beyond the isolation valve.

Portions of system piping that are designed using break exclusion criteria are as follows:

a. The main steam piping from the containment penetration to the auxiliary building MSVH anchor wall, which is downstream of the main steam isolation valve.

b. The main feedwater piping from the containment penetration to the auxiliary building MSVH anchor wall, which is upstream of the isolation valve.

c. The steam generator blowdown piping from the containment penetration outboard weld to the auxiliary building wall, which is downstream of the isolation valve.

d. The startup feedwater piping from the containment penetration outboard weld to the auxiliary building MSVH anchor wall, which is upstream of the isolation valve.

Even though portions of the main steam and feedwater lines meet the break exclusion requirements of Subsection 3.6.2.1.4.1.3.1, they are separated from essential equipment.

Essential equipment is not concentrated in the break exclusion zone. Essential equipment is protected from the environmental effects of an assumed nonmechanistic longitudinal break of the main steam and feedwater lines. Each assumed nonmechanistic longitudinal break has a cross-sectional area of at least 1 ft^2 and is postulated to occur at a location that has the greatest effect on essential equipment.

3.6.2.1.4.1.3.2 Moderate-Energy Piping

For moderate-energy fluid systems, through-wall cracks are not postulated in those portions of piping from the containment wall to and including the inboard or outboard isolation valves provided that they meet the requirements of the ASME Section III, NE-1120, and the stresses calculated by the sum of Equations (9) and (10) of the ASME Section III, NC-3653, do not exceed 0.4 times the sum of the stress limits given in ASME Section III, NC-3653.

3.6.2.1.4.2 Postulated Rupture Configurations

a. Break configurations

Where break locations are postulated without the benefit of a stress calculation, breaks are assumed to occur at the piping welds to each fitting, valve, or welded attachment. If detailed stress analyses or tests are performed, break locations are selected as specified in Subsection 3.6.2.1.4.1.1.

Circumferential breaks are postulated in fluid system piping and branch runs as specified in Subsection 3.6.2.1.4.1.1. Instrument lines with tubing size of 2.54 cm (1 in.) and less nominal pipe are designed to meet the provisions of NRC RG 1.11 (Reference 12).

Circumferential breaks are assumed to result in pipe severance and separation amounting to at least an one-diameter lateral displacement of the ruptured piping sections unless physically limited by piping restraints, structural members, or piping stiffness. The break plane area (A_e) is assumed perpendicular to the longitudinal axis of the pipe, and is assumed to be the cross-sectional flow area of the pipe at the break location. The break flow area, discharge coefficient, and discharge correlation are substantiated analytically.

Longitudinal breaks in fluid system piping and branch runs are postulated as specified in Subsection 3.6.2.1.4.1.1.

A longitudinal break results in an axial split without severance. The split is assumed to be oriented at any point about the circumference of the pipe, or alternatively at the point of highest stress as justified by detailed stress analyses. The break plane area (A_e) is assumed parallel to the longitudinal axis of the pipe and equal to the cross-sectional flow area of the pipe at the break location. The break is assumed to be circular in shape or elliptical (2D × D/2) with its long axis parallel to the axis of the pipe.

b. Crack configurations

Through-wall cracks are postulated at those axial locations specified in Subsection 3.6.2.1.4.1.2.

For high and moderate-energy piping including non-seismically analyzed ASME B31.1 piping, through-wall cracks for determining environmental conditions described in Table 3.11-2 are postulated to be in those axial and circumferential locations that result in the most severe environmental consequences. The flow from the crack is assumed to wet all unprotected components within the compartment with consequent flooding in the compartment and communicating compartments.

Fluid flow from a leakage crack is based on a circular orifice with a cross-sectional area equal to that of a rectangle of one-half the pipe inside diameter in length and one-half the pipe wall thickness in width.

3.6.2.1.5 Details of Containment Penetrations

Details of containment penetrations are described in Subsections 3.8.1 and 3.8.2.

3.6.2.2 Guard Pipe Assembly Design Criteria

Guard pipes are not used in any containment penetrations of high-energy piping.

3.6.2.3 Analytical Methods to Define Forcing Functions and Response Models

3.6.2.3.1 Leak-Before-Break Applied Piping

There are no forcing functions or response models for the piping qualified for LBB.

3.6.2.3.2 Analytical Methods to Define Forcing Functions and Response Models for Piping Not Applied to Leak-Before-Break

This subsection applies to all high-energy piping other than that whose dynamic effects due to pipe breaks are eliminated from the design basis by LBB evaluation.

3.6.2.3.2.1 Determination of Pipe Thrust and Jet Loads

3.6.2.3.2.1.1 Dynamic Force of the Fluid Jet Discharge

The dynamic force of the fluid jet discharge from either a postulated circumferential or longitudinal break is based on a circular break area equal to the cross-sectional flow area of the pipe at the break location and on a calculated fluid pressure multiplied by an analytically determined thrust coefficient, as determined for a circumferential break at the same location.

Flow limiters, positive pump-controlled flow, and the absence of energy reservoirs are taken into account, as applicable, in the reduction of jet discharge.

Piping movement is assumed to occur in the direction of the jet reaction, unless limited by structural members or piping restraints.

Blowdown thrust force (F_{thrust}) is determined by multiplication of three parameters (i.e., appropriately calculated thrust coefficient considering the fluid condition, piping internal pressure, cross-sectional area at the break location). The initial conditions of piping pressurized during operation at power are the greater of the contained energy at 102 percent power or hot standby in accordance with SRP 3.6.2, Section III.4.A. For the realistic calculation, P_aA acting on the outside of the pipe may be subtracted from the thrust force acting on the inside of the pipe.

$$F_{thrust} = (C_T\, P_o - P_a)\, A$$

At first, initial, intermediate, and final thrust coefficients are calculated.

$$F_{ini} = 1.0\, P_o\, A, \text{ or } \quad F_{ini} = (1.0\, P_o - P_a)\, A$$

$$F_{inter} = C_{TI}\, P_o\, A, \text{ or } \quad F_{inter} = (C_{TI}\, P_o - P_a)\, A$$

$$F_{final} = C_{TS}\, P_o\, A, \text{ or } \quad F_{final} = (C_{TS}\, P_o - P_a)\, A$$

Where:

D = pipe inside diameter based on the average or nominal pipe wall thickness

P_o = initial fluid pressure in source or pipe

P_a = atmospheric pressure

A = pipe flow area

C_T = thrust coefficient

C_{TI} = intermediate thrust coefficient

C_{TS} = steady-state thrust coefficient

This methodology is based on the simplified methods described in ANSI/ANS 58.2 (Reference 13) and pipe thrust and jet loads (Reference 14).

3.6.2.3.2.1.2 Evaluation of Jet Impingement Effects

Jet impingement force calculations are performed only if structures or components are adjacent to postulated HELBs, and it cannot be demonstrated that failure of the structure or component would not adversely affect safe shutdown capability. Details for jet impingement effects are described in Section 3.6.2.4.2.

3.6.2.3.2.2 Method of Dynamic Analysis of Unrestricted Pipes

The impact velocity and kinetic energy of unrestricted pipes are calculated on the basis of the assumption that the segments at each side of the break act as rigid-plastic cantilever beams subject to piecewise constant blowdown forces. The hinge location is fixed either at the nearest restraint or at a point determined by the requirement that the shear at an interior plastic hinge is zero. The kinetic energy of an accelerating cantilever segment is equal to the difference between the work done by the blowdown force and that done on the plastic hinge.

$$KE = (TL_h - M_p)\theta$$

Where:

KE	=	impact energy
T	=	thrust force
L_h	=	length of hinge
θ	=	angle of hinged pipe
M_p	=	plastic section modulus of pipe

The impact velocity V_I is found from the expression for the kinetic energy:

$$V_I^2 = \frac{2\,gKE}{W_{eq}}$$

Where:

W_{eq}	=	equivalent weight of the cantilever

For a straight run of pipe rotating about a plastic hinge, the zone of influence of the whipping pipe accounts for an increasing length due to a traveling hinge point caused by strain hardening effects. The impact energy of unrestrained pipe into a barrier (e.g., the divisional wall) is governed by the vector component of its velocity at impact that is perpendicular to the barrier. Impact of small piping into building structures conservatively assumes that all of the impact energy is imparted to the barrier with no dissipation due to local crushing deformation of the pipe.

Bearing area of impact on building structure is generally elliptical, but is treated as a circle of equivalent area, with dimensions based on experimental data for pipe crush behavior. As the impact load is greatest on the periphery of the ellipse, this yields a conservative force distribution into the barrier. Long-term loading on the barrier subsequent to impact due to system blowdown and continued deceleration of remaining pipe (beyond the impact zone) is accounted for in addition to the initial impulsive loading.

Unless a detailed analysis is performed to evaluate the response of an impacted pipe, the impacted pipe of smaller size and wall thickness is assumed to be failed at the point of initial contact. The impacted pipe of larger or equal size with thinner wall thickness is assumed to develop a through-wall crack. If the impacted pipe has both nominal size and wall thickness larger than or equal to that of the whipping pipe, its pressure boundary integrity is assumed to be undamaged.

3.6.2.4 Dynamic Analysis Methods to Verify Integrity and Operability

3.6.2.4.1 Pipe Whip Restraints

This section applies to pipe whip restraints for all piping other than that whose dynamic effects due to pipe breaks are eliminated from the design basis by LBB evaluation.

When required, pipe whip restraints are provided to protect the safety-related component against the effects of pipe whipping during postulated pipe break. The design of pipe whip restraints is governed not only by the pipe break blowdown thrust, but also by functional requirements, deformation limitations, properties of whipping pipe, and the capacity of the support structure. The restraint is designed for the impact force induced by the maximum possible initial gap between the whip restraint and the process pipe.

The impact energy is usually too high for an elastic restraint system or support structure to absorb. Therefore, energy-absorbing restraints are designed using the energy balance approach (impact energy + external work = internal energy of pipe restraint system).

3.6.2.4.1.1 Pipe Whip Restraint Components

Pipe whip restraints typically consist of the components listed below. The typical shape of a pipe whip restraint is shown in Figure 3.6-1.

a. Energy-absorbing members

Members that absorb energy by significant plastic deformations under the influence of impacting pipes (pipe whip). Crushable honeycomb material is not used in pipe whip restraint systems.

b. Non-energy-absorbing members

Components that form a direct link between the pipe and the structure.

c. Structural attachments

Fasteners that provide the method of attaching connecting members to the structure (e.g., welds, bolts).

d. Support structure

Steel and concrete support structures that ultimately carry the restraint load. Design criteria are specified in Subsections 3.8.3 and 3.8.4.

3.6.2.4.1.2 Methods for the Dynamic Analysis of Pipe Whip

A clearance between a pipe whip restraint and pipe is provided for thermal movement of pipe during normal operation and used as the maximum possible initial gap in the dynamic analysis. If a break occurs, the restraints or anchors nearest the break point prevent unlimited movement of the pipe at the point of break. In the absence of analytical justification, a dynamic load factor (DLF) of 2.0 is applied in determining a restraint loading to consider dynamic nature of the piping thrust load. Elasto-plastic pipe and whip restraint material properties may be considered as applicable. The effect of rapid strain rate of material properties is considered in accordance with ANSI/ANS 58.2. A 10 percent increase in yield strength is used to account for strain rate effects.

In general, the loading that may result from a break of piping is determined using either a dynamic blowdown or a conservative static blowdown analysis. The two methods that are used for analyzing the interaction effects between a whipping pipe and a restraint are energy balance method and equivalent static method.

The energy balance method is based on the principle of conservation of energy. The kinetic energy of the whipping pipe generated during the first quarter-cycle of movement is assumed to be converted into equivalent strain energy, which is distributed to the pipe or the whip restraint.

An equivalent static analysis model is used for rigid rupture restraints. In order to obtain the design load for a rigid restraint, the following equation is used:

$$F = 2 \times 1.1 \times F_B = 2.2F_B$$

Where:

F = design load

F_B = maximum blowdown force

The DLF is taken as 2.0 and rebound effects are accounted for by a factor of 1.1.

3.6.2.4.1.3 Design Loads

Restraint design loads are established using the criteria delineated in Subsection 3.6.2.4.1.2.

3.6.2.4.1.4 Allowable Stresses

The strain of energy-absorbing members is limited to 50 percent of the ASTM-specified minimum elongation. The yield stress for energy-absorbing members is equal to using a dynamic yield stress (F_{yd}) that is 1.1 times the static yield stress (F_{ys}) specified in ASTM.

The allowable stresses for non-energy-absorbing members, structural attachment, and support steel structure are specified in AISC N690. In evaluating allowable stresses, dynamic yield stress (F_{yd}) is used for dynamic loads and static yield stress (F_{ys}) for static loads.

3.6.2.4.1.5 Design Criteria

The unique features in the design of pipe whip restraint components relative to the structural steel design are geared to the loads used and the allowable stresses. These are as follows:

a. Energy-absorbing members are designed for the restraint reaction and the corresponding deflection established according to size and material of pipe, and the blowdown force delineated in Subsection 3.6.2.4.

b. Non-energy-absorbing members, structural attachments, and the support structure are designed for the design load delineated in Subsection 3.6.2.4.1.3.

3.6.2.4.1.6 Material

The materials used for pipe whip restraint components are as follows:

a. For energy-absorbing member: ASTM A193, Grade B7

b. For other members: ASTM A500, Grade B, ASTM A572, Grade 50, ASTM A36

3.6.2.4.2 Jet Impingement on Essential Piping and Components

The criteria and procedures for evaluating jet impingement on essential piping and components consider the guidance of SRP 3.6.2 Revision 3 (Reference 3), which identifies potential concerns with the guidance of ANSI/ANS 58.2. In particular, the NRC has questioned jet spreading and pressure distribution within the jet as described in the standard. ANSI/ANS 58.2 includes the option to use NUREG/CR-2913 (Reference 15), which is not explicitly questioned in SRP 3.6.2. Jet impingement in the APR1400 has been considered separately for the different fluid conditions at each HELB location. Specifically, single phase steam, saturated (i.e., two phase steam/water), and liquid jets are addressed through different methodologies that consider:

a. Jet range, shape, and direction (i.e., ZOI)

b. Jet blowdown pressure distribution

c. Jet impingement force, including thrust coefficient

Single-phase liquid jets are assumed not to expand since water is almost incompressible and is issuing from a straight pipe, so the cross-sections of their ZOIs are the same as those of the breaks themselves. The penetration distance for a liquid jet is assumed to extend infinitely until it impinges on a target. Because the distances from potential HELBs to nearby surfaces are relatively short, gravitational effects are not considered. A thrust coefficient of 2.0 is applied.

Two-phase jets are analyzed according to the methodology in NUREG/CR-2913. The jet expansion is determined according to the numerical analyses documented in Chapter 2 and Appendix A of NUREG/CR-2913 and is not dependent on a generalized expansion model, which was the focus of the NRC concern with ANSI/ANS 58.2. Two-phase jets are analyzed up to the penetration distance specified of 10 L/D, which is supported by the experimental foundation of NUREG/CR-2913.

For steam jets, axisymmetric CFD analyses using the ANSYS CFX Version 17.0 code were performed to determine the characteristics of free jets (i.e., unimpinged) for three scenarios that are representative of the range of steam conditions and pipe diameters in the APR1400. The CFD simulations represent the steady-state conditions, assuming the upstream source pressure and temperature remain fixed. The resulting pressure distribution contours display a characteristic Mach disk, within which the pressure is essentially constant at the stagnation pressure at the outlet. Outside of the Mach disk, the pressure drops off very rapidly, except for a downstream barrel shock. The CFD analyses were used to determine:

a. A conservatively large ZOI that bounds any of the thermodynamic conditions for steam jets in the APR1400. The initial spreading angle is broader than that in ANSI/ANS 58.2 (i.e., the Modified Moody Model). Although the jet persists beyond a distance 25 L/D, the pressures farther out are localized and fairly low. Due to the limited distances inside the APR1400 plant, a penetration limit of 25 L/D is considered to bound the range of impingement effects.

b. A conservative static loading methodology, which bounds the thermodynamic conditions found in the APR1400 to apply to targets inside the ZOI. This involves characterizing the pressure internal to the jet as it expands. Although steam jet pressure drops off rapidly with distance beyond the Mach disk, no credit is taken for this decrease as the jet expands and pressure decreases. However, the total force cannot exceed that at the break exit. In addition, for targets smaller than the jet ZOI, the force exerted on the target will be limited due to the smaller area of intersection between the target and the jet. A thrust coefficient of 1.26 is applied for steam jets, which is consistent with guidance in the SRP 3.6.2.

The qualification of essential piping and components includes jet impingement in Service Level D. Concurrent loads include deadweight, thermal, seismic, pressure, and concurrent effects associated with the postulated break.

Where necessary, protection from jets is provided by using jet shields.

3.6.2.4.2.1 Potential for Dynamic Amplification and Jet Resonance

SRP 3.6.2 identifies a concern regarding the potential for jet load amplification associated with formation of unsteadiness in free jets, especially supersonic jets, that propagates in the shear layer to induce time-varying oscillatory loads on obstacles in the flow path. The concern is that synchronization of transient waves with the shear layer vortices emanating from the jet break can lead to significant amplification of the jet pressures and forces (a form of resonance). Should the dynamic response of the neighboring structure also synchronize with the jet loading time scales, further amplification of the loading can occur as the result of formation of a feedback loop. When the impingement surface is within 10 diameters of the jet opening, and when resonance within the jet occurs, significant amplification of impingement loads might result.

Dynamic amplification and resonance does not occur for a HELB at potential locations in the APR1400. This effect occurs where engineered nozzles discharge single phase, high speed jets. The jet issuing from a pipe break is under-expanded. Although there may be supersonic regions downstream of the exit, the jet conditions are not consistent with those needed for dynamic amplification. For the APR1400, multiple physical characteristics of HELBs prevent occurrence of a resonance. These include self-damping effects of a two-phase jet (which is not relevant to single phase jets where resonance has been seen), lack of perpendicular flat surfaces of sufficient size to establish a feedback loop, variation in jet discharge angle and distance that prevent establishing a stable feedback loop, and irregularities in the contours of the broken pipe end and the impingement target that distort the outgoing jet and spread out reflected acoustic energy. The absence of HELB resonant effects is substantiated by a survey of experimental results. Therefore, resonant induced pressure loading is not a concern for jet impingement upon SSCs of the APR1400.

3.6.2.4.3 Implementation of Criteria Dealing with Special Features

Special features used for piping protection (e.g., pipe whip restraints) are described in Subsection 3.6.2.4. Special features such as augmented in-service examination are described in Subsection 3.6.2.1.4.1.3, Item f.

3.6.2.4.4 Blast Effects

SRP 3.6.2 identifies that the first significant fluid load on surrounding SSCs due to a HELB is possible to be induced by a blast wave. Although a spherically expanding blast wave is reasonably approximated to be a short-duration transient and analyzed independently of any subsequent jet formation, reflections and amplifications in enclosed areas of the plant may need to be evaluated. Blast waves are not considered in the ANSI/ANS 58.2 Standard for evaluating the dynamic effects associated with the postulated pipe rupture, and no regulatory guidance or acceptance criteria exist for this evaluation.

The formation of a blast wave and its propagation are complex, interactive phenomena with limited data available to characterize the shock loads due to a HELB. Computational Fluid Dynamics (CFD) modeling was performed for some of the most limiting steam break locations. HELBs in portions of systems with subcooled liquids form only weak, if any, shock waves because boiling fronts propagate at velocities that are orders of magnitude slower than the pressure waves in a liquid, so a liquid layer may remain superheated after a HELB for an extended period and not be able to participate in formation of a shock wave.

The CFD analysis approach was benchmarked against several experiments and analyses of similar conditions to verify its suitability.

CFD results showed that a moderate pressure shock wave formed rapidly, propagated away from the HELB location, and was subject to reflections that resulted in higher localized pressures at certain points on SSC surfaces. The effects of plant-specific geometry, such as proximity to a large structure, on surface pressure were identified. In particular, a shock wave issuing from a pipe that has just broken is directional, rather than spherically uniform, but the amount of energy that can participate in forming the shock wave is limited by the fluid that can be discharged before the shock initiates. In all cases, the shock wave pressure positive impulse was brief (a few milliseconds), which limits the impact upon SSCs in its path.

The results from the APR1400-specific CFD analysis were used to develop a simplified methodology that applies an experimentally-determined pressure vs. distance relationship found in the literature. The severity of the blast effects depends on the initial energy put into the shock wave, which is conservatively determined. The methodology then accounts for effects of plant geometry on reflection and dissipation to determine a conservative estimate of the surface pressure at a point on the surface of an SSC.

3.6.3 Leak-Before-Break Evaluation Procedure

This section describes LBB analysis for all applicable piping. LBB analysis is used to eliminate from the structural design basis the dynamic effects of double-ended guillotine breaks and equivalent longitudinal breaks for an applicable piping system.

According to 10 CFR Part 50, Appendix A, GDC 4, the exclusion of dynamic effects due to the pipe rupture from the design basis is allowed when the analyses demonstrate that the probability of pipe rupture is extremely low under conditions satisfied by the design basis such as normal operation, thermal transients, and seismic events in the process of approval and review.

This section describes how the piping system meets the LBB criteria in accordance with SRP 3.6.3 and demonstrates that the probability of pipe rupture is extremely low. The steps below are followed to carry out the LBB analyses.

a. Evaluate the potential failure mechanism

b. Perform the LBB analysis using piping evaluation diagram (PED)

The method of PEDs allows for the evaluation of the piping system in advance of the final piping analysis, incorporating LBB considerations into the piping design.

The COL applicant is to confirm that the bases for the LBB acceptance criteria are satisfied by the final as-built design and materials of the piping systems as site-specific evaluations, and is to provide the information including LBB evaluation report for the verification of LBB analyses (COL 3.6(3)).

3.6.3.1 Application of Leak-Before-Break

LBB is applied only to the following piping systems:

a. Reactor coolant loop (RCL) piping, hot leg (HL) and cold leg (CL)

b. Surge line (SL)

c. Direct vessel injection (DVI) line (main run inside containment)

d. Shutdown cooling (SC) line (main run inside containment)

3.6.3.2 Piping Design for Leak-Before-Break Application

The approach taken in the APR1400 design is to include LBB considerations in the piping design. One aspect of the LBB evaluation pursued for each selected piping system is the performance of a preliminary LBB evaluation prior to and independent of pipe routing. This evaluation is used to establish LBB acceptance criteria in terms of a range of normal operating and maximum design loads for each piping system designed for LBB. An LBB piping evaluation diagram is established, which is used to route, design and support the piping system within a range of design parameters. Site-specific evaluations will confirm that the bases for the acceptance criteria are satisfied by the final as-built design and materials.

Piping systems designed for LBB meet the requirements defined by the LBB piping evaluation diagrams, which constitute the crack stability acceptance criteria. The LBB piping evaluation diagrams are based on a defined set of piping design parameters for each piping system.

3.6.3.2.1 Piping Design Requirements

Piping design parameters, including pipe size, base metal and weld material, and leak detection capability, form the basis for developing LBB acceptance criteria curves (i.e., the LBB piping evaluation diagrams, PEDs). To demonstrate that LBB acceptance criteria are met, the piping systems are designed such that the load at all locations determined in accordance with the selection criteria of Subsection 3.6.3.5.1 falls within the acceptance area on the piping evaluation diagram. A methodology for developing LBB piping evaluation diagrams is discussed in Subsection 3.6.3.5.5.

Piping design parameters used for developing the PEDs constitute piping design requirements for LBB for a specific pipeline. In addition to the criteria defined by the pipe specific PED, the piping systems, to which LBB is applied, meet the LBB applicability criteria discussed in Subsection 3.6.3.4.

3.6.3.2.2 Piping Design Procedure

The piping is routed, designed, and analyzed in accordance with the ASME Boiler and Pressure Vessel Code, and is evaluated for LBB using the criteria discussed in Subsection 3.6.3.3. As-calculated piping loads at all locations determined in accordance with the selection criteria of Subsection 3.6.3.5.1 are compared to the LBB PED which is based on the set of design parameters for that piping system.

3.6.3.2.3 Plant and Piping Design Conditions

3.6.3.2.3.1 Piping Design Parameters

In piping design, fluid system requirements normally drive the selection of specific piping parameters. For piping systems chosen for LBB evaluation, LBB considerations are integrated into the process of selecting those design parameters. Specifically, the design parameters, for which LBB is considered, include pipe size (cross-section), pipe and weld materials, loads and piping system thermal flexibility.

The pipe and weld materials are chosen considering LBB requirements, along with system, stress and fatigue requirements. Within the limitations of fluid system and ASME Code requirements, pipe and weld materials are selected, which have good corrosion resistance, high yield and high toughness characteristics.

Piping system thermal flexibility is governed by the stress requirements of the ASME Code and the duty cycle of loadings. The piping systems are routed such that they are sufficiently flexible to thermally deflect without exceeding stress or fatigue limits and meet criteria for all load combinations associated with earthquakes (see Subsection 3.6.3.4).

The approach in considering piping system thermal flexibility is to route the pipe subjected to the thermal loads, other normal operating loads, seismic loads, and stress and fatigue limits. Determination of bounding leakage crack lengths for a LBB evaluation is made on the basis of a range of normal operating (NO) loads that span the loads for each pipeline evaluated.

3.6.3.2.3.2 Leakage Detection Systems (LDS)

The various means of leak detection discussed in Subsection 3.6.3.5.2.1 support the requirements of the LBB evaluation even though they may not be designed specifically for LBB. Regulatory Guide 1.45 (Reference 20) requires a LDS capable of detecting a 3.785 L/min (1.0 gpm) rate or less, independent of LBB requirements, and SRP 3.6.3 recommends a safety margin of ten (10) on the LDS capability. The LBB evaluation, however, depends on these "diverse measurement means," their diverse sensitivities and accuracies, which constitute the LDS, in order to correlate a crack length to a flow rate 10 times the leak detection capability. See Subsection 3.6.3.3.2 for the detectable leak rate requirement for LBB evaluations.

3.6.3.2.3.3 Consideration of Potential for Degradation Sources

In order to meet the commitment of Subsection 3.6.3.4, the LBB evaluation considers pipe and weld material selection, significant thermal modes of operation, the environment in which the piping is routed, and potential for water hammer within the particular fluid system, as each relates to potential for degradation of the pipe.

Consideration of LBB is integrated into the process of selecting materials (for corrosion resistance), determining modes of operation (for reduction of loads from critical thermal transients), designing the piping system to preclude water hammer, and routing to minimize potential of failure of the pipe from indirect causes. Piping lines are evaluated for susceptibility to erosion, erosion/corrosion, erosion/cavitation, creep fatigue, cleavage type failure, and fatigue cracking. See Subsection 3.6.3.4 for discussions of consideration of degradation sources.

3.6.3.2.3.4 Consideration of Loading Conditions

Loads due to NO (dead weight, pressure, and normal steady state thermal conditions including, where applicable, long-term thermal stratification effects) are applied to the pipe section at each location selected for LBB evaluation to calculate a crack length that will result in 10 times the detectable leakage rate.

NO loads, critical thermal transients (including loads due to thermal stratification), SSE loads, and normal operation dynamic transient loads (such as from rapid valve closure) are considered in the stability analyses. SSE loads include the effects of SSE inertia plus seismic anchor motion (SAM), except that loads due to SAM are ignored when fractional SSE SAM loads are low in comparison to corresponding fractional SSE inertial loads.

A maximum design load is applied to the cracked pipe section in the stability analyses, along with the applicable load margin. Maximum design load is determined to be the largest of the following combined loads as discussed in Subsection 3.6.3.5.5.3;

a. Combined load of SSE loads, and normal operation dynamic transient loads such as from rapid valve closure with normal operating loads

b. Combined load of normal operating loads and stratified flow loads (where applicable)

3.6.3.3 Criteria for Leak-Before-Break

The LBB evaluation is consistent with the requirements set forth in SRP 3.6.3(Reference 4) and NUREG-1061, Volume 3(Reference 8)

3.6.3.3.1 Applicability of LBB

See Subsection 3.6.3.4 for discussions of LBB applicability with respect to consideration of degradation sources for the piping systems listed in Subsection 3.6.3.1.

3.6.3.3.2 Detectable Leakage Rate Requirement

As per Regulatory Guide 1.45, the detectable leakage rate requirement of the leak detection system is 3.785 L/min (1.0 gpm) or less. The leakage crack subjected to the crack stability analyses must leak at a rate ten times the capability of the LDS unless otherwise justified. Subsection 3.6.3.5.2.1 commits to these requirements of Regulatory Guide 1.45.

The LBB evaluations are based on a leak detection capability of 1.89 L/min (0.5 gpm), and a safety margin of 10.

3.6.3.3.3 Stability Analysis Acceptance Criteria

Stability analysis acceptance criteria are given in Subsection 3.6.3.6.

3.6.3.3.4 LBB Design Criteria Development

LBB acceptance criteria are developed for each of the selected piping systems using the procedure shown in Figure 3.6-2. LBB evaluations are performed to establish LBB acceptance criteria in terms of NO and maximum design loads for all locations determined in accordance with the selection criteria of Subsection 3.6.3.5.1. The LBB acceptance criteria are established in the form of an LBB piping evaluation diagram (PED), which is utilized to route, design and support the piping system.

The analyses done at the LBB design criteria development stage to create the LBB PED are performed using analytical methods of Subsection 3.6.3.5. The PED is further discussed in Subsection 3.6.3.5.5. The LBB PEDs are additional criteria to which the piping system is designed. Design of a piping system to the LBB requirements developed using the above approach assures that LBB has been demonstrated.

3.6.3.4 Potential Failure Mechanisms

3.6.3.4.1 Susceptibility to Failure from Erosion, Erosion/Corrosion, Erosion/Cavitation

Systems susceptible to erosion/corrosion pipe wall thinning are those with wet steam, flashing liquids, or liquid flow with high localized velocities. These factors are considered along with water chemistry and usage time to determine susceptibility and appropriate preventative methods.

3.6.3.4.1.1 Erosion/Corrosion Minimization

For systems susceptible to erosion/corrosion, the following methods are used to minimize degradation:

a. Additional wall thickness is specified to accommodate a limited amount of wall thinning without violating code requirements, if required.

b. The bulk fluid velocity is limited to prevent excessive erosion of the pipe wall.

c. Velocity guidelines may be increased on a case-by-case basis through the use of engineering evaluations that address the erosion/corrosion aspects and piping material selected in the design.

3.6.3.4.1.2 Leak-Before-Break Applicability to Piping

Use of high-quality steels, stainless steel, or stainless steel liners in the RCL, SL, DVI, and SC piping prevents erosion, erosion/corrosion, and erosion/cavitation. Additionally, water chemistry for the RCS is closely controlled and monitored. There is no evidence of unusual wall thinning in these pipes due to erosion, erosion/corrosion, or erosion/cavitation in pressurized water reactor (PWR) plants. Therefore, these pipes have a very low level of susceptibility to failure from these failure mechanisms.

3.6.3.4.2 Susceptibility to Failure from Water Hammer

NUREG-0927 (Reference 23) provides recommendations to be included in operating and maintenance procedures which include: A) prevention of rapid valve motion, B) proper filling and venting of water-filled lines and components, C) introduction of voids into waterfilled lines and components, D) introduction of steam or heated water that can flash into water filled lines, E) introduction of water into steam-filled lines or components, F) proper warm-up of steam-filled lines, G) proper drainage of steam-filled lines, and H) the effects of valve alignments on line conditions.

The implementations within the APR1400 design for each of the items in NUREG-0927 are described in Subsection 3.6.3.4.2.1 through Subsection 3.6.3.4.2.3. Each of items E) though H) in NUREG-0927 is not a cause to the water hammer in piping systems designed for LBB because there is no steam filled lines and valve alignments are not required. The COL applicant is to provide the procedure for initial filling and venting to avoid the known causes for water hammer in each piping system designed for LBB (COL 3.6(4)).

3.6.3.4.2.1 Reactor Coolant Loop (RCL) and Surge Line (SL)

There is a low potential for water hammer in the subcooled water solid portions of the RCS because these portions of the RCS are designed to preclude void formation. Safety valve discharge loads associated with the PZR have been identified and included in the component design basis. The reactor coolant gas vent system (RCGVS) is used to vent/discharge non-condensable gases and steam from the high points of the RCS. Non-condensable gases from the reactor vessel closure head and the pressurizer steam space will be vented during plant startup process to fill the RCS. Therefore, the RCL and SL piping have a low level of susceptibility to failure from water hammer.

3.6.3.4.2.2 Direct Vessel Injection (DVI) Line

The most likely cause for water hammer events in the DVI line is leaking check valves, allowing hot water to enter a low-pressure region and then flash into steam bubbles. The steam pocket thus formed would permit a steam pocket collapse type of water hammer to occur if it were suddenly pressurized by the addition of water to the low-pressure piping.

NUREG/CR-2781 (Reference 16) identifies four water hammer events from the NUREG/CR-2059 (Reference 17) database involving the safety injection system (SIS). EPRI research on water hammer events included these four events and two more related to the SIS as reported in EPRI NP-6766 (Reference 18). Five of these six events occurred in piping upstream of the injection check valves due to steam pocket collapse (3 events), filling of a voided line (1 event), and an unknown cause (1 event). The sixth event occurred in the low-head safety injection suction pump piping due to an unknown cause.

High-point vents provide for the proper venting of lines and pumps. If the piping is then pressurized (above the calculated leakage-induced temperatures/saturation pressures), the pressure coupled with the generally low temperature of the DVI system provides reasonable assurance that the lines will remain full and that steam bubbles will not develop near the check valves.

Further protection against this type of water hammer is provided administratively by monitoring the pressure in the injection line and flushing upon high pressure. Pressure indication and alarms are provided to alert the operator of an increase in pressure to 6.89 MPa (1,000 psig) (from a normal of approximately 4.27 MPa [620 psig]). Increased pressure is an indication of high-temperature RCS leakage past the DVI check valve. Upon an alarm, the operator opens the injection line drain valve to depressurize the injection line to the safety injection tank (SIT) pressure while replenishing the volume with subcooled water at containment ambient temperature. The replenishment is performed slowly so as not to exceed the makeup capability, therefore minimizing the potential for collapse of any steam pockets that may have formed.

Normal valve operation, pump startup, and pump trip create negligible fluid transient loads for the DVI system. The sixth event, as reported in EPRI NP-6766, is not a concern for the APR1400 because the SIS does not have a low-head safety injection pump. All results of all design basis events are mitigated with the use of four high-pressure pumps.

Based on system operating procedures that require venting of DVI lines and the low number and low severity of events reported for safety injection type systems in PWRs, the susceptibility to water-hammer-induced failures in the DVI system is low. Thus, the DVI system meets the screening criterion for the water hammer.

3.6.3.4.2.3 Shutdown Cooling Line

The PWR residual heat removal (RHR) system piping is susceptible only to a small number of the generic causes of water hammer such as rapid valve opening or closing and steam bubble collapse.

There is little potential for water hammer loading due to rapid valve opening or closing because there are no fast-acting valves in the shutdown cooling system (SCS), and a steam bubble is unlikely to form in the line. Under normal power operation, the valves in the line are closed and the fluid in the line is at ambient temperature. Thus, a low vapor pressure and steam bubble formation do not occur. During SC operation, the system is open to the RCS and has the same vapor pressure as the RCS, which would be subcooled due to the hydrostatic head formed by the water and steam in the PZR. Therefore, steam bubble formation is precluded by the characteristics inherent to the system.

Even though there have been water hammer events reported in parts of the PWR RHR system, severe water hammer events are not expected for the SC line in the APR1400 design. Based on the low severity of the types of events to which the SCS is subject, the SCS meets the screening criterion for water hammer.

3.6.3.4.3 Susceptibility to Failure from Creep Fatigue

Creep fatigue is a concern for ferritic steel piping at operating temperatures above 370 °C (700 °F) and for austenitic stainless steel piping at operating temperatures above 425 °C (800 °F). Operating temperatures of the piping systems are below these limits and therefore not susceptible to creep fatigue failure.

3.6.3.4.4 Susceptibility to Failure from Corrosion

Materials used in the RCL (stainless steel cladding), SL, DVI, and SC piping are highly resistant to corrosion. Material selection, fabrication controls, and water chemistry controls provide reasonable assurance of resistance to corrosion.

To prevent intergranular stress corrosion attack on the austenitic stainless steel piping (SL, DVI, and SC), fabrication and operation controls are implemented. Primary water chemistry is controlled to minimize contaminants, and the dissolved oxygen is at a level that would normally preclude intergranular stress corrosion cracking and transgranular stress corrosion cracking.

Therefore, through material selection, chemistry control, and fabrication control, these pipes have a very low level of susceptibility to failure from corrosion.

According to EPRI MRP-111 (Reference 19), primary water stress corrosion cracking in alloy 52/152 butt welds in dissimilar-metal welds is unlikely. Welding procedures including repair procedure will be qualified by the COL applicant to minimize tensile stresses on the internal diameters and dilution effects. Weld repairs that will be in contact with the fluid will be made such that there will be compressive stress conditions on the wetted surface (COL 3.6(5)).

Refer to Subsections 5.2.3.2, 5.2.3.3, and 5.2.3.4 for water chemistry controls and fabrication of reactor coolant boundary components.

3.6.3.4.5 Susceptibility to Failure from Indirect Causes

Pipe degradation or failure from indirect causes such as fires, missiles, and component support failure is prevented by designing, fabricating, and inspecting to criteria that provide reasonable assurance of a low probability of the event or its impact on safety-related structures. The detailed description are provided below:

a. Seismic events: The LBB-applied piping systems are designed to Seismic Category I (see Section 3.2).

b. System over-pressurization: Over-pressure protection for RCS, primary side of auxiliary or emergency systems connected to the RCS, and secondary side of SG is described in Subsection 5.2.2.

c. Human error: Section 18.1 describes human factors engineering program to support the operator and minimize the potential for operator errors.

d. Fires: Fire prevention and protection are described in Subsection 9.5.1.

e. Flooding: Flood protection and evaluation are described in Section 3.4.

f. Missiles: Missile protection is described in Section 3.5.

g. Damages from moving equipment: The containment polar crane is designed to maintain its integrity without dropping its load during an SSE. Subsection 9.1.5 describes the overhead heavy load handling system.

h. Failures of structures, systems or components (SSC): The SSCs in close proximity to the LBB-applied piping system are safety-related and seismically designed (see Section 3.2).

3.6.3.4.6 Susceptibility to Cleavage-Type Failure

Cleavage-type failures are generally not a concern for the system operating temperatures and materials used for the RCL, SL, DVI, and SC piping. Reasonable assurance of the resistance to brittle cleavage-type failure is provided by fracture toughness test or ASME

Section III, Appendix G analysis, and maintained on the full scope of system operation based on the pressure-temperature limit curve. In addition, material tests (ASME Section III required toughness tests and J-Resistance [J-R] tests) show the materials for these pipelines to be highly ductile and highly resistant to cleavage-type failures at operating temperature.

3.6.3.4.7 Susceptibility to Failure from Fatigue Cracking

The RCL, SL, DVI, and SC piping is designed to meet the ASME Section III, NB fatigue criteria. All design basis transients identified in Subsection 3.9.1 are included in the detailed stress analyses. In the detailed stress analysis, the effects on thermal stratification and turbulence penetration are considered. If the impacts by these phenomena are sufficiently low, these phenomena are not considered in the design.

The potential for vibration-induced fatigue cracking within the RCL is primarily due to vibrations by the reactor coolant pumps (RCPs) operation. The RCP-induced vibrations are minimized by limiting pump shaft and frame vibrations during hot functional testing and operation. Also, piping vibrations are tested during initial test program as addressed in Subsection 3.9.2.1. During operation, RCP vibration monitoring system monitors the pump shaft and frame vibrations and provides the alarms to the operators in the main control room (see Subsection 7.7.1.5).

DVI and SC piping systems where LBB is applied are not operated during full power operation mode. Therefore, these system piping will not experience of vibration and result in vibration fatigue problem.

Therefore, these pipes have a very low susceptibility to failure from fatigue cracking.

3.6.3.4.8 Susceptibility to Failure from Thermal Aging

The LBB-applied piping systems for the APR1400 have no cast materials. The materials for the RCL are forged carbon steel and carbon weld metals, and they are known to have non-relevance to thermal aging. The austenitic stainless steel piping for SL, DVI, and SC are all forged products and have a low susceptibility to thermal aging. The welds in austenitic stainless steel piping are fabricated using the gas tungsten arc welding (GTAW) process, and weld metals are controlled to have low delta-ferrites, as described in Subsection 5.2.3.4.5.

Therefore, thermal aging of the LBB-applied piping systems for the APR1400 is not a concern.

3.6.3.4.9 Failure Prevention and Detection

3.6.3.4.9.1 Snubber Reliability

The functional requirements and design specifications provided to the supplier of snubbers contain the information described in Subsection 3.9.3. Snubber application and locations are determined during the design and tested as described in Subsection 3.9.6.

3.6.3.4.9.2 Inspections

For the piping systems identified in Subsection 3.6.3.1 to which LBB is applied, 100% of all welds will undergo a preservice inspection. Additionally, in accordance with the ASME Sections III and XI requirements for ASME Class 1 and 2 piping, both preservice and inservice inspection requirements are implemented to provide assurance of the integrity of those systems to which the LBB methodology is applied.

In accordance with ASME Section XI, Division 1, IWA-1500, and the requirements of 10 CFR 50.55a(g)(3)(i), biological shielding around the reactor coolant piping is designed to afford access to the circumferential and longitudinal welds for examination, as well as the transition piece-to-nozzle welds. The piping systems to which LBB is applied are provided with removable insulation in the areas of all welds and adjacent base metal requiring examination. The volumetric examinations are performed using ultrasonic techniques.

More information on ISI requirements is provided in Subsection 5.2.4.

3.6.3.5 Analysis

Guidance for the approach to LBB analysis is provided in SRP 3.6.3 (Reference 4) and NUREG-1061, Volume 3 (Reference 8). In these documents the use of ductile fracture mechanics is recommended. The J-integral and the tearing modulus are used to assess the stability of the postulated through-wall cracks. LBB PEDs are developed for the piping systems identified in Subsection 3.6.3.1. These diagrams constitute the crack stability acceptance criteria.

3.6.3.5.1 Leakage Crack Location

It is a regulatory requirement that LBB be applied to an entire piping system or analyzable portion thereof, typically segments located between anchor points. A survey of the piping is performed to determine the locations that have the least favorable combination of stress and material properties for base metal, weldments, nozzles, and safe ends. Locations of the highest maximum design stress are determined for each type of material present within the piping run in order to define the locations where the LBB evaluation is performed. Locations of the highest maximum design stress are based on the calculation of the combined stresses from the design basis load discussed in Subsection 3.6.3.2.3.4.

3.6.3.5.2 Leakage Crack Length

There are two major aspects to leak rate based on crack detection in addition to the crack opening size: leak detection capability and flow rate correlation for leakage through a crack.

3.6.3.5.2.1 Leak Detection System

NRC RG 1.45 (Reference 20) recommends a leak detection system that is capable of detecting a leakage rate of 3.785 L/min (1.0 gpm) or less to the reactor containment. The leak detection capability for the APR1400 is 1.89 L/min (0.5 gpm). Diverse measurement means are provided for leakage detection, including RCS inventory monitoring, sump level and flow monitoring, and measurement of airborne radioactive particulates and gases (refer to Subsection 5.2.5). The RCS primary water inventory balance method is used to detect leakage rates of 1.89 L/min (0.5 gpm) or less.

3.6.3.5.2.2 Flow Rate Correlation

The other major aspect of crack detection based on the leak rate, namely the flow rate correlation for leakage through a given crack size, cannot be predicted precisely. Variables such as surface roughness of the side walls of the crack, the nonparallel relationship of the side walls due to the elongated crack shape, and possible zigzag tearing of the material during crack formation introduce uncertainties in defining an exact flow rate correlation.

The leakage rate required to be detectable is 1.89 L/min (0.5 gpm) or less. The licensing guidelines in SRP 3.6.3 recommend a factor of 10 on the leakage rate for conservatism unless otherwise justified. The LBB evaluations of those piping systems listed in Subsection 3.6.3.1 are based on a leak of 18.9 L/min (5 gpm) with a safety margin of 10.

3.6.3.5.2.3 Leakage Crack Length Determination

It is necessary that hypothesized through-wall cracks open significantly to allow detection by normal leakage monitoring under normal full power loadings.

The leakage crack length for a required 18.9 L/min (5 gpm) flow depends upon the pipe loading, thermodynamic conditions, and assumed crack surface roughness conditions. The elastic-plastic estimation method of Reference 21 is used to find the crack opening displacement for a given loading. The PICEP program (Reference 22) is used to calculate the flow for a given crack length and loading. Crack morphology parameters used for PICEP program are shown in Table 3.6-7. For the purpose of generating analysis data for PEDs, a plot of moment versus crack length for an 18.9 L/min (5 gpm) flow is made using PICEP. This is done for each of the pipelines being evaluated for LBB. Each curve provides the relationship between normal operating loads (i.e, deadweight, thermal expansion, and pressure) and the crack length that gives a 18.9 L/min (5 gpm) flow.

At the interface between nozzle and surge line, consideration of the nozzle requires an iterative procedure to find an appropriate crack length which leaks at 18.9 L/min (5 gpm) and employs both the finite element model used for the crack stability analysis and the PICEP program. Since the stiffness of the nozzle is included in the stability analysis, it is also included in the leakage calculation. The iterative procedure used for calculating crack length at the nozzle/pipe interface is as follows:

a. Assume a crack length in finite element model

b. Apply normal operating loads to finite element model and calculate the crack opening area

c. Using PICEP program with the same crack length, vary the applied moment until the crack opening area becomes the same area as calculated with the finite element model.

d. If the calculated flow by PICEP program is greater than 18.9 L/min (5 gpm), the crack length is decreased and go to step ‘a’. If the calculated flow is less than 18.9

L/min (5 gpm), the crack length is increased and go to step ‘a’. If the flow is 18.9 L/min (5 gpm), stop.

The moment vs. crack length curves for the RCL, SL, DVI and SC lines listed in Subsection 3.6.3.1 are shown in Figures 3.6-15 through 3.6-22. These curves are the crack lengths associated with 18.9 L/min (5 gpm) flow for a given moment. An analysis using a longer crack at a given moment results in more than 18.9 L/min (5 gpm) flow.

3.6.3.5.3 Material Properties

3.6.3.5.3.1 Stress-Strain Curves

The hot leg (HL) and cold leg (CL) are typically fabricated from SA-516 Gr. 70 or SA-508 Gr. 1a. The stress-strain curve is taken from the LBB test data for the reference plant. The Ramberg-Osgood material characterization described in Table 3.6-2 is for the detectable crack length calculation and the Ramberg-Osgood fit to these data is described in Figure 3.6-3. The lower-bound stress-strain curve described in Figure 3.6-7 is applied for the crack stability evaluation.

The SL is typically fabricated with SA-312 Type 347 or TP316N stainless steel. The stress-strain curves are taken from the LBB test data for the reference plant bounds for the stainless steel used in the design. The stress-strain data are shown in Table 3.6-2 for the detectable crack length calculation. Figure 3.6-4 shows the Ramberg-Osgood fit to the data. In the crack stability evaluation, the lower-bound data are applied and the stress-strain curve is described in Figure 3.6-8.

The DVI and SC lines are typically fabricated with SA-312 TP304 and SA-312 TP316 stainless steel. The stress-strain curves are taken from the LBB test data for the reference plant. In the calculation of the detectable crack length, the bound data for each material are applied as described in Table 3.6-3. The Ramberg-Osgood data fit is shown in Figures 3.6-5 and 3.6-6. In the determination of the detectable crack length, the base metal test data for each material specification are applied. Otherwise, the lower-bound data are chosen from base and weld metal per material specification. The data are described in Figures 3.6-9 and 3.6-10.

3.6.3.5.3.2 Material J-Resistance Curves

The material J-R curves are taken from the LBB test data for the reference plant for the HL, CL, SL, DVI, and SC lines. The J-R material curve used for the HL and CL is shown in Figure 3.6-11. A fit to the data used in the stability evaluation is shown in the figure. This J-R curve bounds the material toughness behavior in any of these pipelines of the reference plant.

In order to provide reasonable assurance that LBB is satisfied for SL, DVI and SC lines, which are relatively small-diameter pipes, GTAW is specified for all shop and field welds. The material J-R curves are plotted in Figure 3.6-12 for the SL, Figure 3.6-13 for TP304 stainless steel of the DVI line, and Figure 3.6-14 for TP316 stainless steel of the DVI and SC lines.

The parameters on J-R curves for LBB application piping are shown in Table 3.6-6. However, the lower-bound data chosen from LBB test data may be used for conservatism.

3.6.3.5.4 Finite Element Model Description

3.6.3.5.4.1 Geometry and Boundary Conditions

The finite element model for a typical crack stability evaluation is shown in Figure 3.6-23. A close-up of the crack tip area is shown in Figure 3.6-24. The finite element model is simply a means for applying the pressure and moment loading to a section of pipe containing the hypothetical crack at some location in the pipeline. Two planes of symmetry are used to minimize the size of FE models for RCL, DVI, and SC pipes and intermediate pipe of SL. Therefore, each model represents one quarter of the pipe as shown in Figure 3.6-23(b). One plane of symmetry for the crack near the hot leg surge nozzle and pressurizer surge nozzle as shown in Figure 3.6-23(a) is used to minimize the model size, meaning that one half of the nozzle and pipe is modeled.

The length of the pipe is chosen to be at least five pipe diameters in order that the point of load application is not close to the crack tip region. The mesh uses 20-node isoparametric brick reduced integration elements. Boundary conditions are imposed on the model based upon symmetry and crack location. The crack surface area is free from constraint.

3.6.3.5.4.2 Loadings

The internal pressure appropriate to the normal operating conditions of each piping system is applied to the inner surface of the pipe, and the one half of internal pressure is applied to the crack face to account for the pressure drop across the crack. An axial end load traction, which when integrated over the pipe cross-sectional area, is equal to the continuity axial force, is applied to the far end of the pipe. Moments are applied as a linearly varying traction to the far end of the pipe.

3.6.3.5.4.3 J-Integral

The stability of through-wall cracks is evaluated using the J-integral technique. The J-integral parameter is related to the energy release rate at the crack tip. For APR1400 piping system listed in Subsection 3.6.3.1, the J-integral is determined by finite element analysis for maximum design load included in the crack stability evaluation using ABAQUS program (See Subsection 3.9.1.2.1.1).

3.6.3.5.4.4 Stability Evaluation

The stability of the cracked pipes is assessed by comparing the J-integral value due to the applied loads on the pipe to the material crack resistance. The stability criterion for ductile crack extension that is used is as follows:

$$J_{applied} < J_{material}$$

and

$$\left(\frac{dJ}{da}\right)_{applied} < \left(\frac{dJ}{da}\right)_{material}$$

Then, reasonable assurance of crack stability is provided.

The change in J-integral with crack length “a” is determined by analyzing several crack lengths in the region of interest. For a leakage crack of length “a,” crack lengths, “a,” “a-d,” and “a+d,” are analyzed as shown in Figure 3.6-25. Similarly, the change in J-integral with crack length in the region of length “2a” is determined by analyzing cracks with lengths ”2a,” “2a-d,” and “2a+d.” This method provides the derivative information in the two regions of interest. The variation of J with crack length in the region of “a” and

"2a" is plotted along with the material curve. Evaluation of the plots allows for direct verification of the stability criteria.

The evaluations are performed for the locations chosen to envelop all limiting cases. The pipes with the leakage crack length subject to loads of $\sqrt{2}$ times the maximum design load and the pipes with crack length twice the leakage crack length with loads of the maximum design load are demonstrated to have significant margin between the material curve and the loading curve, indicating that all pipe locations satisfy the LBB crack stability criteria.

An acceptable alternative method for the margin on loads and margin on crack length evaluations is to combine each component of the absolute values for the deadweight, thermal expansion, pressure, SSE (inertial), and seismic anchor motion (SAM) loads. This method is referred to as the absolute summation of loads method. If this alternative method is used, the margin on load for the leakage crack size is reduced from $\sqrt{2}$ to 1. The margin on crack length (2 times the leakage crack size) remains the same.

For each load step in the analysis, the loading curve as a function of crack length is fit to a quadratic:

$$J(a) = C_1 a^2 + C_2 a + C_3$$

The values at "a" and "a ± d" provide the boundary conditions necessary to evaluate the constants C_1, C_2, and C_3. At each loading point, the function is differentiated. This provides the dJ/da values for the loading curve. The material curves J(a), dJ(a)/da are evaluated at increasing crack extension. The loading functions J(a), dJ(a)/da are evaluated at either "a" or "2a," whichever crack length is being evaluated. Each point on the J versus dJ/da loading curve corresponds to a different load state. As long as the loading curve stays below the material curve,

$$J_{load} < J_{material}$$

and

$$\frac{dJ_{load}}{da} < \frac{dJ_{material}}{da}$$

the crack growth is stable. For the case of increasing load, the loading curve eventually intersects the material curve. At this point, the crack would experience unstable crack growth. At this point of instability,

$$J_{load} = J_{material}$$

and

$$\frac{dJ_{load}}{da} = \frac{dJ_{material}}{da}$$

Development of the J versus dJ/da diagram for determining points of instability is shown in Figure 3.6-26.

3.6.3.5.5 Piping Evaluation Diagram

3.6.3.5.5.1 Inputs for Development of Piping Evaluation Diagram

The following data forming the basis for developing LBB PEDs are summarized in Table 3.6-4 and Table 3.6-5:

a. Pipe size(diameter and thickness)

b. Materials

c. Weld type

d. Material properties

e. Normal operating temperature

f. Normal operating pressure

g. Leak detection capability

3.6.3.5.5.2 Constructing a Leak-Before-Break Piping Evaluation Diagram

The method by which LBB PEDs are constructed allows for the evaluation of the piping system in advance of the final piping analysis, incorporating LBB considerations into the piping design. The LBB PED for each pipe size, material, and pressure is prepared prior to the piping design and analysis and is used to evaluate critical points in the pipeline. The PED is constructed to allow the maximum design load to be plotted vs. the normal operating (NO) load.

The maximum design load at any time during the plant operation is the loading used in the stability analysis. Traditionally, this loading has been NO+SSE. However, the combination of the NO load and the largest of the design loads are used in the stability analysis. In the case of the SL, for example, the line is evaluated for the larger of either NO+SSE or stratified flow (SF). Subsection 3.6.3.5.5.3 describes the load combination method to determine NO and maximum design loads.

The LBB piping evaluation diagram requires performing two complete LBB evaluations. The evaluations are for two NO loads that span the typical loadings for the line under consideration. A completed typical diagram is shown in Figure 3.6-27. The procedure used for generating that figure is as follows:

a. Choose NO_1 load

b. Determine leakage crack length (a_l and $2a_l$) with corresponding NO_1 load by the approach provided in Subsection 3.6.3.5.2.3.

c. Determine the critical moment, $M_{critical}$ for a_l and $2a_l$ by the approach provided in Subsection 3.6.3.5.4.

d. Calculate the maximum allowable load from the critical moment, $M_{critical}$ for a_l and $2a_l$

$$M_{critical} = \sqrt{2} M_{allowable1} \qquad (a_l \text{ analysis})$$

$$M_{allowable1} = \frac{M_{critical}}{\sqrt{2}} \qquad \text{and}$$

$$M_{critical} = M_{allowable1} \qquad (2a_l \text{ analysis})$$

$$M_{allowable1} = M_{critical}$$

e. Plot $M_{allowable1}$ values at NO_1 load for a_l and $2a_l$ analyses, respectively. This corresponds to the points labeled “1” in Figure 3.6-27.

f. Repeat steps from a to e for NO_2 load. The results are shown in Figure 3.6-27, labeled “2”.

If the absolute summation of loads method is used to evaluate the margin on load and margin on crack length, the PED for the a_1 analysis is constructed using the formulas $M_{critical} = M_{allowable1}$ for the points labeled "1" and $M_{critical} = M_{allowable2}$ for the points labeled "2".

3.6.3.5.5.3 Method of Load Combination

Normal operating load and maximum design load are applied to the LBB evaluation using LBB PED.

Normal operating load is combined algebraically as follows:

a. Piping systems except for surge line ;

$$(M_i)_{NO} = (M_i)_{Deadweight} + (M_i)_{Thermal-100\%} + (M_i)_{Pressure-100\%}$$

b. Surge Line ;

$$(M_i)_{NO} = (M_i)_{Deadweight} + (M_i)_{Thermal-100\%} + (M_i)_{Pressure-100\%} + (M_i)_{stratified-100\%}$$

where M_i is the moment of i-component (i=1,2,3), and the subscript, Thermal-100% means 100% power linear thermal expansion, Pressure-100% means the pressure load at full-power operation, and Stratified-100% means the thermal stratified load at full-power operation.

Maximum design load is combined as follows:

a. Piping systems except for surge line

$$(M_i)_{combined} = \left|(M_i)_{Deadweight} + (M_i)_{Thermal-100\%} + (M_i)_{Pressure-100\%}\right| + \left|(M_i)_{SSE}\right|$$

Where SSE load includes both SSE inertia load and SSE seismic anchor motion(SAM) load. The subscript, Thermal-100% means 100% power linear thermal expansion.

b. Surge Line ;

The larger of the following two loads is considered.

$$(M_i)_{combined} = \left| \begin{matrix} (M_i)_{Deadweight} + (M_i)_{Thermal-100\%} \\ +(M_i)_{Pressure-100\%} + (M_i)_{Stratified-100\%} \end{matrix} \right| + |(M_i)_{SSE}|$$

Where SSE load includes both SSE inertia load and SSE seismic anchor motion(SAM) load. The subscript, Thermal-100% means 100% power linear thermal expansion, and Stratified-100% means the thermal stratified load at full-power operation.

$$\begin{aligned}(M_i)_{combined} = (M_i)_{Deadweight} + (M_i)_{Thermal-hp} \\ +(M_i)_{Pressure-100\%} + (M_i)_{Max.\ stratified}\end{aligned}$$

Where M_i is the moment of i-component (i=1,2,3), and subscript, Thermal-hp means linear thermal expansion at plant heatup, and Max. stratified means maximum thermal stratification load.

To determine NO and maximum design moments for LBB PED input, only the transverse bending moments are used.

$$(M)_{combined} = \sqrt{(M_2)^2{}_{combined} + (M_3)^2{}_{combined}}$$

3.6.3.5.5.4 Using a Leak-Before-Break Piping Evaluation Diagram

Once the lines marking the acceptable areas of allowable piping loads are plotted as described in Subsection 3.6.3.5.5.2, normal operating loads and corresponding maximum design loads for the critical piping locations are calculated as provided in Subsection 3.6.3.5.5.3, and plotted on the piping evaluation diagram. The critical locations are selected as described in Subsection 3.6.3.5.1.

Figure 3.6-28 shows how the plot is used for a hypothetical line. In this example, three points failed LBB and one point passed LBB. The reasons for each failure are given in the figure. The piping design can then be revised using the results (e.g., lowering the SSE response load by rerouting or by adding a snubber). Further review may result in other options for reducing the loads.

3.6.3.6 Results

LBB PEDs for piping systems listed in Subsection 3.6.3.1 provide LBB acceptance criteria for these piping systems and are shown in the figures as listed below:

a. Figure 3.6-29 : LBB piping evaluation diagram (Hot Leg)

b. Figure 3.6-30 : LBB piping evaluation diagram (Cold Leg)

c. Figure 3.6-31 : LBB piping evaluation diagram (Surge Line, Hot leg nozzle/Pipe interface)

d. Figure 3.6-32 : LBB piping evaluation diagram (Surge Line, Intermediate Pipe)

e. Figure 3.6-33 : LBB piping evaluation diagram (Surge Line, Pressurizer nozzle/Pipe interface)

f. Figure 3.6-34 : LBB piping evaluation diagram (DVI, Group 1)

g. Figure 3.6-35 : LBB piping evaluation diagram (DVI, Group 2)

h. Figure 3.6-36 : LBB piping evaluation diagram (SC, Group 3)

These criteria are based on piping design parameters given in Table 3.6-4 and Table 3.6-5. Analyses of preliminary design of these piping systems have demonstrated that the LBB criteria are met. These criteria require the following:

a. Leakage rate from the postulated leakage crack is detectable by the leakage detection system in the containment. The amount of leakage is detectable with a safety margin of at least a factor of 10 unless otherwise justified.

b. Cracks of the length that leak at the rate given above can withstand the maximum design loads with a safety factor of at least $\sqrt{2}$. Alternatively, cracks of the length that leak at the rate given above can withstand the absolute combination of the maximum design loads with a factor of one.

c. Cracks twice as long as those addressed above remain stable when subjected to the maximum design loads.

Site-specific information will demonstrate that the final detailed design parameters of each piping system are consistent with those given in Tables 3.6-4 and 3.6-5, and the final detailed design meets the LBB criteria of Figures 3.6-29 through 3.6-36. If design parameters for a piping system are not enveloped by the parameters in Tables 3.6-4 and 3.6-5, a new PED for that piping system will be constructed using the methodology given in this subsection, and the piping design will be revised, as necessary, to meet the LBB criteria of the new PED. If a PED given in Figures 3.6-29 through 3.6-36 is applicable to the detailed design of a piping system, but the detailed design does not meet the LBB criteria of the PED, the design will be revised to meet the LBB criteria of the PED.

Reconciliation of the as-built piping systems with the final design is documented in an LBB evaluation report. The LBB evaluation report contains the results of the LBB evaluations for as-built piping. The LBB evaluations use the methods described in Subsection 3.6.3. Each as-built piping system qualified for LBB is reconciled by demonstrating that:

a. The as-built piping system meets the screening criteria of Subsection 3.6.3.4.

b. The dimensional and material properties of the as-built piping system are consistent with the parameters used in the development of the final LBB PED(s) for that piping system.

c. The as-built piping responses meet the ASME Code allowable and the final LBB PED criteria.

If the absolute summation of loads method is used, the PEDs will be reconstructed, and the piping design, evaluation, and reconciliation will be based on the reconstructed PEDs.

3.6.4 Combined License Information

COL 3.6(1) The COL applicant is to identify the site-specific SSCs that are safety-related or required for safe shutdown that are located near high- and moderate-energy piping systems and that are susceptible to the consequences of piping failures.

COL 3.6(2) The COL applicant is to provide a list of site-specific high- and moderate-energy piping systems including layout drawings and protection features and the failure modes and effects analysis for safe shutdown due to the postulated HELBs.

COL 3.6(3) The COL applicant is to confirm that the bases for the LBB acceptance criteria are satisfied by the final as-built design and materials of the piping systems as site-specific evaluations, and is to provide the information including LBB evaluation report for the verification of LBB analyses.

COL 3.6(4) The COL applicant is to provide the procedure for initial filling and venting to avoid the known causes for water hammer in each piping system designed for LBB.

COL 3.6(5) The COL applicant is to provide the information on welding of Alloy 52/52M/152 concerning the residual stress and dilution effects of welds.

3.6.5 References

1. 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," U.S. Nuclear Regulatory Commission.

2. NUREG-0800, Standard Review Plan, Section 3.6.1, "Plant Design for Protection against Postulated Piping Failures in Fluid Systems Outside Containment," Rev. 3, U.S. Nuclear Regulatory Commission, March 2007.

3. NUREG-0800, Standard Review Plan, Section 3.6.2, "Determination of Rupture Locations and Dynamic Effects Associated with the Postulated Rupture of Piping," Rev. 3, U.S. Nuclear Regulatory Commission, December 2016.

4. NUREG-0800, Standard Review Plan, Section 3.6.3, "Leak-Before-Break Evaluation Procedures," Rev. 1, U.S. Nuclear Regulatory Commission, March 2007.

5. NUREG-0800, Standard Review Plan, BTP 3-3, "Protection against Postulated Piping Failures in Fluid Systems Outside Containment," Rev. 3, U.S. Nuclear Regulatory Commission, March 2007.

6. NUREG-0800, Standard Review Plan, BTP 3-4, "Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment," Rev. 2, U.S. Nuclear Regulatory Commission, March 2007.

7. 10 CFR Part 100, "Reactor Site Criteria," U.S. Nuclear Regulatory Commission.

8. NUREG-1061, "Evaluation of Potential for Pipe Breaks," Vol. 3, U.S. Nuclear Regulatory Commission, November 1984.

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10. ASME B31.1, "Code for Pressure Piping, Power Piping," The American Society of Mechanical Engineers, the 2010 Edition.

11. ASME Boiler and Pressure Vessel Code, Section XI, "Inservice Inspection of Nuclear Power Plants," The American Society of Mechanical Engineers, the 2007 Edition with the 2008 Addenda.

12. Regulatory Guide 1.11, "Instrument Lines Penetrating Primary Containment," Rev. 1, U.S. Nuclear Regulatory Commission, March 2010.

13. ANSI/ANS 58.2-1988, "American National Standard Design Basis for Protection of Light Water Nuclear Power Plants Against the Effects of Postulated Pipe Rupture," American Nuclear Society, 1988.

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15. NUREG/CR-2913, "Two-Phase Jet load," U.S. Nuclear Regulatory Commission, January 1983.

16. NUREG/CR-2781, "Evaluation of Water Hammer Events in Light Water Reactor Plants," U.S. Nuclear Regulatory Commission, July 1982.

17. NUREG/CR-2059, "Compilation of Data Concerning Known and Suspected Water Hammer Events in Nuclear Power Plants, CY 1969-May 1981," U.S. Nuclear Regulatory Commission, May 1982.

18. EPRI NP-6766, "Water Hammer Prevention, Mitigation, and Accumulation, Volume 1: Plant Water Hammer Experience," Final Report, Eletric Power Research Institute, July 1992.

19. EPRI MRP-111, Materials Reliability Program (MRP), "Resistance to Primary Water Stress Corrosion Cracking of Alloys 690, 52, and 152 in Pressurized Water Reactors (MRP-111)," Electric Power Research Institute, March 2004.

20. Regulatory Guide 1.45, "Guidance on Monitoring and Responding to Reactor Coolant System Leakage," Rev. 1, U.S. Nuclear Regulatory Commission, May 2008.

21. EPRI NP-1931, V. Kumar, M.D. German, and C.F. Shih, “An Engineering Approach for Elastic-Plastic Fracture Analysis,” Electric Power Research Institute, July 1981.

22. EPRI NP-3596-SR, “PICEP: Pipe Crack Evaluation Program,” Rev. 1, Electric Power Research Institute, December 1992.

23. NUREG-0927, “Evaluation of Water-Hammer Occurrence in Nuclear Power Plants: Technical Findings Relevant to Unresolved Safety Issue A-1,” Rev. 1, U.S. Nuclear Regulatory Commission, March 1984.

24. APR1400-E-N-NR-14004-P, “Summary Report of High-Energy Piping Rupture Analysis,” Rev. 2, KEPCO & KHNP, October 2017.

Table 3.6-1

High- and Moderate-Energy Fluid Systems

System (1)(2)	High Energy	Moderate Energy
Reactor Coolant System	○	
Reactor Coolant Gas Vent System	○	
Safety Injection System	○	
Shutdown Cooling System	○	
Chemical and Volume Control System	○	
Steam Generator Blowdown System(3)	○	
Component Cooling System		○
Spent Fuel Pool Cooling and Cleanup System		○
Process and Effluent Radiation Monitoring and Sampling System		○
Process and Post-Accident Sampling System		○
Containment Spray System		○
Essential Service Water System		○
Main Steam System	○	
Condensate and Feedwater System	○	
Auxiliary Feedwater System(5)	○	
Auxiliary Steam System	○	
Emergency Diesel Generator System(4)	○	
Fire Protection System		○
Equipment and Floor Drainage System		○
Essential Chilled Water System		○
Plant Chilled Water System		○
Compressed Air System		○

(1) Systems classified as high-energy are either totally or partially high-energy.
If portions of system are high-energy, it is classified as high-energy system.
The portions of high-energy piping are identified in Figures 3.6-1 through 3.6-12.

(2) Systems or portions of systems outside the containment building and auxiliary building are excluded from this table.

(3) Wet layup recirculation system is classified as moderate-energy system.

(4) Subsystems other than an EDG engine starting air system are classified as moderate-energy systems.

(5) Subsystems other than an auxiliary feedwater pump turbine subsystem are classified as moderate-energy systems.

Table 3.6-2

Material Constants (Reactor Coolant Loop and Surge Line)

Security-Related Information – Withhold Under 10 CFR 2.390

Table 3.6-3

Material Constants (Direct Vessel Injection and Shutdown Cooling Line)

Security-Related Information – Withhold Under 10 CFR 2.390

Table 3.6-4

Design Parameters Used in LBB Evaluations (Reactor Coolant Loop and Surge Line)

Security-Related Information – Withhold Under 10 CFR 2.390

Table 3.6-5

Design Parameters Used In LBB Evaluation (Direct Vessel Injection and Shutdown Cooling Line)

Security-Related Information – Withhold Under 10 CFR 2.390

Table 3.6-6

Parameters on J-R Curves

Security-Related Information – Withhold Under 10 CFR 2.390

Table 3.6-7

Crack Morphology Parameters

Security-Related Information – Withhold Under 10 CFR 2.390

Table 3.6-8 (1 of 6)

High-Energy Line and Break Location

Subsystem	Room Number	High-Energy Line	Break location[1)]	
9RC101	136C02	RCS cold leg (RC003AD30) – PZR spray nozzle	Terminal End	Figure 3.6-37 (1 and 2 of 2)
9RC101	136C02	RCS cold leg (RC003AB30) – PZR spray nozzle	Terminal End	Figure 3.6-37 (1 and 2 of 2)
9RC101	136C02	Charging side regenerative HX outlet – PZR spray line connection	Terminal End	Figure 3.6-37 (2 of 2)
9RC101	136C02	PZR – PZR spray line connection (V200/V201)	Terminal End	Figure 3.6-37 (2 of 2)
9RC101	136C02	PZR – PZR spray line connection (V202/V203)	Terminal End	Figure 3.6-37 (2 of 2)
9RC103	100C02B	RCS cold leg (RC002AD30) – RCS drain line (RC008AD2)	Terminal End	Figure 3.6-37 (1 of 2)
9RC104	100C02A	RCS cold leg (RC002AA30) – RCS drain line (RC008AA2)	Terminal End	Figure 3.6-37 (1 of 2)
9RC105	100C02A	RCS cold leg (RC002AC30) – RCS drain line (RC008AC2)	Terminal End	Figure 3.6-37 (1 of 2)
9RC105	100C02A	RCS drain line letdown line (RC010A2) – Regenerative HX letdown line inlet nozzle	Terminal End	Figure 3.6-37 (1 of 2)
9RC106	100C02B	RCS cold leg (RC002AB30) – RCS drain line (RC008AB2)	Terminal End	Figure 3.6-37 (1 of 2)
9RG101	156C01	RCS gas vent system POSRV inlet vent line – Vent line isolation valve (V412/413)	Terminal End	Figure 3.6-37 (2 of 2) Figure 3.6-38
9SI101	136C01A	SI tank (1A) vent line nozzle (SI009AA12) – RCS DVI nozzle (RC005AA12)	Terminal End	Figure 3.6-39 (2 of 2) Figure 3.6-37 (1 of 2)
9SI102	136C01B	SI tank (1B) vent line nozzle (SI009AB12) – RCS DVI nozzle (RC005AD12)	Terminal End	Figure 3.6-39 (1 of 2) Figure 3.6-37 (1 of 2)

Note:

1) There are no intermediate break locations of the piping system taken to the graded approach as a result of stress analysis and cumulative usage factor analysis for ASME Section III, Class 1 piping.

Table 3.6-8 (2 of 6)

Subsystem	Room Number	High-Energy Line	Break location	
9SI103	136C01B	SI tank (1C) vent line nozzle (SI009AC12) – RCS DVI nozzle (RC005AB12)	Terminal End	Figure 3.6-37 (1 of 2) Figure 3.6-39 (2 of 2)
9SI104	136C01A	SI tank (1D) vent line nozzle (SI009AD12) – RCS DVI nozzle (RC005AC12)	Terminal End	Figure 3.6-37 (1 of 2) Figure 3.6-39 (1 of 2)
9SI105	100C02A	RCS hot leg (RC001AA42) – Shutdown cooling line isolation valve inside containment (V653)	Terminal End	Figure 3.6-37 (1 of 2) Figure 3.6-39 (2 of 2)
9SI105	100C02A	RCS hot leg injection line at containment penetration (PC0123) – Shutdown cooling line connection (RC004AA16)	Terminal End	Figure 3.6-39 (2 of 2)
9SI106	100C02B	RCS hot leg (RC001AB42) – Shutdown cooling line isolation valve inside containment (V654)	Terminal End	Figure 3.6-37 (1 of 2) Figure 3.6-39 (1 of 2)
9SI106	100C02B	RCS hot leg injection line at containment penetration (PC0123) – Shutdown cooling line connection (RC004AB16)	Terminal End	Figure 3.6-37 (1 of 2)
9SI106	100C02B	Shutdown cooling line connection (RC004AB16) – RCS drain line isolation valve (V216)	Terminal End	Figure 3.6-37 (1 of 2)
9SI611	136C01A	SI tank (1A) drain line (SI025BA2) connection –RCS drain line isolation valve (V641)	Terminal End	Figure 3.6-39 (2 of 2)
9SI612	136C01B	SI tank (1B) drain line (SI025BB2) connection –RCS drain line isolation valve (V621)	Terminal End	Figure 3.6-39 (2 of 2)
9SI613	136C01B	SI tank (1C) drain line (SI025BC2) connection –RCS drain line isolation valve (V631)	Terminal End	Figure 3.6-39 (2 of 2)
9SI614	136C01A	SI tank (1D) drain line (SI025BD2) connection –RCS drain line isolation valve (V611)	Terminal End	Figure 3.6-39 (2 of 2)

Table 3.6-8 (3 of 6)

Subsystem	Room Number	High-Energy Line	Break location	
9SI619	156C01	SI tank (1A) atmosphere vent line (SI047AA2) connection – Atmosphere vent valve (V241)	Terminal End	Figure 3.6-39 (2 of 2)
9SI620	156C01	SI tank (1B) atmosphere vent line (SI047AB2) connection – Atmosphere vent valve (V221)	Terminal End	Figure 3.6-39 (2 of 2)
9SI621	156C01	SI tank (1C) atmosphere vent line (SI047AC2) connection – Atmosphere vent valve (V231)	Terminal End	Figure 3.6-39 (2 of 2)
9SI622	156C01	SI tank (1D) atmosphere vent line (SI047AD2) connection – Atmosphere vent valve (V211)	Terminal End	Figure 3.6-39 (2 of 2)
9CV101	100C02B	Regenerative HX charging line outlet nozzle – RCS cold leg (RC003AA30) charging nozzle	Terminal End	Figure 3.6-40 (1 of 2) Figure 3.6-37 (1 of 2)
9CV102	100C02B	Charging line at containment penetration (PC230) – Regenerative HX charging line inlet nozzle	Terminal End	Figure 3.6-40 (1 of 2)
9CV106	100C02B	Regenerative HX letdown line outlet nozzle – Letdown HX letdown line inlet nozzle / isolation valve inside containment (V363)	Terminal End	Figure 3.6-40 (1 of 2)
9CV107	100C02B	Letdown HX letdown line outlet nozzle – Letdown line at containment penetration (PC402)	Terminal End	Figure 3.6-40 (1 of 2)
9CV622	114C01A	RCP seal water line at containment penetration (PC304) – 2"x1" reducer	Terminal End	Figure 3.6-40 (2 of 2)
9SD101	100C02A 136C01A	SG1 wet layup nozzle – Wet layup isolation valve (V1119)	Terminal End	Figure 3.6-41
9SD102	100C02B 136C01B	SG2 wet layup nozzle – Wet layup isolation valve (V1120)	Terminal End	Figure 3.6-41
9SD103	100C02A	SG1 blowdown line nozzle – Blowdown line at containment penetration (PC911)	Terminal End	Figure 3.6-41
9SD104	100C02B	SG2 blowdown line nozzle – Blowdown line at containment penetration (PC921)	Terminal End	Figure 3.6-41

Table 3.6-8 (4 of 6)

Subsystem	Room Number	High-Energy Line	Break location	
9SD215	137A31C	Blowdown line at containment penetration (PC911) – Blowdown flash tank compartment wall	Terminal End	Figure 3.6-41
9SD216	137A31D	Blowdown line at containment penetration (PC921) – Blowdown flash tank compartment wall	Terminal End	Figure 3.6-41
9MS101	136C01B 100C02B	SG2 steam vent nozzle – SG2 main steam line at containment penetration (PC621)	Terminal End	Figure 3.6-42
9MS269	137A31D	SG2 main steam line at containment penetration (PC621) – SG2 main steam valve house anchor wall penetration	Terminal End	Figure 3.6-42
9MS288	137A31D	Main steam line (9M269) condensate drain line nozzle – Main steam valve house anchor wall penetration	Terminal End	Figure 3.6-42
9MS102	156C01 136C01B	SG2 steam vent nozzle – SG2 main steam line at containment penetration (PC622)	Terminal End	Figure 3.6-42
9MS270	137A31D	SG2 main steam line at containment penetration (PC622) – SG2 main steam valve house anchor wall penetration	Terminal End	Figure 3.6-42
9MS287	137A31D	Main steam line (9M270) condensate drain line nozzle – Main steam valve house anchor wall penetration	Terminal End	Figure 3.6-42
9MS275	137A31D	SG2 aux-feedwater pump turbine steam line connection – pipe layout area boundary wall	Terminal End	Figure 3.6-42
9MS103	136C01A 100C02A	SG1 steam vent nozzle – SG1 main steam line at containment penetration (PC612)	Terminal End	Figure 3.6-42
9MS271	137A31C	SG1 main steam line at containment penetration (PC612) – SG1 main steam valve house anchor wall penetration	Terminal End	Figure 3.6-42
9MS286	137A31C	Main steam line (9M271) condensate drain line nozzle – Main steam valve house anchor wall penetration	Terminal End	Figure 3.6-42
9MS273	137A31C	SG1 aux-feedwater pump turbine steam line connection – pipe layout area boundary wall	Terminal End	Figure 3.6-42

Table 3.6-8 (5 of 6)

Subsystem	Room Number	High-Energy Line	Break location	
9MS104	136C01A 100C02A	SG1 steam vent nozzle – SG1 main steam line at containment penetration (PC611)	Terminal End	Figure 3.6-42
9MS272	137A31C	SG1 main steam line at containment penetration (PC611) – SG1 main steam valve house anchor wall penetration	Terminal End	Figure 3.6-42
9MS285	137A31C	Main steam line (9M272) condensate drain line nozzle – Main steam valve house anchor wall penetration	Terminal End	Figure 3.6-42
9FW209	137A31C	SG1 economizer main steam valve house anchor wall – Economizer line at containment penetration (PC511)	Terminal End	Figure 3.6-43 (1 of 1)
9FW101	136C01A	Economizer line at containment penetration (PC511) – SG1 economizer injection nozzle	Terminal End	Figure 3.6-43 (1 of 1)
9FW601	100C02A	SG1 secondary drain line (FW066AA2) nozzle – Drain line isolation valve (V2122)	Terminal End	Figure 3.6-43 (1 of 1)
9FW627	100C02A	SG1 secondary drain line (FW066AB2) nozzle – Drain line isolation valve (V2123)	Terminal End	Figure 3.6-43 (1 of 1)
9FW219	137A31C	SG1 downcomer main steam valve house anchor wall – SG1 downcomer at containment penetration (PC512)	Terminal End	Figure 3.6-43 (1 of 1)
9AF101	136C01A	SG1 downcomer at containment penetration (PC512) / aux-feedwater check valve (V1008A/V1007A) – SG1 downcomer injection nozzle	Terminal End	Figure 3.6-43 (1 of 1) Figure 3.6-44 (1 of 1)
9FW210	137A31D	SG2 economizer main steam valve house anchor wall – Economizer line at containment penetration (PC521)	Terminal End	Figure 3.6-43 (1 of 1)
9FW102	136C01B	Economizer line at containment penetration (PC521) – SG2 economizer injection nozzle	Terminal End	Figure 3.6-43 (1 of 1)
9FW602	100C02B	SG2 secondary drain line (FW066AC2) nozzle – Drain line isolation valve (V2124)	Terminal End	Figure 3.6-43 (1 of 1)
9FW628	100C02B	SG2 secondary drain line (FW066AD2) nozzle –Drain line isolation valve (V2125)	Terminal End	Figure 3.6-43 (1 of 1)

Table 3.6-8 (6 of 6)

Subsystem	Room Number	High-Energy Line	Break location	
9FW220	137A31D	SG2 downcomer main steam valve house anchor wall – SG2 downcomer at containment penetration (PC522)	Terminal End	Figure 3.6-43 (1 of 1)
9AF102	136C01B	SG2 downcomer at containment penetration (PC522) / aux-feedwater check valve (V1008B/V1007B) – SG2 downcomer injection nozzle	Terminal End	Figure 3.6-43 (1 of 1) Figure 3.6-44 (1 of 1)

Table 3.6-9 (1 of 8)

System-Specific High-Energy Line Break Protection

Subsystem	Break Number	Break Type 1)	Break Location	Protection of Essential Target	
Reactor Coolant System (Not applied for Leak-Before-Break): Terminal End Break					
9RC101	BT-RC-01 BT-RC-02 BT-RC-03 BT-RC-04	C	Figure 3.6-37 (2 of 2)	PW 2)	No PW occurs beacause of geometric configuration (limited movement of the broken pipe end)
				JI 3)	No essential target
9RC101	BT-RC-05	C	Figure 3.6-37 (2 of 2)	PW	Pressurizer compartment wall (WCE11-02) (designed to withstand PW impact load)
				JI	Top of pressurizer (designed to withstand JI load)
	BT-RC-06	C	Figure 3.6-37 (1 of 2)	PW	No essential target
				JI	RCS discharge leg (designed to withstand JI load)
	BT-RC-07	C	Figure 3.6-37 (1 of 2)	PW	Steel structure (2CS101) (designed to withstand PW impact load)
				JI	RCS discharge leg (RC003AB30) (designed to withstand JI load)
9RC104	BT-RC-08	C	Figure 3.6-37 (1of 2)	PW	RCP 01A concrete pedestal, El. 100’ floor (SCE41-01) (designed to withstand PW impact load)
				JI	RCS suction leg (RC002AA30) (designed to withstand JI load)
9RC106	BT-RC-09	C	Figure 3.6-37 (1 of 2)	PW	RCP 02B concrete pedestal, El. 100’ floor (SCE11-01) (designed to withstand PW impact load)
				JI	RCS suction leg (RC002AB30) (designed to withstand JI load)
9RC105	BT-RC-10	C	Figure 3.6-37 (1 of 2)	PW	RCP 01B concrete pedestal, El. 100’ floor (SCE31-01) (designed to withstand PW impact load)
				JI	RCS suction leg (RC002AC30) (designed to withstand JI load)

Notes:
1) C and L stand for circumferential and longitudinal breaks, respectively.
2) Pipe whip
3) Jet impingement

Table 3.6-9 (2 of 8)

Subsystem	Break Number	Break Type	Break Location	Protection of Essential Target	
Reactor Coolant System (Not applied for Leak-Before-Break): Terminal End Break					
9RC103	BT-RC-11	C	Figure 3.6-37 (1 of 2)	PW	RCP 02B concrete pedestal, El. 100’ floor (SCE21-01) (designed to withstand PW impact load)
				JI	RCS suction leg (RC002AD30) (designed to withstand JI load)
9SI105	BT-RC-12	C	Figure 3.6-37 (1 of 2)	PW	Steel structure (3CS421) (designed to withstand PW impact load)
				JI	Shutdown cooling line (RC004AA16) (designed to withstand JI load)
9SI106	BT-RC-13	C	Figure 3.6-37 (1 of 2)	PW	Steel structure (3CS221) (designed to withstand PW impact load)
				JI	Shutdown cooling line (RC004AB16) (designed to withstand JI load)
	BT-RC-14	C	Figure 3.6-37 (1 of 2)	PW	El. 100’ floor (SCE21-01) (designed to withstand PW impact load)
				JI	Shutdown cooling line (RC004AB16) (designed to withstand JI load)
9CV101	BT-RC-15	C	Figure 3.6-37 (1 of 2)	PW	Hot leg injection line (SI010EC4) (designed to withstand PW impact load)
				JI	RCP cold leg (RC003AA30) (designed to withstand JI load)
Safety Injection/Shutdown Cooling System (Not applied for Leak-Before-Break): Terminal End Break					
9SI619	BT-SI-01	C	Figure 3.6-39 (2 of 2)	PW	No PW occurs.(not enough reserved energy to move the broken pipe end)
				JI	No essential target
9SI620	BT-SI-02	C	Figure 3.6-39 (1 of 2)	PW	No PW occurs.(not enough reserved energy to move the broken pipe end)
				JI	No essential target
9SI621	BT-SI-03	C	Figure 3.6-39 (2 of 2)	PW	No PW occurs.(not enough reserved energy to move the broken pipe end)
				JI	No essential target
9SI622	BT-SI-04	C	Figure 3.6-39 (1 of 2)	PW	No PW occurs.(not enough reserved energy to move the broken pipe end)
				JI	No essential target

Table 3.6-9 (3 of 8)

Subsystem	Break Number	Break Type	Break Location	Protection of Essential Target	
9SI611	BT-SI-05	C	Figure 3.6-39 (2 of 2)	PW	El. 136'-6" floor (SCH41-01) (designed to withstand PW impact load)
				JI	El. 136' -6" floor (SCH41-01) (designed to withstand JI load)
9SI612	BT-SI-06	C	Figure 3.6-39 (1 of 2)	PW	El. 136'-6" floor (SCH21-01) (designed to withstand PW impact load)
				JI	El. 136'-6" floor (SCH21-01) (designed to withstand JI load)
9SI613	BT-SI-07	C	Figure 3.6-39 (2 of 2)	PW	El. 136'-6" floor (SCH11-01) (designed to withstand PW impact load)
				JI	El. 136'-6" floor (SCH11-01) (designed to withstand JI load)
9SI614	BT-SI-08	C	Figure 3.6-39 (1 of 2)	PW	El. 136'-6" floor (SCH31-01) (designed to withstand PW impact load)
				JI	El. 136'-6" floor (SCH31-01) (designed to withstand JI load)
Chemical and Volume Control System (Not applied for Leak-Before-Break): Terminal End Break					
9RC105	BT-CV-01	C	Figure 3.6-40 (1 of 2)	PW	Regenerative heat exchanger room floor (SCE31-01) (designed to withstand PW impact load)
				JI	Regenerative heat exchanger (designed to withstand JI load)
9CV106	BT-CV-02	C	Figure 3.6-40 (1 of 2)	PW	Regenerative heat exchanger room floor (SCE31-01) (designed to withstand PW impact load)
				JI	Regenerative heat exchanger (designed to withstand JI load)
9CV102	BT-CV-03	C	Figure 3.6-40 (1 of 2)	PW	Regenerative heat exchanger room wall (WCM11-03) (designed to withstand PW impact load)
				JI	Regenerative heat exchanger (designed to withstand JI load)
9CV101	BT-CV-04	C	Figure 3.6-40 (1 of 2)	PW	Regenerative heat exchanger floor (SCE31-01) (designed to withstand PW impact load)
				JI	Regenerative heat exchanger (designed to withstand JI load)

Table 3.6-9 (4 of 8)

Subsystem	Break Number	Break Type	Break Location	Protection of Essential Target	
9CV106	BT-CV-05	C	Figure 3.6-40 (1 of 2)	PW	Letdown heat exchanger room wall (WCE11-01) (designed to withstand PW impact load)
				JI	Letdown heat exchanger, letdown heat exchanger wall (WCE11-01) (designed to withstand JI load)
9CV107	BT-CV-06	C	Figure 3.6-40 (1 of 2)	PW	Letdown heat exchanger room wall (WCM11-01), CC line (CC094A8) (designed to withstand PW impact load)
				JI	Letdown heat exchanger, letdown heat exchanger room floor (SCH11-01)(designed to withstand JI load)
	BT-CV-07	C	Figure 3.6-40 (1 of 2)	PW	No PW occurs. (impacted piping SI008EB12 has larger nominal size and thickness than whipping pipe)
				JI	Containment wall, containment penetration (PC0402) (designed to withstand JI load)
9CV102	BT-CV-08	C	Figure 3.6-40 (1 of 2)	PW	IRWST venting opening (designed to withstand PW impact load)
				JI	Containment wall, containment penetration (PC0230) (designed to withstand JI load)
9CV622	BT-CV-09	C	Figure 3.6-40 (2 of 2)	PW	No essential target
				JI	Containment wall, containment penetration (PC0304) (designed to withstand JI load)
9CV101	BT-CV-10	C	Figure 3.6-40 (1 of 2)	PW	No PW occurs because of geometric configuration (broken pipe is restrained by wall)
				JI	No essential target
Steam Generator Blowdown System (Not applied for Leak-Before-Break): Terminal End Break					
9SD103	BT-SD-01	C	Figure 3.6-41 (1 of 1)	PW	PWR (HSD103-001W) installed to protect RCP01A
				JI	SG1 (designed to withstand JI load)
				Blast	RCP #1A (designed to withstand blast load)
	BT-SD-02	C	Figure 3.6-41 (1 of 1)	PW	PWR (HSD103-002W) required to protect RCP01B
				JI	SG1 (designed to withstand JI load)
				Blast	RCP #1B (designed to withstand blast load)

Table 3.6-9 (5 of 8)

Subsystem	Break Number	Break Type	Break Location	Protection of Essential Target	
9SD104	BT-SD-03	C	Figure 3.6-41 (1 of 1)	PW	PWR (HSD104-001W) required to protect RCP02A
				JI	SG2 (designed to withstand JI load)
				Blast	RCP #2A (designed to withstand blast load)
	BT-SD-04	C	Figure 3.6-41 (1 of 1)	PW	PWR (HSD104-002W) required to protect RCP02B
				JI	SG2 (designed to withstand JI load)
				Blast	RCP #2B (designed to withstand blast load)
9SD103	BT-SD-05	C	Figure 3.6-41 (1 of 1)	PW	PWR (HSD103-003W) required to protect containment liner and to restraint nozzle load due to PW
				JI	Containment Penetration(PC0911) (designed to withstand JI load)
				Blast	No essential target other than Containment Penetration(PC0911) (bounded by JI load)
9SD104	BT-SD-06	C	Figure 3.6-41 (1 of 1)	PW	PWR (HSD104-003W) required to protect containment liner and to restrain nozzle load due to PW
				JI	Containment Penetration(PC0912) (designed to withstand JI load)
				Blast	No essential target other than Containment Penetration(PC0921) (bounded by JI load)
9SD101	BT-SD-07	C	Figure 3.6-41 (1 of 1)	PW	Secondary shield wall (WCE21-01) (designed to withstand PW impact load)
				JI	Secondary shield wall (WCE21-01) (designed to withstand JI load)
				Blast	Secondary shield wall (WCE21-01) (designed to withstand blast load)
9SD102	BT-SD-08	C	Figure 3.6-41 (1 of 1)	PW	Secondary shield wall (WCE11-01) (designed to withstand PW impact load)
				JI	Secondary shield wall (WCE11-01) (designed to withstand JI load)
				Blast	Secondary shield wall (WCE11-01) (designed to withstand blast load)

Table 3.6-9 (6 of 8)

Subsystem	Break Number	Break Type	Break Location	Protection of Essential Target	
Main Steam System (Not applied for Leak-Before-Break): Terminal End Break					
9MS104 9MS272	BT-MS-01	C	Figure 3.6-42 (1 of 1)	PW	PWR (HMS104-001W) installed (to protect containment wall (liner plate))
				JI	Top of SG1 (designed to withstand JI load)
				Blast	SG1 (designed to withstand blast load)
	BT-MS-02	C	Figure 3.6-42 (1 of 1)	PW	PWR(HMS104-002W) installed (to protect feedwater pipe, SG1 nozzle)
				JI	Containment penetration (PC0611) (designed to withstand JI load)
				Blast	FW006 (impulse loading only) CS011,CS003 (out of graded approach scope)
9MS103 9MS271	BT-MS-03	C	Figure 3.6-42 (1 of 1)	PW	PWR(HMS103-001W) installed (to protect containment wall(liner plate))
				JI	Top of SG1 (designed to withstand JI load)
				Blast	SG1 designed to withstand blast load)
	BT-MS-04	C	Figure 3.6-42 (1 of 1)	PW	PWR(HMS103-002W) installed (to protect feedwater pipe, SG1 nozzle)
				JI	Containment penetration (PC612) (designed to withstand JI load)
				Blast	FW006 (impulse loading only) CS011,CS003 (out of graded approach scope)
9MS102 9MS270	BT-MS-05	C	Figure 3.6-42 (1 of 1)	PW	PWR (HMS102-001W) installed (to protect containment wall (liner plate))
				JI	Top of SG2 (designed to withstand JI load)
				Blast	SG2 (designed to withstand blast load)
	BT-MS-06	C	Figure 3.6-42 (1 of 1)	PW	PWR (HMS102-002W) installed (to protect feedwater pipe (FW045AB14), SG2 nozzle)
				JI	Containment penetration (PC622) (designed to withstand JI load)
				Blast	FW006 (impulse loading only) CS011,CS003 (out of graded approach scope)

Table 3.6-9 (7 of 8)

Subsystem	Break Number	Break Type	Break Location	Protection of Essential Target	
Main Steam System Not applicable Leak-Before-Break): Terminal End Break					
9MS101 9MS269	BT-MS-07	C	Figure 3.6-42 (1 of 1)	PW	PWR (HMS101-001W) installed (to protect containment wall (liner plate))
				JI	Top of SG2 (designed to withstand JI load)
				Blast	SG2 (designed to withstand blast load)
	BT-MS-08	C	Figure 3.6-42 (1 of 1)	PW	PWR (HMS101-002W) installed (to protect feedwater pipe, SG2 nozzle)
				JI	Containment penetration (PC621) (designed to withstand JI load)
				Blast	FW006 (impulse loading only) CS011,CS003 (out of graded approach scope)
Feedwater System (Not applied for Leak-Before-Break): Terminal End Break					
9FW101 9FW209	BT-FW-01	C	Figure 3.6-43 (1 of 1)	PW	PWR (HFW101-001W) installed (to minimize load to SG1 nozzle)
				JI	Containment penetration (PC0511) (designed to withstand JI load)
9FW102 9FW210	BT-FW-02	C	Figure 3.6-43 (1 of 1)	PW	PWR (HFW102-001W) installed to minimize load to SG2 nozzle
				JI	Containment penetration (PC0521) (designed to withstand JI load)
9FW101	BT-FW-03	C	Figure 3.6-43 (1 of 1)	PW	Secondary shield wall (WCE41-01) (designed to withstand PW impact load)
				JI	Secondary shield wall (WCE41-01), SG1 (designed to withstand JI load)
9FW101	BT-FW-04	C	Figure 3.6-43 (1 of 1)	PW	Secondary shield wall (WCE21-01) (designed to withstand PW impact load)
				JI	Secondary shield wall (WCE21-01), SG2 (designed to withstand JI load)
9FW101	BT-FW-05	C	Figure 3.6-43 (1 of 1)	PW	Secondary shield wall (WCE31-01) (designed to withstand PW impact load)
				JI	Secondary shield wall (WCE31-01), SG1 (designed to withstand JI load)

Table 3.6-9 (8 of 8)

Subsystem	Break Number	Break Type	Break Location	Protection of Essential Target	
9FW101	BT-FW-06	C	Figure 3.6-43 (1 of 1)	PW	PWR (HFW102-002W) installed to minimize load to pressurizer spray piping, RC007C4
				JI	Secondary shield wall (WCE11-01), SG2 (designed to withstand JI load)
9AF101 9FW219	BT-FW-07	C	Figure 3.6-43 (1 of 1)	PW	PWR (HAF101-001W) required to minimize load to SG1 nozzle
				JI	Containment penetration (PC0512), PWR (HAF101-001W) (designed to withstand JI load)
9AF102 9FW220	BT-FW-08	C	Figure 3.6-43 (1 of 1)	PW	PWR (HFW102-001W) installed (to minimize load to SG1 nozzle)
				JI	Containment penetration (PC0522), PWR (HAF102-001W) (designed to withstand JI load)
9AF101	BT-FW-09	C	Figure 3.6-43 (1 of 1)	PW	Secondary shield wall (WCE21-01) (designed to withstand PW load)
				JI	Secondary shield wall (WCE21-01), SG1 (designed to withstand JI load)
9AF102	BT-FW-10	C	Figure 3.6-43 (1 of 1)	PW	Secondary shield wall (WCE11-01) (designed to withstand PW load)
				JI	Secondary shield wall SG2 (WCE11-01) (designed to withstand JI load)
9FW601	BT-FW-11	C	Figure 3.6-43 (1 of 1)	PW	Steel structure(3CS502) (designed to withstand PW load)
				JI	No essential target
9FW627	BT-FW-12	C	Figure 3.6-43 (1 of 1)	PW	No essential target
				JI	No essential target
9FW602	BT-FW-13	C	Figure 3.6-43 (1 of 1)	PW	No essential target
				JI	No essential target
9FW628	BT-FW-14	C	Figure 3.6-43 (1 of 1)	PW	Steel structure (3CS501) (designed to withstand PW load)
				JI	No essential target

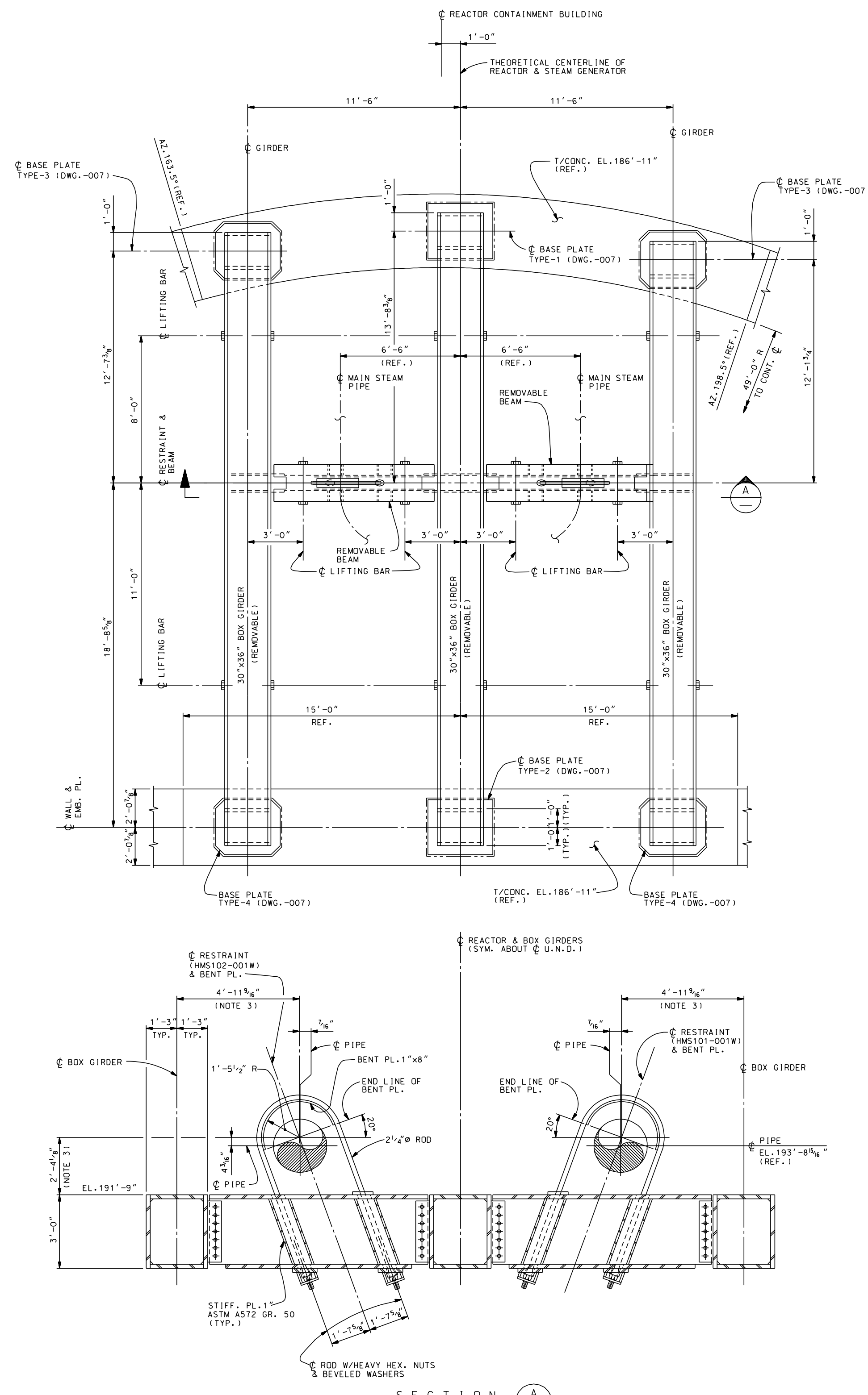


Figure 3.6-1   Typical Pipe Whip Restraint Configuration

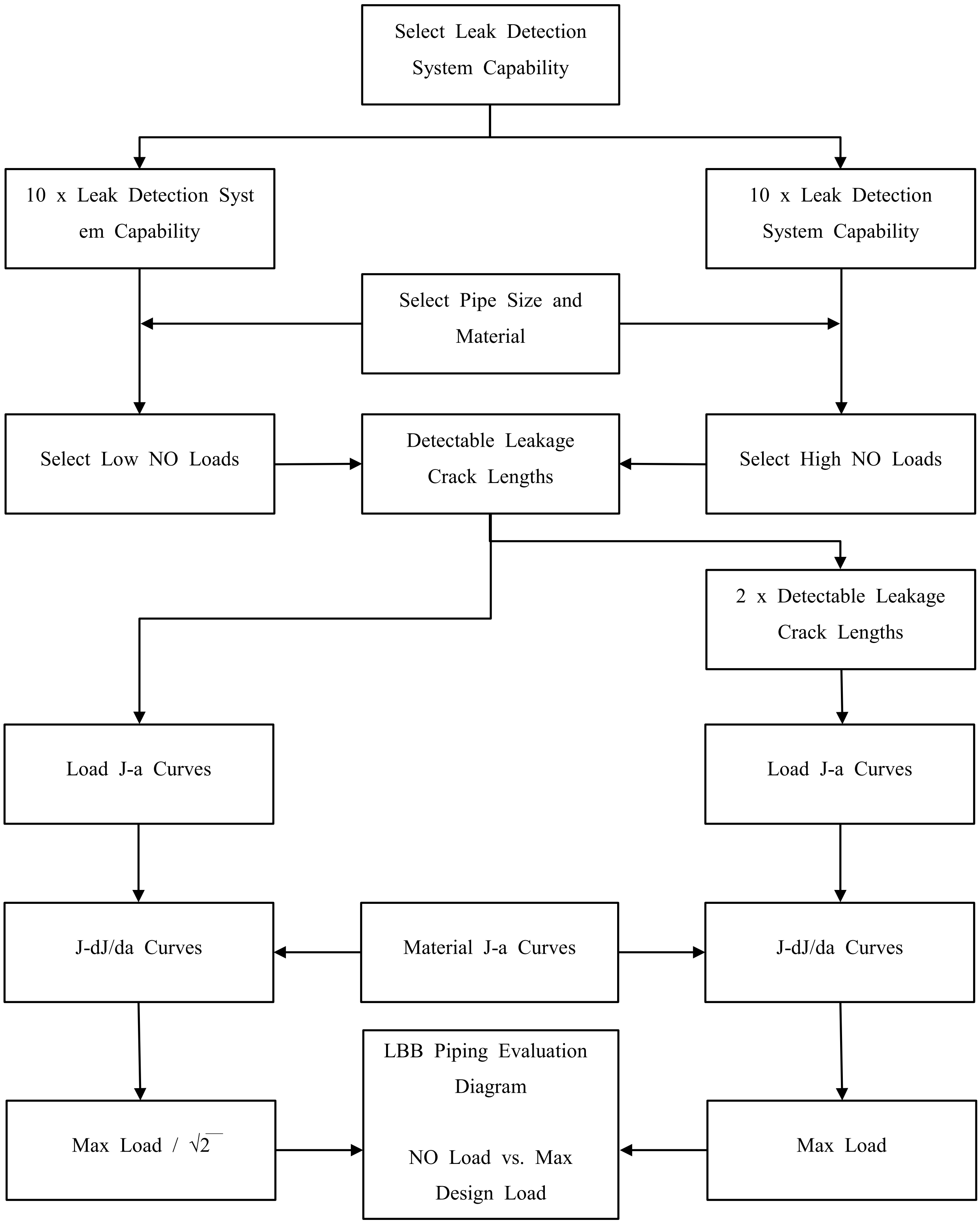


Figure 3.6-2 LBB Design Criteria Development Diagram

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-3 Stress-Strain Curve for Hot Leg and Cold Leg for Leakage Crack Length Calculation

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-4 Stress-Strain Curve for Surge Line for Leakage Crack Length Calculation

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-5 Stress-Strain Curve for DVI (Group 1) for Leakage Crack Length Calculation

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-6 Stress-Strain Curve for DVI/SC (Group 2&3) for Leakage Crack Length Calculation

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-7 Stress-Strain Curve for Hot Leg and Cold Leg for Crack Stability Analysis

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-8 Stress-Strain Curve for Surge Line for Crack Stability Analysis

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-9 Stress-Strain Curve for DVI (Group 1)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-10 Stress-Strain Curve for DVI/SC (Group 2&3)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-11 J-R Curve for Hot Leg and Cold Leg

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-12 J-R Curve for Surge Line

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-13   J-R Curve for DVI (Group 1)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-14   J-R Curve for DVI/SC (Group 2&3)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-15 Moment vs. Crack Length for Surge Line (Hot leg nozzle/Pipe Interface)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-16 Moment vs. Crack Length for Surge Line (Intermediate Pipe)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-17 Moment vs. Crack Length for Surge Line (Pressurizer nozzle/Pipe Interface)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-18   Moment vs. Crack Length for Cold Leg

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-19 Moment vs. Crack Length for Hot Leg

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-20   Moment vs. Crack Length for DVI (Group 1)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-21 Moment vs. Crack Length for DVI (Group 2)

Security-Related Information – Withhold Under 10 CFR 2.390

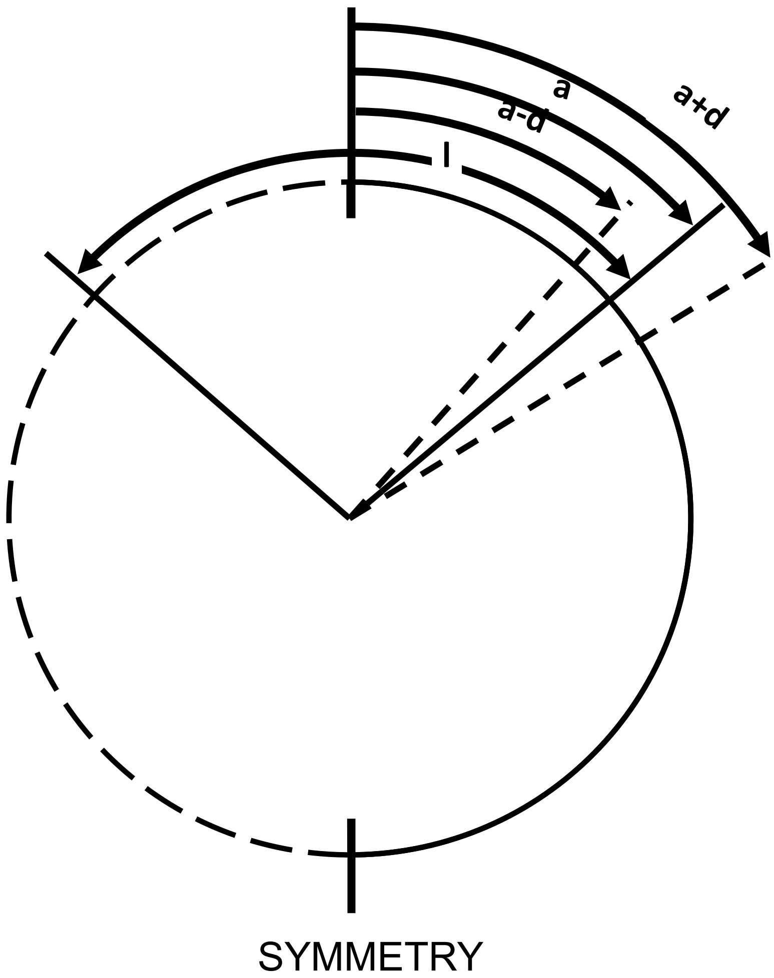
Figure 3.6-22 Moment vs. Crack Length for SC (Group 3)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-23   Overall Finite Element Model

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-24 Crack Area Close-up of Finite Element Model



l = Leakage crack length

a = Model crack length

a ± d = Model crack length ± a small amount

Figure 3.6-25 Different Crack Length Used to Calculate Derivative

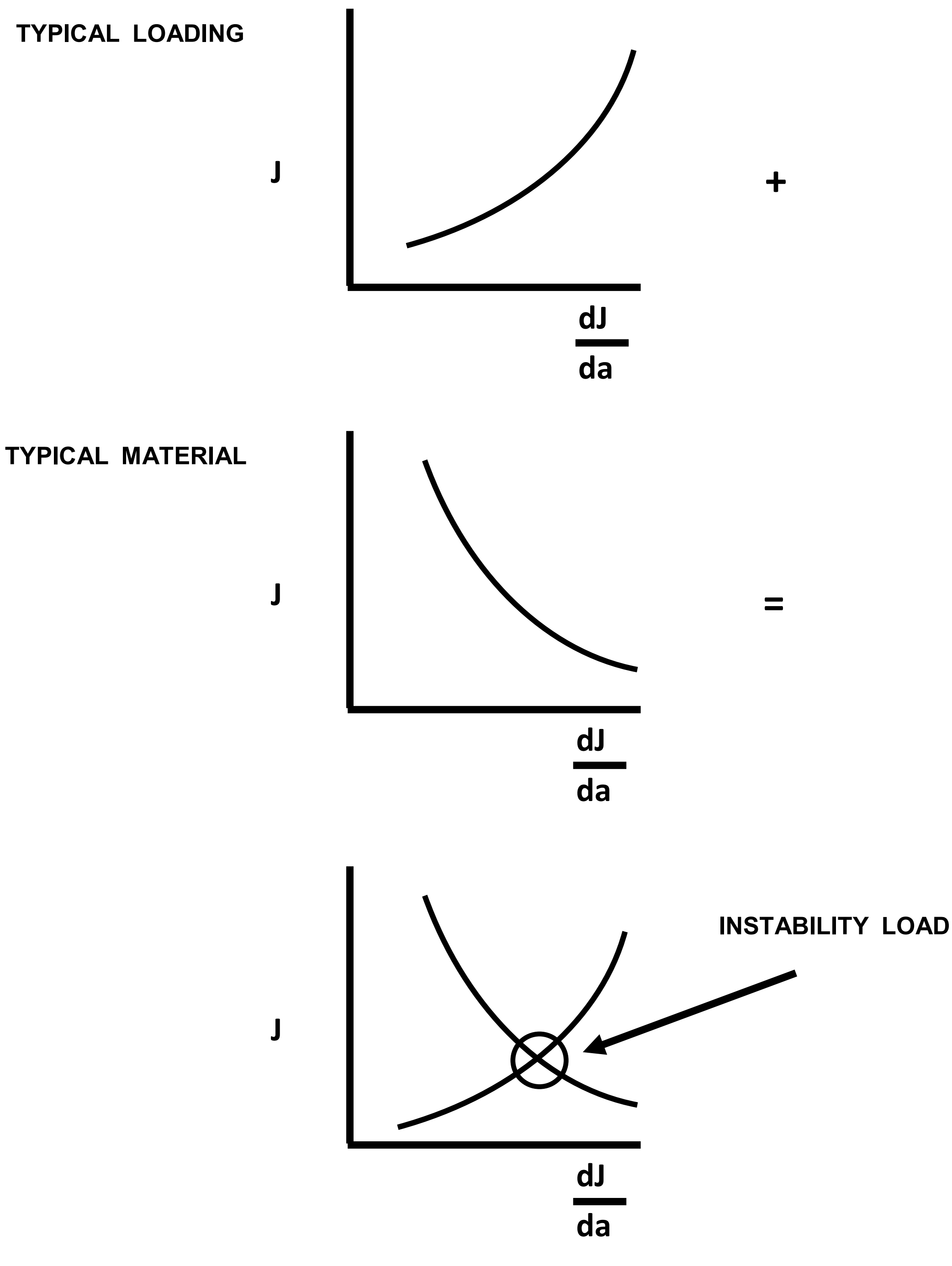


Figure 3.6-26 Development of a Stability Evaluation Diagram

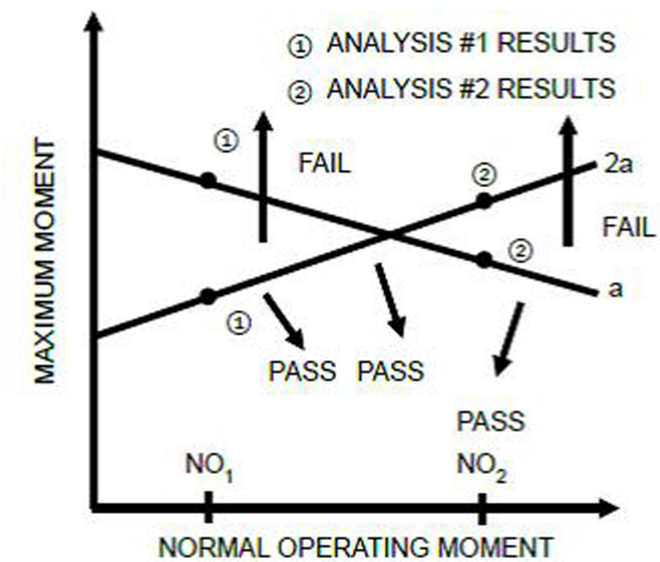
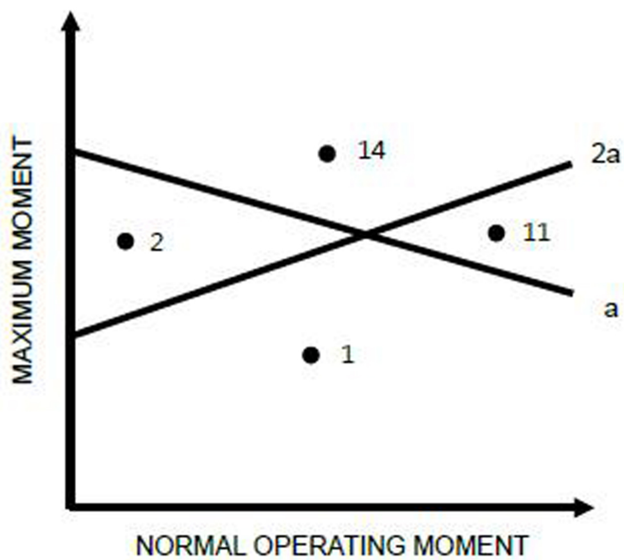


Figure 3.6-27 LBB Piping Evaluation Diagram



- ✓ Point 1 passes LBB on ‘a’ and ‘2a’
- ✓ Point 2 fails maximum moment on ‘2a’
- ✓ Point 11 fails $\sqrt{2}$ (maximum moment) on ‘a’
- ✓ Point 14 fails $\sqrt{2}$ (maximum moment) on ‘a’ and maximum moment on ‘2a’

Figure 3.6-28 Use of the LBB Piping Evaluation Diagram

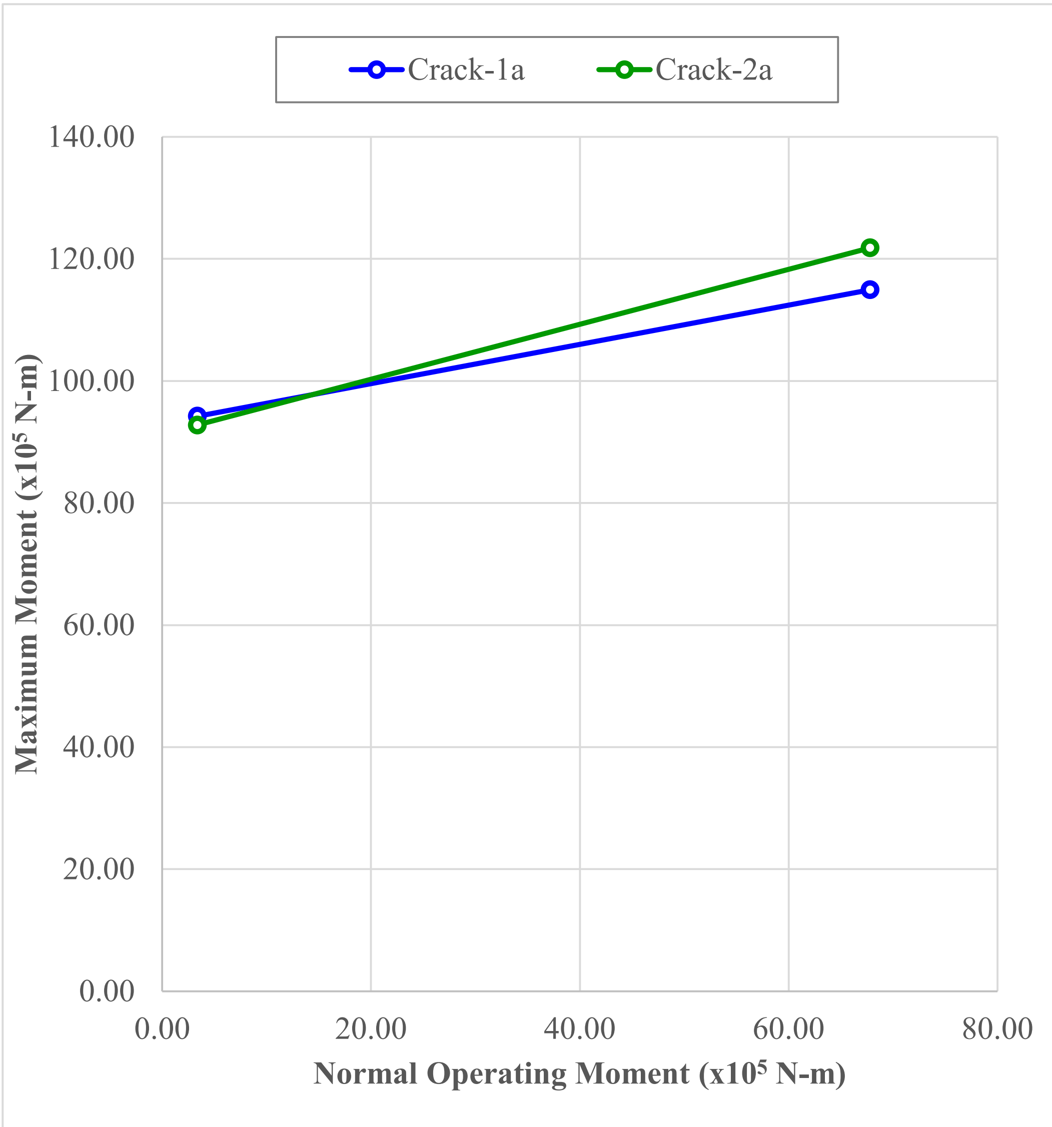


Figure 3.6-29 LBB Piping Evaluation Diagram (Hot Leg)

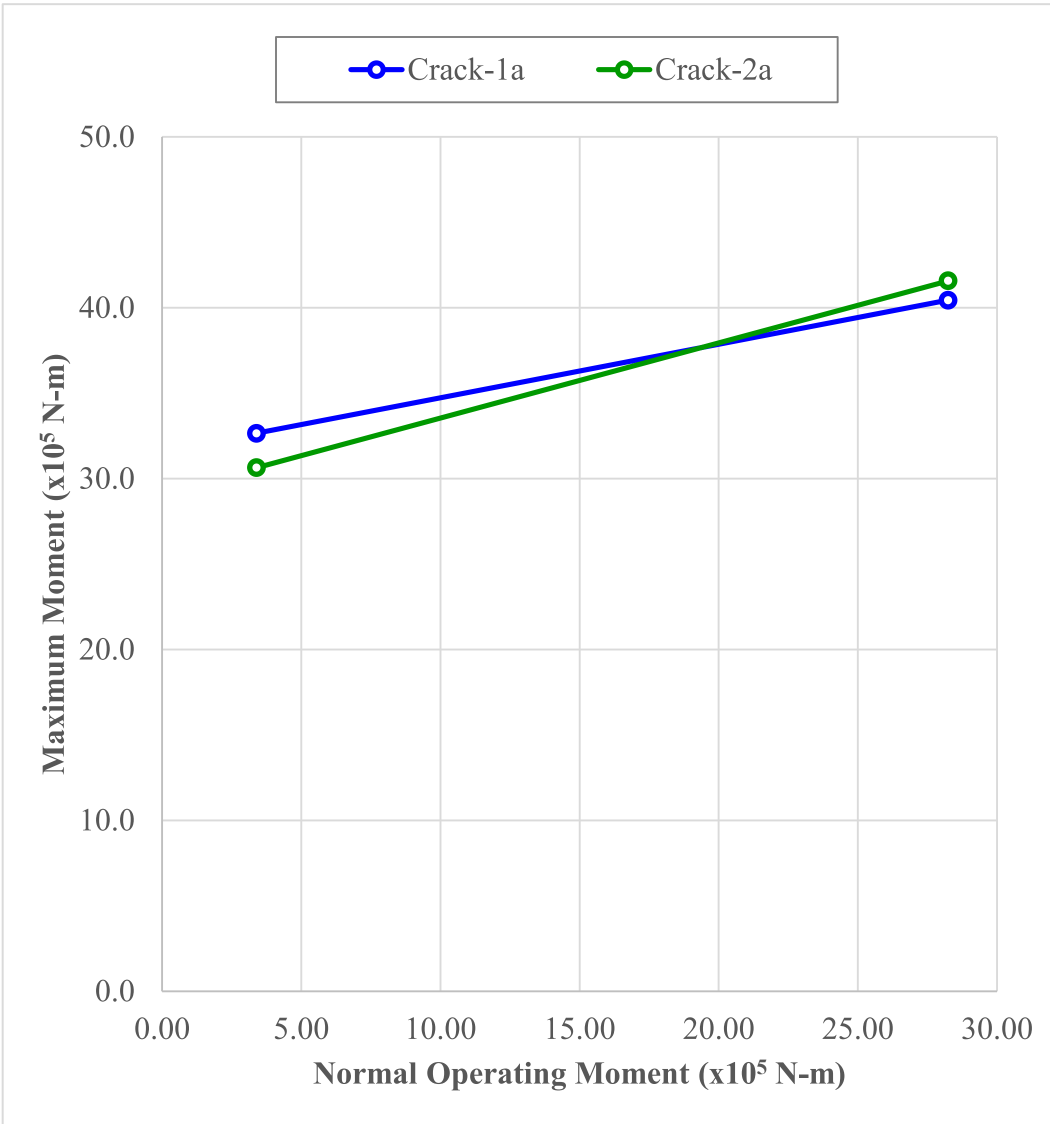


Figure 3.6-30 LBB Piping Evaluation Diagram (Cold Leg)

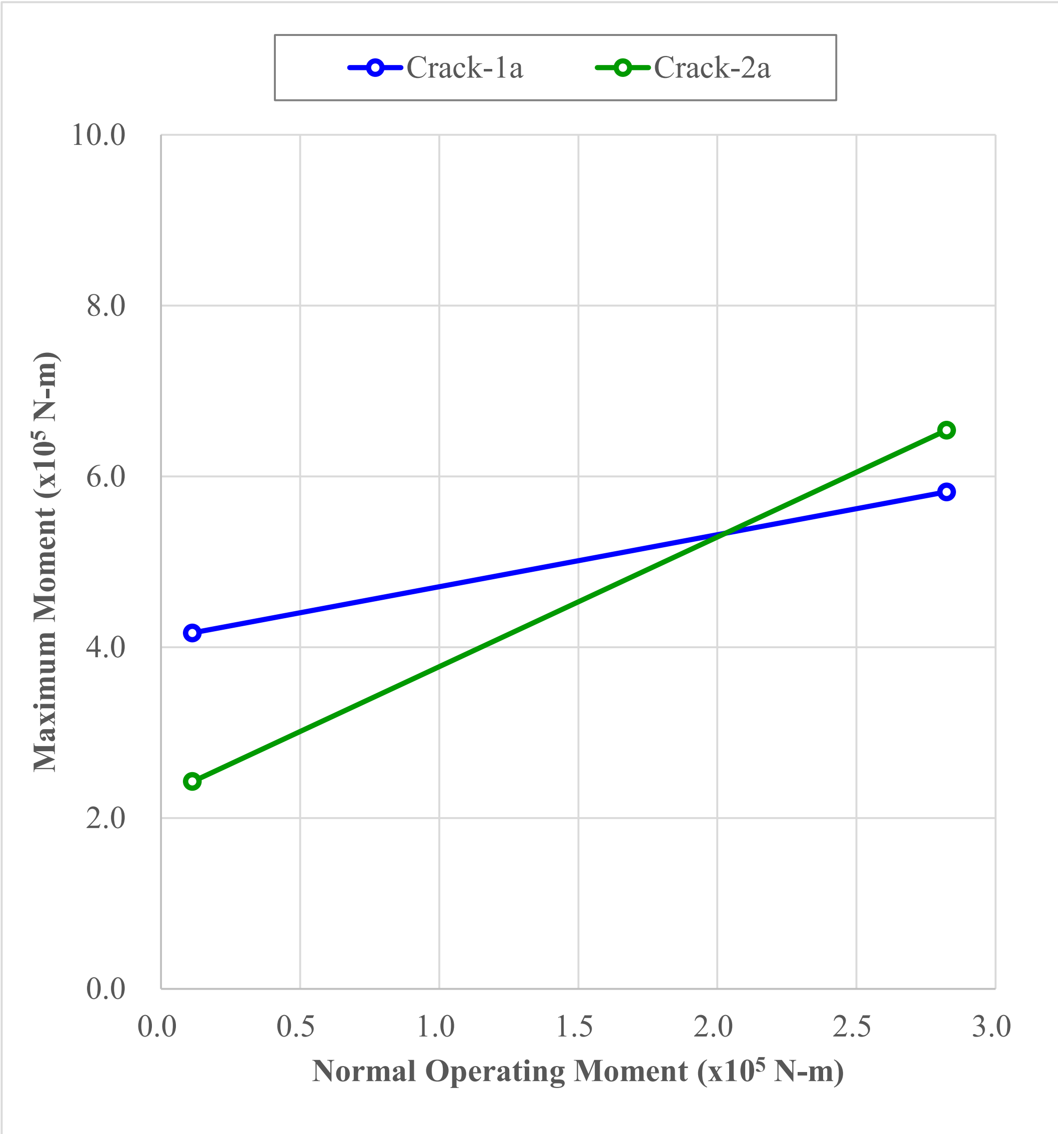


Figure 3.6-31 LBB Piping Evaluation Diagram (Surge Line-Hot leg nozzle/Pipe Interface)

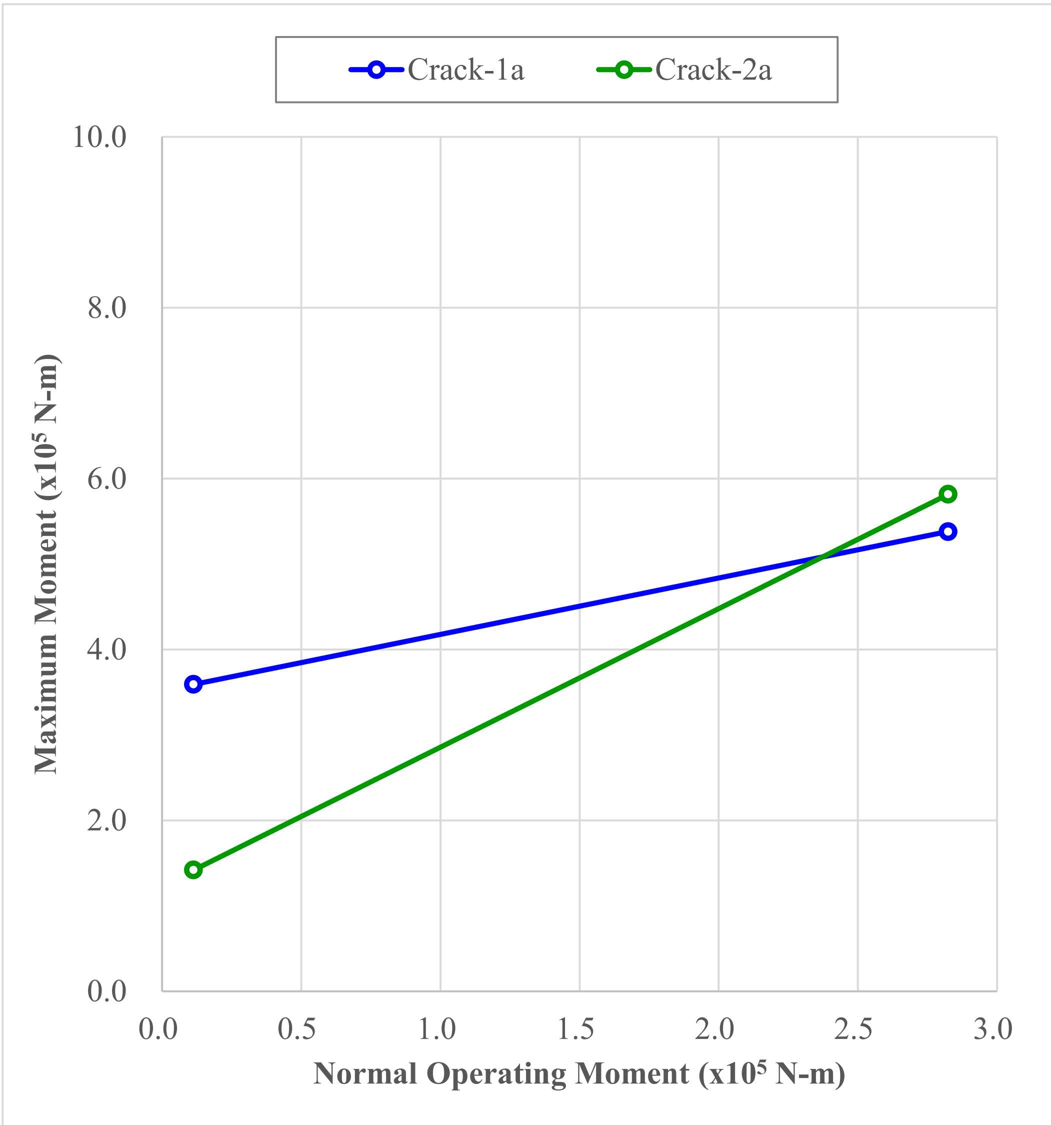


Figure 3.6-32 LBB Piping Evaluation Diagram (Surge Line-Intermediate Pipe)

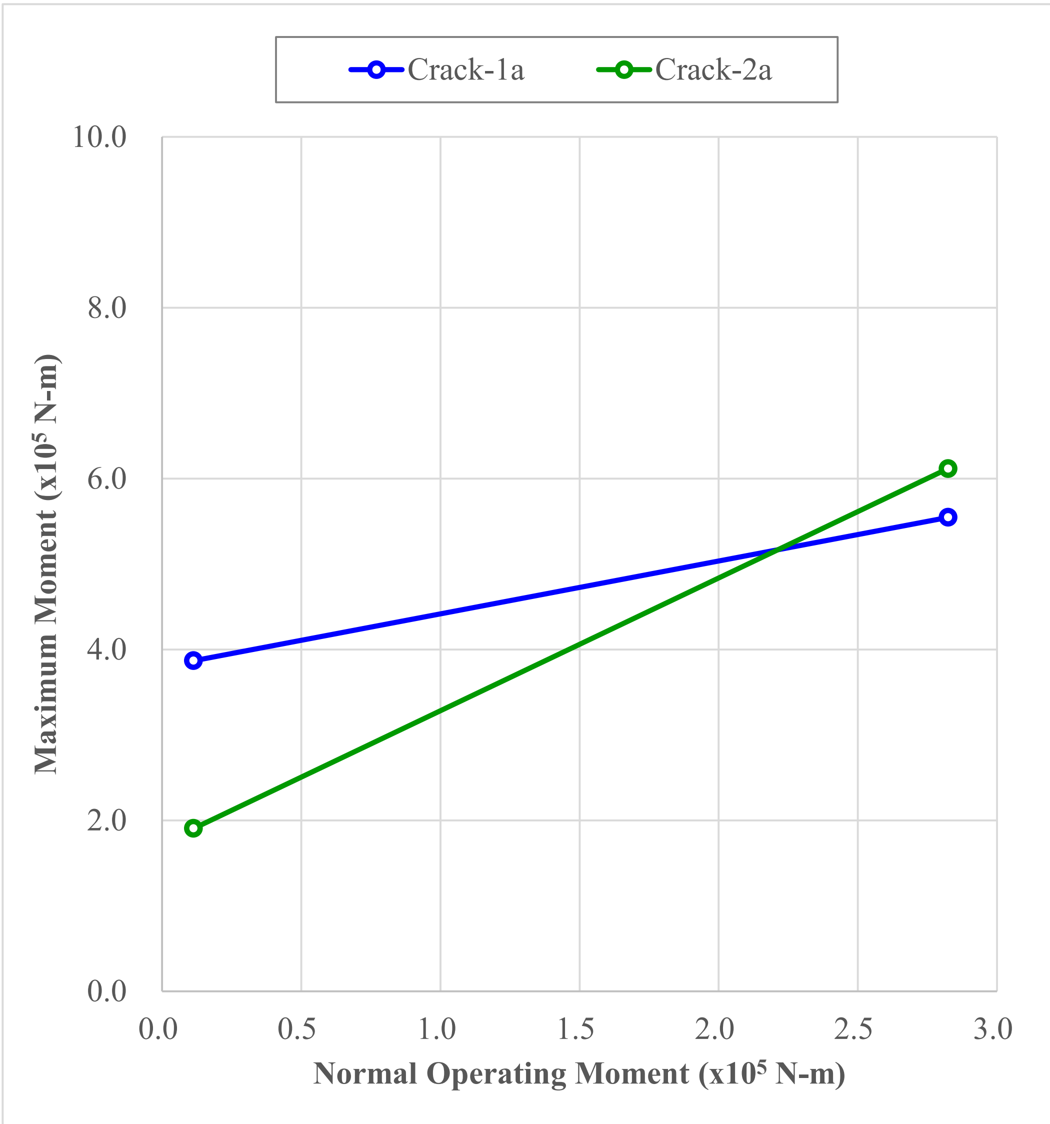


Figure 3.6-33 LBB Piping Evaluation Diagram (Surge Line-Pressurizer nozzle/Pipe Interface)

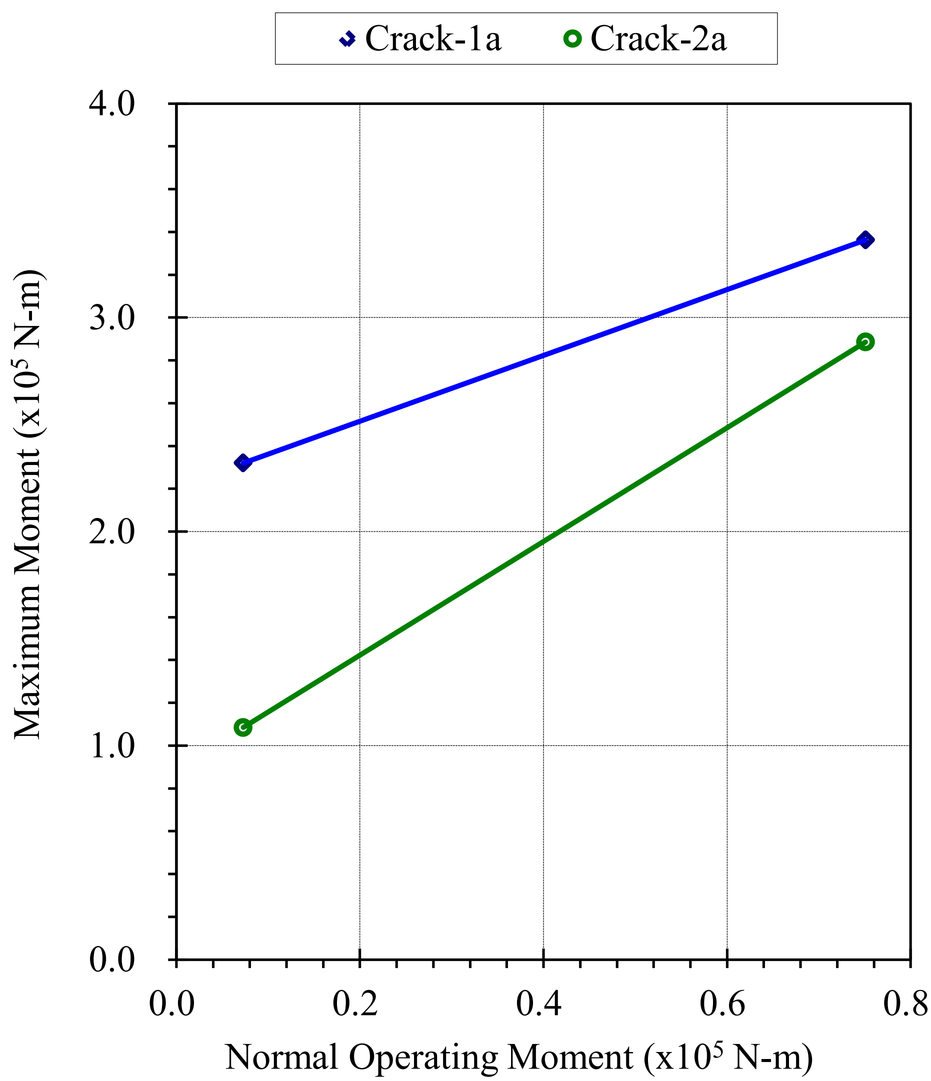


Figure 3.6-34 LBB Piping Evaluation Diagram (DVI Group 1)

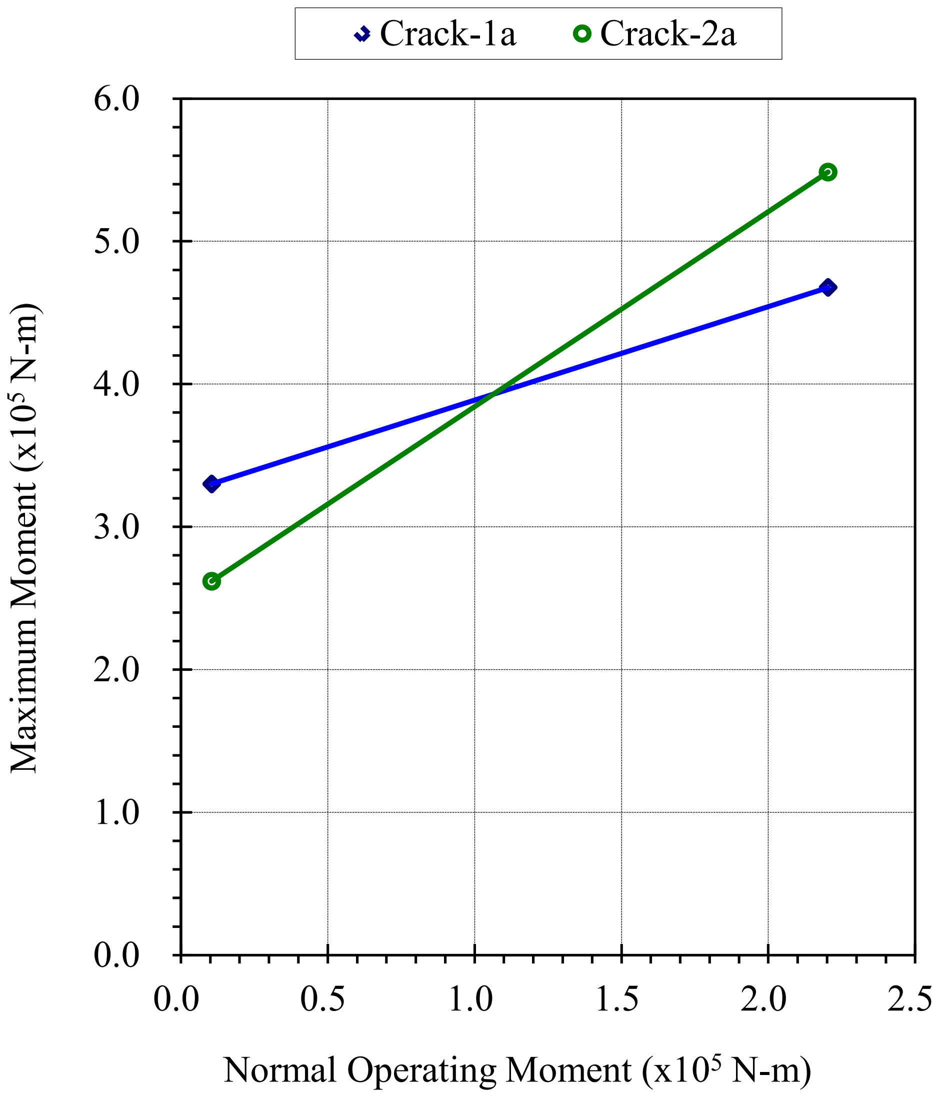


Figure 3.6-35 LBB Piping Evaluation Diagram (DVI Group 2)

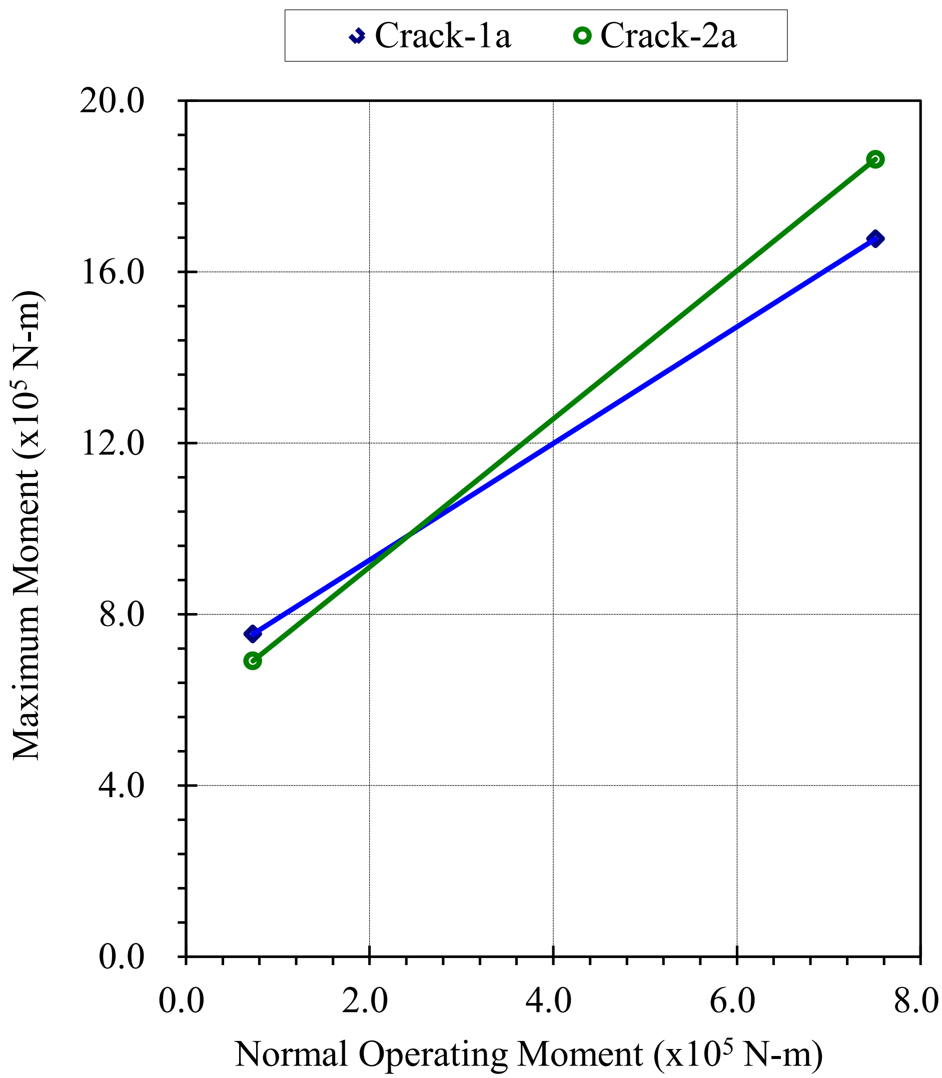


Figure 3.6-36 LBB Piping Evaluation Diagram (SC Group 3)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-37 High-Energy Piping Portion and Break Location for Reactor Coolant System (1 of 2)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-37 High-Energy Piping Portion and Break Location for Reactor Coolant System (2 of 2)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-38 High-Energy Piping Portion and Break Location for Reactor Coolant Gas Vent System

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-39 High-Energy Piping Portion and Break Location for Safety Injection and Shutdown Cooling System (1 of 2)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-39 High-Energy Piping Portion and Break Location for Safety Injection and Shutdown Cooling System (2 of 2)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-40 High-Energy Piping Portion and Break Location for Chemical and Volume Control System (1 of 2)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-40 High-Energy Piping Portion and Break Location for Chemical and Volume Control System (2 of 2)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-41 High-Energy Piping Portion and Break Location for Steam Generator Blowdown System

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-42 High-Energy Piping Portion and Break Location for Main Steam System

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-43 High-Energy Piping Portion and Break Location for Feedwater System

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.6-44   High-Energy Piping Portion and Break Location for Auxiliary Feedwater System

3.7 Seismic Design

The APR1400 structures, systems, and components (SSCs) important to safety are designed to withstand the effects of earthquakes without loss of capability to perform their safety functions, as required by 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 2 (Reference 1).

The APR1400 SSCs are classified in one of the following three seismic categories:

a. Seismic Category I

b. Seismic Category II

c. Seismic Category III (non-seismic)

Seismic Category I SSCs are designed to withstand the effects of the earthquake event and to maintain their specified design functions. Seismic Category II SSCs do not perform safety-related functions, but structural failure or interaction could degrade the function of a seismic Category I SSC to an unacceptable safety level. Seismic Category III SSCs do not perform safety-related functions, and structural failure or interaction could not degrade the function of a seismic Category I SSC to an unacceptable safety level.

3.7.1 Seismic Design Parameters

This subsection describes seismic design parameters such as design ground motions and damping values that are used in the design of the SSCs important to safety and classified as seismic Category I in Section 3.2.

The APR1400 seismic Category I SSCs are designed for the safe shutdown earthquake (SSE). The SSE is defined as the maximum potential vibratory ground motion at the generic plant site. Since the operating basis earthquake (OBE) is defined as one third the SSE, an explicit analysis or design of the APR1400 seismic Category I SSCs based on OBE is not required in accordance with Appendix S of 10 CFR Part 50 (Reference 2).

3.7.1.1 Design Ground Motion

The design response spectra of the site-independent SSE are now referred to as the certified seismic design response spectra (CSDRS). The CSDRS and design time histories compatible with CSDRS are described in the following subsections.

3.7.1.1.1 Design Ground Motion Response Spectra

The peak ground acceleration (PGA) of the CSDRS has been established as 0.3g for the APR1400 design for both the horizontal and vertical directions.

The horizontal and vertical CSDRS for the APR1400 are based on the NRC Regulatory Guide (RG) 1.60 (Reference 3) response spectra, enriched in the high frequency range in the following manner.

a. The spectral amplitudes of the horizontal and vertical response spectra at control frequencies 9 Hz and below are equal to those of the NRC RG 1.60 response spectra.

b. The control frequency at which the PGA is reached is changed from 33 Hz to 50 Hz for both the horizontal and vertical spectra.

c. A control frequency at 25 Hz is added. The spectral amplitudes at 25 Hz are set to the NRC RG 1.60 response spectra at 25 Hz scaled by a factor of 1.30 for both the horizontal and vertical spectra.

d. Linearly vary the modified spectra, on a log-log-scale, between the control frequencies 9 Hz, 25 Hz, and 50 Hz.

The CSDRS at damping values of 3 and 4 percent are developed from the CSDRS at damping values of 2 and 5 percent by linear interpolation using ASCE 4, Section 2.2.1, Equation 2.2-1.

The digitized values of the resulting APR1400 horizontal and vertical CSDRS for 2, 3, 4, 5, 7, and 10 percent damping values are provided in Table 3.7-1. The APR1400 horizontal and vertical CSDRS are presented in Figures 3.7-1 and 3.7-2, respectively.

The CSDRS are applied at the finished grade in the free-field as an additional requirement from 10 CFR Part 50, Appendix S. Figures 3.7A-9 (1 of 3 and 2 of 3), 3.7A-10 (1 of 3 and 2 of 3), and 3.7A-11 (1 of 3 and 2 of 3) in Appendix 3.7A show that the horizontal components of CSDRS in the free-field at the foundation level of the APR1400 standard plant seismic Category I structures satisfy the PGA of at least 0.1g. The vertical component of CSDRS in the free-field at the foundation level of the APR1400 standard plant seismic Category I structures is presented in Figures 3.7A-9 (3 of 3), 3.7A-10 (3 of 3), and 3.7A-11 (3 of 3) in Appendix 3.7A. The site response motions in Figure 3.7A-9 through 3.7A-11 correspond to outcrop motion in the free-field.

The site-specific seismic design can be developed for other seismic Category I and II SSCs, which are not included in the APR1400 standard plant design, at the combined license (COL) stage using the site-specific SSE derived from the ground motion response spectra (GMRS) in accordance with NRC RG 1.208 (Reference 4).

3.7.1.1.2 Design Ground Motion Time History

The three design acceleration time histories composed of two horizontal (H1 and H2) and one vertical components (VT), which envelop the CSDRS, are applied in both soil-structure interaction analyses and fixed-base analyses of seismic Category I structures. The initial seed motions that were modified to create the design time histories are actual seed-recorded Northridge earthquake time histories.

The design time histories are generated with an increment of time size of 0.005 second to provide a Nyquist frequency of 100 Hz. Figures 3.7-3, 3.7-4, and 3.7-5 show the acceleration, velocity, and displacement time histories for H1, H2, and VT components for each time step, respectively. The design time histories, H1, H2, and VT, are applied in the east-west (E-W) direction, north-south (N-S) direction, and vertical direction, respectively. The absolute values of correlation coefficients for each pair of the design time histories are as follows:

Correlation coefficient for H1 and H2 = 0.032

Correlation coefficient for H1 and VT = 0.079

Correlation coefficient for H2 and VT = 0.029

The design time histories are statistically independent because the correlation coefficients between the design time histories are less than 0.16 as specified in Standard Review Plan (SRP) 3.7.1 (Reference 5). Therefore, the representative maximum response of interest of the APR1400 SSCs can be obtained either by performing separate analyses for each of the three components of design time histories or by performing a single analysis with all three components of design time histories applied simultaneously.

The design time histories have a total time duration equal to 20.48 seconds and a corresponding stationary phase, which is the strong-motion duration defined as the time required for the Arias Intensity rise from 5 percent to 75 percent in more than 6 seconds.

The design time histories are developed following the spectrum matching acceptance criteria of Option 1, Approach 1, in Section II of SRP 3.7.1. The comparison plots of the response spectra of the design time histories versus the design response spectra for 2, 3, 4, 5, 7, and 10 percent critical damping are shown in Figures 3.7-6, 3.7-7, and 3.7-8. The figures demonstrate that the design time histories envelop the design response spectra for those damping values, satisfying the requirement of SRP 3.7.1 that no more than 5 points fall below and by no more than 10 percent below the design response spectra. The response spectra are computed at the frequency intervals given in Table 3.7.1-1 of SRP 3.7.1.

In SRP 3.7.1, the requirement of minimum power spectral density (PSD) to prevent the design ground acceleration time histories from having a deficiency of power over any frequency range is described. SRP 3.7.1 specifies that the use of a single time history is justified by satisfying a target PSD requirement in addition to the design response spectra enveloping requirements.

Since the original NRC RG 1.60 horizontal spectrum and the horizontal CSDRS are identical for frequencies less than 9 Hz, no modification to the target horizontal PSD is done in this frequency range. This approach is closely matched as compared to the target PSD function developed by using the method described in NUREG/CR-5347 for the frequency range below 9 Hz.

The time-history simulation method described in NUREG/CR-5347 (Reference 8) is used to develop the CSDRS-compatible horizontal target PSD in the higher frequency range above 9 Hz. The time-history PSDs for the 30 time histories of the CSDRS compatible time-history ensembles are calculated and their ensemble-averaged PSDs are computed. After smoothing of the ensemble-averaged PSDs calculated in accordance with NUREG/CR-5347, the target PSDs compatible with the CSDRS are obtained. The smoothed ensemble-mean PSDs obtained from the PSDs of the 30 time history ensembles are segmentally smoothed using piecewise log-log linear. The detailed procedure for generating target PSD is described in Technical Report, APR1400-E-S-NR-14001-P. The resulting piecewise log-log linear horizontal target PSD developed is given in Table 3.7-3. The minimum required horizontal PSD is then 0.8 times the horizontal target PSD.

The vertical target PSD, compatible with the vertical CSDRS, is obtained from the horizontal target PSD, compatible with the horizontal CSDRS using the following equation:

$$S_V(f) = [\, R_V(f, 2\,\%) / R_H(f, 2\,\%)]^2 \times S_H(f)$$

where $R_H(f, 2\,\%)$ and $R_V(f, 2\,\%)$ are, respectively, the 2 percent damped horizontal and vertical CSDRS values at the frequency (f). The detailed procedure for generating target PSD is described in Technical Report, APR1400-E-S-NR-14001-P (Reference 9). The minimum required vertical PSD is then 0.8 times the vertical target PSD.

The PSDs of the design acceleration time histories are presented in Figures 3.7-9 through 3.7-11. The PSDs of the design acceleration time histories exceed the minimum required PSD throughout the entire frequency range. The PSDs presented are the averaged PSDs obtained over a moving frequent band of ± 20 percent centered at each frequency. The PSD amplitude at frequency (f) has the averaged PSD amplitude between the frequency range of 0.8f and 1.2f as stated in Appendix A of SRP 3.7.1.

The PSDs of the design acceleration time histories in accordance with SRP 3.7.1, Appendix B are computed to further demonstrate satisfying the PSD requirement. As shown in Figure 3.7-9 (b) through 3.7-11 (b), the PSDs are reasonable compared with the PSDs consistent with SRP 3.7.1, Appendix B.

3.7.1.1.3 Hard Rock High Frequency Seismic Input Motions

GMRS for some Central and Eastern United States rock sites show higher amplitude at high frequency than the CSDRS. The GMRS for such a site are called hard rock high frequency (HRHF) seismic input motions. The hard rock is defined as having the low-strain shear wave velocity greater than 2,084 m/sec (9,200 ft/sec) as described in Subsection 2.5.2.6. The PGA of the HRHF target response spectra are prescribed as 0.46g for the evaluation of the APR1400 standard plant design for both the horizontal and vertical directions. The HRHF horizontal and vertical target response spectra are shown in Figures 3.7-12 and 3.7-13, respectively. These HRHF response spectra exceed the CSDRS for frequencies higher than approximately 10 Hz.

The three acceleration time histories composed of two horizontal (H1H and H2H) and one vertical components (VTH), which envelop the HRHF response spectra, are generated. The time histories, H1H, H2H, and VTH are applied in the E-W direction, N-S direction, and vertical direction, respectively. The initial seed motions that were modified to create the time histories compatible with HRHF response spectra are actual seed-recorded Nahanni earthquake time histories.

The time histories are generated with an increment of time size of 0.005 second. Figures 3.7-14, 3.7-15, and 3.7-16 show the acceleration, velocity, and displacement time histories for H1H, H2H, and VTH components for each time step, respectively. The absolute values of correlation coefficients for each pair of the time histories are as follows:

Correlation coefficient for H1H and H2H = 0.028

Correlation coefficient for H1H and VTH = 0.031

Correlation coefficient for H2H and VTH = 0.036

The time histories are statistically independent because the correlation coefficients between the design time histories are less than 0.16. The time histories have a total time duration equal to 20.48 seconds and a corresponding stationary phase, which is the strong-motion duration defined as the time required for the Arias Intensity rise from 5 percent to 75 percent in more than 6 seconds.

The time histories are developed following the spectrum matching acceptance criteria of Option 1, Approach 1, in Section II of SRP 3.7.1. The comparison plots of the response spectra of the time histories versus the HRHF response spectra for 2, 3, 4, 5, 7, and 10 percent critical dampings are shown in Figures 3.7-17, 3.7-18, and 3.7-19. The figures demonstrate that the time histories envelop the HRHF response spectra for those damping values, satisfying the requirement of SRP 3.7.1 that no more than 5 points fall below and by no more than 10 percent below the HRHF response spectra.

The PSDs of the acceleration time histories compatible with the HRHF response spectra in accordance with SRP 3.7.1, Appendix B are computed to further demonstrate satisfying the PSD requirement. As shown in Figure 3.7-20 (b) through 3.7-22(b), the PSDs are reasonable compared with the PSDs consistent with SRP 3.7.1, Appendix B.

For the development of the HRHF-response spectra-compatible target PSDs in the frequency range from 0.3 to 100 Hz, the time-history simulation method described in NUREG/CR-5347 is used. The resulting piecewise log-log linear horizontal and vertical target PSD developed is given in Tables 3.7-5 and 3.7-6. The minimum required horizontal and vertical PSD is then 0.8 times the horizontal and vertical target PSD.

The PSDs of the acceleration time histories compatible with the HRHF response spectra are presented in Figures 3.7-20 through 3.7-22. The PSDs of the acceleration time histories exceed the minimum required PSD throughout the entire frequency range.

The evaluation methodology and results of the APR1400 for the HRHF seismic input motions are provided in Appendix 3.7B.

3.7.1.2 Percentage of Critical Damping Values

Damping values used for various nuclear safety-related SSCs are based on NRC RG 1.61 (Reference 10). These values are expressed in percentages of critical damping and are given in Table 3.7-7. Damping values of soil to be used in soil-structure interaction analysis are provided in Tables 3.7A-1 through 3.7A-8.

3.7.1.3 Supporting Media for Seismic Category I Structures

Seismic Category I structures are founded directly on rock or competent soil. The nuclear island and emergency diesel generator building correspond to the seismic Category I structures of the APR1400 standard plant design. The nuclear island consists of the following seismic Category I structures, the reactor containment building and the auxiliary building, which are founded on a common basemat. The emergency diesel generator building and a diesel fuel oil storage tank room are also seismic Category I structures. The foundation embedment depth, foundation size, and total height of the seismic Category I structures are presented in Table 3.7-8.

For the design of seismic Category I structures, eight soil profiles and one fixed-base condition are established with various shear wave velocities compared with soil depth.

The supporting media for the generic site are described in Appendix 3.7A about soil properties, layering characteristics, shear wave velocity, shear modulus, and density. The site-specific soil degradation models can be determined from dynamic laboratory testing of the site materials or from the published literature. The COL applicant is to demonstrate the applicability of soil degradation models used in site-specific site response analysis for the site conditions (COL 3.7(1)). The COL applicant is to compare the site-specific strain-compatible soil properties with generic soil properties in order to confirm that the site meets the generic soil profile used in the standard design (COL 3.7(2)).

These eight profiles are considered representative to envelop sites where competent soil is defined by the shear wave velocity of the supporting medium at the foundation level exceeding 304.8 m/sec (1,000 ft/sec). The shear wave velocity profiles of the eight sites considered are shown in Figure 3.7-23. The eight soil profiles, S1 through S4 and S6 through S9, are developed as combinations of six soil layering categories, which are designated as 55, 100, 200, 500, 1,000 ft, and half-space, and five shear-wave-velocity categories, namely, 1,200, 2,000, 4,000, 6,000, and 9,200 ft/sec. The generic site soil profiles are described further in Technical Report, APR1400-E-S-NR-14001-P (Reference 9).

To generate more conservative seismic responses, the extreme groundwater level (El. 98 ft 8 in.) in Subsection 3.8A.1.4.2.3.2 is considered in the seismic analyses of the seismic Category I structures, rather than the design groundwater level (El. 96 ft 8 in.) in Subsection 3.8.4.3.1.

3.7.2 Seismic System Analysis

This subsection describes the seismic analysis methods and models for the seismic Category I structures of the APR1400 standard plant design such as the reactor containment building, auxiliary building and emergency diesel generator building. The three-dimensional finite element models (FEMs) having an adequate number of discrete mass degrees of freedom are developed to capture the global and local translational, rocking, and torsional responses of the structures.

The COL applicant is to provide the seismic design of seismic Category I SSCs and seismic Category II structures that are not part of the APR1400 standard plant design. The seismic Category I and II structures are as follows (COL 3.7(3)) :

a. Seismic Category I essential service water building

b. Seismic Category I component cooling water heat exchanger building

c. Seismic Category II turbine generator building

d. Seismic Category II compound building

e. Seismic Category II alternate alternating current gas turbine generator building

3.7.2.1 Seismic Analysis Methods

Seismic Category I SSCs are identified in Section 3.2. The safety-related structures are modeled as three-dimensional FEMs for the seismic analysis. Table 3.7-9 summarizes the types of models, computer programs, and analysis methods that are used in the seismic analyses of the seismic Category I structures, as well as the purposes of the dynamic analyses. Figures 3.7-24, 3.7-25, 3.7-26, and 3.7-27 show FEMs of the safety-related structures for the reactor containment building containment structure, reactor containment building internal structure, auxiliary building, and emergency diesel generator building.

Further details of dynamic modeling of building structures for seismic analysis are described in Subsection 3.7.2.3. The structural model is analyzed with a separate consideration of the excitation in each of the three orthogonal directions, E-W, N-S, and vertical. The results are then combined as described in Subsection 3.7.2.6. The seismic analysis of the above structures is performed by one of the following methods described below.

3.7.2.1.1 Response Spectrum Analysis

The response of a multi-degree-of-freedom system subjected to seismic excitation is represented by the following equation of motion:

$$[M]\left\{\{\ddot{X}\} + \{\ddot{U}_g\}\right\} + [C]\{\dot{X}\} + [K]\{X\} = 0$$

Where:

$[M]$	=	mass matrix $(n \times n)$
$[C]$	=	damping matrix $(n \times n)$
$[K]$	=	stiffness matrix $(n \times n)$
$\{X\}$	=	column vector of relative displacements $(n \times 1)$
$\{\dot{X}\}$	=	column vector of relative velocities $(n \times 1)$
$\{\ddot{X}\}$	=	column vector of relative accelerations $(n \times 1)$
n	=	number of dynamic degrees of freedom

$\{\ddot{U}_g\}$ = column vector of ground accelerations (n × 1)

In the response spectrum analysis, the equations of motion are decoupled using the transformation:

$$\{X\}=\{\varphi\}\ \{Y\}$$

Where:

$\{\varphi\}$ = mode shape matrix

$\{Y\}$ = vector of normal or generalized coordinates (m × 1)

m = number of modes considered

The decoupled equation of motion for each mode is transformed to a single degree of freedom system:

$$\ddot{Y}_j + 2\lambda_j\omega_j\dot{Y}_j + \omega_j^2 Y_j = -\Gamma_j\ddot{U}_g$$

Where:

Yj = generalized coordinate of the jth mode

λ_j = damping ratio for the jth mode expressed as fraction of critical damping

ω_j = circular frequency of the jth mode of the system

Γ_j = modal participation factor of the jth mode = $\frac{\{\emptyset_j\}^T\{M\}\{1\}}{\{\emptyset_j\}^T\{M\}\{\emptyset_j\}}$

The generalized maximum response of each mode is determined from:

$$Y_j(\max) = \Gamma_j \frac{S_{aj}}{\omega_j}$$

Where:

S_{aj} is the spectral acceleration corresponding to frequency ω_j.

The maximum displacement at node i relative to the base due to mode j is:

$$X_{ij}(max) = \phi_{ij} Y_j(max)$$

The modal response $X_{ij}(max)$ is used to determine other modal response quantities, such as forces. The modal combination method is used to obtain the final response by the methods described in Subsection 3.7.2.7.

Response spectrum analysis is used in Subsection 3.8.1.4.4, 3.8.3.4.1, and Appendix 3.8A to compute only the seismic design forces of the containment structure and internal structure in the reactor containment building using the in-structure response spectra at the top of basemat generated from seismic soil-structure interaction analysis. The seismic response forces obtained from the response spectrum analysis are then combined with other design loads to design structural members of the containment structure and internal structure.

3.7.2.1.2 Time-History Methods

The solution of the equation of motion given in Subsection 3.7.2.1.1 is obtained using one of three methods: modal superposition, direct integration, or complex frequency response in the frequency domain.

The method utilizes mode superposition or direct integration for time-history analysis and is used for as an alternative analysis option for seismic Category I systems and subsystems. The seismic responses of the systems and subsystems that are seismic Category I SSCs are obtained using the finite element method. The analyses of all of the systems are performed for three orthogonal (two horizontal and one vertical) components of in-structure response time histories at the points of attachment.

Modal Superposition Method

The modal superposition method is used when the equations of motion can be decoupled as given in Subsection 3.7.2.1.1. Then the decoupled equation of motion for each mode is integrated using a proven technique, such as those listed in Table 3.2-1 of ASCE 4-98 (Reference 11) and the total response is obtained by superposition method. The modal superposition method may be used in dynamic analyses of seismic Category I SSCs.

Direct Integration Method

In this method, the direct integration of the equations of motion by implicit or explicit methods of numerical integration is used to solve the equations of motion. In general implicit methods, ΔT is not larger than 1/10 of the shortest period of interest. The direct integration method is used to validate coarse mesh model to be used in the seismic analysis of the nuclear island structures versus fine mesh model under the fixed-base condition.

Complex Frequency Response Method

The equation of motion can also be solved in the frequency domain using the complex frequency response method. In this method, the transfer functions are first determined and the applied forces are then transformed into the frequency domain. The fast Fourier transform (FFT) algorithm is commonly used for the transformation between the time domain and frequency domain. To facilitate the FFT operation, the total number of digitized points of the excitation time history that is used is a power of 2, which can be achieved by a process known as zero padding, which involves adding trailing zeros to the input ground motion. For damped systems, the trailing zeros also serve as a quiet zone, which allows the transient response motions to die out at the end of the duration to avoid cyclic overlapping in the discrete Fourier transform procedure.

The seismic responses of seismic Category I structures are obtained from site-independent analyses performed using three-dimensional soil-structure interaction models with the program ACS SASSI (Reference 12), which utilizes a time-history analysis in the frequency domain with substructuring techniques and complex stiffness representation of stiffness and damping properties of the structures and subgrade. The global complex stiffness matrix of the structure is assembled from the stiffness matrices of the finite elements.

With the substructuring techniques, impedance, load vector, and complex dynamic stiffness matrices are developed separately for the structure and the subgrade. The input ground motion is transformed into the frequency domain using FFT. The equations of motion for the complex soil-structure interaction system are then developed by combining the equations of motion for the structure with those of the subgrade in the frequency domain. The seismic responses are obtained in the frequency domain from solution of complex algebraic equations for a selected set of frequencies of analysis. The analysis solutions obtained for the selected set of frequencies are then interpolated and transformed into the time domain using inverse FFT.

3.7.2.2 Natural Frequencies and Responses

The modal analyses of the FEMs representing the seismic Category I structures are performed separately using the ANSYS (Reference 13) or GTSTRUDL (Reference 14) computer program. A total of 529 modes and their frequencies from the modal analysis of the FEM for the reactor containment building are computed. Figures 3.7-28, 3.7-29, and 3.7-30 show the first major X-, Y-, and Z-mode shapes of the containment structure, respectively, and modal frequencies and participating mass ratios are summarized in Table 3.7-10. Figures 3.7-31, 3.7-32, and 3.7-33 show the first major X-, Y-, and Z-mode shapes of the internal structure, respectively, and modal frequencies and participating mass ratios are summarized in Table 3.7-11.

A total of 2,500 modes and their frequencies from the modal analysis of the FEM for the auxiliary building are computed. Figures 3.7-34, 3.7-35, and 3.7-36 show the first major X-, Y-, and Z-mode shapes of the auxiliary building, respectively, and modal frequencies and participating mass ratios are summarized in Table 3.7-12.

A total of 150 modes and their frequencies from the modal analysis of the FEM for the emergency diesel generator building are computed. Figures 3.7-37, 3.7-38, and 3.7-39 show the first major X-, Y-, and Z-mode shapes, respectively, and modal frequencies and participating mass ratios are summarized in Table 3.7-13.

The seismic response parameters resulting from the combined effect of both horizontal and one vertical seismic input motions are obtained by using the square root of the sum of the squares (SRSS) method. The soil-structure interaction analyses for eight soil profiles developed to represent generic site conditions and one fixed-base analysis are performed for the seismic Category I structures. The final analysis results are obtained by enveloping both soil-structure interaction analysis results and fixed-base analysis results.

The seismic responses maximum absolute nodal accelerations, maximum displacements relative to the top of foundation mat, and maximum member forces for the reactor containment building containment structure, reactor containment building internal structure, auxiliary building, and emergency diesel generator building are presented in Tables 3.7-14 through 3.7-25. The maximum response acceleration values are obtained from the peak of the response time histories computed by soil-structure interaction analysis.

3.7.2.3 Procedures Used for Analytical Modeling

3.7.2.3.1 Designation of Systems versus Subsystems

The calculation of the dynamic response of a nuclear power plant subject to an earthquake loading is divided into two categories. The first is the safety-related main structural system and the second is the safety-related subsystem. The safety-related main structural system category refers to the analysis of standard plant buildings and structures that house and/or support safety-related systems. The safety-related subsystems category refers to smaller safety-related SSCs supported by the safety-related main structural systems.

The safety-related structures that are analyzed in the main structural system analysis are:

a. Reactor containment building prestressed concrete containment structure and reinforced concrete internal structure

b. Reinforced concrete auxiliary building

c. Reinforced concrete emergency diesel generator building

3.7.2.3.2 Decoupling Criteria for Subsystems

As recommended in the SRP 3.7.2 (Reference 15), the following decoupling criteria are used when a subsystem needs to be modeled:

a. If $R_m < 0.01$, decoupling is performed for any R_f

b. If $0.01 < R_m < 0.1$, decoupling is performed if $R_f \leq 0.8$ or $R_f \geq 1.25$

c. If $R_m > 0.1$, an approximate dynamic model of the subsystem is included in the main structural system

Where:

$$R_m = \frac{\text{total mass of the supported subsystem}}{\text{total mass of the supporting system}}$$

$$R_f = \frac{\text{fundamental frequency of the supported subsytem}}{\text{dominant frequency of the support motion}}$$

In general, most subsystems such as equipment and piping, with the exception of the reactor coolant system (RCS) and of the polar crane in reactor containment building, are decoupled from the floor that supports them.

3.7.2.3.3 Modeling of Safety-related Structures

Safety-related structures are modeled as three-dimensional FEMs. Major structural element systems such as floor slabs, foundation mat, roof slab, shear walls, and main frames are included in the FEM. All subsystems such as equipment and piping are considered in accordance with the decoupling criteria described in Subsection 3.7.2.3.2. For all seismic analyses, the dead load, live load, and attachment load to piping, cable tray and miscellaneous equipment mass are assumed to contribute to the inertial forces. In addition, mass associated with all heavy equipment is also included in the computation of floor or wall masses.

In general, in addition to the mass of the tributary structure dead load, additional mass equivalent to 25% of the specified floor live load or 75% of the specified snow load, where applicable; 2.394 kN/m^2 (50 psf), the equivalent of the miscellaneous dead load supported on the floors; and 0.479 kN/m^2 (10 psf), the equivalent of the attachment load on each face of the walls are included in the calculation of the inertia forces of the FEM.

Some exceptions are considered for floors in the reactor containment building and the roof of the auxiliary building. The seismic live load is not considered for floors in the seismic analysis model of the reactor containment building because the effect of seismic live load on the reactor containment building seismic response has been shown by analysis to be negligibly small. The 2.394 kN/m^2 (50 psf) load equivalent to the roofing material dead load is only considered for the roof of the auxiliary building due to the containment dome not having roofing material.

The reactor containment building consists of the containment structure, internal structure, and RCS. The structures in the reactor containment building share a mat foundation with the auxiliary building. The containment structure is a prestressed concrete structure and the internal structures are made of reinforced concrete. The RCS is connected to the internal structure. Appendix 3.9B provides a detailed description of the RCS structural model. Each substructure is modeled separately, and they are then combined into a total model for the seismic analysis.

3.7.2.3.3.1 Models for Nuclear Island Structures

The models for seismic excitation of the safety-related structures for the APR1400 standard plant design consist of the following structures:

a. Reactor containment building containment structure

b. Reactor containment building internal structure

c. Auxiliary building

The modeling approach used is to develop a separate three-dimensional FEM for each of the structures. The seismic analysis models of the containment structure, internal structure, and auxiliary building are shown in Figures 3.7-24, 3.7-25, and 3.7-26, respectively.

The detailed procedure for the development of the seismic analysis models regarding the nuclear island structures is provided in Technical Report APR1400-E-S-NR-14002-P (Reference 16).

FEM of Reactor Containment Building Containment Structure

The reactor containment building containment structure is a post-tensioned concrete structure that consists of a cylindrical wall and hemispherical dome with three buttresses spaced 120 degrees apart circumferentially. The reactor containment building containment structure is modeled using quadrilateral shell elements as shown in Figure 3.7-24.

FEM of Reactor Containment Building Internal Structure

For the reactor containment building internal structure, the load-resisting elements consist of reinforced concrete walls. These walls are modeled with quadrilateral shell elements or eight-node solid elements depending on the thickness of the walls. Concrete slabs are modeled with quadrilateral shell elements. The internal structure basemat is modeled with eight-node solid and four-node tetrahedral solid elements. Figure 3.7-25 shows the FEM of the reactor containment building internal structure.

FEM of Auxiliary Building

The auxiliary building is composed of rectangular reinforced concrete walls and reinforced concrete slabs, which are lateral load-resisting systems and frames that support the vertical loads. The walls and slabs are modeled with quadrilateral shell elements. The frames are modeled with beam elements. Figure 3.7-26 shows the FEM of the auxiliary building.

Combined Model of Nuclear Island Structures

The dynamic model of the RCS is coupled to the internal structure FEM. The nuclear island structures share one common basemat, the reactor containment building and auxiliary building structural models are combined with each other on the common basemat to form a combined model used for the seismic analysis of the nuclear island structures.

3.7.2.3.3.2 Model for Emergency Diesel Generator Building

The emergency diesel generator building consists of a building structure to accommodate the emergency diesel generator and diesel fuel oil tank room, which is separated from the building structure. The emergency diesel generator building and diesel fuel oil tank room FEMs are individually developed following the procedure used in the development of the auxiliary building model. Figure 3.7-27 shows FEMs of the emergency diesel generator building.

3.7.2.3.4 Modeling for Three Component Input Motions

The three-dimensional FEMs of the safety-related structures as described in Subsection 3.7.2.3.3 are used in separate analyses for each of the three components of design time histories prescribed on the surface of the finished grade.

3.7.2.4 Soil-Structure Interaction

The soil-structure interaction analysis of the seismic Category I structures is performed using the substructuring method formulated in the frequency domain using the complex response method and the finite element method. For the soil-structure interaction analysis, the methodology of the ACS SASSI computer program (Reference 12) is used. ACS SASSI consists of a number of program modules used to solve dynamic soil-structure interaction problems in a seismic environment. The flexible volume method (the so-called direct method) of the ACS SASSI analysis methodology is used. For this analysis, the seismic environment is defined by vertically propagating S-wave for the horizontal excitation and by vertically propagating P-wave for the vertical excitation.

In a substructuring method, the soil strata and half-space are assembled and condensed first for computation of transfer functions in the frequency domain. From this, the impedances at the soil-structure interface are established. Subsequently, the impedances are combined with a model of the structure, the control motion is applied to the combined system, and the equations of motion are solved for computation of final accelerations and displacements.

A detailed description of the seismic responses obtained from the soil-structure interaction analysis for the seismic Category I structures is summarized in Appendix 3.7A.

3.7.2.5 Development of In-Structure Response Spectra

The time-history analysis using complex frequency response method is used to generate the floor response spectra at wall and floor locations in the FEMs. The spectra are generated according to the procedure given in NRC RG 1.122 (Reference 17). As described in Subsection 3.7.2.3.4, the amplified response spectra in horizontal and vertical directions are obtained by three separate analyses. The response spectra resulting from the combined effect of both horizontal and one vertical seismic input motions are obtained by using the square root of the sum of the squares (SRSS) method. The effects of vertical floor flexibility are explicitly included.

The spectra are generated for appropriate critical damping values. The peaks of the response spectra are broadened as described in NRC RG 1.122 and are referred to as in-structure response spectra (ISRS).

3.7.2.6 Three Components of Earthquake Motion

For dynamic analyses of the seismic Category I structures, three statistically independent orthogonal components of earthquake motion, two horizontal and one vertical, are applied to the structural models as separate loading cases. The models are analyzed using either the time-history analysis method in time domain or frequency domain, or response spectrum analysis methods as appropriate. For the time-history analysis, the total response can be obtained by algebraically summing the response parameters. For the response spectrum analysis, the total response of the structure due to the three input seismic motions is obtained by combining the directional responses using the SRSS method.

The peak responses due to the three earthquake components from the response spectrum analysis can also be combined using 100-40-40 percent rule, as described in NRC RG 1.92 (Reference 18). The 100-40-40 percent rule is based on the observation that the maximum increase in the resultant for two orthogonal forces occurs when these forces are equal. The maximum value is 1.4 times of one component. All possible combinations of the three orthogonal responses are considered. The 100-40-40 combination is expressed mathematically as:

R = (± 1.0RX ± 0.4RY ± 0.4RZ), or

R = (± 0.4RX ± 1.0RY ± 0.4RZ), or

R = (± 0.4RX ± 0.4RY ± 1.0RZ).

The 100-40-40 percent rule may apply to combining spatial components of responses in the same direction due to different components of motion.

3.7.2.7 Combination of Modal Responses

The total seismic response of a structure to an input response spectrum loading is obtained by combining the corresponding maximum individual modal responses of the structure in accordance with the requirements of NRC RG 1.92 (Reference 18). Beyond the amplified spectral acceleration region, the modal responses consist of both the periodic and rigid components. The periodic components of modal responses are combined using the following double sum equation:

$$R_{pI} = \left[\sum_{i=1}^{n} \sum_{j=1}^{n} \varepsilon_{ij} R_{Pi} R_{Pj} \right]^{1/2}$$

where R_{pI} is combined periodic response for the I_{th} component of seismic input motion (I=1, 2, and 3, for one vertical and two horizontal components), ε_{ij} is the modal correlation coefficient for modes i and j, R_{Pi} and R_{Pj} are periodic components of responses of modes i and j, respectively, and n is number of modes considered.

If the frequencies of the modes are sufficiently separated, double sum equation is equivalent to the SRSS method. If modes with closely spaced frequencies exist and are defined according to the critical damping ratio, the modal correlation coefficient should be determined appropriately considering modal frequencies, modal damping ratios, and the time duration of earthquake motion using the SRSS method from NRC RG 1.92.

The rigid response component of a modal response, R_i, is defined as follows:

$$R_{ri} = \alpha_i R_i$$

The periodic response component of R_{Pi} can then be expressed as follows:

$$R_{Pi} = \left[1 - \alpha_i^2\right]^{1/2} R_i, \quad \text{where } R_i^2 = R_{Pi}^2 + R_{ri}^2$$

The rigid response coefficient, α_i can be obtained from the equations in NRC RG 1.92. The rigid responses are combined algebraically, as follows:

$$R_{rI} = \sum_{i=1}^{n} R_{\mathrm{ri}} + R_{missmassI}$$

where $R_{missmassI}$ is the residual rigid response of the missing mass modes for the I_{th} component of seismic input motion. The effect of missing mass modes not included in the analysis is accounted for by using the method given in NRC RG 1.92.

Finally, the combined response is calculated as follows:

$$R_I = \left[R_{rI}^2 + R_{pI}^2\right]^{1/2}$$

3.7.2.8 Interaction of Non-Seismic Category I Structures with Seismic Category I Structures

The interfaces between seismic Category I and non-seismic Category I structures are designed for the dynamic loads and displacements produced by both the seismic Category I and non-seismic Category I structures.

To provide reasonable assurance that the failure of a non-seismic Category I structure under the effect of a seismic event does not impair the integrity of an adjacent seismic Category I structure, one of the following criteria is used:

a. Maintenance of sufficient separation between non-seismic Category I structures and seismic Category I structures

b. Analysis and design of non-seismic Category I structures to prevent their failure under SSE conditions

c. Design of seismic Category I structures to withstand loads due to the collapse of the adjacent non-seismic Category I structures if sufficient spatial separation is not achieved

The seismic Category II turbine generator building and compound building are analyzed and designed to prevent their failure under SSE conditions (criterion b). Since the seismic Category II alternate alternating current gas turbine generator building is located at a considerable distance from the seismic Category I structures, as shown in Figure 1.2-1, criterion a is applies to the alternate alternating current gas turbine generator building.

The turbine generator building and compound building are located on the west side and south side of nuclear island with a 900 mm (3 ft) gap on each side. Figures 3.7-40 and 3.7-41 show the FEMs of the turbine generator building and compound building, respectively. To evaluate the structure-soil-structure interaction (SSSI) effects on the nuclear island structures due to presence of adjacent non-seismic Category I structures, the SSSI analysis using the coupled model for entire structures is performed. The interaction effects of these non-seismic Category I structures on the nuclear island are negligible as provided in Technical Report, APR1400-E-S-NR-14005-P (Reference 19).

The COL applicant is to confirm that any site-specific non-seismic Category I structures are designed not to degrade the function of a seismic Category I SSC to an unacceptable safety level due to their structural failure or interaction. The relative displacements calculated by the COL applicant are not to exceed the gaps between seismic Category I and non-seismic Category I structures.

For the seismic analysis of the seismic Category II structures, the site-specific FIRS are applied as seismic input motions and a site-specific soil profile is to be established as a supporting media. The same seismic analysis procedure which is applied to the seismic Category I structures is also applied to the seismic Category II structures.

The design codes used by the COL applicant for the structural design of the seismic Category II structures are as follows:

a. The design of the turbine generator building is performed using ACI 318 or AISC 360 as described in Table 3.2-1.

b. The compound building is designed according to RW-IIa criteria in NRC RG 1.143. Hence, the design of the compound is performed using ACI 349 or AISC N690 as described in Table 3.2-1.

c. The design of the alternate alternating current gas turbine generator building located on the southwest side of the plant is performed using ACI 318 as described in Table 3.2-1.

The potential effects of sliding and uplift for the seismic Category II structures are checked using the same approach applied in the stability check for the seismic Category I structures. The COL applicant is to evaluate the pressures on the below grade walls of the NI, resulting from site-specific SSSI effects between the NI and adjacent seismic Category II structures (COL 3.7(4)).

3.7.2.9 Effects of Parameter Variations on Floor Response Spectra

To consider variations in the structural frequencies due to the uncertainties in material properties of the structure and approximations in modeling, the peaks of the computed floor response spectra are broadened by ± 15 percent and smoothed in accordance with NRC RG 1.122, as described in Subsection 3.7.2.5.

The effects of potential concrete cracking on the structural stiffness of reinforced concrete structures are considered as enveloping the floor response spectra for cracked concrete properties with 7 percent damping for the reinforced concrete structures and those for uncracked properties with 4 percent damping for the reinforced concrete structures.

Both uncracked and cracked concrete stiffnesses are considered separately in the seismic analysis models of the seismic Category I structures. For consideration of potential concrete cracking, the cracked concrete stiffness in horizontal and vertical seismic analysis models is reduced by half of the uncracked concrete stiffness except prestressed concrete containment structure and reinforced concrete columns and walls in the vertical models described in ASCE/SEI 43-05 (Reference 20). Therefore, for eight soil profiles and one fixed-base condition, a total of 18 analysis cases are performed in the seismic analysis to generate the floor response spectra of the seismic Category I structures.

The selected locations where the floor response spectra are obtained in analysis models and resultant floor response spectra enveloping the 18 analysis cases for the nuclear island structures are provided in Technical Report, APR1400-E-S-NR-14003-P (Reference 21).

3.7.2.10 Use of Constant Vertical Static Factors

The safety-related main structural systems are analyzed in the vertical direction using the methods described in Subsection 3.7.2.1. The vertical component is considered to occur simultaneously with the two horizontal components and consistently combined with the horizontal components of the seismic motion as described in Subsection 3.7.2.6. Therefore, a constant vertical static factor is not used for the seismic design of seismic Category I structures.

3.7.2.11 Methods Used to Account for Torsional Effects

Because the structural models used for seismic Category I structures are constructed with finite elements containing 6 degrees of freedom per node, incorporating torsional effects into the models, the mathematical models include sufficient mass points and corresponding dynamic degrees of freedom to provide a three-dimensional representation of the dynamic characteristics of the structure.

Torsional effects are also accounted for in the structural models used to generate floor response spectra. An additional eccentricity of 5 percent of the maximum building dimension, perpendicular to load direction that results in an accidental torque, is applied to the static finite element structural model to calculate element forces due to accidental torsion. Accidental torsion is considered in both the E-W and N-S directions.

3.7.2.12 Comparison of Responses

The time-history analysis method based on complex frequency response method is used for the seismic analysis of seismic Category I structures. The response spectrum analysis is used to compute the seismic design forces of the containment structure and internal structure in the reactor containment building using the in-structure response spectra at the top of the basemat generated from the seismic soil-structure interaction analysis. The responses from these two methods are compared and provided in Technical Report, APR1400-E-S-NR-14003-P (Reference 21).

3.7.2.13 Methods for Seismic Analysis of Dams

The COL applicant is to perform seismic analysis for any site-specific seismic Category I dams, if necessary (COL 3.7(5)).

3.7.2.14 Determination of Dynamic Stability of Seismic Category I Structures

The design overturning moments and base shears for seismic Category I structures are determined by time-history analysis based on the complex frequency response method. The seismic motion is input separately to the structural models in three independent orthogonal directions. To check the overturning and sliding, the simultaneous action of horizontal and vertical seismic forces using methods described in Subsection 3.7.2.6 is incorporated.

The procedure to check the stability of seismic Category I structures is described in Subsection 3.8.5.

3.7.2.15 Analysis Procedure for Damping

For modal superposition method, composite modal damping values are used for structures with components of different damping characteristics. The composite modal damping values are based on weighting the damping factors according to the mass or the stiffness of each element. For the mass-weighted damping, the formulation is as follows:

$$\beta_j = \frac{\sum_{i=1}^{N} \{\phi_j\}^T \beta_i \{M_i\} \{\phi_j\}}{\{\phi_j\}^T [M] \{\phi_j\}}$$

Where:

β_j = composite modal damping for mode j

N = total number of components

β_i = critical modal damping associated with component i

ϕ_j = mode shape vector

$\{M_i\}$ = subregion of mass matrix associated with component i

$[M]$ = mass matrix of the system

For the stiffness-weighted damping, the formulation is as follows:

$$\beta_j = \frac{\sum_{i=1}^{N} \{\phi_j\}^T \beta_i \{K_i\} \{\phi_j\}}{\{\phi_j\}^T [K] \{\phi_j\}}$$

Where:

$\{K_i\}$ = subregion of stiffness matrix associated with component i

[K] = stiffness matrix of the system

For direct integration method, viscous damping proportional to the mass and stiffness matrix is used; thus

$$[C] = \alpha [M] + \beta [K]$$

where [C] is the damping matrix, [K] is the stiffness matrix, and [M] is the mass matrix. The values of α and β are selected so that the damping in the range of frequency of interest is approximately equal to the damping of the structure.

3.7.3 Seismic Subsystem Analysis

This subsection describes the seismic analysis methods for the APR1400 seismic Category I subsystems as civil structures that are not included in the main structural system, such as miscellaneous concrete and steel structures, buried conduit, tunnel, dam, and above-ground tanks.

The seismic analysis of the seismic Category I mechanical subsystems, such as piping and equipment, is described in Section 3.9.

3.7.3.1 Seismic Analysis Methods

The seismic analysis of seismic Category I subsystems is performed using either the response spectrum analysis or time-history analysis, as described in Subsection 3.7.2.1, or the equivalent static method described in Subsection 3.7.3.1.1.

3.7.3.1.1 Use of Equivalent Static Load Method of Analysis

In the seismic analyses of components, the equivalent static load method would be used if a dynamic analysis is not performed. When the equivalent static load method is used for the seismic analysis of components, i) justification of the adequacy of the analysis models and conservatism of the analysis results are to be provided by showing that the analysis results obtained from the equivalent static load method are more conservative than those of a dynamic analysis, such as response spectrum analysis method or time history analysis method, ii) the responses obtained from relative motion between points of support, if any, are combined with the response from the inertial loads, and iii) the constant static factor is equal to 1.5 times the peak spectral acceleration in the applicable required response spectra. A value less than 1.5 times could be used if its conservatism and justification are verified. The equivalent seismic static load is the product of the equipment or component mass and the constant static factor.

3.7.3.1.2 Determination of Number of Earthquake Cycles

The procedure used to account for the fatigue effect of cyclic motion associated with seismic excitation recognizes that the actual motion experienced during a seismic event consists of a single maximum or peak motion and some number of cycles of lesser magnitude. The total or cumulative usage factor can also be specified in terms of a finite number of cycles of the maximum or peak motion. Based on this consideration, seismic Category I subsystems, components, and equipment are designed for a total of two SSE events with 10 maximum stress cycles per event (20 full cycles of the maximum SSE stress range). Alternatively, an equivalent number of fractional vibratory cycles to that of 20 full SSE vibratory cycles may be used (but with an amplitude not less than one-third [1/3] of the maximum SSE amplitude) when derived in accordance with Appendix D of IEEE Std. 344 (Reference 22).

3.7.3.2 Procedure Used for Analytical Modeling

The criteria and bases described in Subsection 3.7.2.3 are used to determine whether a component or structure will be analyzed as a subsystem. The modeling techniques incorporate either a single- or multi-degree of freedom subsystem consisting of discrete masses connected by spring elements. The associated damping coefficients are consistent with Table 3.7-7. The degree of complexity of each model is sufficient to accurately evaluate the dynamic behavior of the component.

3.7.3.3 Analysis Procedures for Damping

The analysis procedure used to account for the damping in subsystems conforms with Subsections 3.7.1.2 and 3.7.2.15.

3.7.3.4 Three Components of Earthquake Motion

Seismic responses resulting from analysis of subsystems due to three components of earthquake motions are combined in the same manner as the seismic response resulting from the analysis of building structures as specified in Subsection 3.7.2.6.

3.7.3.5 Combination of Modal Responses

For combination of modal responses of subsystems, Subsection 3.7.2.7 should be referred for details. When a response spectrum method of analysis is used to analyze a subsystem, the maximum responses such as accelerations, shears, and moments in each mode are calculated regardless of time. If the frequencies of the modes are well separated, the SRSS method of mode combination gives acceptable results; however, where the structural frequencies are not well separated, the modes are combined in accordance with NRC RG 1.92. The criteria for determining how modal frequencies are separated are specified in NRC RG 1.92, as the definition of modes with closely spaced frequencies. The definition of modes with closely spaced frequencies is a function of the critical damping ratio and is as follows;

a. For critical damping ratios $\leq$ 2%, modes are considered closely spaced if the frequencies are within 10% of each other (i.e., for $f_i < f_j$, $f_j \leq 1.1f_i$)

b. For critical damping ratio > 2%, modes are considered closely spaced if the frequencies are within five times the critical damping ratio of each other (i.e., for $f_i < f_j$ and 5% damping, $f_j \leq 1.25\ f_i$, for $f_i < f_j$ and 10% damping, $f_j \leq 1.5\ f_i$)

3.7.3.6 Use of Constant Vertical Static Factors

The seismic analysis of seismic Category I subsystems can be performed using the response spectrum analysis method, the time history analysis method, or the equivalent static load method, as specified in Subsection 3.7.3.1. When the equivalent static load method is employed, the constant vertical static factor can be used to calculate the vertical response loads for the seismic design of seismic Category I subsystems only if it can be demonstrated that the subsystems are rigid in the vertical direction or the acceptance criteria in SRP 3.7.2, II.1.B are satisfied.

3.7.3.7 Buried Seismic Category I Conduits and Tunnels

During an earthquake, buried structures such as conduits and tunnels respond to various seismic waves propagating through the surrounding soil as well as to the dynamic differential movements of the buildings to which the structures are connected. The various waves associated with earthquake motion are P (compression) waves, S (shear) waves, and Rayleigh waves. The stresses in the buried structure are governed by the velocity and angle of incidence of these traveling waves. However, the wave types and their directions during an earthquake are very complex. For design purposes, the seismic-induced upper-bound strains and corresponding stresses in the buried concrete electrical ducts are calculated using expressions given by ASCE 4-98 (Reference 11).

Seismic design for buried seismic Category I structures takes the effect of wave propagation into consideration, based on the assumption that there is no movement of the buried structure remote from anchor points relative to the surrounding soil referred to in ASCE 4-98, Subsection 3.5.2. That is, the strain of the structure is the same as that of the surrounding soil medium, and the stress of the structure is calculated from the strain. Consideration of relative deformation between anchor points and the adjacent soil is applied to the design using the SRSS method for the three orthogonal stresses calculated from the relative displacements of the seismic analysis results.

The resistance effect of the surrounding soil for deformation or displacement of the buried structures, differential movement of the anchors, and shape or curvature changes of the bent parts is taken into account in the analysis. The structures can be modeled by beam elements supported by an elastic foundation representing the stiffness of the adjacent soil.

Lateral dynamic soil pressure on buried seismic Category I structures is calculated in accordance with elastic theory by Wood referred to in ASCE 4-98, Subsection 3.5.3. The effect of underground water is considered by applying the equation proposed by Matuo and O'Hara based on the theory from Westergaard that is referred to in ASCE 4-98, Subsection 3.5.3.1.

The COL applicant is to perform seismic analysis of buried seismic Category I conduits and tunnels (COL 3.7(6)).

3.7.3.8 Methods for Seismic Analysis of Category I Concrete Dams

The COL applicant is to perform seismic analysis for any site-specific seismic Category I dams, if necessary (COL 3.7(5)).

3.7.3.9 Methods for Seismic Analysis of Above-ground Tanks

Above-ground seismic Category I tanks are large, flat-bottomed, single-shell, cylindrical tanks anchored to reinforced concrete pads. Seismic analysis procedures address the issues described in NUREG/CR-1161RD (Reference 23), pages 28-30, based primarily on the methods of Haroun and Housner (Reference 24). The hydrodynamic mass effects following the procedures described in ASCE 4-98, Subsection 3.1.6, are considered in the seismic analysis model.

Because of the symmetry of these vertical tanks, the larger of the two horizontal earthquake components, if they are not equal in magnitude, is combined by the SRSS method with the vertical earthquake component.

The assessment of dynamic loading on storage tanks verifies stability of the tank wall against buckling behavior, accounting for hydrodynamic loads (impulsive and convective) and shell flexibility.

In the generation of dynamic loads, tanks are evaluated as filled, with consideration of convective (sloshing), impulsive (fluid-shell interaction), and rigid modes of behavior. For the convective mode, fluid damping is taken as 0.5 percent of critical damping in accordance with NRC RG 1.61. For the impulsive mode, structural (tank wall) damping is taken for the SSE, in accordance with SRP 3.7.3 (Reference 25). The effective mass, its location, and natural frequency for each mode of behavior are obtained from the equations and graphs in Haroun and Housner.

Using the site-specific foundation input response spectra developed at the base of the tank, spectral accelerations obtained for each mode at the appropriate damping and frequency are applied to the computation of appropriate effective mass.

Structural adequacy of the anchorage provisions for the tank (e.g., anchor bolts, embedments) is developed assuming that the overturning moment on the tank is resisted only by compression in the shell and tension in the anchor bolts. The overturning moment at the base of the tank is computed as the sum of the flexible and rigid mode responses, each of which is the product of the applicable mass, height, and spectral acceleration.

For the seismic Category I tanks constructed as a part of buildings, the seismic analyses are performed considering input motions in three directions, two horizontal and one vertical, as the building is analyzed according to Subsection 3.7.2.3.

For seismic Category I tanks installed in buildings, the seismic analyses are performed in accordance with Subsection 3.9.2.2.14.

The COL applicant is to perform seismic analysis for the seismic Category I above-ground tanks (COL 3.7(7)).

3.7.3.10 Basis for Selection of Frequencies

The fundamental frequencies of components and equipment are selected to be less than one-half or more than twice the dominant frequencies of the support structure to avoid resonance. The equipment must be adequately designed for the applicable loads if the equipment frequencies are within this range.

3.7.3.11 Interaction of Other Systems with Seismic Category I Systems

The non-seismic Category I subsystems are designed to be isolated by either a constraint or barrier or are remotely located from any seismic Category I SSC. Otherwise, adjacent non-seismic Category I subsystems are analyzed according to the same seismic criteria as applicable to seismic Category I SSC. For non-seismic Category I subsystems attached to seismic Category I SSCs, the dynamic effects of the non-seismic Category I subsystems should be simulated in the modeling of the seismic Category I SSC. The attached non-seismic Category I subsystems, up to the first anchor beyond the interface, should also be designed in such a manner that during an earthquake of SSE intensity it will not cause a failure of the seismic Category I SSC.

3.7.3.12 Multiply-Supported Equipment and Components with Distinct Inputs

The seismic response of multiply-supported equipment and components with distinct inputs are obtained by either the response spectrum approach or the time history approach.

Of the response spectrum approaches, the uniform support motion (USM) method is applied with a uniform response spectrum (URS) that envelops all of the individual response spectra at the various support locations. In addition, the maximum relative support displacements are imposed on the supports in the most unfavorable combination. The final responses are obtained by the absolute summation of responses due to inertial effects and relative displacements. As an alternative to the USM method, the independent support motion (ISM) method can be employed such that all of the criteria presented in NUREG-1061 related to the ISM method are satisfied.

When the time history approach is applied, time histories of support motions may be used as input excitations to the subsystems.

3.7.3.13 Torsional Effects of Eccentric Masses

To consider the torsional effects of eccentric masses in seismic Category I subsystems, the eccentric masses are included in the mathematical model as eccentric masses located in their center of gravity coupled by, as applicable, either rigid members or elastic members with their own properties.

3.7.4 Seismic Instrumentation

Appendix S, "Earthquake Engineering Criteria for Nuclear Power Plant," of 10 CFR Part 50 (Reference 2), requires that suitable instrumentation be provided so that the seismic response of nuclear power plant features important to safety can be evaluated promptly after an earthquake. It also requires shutdown of the nuclear power plant if vibratory ground motion exceeds the OBE ground motion.

The seismic monitoring system meets the relevant requirements of 10 CFR Part 50, Appendix S. The seismic monitoring system provides information on the vibratory ground motion and the resultant vibratory responses of the representative seismic Category I structures during a seismic event.

The seismic monitoring system is not a safety system and does not have any effect on safety systems or equipment. The seismic monitoring system is designed for high accuracy, reliability, and to minimize the maintenance and surveillance activities required to support the system.

3.7.4.1 Comparison with NRC Regulatory Guide 1.12

The seismic monitoring system is designed in accordance with NRC RG 1.12 (Reference 26). The instrument type, location, operability, installation, activation, and surveillance requirements are described in the Subsections 3.7.4.2 through 3.7.4.5.

The time-history accelerographs installed at appropriate locations, which are described in NRC RG 1.12, provide time-history data on the seismic responses of the free-field, containment structure, and other seismic Category I structures.

3.7.4.2 Location and Description of Instrumentation

The seismic instruments are located so that their respective responses can be compared and evaluated with appropriate design bases so that occupational radiation exposures to the plant personnel can be kept as low as reasonably achievable (ALARA) when operating and maintaining the seismic instruments. Instruments that enable the prompt processing of data at the plant site are used. The seismic monitoring system consists of time-history accelerographs, including accelerometers, accelerometer-based seismic triggers, recorders, and a seismic monitoring system cabinet.

All components of the seismic monitoring system are qualified to the provisions of IEEE Std. 344 (Reference 23).

The instruments are not mounted directly on plant equipment, piping, or supports since data obtained at these locations could be obscured by the vibratory motion associated with normal plant operation. The components are located in areas that are not generally affected by plant operational hazards such as explosions, fire, and internal flooding.

The in-structure instruments are placed at mass-point locations based on the building dynamic model so that the measured motion can be directly compared with the design spectra.

Provisions are made for instruments that have a sensor located in an inaccessible area to have data recording in an accessible location, and the instrument provides an external remote alarm to indicate a seismic event.

The COL applicant that references the APR1400 design certification will determine whether essentially the same seismic response from a given earthquake is expected at each unit in a multi-unit site or each unit is to be provided with a separate set of seismic instruments (COL 3.7(8)). In the event that only one unit is instrumented, annunciation is provided to each control room.

A triaxial time-history accelerograph is provided at the following locations:

a. Free-field

b. Containment structure (one at the foundation and two at higher elevations)

c. Independent seismic Category I structure (one at the foundation and one at a higher elevation)

The free-field sensor is located at a place where effects of surface features, buildings, and equipment are minimal and insignificant for recording the ground motion.

The COL applicant is to confirm details of the locations of the triaxial time-history accelerographs (COL 3.7(9)).

3.7.4.2.1 Field-Mounted Sensors

The free-field instrument data are used to determine whether the OBE threshold has been exceed. Foundation-level instruments provide data on the actual seismic input to the containment structure and other seismic Category I structures, and are used to quantify the difference between the vibratory ground motion at the free-field and the building structure foundation level. The instruments have a triaxial design and one of the orthogonal axes is vertical. The remaining two are on the perpendicular plane to the vertical and are perpendicular to each other.

3.7.4.2.2 Accelerometers

The accelerometers have a triaxial design with three orthogonal axes, similar to the field-mounted sensors described above. The dynamic range of the device has a zero-to-peak ratio of at least 1,000:1 (e.g., 0.001 g to 1.0 g). The frequency range is at least 0.20 Hz to 50 Hz. The triaxial accelerometer measures acceleration as a function of time in three mutually perpendicular directions and transmits this signal to recorders at the seismic monitoring system cabinet after any one of seismic triggers is actuated. The accelerometer-based seismic triggers activate the recorders whenever the seismic trigger threshold is exceeded for any one of the three axes. The accelerometer-based seismic triggers are located in the seismic monitoring system cabinet.

3.7.4.2.3 Seismic Monitoring System Cabinet

The seismic monitoring system cabinet is provided in the instrumentation and control (I&C) equipment room and includes the following as a minimum:

a. Seismic monitoring instrument

b. Seismic recorder(s) and playback system, annunciators, and power supply unit

The seismic monitoring system cabinet includes provisions for securely bolting and/or welding the cabinet to the floor.

3.7.4.2.4 Seismic Recorder(s) and Playback System

The sampling rate is at least 200 samples per second in each of the three directions. The dynamic range is at least 1000:1 for combined record and playback. The recording medium is capable of storage and playback without deterioration of playback signal quality. The recorder includes the accelerometer-based trigger, which has a software-based on the digital threshold algorithm and activates the archival recorder whenever the adjustable threshold is exceeded in any one of the three axes.

The accelerometer-based trigger has an actuation level between 0.001 g and 0.02 g.

The playback system, including a response spectrum analyzer, remains functional at all times to provide automatic retrieval of acceleration and evaluation of the OBE condition immediately following an event, using the response spectrum check and cumulative absolute velocity (CAV).

The instrument records, at a minimum, 3 seconds of low-amplitude motion prior to seismic trigger actuation, continues to record the motion during the period in which the earthquake motion exceeds the seismic trigger threshold, and continues to record low-amplitude motion for a minimum of 5 seconds beyond the last exceedance of the seismic trigger threshold. Additional pre-event memory (for up to 30 seconds of pre-earthquake recording) is provided for P-wave correlation.

All recording media and printers are capable of operating for a minimum of 25 minutes on backup battery power.

The playback system is powered from the system power distribution unit.

3.7.4.2.5 Power Supply

An instrument power source has sufficient capacity for a time period longer than the maintenance interval to provide required continuous standby power and sufficient power for a minimum 25 minutes of system operation at any time.

The battery has sufficient capacity to power the instrument to sense and record 25 minutes of motion over a period of not less than the channel check test interval. This can be accomplished by providing enough battery capacity for a minimum of 25 minutes in a 24-hour period without recharging, in combination with a battery charger whose line power is connected to an uninterruptible power supply (UPS).

3.7.4.3 Main Control Room Operator Notification

Triggering of the free-field or any foundation-level time-history accelerograph is annunciated in the main control room (MCR) and remote shutdown room (RSR). The operator receives audible and visual annunciation in the MCR and RSR by the triggered seismic instrument. The annunciation is provided to the operator when a time-history accelerograph is activated. Also, the annunciation is provided if one or more seismic trigger setpoints of OBE or safe shutdown earthquake (SSE) are being exceeded. Annunciation of triggering of the time-history accelerograph in the MCR, RSR, and the recorder readouts in the I&C equipment room aid the plant operator in making a decision for plant shutdown.

3.7.4.4 Comparison with NRC Regulatory Guide 1.166

When an earthquake occurs, ground motion data are recorded by the seismic instrument. These data are used to make a rapid determination of the degree of severity of the seismic event. The data from the plant's free-field seismic instrument, coupled with information obtained from a plant walkdown, are used to make the initial determination whether the plant must be shut down.

The evaluation to determine whether the OBE was exceeded is performed using data obtained from the three orthogonal components of the free-field ground motion. The evaluation consists of a check of the response spectrum and CAV and a check on the operability of the instrument.

Exceedance of the OBE response spectrum is determined in accordance with NRC RG 1.166 (Reference 27). The CAV is calculated in accordance with NRC RG 1.166 and EPRI TR-100082 (Reference 29). The CAV limit is determined to be exceeded if the CAV calculation is greater than 0.16 g-second.

If the response spectrum and the CAV cannot be obtained because the seismic instrument or data processing is inoperable, the criteria of NRC RG 1.166 Appendix A are used to determine whether the OBE has been exceeded.

The seismic instrumentation program is designed in accordance with the guidelines of NRC RG 1.166 and EPRI NP-6695 (Reference 28).

The plan for post-earthquake walkdown inspections is established using preselected equipment and structures and is used to quantify the damage caused by the earthquake. It is also used to establish the extent of inspections, tests, and evaluations necessary to demonstrate readiness for plant restart.

The procedures for actions immediately after an earthquake contain a check of the neutron flux monitoring sensors and a check of containment isolation valves. The earthquake-induced vibration of the vessel could lead to a change in neutron flux, so a prompt check of the neutron flux monitoring sensors would provide an indication that the reactor is stable. The containment isolation valve may have malfunctioned during the earthquake. Inspection of the containment isolation system is necessary to ensure continued containment integrity.

3.7.4.5 Instrument Surveillance

The instrumentation is selected to require minimal maintenance and inservice inspection, as well as minimal time and numbers of personnel to conduct installation and maintenance. The seismic instrumentation operates during all modes of plant operation, including periods of plant shutdown. The maintenance and repair procedures will provide for keeping the maximum number of instruments in service during plant operation and shutdown.

As required by NRC RG 1.12, the seismic monitoring system is to be given channel checks every 2 weeks for the first 3 months of service after startup. After the initial 3-month period and three consecutive successful checks, monthly channel checks are sufficient. The monthly channel check is to include checking the batteries. The functional test is performed every 6 months. The channel calibration is performed during each refueling outage at a minimum.

3.7.4.6 Program Implementation

The COL applicant is to identify the implementation milestones for the seismic instrumentation implementation program based on the discussion in Subsections 3.7.4.1 through 3.7.4.5 (COL 3.7(10)).

The milestones covered in program implementation are summarized as follows:

a. A file containing information on all the seismic instrumentation will support keeping the plant safe in conformance with NRC RG 1.166. The file includes information on each instrument type such as model, list of special features, and operation and maintenance manuals.

b. Operational procedures contain an alarm response procedure, pre-shutdown inspection procedure, and post-event inspection procedure.

    1) The alarm response procedure supports immediate actions in the event of a seismic warning alarm. The alarms provide additional information on the status and performance of components and systems.

    2) The pre-shutdown inspection procedure supports determination of the effects of the earthquake on essential safe shutdown equipment. Following the earthquake, the equipment must be inspected for any needed resets or repairs, as well as for readiness prior to initiating shutdown activities.

    3) The post-event inspection procedure supports determination of the degree of damage to equipment and equipment acceptability for continued operation.

The COL applicant is to prepare a procedure for the post shutdown inspection and plant restart in accordance with the guidance of NRC RG 1.167 (Reference 30) (COL 3.7(11)).

3.7.5 Combined License Information

COL 3.7(1) The COL applicant is to demonstrate the applicability of soil degradation models used in site-specific site response analysis for the site conditions.

COL 3.7(2) The COL applicant is to compare the site-specific strain-compatible soil properties with generic soil properties in order to confirm that the site meets the generic soil profile used in the standard design.

COL 3.7(3) The COL applicant is to provide the seismic design of the seismic Category I SSCs and seismic Category II structures that are not part of the APR1400 standard plant design. The seismic Category I and II structures are as follows:

a. Seismic Category I essential service water building

b. Seismic Category I component cooling water heat exchanger building

c. Seismic Category II turbine generator building

d. Seismic Category II compound building

e. Seismic Category II alternate alternating current gas turbine generator building

COL 3.7(4) The COL applicant is to confirm that any site-specific non-seismic Category I structures are designed not to degrade the function of a seismic Category I SSC to an unacceptable safety level due to their structural failure or interaction. The COL applicant is to confirm that the calculated relative displacements do not exceed the gaps between seismic Category I and non-seismic Category I structures.

The COL applicant is to apply the site-specific FIRS as seismic input motions and to establish a site-specific soil profile as a supporting media for the seismic analysis of the seismic Category II structures. The COL applicant is to apply the same seismic analysis procedure as the seismic Category I structures to the seismic Category II structures. The COL applicant is to perform the structural design of the seismic Category II structures using the design codes described in Subsection 3.7.2.8 and Table 3.2-1. The COL applicant is to check the potential effects of sliding and uplift for the seismic Category II structures using the same approach applied in the stability check for the seismic Category I structures. The COL applicant is to evaluate the pressures on the below grade walls of the

NI, resulting from site-specific SSSI effects between the NI and adjacent seismic Category II structures.

COL 3.7(5) The COL applicant is to perform seismic analysis for any site-specific seismic Category I dams, if necessary.

COL 3.7(6) The COL applicant is to perform seismic analysis of buried seismic Category I conduits and tunnels.

COL 3.7(7) The COL applicant is to perform seismic analysis for the seismic Category I above-ground tanks.

COL 3.7(8) The COL applicant that references the APR1400 design certification will determine whether essentially the same seismic response from a given earthquake is expected at each unit in a multi-unit site or each unit is to be provided with a separate set of seismic instruments.

COL 3.7(9) The COL applicant is to confirm details of the locations of the triaxial time-history accelerographs.

COL 3.7(10) The COL applicant is to identify the implementation milestones for the seismic instrumentation implementation program based on the discussion in Subsections 3.7.4.1 through 3.7.4.5.

COL 3.7(11) The COL applicant is to prepare a procedure for the post shutdown inspection and plant restart in accordance with the guidance of NRC RG 1.167.

3.7.6 References

1. 10 CFR Part 50, Appendix A, General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," U.S. Nuclear Regulatory Commission.

2. 10 CFR Part 50, Appendix S, "Earthquake Engineering Criteria for Nuclear Power Plants," U.S. Nuclear Regulatory Commission.

3. Regulatory Guide 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants," Rev. 2, U.S. Nuclear Regulatory Commission, July 2014.

4. Regulatory Guide 1.208, “A Performance-based Approach to Define the Site-specific Earthquake Ground Motion,” Rev. 4, U.S. Nuclear Regulatory Commission, March 2007.

5. NUREG-0800, Standard Review Plan, Section 3.7.1, “Seismic Design Parameters,” Draft Rev. 4, U.S. Nuclear Regulatory Commission, December 2012.

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7. NUREG/CR-6728, “Technical Basis for Revision of Regulatory Guidance on Design Ground Motions: Hazard- and Risk-consistent Ground Motion Spectra Guidelines,” U.S. Nuclear Regulatory Commission, October 2001.

8. NUREG/CR-5347, “Recommendations for Resolutions of Public Comments on USIA-40, ‘Seismic Design Criteria’,” U.S. Nuclear Regulatory Commission, June 1989.

9. APR1400-E-S-NR-14001-P, “Seismic Design Bases,” Rev. 2, KEPCO & KHNP, October 2017.

10. Regulatory Guide 1.61, “Damping Values for Seismic Design of Nuclear Power Plants,” Rev. 1, U.S. Nuclear Regulatory Commission, March 2007.

11. ASCE 4-98, “Seismic Analysis of Safety Related Nuclear Structures and Commentary,” American Society of Civil Engineers, January 2000.

12. ACS SASSI NQA Version 2.3.0, “An Advanced Computational Software for 3D Dynamic Analysis Including Soil-Structure Interactim,” Including “Option A” and NQA “Option FS,” User Manual, Rev. 5, Ghiocel Predictrue Technologies, Inc., January 2012.

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16. APR1400-E-S-NR-14002-P, "Finite Element Seismic Models for SSI Analyses of the NI Buildings," Rev. 2, KEPCO & KHNP, December 2017.

17. Regulatory Guide 1.122, "Development of Floor Design Response Spectra for Seismic Design of Floor-supported Equipment or Components," Rev. 1, U.S. Nuclear Regulatory Commission, February 1978.

18. Regulatory Guide 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis," Rev. 3, U.S. Nuclear Regulatory Commission, October 2012.

19. APR1400-E-S-NR-14005-P, "Evaluation of Structure-soil-structure Interaction (SSSI) Effects," Rev. 2, KEPCO & KHNP, December 2017.

20. ASCE/SEI 43-05, "Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities," American Society of Civil Engineers, 2005.

21. APR1400-E-S-NR-14003-P, "SSI Analysis Methodology and Results of NI Buildings," Rev. 2, KEPCO & KHNP, December 2017.

22. IEEE Std. 344-2004 (Reaffirmed 2009), "Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, June 2005.

23. NUREG/CR-1161RD, "Recommended Revisions to Nuclear Regulatory Commission Seismic Design Criteria," U.S. Nuclear Regulatory Commission, May 1980.

24. M. A. Haroun and G. W. Housner, "Seismic Design of Liquid Storage Tanks," Journal of the Technical Councils of ASCE, Vol. 107, No. TC1, pp. 191-207, American Society of Civil Engineers, April 1981.

25. NUREG-0800, Standard Review Plan, Section 3.7.3, "Seismic Subsystem Analysis," Rev. 4, U.S. Nuclear Regulatory Commission, September 2013.

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28. EPRI Report NP-6695, "Guidelines for Nuclear Plant Response to an Earthquake," Electric Power Research Institute, December 1989.

29. EPRI Report TR-100082, "Standardization of the Cumulative Absolute Velocity," Electric Power Research Institute, December 1992.

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Table 3.7-1

Spectral Amplitude of CSDRS for Control Points

Horizontal

Damping Ratio (%)	Amplification Factor for Control Points						
	0.1 Hz	0.2 Hz	0.25 Hz	2.5 Hz	9 Hz	25 Hz	50 Hz
2	0.0276	0.111	0.171	1.275	1.062	0.511	0.300
3	0.0254	0.102	0.159	1.125	0.939	0.498	0.300
4	0.0238	0.096	0.147	1.020	0.852	0.487	0.300
5	0.0226	0.090	0.141	0.939	0.783	0.479	0.300
7	0.0207	0.084	0.129	0.816	0.681	0.464	0.300
10	0.0188	0.075	0.117	0.684	0.570	0.447	0.300

Vertical

Damping Ratio (%)	Amplification Factor for Control Points						
	0.1 Hz	0.2 Hz	0.25 Hz	3.5 Hz	9 Hz	25 Hz	50 Hz
2	0.0184	0.075	0.114	1.215	1.062	0.511	0.300
3	0.0170	0.069	0.105	1.074	0.939	0.498	0.300
4	0.0159	0.063	0.099	0.972	0.852	0.487	0.300
5	0.0151	0.060	0.093	0.894	0.783	0.479	0.300
7	0.0138	0.057	0.087	0.777	0.681	0.464	0.300
10	0.0125	0.051	0.078	0.651	0.570	0.447	0.300

Table 3.7-2

Numerical Information of CSDRS

a) Strong motion duration for all three directions (sec)

H1	H2	VT
9.2	10.3	8.4

b) Peak values (A, V and D)

	A (g)	V (in/sec)	D (in)
H1	0.300	17.5	16.5
H2	0.300	17.9	16.1
VT	0.300	18.9	13.0

c) Number of points of the response spectra below CSDRS

	H1	H2	VT
2%	4	4	2
3%	1	3	2
4%	4	3	2
5%	5	2	1
7%	4	2	1
10%	1	2	1

d) The lowest percentage below CSDRS (%)

	H1	H2	VT
2%	-6.66	-4.53	-0.48
3%	-4.72	-1.69	-2.99
4%	-4.58	-5.89	-2.94
5%	-3.61	-4.15	-1.00
7%	-6.11	-5.51	-0.62
10%	-6.02	-2.40	-1.43

Table 3.7-3

Target PSD Compatible with Horizontal CSDRS

Frequency (f) Range f (Hz or cps)	Piecewise Linear Target PSD S_H (f) (in^2/sec^4/cps)
0.2 < f ≤ 2.5 Hz	$S_H(f) = 2\pi \times 58.4\ (f / 2.5)^{0.2}$
2.5 < f ≤ 9.0 Hz	$S_H(f) = 2\pi \times 58.4\ (2.5 / f)^{1.8}$
9.0 < f ≤ 16 Hz	$S_H(f) = 2\pi \times 5.82\ (9.0 / f)^{2.2}$
16 < f ≤ 25 Hz	$S_H(f) = 2\pi \times 1.64\ (16 / f)^{3.8}$
25 < f ≤ 35 Hz	$S_H(f) = 2\pi \times 0.30\ (25 / f)^{4.8}$
35 < f ≤ 50 Hz	$S_H(f) = 2\pi \times 0.06\ (35 / f)^{10}$

Table 3.7-4

Numerical Information of HRHF RS

a) Strong motion duration for all three directions (sec)

H1H	H2H	VTH
6.090	6.400	6.505

b) Peak values (A, V and D)

	A (g)	V (in/sec)	D (in)
H1H	0.463	8.86	3.63
H2H	0.463	10.50	3.51
VTH	0.463	9.94	4.16

c) Number of points of the response spectra below CSDRS

	H1H	H2H	VTH
2%	0	1	3
3%	2	4	1
4%	1	5	2
5%	0	4	3
7%	0	0	2
10%	4	3	2

d) The lowest percentage below CSDRS (%)

	H1H	H2H	VTH
2%	1.02	-0.77	-2.94
3%	-1.85	-4.02	-1.49
4%	-0.67	-1.84	-1.61
5%	1.56	-3.02	-2.01
7%	0.76	0.33	-0.89
10%	-1.94	-1.09	-4.40

Table 3.7-5

Target PSD Compatible with Horizontal HRHF Seismic Input Motions

Frequency (f) Range f (Hz or cps)	Piecewise Linear Target PSD $S_H(f)$ (in^2/sec^4/cps)
$0.3 < f \leq 1.5$ Hz	$S_0(f) = 2\pi \times 6.85\ (0.3 / f)^{-0.4}$
$1.5 < f \leq 4.0$ Hz	$S_0(f) = 2\pi \times 13.04\ (1.5 / f)^{-0.2}$
$4.0 < f \leq 19$ Hz	$S_0(f) = 2\pi \times 15.86\ (4.0 / f)^{0.25}$
$19 < f \leq 40$ Hz	$S_0(f) = 2\pi \times 10.75\ (19.0 / f)^{1.1}$
$40 < f \leq 55$ Hz	$S_0(f) = 2\pi \times 4.75\ (40.0 / f)^{2.3}$
$55 < f \leq 70$ Hz	$S_0(f) = 2\pi \times 2.28\ (55.0 / f)^{4.5}$
$70 < f \leq 100$ Hz	$S_0(f) = 2\pi \times 0.76\ (70.0 / f)^{7.1}$

Table 3.7-6

Target PSD Compatible with Vertical HRHF Seismic Input Motions

Frequency (f) Range f (Hz or cps)	Piecewise Linear Target PSD S_H (f) (in²/sec⁴/cps)
$0.3 < f \leq 1.5$ Hz	$S_0(f) = 2\pi \times 3.44\ (0.3 / f)^{-0.5}$
$1.5 < f \leq 4.0$ Hz	$S_0(f) = 2\pi \times 7.69\ (1.5 / f)^{-0.1}$
$4.0 < f \leq 19$ Hz	$S_0(f) = 2\pi \times 8.49\ (4.0 / f)^{0.15}$
$19 < f \leq 40$ Hz	$S_0(f) = 2\pi \times 6.72\ (19.0 / f)^{0.3}$
$40 < f \leq 55$ Hz	$S_0(f) = 2\pi \times 5.38\ (40.0 / f)^{1.5}$
$55 < f \leq 70$ Hz	$S_0(f) = 2\pi \times 3.34\ (55.0 / f)^{3.9}$
$70 < f \leq 100$ Hz	$S_0(f) = 2\pi \times 1.31\ (70.0 / f)^{6.2}$

Table 3.7-7 (1 of 2)

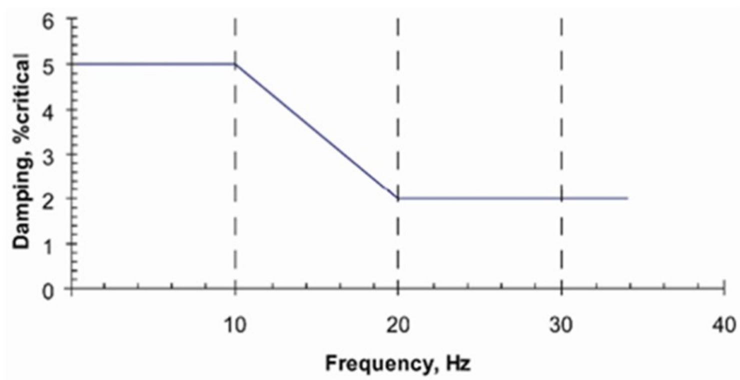
Damping Values

Category	Description	SSE	OBE
Structural Material	Welded steel or bolted steel with friction connections	4 %	3 %
	Bolted steel with bearing connections	7 %	5 %
	Prestressed concrete	5 %	3 %
	Reinforced concrete	7 %	4 %
Piping Systems	Piping systems(1)	4 %	3 %
Electrical Distribution Systems	Full cable trays and related supports(2)	10 %	7 %
	Empty cable trays and related supports	7 %	5 %
	Full conduits and related supports	7 %	5 %
	Empty conduits and related supports	5 %	3 %
HVAC Duct Systems	Pocket lock	10 %	7 %
	Companion angle	7 %	5 %
	Welded	4 %	3 %
Mechanical and Electrical Components	Motor, fan, compressor housings, pressure vessels, heat exchangers, pumps, and valve bodies	3 %	2 %
	Electrical cabinets, panels, and MCCs	3 %	2 %
	Welded instrument racks and tanks (impulsive mode) (3)	3 %	2 %

Table 3.7-7 (2 of 2)

(1) As an alternative for response spectrum analysis using an envelope of the SSE or OBE response spectra at all support points (uniform support motion), frequency-dependent damping values shown in the graph below may be used, subject to the following restrictions:

- Frequency-dependent damping should be used completely and consistently, if at all. Damping values for equipment other than piping are to be consistent with the values in the above table and NRC RG 1.61.
- Use of the specified damping values is limited only to response spectral analyses. Acceptance of the use of the specified damping values with other types of dynamic analyses (e.g., time-history analyses or independent support motion method) requires further justification.
- When used for reconciliation or support optimization of existing designs, the effects of increased motion on existing clearances and online mounted equipment should be checked.
- Frequency-dependent damping is not appropriate for analyzing the dynamic response of piping systems using supports designed to dissipated energy by yielding.
- Frequency-dependent damping is not applicable to piping in which stress corrosion cracking has occurred, unless a case-specific evaluation is provided, reviewed, and found acceptable by the NRC staff.



(2) The use of higher damping values for cable trays with flexible support systems (e.g., rod-hung trapeze systems, strut-hung trapeze systems, and strut-type cantilever and braced cantilever support systems) is permissible, subject to obtaining Regulatory Authority’s review for acceptance on a case-by-case basis.

(3) Use 0.5 % damping for sloshing mode for tanks.

Table 3.7-8

Foundation Embedment Depth, Foundation Size, and Total Height of Seismic Category I Structures

Structures	Foundation Embedment Depth, m (ft)	Foundation Size, m (ft)	Maximum Height, m (ft)
Nuclear Island – Reactor Containment Building – Auxiliary Building	See note 1. 16.4 (53′-8″)	Radius 25.6 (84′-0″) 107.3 × 88.1 (352′-0″ × 289′-0″)	87.9 (288′-6″) 56.4 (185′-0″)
Emergency Diesel Generator (EDG) Building Diesel Fuel Oil Tank (DFOT) Room	2.0 (6′-8″) 12.1 (39′-8″)	39.9 × 18.3 (131′-0” × 60′-0″) 20.3 × 18.3 (66′-6″ × 60′-0″)	17.8 (58′-6″) 18.7 (61′-6″)

(1) The auxiliary building wraps around the reactor containment building with a minimum of 6 inches seismic gap.

Table 3.7-9 (1 of 2)

Summary of Models and Analysis Methods

Model	Analysis Method/Damping	Program	Type of Dynamic Response/Purpose	DCD/TeR Subsections
Reactor containment building fine-mesh model for seismic analysis (Uncracked stiffness model)	• Modal analysis • Direct integration time- history analysis • OBE damping	ANSYS	To verify the mesh sizes of the reactor containment building coarse-mesh model for seismic analysis	Technical Report APR1400-E-S-NR-14002-P, Section 3
Auxiliary building fine-mesh model for seismic analysis (Uncracked stiffness model)	• Modal analysis • Direct integration time- history analysis • OBE damping	ANSYS	To verify the mesh sizes of the auxiliary building coarse-mesh model for seismic analysis	Technical Report APR1400-E-S-NR-14002-P, Section 4
Reactor containment building coarse-mesh model for seismic analysis (Uncracked stiffness model)	• Modal analysis • Direct integration time- history analysis • OBE damping	ANSYS	To create and verify the SASSI reactor containment building model for seismic analysis	Technical Report APR1400-E-S-NR-14002-P, Section 3
Auxiliary building coarse-mesh model for seismic analysis (Uncracked stiffness model)	• Modal analysis • Direct integration time- history analysis • OBE damping	ANSYS	To create and verify the SASSI auxiliary building model for seismic analysis	Technical Report APR1400-E-S-NR-14002-P, Section 4
SASSI reactor containment building model for seismic analysis (Uncracked stiffness model)	• Complex frequency response analysis • OBE damping	ACS SASSI	To create the SASSI combined nuclear island model for seismic analysis	Technical Report APR1400-E-S-NR-14002-P, Section 5
SASSI auxiliary building model for seismic analysis (Uncracked stiffness model)	• Complex frequency response analysis • OBE damping	ACS SASSI	To create the SASSI combined nuclear island model for seismic analysis	Technical Report APR1400-E-S-NR-14002-P, Section 5

Table 3.7-9 (2 of 2)

Model	Analysis Method/Damping	Program	Type of Dynamic Response/Purpose	DCD/TeR Subsections
SASSI combined nuclear island model for seismic analysis (Cracked and uncracked stiffness models)	• Complex frequency response analysis • OBE damping for uncracked stiffness model • SSE damping for cracked stiffness model	ACS SASSI	• To perform seismic analyses for eight generic soil profiles and one fixed-base case • To develop time histories for generating plant design in-structure response spectra • To obtain maximum absolute nodal acceleration • To obtain maximum displacements relative to the basemat and the free-field • To obtain maximum story shear forces and moments	Technical Report APR1400-E-S-NR-14002-P, Section 6
EDG building (include DFOT room) model for seismic analysis (Uncracked stiffness model)	• Modal analysis • OBE damping	GTSTRUDL	• To create and verify the SASSI EDG building (include DFOT room) model for seismic analysis	Subsection 3.7.2.3.3.2
SASSI EDG building (include DFOT room) model for seismic analysis (Cracked and uncracked stiffness models)	• Complex frequency response analysis • OBE damping for uncracked stiffness model • SSE damping for cracked stiffness model	ACS SASSI	• To perform seismic analyses for eight generic soil profiles and one fixed-base case • To develop time histories for generating plant design in-structure response spectra • To obtain maximum absolute nodal acceleration • To obtain maximum displacements relative to the basemat and the free-field • To obtain maximum story shear forces and moments	Subsection 3.7.2.3.3.2

Table 3.7-10

Summary of Modal Properties of Reactor Containment Building
Containment Structure

Modes	Natural Frequency (Hz)	Mass Ratio	Direction
11	3.49	18.2 %	X (E-W)
12	3.58	15.7 %	Y (N-S)
30	10.60	22.5 %	Z (Vertical)
98	19.55	1.1 %	Drumming

Table 3.7-11

Summary of Modal Properties of Reactor Containment Building
Internal Structure

Modes	Natural Frequency (Hz)	Mass Ratio	Direction
18	6.27	4.1 %	Y (N-S)
28	9.72	6.1 %	X (E-W)
25	8.61	1.5 %	Y (N-S)
29	9.93	5.1 %	X (E-W)
132	23.41	8.0 %	Z (Vertical)

Table 3.7-12

Summary of Modal Properties of Auxiliary Building

Modes	Natural Frequency (Hz)	Mass Ratio	Direction
76	5.35	37.5 %	Y (N-S)
75	5.16	18.5 %	X (E-W)
81	5.79	13.9 %	X (E-W)
75	5.16	12.3 %	Y (N-S)
76	5.35	10.7 %	X (E-W)
171	14.52	4.2 %	Z (VT)
140	12.65	3.8 %	Z (VT)

Table 3.7-13

Summary of Modal Properties of Emergency Diesel Generator Building

EDG Building

Modes	Natural Frequency (Hz)	Mass Ratio	Direction
1	11.79	61.3 %	X (E-W)
2	13.74	56.9 %	Y (N-S)
7	17.87	13.69 %	Z (Vertical)

DFOT Room

Modes	Natural Frequency (Hz)	Mass Ratio	Direction
1	13.35	31.87 %	X (E-W)
3	17.01	51.17 %	Y (N-S)
10	28.92	14.74 %	Z (Vertical)

Table 3.7-14

Maximum Response Accelerations of Reactor Containment Building
Containment Structure

Maximum Response Accelerations of Reactor Containment Building (g)				
		Direction		
Structure	Elevation (ft)	X	Y	Z
Containment Structure	78	0.353	0.396	0.398
	90	0.443	0.443	0.416
	104	0.588	0.581	0.452
	118	0.719	0.682	0.495
	124	0.761	0.705	0.525
	132	0.746	0.721	0.563
	160	0.807	0.805	0.692
	180	0.943	0.879	0.776
	196	1.026	0.983	0.844
	216	1.061	1.160	0.926
	241	1.228	1.439	1.023
	255	1.316	1.484	1.071
	275	1.406	1.522	1.127
	302	1.545	1.738	1.272
	328	1.686	1.893	1.457
	332	1.700	1.901	1.529

Table 3.7-15

Maximum Relative Displacements of Reactor Containment Building
Containment Structure

Elevation (ft)	Maximum Displacements Relative to Basemat (in)		
	X-direction	Y-direction	Z-direction
78	0.0906	0.0965	0.3322
90	0.1806	0.1962	0.3429
104	0.3372	0.3239	0.3807
118	0.4908	0.4593	0.4161
124	0.5520	0.5243	0.4290
132	0.6339	0.6011	0.4480
160	0.9273	0.8712	0.5062
180	1.1415	1.0991	0.5454
196	1.3047	1.2676	0.5745
216	1.5239	1.4815	0.6057
241	1.7880	1.7381	0.6342
255	1.9243	1.8747	0.6454
275	2.1183	2.0807	0.6302
302	2.3529	2.3466	0.5183
332	2.6010	2.6096	0.1349

Table 3.7-16

Maximum Member Forces of Reactor Containment Building
Containment Structure

Seismic Force and Moment (kips, ft)						
Elevation (ft)	Fx	Fy	Fz	Mx	My	Mz
307.5	1.195E+04	1.224E+04	1.169E+04	1.762E+05	1.779E+05	1.130E+04
281	2.305E+04	2.365E+04	2.187E+04	7.281E+05	7.241E+05	3.730E+04
254.5	3.047E+04	3.147E+04	2.887E+04	1.562E+06	1.541E+06	6.021E+04
241	3.459E+04	3.586E+04	3.294E+04	2.102E+06	2.067E+06	7.395E+04
220	4.543E+04	4.722E+04	4.172E+04	3.222E+06	3.116E+06	1.034E+05
200	5.117E+04	5.327E+04	4.842E+04	4.326E+06	4.184E+06	1.247E+05
178	5.587E+04	5.823E+04	5.461E+04	5.634E+06	5.456E+06	1.432E+05
156	5.959E+04	6.205E+04	6.000E+04	7.023E+06	6.798E+06	1.640E+05
136	6.163E+04	6.488E+04	6.357E+04	8.315E+06	8.054E+06	1.779E+05
130	6.255E+04	6.609E+04	6.489E+04	8.713E+06	8.439E+06	1.837E+05
125	6.255E+04	6.609E+04	6.489E+04	9.037E+06	8.747E+06	1.837E+05
114	6.497E+04	6.879E+04	6.726E+04	9.777E+06	9.458E+06	1.929E+05
100	6.660E+04	7.086E+04	6.908E+04	1.071E+07	1.036E+07	1.989E+05
78	6.795E+04	7.249E+04	7.098E+04	1.223E+07	1.177E+07	2.037E+05

Table 3.7-17

Maximum Response Accelerations of Reactor Containment Building Internal Structure

Maximum Response Accelerations of Internal Structure (g)				
Structure	Elevation (ft)	Direction		
		X	Y	Z
Primary Shield Wall	66	0.333	0.367	0.392
	78	0.360	0.412	0.406
	100	0.413	0.447	0.466
	107	0.433	0.441	0.519
	114	0.504	0.467	0.544
	130	0.488	0.455	0.561
	137	0.539	0.518	0.600
	156	1.011	0.993	1.019
	191a	1.218	4.937	0.880
	191b	1.647	1.629	1.068
Secondary Shield Wall	78	0.350	0.391	0.395
	100a	0.459	0.474	0.508
	100b	0.520	0.533	0.403
	107	0.543	0.493	0.562
	114	0.613	0.501	0.616
	130	0.631	0.677	0.722
	137	0.690	0.772	0.748
	156	1.182	1.073	0.906
	191	2.524	4.846	1.217
Slabs	66	-	-	0.381
	100	-	-	0.800
	107	-	-	0.452
	111	-	-	0.858
	114	-	-	0.780
	125	-	-	0.768
	156	-	-	0.796

191a : Primary shield wall top
191b : Pressurizer room corners
100a : Secondary shield wall interface with concrete pedestal top
100b : In-containment refueling water storage tank walls

Table 3.7-18

Maximum Relative Displacements of Reactor Containment Building Internal Structure

Structure	Elevation (ft)	Maximum Displacements Relative to Basemat (inches)		
		X-direction	Y-direction	Z-direction
Primary Shield Wall	66	0.0396	0.0435	0.1305
	78	0.0853	0.0906	0.1310
	100	0.1741	0.1825	0.1613
	107	0.2015	0.2103	0.1670
	114	0.2337	0.2449	0.1685
	130	0.2952	0.3119	0.1701
	137	0.3268	0.3499	0.1616
	156	0.4515	0.4838	0.2548
	191a	0.5719	1.5790	0.1755
	191b	0.6315	0.6136	0.2573
Secondary Shield Wall	78	0.0843	0.0939	0.2155
	100a	0.1754	0.1842	0.2247
	100b	0.1730	0.1792	0.2820
	107	0.2039	0.2134	0.2275
	114	0.2362	0.2494	0.2286
	130	0.3115	0.3294	0.2337
	137	0.3424	0.3622	0.2356
	156	0.4492	0.4672	0.2411
	191	0.6630	1.5572	0.2440

Table 3.7-19

Maximum Member Forces of Reactor Containment Building
Internal Structure

Seismic Force and Moment (kips, ft)							
Structure	Elevation (ft)	Fx	Fy	Fz	Mx	My	Mz
Primary Shield Wall	156	2.207E+03	4.327E+03	1.634E+03	1.043E+05	5.266E+04	5.207E+04
	136.5	5.137E+03	5.070E+03	4.599E+03	1.882E+05	1.885E+05	9.742E+04
	130	6.243E+03	5.756E+03	5.861E+03	2.139E+05	2.543E+05	1.177E+05
	114	8.532E+03	7.179E+03	8.580E+03	2.983E+05	4.092E+05	1.424E+05
	100	1.048E+04	8.982E+03	1.128E+04	3.991E+05	5.531E+05	1.566E+05
	78	1.181E+04	1.097E+04	1.385E+04	5.920E+05	7.697E+05	1.529E+05
	66	1.224E+04	1.152E+04	1.445E+04	7.244E+05	9.092E+05	1.520E+05
Secondary Shield Wall	191	2.409E+02	2.644E+02	1.394E+02	4.395E+03	6.691E+03	1.002E+04
	156	5.259E+03	5.172E+03	3.506E+03	1.580E+05	1.619E+05	7.571E+04
	136.5	1.045E+04	7.637E+03	8.318E+03	3.285E+05	4.248E+05	1.151E+05
	130	1.245E+04	8.644E+03	1.070E+04	4.007E+05	5.440E+05	1.306E+05
	114	1.395E+04	9.768E+03	1.275E+04	5.306E+05	7.640E+05	1.467E+05
	100	1.532E+04	1.104E+04	1.507E+04	6.847E+05	9.775E+05	1.626E+05
	78	2.229E+04	2.011E+04	2.517E+04	9.991E+05	1.460E+06	1.805E+05

Table 3.7-20

Maximum Response Accelerations of Auxiliary Building

Maximum Response Accelerations of Auxiliary Building (g)					
Shear Wall				Floor	
	Direction				Direction
Elevation (ft)	X	Y	Z	Elevation (ft)	Z
55	0.304	0.314	0.402	55	0.359
68	0.385	0.370	0.424	68	0.749
78	0.441	0.466	0.468	78	1.267
100	0.677	0.801	0.526	100	1.452
120	0.932	1.190	0.687	120	2.107
137.5	1.093	1.499	0.794	137.5	1.974
156	1.340	1.905	0.892	156	2.241
174	2.085	2.126	0.963	174	2.83
195	2.099	2.187	0.931	195	1.543
195a	2.067	1.312	0.884	195a	1.389
216.75	2.423	2.688	1.003	216.75	3.477
213	2.262	1.530	0.941	213	2.326
213.5	2.154	1.702	1.035	213.5	2.443
195b	1.826	1.520	1.013	195c	2.884
114	0.754	0.669	0.670	114	0.926

195a: Main control room roof
195b: Fuel handling area
195c: Control area 2 emergency exhaust ACU and normal exhaust ACU

Table 3.7-21

Maximum Relative Displacements of Auxiliary Building

Floor Label	Floor Elevation	Maximum Displacement Relative to Basemat (inches)			
		X-direction	Y-direction	Z-direction (Wall)	Z-direction (Slab)
1-F	55'-0"	0.0857	0.0762	0.2525	0.1864
1-M	68'-0"	0.0982	0.990	0.2790	0.2446
2-F	78'-0"	0.1333	0.1674	0.2966	0.2804
3-F	100'-0"	0.2882	0.3747	0.3302	0.2154
4-F	120'-0"	0.4525	0.6397	0.3458	0.2581
5-F	137'-6"	0.5694	0.7879	0.3560	0.2947
6-F	156'-0"	0.6872	0.9541	0.3666	0.2622
7-F	174-'0"	0.8761	1.0461	0.3751	0.2679
8-1	195'-0"	0.9516	0.9842	0.2280	0.1590
8-M	195'-0"	0.9410	0.6651	0.1129	0.1161
8-2	216'-9"	1.0706	1.3213	0.2452	0.3583
8-3	213'-0"	1.0344	0.7538	0.1326	0.1704
8-4	213'-6"	0.9695	0.9637	0.3854	0.6291
8-5	195'-0"	0.8499	0.9060	0.3825	0.2353
3-M	114'-0"	0.3610	0.3703	0.2035	0.1468

Table 3.7-22

Maximum Member Forces of Auxiliary Building

Seismic Force and Moment (kips, ft)						
Elevation (ft)	Fx	Fy	Fz	Mx	My	Mz
213.5(1)	5425	7174	2920	314174	197979	637117
213(1)	14787	13126	5504	478184	711285	1502367
195(1)	19263	17401	6656	765341	945752	1981261
195(2)	10174	7661	5262	184377	550634	706529
174	68233	66361	30736	2430827	2518524	2257363
156	101579	111413	54516	4762013	4780395	3153872
137.5	143267	165299	88733	7929215	7729526	3683445
120	193300	222571	124868	12005966	11199955	4453282
98.5	240185	282559	162898	18111608	16597000	5502930
77	277236	335937	203768	25105085	22507797	6211047
67	293250	358622	225936	28399238	25433525	6478492
55	300911	369591	238280	32392109	28921247	6596912

(1) East part of Auxiliary Building

(2) West part of Auxiliary Building

Table 3.7-23

Maximum Response Accelerations of EDG Building

EDG Building

Slab Elevation	E-W (g)	N-S (g)	Vertical (g)
100′-0″	0.59	0.49	0.33
135′-0″	0.82	0.82	0.45

DFOT Room

Slab Elevation	E-W (g)	N-S (g)	Vertical (g)
63′-0″	0.48	0.37	0.38
100′-0″	0.81	0.90	0.45

Table 3.7-24

Maximum Relative Displacements of EDG Building

EDG Building

Elevation	E-W Direction (in)	N-S Direction (in)	Vertical Direction (in)
135′-0″	0.139	0.085	0.003

DFOT Room

Elevation	E-W Direction (in)	N-S Direction (in)	Vertical Direction (in)
100′-0″	0.075	0.081	0.004

Table 3.7-25

Maximum Member Forces of EDG Building

EDG Building

Seismic Force and Moment (kips, ft)						
Elevation	Fx	Fy	Fz	Mx	My	Mz
135′-0″	2860	2847	1576	50245	37590	19318
100′-0″	9995	8745	5578	347885	342807	66603

DFOT Room

Seismic Force and Moment (kips, ft)						
Elevation	Fx	Fy	Fz	Mx	My	Mz
100′-0″	1051	1170	591	19570	15292	22701
63′-0″	4569	3865	3361	138428	155258	39058

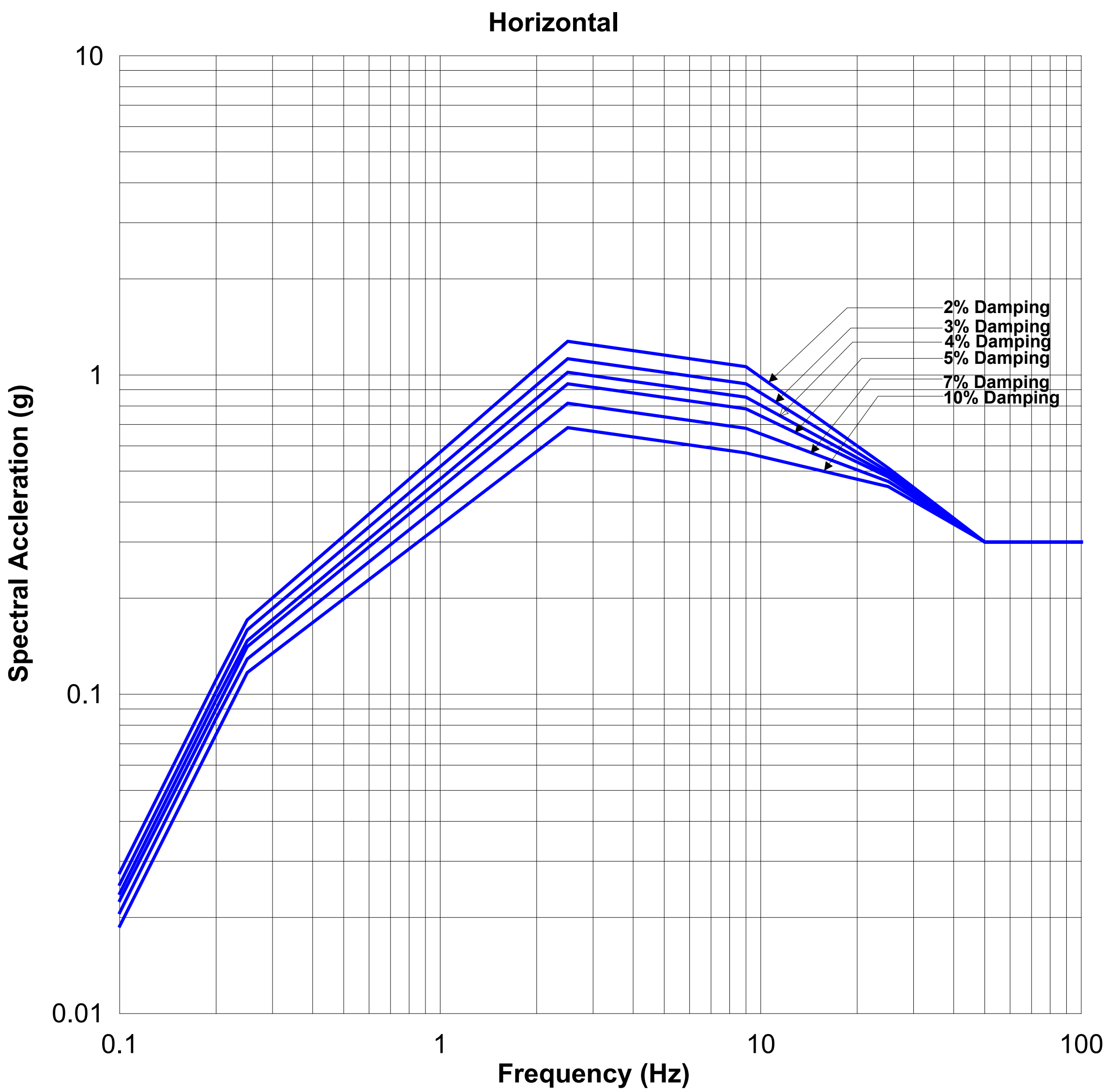


Figure 3.7-1   Horizontal CSDRS

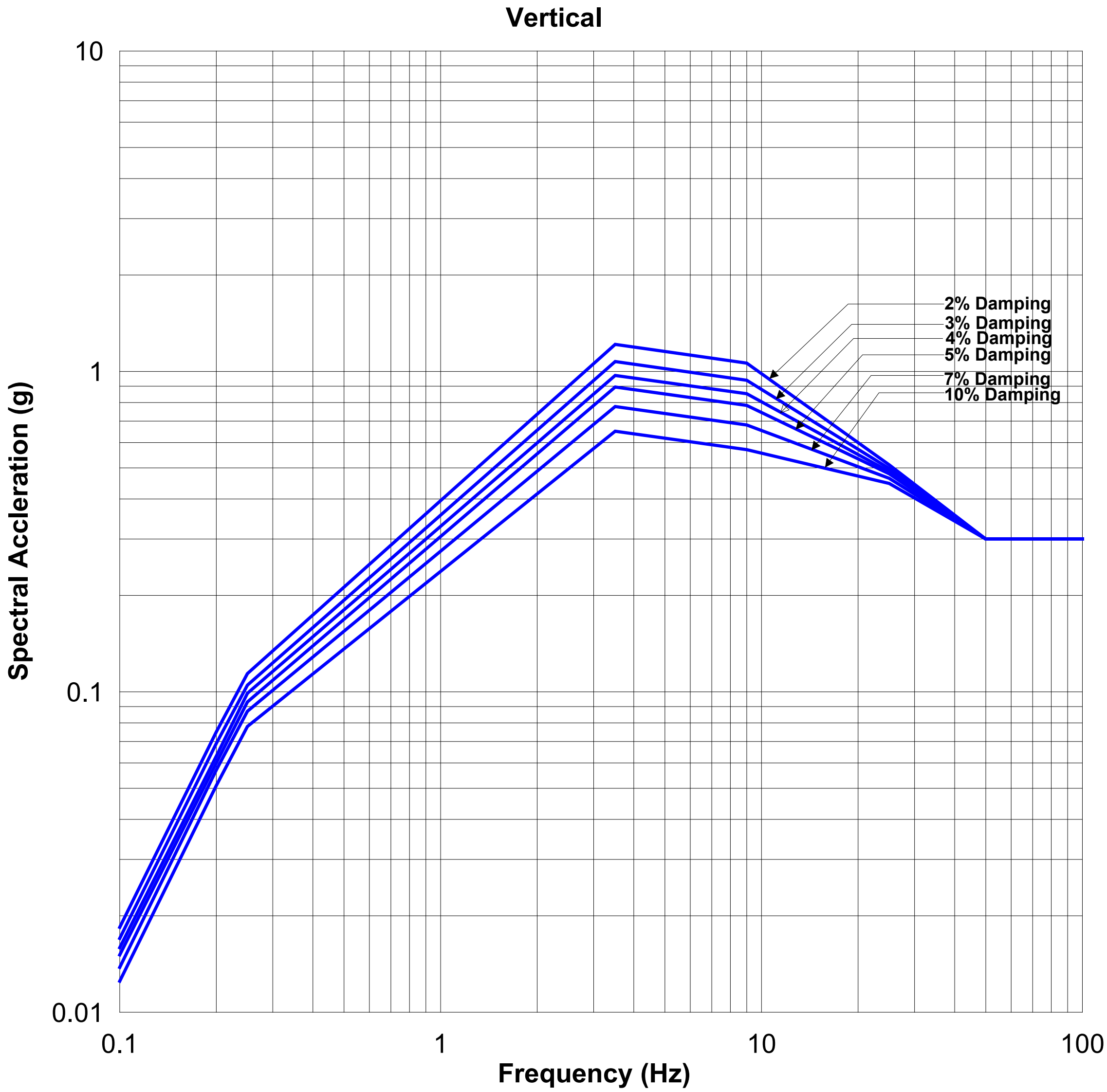


Figure 3.7-2 Vertical CSDRS

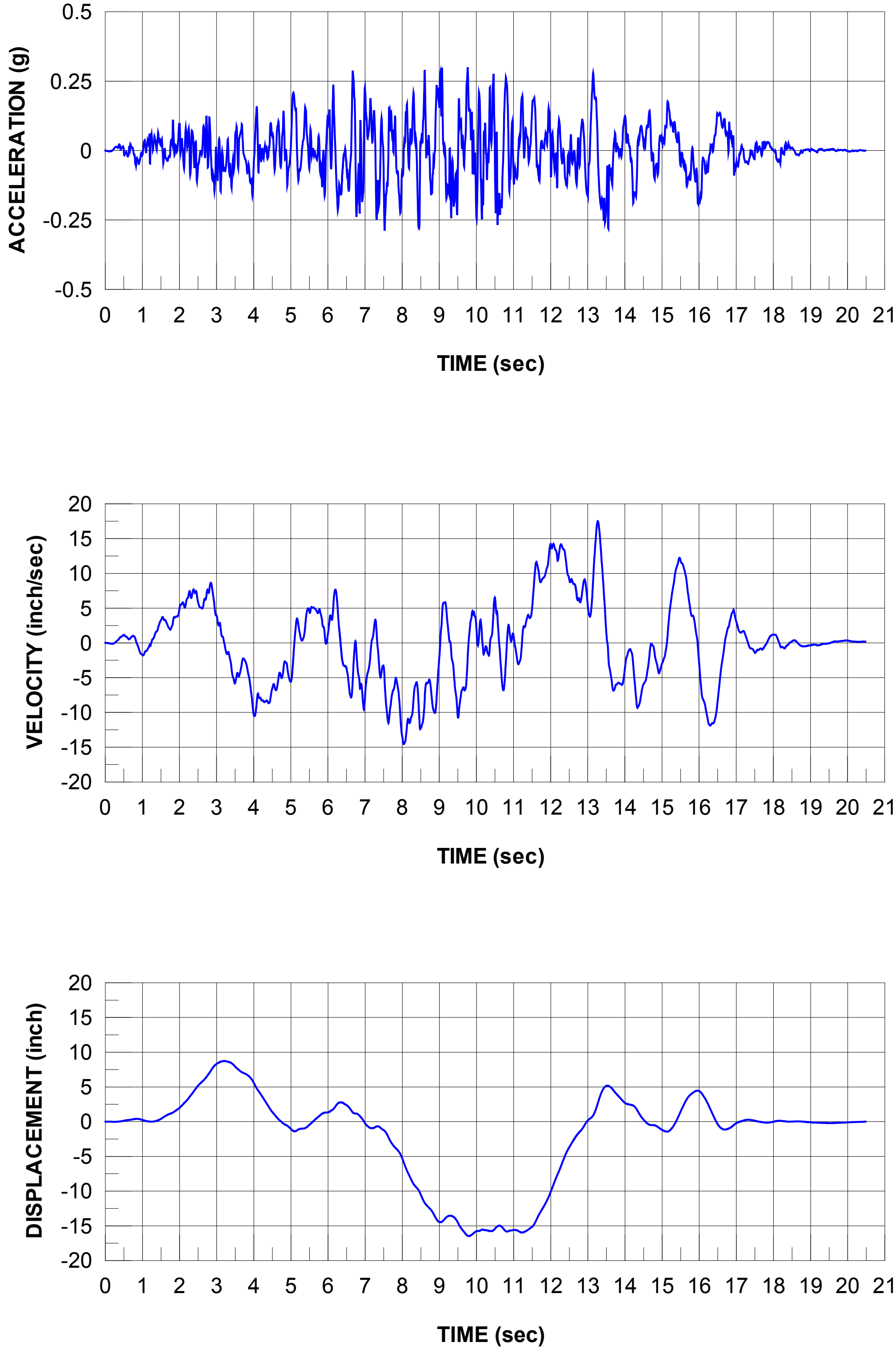


Figure 3.7-3 Acceleration, Velocity, and Displacement of H1 Design Ground Motion

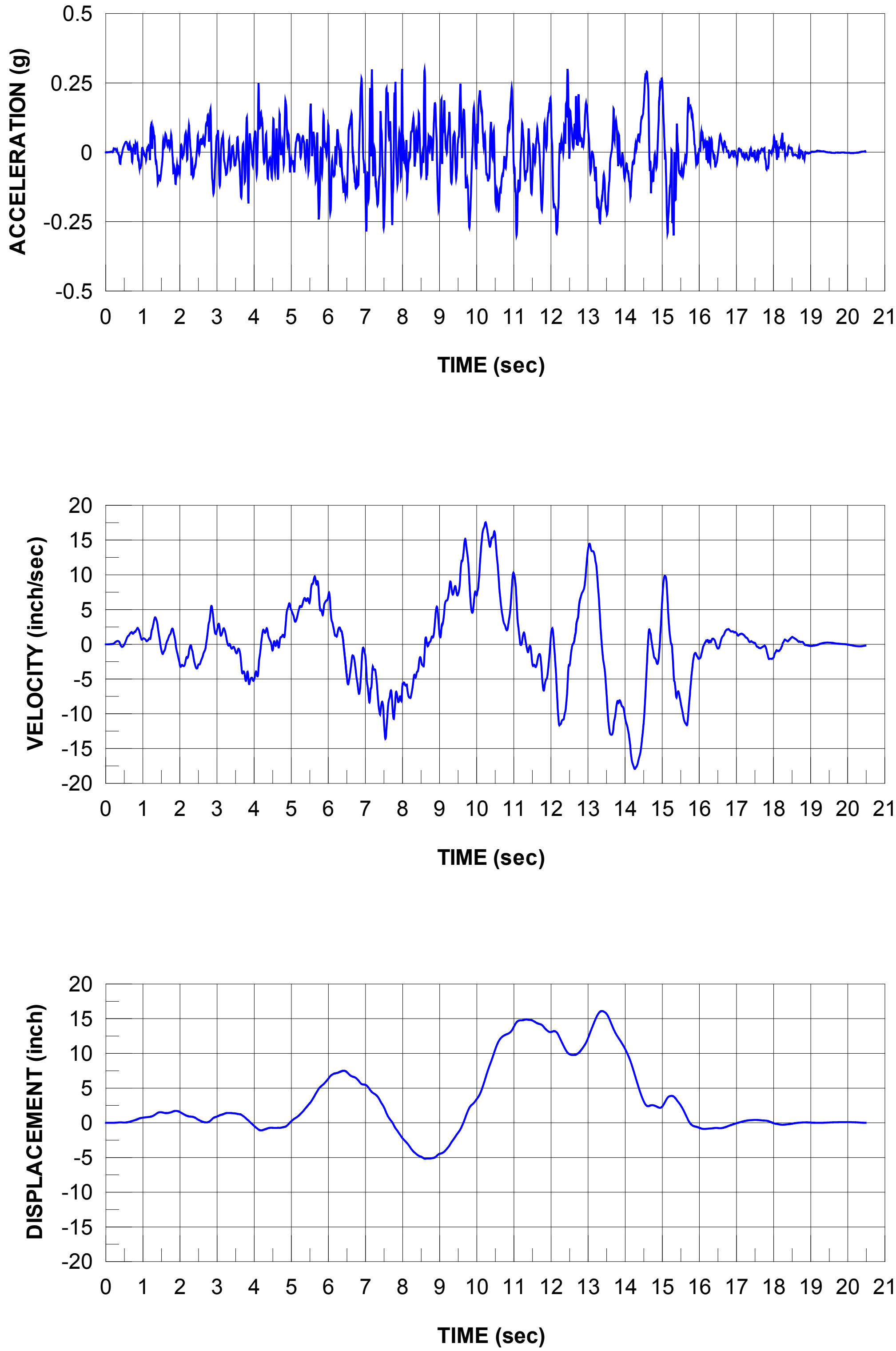


Figure 3.7-4 Acceleration, Velocity, and Displacement of H2 Design Ground Motion

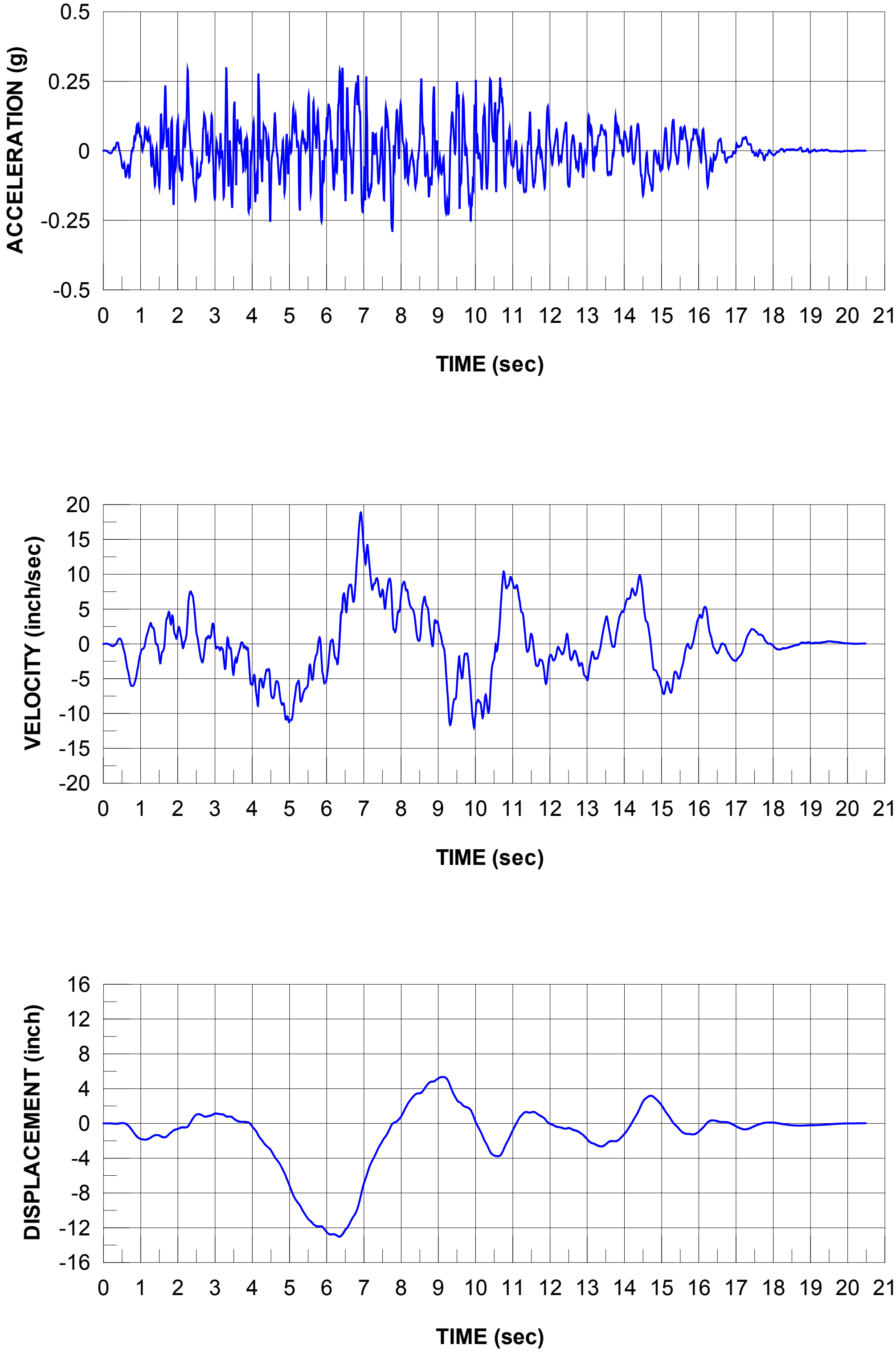


Figure 3.7-5 Acceleration, Velocity, and Displacement of VT Design Ground Motion

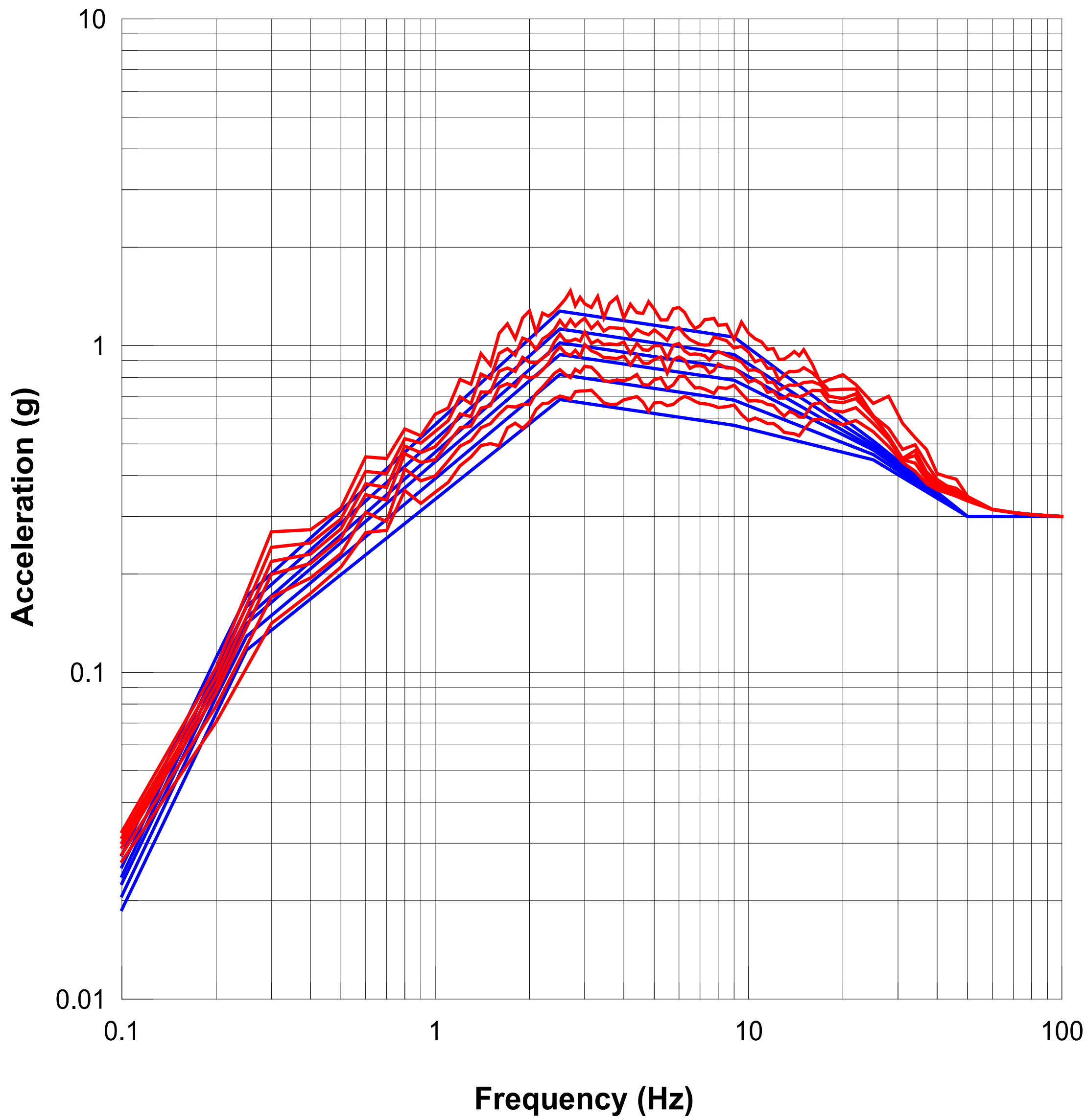


Figure 3.7-6 Comparison of Response Spectra of H1 Design Ground Motion and CSDRS

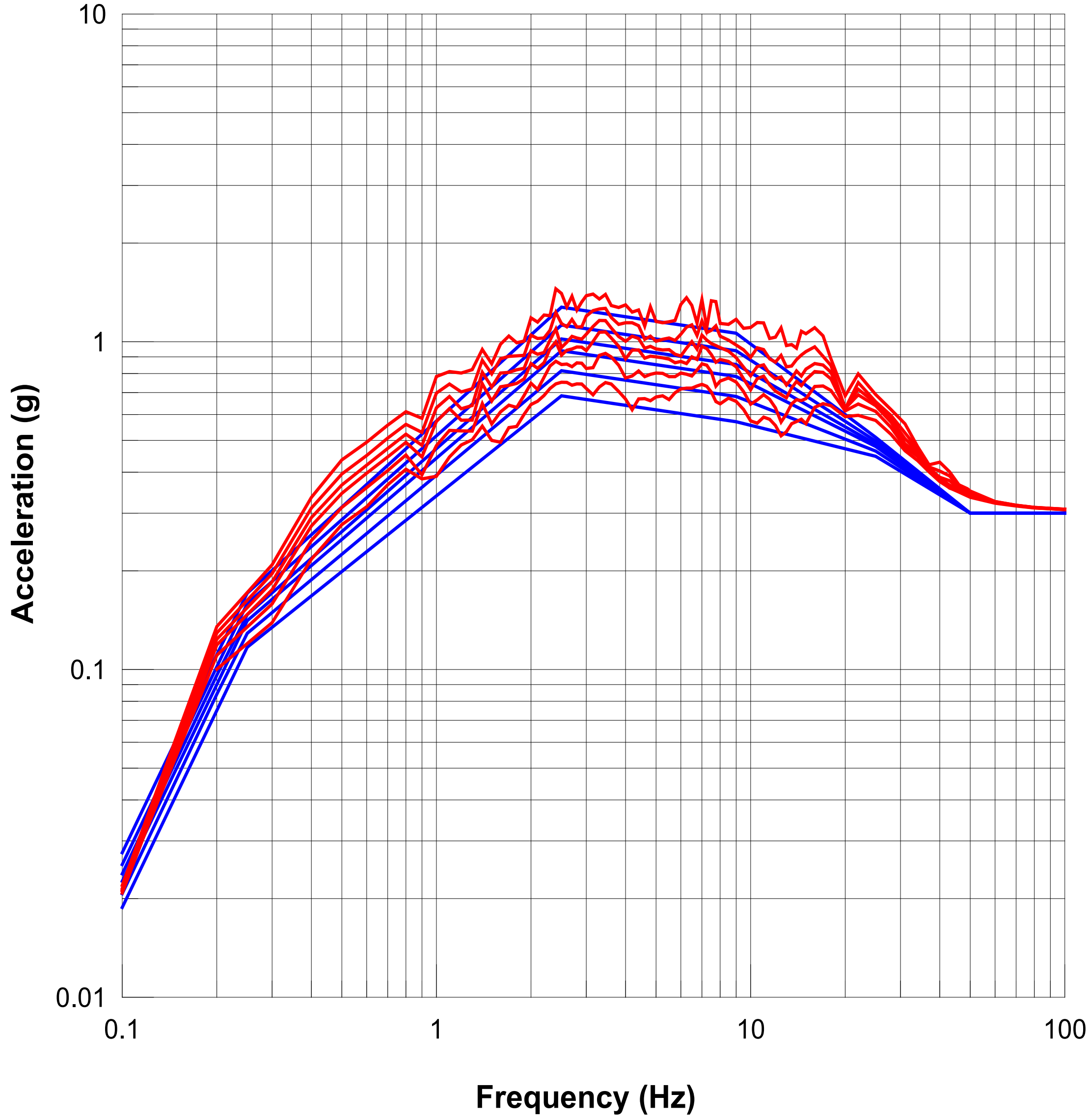


Figure 3.7-7 Comparison of Response Spectra of H2 Design Ground Motion and CSDRS

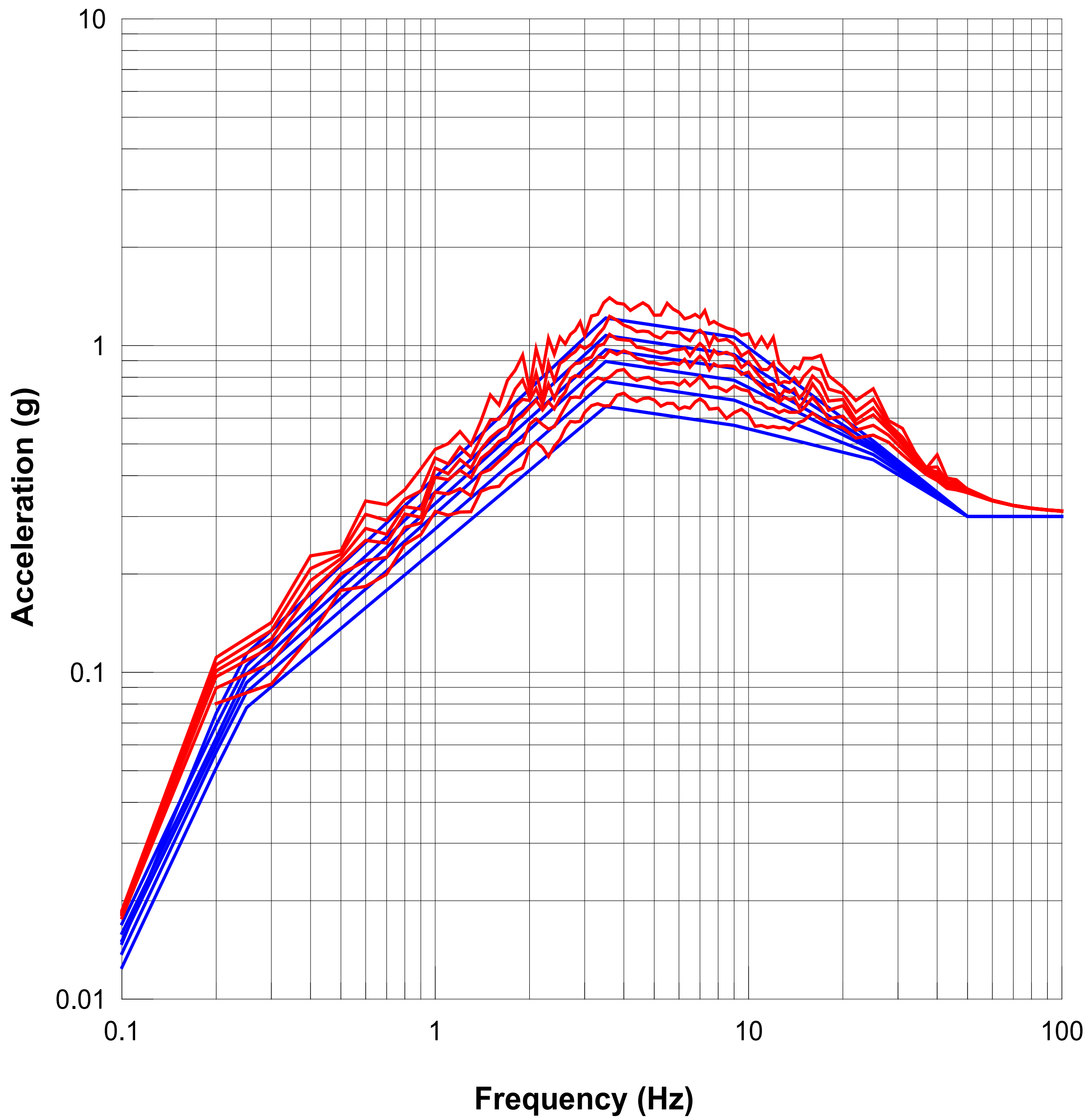
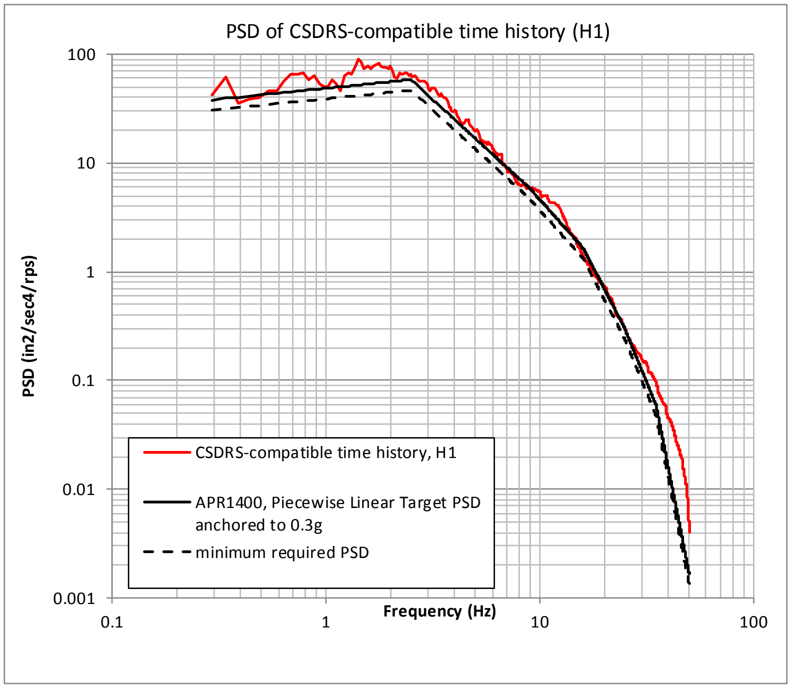
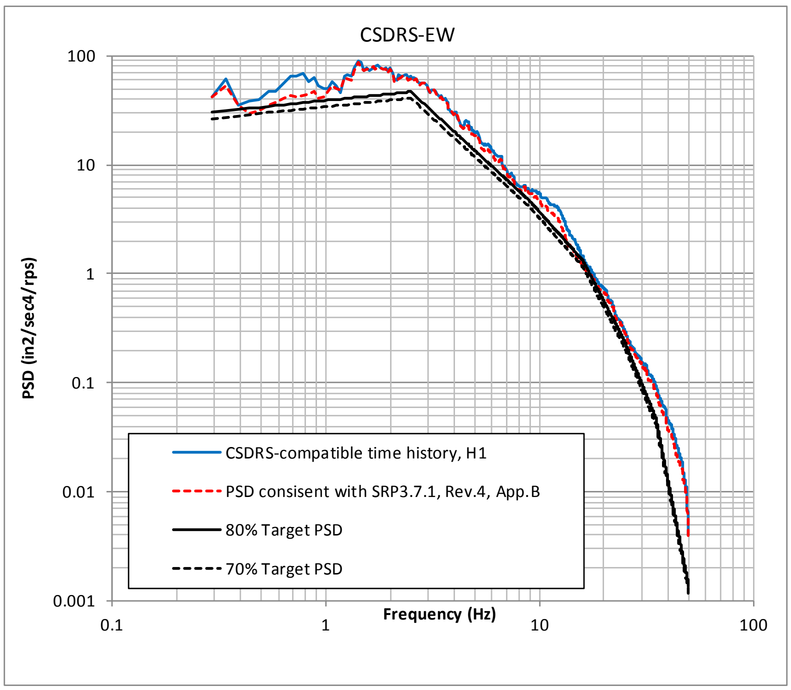


Figure 3.7-8 Comparison of Response Spectra of VT Design Ground Motion and CSDRS

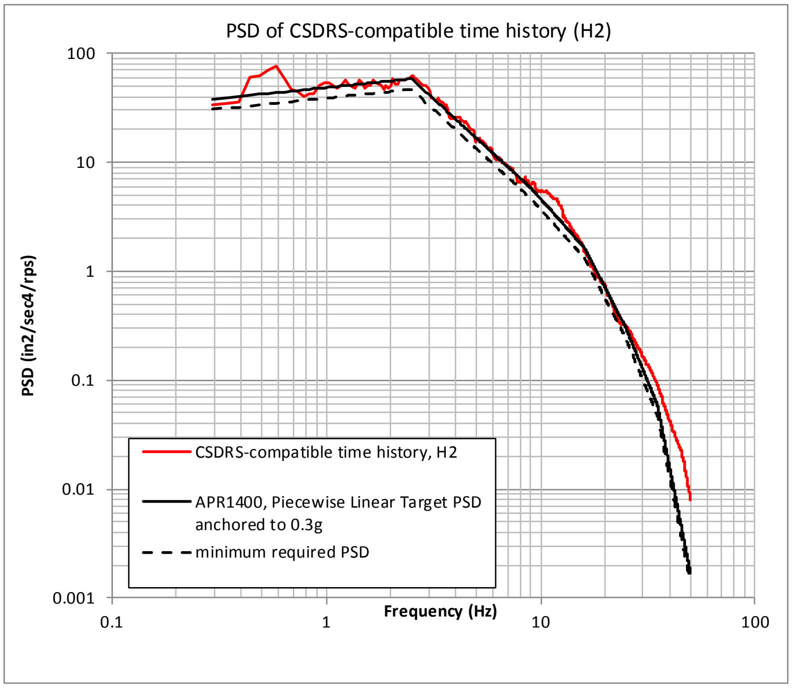


(a) Comparison of PSD of H1 Design Ground Motion and Target PSD and Minimum Required PSD

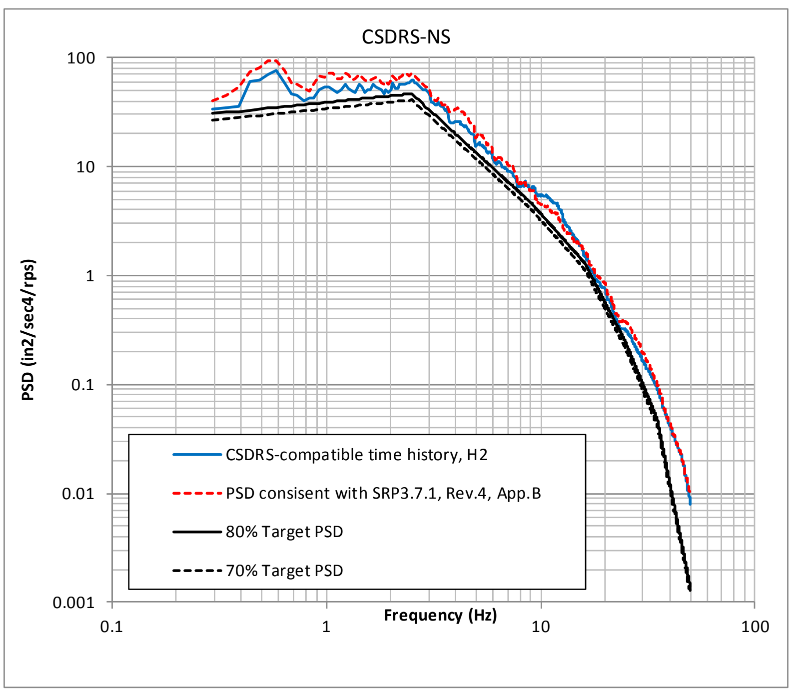


(b) Comparison of PSD for H1 Design Ground Motion and PSD Consistent with SRP 3.7.1, Rev.4, Appendix B

Figure 3.7-9 Comparison of PSD for H1 Design Ground Motion

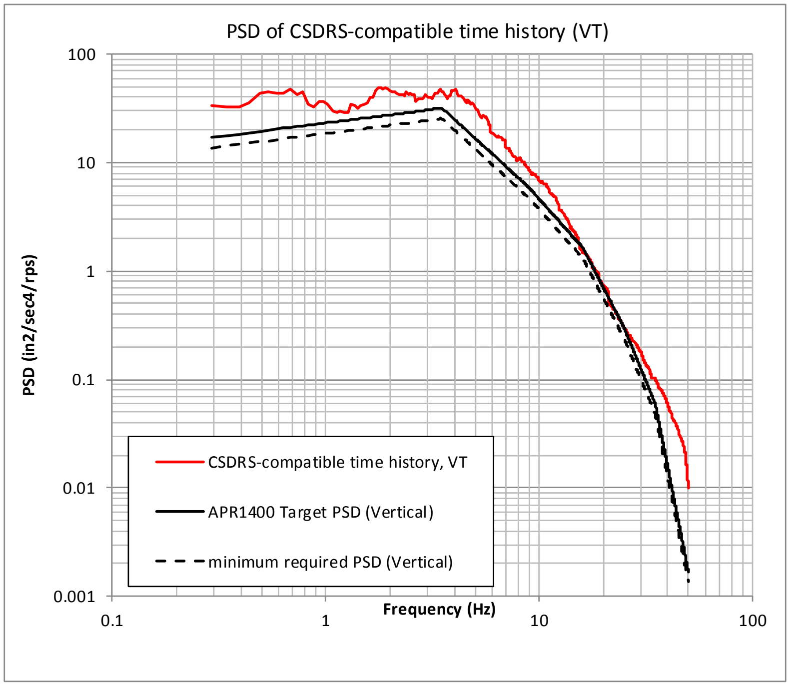


(a) Comparison of PSD of H2 Design Ground Motion and Target PSD and Minimum Required PSD

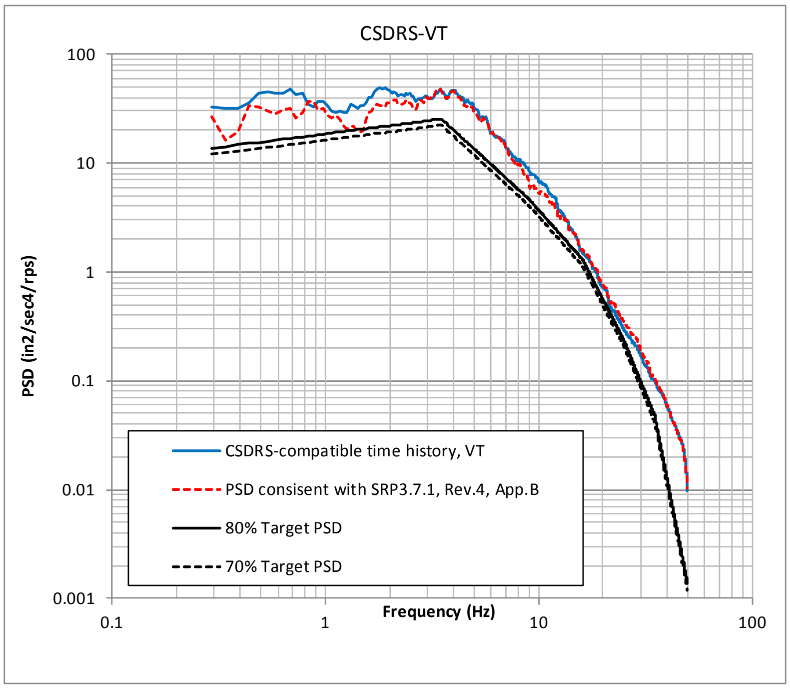


(b) Comparison of PSD for H2 Design Ground Motion and PSD Consistent with SRP 3.7.1, Rev.4, Appendix B

Figure 3.7-10 Comparison of PSD for H2 Design Ground Motion



(a) Comparison of PSD of VT Design Ground Motion and Target PSD and Minimum Required PSD



(b) Comparison of PSD for VT Design Ground Motion and PSD Consistent with SRP 3.7.1, Rev.4, Appendix B

Figure 3.7-11 Comparison of PSD for VT Design Ground Motion

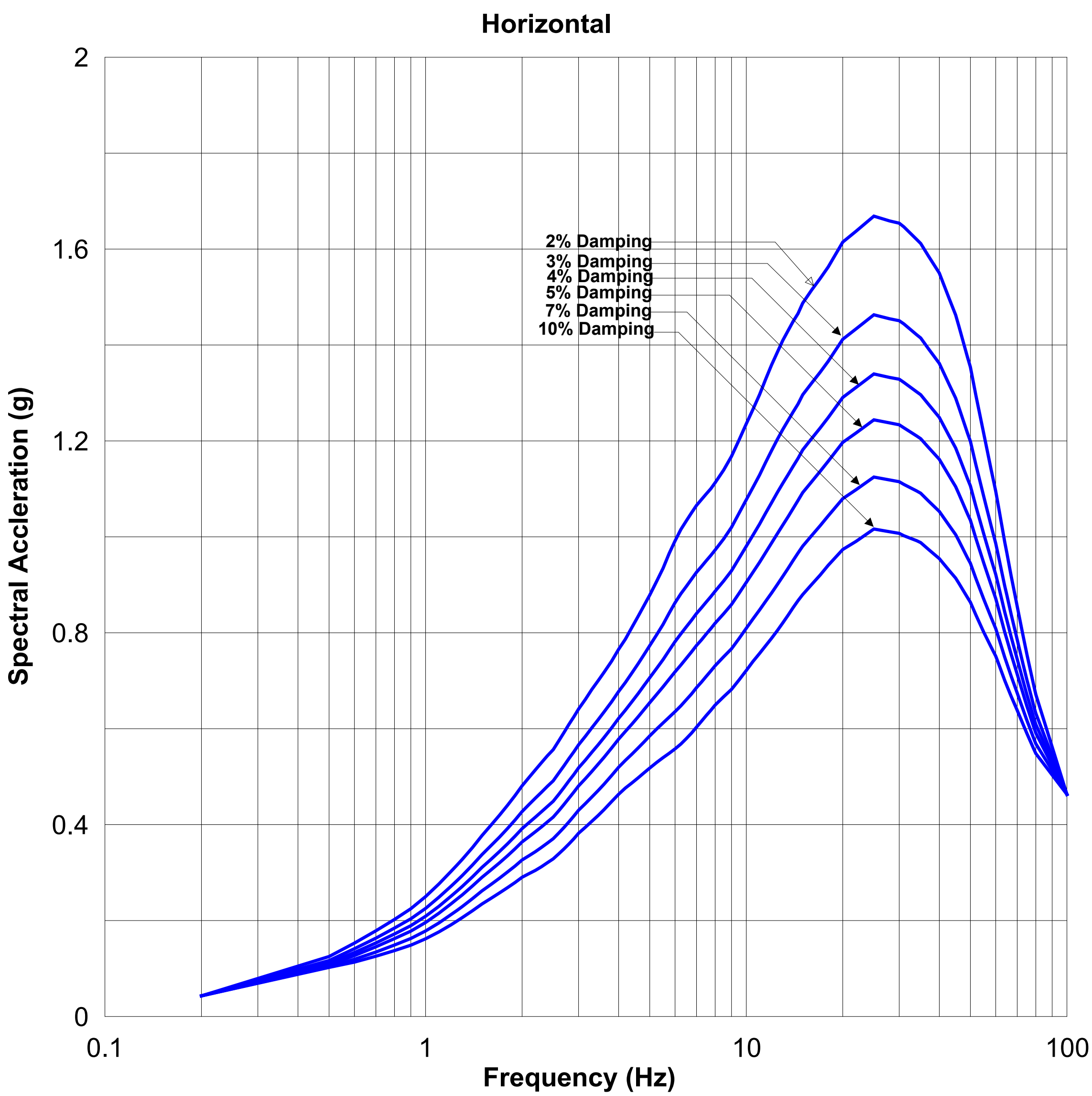


Figure 3.7-12 HRHF Horizontal Target Response Spectra

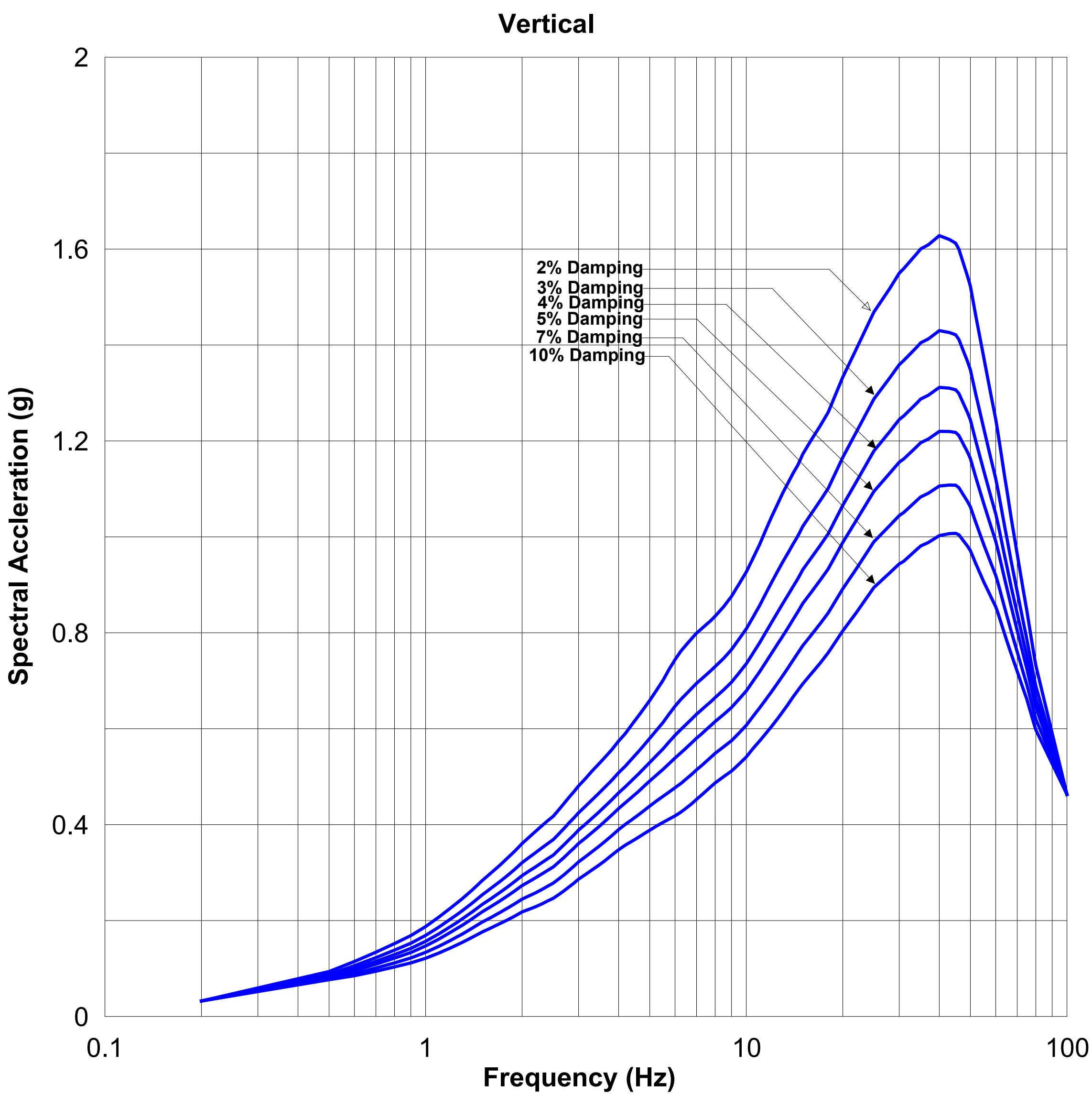


Figure 3.7-13 HRHF Vertical Target Response Spectra

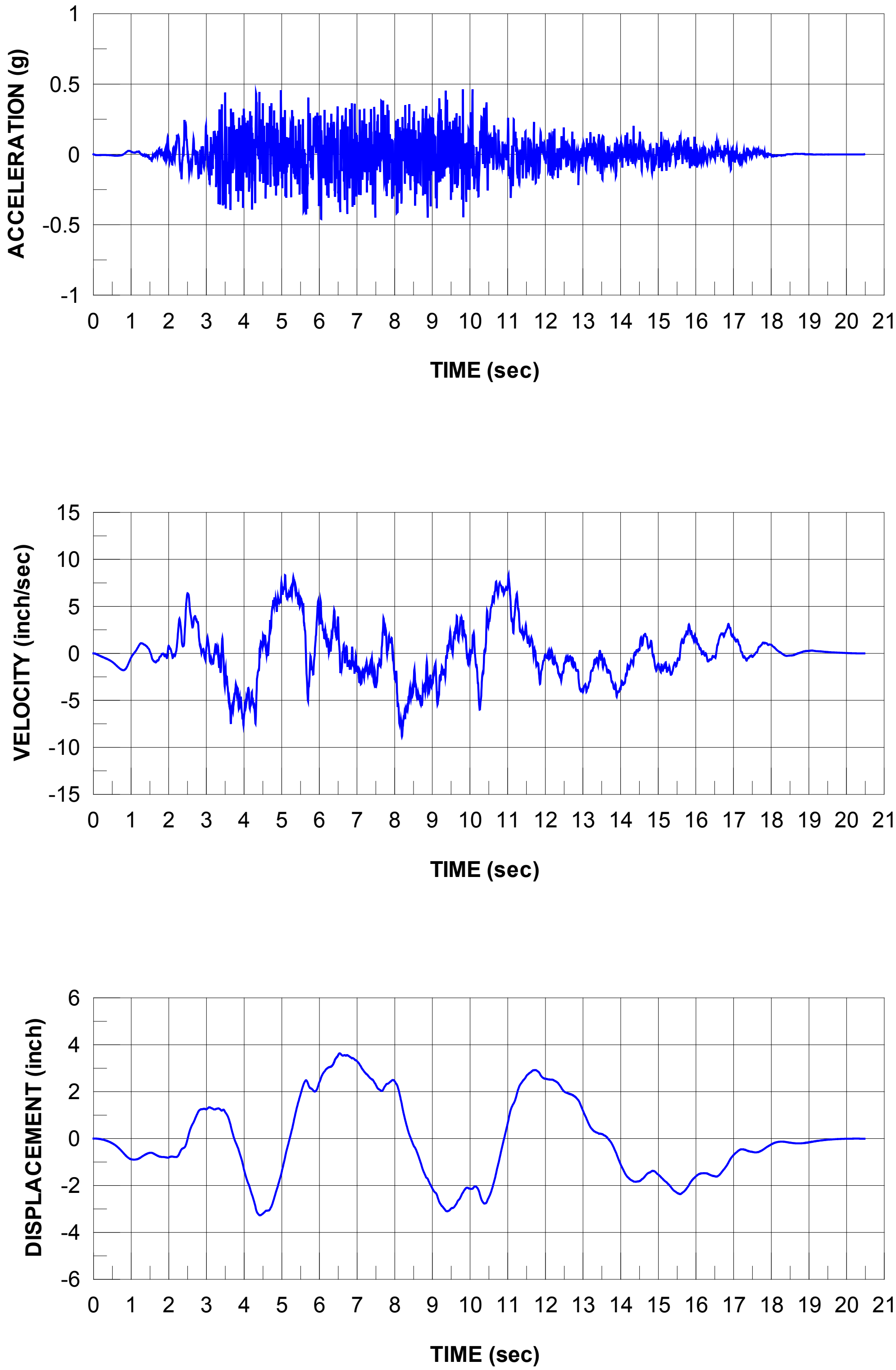


Figure 3.7-14 Acceleration, Velocity, and Displacement of H1H for HRHF

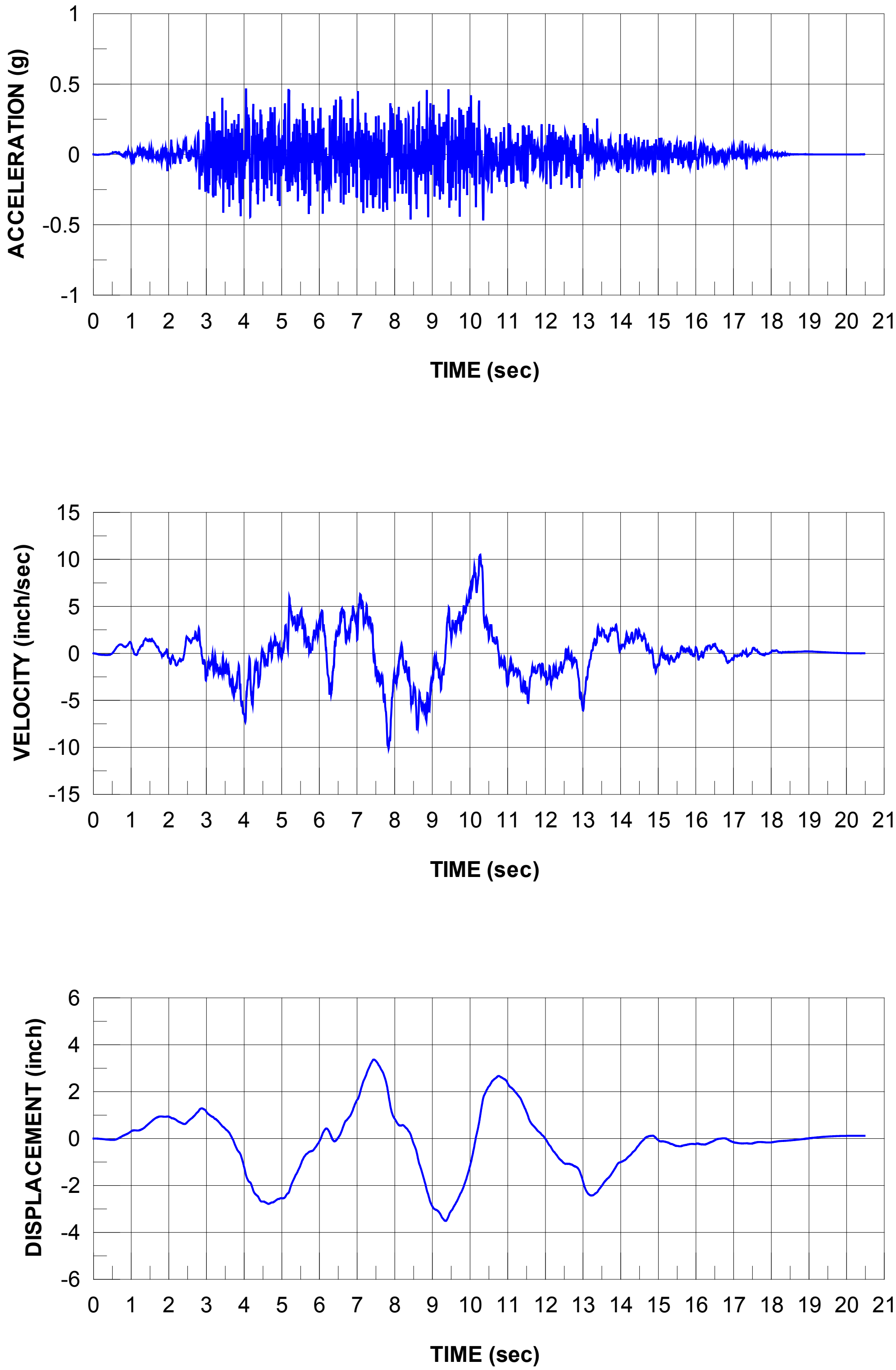


Figure 3.7-15 Acceleration, Velocity, and Displacement of H2H for HRHF

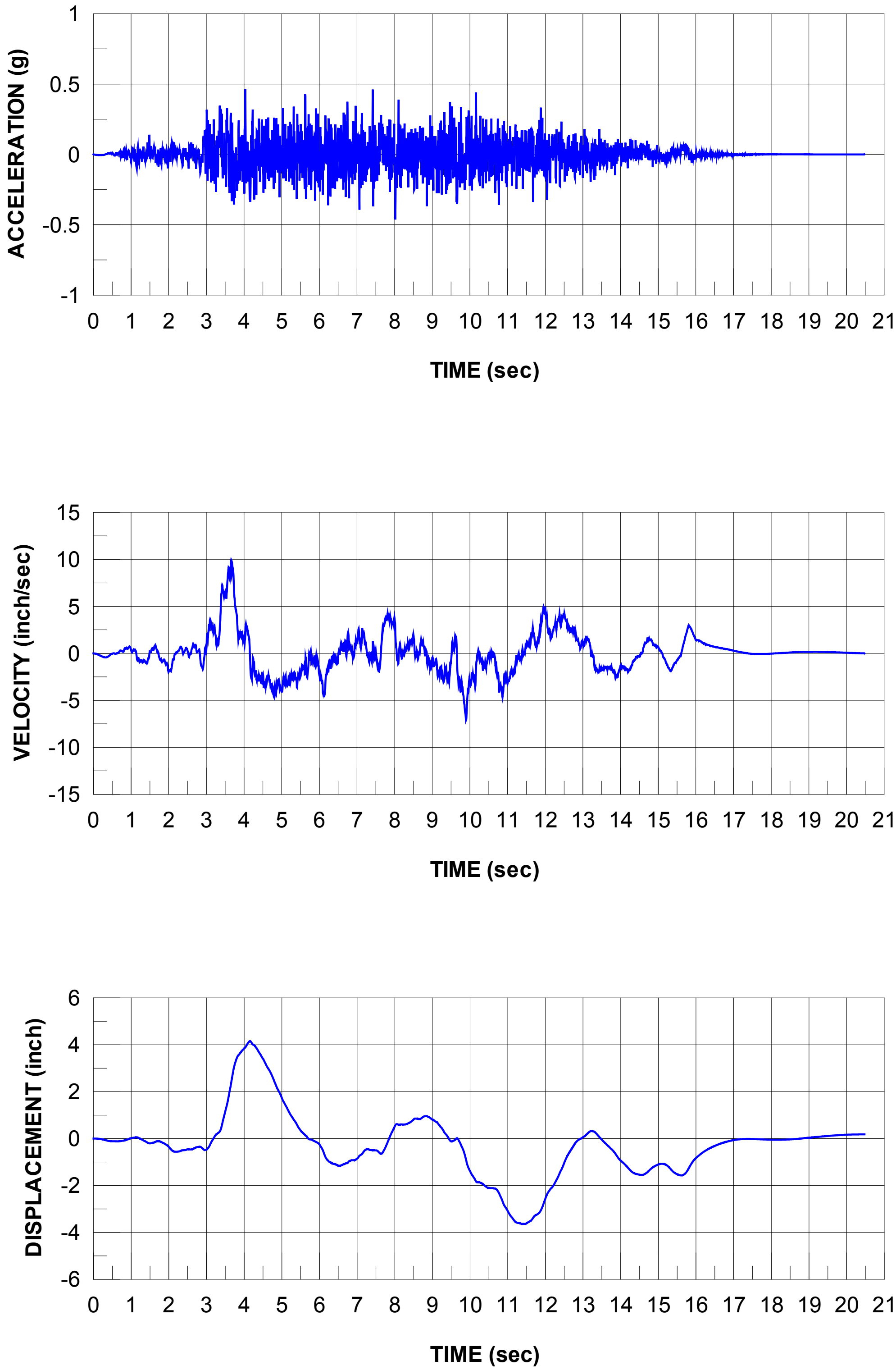


Figure 3.7-16 Acceleration, Velocity, and Displacement of VTH for HRHF

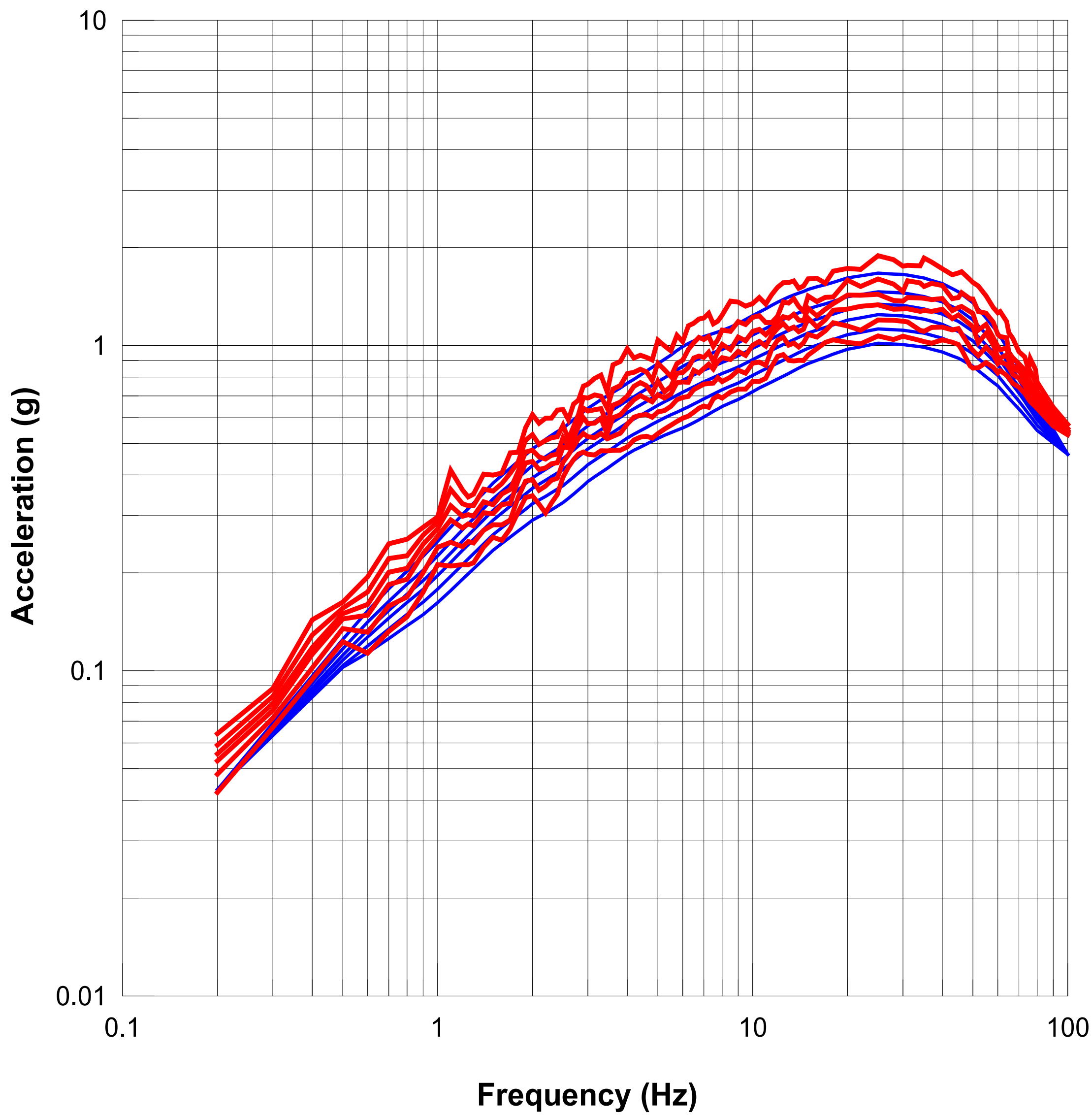


Figure 3.7-17   Comparison of Response Spectra of H1H and HRHF Horizontal Target Design Spectra

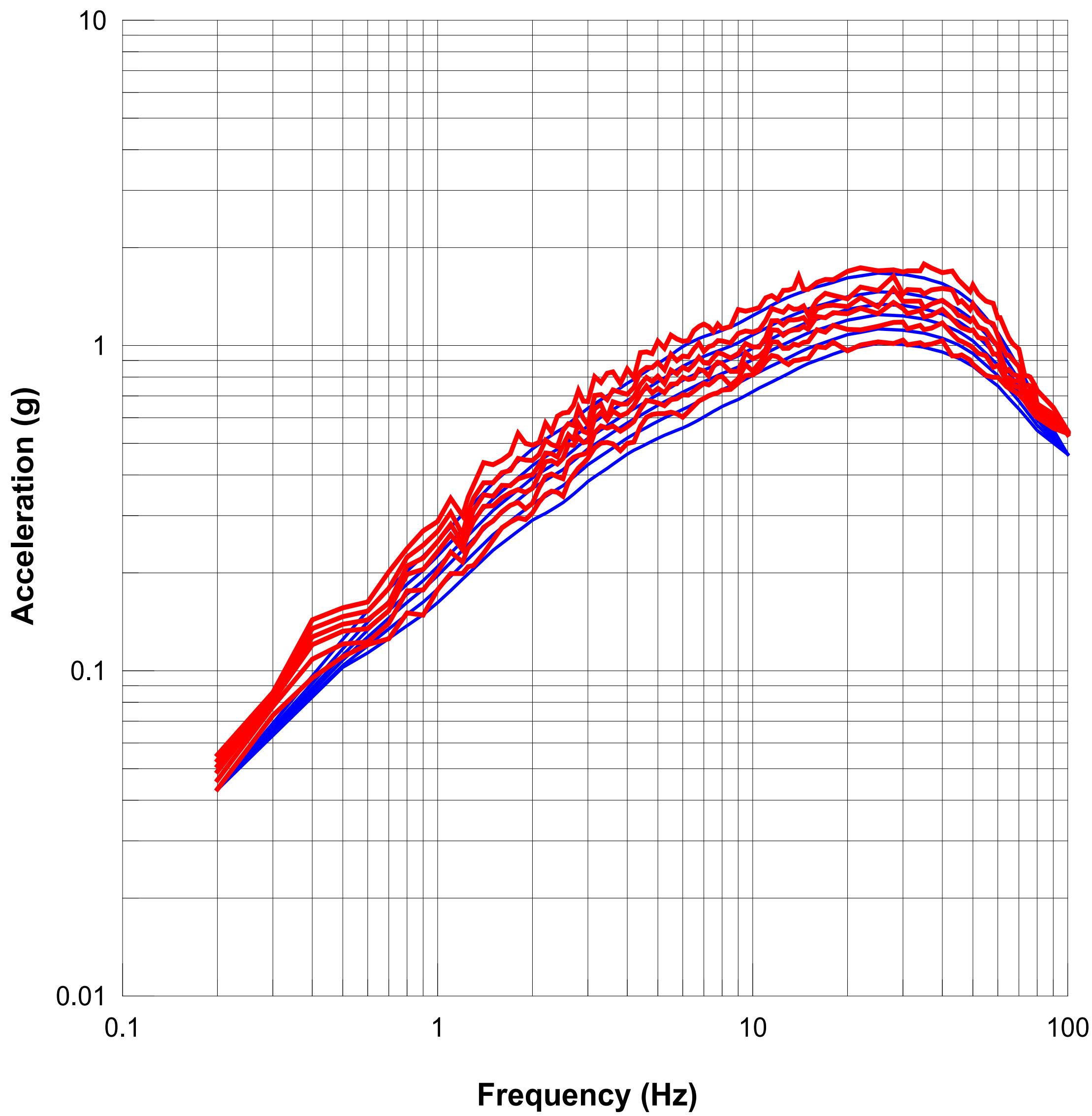


Figure 3.7-18 Comparison of Response Spectra of H2H and HRHF Horizontal Target Design Spectra

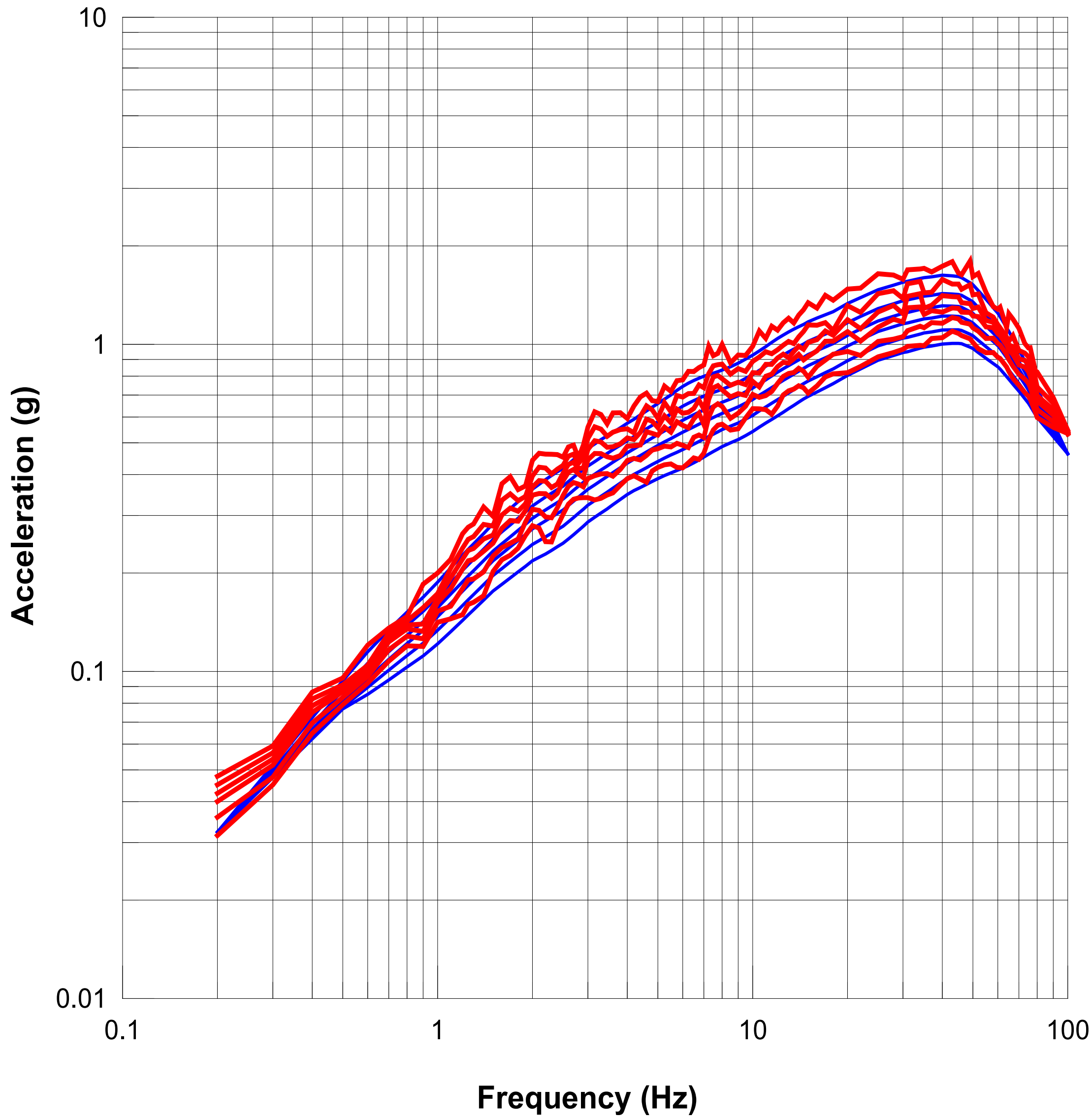
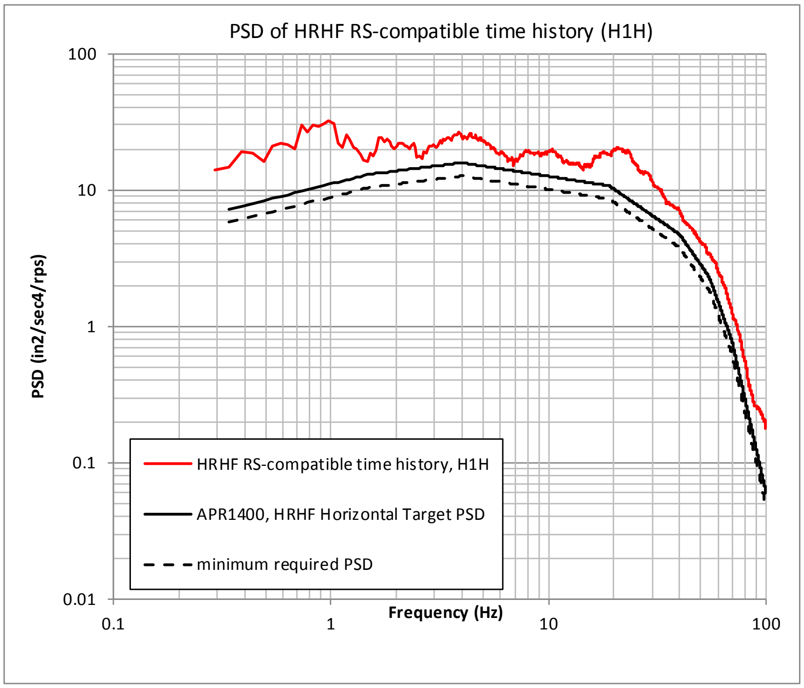
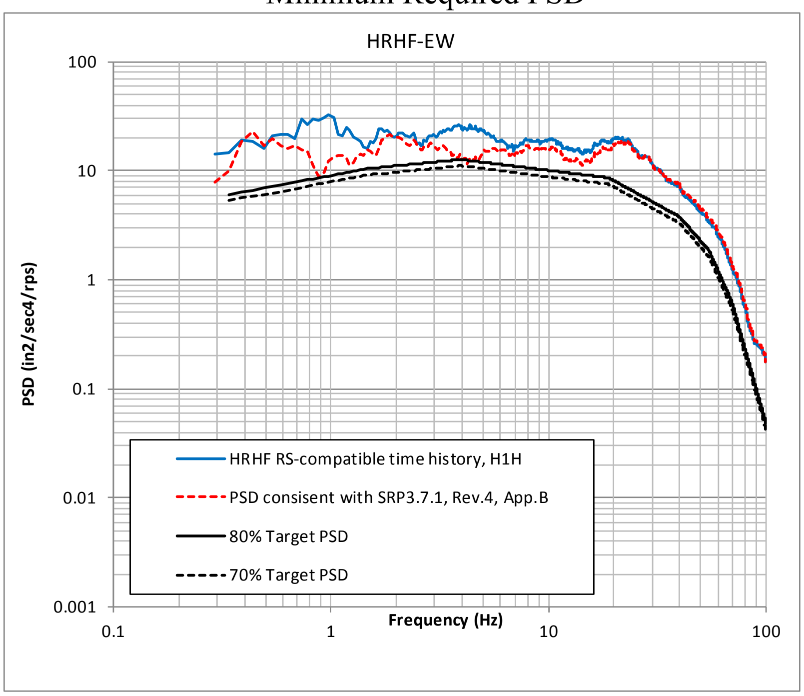


Figure 3.7-19 Comparison of Response Spectra of VTH and HRHF Vertical Target Design Spectra

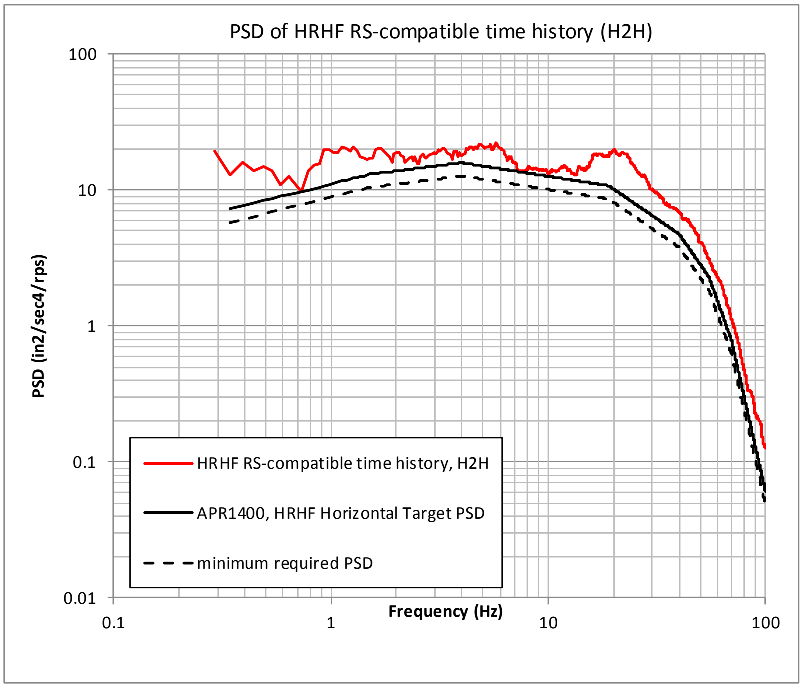


(a) Comparison of PSD of H1H and HRHF Target PSD and Minimum Required PSD

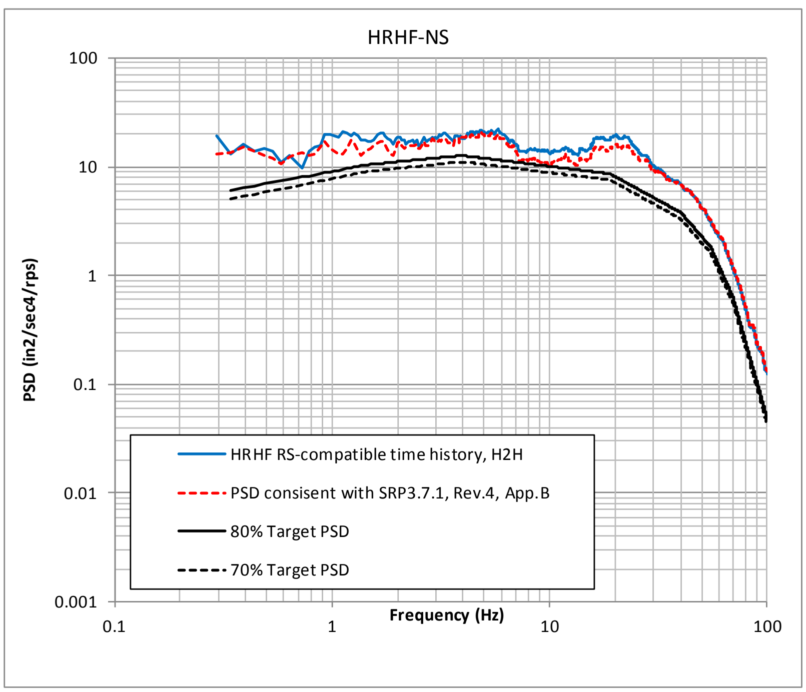


(b) Comparison of PSD for H1H and PSD Consistent with SRP 3.7.1, Rev.4, Appendix B

Figure 3.7-20 Comparison of PSD for H1H

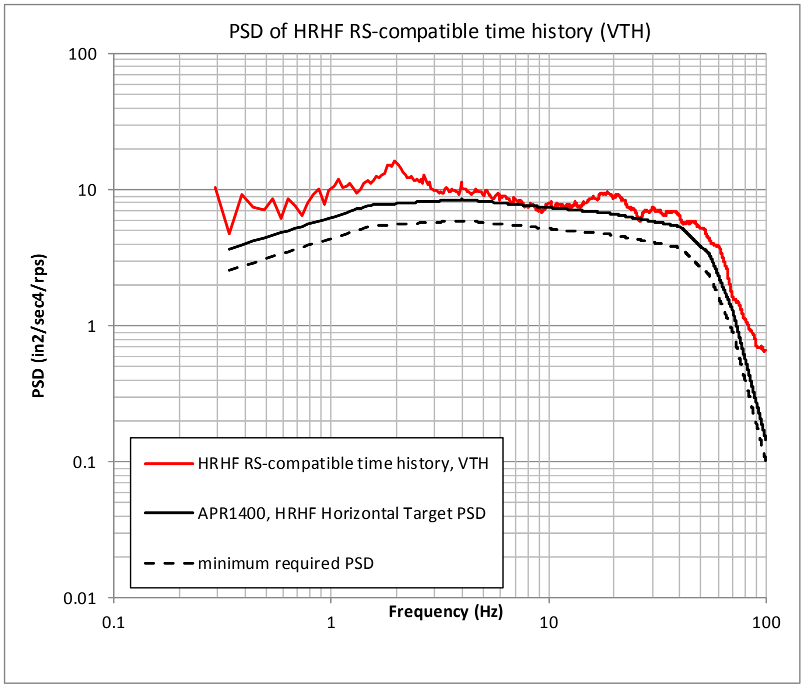


(a) Comparison of PSD of H2H and HRHF Target PSD and Minimum Required PSD

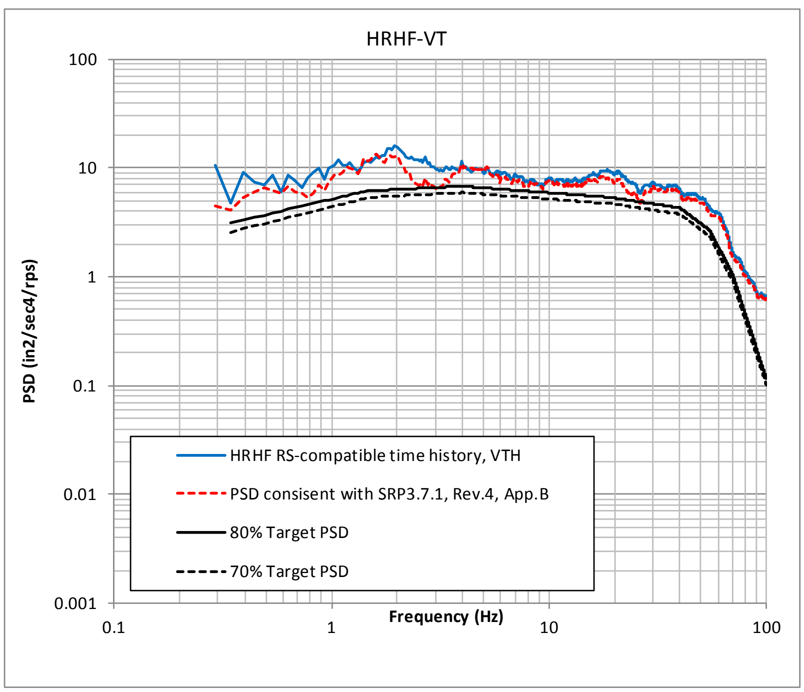


(b) Comparison of PSD for H2H and PSD Consistent with SRP 3.7.1, Rev.4, Appendix B

Figure 3.7-21 Comparison of PSD for H2H



(a) Comparison of PSD of VTH and HRHF Target PSD and Minimum Required PSD



(b) Comparison of PSD for VTH and PSD Consistent with SRP 3.7.1, Rev.4, Appendix B

Figure 3.7-22 Comparison of PSD for VTH

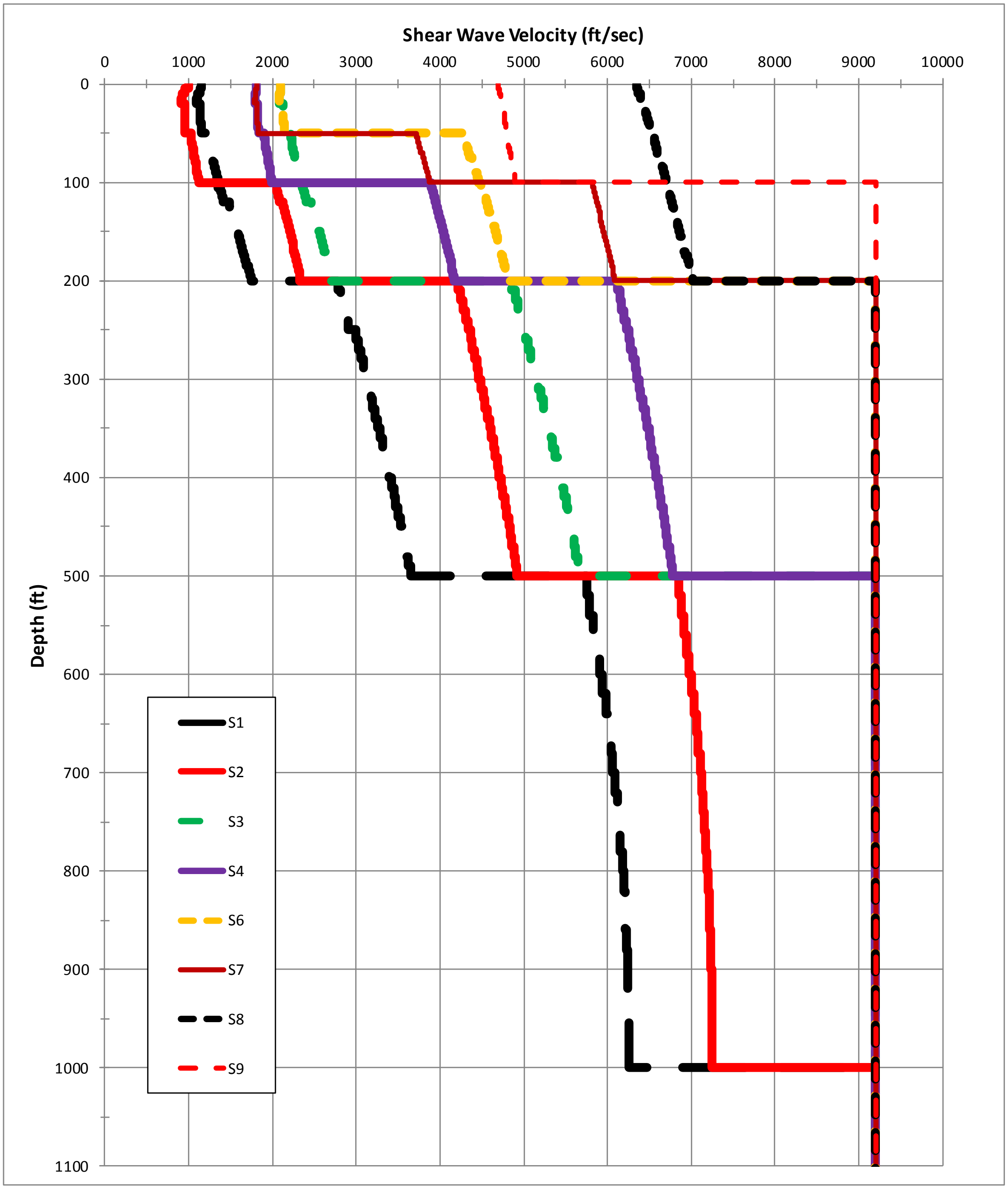


Figure 3.7-23 Generic Soil Profiles Proposed for APR1400 Standard Design

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.7-24 Finite Element Model of Reactor Containment Building Containment Structure

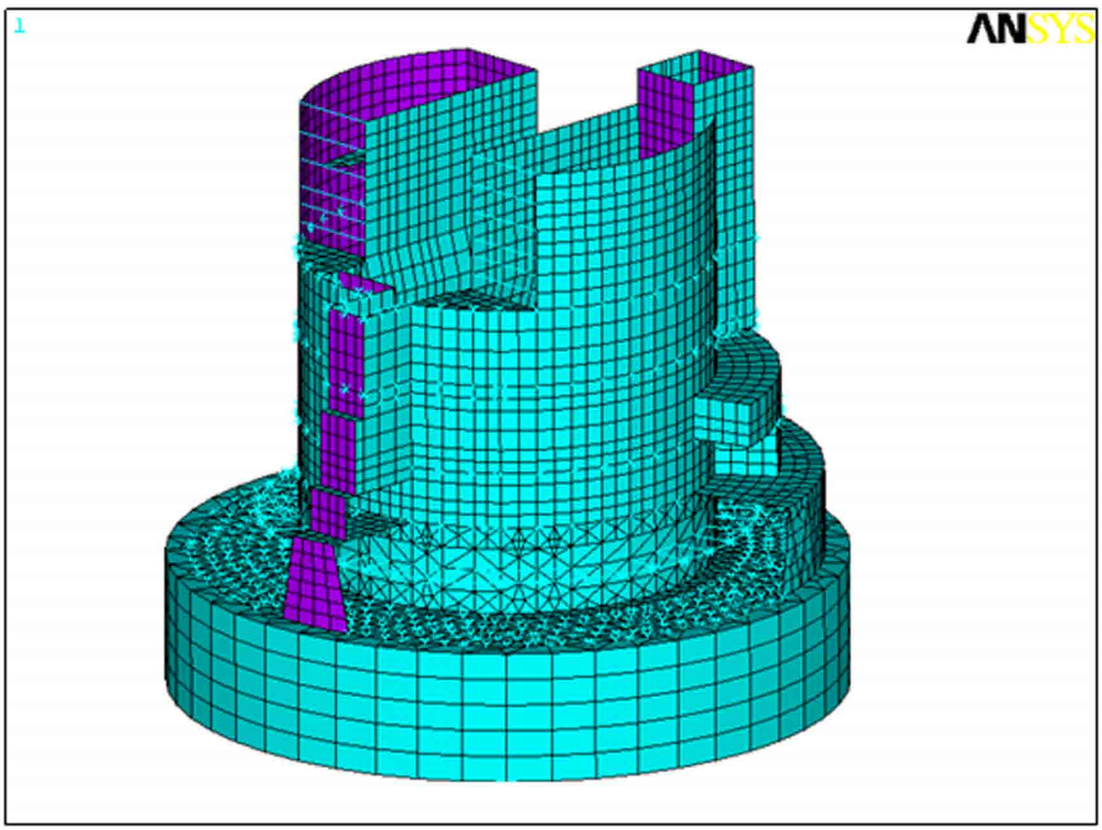


Figure 3.7-25 Finite Element Model of Reactor Containment Building Internal Structure

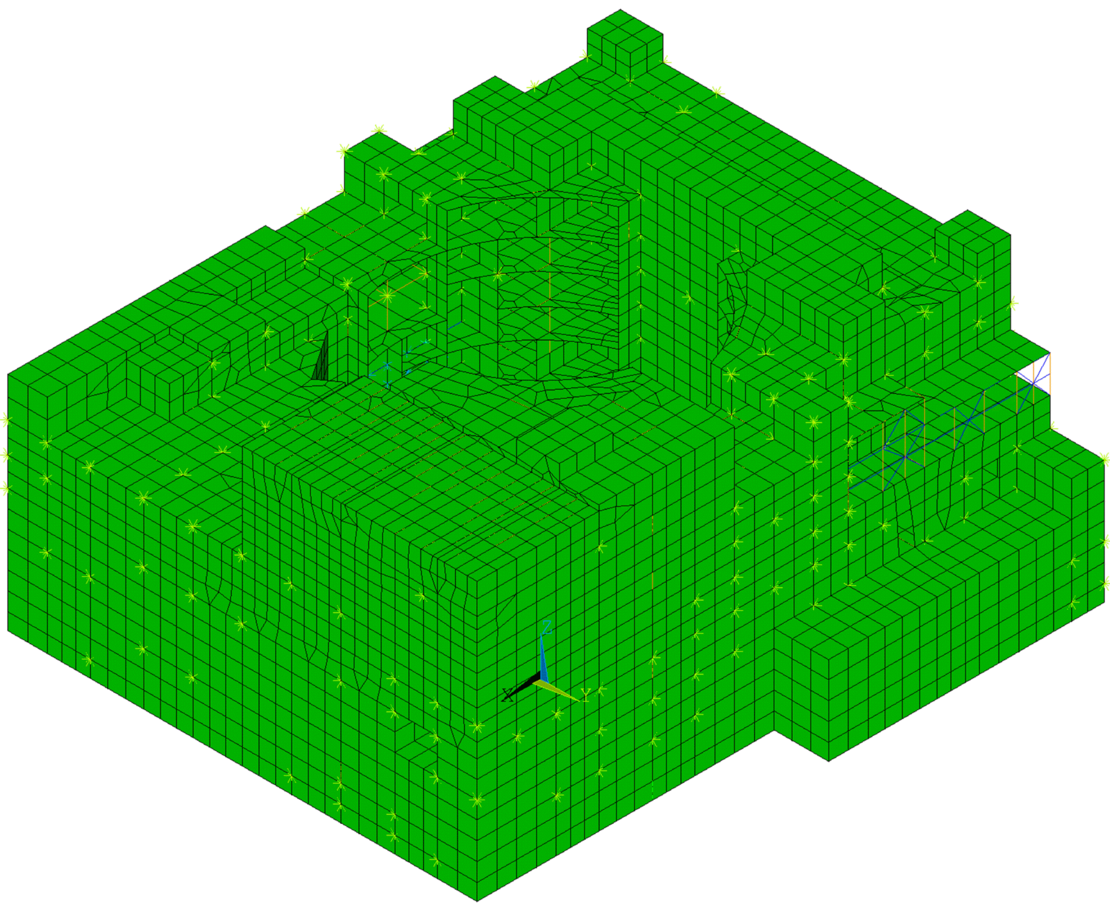


Figure 3.7-26 Finite Element Model of Auxiliary Building

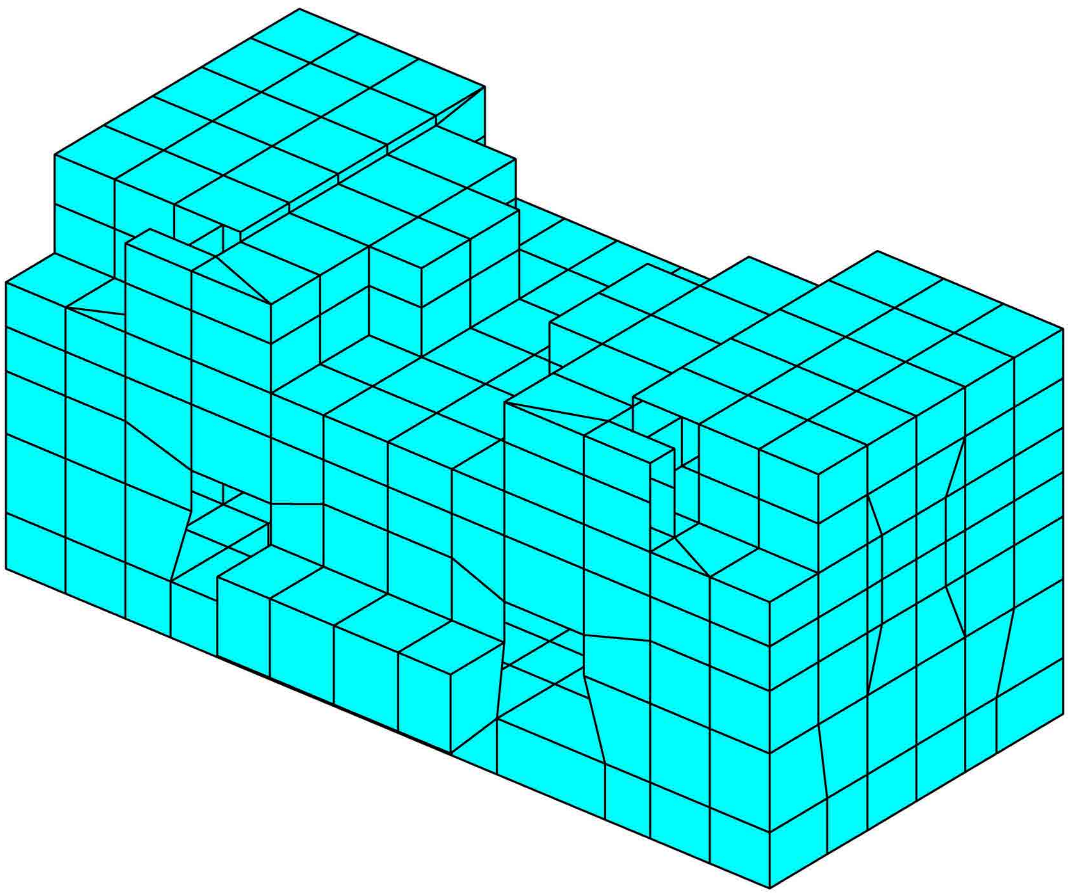


Figure 3.7-27   Finite Element Model of Emergency Diesel Generator Building

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.7-28 First Major X-mode Shape of Reactor Containment Building Containment Structure

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.7-29 First Major Y-mode Shape of Reactor Containment Building Containment Structure

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.7-30 First Major Z-mode Shape of Reactor Containment Building Containment Structure

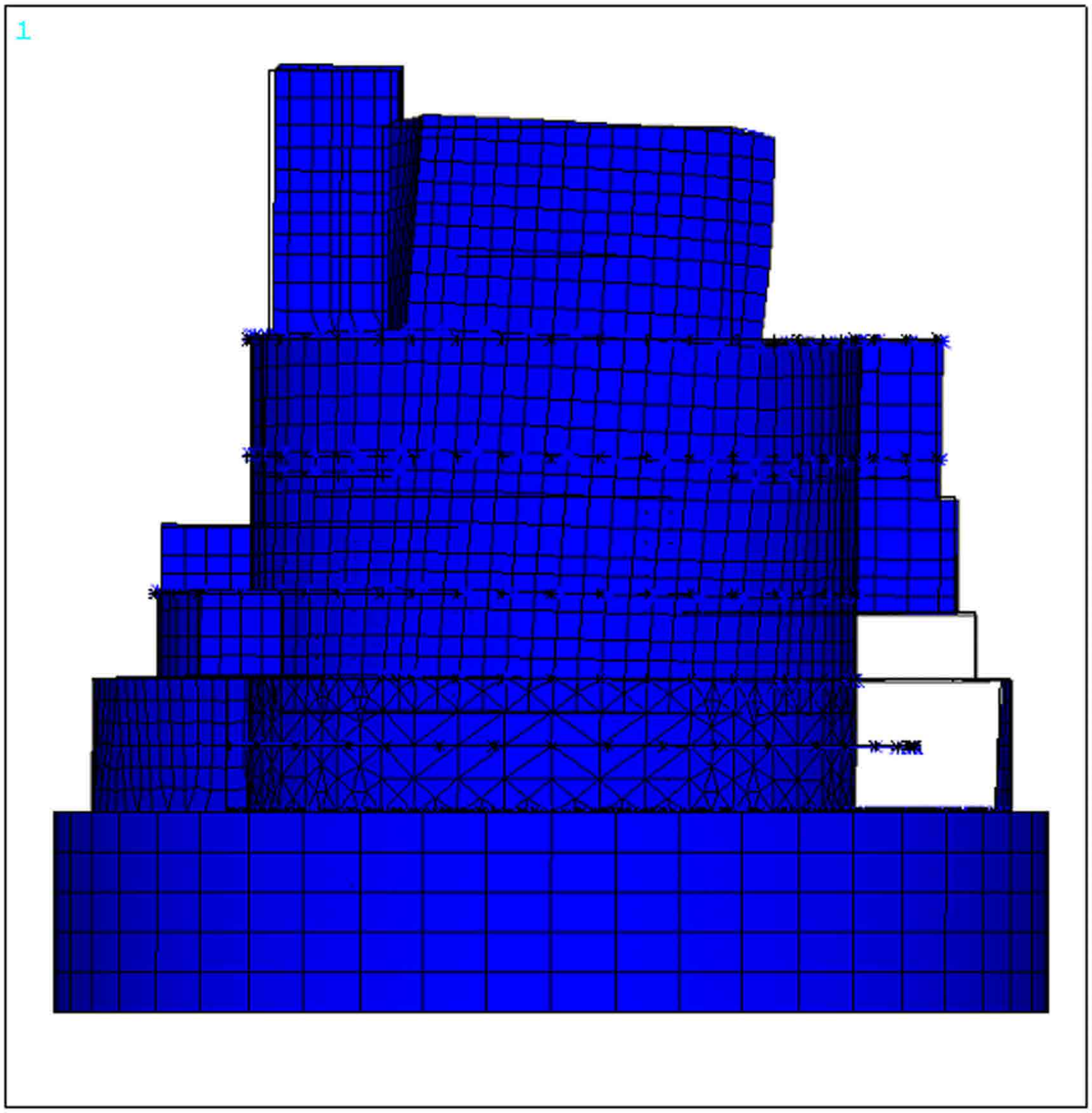


Figure 3.7-31 First Major X-mode Shape of Reactor Containment Building Internal Structure

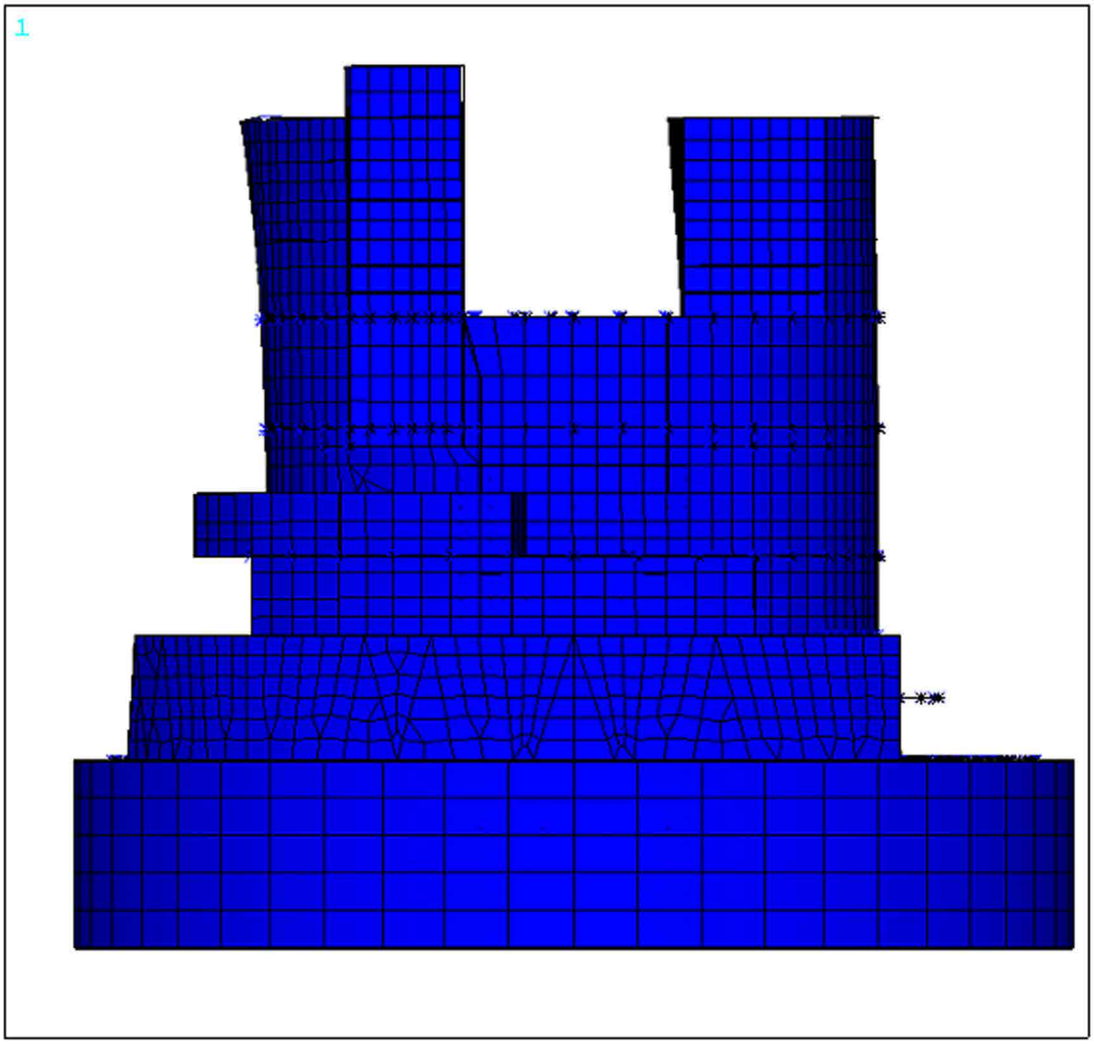


Figure 3.7-32 First Major Y-mode Shape of Reactor Containment Building Internal Structure

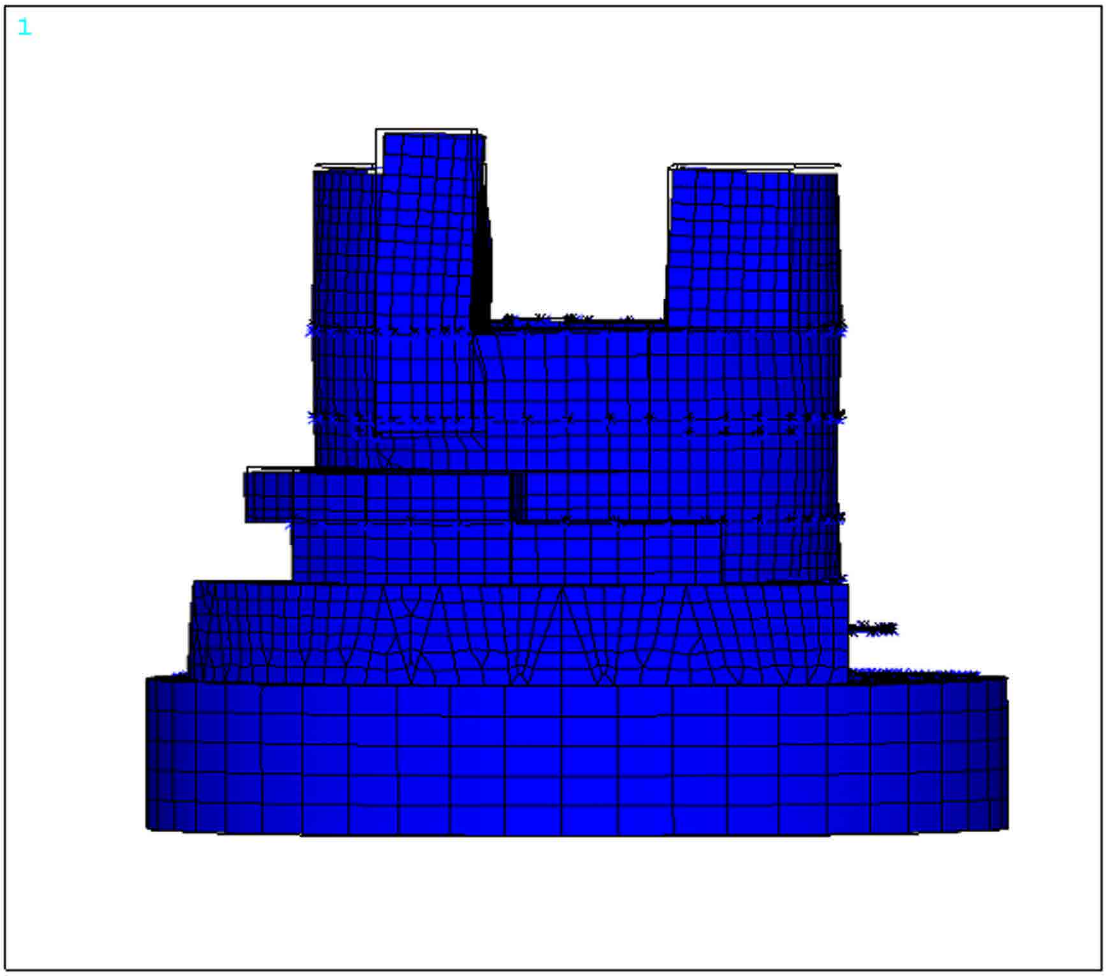


Figure 3.7-33 First Major Z-mode Shape of Reactor Containment Building Internal Structure

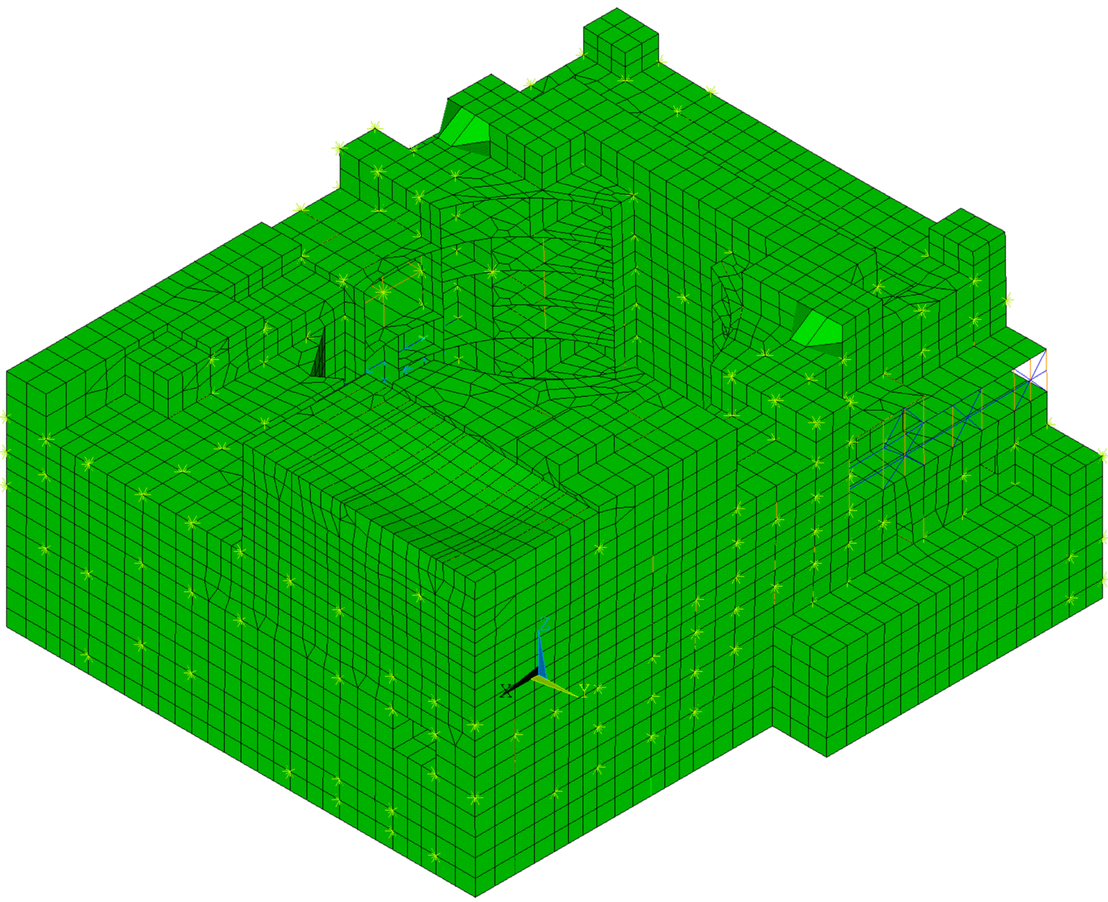


Figure 3.7-34 First Major X-mode Shape of Auxiliary Building

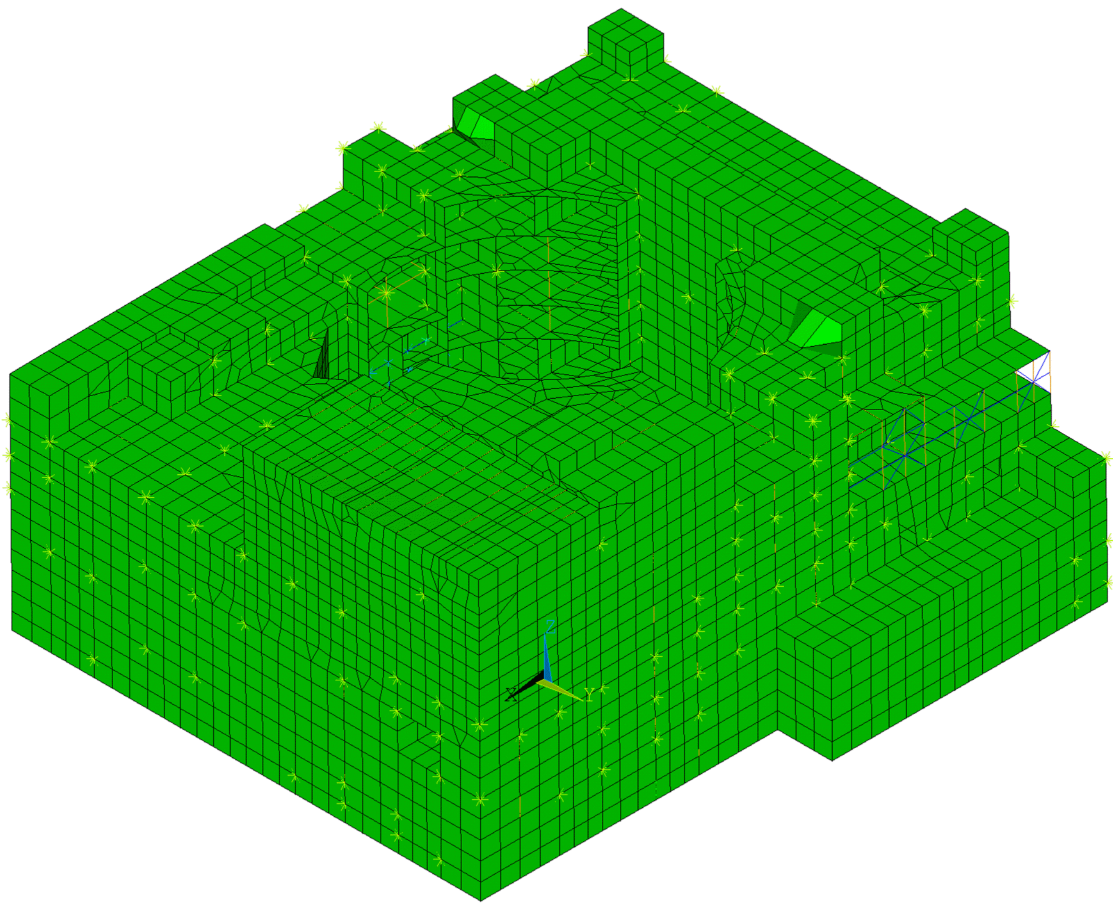


Figure 3.7-35 First Major Y-mode Shape of Auxiliary Building

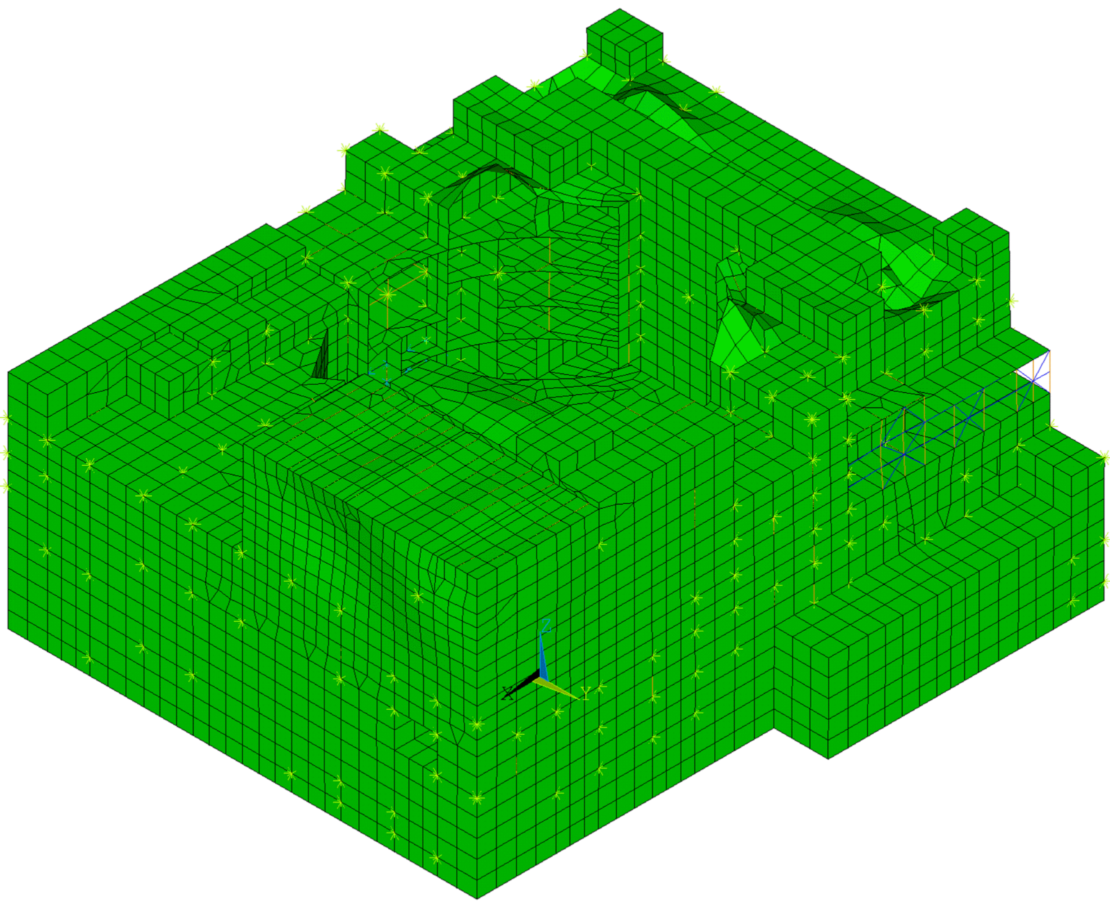


Figure 3.7-36   First Major Z-mode Shape of Auxiliary Building

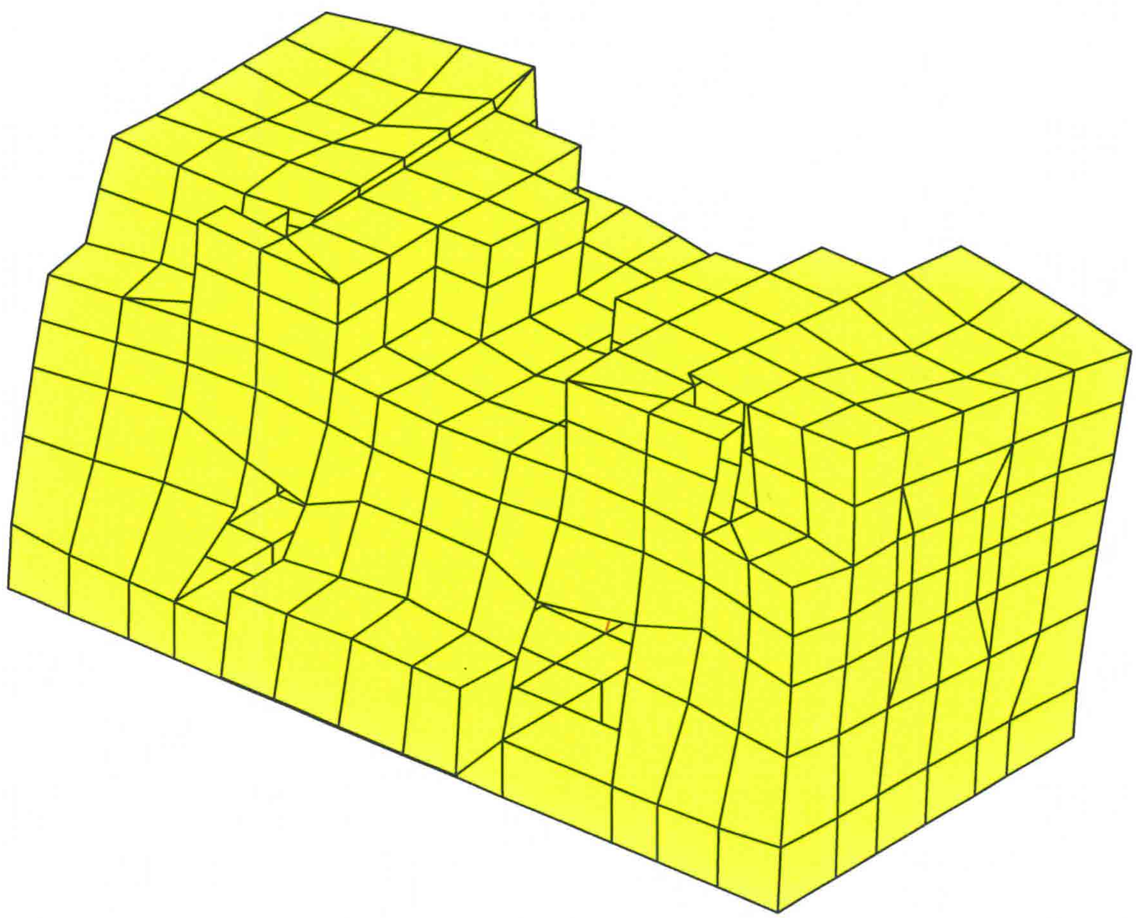


Figure 3.7-37 First Major X-mode Shape of Emergency Diesel Generator Building

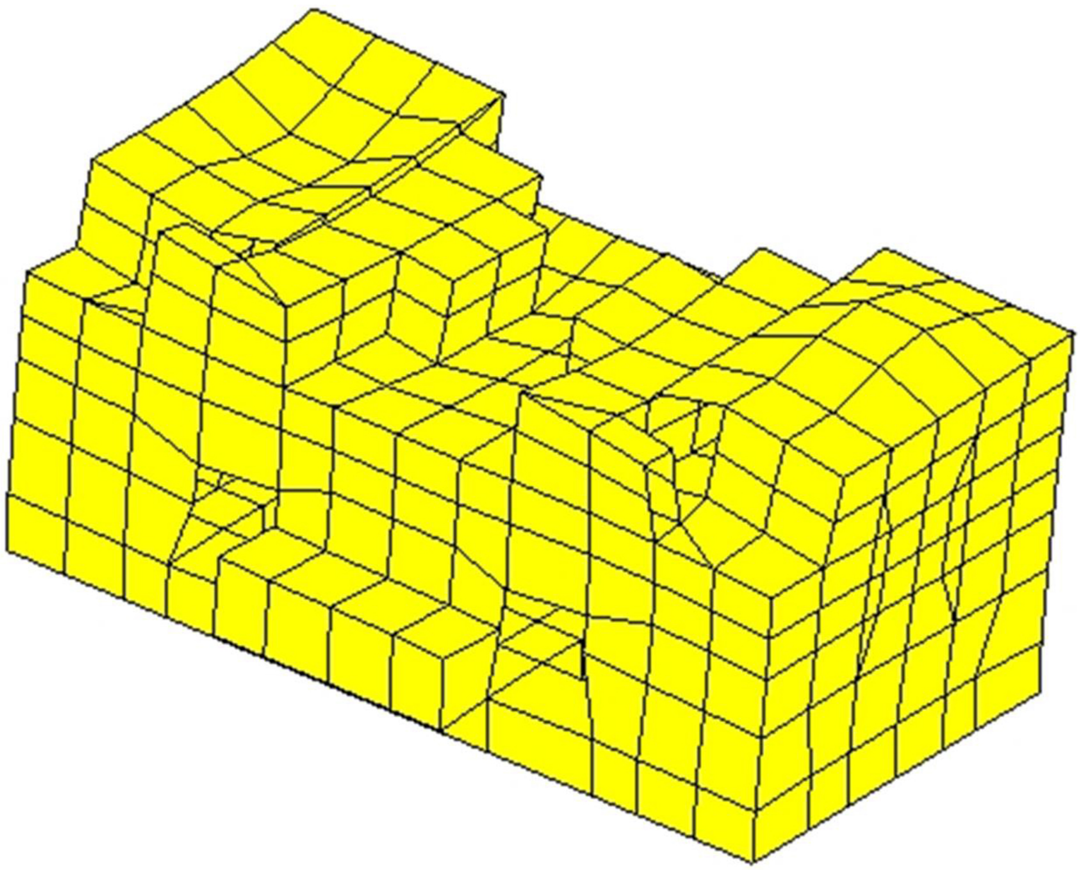


Figure 3.7-38 First Major Y-mode Shape of Emergency Diesel Generator Building

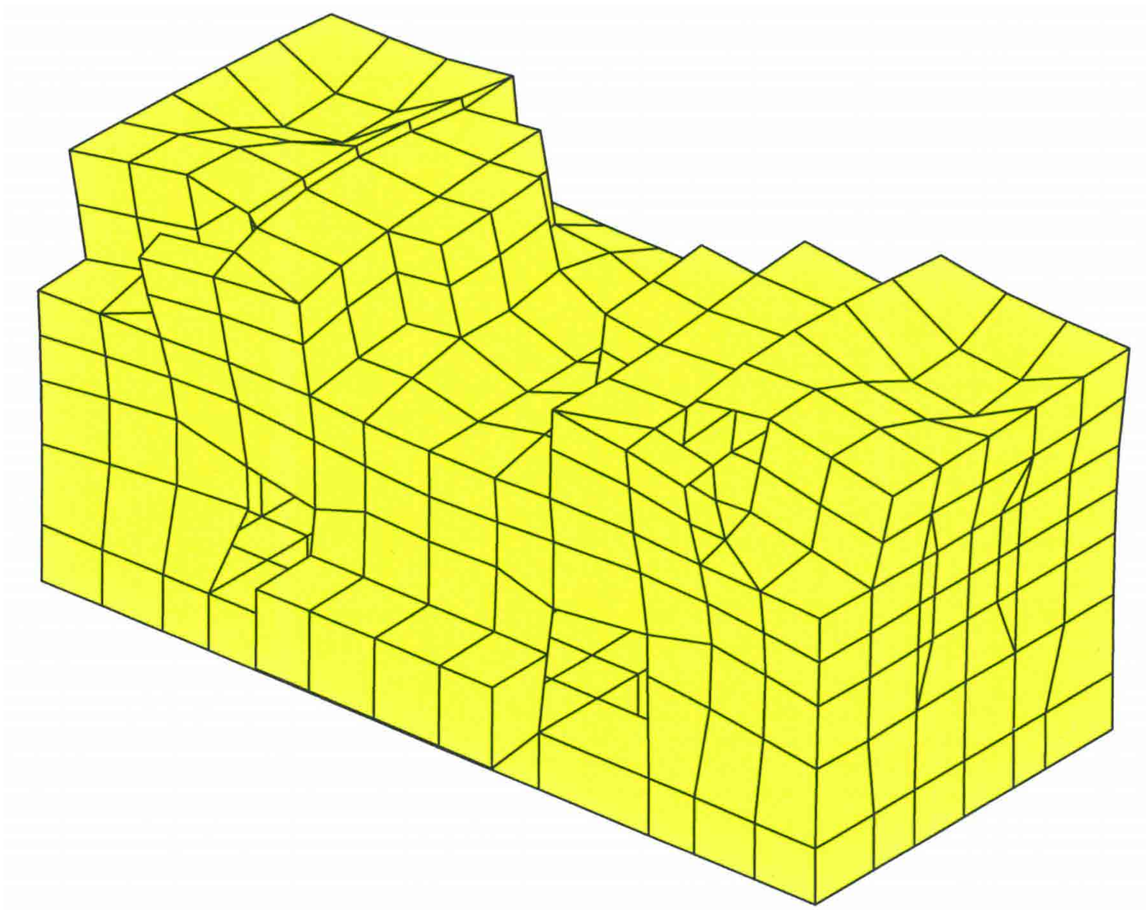


Figure 3.7-39 First Major Z-mode Shape of Emergency Diesel Generator Building

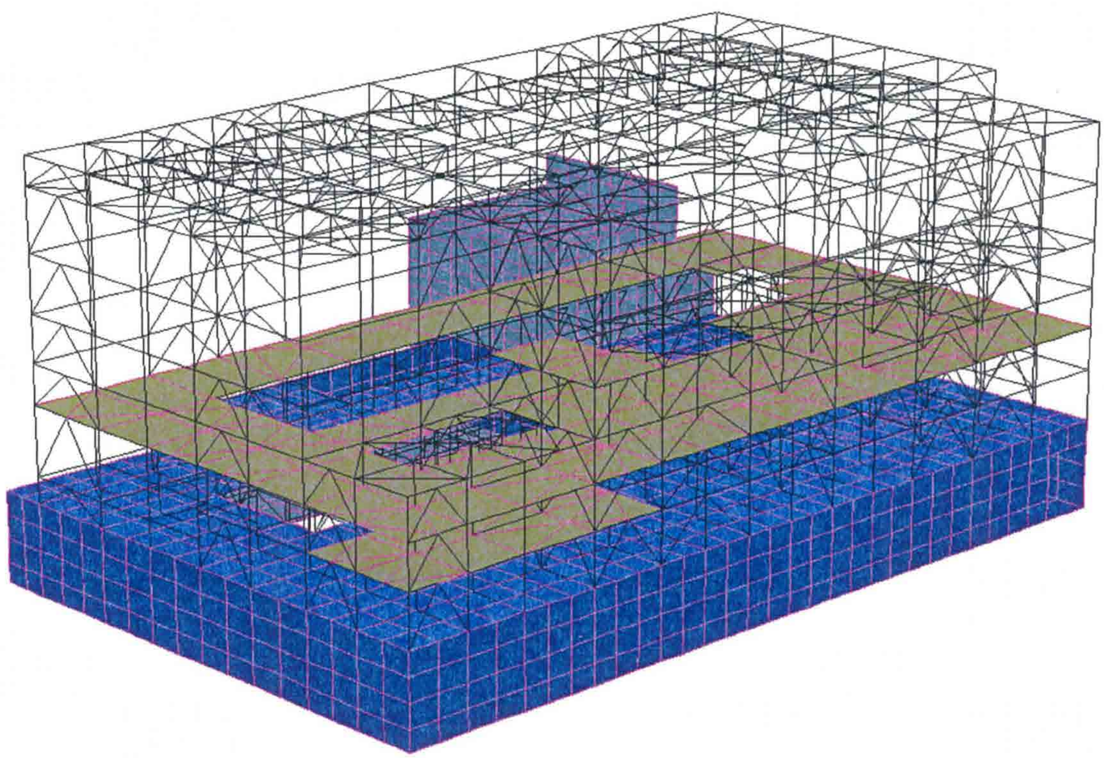


Figure 3.7-40 Finite Element Model of Turbine Generator Building

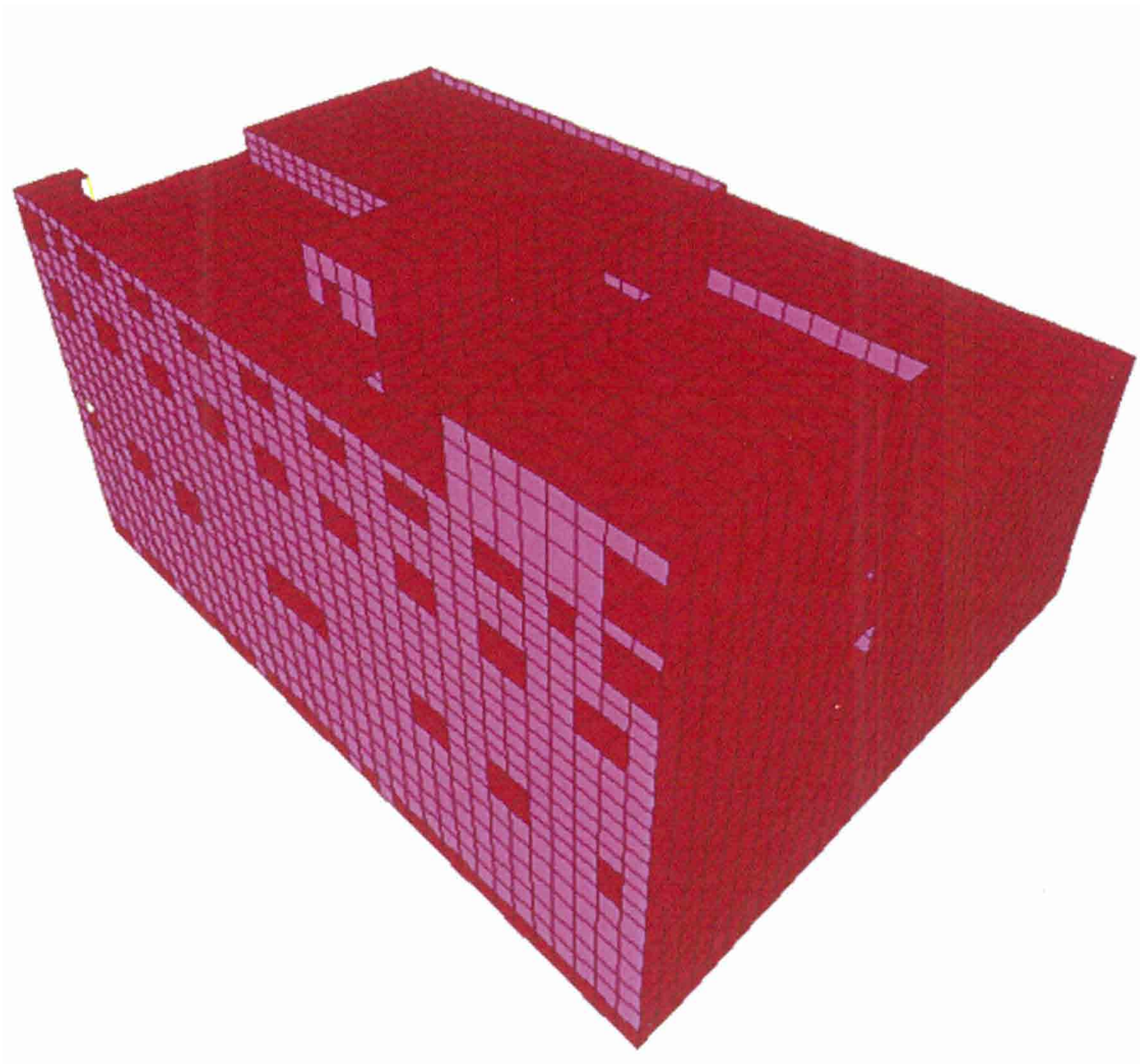


Figure 3.7-41   Finite Element Model of Compound Building

APPENDIX 3.7A

SOIL-STRUCTURE INTERACTION ANALYSIS METHODOLOGY AND RESULTS

APPENDIX 3.7A – SOIL-STRUCTURE INTERACTION ANALYSIS METHODOLOGY AND RESULTS

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APPENDIX 3.7A – SOIL-STRUCTURE INTERACTION ANALYSIS METHODOLOGY AND RESULTS

3.7A.1 Overview

This appendix presents the analysis results that are used to establish the seismic design loads for the nuclear island structures and the emergency diesel generator building in the APR1400 standard plant design. The soil-structure interaction (SSI) analysis and fixed-base analysis are performed using the seismic input parameters and methodology described in Section 3.7.

Three-dimensional SSI analyses are performed based on a safe shutdown earthquake (SSE) excitation of 0.3g horizontal and vertical peak ground accelerations. A set of the certified seismic design response spectra (CSDRS)-compatible time histories is used as the input excitation. The spectral characteristics of the input motions are described in Subsection 3.7.1. A set of eight soil profiles developed to represent generic site conditions are used as the soil medium in the SSI analysis. The SSI analysis results are provided in the form of in-structure response spectra corresponding to major elevations and internal resisting forces on each floor of seismic Category I structures.

A fixed-base analysis with no SSI effects is also performed using CSDRS-compatible time histories. The model for the fixed-base analysis is identical to the model for the SSI analysis except that the shear and compression wave velocities of the foundation medium are set to high values as 6,096 m/sec (20,000 ft/sec) for shear and 15,240 m/sec (50,000 ft/sec) for compression wave velocities and the backfill soil elements are removed so there is no contact of side soils with the structures over the embedment depth. The prescribed seismic input motion on the surface of the finished grade is the same as for the other soil cases. Because the foundation medium is stiff, there is virtually no variation in ground motion with depth. Therefore, the seismic input motion is considered the same as the prescribed motion at the bottom of the basemat level.

This appendix also describes the SSI analyses that are performed for seismic Category I structures. The SSI analyses use the soil profiles described in Subsection 3.7.1.3 and the control motions and structural models described in Subsections 3.7.1.1.2 and 3.7.2.3.3, respectively. The SSI analyses and fixed-base analysis use the ACS SASSI computer program (Reference 1). The final analysis results are obtained by enveloping the SSI analysis results and the fixed-base analysis results.

3.7A.2 Free-field Seismic Response Motions

Free-field response motions at the foundation base elevation are obtained from the site response analyses. The soil models using the generic soil/rock properties as shown in Tables 3.7A-1 through 3.7A-8 are then subjected to the control motion input defined as outcrop motion at the site grade elevation.

Figures 3.7A-9 through 3.7A-11 show the comparison of 5 percent damped response spectra between the seismic input motion at the free-field site grade elevation and the seismic response outcrop motions enveloped for all site soil column models at the seismic Category I structures foundation base elevation. The peak ground accelerations of the horizontal site response motions at the seismic Category I structures foundation base elevation are greater than 0.1g.

3.7A.3 SSI Analysis

Because the analyses are performed in the frequency domain, the transfer functions are generated up to a maximum cut-off frequency. Cut-off frequencies are the maximum frequencies that the soil media can transmit without loss of accuracy in the solution. In the present analyses, cut-off frequencies are computed based on the dimensions of the soil discretization. The maximum frequency that a soil layer can transmit corresponds to a wavelength equal to 5h, where h is the layer thickness. Cut-off frequencies vary according to the soil profiles used in the analyses. Table 3.7A-9 lists the cut-off frequencies for eight soil profiles.

3.7A.3.1 SSI Analysis Cases

A summary of the SSI analysis cases is presented in Table 3.7A-9. Eight SSI analyses are performed using all generic soil profiles described in Subsection 3.7.1.3.

All analyses are three-dimensional with input excitation provided in three directions. The generic soil sites differ from each other with respect to soil properties and depth of soil over bedrock. The embedment depth of the nuclear island is approximately 16.4 m (53 ft 8 in) in all cases.

The soil layers used in the SSI models and their associated generic soil/rock properties are shown in Tables 3.7A-1 to 3.7A-8 for all soil cases.

3.7A.3.2 Generation of Acceleration Time Histories

Acceleration time histories at key locations for the horizontal and vertical analyses due to the three control motions are computed. The locations selected are summarized in Subsection 3.7A.3.4. Time histories are computed for X, Y, and Z translations as follows:

a. The module MOTION is first used to generate transfer functions in the frequency domain at key locations. MOTION uses the uninterpolated transfer functions at the computed frequencies from ANALYS and performs the interpolation for intermediate frequencies. The transfer functions are computed up to the cut-off frequency. The interpolated transfer functions are reviewed to provide reasonable assurance that spurious spikes are not caused by the interpolation. At this step, the control motions are not yet applied.

b. When the transfer functions are finalized, MOTION is again executed for the same set of frequencies as in step (a) but this time multiplying the control motions with the transfer functions in the frequency domain and then obtaining acceleration time histories in the time domain through an inverse Fourier transform technique. In this step, MOTION convolutes the control motions and outputs results in the time domain. Three sets of MOTION runs are made for X, Y, and Z directions, using the appropriate transfer function file in each direction with output at identical locations. This step is repeated three times for control motions in X, Y, and Z directions. All control motions are for a duration of 20.48 seconds at a time step of 0.005 second.

3.7A.3.3 Generation of In-structure Response Spectra

The generation of in-structure response spectra (ISRS) first involves the computation of acceleration time histories at selected in-structure locations X(i), Y(i), and Z(i), i = x, y, z, as described in the previous step.

The time histories X(i), Y(i), and Z(i), i = x, y, z at each location are then used as input for the computation of ISRS for 2, 3, 4, 5, 7, and 10 percent damping. The response spectra are computed at numerous frequencies. These frequencies cover the frequency range of interest and exceed the guidelines of SRP 3.7.1. The total ISRS at each location is then computed using the square-root-of-the-sum-of-the-squares (SRSS) method. The ISRS are then widened by ±15 percent in accordance with NRC Regulatory Guide (RG) 1.122 (Reference 2).

3.7A.3.4 Output Locations

Table 3.7A-10 shows the key locations where the ISRS are obtained. The key locations are locations that are expected to represent the minimum and maximum seismic responses in the structure and include the basemat and roof slab elevations and the support elevations of the major equipment.

3.7A.4 Analysis Results

Representative plots of the envelope SSE response spectra are presented in Figures 3.7A-12 to 3.7A-90. The corresponding locations are at the foundation basemat (El. 55 ft 0 in), auxiliary building (El. 100 ft 0 in, 156 ft 0 in), top of the auxiliary building (El. 213 ft 0 in, 216 ft 9 in), reactor containment building containment structure (El. 104 ft 0 in, 160 ft 0 in), top of the reactor containment building containment structure dome (El. 332 ft 0 in), reactor containment building internal structure (El. 78 ft 0 in, 156 ft 0 in), and top of reactor containment building internal structure (El. 191 ft 0 in), as described in Table 3.7A-10. Damping ratios are 2, 3, 4, 5, 7, and 10 percent of critical. Responses from all soil cases are superimposed on the same plot for each location and each direction (X, Y, Z). The fixed-base spectra are also superimposed on these plots for completeness of the envelope.

The range of site parameters used in the SSI analyses covers a broad range of site conditions. Soil amplification occurs at frequencies in the range of the dominant structural modal frequencies. Therefore, resonance effects between the soil and the structures are captured in the SSI analyses and are reflected in the results. As such, the combined SSI results provide reasonable assurance that adequate seismic loads for APR1400 seismic Category I structures have been generated for sites that are compatible with the generic sites used in these analyses.

3.7A.5 References

1. ACS SASSI NQA Version 2.3.0, "An Advanced Computational software for 3D Dynamic Analysis Including Soil-Structure Interaction," Including "Option A" and "Option FS," User Manual, Rev. 5, Ghiocel Predictrue Technologies, Inc., January 2012.

2. Regulatory Guide 1.122, "Development of Floor Design Response Spectra for Seismic Design of Floor-Supported Equipment or Components," Rev. 1, U.S. Nuclear Regulatory Commission, February 1978.

Table 3.7A-1 (1 of 4)

Soil Layers and Properties (S1)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Sand	1	5	0.125	0.020	1,155	4,800	0.47
	2	5	0.125	0.031	1,132	4,800	0.47
	3	5	0.125	0.041	1,102	4,800	0.47
	4	5	0.125	0.048	1,087	4,800	0.47
	5	5	0.125	0.037	1,142	4,800	0.47
	6	5	0.125	0.042	1,138	4,800	0.47
	7	5	0.125	0.046	1,138	4,800	0.47
	8	5	0.125	0.050	1,141	4,800	0.47
	9	5	0.125	0.053	1,144	4,800	0.47
	10	5	0.125	0.056	1,149	4,800	0.47
	11	5	0.125	0.043	1,224	4,800	0.47
	12	5	0.125	0.044	1,234	4,800	0.46
	13	5	0.125	0.046	1,246	4,800	0.46
	14	5	0.125	0.047	1,257	4,800	0.46
	15	5	0.125	0.047	1,271	4,800	0.46
	16	5	0.125	0.048	1,285	4,800	0.46
	17	5	0.125	0.048	1,299	4,800	0.46
	18	5	0.125	0.049	1,314	4,800	0.46
	19	5	0.125	0.050	1,328	4,800	0.46
	20	5	0.125	0.050	1,342	4,800	0.46
	21	5	0.125	0.050	1,357	4,800	0.46
	22	5	0.125	0.051	1,373	4,800	0.46
	23	5	0.125	0.051	1,389	4,800	0.45
	24	5	0.125	0.051	1,406	4,800	0.45
	25	5	0.125	0.039	1,489	4,800	0.45
	26	5	0.125	0.039	1,506	4,800	0.45
	27	5	0.125	0.039	1,523	4,800	0.44
	28	5	0.125	0.039	1,540	4,800	0.44
	29	5	0.125	0.039	1,556	4,800	0.44

Table 3.7A-1 (2 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Sand (cont.)	30	5	0.125	0.039	1,573	4,800	0.44
	31	5	0.125	0.039	1,590	4,800	0.44
	32	5	0.125	0.039	1,608	4,800	0.44
	33	5	0.125	0.039	1,625	4,800	0.44
	34	5	0.125	0.039	1,642	4,800	0.43
	35	5	0.125	0.039	1,659	4,800	0.43
	36	5	0.125	0.039	1,676	4,800	0.43
	37	5	0.125	0.039	1,692	4,800	0.43
	38	5	0.125	0.039	1,709	4,800	0.43
	39	5	0.125	0.039	1,725	4,800	0.43
	40	5	0.125	0.039	1,742	4,845	0.43
	41	10	0.13	0.022	2,780	6,650	0.39
	42	10	0.13	0.022	2,814	6,732	0.39
	43	10	0.13	0.022	2,845	6,813	0.39
	44	10	0.13	0.023	2,876	6,894	0.39
	45	10	0.13	0.023	2,907	6,973	0.39
	46	10	0.13	0.018	2,992	7,051	0.39
	47	10	0.13	0.019	3,022	7,128	0.39
	48	10	0.13	0.019	3,053	7,204	0.39
	49	10	0.13	0.019	3,083	7,279	0.39
	50	10	0.13	0.019	3,113	7,353	0.39
	51	10	0.13	0.019	3,142	7,426	0.39
	52	10	0.13	0.019	3,172	7,498	0.39
	53	10	0.130	0.019	3,200	7,569	0.39
	54	10	0.130	0.019	3,229	7,639	0.39
	55	10	0.130	0.019	3,258	7,707	0.39
	56	10	0.130	0.019	3,286	7,775	0.39
	57	10	0.130	0.019	3,314	7,842	0.39
	58	10	0.130	0.019	3,342	7,907	0.39
	59	10	0.130	0.019	3,369	7,972	0.39
	60	10	0.130	0.019	3,396	8,035	0.39

Table 3.7A-1 (3 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Sand (cont.)	61	10	0.130	0.019	3,423	8,098	0.39
	62	10	0.130	0.019	3,449	8,159	0.39
	63	10	0.130	0.019	3,475	8,220	0.39
	64	10	0.130	0.019	3,501	8,279	0.39
	65	10	0.130	0.019	3,526	8,337	0.39
	66	10	0.130	0.019	3,550	8,395	0.39
	67	10	0.130	0.019	3,574	8,451	0.39
	68	10	0.130	0.019	3,598	8,506	0.39
	69	10	0.130	0.019	3,621	8,560	0.39
	70	10	0.130	0.019	3,644	8,613	0.39
Soft Rock	71	20	0.135	0.035	5,748	12,029	0.35
	72	20	0.135	0.035	5,792	12,120	0.35
	73	20	0.135	0.035	5,833	12,208	0.35
	74	20	0.135	0.035	5,872	12,292	0.35
	75	20	0.135	0.035	5,909	12,372	0.35
	76	20	0.135	0.035	5,944	12,448	0.35
	77	20	0.135	0.035	5,978	12,520	0.35
	78	20	0.135	0.035	6,009	12,588	0.35
	79	20	0.135	0.035	6,038	12,653	0.35
	80	20	0.135	0.035	6,066	12,714	0.35
	81	20	0.135	0.035	6,092	12,771	0.35
	82	20	0.135	0.035	6,115	12,824	0.35
	83	20	0.135	0.035	6,136	12,873	0.35
	84	20	0.135	0.036	6,157	12,919	0.35
	85	20	0.135	0.036	6,175	12,960	0.35
	86	20	0.135	0.036	6,191	12,998	0.35
	87	20	0.135	0.036	6,206	13,032	0.35
	88	20	0.135	0.036	6,218	13,062	0.35
	89	20	0.135	0.036	6,229	13,089	0.35
	90	20	0.135	0.036	6,238	13,111	0.35

Table 3.7A-1 (4 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Soft Rock (cont.)	91	20	0.135	0.036	6,245	13,130	0.35
	92	20	0.135	0.036	6,251	13,145	0.35
	93	20	0.135	0.036	6,254	13,156	0.35
	94	20	0.135	0.036	6,256	13,163	0.35
	95	20	0.135	0.037	6,255	13,166	0.35
Rock	96	–	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson's Ratio

Table 3.7A-2 (1 of 4)

Soil Layers and Properties (S2)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Sand	1	5	0.125	0.022	996	4,800	0.48
	2	5	0.125	0.037	958	4,800	0.48
	3	5	0.125	0.048	930	4,800	0.48
	4	5	0.125	0.059	902	4,800	0.48
	5	5	0.125	0.047	954	4,800	0.48
	6	5	0.125	0.052	950	4,800	0.48
	7	5	0.125	0.056	948	4,800	0.48
	8	5	0.125	0.061	947	4,800	0.48
	9	5	0.125	0.064	948	4,800	0.48
	10	5	0.125	0.067	950	4,800	0.48
	11	5	0.125	0.051	1,025	4,800	0.48
	12	5	0.125	0.052	1,034	4,800	0.48
	13	5	0.125	0.053	1,044	4,800	0.48
	14	5	0.125	0.054	1,054	4,800	0.47
	15	5	0.125	0.055	1,065	4,800	0.47
	16	5	0.125	0.056	1,075	4,800	0.47
	17	5	0.125	0.057	1,086	4,800	0.47
	18	5	0.125	0.057	1,098	4,800	0.47
	19	5	0.125	0.058	1,110	4,800	0.47
	20	5	0.125	0.059	1,123	4,800	0.47
	21	5	0.130	0.029	2,044	4996	0.40
	22	5	0.130	0.03	2,055	5,037	0.40
	23	5	0.130	0.031	2,065	5,077	0.40
	24	5	0.130	0.031	2,074	5,117	0.40
	25	5	0.130	0.024	2,134	5,157	0.40
	26	5	0.130	0.025	2,147	5,197	0.40
	27	5	0.130	0.025	2,160	5,236	0.40
	28	5	0.130	0.025	2,174	5,275	0.40
	29	5	0.130	0.026	2,188	5,314	0.40

Table 3.7A-2 (2 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Sand (cont.)	30	5	0.130	0.026	2,202	5,353	0.40
	31	5	0.130	0.026	2,216	5,392	0.40
	32	5	0.130	0.026	2,229	5,430	0.40
	33	5	0.130	0.027	2,242	5,468	0.40
	34	5	0.130	0.027	2,255	5,506	0.40
	35	5	0.130	0.027	2,267	5,543	0.40
	36	5	0.130	0.027	2,280	5,581	0.40
	37	5	0.130	0.027	2,293	5,618	0.40
	38	5	0.130	0.028	2,306	5,655	0.40
	39	5	0.130	0.028	2,319	5,692	0.40
	40	5	0.130	0.028	2,332	5,728	0.40
Soft Rock	41	10	0.135	0.035	4,219	8,834	0.35
	42	10	0.135	0.035	4,248	8,900	0.35
	43	10	0.135	0.035	4,277	8,965	0.35
	44	10	0.135	0.035	4,305	9,029	0.35
	45	10	0.135	0.036	4,333	9,092	0.35
	46	10	0.135	0.036	4,361	9,154	0.35
	47	10	0.135	0.036	4,387	9,215	0.35
	48	10	0.135	0.036	4,413	9,276	0.35
	49	10	0.135	0.036	4,440	9,336	0.35
	50	10	0.135	0.036	4,466	9,395	0.35
	51	10	0.135	0.036	4,492	9,453	0.35
	52	10	0.135	0.037	4,517	9,510	0.35
	53	10	0.135	0.037	4,542	9,566	0.35
	54	10	0.135	0.037	4,567	9,622	0.35
	55	10	0.135	0.037	4,592	9,677	0.35
	56	10	0.135	0.037	4,616	9,731	0.35
	57	10	0.135	0.037	4,639	9,784	0.35
	58	10	0.135	0.037	4,663	9,836	0.36
	59	10	0.135	0.037	4,686	9,887	0.36
	60	10	0.135	0.037	4,709	9,938	0.36

Table 3.7A-2 (3 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Soft Rock (cont.)	61	10	0.135	0.037	4,732	9,988	0.36
	62	10	0.135	0.038	4,754	10,037	0.36
	63	10	0.135	0.038	4,776	10,085	0.36
	64	10	0.135	0.038	4,797	10,132	0.36
	65	10	0.135	0.038	4,819	10,178	0.36
	66	10	0.135	0.038	4,839	10,224	0.36
	67	10	0.135	0.038	4,859	10,269	0.36
	68	10	0.135	0.038	4,879	10,313	0.36
	69	10	0.135	0.038	4,898	10,356	0.36
	70	10	0.135	0.038	4,918	10,398	0.36
Rock	71	20	0.145	0.012	6,847	13,946	0.34
	72	20	0.145	0.012	6,881	14,022	0.34
	73	20	0.145	0.012	6,914	14,094	0.34
	74	20	0.145	0.012	6,945	14,164	0.34
	75	20	0.145	0.012	6,976	14,230	0.34
	76	20	0.145	0.012	7,004	14,293	0.34
	77	20	0.145	0.012	7,032	14,353	0.34
	78	20	0.145	0.012	7,057	14,410	0.34
	79	20	0.145	0.012	7,081	14,463	0.34
	80	20	0.145	0.012	7,103	14,514	0.34
	81	20	0.145	0.012	7,124	14,561	0.34
	82	20	0.145	0.012	7,143	14,605	0.34
	83	20	0.145	0.012	7,162	14,646	0.34
	84	20	0.145	0.012	7,178	14,684	0.34
	85	20	0.145	0.012	7,191	14,718	0.34
	86	20	0.145	0.012	7,203	14,750	0.34
	87	20	0.145	0.013	7,214	14,778	0.34
	88	20	0.145	0.013	7,223	14,803	0.34
	89	20	0.145	0.013	7,232	14,825	0.34
	90	20	0.145	0.013	7,238	14,843	0.34

Table 3.7A-2 (4 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	91	20	0.145	0.013	7,244	14,859	0.34
	92	20	0.145	0.013	7,247	14,871	0.34
	93	20	0.145	0.013	7,250	14,880	0.34
	94	20	0.145	0.013	7,250	14,886	0.34
	95	20	0.145	0.013	7,249	14,889	0.34
	96	–	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson’s Ratio

Table 3.7A-3 (1 of 4)

Soil Layers and Properties (S3)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Sand	1	5	0.130	0.015	2,090	4,800	0.38
	2	5	0.130	0.019	2,090	4,809	0.38
	3	5	0.130	0.023	2,081	4,861	0.39
	4	5	0.130	0.026	2,082	4,912	0.39
	5	5	0.130	0.021	2,126	4,963	0.39
	6	5	0.130	0.023	2,129	5,014	0.39
	7	5	0.130	0.025	2,130	5,065	0.39
	8	5	0.130	0.027	2,134	5,115	0.39
	9	5	0.130	0.028	2,140	5,165	0.40
	10	5	0.130	0.030	2,148	5,215	0.40
	11	5	0.130	0.024	2,213	5,264	0.39
	12	5	0.130	0.024	2,226	5,314	0.39
	13	5	0.130	0.025	2,241	5,363	0.39
	14	5	0.130	0.025	2,255	5,412	0.39
	15	5	0.130	0.026	2,270	5,460	0.40
	16	5	0.130	0.026	2,285	5,508	0.40
	17	5	0.130	0.026	2,300	5,556	0.40
	18	5	0.130	0.027	2,315	5,604	0.40
	19	5	0.130	0.027	2,331	5,651	0.40
	20	5	0.130	0.028	2,345	5,699	0.40
	21	5	0.130	0.029	2,358	5,745	0.40
	22	5	0.130	0.029	2,372	5,792	0.40
	23	5	0.130	0.029	2,386	5,839	0.40
	24	5	0.130	0.030	2,400	5,885	0.40
	25	5	0.130	0.023	2,466	5,931	0.40
	26	5	0.130	0.024	2,482	5,976	0.40
	27	5	0.130	0.024	2,498	6,021	0.40
	28	5	0.130	0.024	2,514	6,067	0.40
	29	5	0.130	0.024	2,530	6,111	0.40

Table 3.7A-3 (2 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Sand (cont.)	30	5	0.130	0.025	2,546	6,156	0.40
	31	5	0.130	0.025	2,562	6,200	0.40
	32	5	0.130	0.025	2,578	6,244	0.40
	33	5	0.130	0.025	2,594	6,288	0.40
	34	5	0.130	0.025	2,609	6,332	0.40
	35	5	0.130	0.026	2,624	6,375	0.40
	36	5	0.130	0.026	2,640	6,418	0.40
	37	5	0.130	0.026	2,655	6,461	0.40
	38	5	0.130	0.026	2,670	6,503	0.40
	39	5	0.130	0.026	2,685	6,545	0.40
	40	5	0.130	0.026	2,700	6,587	0.40
Soft Rock	41	10	0.135	0.034	4,860	10,160	0.35
	42	10	0.135	0.034	4,893	10,235	0.35
	43	10	0.135	0.034	4,926	10,309	0.35
	44	10	0.135	0.035	4,959	10,383	0.35
	45	10	0.135	0.035	4,991	10,455	0.35
	46	10	0.135	0.035	5,023	10,527	0.35
	47	10	0.135	0.035	5,055	10,598	0.35
	48	10	0.135	0.035	5,087	10,667	0.35
	49	10	0.135	0.035	5,117	10,736	0.35
	50	10	0.135	0.035	5,147	10,804	0.35
	51	10	0.135	0.036	5,178	10,871	0.35
	52	10	0.135	0.036	5,207	10,936	0.35
	53	10	0.135	0.036	5,237	11,001	0.35
	54	10	0.135	0.036	5,266	11,065	0.35
	55	10	0.135	0.036	5,294	11,128	0.35
	56	10	0.135	0.036	5,322	11,190	0.35
	57	10	0.135	0.036	5,349	11,251	0.35
	58	10	0.135	0.036	5,377	11,311	0.35
	59	10	0.135	0.036	5,403	11,370	0.35
	60	10	0.135	0.036	5,430	11,429	0.35

Table 3.7A-3 (3 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Soft Rock (cont.)	61	10	0.135	0.036	5,456	11,486	0.35
	62	10	0.135	0.036	5,481	11,542	0.35
	63	10	0.135	0.037	5,506	11,597	0.35
	64	10	0.135	0.037	5,530	11,652	0.35
	65	10	0.135	0.037	5,554	11,705	0.35
	66	10	0.135	0.037	5,577	11,757	0.35
	67	10	0.135	0.037	5,601	11,809	0.35
	68	10	0.135	0.037	5,624	11,859	0.35
	69	10	0.135	0.037	5,646	11,909	0.36
	70	10	0.135	0.037	5,668	11,958	0.36
Rock	71	20	0.155	0.010	9,200	18,264	0.33
	72	20	0.155	0.010	9,200	18,264	0.33
	73	20	0.155	0.010	9,200	18,264	0.33
	74	20	0.155	0.010	9,200	18,264	0.33
	75	20	0.155	0.010	9,200	18,264	0.33
	76	20	0.155	0.010	9,200	18,264	0.33
	77	20	0.155	0.010	9,200	18,264	0.33
	78	20	0.155	0.010	9,200	18,264	0.33
	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33

Table 3.7A-3 (4 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	–	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson's Ratio

Table 3.7A-4 (1 of 4)

Soil Layers and Properties (S4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Sand	1	5	0.130	0.016	1,813	4,800	0.42
	2	5	0.130	0.021	1,802	4,800	0.42
	3	5	0.130	0.026	1,794	4,800	0.42
	4	5	0.130	0.029	1,790	4,800	0.42
	5	5	0.130	0.025	1,820	4,800	0.42
	6	5	0.130	0.027	1,817	4,800	0.42
	7	5	0.130	0.029	1,818	4,800	0.42
	8	5	0.130	0.031	1,820	4,800	0.42
	9	5	0.130	0.033	1,826	4,800	0.42
	10	5	0.130	0.034	1,832	4,800	0.41
	11	5	0.130	0.026	1,898	4,800	0.41
	12	5	0.130	0.027	1,909	4,800	0.41
	13	5	0.130	0.027	1,921	4,800	0.40
	14	5	0.130	0.029	1,930	4,800	0.40
	15	5	0.130	0.029	1,939	4,800	0.40
	16	5	0.130	0.030	1,949	4,800	0.40
	17	5	0.130	0.032	1,958	4,831	0.40
	18	5	0.130	0.033	1,967	4,873	0.40
	19	5	0.130	0.033	1,975	4,914	0.40
	20	5	0.130	0.034	1,984	4,955	0.40
Soft Rock	21	5	0.135	0.033	3,892	8,114	0.35
	22	5	0.135	0.034	3,908	8,151	0.35
	23	5	0.135	0.034	3,922	8,188	0.35
	24	5	0.135	0.034	3,937	8,225	0.35
	25	5	0.135	0.034	3,953	8,262	0.35
	26	5	0.135	0.035	3,968	8,298	0.35
	27	5	0.135	0.035	3,983	8,334	0.35
	28	5	0.135	0.035	3,998	8,370	0.35
	29	5	0.135	0.035	4,013	8,406	0.35

Table 3.7A-4 (2 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Soft Rock (cont.)	30	5	0.135	0.035	4,027	8,441	0.35
	31	5	0.135	0.035	4,042	8,476	0.35
	32	5	0.135	0.036	4,057	8,512	0.35
	33	5	0.135	0.036	4,072	8,546	0.35
	34	5	0.135	0.036	4,087	8,581	0.35
	35	5	0.135	0.036	4,102	8,616	0.35
	36	5	0.135	0.036	4,116	8,650	0.35
	37	5	0.135	0.036	4,131	8,684	0.35
	38	5	0.135	0.036	4,145	8,718	0.35
	39	5	0.135	0.036	4,160	8,751	0.35
	40	5	0.135	0.037	4,175	8,785	0.35
Rock	41	10	0.145	0.011	6,120	12,396	0.34
	42	10	0.145	0.011	6,147	12,458	0.34
	43	10	0.145	0.011	6,173	12,520	0.34
	44	10	0.145	0.011	6,200	12,581	0.34
	45	10	0.145	0.011	6,225	12,641	0.34
	46	10	0.145	0.011	6,252	12,700	0.34
	47	10	0.145	0.011	6,278	12,759	0.34
	48	10	0.145	0.011	6,303	12,817	0.34
	49	10	0.145	0.011	6,328	12,874	0.34
	50	10	0.145	0.011	6,353	12,930	0.34
	51	10	0.145	0.012	6,378	12,985	0.34
	52	10	0.145	0.012	6,401	13,040	0.34
	53	10	0.145	0.012	6,425	13,094	0.34
	54	10	0.145	0.012	6,449	13,147	0.34
	55	10	0.145	0.012	6,472	13,199	0.34
	56	10	0.145	0.012	6,494	13,250	0.34
	57	10	0.145	0.012	6,516	13,301	0.34
	58	10	0.145	0.012	6,538	13,351	0.34
	59	10	0.145	0.012	6,559	13,400	0.34
	60	10	0.145	0.012	6,580	13,448	0.34

Table 3.7A-4 (3 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	61	10	0.145	0.012	6,601	13,495	0.34
	62	10	0.145	0.012	6,621	13,542	0.34
	63	10	0.145	0.012	6,641	13,588	0.34
	64	10	0.145	0.012	6,661	13,633	0.34
	65	10	0.145	0.012	6,681	13,677	0.34
	66	10	0.145	0.012	6,700	13,721	0.34
	67	10	0.145	0.012	6,719	13,763	0.34
	68	10	0.145	0.012	6,737	13,805	0.34
	69	10	0.145	0.012	6,755	13,846	0.34
	70	10	0.145	0.012	6,773	13,887	0.34
	71	20	0.155	0.01	9,200	18,264	0.33
	72	20	0.155	0.01	9,200	18,264	0.33
	73	20	0.155	0.01	9,200	18,264	0.33
	74	20	0.155	0.01	9,200	18,264	0.33
	75	20	0.155	0.01	9,200	18,264	0.33
	76	20	0.155	0.01	9,200	18,264	0.33
	77	20	0.155	0.01	9,200	18,264	0.33
	78	20	0.155	0.01	9,200	18,264	0.33
	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33

Table 3.7A-4 (4 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	–	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson's Ratio

Table 3.7A-5 (1 of 4)

Soil Layers and Properties (S6)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Sand	1	5	0.130	0.015	2,090	4,800	0.38
	2	5	0.130	0.019	2,090	4,809	0.38
	3	5	0.130	0.023	2,081	4,861	0.39
	4	5	0.130	0.026	2,082	4,912	0.39
	5	5	0.130	0.021	2,126	4,963	0.39
	6	5	0.130	0.023	2,129	5,014	0.39
	7	5	0.130	0.025	2,130	5,065	0.39
	8	5	0.130	0.027	2,134	5,115	0.39
	9	5	0.130	0.028	2,140	5,165	0.40
	10	5	0.130	0.030	2,148	5,215	0.40
Soft Rock	11	5	0.135	0.032	4,271	8,891	0.35
	12	5	0.135	0.032	4,293	8,936	0.35
	13	5	0.135	0.032	4,314	8,981	0.35
	14	5	0.135	0.032	4,336	9,026	0.35
	15	5	0.135	0.032	4,357	9,070	0.35
	16	5	0.135	0.032	4,378	9,114	0.35
	17	5	0.135	0.032	4,399	9,158	0.35
	18	5	0.135	0.032	4,420	9,202	0.35
	19	5	0.135	0.032	4,441	9,245	0.35
	20	5	0.135	0.032	4,462	9,288	0.35
	21	5	0.135	0.032	4,483	9,331	0.35
	22	5	0.135	0.032	4,503	9,374	0.35
	23	5	0.135	0.032	4,524	9,417	0.35
	24	5	0.135	0.033	4,543	9,459	0.35
	25	5	0.135	0.033	4,561	9,501	0.35
	26	5	0.135	0.033	4,580	9,543	0.35
	27	5	0.135	0.033	4,598	9,584	0.35
	28	5	0.135	0.033	4,617	9,626	0.35
	29	5	0.135	0.034	4,634	9,667	0.35

Table 3.7A-5 (2 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Soft Rock (cont.)	30	5	0.135	0.034	4,651	9,707	0.35
	31	5	0.135	0.034	4,668	9,748	0.35
	32	5	0.135	0.034	4,685	9,788	0.35
	33	5	0.135	0.034	4,702	9,828	0.35
	34	5	0.135	0.034	4,719	9,868	0.35
	35	5	0.135	0.035	4,736	9,908	0.35
	36	5	0.135	0.035	4,753	9,947	0.35
	37	5	0.135	0.035	4,770	9,986	0.35
	38	5	0.135	0.035	4,786	10,025	0.35
	39	5	0.135	0.035	4,803	10,064	0.35
	40	5	0.135	0.035	4,820	10,102	0.35
Rock	41	10	0.155	0.010	9,200	18,264	0.33
	42	10	0.155	0.010	9,200	18,264	0.33
	43	10	0.155	0.010	9,200	18,264	0.33
	44	10	0.155	0.010	9,200	18,264	0.33
	45	10	0.155	0.010	9,200	18,264	0.33
	46	10	0.155	0.010	9,200	18,264	0.33
	47	10	0.155	0.010	9,200	18,264	0.33
	48	10	0.155	0.010	9,200	18,264	0.33
	49	10	0.155	0.010	9,200	18,264	0.33
	50	10	0.155	0.010	9,200	18,264	0.33
	51	10	0.155	0.010	9,200	18,264	0.33
	52	10	0.155	0.010	9,200	18,264	0.33
	53	10	0.155	0.010	9,200	18,264	0.33
	54	10	0.155	0.010	9,200	18,264	0.33
	55	10	0.155	0.010	9,200	18,264	0.33
	56	10	0.155	0.010	9,200	18,264	0.33
	57	10	0.155	0.010	9,200	18,264	0.33
	58	10	0.155	0.010	9,200	18,264	0.33
	59	10	0.155	0.010	9,200	18,264	0.33
	60	10	0.155	0.010	9,200	18,264	0.33

Table 3.7A-5 (3 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	61	10	0.155	0.010	9,200	18,264	0.33
	62	10	0.155	0.010	9,200	18,264	0.33
	63	10	0.155	0.010	9,200	18,264	0.33
	64	10	0.155	0.010	9,200	18,264	0.33
	65	10	0.155	0.010	9,200	18,264	0.33
	66	10	0.155	0.010	9,200	18,264	0.33
	67	10	0.155	0.010	9,200	18,264	0.33
	68	10	0.155	0.010	9,200	18,264	0.33
	69	10	0.155	0.010	9,200	18,264	0.33
	70	10	0.155	0.010	9,200	18,264	0.33
	71	20	0.155	0.010	9,200	18,264	0.33
	72	20	0.155	0.010	9,200	18,264	0.33
	73	20	0.155	0.010	9,200	18,264	0.33
	74	20	0.155	0.010	9,200	18,264	0.33
	75	20	0.155	0.010	9,200	18,264	0.33
	76	20	0.155	0.010	9,200	18,264	0.33
	77	20	0.155	0.010	9,200	18,264	0.33
	78	20	0.155	0.010	9,200	18,264	0.33
	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33

Table 3.7A-5 (4 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	–	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson’s Ratio

Table 3.7A-6 (1 of 4)

Soil Layers and Properties (S7)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Sand	1	5	0.130	0.016	1,813	4,800	0.42
	2	5	0.130	0.021	1,802	4,800	0.42
	3	5	0.130	0.026	1,794	4,800	0.42
	4	5	0.130	0.029	1,790	4,800	0.42
	5	5	0.130	0.025	1,820	4,800	0.42
	6	5	0.130	0.027	1,817	4,800	0.42
	7	5	0.130	0.029	1,818	4,800	0.42
	8	5	0.130	0.031	1,820	4,800	0.42
	9	5	0.130	0.033	1,826	4,800	0.42
	10	5	0.130	0.034	1,832	4,800	0.41
Soft Rock	11	5	0.135	0.032	3,714	7,731	0.35
	12	5	0.135	0.032	3,733	7,770	0.35
	13	5	0.135	0.032	3,752	7,810	0.35
	14	5	0.135	0.032	3,770	7,848	0.35
	15	5	0.135	0.032	3,789	7,887	0.35
	16	5	0.135	0.032	3,807	7,925	0.35
	17	5	0.135	0.033	3,825	7,964	0.35
	18	5	0.135	0.033	3,841	8,002	0.35
	19	5	0.135	0.033	3,858	8,039	0.35
	20	5	0.135	0.033	3,874	8,077	0.35
Rock	21	5	0.145	0.009	5,826	11,709	0.34
	22	5	0.145	0.010	5,839	11,744	0.34
	23	5	0.145	0.010	5,853	11,780	0.34
	24	5	0.145	0.010	5,866	11,815	0.34
	25	5	0.145	0.010	5,880	11,849	0.34
	26	5	0.145	0.010	5,894	11,884	0.34
	27	5	0.145	0.010	5,907	11,919	0.34
	28	5	0.145	0.010	5,921	11,953	0.34
	29	5	0.145	0.010	5,935	11,987	0.34

Table 3.7A-6 (2 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	30	5	0.145	0.010	5,949	12,021	0.34
	31	5	0.145	0.010	5,962	12,054	0.34
	32	5	0.145	0.011	5,976	12,088	0.34
	33	5	0.145	0.011	5,990	12,121	0.34
	34	5	0.145	0.011	6,004	12,154	0.34
	35	5	0.145	0.011	6,018	12,187	0.34
	36	5	0.145	0.011	6,031	12,220	0.34
	37	5	0.145	0.011	6,045	12,252	0.34
	38	5	0.145	0.011	6,059	12,284	0.34
	39	5	0.145	0.011	6,073	12,316	0.34
	40	5	0.145	0.011	6,086	12,348	0.34
	41	10	0.155	0.010	9,200	18,264	0.33
	42	10	0.155	0.010	9,200	18,264	0.33
	43	10	0.155	0.010	9,200	18,264	0.33
	44	10	0.155	0.010	9,200	18,264	0.33
	45	10	0.155	0.010	9,200	18,264	0.33
	46	10	0.155	0.010	9,200	18,264	0.33
	47	10	0.155	0.010	9,200	18,264	0.33
	48	10	0.155	0.010	9,200	18,264	0.33
	49	10	0.155	0.010	9,200	18,264	0.33
	50	10	0.155	0.010	9,200	18,264	0.33
	51	10	0.155	0.010	9,200	18,264	0.33
	52	10	0.155	0.010	9,200	18,264	0.33
	53	10	0.155	0.010	9,200	18,264	0.33
	54	10	0.155	0.010	9,200	18,264	0.33
	55	10	0.155	0.010	9,200	18,264	0.33
	56	10	0.155	0.010	9,200	18,264	0.33
	57	10	0.155	0.010	9,200	18,264	0.33
	58	10	0.155	0.010	9,200	18,264	0.33
	59	10	0.155	0.010	9,200	18,264	0.33
	60	10	0.155	0.010	9,200	18,264	0.33

Table 3.7A-6 (3 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	61	10	0.155	0.010	9,200	18,264	0.33
	62	10	0.155	0.010	9,200	18,264	0.33
	63	10	0.155	0.010	9,200	18,264	0.33
	64	10	0.155	0.010	9,200	18,264	0.33
	65	10	0.155	0.010	9,200	18,264	0.33
	66	10	0.155	0.010	9,200	18,264	0.33
	67	10	0.155	0.010	9,200	18,264	0.33
	68	10	0.155	0.010	9,200	18,264	0.33
	69	10	0.155	0.010	9,200	18,264	0.33
	70	10	0.155	0.010	9,200	18,264	0.33
	71	20	0.155	0.010	9,200	18,264	0.33
	72	20	0.155	0.010	9,200	18,264	0.33
	73	20	0.155	0.010	9,200	18,264	0.33
	74	20	0.155	0.010	9,200	18,264	0.33
	75	20	0.155	0.010	9,200	18,264	0.33
	76	20	0.155	0.010	9,200	18,264	0.33
	77	20	0.155	0.010	9,200	18,264	0.33
	78	20	0.155	0.010	9,200	18,264	0.33
	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33

Table 3.7A-6 (4 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	–	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson's Ratio

Table 3.7A-7 (1 of 4)

Soil Layers and Properties (S8)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock	1	5	0.145	0.002	6,348	12,602	0.33
	2	5	0.145	0.004	6,371	12,648	0.33
	3	5	0.145	0.005	6,394	12,693	0.33
	4	5	0.145	0.006	6,416	12,738	0.33
	5	5	0.145	0.006	6,435	12,782	0.33
	6	5	0.145	0.006	6,450	12,827	0.33
	7	5	0.145	0.007	6,467	12,871	0.33
	8	5	0.145	0.007	6,485	12,915	0.33
	9	5	0.145	0.007	6,503	12,958	0.33
	10	5	0.145	0.007	6,521	13,002	0.33
	11	5	0.145	0.008	6,540	13,045	0.33
	12	5	0.145	0.008	6,559	13,088	0.33
	13	5	0.145	0.008	6,578	13,131	0.33
	14	5	0.145	0.008	6,597	13,174	0.33
	15	5	0.145	0.008	6,616	13,216	0.33
	16	5	0.145	0.008	6,631	13,258	0.33
	17	5	0.145	0.008	6,646	13,300	0.33
	18	5	0.145	0.009	6,662	13,342	0.33
	19	5	0.145	0.009	6,677	13,383	0.33
	20	5	0.145	0.009	6,692	13,424	0.33
	21	5	0.145	0.009	6,708	13,465	0.33
	22	5	0.145	0.009	6,724	13,506	0.34
	23	5	0.145	0.009	6,740	13,546	0.34
	24	5	0.145	0.009	6,756	13,587	0.34
	25	5	0.145	0.009	6,773	13,627	0.34
	26	5	0.145	0.010	6,788	13,667	0.34
	27	5	0.145	0.010	6,805	13,706	0.34
	28	5	0.145	0.010	6,821	13,746	0.34
	29	5	0.145	0.010	6,837	13,785	0.34

Table 3.7A-7 (2 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	30	5	0.145	0.010	6,854	13,824	0.34
	31	5	0.145	0.010	6,869	13,862	0.34
	32	5	0.145	0.010	6,886	13,901	0.34
	33	5	0.145	0.010	6,902	13,939	0.34
	34	5	0.145	0.010	6,918	13,977	0.34
	35	5	0.145	0.010	6,935	14,015	0.34
	36	5	0.145	0.010	6,951	14,053	0.34
	37	5	0.145	0.010	6,967	14,090	0.34
	38	5	0.145	0.010	6,983	14,127	0.34
	39	5	0.145	0.011	7,000	14,164	0.34
	40	5	0.145	0.011	7,015	14,200	0.34
	41	10	0.155	0.010	9,200	18,264	0.33
	42	10	0.155	0.010	9,200	18,264	0.33
	43	10	0.155	0.010	9,200	18,264	0.33
	44	10	0.155	0.010	9,200	18,264	0.33
	45	10	0.155	0.010	9,200	18,264	0.33
	46	10	0.155	0.010	9,200	18,264	0.33
	47	10	0.155	0.010	9,200	18,264	0.33
	48	10	0.155	0.010	9,200	18,264	0.33
	49	10	0.155	0.010	9,200	18,264	0.33
	50	10	0.155	0.010	9,200	18,264	0.33
	51	10	0.155	0.010	9,200	18,264	0.33
	52	10	0.155	0.010	9,200	18,264	0.33
	53	10	0.155	0.010	9,200	18,264	0.33
	54	10	0.155	0.010	9,200	18,264	0.33
	55	10	0.155	0.010	9,200	18,264	0.33
	56	10	0.155	0.010	9,200	18,264	0.33
	57	10	0.155	0.010	9,200	18,264	0.33
	58	10	0.155	0.010	9,200	18,264	0.33
	59	10	0.155	0.010	9,200	18,264	0.33
	60	10	0.155	0.010	9,200	18,264	0.33

Table 3.7A-7 (3 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	61	10	0.155	0.010	9,200	18,264	0.33
	62	10	0.155	0.010	9,200	18,264	0.33
	63	10	0.155	0.010	9,200	18,264	0.33
	64	10	0.155	0.010	9,200	18,264	0.33
	65	10	0.155	0.010	9,200	18,264	0.33
	66	10	0.155	0.010	9,200	18,264	0.33
	67	10	0.155	0.010	9,200	18,264	0.33
	68	10	0.155	0.010	9,200	18,264	0.33
	69	10	0.155	0.010	9,200	18,264	0.33
	70	10	0.155	0.010	9,200	18,264	0.33
	71	20	0.155	0.010	9,200	18,264	0.33
	72	20	0.155	0.010	9,200	18,264	0.33
	73	20	0.155	0.010	9,200	18,264	0.33
	74	20	0.155	0.010	9,200	18,264	0.33
	75	20	0.155	0.010	9,200	18,264	0.33
	76	20	0.155	0.010	9,200	18,264	0.33
	77	20	0.155	0.010	9,200	18,264	0.33
	78	20	0.155	0.010	9,200	18,264	0.33
	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33

Table 3.7A-7 (4 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	20	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson’s Ratio

Table 3.7A-8 (1 of 4)

Soil Layers and Properties (S9)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock	1	5	0.145	0.003	4,692	9,315	0.33
	2	5	0.145	0.005	4,709	9,348	0.33
	3	5	0.145	0.006	4,722	9,382	0.33
	4	5	0.145	0.007	4,730	9,415	0.33
	5	5	0.145	0.007	4,741	9,448	0.33
	6	5	0.145	0.008	4,753	9,481	0.33
	7	5	0.145	0.008	4,765	9,513	0.33
	8	5	0.145	0.008	4,778	9,546	0.33
	9	5	0.145	0.008	4,785	9,578	0.33
	10	5	0.145	0.009	4,793	9,610	0.33
	11	5	0.145	0.009	4,802	9,642	0.34
	12	5	0.145	0.009	4,811	9,674	0.34
	13	5	0.145	0.009	4,821	9,706	0.34
	14	5	0.145	0.010	4,832	9,737	0.34
	15	5	0.145	0.010	4,842	9,768	0.34
	16	5	0.145	0.010	4,853	9,799	0.34
	17	5	0.145	0.010	4,864	9,830	0.34
	18	5	0.145	0.010	4,875	9,861	0.34
	19	5	0.145	0.011	4,886	9,892	0.34
	20	5	0.145	0.011	4,897	9,922	0.34
	21	5	0.155	0.010	9,200	18,264	0.33
	22	5	0.155	0.010	9,200	18,264	0.33
	23	5	0.155	0.010	9,200	18,264	0.33
	24	5	0.155	0.010	9,200	18,264	0.33
	25	5	0.155	0.010	9,200	18,264	0.33
	26	5	0.155	0.010	9,200	18,264	0.33
	27	5	0.155	0.010	9,200	18,264	0.33
	28	5	0.155	0.010	9,200	18,264	0.33
	29	5	0.155	0.010	9,200	18,264	0.33

Table 3.7A-8 (2 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	30	5	0.155	0.010	9,200	18,264	0.33
	31	5	0.155	0.010	9,200	18,264	0.33
	32	5	0.155	0.010	9,200	18,264	0.33
	33	5	0.155	0.010	9,200	18,264	0.33
	34	5	0.155	0.010	9,200	18,264	0.33
	35	5	0.155	0.010	9,200	18,264	0.33
	36	5	0.155	0.010	9,200	18,264	0.33
	37	5	0.155	0.010	9,200	18,264	0.33
	38	5	0.155	0.010	9,200	18,264	0.33
	39	5	0.155	0.010	9,200	18,264	0.33
	40	5	0.155	0.010	9,200	18,264	0.33
	41	10	0.155	0.010	9,200	18,264	0.33
	42	10	0.155	0.010	9,200	18,264	0.33
	43	10	0.155	0.010	9,200	18,264	0.33
	44	10	0.155	0.010	9,200	18,264	0.33
	45	10	0.155	0.010	9,200	18,264	0.33
	46	10	0.155	0.010	9,200	18,264	0.33
	47	10	0.155	0.010	9,200	18,264	0.33
	48	10	0.155	0.010	9,200	18,264	0.33
	49	10	0.155	0.010	9,200	18,264	0.33
	50	10	0.155	0.010	9,200	18,264	0.33
	51	10	0.155	0.010	9,200	18,264	0.33
	52	10	0.155	0.010	9,200	18,264	0.33
	53	10	0.155	0.010	9,200	18,264	0.33
	54	10	0.155	0.010	9,200	18,264	0.33
	55	10	0.155	0.010	9,200	18,264	0.33
	56	10	0.155	0.010	9,200	18,264	0.33
	57	10	0.155	0.010	9,200	18,264	0.33
	58	10	0.155	0.010	9,200	18,264	0.33
	59	10	0.155	0.010	9,200	18,264	0.33
	60	10	0.155	0.010	9,200	18,264	0.33

Table 3.7A-8 (3 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	61	10	0.155	0.010	9,200	18,264	0.33
	62	10	0.155	0.010	9,200	18,264	0.33
	63	10	0.155	0.010	9,200	18,264	0.33
	64	10	0.155	0.010	9,200	18,264	0.33
	65	10	0.155	0.010	9,200	18,264	0.33
	66	10	0.155	0.010	9,200	18,264	0.33
	67	10	0.155	0.010	9,200	18,264	0.33
	68	10	0.155	0.010	9,200	18,264	0.33
	69	10	0.155	0.010	9,200	18,264	0.33
	70	10	0.155	0.010	9,200	18,264	0.33
	71	20	0.155	0.010	9,200	18,264	0.33
	72	20	0.155	0.010	9,200	18,264	0.33
	73	20	0.155	0.010	9,200	18,264	0.33
	74	20	0.155	0.010	9,200	18,264	0.33
	75	20	0.155	0.010	9,200	18,264	0.33
	76	20	0.155	0.010	9,200	18,264	0.33
	77	20	0.155	0.010	9,200	18,264	0.33
	78	20	0.155	0.010	9,200	18,264	0.33
	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33

Table 3.7A-8 (4 of 4)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp$^{(2)}$ (ft/s)	$\rho^{(3)}$
Rock (cont.)	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	–	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson's Ratio

Table 3.7A-9

SSI Analysis Cases and Cut-off Frequencies

Layer	S1	S2	S3	S4	S6	S7	S8	S9	S10
Above Basemat(1)	22	19	40	34	40	34	121	90	381
Below Basemat(2)	50	42	90	77	173	150	263	193	800

(1) Top of soil profile, min. with upper nuclear island basemat

(2) General profile under nuclear island basemat

Table 3.7A-10

Output Locations

Structures	Elevation	Remarks
Reactor Containment Building Internal Structure for primary shield wall (PSW) and secondary shield wall (SSW)	78′-0″ 100′-0″ 156′-0″ 191′-0″	Basemat elevation Support elevation of major equipment Operation floor elevation Top of internal structure
Reactor Containment Building Containment Structure	104′-0″ 160′-0″ 332′-0"	Ground floor elevation Operation floor elevation Top of dome
Auxiliary Building	55′-0″ 100′-0″ 156′-0″ 213′-0″ 216′-9″	Basemat elevation Ground floor elevation Main control room floor elevation Roof of auxiliary building (1) Roof of auxiliary building (2)
Emergency Diesel Generator Building	100′-0″ 135′-0″	Foundation basemat Roof slab elevation
Diesel Fuel Oil Storage Tank Room	63′-0″ 100′-0″	Foundation basemat Roof slab elevation

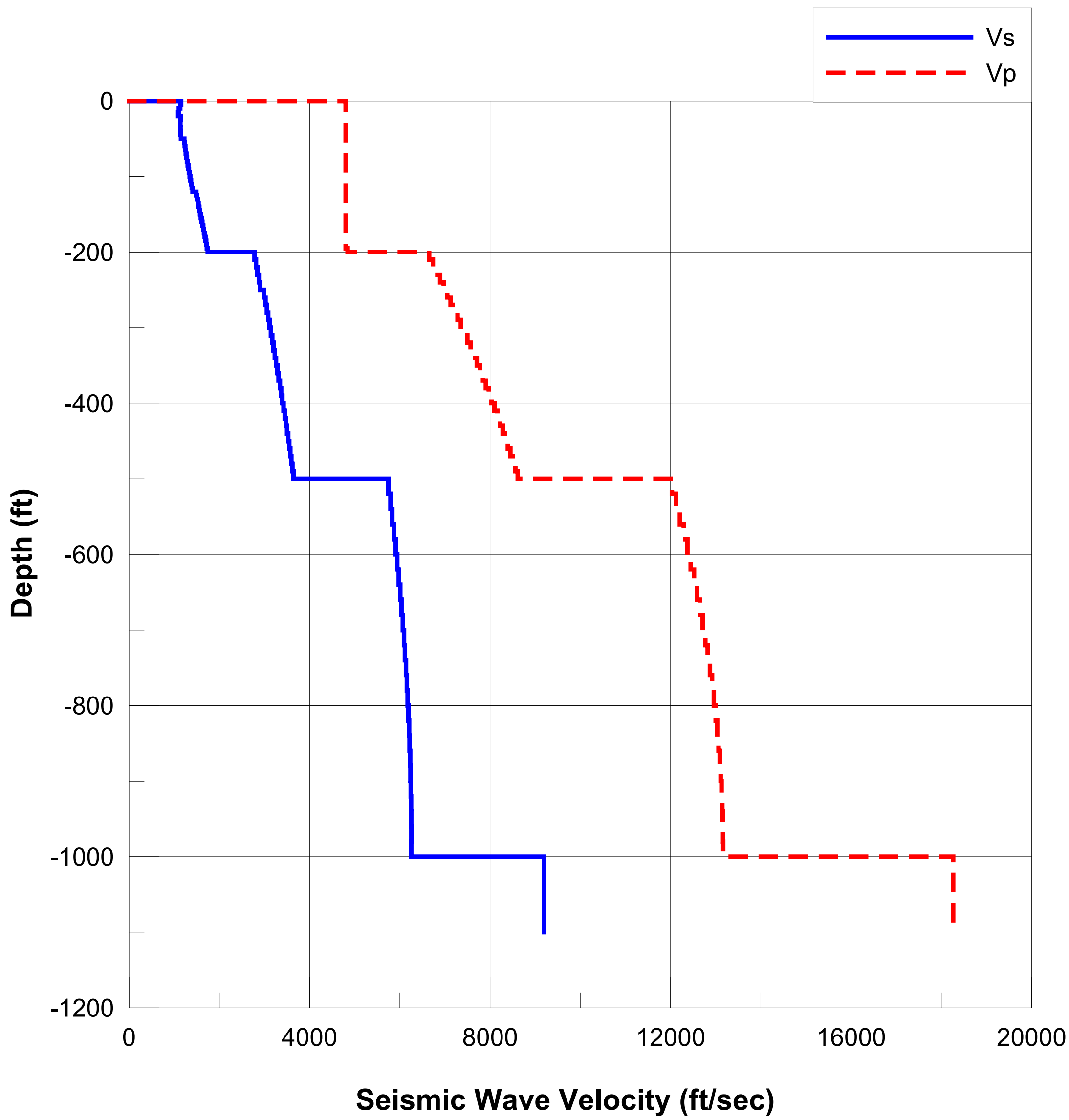

Figure 3.7A-1 Shear and Compression Wave Velocity Profiles for S1

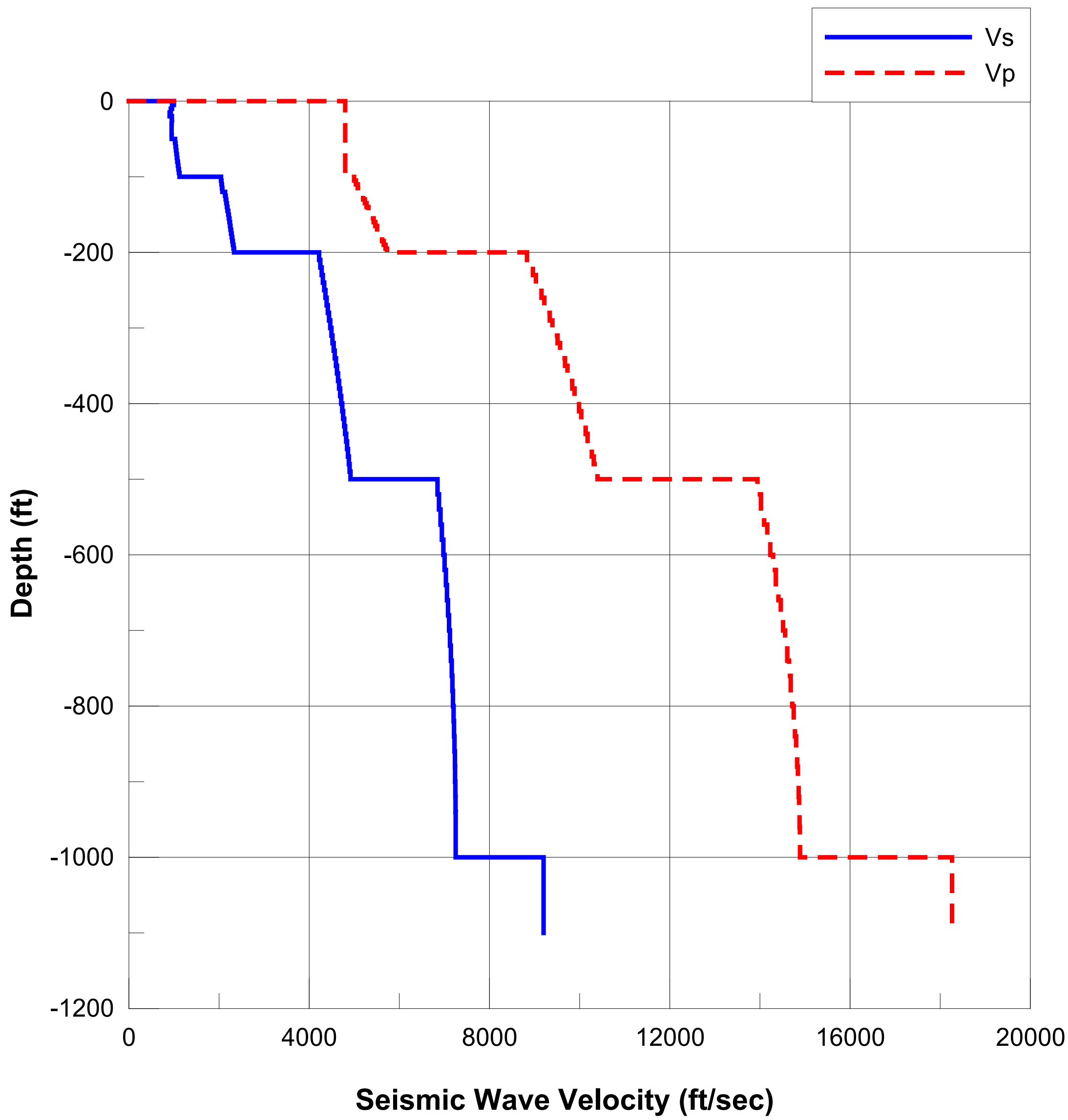

Figure 3.7A-2 Shear and Compression Wave Velocity Profiles for S2

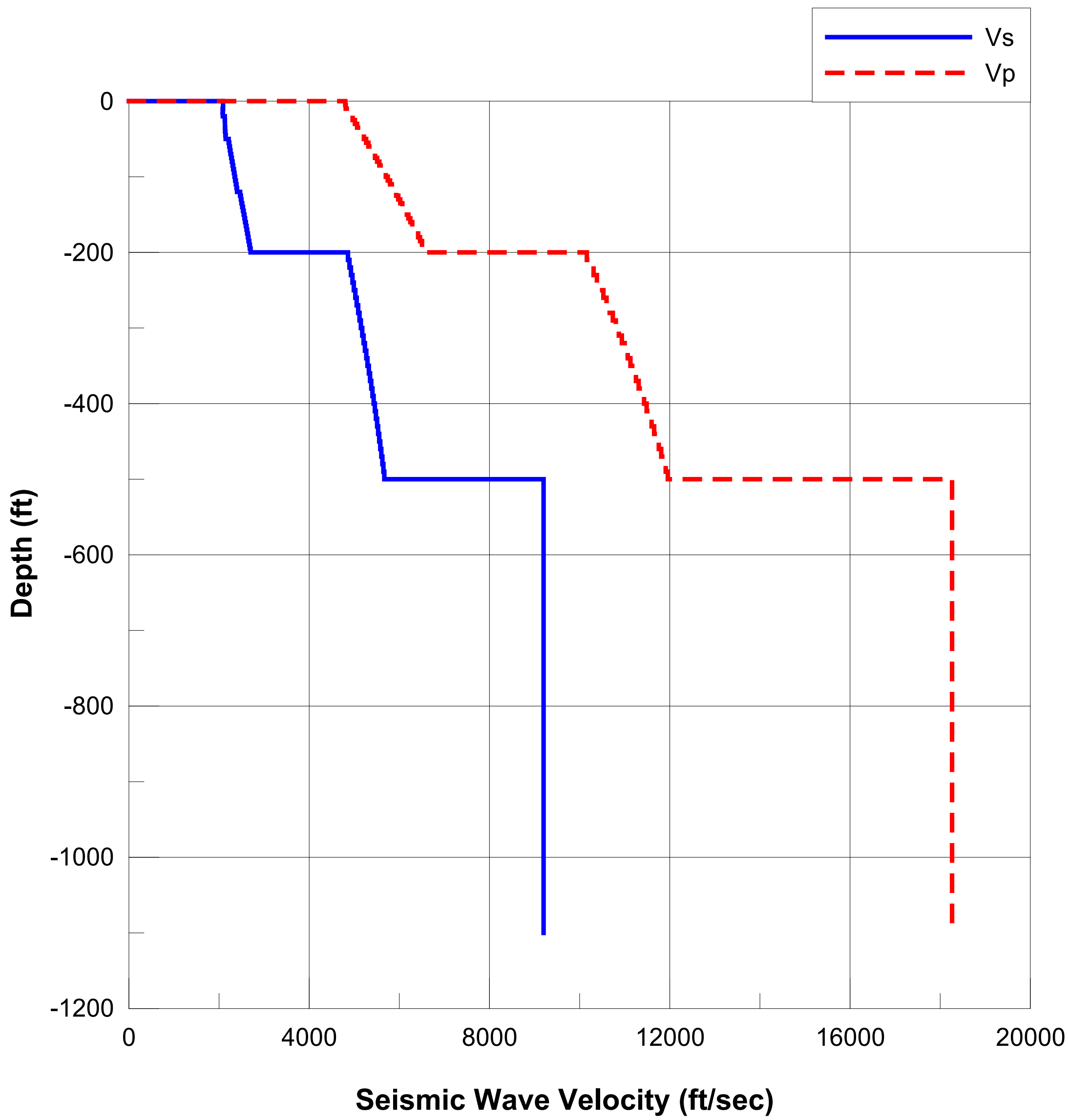

Figure 3.7A-3 Shear and Compression Wave Velocity Profiles for S3

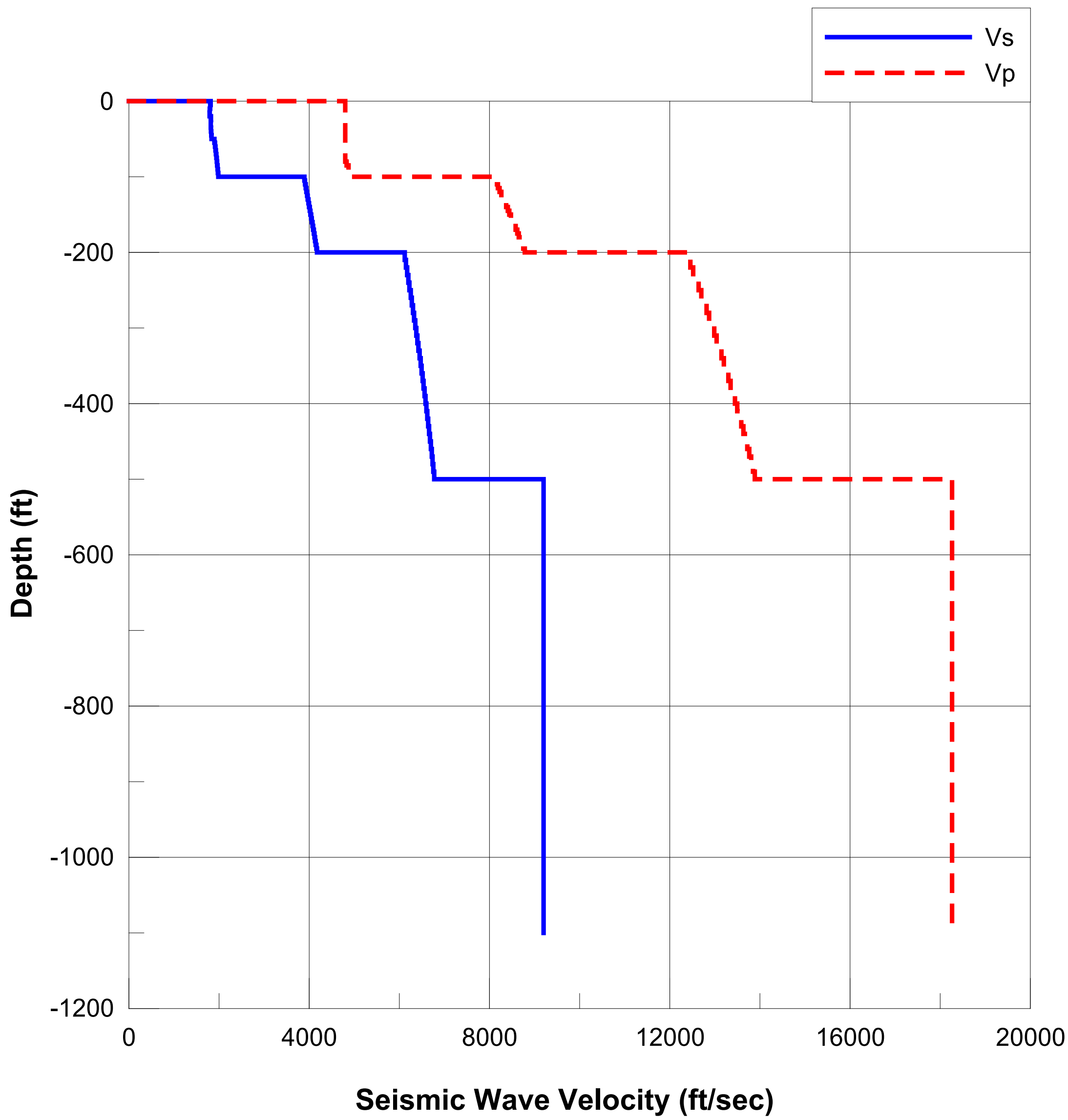

Figure 3.7A-4 Shear and Compression Wave Velocity Profiles for S4

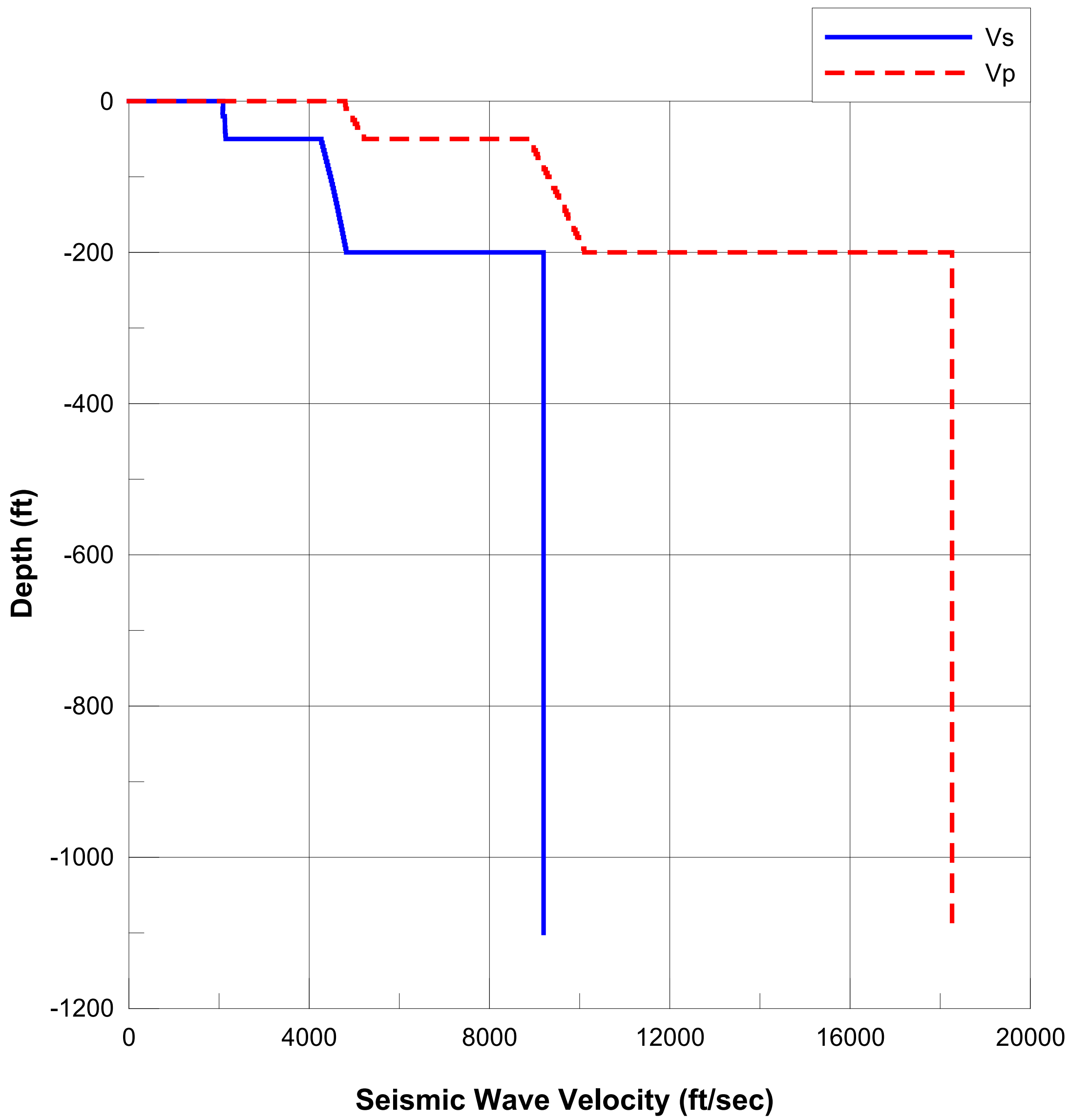

Figure 3.7A-5 Shear and Compression Wave Velocity Profiles for S6

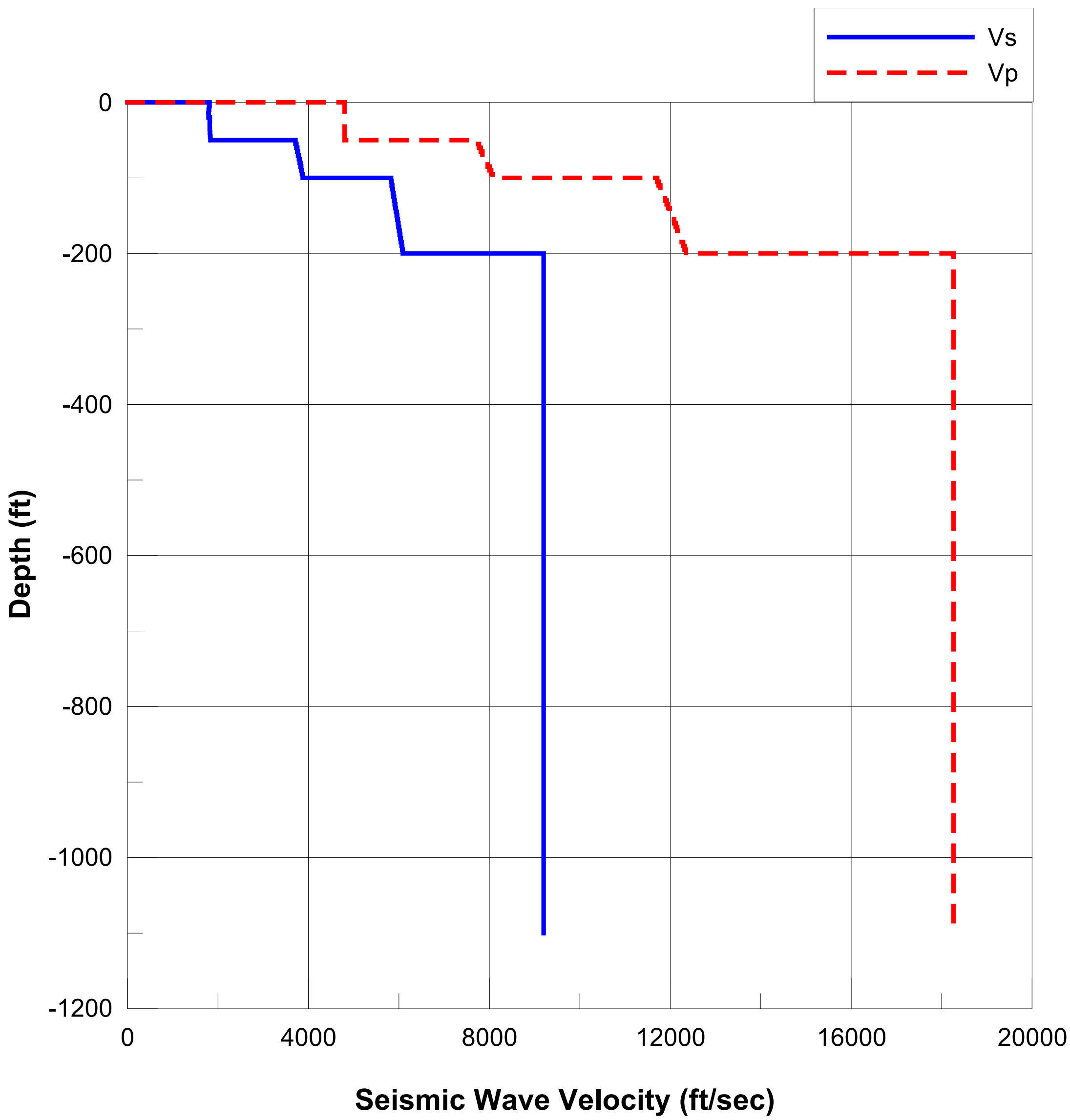

Figure 3.7A-6 Shear and Compression Wave Velocity Profiles for S7

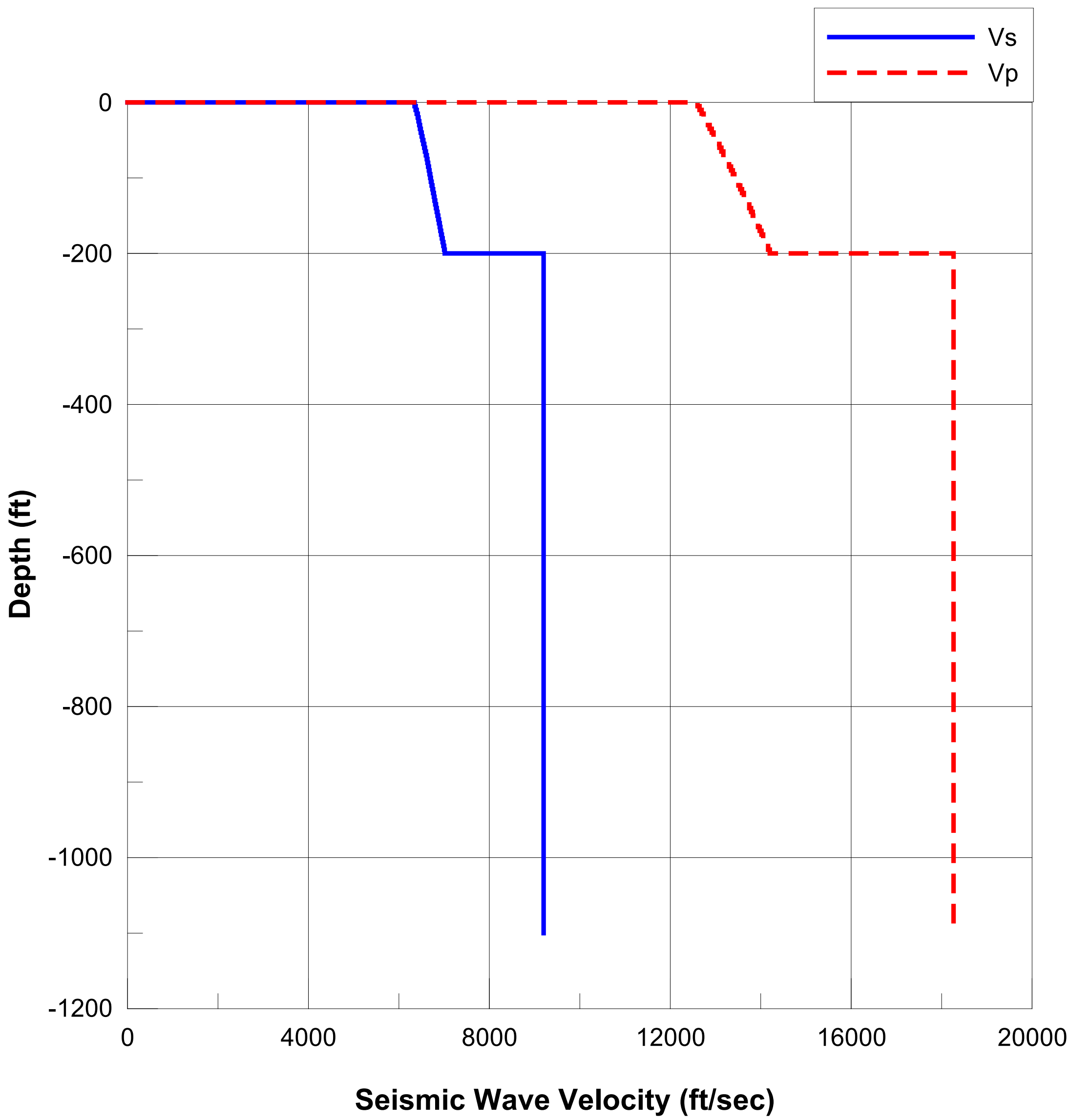

Figure 3.7A-7 Shear and Compression Wave Velocity Profiles for S8

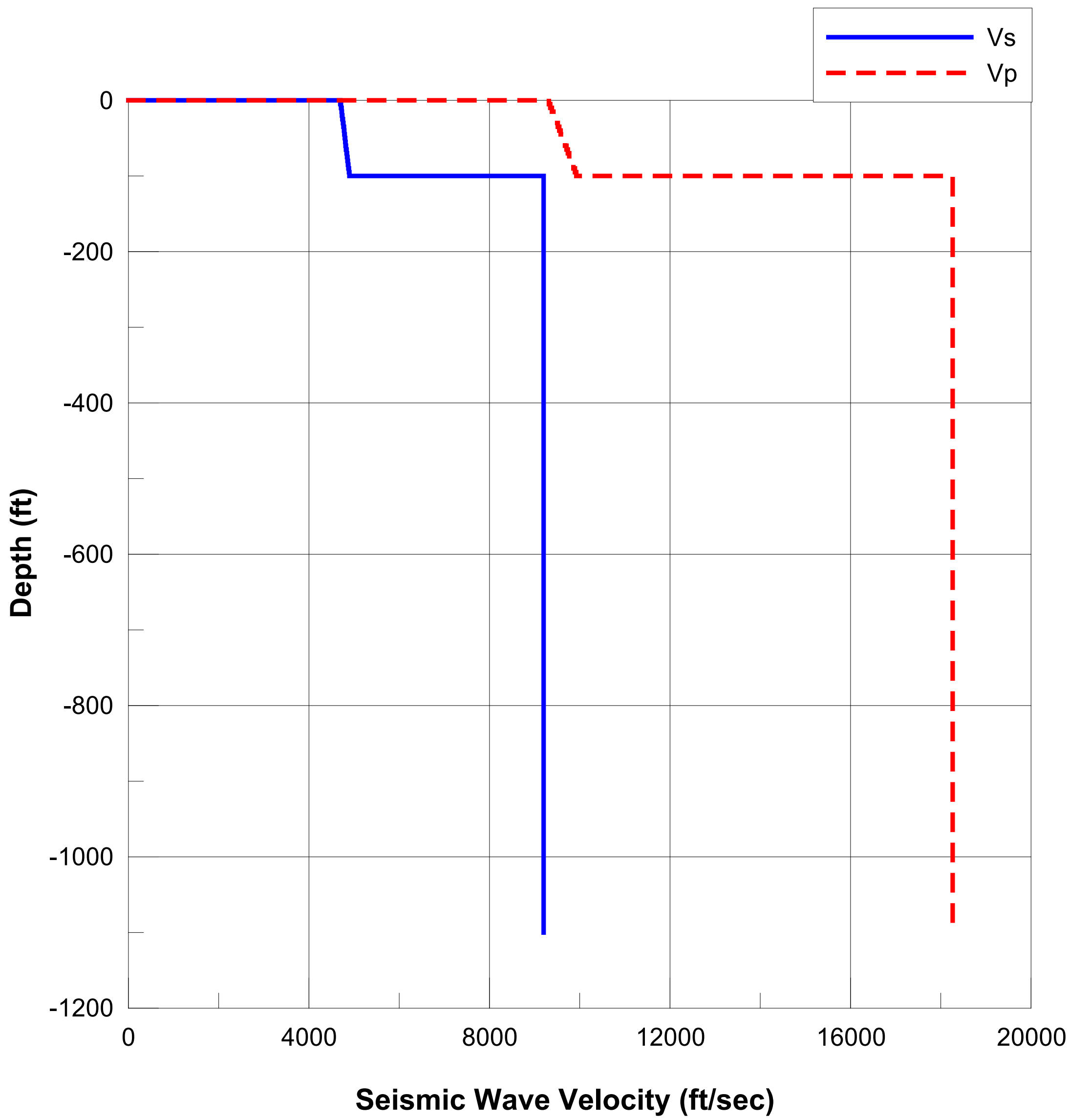

Figure 3.7A-8 Shear and Compression Wave Velocity Profiles for S9

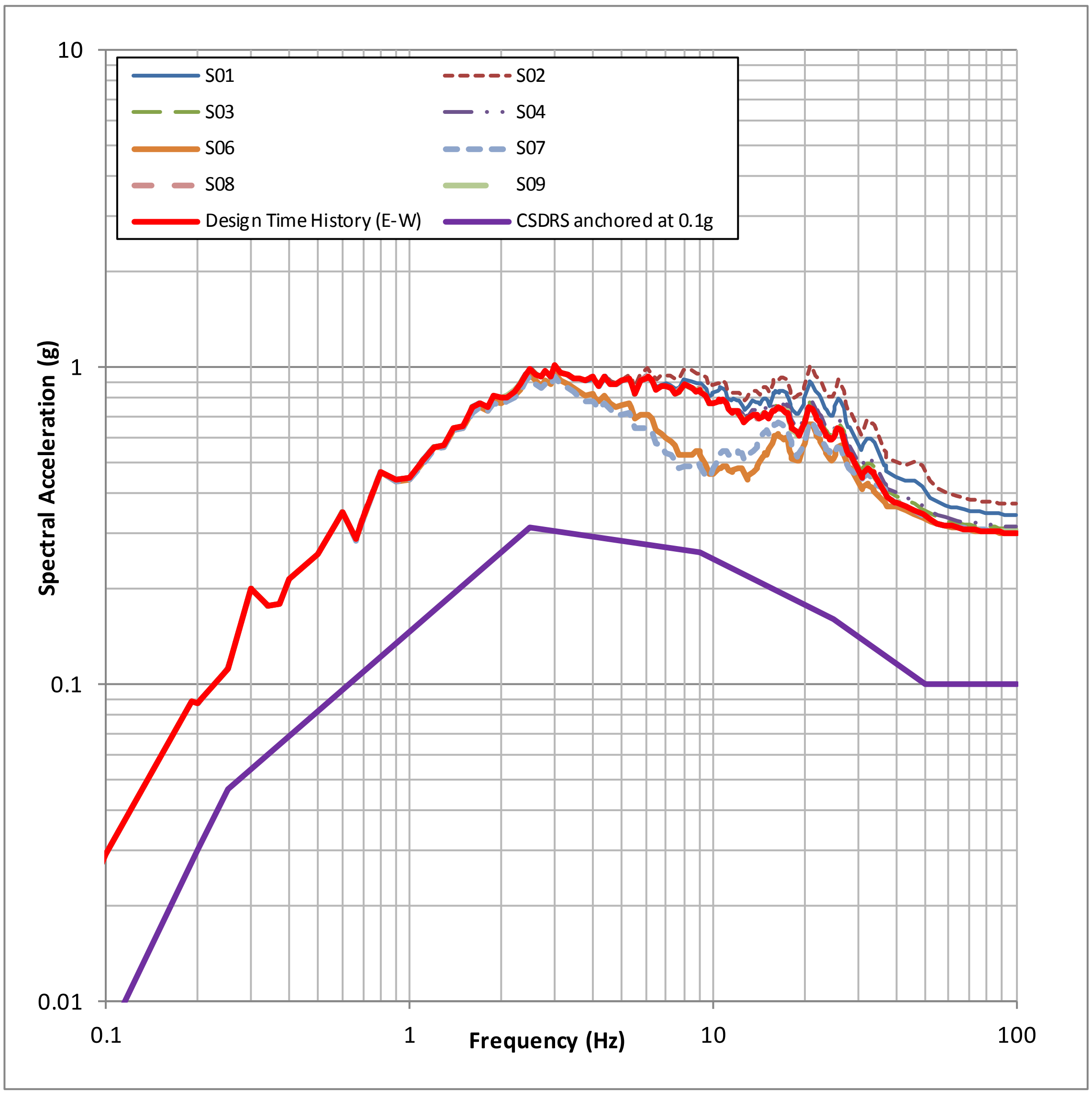

Figure 3.7A-9 Comparison of Design Time History Compatible with CSDRS with Site Response Outcrop Motion at Foundation Base Elevation of Nuclear Island Structure, E-W Motion, 5% damping (1 of 3)

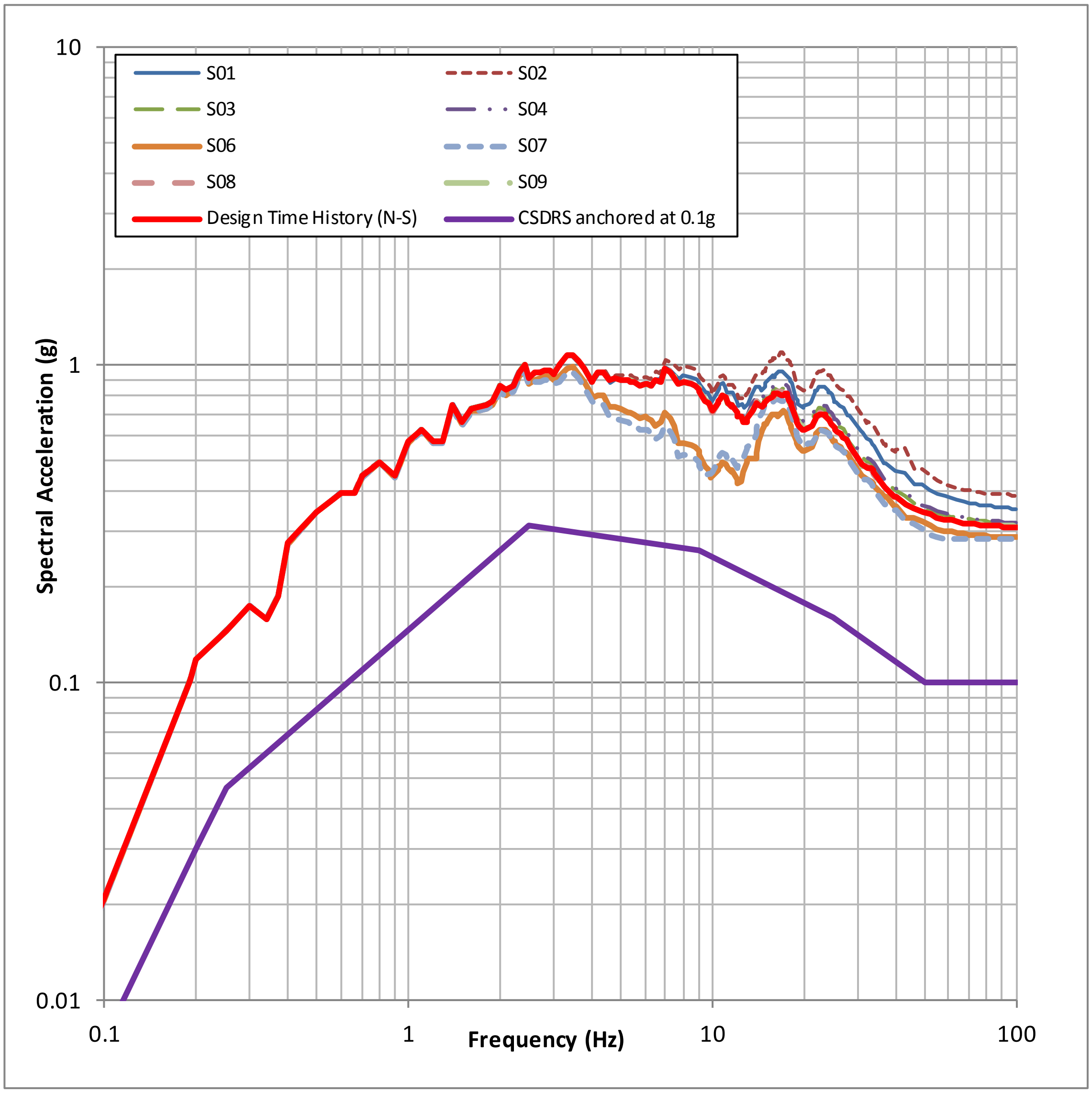

Figure 3.7A-9 Comparison of Design Time History Compatible with CSDRS with Site Response Outcrop Motion at Foundation Base Elevation of Nuclear Island Structure, N-S Motion, 5% damping (2 of 3)

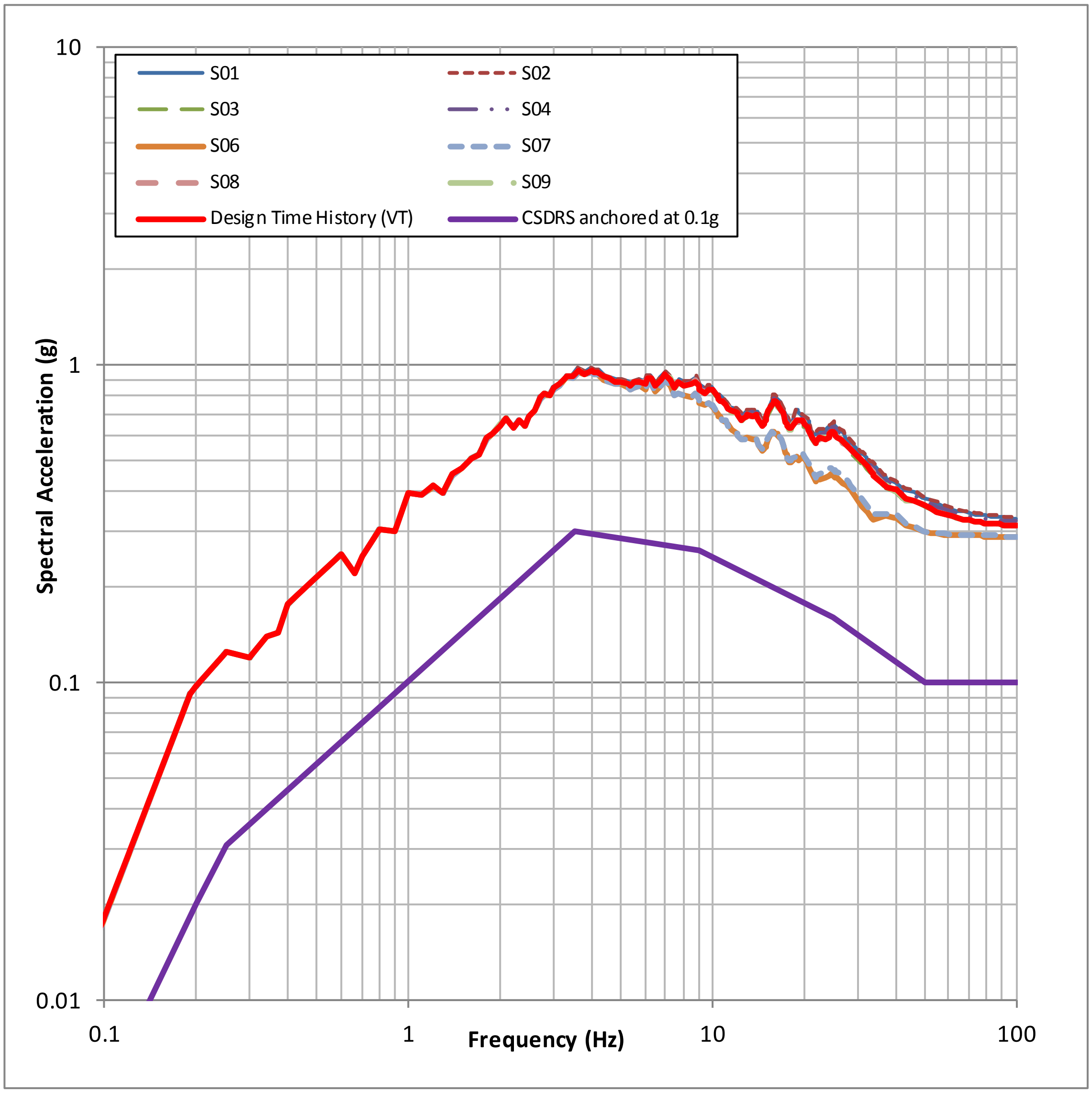

Figure 3.7A-9 Comparison of Design Time History Compatible with CSDRS with Site Response Outcrop Motion at Foundation Base Elevation of Nuclear Island Structure, Vertical Motion, 5% damping (3 of 3)

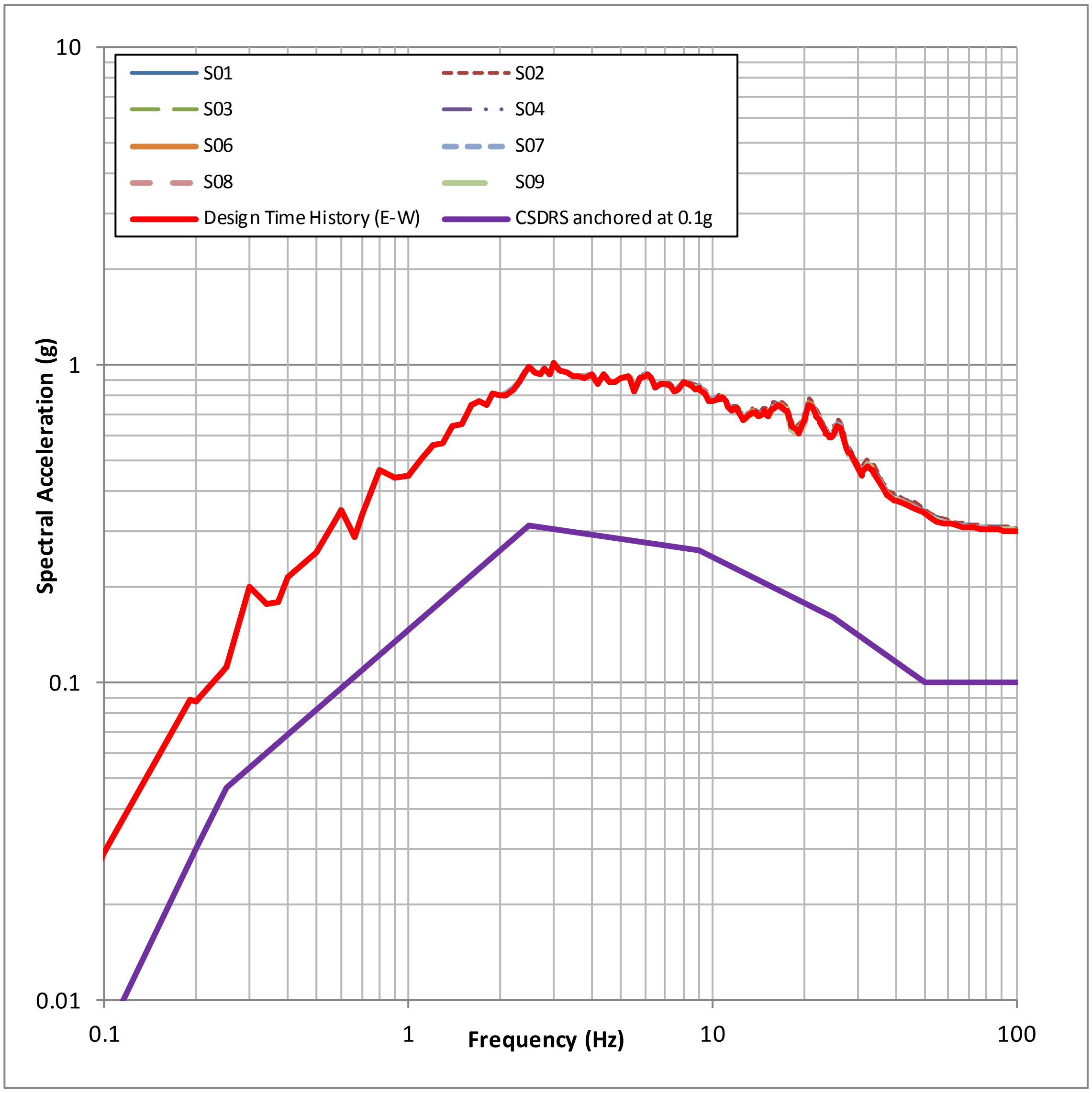

Figure 3.7A-10 Comparison of Design Time History Compatible with CSDRS with Site Response Outcrop Motion at Foundation Base Elevation of Emergency Diesel Generator Building, E-W Motion, 5% damping (1 of 3)

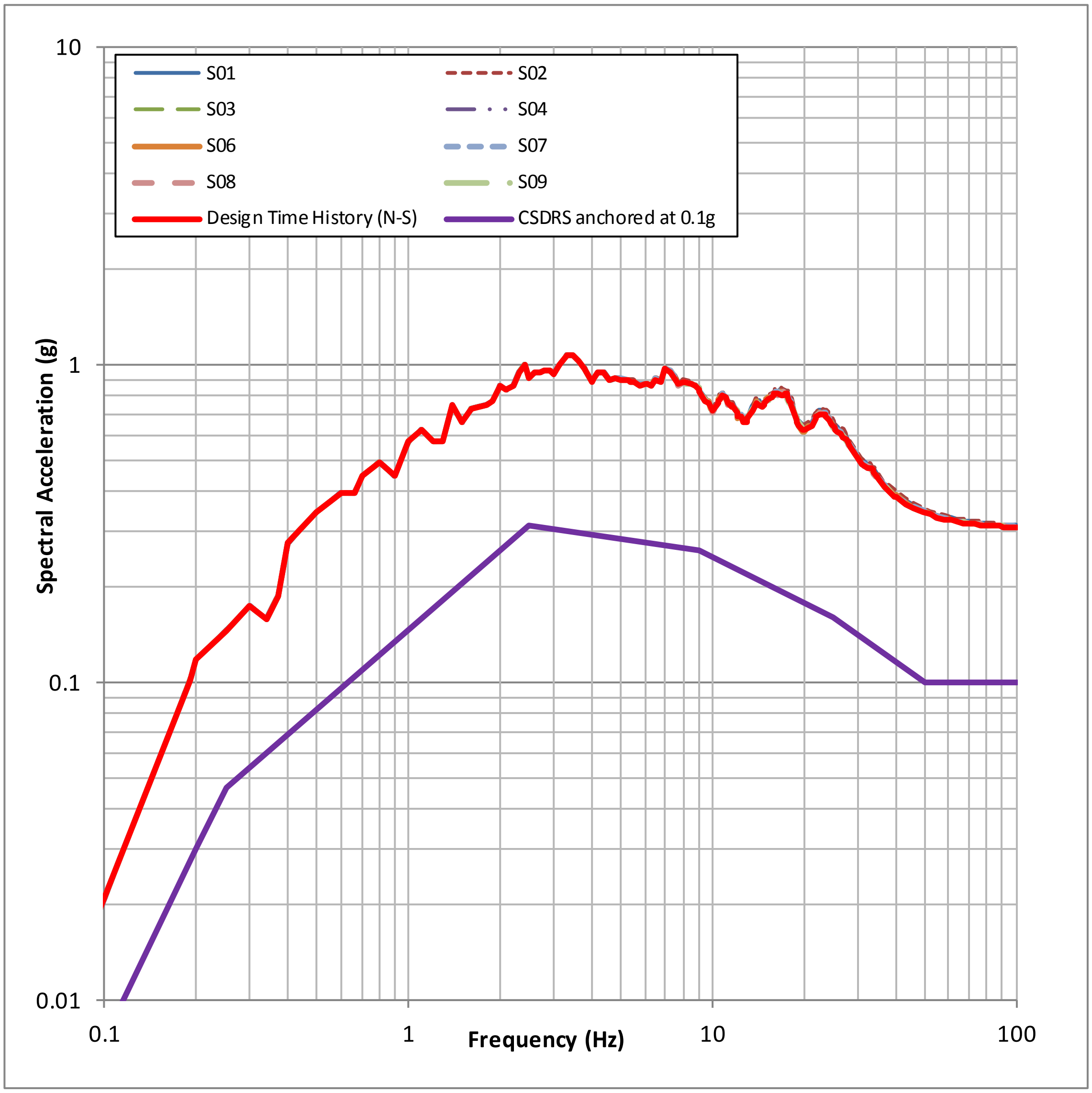

Figure 3.7A-10 Comparison of Design Time History Compatible with CSDRS with Site Response Outcrop Motion at Foundation Base Elevation of Emergency Diesel Generator Building, N-S Motion, 5% damping (2 of 3)

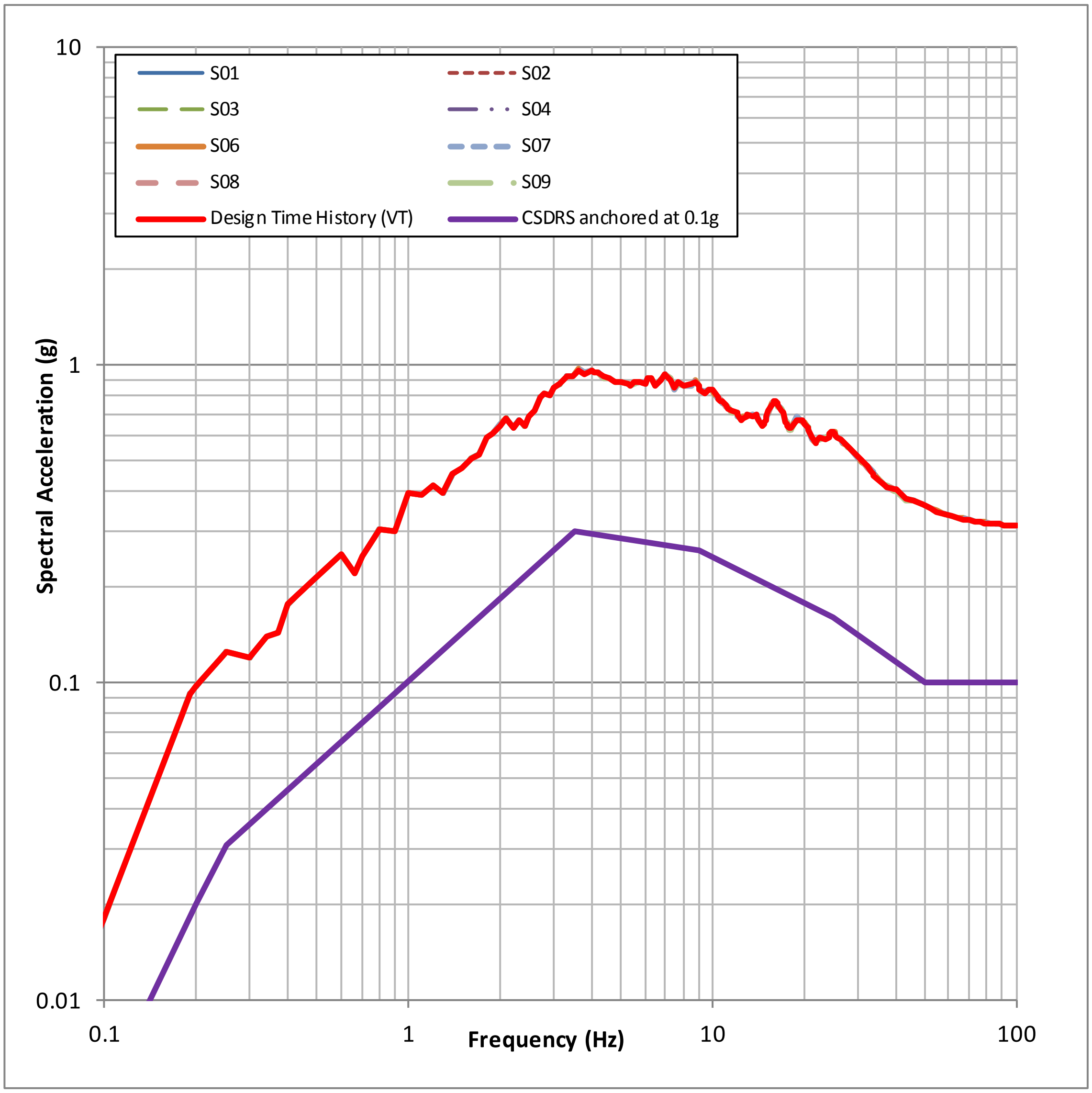

Figure 3.7A-10 Comparison of Design Time History Compatible with CSDRS with Site Response Outcrop Motion at Foundation Base Elevation of Emergency Diesel Generator Building, Vertical Motion, 5% damping (3 of 3)

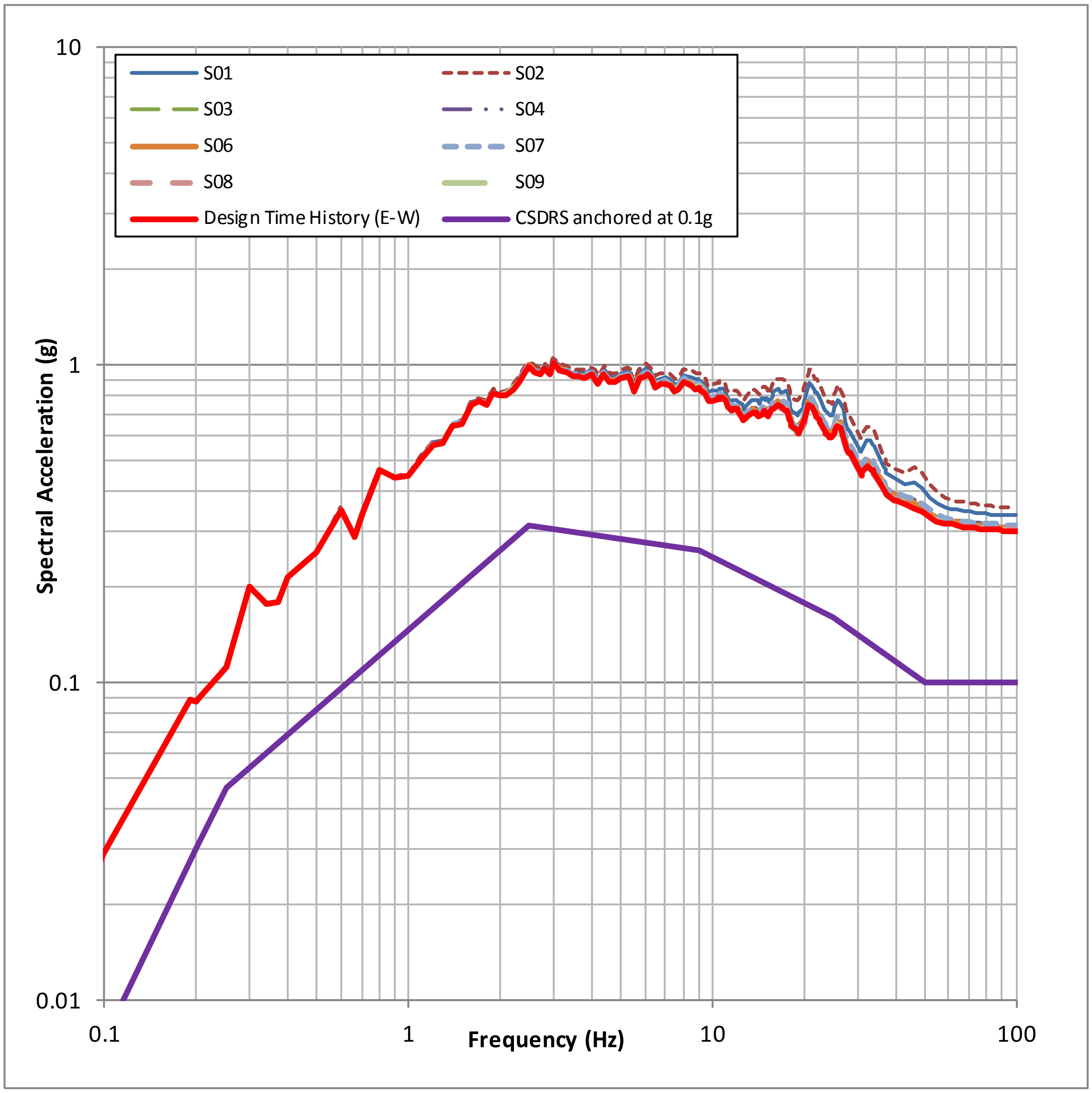

Figure 3.7A-11 Comparison of Design Time History Compatible with CSDRS with Site Response Outcrop Motion at Foundation Base Elevation of Diesel Fuel Oil Tank, E-W Motion, 5% damping (1 of 3)

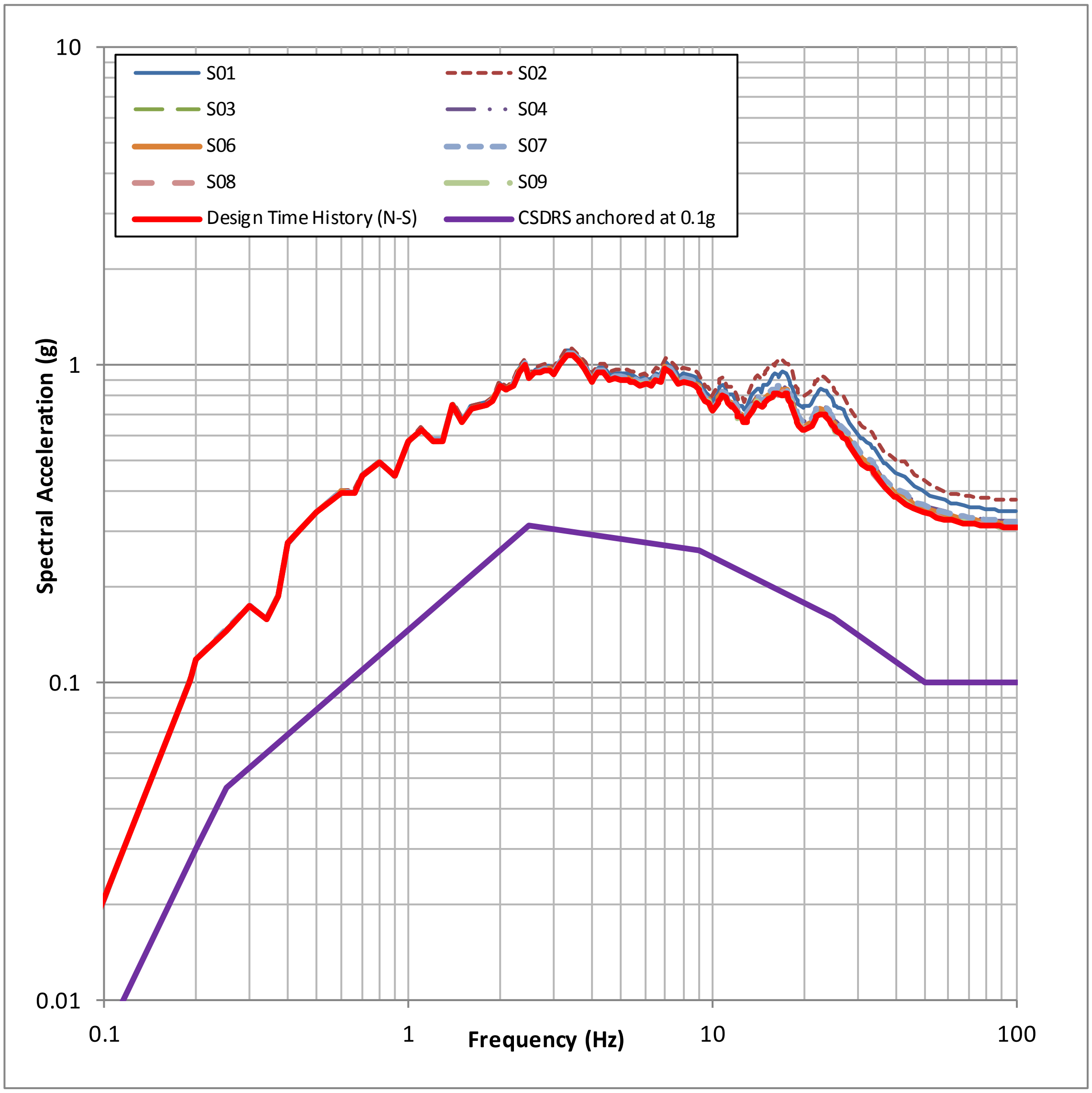

Figure 3.7A-11 Comparison of Design Time History Compatible with CSDRS with Site Response Outcrop Motion at Foundation Base Elevation of Diesel Fuel Oil Tank, N-S Motion, 5% damping (2 of 3)

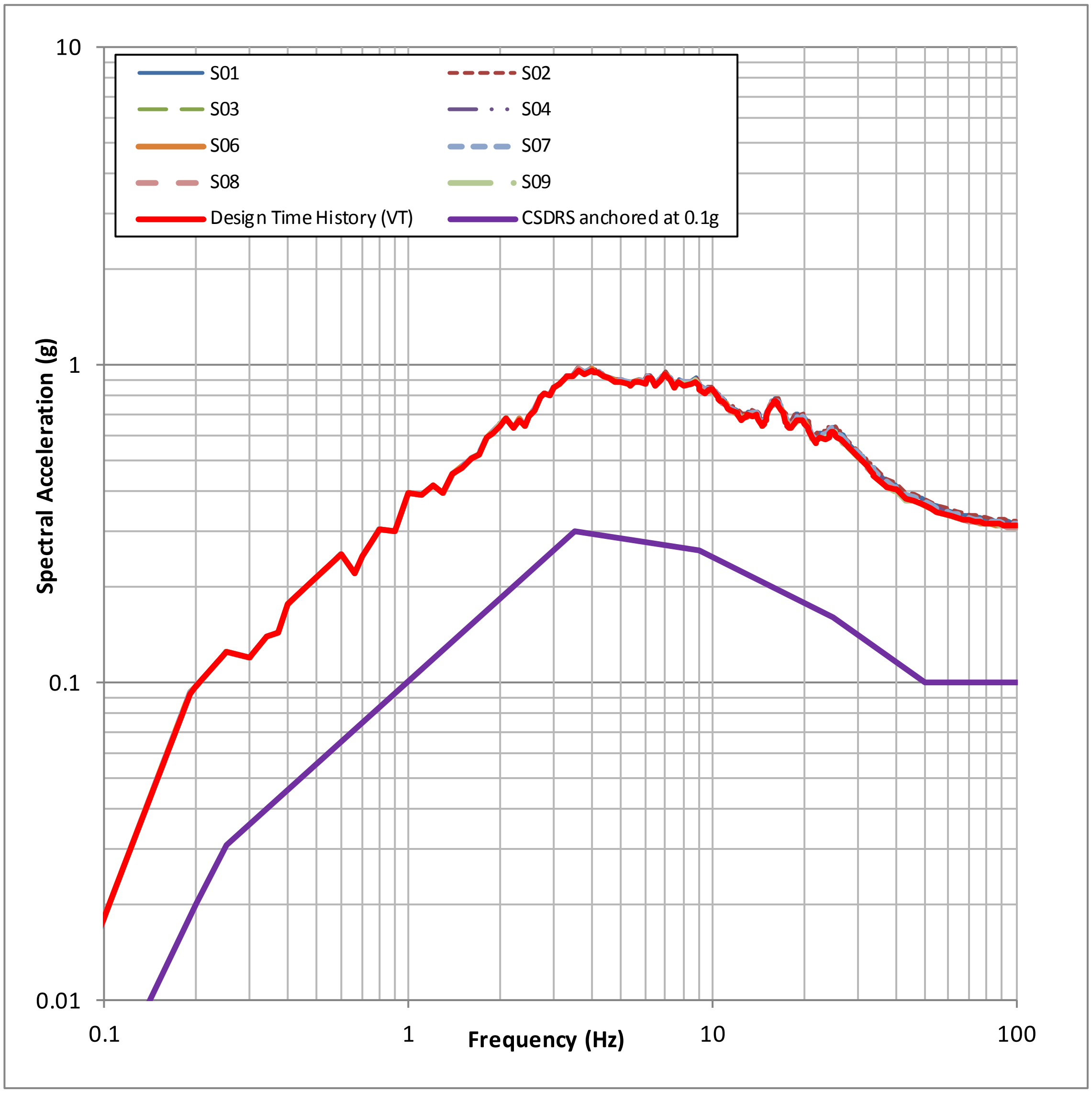

Figure 3.7A-11 Comparison of Design Time History Compatible with CSDRS with Site Response Outcrop Motion at Foundation Base Elevation of Diesel Fuel Oil Tank, Vertical Motion, 5% damping (3 of 3)

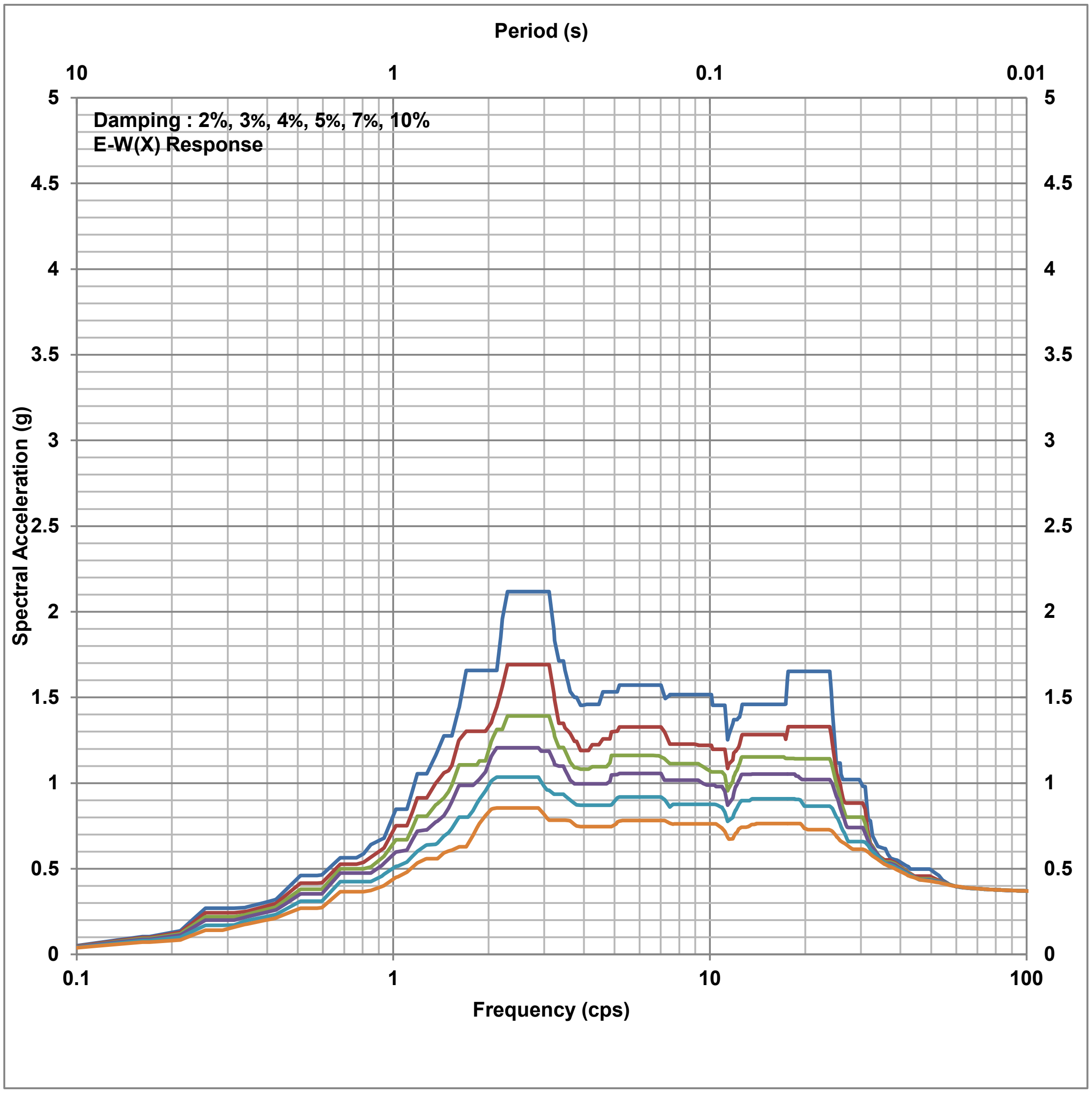

Figure 3.7A-12 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 78′-0″, E-W Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

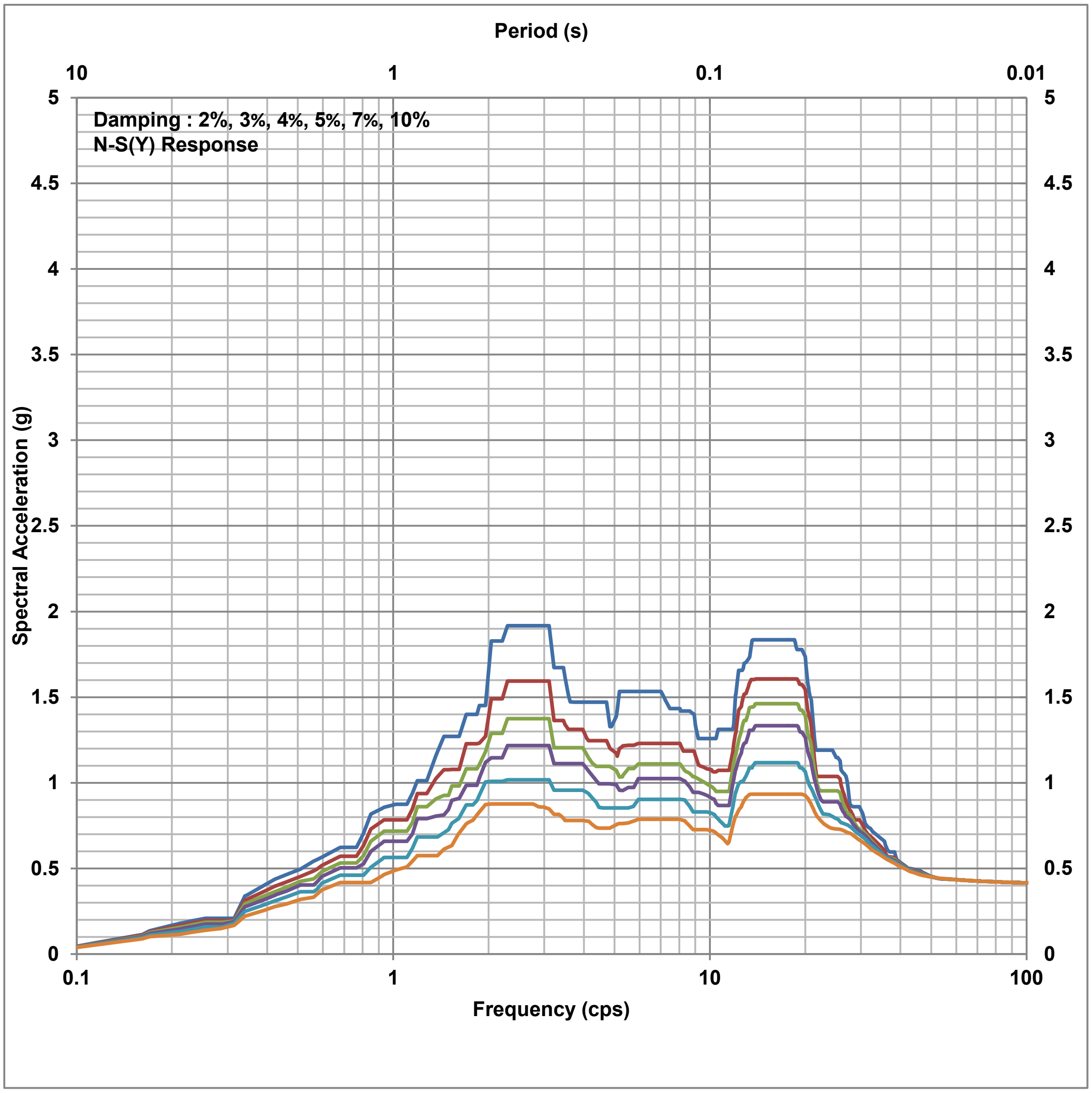

Figure 3.7A-13 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 78′-0″, N-S Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

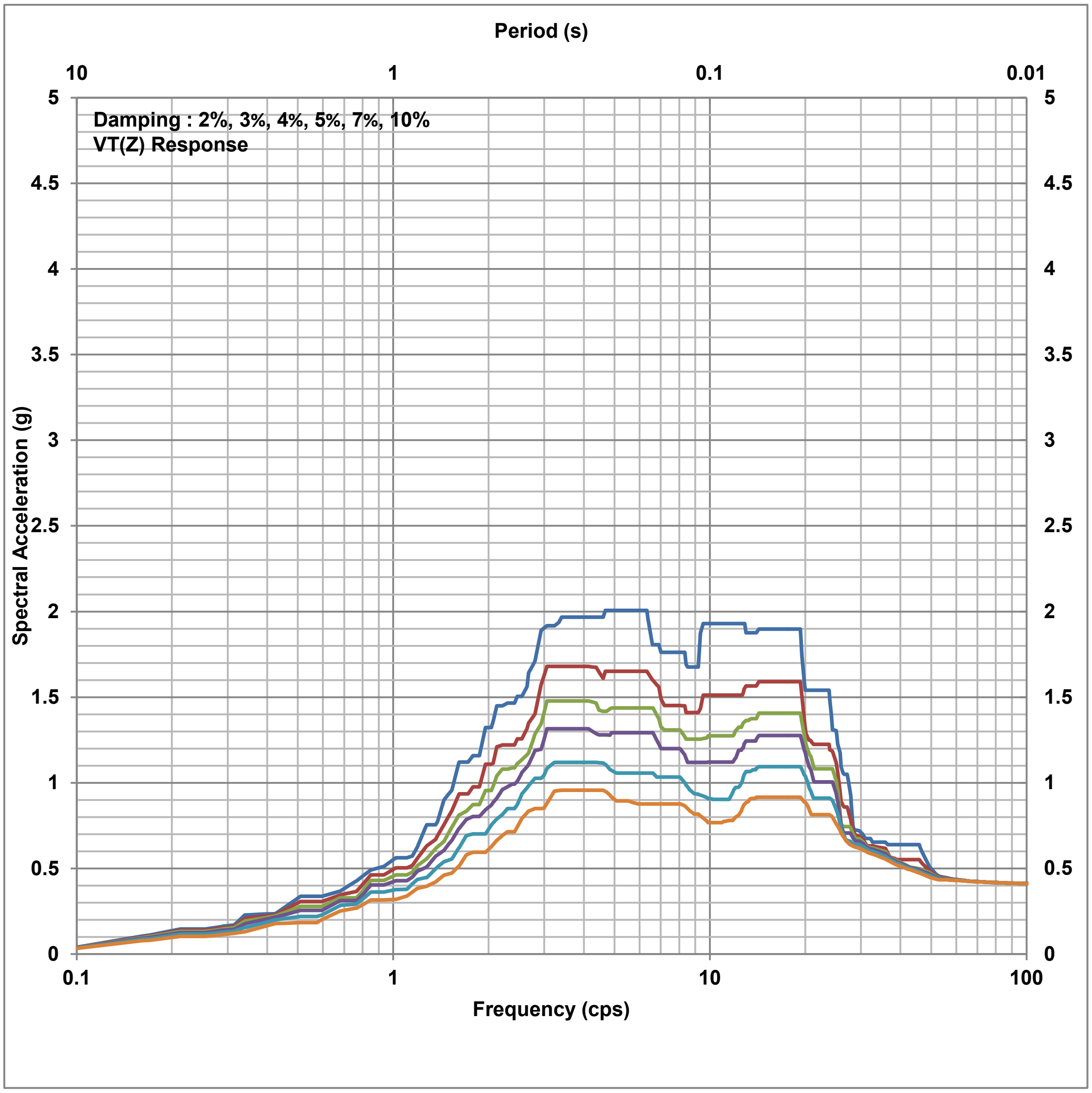

Figure 3.7A-14 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 78′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

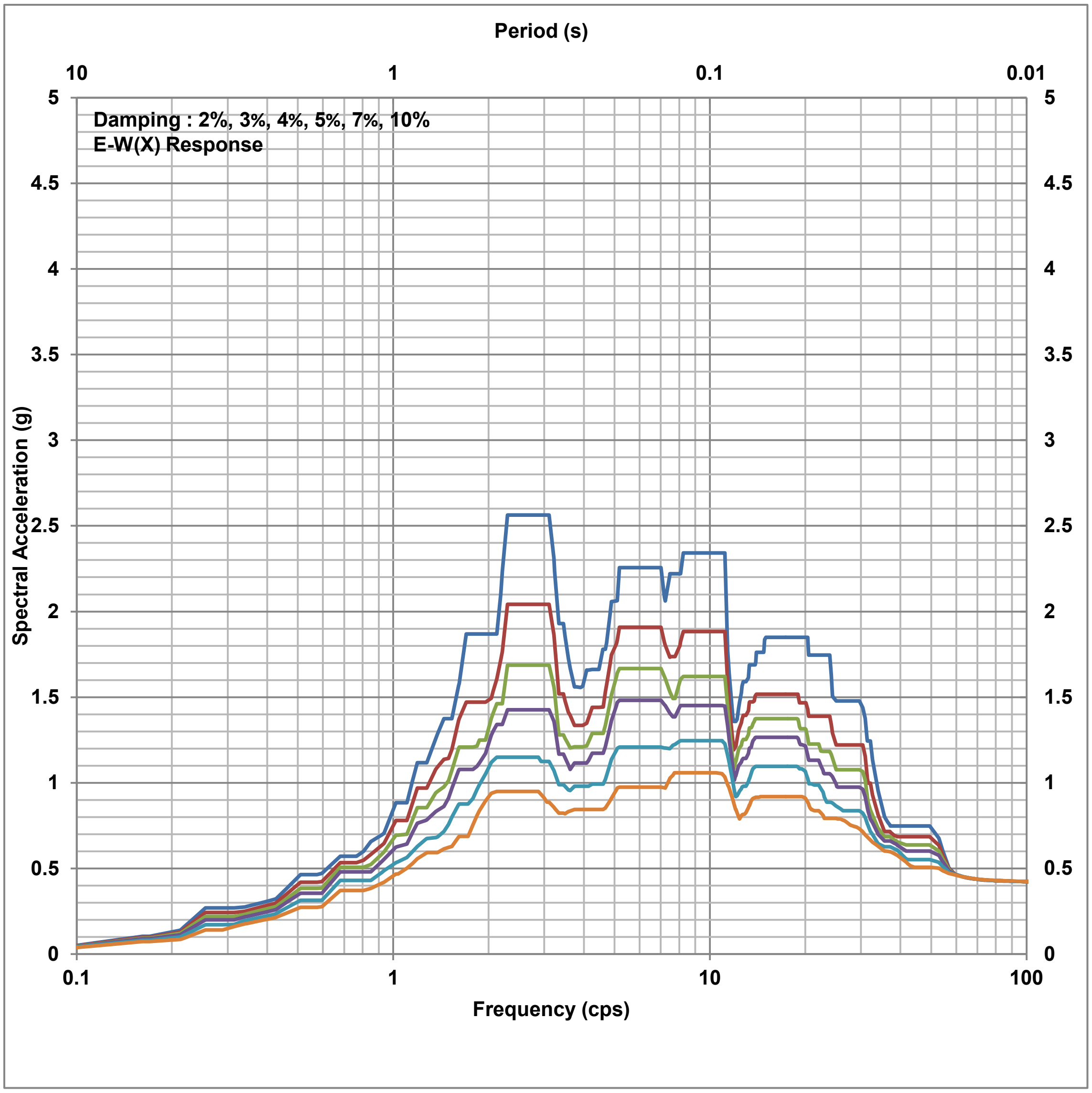

Figure 3.7A-15 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 100′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

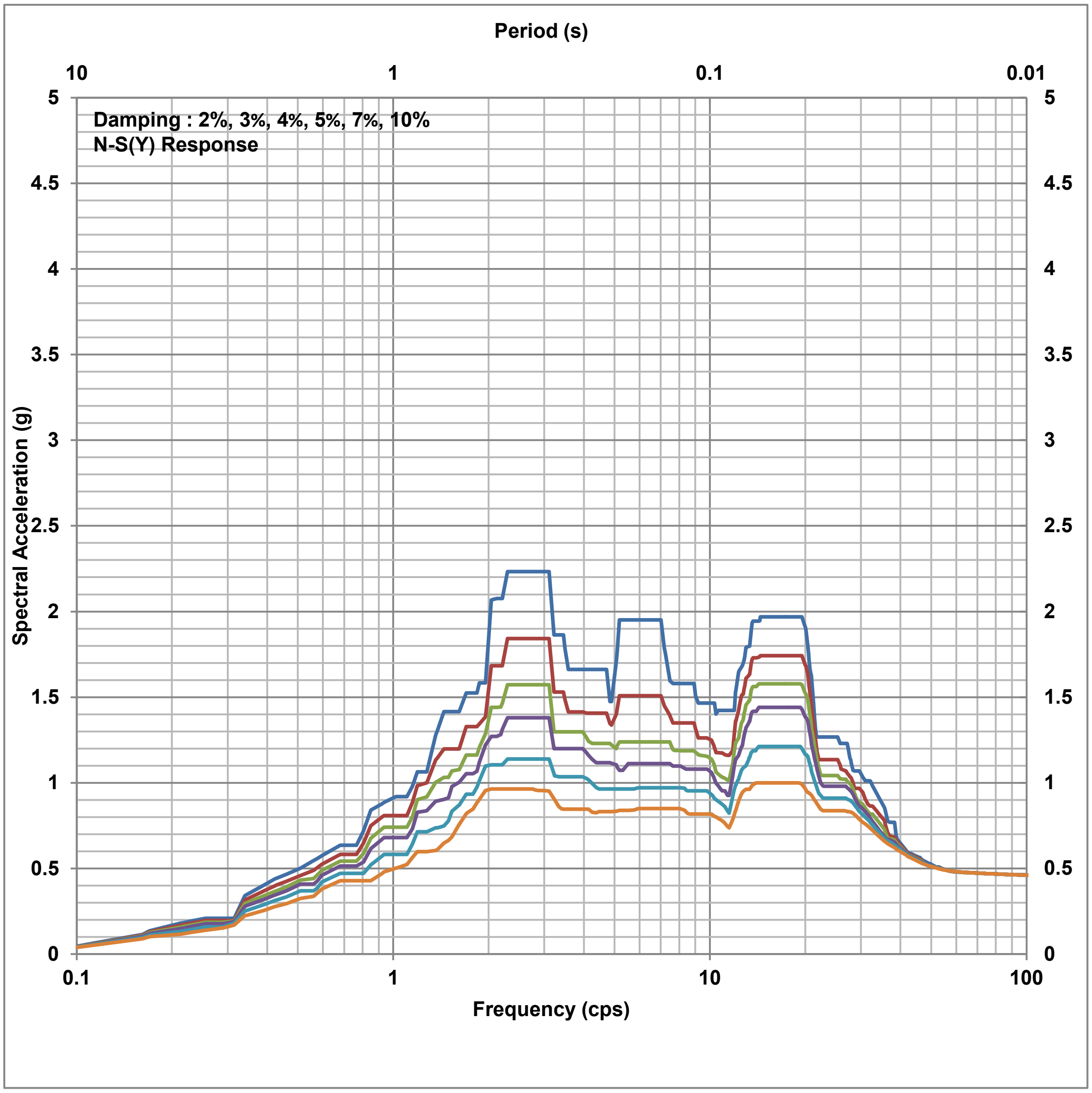

Figure 3.7A-16 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 100′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

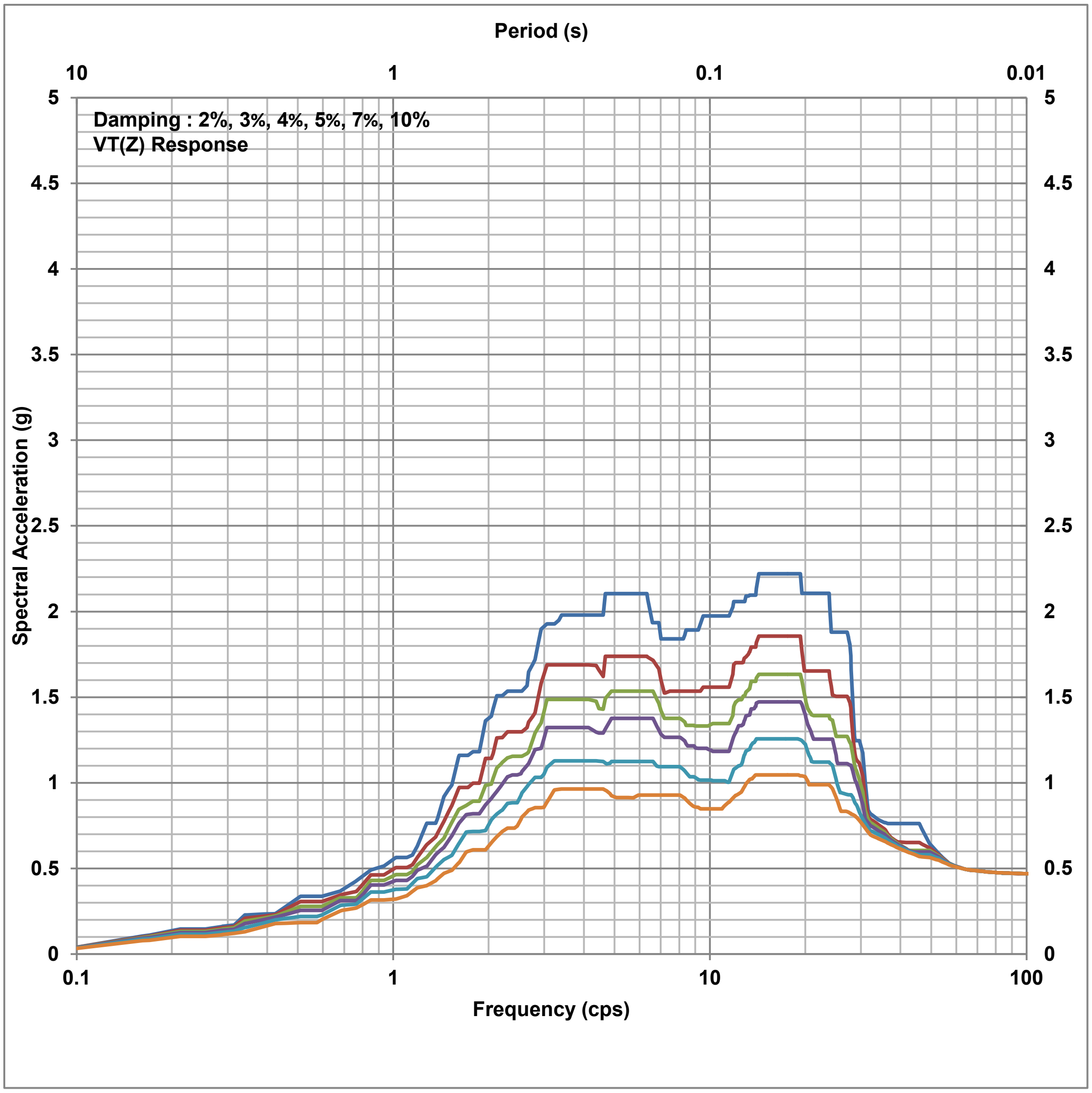

Figure 3.7A-17 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 100′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

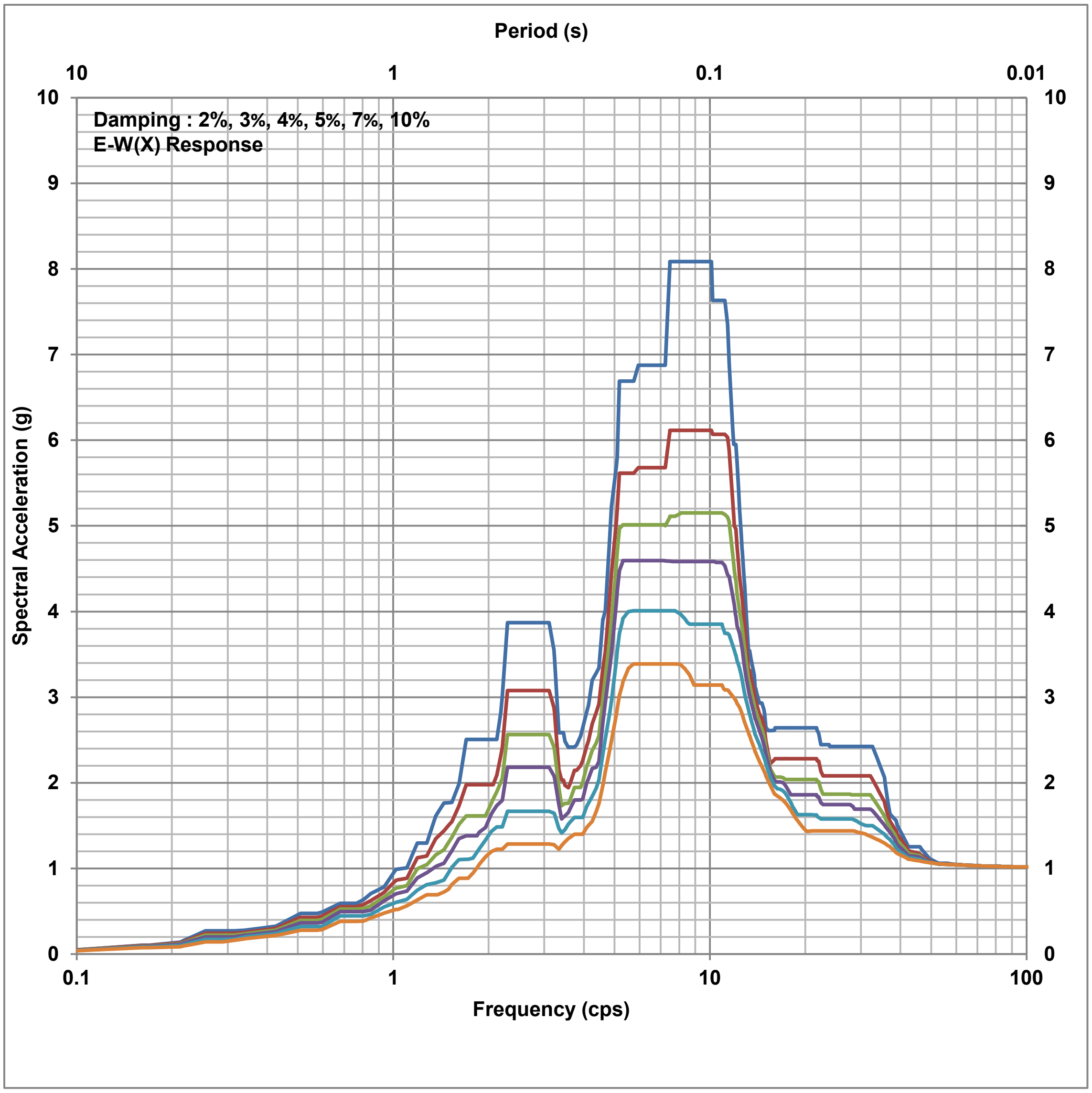

Figure 3.7A-18 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 156′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

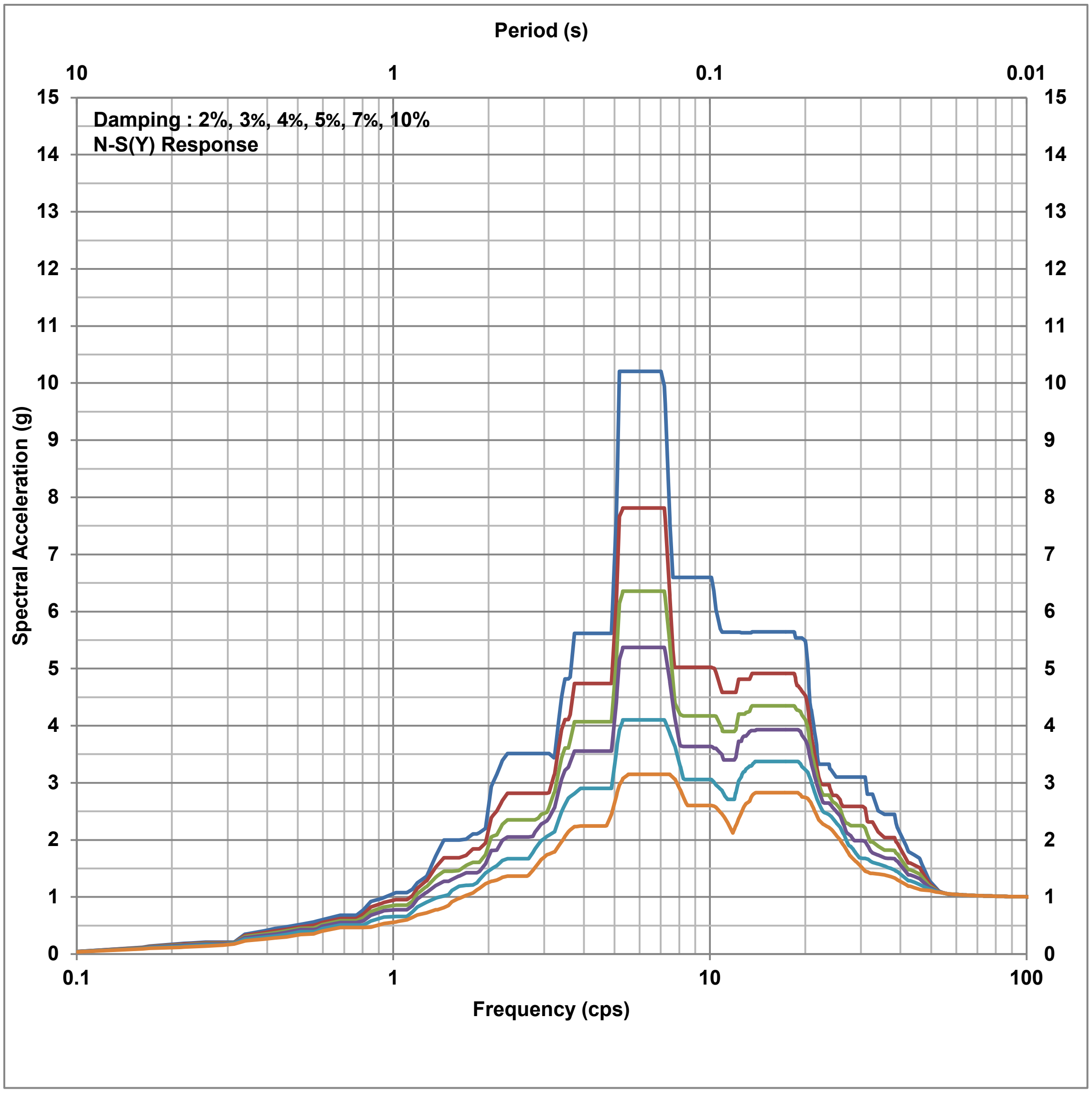

Figure 3.7A-19 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 156′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

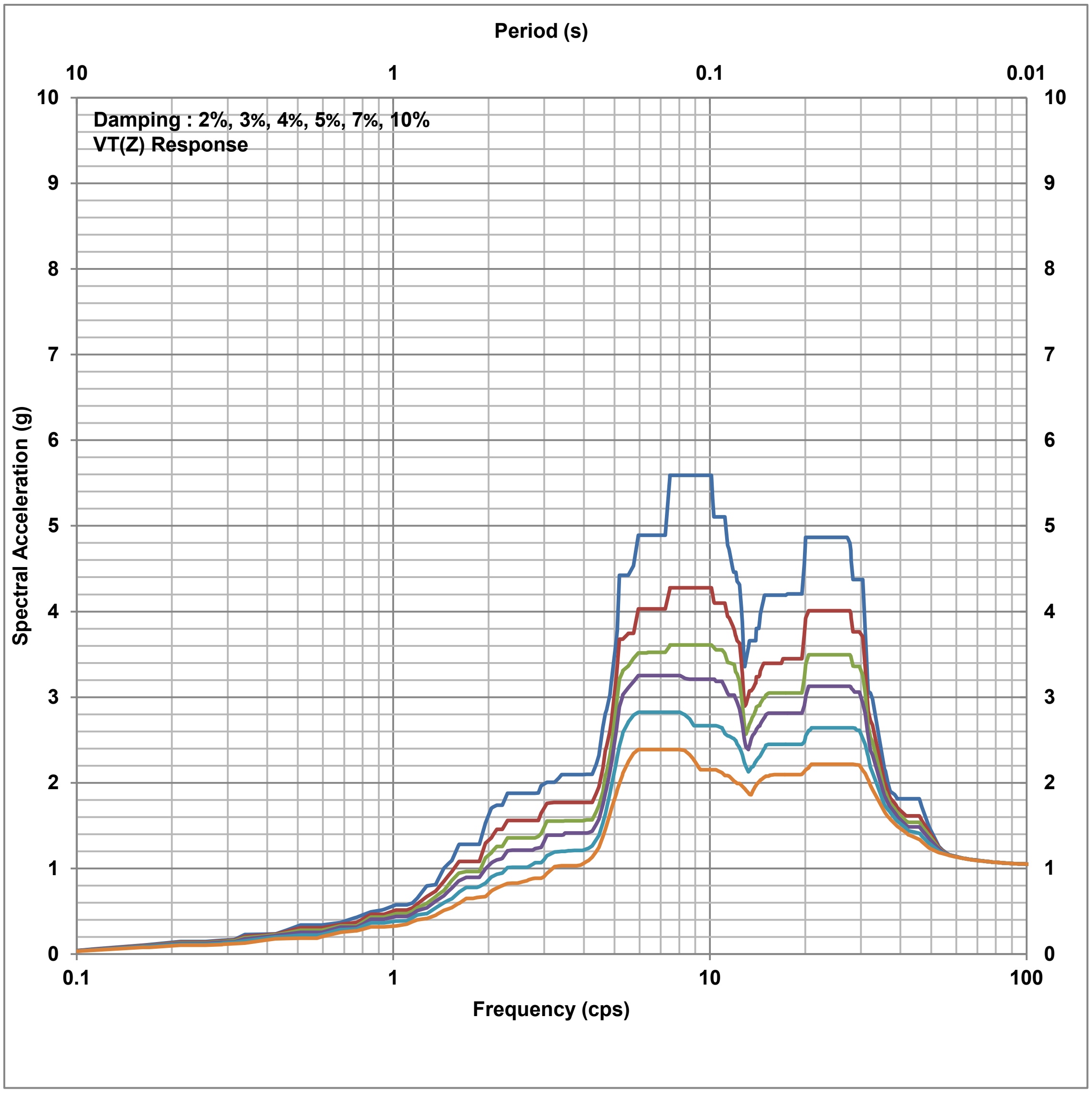

Figure 3.7A-20 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 156′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

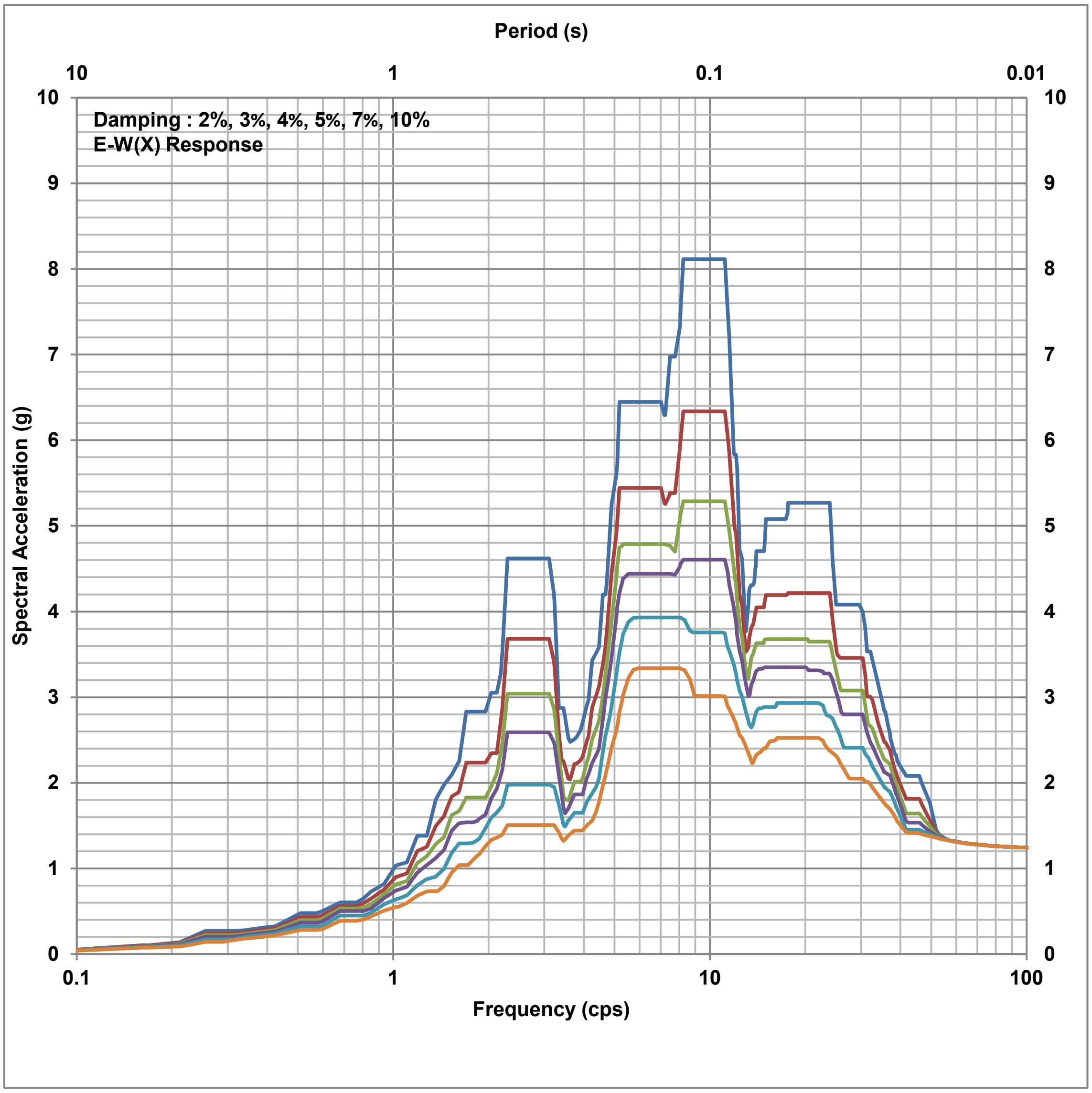

Figure 3.7A-21 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 191′-0″ (General), E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

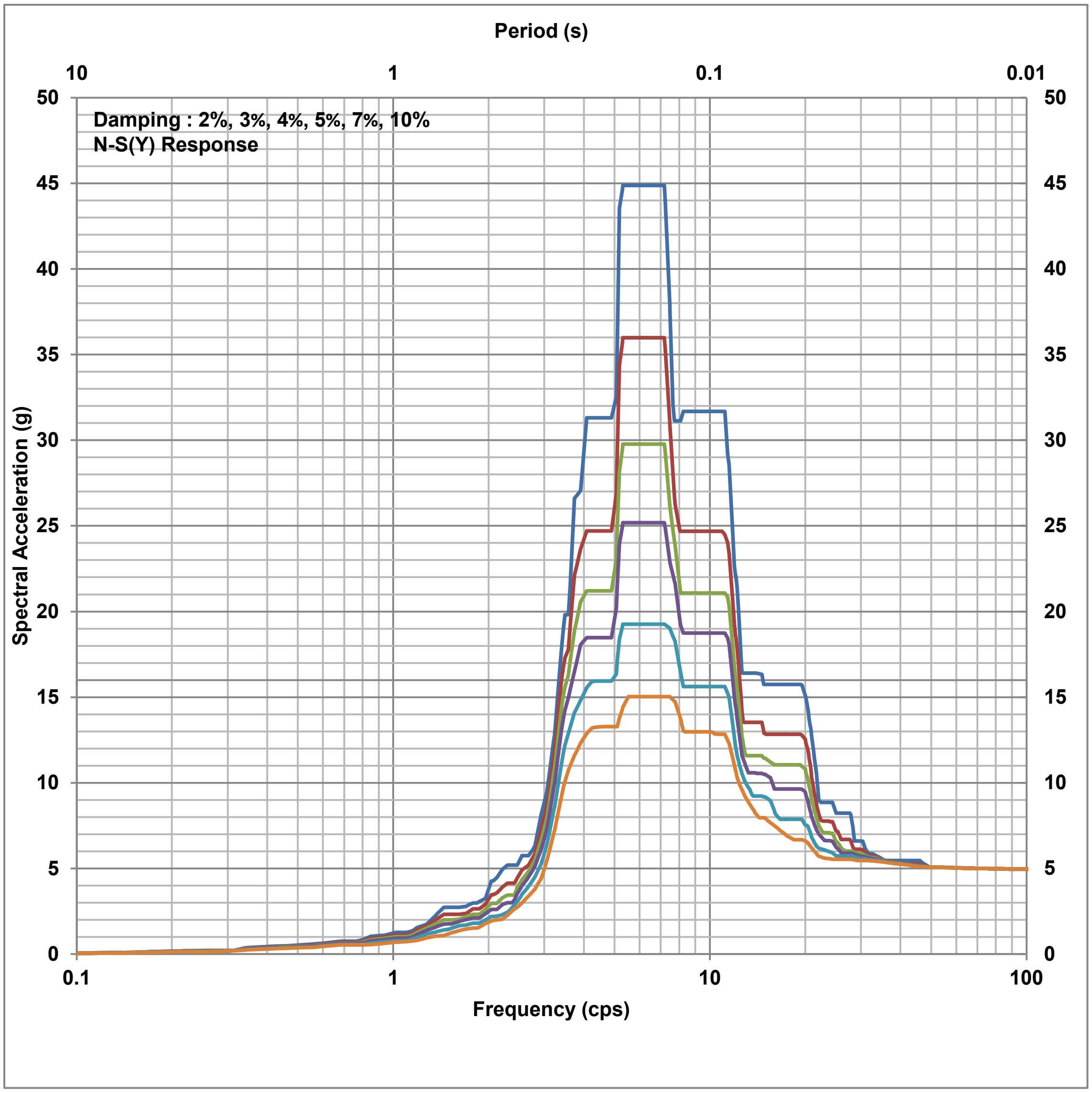

Figure 3.7A-22 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 191′-0″ (General), N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

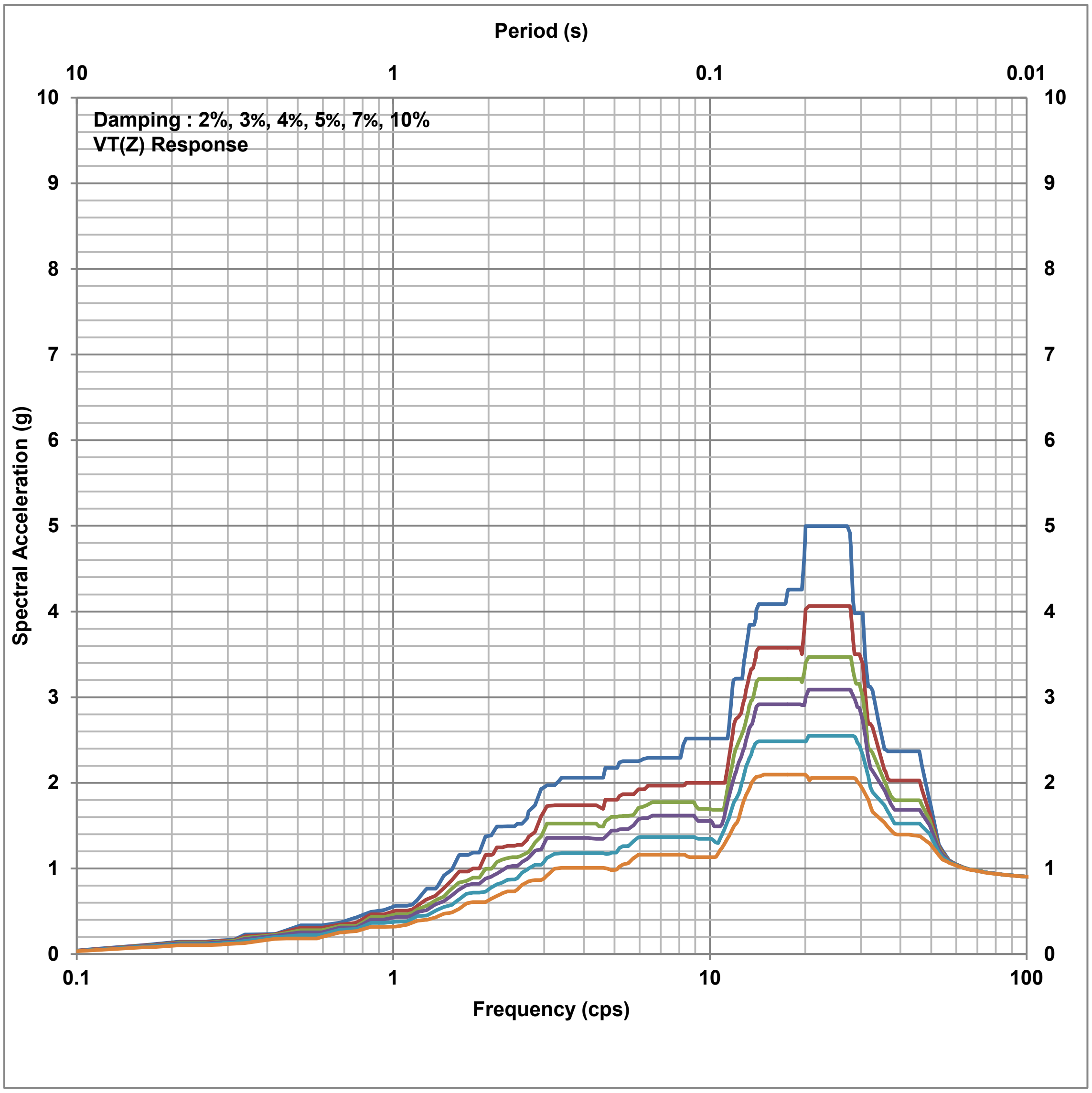

Figure 3.7A-23 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 191′-0″ (General), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

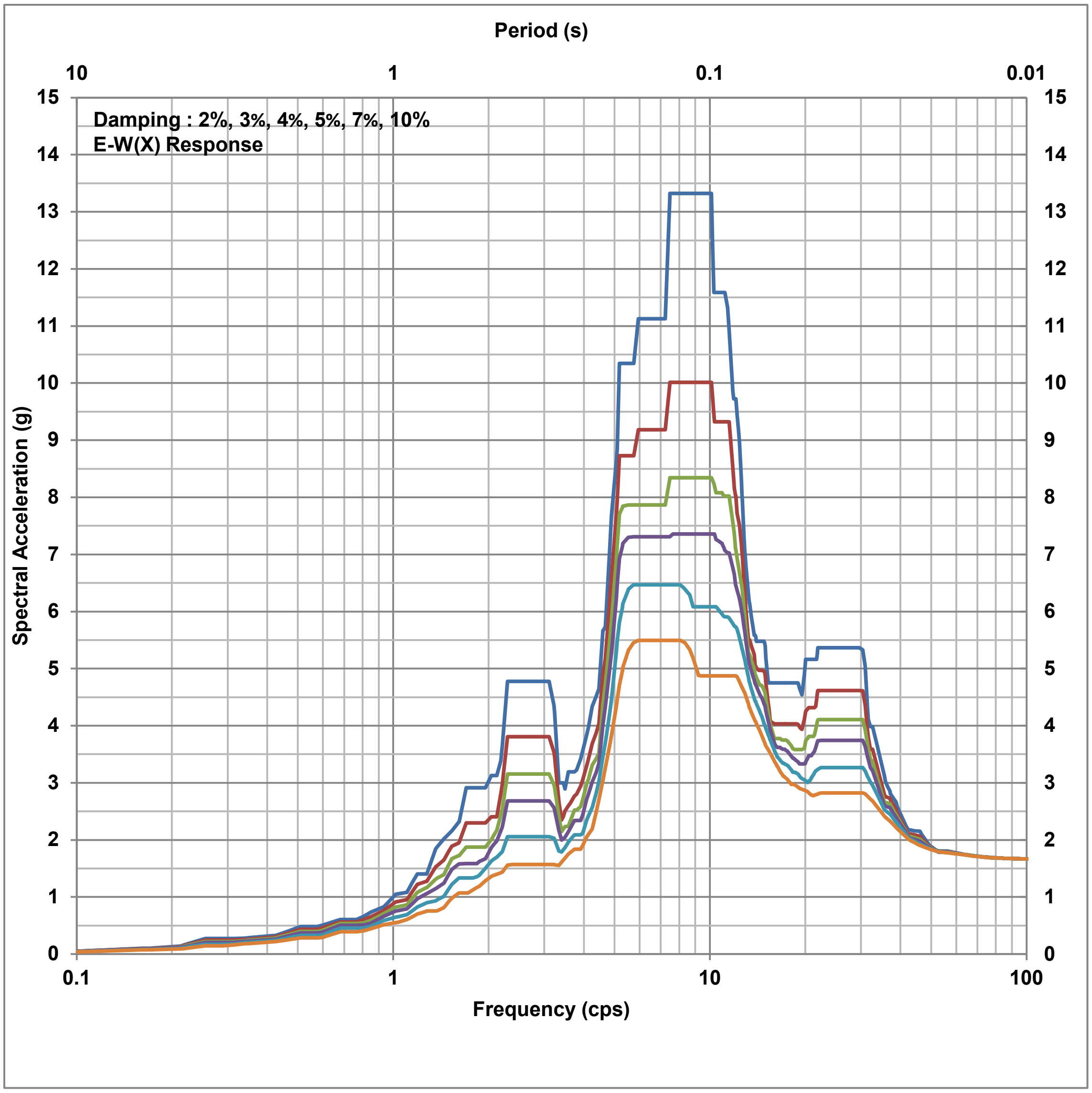

Figure 3.7A-24 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 191′-0″ (Pressurizer Corners), E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

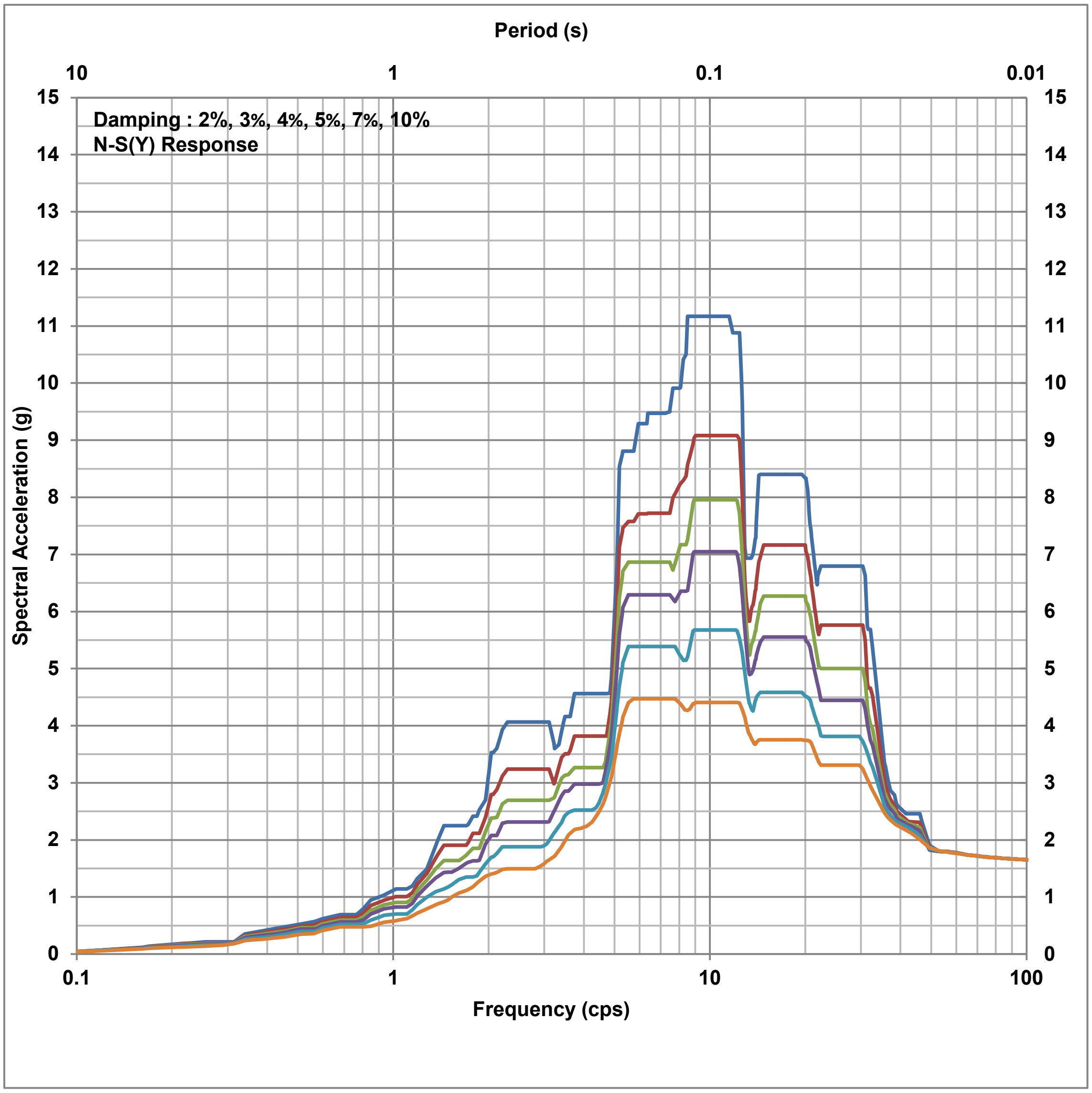

Figure 3.7A-25 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 191′-0″ (Pressurizer Corners), N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

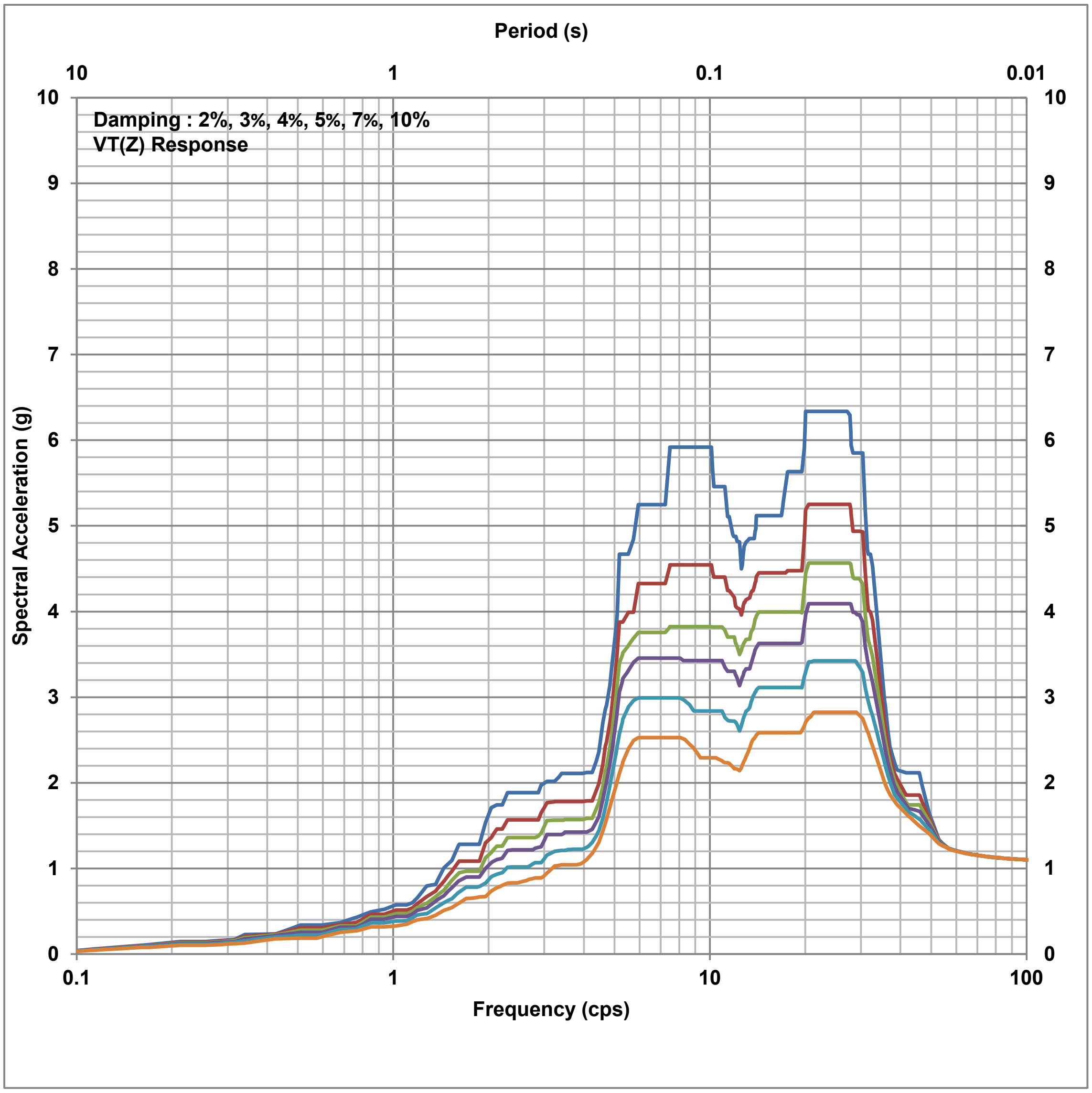

Figure 3.7A-26 Enveloped ISRS for SSE, Reactor Containment Building PSW at El. 191′-0″ (Pressurizer Corners), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

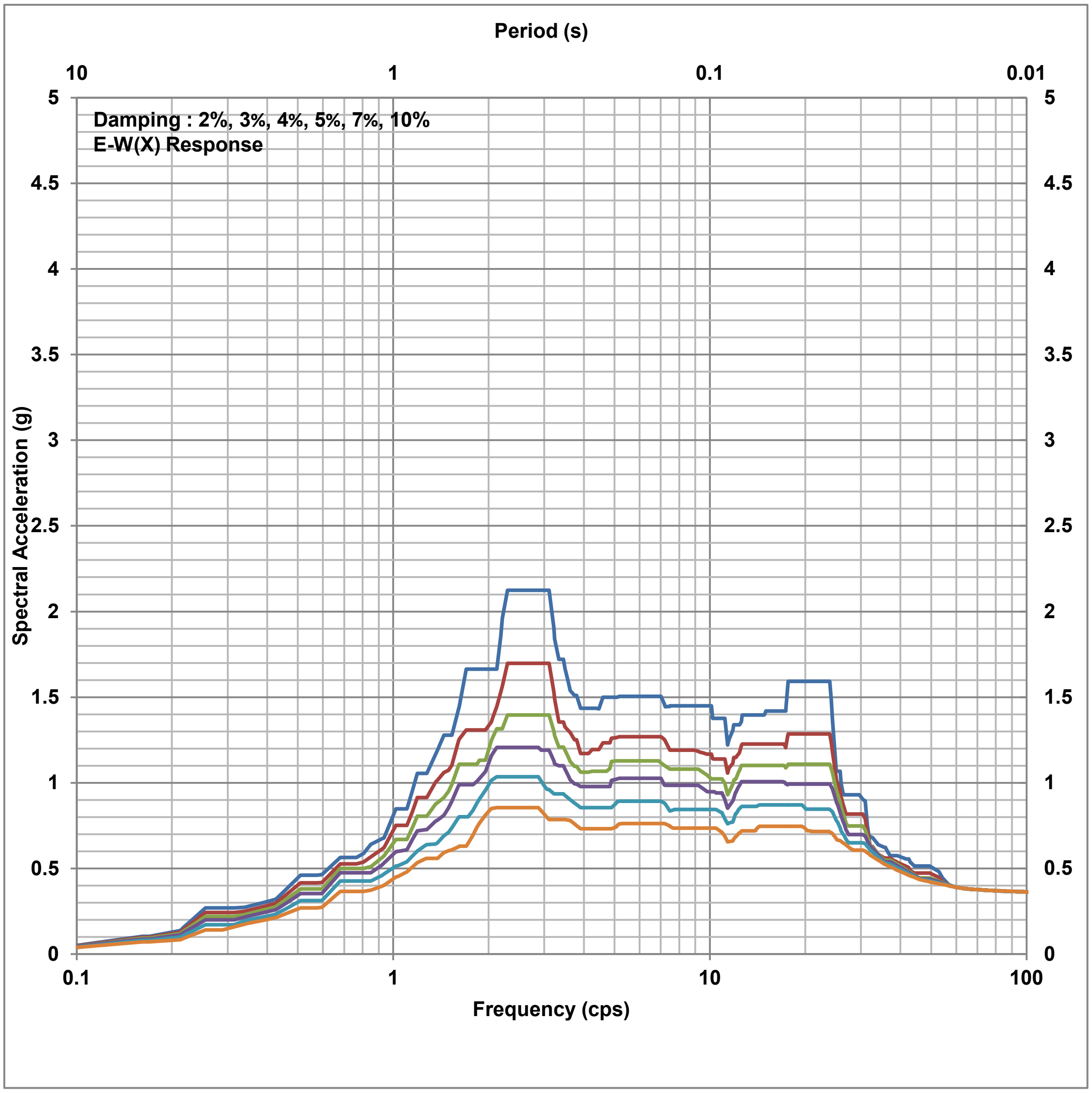

Figure 3.7A-27 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 78′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

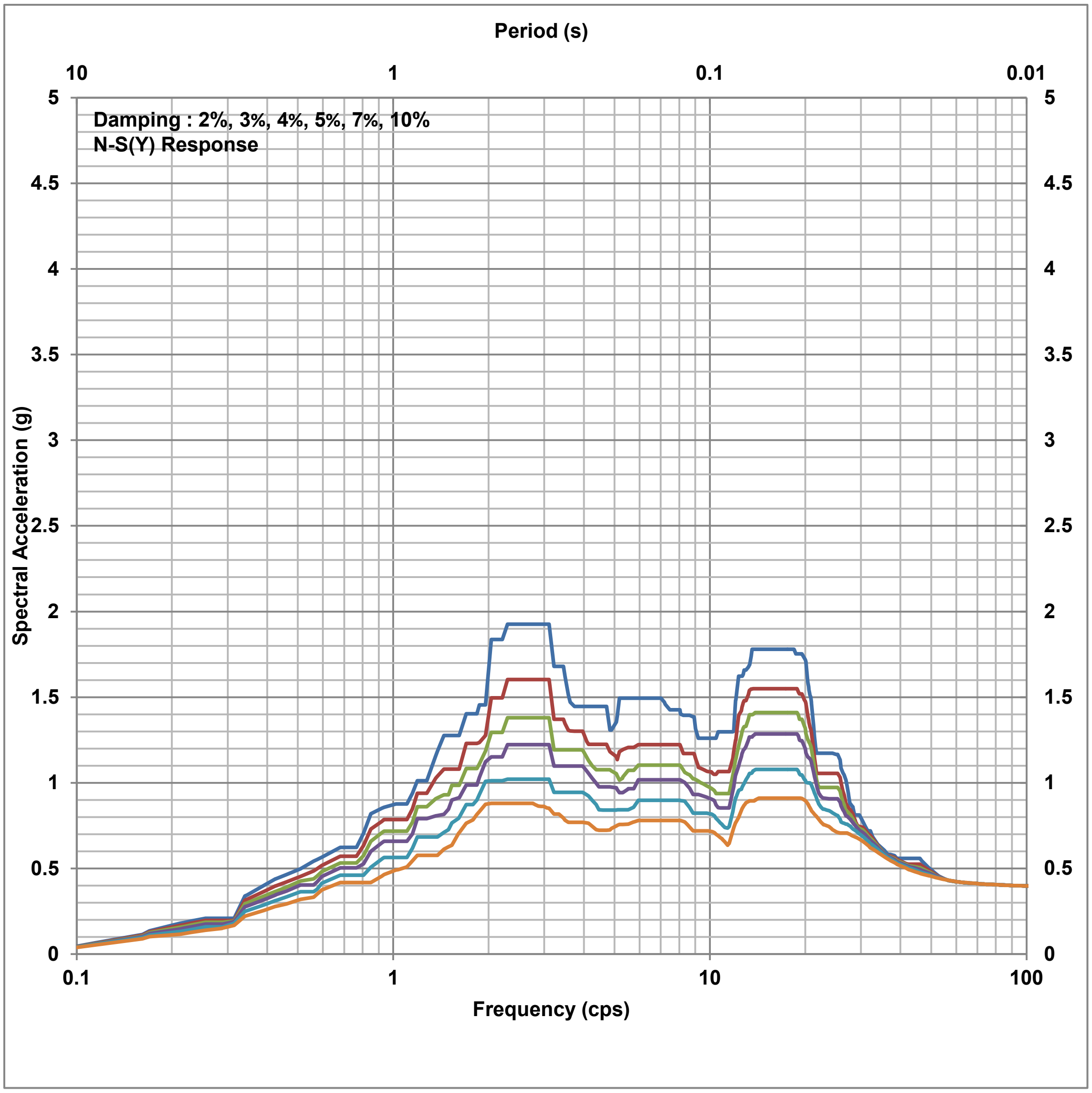

Figure 3.7A-28 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 78′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

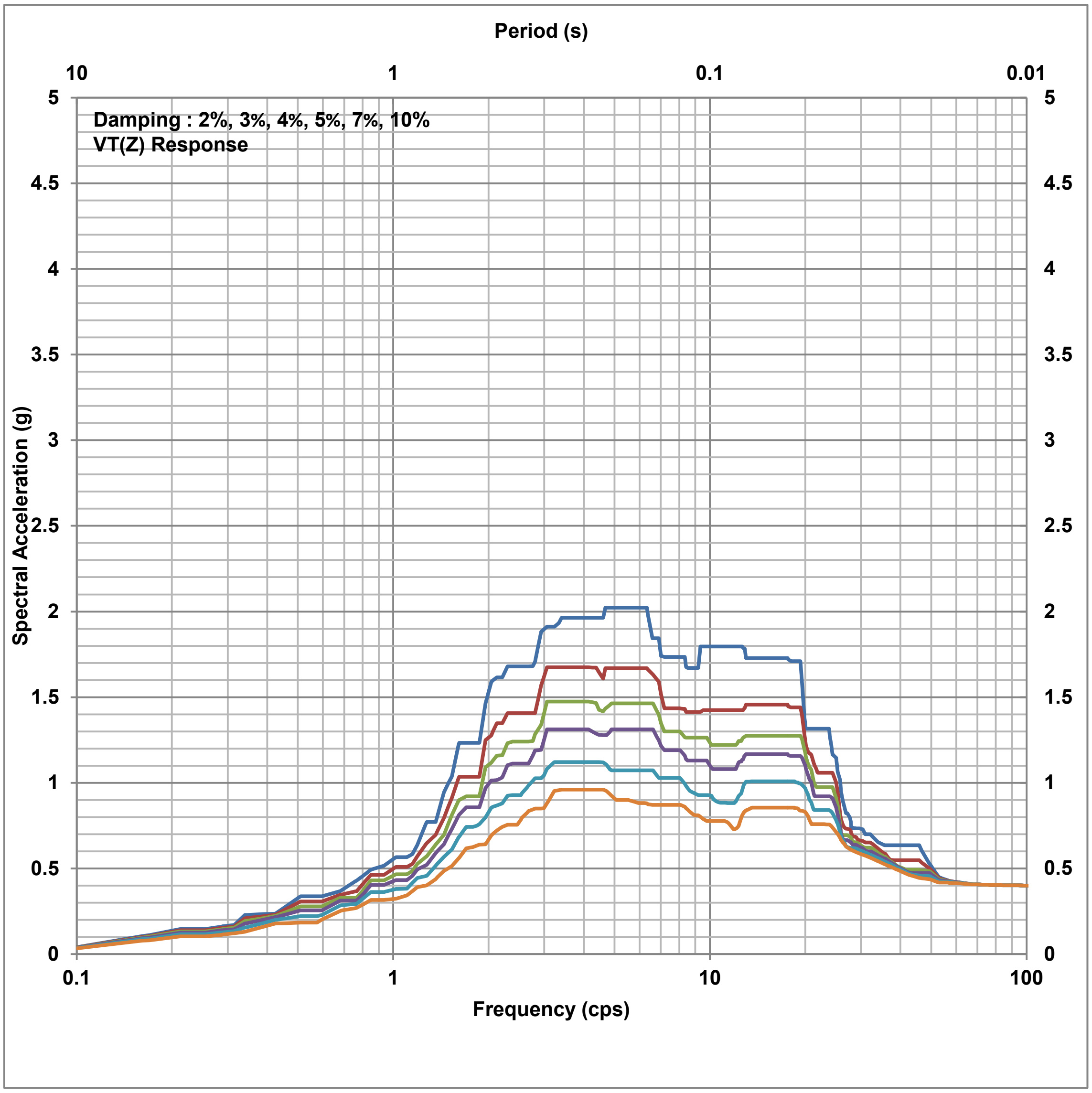

Figure 3.7A-29 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 78′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

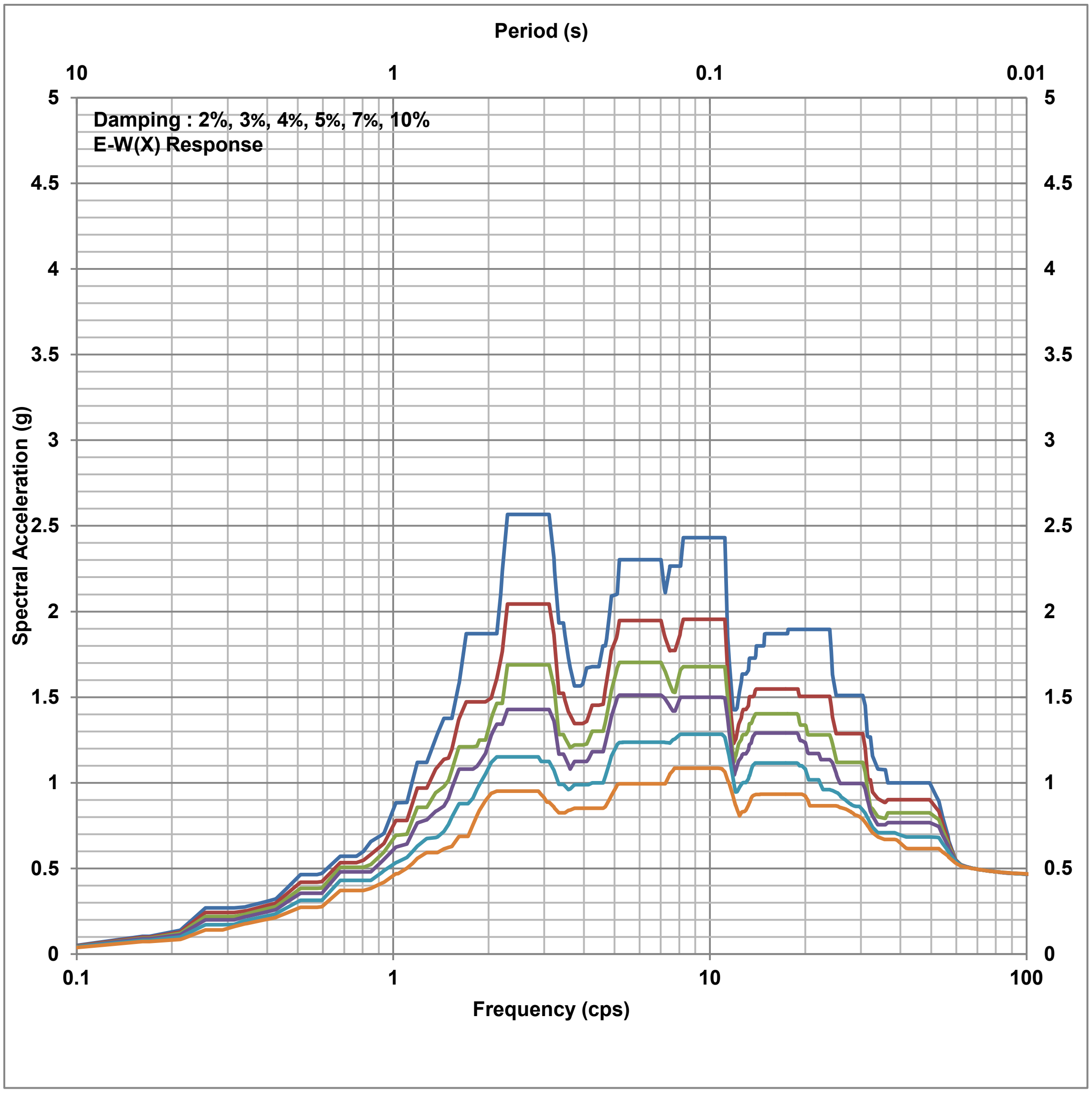

Figure 3.7A-30 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 100′-0″ (General), E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

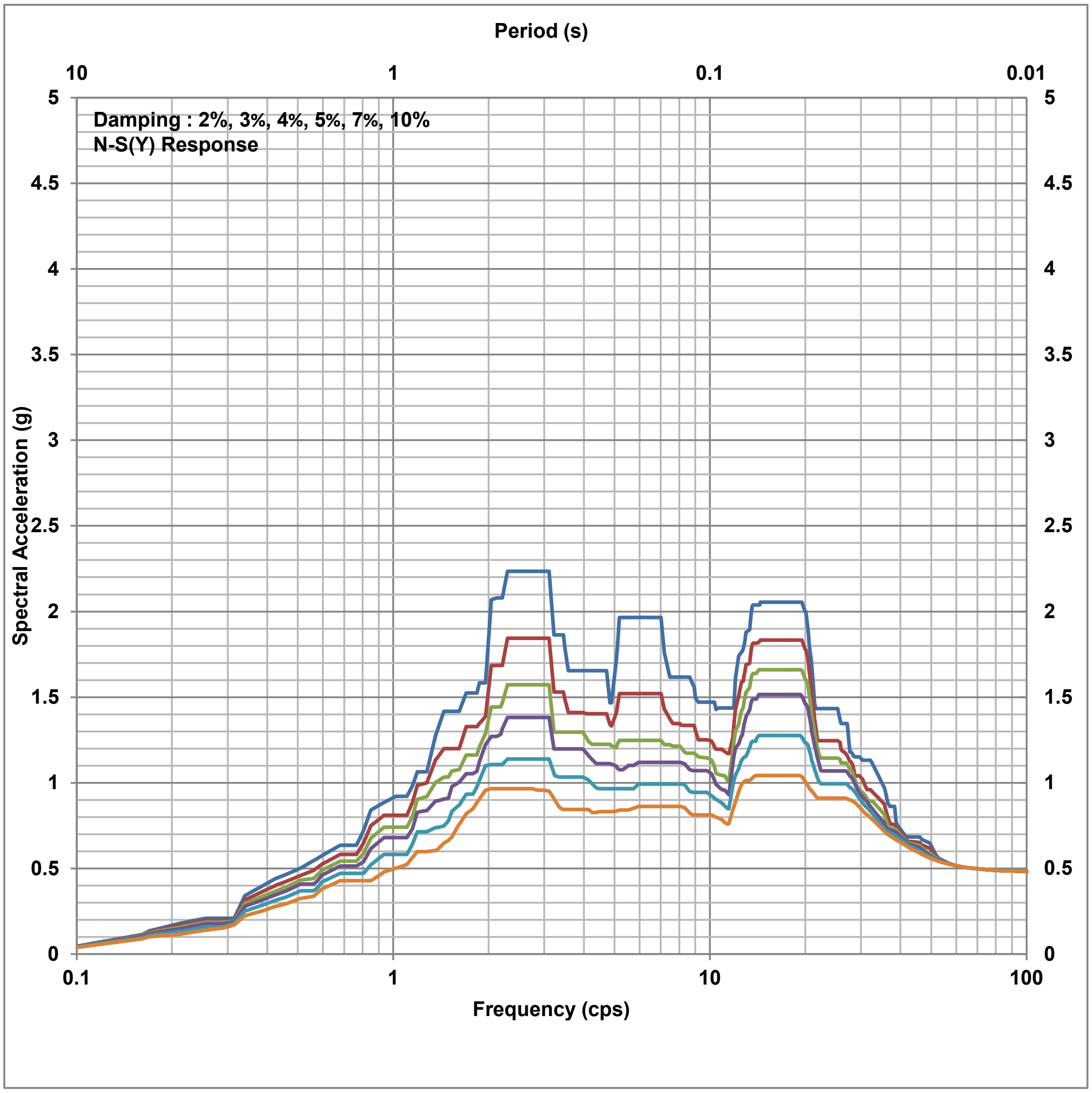

Figure 3.7A-31 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 100′-0″ (General), N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

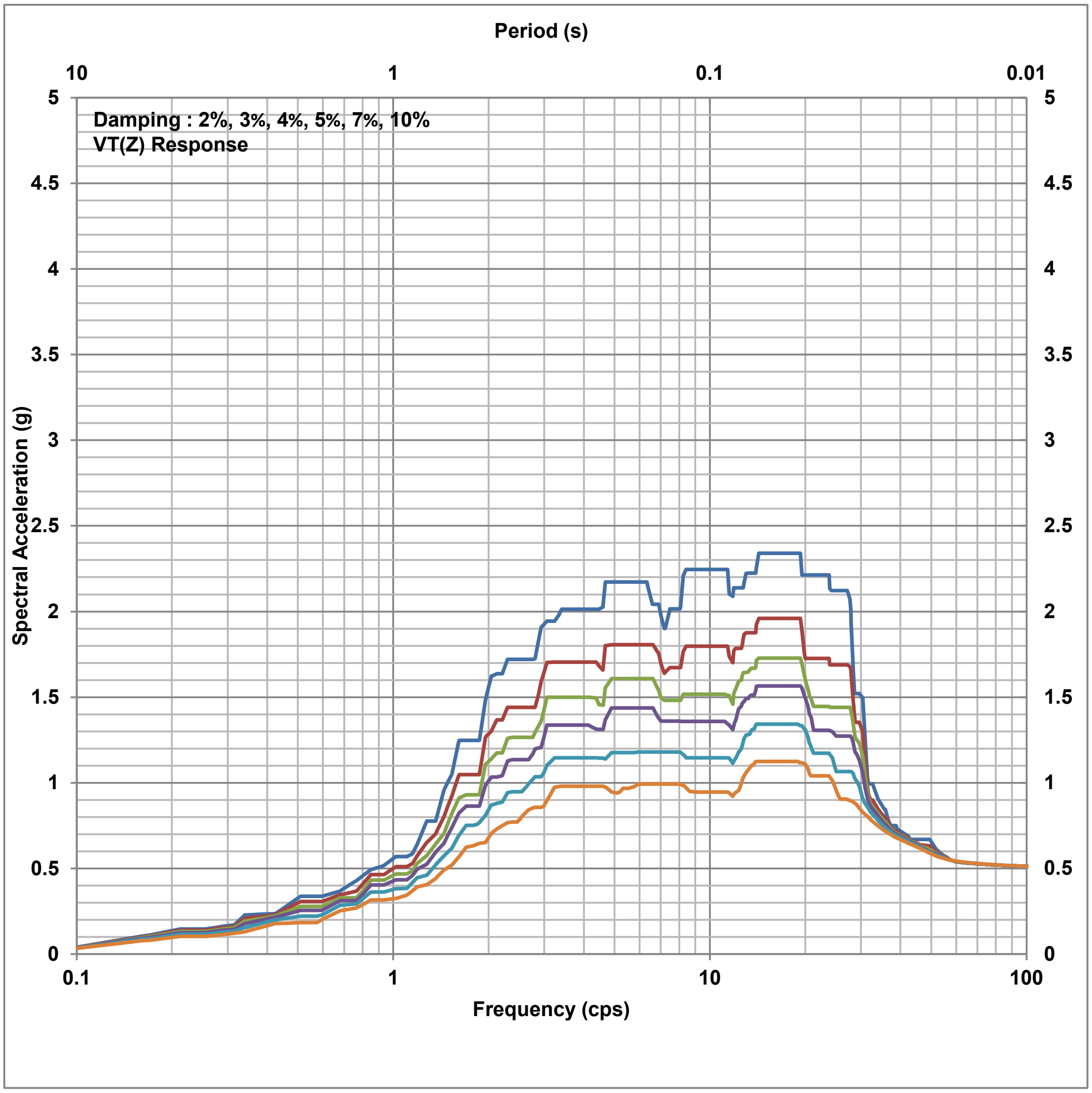

Figure 3.7A-32 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 100′-0″ (General), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

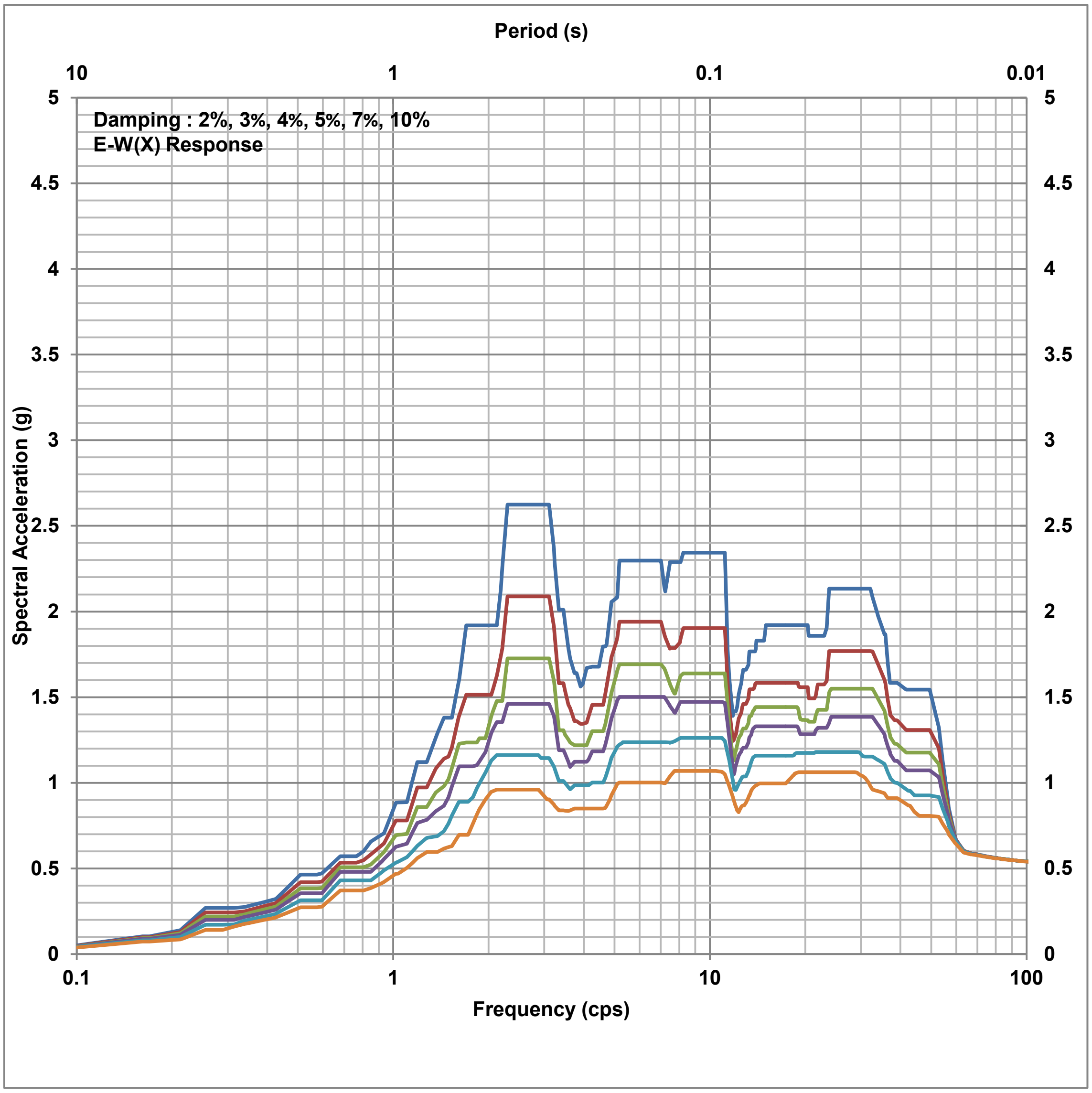

Figure 3.7A-33 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 100′-0″ (IRWST Walls), E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

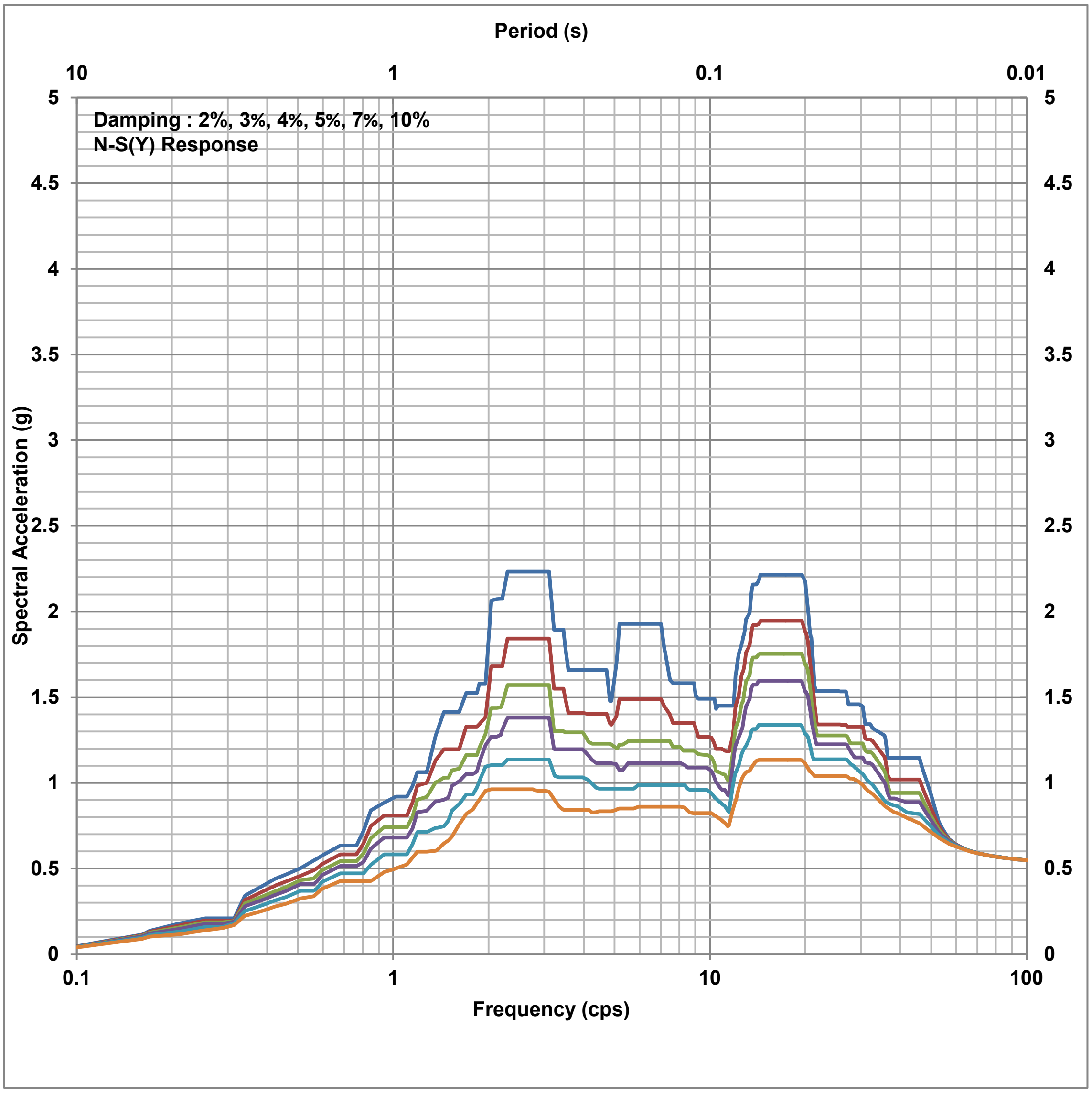

Figure 3.7A-34 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 100′-0″ (IRWST Walls), N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

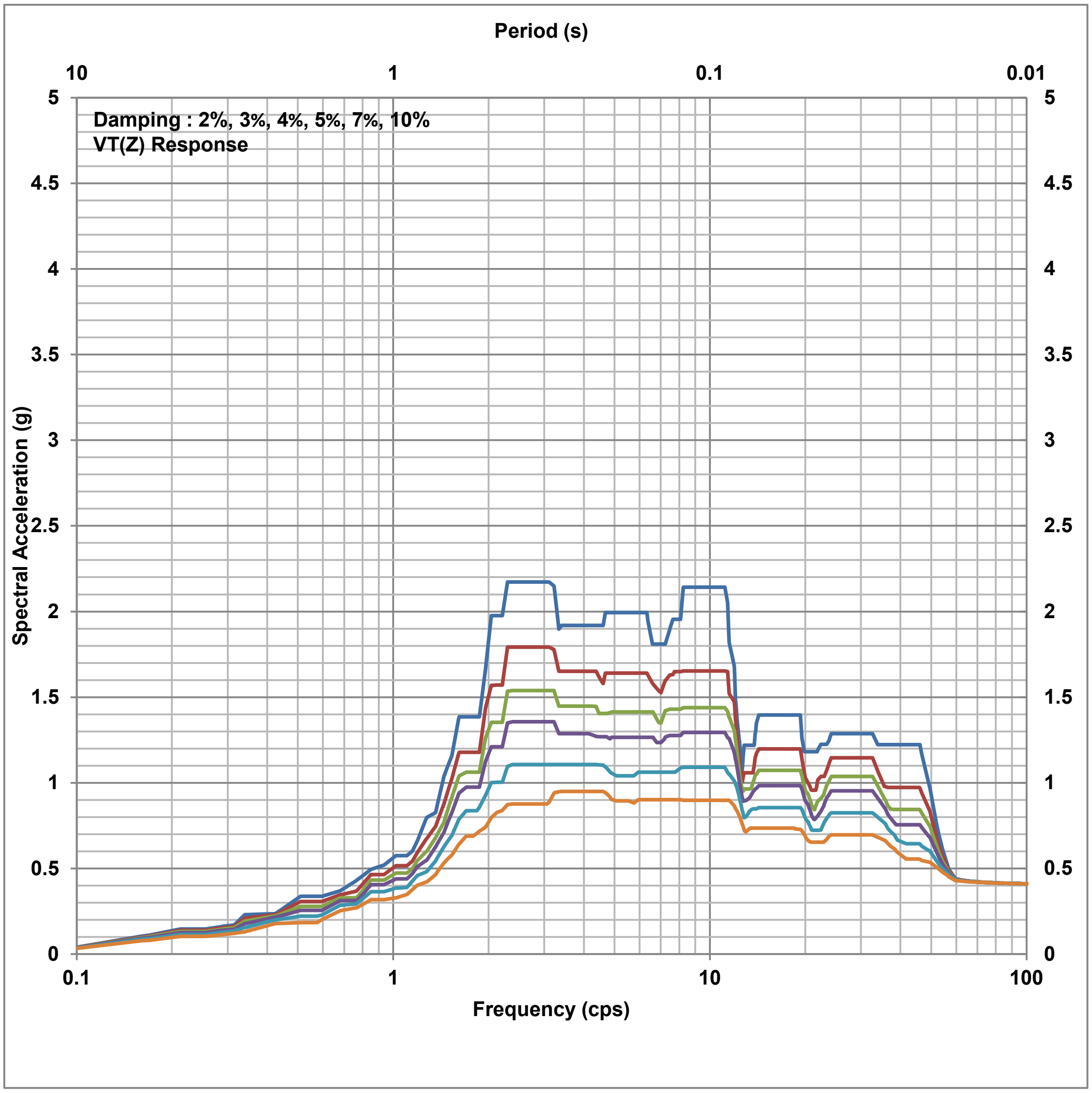

Figure 3.7A-35 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 100′-0″ (IRWST Walls), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

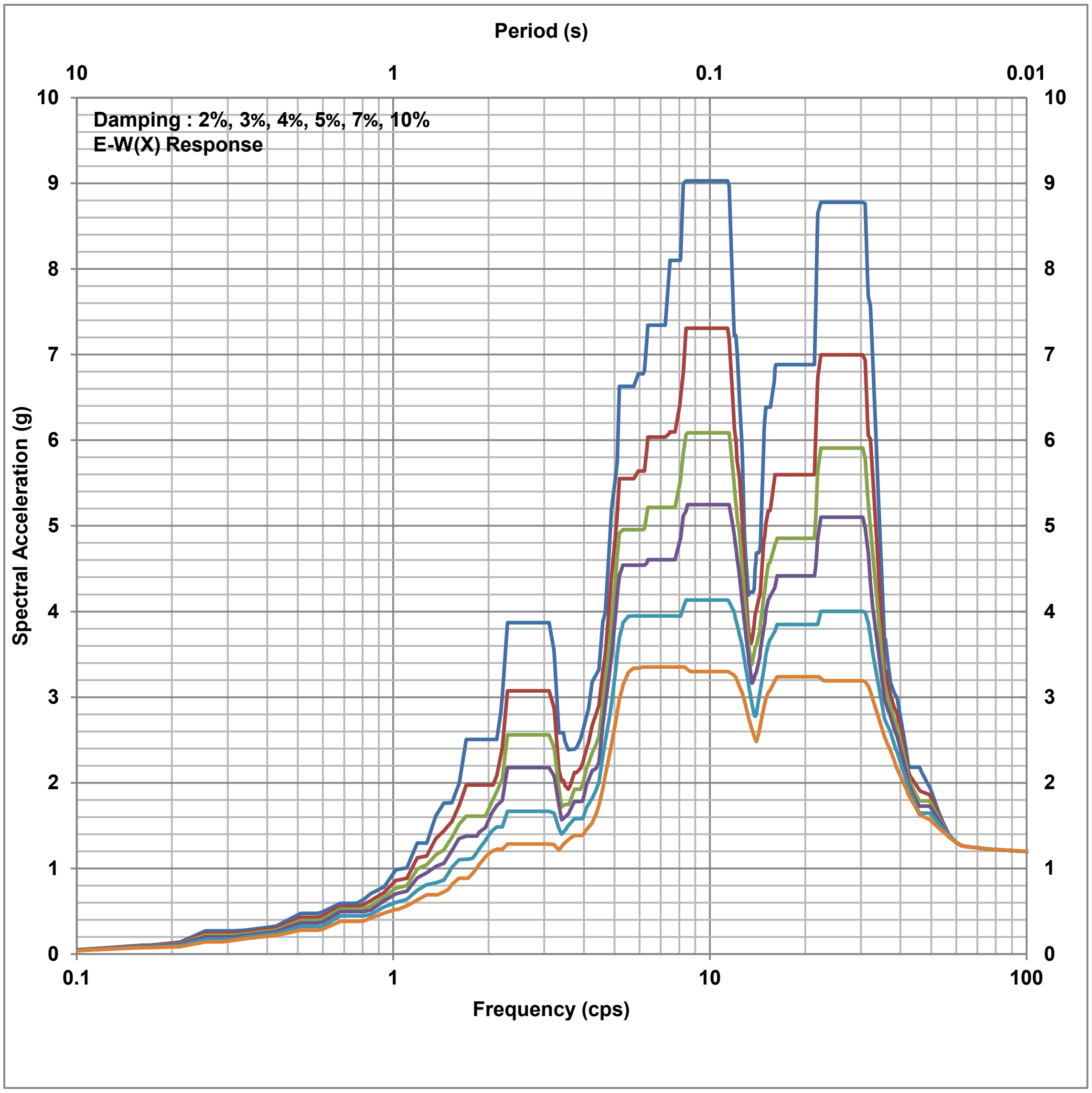

Figure 3.7A-36 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 156′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

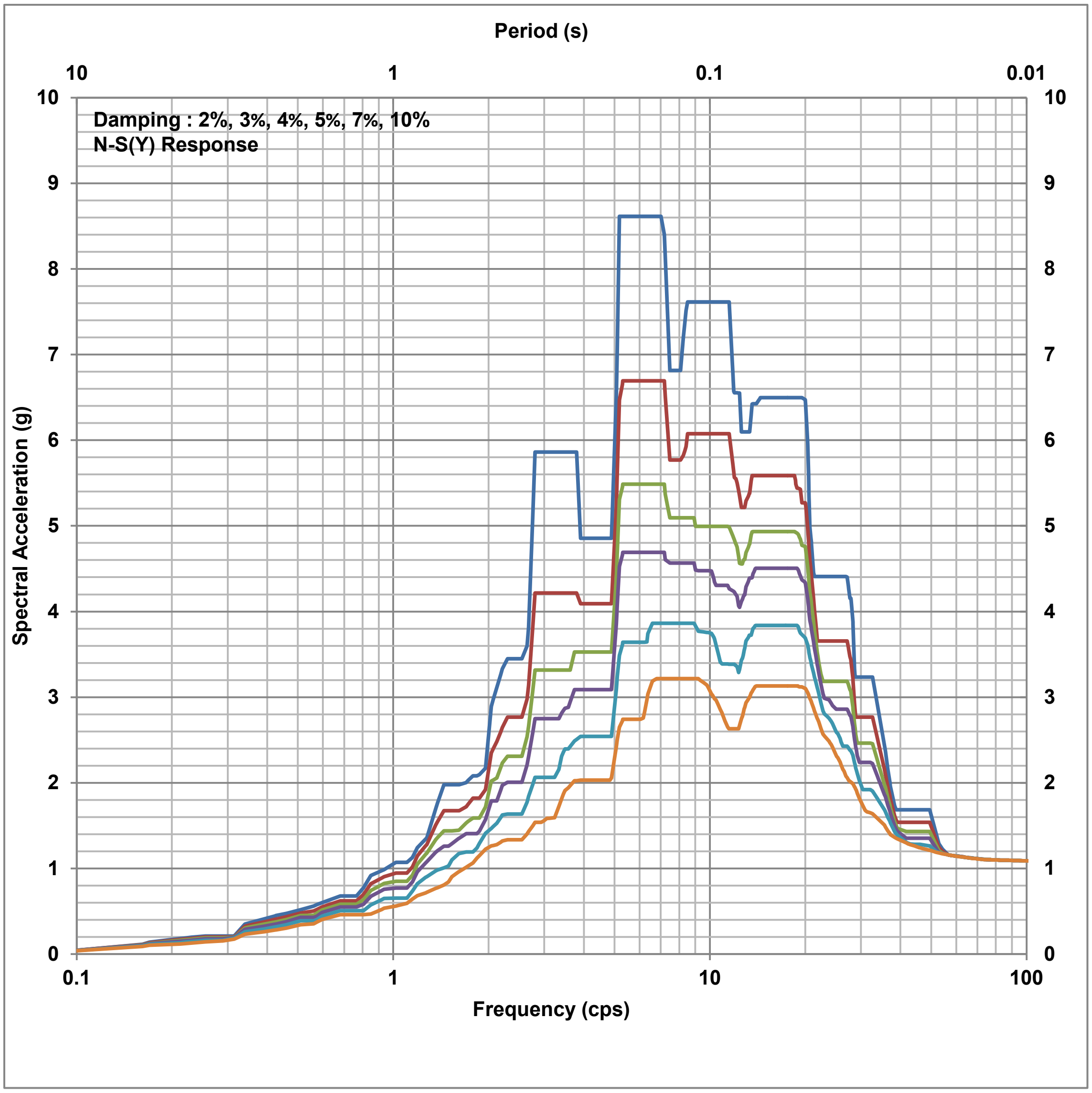

Figure 3.7A-37 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 156′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

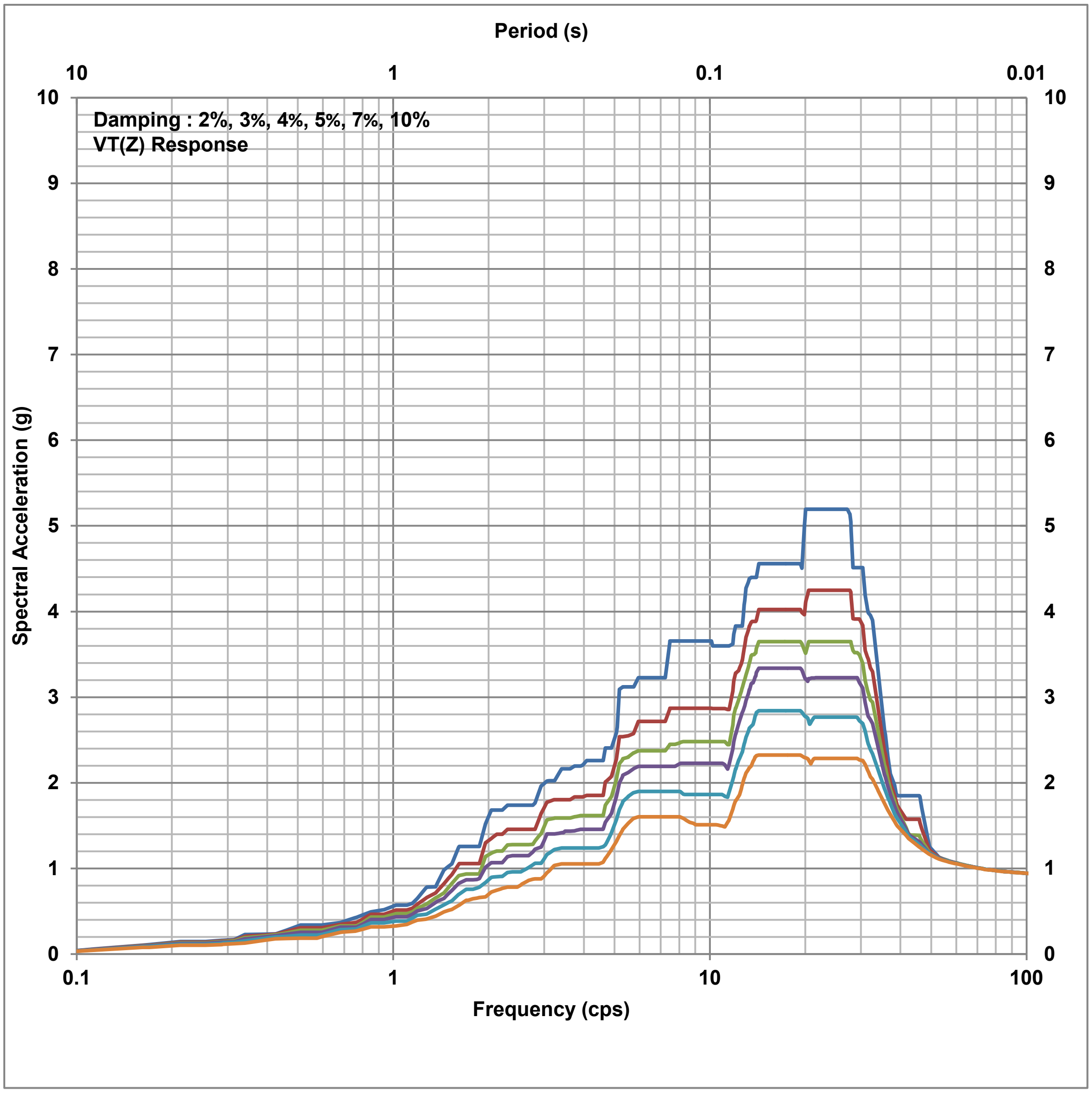

Figure 3.7A-38 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 156′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

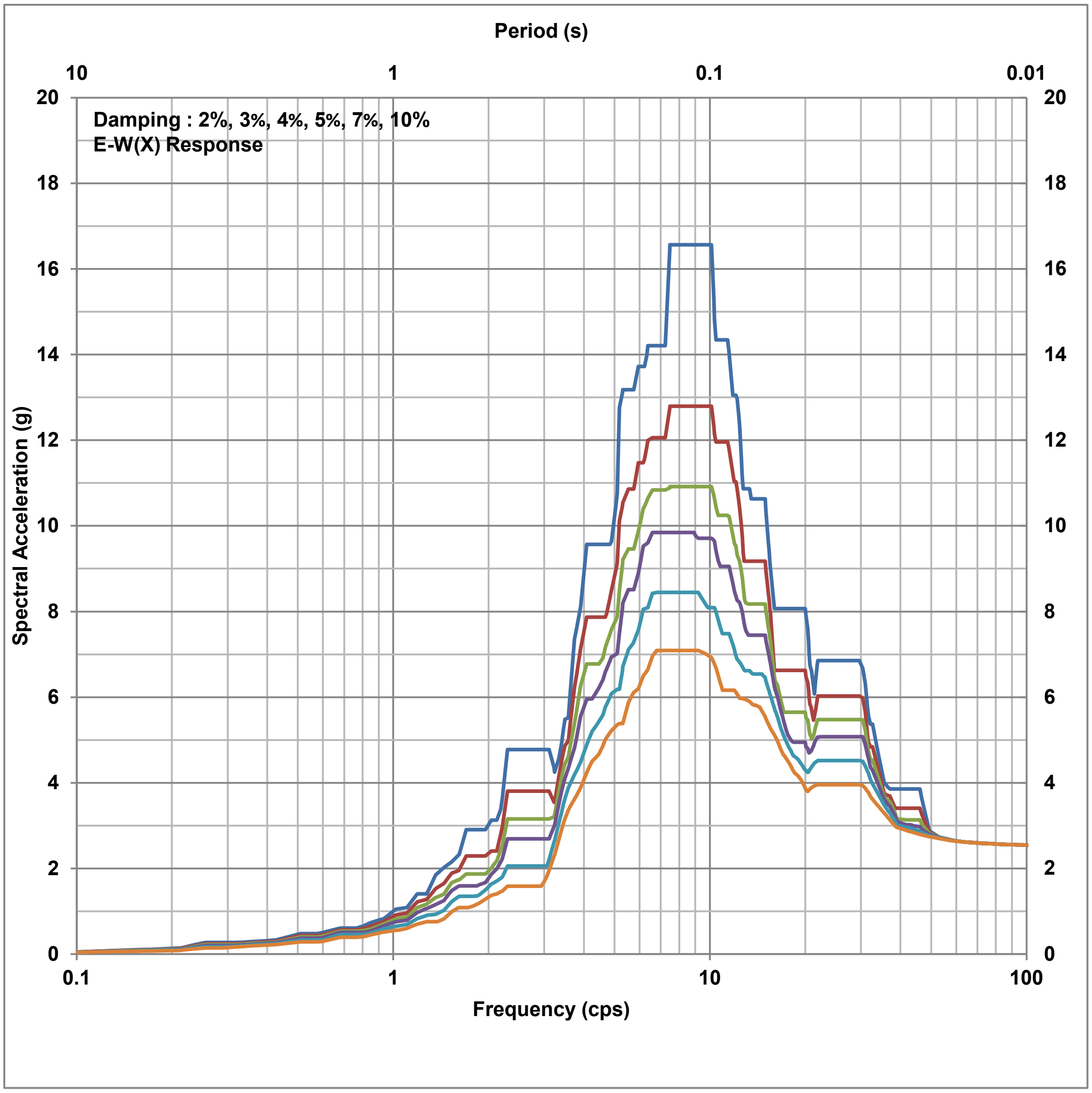

Figure 3.7A-39 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 191′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

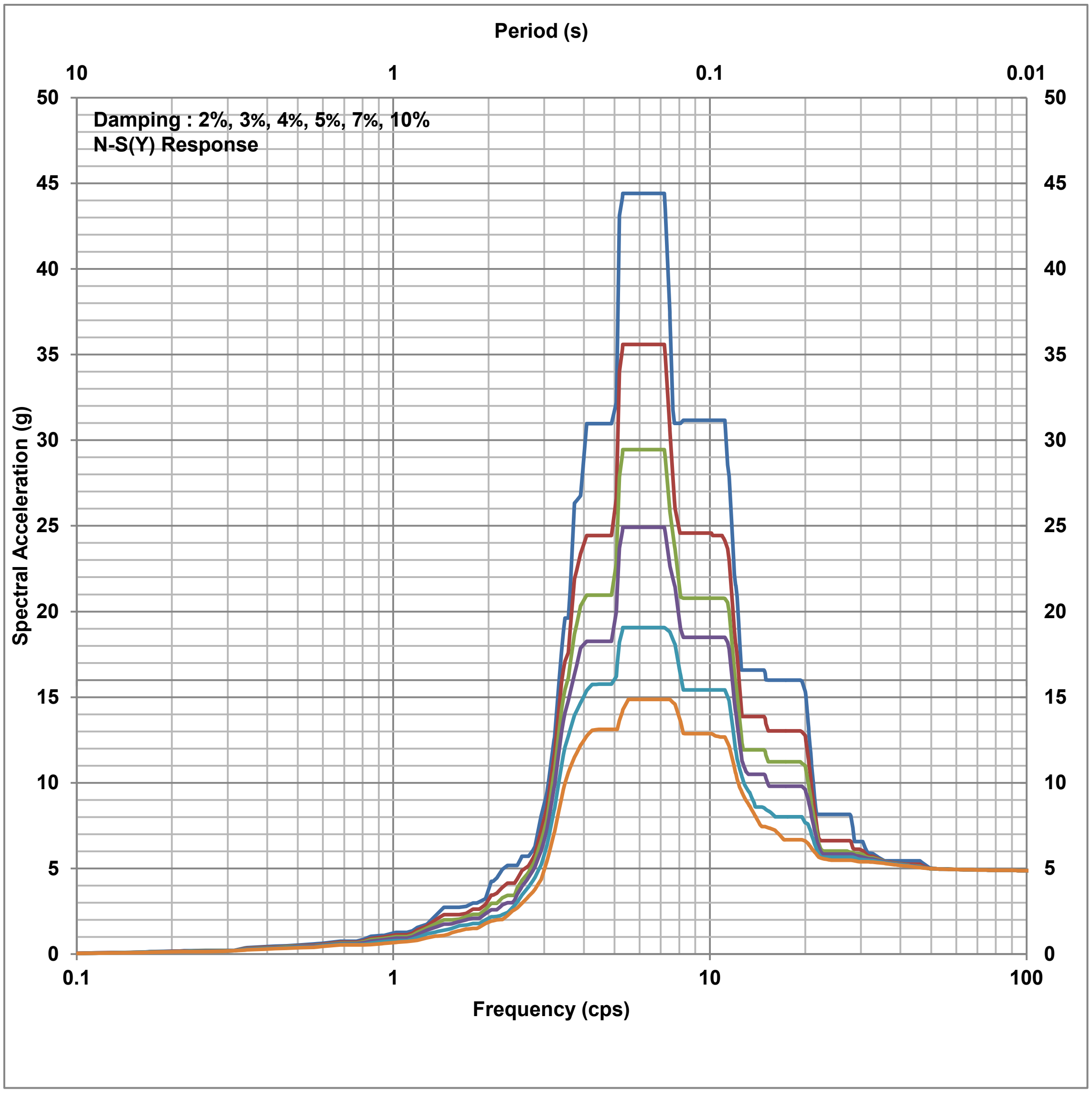

Figure 3.7A-40 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 191′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

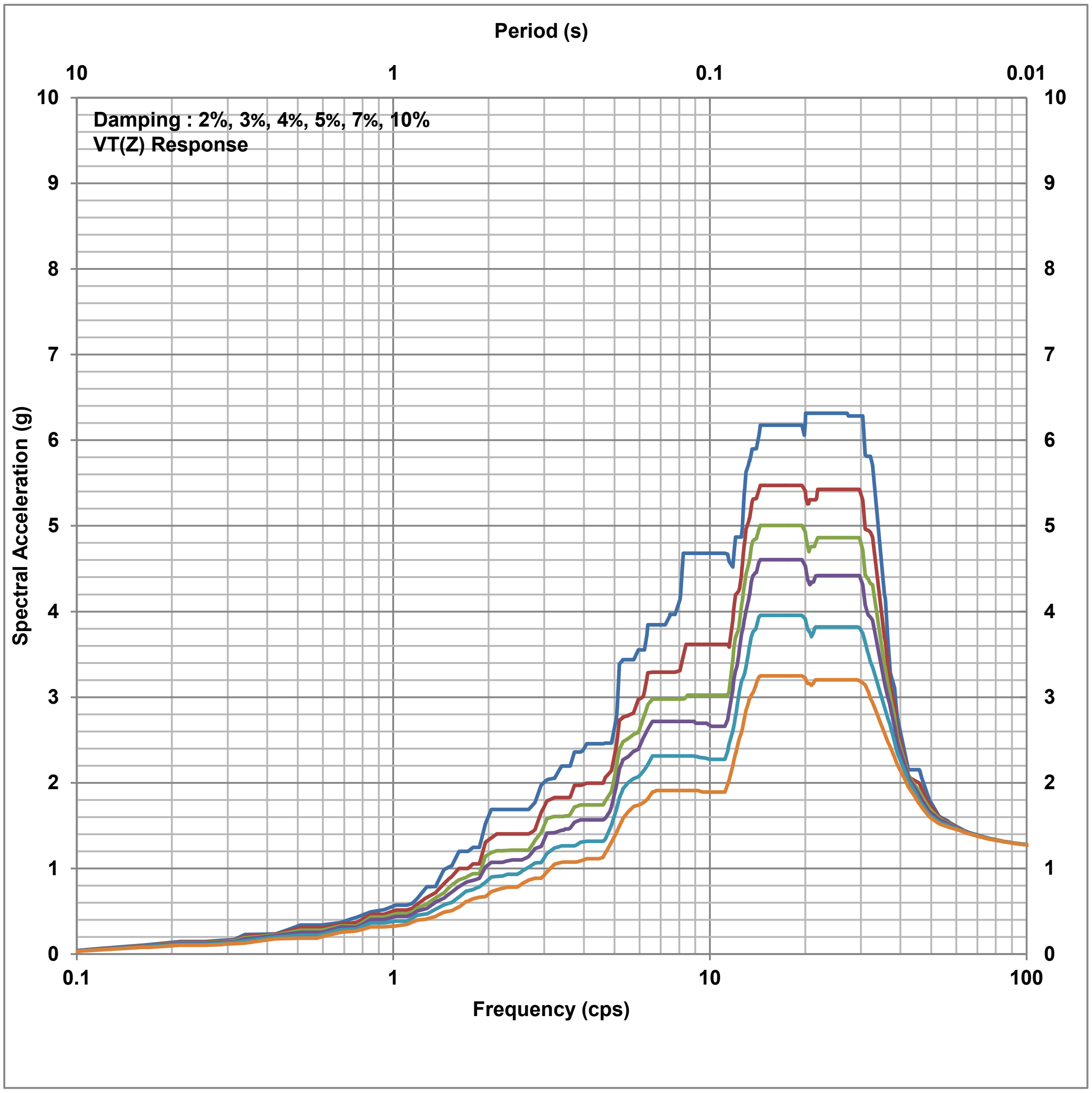

Figure 3.7A-41 Enveloped ISRS for SSE, Reactor Containment Building SSW at El. 191′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

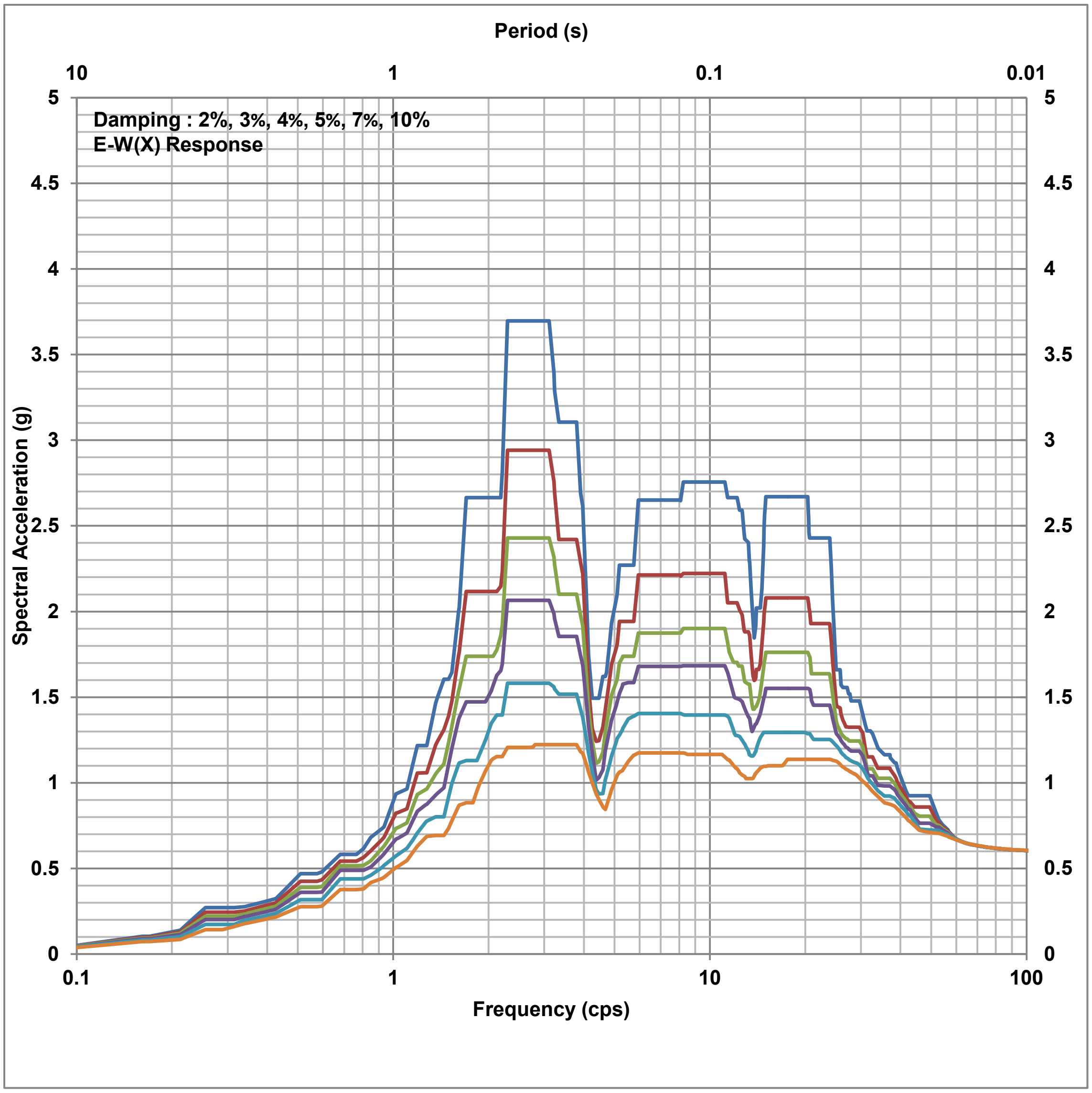

Figure 3.7A-42 Enveloped ISRS for SSE, Reactor Containment Building Containment Structure at El. 104′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

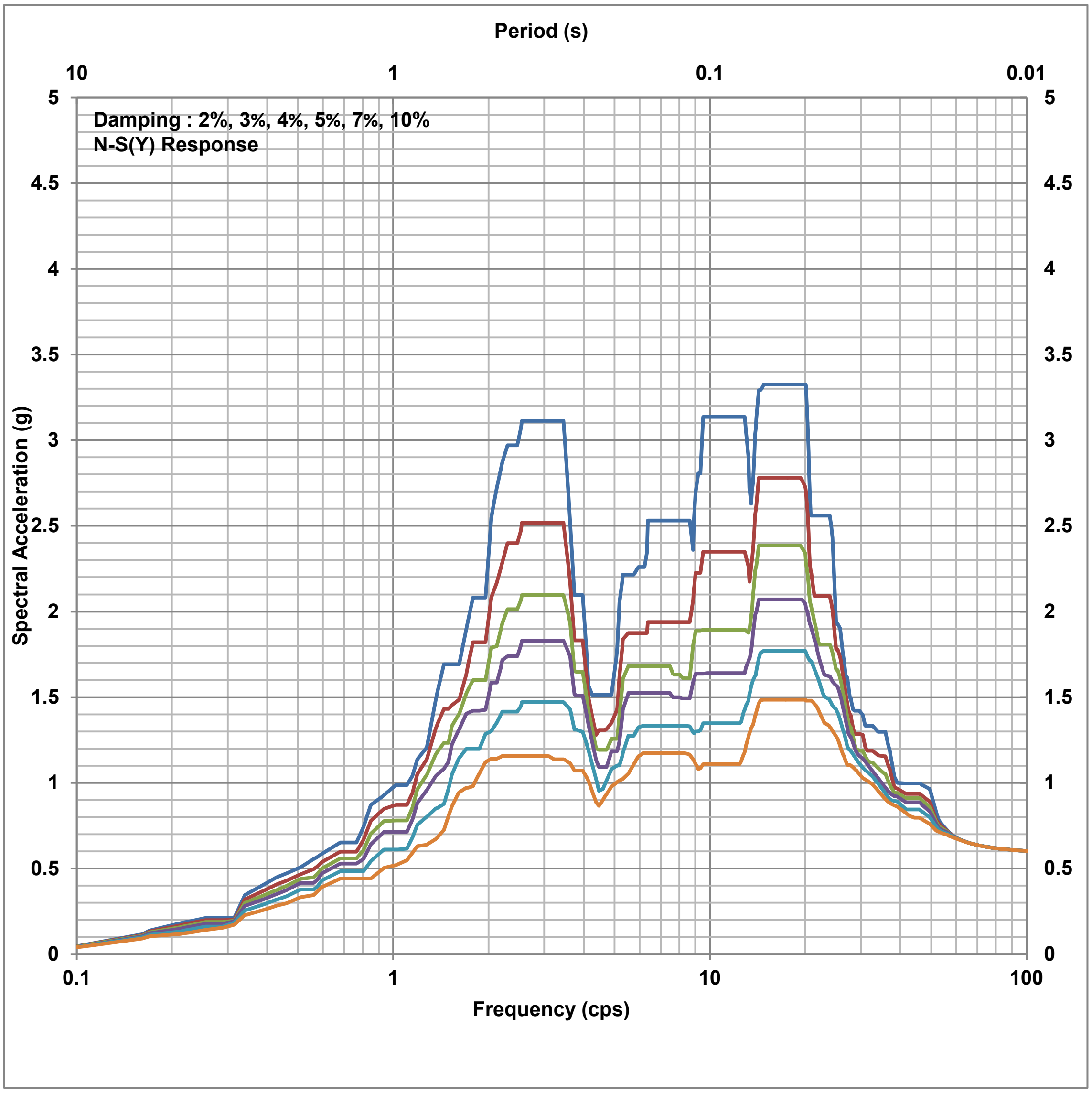

Figure 3.7A-43 Enveloped ISRS for SSE, Reactor Containment Building Containment Structure at El. 104′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

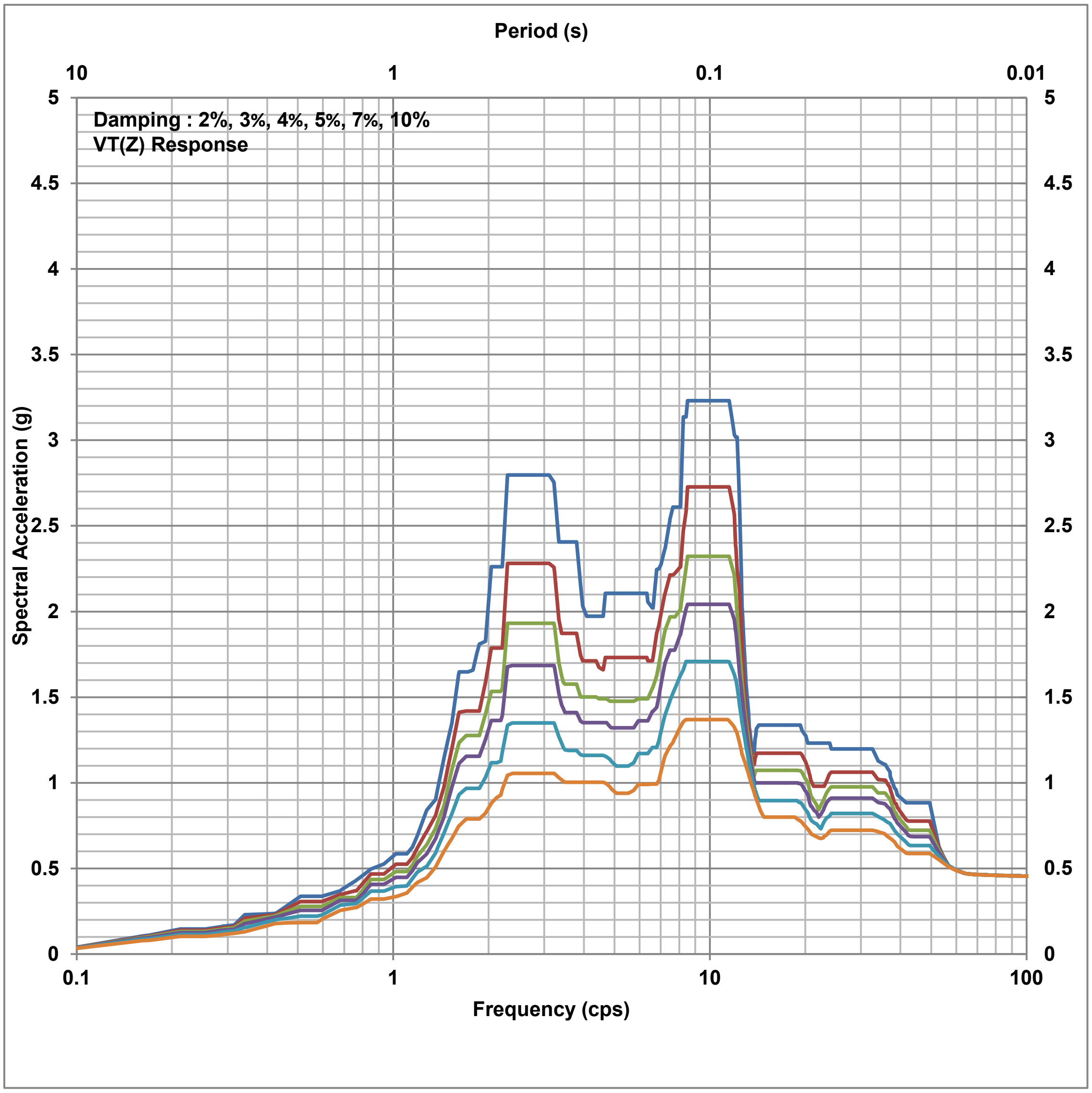

Figure 3.7A-44 Enveloped ISRS for SSE, Reactor Containment Building Containment Structure at El. 104′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

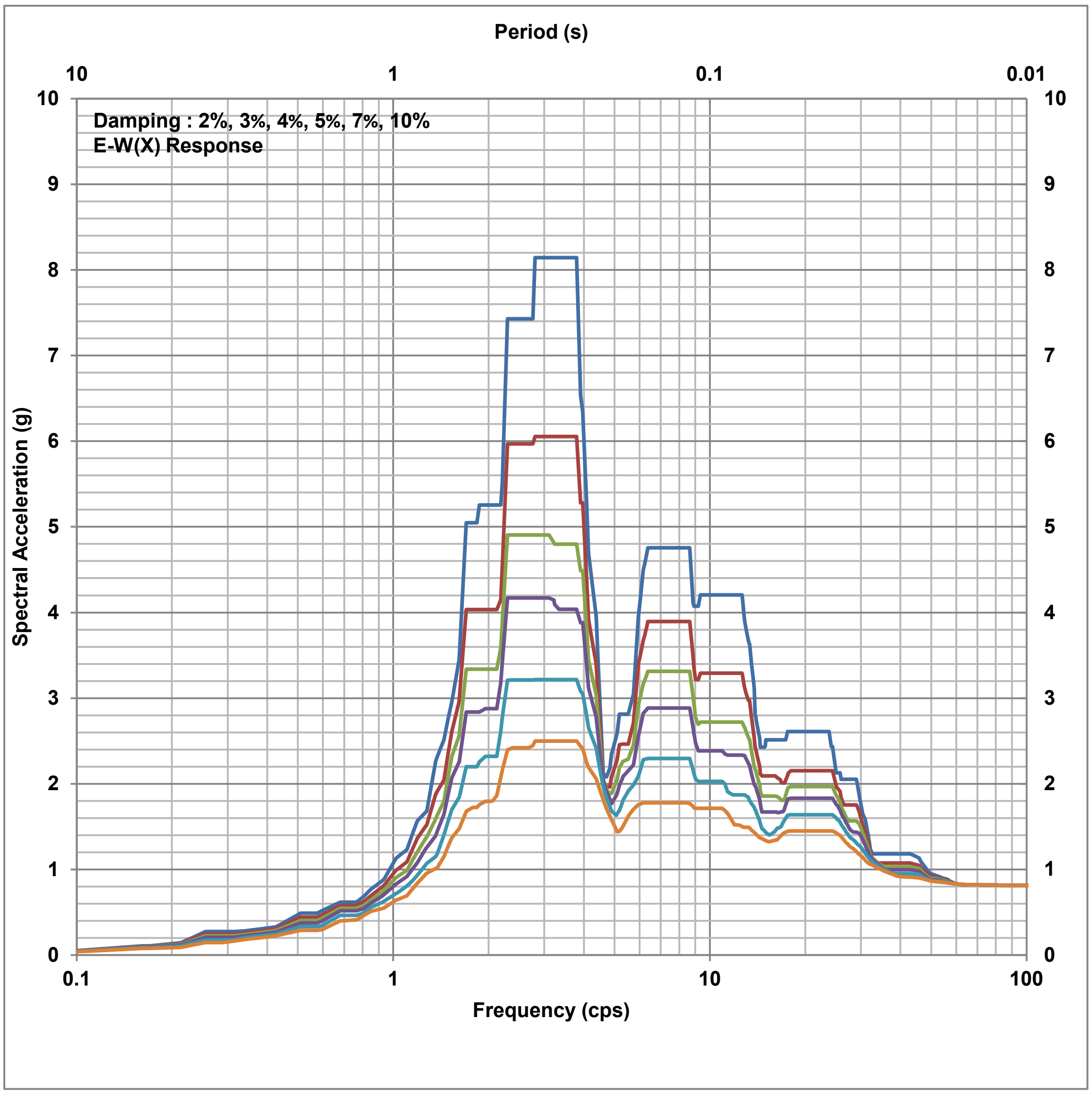

Figure 3.7A-45 Enveloped ISRS for SSE, Reactor Containment Building Containment Structure at El. 160′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

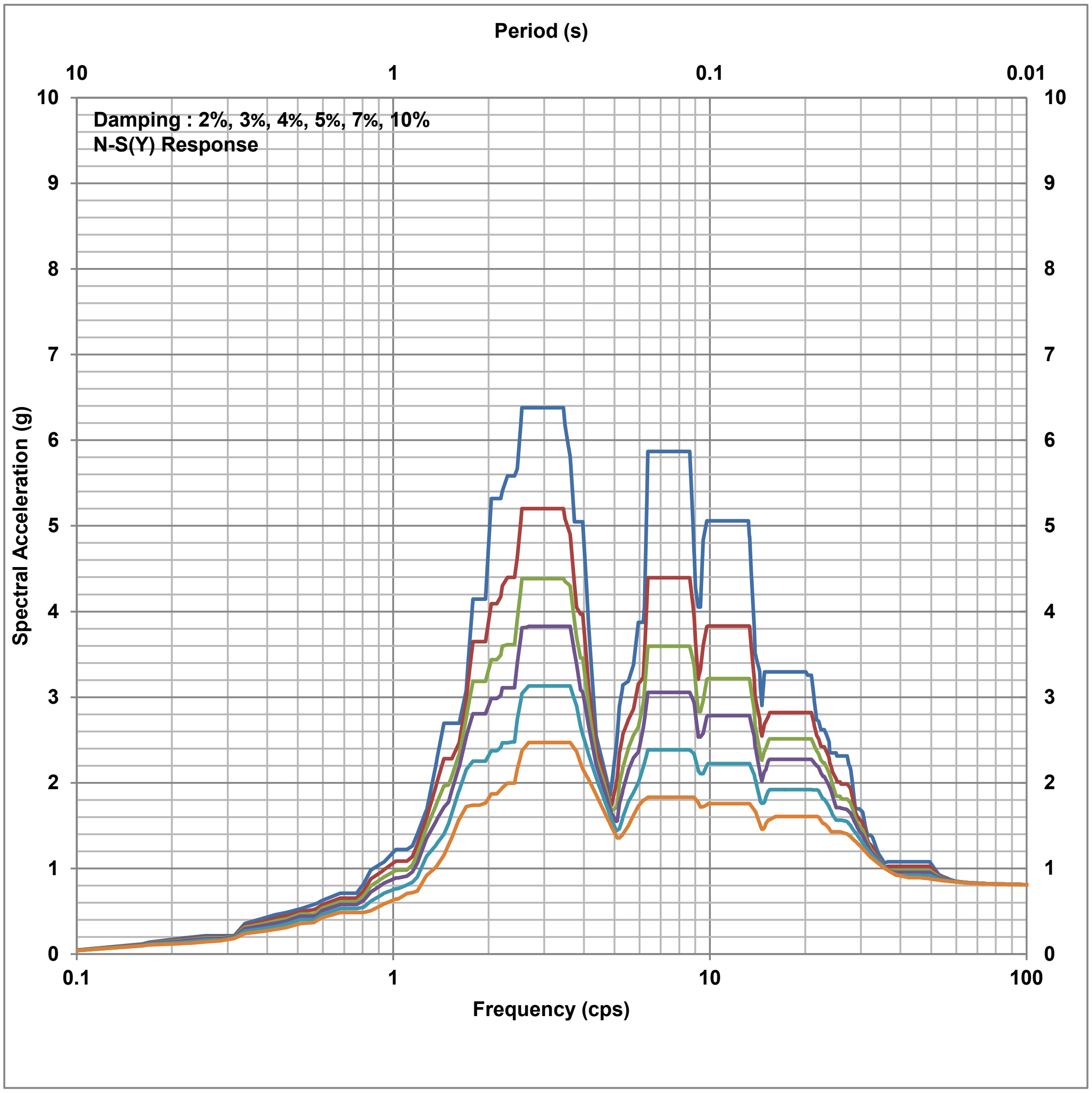

Figure 3.7A-46 Enveloped ISRS for SSE, Reactor Containment Building Containment Structure at El. 160′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

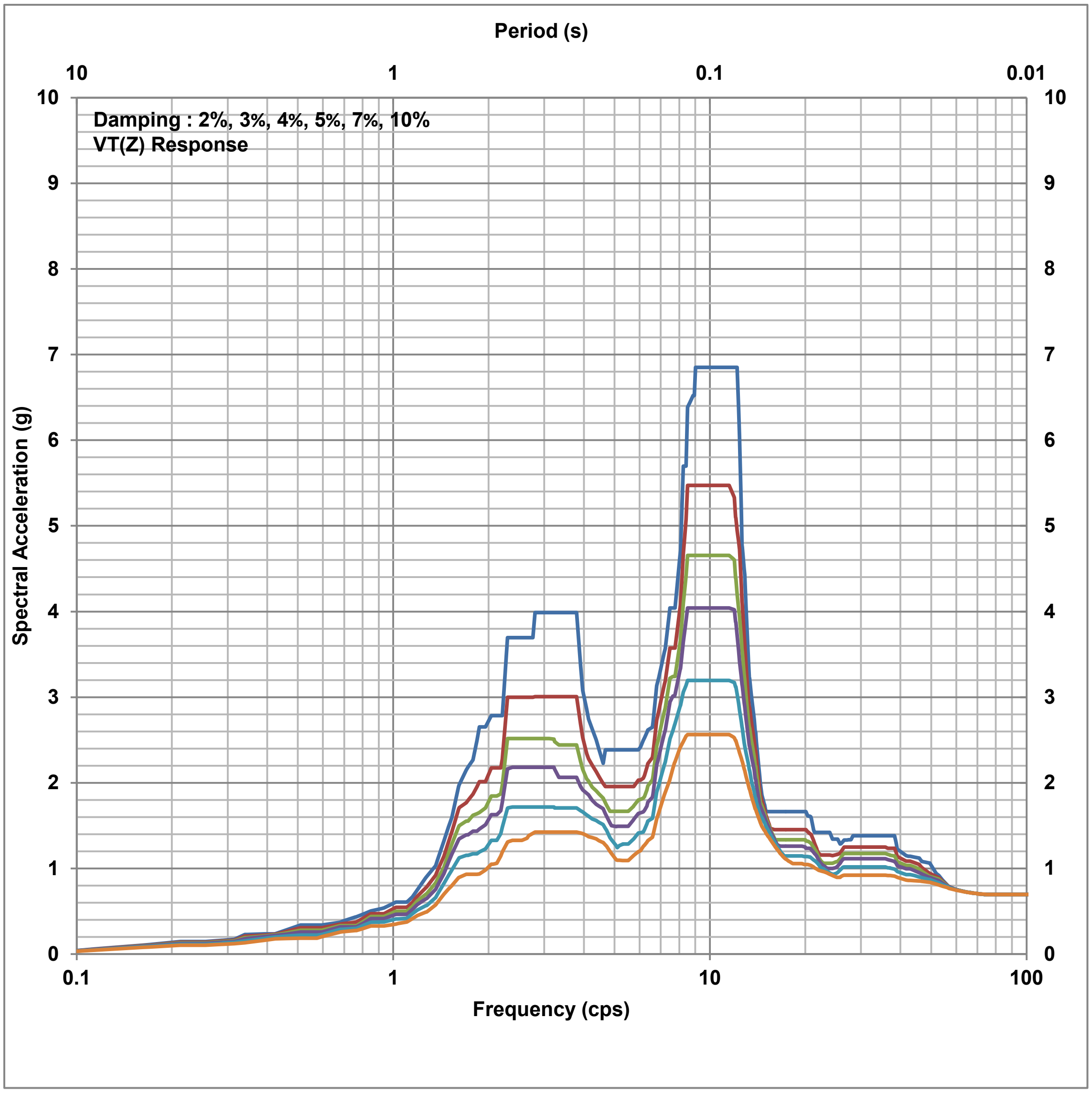

Figure 3.7A-47 Enveloped ISRS for SSE, Reactor Containment Building Containment Structure at El. 160′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

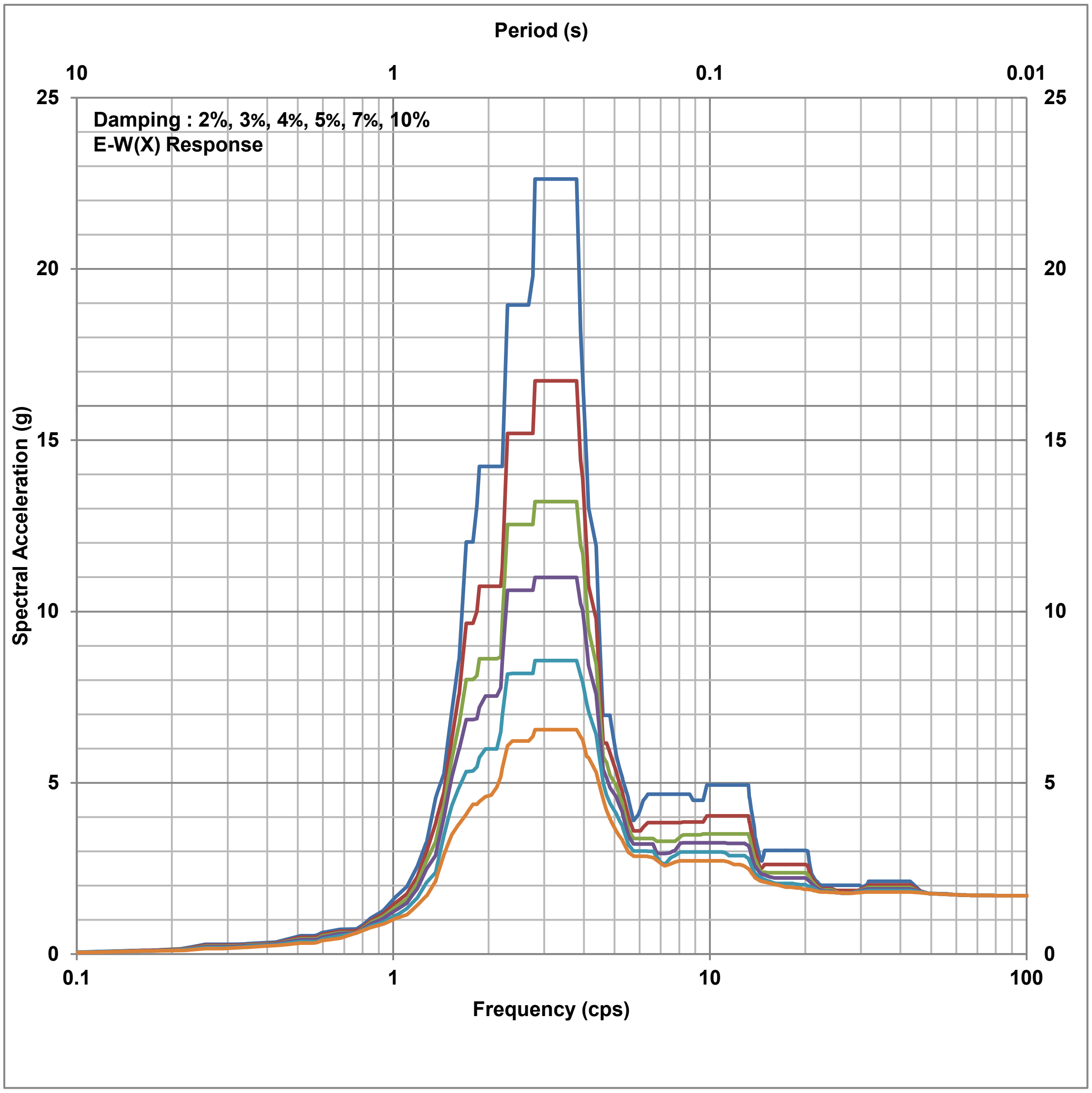

Figure 3.7A-48 Enveloped ISRS for SSE, Reactor Containment Building Containment Structure at El. 332′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

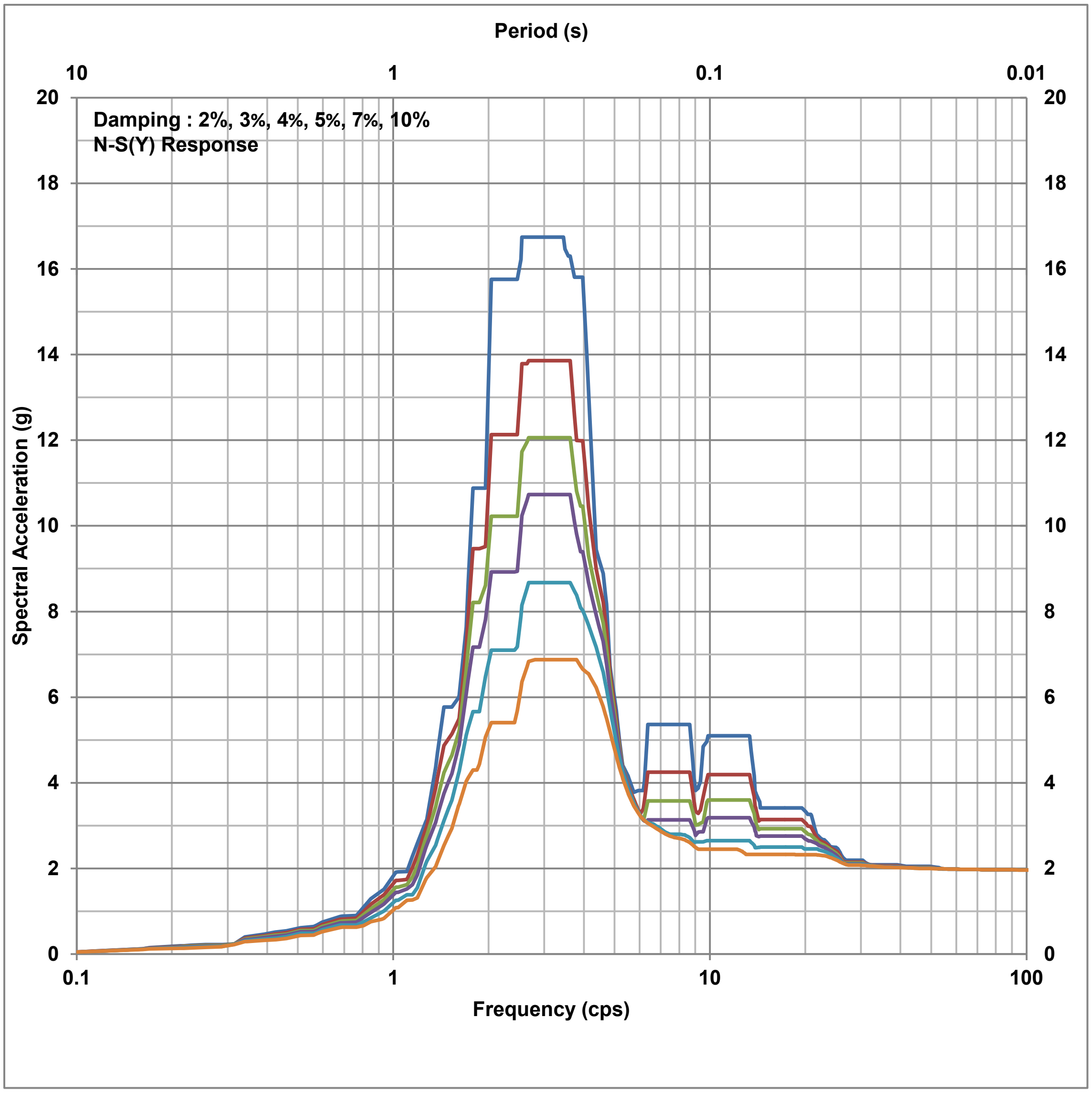

Figure 3.7A-49 Enveloped ISRS for SSE, Reactor Containment Building Containment Structure at El. 332′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

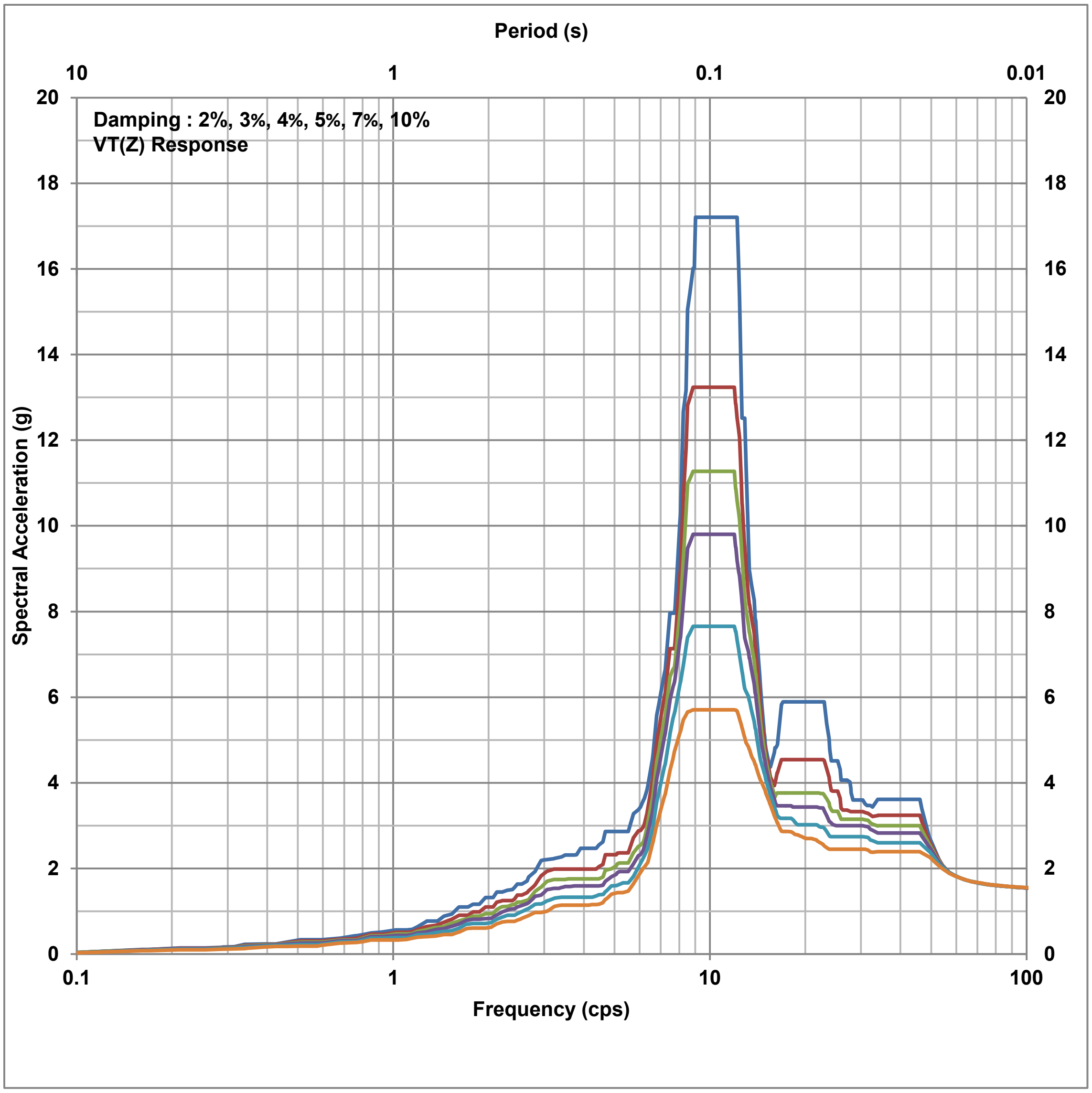

Figure 3.7A-50 Enveloped ISRS for SSE, Reactor Containment Building Containment Structure at El. 332′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

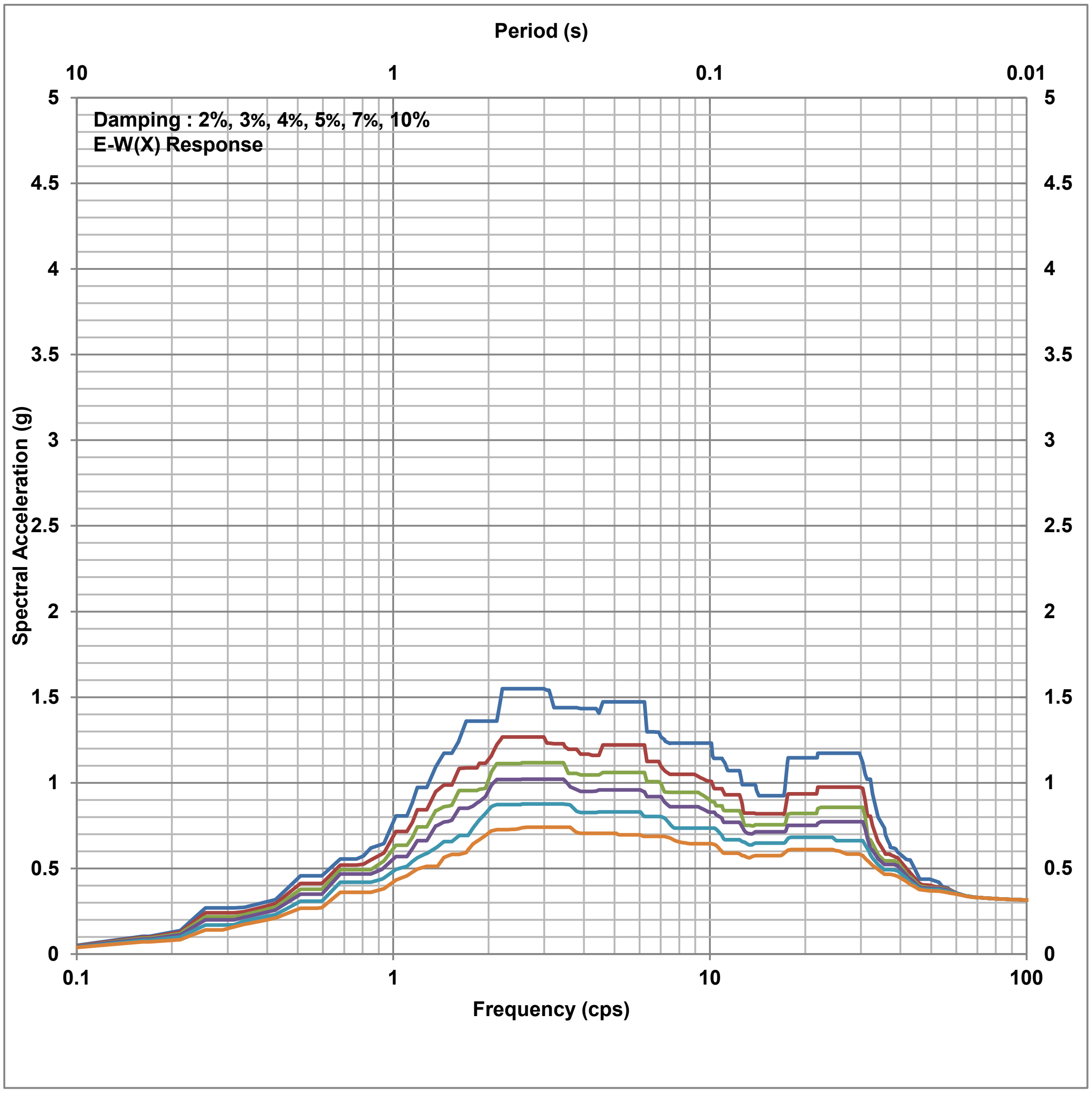

Figure 3.7A-51 Enveloped ISRS for SSE, Auxiliary Building at El. 55′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

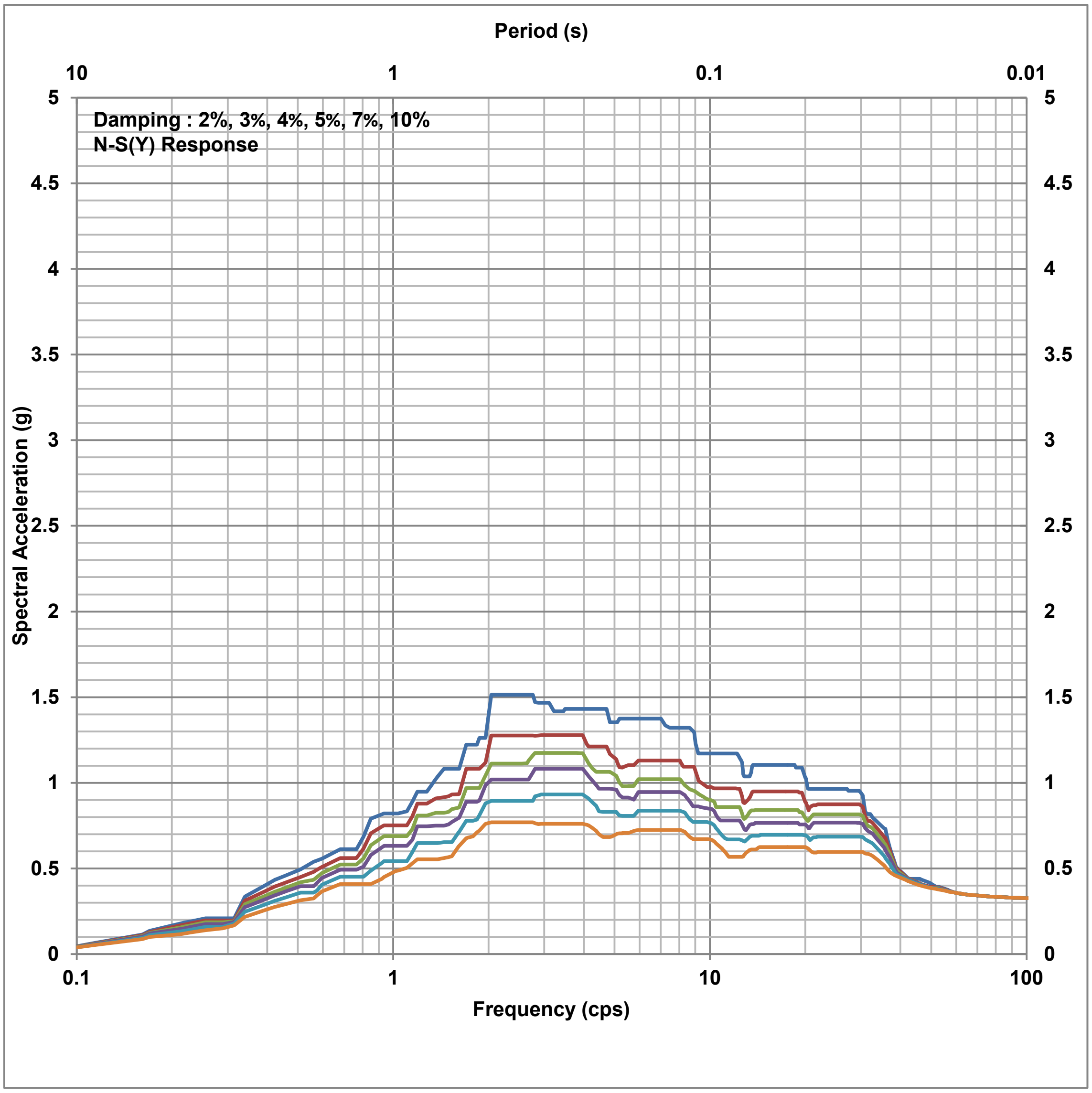

Figure 3.7A-52 Enveloped ISRS for SSE, Auxiliary Building at El. 55′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

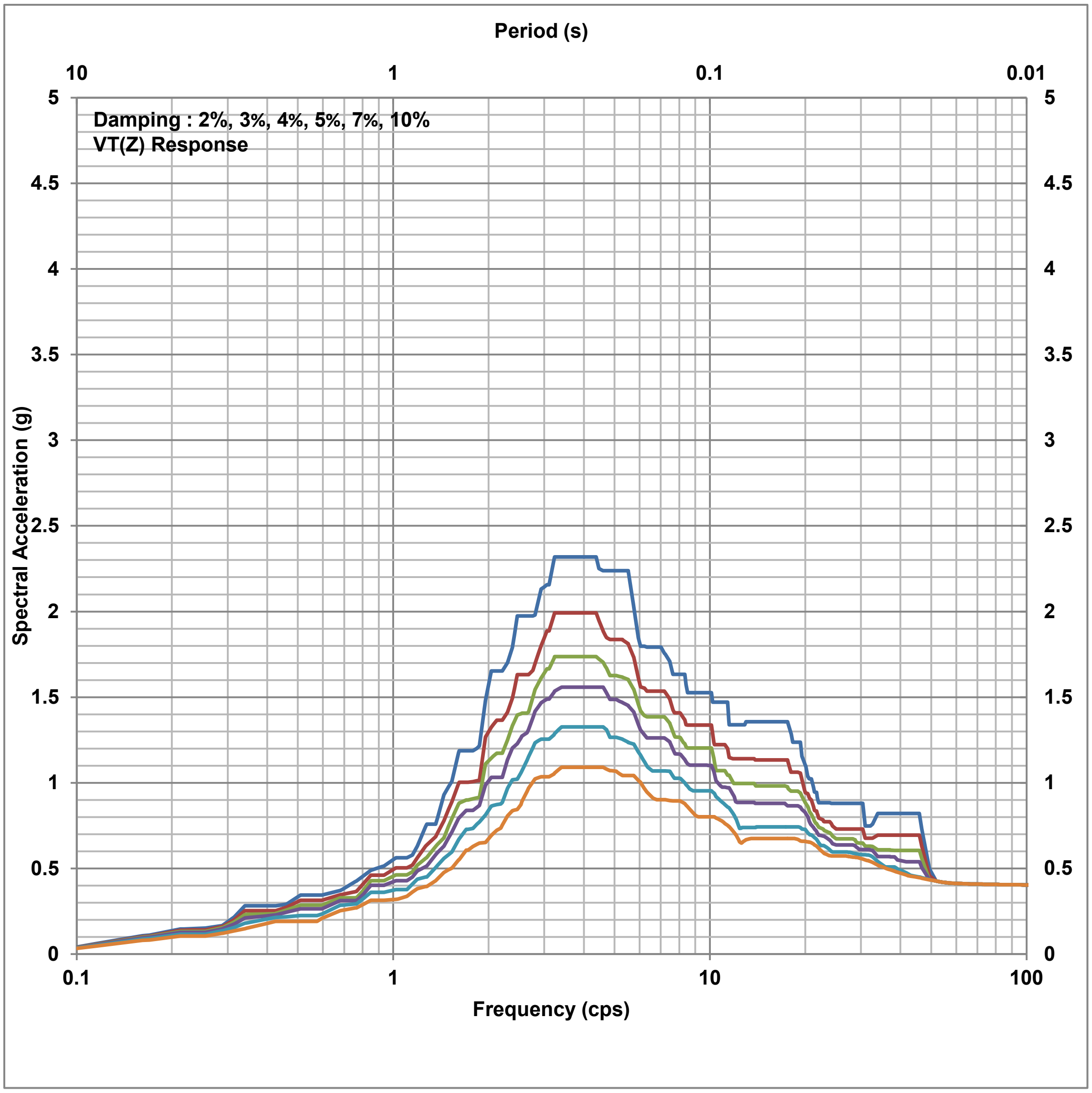

Figure 3.7A-53 Enveloped ISRS for SSE, Auxiliary Building at El. 55′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

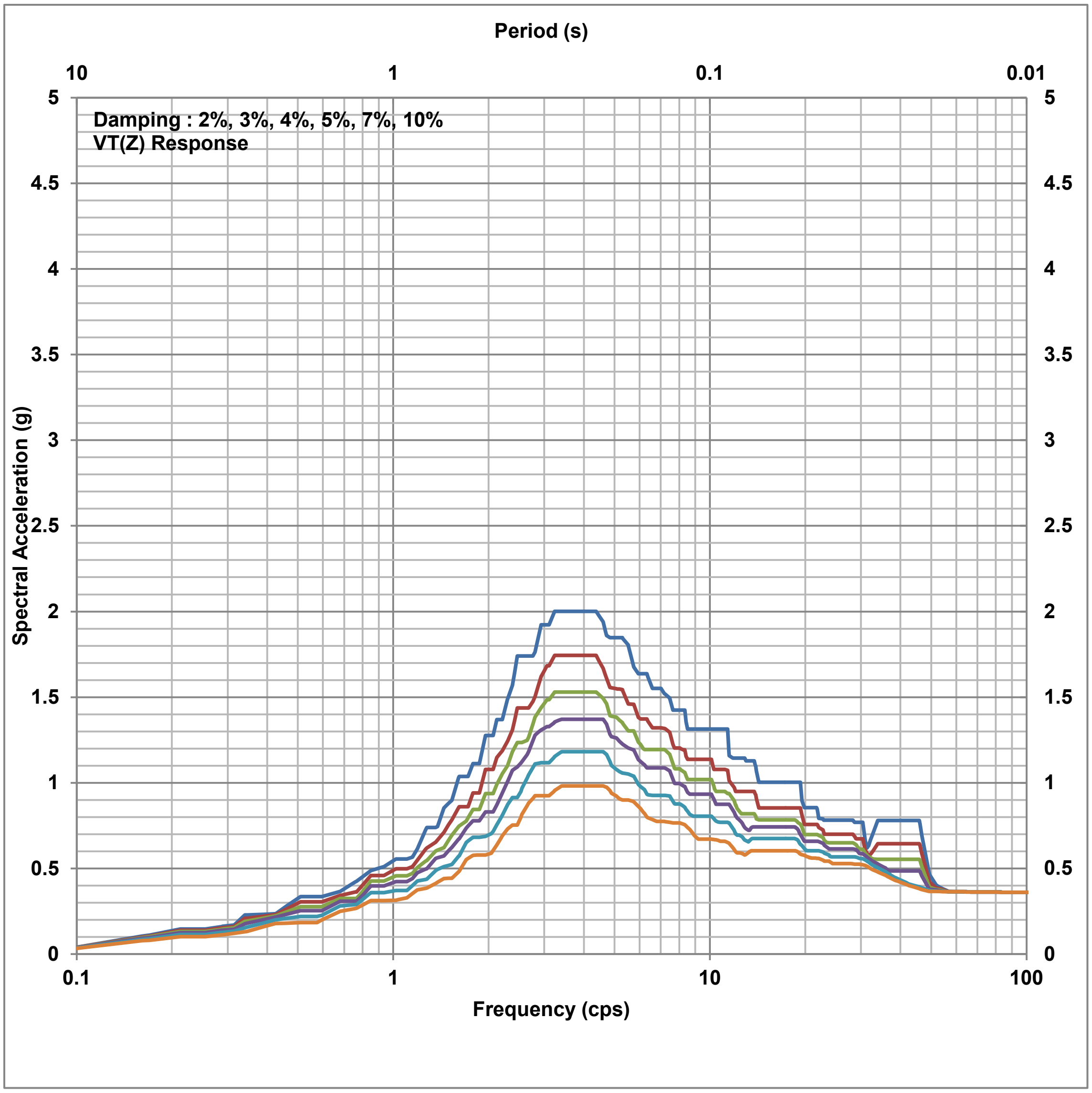

Figure 3.7A-54 Enveloped ISRS for SSE, Auxiliary Building at El. 55′-0″ (Slab), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

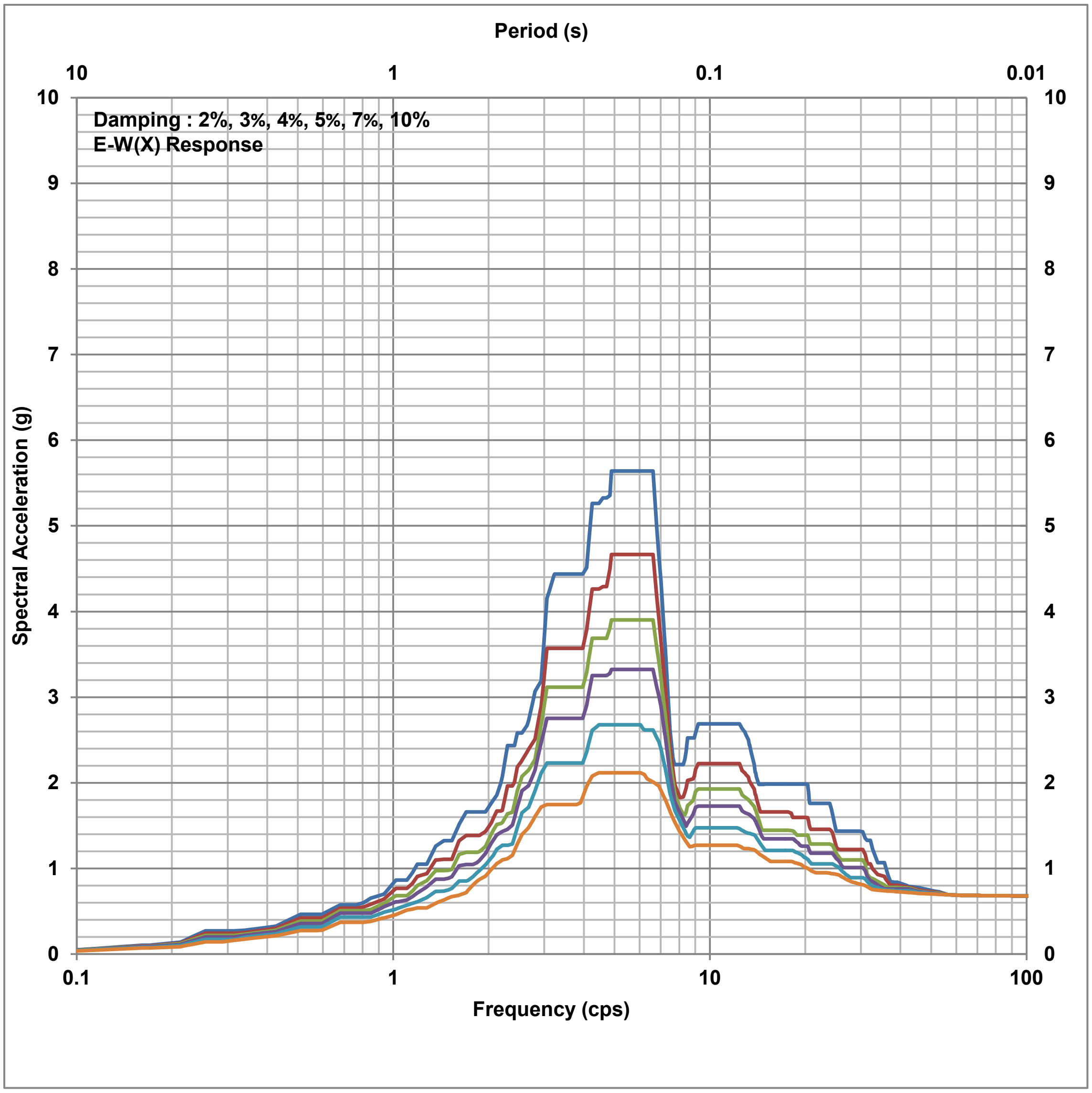

Figure 3.7A-55 Enveloped ISRS for SSE, Auxiliary Building at El. 100′-0″ (General), E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

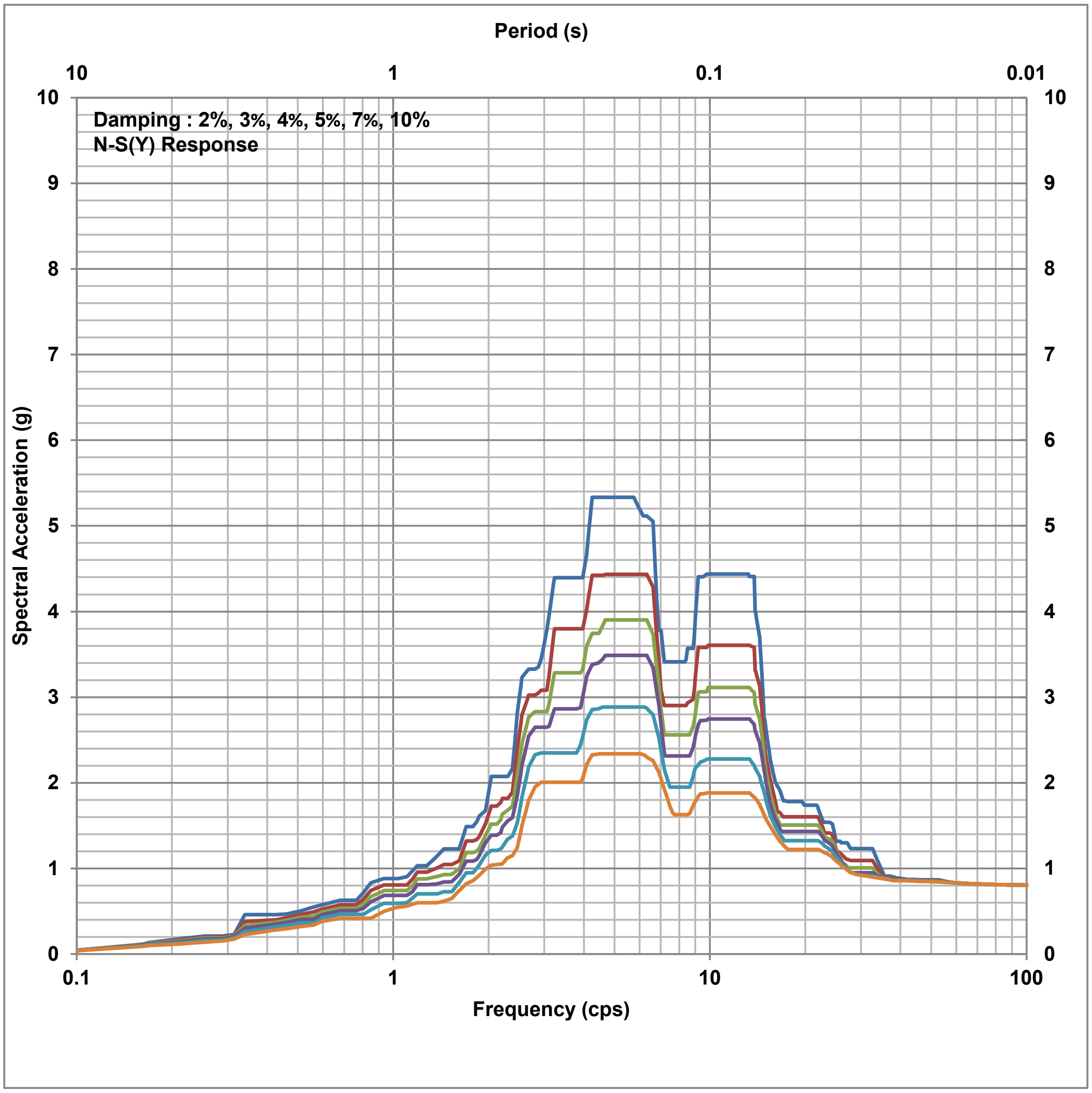

Figure 3.7A-56 Enveloped ISRS for SSE, Auxiliary Building at El. 100′-0″ (General), N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

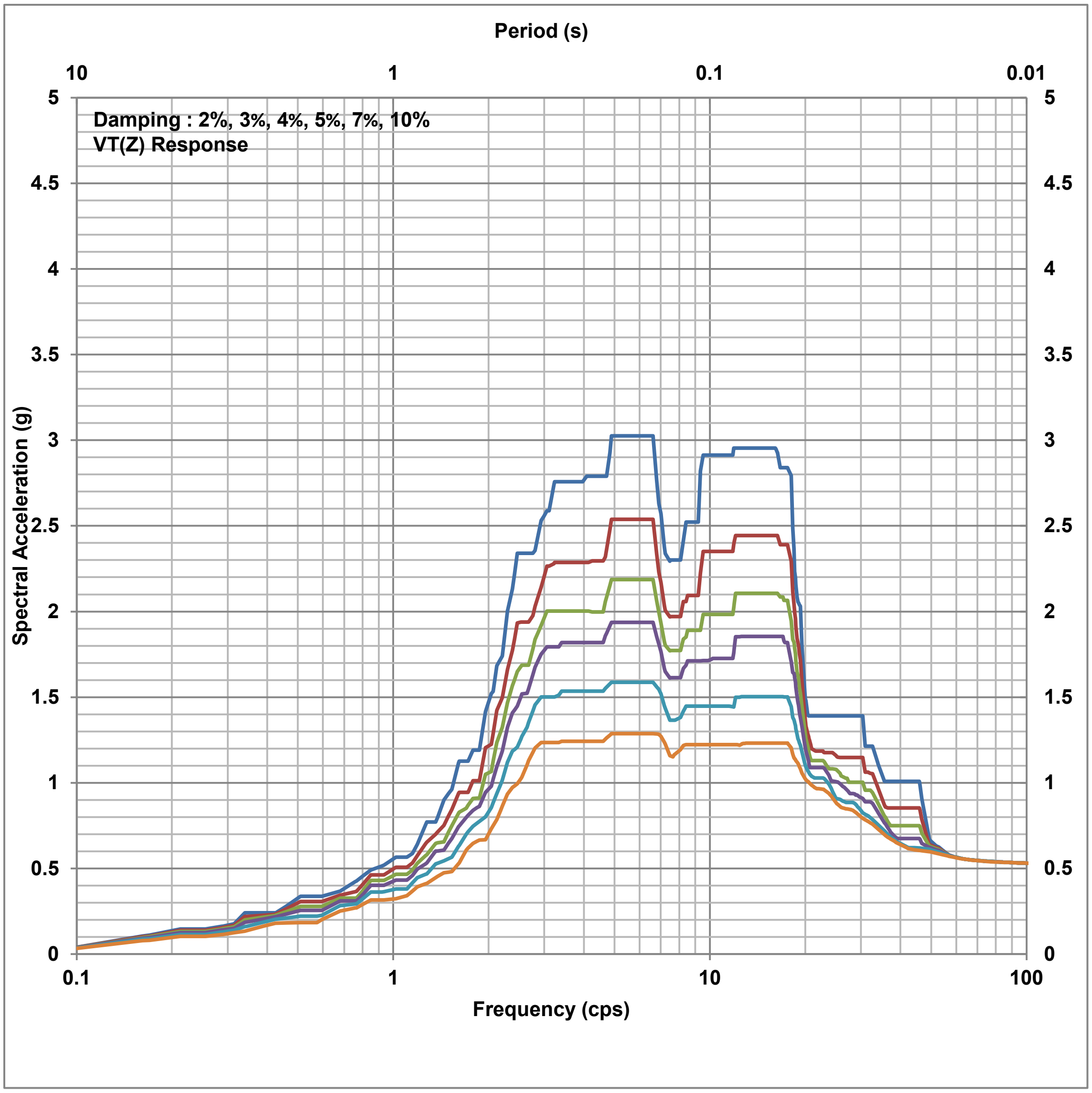

Figure 3.7A-57 Enveloped ISRS for SSE, Auxiliary Building at El. 100′-0″ (General), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

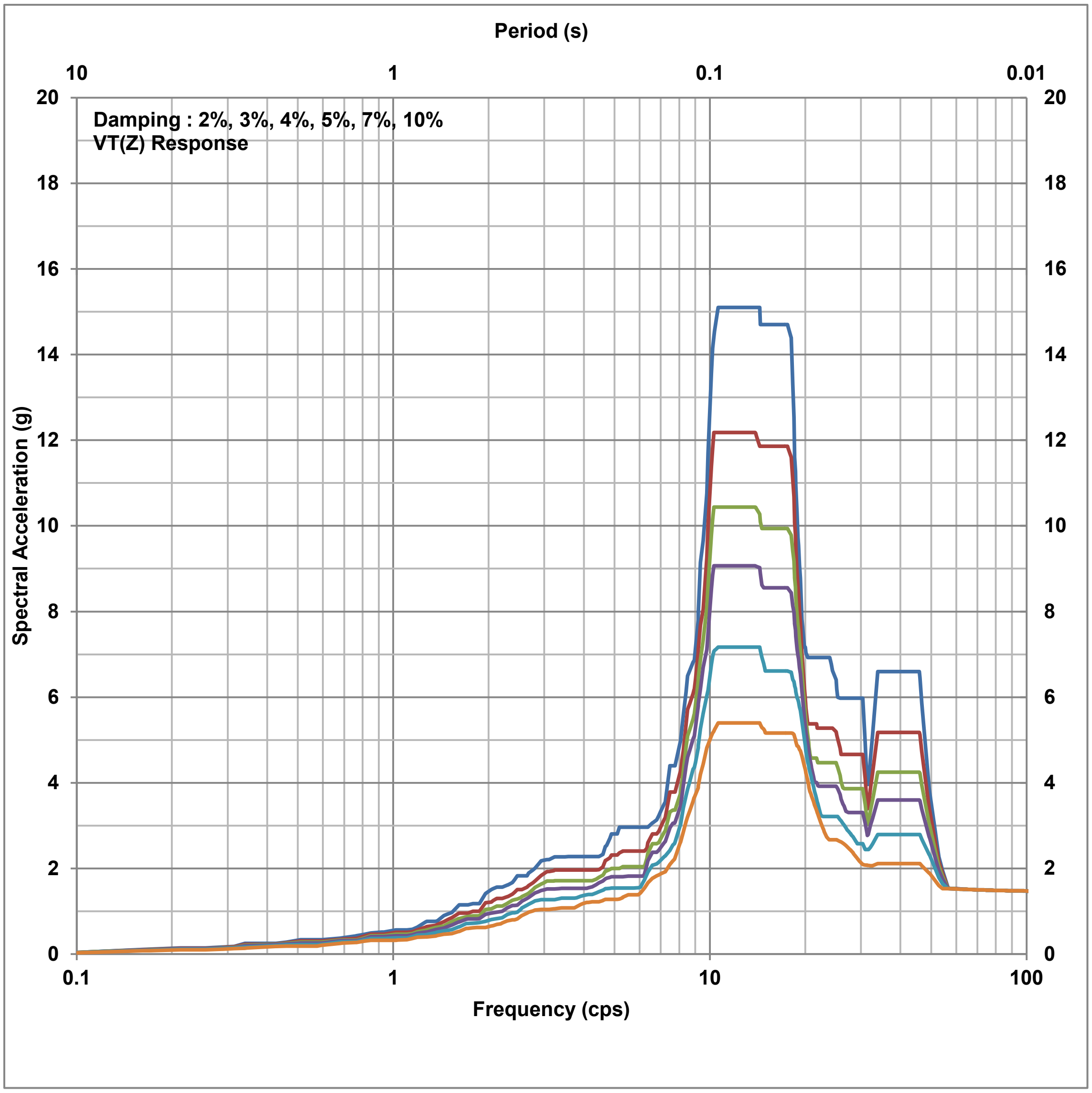

Figure 3.7A-58 Enveloped ISRS for SSE, Auxiliary Building at El. 100′-0″ (General Slab), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

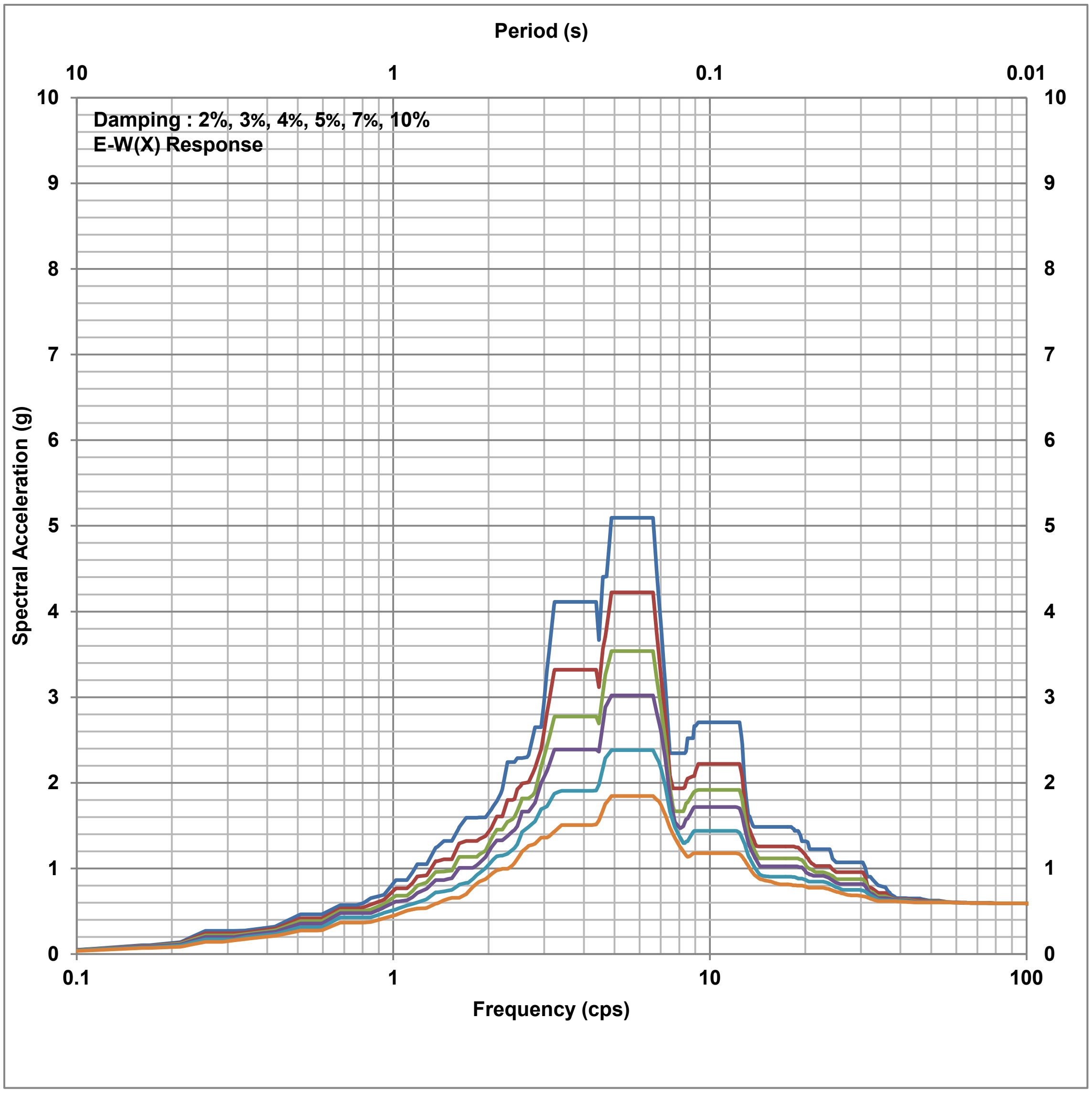

Figure 3.7A-59 Enveloped ISRS for SSE, Auxiliary Building at El. 100′-0″ (Fuel Handling Area), E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

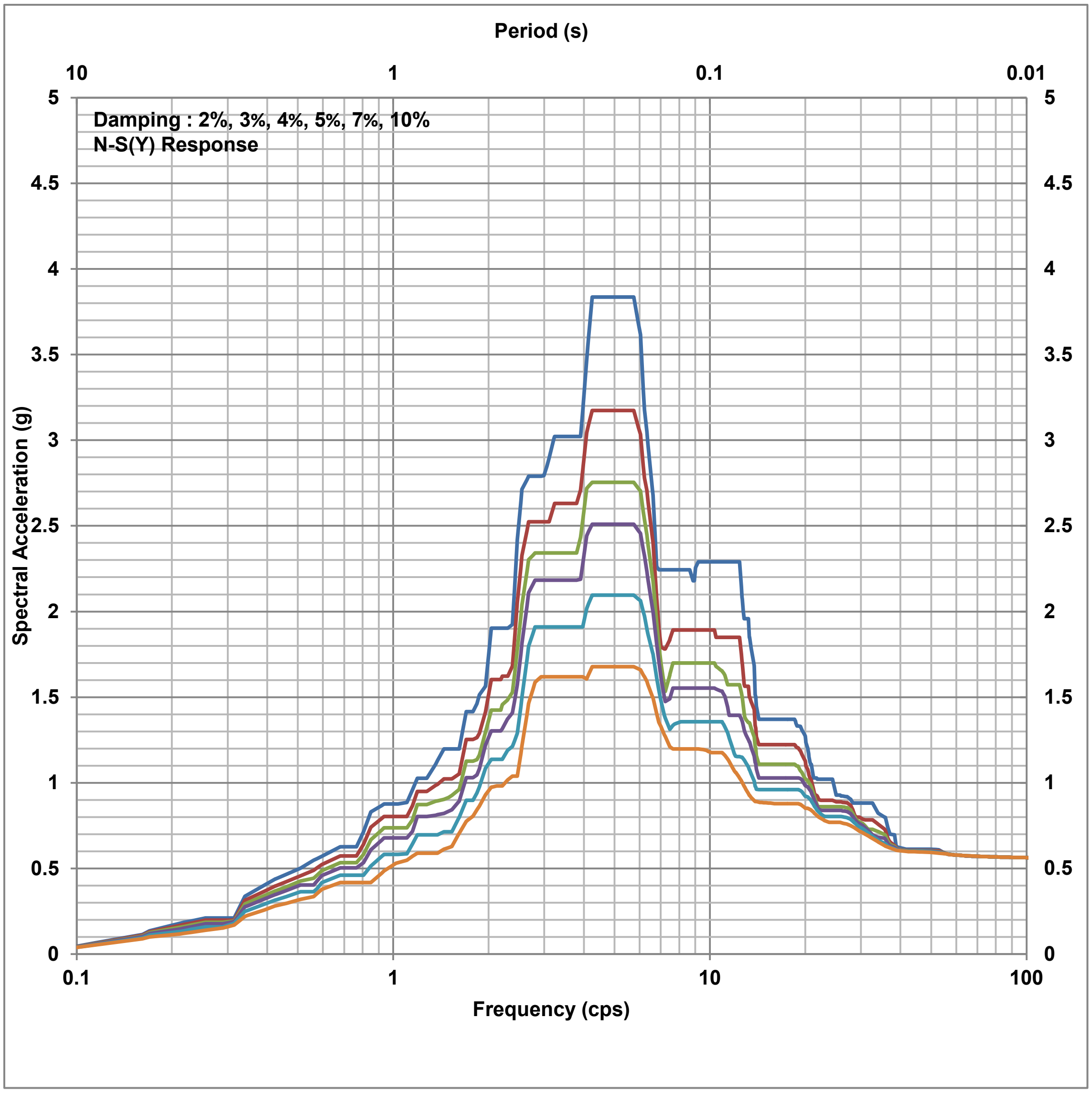

Figure 3.7A-60 Enveloped ISRS for SSE, Auxiliary Building at El. 100′-0″ (Fuel Handling Area), N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

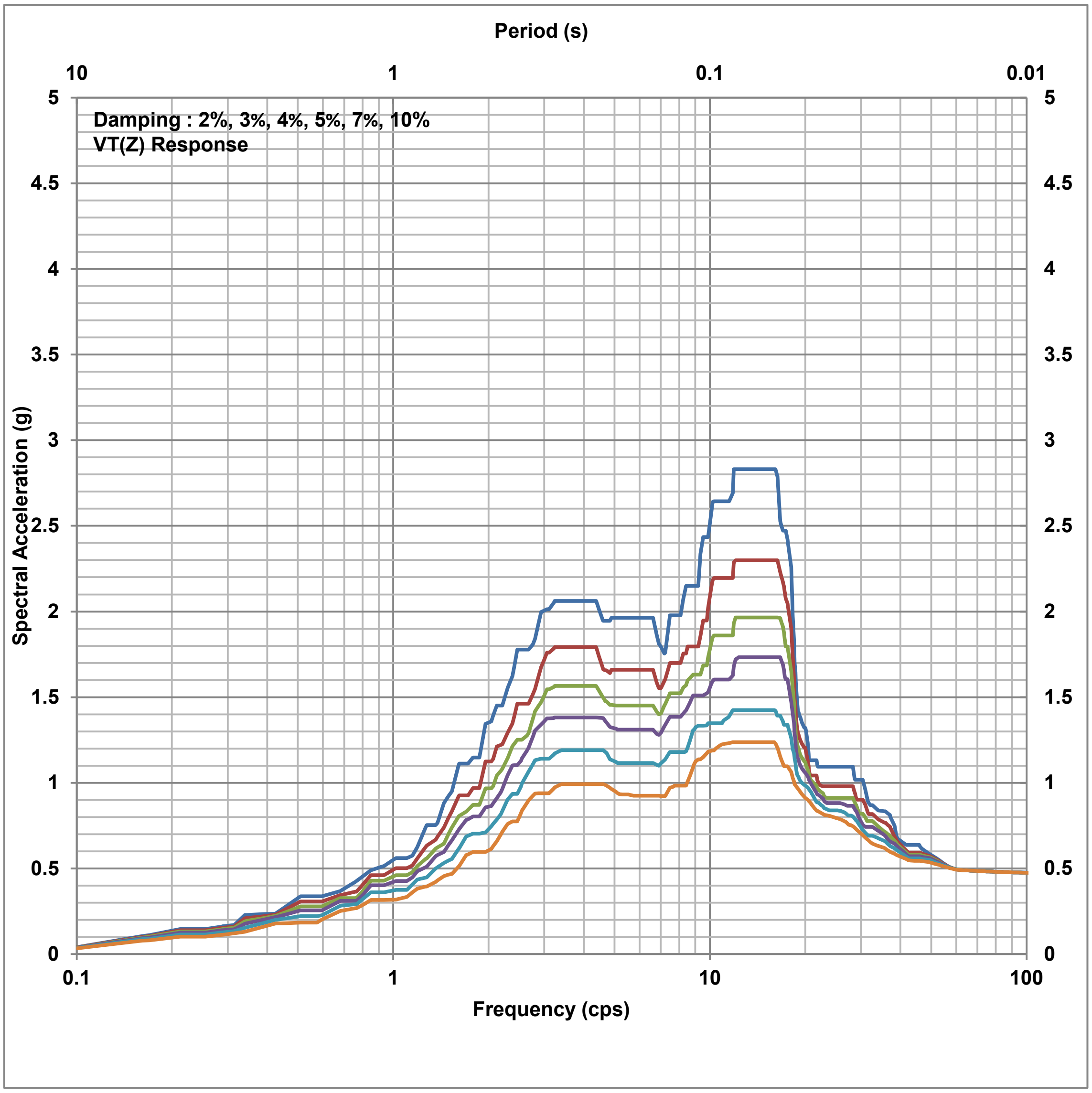

Figure 3.7A-61 Enveloped ISRS for SSE, Auxiliary Building at El. 100′-0″ (Fuel Handling Area), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

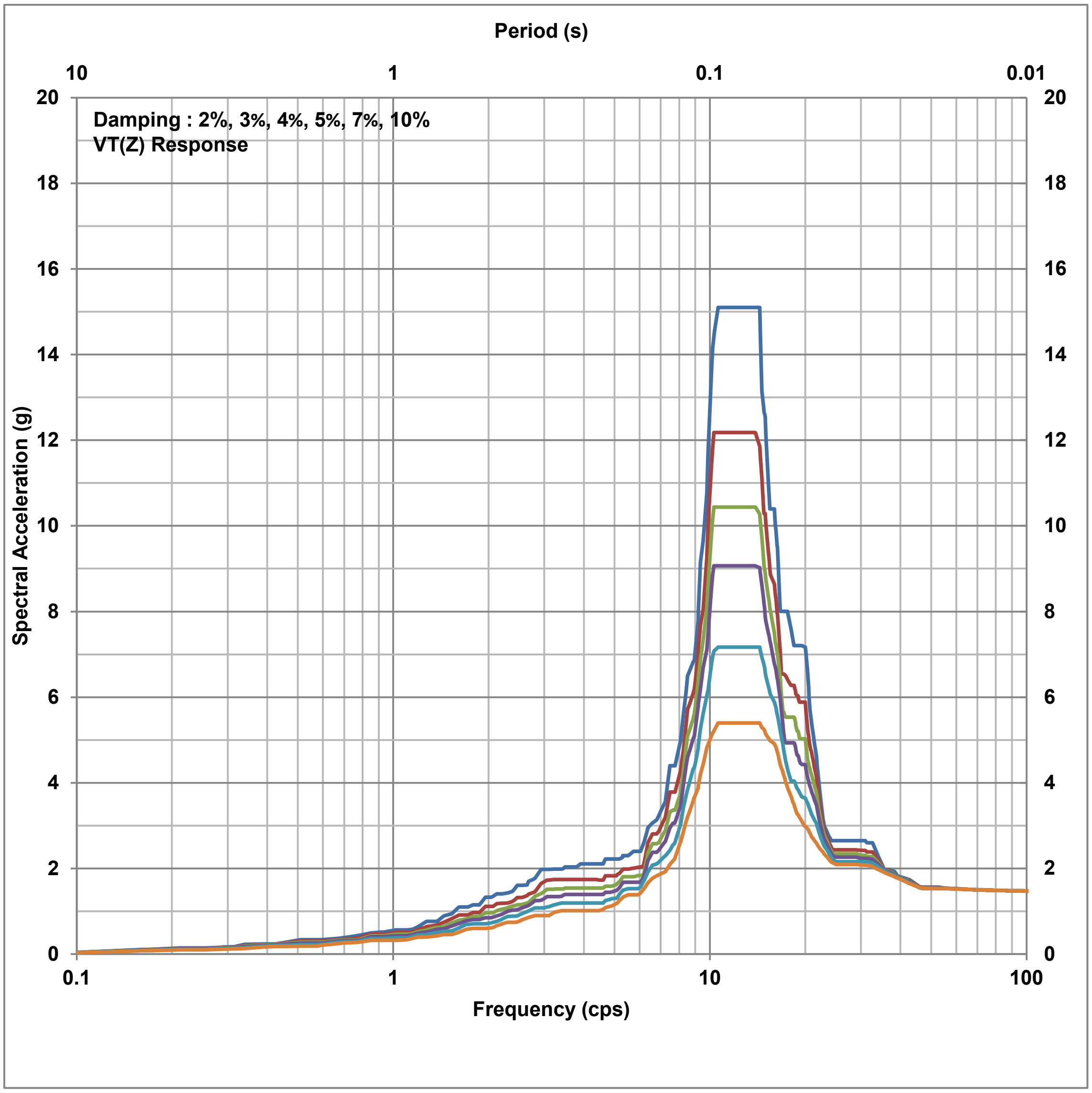

Figure 3.7A-62 Enveloped ISRS for SSE, Auxiliary Building at El. 100′-0″ (Fuel Handling Area Slab), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

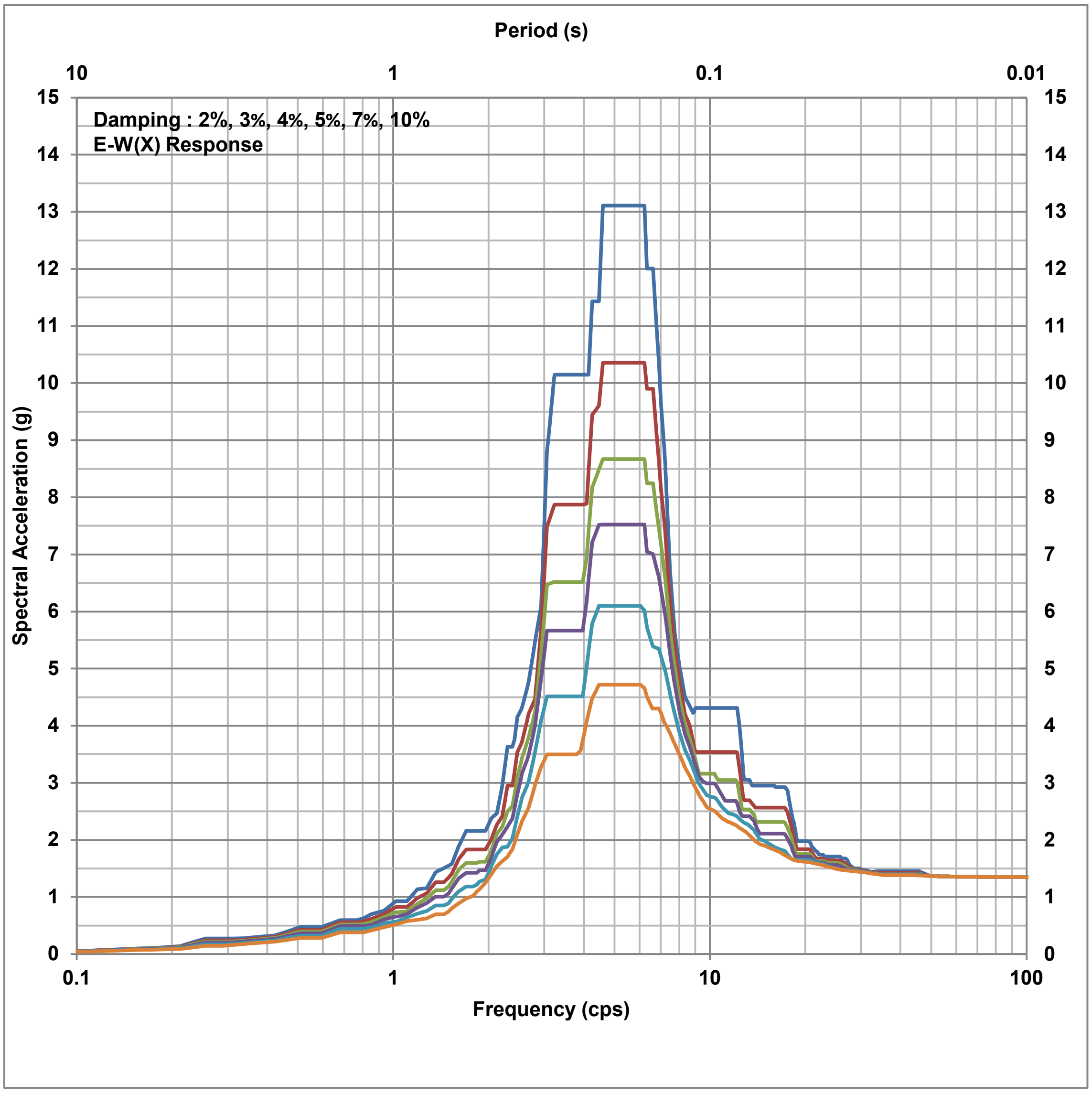

Figure 3.7A-63 Enveloped ISRS for SSE, Auxiliary Building at El. 156′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

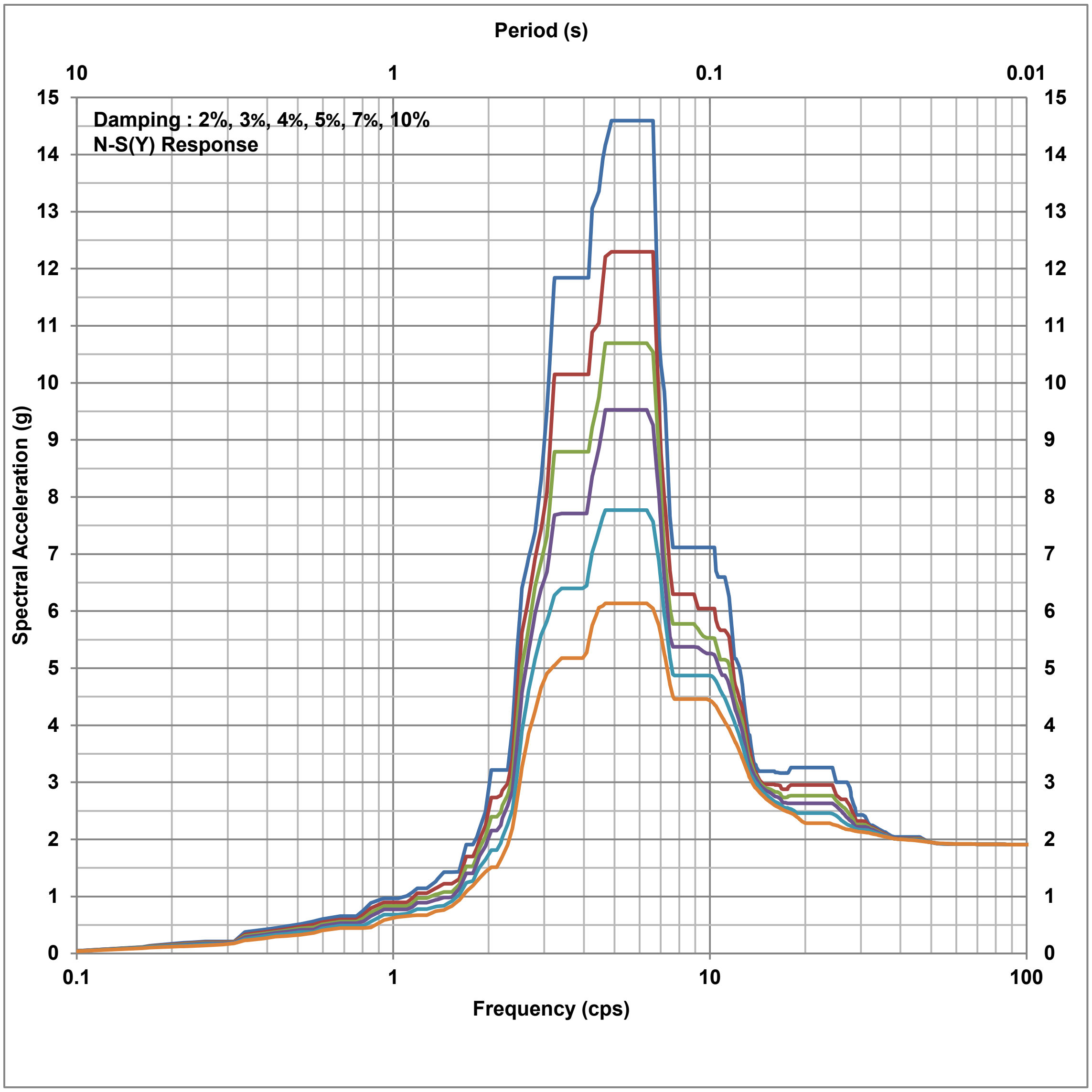

Figure 3.7A-64 Enveloped ISRS for SSE, Auxiliary Building at El. 156′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

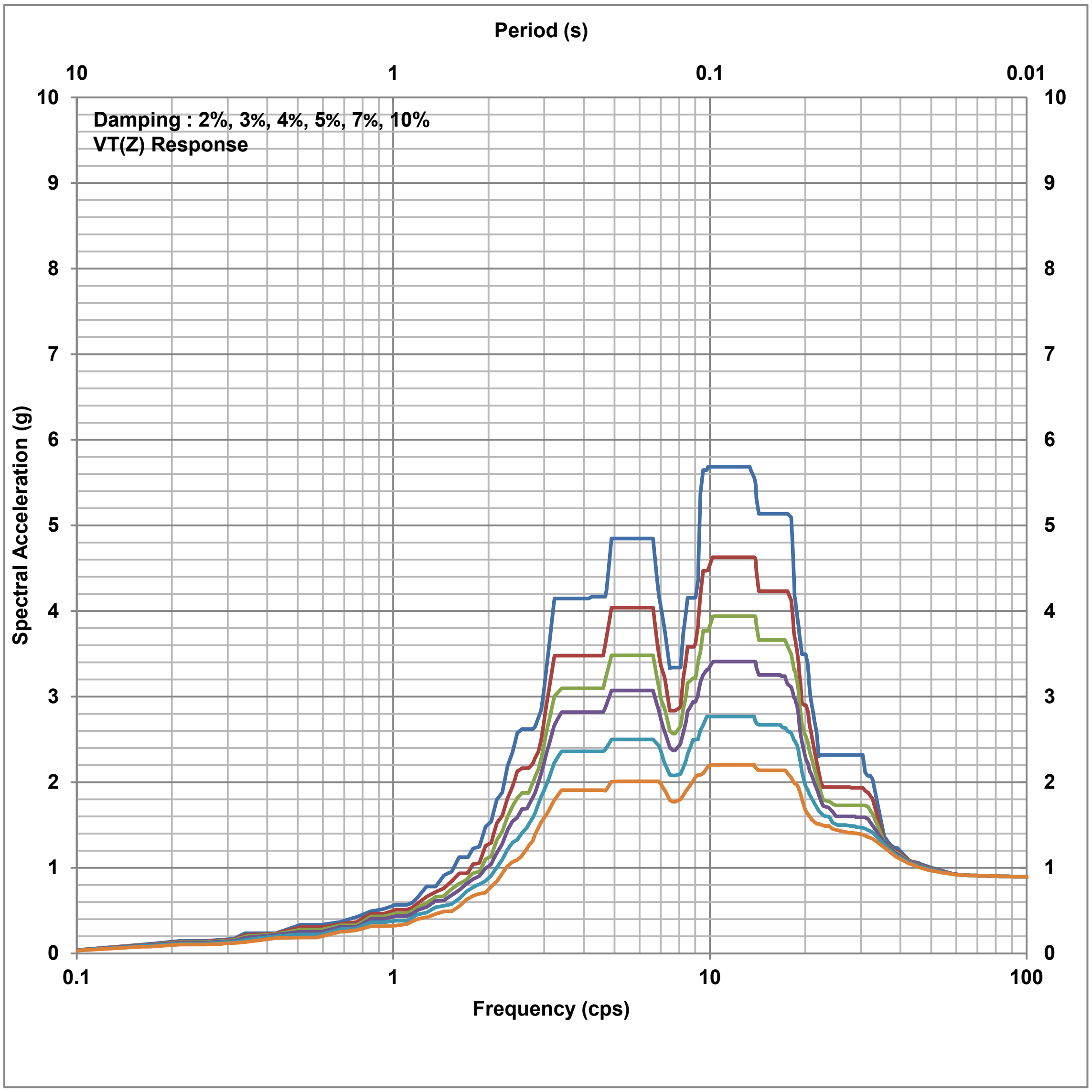

Figure 3.7A-65 Enveloped ISRS for SSE, Auxiliary Building at El. 156′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

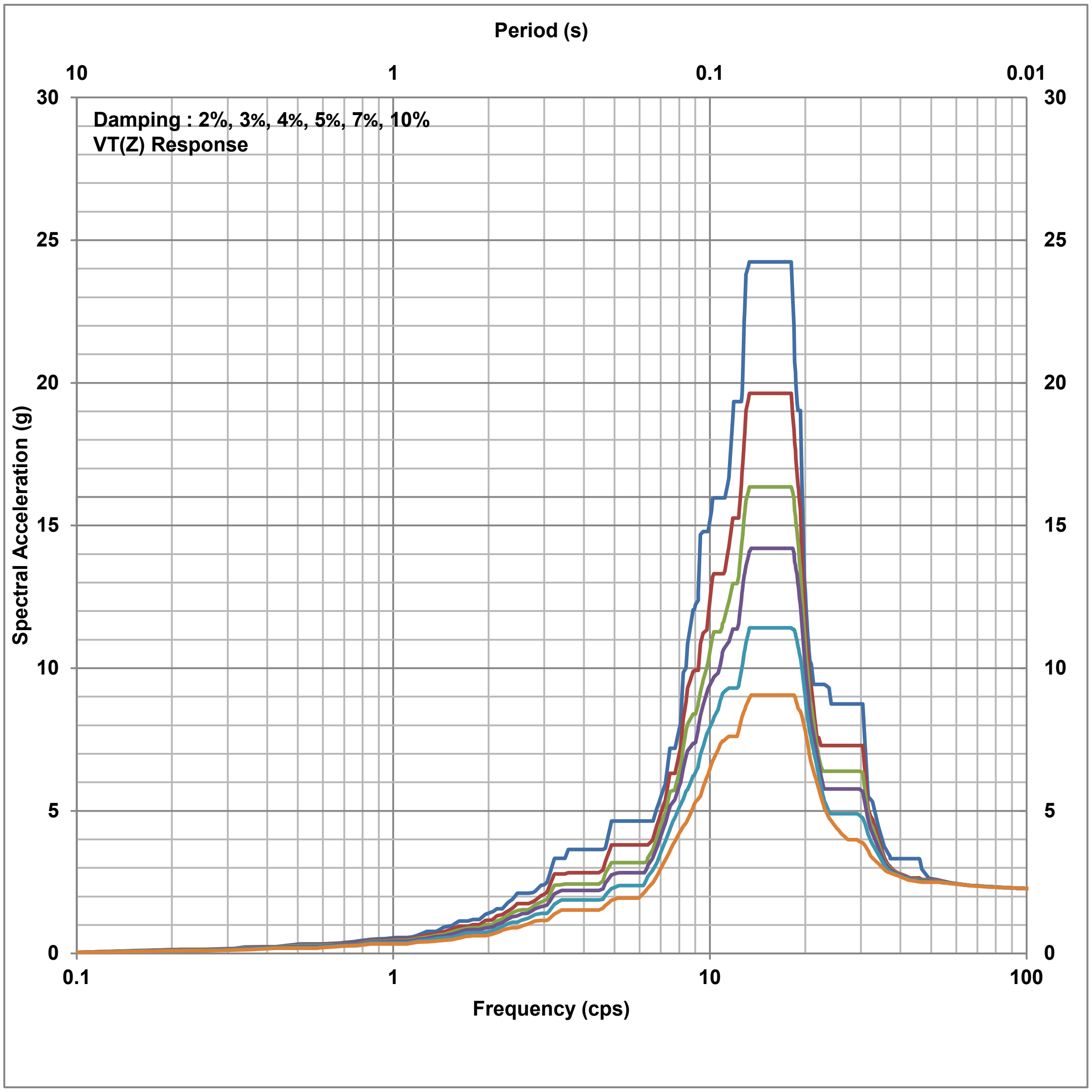

Figure 3.7A-66 Enveloped ISRS for SSE, Auxiliary Building at El. 156′-0″ (Slab), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

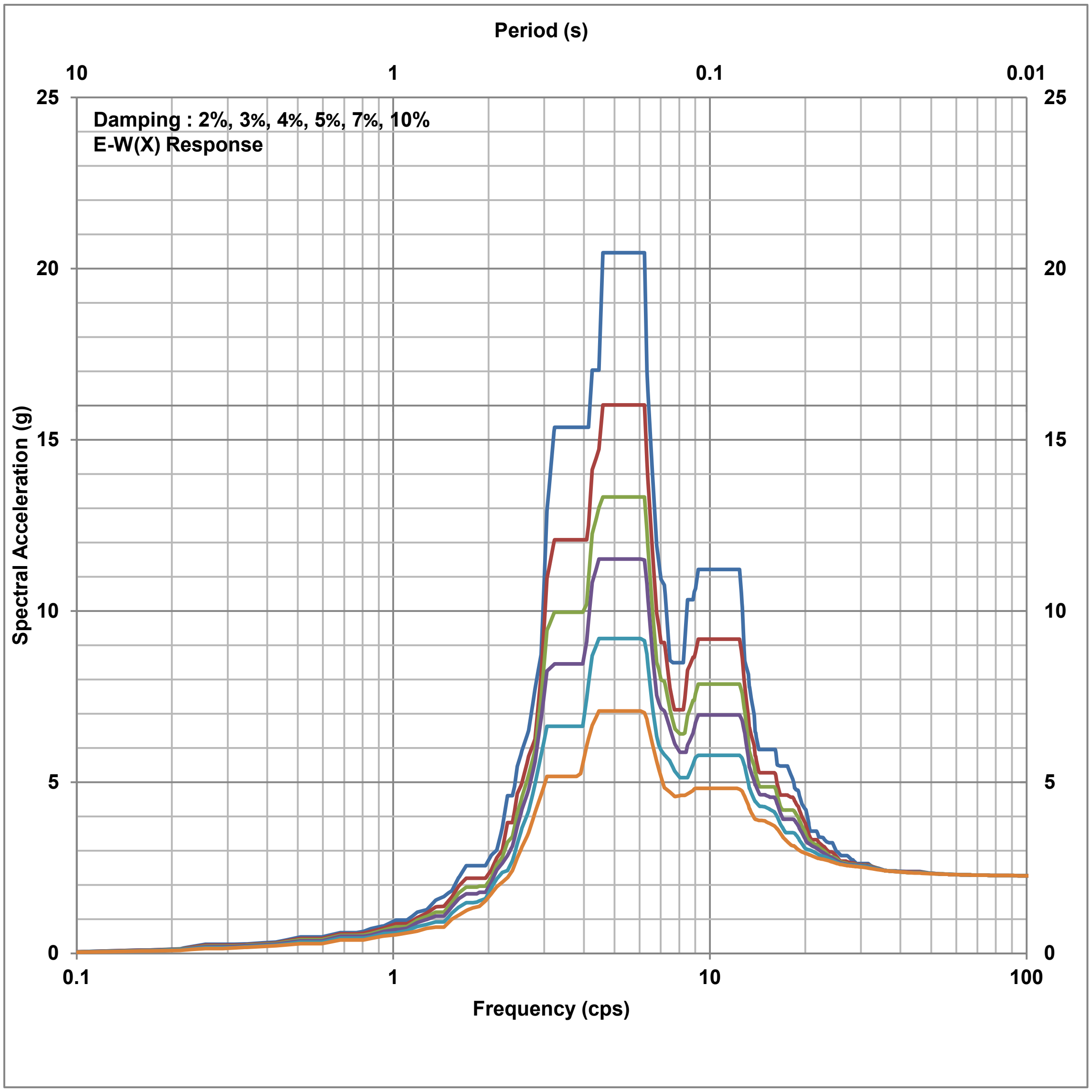

Figure 3.7A-67 Enveloped ISRS for SSE, Auxiliary Building at El. 213′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

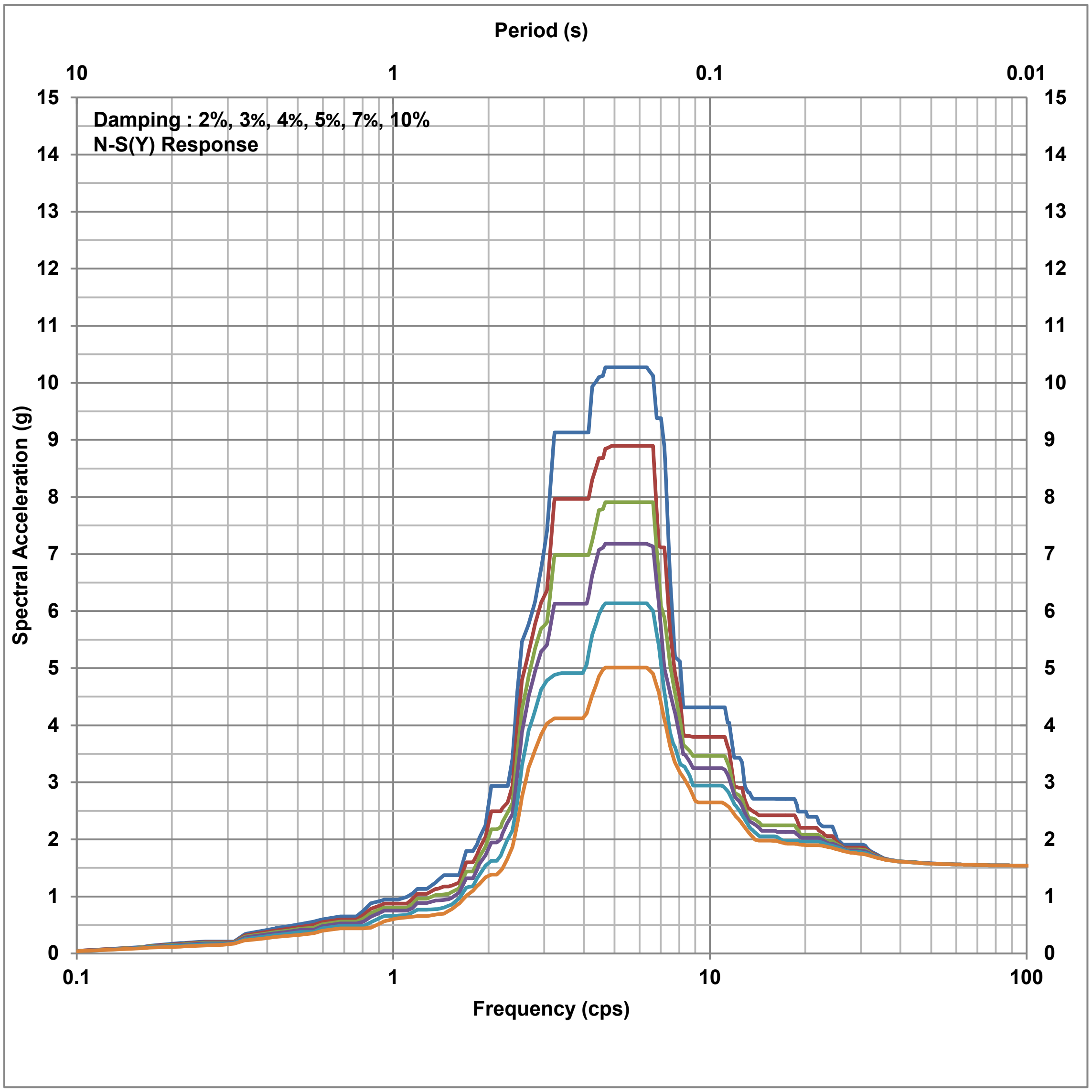

Figure 3.7A-68 Enveloped ISRS for SSE, Auxiliary Building at El. 213′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

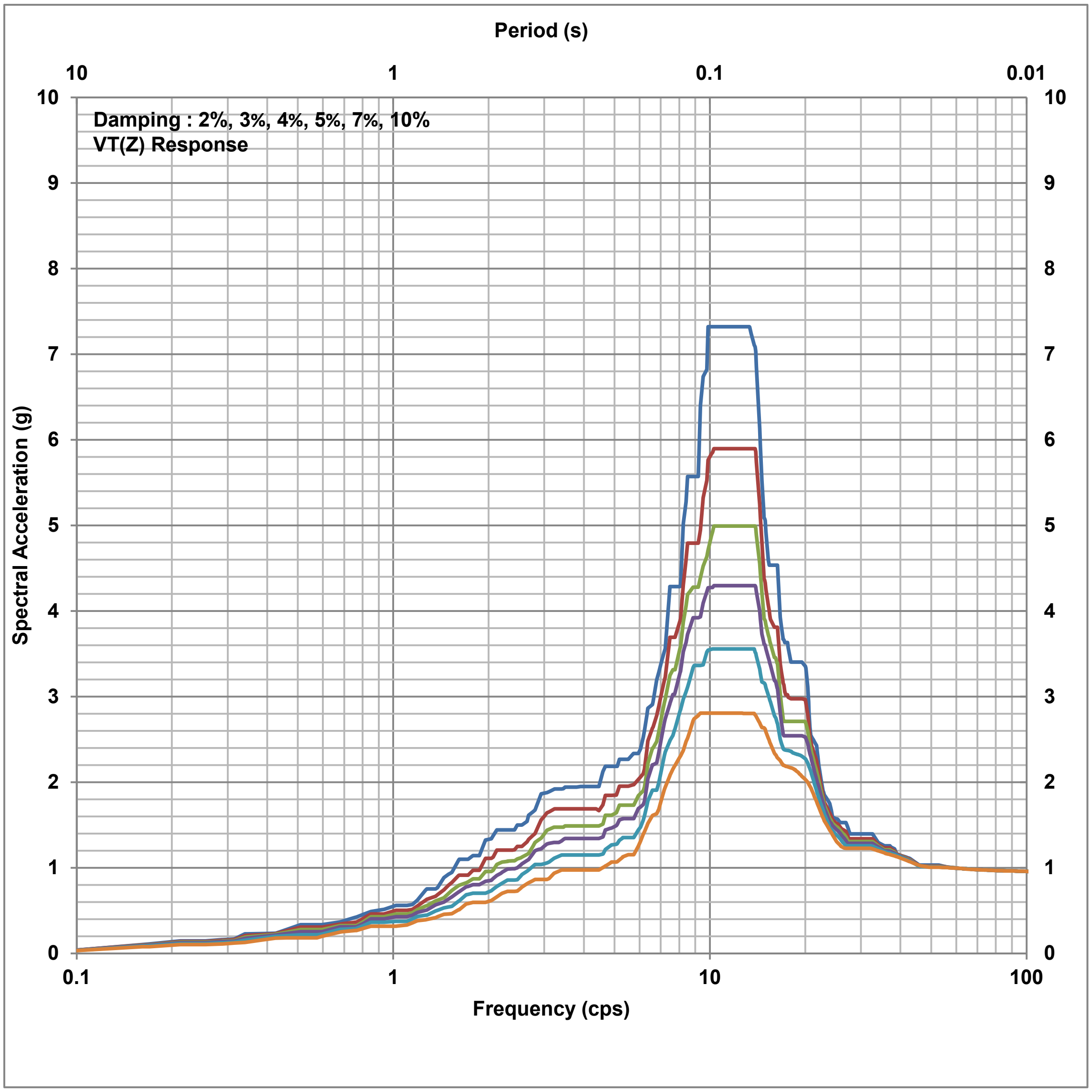

Figure 3.7A-69 Enveloped ISRS for SSE, Auxiliary Building at El. 213′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

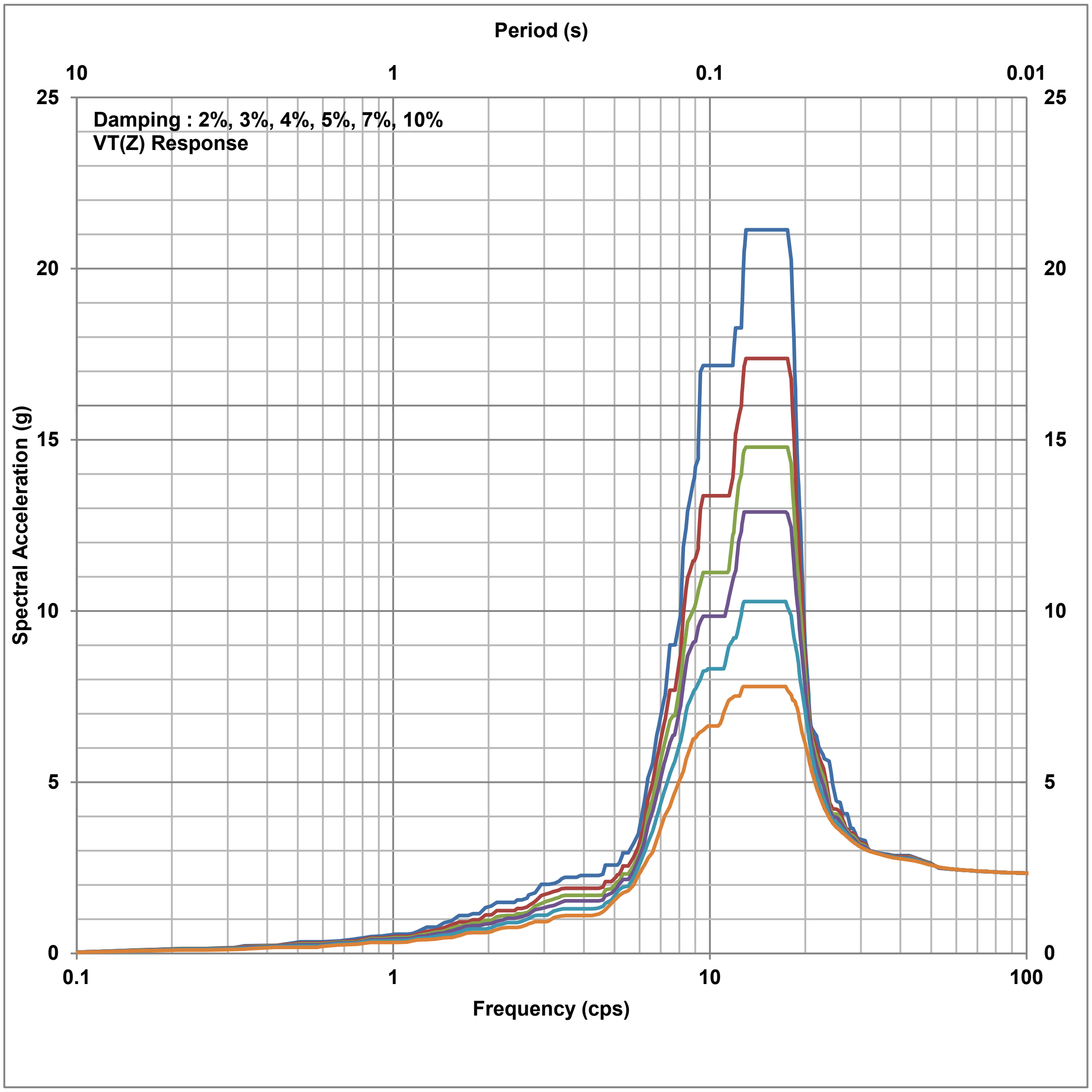

Figure 3.7A-70 Enveloped ISRS for SSE, Auxiliary Building at El. 213′-0″ (Slab), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

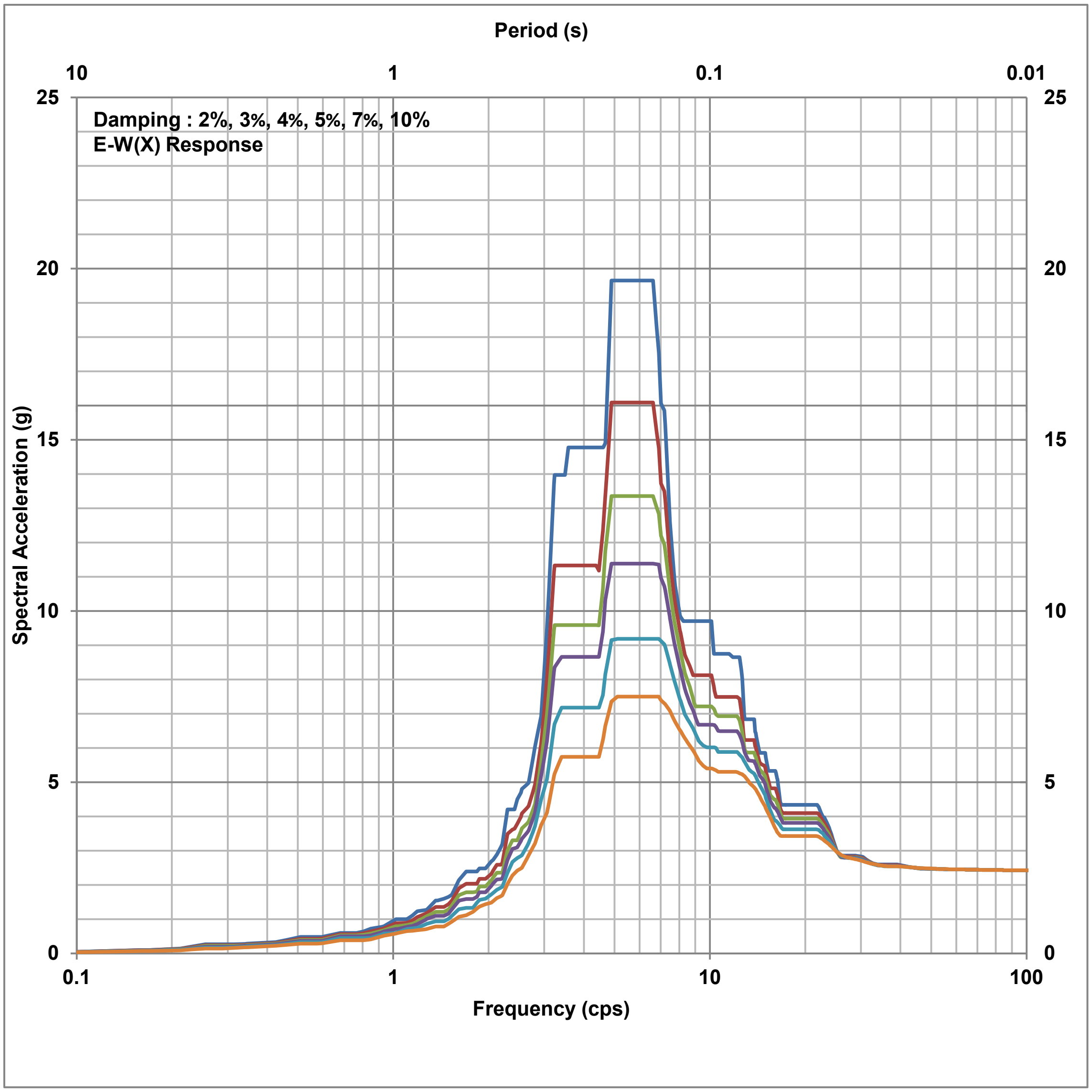

Figure 3.7A-71 Enveloped ISRS for SSE, Auxiliary Building at El. 216′-9″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

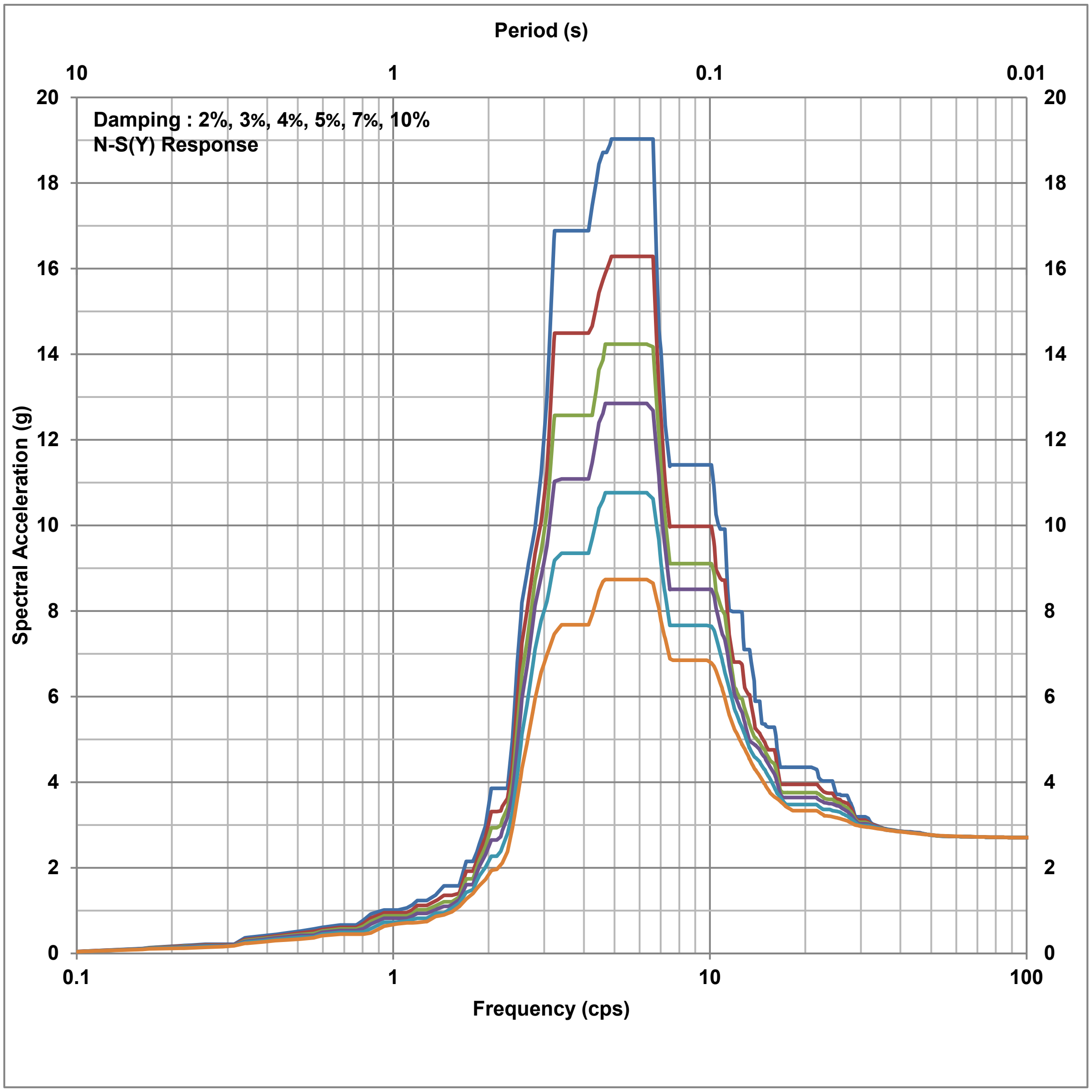

Figure 3.7A-72 Enveloped ISRS for SSE, Auxiliary Building at El. 216′-9″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

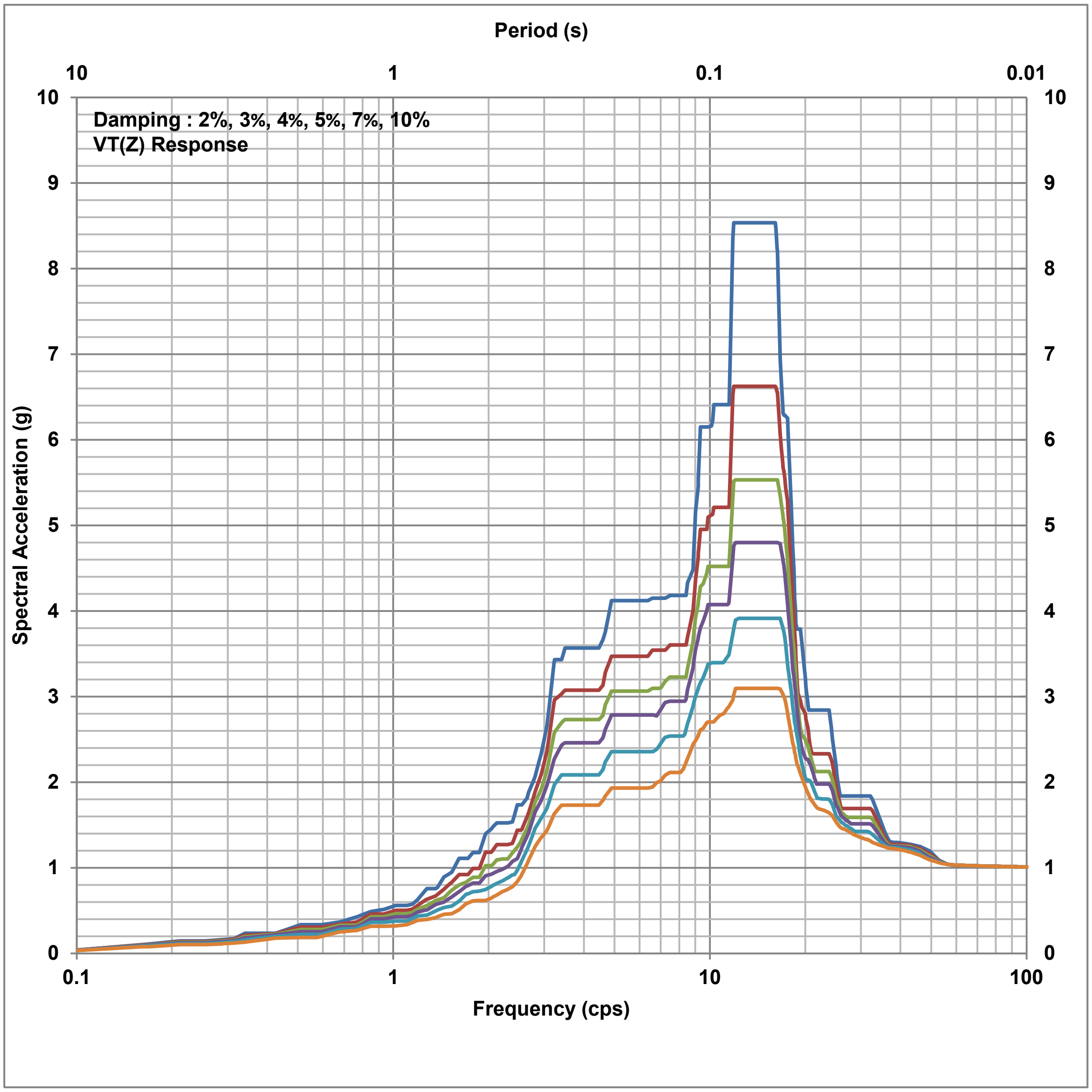

Figure 3.7A-73 Enveloped ISRS for SSE, Auxiliary Building at El. 216′-9″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

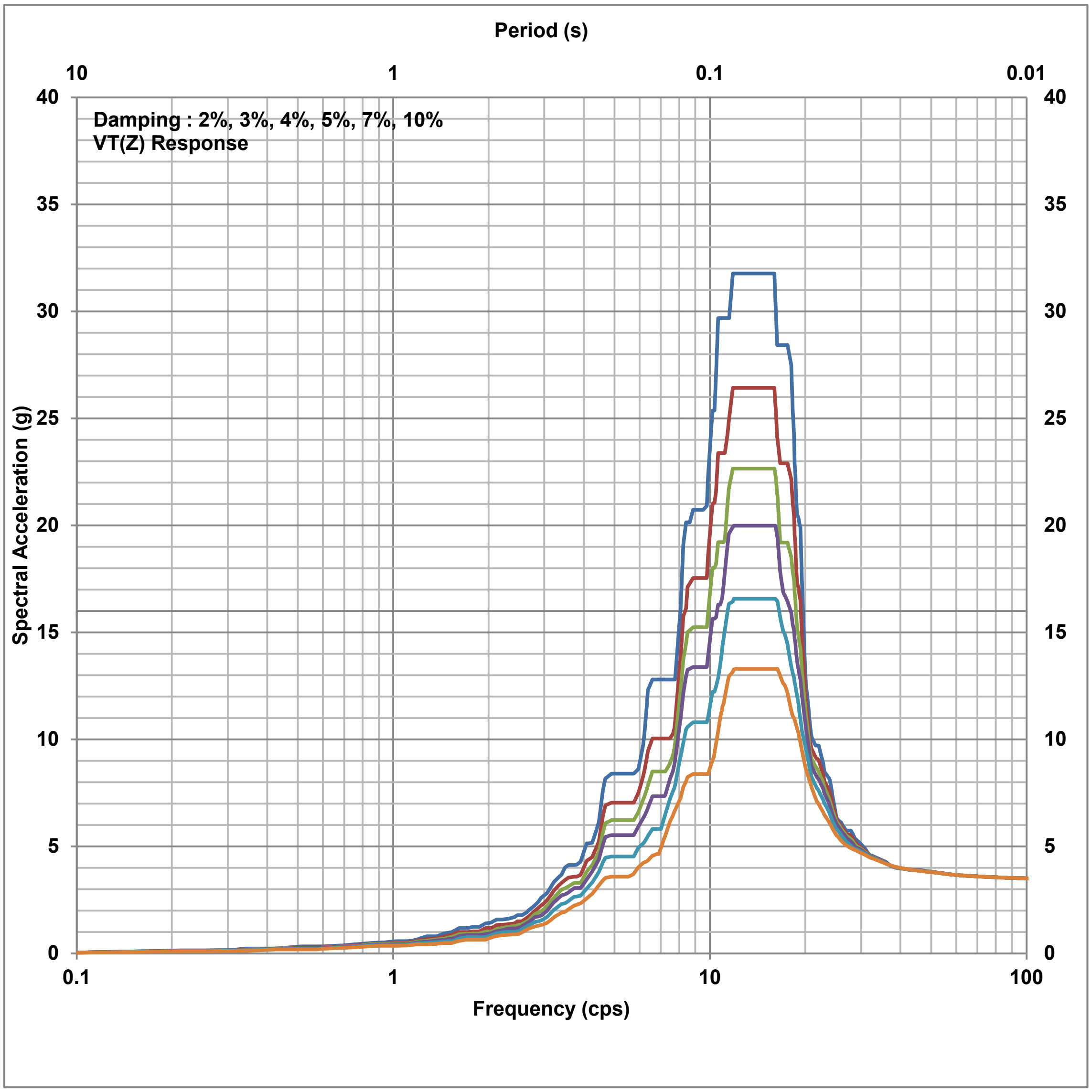

Figure 3.7A-74 Enveloped ISRS for SSE, Auxiliary Building at El. 216′-9″ (Slab), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

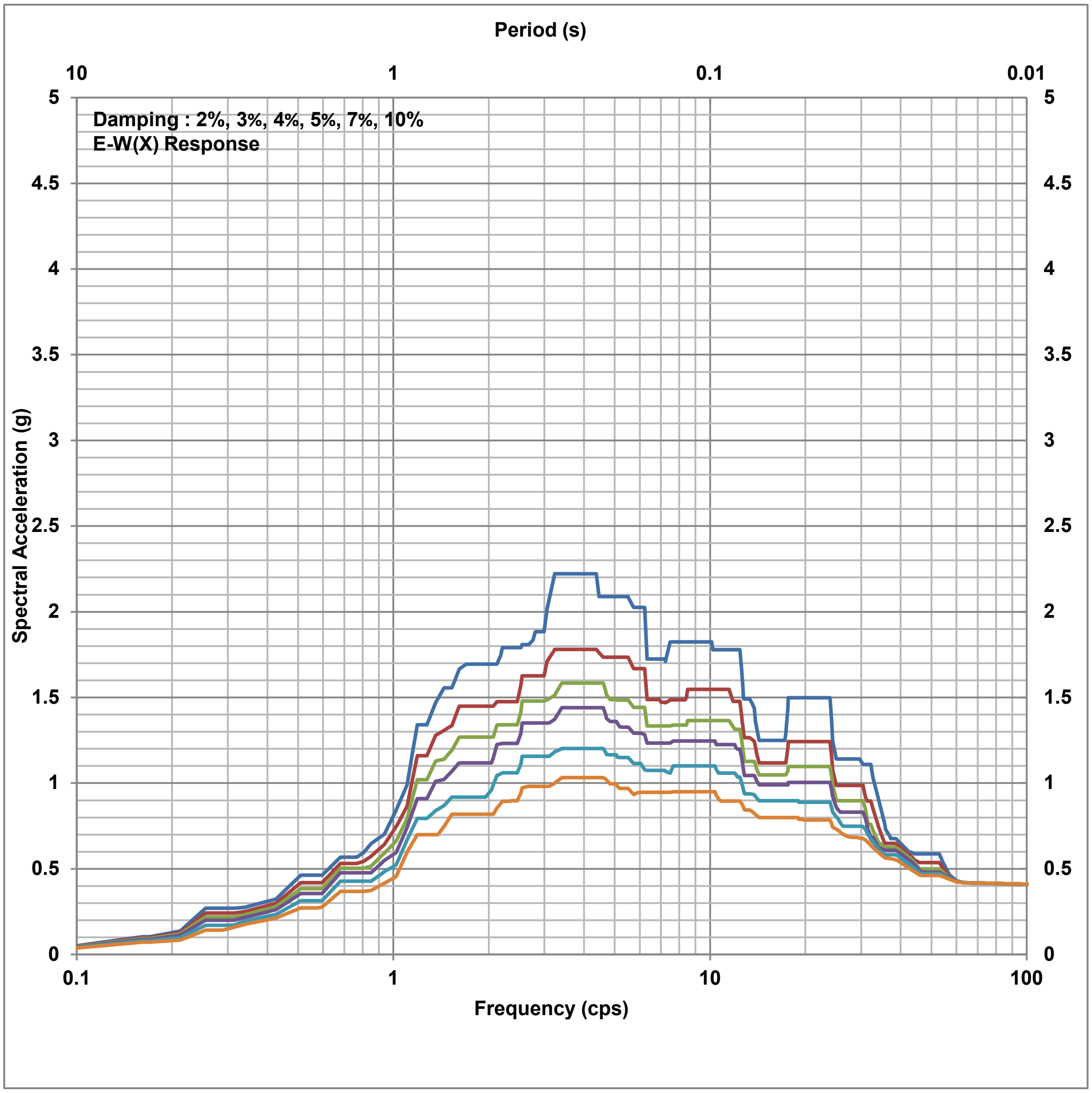

Figure 3.7A-75 Enveloped ISRS for SSE, Emergency Diesel Generator Building at El. 100′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

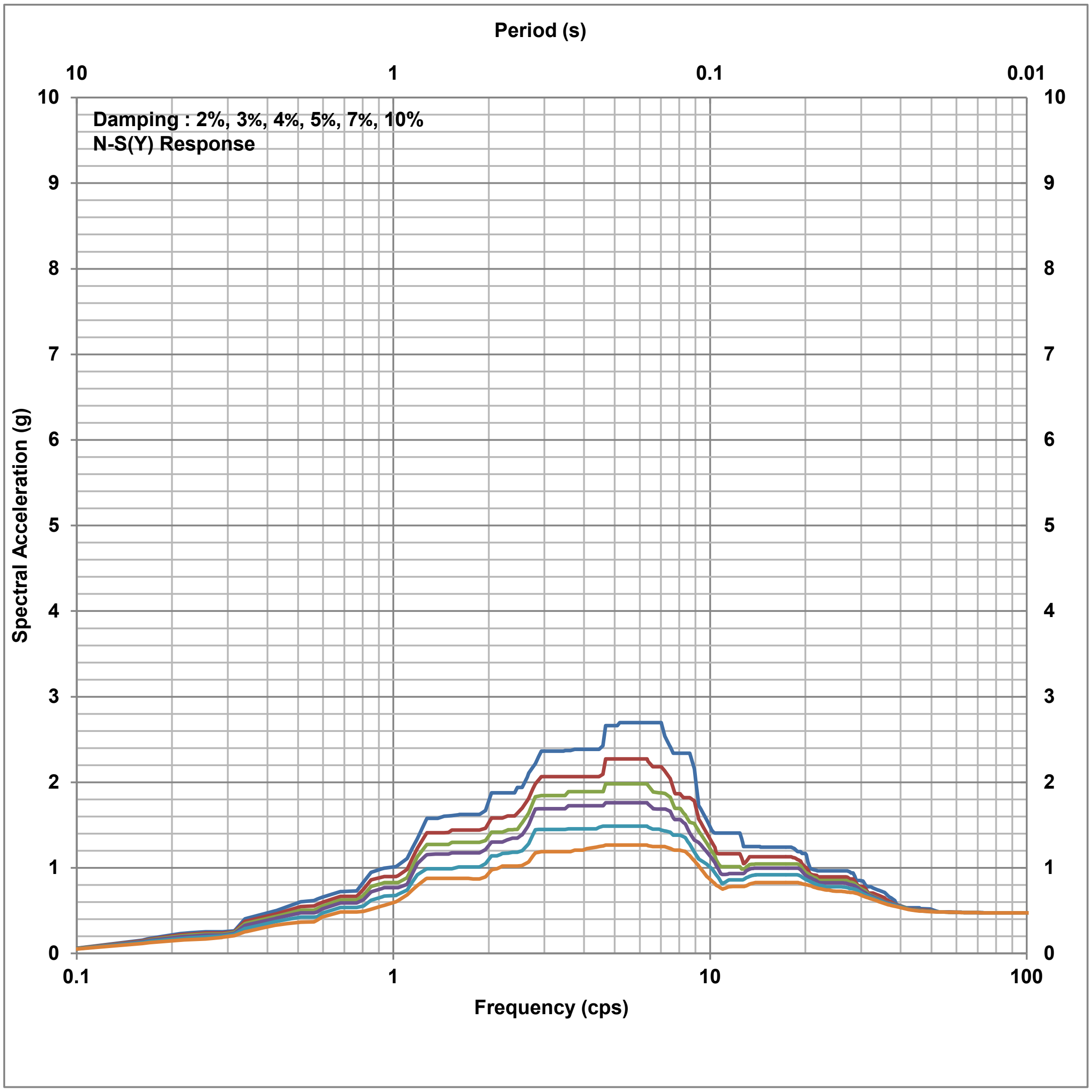

Figure 3.7A-76 Enveloped ISRS for SSE, Emergency Diesel Generator Building at El. 100′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

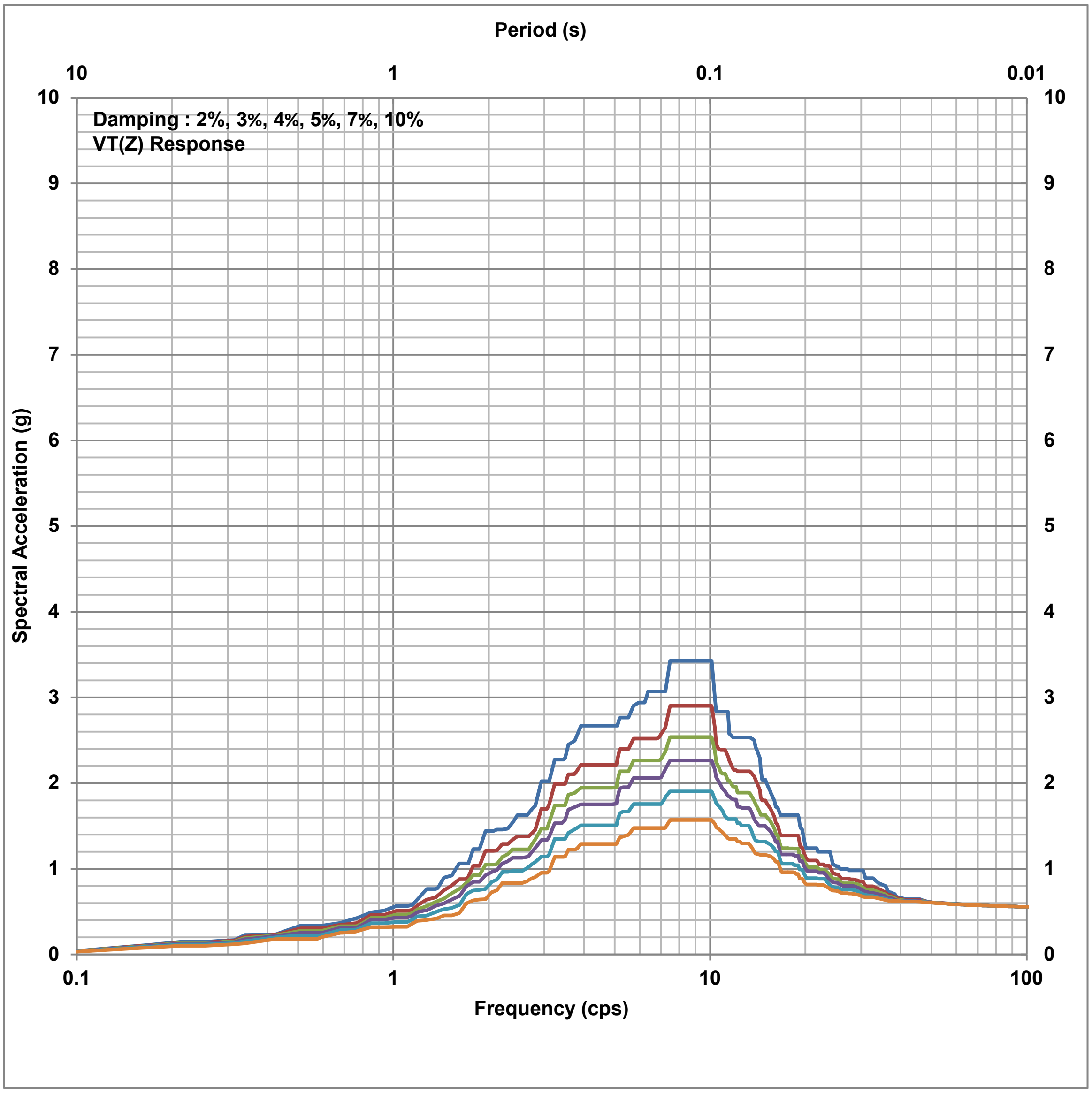

Figure 3.7A-77 Enveloped ISRS for SSE, Emergency Diesel Generator Building at El. 100′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

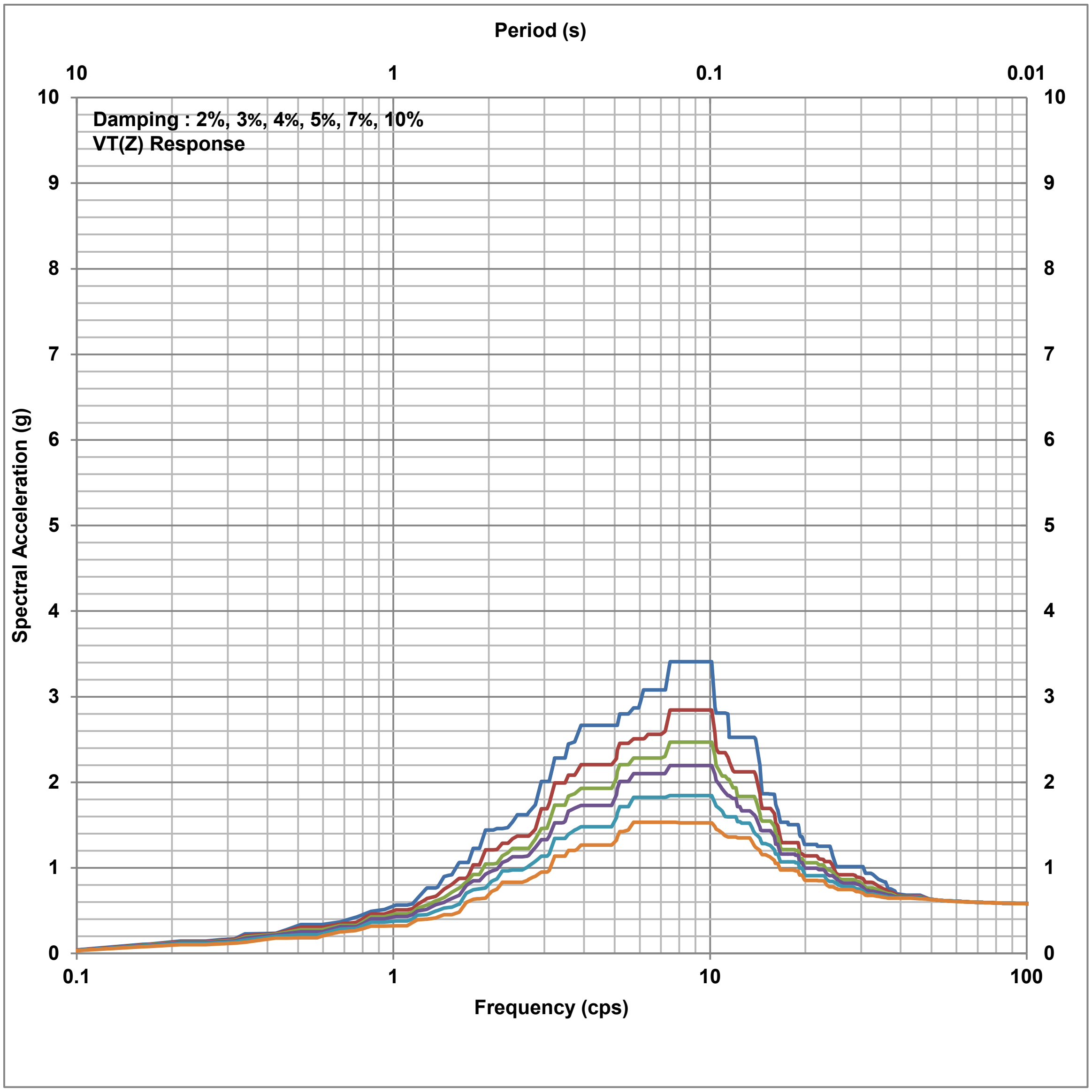

Figure 3.7A-78 Enveloped ISRS for SSE, Emergency Diesel Generator Building at El. 100′-0″ (Slab), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

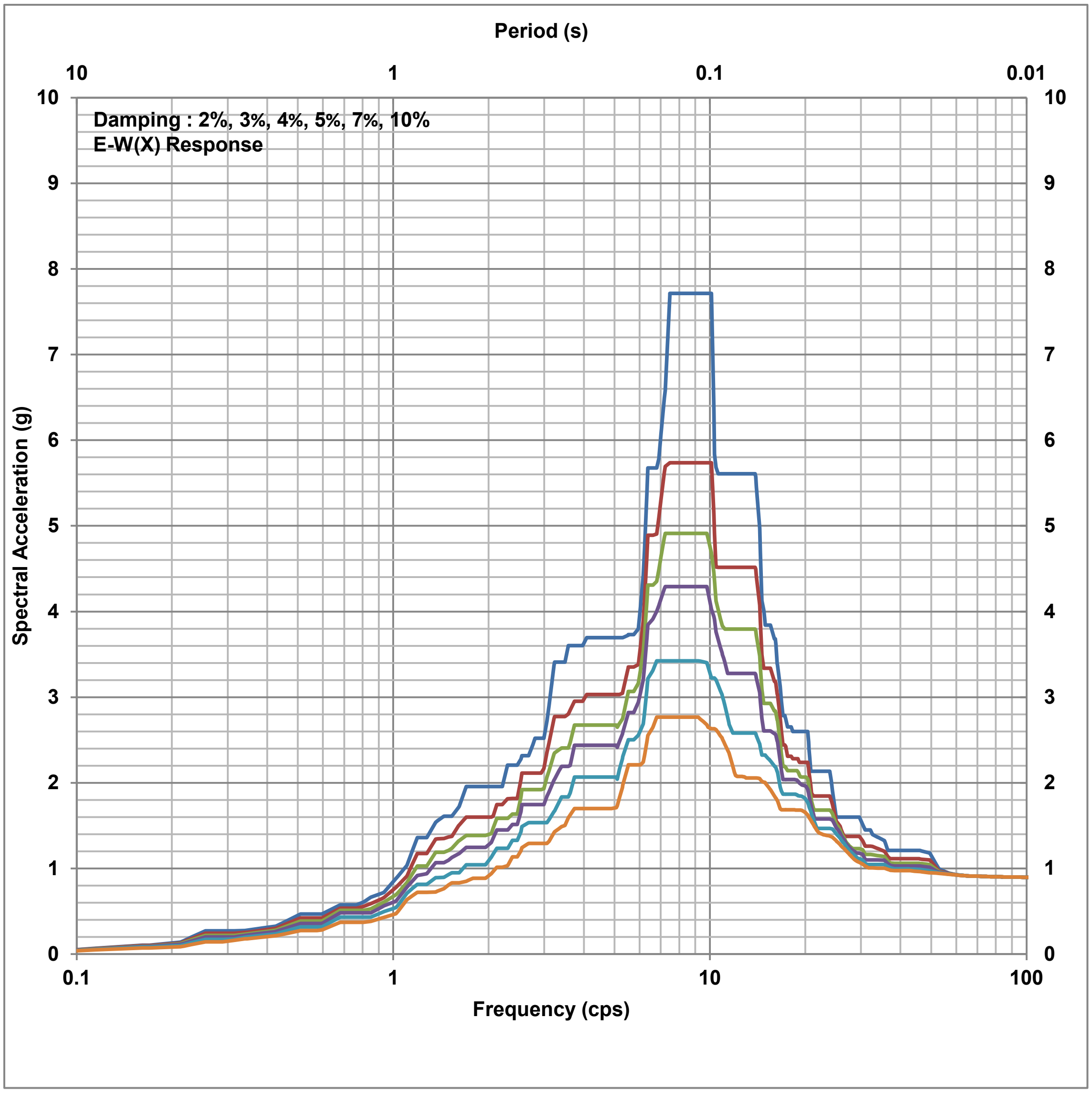

Figure 3.7A-79 Enveloped ISRS for SSE, Emergency Diesel Generator Building at El. 135′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

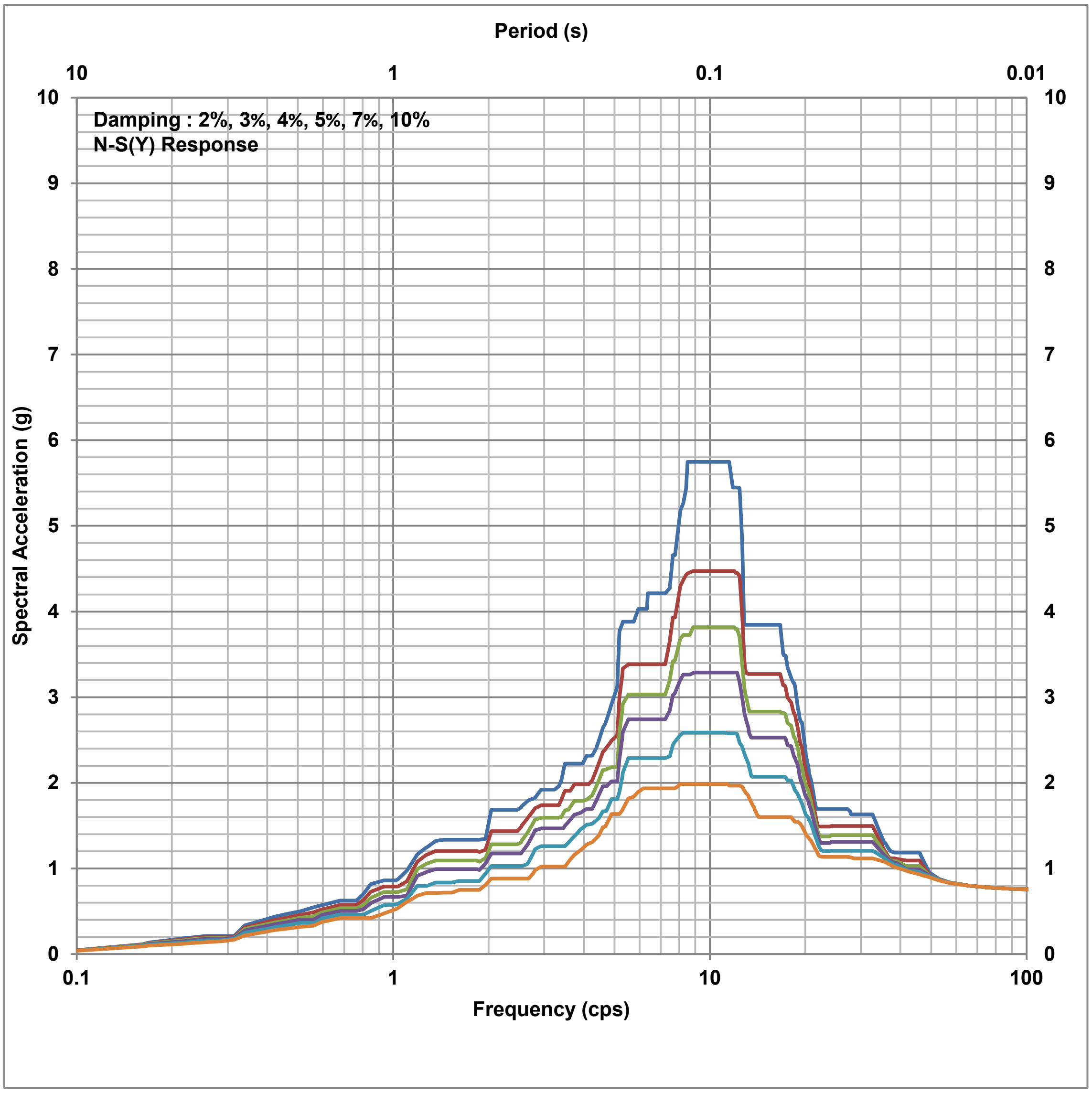

Figure 3.7A-80 Enveloped ISRS for SSE, Emergency Diesel Generator Building at El. 135′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

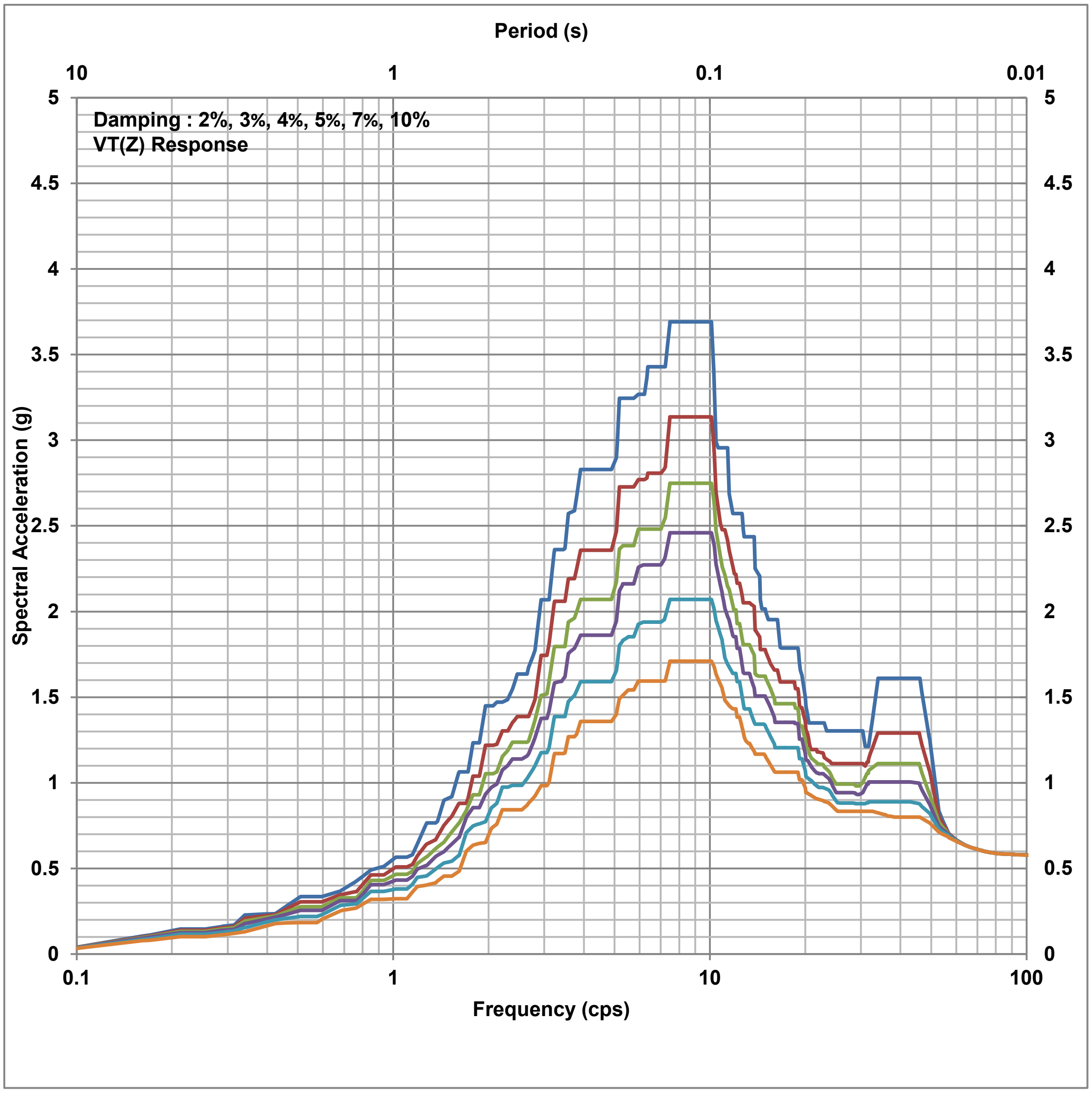

Figure 3.7A-81 Enveloped ISRS for SSE, Emergency Diesel Generator Building at El. 135′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

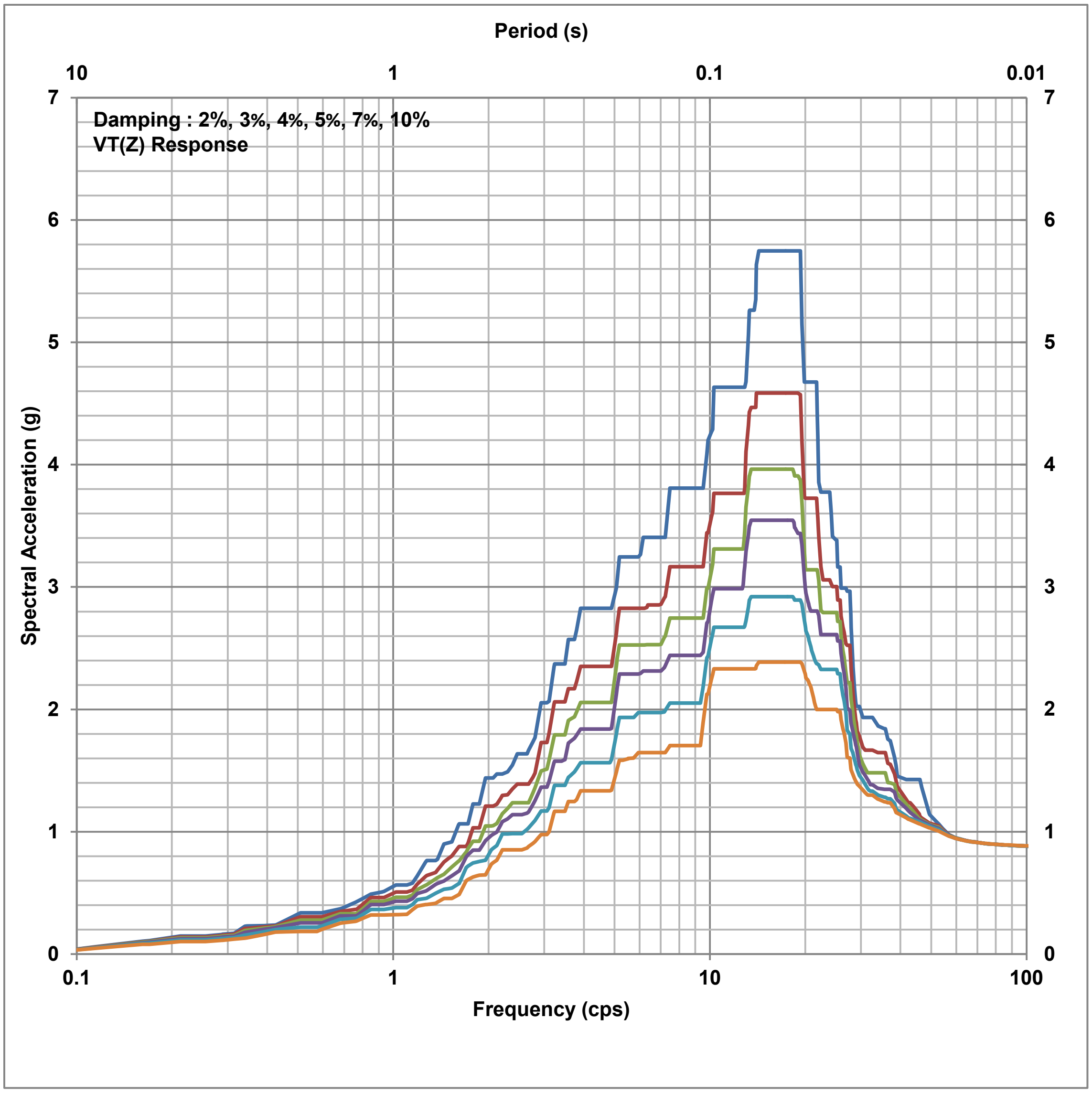

Figure 3.7A-82 Enveloped ISRS for SSE, Emergency Diesel Generator Building at El. 135′-0″ (Slab), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

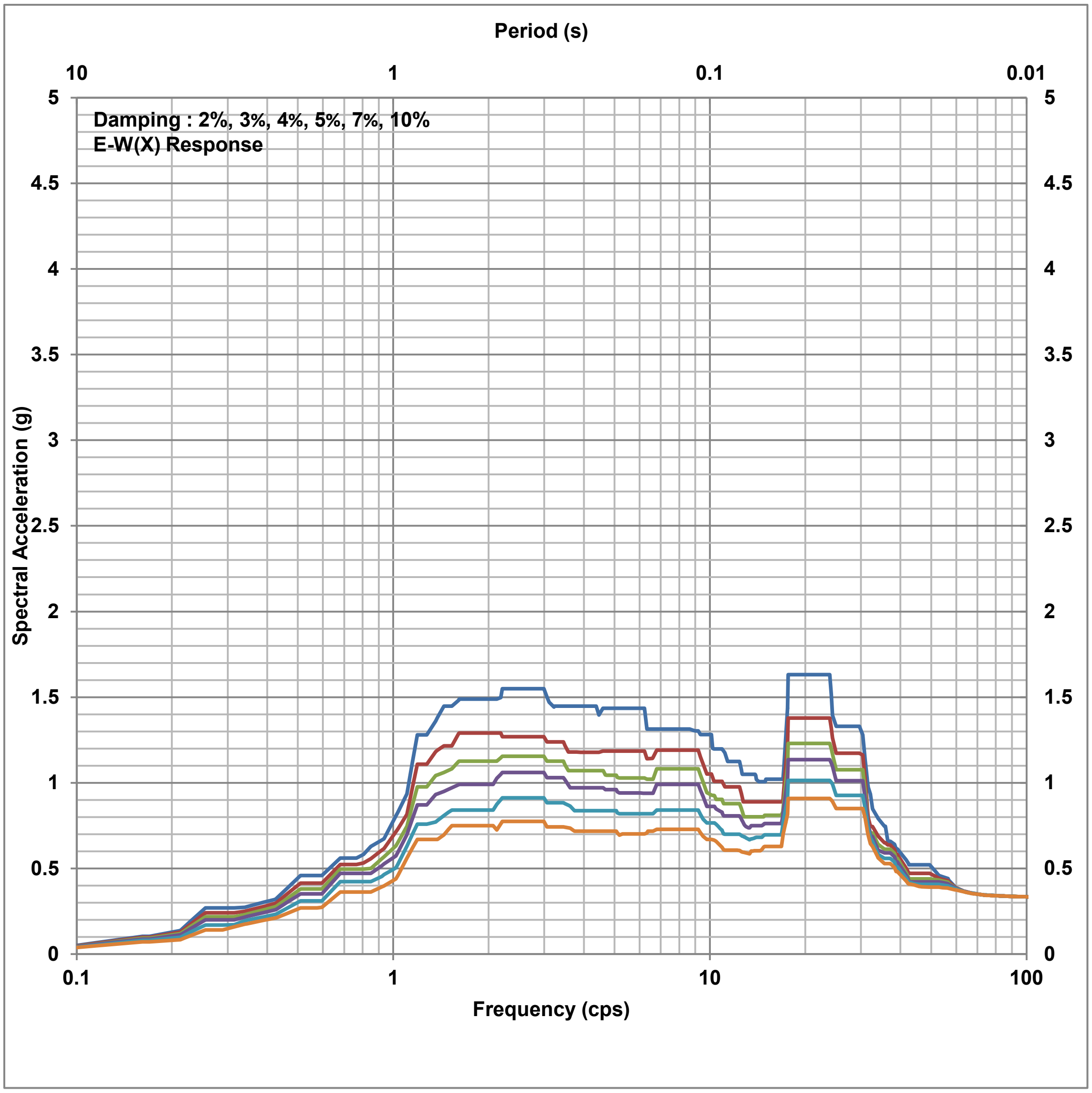

Figure 3.7A-83 Enveloped ISRS for SSE, Diesel Fuel Oil Tank Room at El. 63′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

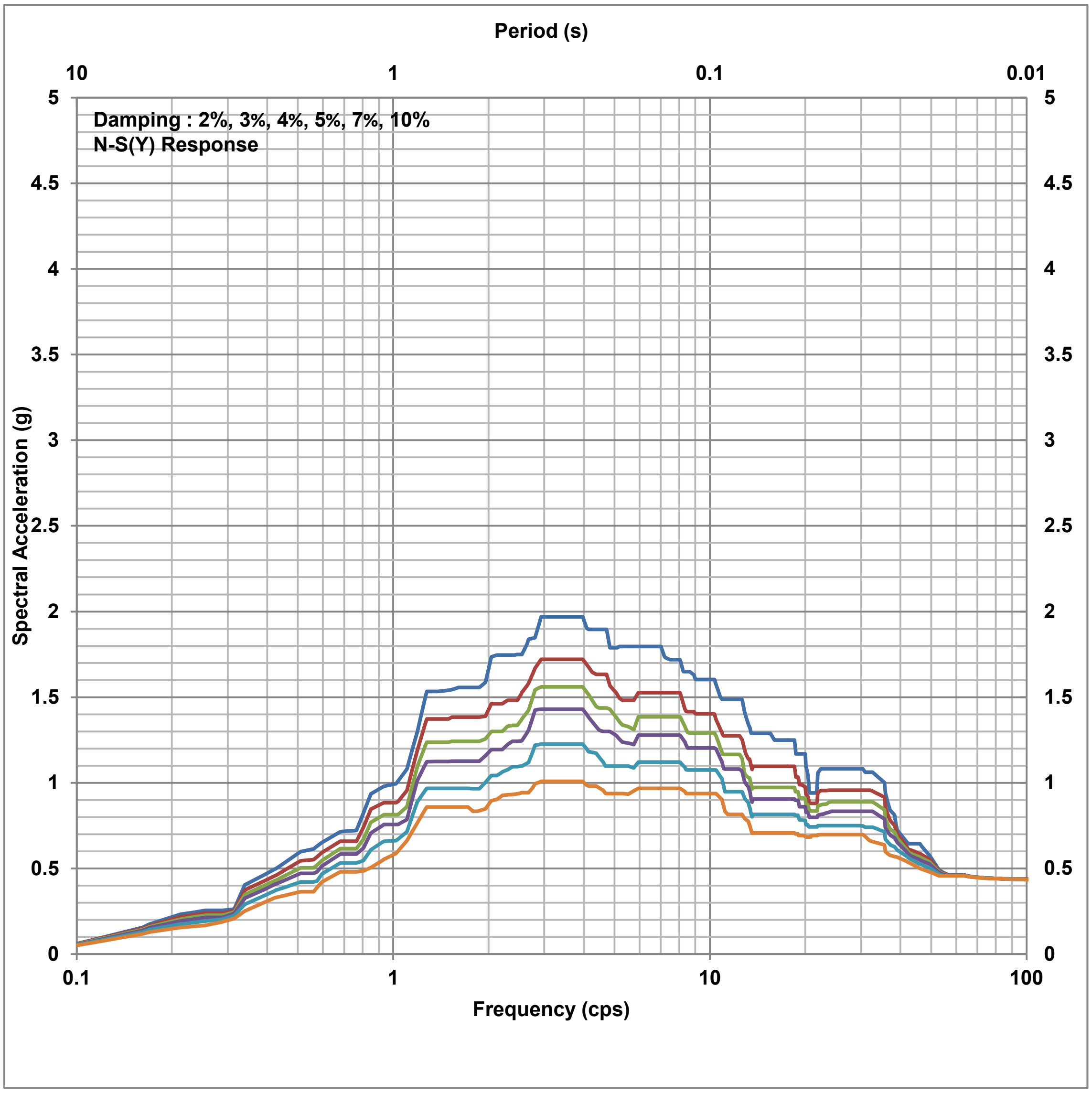

Figure 3.7A-84 Enveloped ISRS for SSE, Diesel Fuel Oil Tank Room at El. 63′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

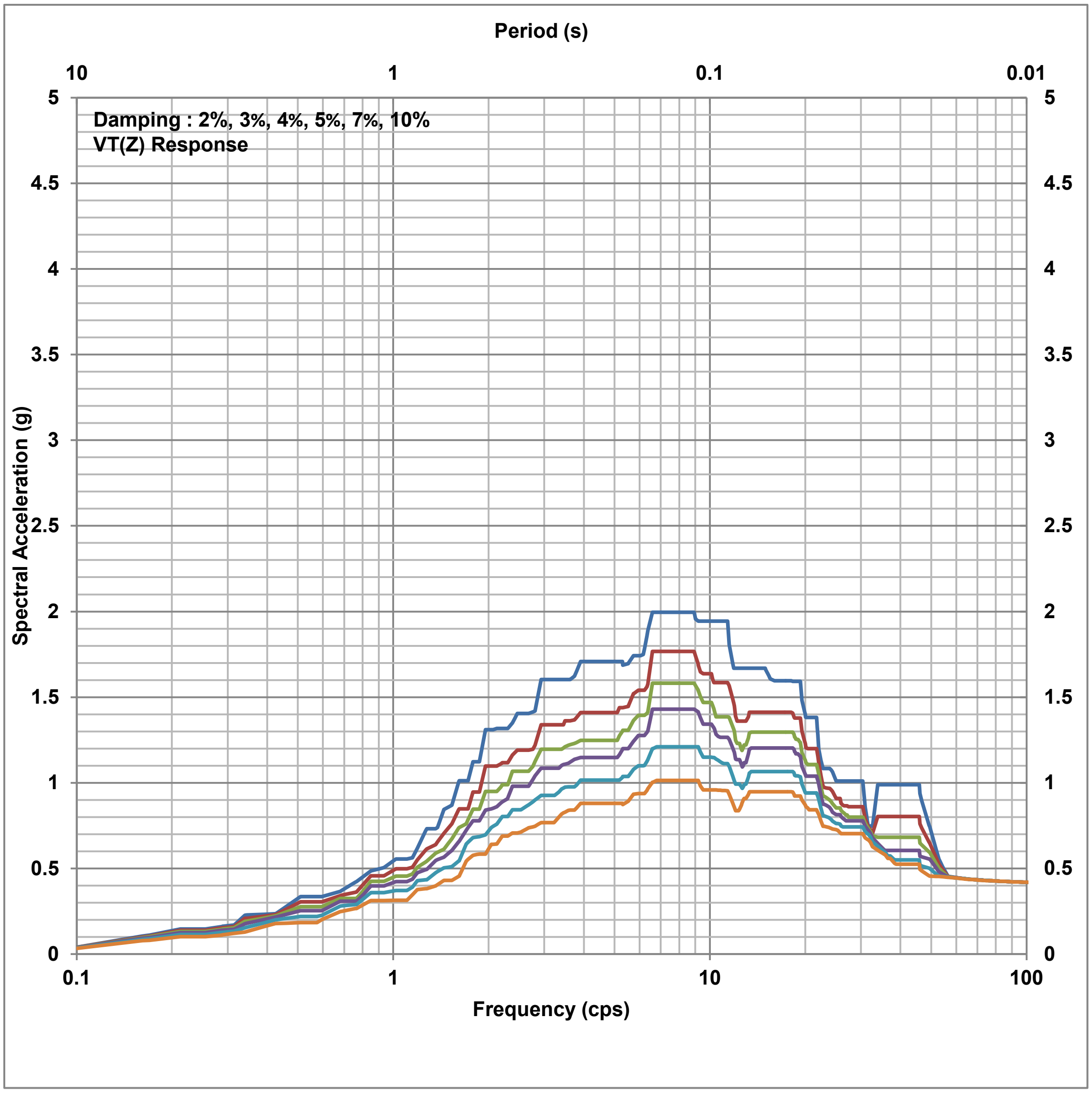

Figure 3.7A-85 Enveloped ISRS for SSE, Diesel Fuel Oil Tank Room at El. 63′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

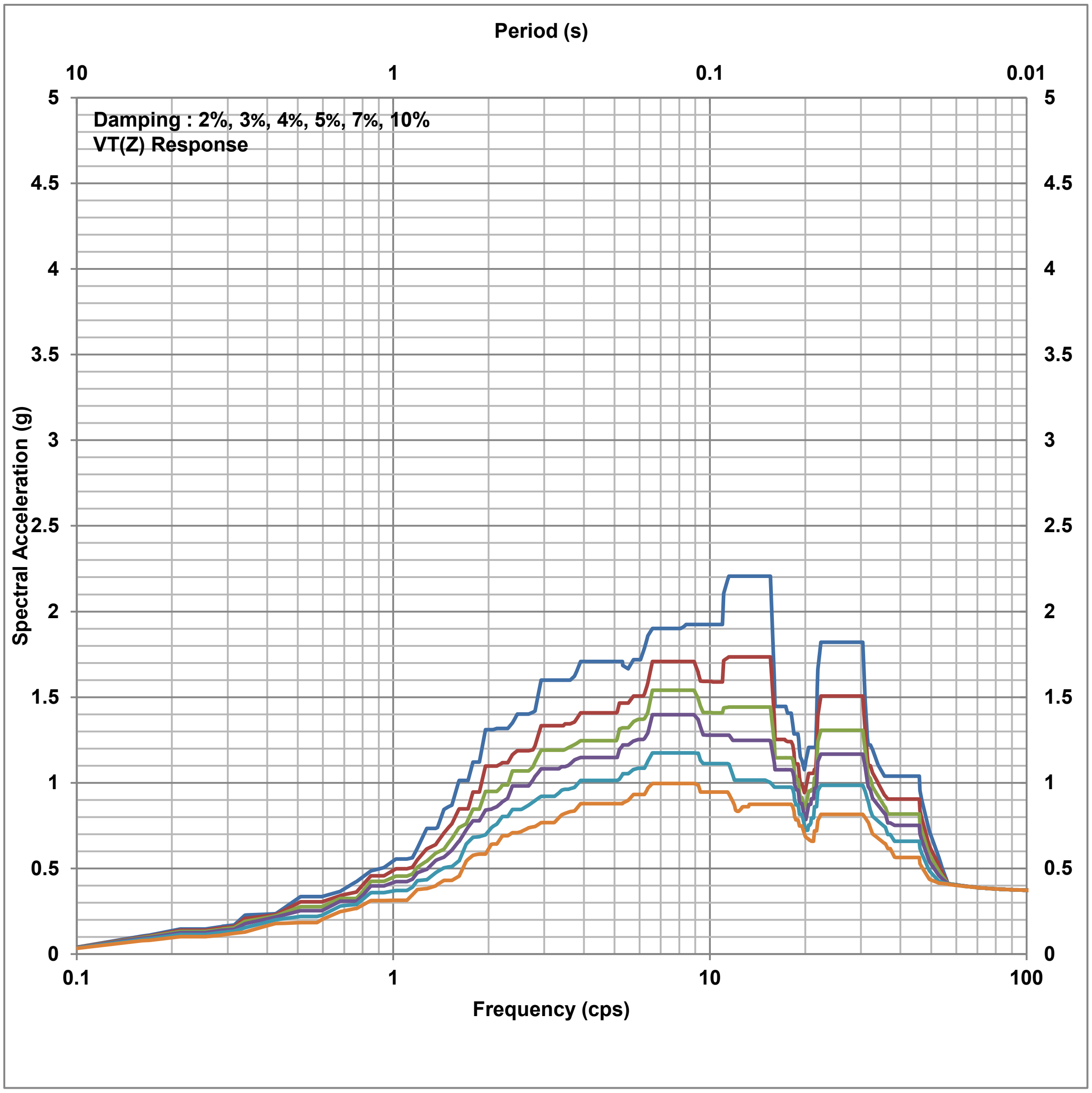

Figure 3.7A-86 Enveloped ISRS for SSE, Diesel Fuel Oil Tank Room at El. 63′-0″ (Slab), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

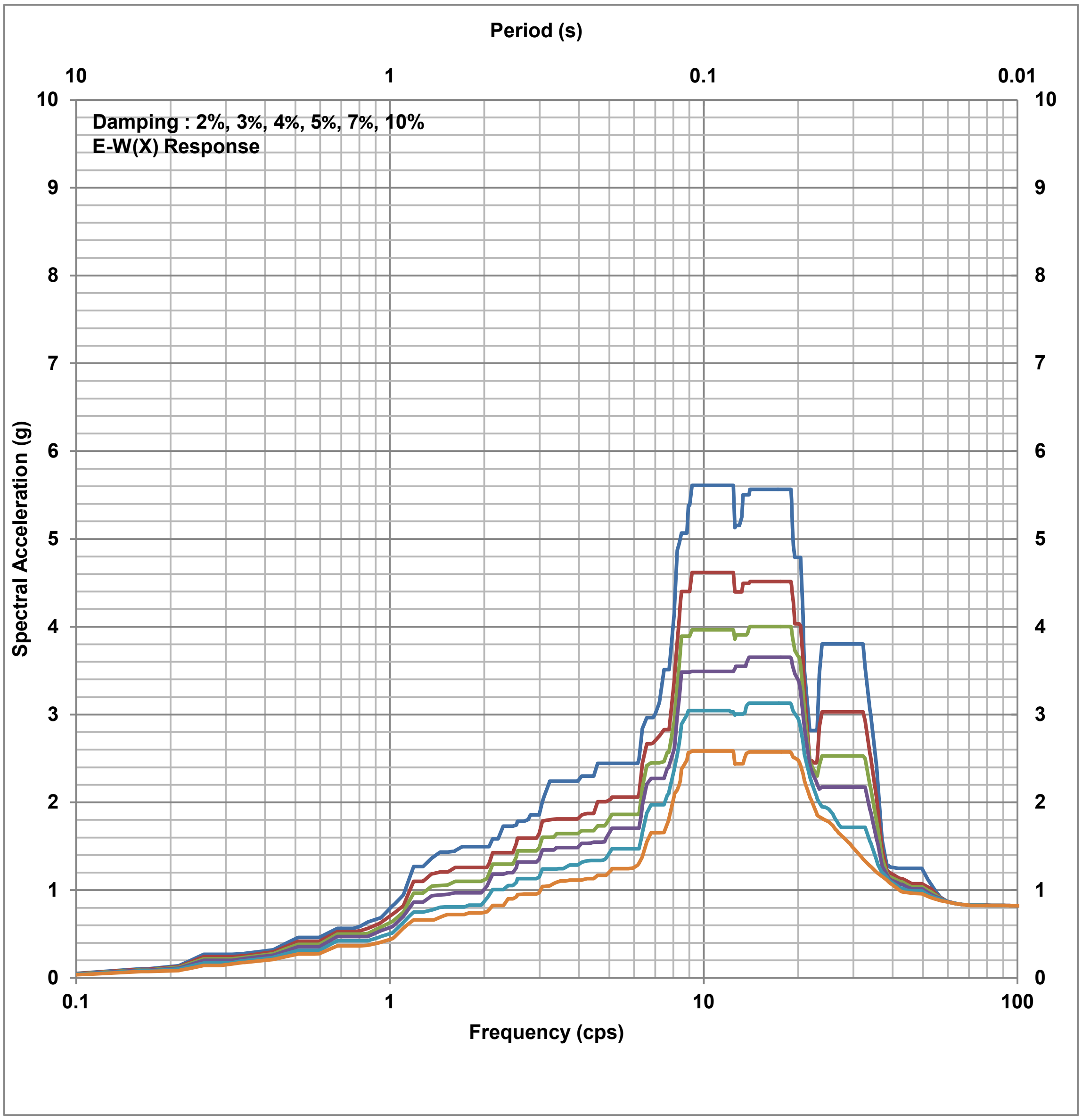

Figure 3.7A-87 Enveloped ISRS for SSE, Diesel Fuel Oil Tank Room at El. 100′-0″, E-W, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

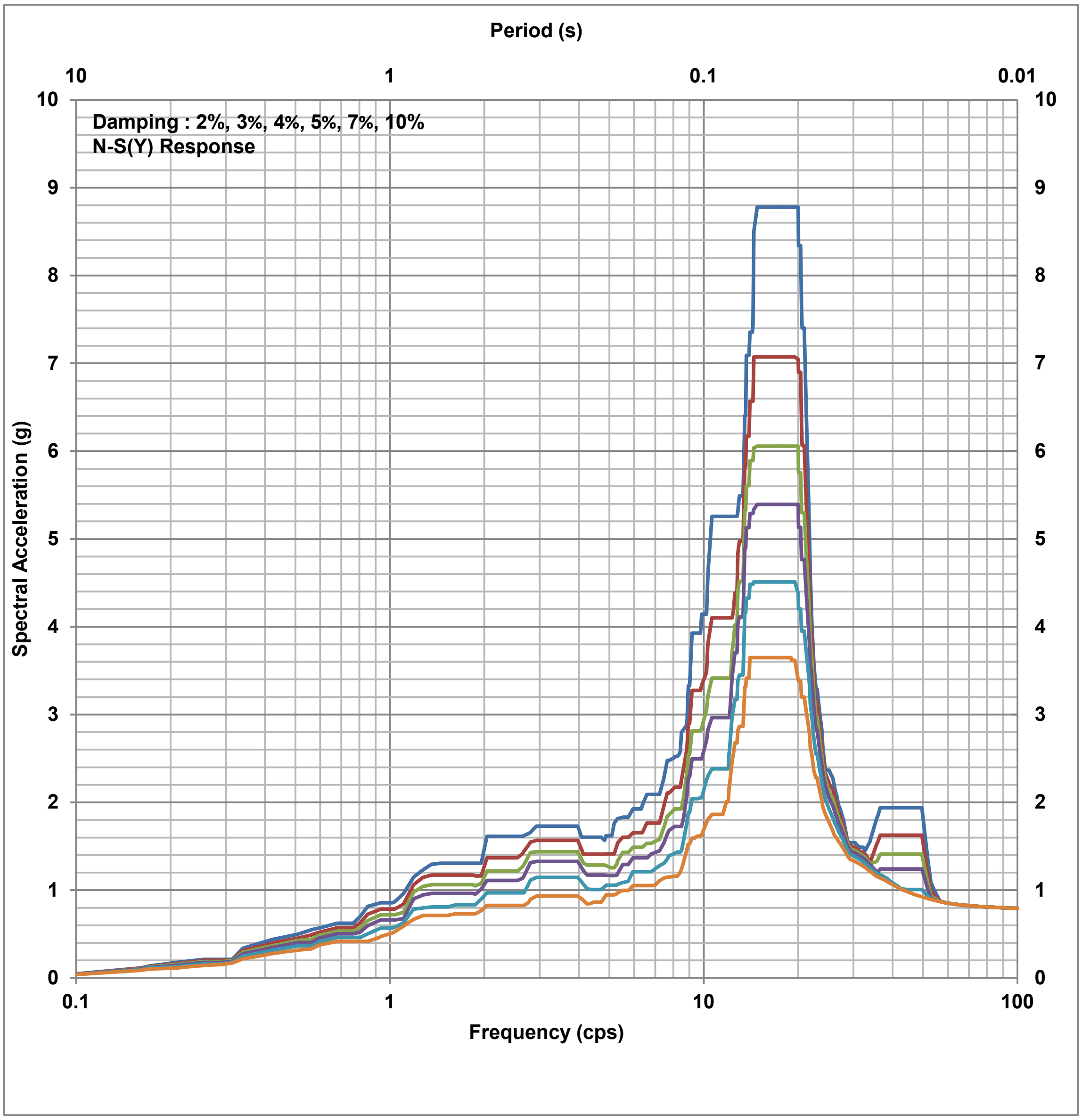

Figure 3.7A-88 Enveloped ISRS for SSE, Diesel Fuel Oil Tank Room at El. 100′-0″, N-S, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

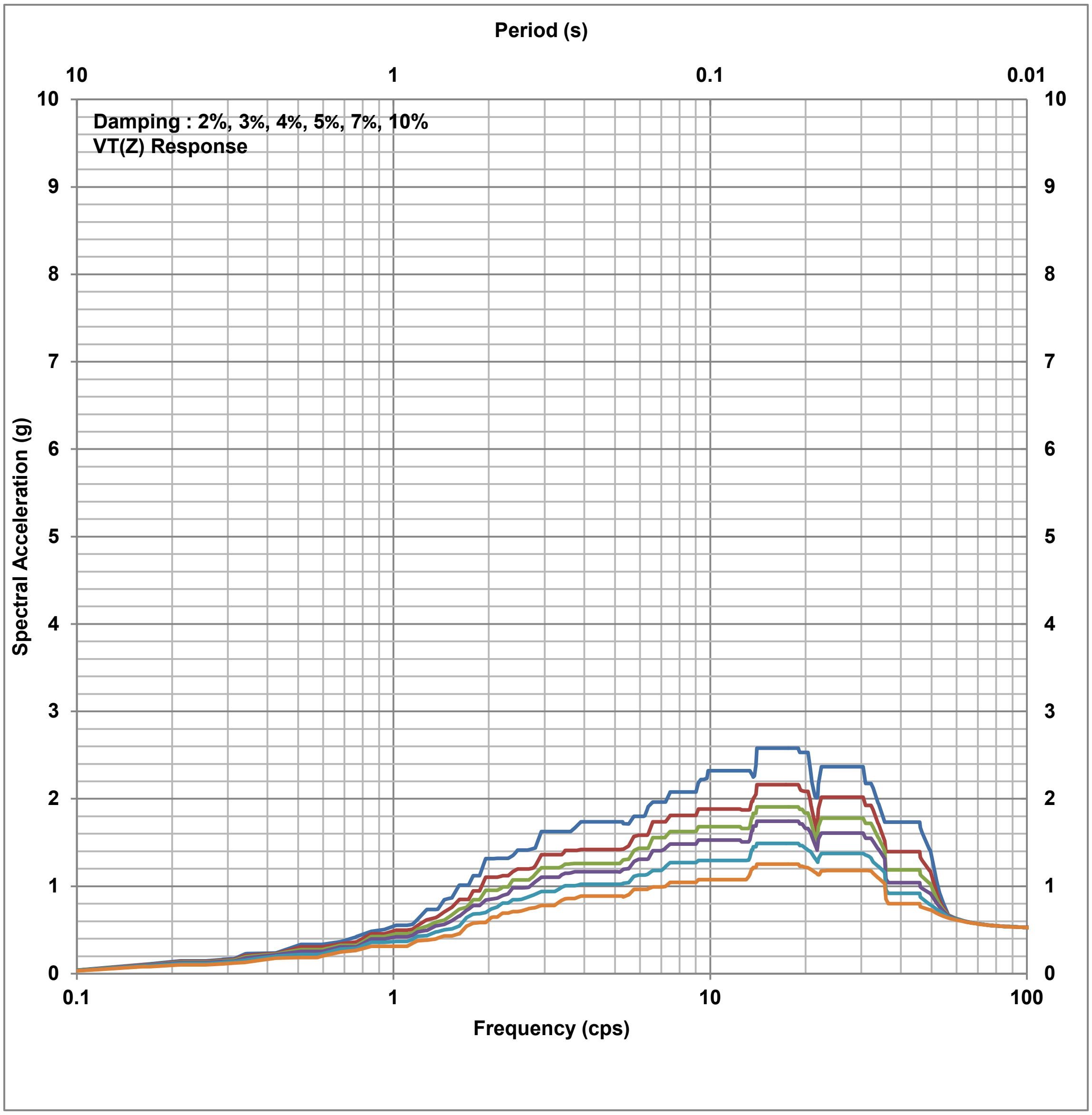

Figure 3.7A-89 Enveloped ISRS for SSE, Diesel Fuel Oil Tank Room at El. 100′-0″, Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

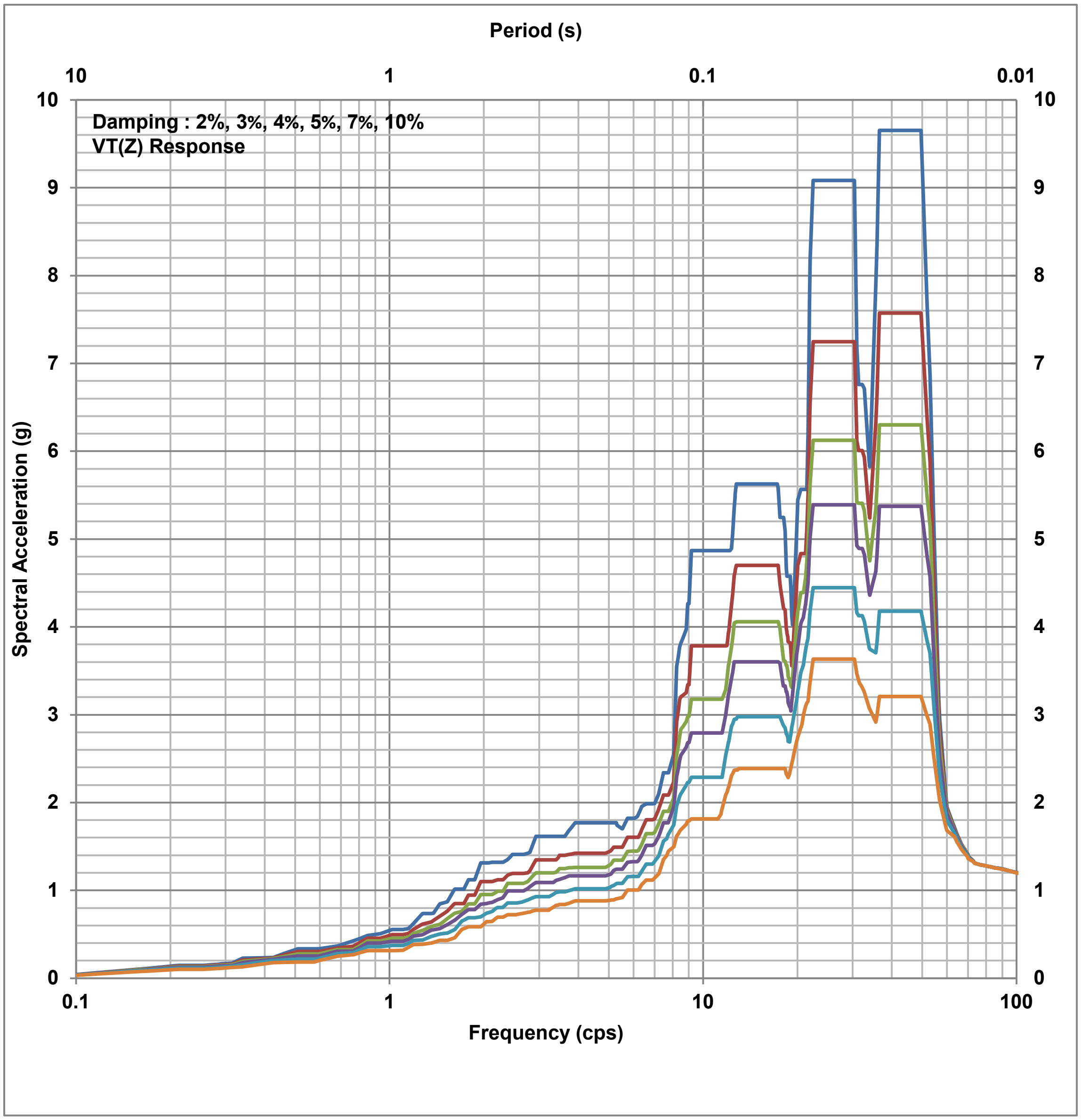

Figure 3.7A-90 Enveloped ISRS for SSE, Diesel Fuel Oil Tank Room at El. 100′-0″ (Slab), Vertical, Damping Ratio 2%, 3%, 4%, 5%, 7%, 10%

APPENDIX 3.7B

EVALUATION FOR HIGH FREQUENCY SEISMIC INPUT

APPENDIX 3.7B – EVALUATION FOR HIGH FREQUENCY SEISMIC INPUT

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APPENDIX 3.7B – EVALUATION FOR HIGH FREQUENCY SEISMIC INPUT

3.7B.1 Overview

The seismic analysis and design of the APR1400 standard plant are based on the certified seismic design response spectra (CSDRS) described in Subsection 3.7.1.1.1. These spectra are based on NRC Regulatory Guide (RG) 1.60 (Reference 1) with an increase in response spectrum amplitude in the 9 to 50 Hz frequency range. However, many of the envelope response spectra of the Central and Eastern United States (CEUS) rock sites show higher response spectrum amplitudes at higher frequencies than the CSDRS. Response spectra with these characteristics are called herein as the hard rock high frequency (HRHF) ground motion response spectra (GMRS).

The HRHF response spectra considered for the APR1400 standard design are shown in Figures 3.7B-1 and 3.7B-2 for the horizontal and vertical directions, respectively, where they are also compared to the APR1400 CSDRS for both the horizontal and vertical directions for 5 percent damping. The HRHF response spectra exceed the CSDRS for frequencies above approximately 10 Hz. However, as presented in the EPRI Draft White Paper, "Considerations for NPP Equipment and Structures Subjected to Response Levels Caused by High Frequency Ground Motions" (Reference 2), the high frequency seismic input is regarded generally as non-damaging.

The structures and equipment qualified by seismic analyses for the seismic response to APR1400 CSDRS are evaluated for the potential to sustain damage from high frequency seismic input motion. The building structures, reactor pressure vessel and internals, primary component supports, primary loop nozzles, piping, and equipment were included in this evaluation to demonstrate that the seismic responses of the selected structures, components, supports, and piping subjected to the high frequency seismic input motion are non-damaging. In the evaluation, the seismic responses of the structures due to high frequency seismic input motion have considered the effects of spatial incoherence of seismic input motion.

This appendix summarizes the methodology and results of the evaluation of the effects of HRHF response spectra the selected on structures, systems, and components (SSCs) of the APR1400 standard plant. The detailed methodology and results of the evaluation are documented in Technical Report, APR1400-E-S-NR-14004-P (Reference 3).

3.7B.2 High Frequency Seismic Input

Comparisons of the horizontal and vertical HRHF response spectra considered for the evaluation of the APR1400 design with the APR1400 CSDRS are presented in Figures 3.7B-1 and 3.7B-2. The APR1400 HRHF response spectra used for the evaluation were developed for the CEUS hard-rock sites. These spectra are higher than the CSDRS in the high frequency range, from approximately 10 to 100 Hz.

The EPRI report, "Evaluation of Seismic Hazard at Central and Eastern US Nuclear Power Plant Sites" (Reference 4), was used to develop the APR1400 HRHF response spectra. In the EPRI report, the maximum and fractile GMRS for the 60 CEUS nuclear power plant sites, assuming they are all hard-rock sites, were developed. The 0.8-fractile, 5 percent damped, horizontal composite envelope GMRS for CEUS hard-rock sites to achieve the appropriate goal of non-exceedance probability were selected as the HRHF horizontal target response spectrum for the APR1400 standard plant evaluation, as shown in Figure 3.7B-3.

The 5 percent damped HRHF vertical target response spectrum was generated by multiplying the vertical/horizontal (V/H) ratios for CEUS rock sites given in Table 4-5 of NUREG/CR-6728 (Reference 5) by the 5 percent damped HRHF horizontal target response spectrum. The resulting 5 percent damped HRHF vertical target response spectrum that was generated is plotted in Figure 3.7B-4.

The digitized values of the HRHF horizontal and vertical target response spectra are given in Tables 3.7B-1 and 3.7B-2, respectively.

The HRHF horizontal target response spectra for damping ratios other than 5 percent (namely, the 2, 3, 7, and 10 percent damping ratios), which are not specified in the EPRI report, were generated from the 5 percent damped HRHF horizontal target response spectrum by multiplying the 5 percent damped spectral values by the spectral ratios for the CEUS rock sites given in Table 1 in Appendix C of Standard Review Plan (SRP) 3.7.1 (Reference 6). For spectral frequencies not listed in Table 1, the ratios that were used follow a log-log amplitude-frequency linear interpolation. The HRHF horizontal target response spectrum for the 4 percent damping ratio was generated by interpolating between the spectral values for 3 percent and 5 percent damping ratios on a log scale for the damping ratio and a linear scale for the spectral acceleration.

The HRHF vertical target response spectra for the 2, 3, 4, 7, and 10 percent damping ratios were generated by multiplying the V/H ratios for the CEUS rock site conditions by the corresponding HRHF horizontal target response spectra.

The generated HRHF horizontal and vertical target response spectra for the 2, 3, 4, 5, 7, and 10 percent damping ratios are shown in Chapter 3, Figures 3.7-12 and 3.7-13, respectively. The guidelines and criteria described in SRP 3.7.1, Rev. 4, for Option 1 Approach 1 (Reference 6), were used for generating a set of three-component acceleration time histories compatible with HRHF target response spectra. The generated HRHF horizontal and vertical acceleration time histories, named H1H and H2H for both horizontal directions and VTH for vertical direction, are plotted along with the integrated velocity and displacement time histories that are presented in Chapter 3, Figures 3.7-14, 3.7-15, and 3.7-16, respectively. The comparisons of the time history response spectra with the corresponding HRHF horizontal and vertical target response spectra for each damping value are shown in in Chapter 3, Figures 3.7-17, 3.7-18, and 3.7-19.

3.7B.3 High Frequency Site Profiles

Among the eight generic site-shear-wave-velocity profiles (site profiles S1 through S4 and S6 through S9) developed for the APR1400 standard plant design, the site profiles that could be classified as hard-rock sites are S8 and S9. For site profile S8, the depth of bedrock where the rock shear-wave velocity (Vs) is equal to 2,804 m/sec (9,200 ft/sec) is 61 m (200 ft). For site profile S9, the depth of bedrock where the Vs is equal to 2,804 m/sec (9,200 ft/sec) is 30.5 m (100 ft).

Site profile S9 was determined to be more critical when subjected to the HRHF horizontal seismic input motion than site profile S8, based on a comparison of the horizontal site response amplification transfer functions from the bedrock where Vs is equal to 2,084 m/sec (9,200 ft/sec) for site profiles S8 and S9. Therefore, the soil-structure interaction (SSI) analysis using the HRHF seismic input motion was performed for site profile S9. The soil layers, and their associated properties, used in the SSI model for HRHF seismic input motions are shown in Table 3.7B-3.

3.7B.4 Soil-Structure Interaction Model

For the evaluation of the impact of HRHF seismic input motion on the APR1400 standard plant design, the nuclear island SSI model described in Subsection 3.7.2 was analyzed using the ACS SASSI computer program. Acceleration time histories compatible with the HRHF target response spectra are applied at the finished grade.

The methodology developed by Tseng and Lilhanand, as described in the 1997 EPRI report TR-102631 (Reference 7), was used for the SSI analysis using ACS SASSI to incorporate spatial incoherence in the seismic input motions. The methodology uses the hard-rock coherency functions for horizontal and vertical seismic ground motions developed by Abrahamson (Reference 8). The analysis considering spatial incoherence of the HRHF seismic input motions was performed for a total of 16 principal coherency modes. The analysis results obtained from SRSS of the responses of modes 1 through 7 and modes 1 through 12 are compared with the corresponding results obtained from SRSS of the responses of modes 1 through 16 (Reference 3). These comparisons indicate that 16 modes are adequate for capturing the incoherent-motion SSI responses of the APR1400 nuclear island structures because the addition of the responses for modes greater than mode 16 leads to insignificant changes in the generated ISRS. Comparisons of in-structure response spectra (ISRS) generated from coherent and incoherent seismic input motions compatible with the HRHF response spectra based on SRSS of 16-mode responses showed little difference in the response spectra below 4 Hz. In the high frequency range above 30 Hz, the incoherent ISRS were lower than the coherent ISRS.

The seismic responses ISRS at selected major locations in nuclear island structures resulting from the CSDRS and HRHF seismic inputs were compared to assess the significance of the HRHF response spectra. The comparison showed that most HRHF response spectra exceed the CSDRS response spectra above 10 Hz. The results are typical of the comparative responses found throughout the APR1400 standard plant.

The exceedances of HRHF-based ISRS in the high frequency range were evaluated to confirm that the high frequency response has marginal effect on the equivalent SSCs qualified by analysis for the ISRS developed from the APR1400 CSDRS.

3.7B.5 Evaluation Methodology

An evaluation of the representative APR1400 SSCs was performed to demonstrate that the APR1400 nuclear power plant is qualified for high frequency seismic response. The evaluation was made on the SSCs that are potentially sensitive to high frequency input selected by screening.

The safety functions of the SSCs selected by screening were assessed using high frequency seismic input to verify that their seismic responses are non-damaging.

3.7B.6 General Selection Screening Criteria

The following general screening criteria were used to identify representative APR1400 SSCs to be evaluated to demonstrate the acceptability of the APR1400 nuclear power plant for high frequency motion:

a. Importance to safety, including the safety function for the safe shutdown earthquake (SSE) event and the potential failure modes due to an SSE. SSCs whose failure modes do not affect the ability to achieve safe shutdown are excluded.

b. Location in areas of the plant that is susceptible to large, high frequency seismic inputs. The analyst verifies that the equipment or structure in the location has high frequency response to seismic input by evaluating the HRHF seismic response spectra at the equipment/structural attachment points.

c. Significant modal response within the region of high frequency amplification, as defined by items such as modal mass, participation factor, stress, and deflection. The analyst determines that the equipment or structure has dynamic response in the region of the seismic input associated with the high frequency amplified response that would result in significant stress or loads that are included in the load combinations.

d. Significant total stress compared to allowable stress in load combinations that include seismic loads. This criterion complements the criterion in item c where it is determined that the seismic stress due to equipment/structure response in the high frequency region is meaningful compared to the allowables and is therefore included in the load combinations.

The portions of the SSCs that were selected for evaluation of their high frequency seismic response were as follows:

a. Building structures

1) Reactor containment building internal structure

2) Reactor containment building containment structure

3) Auxiliary building

b. Reactor coolant system (RCS)

1) Reactor vessel internals (RVI) and core

2) Component supports and nozzles of the RCS

c. Piping system

d. Safety-related equipment

3.7B.7 Evaluation

3.7B.7.1 Building Structures

Maintaining the structural integrity of the nuclear island structures is important to the safety of the plant. Representative portions of the building structures that were evaluated for the effect of high frequency input were selected based on the areas with the potential to experience high seismic shear and moment loads in a seismic event.

The evaluation consisted of a comparison of the seismic loads and equivalent acceleration from high frequency input to those obtained from the APR1400 design-basis CSDRS for the representative building structures. The nuclear island structures were considered to be qualified for high frequency input if the seismic loads and equivalent acceleration from the CSDRS enveloped those from the high frequency input.

3.7B.7.2 Reactor Coolant System

The RVI support the core and are therefore important to safety. RVI consist of complicated components whose natural frequencies are in the relatively high frequency range.

RCS component supports were selected as one of the evaluation items because they help maintain the capability of RCS components to perform their intended safety-related functions.

Nozzles were evaluated because piping failures generally occur at high stress locations, such as at the nozzles of a component, and they represent the sensitivity of the reactor coolant loop piping to high frequency excitation.

For selected items, the HRHF response was evaluated by comparing the design loads with the loads obtained from the HRHF seismic analyses. It was concluded that RCS supports and nozzles are acceptable for the HRHF seismic loads if the design loads from the CSDRS envelope those from the HRHF seismic analyses.

3.7B.7.2.1 Reactor Vessel Internals and Core

The RVI and core were selected because they are important to safety and their analysis is representative of major primary components. Because the natural frequencies of the RVI components are in the relatively high frequency range, the RVI may be sensitive to high frequency excitation.

A series of analyses were performed to obtain the response of the RVI and core to HRHF loads. The RVI HRHF analysis was done using the HRHF excitation of the reactor vessel (RV) obtained from the response of the reactor containment building and RCS to HRHF loads. Then, the response of the core was calculated using the detailed core model, and the core plate motion was obtained from the RVI analysis.

The time history analyses of the RVI and core were performed for each HRHF mode, and the responses of all modes were combined for the resultant response. The maximum response of each mode was used for the combination. The broadening of the input excitation was also considered for the RVI and core analyses by frequency variation as implemented for CSDRS loads.

3.7B.7.2.2 Component Supports and Nozzles of the RCS

The purpose of RCS structural supports is to support the RCS components during normal operation and transients and during SSE and design basis accident conditions. RCS component supports are necessary to maintain the integrity of the RCS components to preserve their safety function. Support loads at all locations of RCS supports were compared.

The RV is supported by four vertical columns located under the vessel inlet nozzles. The columns are designed to be flexible horizontally to allow for horizontal thermal expansion during heatup and cooldown. The columns also support the RV vertically.

The steam generator (SG) is supported at the bottom by a sliding base bolted to an integrally attached conical skirt. The sliding base rests on low friction bearings that allow unrestrained thermal expansion of the RCS. Two keyways in the sliding base join with embedded keys to guide the movement of the SG during expansion and contraction of the RCS and also limit the movement of the bottom of the SG during SSE and branch line pipe break (BLPB) events.

Reactor coolant pump (RCP) supports consist of four vertical columns, four horizontal columns, and two horizontal snubbers.

The pressurizer (PZR) is supported by a cylindrical skirt that is welded to the pressurizer and bolted to the building structure. Four keys welded to the upper shell of the PZR provide additional restraint for an SSE, pressurizer pilot-operated safety relief valve (POSRV) actuation, and BLPB conditions.

The RCS component nozzles of the RV, SG, and RCP were selected to be included in the evaluation because the nozzle of a component has higher potential for failure than other locations of the components and the cold leg, hot leg, and crossover leg are relatively sensitive to high frequency compared to other components.

3.7B.7.3 Piping System

Because piping lines and piping supports throughout the plant are designed according to guidelines, the stress analysis of a sample of lines is representative of all lines in the plant. Susceptibility to excitation caused by high frequency input depends on the following factors:

a. The local HRHF ISRS have exceedances in the high frequency range relative to the APR1400 CSDRS ISRS.

b. The piping system has modes or natural frequencies in the high frequency range.

c. The piping system layout includes valves or other concentrated masses that have closely spaced supports and therefore cause high local natural frequencies. The layout generally yields significant cumulative mass in the high frequency range.

American Society of Mechanical Engineers (ASME), Class 1, 2, and 3 piping systems are required to be evaluated for the HRHF seismic response spectra.

A graded approach is taken to the scope of piping systems and components design. Therefore, the piping systems within the scope of the graded approach are evaluated for the HRHF seismic response spectra.

The combined license (COL) applicant is to evaluate the HRHF response spectra for piping systems other than those within the scope of the graded approach (COL 3.7B(3)).

3.7B.7.4 Safety-Related Equipment

As a result of the high frequency ground motion, the seismic input to SSCs may also contain high-frequency excitations. The use of prior testing results should be justified by demonstrating that the frequency content of the PSD of the test waveform is sufficient.

Safety-related equipment is evaluated for the effect of high frequency input motion to demonstrate their safety-related functionality.

For the evaluation of the equipment and components functionality for those cases where the GMRS/FIRS-based ISRS exceed the CSDRS-based ISRS below 50 Hz, further equipment and component functionality evaluations are needed. The screening process is applied for identification and evaluation of high-frequency sensitive mechanical and electrical equipment/components. For the new qualification test of equipment and components, the RRS that is generated to meet GMRS/FIRS-based ISRS as well as the CSDRS-based ISRS are applied.

Evaluation process for evaluating equipment and components that are screened in is described in Technical Report APR1400-E-S-NR-14004-P (Reference 3) with a basis for the criteria used for each screening step that is used to identify equipment/components with potential to HF sensitivity.

The COL applicant is to perform the HRHF evaluation of safety-related equipment. (COL 3.7B(1)). The seismic qualification test/analysis will be performed for the components to envelop the in-structure response spectra resulting from the entire set of certified seismic design response spectra (CSDRS), including ground motions for the COL sites with high frequency content.

3.7B.7.4.1 Evaluation process steps and description

Identification and evaluation process of HF sensitive mechanical and electrical equipment and components is performed for safety-related equipment and components before performing seismic qualification.

3.7B.7.4.1.1 Potentially high-frequency sensitive equipment

Safety-related equipment and components that have been undergone prior qualification testing/analysis are classified to either HF sensitive or HF insensitive. The potentially HF sensitive equipment and components are evaluated for the HF sensitivity.

The concern with potentially HF-sensitive components is related to the functionality of the devices when subjected to HF motions.

The component types suggested in Table 3.7B-3 are considered potentially sensitive to HF motions and should be screened based on the procedures and criteria provided in Technical Report APR1400-E-S-NR-14004-P (Reference 3). For all safety-related equipment that is designed to have part(s) of its assembly with components classified to be potentially sensitive to HF motions are to be evaluated for the adequacy in accordance with the procedures described in APR1400-E-S-NR-14004-P (Reference 3).

List of HF sensitive equipment is provided to Technical Report APR1400-E-X-NR-14001-P, "Equipment Qualification Program" (Reference 13), Table 3, "Equipment Qualification Equipment List." The COL applicant is to verify the applicability of evaluation of the items potential to HF sensitivity (COL 3.7B(2)).

3.7B.7.4.1.2 Items not potentially HF sensitive

In case that items are not potentially sensitive to HF, the confirmation that the natural frequency of the equipment or components is at the region where CSDRS-based ISRS exceedance occurs is required. When the natural frequency is at the CSDRS exceedance region, the higher seismic load based on the HRHF-based ISRS is imposed to the equipment compared to the CSDRS-based ISRS. Therefore additional evaluation to ensure that HRHF-based ISRS does not affect any structural integrity and functional requirement is required although the equipment is potentially classified to be insensitive to HF. The method of additional evaluation could be evaluating the existing data to envelop the RRS that is prepared for HRHF-based ISRS including margins HRHF-based ISRS, conduct screening test if necessary or any analysis to verify acceptability.

3.7B.8 Combined License Information

COL 3.7B(1) The COL applicant is to perform the HRHF evaluation of safety-related equipment.

COL 3.7B(2) The COL applicant is to verify the applicability of evaluation of the items potential to HF sensitivity.

COL 3.7B(3) The COL applicant is to evaluate the HRHF response spectra for piping systems other than those within the scope of the graded approach.

3.7B.9 References

1. Regulatory Guide 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants," Rev. 2, U.S. Nuclear Regulatory Commission, July 2014.

2. EPRI Draft White Paper, "Considerations for NPP Equipment and Structures Subjected to Response Levels Caused by High Frequency Ground Motions," Elelctric Power Research Institute, March 2007.

3. APR1400-E-S-NR-14004-P, "Evaluation of Effects of HRHF Response Spectra on SSCs," Rev. 3, KEPCO & KHNP, December 2017.

4. EPRI TR-1023389, "Evaluation of Seismic Hazards at Central and Eastern U.S. Nuclear Power Sites," Electric Power Research Institute, June 2011.

5. NUREG/CR-6728, "Technical Basis for Revision of Regulatory Guidance on Design Ground Motions: Hazard- and Risk-consistent Ground Motion Spectra Guidelines," U.S. Nuclear Regulatory Commission, March 2007.

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9. Regulatory Guide 1.100, “Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants,” Rev. 3, U.S. Nuclear Regulatory Commission, September 2009.

10. EPRI TR-1015108, “Program on Technology Innovation: The Effects of High-Frequency Ground Motion on Structures, Components, and Equipment in Nuclear Power Plants,” Electric Power Research Institute, June 2007.

11. EPRI TR-1015109, “Program on Technology Innovation: Seismic Screening of Components Sensitive to High-Frequency Vibratory Motions,” Electric Power Research Institute, October 2007.

12. DC/COL-ISG-01, “Interim Staff Guidance on Seismic Issues Associated with High Frequency Ground Motion in Design Certification and Combined License Applications,” U.S Nuclear Regulatory Commission, 2009.

13. APR1400-E-X-NR-14001-P, “Equipment Qualification Program,” Rev. 4, KEPCO & KHNP, July 2018.

Table 3.7B-1

5%-Damped HRHF Horizontal Target Response Spectrum

Freq. (Hz)	Sa (g)	Freq. (Hz)	Sa (g)	Freq. (Hz)	Sa (g)	Freq. (Hz)	Sa (g)
0.100	0.0144	2.800	0.4550	11.000	0.9471	61.000	0.8530
0.125	0.0225	2.900	0.4679	11.500	0.9674	64.000	0.8015
0.150	0.0323	3.000	0.4808	12.000	0.9873	65.000	0.7856
0.200	0.0431	3.150	0.4961	12.500	1.0067	67.000	0.7553
0.250	0.0539	3.300	0.5111	13.000	1.0245	70.000	0.7136
0.300	0.0647	3.450	0.5259	13.500	1.0420	73.000	0.6726
0.400	0.0862	3.600	0.5405	14.000	1.0591	75.000	0.6474
0.500	0.1078	3.800	0.5596	14.500	1.0759	76.000	0.6354
0.600	0.1271	4.000	0.5783	15.000	1.0924	79.000	0.6017
0.700	0.1452	4.200	0.5942	16.000	1.1150	80.000	0.5911
0.800	0.1622	4.400	0.6097	17.000	1.1367	82.000	0.5733
0.900	0.1780	4.600	0.6249	18.000	1.1575	85.000	0.5483
1.000	0.1960	4.800	0.6398	20.000	1.1969	88.000	0.5251
1.100	0.2153	5.000	0.6545	22.000	1.2168	90.000	0.5107
1.200	0.2346	5.250	0.6711	25.000	1.2441	91.000	0.5055
1.250	0.2442	5.500	0.6873	28.000	1.2376	94.000	0.4904
1.300	0.2535	5.750	0.7032	30.000	1.2336	97.000	0.4763
1.400	0.2720	6.000	0.7187	31.000	1.2274	100.000	0.4630
1.500	0.2905	6.250	0.7328	34.000	1.2102		
1.600	0.3056	6.500	0.7467	35.000	1.2048		
1.700	0.3205	6.750	0.7603	37.000	1.1866		
1.800	0.3351	7.000	0.7736	40.000	1.1615		
1.900	0.3497	7.250	0.7855	43.000	1.1262		
2.000	0.3640	7.500	0.7972	45.000	1.1046		
2.100	0.3747	7.750	0.8087	46.000	1.0896		
2.200	0.3852	8.000	0.8200	49.000	1.0476		
2.300	0.3955	8.500	0.8398	50.000	1.0345		
2.400	0.4056	9.000	0.8589	52.000	0.9970		
2.500	0.4156	9.500	0.8823	55.000	0.9458		
2.600	0.4288	10.000	0.9050	58.000	0.8997		
2.700	0.4420	10.500	0.9263	60.000	0.8715		

Table 3.7B-2

5%-Damped HRHF Vertical Target Response Spectrum

Freq. (Hz)	Sa (g)	Freq. (Hz)	Sa (g)	Freq. (Hz)	Sa (g)	Freq. (Hz)	Sa (g)
0.100	0.0108	2.800	0.3413	11.000	0.7187	61.000	0.9710
0.125	0.0169	2.900	0.3510	11.500	0.7381	64.000	0.9116
0.150	0.0242	3.000	0.3606	12.000	0.7572	65.000	0.8922
0.200	0.0323	3.150	0.3721	12.500	0.7759	67.000	0.8552
0.250	0.0404	3.300	0.3833	13.000	0.7935	70.000	0.8046
0.300	0.0485	3.450	0.3944	13.500	0.8108	73.000	0.7553
0.400	0.0647	3.600	0.4054	14.000	0.8278	75.000	0.7251
0.500	0.0809	3.800	0.4197	14.500	0.8445	76.000	0.7077
0.600	0.0953	4.000	0.4337	15.000	0.8610	79.000	0.6594
0.700	0.1089	4.200	0.4456	16.000	0.8858	80.000	0.6444
0.800	0.1217	4.400	0.4573	17.000	0.9097	82.000	0.6185
0.900	0.1335	4.600	0.4687	18.000	0.9329	85.000	0.5827
1.000	0.1470	4.800	0.4799	20.000	0.9882	88.000	0.5500
1.100	0.1615	5.000	0.4909	22.000	1.0335	90.000	0.5299
1.200	0.1759	5.250	0.5033	25.000	1.0948	91.000	0.5221
1.250	0.1832	5.500	0.5155	28.000	1.1322	94.000	0.4998
1.300	0.1901	5.750	0.5274	30.000	1.1556	97.000	0.4808
1.400	0.2040	6.000	0.5390	31.000	1.1628	100.000	0.4630
1.500	0.2179	6.250	0.5496	34.000	1.1881		
1.600	0.2292	6.500	0.5600	35.000	1.1963		
1.700	0.2403	6.750	0.5702	37.000	1.2040		
1.800	0.2514	7.000	0.5802	40.000	1.2199		
1.900	0.2622	7.250	0.5891	43.000	1.2198		
2.000	0.2730	7.500	0.5979	45.000	1.2177		
2.100	0.2810	7.750	0.6065	46.000	1.2114		
2.200	0.2889	8.000	0.6150	49.000	1.1765		
2.300	0.2966	8.500	0.6298	50.000	1.1632		
2.400	0.3042	9.000	0.6442	52.000	1.1238		
2.500	0.3117	9.500	0.6617	55.000	1.0698		
2.600	0.3216	10.000	0.6788	58.000	1.0210		
2.700	0.3315	10.500	0.6989	60.000	0.9910		

Table 3.7B-3 (1 of 3)

Soil Layers and Properties (S9 for HRHF Seismic Input Motions)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp (ft/s)	$\rho^{(2)}$
Rock	1	5	0.145	0.004	4,692	9,315	0.33
	2	5	0.145	0.006	4,707	9,348	0.33
	3	5	0.145	0.007	4,711	9,382	0.33
	4	5	0.145	0.008	4,720	9,415	0.33
	5	5	0.145	0.008	4,731	9,448	0.33
	6	5	0.145	0.008	4,737	9,481	0.33
	7	5	0.145	0.009	4,743	9,513	0.33
	8	5	0.145	0.009	4,750	9,546	0.34
	9	5	0.145	0.010	4,758	9,578	0.34
	10	5	0.145	0.010	4,767	9,610	0.34
	11	5	0.145	0.010	4,775	9,642	0.34
	12	5	0.145	0.010	4,785	9,674	0.34
	13	5	0.145	0.011	4,795	9,706	0.34
	14	5	0.145	0.011	4,807	9,737	0.34
	15	5	0.145	0.011	4,818	9,768	0.34
	16	5	0.145	0.011	4,830	9,799	0.34
	17	5	0.145	0.011	4,843	9,830	0.34
	18	5	0.145	0.011	4,855	9,861	0.34
	19	5	0.145	0.011	4,868	9,892	0.34
	20	5	0.145	0.011	4,882	9,922	0.34
	21	5	0.155	0.010	9,200	18,264	0.33
	22	5	0.155	0.010	9,200	18,264	0.33
	23	5	0.155	0.010	9,200	18,264	0.33
	24	5	0.155	0.010	9,200	18,264	0.33
	25	5	0.155	0.010	9,200	18,264	0.33
	26	5	0.155	0.010	9,200	18,264	0.33
	27	5	0.155	0.010	9,200	18,264	0.33
	28	5	0.155	0.010	9,200	18,264	0.33
	29	5	0.155	0.010	9,200	18,264	0.33
	30	5	0.155	0.010	9,200	18,264	0.33
	31	5	0.155	0.010	9,200	18,264	0.33
	32	5	0.155	0.010	9,200	18,264	0.33
	33	5	0.155	0.010	9,200	18,264	0.33
	34	5	0.155	0.010	9,200	18,264	0.33
	35	5	0.155	0.010	9,200	18,264	0.33

Table 3.7B-3 (2 of 3)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp (ft/s)	$\rho^{(2)}$
Rock (cont.)	36	5	0.155	0.010	9,200	18,264	0.33
	37	5	0.155	0.010	9,200	18,264	0.33
	38	5	0.155	0.010	9,200	18,264	0.33
	39	5	0.155	0.010	9,200	18,264	0.33
	40	5	0.155	0.010	9,200	18,264	0.33
	41	10	0.155	0.010	9,200	18,264	0.33
	42	10	0.155	0.010	9,200	18,264	0.33
	43	10	0.155	0.010	9,200	18,264	0.33
	44	10	0.155	0.010	9,200	18,264	0.33
	45	10	0.155	0.010	9,200	18,264	0.33
	46	10	0.155	0.010	9,200	18,264	0.33
	47	10	0.155	0.010	9,200	18,264	0.33
	48	10	0.155	0.010	9,200	18,264	0.33
	49	10	0.155	0.010	9,200	18,264	0.33
	50	10	0.155	0.010	9,200	18,264	0.33
	51	10	0.155	0.010	9,200	18,264	0.33
	52	10	0.155	0.010	9,200	18,264	0.33
	53	10	0.155	0.010	9,200	18,264	0.33
	54	10	0.155	0.010	9,200	18,264	0.33
	55	10	0.155	0.010	9,200	18,264	0.33
	56	10	0.155	0.010	9,200	18,264	0.33
	57	10	0.155	0.010	9,200	18,264	0.33
	58	10	0.155	0.010	9,200	18,264	0.33
	59	10	0.155	0.010	9,200	18,264	0.33
	60	10	0.155	0.010	9,200	18,264	0.33
	61	10	0.155	0.010	9,200	18,264	0.33
	62	10	0.155	0.010	9,200	18,264	0.33
	63	10	0.155	0.010	9,200	18,264	0.33
	64	10	0.155	0.010	9,200	18,264	0.33
	65	10	0.155	0.010	9,200	18,264	0.33
	66	10	0.155	0.010	9,200	18,264	0.33
	67	10	0.155	0.010	9,200	18,264	0.33
	68	10	0.155	0.010	9,200	18,264	0.33
	69	10	0.155	0.010	9,200	18,264	0.33
	70	10	0.155	0.010	9,200	18,264	0.33

Table 3.7B-3 (3 of 3)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft^3)	Damp.	Vs (ft/s)	Vp (ft/s)	$\rho^{(2)}$
Rock (cont.)	71	20	0.155	0.010	9,200	18,264	0.33
	72	20	0.155	0.010	9,200	18,264	0.33
	73	20	0.155	0.010	9,200	18,264	0.33
	74	20	0.155	0.010	9,200	18,264	0.33
	75	20	0.155	0.010	9,200	18,264	0.33
	76	20	0.155	0.010	9,200	18,264	0.33
	77	20	0.155	0.010	9,200	18,264	0.33
	78	20	0.155	0.010	9,200	18,264	0.33
	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33
	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	–	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) Poisson's Ratio

Table 3.7B-4

Potentially HF Sensitive Component

- Electro-mechanical relays (e.g.,control relays, time delay relays, protective relays)
- Electro-mechanical contactors (e.g., Motor Control Center (MCC) starter)
- Circuit breakers (e.g., molded case and power breaker - low and medium voltage)
- Auxiliary contacts (e.g., for Molded Case Circuit Breaker (MCCBs), fused disconnects, contactors/starters)
- Control switches (e.g., benchboard panel, operator switches)
- Transfer switches (e.g., low and medium voltage switches with instrumentation)
- Process switches and sensors (e.g., pressure/diff. pressure, temperature, level, limit/position, and flow)
- Potentiometers
- Digital solid-state devices (mounting and connections only)
- Microprocessors-based components
- Connectors and connections (including circuit board connections for digital and analog equipment)
- Unrestrained components

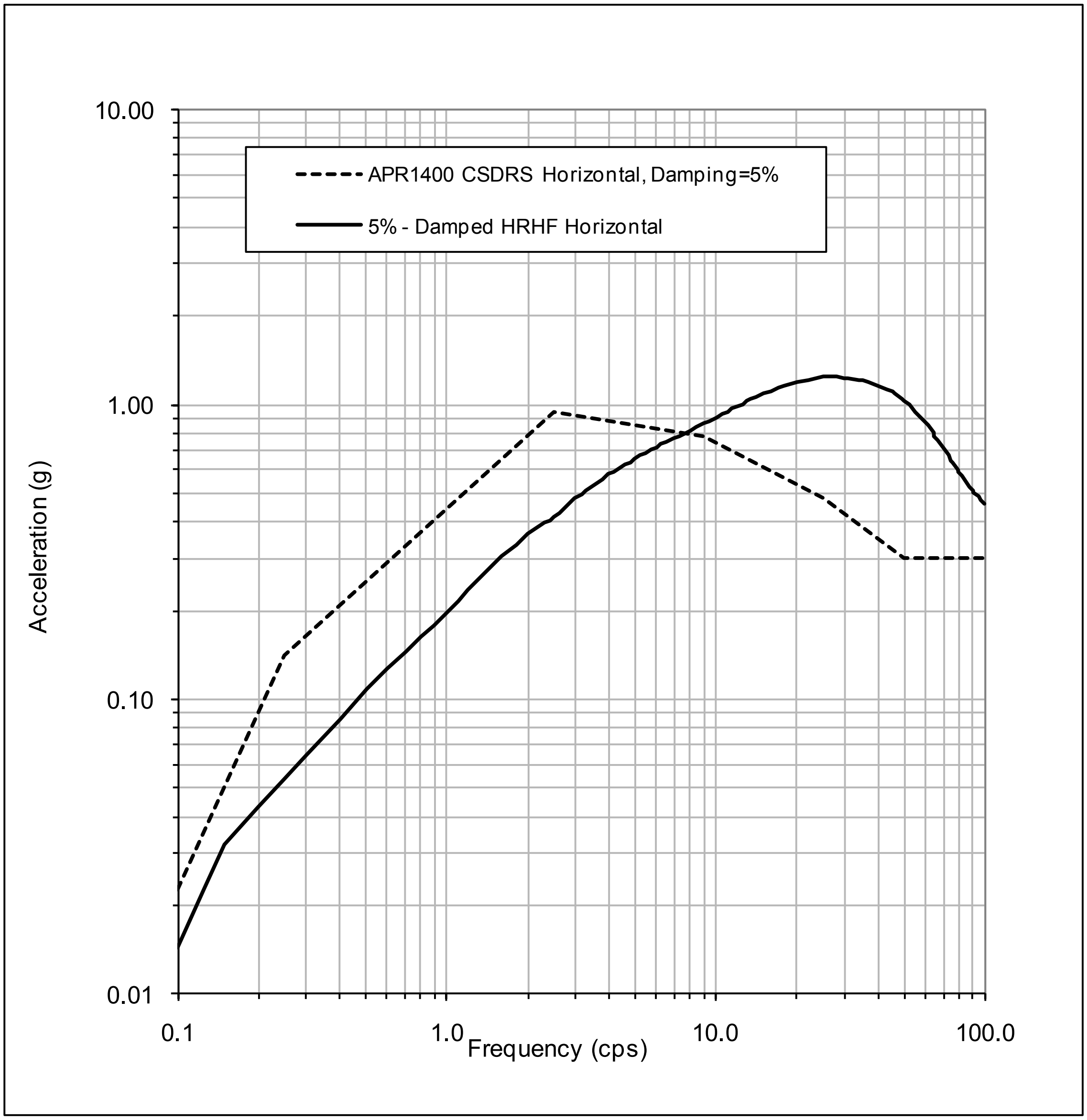

Figure 3.7B-1 Comparison of 5%-Damped HRHF and CSDRS Horizontal Target Response Spectra

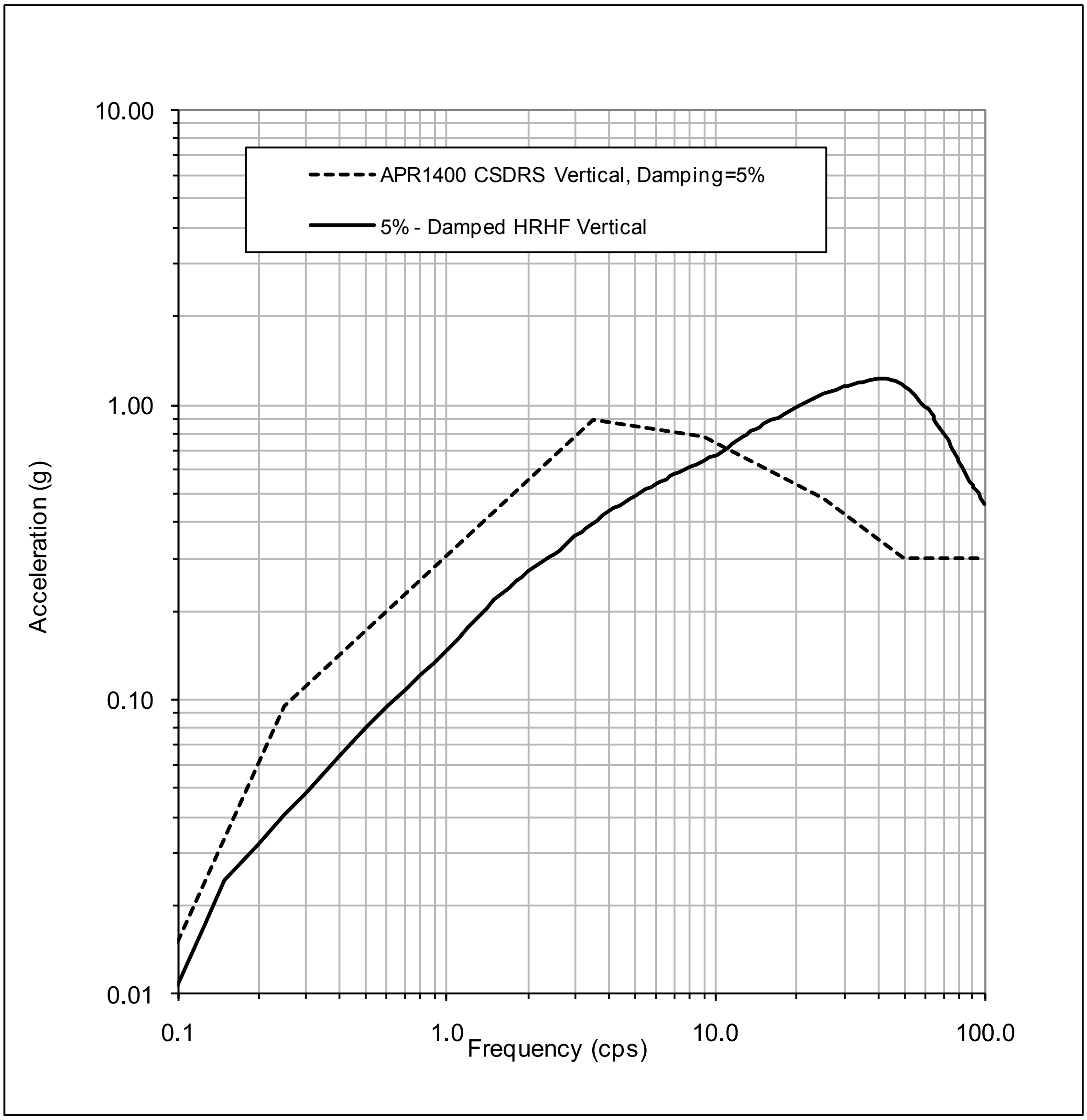

Figure 3.7B-2 Comparison of 5%-Damped HRHF and CSDRS Vertical Target Response Spectra

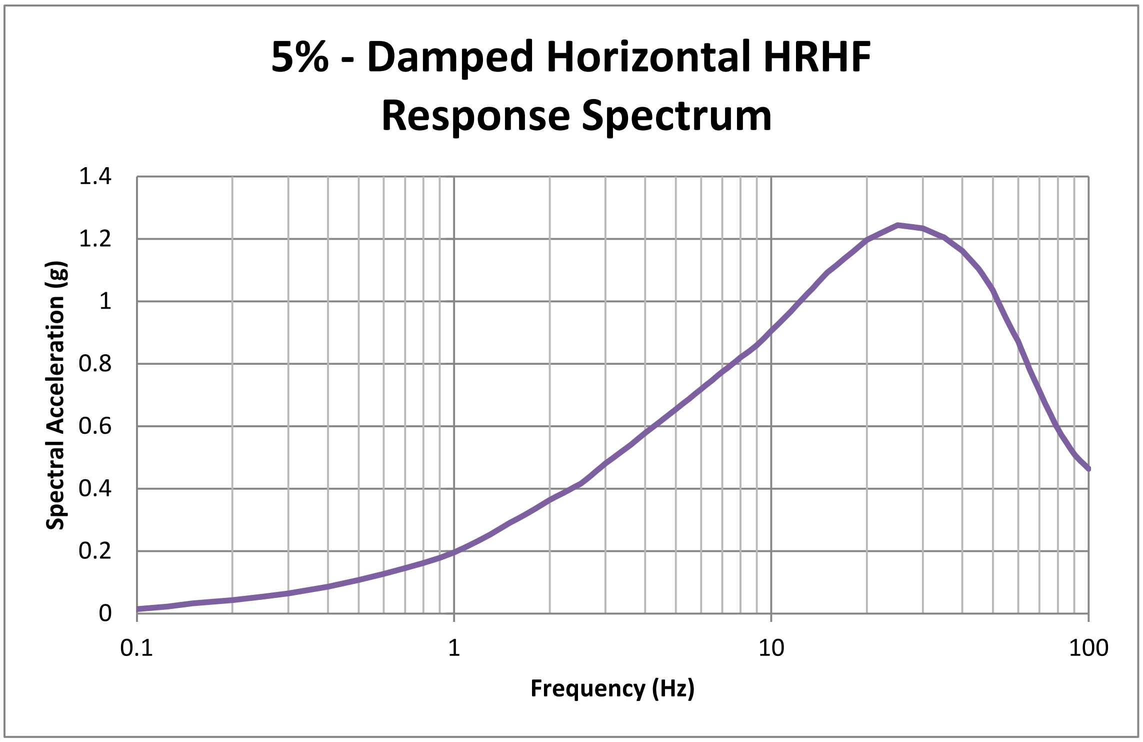

Figure 3.7B-3 5%-Damped HRHF Horizontal Target Response Spectrum

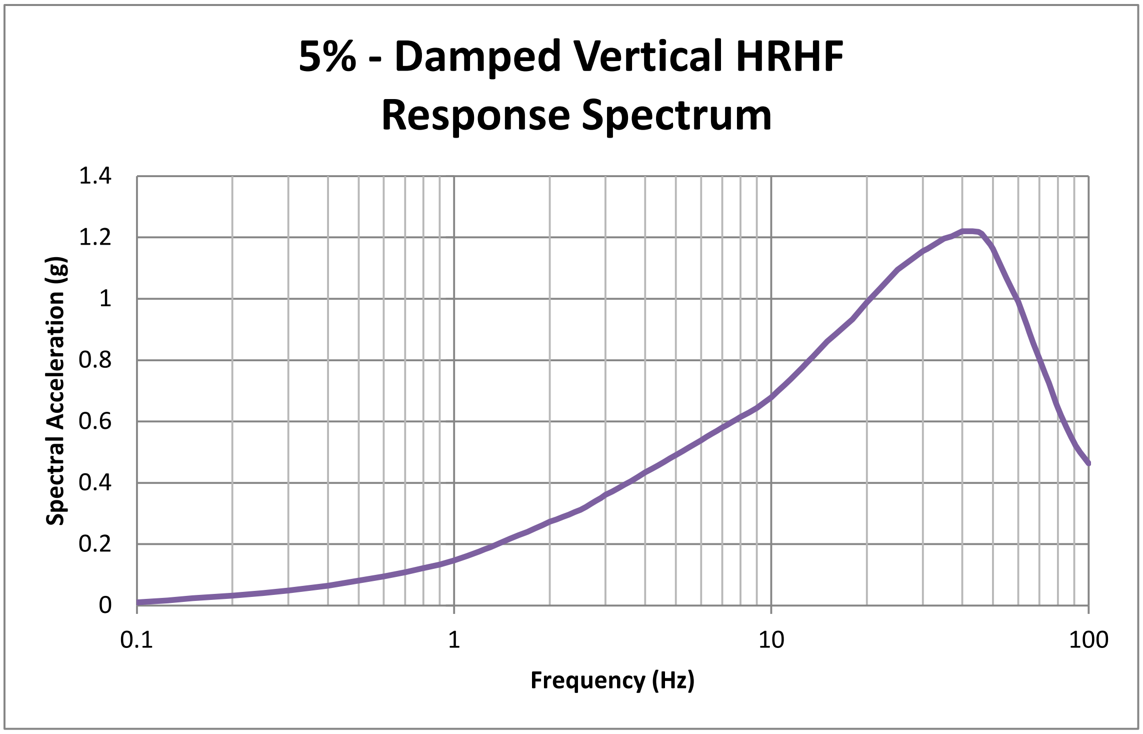

Figure 3.7B-4 5%-Damped HRHF Vertical Target Response Spectrum

3.8 Design of Category I Structures

3.8.1 Concrete Containment

3.8.1.1 Description of the Containment

3.8.1.1.1 Basic Configuration

The containment encloses the reactor vessel, steam generators, reactor coolant loops, and portions of the auxiliary and engineered safety features systems. The containment provides reasonable assurance that leakage of radioactive material to the environment does not exceed the acceptable dose limit as defined in 10 CFR 50.34 (Reference 1) even if a loss-of-coolant accident (LOCA) occurred.

The internal structures are physically independent of the containment, except at the supporting foundation basemat. The connections of operating and intermediate floors to the containment wall are described in Subsection 3.8.3.1.10.

The containment shares a common basemat with the auxiliary building. The auxiliary building wraps around the containment with a seismic isolation gap of 150 mm (6 in.).

The reactor containment building basemat has a continuous tendon gallery that provides access to the vertical tendons below the wall-basemat junction.

The containment is a prestressed concrete structure composed of a right circular cylinder with a hemispherical dome and is founded on safety-related common basemat. The structures are lined on the inside with steel plate that acts as a leak-tight membrane. The cylindrical portion of the containment is prestressed by a post-tensioning system consisting of horizontal and inverted “U” vertical tendons. There are three buttresses equally spaced around the containment wall, and each horizontal tendon is anchored at buttresses 240 degrees apart, bypassing the intermediate buttress. The dome portion is prestressed by a post-tensioning system consisting of horizontal tendons up to a 45-degree vertical angle and of two groups of inverted “U” vertical tendons oriented 90 degrees to each other. The inverted “U” tendons are carried through the cylindrical wall and anchored at the tendon gallery.

The general configuration and dimensions of the containment structure are shown in Figures 3.8-1 and 3.8-2. Local areas at the equipment hatch and two personnel airlock areas are thickened as shown in Figure 3.8-3.

The containment has the following dimensions:

a. Inside diameter of containment: 45.72 m (150 ft)

b. Inside height of containment: 76.66 m (251.5 ft) from the top of base slab to the ceiling of dome apex

c. Thickness of containment wall: 1.37 m (4 ft 6 in.)

d. Dome thickness: 1.22 m (4 ft)

3.8.1.1.2 Foundation Basemat

A description of the foundation basemat is given in Subsection 3.8.5.

Appendix 3.8A shows the reinforcement details of the intersection where the containment wall intersects with nuclear island (NI) common foundation basemat.

The design basis of the NI common basemat under the RCB and the AB conform to the requirement of ASME Section III, Division 2, CC and ACI 349, respectively. The boundary of jurisdiction between the ASME and the ACI codes is shown in Figure 3.8-26. The jurisdictional boundary is placed at the thickness transition interface due to the physical configuration and functional requirements of the basemat. The anchoring of the containment shell reinforcement is limited within the ASME Code boundary as shown in Figures 3.8A-16 and 3.8A-17.

3.8.1.1.3 Containment Shell

3.8.1.1.3.1 General

The cylindrical containment shell has a constant thickness of 1.37 m (4 ft 6 in.) from the top of the foundation basemat to the springline. The shell is thickened locally around the equipment hatch, two personnel airlocks, feedwater, and main steam line penetrations. The containment reinforcing consists primarily of hoop and meridional steel. Prestressing tendons are also arranged in hoop and meridional directions. The tendons in the meridional directions extend over the dome to form an inverted “U” shape.

Structural steel supports are provided for distribution systems on the containment shell and dome, including the electrical conduit, cable tray, and spray system piping. The supports are welded to embedment plates on the inside and outside of the containment shell and dome.

3.8.1.1.3.2 Reinforcing Bar Layout

Continuous hoop and meridional reinforcements are placed at the outside layers of the cylindrical wall. Similar reinforcements are also provided at the inside layers. Additional reinforcing bars are provided around major penetrations in the shell as required. Shear ties are provided where radial shear reinforcing is required.

3.8.1.1.3.3 Prestressing Tendon Layout

The cylindrical wall is post-tensioned with 165 hoop tendons at 305 mm (12 in.) center. Each hoop tendon is anchored at the buttresses located 240 degrees apart, bypassing the intermediate buttress. Thus, three hoop tendons make two complete rings. Vertical post-tensioning for the cylindrical wall is provided by two sets of 50 equally spaced orthogonal inverted “U” vertical tendons.

The spacing of the hoop tendons and inverted “U” vertical tendons in the cylindrical wall is shown in Figure 3.8-4.

3.8.1.1.3.4 Liner Plate Details and Anchorage

The 6.0 mm (0.25 in.) liner plate is attached to inside of the cylindrical wall by vertical angles embedded in the cylindrical wall as shown in Figure 3.8-5. Horizontal stiffeners are provided for the liner plate to serve as an inside formwork for the cylindrical wall during concrete placement. The details for the containment liner below the CIS and anchorage are shown in Figures 3.8-6 and 3.8-7.

3.8.1.1.3.5 Penetrations

Access to the interior of the containment is provided through two personnel airlocks. An equipment hatch permits transfer of equipment into and out of the containment. In addition to these access openings, other major penetrations provided in the containment wall are for the main steam, feedwater, and HVAC lines. The containment wall is also penetrated by various process pipelines (Figure 3.8-8), electrical penetration assemblies (Figure 3.8-9), and the fuel transfer tube penetration. Descriptions are provided in Subsections 3.8.2.1.3.1.1 and 3.8.2.1.3.1.2. The penetrations greater than 457.2 mm (18 inches), except the personnel airlocks and equipment hatch, are given in Table 3.8-9.

The penetration sleeves through the containment are fabricated of steel, anchored to the concrete structure, and seal welded to the containment liner plate. The type, size, and location of the penetration, as well as any load that is imposed on the cylindrical wall by the penetration, determine whether any additional reinforcing is required in the wall around the penetration. Post-tensioning tendons are deflected around the penetrations, if required. Minimum bend radius of all deflected tendons is 9.15 m (30.0 ft) between tangent points. Portions of the containment pressure boundary that are steel and not backed by concrete, such as the equipment hatch, personnel airlocks, and Class MC penetration assemblies including the fuel transfer tube penetration sleeve, are designed in accordance with ASME Section III, Division 1, NE (Reference 2), as described in Subsection 3.8.2.

3.8.1.1.3.5.1 Personnel Airlocks

Access to the containment is provided through two personnel airlocks with a diameter of 3.4 m (11 ft 2 in.). The personnel airlocks are located at the plant grade level (Az. 280 degrees and elevation 103 ft 9 in.) and the operating floor level (Az. 234 degrees and elevation 159 ft 9 in.). The containment wall around the personnel airlocks is thickened, and additional reinforcement is provided for stress concentrations due to the opening, as shown in Figure 3.8-3 and Figure 3.8A-10. The post-tensioning tendons are deflected around the penetrations.

3.8.1.1.3.5.2 Equipment Hatch

The equipment hatch, with a diameter of 7.92 m (26 ft), is located at Az. 280 degrees and elevation 167 ft 6 in. The containment wall around the equipment hatch is thickened, and additional reinforcement is for stress concentrations due to the opening provided around the opening. The post-tensioning tendons are deflected around the opening.

3.8.1.1.3.6 Polar Crane Bracket

The polar crane brackets are spaced equally and embedded in the cylindrical wall to support the polar crane girder. Forces acting on the wall due to bracket loads are accommodated by additional reinforcement in the wall. A thickened liner plate is provided in the bracket areas. The spacing of the vertical liner stiffener in the vicinity of thickened liner plates is designed to limit excessive strain in the adjoining 6.0 mm (0.25 in.) liner plate.

3.8.1.1.4 Containment Dome

3.8.1.1.4.1 General

The roof of the containment is a hemispherical dome. The inside of the dome is lined with a steel liner plate to provide leak-tightness. The buttresses are extended up to 48 degrees into the dome to provide anchorage for the dome hoop tendons.

3.8.1.1.4.2 Reinforcing Bar Layout

The containment dome is reinforced using the same arrangements as the dome tendons. Orthogonal reinforcing is the continuation of the vertical reinforcing in the cylindrical wall. Hoop reinforcing is also provided up to 45 degrees above the springline to complete the system. Radial ties are also provided over the entire dome to account for radial tension due to the curvature of the prestressing tendons.

3.8.1.1.4.3 Prestressing Tendons

Post-tensioning for the dome is provided by the orthogonal inverted "U" vertical tendons and 30 hoop tendons at 1.5 degrees on the center up to 45 degrees above the springline. The spacing of hoop tendons in the dome is shown in Figure 3.8-4.

3.8.1.1.4.4 Liner Plate Details and Anchorage

Radial and hoop stiffeners are provided for attaching the 6.0 mm (1/4 in.) liner plate to the concrete dome, as shown in Figure 3.8-24. However, in the central portion, stiffeners are placed to form a rectangular grid. The liner serves as inside formwork for placing the concrete.

3.8.1.2 Applicable Codes, Standards, and Specifications

The following regulations, codes, standards, and specifications are used in the design of the concrete containment.

3.8.1.2.1 Design Codes, Standards, Specifications, and Regulations

The design codes, standards, specifications, and regulations are listed in Table 3.8-1. The primary design code for concrete containment is ASME Section III, Division 2, CC (Reference 3).

3.8.1.2.2 NRC Regulatory Guides

Conformance to each NRC Regulatory Guide (RG) is described in Section 1.9. The NRC RGs applicable to the design of the concrete containment are NRC RG 1.35.1 (Reference 5), NRC RG 1.136 (Reference 6), NRC RG 1.91 (Reference 30), NRC RG 1.216 (Reference 50), NRC RG 1.221 (Reference 46), and NRC RG 1.7 (Reference 7).

3.8.1.2.3 Industry Standards

Internationally recognized industry standards published by ASTM are used whenever possible to define material properties, testing procedures, and fabrication and construction methods.

3.8.1.3 Loads and Load Combinations

The containment is designed to resist the loads given in CC-3000 of the ASME Code and NRC RG 1.136 with the exceptions listed below.

a. The post-LOCA flooding combined with the safe shutdown earthquake (SSE) is more severe than the post-LOCA flooding combined with the operating basis earthquake (OBE) set at one third or less of the SSE for the plant. Therefore, only the post-LOCA flooding SSE combination is considered in the design.

b. CC-3720 of the ASME Code is satisfied when the containment structure is exposed to the load combination listed below. As a minimum design condition, the pressure ($P_{g1} + P_{g2}$) is not less than 310 kPa (45 psig).

$$D + F + P_{g1} + P_{g2}$$

Where:

D = Dead load

F = Prestress

P_{g1} = Pressure resulting from an accident that releases hydrogen generated from 100 percent fuel clad metal-water reaction

P_{g2} = Pressure resulting from uncontrolled hydrogen burning

A description of load categories and definition of loads are given in Subsections 3.8.1.3.1 and 3.8.1.3.2.

3.8.1.3.1 Load Category

The load categories include any condition encountered during construction and testing, and in the normal operation of a nuclear power plant, as well as the conditions resulting from extreme environmental conditions postulated during the life of the facility and certain combinations thereof.

The design loads are defined as service load category and factored load category depending on the frequency of their occurrence.

3.8.1.3.1.1 Service Loads

Service loads are any loads encountered during construction and in the normal operation of a nuclear power plant and include loads such as any anticipated transient or test loads during normal and emergency startup and shutdown of the nuclear steam supply, safety and auxiliary systems, and the severe environmental loads that may be anticipated during the life of the facility.

Construction

The construction condition considers events and loads during construction, including the various stages of prestressing but excluding those during testing. Contraction loads for buildings and other structures are developed in accordance with Table 3.8-2 and with SEI/ASCE 37-02 (Reference 8).

Testing

The testing condition includes a consideration of events and loads applied during the containment structural integrity or leak rate testing and preoperational tests such as hydrostatic testing of equipment. Each testing event is considered to be mutually exclusive of other testing events.

Normal

The normal condition includes a consideration of events and loads that are reasonably expected during the operation, shutdown, and normal maintenance of the power plant.

3.8.1.3.1.2 Factored Loads

Factored loads include loads encountered infrequently, such as severe environmental, extreme environmental and abnormal loads.

Severe Environmental

The severe environmental condition includes a consideration of the loads due to infrequent site-related environmental events such as operating basis earthquake, design basis wind, and design basis flood or precipitation during the plant life.

Extreme Environmental

The extreme environmental condition includes a consideration of the loads due to site-related environmental events that are credible but highly improbable. These events include the SSE, design basis tornado/hurricane and its associated missiles, probable maximum precipitation, probable maximum water level, and the site-related accidents to be postulated but not included in the abnormal loading category.

Abnormal

The abnormal condition includes a consideration of the loads due to design basis events. They include pressure, temperature, blast, pipe whip, jet impingement, flooding, and pipe reactions due to postulated pipe breaks for design basis accidents. This loading condition also includes plant-related non-environmental missiles. The loads from each postulated accident event are considered to be mutually exclusive of other postulated accidents.

Abnormal/Severe Environmental

The abnormal/extreme condition includes a consideration of the loads due to the highly improbable simultaneous occurrence of abnormal and severe environmental loading conditions. Only the specified combinations of these conditions are considered.

Abnormal/Extreme Environmental

The abnormal/extreme condition includes a consideration of the loads due to the extremely improbable simultaneous occurrence of abnormal and extreme environmental loading conditions. Only the specified combinations of these conditions are considered.

3.8.1.3.2 Design Loads

The design loads pertaining to the design of containment are as follows:

a. Dead load (D)

Dead loads, including hydrostatic and permanent equipment loads

b. Live load (L)

Live loads, including any movable equipment loads and other loads that vary with intensity during each occurrence such as soil pressures

c. Prestress (F)

Loads resulting from the application of prestress, including effects resulting from the construction sequence used to post-tension the tendon

d. Operating temperature (T_o)

Thermal effects and loads during normal operating conditions, based on the most critical transient or steady-state condition; the combination of internal and external temperatures that produce the maximum effects is considered.

e. Pipe reaction (R_o)

Pipe reaction during normal operating or shutdown conditions, based on the most transient or steady-state condition

f. External pressure (P_v)

Pressure loads resulting from pressure variation either inside or outside the containment

g. Test pressure (P_t)

Pressure during the structural integrity and leak rate tests

h. Test temperature (T_t)

Thermal effects and loads during the structural integrity and leak rate tests

i. Wind load (W)

Loads generated by the design wind specified for the plant site

j. Seismic load (E_o)

OBE loads are not applicable to the containment design for the APR1400 because an OBE level is one third of the SSE.

k. Seismic load (E_s)

Loads generated by the SSE; only the actual dead loads and, 25 percent of live load or 75 percent of snow are considered in evaluating seismic response forces.

l. Tornado or hurricane load (W_t)

Tornado or hurricane loading including the effects of missile impact

m. Internal flooding (H_a)

Load resulting from internal flooding other than from pipe breaks

n. Accident pressure (P_a)

Design pressure load within the containment generated by the design basis accident, based on the calculated peak pressure with an appropriate margin

o. Accident temperature (T_a)

Thermal effects and loads generated by the design basis accident including operating temperature (T_o)

p. Pipe reaction (R_a)

Pipe reaction from thermal conditions generated by the design basis accident including pipe reaction at normal operating or shutdown conditions (R_o)

q. Pipe break load (R_r)

Local effects due to the design basis accident normally include all postulated high-energy system ruptures. These loads include an appropriate dynamic load factor to account for the dynamic nature of the load. This load category includes:

1) Pipe break reaction load (Y_r)

   Y_r is defined as the equivalent static load on the structure generated by the reaction of the high-energy pipe during the postulated break.

2) Pipe break jet impingement load (Y_j)

   Y_j is defined as the jet impingement equivalent static load on the structure generated by the postulated break.

3) Pipe break missile impact loads (Y_m)

   Y_m is defined as the missile impact equivalent static load on the structure generated by or during the postulated break, such as pipe whipping.

r. Flooding load (Y_f)

Y_f is the load within or across a compartment or building due to flooding generated by a postulated pipe break. These loads are calculated considering the design basis flood heights.

s. Other Loads

Other loads refer to postulated events or conditions that are not included in the design basis. However the safety of the containment under combustible gas loads and aircraft impact are assessed and demonstrated to conform with the allowable values in CC-3720 of the ASME Code and NEI 07-13, respectively. This load category includes:

1) Aircraft hazard (A)

   Aircraft hazard refers to loads on a structure resulting from the impact of an aircraft. The evaluation of this loading condition is considered as part of the plant safeguards and security measures.

2) Combustible gas load (P_s)

Combustible gas loads are pressure loads that result from a fuel-clad metal-water reaction (P_{g1}) followed by an uncontrolled hydrogen burn (P_{g2}) during a post-accident condition in the containment inerted by carbon dioxide. NRC RG 1.136, Regulatory Position C.5 provides the loads and load combinations acceptable for analysis and design of containment when exposed to the loading conditions associated with combustible gas. The loads and load combinations for combustible gas are provided in Subsection 3.8.1.3.

t. Missile loads other than hurricane generated or tornado-generated missiles

There are no missile loads on the containment resulting from activities of nearby military installations, turbine failures, or other causes.

u. Valve actuation load (G)

Loads resulting from relief valve or other high energy device actuation

v. Design flood/precipitation load (H)

Flood loads on seismic Category I structures are determined based on the maximum site flood levels specified in Chapter 2.

w. Probable maximum flood/precipitation (H_s)

H_s is the forces, due to the probable maximum precipitation as well as the maximum flood level, which includes the effects of seiches, surges, waves, and tsunamis.

x. Crane and trolley loads (C)

This load is the crane and trolley lifted load, including impact load, longitudinal load, and lateral load. All of these loads shall be considered as acting simultaneously. This load is detailed in Subsection 3.8.4.3.1. In the case of the crane lifting load, it is not considered under severe environmental, extreme environmental, abnormal, abnormal/severe environmental, and abnormal/extreme environmental loading condition since the polar crane is not permitted to lift any loads during plant operation. When not in use, the polar crane is required to be in the parking position (location of polar crane: Az.280º, trolley location: 12 ft 7 in away from end of east part), since the crane is placed in the parking position during plant operation. The self-weight for all load conditions and live load (for construction and normal load condition) of polar crane are applied to the parking position (COL 3.8(21)).

3.8.1.3.3 Design Load Combinations

The applicable load combinations and load factors for the design of a concrete containment conform with the requirements of CC-3000 of the ASME Section III, Division 2. Table 3.8-2 lists the load combinations used in the design of the containment.

3.8.1.3.4 Liner Plate Loads and Load Combinations

The load combinations shown in Table CC-3230-1 of the ASME Code are applicable to the liner, except that load factors for all load cases are taken as equal to 1.0. Strains associated with construction-related liner deformations are excluded when calculating liner strains for the service and factored load combinations.

3.8.1.4 Design and Analysis Procedures

3.8.1.4.1 General

The design and analysis procedures are in conformance with the requirements of CC-3000 of the ASME Section III, Division 2.

Throughout the analysis special attention is given to, the following areas of the containment:

a. Intersection between the basemat and the cylinder

b. Intersection between the cylinder and the dome

c. Areas around large penetrations

d. Areas around polar crane brackets

e. Behavior of the base slab relative to the underlying foundation material

f. Stresses due to transient temperature in the liner plate and concrete

g. Penetrations and points of concentrated loads

h. Buttresses

A typical section of the reactor containment building is shown in Figures 3.8-10 and 3.8-11.

The computer programs utilized in the analysis and design of seismic Category I structures are described in Table 3.8-11 and Table 3.8A-40.

3.8.1.4.2 Containment Structure

The ANSYS (Reference 9) computer program is used to analyze the containment for the loads defined in Subsection 3.8.1.3.2. The analysis results of these load case analyses are combined and factored using the loading combinations defined in Subsection 3.8.1.3.3.

The analysis model of the containment consists of the dome, cylindrical wall, and a part of the basemat. No other structures are physically connected to the containment structure; therefore, the basemat is the only interfacing part in the containment model. Subsection 3.8.5 describes the modeling of the common basemat structure.

A three-dimensional, eight-node solid element that is suitable for moderately thick shell structures is used to model the containment concrete dome and cylindrical wall. Five layers of solid elements through the thickness are used to model the dome and cylindrical wall. The buttresses and thickened areas around the large penetrations are included in the ANSYS model. The structural analysis model of containment shell and dome is shown in Figure 3.8-12.

Post-tensioning tendon forces are included in the containment structural analysis. Forces for each tendon in the cylindrical wall and dome are averaged along their routing lengths in the containment model. Post-tensioning forces are transferred to the concrete by imposing initial stresses along the lengths of the modeled tendons which are embedded in the concrete model. The tendons are modeled using two-node three dimensional type elements. The prestress losses are explicitly included in the initial stress values.

Additional descriptions of the containment computer model are provided in Appendix 3.8A.

3.8.1.4.3 Assumptions on Boundary Conditions

The boundary condition is applied at the bottom of the basemat and at vertically cut faces inside and outside the basemat. The cut faces are fixed radially and circumferentially, whereas the bottom face is fixed only vertically so that unimportant parts can be cut and removed.

3.8.1.4.4 Axisymmetric and Non-Axisymmetric Loads

The containment is modeled in its entirety as a three-dimensional structure. The loads described in Subsection 3.8.1.3.2 are applied in the locations and directions appropriate for each load. Overall pressure is applied uniformly to the interior surface of the containment structure.

Localized loads, such as penetration dead loads, hydrostatic pool water loads, live loads, and pipe rupture loads are applied to specific portions of the structural model as appropriate. Post-tension loads are applied to each tendon in its specific location. Localized loads at buttress locations that are caused by the offset of the tendons with respect to the shell are accounted for in the modeling. Response spectrum analysis is applied for the two horizontal and one vertical seismic load directions using the methodology described in Subsection 3.7.2.

3.8.1.4.5 Transient and Localized Loads

3.8.1.4.5.1 Analysis of Areas of Containment Wall Supporting Polar Crane Brackets

The containment wall around the crane brackets is analyzed considering the effects of crane bracket reactions. To account for potential difference in the timing between containment construction and polar crane installation, two models are used for the analyses: the overall containment full model and a partial model with only the containment cylinder.

3.8.1.4.5.2 Thermal Stress Analysis

To analyze the containment for thermal gradients, the nonlinear temperature profile across the containment wall thickness is obtained through the transient heat analysis using the ANSYS program. The resultant forces and moments from the thermal stresses are applied to each design section along with other appropriate axial forces and moments due to mechanical loads acting simultaneously with the thermal loads.

The stresses in the concrete and reinforcing steel are checked by using the DARTEM program, which is verified and validated, taking into account the self- limiting effects of thermal moments due to concrete cracking.

3.8.1.4.6 Creep and Shrinkage Analysis

The effects of concrete creep, shrinkage, elastic shortening, and tendon steel relaxation are included in the computations for prestress losses in the tendons.

a. Concrete creep strain

1) Vertical direction = 592×10^{-6} mm/mm (in/in)

2) Horizontal direction = 930×10^{-6} mm/mm (in/in)

b. Concrete shrinkage strain = 120×10^{-6} mm/mm (in/in)

c. Poisson's ratio = 0.17

d. Elastic modulus

1) Containment external concrete wall = 30,441.74 MPa (4.415×10^{6} psi)

2) Containment internal concrete structure = 30,441.74 MPa (4.415×10^{6} psi)

3) Containment concrete basemat = 27,789.38 MPa (4.031×10^{6} psi)

4) Prestressing steel material = 193,053.20 MPa (2.8×10^{7} psi)

e. Elastic shortening of concrete

1) Vertical direction = 124×10^{-6} mm/mm (in/in)

2) Horizontal direction = 194×10^{-6} mm/mm (in/in)

f. Tendon relaxation = 6 %

g. Friction coefficients

There are two types of friction losses, wobble friction loss from unintended curvature and curvatu friction loss from intended curvature. The two kinds of curvature in tendons induce friction loss of tensile stress. Friction losses are calculated in accordance with CC-3542 of the ASME Code and taken into account in the design of the post-tensioning system. The friction coefficients are determined experimentally and verified by testing while stressing tendons.

3.8.1.4.7 Tangential Shear

The design and analysis procedures for tangential shear are in accordance with ASME Section III, Division 2 and NRC RG 1.136.

Tangential shear is resisted by the vertical reinforcement and the horizontal hoop reinforcement in the containment wall.

3.8.1.4.8 Variations in Physical Properties

In the design and analysis of the containment, consideration is given to the effects of possible variations in the physical properties of materials on the analytical results. The properties used for analysis purposes were established based on engineering experience with similar construction and materials gained through the construction of Shin-Kori units 3&4 in Korea. The values that were used are delineated in Subsection 3.8.1.4.6. The values are to be evaluated and confirmed by certified material test reports (CMTRs) and concrete long-term material testing. The COL applicant is to perform concrete long-term material testing in a way which verifies physical properties of materials used during the design stage and the characteristics of long term deformation of concrete (COL 3.8(1)). The test results are to be reviewed by designers. Additional reviews of materials and their effects on the analysis and design of the containment will be included in design specification development and materials selection.

Losses due to elastic shortening, concrete creep and shrinkage, and relaxation of the post-tensioning cables were accounted for in the analysis. Subsection 3.8.1.4.6 summarizes parameters to consider time-dependent losses such as shrinkage, creep, and tendon relaxations.

When designing the structure under service and factored load conditions, allowable stress levels are used based on the minimum strength of the concrete and reinforcing materials used in construction of the containment to account for variations in physical properties.

3.8.1.4.9 Analysis of Areas around Large Penetrations

Large penetrations can cause stress concentrations. Increased thickness of the containment shell around these areas preserves the overall shell stiffness, compensates for the effects of stress and strain concentrations, and provides space for post-tensioning tendons and reinforcing bars.

The local structural behaviors at large, thickened penetration regions are investigated using the three-dimensional finite element full model.

3.8.1.4.10 Steel Liner Plate and Anchors

Design of the liner plate includes a consideration of construction loads, internal pressure, prestress, creep, shrinkage, and thermal effects. The design of the containment liner conforms with the allowable stress and strain values in CC-3720 of Section III of the ASME Code.

The liner plate is not assumed as a structural member in the design other than during construction. Loads caused by thermal growth of the liner plate are considered in the concrete containment design.

The liner plate is anchored to the concrete so that the liner stain does not exceed the allowable strain given in the code. The anchorage system is designed so that progressive failure of the anchors or massive bucking of the liner does not occur.

The liner anchorage system is analyzed by using the LBAP program, which is verified and validated, calculating the force and deflection at anchorage points. The design of the liner anchorage conforms with the force and displacement allowables in CC-3730 of Section III of the ASME Code.

For the structural design of containment liner plates, the stresses at formworks are calculated for basemat liner, shell liner, and dome liner, respectively. The lowest ratio of allowable stress to induced stress for each part is shown in Table 3.8-10 as margins of safety for the design.

3.8.1.4.11 Ultimate Pressure Capacity

The ultimate pressure capacity (UPC) of the prestressed concrete containment, which is for assessment of the safety margin above the design-basis accident pressure, is evaluated based on the design results (rebar arrangements) of the structure. A full three-dimensional finite element model is developed for the analysis of the concrete containment. Material nonlinear models for steel and concrete are constructed on the basis of the design code and a few references. For simulating the cracking behavior of concrete, smeared crack model is adopted and the tension stiffening effect and their interaction are also taken into consideration. The reinforcement in concrete structures is provided by means of rebars, with this modeling approach, the concrete behavior is considered independently of the rebars. Therefore, in the concrete modeling, the tension stiffening is required in the smeared crack model to simulate load transfer across cracks through the rebar which consider the effects of the reinforcement interaction with concrete. The steel is assumed to be a linear elasto-plastic model. The stress-strain curves for the reinforcing steel and tendons are based on the ASME code-specified minimum yield strengths. An elastic-plastic and a piece-wise linear stress-strain relationship above yield stress is used for the reinforcing steel and tendons.

In the initial state of the nonlinear analysis, the containment structure is subject to dead and prestressing loads. During the UPC analysis, the internal pressure is monotonically increased until a specified failure criterion is reached. The pressure corresponding to failure criterion of the liner, rebar, and tendons is recorded. The pressure at which the first failure criterion is reached is determined to be the ultimate pressure capacity of the prestressed concrete containment.

The design and analysis procedures for determining the UPC are performed in accordance with NRC RG 1.216, and is estimated based on satisfying both of the following strain limits: (1) a total tensile average strain in tendons away from discontinuities of 0.8 percent, which includes the strains in the tendons before pressurization (typically about 0.4 percent) and the additional straining from pressurization; and (2) a global free-field strain for the other materials that contribute to resist the internal pressure (i.e., liner, if considered, and rebars) of 0.4 percent. In addition, the additional failure modes, such as concrete shear and concrete crushing which may occur near discontinuities should be considered.

The ultimate pressure capacity of the containment is a pressure of 1.089 MPa (158 psi), at which the maximum strain of the liner plate is approximately 0.4 percent. It is noted that this UPC pressure is the lowest pressure from the acceptance criteria in NRC RG 1.216, and is determined to occur near the upper portion of the equipment hatch. At this ultimate pressure level, the maximum strains of the rebars and tendons do not reach the allowable limit strain values. In addition, with regard to the punching shear (local failure of concrete) at the near discontinuities such as equipment hatch, the shear capacity of shear rebars exceed the shear force corresponding to the ultimate pressure level. However, the concrete shear strength is neglected.

The COL applicant is to provide the detailed design results and evaluation of the ultimate pressure capacity of penetrations, including the equipment hatch, personnel airlocks, electrical and piping penetrations in accordance with NRC RG 1.216 (COL 3.8(2)).

3.8.1.4.12 Combustible Gas Control Inside Containment

The safety of containment under the combustible gas load (P_s) condition, which includes hydrogen generation pressure load due to 100 percent fuel-clad and water interaction (Pg_1) accompanied by hydrogen burning (Pg_2), is assessed and demonstrated to comply with the allowable values in ASME Section III, CC-3720. In NRC RG 1.216, for concrete containments, the acceptance criteria are limited to demonstrating that the liner strains satisfy the Factored Load Category requirements presented in ASME Section III, Division 2, CC-3720.

Under these conditions, the loadings should not produce strains in the containment liner plate in excess of the limits established in ASME Section III, CC-3720. Allowable strains for factored loads considering membrane only are 0.005 cm/cm in compression and 0.003 cm/cm in tension. Allowable strains for factored loads considering combined membrane and bending are 0.014 cm/cm in compression and 0.010 cm/cm in tension.

The three-dimensional finite element (FE) model for safety evaluation during the combustible gas load condition is based on the structural analysis model for section design. The FE program is used for the nonlinear analysis of the containment structure. The full FE model includes the entire prestressed concrete containment structure which consists of the concrete wall and dome, the liner plate, rebars, and tendons. The solid and shell elements are used for concrete and liner plate, respectively. In addition, the rebars and tendons are modeled as truss elements. Material nonlinear models for steel and concrete are constructed on the basis of the design code and a few references. For simulating the cracking behavior of concrete, smeared crack model is adopted and the tension stiffening effect and their interaction are also taken into consideration. The reinforcement in concrete structures is provided by means of rebars, with this modeling approach, the concrete behavior is considered independently of the rebars. Therefore, in the concrete modeling, the tension stiffening is required in the smeared crack model to simulate load transfer across cracks through the rebar which consider the effects of the reinforcement interaction with concrete. The steel is assumed to be a linear elasto-plastic model. The stress-strain curves for the reinforcing steel and tendons are based on the ASME code-specified minimum yield strengths. An elastic-plastic and a piece-wise linear stress-strain relationship above yield stress is used for the reinforcing steel and tendons.

For the structural analysis under the combustible gas load, the dead load is applied first and then the pressure load is incremented until the pressure from this event is reached. Since the duration of the loading is much larger than the period of the structure, the static analysis methods are adequate for structural integrity evaluation under the combustible gas load. Based on the results of the analyses, all of the tendons and rebars are still in the elastic stage. At the maximum pressure loading level of the combustible gas load condition, the liner plate strains at the cylindrical wall base, mid-height wall, and penetration regions do not reach the allowable limit strain values of membrane only load and combined membrane and bending load.

3.8.1.4.13 Design Summary Report

A design summary report for the containment structures is presented in Appendix 3.8A where the design of representative critical sections of the structures is described.

The evaluation considering the deviations of as-procured or as-built construction to the design is performed with the acceptance criteria described in Subsection 3.8.1.5.

3.8.1.5 Structural Acceptance Criteria

The allowable stresses, strains, forces, displacements and temperatures for the containment structures including the liner are defined based on the requirements given in CC-3000 of the ASME Code, and NRC RG 1.136 and 1.216. When the containment structure is subjected to the load combinations described in Table 3.8-2, the allowable stresses, strains, forces or displacements specified below are not exceeded in order that:

a. The containment is essentially elastic under service load conditions.

b. General yielding of the reinforcing steel does not develop under factored primary load conditions.

c. The leak-tight integrity of the liner is maintained.

3.8.1.5.1 Acceptance Criteria for Service Load Conditions

The acceptance criteria under service load conditions are given below:

3.8.1.5.1.1 Concrete

Compression

The allowable stresses for the service load combinations defined in Table 3.8-2 are as follows:

a. Primary membrane stress: 0.30 f'_c

b. Primary membrane plus flexural stress: 0.45 f'_c

c. Primary plus secondary membrane stress: 0.45 f'_c

d. Primary plus secondary membrane plus flexural stress: 0.60 f'_c

Tension

Concrete tensile strength is not relied on to resist flexural or membrane tension.

Radial Shear

The allowable concrete stress and the limiting maximum stress for radial shear are in accordance with CC-3431.3 of the ASME Code.

Tangential Shear

The allowable concrete stress and the limiting maximum stress for tangential shear are in accordance with CC-3431.3 of the ASME Code.

Peripheral Shear

The allowable concrete stress and the limiting maximum stress for peripheral shear are in accordance with CC-3431.3 of the ASME Code.

Torsional Shear

The allowable concrete stress and the limiting maximum stress for torsional shear are in accordance CC-3431.3 of the ASME Code.

3.8.1.5.1.2 Prestressing System

Tendon

The tendon stresses during stressing and anchoring and the tendon stresses used for the design do not exceed the following:

a. During stressing, the tendon tensile stress at the anchor point does not exceed 0.80 f_{pu} or 0.94 f_{py}, whichever is less.

b. Immediately after anchoring, the tensile stress at the anchor point does not exceed 0.73 f_{pu}, and the calculated average tensile stress over the length of the tendon does not exceed 0.70 f_{pu}.

c. For the purpose of design, the effective prestress is based on tendon stresses not exceeding those calculated to occur immediately after anchoring minus all applicable losses.

End Anchor

Compression under the tendon end anchor bearing plates is in accordance with the requirements of CC-3431.1 of the ASME Code.

Prestress Losses

To determine the effective prestress, the prestress losses are considered in accordance with CC-3542 of the ASME Code. The wobble friction coefficient and curvature friction coefficient are determined experimentally and verified during stressing operations. In addition, NRC RG 1.35.1 is used to establish the upper bound and lower bound of prestress losses at the time of 60-year design life.

3.8.1.5.1.3 Reinforcement Steel

Tension

a. The average tensile stress in reinforcing steel does not exceed 0.5 $f_{y.}$

b. The values given in a. above may be increased by 33.3 percent when the following loads are combined with other loads in the load combination:

   1) Temporary loads from prestressing, which decrease after completion of prestressing (considered in construction load combination)

   2) Secondary loads due to concrete volume change such as creep, shrinkage, and thermal growth

c. The values given in a. above may be increased by 50 percent when the temporary pressure loads during the test condition are combined with other loads in the load combination.

Compression

a. For load-resisting purposes, the compressive stress in reinforcing steel does not exceed 0.5 f_y.

b. The values given in a. above may be increased by 33.3 percent when the following loads are combined with other loads in the load combination.

   1) Temporary loads from prestressing, which decrease after completion of prestressing (considered in construction load combination)

   2) Temporary test pressure loads (considered in test condition)

   3) Secondary loads due to concrete volume change such as creep, shrinkage, and thermal growth

Radial Shear

The radial shear reinforcement for service loads is provided in accordance with CC-3522 of the ASME Code.

Tangential Shear

The tangential shear reinforcement for service loads is provided in accordance with CC-3522 of the ASME Code.

Peripheral Shear

The peripheral shear reinforcement for service loads is provided in accordance with CC-3522 of the ASME Code.

Torsional Shear

The torsional shear reinforcement for service loads is provided in accordance with CC-3522 of the ASME Code.

Radial Tension Reinforcement

Radial tie reinforcement is provided to resist radial tensile forces from curved tendons in portions of the containment with double curvature in accordance with CC-3545 of the ASME Code.

End Anchor Reinforcement

Tendon end anchor reinforcement oriented perpendicular to the direction of applied force is provided to control cracking in the end anchor zone in accordance with CC-3543 of the ASME Code.

3.8.1.5.2 Acceptance Criteria for Factored Load Conditions

The acceptance criteria under factored load conditions are given below.

3.8.1.5.2.1 Concrete

The allowable stresses for the factored load combinations defined in Table 3.8-2 are as follows:

a. Primary membrane stress: 0.60 f'_c

b. Primary membrane plus flexural stress: 0.75 f'_c

c. Primary plus secondary membrane stress: 0.75 f'_c

d. Primary plus secondary membrane plus flexural stress: 0.85 f'_c

Tension

Concrete tensile strength is not relied on to resist flexural or membrane tension.

Radial Shear

Radial shear is a transverse shear and is similar to shear in beam analysis. It occurs in the vicinity of discontinuities in shell flexural or membrane behavior. The allowable shear stress in prestressed concrete is determined in accordance with CC-3421.4 of the ASME Code.

Tangential Shear

Tangential shear is a membrane shear in the plane of the containment shell resulting from lateral load such as earthquake, wind, hurricane, or tornado loading. The allowable shear stress in prestressed concrete is determined in accordance with CC-3421.5 of the ASME Code.

Peripheral Shear

Peripheral shear stress is a transverse shear and is similar to punching shear in slab analysis. It is the shear resulting from a concentrated force or reaction acting transverse to the plane of the wall. The peripheral shear stress carried by concrete is in accordance with CC-3421.6 of the ASME Code.

Torsional Shear

Torsional shear stress is a local, in-plane shear stress induced in the containment wall due to torsional moment (from pipe penetrations or attachments) applied about an axis normal to the containment wall. The torsional shear stress carried by concrete is in accordance with CC-3421.7 of the ASME Code.

3.8.1.5.2.2 Prestressing System

Tendons

The maximum axial tensile capacity of the tendon is 90 percent of the yield strength in accordance with CC-3423 of the ASME Code.

Prestressing Losses

To determine the effective prestress, allowance for the following loss of prestress is considered.

a. Slip at anchorage

b. Elastic shortening of concrete

c. Creep of concrete

d. Shrinkage of concrete

e. Stress relaxation of tendon

f. Frictional loss due to intended or unintended curvature in the tendons

The loss of prestress due to friction losses is calculated in accordance with CC-3542 of the ASME Code. The wobble friction coefficient and curvature friction coefficient are determined experimentally and verified during stressing operations. In addition, NRC RG 1.35.1 is used to establish the upper bound and lower bound of prestress losses at the time of 60-year design life.

3.8.1.5.2.3 Reinforcing Steel

Tension

a. The design yield strength of reinforcing steel does not exceed 413.7 MPa (60 ksi).

b. The allowable stress for load resisting purpose does not exceed 0.9 f_y.

c. If more than one layer of reinforcement is provided to resist primary bending moment, the tensile strain in one or more of the layers may exceed 0.9 ε_y, provided a state of general yielding of the cross section is not reached.

d. The tensile strain in reinforcement around large openings may exceed 0.9 ε_y, provided the average strain for the total forces and moments over a distance of one-half the containment wall thickness from the opening or 25 percent of the opening diameter, whichever is smaller, does not exceed 0.9 ε_y.

e. Under combined primary and secondary forces, the tensile strain in reinforcement may exceed 0.9 ε_y. The maximum tensile strain does not exceed 2 ε_y in any reinforcement.

Compression

a. For load-resisting purposes, the compressive stress in reinforcing steel does not exceed 0.9 f_y.

b. The compressive strains may exceed yield strength when acting in conjunction with concrete if the concrete requires larger strains than the reinforcing yield strain to develop its capacity.

Radial Shear

The radial shear reinforcement is provided in accordance with CC-3521.2 of the ASME Code.

Tangential Shear

The orthogonal tangential shear reinforcement is provided in accordance with CC-3521.1 of the ASME Code.

Peripheral Shear

The peripheral shear reinforcement is provided in accordance with CC-3521.3 of the ASME Code.

Torsional Shear

The torsional shear reinforcement is provided in accordance with CC-3521.4 of the ASME Code.

Radial Tension Reinforcement

Radial tie reinforcement is provided to resist radial tensile forces from curved tendons in portions of the containment with double curvature in accordance with CC-3545 of the ASME Code.

End Anchor Reinforcement

Tendon end anchor reinforcement oriented perpendicular to the direction of applied force is provided to control cracking in the end anchor zone in accordance with CC-3543 of the ASME Code.

3.8.1.5.3 Acceptance Criteria with Respect to Concrete Temperatures

The requirements pertaining to temperature limitations in concrete containments are in accordance with CC-3440 of the ASME Code.

a. For normal operation or any other long-term period, the temperatures are not to exceed 66 °C (150 °F) except for local areas, such as around a penetration, which are allowed to have increased temperatures not to exceed 93 °C (200 °F).

b. For accident or any other short-term period, the temperatures are not to exceed 177 °C (350 °F) for the interior surface. However, local areas are allowed to reach 343 °C (650 °F) from steam or water jets in the event of a pipe rupture.

3.8.1.5.4 Acceptance Criteria for Impactive and Impulsive Loading

Yield strain and displacement values are permitted to exceed general stress and strain limits due to impactive and impulsive loading. In the case of impulse loads, the usable ductility is 33 percent of the failure value and for impact effects, the usable ductility is 67 percent of the failure value in accordance with ASME Section III, CC-3920, for the design of the containment. Examples of impactive and impulsive loading include loading due to high-energy piping line breaks, localized yielding due to jet impingement and whip restraint loads, and external and internal missile loading. The design of containment internal structure is addressed in Subsection 3.8.3. General design for missiles is addressed in Section 3.5.

3.8.1.5.5 Acceptance Criteria for the Liner System

The acceptance criteria for the liner system are provided below.

Liner Plate

The acceptance criteria for the liner plate are the stress and strain limits specified in the ASME Section III, Table CC-3720-1, when considering the load combinations stated in Table CC-3230-1 with a load factor of 1.0.

Liner Anchors

The acceptance criteria for the liner anchors are the force and displacement allowable values given in ASME Section III, Table CC-3730-1.

Penetration Assemblies

The acceptance criteria are the design allowables given in ASME Section III, CC-3740 and CC-3820. In accordance with CC-3740 (b), the design allowables for penetration nozzles are the same as used for ASME Section III, Division 1, where a nozzle is defined as that part of the penetration assembly not backed by concrete.

In accordance with Subarticle CC-3740 (c), the design allowables for the liner in the vicinity of the penetration are the same as those given in AISC N690 for resisting mechanical loads in the service load category. For factored load categories, the allowables are increased by a factor of 1.5, except for impulse loads and impact effects.

In accordance with Subarticle CC-3740(d), the portion of the penetration sleeves backed by concrete is designed to meet the acceptance criteria described above for the liner plate and anchors. Additionally, consistent with requirements in Subarticle CC-3820, to verify acceptability, the structural capacities of penetration assemblies that are designed for pipe loads are compared against (a) the ultimate moment, axial, torque, and shear loadings that the piping is capable of producing or (b) penetration loads based on a dynamic analysis considering pipe rupture thrust as a function of time. In (b), penetration designs are later verified using results of piping analysis to provide reasonable assurance that the load used in the design is not exceeded.

Typically for the APR1400, in order to preclude pipe rupture effects, flued heads are used for high-energy piping if large pipe rupture design loads are anticipated. See Section 3.6 for further details on this topic.

Brackets and Attachments

The allowables given in the ASME Section III, CC-3650 and CC-3750, are used as the acceptance criteria for brackets and attachments to the liner.

The APR1400 design avoids the use of brackets and similar items that transmit loads to the liner in the through-thickness direction. As much as practical in the design of attachments that have structural components carrying major loads, for example the upper plates of crane brackets, such a structural component of the attachment is made continuous through the liner. When through-thickness liner loads cannot be avoided and the liner is 25 mm (1 in.) or more thick, then the special welding and material requirements of Subarticle CC-4543.6 are applied. In addition to the requirements given in Subarticle CC-4543.6 (a) through (d), ultrasonic examinations are required prior to fabrication to preclude the existence of laminations in the installed material.

3.8.1.6 Materials, Quality Control, and Special Construction Techniques

This section contains information relating to the materials, quality control program, and special construction techniques and tolerances used in the fabrication and construction of the containment. Materials and quality control satisfy the following requirements:

a. ASME 2001 Edition with 2003 Addenda, Section III, Division 2, Code for Concrete Containments, CC-2000, CC-4000, CC-5000, and CC-6000

b. NRC RG 1.136, Design Limits, Loading Combinations, Materials, Construction, and Testing of Concrete Containments, Rev. 3, March 2007.

Concrete and reinforcement forming and placement tolerance not specifically addressed in these references are in accordance with ACI 349 and ACI 117. Any provisions in codes which provide acceptance criteria for conditions when to tolerances are exceeded shall not apply, but a licensee referencing the APR1400 DCD may deviate from the tolerances in these codes using alternative acceptance criteria, if these acceptance criteria are approved by the NRC. As-built dimensions will also be evaluated to verify compliance with the design bases and applicable codes and standards identified in Table 3.8-1. The COL applicant may provide construction tolerance acceptance criteria and the basis for the criteria (e.g., through the use of analysis, industry research, or testing) for cases where the tolerances in the ACI 117 and ANSI/AISC 303, for structural concrete and structural steel, respectively, may be exceeded (COL 3.8(22)).

3.8.1.6.1 Concrete and Concrete Ingredients

The materials to be used for concrete and concrete ingredients are given below.

Cement

Cement used for the concrete containment conforms with the requirements of ASTM C150 (Reference 10).

Aggregates

Aggregates used for the concrete containment conforms with the requirements of ASTM C33, (Reference 11) with the requirements specified in CC-2222 of the ASME Section III, Division 2.

Mixing Water

Mixing water used for the concrete containment conforms with the requirements of CC-2223 of the ASME Section III, Division 2.

Admixtures

Air-entraining admixtures used for the concrete containment conform with the requirements of ASTM C260 (Reference 12). Chemical admixtures used for the concrete containment conform with the requirements of ASTM C494 (Reference 13). Mineral admixtures (fly ash and pozzolan) used for the concrete containment conform with the requirements of ASTM C618 (Reference 14).

Concrete Mix Design

The concrete mix design for the concrete containment conforms with the requirements of CC-2230 of the ASME Section III, Division 2.

Concrete Compressive Strength

The specified minimum compressive strength of 41.37 MPa (6,000 psi) at 91 days is used for the containment wall and dome. For the containment common basemat, the specified minimum compressive strength of 34.47 MPa (5,000 psi) at 91 days is used.

3.8.1.6.2 Reinforcing Bars and Splices

The material to be used for reinforcing bars conforms with ASTM A615 (Reference 15) and the requirements described in CC-2330 of ASME Section III, Division 2.

The mechanical splices conform with the permitted types described in CC-4331.2 of ASME Section III, Division 2. The material to be used for bar-to-bar splice sleeves in reinforcing bars conforms with ASTM A513, A519, or A576 (References 16, 17, and 18, respectively). The material to be used for reinforcing bar splice sleeves attached to liner plates or structural steel shapes is a carbon steel conforming to ASTM A513, A519, or A576, Grades 1008 through 1030.

3.8.1.6.3 Prestressing System

The prestressing system of the concrete containment is VSL E6-42, multi-strand system using wedge block with wedge type anchors. The material to be used for prestressing system is given below.

Prestressing Steel

The material for prestressing elements conforms with ASTM A416 (Reference 19) and the requirements described in CC-2420 of ASME Section III, Division 2.

Anchorage Components

Materials for anchorage components such as bearing plates, anchor head assemblies, and wedges conform with the tendon manufacturer’s respective material specifications. In addition, the materials for anchorage components conform with the requirements described in CC-2430 of ASME Section III, Division 2 and NRC RG 1.136.

Non-Load-Carrying and Accessory Materials

Non-load-carrying materials such as tendon duct, channel, trumpet, and transition cones shall be ferrous in conformance with the requirements in CC-2441 of ASME Section III, Division 2. The temporary and permanent corrosion prevention materials conform with the requirements of CC-2442 of ASME Section III, Division 2.

3.8.1.6.4 Liner Plate within Containment Backed by Concrete

The materials, fabrication procedures, and examination requirements conform with the technical provisions of CC-2500, CC-4500, and CC-5500 of ASME Section III, Division 2.

The containment liner materials backed by concrete meet the requirements of CC-2500 of ASME Section III, Division 2, and conform with the following specifications:

Application	Specification
Liner plate, embedment plate	SA-516 Grade 55, 60, or 70 SA-240
Liner anchor	SA-36

The material to be used for containment wall liner at El. 78 ft through El. 101 ft conforms with ASME SA240 (Reference 20) and the requirements described in CC-2500 of the ASME Section III, Division 2.

The fabrication of the containment steel boundaries backed by concrete is in accordance with CC-4500 of ASME Section III, Division 2. The qualifications of welders and welding procedures are in accordance with CC-4530 of ASME Section III, Division 2.

All nondestructive examination procedures are in accordance with Section V of the ASME Code.

3.8.1.7 Testing and Inservice Inspection Requirements

3.8.1.7.1 Structural Integrity Test

The structural integrity test (SIT) is performed in accordance with ASME Section III, Division 2, CC-6000 to verify the structural integrity of the containment. The test is performed after the containment is complete, including the liner, concrete structures, all electrical and piping penetrations, equipment hatch, personnel airlocks, and post-tensioning.

The pressure will be brought up to 115 percent of the containment design pressure in approximately five or more equal increments. At each pressure level, the pressure will be held constant for 1 hour prior to measuring the deflections.

3.8.1.7.1.1 General Requirements

Prior to operating the plant, the SIT is performed to demonstrate the structural acceptability of the primary containment.

At each pressure level, the pressure will be held constant for 1 hour to allow for the pressure and containment response to stabilize and to survey the exterior surface of the primary containment. Internal and external temperature measurements will be taken.

Under each test pressure level, the crack patterns are measured in accordance with CC-6225 of ASME Section III, Division 2. All cracks larger than 0.254 mm (0.01 in.) and longer than 150 mm (6 in.) will be mapped at the locations required in CC-6350 of ASME Section III, Division 2.

Displacement of the containment is measured and evaluated in conformance with CC-6223 and CC-6360 of ASME Section III, Division 2.

Pre- and post-test inspections will be performed to confirm that the concrete, liner plate, and interior structures were not damaged during the SIT.

3.8.1.7.1.2 Response Prediction Prior to the Structural Integrity Test

The expected readings of all devices used to monitor containment behavior are determined before the SIT.

The predictions of the containment responses under test pressure will be obtained using the same analytical models, computer programs, and analysis procedures that are used in the containment design so the adequacy of all analytical results is confirmed by the test.

The liner plate is not permitted to be used as a strength element in designing the containment to resist accident pressure or earthquake loads. However, during the SIT, the liner plate is in tension and is considered in the prediction of response.

Acceptance limits will be developed based on the analytical predictions for each pressurization increment to permit a judgment as to whether the test may proceed safely to the next increment of increased pressure.

3.8.1.7.1.3 Acceptance Criteria

a. Overall structure exhibits elastic behavior.

b. No visible signs of permanent damage to either the concrete structure or the steel liner are detected.

c. Residual displacements at the points of maximum predicted radial and vertical displacement at the completion of depressurization or up to 24 hours later do not exceed 20 percent of measured or predicted displacement at maximum test pressure, whichever is greater, plus 0.25 mm (0.01 in.) plus measurement tolerance. The above criteria are applied to the average of radial displacements measured at the same elevation.

d. When the measured displacements at the points of maximum predicted radial and vertical displacement do not exceed the measurement tolerance plus 30 percent of the measured or predicted displacement at the maximum test pressure, the above criteria are applied to the average of radial displacements measured at the same elevation. This criterion may be waived if the residual displacements within 24 hours are not greater than 10 percent.

Test results and conclusions will be documented in a separate report.

3.8.1.7.2 Inservice Surveillance

3.8.1.7.2.1 General Requirements

During the plant life, the in-service inspection of the containment is performed in accordance with the requirements of the ASME Section XI, IWL (Reference 4), NRC RG 1.35.1, and 10 CFR 50.55a. The inservice inspection includes a visual examination of the concrete exterior surface for cracking, spalling, or grease leakage; a visual inspection of the tendon anchorage assembly of sampled tendons; a tendon lift-off test to discover damaged or broken tendon wires and to provide reasonable assurance of an acceptable prestress level during the plant life.

The visual examination is performed for accessible areas in accordance with IWL-2510 of ASME, Section XI. When conditions exist in accessible areas that could indicated the presence of, or result in, degradation to inaccessible areas, the acceptability of inaccessible areas will be evaluated to meet the requirements of 10 CFR 50.55a.

The examination of the post-tensioning system, including sample selection, tendon force and elongation measurements, and examination of anchorage areas meets the requirements of IWL-2520 of ASME, Section XI.

The containment is designed to allow access to the post-tensioning systems during in-service inspections.

The containment leakage tests comply with 10 CFR Part 50, Appendix J and are performed in accordance with NEI 94-01 and ANSI/ANS 56.8. Type A, B, and C tests are described in Section 6.2.6.

3.8.1.7.2.2 Prediction of Minimum Lift-off Forces

The prediction of the minimum tendon lift-off forces is made prior to in-service inspection.

The prediction of tendon lift-off forces is determined based on the estimated prestress losses at the time of test. As a minimum, the following sources of prestress loss are considered:

a. Elastic shortening taking into consideration the sequence of stressing of the tendon

b. Creep and shrinkage of concrete

c. Stress relaxation in tendon

d. Reduction of wire cross section due to corrosion, if any

e. Ineffective wires (e.g., broken, unseated) documented during initial stressing

The procedures and formulations presented in NRC RG 1.35.1 are used to establish the upper bound and lower bound of prestress losses at the time of test.

3.8.1.7.2.3 Acceptance Criteria

The acceptance criteria for the in-service inspections are as specified in ASME Section XI, IWL-3000.

Items with examination results that do not meet the acceptance standards are evaluated to determine:

a. Causes of the condition

b. Acceptability of the containment without repair

c. Whether or not repair is required, and if required, the extent, method, and completion date for the repair

3.8.2 Steel Containment

The APR1400 does not use a steel containment.

This subsection pertains to ASME Class MC components that are part of the containment described in Subsection 3.8.1. ASME Class MC components include the equipment hatch, personnel airlocks, piping and electrical penetrations, and fuel transfer tube sleeve and bellows.

3.8.2.1 Description of Containment

3.8.2.1.1 Equipment Hatch

The equipment hatch consists of a dished head door, matching barrel frame with anchorage, and the lifting equipment that operate the hatch door as shown in Figure 3.8-13. The clear opening of the equipment hatch has an inside diameter of 7.92 m (26 ft). The hatch is located at centerline elevation of 167 ft 6 in.

The equipment hatch is provided for access to the interior of the reactor containment building during shutdown. The transfer of equipment through the containment wall is accomplished through this hatch. The equipment hatch will be a round barrel frame with a dished head access hatch. The dished head can be fully removed with a lifting bracket located near the center of gravity of the entire removable assembly.

3.8.2.1.2 Personnel Airlocks

A typical personnel airlock is shown in Figure 3.8-14. Two personnel airlocks are provided. Each personnel airlock has an inside diameter of 3.05 m (10 ft) to accommodate a door that is 1.07 m (3 ft 6 in.) wide and 2.03 m (6 ft 8 in.) high.

Personnel airlocks consist of doors with two gaskets in series, which are mechanically interlocked so that one door cannot be opened unless the second door is closed and sealed.

If needed, the mechanical interlock can be overridden by use of a special procedure provided. The doors operate manually. Either door is operated from inside the reactor containment building, inside the access hatch, or outside the reactor containment building. Each door is equipped with a valve for equalizing pressure on both sides of the door before the door can be operated.

Valves are operated at the same location where the associated door can be operated. The valves are interlocked so that only one valve can be operated at a time and only when the opposite door is closed and sealed. Indicators are located on the outside of the access hatch at each door to show whether the opposite door and its valves open or close. The access hatch pressure can be tested any time without interference in the normal operation of the plant. Provisions are made for continuous leak testing of the door seals on both doors.

3.8.2.1.3 Penetrations

Penetrations are provided in the containment wall to:

a. Extend process piping and electrical conductors through the containment wall

b. Provide reasonable assurance of the integrity of the containment

c. Act as supports for the process pipelines

3.8.2.1.3.1 Penetration Types

Penetrations consist of two major types:

a. Process pipe penetrations

b. Electrical penetrations

3.8.2.1.3.1.1 Process Pipe Penetrations

Process pipe penetrations include instrumentation, HVAC, and mechanical piping penetrations. A typical penetration assembly consists of some or all of the following components:

a. Sleeve embedded in concrete wall

b. Sleeve anchors

c. Head fitting

d. Penetration seals (air, water, and radiation)

The process pipe penetrations used are the three types shown in Figure 3.8-8.

Determination of penetration types is made during design process based upon the magnitude of applicable loads and the in-service inspection requirements.

3.8.2.1.3.1.2 Electrical Penetrations

Electrical penetration assemblies are used to extend electrical conductors through the pressure boundary of the reactor containment building. Electrical penetrations are functionally grouped into medium-voltage power, low-voltage power, low-voltage control, and instrument cable penetration assemblies. Figure 3.8-9 shows a typical electric penetration assembly in place within the containment wall. An assembly is sized to be inserted into sleeves in the containment wall.

3.8.2.1.3.2 Component Classification

The portions of the penetration sleeves not backed by concrete are designed as a class MC component in accordance with ASME Section III, Division 1, NE. The portions of the penetration sleeves backed by concrete are designed to meet the requirement of ASME Section III, CC-3700 and CC-3800.

All penetration head fittings (penetration Type 1 of Figure 3.8-8) are classified as piping components and, as such, they have the same classification as the process pipe and are designed in accordance with ASME Section III, Division 1, NB, NC, or ND as applicable. The other head fittings are designed as ASME Class MC components.

3.8.2.1.4 Fuel Transfer Tube Sleeve and Bellows

Nuclear fuel is supplied into the reactor containment building and spent fuel is taken out through the fuel transfer tube penetration. The fuel transfer tube sleeve connects the refueling pool in the reactor containment building and the spent fuel pool in the auxiliary building. The sleeve wraps around the fuel transfer tube and the bellows are installed in case of differential movement of the two buildings. The bellows are welded to the penetration sleeve after installation of the transfer tube. The sleeve and bellows are made of stainless steel. Conceptual fuel transfer tube sleeve and bellows are shown in Figure 3.8-25.

3.8.2.2 Applicable Codes, Standards, and Specifications

The following regulations, codes, standards, and specifications are used in the design of the class MC components.

3.8.2.2.1 Design Codes, Standards, Specifications, and Regulations

The design codes, standards, specifications, and regulations are listed in Table 3.8-1. The primary design code for class MC components is ASME Section III, Division 1, NE (Reference 2).

3.8.2.2.2 NRC Regulatory Guides

Conformance to each NRC Regulatory Guide is described in Section 1.9. NRC RG 1.7 (Reference 7) and NRC RG 1.57 (Reference 21) are applicable to the design of the ASME Class MC components.

3.8.2.2.3 Industry Standards

Nationally recognized industry standards, such as those published by ASTM, are used whenever possible to describe material properties, testing procedures, and fabrication and construction methods.

3.8.2.3 Loads and Load Combinations

The loads and load combinations for class MC components are given in Table 3.8-3. These loads and their combinations conform with ASME Section III, Division 1, NE 3000.

The terms of design loads are defined in Subsection 3.8.1.3.

3.8.2.3.1 Loads for Instrument and Process Pipe Penetrations

The forces and moments imposed at the piping penetration assembly boundaries are due to the following:

a. Internal and external operating and design pressures and temperatures

b. Process pipe reactions due to (as applicable):

1) Weight

2) Safe shutdown earthquake (SSE)

3) Thermal expansion

4) Relative dynamic displacements

5) Fluid dynamics (e.g., pressure, temperature, and hydraulic transients; main steam safety valves)

6) Pipe rupture and jet impingement

c. Severe accident load due to (as applicable):

1) Pressure load generated from 100 percent fuel clad metal-water reaction

2) Pressure loads generated by hydrogen burning

3.8.2.3.2 Load Combinations for Instrument and Process Piping Penetrations

The instrument and process piping penetration assemblies are composed of pipe components and/or MC components. The load combinations for each component of the penetration assemblies are defined to conform to the Code requirements relevant to the applicable Code for each component. Load combinations for ASME Class MC components, such as sleeves and head fittings (penetration Type 2 & 3 of Figure 3.8-8) are given in Table 3.8-3. Load combinations for penetration head fittings of Type 1 from Figure 3.8-8 are given is Table 3.12-1 or Table 3.12-2.

3.8.2.4 Design and Analysis Procedures

3.8.2.4.1 Equipment Hatch, Personnel Airlocks, and Electrical Penetrations

The equipment hatch, personnel airlocks, and electrical penetrations are designed as pressure-retaining components. The portions of the sleeves not backed by concrete are analyzed and designed according to the provisions of ASME Section III, Division 1, NE 3000.

The equipment hatch, personnel airlocks, and electrical penetrations are vendor designed components. The COL applicant is to provide detailed analysis and design procedure for the equipment hatch, personnel airlocks, and electrical penetrations (COL 3.8(3)). The major design aspects and criteria for the equipment hatch and personnel airlocks are as follows.

The equipment hatch design consists of a flanged cover bolted to a matching flanged cylindrical sleeve embedded into the reactor containment building. The equipment hatch closure head and sleeve shall be evaluated for design and service conditions in accordance with the requirements of NE 3000. The closure head spherical shell thickness shall be adequate for the design pressure in accordance with the rules of NE 3133.4. The head flange and sleeve flange shall meet the rules of NE 3326.2 and Appendix XI 3260. The swing bolts shall provide adequate bolt area for all preload, design and service conditions.

The personnel airlock design consists of a cylindrical shell having a bulkhead and pressure retaining door at each end. The personnel airlock pressure retaining components shall be evaluated for design and service conditions in accordance with the requirements of NE 3000. The airlock door plate thickness and stiffeners, and the bulkhead plate and stiffeners shall be adequate for the design condition in accordance with the stress limits of NE 3221. The airlock shell thickness shall meet the requirements of NE 3133 and NE 3324 for the external and internal pressure conditions.

3.8.2.4.2 Process Piping Penetrations

The entire penetration assembly including the sleeve, head fitting, and attached portion of pipe is designed for the loads described in Subsections 3.8.2.3.1 and 3.8.2.3.2 by the finite element computer program ANSYS. The penetration assemblies provide for process piping to pass through the containment structure or other building walls or floors.

Each penetration assembly may consist of the following components.

a. Portion of the process or instrument piping.

b. The penetration sleeve, which encloses the process piping and which is embedded and anchored in the wall or floor.

c. The head fitting (forged flued head or flat plate ring), which is welded to both the process pipe and the penetration sleeve. A typical piping penetration assembly configuration is shown in Figure 3.8-8.

Finite element analysis programs for the axisymmetric structural analysis for the stress analysis of the piping penetration assembly are used. The model will generate an automatic mesh, and imposed load and thermal condition are input to the model to perform FEM structural analysis. The pipe outside diameter, pipe wall thickness, sleeve outer diameter, sleeve wall thickness, head fitting thickness, and insulation thickness are considered in the analysis model.

Boundary conditions can be classified into three categories for the performance of the stress analysis of the piping penetration assembly; 1) stress boundary at the penetration assembly section connected to pipe where the stress distribution is applied corresponding to its location against imposed force, 2) inner surface of the pipe and sleeve where pressure is acting normal to the surface, and therefore stresses normal to the surfaces are applied as pressure for the boundary condition, and 3) fixed point at the concrete wall.

The forces and moments imposed at the penetration assembly boundaries are due to the following:

a. Internal and external operating and design pressures and temperature

b. Process pipe reactions due to (as applicable):

   1) Weight

   2) Safe shutdown earthquake (SSE)

   3) Thermal expansion and relative dynamic displacements

   4) Hydraulic transients and other non-seismic dynamic loads

   5) Pipe rupture and jet impingement

c. Maximum reactor containment building pressure during severe accidents

The penetration assemblies are required to meet the stress limits under the worst loading combinations for testing, design, and Service Conditions for Level A, B, C, and D service limit in accordance with the requirements and provisions of ASME Code Section III.

Loading combinations are formulated in a way that will assure the highest resultant stress. For the sleeve anchors, the types of loads applicable for each condition will be as stated in Table CC-3230-1 of ASME Section III, Division 2. For the ASME Class MC components, the applicable loads for each condition are as listed below and Table 3.8-3

a. Testing Condition: Test pressure and temperature plus dead load and live load

b. Design Condition: These include all design loadings for which the containment vessel or portions thereof might be designed during the expected life of the plant. Such loads include design pressure, design temperature, and the design mechanical loads generated by the design-basis LOCA (as applicable).

c. Service Condition for Level A and B service limits: These service limits are applicable to the service loadings to which the containment is subjected, including the plant or system design basis accident conditions for which the containment function is required. The additional loads resulting from natural phenomena during which the plant must remain operational for Level B service limits.

    1) For Expansion Stress Evaluation: Loads due to operating temperature, thermal expansion and relative dynamic displacements

    2) For Primary-plus-Secondary Stress Evaluation: Pressure, temperature, and reaction load, plus mechanical loads due to: dead load, live load, thermal expansion and relative dynamic displacements, hydraulic transients such as actuation of SRV discharge and subsequent hydrodynamic reaction loads, OBE, and LOCA, as applicable

d. Service Condition for Level C service limits: These service limits include the loads subject to Level A service limits plus the additional loads resulting from natural phenomena for which safe shutdown of the plant is required.

    Pressure, temperature, and reaction load, plus loads due to: dead load, live load, thermal expansion, hydraulic transients such as actuation of SRV discharge and subsequent hydrodynamic reaction loads, SSE, and LOCA, pressure resulting from hydrogen release are applied as applicable.

e. Service Condition for Level D service limits: These service limits include other applicable service limits and loadings of a local dynamic nature for which the containment function is required.

   1) Pressure, temperature, and reaction load, plus loads due to: dead load, live load, thermal expansion, hydraulic transients such as actuation of SRV discharge and subsequent hydrodynamic reaction loads, SSE, and LOCA, pipe rupture and jet impingement are applied as applicable.

   2) Maximum operating pressure applied in the annulus between the process pipe and the penetration sleeve for process piping penetration assembly

f. Post-flooding Condition: This includes the post-LOCA flooding of the containment in combination with OBE-basis earthquake

g Fatigue evaluation: For the metal fatigue evaluation, pressure- and load-range combinations must be formed in a way that will assure cyclic stress optimization. For the formation of these load-range combinations the loads listed in Subsection above c) 2 will be used. Contribution from thermal transients will also be considered. With the exception of the pressure and temperature values, the numerical values of the load components for each penetration assembly are obtained from appropriate stress analysis reports for the corresponding piping systems. Fatigue evaluation for MC component is performed in accordance with NE-3221.5 of the ASME Section III, Division 1.

The mechanical forces and moments are applied to the penetration assembly at each boundary. In addition to the mechanical loads, loads due to the design and operating pressure within the pipe penetration annulus are applied. The loads and their combination methods are specified in the project unique penetration specification. These loads consist of the design and operating pressure, weight, earthquake, hydraulic transients, SRV, condensation oscillation, chugging, thermal expansion, and relative seismic displacements. Stress optimization is achieved by analyzing the penetration for the worst load combination for each loading condition (i.e., Design, Level A and B service limit, and Level C and D service limit).

It is required that the penetration assemblies be analyzed for the various design and operating component conditions, and that the resulting stresses be within the specified allowable limits. The allowable stress limits associated with each service load category are as stated below and Table 3.8-3.

a. Stress Limits for Process Piping: In accordance with the Piping System Design Specification

b. Stress Limits for Penetration Sleeve Anchors: In accordance with Division 2 of the ASME Section III.

c. Stress Limits for Penetration Sleeves and Head Fittings: For MC penetration sleeves and head fittings the allowable stress limits shall be as specified in NE-3200 of the ASME Section III, Division 1, for Class MC components.

3.8.2.4.3 Fuel Transfer Tube Sleeve and Bellows

The fuel transfer tube penetration assembly is supplied by a vendor. The COL applicant is to provide detailed analysis and design procedure for the transfer tube penetration assembly (COL 3.8(4)). The fuel transfer tube sleeve and bellows shall be designed as Class MC components in accordance with ASME Section III, Division 1, NE.

3.8.2.5 Structural Acceptance Criteria

3.8.2.5.1 Equipment Hatch, Personnel Airlocks, and Electrical Penetrations

The equipment hatch, personnel airlocks, and electrical penetrations are designed as Class MC components according to ASME Section III, Division 1, NE.

Stress intensities for MC components other than bolts are limited to the values defined by ASME Section III, Division 1, NE-3221. Buckling stresses are limited to the values defined by ASME Section III, Division 1, NE-3222, while primary, secondary, and peak stresses are defined by ASME Section III, Division 1, NE-3213. Stress limits for bolts and allowable stress for test is in accordance with ASME Section III, Division 1, NE-3230 and NE-3226, respectively. The thickness of components under external loading is determined in accordance with the rules defined by ASME Section III, Division 1, NE-3133. Load combinations and their corresponding service levels to determine the appropriate stress limits are given in Table 3.8-3.

3.8.2.5.2 Process Piping Penetration Assemblies

The process piping penetrations are designed in accordance with ASME Section III, Division 1, NE.

Stress intensities are limited to the values defined by ASME Section III, Division 1, NE-3220. Load combinations and their corresponding service levels to determine the appropriate stress limits are given in Table 3.8-3.

3.8.2.5.3 Fuel Transfer Tube Sleeve and Bellows

The fuel transfer tube penetration sleeve and bellows are designed as class MC components in accordance with ASME Section III, Division 1, NE.

Stress intensities for the penetration sleeve are limited to the values defined by ASME Section III, Division 1, NE-3211. The fuel transfer tube sleeve shall be evaluated for the worst combination of design load, as applicable. Under the loading condition, the sleeve shall meet all applicable stress requirements set forth in ASME Section III, Division 1, NE-3221. The thickness of the sleeve shall be evaluated for design pressure in accordance with ASME Section III, Division 1, NE-3324.3. For the sleeve bellows, the requirements of NE 3366 shall be met for the expansion joint assembly.

3.8.2.6 Materials, Quality Control, and Special Construction Techniques

The materials conform with the requirements of ASME Section III, Division 1, NE-2000 and physical properties for the materials are shown in Table 3.8-4.

The testing of the containment building leak-tight boundaries not backed by concrete is in accordance with ASME Section III, Division 1, NE.

All welds between the penetration and head fitting and between the penetration reinforcing plate and frames for airlocks and access openings are examined radiographically.

All welds in bellows-type expansion joints in penetration assemblies or appurtenances to the containment vessel are examined either by magnetic particle examination for ferrite material or by liquid penetrant examination for austenitic material.

The qualifications of welders and welding procedures are in accordance with ASME Section III, Division 1, NE-4300.

The physical properties of these materials are listed in Table 3.8-4. The penetration components mentioned in Subsection 3.8.1.6 fully conform with the materials specified in ASME Section III, Division 1, NE-2000.

The fabrication and installation requirements of ASME Section III, Division 1, NE-4000, and the provisions of ASME Section III, Division 1, NE-5000 and NE-6000, dealing with examination and testing of components are to be met. Standard construction techniques are used in the fabrication and erection of ASME Class MC components.

3.8.2.7 Testing and Inservice Inspection Requirements

3.8.2.7.1 Structural Acceptance and Initial Leak Rate Tests

All MC components are tested for their structural acceptance and leak rate at the same time of the containment tests described in Subsection 3.8.1.7.

Leak rate tests are performed on all hatches by pressurizing the plenum between the double gaskets. In addition, the personnel airlock will be shop tested according to the following procedure:

a. Pressure tests are performed for hatches in accordance with criteria specified in ASME Section III, Division 1, NE-6000.

b. Initial leak rate test: hatches are tested at a peak pressure. Leakage does not exceed the design limit of the volume of the airlock in 24 hours.

3.8.2.7.2 Inservice Inspection

MC components are tested in accordance with ASME Section III, Division 1, NE-6000.

Inservice inspections of the MC components follow the requirements of ASME Section XI, IWE, with the additional requirements of 10 CFR 50.55a. The visual examination is performed for accessible areas in accordance with IWE-2310 of ASME, Section XI. When conditions exist in accessible areas that could indicate the presence of or the result in degradation to inaccessible areas, the acceptability of inaccessible areas will be evaluated to meet the requirements of 10 CFR 50.55a. The inservice inspection summary report as required by IWA-6000 is to include the evaluation results for inaccessible areas identified for evaluation. The containment leakage tests comply with 10 CFR Part 50, Appendix J and are performed in accordance with NEI 94-01 and ANSI/ANS 56.8. Subsection 6.2.6 describes leak-rate testing of the containment system and associated acceptance criteria.

3.8.3 Concrete and Steel Internal Structures of Steel or Concrete Containment

3.8.3.1 Description of the Internal Structures

The internal structure is a group of reinforced concrete structures that enclose the reactor vessel and primary system. The internal structure provides biological shielding for the containment interior. A description of various structures that constitute the internal structure is given in the following paragraphs. The details of the internal structure are shown in Figures 1.2-2 through 1.2-8.

The internal structures are seismic Category I structures with the exception of platforms that do not support seismic Category I equipment and miscellaneous steel.

Platforms that do not support seismic Category I equipment and miscellaneous steel are seismic Category II structures. Seismic Category II structures are designed for the SSE using seismic Category I criteria to prevent adverse interaction with other seismic Category I structures, systems, and components.

The containment internal structures are connected with the containment basemat by mechanical splices. The reinforcing bar of the internal structures is anchored into the foundation by the use of mechanical splices welded to both sides of a thickened liner plate. The layout of the connections between the internal structures and the foundation is shown in Figures 3.8A-16 and 3.8A-17. And Figure 3.8-7 (3 of 3) provides a typical connection detail.

The internal structures located in the reactor containment building consist of the following major components:

a. Reactor support system

b. Steam generator support system

c. Reactor coolant pump support system

d. Pressurizer support system

e. Primary shield wall (PSW) and reactor cavity

f. Secondary shield wall (SSW)

g. Refueling pool

h. In-containment refueling water storage tank (IRWST)

i. Holdup volume tank

j. Operating and intermediate floors

k. Interior concrete fill slab

l. Polar crane supports

3.8.3.1.1 Reactor Support System

The reactor vessel is supported by four columns under the cold leg nozzles (elevation 35.76 m (117 ft 4 in.)), as described in Subsection 5.4.15.2, which interface with anchor bolts embedded in the primary shield wall. Lateral supports are provided for the reactor vessel to resist horizontal loads. The lateral supports transmit the loads to the reactor cavity wall, which houses the reactor. In addition, shear keys at the lower part of the reactor vessel fit into the keyways located in the base plate (elevation 28.74 m (94 ft 3.5 in.)) of the column supports. The keyways, which are described in Subsection 5.4.15.2, transmit the horizontal loads to the cavity wall through shear bars attached to the bottom of the base plate. Both the lateral supports and shear keys are designed to allow movement that is the result of thermal growth of the reactor vessel in the radial and vertical directions. Reactor vessel supports are shown in Figure 3.8-15. Subsection 5.4.15 provides further information on the design of the reactor vessel support structure.

3.8.3.1.2 Steam Generator Supports

The steam generator is supported at the bottom by a sliding base bolted to an integrally attached conical skirt at elevation 34.53 m (113 ft 3.34 in.). The sliding base rests on low-friction spherical head bearings at elevation 34.21 m (112 ft 2.68 in.), which allows unrestrained thermal expansion of the reactor coolant system. Two keyways in the sliding base mate with keys in a forged plate installed on the concrete pedestal by anchor bolts to guide the movement of the steam generator during expansion and contraction of the reactor coolant system and to limit movement of the bottom of the steam generator during seismic, IRWST discharge, and BLPB events. Keys and snubbers on the steam drum guide the top of the steam generator at centerline elevations 51.672 m (169 ft 6.35 in.) and 48.399 m (158 ft 9.48 in.), respectively, during expansion and contraction of the reactor coolant system and provide support during seismic, IRWST discharge, and BLPB events. Typical steam generator supports are shown in Figure 3.8-16. Subsection 5.4.15 provides further information on the design of the steam generator support structures.

3.8.3.1.3 Reactor Coolant Pump Support System

Reactor coolant pump supports consist of four vertical columns at elevation 31.33 m (102 ft 9.5 in.), two horizontal snubbers, two upper horizontal columns at elevation 40.05 m (131 ft 4.75 in.), and two lower horizontal columns at elevation 34.82 m (114 ft 2.75 in.). These rigid structural columns provide support for the pumps during normal operation, earthquake conditions, IRWST discharge, and BLPB. Each column, horizontal and vertical, and the snubber end in a drilled clevis to accept anchor bolts. Support loads are transmitted to the concrete structures by anchor bolts. Typical reactor coolant pump supports are shown in Figure 3.8-17. Subsection 5.4.15 provides further information on the design of the reactor coolant pump support structures.

3.8.3.1.4 Pressurizer Support System

The pressurizer is supported by a cylindrical skirt as shown in Figure 3.8-18. This skirt is welded to the pressurizer and is anchored to the concrete slab at elevation 41.71 m (136 ft 10.25 in.). The skirt is designed to withstand deadweight and normal operating loads as well as the loads due to earthquakes, pressurizer POSRV actuation, IRWST discharge, and BLPB events. Support loads are transmitted to the concrete slab through the skirt flange and anchor bolts. Four keys welded to the upper shell of the pressurizer at elevation 54.52 m (178 ft 10.38 in.) provide an additional restraint for earthquake, pressurizer POSRV actuation, and BLPB conditions. Four keys in the pressurizer mate with keyways that are installed in the secondary shield wall by anchor bolts as shown in Figure 3.8-18. Subsection 5.4.15 provides further information on the design of the pressurizer support structures.

3.8.3.1.5 Primary Shield Wall and Reactor Cavity

The primary shield wall is a heavily reinforced concrete structure that houses the reactor vessel, provides the primary radiation shielding, and provides protection for the reactor vessel from internal missiles. It is anchored to the containment basemat through the use of mechanical splices welded to both sides of the thickened liner plate. The massive primary shield walls provide a support for the refueling canal walls above the reactor cavity. In plan, the primary shield walls form a monolithic ring, housing the reactor vessel. Penetrations in the primary shield wall are provided for the primary loop. The primary shield wall is designed to withstand the temperatures and pressures following a LOCA. The primary shield wall is a minimum of 2.01 m (6 ft 7 in.) thick.

3.8.3.1.6 Secondary Shield Wall

The secondary shield wall is a reinforced concrete structure surrounding steam generators, reactor coolant pumps, and pressurizer. The secondary shield wall protects the reactor containment building from internal missiles. In addition to providing a biological shield for the coolant loop and equipment, the secondary shield wall also provides structural support for pipe supports/restraints and platforms at various levels. The secondary shield wall is a right cylinder with an inside diameter of 29.87 m (98 ft) and a height of 34.44 m (113 ft) from its base. The secondary shield wall is a minimum of 1.22 m (4 ft) thick.

The secondary shield wall is anchored into the basemat by mechanical splices welded to both sides of the thickened liner plate.

3.8.3.1.7 Refueling Pool

The refueling pool filled with borated water facilitates the fuel handling operation without exceeding the acceptable level of radiation inside the reactor containment building. The inside of refueling pool is lined with a stainless steel liner plate. The refueling pool has the following subcompartments:

a. Upper guide structure laydown area

b. Core support barrel laydown area

c. Refueling area

The refueling pool filled with borated water forms a pool above the reactor vessel. The reactor vessel flange is sealed to the bottom of the refueling pool to prevent leakage of refueling water into the reactor cavity as described in Subsection 9.1.4.2.1.11. The fuel transfer tube connects the refueling pool to the refueling canal. The refueling pool is filled with borated water to a depth that limits the radiation at the surface of the water to acceptable levels during the period when a fuel assembly is being transferred to the spent fuel pool. The shield walls that form the refueling pool are a minimum of 1.22 m (4 ft) thick.

The bottom of the refueling pool varies in elevation from 106 ft 6.375 in to 130 ft. The top of the refueling pool wall elevation is 156 ft. The bottom and wall inside of refueling pool are lined with 5 mm (3/8 in.) thick stainless steel plate.

3.8.3.1.8 In-Containment Refueling Water Storage Tank

The in-containment refueling water storage tank (IRWST) provides storage of refueling water, a single source of water for the safety injection and containment spray pumps, and a heat sink for discharges from the POSRVs and the reactor coolant gas vent system (RCGVS). The IRWST is annular and uses the lower section of the internal structure as its outer boundary. The IRWST is lined with a stainless steel liner plate to prevent leakage. The leak chase channels are seal welded to the back of the liner plate to control the potential leakage of borated water from the IRWST. The design features of the leak chase channel collection pipe drain system are described in Subsection 9.3.3.2.6. The IRWST consists of the top and bottom slab and the exterior wall. The bottom slab of IRWST rests on the reactor containment building basemat, and the top and bottom slabs are rigidly connected to the secondary shield wall. The IRWST is separated from the containment wall by a gap of 50 mm (2 in). The design of the IRWST considers pressurization as a result of the reactor containment building systems design basis accident. Refer to Section 6.8 for a description of the IRWST.

3.8.3.1.9 Holdup Volume Tank

The holdup volume tank (HVT) is a rectangular structural tank located between the primary shield wall and the IRWST inner wall. A screen is provided at the top of the HVT to prevent debris from getting into the tank. The HVT has a sump with pumps to measure the leakage rate and route the liquid to the liquid waste management system. During an accident, the water from breaks and the reactor containment building spray is collected in the HVT and overflows into the IRWST. Refer to Section 6.8 for a description of the HVT.

3.8.3.1.10 Operating and Intermediate Floors

The operating floor provides access for operating personnel functions and biological shielding. Intermediate floors provide access to equipment and components. The operating floor is located at elevation 156 ft 0 in, and intermediate floors are located at elevations 114 ft 0 in and 136 ft 6 in. These floors consist of reinforced concrete or steel grating supported by structural steel framing that spans between the containment wall and the secondary shield wall. The steel framing has a horizontally sliding connection at the containment wall side to allow axial displacement of framing due to seismic displacement and thermal expansion. Openings are provided in the floor for equipment removal.

3.8.3.1.11 Interior Concrete Fill Slab

The interior concrete fill slab is located on the surface of liner plate of the reactor containment building basemat for protection of pressure boundary structures.

3.8.3.1.12 Polar Crane Supports

A large capacity of polar crane is supported by brackets installed in the containment shell, and the bracket is a steel structure consisting of cantilever beam.

3.8.3.2 Applicable Codes, Standards, and Specifications

The following codes, standards, and specifications are applied to the design of internal concrete and steel structures.

3.8.3.2.1 Design Codes and Standards

The design codes, standards, and regulations are listed in Table 3.8-1. The primary design code for concrete internal structure is ACI 349 (Reference 41) and ANSI/AISC N690 (Reference 42).

3.8.3.2.2 NRC Regulatory Guides

Conformance to each NRC RG is described in Section 1.9. The NRC RGs applicable to the design of the concrete and steel structures are 1.60, 1.61, 1.92, 1.122, 1.142, 1.199 (References 22 through 27), 1.69 (Reference 29), and 1.160 (Reference 43).

3.8.3.2.3 Industry Standards

Nationally recognized industry standards, such as those published by ASTM, will be used whenever possible to describe material properties, testing procedures, and fabrications and construction methods.

3.8.3.3 Loads and Load Combinations

The loads and load combinations for the CIS are obtained from Subsection 3.8.4.3.

The internal structures are designed for the following loads:

a. Dead load

b. Equipment operating loads and other live loads

c. Pipe break reactions

d. Seismic load (including 5% Accidental torsion)

e. Internal missiles (The internal structure is designed to withstand internal missiles, as described in Section 3.5. This includes pipe break missile.)

f. Pipe rupture jet impingement

g. Compartment accident pressure

h. The greatest pipe rupture loads from (1) pipe breaks not eliminated by leak-before-break, (2) the largest through-wall leakage crack in a high-energy line (minimum 37.9 L/min (10 gpm)), whether or not consideration of dynamic effects is eliminated by leak-before-break for the line, or (3) the largest leak from another leak source, such as a valve or pump seal.

i. Operating and accident temperatures

j. Hydrostatic and Hydrodynamic loads (POSRV load for IRWST)

k. Pipe, cable tray, duct, and ties

l. Pipe accident reaction

Miscellaneous loads (M_o, M_a), wind loads (W), precipitation loads (H, H_s), and tornado loads (W_t) of the loads in DCD Table 3.8-7A do not affect the design of the containment internal structures (CIS) because the CIS is protected by the concrete containment and there is no column, transformer, belt, etc. Therefore, these loads are not applied to the design of the CIS. There is no large crane supported by the CIS. Jip cranes are evaluated in the local affected area.

Reactions of pipe, cable tray and duct (R_o) and pipe accident reactions (R_a) are evaluated in local affected area after the load informations are provided from the responsible design group and/or the supplier.

Flooding loads (Y_f) are not applied because it is offset by acting equally on both sides of the CIS. During operation, there is little to no pressure (P_o) acting on the CIS.

Seismic Category I concrete structures are designed for impulsive and impactive loads in accordance with the ACI 349 Code, and special provisions of Appendix C of the same code, with exceptions given in NRC RG 1.142. Impactive and impulsive loads are considered concurrent with seismic and other loads (i.e., dead and live loads) in determining the load resistance of structural elements.

Subcompartment pressure loads are the result of postulated high-energy pipe ruptures. In determining an appropriate equivalent static load for Y_r, Y_j, and Y_m, elasto-plastic behavior is acceptable with appropriate ductility ratios, provided excessive deflections do not result in loss of function of any safety-related system.

3.8.3.4 Design and Analysis Procedures

3.8.3.4.1 Analysis Procedure

The internal structure is designed for the loads and loading combinations specified in Subsection 3.8.3.3. The internal reinforced concrete structure including the reactor coolant system (RCS) is modeled with eight-node solid elements, three-node or four-node shell elements, and two-node beam elements using the ANSYS computer program. The design loads for analysis of internal structures are classified dead load, live load, hydrostatic and dynamic loads, temperature load, accident pressure load, pipe break load, and seismic load.

Dead loads include the self-weight of the PSW, SSW, IRWST, and fill concrete; equipment; and intermediate steel floor framing. Large equipment loads (e.g., reactor drain tank, letdown/regenerative heat exchanger, safety injection tank, recirculation fan) are treated as dead loads. In addition, potential loads during construction or operating periods are treated as live loads.

The vertical and lateral pressures of liquids inside containment are treated as dead loads. Structures supporting fluid loads during normal operation and accident conditions are designed for the hydrostatic as well as hydrodynamic loads.

The thermal stress analysis is carried out by inputting the normal operating thermal load into the corresponding FEM of internal structure. During the thermal analysis, the equivalent uniform temperature gradient is input directly in the ANSYS model at the appropriate nodes. In the containment internal structure, the equivalent linear temperature profile for normal operating conditions is more severe than those of the accident conditions since the temperature difference between the inside and the outside surface of the containment internal structure during accident conditions is negligibly small. Therefore, the normal operating thermal load is conservatively applied for design of internal structures in case of normal operating and accident conditions.

The compartment pressures on internal structures are the result of a pipe break inside containment. In addition, branch line pipe break (BLPB) loads are dynamic reactions caused by the combined effects of branch line nozzle reactions or thrust due to pipe break, jet impingement on RCS equipment, or subcompartment pressure effects on RCS equipment. These loads are applied to the ANSYS model with pressure and concentrated loads.

Response spectrum analysis is performed for the two horizontal and one vertical seismic load directions using the methodology described in Subsection 3.7.2.

Regarding the analysis of subelements, the concrete slabs at elevations 114'-0", 136'-6", and 156'-0" between secondary shield wall and containment wall are analyzed using the FE (Finite Element) analysis program GTSTRUDL. A separate analysis model simulating each floor level is prepared and evaluated for each specified design load condition. To incorporate the proper seismic load on each slab, the response spectrum analyses are performed using the FRS which envelope containment shell side and secondary shield wall side at each elevation. In addition, the seismic anchor movement is considered in the seismic design case for concrete slabs.

3.8.3.4.2 Structural Design

The forces and moments resulting from the applied static and dynamic loads are used to design the walls, slabs, beams, and columns that make up the internal structure. The design and reinforcement are performed using ACI 349 or AISC N690 described in Subsection 3.8.4.4.

The walls and floors of internal structure are provided with anchor bolts for the mounting or attachment of RCS equipment. The jurisdictional boundary between supports and the building structure is defined by ASME Section III, Division 1, NF. According to the jurisdictional boundary of ASME Code, the component support and building structure is designed in accordance with ASME Section III, Division 1, NF and ACI 349 or ANSI/AISC N690, respectively. The anchorage for equipment supports to internal structure wall is provided in accordance with the requirements of ACI 349, Appendix B and NRC RG 1.199 described in Subsection 3.8.4.4.2.1. The details of the anchorage for RCS equipment are shown in Figures 3.8-19 through 3.8-22.

The design and analysis details for internal structures including critical sections are discussed in Subsection 3.8A.1.4.3.

3.8.3.4.3 Design Summary Report

A design summary report is prepared in Appendix 3.8A where the design of the representative critical sections of the structures is described.

The evaluation considering the deviations of as-procured or as-built construction to the design will be performed with the acceptance criteria described in Subsection 3.8.3.5.

3.8.3.5 Structural Acceptance Criteria

The structural acceptance criteria for the internal structures are outlined in Subsection 3.8.4.5.

3.8.3.6 Materials, Quality Control, and Special Construction Techniques

3.8.3.6.1 Concrete Internal Structures

Materials, quality control, special construction techniques, and tolerances for the concrete internal structures are outlined in Subsection 3.8.4.6. The compressive strength of concrete is 6,000 psi at 91 days.

3.8.3.6.2 Structural Steel

The following materials are used:

a. Structural steel – ASTM A36, A572, A588, and A53

b. Bolts – ASTM A325, A490, and A307

c. Anchor bolts – ASTM 193, Grade B-7 and A36

Furnishing and fabrication of structural steel conform with all applicable requirements of AISC N690. Certified mill test reports for structural steel are submitted for review.

3.8.3.6.3 Stainless Steel Pool Liners

Stainless steel pool liners including IRWST liners and HVT liners are fabricated from ASTM A240, Type 304 material, hot rolled, annealed and pickled and further processed by cold rolling. This material quality is ensured in accordance with 10 CFR Part 50, Appendix B and ASME NQA-1.

Welding procedures are in accordance with ASME Section III, Division 2, CC-4540 and ASME Section IX. All seam welds are full-penetration butt welds. The liner plate seam welds are examined and tested as follows:

a. Liquid penetrant examination is performed on austenitic materials. The weld surfaces and at least 12.7 mm (1/2 in.) of the adjacent base material on each side of the weld are examined. The examination coverage is 100 percent of all shop and field seam welds.

b. Vacuum leak test is performed for leak-tightness on all liner plate seam welds.

Stainless steel surfaces on the pool sides of the plate conform with the finish of No.4 as specified by ASTM A480.

3.8.3.6.4 Stainless Steel Other Than Pool Liners

Stainless steel embedded plates and stainless steel checkered floor plates are fabricated from A240 Type 304 material, hot rolled, annealed, and pickled. Stainless steel bars and rounds are fabricated from A276 or A479 Type 304 material, hot rolled, annealed, and pickled.

Stainless steel pipes are fabricated from A312 Type 304 or A358 Type 304 or A376 Type 304 materials, hot rolled, annealed, and pickled.

Stainless steel gratings are fabricated from A240 Type 302 or Type 304 materials, hot rolled, annealed, and pickled prior to fabrication and then electro-polished after fabrication.

Stainless steel sump liners are fabricated from A240 Type 304 or Type 316 materials.

Stainless steel bolts are fabricated from A193 Type 304 class 1 material.

Stainless steel nuts are fabricated from A194 Type 304 material.

Stainless shapes are fabricated from A276 or A479 Type 304 materials.

3.8.3.7 Testing and Inservice Inspection Requirements

Testing and inservice inspection requirements are outlined in Subsection 3.8.4.7.

3.8.4 Other Seismic Category I Structures

The other seismic Category I structures of the APR1400 plant are the auxiliary building and the emergency diesel generator building.

The COL applicant is to provide the design of site-specific seismic Category I structures such as the essential service water building and the component cooling water heat exchanger building, essential service water conduits, component cooling water piping tunnel, and class 1E electrical duct runs (COL 3.8(5)).

3.8.4.1 Description of the Structures

3.8.4.1.1 Auxiliary Building

The auxiliary building houses the mechanical and electrical equipment used for normal plant operation and safe shutdown of the reactor. The auxiliary building is composed of the electrical and control area, main steam valve house, chemical and volume control system (CVCS) area, emergency diesel generator area, and fuel handling area.

The electrical and control area consists of the Class 1E electrical equipment rooms at elevation 78 ft 0 in and those areas located above them. The electrical and control area provides two physically separate divisions for electrical distribution, control, and instrumentation systems leading to the main control room (MCR). The upper floor of the electrical and control area contains the MCR, which is designed to provide security, fire, and environmental protection to the control equipment and the MCR operators.

The main steam valve house is a compartment located above the auxiliary feedwater (AFW) tank areas on the north and south sides of the auxiliary building. The compartment is from elevation 137 ft 6 in to 175 ft 0 in. The main steam valve house is designed to provide environmental protection, primarily missile protection, for the main steam and feedwater line safety-related valves and piping.

The CVCS area consists of a number of small rooms that are used to isolate components for water treatment required by operating systems. Individual rooms are used for radiation shielding.

The emergency diesel generator area provides protection to two diesel generators installed in separate compartments located on opposite sides of the auxiliary building.

The fuel handling area includes the spent fuel pool, refueling canal, cask loading pit, cask decontamination pit, truck/rail shipping bay, and new fuel storage area. The spent fuel pool is an open stainless steel lined reinforced concrete vessel used for submerged storage of radioactive spent fuel assemblies. The pool is approximately 10.8 m × 12.8 m (35 ft 6 in × 42 ft) with a depth of 12.8 m (42 ft). The walls and floor of the spent fuel pool are a minimum of 1.7 m (5 ft 6 in.) thick. The stainless steel liner plates cover the entire interior surface of the Fuel Handling Area. The wall liner and its anchorage system is designed and constructed to act initially as form work during concrete placement of walls, and subsequently as a leak tight membrane.

Fuel assemblies are transferred from the fuel handling area to the refueling pool via the refueling canal in the auxiliary building and then the fuel transfer tube in the reactor containment building. The refueling canal measures 1.8 m (6 ft) wide by 20.5 m (67 ft 3 in.) long. The minimum wall thickness on the fuel pool side is 1.8 m (6 ft). An opening in the fuel pool wall allows for passage of fuel between the fuel pool and the refueling canal. A steel divider is provided for the opening. Seals are incorporated to allow draining of the refueling canal while maintaining the water level in the spent fuel pool. An overhead bridge crane with a capacity of 150 tons is provided over the shipping bay and extending over the fuel pool and refueling canal. Interlocks are provided to prevent the crane from moving over the spent fuel storage area during cask handling operations. A new fuel-handling crane, running on rails mounted over the operating floor, is provided to handle the new fuel assemblies.

The two AFW tanks consist of three stainless steel lined reinforced concrete rooms. Each room has a single tank. The tanks extend from elevation 100 ft 0 in to the underside of the floor slab at elevation 137 ft 6 in.

The auxiliary building is rectangular with maximum dimensions of 106.0 m × 107.6 m (348 ft × 353 ft). It wraps around the reactor containment building with a seismic gap of 150 mm (6 in.). The auxiliary building shares common basemat structure with the reactor containment building. The auxiliary building is separated from other buildings by the isolation gap of 900 mm (3 ft).

There are no safety-related masonry walls in the Auxiliary Building.

The outlines of the auxiliary building are shown in Figures 1.2-9 through 1.2-19.

3.8.4.1.2 Emergency Diesel Generator Building

The emergency diesel generator (EDG) building block comprises two buildings, one that houses two additional generators and the other for the diesel fuel oil tank (DFOT). The two buildings are independent structures built on separate basemats – one at elevation 100 ft 0 in for the EDG building, and the other at 63 ft 0 in for the DFOT building. The two basemats are horizontally separated by an isolation gap of 900 mm (3 ft).

The EDG building block is a seismic Category I reinforced concrete rectangular structure. The EDG building is approximately 19.2 m (63 ft) wide, 40.8 m (134 ft) long, and 10.7 m (35 ft) high and the DFOT building is 20.3 m (66 ft 8 in.) wide, 21.6 m (71 ft) long, and

10.5 m (34 ft 6 in.) high. The EDG building block is separated from the other buildings by an isolation gap of 900 mm (3 ft).

The EDG and DFOT buildings are both single-story structures with a basemat and roof slab. The buildings are founded on a 1.2 m (4 ft) thick continuous mat foundation. The roof slab for the EDG building is at elevation 135 ft 0 in, and the roof slab for the DFOT building is at elevation 97 ft 6 in.

The lateral load-resisting system of the two buildings is composed of a diaphragm slab at roof level and shear walls monolithically interconnected at the roof. The lateral loads, such as wind load and horizontal earthquake load, are transferred to the soil foundation through the shear walls and the basemat. The vertical load-resisting system in each of the buildings consists of columns and shear walls. The vertical loads due to gravity and earthquake are carried by slabs, floor beams, columns, and shear walls down to the basemat and soil foundation.

There are no safety-related masonry walls in the EDG Building.

The outlines of the emergency diesel generator building are shown in Figures 1.2-20 and 1.2-22.

3.8.4.1.3 Fuel Storage Racks

The new fuel storage rack is bolted to embedments at the bottom of the new fuel storage pit and designed as a seismic Category I structure.

The spent fuel storage rack is designed as a free-standing type, i.e., neither anchored to the pool floor nor attached to the side walls, and designed as a seismic Category I structure. The new fuel storage rack and spent fuel storage rack are designed to meet the following criteria even under the plant abnormal condition, such as seismic or fuel handling accident:

a. Protect the stored fuel against a physical damage

b. Maintain the stored fuel in a subcritical configuration

c. Maintain the capability to load and unload fuel assemblies

d. Maintain the store fuel in a coolable geometry (spent fuel storage rack only)

The designs of the new fuel storage rack and spent fuel storage rack are described in Subsection 9.1.2.

3.8.4.1.4 Compound Building

The compound building is a non-safety-related seismic Category II structure with an embedment depth of approximately 12.80 m (42 ft). The compound building is separated from the auxiliary building by a 0.91 m (3 ft) gap. The top of basemat is at El. 63 ft 0 in. The exterior walls of the compound building are embedded 10.87 m (35 ft 8 in) with the finished grade at El. 98 ft 8 in. The compound building is rectangular and the major dimension is approximately 65.84 m (216 ft) long and 54.25 m (178 ft) wide, and 37.03 m (121 ft 6 in.) high.

The compound building is composed of reinforced concrete walls, columns, beams and slabs. The structural system of the compound building consists of 6 major floor slabs including the basemat and roof. The labyrinth walls that create numerous compartments utilized for the radwaste management system components are arranged on the basemat and first two floors. A bridge crane, supported below El. 139 ft 6 in on the east end of the building traverses the entire width of the crane area in the north-south direction.

The Class RW-IIa structures related to radwaste management of the compound building use ACI 349 and/or AISC N690, as applicable, in accordance with NRC RG 1.143. Also, the compound building shall be designed to preclude a structural failure that results from the SSE and that degrades the structural integrity of the adjacent auxiliary building.

The design codes, standards, specifications, regulations, regulatory guides, and other industry standards for all seismic Category I structures, other than the reactor containment building, described in Subsection 3.8.4.2 will be used for analysis and design of the compound building structures.

3.8.4.2 Applicable Codes, Standards, and Specifications

The following design codes, standards, specifications, regulations, Regulatory Guides, and other industry standards are used in the design, fabrication, construction, testing, and inspection of all seismic Category I structures other than the reactor containment building.

3.8.4.2.1 Design Codes and Standards

The design codes, standards, and regulations are listed in Table 3.8-1. The primary design codes for other seismic category I structures are ACI 349 (Reference 41) and ANSI/AISC N690 (Reference 42).

3.8.4.2.2 Regulatory Guides

The conformance of other seismic Category I structures to the applicable NRC RGs is addressed in Section 1.9. The NRC RGs that are applicable to the design of all seismic Category I structures other than the reactor containment building are NRC RGs 1.29 (Reference 28), 1.60, 1.61, 1.69 (Reference 29), 1.91 (Reference 30), 1.92, 1.115 (Reference 31), 1.122, 1.127 (Reference 44), 1.136 (Reference 45), 1.142, 1.143 (Reference 32), 1.199, 1.160 (Reference 43), and 1.221 (Reference 46).

3.8.4.2.3 Industry Standards

Nationally recognized industry standards, such as those published by ASTM, are used where practicable to define material properties, testing procedures, and fabrication and construction methods.

3.8.4.3 Loads and Load Combinations

This section presents the structural design load information for the APR1400 seismic Category I structures other than the reactor containment building. This load information consists of a summary list of major loads and load combinations. These load combinations are categorized on the basis of their nature, the probability of occurrence of each of the individual loads, and the probability of simultaneous occurrence of these loads to form a loading combination.

Evaluation of the capability of a structure for a given load combination is based on providing a factor of safety appropriate to the probability of occurrence. The appropriate factor of safety is reflected in the load factors and allowable stresses for the various load combinations.

The COL applicant is to evaluate any applicable site-specific loads such as explosive hazards in proximity to the site, projectiles and missiles generated from activities of nearby military installations, potential non-terrorism related aircraft crashes, and the effects of seiches, surges, waves, and tsunamis (COL 3.8(6)).

3.8.4.3.1 Normal Loads

a. Dead loads – (D)

Dead load refers to loads that are constant in magnitude and point of application. The types and definitions of dead loads and their combination requirements are given in Table 3.8-6.

b. Live loads – (L)

Live load refers to any normal loads that may vary with intensity and location of occurrence. The types and definitions of live loads and their combination requirements are given in Table 3.8-6. The specified design values for live loads are summarized in Table 3.8-5.

1) Soil and surcharge load (L_g)

Soil and surcharge load refers to load due to weight and pressure of soil, water in soil, or other material such as soil surcharge. These loads are applied on seismic Category I structures below grade, with the force directed toward the inside of the structures. Maximum elevation of groundwater is specified to be 0.61 m (2 ft) below plant grade for safety-related structures. For the construction loading condition, the minimum surcharge load is 48.0 kN/m^2 (1,000 psf) over any unoccupied area plus the actual construction loading surcharge from any known structures or load sources. For the normal loading condition, the minimum surcharge load is 24.0 kN/m^2 (500 psf). For the design of underground utilities, the minimum surcharge load for the construction loading condition is 24.0 kN/m^2 (500 psf) and for the normal loading condition is 12.0 kN/m^2 (250 psf). Any loading conditions that result in soil surcharge loads greater than these minimum values are checked on an individual basis.

2) Hydrostatic load (L_h)

Hydrostatic loads are due to weight and pressures of fluids with well-defined densities and controllable maximum heights or related internal moment and forces.

3) Snow load (L_s)

Based on the assumed site-related parameters, the 100-year snowpack roof load is considered to be 2.873 kN/m^2 (60 psf).

c. Thermal operating load – (T_o)

Thermal operating load is thermal load effect from the most critical transient or steady-state thermal condition at normal operation or shutdown conditions. This also includes thermal effects such as frictional loads due to expansion.

d. Equipment, pipe, cable tray, duct, and ties – (R_o)

This includes their dead load, live load, thermal load, seismic load, thrust load, and unbalanced internal pressure under construction, test, normal, severe, abnormal, and extreme environmental conditions.

R_{os} – Self-weights, including contents

R_{ot} – Transient or steady-state thermal loading conditions during normal operation and shutdown conditions

For the test loading condition, this includes piping reactions due to test cleanup and blowdown conditions.

R_{op} – Effects of unbalanced pressure and thrust

e. Crane and trolley loads – (C)

C is crane and trolley lifted load, including impact load, longitudinal load and lateral load. All of these loads are considered as acting simultaneously.

For the crane and trolley loads of the fuel handling overhead crane, the self-weight, lifting load, and vertical load due to vertical seismic acceleration are considered in the structural analysis of auxiliary building and NI common basemat at the worst location through 3 cases analyses. The lateral load due to seismic is not considered in the analysis due to the pendent effect.

1) Bridge crane

A bridge crane is a crane that has a bridge girder that moves longitudinally on two parallel beams, and a trolley hoist that moves laterally along the bridge girder. It can either ride on a rail on top of the two parallel beams or hang from their bottom flanges.

The lifted load is the rated capacity of the main hook. The manufacturer usually provides the maximum wheel load to be applied to the support steel.

The vertical impact load is considered to be 25 percent of the maximum wheel loads.

The longitudinal load is considered as 10 percent of the maximum wheel loads of the crane applied at the supporting beam flange.

The lateral load on crane runways for bridge cranes (to provide for the effect of the moving crane trolleys) is considered as 20 percent of the sum of the lifted load and the crane trolley. The load is applied to each side at the supporting beam flange (top or bottom depending on the support arrangement) acting in either direction normal to the support beams, and is distributed based on lateral stiffness of the structure supporting the bridge crane.

2) Trolley

A trolley is a hoist that can move longitudinally but not laterally and is hung from the bottom flange of the support beam (trolley beam). It can rotate laterally. Trolleys may be motorized or hand-operated.

The lifted load is the rated capacity of the trolley hoist.

The vertical impact load is considered as 25 percent of the maximum wheel loads (lifted load plus the hoist self-weight).

The longitudinal load is considered as 10 percent of the maximum wheel loads of the trolley (lifted load plus the hoist self-weight), without impact, applied at the bottom flange of the support beam.

The lateral load for trolleys is calculated for the maximum wheel loads without impact, rotated a minimum angle of 5 degree about a vertical plane at the bottom flange. When an angle is specified on the equipment removal drawings and is greater than 5 degrees, it is used. The load is applied at the bottom flange of the support beam.

For severe environmental and extreme environmental loading combinations on seismic Category I structures, 100 percent of the lifted load is used.

f. Operating pressure – (P_o)

Operating pressure load is the external or internal air or gas pressure loads during normal operating conditions. Examples of this are pressures within air and gas ducts, and differential air pressures on building walls.

g. Miscellaneous normal loads – (M_o)

M_o is other miscellaneous normal loads, such as the column contingency load, transformer high-voltage line pull-off loads, vehicle loads, miscellaneous material handling loads (e.g., belt pulls, barge berthing impact). Column contingency loads are considered in the column design to account additional loads.

h. Stability load (S)

Stability load (S) includes overall (Frame) column stability loads (SC) and girder stability loads (SG). Overall stability loads may not need to be considered if the effects of wind or seismic loads on the structure are significant. Stability loads are only used in the design of horizontal bracing, moment frames, vertical bracing diagonals, and collector elements (beams or struts which transfer loads to diaphragms, horizontal bracing, vertical bracing, shear walls or moment frames). Additional load combinations shall be utilized as necessary to delete stability loads from the design of other structural elements, such as columns and anchor bolts. P-D analyses are not required for stability loads.

i. Construction loads

Construction loads are related to all events and loads during construction. These include dead loads, live loads, temperature loads, precipitation loads, wind loads, and construction loads such as surcharge loads due to construction equipment, hoisting loads due to construction activities, and laydown loads during construction. SEI/ASCE 37-02 (Reference 8) is considered to be supplemental guidance.

3.8.4.3.2 Abnormal Loads

a. Accident pressure – (P_a)

Accident pressure is applied to external or internal air, gas, or liquid pressure loads during abnormal operating conditions. Examples of this are excursion pressures within gas ducts due to fan or damper type failures and differential air pressure on a building wall due to a postulated pipe break including annulus pressurization effects and flooding loads. An appropriate dynamic factor to account for the dynamic response of the structure and the time dependency of the load is included.

1) Main steam valve house

The compartmental accident pressures due to main steam and feedwater line breaks are considered.

2) Other areas

Accident pressures in other areas of seismic Category I structures are defined during plant layout and design.

b. Accident temperature – (T_a)

Accident temperature is thermal load effects during abnormal operating conditions. Accident temperatures in other areas of seismic Category I structures are defined during plant layout and design.

c. Accident reactions of equipment, pipe, cable tray, duct, and ties − (R_a)

R_a is reactions of pipe, cable tray, duct, and ties. This includes their dead load, live load, thermal load, seismic load, thrust load, and transient unbalanced internal pressure loads under abnormal and/or extreme environmental conditions.

d. Pipe break reactions – (Y_r)

Y_r is equivalent static load on the structure generated by the reaction of the broken high-energy pipe during the postulated break, including an appropriate dynamic factor to account for the dynamic response of the structure, and the time dependency of the load.

1) Pipe whip restraint reactions

Pipe whip restraint reactions are the loads transferred from the restraint to the supporting structure.

2) Pipe hanger loads

This is the portion of the pipe hanger reaction that is due to a pipe break (excluding thermal effects).

e. Jet impingement load – (Y_j)

Y_j is the jet impingement equivalent static load on a structure generated by a postulated pipe break, including an appropriate dynamic factor to account for the dynamic response of the structure, and the time dependency of the load.

f. Missile impact load – (Y_m)

Y_m is the missile impact load on a structure generated by or during a postulated pipe break, like pipe whipping, including an appropriate dynamic load factor to account for the dynamic response of the structure, and the time dependency of the load.

g. Flooding load – (Y_f)

Y_f is the load within or across a compartment and/or building due to flooding generated by a postulated pipe break. These loads are calculated considering the design basis flood heights.

h. Miscellaneous abnormal loads – (M_a)

M_a includes other miscellaneous site-related accidents such as blast, aircraft impact, or internally generated equipment missiles.

i. POSRV load (P_{ac})

P_{ac} is air-clearing load, which is the hydrodynamic load generated by the expulsion of air in POSRV discharge lines during the POSRV discharge following the water clearing phenomena in the sparger.

3.8.4.3.3 Severe Environmental Loads

a. Wind loads – (W)

W is the equivalent static load generated by the design wind velocity, and is calculated in accordance with ASCE 7 (Reference 33) and described in Subsection 3.3.1. Seismic Category I structures are designed for a 100-year recurrence interval wind, and for tornado and hurricane winds and missiles as described in Subsections 3.3.2 and 3.5.1.4.

For seismic Category I structures, an importance factor I of 1.15 is used with 50-year, 3-second gust speed at exposure Category C, as defined in ASCE 7, Section 6.5.

b. Design flood/precipitation – (H)

Flood loads on seismic Category I structures are determined based on the maximum site flood levels specified in Chapter 2.

c. Operating basis earthquake

The operating basis earthquake (OBE) is defined as one-third of the SSE. Therefore, an analysis or design of APR1400 seismic Category I SSCs based on OBE is not required in accordance with Appendix S of 10 CFR Part 50.

3.8.4.3.4 Extreme Environmental Loads

a. Safe shutdown earthquake – (E_s)

SSE loads are considered as follows:

1) Seismic Category I structures

For seismic Category I structures, E_s are the loads generated by the SSE. Hydrodynamic load and dynamic soil pressure are included in E_s. The hydrodynamic load and dynamic soil pressure are added to the SRSS-combined seismic load by the absolute sum.

Seismic response for SSE is determined using a dynamic analysis. Enveloped floor response spectra in both the horizontal (N-S and E-W) and vertical directions are prepared for all major building floor elevations. An equivalent static method is used to determine SSE loads on structural components (e.g., floor slabs, beams).

2) Combination of SSE loads

For each load, the responses from all three directional earthquakes are combined simultaneously. The independent directional responses are combined using the square root of the sum of the squares (SRSS) method or the 100-40-40 percent rule described in ASCE 4, Subsection 3.2.7. For the auxiliary building and the EDG building, the square root of sum of the square method was used to combine the SSE loads.

Stresses due to seismic loads from different directions are combined by the SRSS method using the following expression:

$$R = \pm \sqrt{\sum_i R_i^2}$$

Where R is any response of interest and R_i (i=1, 2, 3) is the two horizontal components and one vertical component of earthquake motion.

3) Additional seismic loads due to accidental torsion

Additional seismic loads due to accidental torsion are accounted for as required by SRP 3.7.2, II.11. An additional eccentricity of the mass at each floor equivalent to 5 percent of the maximum building dimension is included. The accidental torsion load is represented by an additional shear force at each floor elevation determined from the analysis for the product of resultant story shear and accidental eccentricity at each elevation.

b. Tornado or hurricane load – (W_t)

The tornado or hurricane loads are described in Subsection 3.3.2.

c. Probable maximum flood/precipitation – (H_s)

H_s is the forces, due to the probable maximum precipitation as well as the maximum flood level, which includes the effects of seiches, surges, waves, and tsunamis.

3.8.4.3.5 Other Loads

Other loads are loads resulting from aircraft hazard and explosion pressure wave that are not included in the design basis. These loads are evaluated to prevent damage to safety-related structures, systems, and components beyond the design basis condition.

3.8.4.3.6 Load Combinations

The load combinations to be used in the design of the structure are in accordance with Tables 3.8-7A and 3.8-7B, and in conjunction with the definitions of load conditions and design loads as provided in Subsections 3.8.4.3.1 through 3.8.4.3.5.

3.8.4.3.7 Below Grade Exterior Walls

The design and analysis procedures for seismic Category I exterior walls below grade are described below.

Hydrostatic (groundwater)

The hydrostatic unit water pressure (P_w) at a depth h below ground level is calculated as a linearly distributed pressure depending on the design water level (0.61 m (2 ft) below plant grade).

$$P_W = \gamma_W h$$

Where:

γ_W = unit weight of water = 62.4 pcf

Static Earth Pressure

Static earth pressure is based on “at-rest” conditions and the coefficient of earth pressure is calculated as the following relationship. In addition, the soil parameters are described in DCD Table 2.0-1.

$$P_s = K_o \gamma \mathrm{h}$$

Where:

K_o = 1-sin(φ) = Coefficient of earth pressure at rest condition

γ = γ_s = Soil density in saturated condition

γ = γ_{sub} = Soil density in submerged condition

Surcharge Pressures

The surcharge pressure is defined for all soil cases as the at-rest pressure as follows:

$$P_{sur} = K_o q$$

Where:

q = static surcharge pressure

The dynamic lateral surcharge pressure is the same as the static surcharge pressure, for conservatism.

Dynamic Earth Pressures

The dynamic earth pressure is calculated in accordance with ASCE 4 (Reference 47), Section 3.5.3, Figure 3.5-1, "Variation of Normal Dynamic Soil Pressures for the Elastic Solution."

Dynamic Groundwater Pressures

Dynamic groundwater pressure is calculated based on the hydro-dynamic formula suggested by Matsuo and O'Hara in "Principles of Soil Dynamics," written by Braja M. DAS (Reference 48). The design water level (0.61 m (2 ft) below plant grade) is considered in the calculation of hydrodynamic water pressure.

Passive Earth Pressure

The passive earth pressure is not included in the resistance force for sliding and overturning in the basemat stability check. Therefore, passive earth pressure on exterior walls does not need to be considered.

3.8.4.4 Design and Analysis Procedures

The auxiliary building and the emergency diesel generator building are composed of basemat foundation, rectangular walls, floor slabs, columns, and beams. The slabs and shearwalls in the building represent the primary lateral and vertical load-resisting system and are designed for both gravity- and seismic-related loads. Concrete slabs at various elevations in the building distribute lateral forces (via diaphragm action) to the shearwalls as in-plane loads and resist vertical forces (self-weight and seismic forces) as out-of-plane loads. Lateral loads are transferred down to the basemat foundation through shearwalls as in-plane shear forces and moments. Vertical loads on slabs are supported by concrete beams or walls. The loads are transferred to the basemat foundation by the walls and the frames composed of concrete beams and concrete columns. In addition to the structural components, components are designed to provide biological shielding and protection against tornado, hurricane, and turbine missiles.

Structural analyses of the concrete structures are performed by the ANSYS (Reference 9) or GTSTRUDL (Reference 34) program to determine their design forces due to various loads and load combinations.

Other seismic Category I concrete structures are analyzed and designed in accordance with the requirements of ACI 349 with exceptions of the requirements in NRC RG 1.142. Those requirements are incorporated into the design and accommodated in the load combinations described in Subsection 3.8.4.3 for concrete structures.

The design and analysis details for AB and EDGB, including the critical section, are discussed in Subsection 3.8A.2.4 and 3.8A.3.4, respectively.

Other seismic Category I steel structures are designed in accordance with AISC N690 using the allowable stress design method.

The new fuel storage rack in the new fuel storage pit and spent fuel storage rack in the spent fuel pool are designed to withstand the seismic load that is seismic excitation along three (3) orthogonal directions is applied simultaneously for the design of the rack.

The designs of the new fuel storage rack and spent fuel storage rack are described in Subsection 9.1.2.

The new fuel storage pit is covered by steel plates. The steel plate is designed not to fall or collapse for the protection of new fuel and new fuel storage racks in the event of an SSE in accordance with the requirements in AISC N690. The COL applicant is to perform the analysis and design of the steel plate for the new fuel storage pit (COL 3.8(7)).

3.8.4.4.1 Analysis of Structure

A detailed three-dimensional finite element model of the other seismic Category I structures is developed to distribute the global loads to all structural components. The structural analysis model of the auxiliary building is shown in Figure 3.8-23. The model includes all walls, floor slabs, and major structural beams and columns. The walls and slabs are modeled with three- or four-node shell elements, and the beams and columns are modeled with two-node beam elements using the ANSYS computer program.

Global static analysis for each loading condition is performed using the models, and results are combined using the load combinations identified in Subsection 3.8.4.3.4. Seismic analyses of seismic Category I structures conform with the procedures described in Subsection 3.7.2. The accelerations from the seismic analysis are applied to the finite element models as equivalent static loads at the corresponding elevations.

3.8.4.4.2 Structure Design

3.8.4.4.2.1 Concrete Structure

The requirements for the design of seismic Category I concrete structures conform with all requirements of ACI 349 and NRC RG 1.142.

Design provisions for impulsive and impactive effects in the seismic Category I structures are in accordance with ACI 349, Appendix C.

ACI 349Appendix A, ACI Report ACI 349.1R or computer analysis programs are used to evaluate thermally induced forces and moments in seismic Category I structural members.

Required reinforcing for the seismic Category I concrete members are determined in accordance with applicable code provision as follows:

In-Plane Shear

Design for in-plane shear is in accordance with the requirements of ACI 349, Chapter 11.

Out-of-Plane Shear

Design for out-of-plane shear is in accordance with the requirements of ACI 349, Chapter 11.

Bending and Axial Loads

Design for out-of-plane bending with axial compression (or tension) is in accordance with the requirements of ACI 349, Chapter 10.

Minimum reinforcement of design section is in accordance with the requirements of ACI 349, Chapter 7 and 10.

Design for lateral load resisting system, concrete frame, concrete beam and concrete column is in accordance with the requirements of ACI 349, Section 21.5 through 21.7.

When feasible, uniform reinforcement patterns are used for sections with similar requirements, thickness, and loading.

The design of the support anchorage to the concrete structure meets the requirements of ACI 349-01 Appendix B and NRC RG 1.199.

3.8.4.4.2.2 Steel Structure

The design of seismic Category I steel structures and components uses the allowable stress design methods in accordance with AISC N690 including Supplement 2.

Bolted connections are used for field erection of structural steel beams and columns. The design of bolted connections is in accordance with Section Q1.16 of AISC N690 and the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" (Reference 35).

Welding activities associated with seismic Category I structural steel and their connections are accomplished in accordance with the requirements of AWS D1.1 (Reference 36).

3.8.4.4.2.3 Missile Protection

Exterior walls and roof slabs of seismic Category I structures function as missile barriers. Design of missile barriers provides reasonable assurance that the structure will not collapse under the missile load and the barrier will not be penetrated. Safety-related SSCs are protected from secondary missiles as a result of backface scabbing. Interior walls and floors are designed to function as missile barriers when it is evaluated to be necessary.

The design of seismic Category I structures for internally generated and externally generated missiles conforms with the procedures described in Section 3.5.

3.8.4.4.2.4 Flooding

Flooding is addressed in Section 3.4.

3.8.4.4.2.5 Wall/Floor Penetrations

Openings are acceptable without analysis if they meet the criteria in ACI 349, Section 13.5.2.

Penetration sleeves usually consist of a pipe embedded in a concrete wall or concrete floor with a short projection at one of both faces. As a minimum, penetration sleeves have sufficient thickness to maintain roundness during concrete pouring of other construction. Penetration sleeves are designed in accordance with ACI 349 and AISC N690.

Each corner of rectangular openings in walls or slabs is provided with additional reinforcing to reduce cracking due to stress concentration at these locations in accordance with ACI 349, Section 14.3.7.

3.8.4.4.2.6 Embedment Plates

Embedment plates are located throughout the plant to provide sufficient and efficient support for the various structures and components. The plate is designed in accordance with AISC N690. The anchorage to concrete is designed in accordance with ACI 349-97, including Appendix B (2001), and NRC RG 1.199.

3.8.4.4.2.7 Stainless Steel Liner Design

The design of stainless steel liners is similar to the containment liner design as described in Subsection 3.8.1.4.10. The allowable stresses and strains for the liner are consistent with ASME Section III, Division 2, CC-3000.

3.8.4.4.3 Design Summary Report

A design summary report is prepared for the other seismic Category I structures in Appendix 3.8A where the design summaries for the representative critical sections of the structures are described.

Deviations from the standard design of as-procured or as-built construction are acceptable based on an evaluation following the methods and procedures described in Sections 3.7 and 3.8. The structural design is evaluated in accordance with the acceptance criteria described in Subsection 3.8.4.

3.8.4.5 Structural Acceptance Criteria

Structural acceptance criteria for design strengths and allowable stresses are listed in Table 3.8-7A for concrete structures and in Table 3.8-7B for steel structures, and are in accordance with ACI 349 and AISC N690, except as provided in the table notes.

Shear reinforcement is provided in accordance with ACI 349, Chapter 11.

Reinforcement for bending with axial compression (or tension) is provided in accordance with ACI 349, Chapter 7 and 10.

Reinforcement for lateral load-resisting systems, concrete frames, concrete beams, and concrete columns is provided in accordance with ACI 349, Section 21.5 through 21.7.

Limits for crack controls, deflections, and other design criteria are in accordance with ACI 349 and NRC RG 1.142 for concrete structures and AISC N690 for steel structures.

The structural acceptance criteria for the foundation design are described in Subsection 3.8.5.5.

The seismic Category I concrete structures that are subjected to thermal effects conform with the minimum provisions of ACI 349 Appendix A.

The structural acceptance criterion on the new fuel storage rack and spent fuel storage rack is to meet the maximum allowable stress limits with given load combinations described in Table 3.8-7C in accordance with the SRP 3.8.4, Appendix D. When the effects of seismic loads are considered, factors of safety against gross sliding and overturning of racks and rack modules under all probable service conditions is in accordance with the SRP 3.8.5, II.5.

3.8.4.6 Material, Quality Control, and Special Construction Techniques

This section contains information relating to the materials, quality control programs, and special construction techniques and tolerances used in the fabrication and construction of the seismic Category I concrete and steel structures other than the reactor containment building.

The tolerances for structural concrete shall be in accordance with ACI 117, and for structural steel shall be in accordance with ANSI/AISC 303. Any provisions in these codes which provide acceptance criteria for conditions when tolerances are exceeded shall not apply, but a licensee referencing the APR1400 DCD may deviate from the tolerances in these codes using alternative acceptance criteria, if these acceptance criteria are approved by the NRC. As-built dimensions will also be evaluated to verify compliance with the design bases and applicable codes and standards identified in Table 3.8-1. The COL applicant may provide construction tolerance acceptance criteria and the basis for the criteria (e.g., through the use of analysis, industry research, or testing) for cases where the tolerances in the ACI 117 and ANSI/AISC 303, for structural concrete and structural steel, respectively, may be exceeded (COL 3.8 (22)).

3.8.4.6.1 Material

The seismic Category I structures are poured-in-place reinforced concrete structures. The major materials that are used in the construction are concrete, reinforcing bars, and structural steel.

3.8.4.6.1.1 Concrete

The minimum concrete compressive strength used in other seismic Category I structures is 34.5 MPa (5,000 psi) at 91 days. The basic ingredients of concrete are cement, fine aggregates, coarse aggregates, and mixing water. Admixtures may be used if needed. The concrete conforms with ACI 349 and ASTM C94.

The COL applicant is to determine the environmental condition associated with the durability of concrete structures and provide the concrete mix design to prevent concrete degradation caused by factors such as the reactions of sulfate and other chemicals, the corrosion of reinforcing bars, and the effect of reactive aggregates (COL 3.8(8)).

Cement is Type I and conforms with ASTM C150. In special circumstances, other approved cements may be used.

Aggregates conform with ASTM C33.

The water and ice used in mixing concrete are clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or steel. The water and ice do not contain more than 500 ppm of chlorides as Cl^-, as determined in accordance with ASTM D512 and not more than 2,000 ppm of total solids as determined in accordance with ASTM D1888. A comparison of the proposed mixing water properties is made with distilled water by performing the following tests:

a. Time of setting, in accordance with ASTM C191 (Reference 37). The results obtained for the proposed mixing water conform with ASTM C 94.

b. Compressive strength, in accordance with ASTM C109 (Reference 38). The results obtained for the proposed mixing water are not lower by more than 10 percent of those obtained for distilled water.

The water used to make ice for concrete pours in hot weather conforms with the requirements for mixing water described above.

Admixtures, if used and as determined by detailed mix design, conform with the applicable ASTM standards, as follows:

a. Air-entraining admixtures, ASTM C260, "Standard Specification for Air-Entraining Admixtures for Concrete"

b. Water reducing, retarding, and accelerating admixtures, ASTM C494, "Standard Specification for Chemical Admixtures for Concrete"

c. Ground granulated blast-furnace slag, ASTM C989. "Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars"

d. Silica fume, ASTM C1240, "Standard Specification for Silica Fume Used in Cementitious Mixtures"

e. Slag cement, ASTM C595, "Standard Specification for Blended Hydraulic Cements"

f. Plasticizing admixtures, ASTM C1017, “Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete”

The ingredient materials are stored in accordance with the recommendations in ACI 304R.

Concrete mixes are designed in accordance with ACI 301. The batching, mixing, and transporting of concrete conform with ACI 301. The placement of concrete, consisting of preparation before placing, conveying, depositing, protection, and bonding is in accordance with ACI 301.

3.8.4.6.1.2 Reinforcing Steel

Reinforcing steel consists of deformed reinforcing bars conforming to ASTM A615, Grade 60, or ASTM A706, Grade 60. The fabrication of reinforcing bars, including fabrication tolerances, is in accordance with ACI 315 in ACI Detailing Manual (SP-66) (Reference 49). The placing of reinforcing bars, including spacing of bars, concrete protection of reinforcement, splicing of bars and field tolerances is in accordance with ACI 349. Epoxy-coated reinforcing steel may be used for areas where a corrosive environment is encountered.

3.8.4.6.1.3 Structural Steel

Structural steels are used as follows:

Other structural steels listed in AISC N690 may also be used.

a. ASTM A36 (Reference 39), “Standard Specification for Carbon Structural Steel”

b. ASTM A572, “Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural”

c. ASTM A588, “Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi [345 MPa] Minimum Yield Point to 4 in. [100 mm] Thick”

d. ASTM A53, “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless”

Fabrication and erection of structural steel in seismic Category I structures are in accordance with the requirements of AISC N690.

Welding materials conform with the requirements of the Structural Welding Code (AWS-D1.1). AWS D1.1 Table 3.1 shows the compatibility of filler metal with base metal. AISC N690 provides supplemental information on weld materials for stainless steel.

Bolted connections conform with one of the following specifications:

a. ASTM A325, "Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength"

b. ASTM A490, "Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength"

c. ASTM A307, "Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength"

Bolts listed in AISC N690 may also be used.

3.8.4.6.1.4 Stainless Steel

Stainless steel pool liners are fabricated from ASTM A240, Type 304 material, hot rolled, annealed and pickled and further processed by cold rolling. This material quality is ensured in accordance with 10 CFR Part 50, Appendix B and ASME NQA-1. Further requirements for stainless steel pool liners and other stainless steel are described in Subsections 3.8.3.6.3 and 3.8.3.6.4. Welding material for the stainless steel pool liners is used in accordance with ASME Section III, CC-2600 and ASME Section IX.

3.8.4.6.2 Quality Control

The quality of materials is controlled by requiring the suppliers to furnish appropriate mill test reports as required under relevant ASTM specifications as described in Subsection 3.8.4.6.1. The mill test reports are reviewed and approved in accordance with the general provisions of the overall quality assurance program outlined in Chapter 17 and supplemented by the special provisions of the appropriate codes and specifications for design listed in Subsection 3.8.4.2.

Erection tolerances, in general, are in accordance with the referenced design code. Where special tolerances that influence the erection of equipment are required, they are indicated on the design drawings.

3.8.4.6.3 Special Construction Techniques

No special construction techniques are used in the construction of other seismic Category I structures.

The corrosion protection of the auxiliary building reinforcing steel is provided by an adequate cover of high-quality concrete over the reinforcing bar. Since the APR1400 concrete structures are built with concrete of maximum water-cementitious material (w/cm) ratio of 0.4 and minimum compressive strength (f'_c) of 5,000 psi, the auxiliary building concrete structures will be prevented from penetration of chloride or sulfide ions based on the ACI 349 Section 3. Unless the concrete is penetrated by chloride or sulfide ions, the reinforcing bar remains passive and will not corrode.

Slabs in the auxiliary building are constructed using metal deck and steel beams that support metal deck and concrete slab during construction. Steel beams are connected to shear walls or concrete beams. This method allows concrete slabs to be constructed without shorings and forms.

There are two methods to install stainless steel liner plates (SSLP) in spent fuel pool, refueling canal, cask loading pit and cask decontamination pit:

a. Wall-paper type (floors) liner plates are field welded to stainless steel liner embedment strips in the concrete.

b. Form type (wall) liner plates (with its anchorage system) are field welded together as a complete unit or shop welded together as a module at the SSLP assembly filed shop which act initially as form work during concrete placement of walls and subsequently as a leak tight membrane.

The COL applicant is to determine construction techniques to minimize the effects of thermal expansion and contraction due to hydration heat, which could result in cracking (COL 3.8(9)).

3.8.4.7 Testing and Inservice Inspection Requirements

There is no testing or in-service surveillance beyond the quality control tests performed during construction, which is in accordance with ACI 349, AISC N690, or ANSI N45.2.5, in accordance with NRC RG 1.127 and NUMARC 93-01.

For other seismic Category I structures outside containment, the structures monitoring and maintenance requirements program is to be in accordance with 10 CFR 50.65 and NRC RG 1.160.

The structures are monitored in accordance with Paragraph (a)(2) of 10 CFR 50.65, provided there is not significant degradation of the structures. The condition of all structures is assessed periodically. The appropriate frequency of the assessments is commensurate with the safety significance of the structures and their condition.

For water control structures, the inservice inspection program is to be in accordance with NRC RG 1.127. Water control structures covered by this program include concrete structures, embankment structures, reservoirs, cooling water channels and canals, intake and discharge structures, and safety and performance instrumentation.

It is important to accommodate inservice inspection of critical areas. Monitoring and maintaining the condition of the other seismic Category I structures is essential for plant safety. Special design provisions (e.g., providing sufficient physical access, providing alternative means for identification of conditions in inaccessible areas that can lead to degradation, remote visual monitoring of high-radiation areas) to accommodate inservice inspection of other seismic Category I structures is provided on a case-by-case basis.

For plants with nonaggressive ground water/soil, (i.e., pH > 5.5, chlorides < 500 ppm, sulfate < 1,500 ppm), an acceptable program for normally inaccessible, below-grade concrete walls and foundations is to examine the exposed portion of below-grade concrete, when excavated for any reason, for signs of degradation, and to conduct periodic site monitoring of ground water chemistry to confirm that the ground water remains non aggressive.

For plants with aggressive ground water/soil, (i.e., exceeding any of the limits noted above), an acceptable approach is to implement a surveillance program to monitor the condition of normally inaccessible, below-grade concrete for sign of degradation.

Therefore, for safety and serviceability of seismic Category I structures during the operation of the plant, the COL applicant is to provide appropriate testing and inservice inspection programs to examine the condition of normally inaccessible, below-grade concrete for signs of degradation and to conduct periodic site monitoring of ground water chemistry. Inservice inspection of the accessible portion of concrete structures is also to be performed. (COL 3.8(10)).

Monitoring of seismic Category I structures is performed in accordance with NRC RG 1.160.

3.8.5 Foundations

3.8.5.1 Description of the Foundations

The foundation basemat is a reinforced concrete common basemat structure for the nuclear island that consists of the reactor containment building and auxiliary building.

Waterproofing membranes are used for exterior horizontal and vertical surfaces of all seismic Category I building structures. The horizontal waterproofing membranes are installed between lower and upper lean concrete beneath the basemat as shown in Figure 3.8-27. The COL applicant is to verify that the coefficient of friction between the lean concrete and waterproofing membrane is greater than or equal to 0.55 (COL 3.8(11)).

3.8.5.1.1 Reactor Containment Building Foundation

The reactor containment building basemat is reinforced at the top and bottom with layers of reinforcing steel bars. The reinforcing bars are arranged in radial and hoop directions for top layers and orthogonal directions for bottom layers. In addition, the reinforcing bars at the floor of the reactor pit below the liner are arranged in orthogonal directions for the top and bottom layers.

The steel liner plate for the containment basemat is 6.0 mm (0.25 in.) thick except for embedments in local areas where it is thickened. The liner is anchored by welding on the top of the structural steel rolled sections embedded in the concrete.

Interior structural concrete is poured over the basemat liner to provide support for the reactor coolant loop (RCL) equipment, RCL piping, and the interior concrete walls. Tensile loads generated from analyses are carried by anchorage through the liner plate and into the basemat, if required. Tensile loads from internal concrete walls are transferred from the wall reinforcement to a thickened liner plate using mechanical splices and are then transferred to the base slab through steel reinforcement dowels welded to the underside of the thickened liner plate.

3.8.5.1.2 Auxiliary Building Foundation

The foundation of the auxiliary building is a reinforced concrete mat and rests on competent material with a thickness of 3.05 m (10 ft). The bottom of the basemat is located at elevation 40 ft 0 in and 45 ft 0 in, below the finished grade elevation.

The auxiliary building basemat is reinforced at the top and bottom with layers of reinforcing steel bars. The reinforcing bars are arranged in orthogonal directions for the top and bottom layers.

3.8.5.1.3 Emergency Diesel Generator Foundations

The emergency diesel generator (EDG) building block comprises two buildings, one of which houses the EDGs and the other the diesel fuel oil tank (DFOT). The two buildings are independent structures built on a separate concrete reinforced mat foundation with a thickness of 1.2 m (4 ft). The bottom of the basemat is located at elevation 92 ft 0 in for the EDG building and elevation 59 ft 0 in for the DFOT building.

3.8.5.2 Applicable Codes, Standards, and Specifications

The reinforced concrete foundations of the reactor containment building are designed using the codes and standards described in Subsection 3.8.1.2. The reinforced concrete foundations and supports of other seismic Category I structures are designed using the codes and standards described in Subsection 3.8.4.2.

3.8.5.3 Loads and Load Combinations

The design loads and load combinations of the reactor containment building foundation are described in Subsection 3.8.1.3 and Table 3.8-2. The design loads and load combinations of the auxiliary building foundation and EDG building foundation are described in Subsection 3.8.4.3 and Table 3.8-7A. For combining SSE loads, the 100-40-40 percent rule was used for the basemat analysis to combine independent directional loads from superstructures, in accordance with ASCE 4, Subsection 3.2.7. The 100-40-40 percent rule is based on the observation that the maximum increase in the resultant for two orthogonal forces occurs when these forces are equal. This rule may be applied for combining responses in the same direction due to different components of motion.

The analysis and design of the foundation below the reactor containment building conform to the requirements of ASME Section III, Division 2, CC. The analysis and design code for the foundations below the auxiliary building and EDG building is ACI 349. As the design criteria are different, the applications of loads and load combinations for the foundations are in accordance with each code. While the ACI 349 code concentrates on the requirements as one of the concrete structures in a nuclear power plant, the ASME Code describes the requirements with more focus on the functionality of containment. The load factors in Tables 3.8-2 and 3.8-7A are based on these design concepts according to the two codes. For the code application scope and jurisdiction boundary of the NI common basemat, refer to Subsection 3.8.1.1.2 and Figure 3.8-26.

3.8.5.4 Design and Analysis Procedures

The NI common basemat is analyzed using the ANSYS computer program. Stiffening effects of the reactor containment building wall, internal concrete structures, and auxiliary building are included in the model.

The NI common basemat is modeled with eight-node solid element in the ANSYS computer program. In addition, in order to consider the soil effect, the link element in ANSYS is used with the NI common basemat model for static loading case. In case of seismic loading, the foundation model is used with the NI common basemat model. Detailed explanation of spring and foundation stiffiness is described in Subsection 2 of Technical Report, APR1400-E-S-NP-14006-P (Reference 40).

The reinforced concrete basemat of the reactor containment building is designed in accordance with ASME Section III, Division 2, CC. Other seismic Category I basemats of reinforced concrete are designed in accordance with ACI 349 and the provisions of NRC RG 1.142 where applicable.

As the design criteria for the RCB and AB area of the NI common basemat are different, the application of loads is also divided into two parts, as shown in Figure 3.8-26. The load combinations provided by the ASME and the ACI Codes are used in the analysis and design of the RCB and AB foundations, respectively. Regarding the portion beyond the RCB foundation directly beneath the containment shell, the following aspects are additionally considered in the analysis and design of NI common basemat.

At the interface between the two codes, a greater amount of reinforcement required by either code is used, and the reinforcement of the RCB foundation is developed into the AB foundation as shown in Figures 3.8A-16 and 3.8A-17. The provisions of both codes are used to select a conservative development length.

The outside portion of the RCB foundation, i.e., the entire AB foundation area, is conservatively designed using the larger member forces from the analysis results of the ASME and ACI Codes.

For the effect of the ACI load combination on the RCB foundation, the load combinations in the ASME and the ACI Codes are compared. Four kinds of loads that exist in the ACI load combination but do not exist in the ASME load combination are investigated: operating pressure, miscellaneous loads, crane and trolley load, and hydrostatic load. The operating pressure and miscellaneous loads do not have an effect on the global behavior of the basemat, and these loads are not considered in the NI common basemat analysis. The crane and trolley load is applied in the analysis as self-weight of the fuel handling overhead crane. The hydrostatic load of water storage tanks in the AB has minor effect on the RCB foundation.

In addition, the effect of the soil pressure on the RCB foundation is negligibly small because the NI common basemat has a big dimension of 106.0 m × 107.6 m (348 ft × 353 ft) and the distance between the RCB foundation and AB outside wall is accordingly long. Most of the soil pressure on the side walls of the AB foundation is transmitted through the AB internal walls and has little effect on the behavior of the RCB foundation.

The design and analysis details for the foundations of safety-related structures are discussed in Subsections 3.8A.1.4.2, 3.8A.2.4.1 and 3.8A.3.4.1.

The maximum allowable differential settlement of foundation is 12.7 mm per 15.24 m (0.5 in per 50 ft) within NI common basemat. The maximum allowable differential settlement between buildings is provided in Table 2.0-1 based on enveloping properties of subsurface materials. In addition, the common basemat is analyzed for construction sequences to minimize any potential differential settlement during construction.

3.8.5.4.1 Analyses for Loads during Operation

The reinforced concrete foundations of seismic Category I structures are analyzed and designed for the reactions due to static, seismic and all other loads that affect basemat analysis at the base of the superstructures supported by the foundation. The effect of the temperature load in the basemat is negligible and is not considered in the basemat analysis based on ACI 349. According to ACI 349, thermal gradients less than approximately 38 °C (100 °F) need not be analyzed because such gradients do not cause significant stress in the reinforcement or strength deterioration. In the NI common basemat, the temperature gradient is approximately 50 °F and a uniform temperature change is less than 10 °C (50 °F). The analysis of the foundation mat is performed by a three-dimensional finite element structure model, and the forces and moments determined in the analysis are input to the structural design.

The analysis and design of the foundations consider the effects of potential mat uplift, with particular emphasis on differential settlements of the basemat.

The foundation of the seismic Category I structure analysis is performed considering a soil/rock properties beneath the foundation as a nonlinear spring elements. The model is capable of determining the possibility of uplift of the basemat from the subgrade during postulated SSE events. The vertical spring at each node in the analytical model acts in compression only. The horizontal springs are active when the vertical spring is in compression and inactive when the vertical spring lifts off.

3.8.5.4.2 Analyses of Settlement during Construction

The basemat is analyzed and designed to consider settlements in various phases of construction.

The basemat is sufficiently reinforced to control stresses until the concrete placement of basemat walls and containment internal structure is completed.

3.8.5.4.2.1 Construction Sequence

The construction sequence analysis model consists of a foundation media considering 11 layers (soil layer model), NI common basemat (up to El. 78 ft for RCB and 55 ft for Auxiliary Building), and superstructure model (Auxiliary building, Internal structure, and Shell & Dome). The concrete used in the analysis is normal weight concrete with a compressive strength of 5,000 psi at 91 days and 6,000 psi at 91 days for the NI common basemat and superstructures. The concrete strength is assumed at the four hardening conditions to consider change of strength due to the concrete pouring sequence.

For the construction sequence within the NI common basemat, 19 basemat concrete segments are determined based on the concrete placement and hardening stages. For the construction sequence within the superstructure (Auxiliary Building, Containment Shell & Dome, Containment internal structure), the five segments of the superstructure are determined to consider the direction of construction sequence.

The construction sequence analysis, including NI building structure and superstructure, is performed for a total of 58 construction sequences. In addition, the construction sequence of the superstructure considers two cases to check the possibility of different cases (Case 1: Counterclockwise, Case 2: Clockwise). To consider the equipment load, the RCS weight isapplied to each node when the slab, located at 156 ft, is hardening.

For post construction, the settlement due to creep in soil profile S01 is considered. Converserly, in soil profile S08, creep is not considered because the entire profile is rock. To consider the effect of creep in soil, the equation based on several experimental results suggested by Schmertmann (1970) is applied:

$$C_2 = 1 + 0.2\log_{10}(t/0.1) \text{ where, t is time, in years}$$

To consider the effects from the construction sequence, the differences in member forces between the construction sequence analysis and the reference analysis are considered in the design.

A detailed description and results for the construction sequence are described in Technical Report, APR1400-E-S-NR-14006-P (Referenece 40).

3.8.5.4.2.2 <u>Various Settlement</u>

For various types of settlement for the NI, the maximum vertical settlement, titling settlement, differential settlement between structures, and angular distortion are determined under construction and post-construction phases. The following three sequences are considered key for checking the four types settlements. For the EDGB and DFOT, the maximum vertical settlement and differential settlement between structures are determined. These settlements are used to define settlement criteria to be checked by the COL applicant to ensure that the design is adequate at the site.

Sequence No. 22: Completion of construction of NI common basemat.

Sequence No. 58 (Construction phase): Completion of construction of all superstructures.

Sequence No. 59 (Post-construction phase): End of plant life time, considering creep effect of soil.

a. Maximum vertical settlement

Maximum vertical displacement is the maximum calculated vertical deformation for the construction and post-construction phases under sequence No.58 and 59, respectively. Table 3.8-12 summarizes the maximum vertical settlement under construction and post-construction phases. For the maximum vertical settlement of the EDGB and DFOT buildings, it is determined from analysis that the construction sequence is not required. In order to consider characteristics of post-construction, the soil spring reflected in the equation described in section 3.8.5.4.2.1 is considered. Table 3.8-12 summarizes the maximum vertical settlement under construction and post-construction.

b. Maximum Tilting settlement

Tilting settlement is calculated as the ratio of the differential vertical settlement at the opposite edges of the buildings to the length between two edges. In the construction sequence, the maximum tilting settlement for the construction and post-construction phases are determined by the following equation under sequence No.58, end of construction, and No. 59, post-construction. Table 3.8-13 summarizes the maximum tilting settlement under construction and post-construction phases. For the EDGB and DFOT buildings, construction sequence and tilting settlement analysis are not needed because these buildings are relatively small and simple structures, and there are sufficient gaps between the EDGB/DFOT buildings and NI buildings.

Maximum tilting settlement = arctan (ΔUz/L)

c. Maximum differential settlement between structures

The maximum differential settlement between adjacent structures, it is determined based on the vertical displacement obtained from adjacent nodes of each structure. For the maximum differential settlement between structures under construction and post-construction, vertical settlement of the NI basemat is obtained from sequences No.58 and No.59. However, vertical settlement of the EDGB/DFOT is obtained from the analysis which does not consider construction sequence analysis since the other structures (i.e., EDGB/ DFOT) are not required. The construction sequence analysis is not needed because these buildings are relatively small and simple structures, and there are sufficient gaps between the EDGB/DFOT buildings and NI buildings. Table 3.8-14 summarizes the maximum differential settlement between the structures under the construction and post-construction.

d. Maximum Angular distortion

Maximum angular distortion ($\beta = \delta / L$) is a measure of the differential vertical displacement between two adjacent points separated by the distance, L. To determine the angular distortion, three sequences (sequence No.22, No.58, and No.59) are selected for soil profile S01 and two sequences (sequence No.22 and No.58) for soil profile S08. Based on the deformation results from each sequence (Nos.22, 58, and 59), 12 groups are determined as check points for angular distortion. For checking angular distortion of each group corresponding to the soil profiles (S01, S08), angular distortion is plotted by vertical displacement along the distance between adjacent nodes within each group.

Detailed description and displacement graphs for angular distortion results are provided in Technical Report, APR1400-E-S-NR-14006-P (Reference 40). These vertical displacement graphs are used as the acceptance criteria for the COL applicant, not as maximum angular distortion values since these figures show the curvature of the entire basemat.

For the EDGB and DFOT buildings, construction sequence and maximum angular distortion are not needed because these buildings are relatively small and simple structures, and there are sufficient gaps between the EDGB/DFOT buildings and NI buildings.

3.8.5.4.3 Design Summary Report

A design summary report for the basemats is presented in Appendix 3.8A, where the design of representative critical sections of the structures is described. The detailed description of stability, uplift, settlement, bearing pressure check is presented in Appendix 3.8A. A detailed description of analysis for design and stability check is presented in Technical Report, APR1400-E-S-NR-14006-P (Reference 40).

The evaluation considering the deviations of as-procured or as-built construction to the design will be performed with the acceptance criteria, as described in Technical Report, APR1400-E-S-NR-14006-P (Reference 40).

3.8.5.5 Structural Acceptance Criteria

The structural acceptance criteria for the containment and other seismic Category I structures excluding the reactor containment building are described in Subsections 3.8.1.5 and 3.8.4.5, respectively. In particular, the acceptance criteria for the stability of seismic Category I structures are checked together with the structural acceptance criteria against the design loadings. The overturning, sliding, and flotation are checked as a minimum for stability of the basemat.

The design soil conditions are as provided in Section 2.5. The COL applicant is to provide reasonable assurance that the design criteria listed in Table 2.0-1 are met or exceeded (COL 3.8(12)).

The acceptance criteria for overturning, sliding, and flotation are described in Table 3.8-8. The factor of safety to design load combinations is calculated as stated below and compared to the minimum factors to provide reasonable assurance of the stability of the basemats.

3.8.5.5.1 Overturning Acceptance Criteria

The factor of safety against overturning is identified as the ratio of the resisting moment on overturning (M_r) to the overturning moment (M_o). Therefore, FS_o = [M_r / M_o], not less than the factor of safety determined from Table 3.8-8.

Where:

FS_o = structure factor of safety against overturning caused by the design ba sis wind, tornado, or earthquake load

M_r = resisting moment determined as the dead load of the structure minus buoyant force from normal design groundwater table, multiplied by the distance from the structure edge to the structure center of gravity p rovided there is no overstress at the edge of the structure

M_o = overturning moment caused by wind, tornado, or earthquake

Resistance moment due to passive soil pressure is not included in M_r. Therefore, active and overburden soil pressures are also not considered.

3.8.5.5.2 Sliding Acceptance Criteria

The factor of safety against sliding caused by wind, tornado, or earthquake is identified by the following ratio:

FS_s = [F_s]/[F_d], not less than the factor of safety determined from Table 3.8-8

Where:

FS_s = structure factor of safety against sliding caused by wind, tornado, or earthquake

F_s = sliding resistance along bottom of the basemat determined as the dead load of the structure minus the buoyant force from the normal design groundwater table and sliding resistance by shear key effect

F_d = sliding force caused by wind, tornado, or earthquake load

The factor of safety against sliding is calculated by the ratio of resisting force to driving force. The factor of safety of NI common basemat against sliding caused by earthquake may be calculated at each time step for each soil case, i.e., by linear time history method. In this case, the minimum value is selected as the factor of safety.

The driving force is calculated from seismic horizontal force of the structure. From the time history analysis result, the total sum of seismic horizontal force of the structure is obtained for E-W and N-S direction, respectively. At each time step, resultant horizontal driving force is calculated from the E-W and N-S direction forces by square root of sum of their squares.

The resisting force consists of two categories: resisting force by base friction and resisting force by shear keys. The resisting force by base friction is based on the minimum friction force between the sliding interfaces. In the calculation of the resistant force, the coefficient of friction of 0.55 is used. It is based on that the coefficient of friction between waterproofing membrane and lean concrete is the minimum value among the interfaces of dissimilar materials.

The COL applicant is to verify that the coefficient of friction between the lean concrete and the supporting medium at the site is equal to or higher than 0.55. In order to meet this requirement, the COL applicant is to determine the specific undulation pattern in Figure 3.8-27 for two perpendicular horizontal directions (COL 3.8(13)). The minimum angle of internal friction of supporting medium is 35 degrees, which leads to a coefficient of friction of 0.7, and this is to be confirmed by the COL applicant (COL 2.5(10)). The coefficient of friction between the lean concrete and foundation concrete may be used as 1.0 or higher because construction joints of APR1400 shall be intentionally roughened.

The resisting force by base friction is calculated by multiplication of effective dead weight and coefficient of friction. For the calculation of the effective dead weight, probable adverse effects of the buoyant force from design ground water level and seismic uplift force are considered.

For the resisting force by shear keys, partial concave and convex areas of the basemat that are expected to play a role as shear keys are considered. Shear keys may be used to provide additional resistance against basemat sliding. In this sliding evaluation, the difference of passive soil pressure and active soil pressure are considered as the additional resistance provided the direct shear strength on the sliding soil face is larger than the force by passive soil.

3.8.5.5.3 Flotation Acceptance Criteria

The factor of safety against flotation is identified as the ratio of the total dead load of the structure including basemat (D_r) to the buoyant force (F_b). Therefore, $FS_f = D_r / F_b$, not less than the factor of safety determined from Table 3.8-8.

Where:

FS_f = structure factor of safety against flotation caused by the maximum design basis flood or groundwater table

D_r = total dead load of the structure including basemat

F_b = buoyant force caused by the design basis flood or high groundwater table, whichever is greater

3.8.5.6 Material, Quality Control, and Special Construction Techniques

The materials, quality control, special construction techniques, and tolerances for foundations conform with those set forth for the superstructures as discussed in Subsections 3.8.1.6 and 3.8.4.6 and Appendix 3.8A.

The COL applicant is to confirm that uneven settlement due to construction sequence of the NI basemat falls within the values specified in Table 2.0-1 (COL 3.8(14)).

3.8.5.7 Testing and Inservice Inspection Requirements

Testing and inservice surveillance of the basemat are performed in accordance with the requirements described in Subsections 3.8.1.7 and 3.8.4.7.

The COL applicant is to provide a site-specific monitoring program and to monitor maximum vertical settlement, differential settlement, tilt, and angular distortion to ensure they are less than the criteria in Table 2.0-1, Table 3.8-12 thru Table 3.8-14, and section 3.8.5.4.2.2.d during construction and plant operation (COL 3.8(15)).

The COL applicant is to provide testing and inservice inspection programs to examine inaccessible areas of concrete structures for degradation and to monitor groundwater chemistry (COL 3.8(16)).

The long-term settlement is the site-specific characteristics. The COL applicant is to provide the soil parameters for APR1400 site (COL 3.8(17)).

3.8.5.8 SSCs between structures

Differential settlements (76.2 mm (3.0 in) shown in DCD Table 2.0-1) between structures (NI and EDG, NI and DFOT, EDG and DFOT) are used for design of SSCs under static loads.

The SSCs between buildings or structures are designed to allow the relative displacement or resist the forces due to relative movements of buildings. For this purpose, the floor response spectra and seismic anchor motions are used in the following procedure.

1) Seismic analyses of building structures are performed to compute floor response spectra and seismic anchor motions for the SSCs design.

2) SSCs shall have the support details to allow relative movements of between buildings or structures.

3) The seismic anchor motions between buildings or structures are considered in the SSCs design.

3.8.6 Combined License Information

COL 3.8(1) The COL applicant is to perform concrete long-term material testing in a way which verifies physical properties of materials used during the design stage and the characteristics of long term deformation of concrete.

COL 3.8(2) The COL applicant is to provide the detailed design results and evaluation of the ultimate pressure capacity of penetrations, including the equipment hatch, personnel airlocks, electrical and piping penetrations in accordance with NRC RG 1.216.

COL 3.8(3) The COL applicant is to provide detailed analysis and design procedure for the equipment hatch, personnel airlocks, and electrical penetrations.

COL 3.8(4) The COL applicant is to provide detailed analysis and design procedure for the transfer tube penetration assembly.

COL 3.8(5) The COL applicant is to provide the design of site-specific seismic Category I structures such as the essential service water building and the component cooling water heat exchanger building, essential service water conduits, component cooling water piping tunnel, and class 1E electrical duct runs.

COL 3.8(6) The COL applicant is to evaluate any applicable site-specific loads such as explosive hazards in proximity to the site, projectiles and missiles generated from activities of nearby military installations, potential non-terrorism related aircraft crashes, and the effects of seiches, surges, waves, and tsunamis.

COL 3.8(7) The COL applicant is to perform the analysis and design of the steel plate for the new fuel storage pit.

COL 3.8(8) The COL applicant is to determine the environmental condition associated with the durability of concrete structures and provide the concrete mix design that prevents concrete degradation including the reactions of sulfate and other chemicals, corrosion of reinforcing bars, and influence of reactive aggregates.

COL 3.8(9) The COL applicant is to determine construction techniques to minimize the effects of thermal expansion and contraction due to hydration heat, which could result in cracking.

COL 3.8(10) For safety and serviceability of seismic Category I structures during the operation of the plant, the COL applicant is to provide appropriate testing and inservice inspection programs to examine the condition of normally inaccessible, below-grade concrete for signs of degradation and to conduct periodic site monitoring of ground water chemistry. Inservice inspection of the accessible portion of concrete structures is also to be performed.

COL 3.8(11) The COL applicant is to verify that the coefficient of friction between the lean concrete and waterproofing membrane is greater than or equal to 0.55.

COL 3.8(12) The COL applicant is to provide reasonable assurance that the design criteria listed in Table 2.0-1 are met or exceeded.

COL 3.8(13) The COL applicant is to verify that the coefficient of friction between the lean concrete and the supporting medium at the site is equal to or higher than 0.55. In order to meet this requirement, the COL applicant is to determine the specific undulation pattern in Figure 3.8-27 for two perpendicular horizontal directions.

COL 3.8(14) The COL applicant is to confirm that uneven settlement due to construction sequence of the NI basemat falls within the values specified in Table 2.0-1.

COL 3.8(15) The COL applicant is to provide a site-specific monitoring program and to monitor maximum vertical settlement, differential settlement, tilt, and angular distortion to ensure they are less than the criteria in Table 2.0-1, Table 3.8-12 thru Table 3.8-14, and section 3.8.5.4.2.2.d during construction and plant operation.

COL 3.8(16) The COL applicant is to provide testing and inservice inspection programs to examine inaccessible areas of concrete structures for degradation and to monitor groundwater chemistry.

COL 3.8(17) The COL applicant is to provide the following soil information for the APR1400 site: 1) elastic shear modulus and Poisson's ratio of the subsurface soil layers, 2) consolidation properties including data from one-dimensional consolidation tests (initial void ratio, Cc, Ccr, OCR, and complete e-log p curves) and time-versus-consolidation plots, 3) moisture content, Atterberg limits, grain size analyses, and soil classification, 4) construction sequence and loading history, and 5) excavation and dewatering programs.

COL 3.8(18) A detailed construction sequence analysis to determine the resulting construction settlements, including the various standard soils profiles (S01-S04, S06-S09) and sequencing of concrete pours for the NI common basemat (RCB and Auxiliary Building), and superstructure model (Auxiliary Building, internal structures, and Shell & Dome), is presented in Section 3.8.5.4.2. A comparison of the four types of construction settlements (i.e. maximum vertical settlement, tilting settlement, maximum differential settlement between structures, and angular distortion) to the maximum criteria is summarized in Tables 3.8-12 through 3.8-14, and section 3.8.5.4.2.2.d.

The COL applicant should use the construction sequence settlement analysis given in Section 3.8.5.4.2, substituting site-specific soil layer conditions, to ensure that the four types of settlement criteria described in Table 3.8-12 thru Table 3.8-14, and section 3.8.5.4.2.2.d are satisfied. An alternative construction sequence and settlement analysis may be performed by the COL applicant in response to 1) the inability to meet the settlement criteria described in Table 3.8-12 thru Table 3.8-14, and section 3.8.5.4.2.2.d using the DCD approach discussed in Section 3.8.5.4.2 or 2) Other site specific factors that may require a different construction plan and foundation sequence. However, in either case the COL applicant shall satisfy four types of settlement criteria described in Table 3.8-12 thru Table 3.8-14, and section 3.8.5.4.2.2.d.

COL 3.8(19) The following items should be considered by the COL applicant:

1) The surveyed soil profiles will be developed.

2) Based on the surveyed soil characteristics, differences from the DCD soil profiles may exist.

   These differences may include:

   a. Stiff or soft soil areas;

   b. Different soil types (e.g, cohesive);

   c. Potential for loss of cement in the mudmat;

   d. Non-uniformity of soil layers, or

   e. Other differences in the soil profile from the properties assumed in design certification.

   If any of these items and/or conditions are identified, then a site-specific evaluation[1)] shall be performed and checked for adequacy.

3) The time (i.e, short term and long term) instantaneous settlement and time-consolidation effects shall be evaluated in accordance with surveyed soil profiles regardless if a site-specific evaluation is needed under Item 2) above. The bearing pressure shall be checked to demonstrate acceptability with the acceptance criteria in DCD Table 2.0-1. Settlements shall be checked in Table 3.8-12 thru Table 3.8-14, and section 3.8.5.4.2.2.d.

4) The COL applicant will build the seismic Category I structure according to the construction sequence used in the site-specific construction sequence analysis.

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1) evaluation includes basemat and superstructure design (forces/stresses), settlement evaluations, soil bearing pressure evaluation, and stability evaluation.

5) If a site-specific evaluation1) is required, the COL applicant should perform a construction sequence analysis based on the site-specific parameters. If the settlement including results of construction sequence analysis exceeds the acceptance criteria described in Table 3.8-12 thru Table 3.8-14, and section 3.8.5.4.2.2.d the construction sequence will be modified to meet the acceptance criteria described in Table 3.8-12 thru Table 3.8-14, and section 3.8.5.4.2.2.d by COL applicant.

6) The effect on the design of seismic Category I structures due to construction sequence analysis shall be accounted for by the COL applicant.

COL 3.8(20) The COL applicant shall perform site-specific evaluations if the shear wave velocity is less than the shear wave velocity profile used in the various basemat evaluations for design certification. The site-specific evaluations ([settlement (maximum vertical displacement, tilt, differential settlement between structures, angular distortion), soil bearing pressure (static and dynamic loading cases), overturning, and sliding]) and 3D FEM global analysis for basemat design of seismic Category I structures shall be performed using the site-specific parameters (measured $E_{static,}$ $E_{dynamic}$ consistent with soil strain assumed in SSI anlaysis) and the methodology described in DCD Tier 2, Subsection 3.8.5 and Technical Report, APR1400-E-S-NR-14006-P, Subsection 4.

COL 3.8(21) The COL applicant is to confirm that the parking position of the crane and trolley when the crane is not being used is: location of polar crane: Az.280°, trolley location: 12ft 7in away from end of east part. The COL applicant is to confirm that this requirement is included in the technical specification of the COL application for the use of the polar crane.

COL 3.8(22) The COL applicant may provide construction tolerance acceptance criteria and the basis for the criteria (e.g., through the use of analysis, industry research, or testing) for cases where the tolerances in ACI 117 and ANSI/AISC 303, for structural concrete and structural steel, respectively, may be exceeded.

3.8.7 References

1. 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," U.S. Nuclear Regulatory Commission.

2. ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NE, "Class MC Components," The American Society of Mechanical Engineers, the 2007 Edition with the 2008 Addenda.

3. ASME Boiler and Pressure Vessel Code, Section III, Division 2, "Code for Concrete Containments," Subsection CC, The American Society of Mechanical Engineers, the 2001 Edition with the 2003 Addenda.

4. ASME Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," The American Society of Mechanical Engineers, the 2007 Edition with the 2008 Addenda.

5. Regulatory Guide 1.35.1, "Determining Prestressing Forces for Inspection of Prestressed Concrete Containments," U.S. Nuclear Regulatory Commission, July 1990.

6. Regulatory Guide 1.136, "Design Limits, Loading Combinations, Materials, Construction, and Testing of Concrete Containments," Rev. 3, U.S. Nuclear Regulatory Commission, March 2007.

7. Regulatory Guide 1.7, "Control of Combustible Gas Concentrations in Containment," Rev. 3, U.S. Nuclear Regulatory Commission, March 2007.

8. SEI/ASCE 37-02, "Design Loads on Structures during Construction Standard," American Society of Civil Engineers, 2002.

9. ANSYS, "Advanced Analysis Techniques Guide," Release 14.0, ANSYS Inc., November 2011.

10. ASTM C150, "Standard Specification for Portland Cement," American Society for Testing and Materials, 2012.

11. ASTM C33, "Standard Specification for Concrete Aggregates," American Society for Testing and Materials, 2013.

12. ASTM C260, "Standard Specification for Air-Entraining Admixtures for Concrete," American Society for Testing and Materials, 2010.

13. ASTM C494, "Standard Specification for Chemical Admixtures for Concrete," American Society for Testing and Materials, 2013.

14. ASTM C618, "Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete," American Society for Testing and Materials, 2012.

15. ASTM A615, "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement," American Society for Testing and Materials, 2006.

16. ASTM A513, "Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing," American Society for Testing and Materials, 2000.

17. ASTM A519, "Standard Specification for Seamless Carbon and Alloy Steel Mechanical Tubing," American Society for Testing and Materials, 2003.

18. ASTM A576, "Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality," American Society for Testing and Materials, 1990.

19. ASTM A416, "Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete," American Society for Testing and Materials, 2002.

20. ASME Boiler and Pressure Vessel Code, Section III, SA240, "Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications," The American Society of Mechanical Engineers, the 2007 Edition with the 2008 Addenda.

21. Regulatory Guide 1.57, "Design Limits and Loading Combinations for Metal Primary Reactor Containment System Components," Rev. 2, U.S. Nuclear Regulatory Commission, May 2013.

22. Regulatory Guide 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants," Rev. 2, U.S. Nuclear Regulatory Commission, July 2014.

23. Regulatory Guide 1.61, "Damping Values for Seismic Design of Nuclear Power Plants," Rev. 1, U.S. Nuclear Regulatory Commission, March 2007.

24. Regulatory Guide 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis," Rev. 3, U.S. Nuclear Regulatory Commission, October 2012.

25. Regulatory Guide 1.122, "Development of Floor Design Response Spectra for Seismic Design of Floor-Supported Equipment or Components," Rev. 1, U.S. Nuclear Regulatory Commission, February 1978.

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27. Regulatory Guide 1.199, "Anchoring Components and Structural Supports in Concrete," U.S. Nuclear Regulatory Commission, November 2003.

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31. Regulatory Guide 1.115, "Protection Against Low-Trajectory Turbine Missiles," Rev. 2, U.S. Nuclear Regulatory Commission, January 2012.

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37. ASTM C191, "Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle," American Society for Testing and Materials, 2013.

38. ASTM C109, "Standard Test Method for Compressive Strength of Hydraulic Cement Mortars," American Society for Testing and Materials, 2013.

39. ASTM A36, "Standard Specification for Carbon Structural Steel," American Society for Testing and Materials, 2013.

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51. ASME NQA-1, “Quality Assurance Requirements for Nuclear Facility Applications,” American Society of Mechanical Engineers, 2008 Edition with 2009 Addendum.

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54. ACI 301, “Specifications for Structural Concrete for Building,” American Concrete Institute, 2010.

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57. AISI S100, “Specification for the Design of Cold-Formed Steel Structural Members,” American Iron and Steel Institute, 2012.

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59. ACI 214, “Recommended Practice for Evaluation of Strength Test Results of Concrete,” American Concrete Institute, 1991 (R1997).

60. ACI 304 R, “Guide for Measuring, Mixing, Transporting, and Placing Concrete,” American Concrete Institute, 2000 (R2009).

61. ACI 305 R, “Hot Weather Concreting,” American Concrete Institute, 1999.

62. ACI 306 R, “Cold Weather Concreting,” American Concrete Institute, 1998 (R2002).

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68. ANSI/ANS 8.1, “Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors,” American Nuclear Society, 1998.

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78. ACI 117, "Specification for Tolerances for Concrete Construction and Materials and Commentary," American Concrete Institute, 2010.

79. ANSI/AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," American Institute of Steel Construction, 2010.

Table 3.8-1 (1 of 3)

Codes, Standards, Specifications, and Regulations

No.	Document Designation	Edition	Document Tit1e
Codes & Standards			
1	ASME CC	2001 with 2003 Addenda	Code for Concrete Containment
2	ACI 349	1997	Code Requirements for Nuclear Safety-Related Concrete Structure
3	AISC N690	1994 including Supp. 2 (2004)	Specification for the Design, Fabrication and Erection of Steel Safety-Related Structures for Nuclear Facilities
4	ASME NE	2007 with 2008 Addenda	Class MC Components
5	ASME NQA-1	2008 with 2009 Addenda	Quality Assurance Requirements for Nuclear Facility Applications
6	ASME NF	2007 with 2008 Addenda	Supports
7	ACI 318	2008	Building Code Requirements for Reinforced Concrete
8	ASCE 4	1998	Seismic Analysis of Safety-Related Nuclear Structures and Commentary
9	ASCE 7	2005	Minimum Design Loads for Buildings and Other Structures
10	SEI/ASCE 37	2002	Design Loads on Structures During Construction Standard
11	ASTM C150	2012	Standard Specification for Portland Cement
12	ASTM C33	2013	Standard Specification for Concrete Aggregates
13	ASTM C260	2010	Standard Specification for Air-Entraining Admixtures for Concrete
14	ASTM C494	2013	Standard Specification for Chemical Admixtures for Concrete
15	ASTM C618	2012	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
16	ASTM A615	2006	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
17	ASTM A513	2000	Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
18	ASTM A519	2003	Standard Specification for Seamless Carbon and Alloy Steel Mechanical Tubing

Table 3.8-1 (2 of 3)

No.	Document Designation	Edition	Document Tit1e
19	ASTM A576	1990	Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality
20	ASTM A416	2002	Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
21	ASTM C191	2013	Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
22	ASTM C109	2013	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
23	ASTM A36	2012	Standard Specification for Carbon Structural Steel
24	ASME IWE	2007 with 2008 Addenda	Requirements for Class MC and Metallic Liners of Class CC Components of Lightwater Cooled Plants
25	ASME IWL	2007 with 2008 Addenda	Requirements for Class CC Concrete Components of Light-water Cooled Plants
26	ASME IX	2007 with 2008 Addenda	Welding and Brazing Qualifications
27	ANSI/AISC 303	2010	Code of Standard Practice for Steel Buildings and Bridges
Specifications:			
28	AISC 360	2005	Specification for Structural Steel Buildings
29	ACI 301	2010	Specifications for Structural Concrete for Building
30	AWS D1.1	2010	Structural Welding Code – Steel Structure
31	AWS D1.3	2008	Structural Welding Code - Sheet Steel Structure
32	AISI S100	2012	Specification for the Design of Cold-Formed Steel Structural Members
33	ACI 211.1	1991 (R2007)	Standard Practice for Selecting Proportions for Normal, Heavy Weight, and Mass Concrete
34	ACI 214	1991 (R1997)	Recommended Practice for Evaluation of Strength Test Results of Concrete
35	ACI 304 R	2000 (R2009)	Guide for Measuring, Mixing, Transporting, and Placing Concrete
36	ACI 305 R	1999	Hot Weather Concreting
37	ACI 306 R	1998 (R2002)	Cold Weather Concreting
38	ACI 308	1992 (R1997)	Standard Practice for Curing Concrete
39	ACI 309 R	2005	Guide for Consolidation of Concrete

Table 3.8-1 (3 of 3)

No.	Document Designation	Edition	Document Tit1e
40	ACI 311.1 R	1999	ACI Manual of Concrete Inspection
41	ACI 315	1999	Details and Detailing of Concrete Reinforcement
42	ACI 340R	1997	Design of Structural Reinforced Concrete Elements in Accordance with the Strength Design Method of ACI 318-95
43	ACI 347	2004	Guide to Formwork for Concrete
44	ANSI/ANS 8.1	1998	Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors
45	ANSI/ANS 8.17	1984	Criticality Safety Criteria for Handling, Storage, and Transportation of LWR Fuel Outside Reactors
46	ANSI/ANS 57.2	1983	Design Requirements for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Plants
47	ACI 117	2010	Specification for Tolerances for Concrete construction and Materials and Commentary
U.S. Regulations			
48	10 CFR Part 50	-	Domestic Licensing of Production and Utilization Facilities
49	10 CFR Part 52	-	Domestic Licensing of Production and Utilization Facilities
50	10 CFR Part 100	-	Reactor Site Criteria

Abbreviation

ACI American Concrete Institute
AISC American Institute of Steel Construction
AISI American Iron and Steel Institute
ANS American Nuclear Society
ASME American Society of Mechanical Engineers
ASTM American Society of Testing and Materials
AWS American Welding Society

Table 3.8-2

Seismic Category I Structure Load Combination for the Reactor Containment Building

Category /	Loading Condition	No	D(1)	L(2)	F	P_t	G	Pa	T_t	T_o	T_a	E_s	W	Wt	R_o	R_a	Y_r	Y_j	Y_m	Y_f	H	H_s	P_v	H_a	P_s
Serv	Test	1	1.0	1.0	1.0	1.0	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Construction	2	1.0	1.0	1.0	-	-	-	-	1.0	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-
	Normal	3	1.0	1.0	1.0	-	1.0	-	-	1.0	-	-	-	-	1.0	-	-	-	-	-	-	-	1.0	-	-
Factored	Severe environmental	4	1.0	1.3	1.0	-	1.0	-	-	1.0	-	-	1.5	-	1.0	-	-	-	-	-	-	-	1.0	-	-
		5	1.0	1.3	1.0	-	1.0	-	-	1.0	-	-	-	-	1.0	-	-	-	-	-	1.5	-	1.0	-	-
	Extreme environmental	6	1.0	1.0	1.0	-	1.0	-	-	1.0	-	1.0	-	-	1.0	-	-	-	-	-	-	-	1.0	-	-
		7	1.0	1.0	1.0	-	1.0	-	-	1.0	-	-	-	1.0	1.0	-	-	-	-	-	-	-	1.0	-	-
		8	1.0	1.0	1.0	-	1.0	-	-	1.0	-	-	-	-	1.0	-	-	-	-	-	-	1.0	1.0	-	-
	Abnormal	9	1.0	1.0	1.0	-	1.0	1.5	-	-	1.0	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-
		10	1.0	1.0	1.0	-	1.0	1.0	-	-	1.0	-	-	-	-	1.25	-	-	-	-	-	-	-	-	-
		11	1.0	1.0	1.0	-	1.25	1.25	-	-	1.0	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-
	Abnormal/severe environmental	12	1.0	1.0	1.0	-	1.0	1.25	-	-	1.0	-	1.25	-	-	1.0	-	-	-	-	-	-	-	-	-
		13	1.0	1.0	1.0	-	1.0	-		1.0	-	-	1.0	-	-	-	-	-	-	-	-	-	-	1.0	-
	Abnormal/extreme environmental	14	1.0	1.0	1.0	-	1.0	1.0	-	-	1.0	1.0	-	-	-	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-
	Combustible Gas Control inside Containment (3)	15	1.0	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0

(1) D_d in Table 3.8-8 is included in D.

(2) Includes all temporary construction loads during and after construction of the containment; also includes Lh in Table 3.8-8 and C.

(3) The strain does not exceed the values given in ASME Section III, Division 2, Table CC-3720-1.

Table 3.8-3

Load Definitions and Load Combinations for ASME Class MC Components

No	Load Condition	D_o	L	T_o	R_o	P_o	T_t	P_t	T_s	R_s	P_s	T_a	R_a	P_a	E	E′	P_{g1}	P_{g2}	P_{g3}	Y_r	Y_j	Y_m	F_L	Stress Intensity Limits(2)
1	Testing Condition	1.0	1.0				1.0	1.0																Table NE-3221-1
2	Design Condition	1.0	1.0									1.0	1.0	1.0										Table NE-3221-1
3	Service Condition(1)																							Table NE-3221-1
4	Level A Service Limit																							Table NE-3221-1
5	1) Normal operating plant condition	1.0	1.0	1.0	1.0	1.0																		Table NE-3221-1
6	2) Operating plant condition in conjunction with the actuation of multiple SRVs	1.0	1.0						1.0	1.0	1.0													Table NE-3221-1
7	3) Design-basis LOCA	1.0	1.0									1.0	1.0	1.0										Table NE-3221-1
8	4) Multiple SRV actuations in conjunction with small or intermediate break accident	1.0	1.0						1.0	1.0	1.0	1.0	1.0	1.0										Table NE-3221-1
9	Level B Service Limit																							Table NE-3221-1
10	1) Design-basis LOCA in combination with OBE	1.0	1.0									1.0	1.0	1.0	1.0									Table NE-3221-1
11	2) Operating plant condition in combination with OBE	1.0	1.0	1.0	1.0	1.0									1.0									Table NE-3221-1
12	3) Operating plant condition in combination with OBE and multiple SRV actuations	1.0	1.0						1.0	1.0	1.0				1.0									Table NE-3221-1
13	4) Design-basis LOCA in combination with a single active component failure causing one SRV discharge	1.0	1.0						1.0	1.0	1.0	1.0	1.0	1.0										Table NE-3221-1
14	Level C Service Limit																							Table NE-3221-1
15	1) Design-basis LOCA in combination with SSE	1.0	1.0									1.0	1.0	1.0		1.0								Table NE-3221-1
16	2) Operating plant condition in combination with SSE	1.0	1.0	1.0	1.0	1.0										1.0								Table NE-3221-1
17	3) Multiple SRV actuations in combination with small- or intermediate-break accident and SSE	1.0	1.0						1.0	1.0	1.0	1.0	1.0	1.0		1.0								Table NE-3221-1
18	4) Dead load plus pressure resulting from an accident that releases hydrogen	1.0															1.0	1.0						Table NE-3221-1
19	Level D Service Limit																							Table NE-3221-1
20	1) Design-basis LOCA in combination with SSE and local dynamic loadings	1.0	1.0									1.0	1.0	1.0		1.0				1.0	1.0	1.0		Table NE-3221-1
21	2) Multiple SRV actuations in combination with small- or intermediate-break accident, SSE, and local dynamic loading	1.0	1.0						1.0	1.0	1.0	1.0	1.0	1.0		1.0				1.0	1.0	1.0		Table NE-3221-1
22	Post-Flooding Condition	1.0	1.0												1.0								1.0	Table NE-3221-1

(1) The loads may be combined by their actual time history of occurrence taking into consideration their dynamic effect upon the structure.

(2) Acceptance criteria are taken from the referenced section in Section III of the ASME Code

(3) Definitions of the terms in this table are as follows;

D: Dead loads
L: Live loads, including all loads resulting from platform flexibility and deformation and from crane loading, if applicable
P_t: Test pressure
T_t: Test temperature
T_o: Thermal effects and loads during startup, normal operating, or shutdown conditions, based on the most critical transient or steady-state condition
R_o: Pipe reactions during startup, normal operating, or shutdown conditions, based on the most critical transient or steady-state condition
P_o: External pressure loads resulting from pressure variation either inside or outside containment
E: Loads generated by the OBE, including sloshing effects, if applicable
E': Loads generated by the SSE, including sloshing effects, if applicable
P_a: Pressure load generated by the postulated pipe break accident (including pressure generated by postulated small-break or intermediate-break pipe ruptures), pool swell, and subsequent hydrodynamic loads
T_a: Thermal loads under thermal conditions generated by the postulated pipe break accident, pool swell, and subsequent hydrodynamic reaction loads
R_a: Pipe reactions under thermal conditions generated by the postulated pipe break accident, pool swell, and subsequent hydrodynamic reaction loads
P_s: All pressure loads that are caused by the actuation of SRV discharge, including pool swell and subsequent hydrodynamic loads, if applicable
T_s: All thermal loads that are generated by the actuation of SRV discharge, including pool swell and subsequent hydrodynamic thermal loads, if applicable
R_s: All pipe reaction loads that are generated by the actuation of SRV discharge, including pool swell and subsequent hydrodynamic reaction loads, if applicable
Y_r: Equivalent static load on the structure generated by the reaction on the broken pipe during the design-basis accident
Y_j: Jet impingement equivalent static load on the structure generated by the broken pipe during the design-basis accident
Y_m: Missile impact equivalent static load on the structure generated by or during the design-basis accident, such as pipe whipping
F_L: Load generated by the post-LOCA flooding of the containment, if applicable
P_{g1}: Pressure load generated from 100-percent fuel clad metal-water reaction
P_{g2}: Pressure loads generated by hydrogen burning, if applicable

Table 3.8-4

Physical Properties for Materials To Be Used for Pressure Parts or Attachment to Pressure Part ASME Code Class MC Components

Material Specification	S_u Minimum Ultimate Tensile MPa (ksi)	S_y Minimum Yield at Ambience MPa (ksi)	S_y Minimum Yield at 171 °C (340 °F) MPa (ksi)	S_m ASME Code Allowable Stress Intensity at 171 °C (340 °F) MPa (ksi)	Note
Plate					
SA-516 Gr 70	483 (70)	262 (38)	229 (33.26)	153 (22.18)	
SA-516 Gr 60	414 (60)	221 (32)	193 (27.94)	129 (18.66)	
SA-240 Type 304	517 (75)	207 (30)	150 (21.78)	134 (19.48)	
Pipe					
SA-106 Gr B	414 (60)	241 (35)	211 (30.6)	138 (20.0)	
SA-333 Gr 6	414 (60)	241 (35)	211 (30.6)	138 (20.0)	
SA-312 Type 304	517 (75)	207 (30)	150 (21.78)	134 (19.48)	
Forgings and fittings					
SA-350 LF-2	483 (70)	248 (36)	217 (31.5)	144 (20.94)	
SA-182 F22 Class 3	517 (75)	310 (45)	268 (38.84)	168 (24.34)	
Bolting					
SA-193 B7	793 (115)	655 (95)	579 (83.98)	193 (28.0)	Between 6.35 and 10.16 cm (2.5 and 4 in.) diameter
SA-320 Gr L43	862 (125)	724 (105)	642 (93.06)	214 (31.04)	Under 6.35 cm (2.5 in.) diameter

Table 3.8-5 (1 of 2)

Design Loads for Seismic Category I Structures

Structures		Loadings kN/m^2 (psf)							Remarks
		Dead Load (D)	Live Load (L)	Rain and Wind (L and W)	Soil (L_g)	Fluid Pressure (L_h)	Tornado (W_t)	Temp.°F Min/Max (T_o)	
Containment Internal Structure		*	*	N/A	N/A	*	N/A	*	Notes : 1, 2, 6
	Primary Shield Wall	-	-	N/A	N/A	-	N/A	-	
	Operating Floor, El. 156′-0″	-	50.0 (1,000) 10.0 (200)	N/A	N/A	N/A	N/A	-	Note : 11
	Intermediate Floor, El. 136′-6″	-	10.0 (200)	N/A	N/A	N/A	N/A	-	
	Intermediate Floor, El. 114′-0″	-	10.0 (200)	N/A	N/A	N/A	N/A	-	
	Secondary Shield Wall	-	-	N/A	N/A	N/A	N/A	-	

Table 3.8-5 (2 of 2)

Structures	Loadings kN/m^2 (psf)							Remarks
	Dead Load (D)	Live Load (L)	Rain and Wind (L and W)	Soil (L_g)	Fluid Pressure (L_h)	Tornado or hurricane (W_t)	Temp.°F Min/Max (T_o)	
Other Seismic Category I Structure except RCB	*	*	*	*	*	*	*	Notes: 1, 2, 4, 6
Interior walls	1.0 (20)	16.8 (350)	N/A	N/A	-	N/A	-	Note 8
Exterior walls	0.5 (10)	16.8 (350)	-	-	-	-	-	Notes: 3, 7, 8
Roof slabs	-	4.8 (100)	-	N/A	N/A	-	-	Notes: 3, 5, 9
Main floors	-	10.0 (200) ~ 24.0 (500)	-	N/A	-	-	-	Note 10
Basemat at elevation 55 ft 0 in	-	24.0 (500)	N/A		-	N/A	-	-
Cask loading and decontamination pit	-	50.0 (1,000)	N/A	N/A	-	N/A	-	-

(1) The masses of all structures are included in all load combinations as dead loads.

(2) All structures are designed for seismic loads.

(3) See Subsection 3.8.4.3 for design soil loads, including groundwater, thermal loads, wind loads, tornado or hurricane loads, and added live load due to precipitation.

(4) Abnormal loads due to main steam and feedwater line breaks are considered.

(5) Loads for SG removal (1,000 psf) are considered at elevation 156 ft 0 in CVCS area.

(6) Extreme external temperatures are evaluated to determine temperatures to be combined with extreme internal temperatures.

(7) Soil surcharge load on exterior walls due to construction loads.

(8) Live load on shear wall in horizontal (out-of-plane) direction to account for attachment loads.

(9) Snow drifts are considered for live load on lower roofs.

(10) Normal live load is 200 psf and equipment removal load is 500 psf.

(11) 50.0 kN/m^2 (1,000 psf) is for movable equipment during construction and maintenance

Table 3.8-6

<u>Types and Applicable Loading Conditions for Dead Loads and Live Loads</u>

<table>
<tr><th colspan="8">Applicable Loading Conditions</th><th rowspan="2">Load</th><th rowspan="2">Definition of Loads</th></tr>
<tr><th>Construction</th><th>Test</th><th>Normal</th><th>Severe Environmental</th><th>Abnormal</th><th>Extreme Environmental</th><th>Abnormal/ Severe Environmental</th><th>Abnormal/ Extreme Environmental</th></tr>
<tr><td>×</td><td>×</td><td>×</td><td>×</td><td colspan="4">×</td><td rowspan="4">D E A D L O A D S</td><td>D_h – Vertical Pressure of liquids (with due regard to variations in the liquid depth)</td></tr>
<tr><td>×</td><td>×</td><td>×</td><td>×</td><td colspan="4">×</td><td>D_d – Self-weight of structure including waterproofing, siding, and insulation</td></tr>
<tr><td></td><td>×</td><td>×</td><td>×</td><td colspan="4">×</td><td>D_e – Weight of equipment and its contents (gravity load under operating conditions). This includes crane self-weights and trolley hoist self-weights.</td></tr>
<tr><td>×</td><td></td><td></td><td></td><td colspan="4"></td><td>D_{cn} – Shoring and other loads provided by contractor</td></tr>
<tr><td>×</td><td>×</td><td>×</td><td>×</td><td colspan="4">×</td><td rowspan="6">L I V E L O A D S</td><td>L_h – Hydrostatic loads due to weight and pressures of fluids with well-defined densities and controllable maximum height</td></tr>
<tr><td>×</td><td>×</td><td>×</td><td>×</td><td colspan="4">×</td><td>L_g – Loads due to the weight and pressure of soil, water in soil, or other materials</td></tr>
<tr><td>×</td><td>×</td><td>×</td><td>×</td><td colspan="4">×</td><td>L_s – Snow loads</td></tr>
<tr><td></td><td>×</td><td>×</td><td>×</td><td colspan="4">×</td><td>L_f – Floor and roof live loads</td></tr>
<tr><td></td><td>×</td><td>×</td><td>×</td><td colspan="4">×</td><td>L_o – Operating reaction of equipment excluding D_e</td></tr>
<tr><td></td><td></td><td></td><td></td><td colspan="4">×</td><td>L_e – 2.4 kN/m^2 (50 psf) seismic live load for Floor and roof during SSE loadings</td></tr>
</table>

Table 3.8-7A

Seismic Category I Structures Excluding Containment Structure
Reinforced Concrete – Ultimate Strength Design Load Combination Table

Loading Condition	No	Loads (1)																							Design Strength
		Normal									Severe Environmental		Abnormal									POSRV Load	Extreme Environmental			
		$D^{(1)}$	D_d	$L^{(3)}$	L_h	T_o	R_o	C	P_o	M_o	W	H	P_a	T_a	R_a	Y_r	Y_j	Y_m	Y_f	M_a	$P_{ac}^{(4)}$	E_s	W_t	H_s	
Construction	1	1.1	-	1.3	1.1	-	1.3	1.3	-	1.3	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	ACI349
	2	-	0.9	-	1.1	-	-	1.3	-	1.3	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	ACI349
Test	3	1.1	-	1.3	1.1	1.2	1.3	1.3	1.3	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ACI349
Normal	4	1.4	-	1.7	1.4	-	1.7	1.7	1.7	1.7	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	ACI349
	5	1.1	-	1.3	1.1	1.2	1.3	1.3	1.3	1.3	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	ACI349
Severe Environmental	6	1.4	-	1.7	1.4	-	1.7	1.7	1.7	1.7	1.7	-	-	-	-	-	-	-	-	-	1.7	-	-	-	ACI349
	7	1.1	-	1.3	1.1	1.2	1.3	1.3	1.3	1.3	1.3	-	-	-	-	-	-	-	-	-	1.3	-	-	-	ACI349
	8	1.4	-	1.7	1.4	-	1.7	1.7	1.7	1.7	-	1.7	-	-	-	-	-	-	-	-	1.7	-	-	-	ACI349
	9	1.1	-	1.3	1.1	1.2	1.3	1.3	1.3	1.3	-	1.3	-	-	-	-	-	-	-	-	1.3	-	-	-	ACI349
Abnormal	10	1.0	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	1.0	1.25	-	-	-	ACI349
	11	1.0	-	1.0	1.0	-	-	1.0	-	1.0	-	-	1.4 (5)	1.0	1.0	-	-	-	-	-	1.25	-	-	-	ACI349
Extreme Environmental	12	1.0	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	1.0	1.0	-	-	ACI349
	13	1.0	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	1.0	-	1.0	-	ACI349
	14	1.0	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	1.0	-	-	1.0	ACI349
Abnormal/ Extreme Environmental	15	1.0	-	1.0	1.0	-	-	1.0	-	1.0	-	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-	1.0	1.0	-	-	ACI349

(1) Where a load occurs simultaneously with the other loads or is always present and reduces effects of other loads, the load factor is taken as 0.9; otherwise, the load factor is taken as zero.

(2) Hydrodynamic loads associated with seismic loads are included in E_s.

(3) L includes L_g, L_s, L_f, L_0, and L_e loads.

(4) POSRV load (P_{ac}) is used for IRWST design (Refer to SRP 3.8.1).

(5) 1.5 P_a should be used in place of 1.4 P_a for IRWST design.

Table 3.8-7B (1 of 2)

Seismic Category I Structures Structural Steel – Elastic Design Load Combination Table

Loading Condition	No	Loads [1]																					Design Strength[6], [7]
		Normal								Severe Environmental		Abnormal								Extreme Environmental			
		D	D_d	L[12]	T_o	R_o	C	P_o	M_o	W	H	P_a	T_a	R_a	Y_r	Y_j	Y_m	Y_f	M_a	E_s	W_t	H_s	
Construction	1	1.0	-	1.0	-	1.0	1.0	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00 AISC N690
	2	1.0	-	1.0	-	1.0	1.0	-	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	1.00 AISC N690
	3	-	0.75	-	-	-	1.0	-	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	1.00 AISC N690
Test	4	1.0	-	1.0	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00 AISC N690
Normal	5	1.0	-	1.0	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00 AISC N690
	6	1.0	-	1.0	-	-	1.0	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00 AISC N690
Severe Environmental [10], [11]	7	1.0	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	1.00 AISC N690
	8	1.0	-	1.0	-	-	1.0	-	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	1.00 AISC N690
	9	1.0	-	1.0	1.0	1.0	1.0	1.0	1.0	-	1.0	-	-	-	-	-	-	-	-	-	-	-	1.00 AISC N690
Abnormal [4], [7]	10	1.0	-	1.0	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.60 AISC N690[3], [5]
	11	1.0	-	1.0	-	-	1.0	-	1.0	-	-	1.0	1.0	1.0	-	-	-	-	-	-	-	-	1.60 AISC N690[3], [5]
	12	1.0	-	1.0	-	-	1.0	-	1.0	-	-	1.0	1.0	-	-	-	-	-	-	-	-	-	1.60 AISC N690[3], [5]
Extreme Environmental	13	1.0	-	1.0	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	1.0	-	-	1.60 AISC N690[3], [5]
	14	1.0	-	1.0	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	1.0	-	1.60 AISC N690[3], [5]
	15	1.0	-	1.0	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	1.0	1.60 AISC N690[3], [5]
Abnormal/ Extreme Environmental[7],[8]	16	1.0	-	1.0	-	-	1.0	-	1.0	-	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-	1.0	-	-	1.70 AISC N690[3], [5]

Table 3.8-7B (2 of 2)

(1) All load combinations are checked for a no-live-load condition.

(2) For primary plus secondary stress, the allowable stresses are increased by a factor of 1.5.

(3) In load combinations 10 through 16, the design stress in shear is not to exceed 1.4 × AISC N690 in members and bolts.

(4) The load combination 12 is to be used when the global (non-transient) sustained effects of T_a are considered.

(5) The design stress where axial compression exceeds 20 percent of normal allowable is 1.5 × AISC N690 for load combinations 10, 11, 12, 13, 14, and 15 and 1.6 for load combination 16.

(6) In no instance does the allowable stress exceed 0.7 F_u in axial tension or 0.7 F_u times the ratio Z/S for tension plus bending.

(7) The maximum values of P_a, T_a, R_a, Y_j, Y_r and Y_m, including an appropriate dynamic load factor, is used in load combination 11, 12, and 16, unless an appropriate time-history analysis is performed to justify otherwise.

(8) In combining loads from a postulated high-energy pipe break accident and a seismic event the SRSS (square root of the sum of the squares) may be used, provided the responses are calculated on a linear basis.

(9) Secondary stresses that are used to limit primary stresses are treated as primary stresses.

(10) Consideration shall also be given to snow and other loads as defined in ASCE 7.

(11) Allowable stress limits coefficients are applied to the basic stress allowable of AISC. The coefficients for AISC N690 are supplemented by the requirements identified in subsection 3.8.4.5.

(12) L includes L_h, L_g, L_s, L_f, L_0 and L_e loads.

Table 3.8-7C

Fuel Storage Rack – Design Loading Combination Table

Load Combination	Acceptance Limit
D + L D + L + T_o	ASME Section III, NF Level A Service Limits for Class 3
D + L + T_o + P_f	ASME Section III, NF Level B Service Limits for Class 3
D + L + T_a + E'	ASME Section III, NF Level D Service Limits for Class 3
D + L + F_d	The functional capability of the fuel racks should be demonstrated.

Where:

D : Deadweight including fuel assembly weight

L : Live load

E' : Safe shutdown earthquake (SSE)

T_o : Differential temperature-induced loads, based on the most critical transient or steady-state condition under normal operation or shutdown conditions

T_a : Highest temperature associated with the postulated abnormal design conditions

F_d : Force caused by the accidental drop of the heaviest load from maximum possible height

P_f : Upward force on the racks caused by a postulated stuck fuel assembly

Note:

For the APR1400, the operating basis earthquake (OBE) ground motion is defined as one-third the SSE ground motion design response spectra. Therefore, in accordance with 10 CFR Part 50, Appendix S, an OBE design analysis is not required and load combinations involving E have been removed.

Table 3.8-8

Acceptance Criteria for Overturning, Sliding, and Flotation

Load Combination	Minimum Factor of Safety		
	Overturning	Sliding	Flotation
D+He+W	1.5	1.5	-
D+He+E_s	1.1	1.1	-
D+He+W_t	1.1	1.1	-
D+H_s	-	-	1.1

Where:

D : Dead load

H_e : Static and dynamic lateral and vertical earth pressure including buoyant effect of normal design groundwater table level

H_s : Buoyant force of the design basis flood

W : Wind load

W_t: Tornado or hurricane load

E_s : Seismic load

Table 3.8-9 (1 of 2)

List of Containment Penetrations Greater than 18 Inches

Elevation	Azimuth Deg-Min	Sleeve Data				Projection	
		Length	Outside Dia.	Thickness	Material	A(1)	B(2)
142'00-0/0"	044-00	03'11-3/4"	18.000"	0.500"	SA-333 Gr-6	06.00	-6.25
147'00-0/0"	055-00	03'11-3/4"	18.000"	0.500"	SA-333 Gr-6	06.00	-6.25
146'06-0/0"	060-00	03'11-1/4"	24.000"	0.500"	SA-516 Gr-70	06.00	-6.75
146'06-0/0"	063-30	03'11-1/4"	24.000"	0.500"	SA-516 Gr-70	06.00	-6.75
142'00-0/0"	063-30	03'11-3/4"	18.000"	0.500"	SA-333 Gr-6	06.00	-6.25
146'06-0/0"	116-30	03'11-1/4"	24.000"	0.500"	SA-516 Gr-70	06.00	-6.75
142'00-0/0"	116-30	03'11-3/4"	18.000"	0.500"	SA-333 Gr-6	06.00	-6.25
146'06-0/0"	120-00	03'11-1/4"	24.000"	0.500"	SA-516 Gr-70	06.00	-6.75
147'00-0/0"	125-00	03'11-3/4"	18.000"	0.500"	SA-333 Gr-6	06.00	-6.25
142'00-0/0"	136-00	03'11-3/4"	18.000"	0.500"	SA-333 Gr-6	06.00	-6.25
121'00-0/0"	262-39-32	09'01-1/8"	53.750"	0.375"	SA-516 Gr-70	06.00	42.00
108'00-0/0"	311-30	05'00-0/0"	20.000"	0.500"	SA-333 Gr-6	01.50	10.50
109'00-0/0"	008-00	05'00-0/0"	20.000"	0.500"	SA-333 Gr-6	01.50	10.50
116'00-0/0"	311-30	05'00-0/0"	24.000"	1.250"	SA-516 Gr-70	01.50	10.50
109'00-0/0"	307-30	05'00-0/0"	28.000"	1.250"	SA-516 Gr-70	01.50	10.50
129'00-0/0"	348-00	05'00-0/0"	20.000"	0.375"	SA-333 Gr-6	01.50	10.50
129'00-0/0"	352-00	05'00-0/0"	20.000"	0.375"	SA-333 Gr-6	01.50	10.50
122'06-0/0"	004-00	05'00-0/0"	18.000"	0.375"	SA-333 Gr-6	01.50	10.50
122'06-0/0"	008-00	05'00-0/0"	18.000"	0.375"	SA-333 Gr-6	01.50	10.50
129'00-0/0"	275-30	05'00-0/0"	18.000"	0.375"	SA-333 Gr-6	01.50	10.50
129'00-0/0"	279-00	05'00-0/0"	18.000"	0.375"	SA-333 Gr-6	01.50	10.50
122'06-0/0"	282-30	05'00-0/0"	18.000"	0.375"	SA-333 Gr-6	01.50	10.50
129'00-0/0"	289-30	05'00-0/0"	18.000"	0.375"	SA-333 Gr-6	01.50	10.50
109'00-0/0"	300-00	05'00-0/0"	18.000"	0.375"	SA-333 Gr-6	01.50	10.50
115'06-0/0"	228-30	05'00-0/0"	26.000"	1.000"	SA-516 Gr-70	01.50	10.50

Table 3.8-9 (2 of 2)

Elevation	Azimuth Deg-Min	Sleeve Data				Projection	
		Length	Outside Dia.	Thickness	Material	A(1)	B(2)
109'00-0/0"	232-30	05'00-0/0"	28.000"	1.250"	SA-516 Gr-70	01.50	10.50
109'00-0/0"	227-30	05'00-0/0"	20.000"	0.500"	SA-333 Gr-6	01.50	10.50
129'00-0/0"	192-00	05'00-0/0"	18.000"	0.375"	SA-333 Gr-6	01.50	10.50
129'00-0/0"	236-00	05'00-0/0"	18.000"	0.375"	SA-333 Gr-6	01.50	10.50
190'06-0/0"	229-00	05'00-0/0"	60.000"	1.000"	SA-516 Gr-70	01.50	10.50
190'06-0/0"	239-00	05'00-0/0"	60.000"	1.000"	SA-516 Gr-70	01.50	10.50
147'06-0/0"	011-08	08'08-1/4"	44.000"	1.500	SA-516 Gr-70	01.50	15.00
147'06-0/0"	348-04	08'05-0/0"	24.000"	1.500	SA-516 Gr-70	01.50	15.00
147'06-0/0"	168-51	08'08-1/4"	44.000"	1.500	SA-516 Gr-70	01.50	15.00
147'06-0/0"	191-56	08'05-0/0"	24.000"	1.500	SA-516 Gr-70	01.50	15.00
143'00-1/4"	354-16	08'04-3/4"	60.000"	1.500	SA-516 Gr-70	01.50	15.00
143'00-1/4"	004-13	08'03-0/0"	60.000"	1.500	SA-516 Gr-70	01.50	15.00
143'00-1/4"	185-44	08'04-3/4"	60.000"	1.500	SA-516 Gr-70	01.50	15.00
143'00-1/4"	175-47	08'03-0/0"	60.000"	1.500	SA-516 Gr-70	01.50	15.00
162'00-0/0"	348-51	05'10-0/0"	24.000"	1.250	SA-516 Gr-70	01.50	15.00

(1) Sleeve projection length on inside of containment wall

(2) Sleeve projection length on outside of containment wall

Table 3.8-10

Margin of Safety for Design of Containment Liner Plate and Anchorage System

Structure	Category	Allowable Value	Maximum Value	Ratio[(1)]
Liner Plate	Construction (stress)	20 ksi	16.4 ksi	1.22
	Service (membrane strain)	0.002	0.0012	1.67
	Service (membrane & bending strain)	0.004	0.0042	0.95[(2)]
	Factored (membrane strain)	0.005	0.0024	2.08
	Factored (membrane & bending strain)	0.014	0.0061	2.30
Liner Anchorage	0.25 delta u (displacement)	0.02285 in	0.00738 in	3.10

(1) Ratio = Allowable Value / Maximum Value

(2) This value is acceptable with the following two reasons: First, the anchor movement is based on the unbuckled panel having a 15% greater thickness than the buckled panel. This variation accounts for rolling tolerances of the 1/4” liner plate and it is considered conservative since it is very unlikely that the plate thickness fluctuations of this magnitude will occur within 30 inch plate width. Second, the creep and shrinkage strains at the end of the plant life have been combined with the initial prestress strains. This is too conservative because such a combination of maximum strains does not occur simultaneously.

Table 3.8-11 (1 of 3)

Computer Programs for Seismic Category I Structures

Program	Analysis Method	Analysis Model	Analysis Scope	Validation & Verification
ANSYS	• Modal analysis	• Reactor containment building (shell & dome, internal structure)	• Eigenvalue analysis	ANSYS was procured with a Quality Assurance Service Agreement and meets the applicable requirements of the NQA-1, Subpart 2.7, quality assurance requirements of computer software.
		• Spent fuel pool & aux. feed water storage tank	• Eigenvalue analysis	
	• Response spectrum analysis	• Reactor containment building (shell & dome, internal structure)	• Structural analysis of seismic load for RCB	
	• Static analysis	• Reactor containment building (shell & dome, internal structure)	• Structural analysis of RCB for structure design (e.g, dead and live loads, etc.)	
		• Auxiliary building (including spent fuel pool, aux. feed water storage tank)	• Structural analysis of AB for structure design (e.g., dead and live loads, etc.) • Local analysis of spent fuel pool and aux. feed water storage tank (e.g., hydrostatic and hydrodynamic loads, etc.)	
		• Emergency diesel generator building	• Structural analysis of EDGB for structure design (e.g., dead and live loads, etc.)	
		• Diesel fuel oil storage tank building	• Structural analysis of DFOT for structure design (e.g., dead and live loads, etc.)	
	• Heat transfer analysis	• Reactor containment building (shell & dome)	• Temperature analysis	
		• Spent fuel pool	• Temperature analysis	

Table 3.8-11 (2 of 3)

Program	Analysis Method	Analysis Model	Analysis Scope	Validation & Verification
ANSYS (Cont.)	• Nonlinear analysis	• NI common basemat	• Structural analysis of basemat for structure design considering nonlinear soil spring (compressive only spring, reaction of superstructures)	
		• Emergency diesel generator building basemat	• Structural analysis of EDGB for structure design considering nonlinear soil spring (compressive only spring, reaction of superstructures)	
		• Diesel fuel oil storage tank building basemat	• Structural analysis of DFOT for structure design considering nonlinear soil spring (compressive only spring, reaction of superstructures)	
	• Equivalent static analysis	• Auxiliary building (including spent fuel pool, aux. feed water storage tank)	• Structural analysis of seismic load for AB	
		• Emergency diesel generator building	• Structural analysis of seismic load for EDGB	
		• Diesel fuel oil storage tank building	• Structural analysis of seismic load for DFOT	
	• Direct integration time history analysis	• IRWST hydro-dynamic analysis	• Generation of floor response spectrum (FRS) due to POSRV sparger discharge load for mechanical and piping design	
ABAQUS	• Nonlinear analysis	• Reactor containment building	• Ultimate pressure capacity evaluation corresponding to NRC RG 1.216, Position 1 using nonlinear material model • Combustible gas control inside containment evaluation corresponding toNRC RG 1.216, Position 2 using nonlinear material model	ABAQUS is validated in accordance with the registration procedure for computer software of KEPCO E&C.

Table 3.8-11 (3 of 3)

Program	Analysis Method	Analysis Model	Analysis Scope	Validation & Verification
DARTEM	• Static analysis	• Reactor containment building (shell & dome, internal structure, RCB basemat)	• Structural analysis and design of reinforced concrete section subjected to mechanical and thermal loads	DARTEM is validated in accordance with the registration procedure for computer software of KEPCO E&C.
		• Auxiliary building (Spent fuel pool)	• Structural analysis and design of reinforced concrete section subjected to mechanical and thermal loads	
LBAP	• Static analysis	• Reactor containment building (liner plate anchorage system)	• Structural analysis of liner plate anchorage system when liner plate buckled	LBAP is validated in accordance with the registration procedure for computer software of KEPCO E&C.
GTstrudl	• Static analysis	• Auxiliary building (concrete slab analysis model)	• Structural analysis to obtain design forces for concrete slab design (e.g, dead and live loads, etc.)	GTstrudl was procured with a Quality Assurance Service Agreement and meets the applicable requirements of the NQA-1, Subpart 2.7, quality assurance requirements of computer software.

Table 3.8-12

Maximum vertical displacement for construction and post-construction for NI, EDGB, and DFOT building

a) Results of construction sequence analysis

[Unit: ft]

Structures	Category	Max. settlement			
		Soil profile S1		Soil profile S8	
		#1	#2	#1	#2
NI building	Construction (Sequence No. 58)	0.286	0.282	0.012	0.0120
	Post-construction (Sequence No. 59)	0.386	0.380	Not considered [1)]	
EDGB building	Construction	0.142		0.005	
	Post-construction	0.218		Not considered [1)]	
DFOT building	Construction	0.172		0.005	
	Post-construction	0.266		Not considered [1)]	

1) Since soil profile S08 consists of rock profile, the creep effect of soil is not considered.

b) Summary of maximum vertical settlement criteria

Structures	Category	Criteria
NI building	Construction	87.12mm (0.286ft)
	Post-Construction	117.86mm (0.386ft)
EDG building	Construction	43.28mm (0.142ft)
	Post-Construction	66.45mm (0.218ft)
DFOT building	Construction	52.43mm (0.172ft)
	Post-Construction	81.08mm (0.266ft)

Table 3.8-13

Maximum tilting settlement for construction and post-construction for NI building

a) Results of construction sequence analysis

[Unit: degree]

Category	Max. Tilt settlement		Soil profile S1		Soil profile S8	
	Sequence	Direction	#1	#2	#1	#2
Construction	Sequence No.58	E-W	0.00725	0.00507	0.00015	0.00006
		N-S	0.01253	0.00993	0.00032	0.00030
Post-Construction	Sequence No.59	E-W	0.00989	0.00606	Not considered [1)]	
		N-S	0.0136	0.00961		

1) Since soil profile S08 consists of rock profile, the creep effect of soil is not considered.

b) Summary of maximum tilting settlement criteria

[Unit: degree]

Structures	Category	Direction	Criteria
NI building	Construction	E-W	0.00725
		N-S	0.01253
	Post-Construction	E-W	0.00989
		N-S	0.01360

Table 3.8-14

Differential settlement between structures
for all buildings under construction and post-construction

[Unit: inch]

		Max. differential settlement between structures [2)]							
		Construction				Post-construction			
		S01		S08		S01		S08	
		Max	Min	Max	Min	Max	Min	Max	Min
NI common basemat	Case1	2.171	1.566	0.078	0.051	3.358	2.671	Not considered [1)]	
	Case2	2.020	1.527	0.074	0.052	3.132	2.620		
EDGB Basemat		1.701	1.670	0.061	0.046	2.615	2.582		
DFOT Basemat		2.066	0.986	0.054	0.027	3.193	1.521		
Differential Settlement (NI and EDG basemat)		0.501		0.009		0.776			
Differential Settlement (NI and DFOT basemat)		1.185		0.002		1.837			
EDGB Basemat		1.701	1.474	0.061	0.047	2.615	0.189		
DFOT Basemat		2.066	1.787	0.053	0.034	3.193	2.773		
Differential Settlement (DFOT and EDGB basemat)		0.592		0.027		0.925			

1) Since soil profile S08 consists of rock profile, the creep effect of soil is not considered.
2) Maximum allowable differential settlement between buildings is 3inch described in Table 2.0-1.

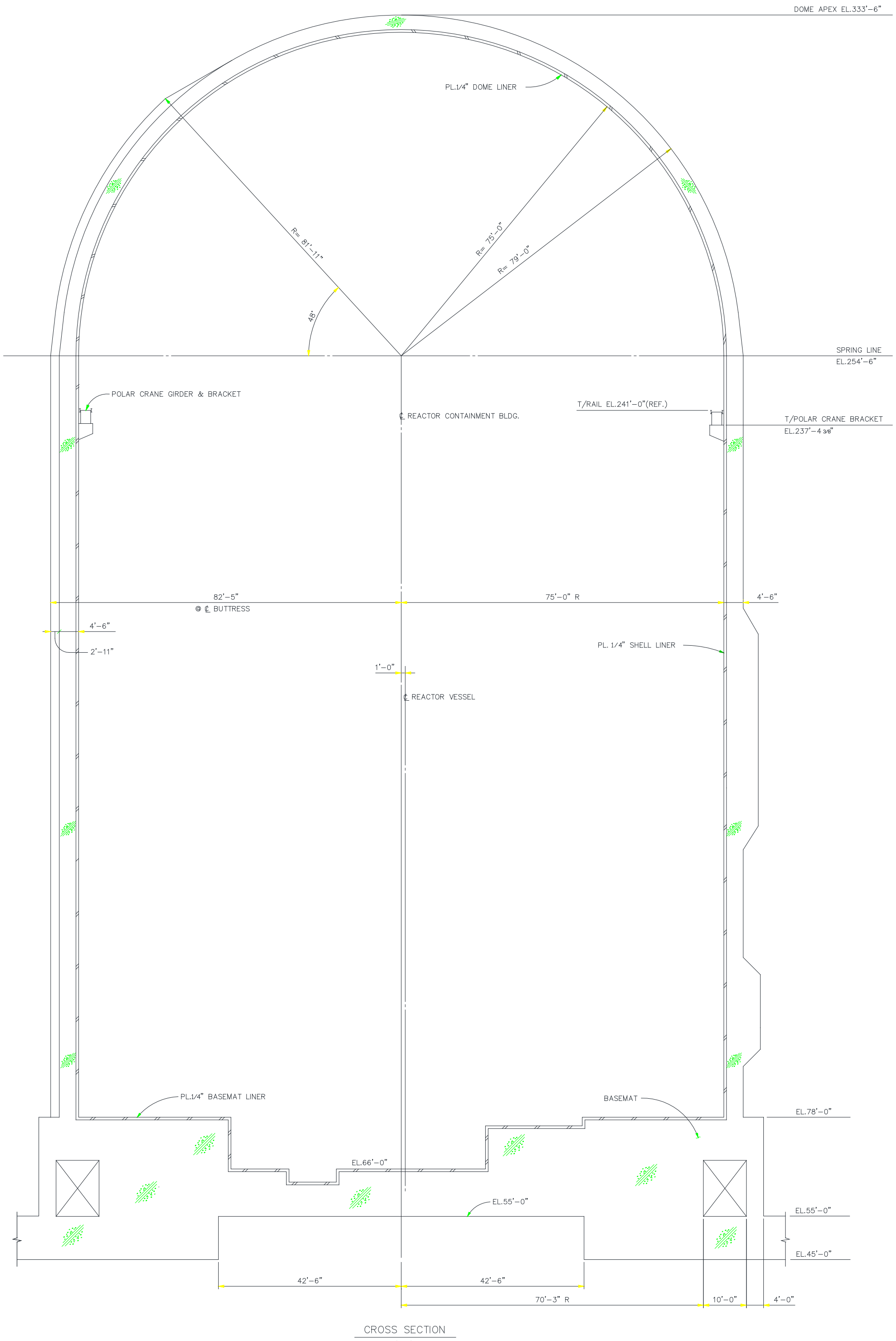

Figure 3.8-1 Typical Section of Containment Structures (Looking North)

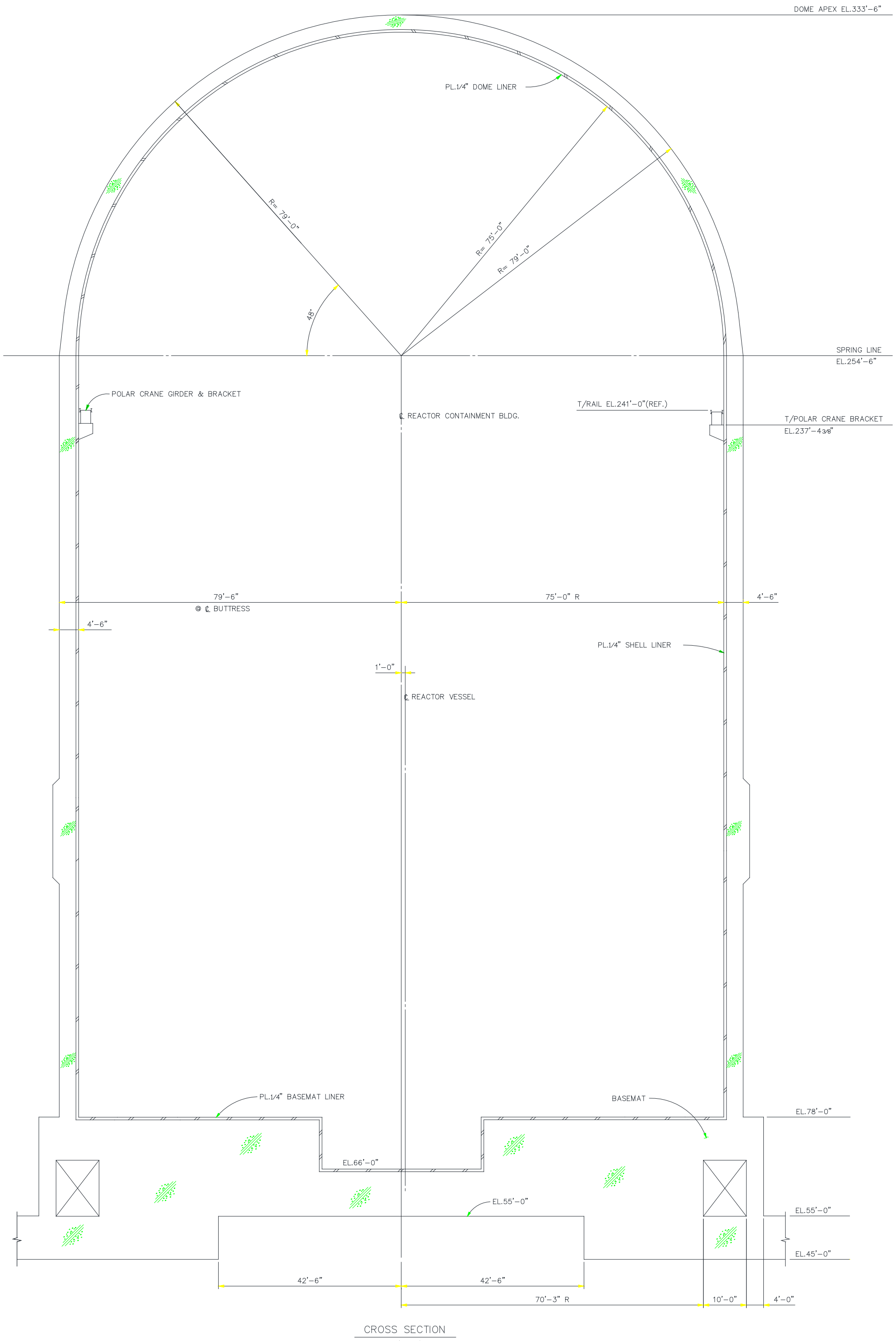

Figure 3.8-2 Typical Section of Containment Structures (Looking East)

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Figure 3.8-3   Local Area around Large Penetrations

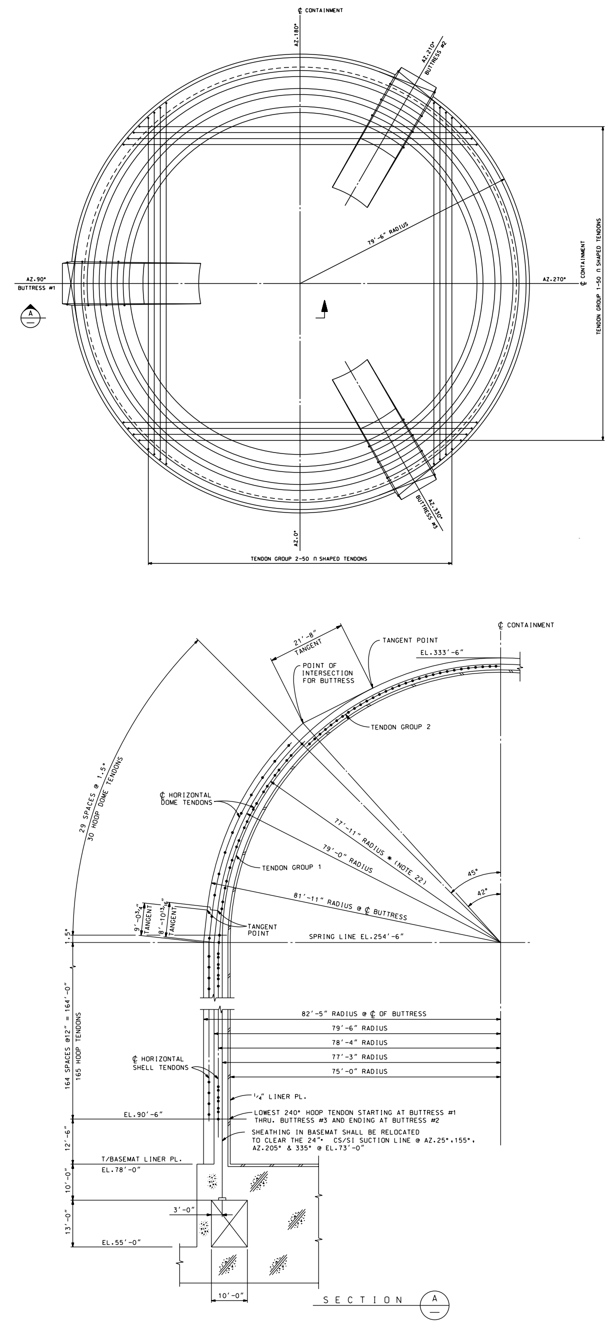


Figure 3.8-4 Arrangement of Containment Post-Tensioning System

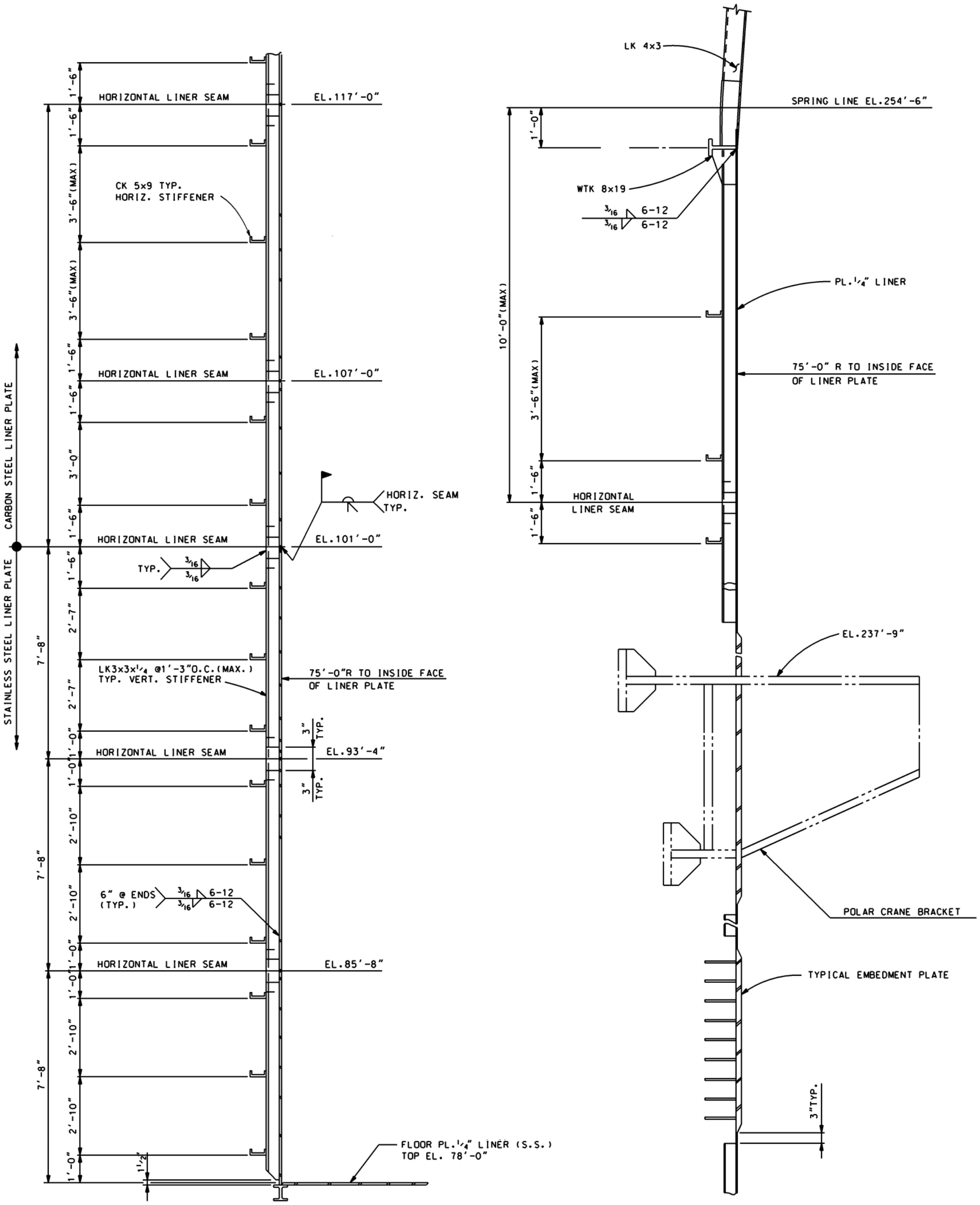


Figure 3.8-5 Liner Plate and Anchorage System

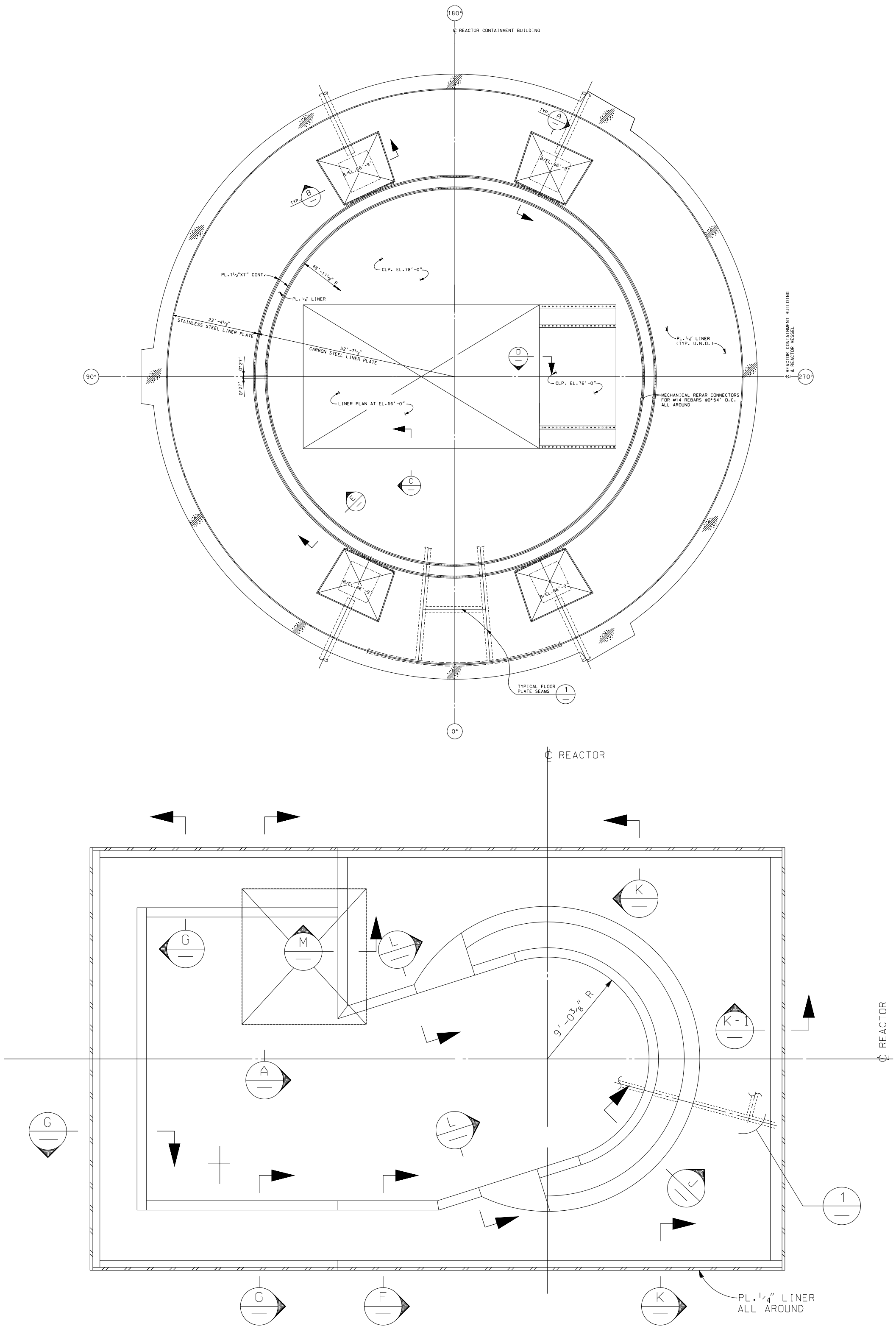
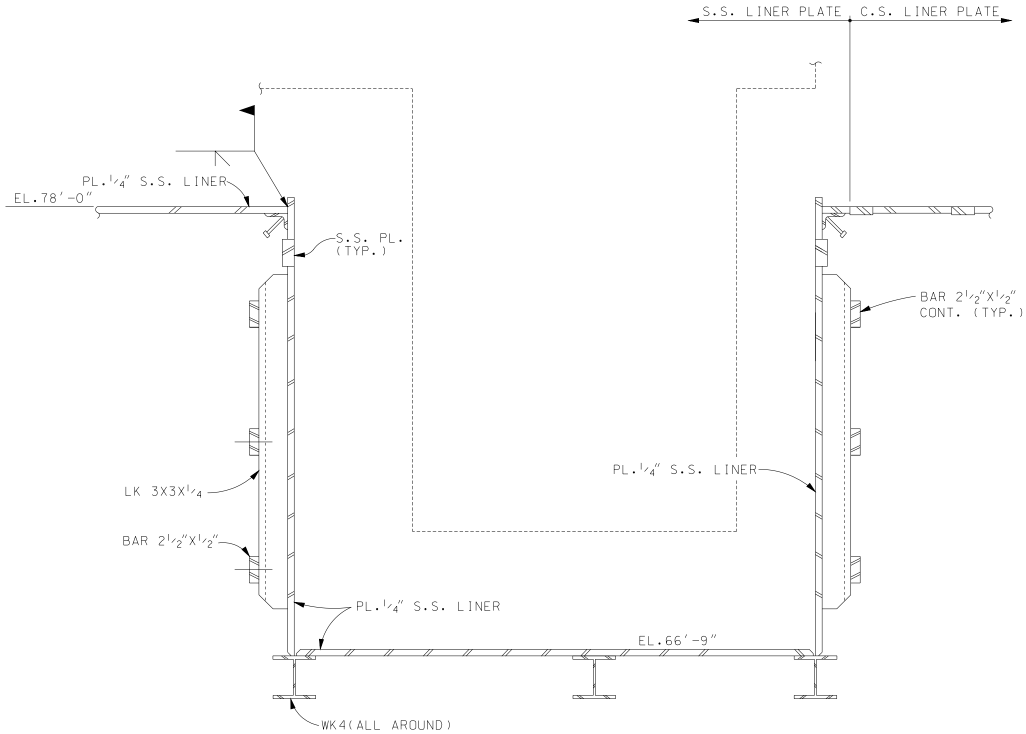
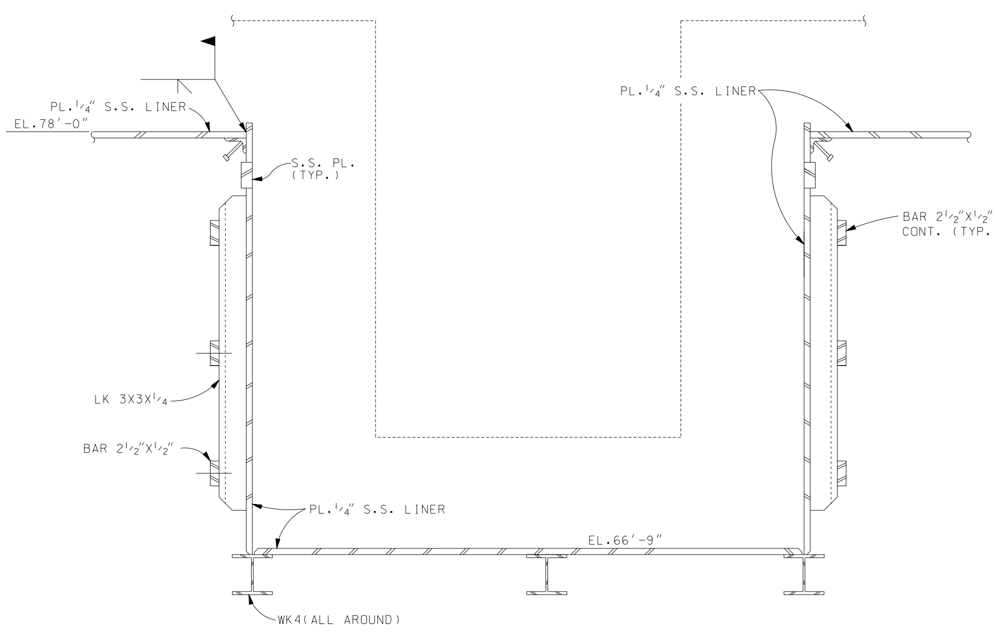


Figure 3.8-6 Plan for Containment Liner below CIS

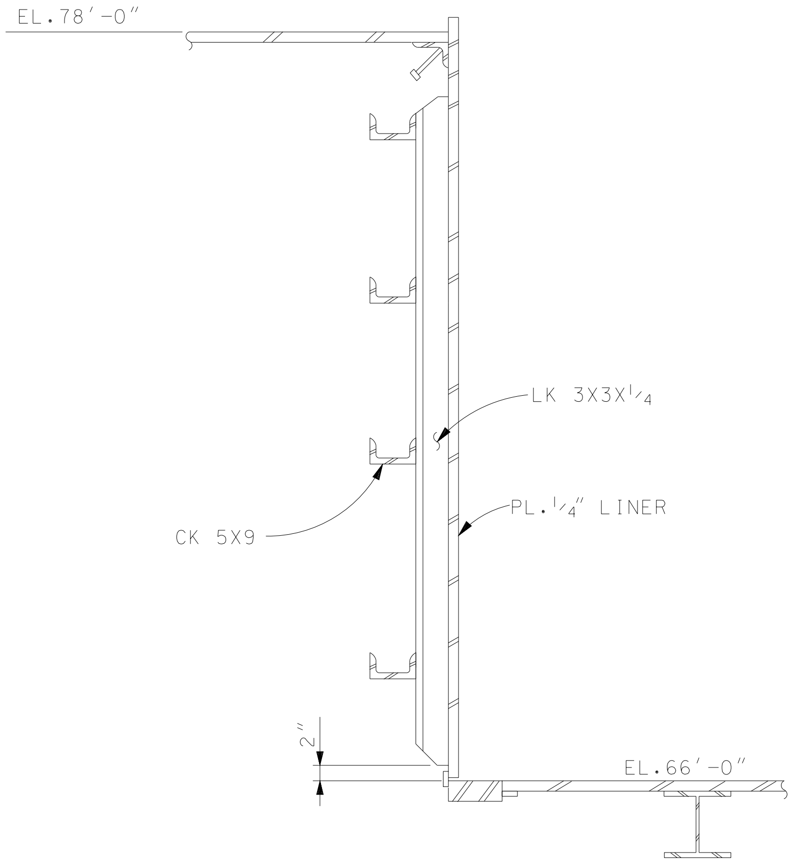


SECTION THRU SUMP A

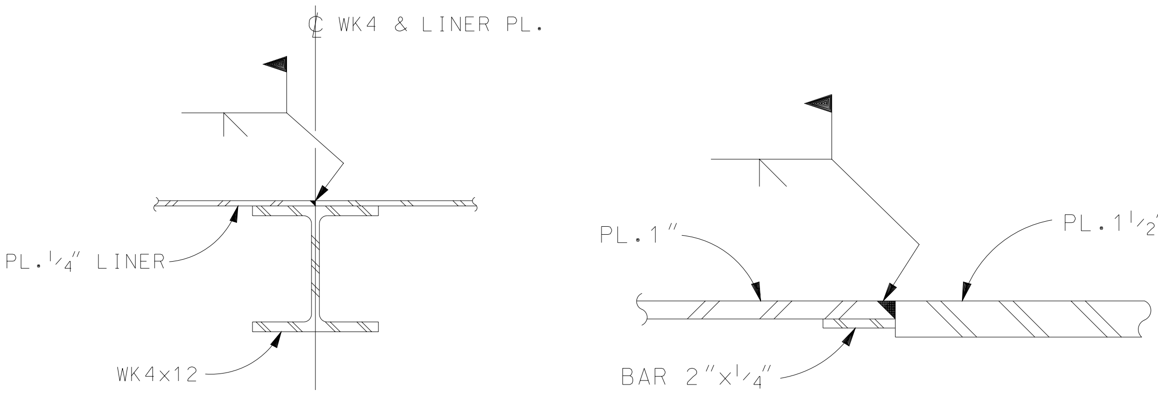


SECTION THRU SUMP B

Figure 3.8-7 Details for Containment Liner below CIS (1 of 3)

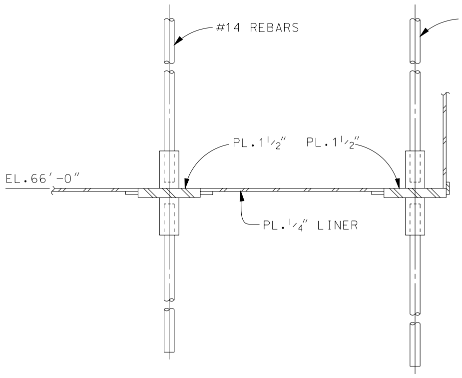


SECTION C & D

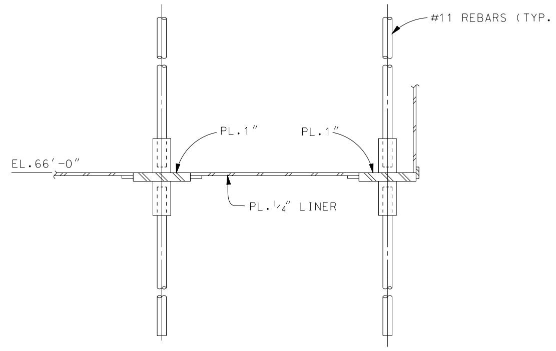


DETAIL 1

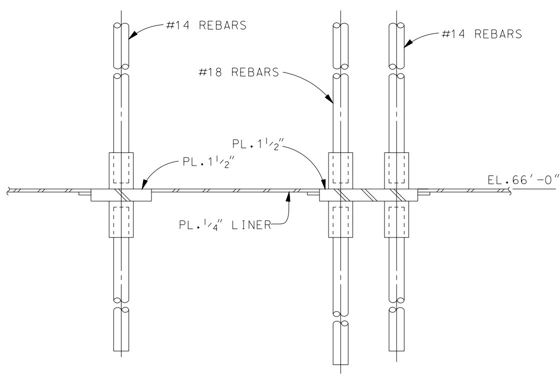
Figure 3.8-7 Details for Containment Liner below CIS (2 of 3)



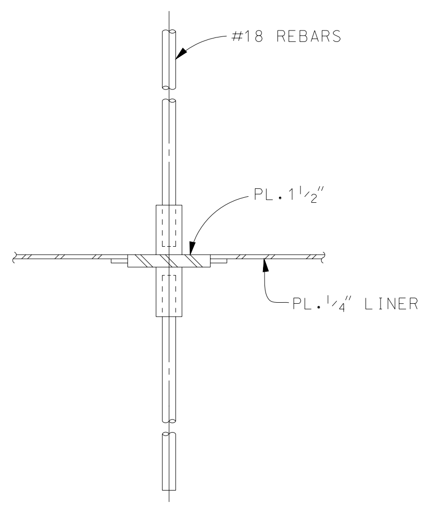
SECTION F



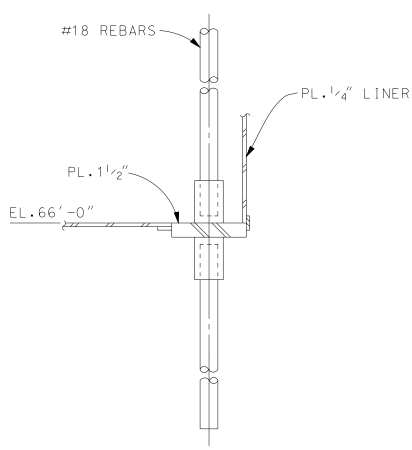
SECTION G



SECTION J



SECTION L



SECTION K & K-1

Figure 3.8-7 Details for Containment Liner below CIS (3 of 3)

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.8-8 Typical Penetration Assembly System

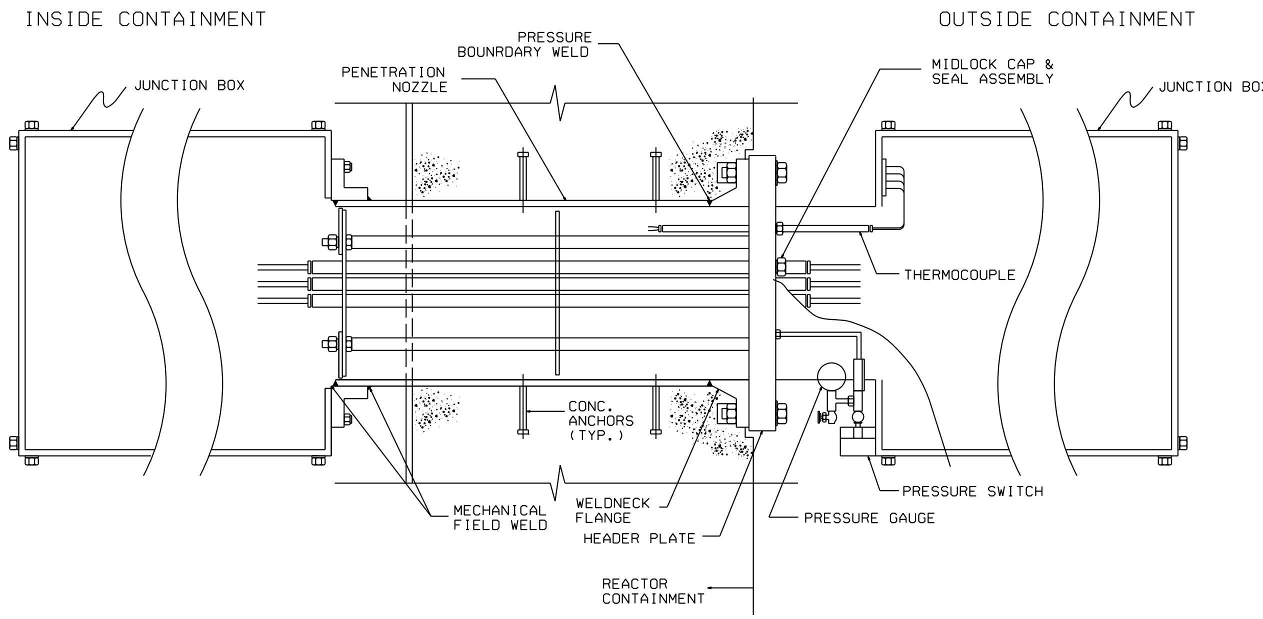


Figure 3.8-9 Typical Electrical Penetration Assembly

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.8-10 Reactor Containment Building Section in N-S Direction

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.8-11 Reactor Containment Building Section in E-W Direction

Figure 3.8-12   Containment Shell and Dome Analysis Model

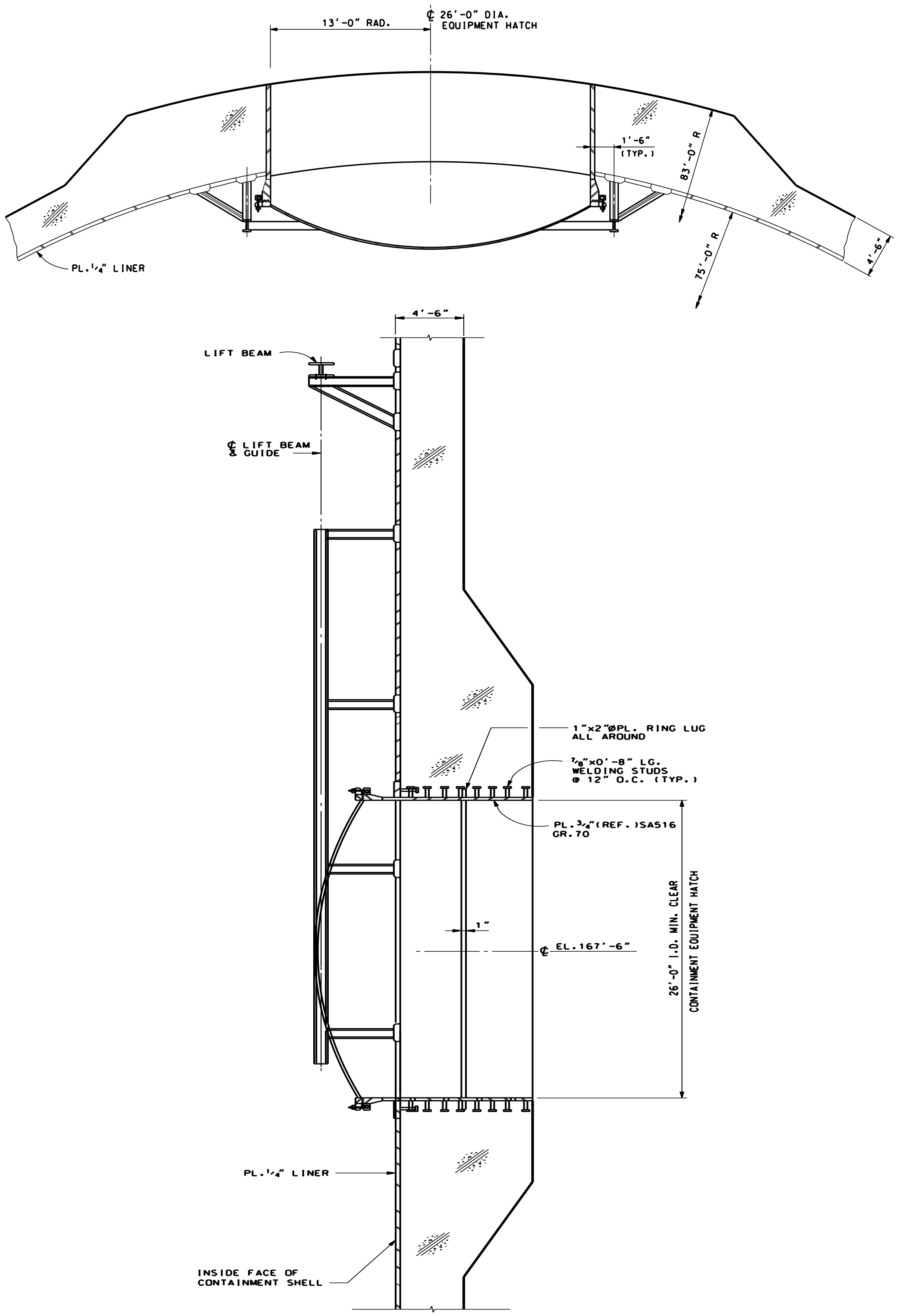


Figure 3.8-13 Equipment Hatch

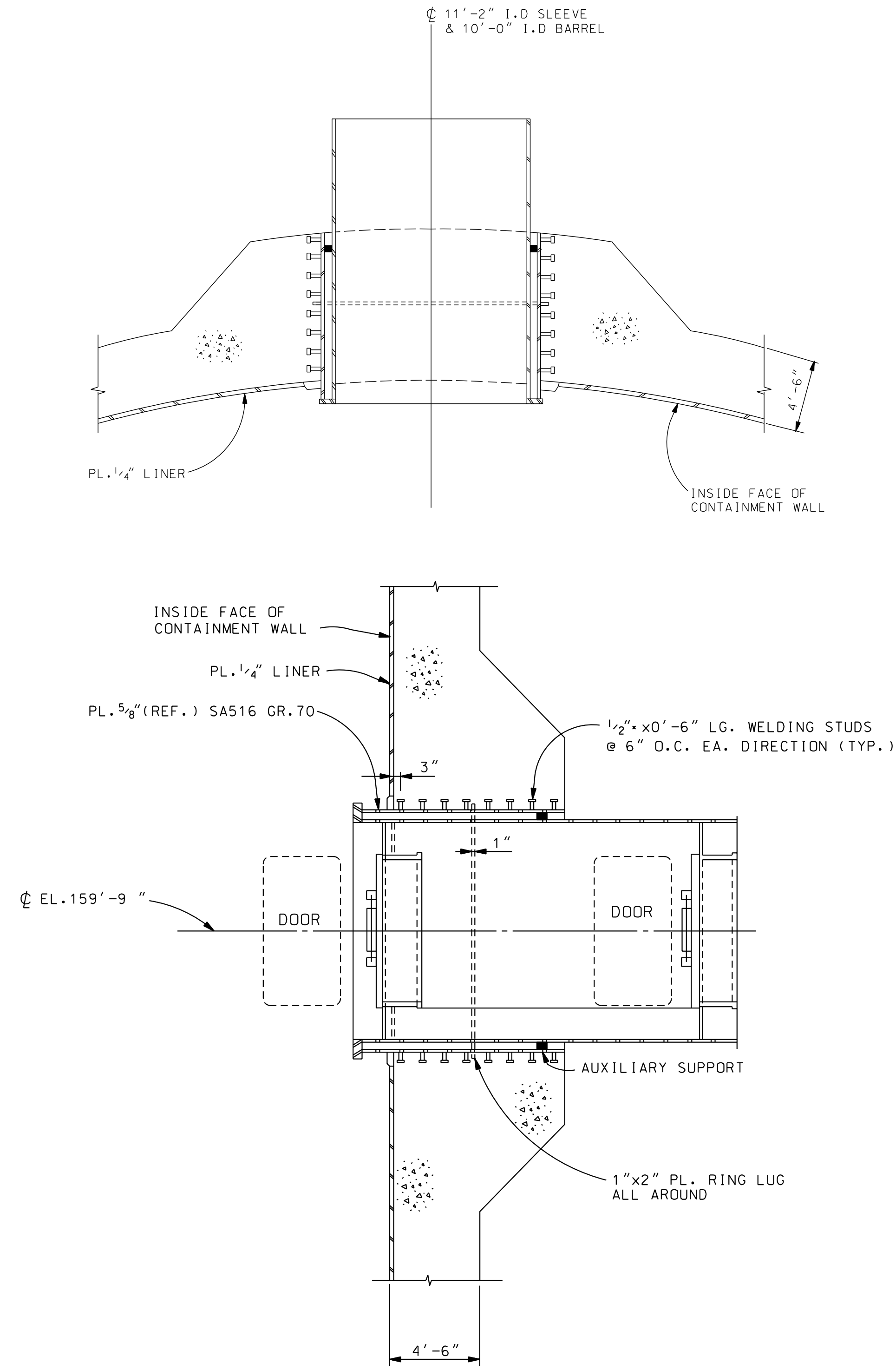


Figure 3.8-14 Personnel Airlock

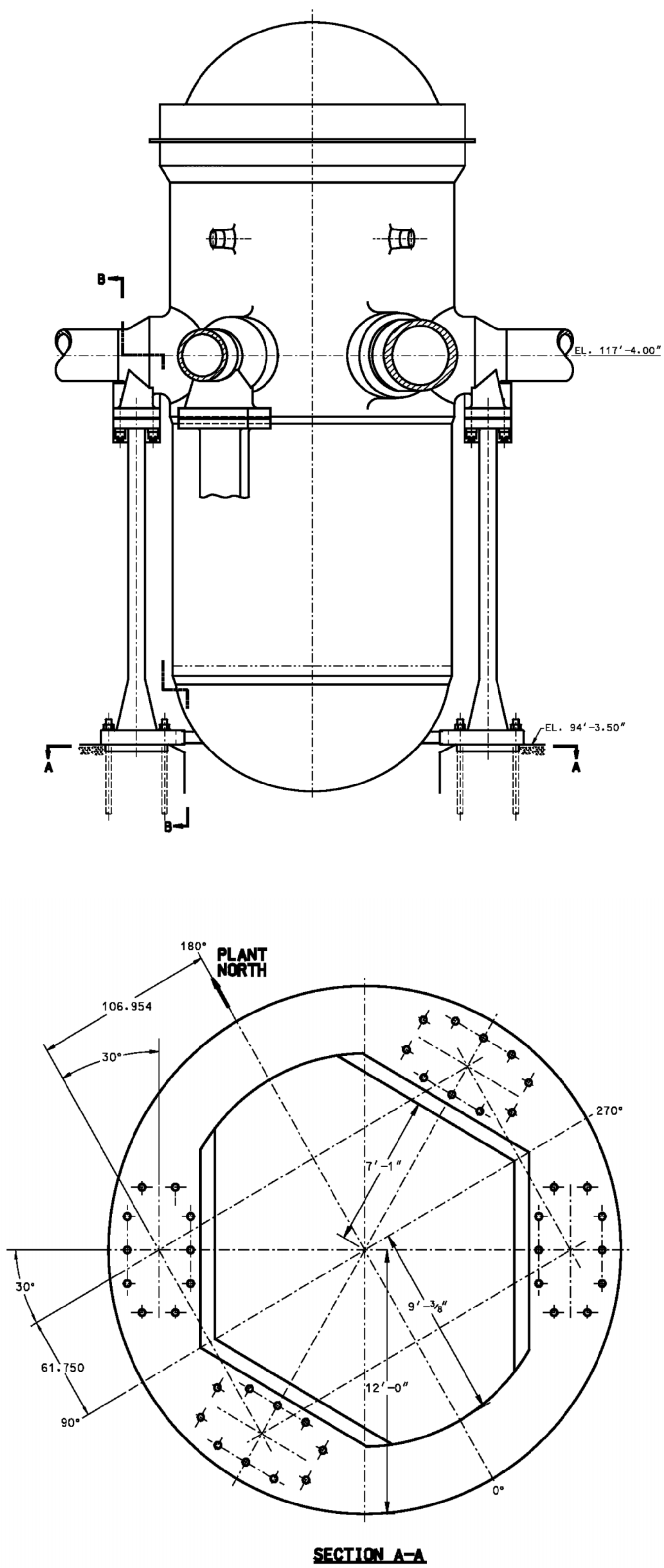
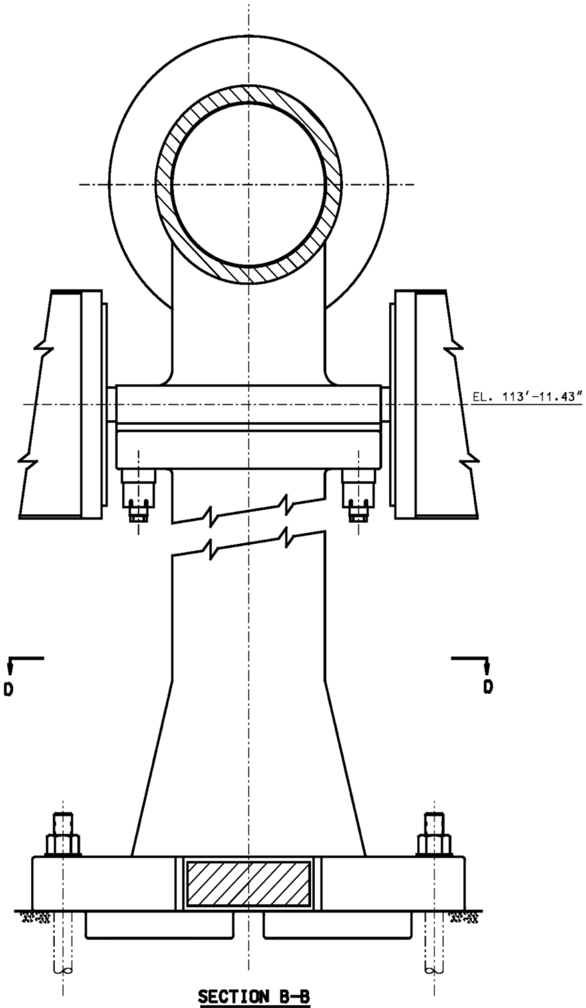


Figure 3.8-15 Reactor Vessel Supports (1 of 2)



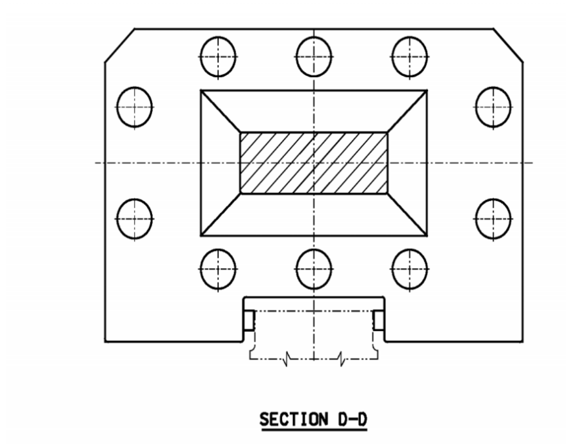


Figure 3.8-15 Reactor Vessel Supports (2 of 2)

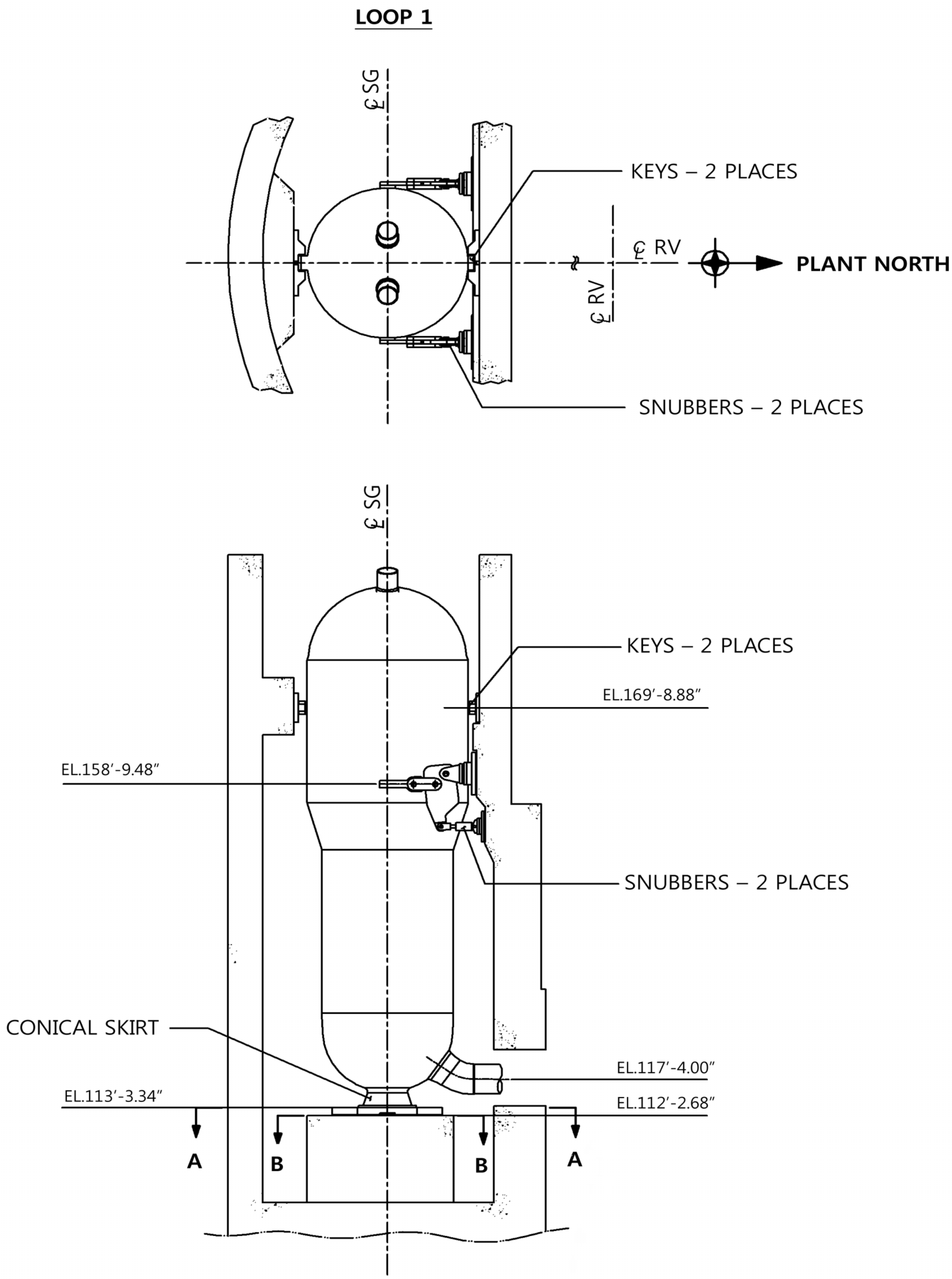
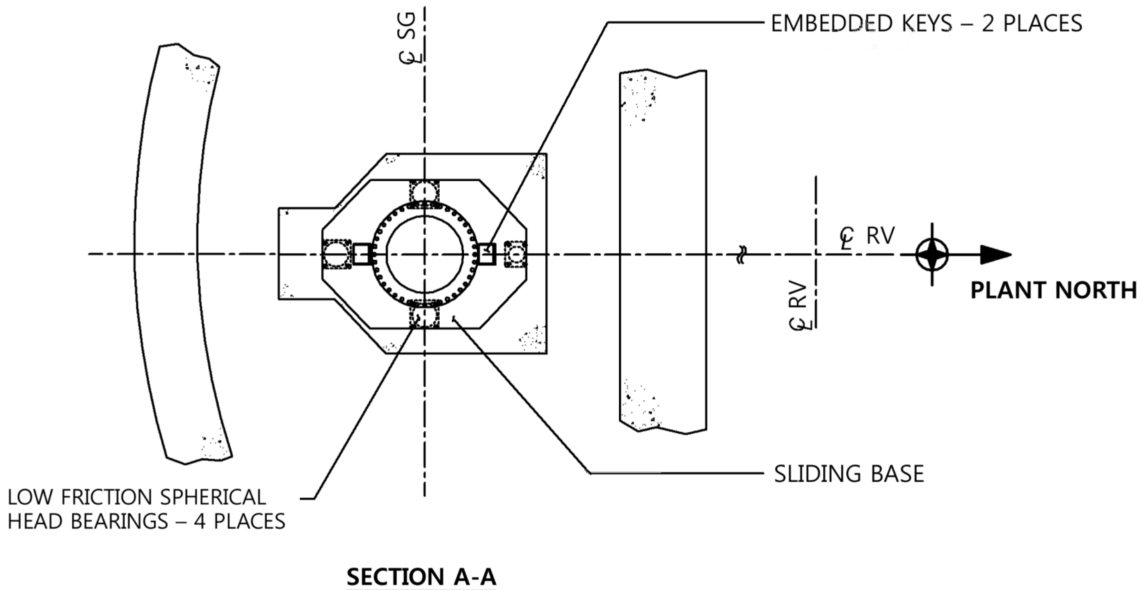


Figure 3.8-16 Steam Generator Supports (1 of 2)



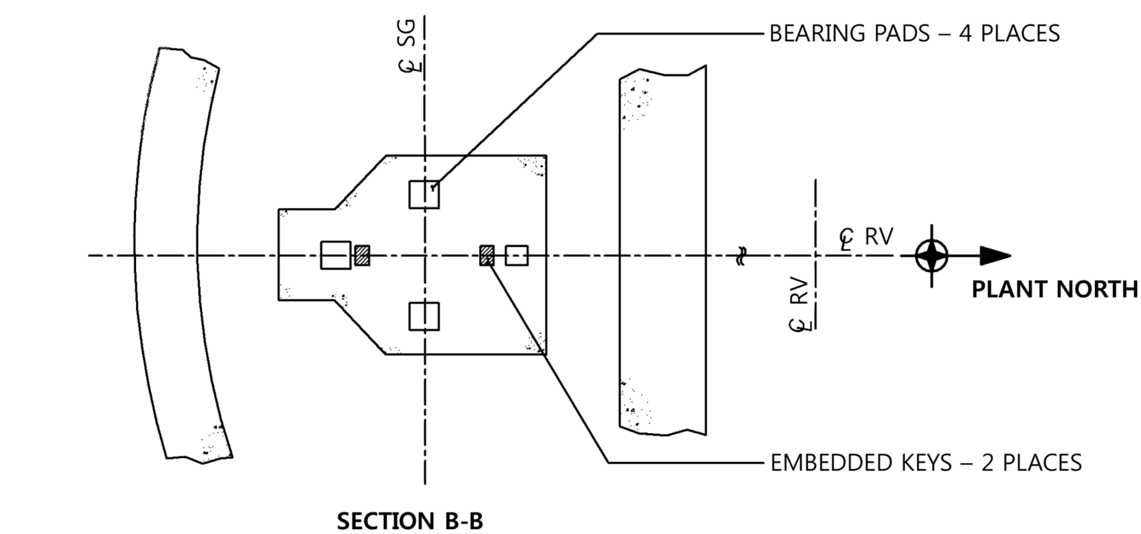
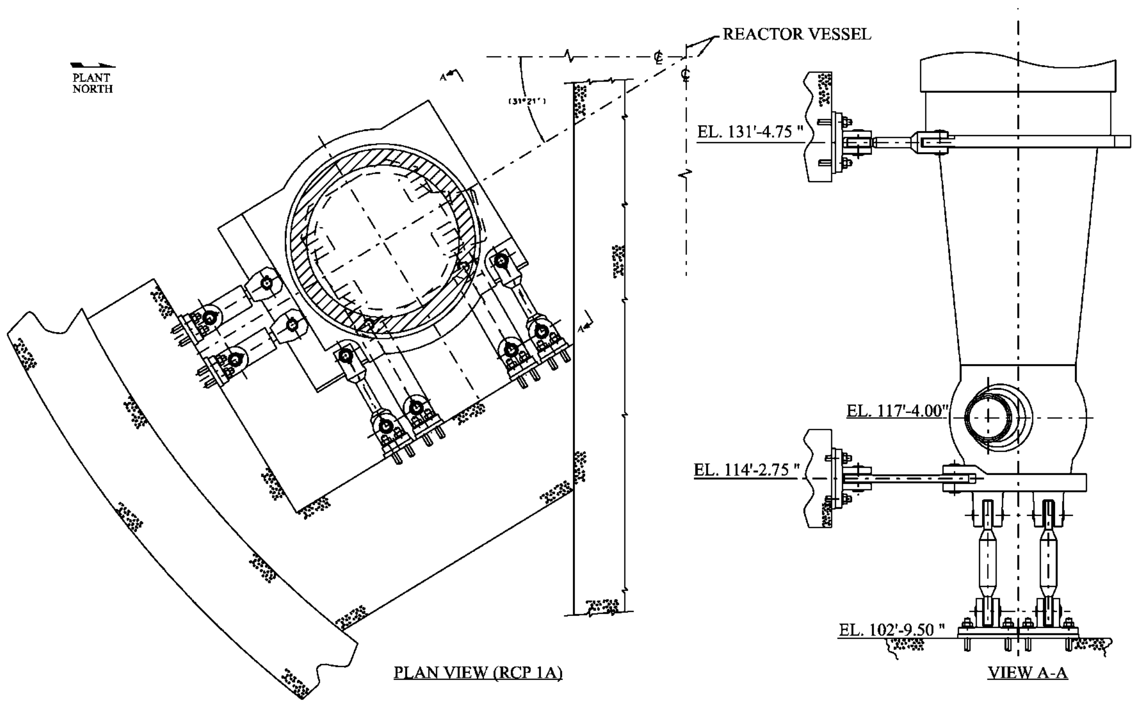


Figure 3.8-16 Steam Generator Supports (2 of 2)



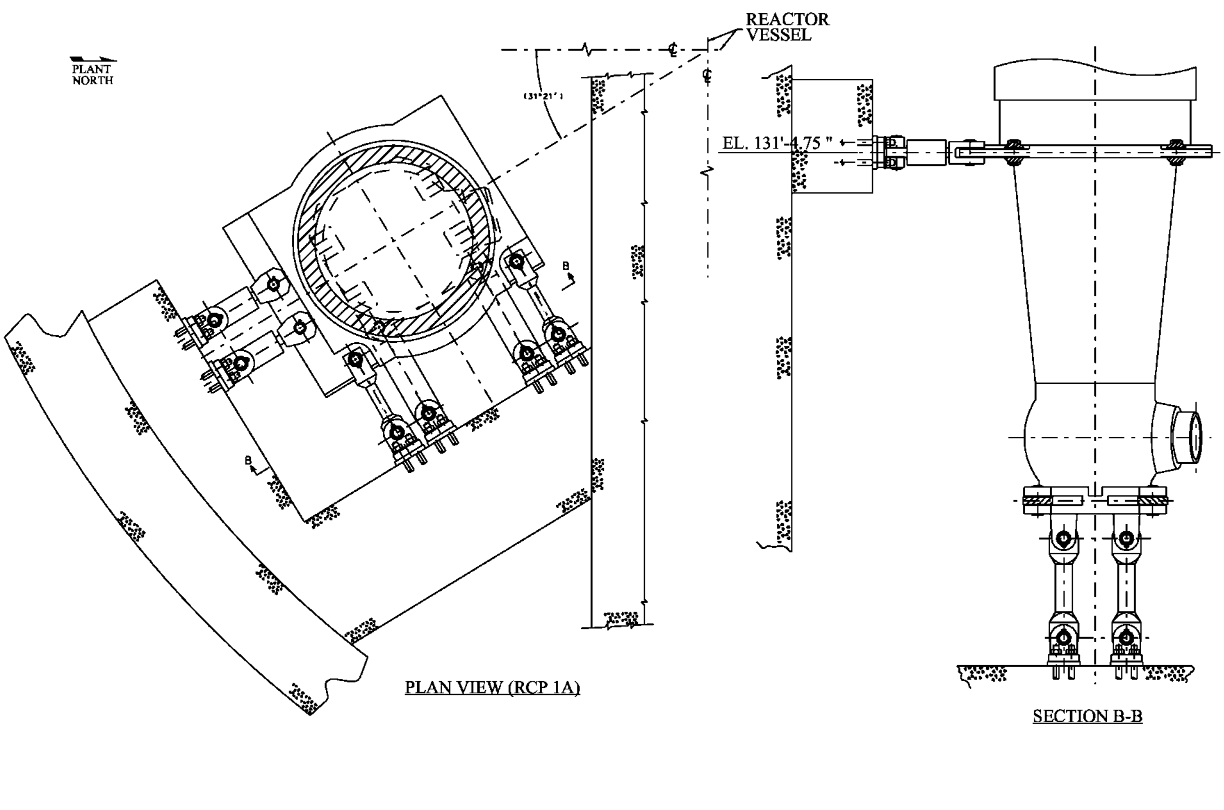


Figure 3.8-17   Reactor Coolant Pump Supports

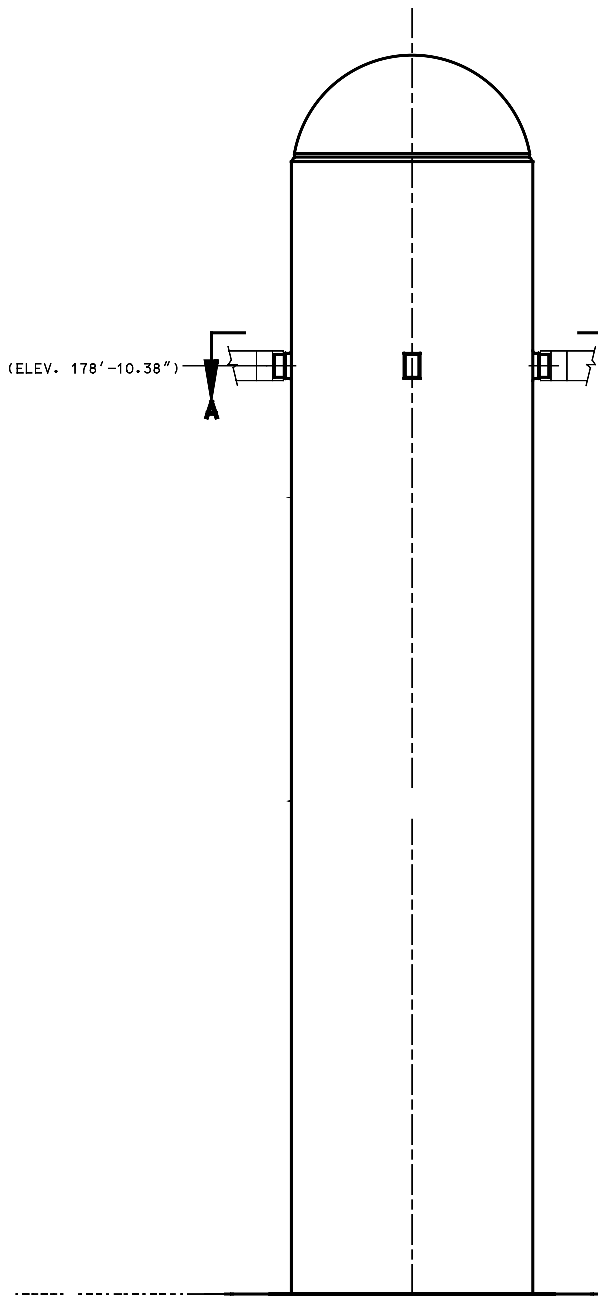


Figure 3.8-18 Pressurizer Supports

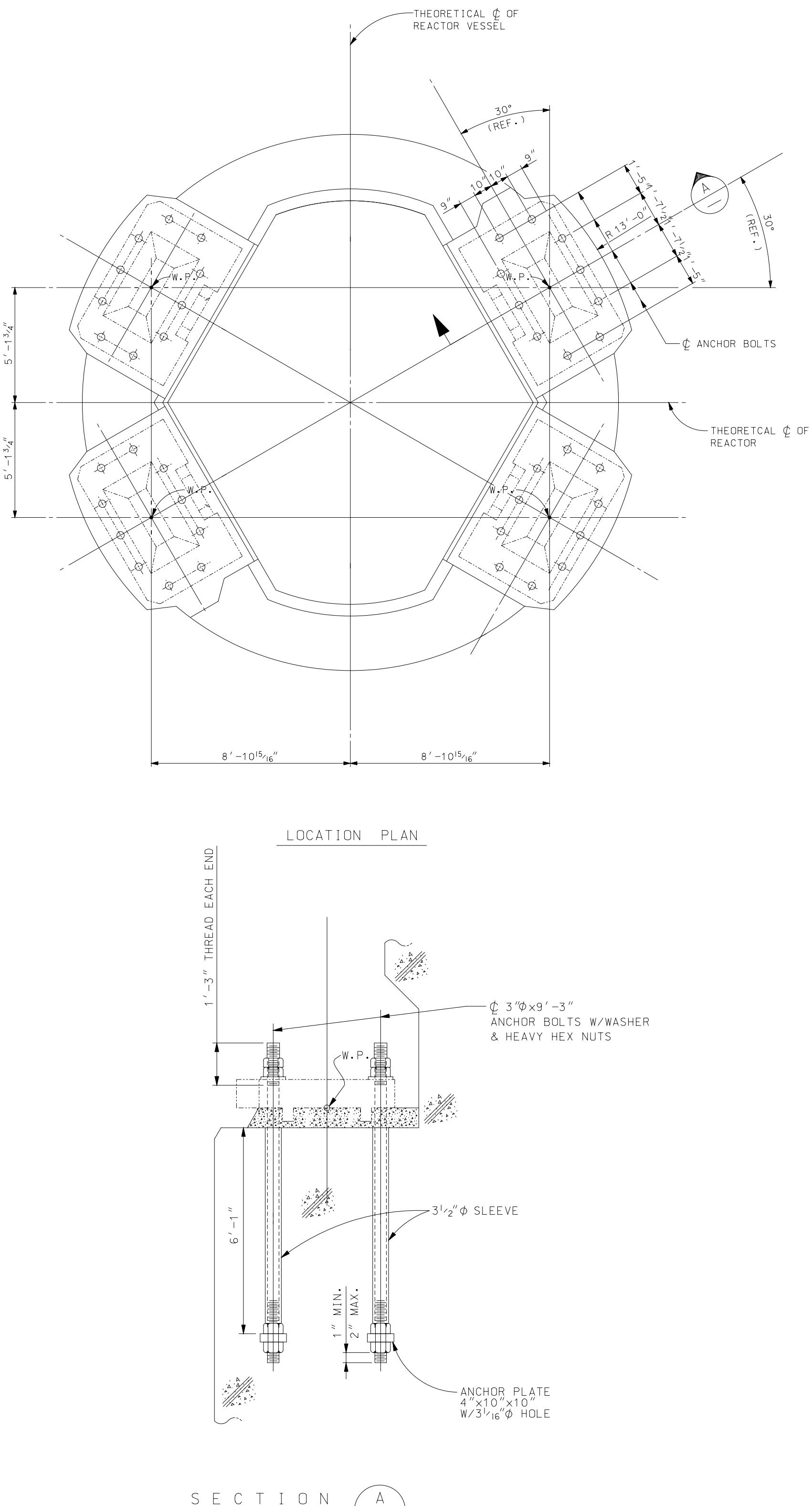


Figure 3.8-19 Detail of the Anchor Bolts for Reactor Vessel Support

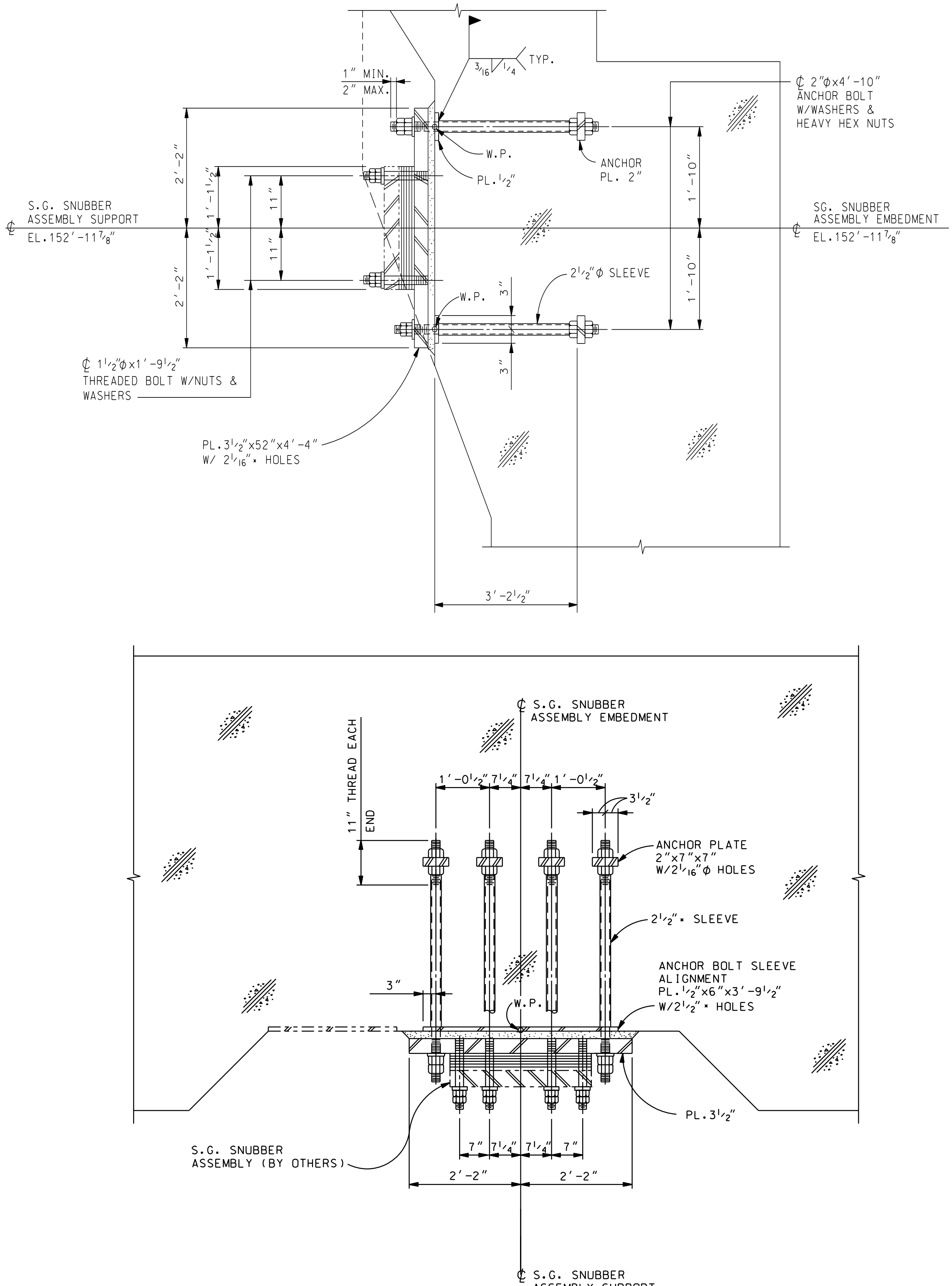


Figure 3.8-20 Detail of the Anchor Bolts for Steam Generator Snubber Support

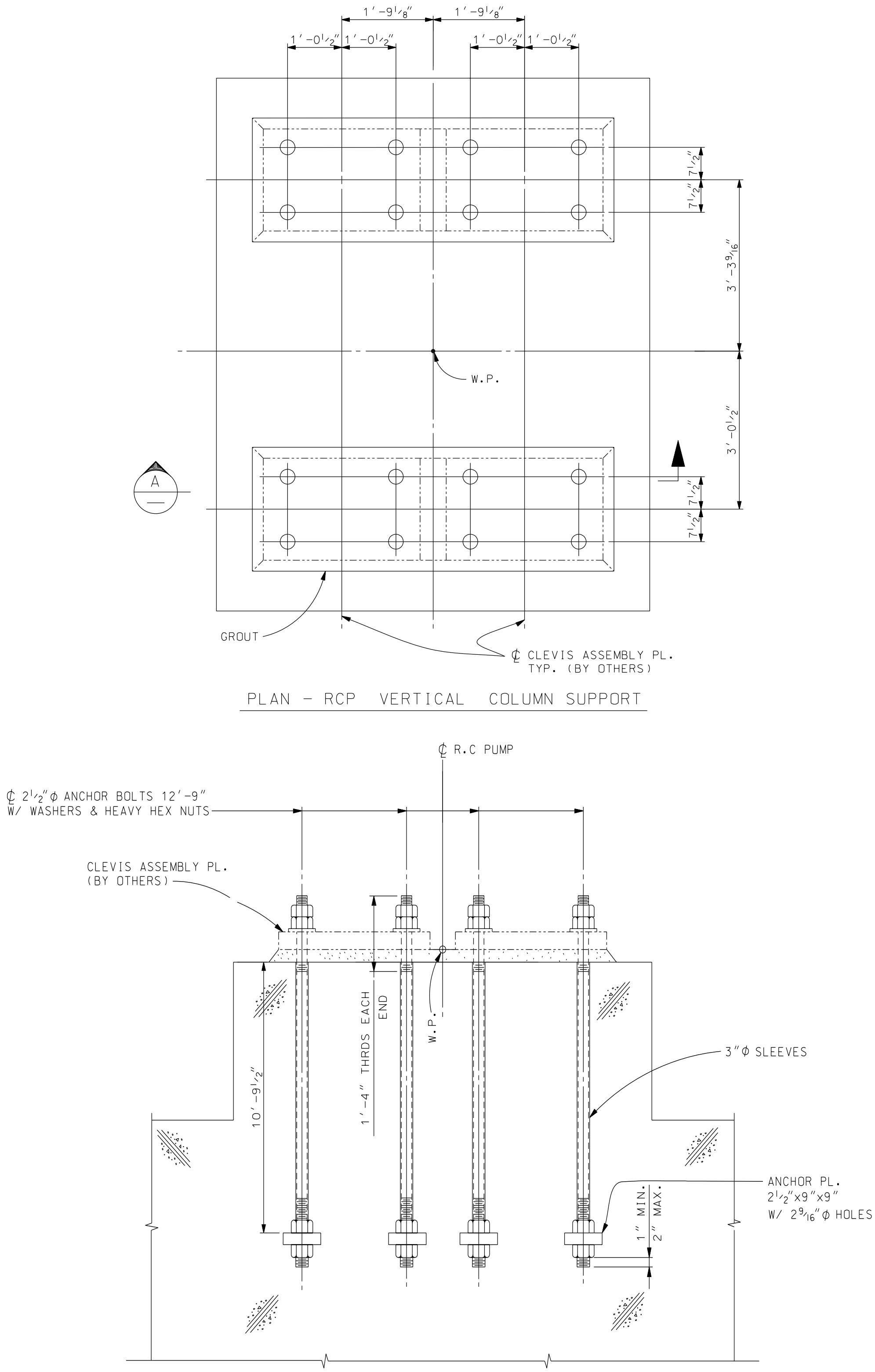
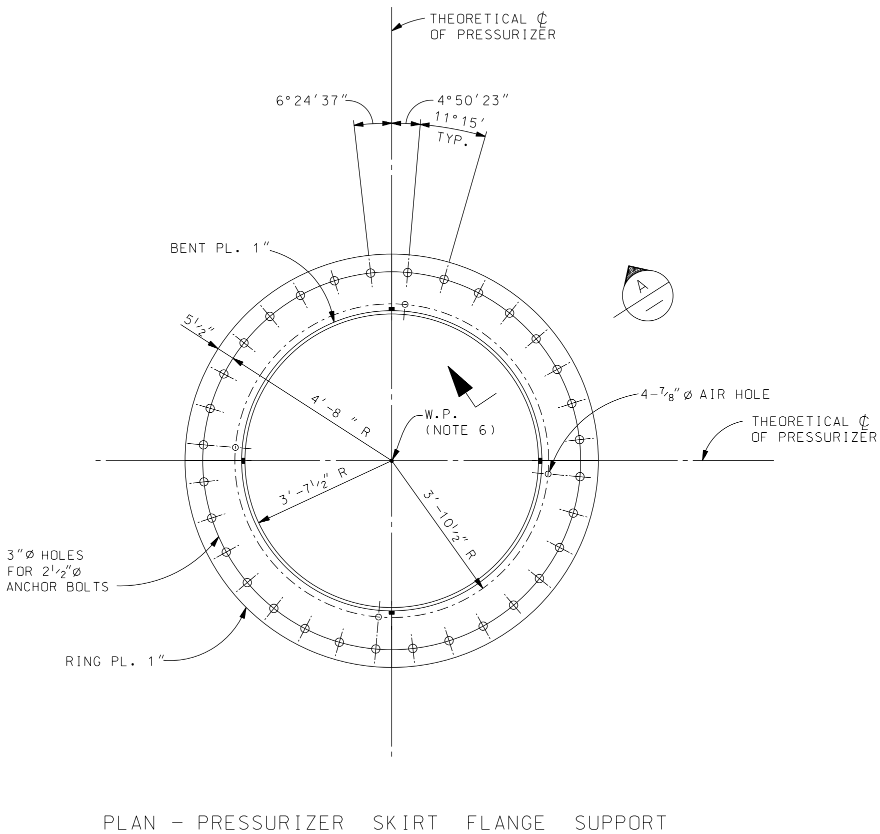


Figure 3.8-21 Detail of the Anchor Bolts for RCP Vertical Column Support



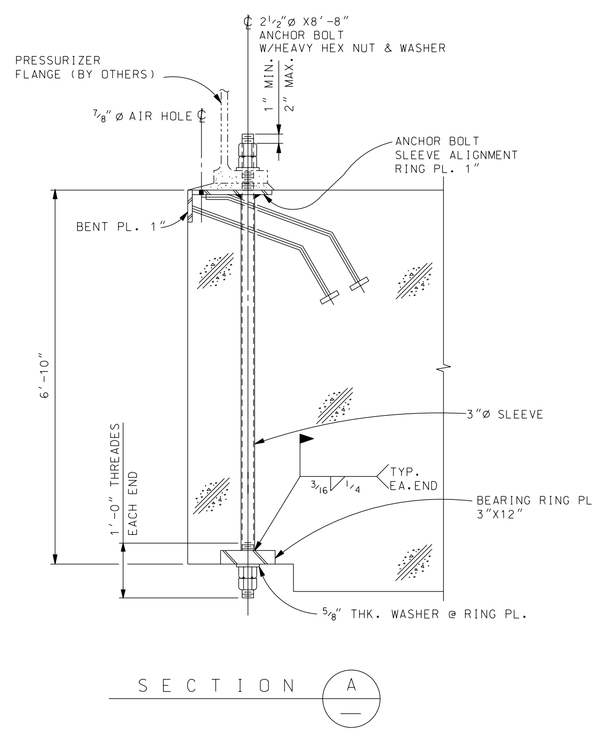


Figure 3.8-22 Detail of the Anchor Bolts for PRZ Skirt Flange Support

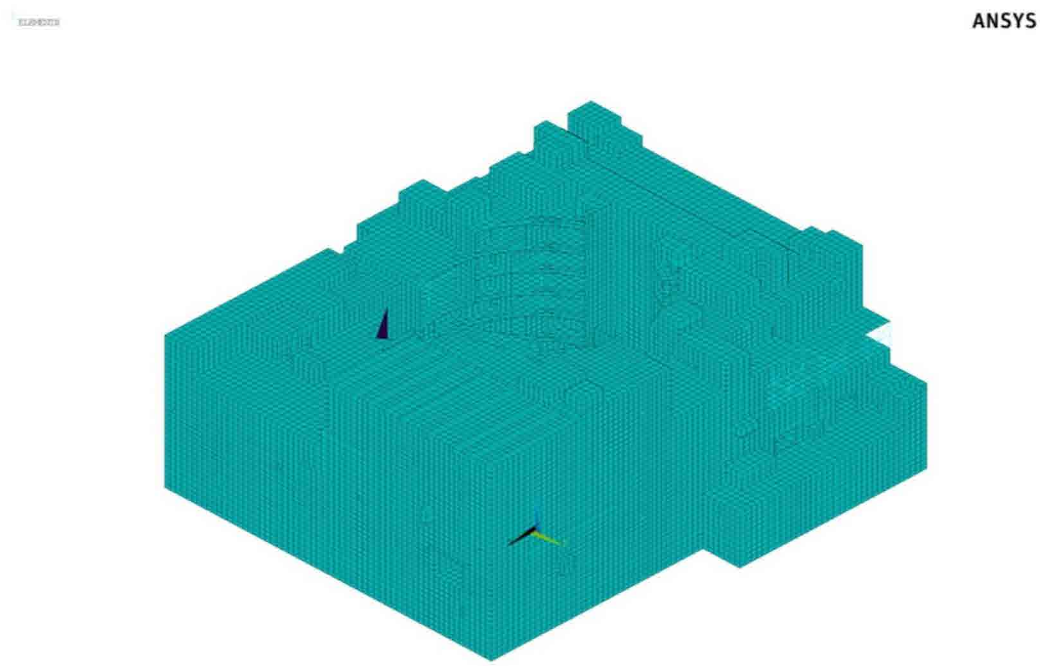


Figure 3.8-23 Finite Element Model for Auxiliary Building Global Structural Analysis

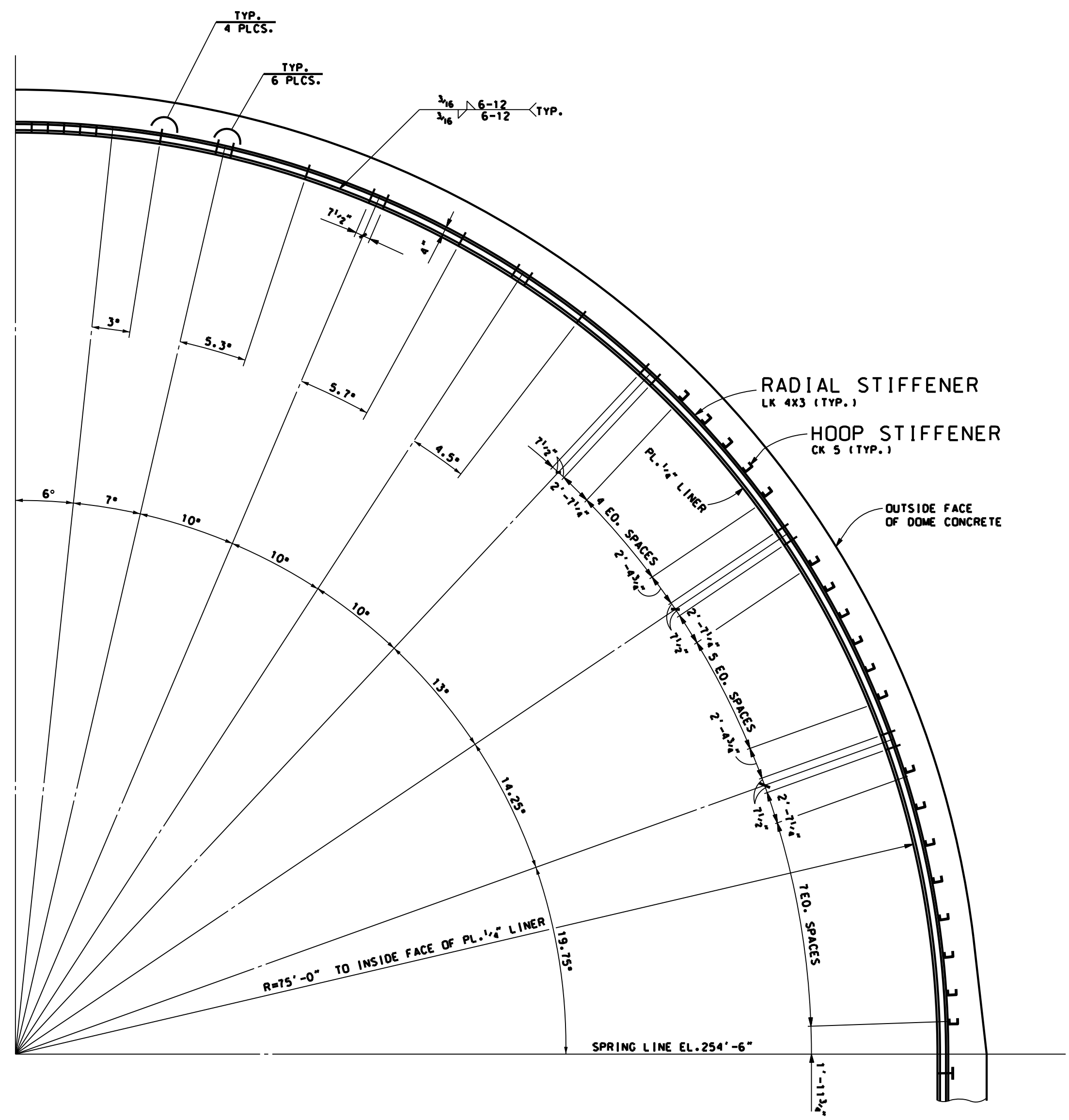
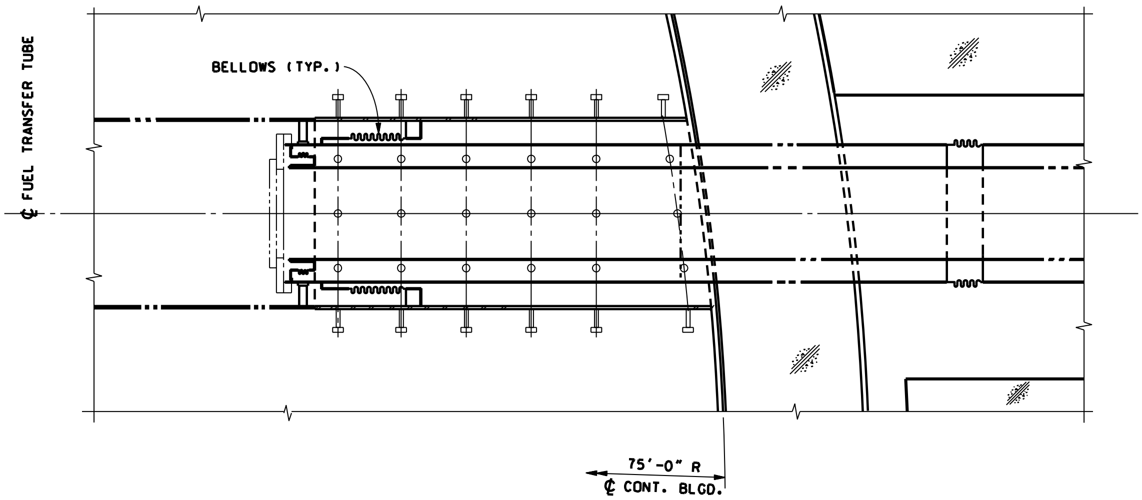


Figure 3.8-24 Liner Plate and Anchorage System of Containment Dome



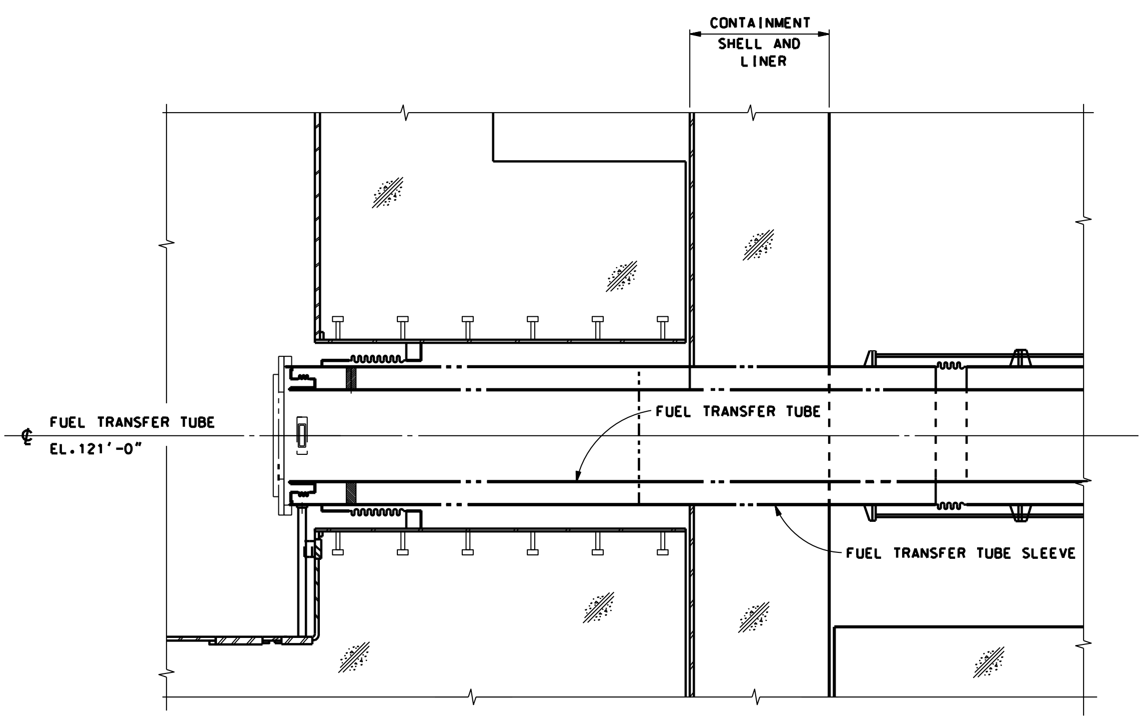
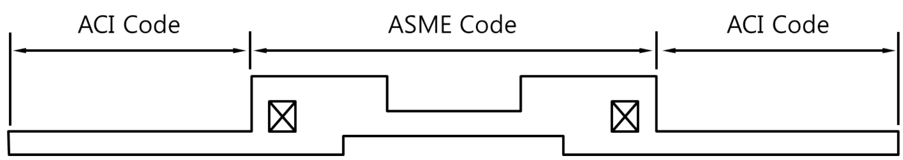
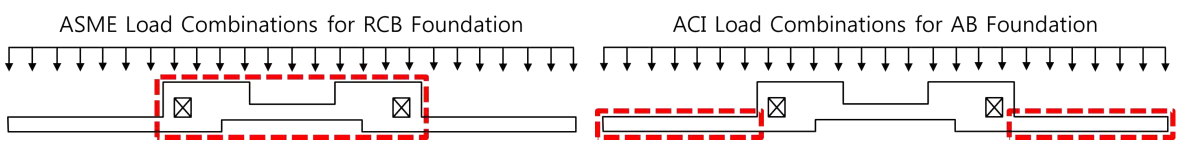


Figure 3.8-25 Fuel Transfer Tube Sleeve and Bellows



Jurisdictional Boundary for Design of Common Basemat



Application of Loads based on Code Criteria

Figure 3.8-26   Code Jurisdiction Boundary of Common Basemat

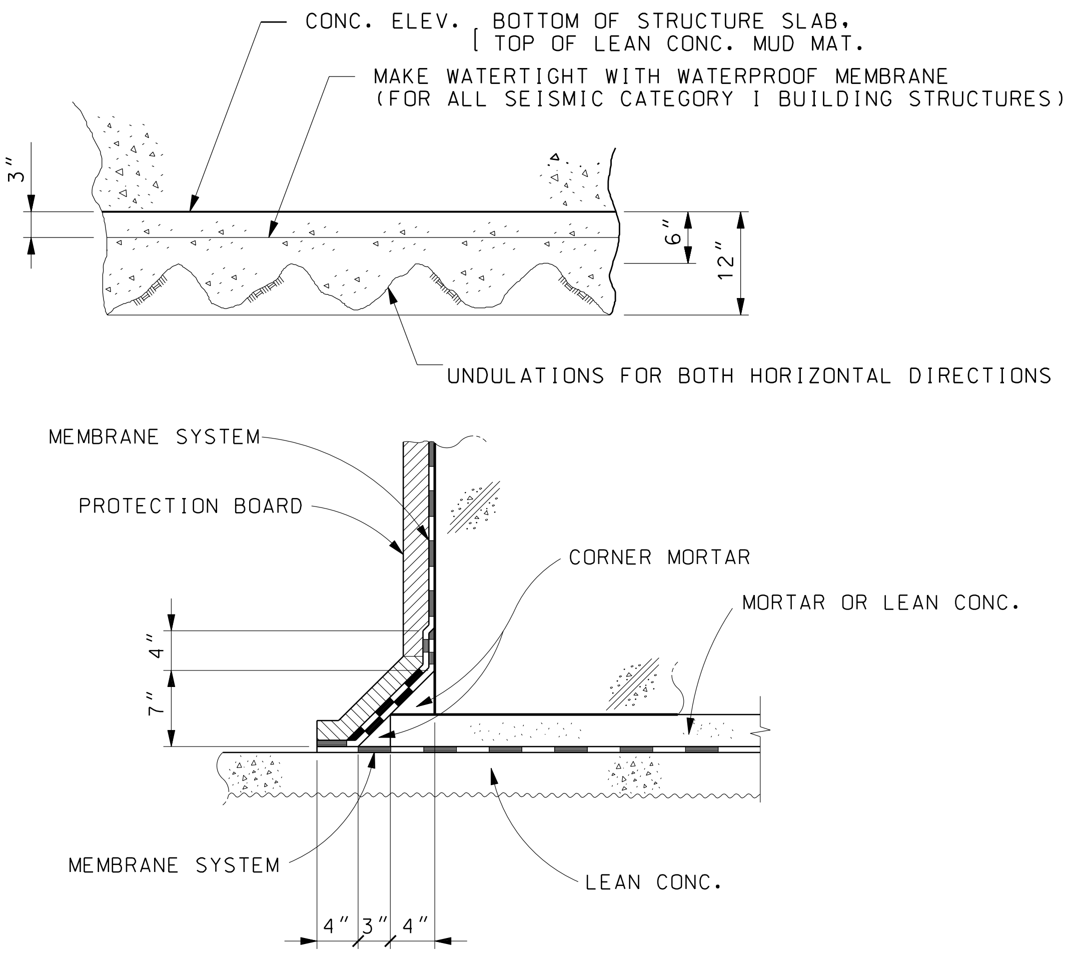


Figure 3.8-27 Typical Detail for Installation of Waterproofing Membrane

APPENDIX 3.8A

STRUCTURAL DESIGN SUMMARY

APPENDIX 3.8A – STRUCTURAL DESIGN SUMMARY

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APPENDIX 3.8A – STRUCTURAL DESIGN SUMMARY

This appendix provides the details of analysis and design for selected critical sections of seismic Category I structures. The critical design sections are the portions of safety-related, seismic Category I structures, which are credited in prevention or mitigation of consequences of postulated design basis accidents, expected to experience the largest structural demands during design basis conditions, or needed for safety evaluation of an essentially complete design.

To determine the critical design sections, structural types and materials such as concrete or steel, structural configurations representing locations and discontinuities are basically considered. Some selected critical sections may be typical of other portions of the structure, where the portions are not identified as critical sections due to their similarities with the selected design critical sections. In this case, the critical design sections are representative of an essentially complete structural design, and their design adequacy provides reasonable assurance of overall plant structural design.

Although certain portions are not subject to the limiting structural demands or can be considered less critical, they are necessary to be selected as critical sections due to their specific aspects such as design code and criteria. This may be a significant consideration because the structural demand based critical sections represent only those portions of a structure that experience high loads or stress and may not identify intervening structural elements that are not subject to high stress or loading but are needed for evaluating structural integrity.

In addition to structural features, safety-related functional role is also considered to select the critical design sections. Some of the APR1400 structures are required to achieve major performance whose failures could degrade system or equipment or pose safety hazard to plant personnel or to the general public.

The above criteria may be applied not only as one criterion, but also as mixed criteria based on engineering judgment and consistency. The specific contents for the critical design structures are presented in Subsection 3.8A.1 through 3.8A.3, and more detailed features in each structure can be further broken into portions, as described in each subsection. The design forces and moments in the tables of each subsection represent the governing set for the design of the structure.

3.8A.1 Reactor Containment Building

This section provides details of the analysis and design for the critical sections relevant to containment structures: containment wall and dome, internal structures, and basemat.

3.8A.1.1 Structural Description and Geometry

3.8A.1.1.1 Containment Wall, Dome and Basemat

The containment consists of a right circular cylinder closed on top by a hemispherical dome. The cylindrical wall, dome, and internal structures are supported on a nuclear island (NI) common basemat with a central cavity and tendon gallery. The cylindrical wall is anchored to the basemat by vertical reinforcements. The containment is constructed of concrete and prestressed by horizontal and vertical post-tensioned tendons in the wall and dome.

The basemat is constructed of conventional reinforced concrete.

An equipment hatch is provided for maintenance and removal of equipment (including the steam generators). Personnel airlocks are also provided.

The interior face of the reactor containment building is lined with 6 mm (0.25 in) thickness steel liner plate to form a leak-tight barrier and this liner plate is used as formwork during concrete placement. Thickened embedment plates and polar crane support brackets are welded into the liner plate. The basemat is lined with steel plate welded to embedded floor beams and covered by fill concrete.

3.8A.1.1.2 Containment Internal Structures

3.8A.1.1.2.1 Primary Shield Wall

The primary shield wall (PSW) is a reinforced concrete structure that houses the reactor, provides primary radiation shielding, and is an integral part of the internal structures. The PSW reinforcing is anchored into the containment basemat by the use of mechanical splices welded to both sides of a thickened liner plate. The PSW provides support for the reactor, refueling pool walls above the reactor cavity, and refueling pool slabs. The PSW forms a monolithic ring that surrounds the reactor vessel (RV). Penetrations in the PSW are provided for the primary loop piping and cavity ventilation system.

3.8A.1.1.2.2 In-Containment Refueling Water Storage Tank (IRWST)

The in-containment refueling water storage tank (IRWST) provides storage of refueling water, a single source of water for the safety injection and containment spray pumps, and a heat sink for discharges from the POSRVs and the reactor coolant gas vent system (RCGVS). The IRWST is annulus shaped and uses the lower section of the internal structure as its outer boundary. The IRWST is provided with a stainless steel liner to prevent leakage. The IRWST consists of a top and bottom slab and exterior and interior walls. The bottom slab of the IRWST rests on the containment basemat and the top and bottom slab are rigidly connected to the secondary shield wall (SSW).

3.8A.1.1.2.3 Secondary Shield Wall

The SSW is a circular reinforced concrete structure that, together with the refueling pool walls, encloses the nuclear steam supply system (NSSS) equipment, except for the reactor vessel. The SSW major reinforcing, which is necessary for carrying the seismic overturning moment, is anchored into the containment basemat in a manner similar to the PSW. The SSW provides lateral support for the steam generators, reactor coolant pumps (RCPs), and pressurizer and supports the operating and intermediate floors.

3.8A.1.2 Structural Materials

The principal construction materials for the reactor containment building are concrete, liner plate, reinforcing steel, and prestressing steel. The minimum specified material properties are used for the conservative design of the reactor containment building. The detailed material properties considered in the analysis and design of the reactor containment building are as follows:

3.8A.1.2.1 Concrete

The concrete used in the analysis and design of the reactor containment building is normal weight concrete.

The concrete characteristics of the containment wall, dome, and internal structures are as follows:

a. Compressive strength: 41.4 MPa (6,000 psi) at 91 days

b. Elastic modulus: 30,440 MPa (4,415 ksi)

c. Unit weight: 2,400 kg/m^3 (150 pcf)

d. Poisson's ratio: 0.17

The concrete characteristics of the containment basemat are as follows:

a. Compressive strength: 34.5 MPa (5,000 psi) at 91 days

b. Elastic modulus: 27,800 MPa (4,030 ksi)

c. Unit weight: 2,400 kg/m^3 (150 pcf)

d. Poisson's ratio: 0.17

3.8A.1.2.2 Liner Plate

The containment wall, dome, and basemat are lined with 6 mm (1/4 in) thick American Society of Mechanical Engineers (ASME) SA-516 and ASME SA-240 steel plates welded together to make a leak-tight membrane on the inside surface of the containment.

The characteristics of the carbon steel liner plate (ASME SA-516, Grade 60) are as follows:

a. Yield strength: 220 MPa (32 ksi)

b. Tensile strength: 415 MPa (60 ksi)

c. Elastic modulus: 200 GPa (29,000 ksi)

d. Poisson's ratio: 0.3

The characteristics of the stainless steel liner plate (ASME SA-240, Type 304) are as follows:

a. Yield strength: 205 MPa (30 ksi)

b. Tensile strength: 515 MPa (75 ksi)

c. Elastic modulus: 200 GPa (29,000 ksi)

d. Poisson's ratio: 0.3

3.8A.1.2.3 Reinforcing Steel

The material to be used for reinforcing bars for the containment conforms with American Society for Testing and Materials (ASTM) A615, Grade 60. The characteristics of the material are as follows:

a. Yield strength: 420 MPa (60 ksi)

b. Tensile strength: 620 MPa (90 ksi)

c. Elastic modulus: 200 GPa (29,000 ksi)

d. Poisson's ratio: 0.3

3.8A.1.2.4 Prestressing Steel

The multi-strand tendons are used for the post-tensioning system of the containment wall and dome. The multi-strand system employs 15.24 mm (0.6 in.) diameter, seven-wire, low-relaxation strand manufactured in accordance with ASTM A416, Grade 270.

The characteristics of the tendons are as follows:

a. Elastic limit: 1,300 MPa (189 ksi)

b. Yield strength: 1,675 MPa (243 ksi)

c. Ultimate strength: 1,860 MPa (270 ksi)

d. Elastic modulus: 193 GPa (28,000 ksi)

e. Poisson's ratio: 0.3

3.8A.1.3 Loads and Load Combinations

3.8A.1.3.1 Design Loads

The design loads applicable to the containment wall, dome, and basemat are in accordance with the requirements of CC-3200 of ASME Section III, Division 2, and U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide (RG) 1.136. The design loads considered in the analysis and design of the containment wall, dome, and basemat are described in Subsection 3.8.1.3.2.

The design loads applicable to the containment internal structures are in accordance with the requirements of American Concrete Institute (ACI) 349. The typical design loads applicable to the containment internal structures are described in Subsection 3.8.4.3.

3.8A.1.3.2 Load Combinations

The design loads, applicable load factors, and load combinations for the analysis and design of the containment wall, dome, and basemat are in accordance with the requirements of CC-3200 of ASME Section III, Division 2, and NRC RG 1.136. The load combinations and applicable load factors considered in the analysis and design of the containment wall, dome, and basemat are shown in Table 3.8-2 (Chapter 3).

The design loads, applicable load factors, and load combinations for the analysis and design of the containment internal structures are in accordance with the requirements of ACI 349. The load combinations and applicable load factors considered in the analysis and design of the containment internal structures are shown in Table 3.8-7A (Chapter 3).

3.8A.1.4 Analysis and Design for Critical Sections

3.8A.1.4.1 Containment Wall and Dome

3.8A.1.4.1.1 Description

The containment encloses the entire pressurized water reactor vessel, steam generators, reactor coolant loops, pressurizer, and portions of the auxiliary and engineered safety features systems. The containment is a prestressed concrete structure composed of a cylindrical wall with a hemispherical dome and is supported by the NI concrete common basemat. The entire inside surface of the containment, including the basemat, is lined with a steel plate to provide reasonable assurance of the leak-tightness of the containment.

Access to the interior of the containment is provided through two personnel airlocks. An equipment hatch permits transfer of equipment into and out of the containment. Other major penetrations in the containment wall are those required for feedwater and main steam lines and various process pipe lines, electrical penetration assemblies, and the fuel transfer tube.

The cylindrical containment wall has a constant thickness of 1.37 m (4 ft 6 in.), starting from the top of the foundation basemat to the springline. The containment wall is thickened locally around the equipment hatch, two personnel airlocks, and main steam line penetration areas to provide sufficient room for deflected prestressing tendons and additional heavy reinforcing bars. Three buttresses for anchoring of horizontal tendons are located at azimuths 90 degrees, 210 degrees, and 330 degrees and extend into the dome approximately 48 degrees above the springline. With the exception of the dome buttresses, the hemispherical dome has a constant thickness of 1.22 m (4 ft).

The cylindrical portion of the containment is prestressed by a post-tensioning system consisting of horizontal and inverted “U” vertical tendons. Each horizontal tendon is anchored at buttresses 240 degrees apart, bypassing the intermediate buttress. The dome portion of the containment is prestressed by a post-tensioning system consisting of horizontal tendons up to a 45-degree vertical angle and two groups of inverted “U” vertical tendons oriented 90 degrees to each other. The inverted “U” tendons are carried through the cylindrical wall and anchored at the tendon gallery in the common basemat.

3.8A.1.4.1.2 <u>Load Combinations Considered</u>

The following loading combinations are critical for the analysis and design of the containment wall and dome:

a. Test: $1.0\ D + 1.0\ L + 1.0\ F_i + 1.0\ P_t + 1.0\ T_t$

b. Construction: $1.0\ D + 1.0\ L + 1.0\ F_i + 1.0\ T_o + 1.0\ W$

c. Normal: $1.0\ D + 1.0\ L + 1.0\ F_i + 1.0\ T_o + 1.0\ P_v$

d. Severe: $1.0\ D + 1.3\ L + 1.0\ F_f + 1.0\ T_o + 1.0\ W + 1.0\ P_v$

e. Extreme: $1.0\ D + 1.0\ L + 1.0\ F_f + 1.0\ T_o + 1.0\ E_s + 1.0\ P_v$

f. Abnormal: $1.0\ D + 1.0\ L + 1.0\ F_f + 1.5P_a + 1.0\ T_a$

g. Abnormal/severe: $1.0\ D + 1.0\ L + 1.0\ F_f + 1.25P_a + 1.0\ T_a + 1.25\ W$

h. Abnormal/extreme: $1.0\ D + 1.0\ L + 1.0\ F_f + 1.0\ P_a + 1.0\ T_a + 1.0E_s + 1.0Y_r$

3.8A.1.4.1.3 Analysis and Design Procedures

3.8A.1.4.1.3.1 General

The containment wall and dome are analyzed for the design loads and load combinations outlined in Subsections 3.8.1.3.2 and 3.8.1.3.3. Linear-elastic stress analyses are performed to investigate the structural behavior of the containment wall and dome using the general-purpose structural analysis program ANSYS.

The overall analysis of the containment wall and dome for various loading combinations is performed using a three-dimensional finite element (FE) model, considering large penetrations and locally thickened sections.

In order to consider the installation and testing of the polar crane before construction of the dome part, a separate FEM consisting only of the cylindrical wall is also constructed. The liner plate is not designed as a structural member to resist structural loads on the containment. It is, therefore, not included in the FEM.

The computer programs described in Section 3.8 are summarized in the Table 3.8A-40. Table 3.8A-40 shows the types of models, analysis methods, computer programs, and purposes of the structural analyses of the nuclear island structures, the emergency diesel generator building, and the diesel fuel oil storage tank building.

The acceptance criteria for the design of the containment wall and dome are defined based on the requirements in CC-3000 of ASME Section III, Division 2, and described in Subsection 3.8.1.5. Table 3.8A-1 shows the allowable stresses of concrete and reinforcing steel for service and factored loads, respectively.

3.8A.1.4.1.3.2 Analysis Model

Configuration of Containment Wall and Dome

The overall configuration of the containment wall and dome is shown in Figures 3.8-1 and 3.8-2. The representative dimensions of the containment wall and dome are as follows:

a. Inside diameter of the containment wall: 45.72 m (150.0 ft)

b. Inside height from the top of basemat to the dome apex: 76.66 m (251.5 ft)

c. Height from the top of the basemat to the springline: 53.80 m (176.5 ft)

d. Thickness of the containment wall: 1.37 m (4.5 ft)

e. Thickness of the containment dome: 1.22 m (4.0 ft)

An equipment hatch, two personnel airlocks, main steam line penetrations, and three buttresses are included in the analysis model. The locally thickened sections around the equipment hatch and personnel airlock are shown in Figure 3.8-3.

Global Model

The global model consists of solid elements for the concrete, truss elements for the tendon, and shell elements for the brackets of the polar crane. An eight-node, linear, solid element (SOLID185) in the ANSYS program is used to model the concrete part of containment wall and dome, including large thickened penetration areas and buttresses. Figure 3.8A-1 shows the schematic view of equipment hatch and personnel airlocks in the FEM. The basemat of the reactor containment building is included partially to consider the junction behavior and anchorage of the prestressing tendon. Figure 3.8A-2 shows the overall structural analysis model with FE mesh.

The prestressing tendon is modeled using truss elements, which have an axial degree of freedom only, and are embedded in the solid element part. A two-node, linear, three-dimensional truss element (LINK180) with initial tendon stress in the ANSYS program is used to model the prestressing tendon. Figure 3.8A-3 shows the tendon model using the truss elements.

The boundary condition is applied at the bottom of the basemat and vertically cut faces inside and outside of the basemat. The cut faces are fixed both radially and circumferentially, whereas the bottom face is fixed only vertically as is common when an unimportant part is cut for removal.

Partial Model

In order to consider the situation of installation and test operation of the polar crane before the dome is constructed, the partial model without the dome is constructed. This model is made simply by removing the solid elements above the El. 254 ft 6 in in the full model. The partial model is exactly the same as the full model, except for the dome part. The boundary condition at the bottom of basemat is also the same as in the full model. Figure 3.8A-4 shows the shape of the partial model.

3.8A.1.4.1.3.3 Analysis Method

The analysis of the containment wall and dome is performed using the ANSYS program with a three-dimensional FEM. A brief description for the major loads considered in the analysis and design of the containment wall and dome are as follows:

Dead Load

The weight of concrete is automatically calculated from its mass density and gravitational acceleration by the ANSYS program. The additional weights such as those of the concrete slab, steel gratings, piping system, cable trays, heating, ventilation, and air conditioning (HVAC) systems, structural steels, and polar crane bracket are also considered dead loads.

Internal Pressure

The design basis accident (DBA) pressure of 413.7 kPa (60 psig) is applied to the inside surface of the containment wall and dome. The structural integrity test pressure is 1.15 times the design pressure. External or internal events such as containment spray actuation can induce a negative pressure on the containment. Therefore, the containment is designed for a negative pressure of 27.6 kPa (4 psig). To consider the pressure, which acts on the equipment hatch cover and attached doors in personnel airlocks, additional point loads are applied through reference nodes, which are located at the center of the penetration holes and inside surface of concrete wall. These reference nodes control and transfer the pressure loads to the surface of the corresponding cylindrical sleeve using the RBE3 command in the ANSYS program.

Prestress

The prestress is divided into two cases. The initial prestress is used for service categories to maximize the concrete compressive stress. For factored categories, the final (effective) prestress is considered to maximize the tensile stress of the reinforcing steels. The prestress losses are estimated in accordance with the guidelines specified in NRC RG 1.35.1. The stress profiles of vertical and horizontal tendons including losses of prestress are shown in Table 3.8A-41.

It is assumed that the stresses of the vertical tendon are constant from the anchor point to the springline and from the springline to the apex of the dome. Horizontal tendons that anchor to different buttresses 240 degrees apart are spaced closely enough to offset the stress variations. Hence, the stress, which is averaged throughout the length of the horizontal tendon, is used as a representative value.

Temperature Load

The thermal effect considers temperature variations during normal operating and accident conditions combined with the worst temperature condition (summer/winter) on the outside of the containment wall and dome. During normal operation, the containment is subject to a steady-state temperature condition. The linear gradient from the steady-state heat transfer analysis is applied to the stress analysis model. The containment is subject to a rapid temperature transient in the event of a loss-of-coolant accident (LOCA). The temperature transients result in a nonlinear temperature distribution within the concrete, which comes from the results of the transient heat transfer analysis.

Operating Temperature

- Inside (Liner Plate) : 120.0 °F
- Outside (exposed area) : 115.0 °F / -40.0 °F (Summer / Winter)
- Outside (enclosed area) : 104.0 °F / 50 °F (Max. / Min.)

Accident Temperature

- Inside (Liner Plate) : 290.0 °F
- Outside (exposed area) : 115.0 °F / -40.0 °F (Summer / Winter)
- Outside (enclosed area) : 104.0 °F / 50 °F (Max. / Min.)

Seismic Load

Structural analysis for the seismic load is based on the response spectrum analysis method, which computes the maximum response of a structure from the results of a modal analysis and their combinations. For the containment wall and dome, the in-structure response spectrum at El. 78 ft 0 in is used as a base excitation input. Figure 3.8A-5(b) shows the in-structure response spectrum of the safe shutdown earthquake (SSE) level at El. 78 ft 0 in with 5 percent damping.

3.8A.1.4.1.3.4 Analysis Results

The section forces and moments for each element are calculated from the integration of stress resultants, which are obtained from various FE analysis results. The maximum section forces and moments for the principal design sections of the containment wall and dome are summarized in Table 3.8A-2.

3.8A.1.4.1.3.5 Design Sections

Critical sections are those portions of the containment wall and dome that (1) perform a safety-critical function, (2) are subjected to the largest stress demands, (3) are considered to be representative of the structural design, and (4) provide reasonable assurance that the structural design is being performed in a manner consistent with the guidance in the SRP, NRC RGs, and other regulatory requirements. Specific aspects of structures such as design code and criteria are also taken into account.

The sections at geometric discontinuities and the expected maximum stress location are considered as critical design sections. The major design sections for the containment wall and dome structures including liner plate/anchorage are as follows:

a. Base of containment wall (wall-basemat junction)

b. Mid-height of wall

c. Polar crane bracket level and springline

d. Thickened sections around large penetrations

   1) Equipment hatch

   2) Personnel airlocks

e. Containment dome

f. Containment liner plate/anchorage

3.8A.1.4.1.3.6 Rebar Arrangement

Continuous vertical and horizontal reinforcements are placed at the inside and outside faces of the containment wall. The vertical reinforcements of the containment wall are extended and anchored to the basemat. Additional reinforcing bars are provided around the large penetrations in the cylindrical wall as required. Shear ties are also provided where shear reinforcing is required.

Table 3.8A-3 summarizes the reinforcing details for the major design sections of the containment wall and dome. Figures 3.8A-6 through 3.8A-10, and 3.8A-53 show the rebar arrangement for the major design sections of the containment wall and dome. Figures 3.8A-16 and 3.8A-17 show the connection detail between the containment wall and basemat.

The containment dome is also reinforced by two-way orthogonal sets of vertical reinforcing steel and hoop reinforcing steel. The orthogonal reinforcing is the continuation of the vertical reinforcing in the containment wall. Hoop reinforcing is also provided up to 45 degrees above the springline. Radial reinforcements are provided over the entire dome to resist radial tension forces resulting from curved tendons.

3.8A.1.4.1.3.7 Design Results

The design sections of the containment wall and dome are analyzed by the computer program DARTEM to check the stresses of concrete and reinforcing steel in the concrete section. The input of DARTEM consists of section geometry, material properties, section forces and moments, and loading combinations. Table 3.8A-4 presents the rebar and concrete stresses and margins of safety for the major design sections of the containment. The margin of safety is the ratio of allowable stress and actual stress of rebar and concrete in the containment.

3.8A.1.4.1.3.8 Liner Plate and Anchorage

The containment liner plate primarily serves as a leak-tight barrier. It also acts as a form for concrete pouring of wall and dome during construction. The liner plate is anchored into the concrete by angle stiffeners. The angle stiffeners serve two major functions as an efficient means to give the liner plate bending stiffness and an increased load resistance during construction and as anchors to keep the liner plate from separating from the concrete during operating and accident conditions.

For these functions, the load combinations and related effects described in Subsections 3.8.1.3.4 and 3.8.1.4.10 are considered in the design of the liner plate and anchorage. The analysis, design, detailing and fabrication requirements of the liner plate and anchorage are performed in accordance with the requirements of ASME, Section III, Division 2, CC, Article CC-3600, CC-3700, CC-3800 and CC-4500, respectively.

According to the requirements of the ASME Code, the liner plate is designed to be within allowable strain criteria for service and factored conditions, and it is designed to be within allowable stress criteria for construction condition, as shown in Table 3.8A-45. The allowable capacity of liner anchors are specified in terms of allowable forces or displacement as shown in Table 3.8A-46.

The unbalanced forces resulting from variations in the liner curvature, liner thickness and liner strength are considered in the anchor analysis. The computer program LBAP is used to determine maximum anchor forces and displacements assuming the liner panel buckles.

For the structural design, the stress as a concrete form is calculated for basemat, shell, and dome liners. The results including the margin of safety for each liner plate/anchorage system are presented in Table 3.8-10.

3.8A.1.4.2 Containment Basemat

3.8A.1.4.2.1 Description

The NI common basemat structure of the APR1400 consists of the auxiliary building (AB) area base and reactor containment building (RCB) area base structure. The NI common basemat is a reinforced concrete mat foundation that covers an area with maximum dimensions of 106.0 m × 107.6 m (348 ft × 353 ft). The thickness of basemat is 10 ft (El. 45 ft 0 in through El. 55 ft 0 in.) in the AB area and variable thickness of 23 ft to 33 ft (El. 45 ft 0 in through El. 78 ft 0 in.) in the RCB area in general, except partial areas such as the tendon gallery and reactor cavity area. The top of the basemat in the RCB is at El. 78 ft 0 in, whereas the basemat is at El. 66 ft 0 in in the reactor cavity area. The arrangements of the structure are shown in Figure 3.8A-11.

The NI common basemat includes a hollow rectangular toroid for the tendon gallery. The tendon gallery provides a space to install and inspect the inverted "U" shaped vertical tendons. It is located entirely within the NI reinforced concrete basemat, as shown in Figures 3.8-1 and 3.8-2. The vertical tendons run up the cylindrical shell, over the dome in a non-radial mesh pattern, run down to the tendon gallery on the opposite side, and are anchored at each end in the tendon gallery, as shown in Figure 3.8-4. As the tendon gallery is located entirely within the NI common basemat, it is analyzed and designed as a part of the common basemat. The codes and standards, loads and load combinations, design and analysis procedures, and structural materials for the tendon gallery are the same as those for the NI common basemat, and are described in Subsections 3.8.5.2 through 3.8.5.4, Subsections 3.8A.1.2.1 and 3.8A.1.2.3, and the following Subsections 3.8A.1.4.2.2 through 3.8A.1.4.2.4. For the analysis model, design section forces and design results of the NI common basemat, including the tendon gallery, are presented in Tables 3.8A-5 through 3.8A-13 and Figures 3.8A-13 through 3.8A-17.

The reactor containment basemat is reinforced at the top and bottom with layers of reinforcing steel bars. The reinforcing bars are arranged in the radial and hoop directions for top layers and in the orthogonal directions for bottom layers. The reinforcement at the upper portion of the tendon gallery is in the radial and hoop directions, and the reinforcement at the lower portion of the tendon gallery is in the rectangular pattern aligned with the plant NS and EW directions as shown in Figures 3.8A-16 and 3.8A-17, and Table 3.8A-12.

3.8A.1.4.2.2 <u>Load Combinations Considered</u>

The following loading combinations are critical for the analysis and design of the basemat:

a. Test: $1.0D + 1.0L + 1.0L_h + 1.0F + 1.0P_t$

b. Normal: $1.0D + 1.0L + 1.0L_h + 1.0F$

c. Severe: $1.0D + 1.3L + 1.3L_h + 1.0F$

d. Abnormal: $1.0D + 1.0L + 1.0L_h + 1.0F + 1.5P_a$

e. Abnormal/Extreme: $1.0D + 1.0L + 1.0L_h + 1.0F + 1.0P_a + 1.0Y_r + 1.0E_s$

3.8A.1.4.2.3 <u>Analysis and Design Procedures</u>

The design of the APR1400 adheres to a standardized design concept and can be constructed on various sites, including soil and rock sites. Among the eight soil profiles, three profiles (Soil profiles #1, #4, and #8) are considered as weak, moderate, and hard soil profiles for the NI common basemat based on comparison to subgrade moduli of each soil profile.

Although only three soil profiles (upper-, medium-, and lower-bound soil cases) are considered in the basemat structural analysis, the superstructure analysis results from enveloped seismic loading in 9 analysis cases are conservatively used in the basemat structural analysis. Therefore, it is concluded that the basemat structural analyses of the three soil profiles cover all of the basemat analyses of the soil categories given for the APR1400.

The load combinations for the basemat structure are summarized in Section 3.8A.1.4.2.2. A total of 288 load combinations (96 combinations × 3 soil profiles) were examined for the NI common basemat structure including phasing consideration of superstructures. The NI common basemat structure is analyzed using the ANSYS program FE computer model. The NI common basemat structure model includes the containment wall, dome, internal structures, AB, and common basemat foundation structure.

The FEM for superstructures, including the RCB wall and dome, RCB internal structure, and AB structure, are connected to the solid basemat model to simulate the stiffness effect of superstructures to the basemat. The FEM consists of a total of 317,373 nodes and 313,101 elements. Figure 3.8A-12 shows the full FEM for the basemat structural analysis. The AB structure, RCB internal structure, RCB wall and dome, and basemat structure FEMs are shown in Figure 3.8A-13.

In the case of soil stiffness, the distributed springs and soil finite elements are used for appropriate loading conditions. In the case of static loading, the distributed springs (LINK180) applied different subgrade moduli is used to consider boussinesq effect. The compression-only option was applied to the LINK180 elements of the ANSYS connected direction with the basemat strucutre, and the fixed boundary condition was applied to the other end side node of LINK180 element, as shown in Figure 3.8A-14. Axial (tributary) areas of each LINK180 element were calculated by applying unit pressure to the surface, which has the same geometry as the basemat model.

In the case of load combination including the seismic case, the soil finite elements are used to represent the overall dynamic foundation stiffness. In a manner consistent with the seismic SSI analysis, the material for the foundation media model is calculated based on strain-compatible shear wave velocity from SASSI.

The reactions from the analysis results of the each superstructure except seismic load are used as nodal forces and moments to the basemat. However, seismic loads from superstructures and basemat are applied by using the equivalent static acceleration method to the basemat. Torsional load is separately considered in the separate basemat analysis. The results from this separate analysis are combined by the absolute sum method to the results from the seismic load analysis. Buoyancy loads (Lh) due to groundwater are applied to the bottom of the basemat structure. The probable maximum water level used for the buoyancy loads calculation is El. 100 ft 0 in (ground level) for added conservatism.

Both the linear case (fully connected basemat to foundation) and nonlinear case (no connectivity between basemat and foundation when basemat uplift occurs) are included in the design. Based on a comparison between member forces and between the nonlinear case and the SSI analysis, 96 cases are sufficient to encompass all permutations caused by the superstructure. Therefore, the conservative design of the basemat is performed under linear and nonlinear condition since it bounds the problem of no uplift/uplift. The envelop of these two cases is used for the design of the members. Under the nonlinear condition, 96 were performed cases using the 100-40-40 method , considering different phasing of three superstructures. A detailed description and comparison results are presented in Technical Report, APR1400-E-S-NR-14006-P (Reference 40 in Subsection 3.8.7).The analysis results are expressed as the normal stresses and the shear stresses of solid elements. The stresses of solid elements are filed with respect to the rectangular and cylindrical coordinate systems to fit with the arrangements of reinforcement.

To envelop the flexural and shear reinforcement for the 36 load combinations, the RCB basemat is divided into eight design sections as represented in Table 3.8A-5. Figure 3.8A-15 shows design sections for the containment basemat.

Tables 3.8A-6 through 3.8A-9 show the calculated section forces and moments for the design. The calculated design forces and moments are used as input in the concrete section design program DARTEM for the design of flexural reinforcement and shear reinforcement. The design of the concrete sections is based on the ASME Section III, Division 2.

3.8A.1.4.2.3.1 Design Summary

The results on the design of the flexural and shear reinforcement are summarized in Tables 3.8A-10 through 3.8A-13. For the flexural reinforcement, it is confirmed that the maximum stresses of the provided reinforcement do not exceed the allowable stresses for both the service and factored load conditions. For the shear reinforcement, it is confirmed that the amounts of provided reinforcement are sufficient to meet the demands of the required reinforcement for each design section. The margins of safety of the flexural and shear reinforcement and concrete stresses are shown in Table 3.8A-10 and 3.8A-11. The design envelops the given parameters so that the design is adequate for any specific site conditions within those parameters. Figures 3.8A-16 and 3.8A-17 show the rebar arrangement for the basemat of the RCB.

3.8A.1.4.2.3.2 Stability Check

The NI common basemat structure is evaluated for stability against overturning, sliding, and flotation. The calculated factors of safety against overturning, sliding, and flotation for the load combinations meet the criteria of Section II of SRP 3.8.5 as shown in Table 3.8A-14.

The sliding and overturning factors of safety are determined using load combination containing dead load (D), wind load (W), SSE (E_s), and buoyant load at normal (H_e). The floatation factor of safety is determined based on dead load (D) and buoyant force at flood (H_s).

For calculation of buoyant load at normal (H_e), the design groundwater level is applied, while the extreme groundwater level is applied to calculate the buoyant force at flood (H_s). The design groundwater level is El. 96 ft 8 in. The extreme groundwater level is the same as plant grade level (El. 98 ft 8 in.) considering probable maximum flood.

In the earthquake load, axial force, shear force, and moment due to horizontal and vertical excitation of the structure are obtained from seismic analysis. Since seismic load governs over tornado load, the tornado load is not necessary to be considered in the stability evaluation. The wind load combination ($D + H_e + W$) in Table 3.8A-14 is considered though the seismic load governs over the wind load, because the allowable factor of safety for wind is 1.5, which is different from 1.1 for the seismic load. A summary of overturning, sliding, and flotation check is provided in Table 3.8A-15.

3.8A.1.4.2.3.3 Basemat Uplift Check

The ground contact ratio between the basemat and soil is carried out to provide reasonable assurance that the linear soil-structure interaction (SSI) analysis remains valid. The ground contact ratio is defined as combining the stresses obtained from soil spring under static loads with stresses obtained from time histories under seismic loads. Table 3.8A-16 shows the ground contact ratio of NI common basemat. The APR1400 NI common basemat has an 80 percent or more contact area during basemat uplift, and it can be concluded that the contact area would be acceptable.

3.8A.1.4.2.3.4 Settlement Check

Differential settlements are divided by the differential settlement within the NI common basemat and the differential settlement between the NI basemat and other seismic category I structures.

Figure 3.8A-18 shows the node location at the bottom of the NI common basemat for checking the settlement. The nodes within a distance of approximately 15.24 m (50 ft) are selected to check the different settlements. Table 3.8A-17 shows the differential settlements at site profiles 1, 4, and 8. The maximum differential settlements per 15.24 m (50 ft) at site profiles 1, 4, and 8 are 5.309 mm (0.209 in.), 2.311 mm (0.091 in.), and 0.991 mm (0.039 in.), respectively.

In addition, differential settlement between NI common basemat and other buildings basemat is evaluated for seismic category I structures. For the case of differential settlement between the NI common basemat and TGB basemat it is not evaluated since TGB is not a seismic category I structures and there are no safety related systems in TGB.

3.8A.1.4.2.3.5 Bearing Pressure

The bearing pressures of the NI common basemat is evaluated for soil profile S01 (weakest), S04 (moderate), S08 (strongest) under static and dynamic loading conditions. The model for the superstructure, NI common basemat, and soil used for the bearing pressure evaluation is identical as that used for the design described in 3.8A.1.4.2.3.

The maximum static bearing pressure is determined as the soil spring forces divided by the tributary area of the soil spring under the dead and live load conditions. The maximum dynamic bearing pressure is determined as the contact pressure between the basemat and foundation media model for statics plus seismic loads. The maximum static bearing pressure of 937.1kPa (19,570 lb/ft2) in the APR1400 NI common basemat is obtained from the basemat analysis results of soil profile S01. A value of 20ksf is defined as the allowable static bearing demand to provide an additional margin of safety at the site. The maximum dynamic bearing pressure of 2586.2kPa (54,010 lb/ft2) is obtained from the basemat analysis results of soil profile S08. A value of 60ksf is defined as the allowable dynamic bearing demand to provide an additional margin of safety at the site.

3.8A.1.4.2.4 Conclusion

The basemat concrete section strengths determined from the ASME criteria are sufficient to resist the design basis loads. It is feasible to design and construct the structural components considered. The assumptions envelop the given parameters so that the design presented is adequate for any specific site conditions within those parameters.

3.8A.1.4.3 Internal Structures

3.8A.1.4.3.1 Primary Shield Wall

3.8A.1.4.3.1.1 Description

The PSW is a massive rectangular concrete structure, 18.80 m (61 ft 8 in.) long by 11.43 m (37 ft 6 in) wide, with cavities consisting of the following:

a. Vertical chase, 2.03 m (6 ft 8 in.) by 5.18 m (17 ft 0 in.), for in-core instrumentation (ICI) guide tubes from the seal table at the bottom of the refueling pool, El. 130 ft 0 in, down to the bottom of the ICI tunnel at El. 69 ft 0 in.

b. Horizontal chase, 5.51 m (18 ft 3/4 in.) wide 4.27 m (14 ft 0 in.) high, from below the seal table to below the reactor vessel for the ICI guide tubes.

c. A cavity to enclose and support the reactor vessel from the top of the PSW at El. 130 ft 0 in to the bottom of the ICI horizontal chase.

d. Openings to allow installation and access to the main coolant loop piping from the reactor vessel to the steam generators and the RCPs back to the reactor vessel.

e. A laydown area for the upper guide structure that is a part of the fuel handing system. This opening is 5.18 m (17 ft 0 in.) by 5.16 m (16 ft 11 in.) and extends from the bottom of the refueling pool down to El. 106 ft 6-3/8 in.

3.8A.1.4.3.1.2 Load Combinations Considered

The following loading combinations are critical for the analysis and design of the PSW:

a. Normal: $1.4D + 1.4L_h + 1.7L + 1.7R_o$ and $1.1D + 1.1L_h + 1.3L + 1.2T_o + 1.3R_o$

b. Abnormal: $1.0D + 1.0L_h + 1.0L + 1.4P_a + 1.0T_a + 1.0R_a$

c. Extreme environmental: $1.0D + 1.0L_h + 1.0L + 1.0T_o + 1.0E_s + 1.0R_o$

d. Abnormal/extreme environmental: $1.0D + 1.0L_h + 1.0L + 1.0P_a + 1.0T_a + 1.0R_a + 1.0Y_r + 1.0E_s + 1.0Y_j + 1.0Y_m$

Pipe break reaction (Y_r), jet impingement loads (Y_j), and missile impact loads (Y_m) do not act on the PSW. So, these loads are not applied to the design of the PSW.

3.8A.1.4.3.1.3 Analysis Methods and Results

The containment internal concrete structures are interconnected at various elevations. Significant lateral loads from the reactor coolant system (RCS) supports are applied at several elevations. In order to properly account for the load distribution in structures, an overall structural model representing containment internal concrete structures is prepared. Operating concrete floor slabs between the SSWs and containment shell are included as reaction forces obtained from local analyses to represent dynamic amplification in the finite element model (FEM).

The ANSYS program is used to perform structural analysis using the containment internal structure full model. The FEM consists of a total of 50,496 nodes. The numbers of shell, solid, and beam elements are 5,522, 41,689, and 827, respectively. The following containment internal structures are included in the analysis model:

Solid Elements

a. PSW

b. IRWST and fill concrete

Shell Elements

a. SSW

b. Refueling pool wall and slab

c. Pressurizer (PZR) enclosure wall and slab

d. Steam generator (SG) enclosure wall

e. Operating floor slab between SSW and refueling pool wall

Frame Elements

a. RCP lateral support beam

b. RCS model

Figure 3.8A-19 shows the full FEM for the containment internal structure. The solid element model (PSW, IRWST, and fill concrete), shell element model (SSW), and beam element model (RCS) are shown in Figure 3.8A-20.

Structure dead load consists of self-weight for PSW, SSW, RV, additional weight of floor and equipment, and dead load of RCS. Fifty percent of the weights and equipment weights on the floor between the containment shell and the SSW are assumed to be distributed to the containment shell and the SSW, respectively. The large equipment weights are applied as nodal forces at the location of equipment loads.

The live load is applied as follows:

a. Concrete slabs at El.100 ft 0 in and El.156 ft 0 in: 0.2 ksf
(1.0 ksf for movable equipment during construction and maintenance)

b. Other slabs: 0.2 ksf

Hydrostatic loads are divided by the surface pressure loads in the refueling pool and IRWST walls and bottom slabs.

An equivalent uniform temperature gradient is input directly in the ANSYS model at the appropriate nodes. The temperature profiles during normal operating condition are more severe than those of the accident condition, thus represent the limiting temperature for all the plant conditions.

Compartment pressures on RCB internal structures are result of a pipe break inside containment. The types of compartment pressures are as follows:

a. SG compartment – feedwater economizer nozzle

b. SG compartment – feedwater downcomer nozzle

c. SG compartment – SG blowdown nozzle

d. PZR compartment – PZR spray nozzle

e. PZR compartment – POSRV nozzle

f. PZR spray valve room – PZR spray line

Branch line pipe break (BLPB) loads are dynamic reactions caused by the combined effects of branch line nozzle reactions or thrust due to pipe break, jet impingement on RCS equipment, or subcompartment pressure effects on RCS equipment. The RCS support reactions due to BLPB are applied as nodal forces at the support locations.

The hydrodynamic pressure load, which is generated by the expulsion of air in the pilot-operated safety relief valve (POSRV) discharge, is applied to the wall and bottom slab of the IRWST through the twelve spargers. For the hydrodynamic pressure load, by multiplying the dynamic impact factor (DIF), the maximum pressure is conservatively considered as the static load in the analysis. In addition, the normalized factor is considered for the spatial distribution due to the location of spargers.

The seismic analysis for structures is performed using response spectrum analysis. A 7 percent damping ratio for reinforced concrete structures (SSE) and 3 percent damping ratio for the RCS model are used. In addition, the damping ratio for the IRWST or refueling pool is the same as that for reinforced concrete structures: the seismic response of water is only considered as impulsive (rigid) mode for structural analysis. Figure 3.8A-5 (a) and (c) show the in-structure response spectrum (ISRS) of the SSE level at El. 78 ft 0 in with 3 percent and 7 percent damping.

Three sections are selected in the PSW as critical sections. Each section is thinnest in the directions of north, south, and east. The design forces and moments for PSW critical sections are presented in the Table 3.8A-18. Table 3.8A-22 presents the margins of safety of reinforcement in the primary shield wall. The margin of safety is the ratio of provided reinforcement and required reinforcement.

3.8A.1.4.3.1.4 Typical Rebar Arrangement

The typical rebar arrangements for PSW are presented in the Table 3.8A-21. Figure 3.8A-58 shows the rebar arrangement for major design section of the PSW.

3.8A.1.4.3.1.5 Conclusion

The PSW concrete section strengths determined from the criteria in ACI 349 are sufficient to resist the design basis loads. It is feasible to design and construct the structural components that are considered. The assumptions envelop the given parameters so the design is adequate for any site-specific conditions within the parameters.

3.8A.1.4.3.2 IRWST

3.8A.1.4.3.2.1 Description

The IRWST provides storage of refueling water, a single source of water for the safety injection and containment spray pumps, and a heat sink for discharges from the POSRVs and the RCGVS. The IRWST is annulus shaped and uses the lower section of the internal structure as its outer boundary. A stainless steel liner is provided inside the IRWST.

The IRWST consists of a top and bottom slab and exterior and interior walls. The bottom slab rests on the containment basemat and the top and bottom slabs are rigidly connected to the SSW. The interior wall is the reactor containment SSW. The fill concrete portion is placed between the SSW and PSW from El. 78 ft 0 in to El. 100 ft 0 in.

The exterior wall thickness of the IRWST is 0.91 m (3 ft), the same as the bottom and roof slabs. The inner radius of the exterior wall is 21.89 m (71 ft 10 in.) and the outer radius of the interior wall (SSW) is 16.15 m (53 ft 0 in.). The top elevation of the IRWST bottom slab is El. 81 ft 0 in. The top elevation of the IRWST roof slab is El. 100 ft 0 in. The normal water level in the IRWST is at El. 93 ft 0 in.

3.8A.1.4.3.2.2 Load Combinations Considered

The following loading combinations are critical for the analysis and design of the IRWST wall:

a. Normal: $1.4D + 1.4L_h + 1.7L + 1.7R_o + 1.7P_{ac}$ and $1.1D + 1.1L_h + 1.3L + 1.2T_o + 1.3R_o + 1.3P_{ac}$

b. Abnormal: $1.0D + 1.0L_h + 1.0L + 1.5P_a + 1.25P_{ac} + 1.0T_a + 1.0R_a$

c. Extreme environmental: $1.0D + 1.0L_h + 1.0L + 1.0T_o + 1.0E_s + 1.0R_o + 1.0P_{ac}$

d. Abnormal/extreme environmental: $1.0D + 1.0L_h + 1.0L + 1.0P_{ac} + 1.0P_a + 1.0T_a + 1.0R_a + 1.0Y_r + 1.0Y_j + 1.0Y_m + 1.0E_s$

e. Severe environmental : $1.4D + 1.4L_h + 1.7L + 1.7R_o + 1.7P_{ac}$ and $1.1D + 1.1L_h + 1.3L + 1.2T_o + 1.3R_o + 1.3P_{ac}$

Accident pressure (P_a), Pipe break reaction (Y_r), jet impingement loads (Y_j), and missile impact loads (Y_m) do not act on the IRWST. So, these loads are not applied to the design of the IRWST.

P_{ac} is the air-clearing load, which is the hydrodynamic load generated by the expulsion of air in POSRV discharge lines during the POSRV discharge following the water clearing phenomena in the sparger.

3.8A.1.4.3.2.3 <u>Analysis Methods and Results</u>

The IRWST FEM is part of the containment internal structure full model. See Subsection 3.8A.1.4.3.1.3. The governing load to the IRWST outer wall and upper slab is the sparger discharge load. Hydrodynamic loads occur at twelve sparger locations (north and west). Because the IRWST is separated from the containment wall by a seismic gap and there is no connection to transfer POSRV load to the containment wall, the POSRV load is not directly applied on the containment wall. The primary and secondary shield wall (PSW and SSW) may be directly influenced by the POSRV load because this load is applied to the IRWST which is integrally connected with the PSW and SSW. However, the transient displacements of PSW and SSW due to POSRV load are comparatively small enough to be ignored. In addition, the spectral acceleration of POSRV is obtained from FRS curves which are generated from time-history analysis. The results comparing with seismic load show that the spectral acceleration by POSRV is less enough to be ignored for PSW and SSW. For reference, the developed FRS is used by other disciplines for qualification of systems and components (e.g., pipes and equipment). Therefore, stresses on the portions of outer wall and upper slab are investigated and critical sections are selected where the largest stress takes place. The design forces and moments for IRWST critical sections are presented in Table 3.8A-19. Table 3.8A-42 presents the margins of safety of reinforcement in the IRWST. The margin of safety is the ratio of provided reinforcement and required reinforcement.

The typical rebar arrangements for the IRWST are presented in the Table 3.8A-23.

3.8A.1.4.3.2.4 Conclusion

The IRWST wall/slab concrete section strengths determined from the criteria in ACI 349 are sufficient to resist the design basis loads. It is feasible to design and construct the structural components considered. The assumptions envelop the given parameters so the design is adequate for any site-specific conditions within the parameters.

3.8A.1.4.3.3 SSW

3.8A.1.4.3.3.1 Description

The SSW is a circular reinforced concrete structure that extends up to the main operating floor. The wall is anchored to the containment basemat. The wall is integrally connected to the refueling pool at the fuel transfer tube side (east) and at the regenerative heat exchanger room (west). At other points, the SSW is connected to the refueling pool through the SG and PZR enclosure walls and RCP lateral support members, which make the SSW and the internal structures almost symmetric around the east-west centerline of the containment.

In addition to enclosing the primary loop and the internal structures, the SSW provides lateral support for the SGs, RCPs, PZR, and the operating and intermediate floors inside the containment.

The major floor elevations are as follows:

a. Base floor: El. 100 ft 0 in

b. Intermediate floor: El. 114 ft 0 in, El. 136 ft 6 in

c. Operating floor: El. 156 ft 0 in

The major design dimensions of the secondary shield wall are as follows:

a. Wall thickness: 1.22 m (4 ft)

b. Inside radius: 14.94 m (49 ft)

c. Height of wall: 17.07 m (56 ft)

3.8A.1.4.3.3.2 Load Combinations Considered

The following loading combinations are critical for the analysis and design of the SSW:

a. Normal: $1.4D + 1.4L_h + 1.7L + 1.7R_o$ and $1.1D + 1.1L_h + 1.3L + 1.2T_o + 1.3R_o$

b. Abnormal: $1.0D + 1.0L_h + 1.0L + 1.4P_a + 1.0T_a + 1.0R_a$

c. Extreme environmental: $1.0D + 1.0L_h + 1.0L + 1.0T_o + 1.0R_o + 1.0E_s$

d. Abnormal/extreme environmental: $1.0D + 1.0L_h + 1.0L + 1.0P_a + 1.0T_a + 1.0R_a + 1.0Y_r + 1.0Y_j + 1.0Y_m + 1.0E_s$

Jet impingement loads (Y_j), missile impact loads (Y_m), reactions of pipe, cable tray and duct (R_o), and pipe accident reactions (R_a) are evaluated in local affected area. Thermal operating load (T_o), and accident temperature (T_a) do not affect the design of SSW since there is no temperature difference between the inside and outside of the SSW.

3.8A.1.4.3.3.3 Analysis Methods and Results

The SSW FEM is a part of the containment internal structure full model. See Subsection 3.8A.1.4.3.1.3. The SSWs extend from El. 100 ft 0 in up to the operating floor at El. 156 ft 0 in. The SSW from El. 100 ft 0 in to El. 114 ft 0 in is selected as the critical section because this portion of the wall includes the junction between SSW and fill concrete.

The refueling pool walls extend from the bottom of the pool at El. 130 ft 0 in up to El. 156 ft 0 in. The north, south, and west walls between these elevations are selected as critical sections.

SG enclosure walls extend from El. 156 ft 0 in up to El. 191 ft 0 in, which is the top of wall. SG enclosure walls between these elevations are selected as critical sections.

PZR enclosure walls extend from El. 133 ft 4 in up to El. 200 ft 0 in, which is the top of wall. PZR enclosure walls from El. 156 ft 0 in up to 191 ft 0 in are selected as critical sections since these portions of the wall support the PZR laterally. The slab at El. 156 ft 0 in is selected as the critical section because the vertical g-value at this elevation which is used for slab design is bigger than the g-value at other elevation.

The design forces and moments for SSW critical sections except the slab are presented in the Table 3.8A-20. Table 3.8A-25 presents the margins of safety of reinforcement in secondary shield wall except the slab. The margin of safety is the ratio of provided reinforcement and required reinforcement. The design forces and moments for the slab are presented in the Table 3.8A-43. Table 3.8A-44 presents the margins of safety of reinforcement at the critical section for the slab. The margin of safety is the ratio of provided reinforcement and required reinforcement.

3.8A.1.4.3.3.4 Typical Rebar Arrangement

The typical rebar arrangements for the SSW and the slab at El. 156 ft 0 in are presented in the Table 3.8A-24 and Table 3.8A-44, respectively. Figure 3.8A-57 shows the rebar arrangement for the slab at El. 156 ft 0 in and Figures 3.8A-59 through 3.8A-62 show the rebar arrangement for each design section of the SSW.

3.8A.1.4.3.3.5 Conclusion

The SSW concrete section strengths determined from the criteria in ACI 349 are sufficient to resist the design basis loads. It is feasible to design and construct the structural components considered. The assumptions envelop the given parameters so that the design presented is adequate for any specific site conditions within those parameters.

3.8A.1.4.3.4 Structural Steel Beam

3.8A.1.4.3.4.1 Description

In the RCB, there is no steel column structure. For steel beam structure, there are three major elevations in the annulus area of the RCB. The steel beams are located between containment wall and secondary shield wall at El. 114 ft 0 in, El. 136 ft 6 in, and El. 156 ft 0 in supporting the concrete slabs and grating area. Typical steel beam, beam connection, and beam seat on each level are designed for highest load case. The concrete slab and steel beams are analyzed separately. The loads on the slab and slab weight are applied on the steel beam by line load.

3.8A.1.4.3.4.2 Load Combinations Considered

In sixteen load combinations given in Table 3.8-7B, only the governing load cases are considered as defined herein. The load case 5 (LC5) governs over the construction conditions (LC1, LC2, LC3), the test condition (LC4), and the normal condition (LC6), and the severe environmental conditions (LC7, LC8, LC9). The load case 13 (LC13) governs over the abnormal conditions (LC10, LC11, LC12), extreme environmental conditions (LC14, LC15) and abnormal/extreme environmental conditions (LC16). The load of To, Ta are not considered since the sliding connections are provided in the steel design to relieve the thermal stresses. The loads of W, H are not considered since the loads do not exist inside of the containment. The loads of Pa, Ra, Yr, Yj, Ym, Yf, Ma, Wt, Hs are not considered since the loads do not affect the steel structures. The load combinations considered are used as input for the analysis by computer program, and they are investigated for all structural members.

3.8A.1.4.3.4.3 Analysis and Design Methods

The computer program GTSTRUDL, which is used for structural analysis, is a software for creation of model, modification of the model, execution of analysis, check of the analysis, and optimization of design. The steel beam structures for design load cases are analyzed using 3-dimensional frame elements. The GTSTRUDL prints the detailed output of results including the stress. For design of steel beam, uniform floor loads are distributed to all beams based on tributary areas. The span direction for concrete slabs on metal deck is considered in determining the tributary areas. Response spectrum analysis is used to design steel member with the FRS that envelop the containment side and SSW side at each level. The steel beam model is built and analyzed for static and seismic loads utilizing GTSTRUDL. After the analysis, the stresses of steel structure are checked according to the allowable values in AISC N690. The allowable stresses in AISC N690 are used for stress acceptance criteria.

Connections are designed based on the reactions from the GTSTRUDL analysis. The capacities of the various connection components are computed. For design, the SSW side connection is composed of a beam seat and welding between the beam and beam seat. The beam seat and stiffener support downward vertical load and the welding between the beam and beam seat support upward vertical load. The axial and horizontal load and torsional moment are supported by concrete slab.

The sliding connection at the containment wall is composed of a beam seat, lower key bumper and gaps (between the end of the steel beam and the containment wall, between the lower key bumper and beam seat). The gap between the end of the steel beam and the containment wall is to allow radial movement. The other gap between the lower key bumper and beam seat is to allow horizontal movement due to seismic and thermal loads. The beam seat support downward vertical load and the lower key bumper support upward vertical load.

Friction force are considered for steel connection design. The friction coefficient of 0.35 is used as recommended in Commentary on the AISC 360-05 chapter J and the type of steel surface is class A.

3.8A.1.4.3.4.4 Conclusion

The design of steel beam and connections is performed to maintain adequate design margins. The details of the steel beam, concrete slab, and connection are shown in Figure 3.8A-56. The summary of design results is shown in Table 3.8A-47.

3.8A.2 Auxiliary Building

This section provides details of the analysis and design for the critical sections relevant to the auxiliary building (AB) structures: reinforced concrete shear wall, slab, concrete frame, and basemat.

3.8A.2.1 Structural Description and Geometry

The auxiliary building consists of the main control room (MCR) area, electrical and control area, main steam valve house area, chemical and volume control system (CVCS) area, emergency diesel generator (EDG) area, and fuel handling area. The building description is provided in Subsection 3.8.4.1.1.

The auxiliary building is a seismic Category I reinforced concrete structure, which is composed of rectangular walls, floor slabs, concrete columns, and beams. The AB surrounds the reactor containment building (RCB) and shares a common foundation basemat with the RCB. Both the structural design and physical arrangement of the AB provide protection against both external and internal hazards.

The slabs and shear walls in the building represent the primary lateral and vertical load-resisting system and are designed for both gravity and seismic-related loads. Concrete slabs at various elevations in the building distribute lateral forces (through diaphragm action) to the shear walls as in-plane loads, and resist vertical forces (self-weight and seismic forces) as out-of-plane loads.

Lateral loads are transferred down to the basemat foundation through shear walls as in-plane shear forces and moments. Vertical loads on slabs are supported either by concrete beams or walls. Those are transferred to the basemat foundation by the walls and the frames composed of concrete columns and beams.

3.8A.2.2 Structural Materials

The major materials that are used in the construction are concrete, reinforcing bars, and structural steels.

Concrete

The minimum concrete compressive strength of the AB is 34.5 MPa (5,000 psi) at 91 days. The properties of the concrete are as follows:

a. Compressive strength: 34.5 MPa (5,000 psi) at 91 days

b. Elastic modulus: 27,800 MPa (4,030 ksi)

c. Unit weight: 2,400 kg/m^3 (150 pcf)

d. Poisson's ratio: 0.17

Reinforcing Bars

The reinforcing bars used in the AB are in accordance with ASTM, A615 Gr. 60. The properties of the reinforcing bars are as follows:

a. Yield strength: 420 MPa (60 ksi)

b. Tensile strength: 620 MPa (90 ksi)

3.8A.2.3 Loads and Load Combinations

3.8A.2.3.1 Design Loads

The following are major design loads that are considered in the design of the AB.

Dead Load (D)

Dead load includes the weight of structures such as slabs, roofs, decking, framing (beams, columns, bracing, and walls), and the weight of permanently attached major equipment such as tanks, machinery, and cranes. Equipment loads heavier than or equal to 44.5 kN (10 kips) are considered concentrated weights.

The attachment loads include equipment loads lower than 10 kips such as piping, cable tray, and HVAC loads. The minimum attachment loads are as follows:

a. Concrete floors: 9.6 kN/m^2 (200 psf)

b. Roof floors: 7.2 kN/m^2 (150 psf)

c. Interior wall: 1.0 kN/m^2 (20 psf)

d. Exterior wall: 0.5 kN/m^2 (10 psf)

Live Load (L)

Live loads are conventional floor loads to account for occupancy, maintenance, equipment removal, equipment laydown, and other loads that vary in intensity. The minimum live loads are as follows:

a. Concrete floors: 9.6 kN/m^2 (200 psf)

b. Roof floors: 4.8 kN/m^2 (100 psf)

c. Equipment removal aisle: 23.9 kN/m^2 (500 psf)

d. Seismic live load: 2.4 kN/m^2 (50 psf) (considered in seismic loading combination)

In order to account for wall attachments, shear walls are designed considering a minimum out-of-plane live load of 16.6 kN/m^2 (350 psf).

Soil and surcharge load (L_g) and hydrostatic load (L_h) are considered as live load.

Wind Load (W)

Wind load is the equivalent static load generated by the design wind velocity and is calculated in accordance with ASCE 7. The AB is designed for a 100-year recurrence interval wind.

Safe Shutdown Earthquake Load (E_s)

In the structural analysis for the AB, seismic loads are considered with the equivalent static load method involving equivalent horizontal and vertical static forces.

Accident Pressure Load (P_a)

Accident pressure is applied external or internal air, gas, or liquid pressure loads during abnormal operating conditions.

High-Energy Line Break (HELB) Load (Y_r, Y_j, Y_m, Y_f)

There are several high- and moderate-energy pipe lines routed through the AB. During an abnormal condition at the plant, it is postulated that these lines can break at various locations. The structural loads associated with pipe breaks include pipe break reactions (Y_r), jet impingement load (Y_j), missile impact load (Y_m), compartmental flooding load (Y_f), and compartment pressure (P_a).

3.8A.2.3.2 Load Combinations

The load combinations are addressed in Subsection 3.8.4.3.6 and are used for analysis and design of the AB and associated components.

3.8A.2.4 Analysis and Design for Critical Sections

This section summarizes the analysis and design for critical sections of the AB. The critical sections are listed below. The description of critical section, analysis and design methods, and design summary are provided for each critical section. The locations of critical sections are shown in Figures 3.8A-21 through 3.8A-24.

a. Basemat

1) AB area of the nuclear island (NI) common basemat

b. Shear walls

1) North wall of the north main steam isolation valve (MSIV) house

2) North wall of the north auxiliary feedwater storage tank (AFWST)

3) West wall of the MCR

4) West wall of the spent fuel pool (SFP)

5) East wall of the fuel handling area (FHA)

c. Slabs

1) Floor slab of the EDG Room at El. 100 ft 0 inch

2) Pool bottom slab of the SFP at El. 113 ft 0 inch

3) Floor slab below the main steam enclosure at El. 137 ft 6 inch

3.8A.2.4.1 Basemat

Description

The AB shares a common foundation basemat with the RCB. The foundation of the RCB and AB is a reinforced concrete mat structure with the maximum dimensions of 106.0 m × 107.6 m (348 ft × 353 ft). The thickness of the basemat is 3.05 m (10 ft) in the AB area. The bottom of the basemat is located at El. 40 ft 0 in and 45 ft 0 in, below the finished grade elevation. The AB basemat is reinforced at the top and bottom with layers of reinforcing steel bars. The reinforcing bars are arranged in the orthogonal directions for top and bottom layers.

Analysis and Design Methods

The reinforced concrete common basemat is analyzed and designed for the reactions due to static, seismic, and all other loads that affect basemat analysis at the base of the superstructures. The forces and moments of the basemat area are obtained by application of design loads to the integrated static three-dimensional FEM. The analysis methods and procedures of the NI common basemat are described in Subsection 3.8A.1.4.2.3. Figure 3.8A-25 shows the solid element model of the basemat for the AB and RCB.

Since the rigid connection between walls and basemat is not simulated in the analysis model of the NI common basemat structure, the basemat of the AB is not subject to any moment that might occur. Therefore, the additional structural analysis is executed to obtain the magnitude of the moment transferred from walls and columns, which are subjected to lateral loads. The design forces and moments for the AB basemat are summarized in Table 3.8A-26.

The AB basemat model is divided into 15 element sets as shown in Table 3.8A-26. The design loads are sorted by these element sets and the basemat design is performed in each element set. The AB basemat is designed in accordance with the requirements of ACI 349. Required reinforcements are calculated based on the governing required capacities obtained from finite element analysis for each design area.

Top and bottom reinforcements are calculated considering axial force, out-of-plane flexural force, and in-plane shear force. The required reinforcements for axial force and out-of-plane flexural force are determined per ACI 349, but a methodology taken from the ACI handbook (ACI 340R) is adopted to combine axial force and out-of-plane flexural force. The required reinforcement for in-plane shear force is determined per ACI 349.

The resultant shear forces are checked with the design nominal concrete strength and appropriate shear reinforcement steel is provided in the areas where the resultant shear force exceeds the design nominal shear strength.

Design Summary

The basemat is symmetrically reinforced to resist the potential moments as a result of differential settlement of the foundation. The maximum top and bottom reinforcements are 3-#18 bar at 300 mm (12 in.) spacing for each direction. The maximum shear reinforcements are required as 2-#8 bar at 300 mm (12 in.) spacing around the RCB and #6 bar at 300 mm (12 in.) spacing provided to the other area. The required reinforcement summary and margins of safety are shown in Table 3.8A-27. The margin of safety is the ratio of required reinforcement and provided reinforcement.

The reinforcement arrangement is shown in Figure 3.8A-32 and the typical sections for the AB basemat are shown in Figures 3.8A-33 and 3.8A-34. Typical details of the basemat are shown on Figure 3.8A-35.

The concrete basemat strength determined from the criteria in Section 3.8.5 is sufficient to resist the design basis loads. It is feasible to design and construct the NI foundation basemat. The design envelops the given parameters so that the design presented is adequate for any specific site conditions, within those parameters.

3.8A.2.4.2 Shear Walls

Description

The AB shear walls, together with the diaphragm slabs, are the primary lateral load resistance system, and are designed essentially for both the seismic and the extreme wind loads.

Concrete slabs at the different elevations of the building distribute the lateral forces through diaphragm action as in-plane loads to the shear walls in proportion to the relative stiffness of the shear walls. These in-plane loads are transferred down to the basemat foundation in the form of in-plane shear forces and moments in the shear walls.

The in-plane shear forces and moments, which are obtained from the structural analysis of the AB, are combined with the applicable out-of-plane loads and vertical loads to determine the arrangement of steel reinforcements required for the AB shear walls.

Analysis and Design Methods

The AB shear walls are modeled and analyzed using finite element analysis. The global structural static analysis is performed using the ANSYS program to evaluate distribution of forces to various elements of the structure. Shell 181 is adopted for the shear wall element, which is suitable for analyzing thin to moderately thick shell structures. It is a four-node element with 6 degrees of freedom at each node. The 3-D view (toward -XY) of the FEM model for the AB is shown Figure 3.8A-26.

The element forces of the AB shear wall are calculated in each level, individual shear wall and all loading combinations, and these are used for shear wall design. The main output data on shell elements by the ANSYS program are composed of in-plane axial forces, in-plane shear forces, out-of-plane bending moments, and transverse shear forces.

The AB shear walls are analyzed and designed in accordance with the requirements of ACI 349. The required reinforcements are designed by the following procedure:

a. Design for in-plane shear forces

b. Design for out-of-plane bending moments with axial forces

c. Combine the required reinforcement calculated above procedure

d. Check for shear capacity: in-plane shear forces, out-of-plane shear forces, and shear friction forces between wall and floor.

Out-of-plane forces and moments are considered in the shear wall design, which are determined by hand calculations or local structural analysis as well as the global analysis. Out-of-plane loads include attachment loads and seismic loads such as the associated hydrodynamic loads and dynamic incremental soil pressure.

The exterior walls below the grade are designed to resist the worst-case lateral earth pressure loads (static and dynamic), soil surcharge loads, and loads due to groundwater (static and dynamic). Lateral earth pressure is equal to the summation of the static earth pressure plus the dynamic earth pressure. The dynamic earth pressures are determined as the governing case between the dynamic earth pressures calculated in accordance with ASCE 4-98 (Reference 47 in Subsection 3.8.7), Section 3.5.3, Figure 3.5-1, "Variation of Normal Dynamic Soil Pressure for the Elastic Solution" and those calculated based on the results of the SSI/SSSI analyses. The hydrodynamic effect of pure water is determined based on the hydrodynamic formula suggested by Matuo and O'Hara, Section 8.10, Equation 8.40 "Principles of Soil Dynamics," Braja M.Das (Reference 48 in Subsection 3.8.7). Design forces and moments are summarized in Table 3.8A-28 for the critical sections.

The local structural analysis is performed for the tanks in the AB such as the AFWT and SFP. Local loads such as hydrodynamic and hydrostatic pressures loads or thermal loads acting on the walls are considered in the analysis. The hydrodynamic analysis includes two horizontal modes and one vertical mode of combined fluid-tank vibration. The horizontal pressure calculations consider the horizontal sloshing convective mode and the impulsive mode in which a portion of the water moves as a mass body along with the tank wall.

For the SFP, thermal loads for the state of the abnormal operation are considered to be 82.2 °C (180 °F) at the inside and 21.1 °C (70 °F) at the outside. The structural integrity of the wall sections for thermal load is evaluated by using the section analysis program DARTEM.

The design of the auxiliary shear wall structure is based on the strength design method specified in ACI 349 with the supplement requirements of NRC RG 1.142.

Selection of Critical Sections

The typical design for the shear wall of the AB uses the procedure described above except that the critical sections of the shear wall meet the more stringent requirement to provide reasonable assurance of the function and safety of the system on the shear wall or the potential load induced by abnormal and extreme environmental conditions. Critical sections are selected according to the following criteria:

a. The section contains the primary safety-related system

b. The section considers the specific load case under abnormal and extreme environmental conditions

c. The section meets protection requirements such as aircraft impact or missile barriers

The north wall of the north MSIV house is designed as a safety-related structure to provide reasonable assurance for the safety of the internal systems. The design forces of this shear wall include the compartment pressure due to a pipe break in the system. As an exterior wall, the design of this shear wall considers the aircraft impact analysis results and meets the missile barrier requirements.

The north wall of the north AFWST is designed as a safety-related structure to contain auxiliary feedwater under specified conditions. The design forces for this shear wall include hydrostatic load and hydrodynamic loads induced by the water in the AFWST.

The west wall of the MCR is designed as a safety-related structure to provide reasonable assurance of the safety of the internal systems and to control the whole system under any specified conditions. As an exterior wall, the design of this shear wall meets the missile barrier requirements.

The west wall of the SFP is designed as a safety-related structure to protect the spent fuel and contain borated water under specified conditions. The design forces of this shear wall include hydrostatic load and hydrodynamic loads induced by the water in the SFP and include thermal load due to the temperature transient in a loss-of-coolant accident (LOCA) event.

The east wall of the FHA is designed as a safety-related structure to protect the fuel handling system. As an exterior wall, the design forces of this shear wall meet the missile barrier requirements.

Design Summary

The structural design for the critical section provides reinforcement to resist the element forces and moments as described below:

a. North wall of north MSIV house: The north wall of the north MSIV house extends from the top of the basemat at El. 55 ft 0 in to the roof at El. 157 ft 0 in. It is 1.52 m (5 ft) thick. The compartment pressurization caused by a high-energy line break (HELB) is considered in the design of the MSIV house wall. The governing forces and moments from the analysis are summarized in Table 3.8A-28. The reinforcement arrangements of the north wall of the north MSIV house are shown in Table 3.8A-29, Figure 3.8A-36, and Figure 3.8A-37.

b. North wall of the north AFWST: The dimensions of the AFWST are 14.63 m (48 ft) × 7.92 m (26 ft). Tank bases are located at El. 100 ft 0 in. The maximum water level is 9.55 m (31 ft 4 in.) from the bottom of the AFWST. The wall thickness is 1.22 m (4 ft). The local structural analysis is additionally performed for local loads such as hydrostatic pressures loads acting on the walls of the north wall of the north AFWST. The governing forces and moments from the analysis are summarized in Table 3.8A-28. Reinforcement arrangement of the north wall of the north AFWST wall is shown in Table 3.8A-29 and Figure 3.8A-38.

c. West wall of the MCR: The wall at column line 12 is a shear wall on the west side of the MCR. It extends from the top of basemat at El. 55 ft 0 in to the top of the roof. The wall thickness is 0.92 m (3 ft) and 1.22 m (4 ft). The west wall of the

MCR is designed for the applicable loads including dead load, live load, hydrostatic load, static/dynamic lateral soil pressure loads, and seismic loads. The wall that is a part of the MCR boundary is from El. 156 ft 0 in to El. 174 ft 0 in. The governing forces and moments from the analysis are summarized in Table 3.8A-28. Reinforcement arrangements of the west wall of the MCR are shown in Table 3.8A-29, Figure 3.8A-39, and Figure 3.8A-40.

d. West wall of the SFP: The size of the west wall of the SFP is 12.80 m (42 ft) × 10.82 m (35.5 ft). Tank bases are located at El. 114 ft 0 in. The maximum water level is 12.24 m (40 ft 2 in.) from the bottom of the SFP. The wall thickness is 2.13 m (7 ft). The local structural analysis is performed for local loads such as the hydrostatic pressures loads and thermal loads. The governing forces and moments from the analysis are summarized in Table 3.8A-28. Reinforcement arrangement of the west wall of the SFP is shown in Table 3.8A-29 and Figure 3.8A-41.

e. East wall of the FHA: The FHA extends from the top of the concrete floor at El. 156 ft 0 in to the roof at El. 213 ft 6 in. The wall thickness is 1.22 m (4 ft). The FHA wall is designed for the applicable loads including dead load, live load, and seismic loads. The governing forces and moments from the analysis are summarized in Table 3.8A-28. Reinforcement arrangement of the fuel handling wall is shown in Table 3.8A-29, Figure 3.8A-42, and Figure 3.8A-43.

Table 3.8A-29 presents the margins of safety of reinforcement in the AB shear wall. The margin of safety is the ratio of required reinforcement and provided reinforcement.

3.8A.2.4.3 Concrete Slabs

Description

The concrete slabs of the AB are supported either by concrete walls or concrete beams. The thicknesses of the slabs are from 0.46 m (1.5 ft) to 1.22 m (4 ft) except for the FHA, which meets the radiation shielding requirement. Span lengths of one-way slabs in the AB do not exceed 7.32 m (24 ft).

Analysis and Design Methods

The concrete slabs are structurally analyzed using the FE analysis program GTSTRUDL. A separate analysis model simulating each floor level is prepared (Figure 3.8A-29) and evaluated for each specified design load condition. To incorporate the proper vertical seismic load on each slab, the pseudo-static analysis is performed by using the response spectrum of corresponding floor.

The thickness of the slab is generally determined by the requirement of radiation and missile protection rather than that of structural integrity. Based on the enveloped results of FE analysis, the slab reinforcements are determined for flexure and out-of-plane shear in accordance with ACI 349. Additionally, the design of the slab at the connection of the shear wall considers the diaphragm shear (in-plane shear), which is transferred to the shear wall. The diaphragm shear considers the effects of lateral loads on the slab for the seismic loading cases, and the concrete slabs are designed for the diaphragm shear, which is determined by in-plane stress of the slab from the global structural static analysis. The reinforcement of the slab adjacent to the shear wall is determined for flexure and combined shear, including the diaphragm shear of the AB in accordance with ACI 349.

<u>Selection of Critical Sections</u>

The typical design for the slab of the auxiliary building is performed by the aforementioned procedure. Aside from that, the critical sections of slab meet the more stringent requirement to provide reasonable assurance of the function and safety of the system on the shear wall or consider potential load induced by abnormal and extreme environmental condition. The critical sections are selected using the following criteria:

a. The section contains the primary safety-related system

b. The section considers the specific load case under abnormal and extreme environmental conditions

The floor slab of the emergency diesel generator room at El. 100 ft 0 in in is designed as a safety-related structure to sustain the emergency system including the emergency diesel generator under specified conditions. The design forces of that slab include the supporting load of equipment such as the emergency diesel generator.

The pool bottom slab of the spent fuel pool at El. 113 ft 0 in is designed as a safety-related structure to support and protect the spent fuel rack and to hold the massive borated water under specified conditions. The design forces of that slab include hydrostatic load and hydrodynamic load induced by water in the SFP and include thermal load due to temperature transient in the LOCA event.

The floor slab below the main steam enclosure at El. 137 ft 6 in is designed as a safety-related structure to provide reasonable assurance of safety of the internal system. The design forces of the slab include the compartment pressure due to a pipe break in the main steam line system.

Design Summary

The slab design results for the critical section are summarized as follows:

a. Concrete slab of the EDG room at El. 100 ft 0 in: The dimensions of the EDG room are 15.8 m (52 ft) × 25.2 m (82.5 ft), as shown in Figure 3.8A-45. The slab thicknesses of the emergency diesel generator room are 0.61 m (2 ft) and 1.22 m (4 ft). The EDG room is supported by the shear walls and intersected concrete beams. The FE analysis is carried out for the slabs located at El. 100 ft 0 in. The heavy equipment load of the EDG and the live load related the equipment removals are considered in the slab design. The governing forces and moments from the analysis are summarized in Table 3.8A-30, and the slab reinforcements considering the diaphragm shear are shown in Table 3.8A-33.

b. Concrete slab of the SFP at El. 114 ft 0 in: Concrete slab of the spent fuel pool is 12.8 m (42 ft) × 10.8 m (35.5 ft) with 1.85 m (6 ft 1 in.) thick. Hydrostatic pressure loads, hydrodynamic pressure loads, and thermal loads are considered in the SFP slab design. Thermal loads for the state of abnormal operation are considered to be 82.2 °C (180 °F) for inside and 21.1 °C (70 °F) for outside. The structural integrity of the slabs for thermal and mechanical loads is checked by the DARTEM program. The design forces and moments of the SFP slab are summarized in Table 3.8A-31, and the slab reinforcements are shown in Figure 3.8A-46.

c. Concrete slab of the main steam enclosure (MSE) at El. 137 ft 6 in: MSE slab measures 7.3 m (24 ft) wide by 37.3 m (122 ft 6 in.) long. The slab thickness is 1.22 m (4 ft). In case of the MSE slab, compartment pressure loads due to HELB are considered in the slab design. The design member forces and moments of the MSE slab are summarized in Table 3.8A-31, and the slab reinforcements considering diaphragm shear are shown in Table 3.8A-33.

Table 3.8A-33 presents the margins of safety of reinforcement at the critical section in the AB slab. The margin of safety is the ratio of required reinforcement and provided reinforcement.

3.8A.3 Emergency Diesel Generator Building

3.8A.3.1 Structural Description and Geometry

The EDG building block consists of two independent buildings, the EDG building at El. 100 ft 0 in and the diesel fuel oil tank (DFOT) building at El. 63 ft 0 in. The two basemats are separated by the isolation gap of 900 mm (3 ft). The EDG building houses two additional generators, and the DFOT building houses the DFOT.

The lateral load-resisting system of this building is composed of a diaphragm slab at roof level and shear walls monolithically interconnected with the roof. The vertical load-resisting system consists of four columns and the shear walls. The DFOT building is a typical box-type structure, which consists of the slabs, shear walls, and basemat. The building description is provided in Subsection 3.8.4.1.2. The arrangements of the structure are shown in Figures 3.8A-63 and 3.8A-64.

3.8A.3.2 Structural Materials

The major materials of the EDG building block are concrete and reinforcing bars. The properties of the materials are identical to those of the AB, which is described in Subsection 3.8A.2.2.

3.8A.3.3 Loads and Load Combinations

3.8A.3.3.1 Design Loads

The following are the major design loads considered in the design of the EDG building.

Dead Load (D)

Dead load includes the weight of structures and the weight of permanently attached major equipment such as tanks, machinery, and cranes.

The minimum attachment loads include equipment loads lower than 10 kips such as piping, cable trays, and HVAC loads:

a. Concrete floors: 9.6 kN/m^2 (200 psf)

b. Roof floors: 7.2 kN/ m^2 (150 psf)

c. Interior wall: 1.0 kN/ m^2 (20 psf)

d. Exterior wall: 0.5 kN/ m^2 (10 psf)

Equipment loads heavier than or equal to 10 kips such as the DFOT, D/G stack, and diesel generator exhaust silencer are considered concentrated weight.

Live Load (L)

Live loads are conventional floor loads to account for occupancy, maintenance, equipment removal, equipment laydown, and other loads that vary in intensity. The design values are identical to those of the AB described in Subsection 3.8A.2.3.1.

Wind Load (W)

Wind load is the equivalent static load generated by the design wind velocity and is calculated in accordance with ASCE 7. The EDG building is designed for a 100-year recurrence interval wind.

Safe Shutdown Earthquake Load (E_S)

In the structural analysis for the EDG building, seismic loads are considered with the equivalent static load method involving equivalent horizontal and vertical static forces.

3.8A.3.3.2 Load Combinations

The load combinations are addressed in Subsection 3.8.4.3.6 and are used for analysis and design of the EDG building and associated components.

3.8A.3.4 Analysis and Design for Critical Sections

This section summarizes the analysis and design for critical sections of the EDG Building. The critical sections are listed below. The description of critical section, analysis and design methods, and design summary are provided for each critical section. The locations of critical sections are shown in Figure 3.8A-49.

3.8A.3.4.1 Basemat

Description

The EDG building and DFOT building are built on a separate concrete-reinforced mat foundation with a thickness of 1.21 m (4 ft). The two basemats are separated by an isolation gap of 900 mm (3 ft).

Vertical loads are transmitted through columns and walls down to the basemat. Lateral loads are transmitted to the basemat by a load-resisting system, such as shear walls and concrete slab. The foundation provides resistance to the transmitted loads through friction and bearing. Friction between the basemat and the foundation is to prevent sliding of the structure. Vertical load and load due to overturning of the structure are resisted by the foundation bearing.

Analysis and Design Methods

Structural analysis for the EDG building is performed using the ANSYS structural analysis program. Global structural analysis is first conducted to compute all member forces of shear wall in the EDG building. The computed member forces are used in the structural design. All fixed boundary conditions are imposed in the basemat and the dead, live, wind, seismic force, and soil pressure are applied.

The additional load is buoyant. This analysis used spring element to consider the influence of soil. All fixed boundary conditions are imposed at the end node of spring element. Figure 3.8A-30 shows the full FEM for the global structural analysis, and Figure 3.8A-31 shows the basemat model of the EDG building. The design forces and moments for the EDG building basemat are summarized in Table 3.8A-34.

The structural design for the EDG building basemat is performed in accordance with all requirements of ACI 349. Required reinforcements are calculated based on the governing required capacities obtained from FE analysis.

Design Summary

For the EDG building area, the maximum required moment capacities obtained from the basemat analysis are 947.3 k-ft/ft for the N-S direction and 794.8 k-ft/ft for the E-W direction. Upon the required design moment capacities, the EDG building basemat is provided with 2-#11 bar at 305 mm (12 in.) spacing in each direction at each face and shear bar #5 at 305 mm (12 in.) spacing is provided to a 1.21 m (4 ft) thick area. Figure 3.8A-50 shows the typical sections of the EDG building basemat. The basemat reinforcement and margins of safety are shown in Table 3.8A-37. The margin of safety is the ratio of required reinforcement and provided requirement.

Stability Check

EDG and DFOT basemat structure is evaluated for stability against overturning, sliding, and floatation. The calculated factors of safety against overturning, sliding, and floatation for the load combinations meet the criteria of Section II of SRP 3.8.5, as shown in Table 3.8A-14.

The sliding and overturning factors of safety are determined using load combination containing dead load (D), wind load (W), SSE (E_s), and buoyant load at normal (H_e). The floatation factor of safety is determined based on dead load (D) and buoyant force at flood (H_s).

The normal design ground water elevation is EL. 96 ft 8 in. The extreme ground water elevation is the same as plant grade level (EL. 98 ft 8 in.) considering probable maximum flood.

In the earthquake load, axial force, shear force, and moment due to horizontal and vertical excitation of the structure are obtained from seismic analysis. Since seismic load governs over tornado load, the tornado load is not necessary to be considered in the stability evaluation. The wind load combination ($D + H_e + W$) in Table 3.8A-14 is considered for the EDG building though the seismic load governs over the wind load, because the allowable factor of safety for wind is 1.5, which is different from 1.1 for the seismic load. Because the DFOT building is a buried structure and the wind load is not applicable to the overturning and sliding check. A summary of overturning, sliding, and flotation check is shown provided in Table 3.8A-38.

Settlement Check

Differential settlements are divided by the differential settlement within the EDG building basemat and the differential settlement within DFOT building. For the differential settlements within the each basemat, the static (dead and live loads) loading case is calculated.

The distance of approximately 15.24 m (50 ft) is selected to check the differential settlement. Table 3.8A-39 shows the differential settlements of each soil profile. The maximum differential settlement for EDG building per 15.24 m (50 ft) is 4.623 mm (0.182 in.). The maximum differential settlement for DFOT building per 15.24 m (50 ft) is 9.754 mm (0.384 in.).

The differential settlement of each soil profiles between the NI common basemat and EDG building is checked. The maximum differential settlement between the NI common basemat and EDG building is 17.932 mm (0.706 in.).

The differential settlement of each soil profiles between the NI common basemat and DFOT building is checked. The maximum differential settlement between the NI common basemat and DFOT building is 46.660mm (1.837 in.).

The differential settlement of each soil profiles between the EDG building and DFOT building is checked. The maximum differential settlement between the EDG building and DFOT building is 23.495 mm (0.925 in.).

Figure 3.8A-54 and Figure 3.8A-55 show the node locations at the bottom of the EDG & DFOT basemat for checking the settlements. The analysis of multiple of settlements (long and short term) will use these nodes.

Bearing Pressure Check

The bearing pressures of the EDG building basemat and DFOT basemat are evaluated for soil profile S (weakest), S04 (moderate), S08 (strongest) under static and dynamic loading conditions. The analysis and design methods used for bearing pressure evaluation is identical as that used for the design described in 3.8A.3.4.1.

The static and dynamic bearing pressure is determined as the soil spring forces divided by the tributary area of the soil spring under static (dead and live load) and dynamic conditions. The maximum static bearing pressure of 396.0kPa (8,270 lb/ft2) in the EDGB basemat is obtained from the basemat analysis results of soil profile S08. The maximum static bearing pressure of 352.9kPa (7,370 lb/ft2) in the DFOT basemat is obtained from the basemat analysis results of soil profile S08. The maximum dynamic bearing pressure of 861.37kPa (17,990 lb/ft2) in the EDGB basemat is obtained from the basemat analaysis results of soil profile S08. The maximum dynamic bearing pressure of 866.7kPa (18,100 lb/ft2) in the DFOT basemat is obtained from the basemat analysis results of soil profile S08.

3.8A.3.4.2 Shear Walls

Description

The shear walls and slabs of the EDG building representing the primary lateral load-resisting system are designed against seismic or extreme wind-related loads. The concrete slab distributes lateral forces through diaphragm action to the shear walls as in-plane loads in proportion to the relative stiffness of the shear walls. These in-plane shear forces are transferred down to the basemat foundation as in-plane shear forces and moments of the shear walls.

The in-plane shear forces and moments, which are obtained from the seismic analysis results, are combined with the applicable out-of-plane loads to determine the quantity and distribution of vertical and horizontal reinforcing steel of the EDG building shear walls.

Analysis and Design Methods

The global static analysis is performed using the ANSYS structural analysis program to evaluate element forces of the shear walls. Shear walls are modeled by the Shell 181 element in ANSYS, while Beam 188 is used to model the concrete frame. The Link 180 element is applied to consider the effects of soil spring on the basemat analysis. The FEM representing the whole EDG building for structural analysis is shown in Figure 3.8A-30.

Before determining the required reinforcing steel in the shear walls, the acceptability of concrete shear stresses is checked. In-plane shear stress, out-of-plane shear stress, and combined concrete shear stresses are calculated for each shear wall to provide reasonable assurance that the shear stress does not exceed the acceptable values in accordance with ACI 349. The horizontal and vertical reinforcements required for the shear walls are computed by combining the individual reinforcement requirements resulting from the various load conditions.

The exterior walls below the grade are designed to resist the worst-case lateral earth pressure loads (static and dynamic), soil surcharge loads, and loads due to groundwater (static and dynamic). Lateral earth pressure is equal to the summation of the static earth pressure plus the dynamic earth pressure. The dynamic earth pressure are determined as the governing case between the dynamic earth pressures calculated in accordance with ASCE 4-98 (Reference 47 in Subsection 3.8.7) and those calculated based on the results of the SSI/SSSI analyses. The hydrodynamic effect of pure water is determined based on the hydrodynamic formula suggested by Matuo and O'Hara (Reference 48 in Subsection 3.8.7).

Design Summary

Table 3.8A-35 shows the summary of the element forces for the critical shear walls of the EDG building. The final vertical and horizontal reinforcing steel required in each shear wall are determined based on both calculation requirements and practicable considerations such as placement of the reinforcing steel in the shear walls. The results of the shear wall analysis and design, in the form of horizontal and vertical reinforcement quantities required and provided for each shear wall at basemat level and margins of safety, are summarized in Table 3.8A-36. The margin of safety is the ratio of required reinforcement and provided reinforcement.

The structural design for the critical section provides reinforcement to resist element forces and moments as described as follows:

a. Center wall located in the middle of the EDG building: The center wall of the EDG building extends from the top of the basemat at El. 100 ft 6 in to the roof at El. 135 ft 0 in. It is 0.76 m (2 ft 6 in.) thick. The reinforcing steel arrangements of the center wall of the EDG building are shown in Figure 3.8A-51.

b. West wall of the EDG building: The west wall of the EDG building extends from the top of the basemat at El. 100 ft 0 in to the roof at El. 135 ft 0 in. It is 0.9 m (3 ft) thick. The reinforcing steel arrangements of the west wall of the EDG building are shown in Figure 3.8A-52.

Table 3.8A-1

Allowable Stresses for Containment Materials

Material and Stress Type	Service Loads	Factored Loads
Concrete		
P_m	0.30 f'_c	0.60 f'_c
$P_m + b$	0.45 f'_c	0.75 f'_c
$(P + Q)_m$	0.45 f'_c	0.75 f'_c
$(P + Q)_m + b$	0.60 f'_c	0.85 f'_c
Reinforcing Steel		
Compression	0.50 f_y	0.90 f_y
Tension	0.50 f_y	0.90 f_y

Pm = Primary membrane stresses

Pm + b = Primary membrane plus bending stresses

(P + Q)m = Primary plus secondary membrane stresses

(P + Q)m + b = Primary plus secondary membrane plus bending stresses

f'_c = Minimum specified compressive strength of concrete

Fy = Minimum specified yield strength of reinforcing steel

Table 3.8A-2 (1 of 2)

Section Forces of Containment Wall and Dome Design Sections

Wall-Basemat Junction Area

N_{Φ} (kip/ft)	M_{Φ} (kip-ft/ft)	$Q_{R\Phi}$ (kip/ft)	N_{θ} (kip/ft)	M_{θ} (kip-ft/ft)	$Q_{R\theta}$ (kip/ft)	Remark
376.56	-422.17	110.59	268.29	-78.46	8.05	Meridional Inside
363.30	253.54	38.88	333.86	54.11	5.66	Meridional Outside
331.52	52.21	6.19	373.59	-7.74	0.38	Hoop Inside
328.69	222.00	5.12	368.07	80.67	3.52	Hoop Outside

Mid-Height Level of Wall

N_{Φ} (kip/ft)	M_{Φ} (kip-ft/ft)	$Q_{R\Phi}$ (kip/ft)	N_{θ} (kip/ft)	M_{θ} (kip-ft/ft)	$Q_{R\theta}$ (kip/ft)	Remark
198.93	-271.97	27.44	241.72	29.67	11.22	Meridional Inside
233.67	124.91	11.05	288.59	152.77	4.50	Meridional Outside
-116.11	-53.26	3.34	373.32	-192.54	-38.69	Hoop Inside
-65.44	55.70	0.04	334.88	179.59	-1.67	Hoop Outside

Polar Crane Bracket Level and Springline

N_{Φ} (kip/ft)	M_{Φ} (kip-ft/ft)	$Q_{R\Phi}$ (kip/ft)	N_{θ} (kip/ft)	M_{θ} (kip-ft/ft)	$Q_{R\theta}$ (kip/ft)	Remark
41.49	-236.69	-4.45	152.44	-112.27	26.10	Meridional Inside
76.39	85.49	12.72	170.73	6.75	25.74	Meridional Outside
-8.07	-100.63	-2.30	389.97	-286.61	11.49	Hoop Inside
10.98	-78.75	-7.73	393.01	-274.63	-8.64	Hoop Outside

Table 3.8A-2 (2 of 2)

Equipment Hatch

N_{Φ} (kip/ft)	M_{Φ} (kip-ft/ft)	$Q_{R\Phi}$ (kip/ft)	N_{θ} (kip/ft)	M_{θ} (kip-ft/ft)	$Q_{R\theta}$ (kip/ft)	Remark
633.51	-900.58	59.89	443.77	-582.97	107.87	Meridional Inside
633.51	1,391.59	59.89	443.77	1,347.08	107.87	Meridional Outside
327.89	-375.99	-62.95	984.87	-1,121.67	-39.04	Hoop Inside
400.38	1,127.27	-14.59	682.06	1,119.63	-10.57	Hoop Outside

Personnel Airlock

N_{Φ} (kip/ft)	M_{Φ} (kip-ft/ft)	$Q_{R\Phi}$ (kip/ft)	N_{θ} (kip/ft)	M_{θ} (kip-ft/ft)	$Q_{R\theta}$ (kip/ft)	Remark
742.23	-641.62	47.73	821.82	-538.01	17.70	Meridional Inside
596.38	1,586.38	66.48	830.83	687.51	38.89	Meridional Outside
595.99	-678.43	58.22	855.75	-615.76	-6.09	Hoop Inside
595.99	1,558.64	58.22	855.75	621.13	-6.09	Hoop Outside

Dome

N_{Φ} (kip/ft)	M_{Φ} (kip-ft/ft)	$Q_{R\Phi}$ (kip/ft)	N_{θ} (kip/ft)	M_{θ} (kip-ft/ft)	$Q_{R\theta}$ (kip/ft)	Remark
84.76	67.80	-3.09	244.55	73.63	-0.37	Meridional Inside
84.76	67.80	-3.09	244.55	73.63	-0.37	Meridional Outside
84.76	67.80	-3.09	244.55	73.63	-0.37	Hoop Inside
84.76	67.80	-3.09	244.55	73.63	-0.37	Hoop Outside

N_{Φ} = Meridional Force with Tangential Shear Force

M_{Φ} = Meridional Moment with Torsional Moment

QR_{Φ} = Meridional Radial Shear Force

N_{Φ} = Hoop Force with Tangential Shear Force

M_{Φ} = Hoop Moment with Torsional Moment

$Q_{R\Phi}$ = Hoop Radial Shear F

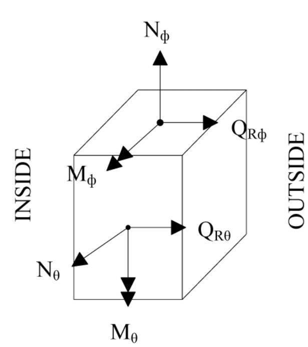


Table 3.8A-3 (1 of 2)

Reinforcing Details of Containment Wall and Dome Design Sections

Wall-Basemat Junction Area

Direction		Rebar Arrangement
Meridional	Inside	Layer 1: #18+#14 @ 0.85° Layer 2: #18 @ 0.85°
	Outside	Layer 1: #18+#18 @ 0.85°
Hoop	Inside	Layer 1: #18 @ 12 in. Layer 2: #11 @ 12 in.
	Outside	Layer 1: #18 @ 12 in. Layer 2: #14 @ 12 in.

Mid-Height Level of Wall

Direction		Rebar Arrangement
Meridional	Inside	Layer 1: #18 @ 0.85°
	Outside	Layer 1: #18+#14 @ 0. 85°
Hoop	Inside	Layer 1: #18+#11 @ 12 in.
	Outside	Layer 1: #18 @ 12 in. Layer 2: #18 @ 12 in.

Polar Crane Bracket Level and Springline

Direction		Rebar Arrangement
Meridional	Inside	Layer 1: #14 @ 0.85° Layer 2: #14 @ 0.85°
	Outside	Layer 1: #18 @ 0.85°
Hoop	Inside	Layer 1: #18 + #14 @ 12 in.
	Outside	Layer 1: #18 @ 12 in. Layer 2: #18 @ 12 in.

Table 3.8A-3 (2 of 2)

Equipment Hatch

Direction		Rebar Arrangement
Meridional	Inside	Layer 1: #18+#14 @ 0.85° Layer 2: #18 @ 0.85°
	Outside	Layer 1: #18+#18 @ 0.85° Layer 2: #18+#18 @ 0.85° Layer 3: #18+#18 @ 0.85°
Hoop	Inside	Layer 1: #18 @ 6 in. Layer 2: #18 @ 6 in.
	Outside	Layer 1: #18 @ 6 in. Layer 2: #18 @ 12 in. Layer 3: #18 @ 12 in. Layer 4: #18 @ 12 in.

Personnel Airlock

Direction		Rebar Arrangement
Meridional	Inside	Layer 1: #18+#14 @ 0.85° Layer 2: #18 @ 0.85° Layer 3: #18 @ 0.85°
	Outside	Layer 1: #18+#18 @ 0.8° Layer 2: #18+#18 @ 0.8° Layer 3: #18+#18 @ 0.85°
Hoop	Inside	Layer 1: #18 @ 12 in. Layer 2: #11 @ 12 in.
	Outside	Layer 1: #18 @ 6 in. Layer 2: #18 @ 12 in. Layer 3: #18 @ 12 in. Layer 4: #14 @ 12 in.

Dome

Direction		Rebar Arrangement
Meridional	Inside	Layer 1: #14 @ 0.85°
	Outside	Layer 1: #18 @ 0.85°
Hoop	Inside	Layer 1: #18 @ 0.75°
	Outside	Layer 1: #18+#11 @ 0.75°

Table 3.8A-4 (1 of 5)

Rebar and Concrete Stresses with Margins of Safety for RCB Wall and Dome Design Sections

Wall-Basemat Junction Area (Rebar)

Meridional				Hoop			
Mechanical		Mech. + Thermal		Mechanical		Mech. + Thermal	
Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
41.7	35.3	43.2	53.2	32.2	36.1	28.8	51.4
Ratio (1)				Ratio (1)			
1.29	1.53	1.25	1.02	1.68	1.50	1.88	1.05

Mid-Height Level of Wall (Rebar)

Meridional				Hoop			
Mechanical		Mech. + Thermal		Mechanical		Mech. + Thermal	
Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
46.8	33.8	38.4	45.6	39.4	33.6	31.2	50.2
Ratio (1)				Ratio (1)			
1.15	1.60	1.41	1.18	1.37	1.61	1.73	1.08

Polar Crane Bracket Level and Springline (Rebar)

Meridional				Hoop			
Mechanical		Mech. + Thermal		Mechanical		Mech. + Thermal	
Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
27.2	18.5	16.4	47.4	43.1	22.4	36.1	43.5
Ratio (1)				Ratio (1)			
1.99	2.92	3.29	1.14	1.25	2.41	1.50	1.24

Table 3.8A-4 (2 of 5)

Equipment Hatch (Rebar)

Meridional				Hoop			
Mechanical		Mech. + Thermal		Mechanical		Mech. + Thermal	
Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
39.4	38.9	39.0	54.0 (2) (ε=0.00192)	40.2	32.9	37.9	48.9
Ratio (1)				Ratio (1)			
1.37	1.39	1.38	1.00	1.34	1.64	1.42	1.10

Personnel Airlock (Rebar)

Meridional				Hoop			
Mechanical		Mech. + Thermal		Mechanical		Mech. + Thermal	
Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
31.7	37.9	28.7	54.0 (2) (ε=0.00192)	51.3	45.6	43.5	53.0
Ratio (1)				Ratio (1)			
1.70	1.42	1.88	1.00	1.05	1.18	1.24	1.02

Dome (Rebar)

Meridional				Hoop			
Mechanical		Mech. + Thermal		Mechanical		Mech. + Thermal	
Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
4.5	22.9	2.6	50.1	20.0	31.3	15.7	50.3
Ratio (1)				Ratio (1)			
12.00	2.36	20.77	1.08	2.70	1.73	3.44	1.07

(1) Ratio = allowable stress ($0.9F_y$) / actual stress

(2) The reinforcement meets the requirement of CC-3422.1 of the ASME Code.

Table 3.8A-4 (3 of 5)

Wall-Basemat Junction Area (Concrete)

	Meridional				Hoop			
	Mechanical		Mech. + Thermal		Mechanical		Mech. + Thermal	
Membrane + Bending	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
	-2.5	-2.1	-2.5	-2.2	-1.0	-0.9	-2.3	-0.9
	Ratio (1)		Ratio (2)		Ratio (1)		Ratio (2)	
	1.77	2.16	2.00	2.32	4.47	5.09	2.26	5.41
Membrane	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
	-1.9	-1.9	-2.6	-2.0	-0.9	-0.9	-2.2	-0.8
	Ratio (3)		Ratio (4)		Ratio (3)		Ratio (4)	
	1.86	1.86	1.76	2.31	4.21	4.21	2.04	5.73

Mid-Height Level of Wall (Concrete)

	Meridional				Hoop			
	Mechanical		Mech. + Thermal		Mechanical		Mech. + Thermal	
Membrane + Bending	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
	-1.9	-1.8	-2.5	-1.8	-2.4	-1.7	-2.5	-1.6
	Ratio (1)		Ratio (2)		Ratio (1)		Ratio (2)	
	2.33	2.49	2.00	2.90	1.91	2.66	2.00	3.26
Membrane	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
	-1.7	-1.7	-2.5	-1.6	-1.7	-1.7	-2.5	-1.6
	Ratio (3)		Ratio (4)		Ratio (3)		Ratio (4)	
	2.10	2.10	1.77	2.77	2.17	2.17	1.81	2.79

Table 3.8A-4 (4 of 5)

Polar Crane Bracket Level and Springline (Concrete)

	Meridional				Hoop			
	Mechanical		Mech. + Thermal		Mechanical		Mech. + Thermal	
Membrane + Bending	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
	-1.5	-1.5	-2.5	-1.5	-2.5	-1.6	-2.6	-1.6
	Ratio [1]		Ratio [2]		Ratio [1]		Ratio [2]	
	3.02	2.96	2.06	3.46	1.84	2.83	2.00	3.25
Membrane	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
	-1.3	-1.3	-2.4	-1.3	-1.6	-1.6	-2.5	-1.5
	Ratio [3]		Ratio [4]		Ratio [3]		Ratio [4]	
	2.71	2.71	1.86	3.52	2.27	2.27	1.79	2.91

Equipment Hatch (Concrete)

	Meridional				Hoop			
	Mechanical		Mech. + Thermal		Mechanical		Mech. + Thermal	
Membrane + Bending	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
	-2.3	-1.7	-2.6	-1.7	-1.5	-1.3	-2.5	-1.3
	Ratio [1]		Ratio [2]		Ratio [1]		Ratio [2]	
	1.95	2.60	2.00	3.04	2.95	3.50	2.08	4.00
Membrane	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
	-1.9	-1.7	-2.6	-1.6	-1.3	-1.3	-2.4	-1.3
	Ratio [3]		Ratio [4]		Ratio [3]		Ratio [4]	
	1.92	2.15	1.76	2.78	2.70	2.80	1.84	3.53

Table 3.8A-4 (5 of 5)

Personnel Airlock (Concrete)

	Meridional				Hoop			
	Mechanical		Mech. + Thermal		Mechanical		Mech. + Thermal	
Membrane + Bending	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
	-2.4	-1.9	-2.5	-1.7	-2.0	-0.8	-2.3	-0.5
	Ratio (1)		Ratio (2)		Ratio (1)		Ratio (2)	
	1.91	2.39	2.00	2.97	2.29	5.76	2.21	9.38
Membrane	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
	-1.6	-1.5	-2.5	-1.4	-1.1	-1.0	-2.2	-0.9
	Ratio (3)		Ratio (4)		Ratio (3)		Ratio (4)	
	2.23	2.34	1.82	3.30	3.15	3.58	2.05	4.77

Dome (Concrete)

	Meridional				Hoop			
	Mechanical		Mech. + Thermal		Mechanical		Mech. + Thermal	
Membrane + Bending	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
	-1.4	-1.0	-2.4	-0.9	-1.0	-0.9	-2.2	-0.9
	Ratio (1)		Ratio (2)		Ratio (1)		Ratio (2)	
	3.19	4.72	2.10	5.65	4.31	4.79	2.29	5.76
Membrane	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)	Inside (ksi)	Outside (ksi)
	-1.1	-1.1	-2.3	-1.1	-0.9	-0.9	-2.2	-0.8
	Ratio (3)		Ratio (4)		Ratio (3)		Ratio (4)	
	3.14	3.14	1.93	4.09	4.10	4.10	2.06	5.44

(1) Ratio = allowable compression stress for mechanical load (0.75 f'_c) / actual stress

(2) Ratio = allowable compression stress for mechanical plus thermal load (0.85 f'_c) / actual stress

(3) Ratio = allowable compression stress for mechanical load (0.6 f'_c) / actual stress

(4) Ratio = allowable compression stress for mechanical plus thermal load (0.75 f'_c) / actual stress

Table 3.8A-5

Critical Sections of RCB Basemat

Design Section	Location	Height (ft)
Section-01	Tendon Gallery Outside Area	33
Section-02	Tendon Gallery Upper Area	10
Section-03	Tendon Gallery Below Area	10
Section-04	R = 63.25′ to 70.5′ at El. 45′ to El. 78′	33
Section-05	R = 42.5′ to 63.25′ Exclude Design Section-06, -07, -08	33
Section-06	Cavity Area at El. 55′ to 66′	11
Section-07	x = 22′ to 39′ and y = 0′ to 18.75′ at El. 55′ to 76′	21
Section-08	x, y = 0′ to 42.5′ Exclude Design Section -06, -07	23

Table 3.8A-6

Flexural Forces of RCB Basemat (Service load)

Design Section	E-W or Radial Direction			
	$+M_x$ (kips-ft/ft)	F_x (kips/ft)	$-M_x$ (kips-ft/ft)	F_x (kips/ft)
Section-01	411.98	-689.04	-294.57	-711.26
Section-02	1,202.21	20.30	-289.72	57.11
Section-03	1,876.71	276.72	55.68	89.49
Section-04	5,601.79	189.17	-68.87	95.11
Section-05	7,300.82	431.25	-1,364.36	174.23
Section-06	321.98	236.43	105.26	223.48
Section-07	2,093.17	121.94	255.36	45.11
Section-08	5,936.07	-65.15	1,401.17	-43.63

Design Section	N-S or Hoop Direction			
	$+M_y$ (kips-ft/ft)	F_y (kips/ft)	$-M_y$ (kips-ft/ft)	F_y (kips/ft)
Section-01	31.96	207.52	-18.41	225.15
Section-02	533.66	-24.90	-75.72	57.28
Section-03	1,732.50	222.78	7.42	27.24
Section-04	5,611.92	405.80	-39.77	163.50
Section-05	8,086.81	483.10	-86.31	235.91
Section-06	216.13	149.51	-225.93	172.38
Section-07	670.62	127.57	30.19	151.43
Section-08	2,685.55	203.26	736.40	124.77

Where,

$+M_x$: Maximum bending moment per unit width about local 2-axis (E-W or Radial)

F_x: Direct axial force per unit width in local 1-direction (E-W or Radial) when $+M_x$ occurs

$-M_x$: Minimum bending moment per unit width about local 2-axis (E-W or Radial)

F_x: Direct axial force per unit width in local 1-direction (E-W or Radial) when $-M_x$ occurs

$+M_y$: Maximum bending moment per unit width about local 1-axis (N-S or Hoop)

F_y: Direct axial force per unit width in local 2-direction (N-S or Hoop) when $+M_y$ occurs

$-M_y$: Minimum bending moment per unit width about local 1-axis (N-S or Hoop)

F_y: Direct axial force per unit width in local 2-direction (N-S or Hoop) when $-M_y$ occurs

Table 3.8A-7

Flexural Forces of RCB Basemat (Factored load)

Design Section	N-S or Hoop Direction			
	$+M_x$ (kips-ft/ft)	F_x (kips/ft)	$-M_x$ (kips-ft/ft)	F_x (kips/ft)
Section-01	534.32	-815.48	-223.03	218.38
Section-02	449.03	312.49	-752.63	257.82
Section-03	1,210.51	434.43	-1,598.54	-826.85
Section-04	5,659.13	191.73	-14,794.69	-1,053.82
Section-05	30,051.97	1,522.57	-24,810.24	-981.30
Section-06	1,237.07	980.91	365.09	729.38
Section-07	5,027.94	1,026.26	-267.80	18.18
Section-08	12,756.73	995.33	-133.87	191.55

Design Section	N-S or Hoop Direction			
	$+M_x$ (kips-ft/ft)	F_x (kips/ft)	$-M_x$ (kips-ft/ft)	F_x (kips/ft)
Section-01	27.65	329.98	-18.58	229.87
Section-02	29.55	316.72	-91.81	323.26
Section-03	1,625.16	678.40	-761.67	366.43
Section-04	13,196.49	1,865.01	704.96	1,337.85
Section-05	29,036.58	1,859.29	-9,142.08	-365.83
Section-06	296.65	587.14	-29.68	550.36
Section-07	1,028.67	691.40	113.96	527.52
Section-08	8,605.74	1,405.47	-139.63	521.66

Where,

$+M_x$: Maximum bending moment per unit width about local 2-axis (E-W or Radial)

F_x: Direct axial force per unit width in local 1-direction (E-W or Radial) when $+M_x$ occurs

$-M_x$: Minimum bending moment per unit width about local 2-axis (E-W or Radial)

F_x: Direct axial force per unit width in local 1-direction (E-W or Radial) when $-M_x$ occurs

$+M_y$: Maximum bending moment per unit width about local 1-axis (N-S or Hoop)

F_y: Direct axial force per unit width in local 2-direction (N-S or Hoop) when $+M_y$ occurs

$-M_y$: Minimum bending moment per unit width about local 1-axis (N-S or Hoop)

F_y: Direct axial force per unit width in local 2-direction (N-S or Hoop) when $-M_y$ occurs

Table 3.8A-8

Shear Forces of RCB Basemat (Service load)

Design Section	N_{xx} (kips/ft)	N_{yy} (kips/ft)	Q_{xz} (kips/ft)	Q_{yz} (kips/ft)	V_{max} (kips/ft)
Section-01	-213.58	-34.70	-56.13	12.17	72.28
Section-02	3.89	-102.44	-5.27	234.96	246.23
Section-03	76.70	274.36	-203.02	-49.17	252.19
Section-04	3.34	-50.29	-70.24	-208.75	278.99
Section-05	228.31	303.62	-87.16	-178.73	265.88
Section-06	223.48	166.19	5.33	112.56	202.21
Section-07	153.81	139.42	39.00	-62.25	175.36
Section-08	5.72	111.55	50.75	-249.73	335.54

Where,

Q_{xz}: Transverse shear force per unit width in local 1-direction

Q_{yz}: Transverse shear force per unit width in local 2-direction

N_{xx}: Direct axial force per unit width in local 1-direction when Q_{xz} and Q_{yz} occurs

N_{yy}: Direct axial force per unit width in local 2-direction when Q_{xz} and Q_{yz} occurs

V_{max}: Design shear force per unit width

Table 3.8A-9

Shear Forces of RCB Basemat (Factored load)

Design Section	N_{xx} (kips/ft)	N_{yy} (kips/ft)	Q_{xz} (kips/ft)	Q_{yz} (kips/ft)	V_{max} (kips/ft)
Section-01	-433.77	-113.11	104.53	-28.02	147.36
Section-02	23.49	-339.30	-36.59	383.98	420.58
Section-03	-388.12	-284.95	-149.30	-161.19	330.75
Section-04	-767.30	328.42	-185.84	-560.74	746.58
Section-05	-82.70	657.22	231.95	-727.95	959.91
Section-06	968.25	231.73	-125.58	363.97	527.52
Section-07	979.48	105.50	-273.05	-500.34	773.40
Section-08	981.22	262.71	515.15	-616.84	1,131.99

Where,

Q_{xz}: Transverse shear force per unit width in local 1-direction

Q_{yz}: Transverse shear force per unit width in local 2-direction

N_{xx}: Direct axial force per unit width in local 1-direction when Q_{xz} and Q_{yz} occurs

N_{yy}: Direct axial force per unit width in local 2-direction when Q_{xz} and Q_{yz} occurs

V_{max}: Design shear force per unit width

Table 3.8A-10

Flexural Rebar and Concrete Stresses and Margins of Safety for RCB Basemat

Rebar

Design Section	Service Load Combination			Factored Load Combination		
	Allowable Stress (ksi)	Maximum Stress (ksi)	Ratio[(1)]	Allowable Stress (ksi)	Maximum Stress (ksi)	Ratio[(1)]
Section-01	30.00	27.13	1.11	54.00	40.76	1.32
Section-02		24.06	1.25		22.99	2.35
Section-03		12.46	2.41		17.35	3.11
Section-04		10.51	2.85		39.18	1.38
Section-05		14.08	2.13		53.46	1.01
Section-06		7.47	4.02		30.52	1.77
Section-07		7.25	4.14		36.09	1.50
Section-08		10.94	2.74		50.83	1.06

Concrete

Design Section	Service Load Combination			Factored Load Combination		
	Allowable Stress (ksi)	Maximum Stress (ksi)	Ratio [(1)]	Allowable Stress (ksi)	Maximum Stress (ksi)	Ratio [(1)]
Section-01	2.25	1.527	1.47	3.75	2.039	1.84
Section-02		0.782	2.88		0.306	12.25
Section-03		0.677	3.32		0.691	5.43
Section-04		0.261	8.62		0.814	4.61
Section-05		0.338	6.66		1.276	2.94
Section-06		0.000	-		0.000	-
Section-07		0.234	9.62		0.015	250.00
Section-08		0.571	3.94		1.046	3.59

(1) Ratio = Allowable Stress / Maximum Stress

Table 3.8A-11

Shear Reinforcement and Margins of Safety for RCB Basemat

Design Section	Required Reinforcement (in^2/ft)	Provided Reinforcement (in^2/ft)	Ratio[(1)]	Remark
Section-01	0.2932	0.3514	1.20	
Section-02	0.5123	0.7029	1.37	
Section-03	0.0896	0.1975	2.20	
Section-04	0.0012	0.1975	164.58 [(2)]	
Section-05	0.1029	0.1975	1.92	
Section-06	0.3549	0.3950	1.11	
Section-07	0.1444	0.1975	1.37	
Section-08	0.3177	0.3950	1.24	

(1) Ratio = Provided Reinforcement / Required Reinforcement

(2) This section is provided a minimum reinforcement of NI basemat.

Table 3.8A-12

Summary of the Flexural Reinforcement of the RCB Basemat

Design Section	Flexural Reinforcement			
	EW or Radial Direction		NS or Hoop Direction	
	Top	Bottom	Top	Bottom
Section-01	1-#18@0.8°	2-#18@0.8°	1-#18@12″	2-#18@12″
Section-02	1-#18@0.4° 2-#18@0.8°	3-#14@0.8°	3-#18@12″	3-#14@12″
Section-03	3-#18@12″	5-#18@6″	3-#18@12″	6-#18@6″
Section-04	1-#18@0.4° 2-#18@0.8°	5-#18@6″	1-#18@6″ 2-#18@12″	6-#18@6″
Section-05	1-#18@0.4° 2-#18@0.8°	5-#18@6″	1-#18@6″ 2-#18@12″	6-#18@6″
Section-06	3-#18@12″	1-#18@12″ 3-#18@6″	3-#18@12″	1-#18@12″ 3-#18@6″
Section-07	3-#18@12″	1-#18@12″ 3-#18@6″	3-#18@12″	1-#18@12″ 3-#18@6″
Section-08	3-#18@12″	1-#18@12″ 3-#18@6″	3-#18@12″	1-#18@12″ 3-#18@6″

Table 3.8A-13

Summary of the Shear Reinforcement of the RCB Basemat

Design Section	Shear Reinforcement	
	EW or Radial Direction	NS or Hoop Direction
Section-01	1-#8@12″	1-#8@1.6°
Section-02	2-#8@12″	2-#8@1.6°
Section-03	1-#8@24″	1-#8@24″
Section-04	1-#8@24″	1-#8@24″
Section-05	1-#8@24″	1-#8@24″
Section-06	1-#8@12″	1-#8@24″
Section-07	1-#8@24″	1-#8@24″
Section-08	1-#8@12″	1-#8@24″

Table 3.8A-14

Factor of Safety for Basemat Stability

Load Combination	Minimum Factor of Safety		
	Overturning	Sliding	Flotation
$D + H_e + W$	1.5	1.5	-
$D + H_e + E_s$	1.1	1.1	-
$D + H_e + W_t$	1.1	1.1	-
$D + H_s$	-	-	1.1

D = Dead load

He = Static and dynamic lateral and vertical earth pressure including buoyant effect of normal design groundwater level

Hs = Buoyant force of the design basis flood

W = Wind load

Wt = Tornado or hurricane load

Es = Safe shutdown earthquake

Table 3.8A-15

Results on Factor of Safety for Basemat Stability

NI Common Basemat	FOS(1)	Allowable FOS	Remark
Overturning by Wind	16.46	1.5	
Overturning by Earthquake	1.24	1.1	
Sliding by Wind	8.30	1.5	
Sliding by Earthquake	1.25	1.1	Time history method
Flotation	3.39	1.10	

FOS = Factor of Safety

Table 3.8A-16

Ground Contact Ratios of NI Common Basemat

Site Profile	Concrete Stiffness	Critical Load Combination	Ground Contact Ratio (%)
S1	Uncracked	$1.0 \cdot D+1.0 \cdot SLL+1.0 \cdot Lh+1.0 \cdot SSE_{EW}+1.0 \cdot SSE_{NS}+1.0 \cdot SSE_{VT}$	95.74
	Cracked	$1.0 \cdot D+1.0 \cdot SLL+1.0 \cdot Lh+1.0 \cdot SSE_{EW}+1.0 \cdot SSE_{NS}+1.0 \cdot SSE_{VT}$	95.62
S4	Uncracked	$1.0 \cdot D+1.0 \cdot SLL+1.0 \cdot Lh+1.0 \cdot SSE_{EW}+1.0 \cdot SSE_{NS}+1.0 \cdot SSE_{VT}$	90.90
	Cracked	$1.0 \cdot D+1.0 \cdot SLL+1.0 \cdot Lh-1.0 \cdot SSE_{EW}-1.0 \cdot SSE_{NS}+1.0 \cdot SSE_{VT}$	92.11
S8	Uncracked	$1.0 \cdot D+1.0 \cdot SLL+1.0 \cdot Lh+1.0 \cdot SSE_{EW}+1.0 \cdot SSE_{NS}+1.0 \cdot SSE_{VT}$	85.40
	Cracked	$1.0 \cdot D+1.0 \cdot SLL+1.0 \cdot Lh-1.0 \cdot SSE_{EW}-1.0 \cdot SSE_{NS}-1.0 \cdot SSE_{VT}$	88.90

D = Dead load

SLL = Seismic live load (25% of live loads)

Lh = Buoyancy load due to groundwater

Table 3.8A-17

NI Common Basemat Differential Settlement According to Site Profiles (Static)

Section	Node #1	Node #2	Distance (ft)	Differential Settlement (inches)		
				Soil #1	Soil #4	Soil #8
AB1	26,810	27,829	48.58	0.197	0.091	0.026
AB2	27,829	29,466	46.26	0.206	0.085	0.037
AB3	29,466	28,901	46.59	0.189	0.067	0.019
AB4	28,901	1,367	44.70	0.209	0.088	0.033
AB5	26,811	27,246	48.73	0.067	0.054	0.013
AB6	27,246	26,610	44.08	0.074	0.041	0.021
AB7	26,610	27,669	41.54	0.087	0.047	0.020
AB8	27,669	790	39.68	0.123	0.076	0.034
AB9	26,620	28,027	48.73	0.001	0.032	0.004
AB10	28,027	26,667	44.08	0.019	0.034	0.031
AB11	26,667	27,610	41.54	0.010	0.018	0.011
AB12	27,610	822	39.68	0.059	0.048	0.024
AB13	26,826	27,117	48.58	0.166	0.091	0.026
AB14	27,117	29,708	46.26	0.180	0.088	0.039
AB15	29,708	30,238	46.59	0.155	0.066	0.019
AB16	30,238	1,466	44.70	0.170	0.087	0.036
RCB1	5,929	18,822	46.06	0.072	0.010	0.007
RCB2	15,931	15,467	47.09	0.006	0.010	0.001
RCB3	6,135	14,571	46.06	0.025	0.002	0.005
RCB4	16,131	15,368	47.09	0.051	0.009	0.005
Total Max. Differential Settlement				0.209	0.091	0.039

Table 3.8A-18

Design Forces and Moments for PSW

Unit: kips/ft, kips-ft/ft

Location	M_φ	M_θ	N_φ	N_θ	Q_φ	Q_θ	Q_T	$M_{\varphi\theta}$
North Wall	188.9 (-202.4)	92.1 (-100.3)	110.6	78.3	250.9	-152.2	282.7	-319.2
South Wall	698.2 (-619.9)	456.5 (-466.2)	177.3	212.8	-268.7	- 187.8	173.0	-359.4
East Wall	211.5 (-192.9)	104.1 (-112.3)	76.5	92.2	-202.9	-102.0	209.5	-190.9

Where,

M_φ: Meridional Moment around Horizontal Axis

M_θ: Hoop Moment around Vertical Axis

N_φ: Meridional Axial Force (+: Tension, -: Compression)

N_θ: Hoop Axial Force (+: Tension, -: Compression)

Q_φ: Meridional Transverse Shear Force

Q_θ: Hoop Transverse Shear Force

Q_T: Tangential Shear Force (In-plane Shear Force)

$M_{\varphi\theta}$: Torsion Moment

Table 3.8A-19

Design Forces and Moments for IRWST

Unit: kips/ft, kips-ft/ft

Location	M_φ	M_θ	N_φ	N_θ	Q_φ	Q_θ	Q_T	$M_{\varphi\theta}$
Top Slab	60.2 (-19.7)	12.6 (-9.3)	45.5	15.4	17.5	15.7	16.3	-5.6
Outer Wall	50.3 (-51.7)	11.6 (-7.5)	-65.3	70.2	47.8	3.7	10.5	-4.0

Where,

M_φ: Meridional Moment around Horizontal Axis
M_θ: Hoop Moment around Vertical Axis
N_φ: Meridional Axial Force (+: Tension, -: Compression)
N_θ: Hoop Axial Force (+: Tension, -: Compression)
Q_φ: Meridional Transverse Shear Force
Q_θ: Hoop Transverse Shear Force
Q_T: Tangential Shear Force (In-plane Shear Force)
$M_{\varphi\theta}$: Torsion Moment

Table 3.8A-20

Design Forces and Moments for SSW

Unit: kips/ft, kips-ft/ft

Type	M_φ	M_θ	N_φ	N_θ	Q_φ	Q_θ	Q_T	$M_{\varphi\theta}$
SSW (1)	299.6 (-227.8)	283.6 (-176.4)	159.5	235.1	-64.5	-65.2	-227.9	115.1
RFP (2)	1,479.3 (-1,242.2)	1,009.0 (-1,026.6)	256.9	382.9	-440.3	412.1	-341.9	662.1
RFP (3)	138.7 (-131.2)	330.6 (-325.9)	48.1	505.8	-50.5	103.6	155.9	78.2
SG (4)	473.8 (-337.7)	490.9 (-428.5)	353.1	249.0	129.6	-98.1	-184.2	276.1
SG (5)	1,026.8 (-880.7)	758.7 (-708.3)	198.3	250.4	181.2	-147.1	238.3	-425.6
PZR (6)	79.3 (-75.9)	318.7 (-308.8)	216.3	230.9	-59.0	-109.1	165.4	78.8

(1) Secondary Shield Wall (Thickness 4 ft)
(2) South/North Wall of Refueling pool (thickness 6 ft 2 in)
(3) West Wall of Refueling pool (Thickness 5 ft)
(4) Circular Wall of Steam Generator (SG) Enclosure (Thickness 4 ft)
(5) Straight Wall of Steam Generator (SG) Enclosure (Thickness 5 ft)
(6) Pressurizer (PZR) Enclosure Wall (Thickness 2 ft 9 in)

Where:

M_φ: Vertical Moment around Horizontal Axis
M_θ: Horizontal Moment around Vertical Axis
N_φ: Vertical Axial Force (+: Tension, -: Compression)
N_θ: Horizontal Axial Force (+: Tension, -: Compression)
Q_φ: Vertical Transverse Shear Force
Q_θ: Horizontal Transverse Shear Force
Q_T: In-plane Shear Force
$M_{\varphi\theta}$: Torsion Moment

Table 3.8A-21

Typical Rebar Arrangement for PSW

Location	Meridional Direction	Hoop Direction	Shear Reinforcement
North Wall	Inside : #18 & #18 @ 4.5° Outside : #18 & #18 @ 12″	Inside : #18 & #18 @ 12″ Outside : #18 & #18 @ 12″	#8 @ 12" Vert. @ 4.5° Horiz.
East Wall	Inside : 2-#18(Bundled) & #14 @ 4.5° Outside : #18 & #18 & #14 @ 12″	Inside : #18 & #18 @ 12″ Outside : #18 & #18 @ 12″	#8 @ 12" Vert. @ 4.5° Horiz.
South Wall	Inside : #18 & #14 @ 4.5° Outside : #18 & #14 @ 12″	Inside : #18 & #14 @ 12″ Outside : #18 & #14 @ 12″	#8 @ 12" Vert. @ 4.5° Horiz.

Table 3.8A-22

Margins of Safety for Primary Shield Wall

Location	Meridional/Vertical Direction			Hoop/Horizontal Direction		
	Reinforcement		Ratio (1)	Reinforcement		Ratio (1)
	Required (in^2)	Provided		Required (in^2)	Provided	
North Wall	6.96	#18 & #18@4.5° ($8.00in^2$)	1.15	6.36	#18 & #18@12” ($8.00in^2$)	1.26
East Wall	7.75	2-#18 & #14@4.5° ($10.38in^2$)	1.34	7.07	#18 & #18@12” ($8.00in^2$)	1.13
South Wall	5.18	#18 & #14@4.5° ($6.28in^2$)	1.21	4.89	#18 & #14@12” ($6.25in^2$)	1.28

(1) Ratio = Provided Rebar / Required Rebar

Table 3.8A-23

Typical Rebar Arrangement for IRWST

Location	Meridional/Vertical Direction	Hoop/Horizontal Direction	Shear Reinforcement
Top Slab	#11 @ 0.9 ^{o} Each Face	#11 @ 12" Each Face	-
Outer Wall	#11 @ 0.9 ^{o} Each Face	#11 @ 12" Each Face	#6 @ 24" Vert. @ 0.9 ^{o} Horiz.

Table 3.8A-24

Typical Rebar Arrangement for SSW

Location		Meridional/Vertical Direction	Hoop/Horizontal Direction	Shear Reinforcement
Secondary Shield Wall		#18 & #14 @ 0.9° Each Face	#18 & #18 @ 12″ Each Face	#7 @ 12″ Vert. @ 0.9° Horiz.
Refueling Pool Wall	South/ North	2-#18(Bundled) & 2-#18(Bundled) @ 12″ Each Face	2-#18(Bundled) & 2-#18(Bundled)@ 12″ Each Face	2-#8 @ 12″ Vert. @ 6″ Horiz.
	West	#14 & #11 @ 12″ Each Face	#18 #14 & #18 @ 12″ Each Face	#8 @ 12″ Vert. @ 12″ Horiz.
SG Enclosure Wall	Circular	#18 #14 & #18 @ 0.9° Each Face	#18 #14 & #18 @ 12″ Each Face	2-#7 @ 12″ Vert. @ 0.9° Horiz.
	Straight	2-#18(Bundled) & 2-#18(Bundled) @ 12″ Each Face	2-#18 & #18 @ 12″ Each Face	2-#8 @ 12″ Vert. @ 12″ Hor.
PZR Enclosure Wall		2-#14(Bundled) & #14 @ 12″ Each Face	#18 #14 & #18@ 12″ Each Face	2-#8 @ 12″ Vert. @ 12″ Hor.

Table 3.8A-25

Margins of Safety for Secondary Shield Wall

Location	Meridional/Vertical Direction			Hoop/Horizontal Direction		
	Reinforcement		Ratio (1)	Reinforcement		Ratio (1)
	Required (in^2)	Provided		Required (in^2)	Provided	
SSW	6.68	#18 & #14@0.9˚ ($7.81in^2$)	1.17	7.29	#18 & #18@12" ($8.00in^2$)	1.10
RPW North/South	14.06	2-#18 & 2-#18@12" ($16.00in^2$)	1.14	14.09	2-#18 & 2-#18@12" ($16.00in^2$)	1.14
RPW West	3.00	#14 & #11@12" ($3.81in^2$)	1.27	8.39	#18#14 & #18@12" ($10.25in^2$)	1.22
SG Circular	9.99	#18#14 & #18@0.9˚ ($12.81in^2$)	1.28	9.14	#18#14 & #18@12" ($10.25in^2$)	1.12
SG Straight	12.41	2-#18 & 2-#18@12" ($16.00in^2$)	1.29	10.40	2-#18 & #18@12" ($12.00in^2$)	1.15
PZR	5.50	2-#14 & #14@12" ($6.75in^2$)	1.23	7.76	#18#14 & #18@12" ($10.25in^2$)	1.32

(1) Ratio = Provided Rebar / Required Rebar

Table 3.8A-26

Enveloped Design Forces of the AB Basemat

Element Set No.	Governing Load Combinations	N_x kip/ft	N_y kip/ft	M_x kip-ft/ft	M_y kip-ft/ft	V_{xz} kip/ft	V_{yz} kip/ft	Vin_x kip/ft	Vin_y kip/ft	Remarks
1	LC11	362.0	500.3	901.1	1,514.5	95.3	159.3	-712.0	-712.0	
2	LC9	298.3	409.5	930.4	1,319.8	81.6	210.1	634.7	634.7	
3	LC15	-471.4	142.7	1,969.0	1,211.5	216.7	37.0	304.1	304.1	
4	LC13	-479.6	112.4	2,268.5	1,428.9	234.8	50.9	-332.6	-332.6	
5	LC6	-482.6	262.4	2,341.8	1,406.9	285.4	128.6	325.2	321.9	
6	LC13	-465.7	229.8	2,637.7	1,557.6	304.3	146.6	-353.0	-356.8	
7	LC6	258.9	434.8	1,066.2	330.4	138.7	49.7	-46.9	-86.7	
8	LC11	1,151.2	521.0	1,148.5	1,503.5	101.8	155.0	-278.7	-208.3	
9	LC9	1,006.8	435.2	1,220.5	1,309.9	72.3	156.7	244.4	182.9	
10	LC14	-195.4	-54.9	612.2	584.5	134.4	99.2	-454.6	-454.6	
11	LC9	-450.1	-126.2	725.8	1,181.7	38.8	205.9	446.6	446.6	
12	LC9	-274.3	193.8	2,082.1	1,667.6	595.1	122.4	-574.2	-586.4	
13	LC6	110.8	-5.4	370.0	1,196.3	85.5	153.3	-52.7	-21.0	
14	LC15	-200.0	57.5	889.4	358.0	91.2	134.4	-352.5	-352.5	
15	LC11	-466.1	-765.9	575.6	1,231.8	126.9	187.5	-225.0	-95.6	

(1) The location of the element sets is shown in Table 3.8A-27. X-axis is in EW direction, and Y-axis is in NS direction. Governing load combinations are as follows;

LC6: $1.4D+1.7L+1.4L_h+1.0F$

LC9: $1.0D+1.0L+1.0L_h+1.0F+1.0P_a+1.0Y_r+1.0E_s02$

LC11: $1.0D+1.0L+1.0L_h+1.0F+1.0P_a+1.0Y_r+1.0E_s04$

LC13: $1.0D+1.0L+1.0L_h+1.0F+1.0P_a+1.0Y_r+1.0E_s06$

LC14: $1.0D+1.0L+1.0L_h+1.0F+1.0P_a+1.0Y_r+1.0E_s07$

LC15: $1.0D+1.0L+1.0L_h+1.0F+1.0P_a+1.0Y_r+1.0E_s08$

Table 3.8A-27

Required Reinforcement and Margins of Safety for the AB Basemat

Element Set No.	Required Top and Bottom Bar						Shear Bar		
	EW-Direction			NS-Direction					
	Required in^2	Provided	Ratio	Required in^2	Provided	Ratio	Required in^2	Provided	Ratio
1	9.19	3-#18@12″	1.31	10.52	3-#18@12″	1.14	0.32	#6@12″	1.38
2	7.4	2-#18@12″	1.08	8.93	3-#18@12″	1.34	0.11	#5@12″	2.82
3	5.28	3-#14@12″	1.28	3.91	3-#11@12″	1.20	0.2	#5@12″	1.55
4	6.11	3-#14@12″	1.11	4.06	3-#11@12″	1.15	0.23	#5@12″	1.35
5	5.25	3-#14@12″	1.29	4.92	3-#14@12″	1.37	0.32	#6@12″	1.38
6	7.15	2-#18@12″	1.12	5.5	3-#14@12″	1.23	0.39	#6@12″	1.13
7	4.79	3-#14@12″	1.41	4.77	3-#14@12″	1.42	0.16	#5@12″	1.94
8	9.57	3-#18@12″	1.25	8.19	3-#18@12″	1.47	0.3	#5@12″	1.03
9	11.03	3-#18@12″	1.09	6.96	2-#18@12″	1.15	0.29	#5@12″	1.07
10	3.71	3-#11@12″	1.26	3.67	3-#11@12″	1.28	0.18	#5@12″	1.72
11	3.78	3-#11@12″	1.24	4.4	3-#11@12″	1.06	0.2	#5@12″	1.55
12	8.42	3-#18@12″	1.43	8.57	3-#18@12″	1.40	1.04	2-#8@12″	1.52
13	2.59	2-#11@12″	1.20	3.17	3-#11@12″	1.48	0.09	#5@12″	3.44
14	3.2	3-#11@12″	1.46	3.48	3-#11@12″	1.34	0.06	#5@12″	5.17
15	2.59	2-#11@12″	1.21	3.27	3-#11@12″	1.43	0.06	#5@12″	5.17

(1) Ratio = Provided Reinforcement / Required Reinforcement

(2) The element sets of the auxiliary building basemat are composed as following :

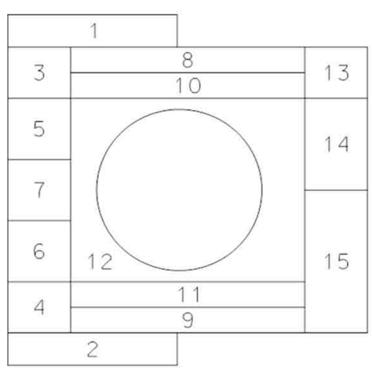


Table 3.8A-28 (1 of 2)

Enveloped Design Forces of the AB Shear Wall

Element Set No.	Zone	Elevation	Governing Load Combinations	N11 kip/ft	N22 kip/ft	M11 kip-ft/ft	M22 kip-ft/ft	Qout kip/ft	N12 kip/ft
North wall of north MSIV house	1	55′-0″ to 100′-0″	LC15C	91.8	159.9	467.4	271.0	235.0	286.3
	2	100′-0″ to 120′-0″	LC15C	30.6	87.6	152.0	147.1	70.9	259.2
	3	120′-0″ to 137′-6″	LC15A	68.9	29.5	128.4	72.8	34.4	218.5
	4	137′-6″ to 174′-0″	LC15A	112.8	7.5	55.1	65.5	2.1	120.9
North wall of north AFWST	1	100′-0″ to 137′-6″	LC15B	-53.9	-144.0	74.3	124.59	68.9	165.6
West wall of MCR	1	55′-0″ to 100′-0″	LC15B	14.3	109.0	73.3	70.0	54.6	245.3
	2	100′-0″ to 137′-6″	LC15C	-59.6	-277.4	76.8	67.7	56.1	166.1
	3	137′-6″ to 156′-0″	LC15C	-196.9	-146.7	29.3	27.1	12.8	194.5
	4	156′-0″ to 174′-0″	LC15B	20.1	-15.4	28.9	51.8	39.6	90.3
	5	174′-0″ to 195′-0″	LC15C	-87.2	-18.8	44.7	73.9	17.5	65.0
West wall of SFP	1	114′-0″ to 156′-0″	LC15B	-51.3	-270.0	248.9	288.4	118.8	291.2
East wall of FHA	1	156′-0″ to 174′-0″	LC15C	72.4	-1.6	69.5	69.2	59.7	131.2
	2	174′-0″ to 213′-6″	LC15B	-68.2	-155.8	125.8	222.1	20.1	165.6

(1) 11 is in horizontal direction, and 22 is in vertical direction.

(2) Design forces and moments in this table are the enveloped values of the following load combinations;

L.C.4 : 1.4 D + 1.7 (L+ L_{g_s}) + 1.4 L_h + 1.4 R_o

L.C.6 : 1.4 D + 1.7 (L+ L_{g_s})+ 1.4 L_h + 1.7 W

L.C.15A : 1.0 D + 1.0 L + 1.0 L_h + 1.0 L_{g_s} + 1.0 E_s + 1.0 L_{g_d}

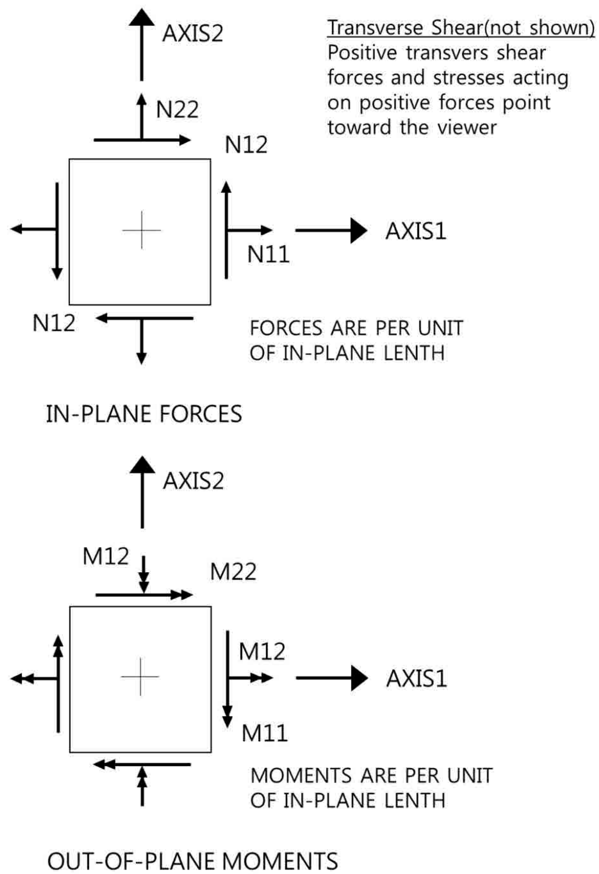
L.C.15B : 1.0 D + 1.0 L + 1.0 L_h + 1.0 Lg_s - 1.0 E_s + 1.0 L_{g_d}

L.C.15C : 0.9 D + 1.0 L_h + 1.0 L_{g_s} + 1.0 Es + 1.0 L_{g_d}

L.C.15D : 0.9 D + 1.0 L_h + 1.0 L_{g_s} - 1.0 Es + 1.0 L_{g_d}

Table 3.8A-28 (2 of 2)

(3) The sign convention for design forces and moments is as follows.



- N11, N22 : In-plane axial forces, (+) tension, (-) compression
- M11, M22 : Out-of plane moments
  M12 : Torsional moment
  M11 = max[(+)M11 + |M12|] or min[(-)M11 - |M12|]
  M22 = max[(+)M22 + |M12|] or min[(-)M22 - |M12|]
- Qout : Transverse shear forces
  Q13 : Transverse shear in the axis 1-3 plane
  Q23: Transverse shear in the axis 2-3 plane
  Qout = max[Q13, Q23] or min[Q13, Q23]
- N12 : In-plane shear forces

Table 3.8A-29

Required Reinforcement and Margins of Safety for the AB Shear Wall

Critical Section	Zone	Elevation	Horizontal			Vertical			Shear		
			Required in^2	Provided	Ratio(1)	Required in^2	Provided	Ratio(1)	Required in^2	Provided	Ratio(1)
North wall of north MSIV house	1	55′-0″ to 100′-0″	5.85	2-#14@9″	1.03	5.11	2-#14@9″	1.17	0.87	2-#6@9″	1.34
	2	100′-0″ to 120′-0″	3.49	3-#14@9″	1.19	3.58	3-#14@9″	1.16	0.18	#9@9″	3.26
	3	120′-0″ to 137′-6″	3.23	3-#14@9″	1.29	2.76	3-#14@9″	1.51	-	#9@9″	-
	4	137′-6″ to 174′-0″	3.59	3-#14@9″	2.51	4.13	3-#14@9″	2.18	0.29	#9@9″	4.60
North wall of north AFWST	1	100′-0″ to 137′-6″	3.16	2-#11@9″	1.32	2.97	2-#11@9″	1.40	-	-	-
West wall of MCR	1	55′-0″ to 100′-0″	3.99	2-#14@12″	1.17	3.47	2-#14@12″	1.30	0.31	#6@12″	1.42
	2	100′-0″ to 137′-6″	2.59	2-#11@12″	1.20	2.71	2-#11@12″	1.15	-	-	-
	3	137′-6″ to 156′-0″	2.39	3-#11@9″	1.06	2.03	3-#11@9″	1.25	-	-	-
	4	156′-0″ to 174′-0″	1.28	#11@12″	1.22	1.31	2-#10@12″	1.94	0.27	#6@12″	1.63
	5	174′-0″ to 195′-0″	1.42	#11@12″	1.10	1.13	#11@12″	1.38	-	-	-
West wall of SFP	1	114′-0″ to 156′-0″	4.79	2-#14@9″	1.25	4.82	3-#11@9″	1.29	0.19	#5@12″	1.63
East wall of FHA area	1	156′-0″ to 174′-0″	2.73	2-#11@9″	1.52	2.78	2-#14@9″	2.16	0.16	#7@9″	5.00
	2	174′-0″ to 213′-6″	2.67	2-#10@9″	1.27	2.61	2-#11@9″	1.59	-	-	-

(1) Ratio = Provided Reinforcement / Required Reinforcement

Table 3.8A-30

Enveloped Design Forces of the EDG Room Slab in AB

Location	Design Force and Moments	Critical Joint No.	Governing Load Combination	M_{xx} (kip-ft/ft)	M_{yy} (kip-ft/ft)	M_{xy} (kip-ft/ft)	V_{xx} (kip/ft)	V_{yy} (kip/ft)
EDG-1 zone at Elevation 100″-0″ (24″ thick)	Max. positive M_{xx}	195	LC15D	15.9	10.31	0.15	0.93	0.26
		196	LC15D	14.55	9.53	1.66	0.83	-0.27
	Max. negative M_{xx}	443	LC15A	-21.55	0.34	-0.72	-7.55	-0.11
		450	LC15A	-19.11	1.34	-0.42	-6.21	-0.16
	Max. positive M_{yy}	182	LC15D	12.12	11.58	0.50	0.68	0.08
		188	LC15D	12.82	11.23	0.84	1.07	-0.10
	Max. negative M_{yy}	264	LC15A	-5.99	-27.97	-0.79	0.54	5.18
		185	LC15A	-6.66	-27.13	-1.15	-1.83	-0.58
	Max.V_{xx}	443	LC15A	-21.55	0.34	-0.72	-7.55	-0.11
		442	LC15A	-18.89	-1.43	0.93	-6.75	-0.17
	Max. V_{yy}	264	LC15D	-3.47	-15.37	1.37	1.00	7.56
		179	LC15D	-2.98	-14.41	1.26	-0.73	7.18
EDG-2 zone at Elevation 100′-0″ (48″ thick)	Max. positive M_{xx}	1114	LC15D	27.51	14.68	31.71	38.79	3.68
		791	LC15D	25.53	42.98	-0.85	0.24	-0.32
	Max. negative M_{xx}	434	LC15A	-29.26	-86.84	-23.22	8.08	13.89
		453	LC15A	-23.46	-32.54	1.37	-0.25	-40.74
	Max. positive M_{yy}	450	LC15D	-5.46	50.99	-2.00	3.34	2.98
		620	LC15D	16.12	46.93	-1.56	2.22	1.61
	Max. negative M_{yy}	434	LC15A	-29.26	-86.84	-23.22	8.08	13.89
		786	LC15A	-16.21	-86.42	1.29	-0.22	-3.87
	Max. V_{xx}	1114	LC15D	27.51	14.68	31.71	38.79	3.68
		539	LC15D	13.59	-7.88	31.82	26.07	4.50
	Max. V_{yy}	453	LC15A	-23.46	-32.54	1.37	-0.25	-40.74
		452	LC15A	-13.22	11.65	-5.60	-0.84	-22.68

(1) X is in EW direction, and Y is in NS direction.

(2) Governing load combinations are as follows;

- LC15A : D+L+E_s (downward) + P_a (downward)
- LC15D : 0.9D+L+E_s (upward) + P_a (upward)

where, P_a: Compartment pressure due to HELB

Table 3.8A-31

Enveloped Design Forces of the SFP Slab in AB

Location	Load Case	Design Force and Moments	Critical joint at model	N_{xx} (kip/ft)	N_{yy} (kip/ft)	M_{xx} (kip-ft/ft)	M_{yy} (kip-ft/ft)	V_{out} (kip/ft)	N_{xy} (kip/ft)
SFP slab at Elevation 114′-0″	Mechanical Load(1)	Max. positive M_{xx}	42,941	34.5	22.8	142.4	176.3	210.2	-224.4
		Max. negative M_{xx}	42,944	377.8	375.3	127.9	77.9	130.1	-89.2
		Max. positive M_{yy}	70,093	30.0	27.3	122.6	216.2	120.2	-133.6
		Max. negative M_{yy}	42,939	98.2	198.9	72.4	162.8	116.0	-90.4
	Thermal Load(2)	Max. positive M_{xx}	42,941	-408.1	-467.4	-1,098.5	-855.4	108.3	134.7
		Max. negative M_{xx}	42,944	-311.2	-501.5	-161.5	-379.0	51.5	337.7
		Max. positive M_{yy}	70,093	-581.2	-590.9	-7,724.5	-790.6	22.1	95.0
		Max. negative M_{yy}	42,939	-279.5	-395.5	-1,222.5	-899.8	188.8	103.4

(1) Mechanical loads are member forces combining the results obtained from structural analysis with those obtained from hydrodynamic analysis at spent fuel pool.

(2) Thermal loads are member forces induced by temperature difference during abnormal operating conditions.

Table 3.8A-32

Enveloped Design Forces of the MSE Slab in AB

Location	Design Force and Moments	Critical joint at model	Load Combination	M_{xx} (kip-ft/ft)	M_{yy} (kip-ft/ft)	M_{xy} (kip-ft/ft)	V_{xx} (kip/ft)	V_{yy} (kip/ft)
MSE slab at Elevation 157′6″	Max. positive M_{xx}	619	LC15A	93.8	135.8	0.6	0.6	-6.9
		688	LC15A	88.7	125.0	-4.6	-7.3	-6.5
	Max. negative M_{xx}	887	LC15A	-146.8	-29.8	-7.1	-8.1	3.2
		343	LC15A	-105.9	-45.0	4.5	-9.5	2.0
	Max. positive M_{yy}	618	LC15A	88.6	138.6	-0.6	0.5	8.0
		619	LC15A	93.8	135.8	0.6	0.6	-6.9
	Max. negative M_{yy}	1392	LC15A	-45.8	-123.9	2.3	1.6	-57.5
		1265	LC15A	-40.5	-111.9	-1.4	-12.9	-67.9
	Max. V_{xx}	1557	LC15A	6.9	13.4	-11.2	-43.1	-3.4
		412	LC15A	-9.4	28.5	13.8	39.2	-3.1
	Max. V_{yy}	622	LC15A	-35.9	-211.7	0.4	-0.3	-60.1
		691	LC15A	-35.8	-201.7	-6.2	10.7	-57.7

(1) X is in EW direction, and Y is in NS direction.

(2) Governing load combinations are as follows:

- LC15A : D+L+E_s (downward)+ P_a (downward)
- LC15D : 0.9D+L+E_s (upward)+ P_a (upward)

where, P_a: Compartment pressure due to HELB

Table 3.8A-33

Slab Reinforcement and Margins of Safety at Each Critical Section in AB

Location	Direction	Top Rebar Arrangement			Bottom Rebar Arrangement		
		Required Rebar (in^2)	Provided Rebar	Ratio(1)	Required Rebar (in^2)	Provided Rebar	Ratio(1)
EDG slab at El. 100'-0"	E-W (EDG-1)	0.43	#7 @ 9"	1.86	0.35	#6 @ 9"	1.68
	N-S (EDG-1)	1.09	#9 @ 9"	1.22	0.35	#7 @ 9"	2.29
	E-W (EDG-2)	1.04	#9 @ 9"	1.28	1.04	#8 @ 9"	1.01
	N-S (EDG-2)	1.04	#9 @ 9"	1.28	1.04	#9 @ 9"	1.28
MSE slab at El. 137'-6"	E-W	1.00	#9 @ 9"	1.33	0.61	#9 @ 9"	2.19
	N-S	0.82	#10 @ 9"	2.06	0.91	#9 @ 9"	1.46
SFP slab at El.114'-0"	E-W	5.62	2-#14@9"	1.07	5.62	2-#14@9"	1.07
	N-S	5.99	2-#14@9"	1.00	5.99	2-#14@9"	1.00

(1) Ratio = Provided Rebar / Required Rebar

Table 3.8A-34

Enveloped Design Forces of the EDG Building Basemat

Element No.	Govern. Load Comb.	N_x kip/ft	N_y kip/ft	M_x kip-ft/ft	M_y kip-ft/ft	V_{xz} kip/ft	V_{yz} kip/ft	V_{in_max} kip/ft	Remarks
21020070	LC6	2.7	0.0	235.0	329.3	-97.9	-133.5	0.5	
21020082	LC6	43.0	16.0	130.2	49.0	29.7	-15.2	1.2	
21020109	LC6	-77.2	-83.4	358.8	946.9	-70.7	-95.3	37.8	
21020138	LC6	17.9	55.6	100.0	294.2	-6.1	-3.9	18.7	
21020186	LC6	-47.7	0.0	794.8	44.4	22.7	-11.0	7.2	
21020188	LC6	-113.0	-40.5	503.9	489.1	133.9	-18.9	29.8	
21020262	LC6	-76.4	-81.8	359.6	947.3	62.8	-55.6	37.3	
21020264	LC6	-160.2	-13.6	604.4	113.7	-44.7	-7.0	14.2	

(1) X is in EW direction, and Y is in NS direction.

(2) Design forces and moments in this table are the enveloped values of the following load combinations:

LC4: 1.4D+1.7L

LC6: 1.4D+1.7L+1.7W

LC15a: 1.0D+1.0L+1.0E_s

LC15b: 0.9D+1.0E_s

Table 3.8A-35

Enveloped Design Forces of the EDG Building Shear Wall

Element Set No.	Elevation	Max./ Min	N11 kip/ft	N22 kip/ft	M11 kip-ft/ft	M22 kip-ft/ft	Qout kip/ft	N12 kip/ft
West wall of EDG building	100′-0″ to 135′-0″	Max.	0.05	22.03	42.88	39.3	12.96	41.4
		Min	-104.2	-20.7	-68.5	-32.8	-12.9	-41.3
Center wall of EDG building		Max.	0.0	21.19	8.56	3.77	5.67	38.94
		Min	-68.59	-13.61	-8.68	-3.70	-5.68	-15.27

(1) Design forces and moments in this table are the enveloped values of the following load combinations:

LC4: 1.4D+1.7L

LC6: 1.4D+1.7L+1.7W

LC15a: 1.0D+1.0L+1.0E_s

LC15b: 0.9D+1.0E_s

Table 3.8A-36

Required Reinforcement and Margins of Safety for the EDG Building Shear Wall

Critical Section	Elevation	Horizontal			Vertical		
		Required Rebar (in^2)	Provided Rebar	Ratio(1)	Required Rebar (in^2)	Provided Rebar	Ratio(1)
West wall of EDG building	100'-0" to 135'-0"	1.171	#11@12"	1.33	1.785	#11@ 9"	1.16
Center wall of EDG building		0.648	#11@12"	2.41	1.898	#11@ 9"	1.10

(1) Ratio = Provided Rebar / Required Rebar

Table 3.8A-37

Required Reinforcement and Margins of Safety for the EDG Building Basemat

Location	EW-Direction			NS-Direction			Shear Bar		
	Required Rebar (in^2)	Provided Rebar	Ratio(1)	Required Rebar (in^2)	Provided Rebar	Ratio(1)	Required Rebar (in^2)	Provided Rebar	Ratio(1)
EDG building at El.100'-0"	2.074	2-#11@12"	1.50	2.907	2-#11@12"	1.07	0.080	#5@12"	2.075

(1) Ratio = Provided Rebar / Required Rebar

Table 3.8A-38

Results on Factor of Safety for Basemat Stability

Building	Item	FOS[1]	Allowable FOS	Remark
EDG	Overturning by Wind	10.67	1.5	
	Overturning by Earthquake	1.58	1.1	
	Sliding by Wind	5.41	1.5	
	Sliding by Earthquake	1.82	1.1	
	Flotation	10.67	1.1	
DFOT	Overturning by Wind	N/A		Buried structure
	Overturning by Earthquake	1.19	1.1	
	Sliding by Wind	N/A		Buried structure
	Sliding by Earthquake	1.29	1.1	
	Flotation	1.81	1.1	

(1) FOS = Factor of Safety

Table 3.8A-39

EDG & DFOT buildings Differential Settlements According to Site Profiles (Static)

Location	Node #1	Node #2	Distance (ft)	Differential Settlement (inches)		
				Soil #1	Soil #4	Soil #8
EDG	4451	4036	41.291	0.181	0.103	0.043
	4036	4774	36.867	0.024	0.033	0.030
	4036	131	47.734	0.155	0.077	0.029
	4036	97	47.734	0.076	0.002	0.016
	131	8308	47.734	0.151	0.076	0.029
	8308	97	47.734	0.080	0.003	0.016
	8308	8678	41.291	0.182	0.103	0.043
	8308	8953	41.291	0.045	0.027	0.031
	4460	8923	33.253	0.032	0.006	0.002
Total Max. Differential Settlement				0.182	0.103	0.043
DFOT	5876	794	45.881	0.330	0.108	0.013
	5860	7068	25.836	0.265	0.091	0.014
	5858	7066	25.836	0.364	0.121	0.017
	63	304	26.023	0.233	0.059	0.005
	5881	5861	26.023	0.337	0.093	0.001
	76	7061	25.836	0.384	0.140	0.025
	5858	7059	25.836	0.275	0.100	0.018
	107	6027	26.023	0.218	0.044	0.011
	63	5872	26.023	0.323	0.080	0.006
	6479	6581	14.916	0.206	0.073	0.014
	6604	6509	14.916	0.194	0.061	0.005
Total Max. Differential Settlement				0.384	0.140	0.025

Table 3.8A-40 (1 of 2)

Summary of Models and Analysis Methods

Model	Analysis Method	Program	Purpose	Subsections
Reactor containment building analysis model (Uncracked stiffness model)	(2) Modal analysis (3) Response spectrum analysis (SSE damping) (4) Static analysis (5) Heat transfer analysis	ANSYS	To generate the design forces of the reactor containment building shell and dome (e,g dead, live, seismic thermal load, etc.)	Subsection 3.8A.1.4.1
Reactor containment building internal structure model (Uncracked stiffness model)	(6) Modal analysis (7) Response spectrum analysis (SSE damping) (8) Static analysis	ANSYS	To generate the design forces of the reactor containment building internal structure walls (e,g dead, live, seismic thermal load, etc.)	Subsection 3.8A.1.4.3
Reactor containment building - IRWST hydro-dynamic analysis model (Uncracked stiffness model)	(9) Direct integration time history analysis	ANSYS	To generate the floor response spectrum due to the POSRV sparger discharge load	Subsection 3.8A.1.4.3.1.3
NI building common basemat analysis model (Uncracked stiffness model)	(10) Nonlinear Analysis	ANSYS	To generate the design forces of the NI common basemat (e,g dead, live, seismic load, etc.)	Subsection 3.8A.1.4.2, 3.8A.2.4.1
Auxiliary building structural analysis model	(11) Static analysis (Equivalent static method)	ANSYS	To generate the design forces of the auxiliary building shear walls (e,g dead, live, seismic load, etc.)	Subsection 3.8A.2.3, 3.8A.2.4.2
Auxiliary building - SFP hydro-dynamic analysis model (Uncracked stiffness model)	(12) Modal analysis (13) Static analysis	ANSYS	To create the auxiliary building SFP hydro-dynamic force	Subsection 3.8A.2.4.2
Auxiliary building - SFP, local analysis model (Uncracked stiffness model)	(14) Heat transfer analysis (15) Static analysis	ANSYS	To generate the design forces of the auxiliary building SFP walls	Subsection 3.8A.2.4.2
Auxiliary building - aux. feed water storage tank hydro-dynamic analysis model (Uncracked stiffness model)	(16) Modal analysis (17) Static analysis	ANSYS	To create the auxiliary building AFWT hydro-dynamic force	Subsection 3.8A.2.4.2

Table 3.8A-40 (2 of 2)

Model	Analysis Method	Program	Purpose	Subsections
Emergency diesel generator building structural analysis model (Uncracked stiffness model)	(18) Static analysis (Equivalent static method) (19) Nonlinear Analysis	ANSYS	To generate the design forces of the emergency diesel generator building shear wall and basemat (e,g dead load, live load, seismic load, etc.)	Subsection 3.8A.3.4.1, 3.8A.3.4.2
Diesel fuel oil storage tank building structure analysis model (Uncracked stiffness model)	(20) Static analysis (Equivalent static method) (21) Nonlinear analysis	ANSYS	To generate the design forces of the diesel fuel oil storage tank building shear wall and basemat (e,g dead load, live load, seismic load, etc.)	Subsection 3.8A.3.4.1, 3.8A.3.4.2
Reactor containment building – combustible gas control inside containment analysis model (Uncracked stiffness model)	(22) Nonlinear analysis	ABAQUS	To evaluate the structural integrity of the reactor containment building under severe accident pressure in accordance with ASME CC-3720	Subsection 3.8.1.4.12
Reactor containment building - ultimate pressure capacity analysis model	(23) Nonlinear analysis	ABAQUS	To evaluate the ultimate pressure capacity of the reactor containment building	Subsection 3.8.1.4.11
Reactor containment building - reinforced concrete section model	(24) Static analysis	DARTEM	To calculate stress and strain of reinforced concrete sections under mechanical and temperature loads	Subsection 3.8A.1.4.1.3.7, 3.8A.1.4.2.3
Auxiliary building - SFP reinforced concrete section model	(25) Static analysis	DARTEM	To calculate stress and strain of reinforced concrete sections under mechanical and temperature loads	Subsection 3.8A.2.4.2, 3.8A.2.4.3
Reactor containment building - liner plate anchorage system model	(26) Static analysis	LBAP	To calculate maximum anchor forces and displacements in the liner anchorage systems attached to concrete walls	Subsection 3.8.1.4.10
Auxiliary building – concrete slab analysis model	(27) Static analysis	GTSTRUDL	To generate the design forces for the concrete slabs of the auxiliary building	Subsection 3.8A.2.4.3

Table 3.8A-41

Stress Profiles of Typical Prestressing Tendons

Vertical Tendon

Stress Point	Stress in Tendon, MPa (ksi)		Losses of Stress, MPa (ksi)
	Initial (1)	Final (2)	
Anchor Point	1291.0 (187.24)	1007.0 (146.06)	Elastic Shortening: 23.9 (3.46) Creep: 142.7 (20.70) Shrinkage: 27.8 (4.03) Relaxation: 89.6 (12.99) Total Loss: 284.0 (41.18)
Spring Line	1372.1 (199.00)	1088.1 (157.81)	
Dome Apex	1089.9 (158.08)	806.0 (116.90)	

Horizontal Tendon

Stress Point	Stress in Tendon, MPa (ksi)		Losses of Stress, MPa (ksi)
	Initial (1)	Final (2)	
Anchor Point	1291.0 (187.24)	914.2 (132.60)	Elastic Shortening: 37.5 (5.44) Creep: 224.4 (32.55) Shrinkage: 27.8 (4.03) Relaxation: 87.1 (12.63) Total Loss: 376.8 (54.65)
Tangent Point	1300.1 (188.57)	923.4 (133.93)	
Midpoint of Tendon	1080.1 (156.66)	703.3 (102.01)	

(1) At time of tendon lock off

(2) 60 years after plant startup

Table 3.8A-42

Margins of Safety for In-containment Refueling Water Storage Tank

Location	Meridional/Vertical Direction			Hoop/Horizontal Direction		
	Reinforcement		Ratio (1)	Reinforcement		Ratio (1)
	Required (in^2)	Provided		Required (in^2)	Provided	
Top Slab	1.16	#11@ 0.9˚	1.19	0.53	#11@12"	2.97
Outer Wall	0.073	#11@ 0.9˚	18.9	0.88	#11@12"	1.77

(1) Ratio = Provided Rebar / Required Rebar

Table 3.8A-43

Design Forces and Moments for Slab in RCB

Location	Thick-ness	Direction	Design Force and Moments	N_{xx} (kip/ft)	N_{yy} (kip/ft)	N_{xy} (kip/ft)	M_{xx} (kip-ft/ft)	M_{yy} (kip-ft/ft)	M_{xy} (kip-ft/ft)	V_{out} (kip/ft)
Operating Floor Slab at El. 156'-0"	2ft	Radial	at SSW Area (1)	165.56	-	8.24	145.31	-	-1.55	
			at Central Area (2)	35.75	-	7.58	88.44	-	-3.71	34.31
		Tangential	All Areas	-	3.67	-65.54	-	9.58	-49.27	
	3ft	Radial	at SSW Area (1)	53.93	-	3.60	287.49	-	-14.96	
			at Central Area (2)	38.72	-	2.92	192.15	-	-19.05	28.43
		Tangential	All Areas	-	-64.97	10.34	-	-65.69	30.36	

(1) These forces are considered when designing the rebar for the connection area between slab and SSW.

(2) These forces are considered when designing the rebar for the central area of slab.

Table 3.8A-44

Slab Reinforcement and Margins of Safety at Each Critical Section in RCB

<table>
<tr><th rowspan="2">Location</th><th rowspan="2">Thick
-ness</th><th colspan="4">Radial Direction</th><th colspan="3">Tangential Direction</th></tr>
<tr><th>Area</th><th>Required Rebar (in^2)</th><th>Provided Rebar</th><th>Ratio[(1)]</th><th>Required Rebar (in^2)</th><th>Provided Rebar</th><th>Ratio[(1)]</th></tr>
<tr><td rowspan="4">Operating Floor slab at El. 156'-0"</td><td rowspan="2">2ft</td><td>at SSW Area</td><td>3.81</td><td>2-#11@0˚45′ (4.50in^2)</td><td>1.18</td><td rowspan="2">1.41</td><td rowspan="2">#11@12" (1.56in^2)</td><td rowspan="2">1.11</td></tr>
<tr><td>at Central Area</td><td>1.75</td><td>#11@0˚45′ (2.17in^2)</td><td>1.24</td></tr>
<tr><td rowspan="2">3ft</td><td>at SSW Area</td><td>3.05</td><td>2-#11@0˚45′ (4.50in^2)</td><td>1.48</td><td rowspan="2">1.44</td><td rowspan="2">#11@12" (1.56in^2)</td><td rowspan="2">1.08</td></tr>
<tr><td>at Central Area</td><td>2.12</td><td>#11@0˚45′ (2.17in^2)</td><td>1.02</td></tr>
</table>

(1) Ratio = Provided Rebar / Required Rebar

Table 3.8A-45

Liner Plate Allowables

Category	Stress-Strain Allowable	
	Membrane	Combined Membrane and Bending
Construction	$f_{st} = f_{sc} = 2/3\ f_{py}$	$f_{st} = f_{sc} = 2/3\ f_{py}$
Service	$\varepsilon_{st} = \varepsilon_{sc} = 0.002$ in/in	$\varepsilon_{st} = \varepsilon_{sc} = 0.004$ in/in
Factored	$\varepsilon_{sc} = 0.005$ in/in	$\varepsilon_{sc} = 0.014$ in/in
	$\varepsilon_{st} = 0.003$ in/in	$\varepsilon_{st} = 0.010$ in/in

Table 3.8A-46

Liner Anchor Allowables

Category	Force and Displacement Allowables	
	Mechanical Loads, Lesser of:	Displacement Limited Loads
Test Normal Severe Environmental Extreme Environmental	$F_a = 0.67\ F_y$ $F_a = 0.33\ F_u$	$\delta_a = 0.25\ \delta_u$
Abnormal Abnormal/Severe Environmental Abnormal/Extreme Environmental	$F_a = 0.90\ F_y$ $F_a = 0.50\ F_u$	$\delta_a = 0.50\ \delta_u$

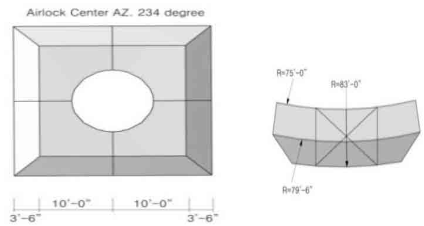
Table 3.8A-47

Design Result of Steel Beams and Connections

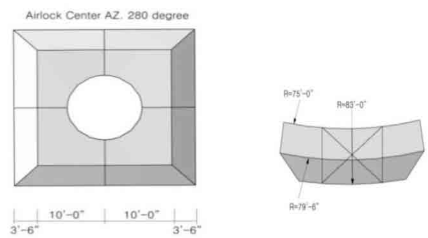
Elevation	Beam Size		Member Stress Check Interaction Ratio (IR)			
			IR from GTSTRUDL	Additional Stress Check due to Torsion	IR Friction	Total IR
114′-0″	Below 2ft Concrete Slab	W21x147	0.563	0.086	0.039	0.688
136′-6″	Below 3ft Concrete Slab	W30x261	0.307	0.036	0.025	0.418
156′-0″	Below 3ft Concrete Slab	BW24x270	0.405	0.026	0.025	0.516

Connection Type	Maximum Load (kips)	Allowable Load (kips)	Ratio(1)
Beam Seat Plate at SSW	98.1	182.3	0.53
Beam Seat Plate at Containment Wall	100.5	218.8	0.45
Beam Seat Welding at SSW	300.3	528.9	0.56
Beam Seat Welding at Containment Wall	307.9	634.7	0.48
Lower Key Bumper	20.6	60.0	0.34
Welding at SSW	100.0	103.0	0.97

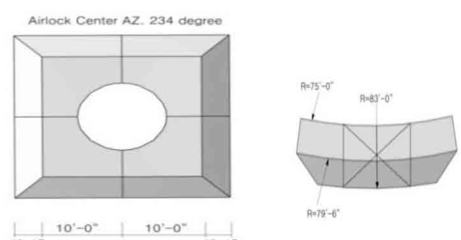
(1) Ratio = Maximum Load / Allowable Load



Equipment Hatch (Az. 280°)



Personnel Airlock (Az. 280°)



Personnel Airlock (Az. 234°)

Figure 3.8A-1 Schematic View of Equipment Hatch and Personnel Airlocks

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Figure 3.8A-2 FE Full Model of Containment

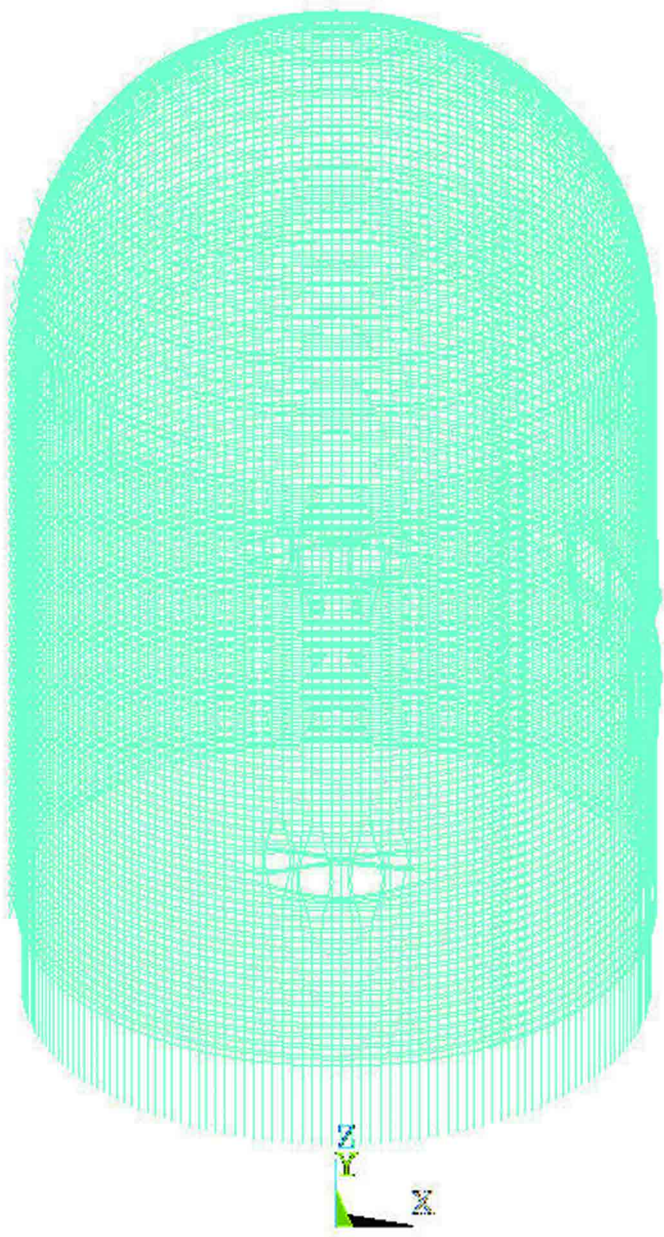
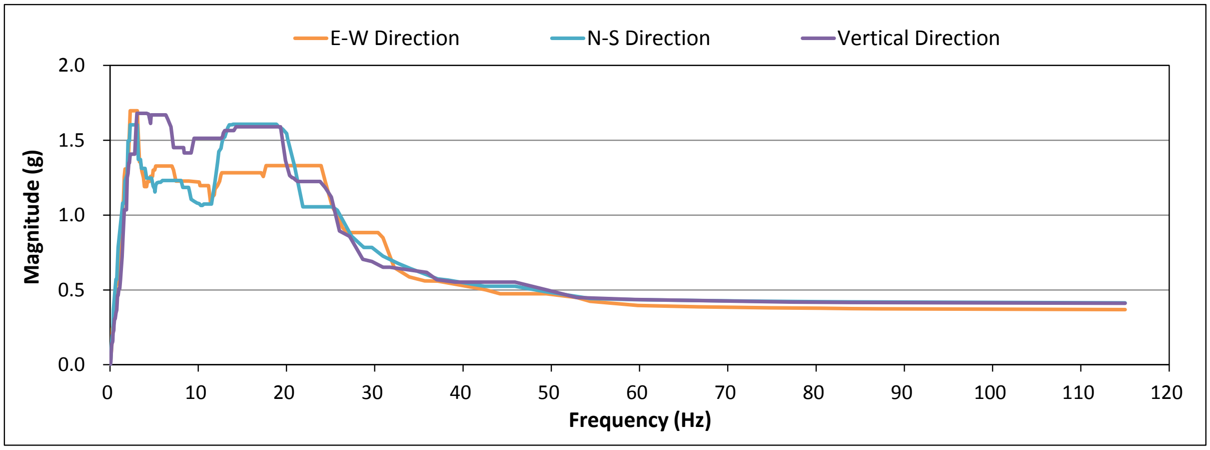


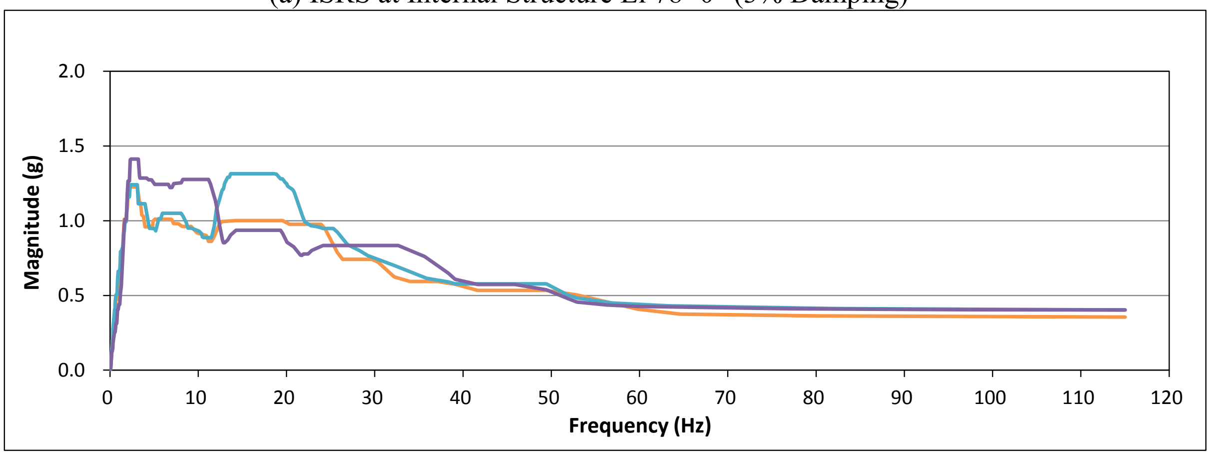
Figure 3.8A-3 Tendon Model Using Truss Elements

Security-Related Information – Withhold Under 10 CFR 2.390

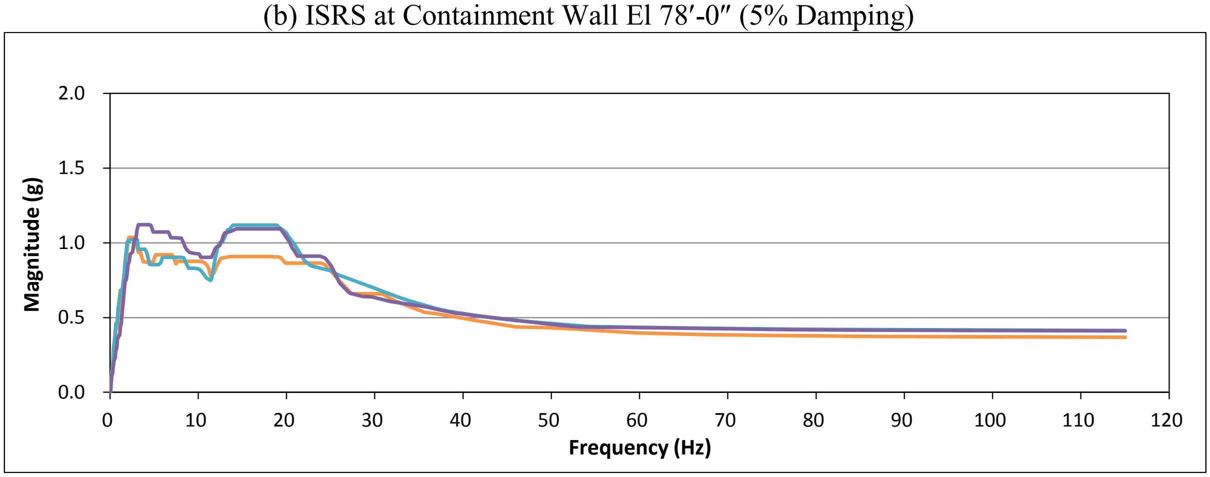
Figure 3.8A-4 FE Partial Model of Containment



(a) ISRS at Internal Structure El 78′-0″ (3% Damping)



(b) ISRS at Containment Wall El 78′-0″ (5% Damping)



(c) ISRS at Internal Structure El 78′-0″ (7% Damping)

Figure 3.8A-5 Input Acceleration Response Spectrum at El. 78′-0″ of RCB

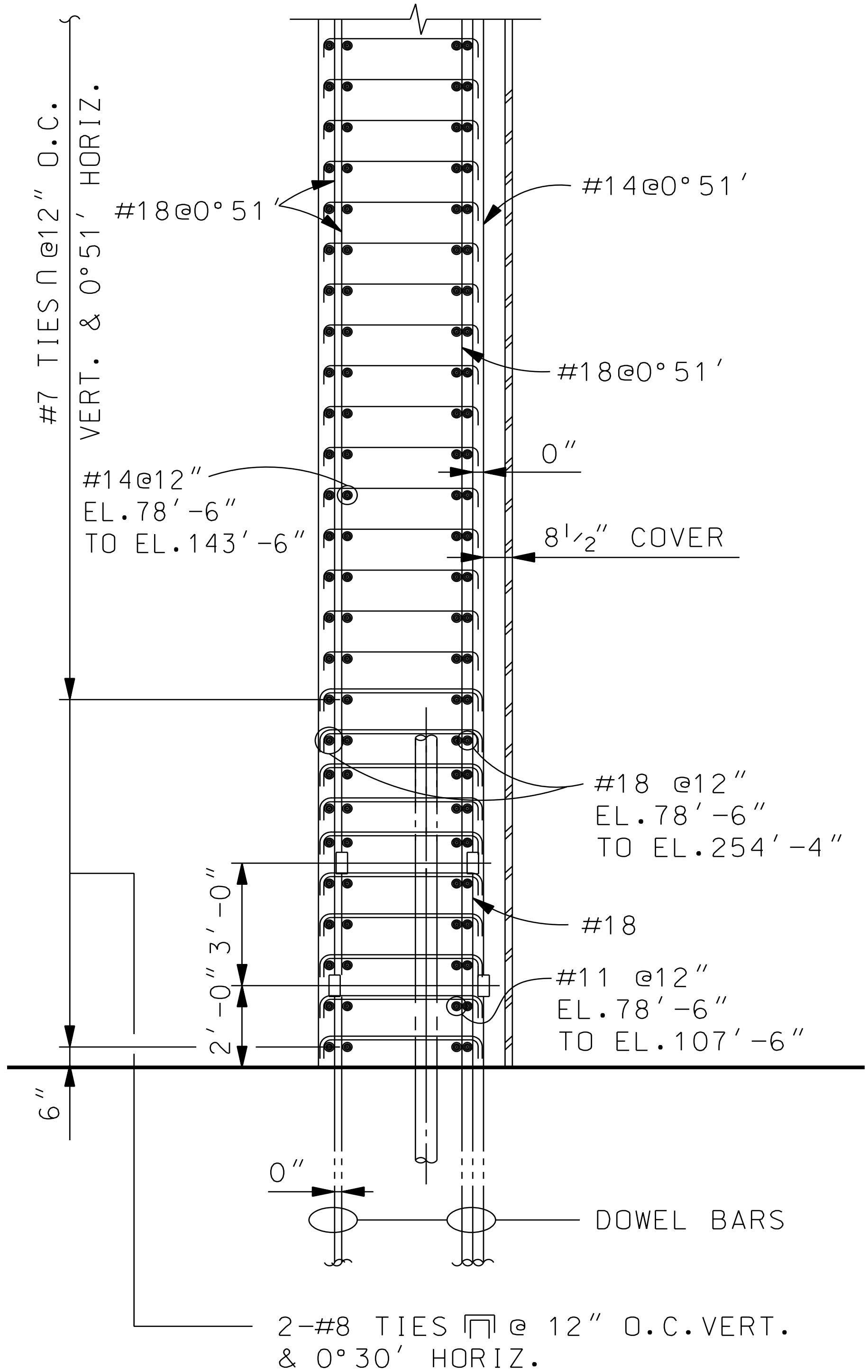


Figure 3.8A-6 Rebar Arrangement of Wall-Basemat Junction Area

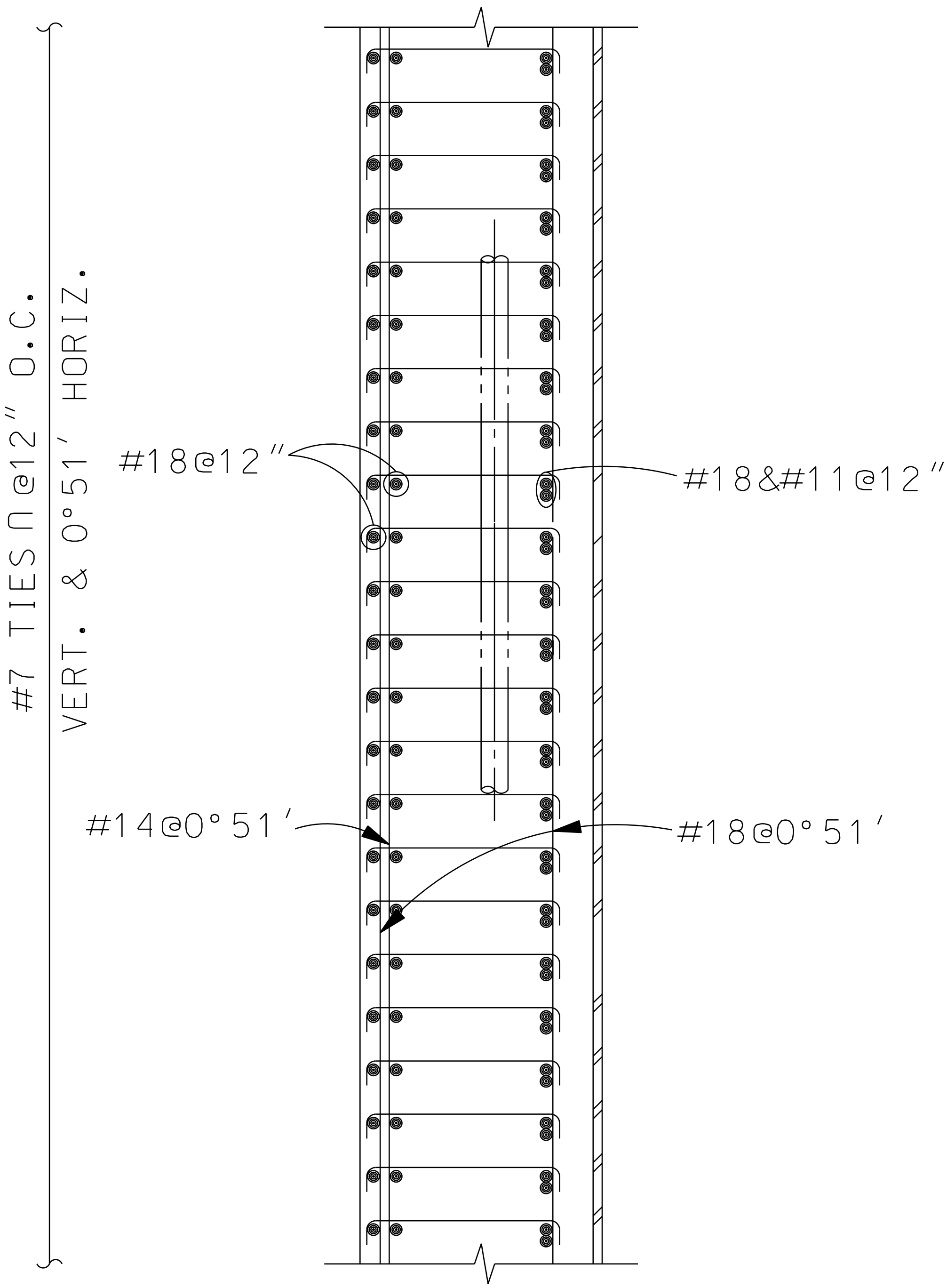


Figure 3.8A-7 Rebar Arrangement of Wall Mid-Height

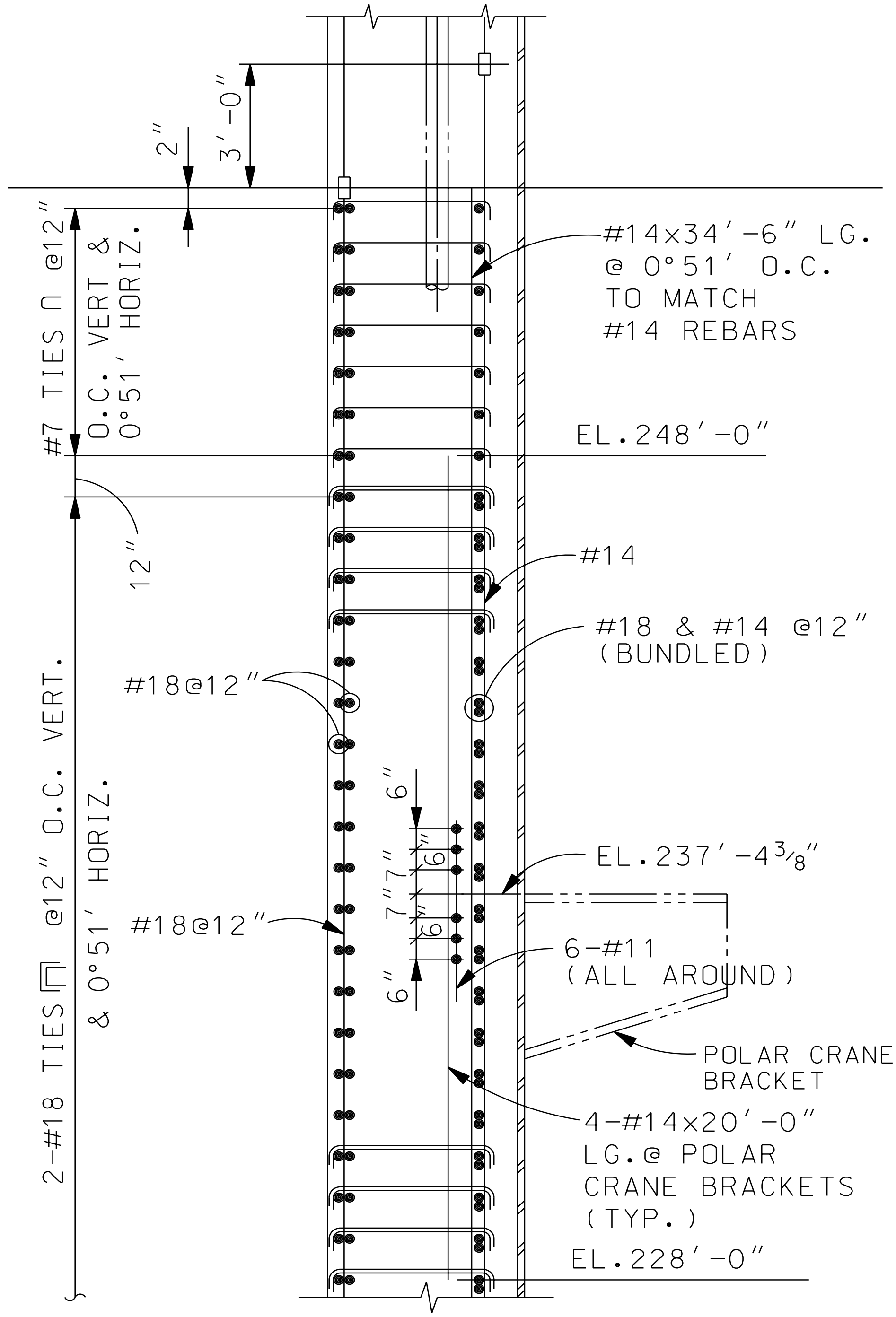


Figure 3.8A-8 Rebar Arrangement of Polar Crane Bracket Level and Springline

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Figure 3.8A-9 Rebar Arrangement of Wall around Equipment Hatch

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.8A-10 Rebar Arrangement of Wall around Personnel Airlock

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Figure 3.8A-11 NI Basemat Plan View at El. 55′-0″

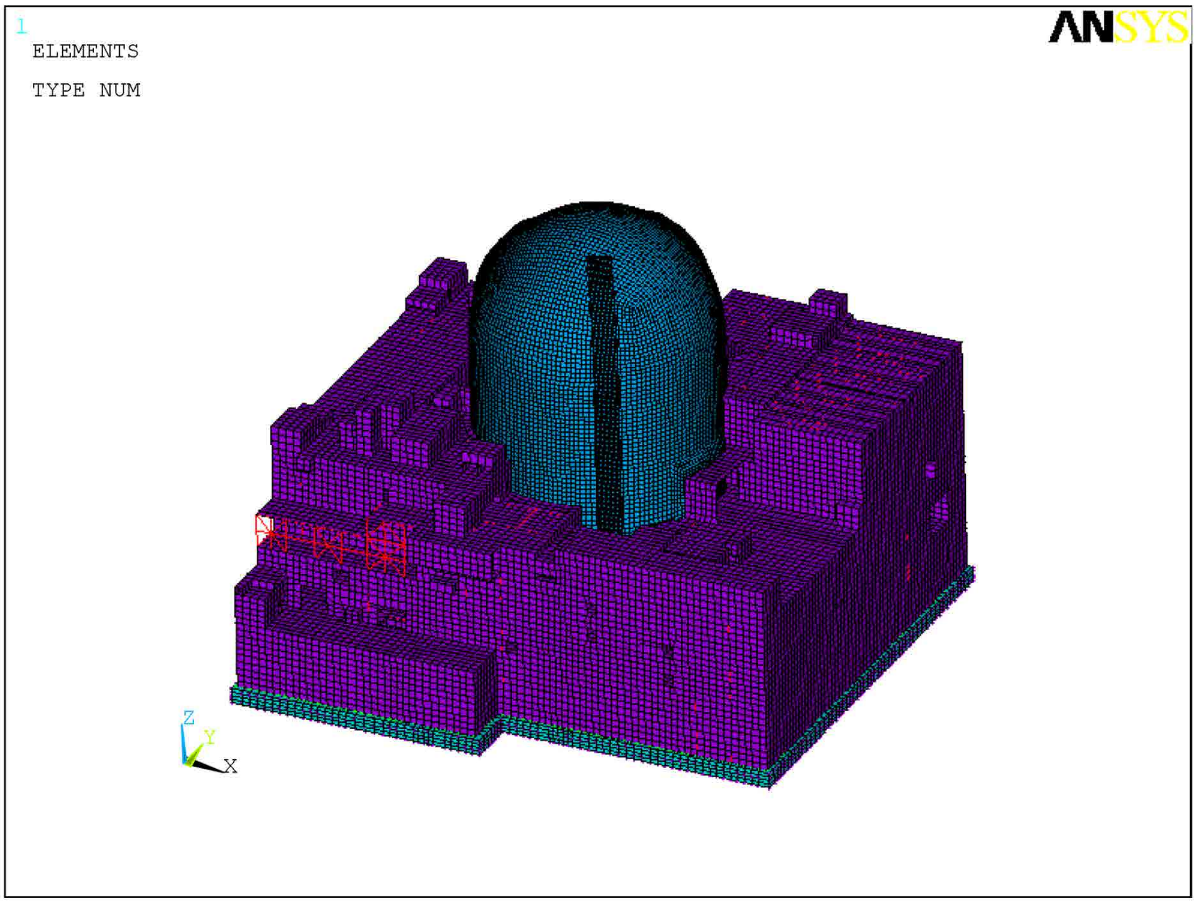
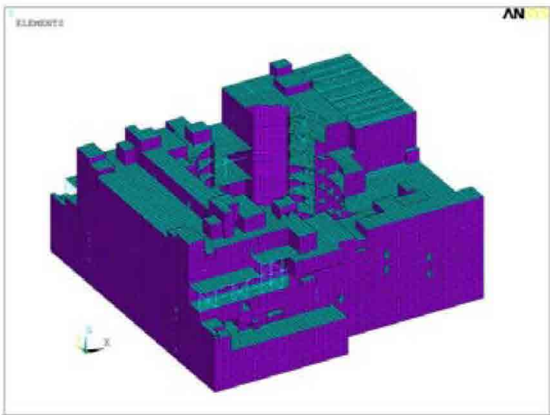
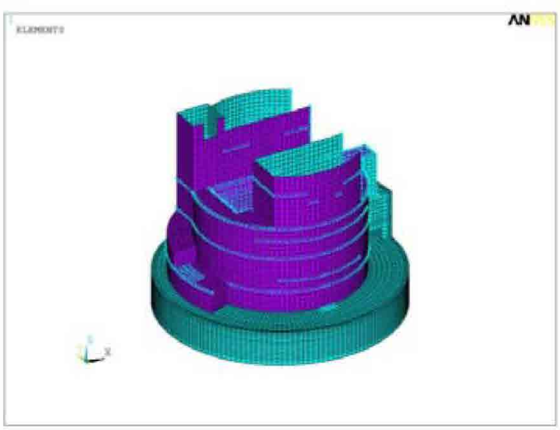


Figure 3.8A-12 Full FE Model for the Basemat Structural Analysis



(a) AB Structure

(b) RCB Shell & Dome



(c) Internal Structure

(d) NI Common Basemat

Figure 3.8A-13 Model for AB, RCB Wall, Dome, Internal Structure, and Basemat

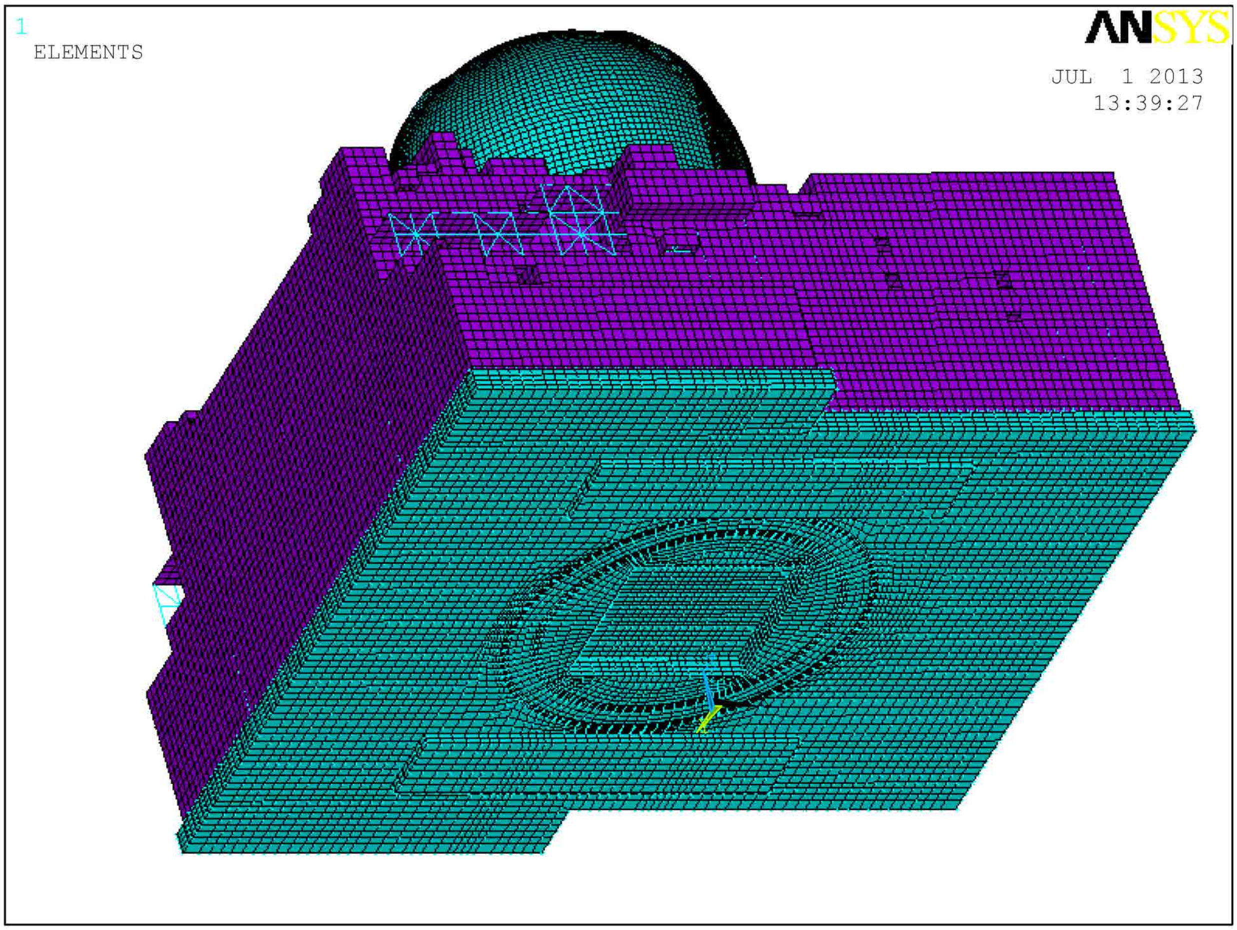
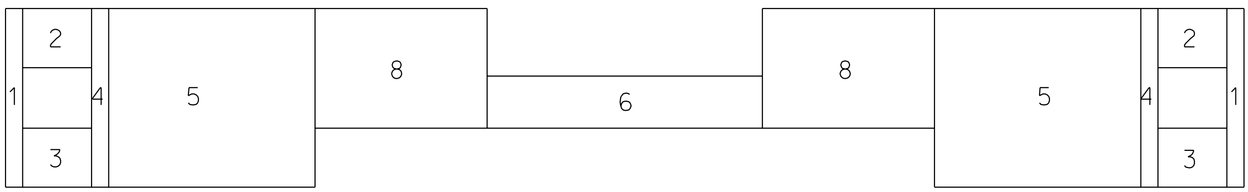
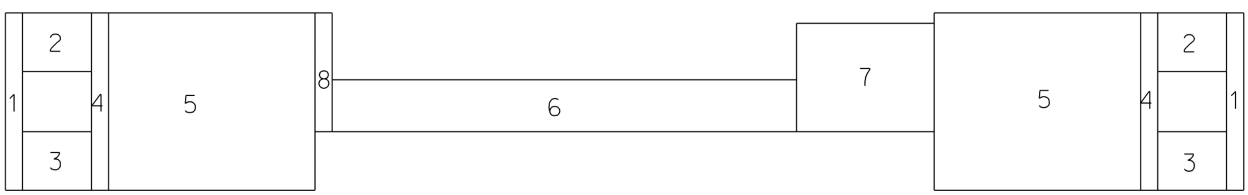


Figure 3.8A-14 LINK180 Element for Soil Spring



(a) Basemat Cross Section for E-W Direction



(b) Basemat Cross Section for N-S Direction

Figure 3.8A-15 Design Sections for Basemat Reinforcement

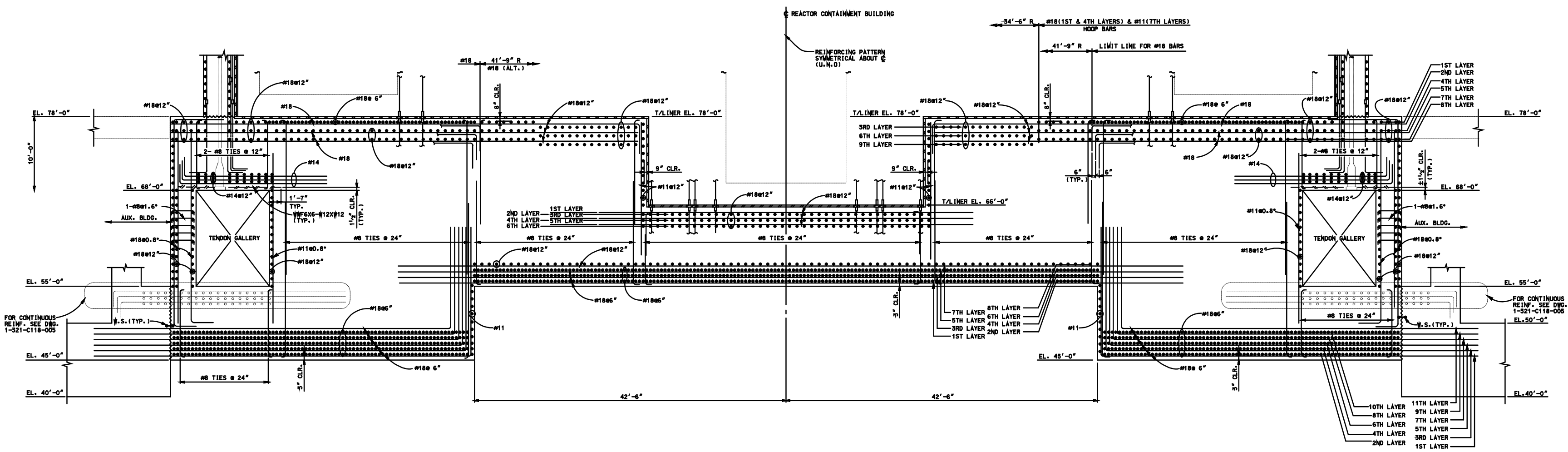


Figure 3.8A-16 Reinforcement Arrangement of RCB Basemat (East-West View)

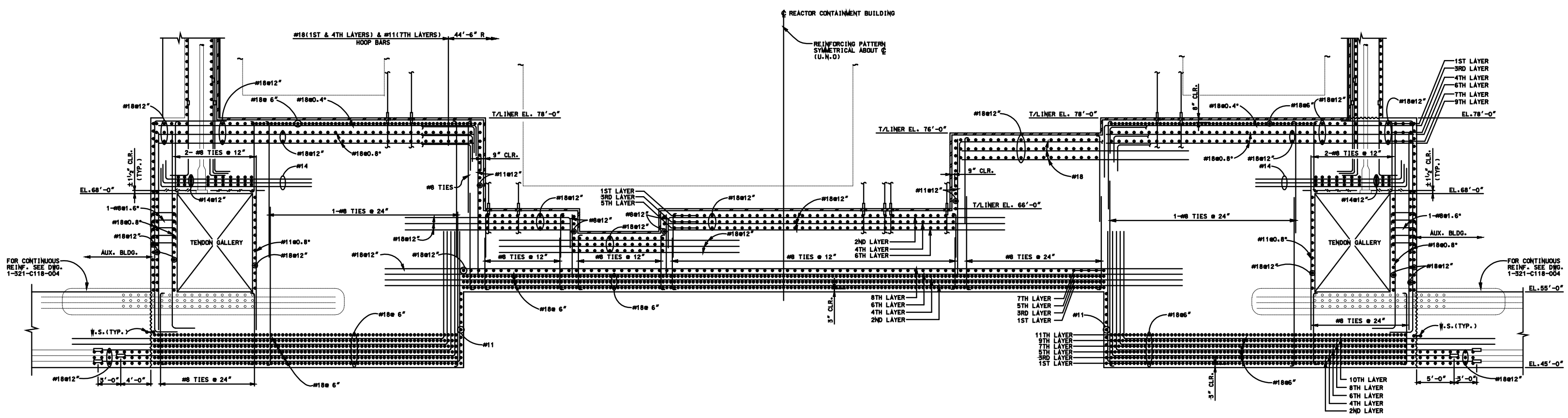


Figure 3.8A-17 Reinforcement Arrangement of RCB Basemat (South-North View)

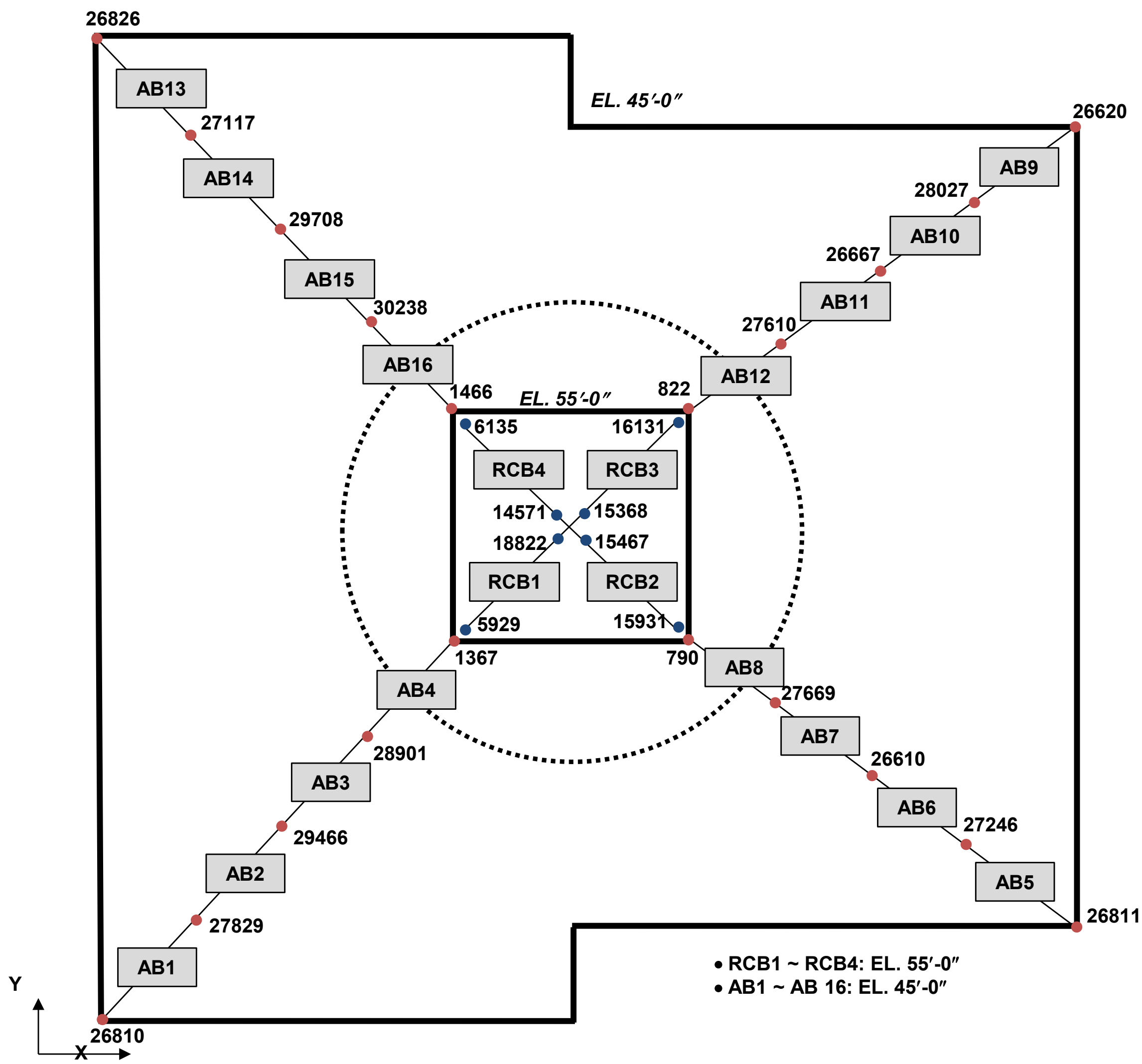


Figure 3.8A-18 Node Location at NI Basemat for Checking Settlement (Static)

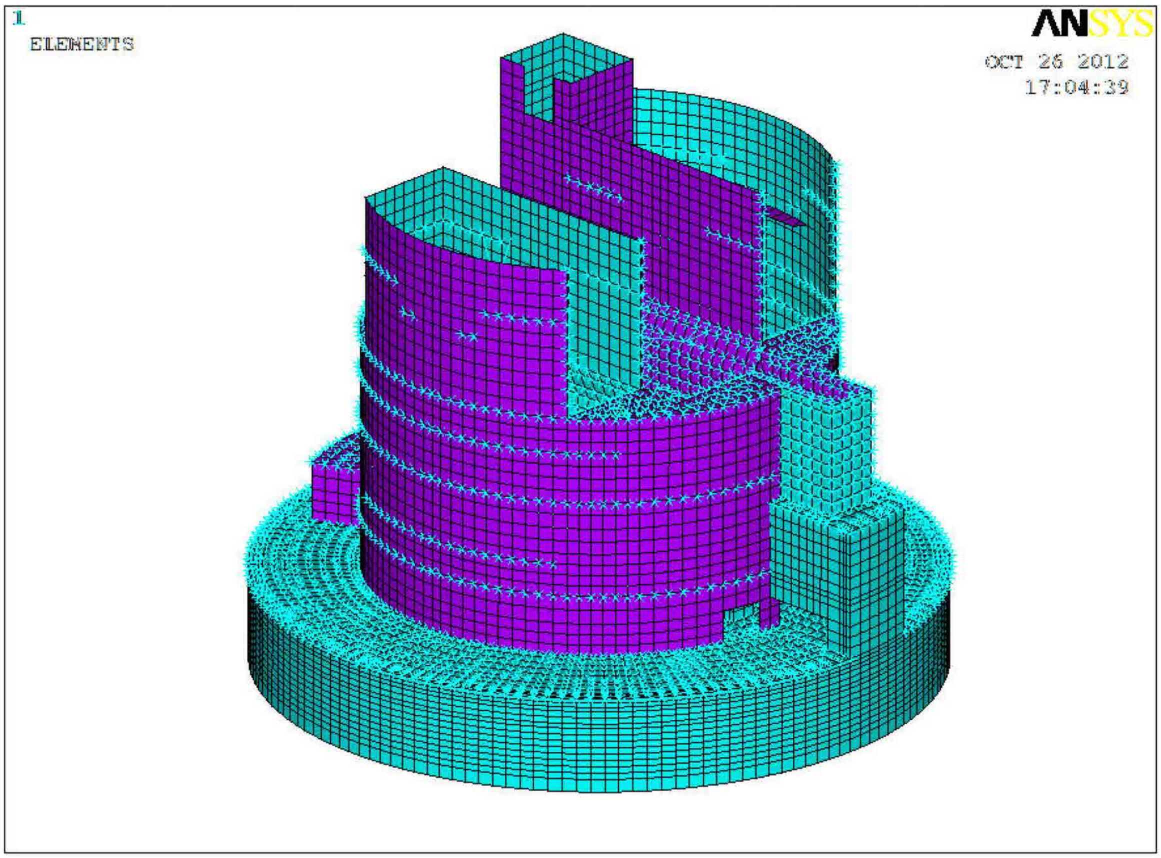
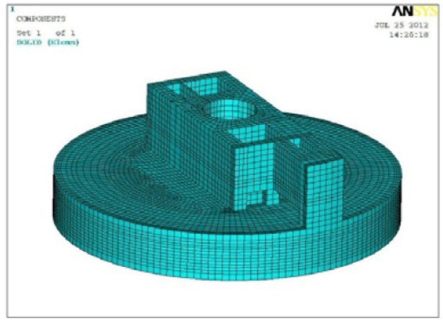
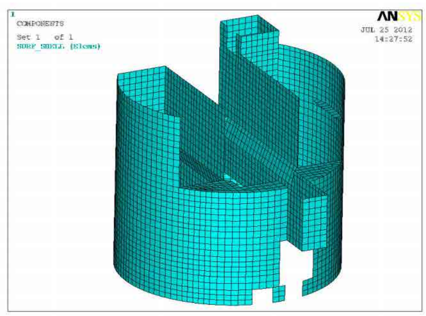


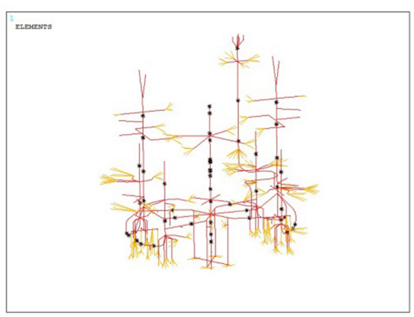
Figure 3.8A-19 Full FE Model for the RCB Internal Structure



(a) Solid Element Model (PSW, IRWST, and Fill Concrete)



(b) Shell Element Model (SSW)



(c) Beam Element Model (RCS)

Figure 3.8A-20 Solid, Shell, and Beam Element Model for RCB Internal Structure

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Figure 3.8A-21 Location of Critical Sections of the AB at El. 100′-0″

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.8A-22 Location of Critical Sections of the AB at El. 120′-0″

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.8A-23 Location of Critical Sections of the AB at El. 137′-6″

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.8A-24 Location of Critical Sections of the AB at El. 156′-0″

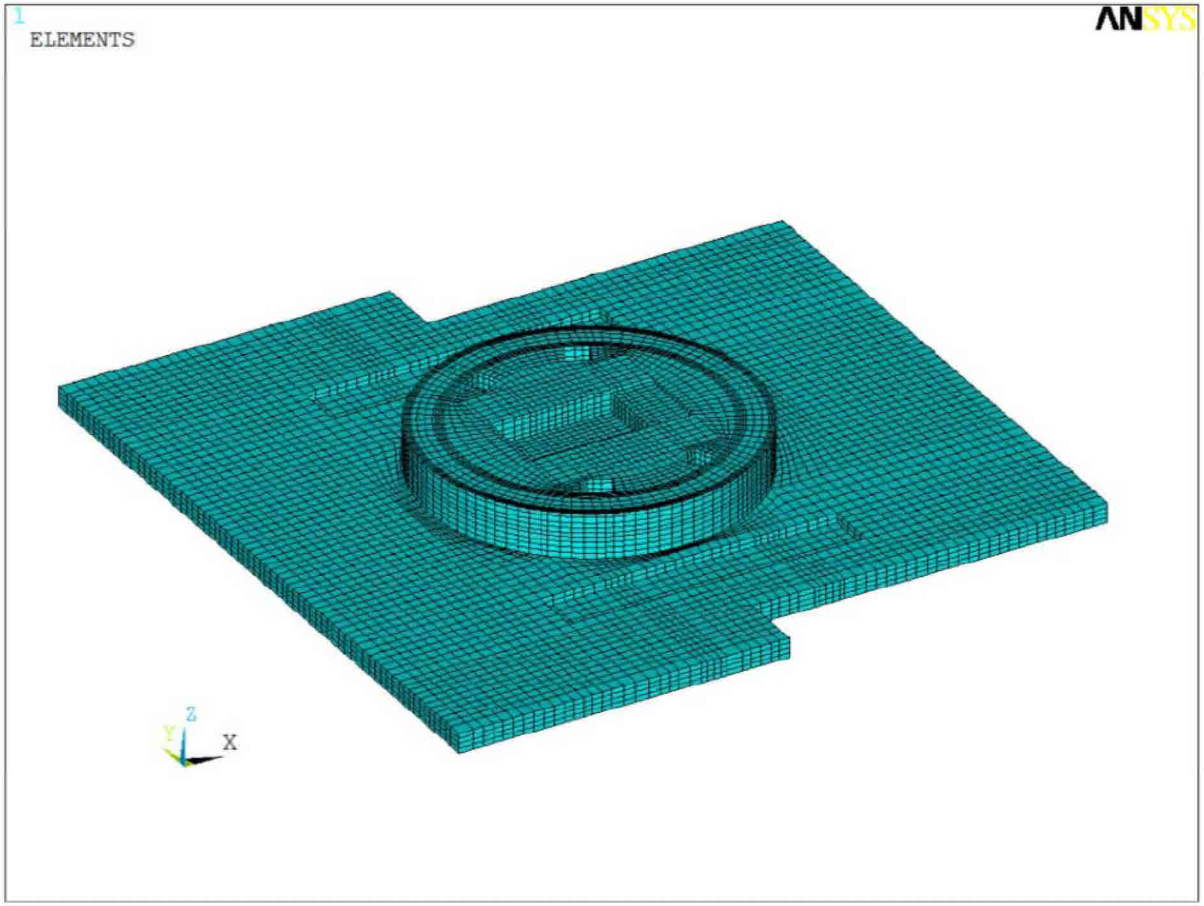


Figure 3.8A-25 Solid Element Model of NI Common Basemat

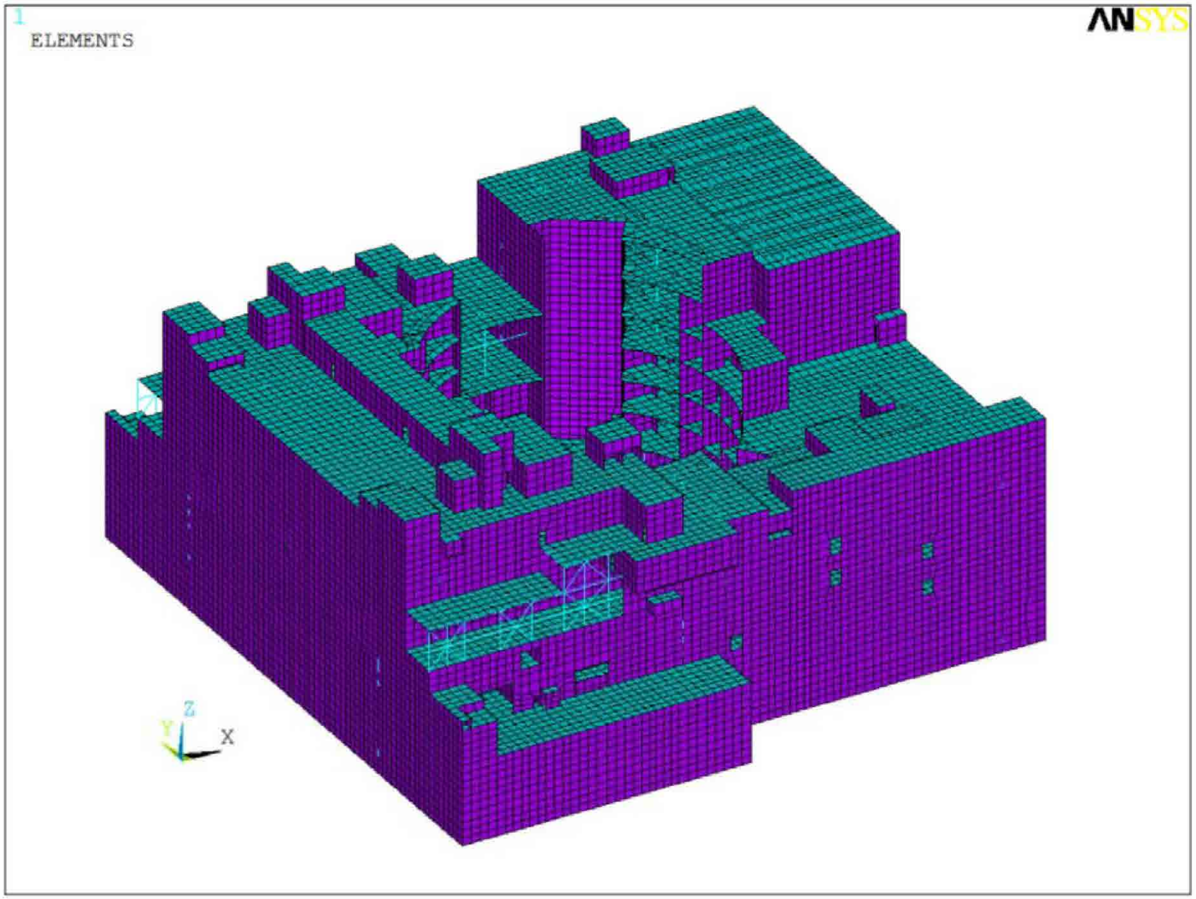


Figure 3.8A-26 3-D View of FE Model for AB Superstructure

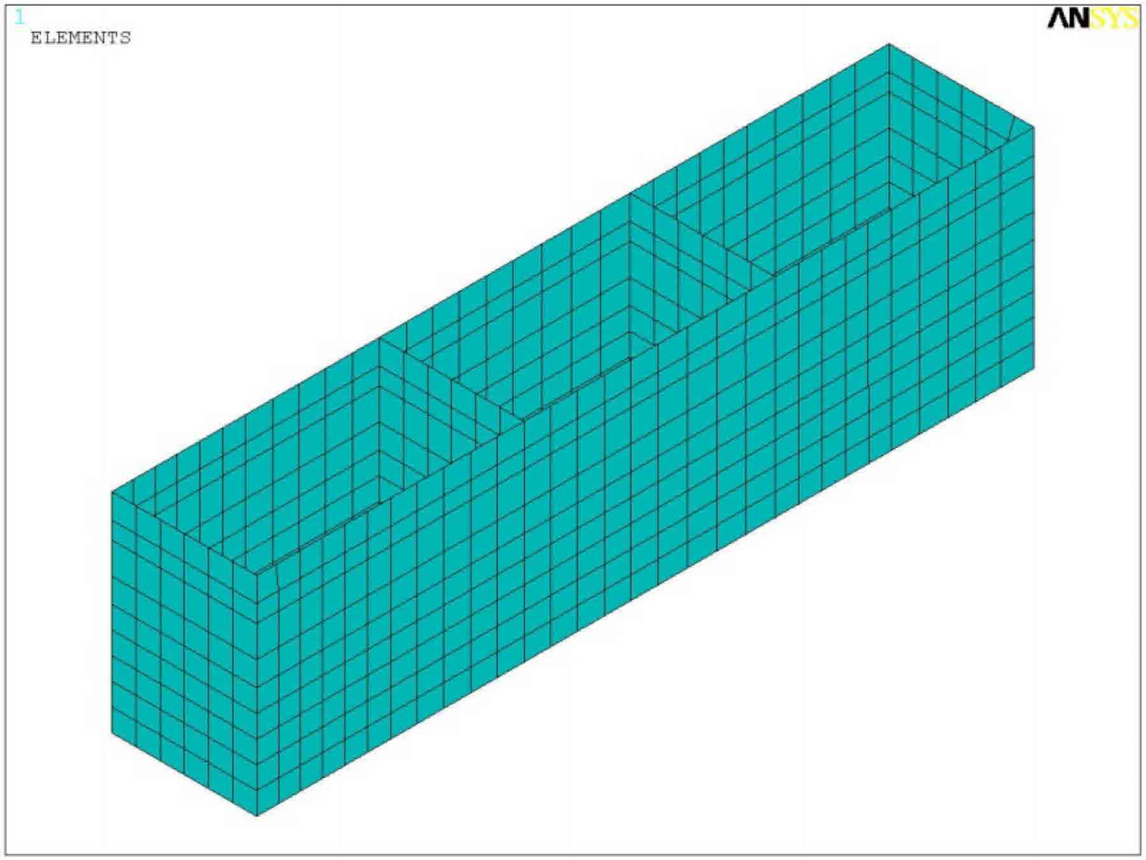


Figure 3.8A-27 Components of FE Model for Rectangular AFW Tank in AB

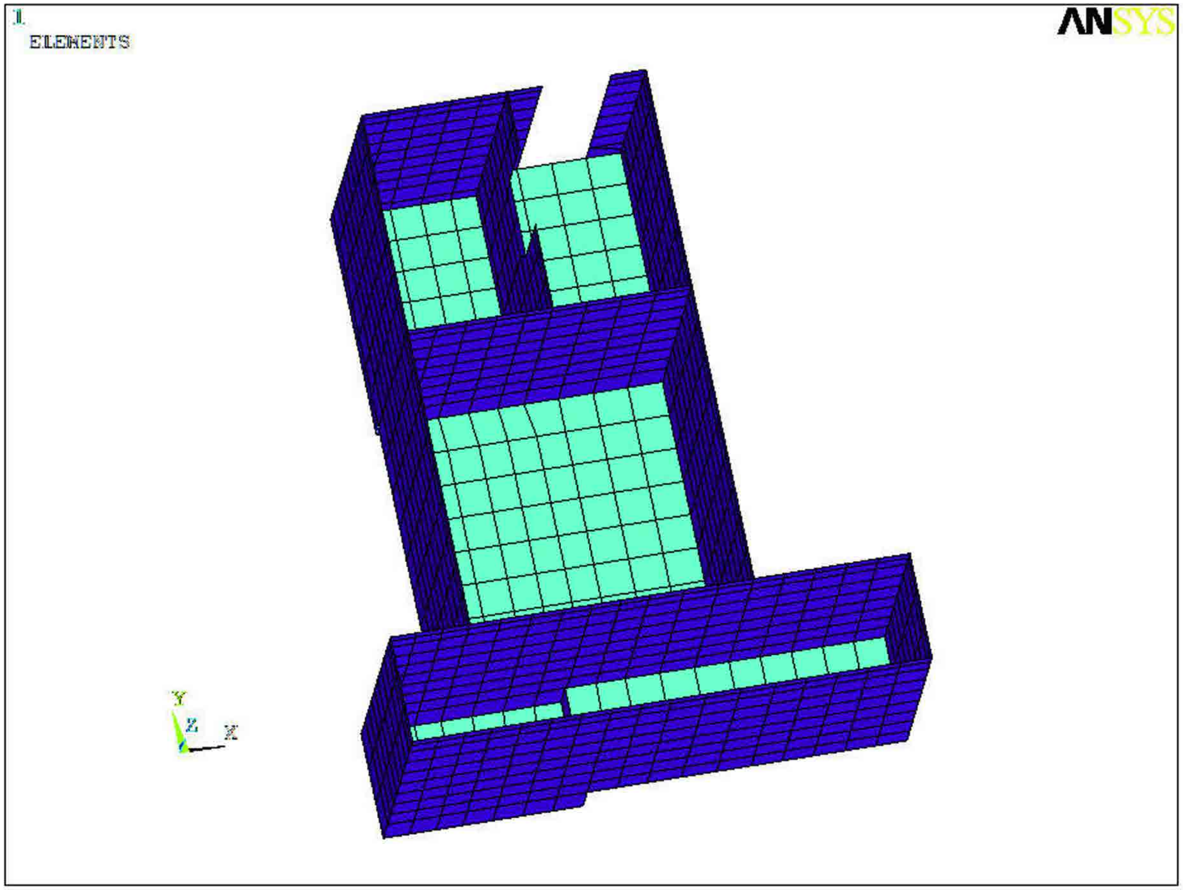


Figure 3.8A-28 Partial FE Model for FHA Pools in AB

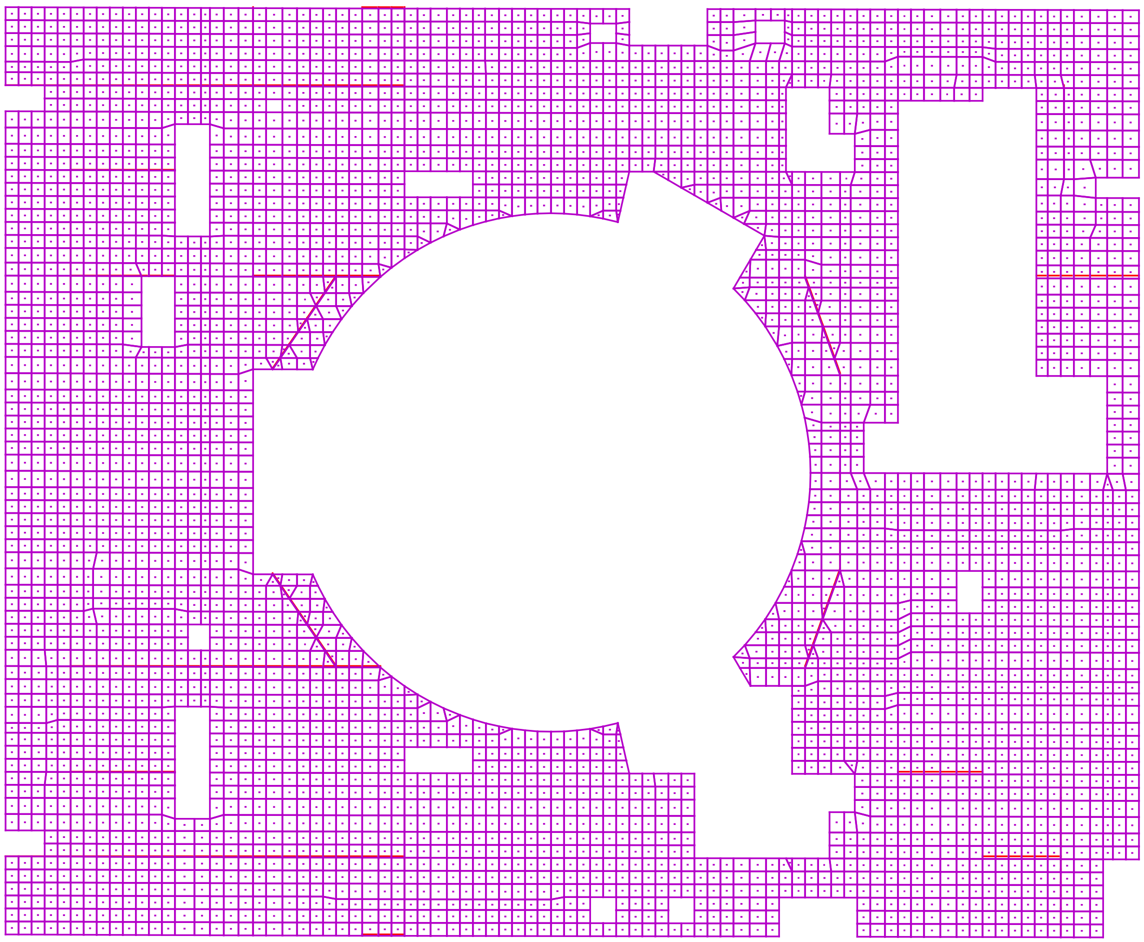


Figure 3.8A-29 FE Model for AB Slab Design at El. 157′-6″

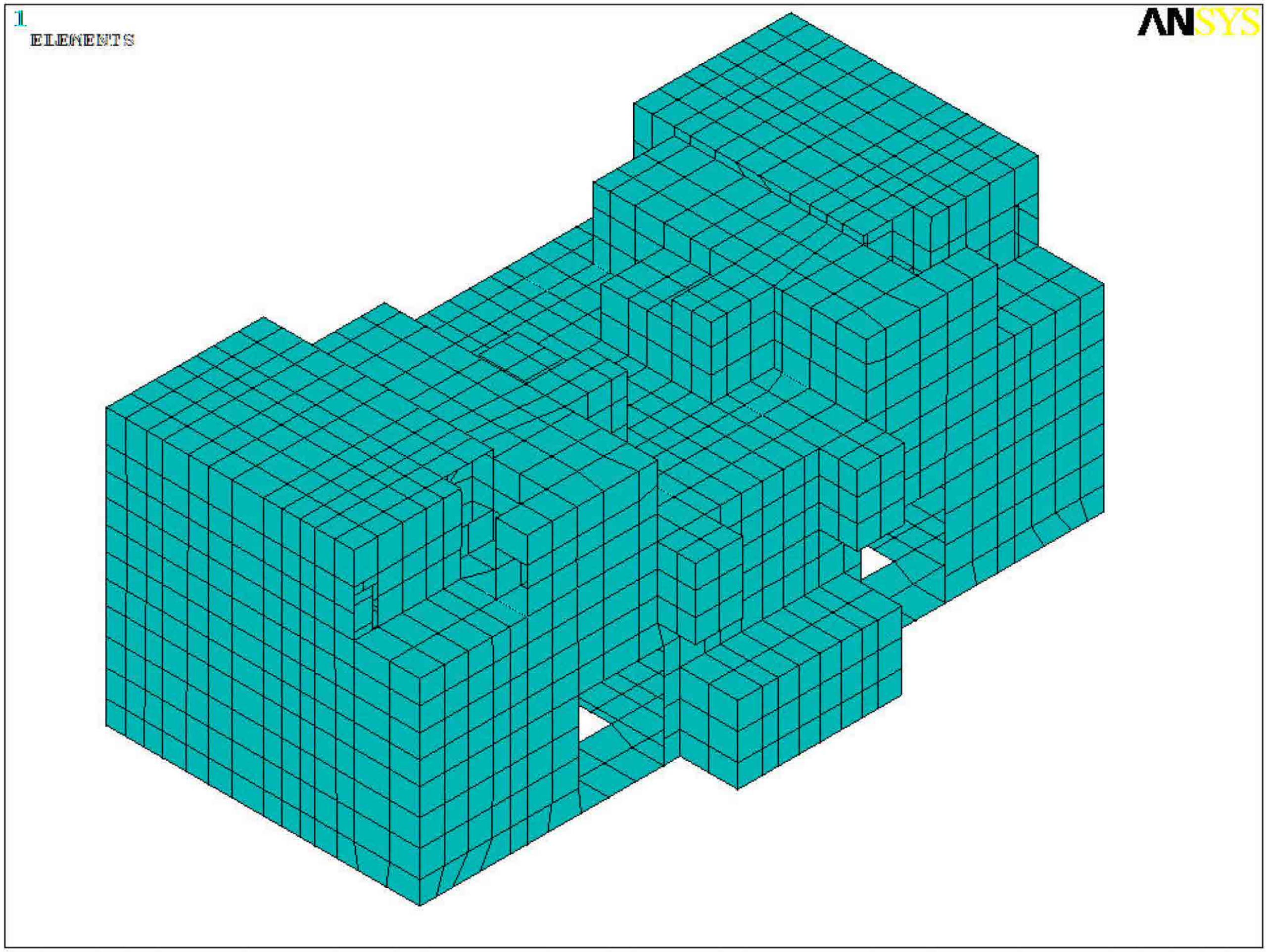


Figure 3.8A-30 Full FE Model for the EDG Building

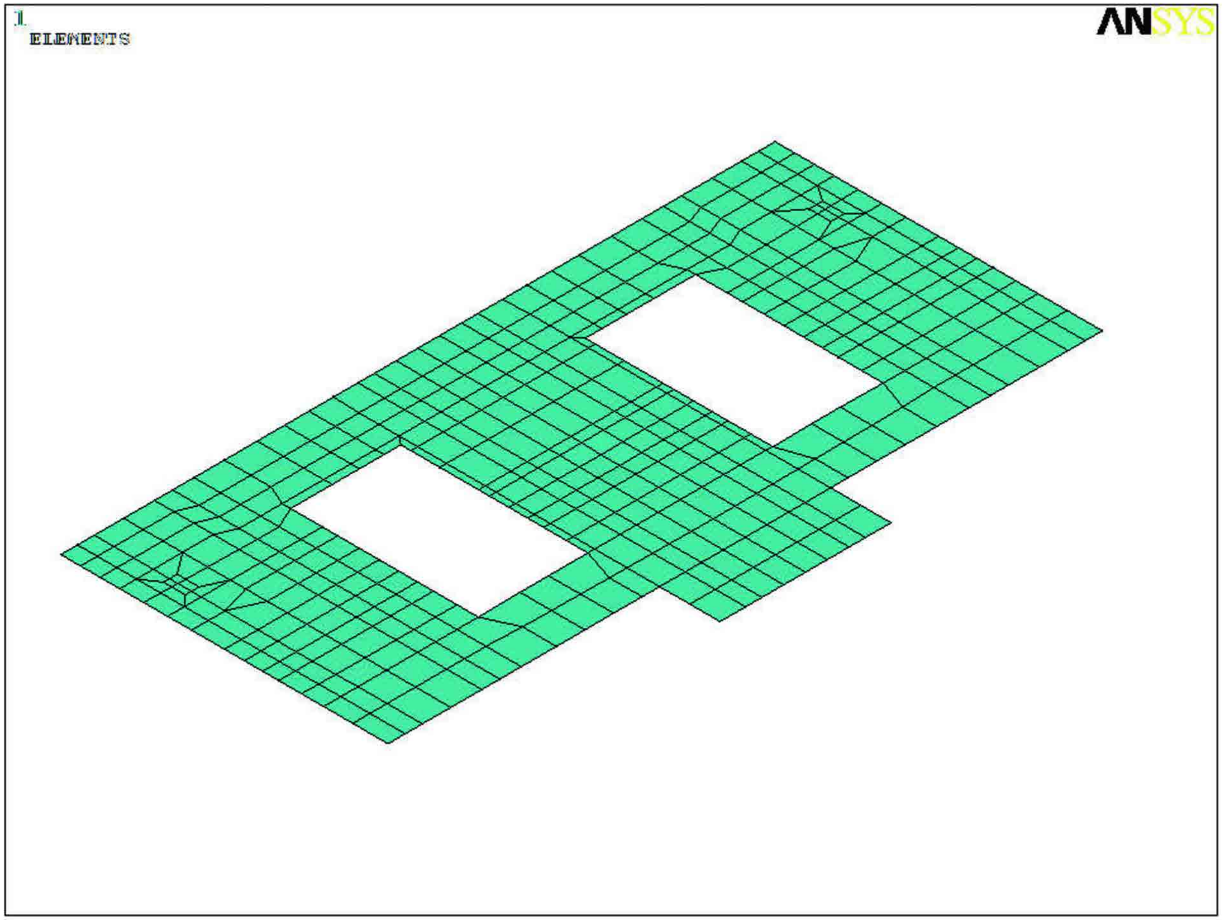


Figure 3.8A-31 FE Model for the EDG Building Basemat

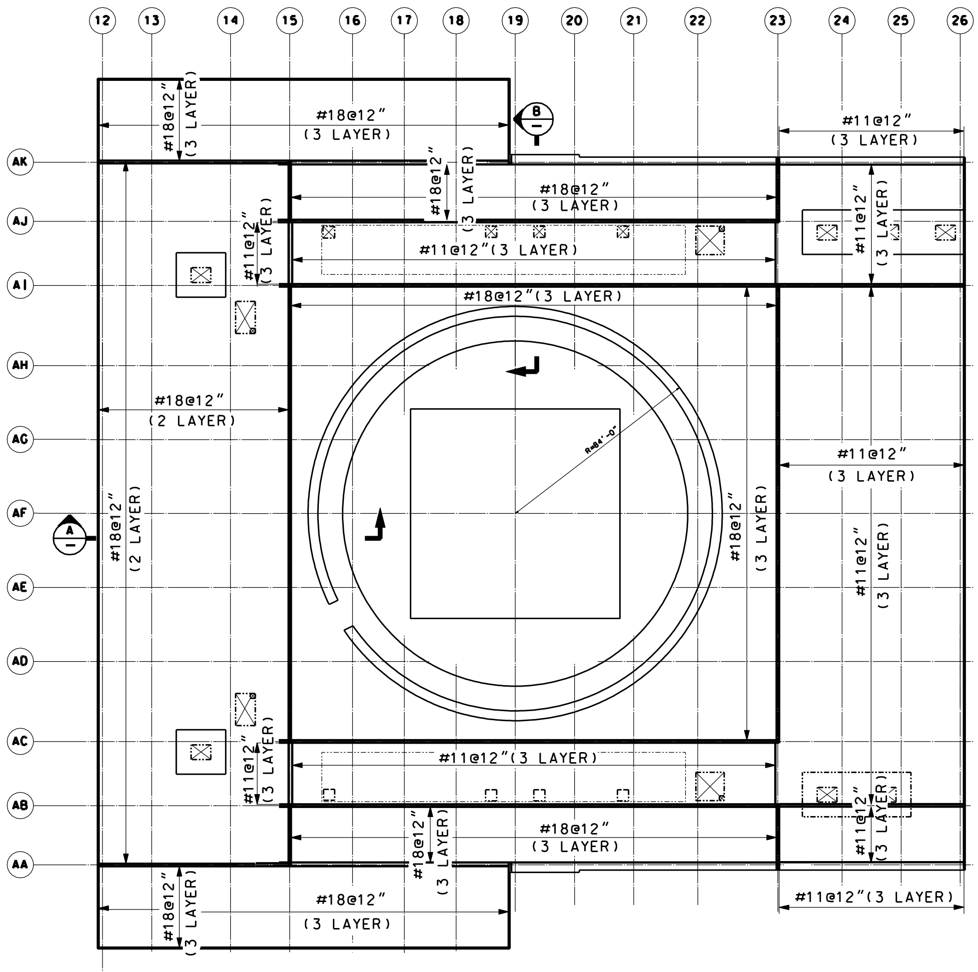


Figure 3.8A-32 Reinforcement Arrangement of the AB Basemat

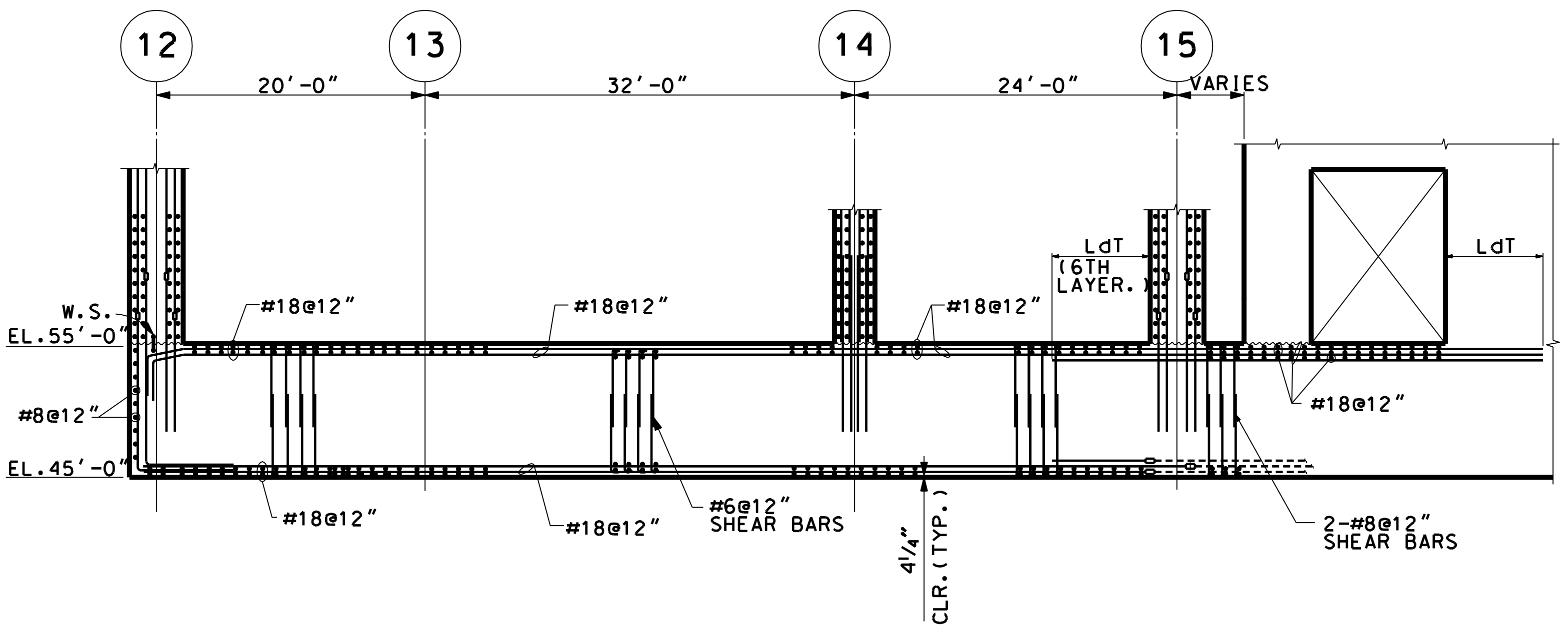


Figure 3.8A-33 Typical Reinforcement of the AB Basemat (Section A)

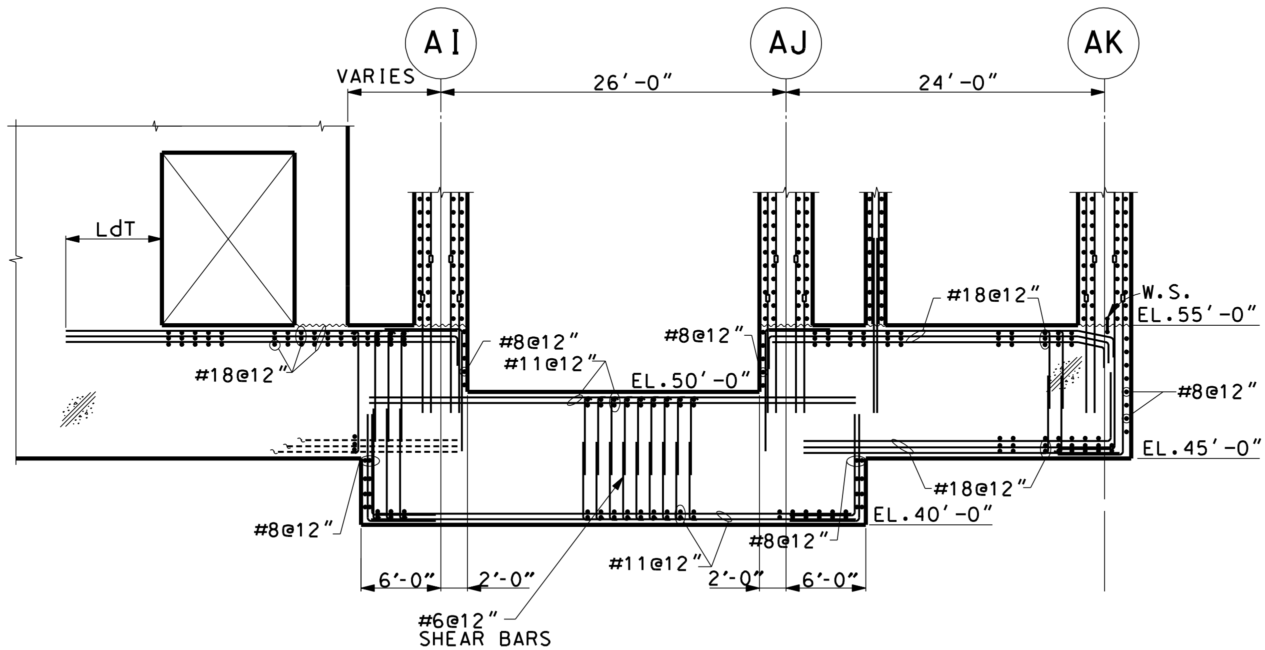
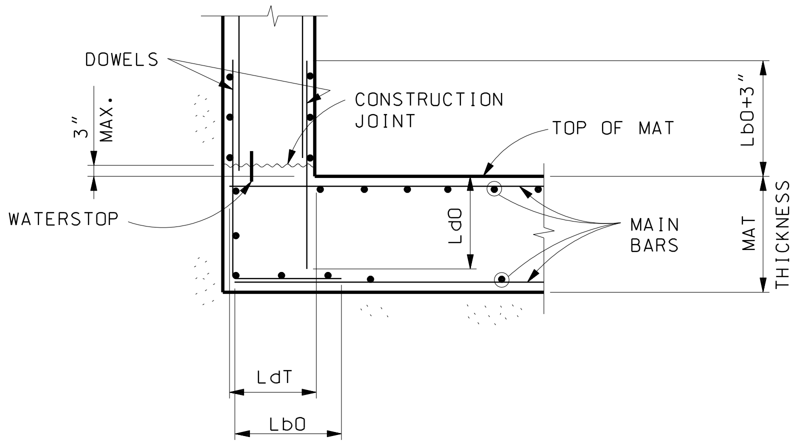
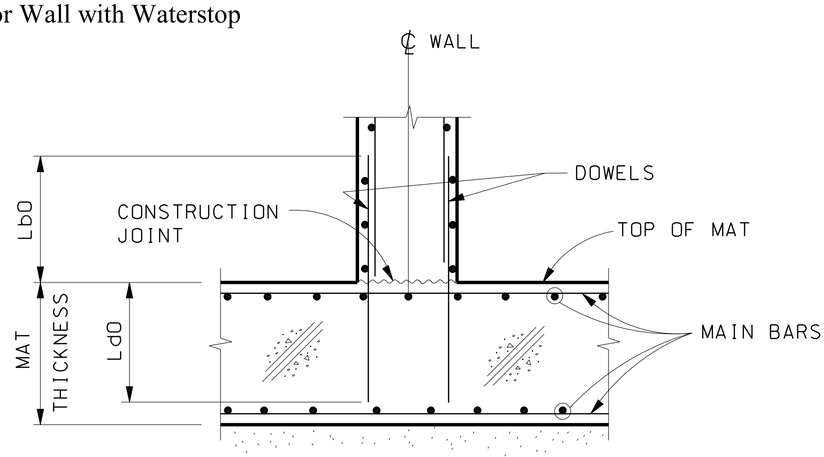


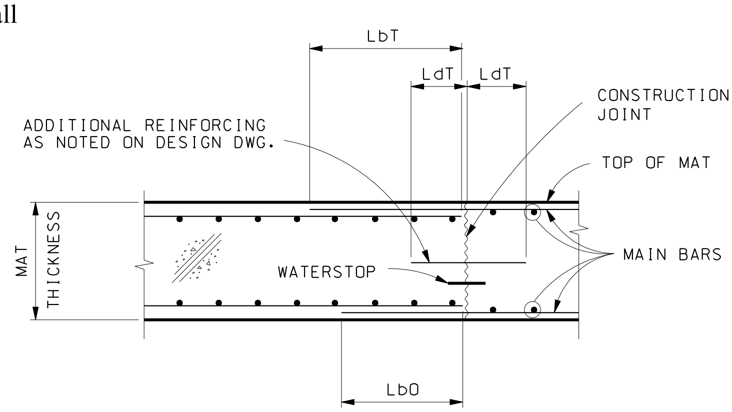
Figure 3.8A-34 Typical Reinforcement of the AB Basemat (Section B)



(28) Exterior Wall with Waterstop



(29) Interior Wall



(30) Typical Construction Joint

Note: L_{dT} - development length for top horizontal bar
(reinforcement location factor = 1.3, ACI 349 12.2.4)
L_{bT} - lap splice length for top horizontal bar
L_{dO} - development length for other bars
L_{bO} - lap splice length for other bars

Figure 3.8A-35 Typical Reinforcement Details of Basemat

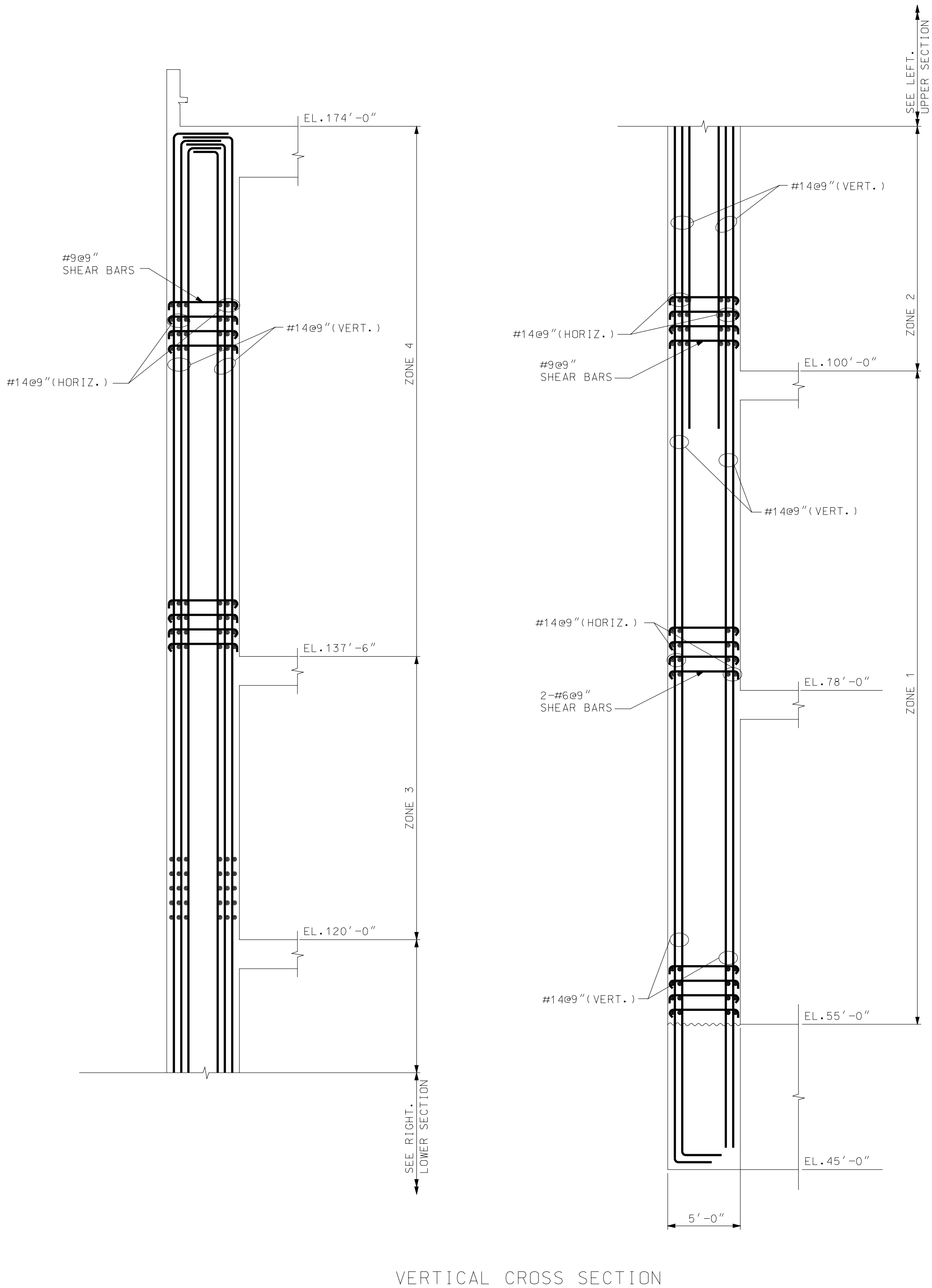
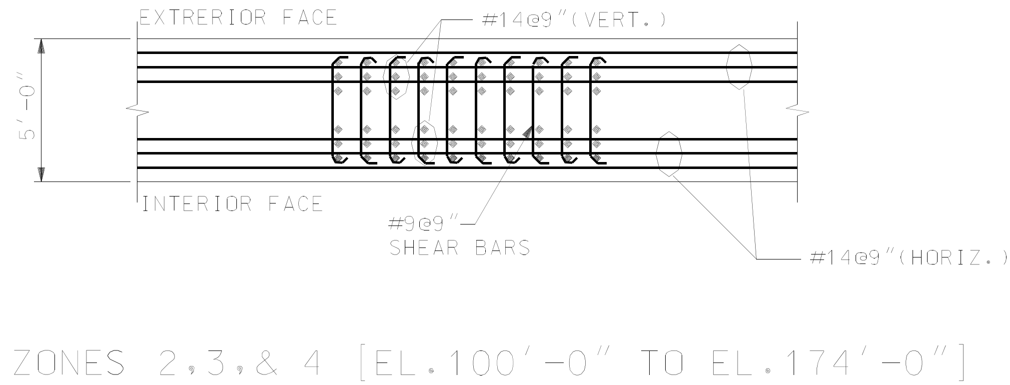
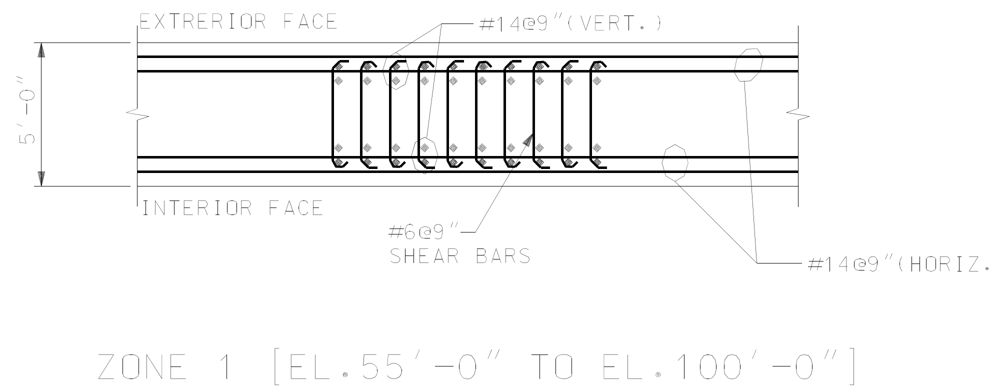


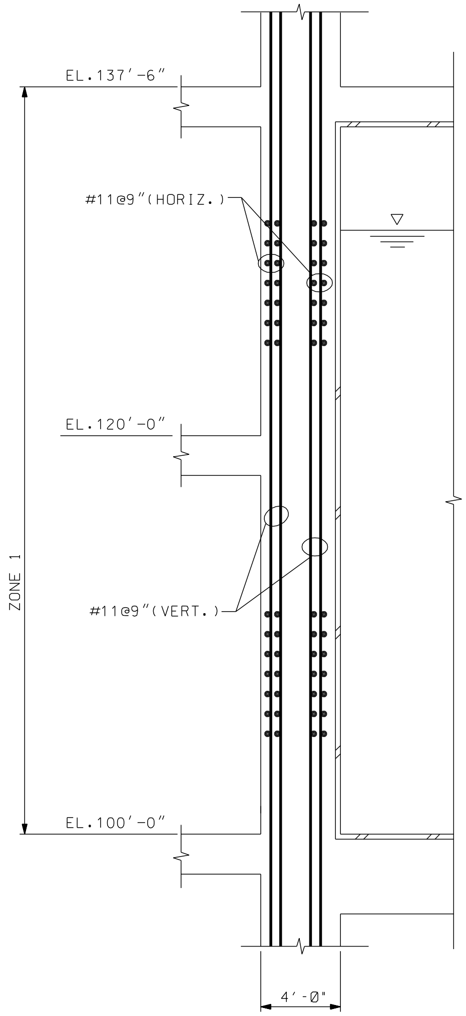
Figure 3.8A-36 Reinforcement Arrangement of the AB MSIV House Wall (Section 1)



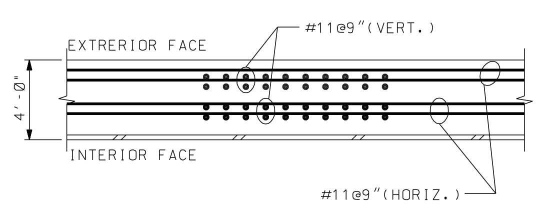


HORIZONTAL CROSS SECTION

Figure 3.8A-37 Reinforcement Arrangement of the AB MSIV House Wall (Section 2)



VERTICAL CROSS SECTION



ZONE 1 [EL.100'-0" TO EL.137'-6"]

HORIZONTAL CROSS SECTION

Figure 3.8A-38 Reinforcement Arrangement of the AB AFWST Wall

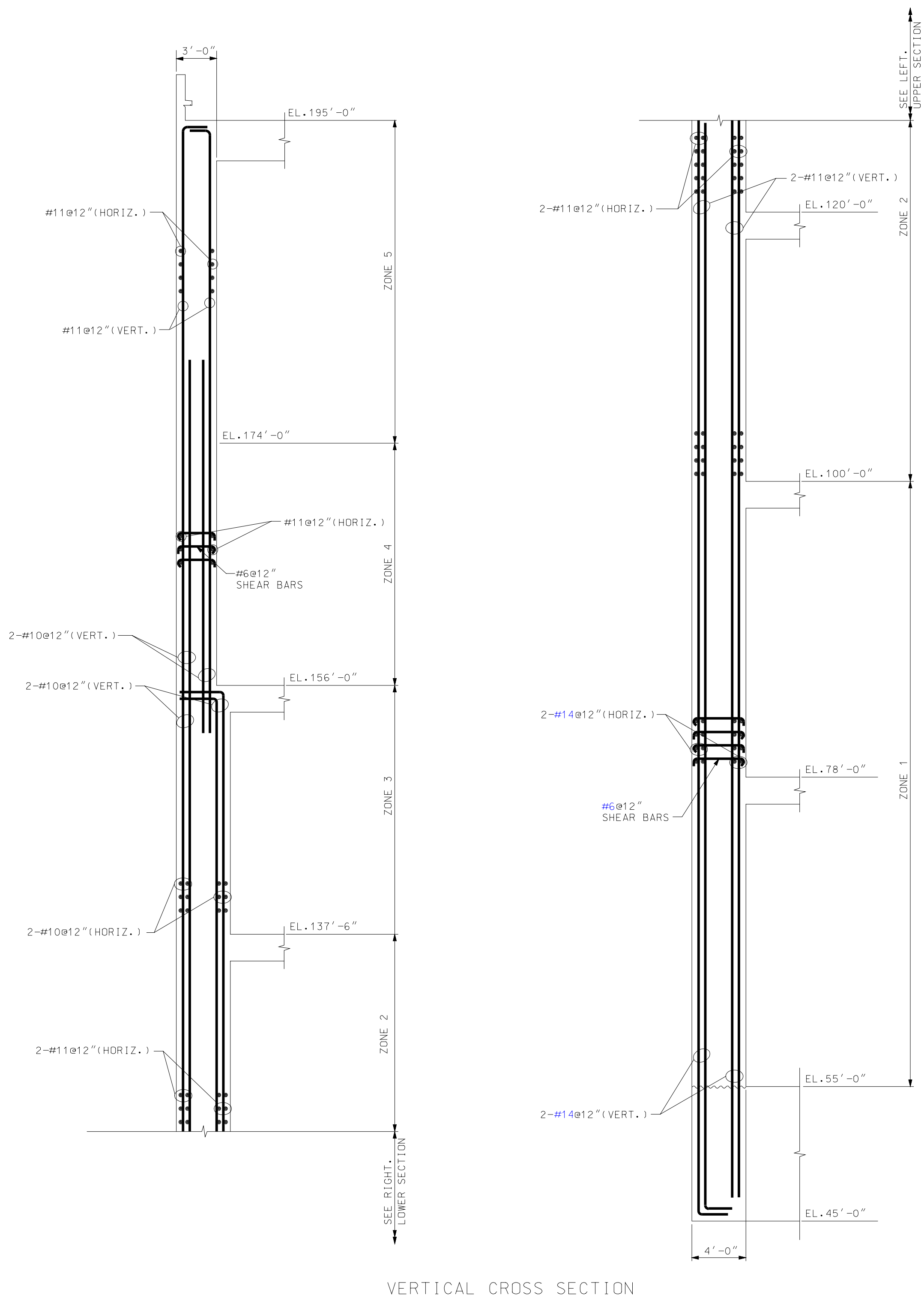


Figure 3.8A-39 Reinforcement Arrangement of the AB MCR Wall (Section 1)

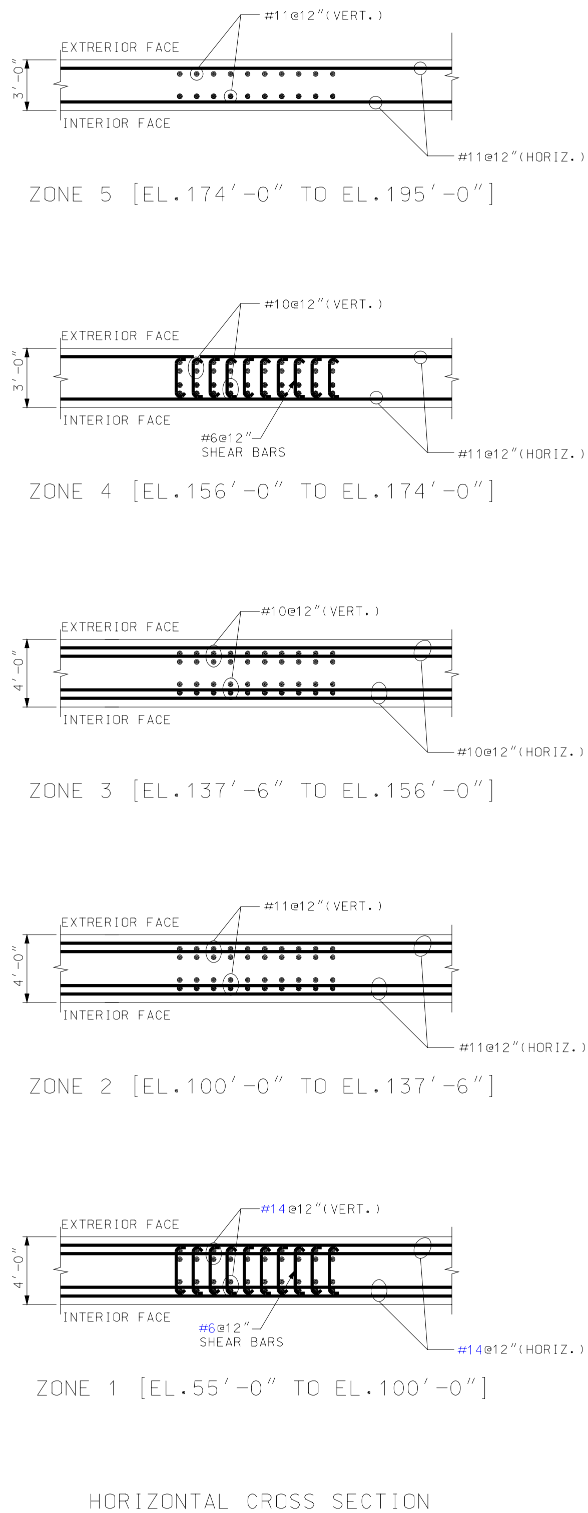


Figure 3.8A-40 Reinforcement Arrangement of the AB MCR Wall (Section 2)

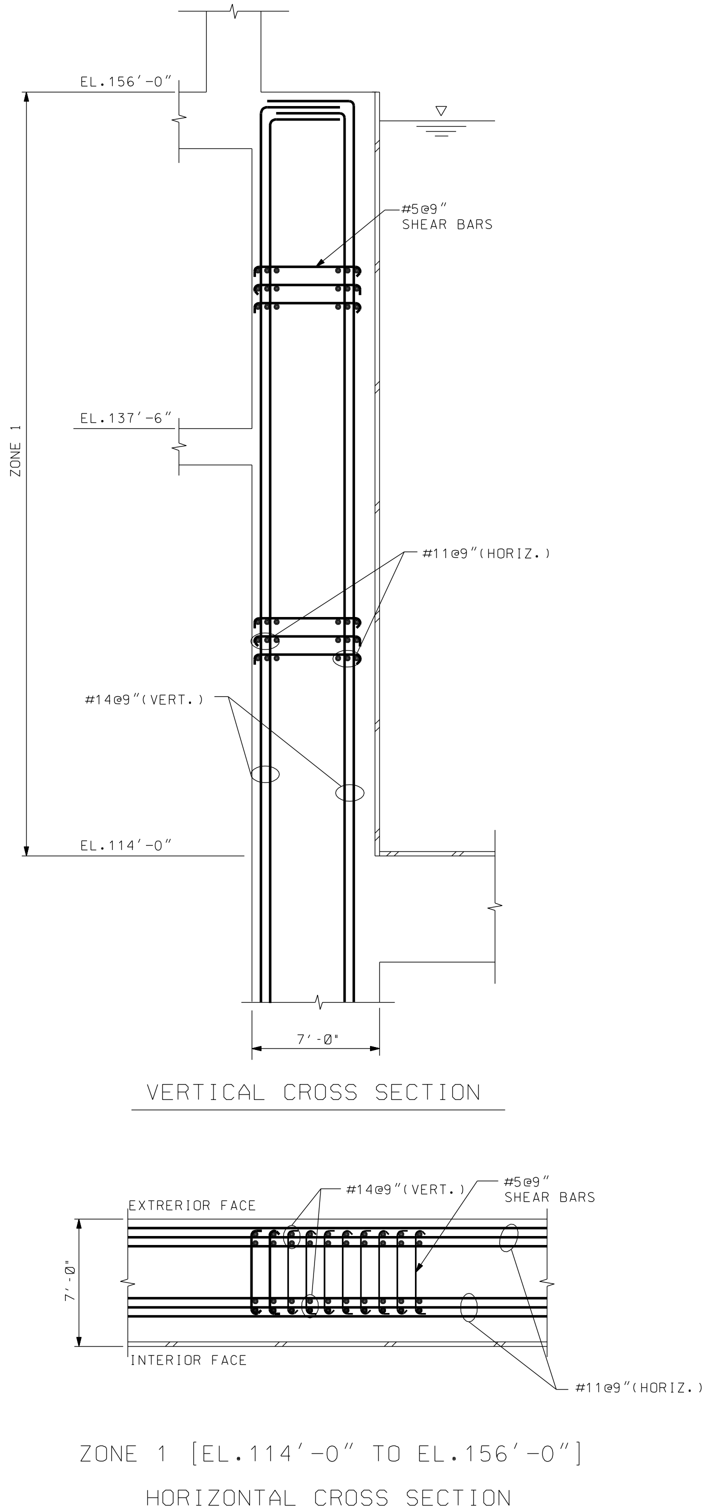


Figure 3.8A-41 Reinforcement Arrangement of the AB SFP Wall

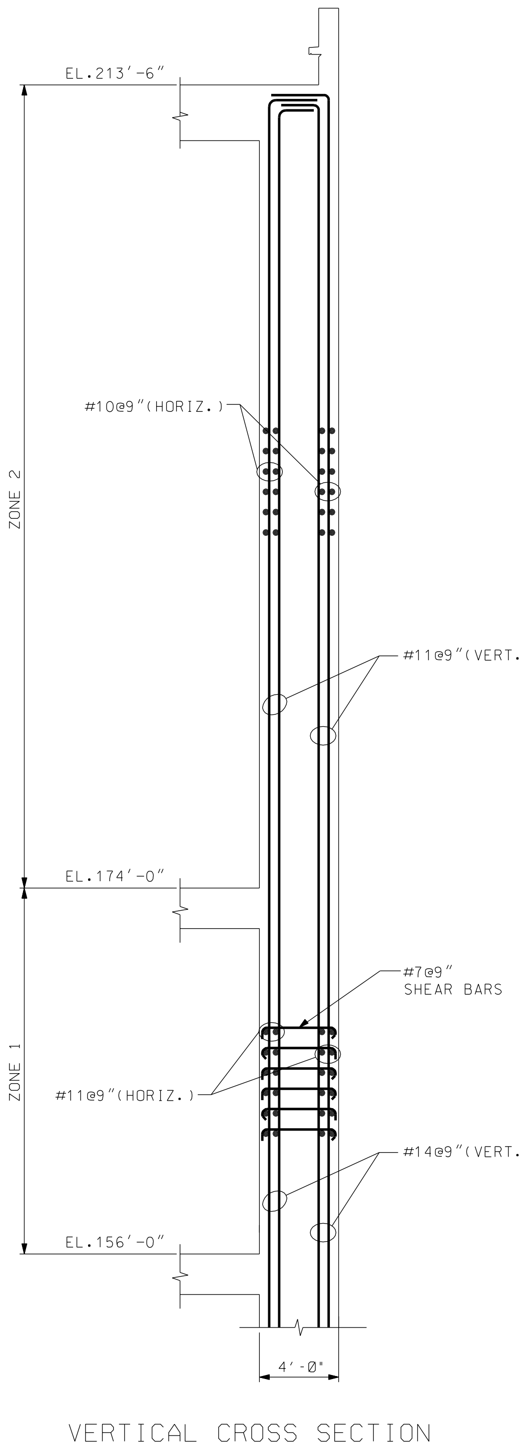


Figure 3.8A-42 Reinforcement Arrangement of the AB FHA Wall (Section 1)

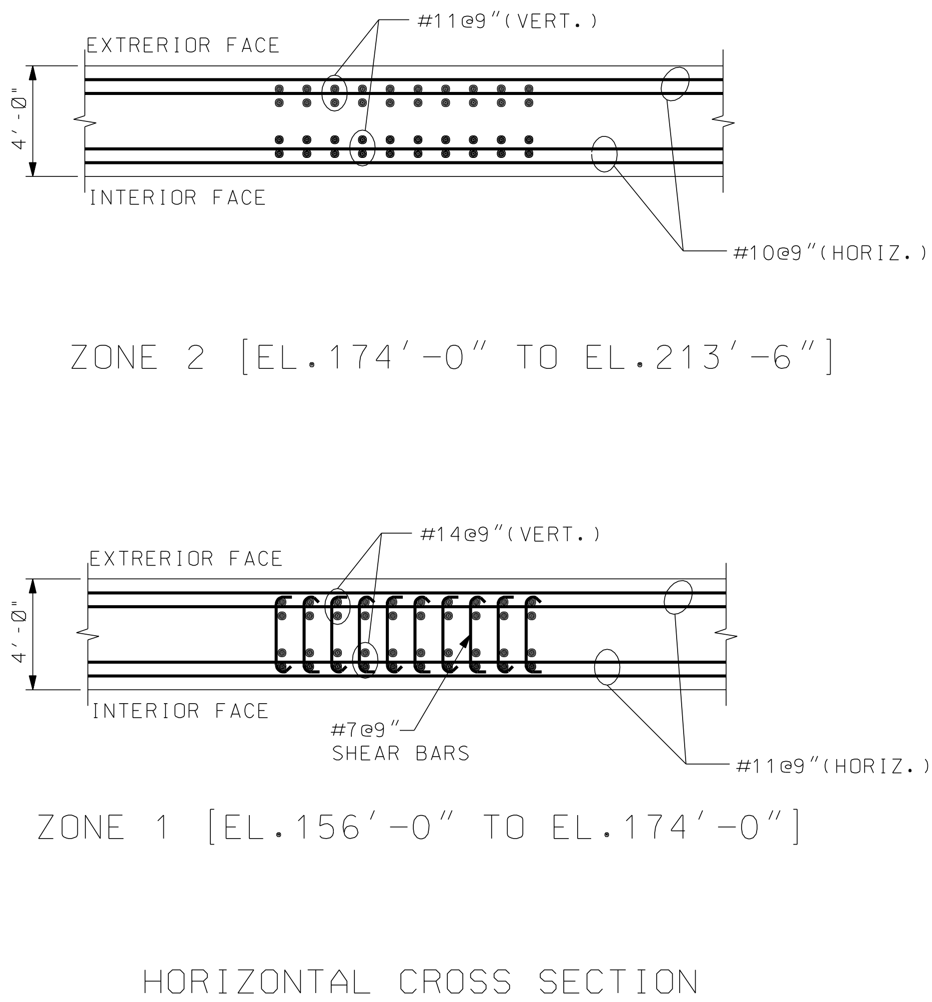
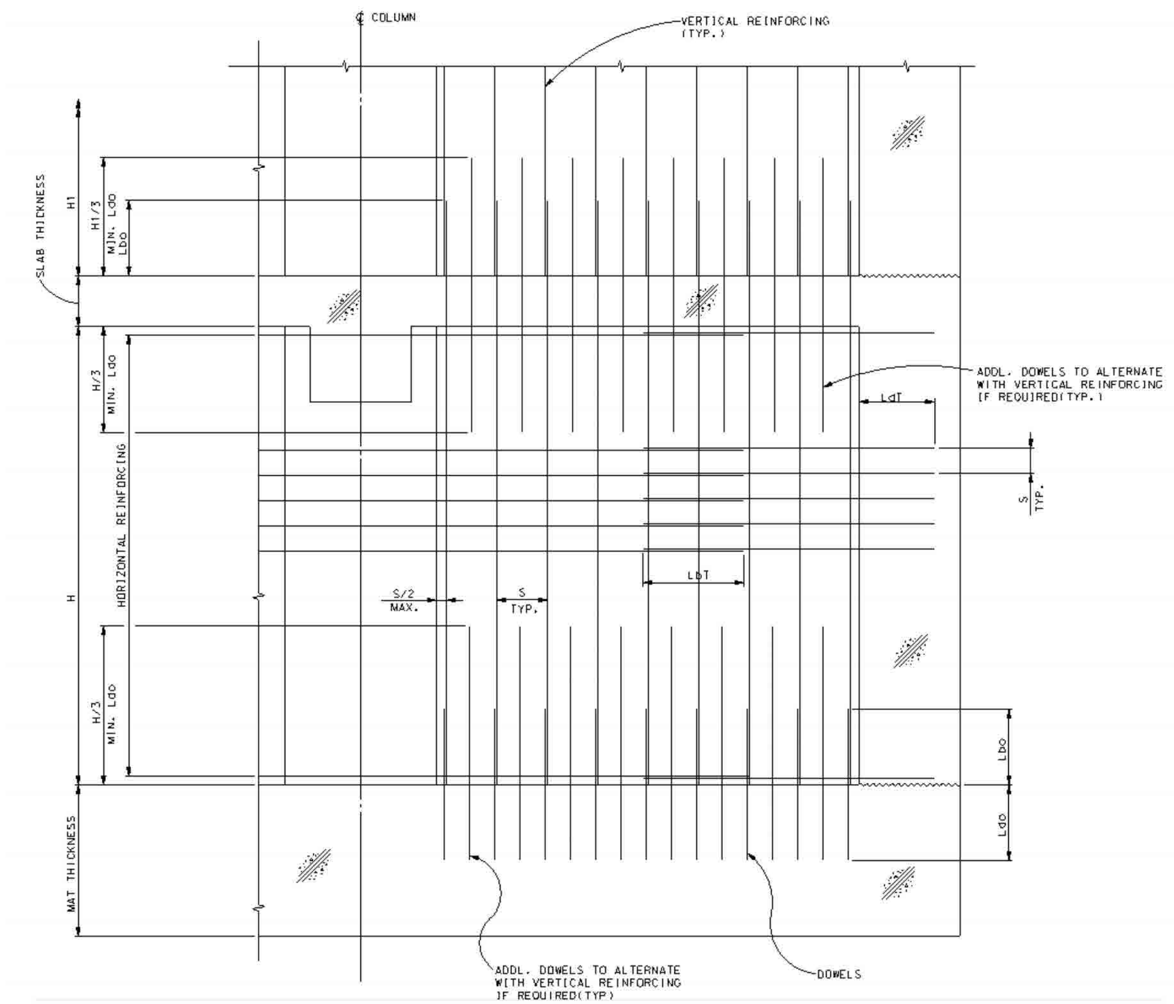


Figure 3.8A-43 Reinforcement Arrangement of the AB FHA Wall (Section 2)



Note: L_{dT} - development length for top horizontal bar
(reinforcement location factor = 1.3, ACI 349 12.2.4)
L_{bT} - lap splice length for top horizontal bar
L_{dO} - development length for other bars
L_{bO} - lap splice length for other bars

Figure 3.8A-44 Typical Shear Wall Reinforcement Arrangement Detail

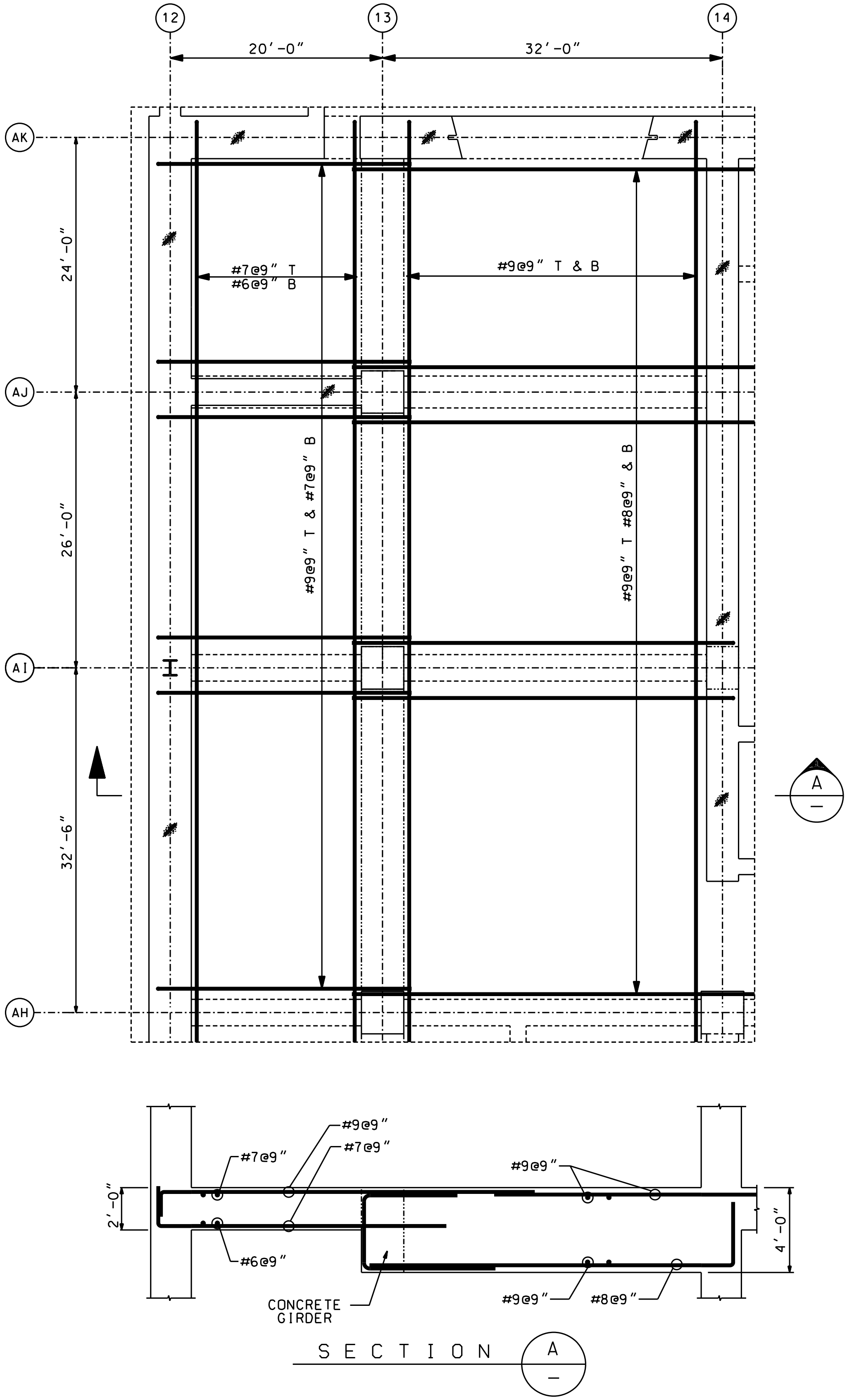


Figure 3.8A-45 Slab Reinforcements for the EDG Room in AB

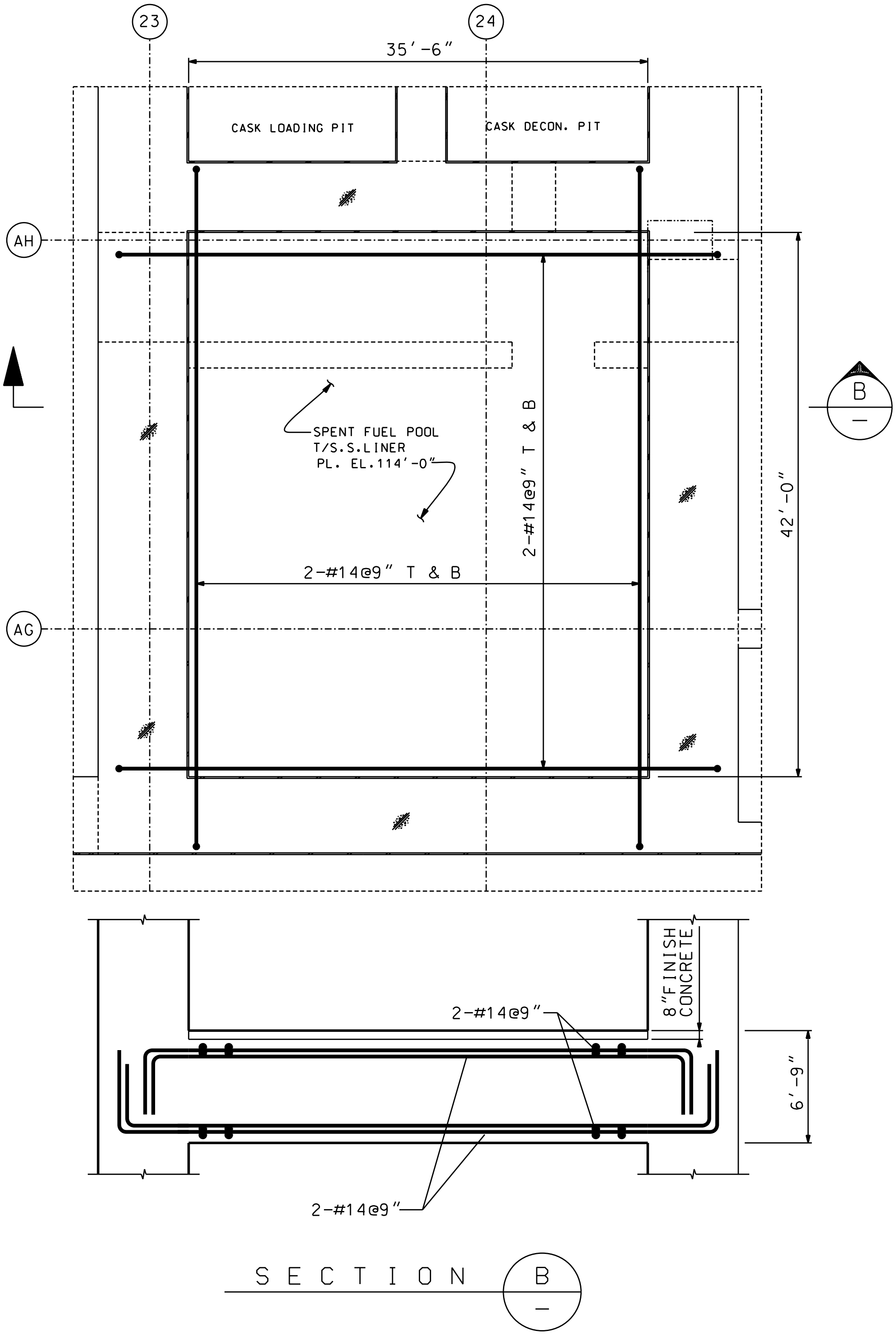


Figure 3.8A-46 Slab Reinforcements for the SFP in AB

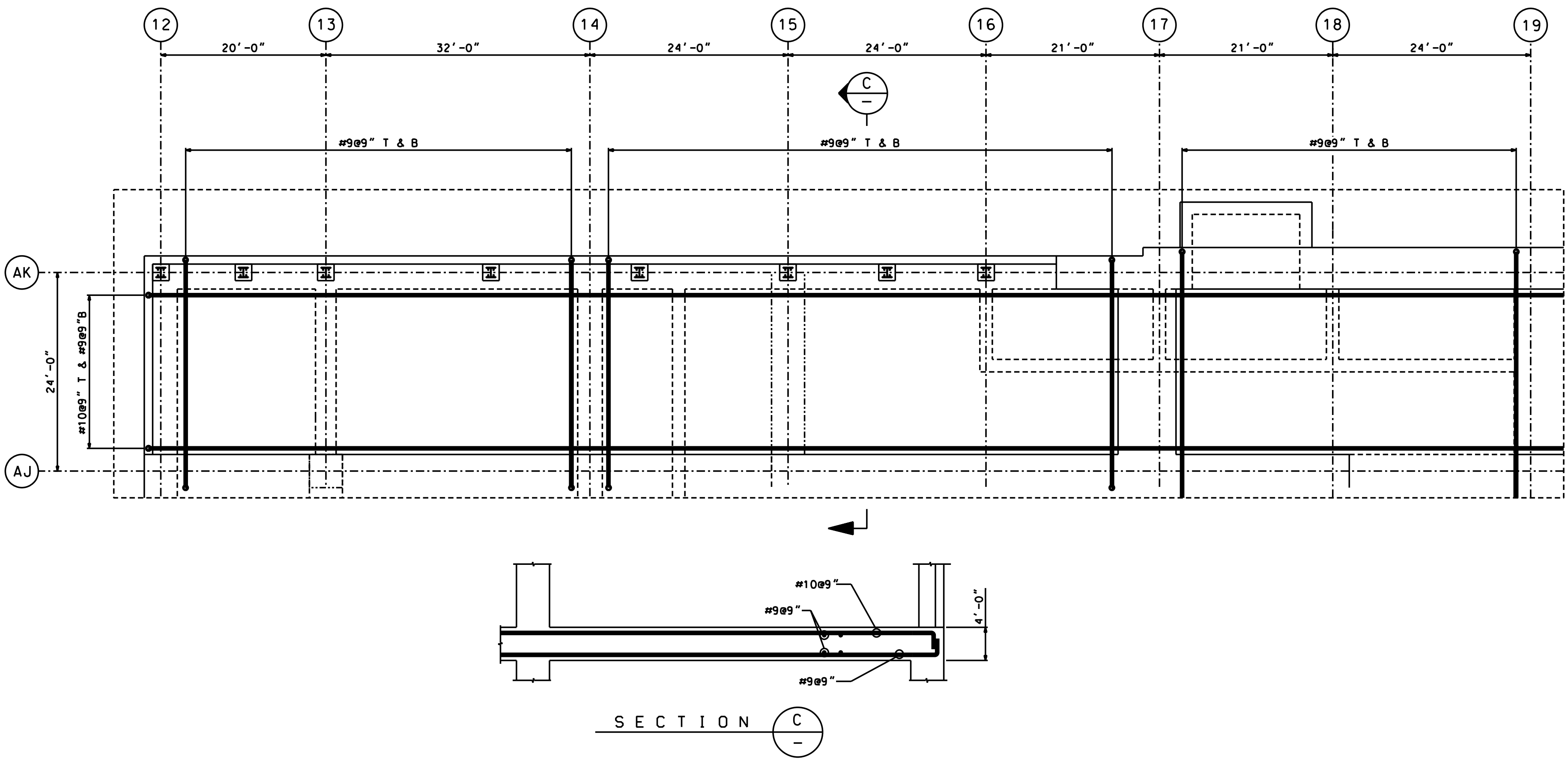
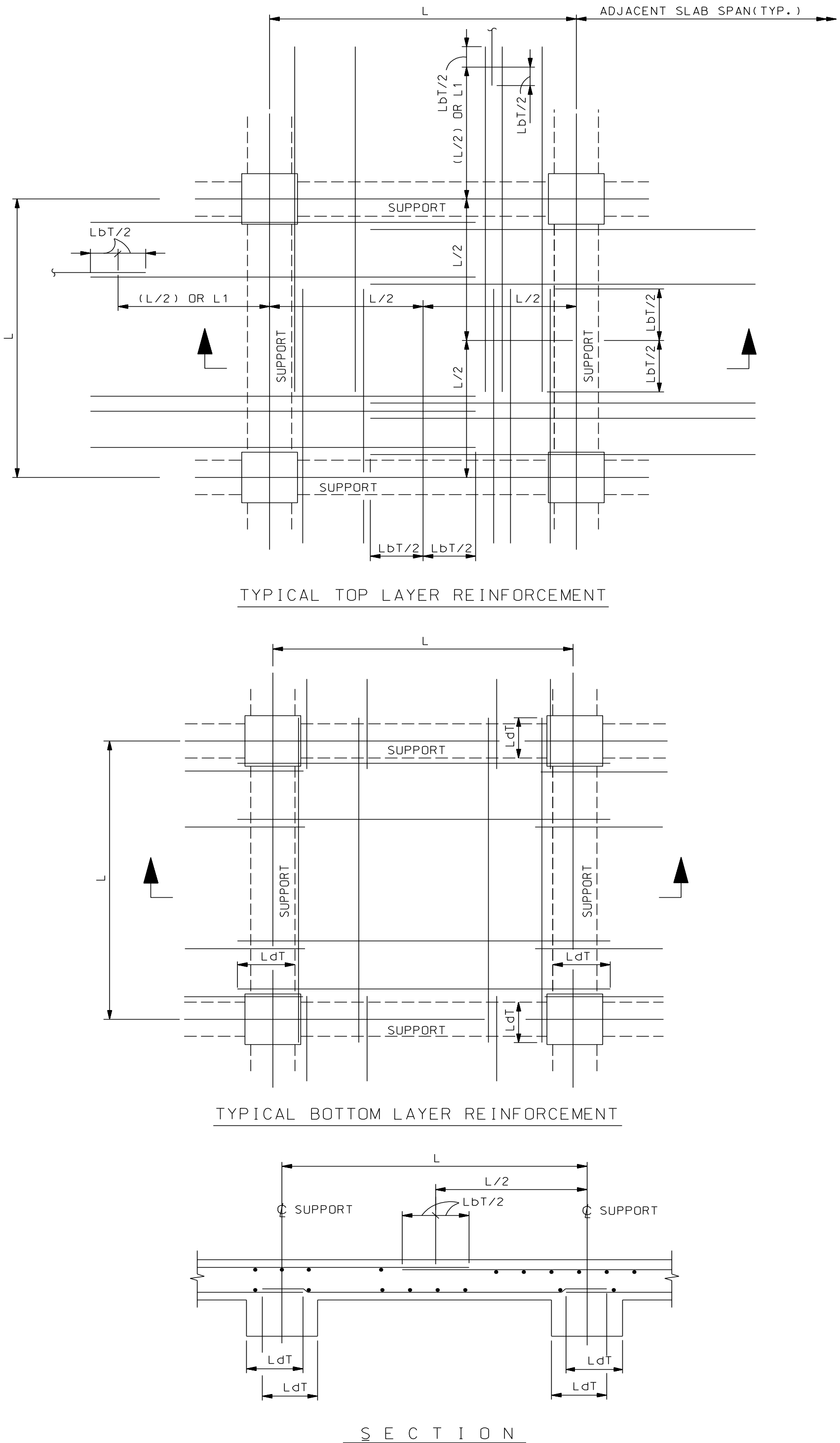


Figure 3.8A-47 Slab Reinforcements for the MSE in AB



Note: L_{dT} - development length for top horizontal bar
(reinforcement location factor = 1.3, ACI 349 12.2.4)
L_{bT} - lap splice length for top horizontal bar
L_{dO} - development length for other bars
L_{bO} - lap splice length for other bars

Figure 3.8A-48 Typical Slab Reinforcement Arrangement Data

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 3.8A-49 Location of Critical Sections of the EDG Building

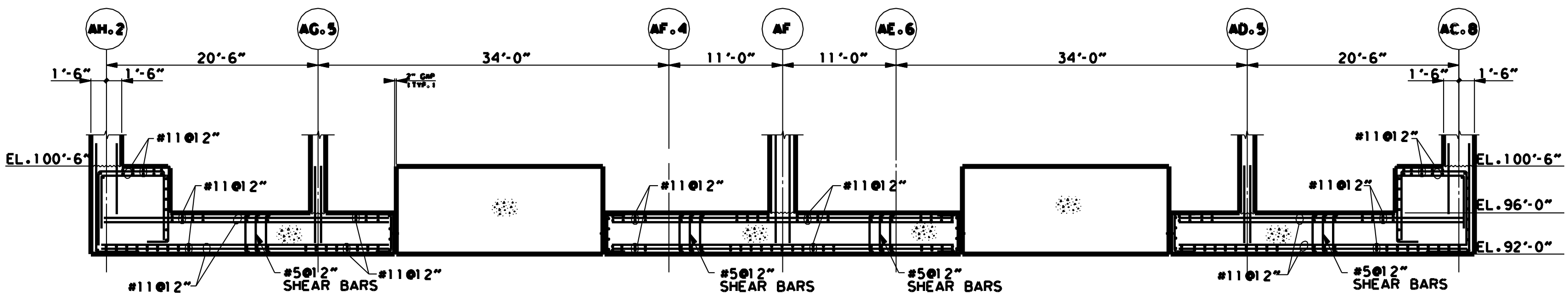


Figure 3.8A-50 Typical Reinforcement of the EDG Building Basemat

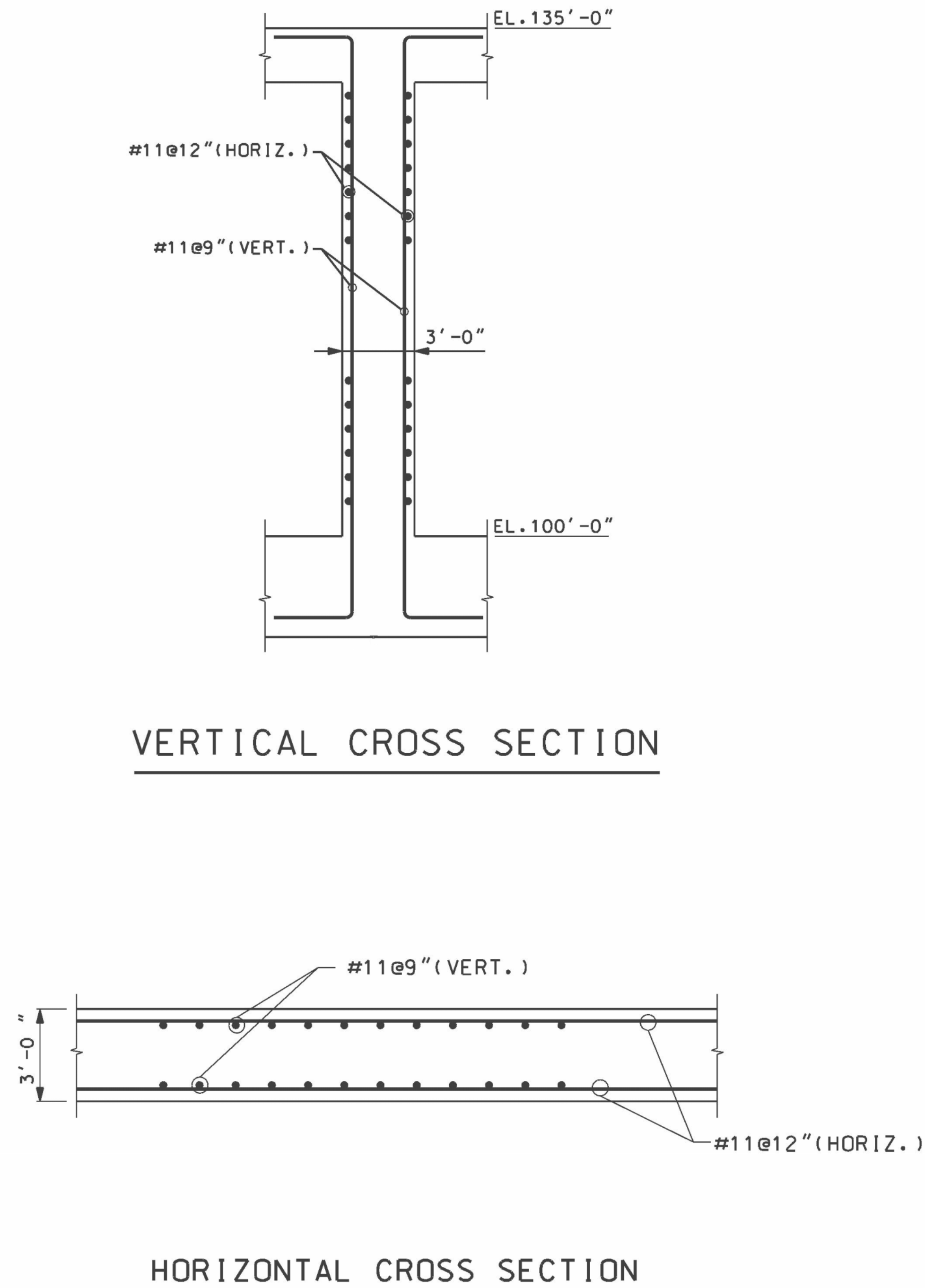


Figure 3.8A-51 Reinforcement Arrangement of Center Wall of the EDG Building

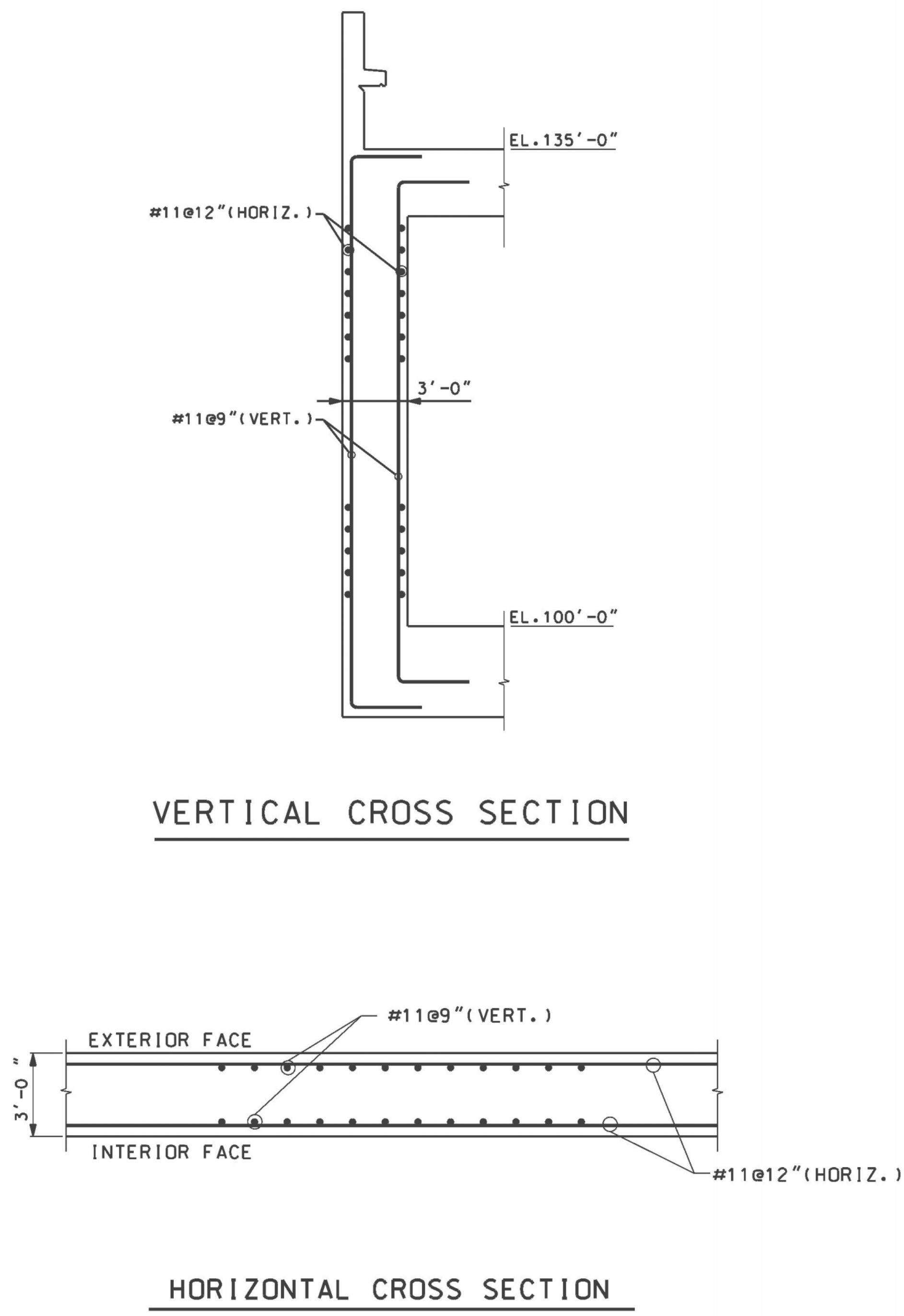


Figure 3.8A-52 Reinforcement Arrangement of the West Wall of the EDG Building

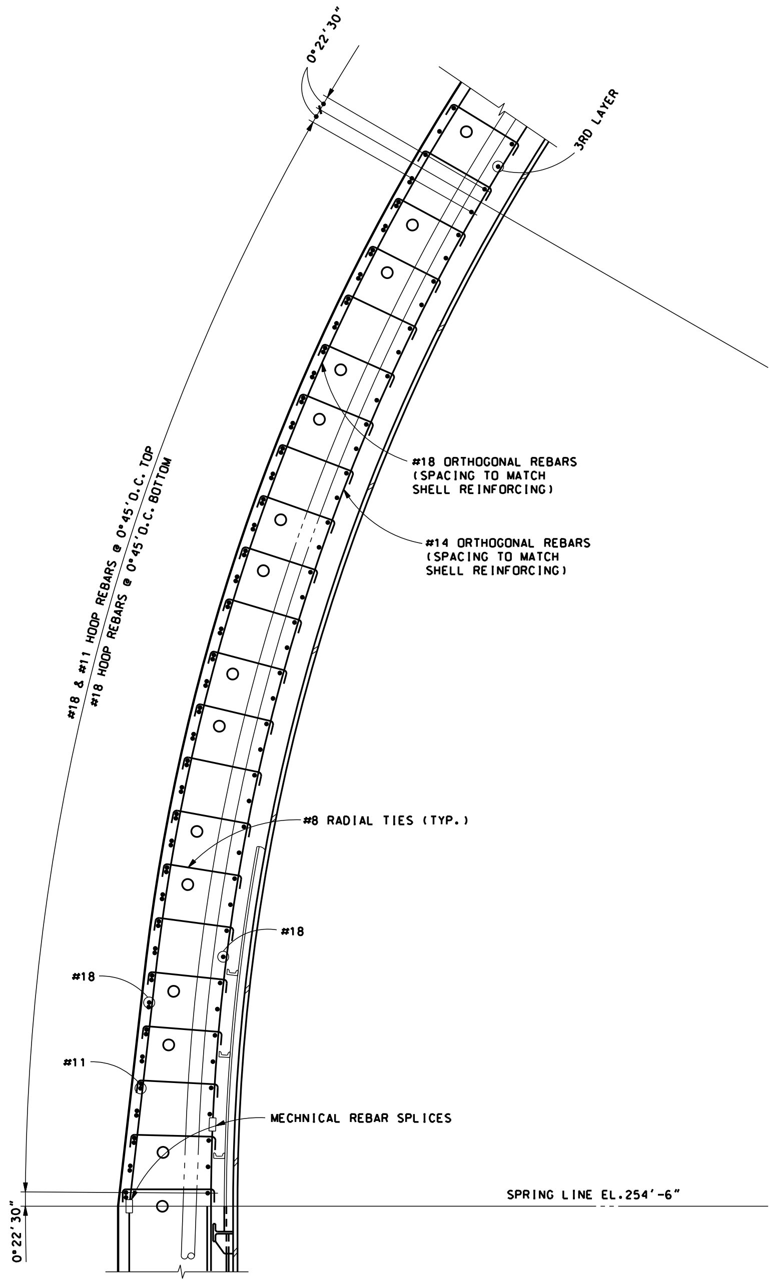


Figure 3.8A-53 Rebar Arrangement of Containment Dome

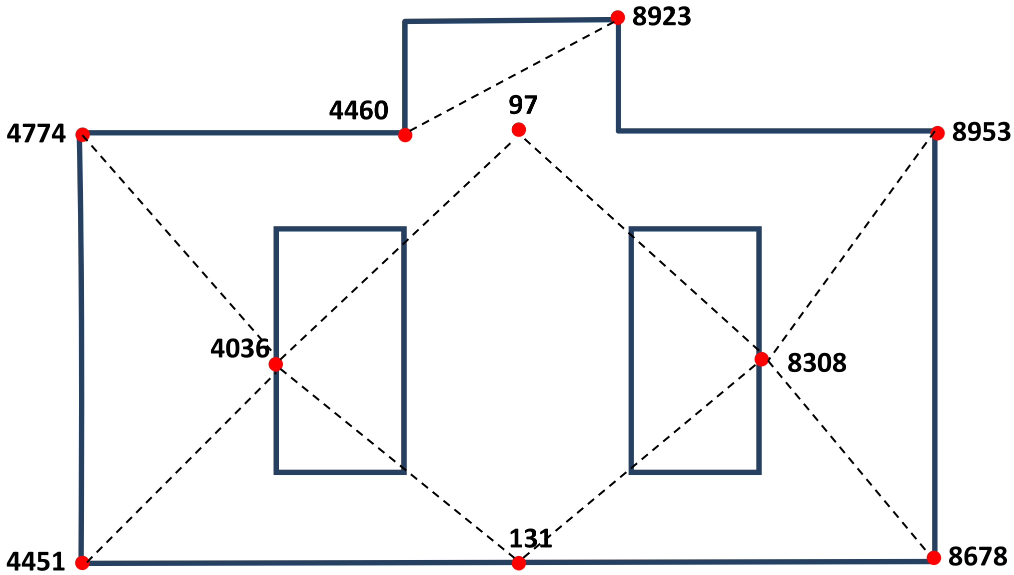


Figure 3.8A-54 Node Locations at EDG Basemat for Checking Settlements (Static)

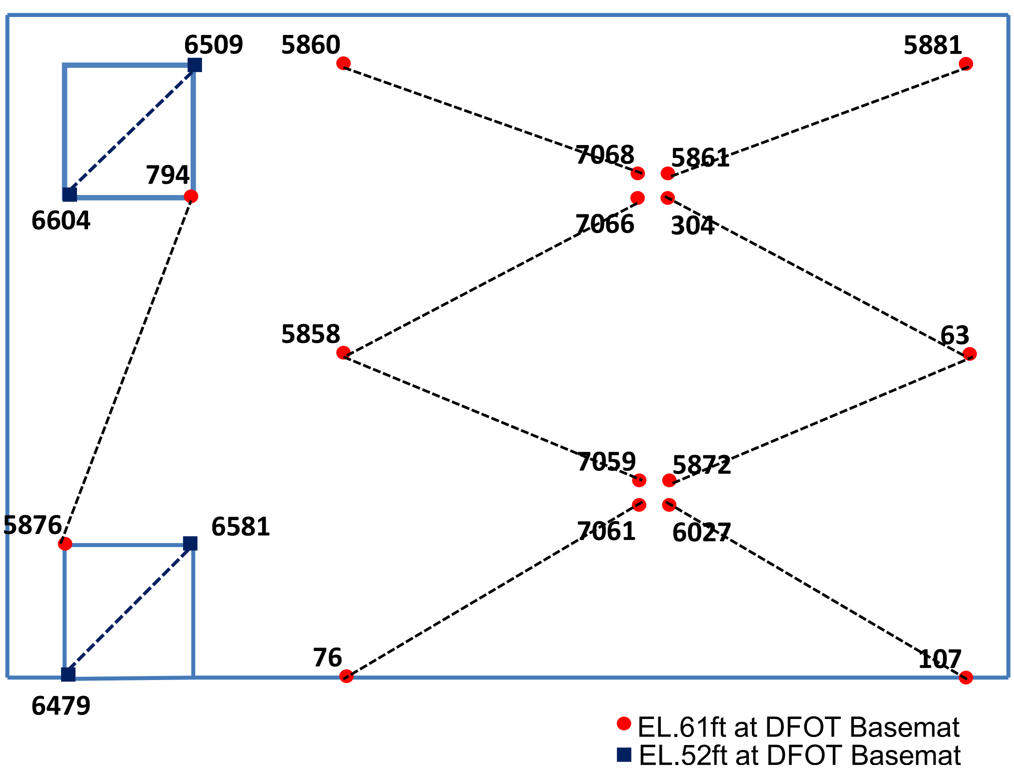


Figure 3.8A-55 Node Locations at DFOT Basemat for Checking Settlements (Static)

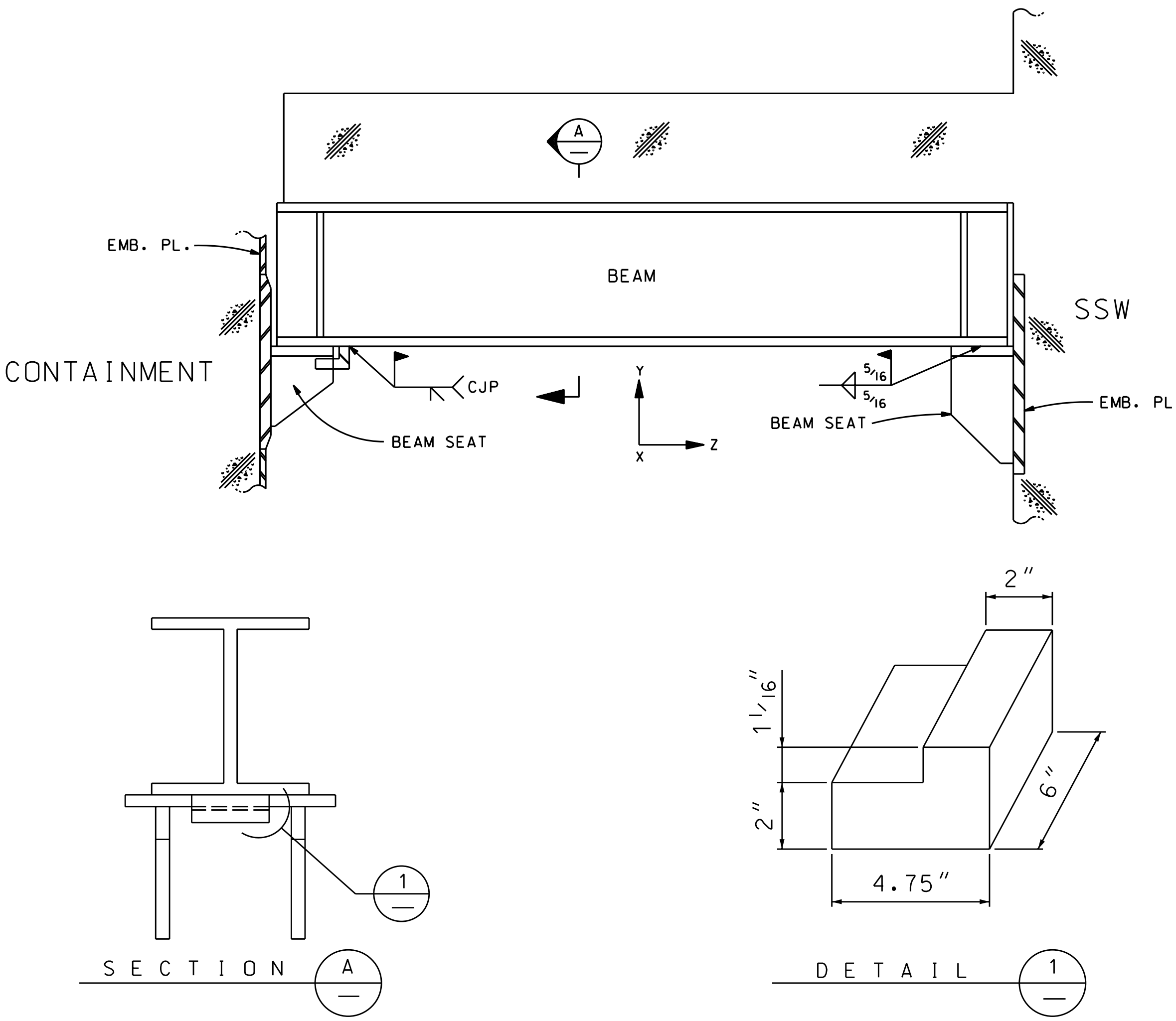


Figure 3.8A-56 Concrete Slab and Steel Beam between Containment Wall and SSW

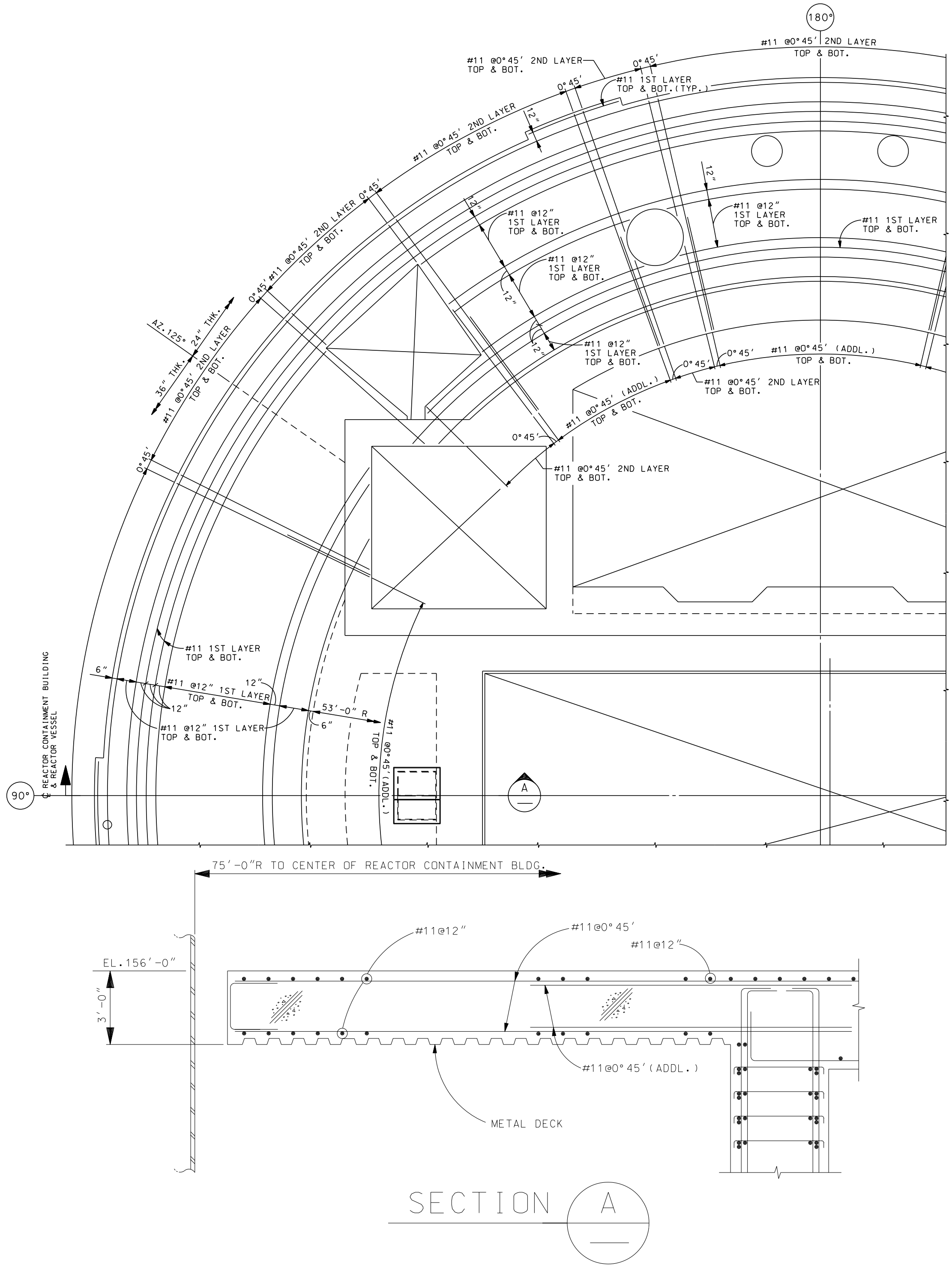


Figure 3.8A-57 Slab Reinforcements for Operating Floor at El. 156'-0" in RCB

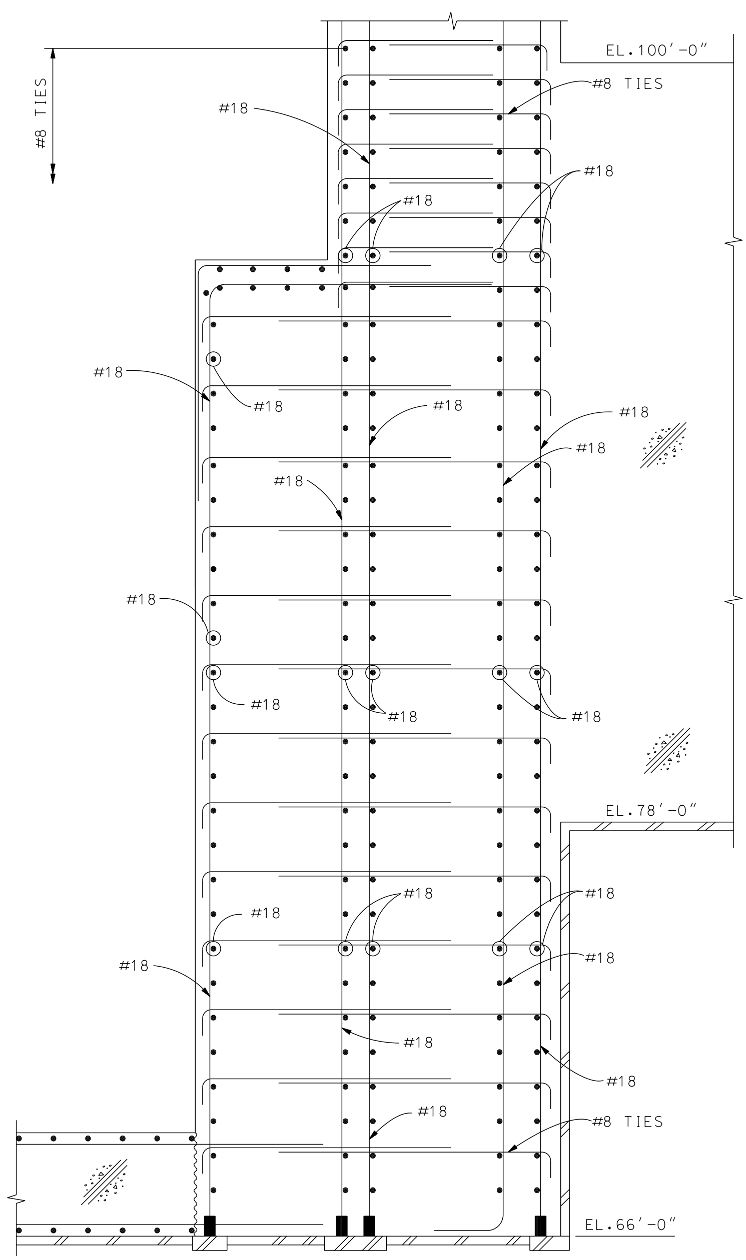


Figure 3.8A-58 Reinforcement Arrangement for Primary Shield Wall

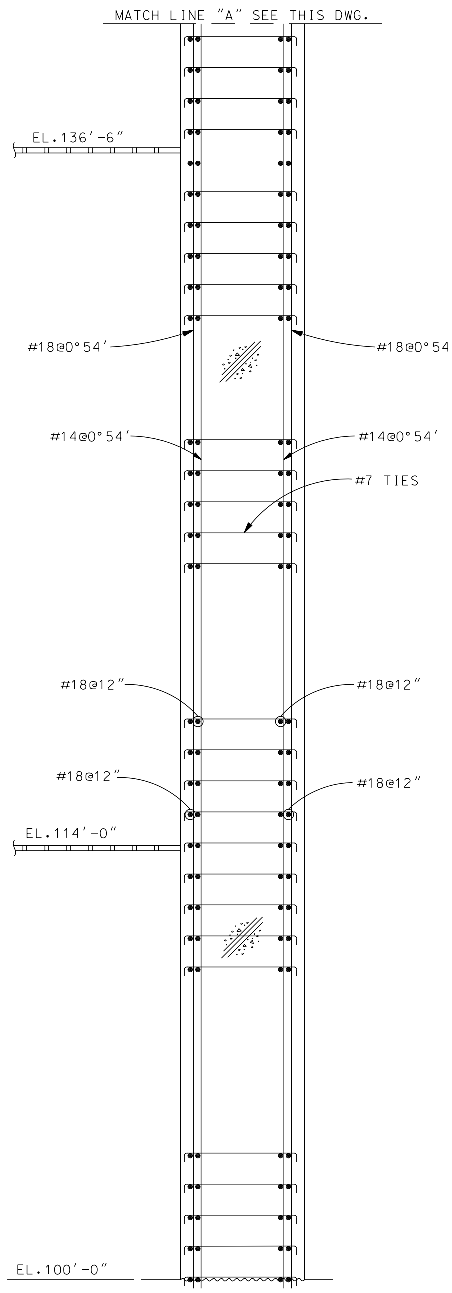


Figure 3.8A-59 Reinforcement Arrangement for Secondary Shield Wall

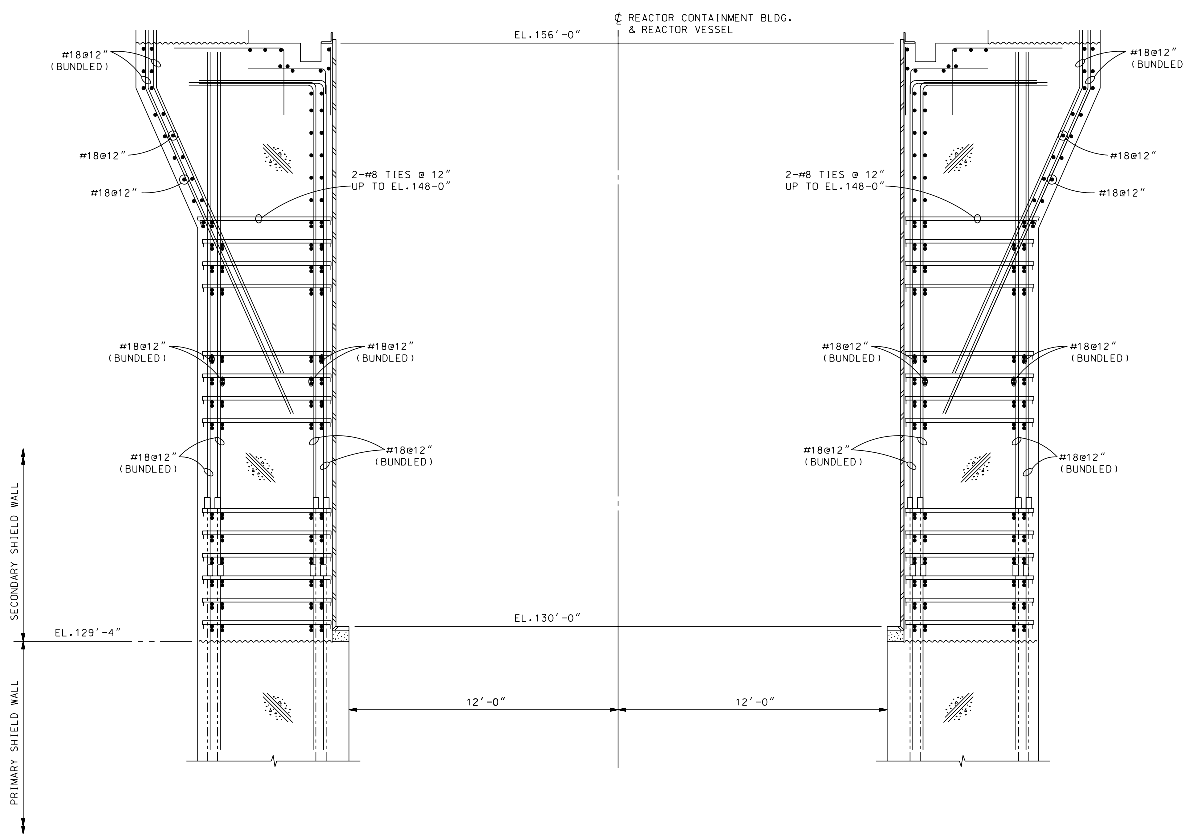


Figure 3.8A-60 Reinforcement Arrangement for Refueling Pool Wall

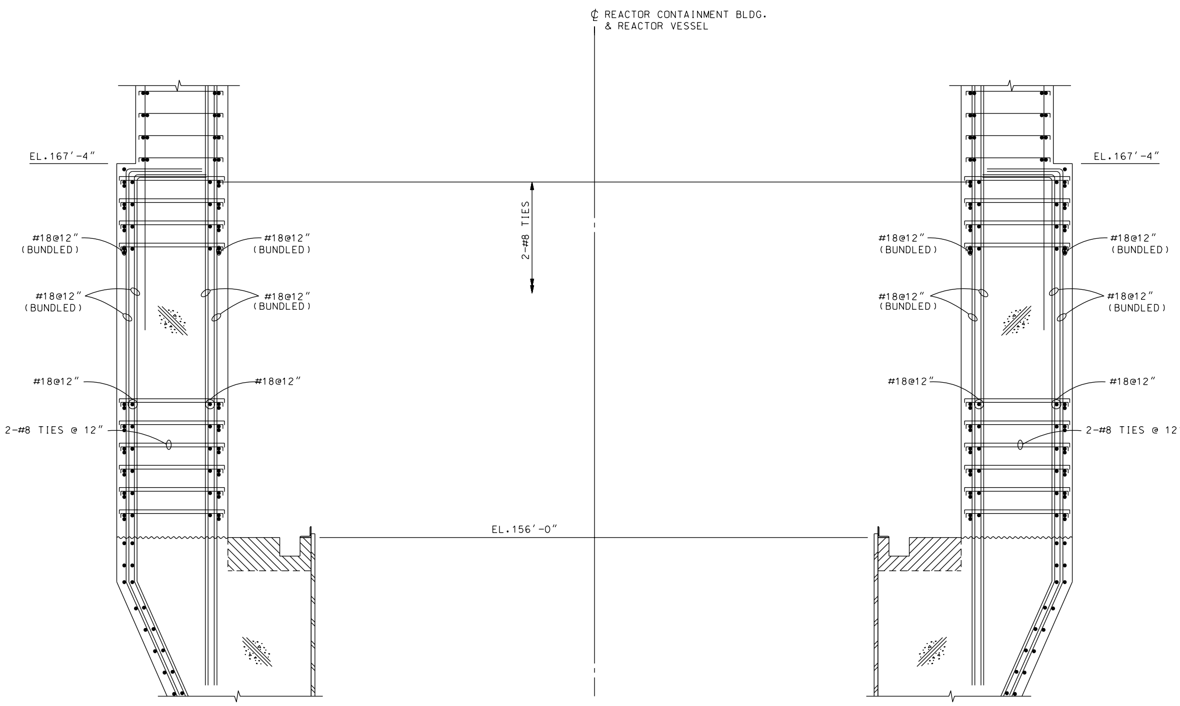


Figure 3.8A-61 Reinforcement Arrangement for SG Enclosure Wall

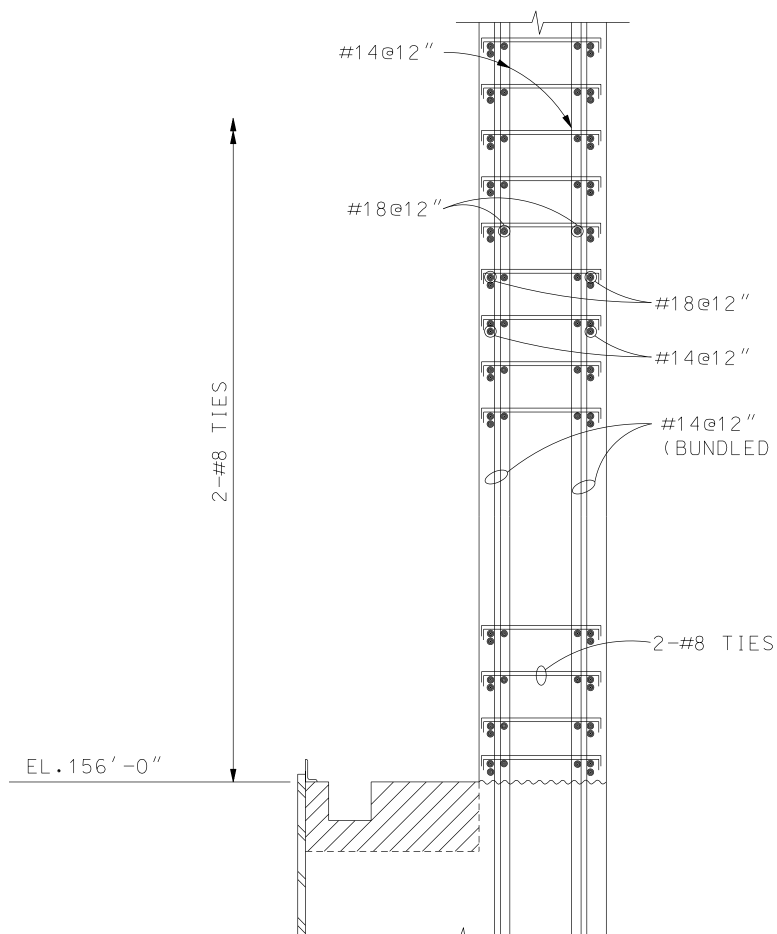


Figure 3.8A-62 Reinforcement Arrangement for PZR Enclosure Wall

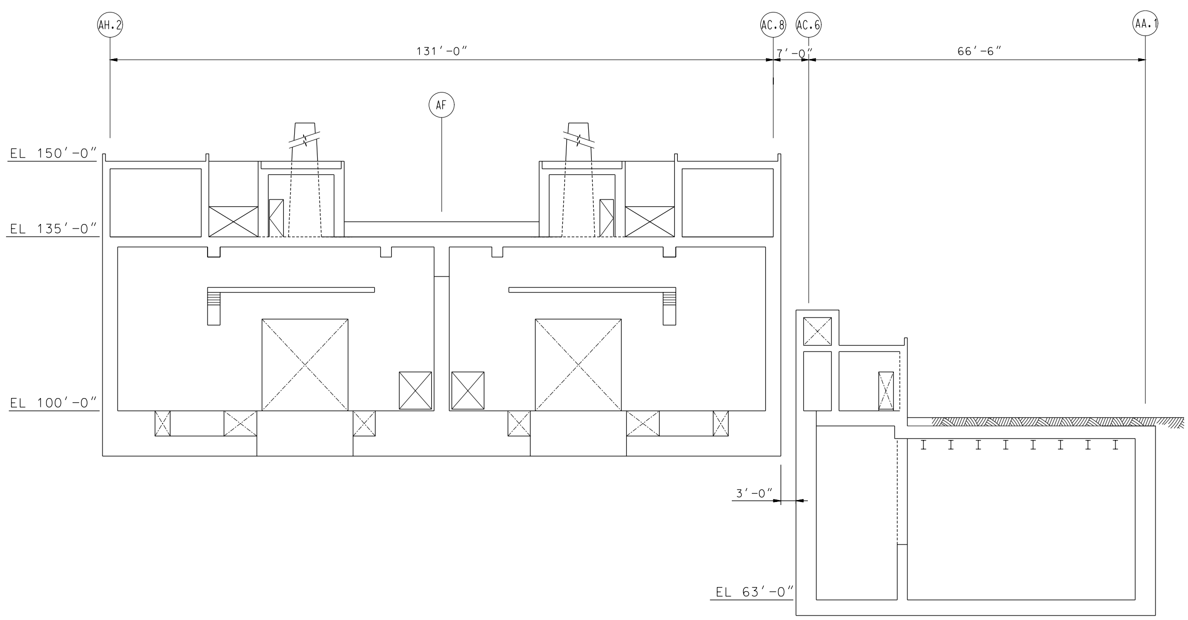


Figure 3.8A-63 Emergency Diesel Generator Building Block Section

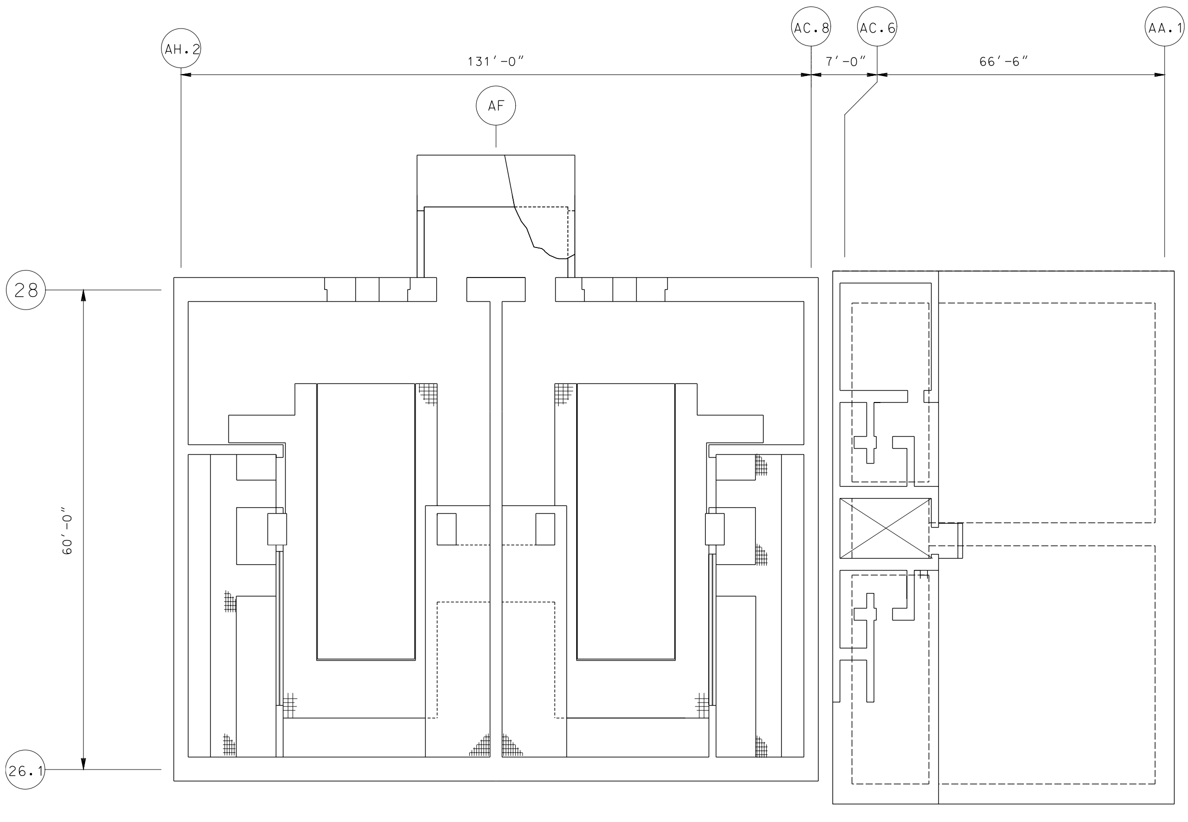


Figure 3.8A-64 Emergency Diesel Generator Building Block Plan

3.9 Mechanical Systems and Components

3.9.1 Special Topics for Mechanical Components

3.9.1.1 Design Transients

The following information identifies the transients used in the design and fatigue analysis of ASME Code Class 1 components, reactor internals, and component supports. All transients are classified with respect to the component operating conditions identified as Level A (Normal), B (Upset), C (Emergency), D (Faulted), and testing as defined in the ASME Section III. The transients specified below represent conservative estimates for design purposes only and are not intended to represent actual transients, nor necessarily reflect actual operating procedures; nevertheless, all envisaged actual transients are accounted for, and the number and severity of the design transients exceeds those that may be anticipated during the life of the plant.

Pressure, temperature, and flow rate resulting from the normal, test, upset, emergency, and faulted transients are computed by means of computer simulations of the nuclear steam supply system (NSSS) components. Design transients are detailed in the design specifications via time-history plots of the fluid temperature, pressure, and flow rate during plant events. The component designer then uses the transient data in the design specification as the basis for design and fatigue analysis. In support of the design of each Code Class 1 and core support (CS) component, a fatigue analysis for the combined effects of mechanical and thermal loads is performed in accordance with the requirements of ASME Section III. The purpose of the analysis is to demonstrate that fatigue failure will not occur when the components are subjected to typical dynamic events that may occur during the life of the plant.

ASME Section III, Division 1, Subsection NB, and NRC RG 1.207 are used for performing fatigue evaluations considering the effects of reactor coolant environment of the APR1400 components.

The fatigue analysis is based on a series of dynamic events depicted in the respective design specifications. Associated with each dynamic event is a mechanical, thermal-hydraulic transient presentation along with an assumed number of occurrences for the event. The presentation is generally simple and straightforward because it is meant to envelop the actual plant responses. The intent is to present material for purposes of design.

The fundamental concept provides reasonable assurance that the consequences of the normal and upset conditions that are expected to occur in the power plant are enveloped by one or more of the dynamic event portrayals in the design specifications. The number of occurrences selected for each dynamic event is conservative so that in the aggregate, a 60-year useful life is provided by the design process.

Design loading combinations for ASME Code Class 1, 2, and 3 components are given in Subsection 3.9.3. Design loading combinations for reactor internals structures are presented in Subsection 3.9.5.2.

The principal design bases of the RCS and reactor internals structures are given in Section 5.2 and Subsection 3.9.5, respectively.

The APR1400 design basis initiating events and frequencies used in the stress analysis of ASME Code Class 1 and Class CS components of the primary system are shown in Table 3.9-1. The resulting APR1400 events and frequencies conservatively represent the 60-year design basis.

The design basis events (DBEs) are classified as normal, upset, emergency, faulted, and test. The normal and test events are planned operations that occur during the life of the plant. Upset events are occurrences that may occur during the life of the plant. Emergency and faulted events are not expected to occur but are included in the design basis for additional design margin. The normal and test events are selected by reviewing the expected plant operations. The upset, emergency, and faulted events are determined by reviewing industry databases (References 1, 2, 3, and 4) for events that have occurred, or that may be postulated to occur, based on observed plant behavior.

Normal and test event frequencies are determined by summing the number of expected plant operations over the 60-year design life. The frequencies for upset, emergency, and faulted events are determined on a probabilistic basis using industry databases (References 1, 2, 3, and 4). The 60-year design frequency of occurrence stated in Table 3.9-1 is always greater than the expected frequency of occurrence.

Conservative mathematical models and methodology are used to determine the thermal-hydraulic consequences of the DBEs on individual plant components. The design margin is further enhanced by enveloping similar events and using the most conservative thermal-hydraulic consequences to represent a composite group. The group frequency is then determined by algebraically summing the individual design frequencies.

Pressure and thermal stress variations associated with the design transients are considered in the design of supports, valves, and piping within the reactor coolant pressure boundary (RCPB).

In addition to the design transients listed above and included in the fatigue analysis, the loadings produced by seismic events are also applied in the design of components and support structures of the RCS. The number of cycles pertaining to fatigue effects of cyclic motion associated with the seismic events is provided in Subsection 3.7.3. Design loading combinations for ASME Code Class 1, 2, and 3 components are addressed in Subsection 3.9.3.

ASME Section III defines the plant conditions (Service Level A, B, C, and D, and Test Conditions) for the design of RCS Class 1 components, auxiliary Class 1 components, RCS component supports, and reactor internals as described below.

Normal Conditions (ASME Service Level A)

Normal conditions include any condition in the course of startup, operation in the design power range, hot standby, and system shutdown other than upset, emergency, faulted, or testing conditions.

Upset Conditions (Incidents of Moderate Frequency; ASME Service Level B)

Upset conditions include any deviations from normal conditions that are anticipated to occur often enough for the design to include a capability to withstand the conditions without operational impairment. Upset conditions include transients that result from any single operator error or control malfunction, transients caused by a fault in a system component requiring its isolation from the system, and transients due to loss of power. Upset conditions also include abnormal incidents not resulting in a forced outage as well as those that cause forced outages for which the corrective action does not include any repair of mechanical damage. The estimated duration of an upset condition is included in the design specifications.

Emergency Conditions (Infrequent Incidents; ASME Service Level C)

Emergency conditions include deviations from normal conditions that require shutdown for correction of the conditions or repair of damage in the system. The emergency conditions have a low probability of occurrence, but are included to demonstrate that no gross loss of structural integrity will result as a concomitant effect of any damage developed in the system.

Faulted Conditions (ASME Service Level D)

Faulted conditions are combinations of conditions associated with low probability, postulated events whose consequences may impair the integrity and operability of the nuclear energy system to the extent that consideration of public health and safety are involved. Such considerations require conformance with safety criteria. The methods of analysis to calculate the stresses and deformations conform with the methods in ASME Section III, Division 1, Appendix F.

Testing Conditions

Testing conditions include hydrostatic pressure tests of individual components and the primary system as specified in this section.

In accordance with ASME Section III, emergency and faulted conditions are not included in fatigue evaluations, with the exception that any significant emergency cycles in excess of 25 are considered in the fatigue analyses.

3.9.1.1.1 Service Level A Conditions

Service Level A conditions consist of 14 event conditions as shown in Table 3.9-1. Each event condition may include several specific events based on the thermal-hydraulic characteristics of the event. The following are the event descriptions for specific events considered in Service Level A conditions.

a. Steady-state operation with normal NSSS parameter variations in the increasing and decreasing directions.

   The plant could undergo primary and secondary process parameter variations because of secondary steam conditions. Power step changes of 10 percent are used to envelop this event. This is conservative since the 10 percent power step change produces more severe plant process parameter variations than those that occurred during any normal plant variations as the result of changing steam conditions.

Each event is assumed to occur 1,500,000 times during the 60-year plant design life.

b. Daily load follow operation

Although APR1400 will be operated as a base load plant, the effects of daily load follow operation are accounted for in the structural design and analysis of ASME Code Class 1 components, reactor internals, and component supports.

For daily load follow operation, the power is maintained at 100 percent for 10 through 16 hours, ramped down from 100 percent to 50 percent over a 2-hour period, operated for 4 through 10 hours at 50 percent, and then ramped up from 50 percent to 100 percent power over a 2-hour period.

Each event is assumed to occur 22,000 times during the 60-year plant design life.

c. Turbine power step changes of 10 percent power (15 to 100 percent power)

This event is a turbine power change from 100 to 90 percent power and from 90 to 100 percent power. The transients of step change from 25 to 15 percent power and step change from 15 to 25 percent power are also considered. These power step changes are representative of other power levels and serve to envelop smaller power step changes.

Each event is assumed to occur 3,200 times during the 60-year plant design life.

d. Turbine power step changes of 1 percent power (5-15 percent)

This power step change is from 15 to 14 percent power and from 14 to 15 percent power. The transients of step change from 6 to 5 percent power and step change from 5 to 6 percent power are also considered. These power steps are representative of other low power levels and serve to envelop other possible power steps.

Each event is assumed to occur 1,600 times during the 60-year plant design life.

e. Turbine load rejection up to 50 percent power (50-100 percent power)

This event is a load rejection up to 50 percent power. The load rejection from 100 percent to 50 percent power is more severe than any other smaller load rejection.

This event is assumed to occur 60 times during the 60-year plant design life.

f. Turbine generator runback to house load

This event is a loss of offsite load with the turbine running back to house load. The house load is about 5 percent of full-power conditions.

This event is assumed to occur 60 times during the 60-year plant design life.

g. Reactor trip

This event is an uncomplicated reactor trip. The uncomplicated reactor trip is an event when the reactor trip is the event initiator. A reactor trip can occur at any power level and causes a turbine trip.

This event is assumed to occur 150 times during the 60-year plant design life.

h. Turbine trip

This event is a turbine trip caused by a mechanical or electrical problem.

This event is assumed to occur 150 times during the 60-year plant design life.

i. Turbine power ramp changes of 5 percent/min (15-100 percent power)

This event is a turbine power ramp change from 100 to 15 percent power and power ramp change from 15 to 100 percent power. The turbine power ramp changes of 5 percent/min between these power levels are more severe than power ramps from any other power levels and serve to envelop the less severe power ramps.

Each event is assumed to occur 3,200 times during the 60-year plant design life.

j. Turbine power ramp changes of 1 percent /min (5-15 percent power)

This event is a turbine power ramp change from 15 percent to 5 percent power and power ramp change from 5 percent to 15 percent power. The turbine power ramp changes of 1 percent/min between these power levels are more severe than power ramps from any other power levels and serve to envelop the less severe power ramps.

Each event is assumed to occur 1,600 times during the 60-year plant design life.

k. Loss of main FW pumps without reactor trip

The loss of main feedwater pumps without generating a reactor trip event is composed of two events: loss of a main feedwater pump and loss of two main feedwater pumps. The loss of one main feedwater pump results in a minor system transient. The two remaining feedwater pumps automatically increase their speeds to match the flow rate requirements of the original power level. The loss of two main feedwater pumps at 100 percent power envelops all other possible cases that may occur during part load operation.

This event is assumed to occur 60 times during the 60-year plant design life.

l. NSSS operations with manual control of the CEAs, turbine bypass valves, pressurizer spray/heaters, pressurizer level control, and feedwater flow (0 to 5 percent power)

This event consists of several manual operations that can be expected to occur during low-power conditions. These include the manual operation of the CEAs, turbine bypass valves, pressurizer spray/heaters, pressurizer level control, and the feedwater flow control.

This event is assumed to occur 1,600 times during the 60-year plant design life.

m. Opening or closure of the economizer feedwater control valve

The steam generator has two feedwater control valves to provide the necessary flow control over the full power range. The smaller downcomer valve controls flow between 0 percent and 20 percent power and the larger economizer feedwater valve controls flow between 20 percent and 100 percent power. The feedwater valve switch is performed at 20 percent reactor power during power increase and at 18 percent reactor power during power decrease.

This event is assumed to occur 500 times during the 60-year plant design life.

n. NSSS operations with the NSSS control systems in the manual mode (5-100 percent power)

This event consists of several manual operations that can be expected to occur during the 5 to 100 percent power range. It includes manual operation of the CEAs, turbine bypass valves, pressurizer spray/heaters, pressurizer level control, and the feedwater flow control. The control systems can be manually controlled within the normal automatic control bands.

This event is assumed to occur 3,200 times during the 60-year plant design life.

o. Manual operation of the auxiliary spray system

The manual operation of the auxiliary spray system may be required during power operation to reduce primary pressure excursions when the main spray system is out-of-service. This transient may be especially severe for the pressurizer spray line since isolated fluid in the auxiliary spray line may cool down to low temperatures before being sprayed into the pressurizer.

This event is assumed to occur 250 times during the 60-year plant design life.

p. High-capacity steam generator blowdown

The steam generator high capacity blowdown is performed with a flow rate of approximately 5 percent of the steam generator maximum steaming rate to maintain steam generator chemistry within control limit.

This event is assumed to occur 3,200 times during the 60-year plant design life.

q. Shift from normal to maximum CVCS flow rate

The chemical and volume control system (CVCS) letdown and charging flow rates may be increased to support required changes in boron concentration or to more rapidly reduce impurities in the RCS.

This event is assumed to occur 3,200 times during the 60-year plant design life.

r. Low-low VCT level and charging pump diversion to the boric acid storage tank

Low volume control tank (VCT) level results in diverting the charging flow sources from VCT to the boric acid storage tank.

This event is assumed to occur 60 times during the 60-year plant design life.

s. Spurious actuation of the pressurizer spray

The spurious actuation of the pressurizer spray may occur because of a mechanical or a control system failure. The failure is assumed to open both spray valves while the plant is operating at full power. This is the more severe event of the possible spray valve failures and envelops other possible failures.

This event is assumed to occur 60 times during the 60-year plant design life.

t. Spurious actuation of the pressurizer heaters

The spurious actuation of the pressurizer heaters may occur because of a mechanical or a control system failure. The failure is assumed to actuate all pressurizer heaters while the plant is operating at full power and at hot standby.

This event is assumed to occur 60 times during the 60-year plant design life.

u. Inadvertent closure of one economizer or downcomer FW control valve

The spurious closure of one economizer or downcomer feedwater control valve may occur because of a mechanical or a control system failure. The failure will result in the loss of feedwater flow to the economizer section of one steam generator.

This event is assumed to occur 60 times during the 60-year plant design life.

v. Inadvertent opening of one economizer or downcomer FW control valve

The spurious opening of one economizer or downcomer feedwater control valve may occur because of a mechanical or a control system failure. The failure will result in increase of feedwater flow to the economizer section of one steam generator.

This event is assumed to occur 60 times during the 60-year plant design life.

w. Inadvertent isolation of one main FW heater

The inadvertent isolation of one main feedwater heater may result from an operator error or mechanical failure. This event results in a decrease in feedwater temperature to the steam generator.

This event is assumed to occur 60 times during the 60-year plant design life.

x. Startup and coastdown of a reactor coolant pump at hot standby (HSB)

The startup and coastdown of a reactor coolant pump at HSB occur during each plant heatup and cooldown operation.

This event is assumed to occur 2,000 times during the 60-year plant design life.

y. Startup and shutdown of the shutdown cooling system at hot shutdown (HSD)

The startup and shutdown of shutdown cooling system (SCS) at HSD condition occur during each plant cooldown and heatup operations.

This event is assumed to occur 250 times during the 60-year plant design life.

z. Spurious startup of a safety injection pump during shutdown condition

Spurious startup of a safety injection pump during shutdown condition is considered to occur due to operator error or control system failure.

This event is assumed to occur 60 times during the 60-year plant design life.

aa. Spurious actuation of the pressurizer heaters at HSB

The spurious actuation of the pressurizer heaters may occur because of a mechanical or a control system failure. The failure is assumed to actuate all pressurizer heaters while the plant is operating at hot standby condition.

This event is assumed to occur 60 times during the 60-year plant design life.

ab. Plant heatup and cooldown

Plant heatup is defined as operations that bring the RCS from a condition where the reactor is subcritical and the RCS is at nearly ambient temperature and atmospheric pressure to a condition where the system temperature and pressure are at their normal operating zero-power values. The temperature changes of 37.8 °C (100 °F) per hour that bound the heatup rate are conducted by four reactor coolant pumps (RCPs). The heatup rate is controlled by the shutdown cooling system and the steam generators. The heatup rate for the pressurizer is 93.3 °C (200 °F) per hour.

Plant cooldown is a series of operations that bring the RCS from a power operation condition to a cold shutdown condition in preparation for refueling or other maintenance operations. The cooldown operations represented by ramp changes in temperature of 37.8 °C (100 °F) per hour that bound the cooldown rate are performed by the steam generator steam dump and shutdown cooling operation. The cooldown rate for the pressurizer is allowed up 93.3 °C (200 °F) per hour.

Each event is assumed to occur 250 times each during the 60-year plant design life.

3.9.1.1.2 Service Level B Conditions

Service Level B conditions consist of eight event conditions as shown in Table 3.9-1. Event conditions are categorized in a similar was as in the safety analysis. Each event condition may include specific events. The following are the event descriptions for specific events considered in Service Level B conditions.

a. Decrease in FW temperature

A decrease in main feedwater temperature results in an increase in heat removal by the secondary system. A postulated failure in the feedwater train is assumed to result in a decrease in feedwater enthalpy.

This event is assumed to occur 20 times during the 60-year plant design life.

b. Increase in FW flow rate

An increase in feedwater flow results in an increase in heat removal from the secondary system. A failure in the main feed train is assumed to cause an increase in feedwater flow up to a maximum flow rate of about 160 percent of rated flow.

This event is assumed to occur 20 times during the 60-year plant design life.

c. Increase in steam flow rate

An increase in main steam flow results in an increase in heat removal from the secondary system. A failure in the secondary system is assumed to cause an increase in steam flow up to about 11 percent of the full-power steaming rate.

This event is assumed to occur 20 times during the 60-year plant design life.

d. Inadvertent opening of a main steam safety valve

An inadvertent opening of a main steam safety valve results in an increase in heat removal from the secondary system. The event is postulated to result in the increase in main steam flow while operating at full power.

This event is assumed to occur 10 times during the 60-year plant design life.

e. Loss of external load

A loss of external load (event) occurs due to the separation of the turbine/generator from the electricity distribution grid. When house load operation is operable, the plant is controlled by reactor power cutback system (RPCS) and steam bypass control system without a reactor trip for loss of external load. When the house load operation is not operable, the turbine is tripped for loss of external load, the turbine stop valve is closed, and the steam flow from the steam generator to the turbine is blocked. This event shows the loss of external load for an inoperable case of house load operation.

This event is assumed to occur 20 times during the 60-year plant design life.

f. Loss of condenser vacuum

A loss of condenser vacuum event results in a decrease in heat removal from the secondary system. A loss of condenser vacuum can be caused by the failure of the circulating water system providing condenser cooling, failure of the main condenser evacuator system to remove non-condensable gases, or excessive in-leakage of air through a turbine gland. The turbine is assumed to trip immediately upon the loss of condenser vacuum.

This event is assumed to occur 20 times during the 60-year plant design life.

g. Loss of non-emergency AC power to the station auxiliaries

A loss of non-emergency ac power to the station auxiliaries event results in a decrease in heat removal by the secondary system. This event may result from a complete loss of the external grid or a loss of the onsite AC power distribution system. Emergency power is still supplied to the plant by emergency diesel generators. The loss of non-emergency AC power to the station results in the loss of the buses that power the reactor coolant pumps, thereby causing all the pumps to coast down.

This event is assumed to occur 20 times during the 60-year plant design life.

h. Main steam isolation valve closure

A main steam isolation valve (MSIV) closure event results in a decrease in heat removal by the secondary system. An MSIV closure event is initiated by the closure of all the MSIVs that is the result of a spurious closure signal (e.g., spurious main steam isolation signal). This results in termination of both main steam and main feedwater flow because the main steam isolation signal closes the main feedwater isolation valves.

This event is assumed to occur 20 times during the 60-year plant design life.

i. Loss of normal feedwater flow

A loss of main feedwater flow event results in a decrease in heat removal from the secondary system. The loss of main feedwater flow is caused by losing one or both main feedwater pumps or by spurious signals in the feedwater control system. The limiting loss of main feedwater event is defined as the total loss of main feedwater to both steam generators. The loss of main feedwater flow results in a decreasing steam generator level and an increasing secondary pressure. These secondary variations cause a corresponding increase in primary system temperatures and pressures.

This event is assumed to occur 20 times during the 60-year plant design life.

j. Loss of forced reactor coolant flow

A loss of forced reactor coolant flow event results in a decrease in the RCS flow. The loss of forced reactor coolant could be initiated by a failure in the RCP auxiliary system or loss of non-emergency AC power.

This event is assumed to occur 20 times during the 60-year plant design life.

k. Natural circulation cooldown (HSB to HSD)

If the AC power to all non-safety systems including the RCPs is lost during power operation, the plant is tripped and cooled down in a natural circulation mode. The amount of time needed to achieve plant shutdown conditions will be greater. Only safety-related systems are used to cool down the plant. A natural circulation cooldown operation is necessary to cool down the RCS from the HSB to HSD condition at which the operation of shutdown cooling system is allowed.

This event is assumed to occur 10 times during the 60-year plant design life.

l. Uncontrolled CEA withdrawal at low power

An uncontrolled control element assembly (CEA) withdrawal at low power or subcritical condition results in a reactivity or power distribution anomaly. The CEA withdrawal at low power or subcritical conditions adds positive reactivity to the reactor core by removing regulating CEAs. This causes an increase in core power and heat flux, resulting in increasing core temperatures and pressures.

This event is assumed to occur five times during the 60-year plant design life.

m. Uncontrolled CEA withdrawal at high power

An uncontrolled CEA withdrawal at high power event causes a reactivity or power distribution anomaly.

This event is assumed to occur five times during the 60-year plant design life.

n. Control rod misoperation, RPCS inadvertent operation, or operator error

A single full-length CEA drop event causes a reactivity or power distribution anomaly. The CEA drop is caused by failure in the CEA drive mechanism, causing an initial insertion of negative reactivity.

This event is assumed to occur 50 times during the 60-year plant design life.

o. Loss of component cooling water to the letdown heat exchanger

The loss of component cooling water to the letdown heat exchanger event results in increase in RCS inventory. The letdown isolation valve closes on high letdown flow temperature to prevent CVCS equipment from being exposed to high-temperature conditions.

This event is assumed to occur 10 times during the 60-year plant design life.

p. CVCS malfunction that increases RCS inventory

A CVCS malfunction event results in an increase in RCS inventory. The limiting scenario with respect to increases in RCS inventory is the pressurizer level control system malfunction. During this event, the letdown line is isolated and the charging control valve is fully opened.

This event is assumed to occur 10 times during the 60-year plant design life.

q. Inadvertent opening of the pilot-operated safety relief valve (POSRV closes as expected)

The inadvertent opening of the POSRV is an incident that results in a decrease in RCS inventory. Only one POSRV is assumed to open. The RCS pressure stops to decrease as the POSRV recloses.

This event is assumed to occur 10 times during the 60-year plant design life.

r. Failure of small lines carrying coolant outside containment (letdown line break)

The double-ended break of a letdown line outside containment event results in a decrease in RCS inventory. Because of the pipe size, the consequences of a double-ended letdown line break outside containment bound all possible instrument or sample line breaks.

This event is assumed to occur 20 times during the 60-year plant design life.

s. Reactor coolant pump seal failure

An RCP seal failure event is set as a DBE for the design of the RCP bleed-off line.

This event is assumed to occur 10 times during the 60-year plant design life.

t. Loss of seal injection with loss of cooling water

A loss of seal injection with a loss of cooling water event is set as a DBE for the design of the RCP bleed-off line.

This event is assumed to occur five times during the 60-year plant design life.

3.9.1.1.3 Service Level C Conditions

There are no events classified as a Service Level C condition. The events traditionally known as Service Level C conditions are classified as other Service Level conditions based on the recent nuclear power plant industry data (for example, a loss of offsite power with natural circulation event is classified as a Service Level B condition and one steam generator tube failure event as a Service Level D condition). The frequencies of events traditionally categorized as a Service Level C condition are conservatively modified to be classified as a Service Level B condition for design purpose.

3.9.1.1.4 Service Level D Conditions

Service Level D conditions consist of six event conditions as shown in Table 3.9-1. Event conditions are categorized similar to the Service Level B conditions. Hypothetical accidents are considered as Service Level D conditions. The following are the event descriptions for specific events considered in Service Level D conditions.

a. Steam system piping failure

A main steam line break (MSLB) results in an increase in heat removal by the secondary system. A rupture in the main steam line is postulated to cause an uncontrolled blowdown of the steam generators until the main steam isolation valves (MSIVs) close upon the receipt of a main steam isolation signal (MSIS). If the steam line break occurs downstream of the MSIV, the closure of the MSIVs will terminate the primary system cooldown. If the steam line break occurs upstream of the MSIVs, the ruptured steam generator continues to blow down after MSIS, causing a greater cooldown of the primary system.

This event is assumed to occur one time during the 60-year plant design life.

b. Feedwater system line break (FWLB)

The feedwater system pipe break or feedwater line break (FWLB) is an accident that results in a decrease in heat removal from the secondary system. A break in the feedwater system piping is postulated to occur and cause a dependent loss of the main feedwater pumps. If the break occurs upstream of the reverse flow check valves, the thermal-hydraulic response will be similar to that of a loss of normal feedwater flow event. If the break occurs between the last reverse flow check valve and the steam generator, both steam generators blow down until the main steam isolation valves close following receipt of a main steam isolation signal.

This event is assumed to occur one time during the 60-year plant design life.

c. Reactor coolant pump rotor seizure

A single RCP rotor seizure with the loss of offsite power is an accident that results in a decrease in reactor coolant system flow rate. The RCP rotor seizure is caused by the seizure of either the upper or the lower RCP thrust-journal bearings.

This event is assumed to occur one time during the 60-year plant design life.

d. Reactor coolant pump shaft break

An RCP shaft break with the loss of offsite power is an accident that results in a decrease in reactor coolant system flow rate. A single reactor coolant pump shaft break is postulated to cause a low reactor coolant system flow trip by reactor protection system.

This event is assumed to occur one time during the 60-year plant design life.

e. Rod ejection accident

A CEA ejection is an accident that causes a reactivity or power distribution anomaly. The CEA ejection is postulated to be caused by a circumferential rupture of the CEA drive mechanism housing or nozzle. The rupture is assumed to allow the instantaneous ejection of the rod with the largest reactivity bite. The subsequent rapid reactivity excursion will cause variations in the NSSS process parameters.

This event is assumed to occur one time during the 60-year plant design life.

f. Inadvertent opening of pilot-operated safety relief valve (POSRV fails to close)

The inadvertent opening of POSRV is an accident that results in a decrease in RCS inventory. The RCS pressure will decrease continuously as the POSRV fails to close. Hence, a reactor trip occurs due to the low pressurizer pressure. This event is a small break loss of coolant accident.

This event is assumed to occur one time during the 60-year plant design life.

g. Steam generator tube rupture (SGTR)

The steam generator tube rupture (SGTR) is an accident that causes a decrease in RCS inventory. It is postulated that a double-ended rupture of a single U-tube occurs penetrating the barrier between the reactor coolant system and the main steam system.

This event is assumed to occur one time during the 60-year plant design life.

h. Loss-of-coolant accident (LOCA) resulting from postulated pipe breaks within the RCS pressure boundary

The LOCA is an accident that results in a decrease in RCS inventory.

This event is assumed to occur one time during the 60-year plant design life.

i. Total loss of feedwater flow (TLOFW)

The total loss of feedwater flow event is a beyond design basis event. This event is initiated by a loss of main and auxiliary feedwater flow and results in decrease in RCS heat removal.

This event is assumed to occur one time during the 60-year plant design life.

3.9.1.1.5 Testing Conditions

Test conditions consist of six event conditions as shown in Table 3.9-1. The following are event descriptions considered in test conditions.

a. RCS hydrostatic test

The hydrostatic test is performed to provide reasonable assurance of the integrity of the RCS pressure boundary, its components, and associated unisolable piping systems at 125 percent of design pressure.

This event is assumed to occur 15 times during the 60-year plant design life.

b. Secondary hydrostatic test

The secondary hydrostatic test is performed to provide reasonable assurance of the integrity of the secondary side of steam generator, including the unisolable portion of the main steam, main feedwater, blowdown, recirculation, and auxiliary feedwater lines, at 125 percent of design pressure.

This event is assumed to occur 15 times during the 60-year plant design life.

c. RCS leak test

Whenever the RCS has been opened, an RCS leak test is conducted at the normal operating pressure. The RCS loop pressure is raised following the limitations curve of the plant hydrostatic test by control of charging and letdown flow.

This event is assumed to occur 200 times during the 60-year plant design life.

d. Secondary leak test

Whenever the secondary system has been opened, a secondary side leak test is conducted at the design pressure.

This event is assumed to occur 200 times during the 60-year plant design life.

e. SIS/SCS preoperational and maintenance test

SIS/SCS preoperational and maintenance test is conducted to provide reasonable assurance of the operability of SIS/SCS components. The preoperational test is a pre-core testing performed to provide reasonable assurance that the components and/or systems perform their intended functions. The maintenance test provides reasonable assurance that the components perform their intended functions after maintenance.

This event is assumed to occur 360 times during the 60-year plant design life.

f. SIS/SCS check valve operability tests

SIS/SCS check valve operability test is conducted to provide reasonable assurance of the operability of SIS/SCS check valves. The test is performed by safety injection pumps (SIPs) in refueling mode or shutdown cooling pumps (SCPs) in cold shutdown mode.

This event is assumed to occur 120 times during the 60-year plant design life.

3.9.1.2 Computer Programs Used in Stress Analyses

3.9.1.2.1 Code Class Systems, Components, and Supports

The following paragraphs provide a summary of the applicable computer programs used in the stress and structural analyses for ASME Code Class systems, components, and supports in the APR1400 design. The summaries include individual descriptions and applicability data. The computer codes used in these analyses have been verified in conformance with design control methods, consistent with the quality assurance program described in Chapter 17.

3.9.1.2.1.1 ABAQUS

The ABAQUS program is a general-purpose nonlinear finite element program with structural and heat transfer capabilities. ABAQUS is used for stress analysis of regions of vessels, piping, or supports that may deform plastically under prescribed loadings. It is also used for elastic analyses of complex geometries where the graphics capability enables a well-defined solution. The thermal capabilities of ABAQUS are used for complex geometries where simplification of input and graphical output are preferred.

ABAQUS is commercially available and has had sufficient use to justify its applicability and validity. See Reference 5 for information on ABAQUS.

3.9.1.2.1.2 PICEP

The PICEP program calculates the flow through a crack in a pipe. PICEP uses the simplified engineering approach for elastic-plastic fracture analysis for finding the crack opening displacement and area. Fluid calculation options include single and two-phase flow as well as allowance for friction. PICEP, commercial software, was developed by the Electric Power Research Institute (EPRI). See Reference 22 in Subsection 3.6.5 for information on PICEP.

3.9.1.2.1.3 CLEVER

CLEVER determines SG and snubber stroke, and building interface boundaries for the SG snubber lever system. The program verifies the kinematics of the snubber lever linkage systems based on input motions of the SG lug and detailed snubber lever system geometry. See Reference 6 for information on CLEVER.

3.9.1.2.1.4 HeadPR (Head Penetration Reinforcement Program)

The HeadPR computer program calculates the available reinforcement and the reinforcement that is needed for penetrations in the hemispherical heads. The technique described in ASME Section is used.

The HeadPR computer program is used to perform the preliminary sizing and reinforcement calculations for hemispherical heads in the reactor vessel.

The program was verified by comparisons of program results and hand-calculated solutions of classical problems. See Reference 7 for more information.

3.9.1.2.1.5 CEFLASH-4B

The CEFLASH-4B computer program calculates transient conditions resulting from a flow line rupture in a water/steam flow system. The program is used to calculate steam generator internal loadings following a postulated main steam line and main feedwater line break.

The program was verified by comparison of program results and the result of the CEFLASH-4A computer program. See Reference 8 for more information.

3.9.1.2.1.6 ANSYS

The ANSYS computer program is a large-scale, general-purpose, finite element analysis program for linear and nonlinear structural and thermal analyses, and additional descriptive information on this code is provided in Subsection 3.9.1.2.2.1.

The program is used in numerous applications for all components in the areas of structural, fatigue, thermal, and eigenvalue analysis. Analysis capabilities include static and dynamic; elastic, plastic, creep and swelling; small and large deflections; steady-state and transient heat transfer; and fluid flow.

The program has been verified by comparison with known theoretical solutions, experimental results, and by other calculated solutions. See Reference 9 for more information.

3.9.1.2.1.7 AFP2D

The AFP2D computer program uses the thermal stresses of two-dimensional axisymmetric structures resulting from an ANSYS program run. The program combines thermal stresses calculated for transient load steps with stresses due to pressure and external mechanical loads, and calculates primary plus secondary stresses, peak stresses, and their ranges of stress intensities and fatigue usage factors.

The program was verified by comparisons of program results and hand-calculated solutions of classical problems. See Reference 10 for more information.

3.9.1.2.1.8 TSPOST

The TSPOST computer program uses the stresses in the tubesheet of the SG resulting from two-dimensional axisymmetric model using an ANSYS program run. The program evaluates the primary stress by various pressure conditions imposed on the SG primary and secondary sides, and calculates range of primary plus secondary stress intensity and cumulative usage factors, by combining the thermal and pressure stresses.

The program was verified by comparisons of program results and hand-calculated solutions of classical problems. See Reference 11 for more information.

3.9.1.2.1.9 AFPOST

The AFPOST computer program uses the thermal stresses of two- and three-dimensional structure resulting from ANSYS program run. The program combines thermal stress calculated for transient load steps with stresses due to pressure and external mechanical loads, and calculates primary plus secondary stresses, peak stresses and their ranges of stress intensities and fatigue usage factors.

The program was verified by comparisons of program results and hand-calculated solutions of classical problems. See Reference 12 for more information.

3.9.1.2.1.10 ATHOS3

The ATHOS3 is a three-dimensional, two-phase flow distribution computer program with both steady-state and transient capabilities. Homogeneous and axial flow algebraic slip models are available. A typical geometric model includes approximately 1,000 cells but more detailed models are possible. Secondary fluid results include the velocity vector components in the three coordinate directions, pressure, temperature/quality, and density in each cell. The corresponding heat flux, tube wall temperature, primary temperatures, and the circulation ratio are also output. Vector and scalar plotting is available. In transient calculations, water level and steam flow are calculated as a function of time.

The program was verified by comparing the results to measured data from small-scale experiments, model SGs, and full-scale SGs (see Reference 13 for more information).

3.9.1.2.1.11 PTXIG

This program applies the procedures of Appendix G of ASME Section XI and the supplemental procedures in Welding Research Council Bulletin 175 to evaluate pressure vessels against failure. The program calculates the allowable internal pressure as a function of crack size, RT_{NDT}, and thermal conditions that are input by the user. The program was verified by comparison of program results and hand calculations (see Reference 14 for more information).

3.9.1.2.1.12 PIPESTRESS

PIPESTRESS (Reference 15) is a piping analysis program that is applied to the static and dynamic analyses including response spectra and time-history analyses.

PIPESTRESS is used for the analysis of ASME Section III, Class 1, 2, and 3 (Reference 16) as well as ASME B31.1 and B31.3 piping systems (References 17 and 18).

3.9.1.2.1.13 REFORC – DEC

REFORC determines flow-induced forces in piping system by serving as a post-processor to a thermal-hydraulic transient code, RELAP5/MOD3.1. See Reference 19 for more information.

3.9.1.2.1.14 RELAP5/MOD3.1

RELAP5/MOD3.1 (Reference 20) is a best-estimate system code suitable for the analysis of all transients and postulated accidents in light water reactor (LWR) systems, including both large- and small-break loss-of-coolant accidents (LOCAs) as well as the full range of operational transients. The one-dimensional RELAP5/MOD3.1 code is based on a non-homogeneous and non-equilibrium model for the two-phase system. This code is also used to analyze rapid transients such as pipe breaks and valve quick opening, and to extract some thermal-hydraulic parameters of the results such as velocity, density, and pressure for generation of hydrodynamic loads on piping system using a force generation code, REFORC-DEC.

3.9.1.2.1.15 RELAP5/MOD3.3

RELAP5/MOD 3.3 is a best-estimate system code suitable for the analysis of all transients and postulated accidents in LWR system, including both large- and small-break LOCAs as well as the full range of operational transients. The one-dimensional RELAP5/MOD3.3 code is based on a non-homogeneous and non-equilibrium model for the two-phase system. This code is also used to analyze rapid transients such as pipe breaks and valve quick opening and some thermal-hydraulic parameters of the results such as velocity, density, and pressure are extracted for generation of hydrodynamic loads on piping system (see Reference 21 for more information).

3.9.1.2.1.16 NOZPROG

The NOZPROG computer program calculates the maximum stress intensities developed in nozzles and nozzle-vessel intersection due to combinations of various external pipe loads under pressure.

The program was verified by comparisons of program results and hand-calculated solutions of classical problems. See Reference 22 for more information.

3.9.1.2.2 Reactor Internals, Fuel, and CEDMs

The following computer programs are used in the static and dynamic analyses of reactor internals, fuel, and CEDMs.

3.9.1.2.2.1 ANSYS

ANSYS is a general-purpose linear and nonlinear finite element program with structural and heat transfer capabilities, and is described in Reference 23. Finite element analyses of reactor internal structures such as flanges and the lower support structure are performed with ANSYS to determine vertical and lateral stiffnesses. The program is also used to perform the static and dynamic analyses of the reactor internals to determine its structural stress responses.

The developer, ANSYS, has published an ANSYS verification manual with numerous examples of its usage.

3.9.1.2.2.2 ASHSD

ASHSD is used to obtain the dynamic response of the core support barrel under normal operating conditions and a LOCA. The program yields the dynamic shell and beam mode response of the structural system.

ASHSD has been verified by demonstration that its solutions are substantially identical to those obtained by hand calculations or from accepted experimental tests or analytical results. The details of these comparisons are provided in References 24 and 25.

3.9.1.2.2.3 CESHOCK

The CESHOCK program is used to obtain the transient response of the reactor internals and fuel assemblies due to pipe break and seismic loads.

The computer program CESHOCK determines the response of structures that can be represented by lumped-mass and spring systems subjected to a variety of arbitrary-type loadings. Further description is provided in Reference 26.

CESHOCK has been verified by demonstration that its solutions are substantially identical to those obtained by hand calculations or from accepted analytical results via an independent computer code. The details of these comparisons are available in References 25 and 26.

3.9.1.2.2.4 CEFLASH-4B

The CEFLASH-4B computer code (Reference 27) predicts the reactor coolant system pressure and flow distribution during the subcooled and saturated portion of the blowdown period of a LOCA. The equations for conservation of mass, energy, and momentum, along with a representation of the equation of state, are solved simultaneously in a node and flow path network representation of the primary RCS.

CEFLASH-4B provides transient pressures, flow rates, and densities throughout the primary system following a postulated pipe break in the RCS.

The CEFLASH-4B computer code is a modified version of the CEFLASH-4A code (References 28 and 29). The CEFLASH-4A computer code has been approved by the NRC (References 30 through 32). The capability of CEFLASH-4B to predict experimental blowdown data is presented in Reference 27.

3.9.1.2.2.5 DPVIB

The DPVIB program is used to calculate fluctuating pressure distribution in the downcomer region caused by RCP pressure pulsation.

Main inputs of DPVIB are system pressure, temperature, and pump forcing frequency. The pressure distribution in the downcomer region is obtained by solving the acoustic wave equation using an analytical method described in Reference 39. The DPVIB program also generates Fourier coefficients that are used in the stress analysis of the CSB.

3.9.1.3 Experimental Stress Analyses

Experimental stress analysis is not used for the APR1400.

3.9.1.4 Consideration for the Evaluation of the Faulted Condition

3.9.1.4.1 Seismic Category I RCS Items

The major components of the RCS are designed to withstand the forces associated with the pipe breaks described in Section 3.6 in combination with the forces associated with the safe shutdown earthquake (SSE), in-containment refueling water storage tank (IRWST) discharge, and normal operating conditions. For structural evaluation, the pipe breaks are those breaks for which a leak-before-break (LBB) cannot be demonstrated. Since the dynamic effects of breaks in piping systems listed in Subsection 3.6.3 are eliminated by LBB, the pipe break loads analysis procedure considers only those branch line pipe breaks not eliminated by an LBB.

The resultant component and support reactions are specified for design verification by the methods described below and in Subsection 3.9.3.

The system or subsystem analysis used to establish or confirm loads that are specified for the design of components and supports is performed on an elastic basis. The details of the models and forcing functions are described in Appendix 3.9B.

When an elastic system analysis is used to establish the loads that act on components and supports, elastic stress analysis methods are also used in the design calculations to evaluate the effects of the loads on the components and supports. In particular, inelastic methods such as plastic instability and limit analysis methods, as defined in the ASME Section III, are not used in conjunction with an elastic system analysis. The RCS and associated supports, which are analyzed using elastic methods, are shown in Figure 3.9-1.

Inelastic methods of analysis are used in cases where deemed desirable and appropriate to permit significant local inelastic response. In these cases, if any, the system or subsystem analyses performed to establish the loads that act on components and component supports are modified to include the inelastic strain compatibility in the local regions of the components and component supports at which significant local inelastic response is permitted.

Inelastic methods defined in the ASME Section III as plastic instability or limit analysis methods are not used.

3.9.1.4.1.1 Non-Code Items

The components not covered by the ASME Code but related to plant safety include:

a. Reactor internal structures (Class IS)

b. Fuel

c. Control element drive mechanisms (CEDMs)

d. Control element assemblies (CEAs)

Each component is designed in accordance with the relevant criteria to provide reasonable assurance of its operability as related to safety. The fuel assembly and CEA design is described in Section 4.2. The non-code components of the CEDMs are proven by testing as described in Subsection 3.9.4.4.

3.9.2 Dynamic Testing and Analysis of Systems, Components, and Equipment

3.9.2.1 Piping Vibration, Thermal Expansion, and Dynamic Effects

Piping vibration, thermal expansion, and dynamic effects are tested during the initial test program (ITP) as delineated in Section 14.2. The ITP is implemented to verify that the piping for all ASME Section III Class 1, 2, and 3 piping systems, other high-energy piping systems inside seismic Category I structures, high energy portions of systems whose failure could reduce the functioning of any seismic Category I plant feature to an unacceptable safety level, and seismic Category I portions of moderate-energy piping systems located outside containment will remain within acceptable limits when subjected to piping vibrations and dynamic transients such as those caused by in-line component trips.

The ITP is conducted in accordance with the ASME OM-S/G-1990 (Reference 70).

The ITP is implemented to demonstrate that these piping systems, restraints, components, and supports have been designed to withstand flow-induced dynamic loading under the steady-state and operational transient conditions anticipated during service, to confirm that proper allowance for thermal contraction and expansion is provided, and to demonstrate that piping vibrations are within the acceptable level. The supports and restraints necessary for operation during the life of the plant are considered to be parts of the piping system.

The test procedure includes a list of systems, flow modes, and selected locations for visual inspections and other measurements, the acceptance criteria, and possible corrective actions if excessive vibration or indications of thermal motion restraint occur.

The proper installation and operation of snubbers is verified through visual inspections, hot and cold position measurements, and observation of thermal movements during the ITP. A check of snubber operability is made by recording hot and cold positions and comparing these positions to calculated hot and cold positions. The list of snubbers on systems, which experience sufficient thermal movement to measure snubber travel from cold to hot position, will be provided as part of the test procedure. In addition, the test procedure includes the procedure necessary to verify the snubber operability when snubber travel is not measured.

During the startup testing, the piping systems which are specified as part of the ITP are operated to check the performance characteristics of critical pumps, valve, controls, and auxiliary equipment. The flow modes of operation and transients that are performed during the test include pump trips and valve closures. In the case of the RCS heatup tests, transients that are applied to the system include the RCP start, RCP trip, the operation of pressure-relieving valves, and closure of a turbine stop valve. Additional requirements of startup testing are outlined in Subsection 14.2.1.

The general requirements for vibration and dynamic effects testing of piping systems are specified in NRC RG 1.68 (Reference 69). Test specifications are in accordance with ASME OM-S/G-1990, Part 3 (Reference 70). If vibration is noted beyond the acceptance levels, corrective measures to the restraints are designed, incorporated in the piping systems analysis, and installed. If the test results determines that the piping system restraints are inadequate or are damaged, corrective measures to the restraints are installed and another test is performed to determine whether the vibrations have been reduced to an acceptable level.

3.9.2.1.1 Steady-State Vibration

The above piping systems in Subsection 3.9.2.1 with the potential to exhibit significant vibration are monitored for steady-state vibration.

The details relating to this test are described in the test procedure prepared in accordance with ASME OM-S/G-1990, Part 3. The piping is monitored for normal operating and test modes along with operating modes expected to result in the most severe vibration. The piping is visually inspected and vibration movements are measured using portable instrumentation at locations where the vibration is determined to be the most severe. The piping, if necessary, is instrumented and monitored remotely.

The measured piping displacements are compared with allowable displacement limits that are based on the allowable stress amplitudes, S_{alt}, calculated in accordance with ASME OM-S/G-1990, Part3. S_{alt} is limited as defined below.

a. For ASME Section III, Class 1 piping systems

$$S_{alt} = \frac{C_2 K_2}{Z} M \leq \frac{S_{el}}{\alpha}$$

Where:

C_2 = secondary stress index as defined in ASME Section III

K_2 = local stress index as defined in ASME Section III

M = maximum zero to peak dynamic moment loading due to vibration only, or in combination with other loads, as required by the system design specification

S_{el} = 0.8 S_A, where S_A is the alternating stress at 10^6 cycles in psi from ASME Section III, Appendices, Figure I-9.1; or S_A at 10^{11} cycles from the ASME Section III, Appendices, Figure I-9.2.2. The user considers the influence of temperature on the modulus of elasticity.

Z = section modulus of the pipe

α = allowable stress reduction factor: 1.3 for materials covered by the ASME Section III, Appendices, Figure I-9.1; or 1.0 for materials covered by the ASME Section III, Appendices, Figure I-9.2.1 or I 9.2.2

b. For ASME Section III, Class 2 and 3 piping systems and ASME B31 piping systems

$$S_{alt} = \frac{C_2K_2}{Z} M \leq \frac{S_{el}}{\alpha}$$

Where:

C_2K_2 = $2i$

i = stress intensification factor, as defined in ASME Section III, NC and ND or ASME B31

The allowable stress reduction factor provides reasonable assurance that the alternating stress S_{alt} is based on the number of cycles during the design life.

If the measured piping displacements exceed allowable limits, one or more of the following actions are taken so that the vibration can be qualified.

a. Analyses are performed to show that the measured displacements are acceptable.

b. Additional testing is performed to show that the peak stresses due to the vibration are acceptable.

c. The source of the excessive vibrations is eliminated.

d. The pipe supporting arrangement is modified to reduce the vibration within acceptable levels.

3.9.2.1.2 Dynamic Transient Vibration

The dynamic transient vibration differs from steady-state vibration in that it occurs in a relatively short period of time and is usually generated by much larger forces.

In piping systems, the dynamic transient vibrations are most evaluated on the basis of pipe deflections and reactions. The primary cause of the dynamic transient vibrations is a high-pressure or low-pressure pulse traveling through the fluid. The dynamic transient vibrations are usually induced by rapid start or trip of a pump or turbine, and the quick closing or opening of valves such as turbine-stop valves and various types of control valves. The dynamic transients also occur as a result of rapid actuation of safety/relief valve (SRV) opening or as a result of unexpected events, such as condensed water accumulating at a low point in steam piping during a plant outage.

The operational dynamic transient condition having significant impact on the piping system is included in the test. The piping system is verified to operate appropriately by monitoring piping and pipe supports, including snubbers, subjected to the effects of the operational dynamic transient condition during the test.

The piping is instrumented to measure the system response during the dynamic transient events. The measured responses are compared with analytically predicted values from the piping stress reports.

If excessive system vibration is apparent during the dynamic transient events, an evaluation is performed to determine the cause and to identify the corrective action.

Alternatively, an analysis may be performed to demonstrate that the measured dynamic transient vibration does not cause the piping system in question to exceed stress or fatigue acceptance criteria.

3.9.2.1.3 Thermal Expansion

For piping systems expected to be subjected to significant thermal movements, the thermal expansion test is performed to verify that the piping system expands and contracts within the acceptable limits based on analytically predicted movements from the piping stress analyses during the ITP and is performed in accordance with the requirements of ASME OM-S/G-1990, Part 7. The detailed description of the thermal motion monitoring program will be included as part of the test procedure. The thermal motion monitoring program will include verification of snubber movement, adequate clearances and gaps, the acceptance criteria, and how the motion is to be measured.

Prior to heatup, the locations of potential thermal interferences are identified and appropriate corrective restraints are installed through a pre-heatup walkdown. One complete thermal cycle (i.e., cold to hot position and back to cold position) is monitored.

The piping and components are visually inspected and piping displacements are monitored at predetermined locations. The measurement locations are based on those of snubbers, hangers, and expected large displacements.

3.9.2.2 Seismic Analysis and Qualification of Seismic Category I Mechanical Equipment

3.9.2.2.1 Seismic Qualification Testing

The recommended guidance and requirements in NRC RG 1.100 (Reference 34) and IEEE Std. 344 (Reference 35) are used for the development and implementation of methods and procedures for seismic qualification of mechanical and electrical equipment. The seismic qualification testing methods for safety-related mechanical equipment are described in Subsection 3.10.2.2.

3.9.2.2.2 Seismic System Analysis Methods

The seismic system analysis methods (e.g., response spectra analysis, time-history analysis, equivalent static load analysis) are described in Subsections 3.7.2 and 3.7.3. The method of analysis for piping and supports is described in Section 3.12. Seismic analysis methods for mechanical equipment and supports use the guidelines in IEEE Std. 344 and Subsection 3.10.2 and 3.10.3. The seismic analysis of mechanical equipment is performed by vendors to provide a seismic qualification report that demonstrates the structural integrity in accordance with the requirement of the design specification. The RCS seismic analysis is described in Appendix 3.9B.

3.9.2.2.3 Determination of Number of Earthquake Cycles

The OBE is chosen as 1/3 of the SSE for the APR1400 (see Section 3.7). When the OBE is less than or equal to 1/3 SSE, design or analysis is not required for the OBE.

With the elimination of the OBE, to account for fatigue in analysis and testing, the guidance for determination of the number of earthquake cycles described in SECY-93-087 (Reference 36) is used to account for fatigue in analysis and testing. For piping analysis, the number of earthquake cycles to be considered is defined in Subsection 3.7.3.1.

Alternatively, an equivalent number of fractional vibratory cycles to that of 20 full SSE vibratory cycles may be used (but with an amplitude not less than one-third of the maximum SSE amplitude) when derived in accordance with Appendix D of IEEE Std. 344-1987.

3.9.2.2.4 Basis for Selection of Frequencies

The seismic analysis is accomplished to account for the resonant frequencies and the seismic responses of structures, subsystems, and components in their design. The fundamental frequency of restraints and supports system is designed to be greater than the ZPA frequency of the applicable ISRS, to ensure no additional amplification of the seismic loads on the restrained/supported equipment and components. The seismic responses of equipment and subsystems are maintained within the established limits. If the natural frequencies of the equipment and supporting structures are in the same range where resonance can occur, the resonance is considered for the seismic design.

3.9.2.2.5 Three Components of Earthquake Motion

The combination of three directional components of earthquake motion is in accordance with NRC RG 1.92 (Reference 37) as described in Subsections 3.7.2.6 and 3.12.3.2.

3.9.2.2.6 Combination of Modal Responses

The combination of modal responses is applicable when the response spectrum method of analysis is used, because the phase relationship between various modes is not identified and only the maximum responses for each mode are determined. Modal responses are combined by the methods described in Subsection 3.7.2.7 for the mechanical equipment.

For piping analysis, the guidance on combining the individual modal results in NRC RG 1.92 is used as described in Subsection 3.12.3.2.

3.9.2.2.7 Analytical Procedures for Piping

All seismic Category I and II piping is analyzed for seismic effects as described in Subsection 3.12.3.

3.9.2.2.8 Multiple-Supported Equipment Components with Distinct Inputs

When the equipment or component is supported at points with different elevations within a building and between buildings, either the envelope of these elevation response spectra or multiple supports excitation is used for the seismic qualification of the equipment.

If ISM (Independent Support Motion) method is utilized for alternate method of multiple supports excitation, the criteria for the use of ISM method will be followed in accordance with NUREG -1061, Volume 2, Section 4.

For analyzing the piping systems supported at multiple locations within a single structure or multiple structures, the method used is described in Subsection 3.12.3.2. The SSCs design procedure for differential settlement and relative displacement is described in Subsection 3.8.5.8.

3.9.2.2.9 Use of Constant Vertical Static Factors

A constant static factor is not used for the seismic design of seismic Category I structures, systems, and components specified in Subsections 3.7.2.10 and 3.7.3.6.

3.9.2.2.10 Torsional Effects of Eccentric Masses

All concentrated loads in a piping subsystem, such as valves and valve operators, are modeled as massless members with the mass of each component lumped at its center of gravity. Massless members are modeled by connecting the center of gravity of components to the centerline of piping so that the torsional effects of the eccentric masses are considered.

Torsional effects of eccentric masses are also considered in the analysis of seismic Category I subsystems other than piping.

3.9.2.2.11 Buried Seismic Category I Conduits, and Tunnels

The seismic criteria and methods used to analyze buried seismic Category I conduit, and tunnels are addressed in Subsections 3.7.3.7.

3.9.2.2.12 Interaction of Other Piping with Seismic Category I Piping

Interaction of other piping with seismic Category I piping is addressed in Subsection 3.12.3.7.

3.9.2.2.13 Analysis Procedure for Damping

The damping values used for seismic analysis are consistent with NRC RG 1.61 (Reference 38) as described in Table 3.7-7.

3.9.2.2.14 Seismic Analysis for Mechanical Tanks

The structural integrity of tanks such as fire water tank, fuel tanks for the emergency diesel generator, and other mechanical tanks that are classified as seismic Category I is demonstrated by analysis. Structural analysis without testing is used if the structural integrity of such tanks can verify the intended design function.

The seismic analyses of the mechanical tanks are performed using a separate (decoupled) finite element model to determine their natural frequencies and mode shape. Seismic loads are calculated, depending on the natural frequency results from the finite element analysis, either by using the equivalent static method or dynamic method if the tanks are considered flexible (i.e., frequency less than 50 Hz). The impulsive and convective forces are also considered in the tank analyses. The stress evaluation of the mechanical tanks, bolts, tank plates, and tank supports are performed to ensure that the calculated stresses at all investigated locations are less than their corresponding allowable values.

The COL applicant is to review the detailed analysis of mechanical tanks, including the effects of fluid sloshing (COL 3.9(7)).

3.9.2.2.15 Test and Analysis Results

The test and analysis results are documented and available for review. The implementation program that includes milestones and completion dates is further described in Section 3.10.

3.9.2.3 Dynamic Response Analysis for Reactor Internals under Operational Flow Transients and Steady-State Conditions

The flow-induced vibration of the reactor internals components during normal operation can be characterized as a forced response to both deterministic and random pressure fluctuations in the coolant. Methods have been developed to predict the various components of the hydraulic forcing function and the response of the reactor internals to such excitation.

This analytical methodology is summarized in Figure 3.9-2. The method separates the response calculations into two groups in accordance with the physical nature of the loading. Methods for developing the deterministic component of the hydraulic forcing function are described in Subsection 3.9.2.3.1.1, while those relating to the random component are described in Subsection 3.9.2.3.1.2.

The responses of the reactor vessel core support and internal structures, including core support barrel assembly, upper guide structure assembly, and lower support structure assembly, to the normal operating hydraulic loads are calculated by finite element techniques. The mathematical models used in these response analyses are described in Subsection 3.9.2.3.2. The methods used in calculating the structural responses are described in Subsection 3.9.2.3.3.

3.9.2.3.1 Hydraulic Forcing Function

3.9.2.3.1.1 Deterministic Forcing Function

An analysis based on a hydrodynamic model is used to obtain the relationship between RCP pulsations in the inlet ducts and the deterministic pressure fluctuations on the core support barrel. A detailed description of this model and subsequent solution are given in References 39 and 40. The model represents the annulus of coolant between the core support barrel and the reactor vessel. In deriving the governing hydrodynamic differential equation for the model, the fluid is taken to be compressible and inviscid. Linearized versions of the equations of motion and continuity are used. The excitation on the hydraulic model is harmonic with the frequencies of excitation corresponding to pump rotational speeds and blade passing frequencies.

The dynamic force on the upper guide structure assembly is due to flow-induced forces on the tube bank. The deterministic components of these forces are caused by pressure pulsations at harmonics of the pump rotor and blade passing frequencies, and vortex shedding due to crossflow over the tubes.

The in-core instrumentation (ICI) nozzles and the skewed beam supports for the ICI support plate of the lower support structure are excited by deterministic and/or random, flow-induced forces. The deterministic component of this loading is due to pump-related pressure fluctuations and vortex shedding due to crossflow.

Data from the System 80 preoperational test (References 41 and 42) is used to determine the magnitude of these pulsations at the pump rotor and blade passing frequencies and their harmonics.

3.9.2.3.1.2 Random Forcing Function

The random hydraulic forcing function is developed based on the System 80 preoperational test (Reference 42). The forcing function is represented in the form of power spectral density together with associated coherence area. The forcing function is modified to reflect the flow rate and density differences based on an analytical expression found in Reference 43.

At normal operating conditions, the shroud tubes of upper guide structure assembly are excited by an upstream wake produced by turbulent buffeting. The forcing function for this type of loading can be represented as a band-limited white noise power spectrum.

The ICI nozzles and ICI support plate support beams of the lower support structure assembly are both subject to turbulent buffeting by the flow skirt jets. The outermost ICI nozzles and beams receive full impact of the jets before the jets decay due to fluid entrainment and the presence of inner tube rows. The force spectrum of these jets is assumed to be represented as wideband white noise. The magnitude of this spectrum is computed based on data from the System 80 preoperational tests.

3.9.2.3.2 Mathematical Models

Finite element analyses are performed on each of the reactor internals components using mathematical models. These models are designed to provide the most efficient analysis under the most significant loading condition to which each structure is exposed. The core support barrel (CSB) assembly is modeled as a shell using the ASHSD computer code as shown in Figure 3.9-3. The structure is fixed at the upper flange to determine the beam modes and frequencies. The shell modes and frequencies are found by considering the upper flange fixed and the lower flange pinned. These analyses include hydrodynamic mass effects. All significant mode shapes and frequencies are used in combination to perform the normal operating deterministic response analysis. A simplified finite element model of the barrel assembly is generated in the ANSYS program for use in the random response analysis.

The inner barrel assembly is modeled as plate and solid elements using the ANSYS computer code as shown in Figure 3.9-4. The model is used to determine the static and dynamic characteristics as well as periodic and random response analyses.

The control element assembly (CEA) guide tubes, fuel alignment plate and UGS support plate are modeled as beam and plate elements using the ANSYS code (Figure 3.9-5). The model includes details in the regions of selected CEA guide tubes and HJTC tubes to analyze detailed responses of these tubes.

The lower support structure is modeled as plate elements using the ANSYS computer code to determine the modes, natural frequencies, and responses. The in-core instrumentation assembly (Figure 3.9-6) is modeled as plate, beam, mass, and spring elements using ANSYS to analyze the dynamic characteristics and responses.

3.9.2.3.3 Response Analysis

3.9.2.3.3.1 Periodic Response

The normal mode method (Reference 44) is used to obtain the structural response of the reactor internals to the periodic forcing functions developed in Subsection 3.9.2.3.1.1. The method is applied to the appropriate finite element models described in Subsection 3.9.2.3.2. Generalized masses based on mode shapes and the mass matrices are calculated for the modes of vibration of each component. Modal force participation factors are based on the mode shapes and the predicted periodic forcing functions are calculated for each mode and forcing function. The generalized coordinate response for each mode is then obtained from the solution of the corresponding set of independent second order single-degree of freedom equation. Using mode shapes, the modal responses of the reactor internals are obtained by means of the appropriate coordinate transformations. Response to any specific forcing function is obtained through summation of the component modes for that forcing function.

3.9.2.3.3.2 Random Response

The normal mode method is used to obtain the structural response of the reactor internals subjected to random forcing functions. The random forcing functions are assumed to be of both the band limited and wide band white noise varieties as described in Subsection 3.9.2.3.1.2. Experimental and analytical expressions are used to define the force power spectral density associated with flow related turbulence and jet impact. The appropriate mathematical models described in Subsection 3.9.2.3.2 are used in the ANSYS. This code computes the root mean square (RMS) displacements, loads, and stresses in a multi-degree-of-freedom linear-elastic structural model subjected to stationary random dynamic loadings, such as those described in Subsection 3.9.2.3.1.2.

A value of 3 × RMS is used for considering peak responses to random loading. These peak values are then combined with results from other analyses and used in design verification analyses. The use of the value 3 × RMS is common design practice based upon the assumptions of Random Gaussian loading of structures made of ductile materials as described in Reference 45.

3.9.2.4 Preoperational Flow Induced Vibration Testing of Reactor Internals

In accordance with NRC RG 1.20 (Reference 46), a comprehensive vibration assessment program (CVAP) is conducted for reactor internals. The detailed evaluation of the CVAP for the APR1400 reactor internals, including the SG internals, the RCS piping and the piping attached to the RCS, is provided in Technical Report, APR1400-Z-M-NR-14009-P (Reference 47). The APR1400 is classified as non-prototype Category I, per NRC RG 1.20, with Palo Verde Unit 1, a Westinghouse System 80 reactor, as the valid prototype (Reference 42). According to CVAP Report of System 80 reactor internals (Reference 42), evaluation of the comparisons of analytical predictions, test measurements, and visual inspection results leads to the conclusion that the System 80 prototype reactor internals are structurally adequate and acceptable for long-term operation. The Palo Verde Unit 1 design and the APR1400 design are substantially the same with regard to arrangement, design, size, and operating conditions. The comparisons of arrangement, design, size, and operating conditions for reactor internals are provided in Tables 3.9-15 through 3.9-17.

The CVAP for the APR1400 design consists of the analysis program and inspection program. The analysis program is described in Subsection 3.9.2.3.

The inspection program consists of a pre-hot functional test inspection and a post-hot functional test inspection of the reactor internals. The duration of the hot functional test is established to provide reasonable assurance that 10^6 cycles of vibration have occurred before the post-hot functional inspection. A detailed inspection of major load-bearing surfaces, contact surfaces, welds, and maximum stress locations identified in the analysis program is performed. All observations made during the pre-hot and post-hot functional test inspections are documented. A comparison of the structures is made to verify that no loss in structural integrity due to flow-induced vibrations has occurred.

The evaluation, consisting of the analysis program and inspection program, confirms the adequacy of the analysis prediction techniques and the structural integrity of the APR1400 design according to the guidance of NRC RG 1.20. The COL applicant is to provide the inspection results for the APR1400 reactor internals classified as non-prototype Category I in accordance with NRC RG 1.20 (COL 3.9(1)).

NRC RG 1.20 recommends that the potential adverse effects from pressure fluctuations and vibrations in piping systems be considered for the steam generator internals in PWRs, which may be adversely affected by the flow-excited acoustic resonances and flow-induced vibrations. The steam dryers and separators in the APR1400 SG are subject to secondary side steam flow. Although there are instances of similar components in boiling water reactors (BWRs) exhibiting excessive vibration resulting from plant power uprate, none have been reported for PWR SG designs to date. This is further supported by the Operational Performance Information System for Nuclear Power Plants (OPIS) database, which also does not have any incidents related to the flow-induced vibration problems for PWR SG upper internals.

The design of the APR1400 SG upper internals and the flow conditions for which they are subjected are similar to the existing and currently operating SGs in the Republic of Korea and around the world. Based on the operational experience for the SG upper internals, KHNP concludes that these non-safety-related components will not exhibit excessive vibration. Consequently, no startup testing with measurement is planned for these components.

The vibration of the piping attached to the RCS as well as SG (main steam and main feedwater lines) is measured during initial startup testing. Strain gauges and accelerometers will be used to measure the vibration at selected locations for both steady-state and transient flow conditions. With regards to the condensate system, hand held vibration measurement equipment is used to measure accelerations at discrete locations in the piping system during startup testing.

The acceptance criteria for the piping will be based upon satisfying the appropriate displacement, acceleration, stress, and fatigue. The acquired data will be used to confirm that unexpected, abnormal vibrations do not occur, and that the vibration responses of the piping are sufficiently small compared to an acceptance criterion based on the design fatigue curves in ASME Section III.

3.9.2.5 Dynamic System Analysis of the Reactor Internals under Faulted Conditions

Dynamic analyses are performed to determine the maximum structural responses of the reactor internals, including the core to postulated pipe breaks and seismic loadings, and to verify the adequacy of their design.

The results of the analyses are required to meet the stress limits of ASME Section III, NG, for core support structures and the functional requirements of the reactor internals design specification. More information on the reactor internals design is provided in Subsection 3.9.5.3.

3.9.2.5.1 Seismic Analysis of Reactor Internals

The seismic analyses of the reactor internals including the core are performed separately for the horizontal and vertical directions.

In the horizontal direction, because the relative displacements between the core and core shroud and between the core support barrel and reactor vessel snubbers are sufficiently large to close the gaps that exist between these components, nonlinear horizontal time-history analyses are performed. The horizontal nonlinear analyses are divided into two parts. In the first part, the internals and core are analyzed to obtain the response of the internals and the proper dynamic input for the reactor core analysis. In the second part, the core plate motion from the first part is applied to a more detailed nonlinear model of the reactor core. The input excitation to the internals model is the response time-history of the reactor vessel at the internals support determined from the RCS analysis. Coupling effects between the internals and reactor vessel are accounted for by including a simplified representation of the internals with the RCS model.

A nonlinear analysis is also performed in the vertical direction. Possible lifting of the core off the core support surface, friction between the fuel rods and spacer grids, and fuel assembly holddown force are examples of nonlinear effects included in the vertical analysis.

In these analyses, two horizontal components and one vertical component of the seismic excitation are considered and the maximum responses for the three components are combined by the square root of the sum of the squares (SRSS) method.

The multi-mass mathematical models are developed to represent the reactor internals and core. The mathematical models of the internals are constructed in terms of lumped masses and linear elastic-spring elements. At appropriate locations within the internals and core, nodes are chosen to lump the weights of the structures. The criterion for choosing the number and location for mass concentration is to provide accurate representation of the significant modes of vibration of each of the internals components. The moments of inertia, cross-sectional areas, effective shear areas, and lengths are calculated for the element properties. The model definitions employ the procedures established in Westinghouse Topical Report CENPD-178 (Reference 48) and include hydrodynamic coupling effects. Separate horizontal and vertical models of the internals and core are formulated to more efficiently account for structural differences in these directions. In the horizontal nonlinear lumped mass representation of the internals and core, shown in Figure 3.9-15, gap and spring elements are used to represent contact between the fuel and core shroud. Lumped-mass nodes in the core are positioned to coincide with fuel-spacer grid locations. To simulate the nonlinear motion of the fuel, nonlinear spring couplings are used to connect corresponding nodes to the fuel assemblies and core shroud. The core is modeled by subdividing it into fuel assembly groupings and choosing stiffness values to adequately characterize its beam response and contacting under dynamic loading.

The horizontal nonlinear reactor core model, consisting of one row of 17 individual fuel assemblies, is depicted in Figure 3.9-16. In this model, each fuel assembly is represented as mass points located at spacer grid locations. To simulate the gaps in the core, nonlinear spring couplings are used to connect corresponding nodes on adjacent fuel assemblies and the core shroud. The impact stiffness and impact damping parameters for the gap elements are derived from the impact tests, which are described in Section 4.2. The spacer grid impact representation used for the analysis is capable of representing two types of fuel assembly impact situations. In the first type, only one side of the spacer grid is loaded. This type of impact occurs when the peripheral fuel assembly hits the core shroud, or when two fuel assemblies strike one another. The second type of impact loading occurs typically when the fuel assemblies pile up on one side of the core. In this case, the spacer grids are subjected to a through-grid compressive loading.

The fuel assemblies in the coupled core/internals model and the detailed core model are modeled with beam elements to represent the horizontal stiffness between mass points and rotational springs at each end to simulate the end fixity existing at the top and bottom of the core. The value used for fuel horizontal stiffness and end fixity is based upon a parametric study in which analytic predictions are correlated with fuel assembly static and dynamic test data. Fuel assembly structural damping as a function of vibrational amplitude is derived from fuel assembly forced vibration and pluck tests. The damping values used in the seismic analysis of the reactor internals are in accordance with the values in Table 3.7-7.

The vertical nonlinear model is shown in Figure 3.9-17. The vertical model stiffness values are generally calculated using bar characteristic equations. Nonlinear couplings are included between components to account for structural interactions such as those between the fuel and core support plate, and between the core support barrel and upper guide structure upper flanges. Preloads, which are caused by the combined action of applied external forces, deadweights, and holddown forces, are also included. Friction elements are used to simulate the coupling between the fuel rods and spacer grids.

It has been shown both analytically and experimentally (Reference 49) that immersion of a body in a dense-fluid medium lowers its natural frequency and significantly alters its vibratory response as compared to those in air. The effect is more pronounced when the confining boundaries of the fluid are close to the vibrating body as in reactor internals. Hydrodynamic mass is employed to account for the effects of surrounding fluid on a vibrating system. The hydrodynamic mass of an immersed system is a function of the dimensions of the real mass and the space between the real mass and confining boundary. Hydrodynamic mass effects for moving cylinders in a water annulus are discussed in References 49 and 50.

The nonlinear seismic response and impact forces for the internals and fuel are determined using the CESHOCK computer program (see Subsection 3.9.1.2.2.3). The computer programs provide numerical solutions to transient dynamic problems by step-by-step integration of the differential equations of motion. The input excitation for the model is the time-history acceleration of the reactor vessel.

Input to the computer program consists of initial conditions, nodal lumped masses, linear-spring coefficients, mass moments of inertia, nonlinear spring curves, and the acceleration time histories. The output from the computer program consists of displacements, velocities, accelerations, impact forces, axial forces, shears, and moments.

The procedures used to account for damping in the analysis of the reactor internals and core are provided in Subsection 3.7.2.15.

The nonlinear response loads for the internals, including impacting, are determined for the vertical and horizontal directions. Vertical loads for the fuel are determined in the coupled model of internals and core and horizontal loads for the fuel are determined in a separate reactor core nonlinear analysis. The results are determined for the SSE.

3.9.2.5.2 Pipe Rupture Analysis of the Reactor Internals

3.9.2.5.2.1 Input Excitation

According to the application of LBB, the postulated pipe breaks for the reactor coolant system, reactor internals, and fuel assembly are defined in Subsection 3.6.2. The secondary side breaks, which cause vibratory motion to the reactor internals, do not cause blowdown loads within the reactor vessel. However, the primary side break causes blowdown loads as well as vibratory motion. The blowdown loads consist of transient pressure, flow rate, and density distributions throughout the primary RCS.

The transient pressure, flow rate, and density distributions are computed for the subcooled and saturated portions of the blowdown period during the pipe breaks. The computer code that is used is based on a node flow path concept in which control volumes (nodes) are connected in any desired manner by flow areas (flow paths). A complex node / flow path network is used to model the reactor coolant system. The modeling procedure has been compared to a large-scale experimental blowdown test with excellent agreement. The laws of conservation of mass, energy, and momentum along with a representation of the equation of state are solved simultaneously. The hydraulic transient of the reactor is coupled to the thermal response of the core by analytically solving the one-dimensional radial heat conduction equation in each core node. Pre-blowdown steady-state conditions in the reactor coolant system are established through the use of specified input quantities. The blowdown loads model uses a non-equilibrium critical flow correlation for computing the subcooled and saturated critical fluid discharge through the break.

A break in the reactor coolant system results in large local pressure differences across various reactor internal components and an acceleration of the local fluid velocity in various regions. The acceleration of the local fluid velocity can result in higher component drag loads than during steady-state reactor operation.

The total instantaneous load across the core is given by the summation of the pressure forces acting in the direction of the pressure gradient and the drag forces acting parallel to the flow. The loads are obtained using a control volume approach using an integrated fluid momentum equation. The drag forces are represented by the fluid shear term in this equation and consist of both frictional and form drag.

3.9.2.5.2.1.1 Reactor Internals Asymmetric Blowdown Loads

During an inlet break, dynamic lateral loads are developed on the core support barrel by the time varying radial pressure disturbances. These are highly asymmetric in the circumferential direction and are caused by the expansion of wave fronts and flow redistributions acting on the surface of the barrel. In order to obtain these applied lateral loads, the time-dependent Fourier coefficients that define the circumferential pressure distributions are first obtained. A linear variation in pressure is assumed to act between each elevation. The sine and cosine pressure distributions produce a response in the barrel, which is analogous to a beam-bending mode. When integrated over the surface area of the core support barrel, these pressures produce resultant lateral loads that are applied to the model.

3.9.2.5.2.1.2 Control Element Guide Tube Loads

During normal operation, the reactor coolant flows axially through the core into the upper guide structure. Within the upper guide structure, the coolant flow changes direction so that it exits through the hot leg nozzles.

During an outlet break, the transverse flow of the coolant across the control element guide tubes gives rise to loads that induce deflections in these tubes. The transverse drag forces are determined from flow model experiments that are geometrically and dynamically similar to the full-scale upper guide structure design for the System 80.

3.9.2.5.2.1.3 Vertical Hydraulic Loads

The vertical hydraulic loads on the reactor internals due to postulated pipe breaks are considered. The loads are obtained using a control volume approach using an integrated fluid momentum equation. This is based on control volumes that are consistent with both fluid volumes and the lumped mass nodes of the vertical analysis model.

The resulting reactor internals blowdown loads are used in subsequent analyses to determine the structural response of the internals and fuel.

3.9.2.5.2.2 Analysis Model

The horizontal model of the reactor internals used for the pipe break analysis is the same as the seismic model (Figure 3.9-15) except for the control element guide tubes (tube bank) region. The outlet pipe breaks (see Subsection 3.9.2.5.2.1.2) result in direct application of hydraulic loads to the tube bank region; therefore, more detail is required in the model for the outlet pipe breaks than for the inlet pipe breaks. The same model with seismic analysis (Figure 3.9-17) is used for pipe break analysis in the vertical direction.

3.9.2.5.2.3 Analysis Method

The nonlinear pipe break response and impact forces for the internals and fuel are determined using the CESHOCK computer program. The computer programs provide the numerical solution to transient dynamic problems by step-by-step integration of the differential equations of motion. The input excitation for the model is the time-history acceleration of the reactor vessel.

Input to the computer program consists of initial conditions, nodal lumped masses, linear-spring coefficients, mass moments of inertia, nonlinear spring curves, and the acceleration time-histories. The output from the computer program consists of displacements, velocities, accelerations, impact forces, axial forces, shears, and moments.

A cold leg branch line break causes a pressure transient on the core support barrel (CSB) that varies circumferentially as well as longitudinally. The ASHSD finite element computer code is used to analyze the shell response of the CSB to the pressure transient from a cold leg branch line break. The CSB is modeled as a series of shell elements joined at their nodal points, as shown in Figure 3.9-3. The length of the elements in each model is selected to be a fraction of the shell attenuation length.

A damped equation of motion is formulated for each degree of freedom of the system. Four degrees of freedom for radial displacement, circumferential displacement, vertical displacement, and meridional rotation are considered in the analysis. The differential equations of motion are solved numerically using a step-by-step integration procedure.

The circumferential variation of the pressure time-history is considered by representing the pressure as a Fourier expansion. The pressure at each node in the model is determined by linear interpolation. Thus, a complete spatial time load distribution compatible with the ASHSD computer program is obtained. Each load harmonic is considered separately by

ASHSD. The results for each harmonic are then added to obtain the nodal displacements, resultant shell forces, and shell stresses as a function of time.

3.9.2.5.3 In-Containment Refueling Water Storage Tank Discharge Analysis

The reactor internals and core are analyzed for the IRWST discharge loads.

The analytical models and the procedures of the reactor internals and core and the detailed core for IRWST discharge loads are the same as those used in the seismic analyses.

The input excitation to the reactor internals and core model is the acceleration time histories of reactor vessel flange and snubbers determined from the RCS IRWST analysis.

The maximum stresses resulting from IRWST, pipe break, and SSE are combined using the SRSS method to obtain the total stress intensities.

3.9.2.6 Correlations of Reactor Internals Vibration Tests with the Analytical Results

The results of the dynamic analysis of the reactor internals are compared with the results of preoperational tests of the prototype reactor (Reference 42) since the APR1400 reactor internals are classified as non-prototype Category I as described in Subsection 3.9.2.4.

The dynamic analysis models for the faulted condition are developed using the dynamic characteristics measured in the test of the prototype.

3.9.2.7 Dynamic System Analysis of the CEDM

The pressure-retaining components of the control element drive mechanism (CEDM) are designed to the appropriate stress criteria of ASME Section III for all loadings specified. The structural integrity of the CEDM for the seismic loadings is verified by combination of test and analysis. Methods of dynamic analysis using response spectrum analysis or time-history analysis are supported with experimentally obtained information.

3.9.2.7.1 Input Excitation Data

For the dynamic analyses, response spectra or time-history definition of the excitation at the base of the CEDM nozzle is obtained from the seismic analysis of the RCS. The excitation is applied simultaneously in three mutually perpendicular directions (two horizontal and one vertical).

3.9.2.7.2 Analysis

A dynamic analysis of the mathematical structural model is performed using one or more of the computer programs described in Subsection 3.9.1.2.

3.9.2.7.3 Functional Test

Scram test using a minimum drop weight was performed by applying an incremental static deflection to the CEDM. From the test, the minimum radius of curvature of 2,025 inches for the upper pressure housing was obtained as the most critical criterion to ensure scramability. Deflection of the CEDM under seismic loading calculated by structural dynamic analysis was compared with the test result to verify scramability.

3.9.3 ASME Code Class 1, 2 and 3 Components, Component Supports, and Class CS Core Support Structures

This section describes the structural integrity of pressure-retaining components, component supports, and core support structures that are designed and constructed in accordance with the rules of the ASME Section III, Division 1 and GDC 1, 2, 4, 14, and 15.

The APR1400 design meets the SRP 3.9.3 criteria as described in the following respects:

a. 10 CFR 50.55a and 10 CFR Part 50, Appendix A, GDC 1, as they relate to structures and components being designed, fabricated, erected, and tested to quality standards commensurate with the safety-related functions to be performed. These requirements provide reasonable assurance that safety-related components and structures meet service loading conditions, stress limits, and quality requirements of ASME Code permitted in 10 CFR 50.55a.

b. GDC 2 and 10 CFR Part 50, Appendix S, as they relate to structures and components important to safety being designed to withstand the effects of earthquakes without loss of capability to perform their safety functions. The effects of expected natural phenomena on the normal and accident conditions are considered in the loading combinations for structures and components important to safety.

c. GDC 4 as it relates to structures and components important to safety being designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including lost-of-coolant accidents. The safety-related structures and components are protected against dynamic effects including LOCA by considering appropriate loading combinations as described in this section.

d. GDC 14 as it relates to the RCPB being designed, fabricated, erected, and tested to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. The RCPB components are designed in accordance with the ASME Code requirements that follow with GDC 14.

e. GDC 15 as it relates to the RCS and associated auxiliary, control, and protection systems being designed with sufficient margin to provide reasonable assurance that the design conditions of the RCPB are not exceeded during any condition of normal operation, including anticipated operational occurrences. These requirements provide reasonable assurance that the RCS and associated auxiliary system components meet ASME Code requirements.

f. 10 CFR Part 52 as it requires that components, component supports, and core support structures be designed and built in accordance with the certified design. Reasonable assurance that the design for the components, component supports, and core support structures is certified is provided by adhering to the applicable ASME Code requirements.

g. 10 CFR 52.47(b)(1), which requires that a DC application contain the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria are met, then a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations. Reasonable assurance that the requirements for the components, component supports, and core support structures are met is provided by adhering to the applicable ASME Code requirements and ITAACs.

h. 10 CFR 52.80(a), which requires that a COL application contain the proposed inspections, tests, and analyses, including those applicable to emergency planning, that the licensee will perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility is constructed and will operate in conformity with the combined license, the provisions of the Atomic Energy Act, and NRC regulations. The proposed inspections, tests, and analyses are described in Section 14.3 and those applicable to emergency planning in Section 13.3.

In accordance with ASME Code, design specifications and design reports are to be provided for ASME Section III, Class 1, 2, and 3 components and piping. The design specification defines the jurisdictional boundary for the NF portion of the piping support. The supports are designed in accordance with ASME Section III, NF and meet its requirements.

Welding activities are performed in accordance with the requirements of ASME Section III. Component supports are fabricated in accordance with the requirements of ASME Section III, NF.

When dissimilar-metal welding joints are used for the fabrication of ASME Code Class components and piping, the weld materials and processes are selected in consideration of the joint degradation caused by the stress corrosion cracking in service environments.

Loading conditions, stress limits, design transients, and methods of analysis for ASME Code Class 1 reactor coolant loop piping and associated components and component supports are described in Subsection 3.9.3.1.

3.9.3.1 Loading Combinations, Design Transients, and Stress Limits

The loading combinations specified for the design ASME Section III, Class 1 components, supports, and piping are categorized as Design, Level A, Level B, Level C, and Level D conditions. The following specific loading combinations are specified for design:

Design Loadings

Mechanical loads are combined as defined in (a) and (b) below.

a. Design pressure plus deadweight plus IRWST discharge

b. Installation or handling loads (only for RV)

Level A Service Loadings

The following loading combination is considered as a Level A service loading.

Normal operation loads in combination with specified system operating transient loads resulting from the normal events.

In addition, handling loads alone at cold shutdown conditions are used to design only the reactor vessel.

Level B Service Loadings

Normal operation (including deadweight) and IRWST discharge loads in conjunction with the upset transients are considered Level B service loadings.

The seismic cycles mentioned in Subsection 3.7.3 are applied in a fatigue analysis, considering the effects of reactor coolant environment in accordance with NRC RG 1.207.

Level C Service Loadings

SRP 3.9.3 defines the design basis pipe break (DBPB) as those postulated pipe breaks other than a LOCA or MS/FWPB and the DBPB is identified as an emergency condition. This includes postulated pipe breaks in Class 1 branch lines that result in the loss of reactor coolant at a rate less than or equal to the capability of the reactor coolant makeup system.

Make-up flow can compensate for the loss of coolant from a break with a 5.56 mm (7/32 in.) internal diameter as described in Subsection 9.3.4. In accordance with the guidance in SRP 3.6.2, postulated breaks in one-inch nominal diameter piping and smaller piping do not require the analysis of the dynamic system loading from a ruptured pipe on components, component supports or core support structures. The DBPB condition also results in RCS temperature and pressure transient conditions and is thus conservatively included as a Level B condition in the RCS design transients given in Table 3.9-1. Therefore, Level C service loadings are not used in any APR1400 analyses.

Postulated breaks in lines larger than 25.4 mm (1 in.) nominal diameter are considered in pipe break analysis as described in Subsection 3.6.2 and included in the BLPB scope, which are treated as Level D conditions. The BLPB scope includes those postulated pipe breaks in the lines connected to the RCS that are not eliminated by LBB and that result in the loss of the reactor coolant at a rate in excess of the capability of the reactor coolant makeup system, up to and including a break equivalent in size to the double-ended rupture of the largest pipe of the RCS except those eliminated by LBB evaluation. The BLPB scope also includes main steam and main feedwater pipe breaks (MS/FWPB).

Level D Service Loadings

Normal operation (including deadweight), SSE, IRWST discharge, branch line pipe breaks, other accident loads, and faulted transients are combined as defined below.

a. Normal Operation + $[SSE^2 + (BLPB + IRWST)^2]^{1/2}$ in conjunction with the faulted transients

b. Normal Operation + $[SSE^2 + (POSRV + IRWST)^2]^{1/2}$ in conjunction with faulted transients (only for the pressurizer)

The SSE and pipe rupture loadings plus IRWST discharge loads are combined by the SRSS method in accordance with the guidelines of NUREG-0484, Rev. 1, 1980, or by a more conservative method.

Test Loadings

Test loadings are the concurrent test pressure in conjunction with hydrostatic deadweight.

The specific design transients specified for design are described in Subsection 3.9.1.1. The loading combinations and the stress limits associated with them, as defined in the ASME Code, also apply to the internals parts that are essential to the component in performing its safety function.

ASME Code Class 1, 2, and 3 piping and components of fluid systems are designed and constructed in accordance with ASME Section III. Hydrostatic testing is performed per ASME Section III.

Design pressure, temperature, and other loading conditions that provide the bases for design of fluid systems are presented in the sections that describe the systems. The other loading conditions mean the loading conditions specified for the design of ASME Section III, Class 1, 2, and 3 components, supports, and piping, Control Element Drive Mechanism (CEDM), and Reactor Pressure Vessel Internals except for design pressure and temperature. These items are defined in Subsections 3.9.3.1, 3.9.4, and 3.9.5.

Stress analysis and fatigue evaluations are performed to determine structural adequacy of pressure components under the operating conditions of normal, upset, emergency, or faulted, as applicable.

Significant structural discontinuities in parts such as nozzles and flanges are considered. In addition to the design calculation required by ASME Section III, stress analysis is also performed by methods outlined in the code appendices.

Thermal stratification and striping are described not to create adverse effect on the associated piping in Subsection 3.12.5.10.

The loading combinations for the design of ASME Code Class 2 and 3 components and supports, CEDM, and reactor internals are described in Subsections 3.9.3.1.3, 3.9.4, and 3.9.5, respectively.

3.9.3.1.1 ASME Code Class 1 Components and Supports

Design transients for ASME Code Class 1 components and component supports are described in Subsection 3.9.1.1. Loading combinations for ASME Code Class 1 components are described in Table 3.9-2. Stress limits for ASME Code Class 1 components, supports, and piping are described in Table 3.9-3. The operating pressures of Code Class 1 active valves are limited to the pressures taken from the pressure-temperature rating of the ASME Section III for the maximum temperature of the given condition.

3.9.3.1.2 Reactor Internals

Design transients for reactor internals are described in Subsection 3.9.1.1. Loading combinations and stress limits are presented in Subsection 3.9.5.

3.9.3.1.3 ASME Code Class 2 and 3 Components and Supports

ASME Section III, NC and ND, provide design requirements for ASME Class 2 and 3 components. Loading combinations applicable to these Class 2 and 3 components and supports are described in Table 3.9-2. The stress criteria for the components are presented in Tables 3.9-5 through 3.9-9.

The Class 2 and 3 components that are subject to thermal or dynamic cyclic loads are evaluated for their fatigue sustainability using the ASME Section III, NC-3219.2 per SRP

3.9.3. A fatigue analysis is also performed in accordance with NC-3200 for the components that do not meet the NC-3219.2 criteria.

Stresses in valve bodies and pump casings are limited to the elastic limit of a material when the pump or valve is subjected to a combination of normal operating loads, seismic, and other applicable loads.

The functionality and operability of Class 2 and 3 safety-related active components are confirmed under combined service loadings at a stress level bounded by the specified service limit. The operability of active valves and pumps is described in Subsection 3.9.3.3.2.

In addition, the integrity of the pressure boundary for these components is properly maintained by verifying that calculated stresses are lower than their corresponding stress limits.

3.9.3.1.4 Preparation of Design Specifications

Design specifications for ASME Section III components and supports are prepared using guidelines given in Reference 34.

3.9.3.2 Design and Installation of Pressure Relief Devices

The pressure-relieving valves are designed in accordance with the requirements of ASME Section III, Appendix O. Where more than one valve is installed on the same pipe run, the sequence of valve openings to be assumed in analyzing for the stress at any piping location is estimated to induce the maximum instantaneous value of stress at that location. The applicable stress limits are satisfied for all components of the pipe run and connecting systems, and the pressure relief valve station, including supports. After the dynamic structural system analysis, a dynamic load factor affects the reaction forces and moments and a dynamic load factor of 2.0 is used in lieu of a dynamic analysis to determine the dynamic load factor.

3.9.3.2.1 Pressure Relief Devices Connected to the Pressurizer

The pressurizer pilot-operated safety relief valves (POSRVs) are designed to provide overpressure protection for the RCS. The POSRVs connected to the pressurizer are the only ASME Section III, Class 1 pressure relief valves in the APR1400.

Four pressurizer POSRVs are connected to the top of the pressurizer by separate inlet lines. There are two main discharge lines to the in-containment refueling water storage tank (IRWST). The steam from two POSRVs is discharged through one common discharge line. Each pressurizer POSRV provides the overpressure protection function with a main valve and two spring-loaded pilot valves in the assembly. The pressurizer POSRVs pass sufficient pressurizer steam to limit the RCS pressure to 110 percent of design pressure following a loss of load with delayed reactor trip, which is assumed to be initiated by the safety-grade signal from the reactor protection system (RPS). A delayed reactor trip is assumed to occur on a high-pressurizer pressure signal.

The pressurizer POSRVs and their pilot operators are qualified to operate in saturated steam, water, and steam and water mixtures in hot or cold conditions.

Details on the design of the POSRVs are provided in Subsections 5.2.2 and 5.4.14.

The opening of the POSRV introduces thermal-hydraulic transients in the discharge lines. The POSRVs discharge overpressurized reactor coolant into piping that carries the flow through a system of turns, straight segments, and area transitions or branches before expulsion at a remote location. Flow acceleration creates reactions forces.

For each main discharge line (two POSRVs), an analytical model is developed. The analytical model consists of the pressurizer, valves, and connecting piping from the pressurizer nozzles to the IRWST spargers. The pressurizer is modeled as a reservoir that is filled with saturated steam at constant pressure. For each straight pipe segment, a transient load is calculated. The analyses of the piping and support consider these reaction forces to be induced by the opening of the POSRVs.

3.9.3.2.2 Pressure Relief Devices for Class 2 Systems and Components

Pressure-relieving devices for ASME Section III, Class 2 systems include the main steam safety valves (MSSVs) and the main steam atmospheric dump valves (MSADVs) on the steam line and the low-temperature overpressure protection (LTOP) relief valves on the containment isolation portion of the normal shutdown cooling system (SCS).

The design and analysis requirements for the MSSVs, MSADVs, and discharge piping for the steam line are described in Subsection 10.3.2.

A relief valve on each of the SCS suction lines provides LTOP for RCS in a failure that initiates the pressure transient while in shutdown cooling and also can prevent overpressurization of the SCS. These relief valves are addressed in Subsection 5.4.7.

3.9.3.2.3 Pressure Relief Devices for Class 3 Systems and Components

Pressure-relieving devices for ASME Section III, Class 3 systems include relief valves and safety valves on heat exchangers, tanks, and piping lines to prevent overpressurization of the components and systems. The thrust load due to the valve opening is usually calculated using static analysis, and the load from static analysis is considered as input to the piping analysis with a dynamic load factor of 2.0. In case the static analysis produces undesirably conservative results, the valve thrust load is accomplished using dynamic analysis.

3.9.3.2.4 Pressure Relief Device Discharge System Design and Analysis

ASME Section III, Appendix O describes two types of discharge systems for pressure relief devices: open-discharge systems and closed-discharge systems. An open-discharge system discharges fluid directly to the atmosphere or to a vent pipe that is open to the atmosphere. A closed-discharge system is hard-piped to a distant location or closed tank. ASME Section III, Appendix O also describes the layout considerations and limits for both types of systems, as well as design equations and considerations for analysis of these systems. The APR1400 design conforms with these requirements.

3.9.3.3 Pump and Valve Functionality Assurance

3.9.3.3.1 Functionality Assurance Program

Active components are defined as pumps and valves and those components that perform a mechanical motion in order to shut down the plant, maintain the plant in a safe shutdown condition, or mitigate the consequences of a postulated event. Non-active components are those whose functional capability is not relied upon to perform a safety-related function for the various transients and plant conditions. The functional design and qualification of safety-related active components are performed in accordance with ASME QME-1-2007 (Reference 51) as accepted in NRC RG 1.100. The functional capability (performance of this mechanical motion) of active components during and after exposure to design basis events is confirmed by:

a. Designing each component to be capable of performing all safety functions during and following design basis events.

   The design specification includes applicable loading combinations and conservative design limits for active components. The specification requires that the manufacturer demonstrate functional capability, by test, or by a combination of analysis and test.

b. Analysis and/or test demonstrating the functional capability of each design under the most severe postulated loadings.

   Methods of functional capability demonstration programs are detailed in Subsections 3.9.3.3.2 and 3.9.3.3.3.

c. Inspection of each component to provide reasonable assurance of critical parameter conformance with specifications and drawings.

   This inspection confirms that specified materials and processes are used, that wall thicknesses meet code requirements, and that fits and finishes meet the manufacturer's requirements based on design clearance requirements.

d. Shop testing of each component to verify as-built conditions, as defined in Subsections 3.9.3.3.2 and 3.9.3.3.3.

e. Startup and periodic inservice testing in accordance with ASME OM Code as incorporated by reference in 10 CFR 50.55a to demonstrate that the active pumps and valves are in operating condition throughout the life of the plant.

The combined license (COL) applicant is to identify the site-specific active pumps (COL 3.9(2)).

3.9.3.3.2 Pump Functionality

ASME Class 2 and 3 safety-related active pumps are listed in Table 3.9-18. The following criteria are employed in a qualification program to ensure functional capability of the pumps required to function during and following design basis events.

a. Test or a combination of test and analysis are used in accordance with ASME QME-1-2007 as accepted in NRC RG 1.100 to confirm the adequacy of the pumps to function over the expected range of service conditions specified, including design basis event and post-design-basis event conditions, as well as inservice testing (IST) conditions.

b. The loads imposed by the attached piping along with the sustained dynamic and seismic loads are taken into account. The design specification includes applicable loading combinations and design stress limits for the pumps. In order to provide reasonable assurance of functional capability under combined loadings, the stresses resulting from the applied test loads envelop the specified service stress limit for which the pump's functional capability is intended. Design stress limits applied in evaluating loading combinations are described in Subsection3.9.3.1.

ASME Section III, Class 2 and 3 non-active pumps include the charging pumps, auxiliary charging pump, and boric acid makeup pumps. Stress limits for non-active and active pumps are shown in Table 3.9-6 and Table 3.9-7, respectively.

3.9.3.3.3 Valve Functionality

Safety-related active valves are listed in Table 3.9-4. ASME Class 1, 2, and 3 valves are designed and analyzed according to the requirements of ASME Section III, NB/NC/ND-3500.

The following criteria are employed in a qualification program to ensure functional capability of the valves required to function during and following design basis events.

a. Test or a combination of test and analysis are used in accordance with ASME QME-1-2007 as accepted in NRC RG 1.100 to confirm the adequacy of the valves to function over the expected range of service conditions specified, including design basis event and post-design-basis event conditions, as well as IST conditions.

b. The loads imposed by the attached piping along with the sustained dynamic and seismic loads are taken into account. The design specification includes applicable loading combinations, and design stress limits for the valves. In order to provide reasonable assurance of functional capability under combined loadings, the stresses resulting from the applied test loads envelop the specified service stress limit for which the valve's functional capability is intended. Design stress limits applied in evaluating loading combinations are described in Subsection 3.9.3.1.

The safety-related valves are subjected to a series of tests prior to service and during the plant life. Prior to installation, the following tests are performed:

a. Shell hydrostatic test to ASME Section III requirements

b. Backseat and main seat leakage tests

c. Disc hydrostatic test

d. Functional tests to verify that valve opens and closes as required when subjected to the design differential pressure and flow

Cold hydro qualification tests, hot functional qualification tests, and periodic in-service operational tests are performed in situ to verify and provide reasonable assurance of the functional ability of the valves. These tests provide reasonable assurance of the reliability of the valve for the design life of the plant.

Stress limits for active and non-active valves are shown in Table 3.9-9 and Table 3.9-8, respectively.

3.9.3.3.4 Non-NSSS Active ASME Code Class 2 and 3 Pumps and Class 1, 2, and 3 Valves

3.9.3.3.4.1 Pumps

ASME Class 2 and 3 safety-related active pumps are listed in Table 3.9-18. The following criteria are employed in a qualification program to provide reasonable assurance of functional capability of the pumps required to function during and following design basis events.

a. Tests or a combination of analyses and tests are used in accordance with ASME QME-1-2007 as accepted in NRC RG 1.100 to confirm that pumps function adequately over the expected range of service conditions, including design basis events and post-design-basis event conditions, as well as inservice inspections and test conditions.

b. The loads imposed by the attached piping, along with the sustained dynamic and seismic loads, are taken into account. The design specification includes applicable loading combinations, and design stress limits for the pumps. To provide reasonable assurance of functional capability under combined loadings, the stresses resulting from the applied test loads envelop the specified service stress limit for which pump functional capability is intended. Design stress limits applied in evaluating loading combinations are described in Subsection 3.9. 3.1.3.

3.9.3.3.4.2 Valves

Reasonable assurance of the functional capability of active valves is provided to perform a safety-related function during and after the specified plant design basis events. The active valves are seismically and functionally qualified in accordance with ASME QME-1-2007 as accepted in NRC RG 1.100, and IEEE Std. 344, and are described in Subsection 3.9.6. Subsection 3.9.6 also provides a description of the functional design and qualification provisions and IST programs for safety-related valves.

To provide reasonable assurance of the functional capability of the valves for the plant design life, they are analyzed and/or tested and inspected during construction including the factory tests.

The valves are designed using either stress analysis or conformance with the standard design rules for minimum wall thickness requirements in accordance with the applicable ASME Section III design requirement.

The maximum stress limits used in the analyses are those required by the applicable ASME Section III for the valve that is analyzed. For active valves with extended topworks (e.g., the operator), an analysis of the extended topworks is performed by applying equivalent static seismic loads applied at the center of gravity of the extended topworks.

Prior to installation, functionality and structural integrity tests of the valve are performed as follows:

a. Shell hydrostatic and valve closure tests in accordance with the ASME Section III, NB/NC/ND-3530 requirements

b. Functional and operational tests to verify that the valve opens and closes as required when subjected to the design differential pressure and flow

c. Functional capability qualification of motor operators for seismic and environmental conditions, if any, in accordance with IEEE Std. 323, 344, and 382 (References 53, 35, and 55)

After installation, the following tests are performed to verify and provide reasonable assurance of the functionality of the valve (References 57, 58, 59, and 60). These tests enhance the reliability of the valve for the design life of the plant.

a. Cold hydrostatic tests

b. Hot functional tests

c. Periodic inservice inspections

d. Periodic inservice operations tests

In addition to the valve qualifications noted above, a representative sample of the valves according to type, load level, and size is tested for functional capability during a simulated plant design basis event of an SSE. The seismic qualification of the valves is performed for the SSE preceded by one or more earthquakes. The number of preceding earthquakes is calculated based on Appendix D of IEEE Std. 344.

Selection of damping values for valves to be qualified is determined in accordance with NRC RG 1.61 and IEEE Std. 344. The valve is mounted to represent the typical valve installation or the specified valve installation. The valve includes operators and all appurtenances that are normally attached to the valve in the plant service. Section 3.10 provides the details of seismic qualification.

The functional capability of the active valves with extended topworks during a Level D service (SSE) condition is verified by satisfying the following criteria:

a. The functional capability evaluation of the valve is performed by analysis and/or test when subjected to equivalent static load resulting from the accelerations applied at the center of gravity during Level D service conditions.

b. For evaluation by test, the valve is subjected to a static deflection. The valve is operable within the specified operating time limits while an equivalent static load is applied to the extended structure center of gravity in the direction of the weakest axis of the yoke under design pressure.

c. For evaluation by analysis, stresses at critical locations are evaluated and compared to the allowable stress to determine structural integrity, and deflections at critical locations are compared to evaluate functional capability.

d. Electrical motor operators and other electrical appurtenances necessary for operation are qualified in accordance with IEEE Std. 382 and IEEE Std. 344.

The active valves without extended topworks, such as check valves and other compact valves, are simple in the valve design, and typically there are no masses causing significant distortions in the affection of the valve operation. Therefore, if these valves are designed so that if structural integrity is maintained, reasonable assurance of valve functional capability is considered to be provided.

In addition to the above design considerations, the valves are tested and inspected for in-shop hydrostatic test, in-shop seat leakage test, and periodic valve testing and inspection as installed.

Using the methods as described above, the active valves in the piping system are qualified for the valve functional capability during and after an SSE. In addition, these methods conservatively simulate the seismic event and verify that the active valves will perform their safety-related function when necessary.

3.9.3.4 Component Supports

Jurisdictional boundaries between ASME Section III, Class 1, 2, and 3 component supports and the building structure are established in accordance with ASME Section III, NF.

ASME Section III, Class 1, 2, and 3 component supports are designed and constructed in accordance with ASME Section III and ASME Code Case(s) approved in NRC RG 1.84.

Seismic Category I component supports are designed to meet the requirements of ASME Section III, NF. Welding fabrication and installation, nondestructive examination (NDE), and acceptance standards are in accordance with ASME Section III, NF, NRC RG 1.124 (Reference 62) and NRC RG 1.130 (Reference 63).

Component support building structures are designed to meet the criteria in Appendix 3.8A.

Component supports that are loaded during normal operation, seismic and following a pipe break (branch line breaks not eliminated by a leak-before-break) are specified for design for loading combinations of Subsection 3.9.3.1. Design stress limits applied in evaluating loading combinations for Level A, B, C or D plant conditions described in Subsection 3.9.3.1 are in accordance with ASME Section III. Loads in compression members are limited to 2/3 of the critical buckling load.

Concrete expansion anchors meet the requirements of ACI-349 and IE Bulletin 79-02 with the provisions identified in Subsection 3.8.4.5.

See Subsection 3.12.6.1 for a discussion of concrete expansion anchors.

Where required, snubber supports are used as shock arrestors for safety-related systems and components. Snubbers are used as structural supports during a dynamic event such as an earthquake or a pipe break but during normal operation act as passive devices that accommodate normal expansions and contractions of the systems without resistance. For the APR1400, snubbers are minimized to the extent practical through the use of design optimization.

The snubber is modeled as a linear spring element whose spring rate is determined using test results between the displacements and the test loads. The displacements include the effects of end fitting clearances, lost motion and compression of the fluid as well. Snubber reaction loads are determined from the system analysis with the spring elements. The snubber end fitting clearance, mismatch of end fitting clearances and mismatch of activation are minimized especially in multiple snubber application at the same support to share loads evenly.

Reasonable assurance of snubber operability is provided by incorporating analytical, design, installation, in-service, and verification criteria. The elements used to provide reasonable assurance of snubber operability for the APR1400 include:

a. Consideration of load cycles and travel that each snubber undergoes during normal plant operating conditions

b. Verification that the thermal growth rates of the system do not exceed the required lock-up velocity of the snubber

c. Accurate characterization of snubber mechanical properties in the structural analysis of the snubber-supported system

d. For engineered, large-bore snubbers, issuance of a design specification to the snubber supplier describing the required structural and mechanical performance of the snubber and verification that the specified design and fabrication requirements are met

e. Verification that snubbers are properly installed and operable prior to plant operation through visual inspection and measurement of thermal movements of snubber-supported systems during startup tests

f. A snubber in-service inspection and testing program, which includes periodic maintenance and visual inspection, inspection following a faulted event, a functional testing program, and repair or replacement of snubbers failing inspection or test acceptance criteria. The inservice testing program for snubbers is described in Subsection 3.9.6.4.

Site-specific information includes a list of all safety-related components that use snubbers in accordance with SRP 3.9.3.

3.9.4 Control Element Drive Mechanisms

The CEDM is designed, constructed, and tested to meet the requirements of GDC 1, 2, 4, 14, 26, 27, and 29, as well as 10 CFR 50.55a.

3.9.4.1 Descriptive Information of Control Element Drive Mechanism

The control element drive mechanism (CEDM) is a magnetic jack-type driving apparatus used to vertically position the control element assemblies (CEAs) as an independent reactivity control system. Each CEDM is capable of withdrawing, inserting, holding, or tripping the CEA from any point within its 3.8 m (150 in.) stroke in response to operation signals. The CEDM is capable of operating at the maximum speed of 76.2 cm/min (30 in/min) with minimum and maximum weight of the ESA and CEA, 100 kg (220 lbs) and 204 kg (450 lbs), respectively. The CEDM is capable of exerting 600 lbs minimum up force on the CEA and ESA.

The CEDM is designed to function during and after all plant transients. The CEA drop time for 90 percent insertion is 4.0 seconds maximum. The drop time is defined as the interval between the time the power is removed from the CEDM coils and the time the CEA has reached 90 percent of its fully inserted position. Drop motion begins within

0.5 second after the removal of power. The CEDM is designed to function normally during and after being subjected to seismic loads. The vibratory motion of the SSE is included in the fatigue evaluation in accordance with Subsection 3.9.2.2.3. The CEDM allows for tripping of the CEA during and after an SSE.

The design and construction of the CEDM pressure housing fulfills the requirements of ASME Section III, NB. The pressure housings are capable of withstanding, throughout the design life, all normal operating loads, including the steady-state and transient operating conditions specified for the vessel. Mechanical excitations are also defined and included as a normal operating load. Design condition of the CEDM pressure housings is 17.2 MPa (2,500 psia) at 343.3 °C (650 °F), and normal operating condition is 15.5 MPa (2,250 psia) at 323.9 °C (615 °F). The loading combinations and stress limit categories are presented in Table 3.9-11 and are consistent with those defined in the ASME Section III.

The design duty requirement for the CEDM is a total cumulative CEA travel of 30,480 m (100,000 ft) operation without loss of function and a total number of full-height CEA drops of 1,000. Design duty requirement of 100,000 ft of travel was determined by operational experience taking into account 40-year life time of the active components such as the motor assembly and extension shaft assembly.

The test programs performed in support of the CEDM design are described in Subsection 3.9.4.4.

3.9.4.1.1 Control Element Drive Mechanism Design Description

The CEDMs are mounted on nozzles on the top of the reactor vessel closure head. A CEDM consists of upper pressure housing, motor housing, motor assembly, coil stack assembly, two reed switch position transmitter (RSPT) assemblies, and an extension shaft assembly (ESA). The CEDM is shown in Figure 3.9-7. The drive power is supplied by the coil stack assembly, which is positioned around the motor housing. Two RSPT assemblies are supported by the upper shroud which encloses the upper pressure housing assembly.

The lifting operation consists of a series of magnetically operated step movements. Two sets of mechanical latches are used to engage an ESA. The magnetic force is obtained from the coil stack assembly mounted on the outside of the motor housing.

The CEDM control system actuates the stepping cycle and moves the CEA by a withdrawal or insertion stepping sequence. CEDM-hold is obtained by energizing a latch coil at a reduced current, while all other coils are de-energized. The CEAs are tripped upon interruption of electrical power to all coils. Each CEDM is connected to the CEAs by an ESA.

The axial position of a CEA in the core is indicated by three independent readout systems. One system counts the CEDM steps electronically, and the other two consist of magnetically actuated reed switches located at regular intervals along the upper pressure housing.

3.9.4.1.1.1 Control Element Drive Mechanism Pressure Housing

The CEDM pressure housing consists of the motor housing assembly and the upper pressure housing assembly. The motor housing assembly is attached to the reactor vessel closure head nozzle by means of a threaded joint and seal welding. The upper pressure housing is threaded into the top of the motor housing assembly and seal welded. The upper pressure housing encloses the ESA and contains a vent.

3.9.4.1.1.2 Motor Assembly

The motor assembly is an integral unit that fits into the motor housing and provides the linear motion to the CEA. The motor assembly consists of a latch guide tube, upper latches, and lower latches. Clearances in the motor assembly enable the CEDM to avoid stuck rod condition, which is verified by the tests described in Subsection 3.9.4.4.

Both upper latches and lower latches are used to perform the stepping of the CEA. The upper latch also performs the holding function when CEA motion is not required. Engagement of the ESA occurs when the appropriate set of magnetic coils is energized. Total CEA motion per cycle is 19.1 mm (3/4 in.).

3.9.4.1.1.3 Coil Stack Assembly

The coil stack assembly consists of four large DC magnetic coils mounted on the outside of the motor housing assembly. The coils supply magnetic force to actuate magnets for engaging and driving the ESA. Power for the magnetic coils is supplied from two separate supplies.

A conduit assembly containing the lead wires for the coil stack assembly is located at the side of the upper shroud.

3.9.4.1.1.4 RSPT Assembly

Two RSPT assemblies provide separate means for transmitting CEA position indication. Reed switches and voltage divider networks are used to provide two independent output voltages proportional to the CEA position. The RSPT assemblies are positioned to use the permanent magnet in the top of the ESA. The permanent magnet actuates the reed switches as it is passed by them.

3.9.4.1.1.5 ESA

The ESAs are used to link the CEDMs to the CEAs. The ESA has a permanent magnet assembly at the top for actuating reed switches in the RSPT assemblies. The center section of the ESA is called the drive shaft, and the lower end of it is a coupling device for connection to the CEA.

The drive shaft is threaded and pinned to the extension shaft. The drive shaft has circumferential notches in 19.1 mm (3/4 in.) increments along the shaft to provide the means of engagement to the motor assembly.

3.9.4.1.2 Description of the CEDM Motor Operation

Withdrawal or insertion of the CEA is accomplished by programmed electric current to the magnetic coils. There are three programmed conditions for each magnetic coil; high current for initial gap closure, low current for maintaining the gap closed, and zero current to allow opening of the gap.

3.9.4.1.2.1 Operating Sequence for the Double Stepping Mechanism

The initial condition is the hold mode. In this condition, the upper latch coil is energized with low current.

a. Withdrawal

   1) The upper lift coil is energized, causing the 11.1 mm (7/16 in.) upper lift gap to close lifting the CEA.

2) The lower latch coil is energized, causing the lower latches to engage the drive shaft with 0.8 mm (1/32 in.) clearance.

3) The upper lift coil is de-energized, allowing the upper latches to drop 19.1 mm (7/16 in.) and the drive shaft to lower 0.8 mm (1/32 in.), placing the load on the lower latches.

4) The upper latch coil is de-energized, disengaging the upper latches.

5) The lower lift coil is energized, lifting the drive shaft 9.5 mm (3/8 in.).

6) The upper latch coil is energized, engaging the upper latches in the drive shaft with 0.8 mm (1/32 in.) clearance.

7) The lower lift coil is de-energized, allowing the lower latches to drop 9.5 mm (3/8 in.) and causing the drive shaft to drop 0.8 mm (1/32 in.), applying the load on the upper latches.

8) The lower latch coil is de-energized, disengaging the lower latches from the drive shaft.

b. Insertion

1) The lower latch coil is energized, causing the lower latches to engage the drive shaft with 8.7 mm (11/32 in.) clearance.

2) The lower lift coil is energized, lifting the lower latches 9.5 mm (3/8 in.) and lifting the drive shaft 0.8 mm (1/32 in.) thus applying the load to the lower latches.

3) The upper latch coil is de-energized, causing the upper latches to disengage the drive shaft.

4) The upper lift coil is energized, moving the de-energized upper latch assembly up 11.1 mm (7/16 in.).

5) The upper latch coil is energized, engaging the latches with 8.7 mm (11/32 in.) clearance.

6) The lower lift coil is de-energized, allowing the lower latch to drop 9.5 mm (3/8 in.). The drive shaft moves down 8.7 mm (11/32 in.), stopping on the upper latch assembly, which is energized and in its up position.

7) The lower latch coil is de-energized, disengaging the lower latches.

8) The upper lift coil is de-energized, lowering the upper latch assembly with the drive shaft 11.1 mm (7/16 in.).

3.9.4.2 Applicable CEDM Design Specifications

The quality assurance requirements of ASME Section III, NCA, and ASME NQA are satisfied for design, fabrication, and test of the CEDM. Classification of the CEDM components is provided in Table 3.2-1.

The components forming the pressure boundary are the motor housing assembly, upper pressure housing assembly, vent stem, and housing nut. The pressure boundary components are designed, constructed, and tested in accordance with ASME Section III, NB, to provide reasonable assurance of extremely low probability of leakage or gross rupture. The material of the CEDM is described in Subsection 4.5.1.

The adequacy of the design of the non-pressure boundary components has been verified by the life tests as described in Subsection 3.9.4.4.

The RSPT assembly is designed to conform with IEEE Std. 323-2003 (Reaffirmed 2008) and IEEE Std. 344-2004 (Reaffirmed 2009). The electrical components are external to the pressure boundary and are non-pressurized.

3.9.4.3 Design Loads, Stress Limits and Allowable Deformations

The CEDM stress analyses consider the following loads:

a. Reactor coolant pressure and temperature

b. Reactor operating transient conditions

c. Normal operating loads

    1) Deadweight

2) Impulse load due to stepping of the CEDM

3) Mechanical base excitation loads

4) Loads produced by the thermal expansion of the reactor vessel closure head

d. IRWST discharge loads

e. BLPB loads

f. Seismic loads

The design and fabrication of the CEDM pressure boundary components fulfill the requirements of ASME Section III, NB. The pressure housings are capable of withstanding all the steady-state and transient operating conditions specified in Table 3.9-11 for a 60-year life. The design report for the ASME Code Class 1 components is to be prepared in accordance with ASME Section III.

Deformation of the CEDM under seismic conditions is evaluated to verify scramability as presented in Subsection 3.9.2.7.3.

The adequacy of the design of the CEDM pressure boundary and non-pressure boundary components has been verified by the life cycle tests as described in Subsection 3.9.4.4.

3.9.4.4 CEDM Operability Assurance Program

The APR1400 CEDM is essentially identical to the System 80 CEDM, which is presently operating at the Palo Verde Nuclear Generating Station, except for the material of the motor housing lower end fitting and thickness of the upper shroud tube. The material of the motor housing lower end fitting was changed to Alloy 690TT from Alloy 600 to improve structural integrity against PWSCC, and thickness of the upper shroud was increased to improve mechanical strength. Besides the design changes of the CEDM, there have been design changes of interfacing components. Material of the RV head nozzle was changed to Ally 690TT from Alloy 600, and the outside diameter of longer RV head nozzle (CEDM nozzle) was increased. Seismic support was installed at the upper portion of the CEDM to restrain horizontal deflection. These changes enhance the structural integrity of the CEDM and do not affect the safety-related functions of the APR1400 CEDM. The following describes the tests performed during development of System 80 CEDM, which provides design verification for the APR1400 CEDM.

For the life cycle test, the CEDM was installed on a test facility that was operated at a nominal temperature of 315.6 °C (600 °F) and a gauge pressure of 15.5 MPa (2,250 psig). The CEDM was operated for a total travel length of 47,854 m (157,000 ft) with no abnormality, which is about 1.5 times the design duty requirement.

During the CEA scram test, 300 full-height drops were completed. All release times were less than 0.3 second, and CEA drop times to 90 percent of full insertion were less than 4.0 seconds, which meets the design criterion.

The life cycle test and scram test provide verification of the ability to overcome a stuck rod because the CEDM operated properly without a stuck rod during such severe tests.

Operating experience also provides design verification of the APR1400 CEDM. The APR1400 CEDM is essentially identical to the CEDM of Palo Verde, HBN 3&4, HBN 5&6, HUN 3&4, HUN 5&6, SKN 1&2, and SWN 1, which are all in operation. The experience has demonstrated that the CEDM operates without malfunction.

First production test programs were completed on the CEDM to verify operability. During the course of this program, more than 1,219 m (4,000 ft) of travel was accumulated and 30 full-height gravity drops were made without mechanism malfunction or measurable wear on operating parts. The program included the following:

a. Operation at 76.2 cm/min (30 in/min) traveling 159 kg (350 lb) of weight at ambient temperature and a gauge pressure of 0.7 MPa (100 psig) for 15.2 m (50 ft)

b. Fifteen full-height drops at simulated reactor operating conditions with 159 kg (350 lb) of weight during the first 61 m (200 ft) travel at 76.2 cm/min (30 in/min)

c. Fifteen full-height drops at simulated reactor operating conditions with 159 kg (350 lb) of weight after traveling 1,162 m (3,812 ft)

d. Operation at simulated reactor operating conditions traveling 159 kg (350 lb) of weight for over 1,219 m (4,000 ft)

e. Operation at 76.2 cm/min (30 in/min) traveling 159 kg (350 lb) at ambient temperature and a gauge pressure of 0.7 MPa (100 psig) for 15.5 m (51 ft)

The mechanism operated without malfunction throughout the test program and, upon final inspection, no measurable wear was found.

Production testing is performed prior to shipment to confirm the capability of the CEDM to meet operation requirements. All production CEDM motors are tested at both ambient pressure and fluid temperatures and at simulated reactor operating conditions for a minimum of 122 m (400 ft) of travel and six full-height gravity drop tests at simulated reactor operating conditions.

No malfunction such as mis-stepping is allowed during the tests, and the total drop time is required to be less than 4.0 seconds with a release time of less than 0.5 second.

After installation of the CEDMs, initial startup testing is performed to verify the insertion, withdrawal, and drop time. The initial startup test program is described in Section 14.2.

3.9.5 Reactor Pressure Vessel Internals

Reactor pressure vessel internals described as reactor internals in this subsection refer to the core support structures and internal structures. Core support structures are those structures or parts of structures which are designed to provide direct support or restraint of the core within the reactor vessel. Internal structures are all structures within the pressure vessel other than core support structures, fuels, control element assemblies, and instrumentation.

3.9.5.1 Design Arrangements

The components of the reactor internals are divided into two major parts consisting of the core support barrel assembly and the upper guide structure assembly. The flow skirt, although functioning as an integral part of the coolant flow path, is separate from the reactor internals and is affixed to the bottom head of the reactor vessel. The arrangement of these components is shown in Figure 3.9-8. The flow paths of the main coolant flow and bypass flow within the reactor vessel are described in Subsection 4.4.2.6.1.

The component classification for core support structures and internal structures as reactor internals is summarized below:

a. Core support structures:

    1) Core support barrel

    2) Lower support structure

    3) Upper guide structure barrel assembly

b. Internal structures:

1) Core shroud

2) Alignment keys

3) Hold-down ring

4) Core support barrel snubbers

5) In-core instrumentation nozzle assembly

6) Core support barrel outlet nozzles

7) Inner barrel assembly

8) Guide lugs

9) Heated junction thermocouple tube assembly

The design arrangements including functional requirements for each component of the reactor internals are described in detail below.

3.9.5.1.1 Core Support Barrel Assembly

The major structural member of the reactor internals is the core support barrel assembly. The core support barrel assembly consists of the core support barrel, the lower support structure and in-core instrumentation nozzle assembly, and the core shroud. The material for the assembly is austenitic stainless steel.

The core support barrel assembly is supported at its upper end by the upper flange of the core support barrel, which rests on a ledge in the reactor vessel. Alignment is accomplished by means of four equally spaced keys in the flange, which fit into the keyways in the reactor vessel ledge and closure head. The lower flange of the core support barrel supports, secures, and positions the lower support structure and is attached to the lower support structure by means of a welded flexural connection. The lower support structure provides support for the core by means of support beams that transmit the load to the core support barrel lower flange. The locating pins in the beams provide orientation for the lower ends of the fuel assemblies. The core shroud provides a flow path for the coolant and limits the amount of coolant bypass flow. Support and positioning for the fuel assemblies are provided by the lower support structure. The lower end of the core support barrel is restricted from excessive lateral and torsional movement by six snubbers that interface with the reactor vessel wall. The core support barrel assembly is shown in Figure 3.9-9.

3.9.5.1.1.1 Core Support Barrel

The core support barrel is a right circular cylinder including a heavy external ring flange at the top end and an internal ring flange at the lower end. The core support barrel is supported from a ledge on the reactor vessel. The core support barrel supports the lower support structure upon which the fuel assemblies rest. Shrunk-fit into the flange of the core support barrel are four alignment keys located 90 degrees apart. The reactor vessel, closure head, and upper guide structure assembly flange are slotted in locations corresponding to the alignment key locations to provide alignment between these components in the reactor vessel flange region.

The upper section of the core support barrel contains two outlet nozzles that interface with internal projections on the reactor vessel outlet nozzles to minimize leakage of coolant from inlet to outlet. Since the weight of the core support barrel is supported at its upper end, it is possible that coolant flow could induce vibrations in the structure. Therefore, amplitude limiting devices, or snubbers, are installed on the outside of the core support barrel near the bottom end. The snubbers consist of six equally spaced lugs around the circumference of the core support barrel and act as a tongue-and-groove assembly with the mating lugs on the reactor vessel. Minimizing the clearance between the tongue-and-groove assembly limits the amplitude of vibration. During assembly, as the reactor internals are lowered into the reactor vessel, the reactor vessel lugs engage the core support barrel lugs in an axial direction. Radial and axial expansions of the core support barrel are accommodated, but lateral movement of the core support barrel is restricted. The reactor vessel lugs have bolted and captured nickel-based alloy X-750 shims. The core support barrel lug mating surfaces are hardfaced with Stellite to minimize wear. The reactor vessel shims are machined during initial installation to provide minimum clearance. The snubber assembly is shown in Figure 3.9-10.

3.9.5.1.1.2 Lower Support Structure and ICI Nozzle Assembly

The lower support structure and in-core instrumentation (ICI) nozzle assembly position and support the fuel assemblies, core shroud, and ICI nozzles. The structure is a welded assembly consisting of a short cylinder, support beams, a bottom plate, ICI nozzles, and ICI nozzle support plate. The lower support structure is made up of a short cylindrical section enclosing an assemblage of grid beams arranged in egg-crate fashion. The outer ends of these beams are welded to the cylinder. Fuel assembly locating pins are attached to the top of the beams. The bottoms of the main support beams in one direction are welded to an array of plates which contain flow holes to provide proper flow distribution. These plates also provide support for the ICI nozzles, support columns, and ICI nozzle support plate. The cylinder guides the main coolant flow and limits the core shroud bypass flow by means of holes located near the base of the cylinder. The ICI nozzle support plate provides lateral support for the ICI nozzles. This plate is provided with flow holes for the requisite flow distribution. The lower support structure and ICI nozzle assembly are shown in Figure 3.9-11.

3.9.5.1.1.3 Core Shroud

The core shroud provides an envelope for the core and limits the amount of coolant bypass flow. The core shroud consists of a welded vertical assembly of plates designed to channel the coolant through the core. Circumferential rings and top and bottom end plates provide lateral support. The rings are attached to the vertical plates by means of full-length welded ribs and horizontal braces. A small gap is provided between the core shroud outer perimeter and the core support barrel in order to provide upward coolant flow in the annulus, thereby minimizing thermal stresses in the core shroud. The core shroud is shown in Figure 3.9-12. Four hard-faced guide lugs, spaced 90 degrees apart, protrude vertically from the top of the core shroud and engage in corresponding hard-faced slots in the upper guide structure fuel alignment plate to provide reasonable assurance of proper alignment between the upper guide structure assembly and core shroud/lower support structure.

3.9.5.1.2 Upper Guide Structure Assembly

The upper guide structure (UGS) assembly aligns and laterally supports the upper end of the fuel assemblies, maintains the control element spacing, holds down the fuel assemblies during operation, prevents fuel assemblies from being lifted out of position during a severe accident condition and protects the control elements from the effects of coolant cross flow in the upper plenum. The UGS assembly is handled as one unit during installation and refueling.

The UGS assembly consists of the UGS barrel assembly and the inner barrel assembly (IBA) (Figure 3.9-13). The UGS barrel assembly consists of UGS support barrel, fuel alignment plate, UGS support plate, and control element guide tubes. The UGS support barrel consists of a right circular cylinder welded to a ring flange at the upper end and to a circular plate (UGS support plate) at the lower end. The flange, which is the supporting member for the entire UGS assembly, seats on its upper side against the reactor vessel head during operation. The lower side of the flange is supported by the hold-down ring, which rests on the core support barrel upper flange. The UGS flange and the hold-down ring engage the core support barrel alignment keys by means of four accurately machined and located keyways equally spaced at 90-degree intervals. This system of keys and slots provides an accurate means of aligning the core with the closure head and thereby with the control element drive mechanisms. The fuel alignment plate is positioned below the UGS support plate by cylindrical control element guide tubes. These tubes are attached to the UGS support plate and the fuel alignment plate by rolling the tubes into the holes in the plates and welding. The fuel alignment plate is designed to align the lower ends of the control element guide tubes which in turn locate the upper ends of the fuel assemblies. The fuel alignment plate also has four equally spaced slots on its outer edge that engage with Stellite hard-faced lugs protruding from the core shroud to provide alignment. The control element guide tubes bear the upward force on the fuel assembly hold-down devices. This force is transmitted from the fuel alignment plate through the control element guide tubes to the UGS barrel support plate.

The IBA limits crossflow and provides separation of the CEA. The IBA consists of top plate welded to a right circular barrel open at the bottom and containing an assemblage of large vertical tubes connected by vertical plates in a grid pattern welded to the inside of the barrel. The IBA is held in position by continuous weld between the barrel flange and the top surface of the UGS barrel upper flange.

Guides for the CEA extension shafts are provided by the top plate of the IBA. The tubes and connecting plates within IBA are furnished with multiple holes to permit hydraulic communication.

The hold-down ring provides axial force on the flanges of the UGS assembly and the core support barrel assembly in order to prevent movement of the structures under hydraulic forces. The hold-down ring is designed to accommodate the differential thermal expansion between the reactor vessel and the reactor internals in the vessel ledge region.

3.9.5.1.3 Flow Skirt

The nickel-based alloy flow skirt is a right circular cylinder, perforated with flow holes, and reinforced with two stiffening rings. The flow skirt is used to reduce inequalities in core inlet flow distributions and to prevent formation of large vortices in the lower plenum. The flow skirt is supported by nine equally spaced machined sections that are welded to the bottom head of the reactor vessel.

3.9.5.1.4 In-Core Instrumentation Support System

The in-core neutron flux monitoring system includes self-powered, in-core detector assemblies, supporting structures and guide paths and an amplifier system to process detector signals. The self-powered in-core detector assemblies and the amplifier system are described in Section 7.7. The instrumentation supporting structures and guide paths are described in this section and shown in Figure 3.9-14.

The support system begins outside the reactor vessel, penetrates the bottom of the vessel boundary and terminates in the upper end of the fuel assembly. Each in-core instrument is guided over the full length by the external guidance conduit, ICI guide tube nozzles of the reactor vessel, the lower support structure, and the guidepost of the fuel assembly. Figure 3.9-14 shows the in-core instrument support structure. The in-core instrumentation support system routes the instruments so that detectors are located in selected fuel assemblies throughout the core. An equal instrument has the same length for all locations. The guide tube routing outside the reactor vessel is a simple 180-degree bend to the seal table. The pressure boundaries for the individual instruments are at the out-of-reactor seal table, where the external electrical connections to the in-core instruments are made. Each instrument has an integral seal plug which forms a seal at the instrument seal table and through which the signal cables pass. Static O-ring seals are used to seal against operating pressure.

The static O-ring seals are classified as safety-related, and shall be capable of leak tight operation for a design life of two years under the following design conditions:

a. Pressure difference from 0 to 2,500 psi.

b. Temperature range from 40 ºF to 150 ºF.

c. Radiation level of 2E04 Gy (This value includes gamma and neutron radiation).

3.9.5.2 Loading Conditions

The following loading conditions are considered in the design of the reactor internals:

a. Normal operating temperature differences

b. Normal operating pressure differences

c. Flow loads

d. Weights, reactions, and superimposed loads

e. Vibration loads

f. Shock loads (including SSEs)

g. Anticipated transient loadings

h. Handling loads (not combined with other loads above)

i. Secondary side break, and LOCA loads

j. IRWST discharge loads

3.9.5.2.1 Design Loadings

The following loading combination is considered as a design loading.

Normal operation loads in combination with IRWST discharge loads. Normal operation loads are defined as the following sustained loads resulting from the normal events:

a. Pressure difference

b. Temperature

c. Mechanical loads

1) Weight

2) Loads from flow impingement or flow of reactor coolant

3) Superimposed or reaction loads

3.9.5.2.2 Level A Service Loadings

The following loading combination is considered as Level A service loadings.

Normal operation loads in combination with specified system operating transient loads resulting from normal events.

3.9.5.2.3 Level B Service Loadings

The following separate loading combinations are considered as Level B service loadings.

a. Normal operation loads in combination with IRWST discharge loads and system operating transient loads from the upset events. The IRWST discharge loads are defined as the loads due to postulated discharge to in-containment refueling water storage tank.

b. Normal operation loads in combination with the system operating transient loads from the upset event (the loss of external load with turbine control system failure). Note that the loss of external load of the upset event, which is evaluated as if it occurs once during the plant lifetime, is the emergency event. This event is evaluated with this combination of loadings for conservatism.

3.9.5.2.4 Level C Service Loadings

There are no Level C service loadings (Refer to Subsection 3.9.3.1).

3.9.5.2.5 Level D Service Loadings

The following loading combination is considered as Level D service loadings.

a. Normal operation loads

b. Either the main steam/feed water pipe break (MS/FWPB) or LOCA loads (including asymmetric blowdown loads), whichever are greater

c. SSE loads

d. IRWST discharge loads

LOCA is defined as the loss of reactor coolant at a rate in excess of the reactor coolant normal makeup rate, from breaks in the reactor coolant pressure boundary inside primary containment up to, and including, a break equivalent in size to the largest primary branch line not eliminated by leak-before-break (LBB) criteria.

3.9.5.3 Design Bases for Reactor Internals

The RCS transient design basis for reactor internals is addressed in Subsection 3.9.1.1.

The potential adverse flow effects of flow-induced vibration (FIV) and acoustic resonances on reactor internals are addressed in Subsection 3.9.2.3. The CVAP for reactor internals is addressed in Subsection 3.9.2.4. The dynamic system analysis of reactor internals under faulted conditions is addressed in Subsection 3.9.2.5.

The reactor internals are designed to meet interface cold gaps between reactor internals and the reactor vessel and between the main parts of the reactor internals.

The reactor internals are designed, fabricated, erected, and tested to conform with the requirements of 10 CFR 50.55a, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), and 10 CFR Part 50, Appendix A (GDC 1, 2, 4, and 10).

The design code, code cases, and acceptance criteria applicable to the design, analysis, fabrication, and nondestructive examination are provided in the design specification to meet the structural and functional integrity of the reactor internals in accordance with ASME Section III. The design specification and design report are prepared in accordance with the NCA requirements of ASME Section III.

The stress limits to which the reactor internals are designed are listed in Table 3.9-12.

The loading categories and stress limits are defined in the applicable section of ASME Section III. The design and construction of core support structures and internal structures are in accordance with ASME Section III as described in Table 3.9-12.

To properly perform their functions, the reactor internals are designed to meet the following deformation limits:

a. Under Level A, Level B, and Level C service loadings, the core is held in place, and deflections are limited so that the CEAs can be inserted under their own weight as the only driving force.

b. Under Level D service loadings that require CEA insertability, deflections are limited so that the core is held in place, adequate core cooling is preserved, and all CEAs can be inserted. Those deflections that would influence CEA movement are limited to less than 80 percent of the deflections required to prevent CEA insertion.

   The allowable deformation limits are established as 80 percent of the loss-of-function deflection limits.

   The significant component deflection limits are designed as follows:

   1) Relative displacement of fuel lower end fitting interface with the lower support structure avoids disengagement.

   2) Relative displacement of fuel upper end fitting interface with the upper guide structure avoids disengagement.

   3) The CEA guide tube lateral deflection allows CEA insertion.

In the design of critical reactor internals that are subject to fatigue, stress analysis is performed using the design fatigue curve of Figure I-9.2 of ASME Section III. A cumulative usage factor of less than one is used as the limiting criterion.

As indicated in the preceding sections, the stress and fatigue limits for reactor internals are obtained from ASME Code. Allowable deformation limits are established as 80 percent of the loss-of-function deflection limits. These limits provide adequate safety factors providing reasonable assurance that as long as calculated stresses, cumulative usage factors, or deformations do not exceed these limits, the design is conservative.

A summary of the maximum calculated total stress, deformation, and cumulative usage factor for each service limit of core support structures in accordance with ASME Section III is provided.

3.9.6 Functional Design, Qualification, and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints

This section describes the functional design and qualification provisions and inservice testing (IST) programs for safety-related pumps, valves, and dynamic restraints. The qualification provisions and IST programs are described to verify that these components are in a state of operational readiness to perform their safety functions throughout the life of the plant.

The APR 1400 utilizes an IST program for ASME Section III, Class 1, 2 and 3 safety-related pumps, valves, and dynamic restraints. The IST program is developed in accordance with the requirements of ASME OM Code (Reference 33), as required by 10 CFR 50.55a(f) and the acceptable ASME Code Cases listed in NRC RG 1.192 (Reference 64) that are incorporated by 10 CFR 50.55a(b).

ASME OM Code, ISTB applies to the inservice testing requirements for pumps, Subsection ISTC applies to the inservice testing requirements for valves, and Subsection ISTD applies to the inservice testing requirements for dynamic restraints. Additionally, APR 1400 IST program incorporates the guidance and information on the format and content for IST program, and relief requests of NUREG-1482, Rev. 2 (Reference 58).

The sections of 10 CFR Part 50, General Design Criteria (GDC), that apply to this section are:

a. GDC 1 as it relates to structures, systems, and components (SSCs), which include pumps, valves, and dynamic restraints being designed, fabricated, erected, and tested to quality standards commensurate with the safety-related functions to be performed. These requirements provide reasonable assurance that safety-related components and structures meet service loading conditions, stress limits, and quality requirements of ASME Code permitted in 10 CFR 50.55a.

b. GDC 2 as it relates to components important to safety being designed to withstand the effects of earthquakes without loss of capability to perform their safety functions. The effects of expected natural phenomena on normal and accident conditions are considered in the loading combinations for components important to safety. Additional design information is provided in the sections that describe the individual safety-related SSCs.

c. GDC 4 as it relates to components important to safety being designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents. The safety-related SSCs are designed to accommodate the effects of, and to be compatible with, the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents (LOCA). Additionally, the APR1400 design is based on the leak-before-break (LBB) concept, as described in Section 3.6.3, to eliminate the dynamic effects of postulated pipe rupture.

d. GDC 14 as it relates to the reactor coolant pressure boundary (RCPB) being designed, fabricated, erected, and tested to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. The RCPB is designed to accommodate the system pressures and temperatures attained under all expected modes of plant operation, including anticipated transients, with stresses within applicable limits.

e. GDC 15 as it relates to the reactor coolant system (RCS) being designed with sufficient margin to provide reasonable assurance that the design conditions of the RCPB are not exceeded during any condition of normal operation, including anticipated operational occurrences (AOO). Steady-state and transient analyses are performed to ensure that the design conditions of the RCS are not exceeded during normal operation. Additionally, RCPB components have sufficient margin of safety based on the use of proven materials and design codes, the use of proven fabrication techniques, nondestructive shop examination, and integrated hydrostatic testing of assembled components.

f. GDC 37 as it relates to the emergency core cooling system (ECCS) being designed to permit appropriate periodic pressure and functional testing to confirm the structural and leak-tight integrity of its components, and the operability and performance of the active components of the system. The ECCS is provided with testing capability to demonstrate system and component leak-tight integrity, operability and performance.

g. GDC 40 as it relates to the containment heat removal system being designed to permit appropriate periodic pressure and functional testing to confirm the structural and leak-tight integrity of its components, and the operability and performance of the active components of the system. System piping, valves, pumps, and other components of the containment heat removal system are arranged so that each component can be tested periodically for leak-tight integrity and operability.

h. GDC 43 as it relates to the containment atmospheric cleanup system being designed to permit appropriate periodic pressure and functional testing to ensure the structural and leak-tight integrity of its components, and the operability and performance of the active components of the system, including pumps and valves. Testing of the CSS is conducted to ensure structural and leak-tight integrity, and operability and performance in accordance with GDC 40. In addition, performance testing is conducted on active components of the CSS.

i. GDC 46 as it relates to the cooling water system being designed to permit appropriate periodic pressure and functional testing to confirm the structural and leak-tight integrity of its components, and the operability and performance of the active components of the system. The design provides measures for periodic testing of active components of the cooling water systems for operability and functional performance.

j. GDC 54 as it relates to piping systems penetrating the primary reactor containment being provided with leak detection and isolation capabilities to test periodically the operability of the isolation valves and determine valve leakage acceptability. Piping systems that penetrate the containment are designed to provide the required isolation and testing capabilities.

Other Sections that interface with this section are:

a. Subsection 3.2.2 addresses the classification system and quality group for pumps and valves.

b. Subsection 3.9.2 addresses dynamic testing and analysis of safety-related pumps, valves, and snubbers.

c. Subsection 3.9.3 addresses the structural design of safety-related pumps, valves, and snubbers.

d. Section 3.10 addresses the seismic and dynamic qualification of safety-related pumps and valves.

e. Section 3.11 addresses the environmental qualification of safety-related pumps and valves.

f. Section 3.12 addresses the design and leak testing provisions of pressure retaining systems and components that interface with the reactor coolant system as part of the primary review responsibility for intersystem LOCAs.

g. Section 3.13 addresses programs for ensuring the adequacy and integrity of bolting and threaded fastener.

h. Subsection 5.2.2 addresses the valves specified for overpressure protection of the reactor coolant pressure boundary.

i. Sections 5.4.7 and 6.3 address residual heat removal and emergency core cooling systems piping, each of which is connected to the reactor coolant system and is subject to thermally stratified flow, thermal striping, and/or thermal cyclic effects.

j. Subsection 6.2.1.2 addresses the analyses of subcompartment differential pressures resulting from postulated pipe breaks.

k. Subsections 6.2.4 and 6.2.6 address the containment isolation system and the overall containment leakage testing program, respectively.

l. Subsection 9.2.1 addresses surveillance, testing, inspection, and maintenance programs of essential service water systems.

m. Section 10.3 addresses the safety-related portion of the main steam system.

n. Section 14.2 addresses preoperational and initial startup testing for systems that contain safety-related pumps, valves, and dynamic restraints.

o. Section 17.6 describes the program for implementation of the Maintenance Rule for systems that contain safety-related pumps, valves, and dynamic restraints.

ASME OM Code describes the IST scope and establishes the requirements for preservice and inservice testing and examination of certain components to assess their operational readiness. ASME OM Code identifies the components subject to test or examination, responsibilities, methods, intervals, parameters to be measured and evaluated, criteria for evaluating the results, corrective action, personnel qualification, and record keeping.

These requirements apply to:

a. Pumps and valves that are required to perform a specific function in shutting down the reactor to a safe shutdown condition, in maintaining the safe shutdown condition, or in mitigating the consequences of an accident.

b. Pressure relief devices that protect systems or portions of systems that perform one or more of the three functions identified above.

c. Dynamic restraints used in systems that perform one or more of the three functions identified above, or that ensure the integrity of the RCPB.

The COL applicant is to provide a full description of the IST program (including preservice testing (PST) and MOV testing) for pumps, valves, and dynamic restraints as required by 10 CFR 50.55a, that will be administratively controlled such that the applicable requirements of ASME OM Code edition and addenda are incorporated in the IST program (COL 3.9(3)).

ASME Code, Section III, Class 1, 2, 3, and non-ASME Code safety-related pumps, valves, and dynamic restraints are incorporated into a 10 year interval IST Program.

3.9.6.1 Functional Design and Qualification of Pumps, Valves, and Dynamic Restraints

The functional qualification of safety-related pumps, valves, and dynamic restraints (snubbers) are performed in accordance with ASME QME-1-2007 (Reference 51), as endorsed in NRC RG 1.100 (Reference 34).

The functional design and qualification of safety-related pumps, valves, and snubbers includes:

a. Safety-related pump, valve, and piping designs include provisions that allow testing of pumps and valves at the maximum flow specified in the plant accident analyses.

b. The functional design and qualification of each safety-related pump and valve is performed such that each pump and valve are capable of performing its intended function for a full range of system differential pressure and flow, ambient temperatures, and available voltage (as applicable) under conditions ranging from normal operating to design-basis accidents.

c. The APR1400 design provides ready access to SSC to facilitate comprehensive testing using currently available equipment and techniques. Accessibility incorporated into the design complies with the requirements of ASME OM Code and 10 CFR 50.55a(f). System design incorporates provisions, including alternate flow paths and required instrumentation, to allow full flow testing of pumps under the IST program. The design also incorporates provisions to permit ready IST of valves.

d. The provisions for the functional design and qualification of snubbers are provided in Subsections 3.9.3 and 3.9.6.4. Snubbers in safety-related systems include provisions to allow access for IST program activities.

e. The design and installation of safety and relief valves are described in Section 3.9.3.

f. The seismic and dynamic qualification of mechanical and electrical equipment is described in Section 3.10.

g. The environmental qualification of safety-related pumps and valves is described in Section 3.11.

h. Safety-related valves that are part of the RCPB are designed and tested such that these valves will not experience any abnormal leakage, or increase in leakage, from their loading, as addressed in Section 3.10.

i. Pumps, valves, and snubbers are designed with sufficient margin to demonstrate that the design conditions are not exceeded.

j. Pump motors are designed to tolerate anticipated frequency and voltage variations due to degraded electrical power supply line conditions.

Pumps and valves are tested within the qualification program requirements to confirm that the required components are capable of performing their intended safety function. The safety analysis includes information concerning the design limitations and functional requirements for the performance of pumps and valves, including operation of them at the maximum flow rate. The pump functional design and qualification include an assessment for degraded flow conditions. The qualification program requires pump and valve testing over the full range of system differential pressures, flow rates, temperatures, and available voltages (as applicable), from normal operating to design basis conditions, and considers degraded flow that may occur during post-accident conditions.

3.9.6.2 Inservice Testing Program for Pumps

IST program for safety-related pumps is developed in accordance with the requirements of ASME OM Code, ISTA and ISTB. Pumps subject to IST in accordance with the ASME Code are listed in Table 3.9-13. This table includes the safety class, test parameters, and the frequency at which the testing is performed.

This program includes baseline pre-service testing to support the periodic in-service testing of the safety-related pumps. Preservice testing is performed on pumps prior to initial plant operation. Depending on the test results, the plan will provide commitment to disassemble and inspect the safety-related pumps.

For each size, type, and model of pump, testing that encompasses design conditions is performed to demonstrate acceptable flow rate and corresponding pump head, bearing vibration levels, and pump internals wear rates for the operating time specified for each system mode of pump operation. From these tests, baseline reference value of pump speed, hydraulic performance and vibration data for evaluating the acceptability of the pump after installation are also developed. Test data are used to provide reasonable assurance that the pump specified for each application is not susceptible to inadequate minimum flow rate and inadequate thrust bearing capacity. With respect to minimum pump flow operation, the sizing of each minimum recirculation flow path is evaluated to provide reasonable assurance that its use under all analyzed conditions does not result in degradation of the pump. The flow rate through minimum recirculation flow paths can be measured periodically to verify that flow is in accordance with the design specification.

The methods, range and accuracy of measurements used to measure pressure, flowrate, speed, and vibration meet the requirements of ASME OM Code, ISTB-5000. The range, accuracy, instrument locations, fluctuations, and frequency response range meet the requirements of ISTB-3510, ASME OM Code.

The safety-related pumps and piping configurations accommodate the IST at a flow rate at least as large as the maximum design flow for the pump application. The safety-related pumps are provided with instrumentation to verify that net positive suction head available (NPSHA) is greater than or equal to the net positive suction head required (NPSHR) during all modes of pump operation. These pumps can be disassembled for evaluation when

ASME OM Code, ISTB testing results in a deviation that falls within the required action range. The code provides criteria limits for the test parameters identified in Table 3.9-13. The detailed IST program establishes the frequency and the extent of disassembly and inspection based on suspected degradation of all safety-related pumps, including the basis for the frequency and the extent of each disassembly. Factors to be considered in the frequency and extent of disassembly include, but are not limited to the following:

a. Performance history of the pump to identify pumps that are prone to degradation/wear.

b. Analysis of trends of pump test parameters and service conditions.

c. Analysis of pump components that are subject to aging and require an approach to maintenance and replacement (e.g., O-rings).

d. Results of non-intrusive pump testing. The non-intrusive technologies used may obviate the need for inspection/disassembly of safety-related pumps, provided the technologies demonstrate an equivalent ability to detect pump degradation as inspection/disassembly would.

The testing requirements and acceptance criteria are identified in ISTB-5000.

The program may be revised throughout the plant life to minimize disassembly based on disassembly experience.

If ASME OM Code, ISTB pump tests cannot be performed on the component cooling water (CCW) or essential service water (ESW) pumps due to inability to repeat pump test at single point flow conditions, pump curve testing will be used to assess pump degradation in accordance with ASME OM Code Case OMN-16 accepted for use in NRC RG 1.192 that is incorporated by reference in 10 CFR 50.55a. The following provisions shall be complied with in the use of pump curve testing for the CCW/ESW pumps:

a. Pump curves are developed, or manufacturer's pump curves are validated, when the pumps are known to be operating acceptably.

b. The reference points used to develop or validate the curve are measured using instruments at least as accurate as required by the code.

c. Pump curves are based on an adequate number of points, with a minimum of five.

d. Points are beyond the "flat" portion (low flow rates) of the curves in a range which includes or is as close as practicable to design basis flow rates.

e. Acceptance criteria based on the curves does not conflict with Technical Specifications or FSAR design bases.

f. If vibration levels vary significantly over the range of pump conditions, a method for assigning appropriate vibration acceptance criteria should be developed for regions of the pumps curve.

g. When the reference pump curve may have been affected by repair, replacement, or routine service, a new reference curve shall be determined or the previous curve revalidated by an inservice test.

The COL applicant is to provide an IST program including the type of testing and frequency of site-specific pumps subject to IST in accordance with the ASME OM Code and Table 3.9-13 (COL 3.9(4)).

3.9.6.3 Inservice Testing Program for Valves

The IST of safety-related valves is addressed in the IST program.

The valves IST program categories are classified based on the safety-related valve functions. The following categories are used in classifying the valve IST categories in accordance with the ASME OM Code.

a. Category A – valves for which seat leakage is limited to a specific maximum amount in the closed position for fulfillment of their required functions.

b. Category B – valves for which seat leakage in the closed position is inconsequential for fulfillment of the required functions.

c. Category C – valves that are self-actuating in response to some system characteristic, such as pressure (relief valves) or flow direction (check valves), for fulfillment of the required functions.

d. Category D – valves that are actuated by an energy source capable of only one operation, such as rupture disks or explosively actuated valves.

Category A and Category B valves are tested as follows:

a. Full-stroke exercising of valves during operation at power to the positions is required to fulfill their functions. If full-stroke exercising during operation at power is not practical, the testing may be limited to part-stroke exercising during operation at power and full-stroke exercising during cold shutdowns.

b. If valve exercising is not practical during operation at power, the testing may be limited to full-stroke exercising of the valves during cold shutdowns. Valve exercising may be limited to part-stroke during cold shutdowns and full-stroke during refueling outages.

c. Valve exercising is not required if the time period since the previous full-stroke exercise is less than 3 months. During extended shutdowns, valves that are required to perform their intended safety function are exercised every 3 months.

d. Valve exercising during cold shutdown commences within 48 hours of achieving cold shutdown and continues until testing is complete or the plant is ready to return to operation at power.

e. For extended outages, testing need not be commenced in 48 hours, provided all valves required to be tested during cold shutdown will be tested before or as part of plant startup. However, it is not the intent of this subsection to keep the plant in cold shutdown to complete cold shutdown testing.

f. All valve testing required to be performed during a refueling outage is completed before returning the plant to operation at power.

Category C valves testing are addressed in Subsections 3.9.6.3.3 (check valves) and 3.9.6.3.6 (safety and relief valves).

IST for safety-related valves is developed in accordance with the requirements of ASME OM Code, ISTA and ISTC. Table 3.9-13 lists the valves to be included in the IST program as well as the valve type, valve identification number, code class, valve category, valve functions, required tests, and test frequencies. Safety-related valves include the valves that are necessary to provide reasonable assurance of the following:

a. Integrity of the RCPB

b. Capability to achieve safe shutdown of the reactor and keep it in a safe shutdown condition

c. Capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures in excess of the guidance of 10 CFR 100.11

Table 3.9-13 also provides explanatory notes/justifications for any code defined testing exceptions. The IST program includes safety-related valve IST details and test schedules and frequencies, in the inspection and testing program. This program includes baseline preservice testing to support the periodic inservice testing of the safety-related valves. Preservice testing is performed on valves prior to initial plant operation. Depending on the test results, the plan will provide commitment to disassemble and inspect the safety-related valves. The primary elements of this plan, including the requirements of Generic Letter (GL) 96-05 (Reference 60) for motor-operated valves (MOVs), are presented in Subsection 3.9.6.3.1.

The specific testing requirements and acceptance criteria are identified in ISTC-5000.

The COL applicant is to provide an IST program including the type of testing and frequency of any site-specific valves subject to IST in accordance with the ASME OM Code and Table 3.9-13 (COL 3.9(5)).

3.9.6.3.1 Inservice Testing Program for Motor-Operated Valves

In addition to the IST program requirements in the ASME OM Code incorporated by reference in 10 CFR 50.55a(f), 10 CFR 50.55a(b)(3)(ii) requires establishment of a program periodically to ensure that the safety-related MOVs continue to be capable of performing their design basis safety functions. GL 96-05 (Reference 60) provides additional guidance for the periodic verification of the design basis capability of MOVs.

Therefore, the IST program for all safety-related MOVs incorporates requirements of ISTC of ASME OM Code, and applicable addenda, as required by 10 CFR 50.55a(f). The IST program incorporates ASME Code Case OMN-1, “Alternative Rules for Preservice and Inservice Testing of Active Electric Motor-Operated Valve Assemblies in Light-Water Reactor Power Plants,” and OMN-11, as accepted by the NRC with conditions in NRC RG 1.192 (Reference 64). The Code Cases listed in Table 2 of NRC RG 1.192 (Reference 64) are conditionally accepted Code Cases, which may be used without request to the NRC provided it is used with any identified limitations or modifications.

The provision listed in Table 2 of NRC RG 1.192 (Reference 64) includes:

a. The adequacy of the diagnostic test interval for each MOV must be evaluated and adjusted as necessary, but not later than 5 years or three refueling outages (whichever is longer) from initial implementation of OMN-1.

b. When extending exercise test intervals for high risk MOVs beyond a quarterly frequency, ensure that the potential increase in Core Damage Frequency (CDF) and risk associated with the extension is small and consistent with the intent of the Commission's Safety Goal Policy Statement.

c. When applying risk insights as part of the implementation of OMN-1, MOVs must be categorized according to their safety significance using the methodology described in Code Case OMN-3, with the conditions discussed in this regulatory guide or use other MOV risk ranking methodologies accepted by the NRC on a plant specific or industry-wide basis with the conditions in the applicable safety evaluations.

The IST program for MOVs also incorporates the guidance of NUREG-1482 (Reference 58). The periodic verification program for all safety-related MOVs incorporates the guidance of GL 96-05 (Reference 60) which supersedes GL 89-10 (Reference 59) and its supplements with regards to MOV periodic performance verification. The MOV periodic verification program also implements the recommendations from the Joint Owners Group (JOG) MOV Periodic Verification Program (MPR-2524-A, November 2006, Reference 65).

The IST of MOVs relies on diagnostic techniques that are consistent with the state-of-the-art and that permit an assessment of the performance of the valve under actual loading. Periodic testing per GL 96-05 (Reference 60) is conducted under adequate differential pressure and flow conditions that allow a justifiable demonstration of continuing MOV capability for design basis conditions. The detailed IST program includes the optimal frequency of this periodic verification. The frequency and test conditions are sufficient to demonstrate continuing design basis and required operating capability. The IST interval between testing to demonstrate continued design basis capability does not exceed 5 years or three refueling outages, whichever is longer. The code provides criteria limits for the test parameters identified in Table 3.9-13 in accordance with ASME OM Code, IST.

Each MOV is tested in the open and closed states under static and maximum achievable preoperational conditions using diagnostic equipment that measures torque and thrust, and motor parameters to verify correct MOV actuator sizing and control settings. The MOV is tested under various differential pressure and flow conditions up to maximum achievable conditions to determine torque and thrust requirements at design conditions. The parameters and acceptance criteria, which demonstrate fulfillment of the functional performance requirements, are as follows:

a. As required by the safety function, the valve is fully open or fully closed with diagnostic indication of hard-seat contact.

b. The control switch settings provide adequate margin to achieve design requirements including consideration of diagnostic equipment inaccuracies, control switch repeatability, load-sensitive behavior, and margin for degradation.

c. The motor output capability at degraded voltage is equal to or exceeds the control switch setting including consideration of diagnostic equipment inaccuracies, control switch repeatability, load-sensitive behavior, and margin for degradation.

d. The maximum torque and thrust achieved by the MOV, including diagnostic equipment inaccuracies and control switch repeatability, do not exceed the allowable structural capability limits for the individual parts of the MOV.

e. The remote position indication testing verifies that proper disk position is indicated in the control room.

f. Stroke time measurements taken during valve opening and closing meet minimum and maximum stroke time requirements.

The detailed IST program establishes the frequency and the extent of disassembly and inspection based on suspected degradation of all safety-related MOVs, including the basis for the frequency and extent of each disassembly. Factors to be considered in the frequency and extent of disassembly include, but are not limited to the following:

a. Performance history of the safety-related valves to identify valves that are prone to degradation/wear

b. Analysis of trends of valve test parameters and service condition

c. Analysis of valve components that are subject to aging and require an approach to maintenance and replacement (e.g., O-rings)

d. Results of non-intrusive valve testing. Use of non-intrusive technologies may obviate the need for inspection/disassembly of safety-related valves altogether, provided the technologies demonstrate an equivalent ability to detect valve degradation as inspection/disassembly would.

The program may be revised throughout the plant life to minimize disassembly based on past disassembly experience.

3.9.6.3.2 Inservice Testing Program for Power-Operated Valves Other than Motor-Operated Valves

IST program of safety-related power-operated valves (air-operated, hydraulic-operated, solenoid-operated) is performed in accordance with the requirements of ASME OM Code by reference in 10 CFR 50.55a(f).

Each power-operated valve (POV) is tested in the open and closed directions under static and maximum achievable preoperational conditions using diagnostic equipment that measures or provides information to determine total friction, stroke time, seat load, spring rate, travel under normal pneumatic or hydraulic pressure (as applicable to the type of POV), and minimum pneumatic or hydraulic pressure. The POV is tested under differential pressure and flow conditions up to maximum achievable conditions and perform tests to determine the force requirements at design conditions.

The force requirements to close the valve to the position at which there is diagnostic indication of full valve closure (as required for the safety function of the applicable valves) will be determined. The determination of design force requirements will be made for such parameters as differential pressure, fluid flow, minimum pneumatic or hydraulic pressure, power supply, temperature, and seismic/dynamic effects for POVs which must operate during these transients. The design force requirements will be adjusted for diagnostic equipment inaccuracies.

The total force delivered by the POV under static and dynamic conditions (including diagnostic equipment inaccuracies) will be measured to compare to the allowable structural capability limits for the assembly and individual parts of the POV. Tests will be conducted for proper MCR position indication of the POV.

Solenoid-operated valves (SOVs) are tested using Class 1E electrical power supply voltage and current to verify SOVs are capable of performing their safety functions at design basis accident conditions. SOV tests include confirmation of the energized position and fail position when de-energized.

All safety-related piping systems incorporate provisions for testing to demonstrate the operability of the POVs under design conditions. The inservice testing of POVs incorporates the use of advanced non-intrusive techniques to periodically assess degradation and performance characteristics of the POVs. The ASME OM Code, ISTC tests are performed, and valves that fail to exhibit the required performance can be disassembled for evaluation.

Periodic verification testing is conducted under adequate differential pressure and flow conditions per the guidance of Regulatory Issue Summary (RIS) 2000-03 (Reference 57), which incorporates the lessons learned from MOV analyses and tests in response to GL 96-05 (Reference 60). Periodic testing allows a justifiable demonstration of continuing POV capability for design basis conditions.

Additional testing is performed as part of the air-operated valve (AOV) periodic verification program, which includes the elements for an AOV periodic verification program as identified in the JOG air-operated valve program. The AOV periodic verification program incorporates the attributes for a successful POV design capability and long-term periodic verification program, as discussed in RIS 2000-03 (Reference 57) by incorporating lessons learned from previous nuclear power plant operations and research programs as they apply to the periodic testing of AOVs and other POVs included in the IST program. The lessons learned addressed in the AOV program include:

a. Setpoints for AOV are defined based on current vendor information or valve qualification diagnostic testing, such that the valve is capable of performing its design-basis function(s).

b. Periodic static testing is performed to identify potential degradation, unless those valves are periodically cycled during normal plant operation, under conditions that meet or exceed the worst case operating conditions within the licensing basis of the plant for the valve, which would provide adequate periodic demonstration of AOV capability. If required based on valve qualification or operating experience, periodic dynamic testing will be performed to re-verify the capability of the valve to perform its required safety function.

c. Sufficient diagnostics are used to collect relevant data (e.g., valve stem thrust and torque, fluid pressure and temperature, stroke time, operating and/or control air pressure, etc.) to verify the valve meets the functional requirements of the qualification specification.

d. Test frequency is specified, and is evaluated each refueling outage based on data trends as a result of testing. Frequency for periodic testing is in accordance with References JOG air-operated valve program (Reference 61) and Comments on JOG air-operated valve program (Reference 66), with a minimum of 5 years (or 3 refueling cycles) of data collected and evaluated before extending test intervals.

e. Post-maintenance procedures include appropriate instructions and criteria to demonstrate baseline testing is re-performed as necessary when maintenance on the valve, valve repair, or replacement has the potential to affect valve functional performance.

f. Guidance is included to address lessons learned from other valve programs in procedures and training specific to the AOV program.

g. Documentation from AOV testing, including maintenance records and records from the corrective action program are retained and periodically evaluated as part of the AOV program.

h. The attributes of the AOV testing program described above, to the extent that they apply to and can be implemented on other safety-related POVs, such as electro-hydraulic valves, are applied to those other POVs.

i. Safety-related valves are categorized according to their safety significance and risk ranking to be consistent with the provision in RIS 2000-03. The safety-related air operated valves (AOVs) are assigned the highest category according to the Joint Owners Group (JOG) AOV program (including NRC staff comments provided in a letter to the Nuclear Energy Institute, dated October 8, 1999).

The ASME OM Code, ISTC, provides criteria limits for the test parameters identified in Table 3.9-13.

The detailed IST program establishes the frequency and the extent of disassembly and inspection based on suspected degradation of all safety-related POVs, including the basis for the frequency and the extent of each disassembly. Factors to be considered in the frequency and extent of disassembly include but are not limited to the following:

a. Performance history of the safety-related valves to identify valves that are prone to degradation/wear

b. Analysis of trends of valve test parameters and service conditions

c. Analysis of valve components that are subject to aging and require an approach to maintenance and replacement (e.g., O-rings)

d. Results of non-intrusive valve testing. Use of non-intrusive technologies may obviate the need for inspection/disassembly of safety-related valves altogether, provided the technologies demonstrate an equivalent ability to detect valve degradation as inspection/ disassembly would.

The program may be revised throughout the plant life to minimize disassembly based on past disassembly experience.

3.9.6.3.3 Inservice Testing Program for Check Valves

All safety-related piping systems incorporate provisions for testing to demonstrate the operability of check valves under design conditions. The IST of check valves incorporates the use of advanced non-intrusive techniques to periodically assess degradation and the performance characteristics of the check valves. The effects of rapid pump starts and stops, as expected for system operating conditions, are considered in the testing. Conditions of reverse flow that may occur during expected system operation are also considered in the testing. Non-intrusive technique includes acoustic, ultrasonic, magnetic, and x-ray technologies, which are used to measure valve operating parameters (e.g., fluid flow, disk position, disk movement, and disk impact forces). The technique is also used for monitoring an upstream pressure or tank level, and for performing a leak test, a system hydrostatic or pressure test, or radiography.

The parameters and acceptance criteria for demonstrating that the above functional performance requirements have been fulfilled are as follows:

a. During all tests modes that simulate expected system operating conditions, the valve disk fully opens or fully closes as expected based on the direction of the differential pressure across the valve.

b. Leak-tightness of valve when fully closed is within established limits, as applicable.

c. Valve disk positions are determinable without disassembly.

d. Valve testing must verify free disk movement whenever moving to and from the seat.

e. The disk is stable in the open position under normal and other required system operating fluid flow conditions.

f. The valve is correctly sized for the flow conditions specified, i.e., the disk is in full-open position at normal full-flow operating condition.

g. Valve design features, material, and surfaces accommodate non-intrusive diagnostic testing methods available in the industry or as specified.

h. Piping system design features accommodate all the applicable check valve testing requirements as described in Table 3.9-13.

The ASME OM Code, ISTC tests are performed, and check valves that fail to exhibit the required performance can be disassembled for evaluation. The ASME OM Code, ISTC, provides criteria limits for the test parameters as identified in Table 3.9-13.

The detailed IST program includes the frequency and extent of disassembly and inspection based on suspected degradation of all safety-related check valves, including the basis for the frequency and the extent of each disassembly. Factors to be considered in the disassembly frequency and extent of disassembly include but are not limited to the following:

a. Performance history of the safety-related check valves to identify valves that are prone to degradation/wear

b. Analysis of trends of valve test parameters and service conditions

c. Analysis of valve components that are subject to aging and require an approach to maintenance and replacement

d. Results of non-intrusive valve testing. Use of non-intrusive technologies may obviate the need for inspection/disassembly of safety-related check valves altogether, provided the technologies demonstrate an equivalent ability to detect check valve degradation as inspection/disassembly would.

The program may be revised throughout plant life to minimize disassembly based on past disassembly experience.

3.9.6.3.4 Pressure Isolation Valve Leak Testing

The leak-tight integrity is verified for each valve relied on to provide a leak-tight function. These valves include:

a. Pressure-isolation valves (PIVs) that provide isolation of a pressure differential from one part of a system to another part or between systems. The leak testing of PIVs associated with the RCS is defined in NUREG-1482, Rev. 2 (Reference 58). The RCS PIVs are listed in Table 3.9-14 and are tested in accordance with Table 3.9-13 and Technical Specifications surveillance requirement 3.4.13.1.

b. Temperature-isolation valves (TIVs) whose leakage may cause unacceptable thermal stress, fatigue, or stratification in the piping and thermal loading on supports or whose leakage may cause steam binding of pumps. Safety-related valves performing this duty are listed in Table 3.9-13, along with a description of specific leakage test requirements.

3.9.6.3.5 Containment Isolation Valve Leak Testing

The leak-tight integrity is verified for each valve relied on to provide a leak-tight function. These valves include containment-isolation valves (CIVs) that provide isolation capability for the piping systems penetrating containment.

CIVs are leak tested in accordance with 10 CFR Part 50, Appendix J. CIVs are listed along with their required testing in Table 6.2.4-1. Those CIVs for which a Type-C leakage rate test is specified in Table 6.2.4-1 are also tested in accordance with ASME OM Code, ISTC. These CIVs are designated in Table 3.9-13 by the valve function CIC. Those CIVs for which a Type-C leakage rate test is not specified in Table 6.2.4-1 are designated in Table 3.9-13 by the valve function CIN. The CIN valve function designation indicates that these valves are listed in Table 6.2.4-1, but are not leakage rate tested in Tables 6.2.4-1 and 3.9-13.

3.9.6.3.6 Inservice Testing Program for Safety and Relief Valves

Pressure-relief devices are tested in accordance with ASME OM Code, including Appendix I to the OM Code, for IST.

Stroke tests are performed for dual-function safety and relief valves. Power-operated relief valves subject to the IST program are tested in accordance with Subsection ISTC-5100 for Category B valves and Subsection ISTC-5240 for Category C valves. The test equipment, including gauges, transducers, load cells, and calibration standards, used to determine valve set pressure is acceptable if the overall combined accuracy does not exceed ±1 percent of the indicated (measured) set pressure.

A list of safety and relief valves included in the IST program is provided in Table 3.9-13.

3.9.6.3.7 Inservice Testing Program for Manually Operated Valves

Safety-related active manually operated valves are identified in the IST Program Plan, and exercised periodically in accordance with frequency and requirements specified in the ASME OM Code.

Manual valves are exercised at least every 2 years. Exercise of a manual valve includes a complete cycle from open to fully closed.

A list of manual valves included in the IST program is provided in Table 3.9-13.

3.9.6.3.8 Inservice Testing Program for Explosively Activated Valves

Explosively activated valves are not included in the APR1400 design.

3.9.6.4 Inservice Testing Program for Dynamic Restraints

Safety-related systems inside and outside of containment may experience dynamic effects under various accident conditions, including seismic events and DBAs. Snubbers are attached to these systems to reduce these dynamic effects in areas where rigid supports are unacceptable. The snubber is selected to satisfy the system design requirements. The snubber design and operating information form the basis for snubber examination and testing requirements.

As described in Subsection 3.12.6.6, dynamic restraints within piping systems is to be minimized as-much-as-possible due to the maintenance and testing requirements for these components. However, dynamic restraints in the form of snubber supports are used where free thermal movements are required and restraining movements caused by dynamic loadings are also required. Snubber operability inspections and tests including scope and frequency requirements are specified and controlled in the components support inspection and testing program plan. The ASME OM Code, provides ISI methods and requirements for examinations and tests of snubbers at nuclear power plants.

Preservice and in-service examinations are performed using the VT-3 visual examination method described in IWA-2213 of the ASME Section XI, 2007 edition with 2008 addenda. Snubbers are visually examined to identify impaired function caused by physical damage, leakage, corrosion, or degradation from environmental exposure or operating conditions. External features that may affect operability are also examined. Intervals with the low rate of problem are in accordance with ASME Code Case OMN-13 (Reference 67) as accepted in NRC RG 1.192 (Reference 64).

Preservice functional testing is performed on snubbers prior to initial plant operation. This testing may be performed at the manufacturer's facility. Inservice functional testing is performed over the test plan intervals specified in ASME OM Code, ISTD. Snubbers are tested in their installed location or removed and bench tested. Snubbers are tested in their as-found condition and the test parameters are selected so that the snubbers are tested to the fullest extent practicable.

The functional test for snubbers is performed to verify activation level of velocity or acceleration, release rate, and drag force.

Generic Letter 90-09 (Reference 68) addresses that a snubber is considered unacceptable if it fails the acceptance criteria of the visual inspection. An engineering evaluation will be conducted to determine the cause of unacceptability for an unacceptable snubber. The unacceptable snubbers will be adjusted, repaired, modified, or replaced.

The APR1400 snubber design incorporates accessibility provisions for maintenance, inspection, and testing of components. The correct installation and operation of snubbers is confirmed as part of the ITP described in Section 14.2. This program includes visual inspections, hot and cold position measurements, and documenting thermally induced component movement that occurs during plant startup.

The methods addressed in Nonmandatory Appendix F of the ASME OM Code (Reference 33) will be applied for service life monitoring of dynamic restraints.

The COL applicant is to provide a table of all safety-related components that use snubbers in support systems and that includes the following information (COL 3.9(6)):

a. Identification of the systems and components that use snubbers

b. The number of snubbers used in each system and on the components in that system

c. Identification of the type(s) of snubber (hydraulic or mechanical)

d. Specification whether the snubber was constructed in accordance with the ASME Section III, NF

e. A statement of whether the snubber is used as a shock, vibration, or dual-purpose snubber

f. If a snubber is identified as a dual-purpose or vibration arrester type, indication of whether the snubber and/or component was evaluated for fatigue strength

3.9.6.5 Relief Requests and Alternative Authorizations to ASME OM Code

In case implementing the full requirements of the ASME OM Code is impractical, the relief requests from the testing requirements of the ASME OM Code will be made on a case-by-case basis by the COL Applicant. The following information should be described in the relief requests.

(1) Identification of the component by name, functions, ASME Section III Code Class, and valve category as defined in ISTC of the ASME OM Code and pump group as defined in ISTB of the ASME OM Code.

(2) Identification of the ASME OM Code requirements from which the applicant is requesting relief.

(3) For a relief request under 10 CFR 50.55a(f)(6) or (g)(6), the basis for requesting the relief and an explanation of why compliance with the ASME OM Code is impractical.

Any alternative request will be also submitted by the COL applicant as applicable. For an alternative request pursuant to which 10 CFR 50.55a(z), details regarding the proposed alternative(s) demonstrating that (1) the proposed IST will provide an acceptable level of quality and safety, or (2) compliance with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

ASME OM Code Cases will be implemented as part of the IST program for pumps, valves, and dynamic restraints as accepted in NRC RG 1.192, if applicable.

3.9.7 [Reserved]

3.9.8 [Reserved]

3.9.9 Combined License Information

COL 3.9(1) The COL applicant is to provide the inspection results for the APR1400 reactor internals classified as non-prototype Category I in accordance with NRC RG 1.20.

COL 3.9(2) The COL applicant is to identify the site-specific active pumps.

COL 3.9(3) The COL applicant is to provide a full description of the IST program (including PST and MOV testing) for pumps, valves, and dynamic restraints that will be administratively controlled such that the applicable requirements of the ASME OM Code edition and addenda are incorporated in the IST program.

COL 3.9(4) The COL applicant is to provide an IST program including the type of testing and frequency of site-specific pumps subject to IST in accordance with the ASME OM Code and Table 3.9-13.

COL 3.9(5) The COL applicant is to provide an IST program including the type of testing and frequency of any site-specific valves subject to IST in accordance with the ASME OM Code and Table 3.9-13.

COL 3.9(6) The COL applicant is to provide a table listing all safety-related components that use snubbers in their support systems.

COL 3.9(7) The COL applicant is to review the detailed analysis of mechanical tanks, including the effects of fluid sloshing.

3.9.10 References

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Table 3.9-1 (1 of 7)

Transients Used in Stress Analysis

Event Conditions	Event Description	Specific Events	Occurrences for Design Purpose 60 Years(1)	Occurrences for Design Purpose 40 Years(1)
Level A Service Conditions				
Normal Event-1A	Steady-state operation with normal parameter variations in the increasing direction (5 to 100 %)		1,500,000	1,000,000
Normal Event-1B	Steady-state operation with normal parameter variations in the decreasing direction (5 to 100 %)		1,500,000	1,000,000
Normal Event-2A	Daily load follow operation (from 100 to 50 % power)(2)		22,000	15,000
Normal Event-2B	Daily load follow operation (from 50 to 100 % power) (2)		22,000	15,000
Normal Event-3A	Turbine step load change in the increasing direction	Turbine power steps of +10 percent (15 to 100 % power)	3,200	2,000
		Turbine power steps of +1 percent (5 to 15 % power)	1,600	1,000
		(Total)	4,800	3,000
Normal Event-3B	Turbine step load change in the decreasing direction	Turbine power steps of -10 percent (15 to 100 % power)	3,200	2,000
		Turbine power steps of -1 percent (5 to 15 % power)	1,600	1,000
		(Total)	4,800	3,000
Normal Event-3C	Large turbine load step decrease	Turbine load rejection up to 50 % (50 to 100 % power)	60	40
		Turbine generator runback to house load	60	40
		Reactor trip	150	100
		Turbine trip	150	100
		(Total)	420	280

Table 3.9-1 (2 of 7)

Event Conditions	Event Description	Specific Events	Occurrences for Design Purpose 60 Years[1]	40 Years[1]
Normal Event-4A	Turbine ramp load change in the increasing direction	Turbine power ramps of +5 %/min (15 to 100 % power)	3,200	2,000
		Turbine power ramps of +1 %/min (5 to 15 % power)	1,600	1,000
		(Total)	4,800	3,000
Normal Event-4B	Turbine ramp load change in the decreasing direction	Turbine power ramps of -5 %/min (15 to 100 % power)	3,200	2,000
		Turbine power ramps of -1 %/min (5 to 15 % power)	1,600	1,000
		Loss of a main feedwater pump without reactor trip	60	40
		(Total)	4,860	3,040
Normal Event-5	Non-load change events (planned)	NSSS operations with the control systems in the manual mode of the CEA, turbine bypass valves, pressurizer spray/heaters, pressurizer level control and feedwater flow (0 to 5 % power)	1,600	1,000
		Opening or closure of the feedwater economizer valve	500	500
		NSSS operations with the control systems in the manual mode (5 to 100 % power)	3,200	2,000
		Manual operation of the auxiliary spray system	250	170
		High steam generator blowdown	3,200	2,000
		Shift from normal to maximum CVCS flow rate and return	3,200	2,000
		(Total)	11,950	7,670

Table 3.9-1 (3 of 7)

Event Conditions	Event Description	Specific Events	Occurrences for Design Purpose 60 Years[1]	40 Years[1]
Normal Event-6	Non-load change events (unplanned)	Low-low VCT level and charging pump diversion to the boric acid storage tank	60	40
		Spurious actuation of the pressurizer spray	60	40
		Spurious actuation of the pressurizer heaters	60	40
		Inadvertent closure of one economizer or downcomer feedwater valve	60	40
		Inadvertent opening of one economizer or downcomer feedwater valve	60	40
		Inadvertent isolation of one main feedwater heater	60	40
		(Total)	360	240
Normal Event-7	Plant events below power operation	Startup and coastdown of a reactor coolant pump at HSB	2,000	1,340
		Startup and shutdown of the shutdown cooling system at HSD	250	170
		Spurious startup of a safety injection pump during shutdown conditions	60	40
		Spurious actuation of the pressurizer heaters at HSB	60	40
		(Total)	2,370	1,590
Normal Event-8	Plant heatup		250	170
Normal Event-9	Plant cooldown		250	170

Table 3.9-1 (4 of 7)

Event Conditions	Event Description	Specific Events	Occurrences for Design Purpose	
			60 Years[(1)]	40 Years[(1)]
Level B Service Conditions				
Upset Event-1	Increase heat removal by the secondary system	Decrease in feedwater temperature	20	20
		Increase in feedwater flow rate	20	20
		Increase in steam flow rate	20	20
		Inadvertent opening of a main steam safety valve	10	10
		(Total)	70	70
Upset Event-2	Decrease heat removal by the secondary system	Loss of external load	20	20
		Loss of condenser vacuum	20	20
		Loss of non-emergency AC power to the station auxiliaries	20	20
		Main steam isolation valve closure	20	20
		Loss of normal feedwater flow	20	20
		(Total)	100	100
Upset Event-3	Decrease in reactor coolant system flow rate	Loss of forced reactor coolant flow	20	20
		Natural circulation cooldown (HSB to HSD)	10	10
		(Total)	30	30

Table 3.9-1 (5 of 7)

Event Conditions	Event Description	Specific Events	Occurrences for Design Purpose	
			60 Years(1)	40 Years(1)
Upset Event-4	Reactivity and power distribution anomalies	Uncontrolled CEA withdrawal at low power	5	5
		Uncontrolled CEA withdrawal at high power	5	5
		Control rod misoperation, RPCS inadvertent operation, or operator error	50	35
		(Total)	60	45
Upset Event-5	Increase in reactor coolant system inventory	Loss of component cooling water to the letdown heat exchanger	10	10
		CVCS malfunction that increases RCS inventory	10	10
		(Total)	20	20
Upset Event-6	Decrease in reactor coolant system inventory	Inadvertent opening of a pilot operated safety and relief valve (POSRV closed as expected)	10	10
		Failure of small lines carrying coolant outside containment (letdown line break)	20	20
		(Total)	30	30
Upset Event-7	Reactor coolant pump seal failure		10	10
Upset Event-8	Loss of seal injection with loss of cooling water		5	5

Table 3.9-1 (6 of 7)

Event Conditions	Event Description	Specific Events	Occurrences for Design Purpose 60 Years(1)	40 Years(1)
Level C Service Conditions				
none				
Level D Service Conditions				
Faulted Event-1	Increase heat removal by the secondary system	Steam system piping failure	1	1
Faulted Event-2	Decrease heat removal by the secondary system	Feedwater system pipe break (FWLB)	1	1
Faulted Event-3	Decrease in reactor coolant system flow rate	Reactor coolant pump rotor seizure	1	1
		Reactor coolant pump shaft break	1	1
		(Total)	2	2
Faulted Event-4	Reactivity and power distribution anomalies	Rod ejection accident	1	1
Faulted Event-5	Decrease in reactor coolant system inventory	Inadvertent opening of a pilot operated safety and relief valve (POSRV fails to close)	1	1
		Steam generator tube rupture (SGTR)	1	1
		Loss of coolant accidents resulting from postulated pipe breaks within the RCS pressure boundary (LOCA)	1	1
		(Total)	3	3
Faulted Event-6		Total loss of feedwater flow	1	1

Table 3.9-1 (7 of 7)

Event Conditions	Event Description	Specific Events	Occurrences for Design Purpose 60 Years(1)	40 Years(1)
Test Conditions				
RCS hydrostatic test			15	10
Secondary hydrostatic test			15	10
RCS leak test			200	200
Secondary leak test			200	200
SIS/SCS preoperational and maintenance test			360	240
SIS/SCS check valve operability test			120	80

(1) The design life for RCS main components and Class 1 piping is 60 years, and the design life for Class 2 and 3 piping and other components except RCS main components is 40 years.

(2) Although APR1400 will be operated as a base load plant, the effects of daily load follow operation are accounted for in the structural design and analysis of ASME Code Class 1 components, reactor internals, and component supports.

Table 3.9-2

Loading Combinations for ASME Code Class 1, 2, and 3 Components(1) and Component Supports(6)

Condition	Design Loading(2) Combination
Design	PD + DW + IRWST
Level A (Normal)(3)	PO + DW
Level B (Upset)(3)	PO + DW + IRWST + DFL
Level C (Emergency)	No Loads (5)
Level D (Faulted)	PO + DW + SRSS(SSE + DF + IRWST)(4)

(1) For piping, see Tables 3.9-10, 3.12-1, and 3.12-2.

(2) Legend:

PD = design pressure

PO = operating pressure

DW = deadweight

SSE = safe shutdown earthquake

DF = dynamic system loadings associated with pipe breaks (not eliminated by a leak-before-break analysis) ,or POSRV actuation

IRWST = In-containment refueling water storage tank discharge loads

DFL = Dynamic fluid loads are occasional loads associated with hydraulic transients caused by events such as valve actuation (safety or relief valve discharge, rapid valve opening/closing), water hammer, or steam hammer.

(3) As required by the ASME Section III, other loads, such as thermal transient, and thermal gradient, require consideration in addition to the primary stress producing loads listed. SSE is considered in equipment fatigue evaluations in accordance with Subsection 3.7.3.1.

(4) Detailed loading combinations of ASME Code Class 1 components and component supports are described in Subsection 3.9.3.1.

(5) Refer to Subsection 3.9.3.1.

(6) Internal operating and/or design pressure loading is applicable to pressure boundary components and not to their supports.

Table 3.9-3

Stress Limits for ASME Code Class 1 Components, Piping, and Component Supports

	Component and Piping Stress Limits(1)	Component Support Stress Limits(2)
Design	NB-3221, NB-3231, and NB-3652	Table NF-3131(a) - 1
Level A (Normal)	NB-3222, NB-3232, and NB-3653	Table NF-3131(a) - 1
Level B (Upset)	NB-3223, NB-3233, and NB-3654	Table NF-3131(a) - 1
Level C (Emergency)	NB-3224, NB-3234, and NB-3655	Table NF-3131(a) - 1
Level D (Faulted)(3)	NB-3225, NB-3235, and NB-3656	Table NF-3131(a) - 1

(1) Stress limits listed are used as required by the ASME Section III, and applicable addenda for all components except active components. Active components are designed to the stress limits of NB-3221 and NB-3231 for design conditions and the stress limits of NB-3222 and NB-3232 for all other conditions for active components.

(2) Stress limits used are as required by the ASME Section III and modified by NRC RGs 1.124 and 1.130.

(3) For faulted condition loadings, bolts in the load path connecting two members of an NF support for Class 1 components are designed in accordance with Appendix F of the ASME Section III for friction type connections with tensile stresses limited to the lesser of 0.7 S_u or S_y.

Table 3.9-4 (1 of 22)

Seismic Category I Active Valves

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
SI-100	IRWST recirculation isolation (operate)	Check	2	None
SI-101	IRWST recirculation isolation (operate)	Check	2	None
SI-113	SIS (operate)	Check	2	None
SI-123	SIS (operate)	Check	2	None
SI-133	SIS (operate)	Check	2	None
SI-143	SIS (operate)	Check	2	None
SI-157	CSS (operate)	Check	2	None
SI-158	CSS (operate)	Check	2	None
SI-159	SC pump suction check	Check	2	None
SI-160	SC pump suction check	Check	2	None
SI-168	SCS (operate)	Check	2	None
SI-178	SCS (operate)	Check	2	None
SI-179	SCS (operate)	Relief	2	None
SI-189	SCS (operate)	Relief	2	None
SI-215	SI tank (operate)	Check	1	None
SI-217	SI system (operate)	Check	1	None
SI-225	SI tank (operate)	Check	1	None
SI-227	SI system (operate)	Check	1	None
SI-235	SI tank (operate)	Check	1	None
SI-237	SI system (operate)	Check	1	None
SI-245	SI tank (operate)	Check	1	None
SI-247	SI system (operate)	Check	1	None
SI-300	CS/SCS IRWST recirculation isolation	Gate	2	Motor
SI-301	CS/SCS IRWST recirculation isolation	Gate	2	Motor
SI-302	SI IRWST recirculation isolation	Gate	2	Motor
SI-303	SI IRWST recirculation isolation	Globe	2	Motor
SI-304	IRWST isolation	Gate	2	Motor
SI-305	IRWST isolation	Gate	2	Motor
SI-308	IRWST isolation	Gate	2	Motor
SI-309	IRWST isolation	Gate	2	Motor
SI-310	SCS 1 flow control (operate)	Globe	2	Motor

Table 3.9-4 (2 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
SI-311	SCS 2 flow control (operate)	Globe	2	Motor
SI-312	SDCHX bypass (operate)	Globe	2	Motor
SI-313	SDCHX bypass (operate)	Globe	2	Motor
SI-314	SCS 1 IRWST recirculation line flow control	Globe	2	Motor
SI-315	SCS 2 IRWST recirculation line flow control	Globe	2	Motor
SI-321	Hot leg injection (operate)	Globe	2	Motor
SI-322	Hot leg injection leakage return (close)	Globe	1	Pneumatic
SI-331	Hot leg injection (operate)	Globe	2	Motor
SI-332	Hot leg injection leakage return (close)	Globe	1	Pneumatic
SI-340	SCS/CSS pump suction cross connection (close)	Gate	2	Motor
SI-341	SCS/CSS pump discharge cross(close) connection (operate)	Gate	2	Motor
SI-342	SCS/CSS pump suction cross connection (close)	Gate	2	Motor
SI-343	SCS/CSS pump discharge cross connection (close)	Gate	2	Motor
SI-344	SC pump suction isolation (close)	Gate	2	Motor
SI-346	SC pump suction isolation (close)	Gate	2	Motor
SI-347	CS pump suction isolation (operate)	Gate	2	Motor
SI-348	CS pump suction isolation (operate)	Gate	2	Motor
SI-391	Reactor cavity isolation (operate)	Gate	2	Motor
SI-393	Reactor cavity isolation (operate)	Gate	2	Motor
SI-395	IRWST return line isolation (operate)	Gate	2	Motor
IW-0001	HVT flooding isolation (close)	Gate	2	Motor
IW-0002	HVT flooding isolation (close)	Gate	2	Motor
IW-0003	Reactor cavity flooding isolation (close)	Gate	2	Motor
IW-0004	Reactor cavity flooding isolation (close)	Gate	2	Motor
IW-0005	BAMP suction isolation (close)	Gate	2	Motor
IW-0006	BAMP suction isolation (close)	Gate	2	Motor
IW-0010	IRWST level instrument isolation (close)	Globe	2	Solenoid

Table 3.9-4 (3 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
IW-0011	IRWST level instrument isolation (close)	Globe	2	Solenoid
IW-0012	HVT level instrument isolation (close)	Globe	2	Solenoid
IW-0013	HVT level instrument isolation (close)	Globe	2	Solenoid
IW-0014	HVT level instrument isolation (close)	Globe	2	Solenoid
IW-0015	HVT level instrument isolation (close)	Globe	2	Solenoid
IW-0016	HVT level instrument isolation (close)	Globe	2	Solenoid
IW-0017	HVT level instrument isolation (close)	Globe	2	Solenoid
IW-0018	Reactor cavity level instrument isolation (close)	Globe	2	Solenoid
IW-0019	Reactor cavity level instrument isolation (close)	Globe	2	Solenoid
IW-0020	Reactor cavity level instrument isolation (close)	Globe	2	Solenoid
IW-0021	Reactor cavity level instrument isolation (close)	Globe	2	Solenoid
IW-0022	IRWST level instrument isolation (close)	Globe	2	Solenoid
IW-0023	IRWST level instrument isolation (close)	Globe	2	Solenoid
IW-0024	IRWST level instrument isolation (close)	Globe	2	Solenoid
IW-0025	IRWST level instrument isolation (close)	Globe	2	Solenoid
IW-0026	IRWST level instrument isolation (close)	Globe	2	Solenoid
IW-0027	IRWST level instrument isolation (close)	Globe	2	Solenoid
IW-0028	HVT level instrument isolation (close)	Globe	2	Solenoid
IW-0029	HVT level instrument isolation (close)	Globe	2	Solenoid
IW-0030	HVT level instrument isolation (close)	Globe	2	Solenoid
IW-0031	HVT level instrument isolation (close)	Globe	2	Solenoid
IW-0032	Reactor cavity level instrument isolation (close)	Globe	2	Solenoid
IW-0033	Reactor cavity level instrument isolation (close)	Globe	2	Solenoid
IW-0034	Reactor cavity level instrument isolation (close)	Globe	2	Solenoid
IW-0035	Reactor cavity level instrument isolation (close)	Globe	2	Solenoid
IW-1003	BAMP suction line relief (operate)	Relief	2	None
SI-404	Safety injection system (operate)	Check	2	None
SI-405	Safety injection system (operate)	Check	2	None
SI-424	SI pump minimum flow IRWST return (operate)	Check	2	None
SI-426	SI pump minimum flow IRWST return (operate)	Check	2	None

Table 3.9-4 (4 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
SI-434	Safety injection system (operate)	Check	2	None
SI-446	Safety injection system (operate)	Check	2	None
SI-448	SI pump minimum flow IRWST return (operate)	Check	2	None
SI-451	SI pump minimum flow IRWST return (operate)	Check	2	None
SI-522	Hot leg injection (operate)	Check	1	None
SI-523	Hot leg injection (operate)	Check	1	None
SI-532	Hot leg injection (operate)	Check	1	None
SI-533	Hot leg injection (operate)	Check	1	None
SI-540	SIS (operate)	Check	1	None
SI-541	SIS (operate)	Check	1	None
SI-542	SIS (operate)	Check	1	None
SI-543	SIS (operate)	Check	1	None
SI-568	SCS (operate)	Check	2	None
SI-569	SCS (operate)	Check	2	None
SI-600	SCS isolation (operate)	Globe	2	Motor
SI-601	SCS isolation (operate)	Globe	2	Motor
SI-602	SIS throttle (operate)	Globe	2	Motor
SI-603	SIS throttle (operate)	Globe	2	Motor
SI-604	Hot leg injection (operate)	Gate	2	Motor
SI-605	SI tank vent (operate)	Globe	2	Solenoid
SI-606	SI tank vent (operate)	Globe	2	Solenoid
SI-607	SI tank vent (operate)	Globe	2	Solenoid
SI-608	SI tank vent (operate)	Globe	2	Solenoid
SI-609	Hot leg injection (operate)	Gate	2	Motor
SI-611	SI tank fill/drain (operate)	Globe	2	Pneumatic
SI-613	SI tank vent (operate)	Globe	2	Solenoid
SI-614	SI tank isolation (operate)	Gate	1	Motor
SI-616	SI system (operate)	Globe	2	Motor
SI-618	Leakage return to IRWST/RDT (close)	Globe	1	Pneumatic
SI-621	SI tank fill/drain (close)	Globe	2	Pneumatic
SI-623	SI tank vent (operate)	Globe	2	Solenoid

Table 3.9-4 (5 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
SI-624	SI tank isolation (operate)	Gate	1	Motor
SI-626	SI isolation (operate)	Globe	2	Motor
SI-628	Leakage return to IRWST/RDT (close)	Globe	1	Pneumatic
SI-631	SI tank fill/drain (close)	Globe	2	Pneumatic
SI-633	SI tank vent (operate)	Globe	2	Solenoid
SI-634	SI tank isolation (operate)	Gate	1	Motor
SI-636	SI system (operate)	Globe	2	Motor
SI-638	Leakage return to IRWST/RDT (close)	Globe	1	Pneumatic
SI-641	SI tank fill/drain (close)	Globe	2	Pneumatic
SI-643	SI tank vent (operate)	Globe	2	Solenoid
SI-644	SI tank isolation (operate)	Gate	1	Motor
SI-646	SI isolation (operate)	Globe	2	Motor
SI-648	Leakage return to IRWST/RDT (close)	Globe	1	Pneumatic
SI-651	Shutdown cooling suction (operate)	Gate	1	Motor
SI-652	Shutdown cooling suction (operate)	Gate	1	Motor
SI-653	Shutdown cooling suction (operate)	Gate	1	Motor
SI-654	Shutdown cooling suction (operate)	Gate	1	Motor
SI-655	Shutdown cooling suction (operate)	Gate	2	Motor
SI-656	Shutdown cooling suction (operate)	Gate	2	Motor
SI-682	SIT fill/drain (close)	Globe	2	Pneumatic
SI-688	SCS 1 IRWST recirculation isolation (operate)	Gate	2	Motor
SI-690	SCS warmup line flow control (operate)	Globe	2	Motor
SI-691	SCS warmup line flow control (operate)	Globe	2	Motor
SI-693	SCS 2 IRWST recirculation isolation (operate)	Gate	2	Motor
SI-801	External emergency injection line check	Check	2	None
SI-803	External emergency injection line isolation	Gate	2	Manual
CV-186	Reactor makeup water line isolation	Packless	3	Manual
CV-189	IRWST makeup line check (close)	Check	2	None
CV-255	Seal injection containment isolation	Globe	2	Motor
CV-362	Shutdown purification line isolation	Gate	2	Manual (handwheel)
CV-363	Shutdown purification line check (close)	Check	2	None

Table 3.9-4 (6 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
CV-494	RSSH to reactor drain header check (close)	Check	2	None
CV-505	RCP controlled bleed-off containment isolation (close)	Globe	2	Pneumatic
CV-506	RCP controlled bleed-off containment isolation (close)	Globe	2	Pneumatic
CV-509	IRWST makeup line containment isolation (close)	Gate	2	Motor
CV-515	Letdown isolation (close)	Globe	1	Pneumatic
CV-516	Letdown isolation (close)	Globe	1	Pneumatic
CV-522	Letdown containment isolation (close)	Globe	2	Pneumatic
CV-523	Letdown containment isolation (close)	Globe	2	Pneumatic
CV-524	Charging containment isolation (close)	Globe	2	Motor
CV-560	RDT effluent containment isolation (close)	Globe	2	Pneumatic
CV-561	RDT effluent containment isolation (close)	Globe	2	Pneumatic
CV-576	Charging flow restricting (close)	Globe	2	Motor
CV-577	Charging flow restricting (close)	Globe	2	Motor
CV-580	RSSH to RDH isolation (close)	Gate	2	Pneumatic
CV-747	Charging line check (close)	Check	2	None
CV-835	Seal injection containment isolation (close)	Check	2	None
RC-120	Reactor coolant system	To be determined by vendor	1	Motor
RC-121	Reactor coolant system	To be determined by vendor	1	Motor
RC-122	Reactor coolant system	To be determined by vendor	1	Motor
RC-123	Reactor coolant system	To be determined by vendor	1	Motor
RC-124	Reactor coolant system	To be determined by vendor	1	Motor
RC-125	Reactor coolant system	To be determined by vendor	1	Motor
RC-126	Reactor coolant system	To be determined by vendor	1	Motor
RC-127	Reactor coolant system	To be determined by vendor	1	Motor
RC-130	Reactor coolant system	To be determined by vendor	1	Motor

Table 3.9-4 (7 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
RC-131	Reactor coolant system	To be determined by vendor	1	Motor
RC-132	Reactor coolant system	To be determined by vendor	1	Motor
RC-133	Reactor coolant system	To be determined by vendor	1	Motor
RC-134	Reactor coolant system	To be determined by vendor	1	Motor
RC-135	Reactor coolant system	To be determined by vendor	1	Motor
RC-136	Reactor coolant system	To be determined by vendor	1	Motor
RC-137	Reactor coolant system	To be determined by vendor	1	Motor
RC-200	Reactor coolant system	POSRV	1	Pilot
RC-201	Reactor coolant system	POSRV	1	Pilot
RC-202	Reactor coolant system	POSRV	1	Pilot
RC-203	Reactor coolant system	POSRV	1	Pilot
RC-300	Reactor coolant system	Spring-loaded	1	None
RC-301	Reactor coolant system	Spring-loaded	1	None
RC-302	Reactor coolant system	Spring-loaded	1	None
RC-303	Reactor coolant system	Spring-loaded	1	None
RC-304	Reactor coolant system	Spring-loaded	1	None
RC-305	Reactor coolant system	Spring-loaded	1	None
RC-306	Reactor coolant system	Spring-loaded	1	None
RC-307	Reactor coolant system	Spring-loaded	1	None
VQ-0011	Reactor containment purge system (close)	Butterfly	2	Electro-hydraulic
VQ-0012	Reactor containment purge system (close)	Butterfly	2	Motor
VQ-0013	Reactor containment purge system (close)	Butterfly	2	Motor
VQ-0014	Reactor containment purge system (close)	Butterfly	2	Electro-hydraulic
VQ-0031	Reactor containment purge system (close)	Butterfly	2	Pneumatic
VQ-0032	Reactor containment purge system (close)	Butterfly	2	Pneumatic
VQ-0033	Reactor containment purge system (close)	Butterfly	2	Pneumatic
VQ-0034	Reactor containment purge system (close)	Butterfly	2	Pneumatic

Table 3.9-4 (8 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
WI-0012	Plant chilled water system	Gate	2	Pneumatic
WI-0013	Plant chilled water system	Gate	2	Pneumatic
WI-0014	Plant chilled water system	Relief	2	None
WI-0015	Plant chilled water system	Gate	2	Motor
WI-1043	Plant chilled water system	Check	2	None
WO-0906A	Essential chilled water system	Three-way	3	Pneumatic
WO-0906B	Essential chilled water system	Three-way	3	Pneumatic
WO-0906C	Essential chilled water system	Three-way	3	Pneumatic
WO-0906D	Essential chilled water system	Three-way	3	Pneumatic
WO-0917A	Essential chilled water system	Three-way	3	Pneumatic
WO-0917B	Essential chilled water system	Three-way	3	Pneumatic
WO-0918A	Essential chilled water system	Three-way	3	Pneumatic
WO-0918B	Essential chilled water system	Three-way	3	Pneumatic
WO-1001A	Essential chilled water system	Relief	3	None
WO-1001B	Essential chilled water system	Relief	3	None
WO-1003A	Essential chilled water system	Check	3	None
WO-1003B	Essential chilled water system	Check	3	None
WO-1010A	Essential chilled water system	Check	3	None
WO-1010B	Essential chilled water system	Check	3	None
WO-1011A	Essential chilled water system	Check	3	None
WO-1011B	Essential chilled water system	Check	3	None
WO-1014A	Essential chilled water system	Check	3	None
WO-1014B	Essential chilled water system	Check	3	None
WO-1022A	Essential chilled water system	Check	3	None
WO-1022B	Essential chilled water system	Check	3	None
WO-1031A	Essential chilled water system	Check	3	None
WO-1031B	Essential chilled water system	Check	3	None
WO-1032A	Essential chilled water system	Check	3	None
WO-1032B	Essential chilled water system	Check	3	None
DO-1005A	Diesel fuel oil transfer system (operate)	Check	3	None
DO-1007A	Diesel fuel oil transfer system (operate)	Check	3	None
DO-1005B	Diesel fuel oil transfer system (operate)	Check	3	None
DO-1007B	Diesel fuel oil transfer system (operate)	Check	3	None

Table 3.9-4 (9 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
DO-1005C	Diesel fuel oil transfer system (operate)	Check	3	None
DO-1007C	Diesel fuel oil transfer system (operate)	Check	3	None
DO-1005D	Diesel fuel oil transfer system (operate)	Check	3	None
DO-1007D	Diesel fuel oil transfer system (operate)	Check	3	None
MS-0011	Main steam system isolation (close)	Gate	2	Electro-hydraulic
MS-0012	Main steam system isolation (close)	Gate	2	Electro-hydraulic
MS-0013	Main steam system isolation (close)	Gate	2	Electro-hydraulic
MS-0014	Main steam system isolation (close)	Gate	2	Electro-hydraulic
MS-0101	Main steam atmospheric dump (close)	Angle	2	Electro-hydraulic
MS-0102	Main steam atmospheric dump (close)	Angle	2	Electro-hydraulic
MS-0103	Main steam atmospheric dump (close)	Angle	2	Electro-hydraulic
MS-0104	Main steam atmospheric dump (close)	Angle	2	Electro-hydraulic
MS-1301	Main steam safety (operate)	Safety	2	None
MS-1302	Main steam safety (operate)	Safety	2	None
MS-1303	Main steam safety (operate)	Safety	2	None
MS-1304	Main steam safety (operate)	Safety	2	None
MS-1305	Main steam safety (operate)	Safety	2	None
MS-1306	Main steam safety (operate)	Safety	2	None
MS-1307	Main steam safety (operate)	Safety	2	None
MS-1308	Main steam safety (operate)	Safety	2	None
MS-1309	Main steam safety (operate)	Safety	2	None
MS-1310	Main steam safety (operate)	Safety	2	None
MS-1311	Main steam safety (operate)	Safety	2	None
MS-1312	Main steam safety (operate)	Safety	2	None
MS-1313	Main steam safety (operate)	Safety	2	None
MS-1314	Main steam safety (operate)	Safety	2	None
MS-1315	Main steam safety (operate)	Safety	2	None

Table 3.9-4 (10 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
MS-1316	Main steam safety (operate)	Safety	2	Electro-hydraulic
MS-1317	Main steam safety (operate)	Safety	2	Electro-hydraulic
MS-1318	Main steam safety (operate)	Safety	2	Electro-hydraulic
MS-1319	Main steam safety (operate)	Safety	2	Electro-hydraulic
MS-1320	Main steam safety (operate)	Safety	2	None
MS-0015	MSIV bypass (close)	Gate	2	Electro-hydraulic
MS-0016	MSIV bypass (close)	Gate	2	Electro-hydraulic
MS-0017	MSIV bypass (close)	Gate	2	Electro-hydraulic
MS-0018	MSIV bypass (close)	Gate	2	Electro-hydraulic
MS-0109	AFW pump turbine steam supply (open)	Globe	2	Solenoid
MS-0110	AFW pump turbine steam supply (open)	Globe	2	Solenoid
MS-0111	AFW pump turbine warmup (open)	Globe	2	Solenoid
MS-0112	AFW pump turbine warmup (open)	Globe	2	Solenoid
MS-105	MSADV isolation valve (operate)	Gate	2	Motor
MS-106	MSADV isolation valve (operate)	Gate	2	Motor
MS-107	MSADV isolation valve (operate)	Gate	2	Motor
MS-108	MSADV isolation valve (operate)	Gate	2	Motor
MS-0090	Main steam drip leg isolation valve	Globe	2	Pneumatic
MS-0091	Main steam drip leg isolation valve	Globe	2	Pneumatic
MS-0092	Main steam drip leg isolation valve	Globe	2	Pneumatic
MS-0093	Main steam drip leg isolation valve	Globe	2	Pneumatic
FW-0121	SG 1 economizer FW isolation (close)	Gate	2	Electro-hydraulic
FW-0122	SG 1 economizer FW isolation (close)	Gate	2	Electro-hydraulic
FW-0123	SG 2 economizer FW isolation (close)	Gate	2	Electro-hydraulic
FW-0124	SG 2 economizer FW isolation (close)	Gate	2	Electro-hydraulic

Table 3.9-4 (11 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
FW-0131	SG 1 economizer FW isolation (close)	Gate	2	Electro-hydraulic
FW-0132	SG 1 economizer FW isolation (close)	Gate	2	Electro-hydraulic
FW-0133	SG 2 economizer FW isolation (close)	Gate	2	Electro-hydraulic
FW-0134	SG 2 economizer FW isolation (close)	Gate	2	Electro-hydraulic
FW-1039	SG 1 downcomer FW line (operate)	Check	2	None
FW-1040	SG 1 downcomer FW line (operate)	Check	2	None
FW-1046	SG 2 downcomer FW line (operate)	Check	2	None
FW-1047	SG 2 downcomer FW line (operate)	Check	2	None
FW-1035	SG 1 economizer FW line (operate)	Check	2	None
FW-1037	SG 1 economizer FW line (operate)	Check	2	None
FW-1042	SG 2 economizer FW line (operate)	Check	2	None
FW-1043	SG 2 economizer FW line (operate)	Check	2	None
FW-1044	SG 2 economizer FW line (operate)	Check	2	None
FW-0138	FW chemical injection valve	Globe	2	Pneumatic
FW-0139	FW chemical injection valve	Globe	2	Pneumatic
FW-1050	FW chemical injection check valve	Check	2	None
FW-1051	FW chemical injection check valve	Check	2	None
NT-0004	Nitrogen system containment isolation (close)	Globe	2	Pneumatic
NT-1016	Nitrogen system containment isolation (operate)	Check	2	None
IA-0020	Instrument air system containment isolation (close)	Globe	2	Pneumatic
IA-1601	Instrument air system containment isolation (operate)	Check	2	None
SA-0001	Service air system containment isolation (close)	Globe	2	pneumatic
SA-1401	Service air system containment isolation (operate)	Check	2	None
AF-1012A	AFW recirculation (operate)	Check	3	None
AF-1014A	AFW recirculation (operate)	Check	3	None
AF-1012B	AFW recirculation (operate)	Check	3	None

Table 3.9-4 (12 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
AF-1014B	AF recirculation (operate)	Check	3	None
AF-1003A	AF discharge (operate)	Check	3	None
AF-1004A	AF discharge (operate)	Check	3	None
AF-1003B	AF discharge (operate)	Check	3	None
AF-1004B	AF discharge (operate)	Check	3	None
AF-0035	AF modulation (open)	Globe	3	Solenoid
AF-0036	AF modulation (open)	Globe	3	Solenoid
AF-0037	AF modulation (open)	Globe	3	Solenoid
AF-0038	AF modulation (open)	Globe	3	Solenoid
AF-0043	AF isolation (closed)	Gate	2	Motor
AF-0044	AF isolation (closed)	Gate	2	Motor
AF-0045	AF isolation (closed)	Gate	2	Motor
AF-0046	AF isolation (closed)	Gate	2	Motor
AF-1007A	AF isolation (operate)	Check	2	None
AF-1008A	AF isolation (operate)	Check	2	None
AF-1007B	AF isolation (operate)	Check	2	None
AF-1008B	AF isolation (operate)	Check	2	None
AF-1022A	AF chemical injection (operate)	Check	3	None
AF-1022B	AF chemical injection (operate)	Check	3	None
AF-1024A	AF chemical injection (operate)	Check	3	None
AF-1024B	AF chemical injection (operate)	Check	3	None
AT-0009	AF pump turbine steam isolation (open)	Globe	3	Pneumatic
AT-0010	AF pump turbine steam isolation (open)	Globe	3	Pneumatic
AT-3001	AFWPT electrical trip solenoid valve	Gate	3	Solenoid
AT-3002	AFWPT electrical trip solenoid valve	Gate	3	Solenoid
AT-0007	Steam supply line drip leg control (open)	Globe	3	Pneumatic
AT-0008	Steam supply line drip leg control (open)	Globe	3	Pneumatic
AT-3015	AFWPT throttle (open)	Globe	3	Pneumatic
AT-3016	AFWPT throttle (open)	Globe	3	Pneumatic
AT-1020A	AFWPT main steam supply (operate)	Check	3	None
AT-1020B	AFWPT main steam supply (operate)	Check	3	None
AT-1022A	AFWPT auxiliary steam supply (operate)	Check	3	None
AT-1022B	AFWPT auxiliary steam supply (operate)	Check	3	None

Table 3.9-4 (13 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
WM-1752	Demineralized water makeup system containment isolation (operate)	Check	2	None
DG-5023A	Safety relief valve	Safety	3	None
DG-5023B	Safety relief valve	Safety	3	None
DG-5023C	Safety relief valve	Safety	3	None
DG-5023D	Safety relief valve	Safety	3	None
DG-5031A	Safety relief valve	Safety	3	None
DG-5031B	Safety relief valve	Safety	3	None
DG-5031C	Safety relief valve	Safety	3	None
DG-5031D	Safety relief valve	Safety	3	None
DG-4035A	Globe valve	Safety	3	None
DG-4035B	Globe valve	Safety	3	None
DG-4035C	Globe valve	Safety	3	None
DG-4035D	Globe valve	Safety	3	None
DG-4037A	Globe valve	Safety	3	None
DG-4037B	Globe valve	Safety	3	None
DG-4037C	Globe valve	Safety	3	None
DG-4037D	Globe valve	Safety	3	None
DG-4230A	Gate valve	Gate	3	Pneumatic
DG-4230B	Gate valve	Gate	3	Pneumatic
DG-4230C	Gate valve	Gate	3	Pneumatic
DG-4230D	Gate valve	Gate	3	Pneumatic
DG-4059A	Gate valve	Gate	3	None
DG-4059B	Gate valve	Gate	3	None
DG-4059C	Gate valve	Gate	3	None
DG-4059D	Gate valve	Gate	3	None
DG-5098A	Globe valve	Globe	3	None
DG-5098B	Globe valve	Globe	3	None
DG-5098C	Globe valve	Globe	3	None
DG-5098D	Globe valve	Globe	3	None
DG-5099A	Globe valve	Globe	3	None
DG-5099B	Globe valve	Globe	3	None

Table 3.9-4 (14 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
DG-5099C	Globe valve	Globe	3	None
DG-5099D	Globe valve	Globe	3	None
DG-4114A	Three-way valve	Three-way	3	Self-controlled
DG-4114B	Three-way valve	Three-way	3	Self-controlled
DG-4114C	Three-way valve	Three-way	3	Self-controlled
DG-4114D	Three-way valve	Three-way	3	Self-controlled
DG-4217A	Three-way valve	Three-way	3	Self-controlled
DG-4217B	Three-way valve	Three-way	3	Self-controlled
DG-4217C	Three-way valve	Three-way	3	Self-controlled
DG-4217D	Three-way valve	Three-way	3	Self-controlled
DG-4250A	Three-way valve	Three-way	3	Self-controlled
DG-4250B	Three-way valve	Three-way	3	Self-controlled
DG-4250C	Three-way valve	Three-way	3	Self-controlled
DG-4250D	Three-way valve	Three-way	3	Self-controlled
DG-4022A	Check valve	Check	3	None
DG-4022B	Check valve	Check	3	None
DG-4022C	Check valve	Check	3	None
DG-4022D	Check valve	Check	3	None
DG-4030A	Check valve	Check	3	None
DG-4030B	Check valve	Check	3	None
DG-4030C	Check valve	Check	3	None
DG-4030D	Check valve	Check	3	None
DG-4034A	Check valve	Check	3	None
DG-4034B	Check valve	Check	3	None

Table 3.9-4 (15 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
DG-4034C	Check valve	Check	3	None
DG-4034D	Check valve	Check	3	None
DG-4312A	Check valve	Check	3	None
DG-4312B	Check valve	Check	3	None
DG-4312C	Check valve	Check	3	None
DG-4312D	Check valve	Check	3	None
DG-4111A	Check valve	Check	3	None
DG-4111B	Check valve	Check	3	None
DG-4111C	Check valve	Check	3	None
DG-4111D	Check valve	Check	3	None
DG-4140A	Check valve	Check	3	None
DG-4140B	Check valve	Check	3	None
DG-4140C	Check valve	Check	3	None
DG-4140D	Check valve	Check	3	None
DG-4231A	Check valve	Check	3	None
DG-4231B	Check valve	Check	3	None
DG-4231C	Check valve	Check	3	None
DG-4231D	Check valve	Check	3	None
DG-4242A	Check valve	Check	3	None
DG-4242B	Check valve	Check	3	None
DG-4242C	Check valve	Check	3	None
DG-4242D	Check valve	Check	3	None
DG-4319A	Check valve	Check	3	None
DG-4319B	Check valve	Check	3	None
DG-4319C	Check valve	Check	3	None
DG-4319D	Check valve	Check	3	None
DG-4321A	Check valve	Check	3	None
DG-4321B	Check valve	Check	3	None
DG-4321C	Check valve	Check	3	None
DG-4321D	Check valve	Check	3	None

Table 3.9-4 (16 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
CA-0013	Condenser exhaust gas containment isolation valve	Gate	2	Motor
CA-1023	Condenser exhaust gas containment isolation check valve	Check	2	None
FP-0030	Reactor containment building fire water standpipe system containment isolation valve	Globe	2	Pneumatic
FP-1440	Reactor containment building fire water standpipe system containment isolation check valve	Check	2	None
CS-0001	Spray header isolation (operate)	Gate	2	Motor
CS-0002	Spray header isolation (operate)	Gate	2	Motor
CS-0003	Spray header isolation (operate)	Gate	2	Motor
CS-0004	Spray header isolation (operate)	Gate	2	Motor
CS-0005	IRWST return line isolation (operate)	Globe	2	Motor
CS-0006	IRWST return line isolation (operate)	Globe	2	Motor
CS-0007	IRWST return line isolation (operate)	Gate	2	Motor
CS-0008	IRWST return line isolation (operate)	Gate	2	Motor

Table 3.9-4 (17 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
CS-1002	Spray line (operate)	Check	2	None
CS-1005	Spray line relief (operate)	Relief	2	None
CS-1006	Spray line relief (operate)	Relief	2	None
CS-1007	Spray header isolation (operate)	Check	2	None
CS-1008	Spray header isolation (operate)	Check	2	None
CS-1014	ECSBS line (operate)	Check	2	None
SD-0005	SG blowdown isolation (close)	Gate	2	Pneumatic
SD-0006	SG blowdown isolation (close)	Gate	2	Pneumatic
SD-0007	SG blowdown isolation (close)	Gate	2	Motor
SD-0008	SG blowdown isolation (close)	Gate	2	Motor
RG-0410	Reactor coolant gas vent system (close)	Globe	1	Solenoid
RG-0411	Reactor coolant gas vent system (close)	Globe	1	Solenoid
RG-0412	Reactor coolant gas vent system (close)	Globe	1	Solenoid
RG-0413	Reactor coolant gas vent system (close)	Globe	1	Solenoid
RG-0414	Reactor coolant gas vent system (close)	Globe	1	Solenoid
RG-0415	Reactor coolant gas vent system (close)	Globe	1	Solenoid
RG-0416	Reactor coolant gas vent system (close)	Globe	1	Solenoid
RG-0417	Reactor coolant gas vent system (close)	Globe	1	Solenoid
RG-0419	Reactor coolant gas vent system (close)	Globe	2	Solenoid
RG-0420	Reactor coolant gas vent system (close)	Globe	2	Solenoid
PX-0001	Hot leg sample line isolation (close)	Globe	2	Solenoid
PX-0002	Hot leg sample line isolation (close)	Globe	2	Solenoid
PX-0003	PZR surge line sample isolation (close)	Globe	2	Solenoid
PX-0004	PZR surge line sample isolation (close)	Globe	2	Solenoid
PX-0005	PZR steam space sample isolation (close)	Globe	2	Solenoid
PX-0006	PZR steam space sample isolation (close)	Globe	2	Solenoid

Table 3.9-4 (18 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
PX-0020	SI tank sample isolation (close)	Globe	2	Solenoid
PX-0021	SI tank sample isolation (close)	Globe	2	Solenoid
PX-0022	SI tank sample isolation (close)	Globe	2	Solenoid
PX-0023	SI tank sample isolation (close)	Globe	2	Solenoid
PX-0024	SI tank sample isolation (close)	Globe	2	Solenoid
PX-0025	SI tank sample isolation (close)	Globe	2	Solenoid
PX-0026	CS pump 1 miniflow (close)	Globe	2	Solenoid
PX-0027	CS pump 2 miniflow (close)	Globe	2	Solenoid
PX-0041	Containment air sample line isolation (close)	Gate	2	Motor
PX-0042	Containment air sample line isolation (close)	Gate	2	Motor
PX-0043	Containment air sample return line isolation (close)	Gate	2	Motor
PX-1020	Containment air sample return line isolation (operate)	Check	2	None
PX-0039	Pass sample isolation (close)	Globe	2	Solenoid
PX-0053	Return to HVT isolation (close)	Globe	2	Solenoid
PX-1023	Return to HVT isolation (operate)	Check	2	None
CC-0011	CCW system (operate)	Globe	3	Motor
CC-0012	CCW system (operate)	Globe	3	Motor
CC-0021	CCW system (open)	Butterfly	3	Motor
CC-0022	CCW system (open)	Butterfly	3	Motor
CC-0023	CCW system (open)	Butterfly	3	Motor
CC-0024	CCW system (open)	Butterfly	3	Motor
CC-0027	CCW system (close)	Butterfly	3	Motor
CC-0028	CCW system (close)	Butterfly	3	Motor
CC-0037	CCW system (close)	Butterfly	3	Motor
CC-0038	CCW system (close)	Butterfly	3	Motor

Table 3.9-4 (19 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
CC-0149	CCW system (close)	Butterfly	3	Motor
CC-0191	CCW system (close)	Butterfly	3	Motor
CC-0192	CCW system (close)	Butterfly	3	Motor
CC-0025	CCW system (open)	Butterfly	3	Motor
CC-0026	CCW system (open)	Butterfly	3	Motor
CC-0031	CCW system (open)	Butterfly	3	Motor
CC-0032	CCW system (open)	Butterfly	3	Motor
CC-0033	CCW system (open)	Butterfly	3	Motor
CC-0034	CCW system (open)	Butterfly	3	Motor
CC-0035	CCW system (open)	Butterfly	3	Motor
CC-0036	CCW system (open)	Butterfly	3	Motor
CC-0097	CCW system (open)	Butterfly	3	Motor
CC-0098	CCW system (open)	Butterfly	3	Motor
CC-0131	CCW system (operate)	Butterfly	3	Motor
CC-0132	CCW system (operate)	Butterfly	3	Motor
CC-0143	CCW system (close)	Butterfly	3	Motor
CC-0144	CCW system (close)	Butterfly	3	Motor
CC-0145	CCW system (close)	Butterfly	3	Motor
CC-0146	CCW system (close)	Butterfly	3	Motor
CC-0147	CCW system (close)	Butterfly	3	Motor
CC-0148	CCW system (close)	Butterfly	3	Motor
CC-0150	CCW system (close)	Butterfly	3	Motor
CC-0181	CCW system (open)	Butterfly	3	Motor
CC-0182	CCW system (open)	Butterfly	3	Motor
CC-0231	Containment isolation (operate)	Butterfly	2	Motor
CC-0249	Containment isolation (operate)	Butterfly	2	Motor
CC-0250	Containment isolation (operate)	Butterfly	2	Motor
CC-0296	Containment isolation (close)	Butterfly	2	Motor
CC-0297	Containment isolation (close)	Butterfly	2	Motor
CC-0301	Containment isolation (close)	Butterfly	2	Motor
CC-0302	Containment isolation (close)	Butterfly	2	Motor
CC-0351	CCW system (close)	Butterfly	3	Motor
CC-0352	CCW system (close)	Butterfly	3	Motor

Table 3.9-4 (20 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
CC-0383	CCW system (operate)	Butterfly	3	Motor
CC-0384	CCW system (operate)	Butterfly	3	Motor
CC-0389	CCW system (Open)	Butterfly	3	Motor
CC-0390	CCW system (Open)	Butterfly	3	Motor
CC-0901	CCW flow control (operate)	3-way	3	Pneumatic
CC-0902	CCW flow control (operate)	3-way	3	Pneumatic
CC-0905	CCW flow control (operate)	3-way	3	Pneumatic
CC-0906	CCW flow control (operate)	3-way	3	Pneumatic
CC-0937	CCW system (close)	Butterfly	3	Motor
CC-0938	CCW system (close)	Butterfly	3	Motor
CC-0939	CCW system (close)	Butterfly	3	Motor
CC-0940	CCW system (close)	Butterfly	3	Motor
CC-1001	CCW system (operate)	Check	3	None
CC-1002	CCW system (operate)	Check	3	None
CC-1003	CCW system (operate)	Check	3	None
CC-1004	CCW system (operate)	Check	3	None
CC-1099	Containment isolation (operate)	Check	2	None
CC-1100	Containment isolation (operate)	Check	2	None
CC-1107	CCW system (operate)	Relief	3	None
CC-1108	CCW system (operate)	Relief	3	None
CC-1109	CCW system (operate)	Check	3	None
CC-1110	CCW system (operate)	Check	3	None
CC-1111	CCW system (operate)	Relief	3	None
CC-1112	CCW system (operate)	Relief	3	None
CC-1303	CCW system (operate)	Check	3	None
CC-1304	CCW system (operate)	Check	3	None
CC-1309	CCW system (operate)	Check	3	None
CC-1310	CCW system (operate)	Check	3	None
CC-1317	CCW system (operate)	Check	3	None
CC-1318	CCW system (operate)	Check	3	None
CC-1319	CCW system (operate)	Check	3	None
CC-1320	CCW system (operate)	Check	3	None
CC-1685	Containment isolation (operate)	Check	2	None

Table 3.9-4 (21 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
CC-1686	Containment isolation (operate)	Check	2	None
CC-1325	CCW system (operate)	Check	3	None
CC-1326	CCW system (operate)	Check	3	None
SX-1003	ESW system (operate)	Check	3	None
SX-1004	ESW system (operate)	Check	3	None
FC-1005	SFP cooling system (operate)	Check	3	None
FC-1006	SFP cooling system (operate)	Check	3	None
FC-1145	Containment isolation (close)	Check	2	None
DE-0005	Containment isolation (close)	Globe	2	Motor
DE-0006	Containment isolation (close)	Globe	2	Pneumatic
PS-0031	SG 1 blowdown hot leg isolation (close)	Gate	2	Pneumatic
PS-0032	SG 2 blowdown hot leg isolation (close)	Gate	2	Pneumatic
PS-0033	SG 1 downcomer isolation (close)	Gate	2	Pneumatic
PS-0034	SG 2 downcomer isolation (close)	Gate	2	Pneumatic
PS-0035	SG 1 blowdown cold leg isolation (close)	Gate	2	Pneumatic
PS-0036	SG 2 blowdown cold leg isolation (close)	Gate	2	Pneumatic
PS-0257	SG 1 blowdown hot leg isolation (close)	Gate	2	Pneumatic
PS-0258	SG 2 blowdown hot leg isolation (close)	Gate	2	Pneumatic
PR-0431	Containment radiation monitoring system (closed)	Gate	2	Motor
PR-0432	Containment radiation monitoring system (closed)	Gate	2	Motor
PR-0434	Containment radiation monitoring system (closed)	Gate	2	Motor
PR-1433	Containment radiation monitoring system (closed)	Check	2	None
CM-001	Containment hydrogen sampling (closed)	Globe	2	Solenoid
CM-002	Containment hydrogen sampling (closed)	Globe	2	Solenoid
SX-1003	ESW system (operate)	Check	3	None
SX-1004	ESW system (operate)	Check	3	None
FC-1005	SFP cooling system (operate)	Check	3	None
FC-1006	SFP cooling system (operate)	Check	3	None
FC-1145	SFP cooling system (operate)	Check	3	None
PS-0031	SG 1 blowdown hot leg isolation (close)	Gate	2	Pneumatic
PS-0032	SG 2 blowdown hot leg isolation (close)	Gate	2	Pneumatic

Table 3.9-4 (22 of 22)

Valve No.	System Name (Safety Function) (1) (2) (3)	Valve Type	ASME Section III Class	Actuator Type
PS-0033	SG 1 downcomer isolation (close)	Gate	2	Pneumatic
PS-0034	SG 2 downcomer isolation (close)	Gate	2	Pneumatic
PS-0035	SG 1 blowdown cold leg isolation (close)	Gate	2	Pneumatic
PS-0036	SG 2 blowdown cold leg isolation (close)	Gate	2	Pneumatic
PS-0257	SG 1 blowdown hot leg isolation (close)	Gate	2	Pneumatic
PS-0258	SG 2 blowdown hot leg isolation (close)	Gate	2	Pneumatic
CM-003	Containment hydrogen sampling (closed)	Globe	2	Solenoid
CM-004	Containment hydrogen sampling (closed)	Globe	2	Solenoid
CM-009	Containment hydrogen sampling (closed)	Globe	2	Solenoid
CM-010	Containment hydrogen sampling (closed)	Globe	2	Solenoid
CM-011	Containment refueling water storage tank hydrogen sampling (closed)	Globe	2	Solenoid
CM-0012	Containment refueling water storage tank hydrogen sampling (closed)	Globe	2	Solenoid
CM-0013	Containment refueling water storage tank hydrogen sampling (closed)	Globe	2	Solenoid
CM-0014	Containment refueling water storage tank hydrogen sampling (closed)	Globe	2	Solenoid
CM-0017	Containment pressure monitoring system (operate)	Globe	2	Solenoid
CM-0018	Containment pressure monitoring system (operate)	Globe	2	Solenoid
CM-0019	Containment pressure monitoring system (operate)	Globe	2	Solenoid
CM-0020	Containment pressure monitoring system (operate)	Globe	2	Solenoid
CM-0021	Containment pressure monitoring system (operate)	Globe	2	Solenoid
CM-0022	Containment pressure monitoring system (operate)	Globe	2	Solenoid
CM-0023	Containment hydrogen sampling (closed)	Globe	2	Solenoid
CM-0024	Containment hydrogen sampling (closed)	Globe	2	Solenoid
CM-1013	Containment hydrogen sampling (closed)	Check	2	None
CM-1014	Containment hydrogen sampling (closed)	Check	2	None

(1) “Operate” is defined as valve being capable of both opening and closing.

(2) “Close” is defined as valve being capable of moving to or maintaining a closed position.

(3) “Open” is defined as valve being capable of moving to or maintaining an open position.

Table 3.9-5

Stress Criteria for Safety-Related
ASME Section III, Class 2 and Class 3 Vessels

Service Level	Stress Limits[1]
Design and Level A	$\sigma_m \leq$ 1.0 S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq$ 1.5 S
Level B	$\sigma_m \leq$ 1.1 S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq$ 1.65 S
Level C	$\sigma_m \leq$ 1.5 S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq$ 1.80 S
Level D	$\sigma_m \leq$ 2.0 S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq$ 2.4 S

(1) Stress limits are taken from ASME Section III, NC/ND, Table 3321-1.

Table 3.9-6

Stress Criteria for ASME Section III, Class 2 and Class 3 Non-active Pumps

Plant Condition	Service Limits[1]	Loads	Stress Limits[2]	P_{max}[3]	Subsections[5]
Design	Design	Sustained loads: pressure, weight, other mechanical loads	$\sigma_m \leq 1.0$ S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq 1.5$ S	-	ASME Section III, NC/ND-3400
Normal	Level A	Sustained loads: pressure, weight, other mechanical loads	$\sigma_m \leq 1.0$ S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq 1.5$ S	1.0	ASME Section III, NC/ND-3400
Upset	Level B	Occupational loads: pressure, weight, thermal effects, dynamic fluid loads[4]	$\sigma_m \leq 1.1$ S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq 1.65$ S	1.1	ASME Section III, NC/ND-3400
Emergency	Level C	No loads (Refer to Subsection 3.9.3.1)	$\sigma_m \leq 1.5$ S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq 1.8$ S	1.2	ASME Section III, NC/ND-3400
Faulted	Level D	Occupational loads: pressure, weight, thermal effects, dynamic fluid loads,[4] SSE inertia, pipe break	$\sigma_m \leq 2.0$ S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq 2.4$ S	1.5	ASME Section III, NC/ND-3400

(1) Service limits are taken from ASME Section III, NCA-2142.4.

(2) Stress limits are taken from ASME Section III, NC and ND, Table NC/ND-3416-1.

(3) The maximum pressure does not exceed the tabulated factors listed under Pmax times the design pressure.

(4) Dynamic fluid loads (DFL) are occasional loads such as safety and relief valve thrust, steam hammer, water hammer, or other loads associated with plant upset or faulted condition as applicable. Dynamic loads are combined by the SRSS method.

(5) SECY-93-087, Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Designs, Paragraph 9, “Elimination of Operating Basis Earthquake,” Nuclear Regulatory Commission, July 21, 1993.

Table 3.9-7

Stress Criteria for ASME, Section III Class 2 and Class 3 Active Pumps

Plant Condition	Service Limits[1]	Loads	Stress Limits[2]	P_{max}[3]	Subsections[5]
Design	Design	Sustained loads: pressure, weight, other mechanical loads	$\sigma_m \leq 1.0$ S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq 1.5$ S	-	ASME Section III, NC/ND-3400
Normal	Level A	Sustained loads: pressure, weight, other mechanical loads	$\sigma_m \leq 1.0$ S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq 1.5$ S	1.0	ASME Section III, NC/ND-3400
Upset	Level B	Occupational loads: pressure, weight, thermal effects, dynamic fluid loads[4]	$\sigma_m \leq 1.1$ S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq 1.65$ S	1.1	ASME Section III, NC/ND-3400
Emergency	Level B	No loads (Refer to Subsection 3.9.3.1)	$\sigma_m \leq 1.1$ S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq 1.65$ S	1.1	ASME Section III, NC/ND-3400
Faulted	Level B	Occupational loads: pressure, weight, thermal effects, dynamic fluid loads,[4] SSE inertia, pipe break	$\sigma_m \leq 1.1$ S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq 1.65$ S	1.1	ASME Section III, NC/ND-3400

(1) Service limits are taken from ASME Section III, NCA-2142.4.

(2) Stress limits are taken from ASME Section III, NC and ND, Table NC/ND-3416-1. However, the stress limits for service level C and D are more restrictive than the ASME Section III limits to provide reasonable assurance of pump operability.

(3) The maximum pressure does not exceed the tabulated factors listed under Pmax times the design pressure.

(4) Dynamic fluid loads (DFLs) are occasional loads such as safety and relief valve thrust, steam hammer, water hammer, or other loads associated with plant upset or faulted condition as applicable. Dynamic loads are combined by the SRSS method.

(5) SECY-93-087, Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Designs, Paragraph 9, "Elimination of Operating Basis Earthquake," July 21, 1993.

Table 3.9-8

Stress Criteria for Safety-Related ASME Section III, Class 2 and Class 3 Non-active Valves

Service Level	Stress Limits[(1)–(4)(6)]	P_{max}[(5)]
Design and Level A	$\sigma_m \leq 1.0$ S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq 1.5$ S	1.0
Level B	$\sigma_m \leq 1.1$ S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq 1.65$ S	1.1
Level C	$\sigma_m \leq 1.5$ S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq 1.8$ S	1.2
Level D	$\sigma_m \leq 2.0$ S $(\sigma_m$ or $\sigma_L) + \sigma_b \leq 2.4$ S	1.5

(1) Valve nozzle (piping load) stress analysis is not required when both of the following conditions are satisfied:

a) The section modulus and areas of every plane, normal to the flow, through the region defined as the valve body crotch are at least 110 percent of those for the piping connected (or joined) to the valve body inlet and outlet nozzles.

b) Code allowable stress, S, for valve body material is equal to or greater than the code allowable stress, S, of connected piping material. If the valve body material allowable stress is less than that of the connected piping, the valve section modulus and area as calculated in (1) above is multiplied by the ratio of S_{pipe}/S_{valve}. If unable to conform with this requirement, the design by analysis procedure of the ASME Section III, NB-3545.2, is an acceptable alternate method.

(2) Casting quality factor of 1.0 is used.

(3) These stress limits are applicable to the pressure retaining boundary, and include the effects of loads transmitted by the extended structures, when applicable.

(4) Design requirements listed in this table are not applicable to valve stems, seat rings, or other parts of valves which are contained within the confines of the body and bonnet.

(5) The maximum pressure resulting from Service Levels B, C, or D does not exceed the tabulated factors listed under Pmax times the design pressure or the rated pressure at the applicable operating condition temperature. If the pressure rating limits are met at the operating conditions, the stress limits in this table are considered to be satisfied.

(6) Stress limits are taken from ASME Section III, Table NC/ND-3521-1.

Table 3.9-9

Stress Criteria for ASME Section III, Class 2 and Class 3 Active Valves

Service Loading Conditions (Plant Condition)	Service Limits[1]	Stress Limits[2]	P_{max}[3]
Design	Design	$\sigma_m \leq 1.0$ S (σ_m or σ_L) + $\sigma_b \leq 1.5$ S	-
Level A (normal)	Level A	$\sigma_m \leq 1.0$ S (σ_m or σ_L) + $\sigma_b \leq 1.5$ S	1.0
Level B (upset)	Level B	$\sigma_m \leq 1.1$ S (σ_m or σ_L) + $\sigma_b \leq 1.65$ S	1.1
Level C (emergency)	Level B	$\sigma_m \leq 1.1$ S (σ_m or σ_L) + $\sigma_b \leq 1.65$ S	1.1
Level D (faulted)	Level B	$\sigma_m \leq 1.1$ S (σ_m or σ_L) + $\sigma_b \leq 1.65$ S	1.1

(1) Service Limits (Level A, B, C, and D) are defined in ASME Section III, NCA-2142.4.

(2) Stress limits are in accordance with ASME Section III, Table NC/ND-3521-1. For service loading conditions level C and level D, the stress limits specified for active valves are more restrictive than ASME Section III limits to assure the operability of valves.

(3) The maximum pressure does not exceed the tabulated factors listed under P_{max} times the design pressure or the rated pressure at the applicable operating condition temperature.

(4) Valve nozzle (piping load) stress analysis is not required when both of the following conditions are satisfied:

a) The section modulus and areas of every plane, normal to the flow, through the region defined as the valve body crotch are at least 110 percent of those for the piping connected (or joined) to the valve body inlet and outlet nozzles.

b) Code allowable stress, S, for valve body material is equal to or greater than the code allowable stress, S, of connected piping material. If the valve body material allowable stress is less than that of the connected piping, the valve section modulus and area as calculated in (1) above is multiplied by the ratio of S_{pipe}/S_{valve}. If unable to conform with this requirement, the design by analysis procedure of ASME Section III, NB-3545.2, is an acceptable alternate method.

(5) Casting quality factor of 1.0 is used.

(6) Design requirements listed in this table are not applicable to valve stems, seat rings, or other parts of valves which are contained within the confines of the body and bonnet.

Table 3.9-10

Loading Conditions and Load Combinations Requirements
for ASME Section III, Class 1, 2, and 3 Piping Supports

Service Level	Loading Combination
Level A	Weight Thermal(1) Friction(5)
Level B	Weight Thermal(1) IRWST discharge loads (3) Dynamic fluid loads(2) Friction(5)
Level C	No loads (Refer to Subsection 3.9.3.1)
Level D	Weight Thermal(1) IRWST discharge loads (3) Dynamic fluid loads(2) SSE inertia SSE seismic movements Pipe break loads(4) Friction(5)

(1) Thermal conditions (including ambient temperature) to be combined to provide maximum load combinations.

(2) Dynamic fluid loads due to safety/relief valve thrust, steam hammer, and water hammer.

(3) In-containment refueling water storage tank discharge loads.

(4) Pipe break loads include loads due to LOCA.

(5) Friction forces included are from the movement of piping due to thermal expansion with sum of deadweight and applicable signed loads.

Table 3.9-11

Stress Limits for CEDM Pressure Housings

Service Level	Stress Categories and Limits of Stress Intensities[1]
1. Design: design pressure, normal operating loads[2], IRWST discharge loads	NB-3221 and Figure NB-3221-1 including notes
2. Level A: normal operating loads, normal operating transients	NB-3222 and Figure NB-3222-1 including notes
3. Level B: normal operating loads, upset transients, IRWST discharge loads, fatigue loads due to SSE[3]	NB-3223 and Figure NB-3222-1 including notes
4. Level C: no loads (Refer to Subsection 3.9.3.1)	NB-3224 and Figure NB-3224-1 including notes
5. Level D[4]: operating pressure, normal operating loads, IRWST discharge loads, BLPB loads, SSE loads	Appendix F Article F-1000 Rules for evaluation of service conditions loading with level D service limits
6. Testing: testing plant transients	NB-3226

(1) References listed are taken from ASME Section III.

(2) “'Normal operating loads” is defined in Subsection 3.9.4.3.

(3) Fatigue loads due to SSE are applied in accordance with Subsection 3.9.2.2.3.

(4) SSE loads is combined with BLPB loads and IRWST discharge loads by the SRSS method in accordance with the guidelines of NUREG-0484.

Table 3.9-12

Stress Limits for Reactor Internals Design and Service Loads

Stress Limit	Description
Design Limits	The reactor internals are designed to meet the design limits defined in ASME Section III, NG-3221, for design loadings. The reactor internals are safety Class 3 and seismic Category I in accordance with ANSI/ANS 51.1. Core support structures are constructed in accordance with ASME Section III, NG-1100. The reactor internals other than core support structures meet the guidelines of ASME Section III, NG-3000 and are constructed so as not to adversely affect the integrity of the core support structures. Under Level D service loadings, the maximum stress intensity is obtained from principal stresses resulting from an SRSS combination of IRWST, BLPB, and SSE plus normal operating dynamic and static loading in accordance with NUREG-0484, Rev. 1. For other than Level D service loading conditions, maximum stress intensity are derived from an SRSS combination of dynamic loads in accordance with NUREG-0484, Rev. 1, or a more conservative summation of stress intensities.
Level A Service Limits	The reactor internals are designed to meet the Level A service limits defined in ASME Section III, NG-3222, for Level A service loadings.
Level B Service Limits	The reactor internals are designed to meet the Level B service limits defined in ASME Section III, NG-3223, for Level B service loadings.
Level C Service Limits	There are no Level C service loadings. Refer to Subsection 3.9.3.1.
Level D Service Limits	The reactor internals are designed to meet the Level D service limits defined in ASME Section III, NG-3225, for elastic system analysis of Appendix F of ASME Section III using Level D service loadings. Maximum stress intensity is obtained from principal stresses resulting from an SRSS combination of IRWST, BLPB, and SSE loadings plus normal operation loads in accordance with NUREG-0484, Rev. 1.

Table 3.9-13 (1 of 85)

Inservice Testing of Safety-Related Pumps and Valves

Pump No	Pump Description	Pump Type	Safety Class	OM Code Group	Test Parameter (h)	Test Freq	Acceptance Criteria	Figure No.
CC-PP01A	Component Cooling Water pump 1A	Centrifugal	3	A	DP, Q, V	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.2-1
CC-PP01B	Component Cooling Water pump 1B	Centrifugal	3	A	DP, Q, V	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.2-1
CC-PP02A	Component Cooling Water pump 2A	Centrifugal	3	A	DP, Q, V	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.2-1
CC-PP02B	Component Cooling Water pump 2B	Centrifugal	3	A	DP, Q, V	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.2-1
CC-PP03A	Component Cooling Water makeup pump 3A	Centrifugal	3	B	DP, Q	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.2-1
CC-PP03B	Component Cooling Water makeup pump 3B	Centrifugal	3	B	DP, Q	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.2-1
SI-PP02A	Safety Injection pump 1	Centrifugal	2	B	DP, Q, V (40)	3 mo	Table ISTB-5100-1 in ASME OM Code	6.3.2-1
SI-PP02B	Safety Injection pump 2	Centrifugal	2	B	DP, Q, V (40)	3 mo	Table ISTB-5100-1 in ASME OM Code	6.3.2-1
SI-PP02C	Safety Injection pump 3	Centrifugal	2	B	DP, Q, V (40)	3 mo	Table ISTB-5100-1 in ASME OM Code	6.3.2-1
SI-PP02D	Safety Injection pump 4	Centrifugal	2	B	DP, Q, V (40)	3 mo	Table ISTB-5100-1 in ASME OM Code	6.3.2-1
SI-PP01A	Shutdown Cooling pump 1	Centrifugal vertical	2	A	DP, Q, V	3 mo	Table ISTB-5100-1 in ASME OM Code	6.3.2-1
SI-PP01A	Shutdown Cooling pump 2	Centrifugal vertical	2	A	DP, Q, V	3 mo	Table ISTB-5100-1 in ASME OM Code	6.3.2-1
CS-PP01A	Containment Spray pump 1	Centrifugal	2	B	DP, Q	3 mo	Table ISTB-5121-1 in ASME OM Code	6.2.2-1
CS-PP01B	Containment Spray pump 2	Centrifugal	2	B	DP, Q	3 mo	Table ISTB-5121-1 in ASME OM Code	6.2.2-1
SX-PP01A	Essential Service Water pump 1A	Vertical line shaft centrifugal	3	A	DP, Q, V	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.1-1
SX-PP01B	Essential Service Water pump 1B	Vertical line shaft centrifugal	3	A	DP, Q, V	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.1-1
SX-PP02A	Essential Service Water pump 2A	Vertical line shaft centrifugal	3	A	DP, Q, V	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.1-1
SX-PP02B	Essential Service Water pump 2B	Vertical line shaft centrifugal	3	A	DP, Q, V	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.1-1
FC-PP01A	Spent Fuel Pool cooling pump A	Centrifugal	3	A	DP, Q, V	3 mo	Table ISTB-5121-1 in ASME OM Code	9.1.3-1
FC-PP01B	Spent Fuel Pool cooling pump B	Centrifugal	3	A	DP, Q, V	3 mo	Table ISTB-5121-1 in ASME OM Code	9.1.3-1
AF-PP02A	Motor Driven AFW pump PP02A	Centrifugal horizontal	3	B	N, DP, Q	3 mo	Table ISTB-5121-1 in ASME OM Code	10.4.9-1

Table 3.9-13 (2 of 85)

Pump No	Pump Description	Pump Type	Safety Class	OM Code Group	Test Parameter (h)	Test Freq	Acceptance Criteria	Figure No.
AF-PP01A	TD AFW pump PP01A	Centrifugal horizontal	3	B	N, DP, Q	3 mo	Table ISTB-5121-1 in ASME OM Code	10.4.9-1
AF-PP02B	MD AFW pump PP02B	Centrifugal horizontal	3	B	N, DP, Q	3 mo	Table ISTB-5121-1 in ASME OM Code	10.4.9-1
AF-PP01B	TD AFW pump PP01B	Centrifugal horizontal	3	B	N, DP, Q	3 mo	Table ISTB-5121-1 in ASME OM Code	10.4.9-1
WO-PP01A	ECW pump PP01A	Centrifugal horizontal	3	A	N, DP, Q, V, P_D	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.7-1
WO-PP02A	ECW pump PP02A	Centrifugal horizontal	3	A	N, DP, Q, V, P_D	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.7-1
WO-PP03A	ECW makeup pump PP03A	Centrifugal horizontal	3	B	N, DP, Q	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.7-1
WO-PP01B	ECW pump PP01B	Centrifugal horizontal	3	A	N, DP, Q, V, P_D	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.7-1
WO-PP02B	ECW pump PP02B	Centrifugal horizontal	3	A	N, DP, Q, V, P_D	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.7-1
WO-PP03B	ECW makeup pumpPP03B	Centrifugal horizontal	3	B	N, DP, Q	3 mo	Table ISTB-5121-1 in ASME OM Code	9.2.7-1
DO-PP01A/02A	DG 1 fuel oil transfer pump 01A/02A	Centrifugal horizontal	3	B	Note 37	Note37	Table ISTB-5121-1 in ASME OM Code	9.5.4-1
DO-PP01B/02B	DG 2 fuel oil transfer pump 01B/02B	Centrifugal horizontal	3	B	Note 37	Note37	Table ISTB-5121-1 in ASME OM Code	9.5.4-1
DO-PP01C/02C-	DG 3 fuel oil transfer pump 01C/02C	Centrifugal horizontal	3	B	Note 37	Note37	Table ISTB-5121-1 in ASME OM Code	9.5.4-1
DO-PP01D/02D	DG 4 fuel oil transfer pump 01D/02D	Centrifugal horizontal	3	B	Note 37	Note37	Table ISTB-5121-1 in ASME OM Code	9.5.4-1
DO-PP022A	DG 1 motor-driven fuel oil feed pump	Rotary (gear) horizontal	3	B	Note 37	Note37	Table ISTB-5321-1 in ASME OM Code	9.5.4-1
DO-PP22B	DG 2 motor-driven fuel oil feed pump	Rotary (gear) horizontal	3	B	Note 37	Note37	Table ISTB-5321-1 in ASME OM Code	9.5.4-1
DO-PP22C	DG 3 motor-driven fuel oil feed pump	Rotary (gear) horizontal	3	B	Note 37	Note37	Table ISTB-5321-1 in ASME OM Code	9.5.4-1
DO-PP22D	DG 4 motor-driven fuel oil feed pump	Rotary (gear) horizontal	3	B	Note 37	Note37	Table ISTB-5321-1 in ASME OM Code	9.5.4-1

Table 3.9-13 (3 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
RC-200	PZR POSRV	POS	SA EL	1	A/C		Open/ Closed	LT RVT LPV	RO
RC-201	PZR POSRV	POS	SA EL	1	A/C		Open/ Closed	LT RVT LPV	RO
RC-202	PZR POSRV	POS	SA EL	1	A/C		Open/ Closed	LT RVT LPV	RO
RC-203	PRZ POSRV	POS	SA EL	1	A/C		Open/ Closed	LT RVT LPV	RO
RC-120	PZR POSRV Motor Operated Isolation Valve	GL	EL	1	A		Closed	LT S LPV MT	RO
RC-121	PZR POSRV Motor Operated Isolation Valve	GL	EL	1	A		Closed	LT S LPV MT	RO
RC-122	PZR POSRV Motor Operated Isolation Valve	GL	EL	1	A		Closed	LT S LPV MT	RO
RC-123	PZR POSRV Motor Operated Isolation Valve	GL	EL	1	A		Closed	LT S LPV MT	RO
RC-124	PZR POSRV Motor Operated Isolation Valve	GL	EL	1	A		Closed	LT S LPV MT	RO

Table 3.9-13 (4 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
RC-125	PZR POSRV Motor Operated Isolation Valve	GL	EL	1	A		Closed	LT S LPV MT	RO
RC-126	PZR POSRV Motor Operated Isolation Valve	GL	EL	1	A		Closed	LT S LPV MT	RO
RC-127	PZR POSRV Motor Operated Isolation Valve	GL	EL	1	A		Closed	LT S LPV MT	RO
RC-130	PZR POSRV Motor Operated Pilot Valve	GL	EL	1	A		Closed	LT S LPV MT	RO
RC-131	PZR POSRV Motor Operated Pilot Valve	GL	EL	1	A		Closed	LT S LPV MT	RO
RC-132	PZR POSRV Motor Operated Pilot Valve	GL	EL	1	A		Closed	LT S LPV MT	RO
RC-133	PZR POSRV Motor Operated Pilot Valve	GL	EL	1	A		Closed	LT S LPV MT	RO
RC-134	PZR POSRV Motor Operated Pilot Valve	GL	EL	1	A		Closed	LT S LPV MT	RO

Table 3.9-13 (5 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
RC-135	PZR POSRV Motor Operated Pilot Valve	GL	EL	1	A		Closed	LT S LPV MT	RO
RC-136	PZR POSRV Motor Operated Pilot Valve	GL	EL	1	A		Closed	LT S LPV MT	RO
RC-137	PZR POSRV Motor Operated Pilot Valve	GL	EL	1	A		Closed	LT S LPV MT	RO
RC-300	PZR POSRV Spring Loaded Pilot Valve	RV	SA	1	A/C		Open/ Closed	LT RVT LPV	RO
RC-301	PZR POSRV Spring Loaded Pilot Valve	RV	SA	1	A/C		Open/ Closed	LT RVT LPV	RO
RC-302	PZR POSRV Spring Loaded Pilot Valve	RV	SA	1	A/C		Open/ Closed	LT RVT LPV	RO
RC-303	PZR POSRV Spring Loaded Pilot Valve	RV	SA	1	A/C		Open/ Closed	LT RVT LPV	RO
RC-304	PZR POSRV Spring Loaded Pilot Valve	RV	SA	1	A/C		Open/ Closed	LT RVT LPV	RO
RC-305	PZR POSRV Spring Loaded Pilot Valve	RV	SA	1	A/C		Open/ Closed	LT RVT LPV	RO
RC-306	PZR POSRV Spring Loaded Pilot Valve	RV	SA	1	A/C		Open/ Closed	LT RVT LPV	RO

Table 3.9-13 (6 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
RC-307	PZR POSRV Spring Loaded Pilot Valve	RV	SA	1	A/C		Open/ Closed	LT RVT LPV	RO
RC-0385	POSRV discharge	3W	EL	3	B		Open to IRWST	S MT LPV	RO (46) RO (46) 2 yr
RC-0386	POSRV discharge	3W	EL	3	B		Open to IRWST	S MT LPV	RO (46) RO (46) 2 yr
RC-1401	POSRV discharge vacuum relief	RV	SA	3	C		Open/Closed	RVT	2 yr
RC-1402	POSRV discharge vacuum relief	RV	SA	3	C		Open/Closed	RVT	2 yr
RC-1403	POSRV discharge vacuum relief	RV	SA	3	C		Open/Closed	RVT	2 yr
RC-1404	POSRV discharge vacuum relief	RV	SA	3	C		Open/Closed	RVT	2 yr
RG-0410	PZR gas vent	GL	S	1	B		Open/Closed	S MT FS LPV	CS (12) CS (12) CS (12) 2 yr
RG-0411	PZR gas vent	GL	S	1	B		Open/Closed	S MT FS LPV	CS (12) CS (12) CS (12) 2 yr
RG-0412	PZR gas vent	GL	S	1	B		Open/Closed	S MT FS LPV	CS (12) CS (12) CS (12) 2 yr
RG-0413	PZR gas vent	GL	S	1	B		Open/Closed	S MT FS LPV	CS (12) CS (12) CS (12) 2 yr

Table 3.9-13 (7 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
RG-0414	Reactor vessel gas vent	GL	S	1	B		Open/Closed	S MT FS LPV	CS (12) CS (12) CS (12) 2 yr
RG-0415	Reactor vessel gas vent	GL	S	1	B		Open/Closed	S MT FS LPV	CS (12) CS (12) CS (12) 2 yr
RG-0416	Reactor vessel gas vent	GL	S	1	B		Open/Closed	S MT FS LPV	CS (12) CS (12) CS (12) 2 yr
RG-0417	Reactor vessel gas vent	GL	S	1	B		Open/Closed	S MT FS LPV	CS (12) CS (12) CS (12) 2 yr
RG-0418	RCGV discharge to reactor drain tank vent	GL	S	2	B	P	Closed	FS LPV	3 mo 2 yr
RG-0419	RCGV discharge to IRWST vent	GL	S	2	B		Open	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
RG-0420	RCGV discharge to IRWST vent	GL	S	2	B		Open	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
RG-1421	RCGV vacuum relief	RV	SA	3	C		Open/Closed	RVT	2 yr

Table 3.9-13 (8 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
SI-100	IRWST return line check	CK	SA	2	A/C	CIC	Open/Closed	S RF LT	3 mo 3 mo 2 yr
SI-101	IRWST return line check	CK	SA	2	A/C	CIC	Open/Closed	S RF LT	3 mo 3 mo 2 yr
SI-113	SI line check	CK	SA	2	C	CIN	Open/Closed	S RF	RO (16) RO (16)
SI-123	SI line check	CK	SA	2	C	CIN	Open/Closed	S RF	CS (17) RO (17)
SI-133	SI line check	CK	SA	2	C	CIN	Open/Closed	S RF	RO (16) RO (16)
SI-143	SI line check	CK	SA	2	C	CIN	Open/Closed	S RF	CS (17) RO (17)
SI-157	CS pump suction check	CK	SA	2	C		Open/Closed	S RF	3 mo 3 mo
SI-158	CS pump suction check	CK	SA	2	C		Open/Closed	S RF	3 mo 3 mo
SI-159	SC pump suction check	CK	SA	2	C		Open /Closed	S RF	3 mo 3 mo
SI-160	SC pump suction check	CK	SA	2	C		Open /Closed	S RF	3 mo 3 mo
SI-166	SI hot leg injection line relief	RV	SA	2	C		-	RVT	10 yr
SI-168	SCS line check	CK	SA	2	C		Open /Closed	S RF	CS (17) 3 mo
SI-169	SCS line relief to RDT	RV	SA	1	C		-	RVT	5 yr

Table 3.9-13 (9 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
SI-178	SCS line check	CK	SA	2	C		Open /Closed	S RF	CS (17) 3 mo
SI-179	SCS suction line relief	RV	SA	2	C	CIN	Open/Closed	RVT	10 yr
SI-187	SCS test return line relief	RV	SA	2	C		-	RVT	10 yr
SI-188	SCS test return line relief	RV	SA	2	C		-	RVT	10 yr
SI-189	SCS suction line relief	RV	SA	2	C	CIN	Open/Closed	RVT	10 yr
SI-211	SIT relief	RV	SA	2	C		-	RVT	10 yr
SI-215	SIT check	CK	SA	1	A/C	PIV	Open /Closed	S LT RF	RR (19) 2 yr (38)
SI-217	SI line check	CK	SA	1	A/C	PIV	Open /Closed	S LT RF	RR (20) 2 yr (38)
SI-221	SIT relief	RV	SA	2	C		-	RVT	10 yr
SI-225	SIT check	CK	SA	1	A/C	PIV	Open /Closed	S LT RF	RR (19) 2 yr (38)
SI-227	SI line check	CK	SA	1	A/C	PIV	Open /Closed	S LT RF	CS (20) 2 yr (38)
SI-231	SIT relief	RV	SA	2	C		-	RVT	10 yr
SI-235	SIT check	CK	SA	1	A/C	PIV	Open /Closed	S LT RF	RR (19) 2 yr (38)

Table 3.9-13 (10 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
SI-237	SI line check	CK	SA	1	A/C	PIV	Open /Closed	S LT RF	RR [(20)] 2 yr (38)
SI-241	SIT relief	RV	SA	2	C		-	RVT	10 yr
SI-245	SIT check	CK	SA	1	A/C	PIV	Open /Closed	S LT RF	RR [(19)] 2 yr (38)
SI-247	SI line check	CK	SA	1	A/C	PIV	Open /Closed	S LT RF	CS [(20)] 2 yr (38)
SI-285	SI miniflow line relief	RV	SA	2	C		-	RVT	10 yr
SI-286	SI miniflow line relief	RV	SA	2	C		-	RVT	10 yr
SI-287	SCS test return line relief	RV	SA	2	C		-	RVT	10 yr
SI-289	SCS test return line relief	RV	SA	2	C		-	RVT	10 yr
SI-292	SIT fill return line relief	RV	SA	3	C		-	RVT	10 yr
SI-293	SIT fill line isolation	GL	M	2	A	P, CIC	Closed	LT	2 yr
SI-300	IRWST return line isolation	GT	EL	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr
SI-301	IRWST return line isolation	GT	EL	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr

Table 3.9-13 (11 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
SI-302	SI combined miniflow line isolation	GT	EL	2	A	CIC	Open	S MT LPV LT	RO (21) RO (21) 2 yr 2 yr
SI-303	SI combined miniflow line isolation	GL	EL	2	A	CIC	Open	S MT LPV LT	RO (21) RO (21) 2 yr 2 yr
SI-304	IRWST isolation	GT	EL	2	B	CIN	Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-305	IRWST isolation	GT	EL	2	B	CIN	Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-308	IRWST isolation	GT	EL	2	B	CIN	Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-309	IRWST isolation	GT	EL	2	B	CIN	Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-310	SDCHX outlet flow isolation	GL	EL	2	B		Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-311	SDCHX outlet flow isolation	GL	EL	2	B		Open /Closed	S MT LPV	3 mo 3 mo 2 yr

Table 3.9-13 (12 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
SI-312	SDCHX bypass flow control	GL	EL	2	B		Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-313	SDCHX bypass flow control	GL	EL	2	B		Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-314	SCS test return line isolation	GL	EL	2	B		Closed	S MT LPV	3 mo 3 mo 2 yr
SI-315	SCS test return line isolation	GL	EL	2	B		Closed	S MT LPV	3 mo 3 mo 2 yr
SI-321	SI hot leg injection line isolation	GL	EL	2	B	CIN	Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-322	Hot leg check valve leakage isolation	GL	AD	1	A	PIV	Closed	S MT FS LPV LT	3 mo 3 mo RO [(36)] 2 yr 2 yr
SI-331	SI hot leg injection line isolation	GL	EL	2	B	CIN	Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-332	Hot leg check valve leakage isolation	GL	AD	1	A	PIV	Closed	S MT FS LPV LT	3 mo 3 mo RO [(36)] 2 yr 2 yr

Table 3.9-13 (13 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
SI-340	SCS/CSS pump suction cross connect	GT	EL	2	B		Closed	S MT LPV	3 mo 3 mo 2 yr
SI-341	SCS/CSS pump discharge cross connect	GT	EL	2	B		Closed	S MT LPV	3 mo 3 mo 2 yr
SI-342	SCS/CSS pump suction cross connect	GT	EL	2	B		Closed	S MT LPV	3 mo 3 mo 2 yr
SI-343	SCS/CSS pump discharge cross connect	GT	EL	2	B		Closed	S MT LPV	3 mo 3 mo 2 yr
SI-344	SC pump suction isolation	GT	EL	2	B		Closed	S MT LPV	3 mo 3 mo 2 yr
SI-346	SC pump suction isolation	GT	EL	2	B		Closed	S MT LPV	3 mo 3 mo 2 yr
SI-347	CS pump suction isolation	GT	EL	2	B		Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-391	Reactor cavity isolation	GT	EL	2	B		Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-393	Reactor cavity isolation	GT	EL	2	B		Open /Closed	S MT LPV	3 mo 3 mo 2 yr

Table 3.9-13 (14 of 85)

Valve No.	Valve Description	Valve Type [a]	Valve Act [b]	Safety Class [c]	Code Cat [d]	Valve Funct [e]	Safety Position	Test Reqd [f]	Test Freq [g]
SI-395	IRWST return line isolation	GT	EL	2	B		Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-348	CS pump suction isolation	GT	EL	2	B		Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-404	SI pump discharge check	CK	SA	2	C		Open /Closed	S RF	RO (16) 3 mo (16A)
SI-405	SI pump discharge check	CK	SA	2	C		Open /Closed	S RF	RO (16) 3 mo (16A)
SI-409	SI line relief	RV	SA	2	C		-	RVT	10 yr
SI-417	SI line relief	RV	SA	2	C		-	RVT	10 yr
SI-422	SDCHX header relief	RV	SA	2	C		-	RVT	10 yr
SI-423	SDCHX header relief	RV	SA	2	C		-	RVT	10 yr
SI-424	SI miniflow check	CK	SA	2	C		Open /Closed	S RF	3 mo 3 mo (22)
SI-426	SI miniflow check	CK	SA	2	C		Open /Closed	S RF	3 mo 3 mo (22)
SI-434	SI pump discharge check	CK	SA	2	C		Open /Closed	S RF	RO (16) 3 mo (16A)
SI-439	SI line relief	RV	SA	2	C		-	RVT	10 yr
SI-446	SI pump discharge check	CK	SA	2	C		Open /Closed	S RF	RO (16) 3 mo (16A)
SI-448	SI miniflow check	CK	SA	2	C		Open /Closed	S RF	3 mo 3 mo (22)
SI-449	SI line relief	RV	SA	2	C		-	RVT	10 yr
SI-450	Reactor cavity line relief	RV	SA	2	C		-	RVT	10 yr

Table 3.9-13 (15 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
SI-451	SI miniflow check	CK	SA	2	C		Open /Closed	S RF	3 mo 3 mo [(22)]
SI-461	SC line relief	RV	SA	2	C		-	RVT	10 yr
SI-462	SC line relief	RV	SA	2	C		-	RVT	10 yr
SI-466	SC line relief	RV	SA	2	C		-	RVT	10 yr
SI-467	SC line relief	RV	SA	2	C		-	RVT	10 yr
SI-468	SI hot leg injection line relief	RV	SA	2	C		-	RVT	10 yr
SI-469	SCS line relief to RDT	RV	SA	1	C		-	RVT	5 yr
SI-473	check valve leakage line relief	RV	SA	2	C		-	RVT	10 yr
SI-474	SIT fill line relief	RV	SA	2	A/C	CIC	-	RVT LT	10 yr 2 yr
SI-522	SI hot leg injection line check	CK	SA	1	A/C	PIV	Open /Closed	S LT RF	RO [(16)] 2 yr (38)
SI-523	SI hot leg injection line check	CK	SA	1	A/C	CIN, PIV	Open /Closed	S LT RF	RO [(16)] 2 yr (38)
SI-532	SI hot leg injection line check	CK	SA	1	A/C	PIV	Open /Closed	S LT RF	RO [(16)] 2 yr (38)
SI-533	SI hot leg injection line check	CK	SA	1	A/C	CIN, PIV	Open /Closed	S LT RF	RO [(16)] 2 yr (38)

Table 3.9-13 (16 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
SI-540	SI line check	CK	SA	1	A/C	PIV	Open /Closed	S LT RF	RO [(16)] 2 yr (38)
SI-541	SI line check	CK	SA	1	A/C	PIV	Open /Closed	S LT RF	CS [(17)] 2 yr (38)
SI-542	SI line check	CK	SA	1	A/C	PIV	Open /Closed	S LT RF	RO [(16)] 2 yr (38)
SI-543	SI line check	CK	SA	1	A/C	PIV	Open /Closed	S LT RF	CS [(17)] 2 yr (38)
SI-568	SC pump discharge check	CK	SA	2	C		Open /Closed	S RF	3 mo 3 mo [(15)]
SI-569	SC pump discharge check	CK	SA	2	C		Open /Closed	S RF	3 mo 3 mo [(15)]
SI-600	SCS line isolation	GL	EL	2	B	CIN	Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-601	SCS line isolation	GL	EL	2	B	CIN	Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-602	SI low flow control	GL	EL	2	B	CIN	Open /Closed	S. MT LPV	3 mo 3 mo 2 yr

Table 3.9-13 (17 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
SI-603	SI low flow control	GL	EL	2	B	CIN	Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-604	SI hot leg injection isolation	GT	EL	2	B		Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-605	SIT atmospheric vent isolation	GL	S	2	B		Open /Closed	S MT FS LPV	CS (31) CS (31) CS (31) 2 yr
SI-606	SIT atmospheric vent isolation	GL	S	2	B		Open /Closed	S MT FS LPV	CS (31) CS (31) CS (31) 2 yr
SI-607	SIT atmospheric vent isolation	GL	S	2	B		Open /Closed	S MT FS LPV	CS (31) CS (31) CS (31) 2 yr
SI-608	SIT atmospheric vent isolation	GL	S	2	B		Open /Closed	S MT FS LPV	CS (31) CS (31) CS (31) 2 yr
SI-609	SI hot leg isolation	GT	EL	2	B		Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-611	SIT fill and drain isolation	GL	AD	2	B		Open /Closed	S MT FS LPV	3 mo 3 mo RO (36) 2 yr

Table 3.9-13 (18 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
SI-612	SIT nitrogen supply isolation	GL	AD	2	B	P	Closed	S FS LPV	EI (35) RO (35) 2 yr
SI-613	SIT atmospheric vent isolation	GL	S	2	B		Open /Closed	S MT FS LPV	CS (31) CS (31) CS (31) 2 yr
SI-614	SIT discharge isolation	GT	EL	1	B		Open /Closed	S MT LPV	CS (24) CS (24) 2 yr
SI-616	SI line isolation	GL	EL	2	B	CIN	Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-618	Check valve leakage isolation	GL	AD	1	A	PIV	Closed	S MT FS LPV. LT	3 mo 3 mo RO (36) 2 yr 2 yr
SI-619	SIT nitrogen supply isolation	GL	AD	2	B	P	Closed	S FS LPV	EI (35) RO (35) 2 yr
SI-621	SIT fill and drain isolation	GL	AD	2	B		Closed	S MT FS LPV	3 mo 3 mo RO (36) 2 yr
SI-622	SIT nitrogen supply isolation	GL	AD	2	B	P	Closed	S FS LPV	EI (35) RO (35) 2 yr

Table 3.9-13 (19 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
SI-623	SIT atmospheric vent isolation	GL	S	2	B		Open /Closed	S MT FS LPV	CS (31) CS (31) CS (31) 2 yr
SI-624	SIT discharge isolation	GT	EL	1	B		Open /Closed	S MT LPV	CS (24) CS (24) 2 yr
SI-626	SI line isolation	GL	EL	2	B	CIN	Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-628	Check valve leakage isolation	GL	AD	1	A	PIV	Closed	S MT FS LPV LT	3 mo 3 mo RO (36) 2 yr 2 yr
SI-629	SIT nitrogen supply isolation	GL	AD	2	B	P	Closed	S FS LPV	EI (35) RO (35) 2 yr
SI-631	SIT fill and drain isolation	GL	AD	2	B		Closed	S MT FS LPV	3 mo 3 mo RO(36) 2 yr
SI-632	SIT nitrogen supply isolation	GL	AD	2	B	P	Closed	S FS LPV	EI (35) RO (35) 2 yr
SI-633	SIT atmospheric vent isolation	GL	S	2	B		Open /Closed	S MT FS LPV	CS (31) CS (31) CS (31) 2 yr

Table 3.9-13 (20 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
SI-634	SIT discharge isolation	GT	EL	1	B		Open /Closed	S MT LPV	CS [(24)] CS [(24)] 2 yr
SI-636	SI line isolation	GL	EL	2	B	CIN	Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-638	Check valve leakage isolation	GL	AD	1	A	PIV	Closed	S MT FS LPV LT	3 mo 3 mo RO [(36)] 2 yr 2 yr
SI-639	SIT nitrogen supply isolation	GL	AD	2	B	P	Closed	S FS LPV	EI [(35)] RO [(35)] 2 yr
SI-641	SIT fill and drain isolation	GL	AD	2	B		Closed	S MT FS LPV	3 mo 3 mo RO [(36)] 2 yr
SI-642	SIT nitrogen supply isolation	GL	AD	2	B	P	Closed	S FS LPV	EI [(35)] RO [(35)] 2 yr
SI-643	SIT atmospheric vent isolation	GL	S	2	B		Open /Closed	S MT FS LPV	CS [(31)] CS [(31)] CS [(31)] 2 yr
SI-644	SIT discharge isolation	GL	EL	1	B		Open /Closed	S MT LPV	CS [(24)] CS [(24)] 2 yr

Table 3.9-13 (21 of 85)

Valve No.	Valve Description	Valve Type [a]	Valve Act [b]	Safety Class [c]	Code Cat [d]	Valve Funct [e]	Safety Position	Test Reqd [f]	Test Freq [g]
SI-646	SI line isolation	GL	EL	2	B	CIN	Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-648	Check valve leakage isolation	GL	AD	1	A	PIV	Closed	S MT FS LPV LT	3 mo 3 mo RO (36) 2 yr 2 yr
SI-649	SIT nitrogen supply isolation	GL	AD	2	B	P	Closed	S FS LPV	EI (35) RO (35) 2 yr
SI-651	SCS suction line isolation	GT	EL	1	A	PIV	Open /Closed	S MT LPV LT	CS (25) CS (25) 2 yr 2 yr
SI-652	SCS suction line isolation	GT	EL	1	A	PIV	Open /Closed	S MT LPV LT	CS (25) CS (25) 2 yr 2 yr
SI-653	SCS suction line isolation	GT	EL	1	A	PIV, CIN	Open /Closed	S MT LPV LT	CS (25) CS (25) 2 yr 2 yr
SI-654	SCS suction line isolation	GT	EL	1	A	PIV, CIN	Open /Closed	S MT LPV LT	CS (25) CS (25) 2 yr 2 yr

Table 3.9-13 (22 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
SI-655	SCS suction line isolation	GT	EL	2	B	CIN	Open /Closed	S MT LPV	CS [(25)] CS [(25)] 2 yr
SI-656	SCS suction line isolation	GT	EL	2	B	CIN	Open /Closed	S MT LPV	CS [(25)] CS [(25)] 2 yr
SI-661	RDT isolation	GL	AD	2	B	P	Open /Closed	S FS LPV	3 mo RO [(36)] 2 yr
SI-670	SIT drain line isolation	GL	AD	2	B	P	Open /Closed	S FS LPV	3 mo RO [(36)] 2 yr
SI-682	SIT fill line isolation	GL	AD	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
SI-688	SCS test return line isolation	GT	EL	2	B		Closed	S MT LPV	3 mo 3 mo 2 yr
SI-690	SCS warmup line flow control	GL	EL	2	B		Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-691	SCS warmup line flow control	GL	EL	2	B		Open /Closed	S MT LPV	3 mo 3 mo 2 yr
SI-693	SCS test return line isolation	GT	EL	2	B		Closed	S MT LPV	3 mo 3 mo 2 yr

Table 3.9-13 (23 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
SI-801	External emergency injection line cheek	CK	SA	2	C		Open /Closed	S RF	3 mo 3 mo
SI-803	External emergency injection line isolation	GT	M	2	B		Open /Closed	S LPV	3 mo 2 yr
CS-0001	Containment spray containment isolation	GT	EL	2	B		Open	S MT LPV	3 mo 3 mo 2 yr
CS-0002	Containment spray containment isolation	GT	EL	2	B		Open	S MT LPV	3 mo 3 mo 2 yr
CS-0003	Containment spray containment isolation	GT	EL	2	A	CIC	Open	LT S MT LPV	2 yr 3 mo 3 mo 2 yr
CS-0004	Containment spray containment isolation	GT	EL	2	A	CIC	Open	LT S MT LPV	2 yr 3 mo 3 mo 2 yr
CS-0005	Containment spray IRWST return isolation	GL	EL	2	B		Closed	S MT LPV	3 mo 3 mo 2 yr
CS-0006	Containment spray IRWST return isolation	GL	EL	2	B		Closed	S MT LPV	3 mo 3 mo 2 yr
CS-0007	Containment spray IRWST return isolation	GT	EL	2	B		Closed	S MT LPV	3 mo 3 mo 2 yr

Table 3.9-13 (24 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
CS-0008	Containment spray IRWST return isolation	GT	EL	2	B		Closed	S MT LPV	3 mo 3 mo 2 yr
CS-1001	CS pump 1A check	CK	SA	2	C		Open/Closed	S RF	3 mo 3 mo
CS-1002	CS pump 1B check	CK	SA	2	C		Open/Closed	S RF	3 mo 3 mo
CS-1005	CSHX 1A relief	RV	SA	2	C		Open/Closed	RVT	10yr
CS-1006	CSHX 1B relief	RV	SA	2	C		Open/Closed	RVT	10yr
CS-1007	Containment isolation check	CK	SA	2	A/C	CIC	Open/Closed	S LT RF	RO (18) 2 yr RO (18)
CS-1008	Containment isolation check	CK	SA	2	A/C	CIC	Open/Closed	S LT RF	RO (18) 2 yr RO (18)
CS-1013	ECSBS containment isolation	GT	M	2	A	P, CIC	Open	LT	2 yr
CS-1014	ECSBS containment isolation check	CK	SA	2	A/C	CIC	Open/Closed	S LT RF	RO (18) 2 yr RO (18)
IW-0001	HVT Flooding	GT	EL	2	B		Closed	MT S LPV	RO (34) RO (34) 2 yr
IW-0002	HVT Flooding	GT	EL	2	B		Closed	MT S LPV	RO (34) RO (34) 2 yr

Table 3.9-13 (25 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
IW-0003	Reactor cavity flooding	GT	EL	2	B		Closed	MT S LPV	RO (34) RO (34) 2 yr
IW-0004	Reactor cavity flooding	GT	EL	2	B		Closed	MT S LPV	RO (34) RO (34) 2 yr
IW-0010	IRWST level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0011	IRWST level instrument isolation	GL	S	2	B	CIN	Open	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
IW-0012	HVT level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0013	HVT level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0014	HVT level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr

Table 3.9-13 (26 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
IW-0015	HVT level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0016	HVT level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0017	HVT level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0018	Reactor cavity level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0019	Reactor cavity level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0020	Reactor cavity level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr

Table 3.9-13 (27 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
IW-0021	Reactor cavity level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0022	IRWST level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0023	IRWST level instrument isolation	GL	S	2	B	CIN	Open	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
IW-0024	IRWST level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0025	IRWST level instrument isolation	GL	S	2	B	CIN	Open	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
IW-0026	IRWST level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr

Table 3.9-13 (28 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
IW-0027	IRWST level instrument isolation	GL	S	2	B	CIN	Open	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
IW-0028	HVT level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0029	HVT level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0030	HVT level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0031	HVT level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0032	Reactor cavity level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr

Table 3.9-13 (29 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
IW-0033	Reactor cavity level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0034	Reactor cavity level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0035	Reactor cavity level instrument isolation	GL	S	2	A	CIC	Open	LT S MT FS LPV	2 yr 3 mo 3 mo 3 mo 2 yr
IW-0005	BAMP suction isolation	GT	EL	2	B	CIN	Closed	MT S LPV	3 mo 3 mo 2 yr
IW-0006	BAMP suction isolation	GT	EL	2	B	CIN	Closed	MT S LPV	3 mo 3 mo 2 yr
IW-1003	BAMP suction line relief	RV	SA	2	C	PIV CIN	Open/Closed	RVT	10 yr
CV-186	Reactor makeup water line isolation	PK	M	3	A		Closed	LT LPV	2 yr 2 yr
CV-189	IRWST makeup line check	CK	SA	2	A/C	CIC	Closed	S LT RF	3 mo 2 yr 3 mo

Table 3.9-13 (30 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
CV-255	Seal injection containment isolation	GL	EL	2	A	CIC	Closed	S MT LPV LT	CS (6) CS (6) 2 yr 2 yr
CV-363	Shutdown purification line check	CK	SA	2	A/C	CIC	Closed	LT RF	2 yr CS (23)
CV-362	Shutdown purification line isolation	GT	M	2	A	P, CIC	Closed	LT LPV	2 yr 2 yr
CV-494	Resin sluice supply header to reactor drain header check	CK	SA	2	A/C	CIC	Closed	S LT RF	3 mo 2 yr 3 mo
CV-505	RCP CBO containment isolation	GL	AD	2	A	CIC	Closed	S MT FS LPV LT	CS (7) CS (7) CS (7) 2 yr 2 yr
CV-506	RCP CBO containment isolation	GL	AD	2	A	CIC	Closed	S MT FS LPV LT	CS (7) CS (7) CS (7) 2 yr 2 yr
CV-509	IRWST makeup line containment isolation	GT	EL	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr
CV-515	Letdown isolation	GL	AD	1	A	TIV	Closed	S MT FS LPV LT	CS (8) CS (8) CS (8) 2 yr 2 yr

Table 3.9-13 (31 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
CV-516	Letdown isolation	GL	AD	1	A		Closed	S MT FS LPV LT	CS (8) CS (8) CS (8) 2 yr 2 yr
CV-522	Letdown containment isolation	GL	AD	2	A	CIC	Closed	S MT FS LPV LT	CS (8) CS (8) CS (8) 2 yr 2 yr
CV-523	Letdown containment isolation	GL	AD	2	A	CIC	Closed	S MT FS LPV LT	CS (8) CS (8) CS (8) 2 yr 2 yr
CV-524	Charging containment isolation	GL	EL	2	A	CIC	Closed	S MT LPV LT	RO (9) RO (9) 2 yr 2 yr
CV-560	Reactor drain tank effluent containment isolation	GL	AD	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
CV-561	Reactor drain tank effluent containment isolation	GL	AD	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr

Table 3.9-13 (32 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
CV-576	Charging flow restricting	GL	EL	2	A		Closed	LT LPV S MT	2 yr [(41)] 2yr RO [(41)] RO [(41)]
CV-577	Charging flow restricting	GL	EL	2	A		Closed	LT LPV MT S	2 yr [(41)] 2 yr RO [(41)] RO [(41)]
CV-580	Resin sluice supply header to reactor drain header isolation	GT	AD	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
CV-747	Charging line check	CK	SA	2	A/C	CIC	Closed	LT RF	2 yr RO [(10)]
CV-835	Seal injection containment isolation	CK	SA	2	A/C	CIC	Closed	LT RF	2 yr CS [(11)]
SD-0005	SG 1 blowdown to flash tank	GT	AD	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
SD-0007	SG 1 blowdown to flash tank	GT	EL	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr

Table 3.9-13 (33 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
SD-0006	SG 2 blowdown to flash tank	GT	AD	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
SD-0008	SG 2 blowdown to flash tank	GT	EL	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr
SD-1115	SG 1 wet layup recirculation isolation	CK	SA	2	A/C	CIC	Closed	S RF LT	CS (27) CS (27) 2 yr
SD-1116	SG 2 wet layup recirculation isolation	CK	SA	2	A/C	CIC	Closed	S RF LT	CS (27) CS (27) 2 yr
SD-1113	SG 1 wet layup recirculation isolation	GT	M	2	A	P, CIC	Closed	LT	2 yr
SD-1114	SG 2 wet layup recirculation isolation	GT	M	2	A	P, CIC	Closed	LT	2 yr
CC-0131	Essential chiller condenser 2A isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0132	Essential chiller condenser 2B isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0181	EDG 1A inlet isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0182	EDG 1B inlet isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr

Table 3.9-13 (34 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
CC-0191	EDG 2A inlet isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0192	EDG 2B inlet isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0383	Essential chiller condenser 1A isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0384	Essential chiller condenser 1B isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0901	Essential chiller condenser 1A outlet throttling	3W	AD	3	B		Open	S FS MT LPV	3 mo 3 mo 3 mo 2 yr
CC-0902	Essential chiller condenser 1B outlet throttling	3W	AD	3	B		Open	S FS MT LPV	3 mo 3 mo 3 mo 2 yr
CC-0905	Essential chiller condenser 2A outlet throttling	3W	AD	3	B		Open	S FS MT LPV	3 mo 3 mo 3 mo 2 yr
CC-0906	Essential chiller condenser 2B outlet throttling	3W	AD	3	B		Open	S FS MT LPV	3 mo 3 mo 3 mo 2 yr
CC-0937	Cross connection isolation	BF	EL	3	B		Closed	S MT LPV	3 mo 3 mo 2 yr

Table 3.9-13 (35 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
CC-0938	Cross connection isolation	BF	EL	3	B		Closed	S MT LPV	3 mo 3 mo 2 yr
CC-0939	Cross connection isolation	BF	EL	3	B		Closed	S MT LPV	3 mo 3 mo 2 yr
CC-0940	Cross connection isolation	BF	EL	3	B		Closed	S MT LPV	3 mo 3 mo 2 yr
CC-1109	CCW surge tank 1A N2 supply check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-1110	CCW surge tank 1B N2 supply check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-1111	CCW surge tank 1A relief	RV	SA	3	C		Open/Closed	RVT	10 yr
CC-1112	CCW surge tank 1B relief	RV	SA	3	C		Open/Closed	RVT	10 yr
CC-1131	CCW pump 01A recirculation check	CK	SA	3	C		Open/Closed	S RF	3 mo. 3 mo.
CC-1132	CCW pump 01B recirculation check	CK	SA	3	C		Open/Closed	S RF	3 mo. 3 mo.
CC-1133	CCW pump 02A recirculation check	CK	SA	3	C		Open/Closed	S RF	3 mo. 3 mo.
CC-1134	CCW pump 02B recirculation check	CK	SA	3	C		Open/Closed	S RF	3 mo. 3 mo.

Table 3.9-13 (36 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
CC-1303	CCW makeup pump 3A discharge check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-1304	CCW makeup pump 3B discharge check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-1309	CCW surge tank 1A makeup check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-1310	CCW surge tank 1B makeup check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-1317	CCW surge tank 1A demi. makeup check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-1318	CCW surge tank 1B demi. makeup check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-1319	CCW surge tank 1A demi. makeup check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-1320	CCW surge tank 1B demi. makeup check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-1325	CCW makeup to AFW storage tank A check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-1326	CCW makeup to AFW storage tank B check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-0027	CCW HXs bypass A isolation	BF	EL	3	B		Closed	S MT LPV	3 mo 3 mo 2 yr
CC-0028	CCW HXS bypass B isolation	BF	EL	3	B		Closed	S MT LPV	3 mo 3 mo 2 yr

Table 3.9-13 (37 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
CC-0143	Non-essential supply header 1A isolation	BF	EL	3	B		Closed	S MT LPV	CS (3) CS (3) 2 yr
CC-0147	Non-essential return header 1B isolation	BF	EL	3	B		Closed	S MT LPV	CS (3) CS (3) 2 yr
CC-0021	CCW HX 01A outlet throttling	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0023	CCW HX 02A outlet throttling	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0025	CCW HX 03A outlet throttling	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0351	SCS HX 1 inlet isolation	BF	EL	3	B		Closed	S MT LPV	3 mo 3 mo 2 yr
CC-0389	SFP HX A inlet isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0097	CS HX 1 inlet isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0145	Non-essential supply header 1 isolation	BF	EL	3	B		Closed	S MT LPV	CS (3) CS (3) 2 yr
CC-0149	Non-essential return header 1 isolation	BF	EL	3	B		Closed	S MT LPV	CS (3) CS (3) 2 yr

Table 3.9-13 (38 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
CC-0231	CCW supply to RCP 1A, 1B, 2A, 2B isolation	BF	EL	2	A	CIC	Open/Closed	S MT LPV LT	CS (1) CS (1) 2 yr 2 yr
CC-1001	CCW pump 1A discharge check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-1003	CCW pump 2A discharge check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-1099	CCW supply to RCP 1A, 1B, 2A, 2B check	CK	SA	2	A/C	CIC	Open/Closed	S RF LT	CS (2) RO (2) 2 yr
CC-0011	CCW surge tank 01A makeup supply header isolation	GL	EL	3	B		Open/Closed	S MT LPV	3 mo 3 mo 2 yr
CC-0249	CCW return from RCP 1A, 1B, 2A, 2B isolation	BF	EL	2	A	CIC	Open/Closed	S MT LPV LT	CS (1) CS (1) 2 yr 2 yr
CC-0250	CCW return from RCP 1A, 1B, 2A, 2B isolation	BF	EL	2	A	CIC	Open/Closed	S MT LPV LT	CS (1) CS (1) 2 yr 2 yr
CC-1100	CCW return from RCP 1A, 1B, 2A, 2B isolation	CK	SA	2	A/C	CIC	Open/Closed	S LT RF	RO (2) 2 yr CS (2)
CC-1107	CCW surge tank 01A vacuum relief	RV	SA	3	C		Open/Closed	RVT	2 yr
CC-0144	Non-essential supply header 2 isolation	BF	EL	3	B		Closed	S MT LPV	CS (3) CS (3) 2 yr

Table 3.9-13 (39 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
CC-0148	Non-essential return header 2 isolation	BF	EL	3	B		Closed	S MT LPV	CS (3) CS (3) 2 yr
CC-0022	CCW HX 01B outlet throttling	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0024	CCW HX 02B outlet throttling	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0026	CCW HX 03B outlet throttling	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0352	SCS HX 2 inlet isolation	BF	EL	3	B		Closed	S MT LPV	3 mo 3 mo 2 yr
CC-0390	SFP HX B inlet isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0098	CS HX 1 inlet isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
CC-0146	Non-essential supply header 2 isolation	BF	EL	3	B		Closed	S MT LPV	CS (3) CS (3) 2 yr
CC-0150	Non-essential return header 2 isolation	BF	EL	3	B		Closed	S MT LPV	CS (3) CS (3) 2 yr
CC-1002	CCW pump 1B discharge check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo

Table 3.9-13 (40 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
CC-1004	CCW pump 2B discharge check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
CC-0012	CCW surge tank 01B makeup supply header isolation	GL	EL	3	B		Open/Closed	S MT LPV	3 mo 3 mo 2 yr
CC-0296	CCW supply to letdown HX isolation	BF	EL	2	A	CIC	Closed	S MT LPV LT	CS (4) CS (4) 2 yr 2 yr
CC-0297	CCW supply to letdown HX isolation	BF	EL	2	A	CIC	Closed	S MT LPV LT	CS (4) CS (4) 2 yr 2 yr
CC-0301	CCW return from letdown HX isolation	BF	EL	2	A	CIC	Closed	S MT LPV LT	CS (4) CS (4) 2 yr 2 yr
CC-0302	CCW return from letdown HX isolation	BF	EL	2	A	CIC	Closed	S MT LPV LT	CS (4) CS (4) 2 yr 2 yr
CC-1685	CCW supply to letdown HX isolation	CK	SA	2	A/C	CIC	Open/Closed	S LT RF	CS (5) 2 yr RO (5)
CC-1686	CCW return from letdown HX isolation	CK	SA	2	A/C	CIC	Open/Closed	S LT RF	RO (5) 2 yr CS (5)
CC-1108	CCW surge tank 01B vacuum relief	RV	SA	3	C		Open/Closed	RVT	2 yr
SX-0043	ESW blowdown isolation	GT	S	3	B		Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr

Table 3.9-13 (41 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
SX-0044	ESW blowdown isolation	GT	S	3	B		Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
SX-0045	ESW pump 1A discharge isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
SX-0046	ESW pump 1B discharge isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
SX-0047	ESW pump 2A discharge isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
SX-0048	ESW pump 2B discharge isolation	BF	EL	3	B		Open	S MT LPV	3 mo 3 mo 2 yr
SX-1001	ESW pump 1A discharge	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
SX-1003	ESW pump 2A discharge	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
SX-1002	ESW pump 1B discharge	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
SX-1004	ESW pump 2B discharge	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
SX-1051	CCW HX Outlet Common Header Vacuum Relief	RV	SA	3	C		Open/Closed	RVT	2 yr
SX-1052	CCW HX Outlet Common Header Vacuum Relief	RV	SA	3	C		Open/Closed	RVT	2 yr
FC-1005	FC pump A discharge check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo
FC-1006	FC pump B discharge check	CK	SA	3	C		Open/Closed	S RF	3 mo 3 mo

Table 3.9-13 (42 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
FC-1142	Refueling pool cleanup suction isolation	GT	M	2	A	P, CIC	Closed	LT	2 yr
FC-1143	Refueling pool cleanup suction isolation	GT	M	2	A	P, CIC	Closed	LT	2 yr
FC-1144	Refueling pool cleanup discharge isolation	GT	M	2	A	P,CIC	Closed	LT	2 yr
FC-1145	Refueling pool cleanup discharge check valve	CK	SA	2	A/C	CIC	Open/Closed	S LT RF	RO [(47)] 2 yr RO [(47)]
GW-0001	Reactor drain tank gas space to GWMS	GL	EL	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr
GW-0002	Reactor drain tank gas space to GWMS	GL	S	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
DE-0005	Containment building isolation	GL	EL	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr
DE-0006	Containment building isolation	GL	AD	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
PX-0001	Hot leg sample	GL	S	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr

Table 3.9-13 (43 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
PX-0002	Hot leg sample	GL	S	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
PX-0003	PZR liquid sample	GL	S	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
PX-0004	PZR liquid sample	GL	S	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
PX-0005	PZR steam space sample	GL	S	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
PX-0006	PZR steam space sample	GL	S	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
PX-0020	SI tank sample containment isolation	GL	S	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr

Table 3.9-13 (44 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
PX-0021	SI tank sample containment isolation	GL	S	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
PX-0041	Containment air sample containment isolation	GT	EL	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr
PX-0042	Containment air sample containment isolation	GT	EL	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr
PX-0043	Containment air sample return containment isolation	GT	EL	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr
PX-0053	PASS sample return	GL	S	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
PX-1005	Containment isolation	CK	SA	2	A/C	CIC	Open/Closed	S RF LT	RO [(42)] RO [(42)] 2 yr
PX-1020	Containment air sample return containment isolation	CK	SA	2	A/C	CIC	Open/Closed	S RF LT	RO [(43)] RO [(43)] 2 yr

Table 3.9-13 (45 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
AF-0035	Motor-driven AFW pump PP02A flow modulating	GL	S	3	B		Control	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
AF-0036	Motor driven AFW pump PP02B flow modulating	GL	S	3	B		Control	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
AF-0037	Turbine driven AFW pump PP01A flow modulating	GL	S	3	B		Control	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
AF-0038	Motor-driven AFW pump PP01B flow modulating	GL	S	3	B		Control	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
AF-0043	Motor-driven AFW pump PP02A AFW isolation	GT	EL	2	B	TIV, CIN	Open/Closed	S MT LPV	3 mo 3 mo 2 yr
AF-0044	Motor driven AFW pump PP02B AFW isolation	GT	EL	2	B	TIV, CIN	Open/Closed	S MT LPV	3 mo 3 mo 2 yr
AF-0045	Turbine-driven AFW pump PP01A AFW isolation	GT	EL	2	B	TIV, CIN	Open/Closed	S MT LPV	3 mo 3 mo 2 yr
AF-0046	Turbine-driven AFW pump PP01B AFW isolation	GT	EL	2	B	TIV, CIN	Open/Closed	S MT LPV	3 mo 3 mo 2 yr

Table 3.9-13 (46 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
AF-1003A	Motor-driven AF pump PP02A discharge	CK	SA	3	C		Open	S RF	CS (44) 3 mo
AF-1003B	Motor-driven AF pump PP02B discharge	CK	SA	3	C		Open	S RF	CS (44) 3 mo
AF-1004A	Turbine-driven AF pump PP01A discharge	CK	SA	3	C		Open	S RF	CS (44) 3 mo
AF-1004B	Turbine-driven AF pump PP01B discharge	CK	SA	3	C		Open	S RF	CS (44) 3 mo
AF-1007A	Motor-driven AFW pump PP02A AFW isolation	CK	SA	2	C		Open	S RF LT	CS (44) 3 mo (44) 2 yr (39)
AF-1007B	Motor-driven AFW pump PP02B AFW isolation	CK	SA	2	C		Open	S RF LT	CS (44) 3 mo (44) 2 yr (39)
AF-1008A	Turbine-driven AFW pump PP01A AFW isolation	CK	SA	2	C		Open	S RF LT	CS (44) 3 mo (44) 2 yr (39)
AF-1008B	Turbine-driven AFW pump PP01B AFW isolation	CK	SA	2	C		Open	S RF LT	CS (44) 3 mo (44) 2 yr (39)
AF-1012A	AFW mini flow check	CK	SA	3	C		Open	S RF	3 mo 3 mo
AF-1012B	AFW mini flow check	CK	SA	3	C		Open	S RF	3 mo 3 mo
AF-1014A	AFW mini flow check	CK	SA	3	C		Open	S RF	3 mo 3 mo
AF-1014B	AFW mini flow check	CK	SA	3	C		Open	S RF	3 mo 3 mo
AF-1022A	Chemical injection for AFW	CK	SA	3	C		Closed	S RF	CS 3 mo

Table 3.9-13 (47 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
AF-1022B	Chemical injection for AFW	CK	SA	3	C		Closed	S RF	CS 3 mo
AF-1024A	Chemical injection for AFW	CK	SA	3	C		Closed	S RF	CS 3 mo
AF-1024B	Chemical injection for AFW	CK	SA	3	C		Closed	S RF	CS 3 mo
AT-0007	AF pump turbine TA01A steam supply line drip leg control	GL	P	3	B		Open/Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
AT-0008	AF pump turbine TA01B steam supply line drip leg control	GL	P	3	B		Open/Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
AT-0009	AF pump turbine TA01A steam isolation	GL	P	3	B		Open	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
AT-0010	AF pump turbine TA01B steam isolation	GL	P	3	B		Open	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
CA-0013	Condenser vacuum exhaust gas Containment isolation	GT	EL	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr
CA-1023	Condenser vacuum exhaust gas Containment isolation	CK	SA	2	A/C	CIC	Closed	S LT RF	3 mo 2 yr 3 mo

Table 3.9-13 (48 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
DO-1005A	Fuel oil transfer pump discharge	CK	SA	3	C		Open	RF S	3 mo 3 mo
DO-1005B	Fuel oil transfer pump discharge	CK	SA	3	C		Open	RF S	3 mo 3 mo
DO-1005C	Fuel oil transfer pump discharge	CK	SA	3	C		Open	RF S	3 mo 3 mo
DO-1005D	Fuel oil transfer pump discharge	CK	SA	3	C		Open	RF S	3 mo 3 mo
DO-1007A	Fuel oil transfer pump discharge	CK	SA	3	C		Open	RF S	3 mo 3 mo
DO-1007B	Fuel oil transfer pump discharge	CK	SA	3	C		Open	RF S	3 mo 3 mo
DO-1007C	Fuel oil transfer pump discharge	CK	SA	3	C		Open	RF S	3 mo 3 mo
DO-1007D	Fuel oil transfer pump discharge	CK	SA	3	C		Open	RF S	3 mo 3 mo
DG-4022A	Backflow prevention for the starting air compressor	CK	SA	3	C		Closed	Note 37	Note 37
DG-4022B	Backflow prevention for the starting air compressor	CK	SA	3	C		Closed	Note 37	Note 37
DG-4022C	Backflow prevention for the starting air compressor	CK	SA	3	C		Closed	Note 37	Note 37
DG-4022D	Backflow prevention for the starting air compressor	CK	SA	3	C		Closed	Note 37	Note 37
DG-4030A	Backflow prevention for the starting air compressor	CK	SA	3	C		Closed	Note 37	Note 37
DG-4030B	Backflow prevention for the starting air compressor	CK	SA	3	C		Closed	Note 37	Note 37
DG-4030C	Backflow prevention for the starting air compressor	CK	SA	3	C		Closed	Note 37	Note 37
DG-4030D	Backflow prevention for the starting air compressor	CK	SA	3	C		Closed	Note 37	Note 37

Table 3.9-13 (49 of 85)

Valve No.	Valve Description	Valve Type [a]	Valve Act [b]	Safety Class [c]	Code Cat [d]	Valve Funct [e]	Safety Position	Test Reqd [f]	Test Freq [g]
DG-4034A	Air receiver 40A discharge	CK	SA	3	C		Open	Note 37	Note 37
DG-4034B	Air receiver 40B discharge	CK	SA	3	C		Open	Note 37	Note 37
DG-4034C	Air receiver 40C discharge	CK	SA	3	C		Open	Note 37	Note 37
DG-4034D	Air receiver 40D discharge	CK	SA	3	C		Open	Note 37	Note 37
DG-4312A	Air receiver 41A discharge	CK	SA	3	C		Open	Note 37	Note 37
DG-4312B	Air receiver 41B discharge	CK	SA	3	C		Open	Note 37	Note 37
DG-4312C	Air receiver 41C discharge	CK	SA	3	C		Open	Note 37	Note 37
DG-4312D	Air receiver 41D discharge	CK	SA	3	C		Open	Note 37	Note 37
DG-4316A	Overspeed Air Receiver 42A inlet	CK	SA	3	C		Open	Note 37	Note 37
DG-4316B	Overspeed Air Receiver 42B inlet	CK	SA	3	C		Open	Note 37	Note 37
DG-4316C	Overspeed Air Receiver 42C inlet	CK	SA	3	C		Open	Note 37	Note 37
DG-4316D	Overspeed Air Receiver 42D inlet	CK	SA	3	C		Open	Note 37	Note 37
DG-4114A	Lube oil/LT water heat exchanger temperature control 3-way valve	3W	SA	3	C		Control	Note 37	Note 37
DG-4114B	Lube oil/LT water heat exchanger temperature control 3-way valve	3W	SA	3	C		Control	Note 37	Note 37
DG-4114C	Lube oil/LT water heat exchanger temperature control 3-way valve	3W	SA	3	C		Control	Note 37	Note 37
DG-4114D	Lube oil/LT water heat exchanger temperature control 3-way valve	3W	SA	3	C		Control	Note 37	Note 37
DG-4217A	HT/CC water heat exchanger temperature control 3-way valve	3W	SA	3	C		Control	Note 37	Note 37
DG-4217B	HT/CC water heat exchanger temperature control 3-way valve	3W	SA	3	C		Control	Note 37	Note 37

Table 3.9-13 (50 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
DG-4217C	HT/CC water heat exchanger temperature control 3-way valve	3W	SA	3	C		Control	Note 37	Note 37
DG-4217D	HT/CC water heat exchanger temperature control 3-way valve	3W	SA	3	C		Control	Note 37	Note 37
DG-4250A	CC/LT water heat exchanger temperature control 3-way valve	3W	SA	3	C		Control	Note 37	Note 37
DG-4250B	CC/LT water heat exchanger temperature control 3-way valve	3W	SA	3	C		Control	Note 37	Note 37
DG-4250C	CC/LT water heat exchanger temperature control 3-way valve	3W	SA	3	C		Control	Note 37	Note 37
DG-4250D	CC/LT water heat exchanger temperature control 3-way valve	3W	SA	3	C		Control	Note 37	Note 37
DG-5023A	Start air receiver 40A relief valve	RV	SA	3	C		Open/Closed	RVT	10 yr
DG-5023B	Start air receiver 40B relief valve	RV	SA	3	C		Open/Closed	RVT	10 yr
DG-5023C	Start air receiver 40C relief valve	RV	SA	3	C		Open/Closed	RVT	10 yr
DG-5023D	Start air receiver 40D relief valve	RV	SA	3	C		Open/Closed	RVT	10 yr
DG-5031A	Start air receiver 41A relief valve	RV	SA	3	C		Open/Closed	RVT	10 yr
DG-5031B	Start air receiver 41B relief valve	RV	SA	3	C		Open/Closed	RVT	10 yr
DG-5031C	Start air receiver 41C relief valve	RV	SA	3	C		Open/Closed	RVT	10 yr
DG-5031D	Start air receiver 41D relief valve	RV	SA	3	C		Open/Closed	RVT	10 yr
FP-0030	Fire water supply	GL	S	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr
FP-1440	Fire water supply	CK	SA	2	A/C	CIC	Closed	LT RF S	2 yr RO (32) RO (32)
FW-0121	SG 1 main FW economizer isolation	GT	EH	2	B	CIN	Closed	S MT FS LPV	CS (13) CS (13) CS (13) 2 yr

Table 3.9-13 (51 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
FW-0122	SG 1 main FW economizer isolation	GT	EH	2	B	CIN	Closed	S MT FS LPV	CS (13) CS (13) CS (13) 2 yr
FW-0123	SG 2 main FW economizer isolation	GT	EH	2	B	CIN	Closed	S MT FS LPV	CS (13) CS (13) CS (13) 2 yr
FW-0124	SG 2 main FW economizer isolation	GT	EH	2	B	CIN	Closed	S MT FS LPV	CS (13) CS (13) CS (13) 2 yr
FW-0131	SG 1 Main FW downcomer isolation	GT	EH	2	B	CIN	Closed	S MT FS LPV	CS (13) CS (13) CS (13) 2 yr
FW-0132	SG 1 main FW downcomer isolation	GT	EH	2	B	CIN	Closed	S MT FS LPV	CS (13) CS (13) CS (13) 2 yr
FW-0133	SG 2 main FW downcomer isolation	GT	EH	2	B	CIN	Closed	S MT FS LPV	CS (13) CS (13) CS (13) 2 yr
FW-0134	SG 2 main FW downcomer isolation	GT	EH	2	B	CIN	Closed	S MT FS LPV	CS (13) CS (13) CS (13) 2 yr

Table 3.9-13 (52 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
FW-0138	Feedwater chemical injection valve	GL	P	2	B	CIN	Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
FW-0139	Feedwater chemical injection valve	GL	P	2	B	CIN	Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
FW-1035	SG 1 economizer FW line check valve	CK	SA	2	C		Closed	RF	CS (29)
FW-1036	SG 1 economizer FW line check valve	CK	SA	2	C		Closed	RF	CS (29)
FW-1037	SG 1 economizer FW line check valve	CK	SA	2	C		Closed	RF	CS (29)
FW-1039	SG 1 downcomer FW line check valve	CK	SA	2	C		Closed	RF	CS (29)
FW-1040	SG 1 downcomer FW line check valve	CK	SA	2	C		Closed	RF	CS (29)
FW-1042	SG 2 economizer FW line check valve	CK	SA	2	C		Closed	RF	CS (29)
FW-1043	SG 1 economizer FW line check valve	CK	SA	2	C		Closed	RF	CS (29)
FW-1044	SG 2 economizer FW line check valve	CK	SA	2	C		Closed	RF	CS (29)
FW-1046	SG 2 downcomer FW line check valve	CK	SA	2	C		Closed	RF	CS (29)
FW-1047	SG 2 downcomer FW line check valve	CK	SA	2	C		Closed	RF	CS (29)
FW-1050	SG 1 feedwater chemical injection	CK	SA	2	C		Closed	S RF	3 mo 3 mo

Table 3.9-13 (53 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
FW-1052	SG 1 feedwater chemical injection	CK	SA	2	C		Closed	S RF	3 mo 3 mo
IA-0020	Instrumentation air supply	GL	P	2	A	CIC	Closed	S MT LPV LT FS	3 mo 3 mo 2 yr 2 yr 3 mo
IA-1601	Instrumentation air supply	CK	SA	2	A/C	CIC	Closed	S LT RF	3 mo 2 yr 3 mo
MS-011	SG 1 main steam isolation	GT	EH	2	B	CIN	Closed	S MT FS LPV	CS (14) CS (14) CS (14) 2 yr
MS-012	SG 1 main steam isolation	GT	EH	2	B	CIN	Closed	S MT FS LPV	CS (14) CS (14) CS (14) 2 yr
MS-013	SG 2 main steam isolation	GT	EH	2	B	CIN	Closed	S MT FS LPV	CS (14) CS (14) CS (14) 2 yr
MS-014	SG 2 main steam isolation	GT	EH	2	B	CIN	Closed	S MT FS LPV	CS (14) CS (14) CS (14) 2 yr
MS-015	SG 1 main steam isolation valve bypass	GT	EH	2	B	CIN	Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr

Table 3.9-13 (54 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
MS-016	SG 1 main steam isolation valve bypass	GT	EH	2	B	CIN	Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
MS-017	SG 2 main steam isolation valve bypass	GT	EH	2	B	CIN	Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
MS-018	SG 2 main steam isolation valve bypass	GT	EH	2	B	CIN	Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
MS-090	SG1 main steam drip leg isolation valve	GL	AD	2	B	CIN	Closed	S MT FS LPV	CS (14) CS (14) CS (14) 2 yr
MS-091	SG1 main steam drip leg isolation valve	GL	AD	2	B	CIN	Closed	S MT FS LPV	CS (14) CS (14) CS (14) 2 yr
MS-092	SG2 main steam drip leg isolation valve	GL	AD	2	B	CIN	Closed	S MT FS LPV	CS (14) CS (14) CS (14) 2 yr
MS-093	SG2 main steam drip leg isolation valve	GL	AD	2	B	CIN	Closed	S MT FS LPV	CS (14) CS (14) CS (14) 2 yr

Table 3.9-13 (55 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
MS-101	SG 1 atmospheric dump valve	GL	EH	2	B	CIN	Closed	S MT FS LPV	2 yr 2 yr 2 yr 2 yr
MS-102	SG 1 atmospheric dump valve	GL	EH	2	B	CIN	Closed	S MT FS LPV	2 yr 2 yr 2 yr 2 yr
MS-103	SG 2 atmospheric dump valve	GL	EH	2	B	CIN	Closed	S MT FS LPV	2 yr 2 yr 2 yr 2 yr
MS-104	SG 2 atmospheric dump valve	GL	EH	2	B	CIN	Closed	S MT FS LPV	2 yr 2 yr 2 yr 2 yr
MS-105	SG 1 MS ADV isolation valve	GT	EL	2	B	CIN	Open	S MT LPV	3 mo 3 mo 2 yr
MS-106	SG 1 MS ADV isolation valve	GT	EL	2	B	CIN	Open	S MT LPV	3 mo 3 mo 2 yr
MS-107	SG 2 MS ADV isolation valve	GT	EL	2	B	CIN	Open	S MT LPV	3 mo 3 mo 2 yr
MS-108	SG 2 MS ADV isolation valve	GT	EL	2	B	CIN	Open	S MT LPV	3 mo 3 mo 2 yr

Table 3.9-13 (56 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
MS-109	AF Pump turbine TA01B steam supply	GL	AD	2	B	-	Open	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
MS-110	AF Pump turbine TA01A steam supply	GL	AD	2	B	-	Open	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
MS-111	AF Pump turbine TA01B warmup supply	GL	AD	2	B	-	Open	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
MS-112	AF Pump turbine TA01A warmup supply	GL	AD	2	B	-	Open	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
MS-1301	SG 1 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1302	SG 1 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1303	SG 1 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1304	SG 1 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1305	SG 1 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1306	SG 1 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1307	SG 1 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1308	SG 1 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1309	SG 1 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1310	SG 1 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1311	SG 2 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr

Table 3.9-13 (57 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
MS-1312	SG 2 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1313	SG 2 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1314	SG 2 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1315	SG 2 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1316	SG 2 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1317	SG 2 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1318	SG 2 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1319	SG 2 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
MS-1320	SG 2 main steam safety valve	RV	SA	2	C	CIN	Open/Closed	RVT	5 yr
NT-0004	Nitrogen supply	GL	AD	2	A	CIC	Closed	S MT LPV LT FS	3 mo 3 mo 2 yr 2 yr 3 mo
NT-1016	Nitrogen supply	CK	SA	2	A/C	CIC	Closed	S LT RF	3 mo 2 yr 3 mo
SA-0001	Service air supply	GL	P ~~AD~~	2	A	CIC	Closed	S MT LPV LT FS	3 mo 3 mo 2 yr 2 yr 3 mo
SA-1401	Service air supply	CK	SA	2	A/C	CIC	Closed	S LT RF	3 mo 2 yr 3 mo

Table 3.9-13 (58 of 85)

Valve No.	Valve Description	Valve Type [a]	Valve Act [b]	Safety Class [c]	Code Cat [d]	Valve Funct [e]	Safety Position	Test Reqd [f]	Test Freq [g]
VQ-0011	Containment High Volume Purge Supply	BF	EH	2	A	CIC	Closed	S MT FS LPV LT	CS (26) CS (26) CS (26) 2 yr 2 yr
VQ-0012	Containment High Volume Purge Supply	BF	EL	2	A	CIC	Closed	S MT FS LPV LT	CS (26) CS (26) CS (26) 2 yr 2 yr
VQ-0013	Containment High Volume Purge Exhaust	BF	EL	2	A	CIC	Closed	S MT FS LPV LT	CS (26) CS (26) CS (26) 2 yr 2 yr
VQ-0014	Containment High Volume Purge Exhaust	BF	EH	2	A	CIC	Closed	S MT FS LPV LT	CS (26) CS (26) CS (26) 2 yr 2 yr
VQ-0031	Containment Low Volume Purge Supply	BF	AD	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
VQ-0032	Containment low volume purge supply	BF	AD	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr

Table 3.9-13 (59 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
VQ-0033	Containment low volume purge exhaust	BF	AD	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
VQ-0034	Containment low volume purge exhaust	BF	AD	2	A	CIC	Closed	S MT FS LPV LT	3 mo 3 mo 3 mo 2 yr 2 yr
WM-1751	Demineralized water supply	GL	M	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr
WM-1752	Demineralized water supply	CK	SA	2	A/C	CIC	Closed	S LT RF	RO (33) 2 yr RO (33)
WO-906A	Essential chilled water flow control control room supply AHU HV01A	3W	AD	3	B		Open	S MT FS LPV	2 yr 2 yr 3 mo 2 yr
WO-906B	Essential chilled water flow control control room supply AHU HV01B	3W	AD	3	B		Open	S MT FS LPV	2 yr 2 yr 3 mo 2 yr
WO-906C	Essential chilled water flow control control room supply AHU HV01C	3W	AD	3	B		Open	S MT FS LPV	2 yr 2 yr 3 mo 2 yr

Table 3.9-13 (60 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
WO-906D	Essential chilled water flow control control room supply AHU HV01D	3W	AD	3	B		Open	S MT FS LPV	2 yr 2 yr 3 mo 2 yr
WO-917A	Essential chilled water flow control EDG room normal supply AHU HV11C	3W	AD	3	B		Open	S MT FS LPV	2 yr 2 yr 3 mo 2 yr
WO-917B	Essential chilled water flow control EDG room normal supply AHU HV11D	3W	AD	3	B		Open	S MT FS LPV	2 yr 2 yr 3 mo 2 yr
WO-918A	Essential chilled water flow control EDG room normal supply AHU HV11A	3W	AD	3	B		Open	S MT FS LPV	2 yr 2 yr 3 mo 2 yr
WO-918B	Essential chilled water flow control EDG room normal supply AHU HV11B	3W	AD	3	B		Open	S MT FS LPV	2 yr 2 yr 3 mo 2 yr
WO-1001A	Essential chilled water compression tank A relief	RV	SA	3	C		Open	RVT	10 yr
WO-1001B	Essential chilled water compression tank B relief	RV	SA	3	C		Open	RVT	10 yr
WO-1003A	Essential chilled water compression tank A MDS makeup line	CK	SA	3	C		Open	S RF	3 mo 3 mo
WO-1003B	Essential chilled water compression tank B makeup line	CK	SA	3	C		Open	S RF	3 mo 3 mo
WO-1010A	Essential chilled water pump PP01A discharge	CK	SA	3	C		Open	S RF	3 mo 3 mo

Table 3.9-13 (61 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
WO-1010B	Essential chilled water pump PP01B discharge	CK	SA	3	C		Open	S RF	3 mo 3 mo
WO-1011A	Essential chilled water makeup pump A discharge	CK	SA	3	C		Open	S RF	3 mo 3 mo
WO-1011B	Essential chilled water makeup pump B discharge	CK	SA	3	C		Open	S RF	3 mo 3 mo
WO-1014A	Essential chilled water pump PP02A discharge	CK	SA	3	C		Open	S RF	3 mo 3 mo
WO-1014B	Essential chilled water pump PP02B discharge	CK	SA	3	C		Open	S RF	3 mo 3 mo
WO-1022A	Essential chilled water makeup pump A discharge	CK	SA	3	C		Open	S RF	3 mo 3 mo
WO-1022B	Essential chilled water makeup pump B discharge	CK	SA	3	C		Open	S RF	3 mo 3 mo
WO-1031A	Essential chilled water compression tank A nitrogen supply	CK	SA	3	C		Open	S RF	3 mo 3 mo
WO-1031B	Essential chilled water compression tank B nitrogen supply	CK	SA	3	C		Open	S RF	3 mo 3 mo
WO-1032A	Essential chilled water compression tank A makeup line	CK	SA	3	C		Open	S RF	3 mo 3 mo
WO-1032B	Essential chilled water compression tank B makeup line	CK	SA	3	C		Open	S RF	3 mo 3 mo

Table 3.9-13 (62 of 85)

Valve No.	Valve Description	Valve Type [(a)]	Valve Act [(b)]	Safety Class [(c)]	Code Cat [(d)]	Valve Funct [(e)]	Safety Position	Test Reqd [(f)]	Test Freq [(g)]
WI-012	PCW containment return from containment ventilation units	GT	AD	2	A	CIC	Closed	S MT FS LPV LT	3 mo(28) 3 mo(28) 3 mo(28) 2 yr 2 yr
WI-013	PCW containment supply to containment ventilation units	GT	AD	2	A	CIC	Closed	S MT FS LPV LT	3 mo(28) 3 mo(28) 3 mo(28) 2 yr 2 yr
WI-014	PCW containment return from containment ventilation units	RV	SA	2	C	CIN	Closed	RVT	10yr
WI-015	PCW containment return from containment ventilation units	GT	EL	2	A	CIC	Closed	S MT FS LPV LT	3 mo(28) 3 mo(28) 3 mo(28) 2 yr 2 yr
WI-1043	PCW containment supply to containment ventilation units	CK	SA	2	A/C	CIC	Closed	S RF LT	3 mo 3 mo 2 yr
PR-0431	Containment radiation monitor sample inlet	GT	EL	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr
PR-0432	Containment radiation monitor sample inlet	GT	EL	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr

Table 3.9-13 (63 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
PR-0434	Containment radiation monitor sample outlet	GT	EL	2	A	CIC	Closed	S MT LPV LT	3 mo 3 mo 2 yr 2 yr
PR-1433	Containment radiation monitor sample outlet	CK	SA	2	A/C	CIC	Closed	S RF LT	RO RO 2 yr
CM-0001	Containment H2 sample Ch. A inlet isolation	GL	S	2	A	CIC	Closed	S FS LT MT LPV	3 mo 3 mo 2 yr 3 mo 2 yr
CM-0002	Containment H2 sample Ch. B inlet isolation	GL	S	2	A	CIC	Closed	S FS LT MT LPV	3 mo 3 mo 2 yr 3 mo 2 yr
CM-0003	Containment H2 analyzer Ch. A inlet isolation	GL	S	2	A	CIC	Closed	S FS LT MT LPV	3 mo 3 mo 2 yr 3 mo 2 yr
CM-0004	Containment H2 analyzer Ch. B inlet isolation	GL	S	2	A	CIC	Closed	S FS LT MT LPV	3 mo 3 mo 2 yr 3 mo 2 yr

Table 3.9-13 (64 of 85)

Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
CM-0009	Containment H2 analyzer Ch. A outlet isolation	GL	S	2	A	CIC	Closed	S FS LT MT LPV	3 mo 3 mo 2 yr 3 mo 2 yr
CM-0010	Containment H2 analyzer Ch. B outlet isolation	GL	S	2	A	CIC	Closed	S FS LT MT LPV	3 mo 3 mo 2 yr 3 mo 2 yr
CM-0011	Containment IRWST H2 sample Ch. A inlet isolation	GL	S	2	A	CIC	Closed	FS LT S MT LPV	3 mo 2 yr 3 mo 3 mo 2 yr
CM-0012	Containment IRWST H2 sample Ch. B inlet isolation	GL	S	2	A	CIC	Closed	FS LT S MT LPV	3 mo 2 yr 3 mo 3 mo 2 yr
CM-0013	Containment IRWST H2 sample Ch. A inlet isolation	GL	S	2	A	CIC	Closed	S FS LT MT LPV	3 mo 3 mo 2 yr 3 mo 2 yr

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Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
CM-0014	Containment IRWST H2 sample Ch. B inlet isolation	GL	S	2	A	CIC	Closed	S FS LT MT LPV	3 mo 3 mo 2 yr 3 mo 2 yr
CM-0017	Containment pressure monitor Ch. A isolation	GL	S	2	A	CIC	Open/Closed	S FS LT MT LPV	3 mo 3 mo 2 yr 3 mo 2 yr
CM-0018	Containment pressure monitor Ch. B isolation	GL	S	2	A	CIC	Open/Closed	FS LT S MT LPV	3 mo 2 yr 3 mo 3 mo 2 yr
CM-0019	Containment pressure monitor Ch. C isolation	GL	S	2	A	CIC	Open/Closed	FS LT S MT LPV	3 mo 2 yr 3 mo 3 mo 2 yr
CM-0020	Containment pressure monitor Ch. D isolation	GL	S	2	A	CIC	Open/Closed	FS LT S MT LPV	3 mo 2 yr 3 mo 3 mo 2 yr

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Valve No.	Valve Description	Valve Type (a)	Valve Act (b)	Safety Class (c)	Code Cat (d)	Valve Funct (e)	Safety Position	Test Reqd (f)	Test Freq (g)
CM-0023	Containment H2 sample Ch. A inlet isolation	GL	S	2	A	CIC	Closed	S FS LT MT LPV	3 mo 3 mo 2 yr 3 mo 2 yr
CM-0024	Containment H2 sample Ch. B inlet isolation	GL	S	2	A	CIC	Closed	S FS LT MT LPV	3 mo 3 mo 2 yr 3 mo 2 yr
CM-1013	Containment H2 sample Ch. A outlet isolation	CK	SA	2	A/C	CIC	Closed	S RF LT	RO RO 2 yr
CM-1014	Containment H2 sample Ch. B outlet isolation	CK	SA	2	A/C	CIC	Closed	S RF LT	RO RO 2 yr
PS-0031	SG 1 blowdown hot leg sample isolation	GT	AD	2	B	CIN	Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
PS-0032	SG 2 blowdown hot leg sample isolation	GT	AD	2	B	CIN	Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr

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Valve No.	Valve Description	Valve Type [a]	Valve Act [b]	Safety Class [c]	Code Cat [d]	Valve Funct [e]	Safety Position	Test Reqd [f]	Test Freq [g]
PS-0033	SG 1 downcomer sample isolation	GT	AD	2	B	CIN	Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
PS-0034	SG 2 downcomer sample isolation	GT	AD	2	B	CIN	Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
PS-0035	SG 1 blowdown cold leg sample isolation	GT	AD	2	B	CIN	Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
PS-0036	SG 2 blowdown cold leg sample isolation	GT	AD	2	B	CIN	Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
PS-0257	SG 1 blowdown hot leg sample isolation	GT	AD	2	B	CIN	Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr
PS-0258	SG 2 blowdown hot leg sample isolation	GT	AD	2	B	CIN	Closed	S MT FS LPV	3 mo 3 mo 3 mo 2 yr

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Notes:

(a) Valve Type:

GL	Globe	BF	Butterfly
GT	Gate	PK	Packless
CK	Check	PL	Plug
RV	Relief	POS	Pilot operated safety relief valve
3W	3Way	BL	Ball

(b) Valve Actuator:

EL	Electric motor	S	Solenoid
SA	Self actuating	EH	Electro-hydraulic
AD	Air diaphragm	P	Air operated with Piston
M	Manual		

(c) Safety Classification as defined in Subsection 3.2.3.

(d) Valve ASME Code Category A, B, C, or D as defined in ASME OM Code, ISTC-1300.

(e) Valve Function:

CIC - Containment isolation valve as listed in Table 6.2.4-1, which is Type-C leakage rate tested in accordance with ANSI/ANS 56.8

CIN - Containment isolation valve as listed in Table 6.2.4-1, which is not Type-C leakage rate tested in accordance with ANSI/ANS 56.8

PIV - Pressure isolation valve

TIV - Temperature isolation valve

P - Passive valves as defined by ASME OM Code, ISTA-2000 are denoted by a P in this column. All other valves are active valves.

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(f) Required valve tests per ASME OM Code, ISTC and Mandatory Appendix I; and additional required testing:

LT - Valve leakage rate test (per ASME OM Code, ISTC): Subsections ASME OM Code, ISTC for valves with function CIC in (e) above.
Subsection ASME OM Code, ISTC for valves with function PIV in (e) above.
Reactor coolant system PIVs are leakage rate tested in accordance with Technical Specifications Surveillance Requirement 3.4.13.1.
Subsection ASME OM Code, ISTC for Category A valves except the valves with function TIV.
Subsection ASME OM Code, ISTC for valves with function TIV.

LPV - Valve position verification (ASME OM Code, ISTC)

S - Valve stroke exercise in the forward flow direction:
Category A or B (ASME OM Code, ISTC)
Category C (ASME OM Code, ISTC)

RF - Reverse flow exercise for A/C and C valves (ASME OM Code, ISTC). “RF” testing is performed at the same testing frequency as the corresponding "S" test, unless otherwise described.

MT - Valve stroke time test of Category A or B power-operated valves (ASME OM Code, ISTC)

FS - Valves test for fail-safe actuation of Category A or B valves (ASME OM Code, ISTC)

RVT - Relief valve test (ASME OM Code, ISTC)

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(g) Pump or valve test exclusions, alternatives, and frequency per ASME OM Code, ISTB and ASME OM Code, ISTC. For valves whose test frequency exceeds the normal frequency, see the note (as indicated in parenthesis beside the test frequency) for additional information/justification.

CS - Cold Shutdown

The following condition applies for all testing performed during cold shutdown:

Cold shutdown testing in accordance with the requirements of ASME OM Code, ISTC. See the note for additional information/justification. Valve exercising during cold shutdown commences until all testing is complete or the plant is ready to return to power. A completion of all valve testing is not a prerequisite to return to power. Any testing not completed by the end of one cold shutdown is performed during subsequent cold shutdowns, starting from the last test performed at the previous cold shutdown. In case of frequent shutdowns, testing is not performed more often than once every 3 months.

RO - Refueling Outage.

All refueling outage valve testing is to be completed prior to returning the plant to operation.

RR - Partially stroke valve at or when proceeding to/starting up from cold shutdown. Fully stroke valve during each refueling outage. Some valves may require mechanical exercising or disassembly during each refueling outage to verify operability. All RR testing measures are completed prior to returning the plant to operation.

QC - Partially stroke valve every 3 months. Fully stroke valve during cold shutdown.

EI - Valve operates in the course of plant operation at a frequency that satisfies test requirements. Additional exercising not required provided the test parameters are analyzed and recorded at an operational interval not exceeding the test interval requirement.

Category A or B (ASME OM Code, ISTC)

Category C (ASME OM Code, ISTC)

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(h) Pump test parameters as defined in ASME OM Code, ISTB-5000:

N -	Speed	V -	Vibration
DP -	Differential Pressure	SPs -	Static Suction Pressure
Q -	Flow Rate	SPo -	Operating Suction Pressure
SPc -	Calculated Suction Pressure		

Note: If ASME OM Code ISTB pump tests cannot be performed on the CCW or ESW pumps due to inability to repeat pump tests single-point flow conditions, pump curve testing will be used to assess pump degradation in accordance with ASME OM Code Case OMN-16, accepted for use in NRC RG 1.192(Rev.1), as described in Subsection 3.9.6.2.

(i) (Intentionally blank)

(1) Valves: CC-0231, CC-0249, CC-0250

During normal operations, these valves are open to supply/return cooling water to/from the reactor coolant pump (RCP) coolers. Failure of these valves in the closed position could lead to pump damage or failure and force a unit shutdown. Therefore, these valves will be tested during cold shutdown when the RCPs are not operating.

(2) Valves: CC-1099, CC-1100

These valves provide containment isolation and overpressure protection for the component cooling water (CCW) supply and return lines to/from the RCPs (refer to Figure 9.2.2-1). Since these CCW lines are to remain in service during plant operation, it is impractical to perform S or RF testing on the valves on a quarterly test frequency.

The reverse stroke (RF) test of CC-1099 is impractical to perform without isolating CC-1071and CC-1070. Since this method of testing requires access to areas of high radiation and contamination, a test of this type can be performed only during refueling. This method of testing is the same as will be employed for the ANSI/ANS 56.8, Type-C leakage rate tests. Therefore, LT testing accomplishes and satisfies the reverse flow testing requirements for CC-1099.

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The reverse stroke (RF) test of CC-1100 is impractical to perform without isolating CC-0249 and CC-1085. Since this method of testing requires access to areas of high radiation and contamination, a test of this type can be performed only during refueling. This method of testing is the same as will be employed for the ANSI/ANS 56.8, Type-C leakage rate tests. Therefore, LT testing accomplishes and satisfies the reverse flow testing requirements for CC-1100.

Valve CC-1100 is reverse flow stroke tested during Cold Shutdown. The forward stroke (S) of CC-1100, however, is impractical to perform without isolating CC-0249, CC-1084, and CC-1085. Since this valve testing methodology requires containment entries to areas of high radiation and contamination, the forward stroke testing of CC-1100 will be performed during refueling.

(3) Valves: CC-0143, CC-0144, CC-0145, CC-0146, CC-0147, CC-0148, CC-0149, CC-0150

These valves close on receipt of a safety injection actuation signal to isolate the non-essential component cooling water (CCW) loops. The non-essential cooling loops provide cooling of the non-essential chillers. When plant chilled water (PCW) is secured for testing of PCW valves and non-essential header CCW valves may then be stroke tested. These valves will use the same test frequency as the PCW valves, as described in (28).

The Division 1 non-essential CCW header services the letdown heat exchanger in addition to the Division 1 non-essential chillers. Closing the Division 1 non-essential CCW header valves during plant operation could result in unnecessary reactor coolant system transients. Also, failure to cool the high temperature letdown flow leaving the regenerative heat exchanger can lead to cavitation at the letdown orifices, which has been known to cause line failure. Therefore, valves CC-0143, CC-0145, CC-0147, and CC-0149 will be tested during cold shutdown.

(4) Valves: CC-0296, CC-0297, CC-0301, CC-0302

These valves isolate cooling water to/from the letdown heat exchanger and close on a containment isolation actuation signal. For reasons stated in Note (3) above, testing these valves during normal operations is not practical. Therefore, these valves will be tested during cold shutdown.

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(5) Valves: CC-1685, CC-1686

These valves provide containment isolation and overpressure protection for the component cooling water (CCW) supply and return lines to/from the letdown heat exchanger (refer to Figure 9.2.2-1 (4 of 4)). Since these CCW lines are to remain in service during plant operation, it is impractical to perform S or RF testing on the valves on a quarterly test frequency.

Valve CC-1685 is forward stroke tested during cold shutdown. The reverse stroke (RF) test of CC-1685, however, is impractical to perform without isolating CC-0297, CC-1683, and CC-1681. Since this method of testing requires access to areas of high radiation and contamination, a test of this type can be performed only during refueling. This method of testing is the same as will be employed for the ANSI/ANS 56.8, Type-C leakage rate tests. Therefore, LT testing accomplishes and satisfies the reverse flow testing requirement for CC-1685.

Valve CC-1686 is reverse flow stroke tested during cold shutdown. The forward stroke (S) of CC-1686, however, is impractical to perform without isolating CC-0301, CC-1682, and CC-1684. Since this valve testing methodology requires containment entries to areas of high radiation and contamination, the forward stroke testing of CC-1686 will be performed during refueling.

(6) Valves: CV-255

This valve isolates seal injection water to the RCP seals. Valve closure during normal operations with the RCPs operating would result in damage to pump seals. Therefore, this valve will be tested during cold shutdown when the RCPs are not operating.

(7) Valves: CV-505, CV-506

These valves close on receipt of a containment spray actuation signal to isolate the RCP seal return line. During normal operations, these valves are open to maintain seal injection flow across the RCP seals. Closure of these valves during normal operations would inhibit seal water flow across the RCP seals, which would result in damage to the pump seals. Therefore, these valves will be tested during cold shutdown when the RCPs are not operating.

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(8) Valves: CV-515, CV-516, CV-522, CV-523

These valves are normally open to pass letdown flow from the RCS to the chemical and volume control system (CVCS). Stroking these valves during normal operations could result in unnecessary RCS transients. In addition, these valves are subjected to high stresses when cycled due to the high-pressure environment in which they operate. Repeated cycling of the valves at this high pressure could severely affect valve integrity over the expected operating life of the valves. In addition, failure of these valves in the closed position could result in a loss of pressurizer level control, forcing a unit shutdown. Therefore, these valves will be tested during cold shutdown when the effects of valve operation are minimized. Globe valve CV-515 performs a temperature isolation valve (TIV) function. This valve isolates the letdown line on a high temperature, as sensed downstream of the letdown heat exchanger by dedicated temperature monitors (refer to Figure 9.3.4-1, Sheet 1).

The setpoints of these temperature monitors and associated valve isolation actuation circuitry are such that the design temperature limits of the interfacing CVCS piping and components will not be exceeded prior to the closure of CV-515. Temperature monitors are also used to evaluate the integrity of CV-515 in this closed position. Each refueling outage, an integrity evaluation of CV-515 is performed by isolating the letdown line using CV-515, and then subjecting the valve to reactor coolant system pressure and temperature and analyzing the resultant temperature differential across the valve over time. RCS pressure and temperature may be actually lower than plant at-power RCS pressure and temperature levels to avoid valve duty stress, provided these parameters are analyzed and extrapolated to full RCS pressure and temperature.

(9) Valves: CV-524

This valve functions as a containment isolation valve and isolates charging flow to the RCS. During normal operations, this charging flow is used to cool the letdown flow in the regenerative heat exchanger and to provide makeup to the RCS. In addition, failure of this valve in the closed position could result in a loss of pressurizer level control, forcing a unit shutdown. Therefore, this valve will be tested during refueling because it is not practical to test during normal operation and cold shutdown.

(10) Valves: CV-747

This valve functions as a containment isolation valve. Testing requires that charging flow be isolated. As stated in Note (9) above, this is not practical during normal operations. Therefore, this valve will be tested during refueling.

(11) Valves: CV-835

This valve functions as a containment isolation valve. Testing requires that seal injection to the RCPs be isolated. As stated in Note (6), this is not practical during normal operations. Therefore, this valve will be tested during cold shutdown.

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(12) Valves: RG-0410, RG-0411, RG-0412, RG-0413, RG-0414, RG-0415, RG-0416, RG-0417

These valves are closed during normal plant operations to maintain the reactor coolant pressure boundary (RCPB). These valves are active valves and are designed to be used during a safety-grade cooldown of the RCS. Opening these valves during normal operation leaves only one Class 1 valve, which does not maintain the RCPB according to 10 CFR 50.2 and ANSI/ANS 51.1 definitions. While there is a third valve downstream of the two reactor coolant gas vent system (RCGVS) valves, the piping and the third valve are Class 2. In order to maintain the integrity of the RCPB, these valves are to be tested during plant shutdown periods only and not during reactor operation.

These valves will be tested as cold shutdown valves.

(13) Valves: FW-0121, FW-0122, FW-0123, FW-0124, FW-0131, FW-0132, FW-0133, FW-0134

These valves isolate main feedwater to the SGs upon receipt of a main steam isolation signal (MSIS). Closure of these valves during normal operations would isolate feedwater to the SGs, which may result in a severe transient in the SG and a unit trip. Therefore, these valves will be tested during cold shutdown.

(14) Valves: MS-011, MS-012, MS-013, MS-014, MS-090, MS-091, MS-092, MS-093

These valves are main steam isolation valves (MSIVs) and main steam drip leg isolation valves, which isolate the main steam lines upon receipt of an MSIS. Performance of either a full-stroke or partial-stroke test during normal operations may cause severe transients in the main steam lines and result in a unit trip. The valves will therefore be full stroke tested on a cold shutdown frequency basis, but with the unit in Mode 3 and at operating temperature and pressure to replicate design conditions under which valve closure is to be achieved.

(15) Valves: SI-568, SI-569

These valves are to close to prevent reverse flow when either the SC/CS pumps are used to provide containment spray or to provide shutdown cooling flow. These valves are tested by operating the SC/CS pump in any train, opening the discharge crossover isolation valve between the two systems, and isolating the suction of the off-line pump. Closure of the check valve on reverse flow in the discharge of the off-line pump is verified by monitoring pressure increase upstream of the valve.

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(16) Valves: SI-113, SI-133, SI-404, SI-405, SI-434, SI-446, SI-522, SI-523, SI-532, SI-533, SI-540, SI-542

Check valves SI-113, SI-133, SI-404, SI-405, SI-434, SI-446, SI-540, and SI-542 are to be provided with sufficient flow from the SI pumps to stroke to their full-open position. The flow for stroke testing these valves passes through the DVI nozzles and into the RCS. The SI pump discharge pressure is not sufficient to overcome normal RCS operating pressure. In addition, any flow from safety injection through these valves and into the RCS during power operations would produce an undesirable temperature transient at the DVI nozzles. The valves are also not full or partial stroked during cold shutdown, since this may result in low-temperature overpressurization of the RCS. Since it is impractical to full stroke test these check valves during plant operation or to perform full/partial stroke test during cold shutdown conditions, these valves are full stroke tested each refueling outage.

Check valves SI-520, SI-522, SI-523, SI-532, and SI-533 are to be provided with sufficient flow from the SI pumps to stroke to their full-open position. The flow for stroke testing these valves passes through the RCS hot legs (hot leg injection). The SI pump discharge pressure is not sufficient to overcome normal RCS operating pressure. In addition, any flow from safety injection through these valves and into the RCS during power operations would produce an undesirable temperature transient at the shutdown cooling line connections to the hot legs. The valves are also not full or partial stroked during cold shutdown, since this may result in low-temperature overpressurization of the RCS. Since it is impractical to full stroke test these check valves during plant operation or to perform full/partial stroke test during cold shutdown conditions, these valves are full stroke tested each refueling outage.

Check valves SI-113 and SI-133 are not reverse flow tested quarterly, since testing of these valves during power operations would require containment entries by plant personnel to high-radiation and airborne contamination areas. These valves are not reverse flow tested every cold shutdown because of the extensive test equipment setup, which could extend the cold shutdown. These valves are reverse flow tested during refueling.

(16A) Valves: SI-404, SI-405, SI-434, SI-446

These valves are reverse flow tested by pressurizing the volume of piping between these valves and their respective SI pump discharge maintenance isolation valve (SI-476, SI-478, SI-435, and SI-447) with water, and using either pressure decay or volumetric analysis to determine valve reverse seating function.

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(17) Valves: SI-123, SI-143, SI-541, SI-543, SI-168, SI-178

Check valves SI-123, SI-143, SI-541, SI-543, SI-168, and SI-178 are to be provided with sufficient flow to stroke to their full-open position. This test flow ultimately passes through the DVI nozzles and into the RCS. Neither the SI nor the SC/CS pump discharge pressures are sufficient to overcome normal RCS operating pressure in order to establish the flow required to perform a partial or full stroke test of these valves. In addition, any flow from safety injection or shutdown cooling to the RCS during power operations would produce an undesirable temperature transient at the DVI nozzles. During cold shutdown, the SI pumps may not be used for stroke testing these valves, because this could result in low-temperature overpressurization of the reactor vessel. A full flow stroke test of these valves during cold shutdown is achievable by use of the SC/CS pumps.

Valves SI-123 and SI-143 are not reverse flow tested quarterly, since testing of these valves during power operations would require containment entries by testing personnel to high radiation and airborne contamination areas. These valves are not reverse flow tested every cold shutdown because of the extensive test equipment setup which could extend the cold shutdown. These valves are reverse flow tested during refueling.

(18) Valves: CS-1007, CS-1008, CS-1014

These valves are required to open to pass flow from the containment spray (CS) pumps to the containment atmosphere. These valves cannot be stroked open with CS flow, since this would result in spraying down containment. These valves will be equipped with external means to exercise the valve obturator and to measure the force required to exercise the valve open and closed (this performs both the S and RF test). Since the valves are located in a containment area subject to moderate to high radiation and contamination levels, the valves will be exercised each refueling outage, instead of during cold shutdown or plant operation (every 3 months).

(19) Valves: SI-215, SI-225, SI-235, SI-245

These SIT outlet check valves are to be provided with sufficient flow from the SITs to the RCS to stroke to their full-open position. During normal operations, the SI tanks are not capable of providing flow to the RCS, due to RCS pressure and tank pressure limitations. Also, providing flow to the DVI nozzles during plant operations would cause undesirable temperature transients at the DVI nozzles. The SITs may be used, however, to provide flow to partially stroke these valves, with minimal temperature transient impact to the DVI nozzles, when proceeding to or starting up from cold shutdown. In this configuration, a full-flow stroke test is impractical due to significant inventory additions to the RCS should the SIT water level become too low. During refueling and with the reactor head removed, full-flow testing of these valves is practical. In this condition, SIT flow may be obtained, which is sufficient to full stroke the SIT outlet check valve, with minimal risk of injecting nitrogen into the RCS. Therefore, these valves will be partially stroke tested during cold shutdown and full-stroke tested during refueling.

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(20) Valves: SI-217, SI-227, SI-237, SI-247

Providing flow to the DVI nozzles in order to stroke these check valves during plant operation is not practicable, since RCS pressure during normal operations is significantly higher than the discharge pressures of the SI pumps, SC/CS pumps, or SITs. In addition, any flow from these sources to the RCS during power operations would produce an undesirable temperature transient at the DVI nozzles.

Check Valves SI-217 and SI-237:

Full-stroke testing of these check valves is not practical at cold shutdown for several reasons. First, SI pumps 4 and 3 are not capable of providing sufficient flow to full stroke their respective DVI check valve (SI-217/SI-237). Secondly, such use of SI pumps during cold shutdown condition is not practical, since it could result in low-temperature overpressurization of the reactor vessel. Thirdly, use of water inventory from their respective SITs to full-stroke test these check valves during cold shutdown when RCS pressure is low is impractical, because of the risk of injecting nitrogen into the RCS, and because the RCS is not capable of accepting the added SIT inventory from a full-stroke test.

However, a partial-stroke test of these check valves may be achieved with minimal temperature transient impact to their respective DVI nozzles, when proceeding to or starting up from cold shutdown, by use of water inventory from their respective SITs to establish flow through these valves. During refueling and with the reactor head removed, full flow testing of these valves is practical. In this condition, SIT flow may be obtained that is sufficient to full stroke the respective DVI check valve, with minimal risk of injecting nitrogen into the RCS. Therefore, these valves will be partially stroke tested during cold shutdown and full-stroke tested during refueling.

Check Valves SI-227 and SI-247:

These check valves have the same testing limitations as SI-217 and SI-237, above, except that a full-stroke test of the check valves is practical during cold shutdown by operating their respective SC/CS pump. SI-227 and SI-247 are tested as cold shutdown valves.

(21) Valves: SI-302, SI-303

Closing of these valves to perform stroke testing renders both SI pumps in the respective valve trains inoperable, which is in violation of Technical Specifications 3.5.2 and 3.5.3. Technical Specification 3.5.3, however, allows inoperability of both train SI pumps during refueling subject to prescribed RCS parameters.

(22) Valves: SI-424, SI-426, SI-448, SI-451

Each of these valves is reverse flow tested by isolating its associated pump and operating the other divisional SI pump in miniflow to provide reverse flow against the tested valve. In this test alignment, the operating pump is to remain in miniflow condition, fully capable of supplying design basis accident flow. Procedural measures are implemented so that only one train SI pump will be inoperable (i.e., the isolated SI pump).

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(23) Valves: CV-362, CV-363

These valves function as containment isolation valves and isolate shutdown cooling purification line. The valves are in the closed position during normal operation and open during shutdown cooling purification. Therefore, these valves will be tested during cold shutdown. To provide reasonable assurance of the operability of CV-363 for its containment isolation function, this valve is reverse flow tested. Reverse flow testing of CV-363 is not practical quarterly, since during unit operation, opening of CV-362 or other venting path could result in an inter-system LOCA.

The appropriate interval for such testing is during cold shutdown when the shutdown purification line is secured prior to unit startup.

(24) Valves: SI-614, SI-624, SI-634, SI-644

These valves are to be open to pass flow from the SITs to the RCS. Technical Specifications do not permit testing these valves during normal operation since all four SITs are to be operable. Normal shutdown/startup procedures require these valves to be closed when proceeding to cold shutdown and to be opened when starting up from cold shutdown. Testing of these valves will be performed at this time.

(25) Valves: SI-651, SI-652, SI-653, SI-654, SI-655, SI-656

These valves are to open to align the SC/CS pump suction to the RCS. These valves are interlocked such that they cannot be opened when RCS pressure is above the operating pressure of the SCS. Therefore, these valves cannot be tested during normal operations. Testing will be performed during cold shutdown when valves can be manipulated.

(26) Valves: VQ-0011, VQ-0012, VQ-0013, VQ-0014

These valves are to close on receipt of a CIAS to perform their containment isolation function. During normal operations, these valves are closed and Technical Specifications do not permit opening. Therefore, these valves will be tested during cold shutdown.

(27) Valves: SD-1115, SD-1116

These valves are to close on reverse flow in the SG wet layup recirculation line to perform their containment isolation function. The recirculation lines are isolated during normal operations and are only used when the SGs are in wet layup conditions such as during cold shutdown. Therefore, these valves will be tested during cold shutdown when the recirculation system is stopped.

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(28) Valves: WI-012, WI-013, WI-015

During normal operations, these valves are open to provide plant chilled water (PCW) to the containment. Stroke testing of any one of these valves will require interruption of at least one division of PCW to the containment. To maintain containment air temperatures within the 120 °F Technical Specifications limit year-round, the containment coolers are required to operate with the two units in standby. There may be periods during the year, however, when two out of four containment cooler operations (one PCW division operating, one PCW division secured) provides sufficient cooling to maintain containment temperature within the Technical Specifications limit, due to less severe site climate and heat sink characteristics (e.g., non-summer months). For these periods of the year, the valves will be stroke tested quarterly.

For other periods of the year during which at least two of the four containment coolers are to be kept in operation to maintain containment temperature within the 48.9 °C (120 °F) Technical Specification limit, the valves will be tested as cold shutdown valves.

(29) Valves: FW-1035, FW-1036, FW-1037, FW-1039, FW-1040, FW-1042, FW-1043, FW-1044, FW-1046, FW-1047

These main feedwater system check valves are located on the feedwater inlet lines to the steam generators. These check valves have only a safety function to close. Since these valves are to remain open during power operations to maintain steam generator level and prevent reactor trip and plant shutdown, quarterly reverse flow testing is impractical. As described in Section 10.4.7 and Figure 10.4.7-1, the feedwater split between the economizer feedwater lines and the downcomer feedwater line always maintains some flow through the downcomer feedwater line, even though the two economizer feedwater lines are sized to collectively provide 100 percent required flow to the steam generator they service. The 10 percent of required steam generator flow that passes through the downcomer line at full-power operation is used to maintain the downcomer line at a constant temperature to protect the line from thermal transient (water hammer) damage. Thus, the downcomer feedwater line may not be isolated during power operations in order to perform a reverse flow test on its feedwater check valves. Flow testing of these valves is performed on a cold shutdown (CS) frequency basis while the plant is in Mode 3 (hot standby), at which condition adequate steam generator pressure exists to perform reverse flow tests on the valves.

(30) (Intentionally Brank)

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(31) Valves: SI-605, SI-606, SI-607, SI-608, SI-613, SI-623, SI-633, SI-634

These solenoid valves are both stroke tested (S) and fail-safe tested (FS) during cold shutdown because opening any of these valves will result in depressurizing the affected SIT, thus causing the SIT to be inoperable. These valves cannot be tested during plant operations, since plant Technical Specification 3.5.1 requires all SITs to remain operable in Mode 1 (power operations). Technical Specification LCO 3.5.1 (required action) for inoperability of any SIT requires restoration of that SIT to operable status in one hour, or commence unit shutdown. Since this LCO is too stringent to allow valve stroke or fail-safe testing of these valves during plant operations, this testing will be performed during cold shutdown.

(32) Valves: FP-1440

The safety function of valves FP-1440 in the forward stroke direction is to relieve thermal pressure to the containment fire water supply piping and thus prevent damage to the containment penetration as a result of containment heatup following a LOCA. It is impractical to perform a forward stroke test for check valves FP-1440 during power operations or cold shutdown for several reasons: significant radiation and contamination exposure to test personnel in containment, the necessity of disabling the sprinkler system within containment to perform the test, which jeopardizes system response to containment fire, and the extensive restoration/draining of the fire supply headers inside of containment post-testing to their normal “dry” status, which would result in extending the cold shutdown.

The reverse flow safety function is containment isolation. Reverse flow testing of these check valves is impractical during power operations or cold shutdown for several reasons: significant radiation and contamination exposure to test personnel in containment, the necessity of disabling the sprinkler systems to fill the “dry” fire water supply piping in the reverse flow test volume in order to establish backpressure on the check valve seat, which jeopardizes system response to containment fire, and the extensive restoration/draining of the fire supply headers inside of containment post-testing to their normal “dry” status, which would result in extending the cold shutdown.

(33) Valves: WM-1752

The safety function of valve WM-1752 in the forward stroke direction is to relieve thermal pressure to the containment demineralized water piping as a result of containment heatup following a LOCA. Verification of this safety function requires forward stroke testing, and use of demineralized water within containment. However, during power operations and cold shutdown, there are no users of demineralized water within containment to establish this flow, without necessitating containment entry to areas of high radiation dose and airborne contamination present during power operations and cold shutdown to manipulate manual valves at decontamination sinks, etc. The forward stroke test will be performed during refueling for ALARA purposes. Similarly, the RF test will require containment entry to areas of high radiation dose and airborne contamination present during power operations and cold shutdown. For ALARA purposes, this test will be performed during refueling.

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(34) Valves: IW-0001, IW-0002, IW-0003, IW-0004

Valves IW-0001 and IW-0002 are motor-operated holdup volume tank (HVT) flooding valves; valves IW-0003 and IW-0004 are reactor cavity flooding valves. The valves are normally closed and remain closed throughout the recovery period of any design basis accident. The valves are opened either individually or simultaneously only for a severe accident, which requires flooding of the reactor cavity in the event of the reactor vessel breach. The opening of the valves allows water to flow from the IRWST to the reactor cavity to cover core debris. Operability of the valves is not required for shutting down the reactor, maintaining cold shutdown, or mitigating the consequences of any design basis accident.

Testing of the HVT flooding valves requires that the manual valves located upstream be closed to prevent the flow of water from the IRWST to the HVT. Closing the manual valves is not practical during operations at power because containment entry would be required. The reactor cavity flooding valves are not tested during operations at power because inadvertent actuation of the valves would result in the simultaneous opening of the reactor cavity flooding valves and the HVT flooding valves. Even though the IRWST water volume is designed to prevent breaching the reactor vessel, abnormal condition which results in flooding the HVT and the reactor cavity should be prevented. The HVT flooding valves and the reactor cavity flooding valves will be tested during each refueling outage. This will limit personnel radiation exposure and prevent the simultaneous opening of the reactor cavity flooding valves and the HVT flooding valves.

(35) Valves: SI-612, SI-619, SI-622, SI-629, SI-632, SI-639, SI-642, SI-649

These air-operated SIT nitrogen pressure control valves are stroked in the course of plant operation as a matter of normal operation and pressure control of the SITs at a frequency that satisfies test requirements of quarterly testing. Fail-safe (FS) actuation on a 3-month basis, however, is impractical during plant operations (quarterly test frequency) or cold shutdown because such testing involves entries to containment to proximity of the SITs (high radiation dose and airborne contamination area) to fail air to the air diaphragm valve actuators. Therefore, the FS test for these valves will be performed on a refueling outage basis for ALARA purposes.

(36) Valves: SI-322, SI-332, SI-611, SI-618, SI-621, SI-628, SI-631, SI-638, SI-648, SI-661, SI-670

These air-operated valves are stroked on a quarterly frequency. Fail-safe (FS) actuation testing on a 3-month basis; however, is impractical during plant operations (quarterly test frequency) or cold shutdown because such testing involves entries to containment to proximity of the SITs (high radiation dose and airborne contamination area) to fail air to the air diaphragm valve actuators. Therefore, the FS test for these valves will be performed on a refueling outage basis for ALARA purposes.

(37) Although these emergency diesel generator support system components are Safety Class 3, they are procured, tested, and maintained as part of the emergency diesel generators themselves, which are tested for operability and reliability by the plant Technical Specifications. Therefore, these components are tested by Technical Specifications Surveillance Requirements of Technical Specification Section 3.8.

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(38) Pressure isolation valves (PIVs) are not reverse flow tested quarterly, since testing of these valves during power operation would require containment entries to high radiation and airborne contamination areas. PIVs are not reverse flow tested every cold shutdown, because of the extensive test equipment setup, which could extend the cold shutdown. The RF function is verified, however, by leakage testing each valve in the reverse flow direction during unit startup for the testing frequency outlined in Technical Specification Surveillance Requirement 3.4.13.1. This surveillance requirement states that leakage testing of these valves is required every 18 months and prior to entering Mode 2 whenever the plant has been in Mode 5 (cold shutdown) for 7 days or more, if leakage testing has not been performed in the previous 9 months and within 24 hours following valve actuation due to automatic or manual action or flow through the valve(s).

(39) Inservice Testing/Monitoring for Valves on Piping Connected to the Steam Generator Secondary Side

Steam generator blowdown valves are tested for gross leakage each refueling outage. Testing is performed by isolating these valves individually against steam generator pressure and then monitoring the steam generator blowdown tank for an increase in tank level, which would be indicative of gross valve leakage.

Steam generator sampling line valves are tested for gross leakage each refueling outage. Testing is performed by isolating these valves individually against steam generator pressure and then monitoring sample line flow for gross valve leakage.

There is potential of thermal stratification in Auxiliary Feedwater (AF) piping, if the Feedwater (FW) back leakage occurs through the inside-containment containment isolation check valves. Therefore, the AF containment isolation valves are tested for gross leakage each refueling outage. The AF isolation check valves are leakage tested by individually subjecting these valves to steam generator pressures experienced during unit startup/shutdown and then measuring resultant valve leakage through the provided test connection. The outside-containment AF isolation valves are leakage tested by pressurizing the piping between these valves and their inside-containment containment isolation check valves while the steam generators are at startup/shutdown pressures. Valve leakage is then measured through the provided test connection. These AF valves also employ installed temperature instrumentation to detect leakage past these valves.

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(40) Safety Injection System

For inservice testing of the safety injection pumps during refueling outages, a walkdown visual examination of safety injection system piping and components outside containment will be conducted to verify the leak-tight integrity of the system.

(41) Valves: CV-576, CV-577

These valves limit charging flow to RCS. In addition, failure of these valves in the closed position could result in a loss of pressurizer level control. Therefore, these valves will be tested during refueling because it is not practical to test during normal operation and cold shutdown.

(42) Valve: PX-1005

This valve is installed to isolate the containment building and protect the overpressure of sample collecting piping of the post-accident primary sampling system (Figure 9.3.2-1). PX-1005 is closed for normal plant operation, and the right-direction and reverse-direction stroke test of PX-1005 is operated by using test-fitting. The right-direction and reverse-direction stroke test of PX-1005 is not operated every quarter because an operator has to enter the high-radiation and radiation contamination air-particle areas in the containment building during power operations. This valve is not tested during cold shutdown because cold shutdown can be extended by the installation of test equipment but tested during refueling operation.

(43) Valve: PX-1020

This valve is installed to isolate the containment building of sample collecting piping of containment atmosphere (Figure 9.3.2-1). PX-1020 is closed for normal plant operation, and the right-direction and reverse-direction stroke test of PX-1020 is operated by using test-fitting. The right-direction and reverse-direction stroke test of PX-1020 is not operated every quarter because an operator has to enter the high-radiation and radiation contamination air-particle areas in the containment building during power operations. This valve is not tested during cold shutdown because cold shutdown can be extended by the installation of test equipment but tested during refueling operation.

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(44) Valves: AF-1003A, AF-1003B, AF-1004A, AF-1004B, AF-1007A, AF-1007B, AF-1008A, AF-1008B

When auxiliary feedwater (AF) system operation is required, these valves are to open to provide flow to the steam generators (SGs).

Testing of these valves requires AF injection into the SGs, which is not practical during normal operations due to the effects of thermal shock to the SG feedwater nozzles and potential overcooling of the RCS. Testing during cold shutdown is not desirable because the SG is in wet layup conditions. Therefore, these valves will be tested following cold shutdown prior to entering Mode 2, which allows normal SG water levels to be established and the system aligned for standby readiness.

Reverse flow for reverse flow testing of valves AF-1008A, AF-1008B, AF-1007A, and AF-1007B is obtained by opening AF pump to AF isolation valves AF-0043, AF-0044, AF-0045, and AF-0046, respectively.

(45) (Intentionally Blank)

(46) Valve: RC-0385, RC-0386

If POSRVs open with POSRV discharge path to the S/G compartments for testing of RC-0385 and RC-0386, reactor coolant will be discharged to the S/G compartments and the containment will be under radioactive contamination environment. This condition limits containment entries by plant personnel when the valves or their indication fail during the testing of RC-0385 and RC-0386. Therefore, testing will be performed during refueling for ALARA purposes.

(47) Valve: FC-1145

Testing of the check valve FC-1145 is not performed quarterly since testing of this valve during power operations would require containment entries by plant personnel to high-radiation and airborne contamination areas. Therefore, forward and reverse stroke tests of this valve are performed during refueling.

Table 3.9-14

RCS Pressure Isolation Valves Associated with the Reactor Coolant System

Detailed testing information is contained in Table 3.9-13 and Technical Specification Surveillance Requirement 3.4.13.1.

Valve	Description
SI-215	SI tank 4 discharge check
SI-217	DVI nozzle 1B check valve
SI-225	SI tank 2 discharge check
SI-227	DVI nozzle 2B check valve
SI-235	SI tank 3 discharge check
SI-237	DVI nozzle 2A check valve
SI-245	SI tank 1 discharge check
SI-247	DVI nozzle 1A check valve
SI-322	Hot leg injection 1 bleed-off isolation
SI-332	Hot leg injection 2 bleed-off isolation
SI-522	Hot leg injection loop 1 check
SI-523	Hot leg injection loop 1 check
SI-532	Hot leg injection loop 2 check
SI-533	Hot leg injection loop 2 check
SI-540	SI pump #4 discharge check
SI-541	SI pump #2 discharge check
SI-542	SI pump #3 discharge check
SI-543	SI pump #1 discharge check
SI-618	SI line 4 leakage return
SI-628	SI line 2 leakage return
SI-638	SI line 3 leakage return
SI-648	SI line 1 leakage return
SI-651	SC pump #1 suction
SI-652	SC pump #2 suction
SI-653	SC pump #1 suction
SI-654	SC pump #2 suction

Table 3.9-15 (1 of 2)

Design and Arrangement Comparison of Reactor Internals

Palo Verde	APR1400
Core Support Barrel	
A. Right circular cylinder, three sections, supported by heavy external flange top end, heavy internal flange bottom end.	A. Right circular cylinder, three sections, supported by heavy external flange top end, heavy internal flange bottom end.
B. Two outlet nozzles through barrel.	B. Two outlet nozzles through barrel.
C. Top flange seats on reactor vessel ledge, and has four alignment keys attached.	C. Top flange seats on reactor vessel ledge, and has four alignment keys attached.
D. Bottom flange supports lower support structure, fuel, and core shroud.	D. Bottom flange supports lower support structure, fuel, and core shroud.
E. Top flange supports upper guide structure assembly.	E. Top flange supports upper guide structure assembly.
F. Six amplitude-limiting devices (snubbers) attached to lower barrel.	F. Six amplitude-limiting devices (snubbers) attached to lower barrel.
Lower Support Structure	
A. Made up of interlocked grid beams with surrounding short cylinder and perforated bottom plates attached to the bottoms of the beams.	A. Made up of interlocked grid beams with surrounding short cylinder and perforated bottom plates attached to the bottom of the beams.
B. Fuel support pins are attached to the top end of the grid beams.	B. Fuel support pins are attached to the top end of the grid beams.
C. The core shroud assembly is attached to the top of the LSS cylinder.	C. The core shroud assembly is attached to the top of the LSS cylinder.
D. The LSS cylinder rests on and is attached to the CSB bottom (internal) flange.	D. The LSS cylinder rests on and is attached to the CSB bottom (internal) flange.

Table 3.9-15 (2 of 2)

Palo Verde	APR1400
Upper Guide Structure	
A. Right circular cylinder supported by a heavy external flange type end, and heavy plate attached to bottom end.	A. Right circular cylinder supported by a heavy external flange top end, and heavy plate attached to bottom end.
B. Heavy plate in A is perforated with flow holes and guide tubes.	B. Heavy plate in A is perforated with flow holes and guide tubes.
C. A second heavy perforated plate supports the bottom ends of the guide tubes, is also perforated.	C. A second heavy perforated plate supports the bottom ends of the guide tubes, is also perforated.
D. This second heavy plate in C engages with guide lugs on the core shroud.	D. This second heavy plate in C engages with guide lugs on the core shroud.
E. The guide tubes are welded to the two heavy plates above.	E. The guide tubes are welded to the two heavy plates above.
CEA Shroud Assembly / Inner Barrel Assembly	
A. A series of large-diameter tubes is connected by full-length webs	A. A series of large-diameter tubes is connected by full-length webs.
B. All welded construction.	B. All welded construction.
C. N/A	C. The shroud tube and web assembly is connected to an external cylinder.
D. The tube and web assembly is supported by the UGS support plate via tie-rods. Incorporates four interlocking snubbers to the upper UGS.	D. The tube, web, and cylinder assembly is supported by the UGS upper flange.
E. Material – austenitic stainless steel	E. Material – austenitic stainless steel

Table 3.9-16

Nominal Dimensional Comparison of Reactor Internals

Component	Palo Verde	APR1400
Core Support Barrel		
Length, mm (in)	9,734.6 (383-1/4)	9,715.5 (382-1/2)
Diameter (ID), mm (in)	3,987.8 (157)	3,987.8 (157)
Thickness upper, mm (in)	76.2 (3)	76.2 (3)
Thickness middle, mm (in)	66.7 (2-5/8)	66.7 (2-5/8)
Thickness lower, mm (in)	76.2 (3)	76.2 (3)
Outlet nozzles (qty)	2	2
Outlet nozzle diameter (ID), mm (in)	1,184.3 (46-5/8)	1,184.3 (46-5/8)
Snubbers (qty)	6	6
Lower Support Structure		
Cylinder height, mm (in)	412.8 (16-1/4)	412.8 (16-1/4)
Cylinder diameter (OD), mm (in)	3,970.3 (156-5/16)	3,970.3 (156-5/16)
Main beams (qty)	16	16
Beam thickness, mm (in)	44.5 (1-3/4)	44.5 (1-3/4)
Beam height, mm (in)	669.9 (26-3/8)	669.9 (26-3/8)
UGS Support Barrel Assembly		
Length, mm (in)	4,924.4 (193-7/8)	4,924.4 (193-7/8)
Diameter flange (OD), mm (in)	4,559.3 (179-1/2)	4,559.3 (179-1/2)
Diameter barrel (OD), mm (in)	3,962.4 (156)	3,962.4 (156)
Barrel thickness, mm (in)	76.2 (3)	76.2 (3)
CEA guide tubes (qty)	804	820
Fuel alignment plate diameter, mm (in)	3,962.4 (156)	3,962.4 (156)
Plate thickness, mm (in)	114.3 (4-1/2)	139.7 (5-1/2)

Table 3.9-17

Comparison of Operating Condition for Reactor Internals

Operating Condition	Palo Verde	APR1400
RV design pressure, kg/cm^2A (psia)	175.8 (2,500)	175.8 (2,500)
RV normal operating pressure, kg/cm^2A (psia)	158.2 (2,250)	158.2 (2,250)
Normal operating coolant inlet temperature, °C (°F)	296.1 (565)	290.6 (555)
Normal operating coolant outlet temperature, °C (°F)	327.3 (621.2)	323.9 (615)
Design temperature, °C (°F)	343.3 (650)	343.3 (650)
Normal operating coolant flow rate, L/min (gpm)	1,687,000 (445,600)	1,689,000 (446,300)
Mechanical design coolant flow rate (with core), L/min (gpm)	1,965,000 (519,124)	1,943,000 (513,200)
Mechanical design coolant flow rate (without core), L/min (gpm)	2,066,000 (545,860)	2,112,000 (557,900)
Reactor coolant pump frequency (Hz)	20	20
Reactor coolant pump blade passing frequency (Hz)	120	120

Table 3.9-18 (1 of 2)

List of Active Pumps

Pump	ASME Class	System (Subsection)
Safety injection pump 1	2	6.3.2
Safety injection pump 2	2	6.3.2
Safety injection pump 3	2	6.3.2
Safety injection pump 4	2	6.3.2
Shutdown cooling pump 1	2	6.3.2
Shutdown cooling pump 2	2	6.3.2
SFP cooling pump 1	3	9.1.3
SFP cooling pump 2	3	9.1.3
CCW pump 1A	3	9.2.2
CCW pump 1B	3	9.2.2
CCW pump 2A	3	9.2.2
CCW pump 2B	3	9.2.2
CCW makeup pump 3A	3	9.2.2
CCW makeup pump 3B	3	9.2.2
ESW pump 1A	3	9.2.2
ESW pump 1B	3	9.2.2
ESW pump 2A	3	9.2.2
ESW pump 2B	3	9.2.2
ECW pump PP01A	3	9.2.7
ECW pump PP02A	3	9.2.7
ECW makeup pump PP03A	3	9.2.7
ECW pump PP01B	3	9.2.7
ECW pump PP02B	3	9.2.7
ECW makeup pump PP03B	3	9.2.7

Table 3.9-18 (2 of 2)

Pump	ASME Class	System (subsection)
Essential chilled water pump PP01A	3	9.2.7
Essential chilled water pump PP02A	3	9.2.7
Essential chilled water makeup pump PP03A	3	9.2.7
Essential chilled water pump PP01B	3	9.2.7
Essential chilled water pump PP02B	3	9.2.7
Essential chilled water makeup pump PP03B	3	9.2.7
DG 1 fuel oil transfer pump 01A/02A	3	9.5.4
DG 1 fuel oil transfer pump 01B/02B	3	9.5.4
MD AFW pump PP02A	3	10.4.9
TD AFW pump PP01A	3	10.4.9
MD AFW pump PP02B	3	10.4.9
TD AFW pump PP01B	3	10.4.9

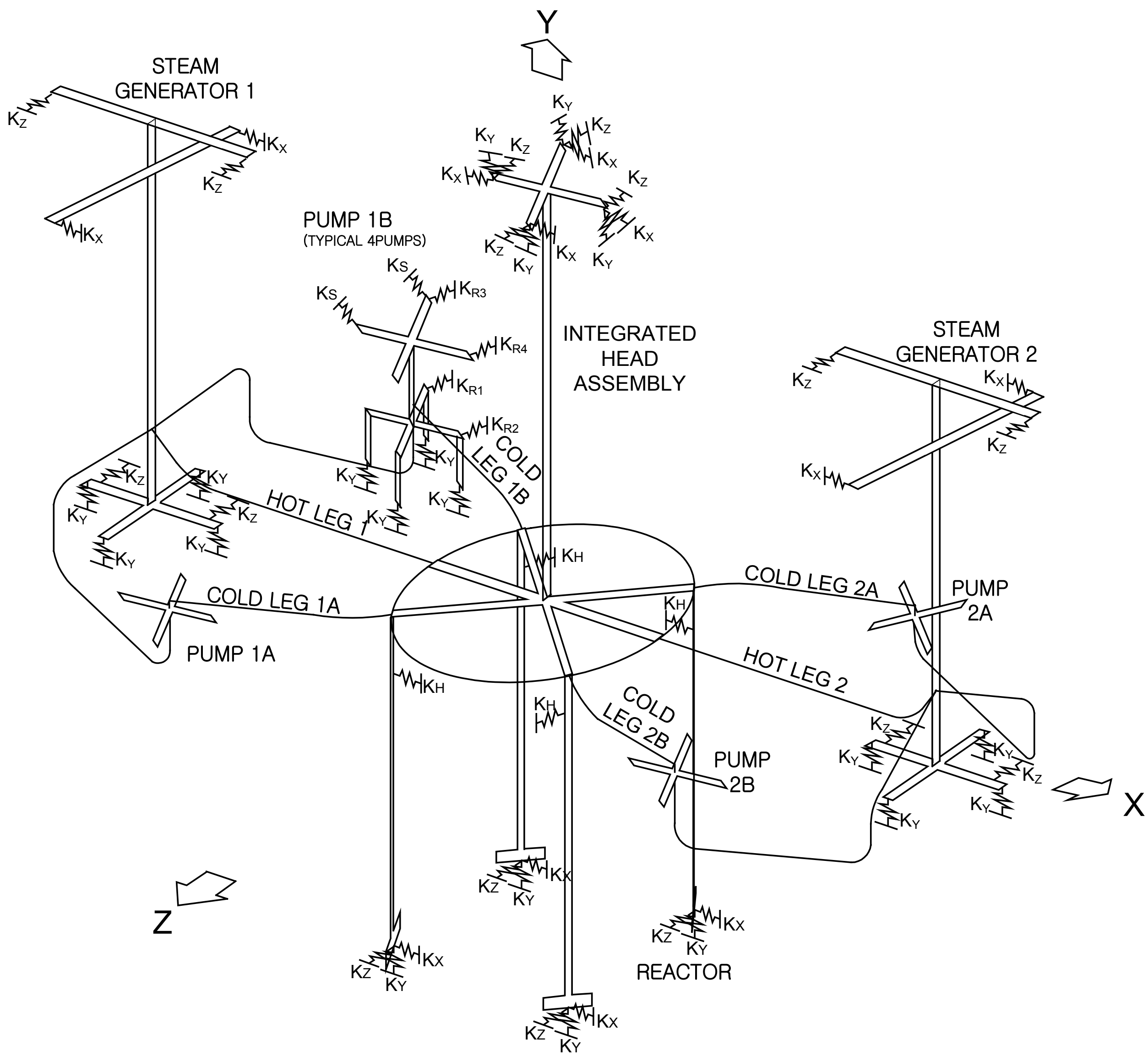

Figure 3.9-1 Reactor Coolant System Supports Diagram

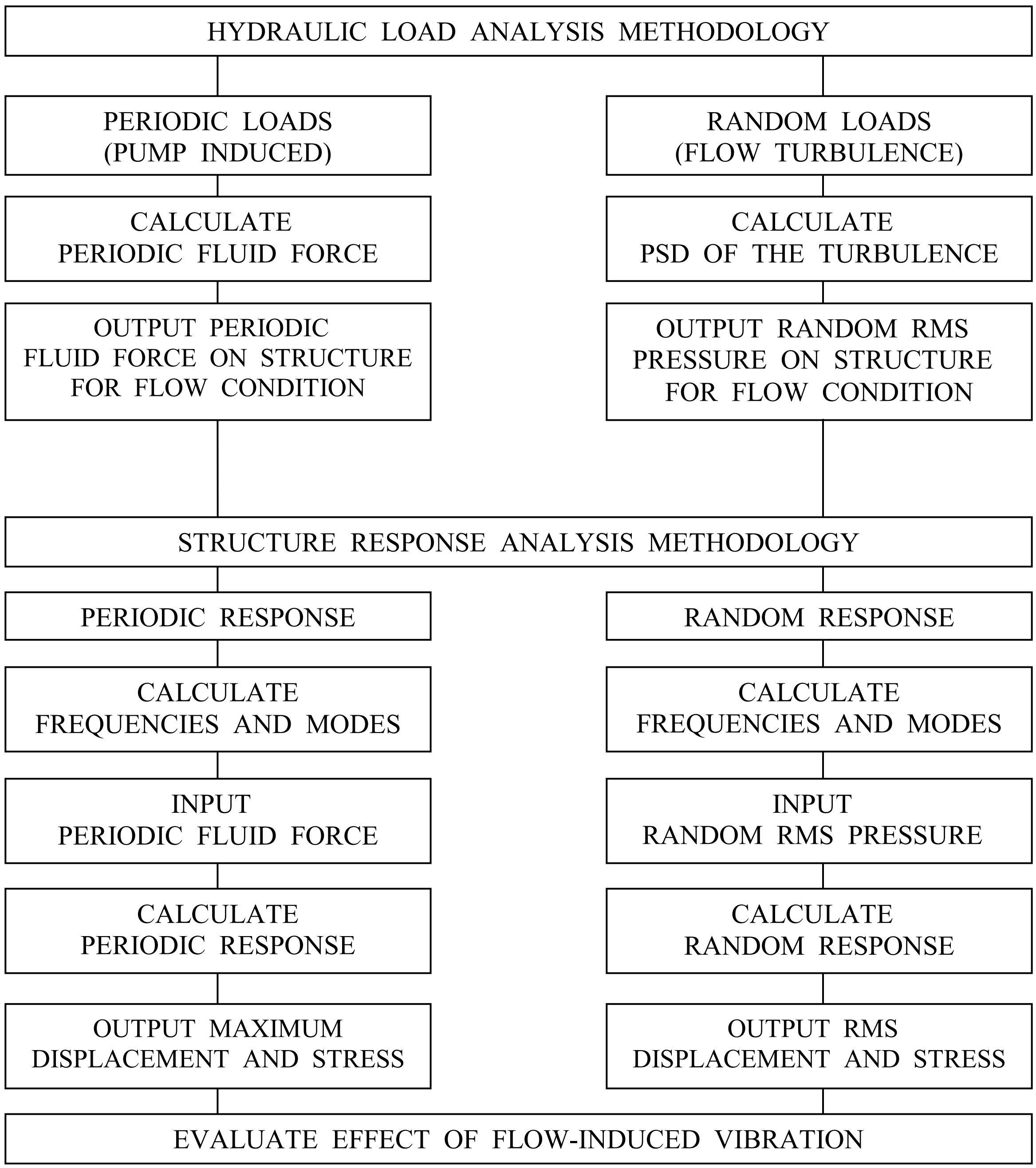

Figure 3.9-2 Summary of Analytical Methodology

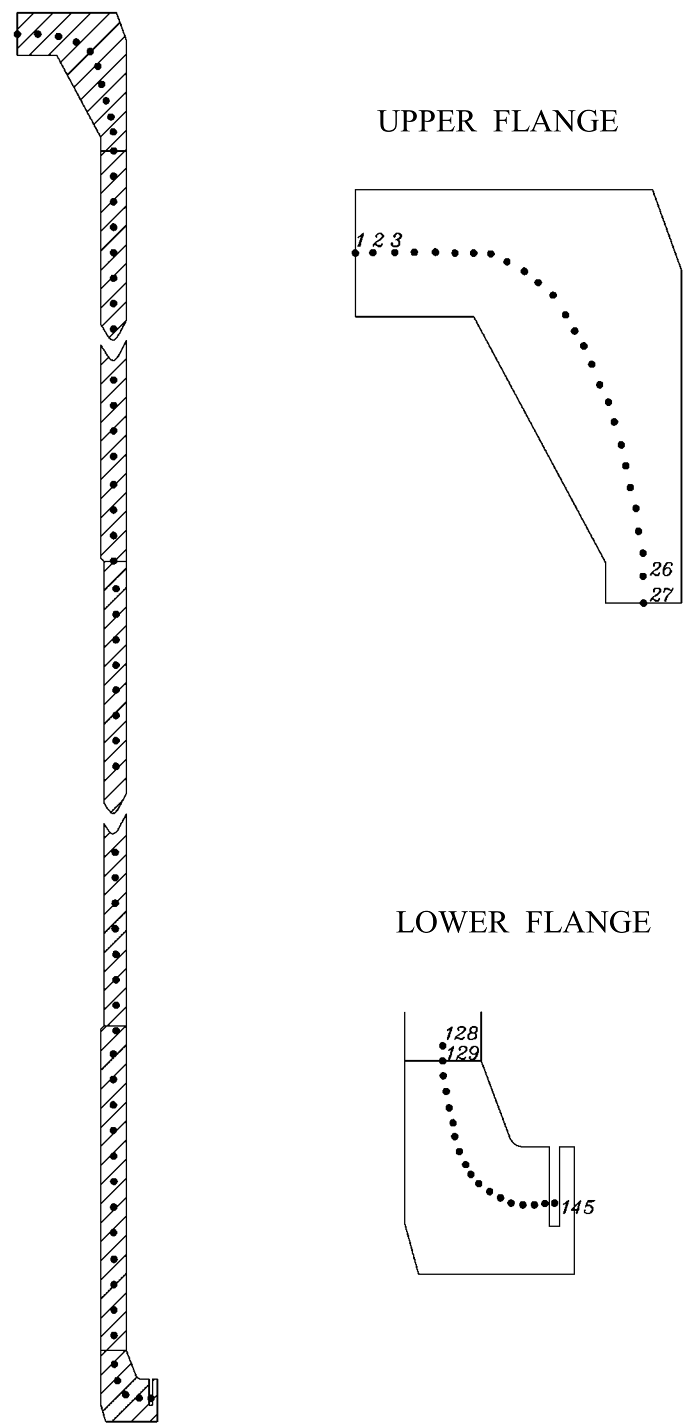

Figure 3.9-3 ASHSD Finite Element Model of Core Support Barrel

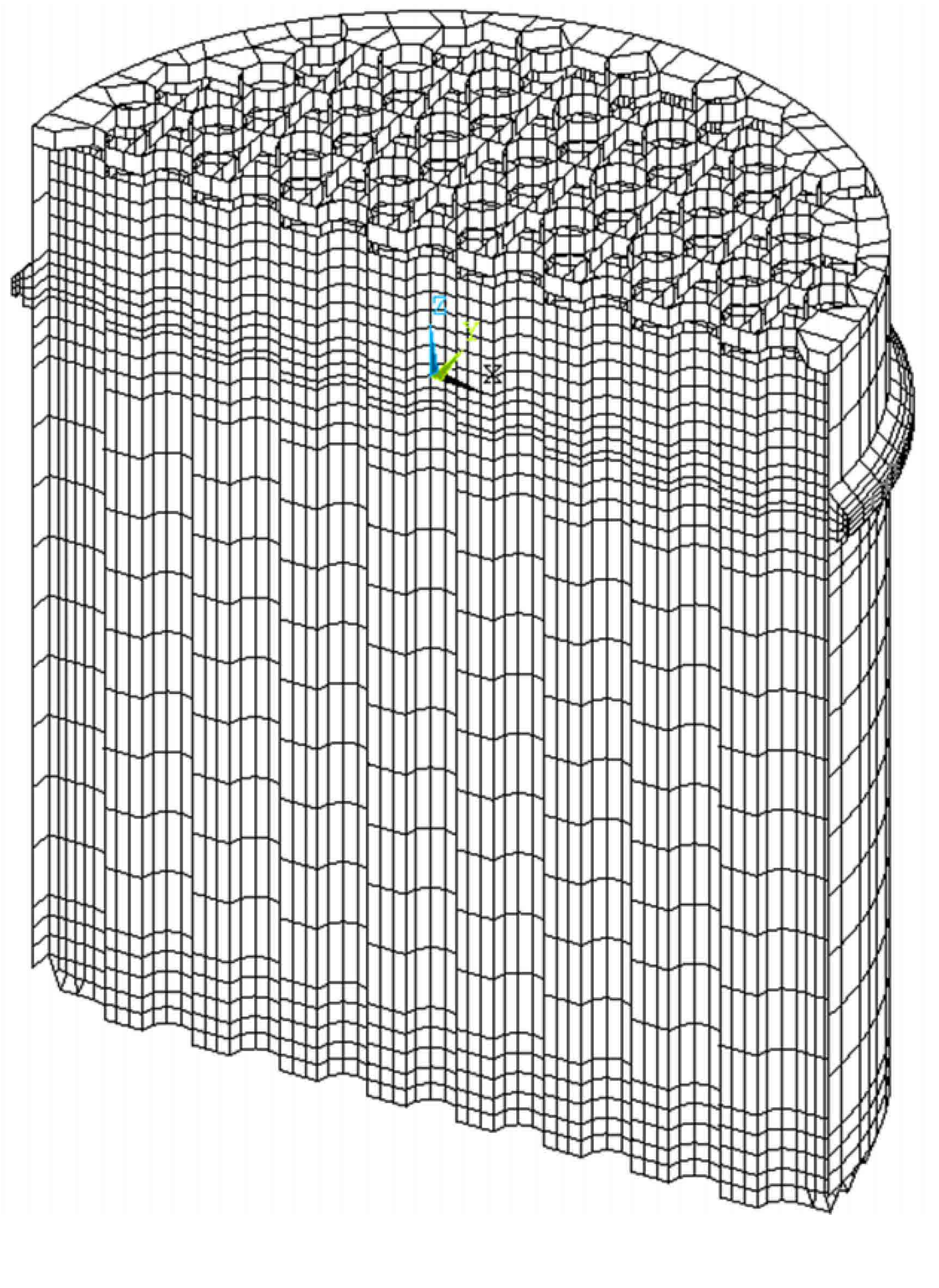

Figure 3.9-4   Finite Element Model of Inner Barrel Assembly

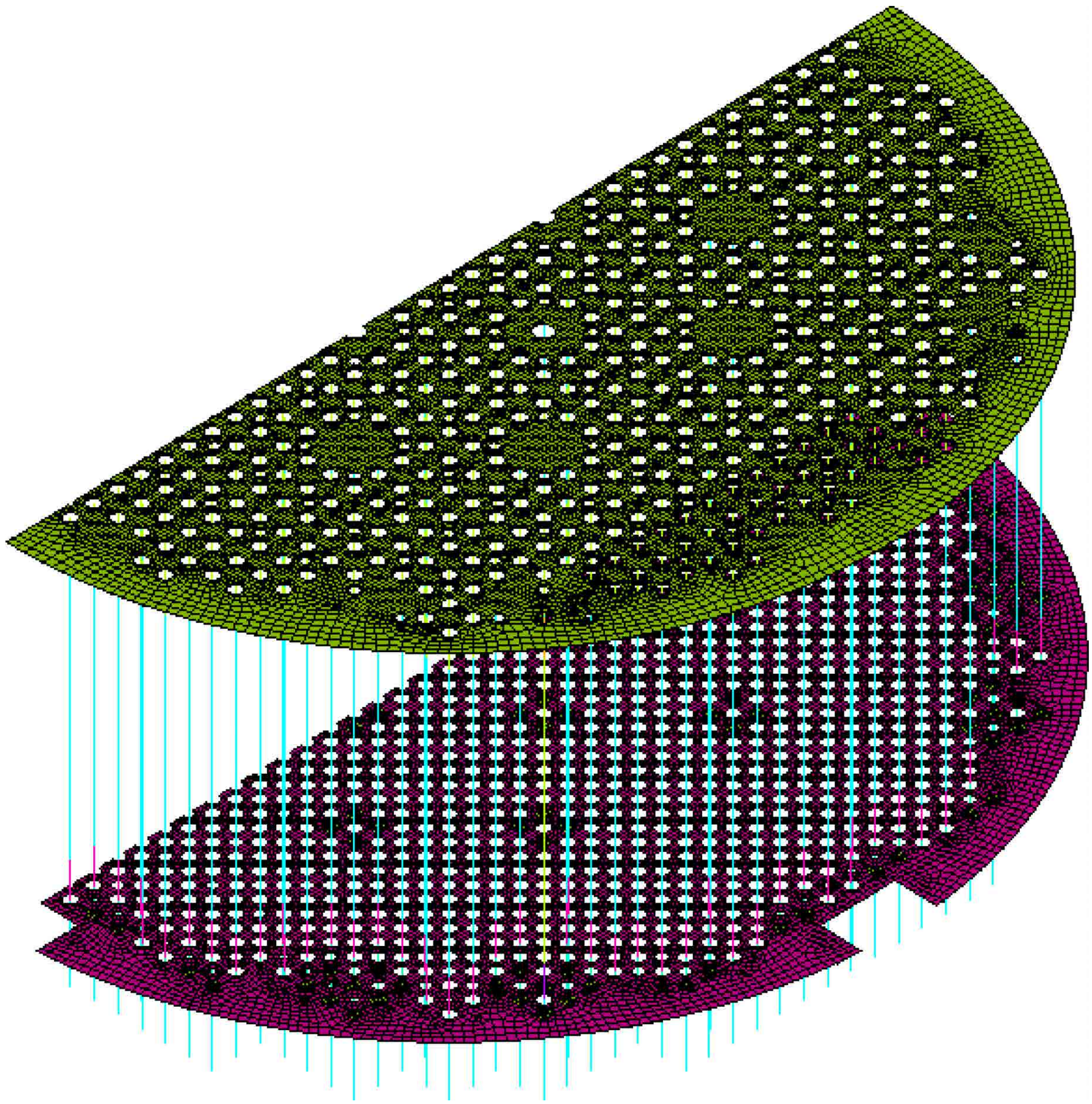

Figure 3.9-5 Finite Element Model of the CEA Guide Tubes

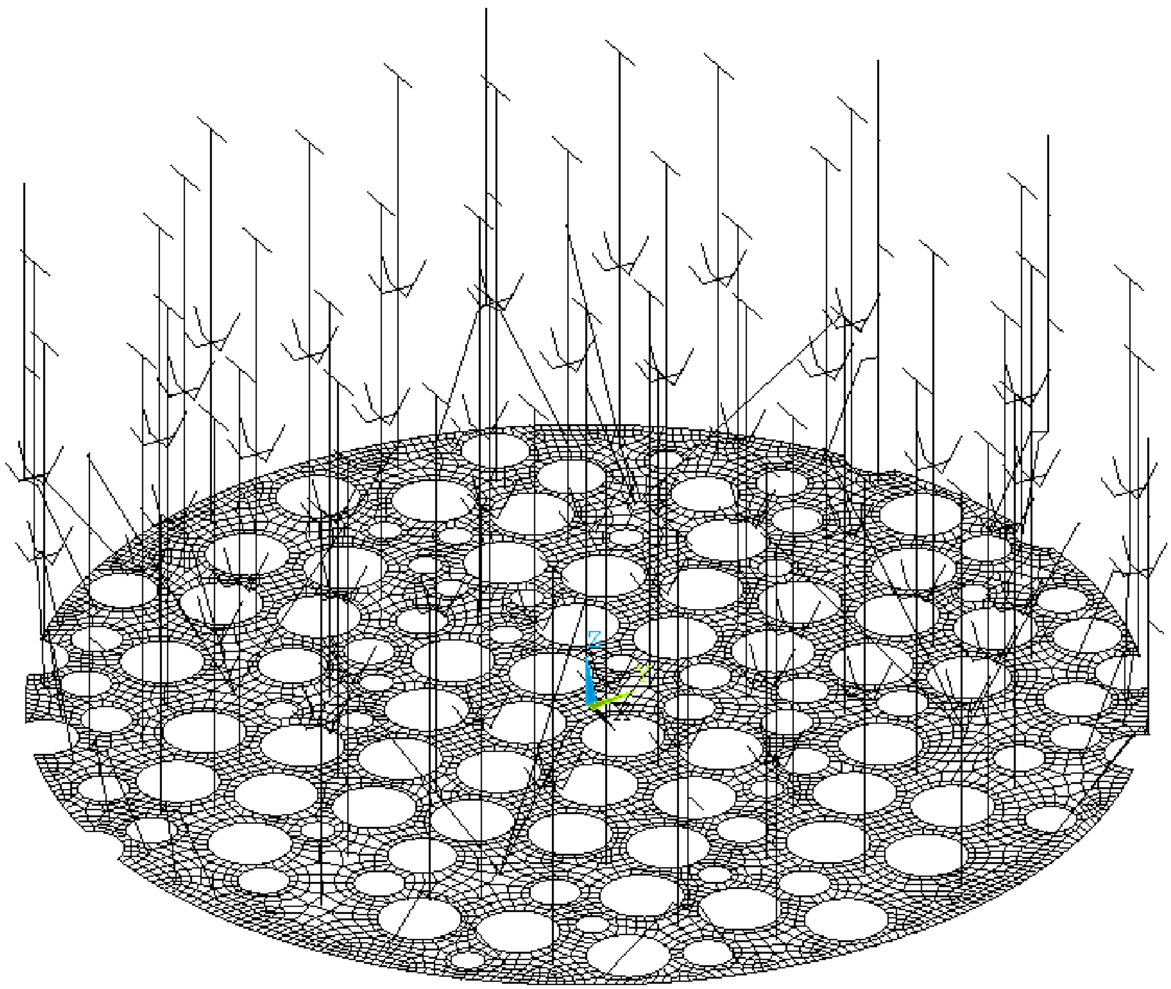

Figure 3.9-6 Finite Element Model of Lower Support Structure / In-Core Instrumentation Nozzle Assembly

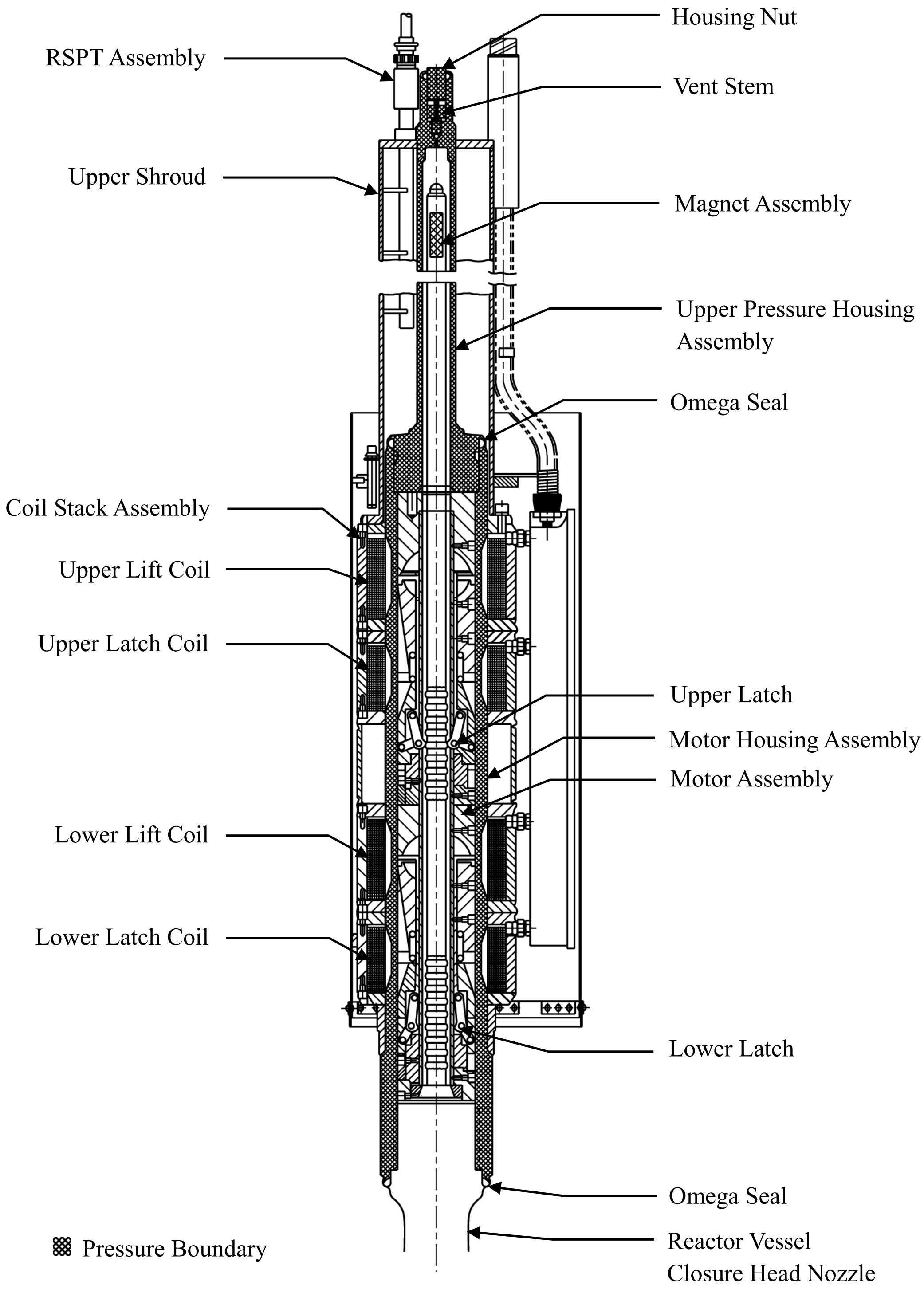

Figure 3.9-7 Control Element Drive Mechanism

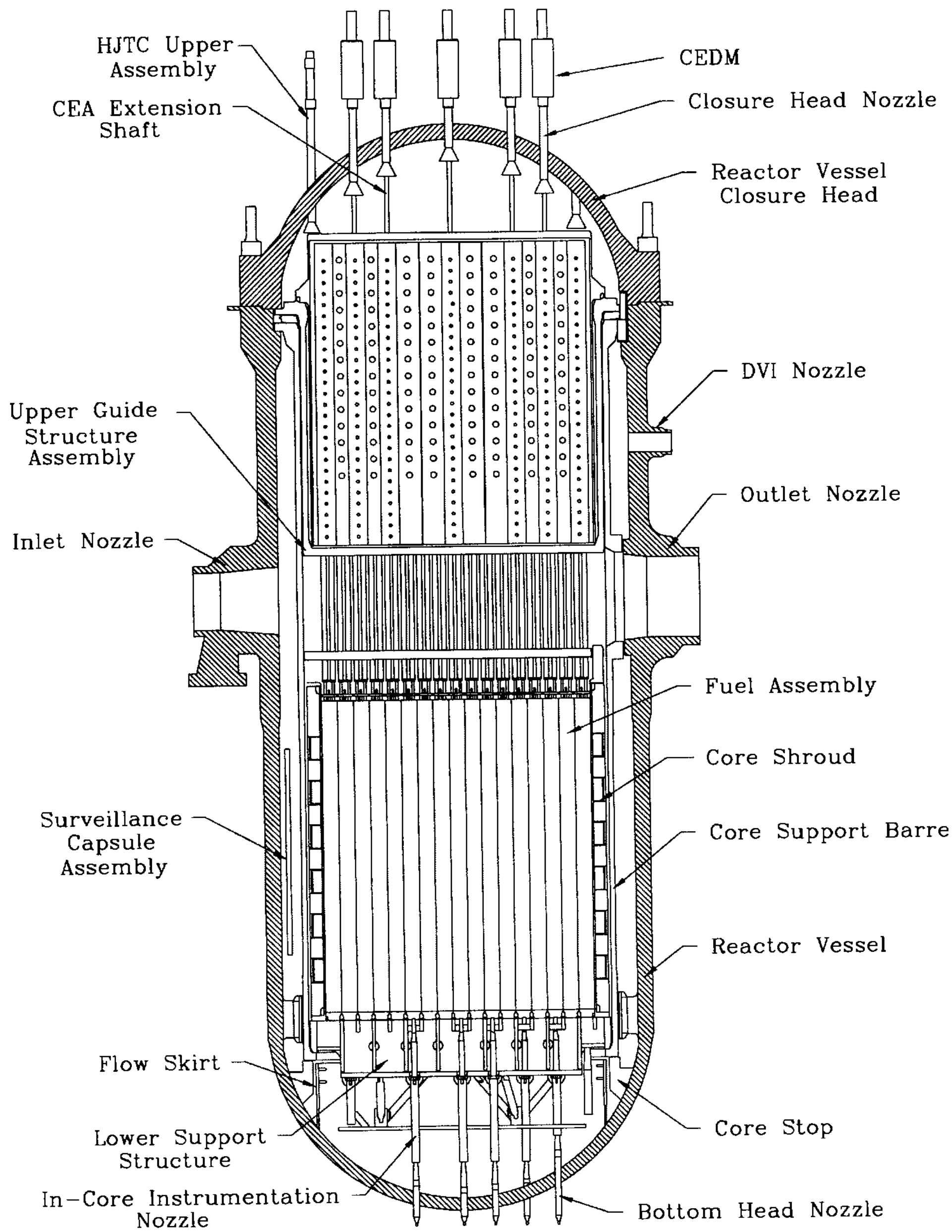

Figure 3.9-8 Reactor Internals Arrangement

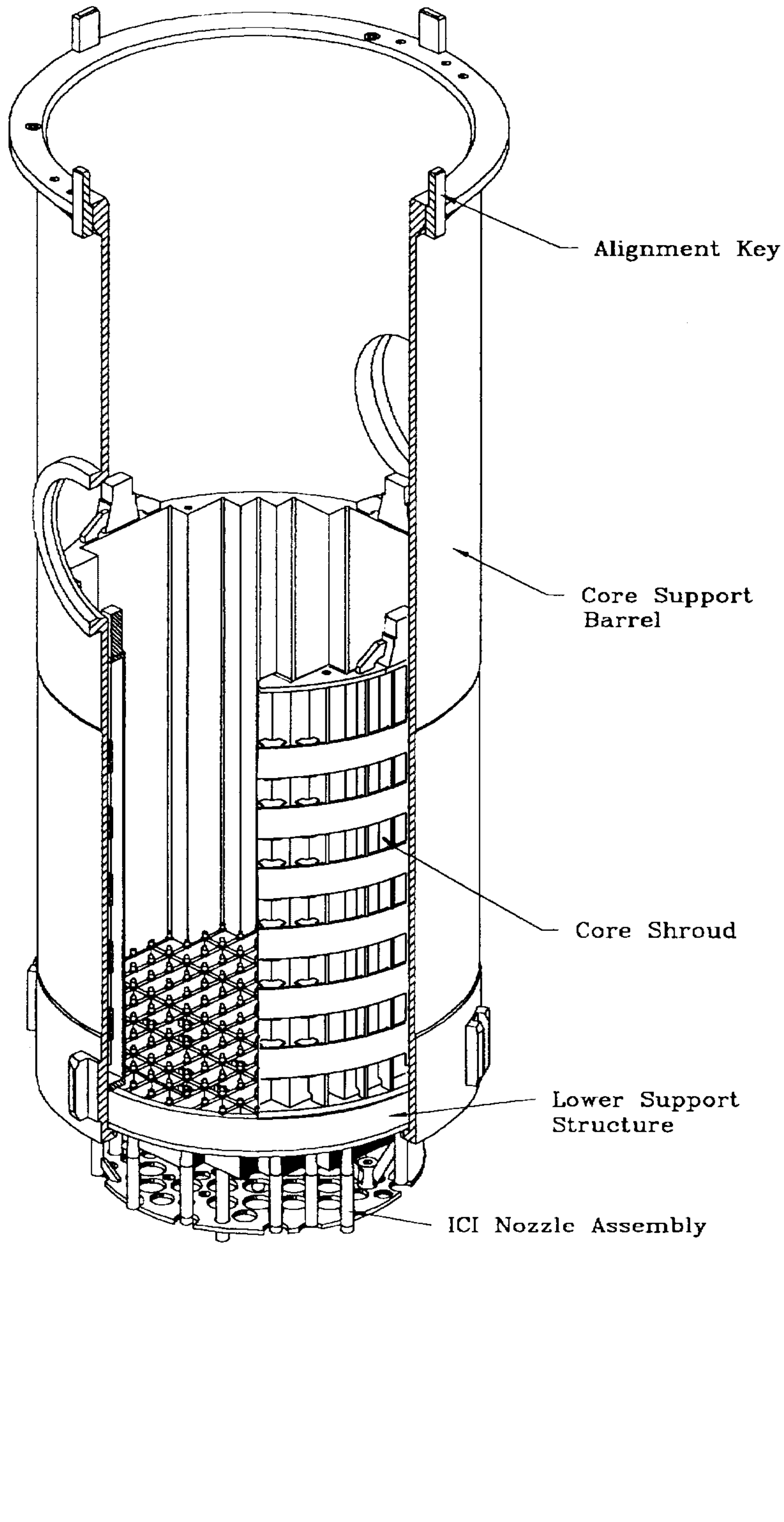

Figure 3.9-9 Core Support Barrel Assembly

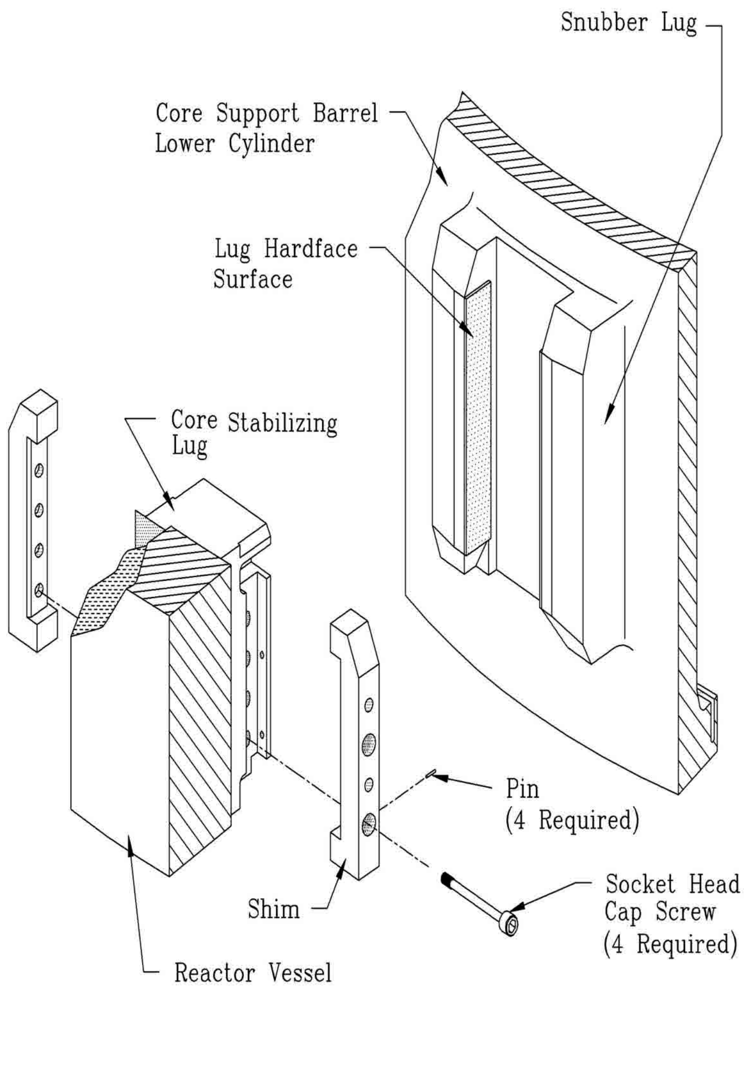

Figure 3.9-10   Reactor Vessel / Core Support Barrel Snubber Assembly

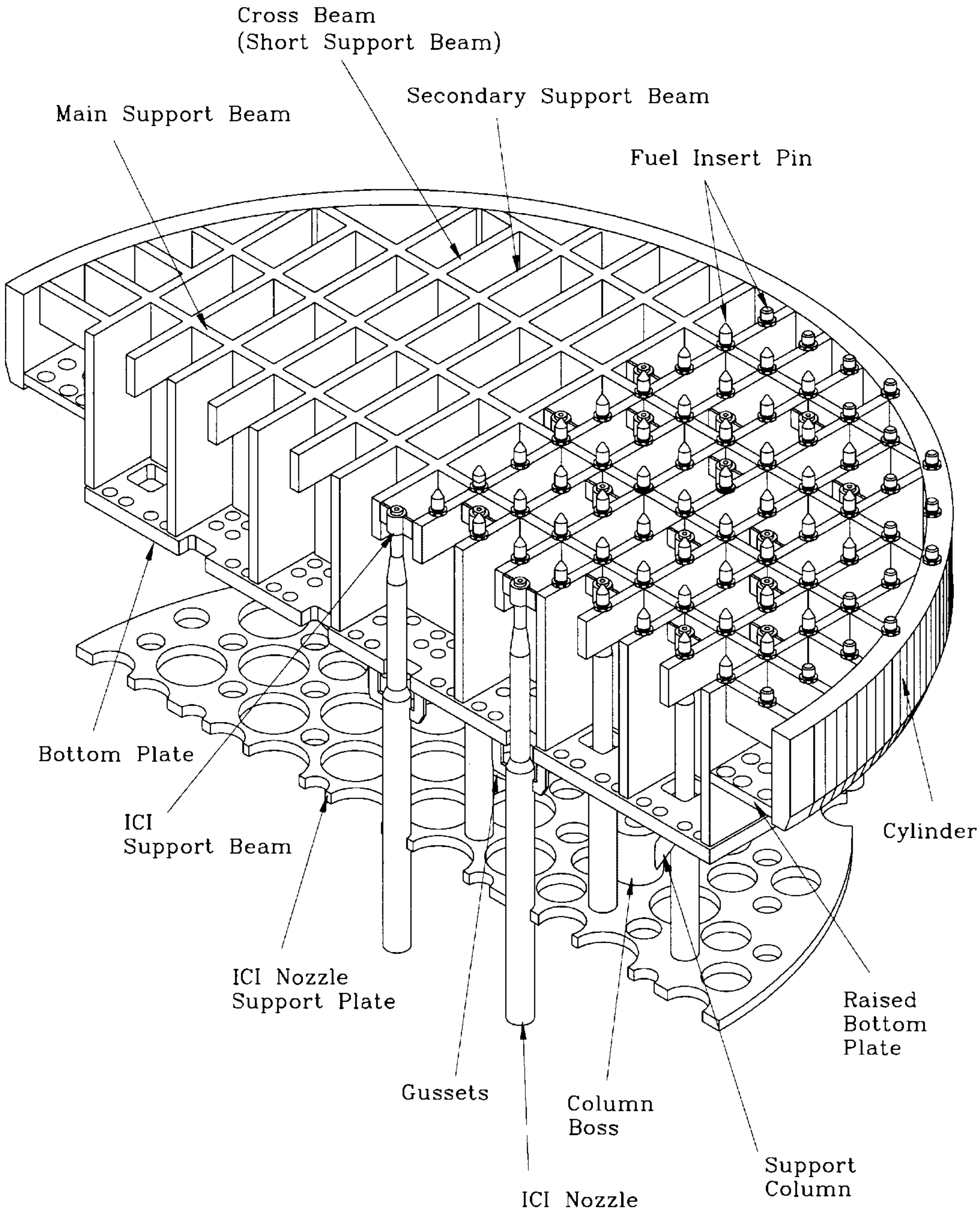

Figure 3.9-11 Lower Support Structure / ICI Nozzle Assembly

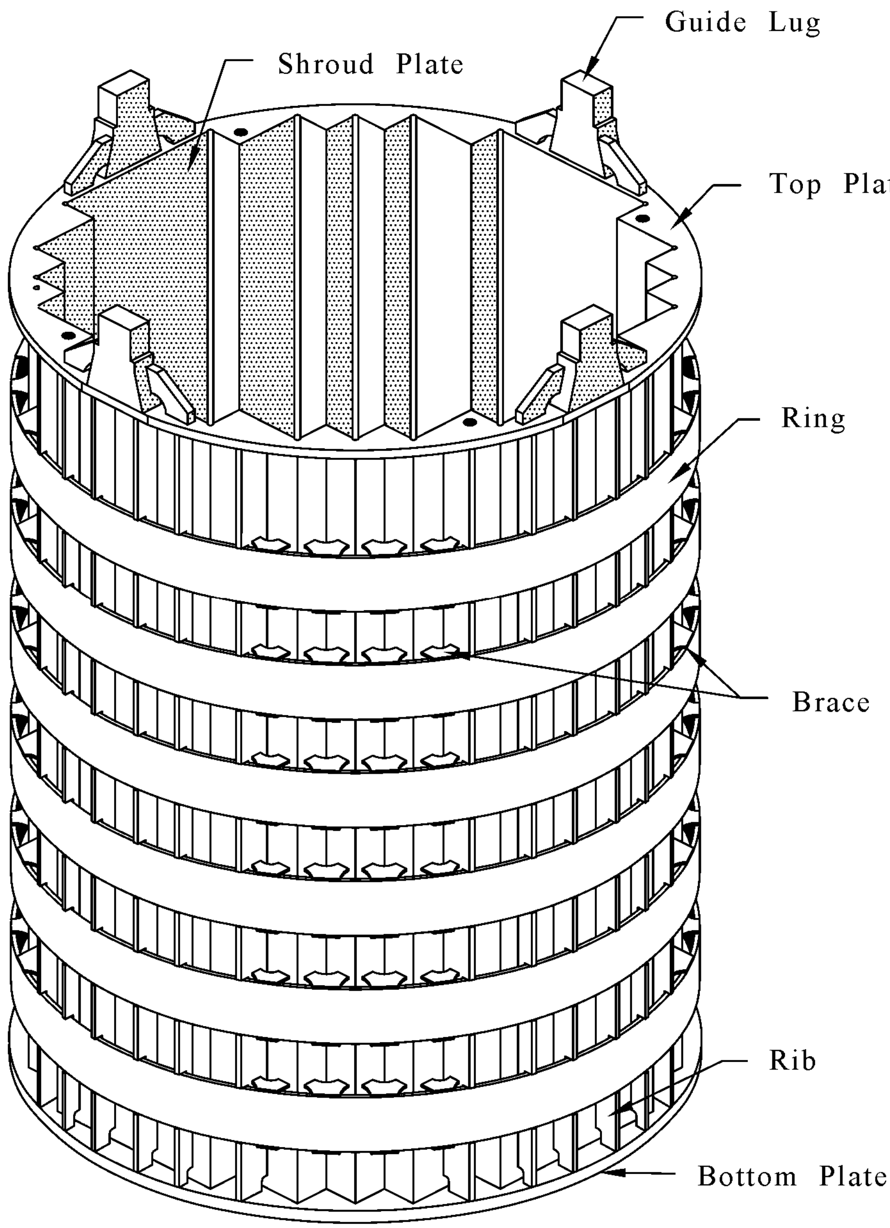

Figure 3.9-12   Core Shroud

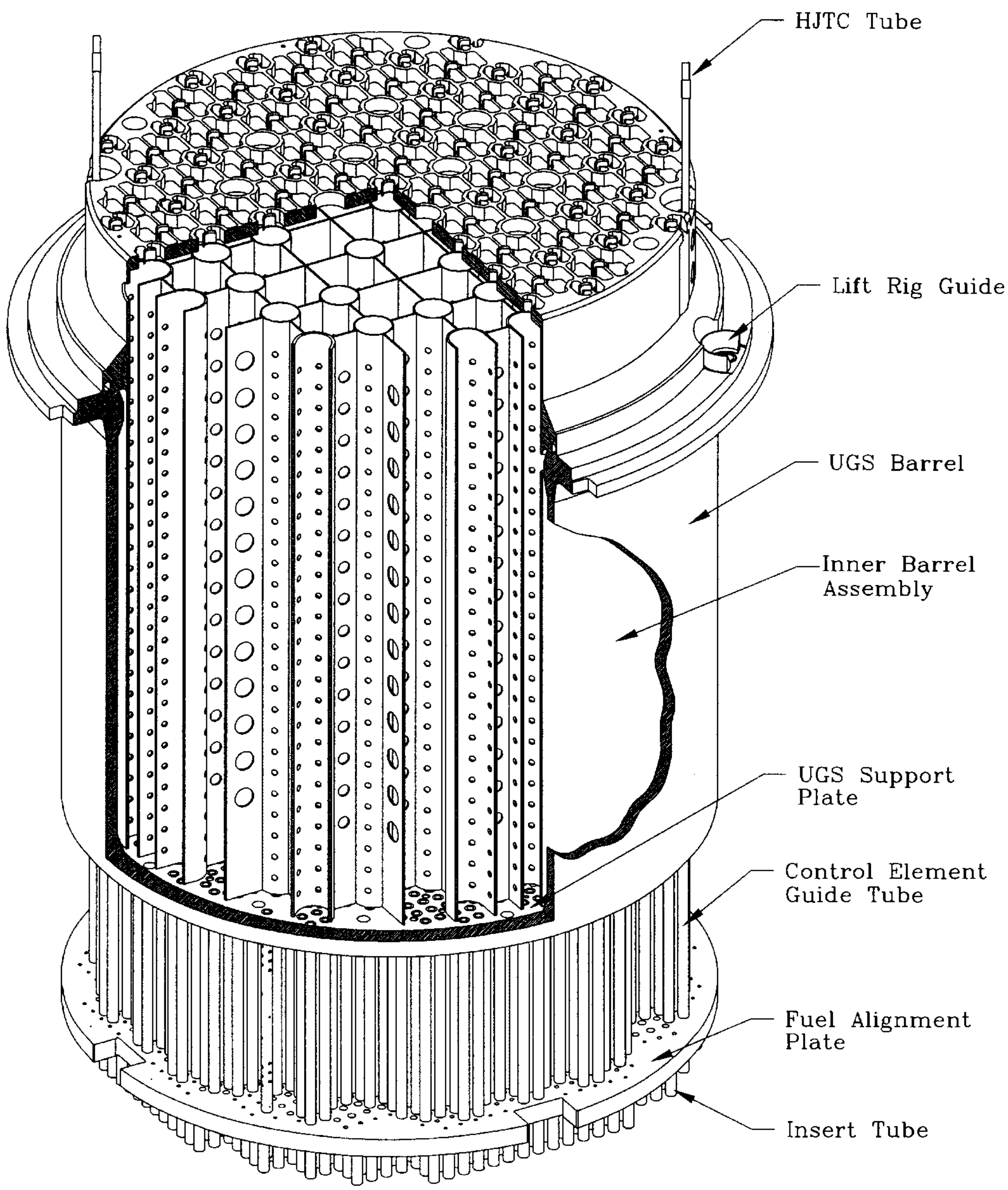

Figure 3.9-13 Upper Guide Structure Assembly

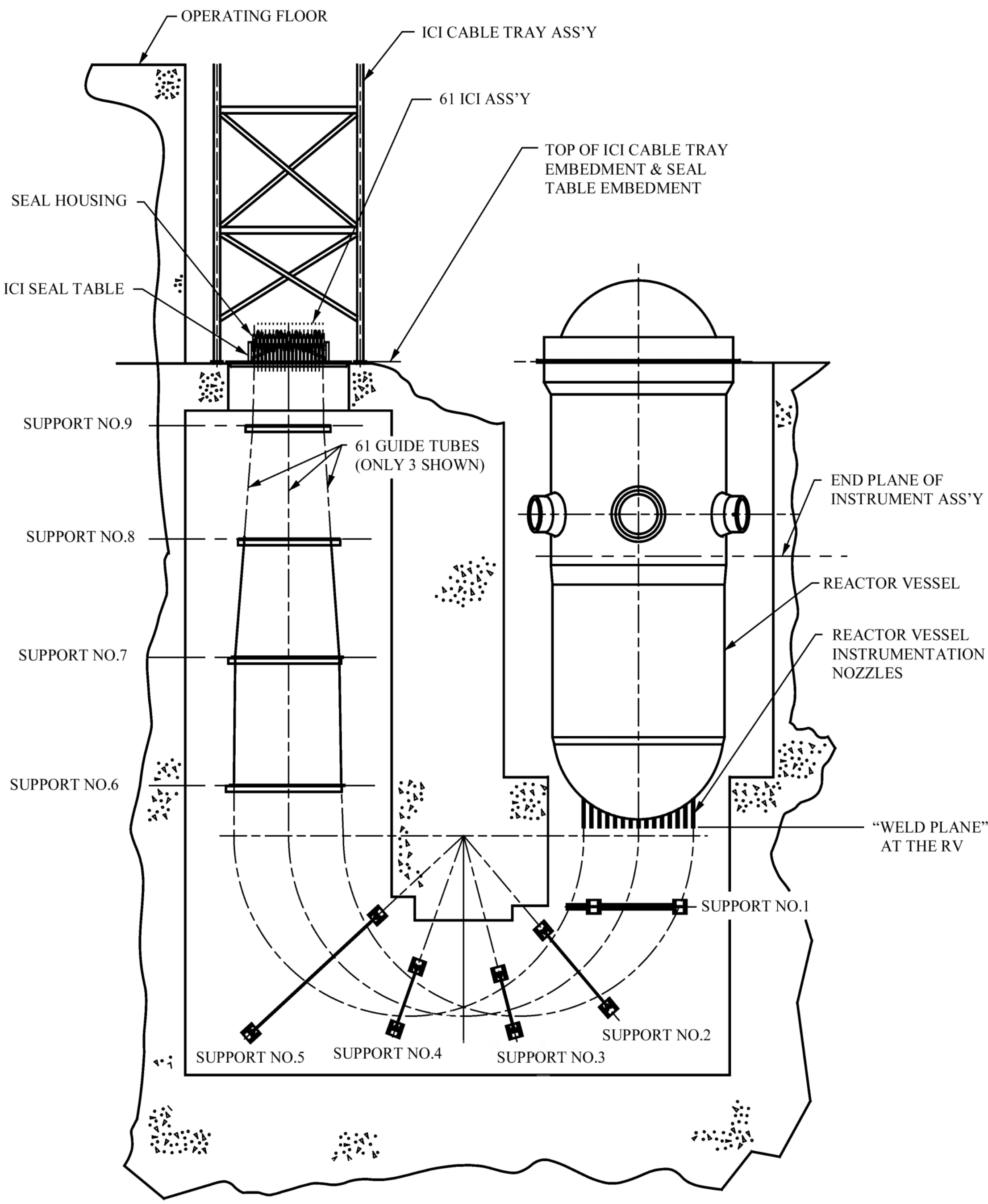

Figure 3.9-14 In-Core Instrumentation Support System

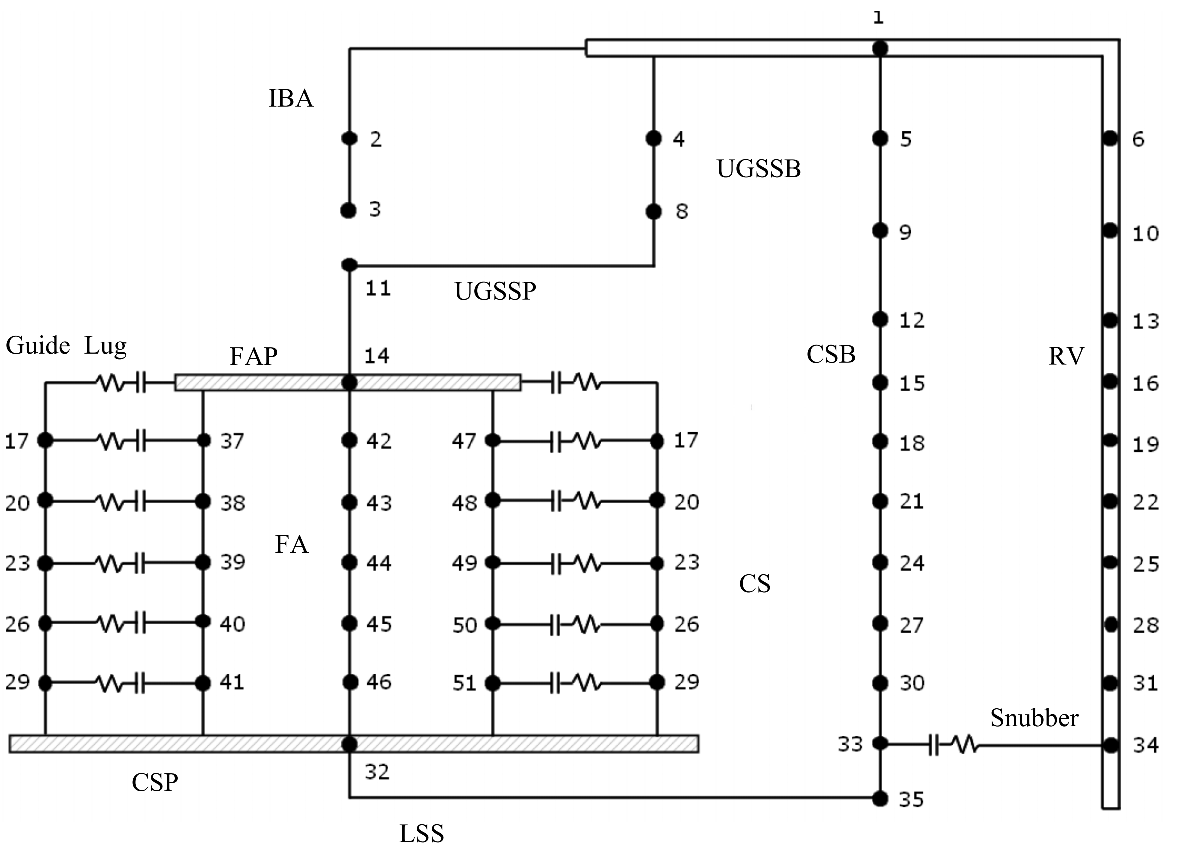

Figure 3.9-15 Horizontal Seismic and Pipe Break Analysis Model of Reactor Internals

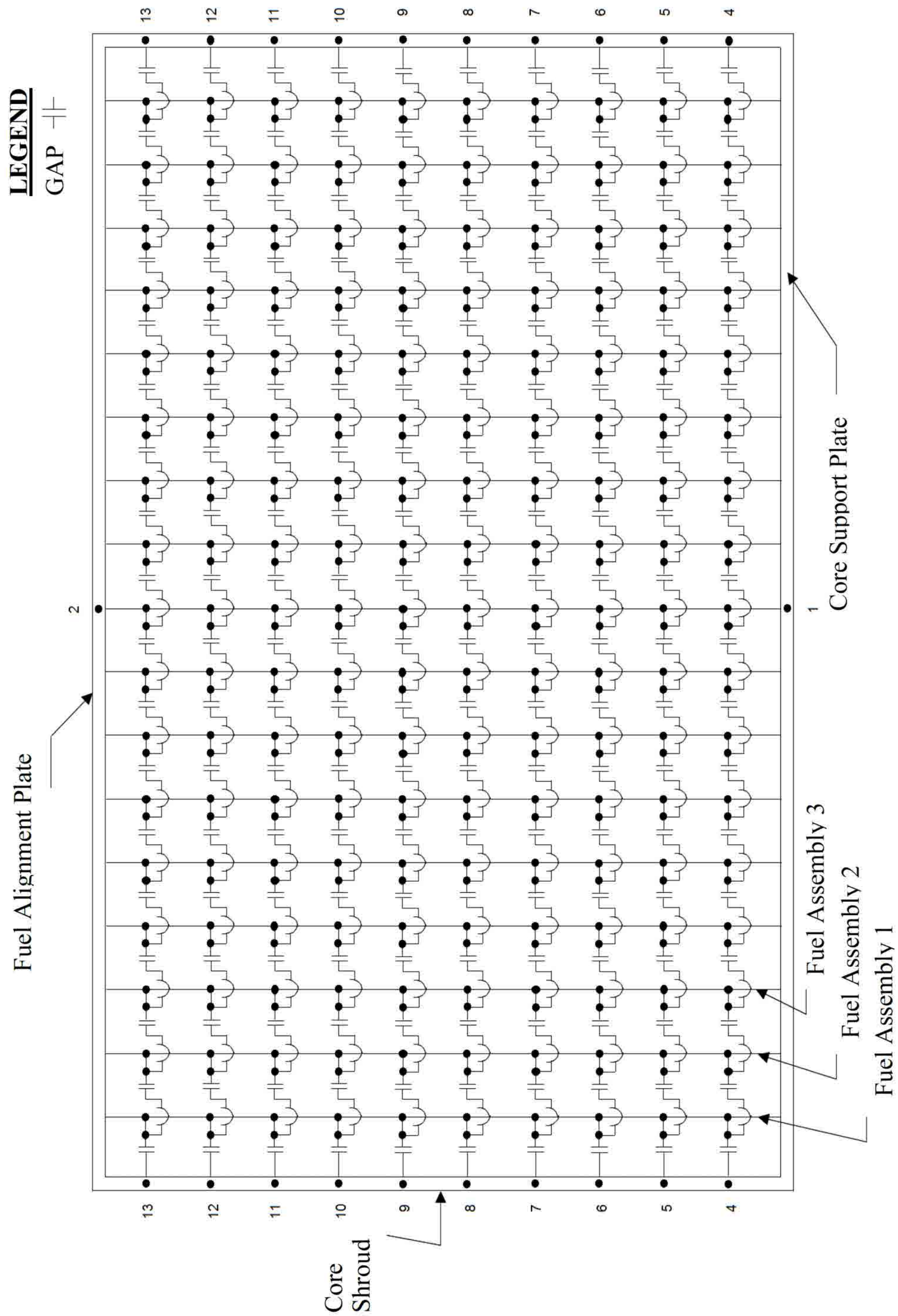

Figure 3.9-16 Core Seismic Analysis Model – One Row of 17 Fuel Assemblies

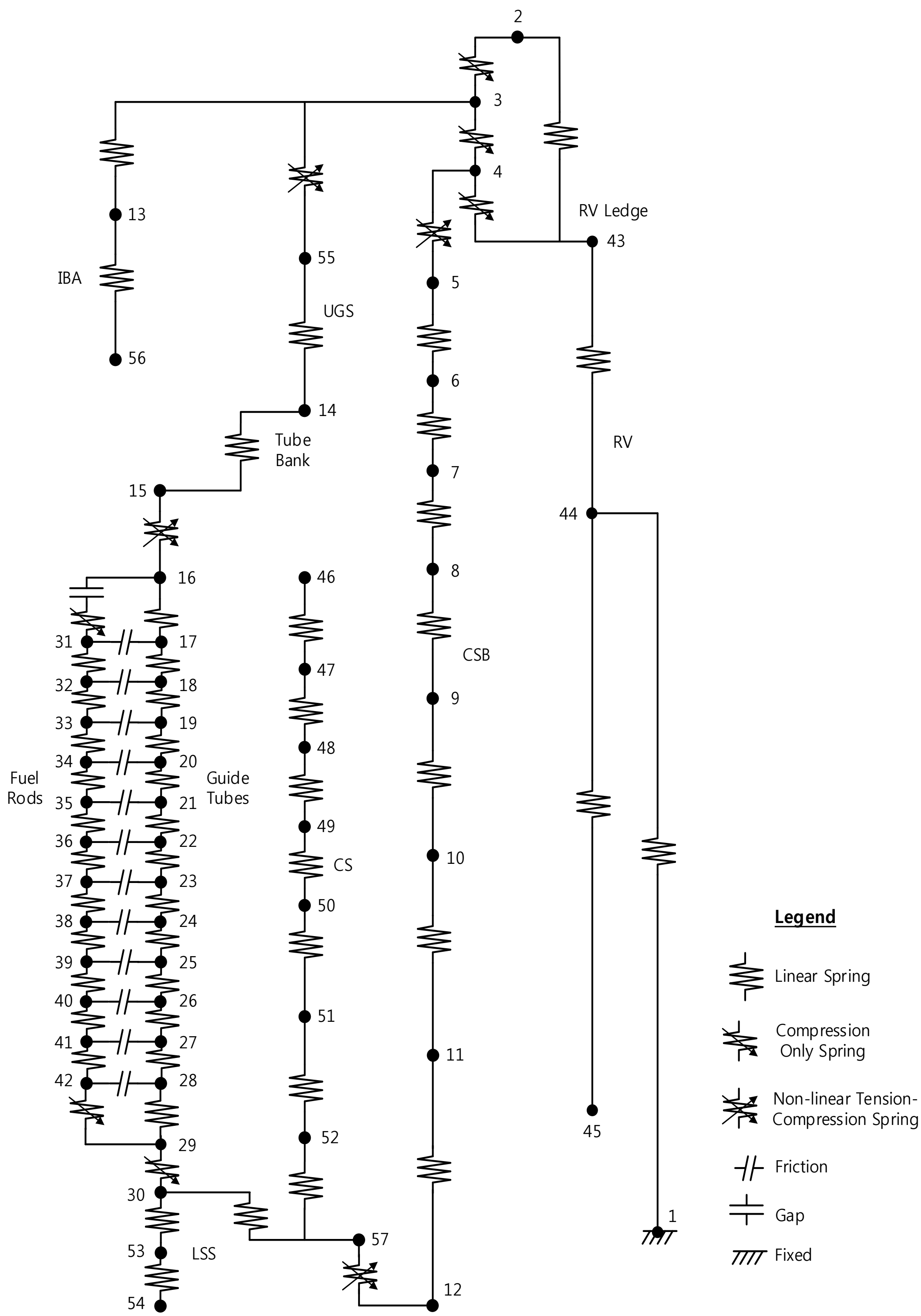

Figure 3.9-17 Vertical Seismic and Pipe Break Analysis Model of Reactor Internals

APPENDIX 3.9A

SUPPLEMENTAL INFORMATION ON CRITERIA OF THE APR1400 DISTRIBUTION SYSTEMS

APPENDIX 3.9A – SUPPLEMENTAL INFORMATION ON CRITERIA OF THE APR1400 DISTRIBUTION SYSTEMS

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APPENDIX 3.9A – SUPPLEMENTAL INFORMATION ON CRITERIA OF THE APR1400 DISTRIBUTION SYSTEMS

3.9A.1 HVAC Ductwork and Supports

3.9A.1.1 General

Heating, ventilation, and air conditioning (HVAC) ductwork is designed and supported to withstand the loading combinations presented in this section, as applicable. The design and analysis guidelines herein apply to seismic Category I and II HVAC ductwork and supports. Seismic Category II HVAC ductwork and supports, as defined in Subsection 3.2.1, are analyzed to provide reasonable assurance that their failure would not adversely impact safety-related equipment or components. The SSCs design procedure for differential settlement and relative displacement is described in Subsection 3.8.5.8.

3.9A.1.2 Design Considerations

3.9A.1.2.1 Internal Pressure Load (P_O, P_A)

Internal pressure loads (P_o, P_A) do not affect the design of HVAC duct supports but should be considered in the design of ductwork. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) guidelines (References 1 and 2) are used in determining duct thickness, stiffener, and companion angle requirements.

3.9A.1.2.2 Dead Load (D)

Dead load (D) includes the weight of the ductwork itself, in-line components (e.g., dampers, humidifiers, in-duct electric heaters), externally mounted components, and insulation. Self-weight of structural members and dead load of ductwork are considered in the design of HVAC duct supports. An additional 23 kg (50 lb) concentrated load is considered in the design of HVAC duct supports for attachments such as conduits and lighting fixtures.

3.9A.1.2.3 Thermal Load (T_O, T_A)

Stresses resulting from the movement of supports or expansion of ductwork under temperature changes are avoided by using expansion joints in the system design. For ducts with gasket companion angles, thermal loads are negligible.

3.9A.1.2.4 Seismic Load (SSE)

Seismic loads on HVAC ductwork and support systems are considered using the methods described in Subsection 3.9A.1.4.3. Stresses are determined from the seismic excitation in each of the three orthogonal directions by a square root of the sum of squares (SRSS) method.

3.9A.1.2.5 Live Load (L)

HVAC duct supports are designed to withstand the expected live load. The live load considered is a construction/maintenance man-load of 114 kg (250 lb). Live load is not considered in the design of HVAC ductwork.

3.9A.1.2.6 External Pressure Differential (EPD)

HVAC ductwork and supports are designed to withstand dynamic external pressure differential (EPD) loads resulting from postulated pipe breaks. This condition is normally precluded by routing ductwork away from the affected area.

3.9A.1.2.7 Wind Load (W)

Exposed safety-related HVAC ductwork and supports are designed to withstand forces generated by wind.

3.9A.1.3 Load Combinations

The load combinations to be considered for the design of HVAC ductwork and support are as follows:

Service Level	Load Combination
A (Normal)	$D + L + P_o + T_o$
B (Severe)	$D + W + P_o + T_o$
C (Extreme)	$D + SSE + P_A + T_A$
D (Abnormal)	$D + SSE + EPD + P_A + T_A$

Where:

D = dead load
L = live load
W = wind load

P_o = internal pressure load in normal operation
P_A = internal pressure load in accidental operation
T_o = thermal load in normal operation
T_A = thermal load in accidental operation
SSE = safe shutdown earthquake
EPD = external pressure differential

3.9A.1.4 Analysis and Acceptance Criteria

3.9A.1.4.1 General

Structural integrity of HVAC ductwork and supports is demonstrated to provide reasonable assurance that the ductwork and support functions are not impaired. Ductwork stresses are maintained within the allowable limits. Ductwork deflection is limited to the maximum deflection criteria. HVAC duct support stresses are also maintained within the allowable limits.

3.9A.1.4.2 Damping Values

The following damping values are used in the design of HVAC ductwork and supports:

Structures	Damping Values
HVAC ductwork	7%
HVAC duct supports	4%

3.9A.1.4.3 Seismic Analysis

3.9A.1.4.3.1 Equivalent Static Analysis Method

The equivalent static analysis method is used for HVAC ductwork and supports. The system response is assumed to be the peak of the required response spectra. This response is then multiplied by a static coefficient of 1.5. The seismic load in the design of HVAC ductwork and supports is obtained by multiplying the peak acceleration by a static coefficient of 1.5 and the participating mass.

3.9A.1.4.3.2 Dynamic Analysis Method

If a specific dynamic analysis is required, HVAC ductwork and supports are modeled to accurately represent the mass distribution and stiffness characteristics. The response spectrum modal analysis or time history analysis can be applicable.

3.9A.1.5 Allowable Stress Criteria

All HVAC ductwork and supports safely sustain stresses induced by the various loading conditions. The stress values are provided as a basis for evaluating the required structural integrity of the HVAC ductwork and supports.

For HVAC ductwork, the allowable stresses for the various operating conditions are as follows:

Service Level	Allowable Stress
A (Normal)	Basic Allowable Stress
B (Severe)	Basic Allowable Stress
C (Extreme)	1.6 × Basic Allowable Stress
D (Abnormal)	1.7 × Basic Allowable Stress

For stiffeners, companion angles, and HVAC duct supports, the allowable stresses for the various operating conditions are as follows:

Service Level	Allowable Stress
A (Normal)	Basic Allowable Stress
B (Severe)	Basic Allowable Stress
C (Extreme)	1.6 × Basic Allowable Stress

Connections are designed so that stress levels in welds and bolts do not exceed the basic allowable stresses under any of the operating conditions.

3.9A.1.5.1 Basic Allowable Stress

3.9A.1.5.1.1 HVAC Ductwork

Basic allowable stresses for HVAC ductwork are per the American Iron and Steel Institute (AISI) “Cold-Formed Steel Design Manual” (Reference 3). The basic allowable stress for the stiffener, companion angle for HVAC ductwork is determined based on ANSI/AISC

N690, "Specification for the Design, Fabrication and Erection of Steel Safety-Related Structures for Nuclear Facilities" (Reference 4).

3.9A.1.5.1.2 HVAC Duct Supports

Basic allowable stresses for structural steel, welds, and bolts are per ANSI/AISC N690 (Reference 4).

3.9A.1.6 Allowable Deflection Criteria

Maximum deflection is evaluated to provide reasonable assurance that the duct function is not impaired and the required clearances are maintained.

3.9A.1.7 Welding and Weld Acceptance Criteria

Welding activities for HVAC ductwork are accomplished in accordance with American Welding Society (AWS) D1.3 (Reference 5). For HVAC duct supports, welding activities are fulfilled in accordance with AWS D1.1 (Reference 6). The visual acceptance criteria of welding are defined in standard NCIG-01 (Reference 7).

3.9A.2 Cable Tray/Conduit Supports

3.9A.2.1 General

Cable tray and conduit are designed and supported to withstand the loading combinations presented in this section, as applicable. The design and analysis guidelines herein apply to seismic Category I and II cable tray/conduit supports as defined in Subsection 3.2.1. The SSCs design procedure for differential settlement and relative displacement is described in Subsection 3.8.5.8.

3.9A.2.2 Design Considerations

3.9A.2.2.1 Dead Load (D)

Dead loads (D) include the weight of the cable tray or conduit, fittings, covers, and any other dead loads applied to the system. An additional 23 kg (50 lb) concentrated load is considered in the design of the cable tray supports for attachments such as conduits and lighting fixtures.

3.9A.2.2.2 Live Load (L)

Cable tray supports are designed to withstand expected live load. The live load considered is a construction/maintenance man load of 90 kg (200 lb). Live load is not considered in the design of conduit supports. However, where live loads such as wind and snow are applicable, they are considered in the design.

3.9A.2.2.3 Seismic Load (SSE)

Cable tray/conduit supports are designed to withstand seismic load. Stresses are determined for the seismic excitation in each of the three orthogonal directions by the SRSS method. Seismic load is determined using the equivalent static analysis method or the dynamic analysis method.

3.9A.2.2.3.1 Equivalent Static Analysis Method

The equivalent static analysis method is used for cable tray/conduit supports. The system response is assumed to be the peak of the required response spectra. This response is then multiplied by a static coefficient of 1.5. The seismic load in the design of the cable tray/conduit supports is obtained by multiplying the peak acceleration by a static coefficient of 1.5 and the participating mass.

3.9A.2.2.3.2 Dynamic Analysis Method

If specific dynamic analysis is required, the cable tray/conduit supports are modeled to accurately represent their mass distribution and stiffness characteristics. The response spectrum modal analysis or time-history analysis can be used.

3.9A.2.3 Load Combinations and Allowable Stress Criteria

The loading combinations considered for the design of cable tray/conduit supports are as follows:

Service Level	Load Combination
A (Normal)	D + L
C (Extreme)	D + SSE

Where:

D = dead load

L = live load (only for cable tray supports)
SSE = safe shutdown earthquake

For cable tray/conduit supports, the allowable stresses for the various operating conditions are as follows:

Service Level	Allowable Stress
A (Normal)	Basic Allowable Stress
C (Extreme)	1.6 × Basic Allowable Stress

3.9A.2.3.1 Basic Allowable Stress

Basic allowable stresses for the structural steel, welds, and bolts of cable tray/conduit supports are determined based on ANSI/AISC N690 (Reference 4).

3.9A.2.4 Damping Value

The following damping values are used in the design of the cable tray/conduit supports:

Structures	Damping Values
Cable tray support	7%
Conduit support	5%

3.9A.2.5 Welding and Weld Acceptance Criteria

Welding activities for cable tray/conduit supports are accomplished in accordance with AWS D1.1 (Reference 6). The visual acceptance criteria of welding are defined in standard NCIG-01 (Reference 7).

3.9A.3 References

1. SMACNA 1922, "Rectangular Industrial Duct Construction Standards," Sheet Metal and Air Conditioning Contractors' National Association, 2004.

2. SMACNA 1520, "Round Industrial Duct Construction Standard," Sheet Metal and Air Conditioning Contractors' National Association, 1999.

3. AISI Manual, "Cold-Formed Steel Design," American Iron and Steel Institute, 2008.

4. ANSI/AISC N690 with Supplement No. 2, "Specification for the Design, Fabrication and Erection of Steel Safety-Related Structures for Nuclear Facilities," American Institute of Steel Construction, 2004.

5. AWS D1.3-2008, "Structural Welding Code - Sheet Steel," American Welding Society, 2008.

6. AWS D1.1-2010, "Structural Welding Code - Steel," American Welding Society, 2010.

7. EPRI NP-5380, NCIG-01, "Visual Weld Acceptance Criteria for Structural Welding of Nuclear Power Plants," Rev. 2, Electric Power Research Institute, 1987.

APPENDIX 3.9B

REACTOR COOLANT SYSTEM ANALYSIS

APPENDIX 3.9B – REACTOR COOLANT SYSTEM ANALYSIS

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APPENDIX 3.9B – REACTOR COOLANT SYSTEM ANALYSIS

3.9B.1 Introduction

This appendix describes the methods that are used to analyze the reactor coolant system (RCS).

The RCS has two loops that are connected to the reactor vessel (RV). Each loop consists of one steam generator (SG), two reactor coolant pumps (RCPs), one hot leg pipe connecting RV and SG, and two cold leg pipes connecting SG, RCP, and RV. One pressurizer (PZR) is connected to one of the hot leg pipes. All components are located inside the containment building. The arrangement of the RCS is shown in Figures 5.1.3-1 and 5.1.3-2.

The RCS structural analyses for safe shutdown earthquake (SSE) and in-containment refueling water storage tank (IRWST) discharge events are performed using the coupled model of the RCS, PZR, and containment building. The structural analyses for normal operating conditions and branch line pipe breaks (BLPBs) are performed by using separate RCS and the PZR models with the building stiffnesses at the support interfaces.

Dynamic analyses of the RCS and PZR under SSE, BLPB, and IRWST discharge conditions are performed by using time-history analysis methods. A time-history analysis adopts direct integration, mode superposition, and complex frequency response method.

The results of the static and dynamic analyses are used for the design and analysis of the RCS components and their substructures. The major components of the RCS are designed in accordance with ASME Section III (Reference 1). Reasonable assurance of the structural integrity is provided by meeting the stress and fatigue limits in ASME Section III (Reference 1).

3.9B.2 Reactor Coolant System Structural Model

This section describes the structural analysis models of the RCS and PZR. The models are created using the finite element analysis code ANSYS, which is described in Subsections 3.9.1.2.1.6 and 3.9.1.2.2.1.

The two-loop RCS structural model, a lumped-mass stick (or beam) model, consists of the representations of the RCS components, RCS supports and reactor coolant loop (RCL) piping. The component models consist of one RV with its internals, including the fuel and the supports; two SGs with their internals and supports; and four RCPs with motors and supports. All branch pipelines are eliminated from the RCS model because the mass and rigidity of the piping do not significantly influence the dynamic behavior of the RCS. This dynamic decoupling is in accordance with the decoupling criteria for the seismic analysis specified in NUREG-0800, SRP 3.7.2 (Reference 2).

The RCS structure is mathematically represented by the elements in the ANSYS library listed below. The model is developed using the nominal dimensions and locations. The RCS and PZR models are illustrated in Figures 3.9B-1 and 3.9B-2, respectively. The spatial locations and orientations are defined by the set of orthogonal axes in which the y axis represents the vertical direction, and the x and z axes are in the horizontal plane.

The ANSYS library elements are as follows:

a. Beam element (3-dimensional)

b. Pipe element (3-dimensional straight pipe and elbow)

c. Spar element (3-dimensional)

d. Stiffness matrix element (3-dimensional)

e. Lumped mass (3-dimensional)

The beam element properties include the cross-sectional area, the moments of inertia about the x, y, and z axes of the element coordinate system, which is dependent on element orientation, and the shear areas. The beam element represents the portions with basic cross-sectional shapes such as a circle or rectangle. Typically, the RCS components and RV vertical support columns are represented by beam elements.

The straight pipe element properties are the inner and outer diameters, and elbow pipe element properties include the inner and outer diameters and the radius of curvature with options for in-plane and out-of-plane bending flexibility factors. The pipe element represents primarily the RCL piping.

The spar element property is the cross-sectional area. The spar element represents primarily the supports pinned at both ends such as RCP support columns and the SG and RCP snubbers.

The stiffness matrix element represents the portions with complicated features that are not simply represented by beam or pipe elements. The stiffnesses of the RV primary inlet and outlet nozzles, and key attachments to components, are determined from static analyses using detailed finite element models, and the stiffnesses are modeled using the matrix elements.

The mass of each component and its enclosed fluid is distributed where the dynamic characteristics can be represented and where the dynamic characteristic of the components can be adequately transmitted to other components by considering possible dynamic interactions between the components. The lumped masses are distributed on the locations that can maintain the center of gravity and the mass moment of inertia of the components.

The PZR is modeled in the same way the RCS model is generated and with the same element types and mass discretization.

To account for dynamic interactions between the RV and the integrated head assembly (IHA) including the control element driving mechanisms (CEDMs), the IHA reduced model is coupled to the RV model. The IHA reduced model is generated in the same way the RCS model is generated.

3.9B.2.1 RCS Component Supports

a. Reactor supports

   The RV is supported by four vertical columns located under the vessel inlet nozzles. A column pad integrally attached to the vessel inlet nozzles is placed in the horizontal direction to allow radial growth of the vessel during thermal expansion and to restrain tangential motions for dynamic load conditions. Four vertical columns also support the RV in the vertical direction. The supports are designed to accommodate normal operation, seismic, IRWST discharge, and BLPB loads. The column base plate acts as a keyway to restrain the bottom of the RV for dynamic load conditions. Typical RV supports are shown in Figure 3.8-15.

b. Steam generator supports

The SG is supported at the bottom by a sliding base bolted to an integrally attached conical skirt. The sliding base rests on low-friction spherical head bearings, which allow unrestrained thermal expansion of the RCS. Two keyways in the sliding base mate with embedded keys to guide the movement of the SG during expansion and contraction of the RCS and also limit movement of the bottom of the SG during seismic, IRWST discharge, and BLPB events.

A system of keys and snubbers located on the steam drum guides the top of the SG during thermal expansion and contraction of the RCS and provide support during seismic, IRWST discharge, and BLPB events. Typical SG supports are shown in Figure 3.8-16.

c. Reactor coolant pump supports

RCP supports consist of four vertical columns that support the vertical loads of the RCP, two horizontal snubbers, two upper horizontal columns, and two lower horizontal columns. The vertical and horizontal columns provide support for the pumps during normal operation, seismic, IRWST discharge, and BLPB conditions. Typical RCP supports are shown in Figure 3.8-17.

d. Pressurizer supports

The pressurizer is supported by a cylindrical skirt, as shown in Figure 3.8-18. This skirt is welded to the pressurizer and bolted to the support structure. The skirt is designed to withstand deadweight and normal operating loads as well as the loads due to seismic, pressurizer pilot-operated safety relief valve (POSRV) actuation, IRWST discharge, and BLPB events. Four keys welded to the upper shell of the pressurizer provide restraints for seismic, pressurizer POSRV actuation, IRWST discharge, and BLPB events.

3.9B.3 Static Analysis

To determine the structural behaviors for normal operating conditions, static analyses are performed. The RCS and the PZR is statically analyzed for the deadweight, internal pressure, and thermal expansion.

For the static analyses, special considerations are given to the supports and the branch lines: the snubbers and gapped supports are released to avoid restraining the RCS and the PZR, and the reaction loads determined from the branch line analyses at the nozzles on the components and piping are imposed on the corresponding nozzles to account for the influences of the branch lines.

3.9B.4 Dynamic Analysis

The RCS is designed to withstand the combined effects of normal operating conditions together with the dynamic loads such as earthquakes, postulated pipe breaks, and IRWST discharge events. Dynamic analyses for these three events are performed to determine the dynamic responses of the RCS and the PZR. This section describes the dynamic analyses.

Dynamic analyses are performed using the time-history method of dynamic response analysis.

The damping values used in the analysis of seismic Category I and II structures, systems, and components are selected from Table 3.7-7. The damping values given in Table 3.7-7 include those recommended in NRC RG 1.61, (Reference 3).

The results of dynamic analyses contain the forces and moments, maximum displacements, response spectra, and time histories. The results of the RCS dynamic analyses are used for the design and analysis of RCS components and substructures including connected branch lines. The resultant response spectra are broadened by 15 percent to account for uncertainties in the frequencies of the structural model.

3.9B.4.1 Seismic Analysis

The RCS seismic model is coupled with the finite element model of the containment internal structures, which is incorporated into the model of nuclear island structures, as described in Subsection 3.7.2.3.3. The RCS model consists of the RV, SG, RCP, RCL piping, PZR, and PZR surge line. The RCS and the PZR models are described in Section 3.9B.2 and shown in Figures 3.9B-1 and 3.9B-2, respectively.

As described in Subsection 3.7.2.4, the soil-structure interaction (SSI) analysis of seismic Category I structures is performed using the complex frequency response method. The model of nuclear island structures including the RCS is used in the SSI analysis. The seismic responses of the RCS are determined from the SSI analysis. Earthquake input motion for the SSI analysis in the form of synthetic acceleration time histories is described in Subsection 3.7.1.1.2.

3.9B.4.2 Postulated Pipe Break Analysis

To determine the structural responses to the break effects of the pipelines to which the leak-before-break (LBB) concept is not applied, the structural analyses of the RCS and the PZR are performed for each break. For the analyses, time-dependent break effects are applied to the RCS and the PZR models, which are modified from the model described in Section 3.9B.2 to accommodate the various dynamic effects: the mass is distributed to more nodes, and the gaps in the support systems are modeled. With the geometric nonlinearities of the gaps, the analyses are performed using the nonlinear time-history analysis method. The integration time step for the analyses is short enough to be able to consider the instantaneous dynamic effects of pipe breaks. Break effects of a specific break are applied to the structural analyses on a case-by-case basis.

Break effects are as follows:

a. Jet impingement and thrust

   The determination of pipe thrust and jet impingement loads for postulated pipe breaks is described in Subsection 3.6.2.3.2.1.

b. Subcompartment pressurization

The differential pressurization across the component described in Subsection 6.2.1.2 is considered to be external forces on the components for the structural analyses of the RCS and PZR. External forces resulting from the differential pressurization across the component in a compartment are determined by multiplying the differential pressures in nodalized spaces by the pressurized areas of the components and a factor of 1.4, as described in Subsection 6.2.1.2.3.

c. Blowdown loads

Blowdown loads for postulated pipe breaks are described in Subsection 3.9.2.5.2.

d. Nozzle loads

Nozzle loads imposed by the dynamic motions of the pipe in an intermediate break and a nozzle break when multiple nozzles are connected to the same pipeline are considered for the structural analyses of the RCS and PZR. The loads are determined from the analyses of the piping systems.

e. Blast wave loads

Blast wave loads for postulated pipe breaks are described in Subsection 3.6.2.4.4.

3.9B.4.3 In-Containment Refueling Water Storage Tank Discharge Analysis

The hydrodynamic loads on the IRWST described in Subsection 6.8.4.3 are taken into consideration for the RCS and PZR structural analyses.

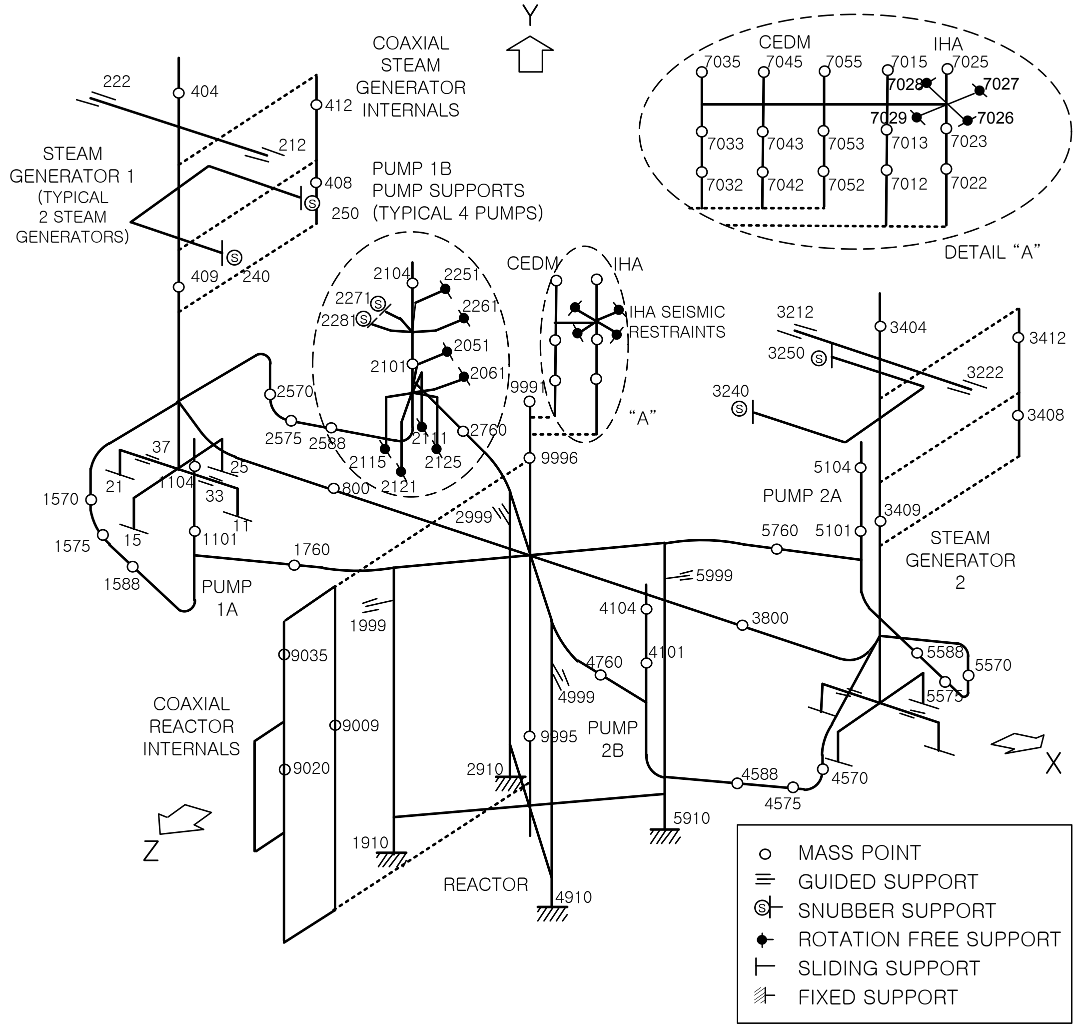
The IRWST discharge analysis model is a coupled model of the RCS and the containment internal structures. Time-history analyses are performed to determine structural responses to the hydrodynamic loads on the IRWST.

3.9B.5 References

1. ASME Boiler and Pressure Vessel Code, Section III, Division 1, "Rules for Construction of Nuclear Facility Components," The American Society of Mechanical Engineers, the 2007 Edition with the 2008 Addenda.

2. NUREG-0800, Standard Review Plan, Section 3.7.2, "Seismic System Analysis," Rev. 4, U.S. Nuclear Regulatory Commission, September 2013.

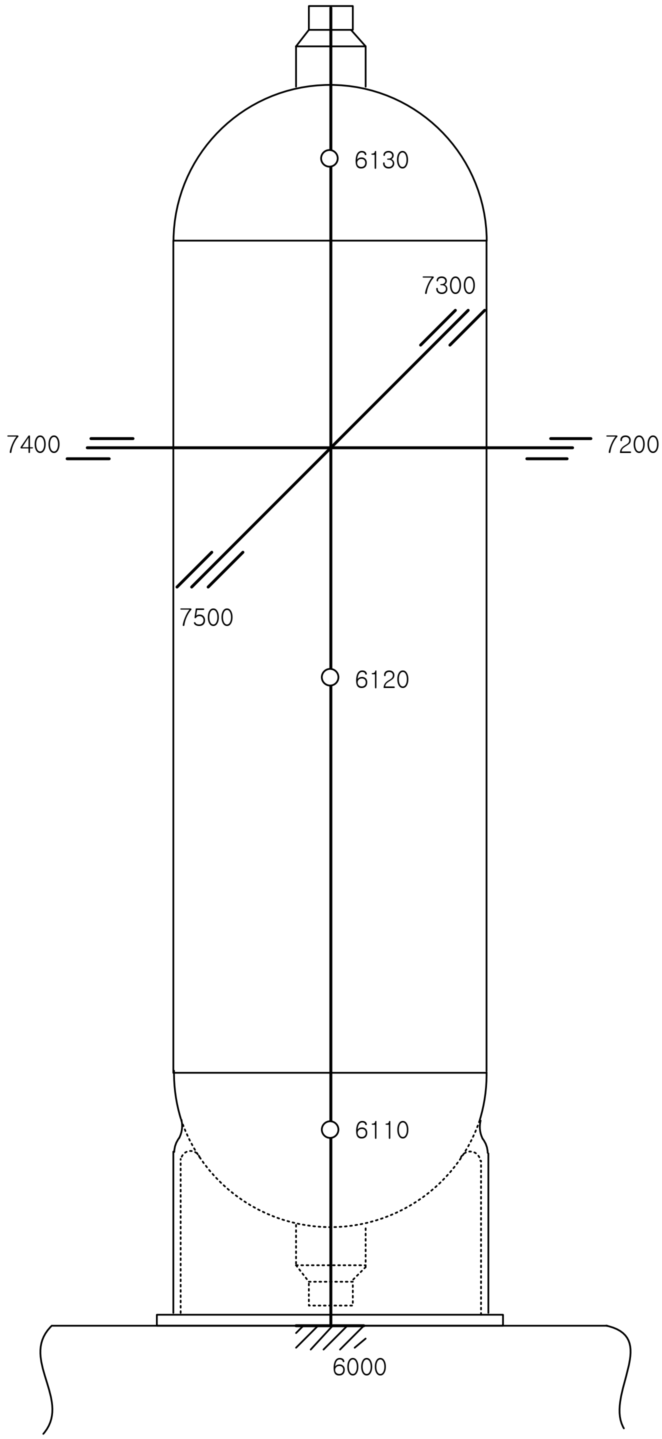
3. Regulatory Guide 1.61, "Damping Values for Seismic Design of Nuclear Power Plants," Rev. 1, U.S. Nuclear Regulatory Commission, March 2007.

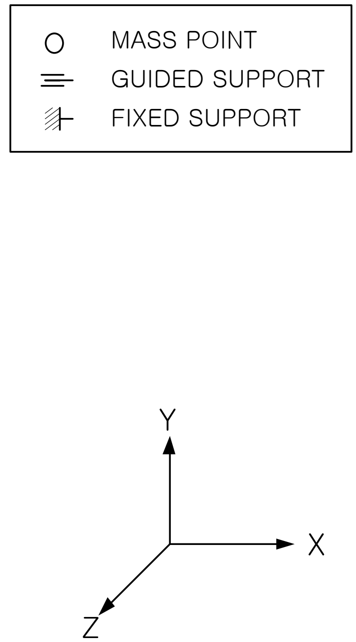


COMPONENT NAME	MASS POINT NUMTER	DEGREES OF FREEDOM
REACTOR	9996,9009,9020,9035,7012 7013,7015,7022,7023,7025 7032,7033,7035,7042,7043 7045,7052,7053,7055 9995,9991	X,Y,Z X,Y,Z X,Y,Z X,Y,Z X,Z
STEAM GENERATOR	404,412,3404,3412 408,409,3408,3409	X,Y,Z X,Z
REACTOR COOLANT PUMP	1101,2101,4101,5101 1104,2104,4104,5104	X,Y,Z X,Y,Z
REACTOR COOLANT PIPING	800,3800 1760,2760,4760,5760 1570,2570,4570,5570 1575,2575,4575,5575 1588,2588,4588,5588	X,Y,Z X,Y,Z X,Y,Z X,Y,Z X,Y,Z

COMPONENT NAME	SUPPORT POINT NUMBER	RESTRAINT DIRECTION
REACTOR	1999,2999,4999,5999 1910,2910,4910,5910 7026,7027,7028,7029	X,Z FIXED X,Y,Z
STEAM GENERATOR	11,15,21,25 3011,3015,3021,3025 33,37,3033,3037 240,3240,250,3250 212,222,3212,3222	Y Y Z X Z
REACTOR COOLANT PUMP (TYPICAL)	2111,2115,2121,2125 2051,2061,2251,2261 2271,2281	Y X,Z X,Z

Figure 3.9B-1 Reactor Coolant System Structural Analysis Model





MASS POINT NUMBER	DEGREE OF FREEDOM
6110, 6130 6120	X, Z X, Y, Z

SUPPORT POINT NUMBER	RESTRAINT DIRECTION
7200, 7400 7300, 7500 6000	Z X FIXED

Figure 3.9B-2 Pressurizer Structural Analysis Model

3.10 Seismic and Dynamic Qualification of Mechanical and Electrical Equipment

This section describes the acceptance criteria, code and standards, procedures, and methods applied to the seismic and dynamic qualification of mechanical and electrical equipment including instrumentation to provide reasonable assurance that they will withstand the effects of postulated events and accidents and still be capable of performing their safety-related functions under the full range of normal, transient, seismic, and accident loadings.

Safety-related equipment is the equipment necessary to provide reasonable assurance of the following:

a. The integrity of the reactor coolant pressure boundary

b. The capability to shut down the reactor and maintain it in a safe shutdown condition

c. The capability to prevent or mitigate the consequences of accidents that would result in potential offsite exposure in excess of the limits stated in 10 CFR Part 100

Seismic Category I equipment includes safety-related equipment and non-safety-related equipment. The seismic Category I equipment covered by this qualification section includes equipment associated with systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment reactor heat removal; equipment essential to preventing significant release of radioactive material to the environment; and instrumentation needed to assess plant and environs conditions during and after an accident as described in NRC RG 1.97 (Reference 1).

The function of this equipment may include:

a. Equipment that performs the above functions automatically

b. Equipment that operators use to perform the above functions manually

c. Equipment for which failure can prevent satisfactory accomplishment of one or more of the above safety functions

This includes equipment in the reactor protection system (RPS), the engineered safety features (ESF) Class 1E equipment, the emergency power system, and all auxiliary safety-related systems and supports.

Examples of mechanical equipment are valves, pumps, fans, and heat exchangers. Examples of electrical and I&C equipment are motor control centers, load centers, battery racks, and indicators. This equipment is divided into two categories:

a. Active Equipment – The equipment that must remain functional both during and after all postulated dynamic event such as fans, pumps, valves, motors, switches, relays, and transmitters.

b. Passive Equipment – The equipment whose safety-related function does not involve operability but that does require assurance of its structural and pressure integrity both during and after postulated dynamic events. Examples of some common items of equipment classified as passive include tanks, heat exchangers, and filter cabinets.

Seismic Category I SSCs are identified in Table 3.2-1. Safety-related mechanical and electrical equipment including instrumentation is designed to meet seismic Category I requirements to provide reasonable assurance of the ability to initiate required protective actions and to supply power to components required to mitigate the consequences of events that require safety system operation during and after a safe shutdown earthquake (SSE).

Some non-safety-related equipment are identified to meet seismic Category I requirements in Table 3.2-1. These equipment shall be capable of providing their intended function and maintaining structural integrity in accordance with specific design requirement. Fire protection system equipment can be in such category.

Mechanical and electrical equipment including instrumentation designated as seismic Category II is shown to maintain its structural integrity and not adversely impact safety-related equipment during an SSE and during all static and dynamic loads from normal, transient, and accident conditions.

3.10.1 Seismic Qualification Criteria

The seismic and dynamic qualification of mechanical and electrical equipment demonstrates the safety system equipment's ability to perform its required function during and/or after the time it is subjected to the forces resulting from SSE and other related dynamic loads at the location of the equipment. For the purpose of equipment seismic qualification, the equipment is qualified with five one-half SSEs followed by one full SSE.

The SSE term is applicable to the site-independent earthquake or the site-specific earthquake. The expression "safe shutdown earthquake" used for seismic qualification of SSCs in this section refers to equipment qualified for the site-specific design. The seismic Category I SSCs are designed for the SSE. Since the operating basis earthquake (OBE) is defined as one-third the SSE, an explicit analysis or design of the seismic Category I SSCs based on OBE is not required in accordance with Appendix S of 10 CFR Part 50 (Reference 2) as defined in Subsection 3.7.1.

When the OBE is defined as less than or equal to 1/3 SSE, explicit design or analysis is not required for the OBE. The COL applicant is to provide documentation that the designs of seismic Category I SSCs are analyzed for OBE, if OBE is higher than 1/3 SSE (COL 3.10(1)).

3.10.1.1 Qualification Codes and Standards

The seismic and dynamic qualification program provides reasonable assurance that equipment classified as seismic Category I meets functional performance requirements, as defined in design specification order of the equipment, during and after dynamic loadings due to normal operating, transient, seismic, and accident conditions.

The employed methods for the dynamic qualification described in Subsection 3.10.2 are in accordance with the requirements of GDC 1, GDC 2, GDC 4, GDC 14, GDC 30, and 10 CFR Part 50, Appendix S and Appendix B. The seismic and dynamic testing portion of the qualification program is performed in a sequence consistent with the requirements of Section 6 of IEEE Std. 323 (Reference 3).

The recommended guidance and requirements in NRC RG 1.100 (Reference 4) and IEEE Std. 344 (Reference 5) are used for the development and implementation of methods and procedures for seismic qualification of mechanical and electrical equipment.

The methods and procedures for seismic qualification of mechanical and electrical equipment are in accordance with the recommended guidance and requirements in NRC RG 1.100 and IEEE Std. 344. The seismic or dynamic qualification based on test, analysis, or a combination of test and analysis are performed except an experience-based qualification. An experience-based qualification is not used for any equipment until it is endorsed by NRC RG 1.100.

The seismic Category I mechanical equipment is designed to provide reasonable assurance of structural integrity of pressure boundary components for the intended service load conditions identified in the equipment's design specification, in accordance with the requirements in ASME Section III (Reference 6) described in Section 3.9. For qualification of non-safety-related, seismic Category I mechanical equipment is designed to provide reasonable assurance of structural integrity and its design intended function. For seismic qualification of active mechanical equipment, the methods and guidance in ASME QME-1-2007 (Reference 7), including Appendix QR-A, with exceptions provided in NRC RG 1.100, are used.

For procurement of equipment, the dynamic requirements for the seismic qualification are specified in the equipment's design specifications. The equipment supplier is to submit a seismic qualification plan/procedure for review and approval prior to performing the seismic qualification. When test is employed, the equipment supplier is to submit a detailed test plan prior to conducting the test. When analysis is employed, the equipment supplier is to submit a detailed analysis procedure showing the methodology, approval, and description of the computer program used. If the plan/procedure is not acceptable, the seismic test plan or analysis procedure will be modified accordingly. The choice between testing and analysis may be made by the equipment supplier. However, the selected qualification program shall satisfy the requirements of the purchase specifications in accordance with the guidelines provided in IEEE Std. 344.

An existing seismic qualification is acceptable if it is properly documented, and if it meets all the requirements of the purchase specifications. The equipment supplier is to submit the seismic qualification documentation for review and approval prior to installation in the plant. The seismic qualification documentation is to include all the information stated in Subsection 3.10.4, to demonstrate that the equipment is qualified in accordance with the requirements of the purchase specifications.

3.10.1.2 Input Motion

The postulated dynamic loads related to the qualification of seismic Category I equipment are seismic loads (OBE and SSE), if applicable, hydrodynamic loads, and non-seismic loads (loads induced by pump trip, safety-relief valve open-case, etc.). The applicable loads are combined as part of the qualification of seismic Category I equipment.

These postulated dynamic loads are generally defined by the required response spectra (RRS). For in-line mounted equipment, they are defined by seismic coefficients. The location(s) in the plant will determine which spectra to use. Floor response spectra (FRS) are generated for specific buildings and elevations (floors) within a building as described in Subsection 3.7.2.5. When equipment is not directly mounted on floors, RRS reflects the amplification of the FRS due to the flexibility of equipment supporting structure. Selection of damping values for equipment to be qualified is made in accordance with NRC RG 1.61 (Reference 8) and IEEE Std. 344. Higher damping values are used only if justified by documented test data with proper identification of the source and mechanism. Margins are added to RRS for testing. Subsection 6.3.2.5 of IEEE Std. 323 recommends a 10 percent margin.

In considering the high-frequency seismic effect, the COL applicant is to investigate if site-specific spectra generated for the COLA exceed the APR1400 design spectra (CSDRS) in the high-frequency range. Accordingly, the COL applicant is to provide reasonable assurance of the functional performance of vibration-sensitive components in the high-frequency range (COL 3.10(2)).

The seismic qualification test/analysis will be performed for the components to envelop the in-structure response spectra resulting from the entire set of CSDRS, including ground motions for the COL sites with high frequency content. Evaluation of seismic Category I equipment for high frequency seismic input is addressed in Subsection 3.7B.7.4 and Technical Report, APR1400-E-S-NR-14004-P, Section 6.4 (Reference 13).

3.10.1.3 Selection of Qualification Method

The dynamic qualification of equipment is performed by analysis, testing, or a combination of testing and analysis. The dynamic qualification of equipment is concerned with the following.

a. Identifying which equipment must be qualified

b. Identifying what the safety-related function(s) or designed intended function(s) required of each piece of equipment is (are)

c. Defining the dynamic loads to be considered

d. Demonstrating the capability of the equipment to perform its function

e. Documenting that the process has been done in accordance with accepted regulatory and industry standards

In general, seismic Category I electrical equipment, for which functional operability must be demonstrated, is qualified by tests. Analysis alone is used for qualification of seismic Category I mechanical equipment if structural integrity alone can provide reasonable assurance of the design intended function.

For equipment whose functional operability cannot be demonstrated by analysis or testing because of its size, complexity, or the large number of similar configurations, a combination of test and analysis may be used. With the elimination of OBE, analysis checks for fatigue effects can be performed at a fraction of the SSE (Such as five one-half SSE events followed by one full SSE event or a number of fractional peak cycles equivalent to the maximum peak cycle for five one-half SSE events followed by one full SSE event).

3.10.2 Methods and Procedures for Qualifying Mechanical and Electrical Equipment and Instrumentation

Qualification of seismic Category I equipment and its supports meets the requirements of NRC RG 1.100 and IEEE Std. 344. Qualification methods of testing and analysis for confirming the functionality of equipment during and after an SSE, and for all static and dynamic loads from normal, transient, and accident conditions, are presented in this section.

3.10.2.1 Qualification by Analysis

The seismic analysis methods are in accordance with the guidance of IEEE Std. 344. Analysis without testing may be acceptable only if structural integrity alone can provide reasonable assurance of the design-intended function.

Procedures are presented that can be used to seismically qualify equipment by analysis for a number of OBEs followed by an SSE. Two approaches to seismic analysis are described. One approach is based on dynamic analysis, the other on static coefficient analysis.

a. Static coefficient analysis

This is an alternate method of analysis that allows a simpler technique in return for added conservatism. A determination of natural frequencies is not required. The acceleration response of the equipment is assumed to be the maximum acceleration in the amplified region peak of the RRS at a conservative and justifiable value of damping. A static coefficient of 1.5 has been established from experience to take into account the effects of multifrequency excitation and multimode response for linear frame-type structures, such as members physically similar to beams and columns, which can be represented by a simple model. A lower static coefficient may be used when it can be shown to yield conservative results. In a static coefficient analysis, the seismic forces on each component of the equipment are obtained by multiplying the values of the mass times the maximum peak of the RRS times the static coefficient. The resulting force should be distributed over the component in a manner proportional to its mass distribution. The stress at any point in the equipment can then be determined by combining the stress at that point due to the earthquake loading in each direction using the SRSS method.

b. Detailed dynamic analysis

Detailed dynamic analysis is basically finite element analysis. As such, it is generally used on equipment for which the simple models used in static-of-seismic-coefficient analysis are inadequate and/or on equipment for which a significant multimode response (when more than one resonant frequency is being excited simultaneously) or cross-coupling (when input in one direction results in response in one or more other directions) is anticipated.

c. Nonlinear equipment response

Nonlinearities may exist in addition to those associated with damping. These effects may be of a geometric nature, such as the closing of gaps, working of connections and rattling of components, or of a material source such as localized yielding. These effects may result in changing stiffness with increasing load. As frequency is also a function of stiffness, the frequencies may also change under increasing load. If a system exhibits significant nonlinearity, such behavior must be recognized and accounted for in any subsequent analysis so as to accurately predict the system response. If the nonlinearities cannot be adequately modeled, an alternative qualification method should be considered.

Nonlinearity may also occur as a result of local vibrations of equipment structure. One example is the high-frequency rattling of electrical cabinet doors that are not solidly secured in place. When such a condition exists and the operability of the mounted devices is deemed sensitive to this type of equipment nonlinear behavior, the analytic procedure must account for the behavior and must be properly validated.

d. Other dynamic loads

The analytical methodology described in this section for seismic loading is equally applicable to other dynamic loadings, such as hydrodynamic loadings.

e. OBE and SSE analysis

The analysis must show that OBE events followed by an SSE will not result in failure of the equipment to perform its safety function. When the OBE is defined as less than or equal to 1/3 of the SSE, explicit design or analysis is not required for the OBE. With the elimination of the OBE, the guidance for determination of the earthquake cycles described in SECY-93-087 (Reference 9) is used. Alternatively, an equivalent number of fractional vibratory cycles to that of 20 full SSE vibratory cycles may be used (but with an amplitude not less than one-third of the maximum SSE amplitude) when derived in accordance with Annex D of IEEE Std. 344.

For floor-level excitation, this should be approximated by demonstrating that each excitation waveform will produce a response that includes the equivalent of at least 10 maximum peak-stress cycles. The number of OBEs and the fatigue-inducing potential per OBE are important only for low-cycle, fatigue-sensitive equipment. The analysis should determine that the structural integrity of the equipment is maintained in combination with other applicable loads during the OBE.

An analysis is performed using one of the previously described methods with five OBE events. Through the dynamic analysis or test, the equipment can be identified either rigid or flexible. For the determination of this characteristic, the modal analysis for the modeling of the equipment and any structural supports to express mass distribution and stiffness characteristics of the equipment and supports is performed to determine whether the equipment is rigid or flexible.

Rigid equipment can be analyzed using static analysis and seismic acceleration associated with the mounting location. Flexible equipment can by analyzed using the static coefficient method or using its dynamic response computed from a response spectrum, time history, or other analysis methods. The analysis determines that the structural integrity of the equipment is maintained in combination with other applicable loads during the OBE.

3.10.2.2 Qualification by Test

The seismic testing methods are performed in accordance with the guidance of IEEE Std. 344. Seismic testing is the most effective way of demonstrating operability, especially for instrumentation and for electrical components. Seismic testing is thus used to qualify these items of equipment. Generally, the seismic qualification by testing is conducted for equipment that cannot be qualified with analysis alone or equipment having components that potentially cause any malfunctions related to their intended functions.

Seismic testing is performed by subjecting equipment to vibratory motion that conservatively simulates movement at the equipment mounting while the operating conditions are simulated, and monitoring the performance of these devices during the test.

These postulated dynamic loads are generally defined by response spectra. The location(s) in the plant will determine which spectra to use. Floor response spectra are generated for specific buildings and elevations (floors) within a building as described in Subsection 3.7.2.5.

Seismic ground motion occurs simultaneously in all directions in a random fashion. Single-axis, biaxial, and triaxial testing is allowed. The single-axis test should be done in a conservative manner to account for the absence of input motion in some of the orthogonal directions. Single-axis and biaxial tests should be applied in a number of directions relative to the equipment to account for potential failure modes. An additional factor to be considered is the dynamic nature of the equipment (flexible or rigid) and the degree of cross-coupling.

a. Single-axis tests can be performed successively in the three principal orthogonal axed of the equipment at these times:

   1) when it can be proved that the coupling is zero (or very low) between the three principal axes of the equipment, taken in pairs; or

2) when the equipment, in a seismic event, is subjected to a single excitation that may be considered as single-axis because of equipment mounting conditions. For example, if a device is normally mounted on equipment that amplifies motion in one direction, or if the method of mounting a device constrains its motion in a particular direction, single-axis testing may be adequate.

b. Biaxial testing is acceptable if the tests conservatively reflect the seismic event at the equipment mounting locations. Coupling in equipment is considered. Biaxial testing includes simultaneous input in horizontal and vertical axes. The selection of the horizontal axis may include the principal axes or some other direction selected to expose potential failure modes by testing the equipment in its most vulnerable direction.

   Independent random inputs are preferred, and the test should be performed in two steps, with the equipment rotated 90 degrees in the horizontal plane for the second step. Statistical independence of the input motions should be reasonably assured.

   If independent inputs are not used (i.e., pseudo-biaxial), four tests should be performed: Test 1 with the inputs in phase, Test 2 with one input 180 degrees out of phase, Test 3 with the equipment rotated 90 degrees horizontally and the inputs in phase, and Test 4 with the same equipment orientation as the third test but with one input 180 degrees out of phase.

c. Triaxial tests are desirable when significant couplings exist simultaneously between the three preferred axes of the equipment. Triaxial tests must be performed with a simulator capable of independent motions in all three orthogonal directions. The input motions should be statistically independent.

d. The test response spectra (TRS) should envelop the RRS over the frequency range of interest. The TRS should be computed with a damping value equal to or greater than that of the RRS. The shake table maximum peak acceleration should equal or exceed the ZPA of the RRS. The total test duration and number of equivalent maximum peak cycles should be per IEEE Std. 344.

   Testing is performed to provide reasonable assurance that equipment can withstand the effects of seismic events and accidents and still be capable of performing its safety-related functions.

Seismic ground motion occurs simultaneously in all directions in a random fashion. Currently, single-axis, biaxial, and triaxial testing are allowed. A 10 percent margin is added on RRS during testing in accordance with Subsection 6.3.1.6 of IEEE Std. 323. The TRS must envelop the RRS in order for an item of equipment to be qualified (or justified). Sometimes, in a low-frequency area (below 3 Hz), TRS does not envelop RRS because of machine limitations. This requires justification based on the dynamic characteristics of the equipment. The TRS and RRS should be compared at the same damping value. A conservative TRS is greater than the RRS. Justification must be made when the TRS is less than the RRS.

Vibration aging testing may be performed preceding the OBE and SSE tests to show that the lower levels of normal and transient vibration associated with the plant operation will not adversely affect the equipment's function.

Seismic qualification tests include five OBE test preceding the SSE for specified seismic events.

3.10.2.3 Operability of Active Equipment

The supplier is to prove the operability of all active equipment before, during, and after design basis events including seismic by test and/or analysis and provide the test or analysis report as a part of the dynamic qualification report.

3.10.2.3.1 Mechanical Equipment

The methods and procedures used for qualifying active mechanical equipment (i.e., valves and pumps) are described in Subsections 3.9.3, 3.10.2, and this subsection. Analysis, test, or a combination of test and analysis are used for qualification of seismic Category I active mechanical equipment to show it maintains structural integrity and functionality. The methods are used to provide reasonable assurance of equipment operability for its intended function under required plant conditions.

Seismic Category I active mechanical equipment is designed to withstand seismic and other dynamic loads, including the intended service load conditions in the equipment design specifications, in accordance with the requirements in ASME Section III described in Subsection 3.9.3.

Seismic qualification for active mechanical equipment is in accordance with IEEE Std. 344, ASME QME-1, and NRC RG 1.100 as stated in Subsection 3.10.2.

For mechanical equipment, the functionality by analysis and/or tests is proven as follows:

a. Pumps

A static deflection analysis and/or test for the shaft and rotor (if applicable) should be performed under design basis loading, including the maximum allowable nozzle loads specified in the equipment design specification. The deflection is less than the allowable/recommended deflection by the equipment supplier.

b. Valves

The following are the acceptable methods that can be applied to demonstrate valve operability:

1) Manual Valves

Active manual valves are those that should be opened or closed after DBA. In this case, the equipment supplier is to prove that the valve moving parts (stem, disc, etc.) are not permanently damaged due to DBA along with the maximum operating and nozzle loads by analysis and/or test.

2) Check Valves

The integrity of the valve and its parts, including disc, disc support, hinge, hinge-pin, hinge-arm, and seat is proven by test and/or analysis. The valve's operability verification document should address all possible worst loading conditions on the valve during and after seismic events.

3) Other Active Valves

For seismic qualification of all other active valves, the methods and guidance in ASME QME-1-2007 are used.

c. Mechanical Drive Turbines

The operability of the mechanical drive turbine focuses primarily on the operability of auxiliary active components (valves, pumps, instruments) associated with or mounted on the turbine. The operability is determined by analysis and/or test.

d. Fans

Shaft and bearing deflections when the fan is subjected to the external design base loads are determined. The resulting clearance between the shaft and bearing as a result of these loads will be smaller than the recommended clearance by the manufacturer.

e. Diesel Engine

For the operability of the diesel engine and its auxiliary active components (valves, pumps, instruments), the methods described in NRC RG 1.9 (Reference 10) and IEEE Std. 387 (Reference 11) are used.

3.10.2.3.2 Electrical and Instrumentation

The supplier is to use the qualification test methods described in Subsection 3.10.2.2 to prove the operability of active electrical and instrumentation equipment.

3.10.3 Methods and Procedures of Analysis or Testing of Supports of Mechanical and Electrical Equipment and Instrumentation

Analyses or tests are performed for all supports of mechanical and electrical equipment to provide reasonable assurance of their structural capability.

The analytical results include the required input motions to the mounted equipment obtained in the manner stated in Subsection 3.10.1.2. Combined stresses of the designed component supports are maintained within the stress limits of the ANSI/AISC N690including Supplement 2 (Reference 12). The loads, load combinations, combined stresses, and stress criteria to demonstrate the design adequacy of cable trays, conduits, and their supports are provided in Appendix 3.9A.

For supports of mechanical (ASME Section III) equipment, the analytical results include the loads, loading combinations, and combined stress limits described in Subsection 3.9.3 for ASME Section III, Class 1, 2, and 3 component supports. The jurisdictional boundary between ASME Section III, Class 1, 2, and 3 component supports and the building structure are established in accordance with ASME Section III, NF.

Supports are tested with equipment installed or with a dummy simulating the equivalent equipment inertial mass effects and dynamic coupling to the support. If the equipment is installed in a nonoperational mode for the support test, the response at the equipment mounting location is monitored and characterized in the manner as stated in Subsection 3.10.2.2. In such a case, equipment is tested separately for operability and the actual input motion to the equipment in this test is to be more conservative in amplitude and frequency content than the monitored response from the support test.

3.10.4 Test and Analysis Results and Experience Database

Complete and auditable records are maintained for the life of the plant at the plant administrative facilities. These records are updated and kept current as equipment is replaced, further tested, or otherwise further qualified.

The COL applicant is to develop the equipment seismic qualification files that summarize the component's qualification, including a list of equipment classified as seismic Category I in Table 3.2-1 and seismic qualification summary data sheets (SQSDS) for each piece of seismic Category I equipment (COL 3.10(3)). The SQSDS include the following information:

a. Identification of equipment, including vendor, model number, and location within each building. Valves that are part of the RCPB are identified.

b. Physical description, including dimensions, weight, and field mounting condition

c. A description of the equipment's function within the system

d. Identification of all design (functional) specifications and qualification reports, and their locations

e. Description of the required loads and their intensities for which the equipment is qualified

f. If qualified by test, identification of the test methods and procedures, important test parameters, and a summary of the test results that includes test response spectra (TRS) enveloping required response spectra (RRS)

g. If qualified by analysis, identification of the analysis methods and assumptions and comparisons between the calculated and allowable stresses and deflections for critical elements

h. The natural frequency (or frequencies) of the equipment

i. Identification of whether the equipment is affected by vibration fatigue cycle effects and a description of the methods and criteria used to qualify the equipment for such loading conditions

j. Indication whether the equipment has met the qualification requirements

k. A compilation of the required response spectra (or time history) and corresponding damping for each seismic and dynamic load specified for the equipment together with all other loads considered in the qualification and the method of combining all loads

3.10.4.1 Implementation Program and Milestones

The COL applicant is to perform equipment seismic qualification for seismic Category I equipment and provide milestones and completion dates of equipment seismic qualification program (COL 3.10(4)).

3.10.4.2 Experience-based Qualification

Experience-based qualification is not used for any equipment.

3.10.5 Combined License Information

COL 3.10(1) The COL applicant is to provide documentation that the designs of seismic Category I SSCs are analyzed for OBE, if OBE is higher than 1/3 SSE.

COL 3.10(2) The COL applicant is to investigate if site-specific spectra generated for the COLA exceed the APR1400 design spectra in the high-frequency range. Accordingly, the COL applicant is to provide reasonable assurance of the functional performance of vibration-sensitive components in the high-frequency range.

COL 3.10(3) The COL applicant is to develop the equipment seismic qualification files that summarize the component's qualification, including a list of equipment classified as seismic Category I in Table 3.2-1 and SQSDS for each piece of seismic Category I equipment.

COL 3.10(4) The COL applicant is to perform equipment seismic qualification for seismic Category I equipment and provide milestones and completion dates of equipment seismic qualification program.

3.10.6 References

1. Regulatory Guide 1.97, "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants," Rev. 4, U.S. Nuclear Regulatory Commission, June 2006.

2. 10 CFR Part 50, Appendix S, "Earthquake Engineering Criteria for Nuclear Power Plants," U.S. Nuclear Regulatory Commission.

3. IEEE Std. 323-2003, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 2003.

4. Regulatory Guide 1.100, "Seismic Qualification of Electric and Mechanical Equipment for Nuclear Power Plants," Rev. 3, U.S. Nuclear Regulatory Commission, September 2009.

5. IEEE Std. 344-2004, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 2005.

6. ASME Boiler and Pressure Vessel Code, Section III, Division 1, "Rules for Construction of Nuclear Facility Components," The American Society of Mechanical Engineers, the 2007 Edition with the 2008 Addenda.

7. ASME QME-1-2007, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants," The American Society of Mechanical Engineers, 2007.

8. Regulatory Guide 1.61, "Damping Values for Seismic Design of Nuclear Power Plants," Rev. 1, U.S. Nuclear Regulatory Commission, March 2007.

9. Staff Review Memorandum for SECY-93-087, "SECY-93-087 - Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Designs," U.S. Nuclear Regulatory Commission, July 1993.

10. Regulatory Guide 1.9, "Application and Testing of Safety-Related Diesel Generators in Nuclear Power Plants," Rev. 4, U.S. Nuclear Regulatory Commission, June 2007.

11. IEEE Std. 387-1995, "IEEE Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 1995.

12. ANSI/AISC N690-1994 including Supplement 2 (2004), "Specification for the Design, Fabrication and Erection of Steel Safety-Related Structures for Nuclear Facilities," American National Standard Institute/American Institute of Steel Construction, 1994&2004.

13 APR1400-E-S-NR-14004-P, "Evaluation of Effects of HRHF Response Spectra on SSCs," Rev. 3, KEPCO & KHNP, December 2017.

14 APR1400-E-X-NR-14001-P, "Equipment Qualification Program," Rev. 4, KHNP, July 2018.

3.11 Environmental Qualification of Mechanical and Electrical Equipment

This section presents the APR1400 approach for selecting and identifying equipment required to be designed and qualified in conformance with the requirements of 10 CFR Part 50, Appendix A, GDCs 1, 2, 4, and 23; 10 CFR Part 50, Appendix B, Quality Assurance Criteria III, XI and XVII, and 10 CFR 50.49.

Mechanical, electrical, and I&C equipment important to safety is qualified to meet its performance requirements under the environmental and operating conditions in which the equipment is required to function and during the length of time for which its function is required.

The APR1400 qualification approach conforms with the requirement of 10 CFR Part 50, Appendix A, GDC 4, "Environmental and Dynamic Effect Design Bases," and includes the scope of the following items:

a. Equipment associated with systems that are essential for emergency reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal, or otherwise essential in preventing significant release of radioactive material to the environment

b. Equipment that initiates the above functions automatically

c. Equipment that is used by the operators to initiate the above functions manually

d. Equipment whose failure can prevent the satisfactory accomplishment of one or more of the safety functions specified in above item a.

e. Electrical equipment important to safety, as described in 10 CFR 50.49(b)(1), and (2) Certain post-accident monitoring equipment as described in 10 CFR 50.49(b)(3) and NRC RG 1.97.

f. Accident monitoring equipment specified in NRC RG 1.97

The implementation of the APR1400 Equipment Qualification is described in the KHNP Technical Report on the APR1400 Equipment Qualification Program (Reference 1), hereinafter referred to APR1400 EQP. Seismic qualification of the equipment is described in Section 3.10 and the APR1400 EQP in detail.

3.11.1 Equipment Location and Environmental Conditions

3.11.1.1 Equipment Location

Plant areas for equipment important to safety are divided into two based on the environmental conditions that potentially could occur within these areas as a result of a variety of plant events.

a. Harsh environment

An environment where a significant increase in pressure, temperature, relative humidity, or chemical environment occurs as a result of a design basis accident, or where a total integrated dose (TID) of greater than 100 Gy is predicted. In electronic components such as semiconductors, the total integrated dose is greater than 10 Gy. Detailed information is included in the APR1400 EQP.

b. Mild environment

An environment that would at no time be significantly more severe than the environment that would occur during normal plant operation, including anticipated operational occurrences. Any area that is not a harsh environment is a mild environment.

Each zone is subdivided into various subzones according to the severity of environmental parameters and its detailed information on the identification and location of equipment and TID values for each room is described in Table 3.11-2 and APR1400 EQP, table 2, table 3.

The COL applicant is to identify and qualify the site-specific mechanical, electrical, I&C, and accident monitoring equipment specified in NRC RG 1.97 (COL 3.11(1)).

3.11.1.2 Definition of Environmental Conditions

The environmental conditions under which the equipment performs its design safety functions include all normal, anticipated operational occurrences (AOOs), accident, and post-accident conditions due to design basis accidents (DBAs), and are defined as follows:

a. Normal condition

The environmental conditions expected during normal plant operation with systems operating normally.

b. Anticipated operational occurrence condition

The limiting environmental conditions expected following an event or transient that is not a normal operating condition but is not considered as an accident.

c. Accident condition

The environmental conditions that would occur during a loss-of-coolant accident (LOCA), main steam line break (MSLB), and high-energy line break (HELB).

d. Post-accident condition

The environmental conditions expected following design basis accident.

The environmental parameters such as temperature, pressure, relative humidity, radiation, and chemical spray for various locations throughout the plant are provided in Figure 3.11-1 through 7, Table 3.11-2, and the APR1400 EQP.

3.11.1.3 Equipment Operability Times

The required operational time during which each equipment is required to operate in the accident environment is identified in Table 3.11-2, and defined as follows:

a. Continuous

Component is required to operate throughout the design basis accident without interruption (i.e., at least 6 months).

The following types of equipment are examples of this category:

- Electrical power source & distribution equipment: SWGR, MCCs, batteries, battery chargers, inverter, cables and other electrical equipment needed to provide electrical power to safety-related equipment.

- Monitoring equipment: Sensors, transmitters and monitoring panels

- Continuous motors: Continuous operation expected motor such as pump motor

b. Short-term

Component is required to operate one time up to 24 hours from the start of the design basis accident.

The following types of equipment are examples of this category:

- Isolation valves: valves's safety function that is completed by one time operation

c. Intermittent

Component is capable of operating throughout the design basis accident (i.e., at least 6 months), starting and stopping on an as-needed basis.

The following types of equipment are examples of this category:

- Valves: Modulating, those that require intermmitent operation depending on system situation

d. Varies

Component is capable of operating throughout the design basis accident (at least 6 months) depending on the situation, but it is not needed if something else can perform the same task.

Any equipment with an operability time labeled as "varies" will be operational for the duration of the most limiting design basis accident.

3.11.2 Qualification Tests and Analyses

Environmental qualification of Class 1E equipment is in accordance with the requirements of 10 CFR 50.49, NRC RG 1.89 (Reference 2), and IEEE Std. 323 (Reference 3). Equipment qualification standards that are available are also met.

A description of the qualification method is contained in a qualification report for each type of equipment. The qualification method encompasses appropriate combinations of any or all of the type testing, operating experience, and analysis.

The typical approach used for the qualification of equipment potentially exposed to a harsh environment is as follows:

a. Evaluate the equipment life capability according to the planned design life service exposure to normal and abnormal environmental conditions plus the worst-case accident exposure condition.

b. Use the Arrhenius methodology on weak link materials if test data exist to derive the qualified life indicated above item.

Environmental qualification of mechanical equipment conforms with GDCs 1 and 4, and 10 CFR Part 50, Appendix B, Criteria III and XVII which requires:

a. Components shall be designed to be compatible with the postulated environmental conditions including those associated with LOCAs.

b. Qualification records shall be maintained and shall include the results of tests and material analyses.

c. Design control measures shall be established for verifying the adequacy of design

Mechanical equipment is principally divided into active and non-active (passive) mechanical equipment.

Environmental qualification of mechanical equipment is focused on the materials that are sensitive to environmental effects (e.g., seals, gaskets, lubricants, fluids for hydraulic systems, and diaphragms) and is limited to active mechanical equipment located in harsh environment which has mechanical moving parts to perform its safety-related function, and the qualification effort requires the evaluation of all safety-related nonmetallic parts against the applicable environmental conditions.

Non-active mechanical equipment (passive mechanical equipment) whose safety function is structural integrity is designed and qualified for the appropriate temperature and pressure environment in accordance with the applicable code to which it is constructed such as ASME Boiler and Pressure Vessel Codes.

The followings shall be confirmed in implementing the environmental qualification of active mechanical equipment:

a. To identify safety-related mechanical equipment located in harsh environment areas, including its required operating time

b. To identify nonmetallic subcomponents of such equipment

c. To Identify the environmental conditions and process parameters for which this equipment must be qualified

d. To identify nonmetallic material capabilities.

   The COL applicant is to identify the nonmetallic parts of mechanical equipment in procurement process (COL 3.11(2)).

e. To evaluate environmental effects

The service requirements and the environmental requirements are defined in the APR1400 design specification for this equipment.

Materials are selected based on extensive testing and long-time service that is compatible with the requirements. Quality assurance of design and quality control of processes provide reasonable assurance that the component meets the specification requirements. Further, the design and manufacturing organizations certify compliance. In-service surveillance and maintenance programs, followed by refurbishment or replacement of parts if necessary, provide further assurance that the safety equipment will remain operable.

The evaluation of environmental adequacy of the equipment is initiated by the full definition of environmental requirements in APR1400 design specification, as stated above. Test reports and analyses that substantiate operability after exposure to the environment, and the quality assurance documentation, are to be filed by the operating licensee.

The results of environmental qualifications are included as a part of the equipment qualification reports. These reports are used to establish the maintenance and repair plan for the equipment and procurement of the parts for the life of the plant. If the components are replaced or qualified by other methods, the reports should be traceable.

The safety-related active mechanical equipment that contains non-metallic parts is also environmentally qualified in accordance with ASME QME-1-2007, “Qualification of Active Mechanical Equipment,” QR-B, “Guide for Qualification of Non-Metallic Parts” (Reference 9.31), as endorsed by NRC RG 1.100, and is listed in Table 3.11-3 as specified by NRC RG 1.206, C.I.3.11.6.

3.11.2.1 Environmental Qualification during Normal Operation

Equipment which is not significantly affected environmentally by the design basis accident (DBA) is said to exist in a mild (normal plus abnormal service conditions) environment. For the qualification of both electrical and mechanical equipment in a mild environment, a qualified life is not required if no significant aging mechanism in mild conditions is identified in accordance with IEEE Std. 323. If the predicted life based on experience, aging analysis, or tests is less than the design life of the plant, that equipment is subjected to a surveillance program and a preventative maintenance program that restores it to qualified operability. The detailed maintenance or surveillance program for specific plants is to be developed based on the specific equipment for the APR1400 and the results of qualification testing and analysis for that equipment.

The ranges of the design temperatures, pressures, relative humidity, and radiation for typical mild environment areas in which safety-related equipment is located are provided in Table 3.11-2.

3.11.2.2 Environmental Qualification during and after a Design Basis Accident

Equipment located in harsh environments is designed to remain functional in the environment that exists at the equipment location, for the length of time during and after the DBA for which it is required to be functional, and for the integrated radiation dose during normal operation. Replacement of equipment will be made before the maximum calculated DBA conditions that could result in exceeding design limits for a piece of equipment, when considering the cumulative effects of the normal operating conditions that each piece of equipment has received, as well as the maximum cumulative worst case conditions calculated for the worst case accident. The temperature, pressure, and humidity environment inside the containment after a LOCA and MSLB is discussed in detail in Subsections 6.2.1.3 and 6.2.1.4. The containment spray characteristics are given in

Subsection 6.2.2.1. The worst-case integrated post-accident radiation doses for those areas at which equipment is located are provided in Table 3.11-2.

10 CFR Part 50, Appendix A, GDCs 1, 4, 23, and 50 are met as discussed in Subsections 3.1.1, 3.1.4, 3.1.19, 3.1.43, and 6.2.1, respectively.

The requirements of 10 CFR Part 50, Appendix B, Quality Assurance Criterion III, are met as discussed in Section 17.5 and applicable Regulatory Guides and codes include the following:

a. Regulatory Guide 1.40, Qualification of Continuous-Duty Safety-Related Motors for Nuclear Power Plants

b. Regulatory Guide 1.63, Electric Penetration Assemblies in Containment Structures for Nuclear Power Plants

c. Regulatory Guide 1.73, Qualification Tests of Electric Valve Operators Installed Inside the Containment of Nuclear Power Plants

d. Regulatory Guide 1.89 Environmental Qualification of Certain Electric Equipment Important to Safety in Nuclear Power Plants

e. Regulatory Guide 1.97, Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants

f. Regulatory Guide 1.151, Instrument Sensing Lines

g. Regulatory Guide 1.156, Environmental Qualifications of Connection Assemblies for Nuclear Power Plants

h. Regulatory Guide 1.158, Qualification of Safety-Related Lead Storage Batteries for Nuclear Power Plants

i. Regulatory Guide 1.180, Guidelines for Evaluating Electromagnetic and Radio Frequency Interference in Safety-Related Instrumentation and Control Systems

j. Regulatory Guide 1.183, Alternative Radiological Source Term for Evaluating Design Basis Accidents at Nuclear Power Reactors

k. Regulatory Guide 1.209, Guidelines for Environmental Qualifications of Safety-Related Computer-Based Instrumentation and Control Systems in Nuclear Power Plants

l. Regulatory Guide 1.210, Qualification of Safety-Related Battery Chargers and Inverters for Nuclear Power Plants

m. Regulatory Guide 1.211, Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants

n. Regulatory Guide 1.213, Qualification of Safety-Related Motor Control Centers for Nuclear Power Plants

o. General Design Criteria 1, 2, 4, and 23 of 10 CFR Part 50, Appendix A

p. Quality assurance in accordance with 10 CFR Part 50, Appendix B

The COL applicant is to address operational aspects for maintaining the environmental qualification status of components after initial qualification (COL 3.11(3)).

The COL applicant is to provide a full description of the environmental qualification of mechanical and electrical equipment program (COL 3.11(4)).

The operational aspects to address development of the operational program to maintain the environmental qualification status of components, consistent with SRP 3.11 will include the following:

a. evaluation of environmental qualification results throughout design life to establish activities that support continued environmental qualification

b. determination of surveillance and preventive maintenance activities based on environmental qualification results and operating experience

c. consideration of environmental qualification maintenance recommendations from equipment vendors

d. evaluation of operating experience in updating surveillance and preventive maintenance activities for specific equipment

e. development of plant procedures that specify individual equipment identification, appropriate references, installation requirements, surveillance and maintenance requirements, post-maintenance testing requirements, condition monitoring requirements, replacement part identification, and applicable design changes and modifications

f. development of plant procedures for reviewing equipment performance and environmental qualification operational activities, trending the results, and incorporating lessons learned through appropriate modifications to the environmental qualification operational program

g. development of plant procedures for the control and maintenance of environmental qualification records

Safety-related passive pressure boundary components are designed and qualified for the appropriate temperature and pressure environment in accordance with the requirement of ASME Boiler and Pressure Vessel Code, Section III. The qualification of non-metallic parts in safety-related passive mechanical equipment is ensured through the means specified in Subsection 3.11.2.3.

The materials used in the fabrication of mechanical and structural components inside the containment are selected to minimize corrosion and hydrogen generation resulting from contact with spray solutions. The use of aluminum and zinc is minimized in these components.

Material incompatibilities at interfaces are demonstrated under the worst case environmental conditions that it will be exposed to.

3.11.2.3 Environmental Qualification Method

a. Qualification by test

   Qualification testing is performed on actual equipment to stimulate normal, abnormal, and accident conditions. While testing, the specimen is subjected to accelerated aging. Synergistic effects are considered in the aging program where synergistic effects have been identified on materials that are included in the equipment being qualified. When size or other practical requirements limit or preclude the type testing, this part of demonstration is completed by use of operating experience, analysis of partial type test data, or combinations of these qualification.

b. Qualification by analysis

If qualification documentation for other equipment is available, it is reviewed to determine if the qualified equipment is similar to that being procured. If the former is enveloped by the latter, then an analysis to determine qualification life is performed using the existing data.

In addition, if extrapolation and interpolation techniques to extend the application of test data (basically, equipment similarity analysis) are used, the following criteria should be met:

Material:

Materials of construction shall either be the same or equivalent. Any identified differences shall be shown not to adversely affect performance of the safety function(s).

Size:

Size may vary if the basic configuration remains the same and dimensions are related to known scaling factors. Consideration shall be taken of such factors as thermal effects of different surface areas and seismic effects of different masses and modes.

Shape:

The shape shall be the same or similar (subject to restrictions of size) and any differences shown shall not adversely affect the performance of the safety function(s).

Stress:

Operating and environmental stresses on the new equipment shall be equal to or less than those experienced on the qualified equipment under normal and abnormal conditions.

Aging Mechanisms:

The aging mechanisms that apply to the tested equipment encompass those that apply to the similar equipment.

Function:

The safety function(s) as evaluated shall be the same.

c. Qualification by operating experience

Qualification of equipment using operating experience is used in combination with supporting documentation as a basis for environmental qualification if certification of conformance by the vendor is not feasible. This type of qualification may be used for equipment for which testing is not feasible due to the equipment physical size. This evaluation is performed using similar equipment with a successful operating history in a service environment equal to or more severe than the environment for the equipment in question. If similarity analysis is used, the extrapolation and interpolation techniques mentioned in Subsection 3.11.2.3.b shall be used. The validity of operating experience as a means of qualification is determined from the type and amount of available supporting documentation, the service conditions, and equipment performance.

d. Combined qualification

Combined qualification is used for any equipment that cannot be qualified through a full type test. Combined qualification usually entails type test, previous operating experience, and analysis. Partial type tests with extrapolation or analysis, operating experience with extrapolation or analysis, and type tests supplemented with tests of components and analysis are examples of combined qualification. The qualification program for the emergency diesel generator utilizes a combined qualification technique.

<u>Aging for Harsh Environment Equipment</u>

Equipment that is located in zones susceptible to a harsh environment is also exposed to a mild environment before DBA. Such equipment undergoes an aging analysis that focuses on the identification of aging mechanisms that significantly increase the equipment's susceptibility to DBA. If no known significant aging mechanisms are found, a surveillance or preventive maintenance program is developed to monitor for degradation. If an aging mechanism is found that is known to significantly degrade the equipment, that mechanism is analyzed to determine whether an accelerated aging program or a periodic part replacement program is appropriate.

Radiation for Harsh and Non-Harsh Environment Equipment

Equipment is designed for the types and levels of radiation associated with its location. The design includes the normal operation contribution plus the radiation associated with the limiting DBA for which the equipment is required to be functional and for the duration of time both during and after the accident for which it is required to be operational. The levels that are defined in Table 3.11-2 are the worst-case values and are intended to represent an upper-bound dose value for that region.

Equipment that is exposed to radiation more than 100 Gy, exceeding 10 Gy for electronic equipment, is irradiated to its anticipated TID before type testing unless determined by analysis that radiation does not affect its ability to perform its required function. Where the application of the accident dose is planned during DBA testing, it need not be included during the aging process.

A TID of 100 Gy or less, not exceeding 10 Gy for electronic equipment, does not affect the strength or properties of material used. Therefore, further qualification analysis and tests for components that are exposed to lesser radiation are not necessary.

Mechanical and electrical equipment is qualified to appropriate radiation environments as discussed previously. If more than one type of radiation is significant, the radiation types such as gamma, beta, or neutron may be applied separately.

Gamma

Safety-related equipment is tested to gamma radiation levels developed. Upper-bound dose values for various plant regions are provided in Table 3 of APR1400-E-X-NR-14001-P.

Beta

Equipment exposed to beta radiation is identified, and an analysis is performed to determine whether the operability of the equipment is affected by beta radiation ionization and heating effects. Qualification is performed by test unless analysis demonstrates that the safety function is not degraded by beta exposure. Equipment is tested or analyzed to the beta radiation levels defined in Table 3 of APR1400-E-X-NR-14001-P. Where testing is recommended, a gamma equivalent radiation source is used.

Neutron

Equipment exposed to neutron radiation is identified and neutron radiation levels defined. When actual neutron dose qualification testing is not performed, an equivalent gamma radiation dose is used for qualification testing to simulate neutron exposure. The basis for establishing an equivalent gamma radiation dose is provided in Table 3 of APR1400-E-X-NR-14001-P.

Chemical spray

After a postulated accident, such as a LOCA or MSLB, components located in the reactor containment building are exposed to a chemical spray. Equipment is environmentally tested to these conditions, and performance requirements are demonstrated during and after the test. The most severe spray composition is determined by single failure analysis of the spray system. Corrosion effects due to long-term exposure are addressed, as appropriate.

Where qualification for a chemical spray environment is required, the simulated spray is initiated.

Typical values of chemical spray composition, concentration and pH are defined in Table 4 of APR1400-E-X-NR-14001-P.

Humidity

Equipment that is adversely affected by a high-humidity environment and required to operate in a high-humidity environment but not subjected to a steam environment during DBA testing is environmentally qualified by type test. The equipment is performance tested before the application of the high-humidity environment to establish a baseline, then retested while exposed to a humid environment that envelops the required humidity condition, and again retested after removal of the high-humidity environment for comparison to the original baseline measurement. Comparison of the baseline tests determines if any degradation is present and ensures that operability criteria are met. Equipment that is subjected to steam environments is subjected to the appropriate test profiles.

Submergence

Equipment locations and operability requirements are reviewed to establish whether or not specific equipment could be subject to submergence during its required operating time.

Flood levels both inside and outside containment are reviewed and potential impacts on equipment qualification are appropriately addressed. Equipment that is required to operate underwater is qualified by type test.

Power Supply Voltage and Frequency Variation

Power supply voltage and frequency variation is addressed in the equipment design and verification process. During the design process, the range of power supply variation is determined. Equipment specifications incorporate the ranges to ensure acceptable operation. Type testing of the equipment at the extremes of power supply variations is performed if required.

Synergistic effects

Synergistic effects are evaluated to verify that these effects do not adversely affect the qualification of the mechanical, electrical, and I&C equipment, as required in accordance with 10 CFR 50.49(e)(7).

Electromagnetic interference and radio-frequency interference

Testing for electromagnetic interference and radio-frequency interference (EMI/RFI) and power surges is performed with the guidance of NRC RG 1.180.

3.11.3 Qualification Test Results

The COL applicant is to document the qualification test results and qualification status in an auditable file for each type of equipment in accordance with the requirements 10 CFR 50.49(j) (COL 3.11(5)). Because EQP is an operational program, the COL applicant is to describe the EQP implementation milestones based on the APR1400 EQP (COL 3.11(6)).

3.11.3.1 Electrical and I&C Equipment

A list of the instrumentation and electrical equipment required to achieve safe shutdown or mitigate the effect of a DBA is presented in Table 3.11-3. Required equipment that is potentially exposed to harsh environments during an event is environmentally qualified. This includes the equipment that acts to safely shut down the reactor, provides adequate core cooling, isolates the containment, provides residual heat removal, and precludes uncontrolled release of radioactive effluents. The results of qualification testing and analysis for Class 1E equipment are described in their qualification reports.

3.11.3.2 Mechanical Equipment

Mechanical equipment is relatively insensitive to environmental conditions considering that service conditions usually far exceed environmental conditions. For mechanical equipment, the service requirements and the environmental requirements are defined in the design specification. Materials are selected based on extensive testing and long service, which is compatible with the requirements. Quality assurance of design and quality control of processes provides reasonable assurance that the component meets the specification requirements. Further, the design and manufacturing organizations certify conformance. In-service surveillance and maintenance programs, followed by refurbishment or replacement of parts if necessary, provide further assurance that the safety equipment remains operable.

The evaluation of environmental adequacy of equipment is initiated by the full definition of environmental requirements in equipment specifications, as stated above. Test reports and analyses that substantiate operability after exposure to the environment, and the quality assurance documentation, are to be filed by an operator.

The results of environmental qualifications are included as a part of the equipment qualification reports. These reports are used to establish the maintenance and repair plan for the equipment and procurement of the parts for the life of the plant. If the components are replaced or qualified by other methods, the reports should be traceable.

The safety-related mechanical equipment that contains non-metallic parts is environmentally qualified in accordance with QR-B, "Guide for Qualification of Non-Metallic Parts" of ASME QME-1-2007 "Qualification of Active Mechanical Equipment," (Reference 9.31), as endorsed by NRC RG 1.100, and is listed in Table 3.11-2 as specified by NRC RG 1.206, C.I.3.11.6.

3.11.4 Loss of Ventilation

The need for the heating, ventilation, and air conditioning (HVAC) systems and the design bases that prevent the loss of safety-related ventilation are described in Sections 6.4 and 9.4. The two-division concept provides 100 percent redundancy of all safety-related equipment and the HVAC system. In event of a failure of one system to deliver the desired conditioned air, the second system is energized automatically in its place. This changeover is also designed to be achieved manually.

All of the areas that are designed with HVAC listed in Table 3.11-1 are cooled with chilled water, which provides reasonable assurance of a temperature level below that for which the equipment is qualified. Therefore, temperature switches are provided in each room.

The vital instrument and equipment in the main control room (MCR), Class 1E switchgear room, battery room, and remote shutdown console room are served with 100 percent redundancy of the HVAC unit.

The containment has standby cooling and ventilation equipment for each of the component parts of the ventilation system to maintain normal equipment qualification conditions. The containment ventilation systems are not credited in maintaining post-accident environmental conditions.

The chilled water system is divided into two circuits, non-essential and essential, in each division. One essential chiller and one essential chilled water pump serve the safety-related cubicle coolers in each division. The chilled water temperature in the essential circuit ranges from 5.6 °C to 11.1 °C (42 °F to 52 °F), which provides humidity and temperature control.

Class 1E equipment that is located in the MCR or similar areas includes the following:

a. Plant protection system (PPS)

b. Main control panels

c. Auxiliary process cabinet (APC)

Other instrumentation, such as process transmitters and signal converters and the reactor trip switchgear system circuit breakers, is located in the auxiliary building or containment building. Equipment in these areas is qualified for the maximum expected temperature, radiation, humidity, and pressure under which and the duration both during and following the accident for which the equipment is expected to be functional.

3.11.5 Estimate Chemical and Radiation Environment

3.11.5.1 Chemical Environment

After a postulated accident, such as the LOCA or MSLB, components located in the reactor containment building are exposed to chemical spray. Equipment is environmentally tested to these conditions, and performance requirements are demonstrated during and after the test. The most severe spray composition is determined by single failure analysis of the spray system. Corrosion effects due to long-term exposure are addressed, as appropriate. The components of engineered safety features (ESFs) inside the containment are designed to perform their safety-related functions in a chemical environment resulting from the boric acid recirculated through the safety injection system (SIS) and containment spray system (CSS). The SIS and CSS are designed to perform their functions under the conditions of the maximum and long term boric acid concentration and pH.

3.11.5.2 Radiation Environment

Safety-related components are designed to ensure acceptable performance, taking into consideration normal operational radiation exposure in addition to the single most adverse post-accident environment for which they are required to be functional.

The radiation qualifications for individual safety-related components are developed based on:

a. the radiation environment expected at the component location from equipment installation up to the time the equipment is required to remain functional postaccident, and

b. the limiting DBA for which the component provides a safety function.

The components in the ESF and the reactor protection systems are designed to provide reasonable assurance of acceptable performance under normal operational radiation exposure in addition to the single most adverse post-accident environment. The normal operational exposures are based on the design source terms presented in Table 11.1-2, which are the design basis source terms based upon 1.0% failed fuel with continuous gas stripping operation.

In accordance with NRC RG 1.89, the source terms based on 1 percent fuel defect are used to calculate the TID during normal operation. The TID is calculated at a distance of 30.48 cm (1 ft) away from the equipment surface, and 60 years of continuous operation at full power is assumed.

For the equipment located in fuel transfer tube and cask loading pit that is used only during the refueling operation, the TID is calculated assuming that the radiation sources affect the equipment only during the refueling period. The TID during normal operation in these areas is negligible since no radiation source exists. Since these equipment do not perform safety-related functions, dose contributions from accident conditions are not considered. A 1-month duration refueling period is assumed for every 18 months of normal operation. Therefore, the TID is calculated based on 40 months of refueling operation during the plant life of 60 years. An additional safety margin of 20 percent is applied to the normal TID considering the potential contribution of radiation from adjacent cubicles. This margin bounds the dose contributions from adjacent sources for most of the cubicles. In cases where the sum of the dose contributions is greater than the margin, the actual dose rates are taken into account in determining the normal TID of the corresponding area.

Accidental TIDs are determined based on the limiting design basis accident to create the expected worst-case environmental conditions (i.e., bounding) for the structure, system, and components. Radiation environments for the components for which the most adverse accident conditions are post-LOCA, are based on the source term assumptions consistent with NRC RG 1.183. Radiation environments for the components for which the most adverse accident conditions are other than the LOCA, such as main steam line break, feedwater line break, or control element assembly (CEA) ejection, are based on conservative estimates of the fuel assembly gap activities and maximum reactor coolant specific activities as discussed in Section 11.1.

Post-accident ESF system and component radiation exposures are dependent on equipment location. In the containment and control room area, exposures are based on a postulated design basis LOCA. Source terms and other accident parameters are presented in Subsection 12.2.2 and Chapter 15 and are consistent with the recommendations of NRC RG 1.183.

In the auxiliary building, exposures are based on the assumption that significant portion of the core fission product inventory are recirculated in the containment sump water plus other post-accident airborne radioactivities as presented in Table 12.2-26. In the fuel handling area, exposures are based on a fuel handling accident. Source terms and other accident parameters are presented in Chapter 15.

Organic materials that are within the containment are identified in Subsection 6.1.2. The design radiation exposures are based on gamma and beta radiation.

Equipment is designed for the types and levels of radiation associated with its location. The design includes the normal operation contribution plus the radiation associated with the limiting DBA for which the equipment is required to be functional and for the duration of time both during and after the accident for which it is required to be operational.

Equipment that is exposed to radiation of more than 100 Gy, exceeding 10 Gy for electronic equipment, is irradiated to its anticipated TID prior to type testing unless determined by analysis that the radiation does not affect its ability to perform its required function. Where the application of the accident dose is planned during DBA testing, it is not included during the aging process. A total integrated dose of 100 Gy or less, not exceeding 10 Gy for electronic equipment, does not affect the strength or properties of material used. Therefore, further qualification analysis and tests for components that are exposed to lesser radiation are not necessary.

Mechanical and electrical equipment are qualified to appropriate radiation environments. If more than one type of radiation is significant, the radiation types such as gamma, beta, or neutron may be applied separately.

With respect to the thermal conductivity degradation (TCD) effect of fuel pellets on the EQ of safety-related equipment in containment, the increased containment pressure and temperature are estimated to be negligible. The detailed description of the TCD effects on the containment integrity is provided in Reference 16.

3.11.6 Qualification of Mechnical Equipment

As mentioned in Subsection 3.11.3.2, for mechanical equipment located in a harsh environment, conformance with the environmental design provisions of GDC 4 is generally achieved by demonstrating that the nonmetallic parts/components (e.g., seal, gasket, lubricants, etc.) are suitable for the postulated design basis environmental conditions.

The effect of process medium temperature and radiation on the nonmetallic parts is evaluated for any process medium whose temperature and radiation are higher than the highest external environmental temperature and radiation, and the combined effect of time-temperature and radiation degradation is considered. Consideration is also given to process pressure, process media type and chemistry, and process humidity.

Nonmetallic parts mainly consist of seals, gaskets, and lubricants whose failure of leakage, interception or wear could lead to hindrance of the safety function in the equipment in which they are installed. The safety-related mechanical equipment that contains non-metallic parts is environmentally qualified in accordance with QR-B, "Guide for Qualification of Non- Metallic Parts" of ASME QME-1-2007 "Qualification of Active Mechanical Equipment," (Reference 9.31), as endorsed by NRC RG 1.100, and is listed in Table 3.11-2 as specified by NRC RG 1.206, C.I.3.11.6.

3.11.7 Combined License Information

COL 3.11(1) The COL applicant is to identify and qualify the site-specific mechanical, electrical, I&C, and accident monitoring equipment specified in NRC RG 1.97.

COL 3.11(2) The COL applicant is to identify the nonmetallic parts of mechanical equipment in procurement process.

COL 3.11(3) The COL applicant is to address operational aspects for maintaining the environmental qualification status of components after initial qualification.

COL 3.11(4) The COL applicant is to provide a full description of the environmental qualification of mechanical and electrical equipment program.

COL 3.11(5) The COL applicant is to document the qualification test results and qualification status in an auditable file for each type of equipment in accordance with the requirements 10 CFR 50.49(j).

COL 3.11(6) The COL applicant is to describe the EQP implementation milestones based on the APR1400 EQP.

COL 3.11(7) The COL applicant is to provide the room number designation for equipment with unidentified rooms in Table 3.11-2, and ensure that the equipment is located within the environmental and radiation conditions specified.

3.11.8 References

1. APR1400-E-X-NR-14001-P, "Equipment Qualification Program," Rev. 4, KEPCO & KEPCO & KHNP, July 2018.

2. Regulatory Guide 1.89, "Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants," Rev. 1, U.S. Nuclear Regulatory Commission, June 1984.

3. IEEE Std. 323-2003, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 2003.

4. Regulatory Guide 1.40, "Qualification of Continuous Duty Safety-Related Motors for Nuclear Power Plants," Rev. 1, U.S. Nuclear Regulatory Commission, February 2010.

5. Regulatory Guide 1.63, "Electric Penetration Assemblies in Containment Structures for Nuclear Power Plants," Rev. 3, U.S. Nuclear Regulatory Commission, February 1987.

6. Regulatory Guide 1.73, "Qualification Tests of Electric Valve Operators Installed Inside the Containment of Nuclear Power Plants," Rev. 1, U.S. Nuclear Regulatory Commission, October 2013.

7. Regulatory Guide 1.97, "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants," Rev.4, U.S. Nuclear Regulatory Commission, June 2006.

8. Regulatory Guide 1.156, "Qualification of Connection Assemblies for Nuclear Power Plants," Rev. 1, U.S. Nuclear Regulatory Commission, July 2011.

9. Regulatory Guide 1.158, "Qualification of Safety-Related Lead Storage Batteries for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, February 1989.

10. Regulatory Guide 1.180, "Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems," Rev. 1, U.S. Nuclear Regulatory Commission, October 2003.

11. Regulatory Guide 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," U.S. Nuclear Regulatory Commission, July 2000.

12. Regulatory Guide 1.209, “Guidelines for Environmental Qualification of Safety-Related Computer-Based Instrumentation and Control Systems in Nuclear Power Plants,” U.S. Nuclear Regulatory Commission, March 2007.

13. Regulatory Guide 1.210, “Qualification of Safety-Related Battery Chargers and Inverters for Nuclear Power Plants,” U.S. Nuclear Regulatory Commission, June 2008.

14. Regulatory Guide 1.211, “Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants,” U.S. Nuclear Regulatory Commission, April 2009.

15. Regulatory Guide 1.213, “Qualification of Safety-Related Motor Control Centers for Nuclear Power Plants,” U.S. Nuclear Regulatory Commission, May 2009.

16. APR1400-F-A-NR-14002-P, “The Effect of Thermal Conductivity Degradation on APR1400 Design and Safety Analyses,” KEPCO & KHNP, September 2014.

17. ASME QME-1-2007 “Qualification of Active Mechanical Equipment Used in Nuclear Power Plants,” The American Society of Mechanical Engineers, 2007.

18. Regulatory Guide 1.100, “Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants,” Rev. 3, U.S. Nuclear Regulatory Commission, September 2009.

19. Regulatory Guide 1.151, “Instrument Sensing Lines,” Rev. 1, U.S. Nuclear Regulatory Commission, July 2010.

20. NUREG-0588, “Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment,” Rev. 1, U.S. Nuclear Regulatory Commission, November 1980.

21. NUREG-1465, “Accident Source Terms for Light-Water Nuclear Power Plants,” U.S. Nuclear Regulatory Commission, February 1995.

22. EPRI TR-102323, “Guidelines for Electromagnetic Interference Testing of Power plant Equipment,” Rev. 2, Electric Power research Institute, 2000.

23. IEEE Std. C37.82-1987 (R2004), “IEEE Standard for the Qualification of Switchgear Assemblies for Class 1E Applications in Nuclear Power Generating Stations,” Institute of Electrical and Electronics Engineers,1987.

24. IEEE Std. C37.105-2010, "IEEE Standard for Qualifying Class 1E Protective Relays and Auxiliaries for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 2010.

25. IEEE Std. 7-4.3.2-2003,"IEEE Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 2003.

26. IEEE Std. 317-1983 (R2003), "IEEE Standard for Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 1983.

27. IEEE Std. 334-2006, "IEEE Standard for Qualifying Continuous-Duty Class 1E Motors for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 2006.

28. IEEE Std. 344-2004, "IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 2005.

29. IEEE Std. 382-2006, "IEEE Standard for Qualification of Safety Related Actuators for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 2006.

30. IEEE Std. 383-2003, "IEEE Standard for Type Test of Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 2003.

31. IEEE Std. 387-1998 (R2007), "IEEE Standard Criteria for Diesel Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 1995.

32. IEEE Std. 497-2002, "IEEE Standard Criteria for Accident Monitoring Instrumentation for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 2002.

33. IEEE Std. 535-2013, "IEEE Standard for Qualification of Class 1E Vented Lead Acid Storage batteries for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 2013.

34. IEEE Std. 572-2006, “IEEE Standard for Qualification of Class 1E Connection Assemblies for Nuclear Power Generating Stations,” Institute of Electrical and Electronics Engineers, 2006.

35. IEEE Std. 627-2010, “IEEE Standard for Design Qualification of Safety Systems Equipment Used in Nuclear Power Generating Stations,” Institute of Electrical and Electronics Engineers, 2010.

36. IEEE Std. 628-2001, “IEEE Standard Criteria for Design, Installation and Qualification of Raceway Systems,” Institute of Electrical and Electronics Engineers, 2001.

37. IEEE Std. 638-1992, “IEEE Standard for Qualification of Class 1E Transformers for Nuclear Power Generating Stations,” Institute of Electrical and Electronics Engineers, 1992.

38. IEEE Std. 649-2006, “IEEE Standard for Qualifying Class 1E Motor Control Centers for Nuclear Power Generating Stations,” Institute of Electrical and Electronics Engineers, 2006.

39. IEEE Std. 650-2006, “IEEE Standard for Qualification of Class 1E Static battery Chargers and Inverters for Nuclear Power Generating Stations,” Institute of Electrical and Electronics Engineers, 2006.

40. IEEE Std. 1202-1991 (R1996), “IEEE Standard for Flame Propagation Testing of Wire and Cable,” Institute of Electrical and Electronics Engineers, 1991.

41. IEEE Std. 1205-2000, “IEEE Guide for Assessing, Monitoring, and Mitigating Aging Effects on Class 1E Equipment Used in Nuclear Generating Stations,” Institute of Electrical and Electronics Engineers, 2000.

42. IEEE Std. 1290-1996 (R2005), “IEEE Guide for Motor Operated valve (MOV) Motor Application, Protection, Control, and Testing in Nuclear Power Generation Station,” Institute of Electrical and Electronics Engineers, 1996.

Table 3.11-1

Ventilation Areas

Area	Safety-Related		Area Temp. Alarm in Control Room	Remark
	Yes	No		
Control Room Area				
1. Control Room and Adjacent Offices	O		O	
2. Computer Room		O	O	
Auxiliary Building Clean Area				
1. Turbine Driven AFP Room		O	O	
2. Motor Driven AFP Room	O		O	
3. Essential Chiller and Pump	O		O	
Auxiliary Building Controlled Area				
1. SC Heat Exchanger Room	O		O	
2. SI Pump Room	O		O	
3. CS Pump Room	O		O	
4. CS Heat Exchanger Room	O		O	
5. Penetration Room	O		O	
6. CCW Pump Room	O		O	
Electrical Equipment Room				
1. Vital Instrument & Equipment	O		O	
2. Class 1E Switchgear Room	O		O	
3. Class 1E Battery Room	O		O	
4. Remote Shutdown Console Room	O		O	
Fuel Handling Area				
1. Spent Fuel Pool Heat Exchanger Room and Pump Room	O		O	
2. Emergency ACU Room	O		O	
Emergency Diesel Generator Area	O		O	
Containment Building		O	O	

Table 3.11-2 (1 of 51)

Equipment Qualification Equipment List

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
Auxiliary Feedwater System													
AFW-PP01A	Turbine Driven Aux. Feedwater Pumps	ESF	AB	078-A15C	Continuous	Harsh	Mild	Mechanical EQ	No	I	(3)	SR	
AFW-PP01B	Turbine Driven Aux. Feedwater Pumps	ESF	AB	078-A15D	Continuous	Harsh	Mild	Mechanical EQ	No	I	(3)	SR	
AFW-PP02A	Motor Driven Aux. Feedwater Pumps	ESF	AB	078-A20A	Continuous	Harsh	Mild	Mechanical EQ	No	I	(3)	SR	
AFW-PP02B	Motor Driven Aux. Feedwater Pumps	ESF	AB	078-A20B	Continuous	Harsh	Mild	Mechanical EQ	No	I	(3)	SR	
AFW-V0035	Globe Valve and Actuator, AFW Modulating	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
AFW-V0036	Globe Valve and Actuator, AFW Modulating	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
AFW-V0037	Globe Valve and Actuator, AFW Modulating	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
AFW-V0038	Globe Valve and Actuator, AFW Modulating	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
AFW-V0043	Gate Valve and Actuator, AFW Isolation, CIV	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
AFW-V0044	Gate Valve and Actuator, AFW Isolation, CIV	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
AFW-V0045	Gate Valve and Actuator, AFW Isolation, CIV	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
AFW-V0046	Gate Valve and Actuator, AFW Isolation, CIV	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
Auxiliary Feedwater Pump Turbine System													
AT-V0007	Globe Valve and Actuator, AFW Pump Turbine Steam Line Drain	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
AT-V0008	Globe Valve and Actuator, AFW Pump Turbine Steam Line Drain	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
AT-V0009	Globe Valve and Actuator, AFW Pump Turbine Steam Line Isolation	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
AT-V0010	Globe Valve and Actuator, AFW Pump Turbine Steam Line Isolation	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
AT-LP01C	AF Pump Turbine Control Panel (12)	ESF	AB	078-A15C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
AT-LP01D	AF Pump Turbine Control Panel (12)	ESF	AB	078-A15D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
Auxiliary Feedwater Storage and Transfer													
AX-LI003A	Field Indicator Device, AFWST 1 (12)	ESF	AB	100-A07C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
AX-LI004B	Field Indicator Device, AFWST 2 (12)	ESF	AB	100-A07D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
AX-LI005A	Field Indicator Device, AFWST 2 (12)	ESF	AB	100-A07D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
AX-LI005C	Field Indicator Device, AFWST 2 (12)	ESF	AB	100-A07D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
AX-LI005D	Field Indicator Device, AFWST 2 (12)	ESF	AB	100-A07D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O

Table 3.11-2 (2 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
AX-LI006B	Field Indicator Device, AFWST 1 (12)	ESF	AB	100-A07C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
AX-LI006C	Field Indicator Device, AFWST 1 (12)	ESF	AB	100-A07C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
AX-LI006D	Field Indicator Device, AFWST 1 (12)	ESF	AB	100-A07C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
Component Cooling Water System													
CC-PP03A	Component Cooling Water Make-up Pumps	ESF	AB	078-A29C	Varies	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-PP03B	Component Cooling Water Make-up Pumps	ESF	AB	078-A29D	Varies	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-PP01A	Component Cooling Water Pumps	ESF	AB	055-A02A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-PP01B	Component Cooling Water Pumps	ESF	AB	055-A02B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-PP02A	Component Cooling Water Pumps	ESF	AB	055-A02C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-PP02B	Component Cooling Water Pumps	ESF	AB	055-A02D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0011	CCW Surge Tank01A Makeup Isolation	ESF	AB	COL 3.11(7)	Varies	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0012	CCW Surge Tank01B Makeup Isolation	ESF	AB	COL 3.11(7)	Varies	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0021	CCW Heat Exchanger HE01A Outlet	ESF	CCWHXB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0022	CCW Heat Exchanger HE01B Outlet	ESF	CCWHXB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0023	CCW Heat Exchanger HE02A Outlet	ESF	CCWHXB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0024	CCW Heat Exchanger HE02B Outlet	ESF	CCWHXB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0025	CCW Heat Exchanger HE03A Outlet	ESF	CCWHXB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0026	CCW Heat Exchanger HE03B Outlet	ESF	CCWHXB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0027	CCW Heat Exchanger Bypass Isolation	ESF	CCWHXB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0028	CCW Heat Exchanger Bypass Isolation	ESF	CCWHXB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0031	CCW Heat Exchanger HE01A Outlet	ESF	CCWHXB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0032	CCW Heat Exchanger HE01B Outlet	ESF	CCWHXB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0033	CCW Heat Exchanger HE02A Outlet	ESF	CCWHXB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0034	CCW Heat Exchanger HE02B Outlet	ESF	CCWHXB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0035	CCW Heat Exchanger HE03A Outlet	ESF	CCWHXB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0036	CCW Heat Exchanger HE03B Outlet	ESF	CCWHXB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0037	CCW Heat Exchanger Bypass Isolation	ESF	CCWHXB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0038	CCW Heat Exchanger Bypass Isolation	ESF	CCWHXB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0097	Containment Spray Heat Exchanger 01A Inlet Isolation	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0098	Containment Spray Heat Exchanger 01B Inlet Isolation	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O

Table 3.11-2 (3 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
CC-V0131	Essential Chiller Condenser 2B Oulet Isolation	ESF	AB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0132	Essential Chiller Condenser 2A Outlet Isolation	ESF	AB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0143	Train A Non-Safety Load Supply Isolation	ESF	AB	COL 3.11(7)	Short-Term	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0144	Train B Non-Safety Load Supply Isolation	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0145	Train A Non-Safety Load Supply Isolation	ESF	AB	COL 3.11(7)	Short-Term	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0146	Train B Non-Safety Load Supply Isolation	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0147	Train A Non-Safety Load Return Isolation	ESF	AB	COL 3.11(7)	Short-Term	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0148	Train B Non-Safety Load Return Isolation	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0149	Train A Non-Safety Load Return Isolation	ESF	AB	COL 3.11(7)	Short-Term	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0150	Train B Non-Safety Load Return Isolation	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0181	DG C Heat Exchanger Inlet Isolation	ESF	AB	COL 3.11(7)	Short-Term	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0182	DG D Heat Exchanger Inlet Isolation	ESF	AB	COL 3.11(7)	Short-Term	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0191	DG A Heat Exchanger Inlet Isolation	ESF	EDGB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0192	DG B Heat Exchanger Inlet Isolation	ESF	EDGB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0231	RCP Cooler Supply Containment Isolation	ESF	AB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0249	RCP Cooler Return Containment Isolation	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0250	RCP Cooler Return Containment Isolation	ESF	AB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0296	Letdown Heat Exchanger Supply Containment Isolation	ESF	AB	COL 3.11(7)	Short-Term (40sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0297	Letdown Heat Exchanger Supply Containment Isolation	ESF	RCB	COL 3.11(7)	Short-Term (40sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0301	Letdown Heat Exchanger Return Containment Isolation	ESF	RCB	COL 3.11(7)	Short-Term (40sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0302	Letdown Heat Exchanger Return Containment Isolation	ESF	AB	COL 3.11(7)	Short-Term (40sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0351	SC Heat Exchanger 01A Inlet Isolation	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0352	SC Heat Exchanger 01B Inlet Isolation	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0383	Essential Chiller Condenser 1A Outlet Isolation	ESF	AB	COL 3.11(7)	Varies	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0384	Essential Chiller Condenser 1B Outlet Isolation	ESF	AB	COL 3.11(7)	Varies	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0389	SFP Cooling Heat Exchanger 02A Inlet Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0390	SFP Cooling Heat Exchanger 02B Inlet Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CC-V0901	Essential Chiller Condenser 1A Outlet Control	ESF	AB	COL 3.11(7)	Varies	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O

Table 3.11-2 (4 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
CC-V0902	Essential Chiller Condenser 1B Outlet Control	ESF	AB	COL 3.11(7)	Varies	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0905	Essential Chiller Condenser 2A Outlet Control	ESF	AB	COL 3.11(7)	Varies	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0906	Essential Chiller Condenser 2B Outlet Control	ESF	AB	COL 3.11(7)	Varies	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0937	Cross Tie Supply Header Isolation	ESF	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0938	Cross Tie Supply Header Isolation	ESF	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0939	Cross Tie Return Header Isolation	ESF	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V0940	Cross Tie Return Header Isolation	ESF	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
CC-V1001	CCW Pump01A Discharge Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1002	CCW Pump01B Discharge Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1003	CCW Pump02A Discharge Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1004	CCW Pump02B Discharge Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1099	CCW Quadrant A to RCP Common Line Check	ESF	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I		SR	
CC-V1100	RCP Return Pressure Release Line Check	ESF	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I		SR	
CC-V1107	CCW Surge Tank Tank01A Vacuum Relief	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
CC-V1108	CCW Surge Tank Tank01B Vacuum Relief	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
CC-V1109	N2 Supply to CCW Surge Tank01A Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1110	N2 Supply to CCW Surge Tank01B Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1111	CCW Surge Tank Tank01A Pressure Relief	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
CC-V1112	CCW Surge Tank Tank01B Pressure Relief	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
CC-V1131	CCW Pump Pump01A Recirculation Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1132	CCW Pump Pump01B Recirculation Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1133	CCW Pump Pump02A Recirculation Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1134	CCW Pump Pump02B Recirculation Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1303	CCW Makeup Pump03A Discharge Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1304	CCW Makeup Pump03B Discharge Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1309	CCW Makeup Pump03A Discharge Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1310	CCW Makeup Pump03B Discharge Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1317	Demi Water Makeup to Surge Tank01A Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1318	Demi Water Makeup to Surge Tank01B Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1319	Demi Water Makeup to Surge Tank01A Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	

Table 3.11-2 (5 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
CC-V1320	Demi Water Makeup to Surge Tank01B Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1325	CCW Makeup Pump03A Recirculation Line Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1326	CCW Makeup Pump03B Recirculation Line Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
CC-V1685	L/D Heat Exchanger Inlet Isolation 297 Bypass Check	ESF	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I		SR	
CC-V1686	L/D Heat Exchanger Outlet Line Pressure Release Check	ESF	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I		SR	
Condenser Vacuum System													
CA-CA013	Gate Valve and Actuator, CA Isolation, CIV	ESF	AB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
Containment Spray System													
CS-PP01A	Containment Spray Pump & Motor	ESF	AB	050-A01C	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CS-PP01B	Containment Spray Pump & Motor	ESF	AB	050-A01D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CS-V0001	Containment Spray Header Block	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CS-V0002	Containment Spray Header Block	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CS-V0003	Containment Spray Header Isolation	ESF	AB	COL 3.11(7)	Short-Term (60sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CS-V0004	Containment Spray Header Isolation	ESF	AB	COL 3.11(7)	Short-Term (60sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CS-V0005	CS Heat Exchanger to IRWST Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CS-V0006	CS Heat Exchanger to IRWST Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CS-V0007	CS Heat Exchanger to IRWST Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CS-V0008	CS Heat Exchanger to IRWST Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
CS-V1001	CS Pump Discharge Check	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I		SR	
CS-V1002	CS Pump Discharge Check	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I		SR	
CS-V1005	CS Heat Exchanger Heat Exchanger01A Thermal Relief To EDT	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
CS-V1006	CS Heat Exchanger Heat Exchanger01B Thermal Relief To EDT	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
CS-V1007	Containment Isolation Check	ESF	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I		SR	
CS-V1008	Containment Isolation Check	ESF	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I		SR	
CS-V1014	ECSBS Spray Header Check	BDBA	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I		SR	
Chemical and Volume Control System													
CV-0505	Globe Valve and Actuator, RCP Controlled Bleedoff, CIV	CIV	AB	COL 3.11(7)	CONT	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O

Table 3.11-2 (6 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
CV-0506	Globe Valve and Actuator, RCP Controlled Bleedoff, CIV	CIV	RCB	COL 3.11(7)	CONT	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
CV-0509	Gate Valve and Actuator, IRWST Makeup Line, CIV	CIV	AB	COL 3.11(7)	CONT	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
CV-0515	Globe Valve and Actuator, Letdown Isolation	To isolate RCS	RCB	COL 3.11(7)	CONT	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
CV-0516	Globe Valve and Actuator, Letdown Isolation	To isolate RCS	RCB	COL 3.11(7)	CONT	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
CV-0522	Globe Valve and Actuator, Letdown Containment Isolation, CIV	CIV	RCB	COL 3.11(7)	CONT	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
CV-0523	Globe Valve and Actuator, Letdown Containment Isolation, CIV	CIV	AB	COL 3.11(7)	CONT	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
CV-0524	Globe Valve and Actuator, Charging Containment Isolation, CIV	CIV	AB	COL 3.11(7)	CONT	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
CV-0255	Globe Valve and Actuator, Seal Injection Containment Isolation, CIV	CIV	AB	COL 3.11(7)	CONT	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
CV-0560	Globe Valve and Actuator, RDT Effluent Containment Isolation, CIV	CIV	RCB	COL 3.11(7)	CONT	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
CV-0561	Globe Valve and Actuator, RDT Effluent Containment Isolation, CIV	CIV	AB	COL 3.11(7)	CONT	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
CV-0580	Gate Valve and Actuator, RSSH to RDH Isolation, CIV	CIV	AB	COL 3.11(7)	CONT	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
CV-0576	Globe Valve and Actuator, Charging Flow Restricting	To Restrict charging flow	AB	COL 3.11(7)	CONT	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
CV-0577	Globe Valve and Actuator, Charging Flow Restricting	To Restrict charging flow	AB	COL 3.11(7)	CONT	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
Emergency Diesel Generator System													
DG-DG01A	Class 1E Diesel Generator including Engine	EDG	EDGB	100-H02A	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
DG-DG01B	Class 1E Diesel Generator including Engine	EDG	EDGB	100-H02B	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
DG-DG01C	Class 1E Diesel Generator including Engine	EDG	AB	100-A03C	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
DG-DG01D	Class 1E Diesel Generator including Engine	EDG	AB	100-A03D	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
DG-DP01A	Control Panels & Cubicles (12)	EDG	EDGB	100-H01A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP02A	Control Panels & Cubicles (12)	EDG	EDGB	100-H01A	Continuous	Mild	Mild	Electrical (EMC)	No	I	(3)	SR	O
DG-DP03A	Control Panels & Cubicles (12)	EDG	EDGB	100-H01A	Continuous	Mild	Mild	Electrical (EMC)	No	I	(3)	SR	O
DG-DP04A	Control Panels & Cubicles (12)	EDG	EDGB	100-H01A	Continuous	Mild	Mild	Electrical (EMC)	No	I	(3)	SR	O

Table 3.11-2 (7 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
DG-DP05A	Control Panels & Cubicles (12)	EDG	EDGB	100-H01A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP06A	Control Panels & Cubicles (12)	EDG	EDGB	100-H01A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP07A	Control Panels & Cubicles (12)	EDG	EDGB	100-H01A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP08A	Control Panels & Cubicles (12)	EDG	EDGB	100-H01A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP09A	Control Panels & Cubicles (12)	EDG	EDGB	100-H01A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP10A	Control Panels & Cubicles (12)	EDG	EDGB	100-H01A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP01B	Control Panels & Cubicles (12)	EDG	EDGB	100-H01B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP02B	Control Panels & Cubicles (12)	EDG	EDGB	100-H01B	Continuous	Mild	Mild	Electrical (EMC)	No	I	(3)	SR	O
DG-DP03B	Control Panels & Cubicles (12)	EDG	EDGB	100-H01B	Continuous	Mild	Mild	Electrical (EMC)	No	I	(3)	SR	O
DG-DP04B	Control Panels & Cubicles (12)	EDG	EDGB	100-H01B	Continuous	Mild	Mild	Electrical (EMC)	No	I	(3)	SR	O
DG-DP05B	Control Panels & Cubicles (12)	EDG	EDGB	100-H01B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP06B	Control Panels & Cubicles (12)	EDG	EDGB	100-H01B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP07B	Control Panels & Cubicles (12)	EDG	EDGB	100-H01B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP08B	Control Panels & Cubicles (12)	EDG	EDGB	100-H01B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP09B	Control Panels & Cubicles (12)	EDG	EDGB	100-H01B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP10B	Control Panels & Cubicles (12)	EDG	EDGB	100-H01B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP01C	Control Panels & Cubicles (12)	EDG	AB	100-A02C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP02C	Control Panels & Cubicles (12)	EDG	AB	100-A02C	Continuous	Mild	Mild	Electrical (EMC)	No	I	(3)	SR	O
DG-DP03C	Control Panels & Cubicles (12)	EDG	AB	100-A02C	Continuous	Mild	Mild	Electrical (EMC)	No	I	(3)	SR	O
DG-DP04C	Control Panels & Cubicles (12)	EDG	AB	100-A02C	Continuous	Mild	Mild	Electrical (EMC)	No	I	(3)	SR	O
DG-DP05C	Control Panels & Cubicles (12)	EDG	AB	100-A02C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O

Table 3.11-2 (8 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
DG-DP06C	Control Panels & Cubicles (12)	EDG	AB	100-A02C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP07C	Control Panels & Cubicles (12)	EDG	AB	100-A02C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP08C	Control Panels & Cubicles (12)	EDG	AB	100-A02C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP09C	Control Panels & Cubicles (12)	EDG	AB	100-A02C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP10C	Control Panels & Cubicles (12)	EDG	AB	100-A02C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP01D	Control Panels & Cubicles (12)	EDG	AB	100-A02D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP02D	Control Panels & Cubicles (12)	EDG	AB	100-A02D	Continuous	Mild	Mild	Electrical (EMC)	No	I	(3)	SR	O
DG-DP03D	Control Panels & Cubicles (12)	EDG	AB	100-A02D	Continuous	Mild	Mild	Electrical (EMC)	No	I	(3)	SR	O
DG-DP04D	Control Panels & Cubicles (12)	EDG	AB	100-A02D	Continuous	Mild	Mild	Electrical (EMC)	No	I	(3)	SR	O
DG-DP05D	Control Panels & Cubicles (12)	EDG	AB	100-A02D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP06D	Control Panels & Cubicles (12)	EDG	AB	100-A02D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP07D	Control Panels & Cubicles (12)	EDG	AB	100-A02D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP08D	Control Panels & Cubicles (12)	EDG	AB	100-A02D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP09D	Control Panels & Cubicles (12)	EDG	AB	100-A02D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
DG-DP10D	Control Panels & Cubicles (12)	EDG	AB	100-A02D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
LP01A	Control Panel (12)	EDG	EDGB	100-H01A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
LP02A	Engine Panel (12)	EDG	EDGB	100-H02A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
LP01B	Control Panel (12)	EDG	EDGB	100-H01B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
LP02B	Engine Panel (12)	EDG	EDGB	100-H02B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
LP01C	Control Panel (12)	EDG	AB	100-A02C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
LP02C	Engine Panel (12)	EDG	AB	100-A03C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O

Table 3.11-2 (9 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
LP01D	Control Panel (12)	EDG	AB	100-A02D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
LP02D	Engine Panel (12)	EDG	AB	100-A03D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(3)	SR	O
Emergency Diesel Engine Cooling Water System													
DG-V4217A	3-Way Thermostatic Control Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4217B	3-Way Thermostatic Control Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4217C	3-Way Thermostatic Control Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4217D	3-Way Thermostatic Control Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4250A	3-Way Thermostatic Control Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4250B	3-Way Thermostatic Control Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4250C	3-Way Thermostatic Control Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4250D	3-Way Thermostatic Control Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4230A	Preheating HT Water Pump Inlet Isolation Valve	EDG	EDGB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4230B	Preheating HT Water Pump Inlet Isolation Valve	EDG	EDGB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4230C	Preheating HT Water Pump Inlet Isolation Valve	EDG	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4230D	Preheating HT Water Pump Inlet Isolation Valve	EDG	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4231A	HT Water Inlet Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4231B	HT Water Inlet Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4231C	HT Water Inlet Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4231D	HT Water Inlet Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
Emergency Diesel Engine Starting Air System													
DG-V4022A	Starting Air Receiver Inlet Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4022B	Starting Air Receiver Inlet Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4022C	Starting Air Receiver Inlet Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4022D	Starting Air Receiver Inlet Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4030A	Starting Air Receiver Inlet Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4030B	Starting Air Receiver Inlet Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4030C	Starting Air Receiver Inlet Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4030D	Starting Air Receiver Inlet Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4308A	Starting Air Common Header Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4308B	Starting Air Common Header Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	

Table 3.11-2 (10 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
DG-V4308C	Starting Air Common Header Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4308D	Starting Air Common Header Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4309A	Starting Air Common Header Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4309B	Starting Air Common Header Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4309C	Starting Air Common Header Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4309D	Starting Air Common Header Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4312A	Starting Air Common Header Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4312B	Starting Air Common Header Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4312C	Starting Air Common Header Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4312D	Starting Air Common Header Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4043A	Starting Air Common Header Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4043B	Starting Air Common Header Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4043C	Starting Air Common Header Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4043D	Starting Air Common Header Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4039A	Starting Air Outlet Regulating Globe Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4039B	Starting Air Outlet Regulating Globe Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4039C	Starting Air Outlet Regulating Globe Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4039D	Starting Air Outlet Regulating Globe Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4040A	Starting Air Outlet Regulating Globe Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4040B	Starting Air Outlet Regulating Globe Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4040C	Starting Air Outlet Regulating Globe Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4040D	Starting Air Outlet Regulating Globe Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V5023A	Starting Air Receiver Relief Valve	EDG	EDGB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V5023B	Starting Air Receiver Relief Valve	EDG	EDGB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V5023C	Starting Air Receiver Relief Valve	EDG	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V5023D	Starting Air Receiver Relief Valve	EDG	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V5031A	Starting Air Receiver Relief Valve	EDG	EDGB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	

Table 3.11-2 (11 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition [1]	Radiation Condition [4][6]	Designation	Influence of Immersion [11]	Seismic Category	Remarks	Classification	HF Sensitive
DG-V5031B	Starting Air Receiver Relief Valve	EDG	EDGB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V5031C	Starting Air Receiver Relief Valve	EDG	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V5031D	Starting Air Receiver Relief Valve	EDG	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4041A	Over Speed Air Receiver Relief Valve	EDG	EDGB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4041B	Over Speed Air Receiver Relief Valve	EDG	EDGB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4041C	Over Speed Air Receiver Relief Valve	EDG	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4041D	Over Speed Air Receiver Relief Valve	EDG	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4316A	Over Speed Air Receiver Inlet Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4316B	Over Speed Air Receiver Inlet Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4316C	Over Speed Air Receiver Inlet Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4316D	Over Speed Air Receiver Inlet Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
Emergency Diesel Engine Lube Oil System													
DG-V4114A	3-Way Thermostatic Control Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4114B	3-Way Thermostatic Control Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4114C	3-Way Thermostatic Control Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4114D	3-Way Thermostatic Control Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4111A	Lube Oil/Preheating Water Heat Exchanger Outlet Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4111B	Lube Oil/Preheating Water Heat Exchanger Outlet Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4111C	Lube Oil/Preheating Water Heat Exchanger Outlet Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4111D	Lube Oil/Preheating Water Heat Exchanger Outlet Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4059A	Lube Oil Regulating Gate Valve	EDG	EDGB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4059B	Lube Oil Regulating Gate Valve	EDG	EDGB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4059C	Lube Oil Regulating Gate Valve	EDG	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4059D	Lube Oil Regulating Gate Valve	EDG	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4140A	Lube Oil Pump Discharge Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4140B	Lube Oil Pump Discharge Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	

Table 3.11-2 (12 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
DG-V4140C	Lube Oil Pump Discharge Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4140D	Lube Oil Pump Discharge Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4232A	Pre Lube Oil Pump Inlet Isolation Valve	EDG	EDGB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4232B	Pre Lube Oil Pump Inlet Isolation Valve	EDG	EDGB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4232C	Pre Lube Oil Pump Inlet Isolation Valve	EDG	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4232D	Pre Lube Oil Pump Inlet Isolation Valve	EDG	AB	COL 3.11(7)	Short-Term	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4109A	Pre Lube Oil Engine Inlet Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4109B	Pre Lube Oil Engine Inlet Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4109C	Pre Lube Oil Engine Inlet Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DG-V4109D	Pre Lube Oil Engine Inlet Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
Emergency Diesel Engine Fuel Oil System													
DO-PP01A	Emergency Diesel Fuel Oil Transfer Pumps	EDG	EDGB	063-H02A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-PP01B	Emergency Diesel Fuel Oil Transfer Pumps	EDG	EDGB	063-H02B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-PP01C	Emergency Diesel Fuel Oil Transfer Pumps	EDG	AB	065-A01C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-PP01D	Emergency Diesel Fuel Oil Transfer Pumps	EDG	AB	065-A01D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-PP02A	Emergency Diesel Fuel Oil Transfer Pumps	EDG	EDGB	063-H02A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-PP02B	Emergency Diesel Fuel Oil Transfer Pumps	EDG	EDGB	063-H02B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-PP02C	Emergency Diesel Fuel Oil Transfer Pumps	EDG	AB	065-A01C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-PP02D	Emergency Diesel Fuel Oil Transfer Pumps	EDG	AB	065-A01D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-V1005A	Diesel Fuel Transfer Pump Discharge Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-V1005B	Diesel Fuel Transfer Pump Discharge Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-V1005C	Diesel Fuel Transfer Pump Discharge Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-V1005D	Diesel Fuel Transfer Pump Discharge Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-V1006A	Diesel Fuel Transfer Pump Discharge Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-V1006B	Diesel Fuel Transfer Pump Discharge Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-V1006C	Diesel Fuel Transfer Pump Discharge Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-V1006D	Diesel Fuel Transfer Pump Discharge Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-V1007A	Diesel Fuel Transfer Pump Discharge Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-V1007B	Diesel Fuel Transfer Pump Discharge Check Valve	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-V1007C	Diesel Fuel Transfer Pump Discharge Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
DO-V1007D	Diesel Fuel Transfer Pump Discharge Check Valve	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	

Table 3.11-2 (13 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
Spent Fuel Pool Cooling System													
FC-PP01A	Spent Fuel Pool Cooling Pump	ESF	AB	100-A24A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
FC-PP01B	Spent Fuel Pool Cooling Pump	ESF	AB	100-A32B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
FC-V1005	SFP Cooling Pump01A Discharge Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
FC-V1006	SFP Cooling Pump01B Discharge Check	ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
FC-V1145	SFP Cleanup Demineralizer Outlet Header Penetration Check	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I		SR	
Main Feedwater System													
FW-V0121	Economizer Main Feedwater Isolation Valve	ESF	AB	137-A31C	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
FW-V0122	Economizer Main Feedwater Isolation Valve	ESF	AB	137-A31C	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
FW-V0123	Economizer Main Feedwater Isolation Valve	ESF	AB	137-A31D	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
FW-V0124	Economizer Main Feedwater Isolation Valve	ESF	AB	137-A31D	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
FW-V0131	Downcomer Main Feedwater Isolation Valves	ESF	AB	137-A31C	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
FW-V0132	Downcomer Main Feedwater Isolation Valves	ESF	AB	137-A31C	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
FW-V0133	Downcomer Main Feedwater Isolation Valves	ESF	AB	137-A31D	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
FW-V0134	Downcomer Main Feedwater Isolation Valves	ESF	AB	137-A31D	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
FW-V0138	Feedwater Chemical Injection Isolation Valve	ESF	AB	COL 3.11(7)	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
FW-V0139	Feedwater Chemical Injection Isolation Valve	ESF	AB	COL 3.11(7)	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
Instrument Air System													
IA-V0020	Cylinder Valve and Actuator, CIV	ESF	AB	COL 3.11(7)	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	
In-Containment Water Storage System													
IW-V0001	Reactor Cavity Flooding Isolation	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0002	Reactor Cavity Flooding Isolation	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0003	Reactor Cavity Flooding Isolation	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0004	Reactor Cavity Flooding Isolation	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0005	BAMP Suction Containment Isolation	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0006	BAMP Suction Containment Isolation	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0010	IRWST Level Transmitter (LT-392D) Upper Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0011	IRWST Level Transmitter (LT-392D) Lower Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0012	HVT Wide Range Level Transmitter (LT-396D) Upper Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0013	HVT Wide Range Level Transmitter (LT-396D) Lower Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O

Table 3.11-2 (14 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
IW-V0014	HVT Wide Range Level Transmitter (LT-397C) Upper Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0015	HVT Wide Range Level Transmitter (LT-397C) Lower Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0016	HVT Narrow Range Level Transmitter (LT-403A) Upper Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0017	HVT Narrow Range Level Transmitter (LT-403A) Lower Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0018	Reactor Cavity Transmitter (LT-397A) Upper Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0019	Reactor Cavity Transmitter (LT-397A) Lower Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0020	Reactor Cavity Transmitter (LT-398B) Upper Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0021	Reactor Cavity Transmitter (LT-398B) Lower Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0022	IRWST Level Transmitter (LT-393C) Upper Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0023	IRWST Level Transmitter (LT-393C) Lower Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0024	IRWST Level Transmitter (LT-391A) Upper Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0025	IRWST Level Transmitter (LT-391A) Lower Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0026	IRWST Level Transmitter (LT-390B) Upper Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0027	IRWST Level Transmitter (LT-390B) Lower Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0028	HVT Wide Range Level Transmitter (LT-394B) Upper Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0029	HVT Wide Range Level Transmitter (LT-394B) Lower Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0030	HVT Wide Range Level Transmitter (LT-395A) Upper Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0031	HVT Wide Range Level Transmitter (LT-395A) Lower Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0032	Reactor Cavity (LT-399C) Transmitter Upper Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0033	Reactor Cavity (LT-399C) Transmitter Lower Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0034	Reactor Cavity (LT-400D) Transmitter Upper Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V0035	Reactor Cavity (LT-400D) Transmitter Lower Tap Isolation	ESF	AB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
IW-V1003	BAMP Suction Line Pressure (Thermal) Relief	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
Main Steam System													
MS-V0011	Main Steam Isolation Valve	ESF	AB	COL 3.11(7)	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V0012	Main Steam Isolation Valve	ESF	AB	COL 3.11(7)	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V0013	Main Steam Isolation Valve	ESF	AB	COL 3.11(7)	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V0014	Main Steam Isolation Valve	ESF	AB	COL 3.11(7)	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V0015	Main Steam Isolation Bypass Valve	ESF	AB	COL 3.11(7)	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O

Table 3.11-2 (15 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
MS-V0016	Main Steam Isolation Bypass Valve	ESF	AB	COL 3.11(7)	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V0017	Main Steam Isolation Bypass Valve	ESF	AB	COL 3.11(7)	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V0018	Main Steam Isolation Bypass Valve	ESF	AB	COL 3.11(7)	Short-Term(5 sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V0090	Main Steam Drip Leg Isolation Valve	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	
MS-V0091	Main Steam Drip Leg Isolation Valve	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	
MS-V0092	Main Steam Drip Leg Isolation Valve	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	
MS-V0093	Main Steam Drip Leg Isolation Valve	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	
MS-V0101	MSADV and Actuator	Dump	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V0102	MSADV and Actuator	Dump	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V0103	MSADV and Actuator	Dump	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V0104	MSADV and Actuator	Dump	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V0105	MSADV Isolation Valve and Actuator	Isolation	AB	COL 3.11(7)	Varies	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V0106	MSADV Isolation Valve and Actuator	Isolation	AB	COL 3.11(7)	Varies	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V0107	MSADV Isolation Valve and Actuator	Isolation	AB	COL 3.11(7)	Varies	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V0108	MSADV Isolation Valve and Actuator	Isolation	AB	COL 3.11(7)	Varies	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
MS-V1301	Main Steam Safety Valve	Safety Valve	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1302	Main Steam Safety Valve	Safety Valve	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1303	Main Steam Safety Valve	Safety Valve	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1304	Main Steam Safety Valve	Safety Valve	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1305	Main Steam Safety Valve	Safety Valve	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1306	Main Steam Safety Valve	Safety Valve	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1307	Main Steam Safety Valve	Safety Valve	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1308	Main Steam Safety Valve	Safety Valve	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1309	Main Steam Safety Valve	Safety Valve	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1310	Main Steam Safety Valve	Safety Valve	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1311	Main Steam Safety Valve	Safety Valve	AB	137-A31D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1312	Main Steam Safety Valve	Safety Valve	AB	137-A31D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1313	Main Steam Safety Valve	Safety Valve	AB	137-A31D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1314	Main Steam Safety Valve	Safety Valve	AB	137-A31D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1315	Main Steam Safety Valve	Safety Valve	AB	137-A31D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1316	Main Steam Safety Valve	Safety Valve	AB	137-A31D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	

Table 3.11-2 (16 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
MS-V1317	Main Steam Safety Valve	Safety Valve	AB	137-A31D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1318	Main Steam Safety Valve	Safety Valve	AB	137-A31D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1319	Main Steam Safety Valve	Safety Valve	AB	137-A31D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
MS-V1320	Main Steam Safety Valve	Safety Valve	AB	137-A31D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
Compressed Gas System													
NT-V0004	Nitrogen Supply to SITs and RDT CIV, Globe Valve and Actuator	ESF	AB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	
Radiation Monitoring System													
PR-RE/RT-039A	Containment Air Monitor (12)	Leak Detection	AB	100-A22A	Continuous	Harsh	Harsh	Electrical (EMC)	No	I		SR	O
PR-RE/RT-040B	Containment Air Monitor (12)	Leak Detection	AB	100-A22A	Continuous	Harsh	Harsh	Electrical (EMC)	No	I		SR	O
PR-RE/RT-071A	Control Room Air Intake Monitor (12)	ESF	AB	174-A05C	Continuous	Harsh	Harsh	Electrical (EMC)	No	I		SR	O
PR-RE/RT-072B	Control Room Air Intake Monitor (12)	ESF	AB	174-A05C	Continuous	Harsh	Harsh	Electrical (EMC)	No	I		SR	O
PR-RE/RT-073A	Control Room Air Intake Monitor (12)	ESF	AB	174-A05D	Continuous	Harsh	Harsh	Electrical (EMC)	No	I		SR	O
PR-RE/RT-074B	Control Room Air Intake Monitor (12)	ESF	AB	174-A05D	Continuous	Harsh	Harsh	Electrical (EMC)	No	I		SR	O
PR-RE/RT-231A	Containment Operating Area Monitor (12)	ESF, Accident Monitoring	RCB	156-C01	Continuous	Harsh	Harsh	Electrical (EMC)	No	I		SR	O
PR-RE/RT-232B	Containment Operating Area Monitor (12)	ESF, Accident Monitoring	RCB	156-C01	Continuous	Harsh	Harsh	Electrical (EMC)	No	I		SR	O
PR-RE/RT-233A	Containment Upper Operating Area Monitor (12)	ESF, Accident Monitoring	RCB	156-C01	Continuous	Harsh	Harsh	Electrical (EMC)	No	I		SR	O
PR-RE/RT-234B	Containment Upper Operating Area Monitor (12)	ESF, Accident Monitoring	RCB	156-C01	Continuous	Harsh	Harsh	Electrical (EMC)	No	I		SR	O
PR-RE/RT-241	Spent Fuel Pool Area Monitor (12)	ESF, Accident Monitoring	AB	156-A08B	Continuous	Mild	Mild	Electrical (EMC)	No	I		SR	O
PR-RE/RT-242	Spent Fuel Pool Area Monitor (12)	ESF, Accident Monitoring	AB	156-A08B	Continuous	Mild	Mild	Electrical (EMC)	No	I		SR	O
Process Sampling System													
PS-V0031	Steam Generator 1 Sample Line from Blowdown Hot Leg CIV, Gate Valve and Actuator (12)	Accident Monitoring	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical (EMC)	No	I	(3)	SR	O
PS-V0032	Steam Generator 2 Sample Line from Blowdown Hot Leg CIV, Gate Valve and Actuator (12)	Accident Monitoring	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical (EMC)	No	I	(3)	SR	O
PS-V0033	Steam Generator 1 Sample Line from Downcomer CIV, Gate Valve and Actuator (12)	Accident Monitoring	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical (EMC)	No	I	(3)	SR	O
PS-V0034	Steam Generator 2 Sample Line from Downcomer CIV, Gate Valve and Actuator (12)	Accident Monitoring	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical (EMC)	No	I	(3)	SR	O

Table 3.11-2 (17 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition [1]	Radiation Condition [4][6]	Designation	Influence of Immersion [11]	Seismic Category	Remarks	Classification	HF Sensitive
PS-V0035	Steam Generator 1 Sample Line from Blowdown Cold Leg CIV, Gate Valve and Actuator	Accident Monitoring	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
PS-V0036	Steam Generator 2 Sample Line from Blowdown Cold Leg CIV, Gate Valve and Actuator	Accident Monitoring	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
PS-V0257	Steam Generator 1 Primary Sample and Cooler Rack ISO Valve, Gate Valve and Actuator	Accident Monitoring	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
PS-V0258	Steam Generator 2 Primary Sample and Cooler Rack ISO Valve, Gate Valve and Actuator	Accident Monitoring	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
Primary Sampling System													
PX-V0001	RCS Hotleg Loop1 Sample CIV	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
PX-V0002	RCS Hotleg Loop1 SAMPLE CIV	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
PX-V0003	PZR Surge Line Sample CIV	ESF	RCB	COL 3.11(7)	Short-Term (15sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
PX-V0004	PZR Surge Line Sample CIV	ESF	AB	COL 3.11(7)	Short-Term (15sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
PX-V0005	PZR Steam Space Sample CIV	ESF	RCB	COL 3.11(7)	Short-Term (15sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
PX-V0006	PZR Steam Space Sample CIV	ESF	AB	COL 3.11(7)	Short-Term (15sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
PX-V0020	SI Tanks Sample CIV	ESF	AB	COL 3.11(7)	Short-Term (15sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
PX-V0021	SI Tanks Sample CIV	ESF	RCB	COL 3.11(7)	Short-Term (15sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
PX-V0041	Containment Air Sample Line CIV	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
PX-V0042	Containment Air Sample Line CIV	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
PX-V0043	Containment Air Sample Line CIV	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
PX-V0053	Sample Return To HVT	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
PX-V1005	PASS Sample Return Line Check CIV	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I		SR	
PX-V1020	Containment Air Sample Return Line Check CIV	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I		SR	
Reactor Coolant System													
RC-V0200	Pilot Operated Safety Relief Valve (POSRV)	Overpressure Protection	RCB	136-C02	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)		O
RC-V0201	Pilot Operated Safety Relief Valve (POSRV)	Overpressure Protection	RCB	136-C02	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)		O
RC-V0202	Pilot Operated Safety Relief Valve (POSRV)	Overpressure Protection	RCB	136-C02	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)		O
RC-V0203	Pilot Operated Safety Relief Valve (POSRV)	Overpressure Protection	RCB	136-C02	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)		O

Table 3.11-2 (18 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
RC-LP01A	POSRV Master Control Cabinet (2)(12)	POSRV Signal Interface	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
RC-LP01B	POSRV Master Control Cabinet (2)(12)	POSRV Signal Interface	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
RC-LP01C	POSRV Master Control Cabinet (2)(12)	POSRV Signal Interface	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
RC-LP01D	POSRV Master Control Cabinet (2)(12)	POSRV Signal Interface	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
Various	Hydraulic Snubbers for Surge Line	RCPB	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
Various	Steam Generator Supports including Snubbers	RCPB	RCB	100-C02A 100-C02B	short-term	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
Various	Reactor Coolant Pump Supports including Snubbers	RCPB	RCB	100-C02A 100-C02B	short-term	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
Reactor Gas Vent System													
RG-V0410	PZR Gas Vent	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
RG-V0411	PZR Gas Vent	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
RG-V0412	PZR Gas Vent	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
RG-V0413	PZR Gas Vent	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
RG-V0414	RX Vessel Gas Vent	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
RG-V0415	RX Vessel Gas Vent	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
RG-V0416	RX Vessel Gas Vent	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
RG-V0417	RX Vessel Gas Vent	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
RG-V0419	Gas Vent To IRWST	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
RG-V0420	Gas Vent To IRWST	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
RG-V1421	RCGVS Vacuum Relief	ESF	RCB	COL 3.11(7)	Varies	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
Service Air System													
SA-V0001	Cylinder Valve and Actuator, CIV	ESF	AB	COL 3.11(7)	Short-Term	Harsh	Harsh	Mechanical EQ	No	I			
S/G Blowdown System													
SD-V0005	S/G-1 Blowdown Containment Isolation	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
SD-V0006	S/G-2 Blowdown Containment Isolation	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
SD-V0007	S/G-1 Blowdown Containment Isolation	ESF	AB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
SD-V0008	S/G-2 Blowdown Containment Isolation	ESF	AB	COL 3.11(7)	Intermittent	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
SD-V1115	Wet Lay Up Recir Pump A Discharge Check	ESF	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I		SR	

Table 3.11-2 (19 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
SD-V1116	Wet Lay Up Recir Pump B Discharge Check	ESF	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Mechanical EQ	No	I		SR	
Safety Injection System													
SI-PP02A	Safety Injection Pumps motors	ESF	AB	050-A03A	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	
SI-PP02B	Safety Injection Pumps motors	ESF	AB	050-A03B	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	
SI-PP02C	Safety Injection Pumps motors	ESF	AB	050-A02C	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	
SI-PP02D	Safety Injection Pumps motors	ESF	AB	050-A02D	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	
SI-V0300	Globe Valve and Actuator, IRWST Return Line Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0301	Gate Valve and Actuator, IRWST Return Line Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0302	Globe Valve and Actuator, SI Combined Miniflow Line Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0303	Globe Valve and Actuator, SI Combined Miniflow Line Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0304	Gate Valve, IRWST Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0305	Gate Valve, IRWST Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0308	Gate Valve, IRWST Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0309	Gate Valve, IRWST Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0321	Globe Valve and Actuator, SI Hot Leg Inject. Line Isol.	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0322	Globe Valve and Actuator, Hot Leg Check Valve Leakage Isolation	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0331	Globe Valve and Actuator, SI Hot Leg Injection Line Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0332	Globe Valve and Actuator, Hot Leg Check Valve Leakage Isolation	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0602	Globe Valve and Actuator, SI Low Flow Control Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0603	Globe Valve and Actuator, SI Low Flow Control Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O

Table 3.11-2 (20 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
SI-V0604	Gate Valve and Actuator, SI Hot Leg Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0609	Gate Valve and Actuator, SI Hot Leg Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0605	Globe Valve and Actuator, SIT Atmospheric Vent Isolation Valves	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0606	Globe Valve and Actuator, SIT Atmospheric Vent Isolation Valves	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0607	Globe Valve and Actuator, SIT Atmospheric Vent Isolation Valves	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0608	Globe Valve and Actuator, SIT Atmospheric Vent Isolation Valves	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0611	Globe Valve and Actuator, SIT Fill & Drain Isolation	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0621	Globe Valve and Actuator, SIT Fill & Drain Isolation	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0631	Globe Valve and Actuator, SIT Fill & Drain Isolation	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0641	Globe Valve and Actuator, SIT Fill & Drain Isolation	ESF	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0613	Globe Valve and Actuator, SIT Atmospheric Vent Isolation Valves	ESF	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0623	Globe Valve and Actuator, SIT Atmospheric Vent Isolation Valves	ESF	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0633	Globe Valve and Actuator, SIT Atmospheric Vent Isolation Valves	ESF	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0643	Globe Valve and Actuator, SIT Atmospheric Vent Isolation Valves	ESF	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0614	Gate Valve, SIT Discharge Isolation Valves	ESF	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O

Table 3.11-2 (21 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
SI-V0624	Gate Valve, SIT Discharge Isolation Valves	ESF	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0634	Gate Valve, SIT Discharge Isolation Valves	ESF	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0644	Gate Valve, SIT Discharge Isolation Valves	ESF	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0616	Globe Valve and Actuator, SI Line Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0626	Globe Valve and Actuator, SI Line Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0636	Globe Valve and Actuator, SI Line Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0646	Globe Valve and Actuator, SI Line Isolation Valves	ESF	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0618	Globe Valve and Actuator, Check Valve Leakoff Isolation Valves	ESF	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0628	Globe Valve and Actuator, Check Valve Leakoff Isolation Valves	ESF	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0638	Globe Valve and Actuator, Check Valve Leakoff Isolation Valves	ESF	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0648	Globe Valve and Actuator, Check Valve Leakoff Isolation Valves	ESF	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0682	Globe Valve and Actuator, SIT Fill Line Isolation	ESF	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
Shutdown Cooling System													
SI-PP01A	Shutdown Cooling Pump and Motor	RT	AB	050-A04A	Continuous	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	
SI-PP01B	Shutdown Cooling Pump and Motor	RT	AB	050-A04B	Continuous	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	

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Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
SI-V0310	Globe Valve and Actuator, SDCHX Outlet Flow Control Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0311	Globe Valve and Actuator, SDCHX Outlet Flow Control Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0312	Globe Valve and Actuator, SDCHX Bypass Flow Control Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0313	Globe Valve and Actuator, SDCHX Bypass Flow Control Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0314	Globe Valve and Actuator, SCS Test Return Line Isolation Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0315	Globe Valve and Actuator, SCS Test Return Line Isolation Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0340	Gate Valve and Actuator, SCS/CSS Pump Suction Cross Connect Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0341	Gate Valve and Actuator, SCS/CSS Pump Discharge Cross Connect Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0342	Gate Valve and Actuator, SCS/CSS Pump Suction Cross Connect Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0343	Gate Valve and Actuator, SCS/CSS Pump Discharge Cross Connect Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0344	Gate Valve and Actuator, SCP Suction Isolation Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0346	Gate Valve and Actuator, SCP Suction Isolation Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0347	Gate Valve and Actuator, CSP Suction Isolation Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0348	CSP Suction Isolation Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0391	Gate Valve and Actuator, Reactor Cavity Isolation Valves	RT	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0393	Gate Valve and Actuator, Reactor Cavity Isolation Valves	RT	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0395	Gate Valve and Actuator, Reactor Cavity Isolation Valves	RT	RCB	COL 3.11(7)	short-term	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0600	Globe Valve and Actuator, SCS Line Isolation Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O

Table 3.11-2 (23 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
SI-V0601	Globe Valve and Actuator, SCS Line Isolation Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0651	Gate Valve and Actuator, SCS Suction Line Isolation Valves	RT	RCB	100-C02A	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0652	Gate Valve and Actuator, SCS Suction Line Isolation Valves	RT	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0653	Gate Valve and Actuator, SCS Suction Line Isolation Valves	RT	RCB	100-C01	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0654	Gate Valve and Actuator, SCS Suction Line Isolation Valves	RT	RCB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0655	Gate Valve and Actuator, SCS Suction Line Isolation Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0656	Gate Valve and Actuator, SCS Suction Line Isolation Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0688	Gate Valve and Actuator, SCS Test Return Line Isolation Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0693	Gate Valve and Actuator, SCS Test Return Line Isolation Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0690	Globe Valve and Actuator, SCS Warmup Line Flow Control Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
SI-V0691	Globe Valve and Actuator, SCS Warmup Line Flow Control Valves	RT	AB	COL 3.11(7)	Intermittent	Harsh	Harsh	Mechanical EQ, Electrical EQ	No	I	(3)	SR	O
Essential Service Water System													
SX-PP01A	Essential Service Water Pump	ESF	ESWPB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
SX-PP01B	Essential Service Water Pump	ESF	ESWPB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
SX-PP02A	Essential Service Water Pump	ESF	ESWPB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
SX-PP02B	Essential Service Water Pump	ESF	ESWPB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
SX-V0045	ESW Pump 01A Discharge	ESF	ESWPB	COL 3.11(7)	Varies	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
SX-V0046	ESW Pump 01B Discharge	ESF	ESWPB	COL 3.11(7)	Varies	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
SX-V0047	ESW Pump 02A Discharge	ESF	ESWPB	COL 3.11(7)	Varies	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
SX-V0048	ESW Pump 02B Discharge	ESF	ESWPB	COL 3.11(7)	Varies	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
SX-V1001	ESW Pump 01A Discharge Check	ESF	ESWPB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
SX-V1002	ESW Pump 01B Discharge Check	ESF	ESWPB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	

Table 3.11-2 (24 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition [1]	Radiation Condition [4][6]	Designation	Influence of Immersion [11]	Seismic Category	Remarks	Classification	HF Sensitive
SX-V1003	ESW Pump 02A Discharge Check	ESF	ESWPB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
SX-V1004	ESW Pump 02B Discharge Check	ESF	ESWPB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
SX-V1051	CCW Heat Exchanger Outlet Common Header Vacuum Relief	ESF	ESWPB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
SX-V1052	CCW Heat Exchanger Outlet Common Header Vacuum Relief	ESF	ESWPB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
Equipment and Floor Drainage System													
DE-V0005	Containment Drain Sump Pump Discharge Line, CIV	ESF	RCB	COL 3.11(7)	Short-Term (20sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
DE-V0006	Containment Drain Sump Pump Discharge Line, CIV	ESF	AB	COL 3.11(7)	Short-Term (20sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
Gaseous Radwaste System													
GW-V0001	Reactor Drain Tank Gas Space to GWMS CIV	ESF	RCB	COL 3.11(7)	Short-Term (15sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
GW-V0002	Reactor Drain Tank Gas Space to GWMS CIV	ESF	AB	COL 3.11(7)	Short-Term (15sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
Control Room Area HVAC System													
VC-HV01A	Supply AHU	Cooling	AB	174-A24C	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VC-HV01B	Supply AHU	Cooling	AB	174-A24D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VC-HV01C	Supply AHU	Cooling	AB	174-A23C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VC-HV01D	Supply AHU	Cooling	AB	174-A23D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VC-AU01A	Emergency Makeup ACU	ESF	AB	174-A24C	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VC-AU01B	Emergency Makeup ACU	ESF	AB	174-A24D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VC-Y0011A	Air Intake Isolation Damper (ESR)	ESF	AB	174-A24C	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0011B	Air Intake Isolation Damper (ESR)	ESF	AB	174-A24C	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0012A	Air Intake Isolation Damper (ESR)	ESF	AB	174-A24D	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0012B	Air Intake Isolation Damper (ESR)	ESF	AB	174-A24D	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0013A	AHU Inlet Isolation Damper (PSR)	ESF	AB	174-A24C	Short-Term (5sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VC-Y0013C	AHU Inlet Isolation Damper (PSR)	ESF	AB	174-A24C	Short-Term (5sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VC-Y0014B	AHU Inlet Isolation Damper (PSR)	ESF	AB	174-A24D	Short-Term (5sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VC-Y0014D	AHU Inlet Isolation Damper (PSR)	ESF	AB	174-A24D	Short-Term (5sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VC-Y0015A	AHU Inlet Isolation Damper (PSR)	ESF	AB	174-A24C	Short-Term (5sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VC-Y0015C	AHU Inlet Isolation Damper (PSR)	ESF	AB	174-A24C	Short-Term (5sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VC-Y0016B	AHU Inlet Isolation Damper (PSR)	ESF	AB	174-A24D	Short-Term (5sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VC-Y0016D	AHU Inlet Isolation Damper (PSR)	ESF	AB	174-A24D	Short-Term (5sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VC-Y0017A	ACU Inlet Isolation Damper (ESR)	Open	AB	174-A24C	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O

Table 3.11-2 (25 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
VC-Y0017C	ACU Inlet Isolation Damper (ESR)	Open	AB	174-A24C	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0018B	ACU Inlet Isolation Damper (ESR)	Open	AB	174-A24D	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0018D	ACU Inlet Isolation Damper (ESR)	Open	AB	174-A24D	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0019A	ACU Return Isolation Damper (ESR)	Open	AB	174-A24C	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0019C	ACU Return Isolation Damper (ESR)	Open	AB	174-A24C	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0020B	ACU Return Isolation Damper (ESR)	Open	AB	174-A24D	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0020D	ACU Return Isolation Damper (ESR)	Open	AB	174-A24D	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0021A	AHU Discharge Flow Control Damper (ESR)	Modulation	AB	174-A24C	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0021C	AHU Discharge Flow Control Damper (ESR)	Modulation	AB	174-A23C	Continuous	Mild	Mild	Electrical EQ	No	I	(3)	SR	O
VC-Y0022B	AHU Discharge Flow Control Damper (ESR)	Modulation	AB	174-A24D	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0022D	AHU Discharge Flow Control Damper (ESR)	Modulation	AB	174-A23D	Continuous	Mild	Mild	Electrical EQ	No	I	(3)	SR	O
VC-Y0023A	ACU Discharge Flow Control Damper (ESR)	Modulation	AB	174-A24C	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0023C	ACU Discharge Flow Control Damper (ESR)	Modulation	AB	174-A24C	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0024B	ACU Discharge Flow Control Damper (ESR)	Modulation	AB	174-A24D	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0024D	ACU Discharge Flow Control Damper (ESR)	Modulation	AB	174-A24D	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VC-Y0027	Kitchen & Toilet Isolation Damper (PSR)	ESF	AB	157-A02C	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VC-Y0028	Kitchen & Toilet Isolation Damper (PSR)	ESF	AB	195-A09C	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VC-Y0029	Smoke Removal Duct Isolation Damper (PSR)	ESF	AB	174-A24D	Short-Term (5sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VC-Y0030	Smoke Removal Duct Isolation Damper (PSR)	ESF	AB	174-A03D	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
Emergency Diesel Generator Area HVAC System													
VD-HV10A	EDG Control Room Cubicle Cooler	Cooling	EDGB	100-H01A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-HV10B	EDG Control Room Cubicle Cooler	Cooling	EDGB	100-H01B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-HV10C	EDG Control Room Cubicle Cooler	Cooling	AB	100-A02C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-HV10D	EDG Control Room Cubicle Cooler	Cooling	AB	100-A02D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-HV11A	EDG Room Normal Supply AHU	Cooling	EDGB	135-H03A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VD-HV11B	EDG Room Normal Supply AHU	Cooling	EDGB	135-H03B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VD-HV11C	EDG Room Normal Supply AHU	Cooling	AB	174-A14C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VD-HV11D	EDG Room Normal Supply AHU	Cooling	AB	174-A14D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VD-HV12A	EDG Room Emergency Cubicle Cooler	Cooling	EDGB	100-H02A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-HV13A	EDG Room Emergency Cubicle Cooler	Cooling	EDGB	100-H02A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	

Table 3.11-2 (26 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
VD-HV12B	EDG Room Emergency Cubicle Cooler	Cooling	EDGB	100-H02B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-HV13B	EDG Room Emergency Cubicle Cooler	Cooling	EDGB	100-H02B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-HV12C	EDG Room Emergency Cubicle Cooler	Cooling	AB	100-A03C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-HV13C	EDG Room Emergency Cubicle Cooler	Cooling	AB	100-A03C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-HV12D	EDG Room Emergency Cubicle Cooler	Cooling	AB	100-A03D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-HV13D	EDG Room Emergency Cubicle Cooler	Cooling	AB	100-A03D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH02A	EDG Room Exhaust Fan	Ventilation	EDGB	100-H02A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH02B	EDG Room Exhaust Fan	Ventilation	EDGB	100-H02B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH02C	EDG Room Exhaust Fan	Ventilation	AB	174-A01C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH02D	EDG Room Exhaust Fan	Ventilation	AB	174-A01D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH05A	Diesel Fuel Oil Storage Tank Room Supply Fan	Ventilation	EDGB	063-H02A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH05B	Diesel Fuel Oil Storage Tank Room Supply Fan	Ventilation	EDGB	063-H02B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH05C	Diesel Fuel Oil Storage Tank Room Supply Fan	Ventilation	AB	065-A01C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH05D	Diesel Fuel Oil Storage Tank Room Supply Fan	Ventilation	AB	065-A01D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH06A	Diesel Fuel Oil Storage Tank Room Exhaust Fan	Ventilation	EDGB	063-H02A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH06B	Diesel Fuel Oil Storage Tank Room Exhaust Fan	Ventilation	EDGB	063-H02A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH06C	Diesel Fuel Oil Storage Tank Room Exhaust Fan	Ventilation	AB	065-A01C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH06D	Diesel Fuel Oil Storage Tank Room Exhaust Fan	Ventilation	AB	065-A01D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH07A	Diesel Fuel Oil Day Tank & L.O. Makeup Tank Room Exhaust Fan	Ventilation	EDGB	100-H02A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH07B	Diesel Fuel Oil Day Tank & L.O. Makeup Tank Room Exhaust Fan	Ventilation	EDGB	100-H02B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH07C	Diesel Fuel Oil Day Tank & L.O. Makeup Tank Room Exhaust Fan	Ventilation	AB	120-A04C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-AH07D	Diesel Fuel Oil Day Tank & L.O. Makeup Tank Room Exhaust Fan	Ventilation	AB	120-A04D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VD-HC01A	EDG Room Electric Duct Heater	Heating	EDGB	100-H02A	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VD-HC01B	EDG Room Electric Duct Heater	Heating	EDGB	100-H02B	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VD-HC02A	Diesel Fuel Oil Storage Tank Room Electric Duct Heater	Heating	EDGB	063-H02A	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VD-HC02B	Diesel Fuel Oil Storage Tank Room Electric Duct Heater	Heating	EDGB	063-H02B	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VD-HC02C	Diesel Fuel Oil Storage Tank Room Electric Duct Heater	Heating	AB	065-A01C	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VD-HC02D	Diesel Fuel Oil Storage Tank Room Electric Duct Heater	Heating	AB	065-A01D	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O

Table 3.11-2 (27 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
Electrical and I&C Equipment Areas HVAC System													
VE-HV01A	Class 1E Switchgear 01C Room Cubicle Cooler	Cooling	AB	078-A02C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV01B	Class 1E Switchgear 01D Room Cubicle Cooler	Cooling	AB	078-A02D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV02A	Class 1E Load Center 01C Room Cubicle Cooler	Cooling	AB	078-A03C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV02B	Class 1E Load Center 01D Room Cubicle Cooler	Cooling	AB	078-A03D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV03A	Train - A DC&IP Equip. Room Cubicle Cooler	Cooling	AB	078-A56A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV03B	Train - B DC&IP Equip. Room Cubicle Cooler	Cooling	AB	078-A56B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV04A	Train - C DC&IP Equip. Room Cubicle Cooler	Cooling	AB	078-A05C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV04B	Train - D DC&IP Equip. Room Cubicle Cooler	Cooling	AB	078-A05D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV06A	480V Class 1E MCC 01A Room Cubicle Cooler	Cooling	AB	100-A12A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV06B	480V Class 1E MCC 01B Room Cubicle Cooler	Cooling	AB	100-A12B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV07A	Class 1E Switchgear 01A Room Cubicle Cooler	Cooling	AB	078-A25A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV07B	Class 1E Switchgear 01B Room Cubicle Cooler	Cooling	AB	078-A25B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV08B	Swing Load Center Room Cubicle Cooler	Cooling	AB	078-A58B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV09A	Electrical Penetration Room C Cubicle Cooler	Cooling	AB	120-A09C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV09B	Electrical Penetration Room D Cubicle Cooler	Cooling	AB	120-A09D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV10A	480V Class 1E MCC 03C Room Cubicle Cooler	Cooling	AB	137-A10C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV10B	480V Class 1E MCC 03D Room Cubicle Cooler	Cooling	AB	137-A10D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV11A	Electrical Penetration Room Cubicle Cooler	Cooling	AB	137-A11C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV11B	Electrical Penetration Room Cubicle Cooler	Cooling	AB	137-A11D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV12A	Penetration. Mux Room A Cubicle Cooler	Cooling	AB	137-A17A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV12B	Penetration Mux Room B Cubicle Cooler	Cooling	AB	137-A17B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV13A	Electrical Penetration Room Cubicle Cooler	Cooling	AB	137-A18A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV13B	Electrical Penetration Room Cubicle Cooler	Cooling	AB	137-A18B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV14A	480V Class 1E MCC 03A Room Cubicle Cooler	Cooling	AB	137-A23A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV14B	480V Class 1E MCC 03B Room Cubicle Cooler	Cooling	AB	120-A15B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV15A	480V Class 1E MCC 04A Room Cubicle Cooler	Cooling	AB	137-A15A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV15B	480V Class 1E MCC 04B Room Cubicle Cooler	Cooling	AB	137-A15B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV16A	I&C Equipment Room Cubicle Cooler	Cooling	AB	157-A25C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV16B	I&C Equipment Room Cubicle Cooler	Cooling	AB	157-A01D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV17A	I&C Equipment Room Cubicle Cooler	Cooling	AB	157-A19C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	

Table 3.11-2 (28 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition [1]	Radiation Condition [4][6]	Designation	Influence of Immersion [11]	Seismic Category	Remarks	Classification	HF Sensitive
VE-HV17B	I&C Equipment Room Cubicle Cooler	Cooling	AB	157-19D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV18A	Remote Shutdown Room Cubicle Cooler	Cooling	AB	137-A43D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HV18B	Remote Shutdown Room Cubicle Cooler	Cooling	AB	137-A43D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-AH20A	Train - A Battery Room Supply Fan	Ventilation	AB	100-A11A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-AH20B	Train - B Battery Room Supply Fan	Ventilation	AB	100-A11B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-AH20C	Train - C Battery Room Supply Fan	Ventilation	AB	078-A06C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-AH20D	Train - D Battery Room Supply Fan	Ventilation	AB	078-A06D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-AH21A	Train - A Battery Room Exhaust Fan	Ventilation	AB	078-A11C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-AH21B	Train - B Battery Room Exhaust Fan	Ventilation	AB	100-A11B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-AH21C	Train - C Battery Room Exhaust Fan	Ventilation	AB	078-A11C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-AH21D	Train - D Battery Room Exhaust Fan	Ventilation	AB	078-A11D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-AH22A	Remote Shutdown Room Supply Fan	Ventilation	AB	137-A43D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-AH22B	Remote Shutdown Room Supply Fan	Ventilation	AB	137-A43D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-AH23A	Remote Shutdown Room Exhaust Fan	Ventilation	AB	137-A43D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-AH23B	Remote Shutdown Room Exhaust Fan	Ventilation	AB	137-A43D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VE-HC01A	Train - A Battery Room Electrical Duct Heater	Heating	AB	100-A11A	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC01B	Train - B Battery Room Electrical Duct Heater	Heating	AB	100-A11B	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC01C	Train - C Battery Room Electrical Duct Heater	Heating	AB	078-A06C	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC01D	Train - D Battery Room Electrical Duct Heater	Heating	AB	078-A07D	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC02A	Class 1E Switchgear 01A Room Electrical Duct Heater	Heating	AB	078-A25A	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC02B	Class 1E Switchgear 01B Room Electrical Duct Heater	Heating	AB	078-A25B	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC03A	Remote Shutdown Room Electrical Duct Heater	Heating	AB	137-A43D	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC03B	Remote Shutdown Room Electrical Duct Heater	Heating	AB	137-A43D	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC04A	I&C Equipment Room Electrical Duct Heater	Heating	AB	157-A25C	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC04B	I&C Equipment Room Electrical Duct Heater	Heating	AB	157-A01D	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC05C	I&C Equipment Room Electrical Duct Heater	Heating	AB	157-A19C	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC05D	I&C Equipment Room Electrical Duct Heater	Heating	AB	157-A19D	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC06A	Elect Penetration A Room Electrical Duct Heater	Heating	AB	137-A18A	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC06B	Elect Penetration B Room Electrical Duct Heater	Heating	AB	137-A18B	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC07A	480V Class 1E MCC 03A Room Elec. Duct Heater	Heating	AB	137-A23A	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC07B	480V Class 1E MCC 03B Room Elec. Duct Heater	Heating	AB	120-A15B	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O

Table 3.11-2 (29 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
VE-HC08A	480V Class 1E 04A MCC 04A Room Elec. Duct Heater	Heating	AB	137-A15A	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC09A	Penetration Mux A Room Electrical Duct Heater	Heating	AB	137-A17A	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC09B	Penetration Mux B Room Electrical Duct Heater	Heating	AB	137-A17B	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
VE-HC10B	Swing Load Center Room Electrical Duct Heater	Heating	AB	078-A58B	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	O
Fuel Handling Area HVAC System													
VF-AU02A	Emergency Exhaust ACU	ESF	FHA	120-A24A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VF-AU02B	Emergency Exhaust ACU	ESF	FHA	120-A25A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VF-HV02A	SFP HX Room Cubicle Cooler	Cooling	FHA	100-A24A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VF-HV02B	SFP HX Room Cubicle Cooler	Cooling	FHA	100-A32B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VF-Y0001A	Air Intake Isolation Damper (PSR)	ESF	FHA	100-A36B	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VF-Y0002B	Air Intake Isolation Damper (PSR)	ESF	FHA	100-A36B	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VF-Y0003A	Normal Exhaust ACU Isolation Damper (PSR)	ESF	FHA	100-A38A	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VF-Y0004B	Normal Exhaust ACU Isolation Damper (PSR)	ESF	FHA	100-A38A	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VF-Y0005A	Emergency Exhaust ACU Isolation Damper (ESR)	Open	FHA	137-A25A	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VF-Y0006B	Emergency Exhaust ACU Isolation Damper (ESR)	Open	FHA	120-A24A	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VF-Y0007A	Emergency Exhaust Flow Control Damper (ESR)	Modulation	FHA	137-A25A	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VF-Y0008B	Emergency Exhaust Flow Control Damper (ESR)	Modulation	FHA	120-A24A	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
Auxiliary Building Controlled Area HVAC System													
VK-AU01A	Aux. Bldg Controlled Area I Emergency Exhaust ACU	ESF	AB	120-A21A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VK-AU01C	Aux. Bldg Controlled Area I Emergency Exhaust ACU	ESF	AB	120-A32A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VK-AU01B	Aux. Bldg Controlled Area II Emergency Exhaust ACU	ESF	AB	120-A29B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VK-AU01D	Aux. Bldg Controlled Area II Emergency Exhaust ACU	ESF	AB	120-A30B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VK-HV10A	CS Pump & Miniflow Heat Exchanger Room Cubicle Cooler	Cooling	AB	050-A01C	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV10B	CS Pump & Miniflow Heat Exchanger Room Cubicle Cooler	Cooling	AB	050-A01D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV11A	SI Pump Room Cubicle Cooler	Cooling	AB	050-A02C	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV11B	SI Pump Room Cubicle Cooler	Cooling	AB	050-A02D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV12A	SI Pump Room Cubicle Cooler	Cooling	AB	050-A03A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV12B	SI Pump Room Cubicle Cooler	Cooling	AB	050-A03B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV13A	CCW Pump Room Cubicle Cooler	Cooling	AB	055-A02A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VK-HV13B	CCW Pump Room Cubicle Cooler	Cooling	AB	055-A02B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	

Table 3.11-2 (30 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition [1]	Radiation Condition [4][6]	Designation	Influence of Immersion [11]	Seismic Category	Remarks	Classification	HF Sensitive
VK-HV14A	CCW Pump Room Cubicle Cooler	Cooling	AB	055-A02C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VK-HV14B	CCW Pump Room Cubicle Cooler	Cooling	AB	055-A02D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VK-HV15A	CS Heat Exchanger Room Cubicle Cooler	Cooling	AB	055-A01C	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV15B	CS Heat Exchanger Room Cubicle Cooler	Cooling	AB	055-A01D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV16A	SC Pump & Miniflow Heat Exchanger Room Cubicle Cooler	Cooling	AB	050-A04A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV16B	SC Pump & Miniflow Heat Exchanger Room Cubicle Cooler	Cooling	AB	050-A04B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV17A	SC Heat Exchanger Room Cubicle Cooler	Cooling	AB	055-A30A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV17B	SC Heat Exchanger Room Cubicle Cooler	Cooling	AB	055-A30B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV18A	Charging Pump Room Cubicle Cooler	Cooling	AB	055-A42A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV18B	Charging Pump Room Cubicle Cooler	Cooling	AB	055-A55B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV19A	Mechanical Penetration Room Cubicle Cooler	Cooling	AB	100-A13A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV19B	Mechanical Penetration Room Cubicle Cooler	Cooling	AB	100-A13B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV20A	Mechanical Penetration Room Cubicle Cooler	Cooling	AB	120-A16A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV20B	Mechanical Penetration Room Cubicle Cooler	Cooling	AB	120-A16B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV21B	Aux. Charging Pump Room Cubicle Cooler	Cooling	AB	055-A54B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV22A	Aux. Bldg Controlled Area Emergency Exhaust ACU Room Cubicle Cooler	Cooling	AB	120-A21A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV22B	Aux. Bldg Controlled Area Emergency Exhaust ACU Room Cubicle Cooler	Cooling	AB	120-A29B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV23A	Aux. Bldg Controlled Area Emergency Exhaust ACU Room Cubicle Cooler	Cooling	AB	120-A32A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-HV23B	Aux. Bldg Controlled Area Emergency Exhaust ACU Room Cubicle Cooler	Cooling	AB	120-A30B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
VK-Y0001A	Aux. Bldg Controlled Area Emergency Exhaust ACU Flow Control Damper (ESR)	Modulation	AB	120-A21A	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	
VK-Y0001B	Aux. Bldg Controlled Area Emergency Exhaust ACU Flow Control Damper (ESR)	Modulation	AB	120-A29B	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VK-Y0001C	Aux. Bldg Controlled Area Emergency Exhaust ACU Flow Control Damper (ESR)	Modulation	AB	120-A32A	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VK-Y0001D	Aux. Bldg Controlled Area Emergency Exhaust ACU Flow Control Damper (ESR)	Modulation	AB	120-A30B	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VK-Y0002A	Aux. Bldg Controlled Area Emergency Exhaust ACU Isolation Damper (ESR)	Open	AB	120-A32A	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VK-Y0002B	Aux. Bldg Controlled Area Emergency Exhaust ACU Isolation Damper (ESR)	Open	AB	120-A29B	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O

Table 3.11-2 (31 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
VK-Y0002C	Aux. Bldg Controlled Area Emergency Exhaust ACU Isolation Damper (ESR)	Open	AB	120-A21A	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VK-Y0002D	Aux. Bldg Controlled Area Emergency Exhaust ACU Isolation Damper (ESR)	Open	AB	120-A30B	Continuous	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VK-Y0017A	Aux. Bldg Controlled Area Supply AHU Outlet Isolation Damper (PSR)	ESF	AB	100-A20A	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VK-Y0018A	Aux. Bldg Controlled Area Supply AHU Outlet Isolation Damper (PSR)	ESF	AB	137-A29B	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VK-Y0019B	Aux. Bldg Controlled Area Supply AHU Outlet Isolation Damper (PSR)	ESF	AB	100-A20A	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VK-Y0020B	Aux. Bldg Controlled Area Supply AHU Outlet Isolation Damper (PSR)	ESF	AB	137-A29B	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VK-Y0021A	Aux. Bldg Controlled Area Normal Exhaust ACU Inlet Isolation Damper (PSR)	ESF	AB	156-A14A	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VK-Y0022A	Aux. Bldg Controlled Area Normal Exhaust ACU Inlet Isolation Damper (PSR)	ESF	AB	195-A08B	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VK-Y0023B	Aux. Bldg Controlled Area Normal Exhaust ACU Inlet Isolation Damper (PSR)	ESF	AB	156-A14A	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VK-Y0024B	Aux. Bldg Controlled Area Normal Exhaust ACU Inlet Isolation Damper (PSR)	ESF	AB	COL 3.11(7)	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VK-Y0050A	Post Accident Sample Room Isolation Damper (PSR)	Open	AB	055-A22A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VK-Y0050B	Post Accident Sample Room Isolation Damper (PSR)	Open	AB	055-A22B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VK-Y0050C	Post Accident Sample Room Isolation Damper (PSR)	Open	AB	055-A22A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VK-Y0050D	Post Accident Sample Room Isolation Damper (PSR)	Open	AB	055-A22B	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
Auxiliary Building Clean Area HVAC System													
VO-HV31A	Essential Chiller Room Cubicle Cooler	Cooling	AB	078-A11C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VO-HV31B	Essential Chiller Room Cubicle Cooler	Cooling	AB	078-A12D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VO-HV32A	Essential Chiller Room Cubicle Cooler	Cooling	AB	078-A12C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VO-HV32B	Essential Chiller Room Cubicle Cooler	Cooling	AB	078-A11D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VO-HV33A	Motor- Driven AFW Pump Room Cubicle Cooler	Cooling	AB	078-A20A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
VO-HV33B	Motor- Driven AFW Pump Room Cubicle Cooler	Cooling	AB	078-A20B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
Reactor Containment Purge System													
VQ-V0012	High Volume Containment Purge System Supply CIV, Butterfly Valve and Actuator	ESF	RCB	156-C01	Short-Term (5sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
VQ-V0011	High Volume Containment Purge System Supply CIV, Butterfly Valve and Actuator	ESF	AB	174-A16B	Short-Term (5sec)	Mild	Mild	Electrical EQ	No	I	(3)	SR	O
VQ-V0013	High Volume Containment Purge System Exhaust CIV, Butterfly Valve Actuator	ESF	RCB	156-C01	Short-Term (5sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O

Table 3.11-2 (32 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
VQ-V0014	High Volume Containment Purge System Exhaust CIV, Butterfly Valve Actuator	ESF	AB	174-A16B	Short-Term (5sec)	Mild	Mild	Electrical EQ	No	I	(3)	SR	O
VQ-V0031	Low Volume Containment Purge System Supply CIV, Butterfly Valve and Actuator	ESF	AB	174-A16B	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
VQ-V0032	Low Volume Containment Purge System Supply CIV, Butterfly Valve and Actuator	ESF	RCB	156-C01	Short-Term (5sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VQ-V0033	Low Volume Cont. Purge System Exhaust CIV, Butterfly Valve and Actuator	ESF	RCB	156-C01	Short-Term (5sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
VQ-V0034	Low Volume Cont. Purge System Exhaust CIV, Butterfly Valve and Actuator	ESF	AB	174-A16B	Short-Term (5sec)	Mild	Mild	Mechanical EQ	No	I	(3)	SR	O
Hydrogen Monitoring System													
Various	Hydrogen Analyzers	ESF	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ	No	I			
Plant Chilled Water System													
WI-V013	PCW Supply to Containment Ventilation Units CIV, Gate Valve and Actuator	ESF	AB	100-A16C	Short-Term (60sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
WI-V014	PCW Supply to Containment Ventilation Units CIV, Check Valve	Relief	RCB	114-C01A	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
WI-V015	PCW Return from Containment Ventilation Units CIV, Gate Valve and Actuator	ESF	RCB	114-C01A	Short-Term (60sec)	Harsh	Harsh	Electrical EQ	No	I	(3)	SR	O
WI-V012	PCW Return from Containment Ventilation Units CIV, Gate Valve and Actuator	ESF	AB	100-A16C	Short-Term (60sec)	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	O
Essential Chilled Water System													
WO-CH01A	Essential Chiller	Cooling	AB	078-A11C	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
WO-CH01B	Essential Chiller	Cooling	AB	078-A11D	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
WO-CH02A	Essential Chiller	Cooling	AB	078-A12C	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
WO-CH02B	Essential Chiller	Cooling	AB	078-A12D	Continuous	Mild	Mild	Mechanical EQ	No	I		SR	
WO-PP01A	Essential Chilled Water Pump	Cooling	AB	078-A11C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
WO-PP01B	Essential Chilled Water Pump	Cooling	AB	078-A11D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
WO-PP02A	Essential Chilled Water Pump	Cooling	AB	078-A12C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
WO-PP02B	Essential Chilled Water Pump	Cooling	AB	078-A12D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
WO-PP03A	Essential Chilled Water Make-up Pump	Cooling	AB	120-A10C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
WO-PP03B	Essential Chilled Water Make-up Pump	Cooling	AB	120-A10D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
WO-V1001A	ECW Compression Tank Relief valve	Relief	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
WO-V1001B	ECW Compression Tank Relief valve	Relief	AB	COL 3.11(7)	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	

Table 3.11-2 (33 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
WO-V0906A	Control Room Supply AHU Chilled Water 3-Way Valve	Cooling	AB	174-A24C	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
WO-V0906B	Control Room Supply AHU Chilled Water 3-Way Valve	Cooling	AB	174-A24D	Continuous	Harsh	Harsh	Mechanical EQ	No	I	(3)	SR	
WO-V0906C	Control Room Supply AHU Chilled Water 3-Way Valve	Cooling	AB	174-A23C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
WO-V0906D	Control Room Supply AHU Chilled Water 3-Way Valve	Cooling	AB	174-A23D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
WO-V0917A	EDG Room Normal Supply AHU Chilled Water 3-Way Valve	Cooling	AB	174-A14C	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
WO-V0917B	EDG Room Normal Supply AHU Chilled Water 3-Way Valve	Cooling	AB	174-A14D	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
WO-V0918A	EDG Room Normal Supply AHU Chilled Water 3-Way Valve	Cooling	AB	135-H03A	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
WO-V0918B	EDG Room Normal Supply AHU Chilled Water 3-Way Valve	Cooling	AB	135-H03B	Continuous	Mild	Mild	Mechanical EQ	No	I	(3)	SR	
WO-LP01A	Essential Chilled Water System Control Panel (12)	Control	AB	078-A11C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
WO-LP01B	Essential Chilled Water System Control Panel (12)	Control	AB	078-A11D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
WO-LP01C	Essential Chilled Water System Control Panel (12)	Control	AB	078-A12C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
WO-LP01D	Essential Chilled Water System Control Panel (12)	Control	AB	078-A12D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
WO-LI003C	Field Indicator Device (12)	Cooling	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
WO-LI003D	Field Indicator Device (12)	Cooling	AB	174-A06D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
Electric System													
PF-SW01A	4.16kV Metal Clad Switchgear	Power Supply (PS)	AB	078-A25A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PF-SW01B	4.16kV Metal Clad Switchgear	Power Supply (PS)	AB	078-A25B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PF-SW01C	4.16kV Metal Clad Switchgear	Power Supply (PS)	AB	078-A02C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PF-SW01D	4.16kV Metal Clad Switchgear	Power Supply (PS)	AB	078-A02D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PG-LC01A	480V Load Center	Power Supply (PS)	AB	078-A25A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PG-LC01B	480V Load Center	Power Supply (PS)	AB	078-A25B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PG -LC01C	480V Load Center	Power Supply (PS)	AB	078-A03C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PG -LC01D	480V Load Center	Power Supply (PS)	AB	078-A03D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PG -LC02	480V Load Center	Power Supply (PS)	AB	078-A58B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH-MC01A	480V Motor Control Center	Power Supply (PS)	AB	100-A12A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O

Table 3.11-2 (34 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
PH -MC02A	480V Motor Control Center	Power Supply (PS)	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC03A	480V Motor Control Center	Power Supply (PS)	AB	137-A23A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC04A	480V Motor Control Center	Power Supply (PS)	AB	137-A15A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC05A	480V Motor Control Center	Power Supply (PS)	AB	100-H01A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC01B	480V Motor Control Center	Power Supply (PS)	AB	100-A12B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC02B	480V Motor Control Center	Power Supply (PS)	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC03B	480V Motor Control Center	Power Supply (PS)	AB	120-A15B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC04B	480V Motor Control Center	Power Supply (PS)	AB	137-A15B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC05B	480V Motor Control Center	Power Supply (PS)	AB	100-H01B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC01C	480V Motor Control Center	Power Supply (PS)	AB	078-A03C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC02C	480V Motor Control Center	Power Supply (PS)	AB	078-A03C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC03C	480V Motor Control Center	Power Supply (PS)	AB	137-A10C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC04C	480V Motor Control Center	Power Supply (PS)	AB	100-A02C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC01D	480V Motor Control Center	Power Supply (PS)	AB	078-A03D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC02D	480V Motor Control Center	Power Supply (PS)	AB	078-A03D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC03D	480V Motor Control Center	Power Supply (PS)	AB	137-A10D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
PH -MC04D	480V Motor Control Center	Power Supply (PS)	AB	100-A02D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
RC-SQ01A	Local Starter	Power Supply (PS)	AB	137A18A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
RC-SQ01B	Local Starter	Power Supply (PS)	AB	137A18B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
RC-SQ01C	Local Starter	Power Supply (PS)	AB	120A09C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
RC-SQ01D	Local Starter	Power Supply (PS)	AB	120A09D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
RC-SQ02A	Local Starter	Power Supply (PS)	AB	137A18A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
RC-SQ02B	Local Starter	Power Supply (PS)	AB	137A18B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
RC-SQ02C	Local Starter	Power Supply (PS)	AB	120A09C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
RC-SQ02D	Local Starter	Power Supply (PS)	AB	120A09D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
RC-SQ03C	Local Starter	Power Supply (PS)	AB	120A09C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
RC-SQ03D	Local Starter	Power Supply (PS)	AB	120A09D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
SI-SQ01C	Local Starter	Power Supply (PS)	AB	120A09C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O

Table 3.11-2 (35 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
SI-SQ01D	Local Starter	Power Supply (PS)	AB	120A09D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
SI-SQ02C	Local Starter	Power Supply (PS)	AB	100A22A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
SI-SQ02D	Local Starter	Power Supply (PS)	AB	120A15B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
IW-SQ01C	Local Starter	Power Supply (PS)	AB	120A09C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
IW-SQ01D	Local Starter	Power Supply (PS)	AB	120A09D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
IW-SQ02C	Local Starter	Power Supply (PS)	AB	120A09C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
IW-SQ02D	Local Starter	Power Supply (PS)	AB	120A09D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
CV-SQ01B	Local Starter	Power Supply (PS)	AB	137A18B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
VK-SQ01	Local Starter	Power Supply (PS)	AB	055A50B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
Various	Local Control Station	Power Supply (PS)	AB	Various	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-BT01A	125Vdc Battery with Rack	Power Supply (PS)	AB	100-A11A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-BT01B	125Vdc Battery with Rack	Power Supply (PS)	AB	100-A11B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-BT01C	125Vdc Battery with Rack	Power Supply (PS)	AB	078-A07C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-BT01D	125Vdc Battery with Rack	Power Supply (PS)	AB	078-A07D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-BC01A	480Vac/125Vdc Battery Charger	Power Supply (PS)	AB	078-A56A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-BC01B	480Vac/125Vdc Battery Charger	Power Supply (PS)	AB	078-A56B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-BC01C	480Vac/125Vdc Battery Charger	Power Supply (PS)	AB	078-A05C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-BC01D	480Vac/125Vdc Battery Charger	Power Supply (PS)	AB	078-A05D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-BC02A	480Vac/125Vdc Standby Battery Charger	Power Supply (PS)	AB	078-A56A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-BC02B	480Vac/125Vdc Standby Battery Charger	Power Supply (PS)	AB	078-A56B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-BC02C	480Vac/125Vdc Standby Battery Charger	Power Supply (PS)	AB	078-A05C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-BC02D	480Vac/125Vdc Standby Battery Charger	Power Supply (PS)	AB	078-A05D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-MC01A	125Vdc Control Center	Power Supply (PS)	AB	078-A56A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-MC01B	125Vdc Control Center	Power Supply (PS)	AB	078-A56B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-MC01C	125Vdc Control Center	Power Supply (PS)	AB	078-A05C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DC-MC01D	125Vdc Control Center	Power Supply (PS)	AB	078-A05D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
IP-TR01A	480Vac/120Vac Regulating Transformer	Power Supply (PS)	AB	078-A56A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
IP-TR01B	480Vac/120Vac Regulating Transformer	Power Supply (PS)	AB	078-A56B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
IP-TR01C	480Vac/120Vac Regulating Transformer	Power Supply (PS)	AB	078-A05C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
IP-TR01D	480Vac/120Vac Regulating Transformer	Power Supply (PS)	AB	078-A05D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
IP-IN01A	125Vdc/120Vac Inverter	Power Supply (PS)	AB	078-A56A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O

Table 3.11-2 (36 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
IP-IN01B	125Vdc/120Vac Inverter	Power Supply (PS)	AB	078-A56B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
IP-IN01C	125Vdc/120Vac Inverter	Power Supply (PS)	AB	078-A05C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
IP-IN01D	125Vdc/120Vac Inverter	Power Supply (PS)	AB	078-A05D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
SI-SQ02C	125Vdc Local Starter	Power Supply (PS)	AB	100-A22A	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
SI-SQ02D	125Vdc Local Starter	Power Supply (PS)	AB	120-A15B	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
AF-SQ01C	125Vdc Local Starter	Power Supply (PS)	AB	120-A09C	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
AF-SQ01D	125Vdc Local Starter	Power Supply (PS)	AB	120-A09D	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
Various	Electrical Penetration Assemblies - Medium Voltage Power	Power Supply (PS)	RCB	136-C01A,B	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	
Various	Electrical Penetration Assemblies - Low Voltage Power & Control	Power Supply (PS)	RCB	136-C01A,B 114-C01A,B	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	
Various	Electrical Penetration Assemblies – Low Voltage Instrumentation	Power Supply (PS)	RCB	136-C01A,B 114-C01A,B	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	
Various	Electrical Conductor Sealing Assemblies	Power Supply (PS)	RCB	Various	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	
N/A(10)	5kV Power Cables	Power Supply (PS)	Various	Various	Continuous	Mild/Harsh	Mild/Harsh	Electrical EQ	No	I		SR	
N/A(10)	600V Power Cables	Power Supply (PS)	Various	Various	Continuous	Mild/Harsh	Mild/Harsh	Electrical EQ	No	I		SR	
N/A(10)	600V Control Cables	Various	Various	Various	Continuous	Mild/Harsh	Mild/Harsh	Electrical EQ	No	I		SR	
N/A(10)	600V Instrumentation Cables	Various	Various	Various	Continuous	Mild/Harsh	Mild/Harsh	Electrical EQ	No	I		SR	
N/A(10)	Thermocouple Extension Cables	Various	Various	Various	Continuous	Mild/Harsh	Mild/Harsh	Electrical EQ	No	I		SR	
N/A(10)	Coaxial Cables	Various	Various	Various	Continuous	Mild/Harsh	Mild/Harsh	Electrical EQ	No	I		SR	
N/A(10)	RSPT Type I & II Cable Assemblies	RT	RCB	Various	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	
N/A(10)	ICI Cable Assemblies	PAM	RCB	Various	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	
N/A(10)	HJTC Cable Assemblies	PAM	RCB	Various	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	
N/A(10)	RSPT Type I, II Cable	RT	RCB	Various	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	
N/A(10)	Reed Switch Position Transmitter	RT	RCB	Various	Continuous	Mild	Mild	Electrical EQ	No	I		SR	
N/A(10)	HJTC MI Cables & Connectors	PAM	RCB	Various	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	
N/A(10)	HJTC Probe	PAM	RCB	Various	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	
N/A(10)	ICI MI Cable & Connectors	PAM	RCB	Various	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	
N/A(10)	ICI Assembly	PAM	RCB	Various	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	
Instrumentation and Control System													
AFW-FT-0047A	AFW Flow Transmitter, Channel A (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AFW-FT-0048B	AFW Flow Transmitter, Channel B (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O

Table 3.11-2 (37 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
AFW-FT-0049C	AFW Flow Transmitter, Channel C (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AFW-FT-0050D	AFW Flow Transmitter, Channel D (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AFW-TE-0053A	AFW Line Back Leakage Temp. Element, Ch. A	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	O
AFW-TE-0054B	AFW Line Back Leakage Temp. Element, Ch. B	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	O
AFW-TE-0053C	AFW Line Back Leakage Temp. Element, Ch. C	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	O
AFW-TE-0054D	AFW Line Back Leakage Temp. Element, Ch. D	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	O
AFW-PT-0005A	AFW Pump Suction Pressure Transmitter, Channel A (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AFW-PT-0006B	AFW Pump Suction Pressure Transmitter, Channel A (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AFW-PT-0007C	AFW Pump Suction Pressure Transmitter, Channel A (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AFW-PT-0008D	AFW Pump Suction Pressure Transmitter, Channel A (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AFW-PT-0023A	AFW Pump Discharge Pressure Transmitter, Channel A (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AFW-PT-0024B	AFW Pump Discharge Pressure Transmitter, Channel B (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AFW-PT-0025C	AFW Pump Discharge Pressure Transmitter, Channel C (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AFW-PT-0026D	AFW Pump Discharge Pressure Transmitter, Channel D (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AFW-Z-0035A	AFW Flow Modulating Valve Position Transmitter, Channel A (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AFW-Z-0036B	AFW Flow Modulating Valve Position Transmitter, Channel B (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AFW-Z-0037C	AFW Flow Modulating Valve Position Transmitter, Channel C (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AFW-Z-0038D	AFW Flow Modulating Valve Position Transmitter, Channel D (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AT-LT-0003C	AFW Turbine Steam Drip Leg Level Transmitter, Channel C (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AT-LT-0004D	AFW Turbine Steam Drip Leg Level, Channel D (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AT-PT-0013C	AFW Turbine Inlet Steam Pressure Transmitter, Channel C (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AT-PT-0014D	AFW Turbine Inlet Steam Pressure Transmitter, Channel D (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AT-S'(3)035C	AFW Pump Turbine Speed Transmitter, Channel C (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AT-S'(3)036D	AFW Pump Turbine Speed Transmitter, Channel D (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AX-LT-0003A	AFWST 1 Level Transmitter, Channel A (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AX-LT-0004B	AFWST 2 Level Transmitter, Channel B (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O

Table 3.11-2 (38 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
AX-LT-0005A	AFWST 2 Level Transmitter, Channel A (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AX-LT-0005C	AFWST 2 Level Transmitter, Channel C (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AX-LT-0005D	AFWST 2 Level Transmitter, Channel D (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AX-LT-0006B	AFWST 1 Level Transmitter, Channel B (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AX-LT-0006C	AFWST 1 Level Transmitter, Channel C (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
AX-LT-0006D	AFWST 1 Level Transmitter, Channel D (12)	Aux. Feedwater	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
CC-FT-0071A	CCW Flow Transmitter, Channel A (12)	Component Cooling WTR.	CCWPH	COL 3.11(7)	Continuous	Mild	Mild	Electrical/EMC	No	I		SR	O
CC-FT-0071B	CCW Flow Transmitter, Channel B (12)	Component Cooling WTR.	CCWPH	COL 3.11(7)	Continuous	Mild	Mild	Electrical/EMC	No	I		SR	O
CC-TE-069A	CCW Temperature Element, Channel A	Component Cooling WTR.	CCWPH	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
CC-TE-070B	CCW Temperature Element, Channel B	Component Cooling WTR.	CCWPH	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
CE-SW-01A	RTSS Cabinet (2), Channel A (12)	RT	AB	137-A36C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
CE-SW-01B	RTSS Cabinet (2), Channel B (12)	RT	AB	137-A38C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
CE-SW-01C	RTSS Cabinet (2), Channel C (12)	RT	AB	137-A35C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
CE-SW-01D	RTSS Cabinet (2), Channel D (12)	RT	AB	137-A37C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
CM-LP01A	Containment Hydrogen Analyzer Cabinet (2)(12)	Containment Hydrogen Concentration Monitoring	AB	120-A20A	Continuous	Harsh	Harsh	Electrical EQ (EMC)	No	I		SR	O
CM-LP01B	Containment Hydrogen Analyzer Cabinet (2)(12)	Containment Hydrogen Concentration Monitoring	AB	120-A36B	Continuous	Harsh	Harsh	Electrical EQ (EMC)	No	I		SR	O
CM-LP02A	Containment Hydrogen Analyzer Cabinet (2)(12)	Containment Hydrogen Concentration Monitoring	AB	137-A17A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
CM-LP02B	Containment Hydrogen Analyzer Cabinet (2)(12)	Containment Hydrogen Concentration Monitoring	AB	137-A17B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
CM-PT-351A	Containment Pressure Protective (NR) Transmitter (12)	RT/ESF	AB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
CM-PT-351B	Containment Pressure Protective (NR) Transmitter (12)	RT/ESF	AB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
CM-PT-351C	Containment Pressure Protective (NR) Transmitter (12)	RT/ESF	AB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O

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Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
CM-PT-351D	Containment Pressure Protective (NR) Transmitter (12)	RT/ESF	AB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
CM-PT-352A	Cont. Pressure Protective (WR) Transmitter (12)	RT/ESF/ PAM	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
CM-PT-352B	Cont. Pressure Protective (WR) Transmitter (12)	RT/ESF/ PAM	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
CM-PT-352C	Cont. Pressure Protective (WR) Transmitter (12)	RT/ESF	AB	COL 3.11(7)	Continuous	Mild	Harsh	Electrical EQ/EMC	No	I		SR	O
CM-PT-352D	Cont. Pressure Protective (WR) Transmitter (12)	RT/ESF	AB	COL 3.11(7)	Continuous	Mild	Harsh	Electrical EQ/EMC	No	I		SR	O
CM-TE-031A	Containment Temperature Element (12)	Accident Monitoring	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
CM-LT-027A	Containment Water Level (12)	Accident Monitoring	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical/EMC	No	I		SR	O
CM-LT-028B	Containment Water Level (12)	Accident Monitoring	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical/EMC	No	I		SR	O
CS-FT-338C	Containment Spray Pump Flow Transmitter (12)	Accident Monitoring	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical/EMC	No	I		SR	O
CS-FT-348D	Containment Spray Pump Flow Transmitter (12)	Accident Monitoring	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	O
CS-TE-071C	Containment Spray Temperature Element, HX	Containment Spray	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	O
CS-TE-072D	Containment Spray Temperature Element, HX	Containment Spray	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	O
DG-LI'(3)001A	HT Water Expansion Tank Level Indicator	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LI'(3)001B	HT Water Expansion Tank Level Indicator	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LI'(3)001C	HT Water Expansion Tank Level Indicator	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LI'(3)001D	HT Water Expansion Tank Level Indicator	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LI'(3)010A	LT Water Expansion Tank Level Indicator	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LI'(3)010B	LT Water Expansion Tank Level Indicator	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LI'(3)010C	LT Water Expansion Tank Level Indicator	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LI'(3)010D	LT Water Expansion Tank Level Indicator	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)001A01	HT Water Expansion Tank Level Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)001B01	HT Water Expansion Tank Level Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)001C01	HT Water Expansion Tank Level Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)001D01	HT Water Expansion Tank Level Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O

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Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
DG-LS'(3)001A02	HT Water Expansion Tank Level Switch High	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)001B02	HT Water Expansion Tank Level Switch High	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)001C02	HT Water Expansion Tank Level Switch High	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)001D02	HT Water Expansion Tank Level Switch High	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)010A01	LT Water Expansion Tank Level Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)010B01	LT Water Expansion Tank Level Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)010C01	LT Water Expansion Tank Level Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)010D01	LT Water Expansion Tank Level Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)010A02	LT Water Expansion Tank Level Switch High	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)010B02	LT Water Expansion Tank Level Switch High	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)010C02	LT Water Expansion Tank Level Switch High	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-LS'(3)010D02	LT Water Expansion Tank Level Switch High	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)086A	Over Speed Air Receiver Pressure Indicator Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)086B	Over Speed Air Receiver Pressure Indicator Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)086C	Over Speed Air Receiver Pressure Indicator Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)086D	Over Speed Air Receiver Pressure Indicator Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)142A	Lube Oil/Preheating Water Heat Exchanger Inlet Pressure Indicator	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)142B	Lube Oil/Preheating Water Heat Exchanger Inlet Pressure Indicator	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)142C	Lube Oil/Preheating Water Heat Exchanger Inlet Pressure Indicator	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)142D	Lube Oil/Preheating Water Heat Exchanger Inlet Pressure Indicator	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)176A	Starting Air Receiver Pressure Indicator	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)176B	Starting Air Receiver Pressure Indicator	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)176C	Starting Air Receiver Pressure Indicator	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)176D	Starting Air Receiver Pressure Indicator	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)177A	Starting Air Receiver Pressure Indicator	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O

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Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
DG-PI'(3)177B	Starting Air Receiver Pressure Indicator	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)177C	Starting Air Receiver Pressure Indicator	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PI'(3)177D	Starting Air Receiver Pressure Indicator	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)041A	Engine Inlet Lube Oil Pressure Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)041B	Engine Inlet Lube Oil Pressure Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)041C	Engine Inlet Lube Oil Pressure Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)041D	Engine Inlet Lube Oil Pressure Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)042A	Engine Inlet Lube Oil Pressure Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)042B	Engine Inlet Lube Oil Pressure Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)042C	Engine Inlet Lube Oil Pressure Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)042D	Engine Inlet Lube Oil Pressure Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)046A	Engine Inlet Lube Oil Pressure Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)046B	Engine Inlet Lube Oil Pressure Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)046C	Engine Inlet Lube Oil Pressure Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)046D	Engine Inlet Lube Oil Pressure Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)047A	Engine Inlet Lube Oil Pressure Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)047B	Engine Inlet Lube Oil Pressure Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)047C	Engine Inlet Lube Oil Pressure Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)047D	Engine Inlet Lube Oil Pressure Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)060A	Crankcase Gas Pressure Measurement Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)060B	Crankcase Gas Pressure Measurement Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)060C	Crankcase Gas Pressure Measurement Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)060D	Crankcase Gas Pressure Measurement Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)182A	Starting Air Receiver Pressure Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)182B	Starting Air Receiver Pressure Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)182C	Starting Air Receiver Pressure Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O

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Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
DG-PS'(3)182D	Starting Air Receiver Pressure Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)183A	Starting Air Receiver Pressure Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)183B	Starting Air Receiver Pressure Switch Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)183C	Starting Air Receiver Pressure Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PS'(3)183D	Starting Air Receiver Pressure Switch Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PT'(3)110A	LT Water Pump Discharge Pressure Transmitter	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PT'(3)110B	LT Water Pump Discharge Pressure Transmitter	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PT'(3)110C	LT Water Pump Discharge Pressure Transmitter	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-PT'(3)110D	LT Water Pump Discharge Pressure Transmitter	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)004A	HT Water Pump Suction Temperature Transmitter	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)004B	HT Water Pump Suction Temperature Transmitter	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)004C	HT Water Pump Suction Temperature Transmitter	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)004D	HT Water Pump Suction Temperature Transmitter	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)007A	HT Water Outlet Temperature Transmitter	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)007B	HT Water Outlet Temperature Transmitter	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)007C	HT Water Outlet Temperature Transmitter	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)007D	HT Water Outlet Temperature Transmitter	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)008A	HT Water Outlet Temperature Transmitter	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)008B	HT Water Outlet Temperature Transmitter	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)008C	HT Water Outlet Temperature Transmitter	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)008D	HT Water Outlet Temperature Transmitter	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)044A	Lube Oil Engine Inlet Temperature Transmitter Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)044B	Lube Oil Engine Inlet Temperature Transmitter Low	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O

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Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
DG-TT'(3)044C	Lube Oil Engine Inlet Temperature Transmitter Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)044D	Lube Oil Engine Inlet Temperature Transmitter Low	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)045A	Lube Oil Engine Inlet Temperature Transmitter High	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)045B	Lube Oil Engine Inlet Temperature Transmitter High	EDG	EDGB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)045C	Lube Oil Engine Inlet Temperature Transmitter High	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
DG-TT'(3)045D	Lube Oil Engine Inlet Temperature Transmitter High	EDG	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
IW-TE-350	IRWST Temperature Element	Accident Monitoring	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	O
IW-TE- 351	IRWST Temperature Element	Accident Monitoring	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ	No	I		SR	O
IW-LT-390B	IRWST LEVEL	Accident Monitoring	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
IW-LT-391A	IRWST LEVEL	Accident Monitoring	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ	No	I		SR	O
MS-PT-1013A	SG 1 Pressure Transmitter (12)	RT/ESF/ PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
MS-PT-1013B	SG 1 Pressure Transmitter (12)	RT/ESF/ PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
MS-PT-1013C	SG 1 Pressure Transmitter (12)	RT/ESF	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
MS-PT-1013D	SG 1 Pressure Transmitter (12)	RT/ESF	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
MS-PT-1023A	SG 2 Pressure Transmitter (12)	RT/ESF/ PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
MS-PT-1023B	SG 2 Pressure Transmitter (12)	RT/ESF/ PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
MS-PT-1023C	SG 2 Pressure Transmitter (12)	RT/ESF	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
MS-PT-1023D	SG 2 Pressure Transmitter (12)	RT/ESF	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
NR-RW-001A	ENFMS Safety Channel Detector, Channel A (12)	RT/PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	
NR-RW-001B	ENFMS Safety Channel Detector, Channel B (12)	RT/PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	
NR-RW-001C	ENFMS Safety Channel Detector, Channel C (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	
NR-RW-001D	ENFMS Safety Channel Detector, Channel D (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	

Table 3.11-2 (44 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
PA-PA03A	ESF-CCS GC Cabinet (2)(12)	ESF	AB	157-A25C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PA-PA03B	ESF-CCS GC Cabinet (2)(12)	ESF	AB	157-A01D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PA-PA03C	ESF-CCS GC Cabinet (2)(12)	ESF	AB	157-A19C	Continuous	Harsh	Harsh	Electrical EQ (EMC)	No	I		SR	O
PA-PA03D	ESF-CCS GC Cabinet (2)(12)	ESF	AB	157-A19D	Continuous	Harsh	Harsh	Electrical EQ (EMC)	No	I		SR	O
PA-PA04A	MTP/ITP Cabinet (2), Channel A (12)	RT/ESF Test and Maintenance	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA04B	MTP/ITP Cabinet (2), Channel B (12)	RT/ESF Test and Maintenance	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA04C	MTP/ITP Cabinet (2), Channel C (12)	RT/ESF Test and Maintenance	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA04D	MTP/ITP Cabinet (2), Channel D (12)	RT/ESF Test and Maintenance	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA06C	ESF-CCS LC Cabinet (2)(12)	ESF	AB	157-A19C	Continuous	Harsh	Harsh	Electrical EQ (EMC)	No	I		SR	O
PA-PA06D	ESF-CCS LC Cabinet (2)(12)	ESF	AB	157-A19D	Continuous	Harsh	Harsh	Electrical EQ (EMC)	No	I		SR	O
PA-PA14A	PPS Cabinet (2), Channel A (12)	RT/ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA14B	PPS Cabinet (2), Channel B (12)	RT/ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA14C	PPS Cabinet (2), Channel C (12)	RT/ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA14D	PPS Cabinet (2), Channel D (12)	RT/ESF	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA15A	CPCS Cabinet (2), Channel A (12)	RT	AB	COL 3.11(7)	Short-term	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA15B	CPCS Cabinet (2), Channel B (12)	RT	AB	COL 3.11(7)	Short-term	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA15C	CPCS Cabinet (2), Channel C (12)	RT	AB	COL 3.11(7)	Short-term	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA15D	CPCS Cabinet (2), Channel D (12)	RT	AB	COL 3.11(7)	Short-term	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA16A	QIAS-P Cabinet (2), Channel A (12)	PAM	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA16B	QIAS-P Cabinet (2), Channel B (12)	PAM	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA18A	APC Cabinet (2), Channel A (12)	SIGNAL SPLITING	CR	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA18B	APC Cabinet (2), Channel B (12)	SIGNAL SPLITING	CR	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA18C	APC Cabinet (2), Channel C (12)	SIGNAL SPLITING	CR	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA18D	APC Cabinet (2), Channel D (12)	SIGNAL SPLITING	CR	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA29C	DRCS Remote I/O Cabinet (2) (Associated Circuit) (12)	Isolating non-safety I&C equipment from safety I&C equipment.	AB	157-A19C	Continuous	Harsh	Harsh	Electrical EQ (EMC)	No	I	(8)	NSR	O

Table 3.11-2 (45 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
PA-PA29D	DRCS Remote I/O Cabinet (2) (Associated Circuit) (12)	Isolating non-safety I&C equipment from safety I&C equipment.	AB	157-A19D	Continuous	Harsh	Harsh	Electrical EQ (EMC)	No	I	(8)	NSR	O
PA-PA47A	BOP Radiation Monitoring Cabinet (2)(12)	ESF, AMI	AB	157-A01D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PA-PA47B	BOP Radiation Monitoring Cabinet (2)(12)	ESF, AMI	AB	157-A25C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PA-PA48A	ENFMS Cabinet (2), Channel A (12)	RT/PAM	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA48B	ENFMS Cabinet (2), Channel B (12)	RT/PAM	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA48C	ENFMS Cabinet (2), Channel C (12)	PAM	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PA-PA48D	ENFMS Cabinet (2), Channel D (12)	PAM	AB	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PE-LX01A	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A25A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE-LX01B	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A25B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE-LX01C	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A03C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE-LX01D	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A03D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE-LX02A	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A25A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE-LX02B	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A25B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE-LX02C	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A03C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE-LX02D	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A03D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE-LX03A	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A25A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE-LX03B	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A25B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE-LX03C	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A02C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE-LX03D	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A02D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE-LX04A	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A25A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX04B	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A25B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX04C	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A10C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX04D	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A10D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX05A	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A17A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O

Table 3.11-2 (46 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
PE -LX05B	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A17B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX05C	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A10C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX05D	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A10D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX06B	ESF-CCS LC Cabinet (2)(12)	ESF	AB	078-A25B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX07A	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A17A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX07B	ESF-CCS LC Cabinet (2)(12)	ESF	AB	120-A15B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX08A	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A15A	Continuous	Harsh	Harsh	Electrical EQ (EMC)	No	I		SR	O
PE -LX08B	ESF-CCS LC Cabinet (2)(12)	ESF	AB	120-A15B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX09A	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A15A	Continuous	Harsh	Harsh	Electrical EQ (EMC)	No	I		SR	O
PE -LX09B	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A15B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX10A	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A17A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX10B	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A15B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX11A	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A17A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX11B	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A17B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX12A	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A17A	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX12B	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A17B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PE -LX13B	ESF-CCS LC Cabinet (2)(12)	ESF	AB	137-A17B	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I		SR	O
PM-PM01	MCR RO Console (12)	Plant Status Monitoring and Control	AB	157-A12C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(7)	SR	O
PM -PM02	MCR TO/EO Console (12)	Plant Status Monitoring and Control	AB	157-A12C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(7)	SR	O
PM -PM03	MCR SS Console (12)	Plant Status Monitoring and Control	AB	157-A12C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(7)	SR	O
PM -PM04	MCR STA Console (12)	Plant Status Monitoring and Control	AB	157-A12C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(7)	SR	O

Table 3.11-2 (47 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
PM -PM05	MCR Safety Console (12)	Plant Status Monitoring and Control	AB	157-A12C	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(7)	SR	O
PM-UC-19	PPS/CPCS/ESF-CCS Operator Module, Channel A (12)	PPS Monitoring	AB	157-A12	Continuous	Mild	Mild	Electrical EQ, EMC	No	I		SR	O
PM-UC-20	PPS/CPCS/ESF-CCS Operator Module, Channel B (12)	PPS Monitoring	AB	157A12	Continuous	Mild	Mild	Electrical EQ, EMC	No	I		SR	O
PM-UC-21	PPS/CPCS/ESF-CCS Operator Module, Channel C (12)	PPS Monitoring	AB	157-A12	Continuous	Mild	Mild	Electrical EQ, EMC	No	I		SR	O
PM-UC-22	PPS/CPCS/ESF-CCS Operator Module, Channel D (12)	PPS Monitoring	AB	157-A12	Continuous	Mild	Mild	Electrical EQ, EMC	No	I		SR	O
PM-UC'(3)9	QIAS-P Display, Channel A (12)	PAM	CR	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
PM-UC-40	QIAS-P Display, Channel B (12)	PAM	CR	COL 3.11(7)	Continuous	Mild	Mild	Electrical EQ/EMC	No	I		SR	O
RC-PDT-115A	SG 1 Differential Pressure Differential Transmitter (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PDT-115B	SG 1 Differential Pressure Differential Transmitter (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PDT-115C	SG 1 Differential Pressure Differential Transmitter (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PDT-115D	SG 1 Differential Pressure Differential Transmitter (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PDT-125A	SG 2 Differential Pressure Differential Transmitter (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PDT-125B	SG 2 Differential Pressure Differential Transmitter (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PDT-125C	SG 2 Differential Pressure Differential Transmitter (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PDT-125D	SG 2 Differential Pressure Differential Transmitter (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PT-102A	Pressurizer Pressure Transmitter (12)	RT/ESF/ PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PT-102B	Pressurizer Pressure Transmitter (12)	RT/ESF/ PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PT-102C	Pressurizer Pressure Transmitter (12)	RT/ESF	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PT-102D	Pressurizer Pressure Transmitter (12)	RT/ESF	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PT-103A	Pressurizer Pressure Transmitter (12)	SI/SCS Valve Control	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PT-104B	Pressurizer Pressure Transmitter (12)	SI/SCS Valve Control	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PT-105C	Pressurizer Pressure Transmitter (12)	SI/SCS Valve Control	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PT-106D	Pressurizer Pressure Transmitter (12)	SI/SCS Valve Control	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PT-190A	RCS Pressure (Cold Leg-Pump Discharge)Transmitter (12)	PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-PT-190B	RCS Pressure (Cold Leg-Pump Discharge)Transmitter (12)	PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O

Table 3.11-2 (48 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition [1]	Radiation Condition [4][6]	Designation	Influence of Immersion [11]	Seismic Category	Remarks	Classification	HF Sensitive
RC-SE-113A	RCP 1A Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-113B	RCP 1A Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-113C	RCP 1A Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-113D	RCP 1A Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-123A	RCP 1B Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-123B	RCP 1B Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-123C	RCP 1B Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-123D	RCP 1B Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-133A	RCP 2A Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-133B	RCP 2A Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-133C	RCP 2A Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-133D	RCP 2A Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-123A	RCP 1B Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-123B	RCP 1B Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-123C	RCP 1B Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-123D	RCP 1B Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-133A	RCP 2A Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-133B	RCP 2A Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-133C	RCP 2A Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-133D	RCP 2A Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-143A	RCP 2B Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-143B	RCP 2B Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-143C	RCP 2B Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-SE-143D	RCP 2B Speed Sensor and Cable	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-113A	RCP 1A Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-113B	RCP 1A Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-113C	RCP 1A Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-113D	RCP 1A Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-123A	RCP 1B Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-123B	RCP 1B Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	

Table 3.11-2 (49 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
RC-ST-123C	RCP 1B Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-123D	RCP 1B Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-133A	RCP 2A Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-133B	RCP 2A Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-133C	RCP 2A Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-133D	RCP 2A Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-143A	RCP 2B Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-143B	RCP 2B Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-143C	RCP 2B Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-ST-143D	RCP 2B Speed Transmitter	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ	No	I		SR	
RC-TE-112A	RCS, Hot Leg Temperature (NR) Element (5)(12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-112B	RCS, Hot Leg Temperature (NR) Element (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-112C	RCS, Hot Leg Temperature (NR) Element (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-112D	RCS, Hot Leg Temperature (NR) Element (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-113A	RCS, Hot Leg Temperature (NR) Element (5)(12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-113B	RCS, Hot Leg Temperature (NR) Element (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-113C	RCS, Hot Leg Temperature (NR) Element (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-113D	RCS, Hot Leg Temperature (NR) Element (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-122A	RCS, Cold Leg Temperature (NR) Element (5)(12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-122B	RCS, Cold Leg Temperature (NR) Element (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-122C	RCS, Cold Leg Temperature (NR) Element (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-122D	RCS, Cold Leg Temperature (NR) Element (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-123A	RCS, Cold Leg Temperature (NR) Element (5)(12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-123B	RCS, Cold Leg Temperature (NR) Element (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-123C	RCS, Cold Leg Temperature (NR) Element (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O

Table 3.11-2 (50 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
RC-TE-123D	RCS, Cold Leg Temperature (NR) Element (12)	RT	RCB	COL 3.11(7)	Short-Term	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-132A	RCS, Hot Leg Temperature Element (12)	PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-132B	RCS, Hot Leg Temperature Element (12)	PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-133A	RCS, Hot Leg Temperature Element (12)	PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-133B	RCS, Hot Leg Temperature Element (12)	PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-142A	RCS, Cold Leg Temperature Element (12)	PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-142B	RCS, Cold Leg Temperature Element (12)	PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-143A	RCS, Cold Leg Temperature Element (12)	PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
RC-TE-143B	RCS, Cold Leg Temperature Element (12)	PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ (EMC)	No	I		SR	O
RS-RU01	Remote Shutdown Console (12)	Plant Status Monitoring and Control	AB	137-A06D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(7)	SR	O
SI-FT-302A	SCS Flow Transmitter (12)	PAM	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-FT-305B	SCS Flow Transmitter (12)	PAM	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-FT-311D	SIS Flow Transmitter (12)	PAM	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-FT'(3)1B	SIS Flow Transmitter (12)	PAM	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-FT- 321B	SIS Flow Transmitter (12)	PAM	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-FT-341A	SIS Flow Transmitter (12)	PAM	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-FT-390D	Hot Leg Injection Flow Transmitter (12)	PAM	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-FT-391C	Hot Leg Injection Flow Transmitter (12)	PAM	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-PT-311D	SI Tank Pressure Transmitter (12)	PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-PT- 321B	SI Tank Pressure Transmitter (12)	PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-PT-331C	SI Tank Pressure Transmitter (12)	PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-PT-341A	SI Tank Pressure Transmitter (12)	PAM	RCB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-TE-300A	SDCHX 1 Inlet and Outlet Temperature Element (12)	SDC	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-TE-301A	SDCHX 1 Inlet and Outlet Temperature Element (12)	SDC	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-TE-302A	SDCHX Outlet Temperature Element (12)	SDC	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O

Table 3.11-2 (51 of 51)

Tag No.	Equipment Identification	Equipment Function	Building	Room No.	Required Operational Time	Environmental Condition (1)	Radiation Condition (4)(6)	Designation	Influence of Immersion (11)	Seismic Category	Remarks	Classification	HF Sensitive
SI-TE-303B	SDCHX 2 Inlet and Outlet Temperature Element (12)	SDC	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-TE-304B	SDCHX 2 Inlet and Outlet Temperature Element (12)	SDC	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
SI-TE-305B	SDCHX Outlet Temperature Element (12)	SDC	AB	COL 3.11(7)	Continuous	Harsh	Harsh	Electrical EQ/EMC	No	I		SR	O
QN-PA17N	QIAS-N Cabinet (2)(12)	Plant Status Monitoring	AB	137-A10D	Continuous	Mild	Mild	Electrical EQ (EMC)	No	I	(8)	NSR	O

(1) See EQP Table 3 for definition of environmental categories.

(2) Equipment located within a cabinet (2) is qualified allowing for temperature increase inside cabinet (2).

(3) Non-metallic consumable parts (as O-Ring, Packing and Gasket) are contained.

(4) Radiation environmental qualification requirements for individual components are developed as discussed in Subsection 3.11.5.

(5) Only Channels A and B are qualified for accident environment.

(6) EQP Table 3 provides the worst case upper bound radiation environment in the region where the component is located.

(7) RO, and TO/EO consoles include ESF-CCS soft control modules (ESCMs) which are Class 1E devices. SS and STA consoles include ESCMs which are Class 1E devices and QIAS-N FPDs which are Non-Class 1E devices.
Safety Console includes Class 1E and Non-Class 1E devices. Class 1E devices are QIAS-P FPD, operator modules, Class 1E switches, ESCM. Non-Class 1E devices are QIAS-N FPDs.
Remote shutdown console includes ESCMs which are Class 1E devices and QIAS-N FPDs which are Non-Class 1E devices.

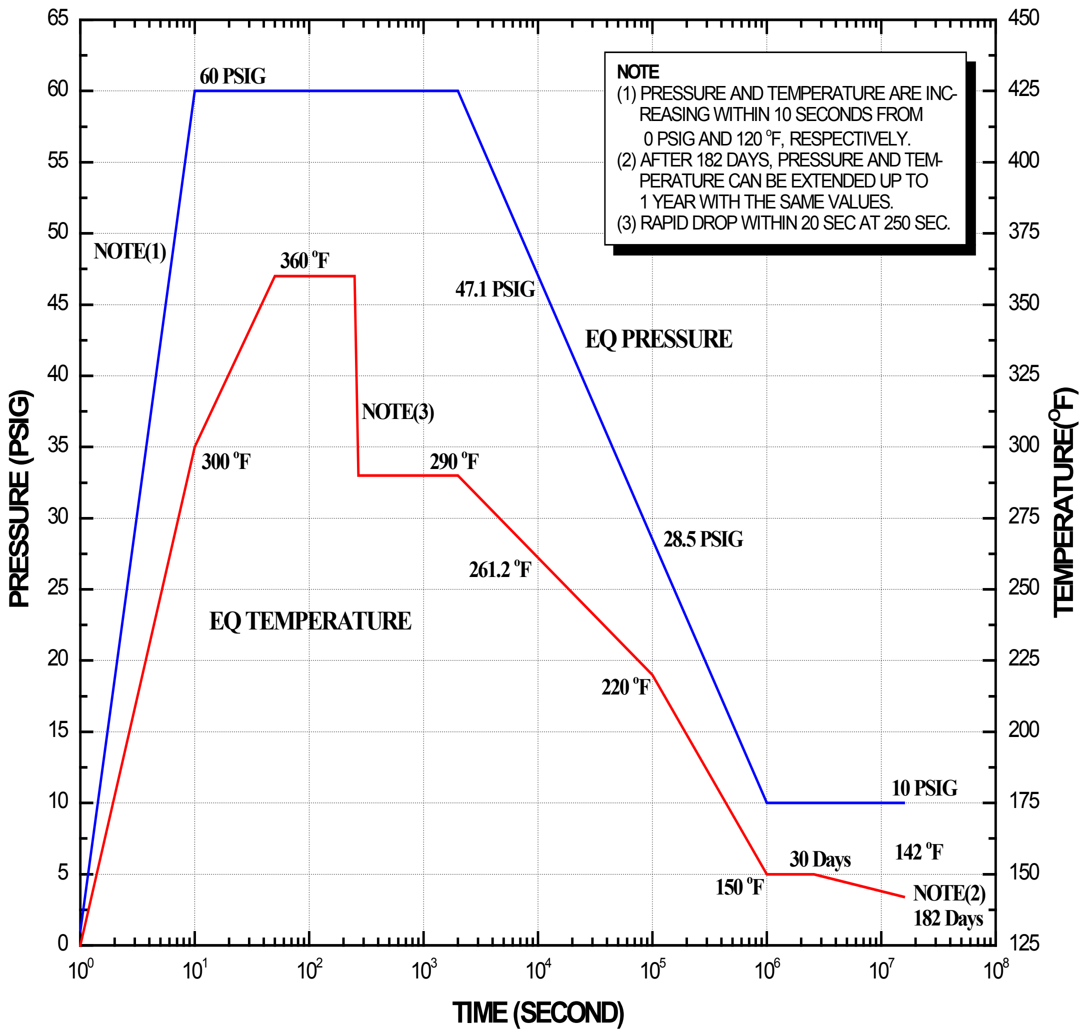
(8) QIAS-N Cabinet (2) and DRCS Remote I/O cabinets are designed by the associated circuit in accordance with the IEEE Std.384, since it performs a non-safety function, but the hardware is qualified.

(9) Piping design determines room number that valves or other equipment will be installed in and is applied to graded approach.
Therefore, room number specified in the "E" column will be defined after piping design is completed. COL applicant will provide information on the room numbers (COL 3.11(7)).

(10) For cables or cable assemblies which do not have tag number due to being supplied as bulk, "N/A" will be specified in the Column labeled "Tag No"

(11) Influence of immersion means susceptible to flooding.

(12) Equipment contains electric components such as semi-conductors or organic materials. It will be designated as H(Harsh) in the Designation. If it is located in a Room with TID greater than 10 Gy.



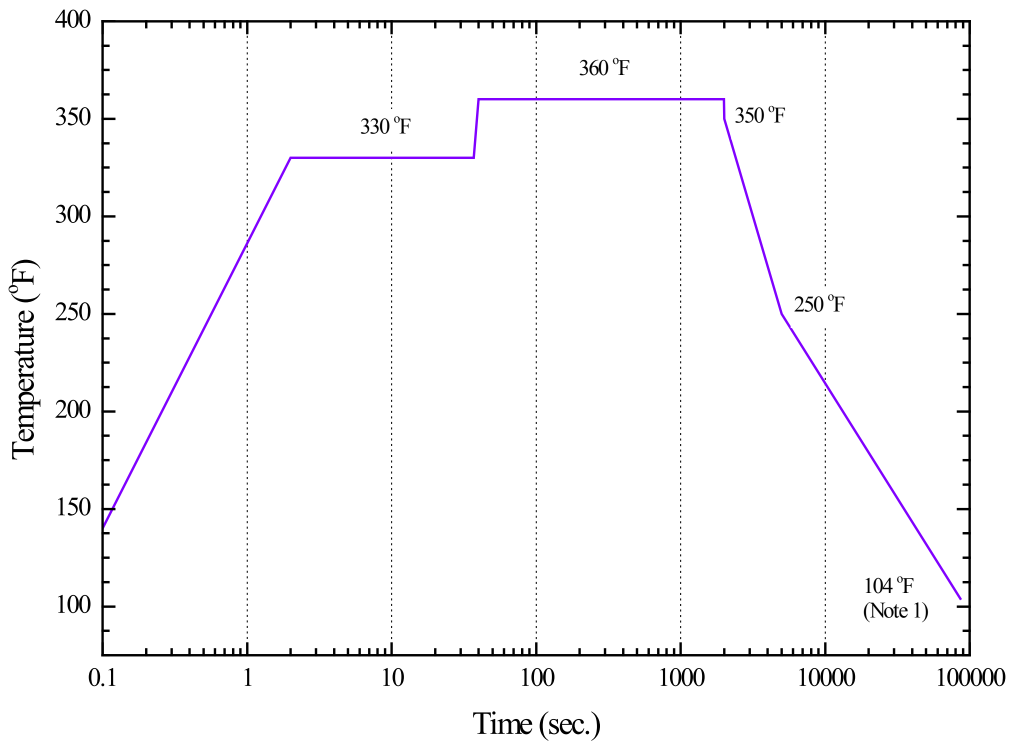
Notes

(1) Pressure and temperature are increasing within 10 seconds from 0 psig and 49 °C (120 °F), respectively.

(2) After 182 days, pressure and temperature can be extended up to 1 year with the same values.

(3) Rapid drop within 20 seconds at 250 seconds.

Figure 3.11-1 Design Basis Containment Atmosphere Temperature and Pressure EQ Profile for Accident

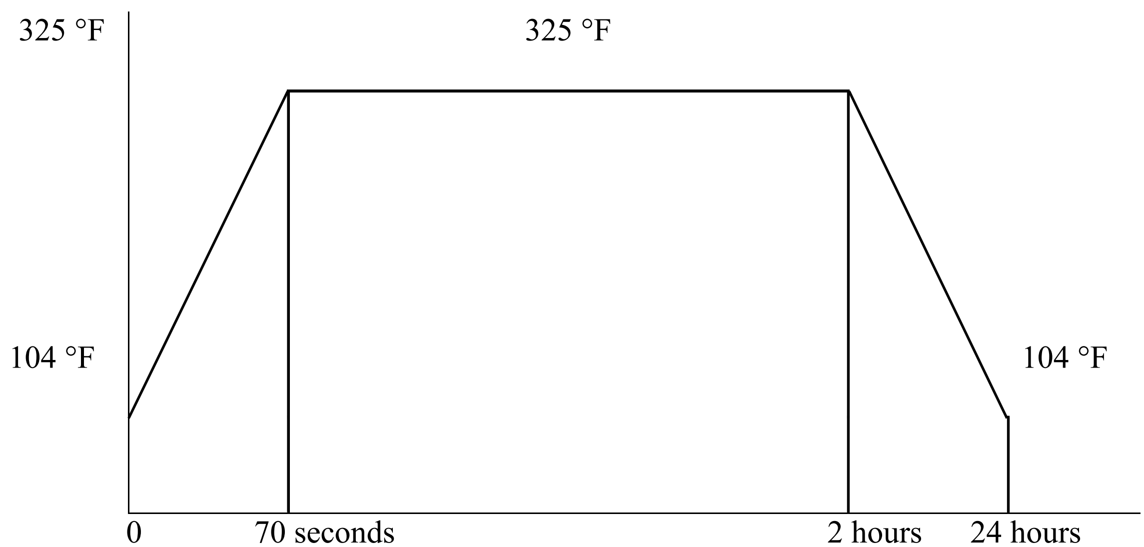


Time (sec.)	0	0.1	2.0	37	40	1,990	2,000	5,000	86,400
Temp. (°F)	104	140	330	330	360	360	350	250	104

<u>Notes</u>

(1) Temperature is decreasing up to 104 °F at 86,400 seconds (24 hours)

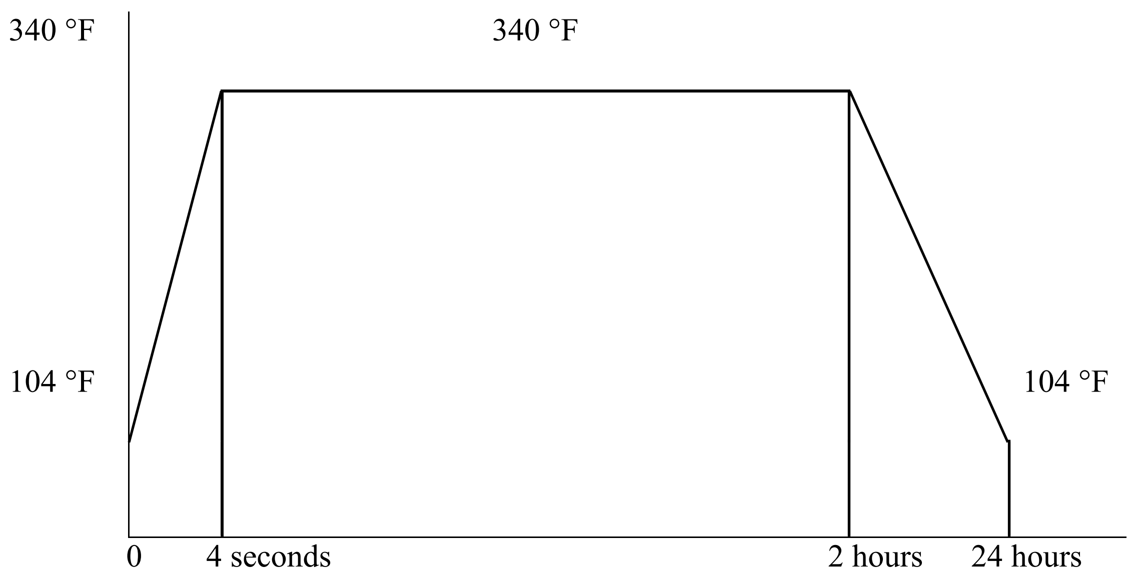
Figure 3.11-2 Main Steam Valve Room MSLB Temperature Profile



Notes

(1) Temperature profile above applies to the following zones: 055-A46B, 068-A06A, 078-A40B, 078-A42B, and 078-A43B

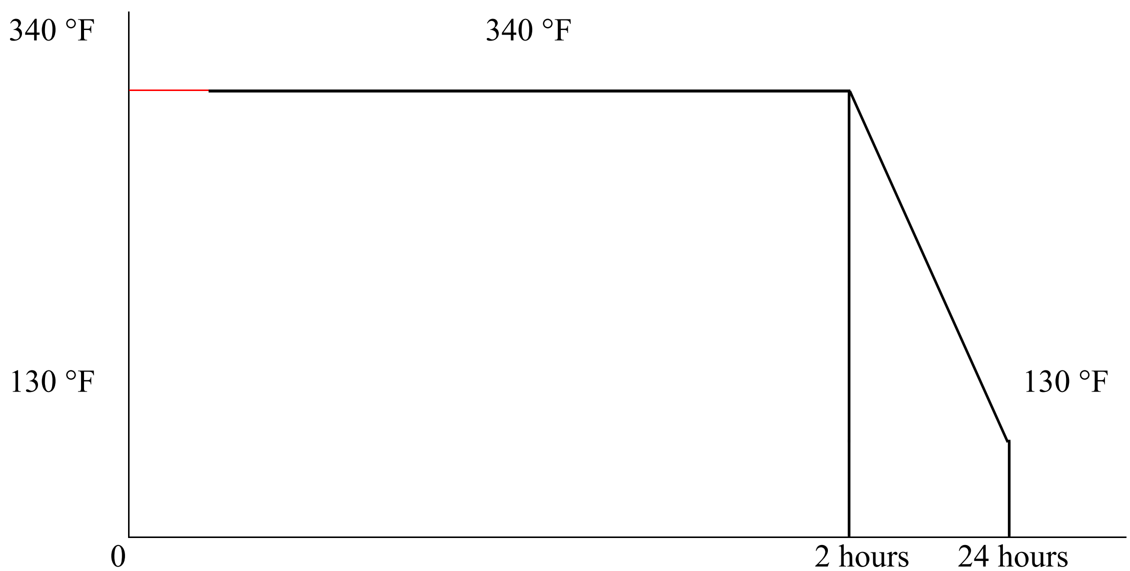
Figure 3.11-3 Auxiliary Building HELB Temperature Profile



Notes

(1) Temperature profile above applies to the following zones: 078-A15C/D

Figure 3.11-4 Turbine Driven AF Pump Room Temperature Profile



Notes

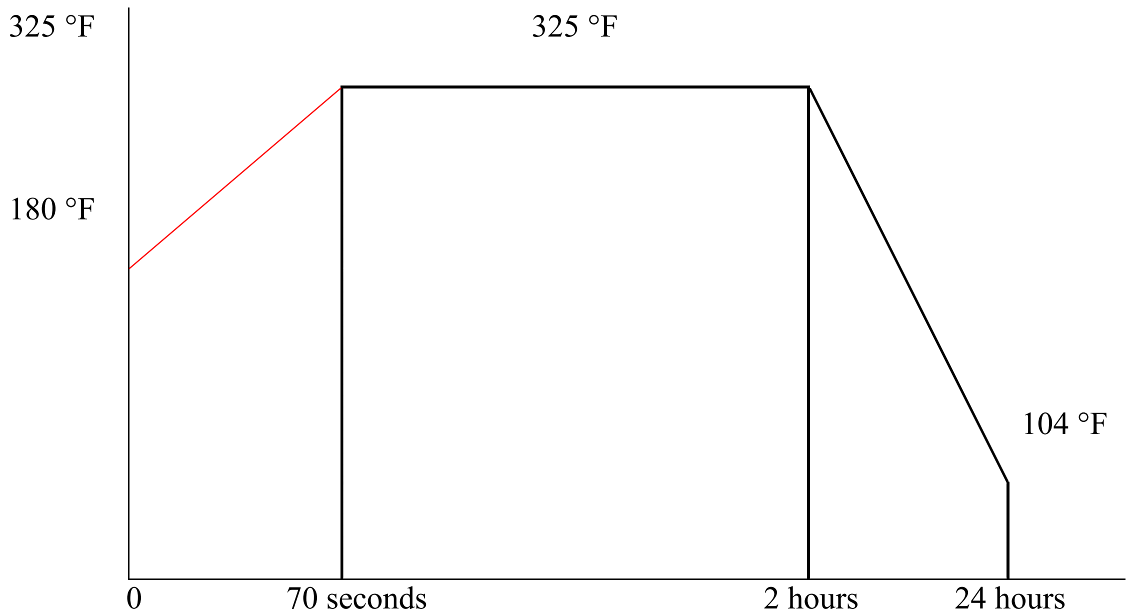
(1) Temperature profile above applies to the following zones: 078-A17C/D, and 137-A30C/D

Figure 3.11-5 Turbine Driven AF Pump Room Vent & Main Steam Enclosures Temperature Profile

Notes

(1) Temperature profile above applies to the following zones: 100-A28B, and 117-A02A

Figure 3.11-6 HELB HVAC Duct Tray Pipe Way Temperature Profile



<u>Notes</u>

(1) Temperature profile above applies to the following zones: 120-A14A and 137-A19A

Figure 3.11-7 S/G Blowdown Flash Tank Room Temperature Profile

3.12 Piping Design Review

3.12.1 Introduction

This section covers the design of the APR1400 piping systems and piping supports consisting of seismic Category I, Category II, and Category III (non-seismic). The seismic classifications are described in Subsection 3.2.1.

This section addresses the adequacy of the structural integrity as well as the functional capability of the safety-related piping system, piping components, and their associated supports. The design of piping systems provides reasonable assurance that they will perform their safety-related functions under normal operating conditions, system operating transients, postulated pipe breaks, seismic events, and combinations.

This design boundary includes pressure-retaining piping components and their supports, instrument lines, and the interaction of seismic Category II piping and associated supports with seismic Category I piping and associated supports.

This section also covers the design transients and resulting loads and load combinations with appropriate specified design and service limits for seismic Category I piping and piping supports, including those designated as ASME Section III, Class 1, 2, and 3, and those covered by ASME B31.1 and B31.3 (References 1, 2, and 3).

3.12.2 Codes and Standards

Applicable codes and standards used in the design, fabrication, construction, testing, and inservice inspection (ISI) of the piping systems and piping supports are consistent with the codes and standards specified in 10 CFR 50.55a; the applicable General Design Criteria (GDC 1, 2, 4, 14, and 15) for nuclear power plants; 10 CFR Part 50, Appendix A, as described in Section 3.1; and 10 CFR Part 50, Appendix S.

3.12.2.1 ASME Boiler and Pressure Vessel Code

The safety-related piping system design and analysis for the APR1400 are performed in accordance with the 2007 Edition with 2008 addenda of the ASME Section III (Reference 1).

However, for socket weld leg dimensions, ASME Section III, Footnote 11 to Figure NC/ND-3673.2(b)-1 in the 1989 Edition is used for socket weld with leg size less than

1.09 t_n instead of Footnote 13 from 2007 Edition and 2008 Addenda to Figures NC/ND-3673.2(b)-1. For ASME Class 1 weld leg dimensions, the requirements of subparagraphs NB-3683.4(c)(1) and NB-3683.4(c)(2) are not applied for welds with leg size less than 1.09t_n.

For ASME Class 1 piping, the material and D_0/t requirements of NB-3656(b) are met for all service limits when service limits include reversing dynamic loads, and alternative rules for reversing dynamic loads are used. When applying Note (1) of Figure NB-3222-1 for Level B service limits, the calculation of P_b stresses includes reversing dynamic loads (including inertia earthquake effects) if evaluation of these loads is required by NB-3223(b).

The non-safety-related piping system design and analysis for the APR1400 are performed in accordance with the 2010 Edition of ASME B31.1 (Reference 2) and the 2010 Edition of ASME B31.3 (Reference 3).

As described in Subsection 3.12.6, all pipe supports are designed in accordance with Subsection NF of the 2007 Edition with 2008 addenda of the ASME Section III.

3.12.2.2 ASME Code Cases

ASME Code Cases applicable for the piping systems and pipe supports of the APR1400 are Code Cases N-122-2, N-71-18, and N-249-14 (Reference 4).

Other ASME Code cases may be used if they are conditionally or unconditionally approved in NRC RG 1.84 (Reference 5).

3.12.2.3 Piping System Design Specification and Design Report

The design specification for all ASME Class 1, 2, and 3 piping systems including loading combinations, design data, and other design inputs is to be developed in accordance with ASME Section III. The design specification defines the code and the edition to be applied to the piping system design. In addition, ASME Section III requires that design reports for all ASME Class 1, 2, and 3 piping systems demonstrating and documenting that as-built piping system and pipe support configurations adhere to the requirements of the design specification (Reference 6).

3.12.3 Piping Analysis Methods

Seismic analysis methods used for all seismic Category I, seismic Category II, and non-seismic piping systems, as described below, include the response spectrum method, time-history method, or where applicable, the equivalent static load method in accordance with Subsection 3.7.3.1.1.

This subsection covers the procedure used for analytical modeling, selection of frequencies, damping criteria, combination of modal responses, the analysis for small-bore piping, and interaction of seismic Category I piping systems with other piping systems.

3.12.3.1 Experimental Stress Analysis Method

For the APR1400, experimental stress analysis methods are not used for the design of the piping system and its supports.

3.12.3.2 Modal Response Spectrum Method

3.12.3.2.1 General

The modal response spectrum method is a measure of how the piping system with certain natural frequencies responds to an earthquake applied at its pipe supports. To determine the piping system natural frequencies, each piping system is idealized as a mathematical model consisting of lumped masses connected by elastic members.

The response spectra are applied to the piping system at locations of structural attachment, such as pipe supports or equipment for each of the three orthogonal spatial components. The response spectra analysis is performed using either uniform support motion (USM) or independent support motion (ISM) method.

The response spectra analysis for piping systems uses the damping values specified in NRC RG 1.61 (Reference 7). No combination of piping damping values in NRC RG 1.61 is allowed.

3.12.3.2.2 Floor Response Spectrum

As described in Subsection 3.7.2.5, a floor response spectrum is a curve that represents the peak acceleration responses versus frequencies of a series of single-degree-of-freedom spring mass systems, which are excited by an earthquake time-history motion.

To account for the uncertainty in the structural frequencies due to uncertainties in the material properties of structures and soil and to approximations in the seismic analysis modeling techniques, the floor response spectra are smoothed with the peak values broadened in accordance with NRC RG 1.122 (Reference 8).

3.12.3.2.3 Uniform Support Motion Method

For analyzing the piping systems or components supported at multiple locations within a single structure or multiple structures, a uniform response spectrum (URS) that envelops all of the individual response spectra at the various support locations is used to calculate the maximum inertial responses of the piping system or component, which is defined as the uniform support motion (USM) method. The enveloped response spectrum is developed and applied in the two mutually perpendicular horizontal directions and in the vertical direction. Typically, the USM method can result in considerable overestimation of seismic responses.

The modal and spatial combination methods using the USM method are described in Subsections 3.12.3.2.4 and 3.12.3.2.5.

The piping system analyses performed using the USM method use damping values specified in Table 3 or the frequency-dependent damping values of Figure 1 of NRC RG 1.61.

3.12.3.2.4 Modal Combination

The response of individual modes is calculated and combined with the other modal responses using the double sum equation as described in NRC RG 1.92 (Reference 9).

$$R_{pI} = \left[\sum_{i=1}^{n} \sum_{j=1}^{n} \varepsilon_{ij} R_{pi} R_{pj} \right]^{1/2}$$

Where:

R_{pI} = combined periodic response for the I^{th} component of seismic input motion (I = 1, 2, and 3, for one vertical and two horizontal components),

ε_{ij} = the modal correlation coefficient for mode i and j,

R_{pi}, R_{pj} = periodic response or periodic components of a response of mode i and j respectively,

n = number of modes considered in the combination of modal responses.

For the piping system modes with no closely spaced, the representative maximum responses are obtained by taking the square root of the sum of the squares (SRSS). If modes with closely spaced frequencies exist, the SRSS method is not applicable. The definition of modes with closely spaced frequencies is a function of the critical damping ratio and is as follows:

a. For critical damping ratios ≤ 2%, modes are considered closely spaced if the frequencies are within 10% of each other (i.e., for $f_i < f_j$, $f_j \leq 1.1 f_i$)

b. For critical damping ratios > 2%, modes are considered closely spaced if the frequencies are within five times the critical damping ratio of each other (i.e., for $f_i < f_j$ and 5% damping, $f_j \leq 1.25 f_i$, for $f_i < f_j$ and 10% damping, $f_j \leq 1.5 f_i$)

If modes with closely spaced frequencies exist, the double sum equation is used considering modal correlation coefficient defined in NRC RG 1.92 (Reference 9).

The responses of low-frequency modes are obtained from all the low-frequency modes with frequencies up to the ZPA cutoff frequency.

Piping system modes greater than the ZPA cutoff frequency are considered as high-frequency or rigid range modes. The response from high frequency must be included in the response of the piping high-frequency rigid mode.

The PIPESTRESS program uses the left-out-force (LOF) method to calculate the effect of the high-frequency rigid modes. The LOF method is described in the PIPESTRESS Theory Manual (Reference 10).

PIPESTRESS generates a pseudo-load vector called a “left-out-force” vector. Generated left-out-force unit solutions are combined to approximate the contribution of the uncalculated modes to the piping system. Each left-out-force unit solution is multiplied by a scalar amplitude equal to the highest spectral acceleration for frequencies greater than the ZPA cutoff frequency. Combine the individual left-out-forces and combine the total left-out-force response with the combination of modal responses by absolute combination, as follows:

$$R = | R_{mod} | + | R_{lof} |$$

Where:

R = combination of response in the periodic modes and residual rigid modes

R_{mod} = response in the periodic modes

R_{lof} = response in the rigid modes

The ANSYS computer program normally uses the SRSS method to combine the modal responses. In order to combine the modal response of the piping system with closely spaced modes, the double sum equation in NRC RG 1.92 (Reference 9) is used. The residual rigid responses of missing mass modes are accounted for by using the missing mass method in NRC RG 1.92 (Reference 9).

3.12.3.2.5 Directional Combination

The responses due to each of the three orthogonal spatial components of earthquake motion are combined by SRSS as described in Regulatory Position C.2.1 of NRC RG 1.92 (Reference 9).

3.12.3.2.6 Seismic Anchor Motion Analysis Method

Seismic anchor motion (SAM) analysis is a static analysis and includes the following effects acting on the piping system supported by either a single structure or more than one structure.

a. Building seismic movements

b. Equipment seismic movements as anchor motions on the piping system

c. Header piping seismic movements for decoupled branch lines

The effects of SAM on the piping system are considered for the safe shutdown earthquake (SSE).

In the SAM analysis, the relative displacements at the support are considered. The maximum relative support displacements are obtained from the structural response calculations. The support displacements are then imposed on the supported item in the most unfavorable combination by static analysis procedures.

In case of the seismic analysis using the USM method, the effects of SAMs in each of the three orthogonal spatial components are analyzed separately considering all dynamic pipe supports to be active. These interspatial responses are combined by the SRSS method to obtain cumulative effect of pipe support displacements.

The effects of these seismic anchor motions are then considered by combining with SSE inertia by the absolute summation method.

In case of the seismic analysis using the ISM method, the effects of SAMs are analyzed with the method specified in Section 2 of NUREG-1061, Volume 4 (Reference 11). The responses from SAM of each group for each spatial direction are combined by the absolute summation method. These interspatial responses are combined by the SRSS method to obtain the cumulative effect of pipe support displacements. The effects of these seismic anchor motions are considered by combining with SSE inertia using the SRSS method.

3.12.3.3 Independent Support Motion Method

The ISM method may be used in lieu of the USM method when piping systems are supported by more than one supporting structure or at multiple levels within the same structure because the USM method can result in considerable overestimation of seismic responses.

In the analysis using the ISM method, the supports are divided into support groups. Each support group consists of the supports that have similar time-history inputs. Typically, all supports in each support group are located on the same floor or portions of the floor of a structure.

The responses caused by each support group are combined by the absolute summation method. The modal and directional responses are then combined as described in Section 2 of NUREG-1061 Volume 4 (Reference 11).

Analyses performed using the ISM method are used for damping values identified in Table 3 of NRC RG 1.61 (Reference 7).

3.12.3.4 Time-History Method

The time-history method may be used for other types of dynamic analyses such as hydraulic transient loads caused by water or steam hammer, safety and relief valve discharge actuation loads, jet force loads, postulated pipe breaks, or any other dynamic loading associated with fluid flow transients.

The dynamic analysis methods used for the reactor coolant loop (RCL) piping are the direct integration method and the complex frequency response method as described in Appendix 3.9B. The surge line is evaluated using the direct integration method. For the dynamic response of the other piping systems, the time-history analysis is performed using the modal superposition method (Reference 12).

When the modal superposition method is used, the cutoff frequency for the determination of modal properties is selected to account for the principal vibration modes of the piping system based upon mass and stiffness properties, modal participation factors, and the frequency content of the input forcing function. As required on a case-by-case basis, the analysis is repeated with more modes to verify the cutoff frequency for the determination of modal properties.

The missing mass effects of high-frequency modes are included based on the same principles described in Subsection 3.12.3.2.4.

Alternatively, the cutoff frequency is determined so that the calculated number of modes produces dynamic analysis results within 10 percent of the results of the dynamic analysis, including the next higher mode.

Damping values are described in Subsection 3.12.5.4.

3.12.3.5 Inelastic Analysis Method

For the APR1400, inelastic analysis methods are not used for the design of the piping system and its supports.

3.12.3.6 Small-Bore Piping System Method

A small-bore piping system is defined as ASME Class 1 piping less than or equal to nominal diameter (DN) 25 (nominal pipe size [NPS] 1) and smaller, and the other classes of piping with nominal diameter DN 50 (NPS 2) and smaller. These small-bore piping systems are analyzed using the response spectrum method or the equivalent static load method.

The modal response spectrum method is described in Subsections 3.12.3.2 and 3.12.3.3, and used when the equivalent static method cannot be justified.

The equivalent static load method is applied based on SRP 3.9.2, II.2.A(ii) (Reference 29). The masses of piping, its contents, and any in-line component are considered as lumped masses at their center of gravity locations. The static forces for the equivalent static load method are determined by multiplying the contributing mass by a seismic acceleration (g factor) at each location. To obtain an equivalent static load of a small-bore piping system, which is represented by a simple model, a factor of 1.5 is applied to the peak acceleration of the applicable floor response spectrum. This static force analysis is performed for all three spatial components of seismic excitation, and the results of these static analyses are combined by the SRSS method.

3.12.3.7 Non-Seismic/Seismic Interaction (II/I)

The APR1400 is designed to minimize the interactions of seismic Category I piping systems with non-seismic Category I piping system and to protect seismic Category I piping systems from adverse interactions with a non-seismic Category I piping system. A non-seismic Category I piping system whose continuous function is not required but whose failure could adversely affect the safety function of structures, systems, and components (SSCs) is seismically designed. The primary method of protecting a seismic Category I piping system is its isolation from a non-seismic Category I piping system. If isolation of the seismic Category I piping system is not feasible or practical, adjacent non-seismic Category I piping is classified as seismic Category II and analyzed in accordance with the same seismic design criteria applicable to the seismic Category I piping and pipe supports.

Similarly, for non-seismic piping attached to seismic piping, the dynamic effects of the non-seismic piping account for the modeling of the seismic piping. The attached non-seismic piping up to the analysis boundary is classified as seismic Category II and designed to preclude causing failure of the seismic piping during a seismic event. Non-seismic piping classified as seismic Category II is isolated from the continuing non-seismic piping by the analysis boundary, such as seismic boundary anchor. The seismic boundary anchor provides reasonable assurance that the seismic response of the seismic Category II is not affected by the dynamic effect from the non-seismic side of the anchor. The seismic boundary anchors are designed considering the plastic hinge moment from the non-seismic piping.

3.12.3.8 Seismic Category I Buried Piping

The APR1400 design has no seismic Category I buried piping

3.12.4 Piping Modeling Technique

3.12.4.1 Computer Codes

The following computer programs are used in the analysis of seismic Category I piping designated as ASME Class 1, 2, and 3, and non-ASME piping systems. These computer programs are further described in Subsection 3.9.1.2. The applicable computer programs are as follows:

a. PIPESTRESS

   PIPESTRESS is a piping analysis program that is used for the analysis of ASME Class 1, 2, and 3 as well as ASME B31.1 and B31.3 piping systems. This program is described in Subsection 3.9.1.2.1.12.

b. ANSYS

   ANSYS is used in numerous applications for all components in the areas of structural, fatigue, thermal, and eigenvalue analysis including static and dynamic; elastic, plastic, creep and swelling; small and large deflections; steady-state and transient heat transfer and fluid flow. This program is described in Subsection 3.9.1.2.1.6.

c. RELAP5/MOD3.3

   RELAP5/MOD 3.3 is developed by the NRC is for best-estimate transient simulation of light water reactor (LWR) coolant systems during postulated accidents in the LWR. This program is also used for the analysis of a dynamic behavior, such as water hammer and safety/relief valve discharge, by modeling the fluid flow. This program is described in Subsection 3.9.1.2.1.15.

d. GTSTRUDL

GTSTRUDL is used for structural analysis of pipe supports in conformance with ASME Section III, NF, and ANSI/AISC 360 (Reference 13). This computer program is a general-purpose structural analysis program including the base plate flexibility, anchor bolts check, and the calculation of weld leg sizes.

e. RELAP5/MOD3.1

RELAP5/MOD3.1 is a best-estimate system code suitable for the analysis of all transients and postulated accidents in LWR systems. This code is used to analyze rapid transients such as pipe breaks and valve quick opening, by modeling the fluid flow. This program is described in Subsection 3.9.1.2.1.14.

3.12.4.2 Dynamic Piping Model

For dynamic analysis, the seismic Category I piping systems and pipe supports are modeled as a three-dimensional space framework using a linear finite element analysis program. The analysis model consists of a series of nodes connected by beam elements with stiffness properties representing the piping and other components. Node points are modeled at points that define piping geometries as well as lumped mass locations, support locations, flange locations, expansion joint locations, or locations of structural or load discontinuities; other appurtenance locations of interest along the piping system are modeled as a node point. The RCL piping is included in RCS structural model described in Appendix 3.9B.

In the dynamic mathematical model, the distributed mass of the piping system, including pipe, contents, and insulation weight, is represented as lumped masses placed at each node.

To provide reasonable assurance that there is a sufficient number of mass points for an accurate dynamic model in the PIPESTRESS program (Reference 14), the length, L (m (ft)), is determined by the following formula based on a simply supported pipe element with fundamental natural frequency.

$$L^4 = (\alpha^2 / f_R^2)\ (EI / W)$$

Where:

E = modulus of elasticity [N/mm^2 (psi)]

I = moment of inertia [mm^4 (in^4)]

W = mass per unit length [kg/m (lbm/ft)]

f_R = fundamental natural frequency [Hz]

α = 0.0016 (0.743)

If the distance between mass points exceeds L/2 when the automatic mass modeling is used, then additional mass points are generated.

Concentrated weights of the components, such as valves, flanges, and other appurtenances, are also modeled as lumped masses. The torsional effect due to eccentricity of an eccentric mass, such as a valve operator, is considered.

In general, pipe supports are modeled as rigid with the rigidity verified by checking support deflection in the restrained direction, if springs with actual stiffness values for the restrained degrees of freedom. Pipe support hardware weight for snubbers, struts, and spring hangers supported by the piping system is considered in the piping analysis. The weight added by the component support is included in the piping analysis when it is greater than 10 percent of the total mass of the adjacent pipe span including pipes, contents, insulations, and in-line components.

In general, an entire piping system cannot be modeled and analyzed as a single model; the piping system is therefore conveniently divided into multiple, smaller piping subsystems that satisfy the analysis size limitations of the computer program used for the piping system analysis. Branch piping that does not have a significant effect on the run piping is decoupled from the run pipe analysis based on the branch decoupling criteria defined in Subsection 3.12.4.4. Intermediate pipe anchors such as wall or slab penetration sleeve anchors and structural anchor supports may also be used for subdividing the piping systems.

3.12.4.3 Piping Benchmark Program

The computer programs used for the piping system analysis are verified in accordance with NRC benchmark problems.

The piping benchmark problems prescribed in NUREG/CR-1677, Volumes 1 and 2 (Reference 15), are used to validate the PIPESTRESS and ANSYS computer programs used in piping system analysis.

3.12.4.4 Decoupling Criteria

Small branch lines including instrument connections may be decoupled from the analysis model of the larger run pipe provided that the ratio of the moments of inertia of the two lines (I_b/I_r) is less than or equal to 1/25, under such conditions that no restraints on the branch are located near the run pipe for the flexibility or no precise magnitudes of reactions are required at the terminal points (Reference 28).

In the case that the branch piping geometry is known, piping systems are consider in accordance with the decoupling criteria described in Subsection 3.7.2.3.2.

In the run pipe analysis, the applicable stress intensification factors (SIFs) and/or stress indices are incorporated. The mass effects of the branch line, where the mass of half the span of the branch pipe is greater than 10 percent of the mass of the pipe run span, are also considered at the run pipe connection point. If a large valve or other large concentrated mass is located within the first span of the branch piping, the torsional effects of the eccentric mass is considered. In these cases, the branch pipe is included in the run pipe model up to the first anchor or four seismic supports in each of the three perpendicular directions to consider eccentric mass effect.

In the decoupled branch pipe analysis, the run pipe connection point is modeled as an anchor with the same SIF and/or stress indices as the run pipe and the effect of seismic excitation from run pipe is considered as follows. The movements of the run pipe due to the thermal, seismic anchor motion (SAM), or pipe break analyses at the header connection are applied as anchor motions in the branch line analysis. In addition, seismic inertial movement from the run pipe analysis is also considered at the header connection. The inertial effects of the run pipe on the branch line are considered in the branch piping analysis to capture the possible amplification of inertial input from the run pipe. The effects of seismic excitations from the two seismic supports in each of the three perpendicular directions to the branch connections in the run pipe are included in the branch piping analysis.

3.12.5 Piping Stress Analysis Criteria

3.12.5.1 Seismic Input Envelope vs. Site-Specific Spectra

Seismic input envelope and site-specific spectra of the APR1400 are described in Subsection 3.7.2.5.

3.12.5.2 Design Transients

RCS design transients used for the design and fatigue analysis of ASME Class 1 piping systems and support components are addressed in Table 3.9-1.

3.12.5.3 Loadings and Load Combination

3.12.5.3.1 Pressure

Internal design pressure, P, is used in the design and analysis of ASME Class 1, 2, and 3 piping (Reference 1). Minimum pipe wall thicknesses are determined using the formulations of NB/NC/ND-3640 and the design pressure. The applicable design and maximum service level pressures are used in load combinations as identified in Tables 3.12-1 and 3.12-2.

3.12.5.3.2 Mechanical Loads

The weight of the piping system, its contents, any insulation and in-line equipment, and any other mechanical loads identified in the design specification are considered in the piping analysis. The weight of water during hydrostatic testing is considered for steam or air-filled piping systems.

3.12.5.3.3 Thermal Expansion

The effect of linear thermal expansion range during various operating modes is considered along with thermal movements of terminal equipment nozzles, anchors, or restraints (thermal anchor movements) corresponding to the operating modes. The stress-free temperature is taken as 21 °C (70 °F). The piping systems operating at a temperature of 65 °C (150 °F) (Reference 1) and below are not analyzed for the effects of linear thermal expansion.

3.12.5.3.4 Seismic

The effects of seismic inertial loads and anchor movements are included in the design analysis. The ground motion of the operating basis earthquake (OBE) for the APR1400 is equal to one-third of the ground motion of the SSE. Per Appendix S to 10 CFR Part 50, the OBE load case does not require explicit design analysis. In the event of an earthquake that meets or exceeds the OBE ground motion, plant shutdown is required and seismic Category I piping and supports are inspected to provide reasonable assurance that no functional damage has occurred. The design of the APR1400 seismic Category I piping and supports includes analysis of the inertial and anchor movement effects of the SSE event. These loads are Service Level D loads.

Fatigue effects due to earthquake loads are addressed in Table 3.12-1. Tables 3.12-1 and 3.12-2 identify SSE inertial and displacement loads in various load combinations for ASME Class 1, 2, and 3 piping and piping supports.

3.12.5.3.5 Fluid Transient Loads

The relief/safety valve thrust loads for open or closed systems are functions of valve opening, flow rate, flow area, and fluid properties. The analysis of these loads is usually accomplished using static loads as input to the piping analysis with appropriate dynamic load factors. Dynamic analysis of relief valve thrusts is used when static analysis produces undesirably conservative results. These loads are considered in Service Level B or D load combinations.

The water hammer phenomenon involves the rapid change in fluid flow creating a "shock wave" effect in the piping system. They are usually set in motion by rapid actuation of control valves, relief valves, and check valves. Rapid start or trip of a pump or turbine can also initiate such a phenomenon. The water hammer phenomenon is analyzed using dynamic analysis methods. The water hammer loads are considered in Level B, or D service load combinations.

The fluid transient loads are identified as dynamic fluid loads in Tables 3.12-1 and 3.12-2.

3.12.5.3.6 Wind/Tornado Loads

Safety-related piping systems of ASME Class 1, 2, and 3 are designed within the wind/tornado protected structure. If COL applicant finds it necessary to route ASME Class 1, 2, or 3 piping systems outside the structure, the wind and/or tornado load must be included in the plant design basis loads considering the site-specific loads (COL 3.12(1)).

3.12.5.3.7 Pipe Break Loads

High-energy line breaks cause loads in the form of pipe whip, jet impingement, and changes in environmental conditions. Pipe break loads include the impact of the RCPB piping break, main steam and feedwater line breaks except for piping breaks that meet the leak-before-break (LBB) criteria (see Subsection 3.6.3) or inside the pipe break exclusion area. Pipe break loads are considered in Level D service load combinations.

3.12.5.3.8 Thermal and Pressure Transient Loads

Thermal and pressure transients are evaluated in the analysis of ASME Class 1 piping by calculating the range of primary plus secondary stress intensities. For ASME Class 2 and 3 piping, these transients are included as load cases in the appropriate ASME Code equations.

3.12.5.3.9 Hydrostatic Pressure Tests

Piping systems are tested for leaks by filling the system with the test fluid and pressurizing to test pressures specified in the design specification. Piping systems that normally carry operating fluids, such as steam or gas, have stops placed in spring hangers and temporary supports added as needed. The effects of the test pressure and fluid weight are considered in satisfying the appropriate ASME Class 1, 2, and 3 stress equations. The effects of hydrostatic pressure tests on ASME Class 1 piping fatigue are in accordance with NB-3226.

3.12.5.3.10 Load Combinations

Using the methodology and equations from the ASME Code, pipe stresses are calculated for various load combinations. The ASME Code includes design limits for design conditions; Service Levels A, B, C, and D; and testing. Load combinations for ASME Class 1 piping are given in Table 3.12-1. ASME Class 2 and 3 load combinations are given in Table 3.12-2.

3.12.5.4 Damping Values

Damping values in Table 3 of NRC RG 1.61 (Reference 7) are used for dynamic response spectra and time-history analyses.

Frequency-dependent damping values identified in Figure 1 of NRC RG 1.61 may also be used for USM response spectra analysis provided the five restrictions identified in C.2 of NRC RG 1.61 (Reference 7) are maintained.

3.12.5.5 Combination of Modal Responses

Seismic responses to each mode are calculated in accordance with the method described in NRC RG 1.92 (Reference 9) and combined with other responses. Seismic responses to periodic modal response with sufficiently separated frequencies are combined by SRSS. Closely spaced frequencies are combined by the double sum equation described in Subsection 3.12.3.2.4.

3.12.5.6 High-Frequency Modes

PIPESTRESS computer program uses left-out-force (LOF) method to calculate the effect of high-frequency rigid modes (Reference 10). The result obtained from this method is multiplied by scalar amplitude that is equivalent to the highest spectral acceleration for frequencies, which is greater than the last natural frequency being calculated by LOF method regarding the corresponding directional spectrum. ANSYS computer program accounts for the effects of high frequency modes in accordance with the missing mass method in NRC RG 1.92 (Reference 9).

3.12.5.7 Fatigue Evaluation of ASME Code Class 1 Piping

Fatigue evaluation of ASME Class 1 piping systems is performed for loadings caused by thermal and pressure transients, thermal stratification, and other cyclic events including earthquakes. Fatigue evaluation of ASME Class 1 piping greater than DN 25 (NPS 1) is performed per ASME Section III, NB-3653.

The fatigue evaluation considering the effects of the reactor coolant environment in ASME Class 1 piping follows the guidance in NRC RG 1.207 (Reference 17).

3.12.5.8 Fatigue Evaluation of ASME Code Class 2 and 3 Piping

The calculation for the cumulative usage factors of ASME Class 2 and 3 piping is not required. Fatigue evaluation of ASME Class 2 and 3 piping is not performed in accordance with the requirements in NC/ND-3653.2(a). Acceptable cyclic stress is reduced by applying stress range reduction factor, f, to thermal expansion stress ranges in accordance with Table NC/ND-3611.2(e)-1. The stress intensification factors that are applicable to piping components and joints are based on fatigue testing.

3.12.5.9 Thermal Oscillations in Piping Connected to the Reactor Coolant System

Unisolable sections of piping connected to the reactor coolant system (RCS) that could be subjected to stresses from thermal stratification caused by valve leakages or turbulent penetrations are reviewed to provide reasonable assurance of the structural integrity of the lines.

APR1400 conforms with the requirements in U.S. NRC Bulletin 88-08 (Reference 18) for all piping connected to the reactor coolant system. Data available from the reference plant have been evaluated and incorporated into the design of the APR1400.

Based on the temperature distributions in the piping between the direct vessel injection (DVI) nozzle and the first isolation valve, and the piping between shutdown cooling system (SCS) nozzle and the first isolation valve, which were evaluated using a commercial thermal-hydraulic analysis code, it is expected that the temperature difference in stratified flow is relatively small and the thermal stratification effects would be negligible for the SCS suction line.

The effect of thermal stratification on the piping system is analyzed in two parts:

a. Global stratification, which causes bending

b. Local stratification, which causes stresses similar to thermal gradient stresses

To consider the global stratification, the global bending stress due to a vertical temperature distribution in horizontal and non-horizontal members is mathematically defined in the computer program PIPESTRESS (Reference 14) as follows:

$$g_u = \frac{\int_{\Omega} \mathrm{T}(\mathrm{v})\mathrm{v}d\Omega}{\mathrm{I}_\mathrm{u}}$$

Where:

Ω = the pipe wall region

T(v) = a vertical temperature distribution on pipe cross-section

I_u = the moment of inertia

v = vertical direction against axis of a horizontal pipe

Then, αg_u is the load on the pipe due to the temperature distribution T(v), where α is the coefficient of thermal expansion of the pipe. The unit of αg_u is rotation-per-unit-length.

Local stresses due to thermal stratification are confined to thermal stratification zone. The boundary conditions are such that local thermal stresses are due only to temperature distribution across the pipe wall. The local stress intensity due to thermal stratification is calculated for the fatigue analysis of the ASME Class 1 piping system. The steps for piping fatigue analysis are as follows:

a. Thermal-hydraulic analysis

b. Conversion of thermal-hydraulic analysis data

c. Direct application of temperature distribution data into three-dimensional piping model

d. Extraction of the maximum stress intensity (local stress)

e. Evaluation of code requirements in accordance with ASME Section III, NB-3600

The reactor vessel and piping segments away from the stratified zone are not affected by thermal stratification and are not considered in local stress determination. The maximum stress intensity extracted from three-dimensional finite element analysis is added to the ΔT_2 term of ASME Section III, NB-3653.2 Equation (11) without considering stress index.

3.12.5.10 <u>Thermal Stratification</u>

NRC Bulletin 79-13 (Reference 19) addresses the effect of thermal stratification that leads to the cracking of the feedwater line. The APR1400 feedwater lines are designed to minimize the thermal stratification. The feedwater lines are angled downward from the horizontal to minimize the potential for thermal stratification. This is also described in Subsection 5.4.2.1.2.1.3.

NRC Bulletin 88-11 (Reference 20) was issued in response to the results of an inspection of the surge line at Trojan that showed large, unexpected movements that closed available gaps between the line and pipe whip restraints. NRC Bulletin 88-11 requires that holders of operating licenses or construction permits establish and implement a program to provide reasonable assurance of the structural integrity of the surge line when subjected to thermal stratification in the pressurizer surge line.

The APR1400 pressurizer surge line features and operational procedures address the structural integrity issues raised by NRC Bulletin 88-11 in minimizing surge line stratification.

a. The surge line piping is routed to insure that sufficient flexibility exists to minimize resistance to uniform thermal growth and the thermal deformation due to stratified flow loadings. The surge line has the horizontal section between the vertical take-off at top of the hot leg and vertical leg at the bottom of the pressurizer. The horizontal section is sloped downward at a minimum rate of 1/16 inch per foot from the pressurizer.

b. The nozzle and surge line from the hot leg are upward vertical and of sufficient length to prevent the colder hot leg fluid from entering the surge line beyond the take-off. During the normal power operation, a continuous bypass spray flow is maintained to further suppress turbulent penetration from the hot leg flow.

c. The maximum temperature difference between the pressurizer and the hot leg can occur during plant heatup and cooldown. The maximum temperature difference is determined based on the shutdown cooling system (SCS) alignment condition. During plant heatup, the RCS is pressurized by the bubble formation using the pressurizer heaters until the system pressure is high enough for RCP operation. The pressurizer temperature increases along with the saturation temperature as the system pressure increases. For the determination of the maximum temperature difference, the pressurizer is conservatively assumed to be heated up to the maximum system pressure for SCS alignment. This temperature difference is established as the design criteria for the surge line and the system operating procedure for heatup and cooldown.

d. The pressurizer versus hot leg temperature differential is limited during heatup and cooldown below the design temperature differential of 188.9 ºC (340 ºF). The differential temperature can be determined by the difference between the pressurizer and the hot leg temperature indications. The differential temperature limits are specified in the operating procedures. Also, the pressurizer heaters are used to maintain a required pressurizer and temperature during the initial heatup. The pressurizer level is maintained at a predetermined level (outsurge) during the plant heatup by the charging and letdown flow controls, which can limit the cooler hot leg fluid insurge.

The APR1400 design conforms with NRC Bulletin 88-11 pressurizer surge line requirements as follows:

a. The stratification test for the surge line piping layout for Younggwang Nuclear Power Plant Unit 3 (YGN 3) was done as part of the YGN 3 pre-core hot functional test. The measurements taken during the test verified the assumptions and methodology of the surge line design basis both from a thermal-hydraulic and structural standpoint. The measurements included both the circumferential and axial temperature gradients and the pipe displacements. The surge line for APR1400 has the almost same operational procedure and piping layout as those for YGN 3 of OPR1000 and was also tested during Shin-Kori Nuclear Power Plant Unit 3 (SKN 3) pre-core hot functional test. Only the pipe displacements were measured from the SKN 3 test because it was confirmed from the YGN 3 test that there are the relationships between pipe temperatures, curvatures, and displacements which forms the basis of the design analysis. The pipe displacements measured from the SKN 3 test verified the design of surge line for APR1400.

b. The COL applicant will implement the monitoring program during the first preoperational testing and continue to monitor by using the fatigue monitoring system during the first cycle of operation to verify the design transients used in the structural design of the surge line (COL 3.12(2)). The monitoring program includes the real-time measurements of the surge line pipe displacements and temperatures at several major locations on the surge line and plant data such as hot leg and pressurizer temperatures, pressurizer pressure and level, charging and letdown flows as well as the status of reactor coolant pumps, pressurizer heaters, and spray valves.

Structural evaluations are performed using elastic and/or simplified elastic-plastic analyses in accordance with the ASME Code, considering the applicable loadings in addition to the stratified flow loadings.

The stratified-flow-induced curvature of the piping and local stresses due to a temperature gradient are obtained from finite element analyses. These analyses provide the local effects and pipe rotations for an unsupported pipe segment. A stratified flow thermal-hydraulic model with the top half of the fluid at hotter temperature and the lower half of the fluid at colder temperature is used to determine the pipe wall temperature based on the thermal-hydraulic conditions. Heat transfer and structural thermal stress analyses are performed using the ANSYS computer program to determine the rotations and local stresses. Rotations are considered to act over all horizontal portions of the pipe. The resulting bending moments are calculated in the piping analysis with the ANSYS computer program by allowing the pipe to thermally expand unconstrained and by then applying a set of equal and opposite displacements at the rigid support points. Local stress effects due to top-to-bottom thermal gradients are also considered to act over all horizontal sections of pipe. For ASME Class 1 piping, gross bending stresses due to stratification are considered as secondary stresses, while local stresses due to thermal gradients are considered as peak stresses.

3.12.5.11 Safety Relief Valve Design, Installation, and Testing

The design and installation of the safety valves and relief valves for overpressure protection are performed per the requirements in Appendix O of the ASME Code (Reference 21).

A static method with a conservative dynamic loading factor is used to calculate the discharge forces of safety valves and relief valves that use open vent stacks for discharging fluid directly into the air. Dynamic transient loads of fluid discharged from safety/relief valve to vessels or headers are considered as forces acting on the changes in direction such as elbows or branch connections. Piping stresses and support/restraint loads resulting from these discharge forces of safety and relief valves are assessed by dynamic time-history analysis or by an equivalent static force analysis in piping systems.

See Subsection 3.12.4.1.c for the computer program used in the analysis.

3.12.5.12 Functional Capability

Functional capability of all ASME Class 1, 2, and 3 piping systems essential for safe shutdown of the plant is reasonably assured in accordance with NUREG-1367 (Reference 22) to provide sufficient fluid flow path under Service Level D loading conditions.

3.12.5.13 Combination of Inertial and Seismic Anchor Motion Effects

The inertial and seismic anchor motion (SAM) effects are analyzed separately. The results of SAM analysis are combined with those of seismic inertial analysis by absolute summation when an enveloped USM method is used, per SRP 3.7.3, and by the SRSS when the ISM method is used for the dynamic analysis per NUREG-1061, Volume 4 (Reference 11).

3.12.5.14 Operating Basis Earthquake as a Design Load

The applicable earthquake load in the design of APR1400 piping systems is described in Section 3.7. The operating basis earthquake (OBE) ground motion has been set as one-third of SSE and, therefore, is not considered in the seismic design in accordance with 10 CFR Part 50.

3.12.5.15 Welded Attachments

If integral welded attachments are used to attach supports on piping systems, they are evaluated by the nonmandatory Appendix Y of ASME Section III, "Evaluation of the Design of Rectangular and Hollow Circular Cross Section Welded Attachments on Class 1, 2, and 3 Piping."

3.12.5.16 Modal Damping for Composite Structures

The composite modal damping for coupled building and piping systems is used for piping systems that are coupled to concrete building structures, if applicable. The procedure used to determine the composite modal damping value for the piping system is described in Subsection 3.7.2.15.

3.12.5.17 Minimum Temperature for Thermal Analyses

The stress-free state temperature for a piping system is typically defined as 21 °C (70 °F). The analysis for a piping system with an operational temperature of greater than 65 °C (150 °F) or less than 4 °C (40 °F) is performed for the effect of thermal expansion/contraction.

3.12.5.18 Intersystem Loss-of-Coolant Accident

The design feature of low-pressure piping systems that interface with reactor coolant pressure boundary (RCPB) is described in Appendix 5A.

3.12.5.19 Effects of Environment on Fatigue Design

The fatigue evaluation considering the effects of the reactor coolant environment in ASME Class 1 piping follows the guidance in NRC RG 1.207 (Reference 17).

3.12.6 Piping Support Design Criteria

This section provides piping support design methods, procedures and criteria, and piping support design criteria provided in Subsection 3.9.3 are used as references.

3.12.6.1 Applicable Codes

Seismic Category I pipe supports are designed in accordance with ASME Section III, NF for Service Levels A, B, C, and D, and the acceptance limits of Appendix F of ASME Section III for Service Level D.

Standard component supports are designed, manufactured, installed, and tested pursuant to NF of ASME Section III.

For non-seismic category pipe supports supporting piping analyzed to ASME B31.1, the requirements of ASME B31.1 for supports (Sections 120 and 121) are met, where applicable. In addition, the structural elements are designed using guidance from the AISC 360 (Reference 13).

In addition to the pipe support design codes mentioned above, expansion anchors and other steel embedments in concrete are designed in accordance with Subsection 3.12.6.4.

3.12.6.2 Jurisdictional Boundaries

The jurisdictional boundary between the pipe and its support structure follows the guidance of NB-1132, NC-1132, or ND-1132, as appropriate for the ASME Section III Class of piping involved.

The jurisdictional boundary between the pipe support and the building structure follows the guidance of ASME Section III, NF-1130. In general, for attachments to building steel, the boundary is taken at the interface with the building steel, with the weld being designed to the rules of NF. For attachments to concrete building structures, the boundary is generally at the weld of the support member to a baseplate or embedded plate, with the weld again being designed to the rules of NF.

3.12.6.3 Loads and Load Combinations

Loading conditions and load combinations for piping supports are defined in Table 3.9-10. Load combinations for piping support design used for Service Levels A, B, C, and D include piping reaction loads calculated for load combinations given in Table 3.12-1 and Table 3.12-2. The deadweight of the support itself for Service Levels A, B, C, and D, friction loads (Subsection 3.12.6.10) for Service Levels A, B, C, and D seismic self-weight excitations (Subsection 3.12.6.8) for Service Level D are considered in addition to piping reaction loads.

The stress limits for pipe support designs meet the criteria of ASME Section III, NF.

3.12.6.4 Pipe Support Baseplate and Anchor Bolt Design

Although the use of baseplates with expansion anchors is expected to be minimized in the APR1400 design, baseplate designs are likely to be needed. For these designs, the concrete is evaluated using ACI 349-01, Appendix B (Reference 23), subject to the conditions and limitations of NRC RG 1.199 (Reference 24). This guidance accounts for the proper consideration of anchor bolt spacing and distance to a free edge of concrete. In addition, all aspects of the anchor bolt design, including baseplate flexibility and factors of safety, will be used in the development of anchor bolt loads, as addressed in NRC Bulletin Letter 79-02 (Reference 25).

3.12.6.5 Use of Energy Absorbers and Limit Stops

Energy absorbers and limit stops for pipe supports are not used for the APR1400 design.

3.12.6.6 Use of Snubbers

Snubbers for piping systems are used for situations requiring free thermal movements, while restraining movements due to dynamic loadings. Typical snubber components are manufactured standard hardware, and may be either hydraulic or mechanical in operation.

Snubbers are not capable of supporting gravity loads. Under certain circumstances, the weight of the snubber bearing on the pipe is included in the piping stress analysis. Snubbers in general are not to be used where thermal movements are small. Also, use of snubbers is minimized to the extent that is reasonable due to the maintenance and testing requirements for these components. As such, accessibility of any snubbers that are used is considered in the design of the piping system.

The functional requirements and design specifications provided to the supplier of snubbers contain the information described in Subsection 3.9.3.4.

3.12.6.7 Pipe Support Stiffness

Rigid stiffness is used for the piping supports in the piping analysis model with a check on support deflection in the restrained directions to verify the rigidity. The actual stiffness is modeled for variable spring supports. If the actual support stiffness is used for any support other than variable spring supports, all supports within the piping model use the actual support stiffness.

Each support modeled as rigid is checked with the deflection in the restrained directions to a maximum of 1.6 mm (1/16 in.) for SSE loadings, and a maximum of 3.2 mm (1/8 in.) for other loadings.

3.12.6.8 Seismic Self-Weight Excitation

The excitation of the support structure to SSE loadings is to be included in the pipe support analysis. Damping values for welded and bolted structures are given in NRC RG 1.61 (Reference 7). This support self-weight SSE response and the piping inertial load SSE response are to be combined by absolute summation.

3.12.6.9 Design of Supplementary Steel

This subsection provides design information on any supplementary steel required to connect the main support structure to the building structure.

As addressed in Subsection 3.12.6.1, all seismic Category I pipe supports for the APR1400 are designed to ASME Section III, NF. For non-seismic pipe supports, AISC 360 (Reference 13) is used for the supplementary steel, as it is for the main support structure.

3.12.6.10 Consideration of Friction Forces

Friction forces are developed in the pipe support when a pipe slides across the surface of a support member in the unrestrained directions under thermal expansion conditions. Because friction is due to the movement of the pipe, loads from friction are calculated using the deadweight and applicable signed loads normal to the applicable support member.

Specifically, the friction forces need to be calculated only if the thermal movement in the applicable unrestrained directions is greater than 1.6 mm (1/16 in.). The coefficient of friction is taken as 0.3 for steel-to-steel conditions and 0.1 for low-friction slide/bearing plates.

3.12.6.11 Pipe Support Gaps and Clearances

For guide type pipe supports modeled as rigid restraints in the piping analysis, the typical industry design practice is to provide small gaps between the pipe and its surrounding structural members. These small gaps allow radial thermal expansion of the pipe as well as allow rotation of the pipe at the support. The normal design practice for the APR1400 is to use a nominal cold condition gap of 1.6 mm (1/16 in.) on each side of the pipe in the restrained direction. For vertical restraint supports in horizontal piping, the pipe will be in contact with the support member in the direction of gravity. The gap between the upper side of the pipe and the support is allowed to have a range up to 3.2 mm (1/8 in.). If frame type supports are used for the larger diameter (>24 in) high temperature (>350 °F) piping, the gap is calculated considering temperature and pressure to allow free radial expansion of the piping and the gap is specified on the pipe support design drawing.

3.12.6.12 Instrumentation Line Support Criteria

The design and analysis loadings, load combinations, and acceptance criteria to be used for instrumentation line supports are similar to those used for pipe supports. The applicable design loads include deadweight, thermal expansion, and seismic loadings where appropriate. The applicable loading combinations similarly follow those used for the ASME Section III Levels in Table 3.9-10 using the design loadings mentioned above. The acceptance criteria are in accordance with ASME Section III, NF for seismic Category I instrumentation lines, AISC 360 (Reference 13) for non-seismic instrumentation lines.

3.12.6.13 Pipe Deflection Limits

For standard component pipe supports using standard manufactured hardware components, the manufacturer's recommendations for limitations in its hardware are followed. The limitations are travel limits for spring hangers; stroke limits for snubbers; swing angles for rods, struts, and snubbers; alignment angles between clamps or end brackets with their associated struts and snubbers; and the variability check for variable spring supports. In addition to the manufacturer's recommended limits, allowances are made in the initial designs for tolerances on such limits. This is especially important for snubber and spring design in which the function of the support may be changed by an exceeded limit.

3.12.6.14 Clamp-induced Local Pipe Stress Evaluation

Stiff pipe clamps of the type identified in Information Notice (IN) 83-80 and Generic Safety Issue (GSI) 89 are not used for the piping supports.

3.12.7 Graded Approach of Piping Systems

The ASME Code Class 1 piping systems include RCS main loops, pressurizer surge line and thirteen piping subsystems of RCS branch piping which include four DVI lines, two SC lines, and four RCS drain lines (letdown, charging, RG and spray lines). Based on the safety function, integrity, piping size and layout, the RCS main loops, pressurizer surge line, DVI and SC lines are selected as ASME Code Class 1 for the graded approach. The DVI and SC lines are selected as the representative RCS branch piping systems based on size; other lines are smaller diameter and have no significant impact on RCS integrity. Considering the symmetrical arrangement of the DVI and SC lines, one out of four SI lines and one out of two SC lines were chosen as representative cases.

The scope of design for ASME Code Class 2 and 3 piping includes main steam and main feedwater piping located inside the containment building. Main steam and main feedwater piping is the largest ASME Class 2 and 3 piping connected to the steam generators and has the highest structural load. The scope of design for main steam and main feedwater piping outside the containment building covers piping (one division) from the containment penetration anchors to the main steam valve house (MSVH) penetration anchors beyond the isolation valves which are located in the break exclusion area in auxiliary building.

The results of the piping analyses are documented in Technical Reports, APR1400-E-B-NR-16001-P, APR1400-E-B-NR-16002-P and APR1400-H-N-NR-14005-P (References 30, 31 and 32), and are commensurate with the requirements of regulations (10 CFR 50.55A; 10 CFR Part 50, Appendix A, GDC-1, GDC-2, GDC-4, GDC-14, and GDC-15; and 10 CFR Part 50, Appendix S).

3.12.8 Combined License Information

COL 3.12(1) If COL applicant finds it necessary to route ASME Class 1, 2, or 3 piping systems outside the structure, the wind and/or tornado load must be included in the plant design basis loads considering the site-specific loads.

COL 3.12(2) The COL applicant will implement the monitoring program during the first preoperational testing and continue to monitor by using the fatigue monitoring system during the first cycle of operation to verify the design transients used in the structural design of the surge line.

3.12.9 References

1. ASME Boiler and Pressure Vessel Code, Section III, Division 1, "Rules for Construction of Nuclear Facility Components," The American Society of Mechanical Engineers, the 2007 Edition with the 2008 Addenda.

2. ASME B31.1, "Code for Pressure Piping, Power Piping," The American Society of Mechanical Engineers, the 2010 Edition.

3. ASME B31.3, "Code for Pressure Piping, Process Piping," The American Society of Mechanical Engineers, the 2010 Edition.

4. ASME Boiler and Pressure Vessel Code, Section III, Division 1, "Code Cases: Nuclear Components, Boiler and Pressure Vessel Code," The American Society of Mechanical Engineers, the 2007 Edition.

5. Regulatory Guide 1.84, "Design, Fabrication, and Materials Code Case Acceptability," Rev. 36, U.S. Nuclear Regulatory Commission, August 2014.

6. EPRI NP-5639, "Guidelines for Piping System Reconciliation," Electric Power Research Institute, May 1988.

7. Regulatory Guide 1.61, "Damping Values for Seismic Design of Nuclear Power Plants," Rev. 1, U.S. Nuclear Regulatory Commission, March 2007.

8. Regulatory Guide 1.122, "Development of Floor Design Response Spectra for Seismic Design of Floor-Supported Equipment or Components," Rev. 1, U.S. Nuclear Regulatory Commission, February 1978.

9. Regulatory Guide 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis," Rev. 3, U.S. Nuclear Regulatory Commission, October 2012.

10. DST Computer Services. S.A., PIPESTRESS Theory Manual, Geneva, Switzerland.

11. NUREG-1061, "Evaluation of Other Loads and Load Combinations," Volume 4, U.S. Nuclear Regulatory Commission, December 1984.

12. K. Gordis, "Outline of Dynamic Analysis for Piping Systems," Nuclear Engineering and Design, Volume 52, No. 1, March 1979.

13. ANSI/AISC 360-05, "Specification for Structural Steel Buildings," American Institute of Steel Construction, 2005.

14. DST Computer Services. S.A., PIPESTRESS User's Manual, version 3.9.0, Geneva, Switzerland, 2016.

15. NUREG/CR-1677, "Piping Benchmark Problems. Vol. 1 and Vol. 2," U.S. Nuclear Regulatory Commission, August 1980.

16. NUREG-0484, "Methodology for Combining Dynamic Responses," Rev. 1, U.S. Nuclear Regulatory Commission, May 1980.

17. Regulatory Guide 1.207, "Guidelines for Evaluating Fatigue Analyses incorporating the Life Reduction of Metal Components Due to the Effects of the Light Water Reactor Environment for New Reactors," U.S. Nuclear Regulatory Commission, March 2007.

18. Bulletin 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant System," U.S. Nuclear Regulatory Commission, June 22, 1988.

19. Bulletin 79-13, "Cracking in Feedwater System Piping," U.S. Nuclear Regulatory Commission, June 25, 1979.

20. Bulletin 88-11, "Pressurizer Surge Line Thermal Stratification," U.S. Nuclear Regulatory Commission, December 20, 1988.

21. ASME Boiler and Pressure Vessel Code, Section III, Division 1, Appendix O, "Rules for Design of Safety Valve Installation," The American Society of Mechanical Engineers, the 2007 Edition.

22. NUREG-1367, "Functional Capability of Piping Systems," U.S. Nuclear Regulatory Commission, November 1992.

23. ACI-349-01, Appendix B, "Code Requirements for Nuclear Safety Related Concrete Structures," American Concrete Institute, 2001.

24. Regulatory Guide 1.199, "Anchoring Components and Structural Supports in Concrete," U.S. nuclear Regulatory Commission, November 2003.

25. Bulletin 79-02, "Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts," Rev. 2, U.S. Nuclear Regulatory Commission, November 18, 1979.

26. IEEE Std. 344-2004 (R2009), "Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 2005.

27. SECY-93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water (ALWR) Designs," U.S. Nuclear Regulatory Commission, 1993.

28. Welding Research Council Bulletin 300, "Part 4: Technical Position on Industry Practice," December 1984.

29. NUREG-0800, Standard Review Plan, Section 3.9.2, "Dynamic Testing and Analysis of Systems, Structures, and Components," Rev. 3, U.S. Nuclear Regulatory Commission, March 2007.

30. APR1400-E-B-NR-16001-P, "Evaluation of Main Steam and Feedwater Piping applied to the graded approach for the APR1400," KEPCO & KHNP, March 2016.

31. APR1400-E-B-NR-16002-P, "Evaluation of Safety Injection and Shutdown Cooling Piping applied to the graded approach for the APR1400," Rev. 1, KEPCO & KHNP, May 2018.

32. APR1400-H-N-NR-14005-P, "Summary Stress Report for Primary Piping," Rev. 1, KEPCO & KHNP, December 2015.

Table 3.12-1 (1 of 4)

Loading Combinations and Acceptance Criteria for ASME Section III, Class 1 Piping

Service Condition	Service Level	Category	Loading	Acceptance Criteria [(1)]	
				Equation (NB-3650)	Stress Limit
Design	-	Primary Stress	Design pressure, deadweight, steady-state flow load and dynamic fluid load [(2)] specified as level A	Eq. 9 NB-3652	1.5 S_m
Normal /Upset	A/B	Primary plus Secondary Stress Intensity Range (S.I.R.)	Service pressure, steady-state flow load, dynamic fluid load [(2)], thermal expansion load [(3)], thermal expansion anchor motion load[(3)], cyclic thermal load [(4)], material discontinuity stress, earthquake inertial load [(7)], IRWST discharge load	Eq. 10 NB-3653.1	3 S_m
		Peak S.I.R.	Service pressure, steady-state flow load, dynamic fluid load [(2)], thermal expansion load [(3)], thermal expansion anchor motion load [(3)], cyclic thermal load [(4)], material discontinuity stress, earthquake inertial load [(7)], IRWST discharge load, thermal radial gradient stress (linear and nonlinear)	Eq. 11 NB-3653.2	
		Thermal S.I.R. [(5)]	Thermal expansion load [(3)], thermal expansion anchor motion load [(3)], cyclic thermal load [(4)]	Eq. 12 NB-3653.6(a)	3 S_m
		Primary plus Secondary Membrane plus Bending S.I.R. [(5)]	Service pressure, steady-state flow load, dynamic fluid load [(2)], material discontinuity stress, earthquake inertial load [(7)], IRWST discharge load	Eq. 13 NB-3653.6(b)	3 S_m
		Alternating Stress Intensity (S.I.) (Fatigue Usage) [(6)]	Service pressure, steady-state flow load, dynamic fluid load [(2)], thermal expansion load [(3)], thermal expansion anchor motion load[(3)], cyclic thermal load [(4)], material discontinuity stress, earthquake inertial load [(7)], IRWST discharge load, thermal radial gradient stress (linear and nonlinear)	NB-3653.3 NB-3653.4 NB-3653.5 NB-3653.6(c)	
		Thermal Stress Ratchet	Linear thermal radial gradient	NB3653.7	

Table 3.12-1 (2 of 4)

Service Condition	Service Level	Category	Loading	Acceptance Criteria: Equation (NB-3650)	Acceptance Criteria: Stress Limit
Upset	B	Permissible Pressure	Maximum level B service pressure	NB-3654.1	1.1 Pa
		Primary Stress	Coincident level B service pressure, deadweight, steady-state flow load, dynamic fluid load (2)	NB-3654.2	Min ($1.8\ S_m$, $1.5\ S_y$)
		Deformation Limits	As set forth in the design specification	NB-3653.7	
Emergency	C	Permissible Pressure	No loads. Refer to Subsection 3.9.3.1.	NB-3655.1	1.5 Pa
		Primary Stress	No loads. Refer to Subsection 3.9.3.1.	NB-3655.2	Min ($2.25\ S_m$, $1.8\ S_y$)
		Deformation Limits	No loads. Refer to Subsection 3.9.3.1.	NB-3655.3	
Faulted	D	Permissible Pressure	Maximum level D service pressure	NB-3656(a)(1)	$2\ P_a$
		Primary Stress (9)	Coincident level D service pressure, deadweight, steady-state flow load, dynamic fluid load (2), (10), earthquake inertial load (10), high-energy line break load (10) (loss-of-coolant accident or secondary side pipe rupture), IRWST discharge load	NB-3656(a)(2)	Min ($3\ S_m$, $2\ S_y$)
		Secondary Stress (11)	Max [range of (bending moments due to thermal expansion load (3) plus thermal expansion anchor motion load (3) plus ½ earthquake anchor motion load) or range of earthquake anchor motion load]	NB-3656(b)(4)	$6\ S_m$ (12)
Pressure Testing (13)	-	Primary Membrane S.I.	Test pressure, deadweight	NB-3657 NB-3226(b)	$0.9\ S_y$, $0.8\ S_y$
		Primary Membrane plus Bending S.I	Test pressure, deadweight	NB-3657 NB-3226(c)	$1.35 S_y$, Min ($2.15\ S_y - 1.2 P_m$)

Table 3.12-1 (3 of 4)

(1) Acceptance criteria are taken from the referenced section in Section III of the ASME Code or are as noted.

(2) Dynamic fluid loads are occasional loads associated with hydraulic transients caused by events such as valve actuation (safety or relief valve discharge, rapid valve opening/closing), water hammer, or steam hammer.

(3) Thermal expansion and thermal expansion anchor motion loads are not calculated for those operating conditions where the piping system does not exceed 65 °C (150 °F).

(4) Cyclic thermal load includes loads due to thermal stratification, and stresses due to high-cycle thermal striping and thermal penetration (i.e., thermal mixing).

(5) The thermal bending and primary plus secondary membrane plus bending stress intensity ranges (Equations 12 and 13) are only calculated for those load sets that do not meet the primary plus secondary stress intensity range (Equation 10) allowable.

(6) The cumulative fatigue usage factor is calculated by summing the Level A and Level B fatigue usage. If applicable, pressure testing conditions is also included in the calculation of the cumulative usage factor (see Note13).

(7) The earthquake inertial load considered in the Level B primary plus secondary stress intensity range, peak stress intensity range and alternating stress intensity calculations (Equations 10, 11, and 14) is taken as one-third of the peak SSE inertial load or as the peak SSE inertial load. If the earthquake inertial load is taken as the peak SSE inertial load, then 20 cycles of earthquake loading are considered. If the earthquake inertial load is taken as one-third of the peak SSE inertial load, then the number of cycles to be considered for earthquake loading is as described in Subsection 3.7.3.1.2 (the equivalent number of 20 full SSE cycles as derived in accordance with Appendix D of IEEE Std. 344 (Reference 26 in Subsection 3.12.9)).

(8) The resultant moment calculated is the maximum of the resultant moment due to the full range of earthquake inertial load or the resultant moment due to the consideration of half of the range of earthquake inertial load with all other applicable loads.

(9) The rules given in Appendix F of the ASME Code may be used in lieu of those given in NB-3656(a) and NB-3656(b) when evaluating Level D primary stress.

(10) Loads due to dynamic events other than high-energy line break (i.e., loss-of-coolant accident and secondary side pipe rupture) and SSE are combined considering the time phasing of the events (i.e., whether the loads are coincident in time). When the time phasing relationship can be established, dynamic loads may be combined by the square-root-sum-of-the-squares (SRSS) method, provided it is demonstrated that the non-exceedance criteria given in NUREG-0484 (Reference 16 in Subsection 3.12.9) are met. When the time phasing relationship cannot be established, or when the non-exceedance criteria in NUREG-0484 are not met, dynamic loads are combined by absolute sum. SSE and high-energy line break loads are always combined using the SRSS method.

Table 3.12-1 (4 of 4)

(11) This secondary stress check is only necessary if the stresses (including those due to earthquake inertial load) exceed the Equation 10 (primary plus secondary stress intensity range for the upset service condition) allowable stress. See Section NB-3656(b)(4) in Section III of the ASME Code.

(12) S_m = Allowable design stress intensity value from Part D of Section II of the ASME Code.

(13) If a piping system is subjected to more than 10 pressure test cycles that result in an alternating stress intensity (S_a) value greater than that for 106 cycles, as determined from the applicable fatigue design curves of Figures I-9.0 in Section III of the ASME Code, then those cycles in excess of 10 are included in the fatigue calculation that determines the cumulative usage factor. See NB-3657 and NB-3226(e) in Section III of the ASME Code.

Table 3.12-2

Loading Combinations for Acceptance Criteria for ASME Section III, Class 2 and 3 Piping

Service Condition	Service Level	Loading	Acceptance Criteria[4]	
			Equation (NC/ND-3650)	Stress Limit
Design	-	Pressure, Weight, Other Sustained Mechanical Loads	Eq. 8 NC/ND-3652[3]	1.5 S_h [3]
Normal /Upset	A/B	Pressure, Weight, Other Sustained Mechanical Loads, Dynamic Fluid Loads (DFL)[1], IRWST discharge load	Eq.9 NC/ND-3653.1 (Level B Only) [6]	Min (1.8 S_h, 1.5 S_y)
		Thermal Expansion, Thermal Anchor Movement (TAM)	Eq.10 NC/ND-3653.2(a)[2]	S_A[2]
		Building Settlement	Eq. 10a NC/ND-3653.2(b)	$3S_c$
		Pressure, Weight, Other Sustained Mechanical Loads, Thermal Expansion, TAM	Eq. 11 NC/ND- 3653.2(c)[2]	$S_h + S_A$ [2]
Emergency	C	No loads. Refer to Subsection 3.9.3.1.	Eq. 9 NC/ND-3654.2(a)[5]	Min(2.25 S_h,1.8 S_y)
Faulted	D	Pressure, Weight , DFL[1], SSE Inertia, Pipe Break [8], IRWST discharge load	Eq. 9 NC/ND-3655(a)[5]	Min(3 S_h, 2 S_y)
		Thermal Expansion, TAM, Seismic Anchor Motion (SAM)	NC/ND-3655(b)[4]	$6S_h$[6] [7]

(1) Dynamic fluid loads (DFLs) are occasional loads such as safety/relief valve thrust, steam hammer, water hammer, or other loads associated with plant upset, emergency, or faulted conditions as applicable.

(2) Stresses are to meet the requirements of either Equation 10 or 11, not both.

(3) If, during operation, the system normally carries a medium other than water (air, gas, steam), sustained loads are to be checked for weight loads during hydrostatic testing as well as normal operation weight loads.

(4) ASME Section III.

(5) When causal relationships can be established, dynamic loads may be combined by SRSS, provided it is demonstrated that the non-exceedance criteria given in NUREG-0484 are met. When the causal relationship cannot be established, or when the non-exceedance criteria given in NUREG-0484 are not met, dynamic loads are to be combined by absolute sum. SSE and high-energy line break loads are always combined using the SRSS method.

(6) OBE inertia and SAM loads are not included in the design of Class 2 and 3 piping (Reference 27 in Subsection 3.12.9).

(7) ASME Code equations and paragraph numbers refer to the 2007 Edition through 2008 Addenda of the ASME Code.

(8) Pipe break loads include loads due to LOCA.

3.13 Threaded Fasteners (ASME Section III, Class 1, 2, and 3)

This section addresses relevant requirements of GDC 1, 4, 14, 30, and 31, and 10 CFR Part 50 Appendices B and G for ASME Section III (Reference 1), Class 1, 2, and 3 component threaded fasteners.

ASME Section III, Class 1, 2, and 3 component fasteners materials are selected, fabricated, designed, tested, and inspected to meet the requirements of ASME Section III, NB, NC, and ND corresponding to their ASME Code Classes except reactor vessel stud bolts, for which the detailed description is provided in paragraph 5.3.1.7.

3.13.1 Design Considerations

3.13.1.1 Materials Selection

ASME Section III, Class 1, 2, and 3 component fasteners are fabricated using the materials that are prescribed in ASME Section III. Threaded fasteners, except the stud bolts for the reactor vessel head and reactor coolant pump (RCP) casing, which consist of the reactor coolant pressure boundary (RCPB) or are in contact with the primary coolant, are made of primary water corrosion-resistant materials such as austenitic stainless steels, martensitic stainless steels, precipitation-hardened stainless steels, and nickel-based alloys. In designing threaded fastener joints, consideration is given for the prevention of galvanic corrosion, except when the design or material of the fasteners has been demonstrated to be acceptable through satisfactory operation in the OPR 1000 plants, where any primary coolant leakage can be automatically identified if it occurs, or where periodic inspections for leakage and verification of the integrity of threaded fasteners are performed as a countermeasure for leakage.

Table 3.13-1 lists the applicable criteria in ASME Section III paragraphs relevant to the material selection and testing of threaded fasteners in Class 1, 2, and 3 components. Materials used in threaded fasteners are selected for their compatibility with the environmental conditions to which they are exposed.

3.13.1.2 Special Materials Fabrication Processes and Special Controls

Special process and controls such as heat treatment, which affects the material properties, and tests for material property evaluation of threaded fasteners procured or fabricated, are in accordance with ASME Section II (Reference 2) and III. Table 3.13-1 identifies the appropriate NB-2200, NC-2200, or ND-2200 of the ASME Code regarding material heat treatment and tensile test coupons preparation criteria for ferritic materials (e.g., carbon steel, high-strength low-alloy steel). The criteria of ASME Section III are applied rather than the criteria of the material specification of ASME Section II applicable to the mechanical testing if there is a conflict between the two sets of criteria.

In addition, threaded fasteners are designed and fabricated using materials and processes that have been selected to minimize stress corrosion cracking or other forms of material degradation.

Threaded fasteners are cleaned in accordance with NRC RG 1.28 (Reference 3) to provide reasonable assurance that contaminants to which they could be exposed will not damage or deteriorate the materials, alter their properties, accelerate effects associated with aging, or increase the susceptibility to failure mechanisms such as stress corrosion cracking.

Reactor vessel closure studs and nuts are surface-treated with a manganese-based phosphate coating for protection against corrosion effects. The reactor vessel closure studs and nuts are fabricated to meet 10 CFR Part 50, Appendix G requirements as stated in Subsection 5.3.1.7.

3.13.1.2.1 Fabrication Inspection

ASME Section III, Class 1, 2, and 3 component fasteners are inspected during fabrication in accordance with ASME Section III, NB-2580, NC-2580, and ND-2580 for the corresponding ASME Code Class (see Table 3.13-1) and material specification.

3.13.1.2.2 Lubricants and Sealants

Lubricants used during installation of ASME Section III, Class 1, 2, and 3 component fasteners are those that meet the requirements prescribed in the relevant design documents to provide reasonable assurance of the compatibility with the fasteners. Lubricants are selected in accordance with the guidance provided in NUREG-1339. Acceptable lubricants are Loctite N-5000, Neolube, and Never Seez Pure Nickel Special Nuclear Grade. These lubricants have shown satisfactory performance in OPR 1000 plants. MoS_2 is not allowed for use with code class fasteners in any circumstance. A single type of lubricant is used at the site, if possible, for easy control. Sealants are not used for the threaded fasteners.

Reactor vessel closure studs and nuts are surface treated with manganese-base phosphate coating for protection against the possibility of incurring corrosion effects.

3.13.1.3 Fracture Toughness Requirements for Threaded Fasteners Made of Ferritic Materials

ASME Section III, Class 1, 2, and 3 component fasteners with diameters that are greater than 25 mm (1 in.) are impact tested in accordance with ASME Section III, NB-2300, NC-2300, or ND-2300 (as appropriate for the assigned ASME Code Class) at a temperature no higher than the lowest service temperature or preload temperature, whichever is less, and meet the acceptance criteria described in ASME Section III, NB-2330, NC-2330, or ND-2330 as for the corresponding Code Class (see Table 3.13-1).

In addition, ferritic bolts, studs, and nuts (i.e., bolts, studs, and nuts made from either low-alloy steel or carbon steel materials) used in RCPB applications meet the fracture toughness requirements of 10 CFR Part 50, Appendix G.

3.13.1.3.1 Prevention of Brittle Fracture and Failure due to Fatigue and Structural Stress

ASME Section III, Class 1, 2, and 3 component fasteners are designed in accordance with ASME Section III, NB-3000, NC-3000, and ND-3000, respectively, to endure the stresses resulting from operation of the corresponding components where the fasteners are installed. In addition, they are evaluated for fatigue and are designed to have enough toughness to prevent brittle fracture during the operation in accordance with ASME Section III, NB-3000, NC-3000, or ND-3000 as for the corresponding code class.

3.13.1.4 [Reserved]

3.13.1.5 Certified Material Test Reports

Quality records such as certified material test reports (CMTRs), which are associated with ASME Section III, Class 1, 2, and 3 component fasteners, are controlled, maintained, and stored in accordance with the quality assurance program to meet the requirements of 10 CFR Part 50, Appendix B; ASME NQA-1; and ASME NCA. The CMTRs contain the contents required by ASME Section III, NCA-3860. Documentation related to fracture toughness testing results for ASME Code Class 1, 2, and 3 component threaded fastener materials, when required, is to be maintained as part of QA records in compliance with the requirements of the ASME Section III.

The combined license (COL) applicant is to maintain quality assurance records including CMTRs on ASME Section III, Class 1, 2, and 3 component threaded fasteners in accordance with the requirements of 10 CFR 50.71 (COL 3.13(1)).

3.13.2 Inservice Inspection Requirements

As required by 10 CFR 50.55a, except where written relief has been granted by the NRC, the relevant requirements of ASME Section XI, Division 1 (Reference 4) are followed for the plant preservice and inservice inspection of ASME Section III, Class 1, 2, and 3 threaded fasteners (see Table 3.13-2).

The COL applicant is to submit the preservice and in-service inspection program for ASME Section III, Class 1, 2, and 3 component threaded fasteners to the NRC prior to performing the inspections (COL 3.13(2)). The inservice inspection program identifies the applicable edition and addenda of ASME Section XI and provides reasonable assurance of conformance with the requirements of 10 CFR 50.55a (b) (2) (xxvi).

3.13.3 Combined License Information

COL 3.13(1) The COL applicant is to maintain quality assurance records including CMTRs on ASME Section III, Class 1, 2, and 3 component threaded fasteners in accordance with the requirements of 10 CFR 50.71.

COL 3.13(2) The COL applicant is to submit the preservice and inservice inspection programs for ASME Section III, Class 1, 2, and 3 component threaded fasteners to the NRC prior to performing the inspections.

3.13.4 References

1. ASME Boiler and Pressure Vessel Code, Section III, "Rules for Construction of Nuclear Facility Components," The American Society of Mechanical Engineers, the 2007 Edition with the 2008 Addenda

2. ASME Boiler and Pressure Vessel Code, Section II, "Materials," Part A, "Ferrous Material Specifications," The American Society of Mechanical Engineers, the 2007 Edition with the 2008 Addenda.

3. Regulatory Guide 1.28, "Quality Assurance Program Criteria (Design and Construction)," Rev. 4, U.S. Nuclear Regulatory Commission, June 2010.

4. ASME Boiler and Pressure Vessel Code, Section XI, Division 1, "Rules for Inspection and Testing of Components of Light-Water Cooled Plants," The American Society of Mechanical Engineers, the 2007 Edition with the 2008 Addenda.

Table 3.13-1

ASME Section III Criteria for Selection and Testing of Bolting Materials(1)

Code Category		ASME Class 1 Components	ASME Class 2 Components	ASME Class 3 Components
Material Selection		NCA-1220 and NB-2128	NCA-1220 and NC-2128	NCA-1220 and ND-2128
Material test coupons and specimens for ferritic steel material (tensile test criteria)	Heat treatment criteria	NB-2210	NC-2210	ND-2210
	Test coupon requirements for bolting/stud materials	NB-2221 NB-2224	NC-2221 NC-2224.3	ND-2221 ND-2224.3
Fracture toughness requirements	Material to be impact tested	NB-2311	NC-2311	ND-2311
	Types of impact test	NB-2321	NC-2321	ND-2321
	Test coupons	NB-2322	NC-2322	ND-2322
	Acceptance standards	NB-2333	NC-2332.3	ND-2333
	Number of impact tests necessary	NB-2345	NC-2345	ND-2345
	Retesting	NB-2350	NC-2352	ND-2352
	Calibration of test equipment	NB-2360	NC-2360	ND-2360
Examination criteria for bolts, studs, and nuts		NB-2580	NC-2580	ND-2580
Certified material test report criteria		NCA-3860	NCA-3860	NCA-3860

(1) Section III paragraphs listed in this table represent those specified in the 2007 Edition of ASME Section III.

Table 3.13-2

ASME Section XI Examination Categories for Inservice Inspections of Mechanical Joints in ASME Code Class 1, 2, and 3 Systems Secured by Threaded Fasteners(1)

Examination Type	ASME Class 1 Components	ASME Class 2 Components	ASME Class 3 Components
Specific bolting inspections	Table IWB-2500-1, Exam. Cat. B-G-1 for bolting greater than 5.08 cm (2 in.) in diameter	Table IWC-2500-1, Exam. Cat. C-D for bolting greater than 5.08 cm (2 in.) in diameter	Not applicable – Currently, there are no examination categories that correspond to those that exist for ASME Class 1 and 2 bolting.
	Table IWB-2500-1, Exam. Cat. B-G-2 for bolting less than or equal to 5.08 cm (2 in.) in diameter		
System pressure tests	Table IWB-2500-1, Exam. Cat. B-P	Table IWC-2500-1, Exam. Cat. C-H	Table IWD-2500-1, Exam. Cat. D-B

(1) Section XI paragraphs listed in this table represent those specified in the 2007 Edition of ASME Section XI.