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June 21, 1983

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Limerick Generating Station, Units 1 & 2 Information for Containment Systems Branch (CSB)

Reference: PECO Letter from E. J. Bradley to A. Schwencer dated May 10, 1983

Dear Mr. Schwencer:

Attached are a revised draft response to Question 480.7 including revised section 6.2.6.5.1 and table 14.2-4 in response to CSB draft SER issue 1, and a revised draft section 6.2.3.2.3 and table 6.2-15 in response to issue 7, previously responded to in the reference letter. These revised responses are the result of discussions with the NRC reviewer, and should closeout these issues.

The information contained on these draft FSAR page changes will be incorporated into the FSAR, exactly as it appears on the attachments, in the revision scheduled for July, 1983.

Sincerely,

Eugene J. Bradley

SAJ/gra/31

Copy to: See Attached Service List

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cc:

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QUESTION 480.7 (Section 6.2.1.1)

Appendix I to SRP Section 6.2.1.1.C provides criteria designed to upgrade the steam bypass capability of the Mark II containment design and to assure that the bypass leakage is not substantially increased over the life of the plant. Provide the following information to demonstrate compliance with Appendix I to SRP Section 6.2.1.1.C:

a. The analysis of the Limerick steam bypass capability for small breaks presented in FSAR Section 6.2.1.1.5 is unacceptable. Provide an analysis that shows the suppression chamber design pressure is not exceeded when a leakage area of $A/\sqrt{K}$ equal to 0.05 ft^2 is assumed and a minimum of 30 minutes is assumed for operator action to terminate the suppression chamber pressure transient following indication in the main control room that a bypass leakage path exists. Specify the plant parameter that will indicate the existence of a bypass leakage path, and commit to providing main control room annunciation of this condition. Also specify the specific operator action that will be taken to terminate the suppression chamber transient. If this analysis shows the suppression chamber design pressure is exceeded prior to the time when operator action can be assumed, then NRC's position is that the wetwell spray must be automatically actuated. If the wetwell sprays must be automatically actuated, the consequences of automatic actuation of the wetwell sprays on ECCS function and long-term pool cooling must be evaluated to show that the minimum ECCS and pool cooling requirements are met.

b. Provide a complete description of the transient analysis requested in part (a) including all analysis assumptions; initial conditions; the pressure history in the drywell and wetwell; wetwell spray capacity, efficiency, coverage, start time and temperature history; and identification and quantification of heat sources. In addition, for the wetwell spray nozzles, provide the spectrum of drop sizes and mean drop size emitted from the nozzles as a function of pressure drop across the nozzles and describe how this data was obtained (e.g., a spray nozzle test program). Also, discuss the consideration given to evaporation due to impingement of spray water on the hot downcomer surfaces.

c. If the wetwell spray system is to be used to mitigate the consequences of suppression pool steam bypass either manually or automatically, it is our position that the wetwell spray headers must meet Quality Group B standards rather than the Quality Group C standards shown in FSAR Table 3.2-1. Provide information on how you will comply with this position.

d. Per the guidance of SRP 6.2.1.1.C (Appendix I) it is our position that a preoperational high-pressure leakage test and postoperational low-pressure leakage tests should be performed to detect leakage from the drywell to the suppression chamber. The high-pressure test should be performed at approximately the peak drywell to wetwell differential pressure. The low-pressure test should be performed at a differential pressure corresponding to approximately the submergence of the vents during each refueling outage. Acceptance criteria for both tests shall be a measured leakage less than 10% of the capability of the containment to accommodate bypass leakage at the test pressure. Verify that the above testing requirements will be met for Limerick.

e. Verify that a visual inspection will be conducted during each refueling outage to detect possible leakage paths and to check each vacuum relief valve and associated piping to determine that it is clear of foreign matter.

f. Demonstrate that the vacuum relief valve position indicator system has adequate sensitivity to detect a total valve opening, for all valves, that is less than the bypass capability of a small break. The detectable valve opening should be based on the assumption that the valve opening is evenly divided among all the vacuum breakers.

g. Verify that the vacuum breakers will be tested for operability at monthly intervals.

RESPONSE

a. No automation of the wetwell spray system is needed. It has been determined for the SBA that the minimum time available to the operator to terminate suppression chamber pressurization by manually activating the

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wetwell spray system exceeds the SRP 30 minute criterion for operator action.

The operator will be alerted to the existence of significant steam bypass leakage by the attendant drywell pressure increase which the operator will be monitoring as part of the emergency procedures.

Termination of the wetwell (and drywell) pressure increase is assured by the operation of only one of the two wetwell sprays.

Insert (1)

b.1 Assumptions

The following assumptions were made in performing the small break bypass leakage computations to demonstrate conformance to the SRP 30 minute criterion.

a. The steam that leaks into the wetwell air space does not mix with the air already there.

b. No portion of the steam that has leaked into the wetwell air space condenses.

c. Only steam leaks into the wetwell; any air moving from the drywell into the wetwell goes through the vents.

d. All of the air initially in the drywell is cleared into the wetwell before the moment when the operator is alerted.

e. The vents do not refill with water during the time span considered in this procedure.

f. The flow of steam through leakage paths is treated as being incompressible.

g. The pressure difference across the leakage path is assumed to be constant and equal to the vent submerged hydrostatic pressure difference.

h. The drywell pressure at which the operator is alerted is 30 psig.

i. The wetwell air temperature when the operator is alerted to the occurrence of bypass leakage is assumed to be equal to the initial wetwell temperature (95°F). Later, when the drywell pressure is reduced due to operator action, the wetwell air temperature is assumed to be 50°F

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The operator will initiate the wetwell spray in accordance with plant emergency procedures which will be based on the BWR Owners Group Emergency Procedure Guidelines (EPGs). These EPGs explicitly consider the possibility of suppression pool bypass leakage in determining spray initiation points. The BWROG EPGs have been reviewed and approved by the NRC (Memorandum for D. Eisenhut (NRC) from R. Mattson and H. Thompson (NRC) dated December 9, 1982).

No Change
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greater than the initial wetwell temperature, i.e., 145°F.

j. Maximum allowable leakage area $A/\sqrt{k}$ = 0.05 ft².

k. The wetwell air space is saturated at the time of spray initiation.

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2. Initial Conditions

Drywell Temperature	135°F
Drywell Pressure	15.45 psia
Drywell Relative Humidity	20%
Wetwell Temperature	95°F
Wetwell Relative Humidity	100%
Drywell Volume	248390 ft³ (HWL)
Wetwell Volume	149425 ft³ (HWL)
Vent Submergence	12.25 ft (HWL)

3. Time for Operator Action

Using the above assumptions and initial conditions, a small break LOCA in the drywell produces a constant drywell-to-wetwell pressure differential equivalent to the vent submergence static head (5.28 psid). The resulting bypass steam flow through the leakage path of $A/\sqrt{k}$ = 0.05 ft² is 3.76 lbm/s. The operator becomes alerted to the existence of bypass leakage when the drywell pressure reaches 30 psig. For the drywell pressure to increase from 30 psig to 55 psig (design pressure), the corresponding wetwell pressure rise is from 24.72 to 49.72 psig. Therefore, based on the amount of bypassed steam needed to produce this pressure rise, the operator has about 31 minutes to complete an action that will terminate the pressure increase.

4. Wetwell Spray Termination Adequacy

The following table shows the minimum required spray efficiency as a function of spray temperature. Because the wetwell airspace is saturated when the spray is initiated (this conservative assumption maximizes pressurization at a given temperature), no net evaporation from hot downcomer surfaces will occur to counteract the spray depressurization effect. The mass

flow rate of one spray system is 500 gpm. With two spray systems in operation, the required efficiency would be halved. The spray efficiency is typically on the order of 0.7 and, therefore, even with a single system is operation, the termination of the wetwell (and drywell) pressure increase is assured.

Spray Temperature	Required Efficiency of 1 Wetwell Spray System
70°F	0.22
90°F	0.24
120°F	0.28

c. The wetwell spray system is to be used to mitigate the consequences of suppression pool steam bypass high pressure. Limerick is in compliance with the guidelines of SRP 3.2.2 and Regulatory Guide 1.26 because the safety-related design basis for the containment spray system is that it provide a means of pressure reduction, not heat removal.

Therefore seismic Category I/Quality Group C standards are adequate for the wetwell spray headers. The containment spray system is also designed to be operable following a loss of offsite power plus a single failure.

As discussed in Section 6.2.1.1.5.2, use of the containment sprays is only one option available to the operator to respond to high pressure resulting from steam bypass of the suppression pool.

The Quality Group designations for the containment spray system have not changed since the PSAR was submitted.

d. Section 6.2.6.5.1 and Table 14.2-4 have been changed to provide the requested information.

e. A visual inspection will be conducted at each refueling outage ~~prior to each integrated leak rate test~~ to detect possible drywell-to-suppression bypass leakage paths. A visual inspection of each primary containment vacuum relief valve assembly will be conducted during each refueling outage to verify that it is clear of foreign matter.

f. The vacuum relief valve position indicator system has adequate sensitivity to detect a total valve opening, for all valves, that is less than the bypass capability for a small break. Valve opening is detectable at a disk lift of 0.06 inches or greater above the valve

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seat. Even assuming that all the vacuum breakers are open by 0.06 inches, the corresponding leakage area, $A/\sqrt{k}$, is well below 0.05 ft^2. Therefore, the valve leakage, which is based on the assumption that the valve opening is evenly divided among all the vacuum breakers, is well within the limits of acceptable bypass leakage.

g. Vacuum breakers will be ~~treated~~ tested for operability at an interval specified by the technical specifications. This surveillance testing will be in accordance with the BWR Standard Technical Specifications (4.6.4.2.b).

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c. System alarms operate properly.

(P-59.2) Primary Containment Integrated Leak Rate Test

Test Objective - The test objective is to determine the leakage rate in the primary containment at the peak calculated accident pressure and to determine the bypass leakage from the drywell to the ~~containment~~ wetwell at the peak drywell to wetwell differential pressure and reduced differential pressure corresponding to approximately the submergence of the vents. In addition, the test will verify the proper connection and tracking of the containment pressure instruments.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The Type B and C testing has been completed in accordance with Chapters 6 and 16. The integrated leakage rate measurement system is calibrated and operational. All containment pressure instruments have been calibrated and are valved into service.

Test Method - The containment is pressurized, and the absolute pressure, dry bulb temperature, and dew point temperature (water vapor pressure) within the containment and the drywell are recorded to determine the leak rate. The containment is depressurized, the drywell is pressurized to reduced test pressure, and data are taken to determine the drywell bypass leakage rate. As containment pressure is increased during the containment integrated leak rate test, proper tracking of all containment pressure instruments is verified.

Acceptance Criteria

The primary containment and drywell bypass leakage rates are within acceptable limits, in accordance with Chapter 16. All containment instruments track properly, and all affected instrument lines are clear of obstructions.

(P-59.3) Suppression Pool, Pool Cleanup and Vacuum Relief

Test Objectives - The test objective is to demonstrate the operability of the suppression pool cleanup and vacuum relief system, the suppression pool level instruments, and system valves.

Prequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The suppression pool is sufficiently full of water and the condenser hotwell is available.

Test Method - The suppression pool cleanup system is operated, and the pump flowrate measured. The suppression pool level is varied, and the operability of the pool level instruments is verified. Primary containment vacuum relief valves and pressure instruments are also operated.

Acceptance Criteria

a. The suppression pool cleanup pump meets acceptable head and flow values.

b. Primary containment vacuum relief valves operate properly.

c. System motor-operated valves operate properly.

d. Suppression pool level instruments operate properly.

e. System alarms operate properly.

f. Containment pressure indicators used to track accident conditions operate properly.

(P-60.1) Drywell HVAC System

Test Objective - The test objective is to demonstrate the operability of the primary containment ventilation system.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Chilled water flow balancing is complete. Drywell air balancing is complete.

Test Method - The ventilation system fans and chillers are operated. Controls and alarms are actuated.

Acceptance Criteria

a. Drywell unit coolers and fans operate properly.

b. Drywell chilled water circulation pumps operate properly.

c. Drywell water chillers operate properly.

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6.2.1.1.5.3 Analytical Assumptions

When calculating the allowable leakage capacities for a spectrum of break sizes, the following assumptions are made:

a. Flow through the postulated leakage path is pure steam. For a given leakage path, if the leakage flow consists of a mixture of liquid and vapor, the total leakage mass flowrate is higher but the steam flow rate is less than for the case of pure steam leakage. Since only the steam entering the suppression chamber free space results in the additional containment pressurization, this is a conservative assumption.

b. There is no condensation of the leakage flow on either the suppression pool surface or the containment and vent system structures. Since condensation acts to reduce the suppression chamber pressure, this is a conservative assumption. For an actual containment there is condensation, especially for the larger primary system break where vigorous agitation at the pool surface occurs during blowdown.

6.2.1.1.5.4 Analytical Results

The containment has been analyzed to determine the allowable leakage between the drywell and suppression chamber. Figure 6.2-21 shows the allowable leakage capacity ($A/\sqrt{K}$) as a function of the primary system break area. A is the area of the leakage flow path and K is the total geometric loss coefficient associated with the leakage flow path.

Figure 6.2-21 is a composite of two curves. If the break area is greater than approximately 0.4 square feet, natural reactor depressurization rapidly terminates the transient and maximum allowable leakage is correspondingly high. For break areas less than approximately 0.4 square feet, however, reactor blowdown is of long duration and the maximum allowable leakage is limited to small values. The smallest maximum allowable leakage capacity is at $A/\sqrt{K}$ = .046 square feet.

6.2.1.1.6 Suppression Pool Dynamic Loads

Hydrodynamic loads due to main steam relief valve (MSRV) discharge and a LOCA are described in Ref 6.2-8.

leakage rate tested with that liquid. The liquid leakage measured is neither converted to equivalent air leakage nor added to the Type B and C test totals. Isolation valves tested with liquid are identified in Table 6.2-25.

The acceptance criteria for all penetrations and isolation valves subject to Type B and C tests are given in Chaper 16.

6.2.6.4 Scheduling and Reporting of Periodic Tests

The periodic leakage rate test schedules for Types A, B and C tests are given in Chapter 16.

Type B and C tests can be conducted at any time during normal plant operations or during shutdown periods, so long as the time interval between tests for any individual Type B or C test does not exceed the maximum allowable interval specified in Chapter 16. Each time a Type B or C test is completed, the overall total leakage rate for all required Type B and C tests is corrected for any differences noted.

Provisions for reporting test results are given in Chapter 16.

6.2.6.5 Special Testing Requirements

6.2.6.5.1 Drywell Steam Bypass Test

Following the drywell (insert A) structural integrity test, described in Section 3.8.1.7, ~~a preoperational drywell leakage rate test is performed at drywell design pressure. Table 14.2-4 gives the test descriptions. Preoperational and periodic drywell leakage rate tests at a reduced pressure, defined in Chapter 16, are performed following the preoperational and periodic Type A tests described above.~~ These drywell leakage rate tests verify, over the design life of the plant, that no paths for gross leakage from the drywell to the suppression chamber air space bypassing the pressure suppression feature exist. The combination of the design pressure and reduced pressure leakage rate tests also verifies that the drywell performs adequately for the full range of postulated primary system break sizes. The drywell leakage rate limits specified in Chapter 16 (for the above tests) are based on a value of 10% of the allowable bypass $A/\sqrt{K}$ for small breaks that are described in Section 6.2.1.1.5.4.

Drywell leakage rate tests are performed with the drywell isolated from the suppression chamber. Valves and system lineups are the same as for the Type A test except any paths for equalizing drywell and suppression chamber pressure open during the Type A test are isolated. The drywell atmosphere is allowed to stabilize for a period of one hour after attaining test pressure. Leakage rate test calculations, using the pressure decay method, commence after the stabilization period.

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....a preoperational drywell to wetwell leakage rate test is performed at the peak drywell to wetwell differential pressure. Also, drywell to wetwell leakage rate tests at a reduced differential pressure corresponding approximately to the submergence of the vents, defined in Chapter 16, are performed following the Type A test and periodically thereafter. Table 14.2-4 gives the test descriptions.

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The pressure decay method is based on drywell atmosphere pressure and temperature observations and the known drywell free air volume specified in Table 6.2-22. Leakage rate is calculated from the pressure and temperature data, drywell free air volume, and elapsed time.

The periodic drywell leakage rate test pressures, test duration, and acceptance criteria are specified in Chapter 16. Periodic drywell leakage rate tests are performed at the intervals specified in Chapter 16. This surveillance testing will be in accordance with the BWR Standard Technical Specifications (4.6.2.1.d).

6.2.7 POST-ACCIDENT SYSTEM ISOLATION

Following an accident in which significant fuel damage is postulated to occur, a number of plant systems whose piping penetrates the primary containment may contain highly radioactive fluids. Adequate system isolation features exist to ensure that the integrity of these systems will be maintained.

6.2.7.1 System Isolation Provisions

The boundaries of potentially contaminated systems are adequately isolated by one of the following:

a) Two normally closed manual valves

b) One normally closed manual valve (low pressure piping)

c) One or two normally closed manual valves and a cap

d) One safety relief valve or one rupture disc

e) Two check valves

f) One remotely actuated valve and one check valve

g) Two remotely actuated valves

In cases where a remotely actuated valve is required to change position to provide system isolation, the valve receives an auto isolation signal. In some cases a system isolation valve does not receive a direct isolation signal but is interlocked to close when a containment isolation valve or other valve opens to permit fluid flow from the containment.

Table 6.2-26 lists remotely-actuated system isolation valves, their normal and required accident positions and their actuation signals. Containment isolation valves that also provide post-accident system isolation are not included in this table but are listed in Table 6.2-17.

The secondary containment design data are in Table 6.2-14.

6.2.3.2.2 Secondary Containment Isolation System

Isolation dampers and the plant protection signals that activate the secondary containment isolation system are described in Section 9.4.2.1.3.

6.2.3.2.3 Containment Bypass Leakage

Upon receipt of a reactor enclosure isolation signal, the reactor enclosure recirculation system (RERS) and the SGTS are automatically activated and begin to process all air flow streams from the reactor enclosure ventilation system. Therefore, if a LOCA occurs, radioactivity that exfiltrates the steel-lined primary containment or piping systems containing radioactive fluids is collected and passed through the RERS and SGTS as described in Section 6.5.

The potential paths by which leakage from the primary containment can bypass the areas serviced by the SGTS have been evaluated. Table 6.2-15 identifies all primary containment penetrations, the termination region of all lines penetrating primary containment, and the bypass leakage barriers in each line. It has been determined that no potential bypass leakage paths exist for the entire spectrum of LOCAs except for a feedwater line break inside containment. A water seal cannot be maintained in the broken feedwater line by the feedwater fill system (Section 6.2.3.2.3.2) for the case of a feedwater line break inside containment. For this case, containment leakage may travel past the broken feedwater line's containment isolation valves into the portion of the feedwater line located in the turbine enclosure. However, a water seal in this portion of the feedwater line would realistically be expected to be maintained by water from the condensate storage tank. Therefore, no bypass leakage is postulated to reach the environment.

When designating the termination region, if either the system line that penetrates primary containment or any branch lines connecting to it penetrate the ~~secondary containment~~ reactor enclosure, the termination region is listed in Table 6.2-15 as outside ~~secondary containment (OSC)~~ reactor enclosure (ORE). The types of bypass leakage barriers employed by these lines are:

1. Redundant primary containment isolation valves
2. Closed ~~seismic Category I~~ piping system inside primary containment
3. A water seal maintained for 30 days following a LOCA

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4. The line beyond the outboard primary [the reactor enclosure] containment isolation valve is vented to ~~secondary containment~~ by use of a vent line located upstream of the two block valves.

insert A

5. A leakage collection system is provided.

6. The line contains a temporary spool piece that is removed during normal operation and replaced by blind flanges so that any leakage through the flange is into ~~secondary containment~~ the reactor enclosure.

Type 1 and 2 leakage barriers are considered to limit but not eliminate bypass leakage. Leakage barriers of types 3 ~~2~~ through 7 ~~4~~ are considered to effectively eliminate any bypass leakage.

Leakage from those lines terminating in the reactor enclosure is collected during the LOCA because the reactor enclosure is restored to and maintained at subatmospheric pressure and all exhaust is processed by the RERS and SGTS during these modes (Section 6.5). Therefore, lines terminating within the reactor enclosure are not considered potential bypass leakage paths.

Lines penetrating primary containment are isolated following a LOCA as described in Section 6.2.4. All containment isolation valves and penetrations are designed to seismic Category I requirements.

The primary containment and penetration leakage is monitored during periodic tests as discussed in Section 6.2.6. Those penetrations for which credit is taken for water seals as a means of eliminating bypass leakage (Table 6.2-15) are preoperationally leak-tested with water and Technical Specification leakage rates are given as water leak rates.

6.2.3.2.3.1 Water Seals

In each case where water [reactor enclosure] seals are used to eliminate the potential of ~~secondary containment~~ bypass leakage, a 30-day water seal is assured because either a loop seal is present or the water for the seal is provided from a large reservoir. The water seals for all of these lines will be maintained at a pressure greater than the peak containment accident pressure. Each of the water seals listed in Table 6.2-15 is discussed below (some penetrations may be listed more than once due to the presence of multiple types of water seals).

a. Penetrations 9A & B and 44. The feedwater fill system (Section 6.2.3.2.3.2) is used to maintain a water seal in the lines downstream of these penetrations.

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7. A closed seismic Category I piping system outside primary containment.

TABLE 6.2-15

EVALUATION OF POTENTIAL SECONDARY CONTAINMENT BYPASS LEAKAGE PATHS

CONTAINMENT PENETRATION	SYSTEM	TERMINATION REGION(1)	BYPASS LEAKAGE BARRIERS(2)	POTENTIAL BYPASS PATH
1	Equipment access door	ISC RE	Double O-Ring	No
2	Equipment access door and personnel lock	ISC RE	Double O-Ring	No
3A	Main steam (MS) line D flow instrumentation	ISC RE	–	No
3B	Inst gas supply	OSC RE	1,4	No
3C	HPCI steam flow inst	ISC RE	–	No
3D	MS line A flow inst	ISC RE	–	No
3D	Instrument gas supply	OSC RE	1,4	No
4	Head access manhole	ISC RE	Double O-Ring	No
5	Spare	–	–	–
6	CRD removal hatch	ISC RE	Double O-Ring	No
7A-D	Primary steam	OSC RE	1,5	No
8	Primary steam line drain	OSC RE	1,4	No
9A&B	Feedwater	OSC RE	1,3	No(3)
10	Steam to RCIC turbine	OSC RE	1,3,6	No
11	Steam to HPCI turbine	OSC RE	1,3,6	No
12	RHR shutdown cooling supply	OSC RE	1,3	No
13A&B	RHR shutdown return	OSC RE	1,3	No
14	RWCU supply	OSC RE	1,3	No
15	Spare	–	–	–
16A&B	Core spray pump discharge	OSC RE	1,3	No
17	RPV head spray	OSC RE	1,3	No
18	Spare	–	–	–
19	Spare	–	–	–
20A	RPV level inst	ISC RE	–	No
20A	LPCI ΔP inst	ISC RE	–	No
20B	LPCI ΔP inst	ISC RE	–	No
20B	RPV level inst	ISC RE	–	No
21	Spare	–	–	–
22	Drywell pressure inst	ISC RE	–	No
23	Closed cooling water supply	OSC RE	1,2,3	No
24	Closed cooling water return	OSC RE	1,2,3	No
25	Drywell purge supply	OSC RE	1,4	No
26	Drywell purge exhaust	ISC RE	–	No
27A	Instrument gas supply	OSC RE	1,4	No
27B	HPCI flow inst	ISC RE	–	No
28A	Recirc loop sample	ISC RE	–	No
28A	Drywell H_2/O_2	ORE ISC	1,7	No
28B	LPCI ΔP inst	ISC RE	–	No
28B	Drywell air sample	ORE ISC	1,7	No
29A	RPV flange leakage inst	ISC RE	–	No
29B	Core spray ΔP inst	ISC RE	–	No
30A	MS line D flow inst	ISC RE	–	No
30B	Drywell pressure inst	ISC RE	–	No
30B	MS line C flow inst	ISC RE	–	No

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TABLE 6.2-15 (Cont'd)

CONTAINMENT PENETRATION	SYSTEM	TERMINATION REGION(1)	BYPASS LEAKAGE BARRIERS(2)	POTENTIAL BYPASS PATH
31A&B	Jet pump flow inst	ISC RE	-	No
32A&B	Jet pump flow inst	ISC RE	-	No
33A	Pressure above core plate inst	ISC RE	-	No
33A	Pressure below core plate inst	ISC RE	-	No
33B	RCIC steam flow inst	ISC RE	-	No
34A	MS line C flow inst	ISC RE	-	No
34B	Recirc flow inst	ISC RE	-	No
35A	Inst gas to TIP indexing mechanism	OSC RE	1,4	NO
35C-G	TIP drives	ISC RE	-	No
36	Spare	-	-	-
37A-D	CRD insert	OSC RE	1,3	No
38A-D	CRD withdraw	OSC RE	1,3	No
39A&B	Drywell spray	OSC RE	1,3	No
40A,B&C	Jet pump flow inst	ISC RE	-	No
40D	Pressure below core plate inst	ISC RE	-	No
40E	Drywell pressure inst	ISC RE	-	No
40F	RCIC steam flow inst	ISC RE	-	No
40F	Inst gas suction	OSC RE	1,4	No
40G	ILRT data acquis system	OSC RE	1,6	No
40H	Instrument gas supply	OSC RE	1,4	No
40H	Recirc pump cooler flow inst	ISC RE	-	No
41	LPCI ΔP inst	ISC RE	-	No
41	RWCU flow inst	ISC RE	-	No
42	Standby liquid control	ISC RE	-	No
43A	Recirc loop A ΔP inst	ISC RE	-	No
43A	Recirc pump seal pressure inst	ISC RE	-	No
43B	Main steam sample	ISC RE	-	No
44	CRD/RWCU return	OSC RE	1,3	No
45A-D	LPCI	OSC RE	1,3	No
46	Spare	-	-	-
47	RWCU flow inst	ISC RE	-	No
48A	RPV level inst	ISC RE	-	No
48A	Core spray ΔP inst	ISC RE	-	No
48B	RPV level inst	ISC RE	-	No
49A&B	MS line A&B flow inst	ISC RE	-	No
50A	Drywell pressure inst	ISC RE	-	No
50A	Recirc flow inst	ISC RE	-	No
50B	Recirc pump seal pressure inst	ISC RE	-	No
50B	Recirc pump cooler flow inst	ISC RE	-	No
51A	Recirc line flow inst	ISC RE	-	No
51B	Jet pump flow inst	ISC RE	-	No
52A	MS line B flow inst	ISC RE	-	No
52B	Recirc line flow inst	ISC RE	-	No
53	Drywell chilled water supply	OSC RE	1,2,3	NO
54	Drywell chilled water return	OSC RE	1,2,3	No
55	Drywell chilled water supply	OSC RE	1,2,3	No
56	Drywell chilled water return	OSC RE	1,2,3	No

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TABLE 6.2-15 (Cont'd)

CONTAINMENT PENETRATION	SYSTEM	TERMINATION REGION(1)	BYPASS LEAKAGE BARRIERS(2)	POTENTIAL BYPASS PATH
57	RWCU flow inst	~~ISC~~ RE	-	No
58A	Recirc loop B ΔP inst	~~ISC~~ RE	-	No
58B	Spare	-	-	-
59A&B	Spare	-	-	-
60	Spare	-	-	-
61	Recirc pump seal purge	~~OSC~~ RE	1,4	No
62	H_2/O_2 sample return	~~OSC~~ RE	1,4	No
63	Recirc loop ΔP inst; recirc pump seal pressure inst	~~ISC~~ RE	-	No
64	Spare	-	-	-
65A&B	RPV pressure inst	~~ISC~~ RE	-	No
66A	RPV level inst	~~ISC~~ RE	-	No
66A	LPCI ΔP inst	~~ISC~~ RE	-	No
66B	RPV level inst	~~ISC~~ RE	-	No
66B	LPCI ΔP inst	~~ISC~~ RE	-	No
67A&B	RPV level and pressure inst	~~ISC~~ RE	-	No
100A-D	Neutron monitoring system	-	-	-
101A-D	Recirc pump power	-	-	-
102A&B	Electrical spare	-	-	-
103A&B	Temp and low level signals	-	-	-
104A-D	CRD position indicator	-	-	-
105A-E	Misc low voltage power	-	-	-
106A-C	Low voltage control	-	-	-
107	Electrical spare	-	-	-
108	Electrical spare	-	-	-
109	Electrical spare	-	-	-
110	Electrical spare	-	-	-
111	Electrical spare	-	-	-
112	Electrical spare	-	-	-
113	Electrical spare	-	-	-
114	Electrical spare	-	-	-
115	Electrical spare	-	-	-
116	Standby liquid control	~~ISC~~ RE	-	No
117A	Electrical spare	-	-	-
117B	Drywell radiation monitoring	~~ISC~~ RE	-	No
118A&B	Electrical spare	-	-	-
200A&B	Access hatch	-	-	-
201A	Supp pool purge supply	~~OSC~~ RE	1,4	No
201B	Spare	-	-	-
202	Supp pool purge exhaust	~~ISC~~ RE	-	No
203A-D	RHR pump suction	~~OSC~~ RE	3	No
204A&B	RHR pump test	~~OSC~~ RE	3	
205A&B	Supp pool spray	~~OSC~~ RE	3	No
206A-D	CS pump suction	~~OSC~~ RE	3	No
207A&B	CS pump test and flush	~~OSC~~ RE	3	No
208A	Spare	-	-	-
208B	CS pump min recirc	~~OSC~~ RE	3	No

TABLE 6.2-15 (Cont'd)

CONTAINMENT PENETRATION	SYSTEM	TERMINATION REGION(1)	BYPASS LEAKAGE BARRIERS(2)	POTENTIAL BYPASS PATH
209	HPCI pump suction	O~~SC~~RE	3	No
210	HPCI turbine exhaust	O~~SC~~RE	3	No
211	Spare	-	-	-
212	HPCI pump test and flush	O~~SC~~RE	3	No
213	Spare	-	-	-
214	RCIC pump suction	O~~SC~~RE	3	No
215	RCIC turbine exhaust	O~~SC~~RE	3	No
216	RCIC min flow	O~~SC~~RE	3	No
217	RCIC vac pump discharge	O~~SC~~RE	3	No
218	Inst gas to vac relief valves	O~~SC~~RE	1,4-	No
219A&B	Supp pool level inst	I~~SC~~RE	-	No
220A	H_2/O_2 sample return	O~~SC~~RE	1,4	No
220B	Supp pool pressure inst	I~~SC~~RE	-	No
221A	Wetwell H_2/O_2 sample	ORE ~~[illegible]~~	~~[illegible]~~ 1,7	No
221B	Supp pool air sample	ORE ~~[illegible]~~	~~[illegible]~~ 1,7	No
222	Indication and control	-	-	-
223	Spare	-	-	-
224	Spare	-	-	-
225	RHR vac relief suction	O~~SC~~RE	3	No
226A&B	RHR min recirc	O~~SC~~RE	3	No
227	ILRT data acquis system	O~~SC~~RE	1,6	No
228A-C	Spare	-	-	-
228D	HPCI vac relief	O~~SC~~RE	1,3,6	No
229A&B	Spare	-	-	-
230A	Strain gage inst	I~~SC~~RE	-	No
230B	Drywell sump level inst	I~~SC~~RE	-	No
231A&B	Drywell sump drains	O~~SC~~RE	1,3	No
232A-S	MSRV discharge	-	-	-
235	Core spray pump min recirc	O~~SC~~RE	3	No
236	HPCI pump min recirc	O~~SC~~RE	3	No
237	Supp pool cleanup pump suction	O~~SC~~RE	1,3	No
238	RHR relief valve discharge	O~~SC~~RE	3	No
239	RHR relief valve discharge	O~~SC~~RE	3	No
240	RHR relief valve discharge	O~~SC~~RE	3	No
241	RCIC vacuum relief	O~~SC~~RE	1,3,6	No

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CONTAINMENT PENETRATION	SYSTEM	TERMINATION REGION(1)	BYPASS LEAKAGE BARRIERS(2)	POTENTIAL BYPASS PATH

(1) The termination regions are: ~~ISC~~ RE - Inside ~~Secondary Containment~~ Reactor Enclosure
~~OSC~~ RE - Ountside ~~Secondary Containment~~ Reactor Enclosure

(2) The bypass leakage barriers are defined as follows (see Section 6.2.3.3.3):
1. Redundant primary containment isolation valves
2. Closed piping system inside containment
3. A water seal maintained for 30 days following a LOCA
4. The line beyond the outboard primary containment isolation valve is vented to ~~secondary containment~~ the reactor enclosure by use of a vent line located between two block valves and ~~the secondary containment~~.
5. A leakage collection system is provided
6. The line contains a temporary spool piece that is removed during normal operation and replaced by blind flanges so that any leakage through the flange is into ~~secondary containment~~.
insert 7. Closed seismic Category I piping system outside containment.

(3) The feedwater fill system will provide a water seal in the feedwater lines for all line breaks other than a feedwater line break inside containment.

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