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V - CONTAINMENT

1.0 SUMMARY DESCRIPTION

1.1 General

The containment systems of Cooper Nuclear Station (CNS) utilize a "multibarrier" concept which consists of two systems. Primary Containment is a pressure suppression system which forms the first barrier. Secondary Containment is a system which minimizes the ground level release of airborne radioactive materials and forms the second barrier. The fuel, fuel cladding, and Reactor Coolant Pressure Boundary form additional barriers to the release of fission products and are described elsewhere in the USAR.

1.2 Primary Containment

Primary Containment houses the Reactor Pressure Vessel, the reactor coolant recirculation system and other branch connections of the reactor coolant system. Primary Containment is a pressure suppression system consisting of a Drywell, a Suppression Chamber which stores a large volume of water (suppression pool), a connecting vent system between the Drywell and suppression pool, isolation valves, PCIS, vacuum relief system, portions of the Emergency Core Cooling System, and other service equipment. The Drywell is a steel pressure vessel in the shape of an inverted light bulb, and the Suppression Chamber is a torus-shaped steel pressure vessel, often referred to as the Torus, located below and encircling the Drywell.

Primary Containment is designed to withstand the Safe Shutdown Earthquake (SSE) and the forces from any size breach of the Reactor Coolant Pressure Boundary up to and including an instantaneous circumferential break of the reactor recirculation piping and provides a hold-up time for decay of any radioactive material released. In addition, Primary Containment is also designed to withstand loads resulting from the suppression pool response to SRV operation associated with plant transient operating conditions.

Primary Containment stores sufficient water to condense the steam released as a result of a breach in the Reactor Coolant Pressure Boundary and to supply the Emergency Core Cooling Systems.

1.3 Secondary Containment System

Secondary Containment encloses the Primary Containment system, and refueling and reactor servicing areas, new and spent fuel storage facilities and other reactor auxiliary systems. Secondary Containment serves as the primary containment, when required, during reactor refueling and maintenance operations, when Primary Containment is inoperable and as an additional barrier when Primary Containment is operable. Secondary Containment serves as a barrier to confine and monitor potential releases during fuel handling operations. Secondary Containment consists of the Reactor Building, Standby Gas Treatment (SGT) system, Elevated Release Point (ERP), Reactor Building Isolation and Control system, and other service equipment.

Secondary Containment is designed to withstand the Safe Shutdown Earthquake (SSE) and be capable of providing hold-up, treatment and an ERP for any fission products released to it. In addition, the Reactor Building is designed to provide protection for the engineered safeguards and nuclear safety systems located in the building from postulated environmental events.

2.0 PRIMARY CONTAINMENT

2.1 Safety Objective

The safety objective of Primary Containment is to provide the capability in conjunction with other engineered safeguard features, to limit the release of fission products in the event of a postulated design basis accident so that offsite doses would not exceed the guideline values set forth in 10CFR100 (or 10CFR50.67 for a Loss of Coolant Accident).

2.2 Safety Design Basis

1. Primary Containment has the capability of withstanding the conditions which could result from any of the postulated design basis accidents for which Primary Containment is assumed to be functional, including the largest amount of energy release and mass flow associated with the accident.

2. Primary Containment has a margin for metal-water reactions and other chemical reactions subsequent to any postulated design basis accident for which Primary Containment is assumed to be functional, consistent with the performance objectives of the nuclear safety systems and engineered safeguards.

3. Primary Containment has the capability to maintain its functional integrity during any postulated external or environmental event.

4. Primary Containment has the capability to be filled with water as an accident recovery method for any postulated design basis accident in which a breach of the Reactor Coolant Pressure Boundary cannot be sealed.

5. Primary Containment, in conjunction with other nuclear safety systems and engineered safeguards, has the capability to limit leakage during any of the postulated design basis accidents for which it is assumed to be functional such that offsite doses do not exceed the guideline values set forth in 10CFR100 (or 10CFR50.67 for a Loss of Coolant Accident).

6. Primary Containment has the capability to rapidly isolate pipes or ducts necessary to establish the primary containment barrier.

7. Primary Containment has the capability to store sufficient water to supply the Emergency Core Cooling System (ECCS) requirements.

8. Primary Containment has the capability to be maintained during normal operation within the range of initial conditions assumed in the "Station Safety Analysis."

2.3 Description

Primary Containment is a GE Mark I design pressure suppression system, as shown in Figure V-2-1. The design employs a low leakage pressure suppression containment system which houses the reactor vessel, the reactor coolant recirculation loops, and other branch connections of the reactor primary system. Primary Containment consists of a Drywell, a Suppression Chamber (torus) which stores a large volume of water (suppression pool), a connecting vent system between the Drywell and the suppression pool, isolation valves, PCIS, and vacuum relief system. Additional equipment including portions of ECCS is located within Primary Containment which provides services to Primary Containment. Primary Containment design parameters are given in Table V-2-1.

2.3.1 General

In the event of a process system piping failure within the Drywell, reactor water and steam will be released into the Drywell gas space. The resulting increased Drywell pressure forces a mixture of air, steam and water through the vent system into the suppression pool. The steam condenses rapidly in the suppression pool resulting in rapid pressure reduction in the Drywell. Air transferred during reactor blowdown to the Suppression Chamber pressurizes the chamber and subsequently is vented to the Drywell through the vacuum relief system as the pressure in the Drywell drops below that in the Suppression Chamber. Steam remaining in the Drywell can be condensed by the containment spray system, as described in Section IV-8.5.3.

Cooling systems are provided to remove heat from the suppression pool to provide for continuous cooling of Primary Containment under the postulated design basis accident conditions for which the Primary Containment is assumed to be functional. Isolation valves are provided to ensure containment of radioactive materials within Primary Containment which might be released from the reactor to the containment during the course of an accident. Other service equipment is provided to maintain the containment within its design parameters during normal operation.

Primary Containment design loading considerations are given in Section XII and Appendix C. The "Station Safety Analysis" presented in Section XIV demonstrates the effectiveness of Primary Containment as a radiological barrier. In addition, Primary Containment pressure and temperature transients from postulated design basis accidents are also presented in Section XIV.

TABLE V-2-1

PRIMARY CONTAINMENT SYSTEM
PRINCIPAL DESIGN PARAMETERS AND CHARACTERISTICS

Primary Containment Design Conditions:
- maximum code allowable internal pressure.................... + 62 psig
- internal design pressure.................................. + 56 psig
- external design pressure.................................... + 2 psid
- design temperature.. 281°F

Drywell free volume (including vent system)...... (approximately) 132,250 ft^3

Pressure suppression chamber free volume, maximum (approximately) 112,240 ft^3

Pressure suppression chamber free volume, minimum (approximately) 106,850 ft^3

Pressure suppression pool water volume, maximum... (approximately) 91,100 ft^3

Pressure suppression pool water volume, minimum... (approximately) 87,650 ft^3

Minimum Submergence of vent pipe below pressure suppression pool surface.. 3 ft

Downcomer vent pressure loss factor.................................. 6.21

Break area/total downcomer area.................................... 0.0178

Drywell free volume/pressure suppression chamber free volume............ 1.20

Primary system volume/pressure suppression pool volume................ 0.157

Drywell free volume/primary system volume............................ 8.83

Maximum Accident Pressures for the Drywell / Suppression Chamber

Design Basis Accident(original analysis)......... 46.2 psig / 29.0 psig

NEDO 10320 Accident Analysis[100] .... 58.2 psig /

Accepted value of peak calculated containment pressure for 10 CFR Part 50, Appendix J leakage rate testing (P_a) ...... 58 psig[115]

[The peak containment pressure of 58.2 psig was determined using the methodology of NEDO-10320. This methodology has been confirmed to be excessively conservative. The current licensing basis calculation yields a more realistic, yet conservative, value of 54.4 psig. Based on this, 58 psig is considered to be a very conservative value of peak containment pressure following a postulated LOCA.]

Mark I DBA.................................... 51.4 psig / 24.3 psig

Mark I IBA.................................... 31.2 psig / 28.9 psig

Mark I SBA.................................... 23.2 psig / 21.3 psig

MELLL/ICF................................... 54.4 psig / 24.0* psig

Maximum Accident Temperatures for the Drywell / Suppression Chamber

Design Basis Accident (original analysis)................ 295°F / 128°F

Mark I DBA.. 295°F / 121°F

Mark I IBA.. 276°F / 162°F

Mark I SBA.. 340°F / 134°F

MELLL/ICF.. 301.4°F[107]

Normal Operating Limits

Maximum Bulk Drywell Temperature................................ 150°F

Maximum Bulk Suppression Pool Temperature........................ 95°F

Minimum Bulk Suppression Pool Temperature........................ 40°F

*During the first 30 seconds.

2.3.2 Drywell

The Drywell is a steel pressure vessel with a spherical lower portion 65 feet in diameter, and a cylindrical upper portion 35 ft. 7 in. in diameter. The overall height is approximately 110 feet. The design, fabrication, inspection, and testing of the Drywell vessel complies with requirements of the ASME Boiler and Pressure Vessel Code, Section III, Subsection B, "Requirements for Class B Vessels," which pertain to containment vessels for nuclear power stations, and Appendix IX provisions for Class B vessels of the winter 1967 addenda to the aforementioned ASME code.

The Drywell is designed for an internal pressure of 56 psig coincident with a temperature of 281°F with applicable dead, live, and seismic loads imposed on the shell. Thus, in accordance with the ASME Code, Section III, Paragraph N-1312-(2) the maximum allowable drywell pressure is 62 psig. Thermal stresses in the steel shell due to temperature gradients were considered in the design of the Drywell.

Special precautions not required by codes were taken in the fabrication of the steel Drywell shell. Charpy V-notch specimens were used for impact testing of plate and forging material to give assurance of proper material properties. Plates, forgings and pipe associated with the drywell have been impact tested at a temperature of 0°F or lower when tested in accordance with the appropriate code for the materials. It is intended that the Drywell will not be pressurized or subjected to substantial stress at temperature below 30°F.

The Drywell internal surfaces were coated with a system which has been shown to satisfactorily withstand the temperatures and pressures of the steam environment postulated during a design basis loss-of-coolant accident (LOCA) as described in Section XIV.[1]

The Drywell is enclosed in reinforced concrete for shielding purposes and to provide additional resistance to deformation and buckling in areas where the concrete backs up the steel shell. Above the transition zone, the Drywell is separated from the reinforced concrete by a gap of approximately two inches. Shielding over the top of the Drywell is provided by removable, segmented, reinforced concrete shield plugs.

In addition to the drywell head, one double-door air lock and two bolted equipment hatches are provided for access to the Drywell. The locking mechanisms on each air lock door are designed so that a tight seal will be maintained when the doors are subjected to design pressures. The doors are normally mechanically interlocked so that neither door may be operated unless the other door is closed and locked. The interlocks may be disabled during periods when primary containment integrity is not required. The drywell head and equipment hatch covers are bolted in place and sealed with gaskets.

2.3.3 Suppression Chamber and Drywell Vent System

2.3.3.1 General (Refer to Figures V-2-1, V-2-2)

The suppression pool, which is contained in the Suppression Chamber, initially serves as the heat sink for any postulated transient or accident condition in which the normal heat sink (Main Condenser or Shutdown Cooling System) is unavailable. Energy is transferred to the suppression pool by either the discharge piping from the reactor pressure relief valves or the drywell vent system. The relief valve discharge piping is used as the energy transfer path for any condition which requires the operation of the relief valves. The drywell vent system is the energy transfer path for all energy releases to the Drywell.

Of all the postulated transient and accident conditions, the instantaneous circumferential rupture of the reactor coolant recirculation piping represents the most rapid energy addition to the suppression pool. For this accident the vent system, which connects the drywell and suppression chamber, conducts flow from the drywell to the suppression chamber without excessive resistance and distributes this flow effectively and uniformly in the pool. The suppression pool receives this flow, condenses the steam portion of this flow, and releases the noncondensable gases and any fission products to the Suppression Chamber air space. These noncondensable gases are cooled by the containment spray system, as described in Section IV-8.5.3.

2.3.3.2 Suppression Chamber

The Suppression Chamber is a steel pressure vessel in the shape of a torus below and encircling the drywell, with a centerline diameter of 101’-9" and a cross-sectional internal diameter of 28'-9". The Suppression Chamber shell is stiffened by 16 internal ring girders located at each miter joint of the Suppression Chamber. The suppression chamber support system consists of 16 pairs of reinforced W14x136 columns at ring girder locations and four lateral seismic restraints. Each support column pair is connected by a saddle support assembly. The suppression chamber will transmit operational, accident, and seismic loadings to the reinforced concrete foundation slab of the Reactor Building. Space is provided outside of the chamber for inspection.

The toroidal Suppression Chamber is designed to the same material and code requirements as the steel Drywell vessel. The material has been impact tested at a temperature of 0°F or less. The lower half of the Suppression Chamber is provided with a general corrosion allowance of 3/32 inches. The Suppression Chamber was coated with a coating that has been shown to satisfactorily withstand the temperatures and pressures of the steam environment postulated during a design basis LOCA.[1] This inorganic zinc coating is designed to deplete as it sacrificially protects the carbon steel structure. In conjunction with desludging, inspection, and coating repairs every other refueling outage, and maintenance of high water quality in accordance with BWRVIP-190, analyses demonstrate that the general corrosion of the Suppression Pool carbon steel components will continue to be mitigated and the service life of the coating system will continue to ensure structural integrity during the period of extended operation.[117] }

In RE24, a test patch was applied to the torus that uses a coating material that has not been qualified to withstand a design basis LOCA. The acceptability of using this coating in this test application has been documented in an engineering evaluation.[116]

The Mark I Containment Long Term program resulted in a redefinition of the LOCA loading conditions. The Cooper plant unique analysis for these new loads is described in Appendix C, Section C-2.5.7.1.

2.3.3.3 Suppression Pool

The suppression pool is approximately 87,650 cubic feet of demineralized water contained within the Suppression Chamber. It serves both as a heat sink for postulated transients and accidents and as a source of water for the ECCS.

The suppression pool receives energy in the form of steam and water from the reactor pressure relief valve discharge piping or the vent system downcomers which discharge under water. The steam is condensed by the suppression pool. The condensed steam and any water carryover cause an increase in pool volume and temperature. Energy can be removed from the suppression pool when the residual heat removal system is operating in the suppression pool cooling mode.

Relief valve discharge piping inside the suppression pool has T-quenchers attached to the open-ended discharge tees (ramsheads).[7] These T-quenchers provide better thermal mixing and reduce the hydrodynamic loads on the torus shell and submerged structures in the pool.

The suppression pool is the primary source of water for the Core Spray (CS) and Residual Heat Removal (RHR) system and the secondary source of water for the Reactor Core Isolation Cooling (RCIC) and High Pressure Coolant Injection (HPCI) systems. The water level and temperature of the suppression pool are continuously monitored in the main control room.

There are no chemical additives used in the suppression pool.[1] The suppression pool is filled initially with demineralized water, using gravity flow to fill the pool from the condensate storage tank. A connection is provided in the RHR system to pump suppression pool water to the waste surge or waste collector tanks for filtration and demineralization in the Radwaste Building. The treated water is then recycled to the condensate storage tank.

2.3.3.4 <u>Suppression Pool Draining</u>

When required for maintenance outages, the suppression pool is drained to Radwaste or the condenser hot well. This may be accomplished in the following manner:

a) The RHR system pumps may be used to drain the water down to the level of the lower RHR torus penetrations, approximately three feet from the bottom.[8] RHR pump discharge is connected to Radwaste or the condensate polishing system (and subsequently to the condensate hot well) through a removable spool piece. This method of torus pump down is not normally used, however.

b) The Torus Drain System may be used to drain the torus into the condenser hotwell. This system consists of one 900 gpm pump, and associated valves and piping; it is physically disconnected from the torus during plant operations. During pumpdown, the system is connected to a valved torus penetration that is normally blanked off to maintain system integrity.[9] A 4-inch butterfly isolation valve has been installed on the discharge of the torus drain pump to permit isolation after the torus has been drained and to prevent backflow.

2.3.3.5 <u>Drywell Vent System</u> (Refer to Figure V-2-2)

Large vent pipes connect the Drywell and the Suppression Chamber. A total of eight circular vent pipes, each having a diameter of 5'11", are anchored at the drywell, radiate outward at 45° interval, and penetrate the torus shell at alternating segments midway between ring girders.[3] To accommodate differential motion between the Drywell and the torus, the vent pipes are provided with flexible expansion joints which are enclosed within sleeves. Jet deflectors are provided in the Drywell at the entrance of each vent pipe to prevent possible damage to the vent pipes from jet forces which might accompany a pipe break in the Drywell. The vent pipes are designed for the same pressure and temperature conditions as the Drywell and Suppression Chamber. The vent system between the Drywell and the Suppression Chamber including the vent pipes, vent header, and downcomers was fabricated, erected and inspected in accordance with the ASME B&PV code, Section III, Subsection B.

The Drywell vent lines are connected to a 4'2" diameter vent header which is contained within the airspace of the Suppression Chamber. The vent header has the same temperature and pressure design requirements as the vent pipes. Projecting downward from the header are 80 downcomer pipes, 24 inches in diameter. This vent header system is supported by 16 pairs of 6" pipe columns, each pair pinned to the bottom of a ring girder.[3] The downcomers terminate a minimum of three feet[2] below the surface of the suppression pool. This minimizes the vent header impact loads that would result from a LOCA, when the vents initially clear and the slugs of water in the downcomers are ejected. Topical Report NEDE 21885-P[5] evaluated the effects of truncating the downcomers at three feet, with the following conclusions:

1. Condensation effectiveness of the suppression pool can be maintained for both short and long term phases of the Design Basis Accident (DBA), Intermediate Break Accident (IBA) and Small Break Accident (SBA) cases with three feet submergence.

2. There is no significant thermal stratification in the condensation oscillation regime after LOCA with three feet submergence.

3. There is some thermal stratification in the chugging regime for all break sizes. However, this will not inhibit the pressure suppression function of the suppression pool.

4. Seismic induced waves will not cause downcomer vent uncovering with three feet submergence.

5. Post-LOCA pool waves will not cause downcomer vent uncovering with three feet submergence.

6. Maximum post-LOCA drawdown will not cause downcomer vent uncovering and condensation effectiveness of the suppression pool will be maintained.

The Drywell vent system also includes vacuum breakers designed to prevent the Drywell and Suppression Chamber from exceeding their 2 psi external pressure design limit (see Section V-2.3.6). There are twelve vacuum breakers installed.

Penetrations of the vent system between the Drywell and Suppression Chamber except the vacuum breaker seats are welded. Penetrations are available for periodic visual inspection.[4]

2.3.4 Penetrations

2.3.4.1 General

Containment penetrations have the following design characteristics:

1. They are designed for the same pressure and temperature conditions as the Drywell or Suppression Chamber.

2. They are capable of withstanding the forces caused by impingement of the fluid from the rupture of the largest local pipe or connection without failure.

3. They are capable of accommodating the thermal and mechanical stresses, which may be encountered during all modes of operation including environmental events, without failure.

4. They are capable of withstanding the maximum reaction that the pipe to which they are attached is capable of exerting.

The number and size of these penetrations are shown in Burns and Roe Drawing 4259, Sheets 1 and 1A, and Burns and Roe Drawing 4260, Sheets 2A and 2B. Load combinations and allowable stresses are described in Appendix C. Table V-2-2 identifies the isolation devices for each penetration.

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
N/A	N/A	N/A	DRYWELL HEAD	PC-PENT-DWH	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	
X-1A	10’-0”	N/A	EQUIPMENT HATCH	PC-PENT-X1A	HATCH	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	
X-1B	10’-0”	N/A	EQUIPMENT HATCH	PC-PENT-X1B	HATCH	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	
X-2	8’-6”	N/A	PERSONNEL ACCESS AIR LOCK	PC-PENT-X2	HATCH	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	
X-3	24”	N/A	BOTTOM HEAD ACCESS HATCH	N/A	HATCH	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	INACCESSIBLE, SEAL WELDED CLOSED
X-4	24”	N/A	DRYWELL HEAD ACCESS HATCH	PC-PENT-X4	HATCH	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	
X-5A	6’-11 ½”	5'-10"	VENT LINE TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-5B	6’-11 ½”	5'-10"	VENT LINE TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-5C	6’-11 ½”	5'-10"	VENT LINE TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-5D	6’-11 ½”	5'-10"	VENT LINE TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-5E	6’-11 ½”	5'-10"	VENT LINE TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-5F	6’-11 ½”	5'-10"	VENT LINE TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-5G	6’-11 ½”	5'-10"	VENT LINE TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-5H	6’-11 ½”	5'-10"	VENT LINE TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-6	24”	N/A	CRD REMOVAL HATCH	PC-PENT-X6	T-T CLOSURE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	
X-7A	42”	24"	MAIN STEAM LINE A INBOARD ISOLATION	MS-AOV-AO80A	Y-PATTERN GLOBE	INSIDE	N2 & AC, DC	N2 & SPRING	A	B, D, P, Q	3-5 SECS NOTE (1)	OPEN	TYPE C	NOTE (32), VALVE USES NITROGEN IN LIEU OF AIR WHEN CONTAINMENT IS INERTED. NOTE (37)
	42”	24"	MAIN STEAM LINE A OUTBOARD BELLOWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (33)
	42”	24"	MAIN STEAM LINE A OUTBOARD ISOLATION	MS-AOV-AO86A	Y-PATTERN GLOBE	OUTSIDE	AIR & AC, DC	AIR & SPRING	A	B, D, P, Q	3-5 SECS NOTE (1)	OPEN	TYPE C	NOTE (37)
	42”	24"	MAIN STEAM LINE A INBOARD BELLOWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (33)
X-7B	42”	24"	MAIN STEAM LINE B INBOARD ISOLATION	MS-AOV-AO80B	Y-PATTERN GLOBE	INSIDE	N2 & AC, DC	N2 & SPRING	A	B, D, P, Q	3-5 SECS NOTE (1)	OPEN	TYPE C	NOTE (32), VALVE USES NITROGEN IN LIEU OF AIR WHEN CONTAINMENT IS INERTED. NOTE (37)
	42”	24"	MAIN STEAM LINE B OUTBOARD BELLOWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (33)
	42”	24"	MAIN STEAM LINE B OUTBOARD ISOLATION	MS-AOV-AO86B	Y-PATTERN GLOBE	OUTSIDE	AIR & AC, DC	AIR & SPRING	A	B, D, P, Q	3-5 SECS NOTE (1)	OPEN	TYPE C	NOTE (37)

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-7B	42″	24"	MAIN STEAM LINE B INBOARD BELLOWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (33)
X-7C	42″	24"	MAIN STEAM LINE C INBOARD ISOLATION	MS-AOV-AO80C	Y-PATTERN GLOBE	INSIDE	N2 & AC, DC	N2 & SPRING	A	B, D, P, Q	3-5 SECS NOTE (1)	OPEN	TYPE C	NOTE (32), VALVE USES NITROGEN IN LIEU OF AIR WHEN CONTAINMENT IS INERTED. NOTE (37)
	42″	24"	MAIN STEAM LINE C OUTBOARD BELLOWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (33)
	42″	24"	MAIN STEAM LINE C OUTBOARD ISOLATION	MS-AOV-AO86C	Y-PATTERN GLOBE	OUTSIDE	AIR & AC, DC	AIR & SPRING	A	B, D, P, Q	3-5 SECS NOTE (1)	OPEN	TYPE C	NOTE (37)
	42″	24"	MAIN STEAM LINE C INBOARD BELLOWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (33)
X-7D	42″	24"	MAIN STEAM LINE D INBOARD ISOLATION	MS-AOV-AO80D	Y-PATTERN GLOBE	INSIDE	N2 & AC, DC	N2 & SPRING	A	B, D, P, Q	3-5 SECS NOTE (1)	OPEN	TYPE C	NOTE (32), VALVE USES NITROGEN IN LIEU OF AIR WHEN CONTAINMENT IS INERTED. NOTE (37)
	42″	24"	MAIN STEAM LINE D OUTBOARD BELLOWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (33)
	42″	24"	MAIN STEAM LINE D OUTBOARD ISOLATION	MS-AOV-AO86D	Y-PATTERN GLOBE	OUTSIDE	AIR & AC, DC	AIR & SPRING	A	B, D, P, Q	3-5 SECS NOTE (1)	OPEN	TYPE C	NOTE (37)
	42″	24"	MAIN STEAM LINE D INBOARD BELLOWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (33)
X-8	18″	3"	MAIN STEAM LINE DRAIN INBOARD	MS-MOV-MO74	GATE	INSIDE	AC	AC	A	B, D, P	30 SECS	OPEN	TYPE C	NOTE (37)
	18″	3"	MAIN STEAM LINE DRAIN OUTBOARD	MS-MOV-MO77	GATE	OUTSIDE	DC	DC	A	B, D, P	30 SECS	OPEN	TYPE C	NOTE (37)
X-9A	34″	18"	FW LINE A INBOARD ISOLATION	RF-CV-16CV	CHECK	INSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW	N/A	OPEN	TYPE C	
	34″	18"	FW LINE A INBOARD BELLOWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (33)
	34″	18"	FW LINE A OUTBOARD BELLOWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (33)
	34″	18"	FW LINE A OUTBOARD ISOLATION	RF-CV-15CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW	N/A	OPEN	TYPE C	
	34″	4"	RCIC INJECTION OUTBOARD ISOLATION	RCIC-CV-26CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW NOTE (3)	N/A	CLOSED	TYPE C	
	34″	4"	RWCU RETURN OUTBOARD ISOLATION	RWCU-CV-15CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW	N/A	OPEN	TYPE C	
X-9B	34″	18"	FW LINE B OUTBOARD ISOLATION	RF-CV-14CV	CHECK	INSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW	N/A	OPEN	TYPE C	
	34″	18"	FW LINE B OUTBOARD BELLOWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (33)

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-9B	34"	18"	FW LINE B INBOARD BELLOWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (33)
	34"	18"	FW LINE B INBOARD ISOLATION	RF-CV-13CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW	N/A	OPEN	TYPE C	
	34"	14"	HPCI INJECTION OUTBOARD ISOLATION	HPCI-CV-29CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW NOTE (3)	N/A	CLOSED	TYPE C	
X-10	34"	3"	RCIC STEAM SUPPLY INBOARD ISOLATION	RCIC-MOV-MO15	GATE	INSIDE	AC	AC	A	K	20 SECS NOTE (18)	OPEN	TYPE C	NOTE (37)
	34"	3"	RCIC STEAM SUPPLY OUTBOARD ISOLATION	RCIC-MOV-MO16	GATE	OUTSIDE	DC	DC	A	K	27 SECS NOTE (18)	OPEN	TYPE C	NOTE (37)
X-11	26"	10"	HPCI STEAM SUPPLY INBOARD ISOLATION	HPCI-MOV-MO15	GATE	INSIDE	AC	AC	A	L, M	50 SECS NOTE (18)	OPEN	TYPE C	NOTE (37)
	26"	10"	HPCI STEAM SUPPLY OUTBOARD ISOLATION	HPCI-MOV-MO16	GATE	OUTSIDE	DC	DC	A	L, M	87 SECS NOTE (18)	OPEN	TYPE C	NOTE (37)
X-12	36"	20"	SDC SUPPLY TO RHR PUMPS INBOARD ISOLATION	RHR-MOV-MO18	GATE	INSIDE	AC	AC	A	A, U, F, RM	40 SECS	CLOSED	N/A	NOTE (37), (39)
	36"	20"	SDC SUPPLY TO RHR PUMPS OUTBOARD ISOLATION	RHR-MOV-MO17	GATE	OUTSIDE	DC	DC	A	A, U, F, RM	40 SECS	CLOSED	TYPE C	NOTE (37)
X-13A	42"	24"	RHR INJECTION LOOP A OUTBOARD ISOLATION	RHR-MOV-MO25A	GATE	OUTSIDE	DC	DC	A-X	RM, A, F	STANDARD	CLOSED	TYPE C	NOTE (17), (11), (37)
	42"	24"	RHR INJECTION LOOP A INBOARD ISOLATION	RHR-CV-26CV	CHECK	INSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW NOTE (3)	N/A	CLOSED	N/A	NOTE (39)
	42"	2"	RHR INJECTION LOOP A CV BYPASS (INBOARD)	RHR-MOV-MO274A	GLOBE	INSIDE	AC	AC	A-X	G	STANDARD	CLOSED	N/A	NOTE (39) DE-ENERGIZED ABOVE 212°F RRCS WATER TEMPERATURE
X-13B	42"	24"	RHR INJECTION LOOP B OUTBOARD ISOLATION	RHR-MOV-MO25B	GATE	OUTSIDE	DC	DC	A-X	RM, A, F	STANDARD	CLOSED	TYPE C	NOTE (17), (11), (37)
	42"	24"	RHR INJECTION LOOP B INBOARD ISOLATION	RHR-CV-27CV	CHECK	INSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW NOTE (3)	N/A	CLOSED	N/A	NOTE (39)
	42"	2"	RHR INJECTION LOOP B CV BYPASS (INBOARD)	RHR-MOV-MO274B	GLOBE	INSIDE	AC	AC	A-X	G	STANDARD	CLOSED	N/A	NOTE (39) DE-ENERGIZED ABOVE 212°F RRCS WATER TEMPERATURE
X-14	22"	6"	RWCU SUPPLY FROM RECIRC INBOARD ISOLATION	RWCU-MOV-MO15	GATE	INSIDE	AC	AC	A	H, W, Y, J, RM	30 SECS NOTE (18)	OPEN	TYPE C	RWCU PUMPS ARE SIGNALED TO STOP AS A RESULT OF VALVE CLOSURE. NOTE (37)
	22"	6"	RWCU SUPPLY FROM RECIRC OUTBOARD ISOLATION	RWCU-MOV-MO18	GATE	OUTSIDE	DC	DC	A	H, W, Y, J, RM	44 SECS NOTE (18)	OPEN	TYPE C	RWCU PUMPS ARE SIGNALED TO STOP AS A RESULT OF VALVE CLOSURE. NOTE (37)
X-15	20"	-	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-16A	26″	10"	CS A PUMP DISCHARGE INBOARD ISOLATION	CS-CV-18CV	CHECK	INSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW NOTE (3)	N/A	CLOSED	N/A	NOTE (39)
	26″	10"	CS A PUMP DISCHARGE OUTBOARD ISOLATION	CS-MOV-MO12A	GATE	OUTSIDE	AC	AC	A-X	RM	N/A	CLOSED	TYPE C	NOTE (11), (36)
X-16B	26″	10"	CS B PUMP DISCHARGE INBOARD ISOLATION	CS-CV-19CV	CHECK	INSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW NOTE (3)	N/A	CLOSED	N/A	NOTE (39)
	26″	10"	CS B PUMP DISCHARGE OUTBOARD ISOLATION	CS-MOV-MO12B	GATE	OUTSIDE	AC	AC	A-X	RM	N/A	CLOSED	TYPE C	NOTE (11), (36)
X-17	22″	6"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-18	6″	3"	DW EQUIP DR SUMP DISCHARGE INBOARD ISOLATION	RW-AOV-AO94	GATE	OUTSIDE	AIR & AC	AIR (19)	B	A, F	15 SECS	OPEN	TYPE C	NOTE (37)
	6″	3"	DW EQUIP DR SUMP DISCHARGE OUTBOARD ISOLATION	RW-AOV-AO95	GATE	OUTSIDE	AIR & AC	AIR (19)	B	A, F	15 SECS	OPEN	TYPE C	NOTE (37)
X-19	4″	3"	DW FL DR SUMP DISCHARGE INBOARD ISOLATION	RW-AOV-AO82	GATE	OUTSIDE	AIR & AC	AIR (19)	B	A, F	15 SECS	OPEN	TYPE C	NOTE (37)
	4″	3"	DW FL DR SUMP DISCHARGE OUTBOARD ISOLATION	RW-AOV-AO83	GATE	OUTSIDE	AIR & AC	AIR (19)	B	A, F	15 SECS	OPEN	TYPE C	NOTE (37)
X-20	8″	4"	DEMINERALIZED WATER SUPPLY INBOARD ISOLATION	DW-V-219	GATE	INSIDE	MANUAL	MANUAL	N/A	N/A	N/A	SEALED CLOSED	TYPE C	OPENED DURING OUTAGES FOR OPERATING CONVENIENCE NOTE (37)
	8″	4"	DEMINERALIZED WATER SUPPLY OUTBOARD ISOLATION	DW-V-133	GATE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	SEALED CLOSED	TYPE C	OPENED DURING OUTAGES FOR OPERATING CONVENIENCE NOTE (37)
X-21	3″	1"	SERVICE AIR INBOARD ISOLATION	SA-V-648	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	SEALED CLOSED	TYPE C	OPENED DURING OUTAGES FOR OPERATING CONVENIENCE NOTE (37)
	3″	1"	SERVICE AIR OUTBOARD ISOLATION	SA-V-647	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	SEALED CLOSED	TYPE C	OPENED DURING OUTAGES FOR OPERATING CONVENIENCE NOTE (37)
X-22	3″	1"	IA TO MSIVS AND SRVS INBOARD ISOLATION	IA-CV-65CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	OPEN	TYPE C	CLOSES ON LOSS OF IA
	3″	1"	IA TO MSIVS AND SRVS OUTBOARD ISOLATION	IA-CV-78CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	OPEN	TYPE C	CLOSES ON LOSS OF IA
X-23	12″	8"	REC DRYWELL SUPPLY OUTBOARD ISOLATION	REC-MOV-702MV	GATE	OUTSIDE	AC	AC	C	RM	N/A	OPEN	TYPE C	NOTE (28)
X-24	12″	8"	REC DRYWELL RETURN OUTBOARD ISOLATION	REC-MOV-709MV	GATE	OUTSIDE	AC	AC	C	RM	N/A	OPEN	TYPE C	NOTE (28)

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PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-25	20″	24"	DW INLET INBOARD ISOLATION	PC-MOV-232MV	BUTTERFLY	OUTSIDE	AC	AC	B	H, F, Z	15 SECS	CLOSED*	TYPE C	NOTE (32), (37)
	20″	24"	TESTABLE FLANGE	PC-FLG-232MV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	
	20″	24"	DW INLET OUTBOARD ISOLATION	PC-AOV-238AV	BUTTERFLY	OUTSIDE	AIR & AC	SPRING	B	H, F, Z	15 SECS	CLOSED*	TYPE C	NOTE (37)
	20″	1"	SBNI SUPPLY INBOARD ISOLATION	PC-MOV-1306MV	GATE	OUTSIDE	AC	AC	B	A, F, RM	15 SECS	CLOSED	TYPE C	NOTE (20), (37)
	20″	1"	SBNI SUPPLY OUTBOARD ISOLATION	PC-MOV-1305MV	GATE	OUTSIDE	DC	DC	B	A, F, RM	15 SECS	CLOSED	TYPE C	NOTE (20), (37)
X-26	20″	24"	DRYWELL EXHAUST INBOARD ISOLATION	PC-MOV-231MV	BUTTERFLY	OUTSIDE	AC	AC	B	H, F, Z	15 SECS	CLOSED	TYPE C	NOTE (15), (20), (32), (37)
	20″	24"	DRYWELL EXHAUST OUTBOARD ISOLATION	PC-AOV-246AV	BUTTERFLY	OUTSIDE	AIR & AC	SPRING	B	H, F, Z	15 SECS	CLOSED	TYPE C	NOTE (15), (20), (37)
	20″	2"	DRYWELL EXHAUST BYPASS INBOARD ISOLATION	PC-MOV-306MV	GATE	OUTSIDE	AC	AC	B	H, F, Z	40 SECS	CLOSED*	TYPE C	NOTE (15), (20), (37)
	20″	1"	DRYWELL VENT BYPASS OUTBOARD ISOLATION	PC-MOV-1310MV	GATE	OUTSIDE	DC	DC	B	A, F, RM	15 SECS	CLOSED*	TYPE C	NOTE (15), (20), (37)
	20″	24"	TESTABLE FLANGE	PC-FLG-231MV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	
	20″	1 ½″	LOCAL INSTRUMENT RACK	PC-PT-1B2, PC-PT-4B2, PC-PT-5B2	INSTRUMENT RACK	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	NOTE (14), (29)
X-27A	10″	1"	INSTRUMENT LINE	NBI-CV-19BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-27B	10″	1"	INSTRUMENT LINE	NBI-CV-20BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-27C	10″	1"	INSTRUMENT LINE	HPCI-CV-11BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-27D	10″	1"	INSTRUMENT LINE	HPCI-CV-10BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-27E	10″	1"	SPARE – CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-27F	10″	1"	SPARE – CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-28A	10″	1"	INSTRUMENT LINE	NBI-CV-13BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	INSTRUMENT LINE	NBI-CV-14BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-28B	10″	1"	INSTRUMENT LINE	NBI-CV-15BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-28C	10″	1"	INSTRUMENT LINE	NBI-CV-12BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-28D	10″	1"	INSTRUMENT LINE	NBI-CV-11BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-28E	10″	1"	INSTRUMENT LINE	NBI-CV-10BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-28F	10″	1"	RPV FLANGE LEAK DETECTION OUTBOARD ISOLATION	NBI-CV-48BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-29A	10″	1"	INSTRUMENT LINE	NBI-CV-23BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	INSTRUMENT LINE	NBI-CV-24BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-29B	10″	1"	INSTRUMENT LINE	NBI-CV-25BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-29C	10″	1"	INSTRUMENT LINE	NBI-CV-21BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-29D	10″	1"	INSTRUMENT LINE	NBI-CV-22BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-29E	10″	1"	N2 TO RR-741AV INBOARD ISOLATION	PC-CV-33CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	C	REV. FLOW	N/A	CLOSED	TYPE C	
	10″	1"	N2 TO RR-741AV OUTBOARD ISOLATION	PC-CV-34CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	C	REV. FLOW	N/A	CLOSED	TYPE C	
X-29F	10″	1″	DRYWELL PRESSURE INDICATION	PC-PT-1A1, PC-PT-4A1, PC-PT-5A1	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	NOTE (14), (29)
X-30A	10″	1"	INSTRUMENT LINE OUTBOARD ISOLATION	MS-CV-11BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-30B	10″	1"	INSTRUMENT LINE OUTBOARD ISOLATION	MS-CV-10BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-30C	10″	1"	INSTRUMENT LINE OUTBOARD ISOLATION	MS-CV-12BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-30D	10″	1"	INSTRUMENT LINE OUTBOARD ISOLATION	MS-CV-13BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-30E	10″	1"	IA TO NBI-737AV INBOARD ISOLATION	PC-V-559	GATE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	10″	1"	IA TO NBI-737AV OUTBOARD ISOLATION	PC-V-560	GATE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
X-30F	10″	1"	IA TO NBI 739AV INBOARD ISOLATION	PC-V-561	GATE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	10″	1"	IA TO NBI 739AV OUTBOARD ISOLATION	PC-V-562	GATE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
X-31A	10″	1"	SPARE INSTRUMENT ISOLATION	RR-V-45	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE A	NOTE (27), (37)

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-31B	10"	1"	SPARE INSTRUMENT ISOLATION	RR-V-46	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE A	NOTE (27), (37)
X-31C	10"	1"	SPARE INSTRUMENT ISOLATION	RR-V-49	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE A	NOTE (37)
X-31D	10"	1"	SPARE INSTRUMENT ISOLATION	RR-V-64	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE A	NOTE (37)
X-31E	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RR-CV-16CV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-31F	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RR-CV-31CV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-32A	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RR-CV-18CV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-32B	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RR-CV-17CV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-32C	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RR-CV-33CV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-32D	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RR-CV-32CV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-32E	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RR-CV-15CV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-32F	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RR-CV-30CV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-33A	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RR-CV-12CV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-33B	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RR-CV-13CV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-33C	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RR-CV-27CV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-33D	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RR-CV-28CV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-33E	10"	1"	IA TO MS-738AV INBOARD ISOLATION	PC-V-563	GATE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	10"	1"	IA TO MS-738AV OUTBOARD ISOLATION	PC-V-564	GATE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
X-33F	10"	1"	IA TO NBI-736AV INBOARD ISOLATION	PC-V-565	GATE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	10"	1"	IA TO NBI-736AV OUTBOARD ISOLATION	PC-V-566	GATE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
X-34A	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	MS-CV-16BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-34B	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	MS-CV-14BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-34C	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	MS-CV-17BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-34D	10"	1"	INSTRUMENT LINE OUTBOARD ISOLATION	MS-CV-15BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-34E	10"	1"	SPARE – CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-34F	10"	1"	SPARE – CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-35A	1 ½"	3/8"	TIP D TESTABLE FLANGE	N/A	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
	1 ½"	3/8"	TIP D INBOARD ISOLATION	NMT-NVA-104D	BALL	OUTSIDE	AC	AC	A-X	A, F	STANDARD	CLOSED*	TYPE C	NOTE (16), (37)
	1 ½"	3/8"	TIP D OUTBOARD ISOLATION	NMT-NVA-104DX	SHEAR	OUTSIDE	DC	DC + EXPLOSIVE	A-X	RM	N/A	OPEN	N/A	NOTE (37)
X-35B	1 ½"	3/8"	TIP A INBOARD ISOLATION	NMT-NVA-104A	BALL	OUTSIDE	AC	AC	A-X	A, F	STANDARD	CLOSED*	TYPE C	NOTE (16), (37)
	1 ½"	3/8"	TIP A TESTABLE FLANGE	N/A	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
	1 ½"	3/8"	TIP A OUTBOARD ISOLATION	NMT-NVA-104AX	SHEAR	OUTSIDE	DC	DC + EXPLOSIVE	A-X	RM	N/A	OPEN	N/A	NOTE (37)
X-35C	1 ½"	3/8"	TIP C TESTABLE FLANGE	N/A	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
	1 ½"	3/8"	TIP C INBOARD ISOLATION	NMT-NVA-104C	BALL	OUTSIDE	AC	AC	A-X	A, F	STANDARD	CLOSED*	TYPE C	NOTE (16), (37)
	1 ½"	3/8"	TIP C OUTBOARD ISOLATION	NMT-NVA-104CX	SHEAR	OUTSIDE	DC	DC + EXPLOSIVE	A-X	RM	N/A	OPEN	N/A	NOTE (37)
X-35D	1 ½"	3/8"	TIP B TESTABLE FLANGE	N/A	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
	1 ½"	3/8"	TIP B INBOARD ISOLATION	NMT-NVA-104B	BALL	OUTSIDE	AC	AC	A-X	A, F	STANDARD	CLOSED*	TYPE C	NOTE (16), (37)
	1 ½"	3/8"	TIP B OUTBOARD ISOLATION	NMT-NVA-104BX	SHEAR	OUTSIDE	DC	DC + EXPLOSIVE	A-X	RM	N/A	OPEN	N/A	NOTE (37)
X-35E	1 ½"	3/8"	N2 PURGE TESTABLE FLANGE	N/A	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
	1 ½"	3/8"	TIP N2 PURGE INBOARD ISOLATION	NM-CV-CV4	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	TYPE C	
	1 ½"	3/8"	TIP N2 PURGE OUTBOARD ISOLATION	NM-CV-CV2	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	TYPE C	
X-36	6"	3"	DIVISION I H2/O2 ANALYZER	PC-AN-H2/O2I	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (14), SAMPLE LINE

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-36	6”	3"	N2 SUPPLY TO DIVISION I H2/O2	PC-CV-21CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	TYPE C	NOTE (14), SAMPLE LINE
	6”	3"	H2 SUPPLY TO DIVISION I H2/O2	PC-CV-22CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	TYPE C	NOTE (14), SAMPLE LINE
	6”	3"	O2 SUPPLY TO DIVISION I H2/O2	PC-CV-23CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	TYPE C	NOTE (14), SAMPLE LINE
	6”	3"	DIVISION II H2/O2 ANALYZER	PC-AN-H2/O2II	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (14), SAMPLE LINE
	6”	3"	N2 SUPPLY TO DIVISION II H2/O2	PC-CV-25CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	TYPE C	NOTE (14), SAMPLE LINE
	6”	3"	H2 SUPPLY TO DIVISION II H2/O2	PC-CV-26CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	TYPE C	NOTE (14), SAMPLE LINE
	6”	3"	O2 SUPPLY TO DIVISION II H2/O2	PC-CV-27CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	TYPE C	NOTE (14), SAMPLE LINE
X-37A	3’-9”W x 2’-6”H	1"	31 CRD COOLING WATER RISER	CRD-CV-138CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	N/A	NOTE (4)	N/A	OPEN	TYPE A	
	3’-9”W x 2’-6”H	1"	31 CRD INSERT, 1 SPARE	CRD-SOV-SO121	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
	3’-9”W x 2’-6”H	1"	31 CRD INSERT SETTLE, 1 SPARE	CRD-SOV-SO123	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
X-37B	3’-9”W x 2’-6”H	1"	37 CRD COOLING WATER RISER	CRD-CV-138CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	N/A	NOTE (4)	N/A	OPEN	TYPE A	
	3’-9”W x 2’-6”H	1"	37 CRD INSERT, 1 SPARE	CRD-SOV-SO121	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
	3’-9”W x 2’-6”H	1"	37 CRD INSERT SETTLE, 1 SPARE	CRD-SOV-SO123	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
X-37C	3’-9”W x 2’-6”H	1"	38 CRD COOLING WATER RISER	CRD-CV-138CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	N/A	NOTE (4)	N/A	OPEN	TYPE A	
	3’-9”W x 2’-6”H	1"	38 CRD INSERT	CRD-SOV-SO121	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
	3’-9”W x 2’-6”H	1"	38 CRD INSERT SETTLE	CRD-SOV-SO123	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
	3’-9”W x 2’-6”H	3/4"	CRD MINI PURGE TO RR PUMP A INBOARD ISOLATION	CRD-CV-14CV	CHECK	INSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW	N/A	OPEN	TYPE C	
	3’-9”W x 2’-6”H	3/4"	CRD MINI PURGE TO RR PUMP A OUTBOARD ISOLATION	CRD-CV-13CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW	N/A	OPEN	TYPE C	

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-37D	3’-9”W x 2’-6”H	1"	31 CRD INSERT, 1 SPARE	CRD-SOV-SO121	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
	3’-9”W x 2’-6”H	1"	31 CRD COOLING WATER RISER	CRD-CV-138CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	N/A	NOTE (4)	N/A	OPEN	TYPE A	
	3’-9”W x 2’-6”H	1"	31 CRD INSERT SETTLE, 1 SPARE	CRD-SOV-SO123	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
X-38A	3’-9”W x 2’-6”H	1"	31 CRD EXHAUST WATER WITHDRAWAL, 1 SPARE	CRD-SOV-SO120	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
	3’-9”W x 2’-6”H	1"	31 CRD WITHDRAWAL, 1 SPARE	CRD-SOV-SO122	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
X-38B	3’-9”W x 2’-6”H	1"	37 CRD EXHAUST WATER WITHDRAWAL, 1 SPARE	CRD-SOV-SO120	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
	3’-9”W x 2’-6”H	1"	37 CRD WITHDRAWAL, 1 SPARE	CRD-SOV-SO122	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
X-38C	3’-9”W x 2’-6”H	1"	38 CRD EXHAUST WATER WITHDRAWAL	CRD-SOV-SO120	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
	3’-9”W x 2’-6”H	1"	38 CRD WITHDRAWAL	CRD-SOV-SO122	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
	3’-9”W x 2’-6”H	3/4"	CRD MINI PURGE TO RR PUMP B INBOARD ISOLATION	CRD-CV-16CV	CHECK	INSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW	N/A	OPEN	TYPE C	
	3’-9”W x 2’-6”H	3/4"	CRD MINI PURGE TO RR PUMP B OUTBOARD ISOLATION	CRD-CV-15CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW	N/A	OPEN	TYPE C	
X-38D	3’-9”W x 2’-6”H	1"	31 CRD EXHAUST WATER WITHDRAWAL, 1 SPARE	CRD-SOV-SO120	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
	3’-9”W x 2’-6”H	1"	31 CRD WITHDRAWAL, 1 SPARE	CRD-SOV-SO122	SOLENOID	OUTSIDE	AC	SPRING	N/A	NOTE (4)	N/A	CLOSED	TYPE A	OPENS ON ROD MOVEMENT & CLOSED AT ALL OTHER TIMES
X-39A	12”	10"	RHR DW SPRAY LOOP A INBOARD ISOLATION	RHR-MOV-MO31A	GATE	OUTSIDE	AC	AC	B-X	G, S	STANDARD	CLOSED	TYPE C	NOTE (2)
	12”	10"	DW SPRAY LOOP A TESTABLE FLANGE	PC-FLG-X39A	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	
	12”	10”	RHR DW SPRAY LOOP A OUTBOARD ISOLATION	RHR-MOV-MO26A	GATE	OUTSIDE	AC	AC	B-X	G, S	STANDARD	CLOSED	N/A	NOTE (2), (39)

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-39B	12″	10"	RHR DW SPRAY LOOP B INBOARD ISOLATION	RHR-MOV-MO31B	GATE	OUTSIDE	AC	AC	B-X	G, S	STANDARD	CLOSED	TYPE C	NOTE (2)
	12″	10"	DW SPRAY LOOP B TESTABLE FLANGE	PC-FLG-X39B	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	
	12″	10"	RHR DW SPRAY LOOP B OUTBOARD ISOLATION	RHR-MOV-MO26B	GATE	OUTSIDE	AC	AC	B-X	G, S	STANDARD	CLOSED	N/A	NOTE (2), (39)
	12″	1"	SBNI INJECTION INBOARD ISOLATION	PC-MOV-1311MV	GATE	OUTSIDE	DC	DC	B	A, F, RM	15 SECS	OPEN	TYPE C	NOTE (20), (37)
	12″	1"	SBNI INJECTION OUTBOARD ISOLATION	PC-MOV-1312MV	GATE	OUTSIDE	AC	AC	B	A, F, RM	15 SECS	OPEN	TYPE C	NOTE (20), (37)
X-40A	10″	1"	JET PUMP (A) INSTRUMENT LINE	NBI-CV-38BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (B) INSTRUMENT LINE	NBI-CV-18BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (C) INSTRUMENT LINE	NBI-CV-17BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (D) INSTRUMENT LINE	NBI-CV-36BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (E) INSTRUMENT LINE	NBI-CV-16BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (F) INSTRUMENT LINE	NBI-CV-37BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	X-40A COUPLING PC PRESSURE INSTRUMENTS	PC-PS-101A, PC-PS-12A, PC-PS-16, PC-PT-512A	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (14)
X-40B	10″	1"	JET PUMP (A) INSTRUMENT LINE	NBI-CV-35BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (B) INSTRUMENT LINE	NBI-CV-31BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (C) INSTRUMENT LINE	NBI-CV-30BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (D) INSTRUMENT LINE	NBI-CV-33BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (E) INSTRUMENT LINE	NBI-CV-32BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (F) INSTRUMENT LINE	NBI-CV-34BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	X-40B COUPLING PC PRESSURE INSTRUMENTS	PC-PS-101C, PC-PS-119A, PC-PS-119C, PC-PS-12B.	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (14)

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-40C	10″	1"	JET PUMP (A) INSTRUMENT LINE	NBI-CV-47BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (B) INSTRUMENT LINE	NBI-CV-28BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (C) INSTRUMENT LINE	NBI-CV-27BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (D) INSTRUMENT LINE	NBI-CV-45BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (E) INSTRUMENT LINE	NBI-CV-44BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (F) INSTRUMENT LINE	NBI-CV-46BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	X-40C COUPLING PC PRESSURE INSTRUMENTS	PC-PS-101B, PC-PS-12C, PC-PT-512B	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (14)
X-40D	10″	1"	JET PUMP (A) INSTRUMENT LINE	NBI-CV-26BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (B) INSTRUMENT LINE	NBI-CV-40BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (C) INSTRUMENT LINE	NBI-CV-39BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (D) INSTRUMENT LINE	NBI-CV-42BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (E) INSTRUMENT LINE	NBI-CV-41BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	JET PUMP (F) INSTRUMENT LINE	NBI-CV-43BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
	10″	1"	X-40D COUPLING PC PRESSURE INSTRUMENTS	PC-PS-101D, PC-PS-119B, PC-PS-119D, PC-PS-12D	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (14)
X-41	6″	3/4"	REACTOR WATER SAMPLE INBOARD ISOLATION	RR-AOV-741AV	GLOBE	INSIDE	AIR & AC	SPRING	A	B, C	15 SECS	OPEN*	TYPE C	NOTE (24), (32), (37)
	6″	3/4"	REACTOR WATER SAMPLE OUTBOARD ISOLATION	RR-AOV-740AV	GLOBE	OUTSIDE	AIR & AC	SPRING	A	B, C	15 SECS	OPEN*	TYPE C	NOTE (24), (37)
X-42	4″	1-1/2"	SLC INJECTION INBOARD ISOLATION	SLC-CV-13CV	CHECK	INSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW	N/A	CLOSED	TYPE C	
	4″	1-1/2"	SLC INJECTION OUTBOARD ISOLATION	SLC-CV-12CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	A-X	REV. FLOW	N/A	CLOSED	TYPE C	
X-43	18″	4"	RR PUMP FLUSHING & ILRT TEST CONN.	RW-FLG-PEN43	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)

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PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-44	18″	4"	RR PUMP FLUSHING & ILRT TEST CONN.	RW-FLG-PEN44	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
X-45A	12″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-45B	12″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-45C	12″	3/4"	RAD MONITOR VENT	RMV-AOV-12AV	GLOBE	OUTSIDE	AIR & AC	SPRING	B	A, F	STANDARD	OPEN	TYPE C	NOTE (8), (37)
	12″	3/4"	RAD MONITOR VENT	RMV-AOV-13AV	GLOBE	OUTSIDE	AIR & AC	SPRING	B	A, F	STANDARD	OPEN	TYPE C	NOTE (8), (37)
X-45D	12″	1"	NBI/MS AIR EXHAUST TO DRYWELL	PC-CV-35CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B	REV. FLOW	N/A	CLOSED	TYPE C	
	12″	1"	NBI/MS AIR EXHAUST TO DRYWELL	PC-CV-36CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B	REV. FLOW	N/A	CLOSED	TYPE C	
X-45E	12″	1-1/2"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-45F	12″	2-1/2"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-46A	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-46B	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-46C	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-46D	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-46E	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-46F	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-47A	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-47B	10″	1"	PRESSURE INSTRUMENTS	PC-PT-513, PC-PI-513, PC-DPT-20	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	NOTE (14), (29), (30), CONNECTED TO X-215
X-47C	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-47D	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-47E	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-47F	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-48	10″	10"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE A	
X-49A	10″	1"	SPARE INSTRUMENT LINE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-49B	10″	1"	SPARE INSTRUMENT LINE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-49C	10″	1"	ELECTRICAL PENETRATION, INDICATION & CONTROL	PC-PENT-X49C	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-49D	10″	1"	ELECTRICAL PENETRATION, INDICATION & CONTROL	PC-PENT-X49D	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-49E	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-49F	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-50A	10″	1"	ELECTRICAL PENETRATION, INDICATION & CONTROL	PC-PENT-X50A	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-50B	10″	1"	ELECTRICAL PENETRATION, INDICATION & CONTROL	PC-PENT-X50B	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-50C	10″	1"	SPARE INSTRUMENT LINE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-50D	10″	1"	SPARE INSTRUMENT LINE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-50E	10″	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RCIC-CV-11BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-50F	10″	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RCIC-CV-10BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-51A	10″	1"	INSTRUMENT LINE OUTBOARD ISOLATION	NBI-CV-29BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-51B	10″	1"	RR-SOV-SPV741 TO DRYWELL IA EXHAUST	PC-CV-33CV, 34CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B	REV. FLOW	N/A	CLOSED	TYPE A	NOTE (29). SEE X29E FOR ADDITIONAL DETAILS.
X-51C	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-51D	10″	1"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-51E	10″	1"	DRYWELL VENT MONITOR INBOARD ISOLATION	RMV-AOV-10AV	GLOBE	OUTSIDE	AIR & AC	SPRING	B	A, F	STANDARD	OPEN	TYPE C	NOTE (37)
	10″	1"	DRYWELL VENT MONITOR OUTBOARD ISOLATION	RMV-AOV-11AV	GLOBE	OUTSIDE	AIR & AC	SPRING	B	A, F	STANDARD	OPEN	TYPE C	NOTE (37)
X-51F	10″	1"	PAS CONT. ATM. SAMPLE INBOARD	PC-AOV-247AV	GLOBE	OUTSIDE	AIR	SPRING	B-X	N/A	N/A	CLOSED	TYPE C	NOTE (23)
	10″	1"	PAS CONT. ATM. SAMPLE OUTBOARD	PC-AOV-248AV	GLOBE	OUTSIDE	AIR	SPRING	B-X	N/A	N/A	CLOSED	TYPE C	NOTE (23)
X-52A	10″	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RCIC-CV-12BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-52B	10”	1"	INSTRUMENT LINE OUTBOARD ISOLATION	RCIC-CV-13BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-52C	10”	1"	INSTRUMENT LINE	CS-CV-17BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-52D	10”	1"	INSTRUMENT LINE	CS-CV-16BCV	EXCESS FLOW CHECK	OUTSIDE	SPRING	PROCESS	N/A	EXCESS FLOW	N/A	OPEN	TYPE A	NOTE (27), (37) CLOSE ON EXCESS FLOW
X-52E	10”	1"	SPARE – CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-52F	10”	1"	SPARE – CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-53	6”	6"	SPARE – CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-100A	12”	12"	LOW VOLTAGE INSTR. & CONTROL	PC-PENT-X100A	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-100B	12”	12"	SPARE – CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-100C	12”	12"	SPARE – CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-100D	12”	12"	SPARE – CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-100E	12”	12"	THERMOCOUPLES	PC-PENT-X100E	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-100F	12”	12"	NEUTRON MONITORING	PC-PENT-X100F	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-100G	12”	12"	LOW VOLTAGE INSTR. & CONTROL	PC-PENT-X100G	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-100H	12”	12"	LOW VOLTAGE INSTR. & CONTROL	PC-PENT-X100H	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-101A	12”	12"	MEDIUM VOLTAGE POWER	PC-PENT-X101A	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-101B	12”	12"	NEUTRON MONITORING	PC-PENT-X101B	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-101C	12”	12"	MEDIUM VOLTAGE POWER	PC-PENT-X101C	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-101D	12”	12"	MEDIUM VOLTAGE POWER	PC-PENT-X101D	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-101E	12”	12"	LOW VOLTAGE INSTR. & CONTROL	PC-PENT-X101E	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-101F	12”	12"	MEDIUM VOLTAGE POWER	PC-PENT-X101F	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-102	12”	12"	LOW VOLTAGE INSTR. & CONTROL	PC-PENT-X102	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-103	12”	12"	NEUTRON MONITORING	PC-PENT-X103	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-104A	12”	12"	CONTROL ROD POSITION INDICATION	PC-PENT-X104A	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-104B	12”	12"	CONTROL ROD POSITION INDICATION	PC-PENT-X104B	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-104C	12”	12"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-104D	12”	12"	CONTROL ROD POSITION INDICATION	PC-PENT-X104D	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-104E	12”	12"	CONTROL ROD POSITION INDICATION	PC-PENT-X104E	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-105A	12”	12"	LOW VOLTAGE POWER	PC-PENT-X105A	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-105B	12”	12"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-105C	12”	12"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-105D	12”	12"	MEDIUM VOLTAGE POWER	PC-PENT-X105D	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-106	12”	12"	NEUTRON MONITORING	PC-PENT-X106	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
SIP-1	16”	N/A	INSPECTION HATCH	PC-PENT-SIP1	FLANGE	INSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	NOTE (31)
SIP-2	16”	N/A	INSPECTION HATCH	PC-PENT-SIP2	FLANGE	INSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	NOTE (31)
SIP-3	16”	N/A	INSPECTION HATCH	PC-PENT-SIP3	FLANGE	INSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	NOTE (31)
SIP-4	16”	N/A	INSPECTION HATCH	PC-PENT-SIP4	FLANGE	INSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	NOTE (31)
SIP-5	16”	N/A	INSPECTION HATCH	PC-PENT-SIP5	FLANGE	INSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	NOTE (31)
SIP-6	16”	N/A	INSPECTION HATCH	PC-PENT-SIP6	FLANGE	INSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	NOTE (31)
SIP-7	16”	N/A	INSPECTION HATCH	PC-PENT-SIP7	FLANGE	INSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	NOTE (31)
SIP-8	16”	N/A	INSPECTION HATCH	PC-PENT-SIP8	FLANGE	INSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	NOTE (31)
X-200A	4’-0”	N/A	ACCESS HATCH	PC-PENT-X200A	HATCH	OUTSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	NOTE (31)
X-200B	4’-0”	N/A	ACCESS HATCH	PC-PENT-X200B	HATCH	OUTSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	TYPE B	NOTE (31)
X-201A	5’-11”	5'-11"	VENT LINE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-201B	5’-11”	5'-11"	VENT LINE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-201C	5’-11”	5'-11"	VENT LINE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-201D	5’-11”	5'-11"	VENT LINE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-201E	5’-11”	5'-11"	VENT LINE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-201F	5′-11″	5'-11"	VENT LINE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-201G	5′-11″	5'-11"	VENT LINE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-201H	5′-11″	5'-11"	VENT LINE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-202A	18″	20″	VACUUM BREAKER	PC-AOV-NRV20	CHECK	INSIDE	PROCESS	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (34)
X-202B	18″	20″	VACUUM BREAKER	PC-AOV-NRV21	CHECK	INSIDE	PROCESS	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (34)
X-202C	18″	20″	VACUUM BREAKER	PC-AOV-NRV22	CHECK	INSIDE	PROCESS	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (34)
X-202D	18″	20″	VACUUM BREAKER	PC-AOV-NRV23	CHECK	INSIDE	PROCESS	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (34)
X-202E	18″	20″	VACUUM BREAKER	PC-AOV-NRV24	CHECK	INSIDE	PROCESS	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (34)
X-202F	18″	20″	VACUUM BREAKER	PC-AOV-NRV25	CHECK	INSIDE	PROCESS	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (34)
X-202G	18″	20″	VACUUM BREAKER	PC-AOV-NRV26	CHECK	INSIDE	PROCESS	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (34)
X-202H	18″	20″	VACUUM BREAKER	PC-AOV-NRV27	CHECK	INSIDE	PROCESS	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (34)
X-202J	18″	20″	VACUUM BREAKER	PC-AOV-NRV28	CHECK	INSIDE	PROCESS	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (34)
X-202K	18″	20″	VACUUM BREAKER	PC-AOV-NRV29	CHECK	INSIDE	PROCESS	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (34)
X-202L	18″	20″	VACUUM BREAKER	PC-AOV-NRV30	CHECK	INSIDE	PROCESS	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (34)
X-202M	18″	20″	VACUUM BREAKER	PC-AOV-NRV31	CHECK	INSIDE	PROCESS	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (34)
X-203A	1″	1"	HYDROGEN/OXYGEN ANALYZER RETURN	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (14), (29), (30), SEE X-36 FOR ADDITIONAL DETAILS
X-203B	1″	1"	HYDROGEN/OXYGEN ANALYZER SUPPLY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (14), (29), (30), SEE X-36 FOR ADDITIONAL DETAILS
X-205	20″	3/4"	ATMOSPHERE TO TORUS DIFF. PRESSURE	PC-DPIS-516B	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	NOTE (14), (29)
	20″	24"	VENT PURGE INLET INBOARD ISOLATION	PC-MOV-233MV	BUTTERFLY	OUTSIDE	AC	AC	B	H, F, Z	15 SECS	CLOSED*	TYPE C	NOTE (21), (32), (37), (40)
	20″	3/4"	ATMOSPHERE TO TORUS DIFF. PRESSURE	PC-DPIS-516A	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	NOTE (14), (29)
	20″	24"	TESTABLE FLANGE	PC-FLG-233MV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
	20″	24"	VENT PURGE INLET OUTBOARD ISOLATION	PC-AOV-237AV	BUTTERFLY	OUTSIDE	AIR & AC	SPRING	B	H, F, Z	15 SECS	CLOSED*	TYPE C	NOTE (21), (37), (40)
	20″	20"	VACUUM RELIEF FROM BLDG.	PC-AOV-243AV	BUTTERFLY	OUTSIDE	SPRING	AIR & AC	B-X	RM	N/A	CLOSED	TYPE C	NOTE (32)

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-205	20″	20"	TESTABLE FLANGE	PC-FLG-243MV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
	20″	20"	VACUUM RELIEF FROM BLDG.	PC-AOV-244AV	BUTTERFLY	OUTSIDE	SPRING	AIR & AC	B-X	RM	N/A	CLOSED	TYPE C	NOTE (32)
	20″	20"	TESTABLE FLANGE	PC-FLG-244MV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
	20″	20"	VACUUM RELIEF FROM BLDG.	PC-CV-13CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	TYPE C	VALVE OPENS WHEN SUPPRESSION CHAMBER PRESSURE IS 0.5 PSI BELOW REACTOR BUILDING PRESSURE
	20″	20"	VACUUM RELIEF FROM BLDG.	PC-CV-14CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	TYPE C	VALVE OPENS WHEN SUPPRESSION CHAMBER PRESSURE IS 0.5 PSI BELOW REACTOR BUILDING PRESSURE
	20″	1"	DILUTION FOR LOOP A FROM SBNI	PC-MOV-1304MV	GATE	OUTSIDE	AC	AC	B	A, F, RM	15 SECS	CLOSED	TYPE C	NOTE (20), (37)
	20″	1"	DILUTION FOR LOOP A FROM SBNI	PC-MOV-1303MV	GATE	OUTSIDE	DC	DC	B	A, F, RM	15 SECS	CLOSED	TYPE C	NOTE (20), (37)
X-206A	1″	1″	LIQUID LEVEL INDICATOR	HPCI-LS-91A, HPCI-LS-91B, PC-LT-11, PC-LT-12	INTSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	NOTE (14), (29), (30)
X-206B	1″	1″	LIQUID LEVEL INDICATOR	HPCI-LS-91A, HPCI-LS-91B, PC-LT-11, PC-LT-12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	NOTE (14), (29), (30)
X-206C	1″	1″	LIQUID LEVEL INDICATOR	PC-LT-10, PC-LT-13, PC-PI-2104BG, PC-PI-2104B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	NOTE (14), (29), (30)
X-206D	1″	1″	LIQUID LEVEL INDICATOR	PC-LT-10, PC-LT-13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	NOTE (14), (29), (30)
X-207A	1″	1"	DW VENT LINE DRAIN TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	LOCATED AT LOW POINT OF VENT LINE
X-207B	1″	1"	DW VENT LINE DRAIN TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	LOCATED AT LOW POINT OF VENT LINE
X-207C	1″	1"	DW VENT LINE DRAIN TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	LOCATED AT LOW POINT OF VENT LINE
X-207D	1″	1"	DW VENT LINE DRAIN TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	LOCATED AT LOW POINT OF VENT LINE
X-207E	1″	1"	DW VENT LINE DRAIN TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	LOCATED AT LOW POINT OF VENT LINE
X-207F	1″	1"	DW VENT LINE DRAIN TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	LOCATED AT LOW POINT OF VENT LINE
X-207G	1″	1"	DW VENT LINE DRAIN TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	LOCATED AT LOW POINT OF VENT LINE
X-207H	1″	1"	DW VENT LINE DRAIN TO TORUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	LOCATED AT LOW POINT OF VENT LINE

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-208A	10”	10"	RELIEF VALVE DISCHARGE FROM MS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DISCHARGES TO TORUS
X-208B	10”	10"	RELIEF VALVE DISCHARGE FROM MS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DISCHARGES TO TORUS
X-208C	10”	10"	RELIEF VALVE DISCHARGE FROM MS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DISCHARGES TO TORUS
X-208D	10”	10"	RELIEF VALVE DISCHARGE FROM MS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DISCHARGES TO TORUS
X-208E	10”	10"	RELIEF VALVE DISCHARGE FROM MS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DISCHARGES TO TORUS
X-208F	10”	10"	RELIEF VALVE DISCHARGE FROM MS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DISCHARGES TO TORUS
X-208G	10”	10"	RELIEF VALVE DISCHARGE FROM MS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DISCHARGES TO TORUS
X-208H	10”	10"	RELIEF VALVE DISCHARGE FROM MS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DISCHARGES TO TORUS
X-209A	1”	1"	AIR TEMPERATURE	PC-TE-20A(1), PC-TE-20A(2)	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	
	1”	1"	TESTABLE FLANGE	PC-FLG-X209A	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
X-209B	1”	1"	SPARE	PC-PENT-X209B	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-209C	1”	1"	AIR TEMPERATURE	PC-TE-20C	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	
	1”	1"	TESTABLE FLANGE	PC-FLG-X209C	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
X-209D	1”	1"	SPARE	PC-PENT-X209D	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-210A	18”	2"	RCIC MIN. FLOW LINE INBOARD ISOLATION	RCIC-MOV-MO27	GLOBE	OUTSIDE	DC	DC	B-X	RM	N/A	CLOSED*	N/A	NOTE (22), MO27 CLOSES WHEN RCIC PUMP EXCEEDS MIN. FLOW
	18”	2"	RCIC MIN. FLOW LINE OUTBOARD ISOLATION	RCIC-CV-13CV	CHECK	OUTSIDE	FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	N/A	NOTE (22)
	18”	4"	RHR HX A DRAIN TO TORUS	RHR-MOV-MO21A	GATE	OUTSIDE	AC	AC	B-X	G, RM	STANDARD	CLOSED	N/A	NOTE (2), (22), (25)
	18”	4"	RHR PUMP MIN. FLOW	RHR-MOV-MO16A	GATE	OUTSIDE	AC	AC	B-X	RM	N/A	OPEN*	N/A	NOTE (22), VALVE CLOSES WHEN RHR PUMP EXCEEDS MIN. FLOW
	18”	3"	RHR PUMP A MIN. FLOW	RHR-CV-10CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	N/A	NOTE (22)
	18”	3"	RHR PUMP C MIN. FLOW	RHR-CV-12CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	N/A	NOTE (22)

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
	18″	1"	RHR LOOP A SUPPLY RV DISCHARGE	RHR-RV-14RV	RELIEF	OUTSIDE	PRESSURE	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (22), (31),
	6″	18"	RHR LOOP A TEST LINE TO TORUS	RHR-MOV-MO34A	GLOBE	OUTSIDE	AC	AC	B-X	G	45 SECS NOTE (18)	CLOSED*	N/A	NOTE (2), (22), (39) CONNECTED TO X-211A, THROTTLING TYPE VALVE
	18″	1"	RHR SDC SUPPLY RV DISCHARGE	RHR-RV-17RV	RELIEF	OUTSIDE	PRESSURE	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (22), (31),
	18″	1 ½″	TESTABLE FLANGE	RHR-FLG-14RV	FLANGE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NOTE (22), (31)
	18″	1 ½″	TESTABLE FLANGE	RHR-FLG-17RV	FLANGE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NOTE (22), (31)
X-210B	18″	4"	HPCI MIN. FLOW LINE	HPCI-MOV-MO25	GLOBE	OUTSIDE	DC	DC	B-X	RM	N/A	CLOSED*	N/A	NOTE (22)
	18″	4"	HPCI MIN. FLOW LINE	HPCI-CV-17CV	CHECK	OUTSIDE	FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	N/A	NOTE (22)
	18″	4"	RHR HX B DRAIN TO TORUS	RHR-MOV-MO21B	GATE	OUTSIDE	AC	AC	B-X	G, RM	STANDARD	CLOSED	N/A	NOTE (2), (22), (25)
	6″	18"	RHR LOOP B TEST LINE TO TORUS	RHR-MOV-MO34B	GLOBE	OUTSIDE	AC	AC	B-X	G	45 SECS NOTE (18)	CLOSED*	N/A	NOTE (2), (22), (39) CONNECTED TO X-211B, THROTTLING TYPE VALVE
	18″	4"	RHR PUMP MIN. FLOW	RHR-MOV-MO16B	GATE	OUTSIDE	AC	AC	B-X	RM	N/A	OPEN*	N/A	NOTE (22), VALVE CLOSES WHEN RHR PUMP EXCEEDS MIN. FLOW
	18″	3"	RHR PUMP B MIN. FLOW	RHR-CV-11CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	N/A	NOTE (22)
	18″	3"	RHR PUMP D MIN. FLOW	RHR-CV-13CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	N/A	NOTE (22)
	18″	1"	RHR LOOP B SUPPLY RV DISCHARGE	RHR-RV-15RV	RELIEF	OUTSIDE	PRESSURE	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (22), (31)
	18″	1 ½″	TESTABLE FLANGE	RHR-FLG-15RV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NOTE (22), (31)
X-211A	6″	6"	SUPPRESSION POOL SPRAY LOOP A	RHR-MOV-MO38A	GLOBE	OUTSIDE	AC	AC	B-X	G, S	STANDARD	CLOSED	TYPE C	NOTE (2), THROTTLING TYPE VALVE
	6″	18"	SUPPRESSION POOL SPRAY LOOP A	RHR-MOV-MO39A	GATE	OUTSIDE	AC	AC	B-X	G	STANDARD	CLOSED*	N/A	NOTE (2), (39)
X-211B	6″	6"	SUPPRESSION POOL SPRAY LOOP B	RHR-MOV-MO38B	GLOBE	OUTSIDE	AC	AC	B-X	G, S	STANDARD	CLOSED	TYPE C	NOTE (2), THROTTLING TYPE VALVE
	6″	18"	SUPPRESSION POOL SPRAY LOOP B	RHR-MOV-MO39B	GATE	OUTSIDE	AC	AC	B-X	G	STANDARD	CLOSED*	N/A	NOTE (2), (39)
	6″	1"	LOOP B DILUTION SUPPLY FROM SBNI	PC-MOV-1302MV	GATE	OUTSIDE	DC	DC	B	A, F, RM	15 SECS	OPEN	TYPE C	NOTE (20), (37)
	6″	1"	LOOP B DILUTION SUPPLY FROM SBNI	PC-MOV-1301MV	GATE	OUTSIDE	AC	AC	B	A, F, RM	15 SECS	OPEN	TYPE C	NOTE (20), (37)
X-212	12″	8"	RCIC TURBINE EXHAUST	RCIC-V-37	STOP CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	TYPE C	NOTE (32), HANDWHEEL SEALED OPEN
	12″	8"	RCIC TURBINE EXHAUST	RCIC-CV-15CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	TYPE C	
X-213A	8″	8"	TORUS DRAIN	PC-V-61	BUTTERFLY	OUTSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	N/A	NOTE (22), (37)

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-213A	8″	8"	TORUS DRAIN TESTABLE FLANGE	PC-FLG-DL1	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	N/A	NOTE (22), (31)
	8″	8"	TORUS DRAIN TESTABLE FLANGE	PC-FLG-DL2	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	N/A	NOTE (22), (31)
X-213B	8″	8"	TORUS DRAIN	N/A	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	CLOSED	N/A	NOTE (22), (31)
X-214	24″	20"	HPCI TURBINE EXHAUST	HPCI-V-44	STOP CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	TYPE C	NOTE (32), HANDWHEEL SEALED OPEN
	24″	20"	HPCI TURBINE EXHAUST	HPCI-CV-15CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	TYPE C	
	24″	1"	RHR HX A VENT TO TORUS	RHR-MOV-MO167A	GLOBE	OUTSIDE	AC	AC	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (25), (32)
	24″	1"	RHR HX A VENT	RHR-MOV-MO166A	GLOBE	OUTSIDE	AC	AC	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (25)
	24″	1"	RHR HX B VENT TO TORUS	RHR-MOV-MO167B	GLOBE	OUTSIDE	AC	AC	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (25), (32)
	24″	1"	RHR HX B VENT	RHR-MOV-MO166B	GLOBE	OUTSIDE	AC	AC	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (25)
	24″	1"	HPCI TURBINE EXHAUST DRIP LEG DRAIN	HPCI-AOV-AO70	BALL	OUTSIDE	AIR & AC	AIR	B-X	L, RM	STANDARD	CLOSED	TYPE C	NOTE (14), (32)
	24″	1"	HPCI TURBINE EXHAUST DRIP LEG DRAIN	HPCI-AOV-AO71	BALL	OUTSIDE	AIR & AC	AIR	B-X	L, RM	STANDARD	CLOSED	TYPE C	NOTE (14)
	24″	4"	TESTABLE FLANGE	RHR-FLG-18	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
	24″	4"	TESTABLE FLANGE	RHR-FLG-19	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
	24″	1"	RHR HX A SHELL SIDE RV DISCHARGE	RHR-RV-20RV	RELIEF	OUTSIDE	PRESSURE	SPRING	N/A	N/A	N/A	CLOSED	TYPE C	
	24″	1.5"	TESTABLE FLANGE	RHR-FLG-20RV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
	24″	1.5"	TESTABLE FLANGE	RHR-FLG-21RV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
	24″	1"	RHR HX B SHELL SIDE RV DISCHARGE	RHR-RV-21RV	RELIEF	OUTSIDE	PRESSURE	SPRING	N/A	N/A	N/A	CLOSED	TYPE C	
X-215	24″	¾″	PRESSURE INSTRUMENTATION	PC-PT-20, PC-PI-20, PC-DPT-20	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	NOTE (14), (29), (30), CONNECTED TO X-47B
X-216	4″	4"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-217	4″	4"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-218	2″	2"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-219	2″	10"	SPARE - CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-220	16″	24"	SUPPRESSION CHAMBER EXHAUST INBOARD ISOLATION	PC-MOV-230MV	BUTTERFLY	OUTSIDE	AC	AC	B	H, F, Z	15 SECS	CLOSED	TYPE C	NOTE (32), (37)
	16″	24"	TESTABLE FLANGE	PC-FLG-230MV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	NOTE (31)
	16″	24"	SUPPRESSION CHAMBER EXHAUST OUTBOARD ISOLATION	PC-AOV-245AV	BUTTERFLY	OUTSIDE	AIR & AC	SPRING	B	H, F, Z	15 SECS	CLOSED	TYPE C	NOTE (37)
	16″	2"	PC-230MV BYPASS	PC-MOV-305MV	GATE	OUTSIDE	AC	AC	B	H, F, Z	40 SECS	CLOSED	TYPE C	NOTE (15), (20), (37)
	16″	1"	PC-245MV BYPASS SBNI SUPPLY	PC-MOV-1308MV	GATE	OUTSIDE	DC	DC	B	A, F, RM	15 SECS	CLOSED	TYPE C	NOTE (15), (20), (37)
X-221	2″	2"	RCIC VACUUM PUMP DISCHARGE	RCIC-CV-16CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	N/A	NOTE (22), (26)
	2″	2"	RCIC VACUUM PUMP DISCHARGE	RCIC-CV-12CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	N/A	NOTE (22), (26)
X-222	2″	2"	HPCI TURBINE DRAIN TO TORUS	HPCI-V-50	STOP CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	N/A	NOTE (22), (26), HANDWHEEL SEALED OPEN
	2″	2"	HPCI TURBINE DRAIN TO TORUS	HPCI-CV-16CV	CHECK	OUTSIDE	FWD. FLOW	PROCESS	B-X	REV. FLOW	N/A	CLOSED	N/A	NOTE (22), (26)
X-223A	10″	10"	CS PUMP A TEST LINE	CS-MOV-MO26A	GLOBE	OUTSIDE	AC	AC	B-X	G	STANDARD	CLOSED*	N/A	NOTE (22)
	10″	3"	CS PUMP A MIN. FLOW LINE	CS-MOV-MO5A	GATE	OUTSIDE	AC	AC	B-X	RM	N/A	OPEN	N/A	NOTE (22)
	10″	2"	CS PUMP RV DISCHARGE	CS-RV-11RV	RELIEF	OUTSIDE	PRESSURE	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (22), (31)
	10″	2″	TESTABLE FLANGE	CS-FLG-11RV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NOTE (22), (31)
X-223B	10″	10"	CS PUMP B TEST LINE	CS-MOV-MO26B	GLOBE	OUTSIDE	AC	AC	B-X	G	STANDARD	CLOSED*	N/A	NOTE (22)
	10″	3"	CS PUMP B MIN. FLOW LINE	CS-MOV-MO5B	GATE	OUTSIDE	AC	AC	B-X	RM	N/A	OPEN	N/A	NOTE (22)
	10″	2"	CS PUMP RV DISCHARGE	CS-RV-13RV	RELIEF	OUTSIDE	PRESSURE	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (22), (31)
	10″	2″	TESTABLE FLANGE	CS-FLG-13RV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NOTE (22), (31)
X-224	6″	6"	RCIC PUMP SUCTION	RCIC-MOV-MO41	GATE	OUTSIDE	DC	DC	B-X	RM	N/A	CLOSED	N/A	NOTE (22), VALVE OPENS ON LOW ECST LEVEL
X-225A	20″	20"	RHR SYSTEM PUMP A SUCTION	RHR-MOV-MO13A	GATE	OUTSIDE	AC	AC	B-X	RM	N/A	OPEN	N/A	NOTE (22)
	20″	2"	RHR PUMP A RV DISCHARGE	RHR-RV-10RV	RELIEF	OUTSIDE	PRESSURE	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (22), (31)
	20″	2″	TESTABLE FLANGE	RHR-FLG-10RV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NOTE (22), (31)

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-225B	20″	20"	RHR SYSTEM PUMP C SUCTION	RHR-MOV-MO13C	GATE	OUTSIDE	AC	AC	B-X	RM	N/A	OPEN	N/A	NOTE (22)
	20″	2"	RHR PUMP C RV DISCHARGE	RHR-RV-12RV	RELIEF	OUTSIDE	AC	AC	N/A	N/A	N/A	CLOSED	N/A	NOTE (22)
	20″	2″	TESTABLE FLANGE	RHR-FLG-12RV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NOTE (22), (31)
X-225C	20″	20"	RHR SYSTEM PUMP B SUCTION	RHR-MOV-MO13B	GATE	OUTSIDE	AC	AC	B-X	RM	N/A	OPEN	N/A	NOTE (22)
	20″	2"	RHR PUMP B RV DISCHARGE	RHR-RV-11RV	RELIEF	OUTSIDE	PRESSURE	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (22)
	20″	2″	TESTABLE FLANGE	RHR-FLG-11RV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NOTE (22), (31)
X-225D	20″	20"	RHR SYSTEM PUMP D SUCTION	RHR-MOV-MO13D	GATE	OUTSIDE	AC	AC	B-X	RM	N/A	OPEN	N/A	NOTE (22)
	20″	2"	RHR PUMP D RV DISCHARGE	RHR-RV-13RV	RELIEF	OUTSIDE	PRESSURE	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (22)
	20″	2″	TESTABLE FLANGE	RHR-FLG-13RV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NOTE (22), (31)
X-226	16″	16"	HPCI PUMP SUCTION	HPCI-MOV-MO58	GATE	OUTSIDE	DC	DC	B-X	RM, L	N/A	CLOSED	N/A	NOTE (22), VALVE OPENS ON LOW ECST LEVEL OR HIGH SUPP. POOL LEVEL; VALVE CLOSES ON SIGNAL CODE L IF HPCI-MOV-MO17 IS FULL OPEN.
X-227A	16″	16"	CORE SPRAY PUMP A SUCTION	CS-MOV-MO7A	GATE	OUTSIDE	AC	AC	B-X	RM	N/A	OPEN	N/A	NOTE (22)
	16″	3/4"	CORE SPRAY PUMP A RV DISCHARGE	CS-RV-10RV	RELIEF	OUTSIDE	PRESSURE	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (22)
	16″	1″	TESTABLE FLANGE	CS-FLG-10RV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NOTE (22), (31)
X-227B	16″	16"	CORE SPRAY PUMP B SUCTION	CS-MOV-MO7B	GATE	OUTSIDE	AC	AC	B-X	RM	N/A	OPEN	N/A	NOTE (22)
	16″	3/4"	CORE SPRAY PUMP B RV DISCHARGE	CS-RV-12RV	RELIEF	OUTSIDE	PRESSURE	SPRING	N/A	N/A	N/A	CLOSED	N/A	NOTE (22)
	16″	1″	TESTABLE FLANGE	CS-FLG-12RV	FLANGE	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NOTE (22), (31)
X-228	10″	10"	SPARE – CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-229A	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV21	PC-V-569	GATE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV21	PC-V-570	GATE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
X-229B	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV20	PC-V-571	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV20	PC-V-572	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-229C	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV23	PC-V-573	GATE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV23	PC-V-574	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
X-229D	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV22	PC-V-575	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV22	PC-V-576	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
X-229E	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV25	PC-V-577	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV25	PC-V-578	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
X-229F	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV24	PC-V-579	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV24	PC-V-580	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
X-229G	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV27	PC-V-581	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV27	PC-V-582	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
X-229H	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV26	PC-V-583	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV26	PC-V-584	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
X-229J	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV29	PC-V-585	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV29	PC-V-586	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
X-229K	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV28	PC-V-587	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	1″	1"	AIR TO VACUUM BREAKER PC-AO-NRV28	PC-V-588	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
X-229L	1″	1"	VACUUM BREAKER PC-AO-NRV30 & 31 ACTIVATING AIR	PC-V-589	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
	1″	1"	VACUUM BREAKER PC-AO-NRV30 & 31 ACTIVATING AIR	PC-V-590	GLOBE	OUTSIDE	MANUAL	MANUAL	N/A	N/A	N/A	CLOSED	TYPE C	NOTE (37)
X-229M	1″	1"	SPARE – CAPPED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-230	1″	12"	LOW VOLTAGE POWER TO TORUS	PC-PENT-X230	N/A	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE B	ELECTRICAL PENETRATION
X-300A	1-1/4″	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300A	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-300B	1-1/14″	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300B	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	

TABLE V-2-2
PRIMARY CONTAINMENT ISOLATION DEVICES

Pen. No.	Pen. Size	Line Size	Component Description	CIC	Component Type (6)	Comp. Locale (13)	Power to Open (5) (6)	Power to Close (5) (6)	USAR Class (38)	Isolation Signals	Max. Closing Time (7)	Normal Position (9) (12)	Leak Test Method	Remarks
X-300C	1-1/4"	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300C	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-300D	1-1/4"	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300D	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-300E	1-1/4"	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300E	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-300F	1-1/4"	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300F	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-300G	1-1/4"	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300G	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-300H	1-1/4"	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300H	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-300I	1-1/4"	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300I	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-300J	1-1/4"	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300J	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-300K	1-1/4"	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300K	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-300L	1-1/4"	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300L	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-300M	1-1/4"	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300M	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-300N	1-1/4"	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300N	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-300O	1-1/4"	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300O	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
X-300P	1-1/4"	1-1/4"	TORUS TEMPERATURE MONITORING	PC-PENT-X300P	INSTRUMENT	OUTSIDE	N/A	N/A	N/A	N/A	N/A	N/A	TYPE A	
N/A	N/A	4"	RHR DISCHARGE TO RW	RHR-MOV-MO57	GLOBE	OUTSIDE	AC	AC	N/A	A, F	20 SECS	CLOSED*		OUTSIDE CONTAINMENT BOUNDARY. POTENTIAL BYPASS LEAKAGE PATH
N/A	N/A	4"	RHR DISCHARGE TO RW	RHR-MOV-MO67	GATE	OUTSIDE	DC	DC	N/A	A, F	40 SECS	CLOSED*		OUTSIDE CONTAINMENT BOUNDARY. POTENTIAL BYPASS LEAKAGE PATH

TABLE V-2-2 (Cont'd)

NOTES FOR TABLE V-2-2

These notes are keyed by number to correspond to numbers, in parentheses, in Table V-2-2.

1. Main steam isolation valves (MSIVs) require that both solenoid pilots be deenergized to close valves. Accumulator nitrogen or air pressure plus spring act together to close valves when both pilots are deenergized. Voltage failure at only one pilot does not cause valve closure. The valves are designed to fully close in less than ten seconds, but in no less than three seconds. Technical Specifications require the valves to close in less than five seconds, but in no less than three seconds.

2. Containment spray and suppression cooling valves have interlocks that allow them to be manually reopened after automatic closure. This setup permits containment spray for high drywell pressure conditions, suppression pool cooling, or during combustible gas control. When automatic signals are not present these valves may be opened for test or operating convenience.

3. Injection check valves are designed for local opening with zero differential pressure across the valve seat. The valves will close on reverse flow and open when pump pressure exceeds reactor pressure.

4. The Control Rod Drives have redundant seals and restrictive flow areas, inherent to the CRDs, that provide redundant Reactor Coolant Pressure Boundary isolation. The hydraulic lines for the Hydraulic Control Units are normally isolated outside primary containment by solenoid operated directional control valves and air operated scram valves, but this is not credited for containment isolation. The CRD hydraulic lines are small and terminate in a system that is designed to prevent out-leakage. The solenoid valves are normally closed, but they open on rod movement. The air-operated valves are normally closed, but open on a scram initiation.

5. A-C motor operated valves are powered from the a-c standby power busses. D-C operated isolation valves are powered from the station batteries.

6. All motor operated isolation valves remain in the last position upon failure of valve power. All air operated valves close on motive air failure or power failure at the solenoid pilots except for the reactor building to suppression chamber vacuum breaker butterfly valves which fail open.[116]

7. Closure times are based on analyzed or licensed limits. If an analyzed or licensed limit has not been established, "Standard" is specified. "Standard" closure rates for automatic isolation valves refer to usual industry practice and are adequate to meet isolation requirements.

8. The Drywell Vent Monitor installed by DC 90-226 installed two automatic isolation valves which close on high drywell pressure in addition to the stainless steel manual shutoff Primary Containment valve.

TABLE V-2-2 (Cont'd)

NOTES FOR TABLE V-2-2

9. Valves identified by an asterisk in the "Normal Position" column can be opened or closed by remote manual switch for operating convenience during any mode of reactor operation except when automatic signal is present.

10. Valves are required to close in 60 seconds for primary containment isolation, but the more limiting closure time from the HELB analysis is used in the table.

11. Coincident signals "G" and "T" open Core Spray and selected LPCI valves. Special interlocks permit testing these valves by manual switch except when automatic signals are present.

12. Normal status position of component (open or closed) is the position during normal power operation of the reactor (see "Normal Position" column).

13. Locations shown are relative to the containment. See Burns and Roe Drawings 4259 Sheets 1 and 1A, and 4260 Sheets 2A and 2B for penetration locations.

14. Instrument portion is considered an extension of containment.

15. Manual switches override all automatic signals on the smaller valves that bypass the suppression chamber and drywell exhaust valves.

16. Signal "A" or "F" causes automatic withdrawal of TIP probe. When probe is withdrawn, the valve automatically closes by mechanical action.

17. Isolation signal "A" or "F" is permitted to close LPCI valves but only when both RHR shutdown cooling supply valves are not fully closed and reactor pressure (signal U) is below 72 psig. Valve position indicating lights are not required at the isolation valve display panel.

18. The closure time limit is based on High Energy Line Break considerations.

19. The air accumulator system is Class IS, essential. This accumulator system provides the motive force required should an isolation signal be received during a period when air from the instrument air system is not available.

20. With control switch in the OVRD position, these valves may be opened manually to permit dilution of the containment atmosphere.

21. Isolation signal may be bypassed during accident conditions requiring use of hardened containment venting system using a key-locked switch.

22. These valves and/or flanges are not subject to testing under 10CFR50, Appendix J requirements.

TABLE V-2-2 (Cont'd)

NOTES FOR TABLE V-2-2

23. Remote manual valve with air supply normally sealed closed and disconnected.

24. Isolation signal may be bypassed during accident conditions to obtain a sample for core damage assessment capability using a key-locked switch.

25. These valves are de-energized closed (their isolation position). They are associated with the steam condensing mode of RHR, which has been operationally abandoned.

26. Although this penetration requires only one primary containment isolation valve since it is a water sealed penetration, two isolation valves are provided. The reason for providing two isolation valves is detailed in USAR Section V.2.3.5.

27. Instrument lines which connect directly to the reactor vessel or to systems containing fluids connecting to the reactor vessel are designed in compliance with the requirements of Safety Guide 11, Supplement 1, except that there is no remote indication of excess flow check valve position.

28. Only one isolation valve provided.

29. Components are subject to testing under 10CFR50, Appendix J Type B requirements if maintenance is performed or modifications are made.

30. In-line manual valves and small diameter vents, drains and test connections are not subject to type C testing.

31. Equipped with double gaskets or o-rings.

32. Reverse direction local leak rate test (LLRT).

33. The expansion bellows assembly for the Type 1 penetrations (MS & FW) consists of two sections of bellows which are located outside of the Drywell shell and are part of containment. The description inboard and outboard describe which section is closest to the drywell and which is closest to the flued head.

34. Suppression Chamber to Drywell Vacuum breakers have a set point range of 0.1 to 0.5 psid. The Air operator is used for remote testing from the control room.

35. Table only includes inline components. Small diameter vents, drains and test connections are not included.

36. To alleviate the pressure locking failure mode of these valves a ¼" hole is drilled in the reactor side of the split wedge disc to enable the bonnet of the gate valve to be vented to the Reactor and still maintain tight shutoff.

37. Technical Specification 3.6.1.3 is applicable to this Primary Containment Isolation Device.

38. See USAR Section V-2.3.5.1 for definition of USAR class.

39. Type C LLRT not required due to closed loop analysis per EE 10-073.

40. Valves PC-MOV-233MV and PC-AOV-237AV must withstand radiological and environmental conditions seen at the location during a severe accident requiring the use of the HCVS.

TABLE V-2-2
ISOLATION SIGNAL CODES FOR TABLE V-2-2

Signal	Description
A*	Reactor vessel low water level (Level 3) -- scram and close isolation valves except main steam lines.
B*	Reactor vessel low low low water level (Level 1) -- close MSIVs.
C*	High radiation -- main steam line.
D*	Line break -- main steam line (steam line high space temperature or high steam flow).
F*	High drywell pressure -- close RHR/shutdown cooling, SBNI, and the RHR to radwaste valves.
G	Reactor vessel low low low water level (Level 1) or high drywell pressure -- initiate Core Spray and RHR systems. In addition, reactor low pressure is required before injection valves open.
H*	Reactor vessel low low water level (Level 2) -- close RWCU and PC purge and ventilation isolation valves.
J*	Line break in RWCU system (high space temperature or high flow).
K*	Line break in RCIC system steam line to turbine (high steam line space temperature, high steam flow, or low steam line pressure)
L*	Line break in HPCI system steam line to turbine (high steam line space temperature, high steam flow, or low steam line pressure)
M*	Line break in steam lines to RHR heat exchanger (high space temperature).
P*	Low main steam line pressure at inlet to main turbine (RUN mode only)
Q*	Low main condenser vacuum.[27]
S	Low drywell pressure -- prevent opening of containment spray valves.
T	Low reactor pressure permissive to open core spray and RHR-LPCI valves.
U	High reactor vessel pressure -- close RHR-shutdown cooling valves.
W	High temperature at outlet of RWCU system nonregenerative heat exchanger.
Y	Standby liquid control system actuated.
Z*	High radiation, reactor building ventilation exhaust.
RM	Remote manual switch from control room.

*These are the isolation functions of the primary containment and reactor vessel isolation control system; other functions are given for information only.

2.3.4.2 Pipe Penetrations

Three general types of pipe penetrations are provided. Type 1 includes expansion joints and is used where the design must accommodate thermal movement. Figure V-2-3 is typical of this type of penetration. Type 2 is used where stresses due to thermal movement are acceptably small. Typical penetrations of this type are illustrated in Figure V-2-4. Type 3 penetrations have thermal sleeves. A typical Type 3 penetration is shown in Figure V-2-5. Figure V-2-6 shows a typical instrument penetration.

Type 1 piping penetrations have special provisions for thermal movement, and are shown in Burns and Roe Drawing 4259, Sheets 1 and 1A, and Burns and Roe Drawing 4260, Sheets 2A and 2B. In these penetrations, the process line is enclosed in a guard pipe that is attached to the line through a multiple head fitting. This fitting is a one-piece forging with integral flues or nozzles and is designed to meet the requirements of the ASME Boiler & Pressure Vessel Code, Section III. The forging is radiographed and ultrasonically tested as specified by this code. The guard pipe and flued head are designed to the same pressure requirements as the process line. The penetration nozzle is welded to the Drywell and extends through the biological shield where it is welded to the expansion bellows assembly which in turn is welded to the flued head fitting. The pipe is guided through pipe supports at the end of the penetration assembly to allow pipe movement parallel to the penetration and to limit pipe reactions of the penetration at the flued head to allowable stress levels.

As described above, Type 1 penetration assemblies are furnished with guard pipes, co-axially located between the pipe and the expansion joint bellows.[10] These guard pipes prevent direct impingement of fluid on the bellow seals in the unlikely event of a rupture of piping within the confines of the penetration. As shown on Figure V-2-3 and Burns and Roe Drawing SKM200, each penetration assembly is also provided with a continuous annular plate, attached to the guard pipe and extending to the outside diameter of the penetration nozzle. This annular plate is located at the inside of containment and serves the double function of testing seal seat and jet deflector plate, which prevents impingement of fluid from an adjacent pipe that is postulated to have ruptured. Consequently, direct impingement of fluid on the expansion joint bellows from a self-break, or an adjacent pipe break is effectively prevented.

Where necessary, the assemblies (flued heads) are anchored outside the Drywell to limit the movement of the line relative to the Drywell. The bellows accommodates the relative movement between the pipe and the Drywell shell.

The bellows expansion joints are designed for 62 psig and 300°F with end nipples of A 516 GR KC70, Cl 1 FBX to A300 and corrugations of stainless steel to SA-240 type T304.[11] The cycle life is specified to be a minimum of 7,000 cycles over a period of 40 years.

The bellows expansion joints are designed for a displacement capability as follows:

1. For Normal Operation:

   Axial compression of 1.5 inches and up to 1.75 inches lateral depending on elevation.

2. For Accident:

   Compression Capability of 3.5 inches maximum.

Specific displacements are larger than the required amount by 21% to 54%. This includes allowances for construction misalignments.

The Code case interpretations employed in the design, fabrication and nondestructive examination of the bellows type expansion joints for containment penetrations are *1177-5 and 1330-1 and pertinent Code paragraphs referred to therein. They are also fabricated in accordance with standards of the Expansion Joint Manufacturers Association.

Type 2 penetrations which are shown in Figure V-2-4 consist of the process pipe welded directly to the end of the penetration nozzle. The nozzle is welded either directly to the vessel shell or to reinforcing insert plate. These penetrations are typically for cold piping, ventilation ducts and instrument line penetrations where thermal stresses and movements typically are small. Suppression Chamber (torus) penetrations are generally Type 2 penetrations.

Type 3 penetrations are similar to Type 1 except that there is no expansion bellows between the penetration nozzle and the flued head. The penetration nozzle is attached directly to the flued head.

The design of the penetrations takes into account the stresses associated with normal thermal expansion, live and dead loads, seismic loads, and loads associated with a loss-of-coolant accident (LOCA). The design takes into account the loadings given above in addition to the jet force loadings resulting from any postulated pipe failure. Containment penetrations were evaluated in accordance with the guidance of NRC Generic Letter 96-06[103] regarding thermally induced overpressurization following a design basis accident. Penetrations which could be potentially overpressurized due to thermal expansion of water trapped in isolated lines were modified to provide pressure relief or to preclude the possibility of thermal overpressurization.

2.3.4.3 Electrical Penetrations

The electrical penetrations include electrical power, signal and instrument leads. Typical electrical penetrations are shown on General Electric Drawings 117C3346 and 117C3349. The penetrating sleeve is welded to the primary containment vessel. A bonding resin is utilized in the seals where the cable emerges from the penetration.

Thermocouple penetrations X-209A and C are designed with a flanged barrier with pressure seals provided by double O-rings and an epoxy material.

Electrical penetrations X-49A, X-49B, X-50A and X-50B contain cabling for the high range containment radiation monitors. These penetrations are designed with pressure seals provided by Conax coaxial penetration assemblies.

2.3.4.4 TIP Penetrations

Traversing in-core probe (TIP) guide tubes pass from the reactor building through Primary Containment. Guide tube penetrations of Primary Containment are sealed by means of brazing which meets the requirements of the ASME Boiler and Pressure Vessel Code, Section VIII. These seals would also meet the intent of Section III of the Code even though the Code has no provisions for qualifying the procedures or performances.

2.3.4.5 Personnel and Equipment Access Locks

One personnel access lock is provided for access to the Drywell. The lock has two gasketed doors in series, and each door is designed to withstand the Drywell design pressure. The doors are mechanically interlocked to ensure that at least one door is locked at all times when Primary Containment operability is required. The locking mechanisms are designed so that a tight seal will be maintained when the doors are subjected to either the design internal or external pressure.

A personnel access hatch is provided on the Drywell head. This hatch is bolted in place.

Two equipment access hatches are also provided. These hatches are bolted in place.

These hatches and their seals are all designed to facilitate leakage testing. On the drywell air lock, strongbacks are provided to hold the inner door in place against the reverse pressure, so that the interior of the lock may be pressurized to permit testing of the lock at 58 psig.[12] The Drywell top head, the two equipment hatches, the Drywell and Suppression Chamber manways, the Control Rod Drive removal hatch and the stabilizer assembly inspection ports have double gasketed closures. A means is provided to pressurize the space between the two gaskets on each closure to permit testing of the gaskets.

These hatches are designed to withstand the normal environmental conditions which may prevail during plant operation, and to retain their integrity during all postulated accidents. The design is in accordance with the ASME Boiler and Pressure Vessel Code, Section III Nuclear Vessels, Subsection B.

2.3.4.6 Access to the Suppression Chamber

Access to the Suppression Chamber is provided at two locations from the reactor building. There are two 4-foot diameter manhole entrances with double gasketed bolted covers connected to the chamber by 4-foot diameter steel pipes.

2.3.4.7 Access for Refueling Operations

The Drywell vessel head is removed during refueling operations. The head is held in place by bolts and is sealed with a double-seal arrangement.

2.3.5 Primary Containment Isolation Valves

2.3.5.1 General Criteria

The basic function of primary containment isolation valves (PCIVs) is to provide necessary isolation to the containment in the event of accidents or similar critical conditions when the free release of containment atmosphere cannot be permitted. The containment isolation valves are listed on Table V-2-2. This table also defines the valve status (normally open or normally closed) during normal reactor operation and shows the signals required to initiate their desired operation. The primary containment isolation valves are grouped into four basic classes. Isolation times are specified for power operated, automatic PCIVs. The subset of PCIVs to which Technical Specification 3.6.1.3 is applicable is designated by Note 37 to Table V-2-2.

Class A valves (motor operated, air operated, nitrogen operated,[13] and check) are on process lines that communicate directly with the Reactor Pressure Vessel and penetrate Primary Containment. These lines require two valves in series, one inside Primary Containment and one outside Primary Containment. They are located as close to the primary containment boundary as practical. Except in the case of check valves, both valves close automatically on isolation signal. Both valves receive the isolation (closure) signal even if normally closed during reactor operation. Since check valves close on reverse process flow, they are used to isolate some incoming lines. Injection check valves are used on selected process inflow lines where flow is expected to be zero or on lines which have low flow with intermittent use during normal station operation. All Class A valves except check valves are capable of remote manual control from the control room.

Class B valves are on process lines that do not directly communicate with the Reactor Pressure Vessel, but penetrate Primary Containment and communicate with the primary containment free space. These lines require two valves, in series, both of them located outside Primary Containment and as close to the primary containment boundary as practical. Except in the case of check valves, both valves close automatically on isolation signal. Both valves receive the isolation closure signal even if normally closed during reactor operation. (See Table V-2-2 for valve status during reactor operation.) All Class B valves except check valves are capable of remote manual control from the control room.

Class C valves are on process lines that penetrate Primary Containment but do not communicate directly with the Reactor Pressure Vessel, with the primary containment free space, or with the environs. Class C lines require only one valve which closes automatically by process action (i.e., reverse flow) or by remote manual operation from the control room.

The fourth class of isolation valves are variations to the above definitions and are referenced in Table V-2-2 by their class designations followed by an "X" suffix. The lines in this class are generally instrument lines or lines used for core cooling such as ECCS suction lines from the suppression pool, ECCS injection lines, and process flow check valves. Examples of these variations include: a) Class A and B PCIVs that receive no PCIV automatic closure signal and b) in-series Class A PCIVs that are both located outside of the drywell and c) Class B PCIVs that have no remote manual operation from the control room.

Motive power for the valves on process lines which require two valves are physically independent sources to provide a high probability that no single accidental event could interrupt motive power to both closure devices.

Sealed closed, remote manual valves are used at Penetration X-51F on the Post Accident Sampling (PAS) containment atmosphere sample line. The air supply to these valves is normally sealed closed and disconnected.

Automatic isolation valves, in the usual sense, are not used on some of the inlet lines (containment cooling and reactor feedwater systems) since operation of these systems is either required or desirable following a design basis loss-of-coolant accident. Since normal flow of water in these systems is inward to the reactor vessel or to the primary containment, check valves located in these lines will provide automatic isolation, if necessary.

No automatic isolation valves are provided on the control rod drive system hydraulic lines. The redundant seals and restrictive flow areas that are inherent to the CRDs provide the required redundant Reactor Coolant Pressure Boundary and Primary Containment isolation. The system hydraulic lines are, therefore, not considered part of the Reactor Coolant Pressure Boundary or Primary Containment boundary.

The small diameter TIP Purge line to the indexers (Penetration X-35E) is provided with two check valves in series for containment isolation purposes.

2.3.5.2 Additional Considerations

Effluent lines such as main steam lines which connect to the Reactor Pressure Vessel or which are open to Primary Containment have air-or nitrogen-powered valves. This arrangement provides a high reliability with respect to functional performance. These valves are closed automatically by the signals indicated in Table V-2-2. Note that the a relief valve has been installed in the Nitrogen supply to prevent overpressurization of these isolation valves.

The inboard Main Steam Isolation Valves (MSIVs) are normally operated with nitrogen in order to prevent air leakage into the drywell from the valve operators.[13] The control air system provides an emergency operating source.

TIP system guide tubes are provided with an isolation valve which closes automatically upon receipt of proper signal and after the TIP cable and ionization chamber have been retracted. In series with this isolation valve, an additional or backup isolation shear valve is included. Both valves are located outside the drywell. The function of the shear valve is to assure integrity of Primary Containment in the unlikely event that the other isolation valve should fail to close or the chamber drive cable should fail to retract if it should be extended in the guide tube during the time that Primary Containment isolation is required. This valve is designed to shear the cable and seal the guide tube upon an actuation signal. Valve position (full open or full closed) of the automatic closing valves will be indicated in the control room. Each shear valve will be operated independently. The valve is an explosive type valve and the continuity of each actuating circuit is monitored. In the event of a PCIS Group 2 containment isolation signal, the TIP system receives a command to retract the traveling probes. Upon full retraction, the isolation valves are then closed automatically. If a traveling probe was jammed in the tube run such that it could not be retracted, instruments would supply this information to the operator, who would in turn investigate to determine if the shear valve should be operated.

For water sealed lines only one Primary Containment isolation valve (CIV) is required in addition to the water seal; Table V-2-2 indicates which penetrations are water sealed. In a post LOCA condition, the water in the torus could be forced back up the penetration piping due to the excess pressure in the torus. There are situations where the penetration piping drains to a sump and the failure of the single CIV could result in water being drained from the Suppression Chamber to the Secondary Containment which could deplete the water in the Suppression Chamber. It could also result in radioactive material in the Secondary Containment in excess of that assumed in the LOCA analysis due to the potentially contaminated water in the sump. In addition, the potentially contaminated water could be pumped from the sump to outside the Secondary Containment. For these penetrations, two isolation valves are required to prevent the above effects in the event of the single failure of a single isolation valve. Those penetrations which are water sealed but which require two isolation valves for this reason are indicated in Table V-2-2 under note 26.

Instrumentation piping connecting to the Reactor Coolant Pressure Boundary which leaves Primary Containment is dead-ended at instruments located in the Reactor Building. All instrument lines which connect directly to the Reactor Pressure Vessel or to systems containing fluids connecting to the Reactor Pressure Vessel are provided with a manual shutoff valve and an automatic excess flow check valve outside Primary Containment.[14] In addition, all such lines are provided with 1/4 inch opening restriction orifices inside Primary Containment in order to restrict flow leakage in the event of an instrument line breakage.[24] Instrument lines which connect to the Primary

Containment free space or to control systems or devices inside Primary Containment are provided with a stainless steel manual shutoff valve directly outside Primary Containment. Included in this category are pneumatic line for valves, dampers and other such devices, lines which measure containment pressure, and sampling lines for Drywell atmospheric sampling. The system as designed is in compliance with the requirements of Safety Guide 11, Supplement 1, except that there is no remote indication of excess flow check valve position.

Additionally, the control rod drive hydraulic system is also provided with three valves which can be utilized for isolation purposes. The first is a ball check valve which comprises an internal portion of the control rod drive mechanism. The other valves are normally closed hydraulic system control valves located in the Reactor Building.

Debris strainers have been installed in the Primary Containment Purge and Vent lines to the Drywell. During a LOCA event, these strainers will prevent any sizable debris from traveling through the lines and interfering with complete isolation valve closure.

2.3.6 Venting and Vacuum Relief System and Primary Containment Pressure Control

Primary Containment is designed for maximum external pressure of 2 psid. Primary Containment is vented during reactor heatup as necessary to eliminate a pressure buildup. It is periodically vented thereafter to maintain pressure within operating limits during planned operations. The Drywell and Suppression Chamber can be vented separately. Venting will be done by venting gases to the reactor building exhaust vent or through the Standby Gas Treatment system to the ERP, depending upon the level of activity present in the gases. (See Burns and Roe Drawing 2037)

Under current operating conditions, the Drywell is normally inerted and slightly pressurized, so vacuum relief is not of concern. Following a LOCA, however, the condensation of steam within the Drywell or Suppression Chamber would produce a vacuum which could exceed the external pressure design limits of these vessels. If the pressure in the Suppression Chamber falls slightly below the Reactor Building pressure, makeup air is automatically supplied through the containment makeup system to the Suppression Chamber. Makeup air to the Drywell is supplied through the Suppression Chamber-to-Drywell vacuum breakers that are a part of the Drywell vent system. If the Suppression Chamber pressure falls more than 0.5 psi below the Reactor Building pressure, makeup air is automatically supplied through the Reactor Building-to-Suppression Chamber vacuum breakers. Two vacuum breakers in series are used in each of the two lines to the reactor building from the Suppression Chamber. One of each pair is actuated by a differential pressure signal. The second is self-actuating. The combined pressure drop, at rated flow, through both valves does not exceed 2 psi.

To ensure the Vacuum Relief Function can be performed, the inboard vacuum breaker is designed to open upon loss of air or power. Under these conditions, only the self-actuated check valve will be closed for Primary Containment.[97]

The vacuum breakers on the Drywell vent system seal and increase seating pressure with increased pressure on the drywell side. Each vacuum breaker is equipped with an air test operator and valve position indicating lights. The air test operator allows remote testing of the valve from the control room during plant operation. Regular maintenance, inspection, and surveillance procedures for operating and cleaning these valves is all that is required to assure their integrity. These valves have stainless steel seats which are rust resistant and easily maintained. The valve position indicating lights consist of one closed position indicating light and one open position indicating light operated by a different switch from the closed light.[4] In addition, each vacuum breaker valve has a position indicating switch which provides separate position indication in the control room; common annunciation is provided to indicate when any vacuum breaker valve is not in its fully closed position.[6] In order to maintain the valve in the closed position unless a differential pressure of at least 0.1 psi exists, each valve is equipped with a magnetic latch.[4][94]

The main purpose of the vacuum breaker valves between the Suppression Chamber and the Drywell is to prevent excessive water level variations in the submerged portion of the vent discharge lines if a small rupture should precede a large primary system rupture. The cross section areas of the vacuum breakers are sized on the basis of the Bodega Bay pressure suppression system tests.[15] The flow area of the vacuum breakers is proportional to the flow area of the vents connecting the Drywell and the suppression pool. The Bodega Bay tests regarding vacuum breaker sizing were conducted by simulating a small system rupture, which tended to cause vent water level variation, as a preliminary step in the large rupture test sequence. The vacuum breaker capacity selected on this test basis is more than adequate (typically by a factor of four) to limit the pressure differential between the Suppression Chamber and Drywell during postaccident Drywell cooling operations to a value which is within the suppression system design values.

TABLE V-2-3

DRYWELL ATMOSPHERE COOLING DATA SHEET

Location	Design Parameters[1]
General[3]	135°F
Recirculation Pump Motor Air Intake Area	128°F
Entering Air Temperature to Cooling Units[2]	150°F
Cooling Water Supply Temperature	95°F
Cooling Water Supply Flow (each)	265 GPM
Total Cooling Unit Coil Capacity (each)	1.60×10^6 Btu/hr
Total Cooling Unit Fan Capacity (each)	30,000 scfm
Total Fan Brake H.P. (each)	60

[1] These values are fan, coil, and cooling system design parameters only and do not represent limiting conditions.

[2] Due to exhaust air from Reactor vessel/shield wall annulus area (Zone 2A) being returned directly to the cooling units.

[3] Average Bulk Maximum Temperature is 150°F.

2.3.6.1 Hardened Containment Venting System

The hardened containment venting system (HCVS) is a reliable, severe accident capable, wetwell venting system in accordance with Phase 1 requirements of Order EA-13-109[118] and Interim Staff Guidance (ISG) JLD-ISG-2013-02[119]. The vent system ties into the torus vent piping near PC-AOV-237AV in the Reactor Building basement, travels through the southwest quad room, up the southwest staircase, and then exits the Reactor Building and vents to atmosphere.

2.3.7 Primary Containment Cooling and Ventilation System

The Primary Containment (Drywell) Cooling system utilizes four fan-coil units distributed inside the Drywell. The Primary Containment Cooling and Ventilation system design parameters are given in Table V-2-3. Each fan-coil unit consists of cooling coils and direct-connected motor-driven fans. Each cooling coil is connected to a cooling water supply and return piping system inside the Drywell. Each unit recirculates the Drywell atmosphere through the cooling coils to control the Drywell space temperature. Cooling water is supplied from the Reactor Equipment Cooling system.

Fan coil units circulate cooled air around the Reactor Recirculation pumps and motors, the control rod drive area and the annular space between the Reactor Pressure Vessel and the sacrificial shield. The personnel access and control rod drive removal openings are sealed to ensure positive flow of cool air from the control rod drive area into the annular space between the Reactor Pressure Vessel and the sacrificial shield through pipe openings in the reactor vessel support located primarily at the upper level of the Control Rod Drive space.

Cooled air is also circulated through the reactor vessel head area, the space immediately below the refueling seal plate and the relief valve area.

Each fan is started from a Control Room panel by using stop-standby-run-override type switches. The fans are started by switching to run. Cooling unit discharge air temperature is sensed by a temperature element and indicated in the control room. The fan-coil units can be operated from the emergency power supplies.

The drywell purge ventilation supply system consists of two full-capacity fans to supply clean Reactor Building air to the Drywell for purge and ventilation purposes during the reactor shutdown and refueling periods for personnel access and occupancy. The purge exhaust air is normally discharged to the atmosphere through the Reactor Building exhaust vent. If necessary, the Standby Gas Treatment system is used for cleanup and the drywell air is exhausted through the elevated release point (ERP). Purging and venting during normal plant operations when Primary Containment Integrity has been established are limited to inerting, deinerting, Primary Containment pressure control, and establishing radiological or air quality conditions suitable for personal entry.

The purge and vent lines supplying the Drywell and Suppression Chamber are provided with two fast-acting butterfly valves, one pneumatic cylinder-operated and the other motor-operated, in series for isolation purposes. These valves are normally closed during station operation. The motor operated valves have torque and limit switch settings which restrict the butterfly valves to a maximum of 60° open. This assures that these valves can meet their credited closing stoke times under DBA-LOCA conditions in accordance with GL 79-46 [104].

2.3.8 Primary Containment Combustible Gas Control

2.3.8.1 General

Primary Containment combustible gas control is required because a major LOCA could result in the generation of hydrogen and oxygen gases at such rates that a combustible, if not explosive, gas mixture could be produced. In order to assure that Primary Containment integrity is not endangered due to the possible ignition and combustion of the gas mixture, the relative concentrations of such gases are controlled to below a combustible mixture level.

During a LOCA, hydrogen is generated by metal-water reaction, radiolysis, and corrosion. These processes are active at different periods during the LOCA and require continuing control of gas concentrations.

CNS has the capability of controlling combustible gases by the following means:

1) Inerting Primary Containment atmosphere with nitrogen so that there is insufficient oxygen to support combustion,
2) Diluting the hydrogen to below combustible concentrations by injecting gaseous nitrogen and venting off the excess pressure through the SGT System, and
3) Purging Primary Containment atmosphere through the SGT System.
4) Limiting the potential pathways in which air (oxygen) can be introduced into Primary Containment.

2.3.8.2 Nitrogen Inerting

The primary method of combustible gas control is nitrogen inerting, wherein Primary Containment is inerted to less than 4% oxygen. In order to allow access for maintenance and inspection, the nitrogen inerting system is only activated when the reactor is at power, except for short inspection periods immediately before and after planned reactor shutdowns.

Gaseous nitrogen can be introduced into the Suppression Chamber or the Drywell. Initial purging of Primary Containment atmosphere is accomplished by introducing liquid nitrogen in a bulk tank, and converting it into gaseous form for transport through the plant piping system. Makeup nitrogen is supplied by a liquid converter supply unit permanently located outside of the Reactor Building, consisting of a storage tank, control cabinet, vaporizer, and a fill stand. Metered filling of the storage tank is accomplished periodically by bulk transport.

The system provides and maintains an inert atmosphere within Primary Containment to avoid energy releases from a possible hydrogen-oxygen reaction following a postulated design basis LOCA which could jeopardize the integrity of Primary Containment.

The nitrogen inerting system introduces a nitrogen atmosphere into Primary Containment. The system is capable of reducing and maintaining the oxygen content to less than 4.0% within Primary Containment. The system and its operational procedures complies with the requirements set forth by the American Gas Association.

Gases, purged from Primary Containment, may be vented to the SGT system or to the Reactor Building exhaust system. A relief valve is provided in the nitrogen supply system to prevent over-pressurization of Primary Containment. The Drywell ventilation blowers are utilized during the purging operation to maximize mixing of the nitrogen and oxygen.

Basically, the equipment in the Nitrogen Inerting system performs two functions: (1) initial purging with nitrogen of Primary Containment, and (2) providing an automatic supply of makeup nitrogen. The purging equipment converts liquid nitrogen into gaseous nitrogen which is then introduced into the Suppression Chamber or Drywell where it will mix with the air. Drywell ventilation fans speed the diffusion process and the mixture is removed through the Suppression Chamber or Drywell vent line to the SGT system or the Reactor Building ventilation exhaust system.

The Nitrogen Inerting system is also capable of automatically providing make-up gas to the primary containment. Make-up gas may be required due to temperature changes and leakage. Nitrogen is supplied by a pressure control valve whenever Drywell pressure falls below a selectable value, which maintains the Drywell pressurized slightly above atmospheric pressure. Indication of nitrogen flow rate and Drywell pressure is provided in the control room.

Instrumentation is provided to analyze the concentration of oxygen in Primary Containment. The oxygen concentration is continuously monitored. CNS Technical Specifications specify the inerting requirements.

The Nitrogen Inerting system Primary Containment isolation valves are isolated on a PCIS Group 6 containment isolation signal (see Section VII-3, "Primary Containment and Reactor Vessel Isolation System").

2.3.8.3 SBNI[91, 92]

The Stand-By Nitrogen Injection (SBNI) system brings CNS into compliance with the design intent of 10CFR50.44, Generic Letter 84-09 [106], and Regulatory Guide 1.7 (Control of Combustible Gas Concentration in Containment following a Loss-Of-Coolant Accident).[91, 92] (See Burns and Roe Drawing 2084). To qualify as meeting the intent of the above regulatory requirements and guidance documents, following a LOCA, without the primary means of combustible gas control being purge-repressurization and H_2O recombination, the technical criteria specified in GL 84-09 must be satisfied. In addition, meeting the design provision in Reg. Guide 1.7 (i.e. provide an "overlap" or safety margin in the protection requirements for Primary Containment to account for "Beyond Design Basis" ECCS degradation and fuel cladding-water reaction/H_2O generation post LOCA) is required.

The SBNI system provides design margin in the event of a "Beyond Design Basis" LOCA scenario (i.e. ECCS degradation and the resulting additional metal-water radiolysis oxygen generation). As such, the SBNI system piping and components inside Secondary Containment, with the exception of the systems containment isolation valves (PC-MO-1301, 1032, 1303, 1304, 1305, 1306, 1308, 1310, 1311, and 1312) which are essential, are non-essential Seismic Class I (IS). The piping and components located outside Secondary Containment and downstream of the normally closed isolation valves, SBNI-V-4 and V-8, are Non-Essential and non-seismically qualified. However, the SBNI system has redundant nitrogen supply connection/control points. One connection point is located inside the south vestibule of the Reactor Building (SBNI train A) but outside Secondary Containment. This location provides protection from natural phenomenon. The redundant train (train B) connection point is located outside the reactor building which offers essentially no natural phenomenon protection. This location increases the likelihood that train B may become unavailable due to damage from natural hazards. However, this redundant design provides reasonable assurance that at least one SBNI train will be available for Primary Containment combustible gas control, if needed, in the event of a "Beyond the Design Basis" LOCA scenario. Therefore, if SBNI[91,92] is needed following a LOCA, the control of combustible gasses is accomplished by injecting additional SBNI gaseous nitrogen from either of two connection/control points. A two day nitrogen supply is stored on site for each connection point. The gaseous nitrogen will dilute the evolved hydrogen gas and maintain a non-combustible gas concentration mixture throughout the event. The resulting pressure increase in Primary Containment is controlled to below the design pressure by intermittent bleeding of the containment atmosphere into the SGT System. The SBNI System presently exists as an emergency backup to the Nitrogen Inerting System.

Using SBNI after a LOCA, the Containment Atmosphere Monitoring system is used to monitor hydrogen levels, and oxygen if desired, in the Drywell and Suppression chamber (wetwell). When the hydrogen concentration reaches 3.5% by volume, dilution nitrogen is manually introduced from one of the two completely redundant and separate trains, until the hydrogen concentration is reduced. At this point the containment gases are intermittently vented to the SGT system.

Diffusion and natural convection will preclude the formation of local areas of high hydrogen concentration. Forced circulation (fan coils) will be also used if available. Detailed calculations substantiating the conclusion as to the effectiveness of diffusion and natural convection on mixing has been addressed in Amendment No. 2 of the Duane Arnold Energy Center FSAR in response to question G1.1(d). It was determined in the aforementioned calculations that the maximum deviation in concentration would be 2%, with containment at a hydrogen concentration level of 5%, isolated areas could be as high as 5.1%. The analysis performed referenced oxygen concentration but the results can be used as a conservative indication of hydrogen concentration.[19]

2.3.8.4 <u>Purging</u>[20]

The Primary Containment purge may be vented directly out the Reactor Building exhaust system if the release will not exceed the Offsite Dose Assessment Manual (ODAM) limitations. For high activity level, the purge from the containment will be through the SGTS. This will not result in any decrease in the availability of the SGTS for its primary accident operation function, in fact, because the system is now operating the response time at accident will be decreased.

2.3.9 <u>Containment Monitoring</u>

The concentration of Oxygen and Hydrogen present in Primary Containment is monitored using the Containment Atmosphere Monitoring system. This system contains two Category I hydrogen/oxygen analyzers (two divisions) and a sampling system. (See Figure V-2-14). Both analyzer divisions receive input from three points in the Drywell and one point in the Suppression Chamber. Other containment atmospheric parameters monitored are radiation, moisture, pressure and temperature.

Drywell temperature and pressure are continuously recorded in the main control room. These instruments can be utilized to monitor the essential drywell parameters that are used in the "Station Safety Analysis" in Section XIV.

2.3.9.1 Containment Oxygen

Containment oxygen is monitored sequentially at three locations inside the Drywell and one location in the Suppression Chamber. Two redundant divisions are provided for measuring containment oxygen. The range of monitoring is 0-30% for normal operation (Division II) with provision for switching range to 0-10% on the redundant system (Division I). Recording is maintained in the control room using a digital meter or two (2) recorders. High Oxygen and High-High Oxygen is annunciated in the control room.

2.3.9.2 Containment Hydrogen[21]

Containment hydrogen is monitored sequentially at three locations inside the Drywell and one location in the Suppression Chamber. Two redundant divisions are provided for measuring containment hydrogen. Ranges of operation are 0-30% for each system (Division I and II). Accuracy is ±2% full scale with recording and annunciation of High Hydrogen and High-High Hydrogen on separate panels in the control room. The Primary Containment hydrogen monitoring instrumentation conforms with the criteria of NUREG-0737 Item II.F.1-6.

2.3.9.3 Containment Radiation[21]

A two channel (particulate and gas) radiation monitor is used to monitor containment atmosphere during normal operation. The radiation monitor provides control room indication and annunciation. This monitor is also used to aid in detection of leaks to the Nuclear System in containment. See Section IV-10, Nuclear System Leakage Rate Limits.

Two redundant area radiation detectors are located 180 degrees from each other within the Drywell above elevation 901'-6". Each detector's range is from 1 R/hr to 10^7 R/hr. Detector readouts are located in the Control Room.[68] These detectors meet the Reg. Guide 1.97 post accident monitoring requirements for containment radiation,[93] and NUREG-0737 Item II.F.1-3.

2.3.9.4 Sampling[22]

Sampling of containment atmosphere in a post accident environment is performed by the Post Accident Sampling System. See Section X-15, "Process Sampling and Post-Accident Sampling Systems." The PAS System remotely transfers containment atmosphere samples to a collection vessel located outside of the Reactor Building.

2.3.9.5 Drywell Moisture[21]

Drywell moisture level is monitored by four (4) dew point sensors located in the inlet ducts to the four Drywell fan coil units. Readout is on four (4) recorders in the main control room. Accuracy is within ± 2.0% span for a range of -40° to 160°F.

2.3.9.6 Containment Pressure[21]

Normal containment pressure is monitored continuously by means of a local pressure gauge and a remote recorder in the control room. Range of measurement is from 0 - 2 psig with an accuracy of ± 2.0% of span.

Pressure is redundantly monitored by narrow and wide range pressure transmitters in each RPS division. The narrow range monitors the range of -5 to +5 psig and the wide range monitors the range of 0-250 psig.[69] Drywell pressure indication from these instruments is recorded in the Main Control Room. The instrument loops have response times which vary between 0.3

and 3.8 seconds, increasing with the magnitude of the pressure transient. This Primary Containment instrumentation is in conformance with NUREG-0737 Item II.F.1-4.

Primary Containment pressure instrumentation used to initiate reactor scram signals is discussed in Section VII-2, "Reactor Protection System." Instrumentation used to initiate injection and control containment spray is discussed in Section VII-4, "Emergency Core Cooling Systems Control and Instrumentation."

In order to ensure that pressure is maintained within Technical Specification limits, Drywell high and low pressure conditions are annunciated in the control room. This is maintained by the containment pressure control system, using the instruments identified in Table V-2-5.[23]

2.3.9.7 Primary Containment Airspace Temperature

2.3.9.7.1 Drywell Temperature[21]

Drywell temperature is monitored continuously by indicators and recorders in the main control room. Accuracy of measurement is within ± 2.0% of span. Points of measurement are as follows:

No. of Points	Description	Range	Type of Readout
2	Air inlet vicinity recirculation pump motors	50-170°F	Recorders
2	Air inlet vicinity recirculation pump motors	50-600°F	Recorders
4	Fan coil inlets	50-170°F	Recorders
4	Fan coil outlets	50-170°F	Recorders
3	Sacrificial shield space (lower area)	50-170°F	Indicators
3	Sacrificial shield space (upper area)	50-350°F	Indicators & Computer
3	Control Drive Area	50-170°F	Indicators
3	Reactor Pressure Vessel head flange area	50-350°F	Indicators
5	Upper drywell area	50-350°F	Recorders
1	Return duct from head Area	50-350°F	Indicators
3	Upper return ring header	50-350°F	Indicators
5	Safety/relief valve area	50-600°F	Indicators

2.3.9.7.2 Suppression Chamber Temperatures[21]

Suppression Chamber air temperatures are indicated and recorded in the main control room from two separate temperature sensing systems. Range of indicating measurement is from 0-400°F with an accuracy of ± 2.0% of span. Range of recording is 0-400°F with an accuracy of ± 2.0% of span.

2.3.9.7.3 Drywell Average Air Temperature

Determination of average drywell air temperature is necessary to ensure that the initial conditions used in the LOCA analyses described in Section XIV-6.3 remain valid. Under the assumptions contained in the analyses, the NPSH LOCA analysis is limiting based on maximum initial drywell temperature; however, the remaining LOCA analyses (namely primary containment

TABLE V-2-5

PRIMARY CONTAINMENT PRESSURE CONTROL

SYSTEM INSTRUMENTATION[23, 101, 102]

Inst. No./Location	Purpose	Range/Accuracy
PC-dPT-20 Local (903' Rx Bldg.)	Transmits to pump around control system* & to DPR-20	0-2 psid/.5%
PC-PT-20 Local (903' Rx Bldg.)	Transmits to PR-20	0-2 psig/.5%
PC-PR-20 Bd. J (Control Room)	Records torus Pressure CH1	0-2 psig/2%
	And Records ΔP between torus-drywell CH2	0-2 psid/2%
PC-PT-515 Local (903' Rx Bldg.)	Transmits to PC-513 and to PR-513	0-2 psig/.5%
PC-PC-513 Bd. H (Control Room)	Controls drywell Pressure	0-2 psig/1%
PC-PR-513 Bd. H (Control Room)	Records drywell Pressure	0-2 psig/2%
PC-PT-512A Local (932' Rx Bldg.)	Transmits to PC-LRPR-1A	-5-70 psig/2%
PC-LRPR-1A Panel 9-3 (Control Room)	Records drywell pressure CH6 and torus pressure CH5	-5-70 psig/2%
PC-PT-512B Local (932' Rx Bldg.)	Transmits to PC-LRPR-1B	-5-70 psig/2%
PC-LRPR-1B Panel 9-4 (Control Room)	Records drywell pressure CH6 and torus pressure CH5	-5-70 psig/2%
PC-PT-30A Local (932' Rx Bldg.)	Transmits to PC-LRPR-1A	-5-70 psig/2%
PC-PT-30B Local (932' Rx Bldg.)	Transmits to PC-LRPR-1B	-5-70 psig/2%

* Use of the pump around system is no longer required.[81]

short-term and long-term, ECCS, and SSLB LOCA) are limiting based on minimum initial drywell temperature. The analyses and supporting documentation contain justification for the initial temperatures assumed. For the latter analyses, the minimum initial temperature assumed is 135°F; supporting documentation demonstrates that initial temperatures as low as 80°F have negligible impact on the results. For the NPSH LOCA analysis, the maximum initial temperature assumed is 160°F. The station's Technical Specifications limit the maximum drywell average air temperature to 150°F or less. These limits drive the requirement for determining the drywell average air temperature.

To determine the drywell average air temperature, a portion of the temperature measurements within primary containment is used.

During normal plant operation and with all drywell fan coil units (FCUs) operating, the average drywell temperature is determined using models which assume 90 percent of the total volume is the structural drywell (inverted light bulb represented by drywell temperature instrumentation) and 10 percent is the vent system (represented by suppression chamber or temperature instrumentation).[113]

During other modes of operation or with any drywell FCU out of service, the average temperature is determined using a model which assumes 100 percent of the total volume is the structural drywell (inverted light bulb) as this is the more conservative.

2.3.10 Suppression Pool Temperature and Level Indication

Suppression pool temperature is continuously recorded, and pool level is continuously indicated in the main control room. These instruments can be utilized to monitor the essential suppression pool parameters that are assumed for initial values in the "Station Safety Analysis" in Section XIV.

2.3.10.1 Suppression Pool Water Temperature[21, 102]

Sixteen separate sensing devices divided into two divisions and a recorder for each division are installed to monitor suppression pool water temperature. The recorders are installed in the control room.[80] Indication is also provided in the Alternate Shutdown Room as discussed in Section VII-18, "Alternate Shutdown Capability."

2.3.10.2 Suppression Chamber Water Level[21]

Suppression Chamber water level is indicated and recorded in the main control room from two separate level transmitters. Range of indication is from -4 feet to +6 feet of vessel centerline with an accuracy of ± 3.0% of span. Normal water level is 1' 7 1/2" below vessel centerline. Range of recording is from -4 feet to +6 feet with an accuracy of ± 3% of span.[82] Indication is also provided in the Alternate Shutdown Room as discussed in Section VII-18, "Alternate Shutdown Capability."

The Suppression Chamber level indication system uses the instruments identified in Table V-2-6.[23] This instrumentation includes two narrow range channels and one wide range channel.[25,26]

Instrumentation used to initiate the transfer of the HPCI system suction upon high suppression pool water level is discussed in Section VII-4, "Emergency Core Cooling Systems Control and Instrumentation."

TABLE V-2-6

SUPPRESSION CHAMBER WATER LEVEL INSTRUMENTATION[23, 102]

Inst. No./Location	Purpose	Range/Accuracy
PC-LT-10 Local (859' Rx Bldg.)	Suppression Chamber level transmitter To PC-LI-10 and PC-LI-110 (see Section VII-18, "Alternate Shutdown Capability")	-4+6 ft./.5%
PC-LI-10 Panel 9-3 (Control Room)	Indicates Suppression Chamber level	-4+6 ft./2%
PC-LT-11 Local (859' Rx Bldg.)	Suppression Chamber level transmitter To PC-LR-11	-4+6 ft./.5%
PC-LR-11 Panel 9-3 (Control Room)	Records Suppression Chamber level	-4+6 ft./2%
PC-LT-12 Local (859' Rx Bldg.)	Suppression Chamber level transmitter To PC-LI-12	±10 in./.5%
PC-LI-12 Panel 9-3 (Control Room)	Indicates Suppression Chamber level	±10 in./2%
PC-LT-13 Local (859' Rx Bldg.)	Suppression Chamber level transmitter To PC-LI-13	±10 in./.5%[83]
PC-LI-13 Panel 9-3 (Control Room)	Indicated Suppression Chamber level	±10 in./2%[83]

2.3.10.3 Primary Containment Water Level[69]

Primary Containment water level is redundantly monitored by narrow and wide range instruments in each RPS division and recorded in the Main Control Room. The narrow range instruments are used to monitor water level in the suppression pool. The narrow range instruments provide water level measurements in the suppression pool with a range of 0-30 feet. The wide range instruments are used to monitor water level in both the suppression pool and the drywell. The wide range instruments provide water level measurements in the suppression pool and the drywell with a range of 0-100 feet. The Primary Containment water level instrumentation is in conformance with NUREG-0737 Item II.F.1-5.

2.4 Safety Evaluation

2.4.1 General

Primary Containment and its associated safeguards systems accomplish the following safety design bases.

1. To accommodate the transient pressures and temperatures associated with the postulated equipment failures within the containment (safety design basis 1).

2. To provide a margin for the effects of a metal-water and other chemical reactions subsequent to postulated accidents involving loss of coolant (safety design basis 2).

3. To provide a high integrity barrier against leakage of any fission products associated with these equipment failures (safety design bases 3 and 5).

4. To provide for long term core flooding (safety design basis 4).

5. To provide for rapid actuation of the containment barrier (safety design basis 6).

6. To store water for the ECCS (safety design basis 7).

7. To maintain the containment parameters during planned operation to within those assumed in the "Station Safety Analysis" (safety design basis 8).

These factors are considered in the following evaluation of Primary Containment.

2.4.2 Primary Containment Characteristics Following a Design Basis Accident

In order to establish a design basis for Primary Containment with regard to pressure and temperature rating and steam condensing capability, the maximum rupture size of the Reactor Coolant Pressure Boundary must be defined. For this design, an instantaneous, circumferential rupture with double-ended flow of one recirculation line has been selected as a basis for determining the maximum gross Drywell pressure and the condensing capability of the pressure suppression system. The selection of a failure of this size for the design basis is entirely arbitrary, since the circumferential failure of a recirculation pipe of this magnitude is considered to be of exceedingly low probability. Nevertheless, for design purposes these failure conditions have been selected to establish the containment parameters.

In addition, to determine the limiting loads for primary containment components, an Intermediate Break Accident (IBA) and a Small Break Accident (SBA) were also postulated during the reevaluation of Primary Containment as part of the Mark I Containment Program.[66] The IBA and SBA are defined to be a liquid break of 0.1 ft^2 and a steam break of 0.01 ft^2 respectively.

The design pressure is established on the basis of the Bodega Bay pressure suppression tests. The design pressure is primarily a function of the postulated rupture area, the Drywell to Suppression Chamber vent area and configuration, vent submergence below the water level in the suppression pool, and the final equilibrium pressure in the Suppression Chamber.

In establishing the containment design, circumferential pipe ruptures are assumed with sufficient distance separation to allow full potential flow from each end of the pipe. Pipeline flow restrictions are not considered in establishing rupture flow rates. Since the assumed initial rupture rate and the accompanying reactor depressurization is so rapid, progressive failure of the piping is not a limiting factor in the containment design.

The containment design parameters listed in Table V-2-1 are concerned primarily with the effects on the Primary Containment caused by the blowdown immediately following the postulated double-ended rupture of the recirculation piping or equivalent failure.

The parameters having the greatest effect on Drywell design pressure are the ratio of pipe break area to total vent area, the vent submergence below the water level in the suppression pool, initial system pressure, and the equilibrium pressure in the Suppression Chamber before the postulated rupture.

Sufficient water is provided in the suppression pool to accommodate the initial energy which can be released into the Drywell from the postulated pipe failure. The Suppression Chamber is sized to contain this water, plus the water displaced from the Reactor Coolant Pressure Boundary together with the free air initially contained in the Drywell.

Primary Containment response analysis to the design basis LOCA, including an evaluation of the performance of the containment and vacuum relief systems following containment spray activation,[27] is presented in the "Station Safety Analysis" in Section XIV-6.3. It is concluded that the safety design bases, including safety design basis 1, are met.

2.4.2.1 Small Steam Line Break

A postulated condition where containment sprays may be desirable is in the case of a small steam line break in the drywell. The consequence of such an occurrence, assuming no containment spray action is taken, is the possibility of the containment atmosphere temperature rising due to superheating, thus presenting the potential to exceed the design temperature of the drywell vessel.

When a postulated leak occurs inside the drywell, the pressure and temperature rise, but the time response is different for every postulated steam or liquid leak depending on leak size, reactor pressure, heat transfer to the containment structure, etc.

If the leak is large enough such that the pressure in the drywell rises above that necessary to clear the wetwell downcomers, venting from the drywell to wetwell will result. As the mixture of noncondensibles and steam is purged to the wetwell gas volume, the steam is condensed in the pool and the noncondensibles accumulate in the wetwell gas volume. The containment pressure will continue to increase to the point where essentially all of the noncondensibles in the drywell are "forced" over to the wetwell. The larger the leak, the more rapid the pressure rise. However, the maximum pressure will occur at the time when all of the noncondensibles initially in the drywell are purged to the wetwell gas volume.

The containment atmosphere temperature response is largely a function of this containment pressure. In the case of liquid or mixture leaks, the maximum temperature at any time has an upper bound due to the saturation temperature corresponding to the containment pressure at that time. The peak atmosphere temperature corresponds to the containment pressure when all the drywell noncondensibles are purged to the wetwell.

In the case of a steam leak, the peak atmosphere temperature has an upper bound due to the maximum superheat temperature. This temperature is a function of both the source pressure (reactor pressure vessel) and the receiver pressure (drywell). Since the containment pressure and temperature response will vary with the postulated steam leak size, a spectrum of leak sizes was analyzed to determine the time temperature response of the drywell wall.

This analysis assumes the reactor initially at rated conditions. The leak occurs and high pressure coolant injection is available to add water to the reactor vessel. A simultaneous loss of offsite AC power is also assumed.

Containment pressure and temperature increase at a rate dependent on the size of the steam leak and the reactor pressure. The containment shell temperature rises as steam condenses on the relatively cool wall. The containment pressure also rises, and the peak pressure occurs at a value corresponding to all the noncondensible gases initially in the drywell being purged over to the wetwell. When the drywell shell temperature reaches the saturated temperature dictated by this containment pressure, steam condensation ceases, and the only energy available to further increase the wall temperature is the superheat energy. The result is a decrease in the rate of temperature rise in the containment wall and an increase in the bulk atmosphere temperature of the drywell.

The activation of one of the two containment sprays any time before the wall temperature reaches 281°F will be effective in terminating the temperature rise because the superheat energy will be quickly removed from the atmosphere. The spray nozzles are designed to give a small particle size, and the heat transfer to the subcooled spray is very effective. To terminate the wall temperature increase, it is necessary to remove only the superheat energy.

An analysis was performed for small steam line breaks (SSLB) over a spectrum of break sizes from 0.01 ft^2 up to 1.0 ft^2. The analysis cases also studied the sensitivity of the resulting conditions with the use of containment spray and with suppression pool cooling without containment spray. In the comparative cases in which suppression pool cooling was used, instead of containment spray, the resulting drywell peak shell temperature was greater than the design limit. Therefore using the containment spray mode, rather than the suppression pool cooling mode, is required to mitigate the effects of a small steam line break. The results of this analysis indicated that the containment shell temperature did not exceed the design temperature of 281°F when drywell spray was used to control peak drywell temperature.[114]

It is concluded that the safety design basis 1 is met for SSLB.

2.4.3 Primary Containment Capability

The pressure of Primary Containment depends on both the system temperatures and the amount of noncondensible gases. Thus, the capability of the system to store gases resulting from metal-water reaction varies with the rate and extent of the reaction.

Containment capability is defined in terms of the maximum percent of fuel channels and fuel cladding material which can enter into a metal-water reaction during a specified duration without the design pressure of the containment structure being exceeded. The analysis of the postulated LOCA discussed in the "Station Safety Analysis" in Section XIV shows that the operation of either of the two Core Spray systems will maintain continuity of core cooling such that the extent of the resultant metal-water reaction is negligible. However, to evaluate the containment system design capability various percentages of metal-water reaction were assumed to take place over various durations of time. This analysis presents an arbitrary method of measuring system capability without requiring prediction of the detailed events in a particular accident condition. The results are presented in the "Station Safety Analysis" section.

It is concluded that safety design basis 2 is met.

2.4.4 Primary Containment Leakage Analysis

Primary Containment is tested to verify that the leakage rate is not in excess of 0.635%[28] per day of Primary Containment atmosphere weight at the calculated peak accident pressure.

For purposes of evaluating containment leakage in accident analyses, it was assumed that Primary Containment had a leakage rate of 0.635% per day for the first 24 hours and decreases to 0.3175% per day after 24 hours for the remainder of the accident duration. This procedure is conservative since the containment leakage will be less during most of the transient when the pressure is lower.

It is concluded that safety design basis 5 is met.

2.4.5 Containment Integrity Protection

Primary Containment is designed for the loading considerations given in Section XII and Appendix C. In addition, special consideration is given to missile protection under the assumed accident conditions. The following summarizes the pertinent design considerations.

Large pipes which penetrate Primary Containment are designed so that they have anchors or limit stops (see Burns and Roe Drawings SKM200 and SK101670R) located outside of Primary Containment to limit the movement of the pipe. These stops are designed to withstand the jet forces associated with the clean break of the pipe and thus maintain the integrity of the containment. Jet forces which may act on the containment are taken as equal to reactor pressure acting directly on the containment over an area equal to the cross-sectional area of the largest local pipe or nozzle.

The Drywell is enclosed in reinforced concrete for shielding purposes and to provide additional resistance to deformation and buckling in areas where the concrete backs up the steel shell. Where concrete is not available, such as at the vent openings, barriers are put across these openings for jet protection.

Based upon the conservative piping design utilizing proven engineering design practice, the proper choice of piping materials, the use of conservative quality control standards and procedures for piping fabrication and installation, and extensive studies of modes of pipe failure, it is concluded that pipes will not break in such a manner as to bring about movement of the pipes sufficient to damage the Primary Containment vessels.

Although it has been concluded that with the application of conservative piping design and proven engineering practices pipes will not break in such a manner as to bring about movement of pipes sufficient to damage the Primary Containment vessels, the design of the containment and piping systems does consider the possibility of missiles being generated from the failure of flanged joints such as valve bonnets, valve stems, recirculation pumps, and from instrumentation such as thermowells.

The most positive manner to achieve missile protection is through basic station arrangement such that, if failure should occur, the direction of flight of the missile is away from the containment vessel. The arrangement of station components takes this possibility into account even though such missiles may not have enough energy to penetrate the containment.

A specific analysis showing that a massive failure of a large rotating component or any part of it will not have enough energy to hit and/or penetrate the Drywell shell, or hit any piping system to make the consequences of a LOCA more severe than discussed in Section VI, was performed for a plant with similar arrangements and design parameters, Enrico Fermi II, Docket Number 50-341.[29] The results of the evaluation were provided in response to NRC Questions 12.37, 12.38, 12.39, and 12.40, submitted in Fermi II FSAR Amendment 3 on 4-15-70, Amendment 10 on 8-15-70, Amendment 15 on 2-1-71, and Amendment 11 on 9-15-70.

Also, a probability analysis of potential missile damage due to recirculation pump overspeed was performed by General Electric Company and was submitted to the NRC on the docket of another plant with similar arrangements and design parameters, James A. Fitzpatrick, Docket No. 50-333.[29] The conclusion of this analysis was that no design modifications are required in the recirculation pump discharge piping. In this analysis it was also concluded that smaller potential missiles such as nuts, bolts, and valve bonnets would not have sufficient energy to penetrate the Drywell shell.

The CNS Drywell piping layout has been examined (possible break locations, target areas, etc.) to determine the effect of missiles formed in the recirculation system following a postulated pipe rupture. The plant layout was compared with the James A. Fitzpatrick Nuclear Power Plant/Enrico Fermi 2 Nuclear Power Plant for which the probability of such an event was calculated. The differences in layout between the plants are not significant and, in our judgment, the results are well within the uncertainty range of the Fitzpatrick/Fermi 2 probabilistic analysis, which is, therefore, considered applicable to the CNS.

A description of the plant protection against blowdown jet forces and pipe whip is provided in USAR Appendix C, Section C-2.5.7.2.

In order to minimize postaccident containment leakage, Primary Containment penetrations are designed to retain their integrity during postulated accidents.

Containment penetrations were evaluated in accordance with the guidance of NRC Generic Letter 96-06. Penetrations which could be overpressurized due to the thermal expansion of water trapped in isolated lines were modified to provide pressure relief or to preclude the possibility of thermal overpressurization.

It is concluded that safety design basis 3 is met.

2.4.6 Containment Isolation

One of the basic purposes of the Primary Containment is to provide a minimum of one protective barrier between the reactor core and the environmental surroundings subsequent to an accident involving failure of the pipe components of the Reactor Coolant Pressure Boundary. To fulfill its role as a barrier, Primary Containment is designed to remain intact before, during and subsequent to any LOCA in a process system either inside or outside Primary Containment. The process system and the Primary Containment are considered as separate systems, but where process lines penetrate the containment, the penetration design achieves the same integrity as Primary Containment. The process line isolation valves are designed to achieve the containment function inside the process lines when required.

Since a rupture of a large line penetrating the containment and connecting to the Reactor Coolant Pressure Boundary may be postulated to take place at the Primary Containment boundary, the isolation valve for that line is required to be located within Primary Containment. This inboard valve in each line is required to be closed automatically on various indications of reactor coolant loss. A certain degree of additional reliability is added if a second valve, located outboard of Primary Containment and as close as practical to it, is included. This second valve also closes automatically on an isolation signal. Both valves shall receive the isolation (closure) signal even if normally closed during reactor operation. If a failure involves one valve, the second valve is available to function as the Primary Containment barrier. The various isolation signals are discussed in USAR Section VII.

By physically separating the two valves there is less likelihood that a failure of one valve would cause a failure of the second. The two valves in series are provided with independent power sources.

The ability of the steam and process line penetrations and the associated steamline isolation valves to fulfill the containment objectives under several postulated break locations in the steam lines are described below and demonstrates the adequacy of the isolation valve design;

a. The failure occurs within the Drywell upstream of the inner isolation valve.

Steam from the reactor is released into the Drywell and the resulting sequence is similar to that of a design basis LOCA except that the pressure transient is less severe since the blowdown rate is slower. For the Main Steam line, both isolation valves close upon receipt of a signal indicating high steam flow, low steam line pressure, or low water level in the reactor pressure vessel, depending on the location of the break. This action provides two barriers within the steam pipe passing through the penetration and prevents further flow of steam to the turbine. Thus when the two isolation valves close subsequent to this postulated failure, the Primary Containment barrier is established, and the reactor is effectively isolated from the external environment. Isolation valves for other primary containment penetrations will receive a close signal for high Drywell pressure or low water level in the Reactor Pressure Vessel as described in USAR Section VII.

b. The failure occurs within the Drywell and renders the inner isolation valve inoperable.

Again the reactor steam will blow down into Primary Containment. The outer isolation valve will close upon receipt of a high steam flow, low steam line pressure, or low water level signal, establishing the Primary Containment barrier. Again, isolation valves for other primary containment penetrations will receive a close signal for high Drywell pressure or low water level in the Reactor Pressure Vessel as described in USAR Section VII.

c. The failure occurs downstream of the inner isolation valve either within the Drywell or within the guard pipe.

Both isolation valves will close upon receipt of a signal indicating high steam flow, low steam line pressure, or low water level in the Reactor Pressure Vessel. The guard pipe is designed to accommodate such a failure without damage to the Drywell penetration bellows, and the design of the pipeline supports protect its welded juncture to the Drywell vessel. Thus the Reactor Pressure Vessel is isolated by the closure of the inner isolation valve and the Primary Containment barrier is established by closure of the outer isolation valve. It should be noted that this condition provides two barriers between the reactor core and the external environment. Again, isolation valves for other primary containment penetrations will receive a close signal for high Drywell pressure or low water level in the Reactor Pressure Vessel as described in USAR Section VII.

d. The failure occurs outside Primary Containment between the guard pipe and the outer isolation valve.

The steam will blow directly into the main steam tunnel and through sleeves and openings (blow out panels) into the turbine building until the isolation valves are automatically closed. Closure of the inner isolation valve places a barrier between the reactor core and the external environment. This barrier serves to isolate the reactor and complete the containment integrity.

e. The failure occurs outside Primary Containment and renders the outer isolation valve inoperative.

The Primary Containment barrier and isolation of the reactor is achieved by closure of the inner isolation valve.

f. The failure occurs outside Primary Containment between the outer isolation valve and the turbine.

The steam will blow down directly into the main steam tunnel or the Turbine Building until both isolation valves are automatically closed. This action isolates the reactor, establishes the Primary Containment barrier, and places two barriers in series between the reactor core and the outside environment.

The exceptions to the arrangement of isolation valves described above for lines connecting directly to the containment or reactor primary system are made only in the cases where it leads to a less desirable situation because of required operation or maintenance of the system in which the valves are located. In the cases where, for example, the two isolation valves are located outside the containment, special attention is given to assure that the piping to the isolation valves has an integrity at least equal to the containment.

The TIP system isolation valves are normally closed. When the TIP system cable is inserted, the valve of the selected tube opens automatically and the chamber and cable are inserted. Insertion, calibration, and retraction of the chamber and cable requires approximately five minutes. Retraction requires approximately 1½ minutes. If closure of the valve is required during calibration, the PCIS Group 2 isolation signal causes the cable to be retracted and the valve to close automatically on completion of cable withdrawal. See Section V-2.3.5.2 for additional description of the TIP system isolation using shear valves.

It is neither necessary nor desirable that every isolation valve close simultaneously with a common isolation signal. For example, if a process pipe were to rupture in the drywell, it would be important to close all lines which are open to the drywell, and some effluent process lines such as the main steam lines. However, under these conditions, it is essential that containment and Emergency Core Cooling Systems be operable. For this reason, specific signals are utilized for isolation of the various process and safeguards systems (see Section VII-3, "Primary Containment and Reactor Vessel Isolation Control System").

Isolation valves must be closed before significant amounts of fission products are released from the reactor core under design basis accident conditions. Because the amount of radioactive materials in the reactor coolant is small, a sufficient limitation of fission product release will be accomplished if the isolation valves are closed before the coolant drops below the top of the core.

It is concluded that safety design basis 6 is met.

2.4.7 Containment Flooding

As is discussed in Section XII-2, "Structural Design," Primary Containment is designed for the conditions associated with flooding the containment to the normal refueling level. One method using the RHR Service Water system is described in Section X-8.

It is concluded that safety design basis 4 is met.

2.4.8 Suppression Pool Water Storage

Based upon the "Station Safety Analysis" presented in Chapter XIV, the quantity of water stored in the suppression pool is sufficient to condense the steam from a design basis accident and to provide water for the Emergency Core Cooling Systems. As is discussed in Appendix C, Section C-2.5.7.1.6, the dynamic analysis of the suppression chamber considers the effects of the mass of suppression pool water.

It is concluded that safety design basis 7 is met.

2.4.9 Limitations During Planned Operations

As is discussed in Sections V-2.3.6, V-2.3.7, and V-2.3.8 Primary Containment is designed to be kept within the limits of parameters assumed in the "Station Safety Analysis" presented in Section XIV during planned operations.

It is concluded that safety design basis 8 is met.

2.4.10 Suppression Pool Local Temperature Limitations

A suppression pool temperature evaluation was performed in 1982 to show conformance to NRC limitations identified in NUREG-0783, i.e., a local suppression pool temperature limit of 200°F. By letter dated August 29, 1994[110], the NRC transmitted to the Boiling Water Reactor Owners Group (BWROG) the NRC Safety Evaluation of the General Electric (GE) report NEDO-30832 titled "Elimination of Limit on BWR Suppression Pool Temperature for SRV Discharge with Quenchers." NEDO-30832[111] presents a discussion of test data and an analysis which supports deletion of the requirement to maintain the local suppression pool temperature below the saturation temperature of the pool during an SRV discharge. The NRC evaluation of

NEDO-30832 concluded that the local suppression pool temperature limit may be eliminated if suppression pool discharges are delivered to the suppression pool through a "T" or an "X" quencher device, and if the ECCS suction piping is below the quencher elevation. The evaluation also indicated that NEDO-30832 was acceptable for reference in future licensing actions when the conditions for its applicability are met.

CNS has since performed an evaluation of the likelihood of steam ingestion in the ECCS suction strainers during SRV actuation. CNS utilizes T quenchers at the discharge of the SRVs to avoid a condensation oscillation phenomenon which could result in extreme vibratory loadings on the containment structure. Along with the quenchers, CNS imposed local suppression pool temperature limits to assure prevention of steam ingestion in the ECCS suction strainers. The evaluation conservatively considers the most limiting geometry, a saturated suppression pool and maximum SRV flow. The results show no ingestion of steam by the ECCS suction strainers. Thus, the local suppression pool temperature limit is not required and has been deleted from the CNS design basis[112].

2.5 Inspection and Testing

The following discussion details the surveillance and testing that is conducted on the various systems or components of the primary containment during station operation. Surveillance and testing during station operation is detailed in Section 3.6 of the Technical Specifications (Reference 28).

In addition, the primary containment is in scope for License Renewal per 10 CFR 54.4(a)(1), (a)(2), and (a)(3) and was subject to aging management review. Aging effects are managed by the following Aging Management Programs: Bolting integrity (see USAR Section K-2.1.2), External Surfaces Monitoring (see USAR Section K-2.1.14), Periodic Surveillance and Preventive Maintenance (see USAR Section K-2.1.31), Selective Leaching (see USAR Section K-2.1.34), and Water Chemistry Control - BWR (see USAR Section K-2.1.39). There are no Time-Limited Aging Analyses that are applicable.

The Nitrogen Inerting System is in scope for License Renewal per 10 CFR 54.4(a)(3) and was subject to aging management review. Aging effects are managed by the following Aging Management Programs: Bolting Integrity (see USAR Section K-2.1.2), Buried Piping and Tanks Inspection (see USAR Section K-2.1.3), External Surfaces Monitoring (see USAR Section K-2.1.14), and Periodic Surveillance and Preventive Maintenance (see USAR Section K-2.1.31). There are no Time-Limited Aging Analyses that are applicable.

The Standby Nitrogen Injection System is in scope for License Renewal per 10 CFR 54.4(a)(2) and was subject to aging management review. Aging effects are managed by the following Aging Management Programs: Bolting Integrity (see USAR Section K-2.1.2), Buried Piping and Tanks Inspection (see USAR Section K-2.1.3), External Surfaces Monitoring (see USAR Section K-2.1.14), and Periodic Surveillance and Preventive Maintenance (see USAR Section K-2.1.31). There are no Time-Limited Aging Analyses that are applicable.

2.5.1 Primary Containment Integrity and Leak Tightness

This USAR section contains historical information as indicated by the italicized text. USAR Section I-3.4 provides a more detailed discussion of historical information. The information being presented in this section as historical has been preserved as it was originally submitted to the NRC in the CNS FSAR.

Fabrication procedures, nondestructive testing and sample coupon tests were made in accordance with the ASME Code of Boilers and Pressure Vessels, Section III, Subsection B. The integrity of the primary containment system was verified during construction. The verification included a pneumatic test of the drywell and suppression chamber at 1.25 times their design pressure in accordance with code requirements.

Preoperational Type-A Primary Containment Integrated Leak Rate Tests (ILRT's) were performed on the containment structure in October, 1973. Leakage rates were measured at the calculated peak design basis accident pressure of 58 psig and at a reduced pressure of 29.9 psig. Tests were conducted in accordance with 10CFR50, Appendix J - 1973 and ANSI N45.4 - 1972. Test methods and results are summarized in "Reactor Containment Building Integrated Leak Rate Test," October, 1973.

The following details apply to surveillance and testing during station operation:

The interior surfaces of the Drywell and Suppression Chamber including water line regions shall be visually inspected each refueling outage cycle for evidence of Drywell or Suppression Chamber corrosion or leakage.

Each Reactor Building-to-Suppression Chamber vacuum breaker shall be inspected and verified to meet design requirements during each refueling outage.

ILRT's are periodically performed to verify Primary Containment operability. Surveillance requirements for ILRT's are set forth in Section 3.6.1.1 of the Technical Specifications.

The following details apply to ILRTs:

Primary Containment integrity is confirmed if the leakage rate does not exceed the equivalent of 0.635 percent of the primary containment volume per 24 hours at 58 psig.

Integrated leak rate tests may be performed at either 58 psig or 29 psig, the leakage rate test period, extending to 24 hours of retained internal pressure. If it can be demonstrated to the satisfaction of those responsible for the acceptance of the containment structure that the leakage rate can be accurately determined during a shorter test period, the agreed-upon shorter period may be used.

The measured leakage rates, L_{tm} and L_{am}, shall be less than 0.75 L_t and 0.75 L_a for the reduced pressure tests and peak pressure test respectively.

2.5.2 Penetrations

Pipe penetrations that must accommodate thermal movement are provided with two-ply expansion bellows. The bellows are leak rate tested by pressurizing between the laminations of the bellows at a pressure of 5 psig. This is an exemption to Appendix J of 10CFR50.

Electrical penetrations are also separately testable. The test taps are located so that the tests of the electrical penetrations can be conducted without entering or pressurizing the drywell or suppression chamber.[109]

Containment closures which are fitted with resilient seals or gaskets are separately testable to verify leak tightness. The covers on flanged closures such as the equipment access hatches, the drywell head and access manholes are provided with double seals and with a test tap which allows pressurization of the space between the seals without pressurizing the entire containment system. These double gasketed seals are tested by pressurizing the space between the gaskets and measuring the leak rate.

The personnel airlock doors are also fitted with resilient seals. The doors are leak tested by pressurizing the airlock through test connections on the exterior wall.

Type-B Local Leak Rate Tests (LLRT's) are periodically performed on the testable penetrations and seals in accordance with Surveillance Requirement (SR) 3.6.1.1 of the Technical Specifications. These tests are in conformance with current requirements of 10CFR50, Appendix J, with certain NRC approved exceptions.

2.5.3 Isolation Valves

The test capabilities which are incorporated in the primary containment system to permit leak detection testing of containment isolation valves are separated into three categories.

The first category (Type A Isolation Valves) consists of those pipelines which connect to the reactor system and contain two isolation valves in series. Test taps are provided in these lines to permit leakage monitoring of these valves. Injection check valves are manually tested with zero differential pressure across the valve seat. The valves close on reverse flow and open when pump pressure exceeds reactor pressure. A closed position indicating light for each valve is located in the control room. Check valves are provided in the CS and RHR systems, which can be manually tested during MODE 4 or 5, and are provided with close position indication lights (1 per valve) located in the control room.

The second category (Type B Isolation Valves) consists of those pipelines which open into the containment atmosphere, do not terminate in closed loops outside the containment and contain two isolation valves in series. Test taps on the piping system are provided to permit leakage monitoring of the valves.

The third category (Class C Isolation Valves) consists of those pipelines which terminate in a closed loop inside the containment and contain a single isolation valve. Test taps on the piping are provided on the Primary Containment side of the valves to permit leakage testing of the valves in the accident direction.

Type-C LLRT's are periodically performed on the testable containment isolation valves in accordance with SR 3.6.1.1 of the Technical Specifications. These tests are in conformance with current requirements of 10CFR50, Appendix J, with certain NRC approved exceptions. Testable primary containment isolation valves are listed on Burns and Roe Drawing 4259, Sheets 1 and 1A, and Burns and Roe Drawing 4260, Sheets 2A and 2B.

LLRTs shall be performed at a pressure of 58 psig unless specific exceptions have been approved by the NRC. The test duration of all valves and penetrations shall be of sufficient length to determine repeatable results.

The MSIV’s are leak rate tested at a pressure of $\geq$ 29 psig during each refueling outage. MSIV leakage is excluded from the overall integrated leakage rate from Type A tests, and the sum of the leakage rates from Type B and C tests. These are exemptions to 10CFR50 Appendix J.

Power operated isolation valves that meet the scope of the Inservice Testing Program shall be exercised closed and/or open at a frequency that is in accordance with the Inservice Testing Program.

3.0 SECONDARY CONTAINMENT

3.1 Safety Objective

The safety objective of the Secondary Containment in conjunction with other engineered safety features and nuclear safety systems is to limit the release to the environs of radioactive materials so that off-site doses from a postulated design basis accident will be below the values of 10CFR100 (10CFR50.67 for a Loss of Coolant Accident), and so that Control Room occupant doses will be below the limits of GDC 19 (10CFR50.67 for a Loss of Coolant Accident), and so that the consequences of non-fuel load movements with the potential to damage irradiated fuel is mitigated.

3.2 Safety Design Basis

The safety design bases of Secondary Containment are as follows:

1. Secondary Containment shall provide Secondary Containment when Primary Containment is operable and Primary Containment when the Primary Containment is open for maintenance or refueling operations, when required.

2. Secondary Containment is designed with sufficient redundancy so that no single active system component failure can prevent the system from achieving its safety objective.

3. Secondary Containment is designed in accordance with Class I design criteria as described in Appendix C.

4. Secondary Containment is designed to limit the ground level release to the environs of airborne radioactive materials resulting from a design basis loss of coolant accident (LOCA) so that off-site doses and Control Room occupant doses are within the limits of 10CFR50.67.

5. Secondary Containment is designed to be sufficiently leaktight to allow the Standby Gas Treatment (SGT) system to reduce the average reactor building pressure to a minimum subatmospheric pressure of 0.25 inches of water (under neutral wind conditions) when the SGT system fans are exhausting reactor building atmosphere at a rate of 100% per day of the reactor building free volume.

6. The Reactor Building isolation and control system is designed to isolate the Reactor Building sufficiently fast to minimize fission products from the postulated fuel handling accident from being released to the environs through the normal discharge path.

7. Secondary Containment is provided with means to conduct periodic tests to verify system performance.

8. Secondary Containment is designed to ensure the ground level release to the environs of airborne radioactive materials resulting from a design basis fuel handling accident is confined and monitored.

9. Secondary Containment is designed to mitigate the consequences of non-fuel load movements with the potential to damage irradiated fuel.

3.3 Description

3.3.1 General

Secondary Containment consists of four subsystems. These subsystems are the Reactor Building, the Reactor Building isolation and control system, the SGT system and the Elevated Release Point (ERP). The SGT system is supported in its function by the Z Sump system which removes condensation generated in the SGT discharge line during SGT system operation (see X-14.0 for details on Z Sump). Secondary Containment surrounds Primary Containment and is designed to provide secondary containment for the postulated LOCA. Secondary Containment also surrounds the refueling facilities and is designed to provide a confined and monitored release path for the postulated fuel handling accidents.

Secondary Containment utilizes four different features to mitigate the consequences of a postulated LOCA (pipe break inside the Drywell). The first feature is a negative pressure barrier which minimizes the ground level release of fission products by exfiltration. The second feature is a low leakage containment volume which provides a hold-up time for fission product decay prior to release. The third feature is the removal of particulates and iodines by filtration prior to release. The fourth feature is the exhausting of the secondary containment atmosphere through an ERP which aids in dispersion of the effluent by atmospheric diffusion. Each of the features is provided by a different combination of subsystems: the first by the Reactor Building, the Reactor Building isolation and control system and the SGT exhaust fans; the second by the Reactor Building and the Reactor Building isolation and control system; the third by the SGT system filters; and fourth by the ERP.

3.3.2 Reactor Building

The Reactor Building completely encloses the Reactor Pressure Vessel and Primary Containment. The Reactor Building houses the refueling and reactor servicing equipment, new and spent fuel storage facilities and other reactor auxiliary and service equipment. Also housed within the reactor building are the Emergency Core Cooling Systems, Reactor Water Clean Up demineralizer system, Standby Liquid Control system, Control Rod Drive system, Reactor Equipment Cooling (REC) system, instrumentation for Reactor Protection System and electrical equipment components.

The structural design features of the Reactor Building are described in Section XII. Discussions of the Reactor Building's Class I design are included in Section XII and Appendix C. The reactor building is also designed to meet the shielding requirements discussed in Section XII.

3.3.3 Reactor Building Isolation and Control System

The Reactor Building isolation and control system serves to trip the Reactor Building supply and exhaust fans, isolate the normal ventilation system and provide the starting signals for the SGT system in the event of the postulated LOCA inside the Drywell. This system also initiates the Control Room Emergency Filter System. Either of three Group 6 isolation signals will initiate Secondary Containment. The signals which indicate a LOCA inside the Drywell are high Drywell pressure or low reactor water level (Level 2). In addition, radiation monitors associated with the Reactor Building ventilation exhaust plenum will detect high radiation, and initiate a Group 6 isolation. However, Secondary Containment isolation is not credited in the Fuel Handling Accident (see Section XIV-6.4). Secondary Containment isolation can also be initiated manually from the control room. For further details, see Section VII-3.

Two normally open dampers, in series, are provided in the supply and exhaust path for Reactor Building and Reactor Recirculation MG set ventilation. Each set of dampers consists of one motor operated damper and one air actuated damper supplied by instrument air backed up by an accumulator with an assured one-hour supply capacity. These dampers ensure redundant, diverse isolation capability for the Reactor Building in the event of a release of radioactive material to the Reactor Building. These dampers close automatically on a Group 6 (Secondary Containment Isolation) isolation signal. Isolation time design values are 12 seconds for the air actuated dampers and 90 seconds for the motor operated dampers following receipt of a Group 6 isolation signal. The detailed arrangement of these dampers is shown on Burns and Roe Drawing 2020.

Penetrations of Secondary Containment are designed to have leakage characteristics consistent with Secondary Containment leakage requirements.

Electrical penetrations in the Reactor Building are designed to withstand normal environmental conditions and to retain their integrity during the postulated fuel handling accident and LOCA inside the Drywell. Sets of sealed doors (inner and outer doors) are provided for personnel and equipment access. One set of doors in each penetration is required to be closed to maintain Secondary Containment. In addition, the railroad airlock and the personnel access airlock doors are equipped with interlocks so that one door cannot be opened unless the second door is closed. Normally open drains are provided with water seals to maintain containment operability.

If the Reactor Building was isolated due to high drywell pressure, low reactor water level (Level 2) or radiation signal, and the isolation signal has been reset, an additional manual action is required to reset the Group 6 isolation.

3.3.4 Standby Gas Treatment System

The Standby Gas Treatment (SGT) system consists of two identical, parallel air filtration assemblies completely enclosed within a Class I structure. Each of the filtration assemblies is full capacity. Each of the two SGT subsystems consists of an air tight sheet metal housing containing the following equipment in air flow series:[84]

Moisture separator
Roughing Filter
Air Heater - Electric Duct Type 7.8 kW
Inlet HEPA Filter
Charcoal Filters
- a) 6 cells per subsystem
- b) Maximum Flow Rate for Each cell 297 CFM, 2" Bed depth, 60 lb charcoal
- c) Total weight 360 lbs

Outlet HEPA Filter

A centrifugal exhaust fan with V-Belt drive is provided for each SGT subsystem.

With the Reactor Building isolated, the SGT system has the necessary capacity to perform its design function which is to reduce and hold the building at a minimum average subatmospheric pressure of 0.25 inches of water (under neutral wind conditions: wind speeds 2 – 5 mph).[79]

Each fan has a design flow rate of 1780 cfm. Automatic air operated exhaust fan outlet valve controls are provided to maintain the required negative pressure during normal operation. The system includes isolation valves which fail open on loss of instrument air to the air operators on the valves, or on loss of electrical power to the pilot solenoids and electrical/pneumatic controller.

The moisture separator is designed to remove entrained water droplets and mist from the entering air stream. Additionally an electric heating element system is included in the SGT system upstream of the HEPA filters and activated carbon iodine adsorber. The heating system is actuated when the inlet gas flow is >800 cfm and the temperature of the gas past the heating elements is less than 170°F. The 7.8 kW heater system will reduce the relative humidity from 100% to 70% when the SGT system is operating. Continuous temperature measurement is provided at the inlet of the heating element and at the outlet of activated carbon iodine adsorber. A high temperature alarm is provided at the outlet of each SGT train. In addition, the electric heater coils are provided with built-in thermal protective devices to open the heater control circuits for temperature rises above

170°F.[85] An interlock with its associated exhaust fan prevents the heating coil from operating when the fan is shutdown.

Each HEPA filter is designed to be capable of removing at least 99.97% of the 0.30 micron particles which impinge on the filter. HEPA filters used in the SGT system are in accordance with CNS Technical Specifications. Filter face air velocities are as follows:[84]

a) Maximum - 1 subsystem operating - 445 fpm
Minimum - 1 subsystem operating - 430 fpm

b) Maximum - 2 subsystems operating - 360 fpm
Minimum - 2 subsystems operating - 345 fpm

The charcoal filters are iodide-impregnated activated carbon filters capable of removing in excess of 97.5% of the methyl iodide in the air stream when tested per ASTM D3803-1989 (@30°C) under entering conditions of 70% relative humidity. The range of charcoal filter temperatures is expected to be from 135°F to 170°F with electric heating coil operation.[87] This laboratory testing acceptance criteria provides a safety factor of 2 when compared to the efficiency used in the safety analysis to allow for degradation of the filter efficiency between tests.

Each subsystem satisfies the full requirement for the filtration of particulates, adsorption of halogen gaseous contaminants (noble gas excepted), and secondary containment pressure control.

Primary controls for the operation of both subsystems are located in the main control room, and electrical requirements are automatically transferred to the standby power source upon loss of primary power source. Shutdown of the system is manual.

The system will start automatically upon a high radiation signal from the Reactor Building ventilation exhaust plenum monitor or upon receipt of high drywell pressure or low reactor water level signals and concurrent shutdown of the Secondary Containment normal ventilation system and closing of the ventilation isolation valves. The system can also be manually started from the control room. Upon receipt of any of the initiation signals, both fans start, all SGT system isolation valves open and each fan draws air from the isolated reactor building at a flow rate of approximately 1780 cfm. When the required negative pressure is reached, a single train of Standby Gas Treatment is capable of maintaining this negative pressure. The system discharges to the ERP through a 10 inch underground line. A redundant 10" buried line is provided from the reactor building to the ERP and is cross-connected, thus improving system reliability.[67] The SGT fans are powered from the emergency service portions of the auxiliary power distribution system. To prevent freezing of water vapor at the ERP release opening, heat tracing is provided.[35] The system is required to be manually shut down.

The total time required to switch from a normal containment ventilation system to the SGT system upon detection of a Group 6 isolation signal is less than or equal to 90 seconds based on the Reactor Building isolation time compared to SGT startup time.

SGT Fan Startup Time to Required Speed[89]	15 seconds
Reactor Building Isolation Time	≤90 seconds

The activation of the second train (unit) and closing of appropriate dampers in the first train is automatic upon failure of the first train. Failure of the second train to go into service annunciates in the main control room.

Alarms in the main control room occur upon (a) high relative humidity ahead of the carbon bed, (b) low flow rate interlocked with fan "run" signal of effluent from the system, (c) high radiation in the off-gas stack (elevated release point) resulting from carbon bed or filter failure, or overload.

Each SGT subsystem is periodically tested as specified in the Technical Specifications. These tests assure that the HEPA and charcoal filter system will perform its intended function and iodine monitoring is not required.[86]

System drains where present shall be inspected every 92 days for adequate water level in the loop seals.

Drywell and Suppression Chamber purge exhaust can also be directed to the SGT system for processing before release to the ERP (see Section II, 2.0). The High Pressure Coolant Injection system (HPCI) gland seal steam condenser exhauster discharge is also routed to the SGT system. The Reactor Building Heating and Ventilation system is discussed in Section X-10.

If SGT was started due to high Drywell pressure, low reactor water level (Level 2) or high radiation, and the isolation signal has been reset, an additional manual action is required to reset the Group 6 isolation.

The SGT system is shown on Burns and Roe Drawings 2020 and 2037.

3.3.5 Elevated Release Point

The location of the ERP is shown on Burns and Roe Drawing 4003. The structural design of the ERP is discussed in Section XII. The top of the discharge pipe is 325 feet above ground level at the ERP location and 12 feet above the supporting tower. For this discussion ground level is defined as the top of the concrete footings in which the ERP tower legs are set. The ground level elevation (the elevation of the tower footings) is 891 feet MSL, thus the top of the discharge pipe is at 1,216 feet MSL. The height and location of the ERP has taken into consideration such factors as station operational characteristics and site meteorological conditions.

The maximum elevation of the terrain within half mile interval radial distances from the ERP stack for each of the 22.5 degree segments is given in Table V-3-1. The effective ERP height versus distance from the ERP is given in Table V-3-2. These tables do not include the height of buildings of other structures within the areas.[108] The structural design of the ERP is discussed in Section XII.

3.4 Safety Evaluation

The CNS Technical Specifications specify the plant conditions where the structures, systems, and components that comprise Secondary Containment are required to be operable. In addition to those requirements, Secondary Containment Integrity is also credited for mitigating the consequences of activities involving the movement of non-fuel loads that could potentially damage irradiated fuel within the Secondary Containment. Secondary Containment Integrity is maintained during non-fuel load movements that can potentially damage irradiated fuel, except where the resultant fuel damage is bounded by the damage assumed in the Fuel Handling Accident. This damage threshold corresponds to load drops with a kinetic energy of 38,700 ft-lbs. For load movements below this kinetic energy, Secondary Containment Integrity is not required provided the fuel has decayed at least 24 hours after shutdown, and the other mitigative elements of the Fuel Handling Accident are in place (see USAR Section XIV-6.4.3). Light loads that exceed this kinetic energy are individually evaluated to ensure the Fuel Handling Accident remains bounding. These load movements are suspended when Secondary Containment Integrity is lost and cannot be restored within 4 hours. Additionally, a single train of Standby Gas Treatment can be inoperable for seven days during the above plant conditions provided all active components that affect the operability of the

TABLE V-3-1

MAXIMUM ELEVATION OF TERRAIN
WITHIN HALF-MILE
INTERVAL RADIAL DISTANCES FROM ERP

Radii (miles)	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Sector	Maximum Elevation Above MSL (feet)									
N	885	890	905	900	900	895	894	895	895	895
NNE	885	890	890	890	895	895	890	895	895	890
NE	890	890	890	890	890	890	890	890	890	890
ENE	890	890	890	890	890	885	890	890	890	890
E	890	890	890	890	889	888	885	885	885	880
ESE	885	890	890	890	887	885	880	880	880	880
SE	900	890	890	880	885	890	890	885	890	890
SSE	900	900	900	900	885	890	885	1050	1090	1100
S	900	900	890	885	885	885	960	1040	1030	1050
SSW	900	890	1010	1010	900	900	980	1000	1010	1030
SW	890	970	1080	1050	970	910	910	950	980	1020
WSW	900	1050	1080	1060	1040	1010	1020	1000	980	970
W	900	1040	1090	1100	1080	1050	1060	1080	1100	1050
WNW	900	890	1070	1120	1130	1110	1130	1130	1130	1130
NW	900	890	1080	1120	1120	1120	1150	1170	1120	1110
NNW	900	890	890	890	1060	1090	1130	1130	895	890

TABLE V-3-2

EFFECTIVE ERP HEIGHT
WITHIN HALF-MILE
INTERVAL RADIAL DISTANCES FROM ERP

Radii (miles)	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Sector	Effective ERP Height (Feet)									
N	331	326	311	316	316	321	322	321	321	321
NNE	331	326	326	326	321	321	326	321	321	326
NE	326	326	326	326	326	326	326	326	326	326
ENE	326	326	326	326	326	331	326	326	326	326
E	326	326	326	326	327	328	331	331	331	336
ESE	331	326	326	326	329	331	336	336	336	336
SE	316	326	326	331	331	326	326	331	326	326
SSE	316	316	316	316	331	326	331	166	126	116
S	316	316	326	331	331	331	256	176	186	166
SSW	316	326	206	206	326	326	236	216	206	186
SW	326	246	136	166	246	306	306	266	236	196
WSW	316	166	136	156	176	206	196	216	246	246
W	316	176	126	116	136	166	156	136	116	166
WNW	316	326	146	96	86	106	86	86	86	86
NW	316	326	136	96	96	96	66	46	96	106
NNW	316	326	326	326	156	126	86	86	321	326

operable Standby Gas Treatment train and its associated diesel generator are operable. Sections X-3.6.3 and X-4.6.3 describe analyses which have been performed for specific load movements (control blades, RPV head, steam dryer, steam separator, shield plugs, drywell head, RPV head insulation, bellows shield, and Main Steam Line plugs) which demonstrate that Secondary Containment Integrity is not necessary since irradiated fuel damage cannot occur.

Secondary Containment provides the principal mechanisms for the mitigation of the consequences of an accident in the Reactor Building. The Primary and Secondary Containment act together to provide the principal mechanisms for the mitigation of the consequences of an accident in the Drywell. If the leakage rate of the building is low, and the leakage air is filtered and discharged to the ERP, (utilizing the SGT system), the offsite radiation doses that result from postulated accidents are reduced significantly. The Reactor Building is a Class I structure designed in accordance with all applicable codes. Testing of the Reactor Building for a maximum inleakage rate of 100% per day at an average building subatmospheric pressure of 0.25 inches of water at neutral wind conditions assures a low exfiltration rate even during high wind conditions.

In the event of a pipe break inside the Primary Containment, Reactor Building isolation will be initiated and the SGT system will be initiated. Both SGT system exhaust fans will start automatically and run to reduce the average Reactor Building pressure to a level of -0.25 inches of water under neutral wind conditions. A brief period of time may exist prior to the SGT system establishing a negative pressure condition in the Secondary Containment. A CNS pressurization analysis indicates that the Reactor Building may have a positive pressure for 210 seconds in the worst case of a failure of the intake damper to close. To account for this period of positive pressurization, the radiological dose analysis for the Loss-of-Coolant Accident conservatively assumes that the drywell releases directly to the environment for the first 5 minutes of the accident. The radiological dose analyses for the Loss-of-Coolant Accident credits one SGT subsystem being manually stopped within one hour of a valid automatic initiation signal if the required negative pressure is reached during that one hour period. The operator will then select one train to run while the other is placed in the standby mode.[88,99] In this configuration, the single SGT fan exhausts to the ERP an amount equivalent to 100% per day of the Reactor Building free volume. With the Reactor Building isolated, each fan in the SGT system has the capability to hold the building at an average subatmospheric pressure of -0.25 inches of water when drawing air from the building at a flowrate equivalent to 100% of the Reactor Building free volume per day. Automatic exhaust fan inlet vane controls on each fan are provided to maintain the required filter train pressure differential. Flow is limited by system capacity and cannot exceed 100% reactor building volume change per day.

Cross connections between the filter trains are provided to maintain the required decay heat removal cooling air flow on the charcoal filters in the inactive treatment train. A throttled open crosstie valve provides the flow path from the shutdown train to the operating train for the removal of decay heat from the shutdown filter. Because failure to remove decay heat from the shutdown filter train can impact the functionality of both trains, system design requires the crosstie valve to be throttled open providing a minimum flow of 100 CFM anytime both filter trains are available.

The Reactor Building isolation and control system performs the required isolation actions of Secondary Containment following receipt of the appropriate isolation signals. Following initiation, the air operated Reactor Building isolation valves close within 12 seconds, and the motor operated Reactor Building isolation valves close within 90 seconds. The Reactor Building isolation control system also automatically trips the Reactor Building supply and exhaust fans and RRMG set ventilation exhaust fan, starts the SGT system, and initiates the Control Room Emergency Filter System.

Secondary Containment Integrity is analyzed as not required during the movement of fuel that has decayed for a period of 24 hours since operating in a critical core (see Section XIV-6.4). Fuel movements sooner than this are prohibited by the Technical Requirements Manual and are not credible. However, consistent with NUMARC 93-01, Revision 3, Section 11.3.6.5, NPPD implements a Secondary Containment breach control strategy during the movements of irradiated fuel inside Secondary Containment. The goal of this strategy is to promptly close unanalyzed Secondary Containment release points to the environment, and to restore a train of the Standby Gas Treatment System to service. Although not credited in the FHA analysis, this strategy helps to keep the expected offsite and onsite exposures ALARA through a confined, monitored, and elevated release. For additional conservatism, the Reactor Building Roof Hatch is maintained closed during the movement of irradiated fuel in Secondary Containment.

The SGT system filters exhaust air from the Reactor Building and discharges the processed air to the ERP. The system filters particulates and iodines from the air stream in order to reduce the level of airborne contamination released to the environs via the ERP. When the system is exhausting from the Reactor Building, the building is held at a minimum average subatmospheric pressure of -0.25 inches of water under neutral wind conditions.

The ERP provides a release pathway for airborne activity during the postulated station loss of coolant and refueling accidents. Release of activity to the environs from Secondary Containment is analyzed in detail in Section XIV, Station Safety Analysis. It is concluded that the safety design bases are met.

3.5 Inspection and Testing

The Secondary Containment leakage rate can be determined in the following manner. The Reactor Building is isolated and the SGT system is started with one treatment train and its associated exhaust fan. The exhaust flow rate is approximately 1780 cfm (system capacity to move 100% of reactor building volume per day). If the average Reactor Building subatmospheric pressure (as measured from the average of the four differential pressure instruments located on the walls of the refueling floor) is equal to or exceeds 0.25 inches of water (with neutral wind conditions at the site) the building safety design basis leaktightness with respect to inleakage is verified.[98] Since most of the Reactor Building in-leakage occurs on the refueling floor, measuring the average Reactor Building differential pressure from this elevation is conservative relative to the average differential pressure of the building as a whole.

Tests of the ability of the various isolation initiation signals to automatically isolate the Reactor Building, to trip the supply and exhaust fans an to start the SGT system can be conducted by simulating the isolation signals. This testing also initiates the Control Room Emergency Filter System (see Sections VII-12.9 and X-10.4).

Provisions are made for periodic tests of each SGT filter unit. These tests include, at a minimum, determinations of differential pressure across each filter and of filter efficiency. Connections for testing are located to provide adequate mixing of the test media and representative sampling and monitoring, so that test results are indicative of performance. Each HEPA filter can be tested with DOP (di-octylphthalate) smoke. The charcoal filters can be tested for bypass with freon.

The electric heating coil in each SGT filter train is tested and shown to reduce the relative humidity of an entering air stream.

The standby gas treatment system is in scope for License Renewal per 10 CFR 54.4(a)(1) and (a)(2), and was subject to aging management review. Aging effects are managed by the following Aging Management Programs: Bolting Integrity (see USAR Section K-2.1.2), Buried Piping and Tanks Inspection (see USAR Section K-2.1.3), External Surfaces Monitoring (see USAR Section K-2.1.14), One-time Inspection (see USAR Section K-2.1.29), Periodic Surveillance and Preventive Maintenance (see USAR Section K-2.1.31), and Water Chemistry Control - BWR (see USAR Section K-2.1.39). There were no applicable Time-Limited Aging Analyses.

4.0 REFERENCES FOR CHAPTER V

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