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1.0 INTRODUCTION

This document contains the Certified Design Material for the Combustion Engineering, Inc., System 80+™ Pressurized Water Reactor. It consists, by sections, of:

1) Introductory material (Definitions, General Provisions, and the Figure Legend & Abbreviation List);

2) Certified Design Material for System 80+™ systems and structures;

3) Certified Design Material for non-system-based aspects of the System 80+™ Certified design;

4) Interface Requirements; and

5) Site Parameters.

1.1 DEFINITIONS

The following definitions apply to terms used in the Design Descriptions and associated inspections, tests, analyses, and acceptance criteria (ITAAC):

Acceptance Criteria means the performance, physical condition, or analysis result for a structure, system, or component that demonstrates the Design Commitment is met.

Analysis means a calculation, mathematical computation, or engineering or technical evaluation. Engineering or technical evaluations could include, but are not limited to, comparisons with operating experience or design of similar structures, systems, or components.

As-built means the physical properties of a structure, system, or component following the completion of its installation or construction activities at its final location at the plant site.

Basic Configuration (for a Building) means the arrangement of building features (e.g., floors, ceilings, walls, basemat, and doorways) and of the structures, systems or components within, as specified in the building Design Description.

Basic Configuration (for a System) means the functional arrangement of structures, systems, or components specified in the Design Description and the verifications for that system specified in Section 1.2.

Design Commitment means that portion of the Design Description that is verified by ITAAC.

Design Description means that portion of the design that is certified.

Division (for electrical systems or equipment) is the designation applied to a given safety-related system or set of components which are physically, electrically, and functionally independent from other redundant sets of components.

Division (for mechanical systems or equipment) is the designation applied to a specific set of safety-related components within a system.

Inspect or Inspection mean visual observations, physical examinations, or reviews of records based on visual observation or physical examination that compare the structure, system, or component condition to one or more Design Commitments. Examples include walkdowns, configuration checks, measurements of dimensions, or non-destructive examinations.

Test means the actuation, operation, or establishment of specified conditions to evaluate the performance or integrity of as-built structures, systems, or components, unless explicitly stated otherwise.

Type Test means a test on one or more sample components of the same type and manufacturer to qualify other components of that same type and manufacturer. A Type Test is not necessarily a test of the as-built structures, systems, or components.

1.2 GENERAL PROVISIONS

The following general provisions are applicable to the Design Descriptions and associated ITAAC:

Verifications For Basic Configuration For Systems

Verifications for Basic Configuration of systems include and are limited to inspection of the system functional arrangement and the following inspections, tests, and analyses:

(1) Inspections, including non-destructive examination (NDE), of the as-built, pressure boundary welds for American Society of Mechanical Engineers (ASME) Code Class 1, 2, or 3 components identified in the Design Description to demonstrate that the requirements of ASME Code Section III for the quality of pressure boundary welds are met.

(2) Type tests, analyses, or a combination of type tests and analyses, of the Seismic Category I mechanical and electrical equipment (including connected instrumentation and controls) identified in the Design Description, to demonstrate that the as-built equipment including associated anchorage, is qualified to withstand design basis dynamic loads without loss of its safety function.

(3) Type tests, or type tests and analyses, of the Class 1E electrical equipment identified in the Design Description (or on accompanying Figures) to demonstrate that it is qualified to withstand the environmental conditions that would exist during and following a design basis accident without loss of its safety function for the time needed to be functional. These environmental conditions, as applicable to the bounding design basis accident(s), are as follows: expected time-dependent temperature and pressure profiles, humidity, chemical effects, radiation, aging, submergence, and their synergistic effects which have a significant effect on equipment performance. As used in this paragraph, the term "Class 1E electrical equipment" constitutes the equipment itself, connected instrumentation and controls, connected electrical components (such as cabling, wiring, and terminations), and the lubricants necessary to support performance of the safety functions of the Class 1E electrical components identified in the Design Description, to the extent such equipment is not located in a mild environment during or following a design basis accident.

Electrical equipment environmental qualification shall be demonstrated through analysis of the environmental conditions that would exist in the location of the equipment during and following a design basis accident and through a determination that the equipment is qualified to withstand those conditions for the time needed to be functional. This determination may be demonstrated by:

(a) type testing of an identical item of equipment under identical or similar conditions with a supporting analysis to show that the equipment is qualified; or

(b) type testing of a similar item of equipment under identical or similar conditions with a supporting analysis to show that the equipment is qualified; or

(c) experience with identical or similar equipment under identical or similar conditions with supporting analysis to show that the equipment is qualified; or

(d) analysis in combination with partial type test data that supports the analytical assumptions and conclusions to show that the equipment is qualified.

(4) Tests or type tests of active safety-related motor-Operated Valves (MOVs) identified in the Design Description to demonstrate that the MOVs are qualified to perform their safety functions under design basis differential pressure, system pressure, fluid temperature, ambient temperature, minimum voltage, and minimum and/or maximum stroke times.

Treatment of Individual Items

The absence of any discussion or depiction of an item in the Design Description or accompanying Figures shall not be construed as prohibiting a licensee from utilizing such an item, unless it would prevent an item from performing its safety functions as discussed or depicted in the Design Description or accompanying Figures.

When the term "operate," "operates," or "operation" is used with respect to an item discussed in the Acceptance Criteria, it refers to the actuation and running of the item. When the term "exist," "exists," or "existence" is used with respect to an item discussed in the Acceptance Criteria, it means that the item is present and meets the Design Description.

Implementation of ITAAC

The ITAAC are provided in tables with the following three-column format:

Design Commitment	Inspections Tests, Analyses	Acceptance Criteria

Each Design Commitment in the left-hand column of the ITAAC tables has an associated Inspections, Tests, or Analyses (ITA) requirement specified in the middle column of the tables.

The identification of a separate ITA entry for each Design Commitment shall not be construed to require that separate inspections, tests, or analyses must be performed for each Design Commitment. Instead, the activities associated with more than one ITA entry may be combined, and a single inspection, test, or analysis may be sufficient to implement more than one ITA entry.

An ITA may be performed by the licensee of the plant, or by its authorized vendors, contractors, or consultants. Furthermore, an ITA may be performed by more than a single individual or group, may be implemented through discrete activities separated by time, and may be performed at any time prior to fuel load (including before issuance of the Combined Operating License for those ITAAC that do not necessarily pertain to as-installed equipment). Additionally, an ITA may be performed as part of the activities that are required to be performed under 10 CFR Part 50 (including, for example, the Quality Assurance (QA) program required under Appendix B to Part 50); therefore, an ITA need not be performed as a separate or discrete activity.

Discussion of Matters Related to Operations

In some cases, the Design Descriptions in this document refer to matters that relate to operation, such as normal valve or breaker alignment during normal operation modes. Such discussions are provided solely to place the Design Description provisions in context (e.g., to explain automatic features for opening or closing valves or breakers upon off-normal conditions). Such discussions shall not be construed as requiring operators during operation to take any particular action (e.g., to maintain valves or breakers in a particular position during normal operation).

Interpretation of Figures

In many but not all cases, the Design Descriptions in Section 2 include one or more Figures. The Figures may represent a functional diagram, general structural representation, or other general illustration. For instrumentation and control (I&C) systems, Figures also represent aspects of the relevant logic of the system or part of the system. Unless specified explicitly, the Figures are not indicative of the scale, location, dimensions, shape, or spatial relationships of as-built structures, systems, and components. In particular, the as-built attributes of structures, systems, and components may vary from the attributes depicted on the Figures, provided that those safety functions discussed in the Design Description pertaining to the Figure are not adversely affected.

Maximum Reactor Core Thermal Power

The initial rated reactor core thermal power for the System 80+™ Certified Design is 3914 megawatts thermal (MWt).

1.3 FIGURE LEGEND and ABBREVIATION LIST

The conventions presented in this Section are employed for Figures used in the Design Descriptions. The abbreviations presented in this Section are used in the Certified Design Material. The figure legend and abbreviation list are provided for information only and are not part of the Certified Design Material.

FIGURE LEGEND

Instrumentation

Flow Instrument	(F)
Temperature Instrument	(T)
Radiation Instrument	(R)
Differential Pressure Instrument	(PD)
Pressure Instrument	(P)
Level Instrument	(L)
Current Instrument	(I)
Humidity Detector	(H)
Ultrasonic Instrument	(U)
Smoke Detector	(SD)
Sensor	(S)
Annunciator (Alarm)	◇A

FIGURE LEGEND (continued)

Valves

Gate Valve 

Globe Valve 

Check Valve 

Butterfly Valve 

Ball Valve 

Relief Valve 

Three Way Valve 

Post Indicator Valve 

Valve Type Not Specified 

Valve Operators

Operator Of Unspecified Type 

Fluid Powered Operator 

Motor Operator 

Solenoid Operator 

Hydraulic Operator 

Pneumatic Operator 

Position Indications For Hydraulic And Pneumatic Operators

-Fails As Is FAI

-Fails Closed FC

-Fails Open FO

Mechanical Equipment

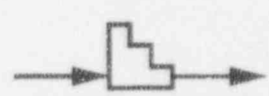
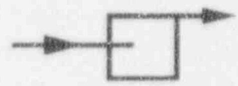
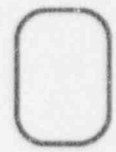
Positive Displacement Pump 

FIGURE LEGEND (continued)

Centrifugal Pump 

Pump Type Not Specified 

Header 

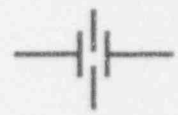
Tank 

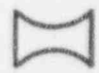
Filter 

Strainer 

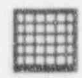
Flexible Connection 

Delay Coil 

Orifice 

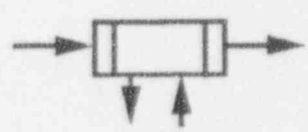
Venturi 

Compressor Or Fan 

Air Distribution Device 

Air Distribution Header 

Vaneaxial Fan 

Heat Exchanger 

Vacuum Breaker 

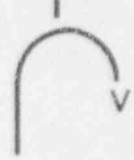
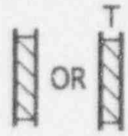
Vent 

FIGURE LEGEND (continued)

Dampers

Manually Operated Damper



Remotely Operated Damper

Louver

Fire Damper

Smoke Damper

Back Draft Damper

Finned Cooling Coil

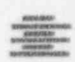
Pump Drivers

Turbine Drive

Motor Drive

Electrical Equipment

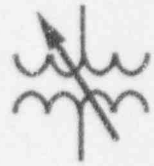
Battery



Circuit Breaker

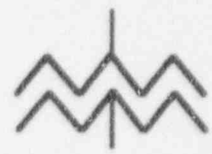
Disconnect Switch

FIGURE LEGEND (continued)

Voltage Regulator 

Multiplexer 

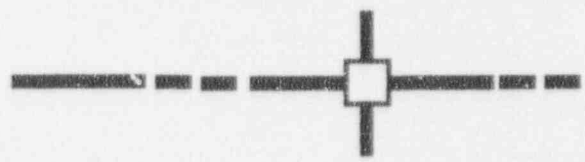
Isolation 

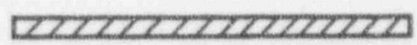
Transformer 

Miscellaneous

A System Or Component That Is not Part Of The Defined System 

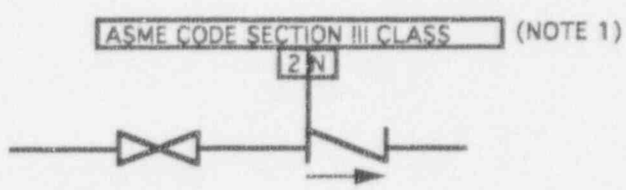
Containment 

Containment with Penetration 

Building Separation 

ASME Code Class Break

An ASME Code class break is identified by a single line to the designated location for the class break, as shown in the example below.



Notes:

1. The header, "ASME Code Section III Class", must appear at least once on each figure on which ASME class breaks are shown, but need not appear at every class break shown on a figure.

[N] Indicates Non-ASME Code Section III

ABBREVIATION LIST

Abbreviation	Meaning
AAC	Alternate AC Source
A/C	Air Conditioning
ADM	Atmospheric Dump Valve
AFAS	Alternate Feedwater Actuation Signal
ALMS	Acoustic Leak Monitoring System
APC	Auxiliary Process Cabinet
APS	Alternate Protection System
ASME	American Society of Mechanical Engineers
ASME Code	American Society of Mechanical Engineers Boiler and Pressure Vessel Code
AVS	Annulus Ventilation System
BAC	Boric Acid Concentrator
BAS	Breathing Air System
CAS	Compressed Air System
CCCT	Containment Cooler Condensate Tank
CCS	Component Control System
CCVS	Control Complex Ventilation System
CCW	Component Cooling Water
CCWHXSVS	CCW Heat Exchanger Structure Ventilation System
CCWLLSTAS	Component Cooling Water Low Level Surge Tank Actuation
CCWS	Component Cooling Water System
CEA	Control Element Assembly
CEACP	CEA Change Platform
CEAE	CEA Elevator
CEDMCS	Control Element Drive Mechanism Control System
CEDM	Control Element Drive Mechanism
CET	Core Exit Thermocouple

ABBREVIATION LIST (Continued)

Abbreviation	Meaning
CFR	Code of Federal Regulations
CFS	Cavity Flooding System
CGCS	Combustible Gas Control System
CGS	Compressed Gas Systems
CH	Channel
CHRS	Containment Hydrogen Recombiner System
CIAS	Containment Isolation Actuation Signal
CIS	Containment Isolation System
CIV	Containment Isolation Valve
COL	Combined Operating License
CONT	Containment
CPC	Core Protection Calculator
CPVS	Containment Purge Ventilation System
CRS	Control Room Supervisor
CSAS	Containment Spray Actuation Signal
CSB	Core Support Barrel
CSS	Containment Spray System
CST	Chemical Sample Tank
CT	Combustion Turbine/Generator
CVAP	Comprehensive Vibration Assessment Program
CVCS	Chemical and Volume Control System
CWT	Chemical Waste Tank
DBVS	Diesel Building Ventilation System
DEMIN	Demineralized
DFSS	Diesel Fuel Storage Structure
DIAS	Discrete Indication and Alarm System
DIAS-N	Discrete Indication and Alarm System - Channel N

ABBREVIATION LIST (Continued)

Abbreviation	Meaning
DIAS-P	Discrete Indication and Alarm System - Channel P
DNBR	Departure From Nucleate Boiling Ratio
DPS	Data Processing System
DVI	Direct Vessel Injection
DWMS	Demineralized Water Makeup System
EAB	Exclusion Area Boundary
ECW	Essential Chilled Water
ECWS	Essential Chilled Water System
EDG	Emergency Diesel Generator
EDT	Equipment Drain Tank
EFAS	Emergency Feedwater Actuation Signal
EFDS	Equipment and Floor Drainage System
EFW	Emergency Feedwater
EFWS	Emergency Feedwater System
EFWST	Emergency Feedwater Storage Tank
ENS	Emergency Notification System
EPDS	Electrical Power Distribution System
ESF	Engineered Safety Features
ESFAS	Engineered Safety Features Actuation System
ESF-CCS	Engineered Safety Features - Component Control System
EWT	Equipment Waste Tank
FBOC	Fuel Building Overhead Crane
FBVS	Fuel Building Ventilation System
FDT	Floor Drain Tank
FHS	Fuel Handling System
FTC	Fuel Temperature Coefficient
FTS	Fuel Transfer System

ABBREVIATION LIST (Continued)

Abbreviation	Meaning
GCB	Generator Circuit Breaker
GWMS	Gaseous Waste Management System
HA	High Activity
HDR	Header
HFE	Human Factors Engineering
HJTC	Heated Junction Thermocouple
HMS	Hydrogen Mitigation System
HPN	Health Physics Network
HSI	Human-System/Interface
HVAC	Heating, Ventilating, Air Conditioning
HVT	Holdup Volume Tank
HX	Heat Exchanger
HZ	Hertz
IAS	Instrument Air System
ICI	In-Core Instrument
ILRT	Integrated Leak Rate Test
INIT	Initiation
INJ	Injection
INST	Instrumentation
IPSO	Integrated Process Status Overview
IRWST	In-containment Refueling Water Storage Tank
ITAAC	Inspections, Tests, Analyses, and Acceptance Criteria
ITP	Interface and Test Processor
IVMS	Internals Vibration Monitoring System
IWSS	In-containment Water Storage System
IX	Ion Exchanger
LA	Low Activity

ABBREVIATION LIST (Continued)

Abbreviation	Meaning
LBB	Leak-Before-Break
LOCA	Loss-of-coolant Accident
LOOP	Loss-of-Offsite-Power
LPMS	Loose Parts Monitoring System
LPZ	Low Population Zone
LS	Liquid Sample
LTOP	Low Temperature Overrpressure Protection
LWMS	Liquid Waste Management System
MCC	Motor Control Center
MCR	Main Control Room
MCRACS	Main Control Room Air Conditioning System
MDNBR	Minimum Departure From Nucleate Boiling Ratio
MFIV	Main Feedwater Isolation Valve
MG	Main Generator
MOV	Motor Operated Valve
MPC	Moderator Pressure Coefficient
MSIS	Main Steam Isolation Signal
MSIV	Main Steam Isolation Valve
MSLB	Main Steam Line Break
MSSS	Main Steam Supply System
MSSV	Main Steam Safety Valve
MSVH	Main Steam Valve House
MTC	Moderator Temperature Coefficient
NA	Nuclear Annex
NAVS	Nuclear Annex Ventilation System
NCW	Normal Chilled Water
NCWS	Normal Chilled Water System

ABBREVIATION LIST (Continued)

Abbreviation	Meaning
NDE	Non-destructive Examination
NFE	New Fuel Elevator
NFS	Nuclear Fuel System
NI	Nuclear Instrumentation
NI Structures	Nuclear Island Structures
NIMS	NSSS Integrity Monitoring System
NNS	Non-Nuclear Safety
NPSH	Net Positive Suction Head
NRC	Nuclear Regulatory Commission
PA	Public Address
PABX	Private Automatic Business Exchange
PAMI	Post Accident Monitoring Instrumentation
PASS	Post Accident Sampling System
P-CCS	Process-Component Control System
PCPS	Pool Cooling and Purification System
PCS	Power Control System
PCS/P-CCS	Power Control System/Process-Component Control System
PERMSS	Processing and Effluent Radiological Monitoring and Sampling System
PPC	Plant Protection Calculator
PPS	Plant Protection System
PRA	Probabalistic Risk Assessment
PSS	Process Sampling System
PSWS	Potable and Sanitary Water Systems
PZR	Pressurizer
RAT	Reserve Auxiliary Transformer
RB	Reactor Building

ABBREVIATION LIST (Continued)

Abbreviation	Meaning
RCGVS	Reactor Coolant Gas Vent Subsystem
RCP	Reactor Coolant Pump
RCPB	Reactor Coolant Pressure Boundary
RCS	Reactor Coolant System
RDS	Rapid Depressurization Subsystem
RDT	Reactor Drain Tank
RM	Refueling Machine
RPS	Reactor Protective System
RSP	Remote Shutdown Panel
RSR	Remote Shutdown Room
RSSH	Resin Sluce Slurry Header
RT	Reactor Trip
RTSG	Reactor Trip Switchgear
RV	Reactor Vessel
RWBVS	Radwaste Building Ventilation System
SAFDL	Specified Acceptable Fuel Design Limit
SAS	Station Air System
SB	Shield Building
SBCS	Steam Bypass Control System
SBVS	Subsphere Building Ventilation System
SCS	Shutdown Cooling System
SDS	Safety Depressurization System
SFHM	Spent Fuel Handling Machine
SFP	Spent Fuel Pool
SFPCS	Spent Fuel Pool Cooling System
SG	Steam Generator
SGBS	Steam Generator Blowdown System

ABBREVIATION LIST (Continued)

Abbreviation	Meaning
SGDT	Steam Generator Drain Tank
SI	Safety Injection
SIAS	Safety Injection Actuation Signal
SIS	Safety Injection System
SIT	Safety Injection Tank
SSC	Systems, Structures, and Components
SSE	Safe Shutdown Earthquake
SSW	Station Service Water
SSWS	Station Service Water System
SWMS	Solid Waste Management System
TBCWS	Turbine Building Cooling Water System
TBSWS	Turbine Building Service Water System
TBV	Turbine Bypass Valve
TBVS	Turbine Building Ventilation System
TC	Thermocouple
TGSS	Turbine Gland Sealing System
TSC	Technical Support Center
TSCACS	Technical Support Center Air Conditioning System
UGS	Upper Guide Structure
UHS	Ultimate Heat Sink
UAT	Unit Auxiliary Transformer
UMT	Unit Main Transformer
VCT	Volume Control Tank
VDU	Video Display Unit
WMT	Waste Monitor Tank

2.1.1 NUCLEAR ISLAND STRUCTURES

Design Description

The Nuclear Island (NI) Structures house, protect, and support plant equipment and provide personnel and equipment access, support for systems and components under operating loads, radiation shielding, structural components to withstand loads due to design basis external and internal events, physical separation between Divisions of safety-related equipment, and barriers to minimize or prevent the release of radioactive materials.

The Basic Configuration of the NI Structures is as shown on Figures. 2.1.1-1 through 2.1.1-12.[1,2] The NI Structures are safety-related.

The NI Structures consist of the Reactor Building (RB) and the Nuclear Annex (NA). The RB and NA are further sub-divided into structures, buildings and areas. The RB and NA are structurally integrated on a common basemat which is embedded below the finished plant grade level. The top of the nuclear island basemat is located 40.75 ft. ± 1.0 ft. below the finished grade elevation.

The RB is a reinforced concrete and structural steel structure, which consists of the Shield Building (SB), the RB Subsphere, the Containment, and the Containment Internal Structures. The SB is composed of a reinforced concrete right cylinder with a hemispherical dome which encloses the Containment and is structurally connected to the NA. The area between the SB and the Containment is the RB Annulus. The RB Subsphere is located below the RB Annulus area and the Containment and is divided by a Divisional wall. Within the RB Subsphere, each Division is further divided, such that the RB Subsphere is separated into quadrants. The structural components of the RB Subsphere are structurally connected to the SB and support the Containment and Containment Internal Structures.

The Containment is a spherical welded steel structure supported by embedding a lower segment between the Containment Internal Structures concrete and the Reactor Building Subsphere concrete. There is no structural connection between the free-standing portion of the containment and adjacent structures other than penetrations and their supports. Shear bars are welded to the containment vessel in the embedded region to provide restraint against sliding. The Containment retains its integrity at the pressure and temperature conditions associated with the most limiting Design Basis Accident without exceeding the design leakage rate to the SB. Access to the Containment is provided through personnel air locks and an equipment hatch. Penetrations are also provided for electrical and mechanical components and for the transport of nuclear fuel.

The Containment Internal Structures are reinforced concrete and structural steel structures that support the reactor vessel and reactor coolant system. The primary shield wall supports and laterally surrounds the reactor vessel. The reactor vessel and reactor coolant system can be supported without the reactor cavity wall directly below the reactor vessel support corbels. The reactor vessel support corbels are constructed of reinforced concrete and are at least 10 feet thick. The secondary shield wall (crane wall) laterally surrounds the primary shield wall and is structurally connected to the primary shield wall by reinforced concrete slabs and walls. The secondary shield wall also provides support for the polar crane. The Containment Internal Structures provide a reactor cavity area below the reactor vessel which can be flooded with water. An indirect gas vent path is provided between the reactor cavity and the free volume of the Containment.

The reactor cavity has a corium debris chamber.

The reactor cavity floor is constructed with a limestone aggregate concrete with a minimum $CaCO_3$ content of 17 percent. The minimum floor thickness in the flat region of the cavity floor is 3.0 ft.

The flat floor area is free from obstructions to corium debris spreading. The minimum flat floor area for the reactor cavity is 693 ft.[2]

The reactor cavity sump is constructed with a limestone aggregate concrete having a minimum thickness of 3.2 feet.

The Containment and its penetrations, shown on Figures 2.1.1-1 through 2.1.1-12, are designed and constructed to ASME Code Section III, Class MC.[3]

The Containment and its penetrations, shown on Figures 2.1.1-1 through 2.1.1-12, retain their pressure boundary integrity associated with the design pressure of at least 53 psig. The Containment pressure boundary is evaluated to assure that the ASME Code Section III Service Level C stress limits are not exceeded for a Containment internal pressure of 120 psig.

The Containment and its penetrations, shown on Figures 2.1.1-1 through 2.1.1-12, maintain the Containment leakage rate less than the maximum allowable leakage rate associated with the peak containment pressure for the design basis accident.

The NA consists of the Control Complex, the Diesel Generator Areas, the Fuel Handling Area, the Spent Fuel Storage Area, the Chemical and Volume Control System and Maintenance Area, and the Main Steam Valve Houses. The NA is a reinforced concrete and structural steel structure which is structurally connected to the SB. The NA laterally surrounds the RB and is divided by a Divisional wall.

The Seismic Category I NI Structures provide the features which accommodate the static and dynamic loads and load combinations which define the structural design basis. The design basis loads are those loads associated with:

Normal plant operation (including dead loads, live loads, lateral earth pressure loads, and equipment loads, including the effects of temperature and equipment vibration);

External events (including rain, snow, wind, flood, tornado, tornado generated missiles, and earthquake); and

Internal events (including flood, pipe rupture, equipment failure, and equipment failure generated missiles).

The NI Structures, shown on Figures 2.1.1-1 through 2.1.1-12, are Seismic Category I, except as noted on Figure 2.1.1-12.

Flood doors, shown on Figures 2.1.1-1 through 2.1.1-12, have sensors with open and closed status displays provided at a central fire alarm station.

Inspections, Tests, Analyses, and Acceptance Criteria

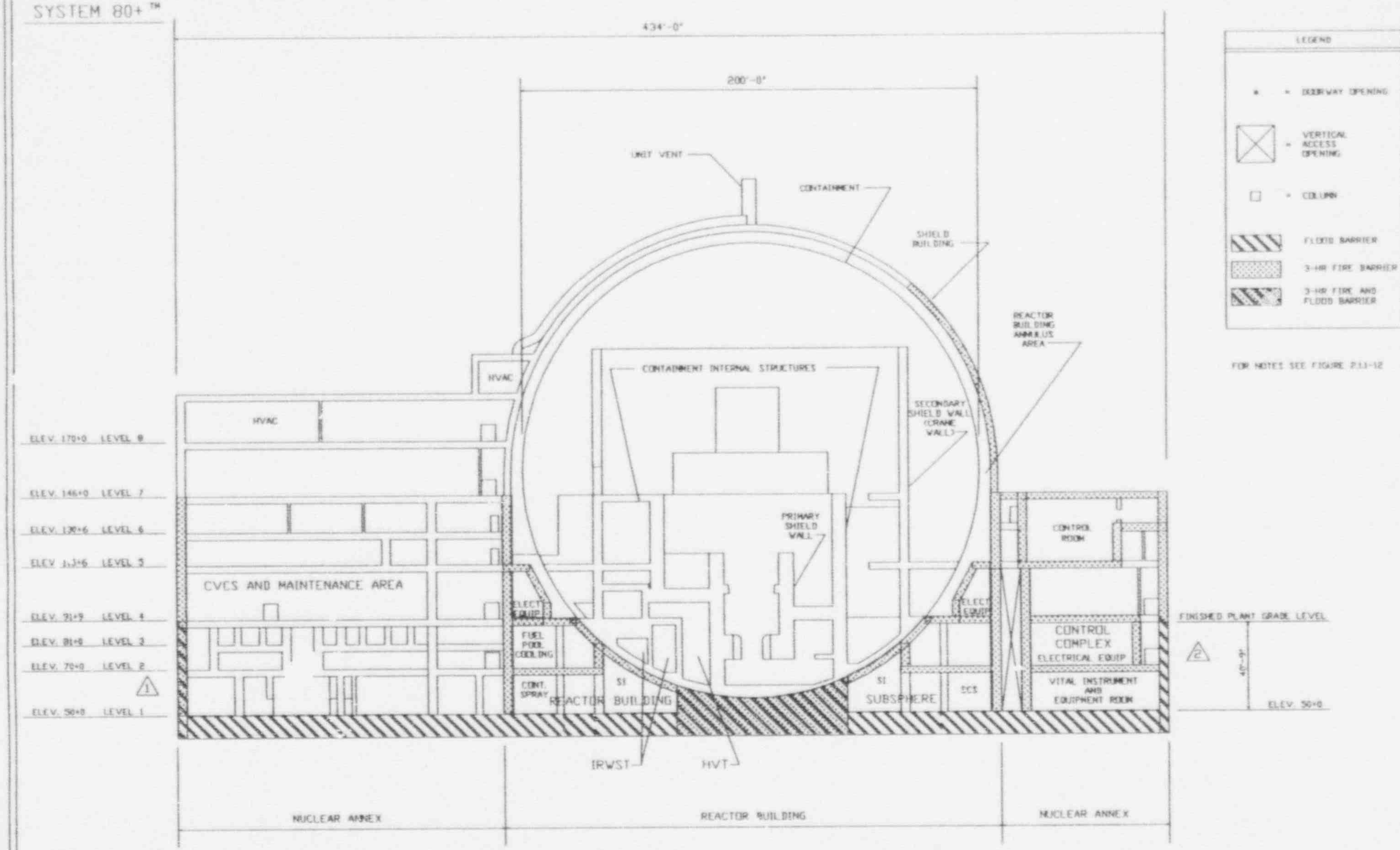
Table 2.1.1-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Nuclear Island Structures.

---

[1] The location of the NI Structures relative to the Turbine Building, the Component Cooling Water System Heat Exchanger Structure, the Diesel Fuel Storage Structures, and the Radwaste Building is described in Sections 2.1.2, 2.1.3, 2.1.4, and 2.1.5, respectively.

[2] The building dimensions and elevations provided in Figures 2.1.1-1 through 2.1.1-12 are provided for information only and are not part of the certified design information.

[3] Containment isolation devices are addressed in Section 2.4.5, Containment Isolation System.



FOR NOTES SEE FIGURE 2.1.1-12

1. THE RADIOACTIVE WASTE STRUCTURE IS LOCATED ADJACENT TO THE NUCLEAR ANNEX
2. THE TURBINE BUILDING IS LOCATED ADJACENT TO THE NUCLEAR ANNEX

NUCLEAR ISLAND STRUCTURES
SECTION A-A

FIGURE 2.1.1-1

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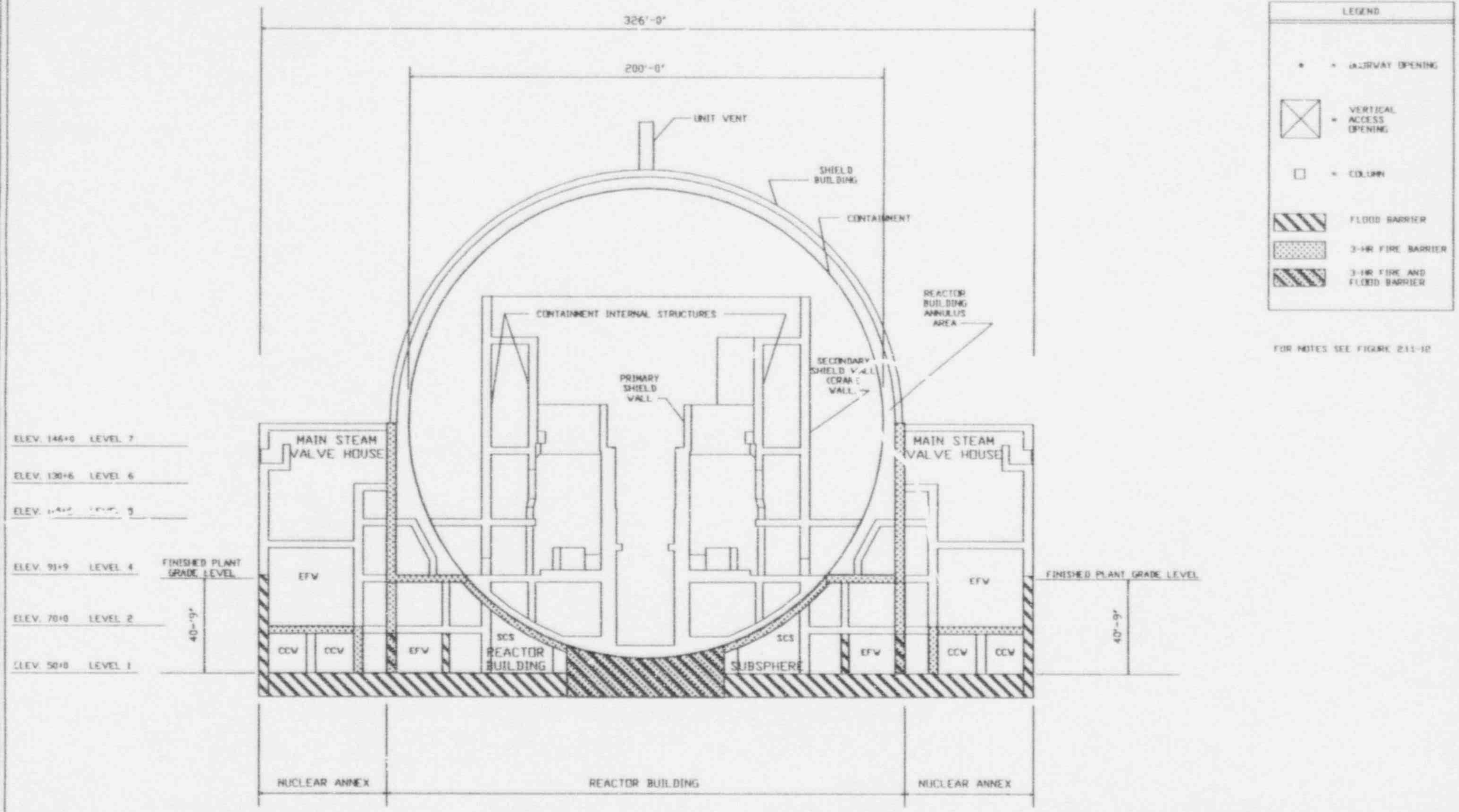

FOR NOTES SEE FIGURE 2.1.1-12

NUCLEAR ISLAND STRUCTURES
SECTION B-B

FIGURE 2.1.1-2

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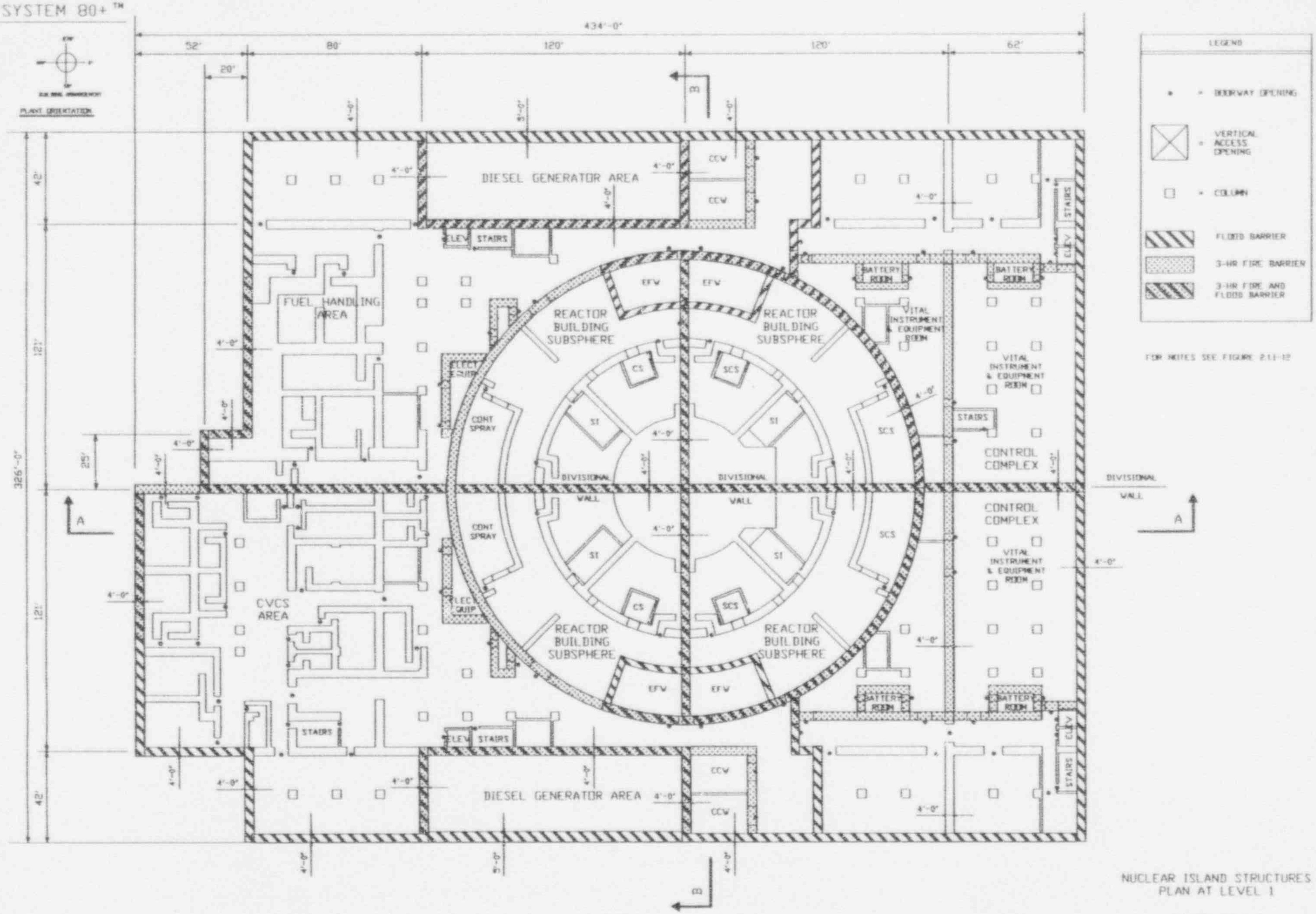

NUCLEAR ISLAND STRUCTURES
PLAN AT LEVEL 1

FIGURE 2.1.1-3

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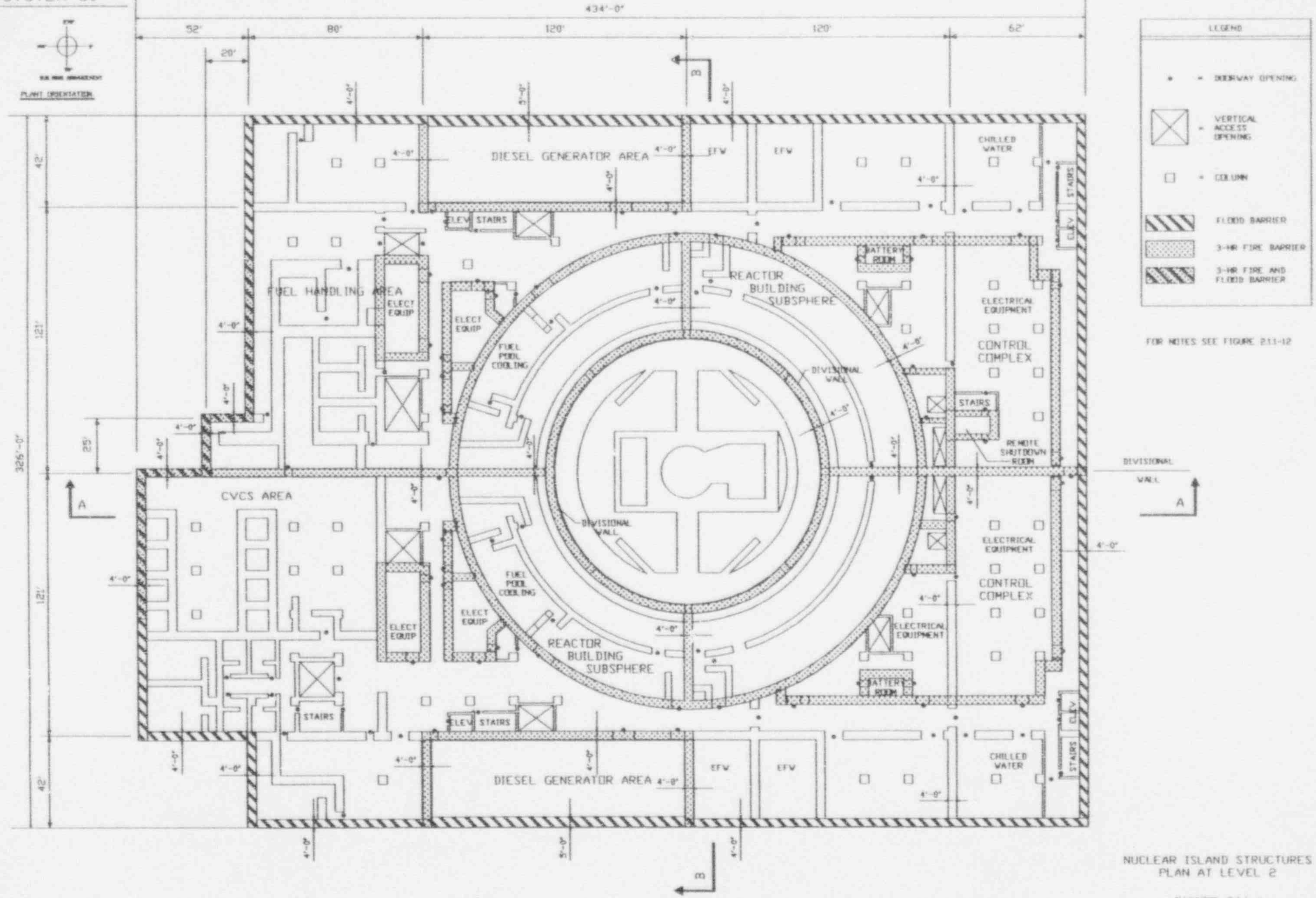

NUCLEAR ISLAND STRUCTURES
PLAN AT LEVEL 2

FIGURE 2.1.1-4

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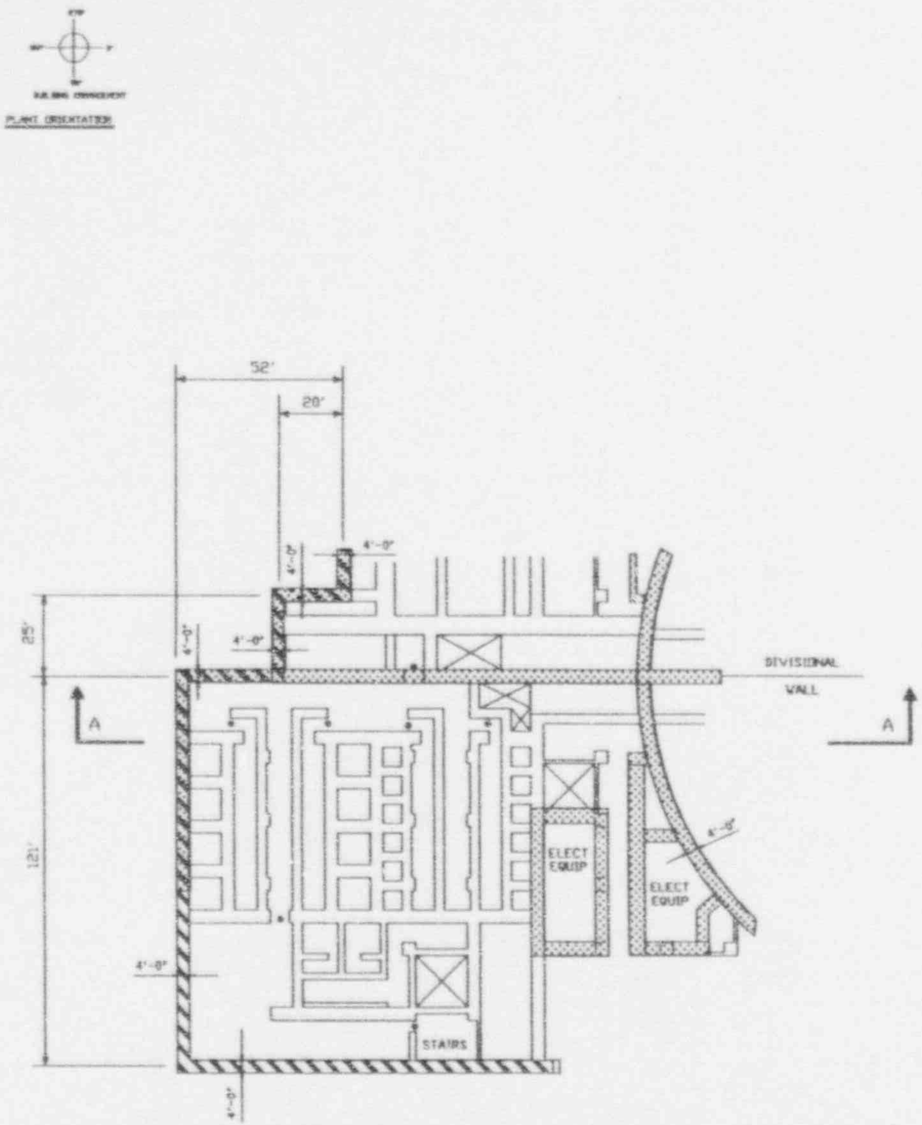

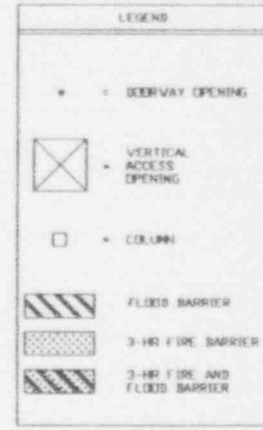

FOR NOTES SEE FIGURE 2.1.1-12

NUCLEAR ISLAND STRUCTURES
PLAN AT LEVEL 3

FIGURE 2.1.1-5

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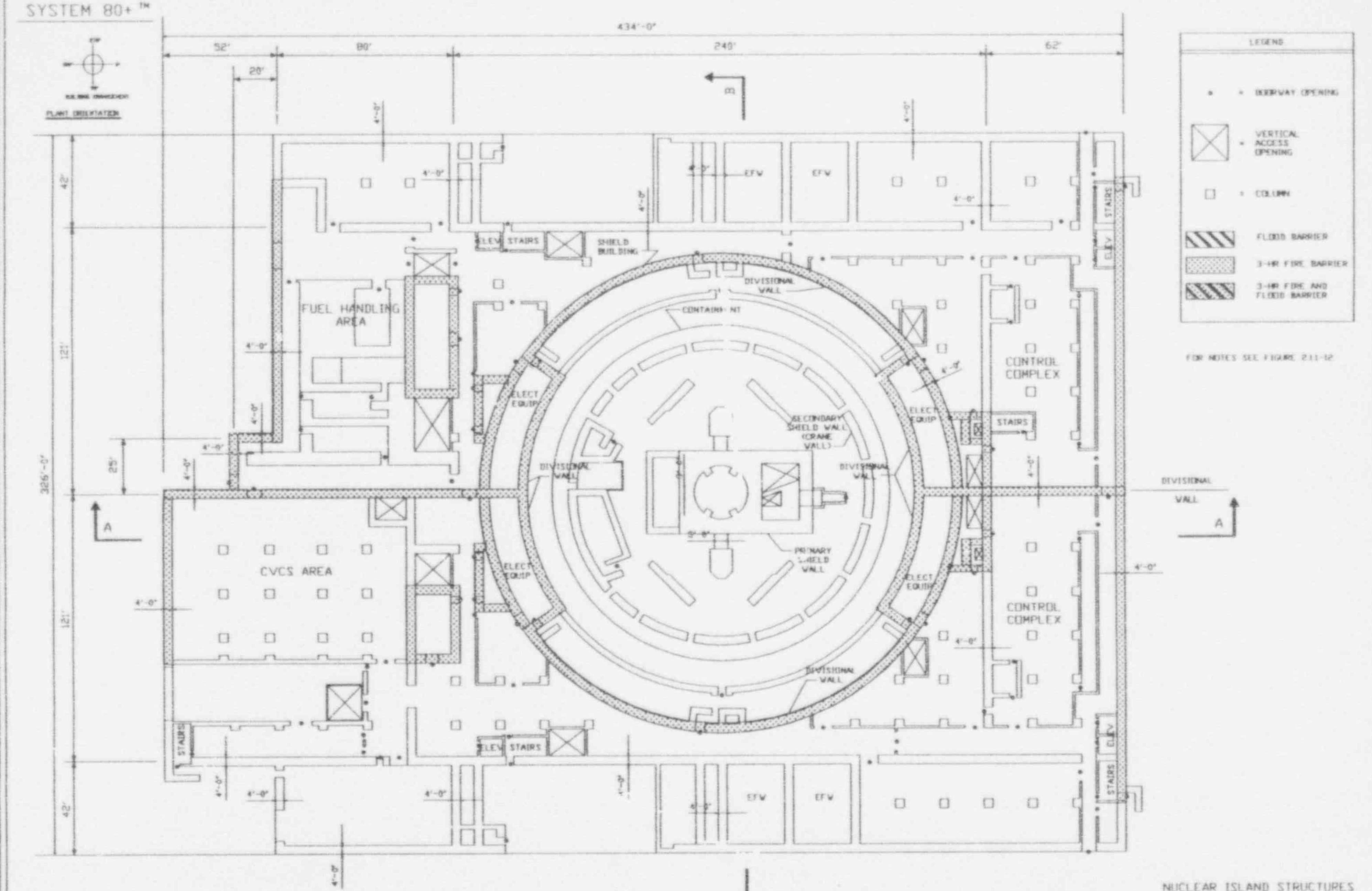
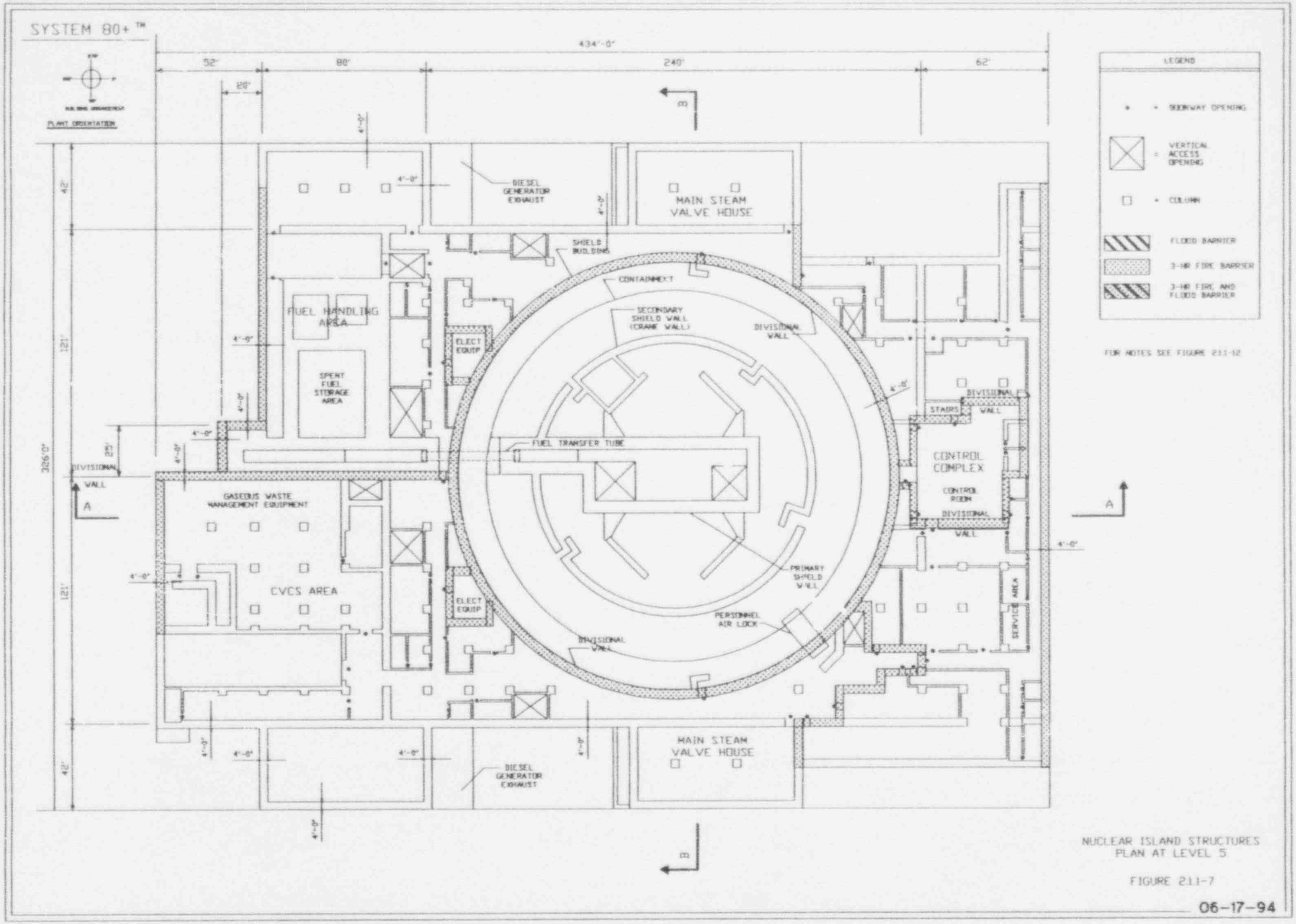


NUCLEAR ISLAND STRUCTURES
PLAN AT LEVEL 4

FIGURE 2.1.1-6



NUCLEAR ISLAND STRUCTURES
PLAN AT LEVEL 5

FIGURE 2.1.1-7

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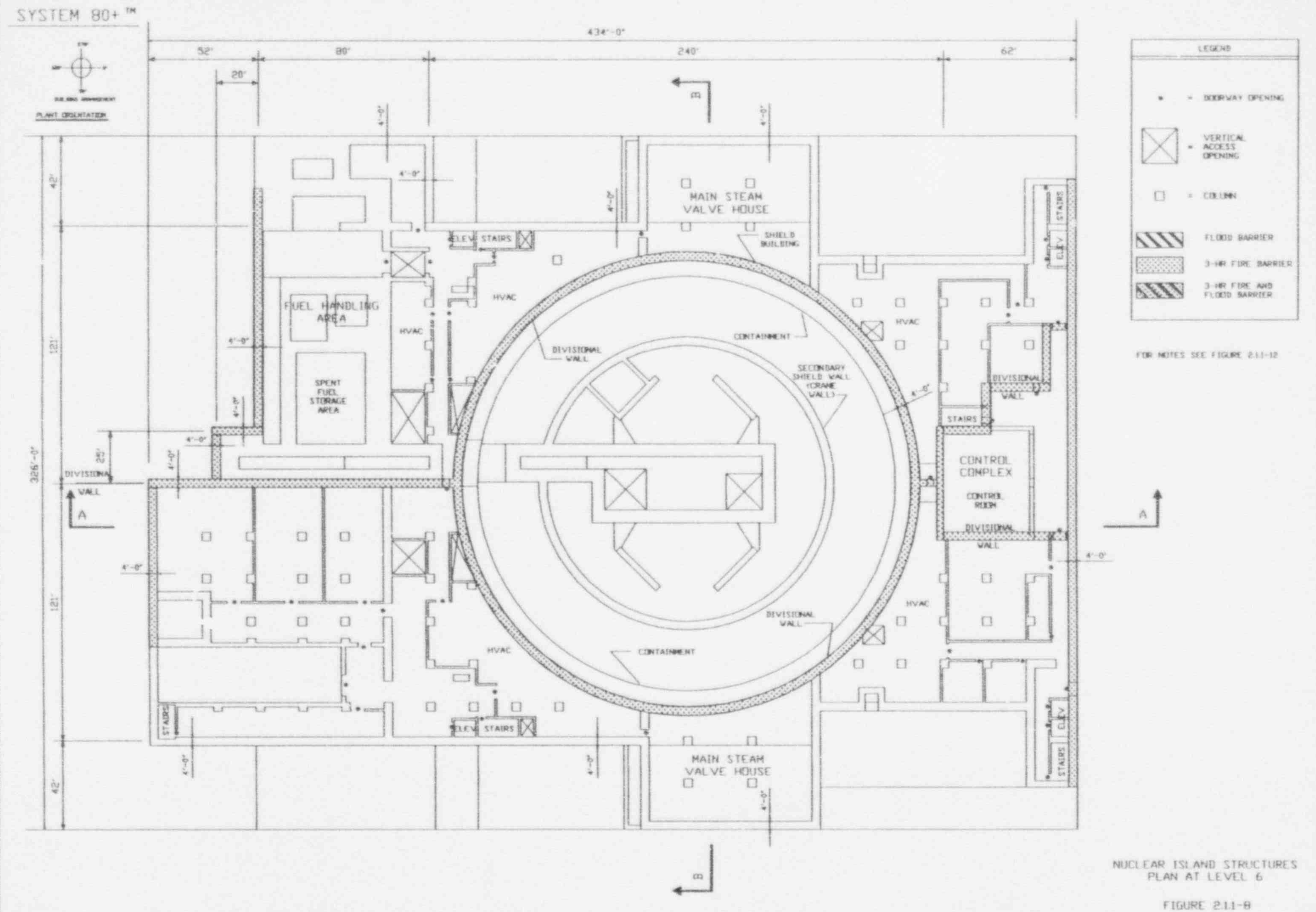

NUCLEAR ISLAND STRUCTURES
PLAN AT LEVEL 6

FIGURE 2.1.1-8

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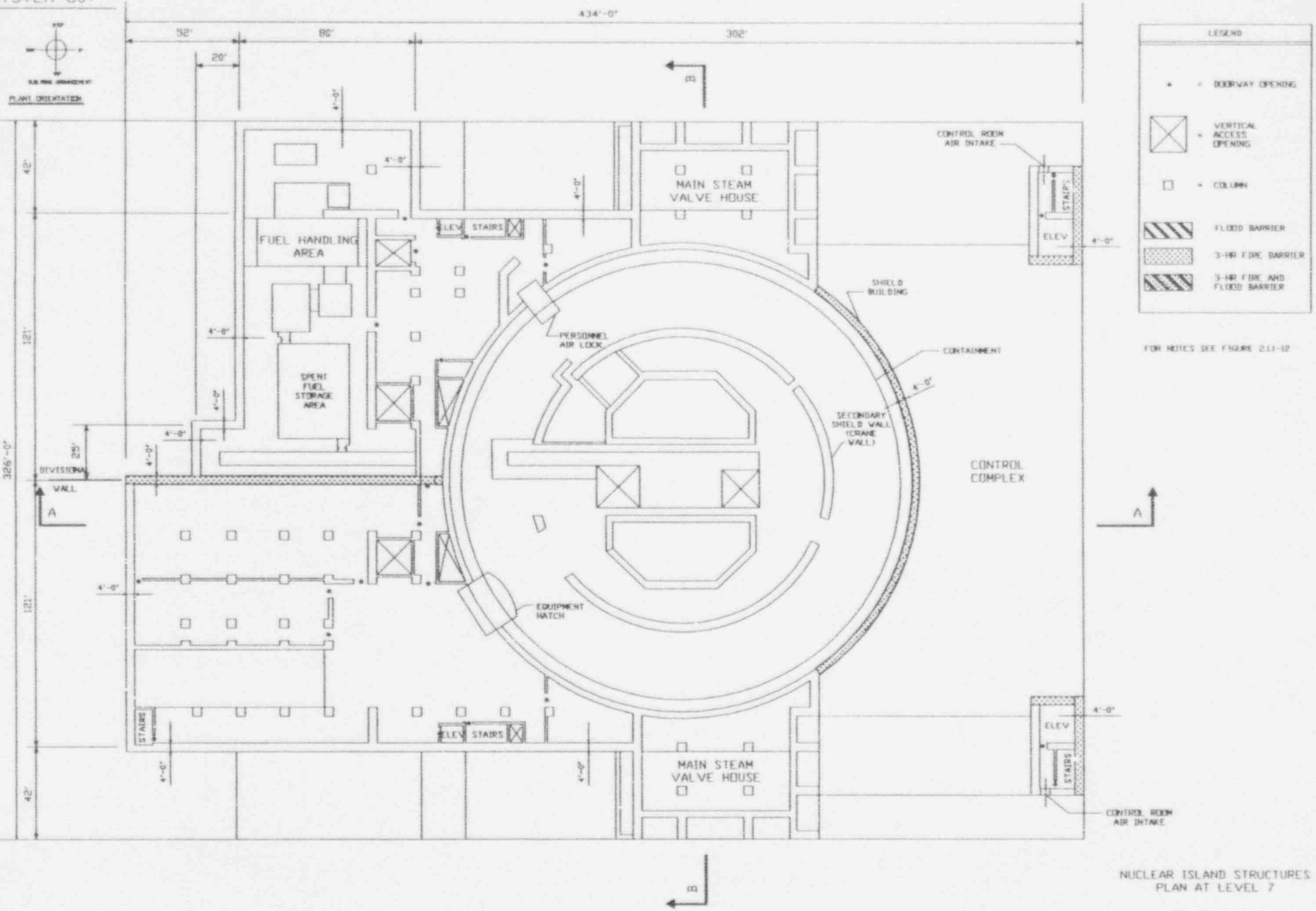

NUCLEAR ISLAND STRUCTURES
PLAN AT LEVEL 7

FIGURE 2.11-9

06-17-94

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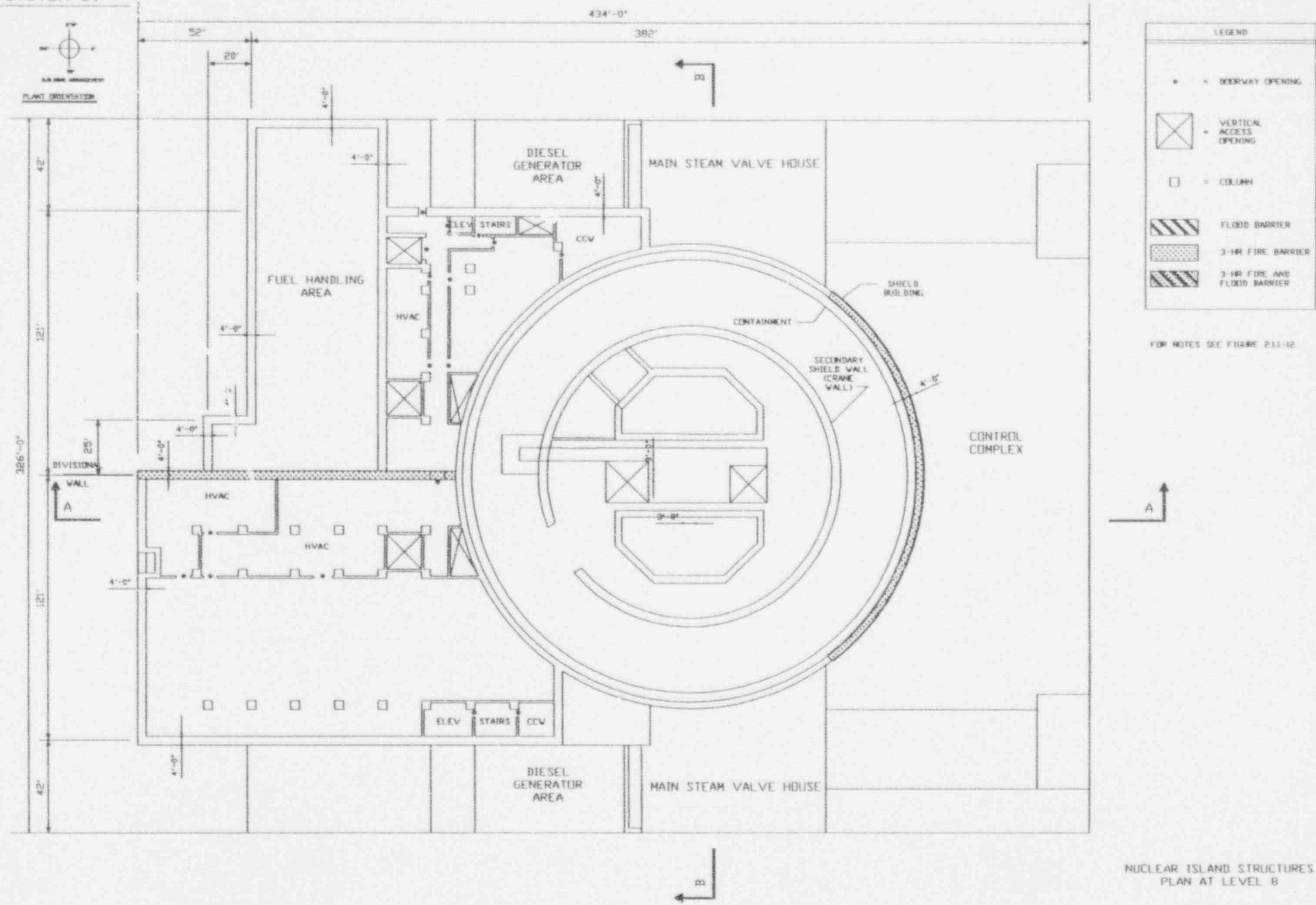

NUCLEAR ISLAND STRUCTURES
PLAN AT LEVEL 8

FIGURE 2.1.1-10

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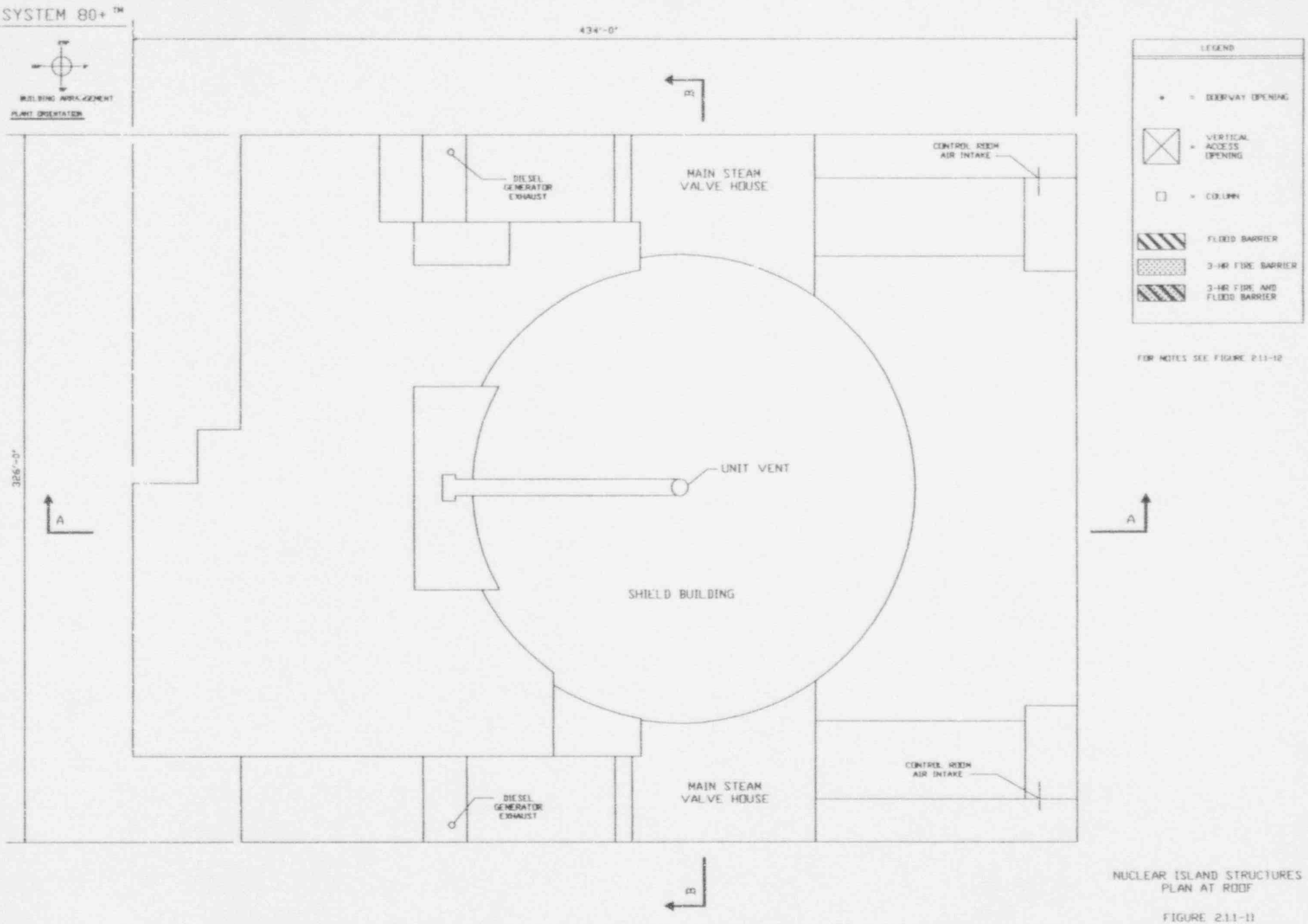

NUCLEAR ISLAND STRUCTURES
PLAN AT ROOF

FIGURE 2.1.1-11

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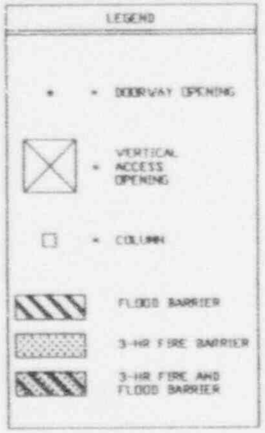


NOTES FOR FIGURES:

1. FLOOD DOORS ARE PROVIDED IN FLOOD BARRIERS, AND PENETRATIONS ARE SEALED UP TO THE EXTERNAL AND INTERNAL FLOOD LEVELS. SENSORS ARE PROVIDED ON FLOOD DOORS WITH OPEN AND CLOSE STATUS INDICATIONS AT A MONITORED LOCATION.

2. 3-HOUR FIRE RATED DOORS AND ELECTRICAL AND MECHANICAL PENETRATION SEALS ARE PROVIDED FOR OPENINGS IN THE 3-HOUR FIRE RATED BARRIERS.

3. THE FOLLOWING STRUCTURES, SYSTEMS, AND COMPONENTS DEPICTED ON THESE FIGURES ARE NOT SEISMIC CATEGORY I:
   - DOORWAY OPENINGS
   - VERTICAL ACCESS OPENINGS
   - STAIRS
   - ELEVATORS
   - UNIT VENT

ABBREVIATIONS:

BLDG .... BUILDING
CONT .... CONTAINMENT
ELECT .... ELECTRICAL
ELEV .... ELEVATOR
EQUIP .... EQUIPMENT
HR .... HOUR
MAINT .... MAINTENANCE
SYS .... SYSTEM

NUCLEAR ISLAND STRUCTURES
NOTES, LEGENDS
AND ABBREVIATIONS

FIGURE 2.1.1-12

TABLE 2.1.1-1

NUCLEAR ISLAND STRUCTURES
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.a) The Basic Configuration of the Nuclear Island Structures is as shown on Figures 2.1.1-1 through 2.1.1-12.	1.a) Inspection of the Basic Configuration of the as-built Nuclear Island Structures will be conducted.	1.a) For the structures shown on Figures 2.1.1-1 through 2.1.1-12, the Nuclear Island Structures conform with the Basic Configuration.
1.b) The top of the nuclear island basemat is located 40.75 ft ± 1.0 ft. below the finished grade elevation.	1.b) Inspection of the as-built nuclear island basemat structure will be conducted.	1.b) The top of the nuclear island basemat is located 40.75 ft ± 1.0 ft. below the finished grade elevation.
2.a) The Containment and its penetrations shown on Figures 2.1.1-1 through 2.1.1-12 are designed and constructed to ASME Code Section III, Class MC.	2.a) Inspection for the existence of ASME Code required documents will be conducted.	2.a) An ASME Code Design Report and Certified Material Test Report exists for the Containment and its penetrations.
2.b) The Containment and its penetrations shown on Figures 2.1.1-1 through 2.1.1-12 retain their pressure boundary integrity associated with the design pressure.	2.b) A pneumatic pressure test will be conducted on the Containment and its penetrations required to be pressure tested by ASME Code Section III.	2.b) The results of the pneumatic pressure test on the Containment and its penetrations conform with the pressure testing acceptance criteria in ASME Code Section III.
2.c) The Containment and its penetrations shown on Figures 2.1.1-1 through 2.1.1-12 maintain the Containment leakage rate less than the maximum allowable leakage rate associated with the peak containment pressure for the design basis accident.	2.c) Inspection and leak rate testing on the Containment and its penetrations will be conducted.	2.c) The results of the inspection and leak rate testing demonstrate that the Containment leakage rate is less than or equal to 0.50 percent by volume of the original content of Containment air at the peak containment pressure for the design basis accident during a 24 hour test period.

TABLE 2.1.1-1 (Continued)

NUCLEAR ISLAND STRUCTURES
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3. The Nuclear Island Structures are Seismic Category I, except as noted on Figure 2.1.1-12, and will withstand the structural design basis loads specified in the Design Description (Section 2.1.1).	3. A structural analysis will be performed which reconciles the as-built data with the structural design basis loads specified in the Design Description (Section 2.1.1).	3. A structural analysis report exists which concludes that the as-built Nuclear Island Structures will withstand the structural design basis loads specified in the Design Description (Section 2.1.1).
4. Flood doors, shown on Figures 2.1.1-1 through 2.1.1-12, have sensors with open and close status displays provided at a central fire alarm station.	4. Inspection for existence of flood door sensors and open and closed status displays will be conducted.	4. The flood door sensors and open and close status displays exist.
5. The reactor cavity sump has a minimum thickness of 3.2 feet.	5. Inspection of the reactor cavity sump and/or inspection of reactor cavity sump construction records will be performed. The thickness of the reactor cavity sump from the bottom of the sump to the top surface of the lower portion of the embedded containment shell will be determined.	5. The reactor cavity sump has a minimum thickness of 3.2 feet.

2.1.2 TURBINE BUILDING

Design Description

The Turbine Building is a non-safety-related structure which houses the main turbine generator and provides housing and support for power conversion cycle equipment and auxiliaries. There is no safety-related equipment in the Turbine Building. The Turbine Building is located on a separate foundation adjacent to the Nuclear Island (NI) Structures.

The Basic Configuration of the Turbine Building is as shown on Figure 2.1.2-1.

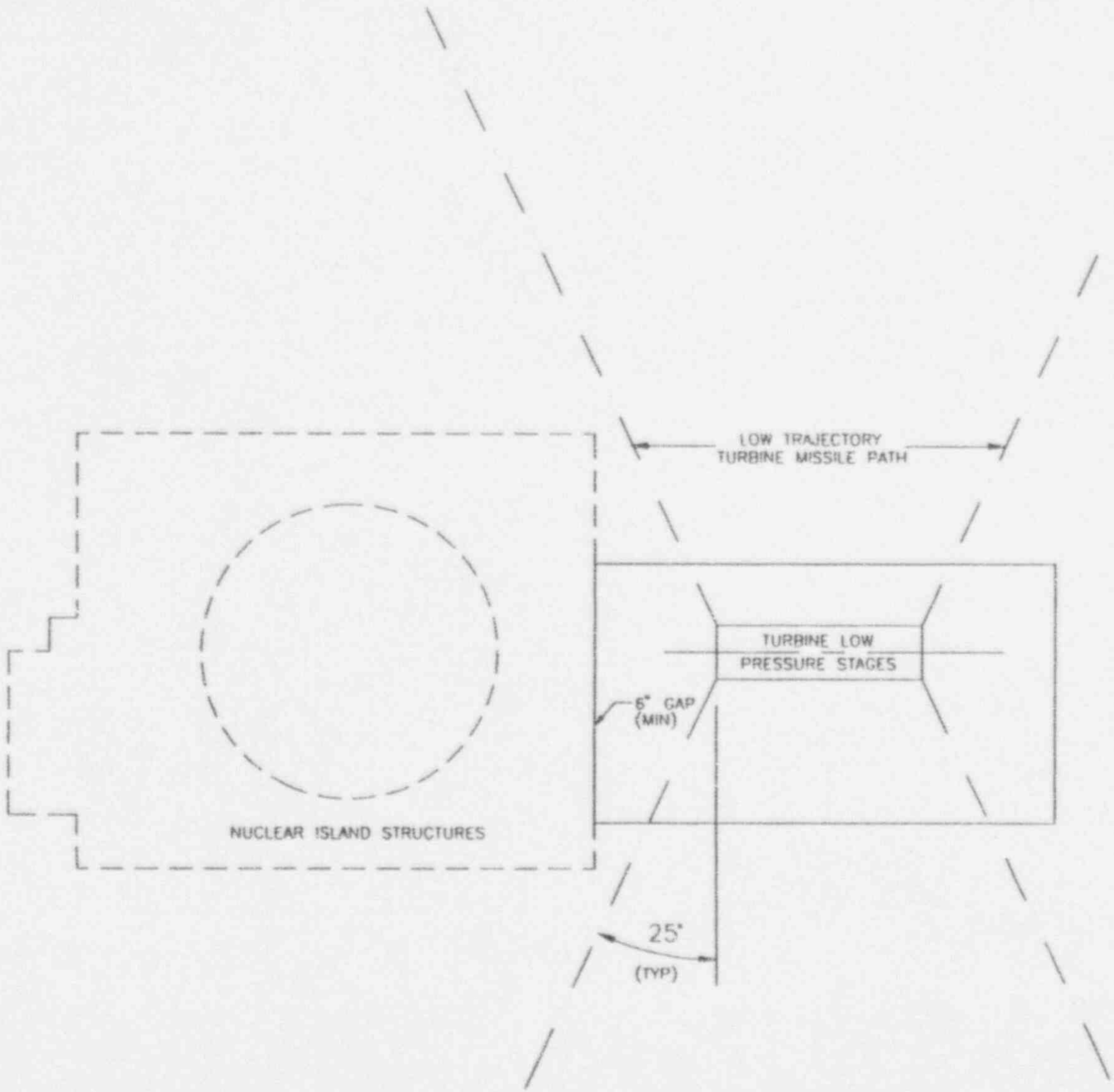
The Turbine Building contains a reinforced concrete turbine generator pedestal, and a structural steel frame supporting bridge cranes, an operating floor, and a mezzanine.

The structural components of the Turbine Building accommodate safe shutdown earthquake (SSE) loads to the extent that the Turbine Building response to these loads cannot result in a loss of safety function of the NI Structures or other safety-related structures, systems, or components adjoining the turbine building.

The turbine generator orientation and projected low trajectory turbine missile path are as shown on Figure 2.1.2-1.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.1.2-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Turbine Building.



TURBINE BUILDING
PLAN

FIGURE 2.12-1

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TABLE 2.1.2-1

TURBINE BUILDING
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Turbine Building is as shown on Figure 2.1.2-1.	1. Inspection of the as-built Turbine Building configuration will be conducted.	1. For the structure shown on Figure 2.1.2-1, the as-built Turbine Building conforms with the Basic Configuration.
2. The structural components of the Turbine Building accommodate safe shutdown earthquake loads to the extent that the Turbine Building response to those loads cannot result in a loss of safety function of the NI Structures, or other safety-related structures, systems, or components adjoining the turbine building.	2. A structural analysis of the Turbine Building will be performed.	2. A structural analysis report for the Turbine Building exists which concludes that structural components of the Turbine Building accommodate safe shutdown earthquake loads to the extent that the Turbine Building response to these loads cannot result in a loss of safety function of the NI Structures or other safety-related structures, systems, or components adjoining the turbine building.

2.1.3 COMPONENT COOLING WATER HEAT EXCHANGER STRUCTURES

Design Description

Each of two Component Cooling Water (CCW) Heat Exchanger Structures houses and provides protection and support for component cooling water heat exchangers and supporting equipment. The CCW Heat Exchanger Structures are located outside the projected low trajectory turbine missile path.

The Basic Configuration of a CCW Heat Exchanger Structure is as shown on Figure 2.1.3-1[1]. The CCW Heat Exchanger Structures are safety-related.

The two CCW Heat Exchanger Structures provide personnel and equipment access, support for systems and components under operating loads, structural components to withstand loads due to design basis external and internal events, and physical separation between Divisions of safety-related equipment.

Each CCW Heat Exchanger Structure is a separate reinforced concrete structure constructed of slabs and shear walls, and contains a Division of CCW Heat Exchangers and CCW components.

Each CCW Heat Exchanger Structure provides features which accommodate the static and dynamic loads and load combinations which define the structural design basis. The design basis loads are those associated with:

> Normal plant operation (including dead loads, live loads, and equipment loads, including the effects of temperature and vibration);
>
> External events (including flood, wind, tornado, tornado generated missiles, earthquake, rain, and snow); and
>
> Internal events (including flood, pipe rupture, equipment failure, and equipment failure generated missiles).

CCW piping enters and exits a CCW Heat Exchanger Structure through underground vaults. The CCW pipe vaults are routed underground from the CCW Heat Exchanger Structure to the CCW pipe chases located on either side of the Nuclear Island (NI) Structures.

Each CCW Heat Exchanger Structure is Seismic Category I.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.1.3-1 specifies the inspections, tests, analyses, and associated acceptance criteria for CCW Heat Exchanger Structures.

[1] The building dimensions and elevations provided in Figure 2.1.3-1 are provided for information only and are not intended to be part of the Certified Design information.

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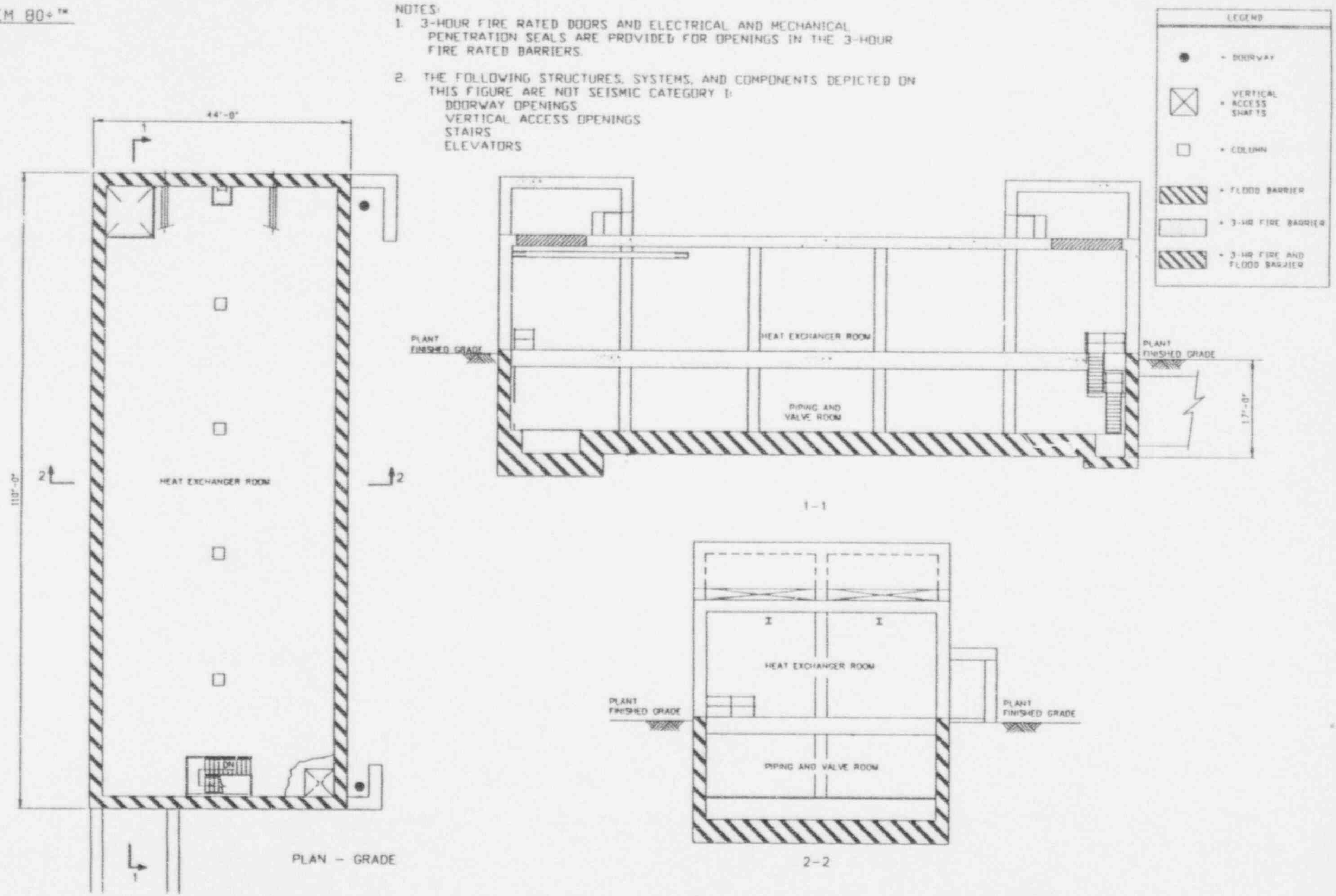

CCW HEAT EXCHANGER STRUCTURE

FIGURE 2.13-1

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TABLE 2.1.3-1

COMPONENT COOLING WATER HEAT EXCHANGER STRUCTURE
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of each Component Cooling Water (CCW) Heat Exchanger Structure is as shown on Figure 2.1.3-1.	1. Inspection of each as-built CCW Heat Exchanger Structure will be conducted.	1. For the structure shown on Figure 2.1.3-1, each CCW Heat Exchanger Structure conforms with the Basic Configuration.
2. Each CCW Heat Exchanger Structure is located outside the projected low trajectory turbine missile path.	2. Inspection of the location of each CCW Heat Exchanger Structure will be performed.	2. Each CCW Heat Exchanger Structure is located outside the projected low trajectory turbine missile path.
3. Each CCW Heat Exchanger Structure is Seismic Category I and withstands the structural design basis loads specified in the Design Description (Section 2.1.3).	3. A structural analysis will be performed which reconciles the as-built data with the structural design basis specified in the Design Description (Section 2.1.3).	3. A structural analysis report exists which concludes that each as-built CCW Heat Exchanger Structure withstands the structural design basis loads specified in the Design Description (Section 2.1.3).

2.1.4 DIESEL FUEL STORAGE STRUCTURE

Design Description

Two separate Diesel Fuel Storage Structures (DFSSs) house and provide protection and support for the diesel generator fuel oil storage tanks and associated piping and equipment. The DFSSs are not connected to the Nuclear Island (NI) Structures except by underground diesel fuel transfer piping.

The Basic Configuration of each DFSS is as shown on Figure 2.1.4-1[1]. The DFSSs are safety-related.

The DFSSs are located outside the projected low trajectory turbine missile path.

Each Diesel Fuel Storage Structure provides personnel and equipment access, support for systems and components under operating loads, and structural components to withstand loads due to design basis external and internal events.

Each DFSS is a reinforced concrete vault containing two Fuel Storage Tank Areas and an attached equipment room and is constructed of slabs and shear walls. Each Fuel Storage Tank Area provides space for a diesel fuel oil storage tank and associated piping and pumps.

Each DFSS provides features which accommodate the static and dynamic loads and load combinations which define the structural design basis. The design basis loads are those associated with:

> Normal plant operation (including dead loads, live loads, lateral earth pressure loads, and equipment loads, including the effects of temperature and vibration);
>
> External events (including flood, wind, tornado, tornado generated missiles, earthquake, rain, and snow); and
>
> Internal events (including flood, pipe rupture, equipment failure, and equipment failure generated missiles).

The DFSSs are Seismic Category I.

The two DFSSs are physically separated by their placement on opposite sides of the NI Structures.

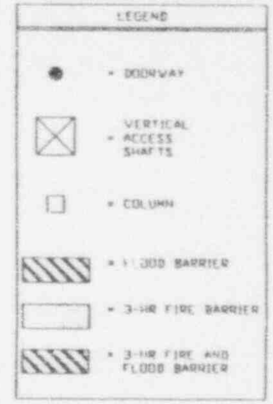
Inspections, Tests, Analyses, and Acceptance Criteria

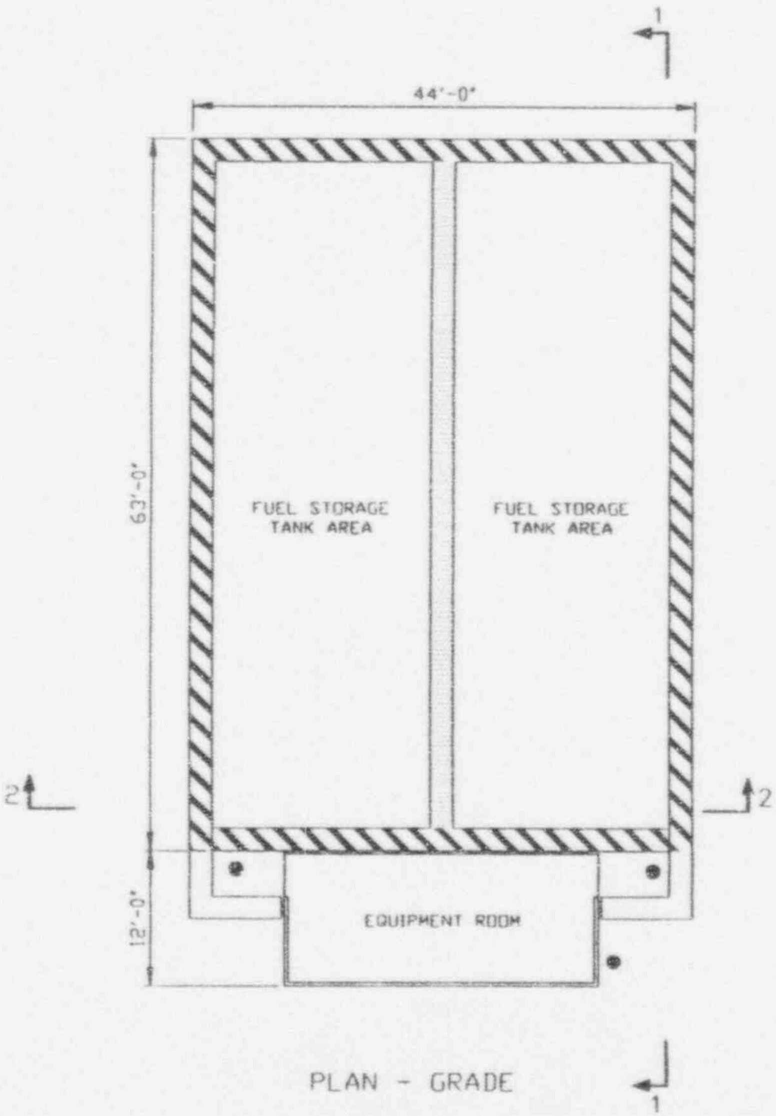
Table 2.1.4-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Diesel Fuel Storage Structures.

[1] The building dimensions and elevations provided in Figure 2.1.4-1 are provided for information only and are not part of the Certified Design information.

NOTES:

1. 3-HOUR FIRE RATED DOORS AND ELECTRICAL AND MECHANICAL PENETRATION SEALS ARE PROVIDED FOR OPENINGS IN THE 3-HOUR FIRE RATED BARRIERS
2. THE FOLLOWING STRUCTURES, SYSTEMS, AND COMPONENTS DEPICTED ON THIS FIGURE ARE NOT SEISMIC CATEGORY I:
   - DOORWAY OPENINGS
   - VERTICAL ACCESS OPENINGS
   - STAIRS
   - ELEVATORS
   - EQUIPMENT ROOM





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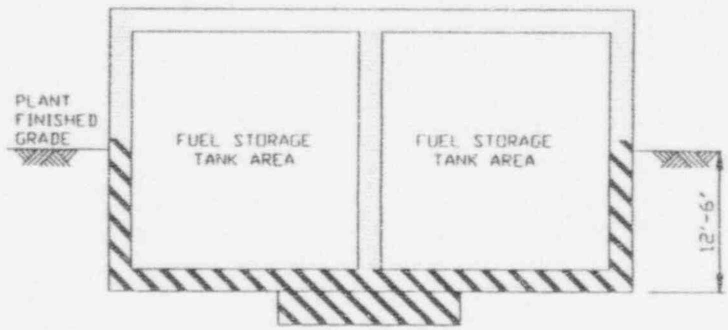
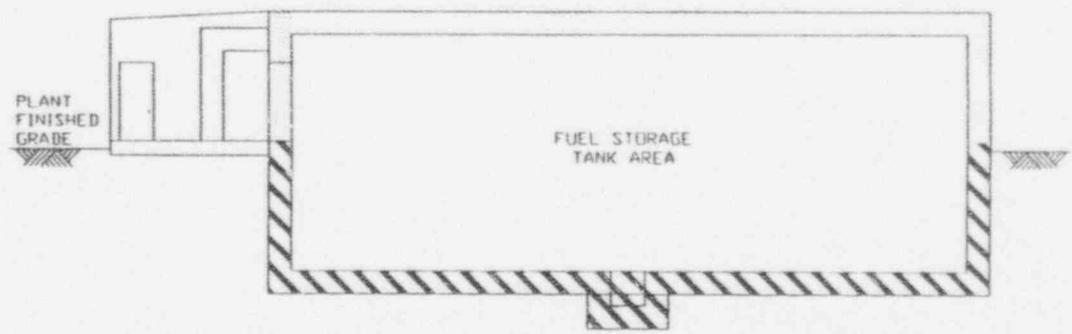


2-2



1-1

DIESEL FUEL STORAGE STRUCTURE

FIGURE 2.14-1

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TABLE 2.1.4-1

DIESEL FUEL STORAGE STRUCTURE
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of each Diesel Fuel Storage Structure is as shown on Figure 2.1.4-1.	1. Inspection of each as-built Diesel Fuel Storage Structure's configuration will be conducted.	1. For the structure shown on Figure 2.1.4-1 each as-built Diesel Fuel Storage Structure conforms with the Basic Configuration.
2. The DFSSs are located outside the projected low trajectory turbine missile path.	2. Inspection of the location of the DFSSs will be performed.	2. The DFSSs are located outside the projected low trajectory turbine missile path.
3. Each Diesel Fuel Storage Structure is Seismic Category I and will withstand the structural design basis loads as specified in the Design Description (Section 2.1.4).	3. A structural analysis will be performed which reconciles the as-built data with the structural design basis as specified in the Design Description (Section 2.1.4).	3. A structural analysis report exists which concludes that each as-built Diesel Fuel Storage Structure will withstand the design basis loads as specified in the Design Description (Section 2.1.4).
4. The two DFSSs are physically separated by their placement on opposite sides of the NI Structures.	4. Inspection of the DFSSs will be performed.	4. The two DFSSs are separated by the Nuclear Island Structures.

2.1.5 RADWASTE BUILDING

Design Description

The Radwaste Building is a non-safety-related structure that houses liquid and solid radioactive waste management structures, systems, and components and provides containment for liquid and solid radioactive waste materials. The Radwaste Building is located on a separate basemat adjacent to the Nuclear Annex. A minimum gap of 6" between the structures will be provided.

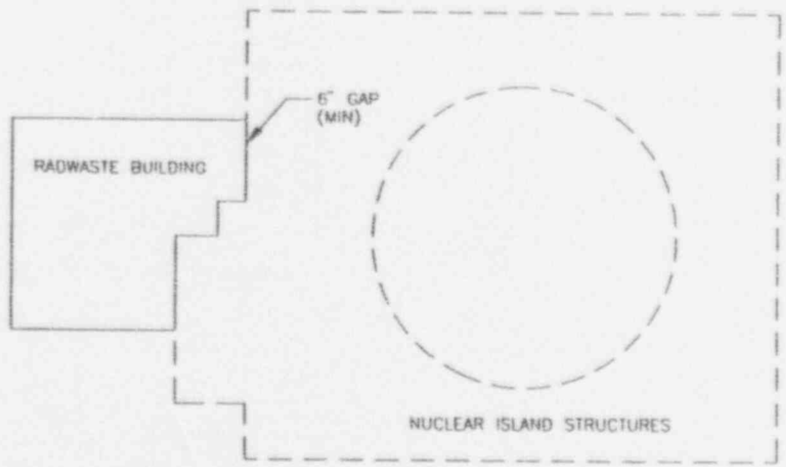
The Basic Configuration of the Radwaste Building is as shown on Figure 2.1.5-1.

The Radwaste Building consists of a reinforced concrete and structural steel structure.

The structural components of the Radwaste Building accommodate safe shutdown earthquake (SSE) loads such that the Radwaste Building response to these loads cannot result in a loss of safety function of the adjoining NI Structures. The Radwaste Building foundations and walls accommodate safe shutdown earthquake loads such that the maximum liquid inventory in the building is contained.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.1.5-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Radwaste Building.



RADWASTE BUILDING
PLAN

FIGURE 2.1.5-1

TABLE 2.1.5-1

RADWASTE BUILDING
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Radwaste Building is as shown on Figure 2.1.5-1.	1. Inspection of the as-built Radwaste Building configuration will be conducted.	1. For the structure shown on Figure 2.1.5-1, the as-built Radwaste Building conforms with the Basic Configuration.
2. The structural components of the Radwaste Building accommodate safe shutdown earthquake loads such that the Radwaste Building response to these loads cannot result in a loss of safety function of the adjoining NI Structures.	2. A structural analysis of the Radwaste Building will be performed.	2. A structural analysis report for the Radwaste Building exists which concludes that structural components of the Radwaste Building accommodate safe shutdown earthquake loads such that the Radwaste Building response to these loads cannot result in a loss of safety function of the adjacent NI Structures.
3. The Radwaste Building foundations and walls accommodate safe shutdown earthquake loads such that the maximum liquid inventory in the building is contained.	3. A capacity analysis of the Radwaste Building will be performed using as-built liquid inventory data.	3. A capacity analysis report for the Radwaste Building exists which concludes that foundations and walls contain the maximum liquid inventory in the building.

2.1.6 REACTOR VESSEL INTERNALS

Design Description

The Reactor Vessel Internals consist of a Core Support Barrel (CSB) Assembly and an Upper Guide Structure (UGS) Assembly.

The Basic Configurations of the CSB and the UGS are as shown on Figures 2.1.6-1 and 2.1.6-2, respectively. The Reactor Vessel Internals are safety-related.

Dimensions of the core support barrel and the upper guide structure assembly are listed in Table 2.1.6-1.

The CSB assembly is suspended from the reactor vessel flange. The CSB assembly provides support and location positioning for the fuel assembly lower end fittings. The CSB assembly contains structural elements that provide an instrumentation guide path from the lower vessel, and hydraulic flow paths through the vessel from the inlet nozzles to the upper end of the fuel assemblies.

The core barrel assembly contains a grid structure which supports the core and provides flow distribution from the lower plenum region to the bottom of the fuel assemblies. The core shroud is part of the CSB assembly and provides an envelope to direct the primary coolant flow through the core. Instrument nozzles in the grid structure provide a guide path for in-core instruments from the reactor vessel lower head to the fuel assemblies.

The UGS assembly is supported by the CSB upper flange and extends into the CSB assembly to engage the top of the fuel assemblies. The UGS assembly provides an insertion path for the control element assemblies (CEA). The UGS assembly contains structural elements which provide both a guide path and lateral support for the upper portion of the control element assemblies and extension shafts in the reactor vessel upper plenum region. The UGS assembly also provides guide paths for heated junction thermocouple (HJTC) assemblies.

The CSB and UGS assemblies are designed and constructed in accordance with ASME Code Section III Subsection NG requirements and are classified Seismic Category I. The reactor vessel internals maintain their integrity during normal operation, transients, and during SSE and design basis accident conditions not eliminated by leak-before-break evaluations. The material of construction for the CSB and UGS components is austenitic stainless steel with the exception of the Holdown Ring, which is made of martensitic stainless steel. Cobalt base material, if used, is used only for hardsurfacing of wear parts.

The Reactor Vessel Internals withstand the effects of flow induced vibration caused by the operation of the reactor coolant pumps.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.1.6-2 specifies the inspections, tests, analyses, and associated acceptance criteria for the Reactor Vessel Internals.

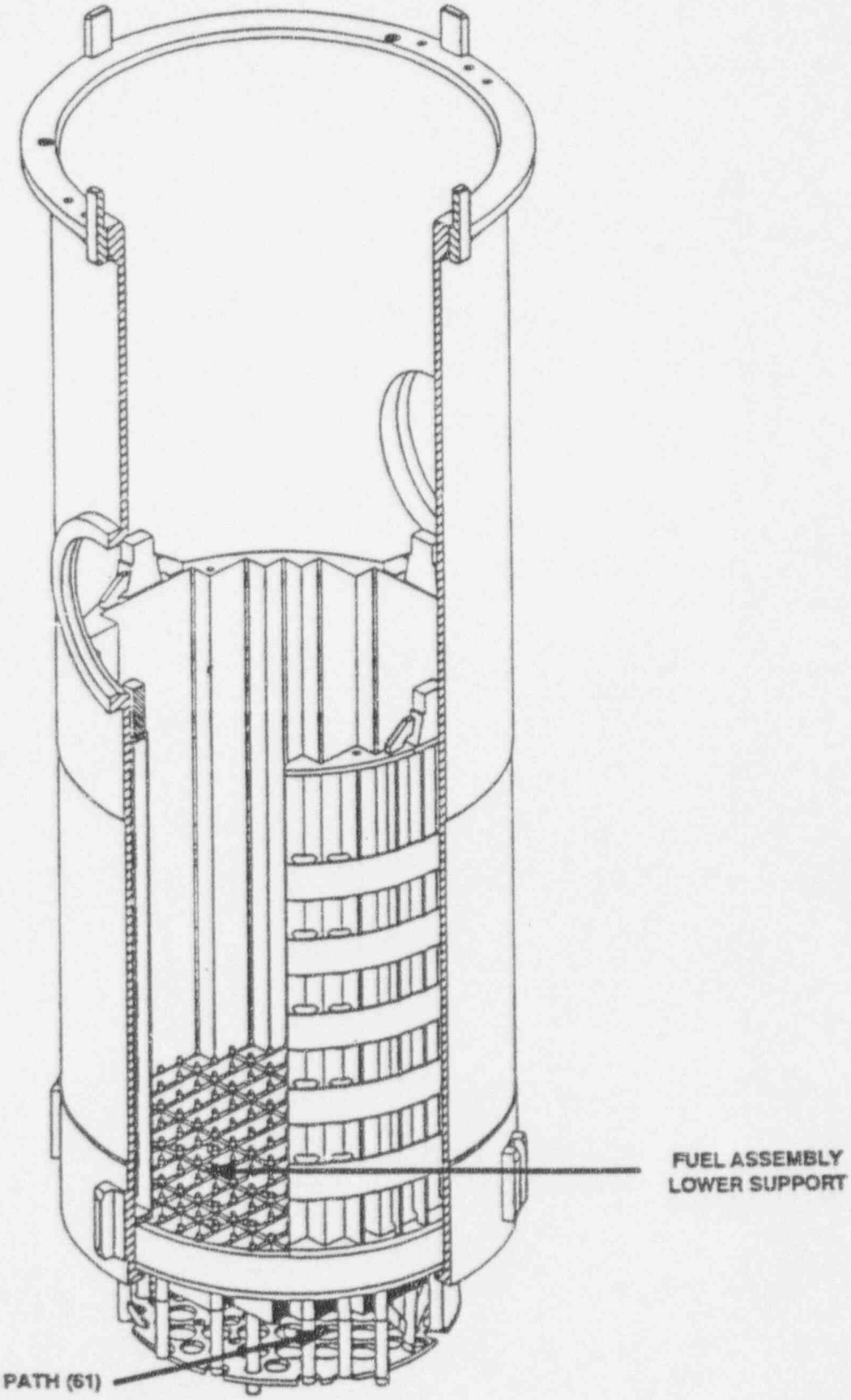


FIGURE 2.1.6-1
CORE SUPPORT BARREL ASSEMBLY

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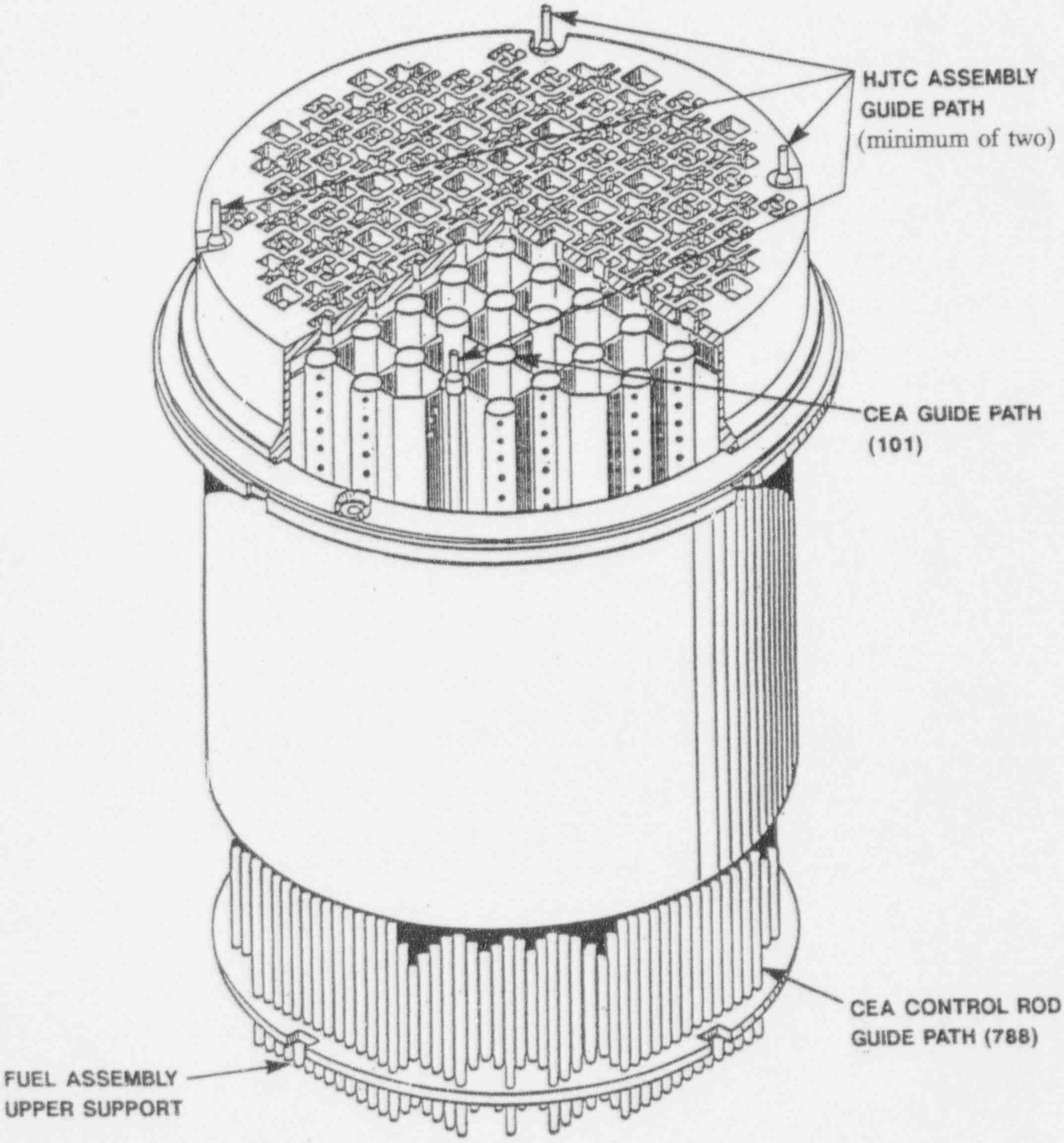


FIGURE 2.1.6-2
UPPER GUIDE STRUCTURE ASSEMBLY

06-17-94

TABLE 2.1.6-1

NOMINAL DESIGN DIMENSION
REACTOR PRESSURE VESSEL INTERNALS

COMPONENT	NOMINAL DIMENSION
CORE SUPPORT BARREL:	
Length in.	383
Inside diameter in.	157
Upper thickness in.	3
Outlet nozzle inside diameter in.	46-5/8
UPPER GUIDE STRUCTURE ASSEMBLY:	
Outside barrel diameter in.	156
Barrel thickness in.	3
Fuel alignment plate diameter in.	156

Note: These nominal dimensions are provided for information only and are not part of the Certified Design information.

TABLE 2.1.6-2

REACTOR VESSEL INTERNALS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Reactor Vessel Internals is as shown on Figures 2.1.6-1 and 2.1.6-2.	1. Inspection of the as-built Reactor Vessel Internals will be conducted.	1. For the components and equipment shown on Figures 2.1.6-1 and 2.1.6-2, the as-built Reactor Vessel Internals conform with the Basic Configuration.
2. The Core Support Barrel and Upper Guide Structure are designed and constructed in accordance with ASME Code Section III Subsection NG requirements and are classified Seismic Category I.	2. Inspection will be performed of the ASME Code Section III required Owner's Review of the ASME Design Report.	2. The completed ASME Code Section III required Owner's Review of the ASME Design Report exists.
3. The Reactor Vessel Internals withstand the effects of flow induced vibration caused by operation of the reactor coolant pumps.	3.a) Testing will be performed to subject the Reactor Vessel Internals to flow induced vibration. Pre- and post-test visual inspection will be performed on the Reactor Vessel Internals.	3.a) Testing and inspection results demonstrate that the Reactor Vessel Internals retain their integrity.
	3.b) A vibration type test will be conducted on the prototype reactor vessel internals.	3.b) A vibration type test report exists and concludes that the prototype reactor vessel internals retain their integrity and have no loose parts as a result of the test.

2.1.7 IN-CORE INSTRUMENT GUIDE TUBE SYSTEM

Design Description

The In-Core Instrument (ICI) Guide Tube System having guide tubes, supports, seal housings and a seal table is safety related in that the guide tubes, and seal housing are pressure retaining components of the reactor coolant system.

The Basic Configuration of the ICI guide tubes, seal housings, supports, and seal table is as shown on Figure 2.1.7-1.

The ICI guide tubes serve as a guide path and provide support for the in-core detector assemblies. The ICI guide tubes connect to the bottom of the reactor vessel and terminate in a seal housing assembly located at the seal table. The ICI guide tubes and seal housings provide the reactor coolant pressure boundary for the ICI guide path outside the reactor vessel. Pressure retaining seals are installed between the seal housing and the in-core instrument, at the seal housing.

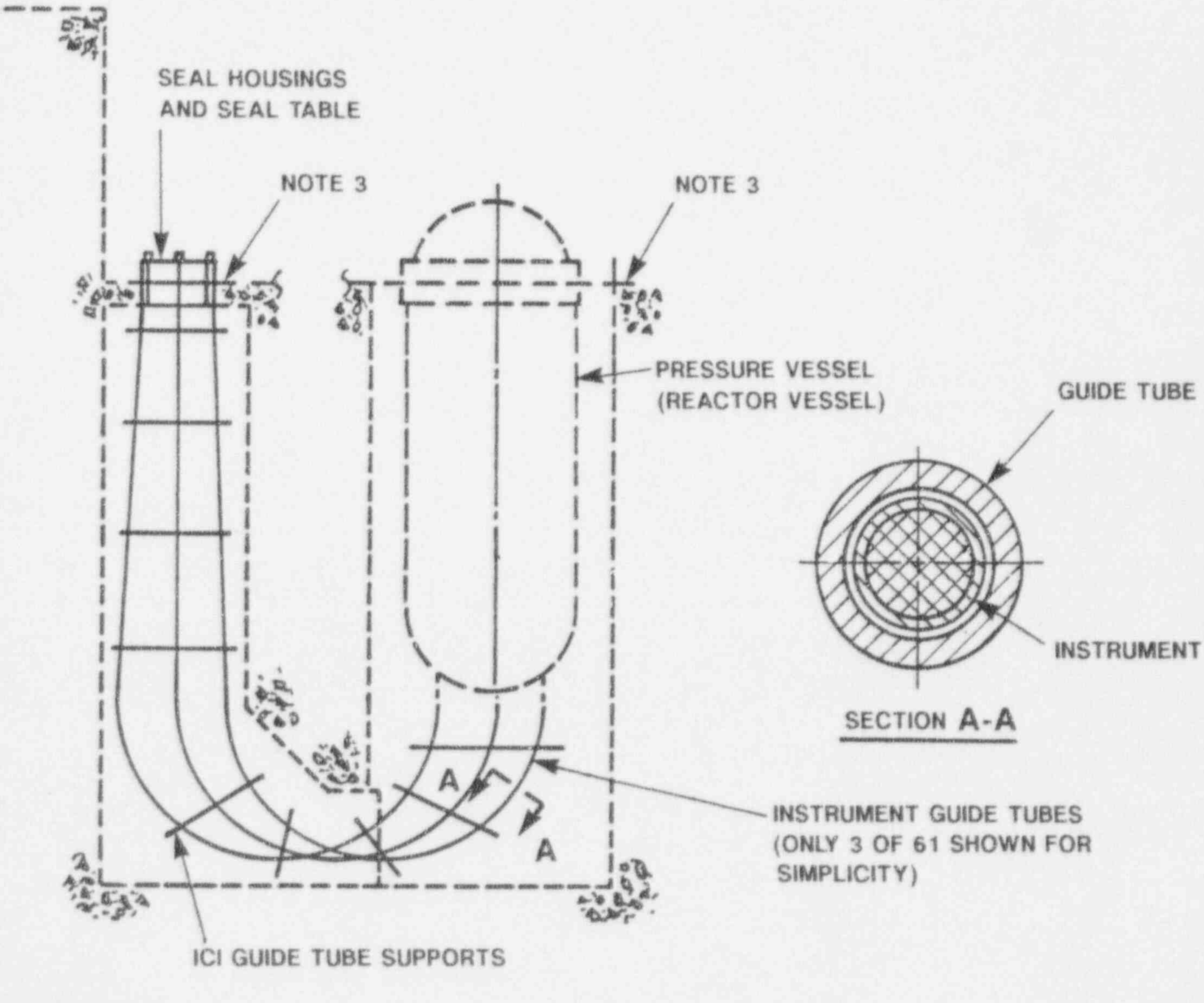
The ICI supports and seal table support the ICI guide tubes and provide tube to tube spacing. The seal table also seals the ICI chase from water ingress during refueling.

The ASME Code Section III classification for the ICI guide tube pressure retaining components is shown on Figure 2.1.7-1. Components shown on Figure 2.1.7-1 are designed and constructed in accordance with ASME Code Class 1 requirements.

The safety-related equipment shown on Figure 2.1.7-1 is classified Seismic Category I.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.1.7-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the ICI Guide Tubes System.



NOTES:

1. ICI GUIDE TUBES, SUPPORTS, SEAL HOUSING AND SEAL TABLE ARE ASME CODE CLASS 1 COMPONENTS.
2. ICI GUIDE TUBES AND SEAL HOUSINGS ARE PRESSURE RETAINING COMPONENTS.
3. THE SEAL TABLE ELEVATION IS AT THE SAME ELEVATION OR HIGHER THAN THE REACTOR PRESSURE VESSEL CLOSURE HEAD MATING SURFACE ELEVATION.

FIGURE 2.1.7-1
IN-CORE INSTRUMENTATION GUIDE TUBE SYSTEM

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TABLE 2.1.7-1

IN-CORE INSTRUMENT GUIDE TUBE SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration for the ICI Guide Tube System is as shown on Figure 2.1.7-1.	1. Inspection of the as-built ICI Guide Tube System configuration will be conducted.	1. For the components and equipment shown on Figure 2.1.7-1, the as-built ICI Guide Tube System conforms with the Basic Configuration.
2.a) The ICI guide tubes and seal housings retain their pressure boundary integrity under internal pressures that will be experienced during service.	2.a) A pressure test will be conducted on those portions of the ICI Guide Tube System required to be pressure tested by the ASME Code Section III.	2.a) The results of the pressure test of ASME Code Section III components of the ICI guide tubes and seal housings conform with the pressure testing acceptance criteria in ASME Code Section III.
2.b) Components shown as ASME Code Class 1 on Figure 2.1.7-1 are designed and constructed in accordance with ASME Code Class 1 requirements.	2.b) Inspection of the ASME design reports will be conducted.	2.b) The ASME Code Section III design reports exist for the ICS Guide Tube System Class 1 components.

2.2.1 NUCLEAR FUEL SYSTEM

Design Description

The Nuclear Fuel System (NFS) generates heat by a controlled nuclear reaction and transfers the heat generated to the reactor coolant. The NFS consists of an arrangement in the reactor vessel of fuel assemblies and control element assemblies (CEAs). The NFS has the safety-related functions of providing a barrier against the release of radioactive material generated by nuclear reactions in the nuclear fuel and providing a means to make the reactor core subcritical.

The Basic Configuration of the fuel assembly, the CEAs, and their arrangement in the reactor core is as shown on Figures 2.2.1-1 2.2.1-2, and 2.2.1-3. The reactor core has a maximum of 241 fuel assemblies and a minimum of 93 CEAs.

Each fuel assembly has fuel rods, spacer grids, guide tubes, and upper and lower end fittings. In each fuel assembly, a minimum of 236 locations are occupied by fuel rods or rods containing burnable neutron absorber material or other non-fuel material. The remaining locations are subdivided into symmetric regions, each of which contains one or more guide tubes. Each guide tube provides a channel for insertion of a CEA finger or an in-core instrument. Each guide tube is attached to fuel assembly spacer grids and to fuel assembly upper and lower end fittings to provide a structural frame to position the fuel rods.

Each CEA has a maximum of 12 CEA fingers, each containing neutron absorbing material within a cylindrical, sealed metal tube. The CEA fingers are held in position at one end and are spaced to allow entry into the guide tubes of fuel assemblies.

Each fuel rod has fissile material in the form of ceramic pellets. The fuel pellets in each fuel rod are contained within a cylindrical, sealed metal tube. Fuel rods can also contain burnable neutron absorbing material. Fuel rods can also be displaced by rods containing burnable neutron absorbing material or other non-fuel material.

One or more fuel assemblies can have a neutron generating source located within a guide tube.

The fuel assemblies and CEAs are classified as Seismic Category I.

The fuel assembly, fuel assembly components (including fuel rods and rods containing burnable neutron absorber material or other non-fuel material), and CEA materials are compatible with the reactor environment.

Fuel rod failure is predicted not to occur during normal operation and anticipated operational occurrences as a result of known fuel rod failure mechanisms during the design lifetime of the fuel.

Specified acceptable fuel design limits are predicted not to be exceeded during normal operation and anticipated operational occurrences during the design lifetime of the fuel.

Coolability will be maintained for all design basis events.

The CEAs are capable of insertion into the core during all modes of plant operation within the insertion time limits assumed in the plant safety analyses for those analyses which presume CEA insertion.

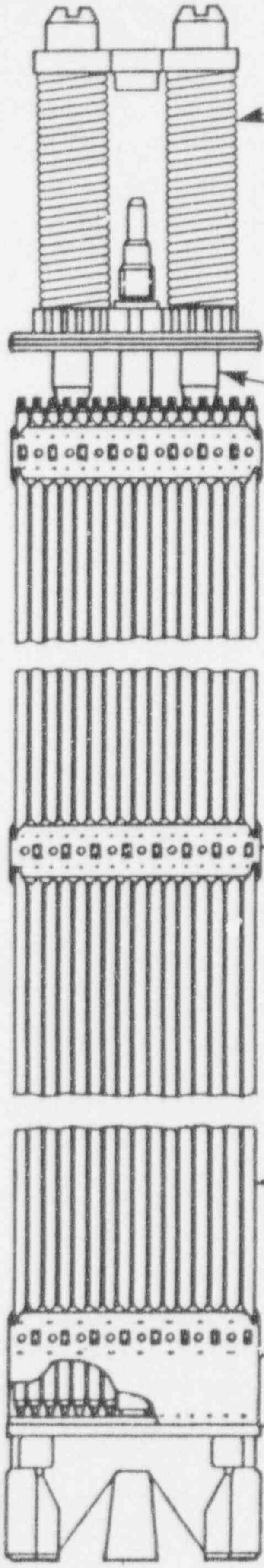
The CEAs are capable of controlling reactivity changes to assure that under normal operation and anticipated operational occurrences, with appropriate margin for stuck CEAs, specified acceptable fuel design limits are predicted not to be exceeded.

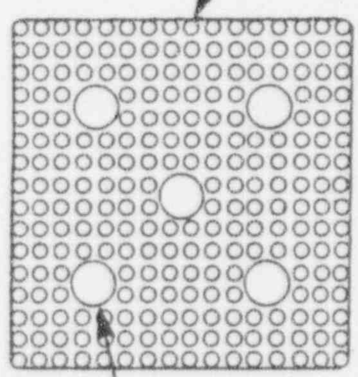
The potential amount and rate of reactivity insertion from the CEAs for design basis reactivity accidents are predicted not to result in (i) damage to the reactor coolant pressure boundary (RCPB) greater than limited local yielding, or (ii) disruption of the reactor core or reactor internals which would impair the capability to cool the core.

In the power operating range, the net effect of the prompt inherent nuclear feedback characteristics (fuel temperature coefficient, moderator temperature coefficient, moderator void coefficient and moderator pressure coefficient) to an increase in reactor thermal power is predicted to be a decrease in reactivity.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.2.1-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Nuclear Fuel System.



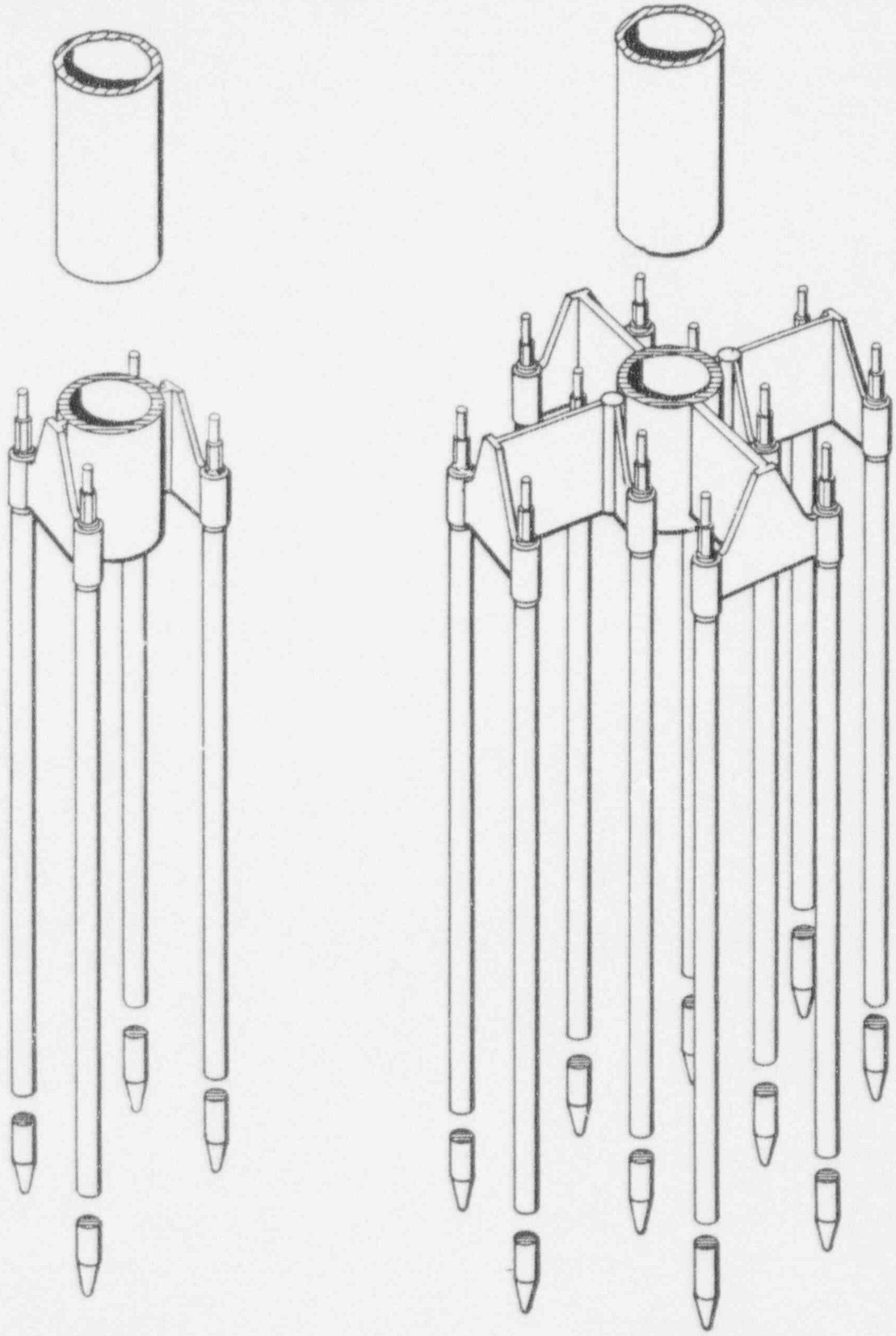


NOTE:

The number of fuel rod locations shown on this figure represnts a minimum number of fuel rod locations. A fuel rod location may be occupied by a fuel rod or a rod containing burnable neutron absorber material or other non-fuel material.

FIGURE 2.2.1-1
FUEL ASSEMBLY

06-17-94



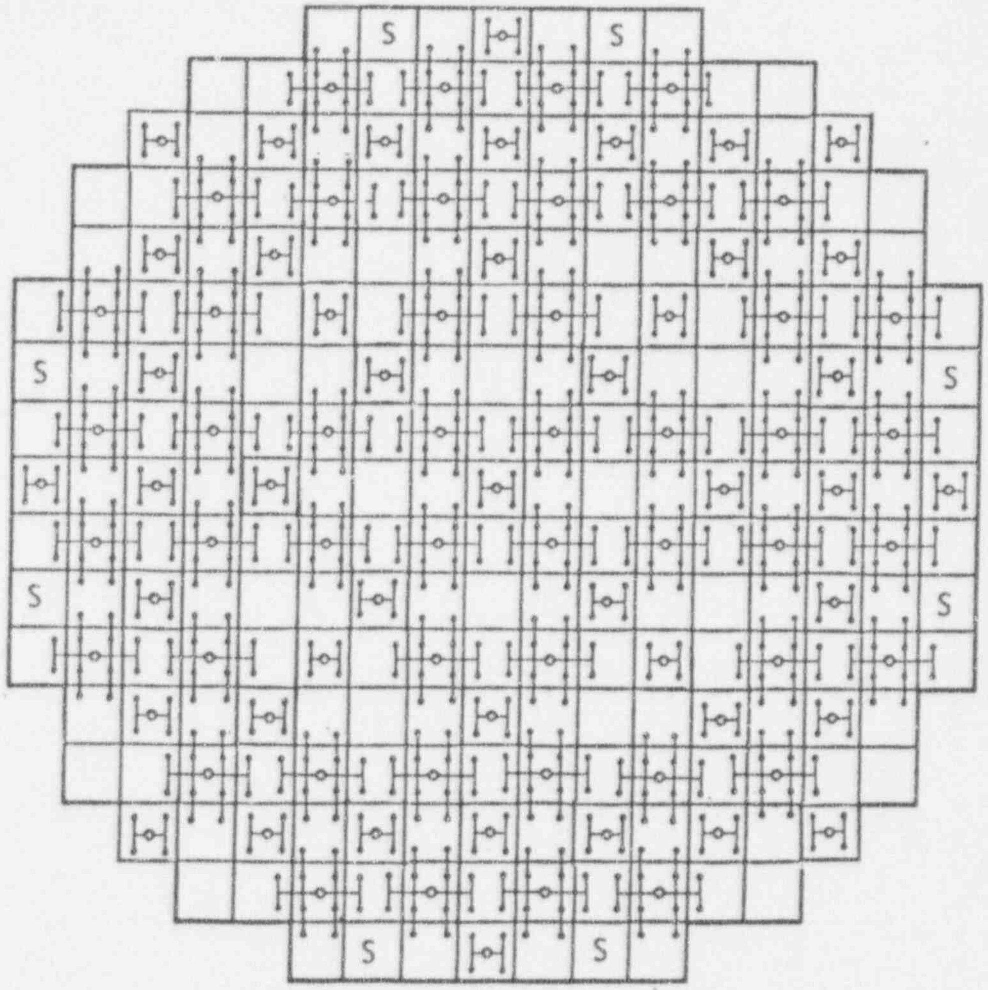
4 FINGER CEA

12 FINGER CEA

NOTE: The number of CEA fingers per CEA shown on this figure represents the minimum (4) and maximum (12) number of CEA fingers per CEA.

FIGURE 2.2.1-2
CONTROL ELEMENT ASSEMBLIES

06-17-94



12 ELEMENT CEAS

4 ELEMENT CEAS

S DENOTES SPARE CEA LOCATIONS

NOTE:

The number of CEAs shown on this figure represents a minimum number of CEAs.

FIGURE 2.2.1-3
NUCLEAR FUEL SYSTEM ARRANGEMENT

06-17-94

TABLE 2.2.1-1

NUCLEAR FUEL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the fuel assemblies, the CEAs, and the Nuclear Fuel System arrangement is as shown on Figures 2.2.1-1, 2.2.1-2 and 2.2.1-3.	1. Inspection of the as-built fuel assemblies, CEAs, and Nuclear Fuel System arrangement will be conducted.	1. For the components and equipment shown on Figures 2.2.1-1 and 2.2.1-2, and the Nuclear Fuel System arrangement shown on Figure 2.2.1-3, the fuel assemblies, CEAs, and Nuclear Fuel System arrangement conform with the Basic Configuration.

2.2.2 CONTROL ELEMENT DRIVE MECHANISM

Design Description

The control element drive mechanism is a magnetic jack device that positions and holds the control element assemblies relative to the fuel assemblies.

The primary safety-related function of the Control Element Drive Mechanism (CEDM) is to release the Control Element Assembly (CEA) upon termination of electrical power to the CEDM. A minimum of 93 CEDMs is required, however, a maximum of one hundred one CEDM can be installed.

The CEDM also acts as a primary pressure boundary as part of the Reactor Coolant System. Refer to Section 2.3.1 for CEDM primary pressure boundary aspects.

Inspections, Tests, Analyses, and Acceptance Criteria

None

The initial test program addressed in Section 2.11 will test the ability of the CEDM to release the CEA upon termination of electrical power to the CEDM.

The Basic Configuration of the CEDM primary pressure boundary components will be verified as part of Section 2.3.1.

The CEDM pattern will be verified as part of Section 2.2.1.

2.3.1 REACTOR COOLANT SYSTEM

Design Description

The Reactor Coolant System (RCS) removes heat generated in the reactor core and transfers the heat to the steam generators. The reactor coolant system forms part of the pressure and fission product boundary between the reactor coolant and the Containment atmosphere.

The Basic Configuration of the RCS is as shown on Figures 2.3.1-1 through 2.3.1-4. The pressure retaining components of the RCS and the RCS instrumentation shown on the figures, except as noted on the Figures, are safety related.

The RCS is located in the Containment and has a reactor vessel (RV), two vertical, U-tube steam generators (SGs), four vertical, shaft sealed reactor coolant pumps (RCPs), one pressurizer (PZR), four pressurizer safety valves, piping, heaters, controls, instrumentation, and valves.

The reactor vessel has a vessel assembly and a removable closure head assembly. The vessel assembly has a shell, lower head, and vessel flange forgings, welded together. The closure head assembly has a dome and head flange forgings, welded together. Forged reactor coolant inlet and outlet nozzles are welded to a shell section. Nozzles for control element drive mechanisms and instrumentation are welded to the closure head assembly, and nozzles for instrumentation are welded to the lower head forging.

RCP seal injection flow is provided by the Chemical and Volume Control System (CVCS). The RCPs have anti-reverse rotation devices.

The RCPs circulate reactor coolant water in loops through the RV to the SGs and back to the RV. The PZR provides a surge volume for the reactor coolant and pressurizes the RCS.

RCS instrumentation has core exit thermocouples (CETs) in the in-core instrumentation (ICI) detector assemblies, heated junction thermocouples (HJTCs) in the HJTC probe assemblies, and differential pressure-based level detectors between the shutdown cooling system (SCS) suction lines and two safety injection system (SIS) direct vessel injection (DVI) lines, and differential pressure-based level detectors between the SCS suction lines and the reactor coolant gas vent subsystem (RCGVS) in the safety depressurization system (SDS). Instrumentation is also provided to measure reactor coolant level across the vertical span of the reactor vessel outlet nozzles.

The pressurizer safety valves provide overpressure protection for reactor coolant pressure boundary components in the RCS. Low temperature overpressure protection for the RCS is provided by the shutdown cooling system (SCS).

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The pressure retaining components of the reactor coolant pressure boundary that are made of ferritic materials meet the fracture toughness requirements of the ASME Code Section III. Reactor vessel beltline materials have Charpy upper shelf energy of no less than 75 ft.-lb. initially. The RV beltline materials are : A-508 Class 2 or 3 for forgings and austenitic stainless steel or Ni-Cr-Fe alloy equivalent to SB-166 for cladding. The reactor vessel base metal in the active core region has a minimum thickness.

The RV is equipped with holders for at least six capsules for accommodating material surveillance specimens. Specimens taken from materials actually used in fabrication of the belt line region are inserted in the capsules and include Charpy V-notch specimens of base metal, weld metal and heat-affected zone material, and tensile specimens from base metal and weld metal.

The RCPs circulate coolant at a rate which removes heat generated in the reactor core.

Each RCP motor has a flywheel which retains its integrity at a design overspeed condition of 125 percent of operating speed.

Each RCP has rotating inertia to slow the pump flow coastdown when electrical power is disconnected

Each SG steam outlet nozzle has an integral flow-limiting venturi.

Each direct vessel injection nozzle cross sectional flow area is limited.

The ASME Code Section III Class for the RCS pressure retaining components shown on Figures 2.3.1-1 through 2.3.1-4 is as depicted on the Figures. Components shown as ASME Code Class 1 on Figures 2.3.1-1 through 2.3.1-4 are designed and constructed in accordance with ASME Code Class 1 requirements. The RV pressure boundary welds are ultrasonically examined during construction in accordance with ASME Code Section XI as it pertains to pre-service baseline inspection.

The safety related equipment shown on Figures 2.3.1-1 through 2.3.1-4 is classified Seismic Category I.

ASME Class 1 and 2 components shown on Figures 2.3.1-1 through 2.3.1-4 have a design pressure of at least 2485 psig and a design temperature of at least 650°F, except the ASME Class 2 portions of the steam generator on Figures 2.3.1-1 and 2.3.1-4, which have a design pressure of at least 1185 psig and a design temperature of at least 570°F.

Displays of the RCS instrumentation shown on Figures 2.3.1-1 through 2.3.1-4 exist in the main control room (MCR) or can be retrieved there.

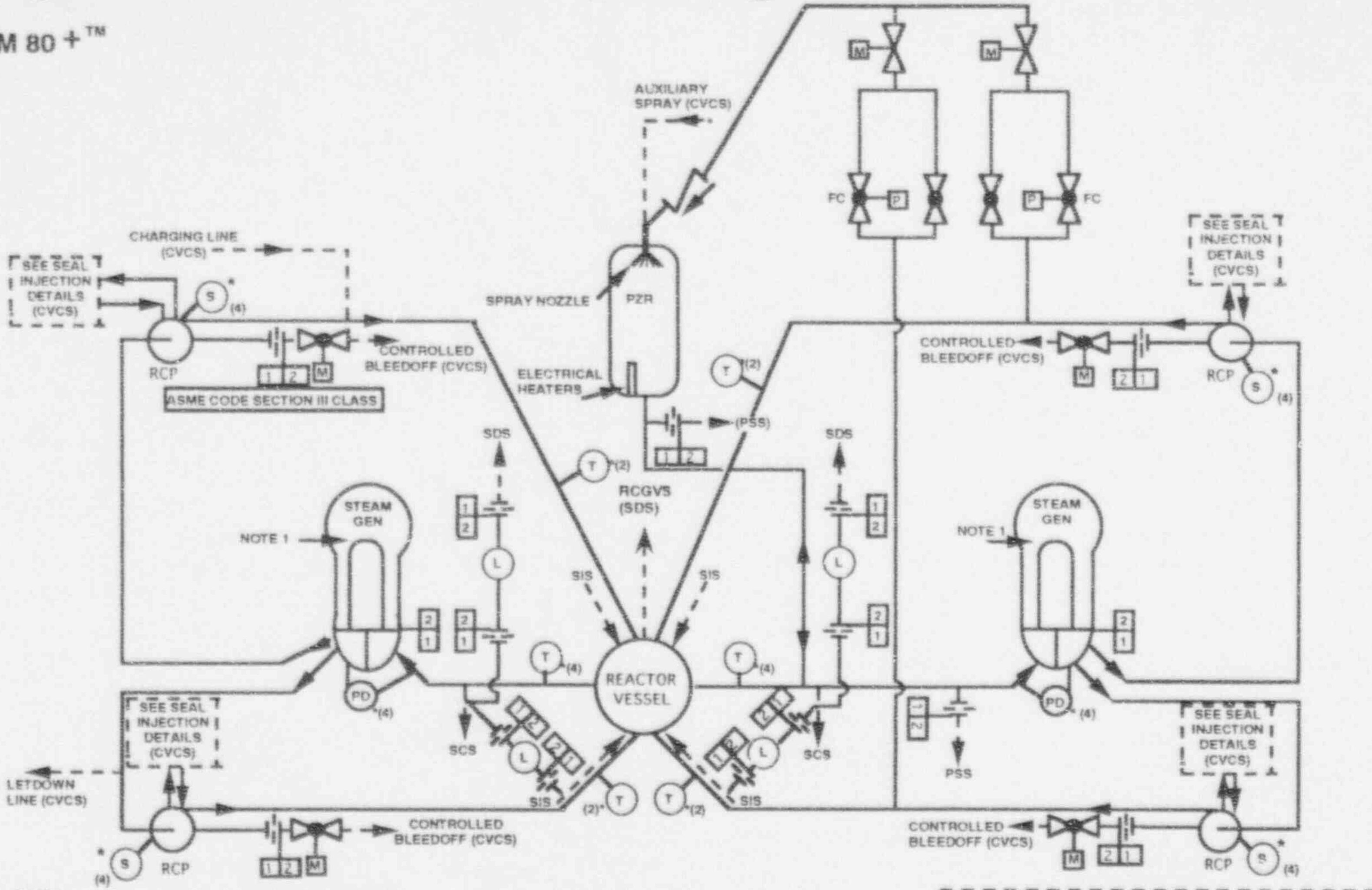
Controls exist in the MCR to start and stop the RCPs, open and close those power operated valves shown on Figures 2.3.1-1 through 2.3.1-4, and energize or de-energize the pressurizer heaters.

Two pressurizer backup heater banks are powered from different Class 1E Divisions. The other pressurizer heaters, the reactor coolant pump motors, and power-operated valves shown on Figure 2.3.1-1 are powered from non-Class 1E sources. Instrumentation shown on Figures 2.3.1-1 through 2.3.1-4 is powered from its respective Class 1E Division except as follows: the instrumentation to measure reactor coolant level across the vertical span of the reactor vessel outlet nozzles, the refueling water level instruments between the SCS suction lines and safety injection system lines, and the refueling water level instruments between the SCS suction lines and the SDS on Figure 2.3.1-1 are powered from non-Class 1E sources. Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the RCS.

Valves with response positions indicated on Figure 2.3.1-1 change position to that indicated on the figure upon loss of motive power.

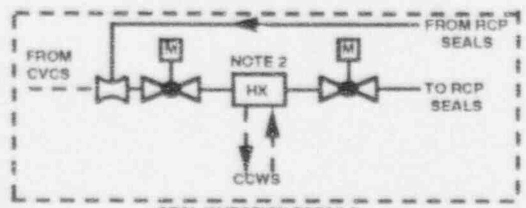
Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.3.1-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Reactor Coolant System.



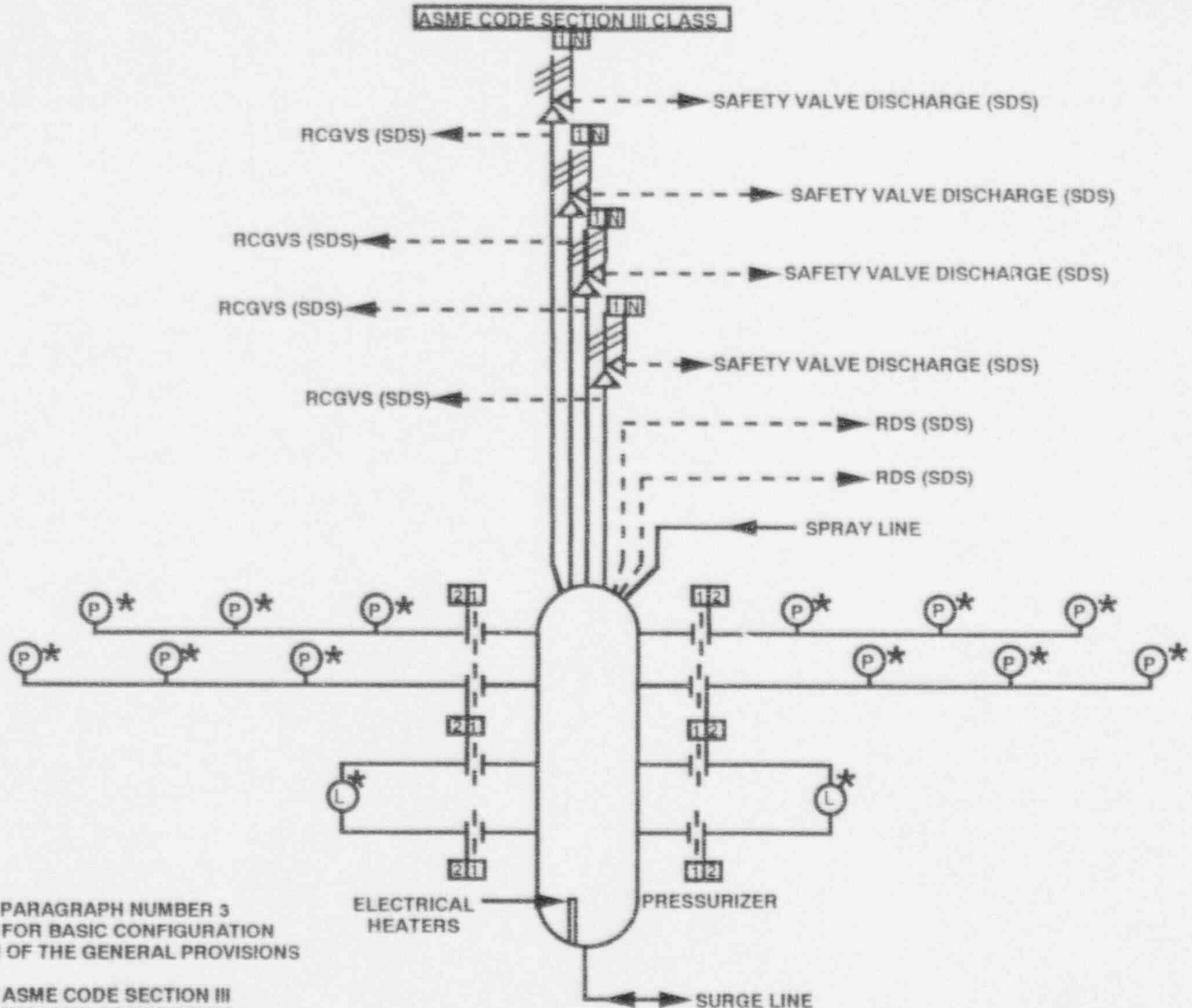
NOTES:

1. SG TUBES ARE ASME CODE SECTION III CLASS 1.
2. TUBE SIDE IS CLASS 1 AND SHELL SIDE IS NON-ASME SECTION III.
3. * : EQUIPMENT FOR WHICH PARAGRAPH NUMBER 3 OF THE "VERIFICATIONS FOR BASIC CONFIGURATION FOR SYSTEMS" SECTION OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.
4. FOR INSTRUMENTS, THE NUMBER OF REDUNDANT DETECTORS AND CHANNELS IS LISTED IN PARENTHESES.
5. THE INSTRUMENTATION (EXCEPT THE LEVEL INSTRUMENTS) AND ASME CODE SECTION III CLASS 1 AND 2 PRESSURE RETAINING COMPONENTS SHOWN ARE SAFETY RELATED. THE SAFETY RELATED INSTRUMENTATION AND TWO SETS OF PRESSURIZER ELECTRICAL HEATERS ARE POWERED FROM THEIR RESPECTIVE CLASS 1E DIVISION.



SEAL INJECTION DETAILS

FIGURE 2.3.1-1
REACTOR COOLANT SYSTEM



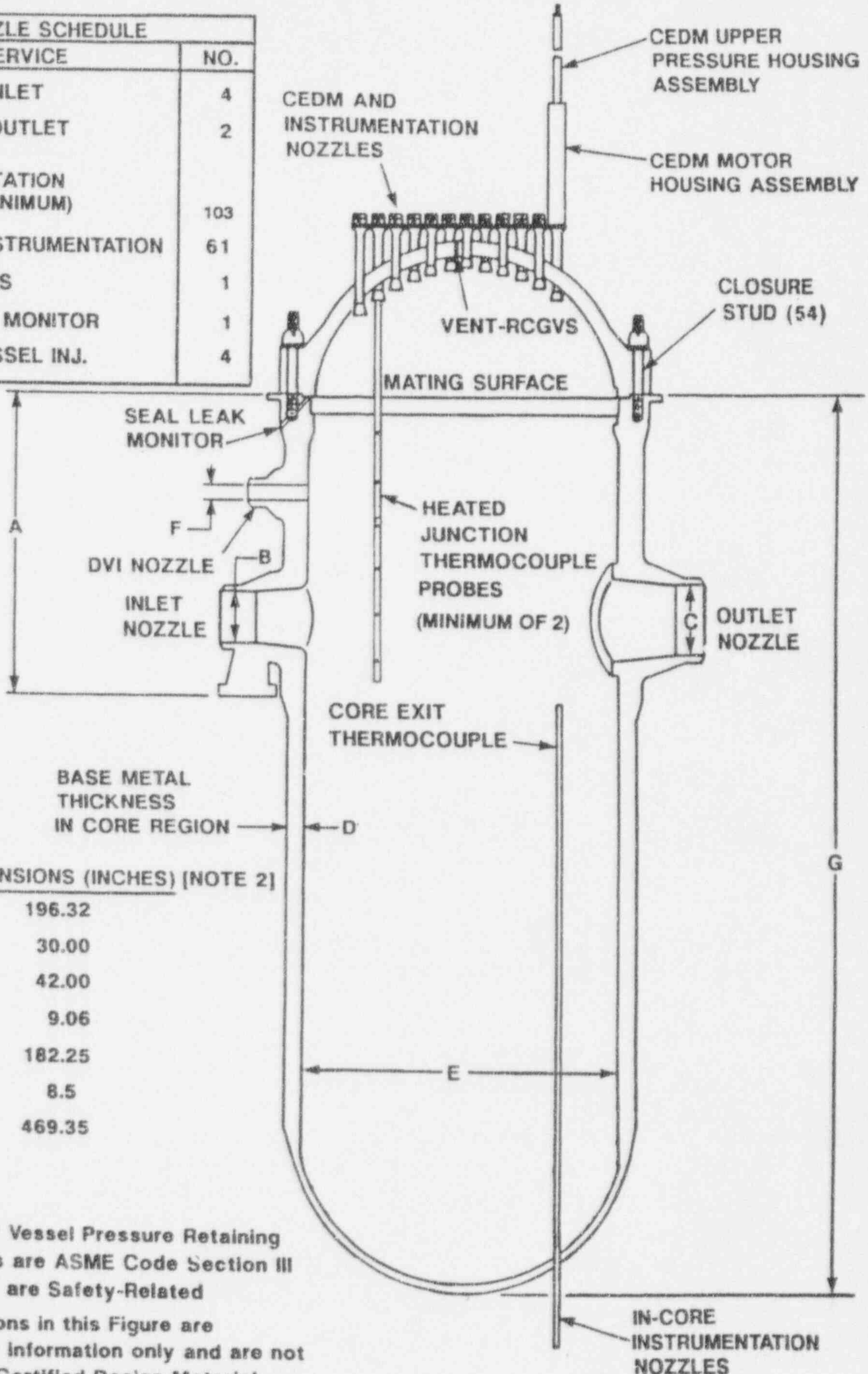
NOTES:

1. *: EQUIPMENT FOR WHICH PARAGRAPH NUMBER 3 OF THE "VERIFICATIONS FOR BASIC CONFIGURATION FOR SYSTEMS" SECTION OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.
2. THE INSTRUMENTATION AND ASME CODE SECTION III CLASS 1 AND 2 PRESSURE RETAINING COMPONENTS SHOWN ARE SAFETY RELATED. THE INSTRUMENTATION AND TWO SETS OF PRESSURIZER ELECTRICAL HEATERS ARE POWERED FROM THEIR RESPECTIVE CLASS 1E DIVISION.

FIGURE 2.3.1-2
REACTOR COOLANT SYSTEM
(PRESSURIZER)

SYSTEM 80+™

NOZZLE SCHEDULE	
SERVICE	NO.
COOLANT INLET	4
COOLANT OUTLET	2
CEDM AND INSTRUMENTATION NOZZLES (MINIMUM)	103
IN-CORE INSTRUMENTATION	61
VENT-RCGVS	1
SEAL LEAK MONITOR	1
DIRECT VESSEL INJ.	4



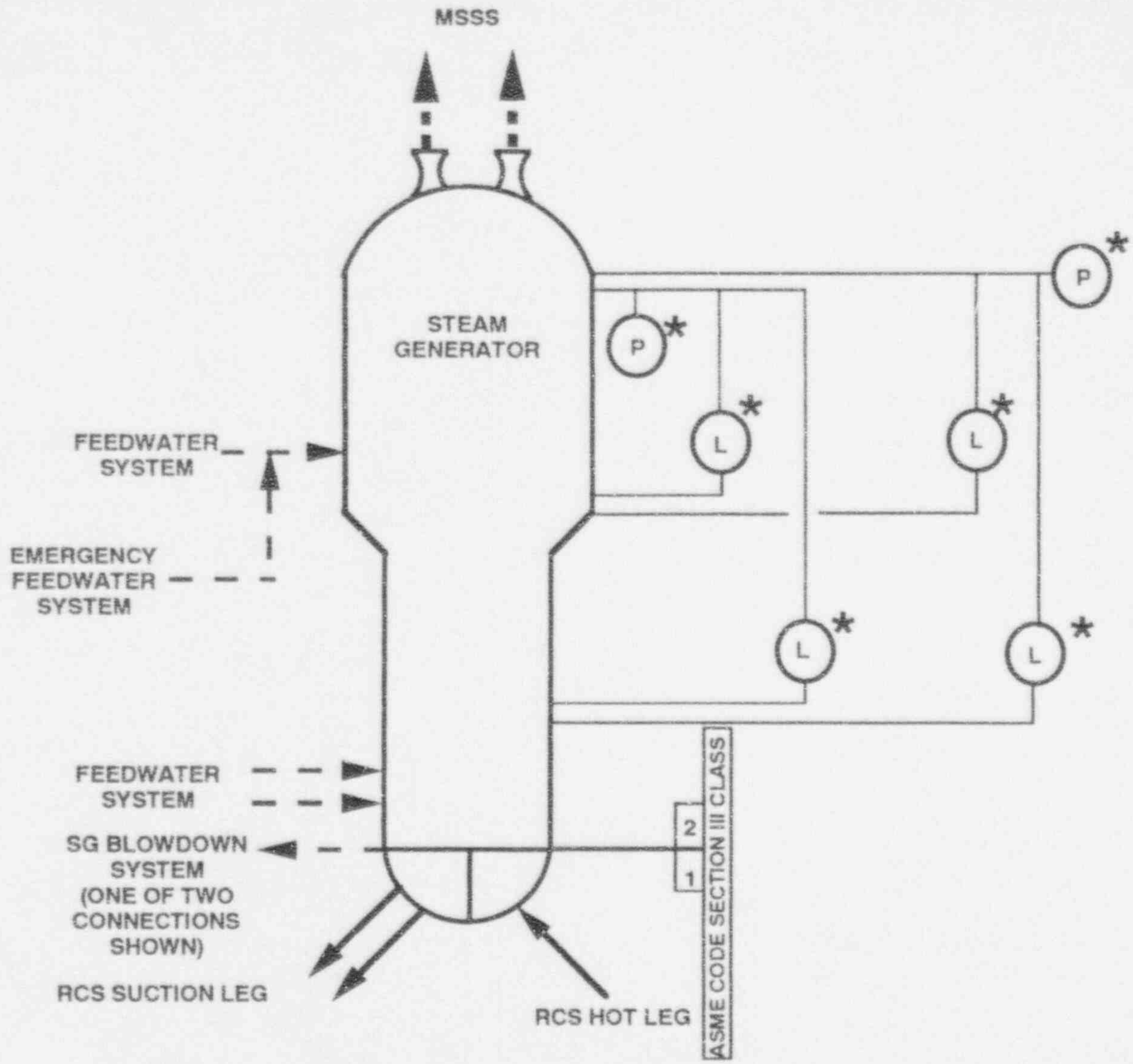
LETTER	DIMENSIONS (INCHES) [NOTE 2]
A	196.32
B	30.00
C	42.00
D	9.06
E	182.25
F	8.5
G	469.35

NOTES:

1. The Reactor Vessel Pressure Retaining Components are ASME Code Section III Class 1 and are Safety-Related
2. The dimensions in this Figure are provided for information only and are not part of the Certified Design Material.

FIGURE 2.3.1-3
REACTOR COOLANT SYSTEM
(REACTOR VESSEL)

06-17-94



NOTES:
1. TWO OF FOUR INSTRUMENT CHANNELS ARE SHOWN. OTHER TWO CHANNELS ARE ARRANGED SIMILARLY.
2. * : EQUIPMENT FOR WHICH PARAGRAPH NUMBER 3 OF THE "VERIFICATION FOR BASIC CONFIGURATION FOR SYSTEMS" SECTION OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.
3. THE INSTRUMENTATION AND ASME CODE SECTION III CLASS 1 AND 2 PRESSURE RETAINING COMPONENTS SHOWN ARE SAFETY-RELATED. THE SAFETY-RELATED INSTRUMENTATION IS POWERED FROM ITS RESPECTIVE CLASS 1E DIVISION.

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FIGURE 2.3.1-4
REACTOR COOLANT SYSTEM (STEAM GENERATOR)

TABLE 2.3.1-1

REACTOR COOLANT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the RCS is as shown on Figures 2.3.1-1 through 2.3.1-4.	1. Inspection of the as-built RCS configuration will be conducted.	1. For the components and equipment shown on Figures 2.3.1-1 through 2.3.1-4, the as-built RCS conforms with the Basic Configuration.
2. The pressurizer safety valves provide overpressure protection for reactor coolant pressure boundary components in the RCS.	2.a) Testing and analysis in accordance with ASME Code Section III will be performed to determine set pressure.	2.a) Pressurizer Safety Valve set pressure equals 2500 psia ± 25 psi.
	b) Type tests of flow capacity of the pressurizer safety valves will be performed in accordance with ASME Code Section III.	b) The minimum valve capacity is 525,000 lb/hr steam.
	c) Type tests of the pressurizer safety valves at full flow and full pressure will be performed.	c) The pressurizer safety valves have been type tested at inlet pressures of at least 2575 psia and the measured valve stem lift is greater than or equal to full flow lift.
3. RV beltline materials have Charpy upper-shelf energy of no less than 75 ft-lb initially.	3. Testing of Charpy V-notch specimens of RCS beltline materials will be performed.	3. The initial RV beltline Charpy upper shelf energy is no less than 75 ft-lb.

TABLE 2.3.1-1 (Continued)

REACTOR COOLANT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4.a) The RV beltline materials are SA-508 Class 2 or 3 for forgings and austenitic stainless steel or Ni-Cr-Fe alloy equivalent to SB-166 for cladding.	4.a) Inspection of the RV beltline material test reports will be conducted.	4.a) The RV beltline materials are SA-508 Class 2 or 3 for forgings and austenitic stainless steel or Ni-Cr-Fe alloy equivalent to SB-166 for cladding.
4.b) The reactor vessel base metal in the active core region has a minimum thickness.	4.b) Inspection of the as-built RV will be performed.	4.b) The RV base metal in the active core region is at least 9.06 inches thick.
5. The RV is equipped with holders for at least six capsules for accommodating material surveillance specimens.	5. Inspection of the RV for presence of capsules will be performed.	5. At least six capsules are in the reactor vessel.
6. RV material specimens taken from the actual material from which the vessel was fabricated are inserted in the capsules, and include Charpy V-notch specimens of base metal, weld metal, and heat-affected zone material, and tensile specimens from base metal and weld metal.	6. Inspection of RV material specimens will be performed.	6. RV material specimens are made from material used in RV fabrication, and include Charpy V-notch specimens of base metal, weld metal, and heat-affected zone material, and tensile specimens from base metal and weld metal.
7.a) The RCPs circulate coolant at a rate which removes heat generated in the reactor core.	7.a) Testing to measure RCS flow with four RCPs operating at normal zero reactor power pressure and temperature conditions will be performed. Analyses to convert the measured pre-core flow rate to an expected post-core flow rate will be performed.	7.a) Calculated post-core RCS flow rate is at least 95 percent of 445,600 gallons per minute (423,320 gpm).

TABLE 2.3.1-1 (Continued)

REACTOR COOLANT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7.b) Each RCP motor has a flywheel which retains its integrity at 125% of operating speed.	7.b) Shop testing of each RCP flywheel will be performed at the vendor facility at overspeed conditions.	7. Each RCP flywheel has passed an overspeed test of no less than 125% of operating speed.
7.c) Each RCP has rotating inertia to slow the pump flow coastdown when electrical power is disconnected.	7.c) Inspection of as-built RCP vendor data will be performed.	7.c) The rotating inertia of each RCP and motor assembly is no less than 147,401 pounds-foot squared.
8. Each steam generator steam outlet nozzle has an integral flow-limiting venturi.	8. Inspection of as-built SG steam outlet nozzles will be performed.	8. Each SG steam outlet nozzle has an integral venturi with a throat area no greater than 1.283 square feet.
9. Each direct vessel injection nozzle cross sectional flow area is limited.	9. Inspection of as-built direct vessel injection nozzles will be performed.	9. Each direct vessel nozzle has a cross sectional flow area no greater than 56.75 square inches.
10.a) The ASME Code Section III RCS components shown on Figures 2.3.1-1 through 2.3.1-4 retain their pressure boundary integrity under internal pressures that will be experienced during service.	10.a) A pressure test will be conducted on those components of the RCS required to be pressure tested by ASME Code Section III.	10.a) The results of the pressure test of the ASME Code Section III components of the RCS conform with the pressure testing acceptance criteria in the ASME Code Section III.
10.b) Components shown as ASME Code Class 1 on Figures 2.3.1-1 through 2.3.1-4 are designed and constructed in accordance with ASME Code Class 1 requirements.	10.b) Inspection of the ASME design reports will be conducted.	10.b) The ASME Code Section III design reports exist for the RCS Class 1 components.

REACTOR COOLANT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11.a) Displays of the RCS instrumentation shown on Figures 2.3.1-1 through 2.3.1-4 exist in the MCR or can be retrieved there.	11.a) Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	11.a) Displays of the instrumentation shown on Figures 2.3.1-1 through 2.3.1-4 exist in the MCR or can be retrieved there.
11.b) Controls exist in the MCR to start and stop the RCPs, to open and close those power operated valves shown on Figures 2.3.1-1 through 2.3.1-4, and to energize or de-energize the pressurizer heaters.	11.b) Testing will be performed using the RCS controls in the MCR.	11.b) RCS controls in the MCR operate to start and stop the RCPs, to open and close those power operated valves shown on Figures 2.3.1-1 through 2.3.1-4, and to energize or de-energize the pressurizer heaters.
12.a) Two pressurizer backup heater banks are powered from different Class 1E Divisions.	12.a) Testing will be performed on the pressurizer heaters by providing a test signal in only one Class 1E Division at a time.	12.a) Within the RCS, a test signal exists only at the equipment powered from the Class 1E Division or bus under test.
12.b) Instrumentation shown on Figures 2.3.1-1 through 2.3.1-4 is powered from its respective Class 1E bus, except as listed in the Design Description.	12.b) Testing will be performed on the Class 1E instrumentation shown on Figures 2.3.1-1 through 2.3.1-4 by providing a test signal in only one Class 1E bus at a time.	12.b) Within the RCS, a test signal exists only at the equipment powered from the Class 1E Division or bus under test.
12.c) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the RCS.	12.c) Inspection of the as-installed Class 1E Divisions of the RCS will be performed.	12.c) Physical separation exists between Class 1E Divisions in the RCS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the RCS.

TABLE 2.3.1-1 (Continued)

REACTOR COOLANT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
13. Valves with response positions indicated on Figure 2.3.1-1 change position to that indicated on the figure upon loss of motive power.	13. Testing of loss of motive power to these valves will be performed.	13. These valves change position to the position indicated on Figure 2.3.1-1 on loss of motive power.

2.3.2 SHUTDOWN COOLING SYSTEM

Design Description

The Shutdown Cooling System (SCS) is a safety-related system which removes heat from the reactor coolant and transfers the heat to the component cooling water system (CCWS) during reduced reactor coolant system (RCS) pressure and temperature conditions. The SCS can be aligned to remove heat from the in-containment refueling water storage tank (IRWST) and transfer the heat to the CCWS. The SCS is actuated manually. The SCS provides low temperature overpressure protection (LTOP) for the RCS.

The SCS is located in the reactor building subsphere and Containment.

The Basic Configuration of the SCS is as shown on Figure 2.3.2-1.

The SCS consists of two Divisions. Each SCS Division has a SCS pump, a SCS heat exchanger, valves, piping, controls, and instrumentation.

Each SCS Division has the heat removal capacity to cool the reactor coolant from SCS entry conditions to cold shutdown conditions, within 36 hours after reactor shutdown, assuming SCS operation commences no later than 14 hours after reactor shutdown.

Each SCS Division has the heat removal capacity to cool the IRWST after design bases events or feed and bleed operation using the SIS and SDS.

Each SCS Division contains a relief valve that provides LTOP for the RCS when the RCS is connected to the SCS.

The SCS pump and the containment spray system (CSS) pump in the same Division are connected by piping and valves such that the CSS pump in a Division can perform the pumping function of the SCS pump in that Division. The piping and valves in the cross-connect line between the SCS pump suction and the CSS pump suction permit flow in either direction.

In each Division, a flow-limiting device is installed downstream from the SCS pump discharge between the cross-connect line from the CSS pump discharge and the Containment isolation valves in the SCS pump discharge line to limit runout flow.

The piping from the RCS to the SCS pump suction is self venting and contains no loop seals.

The SCS pumps can be tested at design flow during plant operation.

The ASME Code Section III Class for the SCS pressure retaining components shown on Figure 2.3.2-1 is as depicted on the Figure.

Safety related equipment shown on Figure 2.3.2-1 is classified Seismic Category I.

SCS pressure retaining components shown on Figure 2.3.2-1, except the shell sides of heat exchangers, have a design pressure of at least 900 psig.

Displays of the SCS instrumentation shown on Figure 2.3.2-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to start and stop the SCS pumps, and to open and close those power operated valves shown on Figure 2.3.2-1. SCS alarms shown on Figure 2.3.2-1 are provided in the MCR.

Water is supplied to each SCS pump at a pressure greater than the pump's required net positive suction head (NPSH) during expected operations.

The Class 1E loads shown on Figure 2.3.2-1 are powered from their respective Class 1E Division. The SCS pump motor and the CSS pump motor in each Division are powered from different Class 1E buses in that Division.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the SCS.

The two mechanical Divisions of the SCS are physically separated.

A containment spray actuation signal (CSAS) can be aligned to start an SCS pump when the CSS pump in the same Division is not operable. If the CSAS is aligned to start the SCS pump in a Division, the CSS pump in the same Division will not start on a CSAS.

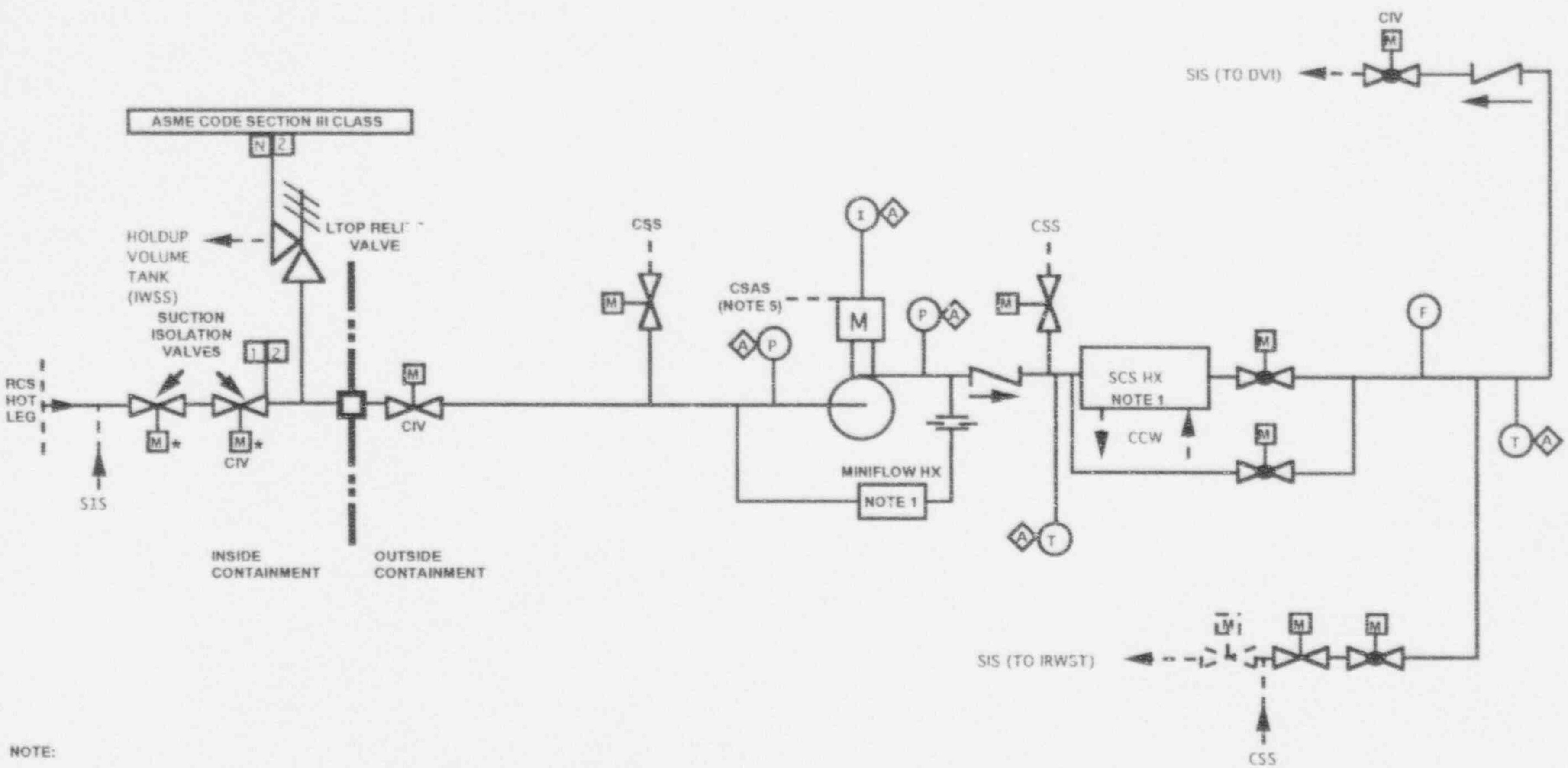
SCS suction line isolation valves have independent interlocks to prevent opening the isolation valves if reactor coolant pressure would cause the SCS LTOP relief valve to lift.

Motor operated valves (MOVs) having an active safety function will open, or will close, or will open and also close, under differential pressure or fluid flow conditions and under temperature conditions.

Check valves shown on Figure 2.3.2-1 will open, or will close, or will open and also close, under system pressure, fluid flow conditions, or temperature conditions.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.3.2-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Shutdown Cooling System.



NOTE:

1. TUBESIDE IS ASME CODE SECTION III CLASS 2 AND SHELLSIDE IS ASME CODE SECTION III CLASS 3.
2. SAFETY-RELATED ELECTRICAL COMPONENTS AND EQUIPMENT SHOWN ON THIS FIGURE ARE CLASS 1E. ALARMS AND PRESSURE AND CURRENT INSTRUMENTS ARE NOT SAFETY- RELATED AND NOT CLASS 1E.
3. *: EQUIPMENT FOR WHICH PARAGRAPH NUMBER 3 OF THE " VERIFICATION FOR BASIC CONFIGURATION FOR SYSTEMS" SECTION OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.
4. THE ASME CODE SECTION III CLASS 1 AND 2 PRESSURE RETAINING COMPONENTS SHOWN ARE SAFETY-RELATED.
5. ONLY WHEN THE CSAS IS ALIGNED TO THE SCS PUMP.

FIGURE 2.3.2-1
SHUTDOWN COOLING SYSTEM
(ONE OF TWO DIVISIONS)

06-17-94

TABLE 2.3.2-1

SHUTDOWN COOLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the SCS is as shown on Figure 2.3.2-1.	1. Inspection of the as-built SCS configuration will be conducted.	1. For the components and equipment shown on Figure 2.3.2-1, the as-built SCS conforms with the Basic Configuration.
2.a) Each SCS Division has the heat removal capacity to cool the reactor coolant from SCS entry conditions to cold shutdown conditions.	2.a) Testing and analysis of the SCS to measure pump head and the shutdown cooling flow at the combined discharge of the SCS heat exchanger and heat exchanger bypass line will be performed. Testing, inspection, and analyses will be performed to determine the heat removal capability of the SCS heat exchanger.	2.a) Flow through the SCS heat exchanger and heat exchanger bypass line can be adjusted while maintaining a flow of no less than 5000 gpm per Division. Each SCS pump provides at least 400 feet of head at a flow rate no less than 5000 gpm. The heat removal capability of one SCS Division, as measured by the product of the service heat transfer coefficient and the effective heat transfer area of the SCS heat exchanger is no less than 1.38×10^6 BTU/hr - °F.
2.b) Each SCS Division has the heat removal capacity to cool the IRWST after design bases events or feed and bleed operation using the SIS and SDS.	2.b) Testing and analyses of the SCS to measure pump head and flow at the combined discharge of the SCS heat exchanger, with suction and return lines aligned to the IRWST, will be performed.	2.b) Each SCS pump develops at least 400 feet of head at a flow rate no less than 5000 gpm.

TABLE 2.3.2-1 (Continued)

SHUTDOWN COOLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3. Each SCS Division contains a relief valve that provides LTOP for the RCS when the RCS is connected to the SCS.	3. Shop testing of the LTOP relief valve set pressure will be performed. Shop testing and analyses of the LTOP relief valves capacity will be conducted in accordance with ASME Code Section III.	3. LTOP relief valve set pressure is not greater than 545 psia and each valve has a capacity of no less than 5000 gpm.
4. The CSS pump in a Division can perform the function of the SCS pump in the Division.	4. Testing to measure the flowrate produced by the CSS pump, when its suction is cross-connected to the SCS pump suction and its discharge to the SCS pump discharge, will be performed.	4. The CSS pump in a Division develops at least 400 ft of head at a flow of at least 5000 gpm through the SCS heat exchanger in the Division.
5. In each Division, a flow limiting device is installed downstream from the SCS pump discharge between the cross-connect line from the CSS pump discharge and the Containment isolation valves to limit runout flow.	5. Testing will be performed with flow aligned to the RCS (suction from the hot leg and discharge to the direct vessel injection nozzle.)	5. In each Division, a flow limiting device is installed downstream from the SCS pump discharge between the cross-connect line from the CSS pump discharge and the containment isolation valves. The SCS maximum flow is less than or equal to 6500 gpm in each Division.
6. The piping from the RCS to the SCS pump suction is self-venting and contains no loop seals.	6. Inspection of the as-built piping will be conducted.	6. The piping from the RCS to the SCS pump suction has no loop seals and is oriented downward or horizontal except for an upward section connecting to the pump suction flange.

TABLE 2.3.2-1 (Continued)

SHUTDOWN COOLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. The SCS pumps can be tested at design flow during plant operation.	7. Testing and analysis of the SCS will be performed by manually aligning suction and discharge valves to the IRWST and starting the SCS pumps manually.	7. Each SCS pump develops at least 400 ft of head at a flow of at least 5000 gpm through the test loop.
8. The ASME Code Section III SCS components shown on Figure 2.3.2-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	8. A pressure test will be conducted on those components of the SCS required to be pressure tested by ASME Code Section III.	8. The results of the pressure test of ASME Code Section III components of the SCS conform with the pressure testing acceptance criteria in ASME Code Section III.
9.a) Displays of the SCS instrumentation shown on Figure 2.3.2-1 exist in the MCR or can be retrieved there.	9.a) Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	9.a) Displays of the instrumentation shown on Figure 2.3.2-1 exist in the MCR or can be retrieved there.
9.b) Controls exist in the MCR to start and stop the SCS pumps, and to open and close those power operated valves shown on Figure 2.3.2-1.	9.b) Testing will be performed using the SCS controls in the MCR.	9.b) SCS controls in the MCR operate to start and stop the SCS pumps, and to open and close those power operated valves shown in Figure 2.3.2-1.
9.c) SCS alarms shown on Figure 2.3.2-1 are provided in the MCR.	9.c) Testing of the SCS alarms shown on Figure 2.3.2-1 will be performed using signals simulating alarm conditions.	9.c) The SCS alarms shown on Figure 2.3.2-1 actuate in the MCR in response to a signal simulating alarm conditions.
10. Water is supplied to each SCS pump at a pressure greater than the pump's required net positive suction head (NPSH).	10. Testing to measure SCS pump suction pressure will be performed. Inspections and analyses to determine NPSH available to each pump will be prepared based on test data and as-built data.	10. The calculated available NPSH exceeds each SCS pump's required NPSH.

TABLE 2.3.2-1 (Continued)

SHUTDOWN COOLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11.a) Class 1E loads shown on Figure 2.3.2-1 are powered from their respective Class 1E Division.	11.a) Testing will be performed on the SCS by providing a test signal in only one Class 1E Division at a time.	11.a) Within the SCS, a test signal exists only at the equipment powered from the Class 1E Division under test.
11.b) The SCS pump motor and the CSS pump motor in each Division are powered from different Class 1E buses in that Division.	11.b) Testing on the SCS and the CSS will be conducted with a test signal applied to one class 1E bus at a time.	11.b) A test signal exists only at the SCS pump motor or CSS pump motor powered from the Class 1E bus under test.
11.c) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the SCS.	11.c) Inspection of the as-installed Class 1E Divisions of the SCS will be performed.	11.c) Physical separation exists between Class 1E Divisions in the SCS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the SCS.
12. The two mechanical Divisions of the SCS are physically separated.	12. Inspection of the as-built SCS mechanical Divisions will be performed.	12. The two mechanical Divisions of the SCS are separated by a Divi-sional wall or a fire barrier except for components of the system within Containment which are sep-arated by spatial arrangement or barriers.
13. SCS suction line isolation valves have independent interlocks to prevent opening the isolation valves if RCS pressure would cause the SCS LTOP relief valve to lift.	13. Testing using a simulated RCS pressure signal greater than the SCS suction line valves interlock pressure will be performed by attempting to open the valves from the MCR. Each valve will be tested independently.	13. The SCS suction isolation valves do not open.

TABLE 2.3.2-1 (Continued)

SHUTDOWN COOLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
14. Motor operated valves (MOVs) having an active safety function will open, or will close, or will open and also close, under differential pressure or fluid flow conditions and under temperature conditions.	14. Testing will be performed to open, or close, or open and also close, MOVs having an active safety function under preoperational differential pressure or fluid flow conditions and under temperature conditions.	14. Each MOV having an active safety function opens, or closes, or opens and also closes.
15. Check valves shown on Figure 2.3.2-1 will open, or will close, or will open and also close under system pressure, fluid flow conditions, or temperature conditions.	15. Testing will be performed to open, or close, or open and also close check valves shown on Figure 2.3.2-1 under system preoperational pressure, fluid flow conditions or temperature conditions.	15. Each check valve shown on Figure 2.3.2-1 opens, or closes, or opens and also closes.
16. A containment spray actuation signal (CSAS) can be aligned to start an SCS pump when the CSS pump in the same Division is not operable. If the CSAS is aligned to start the SCS pump in a Division, the CSS pump in the same Division will not start on a CSAS.	16. Testing will be performed with the CSAS aligned to start the SCS pump using a signal simulating a CSAS.	16. A signal simulating a CSAS starts the SCS pump in a Division and does not start the CSS pump in the same Division, when the CSAS is aligned to start the SCS pump.

2.3.3 REACTOR COOLANT SYSTEM COMPONENT SUPPORTS

Design Description

The reactor vessel, the steam generators, the reactor coolant pumps and the pressurizer are supported by the reactor coolant system (RCS) component supports. The RCS component supports permit movement of the RCS components due to expansion and contraction of the RCS. The component supports are safety related.

The RCS component supports are located within the containment.

The four reactor vessel support columns vertically support the reactor vessel and accommodate horizontal thermal expansion. Each reactor vessel nozzle cold leg forging mates with a reactor vessel support column and serves as a key which mates with a keyway. Lower keys protruding from the reactor vessel mate with a slot in each support column base plate. The slot in the support column base plate serves as a keyway. These horizontal keys and keyways guide the vessel during expansion and contraction of the RCS, maintain the vessel centerline position, and laterally support the vessel. The Basic Configuration of the Reactor Vessel Supports is as shown on Figure 2.3.3-1.

Each steam generator (SG) is supported at the bottom by an integral skirt attached to a sliding base plate resting on bearings. The bearings allow the SG to move as the RCS expands and contracts. Keys and keyways within the sliding base guide the movement of the SG during expansion and contraction of the RCS and limit movement of the SG bottom in the direction at right angles to the direction of motion during RCS expansion and contraction. The upper portion of the SG is supported by a system of keys, keyways and snubbers. The upper SG support system guides the top of the steam generator during expansion and contraction of the RCS and laterally supports the SG. The Basic Configuration of the SG Supports is as shown on Figure 2.3.3-2.

Each reactor coolant pump (RCP) is supported by vertical columns, lower and upper horizontal columns, and snubbers. The columns provide vertical and horizontal support of the RCP, while allowing movement of the RCP during expansion and contraction of the RCS. The Basic Configuration of the RCP Supports is as shown on Figure 2.3.3-3.

The pressurizer is supported at the bottom by an integral skirt. Keys and keyways provide lateral support of the upper portion of the pressurizer. The Basic Configuration of the Pressurizer Supports is as shown on Figure 2.3.3-4.

The RCS Supports are designed for loads due to normal operation, testing, seismic, and accident conditions.

The Reactor Coolant System Component Supports are designed and constructed in accordance with the ASME Code, Section III requirements and are classified Seismic Category I.

Inspection, Test, Analyses, and Acceptance Criteria

Table 2.3.3-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Reactor Coolant System Component Supports.

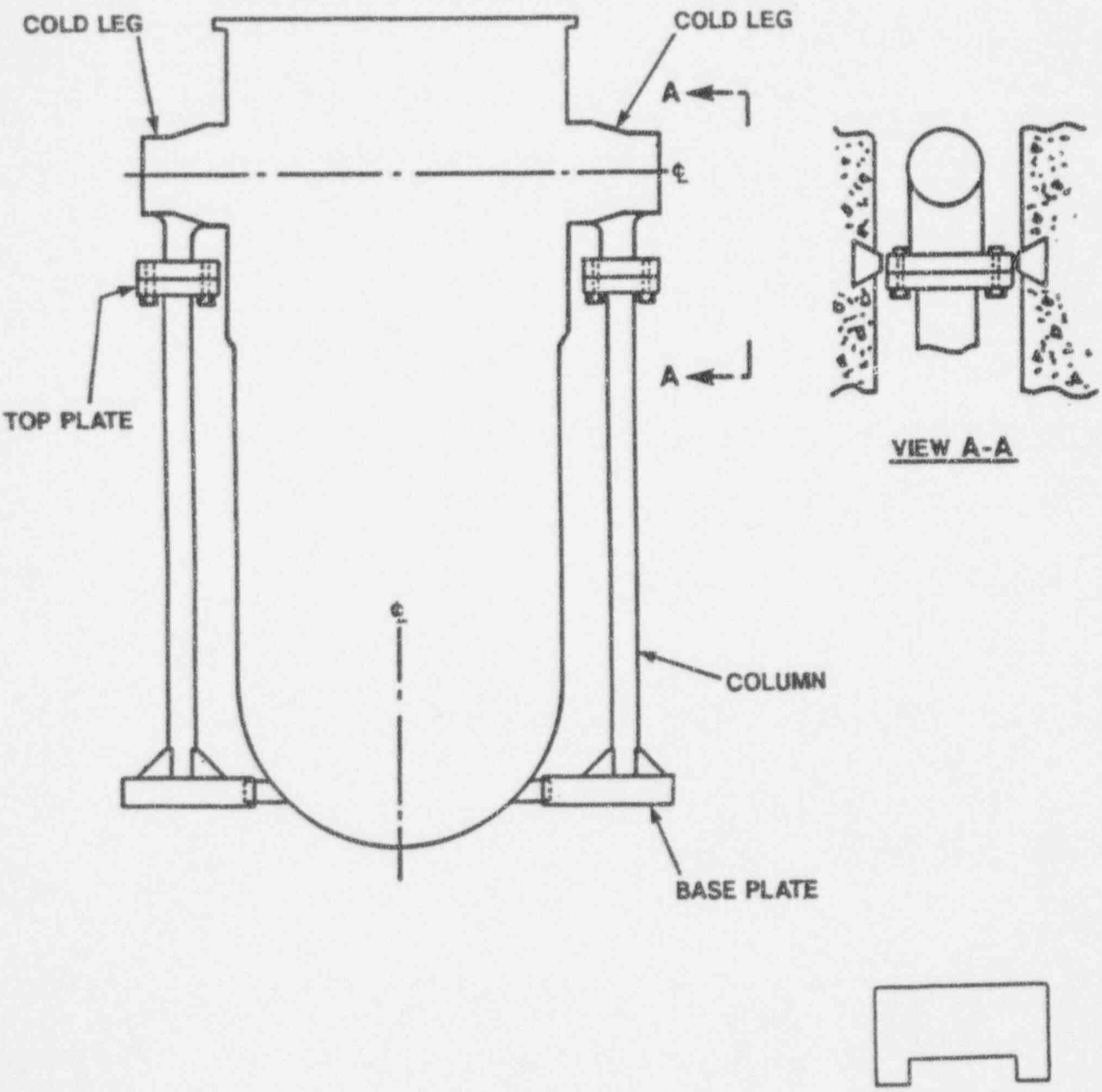


FIGURE 2.3.3-1
REACTOR VESSEL SUPPORTS

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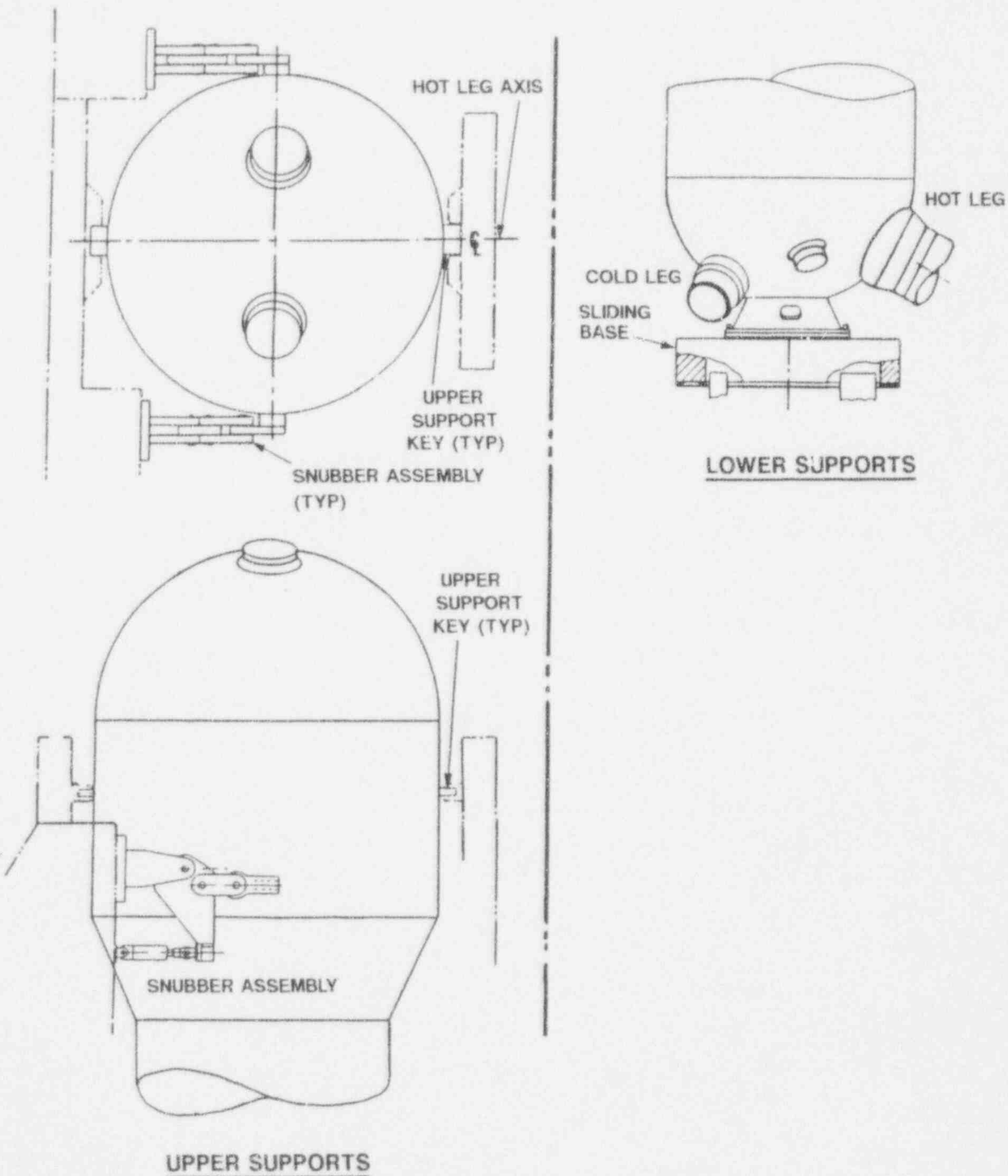

FIGURE 2.3.3-2
STEAM GENERATOR SUPPORTS

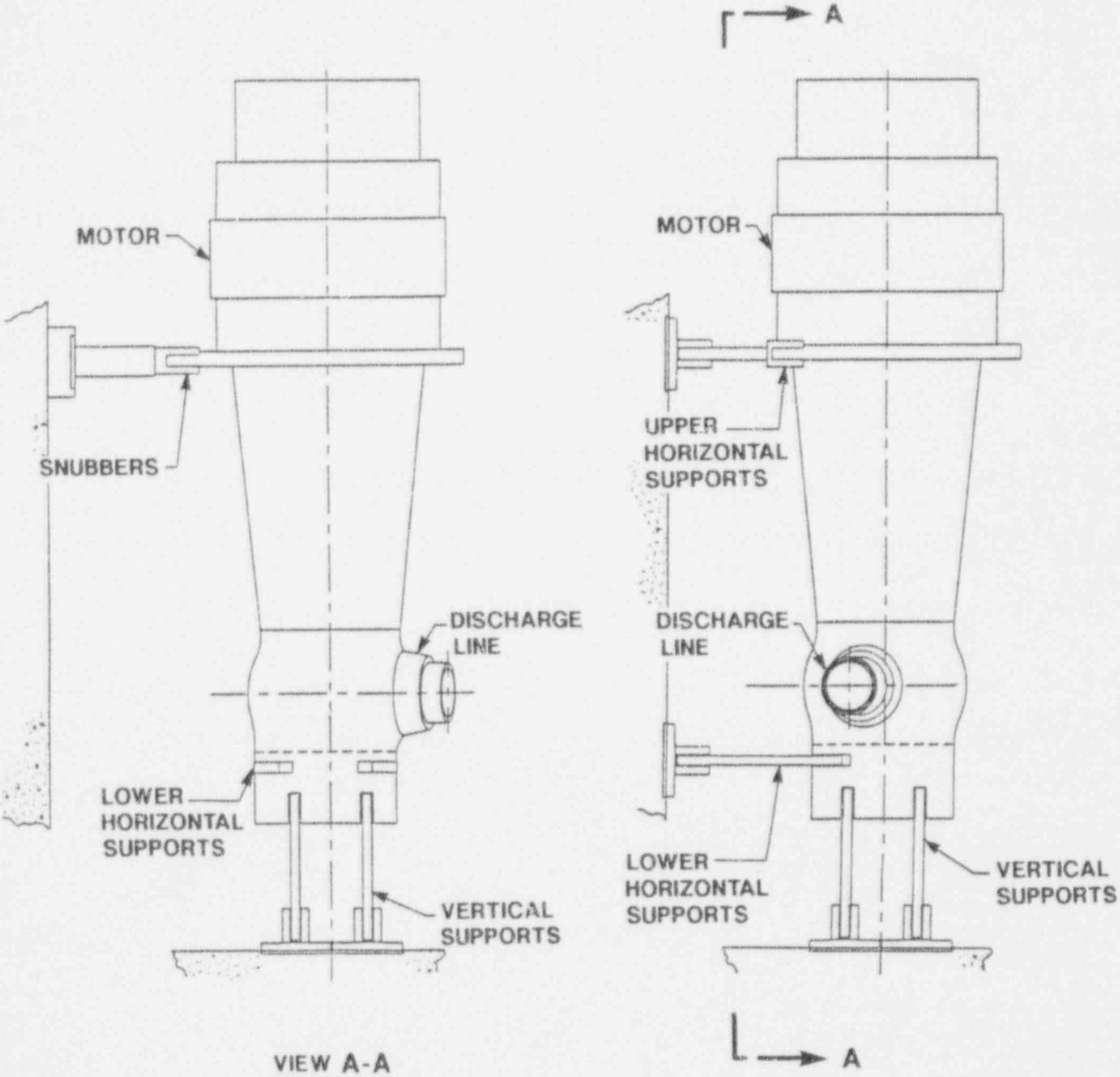

FIGURE 2.3.3-3
REACTOR COOLANT PUMP SUPPORTS

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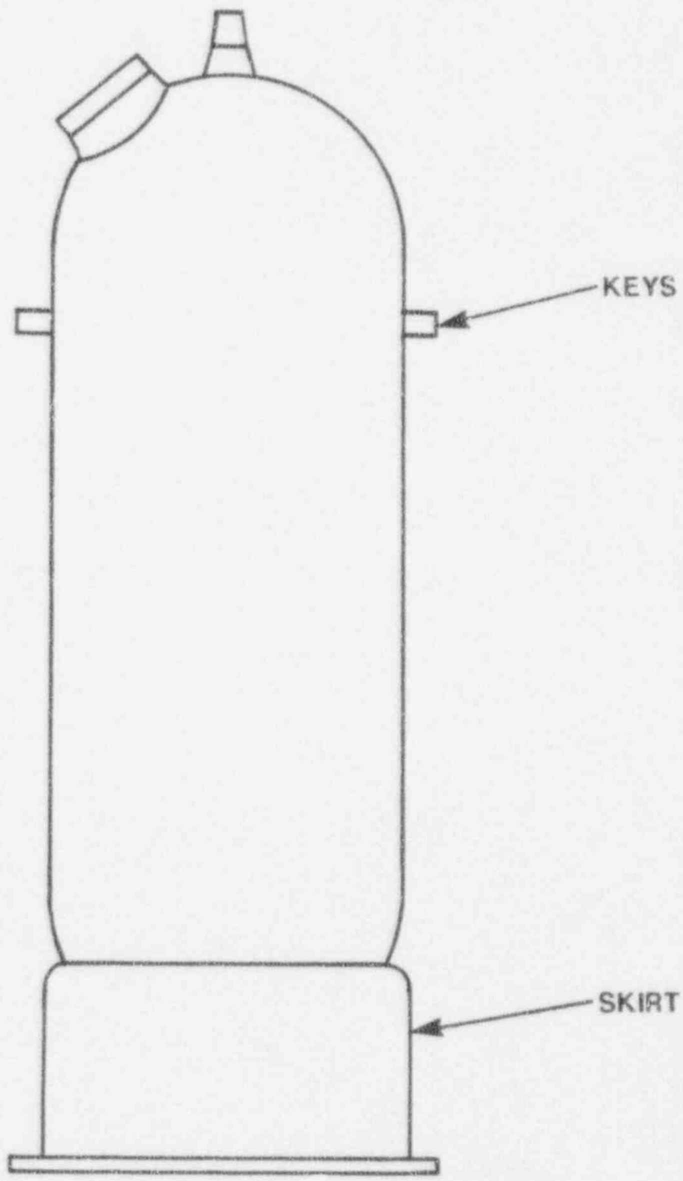

FIGURE 2.3.3-4
PRESSURIZER SUPPORTS

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TABLE 2.3.3-1

REACTOR COOLANT SYSTEM COMPONENT SUPPORTS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The RCS component supports permit movement of the RCS components due to expansion and contraction of the RCS.	1. A test of the RCS will be performed to monitor thermal motion during heatup and cooldown of the RCS.	1. Required gaps exist for the RCS component supports.
2. The Reactor Coolant System Component Supports are designed and constructed in accordance with the ASME Code, Section III.	2. Inspection will be performed for the existence of the ASME Code Section III Design Reports for the Reactor Coolant System Component Supports.	2. ASME Code Section III Design Reports exist for the Reactor Coolant System Component Supports.
3. The Basic Configuration of the RCS Component Supports is as shown on Figures 2.3.3-1 through 2.3.3-4.	3. Inspection of the as-built RCS Component Supports configuration will be conducted.	3. For the RCS Component Supports shown on Figures 2.3.3-1 through 2.3.3-4, the as-built RCS Component Supports conform with the Basic Configuration.
4. The as-built RCS Component Supports are reconciled with the as-designed configuration.	4. Inspection of the RCS Component Supports will be performed to confirm their designed conditions.	4. The as-built RCS Component Supports are reconciled with the as-designed support system.

2.3.4 NSSS INTEGRITY MONITORING SYSTEM

Design Description

The NSSS Integrity Monitoring System (NIMS) is a non-safety-related instrumentation and control system which consists of the Internals Vibration Monitoring System (IVMS), the Acoustic Leak Monitoring System (ALMS), and the Loose Parts Monitoring System (LPMS). The NIMS provides data to the data processing system (DPS). The IVMS provides data from which changes in the motion of the reactor internals can be detected. The ALMS provides data and alarms in response to high acoustic levels originating from a reactor coolant pressure boundary (RCPB) leak. The LPMS provides data and alarms in response to vibration of the RCPB associated with loose parts within the RCPB.

The NIMS is located in the nuclear island structures.

Displays of the NIMS instrumentation exist in the main control room (MCR) or can be retrieved there.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.3.4-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the NSSS Integrity Monitoring System.

TABLE 2.3.4-1

NSSS INTEGRITY MONITORING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The IVMS provides data from which changes in the motion of the reactor internals can be detected.	1. Testing will be performed on the IVMS by providing a test signal simulating a time-varying signal from the ex-core neutron detector channels.	1. The IVMS provides data to the DPS in response to the test signal.
2. The ALMS provides data and alarms in response to high acoustic levels originating from a RCPB leak.	2.a) Inspection of the as-built ALMS configuration will be performed.	2.a) ALMS sensors are provided in locations specified in Table 2.3.4-2.
	2.b) Testing will be performed on the ALMS by providing a test signal simulating high acoustic levels.	2.b) The ALMS provides data and alarms to the DPS in response to the test signal.
3. The LPMS provides data and alarms in response to vibration of the RCPB associated with loose parts within the RCPB.	3.a) Inspection of the as-built LPMS configuration will be performed.	3.a) LPMS sensors are provided in locations specified in Table 2.3.4-3.
	3.b) Testing will be performed on the LPMS by providing a test signal simulating motion of the RCPB locations.	3.b) The LPMS provides data and alarms to the DPS in response to the test signal.
4. Displays of the NIMS instrumentation exist in the MCR or can be retrieved there.	4. Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	4. Displays of the NIMS instrumentation exist in the MCR or can be retrieved there.

TABLE 2.3.4-2

SENSOR LOCATIONS FOR ACOUSTIC LEAK MONITORING SYSTEM

COMPONENT	NUMBER OF SENSORS	LOCATION
Reactor Coolant Pump	4 (1 per pump)	Seal
Steam Generators	2 (1 per SG)	Primary side, manway
Hot Legs	2 (1 per Leg)	Reactor vessel outlet nozzle
Cold Legs	4 (1 per Leg)	Reactor vessel inlet nozzle
Reactor Vessel	3	Upper head, CEDM nozzles
Reactor Vessel	1	Lower head, instrument nozzle
Pressurizer Safety Valves	4 (1 per valve)	Discharge line
Pressurizer	1	Heater region

TABLE 2.3.4-3

SENSOR LOCATIONS FOR LOOSE PARTS MONITORING SYSTEM

COMPONENT	NUMBER OF SENSORS	LOCATION
Reactor Vessel	3	Lower Head
	3	Upper Head
Steam Generator 1	4	Primary (inlet plenum) Primary (outlet plenum) Secondary (economizer region) Secondary (can deck region)
Steam Generator 2	4	Primary (inlet plenum) Primary (outlet plenum) Secondary (economizer region) Secondary (can deck region)

2.4.1 SAFETY DEPRESSURIZATION SYSTEM

Design Description

The Safety Depressurization System (SDS) is a safety-related system composed of two subsystems. The reactor coolant gas vent subsystem (RCGVS) provides a means to vent steam and non-condensible gases from the pressurizer (PZR) and the reactor vessel upper head (RVUH). The rapid depressurization subsystem (RDS) provides a means to rapidly depressurize the RCS by venting the PZR. The SDS is manually actuated.

The SDS is located inside Containment.

The Basic Configuration of the SDS is as shown on Figure 2.4.1-1.

The SDS consists of two redundant RDS piping trains from the pressurizer to the spargers in the in-containment refueling water storage tank (IRWST), and two RCGVS piping trains, one from the pressurizer and one from the RVUH, which discharge to either the reactor drain tank (RDT) or the IRWST spargers.

The RCGVS venting capacity will depressurize the RCS following design basis events.

The RDS depressurization capacity, in conjunction with safety injection system (SIS) operation, will prevent uncovering the core during a total loss of feedwater (TLOFW).

The ASME Code Section III Class for the SDS pressure retaining components shown on Figure 2.4.1-1 is as depicted on the figure.

The safety-related equipment and the ultrasonic instruments on the PZR safety valve discharge lines shown on Figure 2.4.1-1 are classified Seismic Category I.

Displays of the SDS instrumentation shown on Figure 2.4.1-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to open and close those power-operated valves shown on Figure 2.4.1-1. SDS alarms shown on Figure 2.4.1-1 are provided in the MCR.

Within the RDS, in one mechanical train, each isolation valve is powered from a different Class 1E bus within its Class 1E Division, and in the other mechanical train, each isolation valve is powered from a different Class 1E bus in the other Class 1E Division. Within the RCGVS, in the pressurizer vent train and in the RVUH vent train, each isolation valve in one branch line is powered from a different Class 1E bus within its Class 1E Division, and each isolation valve in the other branch line is powered from a different Class 1E bus in the other Class 1E Division. The isolation valve to the RDT and the cross-connect valve between discharge lines to the RDT and the IRWST are powered from different Class 1E Divisions.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the SDS.

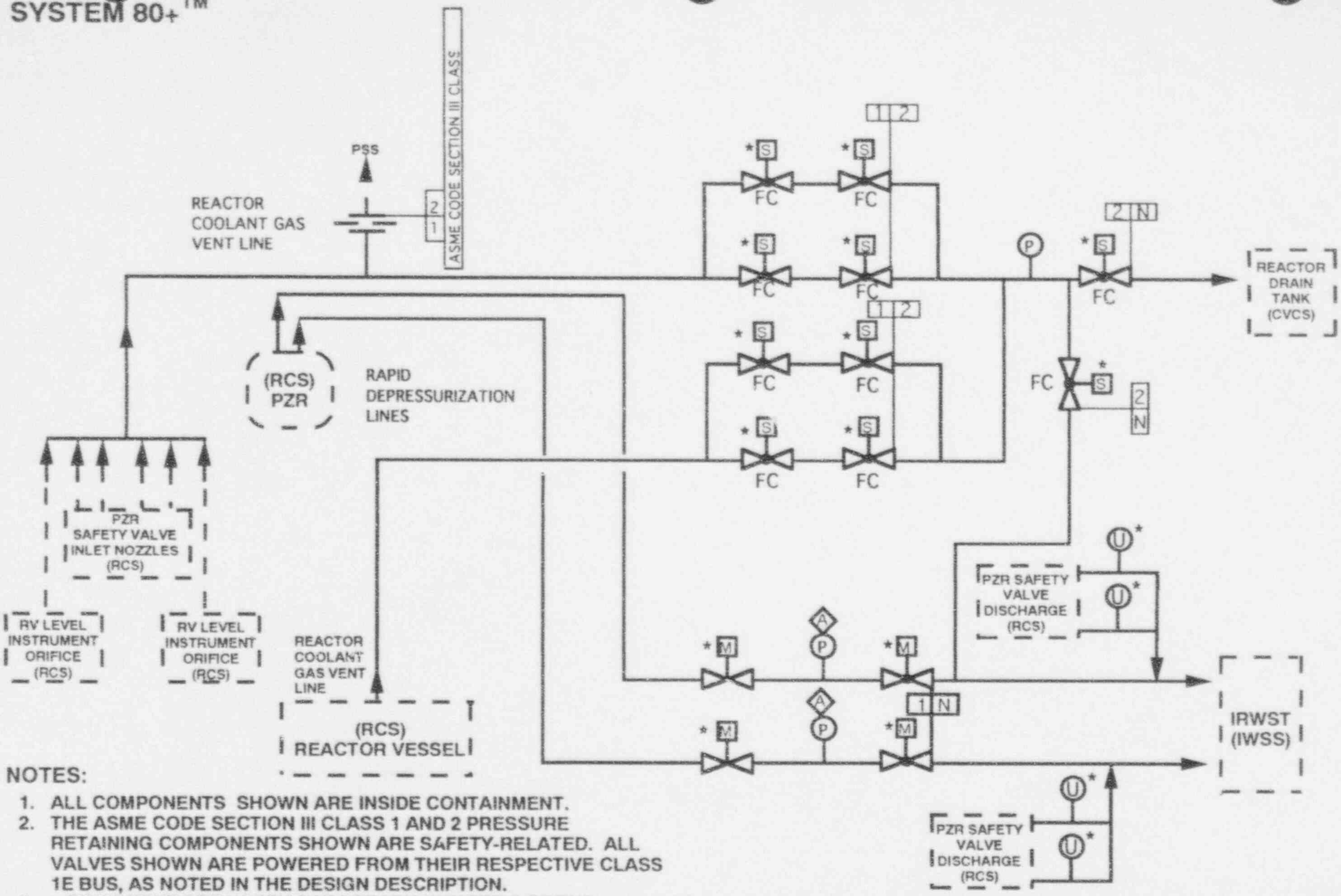
Within the RCGVS in the pressurizer vent train and in the RVUH vent train, the two branch lines with isolation valves are physically separated.

Motor operated valves (MOVs) having an active safety function will open, or will close, or will open and also close, under differential pressure or fluid flow conditions and under temperature conditions.

Valves with response positions indicated on Figure 2.4.1-1 change position to that indicated on the Figure upon loss of motive power.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.1-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Safety Depressurization System.



NOTES:

1. ALL COMPONENTS SHOWN ARE INSIDE CONTAINMENT.
2. THE ASME CODE SECTION III CLASS 1 AND 2 PRESSURE RETAINING COMPONENTS SHOWN ARE SAFETY-RELATED. ALL VALVES SHOWN ARE POWERED FROM THEIR RESPECTIVE CLASS 1E BUS, AS NOTED IN THE DESIGN DESCRIPTION.
3. * :EQUIPMENT FOR WHICH PARAGRAPH NUMBER 3 OF THE "VERIFICATION FOR BASIC CONFIGURATION FOR SYSTEMS" SECTION OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.

FIGURE 2.4.1-1
SAFETY DEPRESSURIZATION SYSTEM

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TABLE 2.4.1-1

SAFETY DEPRESSURIZATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the SDS is as shown on Figure 2.4.1-1.	1. Inspection of the as-built SDS configuration will be conducted.	1. For the components and equipment shown on Figure 2.4.1-1, the as-built SDS conforms with the Basic Configuration.
2. The RCGVS venting capacity will depressurize the RCS following design basis events.	2. Testing to determine RCS depressurization rate will be performed. Analyses will be performed to convert the test results to a depressurization rate at an RCS starting pressure.	2. The RCGVS depressurizes the RCS at a rate of at least 0.9 psi per second at an initial pressurizer pressure of 2250 psia.
3. The RDS depressurization capacity, in conjunction with SIS operation, will prevent uncovering the core during a total loss of feedwater.	3. Type tests of the RDS valve flow capacity will be performed. Analysis of total loss of feedwater will be performed, using the as-built system characteristics.	3. A single RDS train in conjunction with two of four safety injection (SI) pumps, prevents core uncovery following a TLOFW if feed and bleed is initiated immediately following the opening of pressurizer safety valves. The two RDS trains have sufficient total flow capacity with all SI pumps operating to prevent core uncovery following a TLOFW if feed and bleed is delayed up to 30 minutes from the time pressurizer safety valves lift.

TABLE 2.4.1-1 (Continued)

SAFETY DEPRESSURIZATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. The ASME Code Section III SDS components shown on Figure 2.4.1-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	4. A pressure test will be conducted on those components of the SDS required to be pressure tested by ASME Code Section III.	4. The results of the pressure test of ASME Code Section III portions of the SDS conform with the pressure testing acceptance criteria in ASME Code Section III.
5.a) Displays of the SDS instrumentation shown on Figure 2.4.1-1 exist in the MCR or can be retrieved there.	5.a) Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	5.a) Displays of the instrumentation shown on Figure 2.4.1-1 exist in the MCR or can be retrieved there.
5.b) Controls exist in the MCR to open and close those power operated valves shown on Figure 2.4.1-1.	5.b) Testing will be performed using the SDS controls in the MCR.	5.b) SDS controls in the MCR operate to open and close those power operated valves shown on Figure 2.4.1-1.
5.c) SDS alarms shown on Figure 2.4.1-1 are provided in the MCR.	5.c) Testing of the SDS alarms shown on Figure 2.4.1-1 will be performed using signals simulating alarm conditions.	5.c) The SDS alarms shown on Figure 2.4.1-1 actuate in response to signals simulating alarm conditions.
6.a) Within the RDS, in one mechanical train, each isolation valve is powered from a different Class 1E bus within its Class 1E Division, and in the other mechanical train, each isolation valve is powered from a different Class 1E bus in the other Class 1E Division.	6.a) Testing will be performed on the RDS valves by providing a test signal in only one Class 1E bus at a time.	6.a) A test signal exists only at the RDS valves powered from the Class 1E bus under test.

SAFETY DEPRESSURIZATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6.b) Within the RCGVS, in the pressurizer vent train and in the RVUH vent train, each isolation valve in one branch line is powered from a different Class 1E bus within its Class 1E Division, and each isolation valve in the other branch line is powered from a different Class 1E bus in the other Class 1E Division.	6.b) Testing will be performed on the RCGVS valves by providing a test signal in only one Class 1E bus at a time.	6.b) A test signal exists only at the RCGVS valves powered from the Class 1E bus under test.
6.c) The isolation valve to the RDT and the cross-connect valve between discharge lines to the RDT and IRWST are powered from different Class 1E Divisions.	6.c) Testing will be performed on the RCGVS valves by providing a test signal in only one Class 1E Division at a time.	6.c) A test signal exists only at the RCGVS valves powered from the Class 1E Division under test.
6.d) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the SDS.	6.d) Inspection of the as-installed Class 1E Divisions of the SDS will be performed.	6.d) Physical separation exists between Class 1E Divisions in the SDS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the SDS.
7. Within the RCGVS, in the pressurizer vent train, and in the RVUH vent train, the two branch lines with isolation valves are physically separated.	7. Inspection of as-built mechanical trains will be performed.	7. Within the RCGVS, in the pressurizer vent train, and in the RVUH vent train, the two branch lines are separated within Containment by spatial arrangement or barriers.

TABLE 2.4.1-1 (Continued)

SAFETY DEPRESSURIZATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. Motor operated valves (MOVs) having an active safety function will open, or will close, or will open and also close, under differential pressure or fluid flow conditions and under temperature conditions.	8. Testing will be performed to open, or close, or open and also close, MOVs having an active safety function under preoperational differential pressure or fluid flow conditions and under temperature conditions.	8. Each MOV having an active safety function opens, or closes, or opens and also closes.
9. Valves with response positions indicated on Figure 2.4.1-1 change position to that indicated on the Figure upon loss of motive power.	9. Testing of loss of motive power to these valves will be performed.	9. These valves change position to the position indicated on Figure 2.4.1-1 upon loss of motive power.

2.4.2 ANNULUS VENTILATION SYSTEM

Design Description

The Annulus Ventilation System (AVS) reduces the concentration of radioactivity in the annulus air by filtration, holdup (decay), and recirculation before annulus air is released to the atmosphere.

The Basic Configuration of the AVS is as shown on Figure 2.4.2-1. The AVS components shown on Figure 2.4.2-1 are safety-related.

Components of the AVS are located in the nuclear annex and annulus portion of the reactor building.

The AVS takes air from the upper annulus above the primary containment dome, filters it, and discharges part of the air through openings to the lower annulus near the annulus floor and the remainder of the air through the unit vent to the atmosphere.

The AVS has two Divisions. Each Division of the AVS has a filtration unit, a fan, dampers, ductwork, instrumentation, and controls. Each AVS filtration unit removes particulate matter.

Each Division has dampers to modulate exhaust air to maintain a negative pressure within the annulus relative to atmosphere when the AVS is in operation.

The safety-related components of the AVS are classified Seismic Category I.

Safety-related components of the AVS are powered from their respective Class 1E Division.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the AVS.

Active components of the two Divisions of the AVS are physically separated.

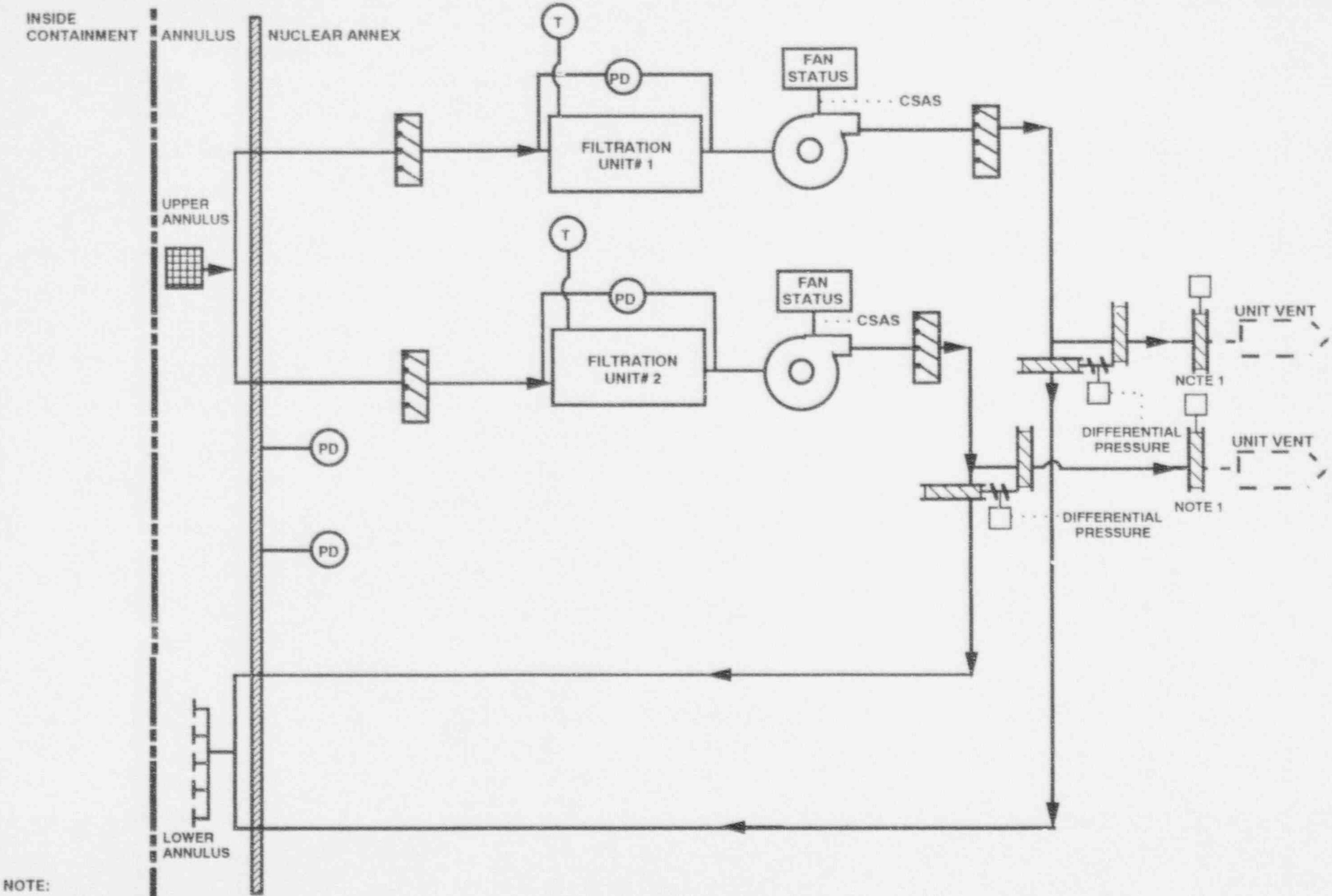
Displays of the AVS instrumentation shown on Figure 2.4.2-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to start and stop the AVS fans, to set the pressure control setpoint, and to open and close those power operated dampers shown on Figure 2.4.2-1.

Each AVS Division is activated by a Containment Spray Actuation Signal (CSAS).

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.2-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Annulus Ventilation System.



NOTE:

1. THE DUCT WORK FROM THE BUILDING EXIT UP TO AND INCLUDING THE ISOLATION DAMPER IS QUALIFIED FOR TORNADO DIFFERENTIAL PRESSURE.

FIGURE 2.4.2-1
ANNULUS VENTILATION SYSTEM

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TABLE 2.4.2-1

ANNULUS VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the AVS is as shown on Figure 2.4.2-1.	1. Inspection of the as-built AVS configuration will be conducted.	1. For the components and equipment shown on Figure 2.4.2-1, the as-built AVS conforms with the Basic Configuration.
2. Each AVS filtration unit removes particulate matter.	2. Testing and analysis will be performed on each AVS filtration unit to determine filter efficiency.	2. The AVS filter efficiency is greater than or equal to $\geq 99\%$ for particulate matter greater than 0.3 microns.
3. Each Division has dampers to modulate exhaust air to maintain negative pressure within the annulus relative to atmosphere when the AVS is in operation.	3. Testing will be performed on each Division to measure annulus pressure during AVS operation.	3. The AVS achieves a negative pressure in the annulus greater than or equal to 0.25 inches water gauge relative to atmosphere within 110 seconds.
4.a) Safety-related AVS components are powered from their respective Class 1E Division.	4.a) Testing will be performed on the AVS system by providing a test signal in only one Class 1E Division at a time.	4.a) Within the AVS, a test signal exists only at the equipment powered from the Class 1E Division under test.
4.b) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the AVS.	4.b) Inspection of the as-installed Class 1E Divisions in the AVS will be performed.	4.b) Physical separation exists between Class 1E Divisions in the AVS. Separation exists between Class 1E Divisions and non-Class 1E equipment in the AVS.
5. Active components of the two Divisions of the AVS are physically separated.	5. Inspection of the as-built mechanical Divisions will be performed.	5. The active components of the two mechanical Divisions of the AVS are separated by a Divisional wall or a fire barrier.

TABLE 2.4.2-1 (Continued)

ANNULUS VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6.a) Displays of the AVS instrumentation shown on Figure 2.4.2-1 exist in the MCR or can be retrieved there.	6.a) Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	6.a) Displays of the instrumentation shown on Figure 2.4.2-1 exist in the MCR or can be retrieved there.
6.b) Controls exist in the MCR to start and stop the AVS fans, and to open and close the isolation dampers shown on Figure 2.4.2-1.	6.b) Testing will be performed using the AVS controls in the MCR.	6.b) AVS controls in the MCR operate to start and stop the AVS filtration units, and to open and close those isolation dampers shown on Figure 2.4.2-1.
7. Each AVS Division is activated by a Containment Spray Actuation Signal.	7. Testing will be performed using a simulated Containment Spray Actuation Signal.	7. Each AVS Division is activated by a simulated Containment Spray Actuation Signal.

2.4.3 COMBUSTIBLE GAS CONTROL SYSTEM

Design Description

The Combustible Gas Control System (CGCS) is used to maintain hydrogen gas concentration in Containment at a level which precludes an uncontrolled hydrogen and oxygen recombination within Containment following design basis and beyond design basis accidents.

The CGCS consists of the Containment Hydrogen Recombiner System (CHRS) and the Hydrogen Mitigation System (HMS). The Basic Configuration of the CHRS is as shown on Figure 2.4.3-1. The HMS consists of hydrogen igniters located inside Containment.

The CHRS hydrogen analyzers are located in the Nuclear Annex and locations are provided in the Nuclear Annex for installation of hydrogen recombiner units post-accident.

The ASME Code Section III Class 2 components shown on Figure 2.4.3-1 are safety-related.

The safety-related equipment shown on Figure 2.4.3-1 is classified Seismic Category I.

The Class 1E loads shown on Figure 2.4.3-1 are powered from their respective Class 1E Division.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment in the CGCS.

At least 80 hydrogen igniters are provided. Forty hydrogen igniters are powered by one Division of Class 1E power sources, of which at least 17 can be powered by the Class 1E batteries. Forty hydrogen igniters are powered by the other Division of Class 1E power sources, of which at least 17 can be powered by the Class 1E batteries.

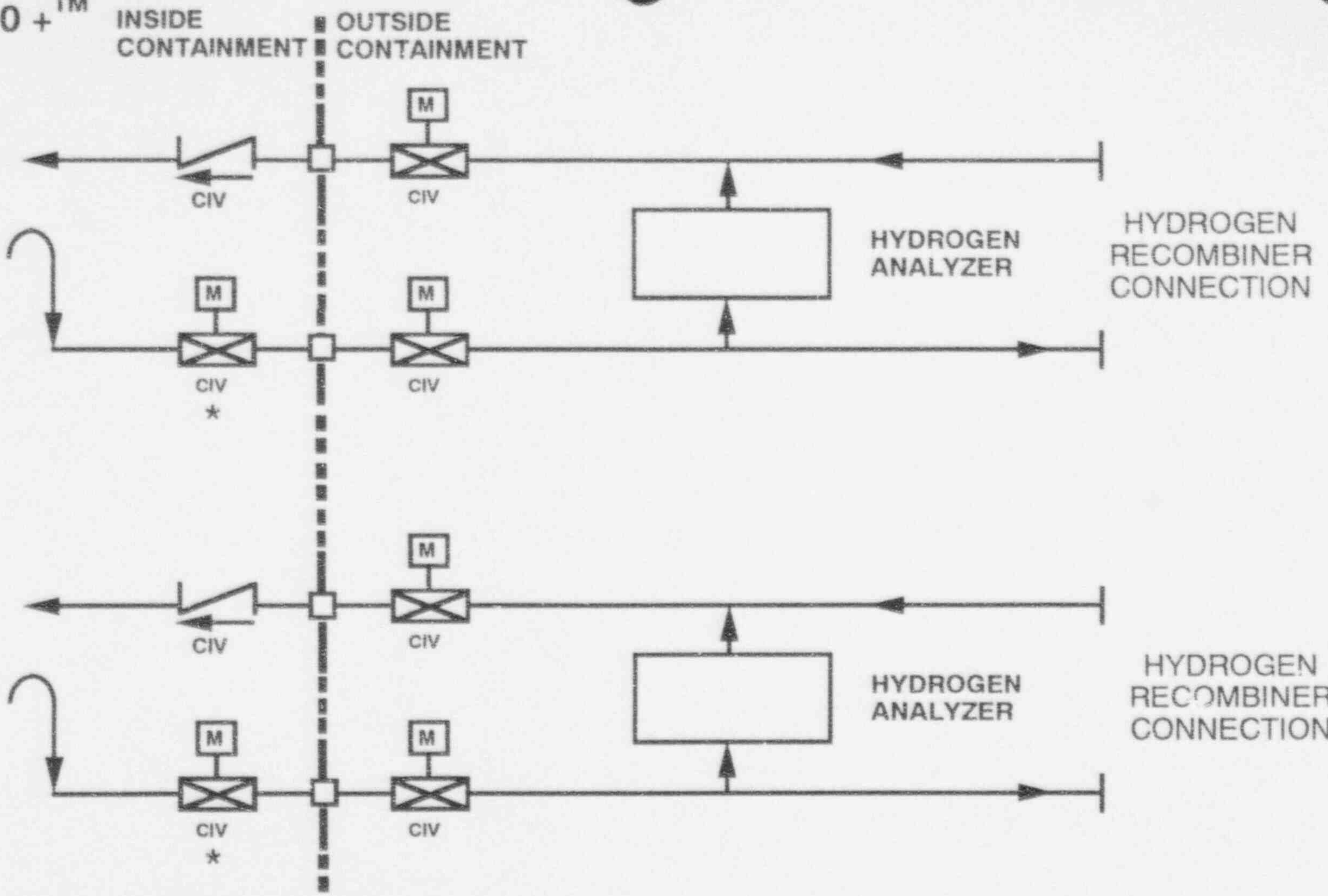
The hydrogen igniters are non-safety related and classified Seismic Category I.

Displays of the CGCS hydrogen analyzer instrumentation exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to energize and de-energize the hydrogen analyzers and the hydrogen igniters.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.3-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Combustible Gas Control System.



NOTES:

A. ALL PIPING AND COMPONENTS SHOWN ARE ASME CODE SECTION III CLASS 2.

B. SAFETY-RELATED COMPONENTS AND EQUIPMENT SHOWN ON THE FIGURE ARE POWERED FROM THEIR RESPECTIVE CLASS 1E DIVISION.

C. * EQUIPMENT FOR WHICH PARAGAPH NUMBER (3) OF THE "VERIFICATIONS FOR BASIC CONFIGURATION FOR SYSTEMS" OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.

FIGURE 2.4.3-1
CONTAINMENT HYDROGEN RECOMBINER SYSTEM

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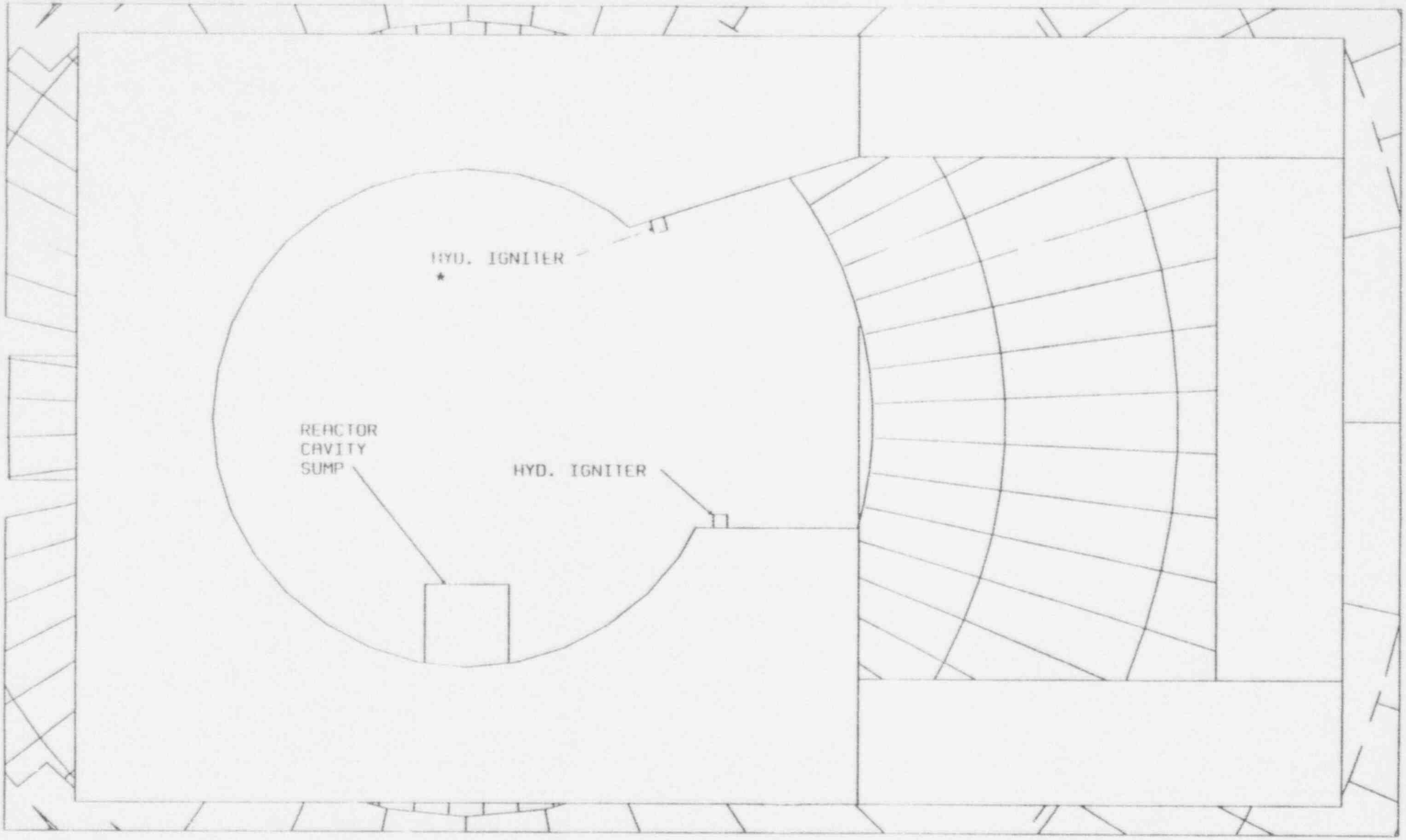
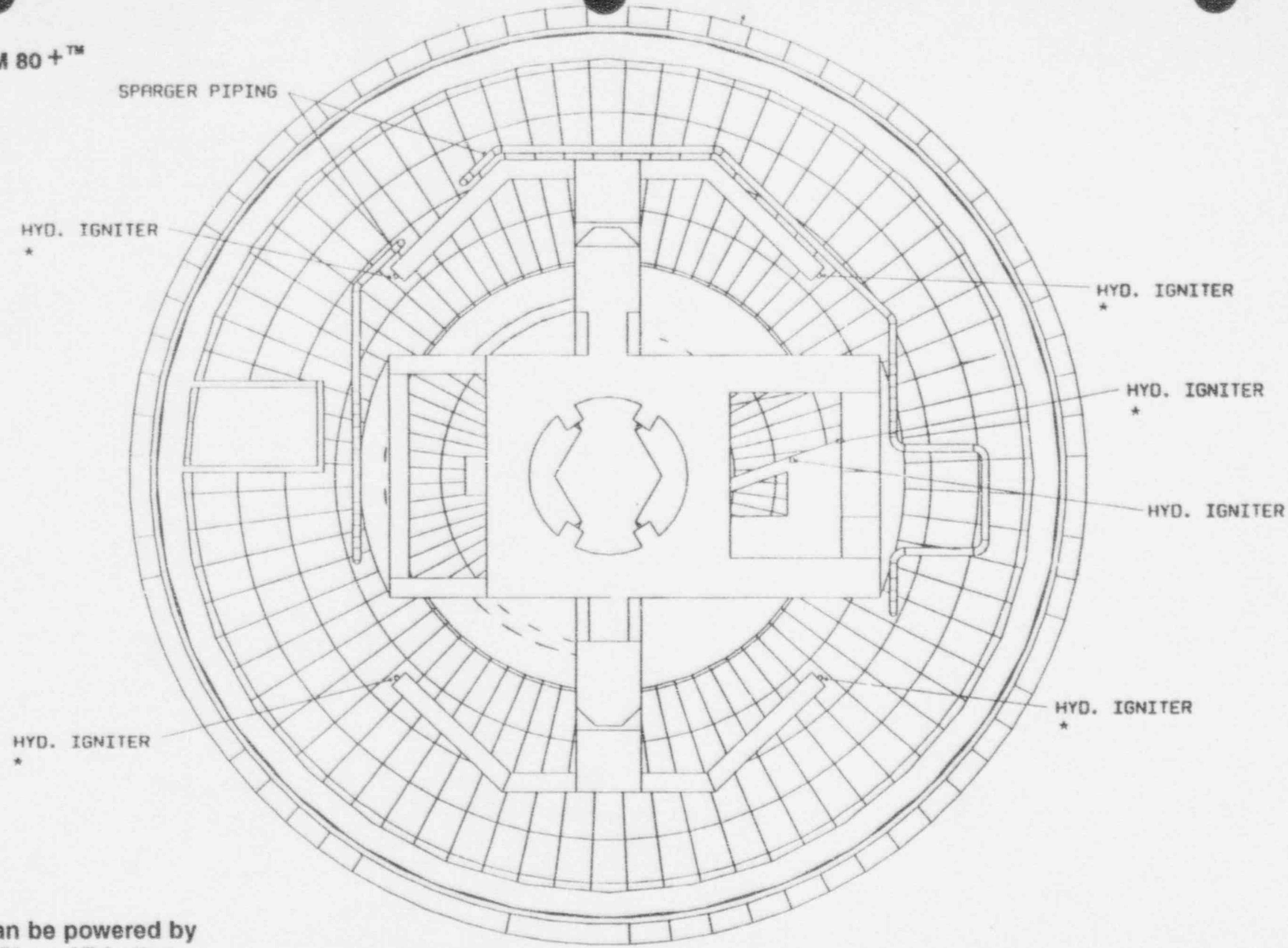


* Can be powered by a Class 1E battery

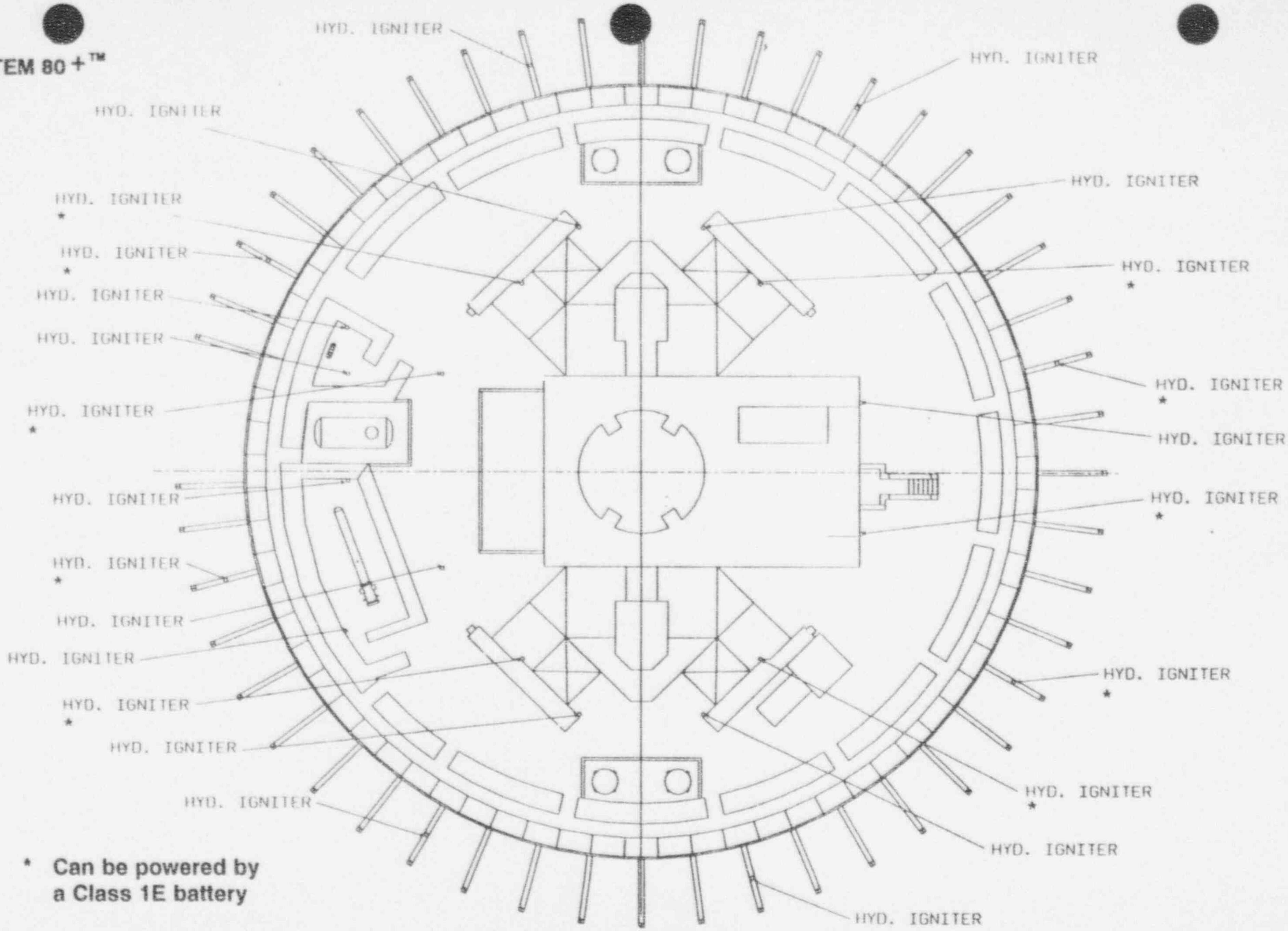
FIGURE 2.4.3-2: HYDROGEN IGNITER LOCATIONS: PLAN VIEW OF REACTOR CAVITY

06-17-94



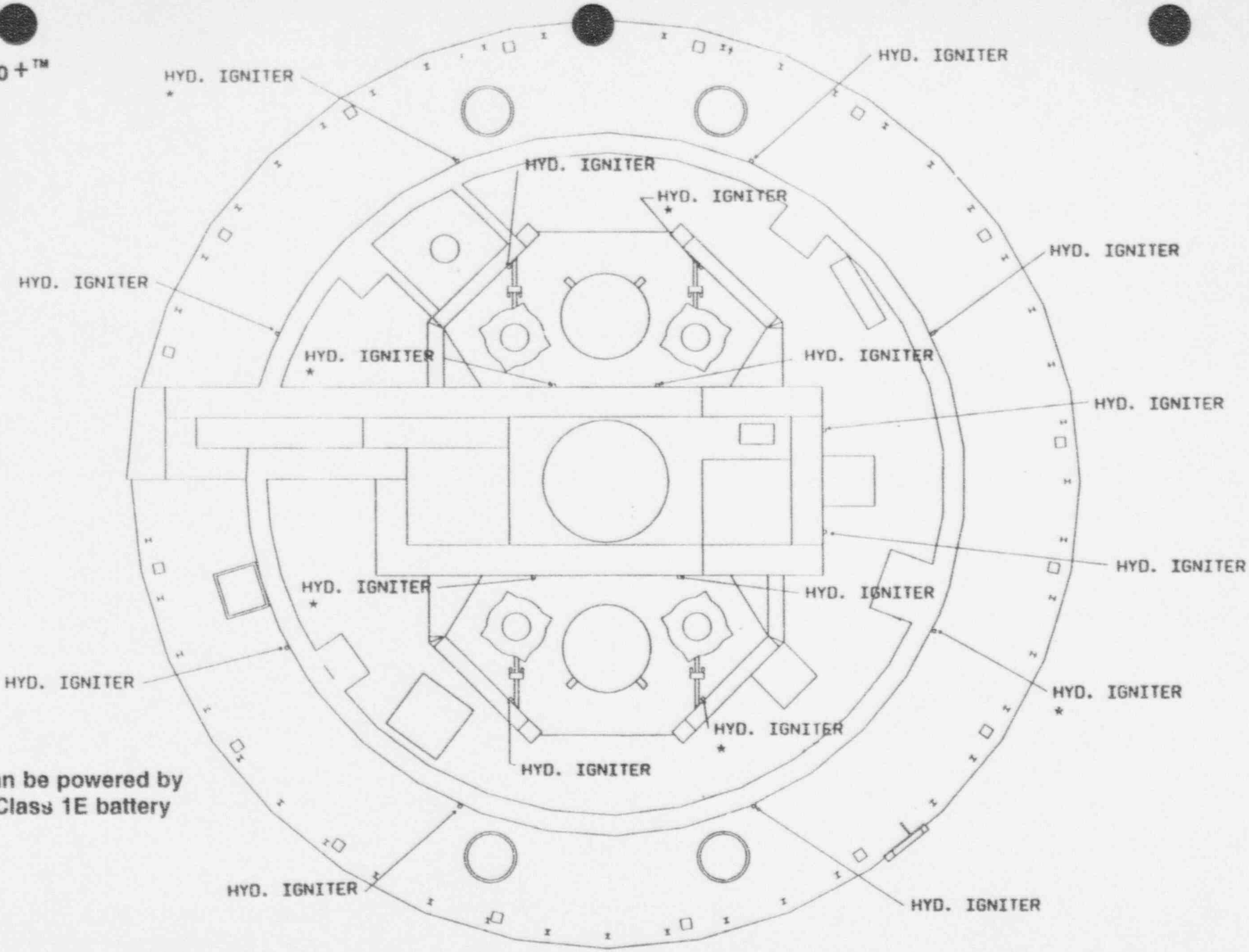
* Can be powered by a Class 1E battery

FIGURE 2.4.3-3: HYDROGEN IGNITER LOCATIONS: PLAN VIEW OF IRWST AND CAVITY AREA



* Can be powered by a Class 1E battery

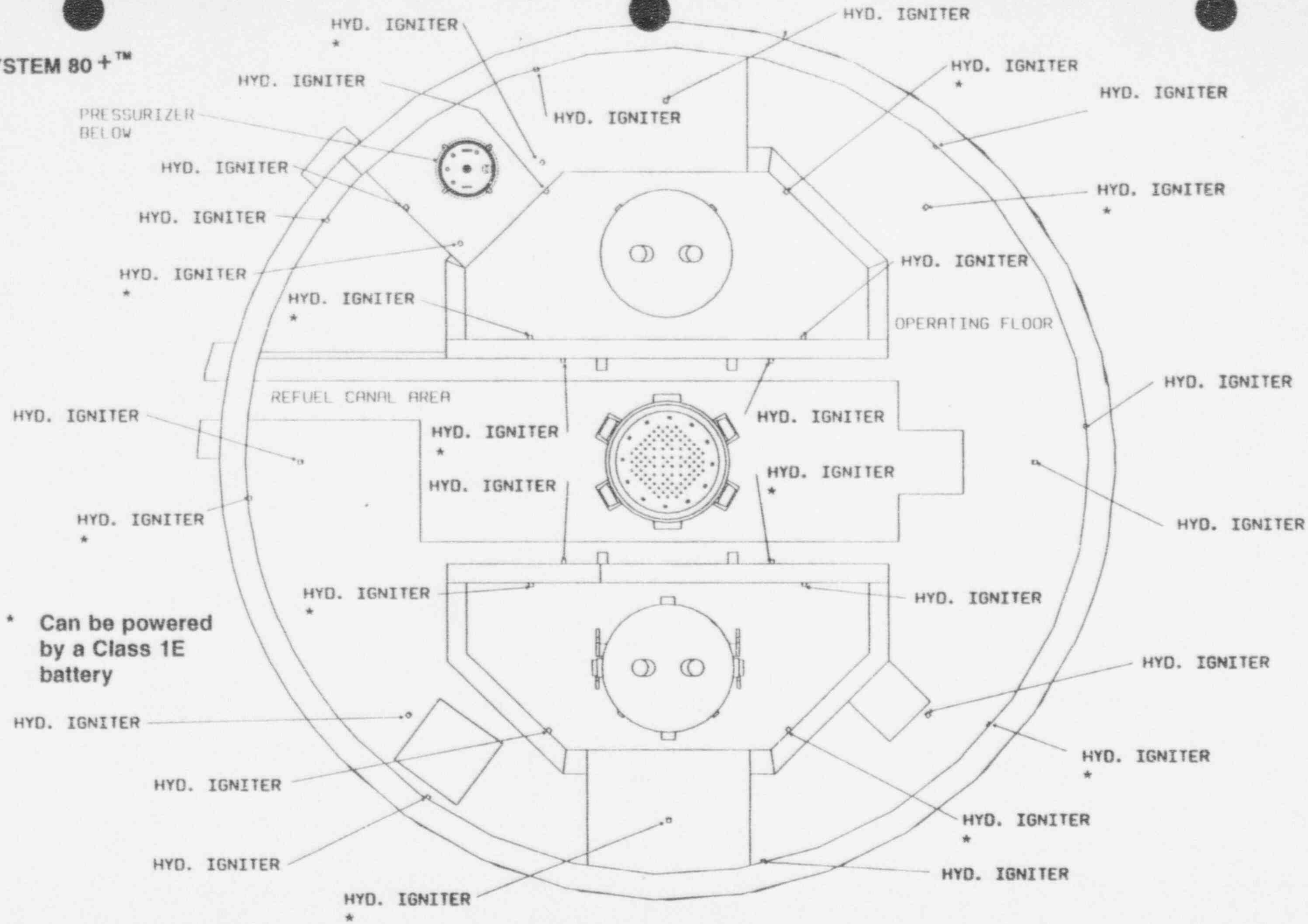
FIGURE 2.4.3-4: HYDROGEN IGNITER LOCATIONS: PLAN VIEW ABOVE ELEVATION 91+9 AND BELOW 115+6



* Can be powered by a Class 1E battery

FIGURE 2.4.3-5: HYDROGEN IGNITER LOCATIONS: PLAN VIEW ABOVE ELEVATION 115+6 AND BELOW ELEVATION 146+0

SYSTEM 80+™



* Can be powered by a Class 1E battery

FIGURE 2.4.3-6: HYDROGEN IGNITER LOCATIONS: PLAN VIEW ABOVE ELEVATION 146+0 TO TOP OF DOME

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TABLE 2.4.3-1

COMBUSTIBLE GAS CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the CHRS is as shown on Figure 2.4.3-1.	1. Inspection of the as-built CHRS configuration will be conducted.	1. For the components and equipment shown on Figure 2.4.3-1, the as-built CHRS conforms with the Basic Configuration.
2.a) The Class 1E loads shown on Figure 2.4.3-1 are powered from their respective Class 1E Division.	2.a) Testing will be performed on the CHRS by providing a test signal in only one Class 1E Division at a time.	2.a) Within the CHRS, a test signal exists only at the equipment powered from the Class 1E Division under test.
2.b) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the CGCS.	2.b) Inspection of the as-installed Class 1E Divisions in the CGCS will be performed.	2.b) Physical separation exists between Class 1E Divisions in the CGCS. Separation exists between Class 1E Divisions and non-Class 1E equipment in the CGCS.
3. The ASME Code Section III CHRS components shown on Figure 2.4.3-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	3. A pressure test will be conducted on those components of the CHRS required to be pressure tested by ASME Code Section III.	3. The results of the pressure test of ASME Code Section III components of the CHRS conform with the pressure testing acceptance criteria in ASME Code Section III.
4.a) Displays of the CGCS hydrogen concentration instrumentation exist in the MCR or can be retrieved there.	4.a) Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	4.a) Displays of the CGCS hydrogen concentration instrumentation exist in the MCR or can be retrieved there.
4.b) Controls exist in the MCR to energize and de-energize the hydrogen analyzers and the hydrogen igniters.	4.b) Testing will be performed using the CGCS controls in the MCR.	4.b) CGCS controls in the MCR operate to energize and de-energize the hydrogen analyzers and the hydrogen igniters.

TABLE 2.4.3-1(Continued)

COMBUSTIBLE GAS CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. Hydrogen recombiner units can be connected to the CHRS.	5. Testing to connect hydrogen recombiner units will be performed.	5. Hydrogen recombiner units can be connected.
6. At least 80 hydrogen igniters are provided.	6. Inspection for the number and location of igniters will be performed.	6. At least 80 hydrogen igniters are provided. The igniters are generally located as shown in Figures 2.4.3-2 through 2.4.3-6.
7. Forty hydrogen igniters are powered by one Division of Class 1E power sources, of which at least 17 can be powered by the Class 1E batteries. Forty hydrogen igniters are powered by the other Division of Class 1E power sources, of which at least 17 can be powered by the Class 1E batteries.	7. Testing will be performed to determine number of igniters that can be energized from each Division of Class 1E power sources, including the number that can be energized from each Division of Class 1E batteries.	7. At least 40 hydrogen igniters are powered from each Division of Class 1E power sources. At least 17 igniters can be powered from each Division of Class 1E batteries.

2.4.4 SAFETY INJECTION SYSTEM

Design Description

The Safety Injection System (SIS) is a safety-related system which injects borated water into the reactor vessel to provide core cooling and reactivity control in response to design basis accidents. The SIS provides core cooling during feed and bleed operation, in conjunction with the safety depressurization system. The SIS is located in the reactor building subsphere and Containment.

The Basic Configuration of the SIS is as shown on Figure 2.4.4-1.

The SIS consists of two Divisions. Each SIS Division has two SIS pumps, two safety injection tanks (SITs), valves, piping, controls, and instrumentation.

Two SIS pumps, in conjunction with the SITs, have the capacity to cool the core during design basis events. One SIS pump, in conjunction with the SITs, has the capacity to cool the core during a direct vessel injection line break.

The SITs contain borated water pressurized by a nitrogen cover gas. When RCS pressure falls below SIT pressure and the associated SIT isolation valve is open, water flows from the SIT into the reactor vessel. The SITs can be depressurized by venting for entry into shutdown cooling.

A flow recirculation line from each SIS pump discharge to the in-containment refueling water storage tank (IRWST) provides a minimum flow recirculation path.

The SIS pumps can be tested at full flow during plant operation.

The ASME Code Section III Class for the SIS pressure retaining components shown on Figure 2.4.4-1 is as depicted on the Figure.

The safety-related equipment shown on Figure 2.4.4-1 is classified Seismic Category I.

SIS Pressure retaining components shown on Figure 2.4.4-1 outside Containment have a design pressure of at least 900 psig.

Displays of the SIS instrumentation shown on Figure 2.4.4-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to start and stop the SIS pumps, and to open and close those power operated valves shown on Figure 2.4.4-1. SIS alarms shown on Figure 2.4.4-1 are provided in the MCR.

Water is supplied to each SIS pump at a pressure greater than the pump's required net positive suction head (NPSH).

The Class 1E loads shown on Figure 2.4.4-1 are powered from their respective Class 1E Division.

Within a Division, one SIS pump and associated valves and controls are powered from a different Class 1E bus in the same Class 1E Division than the other SIS pump and associated valves and controls.

Within a Division, the two hot leg injection isolation valves are powered from different Class 1E buses in the same Class 1E Division.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the SIS.

The two mechanical Divisions of the SIS are physically separated.

Valves with response positions indicated on Figure 2.4.4-1 change position to that indicated on the Figure upon loss of motive power.

The SIS is automatically initiated by a safety injection actuation signal (SIAS).

An interlock automatically opens the SIT motor-operated isolation valves when RCS pressure increases above the SIT normal operating pressure. The interlock prevents closing the SIT motor-operated isolation valves until RCS pressure decreases below the interlock reset point.

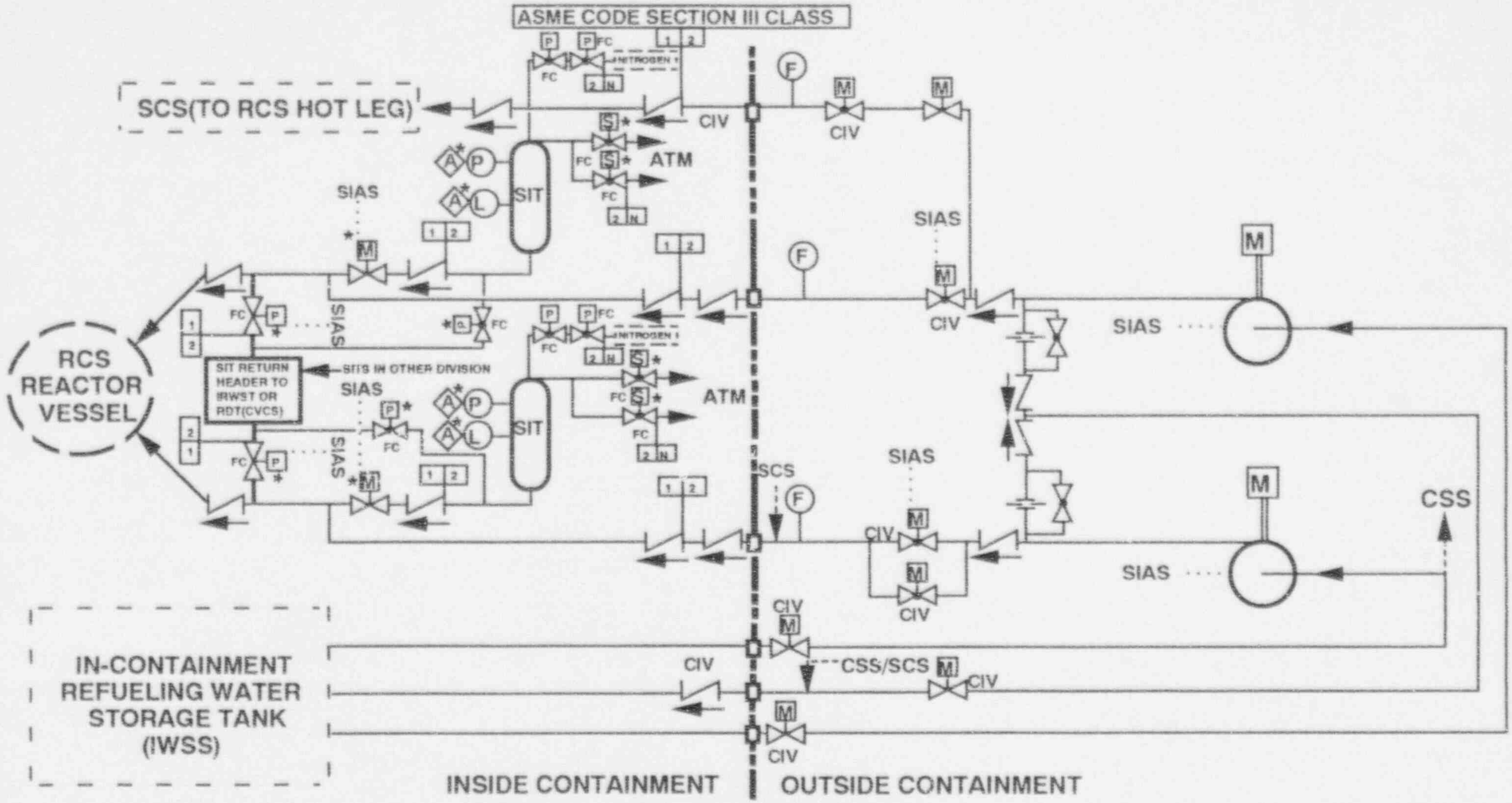
The SIS can be manually realigned for simultaneous hot leg injection and direct vessel injection (DVI). Hot leg injection is used in long term post-LOCA cooling.

Motor operated valves (MOVs) having an active safety function will open, or will close, or will open and also close, under differential pressure or fluid flow conditions and under temperature conditions.

Check valves shown on Figure 2.4.4-1 will open, or will close, or will open and also close, under system pressure, fluid flow conditions, or temperature conditions.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.4-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Safety Injection System.



NOTES:

1. SAFETY-RELATED ELECTRICAL COMPONENTS AND EQUIPMENT SHOWN ON THIS FIGURE ARE CLASS 1E. ALARMS ARE NOT SAFETY-RELATED AND NOT CLASS 1E.
2. * EQUIPMENT FOR WHICH PARAGRAPH NUMBER 3 OF THE "VERIFICATION FOR BASIC CONFIGURATION FOR SYSTEMS" SECTION OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.
3. THE ASME CODE SECTION III CLASS 1 AND 2 PRESSURE RETAINING COMPONENTS SHOWN ARE SAFETY-RELATED

FIGURE 2.4.4-1
SAFETY INJECTION SYSTEM
(ONE OF TWO DIVISIONS)

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TABLE 2.4.4-1

SAFETY INJECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the safety injection system (SIS) is as shown on Figure 2.4.4-1.	1. Inspection of the as-built SIS configuration will be conducted.	1. For the components and equipment shown on Figure 2.4.4-1, the as-built SIS conforms with the Basic Configuration.
2. Two SIS pumps, in conjunction with the SITs, have the capacity to deliver coolant to the reactor vessel to cool the core during design basis events.	2.a) Testing to determine SIS flow will be performed. Analysis will be performed to convert the test results from the test conditions to the design conditions.	2.a) Each SIS pump has a pump-developed pressure differential of no less than 1600 psid and no more than 2040 psid at the vendor's specified minimum flow rate, and injects no less than 980 gpm and no more than 1232 gpm of borated water into the reactor vessel at atmospheric pressure.
	2.b) Testing will be performed using signals simulating a safety injection actuation signal (SIAS).	2.b) The SIS initiates and begins to deliver flow to the reactor vessel within 40 seconds following receipt of a signal simulating SIAS, including emergency diesel generator start time and load time.
	2.c) Testing will be performed to open the SIT isolation valves with the SITs pressurized and the RCS depressurized. Analysis will be performed to convert the test results from the test conditions to the design conditions.	2.c) The pressurized SITs discharge water to the depressurized RCS. Resistance coefficient K of the discharge line from the SIT to the reactor vessel is equal to or between 4.5 to 30 (based on a cross-sectional area of 0.6827 ft^2).

TABLE 2.4.4-1 (Continued)

SAFETY INJECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
2. (Continued)	2.d) Inspection of construction records for SIS piping will be conducted.	2.d) The volume in each direct vessel injection line, from the connection for the SIT return header to the piping-to-DVI nozzle weld, is no greater than 27.8 cubic feet.
3. The safety injection tanks can be depressurized by venting for entry into shutdown cooling.	3. Testing will be performed with the SITs pressurized and the associated SIT isolation valve shut. Each SIT vent valve will be opened from the MCR.	3. The SIT vent valves can be opened from the MCR and the SIT pressure decreases while the SIT is being vented.
4. A flow recirculation line from each SIS pump discharge to the IRWST provides a minimum flow recirculation path.	4. Testing of SIS will be performed by manually aligning SI flow to the IRWST through the minimum flow recirculation line and manually starting each SIS pump.	4. Minimum flow recirculation rate meets or exceeds the pump vendor's minimum flow requirements.
5. The SIS pumps can be tested at full flow during plant operation.	5. Testing of the SIS will be performed by manually aligning SIS flow to the IRWST and manually starting each SIS pump.	5. Each SIS pump has a flow capacity of at least 980 gpm to the IRWST through the test line.
6. The ASME Code Section III SIS components shown on Figure 2.4.4-1 retain their pressure boundary integrity under internal pressures that will be experienced under service.	6. A pressure test will be conducted on those components of the SIS required to be pressure tested by ASME Code Section III.	6. The results of the pressure test of ASME Code Section III components of the SIS conform with the pressure testing acceptance criteria in ASME Code Section III.

TABLE 2.4.4-1 (Continued)

SAFETY INJECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7.a) Displays of the SIS instrumentation shown on Figure 2.4.4-1 exist in the MCR or can be retrieved there.	7.a) Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	7.a) Displays of the instrumentation shown on Figure 2.4.4-1 exist in the MCR or can be retrieved there.
7.b) Controls exist in the MCR to start and stop the SIS pumps, and to open and close those power operated valves shown on Figure 2.4.4-1.	7.b) Testing will be performed using the SIS controls in the MCR.	7.b) SIS controls in the MCR operate to start and stop the SIS pumps and to open and close those power operated valves shown on Figure 2.4.4-1.
7.c) SIS alarms shown on Figure 2.4.4-1 are provided in the MCR.	7.c) Testing of the SIS alarms shown on Figure 2.4.4-1 will be performed using signals simulating SIS alarm conditions.	7.c) The SIS alarms shown on Figure 2.4.4-1 actuate in the MCR in response to signals simulating SIS alarm conditions.
8. Water is supplied to each SIS pump at a pressure greater than the pump's required NPSH.	8. Testing to measure SIS pump suction pressure will be performed. Inspection and analysis to determine NPSH available to each SIS pump will be performed based on test data and as-built data.	8. The calculated available NPSH exceeds each SIS pump's required NPSH.
9.a) The Class 1E loads shown on Figure 2.4.4-1 are powered from their respective Class 1E Division.	9.a) Testing on the SIS will be conducted by providing a test signal in only one Class 1E Division at a time.	9.a) Within the SIS, a test signal exists only at the equipment powered from the Class 1E Division under test.
9.b) Within a Division, one SIS pump and associated valves and controls are powered from a different Class 1E bus in the same Class 1E Division than the other SIS pump and associated valves and controls.	9.b) Testing on the SIS will be conducted by providing a test signal in only one Class 1E bus at a time.	9.b) Within the SIS, a test signal exists only at the equipment powered from the Class 1E bus under test.

TABLE 2.4.4-1 (Continued)

SAFETY INJECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
9.c) Within a Division, the two hot leg injection isolation valves are powered from different Class 1E buses in the same Class 1E Division.	9.c) Testing on the SIS will be conducted by providing a test signal in only one Class 1E bus at a time.	9.c) Within the SIS, a test signal exists only at the equipment powered from the Class 1E bus under test.
9.d) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the SIS.	9.d) Inspection of the as-installed Class 1E Divisions of the SIS will be performed.	9.d) Physical separation exists between Class 1E Divisions in the SIS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the SIS.
10. The two mechanical Divisions of the SIS are physically separated.	10. Inspection of as-built mechanical Divisions will be performed.	10. The two mechanical Divisions of the SIS are separated by a Divisional wall or a fire barrier except for components of the system within containment which are separated by spatial arrangement or barriers.
11. Valves with response positions indicated on Figure 2.4.4-1 change position to that indicated on the Figure upon loss of motive power.	11. Testing of loss of motive power to these valves will be performed.	11. These valves change position to the position indicated on Figure 2.4.4-1 upon loss of motive power.
12. The SIS is automatically initiated by a safety injection actuation signal (SIAS).	12. Testing will be performed by generating a signal simulating SIAS.	12. A signal simulating SIAS starts the SI pumps and opens the SI header isolation valves and safety injection tank (SIT) isolation valves. The SIT isolation valves, when open, receive a confirmatory open signal.

TABLE 2.4.4-1 (Continued)

SAFETY INJECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
13. The SIS can be manually realigned for simultaneous hot leg injection and direct vessel injection (DVI).	13. Testing will be performed with the system manually aligned for simultaneous DVI and hot leg injection.	13. The SIS injects no less than 980 and no more than 1232 gpm through each hot leg injection line with the RCS at atmospheric pressure.
14. Motor operated valves (MOVs) having an active safety function will open, or will close, or will open and also close, under differential pressure or fluid flow conditions and under temperature conditions.	14. Testing will be performed to open, or close, or open and also close MOVs having an active safety function under preoperational differential pressure or fluid flow conditions and under temperature conditions.	14. Each MOV having an active safety function opens, or closes, or opens and also closes.
15. Check valves shown on Figure 2.4.4-1 will open, or will close, or will open and also close under system pressure, fluid flow conditions, or temperature conditions.	15. Testing will be performed to open, or close, or open and also close check valves shown on Figure 2.4.4-1 under system preoperational pressure, fluid flow conditions, or temperature conditions.	15. Each check valve shown on Figure 2.4.4-1 opens, or closes, or opens and also closes.
16.a) An interlock automatically opens the SIT motor-operated isolation valves when RCS pressure increases above the SIT normal operating pressure.	16.a) Testing will be performed using a signal simulating increasing RCS pressure, with the SIT isolation valves closed.	16.a) The SIT motor-operated isolation valves open in response to a signal simulating RCS pressure increasing above the SIT normal operating pressure.
16.b) The interlock prevents closing the SIT motor-operated isolation valves until RCS pressure decreases below the interlock reset point.	16.b) Testing will be performed using a signal simulating decreasing RCS pressure with the SIT isolation valves open and attempting to close the valves from the main control room.	16.b) The SIT motor-operated isolation valves do not close when RCS pressure is above the interlock reset point.

2.4.5 CONTAINMENT ISOLATION SYSTEM

Design Description

The Containment Isolation System (CIS) provides a safety-related means to close valves in fluid system piping that passes through Containment penetrations[1]. The CIS provides a pressure barrier at each of these Containment penetrations.

The Basic Configuration of the Containment isolation valves for piping which penetrates containment is as shown on Figure 2.4.5-1; each Containment isolation valve arrangement is as shown in one of the configurations on the figure.

The ASME Code Section III Class for the CIS pressure retaining components is as shown on Figure 2.4.5-1.[2]

The Containment isolation valves and connecting ASME Code Section III Class 2 piping shown on Figure 2.4.5-1 are classified Seismic Category I.

Electrically-powered Containment isolation valves are Class 1E. These Class 1E loads are powered from their respective Class 1E Divisions.

The Containment equipment hatch trolley receives Class 1E power.

Redundant Containment isolation valves which require electrical power are powered from different Class 1E Divisions.[3]

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment in the CIS.

Displays of CIS valve positions for remotely operated and automatic Containment isolation valves exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to open and close CIS power operated valves.

Only those valves required to close automatically for Containment isolation are closed by a Containment isolation actuation signal (CIAS). Containment isolation valves that receive a CIAS close within the time allocated to the function performed.

Containment isolation valves that receive a CIAS, upon closure, do not reopen as a direct result of reset of the CIAS.

Pneumatic Containment isolation valves close upon loss of motive or control power to the valve.

Motor-operated valves (MOVs) that receive a CIAS will close under differential pressure or fluid flow conditions, and under temperature conditions.

Containment isolation check valves having an active safety function will close under system pressure, fluid flow conditions, or temperature conditions.

Containment isolation valves required to close automatically against containment atmosphere systems are designed to close against at least containment design pressure. Containment Isolation valves and piping between CIVs are designed for pressures at least equal to the containment design pressure.

The induced stresses in the pressure retaining components of the CIVs due to an internal containment pressure of less than or equal to 120 psig are within the ASME Code Section III service Level C stress limits.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.5-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Containment Isolation System.

NOTES:

[1] Containment isolation valves are assigned as components of their respective systems.
[2] Containment penetration leak rate testing is addressed in Section 2.1.1, Nuclear Island Structures.
[3] Electrical penetrations are addressed in Section 2.6.4, Containment Electrical Penetration Assemblies.

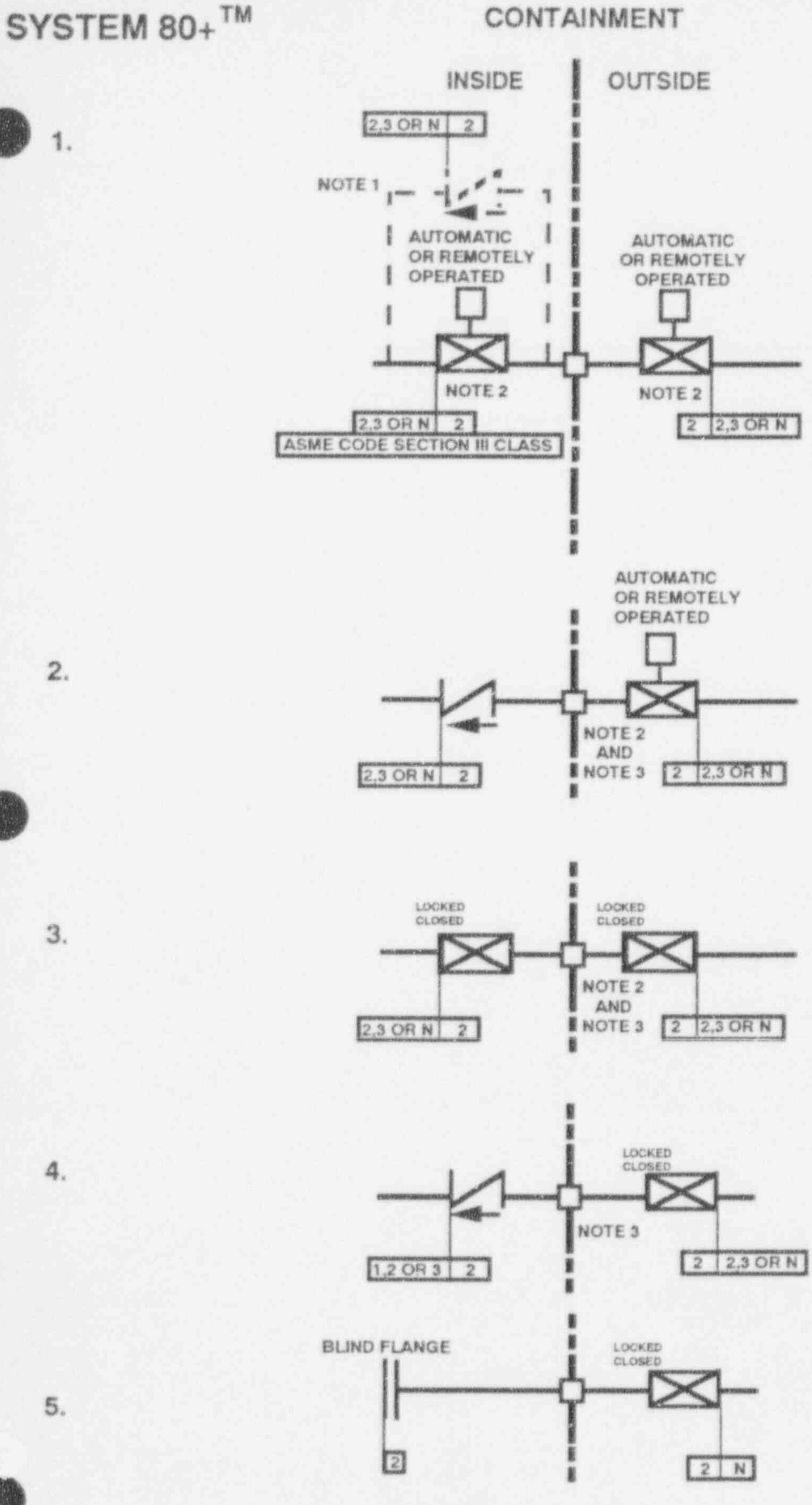

FIGURE 2.4.5-1 (PAGE 1 OF 4)
CONTAINMENT ISOLATION VALVE CONFIGURATION

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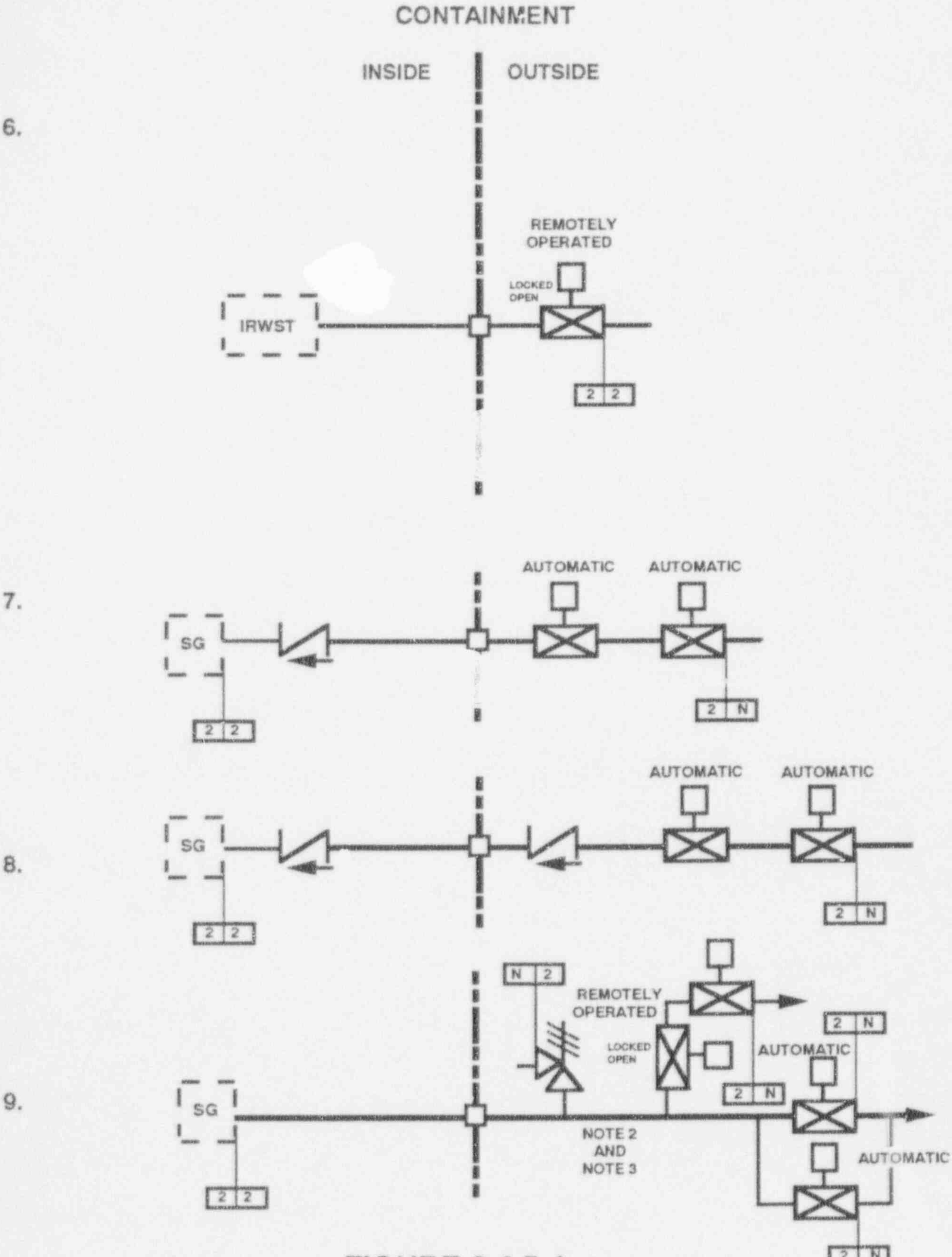


FIGURE 2.4.5-1 (PAGE 2 OF 4)
CONTAINMENT ISOLATION VALVE CONFIGURATION

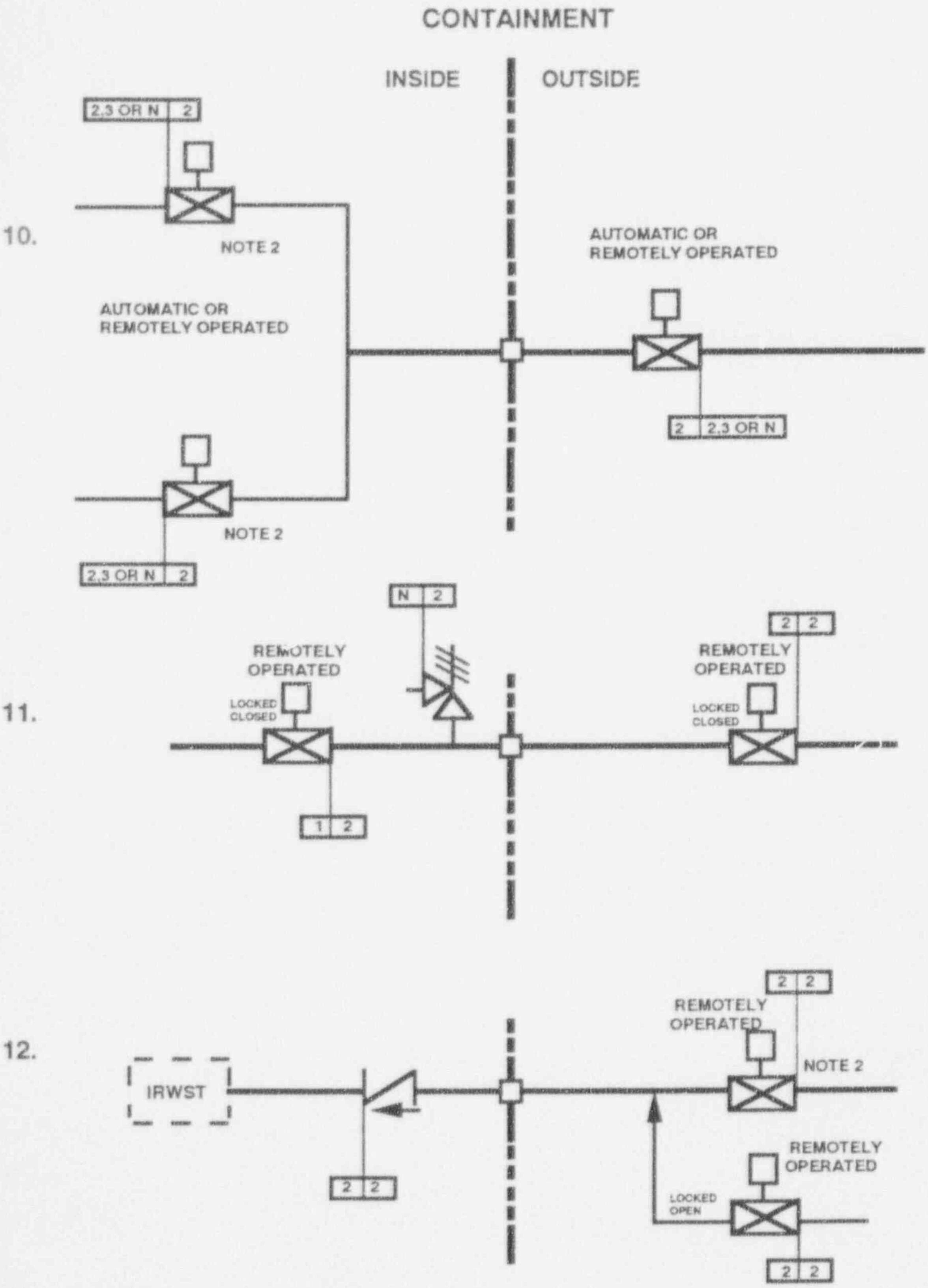
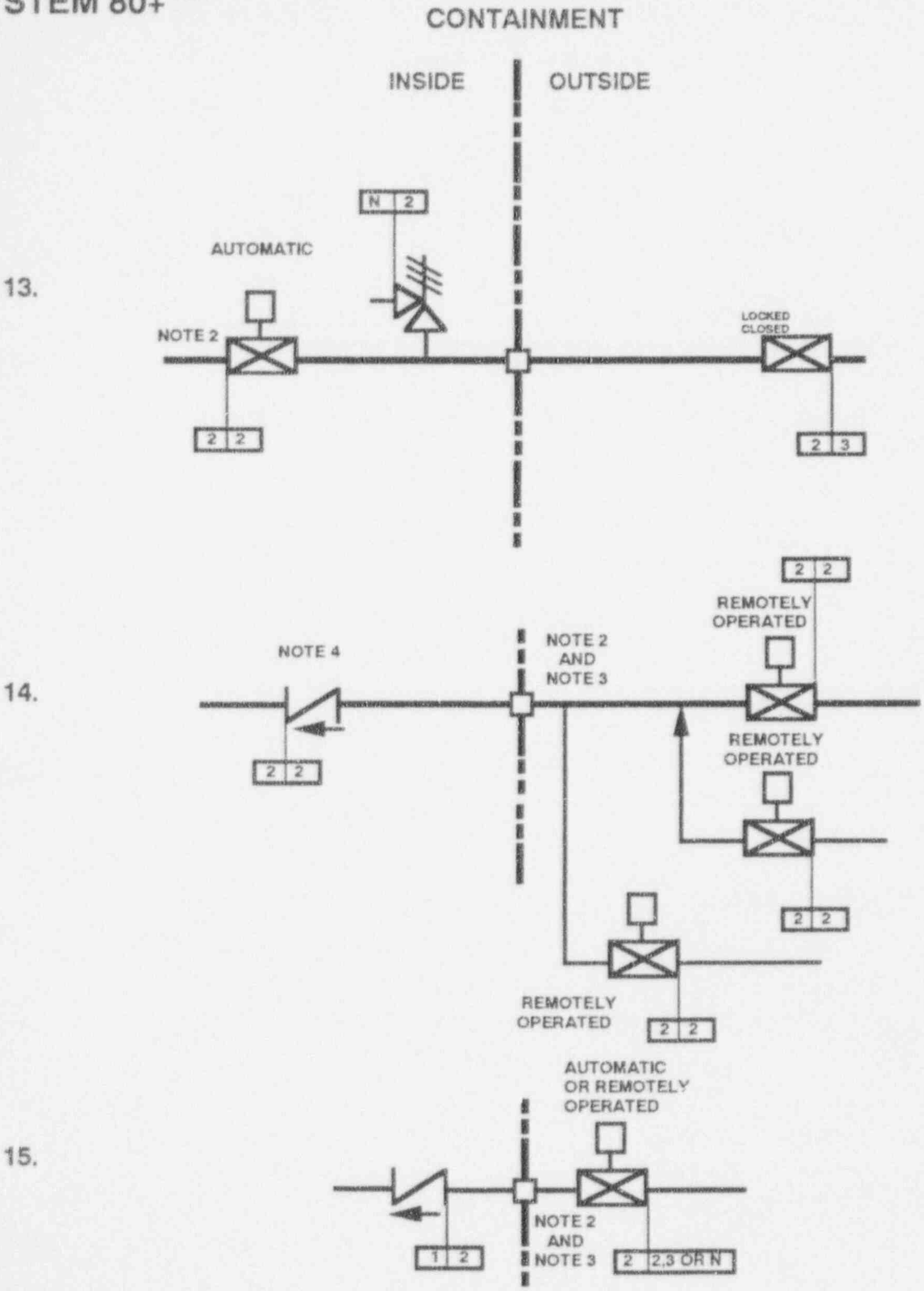


FIGURE 2.4.5-1 (PAGE 3 OF 4)
CONTAINMENT ISOLATION VALVE CONFIGURATION



NOTES:
1. LIQUID RELIEF VALVE CAN BE INCLUDED IN CONFIGURATION
2. VALVE CAN BE OPEN OR CLOSED IN NORMAL POSITION
3. FLOW ELEMENT/ROOT VALVES OMITTED FOR CLARITY, WHERE APPLICABLE.
4. CHECK VALVE IS NOT A CONTAINMENT ISOLATION VALVE

FIGURE 2.4.5-1 (PAGE 4 OF 4)
CONTAINMENT ISOLATION VALVE CONFIGURATION

TABLE 2.4.5-1

CONTAINMENT ISOLATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Containment isolation valves for piping which penetrates Containment is as shown on Figure 2.4.5-1; each Containment isolation valve arrangement is as shown in one of the configurations on the figure.	1. Inspection of the as-built CIS configuration will be conducted.	1. For the components and equipment shown on Figure 2.4.5-1 and specified in Table 2.4.5-2, the as-built CIS conforms with the specified Basic Configuration shown on Figure 2.4.5-1.
2. The ASME Code Section III valves shown on Figure 2.4.5-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	2. A pressure test will be performed on those components of the CIS required to be pressure tested by ASME Code Section III.	2. The results of the pressure test of ASME Code Section III components of the CIS specified in Table 2.4.5-2 conform with the pressure testing acceptance criteria in ASME Code Section III.
3.a) Electrically-powered Containment isolation valves are Class 1E. These Class 1E loads are powered from their respective Class 1E Divisions.	3.a) Testing will be performed on the Containment isolation valves by providing a test signal in only one Class 1E Division at a time.	3.a) Within the CIS, a test signal exists only at the equipment powered from the Class 1E Division under test.
3.b) The Containment equipment hatch trolley receives Class 1E power.	3.b) Inspection of the as-built Containment equipment hatch trolley will be performed.	3.b) The Containment equipment hatch trolley receives Class 1E power.
3.c) Independence is provided between Class 1E Divisions and between Class 1E Divisions and non-Class 1E equipment in the CIS.	3.c) Inspection of the as-installed Class 1E Divisions in the CIS will be performed.	3.c) Physical separation exists between Class 1E Divisions in the CIS. Separation exists between Class 1E Divisions and non-Class 1E equipment in the CIS.

TABLE 2.4.5-1 (Continued)

CONTAINMENT ISOLATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. Redundant Containment isolation valves which require electrical power are powered from different Class 1E Divisions.	4. Testing will be performed on the Containment isolation valves by providing a test signal in only one Class 1E Division at a time.	4. Within the CIS, a test signal exists only at the equipment powered from the Class 1E Division under test.
5.a) Displays of CIS valve positions for remotely operated and automatic Containment isolation valves exist in the MCR or can be retrieved there.	5.a) Inspection for the existence or retrievability in the MCR of displays of Containment isolation valve positions will be performed.	5.a) Displays of CIS valve positions for remotely operated and automatic Containment isolation valves exist in the MCR or can be retrieved there.
5.b) Controls exist in the MCR to open and close CIS power operated valves.	5.b) Testing will be performed using the Containment isolation valve controls in the MCR.	5.b) Controls in the MCR operate to open and close power operated Containment isolation valves.
6.a) Only those valves required to close automatically for Containment isolation are closed by a CIAS.	6.a) Testing of the isolation function will be performed using a signal simulating CIAS.	6.a) Containment isolation valves respond to a signal simulating CIAS as specified in Table 2.4.5-2.
6.b) Containment isolation valves that receive a CIAS close within the time allocated to the function performed.	6.b) Testing of the closure times of automatically actuated Containment isolation valves will be performed using a signal that simulates a CIAS.	6.b) Containment isolation valves close upon receipt of a signal that simulates a CIAS in less than or equal to the time specified in Table 2.4.5-2, if specified.
6.c) Containment isolation valves that receive a CIAS, upon closure, do not reopen as a direct result of reset of the CIAS.	6.c) Following closure of Containment isolation valves on a signal that simulates a CIAS, tests will be performed to verify that the valves do not reopen when a signal that simulates the CIAS reset is applied.	6.c) Containment isolation valves, once closed by a signal that simulates a CIAS, do not reopen as a direct result of a signal that simulates resetting the CIAS.

TABLE 2.4.5-1 (Continued)

CONTAINMENT ISOLATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. Pneumatic Containment isolation valves close upon loss of motive or control power to the valve.	7. Testing will be performed on each pneumatic Containment isolation valve to simulate a loss of motive power and a loss of control power.	7. Pneumatic Containment isolation valves close.
8. Motor-operated valves (MOVs) that receive a CIAS will close under differential pressure or fluid flow conditions, and under temperature conditions.	8. Testing to close MOVs that receive a CIAS will be conducted under preoperational differential pressure or fluid flow conditions, and under temperature conditions.	8. Each MOV that receives a CIAS closes.
9. Containment isolation check valves having an active safety function will close under system pressure, fluid flow conditions, or temperature conditions.	9. Testing of Containment isolation check valves will be conducted under system preoperational pressure, fluid flow conditions, or temperature conditions.	9. Each Containment isolation check valve specified in Table 2.4.5-2 closes.
10.a) Containment isolation valves required to close against containment atmosphere are designed to close against at least containment design pressure.	10.a) Inspection and analysis will be performed on Containment isolation valves required to close against containment atmosphere.	10.a) Reports exist which conclude that containment isolation valves required to close against containment atmosphere are designed to close against at least containment design pressure.
10.b) Containment isolation valves and piping between CIVs are designed for pressures at least equal to the containment design pressure.	10.b) Inspection and analysis of containment isolation valves and piping between CIVs will be performed.	10.b) Reports exist which conclude that containment isolation valves and piping between CIVs are designed for pressures at least equal to the containment design pressure.

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
1	Main Steam Line #1 from Steam Generator #1 Remotely Operated Safety Valve Safety Valve Safety Valve Safety Valve Safety Valve Remotely Operated Remotely Operated Remotely Operated Manual Valve Manual Valve	9	No	 – – – – – – – – – – –
2	Main Steam Line #2 from Steam Generator #1 Remotely Operated Safety Valve Safety Valve Safety Valve Safety Valve Safety Valve Remotely Operated Remotely Operated Remotely Operated Manual Valve	9	No	 – – – – – – – – – –
3	Main Steam Line #1 from Steam Generator #2 Remotely Operated Safety Valve Safety Valve Safety Valve Safety Valve Safety Valve Remotely Operated Remotely Operated Remotely Operated Manual Valve	9	No	 – – – – – – – – – –

TABLE 2.4.5-2 (Continued)

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
4	Main Steam Line #2 from Steam Generator #2	9	No	
	Remotely Operated			–
	Safety Valve			–
	Safety Valve			–
	Safety Valve			–
	Safety Valve			–
	Safety Valve			–
	Remotely Operated			–
	Remotely Operated			–
	Remotely Operated			–
	Manual Valve			–
	Manual Valve			–
5	Main Feedwater to Downcomer Nozzle Steam Generator #1	8	No	
	Remotely Operated			–
	Remotely Operated			–
	Check Valve			–
	Check Valve			–
6	Main Feedwater to Downcomer Nozzle Steam Generator #2	8	No	
	Remotely Operated			–
	Remotely Operated			–
	Check Valve			–
	Check Valve			–
7	Main Feedwater to Economizer Nozzles for Steam Generator #1	7	No	
	Remotely Operated			–
	Remotely Operated			–
	Check Valve			–

TABLE 2.4.5-2 (Continued)

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
8	Main Feedwater to Economizer Nozzles for Steam Generator #2	7	No	
	Remotely Operated			–
	Remotely Operated			–
	Check Valve			–
9	Motor-Driven EFW Pump #1 Discharge	2	No	
	Remotely Operated			–
	Check Valve			–
10	Motor-Driven EFW Pump #2 Discharge	2	No	
	Remotely Operated			–
	Check Valve			–
11	Steam-Driven EFW Pump #1 Discharge	2	No	
	Remotely Operated			–
	Check Valve			–
12	Steam-Driven EFW Pump #2 Discharge	2	No	
	Remotely Operated			–
	Check Valve			–
13	Safety Injection Pump #4 Discharge	2	No	
	Remotely Operated			–
	Check Valve (Note 4)			–
14	Safety Injection Pump #2 Discharge	14	No	
	Remotely Operated			–
	Remotely Operated			–
	Check Valve (Note 4)			–
	Remotely Operated			–

TABLE 2.4.5-2 (Continued)

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
15	Safety Injection Pump #3 Discharge	2	No	
	Remotely Operated			–
	Check Valve (Note 4)			–
16	Safety Injection Pump #1 Discharge	14	No	
	Remotely Operated			–
	Remotely Operated			–
	Check Valve (Note 4)			–
	Remotely Operated			–
17	SCS Pump #2 Suction	11	No	
	Remotely Operated			–
	Relief Valve			–
	Remotely Operated			–
18	SCS Pump #1 Suction	11	No	
	Remotely Operated			–
	Relief Valve			–
	Remotely Operated			–
19	Hot Leg Injection Loop #2	15	No	
	Remotely Operated			–
	Check Valve			–
20	Hot Leg Injection Loop #1	15	No	
	Remotely Operated			–
	Check Valve			–

TABLE 2.4.5-2 (Continued)

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
21	Containment Spray Pump #2 Discharge Remotely Operated Check Valve	2	No	 – –
22	Containment Spray Pump #1 Discharge Remotely Operated Check Valve	2	No	 – –
23	Safety Injection Pump #1 and Containment Spray Pump #1 Suction Line Remotely Operated	6	No	 –
24	Safety Injection Pump #2 and Containment Spray Pump #2 Suction Line Remotely Operated	6	No	 –
25	Safety Injection Pump #3 Suction Remotely Operated	6	No	 –
26	Safety Injection Pump #4 Suction Remotely Operated	6	No	 –
27	SIS Division 1 Miniflow Return to IRWST Remotely Operated Check Valve Remotely Operated	12	No	 – – –
28	SIS Division 2 Miniflow Return to IRWST Remotely Operated Check Valve Remotely Operated	12	No	 – – –

TABLE 2.4.5-2 (Continued)

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
29	Return Header from SI Tanks	13	No	
	Remotely Operated			–
	Manual Valve			–
	Relief Valve			–
30	CCW Supply to Letdown Heat Exchanger	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
	Check Valve			–
31	CCW Return from Letdown Heat Exchanger	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
	Check Valve			–
32	CCW Supply to RCP Heat Exchangers 1A and 1B	1	No	
	Remotely Operated			–
	Remotely Operated			–
	Check Valve			–
33	CCW Return from RCP Heat Exchangers 1A and 1B	1	No	
	Remotely Operated			–
	Remotely Operated			–
	Check Valve			–
34	CCW Supply to RCP Heat Exchangers 2A and 2B	1	No	
	Remotely Operated			–
	Remotely Operated			–
	Check Valve			–

TABLE 2.4.5-2 (Continued)

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
35	CCW Return from RCP Heat Exchangers 2A and 2B	1	No	
	Remotely Operated			–
	Remotely Operated			–
	Check Valve			–
36	Shutdown Purification Line to Letdown Heat Exchanger	4	No	
	Manual Valve			–
	Check Valve			–
37	Letdown to Purification System	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
38	CVCS Charging Line	2	No	
	Remotely Operated			–
	Check Valve			–
39	RCP Seal Injection	2	No	
	Remotely Operated			–
	Check Valve			–
40	RCP Seal Return Flow	1	No	
	Remotely Operated			–
	Remotely Operated			–
41	RDT Flow to RDPs	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec

TABLE 2.4.5-2 (Continued)

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
42	Resin Sluice Supply to Reactor Drain Tank Remotely Operated Check Valve	2	Yes	60 sec –
43	Breathing Air Supply Remotely Operated Check Valve	2	Yes	60 sec –
44	Station Air Supply Remotely Operated Check Valve	2	Yes	60 sec –
45	Instrument Air Supply Remotely Operated Check Valve	2	Yes	60 sec –
46	Instrument Air Supply Remotely Operated Check Valve	2	Yes	60 sec –
47	Refueling Pool Cleanup Suction Line Manual Valve Manual Valve	3	No	– –
48	Refueling Pool Cleanup Return Header Manual Valve Manual Valve	3	No	– –

TABLE 2.4.5-2 (Continued)

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
49	Pressurizer Liquid Sample Line	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
50	Pressurizer Steam Space Sample Line	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
51	Hot Leg Sample Line	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
52	Holdup Volume Tank Sample Line	10	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
	Remotely Operated			60 sec
53	Steam Generator #1 Cold Leg Sample	1	No	
	Remotely Operated			–
	Remotely Operated			–
54	Steam Generator #1 Hot Leg Sample	1	No	
	Remotely Operated			–
	Remotely Operated			–
55	Steam Generator #1 Downcomer Sample	1	No	
	Remotely Operated			–
	Remotely Operated			–

TABLE 2.4.5-2 (Continued)

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
56	Steam Generator #2 Cold Leg Sample	1	No	
	Remotely Operated			–
	Remotely Operated			–
57	Steam Generator #2 Hot Leg Sample	1	No	
	Remotely Operated			–
	Remotely Operated			–
58	Steam Generator #2 Downcomer Sample	1	No	
	Remotely Operated			–
	Remotely Operated			–
59	High Volume Containment Purge System Supply #1	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
60	High Volume Containment Purge System Supply #2	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
61	High Volume Containment Purge System Exhaust #1	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
62	High Volume Containment Purge System Exhaust #2	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec

TABLE 2.4.5-2 (Continued)

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
63	Low Volume Containment Purge System Supply Remotely Operated Check Valve	2	Yes	 30 sec –
64	Low Volume Containment Purge System Exhaust Remotely Operated Remotely Operated	1	Yes	 30 sec 30 sec
65	Steam Generator #1 Combined Blowdown Remotely Operated Remotely Operated Check Valve	1	Yes	 60 sec 60 sec
66	Steam Generator #2 Combined Blowdown Remotely Operated Remotely Operated Check Valve	1	Yes	 60 sec 60 sec
67	Fire Protection Water Supply to Containment (Line Number 1) Remotely Operated Check Valve	2	Yes	 60 sec –
68	Fire Protection Water Supply to Containment (Line Number 2) Remotely Operated Check Valve	2	Yes	 60 sec –
69	Division 1 NCWS Supply to Containment Ventilation Units and CEDM Units Remotely Operated Remotely Operated	1	Yes	 60 sec 60 sec

TABLE 2.4.5-2 (Continued)

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
70	Division 2 NCWS Supply to Containment Ventilation Units and CEDM Units	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
71	Division 1 NCWS Return From Containment Ventilation Units and CEDM Units	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
72	Division 2 NCWS Return From Containment Ventilation Units and CEDM Units	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
73	Containment Radiation Monitor (Inlet)	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
74	Containment Radiation Monitor (Outlet)	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
75	ILRT Pressure Sensing Line	3	No	
	Manual Valve			--
	Manual Valve			--
76	Demineralized Water	2	Yes	
	Remotely Operated			60 sec
	Check Valve			--

TABLE 2.4.5-2 (Continued)

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
77	Nitrogen Supply to Safety Injection Tanks and RDT	2	Yes	
	Remotely Operated			60 sec
	Check Valve			–
78	ILRT Pressurization Line	5	No	
	Manual Valve			–
	Flange			–
79	RCP Oil Fill Line	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			–
80	Containment Sump Pump Discharge Line	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
	Check Valve			–
81	Containment Ventilation Units' Condensate Drain Header	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
	Check Valve			–
82	Reactor Drain Tank Gas Space to GWMS	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
83	Decontamination Line	3	No	
	Manual Valve			–
	Manual Valve			–

TABLE 2.4.5-2 (Continued)

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
84	Division 1 Hydrogen Recombiner Suction from Containment	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
85	Division 2 Hydrogen Recombiner Suction from Containment	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
86	Division 1 Hydrogen Recombiner Discharge to Containment	2	Yes	
	Remotely Operated			60 sec
	Check Valve			–
87	Division 2 Hydrogen Recombiner Discharge to Containment	2	Yes	
	Remotely Operated			60 sec
	Check Valve			–
88	Steam Generator Wet Layup Recirculation Return to Steam Generator #1	4	No	
	Manual Valve			–
	Check Valve			–
89	Steam Generator Wet Layup Recirculation Return to Steam Generator #2	4	No	
	Manual Valve			–
	Check Valve			–
90	SI IRWST Boron Recovery Supply to CVCS	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec

TABLE 2.4.5-2 (Continued)

CONTAINMENT PENETRATIONS

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
91	CVCS IRWST Boron Recovery Return Remotely Operated Check Valve	2	Yes	 60 sec –

NOTES:

1. Valve arrangements are in accordance with the Containment isolation valve configurations shown on Figure 2.4.5-1.
2. Paragraph Number 3 of the General Provisions (Section 1.2) applies to Containment isolation valves which receive a CIAS.
3. A dash (–) denotes NOT APPLICABLE
4. Not a containment isolation valve.

2.4.6 CONTAINMENT SPRAY SYSTEM

Design Description

The Containment Spray System (CSS) is a safety-related system which removes heat and reduces the concentration of radionuclides released from the fuel from the Containment atmosphere and transfers the heat to the component cooling water system following events which increase Containment temperature and pressure. The CSS can also remove heat from the in-containment refueling water storage tank (IRWST).

The CSS is located in the reactor building subsphere and Containment.

The Basic Configuration of the CSS is as shown on Figure 2.4.6-1.

The CSS consists of two Divisions. Each CSS Division has a CSS pump, a CSS heat exchanger, valves, piping, spray headers, nozzles, controls, and instrumentation.

Each CSS Division has the heat removal capacity to cool and depressurize the containment atmosphere, such that containment design temperature and pressure are not exceeded following a loss of coolant accident (LOCA) or a main steam line break (MSLB).

Each CSS Division has the capacity to reduce the concentration of radioactive material in the containment atmosphere such that the design basis accident dose criteria are not exceeded.

The CSS limits the maximum flow in each Division.

The CSS pump and the Shutdown Cooling System (SCS) pump in the same Division are connected by piping and valves such that the SCS pump in a Division can perform the pumping function of the CSS pump in that Division. The piping and valves in the cross-connect line between the SCS pump suction and the CSS pump suction permit flow in either direction.

A flow recirculation line around each CSS pump provides a minimum flow recirculation path.

The CSS pumps can be flow tested during plant operation.

The ASME Code Section III Class for the CSS pressure retaining components shown on Figure 2.4.6-1 is as depicted on the Figure.

The safety related equipment shown on Figure 2.4.6-1 is classified Seismic Category I.

CSS pressure retaining components shown on Figure 2.4.6-1, except the shell side of the heat exchangers, have a design pressure outside Containment of at least 900 psig.

Displays of the CSS instrumentation shown on Figure 2.4.6-1 exist in the main control room (MCR) or can be retrieved there. Controls exist in the MCR to start and stop the CSS pumps, and to open and close those remote-operated valves shown on Figure 2.4.6-1. CSS alarms shown on Figure 2.4.6-1 are provided in the MCR.

Water is supplied to each CSS pump at a pressure greater than the pump's required net positive suction head (NPSH).

The Class 1E loads shown on Figure 2.4.6-1 are powered from their respective Class 1E Division. The CSS pump motor and the SCS pump motor in each Division are powered from different Class 1E buses in that same Division.

Independence is provided between Class 1E Divisions and between Class 1E Divisions and non-Class 1E equipment in the CSS.

The two mechanical Divisions of the CSS are physically separated.

The CSS pumps are started upon receipt of a containment spray actuation signal (CSAS), except when the CSAS is aligned to the SCS pump in the same Division. The isolation valves to the CSS spray headers and nozzles are opened upon receipt of a containment spray actuation signal (CSAS).

Motor operated valves (MOVs) having an active safety function will open, or will close, or will open and also close under differential pressure or fluid flow conditions, and under temperature conditions.

Check valves shown on Figure 2.4.6-1 will open, or will close, or will open and also close under system pressure, fluid flow conditions, or temperature conditions.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.6-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Containment Spray System.

SYSTEM 80+™

Notes:

1. TUBE SIDES ARE ASME CODE SECTION III CLASS 2 AND SHELL (CCW) SIDES ARE ASME CODE SECTION III CLASS 3.

2. SAFETY-RELATED ELECTRICAL COMPONENTS AND EQUIPMENT SHOWN ON THIS FIGURE ARE CLASS 1E. ALARMS AND PRESSURE AND CURRENT INSTRUMENTS ARE NOT SAFETY-RELATED AND NOT CLASS 1E.

3. THE ASME CODE SECTION III CLASS 2 AND 3 PRESSURE RETAINING COMPONENTS SHOWN ARE SAFETY-RELATED

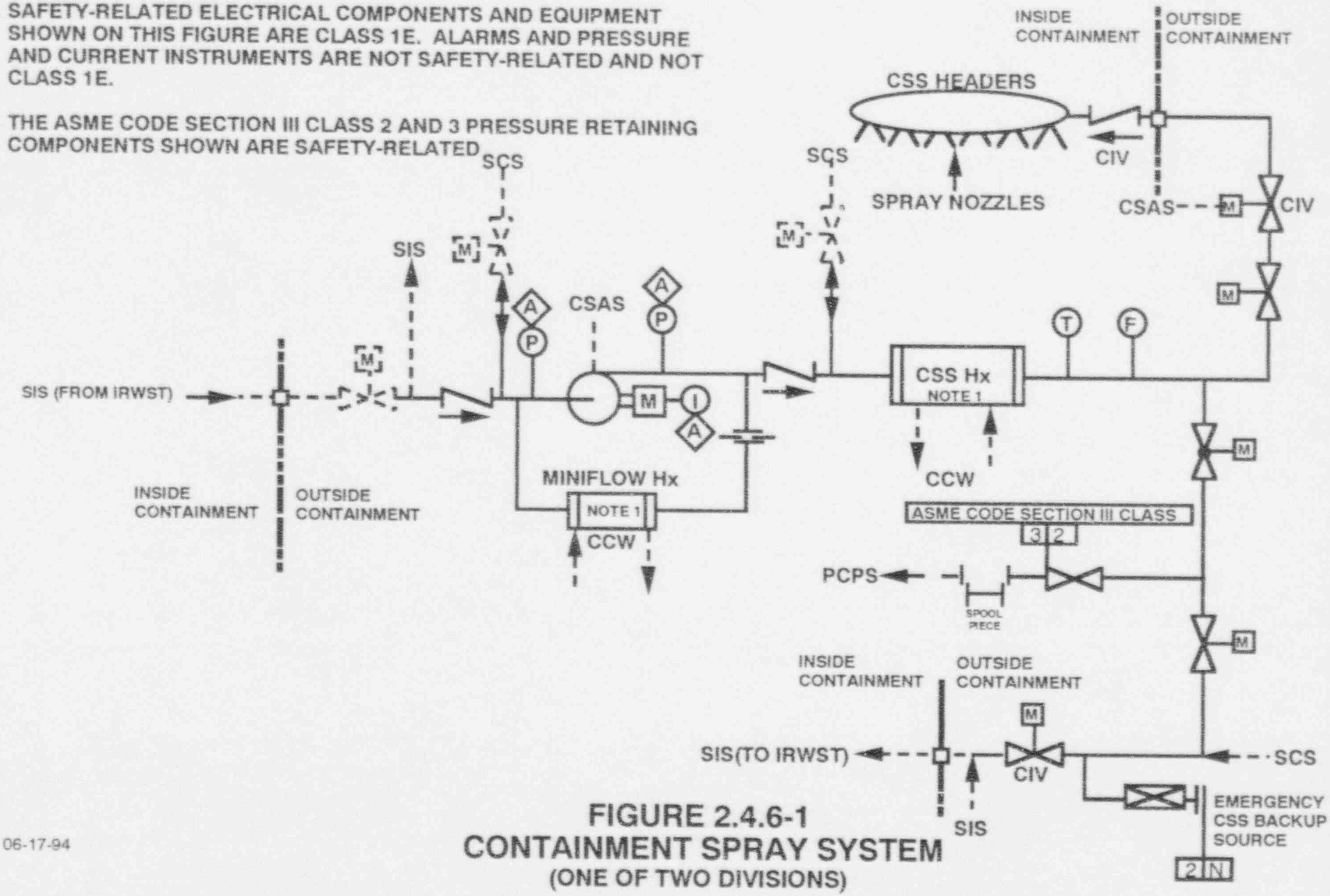


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FIGURE 2.4.6-1
CONTAINMENT SPRAY SYSTEM
(ONE OF TWO DIVISIONS)

TABLE 2.4.6-1

CONTAINMENT SPRAY SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the CSS is as shown on Figure 2.4.6-1.	1. Inspection of the as-built CSS configuration will be conducted.	1. For the components and equipment shown on Figure 2.4.6-1, the as-built CSS conforms with the Basic Configuration.
2. Each CSS Division has the heat removal capacity to cool and depressurize the containment atmosphere such that containment design temperature and pressure are not exceeded following a LOCA or MSLB.	2.a) Testing of the CSS to measure the containment spray flow at the discharge of the CSS pump will be performed. Testing and analysis will be performed to determine the pump head.	2.a) Each CSS pump develop at least 400 feet of head at a flow rate no less than 5000 gpm.
	2.b) Testing of the CSS will be performed using signals simulating a CSAS. The test results will be converted by analysis to a delay time for spray initiation.	2.b) Flow to the spray nozzles begins within 68 seconds after receipt of a CSAS.
	2.c) Testing and analyses will be performed to determine the heat removal capability of the CSS heat exchanger.	2.c) One CSS heat exchanger cools CSS flow to a maximum temperature of 175°F with an inlet temperature of 218°F when supplied with 8000 gpm from the CCWS at 120°F.
3. Each CSS Division has the capacity to reduce the concentration of radioactive material in the containment atmosphere such that the design basis accident dose criteria are not exceeded.	3. Inspection of the CSS spray headers will be performed.	3. Each CSS Division has spray headers and nozzles as follow: At least 168 nozzles at plant elevation of at least 225 feet, at least 121 nozzles at plant elevation of at least 197 feet, and at least 40 nozzles at plant elevation of at least 141 feet.

TABLE 2.4.6-1 (Continued)

CONTAINMENT SPRAY SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. The CSS limits the maximum flow in each Division.	4. Testing of the CSS will be performed with flow aligned to the IRWST. Inspection of the as-built spray header will be performed. Analyses will convert the test flow rates to the maximum expected flow rate.	4. The CSS maximum expected flow is less than or equal to 6500 gpm in each Division.
5. The SCS pump in a Division can perform the pumping function of the CSS pump in the Division.	5. Testing to measure the flowrate produced by the SCS pump when its suction is connected to the CSS pump suction and its discharge to the CSS pump discharge will be performed.	5. The SCS pump in a Division pumps at least 5000 gpm through the CSS heat exchanger in the Division.
6. A flow recirculation line around each CSS pump provides a minimum flow recirculation path.	6. Inspection of the as-built system configuration will be performed and testing of the minimum flow recirculation rate will be performed.	6. Minimum flow recirculation rate meets or exceeds the pump vendor's requirements.
7. The CSS pumps can be flow tested during plant operation.	7. Testing of the CSS will be performed by manually aligning suction and discharge valves to the IRWST and starting the CSS pumps manually.	7. The CSS pump has a flow capacity of at least 5000 gpm each through the test loop.
8. The ASME Code Section III CSS components shown on Figure 2.4.6-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	8. A pressure test will be conducted on those components of the CSS required to be pressure tested by ASME Code Section III.	8. The results of the pressure test of ASME Code Section III components of the CSS conform with the pressure testing acceptance criteria in ASME Code Section III.

TABLE 2.4.6-1 (Continued)

CONTAINMENT SPRAY SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
9.a) Displays of the CSS instrumentation shown on Figure 2.4.6-1 exist in the MCR or can be retrieved there.	9.a) Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	9.a) Displays of the instrumentation shown on Figure 2.4.6-1 exist in the MCR or can be retrieved there.
9.b) Controls exist in the MCR to start and stop the CSS pumps, and to open and close those power operated valves shown on Figure 2.4.6-1.	9.b) Testing will be performed using the CSS controls in the MCR.	9.b) CSS controls in the MCR operate to start and stop the CSS pumps and to open and close those power operated valves shown on Figure 2.4.6-1.
9.c) CSS alarms shown on Figure 2.4.6-1 are provided in the MCR.	9.c) Testing of the CSS alarms shown on Figure 2.4.6-1 will be performed using signals simulating alarm conditions.	9.c) The CSS alarms shown on Figure 2.4.6-1 actuate in response to signals simulating alarm conditions.
10. Water is supplied to each CSS pump at a pressure greater than the pump's required net positive suction head (NPSH).	10. Testing to measure CSS pump suction pressure will be performed. Inspection and analysis to determine NPSH available to each pump will be performed based on test data and as-built data.	10. The calculated available NPSH exceeds each CSS pump's required NPSH.

TABLE 2.4.6-1 (Continued)

CONTAINMENT SPRAY SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11.a) The Class 1E loads shown on Figure 2.4.6-1 are powered from their respective Class 1E Division.	11.a) Testing will be performed on the CSS by providing a test signal in only one Class 1E Division at a time.	11.a) Within the CSS, a test signal exists only at the equipment powered from the Class 1E Division under test.
11.b) The CSS pump motor and the SCS pump motor in each Division are powered from different Class 1E buses in that same Division.	11.b) Testing on the CSS and the SCS will be conducted with a test signal applied to one Class 1E bus at a time.	11.b) A test signal exists only at the CSS pump motor or SCS pump motor powered from the Class 1E bus under test.
11.c) Independence is provided between Class 1E Divisions and between Class 1E Divisions and non-Class 1E equipment in the CSS.	11.c) Inspection of the as-installed Class 1E Divisions in the CSS will be performed.	11.c) Physical separation exists between Class 1E Divisions in the CSS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the CSS.
12. The two mechanical Divisions of the CSS are physically separated.	12. Inspection of as-built mechanical Divisions will be performed.	12. The two mechanical Divisions of the CSS are separated by a Divisional wall or a fire barrier except for components of the system within Containment which are separated by spatial arrangement or barriers.
13. The CSS pumps are started upon receipt of a CSAS, except when the CSAS is aligned to the SCS pump in the same Division.	13. Testing will be performed on the CSS pumps using a signal simulating a CSAS.	13. The CSS pumps start upon receiving a signal simulating a CSAS, except when the CSAS is aligned to the SCS pump in the same Division.

TABLE 2.4.6-1 (Continued)

CONTAINMENT SPRAY SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
14. In each Division, the CSS isolation valve to the CSS spray header and nozzles opens upon receipt of a CSAS.	14. Testing will be performed using a signal simulating a CSAS.	14. The CSS isolation valve to the CSS spray header and nozzles opens upon receipt of a signal simulating a CSAS.
15. Motor operated valves (MOVs) having an active safety function will open, or will close, or will open and also close under differential pressure or fluid flow conditions, and under temperature conditions.	15. Testing will be performed to open, or close, or open and also close MOVs having an active safety function under preoperational differential pressure or fluid flow conditions and under temperature conditions.	15. Each MOV having an active safety function opens or closes, or opens and also closes.
16. Check valves shown on Figure 2.4.6-1 will open, or will close, or will open and also close under system pressure, fluid flow conditions, or temperature conditions.	16. Testing will be performed to open, or close, or open and also close check valves shown on Figure 2.4.6-1 under system preoperational pressure, fluid flow conditions, or temperature conditions.	16. Each check valve shown on Figure 2.4.6-1 opens, or closes, or opens and also closes.

2.4.7 IN-CONTAINMENT WATER STORAGE SYSTEM

Design Description

The In-containment Water Storage System (IWSS) includes the in-containment refueling water storage tank (IRWST) which is an integral part of the NI structures, the holdup volume tank (HVT) which is an integral part of the NI structures, and the cavity flooding system (CFS).

The IRWST provides borated water for the safety injection system (SIS) and the containment spray system (CSS). It is the primary heat sink for discharges from the reactor coolant system (RCS) pressurizer safety valves and the safety depressurization system (SDS) rapid depressurization subsystem. It is the source of water for the CFS. It is the source of water to fill the refueling pool via the SIS and CSS. The IRWST and IRWST instrumentation are safety-related except as noted in Figure 2.4.7-1.

The HVT collects water released in Containment during design basis events and returns water to the IRWST through spillways. It also collects component leakage not routed to other drain systems inside Containment and receives water discharged from the IRWST by the CFS.

The CFS is used to provide water to flood the reactor cavity in response to beyond design basis events.

CFS valves located in the holdup volume are designed such that they may be actuated while submerged.

The IWSS is located in the Containment.

The Basic Configuration of the IWSS is as shown on Figure 2.4.7-1 and locations of IRWST and HVT are shown on Figure 2.1.1-1 in Section 2.1.1, Nuclear Island Structures.

The IRWST has a volume above the SIS/CSS pump suction line penetrations to permit proper SIS and CSS operation following design basis events. The IRWST has a total volume that permits dilution of radionuclides from core and RCS release following design basis loss-of-coolant accidents (LOCAs). The IRWST can be vented to allow communication between the IRWST and the containment atmosphere.

Stainless steel baskets containing trisodium phosphate are located in the HVT.

The ASME Code Section III Class for the IWSS pressure retaining components is as shown on Figure 2.4.7-1.

The safety related equipment shown on Figure 2.4.7-1 is classified Seismic Category I.

Displays of IWSS instrumentation shown on Figure 2.4.7-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to open and close those power operated valves shown on Figure 2.4.7-1.

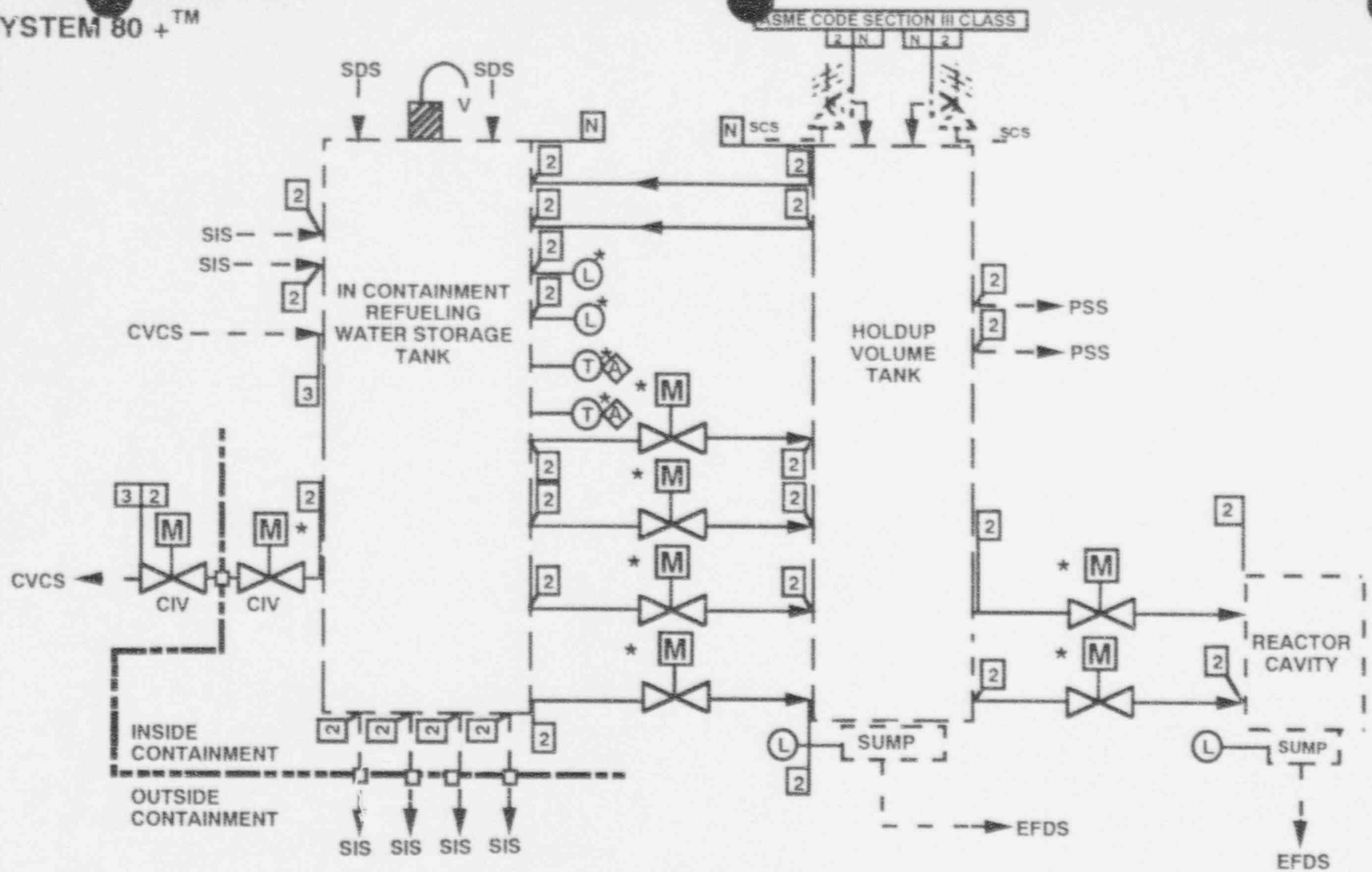
IWSS alarms shown on Figure 2.4.7-1 are provided in the MCR.

The power operated valves and IRWST instrumentation, except alarms, shown on Figure 2.4.7-1 are powered from their respective Class 1E Division. Within the CFS, each of the four valves in the spillways from the IRWST to the HVT is powered from a different Class 1E bus, and each of the two valves in the spillways from the HVT to the reactor cavity is powered from a different Class 1E Division.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the IWSS.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.7-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Incontainment Water Storage System.



NOTES:

1. THE INSTRUMENTATION SHOWN, EXCEPT ALARMS AND SUMP LEVEL INSTRUMENTATION, ARE SAFETY-RELATED
2. THE POWER OPERATED VALVES AND IRWST INSTRUMENTATION SHOWN, EXCEPT ALARMS ARE POWERED FROM THEIR RESPECTIVE CLASS 1E DIVISION
3. ★ : EQUIPMENT FOR WHICH PARAGRAPH NUMBER 3 OF THE "VERIFICATION FOR BASIC CONFIGURATION FOR SYSTEMS" SECTION OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.

FIGURE 2.4.7-1
IN-CONTAINMENT WATER STORAGE SYSTEM

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TABLE 2.4.7-1

IN-CONTAINMENT WATER STORAGE SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the IWSS is as shown on Figure 2.4.7-1.	1. Inspection of the as-built IWSS configuration will be conducted.	1. For the components and equipment shown on Figure 2.4.7-1, the as-built IWSS conforms with the Basic Configuration.
2.a) The IRWST has a volume above the SIS/CSS pump suction line penetrations to permit proper SIS and CSS operation following design basis events.	2.a) Inspection of construction records for the IRWST will be performed.	2.a) The IRWST has a useable volume of at least 495,000 gallons above the SIS/CSS pump suction line penetrations.
2.b) The IRWST has a total volume that permits dilution of radionuclides from core and RCS release following design basis LOCAs.	2.b) Inspection of construction records for the IRWST will be performed.	2.b) The IRWST has a minimum total volume of at least 545,800 gallons.
3. Stainless steel baskets containing trisodium phosphate are located in the HVT.	3. Inspection of the as-built HVT will be performed.	3. Stainless steel baskets containing trisodium phosphate are located in the HVT.
4. The ASME Code Section III IWSS components shown on Figure 2.4.7-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	4. A pressure test will be conducted on those components of the IWSS required to be pressure tested by ASME Code Section III.	4. The results of the pressure test of ASME Code Section III portions of the IWSS conform with the pressure testing acceptance criteria in ASME Code Section III.

TABLE 2.4.7-1 (Continued)

IN-CONTAINMENT WATER STORAGE SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5.a) Displays of the IWSS instrumentation shown on Figure 2.4.7-1 exist in the MCR or can be retrieved there.	5.a) Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	5.a) Displays of the instrumentation shown on Figure 2.4.7-1 exist in the MCR or can be retrieved there.
5.b) Controls exist in the MCR to open and close those power operated valves shown on Figure 2.4.7-1.	5.b) Testing will be performed using the IWSS controls in the MCR.	5.b) IWSS controls in the MCR operate to open and close those power operated valves shown on Figure 2.4.7-1.
5.c) IWSS alarms shown on Figure 2.4.7-1 are provided in the MCR.	5.c) Testing of the IWSS alarms shown on Figure 2.4.7-1 will be performed using signals simulating alarm conditions.	5.c) The IWSS alarms shown on Figure 2.4.7-1 actuate in response to signals simulating alarm conditions.
6.a) The power operated valves and IRWST instrumentation, except alarms, shown on Figure 2.4.7-1 are powered from their respective Class 1E Division.	6.a) Testing will be performed on the IWSS components by providing a test signal in only one Class 1E Division at a time.	6.a) A test signal exists only at the IWSS components powered from the Class 1E Division under test.
6.b) Within the CFS, each of the four valves in the spillways from the IRWST to the HVT is powered from a different Class 1E bus.	6.b) Testing will be performed on the CFS valves by providing a test signal in only one Class 1E bus at a time.	6.b) A test signal exists only at the CFS valves powered from the Class 1E bus under test.
6.c) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the IWSS.	6.c) Inspection of the as-installed Class 1E Divisions in the IWSS will be performed.	6.c) Physical separation exists between Class 1E Divisions in the IWSS. Separation exists between Class 1E Divisions and non-Class 1E equipment in the IWSS.

2.5.1 PLANT PROTECTION SYSTEM

Design Description

The Plant Protection System (PPS) is a safety related instrumentation and control system which initiates reactor trip, and actuation of engineered safety features in response to plant conditions monitored by process instrumentation. Initiation signals from the PPS logic are sent to the reactor trip switchgear and to the Engineered Safety Features - Component Control System (ESF-CCS) to actuate protective functions.

The PPS is located in the nuclear island structures.

The Basic Configuration of the PPS is as shown on Figure 2.5.1-1.

The PPS and the electrical equipment that initiate reactor trip or engineered safety feature actuation are classified Seismic Category I.

The PPS uses sensors, transmitters, signal conditioning equipment, and digital equipment which performs the calculations and logic to generate protective function initiation signals.

The PPS features and equipment are software programmable processors, that operate with fixed sequenced program execution, and fixed memory allocation tables. There are two bistable processors per channel which provide separate trip paths where multiple sensors are available to detect the same transient.

There are two coincidence processors per channel each providing a local coincidence logic (LCL) for each assigned bistable trip function. Each coincidence processor has dedicated remote multiplexing from each bistable processor.

The Interface and Test Processor (ITP) communicates with the bistable trip processors, and coincidence processors. Separation is provided between protective (safety critical) PPS processing functions and auxiliary functions of man-machine interfaces, data communications, and automatic testing.

Data communication networks support the transmission of safety critical data on a continuous cyclical basis independent of plant transients.

The PPS equipment is classified Class 1E.

An environmental qualification program assures the PPS equipment is able to perform its intended safety function for the time needed to be functional, under its design environmental conditions. The environmental conditions, bounded by applicable design basis events, are: temperature, pressure, humidity, chemical effects, radiation, aging, seismic events, submergence, power supply voltage & frequency variations, electromagnetic compatibility, and synergistic effects which may have a significant effect on equipment performance. The environmental qualification of PPS equipment is achieved via tests, analyses, or a combination of analyses and tests.

Electromagnetic interference (EMI) qualification is applied for equipment based on operating environment and/or inherent design characteristics.

The PPS is qualified according to an established plan for Electromagnetic Compatibility (EMC).

The qualification plan requires the equipment to function properly when subjected to the expected operational electrical surges, EMI, electrostatic discharge (ESD), and radio frequency interference (RFI).

The equipment to be tested will be configured for intended service conditions.

A site survey is performed upon completion of system installation to characterize the installed EMI environment.

PPS software is designed, tested, installed, and maintained using a process which:

a. Defines the organization, responsibilities, and software quality assurance activities for the software engineering life cycle that provides for:

- establishment of plans and methodologies
- specification of functional, system, and software requirements and standards, identification of safety critical requirements
- design and development of software
- software module, unit, and system testing practices
- installation and checkout practices
- reporting and correction of software defects during operation

b. Specifies requirements for:

- software management, documentation requirements, standards, review requirements, and procedures for problem reporting and corrective action
- software configuration management, historical records of software, and control of software changes

- verification & validation, and requirements for reviewer independence

c. Incorporates a graded approach according to the software's relative importance to safety.

The use of commercial grade computer hardware and software items in the PPS is accomplished through a process that has:

- requirements for supplier design control, configuration management, problem reporting, and change control;
- review of product performance;
- receipt acceptance of the commercial grade item;
- final acceptance, based on equipment qualification and software validation in the integrated system.

Setpoints for initiation of PPS safety-related functions are determined using methodologies which have the following characteristics:

a) Requirements that the design basis analytical limits, data, assumptions, and methods used as the bases for selection of trip setpoints are specified and documented.

b) Instrumentation accuracies, drift and the effects of design basis transients are accounted for in the determination of setpoints.

c) The method utilized for combining the various uncertainty values is specified.

d) Identifies required pre-operational and surveillance testing.

e) Identifies performance requirements for replacement of setpoint related instrumentation.

f) The setpoint calculations are consistent with the physical configuration of the instrumentation.

Reactor Trip Initiation Function

Process instrumentation, the Plant Protection Calculators (PPCs), the Core Protection Calculators (CPCs), and the reactor trip switchgear function to initiate an automatic reactor trip. The process instrumentation provides sensor data input to the PPS which monitors the following plant conditions to provide a reactor trip:

Reactor Power - High
Reactor Coolant System Pressure - Low or High

Steam Generator Water Level - Low or High
Steam Generator Pressure - Low
Containment Pressure - High
Reactor Coolant Flow - Low
Departure from Nucleate Boiling Ratio - Low
Linear Heat Generation Rate - High

Setpoints for initiation of a reactor trip are installed for each monitored condition to provide for initiation of a reactor trip prior to exceeding reactor fuel thermal limits and the Reactor Coolant System pressure boundary limits for anticipated operational occurrences. If a monitored condition reaches its setpoint, the PPS automatically actuates the reactor trip switchgear.

Engineered Safety Features Initiation Function

Process instrumentation, the PPCs, the ESF-CCS, motor starters, and other actuated devices function to initiate the engineered safety feature systems. The process instrumentation provides sensor data input to the PPCs, which monitor the following plant conditions to initiate the engineered safety features systems.

Pressurizer Pressure - Low
Steam Generator Water Level - Low or High
Steam Generator Pressure - Low
Containment Pressure - High

If a monitored condition reaches its setpoint, the PPCs automatically generate one or more of the following Engineered Safety Feature Actuation Signals (ESFAS).

Safety Injection Actuation Signal
Containment Isolation Signal
Containment Spray Actuation Signal
Main Steam Isolation Signal
Emergency Feedwater Actuation Signals

These initiating signals are provided to the ESF-CCS, which responds by actuating the engineered safety feature systems.

Elements Of The PPS

The PPS is divided into four redundant channels. The following elements, depicted in Figures 2.5.1-2 and 2.5.1-3, are included in each channel of the PPS:

Process Instrumentation
Signal Conditioning Equipment
Limit Logic (PPC Bistables and CPCs)

Local Coincidence Logic
Initiation Logic
Reactor Trip Switchgear
Interface and Test Processor
Operator's Modules
Switches for Manual Activation of Reactor Trip Signals
Switches for Manual Activation of ESF Initiating Signals

Figure 2.5.1-2 shows the plant systems in which process instrumentation is implemented for generation of the sensor signal input to the PPS. Limit logic for process-value to setpoint comparison is implemented in bistable processors in each channel. System protective functions are distributed between bistable processors to provide functional diversity. The bistable processors generate trip signals based on the channel digitized value reaching a digital setpoint. The PPS maintenance and test panels provide the capability for trip limit setpoint changes. Limit logic for calculated departure from nucleate boiling ratio and high linear heat generation rate are implemented in each channel in a section of the PPS referred to as the Core Protection Calculator (CPC).

The trip output signals of the bistable processors and the CPC in each channel are sent to the local coincidence logic processors in all four PPS channels. Therefore, for each trip condition, the local coincidence logic processor in each channel receives four trip signals, one from its associated bistable processors or CPC from within the channel, and one from the equivalent bistable processors or CPC located in each of the other three redundant channels. The coincidence processors evaluate the local coincidence logic based on the state of the four like trip signals and their respective bypasses. A coincidence of any two like trip signals is required to generate a reactor trip or ESF initiation signal.

Operating bypasses are implemented in the PPS to provide for the bypass of trip functions which are plant mode specific. These bypasses are manually activated. The PPS automatically removes an operating bypass if the plant approaches conditions for which the associated trip function is designed to provide protection. Bistable trip channel bypasses allow one channel of the bistable inputs to the coincidence processors to be bypassed for each trip function. This converts the local coincidence logic to two-out-of-three coincidence for each trip function for which a bistable trip channel bypass is initiated. For each trip function, the PPS allows only one bistable trip channel to be bypassed at a time.

Upon coincidence of two like signals indicating one of the conditions for reactor trip, the PPS logic initiates actuation of a channel of the reactor trip switchgear. As shown on Figure 2.5.1-2, actuation of a selective two single channels of the reactor trip switchgear is required to cause a reactor trip. The reactor trip switchgear breakers interrupt power to the Control Element Drive Mechanism (CEDM) coils, allowing all Control Element Assemblies to drop into the core by gravity.

The reactor trip switchgear system (RTSS) can be tripped manually from the Main Control Room or the Remote Shutdown Room. The manual reactor trip uses hardwired circuits which are independent of the PPS bistable and coincidence processors. Once a reactor trip has been initiated, the breakers in the RTSS latch open.

Upon coincidence of two like signals indicating a condition for generating an ESFAS, the ESF initiation logic transmits the respective initiation signal to the ESF-CCS.

The PPS interfaces in the Main Control Room allow for manual activation of each of the ESF initiating signals input to the ESF-CCS. The PPS interfaces in the Remote Shutdown Room allow for manual activation of the initiating signals for Main Steam Isolation. Manual activation of these initiating signals is independent of the PPS bistable and coincidence processors.

The PPS operator's modules at the Main Control Room, the Remote Shutdown Room and at the maintenance and test panel allow operators to enter trip channel bypasses, operating bypasses, and variable setpoint resets. These modules provide indication of bypass status and bistable trip and pre-trip status.

Manual control capability for the PPS is transferred from the Main Control Room to the Remote Shutdown Room upon actuation of the Master Transfer Switches via signals from the ESF-CCS for all control functions except reactor trip. The manual reactor trip switches are active in both locations at all times. Provision for transferring PPS control capability back to the Main Control Room is provided at the maintenance and test panel.

Loss of power to, or disconnection of a reactor trip path component in a PPC or CPC will cause a trip initiating state to be detected in a downstream component in that channel.

Periodic testing to verify operability of the PPS can be performed with the reactor at power or when shutdown without interfering with the protective function of the system. Overlap in individual tests assures that all functions are tested from sensor input through to the actuation of a reactor trip circuit breaker and to the generation of protection function initiation signals provided to the ESF-CCS.

The ITP monitors the on-line continuous automatic PPC and CPC hardware testing and performs on-line periodic automatic software logic functional testing of PPS logic.

Where automatic testing is implemented in the PPS, it does not degrade the capability of the PPS to perform its protective function. Indication of the automatic test system status and test results are provided to the operator via the Interface and Test Processor interface to the DIAS and DPS.

Manual testing of PPS functions and hardware can be performed at the maintenance and test panel.

PPS Channel Separation and Isolation

Figure 2.5.1-3 shows the PPS channels and the signal flow from the process instrumentation to the individual channels for initiation of protection system functions. Four measurement channels with electrical independence are provided for each parameter used in the direct generation of these initiation signals, with the exception of the Control Element Assembly position which is a two channel measurement.

The four PPS channels are physically separated and electrically isolated.

Each PPS channel is powered from its respective Class 1E bus.

System Characteristics:

Number of independent channels of equipment	4
Minimum number of sensors per trip variable (at least one per channel except as identified above for the Control Element Assembly position))	4
Coincidence logic used for plant sensor inputs	Local 2-out-of-4
Reactor Manual/Automatic actuation trip logic	Selective 2-out-of-4
ESF Manual/Automatic Actuation Logic	Selective 2-out-of-4

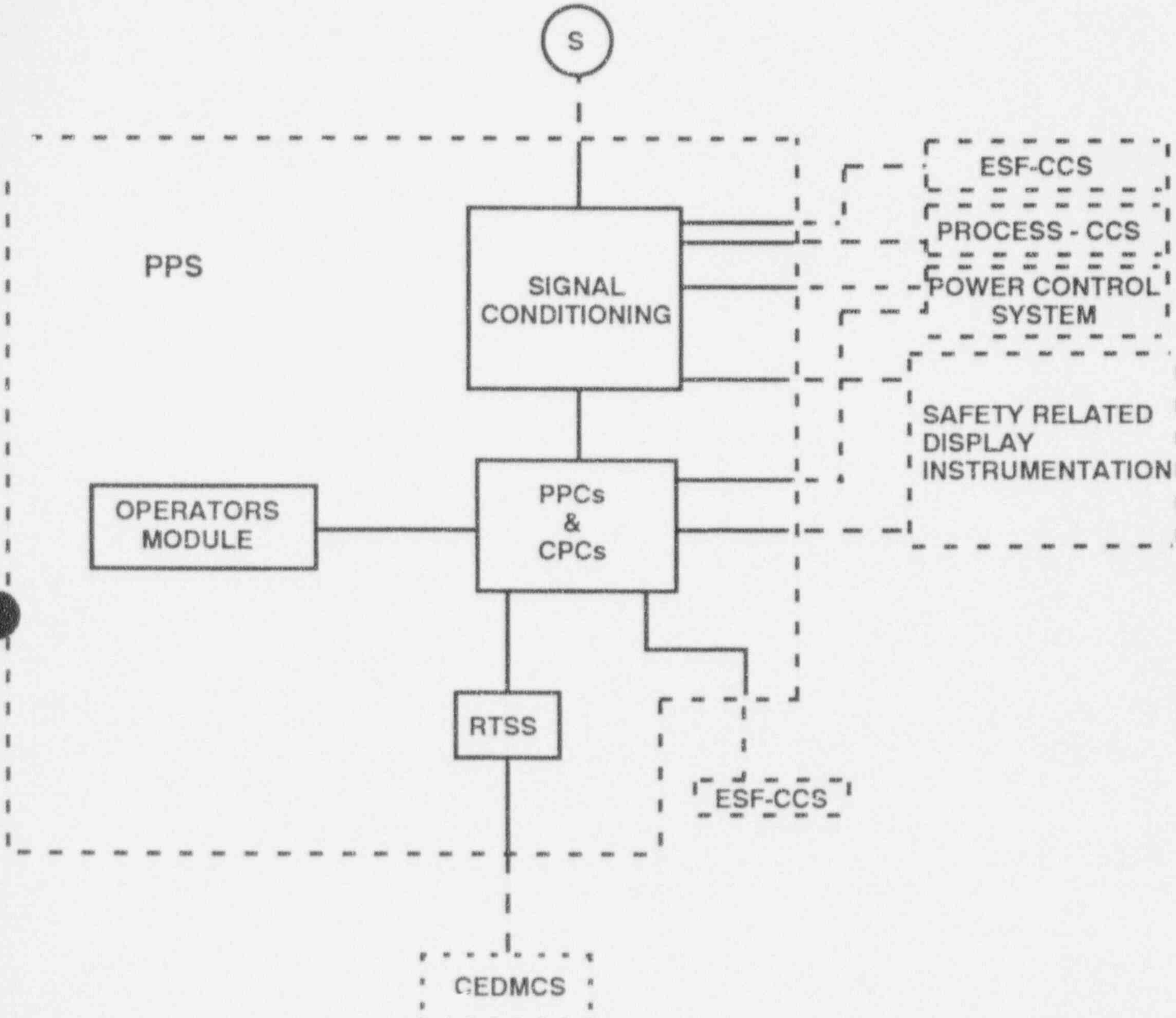
Electrical isolation and physical separation are provided between the PPS and the process control system. Where the PPS and the process control system interface with the same component (e.g., with sensors, signal conditioners, or actuated devices), electrical isolation devices are provided between the process control system and the shared component. Electrical isolation devices are provided at PPS interfaces with the Power Control System, the Discrete Indication and Alarm System - Channel N, and the Data Processing System as shown on Figure 2.5.1-2. Electrical isolation devices are provided between the signal conditioning equipment and the Discrete Indication and Alarm System - Channel P.

Physical separation is provided between PPS channels for the hardwired circuits used for manual initiation of reactor trip signals.

Other operator interfaces from the main control panel and the remote shutdown panel to the PPS have electrical isolation devices.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.5.1-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Plant Protection System.



NOTES:

1. PPS EQUIPMENT SHOWN ON THE FIGURE IS CLASS 1E.
2. PPS EQUIPMENT IS POWERED FROM CLASS 1E SUPPLIES.
3. EACH PPS CHANNEL (4 IN NUMBER) IS POWERED FROM A SEPARATE CLASS 1E BUS.

FIGURE 2.5.1-1
PPS CONFIGURATION

06-17-94

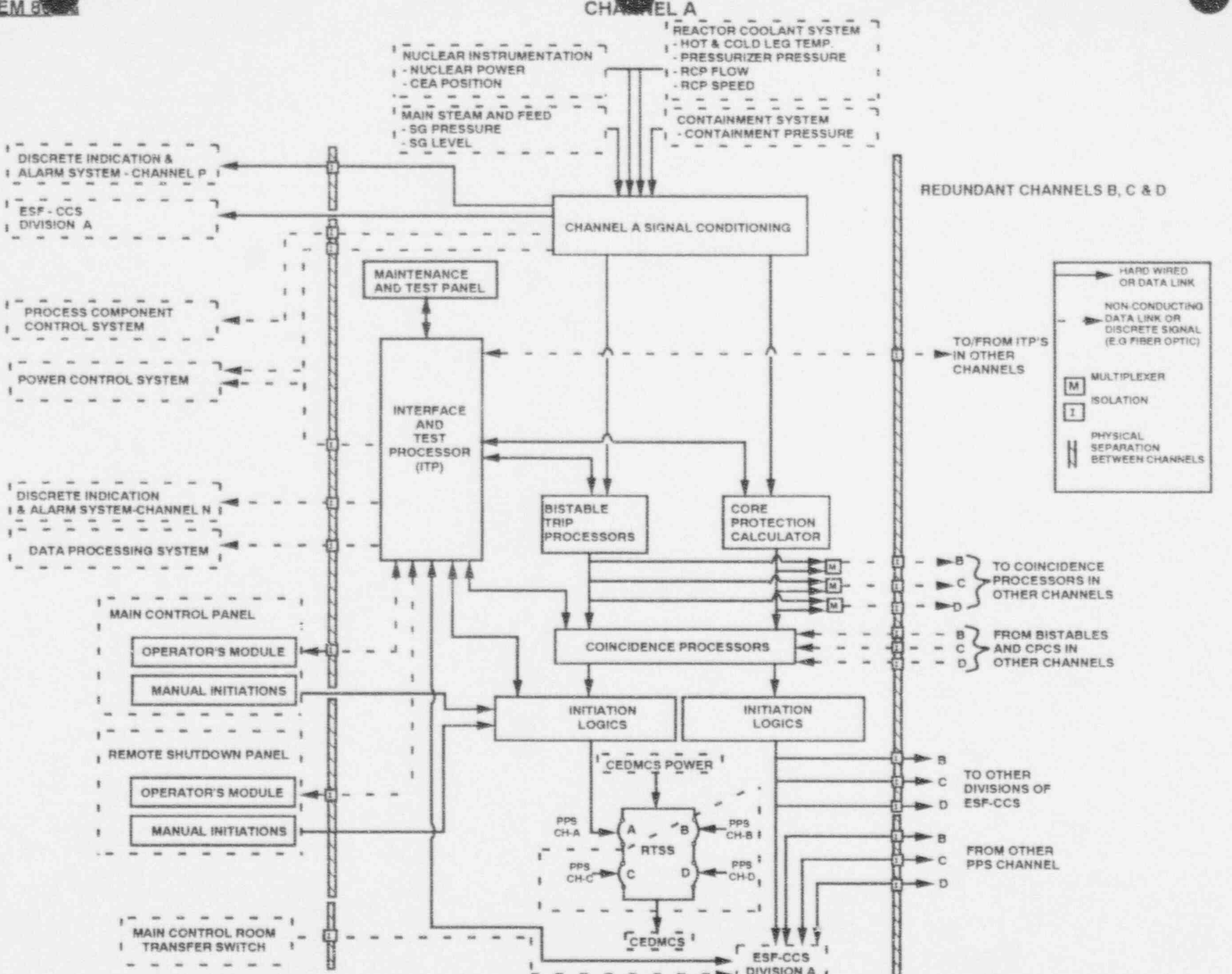


FIGURE 2.5.1-2
PLANT PROTECTION SYSTEM INTERCONNECTIONS

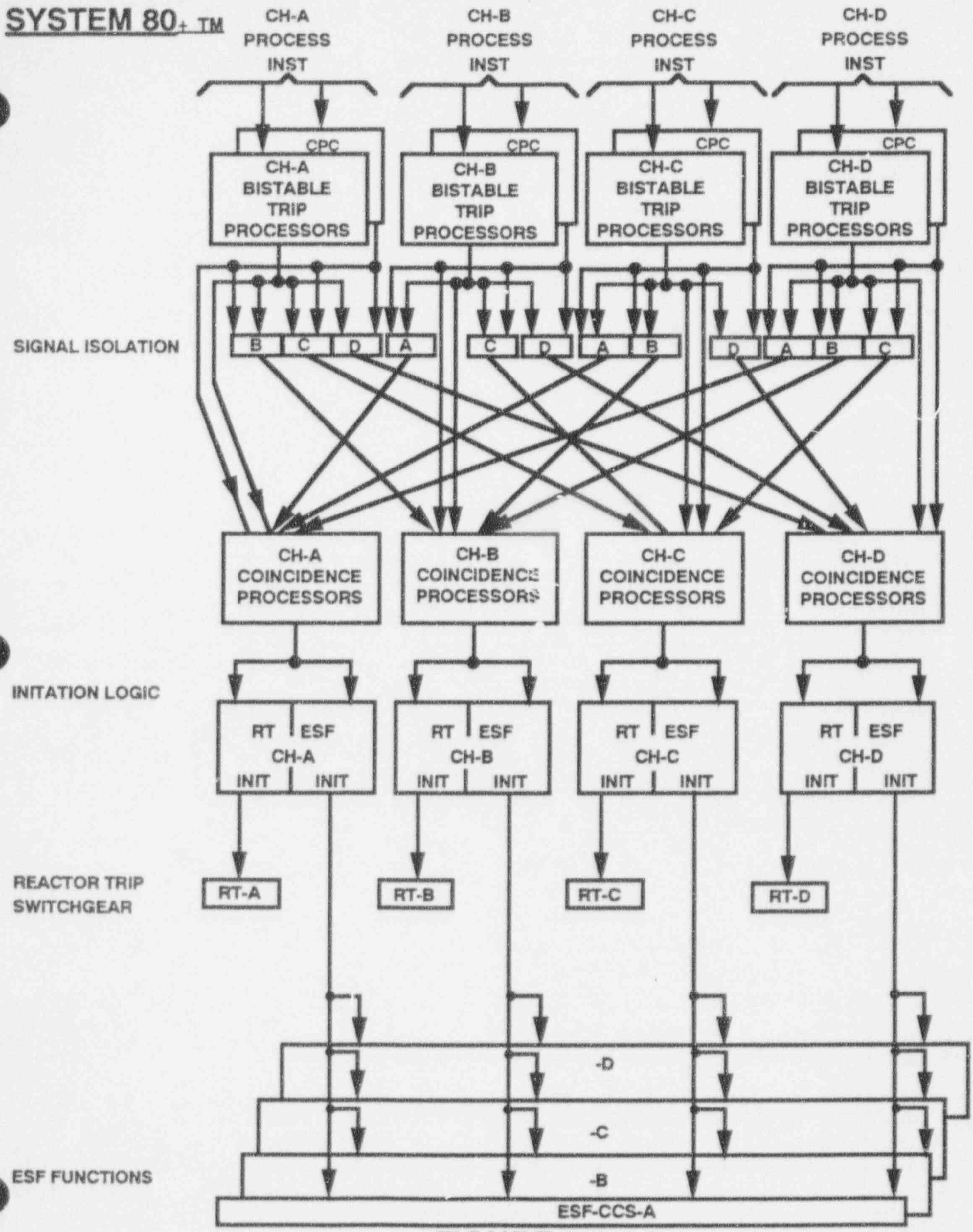


FIGURE 2.5.1-3
PPS BASIC BLOCK DIAGRAM

06-17-94

TABLE 2.5.1-1

PLANT PROTECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.a) The Basic Configuration of the PPS is as shown on Figure 2.5.1-1.	1.a) Inspection of the as-built PPS configuration will be conducted.	1.a) For the components and equipment shown on Figure 2.5.1-1, the as-built PPS conforms with the Basic Configuration.
1.b) Separation is provided between safety critical PPS processing functions and auxiliary functions of man-machine interfaces, data communications and automatic testing. Data communication networks support the transmission of safety critical data on a continuous cyclical basis independent of plant transients.	1.b) Inspection of the as-built PPS hardware and software will be conducted.	1.b) The as-built PPS hardware and software has: • Processors that provide fixed sequenced program execution with fixed memory allocation • Separation provided between safety critical PPS processing functions and auxiliary functions of man-machine interfaces, data communications and automatic testing. • Data communication networks that support the transmission of safety critical data on a continuous cyclical basis independent of plant transients.
2. The four PPS channels are physically separated and electrically isolated.	2. Inspection for separation and isolation of the four as-built PPS channels will be conducted.	2. Physical separation exists between the 4 PPS channels. Electrical isolation devices are provided at interfaces between the 4 PPS channels.

TABLE 2.5.1-1 (Continued)

PLANT PROTECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3. Each PPS channel is powered from its respective Class 1E bus.	3. Testing will be performed on the PPS by providing a test signal in only one Class 1E bus at a time.	3. Within the PPS, a test signal exists only at the equipment powered from the Class 1E bus under test.
4. Where the PPS and the process control system interface to the same component, isolation devices are provided between the process control system and the shared component.	4. Inspection of the as-built PPS configuration will be conducted.	4. Electrical isolation devices are provided between the process control system and sensors, signal conditioners and actuated devices which interface to the PPS.
5. Electrical isolation devices are provided at PPS interfaces with the Power Control System, the Discrete Indication and Alarm System - Channel N and the Data Processing System and between the signal conditioning equipment and the Discrete Indication and Alarm System - Channel P.	5. Inspection of the as-built configuration will be conducted.	5. Electrical isolation devices are provided at PPS interfaces with the Power Control System, the Discrete Indication and Alarm System - Channel N and the Data Processing System and between the signal conditioning equipment and the Discrete Indication and Alarm System - Channel P.
6. Loss of power to, or disconnection of any reactor trip path active component (i.e., circuit boards and power supply modules) in a PPC or CPC will cause a trip initiating state to be detected in a downstream component in that channel.	6. Loss of power and component disconnect type testing will be conducted at the factory or on the as-installed equipment.	6. Loss of power to, or disconnection of a reactor trip path active component (i.e., circuit boards and power supply modules) in a PPC or CPC causes a trip initiating state to be detected in a downstream component in that channel.

TABLE 2.5.1-1 (Continued)

PLANT PROTECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7.a) When a process value input signal crosses the setpoint threshold, the trip limit bistable processor will generate a trip signal.	7.a) Testing will be performed using simulated initiating input signals to the PPS.	7.a) Bistable processor generates a trip signal when an input signal crosses a limit logic setpoint threshold.
7.b) The PPS maintenance and test panels provide the capability for trip limit setpoint changes.	7.b) Testing will be performed using the built-in trip limit setpoint change feature.	7.b) Setpoint changes affect only the intended trip limit functions.
7.c) Upon coincidence of two like signals indicating one of the following conditions for reactor trip, the PPS logic initiates a reactor trip: Reactor Power - High Reactor Coolant System Pressure - Low or High Steam Generator Level - Low or High Steam Generator Pressure - Low Containment Pressure - High Reactor Coolant Flow - Low Departure from Nucleate Boiling Ratio - Low Linear Heat Generation Rate - High	7.c) Testing will be performed using simulated initiating signals to the PPS. 7.d) Testing will be performed using simulated input signals to each coincidence processor, for combinations of 2, 3 and 4 like signals for a trip condition and for combinations of 2 and 3 like signals with one bistable trip channel in bypass.	7.c) The PPS generates reactor trip switchgear actuation signals. 7.d) Each coincidence processor outputs a trip signal whenever it receives 2 or more like signals.

TABLE 2.5.1-1 (Continued)

PLANT PROTECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. Upon coincidence of two like signals indicating one of the following conditions for an ESFAS, the ESF initiation logic transmits the respective initiation signal to the ESF-CCS. Pressurizer Pressure - Low Steam Generator Water Level - Low or High Steam Generator Pressure - Low Containment Pressure - High	8.a) Testing will be performed using simulated initiating signals to the PPS.	8.a) The PPS generates ESFAS signals related to the initiating conditions for each condition listed in the Design Commitment as follows: ESFAS — PARAMETER SIAS and CIAS — Low Pressurizer Pressure; High Containment Pressure CSAS — High-High Containment Pressure MSIS — Low Steam Generator Pressure; High Containment Pressure; High Steam Generator Level EFAS — Low Steam Generator Level; High Steam Generator Level
	8.b) Testing will be performed using simulated input signals to each coincidence processor, for combinations of 2, 3 and 4 like signals indicating a condition for generating an ESFAS, and for combinations of 2 and 3 like signals with one bistable trip channel in bypass.	8.b) Each coincidence processor outputs the respective initiation signal whenever it receives 2 or more like signals indicating conditions for generating an ESFAS.

TABLE 2.5.1-1 (Continued)

PLANT PROTECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
9.a) A reactor trip initiation signal from a PPS channel results in actuation of the correct reactor trip switchgear breaker.	9.a) Testing of the as-built reactor trip switchgear actuation circuits will be conducted.	9.a) The reactor trip initiation signal from each PPS channel actuates the correct single reactor trip switchgear breaker.
9.b) Each reactor trip switchgear breaker can be tripped by either an under voltage or a shunt trip.	9.b) Testing will be performed separately for the under voltage trip and the shunt trip for each reactor trip switchgear breaker.	9.b) Each reactor trip switchgear breaker trips for either an under voltage trip or a shunt trip.
10. The RTSG can be tripped manually from the Main Control Room or the Remote Shutdown Room.	10. Testing of manual reactor trip from Main Control Room and Remote Shutdown Room will be performed.	10. Actuation of either pair of reactor trip switches at the Main Control Room or either pair of trip switches at the Remote Shutdown Room interrupts power to the CEDMs.
11.a) The following ESFAS signals can be manually actuated at the Main Control Room. Safety Injection Actuation Signal Containment Spray Actuation Signal Containment Isolation Signal Main Steam Isolation Signal Emergency Feedwater Actuation Signal	11.a) Testing of manual ESF actuation from Main Control Room will be performed.	11.a) Actuation of either pair of ESFAS actuation switches for an ESF function at the Main Control Room initiates the associated ESFAS signal input to the ESF-CCS.
11.b) A Main Steam Isolation Signal can be manually actuated at the Remote Shutdown Room.	11.b) Testing of manual MSIS actuation from the Remote Shutdown Room will be performed.	11.b) Following transfer of control from the Main Control Room to the Remote Shutdown Room actuation of either pair of MSIS actuation switches at the Remote Shutdown Room initiates a MSIS input to the ESF-CCS.

TABLE 2.5.1-1 (Continued)

PLANT PROTECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
12.a) A bistable trip channel bypass can be activated in only one channel at a time.	12.a) Testing of PPS Trip Channel Bypasses will be performed.	12.a) With one trip channel in bypass, attempts to actuate a second like parameter bypass in a second channel are rejected.
12.b) The PPS automatically removes an operating bypass if the plant approaches conditions for which the associated trip function is designed to provide protection.	12.b) Testing will be performed for each operating bypass implemented in the PPS.	12.b) Each operating bypass becomes deactivated when the input signal for the mode dependent parameter monitored for that function reaches the associated setpoint.
13. The PPS initiates reactor trip and ESF system actuations within allocated response times.	13. Testing and analysis will be performed to measure PPS equipment response times.	13. Measured response times are less than or equal to the response time values required for reactor trip and ESF actuations.
14. Setpoints for initiation of PPS safety-related functions are determined using methodologies which have the following characteristics: a) Requirements that the design basis analytical limits, data, assumptions, and methods used as the bases for selection of trip setpoints are specified and documented.	14. Inspection will be performed on the setpoint calculations.	14. The inspection of the setpoint calculation confirms the use of setpoint methodologies that require: a) Documentation of data, assumptions, and methods used in the bases for selection of trip setpoints is performed.

TABLE 2.5.1-1 (Continued)

PLANT PROTECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
14. (Continued)	14. (Continued)	14. (Continued)
b) Instrumentation accuracies, drift, and the effects of design basis transients are accounted for in the determination of setpoints.		b) Consideration of instrument calibration uncertainties and uncertainties due to environmental conditions, instrument drift, power supply variation, and the effect of design basis event transients is included in determining the margin between the trip setpoint and the safety limit.
c) The method utilized for combining the various uncertainty values is specified.		c) The methods used for combining uncertainties is consistent with those specified in the methodology plan.
d) Identifies required preoperational and surveillance testing.		d) The use of written procedures for required preoperational and surveillance testing.
e) Identifies performance requirements for replacement of setpoint related instrumentation.		e) Evaluation for equivalent or better performance of replacement instrumentation which is not identical to original equipment is documented.
f) The setpoint calculations are consistent with the physical configuration of the instrumentation.		f) The configuration of the as-built instrumentation is consistent with the attributes used in the setpoint calculations for location of taps and sensing lines.

PLANT PROTECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
15. PPS software is designed, tested, installed and maintained using a process which: a. Defines the organization, responsibilities, and software quality assurance activities for the software engineering life cycle that provides for: • establishment of plans and methodologies • specification of functional, system and software requirements and standards, identification of safety critical requirements • design and development of software • software module, unit, and system testing practices • installation and checkout practices • reporting and correction of software defects during operation	15. Inspection will be performed of the process used to design, test, install, and maintain the PPS safety related software.	15.a) The process defines the organization, responsibilities and activities for the following phases of the software engineering life cycle: • Establishment of plans and methodologies for all software to be developed. • Specification of functional, system and software requirements, and identification of safety critical requirements. • Design of the software architecture, program structure, and definition of the software modules. • Development of the software code and testing of the software modules. • Interpretation of software and hardware and performance of unit and system tests. • Software installation and checkout testing. • Reporting and correction of software defects during operation.

TABLE 2.5.1-1 (Continued)

PLANT PROTECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
15. (Continued)	15. (Continued)	15. (Continued)
b) Specifies requirements for:		b) The process has requirements for the following software development functions:
• software management, documentation requirements, standards, review requirements, and procedures for problem reporting and corrective action		• Software management, which defines organization responsibilities, documentation requirements, standards for software coding and testing, review requirements, and procedures for problem reporting and corrective actions.
• software configuration management, historical records of software, and control of software changes		• Software configuration management, which establishes methods for maintaining historical records of software as it is developed, controlling software changes and for recording and reporting software changes.
• verification & validation, and requirements for reviewer independence		• Verification and validation, which specifies the requirements for the verification review process, the validation testing process, review and test activity documentation, and reviewer independence.
c) Incorporates a graded approach according to the software's relative importance to safety.		15.c) The process establishes the method for classifying PPS software elements according to their relative importance to safety. The process defines the tasks to be performed for software assigned to each safety classification.

TABLE 2.5.1-1 (Continued)

PLANT PROTECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
16. The use of commercial grade computer hardware and software items in the PPS is accomplished through a process that has: • requirements for supplier design control, configuration management, problem reporting, and change control; • review of product performance; • receipt acceptance of the commercial grade item; • final acceptance, based on equipment qualification and software validation in the integrated system.	16. Inspection will performed of the process defined to use commercial grade components in the application.	16. A process is defined that has: • requirements for supplier's design and production control, configuration management, problem reporting, and change control; • review of product performance; • receipt of acceptance of commercial grade item; • final acceptance, based on equipment qualification and software validation in the integrated system.
17. The PPS is qualified according to an established plan for Electromagnetic compatibility (EMC). The qualification plan requires the equipment to function properly when subjected to the expected operational electrical surges or electromagnetic interference (EMI), electrostatic discharge (ESD), and radio frequency interference (RFI).	17. Inspection of the PPS EMC qualification reports and the as-built PPS equipment installation configuration and environment will be conducted.	17. For the PPS components and equipment shown on Figure 2.5.1-1, the as-built installation configuration and site survey are bounded by those used in the PPS EMC qualification report(s).

TABLE 2.5.1-1 (Continued)

PLANT PROTECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
17. (Continued) The qualification plan will require that the equipment to be tested be configured for intended service conditions.		
18. An environmental qualification program assures the PPS equipment is able to perform its intended safety function for the time needed to be functional, under its design environmental conditions. The environmental conditions, bounded by applicable design basis events, are: temperature, pressure, humidity, chemical effects, radiation, aging, seismic events, submergence, power supply voltage & frequency variations, electromagnetic compatibility, and synergistic effects which may have a significant effect on equipment performance. The environmental qualification of PPS equipment is achieved via tests, analysis or a combination of analyses and tests.	18. Inspection of the PPS qualification report and the as-built PPS equipment installation configuration and environment will be conducted.	18. For the PPS components and equipment shown on Figure 2.5.1-1, the as-built installation, configuration, and design environmental conditions are bounded by those used in the environmental qualification report.

2.5.2 ENGINEERED SAFETY FEATURES - COMPONENT CONTROL SYSTEM

Design Description

The Engineered Safety Features-Component Control System (ESF-CCS) is a safety-related instrumentation and control system which provides automatic actuation of Engineered Safety Features (ESF) systems upon receipt of ESF initiation signals from the Plant Protection System (PPS). The ESF-CCS also provides the capability for manual actuation of ESF systems, manual control of ESF system components and manual control of other safety-related systems and components identified below.

The ESF-CCS is located in the nuclear island structures.

The Basic Configuration of the ESF-CCS is as shown on Figure 2.5.2-1.

The ESF-CCS is classified Seismic Category I.

The ESF-CCS equipment is classified Class 1E.

An environmental qualification program assures the ESF-CCS equipment is able to perform its intended safety function for the time needed to be functional, under its design environmental conditions. The environmental conditions, bounded by applicable design basis events, are: temperature, pressure, humidity, chemical effects, radiation, aging, seismic events, submergence, power supply voltage & frequency variations, electromagnetic compatibility, and synergistic effects which may have a significant effect on equipment performance. The environmental qualification of ESF-CCS equipment is achieved via tests, analyses or a combination of analyses and tests.

Electromagnetic interface (EMI) qualification is applied for equipment based on operating environment and/or inherent design characteristics.

The ESF-CCS is qualified according to an established plan for Electromagnetic Compatibility (EMC).

The qualification plan requires the equipment to function properly when subjected to the expected operational electrical surges or electromagnetic interference (EMI), electrostatic discharge (ESD), and radio frequency interference (RFI).

The equipment to be tested will be configured for intended service conditions.

A site survey is performed upon completion of system installation to characterize the installed EMI environment.

The ESF-CCS uses sensors, transmitters, signal conditioning equipment, and digital equipment which perform the calculations, communications, and logic to generate signals to actuate protective system equipment. This equipment is Class 1E.

The ESF-CCS design incorporates the following features: software programmable processors arranged in primary and standby processor configurations within each ESF-CCS division. Processors provide fixed sequence program (non-interrupt driven) execution with fixed memory allocation. ESFAS functions are divided into ESF-CCS distributed segments with two separate multiplexers per segment which receive PPS initiation signals. Separation is provided between protection (safety critical) ESFAS processing functions and auxiliary functions of man-machine interfaces, data communication and automatic testing. Redundant data communication networks support the transmission of protection (safety critical) data on a continuous cyclical basis independent of plant transients.

For each defined failure of the ESF-CCS data communication links, a predetermined failure mode for the affected system has been defined and determined to have acceptable consequences.

The ESF-CCS is divided into four divisions. Each division of the ESF-CCS has the following elements, as depicted on Figure 2.5.2-2:

selective 2-out-of-4 logic,
component control logic,
process instrumentation,
signal conditioning equipment,
maintenance and test panel,
control and display interface devices, and a
master transfer switch.

The four ESF-CCS divisions are physically separated and electrically isolated.

Each ESF-CCS division is powered from its respective Class 1E bus.

Each ESF-CCS division receives 4 channels of initiation signals from the PPS which are processed using selective 2-out-of-4 logic to generate actuation signals for the ESF systems controlled by that division. Basic block diagrams for the functional logic used in the ESF-CCS for actuation of ESF systems are shown on Figures 2.5.2-3 and 2.5.2-4.

The ESF-CCS provides control capability and, upon receipt of initiation signals from the PPS, automatically generates actuation signals to the following ESF systems within allocated response times:

safety injection system,
containment isolation system,
containment spray system,
main steam isolation, and
steam generator 1 and steam generator 2
emergency feedwater system.

Once initiation signals are received from the PPS, the ESF-CCS actuation logic signals remain following removal of the initiation signal.

ESF functions are assigned to individual group control segments within each ESF-CCS division. This functional assignment approach limits the effect of a single group failure to selected ESF functions in a given division.

Additional segmentation of functional assignment is applied within each ESF-CCS group control segment. This practice limits the effect of a single multiplexer or module failure to selected ESF functions in the division. ESF system interfaces are also confined within group control segments to minimize reliance on the intradivision communication network for ESF operability.

The ESF-CCS provides control capability and, upon receipt of initiation signals from the PPS, automatically generates actuation signals to the following non-ESF systems:

annulus ventilation system,
component cooling water system,
onsite power system,
diesel generators, and
control complex ventilation system.

The ESF-CCS provides control and display capability for the following safety-related systems:

shutdown cooling system,
safety depressurization system,
atmospheric dump system,
station service water system,
heating, ventilating, and air conditioning systems, and
hydrogen mitigation devices.

Upon receipt of ESF initiation signals for safety injection, containment spray or emergency feedwater, the ESF-CCS initiates an automatic start of the diesel generators and automatic load sequencing of ESF loads.

Upon detecting loss of power to Class 1E Division buses through protective devices, the ESF-CCS automatically initiates startup of the diesel generators, shedding of electrical load, transfer of Class 1E bus connections to the diesel generator, and sequencing of the reloading of safety-related loads to the Class 1E bus. In performing load sequencing, normally used safety related plant loads are loaded first in a predetermined sequence unless an ESF actuation signal is generated. Upon ESF actuation, the normal load sequence is interrupted and priority is given to loading the actuated ESF systems and associated safety-related systems. The sequence for loading the normally used safety related plant loads is then resumed.

The ESF-CCS provides interlock control for isolation valves in the shutdown cooling system (SCS) suction lines, the safety injection tank (SIT) discharge lines and the emergency feedwater (EFW) pump discharge lines. The SCS interlocks prevent the ESF-CCS from generating a signal to open the SCS isolation valves when the RCS pressure is above the entry pressure of the SCS. The SIT interlocks prevent the ESF-CCS from generating a signal to close the SIT isolation valves when the RCS pressure is above the entry pressure of the SCS. The interlock on the EFW isolation valves automatically closes the isolation valves on high SG levels when an Emergency Feedwater Actuation Signal is not present.

The control and display interface devices of the ESF-CCS in the MCR provide for automatic and manual control of ESF systems and components. In the remote shutdown room, the control and display interface devices provide for manual control of ESF system components needed to achieve hot standby. Actuation of master transfer switches at either exit of the MCR transfers control capability from the control and display interface devices in the MCR to those in the remote shutdown room. Indication of transfer is provided in the MCR. Each ESF-CCS division's maintenance and test panel provides capability to transfer control from the MCR to the remote shutdown room for its respective ESF-CCS division and to transfer control back to the MCR for its respective ESF-CCS division.

Diverse manual actuation switches are provided as an alternate means for manual actuation of ESF components in two divisions of the ESF-CCS as follows:

2 trains of safety injection,
1 train of containment spray,
1 train of emergency feedwater to each steam generator,
1 main steam isolation valve in each main steam line,
1 isolation valve in each containment air purge line, and
1 letdown isolation valve.

The diverse manual actuation switches provide input signals to the lowest level in the ESF-CCS digital equipment. Communication of the signals from the switches is diverse from the software used in the higher levels of the ESF-CCS. Actuation of the switches provides a signal which overrides higher level signals, to actuate the associated ESF component or components. Diverse manual actuation status indication is provided in the MCR.

Periodic testing to verify operability of the ESF-CCS can be performed with the reactor at power or when shutdown without interfering with the protective function of the system. Capability is provided for testing all functions, from ESF initiating signals received from the PPS through to the actuation of protective system equipment. Testing consists of on-line automatic hardware testing, automated functional testing of PPS/ESFAS initiations and interfaces, and manual testing. The maintenance and test panel provides capability for manual testing of ESF-CCS functions and hardware.

Where the ESF-CCS and the process control system interface with the same component (e.g., with sensors, signal conditioners, or actuated devices), electrical isolation devices are provided between the process control system and the shared component. Electrical isolation devices are provided at ESF-CCS interfaces with the discrete indication and alarm system - channel N (DIAS-N), the data processing system (DPS), the process-component control system (P-CCS), the control and display interface devices, the master transfer switches and between the signal conditioning equipment and the discrete indication and alarm system - channel P (DIAS-P), as shown on Figure 2.5.2-2.

ESF-CCS software is designed, tested, installed, and maintained using a process which:

a. Defines the organization, responsibilities, and software quality assurance activities for the software engineering life cycle that provides for:

- establishment of plans and methodologies
- specification of functional, system and software requirements and standards, identification of safety critical requirements
- design and development of software
- software module, unit and system testing practices
- installation and checkout practices
- reporting and correction of software defects during operation

b. Specifies requirements for:

- software management, documentation requirements, standards, review requirements, and procedures for problem reporting and corrective action
- software configuration management, historical records of software, and control of software changes
- verification & validation, and requirements for reviewer independence

c. Incorporates a graded approach according to the software's relative importance to safety.

The use of commercial grade computer hardware and software items in the ESF-CCS is accomplished through a dedication process that has:

- requirements for supplier design control, configuration management, problem reporting, and change control;
- review of product performance;
- receipt acceptance of the commercial grade item;
- final acceptance, based on equipment qualification and software validation in the integrated system.

Setpoints for interlocks and actuation of ESF-CCS safety-related functions are determined using methodologies which have the following characteristics:

a) Requirements that the design basis analytical limits, data, assumptions, and methods used as the bases for selection of trip setpoints are specified and documented.

b) Instrumentation accuracies, drift and the effects of design basis transients are accounted for in the determination of setpoints.

c) The method utilized for combining the various uncertainty values is specified.

d) Identifies required pre-operational and surveillance testing.

e) Identifies performance requirements for replacement of setpoint related instrumentation.

f) The setpoint calculations are consistent with the physical configuration of the instrumentation.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.5.2-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Engineered Safety Features-Component Control System.

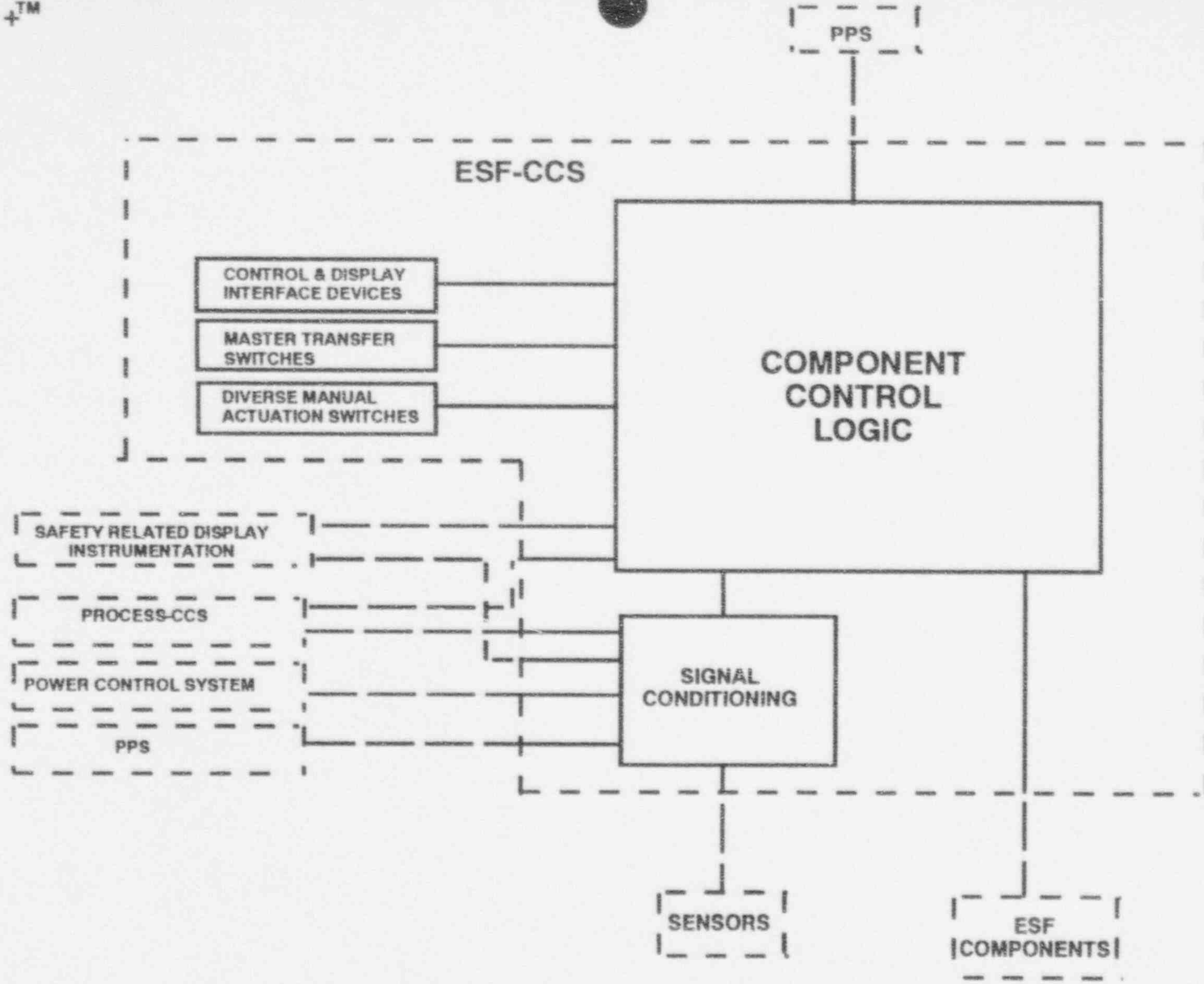


FIGURE 2.5.2-1
ENGINEERED SAFETY FEATURES-COMPONENT CONTROL SYSTEM CONFIGURATION

06-17-94

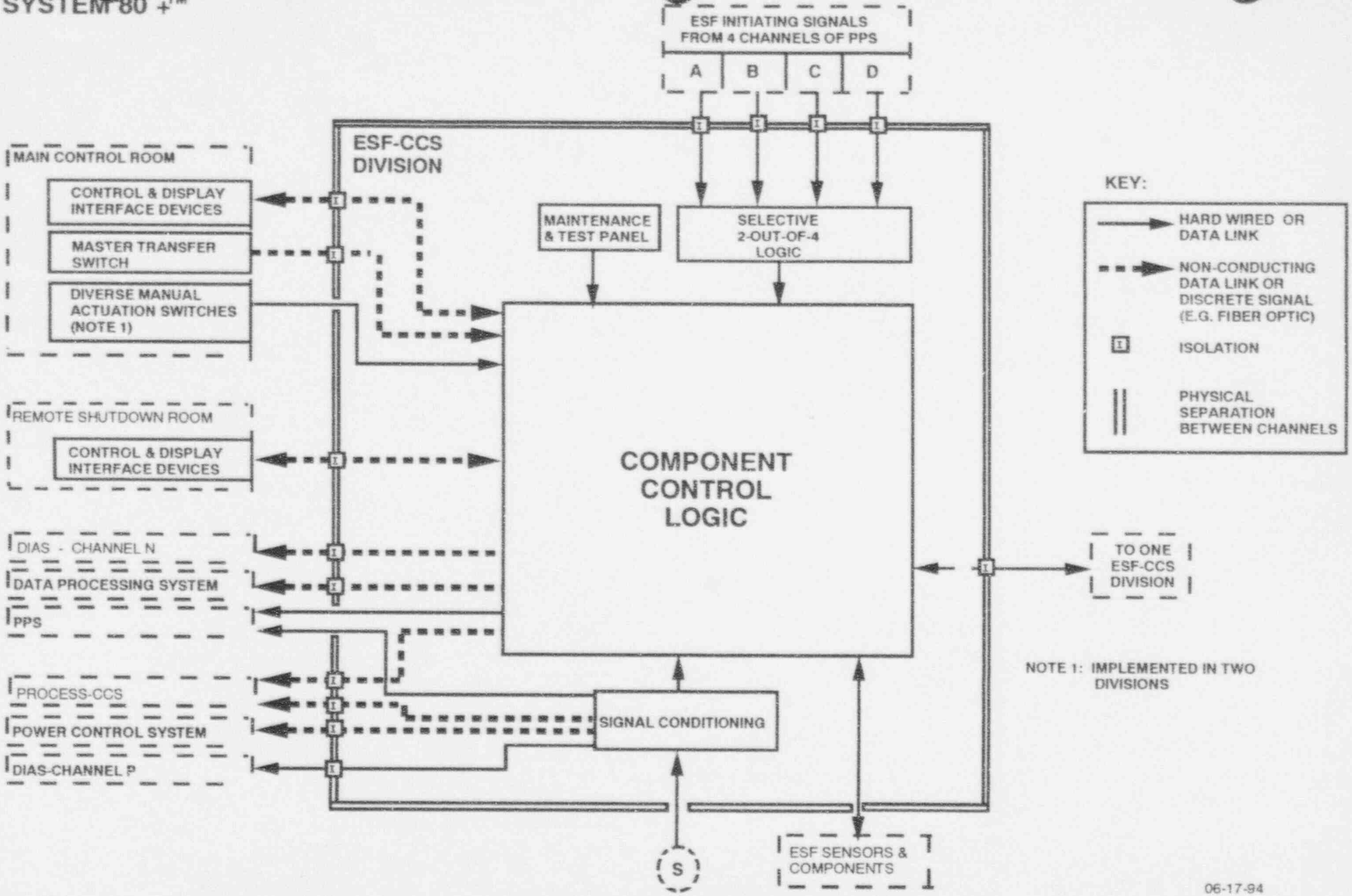


FIGURE 2.5.2-2
ENGINEERED SAFETY FEATURES-COMPONENT CONTROL SYSTEM ONE DIVISION AND INTERCONNECTIONS

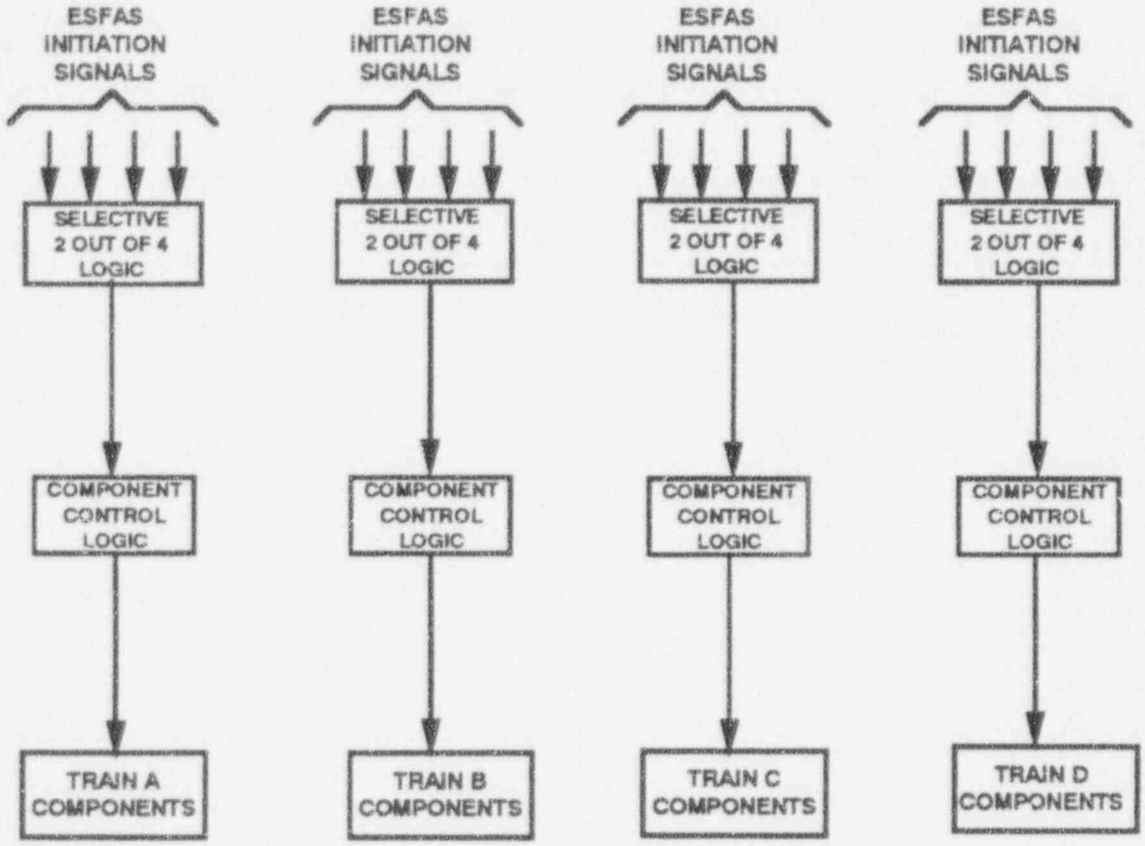


FIGURE 2.5.2-3
ESFAS BASIC BLOCK DIAGRAM FOR SAFETY INJECTION ACTUATION AND EMERGENCY FEEDWATER ACTUATION

06-17-94

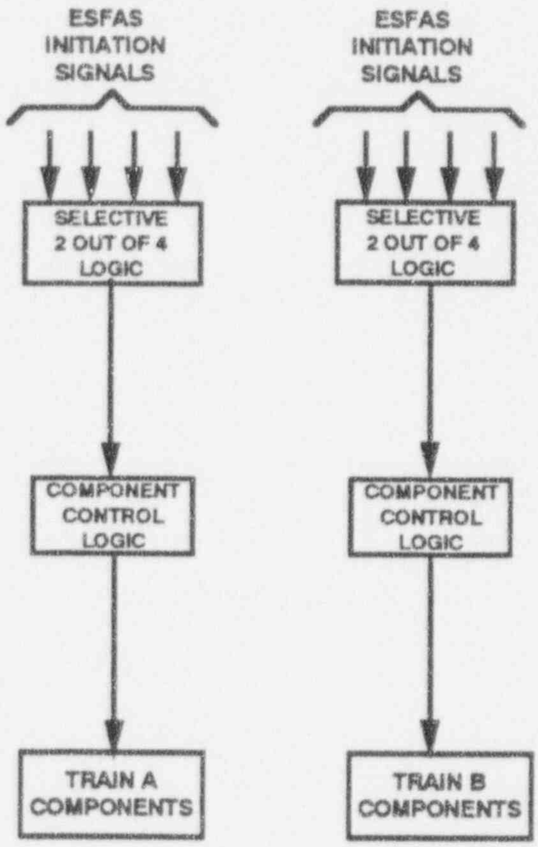


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FIGURE 2.5.2-4
ESFAS BASIC BLOCK DIAGRAM FOR MAIN STEAM ISOLATION, AND CONTAINMENT ISOLATION

TABLE 2.5.2-1

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.a) The Basic Configuration of the ESF-CCS is as shown on Figures 2.5.2-1 and 2.5.2-2.	1.a) Inspection of the as-built ESF-CCS configuration will be conducted.	1.a) For the components and equipment shown on Figures 2.5.2-1 and 2.5.2-2, the as-built ESF-CCS conforms with the Basic Configuration.
1.b) The ESF-CCS has the following features: • Software programmable processors arranged in primary and standby processor configuration within each ESF-CCS division • Processors provide fixed sequence program (non-interrupt driven) execution with fixed memory allocation • ESFAS functions are divided into ESF-CCS distributed segments with two separate multiplexers per segment which receive PPS initiation signals. • Separation is provided between protective (safety critical) ESFAS processing functions and auxiliary functions of man-machine interfaces, data communications, and automatic testing • Redundant data communication networks support the transmission of safety critical data on a continuous cyclical basis independent of plant transients	1.b) Inspection of the as-built ESF-CCS will be performed.	1.b) The ESF-CCS has the following features: • Software programmable processors arranged in primary and standby processor configuration within each ESF-CCS division • Processors provide fixed sequence program (non-interrupt driven) execution with fixed memory allocation • ESFAS functions are divided into ESF-CCS distributed segments with two separate multiplexers per segment which receive PPS initiation signals • Separation is provided between safety critical ESFAS processing functions and auxiliary functions of man-machine interfaces, data communications, and automatic testing • Redundant data communication networks support the transmission of safety critical data on a continuous cyclical basis independent of plant transients

TABLE 2.5.2-1 (Continued)

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acce[illegible]ce Criteria
2. Each division of the ESF-CCS has the following elements, as depicted on Figure 2.5.2-2: selective 2-out-of-4 logic, component control logic, process instrumentation, signal conditioning equipment, maintenance and test panel, control and display interface devices, and a master transfer switch.	2. Inspection of the four as-built ESF-CCS divisions will be performed.	2. Each ESF-CCS division has equipment for the following: selective 2-out-of-4 logic, component control logic, process instrumentation, signal conditioning equipment, maintenance and test panel, control and display interface devices, and a master transfer switch.
3. The four ESF-CCS divisions are physically separated and electrically isolated.	3. Inspection for separation and isolation of the four as-built ESF-CCS divisions will be conducted.	3. Physical separation exists between the 4 ESF-CCS divisions. Electrical isolation devices are provided at interfaces between the four ESF-CCS divisions.
4. Each ESF-CCS division is powered from its respective Class 1E bus.	4. Testing will be performed on the ESF-CCS by providing a test signal in only one Class 1E bus at a time.	4. Within the ESF-CCS, a test signal exists only at the equipment powered from the Class 1E bus under test.
5. Each ESF-CCS division receives 4 channels of initiation signals from the PPS which are processed using selective 2-out-of-4 logic to generate actuation signals for the ESF systems controlled by that division. Basic block diagrams for the function logic used in the ESF-CCS for actuation of ESF systems are shown on Figures 2.5.2-3 and 2.5.2-4.	5. Testing will be performed using simulated PPS signals for ESF initiation input to each division of the ESF-CCS.	5.a) Each ESF-CCS division receives four channels of PPS initiation signals for each ESF actuation function performed by that ESF-CCS division.

TABLE 2.5.2-1 (Continued)

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. (Continued)		5.b) For each ESF actuation function performed by an ESF-CCS division, receipt of an ESF initiation signal from only one PPS channel does not result in generation of an ESF actuation signal The receipt of like PPS initiation signals which do not satisfy the selective 2-out-of-4 logic does not result in actuation signals for that ESF function. The receipt of like PPS ESF initiation signals which satisfy the selective 2-out-of-4 logic does result in actuation signals for that ESF function.
6. The ESF-CCS provides control capability and, upon receipt of initiation signals from the PPS, automatically generates actuation signals to the following ESF systems within allocated response times: safety injection system, containment isolation system, containment spray system, main steam isolation, and emergency feedwater system.	6.a) Testing will be performed on the as-built ESF-CCS control and display interface equipment.	6.a) The control and display interface equipment provide control capability for the following systems: safety injection system, containment isolation system, containment spray system, main steam isolation, and emergency feedwater system.

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6. (Continued) Once initiation signals are received from the PPS, the ESF-CCS actuation logic signals remain following removal of the initiation signal.	6.b) Testing will be performed using signals simulating PPS initiation to the ESF-CCS.	6.b) PPS initiation signals which satisfy the selective 2 out of 4 criteria result in ESF actuation signals for related system components for the following systems: safety injection system, containment isolation system, containment spray system main steam isolation, and steam generator 1 and steam generator 2 emergency feedwater system.
	6.c) Testing will be performed using signals simulating PPS initiation to the ESF-CCS.	6.c) Measured response times are less than or equal to the response time values required for each ESF actuation signal.
	6.d) Testing will be performed using signals simulating PPS initiation to the ESF-CCS.	6.d) Once initiated, ESF-CCS actuation logic signals remain following removal of the initiation signal.
7. The ESF-CCS provides control capability and, upon receipt of initiation signals from the PPS, automatically generates actuation signals to the following non-ESF systems: annulus ventilation system, component cooling water system, onsite power system, diesel generators, and control complex ventilation system.	7.a) Testing will be performed on the as-built ESF-CCS control and display interface equipment.	7.a) The control and display interface equipment provide control capability for the following systems: annulus ventilation system, component cooling water system, onsite power system, diesel generators, and control complex ventilation system.

TABLE 2.5.2-1 (Continued)

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. (Continued)	7.b) Testing will be performed using signals simulating PPS initiation to the ESF-CCS.	7.b) PPS initiation signals which satisfy the selective 2 out of 4 criteria result in ESF actuation signals for related system components for the following systems: annulus ventilation system, component cooling water system, onsite power system, diesel generators, and control complex ventilation system.
8. The ESF-CCS provides control and display capability for the following safety-related systems: shutdown cooling system, safety depressurization system, atmospheric dump system, station service water system, heating, ventilating, and air conditioning systems, and hydrogen mitigation devices.	8. Testing will be performed on the as-built ESF-CCS control and display interface equipment.	8. The control and display interface equipment provide component status and control capability for the following systems: shutdown cooling system, safety depressurization system, atmospheric dump system, station service water system, heating, ventilating and air conditioning systems, and hydrogen mitigation devices.

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
9. Upon receipt of ESF initiation signals for safety injection, containment spray, or emergency feedwater, the ESF-CCS initiates an automatic start of the diesel generators and automatic load sequencing of ESF loads.	9. Testing will be performed using signals simulating ESF initiation signals.	9. Upon receipt of signals simulating initiation of safety injection, containment spray, or emergency feedwater which satisfy the selective 2-out-of-4 criteria, the ESF-CCS will initiate an automatic start of the diesel generators and automatic load sequencing of ESF loads. The loads are sequenced in the assigned order for each of the accident sequencing scenarios.
10.a) Upon detecting loss of power to Class 1E division buses through protective devices, the ESF-CCS automatically initiates startup of the respective diesel generators, shedding of electrical load, transfer of Class 1E bus connections to the diesel generators, and sequencing to the reloading of safety-related loads to the Class 1E bus.	10.a) Testing will be performed using simulated loss of power to the Class 1E buses.	10.a) Upon loss of power at a Class 1E bus, signals are generated automatically by each of two ESF-CCS divisions which will: 1) initiate an automatic start of the emergency diesel generator associated with that division, 2) cause each medium voltage switchgear circuit breaker to open, 3) cause transfer of the Class 1E bus connections to the diesel generator, and 4) sequentially reclose each medium voltage switchgear circuit breaker after the diesel generator has started.

TABLE 2.5.2-1 (Continued)

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10.b) Upon ESF actuation, the normal load sequence is interrupted and priority is given to loading the actuated ESF systems and associated safety-related systems.	10.b) Testing will be performed using a simulated loss of power to the Class 1E buses and simulated PPS initiation signals input to the ESF-CCS during the reloading sequence for each of the following ESF initiation signals: safety injection actuation signal, containment spray actuation signal, emergency feedwater actuation signal to steam generator 1, and emergency feedwater actuation signal to steam generator 2.	10.b) Upon receipt of the PPS initiation signal, the ESF-CCS automatically interrupts the loading sequence to load the equipment associated with the ESF initiation signal and then resumes the reloading sequence.
10.c) Loss of power in an ESF-CCS Division results in ESF-CCS outputs assuming fail-safe output operation.	10.c) Testing will be performed simulating loss of power in the ESF-CCS Division.	10.c) Loss of power in an ESF-CCS Division results in ESF-CCS outputs assuming fail-safe output operation.
10.d) Protective devices are designed to detect loss of power if a setpoint is exceeded.	10.d) Inspection of the as-built protective devices will be performed.	10.d) Protective devices are installed to detect loss of power, if a setpoint is exceeded.

TABLE 2.5.2-1 (Continued)

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11.a) The ESF-CCS provides an interlock which prevents the ESF-CCS from generating a signal to open the shutdown cooling system isolation valves when the RCS pressure is above the entry pressure of the shutdown cooling system.	11.a) Testing will be performed using signals simulating RCS pressure input to the ESF-CCS.	11.a) Manual control signals input to the ESF-CCS to open the shutdown cooling system isolation valves do not result in generation of signals to open the valves when the ESF-CCS receives signals simulating RCS pressure that is greater than the shutdown cooling system entry pressure.
11.b) The ESF-CCS provides an interlock which prevents the ESF-CCS from generating signals to close the SIT isolation valves when the RCS pressure is above the entry pressure of the SCS.	11.b) Testing will be performed using signals simulating RCS pressure input signals to the ESF-CCS.	11.b) Manual control signals input to the ESF-CCS to close the SIT isolation valves do not result in generation of signals to close the valves when the ESF-CCS receives signals simulating RCS pressure that is greater than the SCS entry pressure.
11.c) The interlock on the EFW isolation valves automatically closes the isolation valves on high SG levels when an Emergency Feedwater Actuation Signal is not present.	11.c) Testing will be performed using signals simulating SG level and Emergency Feedwater Actuation input signals to the ESF-CCS.	11.c) Input of signals indicating high SG level results in generation of a signal to close the EFW isolation valves unless signals for Emergency Feedwater Actuation are also input to the ESF-CCS.

TABLE 2.5.2-1 (Continued)

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
12. The operator interface devices of the ESF-CCS in the MCR provide for automatic and manual control of ESF systems and components.	12. Addressed in 6.a), 7.a), and 8.	12. Addressed in 6.a), 7.a) and 8.
13. In the remote shutdown room, operator interface devices provide for manual control of ESF system components needed to achieve hot standby.	13. Testing will be performed on the as-built ESF-CCS control and display interface devices in the remote shutdown room following a transfer of control capability to the remote shutdown room.	13. Control capability is provided at the ESF-CCS control and display interface devices in the remote shutdown room for the following systems: safety injection system, steam generator 1 and steam generator 2 emergency feedwater system, component cooling water system, onsite power system, diesel generators, shutdown cooling system, safety depressurization system, atmospheric dump system, station service water system, and heating, ventilating and air conditioning systems.

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
14.a) Actuation of master transfer switches at either exit in the MCR transfers control capability from the ESF-CCS control and display interface devices depicted in the MCR to those in the remote shutdown room. Indication of transfer status is provided in the MCR.	14.a) Testing will be performed using master transfer switches at each exit of the MCR and each of the ESF-CCS control and display interface devices in the MCR and the remote shutdown room.	14.a) Upon actuation of the master transfer switches in the MCR at either exit: 1) control actions at the ESF-CCS control and display interface devices do not cause the ESF-CCS to generate the associated control signals, and 2) control actions at the ESF-CCS control and display interface devices in the remote shutdown room cause the ESF-CCS to generate the associated control signals. 3) indication of transfer status is provided in the MCR.
14.b) Each ESF-CCS division's maintenance and test panel provides capability to transfer control from the MCR to the remote shutdown panel for its respective ESF-CCS division and to transfer control back to the MCR for its respective ESF-CCS division.	14.b) Testing will be performed using each ESF-CCS division's maintenance and test panel and control and display interface devices in the MCR and the remote shutdown room.	14.b) Upon actuation of the master transfer switching function from each ESF-CCS division's maintenance and test panel: 1) control actions at the ESF-CCS control and display interface devices in the MCR for that ESF-CCS division do not cause the ESF-CCS to generate the associated control signals, and

TABLE 2.5.2-1 (Continued)

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
		14.b) (Continued) 2) control actions at the ESF-CCS control and display interface devices in the remote shutdown room for that ESF-CCS division cause the ESF-CCS to generate the associated control signals. Upon de-actuation of the master transfer switching function from each ESF-CCS division's maintenance and test panel: 3) control actions at the ESF-CCS control and display interface devices in the remote shutdown room for that ESF-CCS division do not cause the ESF-CCS to generate the associated control signals, and 4) control actions at the ESF-CCS control and display interface devices in the MCR for that ESF-CCS division cause the ESF-CCS to generate the associated control signals.

TABLE 2.5.2-1 (Continued)

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
14.c) Prior to transfer of control to the remote shutdown room, control actions in the remote shutdown room do not cause the ESF-CCS to generate the associated control signals.	14.c) Testing will be performed on the as-built ESF-CCS control and display devices in the remote shutdown room prior to transfer of control capability to the remote shutdown room.	14.c) Prior to transfer of control to the remote shutdown room, control actions in the remote shutdown room do not cause the ESF-CCS to generate the associated control signals.
15.a) Diverse manual actuation switches are provided as an alternate means for manual actuation of ESF components in two divisions of the ESF-CCS as follows: 2 trains of safety injection, 1 train of containment spray, 1 train of emergency feedwater to each steam generator 1 main steam isolation valve in each main steam line, 1 isolation valve in each containment air purge line, and 1 letdown isolation valve.	15.a) Testing will be performed using the diverse manual actuation switches.	15.a) Actuation of the switches provides signals to achieve actuation of ESF components for the following: 2 trains of safety injection, 1 train of containment spray, 1 train of emergency feedwater to each steam generator 1 main steam isolation valve in each main steam line, 1 isolation valve in each containment air purge line, and 1 letdown isolation valve.
15.b) The diverse manual actuation switches provide signals to the lowest level in the ESF-CCS digital equipment. Communication of the signals from the switches is diverse from the software used in the higher levels of the ESF-CCS.	15.b) Inspection of the as-built ESF-CCS equipment will be performed.	15.b) Communication of the signals from the diverse manual actuation switches implements hardwired signal communication to the lowest level in the ESF-CCS digital equipment.

TABLE 2.5.2-1 (Continued)

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
15.c) Actuation of the switches provides a signal which overrides the higher level signals, to actuate the associated ESF component or components.	15.c) Testing will be performed for each diverse manual actuation switch with concurrent and opposing control commands initiated from the control and display interface devices depicted on Figure 2.5.2-2.	15.c) Each diverse manual actuation switch is able to generate a signal which overrides the manual signals input via the control and display interface devices, such that signals are provided to the associated motor control centers to actuate the ESF equipment.
15.d) Diverse manual actuation status indication is provided in the MCR.	15.d) Testing will be performed for each diverse manual actuation switch.	15.d) Diverse manual actuations are indicated in the MCR.
16.a) Periodic testing to verify operability of the ESF-CCS can be performed with the reactor at power or when shutdown without interfering with the protective function of the system.	16.a) Inspection of design documentation will be performed to verify the capability to perform surveillance tests while the plant is operating. Manual surveillance tests will be conducted while simulating ESF initiation signals.	16.a) The design documentation specifies tests that can be performed while the plant is operating without disabling the protection functions to verify operability of the selective 2-out-of-4 logic and the response of ESF systems to ESF actuation signals and interlocks. The manual test does not interfere with the actuation of the ESF-CCS.
16.b) Capability is provided for testing all functions from ESF initiating signals received from the PPS through to the actuation of protective system equipment. Testing consists of on-line automatic hardware testing, automated testing of PPS/ESFAS initiations and interfaces, and manual testing.	16.b) Inspection of the as-built ESF-CCS equipment will be performed to verify the capability for functional testing.	16.b) Testing capability provides overlap in individual tests such that all functions from ESF initiating signals received from the PPS through to the actuation of protective system equipment are tested. Testing consists of on-line automatic hardware testing, automated functional testing of PPS/ESFAS initiations and interfaces, and manual testing.

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
16.c) The maintenance and test panel provides capability for manual testing of ESF-CCS functions and hardware.	16.c) Inspection of the as-built ESF-CCS equipment will be performed.	16.c) The maintenance and test panel includes the capability to perform manual testing of ESF-CCS functions and hardware.
17.a) Where the ESF-CCS and the process control system interface to the same component, elctrical isolation devices are provided between the process control system and the shared component.	17.a) Inspection of the as-built ESF-CCS configuration will be conducted.	17.a) Electrical isolation devices are provided between the process control system and sensors, signal conditioners and actuated devices which interface to the ESF-CCS.
17.b) For each defined failure of the ESF-CCS data communication links, a predetermined failure mode for the affected system has been defined and determined to have acceptable consequences.	17.b) Testing of the ESF-CCS and a failure mode and affects analysis will be performed.	17.b) For each defined failure of the ESF-CCS data communication links, a predetermined failure mode for the affected system has been defined and determined to have acceptable consequences.
18. Electrical isolation devices are provided at ESF-CCS interfaces with the DIAS-N, the DPS, the P-CCS, the control and display interface devices, the master transfer switches, and between the signal conditioning equipment and the DIAS-P, as shown on Figure 2.5.2-2.	18. Inspection of the as-built ESF-CCS equipment will be conducted.	18. Electrical isolation devices are provided at ESF-CCS interfaces with the DIAS-N, the DPS, the P-CCS, the control and display interface devices, the master transfer switches, and between the signal conditioning equipment and the DIAS-P, as shown on Figure 2.5.2-2.

TABLE 2.5.2-1 (Continued)

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
19. Setpoints for interlocks and actuation of ESF-CCS safety-related functions are determined using methodologies which have the following characteristics: a) Requirements that the design basis analytical limits, data, assumptions, and methods used as the bases for selection of trip setpoints are specified and documented. b) Instrumentation accuracies, drift and the effects of design basis transients are accounted for in the determination of setpoints. c) The method utilized for combining the various uncertainty values is specified. d) Identifies of required preoperational and surveillance testing. e) Identifies performance requirements for replacement of setpoint related instrumentation. f) The setpoint calculations are consistent with the physical configuration of the instrumentation.	19. Inspection will be performed on the setpoint calculations.	19. The inspection of the setpoint calculation confirms the use of setpoint methodologies that require: a) Documentation of data, assumptions, and methods used in the bases for selection of trip setpoints is performed. b) Consideration of instrument calibration uncertainties and uncertainties due to environmental conditions, instrument drift, power supply variation, and the effect of design basis event transients is included in determining the margin between the trip setpoint and the safety limit. c) The methods used for combining uncertainties is consistent with those specified in the methodology plan. d) The use of written procedures for required preoperational and surveillance testing. e) Evaluation for equivalent or better performance of replacement instrumentation which is not identical to original equipment is documented. f) The configuration of the as-built instrumentation is consistent with the attributes used in the setpoint calculations for location of taps and sensing lines.

TABLE 2.5.2-1 (Continued)

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
19. (Continued)	19.b) Testing will be performed to verify interlock and actuation responses to simulated input signals.	19.b) 1) The correct ESF-CCS response occurs when an input signal crosses the setpoint threshold. 2) Changing of a setpoint does not also change the setpoints of other trips or interlocks.
20. ESF-CCS software is designed, tested, installed, and maintained using a process which: a. Defines the organization, responsibilities, and software quality assurance activities for the software engineering life cycle that provides for: • establishment of plans and methodologies • specification of functional, system and software requirements and standards, identification of safety critical requirements • design and development of software • software module, unit and system testing practices	20. Inspection will be performed of the process used to design, test, install, and maintain the ESF-CCS software.	20.a) The process defines the organization, responsibilities and activities for the following phases of the software engineering life cycle: • Establishment of plans and methodologies for all software to be developed; • Specification of functional, system, and software requirements and identification of safety critical requirements; • Design of the software architecture, program structure, and definition of the soft-ware modules; • Development of the software code and testing of the software modules; • Interpretation of software and hardware and performance of unit and system tests;

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
20. (Continued) • installation and checkout practices • reporting and correction of software defects during operation		20.a) (Continued) • Software installation and checkout testing; and • Reporting and correction of software defects during operation.
b. Specifies requirements for: • software management, documentation requirements, standards, review requirements, and procedures for problem reporting and corrective action • software configuration management, historical records of software, and control of software changes • verification & validation, and requirements for reviewer independence		20.b) The process has requirements for the following software development functions: • Software management, which defines organization responsibilities, documentation requirements, standards for software coding and testing, review requirements, and procedures for problem reporting and corrective actions; • Software configuration management, which establishes methods for maintaining historical records of software as it is developed, controlling software changes and for recording and reporting software changes; and • Verification and validation, which specifies the requirements for the verification review process, review and test activity documentation, and reviewer independence.
c. Incorporates a graded approach according to the software's relative importance to safety.		

TABLE 2.5.2-1 (Continued)

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
		20.c) The process establishes the method for classifying ESF-CCS software elements according to their relative importance to safety. The process defines the tasks to be performed for software assigned to each safety classification.
21. An environmental qualification program assures the ESF-CCS equipment is able to perform its intended safety function for the time needed to be functional, under its design environmental conditions. The environmental conditions, bounded by applicable design basis events, are: temperature, pressure, humidity, chemical effects, radiation, aging, seismic events, submergence, power supply voltage & frequency variations, electromagnetic compatibility, and synergistic effects which may have a significant effect on equipment performance. The environmental qualification of ESF-CCS equipment is achieved via tests, analysis, or a combination of analyses and tests.	21. An inspection of the ESF-CCS qualification report and the as-built ESF-CCS equipment installation configuration and environment will be conducted.	21. For the ESF-CCS components and equipment shown on Figure 2.5.2-1, the as-built installation, configuration, and design environmental conditions are bounded by those used in the environmental qualification report.

ENGINEERED SAFETY FEATURES COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
22. The use of commercial grade computer hardware and software items in the ESF-CCS is accomplished through a dedication process that has: • requirements for supplier design control, configuration management, problem reporting, and change control; • review of product performance; • receipt acceptance of the commercial grade item; • final acceptance, based on equipment qualification and software validation in the integrated system.	22. Inspection will be performed of the process defined to use commercial grade components in the application.	22. A process is defined that has: • requirements for supplier's design and production control, configuration management, problem reporting, and change control; • review of product performance; • receipt of acceptance of commercial grade item; • final acceptance, based on equipment qualification and software validation in the integrated system.
23. The ESF-CCS is qualified according to an established plan for Electromagnetic compatibility (EMC). The qualification plan requires the equipment to function properly when subjected to the expected operational electrical surges or electromagnetic interference (EMI), electrostatic discharge (ESD), and radio frequency interference (RFI). The qualification plan will require that the equipment to be tested be configured for intended service conditions.	23. An inspection of the ESF-CCS EMC qualification reports and the as-built ESF-CCS equipment installation configuration and environment will be conducted.	23. For the ESF-CCS components and equipment shown on Figure 2.5.2-1, the as-built installation configuration and site survey are bounded by those used in the ESF-CCS EMC qualification report(s).

2.5.3 DISCRETE INDICATION AND ALARM SYSTEM AND DATA PROCESSING SYSTEM

Design Description

The Discrete Indication and Alarm System (DIAS) and the Data Processing System (DPS) are non-safety related instrumentation and display systems which display information for monitoring conditions in the reactor, the reactor coolant system, Containment, and safety-related process systems during and following design basis events.

The DIAS and DPS are non-Class 1E systems used to display safety-related information.

The Basic Configuration for the DIAS and DPS is as shown on Figure 2.5.3-1.

The DIAS and the DPS are located in the nuclear island structures.

The DIAS and the DPS use sensors, transmitters, signal conditioning equipment, information display equipment, and digital equipment which perform the data processing, data communication, calculations, and logic to display safety-related information.

Post-Accident Monitoring Instrumentation (PAMI) Category I instruments and computers up to and including the channel isolation devices are Class 1E environmentally qualified.

The DIAS power supplies, displays, and processors are seismically qualified for physical and functional integrity. The main control room (MCR) and remote shutdown room (RSR) DPS display devices are seismically qualified for physical integrity.

The DIAS is divided into two segments:

DIAS - Channel P (DIAS-P)
DIAS - Channel N (DIAS-N)

The DIAS hardware components have the following attributes:

- software programmable processors;
- software execution without process dependent interrupts;
- segmented design such that the impact of a single electrical failure is limited to the display devices of the segment.

Physical separation and electrical isolation are provided between the DIAS-P, the DIAS-N and the DPS as shown on Figure 2.5.3-2.

The DIAS displays and processors are non-class 1E which are designed for room ambient temperature and humidity environmental conditions. Temperature sensors mounted in the DIAS cabinets provide high temperature status indication in the MCR.

The hardware and software used in the DPS for information processing and display is diverse from that used in the DIAS-N and the DIAS-P.

The DIAS-P provides a continuous display in the main control room (MCR) of key parameters for indication of critical function status during and following design basis events. These parameters are provided to the DIAS-P displays via two channels of instrumentation which include protection system signal conditioning equipment and post accident monitoring instrumentation (PAMI) equipment, as shown on Figure 2.5.3-2. The PAMI computers calculate values for the reactor coolant subcooled margin, the coolant temperature at the core exit, and the coolant level in the reactor vessel which are displayed by the DIAS-P. The information provided to the DIAS-P displays are communicated via means which are diverse from the communication software used in the plant protection system (PPS) and the engineered safety features-component control system (ESF-CCS).

The DIAS-N provides for display of the key parameters for indication of critical function status during and following design basis events, and the operating status of success path systems using dedicated display devices. The DIAS-N provides multi-parameter displays with access to backup information for the key indicators, and access to diagnostic information. The DIAS-N provides displays for specified alarm conditions. The DIAS-N also provides displays with access to information from non-safety-related systems.

The DPS displays provide access to information from safety related systems, as identified above for DIAS-N, and to non-safety related information.

The DIAS-N and the DPS provide for monitoring of the following:

a) Specified process conditions in the reactor and related systems for startup, operation, and shutdown from the MCR and for shutdown to hot standby from the remote shutdown room.

b) Reactor trip system status to confirm that a reactor trip has taken place and whether or not a setpoint for initiation of a reactor trip response has been reached.

c) The status and operation of each engineered safety features system and for specified related systems in the post accident period.

d) The positions of the control element assemblies.

e) Specified parameters that provide information to indicate whether plant safety functions are being accomplished during and following design basis accident events.

f) Indication of bypassed and inoperable status of plant safety systems, as follows:

    i. Status of plant operating mode related bypasses of the PPS.

    ii. Bypass status of each channel of the PPS.

    iii. Bypass and inoperable status of engineered safety feature systems.

g) The status of core cooling prior to and following an accident, as follows:

    i. Subcooling.

    ii. Liquid inventory in the reactor vessel above the fuel alignment plate.

    iii. Coolant temperature at the core exit.

h) Four channels of PPS status information.

i) Four channels of status and parameter information from the ESF-CCS.

j) The following information from the power control system and the process component control system (PCS/P-CCS):

    alternate reactor trip status,
    alternate feedwater actuation signal status,
    pressurizer pressure, and
    steam generator 1 and 2 levels.

The DIAS-N and DPS provide alarm indication consisting of alarm tiles (DIAS-N only) and display messages, provision for alarm acknowledgement, and priority distinction in alarm display.

The DIAS-N and the DPS perform automatic signal validation using cross channel data comparison prior to data presentation and alarm generation.

Electrical isolation devices are provided at DIAS-N and DPS interfaces to the PPS, ESF-CCS, PCS/P-CCS, and at interfaces to display devices in the MCR and remote shutdown room.

Electrical isolation is provided between the DIAS-P display devices and protection system signal conditioning equipment, as shown on Figure 2.5.3-2.

DIAS uses redundant networks for communications. The networks utilize isolation technology (e.g., fiber optics) to ensure electrical independence of the redundant safety channels and electrical independence of the MCR and the RSR. The DIAS communications network provide communication paths to allow display of information from safety-related I&C systems. Data communications is on a cyclical basis, independent of plant transients.

A loss of electrical power to DIAS or DPS equipment will result in a blank screen, inactive running indicator, or bad data symbol.

EMI qualification is applied for equipment based on operating environment and/or inherent design characteristics.

The DIAS/DPS is qualified according to an established plan for Electromagnetic Compatibility (EMC).

The qualification plan requires the equipment to function properly when subjected to the expected operational electrical surges, electromagnetic interference (EMI), electrostatic discharge (ESD), and radio frequency interference (RFI).

The equipment to be tested will be configured for intended service conditions.

A site survey is performed upon completion of system installation to characterize the installed EMI environment.

The use of commercial grade computer hardware and software items in the DIAS/DPS is accomplished through a process that has:

- requirements for supplier design control, configuration management, problem reporting and change control;
- review of product performance;
- receipt acceptance of the commercial grade item;
- final acceptance, based on equipment qualification and software validation in the integrated system.

DIAS/DPS software is designed, tested, installed, and maintained using a process which:

a. Defines the organization, responsibilities, and software quality assurance activities for the software engineering life cycle that provides for:

- establishment of plans and methodologies
- specification of functional, system and software requirements and standards, identification of safety critical requirements
- design and development of software
- software module, unit and system testing practices
- installation and checkout practices
- reporting and correction of software defects during operation

b. Specifies requirements for:

- software management, documentation requirements, standards, review requirements, and procedures for problem reporting and corrective action
- software configuration management, historical records of software, and control of software changes
- verification & validation, and requirements for reviewer independence

c. Incorporates a graded approach according to the software's relative importance to safety.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.5.3-1 specifies the inspections, tests, analyses, and acceptance criteria for the Discrete Indication and Alarm System and Data Processing System.

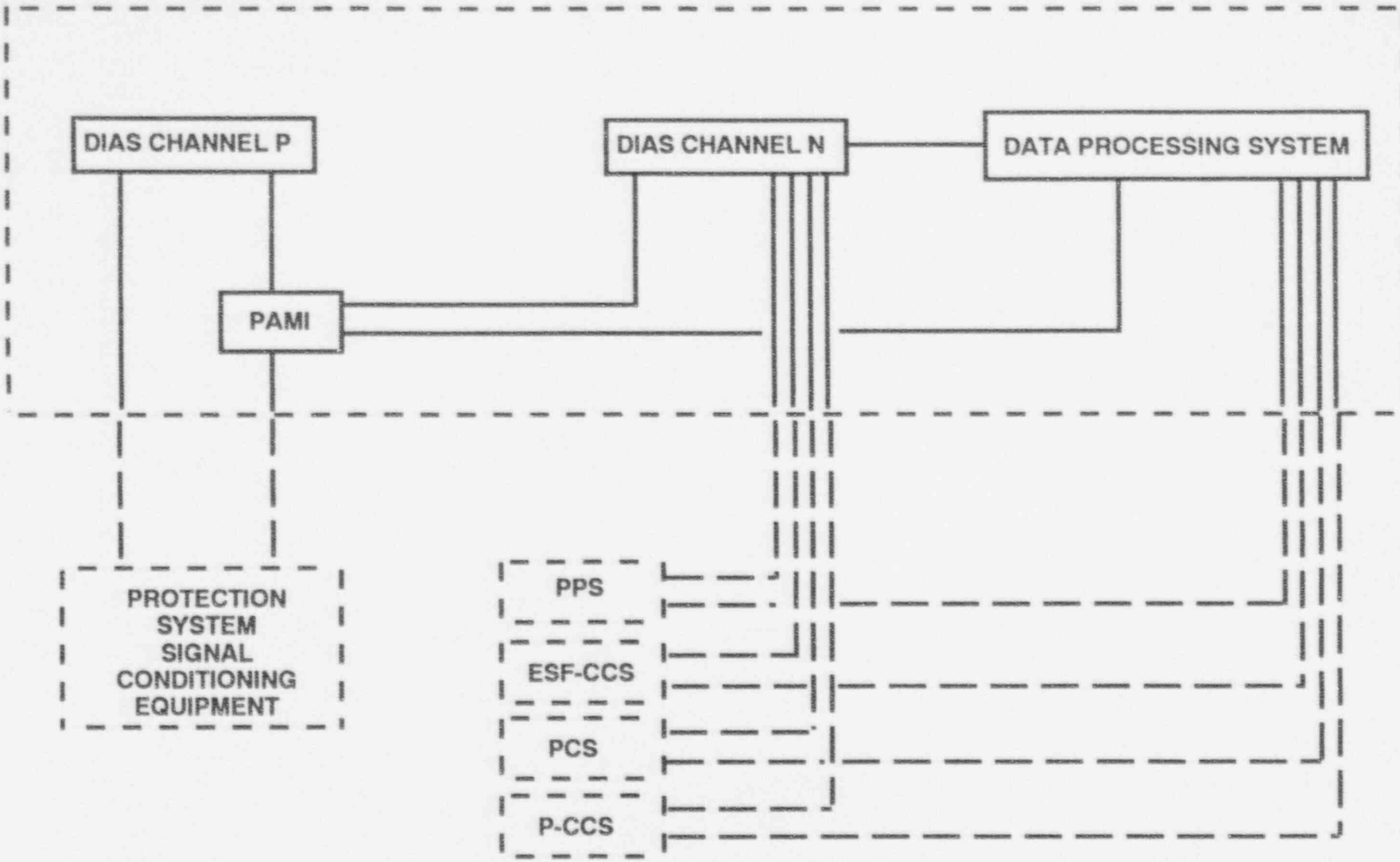

FIGURE 2.5.3-1
DIAS AND DPS CONFIGURATION

06-17-94

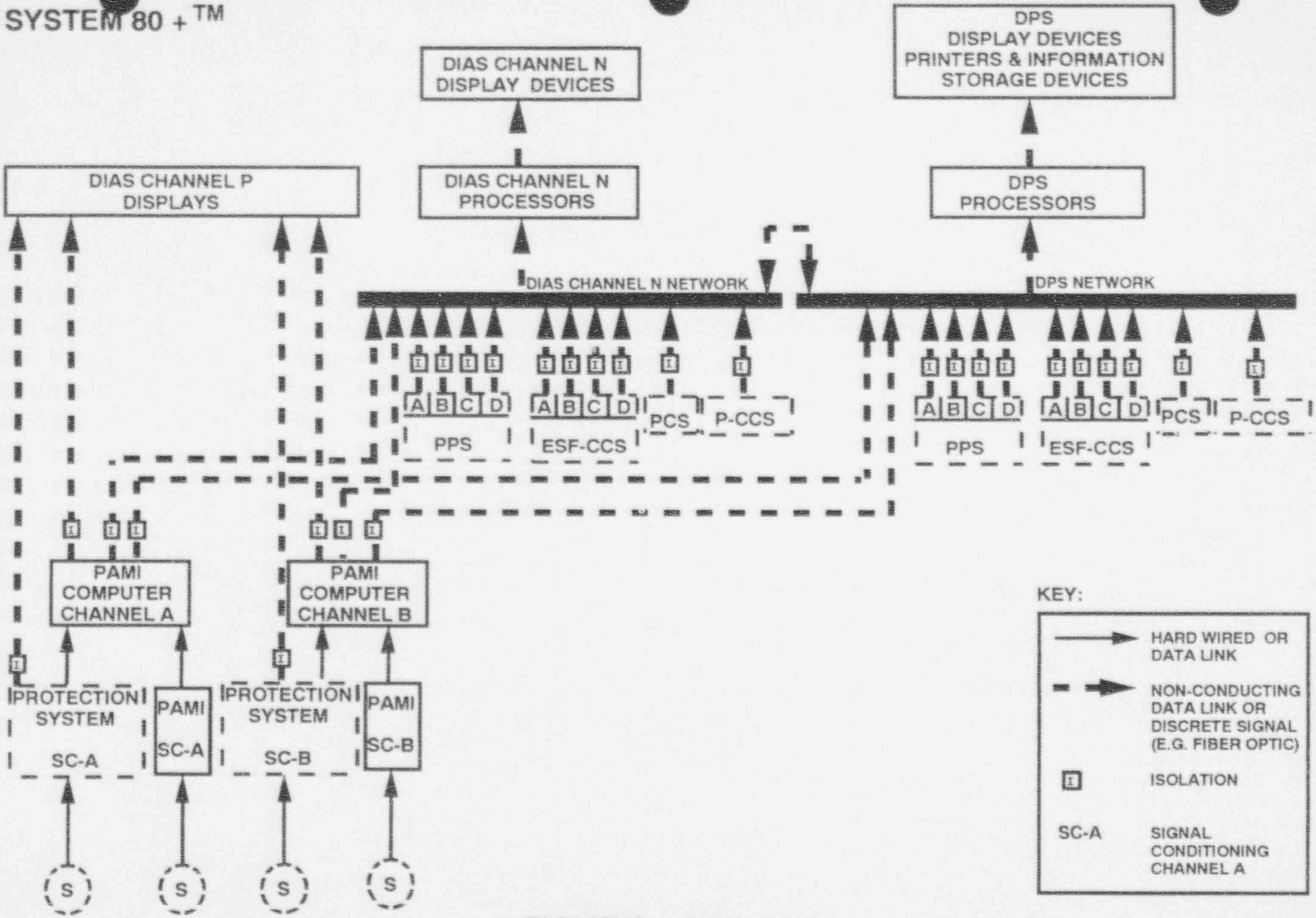

FIGURE 2.5.3-2
DIAS-P, DIAS-N, DPS, AND INTERCONNECTIONS

06-17-94

TABLE 2.5.3-1

DISCRETE INDICATION AND ALARM SYSTEM AND DATA PROCESSING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the DIAS and DPS is as shown on Figure 2.5.3-1.	1. Inspection of the as-built configuration of the DIAS and the DPS will be conducted.	1. For the components and equipment shown on Figure 2.5.3-1, the as-built DIAS and DPS conform with the Basic Configuration.
2. Physical separation and electrical isolation are provided between the DIAS-P, the DIAS-N and the DPS as shown on Figure 2.5.3-2.	2. Inspection of the as-built DIAS-P, DIAS-N, and DPS equipment will be conducted.	2. Physical separation exists between the DIAS-P, the DIAS-N, and the DPS. Electrical isolation devices are provided at interfaces between the DIAS-P, DIAS-N and DPS, consistent with Figure 2.5.3-2.
3. The hardware and software used in the DPS for information processing and display are diverse from that used in the DIAS-N and the DIAS-P.	3.a) Inspection of the as-built DIAS-P, DIAS-N, and DPS equipment will be performed.	3.a) Digital equipment used for data processing, data communication and display in the DPS uses microprocessors which are diverse from the microprocessors used in corresponding equipment in the DIAS-N and the DIAS-P.
	3.b) Inspection of the DPS, DIAS-N and DIAS-P design documentation will be performed to confirm that the software was developed by different design groups.	3.b) The design documentation confirms that the design group(s) which developed the DPS software is different from the design group(s) which developed the DIAS-N and DIAS-P software.

TABLE 2.5.3-1 (Continued)

DISPLAY INSTRUMENTATION FOR INFORMATION FROM SAFETY RELATED SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4.a) The DIAS-P provides a continuous display in the MCR of the key parameters for indication of critical function status during and following design basis events. These parameters are provided to the DIAS-P displays via two channels of instrumentation which include protection system signal conditioning equipment and PAMI equipment, as shown on Figure 2.5.3-2.	4.a) Inspection of as-built DIAS-P equipment will be performed.	4.a) The DIAS-P displays in the MCR provide the key parameters for indication of critical function status during and following design basis events, and two channels of instrumentation which include protection system signal conditioning equipment and PAMI equipment are used to provide the information to the DIAS-P displays consistent with Figure 2.5.3-2.
4.b) The information provided the DIAS-P displays are communicated via means which are diverse from the communication software used in the plant protection system (PPS) and the engineered safety features ESF-CCS.	4.b) Inspection of the as-built DIAS-P equipment will be performed. Where digital equipment is used for communication of signals to DIAS-P, then inspection of the documentation will be performed to confirm that the signal communication software is diverse from the signal communication software for the PPS and ESF-CCS.	4.b) Communication of the signals from the signal conditioning equipment to the DIAS-P display devices is consistent with Figure 2.5.3-2 and implements either of the following: i. hardwired signal communication for displays derived directly from the signal conditioning equipment, ii. digital signal communication equipment that uses software that is diverse from the signal communication for the PPS and ESF-CCS.

TABLE 2.5.3-1 (Continued)

DISPLAY INSTRUMENTATION FOR INFORMATION FROM SAFETY RELATED SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. The DIAS-N provides for display of the key parameters for indication of critical function status during and following design basis events and the operating status of success path systems using dedicated display devices. The DIAS-N provides multi-parameter displays with access to backup information for the key indicators and access to diagnostic information. The DIAS-N provides displays for specified alarm conditions.	5. Inspection of the as-built DIAS-N equipment will be performed.	5. The DIAS-N provides dedicated display devices in the MCR for the display of the key parameters for indication of critical function status during and following design basis events and the operating status of success path systems. The DIAS-N provides multi-parameter displays in the MCR with access to backup information for the key indicators and access to diagnostic information. The DIAS-N provides displays in the MCR for specified alarm conditions.
6. The DPS provides for display of the key parameters for indication of critical function status during and following design basis events, the operating status of success path systems, backup information for the key indicators, access to diagnostic information, and for specified alarm conditions.	6. Inspection of the as-built DPS equipment will be performed.	6. The DPS displays in the MCR provide for display of the key parameters for indication of critical function status during and following design basis events, the operating status of success path systems, backup information for the key indicators, access to diagnostic information, and for specified alarm conditions.

TABLE 2.5.3-1 (Continued)

DISPLAY INSTRUMENTATION FOR INFORMATION FROM SAFETY RELATED SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. The DIAS-N and the DPS provide for monitoring the following:	7. Inspection of the as-built DIAS-N and DPS displays in the MCR and remote shutdown room will be performed. Testing will be performed using actual or simulated input signals.	7. The DIAS-N and DPS display equipment provides monitoring capability for the following:
a) Specified process conditions in the reactor and related systems for startup, operation, and shutdown from the MCR and for shutdown to hot standby from the remote shutdown room (NOTE 1).		a) Specified process conditions in the reactor and related systems for startup, operation, and shutdown from the MCR and for shutdown to hot standby from the remote shutdown room (NOTE 1).
b) Reactor trip system status to confirm that a reactor trip has taken place and whether or not a setpoint for initiation of a reactor trip response has been reached.		b) Reactor trip system status to confirm that a reactor trip has taken place and whether or not a setpoint for initiation of a reactor trip response has been reached.
c) The status and operation of each engineered safety feature system and for specified related systems in the post accident period.		c) The status and operation of each engineered safety feature system and for specified related systems in the post accident period.
d) The position of the control element assemblies.		d) The position of the control element assemblies.
e) Specified parameters that provide information to indicate whether plant safety functions are being accomplished during and following design basis accident events.		e) Specified parameters that provide information to indicate whether plant safety functions are being accomplished during and following design basis accident events.

NOTE 1

Refer to Section 2.12.1, MCR and 2.12.2, RSR for identification of MCR and RSR indications and controls provided by DIAS-N and DPS

TABLE 2.5.3-1 (Continued)

DISPLAY INSTRUMENTATION FOR INFORMATION FROM SAFETY RELATED SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. (Continued)		7. (Continued)
f) Indication of bypassed and inoperable status of plant safety systems, as follows:		f) Indication of bypassed and inoperable status of plant safety systems, as follows:
i. Status of plant operating mode related bypasses of the PPS.		i. Status of plant operating mode related bypasses of the PPS.
ii. Bypass status of each channel of the PPS.		ii. Bypass status of each channel of the PPS.
iii. Bypass and inoperable status of engineered safety feature systems.		iii. Bypass and inoperable status of engineered safety feature systems.
g) The status of core cooling prior to and following an accident, as follows:		g) The status of core cooling prior to and following an accident, as follows:
i. Subcooling.		i. Subcooling.
ii. Liquid inventory in the reactor vessel above the fuel alignment plate.		ii. Liquid inventory in the reactor vessel above the fuel alignment plate.
iii. Coolant temperature at the core exit.		iii. Coolant temperature at the core exit.

TABLE 2.5.3-1 (Continued)

DISPLAY INSTRUMENTATION FOR INFORMATION FROM SAFETY RELATED SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. (Continued)		7. (Continued)
h) Four channels of PPS status information.		h) Four channels of PPS status information.
i) Four channels of status and parameter information from the ESF-CCS.		i) Four channels of status and parameter information from the ESF-CCS.
j) The following information from the PCS/P-CCS: alternate reactor trip status, alternate feedwater actuation signal status, pressurizer pressure, and steam generator 1 and 2 levels.		j) The following information from the PCS/P-CCS: alternate reactor trip status, alternate feedwater actuation signal status, pressurizer pressure, and steam generator 1 and 2 levels.
8. The DIAS-N and the DPS perform automatic signal validation using cross channel data comparison prior to data presentation and alarm generation.	8. Testing will be performed simulating the multiple channel input signals to the DIAS-N and DPS for each parameter selected as a key indicator of critical function status, as follows:	
	8.a) The input signals will simulate a failure of one of the multiple channels of input signals for the parameter under test.	8.a) The DIAS-N and the DPS display a value for the parameter under test which is consistent with the signals which were simulated not to fail, and the DIAS-N and DPS indicate that the displayed value is validated.

TABLE 2.5.3-1 (Continued)

DISPLAY INSTRUMENTATION FOR INFORMATION FROM SAFETY RELATED SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
	8.b) The input signals will simulate a failure of all but one of the multiple channels of input signals for the parameter under test.	8.b) The DIAS-N and DPS indicate that the displayed value for the parameter under test is not validated.
	8.c) The input signals will simulate failure of one channel with the other channel previously removed from service.	8.c) The DIAS-N and DPS display a value for the parameter under test which is consistent with the signals which were simulated not to be removed from service or failed, and the DIAS-N and DPS indicate that the value is validated.
	8.d) The DIAS-N and DPS display capability will be verified.	8.d) The DIAS-N and DPS indicate operability by verifying that the status signal is present and functional. The display used to verify 8.a) through 8.c) display these signals upon request, which make up the validated signal.
9.a) Electrical isolation devices are provided at DIAS-N and DPS interfaces to the PPS, ESF-CCS, PCS/P-CCS and at interfaces to display devices in the MCR and remote shutdown room.	9.a) Inspection of the as-built DIAS-N and DPS equipment will be conducted.	9.a) Electrical isolation devices are provided at DIAS-N and DPS interfaces to the PPS, ESF-CCS, PCS/P-CCS and at interfaces to display devices in the MCR and remote shutdown room, consistent with Figure 2.5.3-2.
9.b) Electrical isolation is provided between the DIAS-P display devices and one of the two channels of protection system signal conditioning equipment, as shown on Figure 2.5.3-2.	9.b) Inspection of the as-built DIAS-P equipment will be conducted.	9.b) Electrical isolation devices are provided between the DIAS-P display devices and one of the two channels of protection system signal conditioning equipment, consistent with Figure 2.5.3-2.

TABLE 2.5.3-1 (Continued)

DISPLAY INSTRUMENTATION FOR INFORMATION FROM SAFETY RELATED SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10. DIAS/DPS software is designed, tested, installed, and maintained using a process which: a. Defines the organization, responsibilities, and software quality assurance activities for the software engineering life cycle that provides for: • establishment of plans and methodologies • specification of functional, system and software requirements and standards, identification of safety critical requirements • design and development of software • software module, unit, and system testing practices • installation and checkout practices • reporting and correction of software defects during operation b. Specifies requirements for: • software management, documentation requirements, standards, review requirements, and procedures for problem reporting and corrective action	10. Inspection will be performed of the process used to design, test, install, and maintain the DIAS and DPS software.	10.a) The process defines the organization, responsibilities and activities for the following phases of the software engineering life cycle: • Establishment of plans and methodologies for all software to be developed. • Specification of functional, system and software requirements and identification of safety critical requirements. • Design of the software architecture, program structure and definition of the software modules. • Development of the software code and testing of the software modules. • Interpretation of software and hardware and performance of unit and system tests. • Software installation and checkout testing. • Reporting and correction of software defects during operation.

TABLE 2.5.3-1 (Continued)

DISPLAY INSTRUMENTATION FOR INFORMATION FROM SAFETY RELATED SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10. (Continued) • software configuration management, historical records of software, and control of software changes • verification & validation, and requirements for reviewer independence c. Incorporates a graded approach according to the software's relative importance to safety.		10.b) The process has requirements for the following software development functions: • Software management, which defines organization responsibilities, documentation requirements, standards for software coding and testing, review requirements, and procedures for problem reporting and corrective actions. • Software configuration management, which establishes methods for maintaining historical records of software as it is developed, controlling software changes, and for recording and reporting software changes. • Verification and validation, which specifies the requirements for the verification review process, the validation testing process, review and test activity documentation, and reviewer independence. 10.c) The process establishes the method for classifying DIAS and DPS software elements according to their relative importance to safety. The process defines the tasks to be performed for software assigned to each safety classification.

TABLE 2.5.3-1 (Continued)

DISPLAY INSTRUMENTATION FOR INFORMATION FROM SAFETY RELATED SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11. The DIAS/DPS is qualified according to an established plan for Electromagnetic compatibility (EMC). The qualification plan requires the equipment to function properly when subjected to the expected operational electrical surges or electromagnetic interference (EMI), electrostatic discharge (ESD), and radio frequency interference (RFI). The qualification plan will require that the equipment to be tested be configured for intended service conditions.	11. Inspection of the DIAS/DPS EMC qualification reports and the as-built DIAS/DPS equipment installation configuration and environment will be conducted.	11. For the DIAS/DPS components and equipment shown on Figure 2.5.3-1, the as-built installation configuration and site survey are bounded by those used in the DIAS/DPS EMC qualification report(s).
12. DIAS and DPS are non-Class 1E systems used to display safety-related information.	12. Inspection of the DIAS and DPS equipment will be performed.	12. DIAS and DPS display safety-related information (NOTE 2).
13. The DIAS-N and DPS provide alarm indication consisting of alarm tiles (DIAS-N only) and display messages, provisions for alarm acknowledgement, and priority distinction in alarm display.	13. Testing will be performed to verify DIAS-N and DPS alarm indication.	13. The DIAS-N and DPS provide alarm indication consisting of alarm tiles (DIAS-N only) and display messages, provisions for alarm acknowledgement, and priority distinction in alarm display.

NOTE 2

Refer to Section 2.12.1, MCR for identification of information displayed.

TABLE 2.5.3-1 (Continued)

DISPLAY INSTRUMENTATION FOR INFORMATION FROM SAFETY RELATED SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
14. DIAS communications has the following safety critical attributes: • cyclical data communications independent of plant transients, • redundant networks for communication, • networks utilize isolation technology to ensure electrical independence of redundant safety channels and electrical independence of the Main Control Room and Remote Shutdown Room, • and networks provide communication paths to allow display of information from safety-related I&C systems.	14. Inspection of the as-built DIAS will be performed.	14. The equipment used for DIAS has the following attributes: • cyclical data communications independent of plant transients, • redundant networks for communication, • networks utilize isolation technology to ensure electrical independence of redundant safety channels and electrical independence of the Main Control Room and Remote Shutdown Room, • and networks provide communication paths to allow display of information from safety-related I&C systems.
15.a) PAMI Category I instruments and computers up to and including the channel isolation devices are Class 1E environmentally and seismically qualified.	15.a) Inspection of the PAMI Category I equipment qualification report and the as-built equipment installation, configuration, and environment will be conducted.	15.a) The qualification report concludes that the PAMI Category I instruments and computers are Class 1E environmental and seismically qualified.
15.b) The DIAS displays and processors are non-Class 1E which are designed for room ambient temperature and humidity environmental conditions.	15.b) Inspection of non-Class 1E equipment documentation will be conducted.	15.b) The non-Class 1E DIAS equipment environmental specifications envelope the room's design ambient temperature and humidity environmental conditions.

TABLE 2.5.3-1 (Continued)

DISPLAY INSTRUMENTATION FOR INFORMATION FROM SAFETY RELATED SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
15.c) Temperature sensors mounted in the DIAS cabinets provide status indication in the MCR.	15.c) Testing will be performed to simulate high temperature in the DIAS cabinets.	15.c) Temperature sensors mounted in the DIAS cabinets provide status indication in the MCR.
15.d) The DIAS power supplies, displays and processors are seismically qualified for physical and functional integrity.	15.d) Inspection of the DIAS equipment qualification report and an inspection of the as-built equipment installation, configuration, and location will be conducted.	15.d) The qualification report concludes the DIAS equipment is seismically qualified for physical and functional integrity.
15.e) The MCR and RSR DPS display devices are seismically qualified for physical integrity.	15.e) Inspection of the DPS display device seismic qualification report and an inspection of the as-built equipment installation, configuration, and location will be conducted.	15.e) The seismic qualification report concludes the DPS display device is seismically qualified for physical integrity.
16. The DIAS hardware components have the following attributes: • software programmable processors; • software execution without process dependent interrupts; • segmented design such that the impact of a single electrical failure is limited to the display devices of the segment.	16. Inspection of the design documentation for the as-built DIAS equipment will be performed.	16. The design documentation concludes that the DIAS equipment has the following features: • software programmable processors; • software execution without process dependent interrupts; • segmented design such that the impact of a single electrical failure is limited to the display devices of the segment.

TABLE 2.5.3-1 (Continued)

DISPLAY INSTRUMENTATION FOR INFORMATION FROM SAFETY RELATED SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
17. Loss of electrical power will result in either a blank display, inactive status indicator, or bad data status symbol.	17. Inspection of the DIAS and DPS during loss of power will be performed.	17. Loss of power to a display device results in a blank screen. Loss of power to a DIAS segment results in an inactive running indicator. Loss of power to a DPS application processor results in a bad data symbol on the display device.
18. The use of commercial grade computer hardware and software items in the DIAS/DPS is accomplished through a process that has: • requirements for supplier design control, configuration management, problem reporting and change control; • review of product performance; • receipt acceptance of the commercial grade item; • final acceptance, based on equipment qualification and software validation.	18. Inspection will be performed of the process defined to use commercial grade components in the application.	18. A process is defined that has: • requirements for supplier's design and production control, configuration management, problem reporting, and change control; • review of product performance; • receipt acceptance of commercial grade item; • final acceptance, based on equipment qualification and software validation in the integrated system.

2.5.4 POWER CONTROL SYSTEM/PROCESS-COMPONENT CONTROL SYSTEM

Design Description

The Power Control System and the Process-Component Control System (PCS/P-CCS) are non-safety-related instrumentation and control systems which provide control of functions to maintain the plant within its normal operating range for all normal modes of plant operation.

The PCS/P-CCS are located in the nuclear island structures.

The Basic Configuration of the PCS/P-CCS is as shown on Figure 2.5.4-1.

The PCS/P-CCS use sensors, transmitters, signal conditioning equipment, control and display interface devices, and digital processing equipment which perform the calculations, data communications, and logic to support the control functions. The digital equipment and software used in the PCS/P-CCS are diverse from those used in the plant protection system (PPS) and the engineered safety features - component control system (ESF-CCS).

The PCS/P-CCS provide control interfaces for the following control functions:

PCS-reactivity control using control element assemblies,
PCS-reactor power cutback,
PCS-power change limiter (Megawatt Demand Setter),
P-CCS-pressurizer pressure and level,
P-CCS-main feedwater flow,
P-CCS-main steam bypass flow,
P-CCS-boron concentration,
P-CCS-alternate reactor trip actuation, and
P-CCS-alternate emergency feedwater actuation.

The circuits used for alternate actuation of reactor trip, turbine trip, and emergency feedwater are independent and diverse from the protection system actuation circuits.

The PCS/P-CCS provide the following information to the Discrete Indication and Alarm System (DIAS):

alternate reactor trip status,
alternate feedwater actuation signal status,
pressurizer pressure, and
steam generator 1 and 2 levels.

For parameters used in PCS/P-CCS control functions which are provided from the redundant Class 1E sensors that are used independently by each channel of the protective system, the PCS/P-CCS monitors the four redundant instrument channels. The PCS/P-CCS apply signal validation logic to the signals received from the four redundant channels to detect bypassed or failed sensors and to determine the sensed value to be used in the control system.

Control and display interface devices for the PCS/P-CCS are provided in the main control room (MCR) and in the remote shutdown room for control and monitoring of PCS/P-CCS controlled equipment.

Actuation of master transfer switches at either exit of the MCR transfers control capability from the PCS/P-CCS control and display interface devices in the MCR to those in the remote shutdown room. The transfer can also be performed at the PCS/P-CCS equipment cabinets, which also provide capability for transferring control back to the MCR. Indication of transfer status is provided in the MCR.

Electrical isolation devices are implemented between the PCS/P-CCS and the protection system signal conditioning equipment for each protection signal provided to them, as shown on Figure 2.5.4-2. Electrical isolation devices are provided for the PCS/P-CCS interfaces with the MCR equipment, the remote shutdown room equipment, the DIAS-N and the Data Processing System (DPS), the protection system, and with protection system components as shown on Figure 2.5.4-2.

PCS/P-CCS software is designed, tested, installed, and maintained using a process which:

a. Defines the organization, responsibilities, and software quality assurance activities for the software engineering life cycle that provides for:

- establishment of plans and methodologies
- specification of functional, system and software requirements and standards, and identification of safety critical requirements
- design and development of software
- software module, unit, and system testing practices
- installation and checkout practices
- reporting and correction of software defects during operation

b. Specifies requirements for:

- software management, documentation requirements, standards, review requirements, and procedures for problem reporting and corrective action

- software configuration management, historical records of software, and control of software changes
- verification & validation, and requirements for reviewer independence

c. Incorporates a graded approach according to the software's relative importance to safety.

The use of commercial grade computer hardware and software items in the PCS/P-CCS is accomplished through a process that has:

- requirements for supplier design control, configuration management, problem reporting, and change control;
- review of product performance;
- receipt acceptance of the commercial grade item;
- final acceptance, based on equipment qualification and software validation.

Inspection, Test, Analyses, and Acceptance Criteria

Table 2.5.4-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Power Control System/Process-Component Control System.

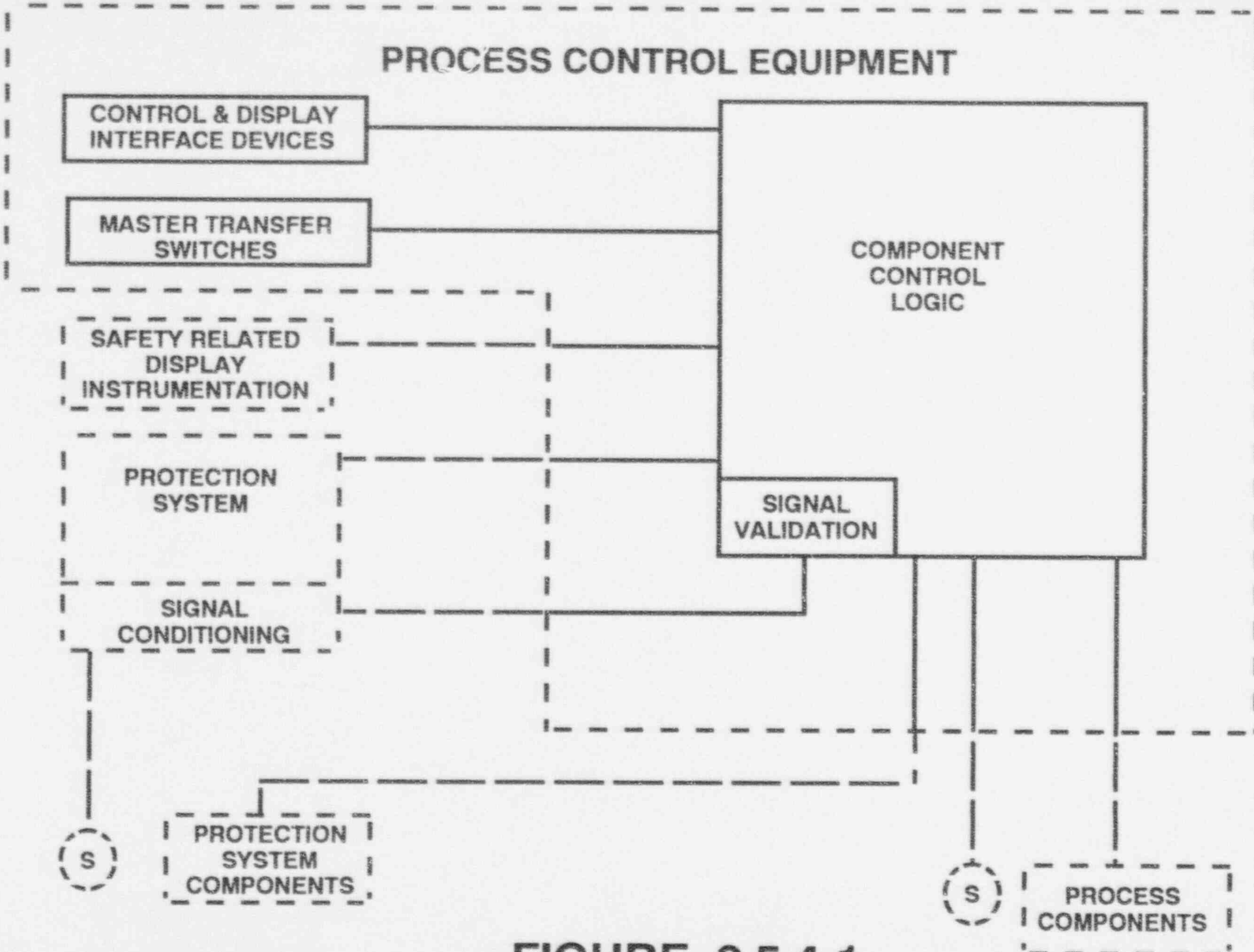

FIGURE 2.5.4-1
PROCESS CONTROL EQUIPMENT CONFIGURATION

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PROCESS CONTROL EQUIPMENT

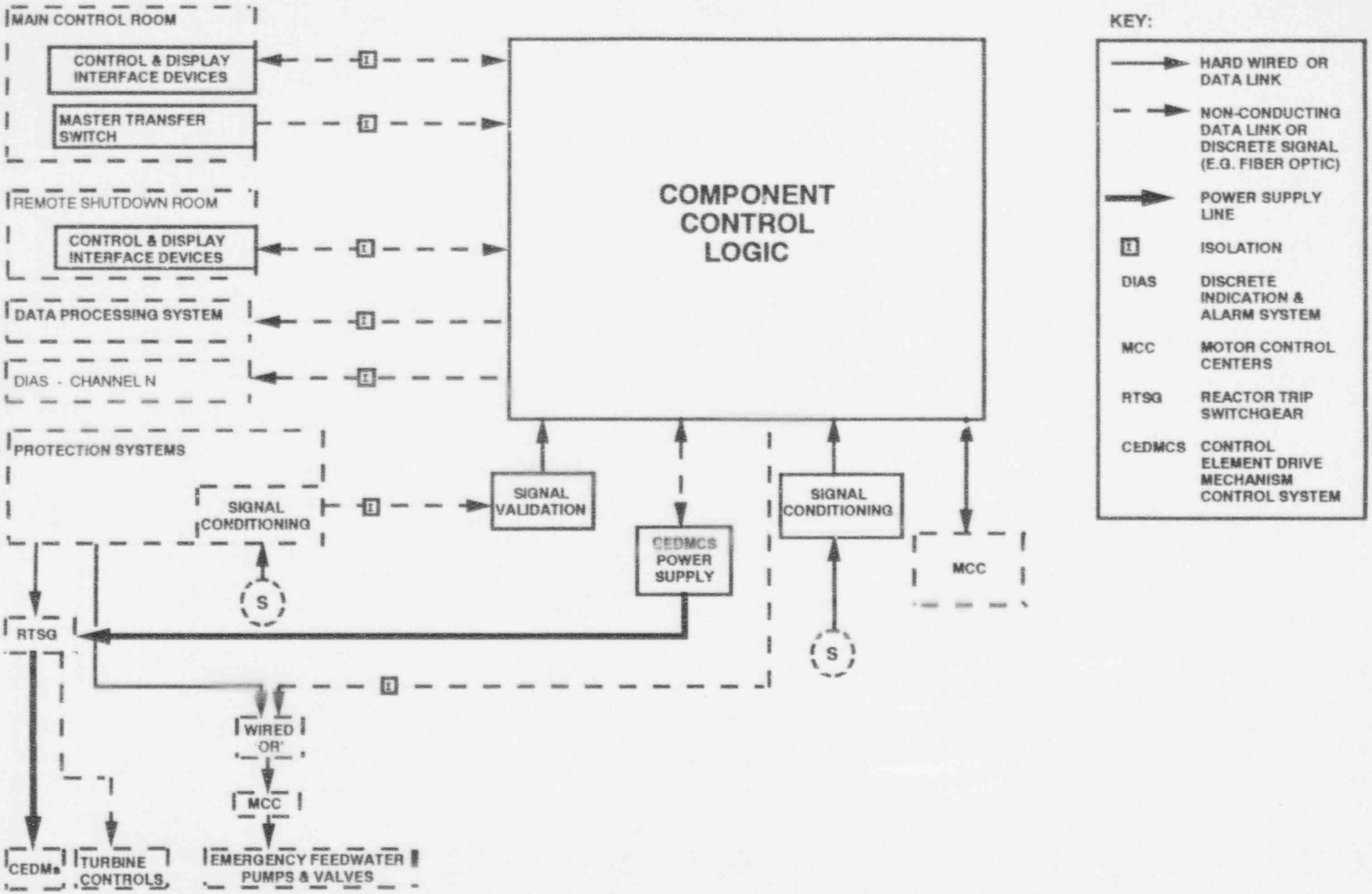

FIGURE 2.5.4-2
PROCESS CONTROL EQUIPMENT AND INTERCONNECTIONS

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POWER CONTROL SYSTEM/PROCESS-COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the PCS/P-CCS is as shown on Figure 2.5.4-1.	1. Inspection of the as-built configuration of the PCS/P-CCS will be conducted.	1. For the components and equipment shown on Figure 2.5.4-1, the as-built PCS/P-CCS conforms with the Basic Configuration.
2. The digital equipment and software used in the PCS/P-CCS are diverse from those used in the PPS and ESF-CCS.	2.a) Inspection of the as-built PCS/P-CCS, PPS and ESF-CCS equipment will be performed.	2.a) The digital equipment used in the PCS/P-CCS uses microprocessors which are diverse from the microprocessors used in the PPS and ESF-CCS equipment.
	2.b) Inspection of the design documentation will be performed to confirm that the software was developed by different design groups.	2.b) The software documentation confirms that the design group(s) which developed the PCS/P-CCS software is different from the design group(s) which developed the PPS and ESF-CCS software.
3. The PCS/P-CCS provide control interfaces for the following control functions: PCS-reactivity control using control element assemblies, PCS-reactor power cutback, PCS-power change limiter (Megawatt Demand Setter), P-CCS-pressurizer pressure and level, P-CCS-main feedwater flow, P-CCS-steam bypass flow, P-CCS-boron concentration, P-CCS-alternate reactor trip actuation, and P-CCS-alternate emergency feedwater actuation.	3. Inspection will be performed on the as-built PCS/P-CCS control interface equipment.	3. PCS/P-CCS control interfaces are provided for the following functions: PCS-reactivity control using control element assemblies, PCS-reactor power cutback, PCS-power change limiter (Megawatt Demand Setter), P-CCS-pressurizer pressure and level, P-CCS-main feedwater flow, P-CCS-steam bypass flow, P-CCS-boron concentration, P-CCS-alternate reactor trip actuation, and P-CCS-alternate emergency feedwater actuation.

TABLE 2.5.4-1 (Continued)

POWER CONTROL SYSTEM/PROCESS-COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. The circuits used for alternate actuation of reactor trip, turbine trip, and emergency feedwater are independent and diverse from the protection system actuation circuits.	4. Inspection of the design documentation will be performed to confirm that the specified alternate actuation circuits are independent and diverse from the protection system actuation circuits.	4. The documentation confirms that circuits are implemented in the PCS/P-CCS to perform actuation of reactor trip, turbine trip, and emergency feedwater which do not utilize signals from the PPS or ESF-CCS and that the PPS and ESF-CCS digital equipment is not used to communicate the actuation signals from the PCS/P-CCS to the actuated components.
5. The PCS/P-CCS provide the following information to the DIAS: alternate reactor trip status, alternate feedwater actuation signal status, pressurizer pressure, and steam generator 1 and 2 levels.	5. Inspection will be performed of the as-built DIAS equipment.	5. The following information is available at a DIAS-N display device: alternate reactor trip status, alternate feedwater actuation signal status, pressurizer pressure, and steam generator 1 and 2 levels.
6. For parameters used in PCS/P-CCS control functions which are provided from the redundant Class 1E sensors that are used independently by each channel of the protective system, the PCS/P-CCS monitors the four redundant instrument channels. The PCS/P-CCS applies signal validation logic to the signals received from the four redundant channels to de-tect bypassed or failed sensors and to determine the sensed value to be used in the control system.	6. Testing will be performed using signals simulating each parameter provided to the PCS/P-CCS via the redundant Class 1E sensors that are used independently by each channel of the protective system. The signals will simulate a failure of one of the four sensor inputs for each parameter.	6. For each parameter, the representative parameter value determined by the PCS/P-CCS from the Class 1E sensor inputs is bounded by the three signals which are simulated to be unaffected by the failure.

TABLE 2.5.4-1 (Continued)

POWER CONTROL SYSTEM/PROCESS-COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. Control and display interface devices for the PCS/P-CCS are provided in the MCR and in the remote shutdown room.	7. Inspection will be performed of the as-built PCS/P-CCS control and display interface devices in the MCR and remote shutdown room.	7. Control and display interface devices for the PCS/P-CCS are provided in the MCR and in the remote shutdown room.
8.a) Actuation of master transfer switches at either exit of the MCR transfers control capability from the PCS/P-CCS control and display interface devices in the MCR to those in the remote shutdown room. Indication of transfer status is provided in the MCR.	8.a) Testing will be performed using the master transfer switches at each exit of the MCR and each of the PCS/P-CCS control and display interface devices in the MCR and the remote shutdown panel.	8.a) Upon actuation of the master transfer switches at either MCR exit: 1) control actions at the PCS/P-CCS control and display interface devices in the MCR do not cause the process control systems to generate the associated control signals; and 2) control actions at the PCS/P-CCS control and display interface devices in the remote shutdown room cause the process control systems to generate the associated control signals. 3) Indication of transfer status is provided in the MCR.
8.b) The transfer of control capability can also be performed at the PCS/P-CCS equipment cabinets, which also provide capability for transferring control back to the MCR. Indication of transfer status is provided in the MCR.	8.b) Testing will be performed at the equipment cabinets for the PCS/P-CCS and using the PCS/P-CCS control and display interface devices in the MCR and the remote shutdown room.	8.b) Upon actuation of the master transfer switching function from the equipment cabinets for the PCS/P-CCS:

TABLE 2.5.4-1 (Continued)

POWER CONTROL SYSTEM/PROCESS-COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8.b) (Continued)		8.b) (Continued) 1) control actions at the PCS/P-CCS control and display interface devices in the MCR do not cause the process control systems to generate the associated control signals; and 2) control actions at the PCS/P-CCS control and display interface devices in the remote shutdown room cause the process control systems to generate the associated control signals. 3) Indication of transfer status is provided in the MCR. Upon de-actuation of the master transfer switching function from the equipment cabinets for the PCS/P-CCS: 1) control actions at the PCS/P-CCS control and display interface devices in the remote shutdown room do not cause the process control systems to generate the associated control signals; and

POWER CONTROL SYSTEM/PROCESS-COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8.b) (Continued)		8.b) (Continued) 2) control actions at the PCS/P-CCS control and display interface devices in the MCR cause the process control systems to generate the associated control signals. 3) Indication of transfer status is provided in the MCR.
9.a) Electrical isolation devices are provided between the PCS/P-CCS and the protection system signal conditioning equipment for each protection signal provided to them, as shown on Figure 2.5.4-2.	9.a) Inspection of the as-built PCS/P-CCS configuration will be conducted.	9.a) Electrical isolation devices are provided between the PCS/P-CCS and the protection system signal conditioning equipment, consistent with Figure 2.5.4-2 for each protection signal provided to them.
9.b) Electrical isolation devices are provided for the PCS/P-CCS interfaces with the MCR, the remote shutdown room, the safety related display instrumentation, the protection systems, and with protection system components, as shown on Figure 2.5.4-2.	9.b) Inspection of the as-built PCS/P-CCS configuration will be conducted.	9.b) Electrical isolation devices are provided for the PCS/P-CCS interfaces with the MCR, the remote shutdown room, the safety related display instrumentation, the protection systems, and with protection system components, conforming to Figure 2.5.4-2.

TABLE 2.5.4-1 (Continued)

POWER CONTROL SYSTEM/PROCESS-COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10. PCS/P-CCS software is designed, tested, installed, and maintained using a process which: a. Defines the organization, responsibilities, and software quality assurance activities for the software engineering life cycle that provides for: • establishment of plans and methodologies • specification of functional, system, and software requirements and standards, identification of safety critical requirements • design and development of software • software module, unit and system testing practices • installation and checkout practices • reporting and correction of software defects during operation	10. Inspection will be performed of the process used to design, test, install, and maintain the PCS/P-CCS software.	10.a) The process defines the organization, responsibilities, and activities for the following phases of the software engineering life cycle: • Establishment of plans and methodologies for all software to be developed; • Specification of functional, system, and software requirements and identification of safety critical requirements; • Design of the software architecture, program structure, and definition of the soft-ware modules; • Development of the software code and testing of the software modules; • Interpretation of software and hardware and performance of unit and system tests; • Software installation and checkout testing; and • Reporting and correction of software defects during operation.

TABLE 2.5.4-1 (Continued)

POWER CONTROL SYSTEM/PROCESS-COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10.b) (Continued) b. Specifies requirements for: • software management, documentation requirements, standards, review requirements, and procedures for problem reporting and corrective action • software configuration management, historical records of software, and control of software changes • verification & validation, and requirements for reviewer independence c. Incorporates a graded approach according to the software's relative importance to safety.		10.b) The process has requirements for the following software development functions: • Software management, which defines organization responsibilities, documentation requirements, standards for software coding and testing, review requirements, and procedures for problem reporting and corrective action; • Software configuration management, which establishes methods for maintaining historical records of software as it is developed, controlling software changes, and for recording and reporting software changes; and • Verification and validation, which specifies the requirements for the verification review process, the validation testing process, review and test activity documentation, and reviewer independence.

POWER CONTROL SYSTEM/PROCESS-COMPONENT CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
		10.c) The process establishes the method for classifying PCS/P-CCS software elements according to their relative importance to safety. The process defines the tasks to be performed for software assigned to each safety classification.
11. The use of commercial grade computer hardware and software items in the PCS/P-CCS is accomplished through a process that has: • requirements for configuration management; • review of product performance; • receipt acceptance of the commercial grade item; and • final acceptance based on equipment qualification and software validation.	11. Inspection will be performed of the process defined to use commercial grade components in the application.	11. A process is defined that has: • requirements for configuration management; • review of product performance; • receipt acceptance of the commercial grade item; and • final acceptance based on equipment qualification and software validation in the integrated system.

2.6.1 AC ELECTRICAL POWER DISTRIBUTION SYSTEM

DESIGN DESCRIPTION

The AC Electrical Power Distribution System (EPDS) consists of the transmission system, the plant switching stations, the Unit Main Transformer (UMT), two Unit Auxiliary Transformers (UATs), two Reserve Auxiliary Transformers (RATs), a Main Generator (MG), Generator Circuit Breaker (GCB), buses, switchgear, load centers (L/Cs), motor control centers (MCCs), breakers, and cabling. The EPDS includes the power, instrumentation, and control cables and buses to the distribution system loads, and electrical protection devices (circuit breakers and fuses) for the power, instrumentation, and control cables and buses. The portion of the EPDS from the high voltage sides of the UMT and RATs to the distribution system loads constitutes the EPDS Certified Design scope. Interface requirements for the transmission system, plant switching stations, UMT, and RATs are specified below under the heading, "Interface Requirements."

Two Emergency Diesel Generators (EDGs) provide Class 1E power to the two independent Class 1E Divisions.

A non-safety-related Alternate AC Source (AAC) (i.e., combustion turbine) supplies non-Class 1E power to the EPDS.

The backup pressurizer heaters, emergency lighting, RCP seal injection pump, and RCP seal injection pump room ventilation fan are the only electrical loads classified as non-Class 1E which are directly connectable to the Class 1E buses.

Class 1E equipment is classified as Seismic Category I.

The Basic Configuration of the Class 1E portion of the EPDS is as shown on Figure 2.6.1-1.

During plant power operation, the MG supplies power through the GCB through the UMT to the transmission system, and to the UATs. When the GCB is open, power is backfed from the transmission system through the UMT to the UATs.

The UATs are sized to supply the design operating requirements of their respective Class 1E buses and non-Class 1E medium voltage non-safety and permanent non-safety buses.

The UMT and UATs are separated from the RATs.

UMT, UATs, and RATs are provided with their own oil pit, drain, fire deluge system, grounding, and lightning protection systems.

The MG and GCB are separated from the RAT power feeders. The MG and GCB instrumentation and control circuits are separated from the RAT's instrumentation and control circuits.

Each RAT is sized to supply the design operating power requirements of at least its respective Class 1E buses and permanent non-safety bus, and one reactor coolant pump and its reactor coolant pump support loads. Each RAT has the capability of supplying power directly (i.e., not through any bus supplying non-Class 1E loads) to its respective Class 1E buses.

UAT power feeders, and instrumentation and control circuits are separated from the RAT's power feeders, and instrumentation and control circuits

Power feeders, and instrumentation and control circuits for the UMT and its switching station are separated from power feeders, and instrumentation and control circuits for the RATs and their switching station.

EPDS medium voltage switchgear, low voltage switchgear and their respective transformers, MCCs, and MCC feeder and load circuit breakers are sized to supply their load requirements. EPDS medium voltage switchgear, low voltage switchgear and their respective transformers, and MCCs are rated to withstand fault currents for the time required to clear the fault from its power source.

The GCB, medium voltage switchgear, low voltage switchgear, and MCC feeder and load circuit breakers are rated to interrupt fault currents.

EPDS interrupting devices (circuit breakers and fuses) are coordinated so that the circuit interrupter closest to the fault is designed to open before other devices.

Instrumentation and control power for Class 1E Divisional medium voltage switchgear and low voltage switchgear is supplied from the Class 1E DC Power System in the same Division.

The GCB is equipped with redundant trip devices supplied from separate non-Class 1E DC power systems.

EPDS cables and buses are sized to supply their load requirements. EPDS cables and buses are rated to withstand fault currents for the time required to clear the fault from its power source.

For the EPDS, Class 1E power is supplied by two independent Class 1E Divisions. Independence is maintained between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment.

Class 1E medium voltage switchgear, low voltage switchgear, and MCCs are identified according to their Class 1E Division. Class 1E medium voltage switchgear, low voltage switchgear, and MCCs are located in Seismic Category I structures and in their respective Division areas.

Class 1E EPDS cables and raceways are identified according to their Class 1E Division. Class 1E EPDS cables are routed in Seismic Category I structures and in their respective raceways.

Class 1E equipment is not prevented from performing its safety functions by harmonic distortion waveforms.

The EPDS supplies an operating voltage at the terminals of the Class 1E equipment which is within the equipment's voltage tolerance limits.

Class 1E equipment is protected from degraded voltage conditions.

An electrical grounding system is provided for (1) instrumentation, control, and computer systems, (2) electrical equipment (switchgear, motors, transformers, distribution panels), and (3) mechanical equipment (fuel and chemical tanks). Lightning protection systems are provided for buildings, structures and transformers located outside of the buildings. Each grounding system and lightning protection system is separately grounded to the plant ground grid.

There are no automatic connections between Class 1E Divisions.

Displays of EPDS voltage, amperage, frequency, watts and vars instrumentation exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to operate the EPDS, specifically to open and close the main turbine generator breaker, the 4.16kv supply and crossover breakers for the Class 1E buses, and the diesel generator output breakers.

Interface Requirements

The offsite system shall consist of a minimum of two independent offsite transmission circuits from the transmission system.

The offsite transmission circuits shall be sized to supply their load requirements, during all design operating modes, of their respective Class 1E divisions and non-Class 1E loads.

The UMT and RATs shall be connected to independent switching stations. Switching stations and their circuit breakers shall be sized to supply their load requirements and be rated to interrupt fault currents.

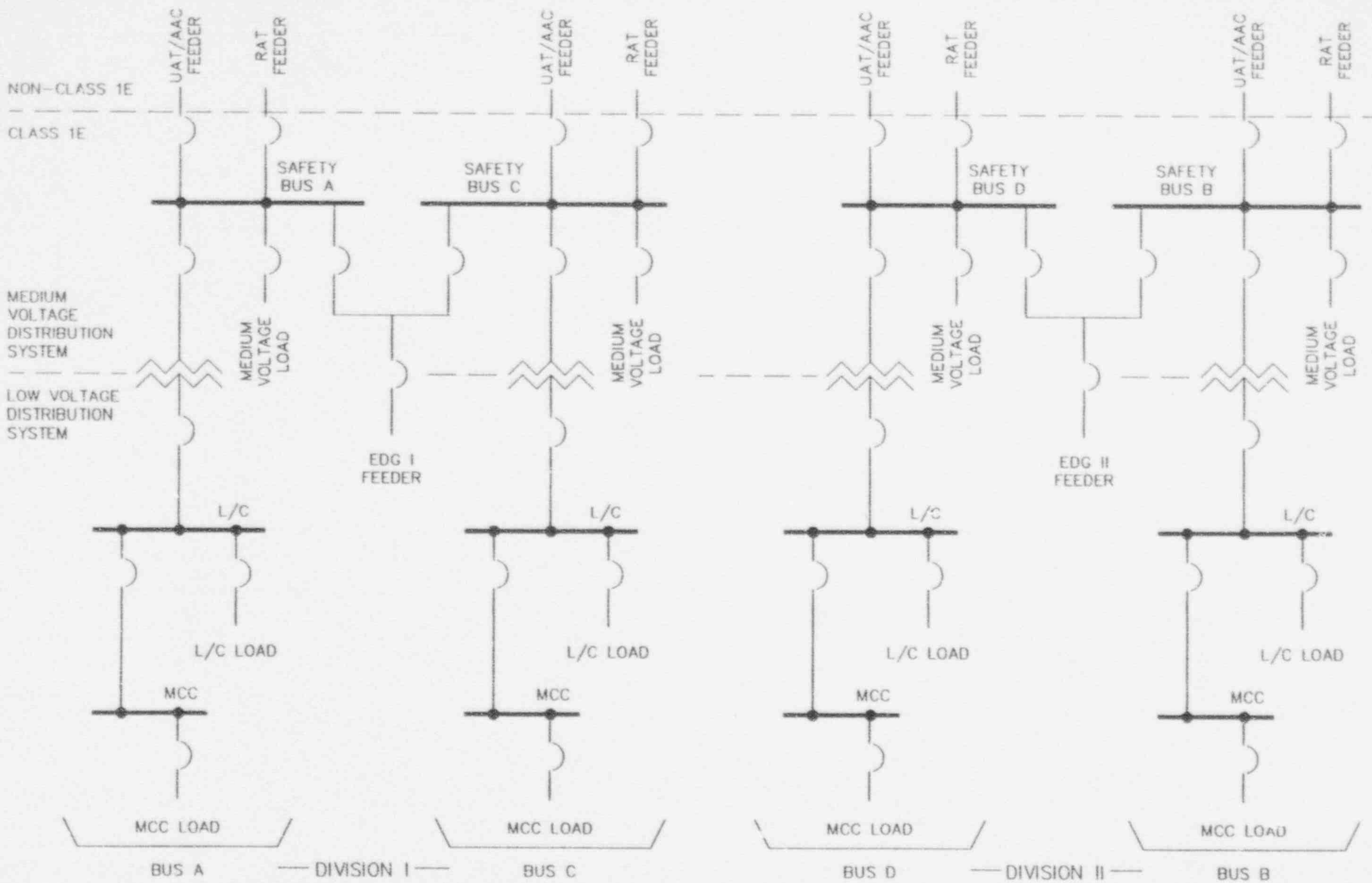
Voltage variations of the transmission system shall not cause voltage variations at the loads of more than plus or minus 10% of the loads' nominal voltage rating.

The normal steady-state frequency of the offsite system shall be within plus or minus 2 Hertz of 60 Hertz during recoverable periods of system instability.

The transmission system does not subject the reactor coolant pumps to sustained frequency decays of greater than 3 Hertz per second.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.6.1-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the AC Electrical Power Distribution System.



NOTE: ONLY ONE MEDIUM VOLTAGE LOAD, L/C, L/C LOAD, MCC, AND MCC LOAD SHOWN FOR EACH SAFETY BUS.

FIGURE 2.6.1-1

AC ELECTRICAL POWER DISTRIBUTION SYSTEM

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TABLE 2.6.1-1

AC ELECTRICAL POWER DISTRIBUTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the EPDS is as described in the Design Description (Section 2.6.1).	1. Inspection of the as-built EPDS will be conducted.	1. The as-built EPDS conforms with the Basic Configuration as described in the Design Description (Section 2.6.1).
2. UATs are sized to supply the design operating power requirements of their respective Class 1E buses and non-Class 1E medium voltage non-safety and permanent non-safety buses.	2. Analysis for the as-built UATs to determine their load requirements will be performed.	2. Analysis for as-built UATs exists and concludes that the capacity of each UAT, as determined by its nameplate rating, exceeds the analyzed design operating load requirements of its respective Class 1E buses and non-Class 1E medium voltage non-safety and permanent non-safety buses.
3. UMT and UATs are separated from the RATs.	3. Inspection of the as-built UMT and UATs will be conducted.	3. As-built UMT and UATs are separated from the RATs by a minimum of 50 feet.
4. UMT, UATs, and RATs are provided with their own oil pit, drain, fire deluge system, grounding, and lightning protection systems.	4. Inspection of the as-built UMT and UATs will be conducted.	4. As-built UMT, UATs, and RATs are provided with their own oil pit, drain, fire deluge system, grounding, and lightning protection systems.

AC ELECTRICAL POWER DISTRIBUTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. The MG and the GCB are separated from the RAT power feeders. The MG and GCB instrumentation and control circuits are separated from the RATs' instrumentation and control circuits.	5. Inspection for the as-built MG, the GCB, the RATs, and their respective instrumentation and control circuits will be conducted.	5. As-built MG and GCB are separated from the RATs' power feeders by a minimum of 50 feet, or by fire-rated walls or fire-rated floors. Outside the MCR, the MG and GCB instrumentation and control circuits are separated from the RATs' instrumentation and control circuits by a minimum of 50 feet, or by fire-rated walls or fire-rated floors. Within the MCR, the MG and GCB instrumentation and control circuits are separated from the RATs' instrumentation and control circuits by routing the circuits in separate raceways.
6. Each RAT is sized to supply the design operating power requirements of at least its respective Class 1E buses and permanent non-Safety bus, and one reactor coolant pump and its reactor coolant pump support loads.	6. Analysis for the as-built RATs to determine their load requirements will be performed.	6. Analysis for as-built RATs exists and concludes that the capacity of each RAT, as determined by its nameplate rating, exceeds the analyzed design operating load requirements of at least its respective Class 1E buses and permanent non-safety bus, and one reactor coolant pump and its reactor coolant pump support loads.

TABLE 2.6.1-1 (Continued)

AC ELECTRICAL POWER DISTRIBUTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. UAT power feeders, and instrumentation and control circuits are separated from the RATs' power feeders, and instrumentation and control circuits.	7. Inspection of the as-built UATs' and RATs' power feeders, and instrumentation and control circuits will be conducted.	7. As-built UAT power feeders are separated from the RATs' power feeders by a minimum of 50 feet or by fire-rated walls or fire-rated floors, except at the switchgear, where they are routed to opposite ends of the medium voltage switchgear. As-built UAT instrumentation and control circuits are separated from the RATs' instrumentation and control circuits by a minimum of 50 feet or by fire-rated walls or fire-rated floors, except as follows: a) inside the MCR, where they are separated by routing the circuits in separate raceways, and b) at the switchgear, where they are routed to opposite ends of the medium voltage switchgear.
8. Power feeders and instrumentation and control circuits for the UMT and its switching station are separated from power feeders, and instrumentation and control circuits for the RATs and their switching station.	8. Inspection for the as-built power feeders, instrumentation and control circuits for the UMT, RATs, and their respective switching stations will be conducted.	8. Outside the MCR, power feeders and instrumentation and control circuits for the UMT and its switching station are separated from the instrumentation and control circuits for the RATs and their switching station by a minimum of 50 feet, or by fire-rated walls or fire-rated floors. Within the MCR, instrumentation and control circuits for the UMT and its switching station are separated from the instrumentation and control circuits for the RATs and their switching station by routing in separate raceways.

TABLE 2.6.1-1 (Continued)

AC ELECTRICAL POWER DISTRIBUTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
9. EPDS medium voltage switchgear, low voltage switchgear and their respective transformers, MCCs, and MCC feeder and load circuit breakers are sized to supply their load requirements.	9. Analysis for the as-built EPDS to determine load requirements will be performed.	9. Analysis for the as-built EPDS exists and concludes that the capacities of the Class 1E medium voltage switchgear, low voltage switchgear and their respective transformers, MCCs, and MCC feeder and load circuit breakers, as determined by their nameplate ratings, exceed their analyzed load requirements.
10.a) EPDS medium voltage switchgear, low voltage switchgear and their respective transformers, and MCCs are rated to withstand fault currents for the time required to clear the fault from its power source.	10.a) Analysis for the as-built EPDS to determine fault currents will be performed.	10.a) Analysis for the as-built EPDS exists and concludes that the current capacities of the Class 1E medium voltage switchgear, low voltage switchgear and their respective transformers, and MCCs exceed their analyzed fault currents for the time required, as determined by the circuit interrupting device coordination analyses, to clear the fault from its power source.
10.b) The GCB, medium voltage switchgear, low voltage switchgear, and MCC feeder and load circuit breakers are rated to interrupt fault currents.	10.b) Analysis for the as-built EPDS to determine fault currents will be performed.	10.b) Analysis for the as-built EPDS exists and concludes that the analyzed fault currents do not exceed the GCB and medium voltage switchgear, low voltage switchgear, and MCC feeder and load circuit breakers interrupt capacities, as determined by their nameplate ratings.

AC ELECTRICAL POWER DISTRIBUTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11. EPDS interrupting devices (circuit breakers and fuses) are coordinated so that the circuit interrupter closest to the fault is designed to open before other devices.	11. Analysis for the as-built EPDS to determine circuit interrupting device coordination will be performed.	11. Analysis for the as-built EPDS exists and concludes that the analyzed Class 1E circuit interrupter closest to the analyzed fault will open before other devices.
12. Instrumentation and control power for Class 1E Divisional medium voltage switchgear and low voltage switchgear is supplied from the Class 1E DC power system in the same Division.	12. Testing of the as-built Class 1E medium and low voltage switchgear will be conducted by providing a test signal in only one Class 1E Division at a time.	12. A test signal exists in only the Class 1E Division under test.
13. The GCB is equipped with redundant trip devices which are supplied from separate non-Class 1E DC power systems.	13. Testing of the as-built GCB will be conducted by providing a test signal in only one trip circuit at a time.	13. A test signal exists in only the circuit under test.
14. EPDS cables and buses are sized to supply their load requirements.	14. Analysis for the as-built EPDS cables and buses will be performed.	14. Analysis for the as-built EPDS exists and concludes that Class 1E cables and bus capacities, as determined by cable and bus ratings, exceed their analyzed load requirements.
15. EPDS cables and buses are rated to withstand fault currents for the time required to clear the fault from its power source.	15. Analysis for the as-built EPDS to determine fault currents will be performed.	15. Analysis for the as-built EPDS exists and concludes that Class 1E cables and buses will withstand the analyzed fault currents for the time required, as determined by the circuit interrupting device coordination analyses, to clear the analyzed faults from their power sources.

AC ELECTRICAL POWER DISTRIBUTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
16. For the EPDS, Class 1E power is supplied by two independent Class 1E Divisions. Independence is maintained between Class 1E Divisions and between Class 1E Divisions and non-Class 1E equipment.	16.a) Testing on the as-built EPDS will be performed by providing a test signal in only one Class 1E Division/Channel at a time.	16.a) A test signal exists in only the Class 1E Division/Channel under test in the EPDS.
	16.b) Inspection of the as-built EPDS Class 1E Divisions will be conducted.	16.b) In the EPDS, physical separation or electrical isolation exists between Class 1E Divisions. Physical separation or electrical isolation exists between these Class 1E Divisions and non-Class 1E equipment.
17. Class 1E medium voltage switchgear, low voltage switchgear, and MCCs are identified according to their Class 1E Division.	17. Inspection of the as-built EPDS Class 1E medium voltage switchgear, low voltage switchgear, and MCCs will be conducted.	17. As-built Class 1E medium voltage switchgear, low voltage switchgear, and MCCs are identified according to their Class 1E Division.
18. Class 1E medium voltage switchgear, low voltage switchgear, and MCCs are located in Seismic Category I structures and in their respective Divisional areas.	18. Inspection of the as-built Class 1E medium voltage switchgear, low voltage switchgear, and MCCs will be conducted.	18. As-built Class 1E medium voltage switchgear, low voltage switchgear, and MCCs are located in Seismic Category I structures and in their respective Divisional areas.
19. Class 1E EPDS cables and raceways are identified according to their Class 1E Division.	19. Inspection of the as-built Class 1E EPDS Divisional cables and raceways will be conducted.	19. As-built EPDS cables and raceways are identified according to their Class 1E Division.

TABLE 2.6.1-1 (Continued)

AC ELECTRICAL POWER DISTRIBUTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
20. Class 1E Division cables are routed in Seismic Category I structures and in their respective raceways.	20. Inspection of the as-built EPDS Division cables and raceways will be conducted.	20. As-built Class 1E Division cables are routed in Seismic Category I structures and in their respective Division raceways.
21. Class 1E equipment is not prevented from performing its safety functions by harmonic distortion waveforms.	21. Analysis for the as-built EPDS to determine harmonic distortions will be performed.	21. Analysis for the as-built EPDS exists and concludes that harmonic distortion waveforms do not exceed 5 percent voltage distortion on the Class 1E EPDS.
22. The EPDS supplies an operating voltage at the terminals of the Class 1E equipment which is within the equipment's voltage tolerance limits.	22.a) Analysis for the as-built EPDS to determine voltage drops will be performed.	22.a) Analysis for the as-built EPDS exists and concludes that the analyzed operating voltage supplied at the terminals of the Class 1E equipment is within the equipment's voltage tolerance limits, as determined by their nameplate ratings.
	22.b) Testing of the as-built EPDS will be performed by operating connected Class 1E loads at the analyzed minimum voltage.	22.b) Connected Class 1E loads operate at the analyzed minimum voltage determined by the voltage drop analysis.

TABLE 2.6.1-1 (Continued)

AC ELECTRICAL POWER DISTRIBUTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
23. Class 1E equipment is protected from degraded voltage conditions.	23.a) Analysis for the as-built EPDS to determine the trip conditions for degraded voltage conditions will be performed.	23.a) Analysis for the as-built EPDS exists and concludes that the Class 1E preferred offsite power feeder breakers to the Class 1E medium voltage switchgear will trip before Class 1E loads experience degraded voltage conditions exceeding those voltage conditions for which the Class 1E equipment is qualified.
	23.b) Testing for each as-built Class 1E medium voltage switchgear will be conducted by providing a simulated degraded voltage signal.	23.b) As-built Class 1E feeder breakers from preferred offsite power to the Class 1E medium voltage switchgear trip when a degraded voltage conditions exists.
24. An electrical grounding system is provided for (1) instrumentation, control, and computer systems, (2) electrical equipment (switchgear, transformers, distribution panels, and motors), and (3) mechanical equipment (fuel and chemical tanks). Lightning protection systems are provided for major plant structures, transformers and equipment located outside buildings. Each grounding system and lightning protection system is separately grounded to the plant ground grid.	24. Inspection of the plant grounding and lightning protection systems will be performed.	24. The as-built EPDS instrumentation, control, and computer grounding system, electrical equipment and mechanical equipment grounding system, and lightning protection systems provided for buildings and for structures and transformers located outside of the buildings, are separately grounded to the plant ground grid.

TABLE 2.6.1-1 (Continued)

AC ELECTRICAL POWER DISTRIBUTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
25. There are no automatic connections between Class 1E Divisions.	25. Inspection of the as-built Class 1E Divisions will be conducted.	25. There are no automatic connections between Class 1E Divisions.
26.a) The EPDS displays identified in the Design Description (Section 2.6.1) exist in the MCR or can be retrieved there.	26.a) Inspection for the existence or retrievability in the MCR of instrumentation displays will be conducted.	26.a) Displays of the instrumentation identified in the Design Description (Section 2.6.1) exist in the MCR or can be retrieved there.
26.b) Controls exist in the MCR to operate the EPDS, specifically to open and close the main turbine generator breaker, the 4.16kv supply and crossover breakers for the Class 1E buses, and the diesel generator output breakers.	26.b) Testing will be performed using the EPDS controls in the MCR.	26.b) EPDS controls in the MCR operate to open and close the main turbine generator breaker, the 4.16kv supply and crossover breakers for the Class 1E buses, and the diesel generator output breakers.

2.6.2 EMERGENCY DIESEL GENERATOR SYSTEM

DESIGN DESCRIPTION

The Emergency Diesel Generator (EDG) System is a safety-related system which has two diesel generators and their respective fuel oil, lube oil, engine cooling, starting air, and air intake and exhaust support systems. One EDG is connectable to the two Class 1E buses of an Electrical Power Distribution System (EPDS) Class 1E Division and the other EDG is connectable to the two Class 1E buses of the other EPDS Class 1E Division.

Each EDG and its support systems are physically separated from the other EDG and its support systems, and are located in physically separate areas of the Nuclear Island Structures. Portions of the EDG support systems which perform the safety function of starting and operating the EDG are classified ASME Code Class 3. The EDG generators are classified Class 1E. Class 1E equipment is classified Seismic Category I. The EDG engine and ASME Code Class 3 portions of its respective support systems are classified Seismic Category I.

The diesel fuel storage tanks for each of the two EDGs are located in physically separate diesel fuel storage structures. The underground fuel oil piping from each diesel fuel storage structure to its respective EDG day tank is classified Seismic Category I. Divisional separation is established by pipe routing and use of the Divisional wall.

The EDGs are sized to supply their load demands following a design basis accident which requires use of emergency power.

Each EDG has fuel storage capacity to provide fuel to its EDG for a period of no less than 7 days with the EDG supplying the power requirements for the most limiting design basis accident.

The starting air system receiver tanks of each EDG have a combined air capacity for 5 starts of the EDG without replenishing air to the receiver tanks.

The EDG combustion air intakes are separated from the EDG exhaust ducts.

Electrical independence is provided between Class 1E Divisions and between the Class 1E Divisions and non-Class 1E equipment.

A loss of power to a Class 1E bus initiates an automatic start of the respective EDG, load shedding of both Class 1E buses within the affected Division, and automatic connection to the Class 1E buses in the affected Division. Following attainment of required voltage and frequency, the EDG automatically connects to its respective

Divisional buses. After the EDG connects to its respective buses, the non-accident loads are automatically sequenced onto the buses.

Each EDG receives an automatic start signal in response to a safety injection actuation signal (SIAS), a containment spray actuation signal (CSAS), or an emergency feedwater actuation signal (EFAS). An EDG does not automatically connect to its Divisional Class 1E buses, if the Divisional Class 1E buses are energized.

For a loss-of-power to a Class 1E medium voltage safety bus condition concurrent with a Design Basis Accident condition (SIAS/CSAS/EFAS), each EDG automatically starts and load shedding of both Class 1E buses within the affected Division occurs. Following attainment of required voltage and frequency, the EDG automatically connects to its respective buses, and loads are sequenced onto the buses.

When operating in a test mode, an EDG is capable of responding to an automatic start signal.

Displays of EDG voltage, amperage, frequency, watts, and vars instrumentation exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to manually start and stop each EDG and to synchronize each EDG to its respective Class 1E buses. Controls exist at each EDG local control panel to manually start and stop its respective EDG.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.6.2-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Emergency Diesel Generator System.

TABLE 2.6.2-1

EMERGENCY DIESEL GENERATOR SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the EDG System is as described in the Design Description (Section 2.6.2).	1. Inspection of the as-built EDG System will be conducted.	1. The as-built EDG System conforms with the Basic Configuration as described in the Design Description (Section 2.6.2).
2. Each EDG and its support systems are physically separated from the other EDG and its support systems, and are located in physically separate areas of the nuclear island structures.	2. Inspection of the as-built EDGs and EDG support systems will be performed.	2. The two EDGs and their respective support systems are located on opposite sides of the nuclear island structures and are separated by the Divisional wall.
3. The ASME Code Section III components of the EDG's and their fuel oil, lube oil, engine cooling, starting air, and air intake and exhaust support systems retain their pressure boundary integrity under internal pressures that will be experienced during service.	3. A pressure test will be conducted on the EDG's and their fuel oil, lube oil, engine cooling, starting air, and air intake and exhaust support systems required to be pressure tested by ASME Code Section III.	3. The results of the pressure test of ASME Code Section III components of the EDG's and their fuel oil, lube oil, engine cooling, starting air, and air intake and exhaust support systems conform with the pressure testing acceptance criteria in ASME Code Section III.
4. The diesel fuel storage tanks for each of the two EDGs are located in physically separate diesel fuel storage structures.	4. Inspection of the as-built diesel fuel storage tank structures will be performed.	4. The diesel fuel storage tanks for one EDG are located in a different structure from the diesel fuel storage tanks for the other EDG.
5. The fuel oil piping from each diesel fuel storage structure to its respective EDG day tank is classified Seismic Category I. Divisional separation is established by pipe routing and use of the Divisional wall.	5. Inspection of the as-built piping from each diesel fuel storage structure to its respective EDG day tank will be performed.	5. The as-built fuel oil piping from each diesel fuel storage structure to its respective EDG day tank is classified Seismic Category I. Divisional separation is established by pipe routing and use of the Divisional wall.

TABLE 2.6.2-1 (Continued)

EMERGENCY DIESEL GENERATOR SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6. The EDGs are sized to supply their load demands following a design basis accident which requires use of emergency power.	6. Analysis to determine EDG load demand, based on the as-built EDG load profile, will be performed.	6. Analysis for the as-built EDGs exists and concludes that the EDGs' capacities exceed, as determined by their name-plate ratings, their load demand following a design basis accident which requires the use of emergency power.
7. Each EDG has fuel storage capacity to provide fuel to its EDG for a period of no less than 7 days with the EDG supplying the power requirements for the most limiting design basis accident.	7. Inspection and analysis will be performed to determine fuel storage capacities and EDG fuel consumption.	7. An analysis exists and concludes that each EDG has fuel storage capacity to operate the EDG for 7 days with the EDG supplying power during the most limiting design basis accident.
8. The starting air system receiver tanks of each EDG have a combined air capacity for 5 starts of the EDG without replenishing air to the receiver tanks.	8. Testing will be performed with the EDGs and their air start systems.	8. Each EDG can be started 5 times without replenishing air to the receiver tanks.
9. The EDG combustion air intakes are separated from the EDG exhaust ducts.	9. Inspection of the as-built EDG air intakes and air exhaust will be performed.	9. Each EDG's air intake and air exhaust is separated by distance and orientation. The air intakes and exhausts of the two EDGs are separated by the location of the EDGs on opposite sides of the nuclear island structures.

TABLE 2.6.2-1 (Continued)

EMERGENCY DIESEL GENERATOR SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10.a) Electrical independence is provided between Class 1E Divisions and between the Class 1E Divisions and non-Class 1E equipment.	10.a) Testing will be performed on each EDG and support systems by providing a test signal in only one Class 1E Division at a time.	10.a) A test signal exists only in the EDG and support systems Division under test.
	10.b) Inspection of the as-installed Class 1E Divisions of the EDG System will be performed.	10.b) Physical separation exists between Class 1E Divisions of the EDG system. Separation exists between Class 1E Divisions and non-Class 1E equipment in the EDG system.
11. A loss-of-power to a Class 1E medium voltage safety bus automatically starts its respective EDG and load sheds both Class 1E buses within the affected Division. Following attainment of required voltage and frequency, the EDG automatically connects to its respective Divisional buses. After the EDG connects to its respective buses, the non-accident loads are automatically sequenced onto the buses.	11. Testing for the actuation and connection of each EDG will be performed using a signal that simulates a loss-of-power.	11. As-built EDGs automatically start on receiving a LOOP signal and attain a voltage and frequency in ≤ 20 seconds which will assure an operating voltage and frequency at the terminals of the Class 1E equipment that is within the equipment's tolerance limits, automatically connect to their respective Divisional buses, and sequence their non-accident loads onto their Divisional buses.

TABLE 2.6.2-1 (Continued)

EMERGENCY DIESEL GENERATOR SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
12. Each EDG receives an automatic start signal in response to a safety injection actuation signal (SIAS), a containment spray actuation signal (CSAS), or an emergency feedwater actuation signal (EFAS). An EDG does not automatically connect to its Divisional buses, if the Divisional Class 1E buses are energized.	12. Testing for the actuation of each EDG will be performed using signals that simulate a SIAS, a CSAS, and a EFAS.	12. Each EDG receives a start signal in response to each of the following simulated signals; a SIAS, a CSAS, and a EFAS, but does not automatically connect to its Divisional buses if the Divisional buses are energized.
13. For a loss-of-power to a Class 1E medium voltage safety bus condition concurrent with a Design Basis Accident condition (SIAS/CSAS/EFAS), each EDG automatically starts and load shedding of both Class 1E buses within the affected Division occurs. Following attainment of required voltage and frequency, the EDG automatically connects to its respective buses and loads are sequenced onto the buses.	13. Testing on the as-built EDG Systems will be performed by providing simulated SIAS/CSAS/EFAS and loss-of-power signals.	13. In the as-built EDG Systems, when SIAS/CSAS/EFAS and loss-of-power signals exist, the EDG automatically starts, attains rated voltage and frequency and is connected to its Divisional buses within 20 seconds. Following connection, the automatic load sequence begins. Upon application of each load, the voltage on these buses does not drop more than 20% measured at the buses. Frequency is restored to within 2% of nominal, and voltage is restored to within 10% of nominal within 60% of each load sequence time interval. The SI, CS, and EFW loads are sequenced onto the buses in ≤ 40 seconds total time from initiating SIAS/CSAS/EFAS.

TABLE 2.6.2-1 (Continued)

EMERGENCY DIESEL GENERATOR SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
14. When operating in a test mode, an EDG is capable of responding to an automatic start signal.	14. Testing will be performed with each EDG in a test mode configuration. An automatic start signal will be simulated.	14. When operating in a test mode, each EDG resets to its automatic control mode upon receipt of a simulated automatic start signal.
15.a) The EDG System displays identified in the Design Description (Section 2.6.2) exist in the MCR or can be retrieved there.	15.a) Inspection for the existence or retrievability in the MCR of instrumentation displays will be conducted.	15.a) Displays of the instrumentation identified in the Design Description (Section 2.6.2) exist in the MCR or can be retrieved there.
15.b) Controls exist in the MCR to start and stop each EDG and to synchronize each EDG to its respective Class 1E buses. Controls exist at each EDG local control panel to manually start and stop its respective EDG.	15.b) Testing will be performed using the EDG controls in the MCR and EDG local control panels.	15.b) EDG controls in the MCR operate to start and stop each EDG and to synchronize each EDG to its respective Class 1E buses. EDG controls at each EDG local control panel operate to start and stop its respective EDG. After starting, the EDG remains in a standby mode, unless a LOOP signal exists.

2.6.3 AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM

DESIGN DESCRIPTION

The AC Instrumentation and Control (I&C) Power System and DC Power System consist of Class 1E and non-Class 1E power systems. The non-Class 1E AC I&C Power System and DC Power System have non-Class 1E batteries, inverters, electrical distribution panels, and battery chargers. The non-Class 1E AC I&C Power System and DC Power System provide power to non-Class 1E equipment.

The Class 1E AC Instrumentation and Control (I&C) Power System (also referred to as the Vital AC I&C Power System) and the Class 1E DC Power System (also referred to as the Vital DC Power System) consist of Class 1E uninterruptible power supplies, their respective alternating current (AC) and direct current (DC) distribution centers, along with power, instrumentation and control cables to the distribution system loads. The Class 1E AC I&C Power System and the Class 1E DC Power System include the protection equipment provided to protect the AC and DC distribution equipment.

The containment equipment hatch trolley, the reactor cavity flood valves, the holdup volume flood valves, and the hydrogen ignitors are the only electrical loads classified as non-Class 1E which are directly connectable to the Class 1E buses.

Class 1E equipment is classified as Seismic Category I.

The Basic Configuration of the Class 1E AC Instrumentation and Control Power System and Class 1E DC Power System is as shown on Figures 2.6.3-1 and 2.6.3-2.

<u>Class 1E AC Instrumentation and Control Power System</u>

The Class 1E AC I&C Power System consists of two Division (Division I and II) and four Channel (A, B, C, D) uninterruptible power supplies, with their respective distribution panels.

Each Class 1E AC I&C power supply is a constant voltage constant frequency inverter power supply unit, which in normal operating mode receives Class 1E direct current (DC) power from its respective Class 1E DC distribution center. Each Class 1E inverter power supply unit also has capability to transfer from its respective Class 1E DC distribution center to an alternate source of alternating current (AC) power to directly supply the Class 1E AC I&C Power System loads while maintaining continuity of power during transfer from the inverter power supply unit to the alternate power supply. This alternate power source is a voltage regulating device which is supplied power from the same AC power source as the battery charger associated with the Class 1E DC distribution center servicing the inverter power supply unit.

Each Class 1E inverter power supply unit is sized to provide power to its respective distribution center loads.

Class 1E inverter power supply units and their respective distribution centers are identified according to their Class 1E Division/Channel and are located in Seismic Category I structures and in their respective Division/Channel areas.

Independence is provided between Class 1E Divisions. Independence is provided between Class 1E Channels. Independence is provided between Class 1E Divisions/Channels and non-Class 1E equipment.

Class 1E AC I&C Power System distribution panels and their circuit breakers, disconnect switches, and fuses are sized to supply their load requirements. Distribution panels and disconnect switches are rated to withstand fault currents for the time required to clear the fault from its power source. Circuit breakers and fuses are rated to interrupt fault currents.

Class 1E AC I&C Power System interrupting devices (circuit breakers and fuses) are coordinated so that the circuit interrupter closest to the fault opens before other devices.

Class 1E AC I&C Power System cables are sized to supply their load requirements and are rated to withstand fault currents for the time required to clear the fault from its power source.

The Class 1E AC I&C Power System supplies an operating voltage at the terminals of the Class 1E equipment which is within the equipment's voltage tolerance limits.

Class 1E AC I&C Power System cables and raceways are identified according to their Class 1E Division/Channel. Class 1E cables are routed in Seismic Category I structures and in their respective Division or Channel raceways.

Class 1E equipment is classified as Seismic Category I.

Class 1E DC Power System

The Class 1E DC Power System consists of two Divisional (Division I and II) and four Channel (A, B, C, D) batteries (2 Channel batteries per Division) with their respective DC electrical distribution panels and battery chargers. The Class 1E DC distribution system provides DC power to Class 1E DC equipment and instrumentation and control circuits.

Each Class 1E battery is provided with a battery charger supplied alternating current (AC) from a MCC in the same Class 1E Division as the battery.

Each Class 1E battery is sized to supply its Design Basis Accident (DBA) loads, at the end-of-installed-life, for a minimum of 2 hours without recharging.

Each Class 1E battery charger is sized to supply its respective Class 1E Division/Channel steady-state loads while charging its respective Class 1E battery.

Manual interlocked transfer capability exists within a Division between Class 1E DC distribution centers.

The Class 1E batteries, battery chargers and respective MCCs, DC distribution panels, disconnect switches, circuit breakers, and fuses are sized to supply their load requirements. The Class 1E batteries, battery chargers and respective MCCs, DC distribution panels, and disconnect switches are rated to withstand fault currents for the time required to clear the fault from its power source.

Class 1E DC Power System circuit breakers and fuses are rated to interrupt fault currents.

Class 1E DC Power System electrical distribution system circuit interrupting devices (circuit breakers and fuses) are coordinated so that the circuit interrupter closest to the fault is designed to open before other devices.

Class 1E DC Power System electrical distribution system cables are sized to supply their load requirements and are rated to withstand fault currents for the time required to clear the fault from its power source.

The Class 1E DC Power System electrical distribution system supplies an operating voltage at the terminals of the Class 1E equipment which is within the equipment's voltage tolerance limits.

Each Class 1E battery is located in a Seismic Category I structure and in its respective Division/Channel battery room.

Class 1E DC Power System distribution panels and MCCs are identified according to their Class 1E Division/Channel.

Class 1E DC Power System cables are identified according to their Class 1E Division/Channel. Class 1E cables are routed in Seismic Category I structures and in their respective Division/Channel raceways.

Independence is provided between Class 1E Divisions. Independence is provided between Class 1E Channels. Independence is provided between Class 1E Divisions/Channels and non-Class 1E equipment.

The Class 1E DC Power System has the following alarms and displays in the main control room (MCR):

1) Alarms for battery ground detection.

2) Parameter displays for battery voltage and amperes.

3) Status indication for battery circuit breaker/disconnect position.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.6.3-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the AC Instrumentation and Control Power System and DC Power System.

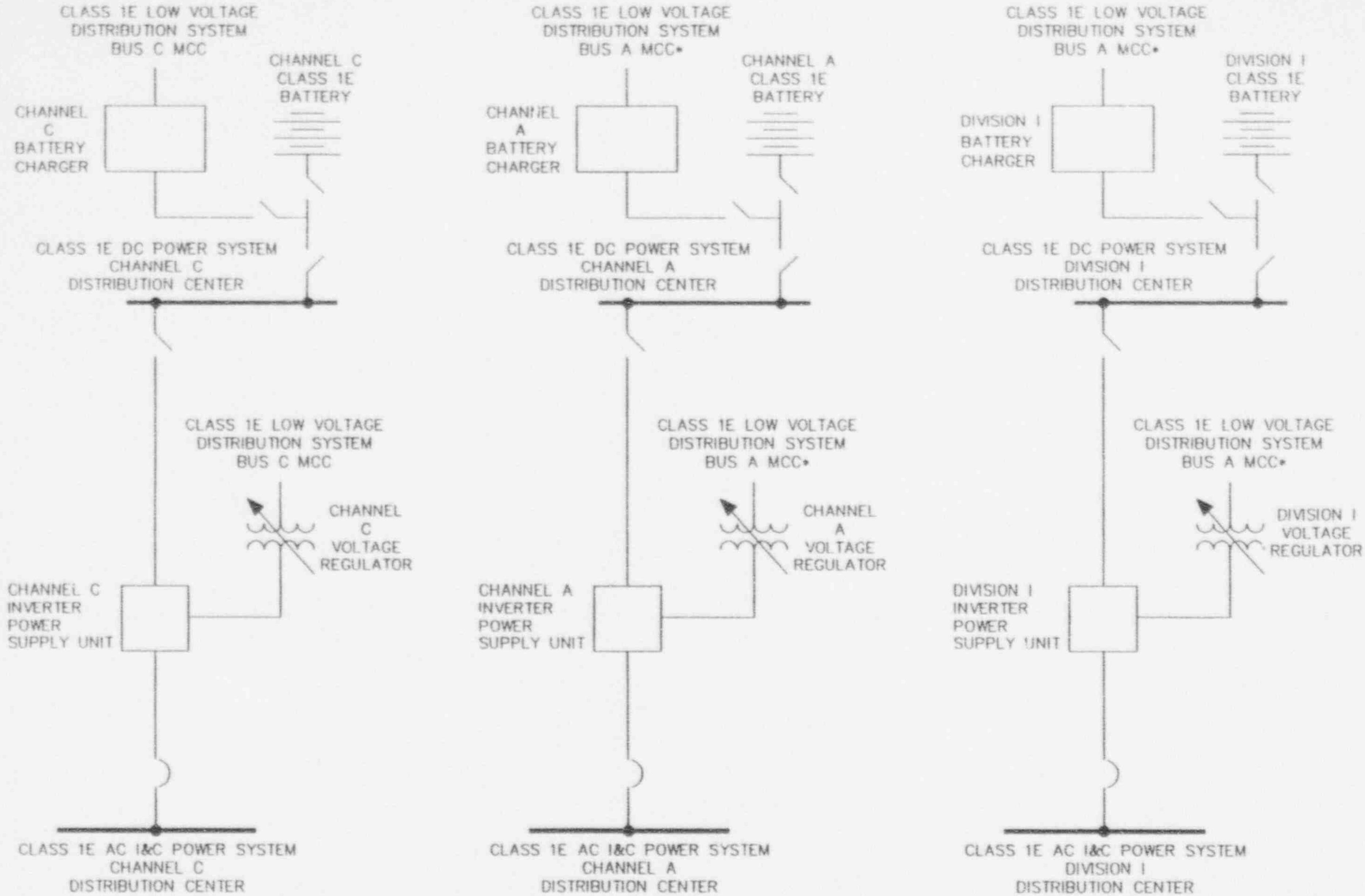

FIGURE 2.6.3-1

CLASS 1E AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND CLASS 1E DC POWER SYSTEM

* BUS A MCC SERVICING CHANNEL A IS DIFFERENT FROM THE BUS A MCC SERVICING DIVISION I

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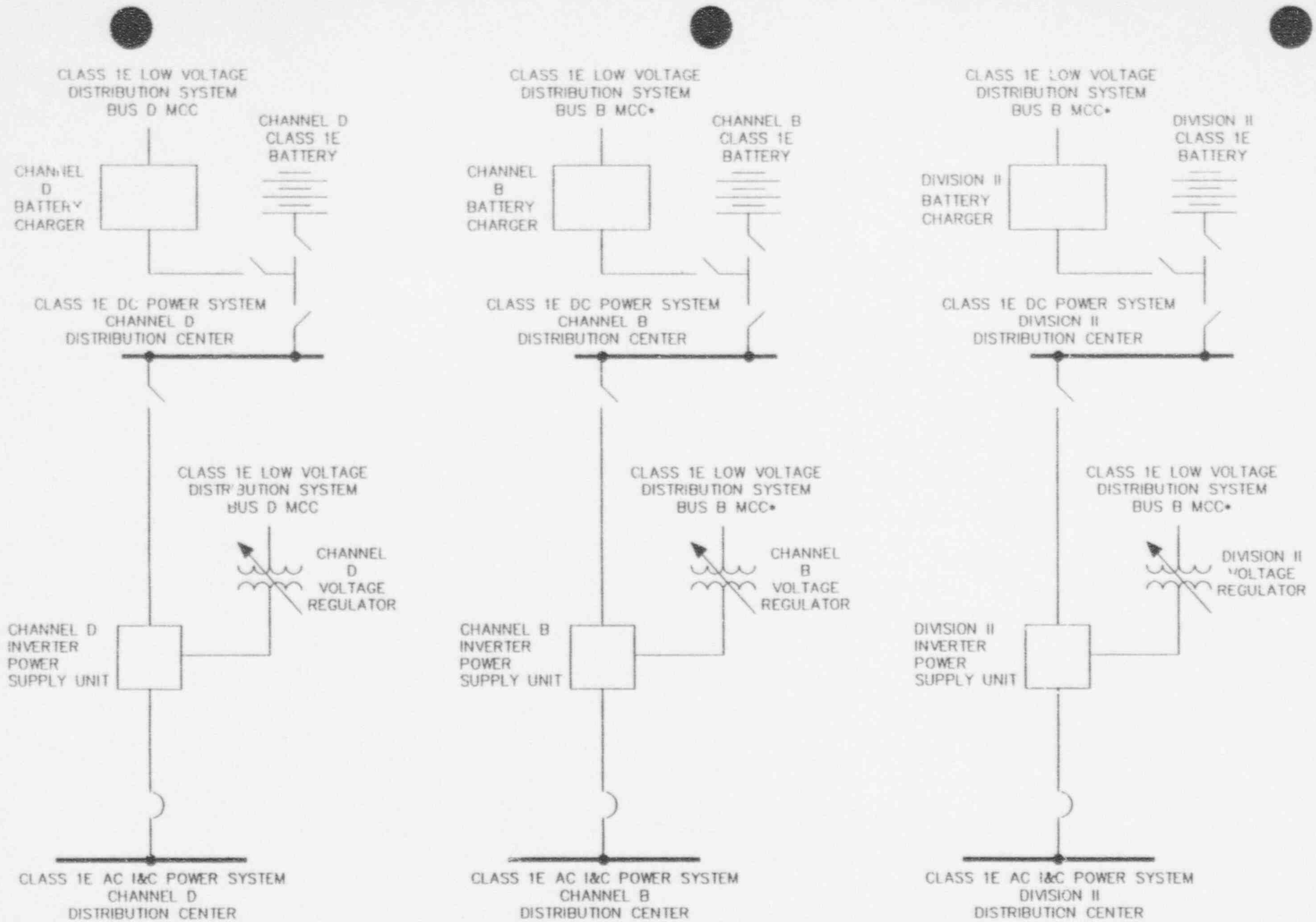


FIGURE 2.6.3-2

CLASS 1E AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND CLASS IE DC POWER SYSTEM

* BUS B MCC SERVICING CHANNEL B IS DIFFERENT FROM THE BUS B MCC SERVICING DIVISION II

06-17-94

TABLE 2.6.3-1

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the AC Instrumentation and Control Power System and the DC Power System is as described in the Design Description (Section 2.6.3).	1. Inspection of the as-built AC Instrumentation and Control Power System and the DC Power System configuration will be conducted.	1. The as-built AC Instrumentation and Control Power System and the as-built DC Power System conforms with the Basic Configuration as described in the Design Description (Section 2.6.3).
2. Each Class 1E constant voltage, constant frequency inverter power supply unit in normal operating mode receives Class 1E direct current (DC) power from its respective DC distribution center. Each Class 1E inverter power supply unit also has capability to transfer from its respective Class 1E DC distribution center normal power source to an alternate source of alternating current (AC) power to directly supply the Class 1E AC I&C Power System loads. This alternate power source is a voltage regulating device which is supplied power from the same AC power source as the battery charger associated with the Class 1E DC distribution center servicing the inverter power supply unit.	2. Inspection of the as-built Class 1E constant voltage, constant frequency inverter power supply unit will be conducted.	2. Each Class 1E constant voltage, constant frequency inverter power supply unit in normal operating mode receives Class 1E direct current (DC) power from its respective DC distribution center. Each Class 1E inverter power supply unit also has capability to transfer from its respective Class 1E DC distribution center normal power source to an alternate source of alternating current (AC) power to directly supply the Class 1E AC I&C Power System loads. This alternate power source is a voltage regulating device which is supplied power from the same AC power source as the battery charger associated with the Class 1E DC distribution center servicing the inverter power supply unit.

TABLE 2.6.3-1 (Continued)

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3. Automatic transfer between the normal and alternate power supplies for each Class 1E inverter power supply unit is provided and maintains continuity of power during transfer from the inverter power supply unit to the alternate power supply. Manual transfer between the normal and alternate power supplies for each Class 1E inverter power supply unit is also provided.	3. Testing on each as-built Class 1E inverter power supply unit will be conducted by providing a test signal in one power source at a time. A test of the manual transfer will also be conducted.	3. Each Class 1E inverter power supply unit automatically and manually transfers between its normal and alternate power sources and maintains continuity of power during transfer from the invert: to the alternate supply.
4. Each Class 1E inverter power supply unit is sized to provide power to its respective Class 1E distribution center loads.	4. Analyses for each as-built Class 1E inverter power supply unit to determine the power requirements of its loads will be performed.	4. Analyses for each as-built Class 1E inverter power supply unit exist and conclude that each inverter power supply unit's capacity, as determined by its nameplate rating, exceeds its analyzed load requirements.
5. Class 1E inverter power supply units and their respective distribution panels are identified according to their Class 1E Division/Channel and are located in Seismic Category I structures and in their respective Division/Channel areas.	5. Inspection of the as-built Class 1E inverter power supply units and their respective distribution panels will be conducted.	5. The as-built Class 1E inverter power supply units and their respective distribution panels are identified according to their Class 1E Division/Channel and are located in Seismic Category I structures and in their Division/Channel areas.

TABLE 2.6.3-1 (Continued)

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6. In the Class 1E AC I&C Power System, independence is provided between Class 1E Divisions. Independence is provided between Class 1E Channels. Independence is provided between Class 1E Divisions/Channels and non-Class 1E equipment.	6.a) Testing on the Class 1E AC I&C Power System will be conducted by providing a test signal in only one Class 1E Division/Channel at a time.	6.a) A test signal exists only in the Class 1E Division/Channel under test in the Class 1E AC I&C Power System.
	6.b) Inspection of the as-built Class 1E Divisions/Channels in the Class 1E AC Power System will be conducted.	6.b) In the Class 1E AC I&C Power System, physical separation or electrical isolation exists between the Class 1E Divisions/Channels. Physical separation or electrical isolation exists between these Class 1E Divisions/Channels and non-Class 1E equipment.
7. Class 1E AC I&C Power System distribution panels, disconnect switches, circuit breakers, and fuses are sized to supply their load requirements.	7. Analysis for the as-built Class 1E AC I&C Power System distribution panels, disconnect switches, circuit breakers, and fuses to determine their load requirements will be performed.	7. Analysis for the as-built Class 1E AC I&C Power System distribution panels, disconnect switches, circuit breakers, and fuses exists and concludes that the capacities of the distribution panels, disconnect switches, circuit breakers, and fuses exceed, as determined by their nameplate ratings, their analyzed load requirements.

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. Class 1E AC I&C Power System distribution panels and disconnect switches are rated to withstand fault currents for the time required to clear the fault from its power source.	8. Analysis for the as-built Class 1E AC I&C Power System to determine fault currents will be performed.	8. Analysis for the as-built Class 1E AC I&C Power System exists and concludes that the current capacities of the distribution panels and disconnect switches exceed their analyzed fault currents for the time required, as determined by the circuit interrupting device coordination analyses, to clear the fault from its power source.
9. Class 1E AC I&C Power System circuit breakers and fuses are rated to interrupt fault currents.	9. Analysis for the as-built Class 1E AC I&C Power System to determine fault currents will be performed.	9. Analysis for the as-built Class 1E AC I&C Power System exists and concludes that the analyzed fault currents do not exceed the distribution system circuit breakers and fuses interrupt capabilities, as determined by their nameplate ratings.
10. Class 1E AC I&C Power System interrupting devices (circuit breakers and fuses) are coordinated so that the circuit interrupter closest to the fault is designed to open before other devices.	10. Analysis for the as-built Class 1E AC I&C Power System to determine circuit interrupting device coordination will be performed.	10. Analysis for the as-built Class 1E AC I&C Power System circuit interrupting devices (circuit breakers and fuses) coordination exists and concludes that the analyzed circuit interrupter closest to the fault will open before other devices.

TABLE 2.6.3-1 (Continued)

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11. Class 1E AC I&C Power System cables are sized to supply their load requirements.	11. Analysis for the as-built Class 1E AC I&C Power System cables to determine their load requirements will be performed.	11. Analysis for the as-built Class 1E AC I&C Power System exists and concludes that the capacities of the distribution system cables exceed, as determined by their cable ratings, their analyzed load requirements.
12. Class 1E AC I&C Power System cables are rated to withstand currents for the time required to clear the fault from its power source.	12. Analysis for the as-built Class 1E AC I&C Power System to determine fault currents will be performed.	12. Analysis for the as-built Class 1E AC I&C Power System cables exists and concludes that the distribution system cable current capacities exceed their analyzed fault currents for the time required, as determined by the circuit interrupting device coordination analysis, to clear the fault from its power source.
13. The Class 1E AC I&C Power System supplies an operating voltage at the terminals of the Class 1E equipment which is within the equipment's voltage tolerance limits.	13. Analysis for the as-built Class 1E AC I&C Power System to determine voltage drops will be performed.	13. Analysis for the as-built Class 1E AC I&C Power System exists and concludes that the analyzed operating voltage supplied at the terminals of the Class 1E equipment is within the equipment's voltage tolerance limits, as determined by their nameplate ratings.

TABLE 2.6.3-1 (Continued)

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
14. Class 1E AC I&C Power System cables and raceways are identified according to their Class 1E Division/Channel. Class 1E cables are routed in Seismic Category I structures and in their respective Division or Channel raceways.	14. Inspection of the as-built Class 1E AC Power System cables and raceways will be conducted.	14. As-built Class 1E AC Power System cables and raceways are identified according to their Class 1E Division/Channel. Class 1E Divisional/Channel cables are routed in Seismic Category I structures and in their respective Division/Channel raceways.
15. Each Class 1E battery is provided with a normal battery charger supplied alternating current (AC) from a MCC in the same Class 1E Division as the battery.	15. Inspections of the as-built Class 1E DC Power System will be conducted.	15. Each Class 1E battery is provided with a battery charger supplied alternating current (AC) from a MCC in the same Class 1E Division as the battery.
16. Each Class 1E battery is sized to supply its Design Basis Accident (DBA) loads, at the end-of-installed-life, for a minimum of 2 hours without recharging.	16.a) Analysis for the as-built Class 1E batteries to determine battery capacities will be performed based on the DBA duty cycle for each battery.	16.a) Analysis for the as-built Class 1E batteries exists and concludes that each Class 1E battery has the capacity, as determined by the as-built battery rating, to supply its analyzed DBA loads, at the end-of-installed-life, for a minimum of 2 hours without recharging.
	16.b) Testing of each as-built Class 1E battery will be conducted by simulating loads which envelope the analyzed battery DBA duty cycle.	16.b) The capacity of each as-built Class 1E battery equals or exceeds the analyzed battery design duty cycle capacity.

TABLE 2.6.3-1 (Continued)

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
17. Each Class 1E battery charger is sized to supply its respective Class 1E Division's steady-state loads while charging its respective Class 1E battery.	17. Testing of each Class 1E battery charger will be conducted by supplying its respective Class 1E Division's normal steady-state loads while charging its respective Class 1E battery.	17. Each Class 1E battery charger can supply its respective Class 1E Division's/Channel's normal steady-state loads while charging its respective Class 1E battery.
18. Manual interlocked transfer capability exists within a Division between Class 1E DC distribution centers.	18. Testing of the as-built Class 1E DC distribution centers will be performed by attempting to close interlocked breakers.	18. The as-built Class 1E interlocks prevent paralleling of the Class 1E DC distribution centers within a Division.
19. The Class 1E DC Power System batteries, battery chargers, MCCs, DC distribution panels, disconnect switches, circuit breakers, and fuses are sized to supply their load requirements.	19. Analysis for the as-built Class 1E DC Power System electrical distribution system to determine the capacities of the battery, battery charger, MCCs, DC distribution panels, disconnect switches, circuit breakers, and fuses will be performed.	19. Analysis for the as-built Class 1E DC Power System exists and concludes that the capacities of the batteries, battery chargers, MCCs, DC distribution panels, disconnect switches, circuit breakers, and fuses, as determined by their nameplate ratings, exceed their analyzed load requirements.

TABLE 2.6.3-1 (Continued)

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
20.a) The Class 1E batteries, battery chargers, DC distribution panels, MCCs, and disconnect switches are rated to withstand fault currents for the time required to clear the fault from its power source.	20.a) Analysis for the as-built Class 1E DC Power System to determine fault currents will be performed.	20.a) Analysis for the as-built Class 1E DC Power System exists and concludes that the capacities of the as-built Class 1E batteries, battery chargers, DC distribution panels, MCCs, and disconnect switches current capacities exceed their analyzed fault currents for the time required, as determined by the circuit interrupting device coordination analyses, to clear the fault from its power source.
20.b) Class 1E DC Power System circuit breakers and fuses are rated to interrupt fault currents.	20.b) Analysis for the as-built Class 1E DC Power System to determine fault currents will be performed.	20.b) Analysis for the as-built Class 1E DC Power System exists and concludes that the analyzed fault currents do not exceed the circuit breaker and fuse interrupt capacities, as determined by their nameplate ratings.
21. Class 1E DC Power System circuit interrupting devices (circuit breakers and fuses) are coordinated so that the circuit interrupter closest to the fault is designed to open before other devices.	21. Analysis for the as-built Class 1E DC Power System to determine circuit interrupting device coordination will be performed.	21. Analysis for the as-built Class 1E DC Power System circuit interrupting devices (circuit breakers and fuses) exists and concludes that the analyzed circuit interrupter closest to the fault is designed to open before other devices.

TABLE 2.6.3-1 (Continued)

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
22. Class 1E DC Power System cables are sized to supply their load requirements.	22. Analysis for the as-built Class 1E DC Power System cables to determine their load requirements will be performed.	22. Analysis for the as-built Class 1E DC Power System cables exists and concludes that the Class 1E DC electrical distribution system cable capacities, as determined by cable ratings, exceed their analyzed load requirements.
23. Class 1E DC Power System cables are rated to withstand fault currents for the time required to clear the fault from its power source.	23. Analysis for the as-built Class 1E DC Power System to determine fault currents will be performed	23. Analysis for the as-built Class 1E DC Power System exists and concludes that the Class 1E DC electrical distribution system cables will withstand the analyzed fault currents for the time required, as determined by the circuit interrupting device coordination analysis, to clear the fault from its power source.
24. The Class 1E DC Power System supplies an operating voltage at the terminals of the Class 1E equipment which is within the equipment's voltage tolerance limits.	24.a) Analysis for the as-built Class 1E DC Power System to determine system voltage drops will be performed.	24.a) Analysis for the as-built Class 1E DC Power System exists and concludes that the analyzed operating voltage supplied at the terminals of the Class 1E equipment is within the equipment's voltage tolerance limits, as determined by their nameplate ratings.

TABLE 2.6.3-1 (Continued)

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM

Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
	24.b) Testing of the as-built Class 1E DC Power System will be conducted by operating connected Class 1E loads at less than or equal to minimum allowable voltage and at greater than or equal to the maximum battery charging voltage.	24.b) Connected as-built Class 1E loads operate at less than or equal to the minimum allowable battery voltage and at greater than or equal to the maximum charging voltage.
25. Each Class 1E battery is located in a Seismic Category I structure and in its respective Division/Channel battery room.	25. Inspection of the as-built Class 1E batteries will be conducted.	25. Each Class 1E battery is located in a Seismic Category I structure and in its respective Division/Channel battery room.
26. Class 1E DC Power System distribution panels and MCCs are identified according to their Class 1E Division/Channel.	26. Inspection of the as-built Class 1E DC distribution panels and MCCs will be conducted.	26. Class 1E DC Power System distribution panels and MCCs are identified according to their Class 1E Division/Channel.
27. Class 1E DC Power System cables are identified according to their Class 1E Division/Channel.	27. Inspection of the as-built Class 1E DC Power System cables will be conducted.	27. As-built Class 1E DC Power System cables are identified according to their Class 1E Division/Channel.
28. Class 1E Division/Channel cables are routed in Seismic Category I structures in their respective Division/Channel raceways.	28. Inspection of the as-built Class 1E DC Power System cables and raceways will be conducted.	28. Class 1E Division/Channel cables are routed in Seismic Category I structures in their respective Division/Channel raceways.

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
29. In the Class 1E DC Power System, independence is provided between Class 1E Divisions. Independence is provided between Class 1E Channels. Independence is provided between Class 1E Divisions/Channels and non-Class 1E equipment.	29.a) Testing will be conducted on the as-built Class 1E DC Power System by providing a test signal in only one Class 1E Division/Channel at a time.	29.a) A test signal exists in only the Class 1E Division/Channel under test in the Class 1E DC Power System.
	29.b) Inspection of the as-built Class 1E DC Power System will be conducted.	29.b) In the as-built Class 1E DC Power System, physical separation or electrical isolation exists between Class 1E Divisions/Channels. Physical separation or electrical isolation exists between these Class 1E Divisions/Channels and non-Class 1E equipment.
30. The Class 1E DC Power System displays identified in the Design Description (Section 2.6.3) exist in the MCR or can be retrieved there.	30. Inspection for the existence or retrievability in the MCR of instrumentation displays will be conducted.	30. Displays of the instrumentation identified in the Design Description (Section 2.6.3) exist in the MCR or can be retrieved there.

2.6.4 CONTAINMENT ELECTRICAL PENETRATION ASSEMBLIES

DESIGN DESCRIPTION

Containment Electrical Penetration Assemblies are provided for electrical cables passing through the primary containment.

Containment Electrical Penetration Assemblies are classified as Seismic Category I.

Class 1E Division Containment Electrical Penetration Assemblies only contain cables of one Class 1E Division, and Class 1E Channel Containment Electrical Penetration Assemblies only contain cables of one Class 1E Channel.

Independence is provided between Division Containment Electrical Penetrations Assemblies. Independence is provided between Channel Containment Electrical Penetration Assemblies. Independence is provided between Containment Electrical Penetration Assemblies containing Class 1E cables and Containment Electrical Penetration Assemblies containing non-Class 1E cables.

Containment Electrical Penetration Assemblies are protected against currents which are greater than their continuous ratings.

Containment Electrical Penetration Assemblies are equipment for which paragraph number (3) of the "Verification for Basic Configuration for Systems" of the General Provisions (Section 1.2) applies.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.6.4-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Containment Electrical Penetration Assemblies.

TABLE 2.6.4-1

CONTAINMENT ELECTRICAL PENETRATION ASSEMBLIES
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Containment Electrical Penetration Assemblies is as described in the Design Description (Section 2.6.4).	1. Inspection of the as-built Containment Electrical Penetration Assemblies will be conducted.	1. The as-built Containment Electrical Penetration Assemblies conforms with the Basic Configuration described in the Design Description (Section 2.6.4).
2. Class 1E Division Containment Electrical Penetration Assemblies only contain cables of one Class 1E Division, and Class 1E Channel Containment Electrical Penetration Assemblies only contain cables of one Class 1E Channel.	2. Inspection of the as-built Division and Channel Containment Electrical Penetration Assemblies will be conducted.	2. As-built Class 1E Divisional Containment Electrical Penetration Assemblies only contain cables of one Class 1E Division, and Class 1E Channel Containment Electrical Penetration Assemblies only contain cables of one Class 1E Channel.
3. Independence is provided between Division Containment Electrical Penetration Assemblies. Independence is provided between Channel Containment Electrical Penetration Assemblies. Independence is provided between Containment Electrical Penetration Assemblies containing Class 1E cables and Containment Electrical Penetration Assemblies containing non-Class 1E cables.	3. Inspection of the as-built Containment Electrical Penetration Assemblies will be conducted.	3. Physical separation exists between as-built Division Containment Electrical Penetration Assemblies. Physical separation exists between Channel Containment Electrical Penetration Assemblies. Physical separation exists between Containment Electrical Penetration Assemblies containing Class 1E cables and Containment Electrical Penetration Assemblies containing non-Class 1E cables.

TABLE 2.6.4-1 (Continued)

CONTAINMENT ELECTRICAL PENETRATION ASSEMBLIES
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. Containment Electrical Penetration Assemblies are protected against currents which are greater than their continous ratings.	4. Analysis for the as-built Containment Electrical Penetration Assemblies will be performed.	4. Analysis exists for the as-built Containment Electrical Penetration Assemblies and concludes either (1) that the maximum current of the circuits does not exceed the continuous rating of the Containment Electrical Penetration Assembly, or (2) that the circuits have redundant protection devices in series and that the redundant current protection devices are coordinated with the Containment Electrical Penetration Assembly's rated short circuit thermal capacity data and prevent current from exceeding the continuous current rating of the Containment Electrical Penetration Assembly.

2.6.5 ALTERNATE AC SOURCE

DESIGN DESCRIPTION

The Alternate AC Source (AAC) (i.e., combustion turbine) is a self-contained power generating unit with its own supporting auxiliary systems.

The AAC is classified as non-safety-related.

The AAC can supply power to the non-Class 1E permanent non-safety buses or to a Class 1E Division through its associated non-Class 1E permanent non-safety bus. The load capacity of the AAC is at least as large as the capacity of an emergency diesel generator (EDG). The AAC is located in its own structure.

The AAC has the following displays and controls in the main control room (MCR):

1) Parameter displays for the AAC output voltage, amperes, watts, and frequency.

2) Controls for manually starting the AAC.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.6.5-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Alternate AC Source.

TABLE 2.6.5-1

ALTERNATE AC SOURCE
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the AAC is as described in the Design Description (Section 2.6.5).	1. Inspection of the as-built AAC will be conducted.	1. The as-built AAC conforms with the Basic Configuration as described in the Design Description (Section 2.6.5).
2. The AAC can supply power to:	2. Testing on the as-built AAC will be conducted by connecting the AAC to:	2. The as-built AAC can supply power to:
a) the non-Class 1E permanent non-safety buses; or	a) the non-Class 1E permanent non-safety buses; and then	a) the non-Class 1E permanent non-safety buses; or
b) to a Class 1E Division through its associated non-Class 1E permanent non-safety bus.	b) to a Class 1E Division through its associated non-Class 1E permanent non-safety bus.	b) to a Class 1E Division through its associated non-Class 1E permanent non-safety bus.
3. The load capacity of the AAC is at least as large as the capacity of an EDG.	3. Inspection of the as-built AAC and EDGs will be conducted.	3. The as-built AAC load capacity is at least as large as the capacity of an EDG as determined by the AAC and EDG nameplate ratings.
4. The AAC displays and controls identified in the Design Description (Section 2.6.5) exist in the MCR or can be retrieved there.	4. Inspection for the existence or retrievability in the MCR of instrumentation displays and controls will be conducted.	4. Displays and controls identified in the Design Description (Section 2.6.5) exist in the MCR or can be retrieved there.

2.7.1 NEW FUEL STORAGE RACKS

Design Description

The New Fuel Storage Racks provide on-site storage for at least 121 new fuel assemblies. The New Fuel Storage Racks are safety-related.

The New Fuel Storage Racks are located in the nuclear island structures in the new fuel storage pit.

The New Fuel Storage Racks support and protect new fuel assemblies. The New Fuel Storage Racks maintain the effective neutron multiplication factor less than the required criticality limits during normal operation and design postulated accident conditions.

The New Fuel Storage Racks are anchored to embedments at the bottom of the storage cavity.

The New Fuel Storage Racks are designed and constructed in accordance with ASME Code Section III, Subsection NF, Class 3 Component Supports requirements.

The New Fuel Storage Racks are designed to accommodate design basis loads and load combinations including the effects of impact of fuel assemblies on the racks and the impact due to postulated fuel handling accidents without losing the structural capability to maintain the fuel in a non-critical configuration.

The New Fuel Storage Racks are classified Seismic Category I.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.1-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the New Fuel Storage Racks.

TABLE 2.7.1-1

NEW FUEL STORAGE RACKS
Inspection, Tests, Analyses and Acceptance Criteria

Design Commitment	Inspection, Test, Analyses	Acceptance Criteria
1. The Basic Configuration of the New Fuel Storage Racks is as described in the Design Description (Section 2.7.1).	1. Inspection of the as-built New Fuel Storage Racks configuration will be conducted.	1. For the New Fuel Storage Racks described in the Design Description (Section 2.7.1), the as-built New Fuel Storage Racks conform with the Basic Configuration.
2. The New Fuel Storage Racks maintain the effective neutron multiplication factor less than the required criticality limits during normal operation and design postulated accident conditions.	2. Analysis will be performed to calculate the effective neutron multiplication factor.	2. The calculated effective neutron multiplication factor for the New Fuel Storage Racks is less than 0.95 during normal operation and postulated accident conditions (less than 0.98 for immersion in a uniform density aqueous foam or mist of optimum moderation density).
3. The New Fuel Storage Racks are designed and constructed in accordance with ASME Code Section III Subsection NF, Class 3 Component Supports requirements and are classified Seismic Category I.	3. Inspection will be performed of the Fabrication Data Package, Certificate of Conformance and the Design Report Document.	3. The Fabrication Data Package, Certificate of Conformance and the Design Report Document exist, and conclude that the design requirements are met.

2.7.2 SPENT FUEL STORAGE RACKS

Design Description

The Spent Fuel Storage Racks provide on-site storage for at least 907 spent fuel assemblies. The Spent Fuel Storage Racks are safety-related.

The Spent Fuel Storage Racks are located in the nuclear island structures in the spent fuel pool.

The Spent Fuel Storage Racks are free standing structures that support and protect spent fuel assemblies. The Spent Fuel Storage Racks maintain the effective neutron multiplication factor less than the required criticality limits during normal operation and postulated accident conditions.

The Spent Fuel Storage Racks are designed and fabricated in accordance with ASME Code Section III, Subsection NF, Class 3 Component Supports requirements.

The Spent Fuel Storage Racks are designed to accommodate design basis loads and load combinations including the effects of impact of fuel assemblies on the racks and the impact due to postulated fuel handling accidents without losing the structural capability to maintain the fuel in a non-critical configuration.

The Spent Fuel Racks and support system are classified Seismic Category I.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.2-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Spent Fuel Storage Racks.

TABLE 2.7.2-1

SPENT FUEL STORAGE RACKS
Inspection, Tests, Analyses and Acceptance Criteria

Design Commitment	Inspection, Test, Analyses	Acceptance Criteria
1. The Basic Configuration of the Spent Fuel Storage Racks is as described in the Design Description (Section 2.7.2).	1. Inspection of the as-built Spent Fuel Storage Racks configuration will be conducted.	1. For the Spent Fuel Storage Racks described in the Design Description (Section 2.7.2) the as-built Spent Fuel Storage Racks conform with the Basic Configuration.
2. The Spent Fuel Storage Racks maintain the effective neutron multiplication factor less than the required criticality limits during normal operation and postulated accident conditions.	2. Analysis will be performed to calculate the effective neutron multiplication factor.	2. The calculated effective neutron multiplication factor is less than 0.95 during normal operation and postulated accident conditions.
3. The Spent Fuel Storage Racks are designed and fabricated in accordance with the ASME Code Section III, Subsection NF, Class 3 Component Supports requirements and are classified Seismic Category I.	3. Inspection will be performed of the Fabrication Data Package, Certificate of Conformance and Design Report Document.	3. The Fabrication Data Package, Certificate of Conformance and the approved Design Report Document exist and conclude that the design requirements are met.

2.7.3 POOL COOLING AND PURIFICATION SYSTEM

Design Description

The Pool Cooling and Purification System (PCPS) consists of a spent fuel pool cooling system (SFPCS) and a pool purification system. The SFPCS removes heat generated by the stored spent fuel assemblies in the spent fuel pool water. The pool purification system pumps spent fuel pool water, refueling pool water, and fuel transfer canal water through filters and ion exchangers.

The Basic Configuration of the PCPS is as shown on Figure 2.7.3-1. The SFPCS is safety-related and the pool purification system is non-safety-related.

The PCPS is located in the reactor building and nuclear annex.

The SFPCS has two Divisions, each with a spent fuel pool (SFP) pump, a SFP heat exchanger, and associated valves, piping, controls, and instrumentation. A cross-connect line with isolation valves between the SFP pump discharge lines is provided to allow either pump to be used with either heat exchanger.

Each SFPCS Division has the heat removal capacity to prevent boiling in the spent fuel pool with a full core offload of fuel assemblies and a ten year inventory of stored irradiated fuel. Heat from the spent fuel pool is transferred to the component cooling water system (CCWS) in the spent fuel pool cooling heat exchangers.

The PCPS includes provisions to prevent gravity and siphonic draining of the spent fuel pool and refueling pool.

The ASME Code Section III Class for the PCPS pressure retaining components shown on Figure 2.7.3-1 is as depicted on the figure.

Safety-related equipment shown on Figure 2.7.3-1 is classified Seismic Category I.

Displays of the PCPS instrumentation shown on Figure 2.7.3-1 are available as noted on the Figure.

Controls exist in the main control room (MCR) to start and stop the spent fuel pool cooling pumps.

PCPS alarms shown on Figure 2.7.3-1 are provided as shown on the Figure.

Water is supplied to each SFPCS pump at a pressure greater than the pump's required net positive suction head (NPSH).

The Class 1E loads shown on Figure 2.7.3-1 are powered from their respective Class 1E Division.

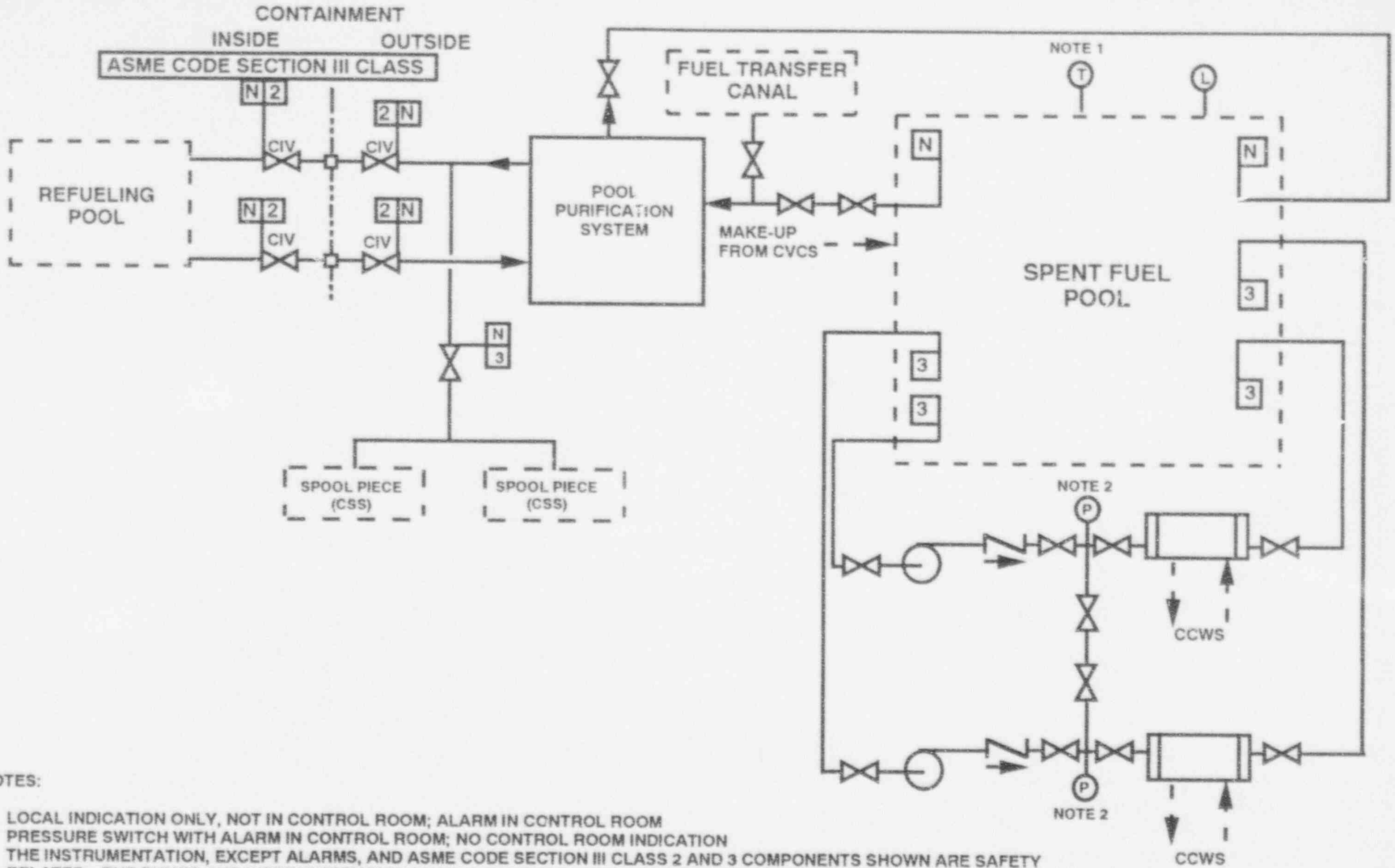
Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the PCPS.

The two mechanical Divisions of the SFPCS are physically separated except for the cross-connect line between SFPCS pump discharge lines.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.3-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Pool Cooling and Purification System.

SYSTEM 80+™



NOTES:

1. LOCAL INDICATION ONLY, NOT IN CONTROL ROOM; ALARM IN CONTROL ROOM
2. PRESSURE SWITCH WITH ALARM IN CONTROL ROOM; NO CONTROL ROOM INDICATION
3. THE INSTRUMENTATION, EXCEPT ALARMS, AND ASME CODE SECTION III CLASS 2 AND 3 COMPONENTS SHOWN ARE SAFETY RELATED. THE PUMPS AND INSTRUMENTATION SHOWN, EXCEPT ALARMS, ARE POWERED FROM THEIR RESPECTIVE CLASS 1E DIVISION.

FIGURE 2.7.3 -1
POOL COOLING AND PURIFICATION SYSTEM

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TABLE 2.7.3-1

POOL COOLING AND PURIFICATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the PCPS is as shown on Figure 2.7.3-1.	1. Inspection of the as-built PCPS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.3-1, the as-built PCPS conforms with the Basic Configuration.
2. Each SFPCS Division has the heat removal capacity to prevent boiling in the spent fuel pool with a full core offload of fuel assemblies and a ten year inventory of stored irradiated fuel.	2. Testing to measure SFPCS pump flow in each Division will be performed. Inspection and analysis to determine the heat removal capability of each SFPCS Division will be performed based on test data and as-built data.	2. Each SFPCS Division will remove at least 67.25 million btu/hr from the spent fuel pool, with the spent fuel pool at 180°F and component cooling water supplied at 5000 gpm and 105°F.
3. The PCPS includes provisions to prevent gravity and siphonic draining of the spent fuel pool and the refueling pool.	3. Inspection of the PCPS suction and return line connections to the refueling pool and spent fuel pool will be performed.	3. Spent fuel pool cooling suction connections are located at least 10 feet above the top of the spent fuel. Anti-siphon devices are provided in the lines for spent fuel pool cooling return, spent fuel pool purification suction and return, and refueling pool suction and return.
4. The ASME Code Section III PCPS components shown on Figure 2.7.3-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	4. A pressure test will be conducted on those components of the PCPS required to be pressure tested by the ASME Code Section III.	4. The results of the pressure test of ASME Code Section III components of the PCPS conform with the pressure testing acceptance criteria in ASME Code Section III.

TABLE 2.7.3-1 (Continued)

POOL COOLING AND PURIFICATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5.a) Displays of the PCPS instrumentation shown on Figure 2.7.3-1 are available as noted on the figure.	5.a) Inspection for the existence or retrieveability of instrumentation displays will be performed.	5.a) Displays of the instrumentation shown on Figure 2.7.3-1 are available as noted on the figure.
5.b) Controls exist in the MCR to start and stop the spent fuel pool cooling SFP pumps.	5.b) Testing will be performed using the PCPS controls in the MCR.	5.b) PCPS controls in the MCR operate to start and stop the SFP pumps.
5.c) PCPS alarms shown on Figure 2.7.3-1 are provided as shown on the figure.	5.c) Testing of the PCPS alarms shown on Figure 2.7.3-1 will be performed using signals simulating alarm conditions.	5.c) The PCPS alarms shown on Figure 2.7.3-1 actuate in response to signals simulating alarm conditions.
6. Water is supplied to each SFP cooling pump at a pressure greater than the pump's required net positive suction head (NPSH).	6. Testing to measure SFP pump suction pressure will be performed. Inspection and analysis to determine NPSH available to each SFP pump will be performed based on test data and as-built data.	6. The available NPSH exceeds each SFP pump's required NPSH.
7.a) The Class 1E loads shown on Figure 2.7.3-1 are powered from their respective Class 1E Division.	7.a) Testing will be performed on the SFPCS system by providing a test signal in only one Class 1E Division at a time.	7.a) Within the SFPCS, a test signal exists only at the equipment powered from the Class 1E Division under test.
7.b) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the PCPS.	7.b) Inspection of the as-installed Class 1E Divisions in the PCPS will be performed.	7.b) Physical separation exists between Class 1E Divisions in the PCPS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the PCPS.

TABLE 2.7.3-1 (Continued)

POOL COOLING AND PURIFICATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. The two mechanical Divisions of the SFPCS are physically separated except for the cross-connect line between SFP pump discharge lines.	8. Inspections of as-built mechanical Divisions will be performed.	8. The two mechanical Divisions of the SFPCS are separated by a wall, or by a fire barrier, or by spatial separation in the spent fuel pool, except for the cross-connect line between SFP pump discharge lines.

2.7.4 FUEL HANDLING SYSTEM

Design Description

The Fuel Handling System (FHS) is a non-safety system of equipment and tools that handles and moves fuel assemblies and control element assemblies (CEAs), and also provides storage for them during fuel transfer operations. The FHS load handling devices are designed to reduce the potential for damage to a fuel assembly.

The FHS has a refueling machine (RM), a spent fuel handling machine (SFHM), a CEA change platform (CEACP), a fuel transfer system (FTS), a CEA elevator (CEAE), a new fuel elevator (NFE), and a fuel building overhead crane (FBOC). The reactor building polar crane is used to remove and replace the reactor vessel head and reactor vessel internals during refueling. The RM, CEACP, CEAE and reactor building polar crane are located in the reactor building. The SFHM, NFE and FBOC are located in the nuclear annex. The fuel transfer tube is located in both the reactor building and the nuclear annex.

The RM, SFHM, and CEACP hoists are each provided with load-measuring devices and are interlocked to interrupt hoisting if their individual loads exceed an overload limit and to interrupt lowering if their individual loads decrease below an underload limit.

The RM, SFHM, CEACP hoists, and reactor building polar crane are interlocked to limit upward hoist travel. They are also provided with positive mechanical stops to limit upward movement of the hoists.

In the event of a safe shutdown earthquake or of loss of electrical power to the RM or SFHM, the RM or SFHM will not drop a fuel assembly held by its hoist. The RM and SFHM each have manual drive mechanisms to allow hoist operation and machine translation without electrical power.

The new fuel handling hoist is interlocked to prevent moving new fuel over the spent fuel racks.

The cask handling hoist is interlocked and equipped with mechanical stops to prevent moving a cask over either the new or spent fuel racks.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.4-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Fuel Handling System.

TABLE 2.7.4-1

FUEL HANDLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the RM, SFHM, CEACP, FTS, CEAE, NFE, and FBOC is as described in the Design Description (Section 2.7.4).	1. Inspection of the as-built system will be conducted.	1. For the RM, SFHM, CEACP, FTS, CEAE, NFE, and FBOC described in the Design Description (Section 2.7.1), the as-built equipment conforms with the basic configuration.
2.a) The RM, SFHM, and CEACP hoists are provided with load-measuring devices and are interlocked to interrupt hoisting if load limits are reached.	2.a) Testing of the RM, SFHM, and CEACP hoists will be performed to evaluate equipment response to simulated loads.	2.a) The RM, SFHM, and CEACP hoist load measuring devices and interlocks interrupt hoisting when simulated load limits are reached.
2.b) The RM, SFHM, and CEACP hoists are provided with load-measuring devices and interlocks to interrupt lowering if load limits are reached.	2.b) Testing of the RM, SFHM, and CEACP hoists will be performed to evaluate equipment response to simulated loads.	2.a) The RM, SFHM, and CEACP hoist load measuring devices and interlocks interrupt lowering when simulated load limits are reached.
3. The RM, SFHM, CEACP, and reactor building polar crane hoists, are each interlocked to limit upward hoist travel.	3. Testing of the RM, SFHM, CEACP, and reactor building polar crane hoists will be performed to confirm interlock function to limit upward hoist travel.	3. The RM, SFHM, CEACP hoist, and reactor building polar crane are interlocked to limit upward hoist travel.
4. The RM, SFHM, and CEACP hoists are each provided with mechanical stops to limit upward hoist travel.	4. Testing of the RM, SFHM, and CEACP hoists will be performed to confirm the functioning of mechanical stops to limit upward hoist travel.	4. The RM, SFHM, and CEACP hoist mechanical stops limit upward hoist travel.

TABLE 2.7.4-1 (Continued)

FUEL HANDLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. In the event of loss of electrical power to the RM or SFHM, the RM or SFHM will not drop a full assembly held by its hoist.	5. Testing of the RM and SFHM will be performed by removing electrical power from the loaded equipment.	5. The grapple does not open upon loss of electrical power.
6. The RM and SFHM each have manual drive mechanisms to allow hoist operation and machine translation without electrical power.	6. Testing of the RM and SFHM hoists will be performed manually without electrical power.	6. The hoists operate and the machines move manually.
7. The new fuel handling hoist is interlocked to prevent moving new fuel over the spent fuel racks.	7. Testing of the new fuel handling hoist will be performed to confirm interlock functioning.	7. The new fuel handling hoist is interlocked to prevent moving new fuel over spent fuel racks.
8. The cask handling hoist is interlocked to prevent moving a cask over either the new or spent fuel racks.	8. Testing of the cask handling hoist will be performed to confirm interlock functioning.	8. The cask handling hoist is interlocked to prevent moving a cask over either the new or spent fuel racks.

2.7.5 STATION SERVICE WATER SYSTEM

Design Description

The Station Service Water System (SSWS), in conjunction with the ultimate heat sink (UHS), provides cooling water to remove heat from the component cooling water system (CCWS).

The Basic Configuration of the SSWS is as shown on Figure 2.7.5-1. The SSWS is a safety-related system as noted on the Figure.

The SSWS consists of two Divisions. Each SSWS Division receives heat from its corresponding CCWS Division through the component cooling water heat exchangers.

Each Division of the SSWS has two station service water pumps, two station service water strainers, piping, valves, controls, and instrumentation.

The SSWS pumps and strainers are located in the SSWS pump structure(s). Interconnecting piping runs between the SSWS pump structure(s) and the component cooling water heat exchanger structure.

The SSWS has the capacity to remove heat from the CCWS during operation, shutdown, refueling, and design basis accident conditions. Each Division has the heat dissipation capacity to achieve and maintain cold shutdown.

The ASME Code Section III Class for the SSWS pressure retaining components shown on Figure 2.7.5-1 is as depicted on the Figure.

The safety-related equipment shown on Figure 2.7.5-1 is classified Seismic Category I.

The Class 1E loads shown on Figure 2.7.5-1 are powered from their respective Class 1E Division.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the SSWS.

The two mechanical Divisions of the SSWS are physically separated.

Displays of the SSWS instrumentation shown on Figure 2.7.5-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to start and stop the station service water pumps, and to open and close those power operated valves shown on Figure 2.7.5-1.

Check valves shown on Figure 2.7.5-1 will open, or will close, or will open and also close, under system pressure, fluid flow conditions, or temperature conditions.

Interface Requirements

The Ultimate Heat Sink (UHS) transfers heat from the SSWS to the environment during operation, shutdown, refueling, and design basis accident conditions. The Ultimate Heat Sink is capable of dissipating a heat load of at least 134.3 million BTU/hr during the initial phase of a design basis accident. The UHS is sized so that makeup water is not required for at least 30 days following a design basis accident. During this period of 30 days, the design basis temperatures of safety-related equipment are not exceeded.

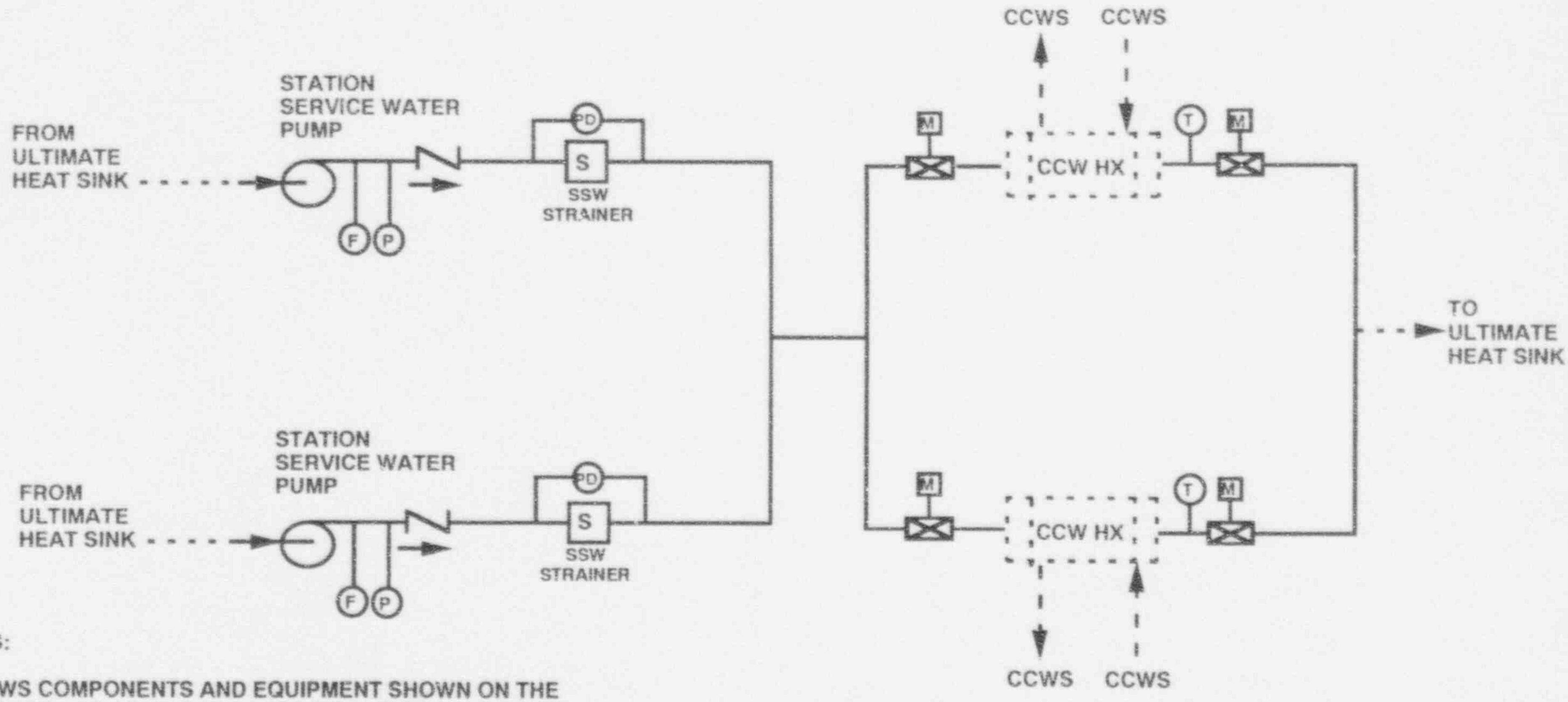
Water is supplied to each SSWS pump at a net positive suction head (NPSH) greater than the pump's required NPSH.

The Station Service Water Pump Structure is classified Seismic Category I and provides a physical barrier and fire barrier to maintain separation of SSWS mechanical Divisions.

The SSWS pump structure ventilation system is classified Seismic Category I, and its mechanical Divisions are separated by physical barriers.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.5-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Station Servic Water System.



NOTES:

A. SSWS COMPONENTS AND EQUIPMENT SHOWN ON THE FIGURE ARE ASME CODE SECTION III CLASS 3 AND ARE SAFETY-RELATED.
B. SAFETY-RELATED COMPONENTS AND EQUIPMENT SHOWN ON THE FIGURE ARE POWERED FROM THEIR RESPECTIVE CLASS 1E DIVISION.

FIGURE 2.7.5-1
STATION SERVICE WATER SYSTEM
(ONE OF TWO DIVISIONS)

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TABLE 2.7.5-1

STATION SERVICE WATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the SSWS is as shown on Figure 2.7.5-1.	1. Inspection of the as-built SSWS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.5-1, the as-built SSWS conforms with the Basic Configuration.
2. The SSWS has the capacity to remove heat from the CCWS during operation, shutdown, refueling, and design basis accident conditions.	2. Testing will be performed to measure SSWS flow rates, inspections will be conducted of the as-built SSWS, and analyses will be performed to determine the heat removal capacities of the as-built SSWS.	2. The SSWS has the capacity to remove heat from the CCWS during operation, shutdown, refueling, and design basis accident conditions.
3. The ASME Code Section III SSWS components shown on Figure 2.7.5-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	3. A pressure test will be conducted on those components of the SSWS required to be pressure tested by ASME Code Section III.	3. The results of the pressure test of ASME Code Section III components of the SSWS conform with the pressure testing acceptance criteria in ASME Code Section III.
4.a) The Class 1E loads shown on Figure 2.7.5-1 are powered from their respective Class 1E Division.	4.a) Testing will be performed on the SSWS by providing a test signal in only one Class 1E Division at a time.	4.a) Within the SSWS, a test signal exists only at the equipment powered from the Class 1E Division under test.
4.b) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the SSWS.	4.b) Inspection of the as-installed Class 1E Divisions in the SSWS will be performed.	4.b) Physical separation exists between Class 1E Divisions in the SSWS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the SSWS.

TABLE 2.7.5-1 (Continued)

STATION SERVICE WATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. The two mechanical Divisions of the SSWS are physically separated.	5. Inspection of the as-built mechanical Divisions will be performed.	5. The two mechanical Divisions of the SSWS are separated by a Divisional wall or a fire barrier.
6.a) Displays of the SSWS instrumentation shown on Figure 2.7.5-1 exist in the MCR or can be retrieved there.	6.a) Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	6.a) Displays of the instrumentation shown on Figure 2.7.5-1 exist in the MCR or can be retrieved there.
6.b) Controls exist in the MCR to start and stop the station service water pumps, and to open and close those power operated valves shown on Figure 2.7.5-1.	6.b) Testing will be performed using the SSWS controls in the MCR.	6.b) SSWS controls in the MCR operate to start and stop station service water pumps, and to open and close those power operated valves shown on Figure 2.7.5-1.
7. Check valves shown on Figure 2.7.5-1 will open, or will close, or will open and also close under system pressure, fluid flow conditions, or temperature conditions.	7. Testing will be conducted to open, or close, or open and also close, check valves shown on Figure 2.7.5-1 under system preoperational pressure, fluid flow conditions, or temperature conditions.	7. Each check valve shown on Figure 2.7.5-1 opens, or closes, or opens and also closes.

2.7.6 COMPONENT COOLING WATER SYSTEM

Design Description

The Component Cooling Water System (CCWS) is a closed loop cooling water system that, in conjunction with the station service water system (SSWS) and the ultimate heat sink (UHS), removes heat generated from the plant's safety-related and non-safety-related components connected to the CCWS.

Equipment listed in Table 2.7.6-1 can receive cooling water flow during the plant modes indicated. The ASME Code Section III Class 2 and 3 components and the instrumentation (except the radiation instrument) shown on Figure 2.7.6-1 are safety-related.

The Basic Configuration of the CCWS is as shown on Figure 2.7.6-1.

The CCWS consists of two Divisions. Each CCWS Division transfers heat to its corresponding SSWS Division through the component cooling water heat exchangers.

Each Division of the CCWS has two component cooling water heat exchangers, a component cooling water surge tank, two component cooling water pumps, piping, valves, controls, and instrumentation.

The CCWS heat exchangers are located in the CCWS heat exchanger structure. The remainder of the CCWS components and equipment is located within the nuclear island structures except for piping that connects the CCWS heat exchangers to the components and equipment in the nuclear island structures.

The CCWS, in conjunction with the SSWS and UHS, has the capacity to dissipate the heat loads of connected components during operation, shutdown, refueling, and design basis accident conditions. Each Division has the heat dissipation capacity to achieve and maintain cold shutdown.

The ASME Code Section III Class for the CCWS pressure retaining components shown on Figure 2.7.6-1 is as depicted on the Figure.

The safety-related equipment shown on Figure 2.7.6-1 is classified Seismic Category I.

The Class 1E loads shown on Figure 2.7.6-1 are powered from their respective Class 1E Division.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the CCWS.

The two mechanical Divisions of the CCWS are physically separated.

Displays of the CCWS instrumentation shown on Figure 2.7.6-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to start and stop the component cooling water pumps, and to open and close those power operated valves shown on Figure 2.7.6-1.

Upon receipt of a Safety Injection Actuation Signal (SIAS), the system response is as follows:

1) The ASME Code Section III Class 3 valves that separate ASME Code Section III Class 3 component cooling water piping and non-ASME Code Section III component cooling water piping close automatically.

2) The spent fuel pool cooling heat exchanger isolation valve closes automatically.

3) The component cooling water heat exchanger bypass valves close automatically.

Upon receipt of a Containment Spray Actuation Signal (CSAS), the containment spray heat exchanger isolation valve opens automatically.

Upon receipt of a component cooling water low-low surge tank level signal, isolation valves for cooling loops composed of non-ASME Code Section III piping close automatically.

Motor-operated valves (MOVs) having an active safety function will open, or will close, or will open and also close, under differential pressure or fluid flow conditions and under temperature conditions.

Check valves shown on Figure 2.7.6-1 will open, or will close, or will open and also close, under system pressure, fluid flow conditions, or temperature conditions.

Valves with response positions indicated on Figure 2.7.6-1 change position to that indicated on the Figure upon loss of motive power.

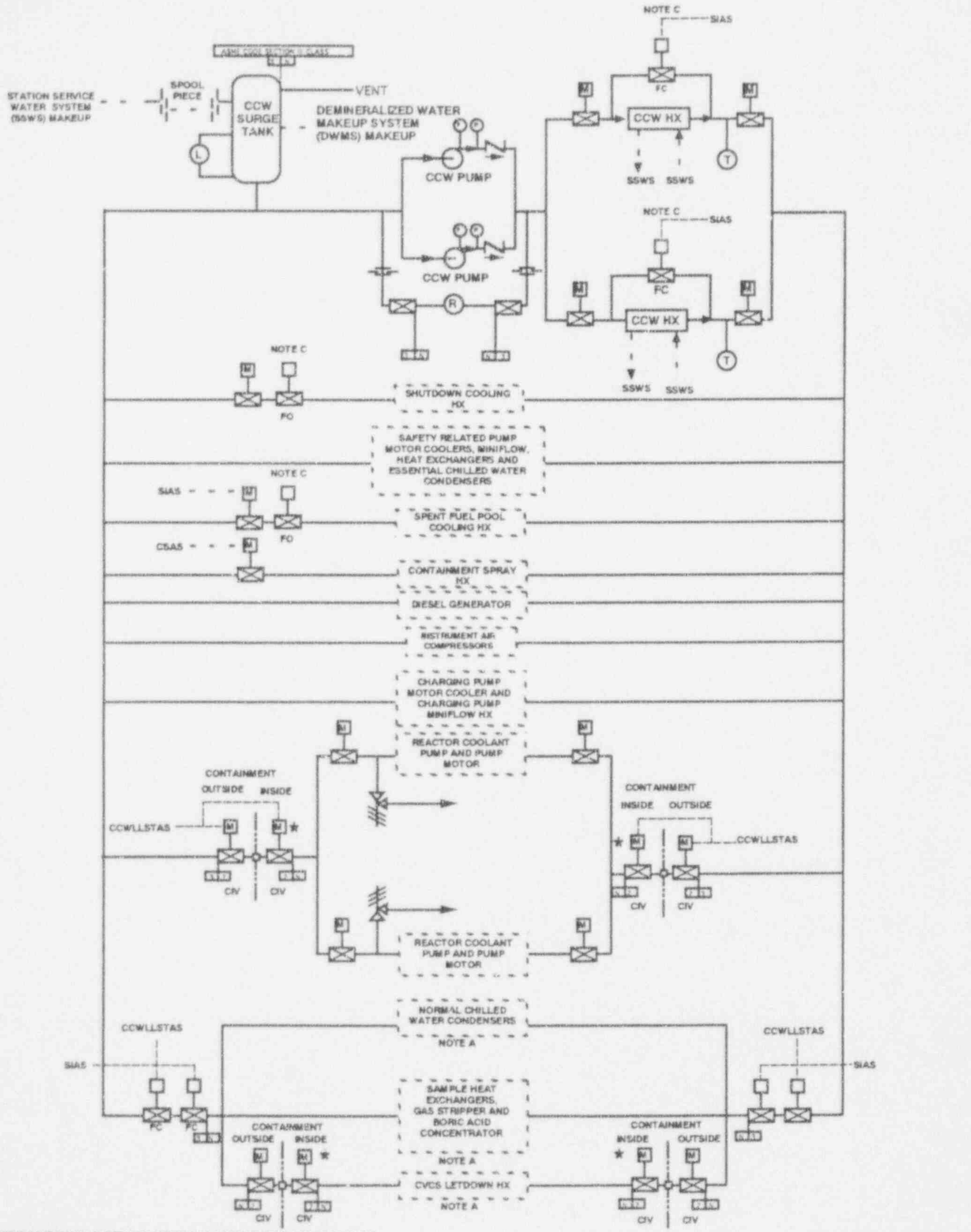
Makeup water to the CCWS is supplied by the demineralized water makeup system (DWMS). A safety-related Seismic Category I makeup line is provided to each Division from the SSWS via a spool piece which can be connected.

Pressure relief and flow isolation valves are provided for each reactor coolant pump as shown on Figure 2.7.6-1. Pressure relief capacity is sized to accept the maximum expected in-leakage from a reactor coolant pump seal cooler tube rupture.

The CCWS pipe channels from the nuclear island structures to the component cooling water heat exchanger structures are classified Seismic Category I and provide physical barriers between CCWS mechanical Divisions.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.6-2 specifies the inspections, tests, analyses, and associated acceptance criteria for the Component Cooling Water System.



NOTES:

A. ASSIGNMENT OF THE NON-SAFETY RELATED CCWS HEAT REMOVAL LOADS TO THEIR RESPECTIVE CCWS DIVISION IS DEPENDENT UPON THE LOCATION OF COMPONENTS ASSOCIATED WITH THOSE LOADS.

B. SAFETY RELATED COMPONENTS AND EQUIPMENT SHOWN ON THE FIGURE ARE POWERED FROM THEIR RESPECTIVE CLASS 1E DIVISION.

C. THIS VALVE IS FOR FLOW CONTROL. OPEN/CLOSE OPERATION FROM THE MAIN CONTROL ROOM IS NOT REQUIRED.

★ EQUIPMENT FOR WHICH PARAGRAPH NUMBER (3) OF THE "VERIFICATIONS FOR BASIC CONFIGURATION FOR SYSTEMS" OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.

FIGURE 2.7.6-1
COMPONENT COOLING WATER SYSTEM
(ONE OF TWO DIVISIONS)

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TABLE 2.7.6-1

Equipment Receiving Component Cooling Water Flow

Plant Mode/ Components	Normal Operation	Shutdown Cooling	Refueling	Design Basis Accident
SAFETY RELATED		(Note a)		
Shutdown cooling heat exchanger	-	X	X	-
Containment spray heat exchanger	-	-	-	X
Spent fuel pool cooling heat exchanger	X	X	X	X (Note b)
Diesel Generator	X	X	X	X
Pump Motor Coolers, Miniflow Heat Exchangers, and Essential Chilled Water Condensers	X	X	X	X

TABLE 2.7.6-1 (Continued)

Equipment Receiving Component Cooling Water Flow

Plant Mode/ Components	Normal Operation	Shutdown Cooling	Refueling	Design Basis Accident
NON-SAFETY RELATED		(Note a)		
Reactor coolant pumps and pump motors	X	X	X	X
Charging pump motor coolers	X	X	X	X
Charging pump miniflow heat exchanger	X	X	X	X
Instrument Air Compressors	X	X	X	X
Normal Chilled Water Condensers (Note c)	X	X	X	-
Letdown Heat Exchanger, Sample Heat Exchangers, Gas Stripper, and Boric Acid Concentrator (Note c)	X	X	X	-

NOTES FOR TABLES 2.7.6-1

a. (X) = Equipment can receive component cooling water flow in this mode.

(-) = Equipment does not receive component cooling water flow in this mode.

b. Will require operator action to restore.

c. Assignment of the non-safety-related CCWS heat removal loads to the respective CCWS Division is dependent upon the location of the components associated with those loads.

TABLE 2.7.6-2

COMPONENT COOLING WATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the CCWS is as shown on Figure 2.7.6-1.	1. Inspection of the as-built CCWS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.6-1, the as-built CCWS conforms with the Basic Configuration.
2. The CCWS, in conjunction with the SSWS and UHS, has the capacity to dissipate the heat loads of connected components during operation, shutdown, refueling and design basis accident conditions.	2. Testing will be performed to measure CCWS flow rates, inspections will be conducted of the as-built CCWS, and analyses will be performed to determine the heat removal capacities of the as-built component cooling water heat exchangers.	2. The CCWS, in conjunction with the SSWS and UHS, has the capacity to dissipate the heat loads of connected components during operation, shutdown, refueling and design basis accident conditions.
3. The ASME Code Section III CCWS components shown on Figure 2.7.6-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	3. A pressure test will be conducted on those components of the CCWS required to be pressure tested by ASME Code Section III.	3. The results of the pressure test of ASME Code Section III components of the CCWS conform with the pressure testing acceptance criteria in ASME Code Section III.
4.a) The Class 1E loads shown on Figure 2.7.6-1 are powered from their respective Class 1E Division.	4.a) Testing will be performed on the CCWS by providing a test signal in only one Class 1E Division at a time.	4.a) Within the CCWS, a test signal exists only at the equipment powered from the Class 1E Division under test.
4.b) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the CCWS.	4.b) Inspection of the as-installed Class 1E Divisions in the CCWS will be performed.	4.b) Physical separation exists between Class 1E Divisions in the CCWS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the CCWS.

TABLE 2.7.6-2 (Continued)

COMPONENT COOLING WATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. The two mechanical Divisions of the CCWS are physically separated.	5. Inspection of the as-built mechanical Divisions will be performed.	5. The two mechanical Divisions of the CCWS are separated by a Divisional wall or a fire barrier except for components of the CCWS within Containment which are separated by spatial arrangement or physical barriers.
6.a) Displays of the CCWS instrumentation shown on Figure 2.7.6-1 exist in the MCR or can be retrieved there.	6.a) Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	6.a) Displays of the instrumentation shown on Figure 2.7.6-1 exist in the MCR or can be retrieved there.
6.b) Controls exist in the Main Control Room to start and stop the component cooling water pumps, and to open and close those power operated valves shown on Figure 2.7.6-1.	6.b) Testing will be performed using the CCWS controls in the MCR.	6.b) CCWS controls in the MCR operate to start and stop component cooling water pumps, and to open and close those power operated valves shown on Figure 2.7.6-1.
7. Upon receipt of a Safety Injection Actuation Signal (SIAS), the system response is as follows:	7. Testing will be performed using a simulated SIAS.	7. The system responds as follows:
7.a) The ASME Code Section III Class 3 valves that separate the ASME Code Section III Class 3 component cooling water piping and non-ASME Code Section III component cooling water piping close automatically.		7.a) Upon receipt of a SIAS, the valves close.

TABLE 2.7.6-2 (Continued)

COMPONENT COOLING WATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7.b) The spent fuel pool cooling heat exchanger isolation valve closes automatically.		7.b) Upon receipt of a SIAS, the valve closes.
7.c) The component cooling water heat exchanger bypass valves close automatically.		7.c) Upon receipt of a SIAS, the valves close.
8. Upon the receipt of a component cooling water low-low surge tank level signal, isolation valves for cooling loops composed of non-ASME Code Section III piping close automatically.	8. Testing will be performed using a simulated component cooling water surge tank low-low level signal.	8. Upon the receipt of a component cooling water surge tank low-low level signal, the valves close.
9. Upon receipt of a Containment Spray Actuation Signal (CSAS), the containment spray heat exchanger isolation valve opens automatically.	9. Testing will be performed using a simulated CSAS signal.	9. Upon receipt of a CSAS, the valve opens.
10. Motor-operated valves (MOVs) having an active safety function will open, or will close, or will open and also close, under differential pressure or fluid flow conditions and under temperature conditions.	10. Testing will be performed to open, or close, or open and also close, MOVs having an active safety function under preoperational differential pressure or fluid flow conditions and under temperature conditions.	10. Each MOV having an active safety function opens, or closes, or opens and also closes.

TABLE 2.7.6-2 (Continued)

COMPONENT COOLING WATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11. Check valves shown on Figure 2.7.6-1 will open, or will close, or will open and also close, under system pressure, fluid flow conditions, or temperature conditions.	11. Testing will be performed to open, or close, or open and also close, check valves shown on Figure 2.7.6-1 under system preoperational pressure, fluid flow conditions or temperature conditions.	11. Each che[illegible] alve shown on Figure 2.7.6-1, o[illegible], or closes, or opens and also closes.
12. Valves with response positions indicated on Figure 2.7.6-1 change position to that indicated on the figure upon loss of motive power.	12. Testing of loss of motive power to these valves will be performed.	12. These valves change position to the position indicated on Figure 2.7.6-1 on loss of motive power.
13. The spool piece on the SSWS makeup line to each Division of the CCWS can be connected.	13. Testing of the spool piece will be performed to confirm that it can be connected.	13. The spool piece on the SSWS makeup line to each Division of the CCWS can be connected.
14. Pressure relief capacity provided for each reactor coolant pump is sized to accept the maximum expected in-leakage from a reactor coolant pump seal cooler tube rupture.	14. An analysis will be performed to confirm the pressure relief capacity provided for each reactor coolant pump.	14. An analysis exists and concludes that the pressure relief capacity provided for each reactor coolant pump is sized to accept the maximum in-leakage from a reactor coolant pump seal cooler tube rupture.

2.7.7 DEMINERALIZED WATER MAKEUP SYSTEM

Design Description

The Demineralized Water Makeup System (DWMS) supplies filtered water reduced in gases and ions to the condensate storage system, component cooling water system (CCWS), emergency feedwater system (EFWS), normal and essential chilled water systems, and the diesel generator cooling system.

The Basic Configuration of the DWMS is as shown on Figure 2.7.7-1. The DWMS is non-safety-related with the exception of the containment penetration isolation valves and piping in between covered in Section 2.4.5.

The DWMS has pumps, demineralizers, a degasifier, a demineralized water storage tank, piping, instrumentation, and controls.

The DWMS demineralizers, pumps, regeneration, and neutralization equipment, including the regenerant waste neutralization tank are located in the station service building. The demineralized water storage tank is located in the yard.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.7-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Demineralized Water Makeup System.

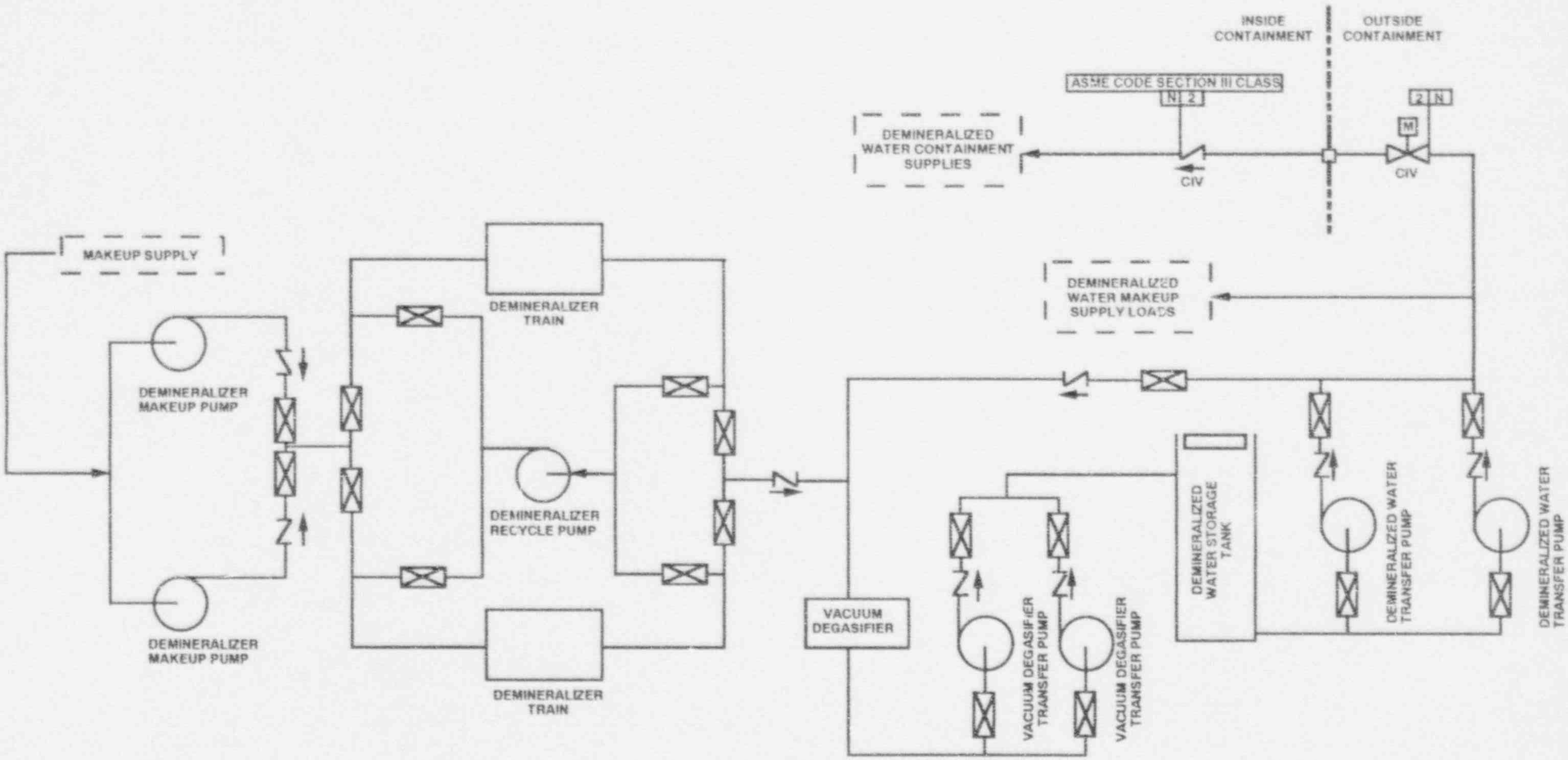


FIGURE 2.7.7-1
DEMINERALIZED WATER MAKEUP SYSTEM

06-17-94

TABLE 2.7.7-1

DEMINERALIZED WATER MAKEUP SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the DWMS is as shown on Figure 2.7.7-1.	1. Inspection of the as-built DWMS configuration will be performed.	1. For the components and equipment shown on Figure 2.7.7-1, the as-built DWMS conforms with the Basic Configuration.

2.7.8 CONDENSATE STORAGE SYSTEM

Design Description

The Condensate Storage System provides a source of condensate for makeup to the main condenser, is a source of startup feedwater to the steam generators, and provides a non-safety source of condensate to the emergency feedwater storage tanks.

The Basic Configuration is as shown on Figure 2.7.8-1. The Condensate Storage System is non-safety-related.

The Condensate Storage System has a condensate storage tank, a condensate storage tank recycle pump, and associated valves, piping, and controls. The condensate storage tank is located in the yard. The Condensate Storage System recycle pump is located in the station services building.

The Condensate Storage System provides makeup or receives excess condensate from the main condenser hotwell. The Condensate Storage System also serves to collect and store condensate from plant condensate drains.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.8-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Condensate Storage System.

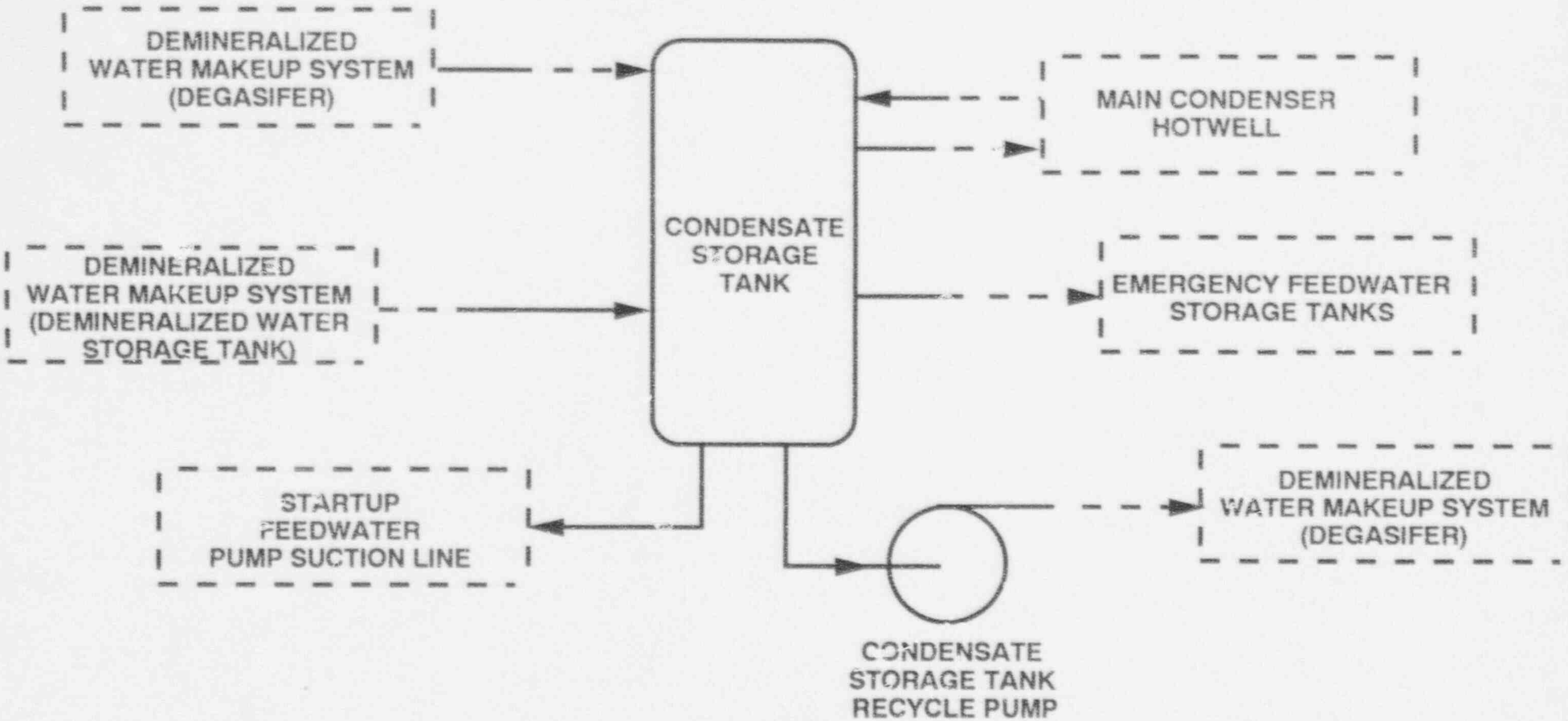


FIGURE 2.7.8-1
CONDENSATE STORAGE SYSTEM

06-17-94

TABLE 2.7.8-1

CONDENSATE STORAGE SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Condensate Storage System is as shown on Figure 2.7.8-1.	1. Inspection of the as-built Condensate Storage System configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.8-1, the as-built Condensate Storage System conforms with the Basic Configuration.

2.7.9 PROCESS SAMPLING SYSTEM

Design Description

The Process Sampling System (PSS) collects and delivers samples from process systems to sample stations for analyses. Portions of the system which form part of the reactor coolant pressure boundary are safety-related. A sub-system of the PSS is the post-accident sampling system (PASS). The PASS is used to collect post-accident samples of containment atmosphere and reactor coolant for analysis. Reactor coolant samples are collected for boron, radiological, and total dissolved gas measurements. Containment atmosphere samples are collected for radiological measurements. The PASS may be remotely operated as necessary to reduce personnel radiation exposure.

The PSS is located within the nuclear island structures.

The Basic Configuration of the PSS is as shown on Figure 2.7.9-1.

The ASME Code Section III Class for the PSS pressure retaining components shown on Figure 2.7.9-1 is as depicted on the Figure.

The safety-related equipment shown on Figure 2.7.9-1 is classified Seismic Category I.

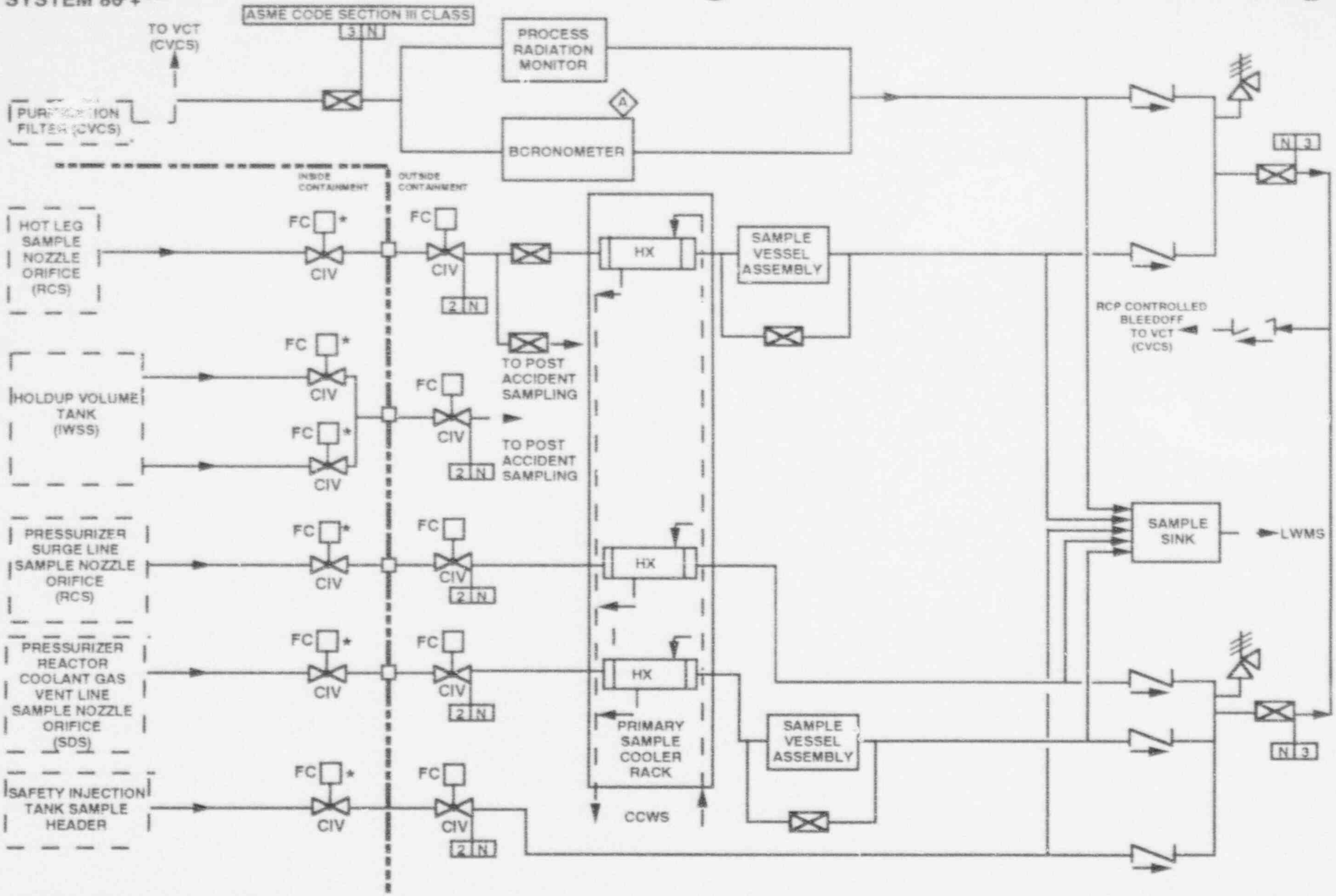
Displays of the PSS instrumentation shown on Figure 2.7.9-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to open and close those power operated valves shown on Figure 2.7.9-1. PSS alarms shown on Figure 2.7.9-1 are provided in the MCR.

Valves with response positions indicated on Figure 2.7.9-1 change position to that indicated on the Figure upon loss of motive power.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.9-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Process Sampling System.



NOTES:
1. THE ASME CODE SECTION III CLASS 2 COMPONENTS SHOWN ARE SAFETY-RELATED
2. ★ EQUIPMENT FOR WHICH PARAGRAPH NUMBER 3 OF THE "VERIFICATION FOR BASIC CONFIGURATION FOR SYSTEMS" SECTION OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES

FIGURE 2.7.9-1
PROCESS SAMPLING SYSTEM

08-17-94

TABLE 2.7.9-1

PROCESS SAMPLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the PSS is as shown on Figure 2.7.9-1.	1. Inspection of the as-built PSS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.9-1, the as-built PSS conforms with the Basic Configuration.
2. The ASME Code Section III PSS components shown on Figure 2.7.9-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those components of the PSS required to be pressure tested by ASME Code Section III.	2. The results of the pressure test of ASME Code Section III components of the PSS conform with the pressure testing acceptance criteria in ASME Code Section III.
3.a) Displays of the PSS instrumentation shown on Figure 2.7.9-1 exist in the MCR or can be retrieved there.	3.a) Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	3.a) Displays of the instrumentation shown on Figure 2.7.9-1 exist in the MCR or can be retrieved there.
3.b) Controls exist in the MCR to open and close those power operated valves shown on Figure 2.7.9-1.	3.b) Testing will be performed using the PSS controls in the MCR.	3.b) PSS controls in the MCR operate to open and close those power operated valves shown on Figure 2.7.9-1.
3.c) PSS alarms shown on Figure 2.7.9-1 are provided in the MCR.	3.c) Testing of the PSS alarms shown on Figure 2.7.9-1 will be performed using signals simulating alarm conditions.	3.c) The PSS alarms shown on Figure 2.7.9-1 actuate in the MCR in response to signals simulating alarm conditions.

TABLE 2.7.9-1 (Continued)

PROCESS SAMPLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. Valves with response positions indicated on Figure 2.7.9-1 change position to that indicated on the Figure upon loss of motive power.	4. Testing of loss of motive power to these valves will be performed.	4. These valves change position to the position indicated on Figure 2.7.9-1 on loss of motive power.
5. The PASS can collect samples of reactor coolant and containment atmosphere.	5. Testing of the PASS capability to obtain samples will be performed under preoperational conditions.	5. Samples of reactor coolant and containment atmosphere are collected by the PASS.

2.7.10 COMPRESSED AIR SYSTEMS

Design Description

The Compressed Air Systems (CAS) consist of the Instrument Air System (IAS), Station Air System (SAS), and Breathing Air System (BAS).

The IAS supplies compressed air to air-operated instrumentation, air-operated controls, and air-operated valves.

The Basic Configuration of the IAS is as shown on Figure 2.7.10-1.

IAS air compressors, air receivers, and dryer/filters are located in the nuclear annex.

The IAS supply lines extend to, and end at, the controller of the connected component.

Each IAS air compressor shown on Figure 2.7.10-1 is powered from a permanent non-safety bus.

A display of the IAS instrumentation shown on Figure 2.7.10-1 exists in the main control room (MCR) or can be retrieved there.

The SAS supplies compressed air for air-operated tools and for general use in the plant.

The Basic Configuration of the SAS is as shown on Figure 2.7.10-2.

The BAS supplies compressed air for breathing protection.

The Basic Configuration of the BAS is as shown on Figure 2.7.10-3.

The CAS are non-safety-related systems with the exception of the containment penetration isolation valves and piping in between which are covered in Section 2.4.5.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.10-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Compressed Air Systems.

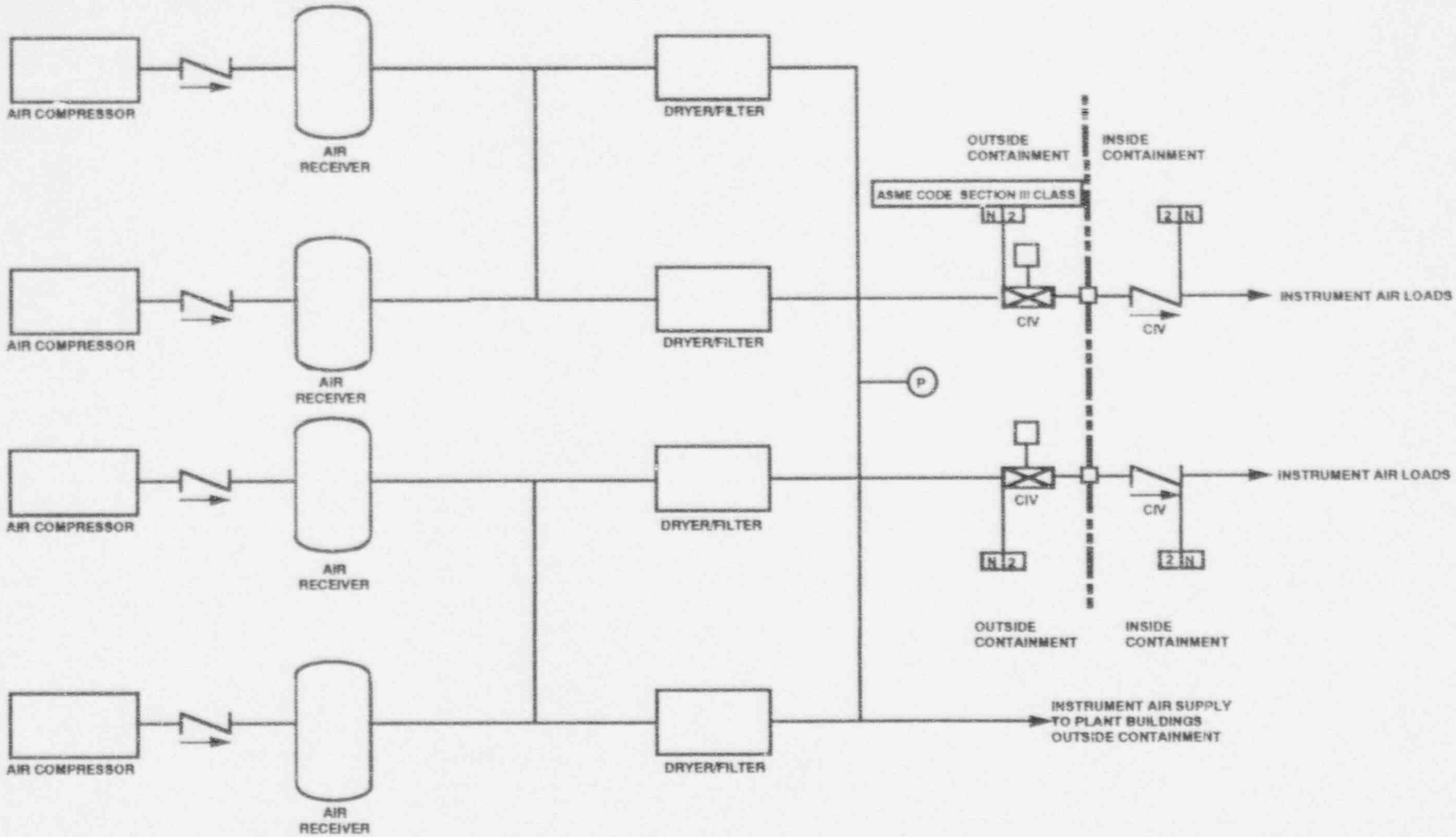


FIGURE 2.7.10-1
INSTRUMENT AIR SYSTEM

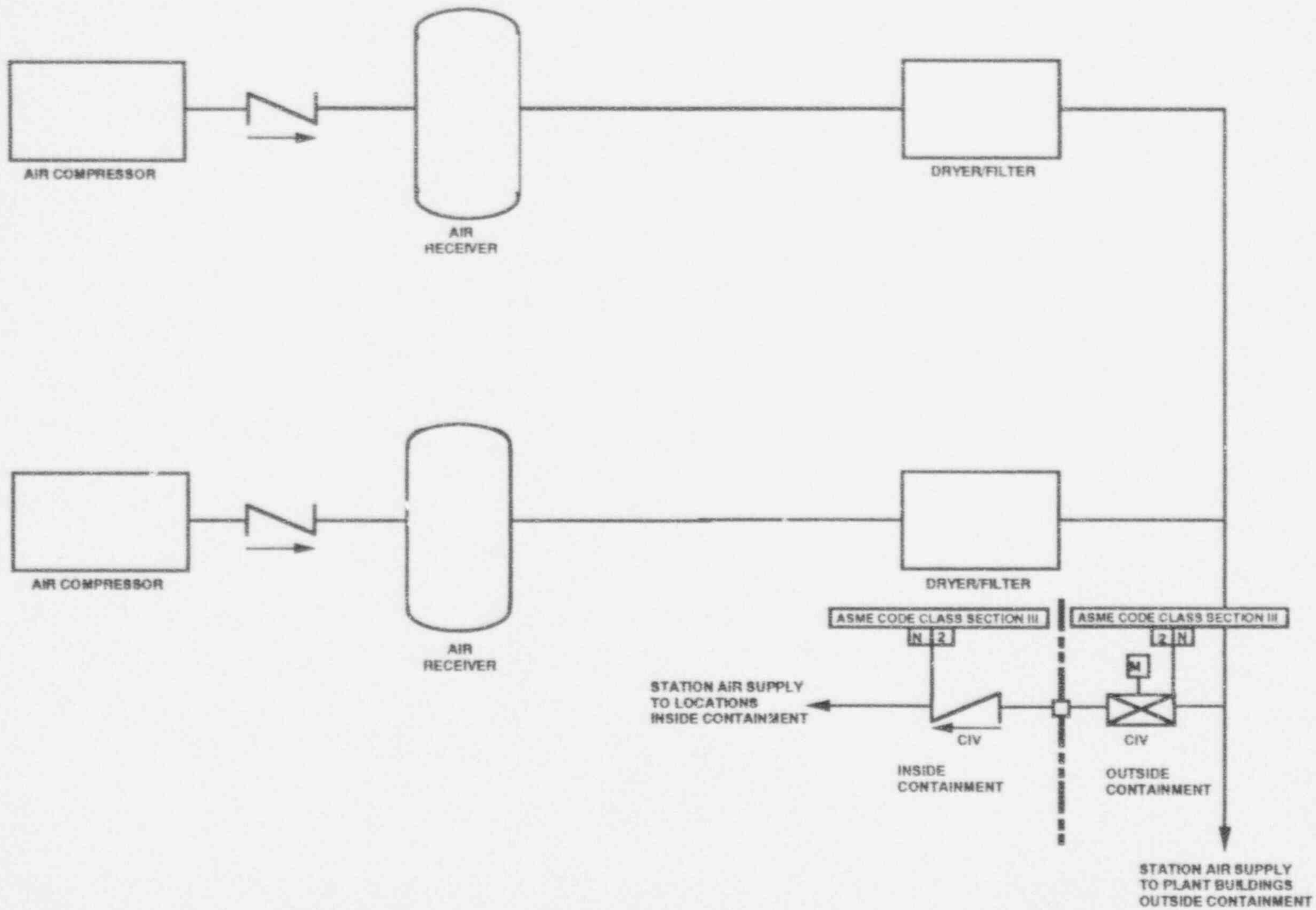


FIGURE 2.7.10-2
STATION AIR SYSTEM

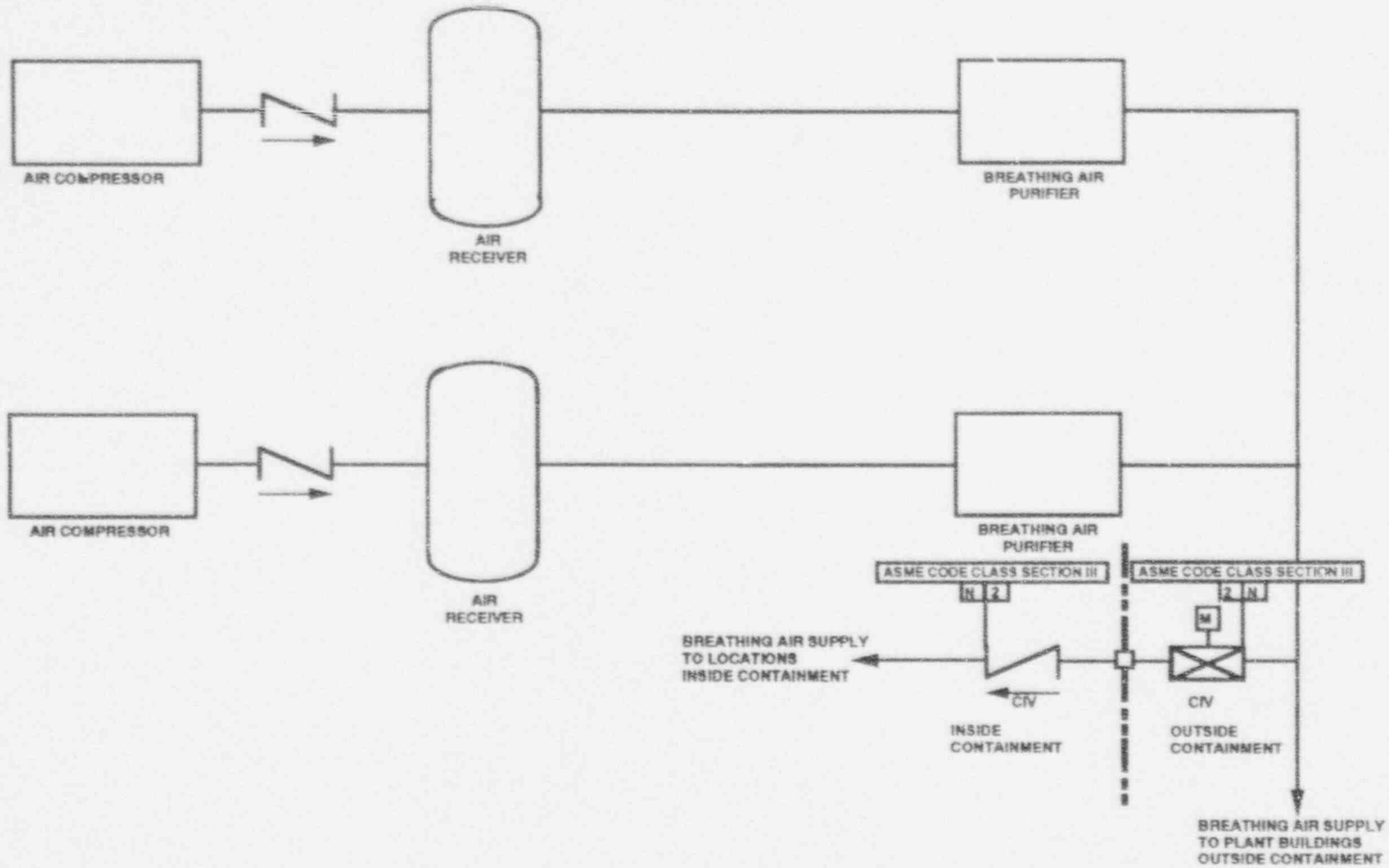


FIGURE 2.7.10-3
BREATHING AIR SYSTEM

TABLE 2.7.10-1

COMPRESSED AIR SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the IAS is as shown on Figure 2.7.10-1.	1. Inspection of the as-built IAS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.10-1, the as-built IAS conforms with the Basic Configuration.
2. The Basic Configuration of the SAS is as shown on Figure 2.7.10-2.	2. Inspection of the as-built SAS configuration will be conducted.	2. For the components and equipment shown on Figure 2.7.10-2, the as-built SAS conforms with the Basic Configuration.
3. The Basic Configuration of the BAS is as shown on Figure 2.7.10-3.	3. Inspection of the as-built BAS configuration will be conducted.	3. For the components and equipment shown on Figure 2.7.10-3, the as-built BAS conforms with the Basic Configuration.
4. A display of the IAS instrumentation shown on Figure 2.7.10-1 exists in the MCR or can be retrieved there.	4. Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	4. A display of the instrumentation shown on Figure 2.7.10-1 exists in the MCR or can be retrieved there.
5. The IAS electrical loads shown on Figure 2.7.10-1 are powered from a permanent non-safety bus.	5. Testing will be performed on the IAS by providing a test signal in the permanent non-safety bus.	5. Within the IAS, a test signal exists at the equipment powered by the permanent non-safety bus under test.

2.7.11 TURBINE BUILDING COOLING WATER SYSTEM

Design Description

The Turbine Building Cooling Water System (TBCWS) provides cooling water to the non-safety-related turbine plant auxiliary system components.

The Basic Configuration of the TBCWS is as shown on Figure 2.7.11-1. The TBCWS is non-safety-related.

The TBCWS is a single closed loop cooling water system. The TBCWS has two heat exchangers, two pumps, one surge tank, piping, valves, and controls. The TBCWS is located in the turbine building and yard.

The TBCWS transfers heat from turbine building auxiliary system components to the turbine building service water system (TBSWS).

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.11-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Turbine Building Cooling Water System.

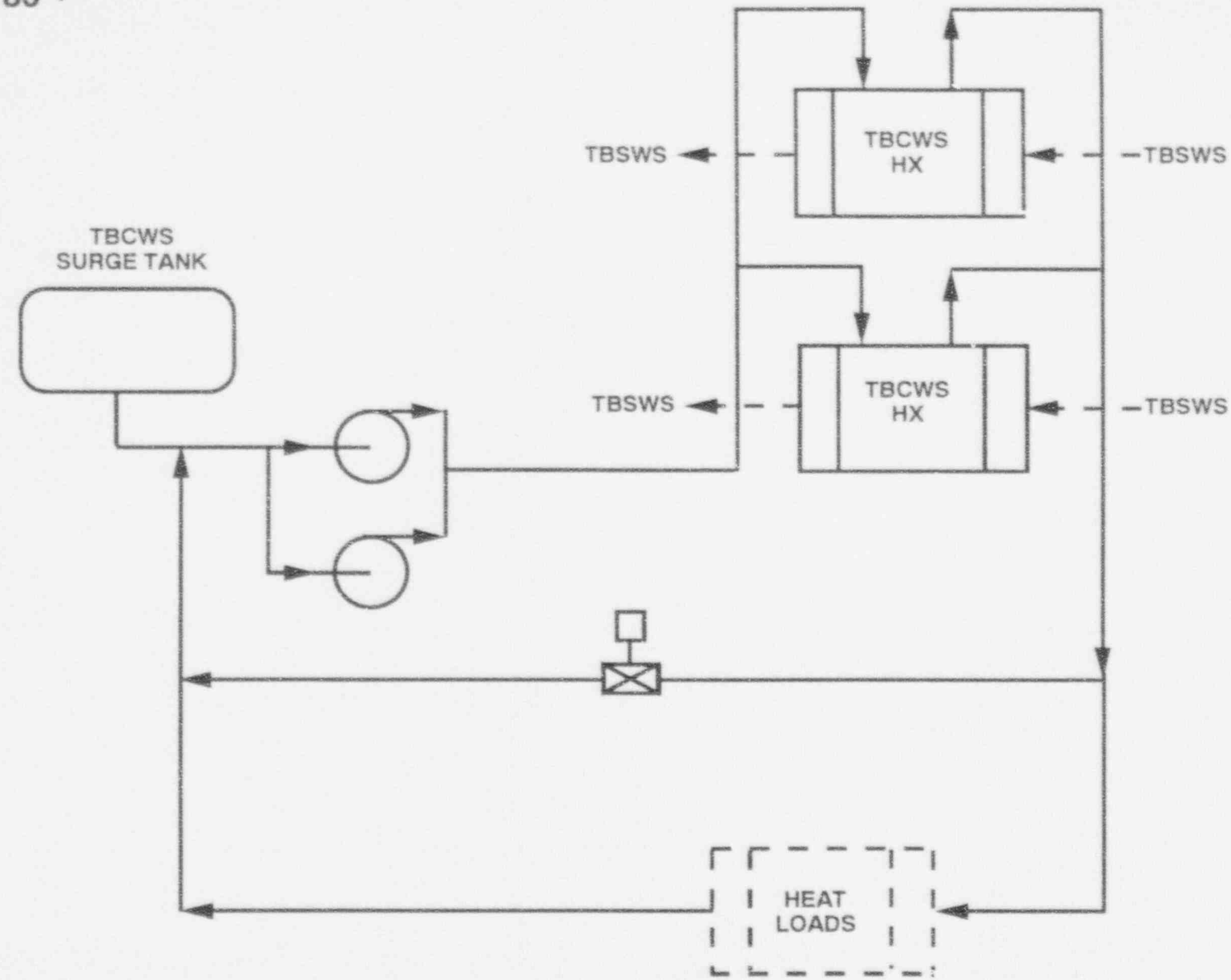


FIGURE 2.7.11-1
TURBINE BUILDING COOLING WATER SYSTEM

06-17-94

TABLE 2.7.11-1

TURBINE BUILDING COOLING WATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the TBCWS is as shown on Figure 2.7.11-1.	1. Inspection of the as-built TBCWS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.11-1, the as-built TBCWS conforms with the Basic Configuration.

2.7.12 ESSENTIAL CHILLED WATER SYSTEM

Design Description

The Essential Chilled Water System (ECWS) is a safety-related closed loop chilled water system that serves safety-related HVAC cooling loads. The ECWS provides chilled water to connected safety-related air handling units.

The Basic Configuration of the ECWS is as shown on Figure 2.7.12-1.

The essential chilled water (ECW) expansion tanks, ECW pumps, essential chillers, and ECW heat exchangers are located in the nuclear annex.

The ECWS consists of two Divisions. Each Division includes a chiller, a heat exchanger, two chilled water pumps, an expansion tank, piping, valves, controls and instrumentation.

The ASME Code Section III Class for the ECWS pressure retaining components shown on Figure 2.7.12-1 is as depicted on the Figure.

The safety-related equipment shown on Figure 2.7.12-1 is classified Seismic Category I.

The Class 1E loads shown on Figure 2.7.12-1 are powered from their respective Class 1E Division.

The two mechanical Divisions of the ECWS are physically separated.

Controls exist in the main control room (MCR) to start and stop the essential chilled water pumps and essential chiller shown on Figure 2.7.12-1.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the ECWS.

The ECWS is automatically actuated to furnish essential chilled water upon a loss of the normal chilled water system (NCWS).

Makeup water to the ECWS is supplied by the demineralized water makeup system (DWMS) A safety-related Seismic Category I makeup line is provided to each Division from the station service water system (SSWS) via a spool piece which can be connected.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.12-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Essential Chilled Water System.

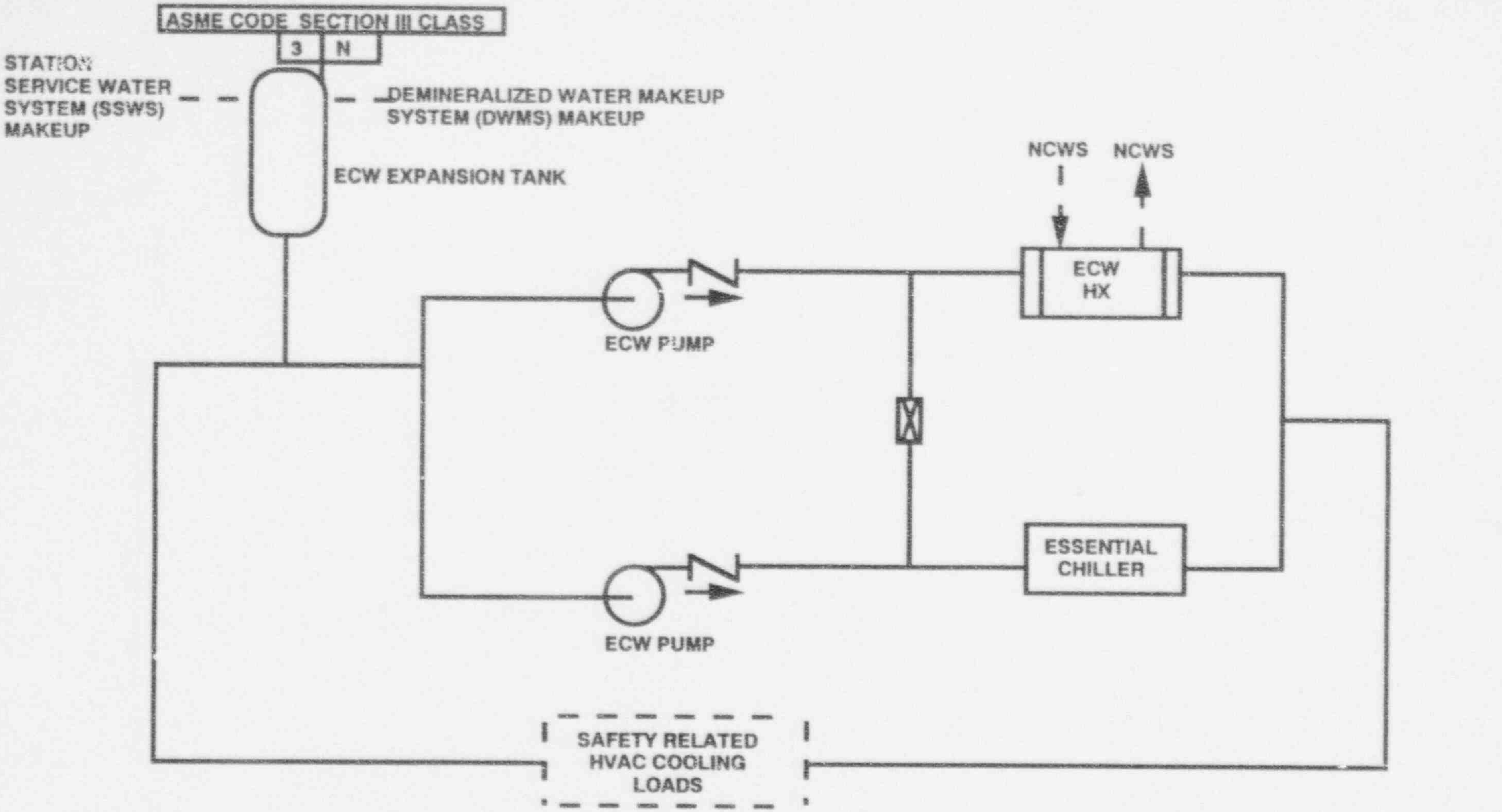


FIGURE 2.7.12-1
ESSENTIAL CHILLED WATER SYSTEM
(ONE OF TWO DIVISIONS)

06-17-94

TABLE 2.7.12-1

ESSENTIAL CHILLED WATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the ECWS is as shown on Figure 2.7.12-1.	1. Inspection of the as-built ECWS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.12-1, the as-built ECWS conforms with the Basic Configuration.
2. The ASME Code Section III ECWS components shown on Figure 2.7.12-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those components of the ECWS required to be pressure tested by ASME Code Section III.	2. The results of the pressure test of the ASME Code Section III components of the ECWS conform with the pressure testing acceptance criteria in ASME Code Section III.
3.a) The Class 1E loads shown on Figure 2.7.12-1 are powered from their respective Class 1E Division.	3.a) Testing will be performed on the ECWS by providing a test signal in only one Class 1E Division at a time.	3.a) Within the ECWS, a test signal exists only at the equipment powered from the Class 1E Division under test.
3.b) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the ECWS.	3.b) Inspection of the as-installed Class 1E Divisions in the ECWS will be performed.	3.b) Physical separation exists between Class 1E Divisions in the CCWS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the ECWS.
4. The two mechanical Divisions of the ECWS are physically separated.	4. Inspection of the as-built mechanical Divisions will be performed.	4. The two mechanical divisions of the ECWS are separated by a Divisional wall or by a fire barrier.

TABLE 2.7.12-1 (Continued)

ESSENTIAL CHILLED WATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. Controls exist in the MCR to start and stop the essential chilled water pumps and essential chiller shown on Figure 2.7.12-1.	5. Testing will be performed using the ECWS controls in the MCR.	5. ECWS controls in the MCR operate to start and stop the essential chilled water pumps and essential chiller shown on Figure 2.7.12-1.
6. The ECWS is automatically actuated to furnish essential chilled water upon a loss of the normal chilled water system (NCWS).	6. Testing will be performed using a signal to simulate loss of the normal chilled water system.	6. The ECWS is automatically actuated to furnish essential chilled water upon a loss of the NCWS.
7. The spool piece on the SSWS makeup line to each Division of the ECWS can be connected.	7. Testing of the spool piece will be performed to confirm that it can be connected.	7. The spool piece on the SSWS makeup line to each Division of the ECWS can be connected.

2.7.13 NORMAL CHILLED WATER SYSTEM

Design Description

With the exception of the Containment penetration isolation valves and piping in between covered in Section 2.4.5, the Normal Chilled Water System (NCWS) is a non-safety-related closed loop chilled water system that serves non-safety-related HVAC cooling loads. The NCWS provides chilled water to connected air handling units and the essential chilled water heat exchanger.

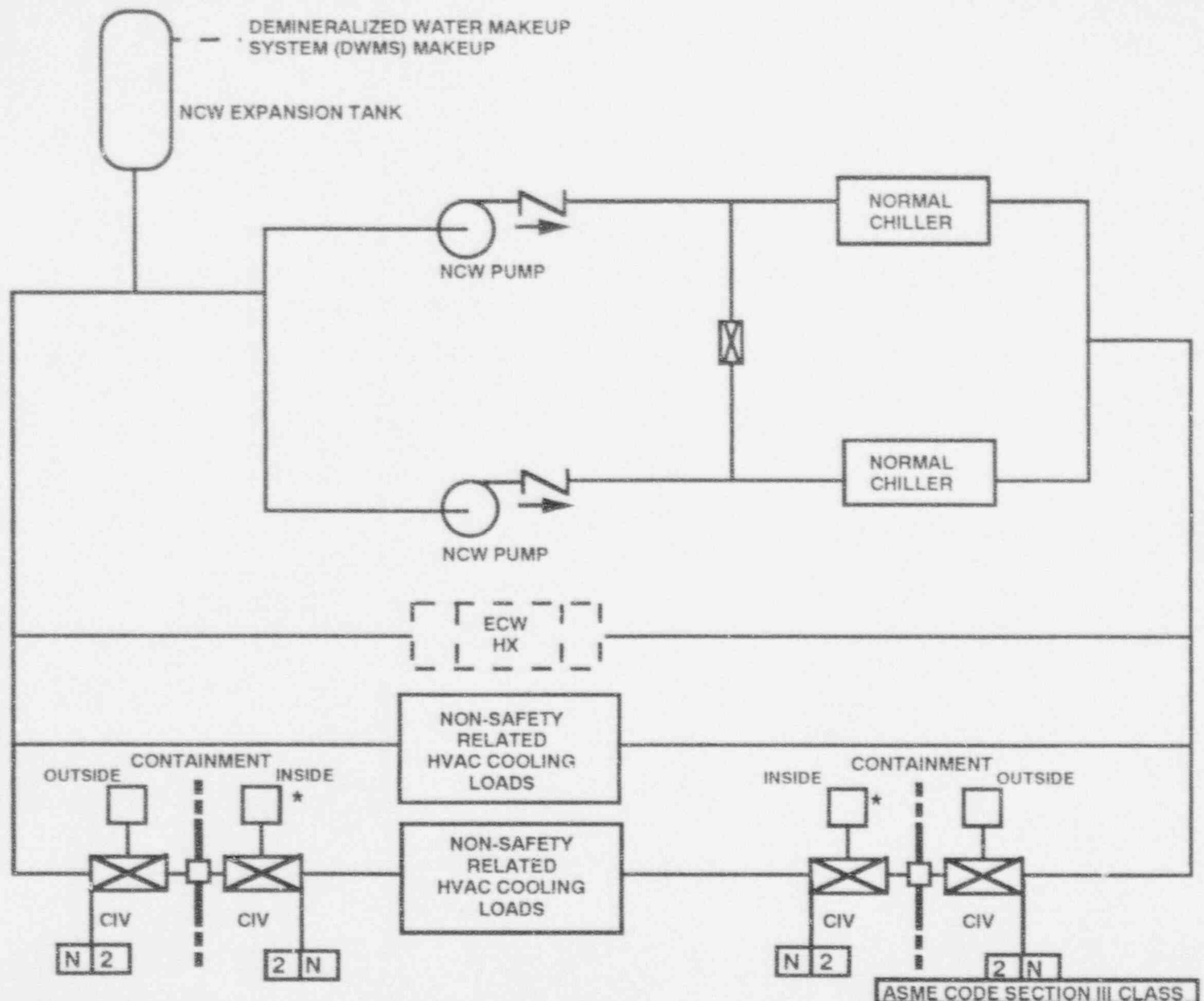
The Basic Configuration of the NCWS is as shown on Figure 2.7.13-1.

The normal chilled water (NCW) expansion tanks, NCW pumps, and normal chillers are located in the nuclear annex.

The NCWS consists of two Divisions. Each Division of the NCWS includes two chillers, two chilled water pumps, an expansion tank, piping, valves, controls and instrumentation.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.13-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Normal Chilled Water System.



NOTE:

* EQUIPMENT FOR WHICH PARAGRAPH NUMBER (3) OF THE "VERIFICATIONS FOR BASIC CONFIGURATION FOR SYSTEMS" OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.

FIGURE 2.7.13-1
NORMAL CHILLED WATER SYSTEM
(ONE OF TWO DIVISIONS)

06-17-94

TABLE 2.7.13-1

NORMAL CHILLED WATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the NCWS is as shown on Figure 2.7.13-1.	1. Inspection of the as-built NCWS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.13-1, the as-built NCWS conforms with the Basic Configuration.

2.7.14 TURBINE BUILDING SERVICE WATER SYSTEM

Design Description

The Turbine Building Service Water System (TBSWS) removes heat from the turbine building cooling water system (TBCWS) and transfers heat to the condenser circulating water system.

The Basic Configuration of the TBSWS is as shown on Figure 2.7.14-1. The TBSWS is non-safety-related.

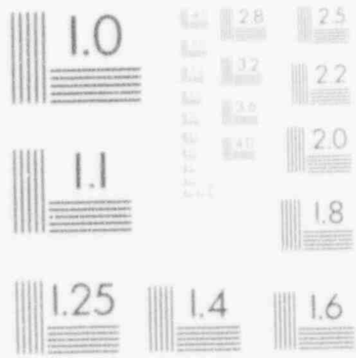
The TBSWS has two pumps and associated piping, valves, and controls which provide cooling water to the TBCWS heat exchangers. The TBSWS is located in the yard.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.14-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Turbine Building Service Water System.

1

IMAGE EVALUATION TEST TARGET (MT-3)



150mm

6"

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

1

IMAGE EVALUATION
TEST TARGET (MT-3)

150mm

6"

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

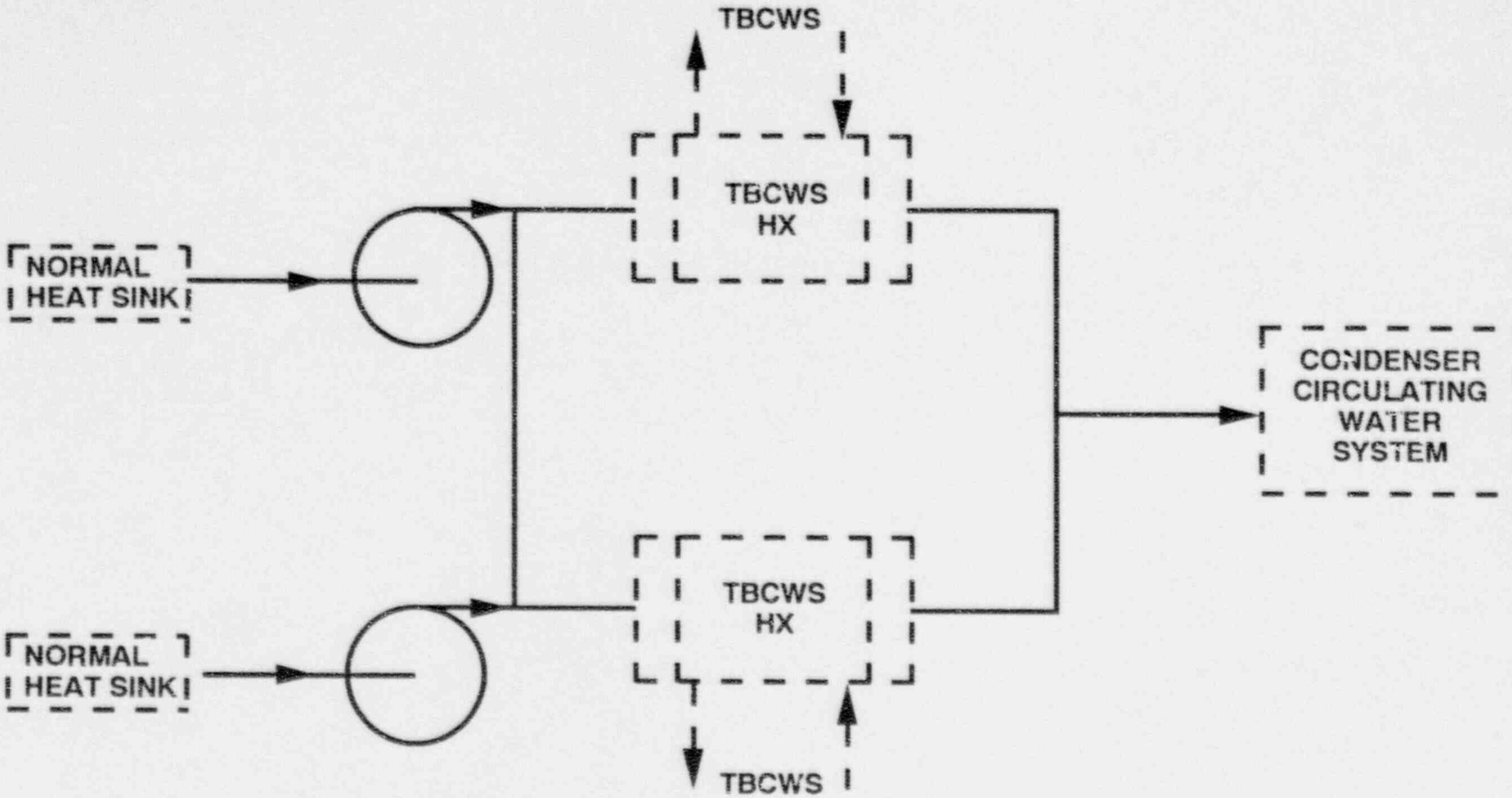


FIGURE 2.7.14-1
TURBINE BUILDING SERVICE WATER SYSTEM

06-17-94

TABLE 2.7.14-1

TURBINE BUILDING SERVICE WATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Turbine Building Service Water System (TBSWS) is as shown on Figure 2.7.14-1.	1. Inspection of the as-built TBSWS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.14-1, the as-built TBSWS conforms with the Basic Configuration.

2.7.15 EQUIPMENT AND FLOOR DRAINAGE SYSTEM

Design Description

The Equipment and Floor Drainage System (EFDS) segregates and transports liquids containing wastes to the liquid waste management system (LWMS). The EFDS has components in the nuclear island structures, the turbine building and the radwaste building.

The Basic Configuration of the EFDS is as shown on Figure 2.7.15-1. The ASME Code Section III Class 2 and 3 components shown on Figure 2.7.15-1 are safety-related.

The equipment and floor drains are separated into equipment drains, floor drains, chemical waste drains, and detergent waste drains. Liquid wastes are routed to the LWMS subsystem that processes the particular waste type.

Nonradioactive equipment and floor drains are not connected to radioactive or potentially radioactive equipment and floor drains.

Floor drains in the nuclear annex (NA) are physically separated into two Divisions and there are no common drain lines between Divisions. Floor drains in the reactor building (RB) subsphere are physically separated into quadrants (two in each Division) and there are no common floor drain lines between quadrants.

Within Containment, the EFDS has no direct downward gravity flowpaths that will allow the release of radioactive material.

The safety-related equipment shown on Figure 2.7.15-1 is classified Seismic Category I.

The Class 1E loads shown on Figure 2.7.15-1 are powered from their respective Class 1E Division.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the EFDS.

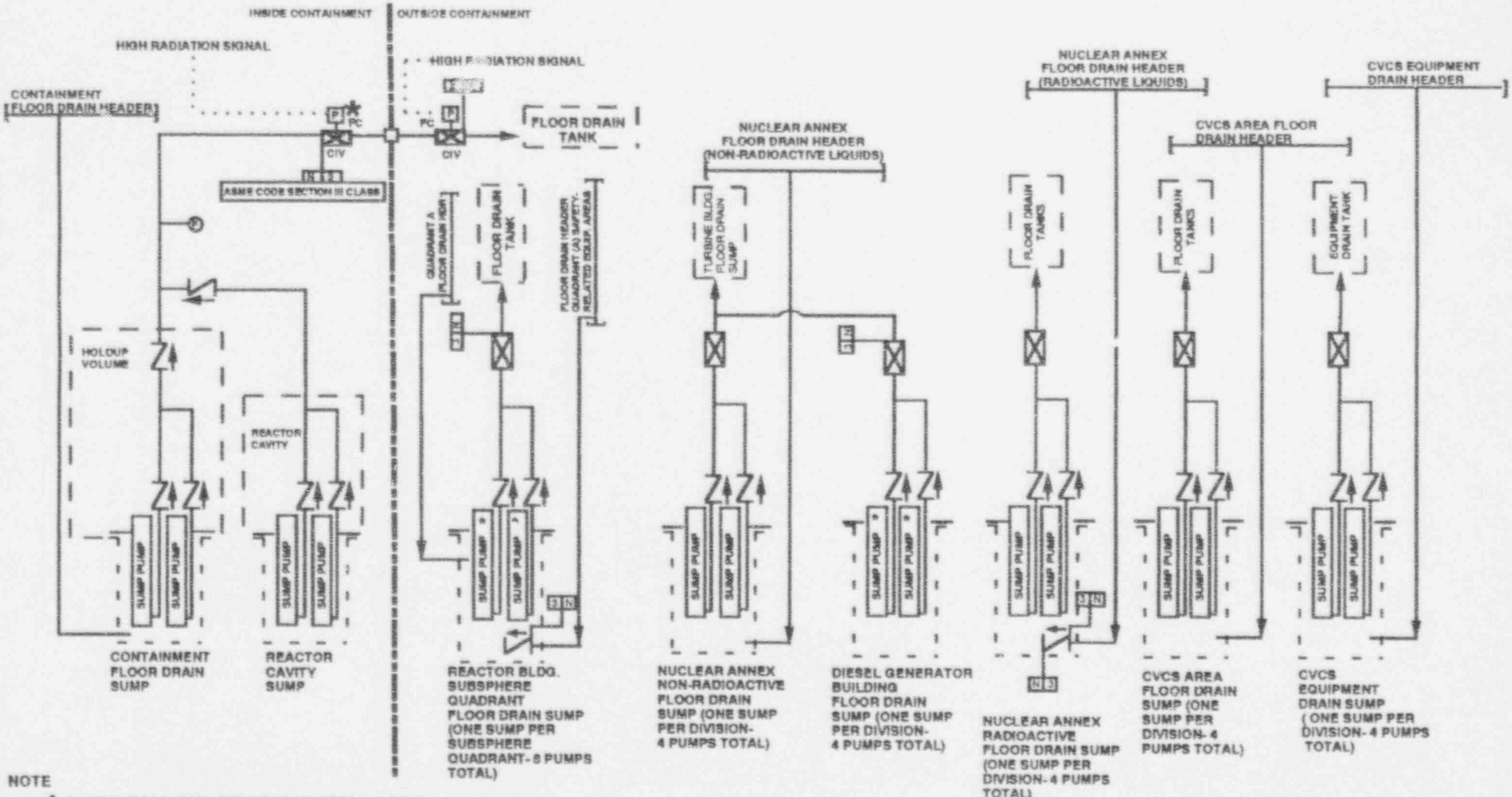
The turbine building floor drain sump is equipped with a radiation detection instrument. If radioactivity is detected in the turbine building floor drain sump, the sump discharge is automatically terminated and can be routed to the LWMS.

The ASME Section III Class for the EFDS pressure retaining components shown on Figure 2.7.15-1 is as depicted on the Figure.

Displays of EFDS instrumentation shown on Figure 2.7.15-1 exist in the main control room (MCR) or can be retrieved there.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.15-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Equipment and Floor Drainage System.



NOTE

1. * EQUIPMENT FOR WHICH PARAGRAPH NUMBER (3) OF THE "VERIFICATION FOR BASIC CONFIGURATION FOR SYSTEMS" OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.
2. THE SAFETY-RELATED ELECTRICAL EQUIPMENT IS CLASS 1E.

FIGURE 2.7.15-1
EQUIPMENT AND FLOOR DRAINAGE SYSTEM

TABLE 2.7.15-1

EQUIPMENT AND FLOOR DRAINAGE SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.a) The Basic Configuration of the EFDS is as shown on Figure 2.7.15-1.	1.a) Inspection of the as-built EFDS configuration will be conducted.	1.a) For the components and equipment shown on Figure 2.7.15-1, the as-built EFDS conforms with the Basic Configuration.
1.b) Displays of the EFDS instrumentation shown on Figure 2.7.15-1 exist in the MCR or can be retrieve there.	1.b) Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	1.b) Displays of the instrumentation shown on Figure 2.7.15-1 exist in the MCR or can be retrieved there.
2. The ASME Code Section III EFDS components shown on Figure 2.7.15-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those components of the EFDS required to be pressure tested by ASME Code Section III.	2. The results of the pressure test of ASME Code Section III components of the EFDS conform with the pressure testing acceptance criteria in ASME Code Section III.
3. The equipment and floor drains are separated into equipment drains, floor drains, chemical waste drains, and detergent waste drains. Liquid wastes are routed to the LWMS subsystem that processes the particular waste type.	3. Inspection of the EFDS will be performed.	3. Equipment drain liquid waste, floor drain liquid waste, chemical liquid waste, and detergent liquid waste are transported through separate piping to the LWMS subsystem that processes that waste type.
4. Nonradioactive equipment and floor drains are not connected to radioactive or potentially radioactive equipment and floor drains.	4. Inspection of the EFDS will be performed.	4. Nonradioactive equipment and floor drains are not connected to radioactive or potentially radioactive equipment and floor drains.

TABLE 2.7.15-1 (Continued)

EQUIPMENT AND FLOOR DRAINAGE SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5.a) Floor drains in the NA are physically separated into two Divisions and there are no common drain lines between Divisions.	5.a) Inspection of the EFDS will be performed.	5.a) The floor drains in the NA are separated by a Divisional wall and have no common drain lines between Divisions.
5.b) Floor drains in the RB subsphere are physically separated into quadrants (two in each Division) and there are no common floor drain lines between quadrants.	5.b) Inspection of the EFDS will be performed.	5.b) The EFDS RB subsphere floor drains in each quadrant of the RB subsphere are separated by walls and have no common drain lines between quadrants.
6. Within Containment, the EFDS has no direct gravity downward flowpath that will allow the release of radioactive material.	6. Inspection of the EFDS will be performed.	6. Within Containment, no direct downward flowpath that would allow the release of radioactive material exists.
7.a) The Class 1E loads shown on Figure 2.7.15-1 are powered from their respective Class 1E Division.	7.a) Testing will be performed on the EFDS by providing a test signal in only one Class 1E Division at a time.	7.a) Within the EFDS, a test signal exists only at the equipment powered from the Class 1E Division under test.
7.b) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the EFDS.	7.b) Inspection of the as-installed Class 1E Divisions of the EFDS will be performed.	7.b) Physical separation exists between Class 1E Divisions in the EFDS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the EFDS.

TABLE 2.7.15-1 (Continued)

EQUIPMENT AND FLOOR DRAINAGE SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8.a) The turbine building floor drain sump is equipped with a radiation detection instrument.	8.a) Inspection of the turbine building floor drain sump will be performed.	8.a) A radiation detection instrument is installed.
8.b) If radioactivity is detected in the turbine building floor drain sump, the sump discharge is automatically terminated and can be routed to the LWMS.	8.b) Testing of the flow termination from the turbine building floor drain sump will be performed using a signal that simulates radiation in the sump.	8.b) In response to a signal that simulates radioactivity in the turbine building floor drain sump, the sump discharge is automatically terminated.

2.7.16 CHEMICAL AND VOLUME CONTROL SYSTEM

Design Description

The Chemical and Volume Control System (CVCS) maintains the required volume of water in the reactor coolant system (RCS) (in conjunction with the pressurizer level control system), removes noble gases from the RCS, and permits addition of chemicals for primary coolant chemistry control. The CVCS removes coolant water from the RCS, passes the coolant water through filters and ion exchangers, adds or removes soluble boron from the coolant, provides backup spray water to the pressurizer, provides cooling water to the reactor coolant pump (RCP) seals, collects controlled RCP seal bleedoff, provides water to the spent fuel pool, and returns water to the RCS. The CVCS is a non-safety-related system except for portions of the system which form part of the reactor coolant pressure boundary, which are safety-related.

The Basic Configuration of the CVCS is as shown on Figure 2.7.16-1. Components shown on the Figure are located in the nuclear island structures.

The CVCS includes pumps, valves, tanks, heat exchangers, ion exchangers, piping, instrumentation, and controls.

Flow limiting orifices are provided in the letdown line.

The ASME Code Section III Class for the CVCS pressure retaining components shown on Figure 2.7.16-1 is as depicted on the Figure. The safety-related equipment shown on Figure 2.7.16-1 is classified Seismic Category I. Pressure retaining components in the charging pump suction line from the check valve to the pumps have a design pressure of at least 900 psig.

Displays of the CVCS instrumentation shown on Figure 2.7.16-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to start and stop the charging pumps and the dedicated seal injection pump, and to open and close those power operated valves shown on Figure 2.7.16-1.

CVCS alarms are provided as shown on Figure 2.7.16-1.

The dedicated seal injection pump receives Class 1E power. Each ASME Code Section III Class 1 letdown line isolation valve is powered from a different Class 1E Division.

Motor operated valves (MOVs) having an active safety function will open, or will close, or will open and also close, under differential pressure or fluid flow conditions and under temperature conditions.

Check valves shown on Figure 2.7.16-1 will open, or will close, or will open and also close, under system pressure, fluid flow conditions, or temperature conditions.

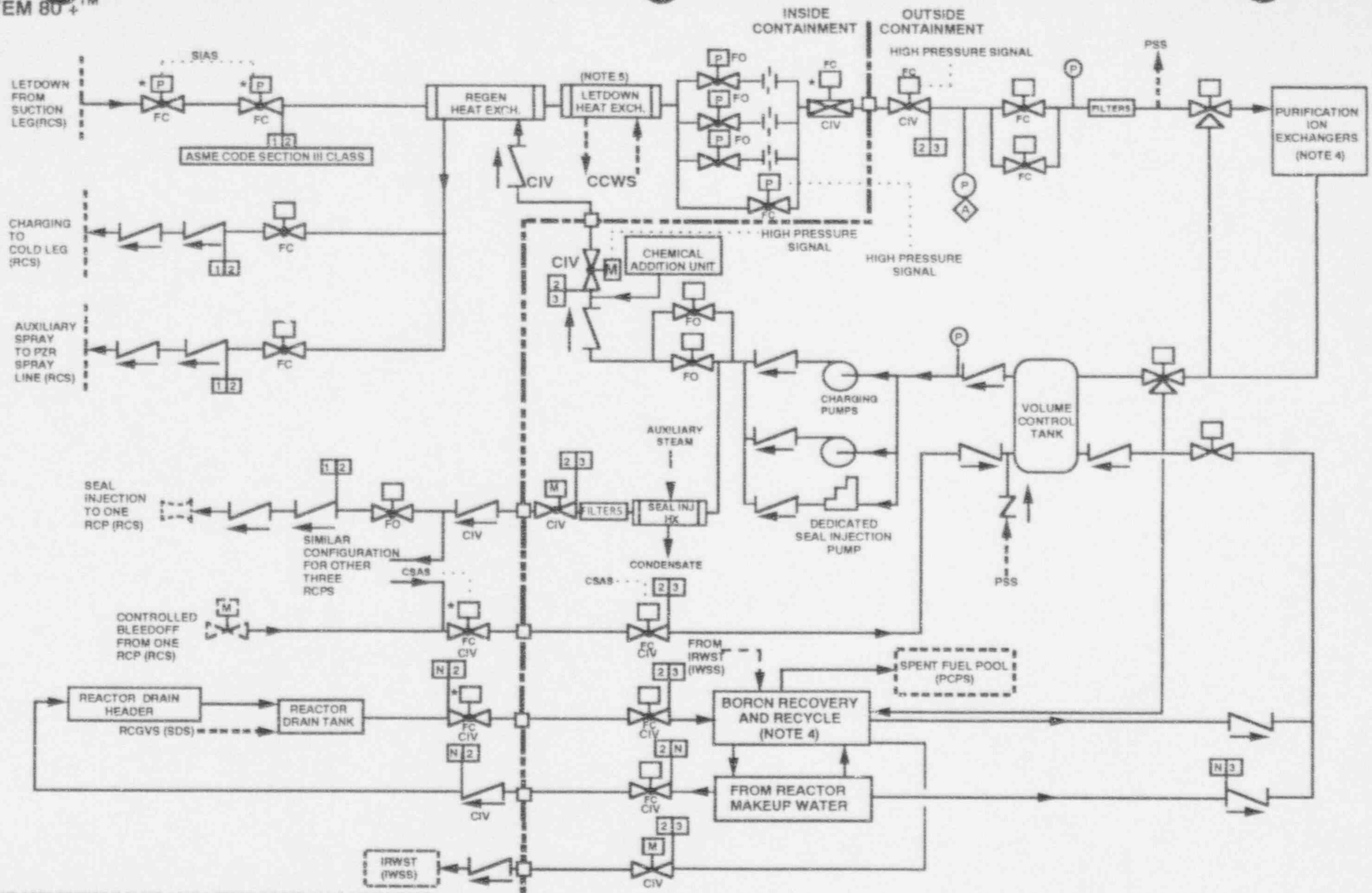
Valves with response positions indicated on Figure 2.7.16-1 change position to that indicated on the Figure upon loss of motive power.

The letdown line is isolated by a safety injection actuation signal (SIAS). The RCP controlled bleedoff line is isolated by a containment spray actuation signal (CSAS).

An interlock is provided so that no more than one charging pump is operating at a time.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.16-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Chemical and Volume Control System.



NOTES:
1. THE ASME CODE SECTION III CLASS 1 AND 2 PRESSURE RETAINING COMPONENTS SHOWN ARE SAFETY-RELATED.
2. THE DEDICATED SEAL INJECTION PUMP AND THE ASME CODE SECTION III CLASS 1 LETDOWN LINE ISOLATION VALVES RECEIVE CLASS 1E POWER.
3. *EQUIPMENT FOR WHICH PARAGRAPH NUMBER 3 OF THE "VERIFICATIONS FOR BASIC CONFIGURATION FOR SYSTEMS" SECTION OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.
4. SOME COMPONENTS WITHIN THESE SUBSYSTEMS ARE NON-ASME CODE SECTION III CLASS.
5. TUBE SIDE IS ASME CODE SECTION III CLASS 2 AND SHELL (CCW) SIDE IS ASME CODE SECTION III CLASS 3.

FIGURE 2.7.16-1
CHEMICAL AND VOLUME CONTROL SYSTEM

06-17-94

TABLE 2.7.16-1

CHEMICAL AND VOLUME CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the CVCS is as shown on Figure 2.7.16-1.	1. Inspection of the as-built CVCS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.16-1, the as-built CVCS conforms with the Basic Configuration.
2. The ASME Code Section III CVCS components shown on Figure 2.7.16-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those components of the CVCS required to be pressure tested by ASME Code Section III.	2. The results of the pressure test of ASME Code Section III components of the CVCS conform with the pressure testing acceptance criteria in ASME Code Section III.
3.a) Displays of CVCS instrumentation shown on Figure 2.7.16-1 exist in the MCR or can be retrieved there.	3.a) Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	3.a) Displays of the instrumentation shown on Figure 2.7.16-1 exist in the MCR or can be retrieved there.
3.b) Controls exist in the MCR to start and stop the charging pumps and the dedicated seal injection pump, and to open and close those power operated valves shown on Figure 2.7.16-1.	3.b) Testing will be performed using the CVCS controls in the MCR.	3.b) CVCS controls in the MCR operate to start and stop the charging pumps and the dedicated seal injection pump, and to open and close those power-operated valves shown on Figure 2.7.16-1.
3.c) CVCS alarms shown on Figure 2.7.16-1 are provided as shown on the Figure.	3.c) Testing of the CVCS alarms shown on Figure 2.7.16-1 will be performed using signals simulating alarm conditions.	3.c) The CVCS alarms shown on Figure 2.7.16-1 actuate in response to signals simulating alarm conditions.

TABLE 2.7.16-1 (Continued)

CHEMICAL AND VOLUME CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4.a) The dedicated seal injection pump receives Class 1E power.	4.a) Testing will be performed on the CVCS by providing a test signal in the Class 1E Division which supplies power to the dedicated seal injection pump.	4.a) A test signal exists at the CVCS component powered from the Class 1E Division under test.
4.b) Each ASME Code Section III Class 1 letdown line isolation valve is powered from a different Class 1E Division.	4.b) Testing will be performed on the CVCS by providing a test signal in only one Class 1E Division at a time.	4.b) A test signal exists only at the CVCS component powered from the Class 1E Division under test.
5. Valves with response positions indicated on Figure 2.7.16-1 change position to that indicated on the Figure upon loss of motive power.	5. Testing of loss of motive power to these valves will be performed.	5. These valves change position to the position indicated on Figure 2.7.16-1 on loss of motive power.
6.a) The letdown line is isolated by a safety injection actuation signal (SIAS).	6.a) Testing will be performed using a signal simulating an SIAS.	6.a) The two CVCS letdown isolation valves inside containment close upon receipt of a signal simulating an SIAS.
6.b) The RCP seal controlled bleedoff line is isolated by a containment spray actuation signal (CSAS).	6.b) Testing will be performed using a signal simulating a CSAS.	6.b) The RCP seal controlled bleedoff line isolation valves close upon receipt of a signal simulating a CSAS.
7. An interlock is provided so that no more than one charging pump is operating at a time.	7. Testing will be performed by attempting to start each charging pump from the MCR with the other pump running.	7. The idle charging pump will not start when the other pump is running.

TABLE 2.7.16-1 (Continued)

CHEMICAL AND VOLUME CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. Motor operated valves (MOVs) having an active safety function will open, or will close, or will open and also close, under differential pressure or fluid flow conditions and under temperature conditions.	8. Testing will be performed to open, or close, or open and also close, MOVs having an active safety function under preoperational differential pressure or fluid flow conditions and under temperature conditions.	8. Each MOV having an active safety function opens, or closes, or opens and also closes.
9. Check valves shown on Figure 2.7.16-1 will open, or will close, or will open and also close, under system pressure, fluid flow conditions, or temperature conditions.	9. Testing will be performed to open, or close, or open and also close, check valves shown on Figure 2.7.16-1 under system preoperational pressure, fluid flow conditions, or temperature conditions.	9. Each check valve shown on Figure 2.7.16-1, opens, or closes, or opens and also closes.
10. Flow limiting orifices are provided in the letdown line.	10. Inspection of the as-built letdown orifices will be performed.	10. Each letdown line flow limiting orifice has a cross-sectional area not greater than 0.01556 square feet.

2.7.17 CONTROL COMPLEX VENTILATION SYSTEM

Design Description

The Control Complex Ventilation System (CCVS) maintains environmental conditions within the control complex areas in the nuclear annex.

The CCVS consists of (a) the main control room air conditioning system (MCRACS) and the technical support center air conditioning system (TSCACS), and (b) the balance of the control complex air conditioning systems.

a) The Basic Configuration of the MCRACS and the TSCACS is as shown on Figure 2.7.17-1. The safety-related components of the MCRACS and the TSCACS are as indicated on the Figure.

The MCRACS consists of two Divisions. Each Division has an outside air intake, louver, tornado dampers, dampers, filtration unit, air conditioning with fan, ducting, instrumentation, and controls.

The TSCACS receives outside air from the MCRACS air intake ducts and has a filtration unit and an air conditioning unit.

Each outside air intake has a minimum of two redundant isolation dampers, at least one detector to detect the products of combustion, two radiation detection monitors, and a tornado damper.

The air intake isolation dampers close upon receipt of a signal indicating the detection of smoke. The smoke isolation signals can be manually overridden to open the isolation dampers from the main control room (MCR).

Upon detection of radiation in the outside air intakes, the air intake isolation dampers in the air intake having the higher radiation level close automatically. The air intake isolation dampers in the other air intake line remain open. After initial actuation of the air intake isolation dampers, the air intake isolation dampers realign automatically, such that the air intake having the lower radiation level opens before the isolation dampers in the air intake line having a higher radiation level close. The air intake isolation dampers can be manually controlled from the MCR.

Each MCR filtration unit and the technical support center (TSC) filtration unit remove particulate matter and iodine.

The MCR is maintained at a positive pressure with respect to adjacent areas.

The TSC can be pressurized with respect to adjacent areas.

The designated MCR filtration unit starts automatically and the MCR air conditioning unit starts or continues to operate, if running, on receipt of a safety injection actuation signal (SIAS) or a high radiation signal. In addition, the dampers in the MCR circulation lines and the bypass lines reposition to establish the flow path through the MCR filtration units.

b) The Basic Configuration of the balance of the CCVS is as shown on Figures 2.7.17-2 and 2.7.17-3. The safety-related portions of the balance of the CCVS are as shown on the Figures.

The CCVS serves the following safety-related areas: essential electrical equipment rooms, vital instrumentation and equipment rooms, battery rooms, and the remote shutdown panel room.

The CCVS serves the following non-safety related areas: the operation support center, non-essential electrical rooms, computer rooms, non-safety battery rooms and other non-essential areas within the control complex.

Each battery room has an exhaust fan taking suction near the battery room ceiling. Hydrogen detection devices are installed in the battery rooms.

Smoke removal is accomplished with the smoke purge fans.

The CCVS equipment shown on Figures 2.7.17-1, 2.7.17-2, and 2.7.17-3 is classified seismic Category I except as noted on the Figures.

Safety-related components of the CCVS are Class 1E.

The Class 1E loads shown on Figures 2.7.17-1, 2.7.17-2 and 2.7.17-3 are powered from their respective Class 1E Division.

The two MCRACS air intake isolation dampers in a Division are powered from different Class 1E buses.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the CCVS.

The active components of the two mechanical Divisions of the CCVS are physically separated.

Displays of the CCVS instrumentation shown on Figure 2.7.17-1 exist in the MCR or can be retrieved there.

Controls exist in the MCR to start and stop the MCR filtration units and air conditioning units, and the TSC filtration unit and air conditioning unit, and to open and close those power operated isolation dampers shown on Figures 2.7.17-1, 2.7.17-2, and 2.7.17-3.

Components with response positions indicated on Figure 2.7.17-1 change position to that indicated on the Figure upon loss of motive power.

The leakage through MCRACS intake ductwork is less than the maximum allowable for the associated design.

The fire dampers in the CCVS HVAC ductwork can close under design air flow conditions.

Inspections, Tests, Analyses, and Acceptance Criteria:

Table 2.7.17-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Control Complex Ventilation System.

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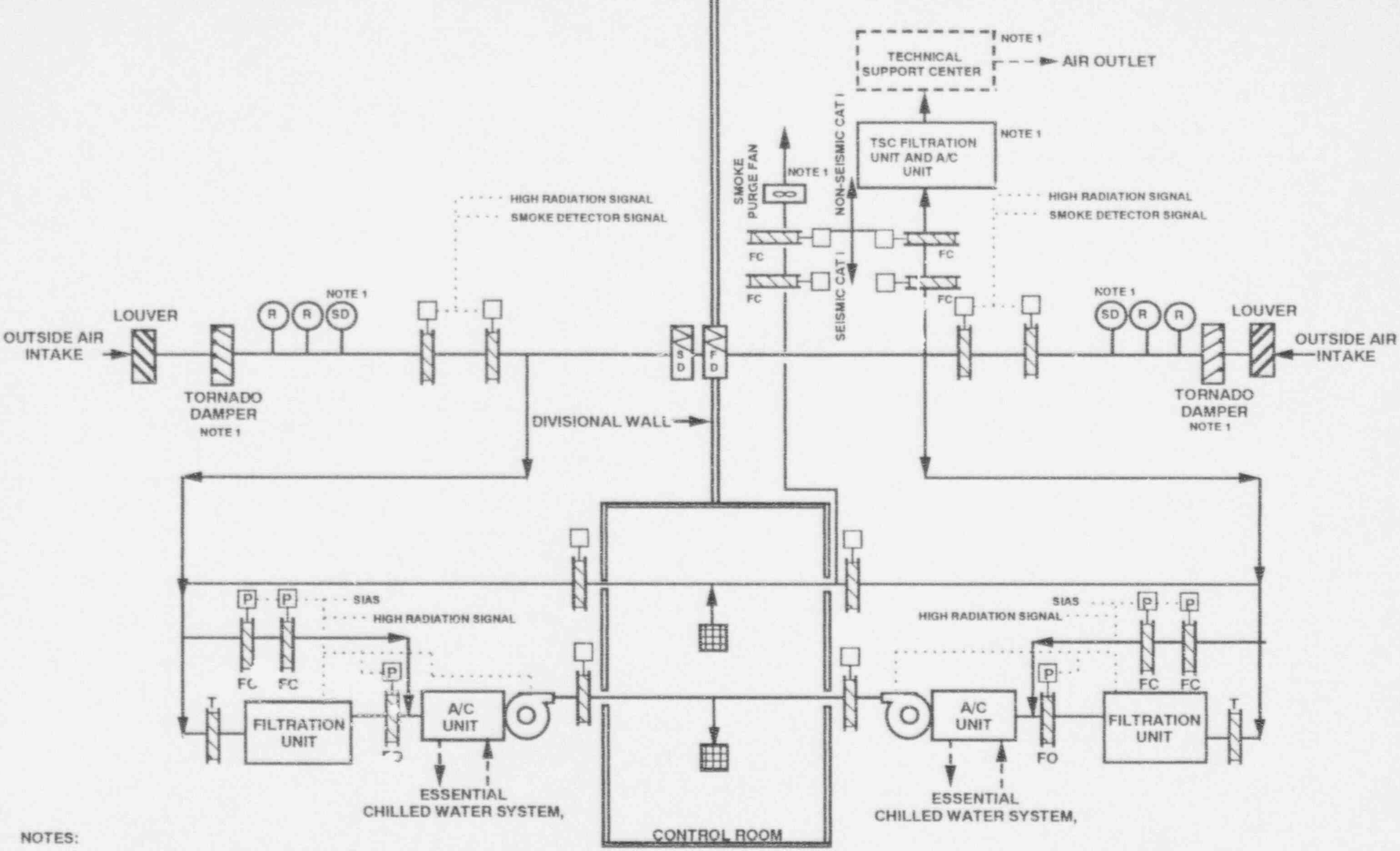

NOTES:

1. NON-SAFETY RELATED COMPONENTS.
2. SAFETY-RELATED ELECTRICAL EQUIPMENT IS CLASS 1E.

FIGURE 2.7.17-1
CONTROL COMPLEX VENTILATION SYSTEM
(MCRACS AND TSCACS)

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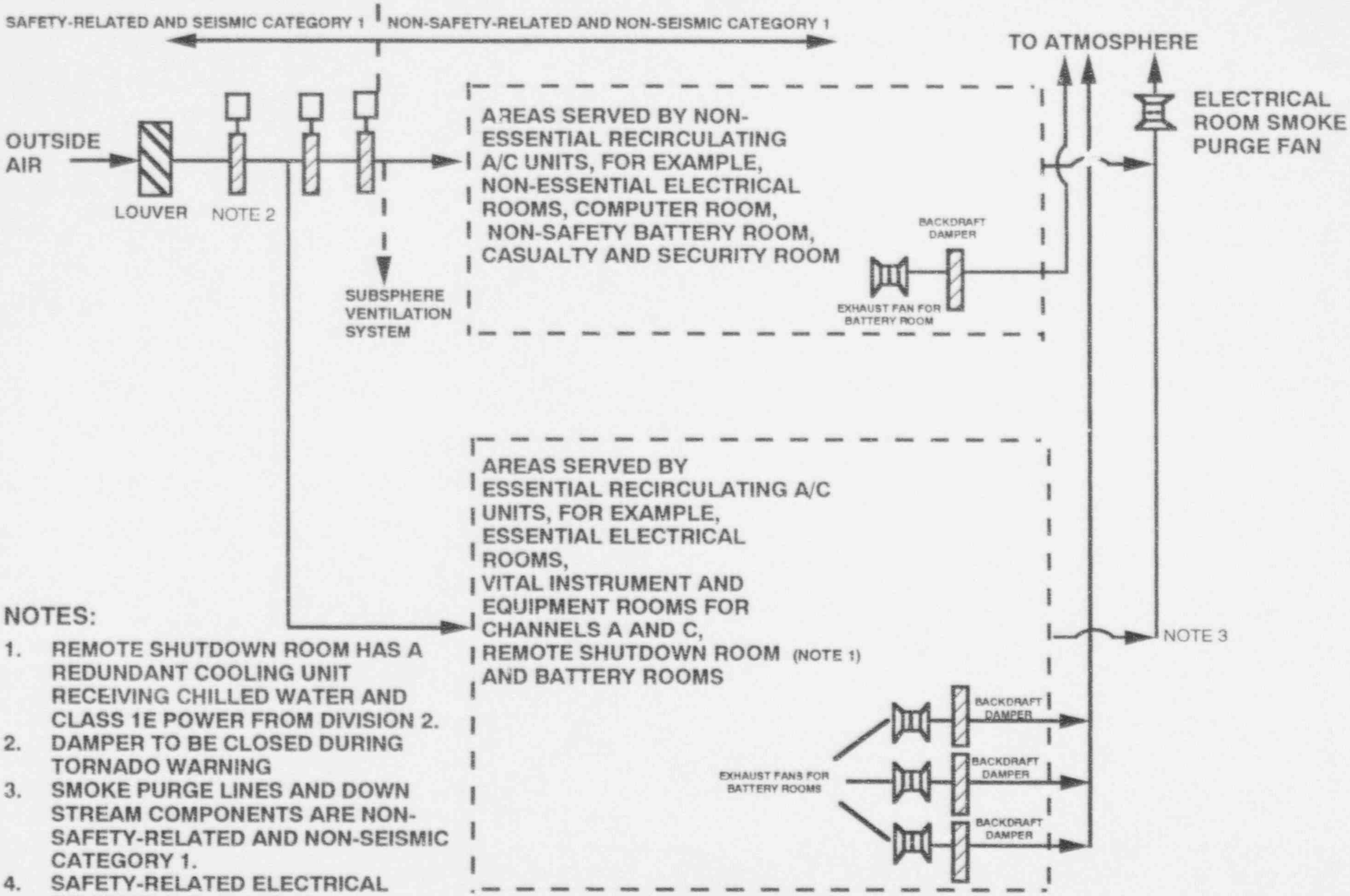

NOTES:

1. REMOTE SHUTDOWN ROOM HAS A REDUNDANT COOLING UNIT RECEIVING CHILLED WATER AND CLASS 1E POWER FROM DIVISION 2.
2. DAMPER TO BE CLOSED DURING TORNADO WARNING
3. SMOKE PURGE LINES AND DOWN STREAM COMPONENTS ARE NON-SAFETY-RELATED AND NON-SEISMIC CATEGORY 1.
4. SAFETY-RELATED ELECTRICAL EQUIPMENT IS CLASS 1E.

FIGURE 2.7.17-2
CONTROL COMPLEX VENTILATION SYSTEM
(BALANCE OF CCVS-DIVISION 1)

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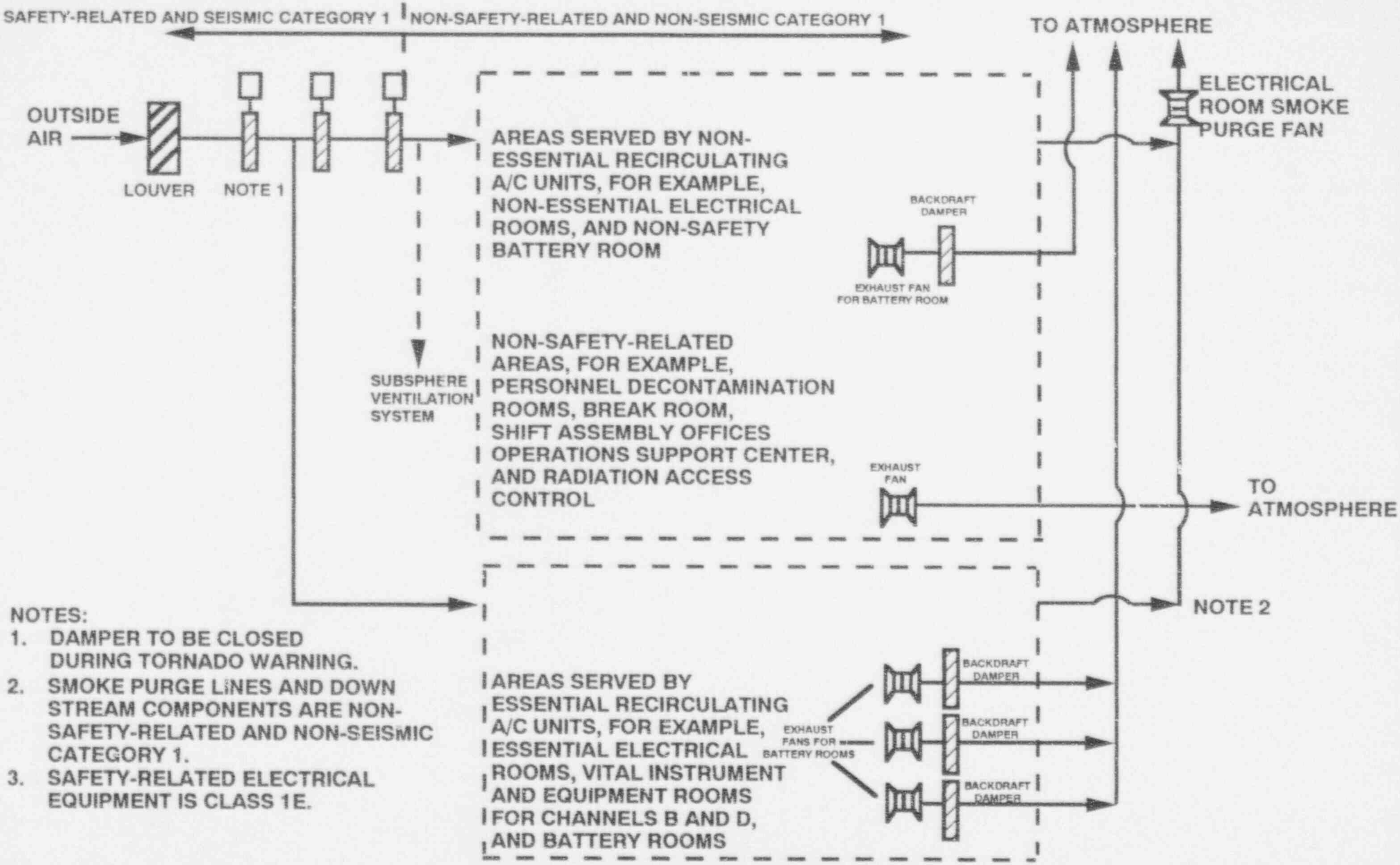


NOTES:

1. DAMPER TO BE CLOSED DURING TORNADO WARNING.
2. SMOKE PURGE LINES AND DOWN STREAM COMPONENTS ARE NON-SAFETY-RELATED AND NON-SEISMIC CATEGORY 1.
3. SAFETY-RELATED ELECTRICAL EQUIPMENT IS CLASS 1E.

FIGURE 2.7.17-3
CONTROL COMPLEX VENTILATION SYSTEM
(BALANCE OF CCVS-DIVISION 2)

06-17-94

TABLE 2.7.17-1

CONTROL COMPLEX VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the MCRACS and TSCACS is as shown on Figure 2.7.17-1.	1. Inspection of the as-built MCRACS and TSCACS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.17-1, the as-built MCRACS and TSCACS conform with the Basic Configuration.
2. The Basic Configuration of the balance of the CCVS is as shown on Figures 2.7.17-2 and 2.7.17-3.	2. Inspection of the balance of the as-built CCVS will be conducted.	2. For the components and equipment shown on Figures 2.7.17-2 and 2.7.17-3, the balance of the as-built CCVS conforms with the Basic Configuration.
3. The CCVS maintains environmental conditions within the control complex areas in the nuclear annex.	3. Testing will be performed on the CCVS to measure room temperatures and analyses will be performed to convert test data to limit temperatures.	3. The CCVS controls the temperature to: 3.a) less than 85°F in the MCR. 3.b) between 60°F and 90°F in the battery rooms. 3.c) less than or equal to 104°F in mechanical equipment rooms. 3.d) less than or equal to 85°F in other areas of the control complex.

TABLE 2.7.17-1 (Continued)

CONTROL COMPLEX VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4.a) The MCR outside air intake isolation dampers close upon receipt of a signal indicating the detection of smoke.	4.a) Testing will be conducted on each MCR outside air intake isolation damper using a signal that simulates the detection of smoke in the associated air intake.	4.a) Each isolation damper closes upon receipt of a signal simulating the detection of smoke in the associated air intake.
4.b) Smoke isolation signals can be manually overridden to open the isolation dampers from the MCR.	4.b) Testing will be performed to simulate smoke isolation signals and verify that the isolation dampers may be manually opened from the MCR.	4.b) With simulated smoke damper isolation signal present, isolation dampers may be manually opened from the MCR.
5. Upon detection of radiation in the outside air intakes, the air intake isolation dampers in the air intake having the higher radiation level close automatically. The air intake isolation dampers in the other air intake line remain open. After initial actuation of the air intake isolation dampers, the air intake isolation dampers realign automatically, such that the air intake having the lower radiation level opens before the isolation dampers in the air intake line having a higher radiation level close. The air intake isolation dampers can be manually controlled from the MCR.	5. Testing will be performed on the MCRACS isolation dampers using signals that simulate radiation levels in the outside air intakes.	5. Upon detection of radiation in the outside air intakes, the air intake isolation dampers in the air intake having the higher radiation level close automatically. The air intake isolation dampers in the other air intake line remain open. After initial actuation of the air intake isolation dampers, the air intake isolation dampers realign automatically, such that the air intake having the lower radiation level opens before the isolation dampers in the air intake line having a higher radiation level close. The air intake isolation dampers can be manually controlled from the MCR.

TABLE 2.7.17-1 (Continued)

CONTROL COMPLEX VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6. Each MCR filtration unit and the TSC filtration unit remove particulate matter and iodine.	6. Testing and analysis will be performed on each MCR filtration unit and the TSC filtration unit to determine filter efficiencies.	6. The MCR and TSC filter efficiencies are greater than or equal to 95% for all forms of non-particulate iodine and greater than or equal to 99% for particulate matter greater than 0.3 micron.
7. The MCR is maintained at a positive pressure with respect to the adjacent areas.	7. Testing and analysis will be performed on the MCRACS.	7. The MCR is pressurized to at least 0.125 inches of water gauge relative to the adjacent areas with outside air supply no more than 2000 CFM and a recirculation flow of at least 4000 CFM.
8. The TSC can be pressurized with respect to the adjacent areas.	8. Testing will be performed on the TSC.	8. The TSC can be maintained at a positive pressure with respect to the adjacent areas except for the MCR.
9. The designated MCR filtration unit starts automatically and the MCR air conditioning unit starts or continues to operate, if running, on receipt of a safety injection actuation signal (SIAS) or a high radiation signal. In addition, the dampers in the MCR circulation lines and the bypass lines reposition to establish the flow path through the MCR filtration units.	9. Testing will be performed on the MCR filtration units, MCR air conditioning units, and dampers using a signal that simulates a safety injection actuation signal (SIAS). The testing will be repeated for a signal that simulates a high radiation signal.	9. The MCR filtration units and MCR air conditioning units start on receipt of a signal that simulates a SIAS,or a signal that simulates high radiation,and dampers reposition to establish the flow path through the MCR filtration units.

TABLE 2.7.17-1 (Continued)

CONTROL COMPLEX VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10.a) Each battery room has an exhaust fan taking suction near the battery room ceiling.	10.a) Inspection of the battery rooms will be performed	10.a) An exhaust fan is installed in each battery room, and its suction duct is located near the ceiling.
10.b) Hydrogen detection devices are installed in the battery rooms.	10.b) Inspection for hydrogen detection devices in the battery rooms will be performed.	10.b) Hydrogen detection devices are installed.
11.a) The Class 1E loads shown on Figures 2.7.17-1, 2.7.17-2 and 2.7.17-3 are powered from their respective Class 1E Division.	11.a) Testing will be performed on the CCVS by providing a test signal in only one Class 1E Division at a time.	11.a) Within the CCVS, a test signal exists only at the equipment powered from the Class 1E Division under test.
11.b) The two MCRACS air intake isolation dampers in a Division are powered from different Class 1E buses.	11.b) Testing will be performed on the air intake isolation dampers in each MCRACS Division by providing a test signal in only one Class 1E bus at a time.	11.b) Within the MCRACS Division, a test signal exists only at the air intake isolation damper powered from the Class 1E bus under test.
11.c) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the CCVS.	11.c) Inspection of the as-installed Class 1E Divisions in the CCVS will be performed.	11.c) Physical separation exists between Class 1E Divisions in the CCVS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the CCVS.
12. The active components of the two mechanical divisions of the CCVS are physically separated.	12. Inspection of as-built mechanical separations will be conducted.	12. The active components of the two CCVS Divisions are separated by a Divisional Wall.

TABLE 2.7.17-1 (Continued)

CONTROL COMPLEX VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
13.a) Displays of the CCVS instrumentation shown on Figure 2.7.17-1 exist in the MCR or can be retrieved there.	13.a) Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	13.a) Display of the instrumentation shown on Figure 2.7.17-1 exist in the MCR or can be retrieved there.
13.b) Controls exist in the MCR to start and stop the MCR filtration units and the TSC filtration unit, and to open and close the isolation dampers shown on Figures 2.7.17-1, 2.7.17-2 and 2.7.17-3.	13.b) Tests will be performed using the CCVS controls in the MCR.	13.b) CCVS controls in the MCR operate to start and stop the MCR filtration units and the TSC filtration unit and air conditioning unit, and to open and close the power operated isolation dampers shown on Figures 2.7.17-1, 2.7.17-2 and 2.7.17-3.
14. Components with response positions indicated on Figure 2.7.17-1 change position to that indicated on the figure upon loss of motive power.	14. Testing of loss of motive power to these components will be performed.	14. These components change position to the position indicated on Figure 2.7.17-1 on loss of motive power.
15. The leakage through MCRACS intake ductwork is less than the maximum allowable for the associated design.	15. The ductwork will be pressure tested for leakage. Analysis of the dose to the MCR operators due to the measured leakage will be performed.	15. Analysis of the dose to the control room operators due to the measured leakage exists and concludes that the leakage through ductwork is less than the maximum allowable for the associated design.
16. The fire dampers in the CCVS HVAC ductwork can close under design air flow conditions.	16. A type test will be performed to demonstrate that the dampers can close under design air flow conditions.	16. A test and analysis report exists that concludes the fire dampers can close under design air flow conditions.

2.7.18 FUEL BUILDING VENTILATION SYSTEM

Design Description

The Fuel Building Ventilation System (FBVS) provides ventilation, heating, and cooling to the fuel handling and fuel storage areas located in the nuclear annex.

The Basic Configuration of the FBVS is as shown on Figure 2.7.18-1. The FBVS has a non-safety-related air supply subsystem and a safety-related air exhaust subsystem.

The FBVS has one air supply subsystem and two Divisions of air exhaust. The air supply subsystem has an air supply unit, a fan, dampers, ductwork, instrumentation, and controls. Each Division of air exhaust has a filtration unit, a fan, dampers, ductwork, instrumentation, and controls. The filtration unit in each FBVS air exhaust Division removes particulate matter.

Each Division of air exhaust has the capability to maintain the fuel handling and fuel storage areas of the nuclear annex at a negative pressure relative to the atmosphere.

The safety-related equipment shown on Figure 2.7.18-1 is classified Seismic Category I.

The Class 1E loads shown on Figure 2.7.18-1 are powered from their respective Class 1E Division.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the FBVS.

The active components of the two mechanical Divisions of the FBVS air exhaust subsystem are physically separated.

Displays of the FBVS instrumentation shown on Figure 2.7.18-1 exist in the main control room (MCR) or can be retrieved there.

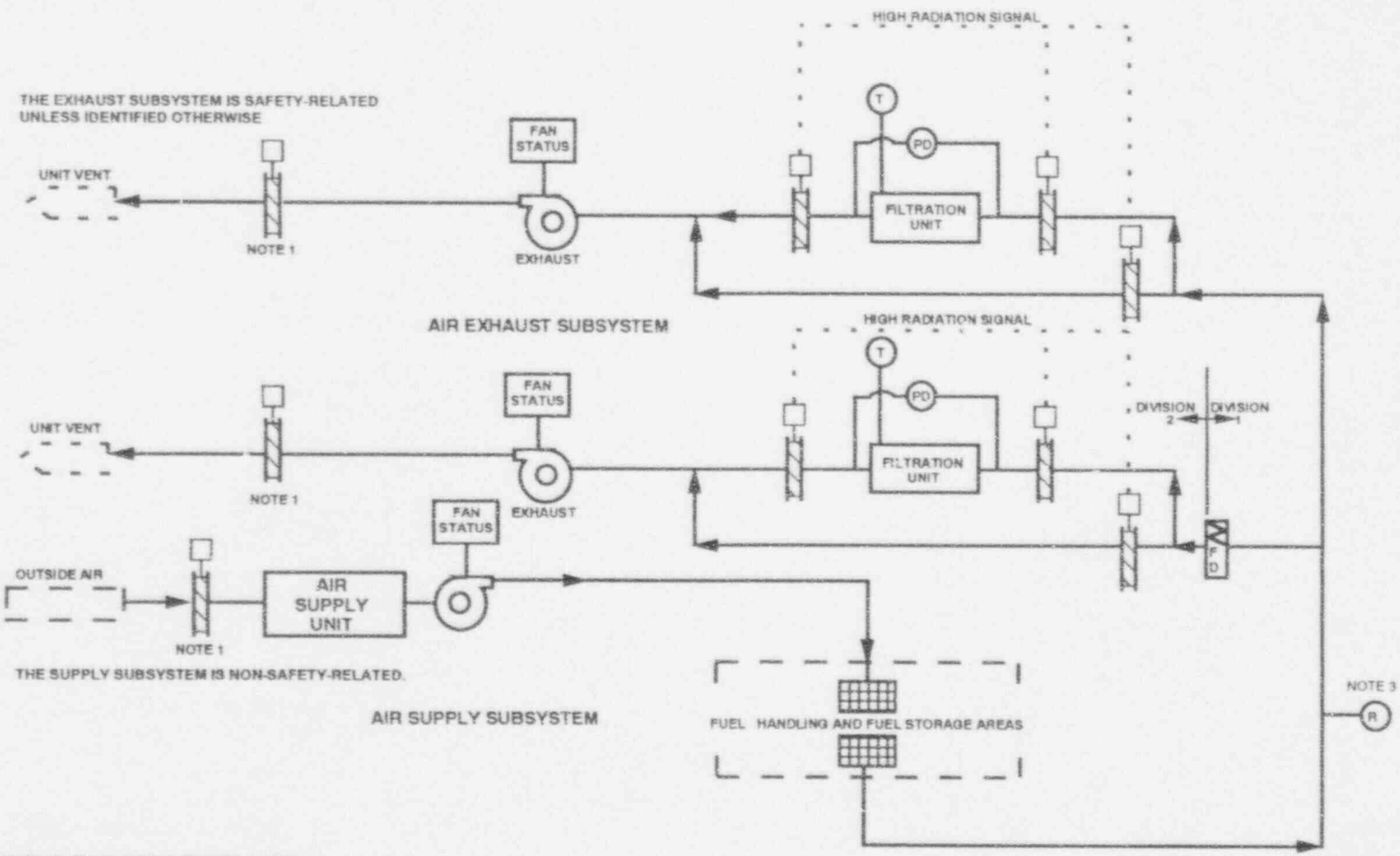
Controls exist in the MCR to start and stop the FBVS air supply unit, fans, and filtration units, and to open and close the power operated dampers shown on Figure 2.17.18-1.

In response to a high radiation signal, the FBVS air exhaust bypass dampers close and the filtration unit dampers open to direct flow through the filtration units.

The exhaust and supply fans can be used for smoke removal. The fire dampers in HVAC ductwork close under design air flow conditions.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.18-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Fuel Building Ventilation System.



NOTES:

1. THE DUCTWORK FROM THE BUILDING EXIT UP TO AND INCLUDING THE ISOLATION DAMPER IS QUALIFIED FOR THE TORNADO DIFFERENTIAL PRESSURE.
2. THE ELECTRICAL LOADS SHOWN FOR THE AIR EXHAUST SUBSYSTEM ARE CLASS 1E.
3. THE RADIATION DETECTION INSTRUMENTATION IS NON-SAFETY-RELATED.

FIGURE 2.7.18-1
FUEL BUILDING VENTILATION SYSTEM

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TABLE 2.7.18-1

FUEL BUILDING VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the FBVS is as shown on Figures 2.7.18-1.	1. Inspection of the as-built FBVS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.18-1, the as-built FBVS conforms with the Basic Configuration.
2. The filtration unit in each FBVS air exhaust Division removes particulate matter.	2. Testing and analysis will be performed on each FBVS filtration unit to determine filter efficiency.	2. The FBVS filter efficiencies are greater than or equal to 99% for particulate matter greater than 0.3 microns.
3. Each Division of air exhaust has the capability to maintain the fuel handling and fuel storage areas of the nuclear annex at a negative pressure relative to the atmosphere.	3. Testing will be performed for each Division to measure the pressure in the fuel handling and fuel storage areas of the nuclear annex with a FBVS Division operating.	3. A negative pressure can be maintained relative to atmospheric pressure in the fuel handling and fuel storage areas of the nuclear annex.
4.a) The Class 1E loads shown on Figure 2.7.18-1 are powered from their respective Class 1E Division.	4.a) Testing will be performed on the FBVS by providing a test signal in only one Class 1E Division at a time.	4.a) Within the FBVS, a test signal exists only at the equipment powered from the Class 1E Division under test.
4.b) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the FBVS.	4.b) Inspection of the as-installed Class 1E Divisions in the FBVS will be performed.	4.b) Physical separation exists between Class 1E Divisions in the FBVS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the FBVS.
5. The active components of the two mechanical Divisions of the FBVS air exhaust subsystem are physically separated.	5. Inspection of the as-built FBVS will be performed.	5. The active components of the two mechanical Divisions of the FBVS are separated by a Divisional wall or fire barriers.

TABLE 2.7.18-1 (Continued)

FUEL BUILDING VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6.a) Displays of the FBVS instrumentation shown on Figure 2.7.18-1 exist in the MCR or can be retrieved there.	6.a) Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	6.a) Displays of the instrumentation shown on Figure 2.7.18-1 exist in the MCR or can be retrieved there.
6.b) Controls exist in the MCR to start and stop the FBVS air supply unit, fans, and filtration units and to open and close those power operated dampers shown on Figure 2.7.18-1.	6.b) Testing will be performed using the FBVS controls in the MCR.	6.b) FBVS controls in the MCR operate to start and stop the FBVS air supply unit, fans, and filtration units, and to open and close those dampers shown on Figure 2.7.18-1.
7. In response to a high radiation signal, the FBVS air exhaust bypass dampers close and the filtration unit dampers open to direct flow through the filtration units.	7. Testing will be conducted while exhaust filters are in bypass mode using signals that simulate a high radioactivity level.	7. In response to a signal that simulates a high radioactivity level, the bypass dampers in the air exhaust ductwork close and the dampers in the filtration unit ductwork open.
8. The fire dampers in the FBVS ductwork can close under design air flow conditions.	8. A type test will be performed to demonstrate that the dampers can close under design air flow conditions.	8. A test and analysis report exists that concludes the fire dampers can close under design air flow conditions.

2.7.19 DIESEL BUILDING VENTILATION SYSTEM

Design Description

The Diesel Building Ventilation System (DBVS) provides ventilation, cooling and heating to each of the two diesel generator areas inside the nuclear annex.

The exhaust and supply fans can be used for smoke removal.

The Basic Configuration of the DBVS is as shown on Figure 2.7.19-1. The safety-related components of the DBVS are as shown on the Figure.

The safety-related equipment shown on Figure 2.7.19-1 is classified Seismic Category I.

The safety-related components shown on Figure 2.7.19-1 are powered from their respective Class 1E Divisions.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the DBVS.

Active components of the two mechanical Divisions of the DBVS are physically separated.

Displays of the DBVS instrumentation shown on Figure 2.7.19-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to start and stop the DBVS fans shown on Figure 2.7.19-1.

The safety-related DBVS fans in a Division start automatically and the non-safety fans stop automatically when the diesel generator starts.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.19-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Diesel Building Ventilation System.

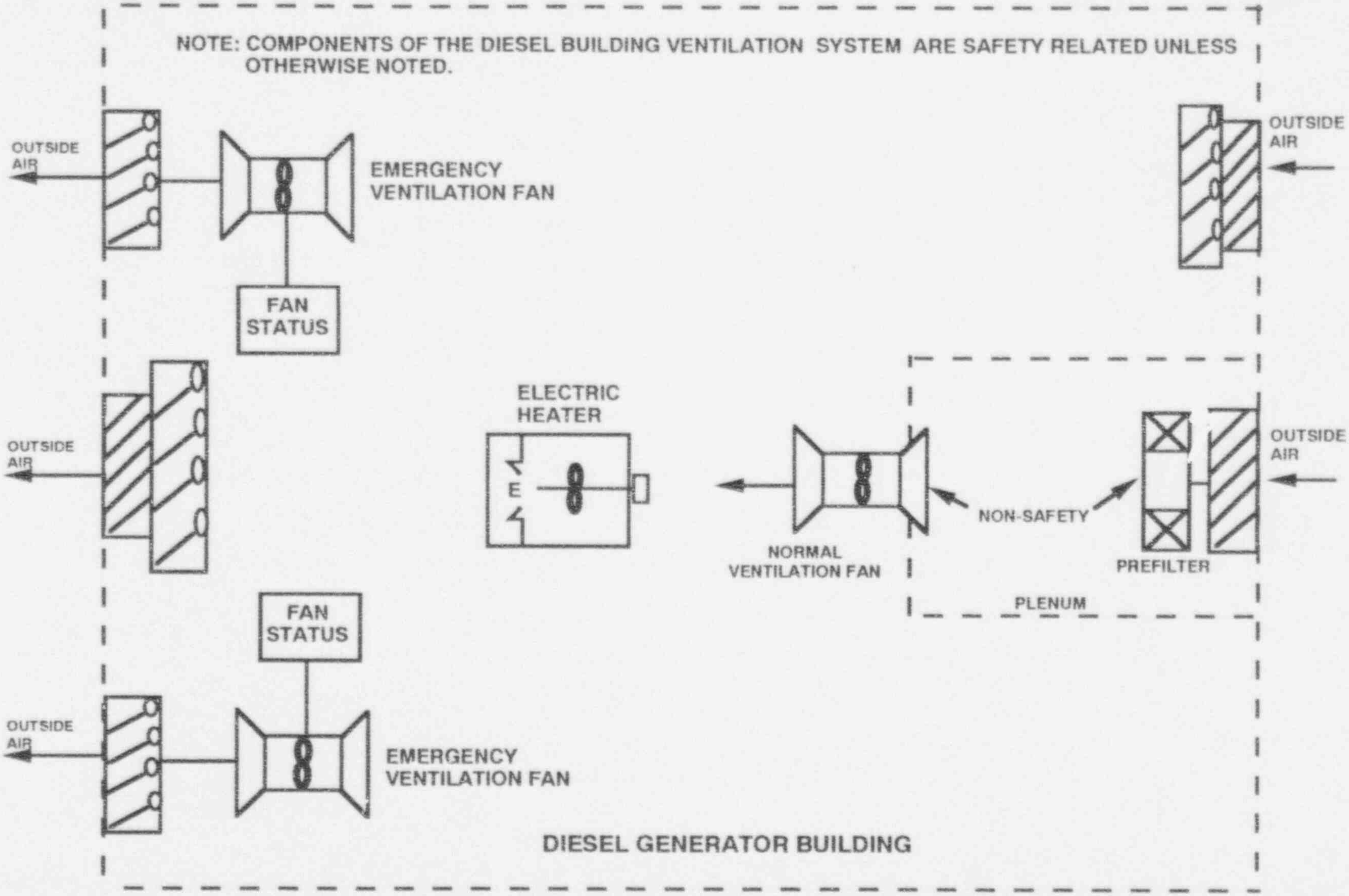


FIGURE 2.7.19-1
DIESEL BUILDING VENTILATION SYSTEM
(ONE OF TWO DIVISIONS)

06-17-94

TABLE 2.7.19-1

DIESEL BUILDING VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the DBVS is as shown on Figure 2.7.19-1.	1. Inspection of the as-built DBVS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.19-1, the as-built DBVS conforms with the Basic Configuration.
2.a) The safety-related DBVS components are powered from their respective Class 1E Division.	2.a) Testing will be performed on the DBVS by providing a test signal in only one Class 1E Division at a time.	2.a) Within the DBVS, a test signal exists only at the equipment powered from the Class 1E Division under test.
2.b) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the DBVS.	2.b) Inspection of the as-installed Class 1E Divisions in the DBVS will be performed.	2.b) Physical separation exists between Class 1E Divisions in the DBVS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the DBVS.
3.a) Displays of the DBVS instrumentation shown on Figure 2.7.19-1 exist in the MCR or can be retrieved there.	3.a) Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	3.a) Displays of the instrumentation shown on Figure 2.7.19-1 exist in the MCR or can be retrieved there.
3.b) Controls exist in the MCR to start and stop the DBVS fans shown on Figure 2.7.19-1.	3.b) Testing will be performed using the DBVS controls in the MCR.	3.b) DBVS controls in the MCR operate to start and stop the DBVS fans shown on Figure 2.7.19-1.
4. Active components of the two mechanical Divisions of the DBVS are physically separated.	4. Inspection of the as-built mechanical Divisions will be performed.	4. The active components of the two mechanical Divisions of the DBVS are separated by a Divisional wall or a fire barrier.

TABLE 2.7.19-1 (Continued)

DIESEL BUILDING VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. The safety-related DBVS fans in a Division start automatically and the non-safety fans stop automatically when the diesel generator starts.	5. Testing will be performed for each Division using an actual diesel start or a signal that simulates a diesel start.	5. The safety-related DBVS fans in a Division are started automatically and the non-safety fans are stopped automatically by an actual diesel start, or by a signal that simulates a diesel start, in the Division under test.

2.7.20 SUBSPHERE BUILDING VENTILATION SYSTEM

Design Description

The Subsphere Building Ventilation System (SBVS) provides ventilation, cooling and heating to the subsphere building. The SBVS is located in the nuclear annex (NA) and the reactor building (RB). The SBVS has a safety-related air exhaust subsystem and a non-safety-related air supply subsystem.

The following safety-related rooms are cooled by the essential chilled water system recirculating units:

> safety injection pump rooms, shutdown cooling pump rooms, containment spray pump rooms, fuel pool heat exchanger rooms, motor-driven and steam-driven emergency feedwater pump rooms, shutdown cooling heat exchanger rooms, containment spray heat exchanger rooms, and penetration rooms.

The Basic Configuration of the SBVS is as shown on Figure 2.7.20-1.

The SBVS has two Divisions. Each Division of the SBVS has a filtration unit, fans, dampers, an air supply unit, ductwork, instrumentation, and controls. Each SBVS filtration unit removes particulate matter.

Each SBVS Division maintains its Division of the subsphere building at a negative pressure relative to the atmosphere.

The safety-related equipment shown on Figure 2.7.20-1 is classified Seismic Category I.

Active components of the two Divisions of the SBVS are physically separated.

Safety-related components of the SBVS are powered from their respective Class 1E Division.

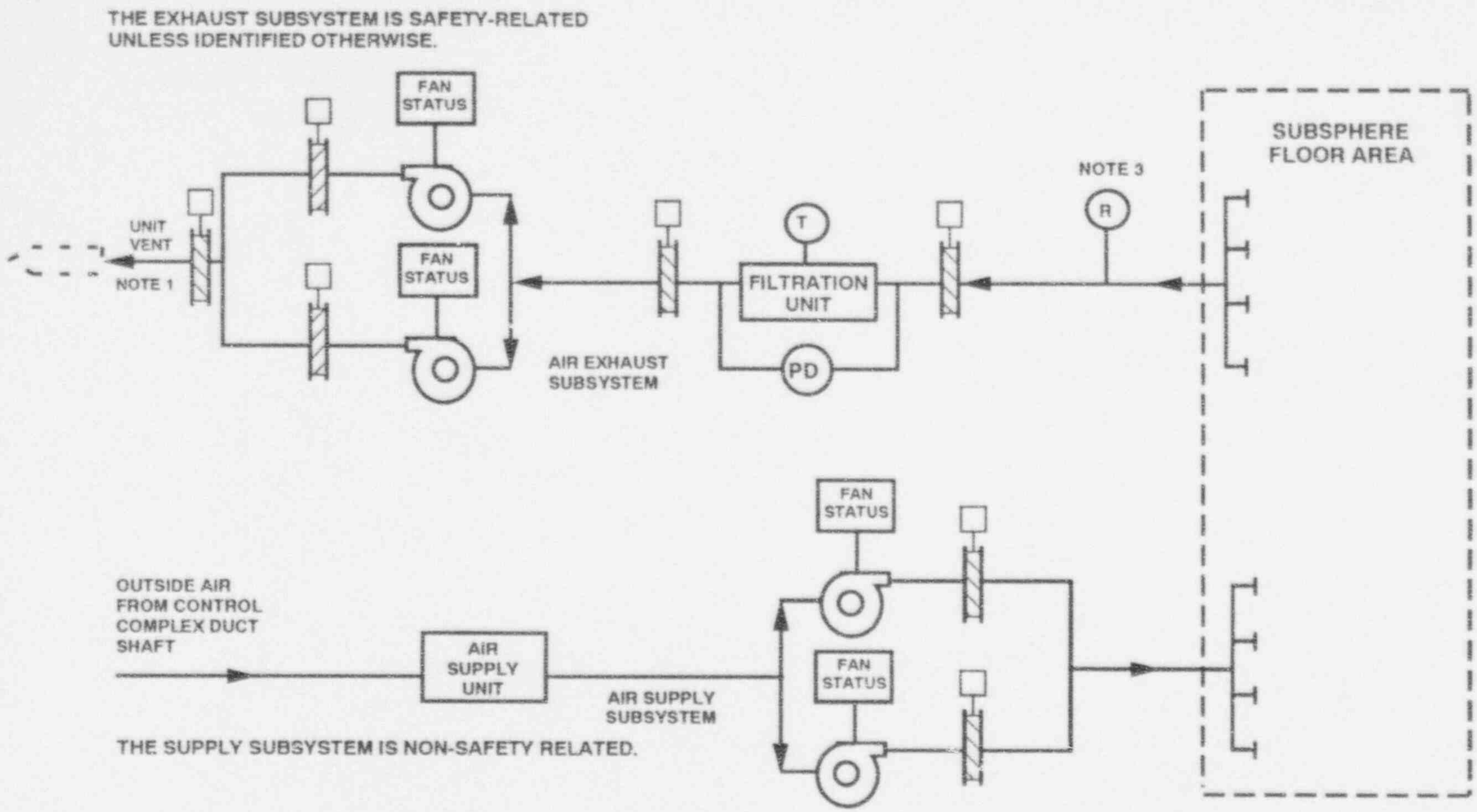
Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the SBVS.

Displays of the SBVS instrumentation shown on Figure 2.7.20-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to start and stop the SBVS air supply units, filtration units and fans, and to open and close those power operated dampers shown on Figure 2.7.20-1.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.20-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Subsphere Building Ventilation System.



NOTES:
1. THE DUCT WORK FROM THE BUILDING EXIT UP TO AND INCLUDING THE ISOLATION DAMPER IS QUALIFIED FOR THE TORNADO DIFFERENTIAL PRESSURE.
2. SAFETY-RELATED ELECTRICAL EQUIPMENT OF THE AIR EXHAUST SUBSYSTEM IS CLASS 1E.
3. THE RADIATION DETECTOR INSTRUMENTATION IS NON-SAFETY-RELATED.

06-17-94

FIGURE 2.7.20-1
SUBSPHERE BUILDING VENTILATION SYSTEM
(ONE OF TWO DIVISIONS)

TABLE 2.7.20-1

SUBSPHERE BUILDING VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the SBVS is as shown on Figure 2.7.20-1.	1. Inspection of the as-built SBVS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.20-1, the as-built SBVS conforms with the Basic Configuration.
2. Each SBVS filtration unit removes particulate matter.	2. Testing and analysis will be performed on each SBVS filtration unit to determine filter efficiency.	2. The SBVS filter efficiencies are greater than or equal to 99% for particulate matter greater than 0.3 micron.
3. Each SBVS Division maintains its Division of the subsphere building at a negative pressure relative to the atmosphere.	3. Testing will be performed to measure the subsphere building pressure in each Division with the SBVS operating.	3. Each Division of the SBVS maintains its Division of the subsphere building at a negative pressure relative to the atmosphere.
4. Active components of the two Divisions of the SBVS are physically separated.	4. Inspection of the as-built SBVS will be performed.	4. The active components of the two mechanical Divisions of the SBVS are separated by a Divisional wall or a fire barrier.
5.a) Safety related components shown on Figure 2.7.20-1 are powered from their respective Class 1E Divisions.	5.a) Testing will be performed on the SBVS by providing a test signal in only one Class 1E Division at a time.	5.a) Within the SBVS, a test signal exists only at the equipment powered from the Class 1E Division under test.
5.b) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the SBVS.	5.b) Inspection of the as-installed Class 1E Divisions in the SBVS will be performed.	5.b) Physical separation exists between Class 1E Divisions in the SBVS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the SBVS.

TABLE 2.7.20-1 (Continued)

SUBSPHERE BUILDING VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6.a) Displays of the SBVS instrumentation shown on Figure 2.7.20-1 exist in the MCR or can be retrieved there.	6.a) Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	6.a) Displays of the instrumentation shown on Figure 2.7.20-1 exist in the MCR or can be retrieved there.
6.b) Controls exist in the MCR to start and stop the SBVS air supply units, filtration units and fans, and to open and close those power operated dampers shown on Figure 2.7.20-1.	6.b) Testing will be performed using the SBVS controls in the MCR.	6.b) SBVS controls in the MCR operate to start and stop the SBVS air supply units, filtration units and fans, and to open and close those power operated dampers shown on Figure 2.7.20-1.

2.7.21 CONTAINMENT PURGE VENTILATION SYSTEM

Design Description

The Containment Purge Ventilation System (CPVS) has a Low Purge Subsystem and a High Purge Subsystem. The Low Purge Subsystem provides Containment pressure relief during plant startup and shutdown and ventilation in the area of the in-containment refueling water storage tank. The High Purge Subsystem reduces airborne radioactivity and maintains environmental conditions within containment during plant outages.

The CPVS is located in the nuclear annex (NA) and the reactor building (RB).

The Basic Configurations of the CPVS Low Purge and High Purge Subsystems are as shown on Figures 2.7.21-1 and 2.7.21-2, respectively. The CPVS is non-safety-related with the exception of the containment penetration isolation valves and piping in between covered in Section 2.4.5.

Each subsystem of the CPVS has an air supply unit, a filtration unit, fans, ductwork, instrumentation, and controls. Each CPVS filtration unit removes particulate matter.

The safety-related equipment shown on Figures 2.7.21-1 and 2.7.21-2 is classified Seismic Category I.

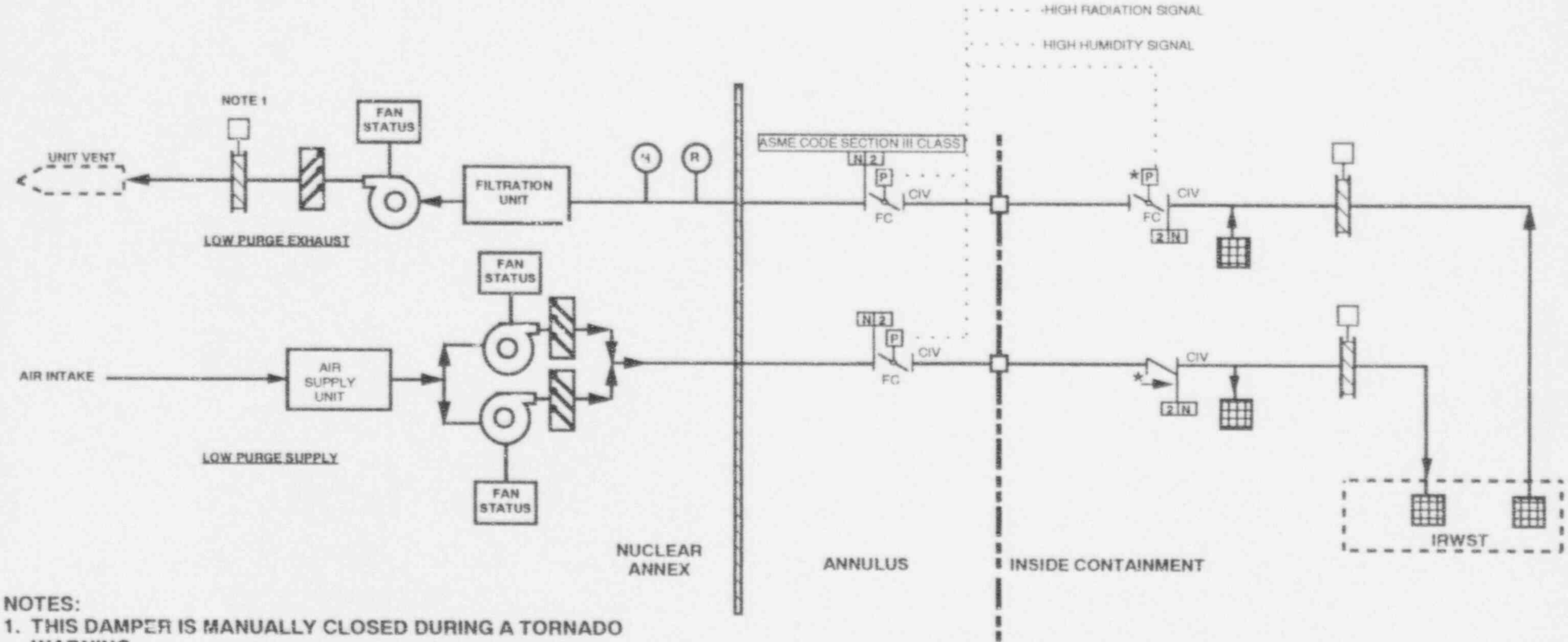
Displays of the CPVS instrumentation shown on Figures 2.7.21-1 and 2.7.21-2 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to start and stop the CPVS air supply units, filtration units, and fans, and to open and close those power operated dampers and valves shown on Figures 2.7.21-1 and 2.7.21-2.

In response to a high radiation signal or a high humidity signal, the CPVS exhaust Containment isolation valves close.

Inspection, Test, Analyses, and Acceptance Criteria

Table 2.7.21-1 provides the inspections, test, analyses, and associated acceptance criteria for the Containment Purge Ventilation System.

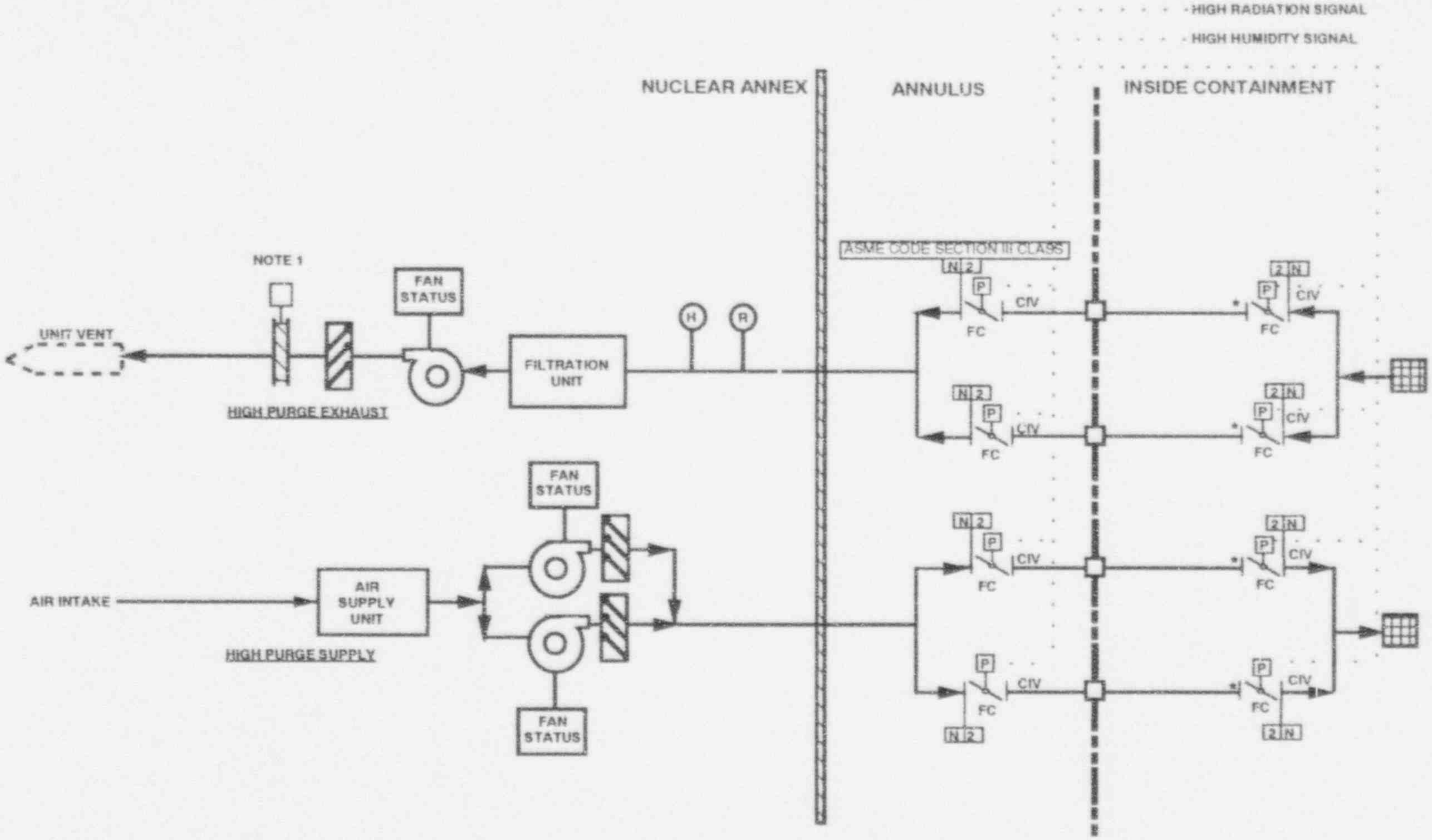


NOTES:

1. THIS DAMPER IS MANUALLY CLOSED DURING A TORNADO WARNING.
2. * EQUIPMENT FOR WHICH PARAGRAPH NUMBER (3) OF THE " VERIFICATIONS FOR BASIC CONFIGURATION FOR SYSTEMS" OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.
3. THE SAFETY-RELATED ELECTRICAL EQUIPMENT IS CLASS 1E.

FIGURE 2.7.21-1
CONTAINMENT PURGE VENTILATION SYSTEM (LOW PURGE)

06-17-94



NOTES:

1. THIS DAMPER IS MANUALLY CLOSED DURING A TORNADO WARNING.
2. * EQUIPMENT FOR WHICH PARAGRAPH NUMBER (3) OF THE " VERIFICATION FOR BASIC CONFIGURATION FOR SYSTEMS" OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.
3. THE SAFETY-RELATED ELECTRICAL EQUIPMENT IS CLASS 1E.

FIGURE 2.7.21-2
CONTAINMENT PURGE VENTILATION SYSTEM (HIGH PURGE)

06-17-94

TABLE 2.7.21-1

CONTAINMENT PURGE VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configurations of the CPVS Low Purge and High Purge Subsystems are as shown on Figures 2.7.21-1 and 2.7.21-2, respectively.	1. Inspection of the as-built CPVS configuration will be conducted.	1. For the components and equipment shown on Figures 2.7.21-1 and 2.7.21-2, the as-built CPVS Low Purge and High Purge Subsystems conform with the Basic Configurations.
2. Each CPVS filtration unit removes particulate matter.	2. Testing and analysis will be performed on each CPVS filtration unit to determine filter efficiency.	2. The CPVS filter efficiencies are greater than or equal to 99% for particulate matter greater than 0.3 microns.
3.a) Displays of the CPVS instrumentation shown on Figures 2.7.21-1 and 2.7.21-2 exist in the MCR or can be retrieved there.	3.a) Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	3.a) Displays of the instrumentation shown on Figure 2.7.21-1 exist in the MCR or can be retrieved there.
3.b) Controls exist in the MCR to start and stop the CPVS air supply units, filtration units, and fans,and to open and close the power operated dampers and valves shown on Figures 2.7.21-1 and 2.7.21-2.	3.b) Testing will be performed using the CPVS controls in the MCR.	3.b) CPVS controls in the MCR operate to start and stop the CPVS air supply units, filtration units, and fans, and to open and close the power operated dampers and valves shown on Figures 2.7.21-1 and 2.7.21-2.

TABLE 2.7.21-1 (Continued)

CONTAINMENT PURGE VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. In response to a high radiation signal or a high humidity signal, the CPVS exhaust Containment isolation valves close.	4. Testing will be performed on the CPVS exhaust Containment isolation valves using signals that simulate high radiation or high humidity in separate tests.	4. The CPVS exhaust Containment isolation valves close upon receipt of a signal that simulates high radiation or high humidity.
5. Valves with response positions indicated on Figures 2.7.21-1 and 2.7.21-2 change position to that indicated on the Figures upon loss of motive power.	5. A test of loss of motive power to these valves will be performed.	5. These valves change position to the position indicated on Figures 2.7.21-1 and 2.7.21-2 on loss of motive power.

2.7.22 CONTAINMENT COOLING AND VENTILATION SYSTEM

Design Description

The Containment Cooling and Ventilation System provides cooling and air recirculation in the Containment. The Containment Cooling and Ventilation System has a Containment Recirculation Cooling Subsystem, a Control Element Drive Mechanism Cooling Subsystem, a Reactor Cavity Cooling Subsystem, a Containment Pressurizer Cooling Subsystem, and a Containment Air Cleanup Subsystem. The Containment Cooling and Ventilation System is non-safety-related. The Containment Cooling and Ventilation System is located within the Containment except for the radiation instrument which can be located outside the Containment.

The Basic Configuration of the Containment Cooling and Ventilation System is as shown on Figure 2.7.22-1. The Containment Recirculation Cooling Subsystem, the Control Element Drive Mechanism Cooling Subsystem, the Reactor Cavity Cooling Subsystem, and the Containment Pressurizer Cooling Subsystem combine cooling units and recirculation fans to cool and recirculate air within the Containment.

The Containment Recirculation Cooling Subsystem cools and recirculates air inside the Containment.

The Control Element Drive Mechanism Cooling Subsystem cools and recirculates air to the control element drive mechanisms.

The Reactor Cavity Cooling Subsystem provides cooled air to the concrete surrounding the reactor.

The Containment Pressurizer Cooling Subsystem delivers air to the pressurizer compartment.

The Containment Air Cleanup Subsystem passes air in the Containment through filtration units to reduce radioactivity in Containment.

Displays of the Containment Cooling and Ventilation System instrumentation shown on Figure 2.7.22-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to start and stop the Containment Cooling and Ventilation System filtration units, cooling units, and fans shown on Figure 2.7.22-1.

Inspection, Test, Analyses, and Acceptance Criteria

Table 2.7.22-1 provides the inspections, tests, analyses, and associated acceptance criteria for the Containment Cooling and Ventilation System.

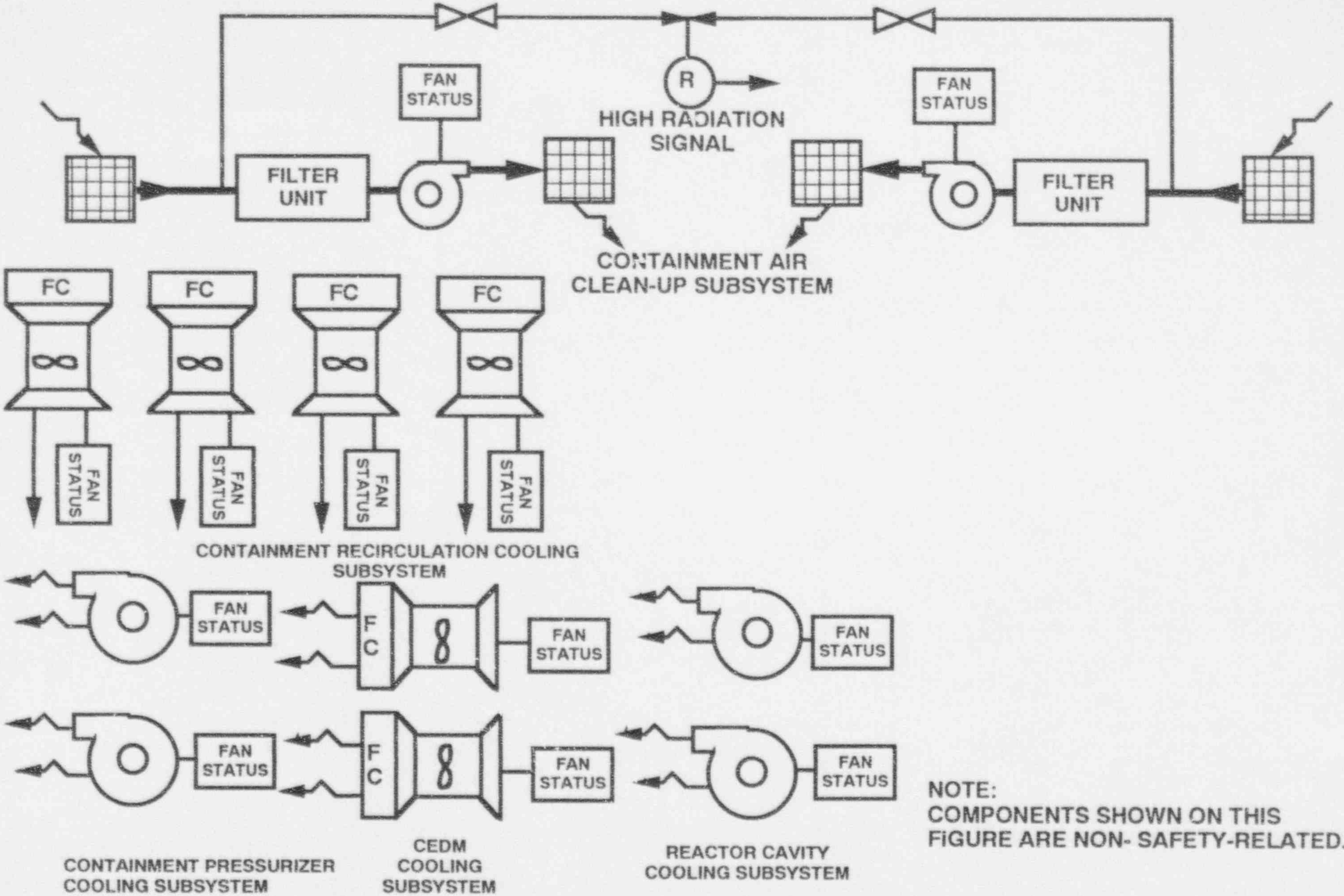


FIGURE 2.7.22-1
CONTAINMENT COOLING AND VENTILATION SYSTEM

06-17-94

TABLE 2.7.22-1

CONTAINMENT COOLING AND VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Containment Cooling and Ventilation System is as shown on Figure 2.7.22-1.	1. Inspection of the as-built Containment Cooling and Ventilation System configuration will be conducted.	1. For components and equipment shown on Figure 2.7.22-1, the as-built Containment Cooling and Ventilation System conforms with the Basic Configuration.
2.a) Displays of the Containment Cooling and Ventilation System instrumentation shown on Figure 2.7.22-1 exist in the MCR or can be retrieved there.	2.a) Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	2.a) Displays of the instrumentation shown on Figure 2.7.22-1 exist in the MCR or can be retrieved there.
2.b) Controls exist in the MCR to start and stop the Containment Cooling and Ventilation System filtration units, cooling units, and fans shown on Figure 2.7.22-1.	2.b) Testing will be performed using the Containment Cooling and Ventilation System controls in the MCR.	2.b) Containment Cooling and Ventilation System controls in the MCR operate to start and stop the Containment Cooling and Ventilation System filtration units, cooling units, and fans shown on Figure 2.7.22-1.

2.7.23 NUCLEAR ANNEX VENTILATION SYSTEM

Design Description

The Nuclear Annex Ventilation System (NAVS) provides ventilation, cooling and heating to the nuclear annex and is located inside the nuclear annex. The exhaust and supply fans can be used for smoke removal.

The safety-related component cooling water system pump rooms and essential chilled water system pump and chiller rooms are cooled by the Essential Chilled Water System recirculating units.

The Basic Configuration of the NAVS is as shown on Figures 2.7.23-1 and 2.7.23-2. The NAVS is a non-safety-related system.

The NAVS has two Divisions. Each Division of the NAVS has a filtration unit, fans, ductwork, instrumentation, and controls.

Each division of the NAVS maintains its Division of the nuclear annex at a negative pressure relative to the outside atmosphere.

The two mechanical Divisions of the NAVS are physically separated.

Displays of the NAVS instrumentation shown on Figures 2.7.23-1 and 2.7.23-2 exist in the main control room (MCR) or can be retrieved there.

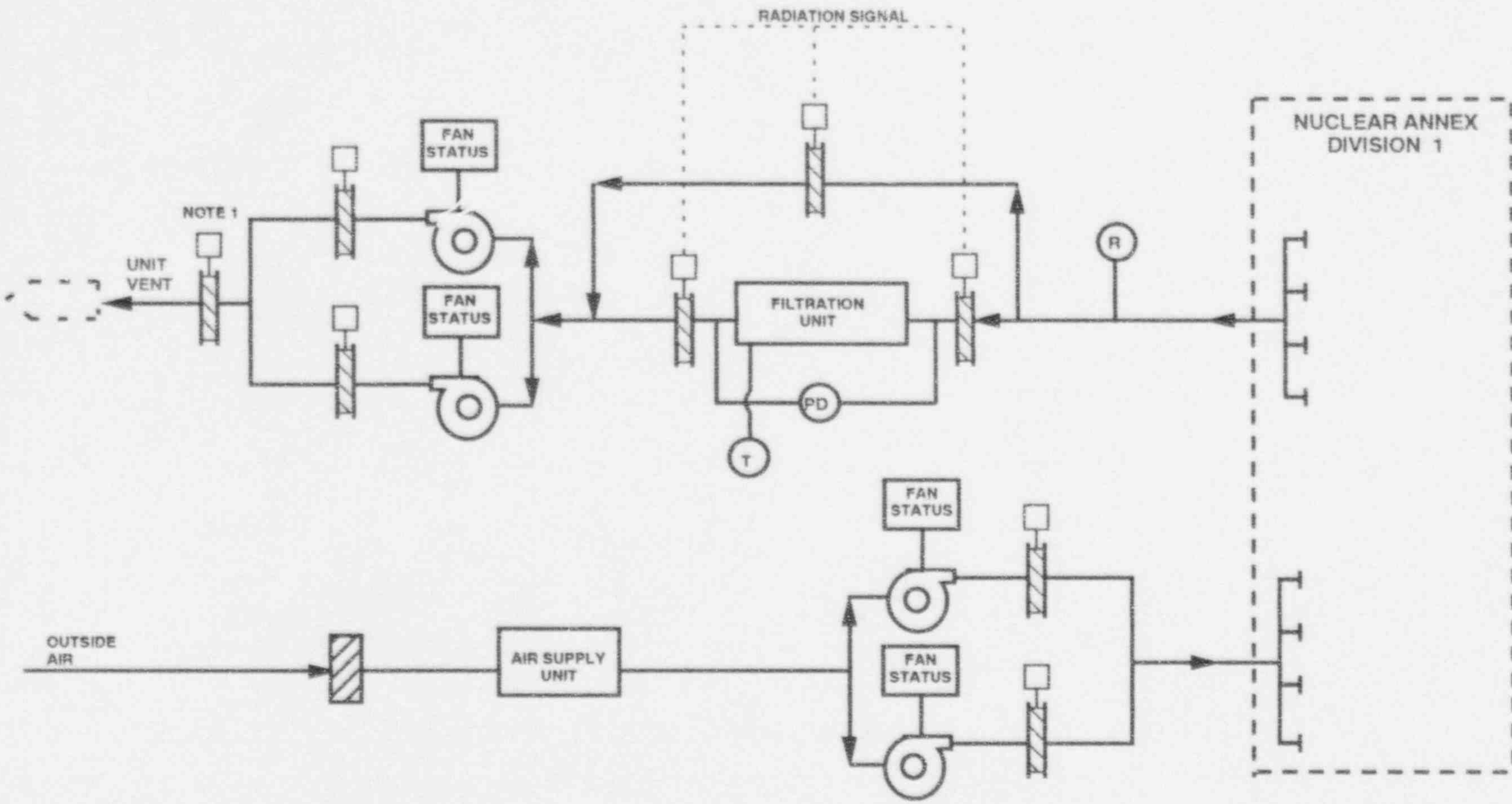
Controls exist in the MCR to start and stop the NAVS filtration units and fans, and to open and close those power operated dampers shown on Figures 2.7.23-1 and 2.7.23-2.

In response to a high radiation signal, the filtration unit bypass dampers close and the filtration unit dampers open to route exhaust air through the filtration units.

The exhaust and supply fans can be used for smoke removal.

Inspections, Tests, Analyses, and Acceptance Criteria

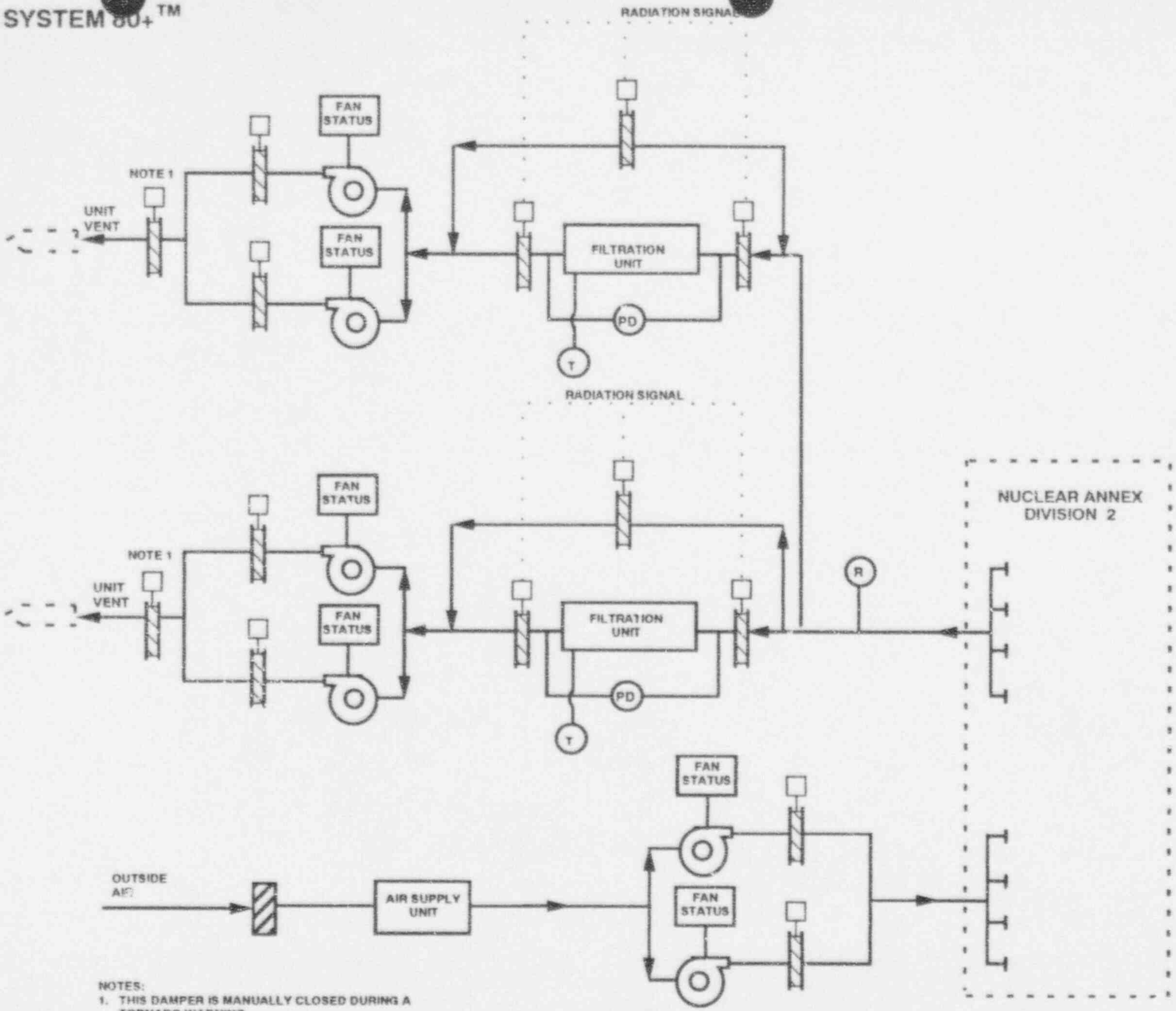
Table 2.7.23-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Nuclear Annex Ventilation System.



NOTE:
1. THIS DAMPER IS MANUALLY CLOSED DURING A TORNADO WARNING.

FIGURE 2.7.23-1
NUCLEAR ANNEX VENTILATION SYSTEM
(DIVISION 1)

06-17-94



NOTES:
1. THIS DAMPER IS MANUALLY CLOSED DURING A TORNADO WARNING

FIGURE 2.7.23-2
NUCLEAR ANNEX VENTILATION SYSTEM
(DIVISION 2)

06-17-94

TABLE 2.7.23-1

NUCLEAR ANNEX VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the NAVS is as shown on Figures 2.7.23-1 and 2.7.23-2.	1. Inspection of the as-built NAVS configuration will be conducted.	1. For the components and equipment shown on Figures 2.7.23-1 and 2.7.23-2, the as-built NAVS conforms with the Basic Configuration.
2. Each Division of the NAVS maintains its Division of the nuclear annex at a negative pressure relative to the outside atmosphere.	2. Testing will be performed to measure the nuclear annex building pressure in each Division with the NAVS operating.	2. Each Division of the NAVS maintains its Division of the nuclear annex at a negative pressure relative to the outside atmosphere.
3. The two mechanical Divisions of the NAVS are physically separated.	3. Inspection of as-built mechanical Divisions will be performed.	3. The two mechanical Divisions of the NAVS are separated by a Divisional wall or a fire barrier.
4.a) Displays of the NAVS instrumentation shown on Figures 2.7.23-1 and 2.7.23-2 exist in the MCR or can be retrieved there.	4.a) Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	4.a) Displays of the instrumentation shown on Figures 2.7.23-1 and 2.7.23-2 exist in the MCR or can be retrieved there.
4.b) Controls exist in the MCR to start and stop the NAVS filtration units and fans, and to open and close the power operated dampers shown on Figures 2.7.23-1 and 2.7.23-2.	4.b) Testing will be performed using the NAVS controls in the MCR.	4.b) NAVS controls in the MCR operate to start and stop the NAVS filtration units and fans, and to open and close the power operated dampers shown on Figures 2.7.23-1 and 2.7.23-2.
5. In response to a high radiation signal, the filtration unit bypass dampers close and the filtration unit dampers open to route exhaust air through the filtration units.	5. Testing will be conducted in each Division with NAVS exhaust filters in bypass mode and using signals that simulate high radioactivity levels.	5. Upon receipt of signals simulating high radioactivity level, the bypass dampers in the exhaust ducting close and the dampers in the filtration unit ducting open in the Division under test.

2.7.24 FIRE PROTECTION SYSTEM

Design Description

The Fire Protection System (FPS) provides fire detection and suppression capabilities and mitigates fire propagation. The FPS consists of a water distribution system, automatic and manual suppression systems, a fire detection and alarm system, and portable fire extinguishers. The FPS provides as a minimum, fire protection for the reactor building, nuclear annex, turbine building, service building, and radwaste building. The FPS is non-safety-related with the exception of the containment penetration isolation valves and piping in between covered in Section 2.4.5.

The Basic Configuration of the FPS water distribution system is as shown on Figure 2.7.24-1. Each fire protection water supply tank has a capacity of at least 300,000 gallons. Two fire pumps, one electric motor driven and one diesel engine driven, are provided. The electric motor driven fire pump and the diesel engine driven fire pump are separated by a three-hour fire barrier. The electric motor driven fire pump is powered from a permanent non-safety bus. A diesel fuel oil storage tank is sized to provide at least an eight hour fuel supply to the diesel engine driven fire pump. A jockey pump is used to maintain fire protection water distribution system pressure.

The fire protection system water supply tanks are located in the yard. The electric motor driven fire pump, the diesel engine driven fire pump and the jockey pump are located in the fire pump house.

The diesel and motor driven pumps are design to meet the most hydraulically demanding fire suppression system and hose station.

Standpipe systems have piping connections to the fire protection water distribution system, isolation valves, and fire hoses. Water is supplied to the standpipe system from the fire protection water distribution system.

Standpipe systems provided in the nuclear annex and in the reactor building are Seismic Category I. The standpipe systems in the nuclear annex and in the reactor building can be supplied water from a Seismic Category I classified backup water supply. The backup water supply has a capacity of at least 18,000 gallons.

The Seismic Category I portions of the FPS are located in the nuclear annex and reactor building (Seismic Category I structures).

Automatic sprinkler systems are provided for fire suppression. The sprinkler systems receive water from the fire protection water distribution system.

Manual pull stations or individual fire detectors provide fire detection capability and can be used to initiate fire alarms. Batteries supply backup power for the fire detection and alarm system.

The FPS has the following displays and alarms in the main control room (MCR): detection system fire alarms; status of fire pumps; and sprinkler/preaction system alarms.

Portable fire extinguishers are provided for fire suppression.

A plant fire hazards analysis considers potential fire hazards, determines the effects of fires on the ability to shutdown the reactor and to control the release of radioactivity to the environment, and specifies measures for fire prevention, fire detection, fire suppression, and fire containment.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.7.24-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Fire Protection System.

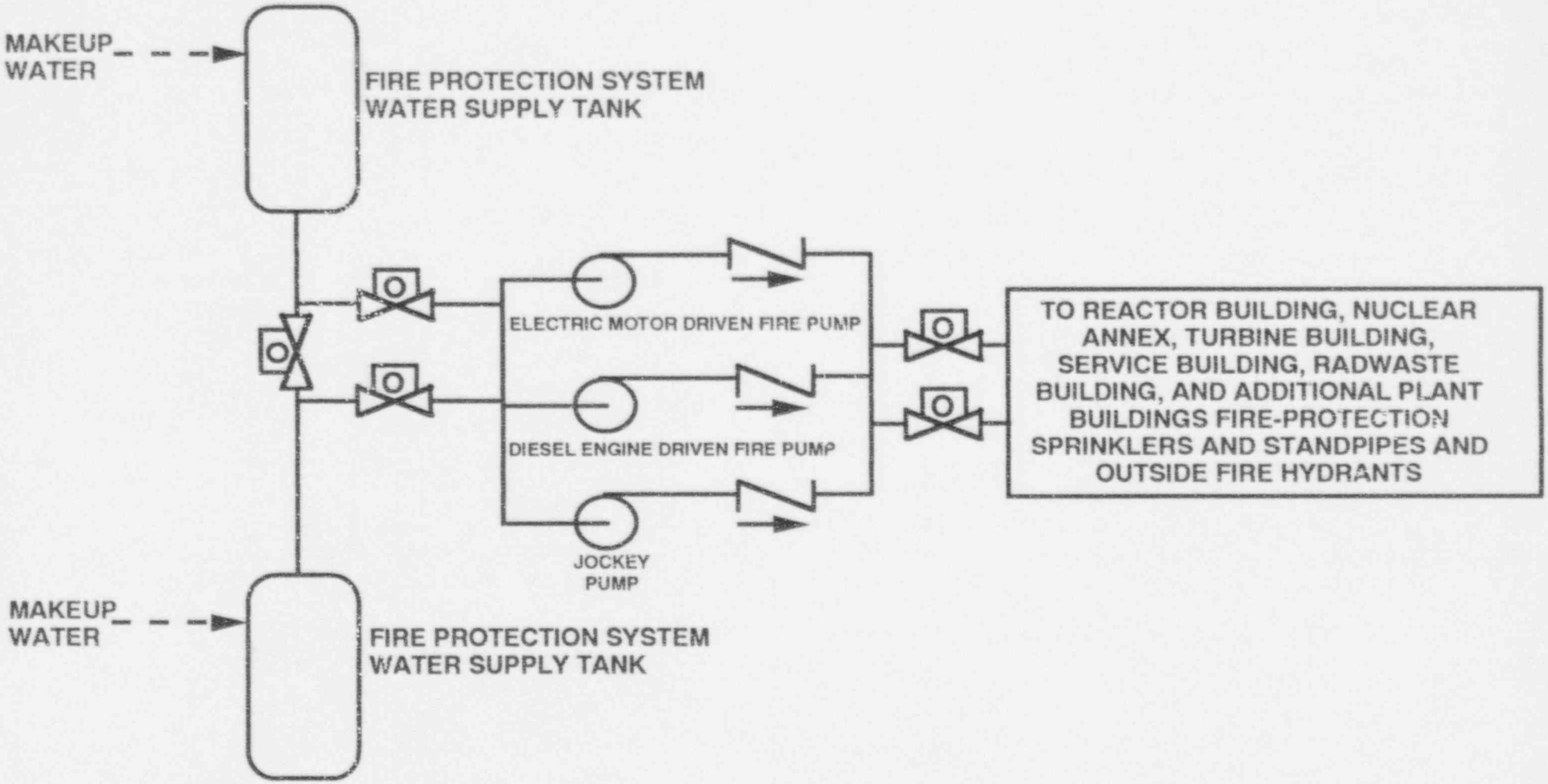


FIGURE 2.7.24-1
FIRE PROTECTION WATER DISTRIBUTION SYSTEM

06-17-94

TABLE 2.7.24-1

FIRE PROTECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the FPS water distribution system is as shown on Figure 2.7.24-1.	1. Inspection of the as-built FPS water distribution system configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.24-1, the as-built FPS water distribution system conforms with the Basic Configuration.
2. Each fire protection water supply tank has a capacity of at least 300,000 gallons.	2. Inspection of the as-built fire protection water supply tanks will be performed.	2. Each fire protection water supply tank has a capacity of at least 300,000 gallons.
3. The electric motor driven fire pump and the diesel engine driven fire pump are separated by a three-hour fire barrier.	3. Inspection of the as-built fire barrier will be performed.	3. The electric motor driven fire pump and the diesel engine driven fire pump are separated by a three-hour fire barrier.
4. The electric motor driven fire pump is powered from a permanent non-safety bus.	4. Testing will be performed on the FPS by providing a test signal in the permanent non-safety bus.	4. Within the FPS, a test signal exists at the equipment powered by the permanent non-safety bus under test.
5. The diesel and motor-driven pumps are designed to meet the most hydraulically demanding fire suppression system and hose station.	5. Testing and analysis will be performed to determine pump minimum flow and pressure requirements are met.	5. An analysis exists and concludes that each pump provides a minimum flow and pressure to supply the largest design demand of any sprinkler, preaction or deluge system plus 500 GPM for manual hoses.
6. A diesel fuel oil storage tank is sized to provide at least an eight hour fuel supply to the diesel engine driven fire pump.	6. Testing of the fuel consumption of the diesel engine driven fire pump will be performed. Inspection of the fuel supply tank will be performed. The fuel supply capacity will be determined.	6. The diesel fuel oil storage tank has at least an eight hour fuel supply for the diesel engine driven fire pump.

TABLE 2.7.24-1 (Continued)

FIRE PROTECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. The standpipe systems in the nuclear annex and reactor building along with their backup water supply are classified Seismic Category I.	7. Seismic analysis of the as-built fire protection system will be performed.	7. An analysis report exists which concludes that the standpipe systems in the nuclear annex and reactor building along with their backup water supply are classified Seismic Category I.
8. The backup water supply to the standpipe systems in the nuclear annex and the reactor building has a capacity of at least 18,000 gallons.	8. Inspection of the as-built backup water supply will be performed.	8. The backup water supply has a capacity of at least 18,000 gallons.
9. Manual pull stations or individual fire detectors provide fire detection capability and can be used to initiate fire alarms.	9. Inspection and testing of the as-built manual pull stations and individual fire detectors will be performed. Individual fire detectors will be tested using simulated fire conditions.	9. Manual pull stations can be used to initiate fire alarms and individual fire detectors respond to simulated fire conditions.
10. Batteries supply backup power for the fire detection and alarm system.	10. Testing of the fire detection and alarm system will be conducted under a simulated loss of power.	10. The fire detection and alarm system is provided battery-supplied backup power.
11. A plant fire hazards analysis considers potential fire hazards, determines the effects of fires on the ability to shutdown the reactor and to control the release of radioactivity to the environment, and specifies measures for fire prevention, fire detection, fire suppression, and fire containment.	11. A fire hazards analysis will be performed.	11. A fire hazards analysis exists and considers potential fire hazards, determines the effects of fires on the ability to shutdown the reactor and to contain the release of radioactivity to the environment, and specifies measures for fire prevention, fire detection, fire suppression, and fire containment.

TABLE 2.7.24-1 (Continued)

FIRE PROTECTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
12. MCR alarms and displays provided for the FPS are as defined in the Design Description (Section 2.7.24).	12. Inspections will be performed on the MCR alarms and displays for the FPS.	12. Alarms and displays exist or can be retrieved in the MCR as defined in the Design Description (Section 2.7.24).

2.7.25 COMMUNICATIONS SYSTEMS

Design Description

The Communications Systems are non-safety-related systems that provide onsite communications capability and means to communicate with offsite specified participating entities. The Communications Systems consist of a Portable Wireless Communication System, a Private Automatic Business Exchange (PABX) Telephone System, a Public Address (PA) System, a Sound-Powered Telephone System, and an Offsite Communications System.

The Portable Wireless Communication System provides communications capability among control room operators, equipment operators, and maintenance technicians for routine and emergency operations.

The PABX Telephone System and the PA System are provided as alternate means of communications. The PABX Telephone System provides intraplant communications and access to offsite telephone systems. The PA System provides a means to alert plant personnel through audible speakers located throughout the plant.

The intraplant Sound-Powered Telephone System uses phone jacks which can be patched together to establish communications between areas of the plant where maintenance, refueling, or shutdown operations are conducted.

In addition to the PABX interface with the offsite telephone system, direct offsite communications, independent of the PABX, are provided to the plant and support facilities. The direct offsite emergency telephones are identified distinctly from the PABX telephones. The emergency telephones provide links with the Nuclear Regulatory Commission (NRC) and specified participating local and state agencies. A security radio system and a crisis management radio system are provided for communication between specified participating entities.

Loss of electrical power to any of the Communications Systems does not affect the operability of the remaining Communications Systems.

The Portable Wireless Communication System is provided with backup power.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.25-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Communications Systems.

TABLE 2.7.25-1

COMMUNICATIONS SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Portable Wireless Communication System provides communications capability among control room operators, equipment operators, and maintenance technicians for routine and emergency operations.	1.a) Testing of the Portable Wireless Communication System will be performed.	1.a) Voice transmission and reception are accomplished.
	1.b) Inspection of the Portable Wireless Communication equipment for emergency operations will be performed.	1.b) Portable Wireless Communication equipment for emergency operations exists.
2. The PABX Telephone System provides intraplant communications and access to offsite telephone systems.	2. Testing of the PABX Telephone System will be performed.	2. Voice transmission and reception between plant terminals are accomplished. Voice transmission and reception between onsite terminals and the offsite telephone systems are accomplished.
3. The PA System provides a means to alert plant personnel through audible speakers located throughout the plant.	3. Testing of the PA System will be performed.	3. Voice transmission and reception are accomplished.
4. The intraplant Sound-Powered Telephone System uses phone jacks which can be patched together to establish communications between areas of the plant where maintenance, refueling, or shutdown operations are conducted.	4. Testing of the intraplant Sound-Powered Telephone System will be performed.	4. Voice transmission and reception are accomplished.

TABLE 2.7.25-1 (Continued)

COMMUNICATIONS SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5.a) In addition to the PABX interface with the offsite telephone system, direct offsite communications, independent of the PABX, are provided to the plant and support facilities. The emergency telephones provide links with the NRC, and specified participating local and state agencies.	5.a) Testing of the offsite telephone system will be performed.	5.a) Voice transmission and reception are accomplished to the NRC and specified participating local and state agencies.
5.b) The direct offsite emergency telephones are identified distinctly from the PABX telephones.	5.b) Inspection of the offsite emergency telephones will be performed.	5.b) The direct offsite emergency telephones are color coded to distinguish them from the PABX telephones.
6. A security radio system and a crisis management radio system are provided to provide communications between specified participating entities.	6. Testing of the security radio system and the crisis management radio system will be performed.	6. Two way communication between specified participating entities is demonstrated.
7. Loss of electrical power to any of the Communications Systems does not affect the operability of the remaining Communications Systems.	7. Testing for operability of the Communications Systems will be performed.	7. Loss of power to any of the Communications Systems does not disrupt the voice transmission and reception capabilities of the remaining Communication Systems.
8. The Portable Wireless Communication system is provided with backup power.	8. Testing of the Portable Wireless Communication System will be performed using backup power.	8. Voice transmission and reception are accomplished.

2.7.26 LIGHTING SYSTEM

Design Description

The Lighting System is a non-safety-related system that is used to provide illumination in the plant and on the plant site. The Lighting System has a Normal Lighting System, a Security Lighting System, and an Emergency Lighting System.

The Normal Lighting System provides general illumination in the plant.

The Security Lighting System provides illumination in isolation zones and outdoor areas within the plant protected perimeter. The Security Lighting System is powered from the permanent non-safety buses.

The Emergency Lighting System consists of conventional AC fixtures fed from Class 1E AC power sources and Class 1E DC self contained battery operated lighting units. Class 1E DC self contained battery operated lighting units are provided with rechargeable batteries with a minimum 8 hour capacity. Class 1E DC self contained battery operated lighting units are supplied AC power from the same power source as the Normal Lighting System in the area in which they are located.

The Emergency Lighting System provides illumination in the vital areas that include the main control room (MCR), the technical support center, the operations support center, the remote shutdown room, and the stairway which provides access from the MCR to the remote shutdown room.

Emergency lighting in the MCR is provided such that at least two circuits of lighting fixtures are powered from different Class 1E Divisions. The emergency lighting in the MCR maintains minimum illumination levels in the MCR during emergency conditions including station blackout. The emergency lighting installations which serve the MCR are designed to remain operational following a design basis earthquake.

Lighting circuits which are connected to a Class 1E power source are treated as associated circuits.

Independence is maintained between Class 1E Divisions and between Class 1E Divisions and non-Class 1E equipment.

Class 1E or associated lighting distribution system equipment is identified according to its Class 1E Division. Class 1E or associated lighting distribution system equipment is located in Seismic Category I structures and in its respective Divisional areas.

Class 1E or associated lighting system cables and raceways are identified according to their Class 1E Division. Class 1E or associated lighting system cables are routed in Seismic Category I structures and in their respective Divisional raceways.

Class 1E equipment is classified as Seismic Category I.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.26-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Lighting System.

TABLE 2.7.26-1

LIGHTING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Lighting System is as described in the Design Description (Section 2.7.26).	1. Inspection of the as-built Lighting System will be conducted.	1. For the Lighting System described in the Design Description (Section 2.7.26), the as-built Lighting System conforms with the Basic Configuration.
2. The Security Lighting System provides illumination in isolation zones and outdoor areas within the plant protected perimeter.	2. Inspection and testing of illumination levels in isolation zones and outdoor areas within the plant protected perimeter will be performed.	2. Security lighting is installed in isolation zones and outdoor areas within the plant protected perimeter. Security lighting provides illumination levels greater than 0.2 foot-candles when measured horizontally at ground level in these areas.
3. The Security Lighting System is powered from the permanent non-safety buses.	3. Testing will be performed on the security lighting by providing a test signal in the permanent non-safety buses.	3. Within the Security Lighting System, a test signal exists at the equipment powered by the permanent non-safety bus under test.

TABLE 2.7.26-1 (Continued)

LIGHTING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. The Emergency Lighting System provides illumination in the vital areas that include the MCR, the technical support center, the operations support center, the remote shutdown room, and the stairway which provides access from the MCR to the remote shutdown room.	4. Inspection of the MCR, the technical support center, the operations support center, the remote shutdown room, and the stairway which provides access from the MCR to the remote shutdown room will be performed.	4. Emergency lighting is installed in the MCR, the technical support center, the operations support center, the remote shutdown room, and the stairway which provides access from the MCR to the remote shutdown room and emergency lighting provides illumination levels greater than or equal to 10 foot-candles in the MCR, technical support center, operations support center, and the remote shutdown panel room. Emergency lighting provides an illumination level greater than or equal to 2 foot candles in the stairway which provides access from the MCR to the remote shutdown room.
5. Class 1E DC self contained battery operated lighting units are provided with rechargeable batteries with a minimum 8 hour capacity. Class 1E DC self contained battery operated lighting units are supplied AC power from the same power source as the normal lighting system in the area in which they are located.	5.a) Inspection of the as-built Class 1E DC self contained battery operated lighting units will be conducted.	5.a) Class 1E DC self contained battery operated lighting units are provided with rechargeable batteries with a minimum 8 hour capacity.
	5.b) Testing will be conducted by providing a test signal on electrical divisions that supply power to the normal lighting system.	5.b) Class 1E DC self contained battery operated lighting units are supplied AC power from the same power source as the normal lighting system in the area in which they are located. Class 1E DC self contained battery operated lighting units are turned on when the normal lighting system in the area in which they are located is lost.

LIGHTING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6. Emergency lighting in the MCR is provided such that at least two circuits of lighting fixtures are powered from different Class 1E Divisions.	6. Testing will be performed on the emergency lighting system in the MCR by providing a test signal in only one Class 1E Division at a time.	6. Within the MCR emergency lighting system, a test signal exists only at the equipment powered from the Class 1E Division under test.
7. The emergency lighting in the MCR maintains minimum illumination levels in the MCR during emergency conditions including station blackout.	7. Testing of the emergency lighting system will be performed under simulated station blackout conditions.	7. Under simulated station blackout conditions, the emergency lighting system in the MCR maintains illumination levels greater than or equal to 10 foot-candles.
8. Lighting circuits which are connected to a Class 1E power source are treated as associated circuits.	8. Inspection of the associated lighting circuits will be conducted.	8. The as-built associated lighting circuits are identified as associated circuits.
9. Independence is maintained between Class 1E Divisions and between Class 1E Divisions and non-Class 1E equipment.	9.a) Testing on the Lighting System will be conducted by providing a test signal in only one Class 1E Division at a time.	9.a) A test signal exists only in the class 1E Division under test in the Lighting System.
	9.b) Inspection of the as-built Class 1E Divisions in the Lighting System will be conducted.	9.b) In the Lighting System, physical separation or electrical isolation exists between Class 1E Divisions. Physical separation or electrical isolation exists between Class 1E Divisions and non-Class 1E equipment.
10. Class 1E or associated lighting distribution system equipment is identified according to its Class 1E Division.	10. Inspection of the as-built Class 1E and associated lighting distribution system equipment will be conducted.	10. The as-built Class 1E or associated lighting distribution system equipment is identified according to its Class 1E Division.

LIGHTING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11. Class 1E or associated lighting distribution system equipment is located in Seismic Category I structures and in its respective Divisional areas.	11. Inspection of the as-built Class 1E and associated lighting distribution system equipment will be conducted.	11. The as-built Class 1E or associated lighting distribution system equipment is located in Seismic Category I structures and in its respective Divisional areas.
12. Class 1E or associated lighting system cables and raceways are identified according to their Class 1E Division.	12. Inspection of the as-built Class 1E and associated lighting system cables and raceways will be conducted.	12. The as-built Class 1E or associated lighting system cables and raceways are identified according to their Class 1E Division.
13. Class 1E or associated lighting system cables are routed in Seismic Category I structures and in their respective Divisional raceways.	13. Inspection of the as-built Class 1E and associated lighting system cables and raceways will be conducted.	13. The as-built Class 1E or associated lighting system cables are routed in Seismic Category I structures and in their respective Divisional raceways.

2.7.27 COMPRESSED GAS SYSTEMS

Design Description

The Compressed Gas Systems (CGS) are non-safety-related systems, except for containment penetration isolation valves and piping in between covered in Section 2.4.5, which supply gases to equipment and instrumentation for cooling, purging, diluting, inerting, and welding. The CGS consists of high pressure gas cylinders and pressure regulators to control the pressure and distribution of the compressed gases. The CGS consists of some or all of the following separate subsystems:

A. N_2 System

B. H_2 System

C. O_2 System

D. CO_2 System

E. Argon/Methane System

F. Acetylene System

G. Argon System

The CGS gas cylinders are located in areas which contain no safety-related structures, systems, or components.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.27-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the CGS.

TABLE 2.7.27-1

COMPRESSED GAS SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The CGS gas cylinders are located in areas which contain no safety-related structures, systems, or components.	1. Inspection of the as-built plant arrangement will be performed.	1. The CGS gas cylinder storage areas contain no safety-related structures, systems, or components.

2.7.28 POTABLE AND SANITARY WATER SYSTEMS

Design Description

The Potable and Sanitary Water Systems (PSWS) are non-safety systems that provide water for general plant use and collect liquid wastes in order to convey them to a sewage treatment facility. The PSWS provide water to, and collect liquid wastes in, the reactor building, nuclear annex, turbine building, radwaste building, and station service building.

Those portions of the PSWS that are within the reactor building, nuclear annex, turbine building, radwaste building, and station service building are within the scope of the Certified Design. Those portions of the PSWS that are not within the reactor building, nuclear annex, turbine building, radwaste building, and station services building are not within the scope of the Certified Design.

There are no interconnections between the Potable and Sanitary Water Systems and systems having the potential for containing radioactive material.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.28-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Potable and Sanitary Water Systems.

TABLE 2.7.28-1

POTABLE AND SANITARY WATER SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the PSWS is as described in the Design Description (Section 2.7.28).	1. Inspection of the as-built PSWS configuration will be conducted.	1. For the portions of the PSWS described in the Design Description (Section 2.7.28), the as-built PSWS conforms with the Basic Configuration.
2. There are no interconnections between the PSWS and systems having the potential for containing radioactive material.	2. Inspection and testing of the as-built system will be performed.	2. There are no interconnections between the PSWS as described in the Design Description (Section 2.7.28) and systems having the potential for containing radioactive material.

2.7.29 RADWASTE BUILDING VENTILATION SYSTEM

Design Description

The Radwaste Building Ventilation System (RWBVS) provides ventilation, heating and cooling in the radwaste building. The RWBVS is located within the radwaste building, except for the portion which connects with the unit vent at the juncture of the shield building and nuclear annex.

The Basic Configuration of the RWBVS is as shown on Figure 2.7.29-1. The RWBVS is non-safety-related.

The RWBVS has two supply subsystems and two exhaust subsystems. Each RWBVS supply subsystem has an air supply unit, fans, dampers, ductwork, instrumentation, and controls. Each RWBVS exhaust subsystem has a filtration unit, fan, dampers, ductwork, instrumentation, and controls.

The fire damper in the RWBVS HVAC ductwork can close under design air flow conditions.

In response to a high radiation signal, an alarm is activated in the radwaste building control room.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.29-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Radwaste Building Ventilation System.

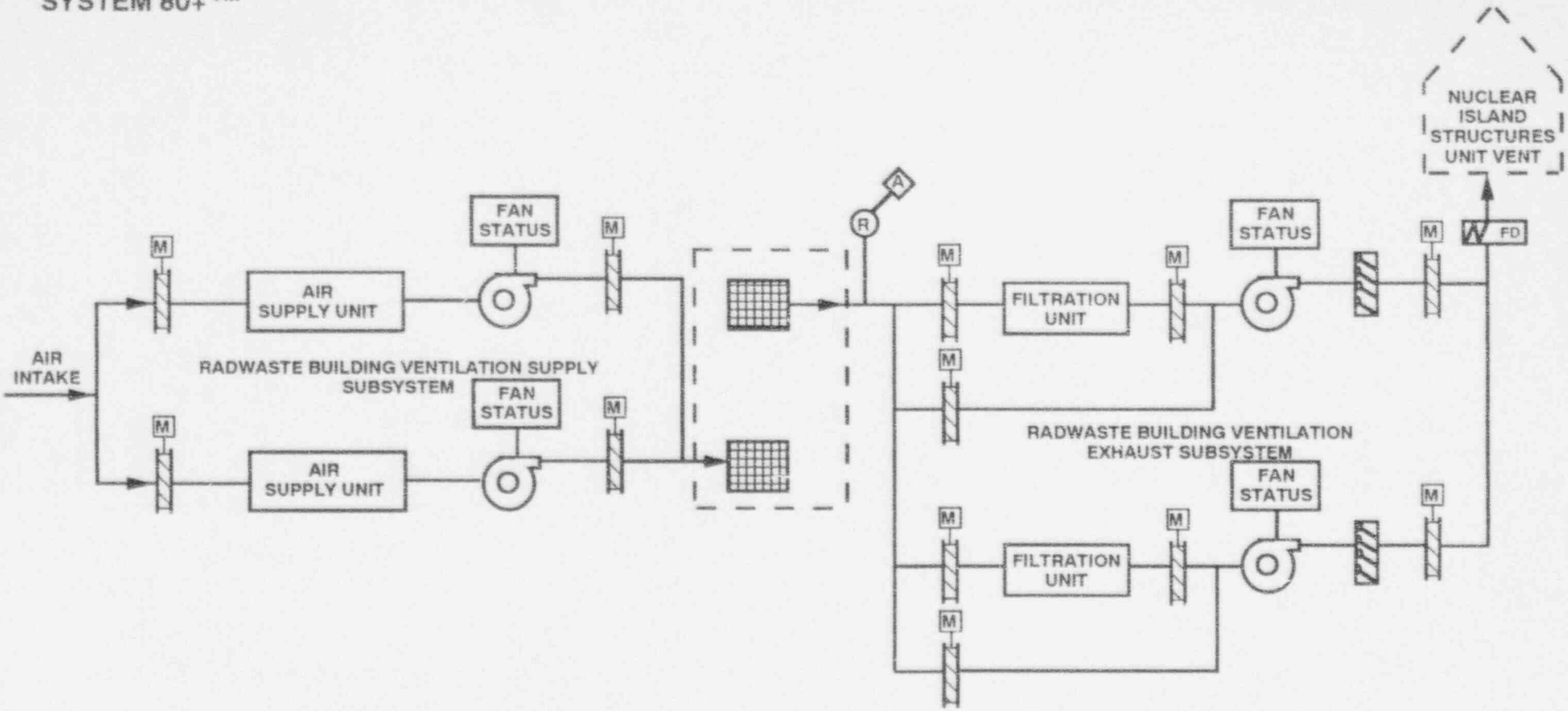


FIGURE 2.7.29-1
RADWASTE BUILDING VENTILATION SYSTEM

06-17-94

TABLE 2.7.29-1

RADWASTE BUILDING VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the RWBVS is as shown on Figure 2.7.29-1.	1. Inspection of the as-built RWBVS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.29-1, the as-built RWBVS conforms with the Basic Configuration.
2. In response to a high radiation signal, an alarm is activated in the radwaste building control room.	2. Testing will be performed using a signal that simulates a radiation level limit at the exhaust duct radiation monitor.	2. The RWBVS exhaust duct radiation monitor activates an alarm in the radwaste building control room upon receipt of a signal simulating radiation above a limit at the radiation monitor.
3. The fire damper in the RWBVS HVAC ductwork can close under design air flow conditions.	3. A type test will be performed to demonstrate that the damper can close under design air flow conditions.	3. A test and analysis report exists that concludes the fire damper can close under design air flow conditions.

2.7.30 TURBINE BUILDING VENTILATION SYSTEM

Design Description

The Turbine Building Ventilation System (TBVS) is a non-safety-related system that is used to maintain the environmental conditions in the turbine building.

The TBVS has fans, intake louvers, exhaust fans, ductwork, instrumentation and controls. The TBVS also has recirculation fans to provide mixing of air within the turbine building, and roof-mounted vents.

The TBVS is located in the turbine building.

Inspections, Tests, Analyses, and Acceptance Criteria:

Table 2.7.30-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Turbine Building Ventilation System.

TABLE 2.7.30-1

TURBINE BUILDING VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the TBVS is as described in the Design Description (Section 2.7.30).	1. Inspection of the as-built TBVS configuration will be conducted.	1. For the TBVS described in the Design Description (Section 2.7.30), the as-built TBVS conforms with the Basic Configuration.

2.7.31 CCW HEAT EXCHANGER STRUCTURE VENTILATION SYSTEM

Design Description

The CCW Heat Exchanger Structure Ventilation System (CCWHXSVS) is a non-safety-related system that is used to maintain environmental conditions in a CCW heat exchanger structure.

The Basic Configuration of the CCWHXSVS is as shown on Figure 2.7.31-1.

A CCWHXSVS is located in each CCW heat exchanger structure.

The CCWHXSVS has one air supply unit and one air exhaust unit for each Division of the CCW heat exchangers. Each CCWHXSVS air supply unit has a damper, instrumentation and controls. Each CCWHXSVS air exhaust unit has an exhaust fan, a damper, ductwork, instrumentation, and controls. Air heaters are provided in each Division.

Inspections, Tests, Analyses, and Acceptance Criteria:

Table 2.7.31-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the CCW Heat Exchanger Structure Ventilation System.

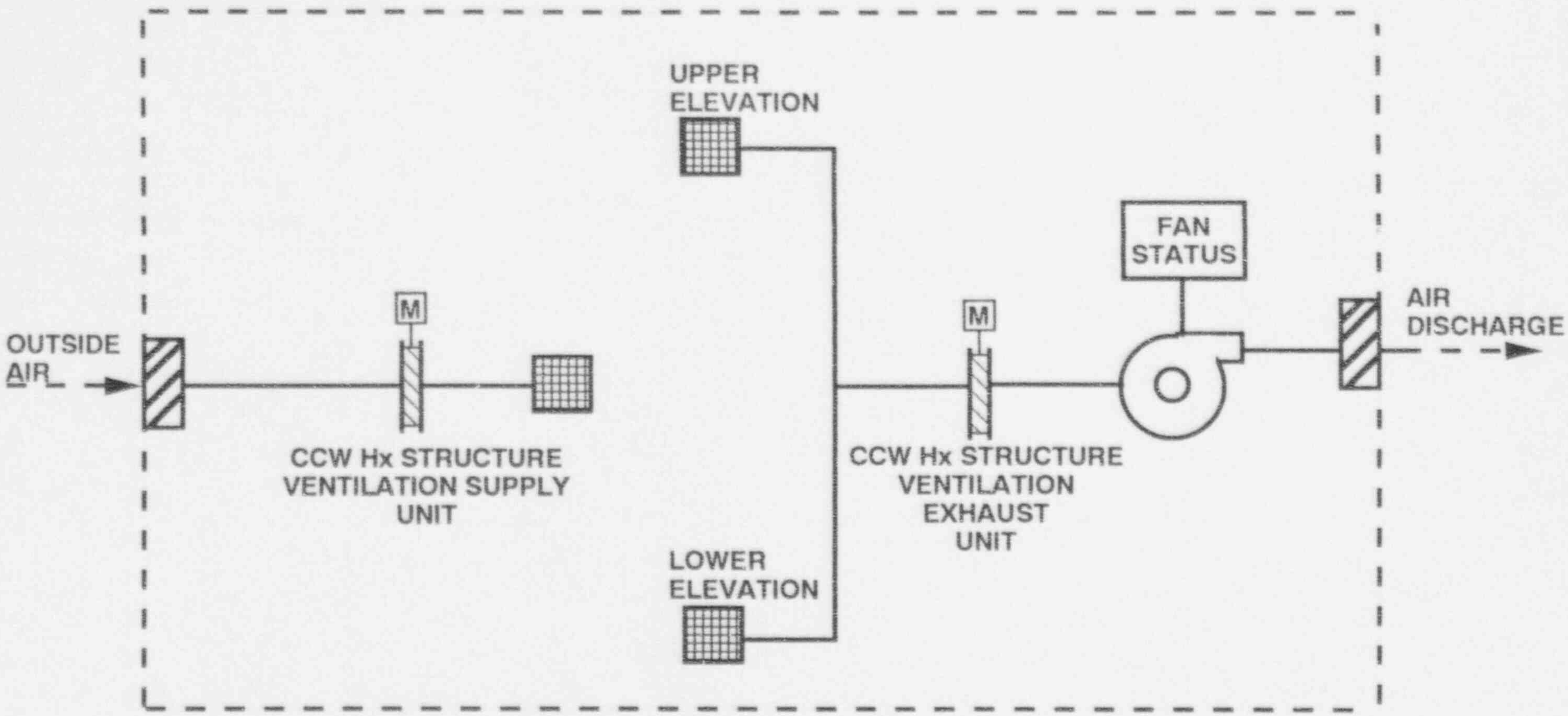


FIGURE 2.7.31-1
CCW HEAT EXCHANGER STRUCTURE VENTILATION SYSTEM 06-17-94
(ONE OF TWO SYSTEMS)

TABLE 2.7.31-1

CCW HEAT EXCHANGER STRUCTURE VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the CCWHXSVS is as shown on Figure 2.7.31-1.	1. Inspection of the as-built CCWHXSVS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.31-1, the as-built CCWHXSVS conforms with the Basic Configuration.

2.8.1 TURBINE GENERATOR

Design Description

The Turbine Generator is a non-safety-related system that converts the energy of the steam produced in the steam generators into mechanical shaft power and then into electrical energy.

The Turbine Generator is located on the turbine pedestal in the turbine building.

The Basic Configuration of the Turbine Generator is as shown on Figure 2.8.1-1.

The flow of steam is directed from the steam generators to the turbine through the main steam equalization header, stop valves, and control valves. After expanding through the turbine, which drives the main generator, exhaust steam is transported to the main condenser.

Turbine Generator operation is monitored and controlled by the turbine control and safety systems. The control and safety systems provide overspeed protection, speed and load control, and trip of the Turbine Generator by closing the turbine stop valves and control valves. The Turbine Generator trips in response to a reactor trip.

Controls exist in the main control room (MCR) to manually trip the Turbine Generator.

The Turbine Generator has an electronic overspeed trip device and a mechanical overspeed trip device.

The Turbine Gland Sealing System (TGSS) is a non-safety subsystem that provides sealing at leakage points in the Turbine Generator system using sealing steam as a pressurizing medium.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8.1-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Turbine Generator.

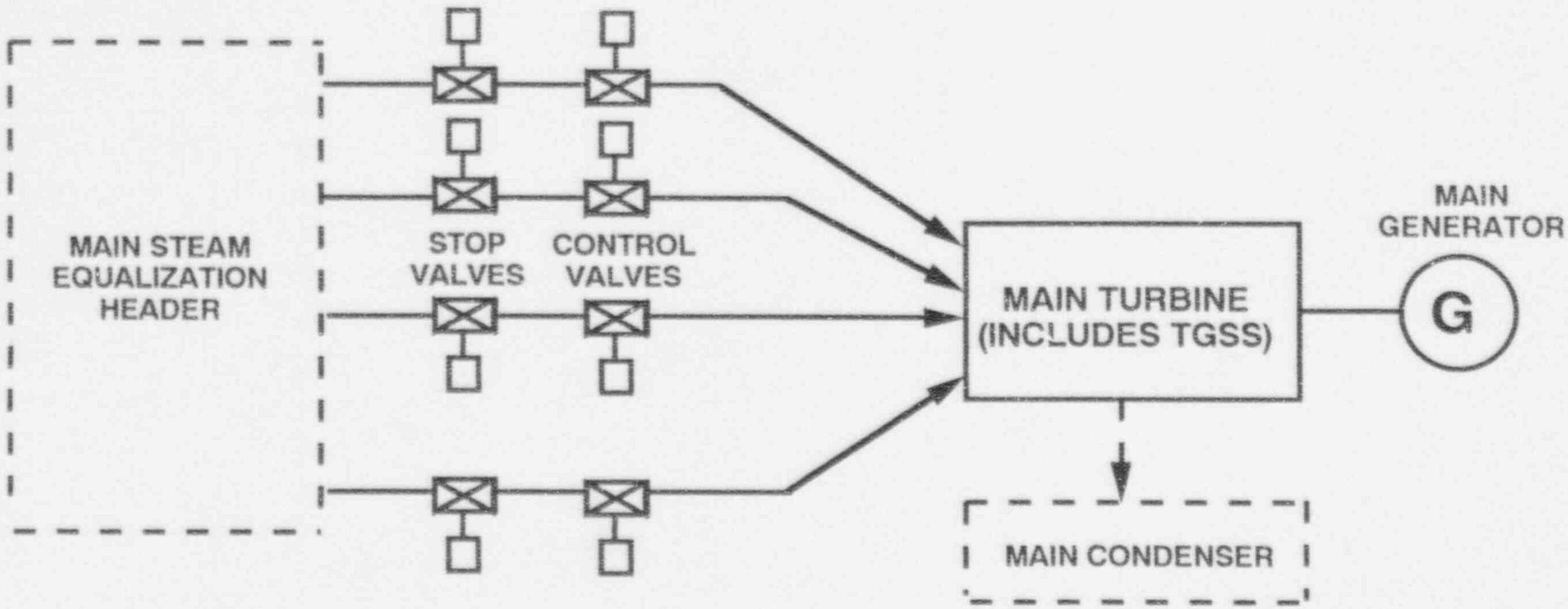


FIGURE 2.8.1-1
TURBINE GENERATOR

06-17-94

TABLE 2.8.1-1

TURBINE GENERATOR
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Turbine Generator is as shown on Figure 2.8.1-1.	1. Inspection of the as-built Turbine Generator configuration will be conducted.	1. For the components and equipment shown on Figure 2.8.1-1, the as-built Turbine Generator conforms with the Basic Configuration.
2. The Turbine Generator trips in response to a reactor trip.	2. Testing will be performed on the Turbine Generator using a signal simulating reactor trip.	2. The Turbine Generator control system generates a turbine trip signal in response to a signal simulating reactor trip.
3. Controls exist in the MCR to manually trip the Turbine Generator.	3. Testing will be performed using the Turbine Generator controls in the MCR.	3. Turbine Generator controls in the MCR operate to manually trip the Turbine Generator.
4. The Turbine Generator has an electronic overspeed trip device and a mechanical overspeed trip device.	3. Inspection of the Turbine Generator over-speed trip devices will be conducted.	4. The Turbine Generator electronic and mechanical overspeed trip devices are installed.

2.8.2 MAIN STEAM SUPPLY SYSTEM

Design Description

The Main Steam Supply System (MSSS) transports steam from the steam generators to the power conversion system and removes heat from the reactor coolant system (RCS).

The Basic Configuration of the MSSS is as shown on Figure 2.8.2-1. The safety-related portion of the MSSS consists of the main steam piping and valves located between the steam generator outlet nozzles in the Containment up to and including the main steam isolation valves (MSIVs) in the main steam valve houses (MSVHs). The non-safety-related portions of the MSSS are located in the yard and the turbine building. Downstream of the isolation valves in the MSVHs, the MSSS lines exit the MSVHs and cross above the yard into the turbine building.

The MSSS supplies steam to the emergency feedwater pump turbines and provides a flow path to the turbine bypass system.

The main steam safety valves (MSSVs) provide overpressure protection for the secondary side of the steam generators and for pressure boundary components in the MSSS.

The ASME Code Section III Class for the MSSS pressure retaining components shown on Figure 2.8.2-1 is as depicted on the Figure.

The safety-related equipment shown on Figure 2.8.2-1 is classified Seismic Category I.

Within a mechanical Division, the electrical controls for the atmospheric dump valve (ADV), MSIV, and MSIV bypass valve on each main steam line from a steam generator are powered from their respective Class 1E Division.

Within a mechanical Division, the ADV block valve on each main steam line from a steam generator is powered from a Class 1E Division different from the Class 1E Division of the respective mechanical Division.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the MSSS.

Controls exist in the main control room (MCR) to open and close those power operated valves shown on Figure 2.8.2-1.

The safety-related portions of the MSSS mechanical Divisions are physically separated.

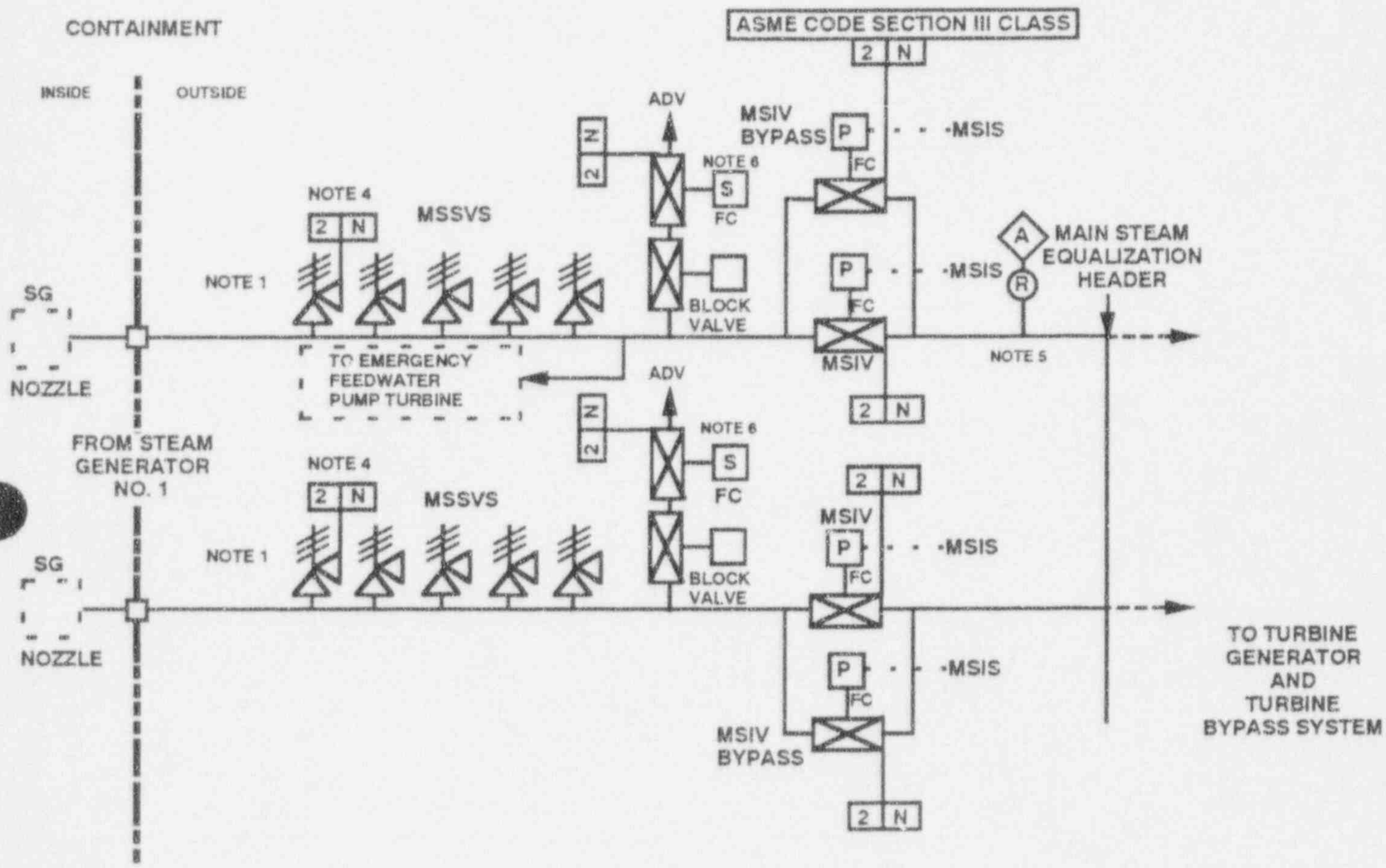
Valves with response positions indicated on Figure 2.8.2-1 change position to that indicated on the Figure upon loss of motive power.

The MSIV and MSIV bypass valves close on receipt of a main steam isolation signal (MSIS).

A radiation monitor is installed for one steam line from each steam generator to monitor primary-to-secondary leakage.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8.2-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Main Steam Supply System.



NOTES:

1. NOT LESS THAN 5 MSSV WILL BE INSTALLED FOR EACH STEAMLINE.
2. ASME CODE SECTION III CLASS COMPONENTS SHOWN ON THE FIGURE ARE SAFETY-RELATED.
3. SAFETY-RELATED ELECTRICAL COMPONENTS AND EQUIPMENT SHOWN IN THIS FIGURE ARE CLASS 1E.
4. THE ASME CODE SECTION III CLASS BREAK OCCURS AT THE DISCHARGE OF EACH MSSV.
5. PRIMARY TO SECONDARY LEAKAGE MONITOR IS NOT SAFETY- RELATED
6. ADV IS MODULATING ELECTRICALLY OPERATED VALVE WITH INTERNAL SOLENOID PILOT.

FIGURE 2.8.2-1
MAIN STEAM SUPPLY SYSTEM
(ARRANGEMENT SHOWN FOR ONE STEAM GENERATOR)

06-17-94

TABLE 2.8.2-1

MAIN STEAM SUPPLY SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the MSSS is as shown on Figure 2.8.2-1.	1. Inspection of the as-built MSSS configuration will be conducted.	1. For the components and equipment shown on Figure 2.8.2-1, the as-built MSSS conforms with the Basic Configuration.
2. The ASME Code Section III MSSS components shown on Figure 2.8.2-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those components of the MSSS required to be pressure tested by ASME Code Section III.	2. The results of the pressure test of the ASME Code Section III components of the MSSS conform with the pressure testing acceptance criteria in ASME Code Section III.
3. Controls exist in the MCR to open and close those power operated valves shown on Figure 2.8.2-1.	3. Testing will be performed using the MSSS controls in the MCR.	3. MSSS controls in the MCR open and close those power operated valves shown on Figure 2.8.2-1.
4. The MSSVs provide overpressure protection for the secondary side of the steam generators and for pressure boundary components in the MSSS.	4. Testing and analysis in accordance with ASME Code Section III will be performed to determine set pressure. Type tests and analyses of flow capacity of each MSSV will be performed.	4. An ASME code test and analysis report exists that concludes that the MSSV set pressures are set such that the maximum allowable pressure in the steam generator does not exceed 110% of the steam generator design pressure, and that the total MSSV capacity is sufficient to pass 19×10^6 lb./hr. at 110% of the steam generator design pressure.

TABLE 2.8.2-1 (Continued)

MAIN STEAM SUPPLY SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. Within a mechanical Division, the electrical controls for the ADV, MSIV, and MSIV bypass valve on each main steam line from a steam generator are powered from their respective Class 1E Division.	5. Testing will be performed on the MSSS by providing a test signal in only one Class 1E Division at a time.	5. Within the MSSS, a test signal exists only at the equipment powered from the Class 1E Division under test.
6. Within a mechanical Division, the ADV block valve on each main steam line from a steam generator is powered from a Class 1E Division different from the Class 1E Division of the respective Mechanical Division.	6. Testing will be performed on the MSSS by providing a test signal in only one Class 1E Division at a time.	6. Within the MSSS, a test signal exists only at the equipment powered from the Class 1E Division under test.
7. Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the MSSS.	7. Inspection of the as-installed Class 1E Divisions of the MSSS will be performed.	7. Physical separation exists between Class 1E Divisions in the MSSS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the MSSS.
8. The safety-related portions of the MSSS mechanical Divisions are physically separated.	8. Inspection of the as-built mechanical Divisions will be performed.	8. The safety-related portions of the MSSS mechanical Divisions are located in two MSVHs that are separated by the Containment. Components of the system within the Containment are separated by spatial arrangement or barriers.

TABLE 2.8.2-1 (Continued)

MAIN STEAM SUPPLY SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
9. Valves with response positions indicated on Figure 2.8.2-1 change position to that indicated on the Figure upon loss of motive power.	9. Testing of loss of motive power to these valves will be performed.	9. These valves change position to the position indicated on Figure 2.8.2-1 upon loss of motive power.
10.a) The MSIVs close on receipt of a MSIS.	10.a) Testing will be performed using a signal simulating a MSIS.	10.a) The MSIVs close within 5 seconds of receipt of a signal simulating a MSIS.
10.b) The MSIV bypass valves close on receipt of a MSIS.	10.b) Testing will be performed using a signal simulating a MSIS.	10.b) The MSIV bypass valves close within 10 seconds of receipt of a signal simulating a MSIS.
11. A radiation monitor is installed for one steam line from each steam generator to monitor primary-to-secondary leakage.	11. Inspection of the as-built radiation monitors for the steam lines will be performed.	11. An N-16 detector is installed for one steam line from each steam generator.

2.8.3 MAIN CONDENSER

Design Description

The Main Condenser is a non-safety-related component that converts the turbine exhaust steam to condensate so it can be pumped back through the condensate and feedwater systems to the steam generators. The condenser circulating water system provides cooling water to the Main Condenser tubes to condense the exhaust steam from the main turbine. The Main Condenser also serves as a collection point for auxiliary equipment vents and drains, and for condensate and feedwater system makeup. The main condenser is located in the turbine building.

The Basic Configuration of the Main Condenser is as shown on Figure 2.8.3-1.

Displays of the Main Condenser instrumentation shown on Figure 2.8.3-1 exist in the main control room (MCR) or can be retrieved there.

A turbine trip signal is generated in response to signals from the Main Condenser pressure instrumentation on loss of condenser vacuum.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8.3-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Main Condenser.

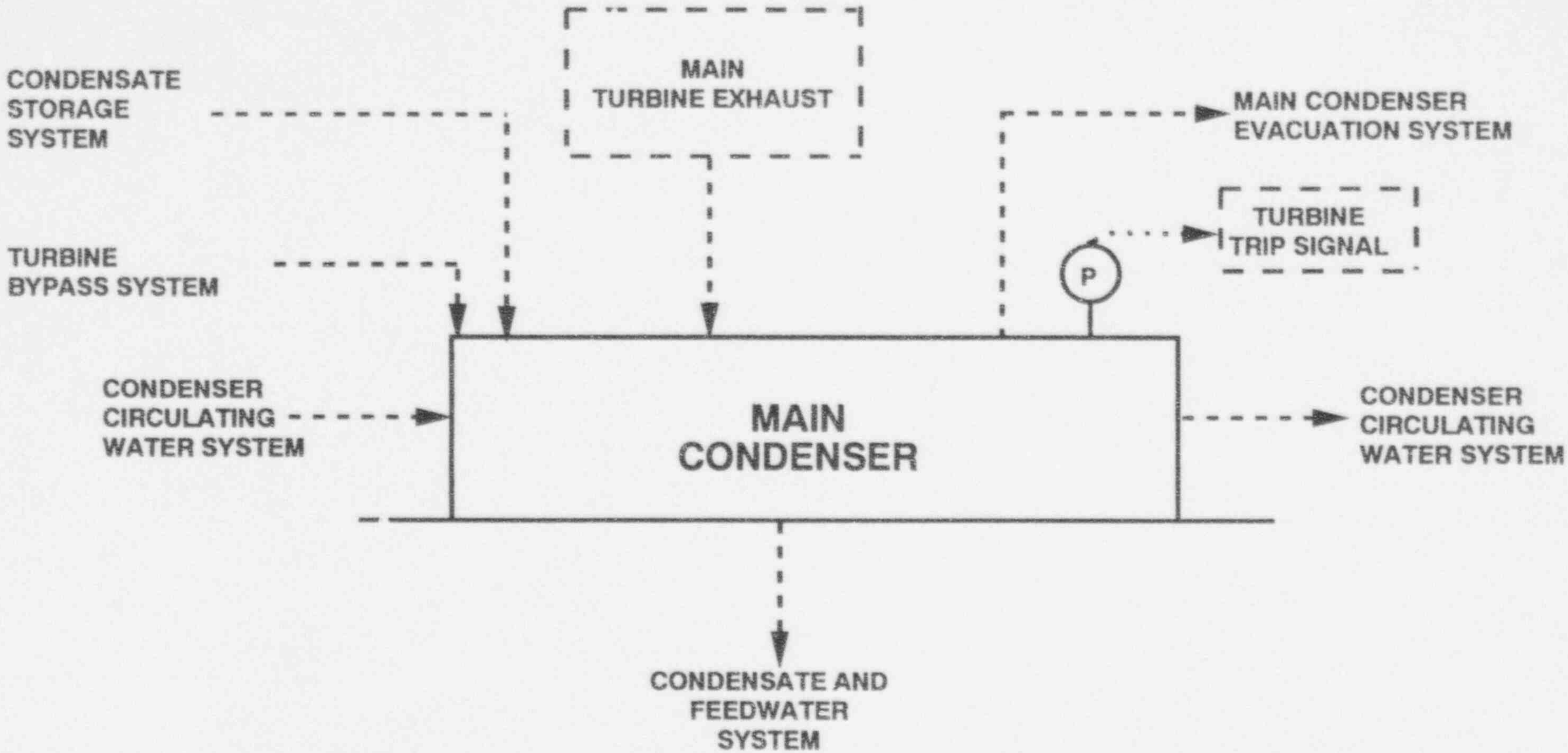


FIGURE 2.8.3-1
MAIN CONDENSER

06-17-94

TABLE 2.8.3-1

MAIN CONDENSER
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Main Condenser is as shown on Figure 2.8.3-1.	1. Inspection of the as-built Main Condenser configuration will be conducted.	1. For the components and equipment shown on Figure 2.8.3-1, the as-built Main Condenser conforms with the Basic Configuration.
2. Displays of the Main Condenser instrumentation shown on Figure 2.8.3-1 exist in the MCR or can be retrieved there.	2. Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	2. Displays of the instrumentation shown on Figure 2.8.3-1 exist in the MCR or can be retrieved there.
3. A turbine trip signal is generated in response to signals from the Main Condenser pressure instrumentation on loss of condenser vacuum.	3. Testing will be performed to verify generation of a turbine trip signal using signals from the Main Condenser pressure instrumentation which simulate a loss of condenser vacuum.	3. A turbine trip signal from the Main Condenser pressure instrumentation is activated on receipt of a signal simulating loss of condenser vacuum.

2.8.4 MAIN CONDENSER EVACUATION SYSTEM

Design Description

The Main Condenser Evacuation System is a non-safety-related system that removes air and other noncondensable gases from the main condenser. The Main Condenser Evacuation System is located in the turbine building, with the exhaust line going to the unit vent in the nuclear annex.

The Basic Configuration of the Main Condenser Evacuation System is as shown on Figure 2.8.4-1.

The Main Condenser Evacuation System has vacuum pumps and associated piping and instrumentation. The vacuum pump air discharge is routed to the unit vent and monitored for radiation.

Displays of the Main Condenser Evacuation System instrumentation shown on Figure 2.8.4-1 exist in the main control room (MCR) or can be retrieved there.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8.4-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Main Condenser Evacuation System.

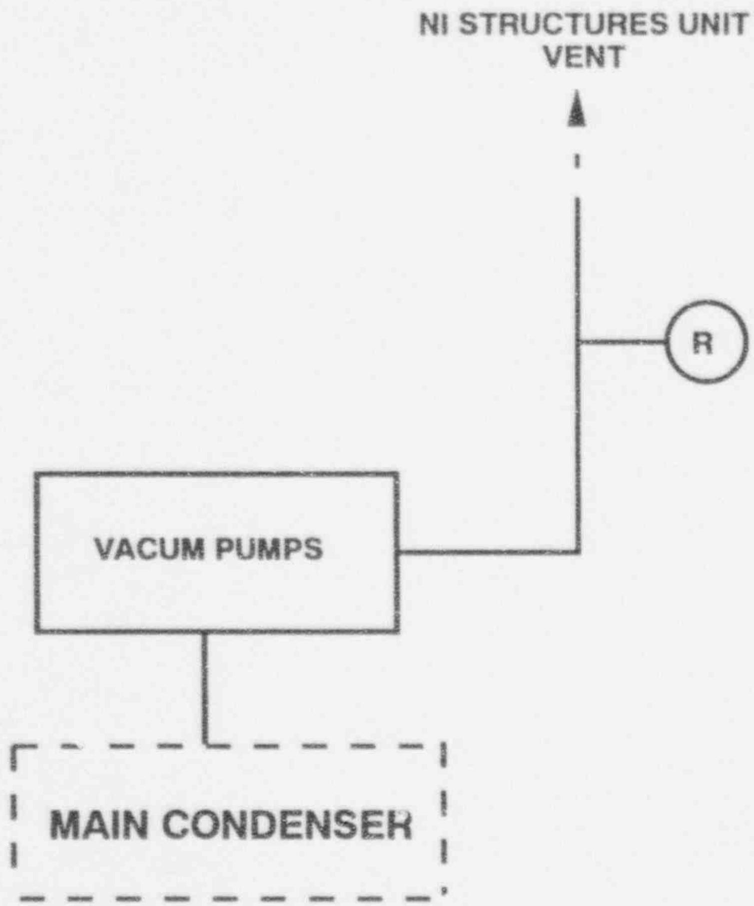


FIGURE 2.8.4-1
MAIN CONDENSER EVACUATION SYSTEM

TABLE 2.8.4-1

MAIN CONDENSER EVACUATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Main Condenser Evacuation System is as shown on Figure 2.8.4-1.	1. Inspection of the as-built Main Condenser Evacuation System configuration will be conducted.	1. For the components and equipment shown on Figure 2.8.4-1, the as-built Main Condenser Evacuation System conforms with the Basic Configuration.
2. Displays of the Main Condenser Evacuation System instrumentation shown on Figure 2.8.4-1 exist in the MCR or can be retrieved there.	2. Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	2. Displays of the instrumentation shown on Figure 2.8.4-1 exist in the MCR or can be retrieved there.

2.8.5 TURBINE BYPASS SYSTEM

Design Description

The Turbine Bypass System is a non-safety-related system. For startup, shutdown, and during load shedding, the Turbine Bypass System provides the capability to take steam from the main steam equalization header and discharge it directly to the main condenser, bypassing the turbine generator.

The Basic Configuration of the Turbine Bypass System is as shown on Figure 2.8.5-1.

The Turbine Bypass System consists of at least eight turbine bypass valves (TBVs), and associated piping and controls. The Turbine Bypass System is located in the turbine building.

Controls exist in the main control room (MCR) to open and close those power operated valves shown on Figure 2.8.5-1.

Valves with response positions indicated on Figure 2.8.5-1 change position to that indicated on the Figure upon loss of motive power.

The turbine bypass valves are controlled by the steam bypass control system (SBCS).

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8.5-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Turbine Bypass System.

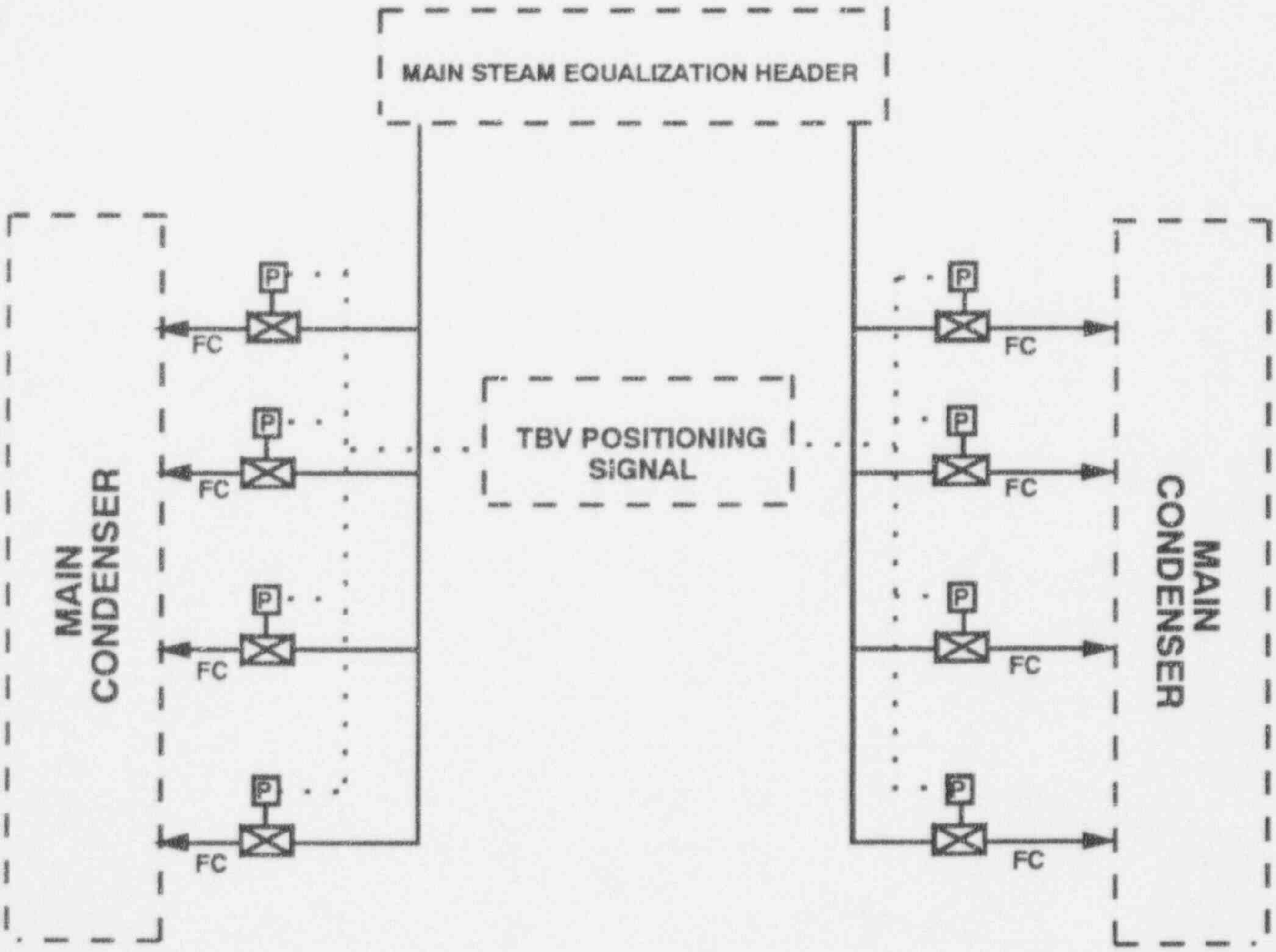


FIGURE 2.8.5-1
TURBINE BYPASS SYSTEM

06-17-94

TABLE 2.8.5-1

TURBINE BYPASS SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Turbine Bypass System is as shown on Figure 2.8.5-1.	1. Inspection of the as-built Turbine Bypass System configuration will be conducted.	1. For the components and equipment shown on Figure 2.8.5-1, the as-built Turbine Bypass System conforms with the Basic Configuration.
2. Controls exist in the MCR to open and close those power operated valves shown on Figure 2.8.5-1.	2. Testing will be performed using the Turbine Bypass System controls in the MCR.	2. Turbine Bypass System controls in the MCR open and close those power operated valves shown on Figure 2.8.5-1.
3. The turbine bypass valves open on receipt of a turbine bypass signal.	3. Testing will be conducted using a signal simulating a turbine bypass signal.	3. The turbine bypass valves open on receipt of a signal simulating a turbine bypass signal.
4. Valves with response positions indicated on Figure 2.8.5-1 change position to that indicated on the Figure upon loss of motive power.	4. Testing of loss of motive power to these valves will be performed.	4. These valves change position to the position indicated on Figure 2.8.5-1 on loss of motive power.

2.8.6 CONDENSATE AND FEEDWATER SYSTEMS

Design Description

The Condensate and Feedwater Systems transfer condensate from the main condenser hotwells to the steam generators.

The Basic Configuration of the Condensate and Feedwater Systems is as shown in Figure 2.8.6-1A and Figure 2.8.6-1B. The ASME Code Section III Class 2 components shown on Figure 2.8.6-1B are safety-related.

The Condensate System has three motor-driven condensate pumps, a deaerator storage tank, a gland seal steam condenser, low pressure heaters, associated piping, valves, instrumentation and controls located in the turbine building. The Condensate System also has a condensate cleanup system which is located in the condensate cleanup system area. The Feedwater System is located in the turbine building, above the yard, in the nuclear annex, main steam valve houses, and Containment.

The Feedwater System has three sets of feedwater booster and main feedwater pumps, high pressure feedwater heaters, and associated piping, valves, instrumentation and controls. Feedwater control valves are provided to regulate the feedwater flow to each steam generator and to maintain water level in the steam generator.

The ASME Code Section III Class for Feedwater System pressure retaining components shown on Figure 2.8.6-1B is as depicted on the Figure.

The safety related equipment shown on Figure 2.8.6-1B is classified Seismic Category I.

Controls exist in the main control room (MCR) to start and stop the feedwater pumps and condensate pumps, and to open and close those power operated valves shown on Figure 2.8.6-1B.

Within a mechanical Division, the electrical controls of one main feedwater isolation valve (MFIV) of each set of two MFIVs on the main feedwater lines which penetrate the containment boundary are powered from their respective Class 1E Division. The electrical controls of the other MFIV of each set of two MFIVs within a mechanical Division on the main feedwater lines which penetrate the containment boundary are powered from a Class 1E Division different from the Class 1E Division of the respective mechanical Division.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the Condensate and Feedwater Systems.

The two mechanical Divisions of the safety-related portions of the Feedwater System are physically separated.

Valves with response positions indicated on Figure 2.8.6-1B change position to that indicated on the Figure upon loss of motive power.

The MFIVs close on receipt of a main steam isolation signal (MSIS) or when remotely actuated from the control room.

Check valves shown on Figure 2.8.6-1B will open, or will close, or will open and also close, under system pressure, fluid flow conditions, or temperature conditions.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8.6-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Condensate and Feedwater Systems.

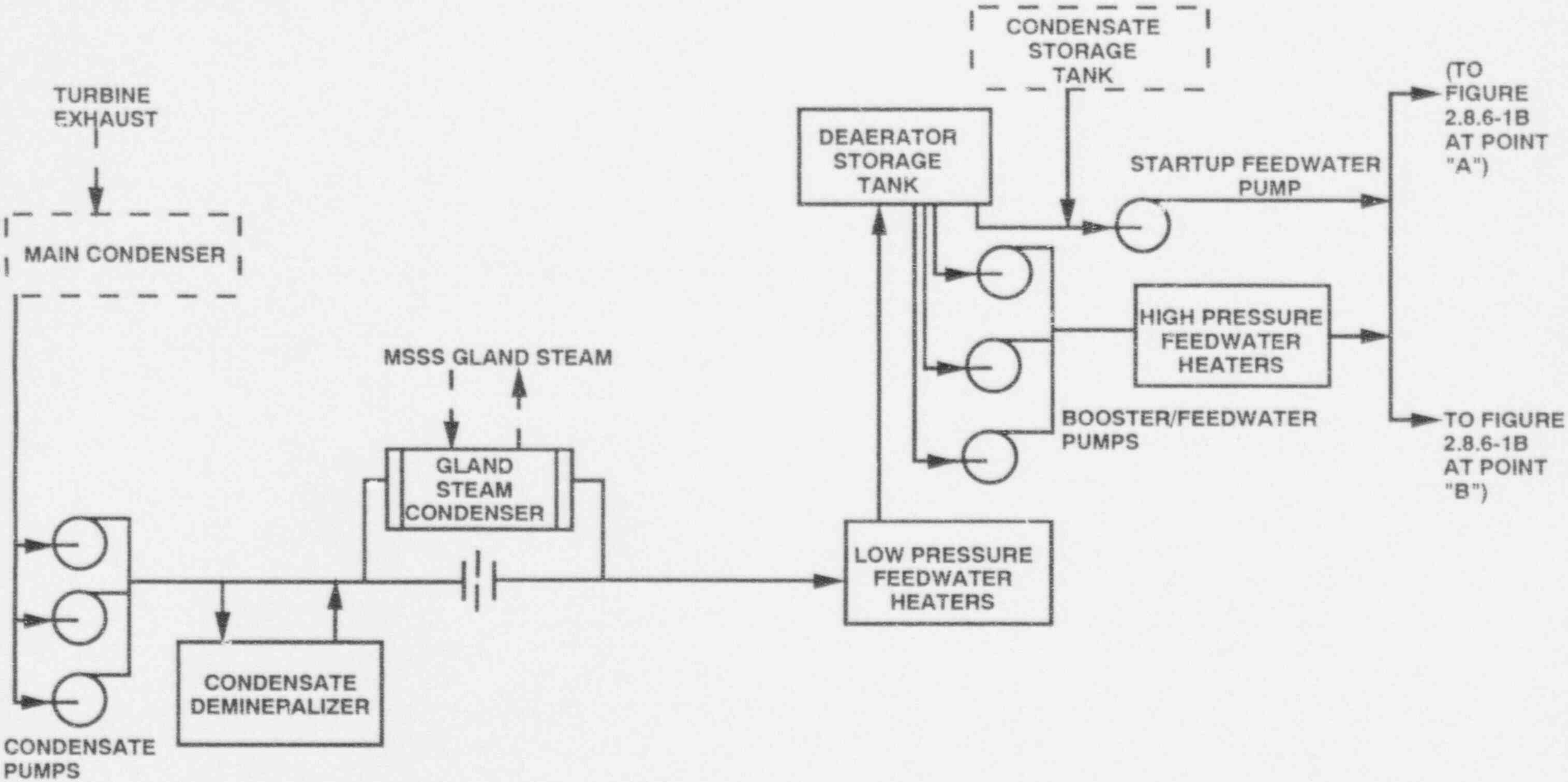
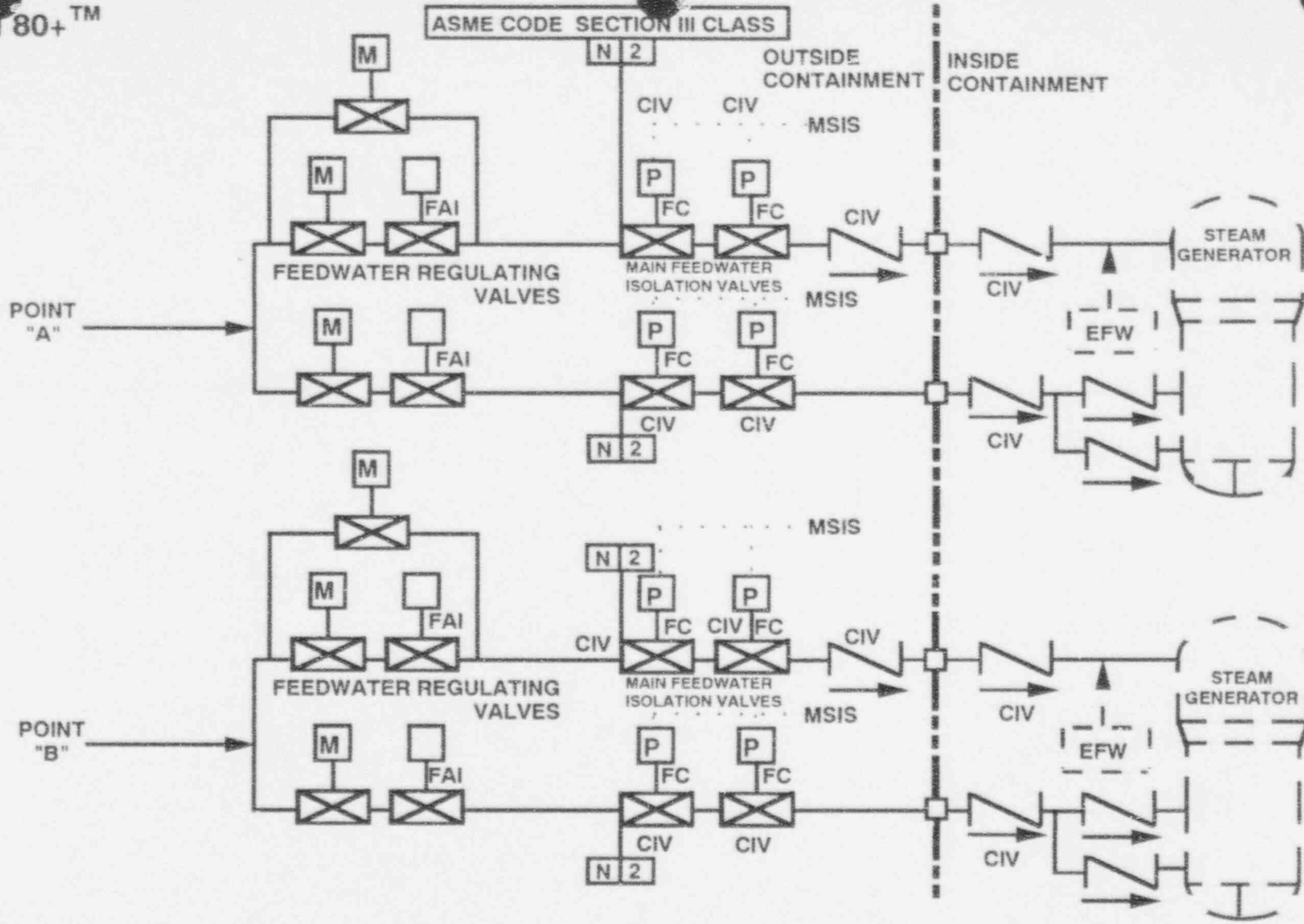


FIGURE 2.8.6-1A
CONDENSATE AND FEEDWATER SYSTEMS

06-17-94



NOTE:

1. SAFETY RELATED ELECTRICAL COMPONENTS AND EQUIPMENT SHOWN ON THIS FIGURE ARE CLASS 1E.

FIGURE 2.8.6-1B
CONDENSATE AND FEEDWATER SYSTEMS

06-17-94

TABLE 2.8.6-1

CONDENSATE AND FEEDWATER SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Condensate and Feedwater System is as shown on Figure 2.8.6-1A and Figure 2.8.6-1B.	1. Inspection of the as-built Condensate and Feedwater Systems configuration will be performed.	1. For the components and equipment shown on Figure 2.8.6-1A and Figure 2.8.6-1B, the as-built Condensate and Feedwater System conform with the Basic Configuration.
2. The ASME Code Section III Feedwater System components shown on Figure 2.8.6-1B retain their pressure boundary integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those components of the Feedwater System required to be pressure tested by ASME Code Section III.	2. The results of the pressure test of ASME Code Section III components of the Feedwater System conform with the pressure testing acceptance criteria in the ASME Code Section III.
3.a) Within a mechanical Division, the electrical controls of one MFIV of each set of two MFIVs on the main feedwater lines which penetrate the containment boundary are powered from their respective Class 1E Division.	3.a) Testing will be performed on the Feedwater System by providing a test signal in only one Class 1E Division at a time.	3.a) Within the Feedwater System, a test signal exists only at the equipment powered from the Class 1E Division under test.
3.b) The electrical controls of the other MFIV of each set of two MFIVs within a mechanical Division on the main feedwater lines which penetrate the containment boundary are powered from a Class 1E Division different from the Class 1E Division of the respective mechanical Division.	3.b) Testing will be performed on the Feedwater System by providing a test signal in only one Class 1E Division at a time.	3.b) Within the Feedwater System, a test signal exists only at the equipment powered from the Class 1E Division under test.

TABLE 2.8.6-1 (Continued)

CONDENSATE AND FEEDWATER SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3.c) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the Condensate and Feedwater Systems.	3.c) Inspection of the as-installed Class 1E Divisions of the Condensate and Feedwater Systems will be performed.	3.c) Physical separation exists between Class 1E Divisions in the Condensate and Feedwater Systems. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the Condensate and Feedwater Systems.
4. The two mechanical Divisions of the safety-related portions of the Feedwater System are physically separated.	4. Inspection of the as-built mechanical Divisions will be performed.	4. The mechanical Divisions of the safety-related portions of the Feedwater System are located in two main steam valve houses separated by the Containment. Components of the system within the Containment are separated by spatial arrangement or barriers.
5. Controls exist in the MCR to start and stop the feedwater and condensate pumps, and to open and close those power operated valves shown on Figure 2.8.6-1B.	5. Testing will be performed using the Condensate and Feedwater Systems controls in the MCR.	5. Condensate and Feedwater System controls in the MCR operate to start and stop the feedwater and condensate pumps, and to open and close those power operated valves shown on Figure 2.8.6-1B.
6. The Main Feedwater Isolation Valves close on receipt of a MSIS.	6. Testing will be performed using a signal simulating a MSIS.	6. The MFIVs close within 5 seconds after receipt of a signal simulating a MSIS.

TABLE 2.8.6-1 (Continued)

CONDENSATE AND FEEDWATER SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. Check valves shown on Figure 2.8.6-1B will open, or will close, or will open and also close under system pressure, fluid flow conditions, or temperature conditions.	7. Testing will be conducted to open, or close, or open and also close the check valves shown on Figure 2.8.6-1B under system preoperational pressure, fluid flow conditions, or temperature conditions.	7. Each check valve shown on Figure 2.8.6-1B opens, or closes, or opens and also closes.
8. Valves with response positions indicated on Figure 2.8.6-1B change position to that indicated on the Figure upon loss of motive power.	8. Testing of loss of motive power to these valves will be performed.	8. These valves change position to the position indicated on Figure 2.8.6-1B on loss of motive power.

2.8.7 STEAM GENERATOR BLOWDOWN SYSTEM

Design Description

The Steam Generator Blowdown System (SGBS) removes and processes steam generator fluid containing impurities, and returns the water to the feedwater and condensate system.

The Basic Configuration of the SGBS is as shown on Figure 2.8.7-1.

The ASME Code Section III Class 2 pressure retaining components of the SGBS shown on the Figure are safety-related.

The SGBS has a mechanical piping train from each steam generator. Each train includes two blowdown lines from the secondary side of each steam generator. The trains discharge blowdown fluid to a flash tank from which the blowdown fluid is processed and returned to the condensate and feedwater system.

The ASME Code Section III Class for the SGBS pressure retaining components shown in Figure 2.8.7-1 is as depicted on the Figure.

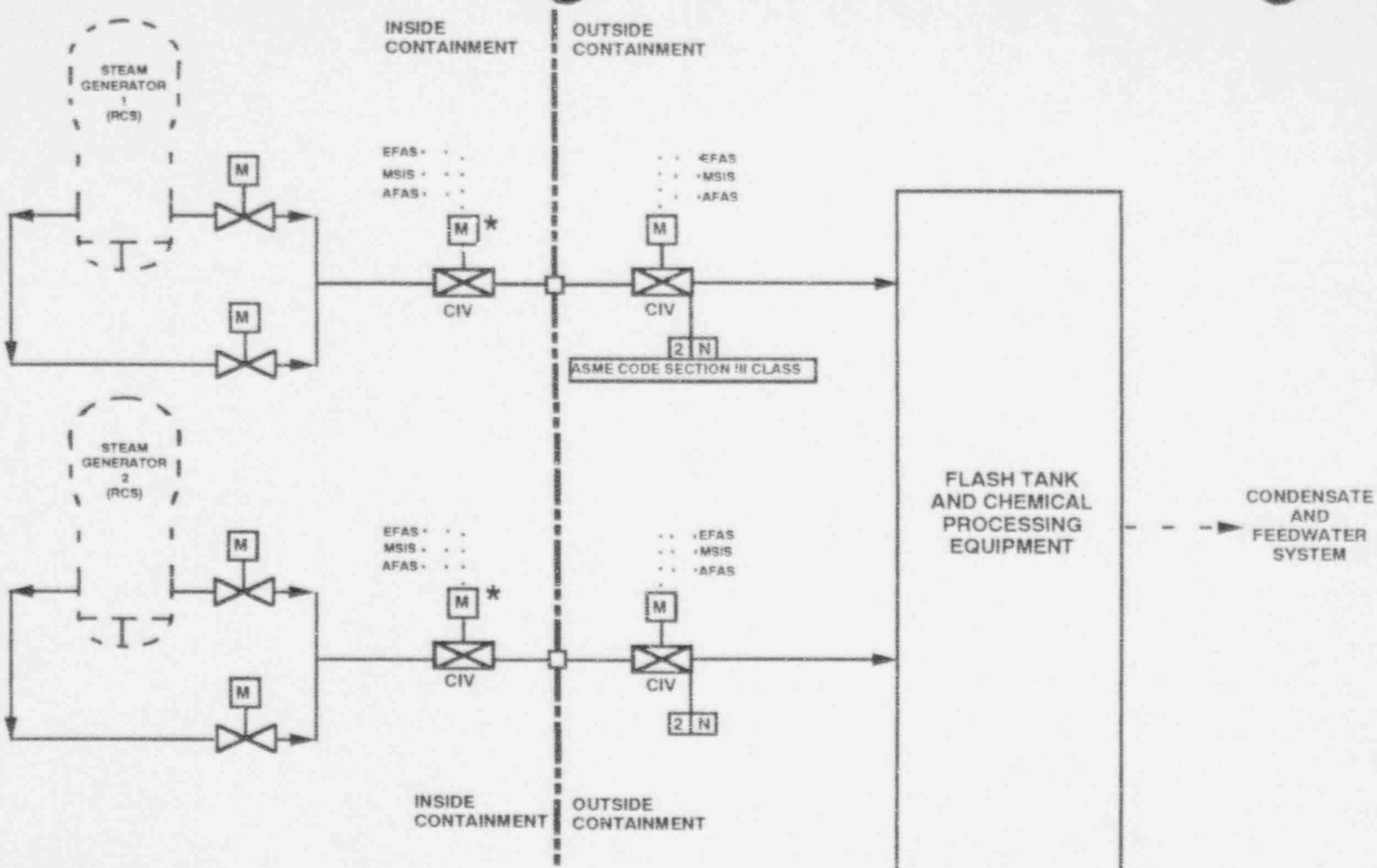
The safety-related equipment shown on Figure 2.8.7-1 is classified Seismic Category I.

Controls exist in the main control room (MCR) to open and close those power operated valves shown on Figure 2.8.7-1.

Each SGBS blowdown line penetrating containment contains valves which close upon receipt of a main steam isolation signal (MSIS), an emergency feedwater actuation signal (EFAS), or an alternate feedwater actuation signal (AFAS).

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8.7-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Steam Generator Blowdown System.



NOTE:

* EQUIPMENT FOR WHICH PARAGRAPH NUMBER 3 OF THE "VERIFICATION FOR BASIC CONFIGURATION FOR SYSTEMS" SECTION OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.

FIGURE 2.8.7-1
STEAM GENERATOR BLOWDOWN SYSTEM

06-17-94

TABLE 2.8.7-1

STEAM GENERATOR BLOWDOWN SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the SGBS is as shown on Figure 2.8.7-1.	1. Inspection of the as-built SGBS configuration will be conducted.	1. For the components and equipment shown on Figure 2.8.7-1, the as-built SGBS conforms with the Basic Configuration.
2. The ASME Code Section III SGBS components shown on Figure 2.8.7-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those components of the SGBS required to be pressure tested by the ASME Code Section III.	2. The results of the pressure test of ASME Code Section III components of the SGBS conform with the pressure testing acceptance criteria in ASME Code Section III.
3. Controls exist in the MCR to open and close those power operated valves shown on Figure 2.8.7-1.	3. Testing will be performed using the SGBS controls in the MCR.	3. SGBS controls in the MCR operate to open and close those power operated valves shown on Figure 2.8.7-1.
4. Each SGBS blowdown line penetrating containment contains valves which close upon receipt of a MSIS, an EFAS, or a AFAS.	4. Testing will be performed using signals simulating an MSIS, EFAS, and AFAS in individual tests. The SGBS containment isolation valves response to each signal will be observed.	4. SGBS containment isolation valves close upon receipt of a signal simulating an MSIS, EFAS, or AFAS.

2.8.8 EMERGENCY FEEDWATER SYSTEM

Design Description

The Emergency Feedwater System (EFWS) supplies feedwater to the steam generators for events resulting in loss of normal feedwater and requiring heat removal through the steam generators.

The EFWS is located within the nuclear island (NI) structures, including Containment, reactor building (RB), and nuclear annex (NA).

The Basic Configuration of the EFWS is as shown on Figure 2.8.8-1. The EFWS is safety-related as noted on Figure 2.8.8-1.

The EFWS consists of two mechanical Divisions, each with an emergency feedwater storage tank (EFWST) which is an integral part of the NI structures, two EFW pumps, a cavitating flow-limiting venturi, valves, piping, instrumentation and controls. The EFW pumps in each Division are powered by diverse drivers.

A gravity-fed non-safety grade source of condensate makeup is provided to either EFWST.

The flow recirculation line from each EFW pump discharge back to its associated EFWST provides required EFW pump minimum flow and permits testing each EFW pump at full flow.

Each EFW pump delivers at least the minimum flow required for removal of core decay heat using the steam generator(s), (SG) against steam generator feedwater nozzle pressures up to main steam safety valve lift pressure.

The cavitating flow-limiting venturis limit emergency feedwater flow to each SG with both EFW pumps running in the Division against steam generator pressures down to 0 psig.

Each EFWST has a volume above the EFW pump suction line penetrations to permit plant cooldown to shutdown cooling entry conditions following the most limiting design basis event.

The ASME Code Section III Class for the EFWS pressure retaining components shown on Figure 2.8.8-1 is as depicted on the Figure.

The safety-related equipment shown on Figure 2.8.8-1 is classified Seismic Category I.

Displays of the EFWS instrumentation shown on Figure 2.8.8-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to start and stop the EFW pumps, and to open and close those power operated valves shown on Figure 2.8.8-1.

Alarms shown on Figure 2.8.8-1 are provided in the MCR.

Water is supplied to each EFW pump at a pressure greater than the pump's required net positive suction head (NPSH).

Within a mechanical Division, the following components are powered from their respective Class 1E Division:

the motor-driven EFW pump,

the two motor-operated valves in the motor-driven EFW pump's discharge line, and

process instrumentation, except alarms, in the motor-driven EFW pump's suction and discharge lines.

Within a mechanical Division, the following components are powered from a Class 1E Division different from the Class 1E Division powering the motor-driven EFW pump:

the turbine-driven EFW pump electrical controls,

the two motor-operated valves in the turbine-driven EFW pump's discharge line,

the motor-operated valve and electrical controls for the pneumatic valve and hydraulic valve in the turbine-driven EFW pump's steam supply line, and

process instrumentation, except alarms, in the turbine-driven EFW pump's suction and discharge lines.

In each EFW pump's discharge line, each of the two motor-operated valves is powered from a different Class 1E bus in the same Class 1E Division.

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the EFWS.

The two mechanical Divisions of the EFWS are physically separated except for the cross-connect lines between EFWSTs and between Divisional EFW pump discharge lines.

The EFWS is actuated by an emergency feedwater actuation signal (EFAS) from the engineered safety features actuation system (ESFAS) or by an alternate feedwater actuation signal (AFAS) from the alternate protection system (APS). The engineered safety features component control system (ESF-CCS) includes logic to close the isolation valves and flow control valves when SG water level has risen above a high level setpoint, and to re-open those valves when SG water level drops below a low level setpoint.

Motor operated valves (MOVs) having an active safety function will open, or will close, or will open and also close, under differential pressure or fluid flow conditions and under temperature conditions.

Check valves shown on Figure 2.8.8-1 will open, or will close, or will open and also close, under system pressure, fluid flow conditions, or temperature conditions.

Valves with response positions indicated on Figure 2.8.8-1 change position to that indicated on the Figure upon loss of motive power.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8.8-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Emergency Feedwater System.

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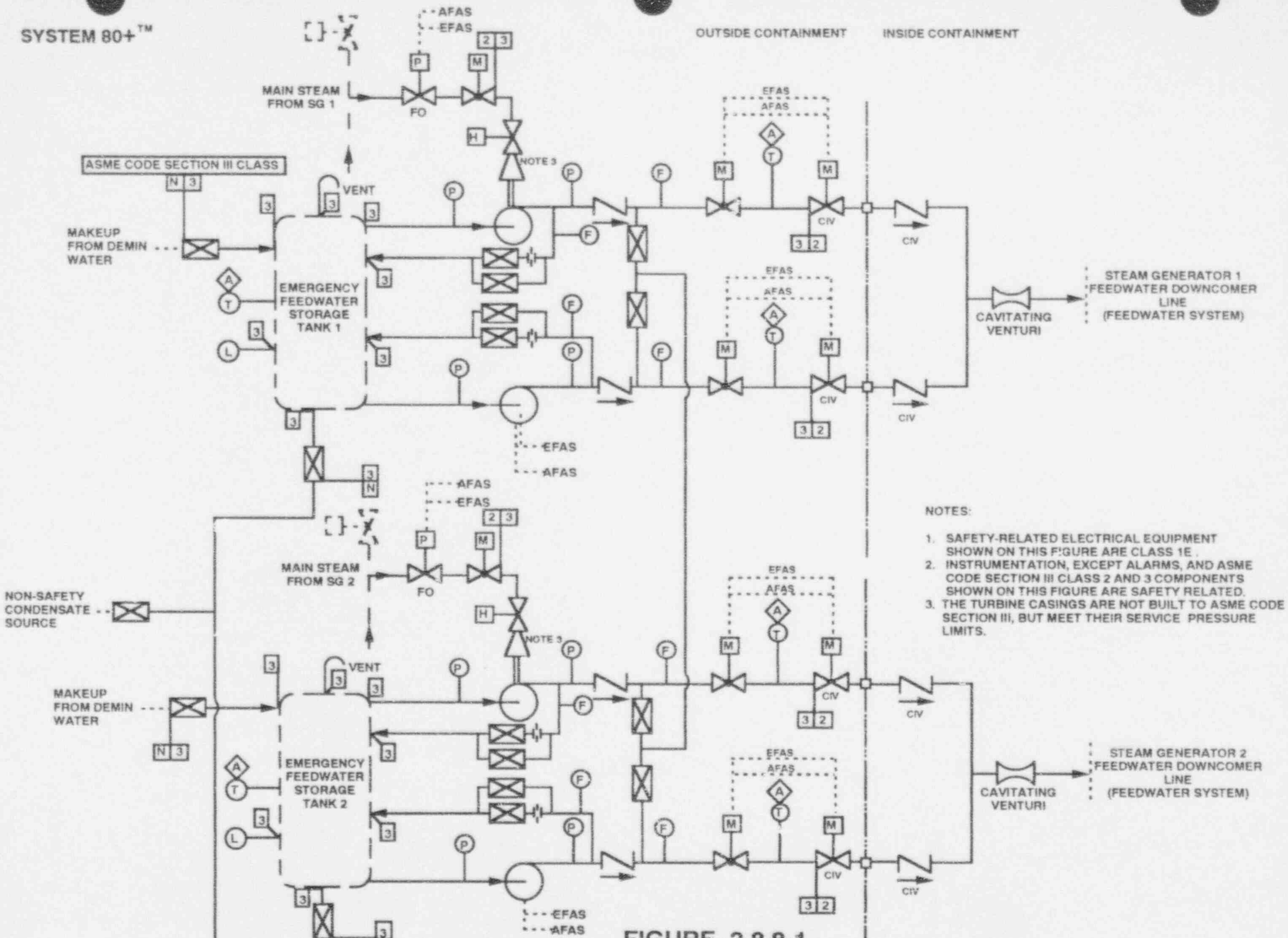


FIGURE 2.8.8-1
EMERGENCY FEEDWATER SYSTEM

TABLE 2.8.8-1

EMERGENCY FEEDWATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the EFWS is as shown on Figure 2.8.8-1.	1. Inspection of the as-built EFWS configuration will be conducted.	1. For the components and equipment shown on Figure 2.8.8-1, the as-built EFWS conforms with the Basic Configuration.
2. A gravity-fed non-safety grade source of condensate makeup is provided to either EFWST.	2. Testing of the non-safety grade source of condensate makeup to the EFWSTs will be performed by manually aligning the makeup source to each EFWST with the EFWST at a low water level. Water level will be observed.	2. The water level increases in the EFWST being fed from the makeup source.
3. The flow recirculation line from each EFW pump discharge back to its associated EFWST provides required EFW pump minimum flow and permits testing each EFW pump at full flow.	3. Testing of each EFW pump in the minimum flow and the full flow test modes will be conducted with flow directed to the EFWST through the pump's recirculation lines.	3. Minimum recirculation flow meets or exceeds the pump vendor's required minimum flow. Full flow from each pump (at least 500 gpm) is returned to the EFWST.
4.a) Each EFW pump delivers at least the minimum flow required for removal of core decay heat using the steam generator(s) against a steam generator feedwater nozzle pressure up to main steam safety valve lift pressure.	4.a) Testing of each EFW pump will be performed to determine system flow vs. steam generator pressure. Analysis will be performed to convert the test results to the design conditions.	4.a) Each EFW pump delivers at least 500 gpm to the steam generator(s) against a steam generator feedwater nozzle pressure of 1217 psia.
4.b) The cavitating flow-limiting venturis limit maximum flow to each SG with both pumps in the Division running against a steam generator pressure of 0 psig.	4.b) Testing will be performed with both pumps in a Division running. Analysis will be used to convert the test results to the conditions of the Design Commitment.	4.b) The maximum flow to each SG is 800 gpm with both pumps running against a steam generator pressure of 0 psig.

TABLE 2.8.8-1 (Continued)

EMERGENCY FEEDWATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. Each emergency feedwater storage tank has a volume above the EFW pump suction line penetrations to permit plant cooldown to shutdown cooling entry conditions following the most limiting design basis event.	5. Inspection of the EFWSTs will be performed and the internal volume of each tank available for emergency feedwater will be determined.	5. The internal volume above the EFW pump suction line penetrations of each EFWST is at least 350,000 gallons.
6. The ASME Code Section III EFW components shown on Figure 2.8.8-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	6. A pressure test will be conducted on those components of the EFW required to be pressure tested by ASME Code Section III.	6. The results of the pressure test of ASME Code Section III components of the EFW conform with the pressure testing acceptance criteria in ASME Code Section III.
7.a) Displays of the EFW instrumentation shown on Figure 2.8.8-1 exist in the MCR or can be retrieved there.	7.a) Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	7.a) Displays of the instrumentation shown on Figure 2.8.8-1 exist in the MCR or can be retrieved there.
7.b) Controls exist in the MCR to start and stop the EFW pumps, and to open and close those power operated valves shown on Figure 2.8.8-1.	7.b) Testing will be performed using the EFW controls in the MCR.	7.b) EFW controls in the MCR operate to start and stop the EFW pumps, and to open and close those power operated valves shown on Figure 2.8.8-1.
7.c) EFWS alarms shown on Figure 2.8.8-1 are provided in the MCR.	7.c) Testing of the EFWS alarms shown on Figure 2.8.8-1 will be performed using signals simulating alarm conditions.	7.c) The EFWS alarms shown on Figure 2.8.8-1 actuate in the MCR.

TABLE 2.8.8-1 (Continued)

EMERGENCY FEEDWATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. Water is supplied to each EFW pump at a pressure greater than the pump's required net positive suction head (NPSH).	8. Testing to measure EFW pump suction pressure will be performed. Inspections and analyses to determine NPSH available to each pump will be performed based on test data and as-built data.	8. The available NPSH exceeds each EFW pump's required NPSH.
9.a) Within a mechanical Division, the following components are powered from their respective Class 1E Division: the motor-driven EFW pump, the two motor-operated valves in the motor-driven EFW pump's discharge line, and process instrumentation, except alarms, in the motor-driven pump's suction and discharge lines.	9.a) Testing will be performed on the EFW by providing a test signal in only one Class 1E Division at a time.	9.a) Within the EFW, a test signal exists only at the equipment powered from the Class 1E Division under test.
9.b) Within a mechanical Division, the following components are powered from a Class 1E Division different from the Class 1E Division powering the motor-driven EFW pump: the turbine-driven EFW pump electrical controls, the two motor-operated valves in the turbine-driven EFW pump's discharge line,	9.b) Testing will be performed on the EFW by providing a test signal in only one Class 1E Division at a time.	9.b) Within the EFW, a test signal exists only at the equipment powered from the Class 1E Division under test.

TABLE 2.8.8-1 (Continued)

EMERGENCY FEEDWATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
the motor-operated valve and electrical controls for the pneumatic valve and hydraulic valve in the turbine-driven EFW pump's steam supply line, and process instrumentation, except alarms, in the turbine-driven EFW pump's suction and discharge lines.		
9.c) In each EFW pump's discharge line, each of the two motor-operated valves is powered from a different Class 1E bus in the same Class 1E Division.	9.c) Testing will be performed on the EFW motor-operated valves in each EFW pump discharge line by providing a test signal in only one Class 1E bus at a time.	9.c) A test signal exists only at the EFW motor-operated valve powered from the Class 1E bus under test.
9.d) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the EFWS.	9.d) Inspection of the as-installed Class 1E Divisions of the EFWS will be performed.	9.d) Physical separation exists between Class 1E Divisions in the EFWS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the EFWS.
10. The two mechanical Divisions of the EFW are physically separated, except for the cross-connect lines between EFWSTs and between Divisional EFW pump discharge lines.	10. Inspection of as-built mechanical Divisions will be performed.	10. The two mechanical Divisions of the EFW are separated by a Divisional wall or a fire barrier except for the cross-connect lines between Divisional EFW pump discharge lines. Within containment, the EFWS Divisions are separated by spatial arrangement or barriers.

TABLE 2.8.8-1 (Continued)

EMERGENCY FEEDWATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11.a) The EFWS is actuated by an emergency feedwater actuation signal (EFAS) or an alternate feedwater actuation signal (AFAS).	11.a) Testing will be performed by generating a signal simulating an EFAS for its corresponding steam generator. The test will be repeated using a signal simulating an AFAS.	11.a) The motor-driven and turbine-driven pumps start, and the steam generator isolation and flow control valves open, in the Division receiving the signal simulating an EFAS. The same components actuate in response to a signal simulating an AFAS. Flow is delivered to the steam generator(s) in no more than 60 seconds following an EFAS or AFAS.
11.b) The ESF-CCS includes logic to close the isolation valves and flow control valves when SG water level has risen above a high level setpoint, and to re-open those valves when SG water level drops below a low level setpoint.	11.b) Testing of each EFWS Division will be performed using signals simulating high and low SG water level.	11.b) A signal simulating high SG water level signal closes the SG isolation valves and the flow control valves in its associated Division. A signal simulating low SG water level signal opens the SG isolation valves and the flow control valves in its associated Division.
12. Motor-operated valves (MOVs) having an active safety function will open, or will close, or will open and also close under differential pressure or fluid flow conditions and under temperature conditions.	12. Testing will be performed to open, or close, or open and also close MOVs having an active safety function under preoperational differential pressure or fluid flow conditions and under temperature conditions.	12. Each MOV having an active safety function opens, or closes, or opens and also closes.

TABLE 2.8.8-1 (Continued)

EMERGENCY FEEDWATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
13. Check valves shown on Figure 2.8.8-1 will open, or will close, or will open and also close under system pressure, fluid flow conditions, or temperature conditions.	13. Testing will be performed to open, or close, or open and also close check valves shown on Figure 2.8.8-1 under system preoperational pressure, fluid flow conditions, or temperature conditions.	13. Each check valve shown on Figure 2.8.8-1 opens, or closes, or opens and also closes.
14. Valves with response positions indicated on Figure 2.8.8-1 change position to that indicated on the Figure upon loss of motive power.	14. Testing of loss of motive power to these valves will be performed.	14. These valves change position to the position indicated on Figure 2.8.8-1 on loss of motive power.

2.8.9 CONDENSER CIRCULATING WATER SYSTEM

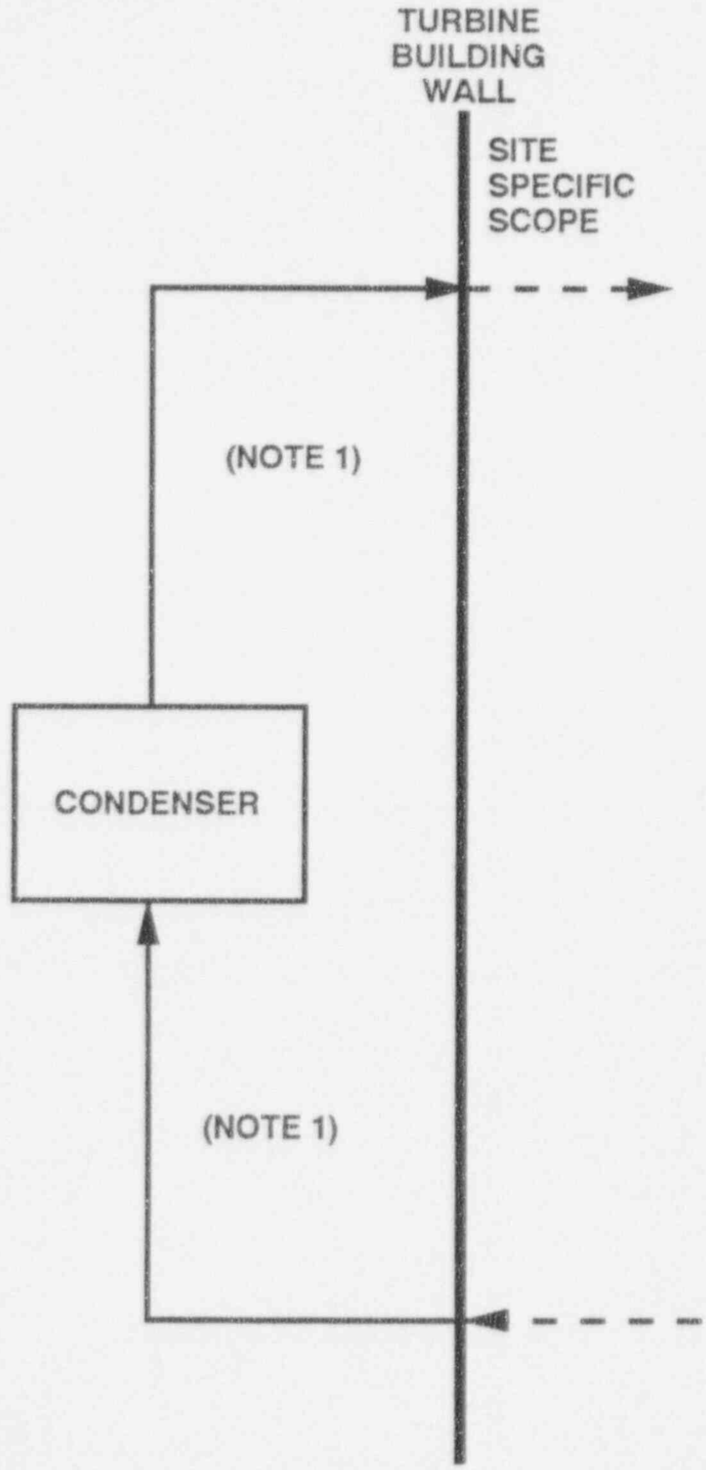
Design Description

The Condenser Circulating Water System is a non-safety interface system that provides cooling water for the turbine condensers and transfers heat from the Turbine Building Service Water System to the normal heat sink.

The parts of the Condenser Circulating Water System that are in the Turbine Building are within the Certfied Design. Those parts of the system that are outside the Turbine Building are not in the Certified Design. Figure 2.8.9-1 shows the system basic configuration and scope of the Condenser Circulating Water System within the Certified Design.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8.9-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Condenser Circulating Water System.



NOTE:
1. MULTIPLE LINES MAY BE USED

FIGURE 2.8.9-1
CONDENSER CIRCULATING WATER SYSTEM

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TABLE 2.8.9-1

CONDENSER CIRCULATING WATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A Basic Configuration for the Condenser Circulating Water System is as shown on Figure 2.8.9-1.	1. Inspection of the as-built system will be conducted.	1. The as-built Condenser Circulating Water System conforms with the Basic Configuration shown on Figure 2.8.9-1.

2.9.1 LIQUID WASTE MANAGEMENT SYSTEM

Design Description

The Liquid Waste Management System (LWMS) is used to collect, segregate, store, process, sample, and monitor radioactive liquid waste. The LWMS is non-safety-related with the exception of the containment isolation valves and piping in between covered in Section 2.4.5.

The LWMS is located in the radwaste building.

The Basic Configuration of the LWMS is as shown on Figure 2.9.1-1.

The LWMS has four subsystems which process radioactive or potentially radioactive liquid waste. These four subsystems segregate liquid waste into high level waste, low level waste, laundry and hot shower/chemical waste, and the containment cooler condensate waste.

The high level waste subsystem has filters, demineralizers, provisions for batch sampling, and piping for recirculation of liquid waste for further processing.

The low level waste subsystem has filters, demineralizers, provisions for batch sampling, and piping for recirculation of liquid waste for further processing.

The laundry and hot shower/chemical waste subsystem has filters, demineralizers, provisions for batch sampling, and piping for recirculation of liquid waste for further processing.

The containment cooler condensate subsystem has tanks to collect containment cooler condensate. The discharge from the tanks is monitored for radioactivity. Although not normally radioactive, this discharge can be diverted to the low level waste subsystem. The containment cooler condensate tank levels and discharge flow are also monitored by level and flow instrumentation.

The LWMS subsystems have collection and storage capacity to process waste volumes expected during normal operation and from anticipated operational occurrences.

Displays of the LWMS instrumentation shown on Figure 2.9.1-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to open and close the power operated valves shown on Figure 2.9.1-1.

The valves with the response position indicated on Figure 2.9.1-1 change position to that indicated on the Figure upon loss of motive power.

The LWMS has means to monitor radioactivity levels in the processed liquid waste prior to release. The radioactivity monitor provides a signal to terminate LWMS discharge when a specified radioactivity level is reached.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.9.1-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Liquid Waste Management System.

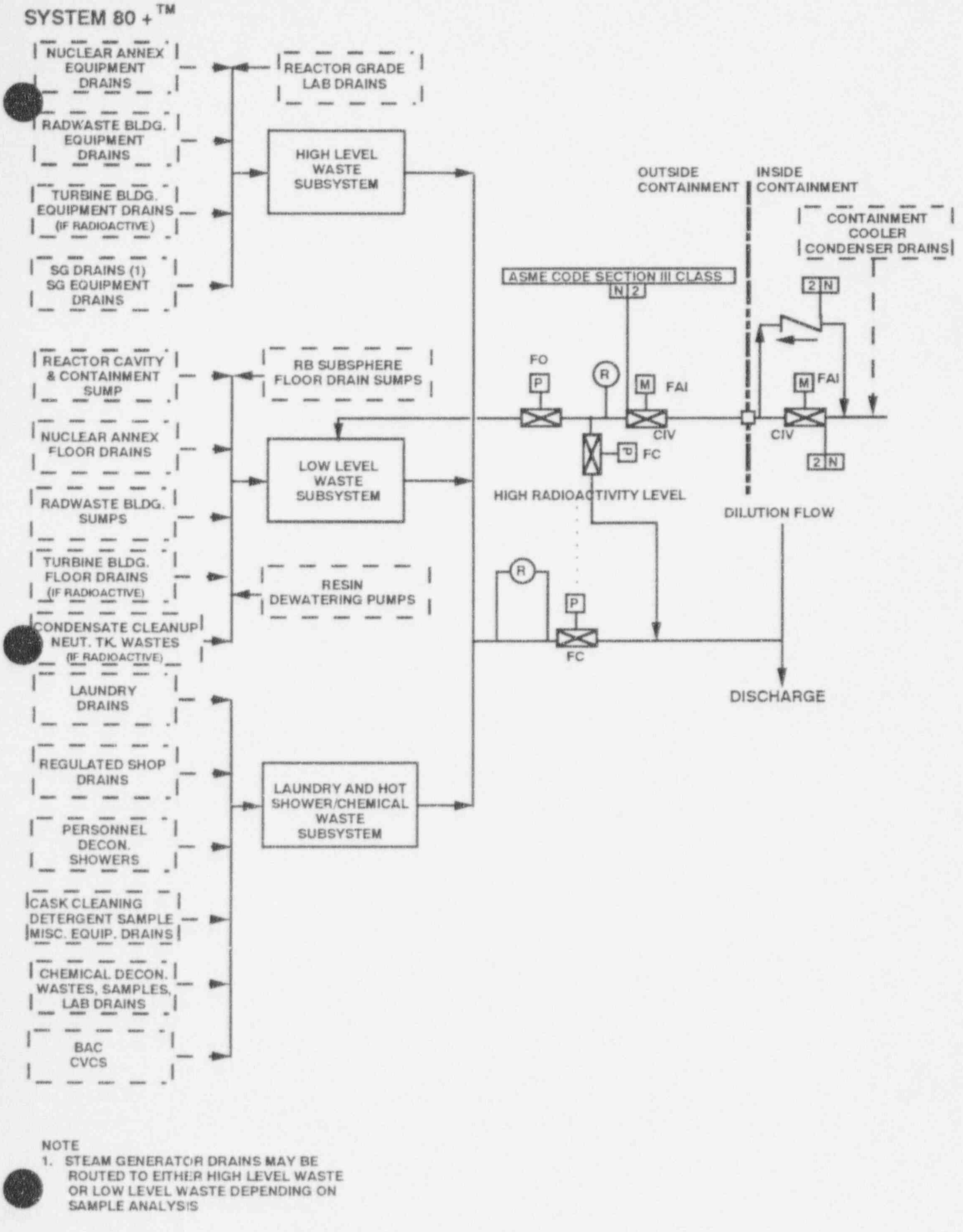

FIGURE 2.9.1-1
LIQUID WASTE MANAGEMENT SYSTEM

06-17-94

TABLE 2.9.1-1

LIQUID WASTE MANAGEMENT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Liquid Waste Management System (LWMS) is as shown on Figure 2.9.1-1.	1. Inspection of the as-built LWMS configuration will be conducted.	1. For the components and equipment shown on Figure 2.9.1-1, the as-built LWMS conforms with the Basic Configuration.
2. The ASME Code Section III LWMS components shown on Figure 2.9.1-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those components of the LWMS required to be pressure tested by ASME Code Section III.	2. The results of the pressure test of the ASME Code Section III components of the LWMS conform with the pressure testing acceptance criteria in ASME Code Section III.
3. The LWMS subsystems have collection and storage capacity to process waste volumes expected during normal operation and from anticipated operational occurrences.	3. Analysis of the as-built LWMS subsystems' processing capability will be performed.	3. An analysis exists which concludes the LWMS subsystems have collection and storage capacity to process waste volumes expected during normal operation and from anticipated operational occurrences.
4. Displays of the LWMS instrumentation shown on Figure 2.9.1-1 exist in the MCR or can be retrieved there.	4. Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	4. Displays of the instrumentation shown on Figure 2.9.1-1 exist in the MCR or can be retrieved there.
5. Controls exist in the MCR to open and close the power operated valves shown on Figure 2.9.1-1.	5. Testing will be performed using the LWMS controls in the MCR.	5. LWMS controls in the MCR operate to open and close the power operated valves shown on Figure 2.9.1-1.

TABLE 2.9.1-1 (Continued)

LIQUID WASTE MANAGEMENT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6. The valves with the response position indicated on Figure 2.9.1-1 changes position to that indicated on the Figure upon loss of motive power.	6. Testing of loss of motive power to the valves will be performed.	6. The valves change position to the position indicated on Figure 2.9.1-1 upon loss of motive power.
7. The radioactivity monitor provides a signal to terminate LWMS discharge when a specified radioactivity level is reached.	7. Testing of the as-built LWMS discharge controls will be performed using a signal which simulates radioactivity levels.	7. LWMS discharge is terminated in response to a signal simulating that the radioactivity level in the waste discharge line has reached a specified limit.

2.9.2 GASEOUS WASTE MANAGEMENT SYSTEM

Design Description

The Gaseous Waste Management System (GWMS) is used to collect, store, process, sample, and monitor radioactive gaseous waste.

The GWMS is located in the nuclear annex. With the exception of containment penetration isolation valves and the piping in between covered in Section 2.4.5, the GWMS is non-safety-related.

The Basic Configuration of the GWMS is as shown on Figure 2.9.2-1.

The GWMS processing unit has a cooler condenser, a charcoal guard bed, and charcoal adsorbers. The GWMS charcoal vessels, cooler, condenser, piping, components, and valves are capable of withstanding a hydrogen explosion, including the pressure boundary of the analyzers. In the GWMS, one analyzer is provided to monitor the concentration of hydrogen, and one analyzer is provided to monitor the concentration of oxygen. The GWMS and its supports will not collapse in a safe shutdown earthquake.

Displays of the GWMS instrumentation shown on Figure 2.9.2-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to open and close the power operated valve shown on Figure 2.9.2-1.

The valve with the response position indicated on Figure 2.9.2-1 changes position to that indicated on the Figure upon loss of motive power.

The GWMS provides a means to monitor radioactivity levels in the processed gaseous waste prior to release through the unit vent. The radioactivity monitor provides a signal to terminate GWMS discharge when a specified radioactivity level is reached.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.9.2-1 specifies the inspections, tests, and analyses, and associated acceptance criteria for the Gaseous Waste Management System.

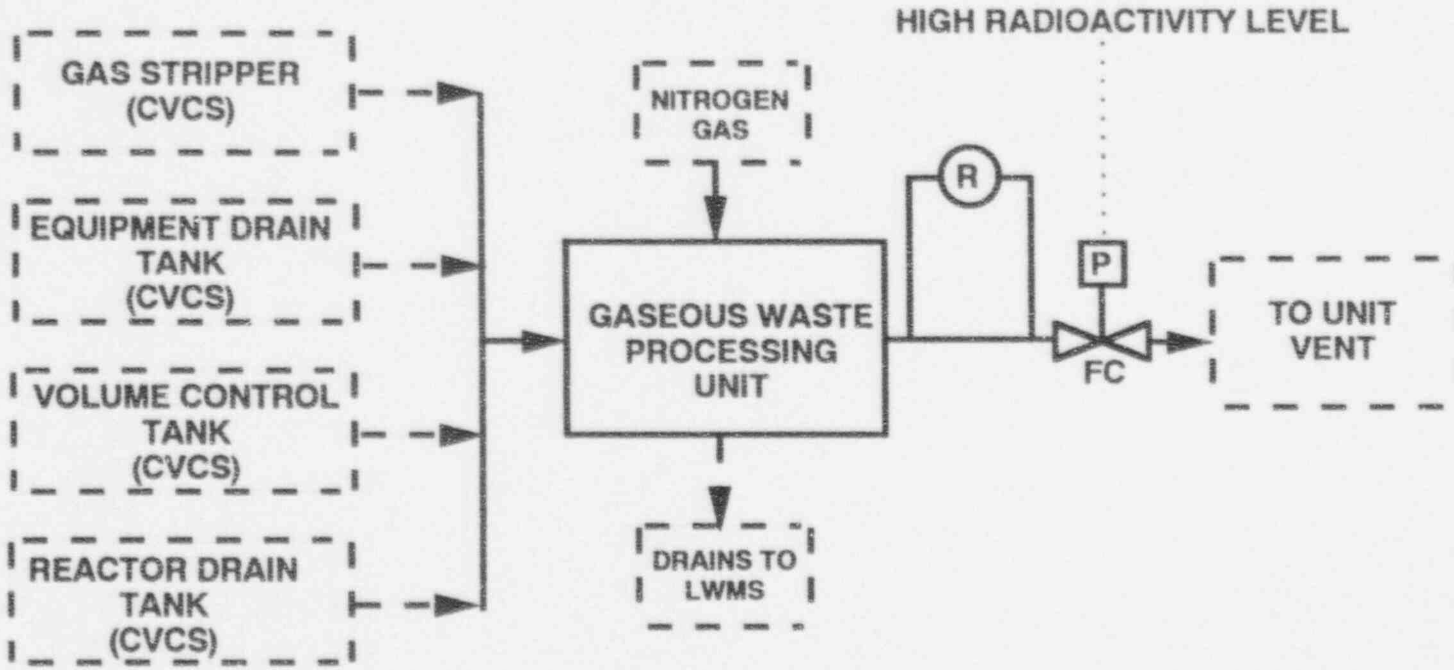

FIGURE 2.9.2-1
GASEOUS WASTE MANAGEMENT SYSTEM

06-17-94

TABLE 2.9.2-1

GASEOUS WASTE MANAGEMENT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the GWMS is as shown on Figure 2.9.2-1.	1. Inspection of the as-built GWMS configuration will be conducted.	1. For the components and equipment shown on Figure 2.9.2-1, the as-built GWMS conforms with the Basic Configuration.
2. The GWMS and its supports will not collapse in a safe shutdown earthquake (SSE).	2. A seismic analysis of the GWMS and its supports will be conducted.	2. An analysis of the GWMS exists that concludes the GWMS and its supports do not collapse under an SSE.
3. The GWMS will withstand a hydrogen explosion (i.e., twenty times normal operating pressure).	3. A hydrogen explosion pressure rise analysis of the GWMS will be conducted.	3. An analysis of the GWMS exists that concludes the GWMS withstands a hydrogen explosion (i.e., twenty times normal operating pressure).
4. Displays of the GWMS instrumentation shown on Figure 2.9.2-1 exist in the MCR or can be retrieved there.	4. Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	4. Displays of the instrumentation shown on Figure 2.9.2-1 exist in the MCR or can be retrieved there.
5. Controls exist in the MCR to open and close the power operated valve shown on Figure 2.9.2-1.	5. Testing will be performed using the GWMS controls in the MCR.	5. GWMS controls in the MCR operate to open and close the power operated valve shown on Figure 2.9.2-1.
6. The valve with the response position indicated on Figure 2.9.2-1 changes position to that indicated on the Figure upon loss of motive power.	6. Testing of loss of motive power to this valve will be performed.	6. This valve changes position to that indicated on Figure 2.9.2-1 upon loss of motive power.

TABLE 2.9.2-1 (Continued)

GASEOUS WASTE MANAGEMENT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. The radioactivity monitor provides a signal to terminate GWMS discharge when a specified radioactivity level is reached.	7. Testing of the as-built GWMS discharge controls will be performed using a signal which simulates radioactivity levels.	7. GWMS discharge is terminated when the simulated radioactivity level in the discharge waste line reaches a specified limit.

2.9.3 SOLID WASTE MANAGEMENT SYSTEM

Design Description

The Solid Waste Management System (SWMS) is a non-safety-related system which is used to collect, segregate, decontaminate, process, sample, and store radioactive solid waste.

The SWMS is located in the radwaste building.

The Basic Configuration of the SWMS is as shown on Figure 2.9.3-1.

Solid waste is segregated into the following:

> High activity and low activity wetted waste, e.g. spent ion exchanger resin and spent filter assemblies; and,
>
> Compactible and non-compactible dry solid waste, e.g. plastic sheeting, clothing, or metal tools.

The high activity and low activity spent resin processing units have collection and storage capacity to process waste volumes expected during normal operation and from anticipated operational occurrences. These subsystems can process waste by dewatering in the shipping container.

The dry solid material subsystems have provisions for sorting of wastes, compaction of compactible waste and placement in shipping containers, and for either decontamination or direct placement of non-compactible waste into shipping containers.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.9.3-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Solid Waste Management System.

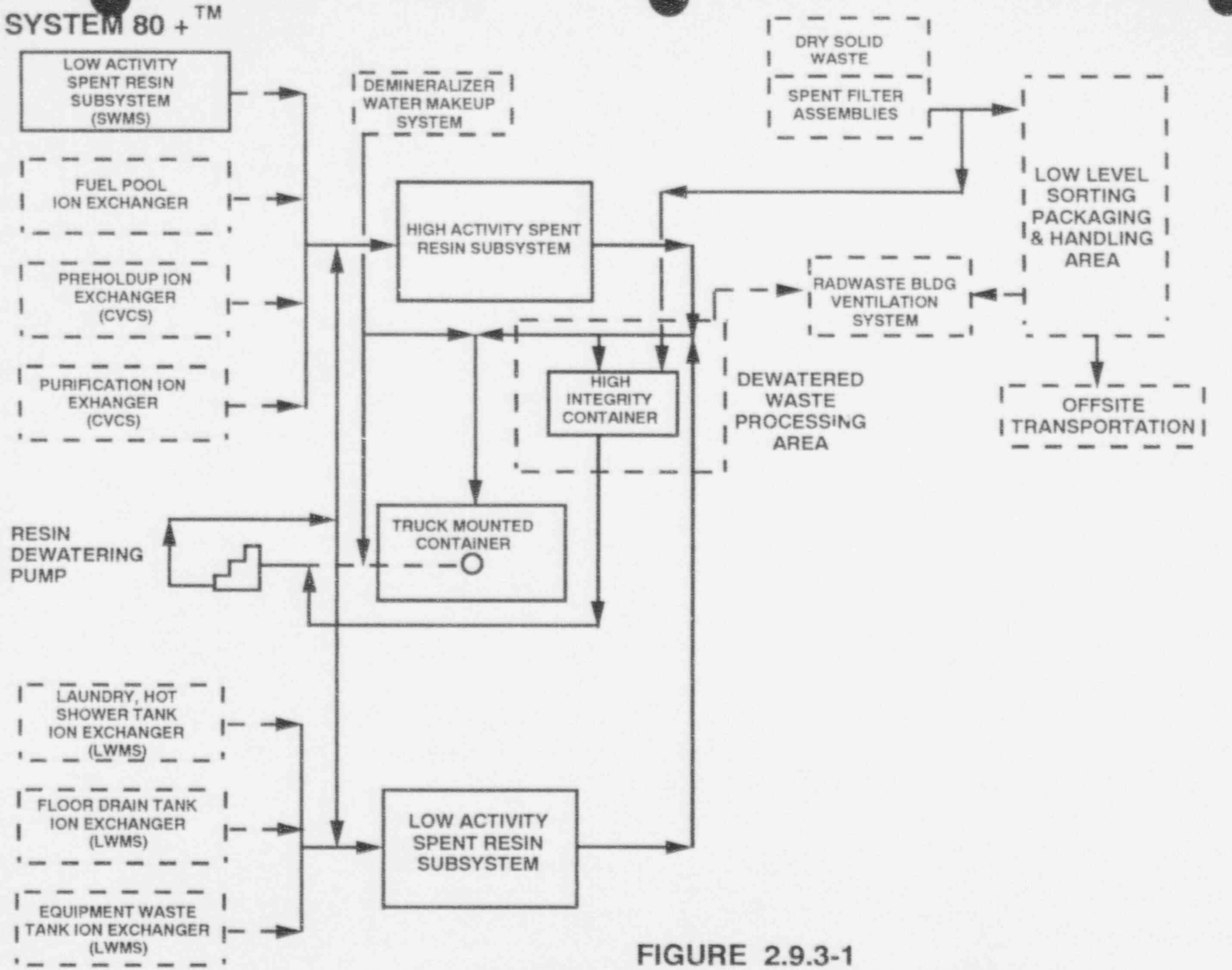

FIGURE 2.9.3-1
SOLID WASTE MANAGEMENT SYSTEM

06-17-94

TABLE 2.9.3-1

SOLID WASTE MANAGEMENT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the SWMS is as shown on Figure 2.9.3-1.	1. Inspection of the as-built SWMS configuration will be conducted.	1. For the components and equipment shown on Figure 2.9.3-1, the as-built SWMS conforms with the Basic Configuration.
2. The high activity and low activity spent resin processing units have collection and storage capacity to process waste volumes expected during normal operation and from anticipated operational occurrences.	2. Analysis of the as-built spent resin subsystems' processing capability will be performed.	2. An analysis exists which concludes that the spent resin processing units have collection and storage capacity to process waste volumes expected during normal operation and from anticipated operational occurrences.

2.9.4 PROCESS AND EFFLUENT RADIOLOGICAL MONITORING AND SAMPLING SYSTEM

Design Description

The Process and Effluent Radiological Monitoring and Sampling System (PERMSS) provides components to monitor liquid and gaseous effluents prior to release to unrestricted areas, and to monitor for inplant radioactivity.

Components of the PERMSS are located in the nuclear island structures, the radwaste building, the turbine building, and the station service water pump structure.

The PERMSS has components that provide radiological monitoring of gaseous and liquid processing systems and their effluents, airborne radioactivity, radiation areas, and specified plant equipment.[1]

The system provides radiological monitoring during plant operation and post-accident conditions. The two high range containment area radiation monitors provide indication of the radiation levels in Containment throughout the course of a design basis accident.

The PERMSS is non-safety-related with the exception of the following, each of which is safety-related, Seismic Category I, and Class 1E:

a. main control room (MCR) intake radiation monitor (2/intake),
b. high range containment area radiation monitor (2),
c. containment atmosphere radiation monitor (particulate channel only),
d. primary coolant loop radiation monitors (2).

Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the PERMSS.

The MCR intake radiation monitors shall have the capability for auto selection and closure of the most contaminated intake.

---

1 The radiation monitors that monitor gaseous and liquid processing systems and their effluents and the response of these systems to detection of radiation are addressed in the individual systems which they support.

Displays of the PERMSS safety-related instrumentation (the MCR air intake radiation monitors, the reactor coolant radiation monitors, the high range containment area monitors and the containment atmosphere particulate monitors) exist in the MCR or can be retrieved there.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.9.4-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Process and Effluent Radiological Monitoring and Sampling System.

TABLE 2.9.4-1

PROCESS AND EFFLUENT RADIOLOGICAL MONITORING AND SAMPLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The PERMSS has components that provide radiological monitoring of gaseous and liquid processing systems and their effluents, airborne radioactivity, radiation areas, and specified plant equipment.	1. Inspection of the PERMSS components will be performed.	1. The PERMSS provides the components specified in Table 2.9.4-2.
2. Displays and alarms of the PERMSS safety-related instrumentation (the MCR air intake radiation monitors, the reactor coolant radiation monitors, the high range containment area monitors and the containment atmosphere particulate monitors) exist in the MCR or can be retrieved there.	2. Inspection for the existence or retrievability in the MCR of instrumentation displays and alarms will be performed.	2. Displays and alarms of the PERMSS safety-related instrumentation (the MCR air intake radiation monitors, the reactor coolant radiation monitors, the high range containment area monitors and the containment atmosphere particulate monitors) exist in the MCR or can be retrieved there.
3. The MCR intake radiation monitors shall have the capability for auto selection and closure of the most contaminated intake.	3. Testing of each monitor will be conducted using manual controls and simulated automatic initiation signals.	3. Each MCR intake monitor is activated upon receipt of test signals and the associated control room intake is closed automatically.
4. Operation of each safety-related PERMSS division can be manually activated from the MCR or automatically.	4. Testing of each division (including each channel of the safety-related portion of the area radiation monitoring system) will be conducted using manual controls and simulated automatic initiation signals.	4. Each division is activated upon receipt of test signal.

TABLE 2.9.4-1 (Continued)

PROCESS AND EFFLUENT RADIOLOGICAL MONITORING AND SAMPLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. Each safety-related area radiation monitor channel monitors the radiation level in its assigned area, and indicates its respective MCR alarm and local audible and visual alarm (if provided) when the radiation level reaches a preset level.	5. Testing of each channel of the safety-related area radiation monitors will be conducted using simulated input signals.	5. MCR and local alarms are initiated when the simulated radiation level reaches a preset limit.
6. The following PERMSS safety-related instrumentation shall be provided: a. MCR intake radiation monitor (2/intake), b. high range containment area radiation monitor (2), c. containment atmosphere radiation monitor (particulate channel only), d. primary coolant loop radiation monitors (2).	6. Inspection of the as-built system will be conducted.	6. The as-built PERMSS conforms with the design description.
7. The PERMSS safety-related instrumentation (the MCR intake radiation monitors, high range containment area radiation monitors, containment atmosphere radiation monitor (particulate channel), and the primary coolant loop radiation monitors) are classified Seismic Category I.	7. Seismic analyses of the as-built PERMSS safety-related instrumentation will be performed.	7. An analysis report exists which concludes that the PERMSS safety-related instrumentation (the MCR intake radiation monitors, high range containment area radiation monitors, containment atmosphere radiation monitor (particulate channel), and the primary coolant loop radiation monitors) are classified Seismic Category I.

TABLE 2.9.4-1 (Continued)

PROCESS AND EFFLUENT RADIOLOGICAL MONITORING AND SAMPLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the PERMSS.	8. Inspection of the as-installed Class 1E Divisions of the PERMSS will be performed.	8. Physical separation exists between Class 1E Divisions in the PERMSS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the PERMSS.

TABLE 2.9.4-2

GASEOUS PROCESS AND EFFLUENT MONITORS

Gaseous waste management system waste gas discharge (1)

Unit Vent - Normal (1)

Unit Vent - Post Accident (1)

Containment high purge exhaust (1)

Containment low purge exhaust (1)

Main Condenser Evacuation System (1)

LIQUID PROCESS AND EFFLUENT MONITORS

Component cooling water system (1 /division)

Liquid waste management system liquid waste discharge (1)

Steam generator blowdown (1)

Reactor coolant gross activity (1)

Turbine floor building drains (1)

Station service water system (1/Division)

Containment cooler condensate tank (1)

Condensate Cleanup System Neutralization Tank Discharge (1)

AIRBORNE RADIATION MONITORS

Containment atmosphere (1)

Radwaste building ventilation exhaust (1)

Fuel building ventilation exhaust (1)

Ventilation systems multisampler (2 monitors - 1/division in Nuclear Annex) (1 in Radwaste Building)

Nuclear annex building ventilation (2 monitors - 1/division)

Main control room air intake (2/intake)

Reactor building annulus exhaust (2 monitors - 1/division)

Reactor building subsphere ventilation exhaust (2 monitors - 1/division)

Portable airborne

Emergency operations facility ventilation (1)

TABLE 2.9.4-2 (Continued)

AREA RADIATION MONITORS

Reactor Containment entrance

Refueling bridge crane

In-core instrumentation equipment

Decontamination area

Sample room

Main control room

Primary chemistry laboratory

New fuel storage area

Spent fuel pool bridge

Fuel building area

Nuclear annex building (normal operation)

Nuclear annex building (post accident)

Reactor building subsphere (normal operation)

Reactor building subsphere (post accident)

Solid waste drum storage and handling area

Radwaste building loading bay

Hot machine shop

Hot instrument shop

Radwaste building areas

Technical support center

SPECIAL PURPOSE AREA RADIATION MONITORS

Main steam lines area (2 monitors - 1/loop)

Purification filters (1/filter)

Primary coolant loops (2 monitors - 1/loop)

High range containment area monitors (2)

Main steam lines (primary-to-secondary leakage) (2 monitors - 1/SG)

2.10 TECHNICAL SUPPORT CENTER AND OPERATIONS SUPPORT CENTER

Design Description

The Technical Support Center (TSC) performs a non-safety-related function and is located adjacent to the main control room (MCR) in the nuclear annex. The TSC provides facilities for management and technical support to plant operations during emergency conditions.

The TSC is located less than or equal to two minutes walking time from the MCR.

The TSC has floor space of at least 75 square feet per person for a minimum of 25 persons.

The TSC has radiation detection equipment for monitoring radiation levels within the TSC when the TSC is in use.

The TSC has means for voice communication to the MCR, to on-site emergency support facilities, and to off-site via dedicated or commercial telephone networks.[1]

Displays of the information from the discrete indication and alarm system (DIAS) and the data processing system (DPS) exist in the TSC or can be retrieved there.[2]

The Operations Support Center (OSC) performs a non-safety related function and is located in the nuclear island structures. The OSC provides an assembly area separate from the MCR and TSC where operations support personnel can assemble in an emergency.

The OSC has equipment for voice communications with the MCR and the TSC.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.10-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Technical Support Center.

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[1] Communication Systems are addressed in Section 2.7.25.

[2] Display information from the DIAS and DPS is addressed in Section 2.5.3.

TABLE 2.10-1

TECHNICAL SUPPORT CENTER
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.a) The TSC is located less than or equal to two minutes walking time from the MCR.	1.a) A test of walking time from the TSC to the MCR will be performed.	1.a) The TSC can be reached in less than or equal to two minutes walking time from the MCR.
1.b) The TSC has floor space of at least 75 square feet per person for a minimum of 25 persons.	1.b) Inspection of the TSC will be performed.	1.b) Floor space of at least 1875 sq. ft. is provided in the TSC.
1.c) The TSC has radiation detection equipment for monitoring radiation levels within the TSC when the TSC is in use.	1.c) An inspection of the radioactivity detection equipment in the TSC will be performed.	1.c) Radiation detection equipment to monitor radiation levels within the TSC is available in the TSC.
1.d) The TSC has means for voice communications to the MCR, to on-site emergency support facilities, and to off-site via dedicated or commercial telephone networks.	1.d) An inspection of the TSC will be performed.	1.d) Communications equipment is installed, and voice transmission and reception are accomplished.
2. Displays of information from the DIAS and the DPS exist in the TSC or can be retrieved there.	2. Inspection for the existence or retrievability in the TSC of the information from the DIAS and the DPS will be performed.	2. Displays of information from the DIAS and the DPS exist in the TSC or can be retrieved there.
3. The OSC is located in the nuclear island structures.	3. Inspection of the location of the OSC will be performed.	3. The OSC is located in the nuclear island structures.
4. The OSC has equipment for voice communication with the MCR and the TSC.	4. Testing of the equipment for voice communication will be performed.	4. Communications equipment is installed and voice transmission and reception are accomplished.

2.11 INITIAL TEST PROGRAM

An Initial Test Program is performed during and following construction activities and construction-related inspections and tests and extends to a declaration of commercial operation. The Initial Test Program has preoperational and startup test phases.

As part of the Initial Test Program, preoperational testing is conducted to demonstrate that structures, systems, components, and design features of the as-built plant meet the performance requirements of the design. Equipment functional tests, system operational tests, and system vibration and expansion measurements are conducted during preoperational testing.

As part of the Initial Test Program, startup testing is conducted to demonstrate that the integrated plant with the nuclear fuel in the reactor pressure vessel meets the performance requirements of the design. Startup testing is performed with the plant operating at power levels ranging from zero power to full rated power. Startup testing is conducted at five test conditions: open vessel (fuel load), heatup, low power, mid-power, and high power. Startup testing includes testing of:

nuclear fuel system performance;

steady-state plant performance;

control system performance; and

transient performance.

The Initial Test Program is performed using detailed preoperational and startup procedures to control the conduct of testing. Detailed test procedures delineate the test methods to be used and the applicable acceptance criteria against which performance is evaluated. Test procedures are developed from preoperational and startup test specifications. Approved test procedures are made available to the NRC for review. Administrative procedures are used to control the conduct of the test program; the review, evaluation and approval of test results; and test record retention.

The tests specified in Section 2.0 may be a subset of the Initial Test Program.

This section represents a commitment that combined operating license applicants referencing the certified design will implement an Initial Test Program that meets the objectives presented above.

2.12.1 MAIN CONTROL ROOM [1]

Design Description

The Main Control Room (MCR) permits execution of MCR tasks performed by MCR operators to operate the plant and maintain plant safety. The MCR provides suitable workspace and environment for continuous occupancy and use by MCR operators when the MCR is used for Plant Control. The MCR makes available the annunciators, displays, and controls to operate the plant and maintain plant safety, including at least those annunciators, displays, and controls identified in Table 2.12.1-1. Other annunciators, displays, and controls for systems operation are described in the design descriptions for the respective systems.

The Basic Configuration of the MCR is as shown on Figure 2.12.1-1.

The MCR contains the master control console, the auxiliary console, the safety console, the control room supervisor (CRS) Console, administrative support facilities, and the integrated process status overview (IPSO).

Control panels with Class 1E instrumentation are classified Seismic Category I.

The MCR is located in the nuclear annex within fire and ventilation isolation boundaries.

MCR consoles are organized functionally according to the following:

Master Control Console	Auxiliary and Safety Consoles
Reactor Coolant System	Heating, Ventilation & Air Conditioning
Chemical & Volume Control System	Cooling Water Systems
Plant Monitoring & Control	Engineered Safety Features
Feedwater & Condensate Systems	Safety Monitoring
Turbine Control	Secondary Auxiliaries
	Switchyard
	Electrical Distribution

The CRS console provides a workstation from which the CRS coordinates MCR operations. Administrative support facilities provide office workspace. The IPSO provides safety parameter display information at a fixed location that can be viewed from the MCR consoles and administrative support facilities.

Inspection, Test, Analyses, and Acceptance Criteria

Table 2.12.1-2 specifies the inspections, tests, analyses, and associated acceptance criteria for the Main Control Room.

---

[1] (Nuclear island structures, ventilation. fire protection, communications, lighting, and radiation protection are addressed in Sections 2.1.1, 2.7.17, 2.7.24, 2.7.25, 2.7.26, and 3.2 respectively.)

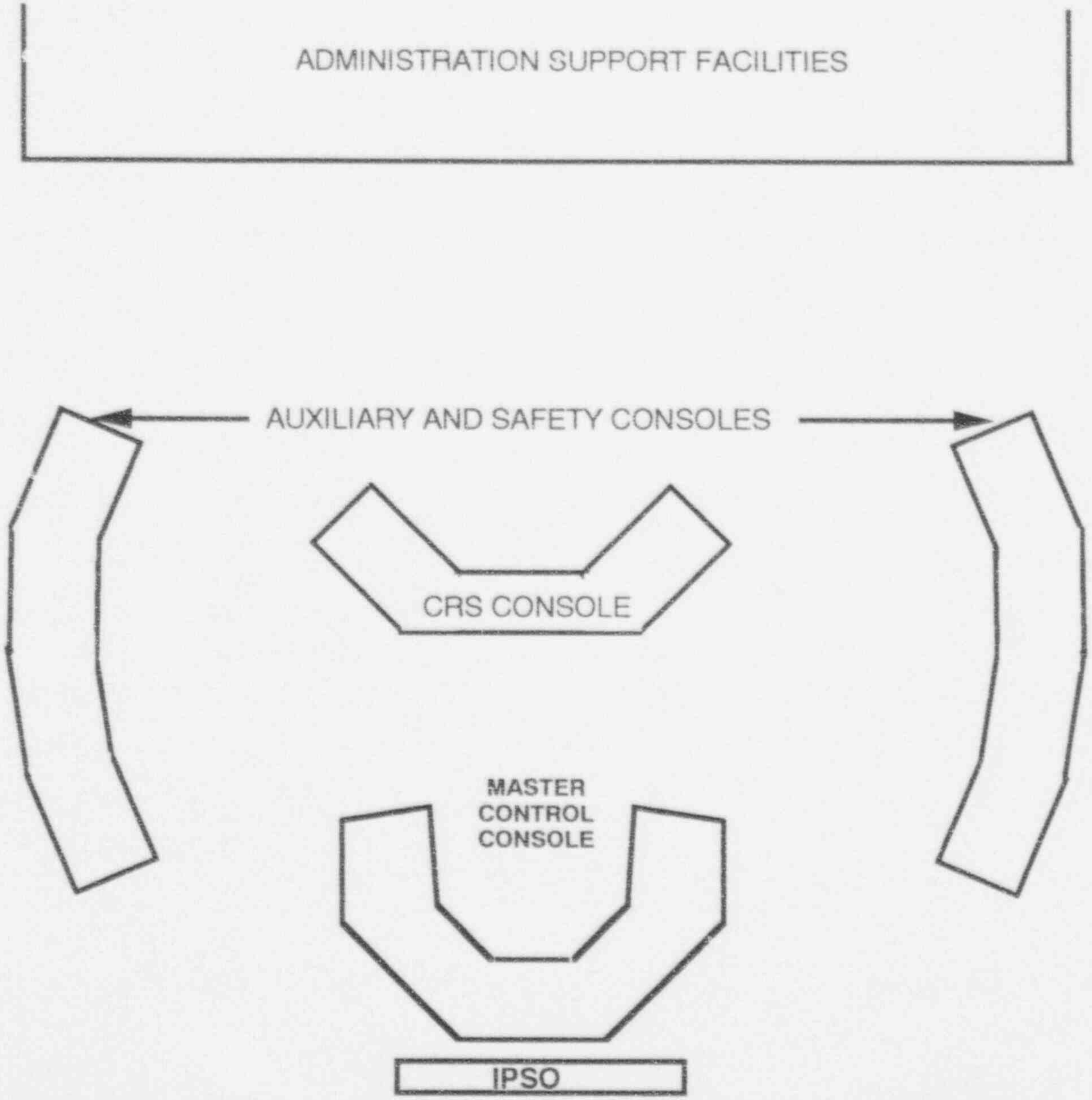

FIGURE 2.12.1-1 MAIN CONTROL ROOM

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TABLE 2.12.1-1

MCR MINIMUM INVENTORY OF FIXED POSITION ANNUNCIATORS, DISPLAYS AND CONTROLS

PARAMETER DESCRIPTION	Annunciators[1]	Displays	Controls
Offsite Bus voltage status	X		
120 VAC Vital load center voltage status	X	X	
125 VDC Vital load center voltage status	X	X	
24 KV Main Turbine Generator output breaker position	X	X	X
4.16 KV Class 1E bus breaker positions (supply & crossover)		X	X
4.16 KV Class 1E voltage status	X	X	
4.16 KV Diesel Generator output breaker position		X	X
4.16 KV Diesel Generator start control		X	X
4.16 KV Diesel Generator synchroscope		X	X
4.16 KV Reserve Aux Xfmr output voltage status	X		
480 VAC Class 1E voltage status	X	X	
Annulus ventilation control setpoint		X	X
Annulus ventilation damper position		X	X
Annulus ventilation fan on/off		X	X
Atmospheric dump valve position		X	X
CEA position	X		
CET temperature		X	
CIAS actuation	X		X
CIAS success monitor	X	X	
CCW HX inlet valve position		X	X
CCW HX outlet valve position		X	X
CCW HX outlet flow	X		
CCW pumps on/off		X	X
CCW surge tank level	X		
Containment hydrogen level (when analyzer is in operation)	X	X	
Containment pressure	X	X	
Containment radiation	X	X	

TABLE 2.12.1-1 (Continued)

MCR MINIMUM INVENTORY OF FIXED POSITION ANNUNCIATORS, DISPLAYS AND CONTROLS

PARAMETER DESCRIPTION	Annunciators[1]	Displays	Controls
CSAS actuation	X		X
Containment Spray flow		X	
Containment Spray pump on/off		X	X
Containment Spray pump discharge valve position		X	X
Containment temperature	X	X	
DVI valve position		X	X
EFAS actuation	X		X
EFW flow control valve position		X	X
EFW header flow		X	
EFW motor-driven pump on/off		X	X
EFW pump suction pressure	X		
EFW steam-driven pump on/off		X	X
EFW-to-SG isolation valve position		X	X
EFW Storage Tank level	X	X	
Hot Leg Injection valve position		X	X
IRWST level	X		
Main Control Room HVAC isolation dampers		X	X
Main Steam radiation (Area monitors & Line monitors)	X		
SG safety valve position	X		
MSIS actuation	X	X	X
Nuclear Annex building ventilation radiation	X		
Primary Coolant Radiation	X	X	
Pzr Backup Heaters on/off		X	X
Pzr Level	X	X	
Pzr Pressure	X	X	
Rapid Depressurization valve position		X	X
RCP on/off		X	X

TABLE 2.12.1-1 (Continued)

MCR MINIMUM INVENTORY OF FIXED POSITION ANNUNCIATORS, DISPLAYS AND CONTROLS

PARAMETER DESCRIPTION	Annunciators[1]	Displays	Controls
RCS Cold Leg temperature		X	
RCS Hot Leg temperature		X	
RCS Pressure		X	
RCS subcooling margin	X	X	
Reactor Building subsphere ventilation radiation	X		
Reactor Cavity Level	X	X	
Reactor Coolant gas vent valve position		X	X
Reactor power (NI)		X	
Reactor Trip (RPS)	X		X
Reactor Vessel level	X	X	
SCS flow (while SCS is in operation)	X	X	
SCS Isolation valve position (& LTOP)	X	X	X
SCS HX Bypass Valve position		X	X
SCS HX CCW supply/isolation valve position		X	X
SCS HX/Bypass Inlet & Outlet temperature (when SCS is in operation)		X	
SCS HX outlet valve position		X	X
SCS pump on/off		X	X
SCS/CSS pump suction cross-connect valve position		X	X
SCS/CSS pump discharge cross-connect valve position		X	X
SIAS actuation	X		X
SI flow		X	
SI pump on/off		X	X
SI throttling isolation valve position		X	X
Spent Fuel Pool level	X		
Startup Rate (NI)		X	
CCW HX Station Service Water inlet isolation valve position		X	X
CCW HX Station Service Water outlet isolation valve position		X	X

TABLE 2.12.1-1 (Continued)

MCR MINIMUM INVENTORY OF FIXED POSITION ANNUNCIATORS, DISPLAYS AND CONTROLS

PARAMETER DESCRIPTION			
	Annunciators[1]	Displays	Controls
CCW HX Station Service Water outlet flow	X		
SSW pump on/off		X	X
SG Blowdown sample radiation	X		
SG level	X	X	
SG pressure	X	X	
Vacuum Pump Activity	X		
Turbine Trip		X	X

[1] Annunciators are alarms and other alerting displays designed to direct operator attention.

TABLE 2.12.1-2

MAIN CONTROL ROOM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the MCR is as shown on Figure 2.12.1-1.	1. Inspection of the as-built MCR configuration will be conducted.	1. For the components and equipment shown on Figure 2.12.1-1, the as-built MCR conforms with the Basic Configuration.
2. The MCR makes available the annunciators, displays, and controls identified in Table 2.12.1-1.	2. Human Factors Engineering (HFE) availability verification inspection of the as-built MCR will be performed.	2. The MCR makes available the annunciators, displays, and controls identified in Table 2.12.1-1.
3. The MCR provides suitable workspace and environment for continuous occupancy and use by MCR operators when the MCR is used for plant control.	3. HFE suitability inspection against verification criteria will be performed.	3. The MCR workspace and environment are determined to be suitable for use by MCR operators.
4. The MCR permits execution of MCR tasks performed by MCR operators to operate the plant and maintain plant safety.	4. Testing and analysis against the validation criteria using a facility that physically represents the MCR configuration and dynamically represents the MCR interface characteristics and the operating characteristics and responses of the System 80+ design will be performed.	4. The test and analysis results demonstrate validation of MCR task execution by MCR operators to operate the plant, and maintain plant safety.

2.12.2 REMOTE SHUTDOWN ROOM [1]

Design Description

The Remote Shutdown Room (RSR) permits execution of RSR tasks performed by RSR operators to place and maintain the plant in a safe shutdown condition. The RSR provides suitable workspace and environment separate from the main control room (MCR) for use by RSR operators in the event that the MCR becomes uninhabitable. The RSR makes available the annunciators, displays, and controls to achieve and maintain prompt shutdown of the plant and maintain safe shutdown conditions including at least those annunciators, displays, and controls identified in Table 2.12.2-1. The RSR provides capability for RSR operators to perform RSR tasks to achieve subsequent cold shutdown of the plant.

The Basic Configuration of the RSR is as shown on Figure 2.12.2-1.

The RSR contains the Remote Shutdown Panel. The Remote Shutdown Panel provides a workstation from which RSR operators perform RSR operations.

Controls exist in the RSR to stop the reactor coolant pumps (RCPs), trip the reactor, control the emergency feedwater (EFW) steam-driven pump turbine speed, and to start and stop those other pumps, open and close those valves, and energize or de-energize those pressurizer heaters listed in Tale 2.12.2-1.

Control panels with Class 1E instrumentation are classified Seismic Category I.

The RSR is located in the nuclear annex within fire and ventilation isolation boundaries.

Inspection, Test, Analyses, and Acceptance Criteria

Table 2.12.2-2 specifies the inspections, tests, analyses, and acceptance criteria for the RSR.

---

[1] (Nuclear Island Structures, ventilation, fire protection, communications, lighting, and radiation protection are addressed in Sections 2.1.1, 2.7.17, 2.7.24, 2.7.25, 2.7.26, and 3.2.)

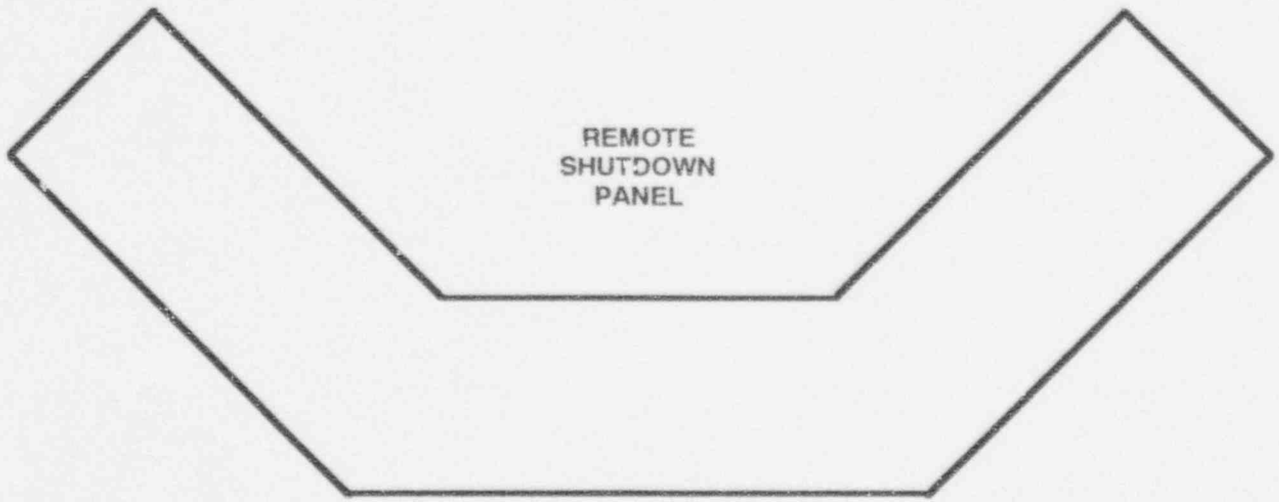

FIGURE 2.12.2-1 REMOTE SHUTDOWN ROOM

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TABLE 2.12.2-1

MINIMUM INVENTORY OF AVAILABLE RSR ANNUNCIATORS, DISPLAYS AND CONTROLS

PARAMETER DESCRIPTION	Annunciators[1]	Displays	Controls
Reactor Power (Neutron Logarithmic Power)		X	
RCS Cold Leg Temperature		X	
RCS Hot Leg Temperature		X	
PZR Level		X	
PZR Pressure		X	
Reactor Trip (RPS)		X	X
SG Level		X	
SG Pressure		X	
CVCS Charging Flow		X	
CVCS Charging Pressure		X	
Boric Acid Storage Tank Level		X	
IRWST Level		X	
EFW Steam-Driven Pump Suction Pressure	X	X	
EFW Motor-Driven Pump Suction Pressure	X	X	
EFW Steam-Driven Pump Discharge Pressure		X	
EFW Motor-Driven Pump Discharge Pressure		X	
EFW Steam-Driven Pump Turbine Inlet Pressure		X	
EFW Steam-Driven Pump Flow		X	
EFW Motor-Driven Pump Flow		X	
EFW Steam-Driven Pump Recirculation Flow		X	
EFW Motor-Driven Pump Recirculation Flow		X	
EFW Storage Tank Level	X	X	
EFW Steam-Driven Pump Turbine Speed		X	X
EFW Turbine Trip and Throttle (Stop) Valve Open/Close Position (Trip/Reset)	X	X	X
Ultimate Heat Sink Status		X	X

TABLE 2.12.2-1 (Continued)

MINIMUM INVENTORY OF AVAILABLE RSR ANNUNCIATORS, DISPLAYS AND CONTROLS

PARAMETER DESCRIPTION	Annunciators[1]	Displays	Controls
4.16 KV Diesel Generator Status (Emergency)		X	
Reactor Coolant Pump Trip		X	X
PZR Backup Heaters (Groups 1 & 2) On/Off		X	X
Atmospheric Dump Valve Position		X	X
ADV Block Valve Position		X	X
PZR Auxiliary Spray Valve Position		X	X
Reactor Coolant Gas Vent Valve Position		X	X
CVCS Charging Pump On/Off		X	X
Letdown Isolation Valve Position		X	X
RCP Seal Bleedoff Valve Position		X	X
MSIS Actuation		X	X
EFW Motor Driven Pump On/Off		X	X
EFW Steam Driven Pump On/Off		X	X
EFW Flow Control Valve Position		X	X
EFW-to-SG Isolation Valve Position		X	X
EFW Steam Supply Bypass Valve Position		X	X
EFW Steam Supply Isolation Valve Position		X	X
PZR Pressure Control Setpoint		X	X
SG Pressure Control Setpoint		X	X
SCS Suction Line Isolation Valve Interlock Status		X	
SCS HX/Bypass Inlet & Outlet Temperature (when SCS is in operation)		X	
SCS Flow	X	X	
SCS HX Bypass Valve Position		X	X
SCS Pumps On/Off		X	X
SIT Pressure		X	

TABLE 2.12.2-1 (Continued)

MINIMUM INVENTORY OF AVAILABLE RSR ANNUNCIATORS, DISPLAYS AND CONTROLS

PARAMETER DESCRIPTION	Annunciators[1]	Displays	Controls
SIT Vent Valve Position		X	X
SIT Isolation Valve Position		X	X
SCS Isolation Valve Position		X	X
SCS HX Outlet Valve Position		X	X
SCS Warmup Bypass Valve Position		X	X
SI Flow[2]		X	
SI Discharge Header Pressure[2]		X	
SI Pump On/Off[2]		X	X
SI Throttling Isolation Valve Position[2]		X	X

[1] Annunciators are alarms and other alerting displays designed to direct operator attention.

[2] Indication for two discharge headers only

TABLE 2.12.2-2
REMOTE SHUTDOWN ROOM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the RSR is as shown on Figure 2.12.2-1.	1. Inspection of the as-built RSR configuration will be conducted.	1. For the components and equipment shown on Figure 2.12.2-1, the as-built RSR conforms with the Basic Configuration.
2. The RSR makes available the annunciators, displays, and controls identified in Table 2.12.2-1.	2. Human Factors Engineering (HFE) availability verification inspection of the as-built RSR will be performed.	2.a) The as-built RSR makes available the annunciators, displays, and controls necessary to achieve and maintain prompt hot shutdown of the reactor.
		2.b) The as-built RSR provides capability for RSR operators to perform RSR tasks to achieve subsequent cold shutdown of the plant.
3. The RSR provides suitable workspace and environment for use by RSR operators.	3. HFE suitability inspection against verification criteria will be performed.	3. The RSR workspace and environment are determined to be suitable for use by RSR operators.
4. The RSR permits execution of RSR tasks performed by RSR operators to shutdown the plant and maintain safe shutdown conditions.	4. Testing and analysis against the validation criteria using a facility that physically represents the RSR configuration and dynamically represents the RSR interface characteristics and the operating characteristics of the System 80+ design will be performed.	4. The test and analysis results demonstrate validation of RSR task execution by RSR operators to achieve and maintain safe shutdown conditions.

TABLE 2.12.2-2 (Continued)
REMOTE SHUTDOWN ROOM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. Controls exist in the RSR to stop the RCPs, trip the reactor, control the EFW steam-driven pump turbine speed, and to start and stop those other pumps, open and close those valves, and energize or de-energize those pressurizer heaters listed in Tale 2.12.2-1.	5. Testing will be performed using the controls in the RSR.	5. Controls in the RSR operate to stop the RCPs, trip the reactor, control the EFW steam-driven pump turbine speed, and to start and stop those other pumps, open and close those valves, and energize or de-energize those pressurizer heaters listed in Table 2.12.2-1.

3.1 PIPING DESIGN

Design Description

The requirements for piping design in this section apply to ASME Code Class 1, 2, and 3 piping that is classified as Seismic Category I unless otherwise noted.

Piping classified as Seismic Category I is required to withstand the effects of a safe shutdown earthquake (SSE), maintain dimensional stability, and remain functional. Seismic Category I piping, structures, systems, and components assure: (1) the integrity of the reactor coolant pressure boundary, and (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 which could result in potential offsite exposures. Piping which does not perform a safety related function but whose structural failure or interaction could degrade the functioning of a Seismic Category I structure, system, or component to an unacceptable safety level or could result in an incapacitating injury to an occupant of the control room is classified as Seismic Category II.

Seismic Category I piping is designed to meet the requirements of the ASME Code, Section III. Seismic Category II piping is designed and constructed such that the SSE will not cause failure in a manner to adversely affect a safety system or result in an incapaciting injury to a control room occupant.

Applicable piping loads due to pressure, gravity, thermal expansion, seismic excitation, wind, tornado, fluid transients, thermal stratification, missiles, and postulated pipe breaks are considered in the piping analyses. Analytical methods and load combinations used for analysis of piping systems will be referenced or specified in the ASME Code certified stress report. Computer programs used for piping system dynamic analysis shall be benchmarked.

The as-built ASME Code Section III piping will be reconciled with the piping design requirements described herein. The as-built reconciliation will be documented in the as-built piping report.

Piping systems are designed to reduce the potential for effects of erosion/corrosion, and to reduce the potential for waterhammer and steam hammer. Piping system supports for Seismic Category I and II piping systems are designed to meet the requirements of the ASME Code Section III, Subsection NF. Pipe loads applied to attached equipment are shown to be less than the equipment allowable loads.

For those piping systems using ferritic materials as permitted by the design specification, the materials and fabrication processes will be chosen to ensure that the system is not susceptible to brittle fracture under the expected service conditions. For those piping systems using austenitic stainless steel materials as permitted by the design specification, the material and fabrication process will be selected to reduce the possibility of cracking during service. Chemical, fabrication, handling, welding, and examination requirements that reduce the potential for cracking shall be employed.

Piping systems classified as ASME Code Section III Class 1, 2, or 3 are designed to maintain dimensional stability and functional integrity under design loadings expected to be experienced during a 60 year design life.

Design of piping systems provides for clearances between adjacent piping, components, and other structures when the piping moves due to design static, dynamic, and thermal loadings.

The following piping systems are designed to meet leak-before-break (LBB) criteria:

Reactor coolant system hot leg piping, reactor coolant pump (RCP) suction piping and RCP discharge piping,

Surge line,

Main steam lines inside containment from the steam generator to the anchor at the containment penetrations,

Shutdown cooling lines inside containment from the reactor coolant system to the anchor at the containment penetration, and

Direct vessel injection lines inside containment from the reactor vessel to the safety injection tank and the anchor at the containment penetration.

LBB acceptance criteria are established and LBB evaluations are performed for each piping system designed to meet LBB criteria. For each piping system qualified for LBB, the as-built piping and materials will be reconciled with the bases for the LBB acceptance criteria.

Structures, components, and systems required for safe shutdown are protected from the dynamic and environmental effects of postulated pipe breaks and cracks in Seismic Category I and non-nuclear safety-related (NNS) piping systems where consideration of these dynamic effects is not eliminated by LBB. Each postulated pipe crack and break shall be documented in a pipe break analysis report. Design of features which protect these items consider, as applicable, pipe whip, water spray, jet impingement, flooding, compartment pressurization, and environmental conditions in the area where the piping is located.

Structures, systems, and components that are required to be functional during and following an SSE are protected against the effects of spraying, flooding, pressure, and temperature due to postulated pipe breaks and cracks in Seismic Category I and NNS piping systems.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 3.1-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Piping Design.

TABLE 3.1-1

PIPING DESIGN
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The as-built piping is reconciled with the as-designed piping configurations.	1. A reconciliation analysis using the as designed and as-built information will be performed.	1. An as-built piping stress report exists and concludes that the as-built piping has been reconciled with the documents used for design. The as-built piping is reconciled with the piping design requirements described in the piping design description. For ASME Code Class piping, the as-built stress report includes the ASME Code Certified Stress Report and documentation of the results of the as-built reconciliation analysis.
2. Piping systems classified as ASME Code Section III Class 1, 2, or 3 are designed to maintain dimensional stability and functional integrity under design loadings expected to be experienced during a 60-year design life.	2. Inspection for the existence of ASME design reports will be performed.	2. ASME design reports for piping systems classified as ASME Code Section III Class 1, 2, or 3 exist and conclude that the design complies with the requirements of the ASME Code, Section III.
3. For each piping system qualified for LBB, the as-built piping and materials will be reconciled with the bases for the LBB acceptance criteria.	3. For each piping system qualified for LBB, an inspection of the LBB evaluation report will be performed.	3. A LBB evaluation report exists which documents that leak-before-break acceptance criteria are met by the as-built piping and piping materials.

TABLE 3.1-1 (Continued)

PIPING DESIGN
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. Structures, components, and systems required for safe shutdown are protected from the dynamic and environmental effects of postulated pipe breaks and cracks in Seismic Category I and non-nuclear safety-related (NNS) piping systems where consideration of these dynamic effects is not eliminated by LBB. Each postulated pipe crack and break shall be documented in a pipe break analysis report.	4. For piping systems with postulated pipe breaks, an inspection of the pipe break analysis report will be performed. An inspection of the as-built high and moderate energy pipe break mitigation features will be performed.	4. A pipe break analysis report exists and concludes that Seismic Category I structures, systems, and components remain functional after postulated pipe breaks. The pipe break analysis report includes the results of inspections of high and moderate energy pipe break mitigation features (including spatial separation).

3.2 RADIATION PROTECTION

Design Description

Radiation Protection features in the plant provide for limitation of radiological exposures to plant personnel and to the general public from plant operations consistent with NRC radiological exposure regulations.

The Radiation Protection design includes provisions for:

- shielding or temporary shielding of rooms, corridors, cubicles, labyrinth access, and operating areas commensurate with their expected occupancy and use;
- plant shielding to permit operators to perform actions that may require operator access during and following a design basis accident;
- ventilation features to reduce airborne radioactivity levels consistent with personnel access requirements;
- airborne radioactivity monitoring in those areas of the plant where, consistent with occupancy and use, airborne contamination could restrict personnel access.

In each case described above, the Radiation Protection design is based on expected radiation environments associated with operational modes and post-design basis accident conditions.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 3.2-1 specifies the inspections, tests, analyses, and associated acceptance criteria for Radiation Protection.

TABLE 3.2-1

RADIATION PROTECTION
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Radiation Protection includes shielding or provisions for temporary shielding of rooms, corridors, cubicles, labyrinth access, and operating areas commensurate with their expected occupancy and use.	1. An analysis of the expected radiation levels in each plant area will be performed to verify the adequacy of the shielding design. This analysis shall consider the following: a) Confirmatory calculations shall consider significant radiation sources (greater than 5% contribution) for an area. Radiation source strength in plant systems and components will be determined based on an assumed source term of 0.25% fuel cladding defects and a core inventory commensurate with a 3914 MWt equilibrium core. Source terms shall be adjusted for radiological decay and buildup of activated corrosion and wear products. b) Commonly accepted shielding codes, using nuclear properties derived from well known references shall be used to model and evaluate plant radiation environments. 1) For non-complex geometries, point kernel shielding codes may be used. 2) For complex geometries, more sophisticated two or three dimensional transport codes shall be used.	1. Maximum radiation levels are less than or equal to the radiation levels in the radiation zones specified in Table 3.2-2. Plant layout is such that access to higher zones (areas with higher dose rates) is from lower zoned areas. Corridors and normal traffic areas are Zone 3 or less. Control Rooms are Zone 2 or less. Radiation zone designations for components during normal operating conditions are listed in Table 3.2-3.

TABLE 3.2-1 (Continued)

RADIATION PROTECTION
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
2. The plant design shall have provisions to reduce radiation exposure from adjacent sources of radiation.	2. Using the methods identified in 1. above, radiation levels in zones shall be evaluated for contribution from adjacent sources of radiation.	2. Shielding design of a zone is such that radiation from adjacent sources of radiation shall contribute no more than a small fraction of the dose rate in the zone.
3. The Radiation Protection design includes plant shielding to permit operators to perform actions that may require operator access during and following a design basis accident.	3. An analysis will be performed using design basis accident source terms and calculational methods consistent with 1.b. above to determine the expected radiation levels in areas of the plant that may require operator access during and following a design basis accident.	3.a) The predicted individual personnel occupational does are less than or equal to 5 rem to the whole body total, or its equivalent, over the entire time period(s) during which operator access is required. 3.b) For areas requiring continuous occupancy, the predicted individual personnel occupational dose rates do not exceed 15 mrem/hr, averaged over 30 days.
4. The Radiation Protection design includes provisions for ventilation to limit airborne radioactivity to levels that permit personnel access.	4. An analysis will be performed to predict airborne radioactivity concentrations in rooms, corridors, cubicles, and operating areas during normal operations. Total ventilation flow rates and equipment leakages will be considered in the analysis, which will be based on source terms consistent with item 1.a).	4. The analysis concludes that airflows are from areas of lower potential airborne contamination to those of higher potential airborne contamination, prior to removal by the filters or vent system, and,

TABLE 3.2-1 (Continued)

RADIATION PROTECTION
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. (Continued)		4. (Continued) a) For normally occupied areas of the plant, (i.e., those areas requiring routine access to operate and maintain the plant), equilibrium concentrations of airborne radionuclides will be a small fraction of the Derived Air Concentrations in NRC dose regulations. b) For areas that require infrequent access (such as for non-routine equipment maintenance), the ventilation system shall be capable of reducing radioactive airborne concentrations to the Derived Air Concentration in NRC dose regulations during the periods that occupancy is required. c) For rooms where access is not anticipated to perform scheduled maintenance, plant design shall provide features to reduce airborne contamination spread to other areas of lower contamination.

TABLE 3.2-1 (Continued)

RADIATION PROTECTION
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. The Radiation Protection design includes provisions for airborne radioactivity monitoring in those areas of the plant where, consistent with expected occupancy and use, airborne contamination could restrict personnel access.	5. An analysis will be performed to identify plant areas that require airborne radiation monitoring.	5. Airborne radioactivity monitoring in the plant is consistent with the analysis in that: a) each monitor has the capability of detecting the time-integrated radioactivity concentrations of the most limiting internal dose particulate and iodine radionuclide in each monitored area equivalent to the Derived Air Concentrations in NRC dose regulations for 10 hours (10 DAC-hours); b) each monitor provides a calibrated response, representative of the radioactivity concentrations within the monitored area; c) each monitor provides local audible alarms with visual alarms in high noise areas, and with variable alarm setpoints and readout capability.
6. The plant design shall provide radiation shielding to protect the general public outside of the controlled area during normal operations, consistent with Federal regulations.	6. Using the methods identified in 1. above, the radiation dose to the maximally exposed member of the general public outside of the controlled area during normal operations from direct and scattered radiation shall be determined.	6. As a result of normal operations, the analyzed radiation does from direct and scattered radiation to the maximally exposed member of the public outside of the controlled area is equal to or less than a small fraction of the Federal regulations.

TABLE 3.2-2

RADIATION ZONE DESIGNATIONS DURING NORMAL OPERATING CONDITIONS ACCESS ACCEPTANCE CRITERIA

Zone Designations	Dose Rate (mrem/hr)*	Allowed Occupancy
1	≤ 0.5	Uncontrolled, unlimited access (plant personnel)
2	> 0.5 to < 2.5	Controlled, limited access, 40 hr/wk to unlimited
3	≥ 2.5 to < 15	Controlled, limited access, 6 to 40 hr/wk
4	≥ 15 to ≤ 100	Controlled, limited access, 1 to 6 hr/wk
5	≥ 100	Normally unaccessible, access only permitted by radiation protection personnel 1 hr/wk.

* Dose rates calculated at 30 cm from the source of the radiation, not contact dose rates.

TABLE 3.2-3

RADIATION ZONE DESIGNATIONS FOR COMPONENTS DURING NORMAL OPERATING CONDITIONS

	Zone Designation[1] OPERATING	SHUTDOWN
Annulus Ventilation System Filters	2	2
Boric Acid Batch Tank	3	3
Boric Acid Concentrator	5	5
Boric Acid Concentrator Ion Exchanger	5	5
Boric Acid Filter	5	5
Boric Acid Makeup Pumps	5	5
Channel A, B, C, D Battery Room	1	1
Charging Pumps	5	5
Charging Pump Miniflow Heat Exchanger	5	5
Chemical and Volume Control System Equipment Drain Sumps	5	5
Condensate Cooling Water Surge Tank	2	2
Containment Spray Heat Exchanger	3	5
Containment Spray Miniflow Heat Exchanger	3	5
Containment Spray Pump	3	5
Control Complex Corridors up to the Radiation Access Control Point	1	1
Control Room	1	1
Control Room HVAC Areas	1	1
Deborating Ion Exchangers	5	5
Division 1 Battery Room	1	1
Division 2 Battery Room	1	1
Emergency Feedwater Motor Driven Pump	2	2
Emergency Feedwater Turbine Driven Pump	2	2
Equipment Drain Sumps	5	5
Equipment Drain Tank	5	5
Essential Chillers	1	1
Floor Drain Sumps	5	5
Fuel Pool Cooling Pumps	3	3
Fuel Pool Filters	5	5
Fuel Pool Heat Exchanger	3	3
Fuel Pool Ion Exchangers	5	5
Fuel Pool Purification Pumps	5	5
Fuel Transfer Tube	5	5
Gas Stripper	5	5
Hi Purge Filters	2	2
Holdup Pumps	5	5
Letdown Heat Exchanger	5	5
Lo Purge Filters	2	2
Nuclear Annex Ventilation Filters	2	2

TABLE 3.2-3 (Continued)

RADIATION ZONE DESIGNATIONS FOR COMPONENTS DURING NORMAL OPERATING CONDITIONS

	Zone Designation[1]	
	OPERATING	SHUTDOWN
Post-accident Hydrogen Recombiners	2	2
Preholdup Ion Exchanger	5	5
Purification Filters	5	5
Purification Ion Exchangers	5	5
Radiation Access Control Point	1	1
Reactor Coolant System	5	5
Reactor Vessel		
Hot and Cold Legs		
Steam Generators		
Reactor Drain Filter	5	5
Reactor Drain Pumps	5	5
Reactor Drain Tank	5	5
Reactor Makeup Water Filter	5	5
Reactor Makeup Water Pump	4	3
Regenerative Heat Exchanger	5	5
Remote Shutdown Room	1	1
Resin Sluice Tanks	5	5
Safety Injection Filters	5	5
Safety Injection Pump	3	5
Sampling Panels	5	5
Sampling Panels Pipe Chase	5	5
Seal Injection Heat Exchanger	5	5
Shutdown Cooling System Heat Exchanger	3	5
Shutdown Cooling System Pump	3	5
Spent Fuel Pool (Bottom) w/ fuel	5	5
Subsphere Ventilation System Filters	2	2
Vital I & C Channel A, B, D, D	1	1
Volume Control Tank	5	5

[1] Radiation Zone Designations are provided in Table 3.2-2.

4.0 INTERFACE REQUIREMENTS

The System 80+™ Certified Design encompasses interfaces to certain portions of the essentially complete System 80+™ nuclear plant design that are not within the scope, and are not a part of, the Certified Design (the "out-of-scope" portions). This section indicates the location in Section 2 where requirements for those interfaces are specified, including requirements pertaining to certain design attributes and performance characteristics of the out-of-scope portions of the design. These interface requirements were established to allow completion of the final safety analysis and the design-specific probabilistic risk assessment.

Some interface requirements encompassed by the System 80+ Certified Design are written to specify physical characteristics of out-of-scope portions of the design (e.g., separation of mechanical Divisions), while other interface requirements are written to specify a functional requirement (e.g., heat removal capacity) of the out-of-scope portion of the design.

An application for a combined license (COL) that references the System 80+ Certified Design must describe design provisions that comply with the interface requirements and must also provide ITAAC aimed at verifying that the as-built facility has those design provisions.

ITAAC Justification

The interface requirements specified for the System 80+ Certified Design are similar in form, and in the type of content, to the Design Descriptions specified in Section 2 for individual System 80+ systems. Thus, ITAAC can be developed for System 80+ interface requirements in the same manner as ITAAC were developed for System 80+ systems.

Method for ITAAC Verification

The method to be used for verification of interface requirements must be specified in the COL ITAAC and will be identical to the methods specified for verification of Design Descriptions in Section 2. That is, the interface requirements themselves will be specified in ITAAC tables as individual Design Commitments. Verification that the requirements are met will be accomplished through Inspections, Tests, and Analyses also specified in the ITAAC tables. Finally, Acceptance Criteria to verify that the as-built facility conforms with the interface requirements identified in the Design Commitments will also be specified in the ITAAC tables. Fuel load may not occur without each of those Acceptance Criteria being met.

4.1 OFFSITE POWER SYSTEM

Interface Requirements

Interface requirements for the Offsite Power System, including the switchyard, are provided in Section 2.6.1.

4.2 ULTIMATE HEAT SINK

Interface Requirements

Interface requirements for the Ultimate Heat Sink are provided in Section 2.7.5.

4.3 STATION SERVICE WATER PUMP STRUCTURE

Interface Requirements

Interface requirements for the Station Service Water Pump Structure are provided in Section 2.7.5.

4.4 STATION SERVICE WATER PUMP STRUCTURE VENTILATION SYSTEM

Interface Requirements

Interface requirements for the Station Service Water Pump Structure Ventilation System are provided in Section 2.7.5.

5.0 SITE PARAMETERS

This section presents the parameters encompassed in the System 80+™ Certified Design.

An applicant selecting a site for the construction of the System 80+ Certified Design shall either describe how the actual site location characteristics are enveloped by the Site Parameters in this section, or demonstrate that those site characteristics not bounded by the Site Parameters do not invalidate the certified design commitments in Sections 1.0, 2.0, 3.0, and 4.0.

TABLE 5.0-1

SITE PARAMETERS

Maximum Ground Water Level	2 feet below finished plant grade level
Maximum Flood (or Tsunami) Level	1 foot below finished plant grade level
Precipitation (for Roof Design)	
Probable Maximum Precipatation (PMP) Estimate (Maximum Average Value Over One Square Mile Area for one hour)	19.4 inches per hour with a ratio of 0.32 for 5 minute to 1 hour PMP estimate. (6.2 inches per 5 minutes)
Maximum Snow Load	50 pounds per square foot
Design Ambient Temperatures	
0% Exceedance Values (Historical Limit Excluding Peaks < 2 hours)	
Maximum	115°F dry bulb 80°F coincident wet bulb temperature 81°F wet bulb (non-coincident) temperature
Minimum	-40°F
Extreme Wind	
Basic Wind Speed	110 miles per hour (50 year recurrence) 122 miles per hour (100 year recurrence)
Tornado	
Maximum Tornado Wind Speed	330 miles per hour
Maximum Pressure Differential	2.4 pounds per square inch

TABLE 5.0-1 (Continued)

SITE PARAMETERS

Soil Properties

Minimum Static Bearing Capacity	12,000 pounds per square foot at foundation level of Nuclear Island Structure
Best Estimate Minimum Shear Wave Velocity	700 feet per second
Liquefaction	The soils under safety-related structures and buried piping are stable against liquefaction at the site-specific Safe Shutdown Earthquake (SSE) level.

Seismology

SSE Response Spectra	See Figures 5.0-1 and 5.0-2.

Dilution Factors

	Time Period	Dilution Factor (sec/m^3)
EAB	0 - 2 hours	1.00×10^{-3}
LPZ	0 - 8 hours	1.35×10^{-4}
LPZ	8 - 24 hours	1.00×10^{-4}
LPZ	1 - 4 days	5.40×10^{-5}
LPZ	4 - 30 days	2.20×10^{-5}

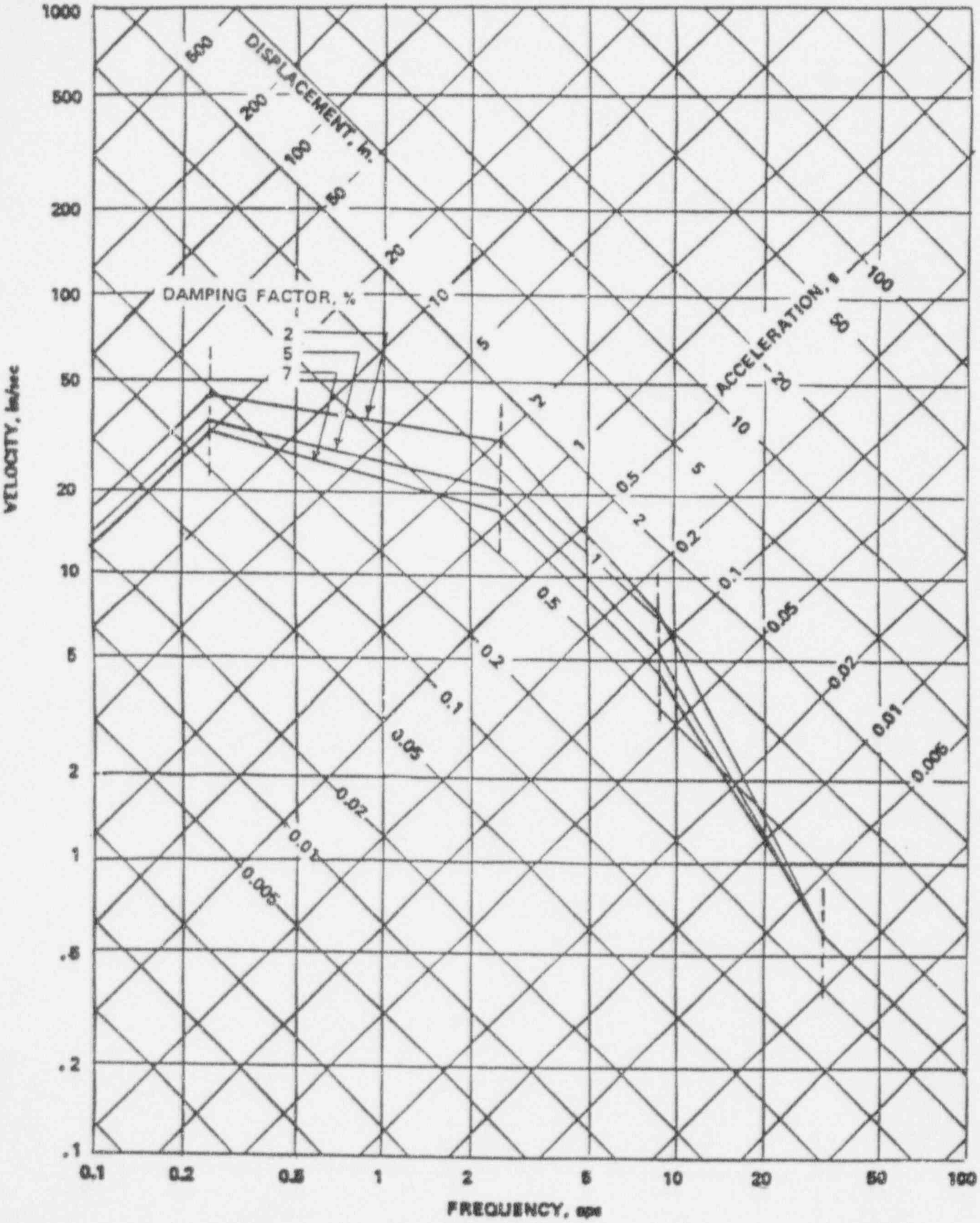

FIGURE 5.0-1
HORIZONTAL FREE FIELD SURFACE SPECTRA AT FINISHED PLANT GRADE LEVEL

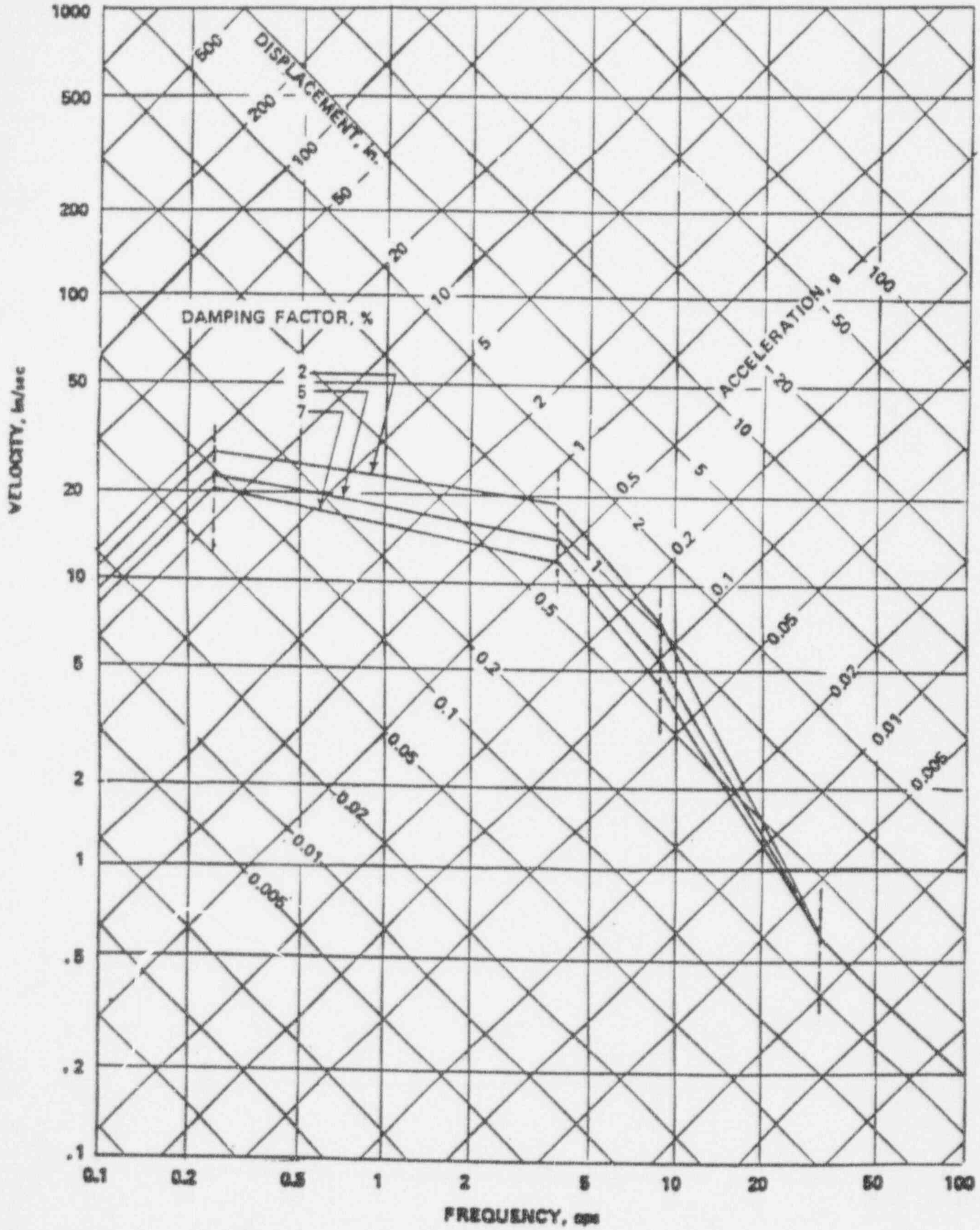

FIGURE 5.0-2
VERTICAL FREE FIELD SURFACE SPECTRA AT FINISHED PLANT GRADE LEVEL