Westinghouse

Westinghouse Electric Company
Nuclear Power Plants
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355
USA

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, D.C. 20555

Direct tel: 412-374-6206
Direct fax: 724-940-8505
e-mail: sisk1rb@westinghouse.com

Your ref: Docket Number 52-006
Our ref: DCP_NRC_002879

May 25, 2010

References:

1. DCP_NRC_002744, Re-submittal of Proposed Changes for AP1000 Design Control Document Rev.18, January 20, 2010
2. DCP_NRC_002818, Supplementary Information to DCP_NRC_002744 – Re-Submittal of Proposed Changes for AP1000 Design Control Document Rev.18, March 12, 2010
3. DCP_NRC_002850, Final Information on Proposed Changes for the AP1000 Design Control Document Rev. 18, April 26, 2010
4. DCP_NRC_002874, Final Information on Proposed Changes for the AP1000 Design Control Document Rev. 18, May 21, 2010
5. DCP_NRC_002863, Information on Proposed Changes for the AP1000 Design Control Document Rev. 18, May 10, 2010

Subject: Information on Proposed Changes for the AP1000 Design Control Document Rev. 18

This letter is submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information provided is generic and is expected to apply to all Combined License (COL) applicants referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

This submittal contains proprietary information of Westinghouse Electric Company, LLC. In conformance with the requirements of 10 CFR Section 2.390, as amended, of the Commission's regulations, we are enclosing with this submittal one copy of the Application for Withholding, AW-10-2818 (non-proprietary, Enclosure 1), and one copy of the associated Affidavit (non-proprietary, Enclosure 2) with Proprietary Information and Copyright Notices. The affidavit sets forth the basis on which the information identified as proprietary may be withheld from public disclosure by the Commission. Pursuant to 10 CFR 50.30(b), "Description of Proposed Changes for AP1000 DCD Rev. 18 – Proprietary" and "Description of Proposed Changes for AP1000 DCD Rev. 18 – Non-Proprietary" are submitted as Enclosures 3 and 4. Correspondence with respect to the affidavit or Application for Withholding should include our reference number AW-10-2818 and should be addressed to James A. Gresham, Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company, LLC, P. 0. Box 355, Pittsburgh, Pennsylvania 15230-0355.

Westinghouse provided preliminary information on changes which it proposed to include in Revision 18 of the AP1000 Design Control Document (DCD-18) in a January 20, 2010 letter (Reference 1).

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Supplementary information on some of those changes requested by the NRC was provided in a March 12, 2010 letter (Reference 2). Information was provided in an April 26, 2010 letter (Reference 3) for seven of the changes identified in the January 20, 2010 that were determined to meet one or more of the Interim Staff Guidance-11 (ISG-11) criteria for reporting to the NRC staff. The remaining 50 "elective" items in the January 20 letter are addressed in a letter dated May 21, 2010 (Reference 4). In addition, in a letter dated May 10, 2010 (Reference 5), information was provided for seven design changes that met one or more of the ISG-11 criteria and which supported the AP1000 Licensing Finalization schedule.

This letter provides information on two additional design changes. Change Notice 64 addresses the re-location of containment pressure and differential pressure transmitters and the design change was found to meet one or more of the ISG-11 criteria. Change Notice 66 addresses the industry generic issue on "gas intrusion" and was also found to meet one or more of the ISG-11 criteria. Information for these two changes is provided in Enclosure 3, including the reasons for the changes and the sections of the DCD which are impacted. Additional information is also provided which responds to questions raised by the NRC staff on these two changes at the May 20, 2010 meeting. Enclosure 4 provides a non-proprietary version of the information in Enclosure 3. Enclosure 5 provides a copy of the revised DCD pages. Enclosure 6 provides amplifying information for DCD Figures 6.3-1 and 6.3-2 (CN66). Enclosure 7 provides a non-proprietary version of the information in Enclosure 6.

As noted previously, the changes described in this and the referenced letters do not constitute all of the changes which Westinghouse proposes to include in DCD-18. Rather, the changes in this letter are in addition to those which Westinghouse either has submitted or will submit to the NRC as responses to Requests for Additional Information or Safety Evaluation Report Open Items.

Westinghouse will work with the NRC staff to disposition the changes described in this letter as expeditiously as possible. Questions related to the content of this letter should be directed to Westinghouse. Please send copies of such questions to the prospective COL applicants referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,

Robert Sisk, Manager
Licensing and Customer Interface
Regulatory Affairs and Strategy

/Enclosures

1. AW-10-2818, Application for Withholding Proprietary Information from Disclosure, dated May 25, 2010
2. AW-10-2818, Affidavit, Proprietary Information Notice, Copyright Notice, dated May 25, 2010
3. Description of Proposed Changes for AP1000 DCD Rev. 18, Proprietary
4. Description of Proposed Changes for AP1000 DCD Rev. 18, Non-Proprietary
5. DCD Pages
6. Amplifying Information for Figures 6.3-1 and 6.3-2, Proprietary
7. Amplifying Information for Figures 6.3-1 and 6.3-2, Non-Proprietary

cc:	D. Jaffe	-	U.S. NRC	7E
	E. McKenna	-	U.S. NRC	7E
	T. Spink	-	TVA	7E
	P. Hastings	-	Duke Power	7E
	R. Kitchen	-	Progress Energy	7E
	A. Monroe	-	SCANA	7E
	P. Jacobs	-	Florida Power & Light	7E
	C. Pierce	-	Southern Company	7E
	E. Schmiech	-	Westinghouse	7E
	G. Zinke	-	NuStart/Entergy	7E
	R. Grumbir	-	NuStart	7E
	M. Melton	-	Westinghouse	7E

DCP_NRC_002879
May 25, 2010

ENCLOSURE 1

AW-10-2818

APPLICATION FOR WITHHOLDING
PROPRIETARY INFORMATION FROM DISCLOSURE

Westinghouse

Westinghouse Electric Company
Nuclear Services
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355
USA

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, D.C. 20555

Direct tel: 412-374-6206
Direct fax: 412-374-5005
e-mail: sisk1rb@westinghouse.com

Your ref: Docket Number 52-006
Our ref: AW-10-2818

May 25, 2010

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: Final Information on Proposed Changes for the AP1000 Design Control Document Rev. 18

The Application for Withholding is submitted by Westinghouse Electric Company, LLC (Westinghouse), pursuant to the provisions of Paragraph (b) (1) of Section 2.390 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse and customarily held in confidence.

The proprietary material for which withholding is being requested is identified in the proprietary version of the subject report. In conformance with 10 CFR Section 2.390, Affidavit AW-10-2818 accompanies this Application for Withholding, setting forth the basis on which the identified proprietary information may be withheld from public disclosure.

Accordingly, it is respectively requested that the subject information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.390 of the Commission's regulations.

Correspondence with respect to this Application for Withholding or the accompanying affidavit should reference AW-10-2818 and should be addressed to James A. Gresham, Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company, LLC, P.O. Box 355, Pittsburgh, Pennsylvania, 15230-0355.

Very truly yours,

Robert B. Sisk
Manager
Licensing and Customer Interface

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ENCLOSURE 2

Affidavit

AW-10-2818
May 25, 2010

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

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COUNTY OF BUTLER:

Before me, the undersigned authority, personally appeared Robert B. Sisk, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

Robert B. Sisk
Manager
Licensing and Customer Interface

Sworn to and subscribed
before me this 25th day
of May 2010.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Patricia S. Aston, Notary Public
Murrysville Boro, Westmoreland County
My Commission Expires July 11, 2011
Member, Pennsylvania Association of Notaries

Notary Public

0531ljb.doc

(1) I am Manager, Licensing and Customer Interface, Westinghouse Electric Company, LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse "Application for Withholding" accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.

(4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.

(ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

(a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.

(b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

(c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

(d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

(e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.

(f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.

(iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.

(iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

(v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in "Final Information on Proposed Changes for the AP1000 Design Control Document Rev. 18" in support of the AP1000 Design Certification Amendment Application, being transmitted by Westinghouse letter (DCP_NRC_002879) and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse for the AP1000 Design Certification Amendment application is expected to be applicable in all licensee submittals referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application in response to certain NRC requirements for justification of compliance of the safety system to regulations.

This information is part of that which will enable Westinghouse to:

(a) Manufacture and deliver products to utilities based on proprietary designs.

(b) Advance the AP1000 Design and reduce the licensing risk for the application of the AP1000 Design Certification

(c) Determine compliance with regulations and standards

(d) Establish design requirements and specifications for the system.

Further this information has substantial commercial value as follows:

(a) Westinghouse plans to sell the use of similar information to its customers for purposes of plant construction and operation.

(b) Westinghouse can sell support and defense of safety systems based on the technology in the reports.

(c) The information requested to be withheld reveals the distinguishing aspects of an approach and schedule which was developed by Westinghouse.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar digital technology safety systems and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).

COPYRIGHT NOTICE

ENCLOSURE 4

Description of Proposed Changes for AP1000 DCD Rev. 18, Non-Proprietary

Change No. 64

Subject
Changes to Post-DBA Transmitter Requirements
DCD Sections Impacted
Tier 1: Table 2.2.1-1, Figure 2.2.1-1, and Table 2.2.2-1. Tier 2: Appendix 1A (pages 1A-3, 1A-63), Chapter 3 (page 3.1-31, Table 3.2-3 (sh 13/69), Section 3.8.2.1.7, Figure 3.8.2-4 (sh 4/6), Table 3.11-1 (sh 13, 14/51), and Table 3D.4-2), Chapter 5 (Figure 5.1-5 (sh 1, 2/3), Chapter 6 (Sections 6.2.1.1.3, 6.2.1.7, 6.2.2.3, 6.2.3.1.1, 6.2.3.3, and Figure 6.2.2-1 (sh 1/2)), Table 7.5-1 (sh 3/12), Appendix 9A (Sections 9A.3.1.1.2, 9A.3.1.1.3, 9A.3.1.1.7, 9A.3.1.1.8, 9A.3.1.1.9, 9A.3.1.1.14, 9A.3.1.1.15, 9A.3.1.3.1.1, and Table 9A-2 (sh 1, 2, 3, 5, 7, 8/14)), and Tech Spec Bases 3.3.2
Description of change to DCD/Reason for change to DCD

Description of DCD Change: There are numerous changes to the DCD that support the three main design changes.

Description of Design Change: There are three main design changes;

A. Move 7 Containment Pressure Transmitters outside containment, and connect to remote pressure sensors inside containment by sealed capillary tubing. This change requires the addition of four new containment penetrations, one for each safety division. In divisions A, B and C, the normal-range and wide-range transmitters share one capillary line and penetration. For division D there is no wide-range transmitter, so the normal-range transmitter is on its own capillary.

   In choosing proposed transmitter and penetration locations, separation between safety divisions was maintained. Division A & C Containment Pressure Transmitters will be located in the VFS Penetration Room (Room 12452) which is in Fire Zone 1200 AF 01. Division B & D Containment Pressure Transmitters will be located in the Middle Annulus (Room 12341) which is Fire Zone 1200 AF 12341. Penetration P46 (Division A) and Penetration P48 (Division B) will be 27 inches apart, which is greater than the 18" minimum separation requirement by ISA 67.02 for redundant instrument sensing lines. Similarly, Penetrations P47 (Division C) and P49 (Division D) will also be 27 inches apart.

   Routing and protection of the containment pressure instrumentation capillary lines as they pass through the middle annulus between containment and the auxiliary building wall will be addressed in the same way as for fluid system piping and tubing. The capillary lines are Seismic Category I, and will be routed and supported accordingly. For these lines, as well as for fluid system lines penetrating containment, routing and support design and analysis will take into account both the relative seismic displacement and displacements caused by temperature and pressure changes. The proposed locations for the containment pressure transmitters are outside of the zone of influence of any postulated high energy line break. The capillary tubing will also be protected from incidental damage that could result from maintenance activity in the surrounding area. The instrumentation is not in an area subject to the movement of heavy loads. There are no other known causes of common mode failure that must be considered.

   Because there were previously no instrument penetrations in the AP1000 design, the basis for conformance to Regulatory Guides 1.11 and 1.151 is revised. Conformance with Regulatory Guide 1.11 is updated to reflect recent issuance of revision 1. Details are added in DCD Chapters 1, 3 and 6 to demonstrate conformance with Regulatory Guide 1.151.

B. Move 18 Category 1 PAMS Transmitters above the maximum DBA flood level.

C. Reduce Post-Accident Operability time for 18 Category 2 PAMS Transmitters from 4 months to 2 weeks.

a,c

ISG-11 Review Results	
Must the change be included in the next DCD Revision?	☒ Yes ☐ No

Change No. 66

Subject
Passive Core Cooling System (PXS) Changes due to Gas Accumulation
DCD Sections Impacted
Tier 1: Figure 2.2.3-1 (sh 2/2) Tier 2: Table 3.2-3 (sh 17, 20, 21, 22, 27, 33/69); Table 3.9-17; Table 3.11-1 (sh 34, 36, 37, 38, 40, 43/51); Table 3I.6-3 (sh 14, 17, 18, 20, 23/32); Figure, 5.1-5 (sh 1/3), Figure 6.3-1 (sh 1), Figure 6.3-2 (sh 2); Section 16.1 Technical Specifications: LCO 3.5.6, LCO 3.5.7, LCO 3.5.8, B 3.5.6, B 3.5.7, B 3.5.8
Description of change to DCD/Reason for change to DCD

Description of DCD Changes:

Tier 1: Figure 2.2.3-1; This figure change includes moving the location of the IRWST injection paths to the outside of the figure and raising the IRWST and associated piping such that a solid line of flow could be shown to the IRWST injection isolation valves.

Tier 2:

Table 3.2-3: Add new Class A/B/C vent valves to table list for PXS;
Table 3.9-17; Update entry in Tech Spec Column for IRWST
Table 3.11-1; Add non-active valves to the list of environmentally qualified electrical and mechanical equipment
Table 3I.6-3; Add valves to the list of mechanical equipment not sensitive to high frequency
Figure 5.1-5 (sh 1/3); add manual maintenance drain valve in line from PRHR heat exchanger to steam generator
Figure 6.3-1 Sheets 1 and 2; See P&ID Markups, DCP Figures 5 and 6, with enlarged excerpts in DCP Figures 7 through 22.
Section 16.1, Technical Specifications

3.5.6; Add IRWST Operating Actions and Surveillance Requirements
3.5.7; Add IRWST Shutdown MODE 5 Actions and Surveillance Requirements
3.5.8; Add IRWST Shutdown MODE 6 Actions and Surveillance Requirements
B 3.5.6, LCO: Include Noncondensible Gas as Criteria for IRWST Operability
B 3.5.6, ACTIONS: Add Action for Noncondensible Gas Surveillance Requirements for IRWST High Point Vents
B 3.5.6, SURVEILLANCE REQUIREMENTS: Add Noncondensible Gas Surveillance Requirements for IRWST High Point Vents
B 3.5.7, LCO: Include Noncondensible Gas as Criteria for IRWST Operability
B 3.5.7, ACTIONS: Add Action for Noncondensible Gas Surveillance Requirements for IRWST High Point Vents
B 3.5.7, SURVEILLANCE REQUIREMENTS: Add Noncondensible Gas Surveillance Requirements for IRWST High Point Vents
B 3.5.8, LCO: Include Noncondensible Gas as Criteria for IRWST Operability
B 3.5.8, ACTIONS: Add Action for Noncondensible Gas Surveillance Requirements for IRWST High Point Vents
B 3.5.8, SURVEILLANCE REQUIREMENTS: Add Noncondensible Gas Surveillance Requirements for IRWST High Point Vents

Description of Design Change:

This design change is being made to PXS injection lines to address gas intrusion concerns and design finalization by:

- Adding eight (8) manual maintenance vent valves in six (6) PXS passive injection and recirculation line piping high point locations
- Adding four (4) pipe stubs with maintenance vents and associated valves, line routing to tee into CMT vent line routing to the RCDT, and remote pipe stub gas void indications at the outlets of each of the IRWST passive injection

squib valves

- Re-routing the two (2) accumulator discharge line connections to both DVI line vertical cold trap (riser) pipes to tee in physically above (in elevation) and downstream of the associated IRWST connection into the DVI riser pipes, instead of having the accumulator connection be upstream of and below the IRWST tee
- Adding twenty (20) manual maintenance drain valves in fourteen (14) PXS passive injection and recirculation piping locations, five (5) RNS piping locations, and one (1) RCS piping location (the RNS and RCS drains are unrelated to gas intrusion effects but part of design finalization to consolidate required PXS line changes and piping analyses)

The DCD changes attached to this letter focus on the specific system changes made to address gas intrusion. Westinghouse will provide additional DCD markups that generically address the topic of gas intrusion and also describe periodic plant surveillance and venting procedures to verify gas void elimination during plant startup and operations. Additionally, Westinghouse will provide a description of the results of evaluations that were performed to address gas intrusion.

a,c

ISG-11 Review Results	
Must the change be included in the next DCD Revision?	☒ Yes ☐ No

ENCLOSURE 5

DCD Pages

Change Number 64

Table 2.2.1-1 (cont.)

Equipment Name	Tag No.	ASME Code Section III	Seismic Cat. I	Remotely Operated Valve	Class 1E/ Qual. for Harsh Envir.	Safety-Related Display	Control PMS/ DAS	Active Function	Loss of Motive Power Position
Electrical Penetration P25	ECS-EY-P25W	Yes	Yes	-	No/Yes	-	-/-	-	-
Electrical Penetration P26	ECS-EY-P26W	Yes	Yes	-	No/Yes	-	-/-	-	-
Electrical Penetration P27	IDSC-EY-P27Z	Yes	Yes	-	Yes/Yes	-	-/-	-	-
Electrical Penetration P28	IDSC-EY-P28Y	Yes	Yes	-	Yes/Yes	-	-/-	-	-
Electrical Penetration P29	IDSC-EY-P29Y	Yes	Yes	-	Yes/Yes	-	-/-	-	-
Electrical Penetration P30	IDSB-EY-P30Z	Yes	Yes	-	Yes/Yes	-	-/-	-	-
Electrical Penetration P31	IDSB-EY-P31Y	Yes	Yes	-	Yes/Yes	-	-/-	-	-
Electrical Penetration P32	IDSB-EY-P32Y	Yes	Yes	-	Yes/Yes	-	-/-	-	-
Instrument Penetration P46	PCS-PY-C01	Yes	Yes	-	-/-	-	-/-	-	-
Instrument Penetration P47	PCS-PY-C02	Yes	Yes	-	-/-	-	-/-	-	-
Instrument Penetration P48	PCS-PY-C03	Yes	Yes	-	-/-	-	-/-	-	-
Instrument Penetration P49	PCS-PY-C04	Yes	Yes	-	-/-	-	-/-	-	-

Note: Dash (-) indicates not applicable.

Table 2.2.2-1 (cont.)									
Component Name	**Tag No.**	**ASME Code Section III**	**Seismic Cat. I**	**Remotely Operated Valve**	**Class 1E/ Qual. for Harsh Envir.**	**Safety-Related Display**	**Control PMS/ DAS**	**Active Function**	**Loss of Motive Power Position**
PCS Water Delivery Flow Sensor	PCS-002	No	Yes	-	Yes/No	Yes	-	-	-
PCS Water Delivery Flow Sensor	PCS-003	No	Yes	-	Yes/No	Yes	-	-	-
PCS Water Delivery Flow Sensor	PCS-004	No	Yes	-	Yes/No	Yes	-	-	-
Containment Pressure Sensor	PCS-005	No	Yes	-	Yes/~~Yes~~No	Yes	-	-	-
Containment Pressure Sensor	PCS-006	No	Yes	-	Yes/~~Yes~~No	Yes	-	-	-
Containment Pressure Sensor	PCS-007	No	Yes	-	Yes/~~Yes~~No	Yes	-	-	-
Containment Pressure Sensor	PCS-008	No	Yes	-	Yes/~~Yes~~No	Yes	-	-	-
PCCWST Water Level Sensor	PCS-010	No	Yes	-	Yes/No	Yes	-	-	-
PCCWST Water Level Sensor	PCS-011	No	Yes	-	Yes/No	Yes	-	-	-
High-range Containment Pressure Sensor	PCS-012	No	Yes	-	Yes/~~Yes~~No	Yes	-	-	-
High-range Containment Pressure Sensor	PCS-013	No	Yes	-	Yes/~~Yes~~No	Yes	-	-	-
High-range Containment Pressure Sensor	PCS-014	No	Yes	-	Yes/~~Yes~~No	Yes	-	-	-

Note: Dash (-) indicates not applicable.

Table 2.2.2-1 (cont.)

Component Name	Tag No.	ASME Code Section III	Seismic Cat. I	Remotely Operated Valve	Class 1E/ Qual. for Harsh Envir.	Safety-Related Display	Control PMS/ DAS	Active Function	Loss of Motive Power Position
PCS Water Delivery Flow Sensor	PCS-002	No	Yes	-	Yes/No	Yes	-	-	-
PCS Water Delivery Flow Sensor	PCS-003	No	Yes	-	Yes/No	Yes	-	-	-
PCS Water Delivery Flow Sensor	PCS-004	No	Yes	-	Yes/No	Yes	-	-	-
Containment Pressure Sensor	PCS-005	No	Yes	-	Yes/~~Yes~~No	Yes	-	-	-
Containment Pressure Sensor	PCS-006	No	Yes	-	Yes/~~Yes~~No	Yes	-	-	-
Containment Pressure Sensor	PCS-007	No	Yes	-	Yes/~~Yes~~No	Yes	-	-	-
Containment Pressure Sensor	PCS-008	No	Yes	-	Yes/~~Yes~~No	Yes	-	-	-
PCCWST Water Level Sensor	PCS-010	No	Yes	-	Yes/No	Yes	-	-	-
PCCWST Water Level Sensor	PCS-011	No	Yes	-	Yes/No	Yes	-	-	-
High-range Containment Pressure Sensor	PCS-012	No	Yes	-	Yes/~~Yes~~No	Yes	-	-	-
High-range Containment Pressure Sensor	PCS-013	No	Yes	-	Yes/~~Yes~~No	Yes	-	-	-
High-range Containment Pressure Sensor	PCS-014	No	Yes	-	Yes/~~Yes~~No	Yes	-	-	-

Note: Dash (-) indicates not applicable.

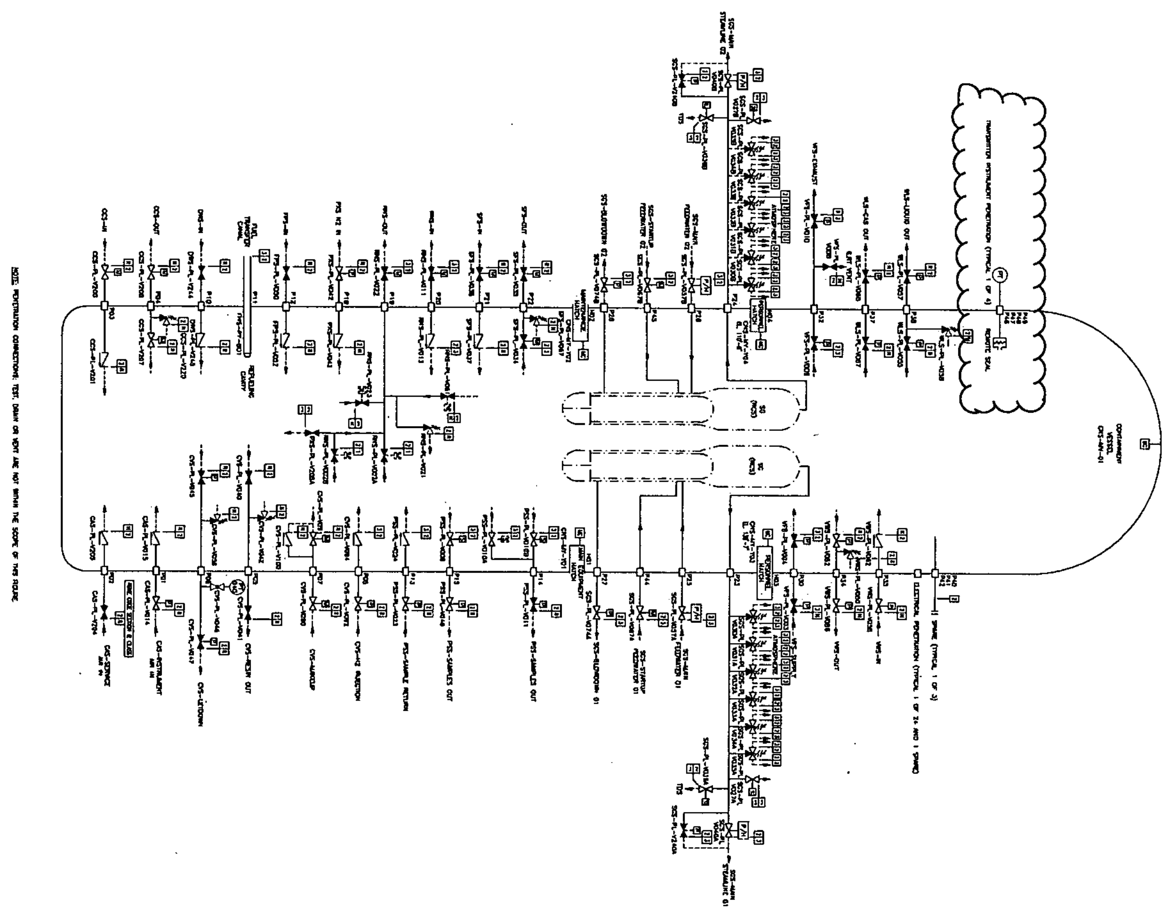


Figure 2.2.1-1
Containment System

Criteria Section	Referenced Criteria	AP1000 Position	Clarification/Summary Description of Exceptions
Reg. Guide 1.9, Rev. 2, 12/79 – Selection, Design, and Qualification of Diesel Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants			
General		N/A	Guidelines apply to Class 1E diesel-generators. They are not applicable to the AP1000.
C.1-14		N/A	Guidelines apply to Class 1E diesel-generators. They are not applicable to the AP1000.
Reg. Guide 1.10 – Withdrawn			
Reg. Guide 1.11, Rev. ~~0~~1, 3/~~71~~10 – Instrument Lines Penetrating Primary Reactor Containment			
General		Conforms	~~The AP1000 has no instrument lines penetrating primary reactor containment.~~
C.1~~.a~~		Conforms	
C.~~1.b~~2.a-c	~~10 CFR 100~~	Conforms	
C.~~1.c-e~~2.d	10 CFR 100	Conforms	
C.~~2~~3.a-c		~~Conforms~~N/A	Design features described are not applicable to AP1000 Design.
~~E.1~~C.4		Conforms	Regulatory position describes the AP1000 implementation.
~~E.2~~C.5		~~N/A~~ Conforms	~~This section applies only to plants for which a notice of hearing on application for construction permit was published between January 5, 1967, and December 30, 1969. Therefore, it is not applicable to the AP1000.~~
~~E.3~~C.6		~~N/A~~ Conforms	~~This section applies only to plants for which a notice of hearing on application for construction permit was published on or before December 30, 1966. Therefore, it is not applicable to the AP1000.~~
C.7.a-b		N/A	There are no instrument lines penetrating containment that are not associated with protection or safety system instrumentation.
Reg. Guide 1.12, Rev. 2, 3/97 – Instrumentation for Earthquakes			
C.1		Exception	Two elevations (excluding the foundation) on a structure internal to the containment are specified in the draft regulatory guide. A second sensor internal to the containment is not provided because access to a sensor at a lower elevation is inconsistent with maintaining

Criteria Section	Referenced Criteria	AP1000 Position	Clarification/Summary Description of Exceptions
Reg. Guide 1.150, Rev. 1, 2/83 – Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations			
General		Conforms	The reactor vessel design includes features that permit conformance to the pre-service and in-service inspection of this regulatory guide. Guidelines for such features as positioning of welds, vessel contour, and weld surface preparation are included.
Reg. Guide 1.151, (Task 1C 126-5), Rev. 0, 7/83 – Instrument Sensing Lines			
General	ISA-S67.02	Conforms	This regulatory guide addresses the use of ISA-S67.02, "Nuclear-Safety-Related Instrument Sensing Line Piping and Tubing Standards for Use in Nuclear Power Plants," 1980, difference between the pressure boundary integrity of an to provide a basis for the design and installation of instrument sensing lines. It establishes the applicable ASME code requirements and boundaries for the design and installation of instrument sensing line in accordance with the appropriate parts of ASME Code, Section III, or ANSI B31.1, as applicable, and the availability of the protection function of safety-related instruments. Where there is a conflict between the ISA standard and the ASME Code, Section III, the ASME Code requirements are followed. Because this instrument configuration (permanently sealed, fluid-filled tubing) is excluded from the scope of Section III, the tubing is designed and fabricated to ASME B31.1. Industry standard ISA-S67.02 reiterates and clarifies the practice of controlling documents such as interface requirements and regulations. The AP1000 uses the Piping and Instrumentation Diagram as the approved document to designate the safety classification system boundaries.
C.1		Conforms	
C.2	ASME Code, Class 2 SC I	Conforms	Safety-related instrumentation has safety class pressure boundaries, including the sensing line, valves, and instrumentation sensors. The pressure boundary is the same safety class as the equipment to which it is connected. The AP1000 credits design features such as flow restrictors and diaphragms as class separation. For that portion of a sensing line from the ASME Code, Class 1 piping or vessel out to the class separation device, ISA-S67.02 includes the ASME Code, Class 1 requirement. For that portion of the sensing line from

Criterion 56 – Primary Containment Isolation

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

1. One locked closed isolation valve inside and one locked closed isolation valve outside the containment; or

2. One automatic isolation valve inside and one locked closed isolation valve outside the containment; or

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

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

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

AP1000 Compliance

Lines connecting directly with the containment atmosphere and penetrating the reactor containment are normally provided with two isolation valves in series, one inside and one outside the containment, in accordance with one of the acceptable arrangements as described in GDC 56. Isolation of instrument lines for containment pressure measurement is demonstrated on a different basis and does not require isolation valves. Additional information is found in subsection 6.2.3.

Criterion 57 – Closed System Isolation Valves

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

AP1000 Compliance

Lines that penetrate the containment and are neither part of the reactor coolant pressure boundary nor connected directly to the containment atmosphere are considered closed systems within the

Table 3.2-3 (Sheet 13 of 69)

AP1000 CLASSIFICATION OF MECHANICAL AND FLUID SYSTEMS, COMPONENTS, AND EQUIPMENT

Tag Number	Description	AP1000 Class	Seismic Category	Principal Construction Code	Comments
Passive Containment Cooling System (Continued)					
PCS-PY-C01	Containment Pressure Instrument Line Penetration	B	I	ASME, MC	
PCS-PY-C02	Containment Pressure Instrument Line Penetration	B	I	ASME, MC	
PCS-PY-C03	Containment Pressure Instrument Line Penetration	B	I	ASME, MC	
PCS-PY-C04	Containment Pressure Instrument Line Penetration	B	I	ASME, MC	
Balance of system components are Class E					
Plant Gas Systems (PGS)					Location: Various
System components are Class E					
Primary Sampling System (PSS)					Location: Containment and Auxiliary Building
n/a	Grab Sample Unit	D	NS	Manufacturer Std.	
n/a	Sample Cooler, PSS and CCS Side	D	NS	ASME VIII/ TEMA	
n/a	Valves Providing PSS AP1000 Equipment Class D Function	D	NS	ANSI 16.34	
PSS-PL-V001A	Hot Leg Sample Isolation	B	I	ASME III-2	
PSS-PL-V001B	Hot Leg Sample Isolation	B	I	ASME III-2	
PSS-PL-V003	Pressurizer Liquid Isolation	B	I	ASME III-2	
PSS-PL-V004A	PXS Accumulator Sample Isolation	C	I	ASME III-3	
PSS-PL-V004B	PXS Accumulator Sample Isolation	C	I	ASME III-3	
PSS-PL-V005A	PXS CMT A Sample Isolation	B	I	ASME III-2	
PSS-PL-V005B	PXS CMT B Sample Isolation	B	I	ASME III-2	
PSS-PL-V005C	PXS CMT A Sample Isolation	B	I	ASME III-2	
PSS-PL-V005D	PXS CMT B Sample Isolation	B	I	ASME III-2	
PSS-PL-V008	Containment Air Sample Containment Isolation IRC	B	I	ASME III-2	
PSS-PL-V010A	Liquid Sample Line Containment Isolation IRC	B	I	ASME III-2	

thermal growth of the main steam and feedwater piping during plant operation, relative seismic movements, and containment accident and testing conditions. Cover plates are provided to protect the bellows from foreign objects during construction and operation. These cover plates are removable to permit in-service inspection.

The fuel transfer penetration, shown in Figure 3.8.2-4, sheet 5, is provided to transfer fuel between the containment and the fuel handling area of the auxiliary building. The fuel transfer tube is welded to the penetration sleeve. The containment boundary is a double-gasketed blind flange at the refueling canal end. The expansion bellows are not a part of the containment boundary. Rather, they are water seals during refueling operations and accommodate differential movement between the containment vessel, containment internal structures, and the auxiliary building.

3.8.2.1.6 Electrical Penetrations

Figure 3.8.2-4, sheet 6, shows a typical 18-inch-diameter electrical penetration. The penetration assemblies consist of conductor modules (or medium voltage cable modules in a similar 18-inch-diameter penetration) passing through a bulkhead attached to the containment nozzle. Electrical design of these penetrations is described in subsection 8.3.1.1.6.

Electrical penetrations are designed to maintain containment integrity under design basis accident conditions, including pressure, temperature, and radiation. Double barriers permit testing of each assembly to verify that containment integrity is maintained. Design and testing is according to IEEE Standard 317-83 and IEEE Standard 323-74.

3.8.2.1.7 Instrument Line Penetrations

Instrument line penetrations are designed to maintain containment integrity under design basis accident conditions, including pressure, temperature, and radiation.

Figure 3.8.2-4, sheet 4, detail B, shows typical details for the containment pressure instrumentation penetrations. The penetrations consist of sleeves welded to the containment vessel. Pressure transmitters outside containment are connected to pressure sensors inside containment by sealed, fluid-filled tubing (capillary), which passes through the sleeves. The capillary tubing is welded directly to the sleeve at a tubing coupling, which has a thicker wall and larger diameter than the capillary tubing.

Design and construction of the penetrations are in accordance with ASME Section III. The penetration sleeves, including the welds to the tubing couplings, follow ASME Section III, Subsection NE. Because ASME Section III, Subsection NCA excludes the sealed-tubing instrument configuration from the scope of Section III, the capillary tubing is designed and fabricated in accordance with ASME B31.1.

3.8.2.2 Applicable Codes, Standards, and Specifications

[*The containment vessel is designed and constructed according to the 2001 edition of the ASME Code, Section III, Subsection NE, Metal Containment, including the 2002 Addenda. Stability of the containment vessel and appurtenances is evaluated using ASME Code, Case N-284-1, Metal*

*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.

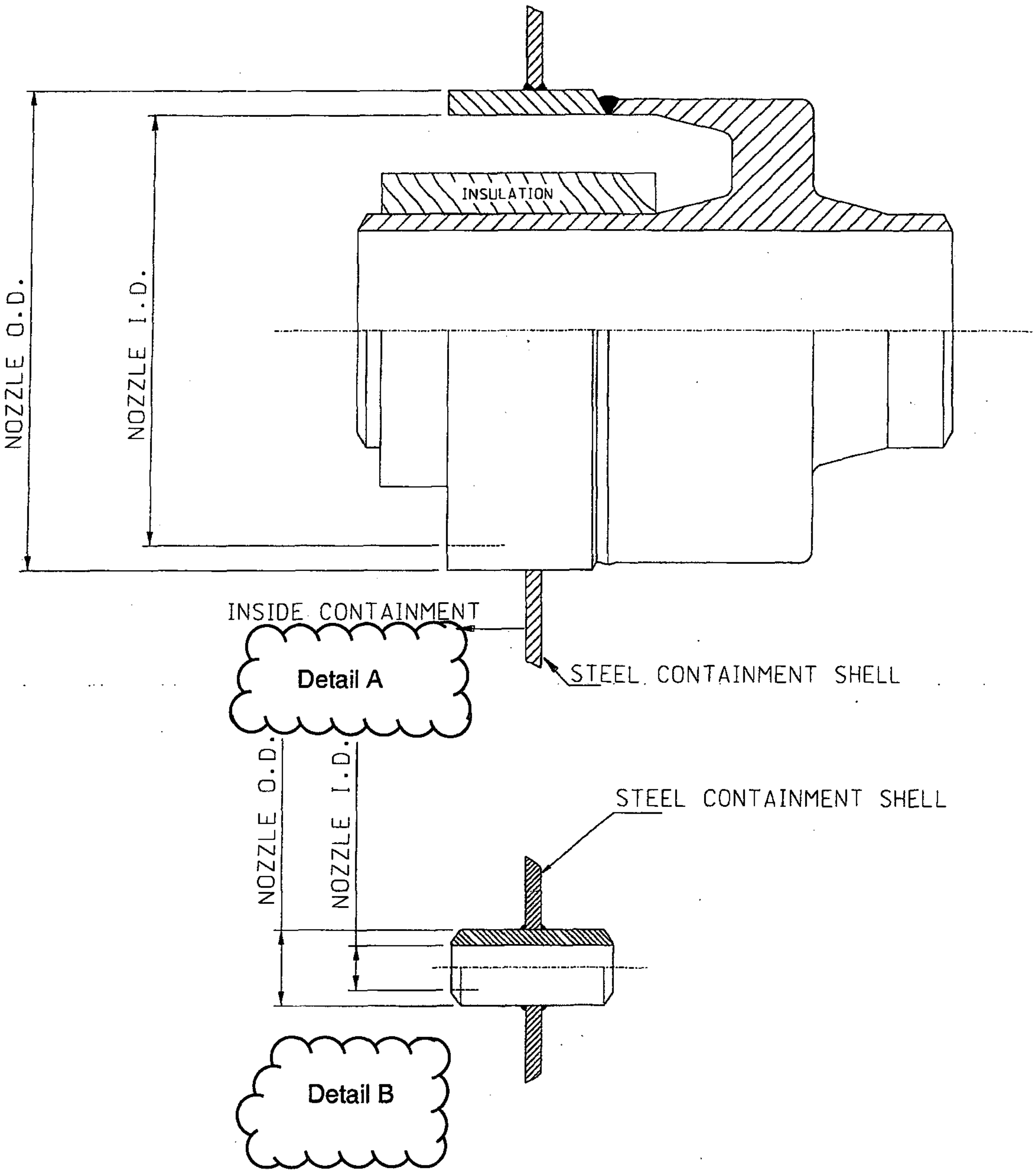


Figure 3.8.2-4 (Sheet 4 of 6)

Containment Penetrations

Table 3.11-1 (Sheet 13 of 5~~0~~1)

ENVIRONMENTALLY QUALIFIED ELECTRICAL AND MECHANICAL EQUIPMENT

Description	AP1000 Tag No.	Envir. Zone (Note 2)	Function (Note 1)	Operating Time Required (Note 5)	Qualification Program (Note 6)
RCS Hot Leg Water Level	RCS-JE-LT160A	1	PAMS	2 wks~~4 mos~~	E *
RCS Hot Leg Water Level	RCS-JE-LT160B	1	PAMS	2 wks~~4 mos~~	E *
PZR Level	RCS-JE-LT195A	1	RT ESF PAMS	5 min 5 min 4 mos	E *
PZR Level	RCS-JE-LT195B	1	RT ESF PAMS	5 min 5 min 4 mos	E *
PZR Level	RCS-JE-LT195C	1	RT ESF PAMS	5 min 5 min 4 mos	E *
PZR Level	RCS-JE-LT195D	1	RT ESF PAMS	5 min 5 min 4 mos	E *
SG1 Narrow Range Level	SGS-JE-LT001	1	RT ESF PAMS	5 min 5 min 2 wks~~4 mos~~	E *
SG1 Narrow Range Level	SGS-JE-LT002	1	RT ESF PAMS	5 min 5 min 2 wks~~4 mos~~	E *
SG1 Narrow Range Level	SGS-JE-LT003	1	RT ESF PAMS	5 min 5 min 2 wks~~4 mos~~	E *
SG1 Narrow Range Level	SGS-JE-LT004	1	RT ESF PAMS	5 min 5 min 2 wks~~4 mos~~	E *
SG2 Narrow Range Level	SGS-JE-LT005	1	RT ESF PAMS	5 min 5 min 2 wks~~4 mos~~	E *
SG2 Narrow Range Level	SGS-JE-LT006	1	RT ESF PAMS	5 min 5 min 2 wks~~4 mos~~	E *
SG2 Narrow Range Level	SGS-JE-LT007	1	RT ESF PAMS	5 min 5 min 2 wks~~4 mos~~	E *
SG2 Narrow Range Level	SGS-JE-LT008	1	RT ESF PAMS	5 min 5 min 2 wks~~4 mos~~	E *

Table 3.11-1 (Sheet 14 of 5~~0~~1)

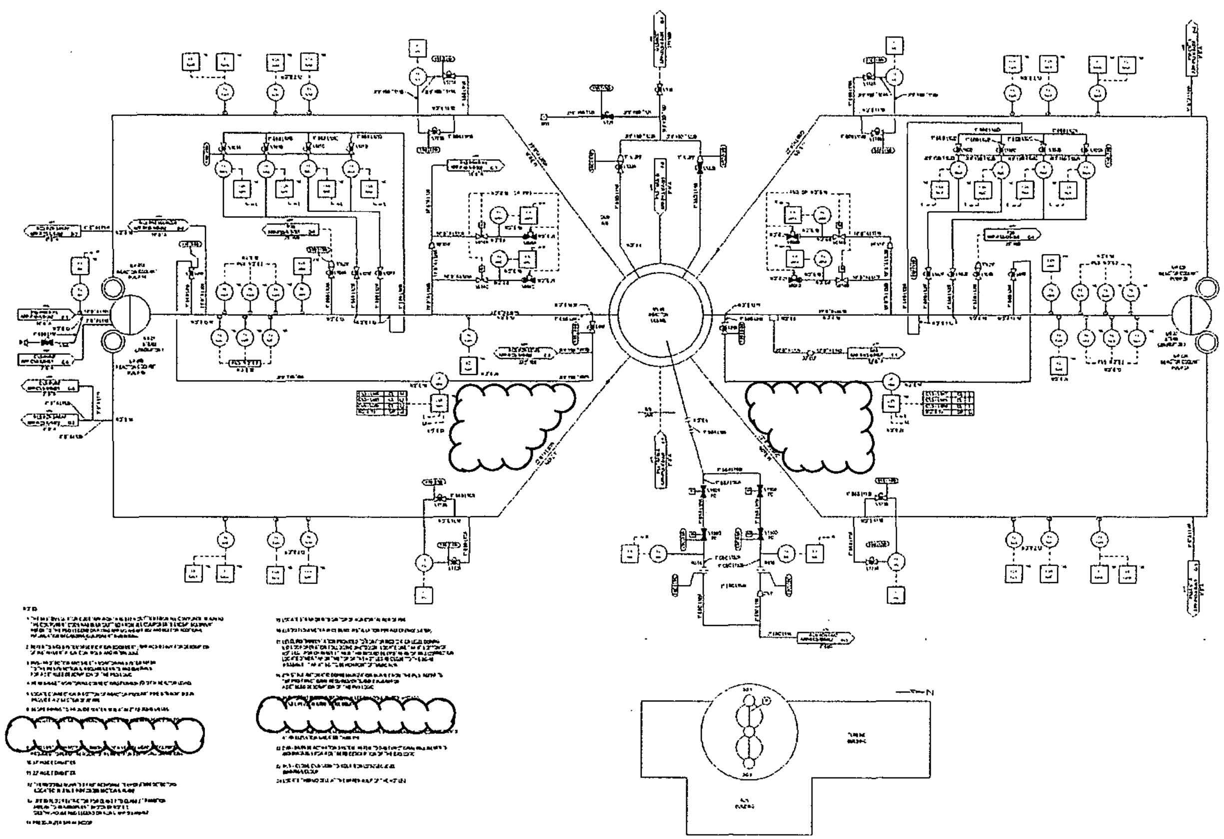
ENVIRONMENTALLY QUALIFIED ELECTRICAL AND MECHANICAL EQUIPMENT

Description	AP1000 Tag No.	Envir. Zone (Note 2)	Function (Note 1)	Operating Time Required (Note 5)	Qualification Program (Note 6)
SG1 Wide Range Level	SGS-JE-LT011	1	ESF PAMS	5 min 2 wks~~4 mos~~	E *
SG1 Wide Range Level	SGS-JE-LT012	1	ESF PAMS	5 min 2 wks~~4 mos~~	E *
SG1 Wide Range Level	SGS-JE-LT015	1	ESF PAMS	5 min 2 wks~~4 mos~~	E * E *
SG1 Wide Range Level	SGS-JE-LT016	1	ESF PAMS	5 min 2 wks~~4 mos~~	E * E *
SG2 Wide Range Level	SGS-JE-LT013	1	ESF PAMS	5 min 2 wks~~4 mos~~	E *
SG2 Wide Range Level	SGS-JE-LT014	1	ESF PAMS	5 min 2 wks~~4 mos~~	E *
SG2 Wide Range Level	SGS-JE-LT017	1	ESF PAMS	5 min 2 wks~~4 mos~~	E *
SG2 Wide Range Level	SGS-JE-LT018	1	ESF PAMS	5 min 2 wks~~4 mos~~	E *
Spent Fuel Pool Level	SFS-JE-LT019A	11	PAMS	2 wks	E **
Spent Fuel Pool Level	SFS-JE-LT019B	11	PAMS	2 wks	E **
Spent Fuel Pool Level	SFS-JE-LT019C	11	PAMS	2 wks	E **
Air Storage Tank Pressure – A	VES-JE-PT001A	7	PAMS	2 wks	E+
Air Storage Tank Pressure – B	VES-JE-PT001B	7	PAMS	2 wks	E+
Containment Pressure Normal Range	PCS-JE-PT005	7~~1~~	ESF PAMS	5 min 4 mos	E *
Containment Pressure Normal Range	PCS-JE-PT006	7~~1~~	ESF PAMS	5 min 4 mos	E *
Containment Pressure Normal Range	PCS-JE-PT007	7~~1~~	ESF PAMS	5 min 4 mos	E *
Containment Pressure Normal Range	PCS-JE-PT008	7~~1~~	ESF PAMS	5 min 4 mos	E *
Containment Pressure Extended Range	PCS-JE-PT012	7~~1~~	PAMS	4 mos	E *
Containment Pressure Extended Range	PCS-JE-PT013	7~~1~~	PAMS	4 mos	E *
Containment Pressure Extended Range	PCS-JE-PT014	7~~1~~	PAMS	4 mos	E *

Table 3D.4-2

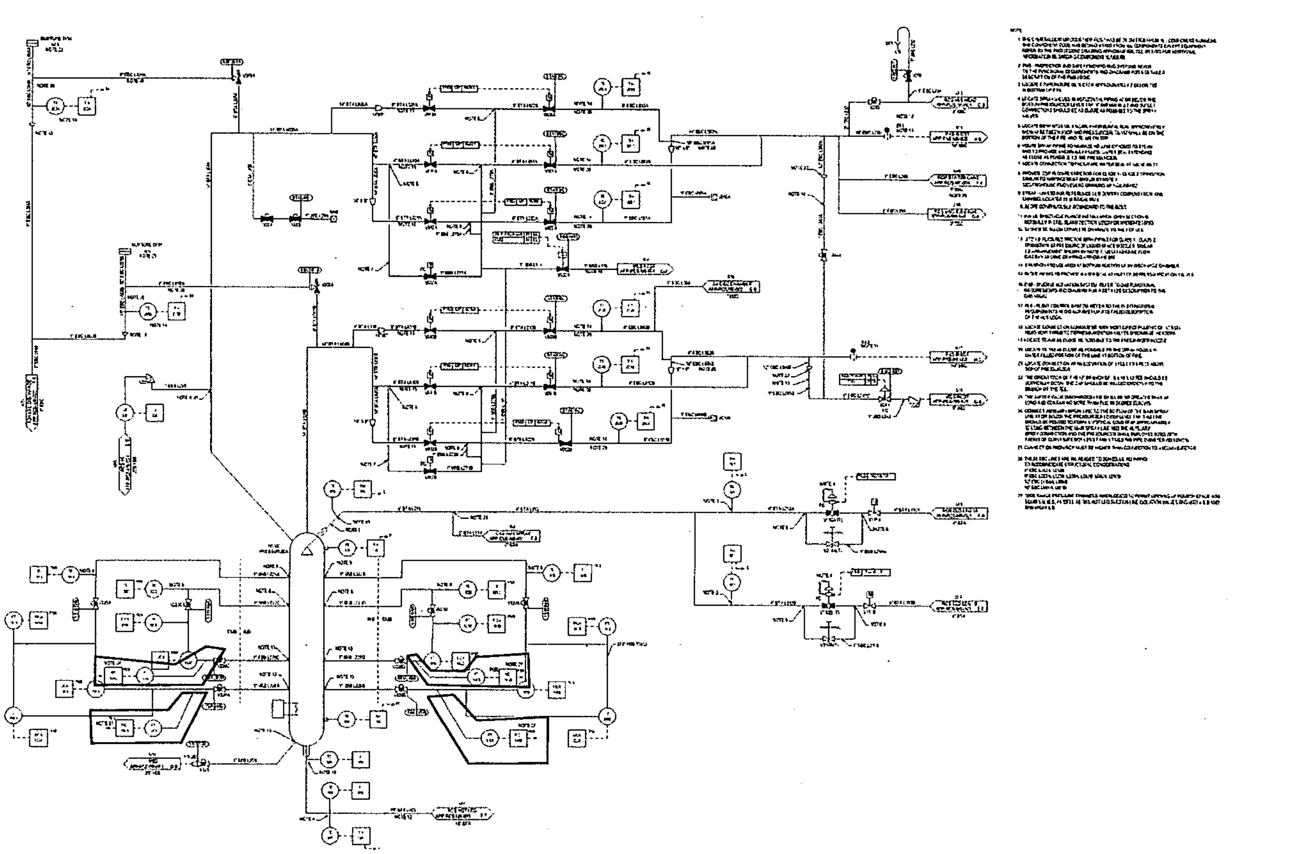
EQUIPMENT POST-ACCIDENT OPERABILITY TIMES

Equipment	Required Post-Accident Operability	
Equipment necessary to perform trip functions	5 minutes	(Envelops trip time requirements)
Equipment located outside containment, is accessible, and can be repaired, replaced, or recalibrated	2 weeks	
Equipment located inside containment that is inaccessible and is required for post-accident monitoring	4 months	(This number is based on an acceptable amount of time to be repaired, replaced, or recalibrated, or for an equivalent indication to be obtained.)
Equipment located inside containment, is inaccessible, or cannot be repaired, replaced, recalibrated or equivalent indication cannot be obtained	1 year	
Equipment in a location that will have a mild environment following an accident or equipment that does not provide information for a Type A, B, or C primary post-accident monitoring parameter~~located in a mild environment following an accident~~	Various	(Specific as to function, maximum of 1 year)



Inside Reactor Containment
Figure 5.1-5 (Sheet 1 of 3)

Reactor Coolant System
Piping and Instrumentation Diagram



Inside Reactor Containment
Figure 5.1-5 (Sheet 2 of 3)

Reactor Coolant System
Piping and Instrumentation Diagram

For the LOCA events, two double-ended guillotine reactor coolant system pipe breaks are analyzed. The breaks are postulated to occur in either a hot or a cold leg of the reactor coolant system. The hot leg break results in the highest blowdown peak pressure. The cold leg break results in the higher post-blowdown peak pressure. The cold leg break analysis includes the long term contribution to containment pressure from the sources of stored energy, such as the steam generators. The LOCA mass and energy releases described in subsection 6.2.1.3 are used for these calculations.

For the MSLB event, a representative pipe break spectrum is analyzed. Various break sizes and power levels are analyzed with the WGOTHIC code. The MSLB mass and energy releases described in subsection 6.2.1.4 are used for these calculations.

The results of the LOCA and MSLB postulated accidents are provided in Table 6.2.1.1-1. A comparison of the containment integrity acceptance criteria to General Design Criteria is provided in Table 6.2.1.1-3.

The containment pressure response for the peak pressure steam line break case is provided in Figure 6.2.1.1-1. The containment temperature response for the peak temperature steam line break case is provided in Figure 6.2.1.1-2.

The passive internal containment heat sink data used in the WGOTHIC analyses is presented in Reference 20, Section 13. Data for both metallic and concrete heat sinks are presented. The containment pressure and temperature responses to a double-ended cold leg guillotine are presented in Figures 6.2.1.1-5 and 6.2.1.1-6 for the 24 hour portion of the transient and Figures 6.2.1.1-7 and 6.2.1.1-8 for the 72 hour transient. A separate analysis for the double-ended cold leg guillotine LOCA event, without considering heat conduction from the dry to wet section, results in somewhat higher containment pressure in the long term, but still below 50 percent of design pressure at 24 hours. This separate analysis confirms the assumption in subsection 15.6.5.3.3 of reducing the containment leakage to half its design value at 24 hours. The containment pressure and temperature response to a double-ended hot leg guillotine break are presented in Figures 6.2.1.1-9 and 6.2.1.1-10. The physical properties of the materials corresponding to the heat sink information are presented in Table 6.2.1.1-8.

The instrumentation provided ~~inside~~ outside containment to monitor and record the containment pressure and the instrumentation provided inside containment to monitor and record temperature ~~is~~ are found in Section 7.5.

6.2.1.1.4 External Pressure Analysis

Certain design basis events and credible inadvertent systems actuation have the potential to result in containment external pressure loads. Evaluations of these events show that a loss of all ac power sources~~n inadvertent actuation of active containment cooling~~ during extreme cold ambient conditions has the potential for creating the worst-case external pressure load on the containment vessel. This event leads to a ~~temperature~~ reduction ~~with~~in the internal containment heat loads from the reactor coolant system and other active components. This results in a temperature reduction within the containment and an accompanying pressure reduction. Evaluations are performed to determine the design~~maximum~~ external pressure for~~to~~ which the containment is analyzed based on ~~may be subjected during~~ a postulated loss of all ac power sources~~actuation of active containment cooling~~.

Testing is not required on any subcompartment vent or on the collection of condensation from the containment shell. The collection of condensate from the containment shell and its use in leakage detection are discussed in subsection 5.2.5.

6.2.1.7 Instrumentation Requirements

Instrumentation is provided to monitor the conditions inside the containment and to actuate the appropriate engineered safety features, should those conditions exceed the predetermined levels. The instruments measure the containment pressure, containment atmosphere radioactivity, and containment hydrogen concentration. Instrumentation to monitor reactor coolant system leakage into containment is described in subsection 5.2.5.

The containment pressure is measured by four independent pressure transmitters. The signals are fed into the engineered safety features actuation system, as described in subsection 7.3.1. Upon detection of high pressure inside the containment, the appropriate safety actuation signals are generated to actuate the necessary safety-related systems. Low pressure is alarmed but does not actuate the safety-related systems.

The physically separated pressure transmitters are located ~~inside~~ outside the containment. Section 7.3 provides a description.

The containment atmosphere radiation level is monitored by four independent area monitors located above the operating deck inside the containment building. The measurements are continuously fed into the engineered safety features actuation system logic. Section 11.5 provides information on the containment area radiation monitors. The engineered safety features actuation system operation is described in Section 7.3.

The containment hydrogen concentration is measured by hydrogen monitors, as described in subsection 6.2.4. Hydrogen concentrations are monitored by three sensors distributed throughout containment to provide a representative indication of bulk containment hydrogen concentration.

These indications are used by the plant operators to monitor hydrogen concentrations. High hydrogen concentration is alarmed in the main control room.

6.2.2 Passive Containment Cooling System

The passive containment cooling system (PCS) is an engineered safety features system. Its functional objective is to reduce the containment temperature and pressure following a loss of coolant accident (LOCA) or main steam line break (MSLB) accident inside the containment by removing thermal energy from the containment atmosphere. The passive containment cooling system also serves as the means of transferring heat to the safety-related ultimate heat sink for other events resulting in a significant increase in containment pressure and temperature.

The passive containment cooling system limits releases of radioactivity (post-accident) by reducing the pressure differential between the containment atmosphere and the external environment, thereby diminishing the driving force for leakage of fission products from the containment to the atmosphere. This subsection describes the safety design bases of the

~~The passive containment cooling system components located inside containment, the containment pressure sensors, are tested and qualified to perform in a simulated design basis accident environment. These components are protected from effects of postulated jet impingement and pipe whip in case of a high energy line break.~~

There are four instrument lines that penetrate containment and are required to remain functional following an accident. The lines are used to sense the pressure of the containment atmosphere and convey it to pressure transmitters outside containment. The pressure transmitters, tubing, and pressure sensors inside containment comprise a sealed, fluid-filled assembly forming a double barrier between inside and outside containment. If the instrument line breaks outside containment, leakage of containment atmosphere is prevented by the pressure sensor and the sealed tubing boundary inside containment. If a break occurs inside containment, leakage is prevented by the transmitter and tubing boundary outside containment. The pressure sensors, tubing, and pressure transmitters are designed and tested for seismic Category I service.

The containment pressure analyses are based on an ambient air temperature of 115°F dry bulb and 86.1°F coincident wet bulb. The passive containment cooling water storage tank water temperature basis is 120°F. Results of the analyses are provided in subsection 6.2.1.

6.2.2.4 Testing and Inspection

6.2.2.4.1 Inspections

The passive containment cooling system is designed to permit periodic testing of system readiness as specified in the Technical Specifications.

The portions of the passive containment cooling system from the isolation valves to the passive containment cooling water storage tank are accessible and can be inspected during power operation or shutdown for leaktightness. Examination and inspection of the pressure retaining piping welds is performed in accordance with ASME Code, Section XI. The design of the containment vessel and air baffle retains provisions for the inspection of the vessel during plant shutdowns.

6.2.2.4.2 Preoperational Testing

Preoperational testing of the passive containment cooling system is verified to provide adequate cooling of the containment. The flow rates are confirmed at the minimum initial tank level, an intermediate step with all but one standpipe delivering flow and at a final step with all but two standpipes delivering to the containment shell. The flow rates are measured utilizing the differential pressure across the orifices within each standpipe and will be consistent with the flow rates specified in Table 6.2.2-1.

The containment coverage will be measured at the base of the upper annulus in addition to the coverage at the spring line for the full flow case using the PCS water storage tank delivering to the containment shell and a lower flow case with both PCS recirculation pumps delivering to the containment shell. For the low flow case, a throttle valve is used to obtain a low flow rate less than the full capacity of the PCS recirculation pumps. This flow rate is then re-established for subsequent tests using the throttle valve. These benchmark values will be used to develop

6.2.3.1 Design Basis

6.2.3.1.1 Safety Design Basis

A. The containment isolation system is protected from the effects of natural phenomena, such as earthquakes, tornadoes, hurricanes, floods, and external missiles (General Design Criterion 2).

B. The containment isolation system is designed to remain functional after a safe shutdown earthquake (SSE) and to perform its intended function following the postulated hazards of fire, internal missiles, or pipe breaks (General Design Criteria 3 and 4).

C. The containment isolation system is designed and fabricated to codes consistent with the quality group classification, described in Section 3.2. Conformance with Regulatory Guide 1.26, 1.29, and 1.32 is described in subsection 1.9.

D. The containment isolation system provides isolation of lines penetrating the containment for design basis events requiring containment integrity.

E. Upon failure of a main steam line, the containment isolation system isolates the steam generators as required to prevent excessive cooldown of the reactor coolant system or overpressurization of the containment.

F. The containment isolation system is designed in accordance with General Design Criterion 54.

G. Each line that penetrates the containment that is either a part of the reactor coolant pressure boundary or that connects directly to the containment atmosphere, and does not meet the requirements for a closed system (as defined in paragraph H below), is provided with containment isolation valves according to satisfies the requirements of General Design Criteria 55 and 56. For most lines, the safety design basis is isolation valve(s) in one of the configurations described in GDC 55 and GDC 56. The acceptable basis for isolation of instrument lines for containment pressure measurements is as specified in NUREG-0800, Standard Review Plan, Section 6.2.4:

"Regulatory Guide (RG) 1.11 describes acceptable containment isolation provisions for instrument lines. In addition, instrument lines closed both inside and outside containment are designed to withstand pressure and temperature conditions following a loss-of-coolant accident (LOCA) and dynamic effects are acceptable without isolation valves."

H. Each line that penetrates the containment, that is neither part of the reactor coolant pressure boundary nor connected directly to the atmosphere of the containment, and that satisfies the requirements of a closed system is provided with a containment isolation valve according to General Design Criterion 57. A closed system is not a part of the reactor coolant pressure boundary and is not connected directly to the atmosphere of the containment. A closed system also meets the following additional requirements:

- The system is protected against missiles and the effects of high-energy line break.

C. The containment isolation system is designed according to General Design Criterion 54. Leakage detection capabilities and leakage detection test program are discussed in subsection 6.2.5. Valve operability tests are also discussed in subsection 3.9.6. Redundancy of valves and reliability of the isolation system are provided by the other safety design bases stated in Section 6.2. Redundancy and reliability of the actuation system are covered in Section 7.3.

The use of motor-operated valves that fail as-is upon loss of actuating power in lines penetrating the containment is based upon the consideration of what valve position provides the plant safety. Furthermore, each of these valves, is provided with redundant backup valves to prevent a single failure from disabling the isolation function. Examples include: a check valve inside the containment and motor-operated valve outside the containment or two motor-operated valves in series, each powered from a separate engineered safety features division.

D. Lines that penetrate the containment and which are either part of the reactor coolant pressure boundary, connect directly to the containment atmosphere, or do not meet the requirements for a closed system are provided with one of the following valve arrangements conforming to the requirements of General Design Criteria 55 and 56, as follows:

- One locked-closed isolation valve inside and one locked-closed isolation valve outside containment
- One automatic isolation valve inside and one locked-closed isolation valve outside containment
- One locked-closed isolation valve inside and one automatic isolation valve outside containment. (A simple check valve is not used as the automatic isolation valve outside containment.)
- One automatic isolation valve inside and one automatic isolation valve outside containment. (A simple check valve is not used as the automatic isolation valve outside containment).

Isolation valves outside containment are located as close to the containment as practical. Upon loss of actuating power, air-operated automatic isolation valves fail closed.

In accordance with GDC 56, isolation of instrument lines for containment pressure transmitters is demonstrated on a different basis. The lines are closed inside and outside containment, and are designed to withstand pressure and temperature conditions following a loss-of-coolant accident (LOCA) and dynamic effects.

E. Each line penetrating the containment that is neither part of the reactor coolant pressure boundary nor connected directly to the containment atmosphere, and that satisfies the requirements of a closed system, has at least one containment isolation valve. This containment isolation valve is either automatic, locked-closed, or capable of remote-manual operation. The valve is outside the containment and located as close to the containment as

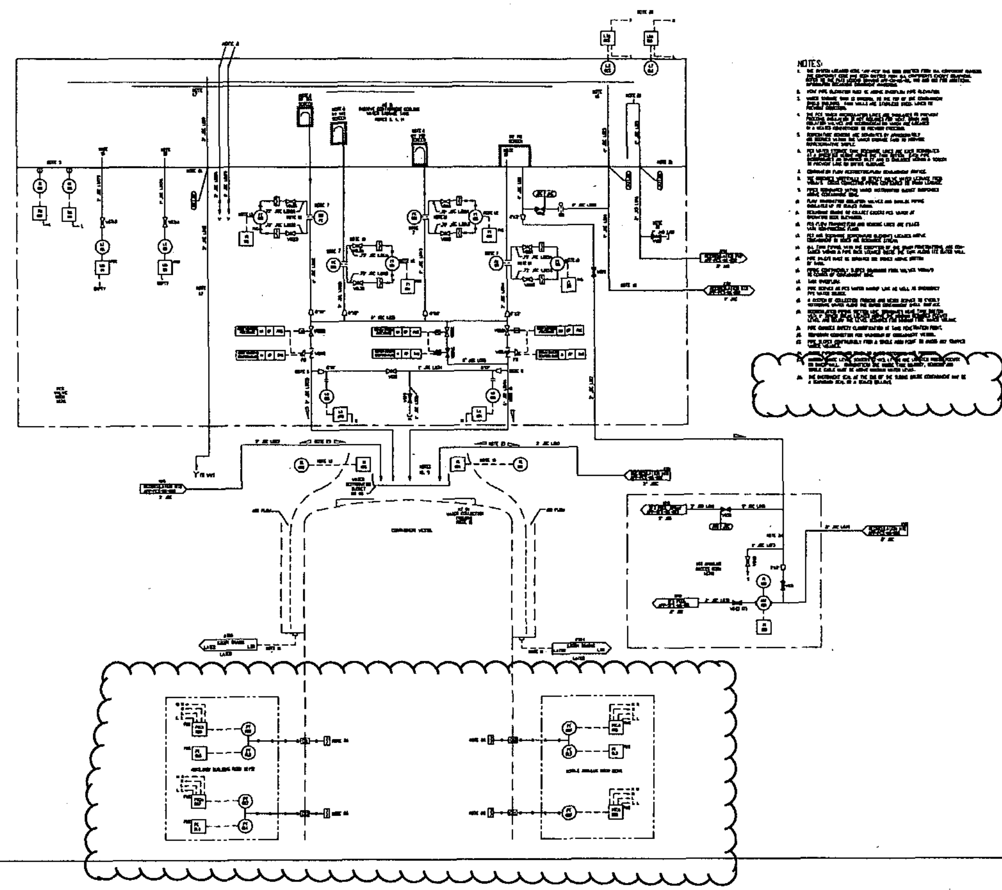


Figure 6.2.2-1 (Sheet 1 of 2)

Passive Containment Cooling System
Piping and Instrumentation Diagram
(REF) PCS 001

Table 7.5-1 (Sheet 3 of 12)

POST-ACCIDENT MONITORING SYSTEM

Variable	Range/ Status	Type/ Category	Qualification		Number of Instruments Required	Power Supply	QDPS Indication (Note 2)	Remarks
			Environmental	Seismic				
Startup feedwater flow	0-600 gpm	F2	Mild	Yes	1/steam generator (Note 11)	1E	No	
Startup feedwater control valve status	Open/ Closed	D2, F3	Harsh	Yes	1/valve (Note 7)	1E	Yes	
Containment pressure	-5 to 10 psig	B1, C2, D2, F2	~~Harsh~~Mild	Yes	3 (Note 4)	1E	Yes	
Containment pressure (extended range)	0 to 240 psig	C1	~~Harsh~~Mild	Yes	3 (Note 4)	1E	Yes	
Containment area radiation (high range)	10^0-10^7 R	C1, E2, F2	Harsh	Yes	3 (Note 4)	1E	Yes	
Reactor vessel hot leg water level	0-100% of span	B2, B3	Harsh	Yes	1	1E	Yes	Two instruments are provided
Plant vent radiation level	(Note 3)	C2, E2	Mild	None	1	Non-1E	No	
Remotely operated containment isolation valve status	Open/ Closed	B1, D2	Harsh/mild	Yes	1/valve (Note 7)	1E	Yes	Separate divisions on series valves
Boundary environs radiation	N/A	C3, E3	None	None	N/A	Non-1E	No	Site specific
Hydrogen concentration	0-20%	C3	None	None	1	Non-1E	No	Three instruments are provided

9A.3.1.1.2 Fire Zone 1100 AF 11204

This fire zone is comprised of the following room(s):

Room No.

11104	Reactor coolant drain tank room
11204	Vertical access area

Safe Shutdown Evaluation

The quantity and arrangement of the combustible materials in this fire zone, and the characteristics of the barriers that separate this zone from other fire zones are such that a fire which damages safe shutdown components in this zone does not propagate to the extent that it damages redundant safe shutdown components in another fire zone.

The quantity of combustible materials in this fire zone is very low, consisting primarily of cable insulation associated with the instrumentation in this zone. The cable raceways are located against one structural concrete wall of the fire zone and in the reactor coolant drain tank room at the bottom of the fire zone. The floor of this fire zone is solid concrete at the bottom of containment. Thick concrete walls separate this fire zone from adjacent fire zones, except for access passageways to and from the steam generator compartments (fire zones 1100 AF 11301/11302). Steel grating and the vertical access stairway form the boundary between this fire zone and the maintenance floor above (fire zone 1100 AF 11300B). There is a doorway between the reactor coolant drain tank room and the bottom of the reactor cavity (fire zone 1100 AF 11105) that is closed.

Smoke and hot gases from a fire in this fire zone rise through the grating at the top of the vertical access area and spread through the large maintenance floor air space (fire zones 1100 AF 11300A and B). They are cooled by mixing with the air and by contact with structural surfaces and thus do not cause propagation of the fire beyond this fire zone. Safe shutdown components listed in Table 9A-2 for the adjacent fire zones are not susceptible to damage by the diluted and cooled smoke and gases from this fire zone.

~~Table 9A-2 lists the safe shutdown components contained in this fire zone. Although it is unlikely that all of the components would be damaged, a fire in this fire zone is conservatively assumed to disable the passive core cooling system containment floodup level and reactor coolant system hot leg instrumentation. The redundant reactor coolant system hot leg instrumentation located in 1100 AF 11206 and passive core cooling system floodup level instrumentation located in 1100 AF 11105 are sufficient to perform the applicable functions to achieve and maintain safe shutdown.~~

<u>There are no safe shutdown components in this fire zone.</u> No fire in this zone can cause spurious actions which could cause a breach in the reactor coolant boundary or defeat safety-related decay heat removal capability or cause an increase in shutdown reactivity of the reactor.

9A.3.1.1.3 Fire Zone 1100 AF 11206

This fire zone is comprised of the following room(s):

Room No.

11206 Passive core cooling system valve/accumulator room A

Safe Shutdown Evaluation

The quantity and arrangement of the combustible materials in this fire zone, and the characteristics of the barriers that separate this zone from other fire zones are such that a fire which damages safe shutdown components in this zone does not propagate to the extent that it damages redundant safe shutdown components in another fire zone.

The quantity of combustible materials in this fire zone is very low, consisting primarily of cable insulation related to the valves located in this fire zone. There are no significant concentrations of combustible materials. This fire zone is physically separated from other fire zones by walls, floor and ceiling with minimum concrete thicknesses of one foot, except for an access hatch and a small CMT pipe penetration in the ceiling. The penetration is beneath core makeup tank A, located on the maintenance floor (fire zone 1100 AF 11300A).

Smoke and hot gases from a fire in this fire zone rise through the CMT pipe penetration and access hatch and spread through the large maintenance floor air space (fire zones 1100 AF 11300A and B). They are cooled by mixing with the air and by contact with structural surfaces and thus do not cause propagation of the fire beyond this fire zone. Safe shutdown components listed in Table 9A-2 for the adjacent fire zones are not susceptible to damage by the diluted and cooled smoke and gases from this fire zone.

Table 9A-2 lists the safe shutdown components contained in this fire zone. A fire in this fire zone is conservatively assumed to disable control of all of the valves and instrumentation in this fire zone. The passive core cooling system safe shutdown components located in fire zones 1100 AF 11207 and 1100 AF 11300B are redundant to those in this fire zone, and are sufficient to perform applicable functions to achieve and maintain safe shutdown. The spent fuel pool cooling system containment isolation valve located outside the containment fire area is redundant to the containment isolation valve inside containment in this fire zone and is sufficient to maintain containment integrity.

~~Redundant reactor coolant hot leg instruments in fire zone 1100 AF 11204 provide the operator with information required to take corrective action during reduced inventory operation.~~

No fire in this zone can cause spurious actions which could cause a breach in the reactor coolant boundary or defeat safety-related decay heat removal capability or cause an increase in shutdown reactivity of the reactor.

fire can prevent operation of the second valve. These valves are qualified to operate with elevated temperatures of 340°F.

Although the consequences of a fire are expected to be very limited, a fire in this fire zone is conservatively assumed to eventually disable all of the safe shutdown components in this fire zone.

The redundant passive core cooling system, ~~passive containment cooling system~~ and steam generator system safe shutdown components (listed in Table 9A-2), located in fire zones 1100 AF 11207 and 1100 AF 11300B, are sufficient to perform applicable functions to achieve and maintain safe shutdown.

The primary sampling system and containment air filtration system containment isolation valves, located outside the containment fire area, are redundant to the containment isolation valves in this fire zone and are sufficient to maintain containment integrity.

The redundant reactor coolant system hot leg flow instrumentation located in fire zones 1100 AF 11300B and 1100 AF 11301 is sufficient to perform applicable functions to achieve and maintain safe shutdown.

No fire in this zone can cause spurious actions which could cause a breach in the reactor coolant boundary or defeat safety-related decay heat removal capability or cause an increase in shutdown reactivity of the reactor.

9A.3.1.1.8 Fire Zone 1100 AF 11300B

This fire zone is comprised of the following room(s):

Room No.	
11300	Maintenance floor (northern part)
11400	Maintenance floor mezzanine (northern part)

Safe Shutdown Evaluation

The quantity and arrangement of the combustible materials in this fire zone, and the characteristics of the barriers that separate this zone from other fire zones are such that a fire which damages safe shutdown components in this zone does not propagate to the extent that it damages redundant safe shutdown components in another fire zone.

The quantity of combustible materials in this fire zone is low, consisting primarily of cable insulation in the termination boxes and cable trays. There is a concentration of cables on the south side of the zone near the refueling cavity and small concentrations of cables at the top of the zone and at several locations along the walls. This fire zone is physically separated from fire zones below by the maintenance floor, which has a concrete thickness of more than one foot, except for access stairways and hatches. This fire zone is separated from the operating deck above (fire zone 1100 AF 11500) by a ceiling that has a concrete thickness of more than one foot, except for several openings for an access stairway, elevator, hatches and blockouts. The walls of this fire provided near each valve. The only combustibles in the area are the valves themselves and their cables. A fire that would affect these valves would be expected to start at one of the valves. The barrier protects the other valve from the initial effects of the fire. The fire detectors would alert the operators and allow them to actuate the other valve before the fire could spread and damage it. These valves are qualified to operate with elevated temperatures of 340°F.

Reactor coolant system, and steam generator system instrumentation located in this fire zone are conservatively assumed to be disabled as a result of a fire in this fire zone. The redundant passive core cooling system instrumentation, ~~and the passive containment cooling system,~~ reactor coolant system pressurizer, and steam generator system instrumentation located in fire zones 1100 AF 11206, 1100 AF 11300A, 1100 AF 11301, and 1100 AF 11500 are sufficient to perform the applicable functions to achieve and maintain safe shutdown.

Reactor coolant system temperature instrumentation located in fire zones 1000 AF 11301 and 1000 AF 11302 are sufficient to provide the monitoring function accomplished by the passive residual heat removal heat exchanger flow instrumentation located in this fire zone.

The reactor coolant system to chemical and volume control system stop valves located in this fire zone are conservatively assumed to be disabled as a result of a fire in this fire zone. The chemical and volume control system containment isolation valves located outside of this fire zone provide backup isolation capability to maintain the reactor coolant pressure boundary.

The redundant reactor coolant system hot leg flow instrumentation located in fire zones 1100 AF 11300A and 1100 AF 11301 is sufficient to perform applicable functions to achieve and maintain safe shutdown.

The chemical and volume control system and the liquid radwaste system containment isolation valves located outside the containment fire area are redundant to the containment isolation valves inside containment in this fire zone and are sufficient to perform the applicable functions to maintain containment integrity.

The redundant steam line pressure instruments located in fire area 1201 AF 05 for steam generator 1 and in fire area 1201 AF 06 for steam generator 2 are sufficient to perform the applicable functions to achieve and maintain safe shutdown.

The redundant core exit thermocouples located in fire zone 1100 AF 11500 are sufficient to provide the applicable safe shutdown monitoring function.

No fire in this zone can cause spurious actions which could cause a breach in the reactor coolant boundary or defeat safety-related decay heat removal capability or cause an increase in shutdown reactivity of the reactor.

The redundant reactor coolant system hot leg/cold leg instrumentation located in fire zone 1100 AF 11302, and redundant ~~reactor coolant system pressurizer and~~ steam generator system steam generator level instrumentation located in 1100 AF 11300B are sufficient to perform applicable functions to achieve and maintain safe shutdown.

The four divisions of reactor coolant system/reactor coolant pump bearing water temperature instrumentation are assumed to be disabled and would not be available to detect and provide a trip signal on a loss of component cooling water to the pump. If the fire in this fire zone does not disable the pump, the component cooling water flow to the pump will be unaffected by the fire and will continue to provide cooling water to the pump bearings until the pump is tripped by other means.

The reactor coolant system reactor coolant pump shaft speed instruments are conservatively assumed to be disabled. The redundant reactor coolant system hot leg flow instrumentation located in fire zones 1100 AF 11300A and 1100 AF 11300B is sufficient to perform applicable functions to achieve and maintain safe shutdown.

The four reactor coolant system reactor head vent valves are assumed to be disabled. If power is lost while in the closed position, the head vent valves will maintain reactor coolant pressure boundary integrity. Refer to subsection 9A.3.7.1.1 for a discussion on spurious actuation of reactor coolant system reactor head vent valves.

No fire in this zone can cause spurious actions which could cause a breach in the reactor coolant boundary or defeat safety-related decay heat removal capability or cause an increase in shutdown reactivity of the reactor.

9A.3.1.1.10 Fire Zone 1100 AF 11302

This fire zone is comprised of the following room(s):

Room No.	
11202	Steam generator compartment 2
11302	Steam generator 2 lower manway area
11402	Steam generator 2 tubesheet area
11502	Steam generator 2 operating deck
11602	Steam generator 2 feedwater nozzle area
11702	Steam generator 2 upper manway area

Safe Shutdown Evaluation

The quantity and arrangement of the combustible materials in this fire zone, and the characteristics of the barriers that separate this zone from other fire zones are such that a fire which damages safe shutdown components in this zone does not propagate to the extent that it damages redundant safe shutdown components in another fire zone.

The quantity of combustible materials in this fire zone is very low, consisting primarily of cable insulation related to the reactor coolant pump motors and other components in this fire zone.

the reactor vessel integrated head package. This fire zone encompasses much of the containment. It is physically separated from fire zones below by the operating deck or the bottom of the refueling cavity, which have a concrete thicknesses of more than one foot, except for penetrations described in the evaluations of fire zones below this fire zone. There also is a few inch clearance annulus around the entire operating deck. The walls of this fire zone are the steel containment vessel or walls with a concrete thickness of more than one foot, with exceptions as described earlier for fire zones 1100 AF 11301, 1100 AF 11302, 1100 AF 11303, and 1100 AF 11303A & B. The boundary of this fire zone also includes the 3-hour fire barriers that protect the division B and D containment penetrations on elevation 107'-2" and the associated raceways from these penetrations up to the operating deck. A fire does not propagate beyond this fire zone to the extent that it damages redundant safe shutdown components in another fire zone.

Smoke and hot gases from a fire in this fire zone rise into the large air space above the operating deck. They are cooled by mixing with the air and by contact with structural surfaces and thus do not cause propagation of the fire beyond this fire zone. Safe shutdown components listed in Table 9A-2 for the adjacent fire zones are not susceptible to damage by the diluted and cooled smoke and gases from this fire zone.

Table 9A-2 lists the safe shutdown components located in this fire zone. Although the consequences of a fire are expected to be very limited, a fire in this fire zone is conservatively assumed to disable all of the safe shutdown components in this fire zone.

Control of all division B and D components in the containment is conservatively assumed to be disabled. The primary division A and C electrical cables that provide power supply to safe shutdown components in containment are located in 1100 AF 11300B and are sufficient to perform the applicable functions to achieve and maintain safe shutdown.

The in-core instrumentation system core exit temperature instrument termination cabinets located in this fire zone are conservatively assumed to be disabled as a result of a fire in this fire zone. The reactor coolant system hot leg temperature (wide range) instrumentation located in fire zones 1100 AF 11301 and 1100 AF 11302 provide a diverse means of observing temperature conditions in the reactor vessel to support the safe shutdown process.

The reactor coolant system narrow range level instrumentation is conservatively assumed to be disabled. The redundant reactor coolant system narrow range level instrumentation located in fire zone 1100 AF 11300B is sufficient to perform the applicable functions to achieve and maintain safe shutdown.

The central chilled water system containment isolation valve located outside the containment fire area is redundant to the containment isolation valve inside containment in this fire zone and is sufficient to perform the applicable functions to maintain containment integrity.

The redundant reactor coolant system pressurizer instrumentation and redundant reactor coolant system hot leg instrumentation located in 1100 AF 11300B are sufficient to perform applicable functions to achieve and maintain safe shutdown.

No fire in this zone can cause spurious actions which could cause a breach in the reactor coolant boundary or defeat safety-related decay heat removal capability or cause an increase in shutdown reactivity of the reactor.

9A.3.1.1.15 Fire Zone 1200 AF 12341

This fire zone is comprised of the following room(s):

Room No.	
12341	Middle annulus

Safe Shutdown Evaluation

The quantity and arrangement of the combustible materials in this fire zone, and the characteristics of the barriers that separate this zone from other fire zones are such that a fire does not propagate to or from this fire zone.

The quantity of combustible materials in this fire zone is low, consisting primarily of cable insulation in the non-Class 1E electrical penetration assemblies, located in the northeast quadrant of the fire zone. The Class 1E electrical penetration assemblies also pass through this fire zone, but are enclosed by 3-hour fire barriers and are considered extensions of the associated Class 1E divisional fire areas on the other side of the shield building wall. This fire zone is physically separated from other fire zones by the steel wall of containment and by the steel and concrete vessel stiffener and flexible ventilation seal above, and it is separated from adjacent fire areas by the walls and floor of the shield building, which have concrete thicknesses of more than one foot, and the 3-hour fire barriers enclosing the Class 1E electrical penetrations. The access doorway to the middle annulus fire zone is closed by a door.

The radiologically controlled area ventilation system serves this fire area on a once-through basis. Smoke and hot gases are confined in this fire zone following automatic closure of the fire dampers on high temperature, while the balance of the radiologically controlled area ventilation system continues to operate at the discretion of the operator. There is no propagation of the fire beyond this fire zone. Smoke and gases are removed from the fire zone by reopening the fire dampers after a fire. The radiologically controlled area ventilation system exhausts the smoke and gases to the atmosphere.

Table 9A-2 lists the safe shutdown components located in this fire zone. The redundant passive containment cooling system safe shutdown components located in fire zone 1200 AF 01 are sufficient to perform applicable functions to achieve and maintain safe shutdown. ~~There are no safe shutdown components in this fire zone.~~ The Class 1E electrical penetrations are separated from this fire zone by 3-hour fire barriers and are part of the associated divisional fire areas outside the shield building.

No fire in this zone can cause spurious actions which could cause a breach in the reactor coolant boundary or defeat safety-related decay heat removal capability or cause an increase in shutdown reactivity of the reactor.

The redundant passive containment cooling system safe shutdown components located in fire zone 1200 AF 12341 are sufficient to perform applicable functions to achieve and maintain safe shutdown.

Following detection of a fire in the non-Class 1E equipment/penetration room, the operators can close the automatic depressurization system stage 4 block valves, then remove DAS actuation power. This operator action will prevent spurious actuation of squib valves resulting from multiple hot shorts in the non-Class 1E equipment/penetration room.

Neither a fire nor fire suppression activities in this fire area affect the safe shutdown capability of components located in adjacent fire areas.

No fire in this fire area can cause spurious actions which could cause a breach in the reactor coolant boundary or defeat safety-related decay heat removal capability or cause an increase in shutdown reactivity of the reactor.

9A.3.1.3.1.2 Fire Area 1200 AF 02

This fire area is subdivided into the following fire zones:

Fire Zone	Room No.	
• 1200 AF 12562	12462	Cask washdown pit
• 1200 AF 12562	12463	Cask loading pit
• 1200 AF 12562	12472	New fuel storage pit
• 1200 AF 12562	12563	Spent fuel storage pool
• 1200 AF 12562	12564	Fuel transfer canal
• 1230 AF 12371	12371	Rail car bay/filter storage area
• 1230 AF 12371	12374	Waste disposal container area
• 1236 AF 12372	12372	Resin transfer pump/valve room
• 1236 AF 12373	12373	Spent resin tank room
• 1246 AF 12471	12471	Solid waste system valve/piping area

The spent fuel storage pool, spent fuel handling systems and components, and the solid radwaste rooms normally contain radioactive material.

Fire Detection and Suppression Features

- Fire detectors
- Wet pipe sprinklers (Fire Zone 1230 AF 12371, room 12371 rail car bay only)
- Hose station(s)
- Portable fire extinguishers

Smoke Control Features

The radiologically controlled area ventilation system serves this fire area on a once-through basis. In the event of a fire the system continues to ventilate the fire area unless the operator decides to

Table 9A-2 (Sheet 1 of 14)

SAFE SHUTDOWN COMPONENTS

Fire Area/ Fire Zone	System	Description	Class 1E Division			
			A	C	B	D
1000 AF 01/ 1100 AF 11105	RCS	Reactor Vessel (MV-01)				
	RXS	Source Range Excore Detectors	NE-001A	NE-001C	NE-001B	NE-001D
		Intermediate Range Excore Detectors	NE-002A	NE-002C	NE-002B	NE-002D
		Power Range Excore Detectors (Lower)	NE-003A	NE-003C	NE-003B	NE-003D
		Power Range Excore Detectors (Upper)	NE-004A	NE-004C	NE-004B	NE-004D
1000 AF 01/ 1100 AF 11204	~~RCS~~	~~Hot Leg 1 Wide Range Pressure~~None	~~PT-140A~~	~~PT-140C~~		
1000 AF 01/ 1100 AF 11206	PXS	Core Makeup Tank A Discharge Isolation Valve			V015A	V014A
	SFS	Suction Line Containment Isolation Valve			V034	
	~~RCS~~	~~Hot Leg 2 Wide Range Pressure~~			~~LT-140B~~	~~PT-140D~~
1000 AF 01/ 1100 AF 11207		Core Makeup Tank B Discharge Isolation Valve	V015B	V014B		
1000 AF01/ 1100 AF 11208	RNS	Suction from IRWST Cont. Isolation Valve			V023	
		Return from CVS Cont. Isolation Valve			V061	

Table 9A-2 (Sheet 2 of 14)

SAFE SHUTDOWN COMPONENTS

Fire Area/ Fire Zone	System	Description	Class 1E Division			
			A	C	B	D
1000 AF 01/ 1100 AF 11300A	PSS	Containment Air Sample Cont. Isolation Valve			V008	
		Liquid Sample Line Cont. Isolation Valve			V010A	V010B
	RCS	Hot Leg 2 Flow			FT-102B	FT-102D
	VFS	Containment Purge Discharge Cont. Isolation Valve				V009
	VFS	Containment Purge Inlet Cont. Isolation Valve				V004
	PXS	IRWST Level			LT-046	LT-048
		IRWST Gutter Isolation Valve			V130A	V130B
		Core Makeup Tank (MT-02A)				
	~~PCS~~	~~Containment Pressure~~			~~PT-006~~	~~PT-008~~
	SGS	Steam Generator 2 Wide Range Level			LT-014	LT-018
1000 AF 01/ 1100 AF 11300B	CCS	Outlet Line Cont. Isolation Valve	V207			
	CVS	Letdown Containment Isolation Valve	V045			
		Makeup Line Cont. Isolation Valve	V091			
		RCS Purification Stop Valve (RCPB)	V001	V002		

Table 9A-2 (Sheet 3 of 14)

SAFE SHUTDOWN COMPONENTS

Fire Area/ Fire Zone	System	Description	Class 1E Division			
			A	C	B	D
1000 AF 01/ 1100 AF 11300B	IDS	Class 1E Electrical Penetrations	EY-P11Z	EY-P27Z		
		Class 1E Electrical Penetrations	EY-P12Y	EY-P29Y		
		Class 1E Electrical Penetrations	EY-P13Y	EY-P28Y		
		Class 1E Cable Trays	Note 1	Note 1		
	~~PCS~~	~~Containment Pressure~~	~~PT-005~~	~~PT-007~~		
	PXS	PRHR Heat Exchanger Control Valve		V108B	V108A	
		IRWST Level	LT-045	LT-047		
		Core Makeup Tank (MT-02B)				
	RCS	Pressurizer Pressure	PT-191A	PT-191C		
		Reference Leg Temperature	TE-193A	TE-193C		
		Pressurizer Level	LT-195A	LT-195C		
		PRHR Heat Exchanger Outlet Temperature		TE-161		
		Hot Leg 1 Flow	FT-101A	FT-101C		
		Hot Leg 2 Flow	FT-102A	FT-102C		
		Hot Leg 1 Wide Range Pressure	PT-140A	PT-140C		
	SGS	Steam Generator 1 Narrow Range Level	LT-001	LT-003		
		Steam Generator 2 Narrow Range Level	LT-005	LT-007		
		Steam Generator 2 Wide Range Level	LT-013	LT-017		

Table 9A-2 (Sheet 5 of 14)

SAFE SHUTDOWN COMPONENTS

Fire Area/ Fire Zone	System	Description	Class 1E Division A	C	B	D
			A	C	B	D
1000 AF 01/ 1100 AF 11301	RCS	Hot Leg 1 Temperature (Wide Range)		TE-135A		
		~~Pressurizer Pressure~~			~~PT-191B~~	~~PT-191D~~
		Reference Leg Temperature			TE-193B	TE-193D
		~~Pressurizer Level~~			~~LT-195B~~	~~LT-195D~~
		RCP Shaft Speed	ST-281	ST-282		
		Hot Leg 1 Flow			FT-101B	FT-101D
	SGS	Steam Generator 1 Wide Range Level			LT-012	LT-016
1000 AF 01/ 1100 AF 11302	RCS	RCP 2A Bearing Water Temperature	TE-213A	TE-213C	TE-213B	TE-213D
		RCP 2B Bearing Water Temperature	TE-214A	TE-214C	TE-214B	TE-214D
		Cold Leg 2B Temperature (Narrow Range)	TE-122A			TE-122D
		Cold Leg 2A Temperature (Narrow Range)		TE-122C	TE-122B	
		Cold Leg 2A Temperature (Wide Range)			TE-125B	
		Cold Leg 2B Temperature (Wide Range)				TE-125D
		Hot Leg 2 Temperature (Narrow Range)			TE-131B	TE-131D
		Hot Leg 2 Temperature (Narrow Range)			TE-132B	TE-132D
		Hot Leg 2 Temperature (Narrow Range)			TE-133B	TE-133D
		Hot Leg 2 Temperature (Wide Range)			TE-135B	
		RCP Shaft Speed			ST-283	ST-284

Table 9A-2 (Sheet 7 of 14)

SAFE SHUTDOWN COMPONENTS

Fire Area/ Fire Zone	System	Description	Class 1E Division A	C	B	D
1000 AF 01/ 1100 AF 11500	SGS	Steam Generator 1 Narrow Range Level			LT-002	LT-004
		Steam Generator 2 Narrow Range Level			LT-006	LT-008
	VWS	Fan Coolers Return Cont. Isolation Valve			V082	
	RCS	Hot Leg 2 Wide Range Pressure			PT-140B	PT-140D
		Pressurizer Pressure			PT-191B	PT-191D
		Pressurizer Level			LT-195B	LT-195D
1000 AF 01/ 1200 AF 12341	PCS	~~None~~Containment Pressure			PT-006	PT-008
1000 AF 01/ 1200 AF 12541	IDS	Class 1E Cables		Note 1	Note 1	
1000 AF 01/ 1270 AF 12701	IDS	Class 1E Cables		Note 1	Note 1	
	PCS	PCCWST Isolation Valve	V001A	V001C	V001B	
		PCCWST Series Isolation Valve	V002A	V002C	V002B	
		PCS Water Delivery Flow		FT-001	FT-002	
		PCS Water Delivery Flow			FT-003	
		PCS Storage Tank Level		LT-010	LT-011	
1200 AF 01	IDS	Class 1E Cable Trays	Note 1	Note 1		
	SFS	Suction Line Cont. Isolation Valve	V035			
	VFS	Containment Purge Inlet Cont. Isolation Valve	V003			

Table 9A-2 (Sheet 8 of 14)

SAFE SHUTDOWN COMPONENTS

Fire Area/ Fire Zone	System	Description	Class 1E Division A	Class 1E Division C	Class 1E Division B	Class 1E Division D
1200 AF 01	PSS	Liquid Sample Line Cont. Isolation Valve	V011			
		Sample Return Line Cont. Isolation Valve	V023			
		Air Sample Line Cont. Isolation Valve	V046			
	SFS	Discharge Line Cont. Isol. Valve	V038			
	VFS	Containment Purge Discharge Cont. Isolation Valve	V010			
	RNS	Discharge Cont. Isolation Valve	V011			
		Suction Header Cont. Isolation Valve	V022			
	PCS	Containment Pressure	PT-005	PT-007		
1200 AF 03	IDS	Class 1E Cable Trays			Note 1	Note 1
1201 AF 02	IDSB	24 Hr Battery 1A			DB-1A	
		24 Hr Battery 1B			DB-1B	
		72 Hr Battery 2A			DB-2A	
		72 Hr Battery 2B			DB-2B	
		250 Vdc Distribution Panel			DD-1	
		208/120 Vac Distribution Panel			EA-1	
		208/120 Vac Distribution Panel			EA-2	
		208/120 Vac Distribution Panel			EA-3	
		250 Vdc Switchboard			DS-1	
		250 Vdc Switchboard			DS-2	
		208/120 Vac Inverter			DU-1	
		208/120 Vac Inverter			DU-2	

BASES

APPLICABLE SAFETY ANALYSES, LCOs, and APPLICABILITY (continued)

1.b. Containment Pressure – High 2

This signal provides protection against the following accidents:

- SLB inside containment;
- LOCA; and
- Feed line break inside containment.

The transmitters (d/p cells) and electronics are located ~~inside~~ outside of containment. Since the transmitters and electronics are located ~~inside~~ outside of containment, they will not experience adverse environmental conditions ~~and the trip setpoint reflects environmental instrument uncertainties~~. The Containment Pressure – High 2 setpoint has been specified as low as reasonable, without creating potential for spurious trips during normal operations, consistent with the TMI action item (NUREG-0933, Item II.E.4.2) guidance.

The LCO requires four channels of Containment Pressure – High 2 to be OPERABLE in MODES 1, 2, 3, and 4. Four channels are provided to permit one channel to be in trip or bypass indefinitely and still ensure no single random failure will disable this trip Function.

1.c. Pressurizer Pressure – Low

This signal provides protection against the following accidents:

- Inadvertent opening of a steam generator (SG) safety valve;
- SLB;
- A spectrum of rod cluster control assembly ejection accidents (rod ejection);
- Inadvertent opening of a pressurizer safety valve;
- LOCAs; and
- Steam Generator Tube Rupture (SGTR).

BASES

APPLICABLE SAFETY ANALYSES, LCOs, and APPLICABILITY (continued)

4.b. Containment Pressure – High 2

This Function actuates closure of the MSIVs in the event a SLB inside containment to limit the mass and energy release to containment and limit blowdown to a single SG.

The transmitters and electronics are located ~~inside~~ outside containment~~,~~; thus, they will not experience harsh environmental conditions ~~and the Trip Setpoint reflects environmental instrument uncertainties~~.

The Containment Pressure – High 2 setpoint has been specified as low as reasonable, without creating potential for spurious trips during normal operations, consistent with the TMI action item (NUREG-0933, Item II.E.4.2) guidance. The LCO requires four channels of Containment Pressure – High 2 to be OPERABLE in MODES 1, 2, 3, and 4, with any main steam valve open, when there is sufficient energy in the primary and secondary side to pressurize the containment following a pipe break. Four channels are provided to permit one channel to be in trip or bypass indefinitely and still ensure no single random failure will disable this trip Function. There would be a significant increase in the containment pressure, thus allowing detection and closure of the MSIVs. In MODES 5 and 6, there is not enough energy in the primary and secondary sides to pressurize the containment to the Containment Pressure – High 2 setpoint.

4.c. Steam Line Pressure

(1) Steam Line Pressure – Low

Steam Line Pressure – Low provides closure of the MSIVs in the event of an SLB to limit the mass and energy release to containment and limit blowdown to a single SG.

The LCO requires four channels of Steam Line Pressure – Low Function to be OPERABLE in MODES 1, 2, and 3 (above P-11, when the RCS boron concentration is below that necessary to meet the SDM requirements at an RCS temperature of 200°F), with any main steam isolation valve open, when a secondary side break or stuck open valve could result in the rapid

BASES

APPLICABLE SAFETY ANALYSES, LCOs, and APPLICABILITY (continued)

switches in the main control room, either of which will actuate containment cooling in all divisions. Manual Initiation of containment cooling also actuates containment isolation.

12.b. Containment Pressure – High 2

This signal provides protection against a LOCA or SLB inside containment. Four channels are provided to permit one channel to be in trip or bypass indefinitely and still ensure no single random failure will disable this trip Function.

The transmitters and electronics are located ~~inside~~ outside containment~~,~~; thus, they will not experience harsh environmental conditions ~~and the trip setpoint reflects only steady state instrument uncertainties associated with the containment environment~~. The Containment Pressure – High 2 setpoint has been specified as low as reasonable, without creating potential for spurious trips during normal operations, consistent with the TMI action item (NUREG-0933, Item II.E.4.2) guidance.

13. PRHR Heat Exchanger Actuation

The PRHR Heat Exchanger (HX) provides emergency core decay heat removal when the Startup Feedwater System is not available to provide a heat sink. PRHR is actuated when the discharge valves are opened in response to Steam Generator Narrow Range (NR) Level – Low coincident with Startup Feedwater Flow – Low, Steam Generator Wide Range (WR) Level – Low, ADS Stages 1, 2, and 3 Actuation, CMT Actuation, Pressurizer Water Level – High 3, or Manual Initiation.

13.a. Manual Initiation

Manual PRHR actuation is accomplished by either of two switches in the main control room. Either switch actuates all four ESFAC Divisions.

This Function is required to be OPERABLE in MODES 1, 2, 3, and 4, and MODE 5 with the RCS pressure boundary intact. This ensures that PRHR can be actuated in the event of a loss of the normal heat removal systems.

Change Number 66

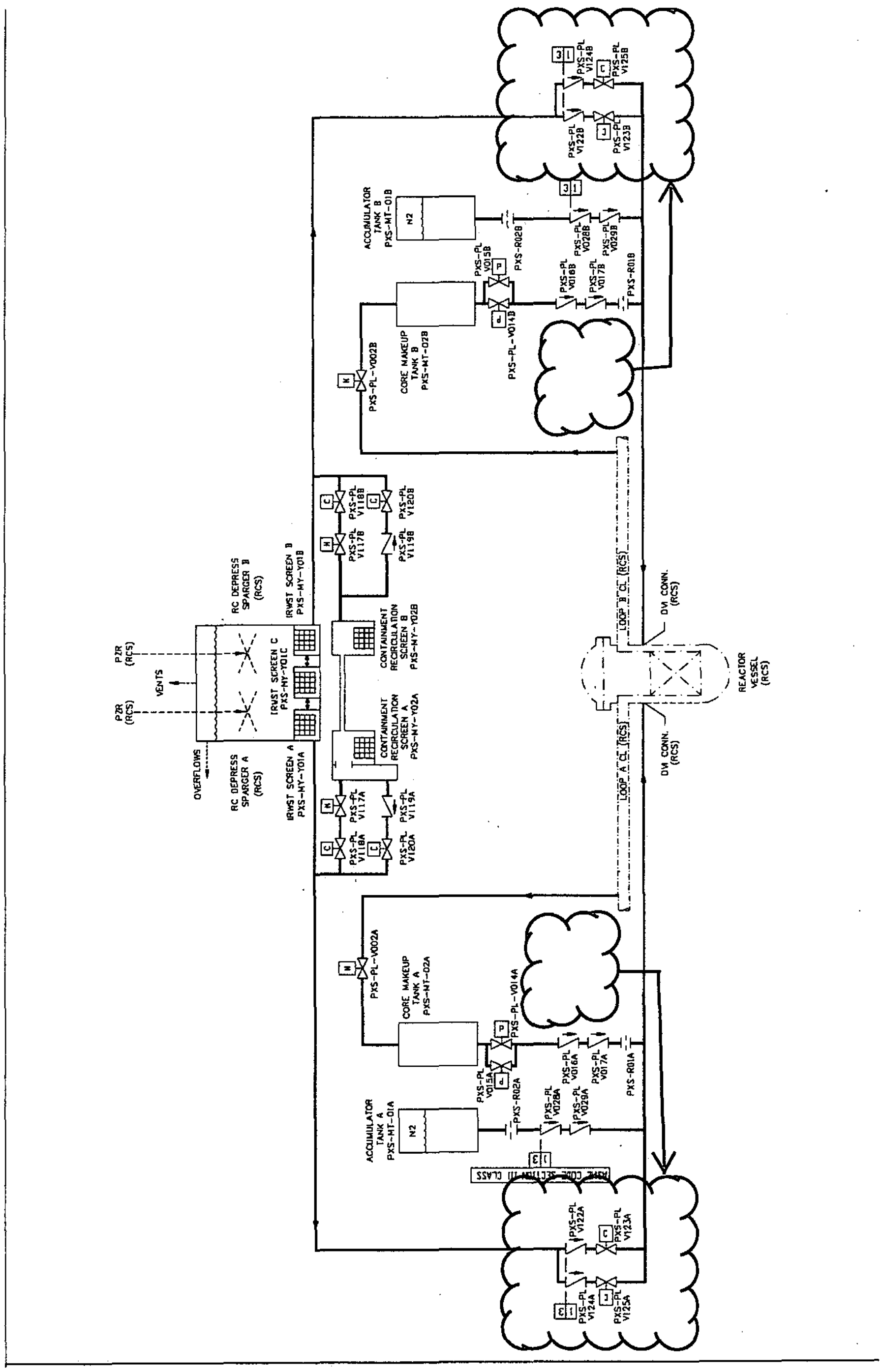


Figure 2.2.3-1 (Sheet 2 of 2)
Passive Core Cooling System

Table 3.2-3 (Sheet 17 of 6569)

AP1000 CLASSIFICATION OF MECHANICAL AND FLUID SYSTEMS, COMPONENTS, AND EQUIPMENT

Tag Number	Description	AP1000 Class	Seismic Category	Principal Construction Code	Comments
Passive Core Cooling System (Continued)					
PXS-PL-V016A	CMT A Discharge Check	A	I	ASME III-1	
PXS-PL-V016B	CMT B Discharge Check	A	I	ASME III-1	
PXS-PL-V017A	CMT A Discharge Check	A	I	ASME III-1	
PXS-PL-V017B	CMT B Discharge Check	A	I	ASME III-1	
PXS[rmk35]-PL-V019A	RNS to CMT Injection Line A Drain	B	I	ASME III-3	
PXS-PL-V019B	RNS to CMT Injection Line B Drain	B	I	ASME III-3	
PXS-PL-V020A	IRWST Injection Line A Drain	B	I	ASME III-3	
PXS-PL-V020B	IRWST Injection Line B Drain	B	I	ASME III-3	
PXS-PL-V021A	Accumulator A Nitrogen Vent	C	I	ASME III-3	
PXS-PL-V021B	Accumulator B Nitrogen Vent	C	I	ASME III-3	
PXS-PL-V022A	Accumulator A Pressure Relief	C	I	ASME III-3	
PXS-PL-V022B	Accumulator B Pressure Relief	C	I	ASME III-3	
PXS-PL-V023A	Accumulator A Pressure Transmitter B Isolation	C	I	ASME III-3	
PXS-PL-V023B	Accumulator B Pressure Transmitter B Isolation	C	I	ASME III-3	
PXS-PL-V024A	Accumulator A Pressure Transmitter A Isolation	C	I	ASME III-3	
PXS-PL-V024B	Accumulator B Pressure Transmitter A Isolation	C	I	ASME III-3	
PXS-PL-V025A	Accumulator A Sample	C	I	ASME III-3	
PXS-PL-V025B	Accumulator B Sample	C	I	ASME III-3	
PXS-PL-V026A	Accumulator A Drain	C	I	ASME III-3	
PXS-PL-V026B	Accumulator B Drain	C	I	ASME III-3	
PXS-PL-V027A	Accumulator A Discharge Isolation	C	I	ASME III-3	
PXS-PL-V027B	Accumulator B Discharge Isolation	C	I	ASME III-3	
PXS-PL-V028A	Accumulator A Discharge Check	A	I	ASME III-1	

Table 3.2-3 (Sheet 20 of ~~65~~69)

AP1000 CLASSIFICATION OF MECHANICAL AND FLUID SYSTEMS, COMPONENTS, AND EQUIPMENT

Tag Number	Description	AP1000 Class	Seismic Category	Principal Construction Code	Comments
Passive Core Cooling System (Continued)					
PXS-PL-V101	PRHR HX Inlet Isolation	A	I	ASME III-1	
PXS-PL-V102A	PRHR HX Inlet Head Vent	B	I	ASME III-2	
PXS-PL-V102B	PRHR HX Inlet Head Drain	B	I	ASME III-2	
PXS-PL-V103A	PRHR HX Outlet Head Vent	B	I	ASME III-2	
PXS-PL-V103B	PRHR HX Outlet Head Drain	B	I	ASME III-2	
PXS-PL-V104A	PRHR HX Flow Transmitter A Isolation	B	I	ASME III-2	
PXS-PL-V104B	PRHR HX Flow Transmitter B Isolation	B	I	ASME III-2	
PXS-PL-V105A	PRHR HX Flow Transmitter A Isolation	B	I	ASME III-2	
PXS-PL-V105B	PRHR HX Flow Transmitter B Isolation	B	I	ASME III-2	
PXS-PL-V106	Containment Recirculation A Highpoint Vent	C	I	ASME III-3	
PXS-PL-V107	Containment Recirculation A Highpoint Vent	C	I	ASME III-3	
PXS-PL-V108A	PRHR HX Control	A	I	ASME III-1	
PXS-PL-V108B	PRHR HX Control	A	I	ASME III-1	
PXS-PL-V109	PRHR HX/RCS Return Isolation	A	I	ASME III-1	
PXS-PL-V111A	PRHR HX Highpoint Vent	B	I	ASME III-2	
PXS-PL-V111B	PRHR HX Highpoint Vent	B	I	ASME III-2	
PXS-PL-V113	PRHR HX Pressure Transmitter Isolation	B	I	ASME III-2	
PXS-PL-V115A	Containment Recirculation A Drain	C	I	ASME III-3	
PXS-PL-V115B	Containment Recirculation B Drain	C	I	ASME III-3	
PXS-PL-V116A	Containment Recirculation A Drain	C	I	ASME III-3	
PXS-PL-V116B	Containment Recirculation B Drain	C	I	ASME III-3	
PXS-PL-V117A	Containment Recirculation A Isolation	C	I	ASME III-3	

Table 3.2-3 (Sheet 21 of ~~65~~69)

AP1000 CLASSIFICATION OF MECHANICAL AND FLUID SYSTEMS, COMPONENTS, AND EQUIPMENT

Tag Number	Description	AP1000 Class	Seismic Category	Principal Construction Code	Comments
Passive Core Cooling System (Continued)					
PXS-PL-V117B	Containment Recirculation B Isolation	C	I	ASME III-3	
PXS-PL-V118A	Containment Recirculation A Isolation	C	I	ASME III-3	
PXS-PL-V118B	Containment Recirculation B Isolation	C	I	ASME III-3	
PXS-PL-V119A	Containment Recirculation A Check	C	I	ASME III-3	
PXS-PL-V119B	Containment Recirculation B Check	C	I	ASME III-3	
PXS-PL-V120A	Containment Recirculation A Isolation	C	I	ASME III-3	
PXS-PL-V120B	Containment Recirculation B Isolation	C	I	ASME III-3	
PXS-PL-V121A	IRWST Line A Isolation	C	I	ASME III-3	
PXS-PL-V121B	IRWST Line B Isolation	C	I	ASME III-3	
PXS-PL-V122A	IRWST Injection A Check	A	I	ASME III-1	
PXS-PL-V122B	IRWST Injection B Check	A	I	ASME III-1	
PXS-PL-V123A	IRWST Injection A Isolation	A	I	ASME III-1	
PXS-PL-V123B	IRWST Injection B Isolation	A	I	ASME III-1	
PXS-PL-V124A	IRWST Injection A Check	A	I	ASME III-1	
PXS-PL-V124B	IRWST Injection B Check	A	I	ASME III-1	
PXS-PL-V125A	IRWST Injection A Isolation	A	I	ASME III-1	
PXS-PL-V125B	IRWST Injection B Isolation	A	I	ASME III-1	
~~PXS-PL-V126A~~	~~IRWST Injection Check Test~~	~~C~~	~~I~~	~~ASME III-3~~	
PXS-PL-V126B	IRWST Injection Check Test	C	I	ASME III-3	
PXS-PL-V127	IRWST Injection Line A Drain	C	I	ASME III-3	
~~PXS-PL-V128A~~	~~IRWST Injection Check Test~~	~~B~~A	I	ASME III-~~2~~1	
PXS-PL-V128B	IRWST Injection Check Test	~~B~~A	I	ASME III-~~2~~1	
PXS-PL-V129A	IRWST Injection Check Test	~~B~~A	I	ASME III-~~2~~1	
PXS-PL-V129B	IRWST Injection Check Test	~~B~~A	I	ASME III-~~2~~1	
PXS-PL-V130A	IRWST Gutter Bypass A Isolation	C	I	ASME III-3	

Table 3.2-3 (Sheet 22 of ~~65~~69)

AP1000 CLASSIFICATION OF MECHANICAL AND FLUID SYSTEMS, COMPONENTS, AND EQUIPMENT

Tag Number	Description	AP1000 Class	Seismic Category	Principal Construction Code	Comments
Passive Core Cooling System (Continued)					
PXS-PL-V130B	IRWST Gutter Bypass B Isolation	C	I	ASME III-3	
PXS-PL-V131A	IRWST Injection Line A Drain	B	I	ASME III-2	
PXS-PL-V131B	IRWST Injection Line B Drain	B	I	ASME III-2	
PXS-PL-V132A	IRWST Injection Line A Drain	B	I	ASME III-2	
PXS-PL-V132B	IRWST Injection Line B Drain	B	I	ASME III-2	
PXS-PL-V133A	IRWST Injection Line A Highpoint Vent	B	I	ASME III-2	
PXS-PL-V133B	IRWST Injection Line B Highpoint Vent	B	I	ASME III-2	
PXS-PL-V134A	IRWST Injection Line A Highpoint Vent	B	I	ASME III-2	
PXS-PL-V134B	IRWST Injection Line B Highpoint Vent	B	I	ASME III-2	
PXS-PL-V135A	IRWST Injection Line A Highpoint Vent Isolation	B	I	ASME III-2	
PXS-PL-V135B	IRWST Injection Line B Highpoint Vent Isolation	B	I	ASME III-2	
PXS-PL-V149	RNS Suction Pump Line Drain	C	I	ASME III-3	
PXS-PL-V150A	IRWST Level Transmitter A Isolation	C	I	ASME III-3	
PXS-PL-V150B	IRWST Level Transmitter B Isolation	C	I	ASME III-3	
PXS-PL-V150C	IRWST Level Transmitter C Isolation	C	I	ASME III-3	
PXS-PL-V150D	IRWST Level Transmitter D Isolation	C	I	ASME III-3	
PXS-PL-V151A	IRWST Level Transmitter A Isolation	C	I	ASME III-3	
PXS-PL-V151B	IRWST Level Transmitter B Isolation	C	I	ASME III-3	

Table 3.2-3 (Sheet 267 of 6569)

AP1000 CLASSIFICATION OF MECHANICAL AND FLUID SYSTEMS, COMPONENTS, AND EQUIPMENT

Tag Number	Description	AP1000 Class	Seismic Category	Principal Construction Code	Comments
Reactor Coolant System (Continued)					
RCS-PL-V102C	Hot Leg 2 Flow Instrument Root	B	I	ASME III-2	
RCS-PL-V102D	Hot Leg 2 Flow Instrument Root	B	I	ASME III-2	
RCS-PL-V102E	Hot Leg 2 Flow Instrument Root	B	I	ASME III-2	
RCS-PL-V102F	Hot Leg 2 Flow Instrument Root	B	I	ASME III-2	
[rmk51]RCS-PL-V103	PRHR HX Outlet Line Drain	B	I	ASME III-2	
RCS-PL-V171A	Cold Leg 1A Bend Instrument Root	B	I	ASME III-2	
RCS-PL-V171B	Cold Leg 1A Bend Instrument Root	B	I	ASME III-2	
RCS-PL-V172A	Cold Leg 1B Bend Instrument Root	B	I	ASME III-2	
RCS-PL-V172B	Cold Leg 1B Bend Instrument Root	B	I	ASME III-2	
RCS-PL-V173A	Cold Leg 2A Bend Instrument Root	B	I	ASME III-2	
RCS-PL-V173B	Cold Leg 2A Bend Instrument Root	B	I	ASME III-2	
RCS-PL-V174A	Cold Leg 2B Bend Instrument Root	B	I	ASME III-2	
RCS-PL-V174B	Cold Leg 2B Bend Instrument Root	B	I	ASME III-2	
RCS-PL-V108A	Hot Leg 1 Sample Isolation	B	I	ASME III-2	
RCS-PL-V108B	Hot Leg 2 Sample Isolation	B	I	ASME III-2	
RCS-PL-V110A	Pressurizer Spray Valve	A	I	ASME III-1	
RCS-PL-V110B	Pressurizer Spray Valve	A	I	ASME III-1	
RCS-PL-V111A	Pressurizer Spray Block Valve	A	I	ASME III-1	
RCS-PL-V111B	Pressurizer Spray Block Valve	A	I	ASME III-1	

Table 3.2-3 (Sheet 323 of 6569)

AP1000 CLASSIFICATION OF MECHANICAL AND FLUID SYSTEMS, COMPONENTS, AND EQUIPMENT

Tag Number	Description	AP1000 Class	Seismic Category	Principal Construction Code	Comments
Normal Residual Heat Removal System (Continued)					
RNS-PL-V055	RNS Pump Suction to Cask Loading Pit Isolation	C	I	ASME III-3	
RNS-PL-V056	RNS Pump Suction to Cask Loading Pit Isolation	C	I	ASME III-3	
RNS-PL-V057A	RNS Pump A Miniflow Isolation	C	I	ASME III-3	
RNS-PL-V057B	RNS Pump B Miniflow Isolation	C	I	ASME III-3	
RNS-PL-V059	RNS Pump Suction Containment Isolation Test Connection	C	I	ASME III-3	
RNS-PL-V061	RNS Return from CVS - Containment Isolation	B	I	ASME III-2	
RNS[rmk54]-PL-V066A	RNS Discharge to DVI Line A Drain	C	I	ASME III-3	
RNS-PL-V066b	RNS Discharge to DVI Line B Drain	C	I	ASME III-3	
RNS-PL-V067A	RNS Discharge to DVI Line A Drain	A	I	ASME III-3	
RNS-PL-V067b	RNS Discharge to DVI Line B Drain	A	I	ASME III-3	
RNS-PL-V068	RNS Discharge to IRWST Drain	C	I	ASME III-3	
RNS-PY-C01	Normal Residual Heat Removal Suction Line Penetration	B	I	ASME III, MC	
RNS-PY-C02	Normal Residual Heat Removal Discharge Line Penetration	B	I	ASME III, MC	
Balance of system components are Class E					
Raw Water System (RWS)				Location: Yard, Turbine Building	
System components are Class E					
Reactor System (RXS)				Location: Containment	
n/a	Fuel Assemblies	C	I	Manufacturer Std.	
RXS-FR-B06	Control Rod Cluster B6	B	I	Manufacturer Std.	
RXS-FR-B10	Control Rod Cluster B10	B	I	Manufacturer Std.	

Table 3.9-17

SYSTEM LEVEL OPERABILITY TEST REQUIREMENTS

System/Feature	Test Purpose	Test Method	Tech Spec[a]
PCS			
PCCWST drain lines	Flow capability and water coverage	Note 1	SR 3.6.6.6
PXS			
Accumulator injection lines	Flow capability	Note 2	SR 3.5.1.6
CMT injection lines	Flow capability	Note 3	SR 3.5.2.7
PRHR HX	Heat transfer capability	Note 4	SR 3.5.4.6
IRWST injection lines	Flow capability	Note 5	SR 3.5.6.910 [rmk95]
Containment recirculation lines	Flow capability	Note 6	SR 3.5.6.910
VES			
MCR isolation/makeup	MCR pressurization capability	Note 7	SR 3.7.6.10

Alpha Note:

a. Refer to the Technical Specification surveillance identified in this column for the test frequency.

Notes:

1. The flow capability of each PCS water drain line is demonstrated by conducting a test where water is drained from the PCS water storage tank onto the containment shell by opening two of the three parallel isolation valves. During this flow test the water coverage is also demonstrated. The test is terminated when the flow measurement is obtained and the water coverage is observed. The minimum allowable flow rate is 469.1 gpm with the passive containment cooling water storage tank level 27.3 feet above the lowest standpipe. The test may be run with a higher water level and the test results adjusted for the increased level. Water coverage is demonstrated by visual inspection that there is unobstructed flow from the lower weirs. In addition, at least four air baffle panels will be removed at the containment vessel spring line, approximately 90 degrees apart, to permit visual inspection of the water coverage and the vessel coating. The water coverage observed at these locations will be compared against the coverage measured at the same locations during pre-operational testing (see item 7.(b)(i) of ITAAC Table 2.2.2-6).

2. The flow capability of each accumulator is demonstrated by conducting a test during cold shutdown conditions. The initial conditions of the test include reduced accumulator pressure. Flow from the accumulator to the RCS is initiated by opening the accumulator isolation valve. Sufficient flow is provided to fully open the check valves. The test is terminated when the flow measurement is obtained. The allowable calculated flow resistance between each accumulator and the reactor vessel is $\geq 1.47 \times 10^{-5}$ ft/gpm^2 and $\leq 1.83 \times 10^{-5}$ ft/gpm^2.

3. The flow capability of each CMT is demonstrated by conducting a test during cold shutdown conditions. The initial conditions of the test include the RCS loops drained to a level below the top of the RCS hot leg. Flow from the CMT to the RCS is initiated by opening one CMT isolation valve. The test is terminated when the flow measurement is obtained. The allowable calculated flow resistance between each CMT and the reactor vessel is $\geq 1.83 \times 10^{-5}$ ft/gpm^2 and $\leq 2.25 \times 10^{-5}$ ft/gpm^2.

Table 3.11-1 (Sheet 34 of 501)

ENVIRONMENTALLY QUALIFIED ELECTRICAL AND MECHANICAL EQUIPMENT

Description	AP1000 Tag No.	Envir. Zone (Note 2)	Function (Note 1)	Operating Time Required (Note 5)	Qualification Program (Note 6)
Containment Isolation Test Connection Isolation Valve	PSS-PL-V085	1	PB	1 yr	M *
Containment Isolation Test Connection Isolation Valve	PSS-PL-V086	1	PB	1 yr	M *
Core Makeup Tank A CL Inlet Isolation	PXS-PL-V002A	1	PB	1 yr	M *
Limit Switch	PXS-PL-V002A-L	1	PAMS	1 yr	E *
Motor Operator	PXS-PL-V002A-M	1	ESF	5 min	E *
Core Makeup Tank B CL Inlet Isolation	PXS-PL-V002B	1	PB	1 yr	M *
Limit Switch	PXS-PL-V002B-L	1	PAMS	1 yr	E *
Motor Operator	PXS-PL-V002B-M	1	ESF	5 min	E *
Core Makeup Tank A Upper Sample	PXS-PL-V010A	1	PB	1 yr	M *
Core Makeup Tank B Upper Sample	PXS-PL-V010B	1	PB	1 yr	M *
Core Makeup Tank A Lower Sample	PXS-PL-V011A	1	PB	1 yr	M *
Core Makeup Tank B Lower Sample	PXS-PL-V011B	1	PB	1 yr	M *
Core Makeup Tank A Drain	PXS-PL-V012A	1	PB	1 yr	M *
Core Makeup Tank B Drain	PXS-PL-V012B	1	PB	1 yr	M *
Core Makeup Tank Discharge Manual Isolation	PXS-PL-V013A	1	PB	1 yr	M *
Core Makeup Tank B Discharge Manual Isolation	PXS-PL-V013B	1	PB	1 yr	M *
RNS to CMT Injection Line A Drain	PXS-PL-V019A	1	PB	1 yr	M *
RNS to CMT Injection Line B Drain	PXS-PL-V019B	1	PB	1 yr	M *
IRWST Injection Line A Drain	PXS-PL-V020A	1	PB	1 yr	M *
IRWST Injection Line B Drain	PXS-PL-V020B	1	PB	1 yr	M *
Accumulator A N_2 Vent	PXS-PL-V021A	1	PB	1 yr	M *
Accumulator B N_2 Vent	PXS-PL-V021B	1	PB	1 yr	M *
Accumulator A PZR Transmitter Isolation	PXS-PL-V023A	1	PB	1 yr	M *
Accumulator B PZR Transmitter Isolation	PXS-PL-V023B	1	PB	1 yr	M *
Accumulator A PZR Transmitter Isolation	PXS-PL-V024A	1	PB	1 yr	M *
Accumulator B PZR Transmitter Isolation	PXS-PL-V024B	1	PB	1 yr	M *

Table 3.11-1 (Sheet 36 of 501)

ENVIRONMENTALLY QUALIFIED ELECTRICAL AND MECHANICAL EQUIPMENT

Description	AP1000 Tag No.	Envir. Zone (Note 2)	Function (Note 1)	Operating Time Required (Note 5)	Qualification Program (Note 6)
CMT A Lower Level A Isolation 2	PXS-PL-V093A	1	PB	1 yr	M *
CMT B Lower Level A Isolation 2	PXS-PL-V093B	1	PB	1 yr	M *
CMT A Lower Level A Vent	PXS-PL-V094A	1	PB	1 yr	M *
CMT B Lower Level A Vent	PXS-PL-V094B	1	PB	1 yr	M *
CMT A Lower Level A Drain	PXS-PL-V095A	1	PB	1 yr	M *
CMT B Lower Level A Drain	PXS-PL-V095B	1	PB	1 yr	M *
CMT A Lower Level B Isolation 1	PXS-PL-V096A	1	PB	1 yr	M *
CMT B Lower Level B Isolation 1	PXS-PL-V096B	1	PB	1 yr	M *
CMT A Lower Level B Isolation 2	PXS-PL-V097A	1	PB	1 yr	M *
CMT B Lower Level B Isolation 2	PXS-PL-V097B	1	PB	1 yr	M *
CMT A Lower Level B Vent	PXS-PL-V098A	1	PB	1 yr	M *
CMT B Lower Level B Vent	PXS-PL-V098B	1	PB	1 yr	M *
CMT A Lower Level B Drain	PXS-PL-V099A	1	PB	1 yr	M *
CMT B Lower Level B Drain	PXS-PL-V099B	1	PB	1 yr	M *
PRHR HX Inlet Isolation Limit Switch Motor Operator	PXS-PL-V101 PXS-PL-V101-L PXS-PL-V101-M	1 1 1	PB PAMS ESF	1 yr 1 yr 5 min	M * E * E *
PRHR HX Inlet Head Vent	PXS-PL-V102A	1	PB	1 yr	M *
PRHR HX Inlet Head Drain	PXS-PL-V102B	1	PB	1 yr	M *
PRHR HX Outlet Head Vent	PXS-PL-V103A	1	PB	1 yr	M *
PRHR HX Outlet Head Drain	PXS-PL-V103B	1	PB	1 yr	M *
PRHR HX Flow Transmitter A Isolation	PXS-PL-V104A	1	PB	1 yr	M *
PRHR HX Flow Transmitter B Isolation	PXS-PL-V104B	1	PB	1 yr	M *
PRHR HX Flow Transmitter A Isolation	PXS-PL-V105A	1	PB	1 yr	M *
PRHR HX Flow Transmitter B Isolation	PXS-PL-V105B	1	PB	1 yr	M *
Containment Recirculation A Highpoint Vent	PXS-PL-V106	1	PB	1 yr	M *
Containment Recirculation A Highpoint Vent	PXS-PL-V107	1	PB	1 yr	M *
PRHR HX/RCS Return Isolation	PXS-PL-V109	1	PB	1 yr	M *
PRHR HX Highpoint Vent	PXS-PL-V111A	1	PB	1 yr	M *
PRHR HX Highpoint Vent	PXS-PL-V111B	1	PB	1 yr	M *

Table 3.11-1 (Sheet 37 of 501)

ENVIRONMENTALLY QUALIFIED ELECTRICAL AND MECHANICAL EQUIPMENT

Description	AP1000 Tag No.	Envir. Zone (Note 2)	Function (Note 1)	Operating Time Required (Note 5)	Qualification Program (Note 6)
PRHR HX PZR Transmitter Isolation	PXS-PL-V113	1	PB	1 yr	M *
Containment Recirculation A Drain	PXS-PL-V115A	1	PB	1 yr	M *
Containment Recirculation B Drain	PXS-PL-V115B	1	PB	1 yr	M *
Containment Recirculation A Drain	PXS-PL-V116A	1	PB	1 yr	M *
Containment Recirculation B Drain	PXS-PL-V116B	1	PB	1 yr	M *
Recirc Sump A Isolation Limit Switch Motor Operator	PXS-PL-V117A PXS-PL-V117A-L PXS-PL-V117A-M	1 1 1	ESF PAMS ESF	24 hr 1 yr 24 hr	M * E * E *
Recirc Sump B Isolation Limit Switch Motor Operator	PXS-PL-V117B PXS-PL-V117B-L PXS-PL-V117B-M	1 1 1	ESF PAMS ESF	24 hr 1 yr 24 hr	M * E * E *
IRWST Line A Isolation	PXS-PL-V121A	1	PB	1 yr	M *
IRWST Line B Isolation	PXS-PL-V121B	1	PB	1 yr	M *
IRWST Injection Check Test	PXS-PL-V126A	1	PB	1 yr	M *
IRWST Injection Check Test	PXS-PL-V126B	1	PB	1 yr	M *
IRWST Injection Line A Drain	PXS-PL-V127	1	PB	1 yr	M *
IRWST Injection Check Test	PXS-PL-V128A	1	PB	1 yr	M *
IRWST Injection Check Test	PXS-PL-V128B	1	PB	1 yr	M *
IRWST Injection Check Test	PXS-PL-V129A	1	PB	1 yr	M *
IRWST Injection Check Test	PXS-PL-V129B	1	PB	1 yr	M *
IRWST Injection Line A Drain	PXS-PL-V131A	1	PB	1 yr	M *
IRWST Injection Line B Drain	PXS-PL-V131B	1	PB	1 yr	M *
IRWST Injection Line A Drain	PXS-PL-V132A	1	PB	1 yr	M *
IRWST Injection Line B Drain	PXS-PL-V132B	1	PB	1 yr	M *
IRWST Injection Line A Highpoint Vent	PXS-PL-V133A	1	PB	1 yr	M *
IRWST Injection Line B Highpoint Vent	PXS-PL-V133B	1	PB	1 yr	M *
IRWST Injection Line A Highpoint Vent	PXS-PL-V134A	1	PB	1 yr	M *
IRWST Injection Line B Highpoint Vent	PXS-PL-V134B	1	PB	1 yr	M *
IRWST Injection Line A Highpoint Vent Isolation	PXS-PL-V135A	1	PB	1 yr	M *
IRWST Injection Line B Highpoint Vent Isolation	PXS-PL-V135B	1	PB	1 yr	M *

Table 3.11-1 (Sheet 38 of 501)

ENVIRONMENTALLY QUALIFIED ELECTRICAL AND MECHANICAL EQUIPMENT

Description	AP1000 Tag No.	Envir. Zone (Note 2)	Function (Note 1)	Operating Time Required (Note 5)	Qualification Program (Note 6)
RNS Suction Pump Line Drain	PXS-PL-V149	1	PB	1 yr	M *
IRWST Level Transmitter A Isolation	PXS-PL-V150A	1	PB	1 yr	M *
IRWST Level Transmitter B Isolation	PXS-PL-V150B	1	PB	1 yr	M *
IRWST Level Transmitter C Isolation	PXS-PL-V150C	1	PB	1 yr	M *
IRWST Level Transmitter D Isolation	PXS-PL-V150D	1	PB	1 yr	M *
IRWST Level Transmitter A Isolation	PXS-PL-V151A	1	PB	1 yr	M *
IRWST Level Transmitter B Isolation	PXS-PL-V151B	1	PB	1 yr	M *
IRWST Level Transmitter C Isolation	PXS-PL-V151C	1	PB	1 yr	M *
IRWST Level Transmitter D Isolation	PXS-PL-V151D	1	PB	1 yr	M *
Accumulator A Leak Test	PXS-PL-V201A	1	PB	1 yr	M *
Accumulator B Leak Test	PXS-PL-V201B	1	PB	1 yr	M *
Accumulator A Leak Test	PXS-PL-V202A	1	PB	1 yr	M *
Accumulator B Leak Test	PXS-PL-V202B	1	PB	1 yr	M *
RNS Discharge Leak Test	PXS-PL-V205A	1	PB	1 yr	M *
RNS Discharge Leak Test	PXS-PL-V205B	1	PB	1 yr	M *
RNS Discharge Leak Test	PXS-PL-V206	1	PB	1 yr	M *
RNS Suction Leak Test	PXS-PL-V207A	1	PB	1 yr	M *
RNS Suction Leak Test	PXS-PL-V207B	1	PB	1 yr	M *
RNS Suction Leak Test	PXS-PL-V208A	1	PB	1 yr	M *
Core Makeup Tank A Fill Isolation	PXS-PL-V230A	1	PB	1 yr	M *
Core Makeup Tank B Fill Isolation	PXS-PL-V230B	1	PB	1 yr	M *
Core Makeup Tank A Fill Check	PXS-PL-V231A	1	PB	1 yr	M *
Core Makeup Tank B Fill Check	PXS-PL-V231B	1	PB	1 yr	M *
Accumulator A Fill/Drain Isolation	PXS-PL-V232A	1	PB	1 yr	M *
Accumulator B Fill/Drain Isolation	PXS-PL-V232B	1	PB	1 yr	M *
CMT A Check Valve Test Valve	PXS-PL-V250A	1	PB	1 yr	M *
CMT B Check Valve Test Valve	PXS-PL-V250B	1	PB	1 yr	M *
CMT A Check Valve Test Valve	PXS-PL-V251A	1	PB	1 yr	M *
CMT B Check Valve Test Valve	PXS-PL-V251B	1	PB	1 yr	M *

Table 3.11-1 (Sheet 40 of 501)

ENVIRONMENTALLY QUALIFIED ELECTRICAL AND MECHANICAL EQUIPMENT

Description	AP1000 Tag No.	Envir. Zone (Note 2)	Function (Note 1)	Operating Time Required (Note 5)	Qualification Program (Note 6)
Hot Leg 2 Flow Instrument Root	RCS-PL-V102C	1	PB	1 yr	M *
Hot Leg 2 Flow Instrument Root	RCS-PL-V102D	1	PB	1 yr	M *
Hot Leg 2 Flow Instrument Root	RCS-PL-V102E	1	PB	1 yr	M *
Hot Leg 2 Flow Instrument Root	RCS-PL-V102F	1	PB	1 yr	M *
PRHR HX Outlet Line Drain	RCS-PL-V103	1	PB	1 yr	M *
Hot Leg 1 Sample Isolation	RCS-PL-V108A	1	PB	1 yr	M *
Hot Leg 2 Sample Isolation	RCS-PL-V108B	1	PB	1 yr	M *
PZR Spray Valve	RCS-PL-V110A	1	PB	1 yr	M *
PZR Spray Valve	RCS-PL-V110B	1	PB	1 yr	M *
PZR Spray Block Valve	RCS-PL-V111A	1	PB	1 yr	M *
PZR Spray Block Valve	RCS-PL-V111B	1	PB	1 yr	M *
Cold Leg 1A Bend Instrument Root	RCS-PL-V171A	1	PB	1 yr	M *
Cold Leg 1A Bend Instrument Root	RCS-PL-V171B	1	PB	1 yr	M *
Cold Leg 1B Bend Instrument Root	RCS-PL-V172A	1	PB	1 yr	M *
Cold Leg 1B Bend Instrument Root	RCS-PL-V172B	1	PB	1 yr	M *
Cold Leg 2A Bend Instrument Root	RCS-PL-V173A	1	PB	1 yr	M *
Cold Leg 2A Bend Instrument Root	RCS-PL-V173B	1	PB	1 yr	M *
Cold Leg 2B Bend Instrument Root	RCS-PL-V174A	1	PB	1 yr	M *
Cold Leg 2B Bend Instrument Root	RCS-PL-V174B	1	PB	1 yr	M *
PZR Manual Vent	RCS-PL-V204	1	PB	1 yr	M *
PZR Manual Vent	RCS-PL-V205	1	PB	1 yr	M *
PZR Spray Bypass	RCS-PL-V210A	1	PB	1 yr	M *
PZR Spray Bypass	RCS-PL-V210B	1	PB	1 yr	M *
PZR Level Steam Space Instrument Root	RCS-PL-V225A	1	PB	1 yr	M *
PZR Level Steam Space Instrument Root	RCS-PL-V225B	1	PB	1 yr	M *
PZR Level Steam Space Instrument Root	RCS-PL-V225C	1	PB	1 yr	M *
PZR Level Steam Space Instrument Root	RCS-PL-V225D	1	PB	1 yr	M *
PZR Level Liquid Space Instrument Root	RCS-PL-V226A	1	PB	1 yr	M *

Table 3.11-1 (Sheet 43 of 501)

ENVIRONMENTALLY QUALIFIED ELECTRICAL AND MECHANICAL EQUIPMENT

Description	AP1000 Tag No.	Envir. Zone (Note 2)	Function (Note 1)	Operating Time Required (Note 5)	Qualification Program (Note 6)
RNS Discharge to SFP Isolation	RNS-PL-V053	6	PB	1 yr	M **
RNS Suction from Cask Loading Pit Isolation Valve	RNS-PL-V055	6	PB	1 yr	M **
RNS Pump Suction to Cask Loading Pit Isolation	RNS-PL-V056	6	PB	1 yr	M **
RNS Train A Miniflow Isolation Valve	RNS-PL-V057A	6	PB	1 yr	M **
RNS Train B Miniflow Isolation Valve	RNS-PL-V057B	6	PB	1 yr	M **
RNS Pump Suction Containment Isolation Test Connection	RNS-PL-V059	6	PB	1 yr	M **
RNS Discharge to DVI Line A Drain	RNS-PL-V066A	1	PB	1 yr	M *
RNS Discharge to DVI Line B Drain	RNS-PL-V066B	1	PB	1 yr	M *
RNS Discharge to DVI Line A Drain	RNS-PL-V067A	1	PB	1 yr	M *
RNS Discharge to DVI Line B Drain	RNS-PL-V067B	1	PB	1 yr	M *
RNS Discharge to IRWST Drain	RNS-PL-V068	1	PB	1 yr	M *
LT019A Root Isolation Valve	SFS-PL-V024A	6	PB	1 yr	M **
LT019B Root Isolation Valve	SFS-PL-V024B	6	PB	1 yr	M **
LT019C Root Isolation Valve	SFS-PL-V024C	6	PB	1 yr	M **
LT020 Root Isolation Valve	SFS-PL-V028	6	PB	1 yr	M **
SFS Refueling Cavity Drain to SGS Compartment Isolation	SFS-PL-V031	1	PB	1 yr	M *
Limit Switch	SFS-PL-V031-L	1	PAMS	1 yr	E *
SFS Refueling Cavity Suction Isolation	SFS-PL-V032	1	PB	1 yr	M *
SFS Refueling Cavity Drain to Containment Sump Isolation	SFS-PL-V033	1	PB	1 yr	M *
Limit Switch	SFS-PL-V033-L	1	PAMS	1 yr	E *
SFS Suction Line from IRWST Isolation	SFS-PL-V039	1	PB	1 yr	M *
SFS Fuel Transfer Canal Suction Isolation	SFS-PL-V040	6	PB	1 yr	M **
SFS Cask Loading Pit Suction Isolation	SFS-PL-V041	6	PB	1 yr	M **
SFS CVS Makeup Reverse Flow Prevention	SFS-PL-V043	6	PB	1 yr	M **
SFS Containment Penetration Test Connection	SFS-PL-V048	6	PB	1 yr	M **

Table 31.6-3 (Sheet 14 of 32)

LIST OF AP1000 SAFETY-RELATED ELECTRICAL AND MECHANICAL EQUIPMENT NOT HIGH FREQUENCY SENSITIVE

Description	AP1000 Tag Number	Comment
Containment Isolation Test Connection Isolation Valve	PSS-PL-V083	2
Containment Isolation Test Connection Isolation Valve	PSS-PL-V085	2
Containment Isolation Test Connection Isolation Valve	PSS-PL-V086	2
~~MCR Potable Water Inlet Check Valve~~	~~PWS-PL-V418~~	~~2~~
Core Makeup Tank A CL Inlet Isolation	PXS-PL-V002A	2
Core Makeup Tank B CL Inlet Isolation	PXS-PL-V002B	2
Core Makeup Tank A Upper Sample	PXS-PL-V010A	2
Core Makeup Tank B Upper Sample	PXS-PL-V010B	2
Core Makeup Tank A Lower Sample	PXS-PL-V011A	2
Core Makeup Tank B Lower Sample	PXS-PL-V011B	2
Core Makeup Tank A Drain	PXS-PL-V012A	2
Core Makeup Tank B Drain	PXS-PL-V012B	2
Core Makeup Tank Discharge Manual Isolation	PXS-PL-V013A	2
Core Makeup Tank B Discharge Manual Isolation	PXS-PL-V013B	2
RNS to CMT Injection Line A Drain	PXS-PL-V019A	2
RNS to CMT Injection Line B Drain	PXS-PL-V019B	2
IRWST Injection Line A Drain	PXS-PL-V020A	2
IRWST Injection Line B Drain	PXS-PL-V020B	2
Accumulator A N_2 Vent	PXS-PL-V021A	2
Accumulator B N_2 Vent	PXS-PL-V021B	2
Accumulator A PZR Transmitter Isolation	PXS-PL-V023A	2
Accumulator B PZR Transmitter Isolation	PXS-PL-V023B	2
Accumulator A PZR Transmitter Isolation	PXS-PL-V024A	2
Accumulator B PZR Transmitter Isolation	PXS-PL-V024B	2
Accumulator A Sample	PXS-PL-V025A	2

PRHR HX Inlet Head Drain	PXS-PL-V102B	2
PRHR HX Outlet Head Vent	PXS-PL-V103A	2

Table 31.6-3 (Sheet 17 of 32)

LIST OF AP1000 SAFETY-RELATED ELECTRICAL AND MECHANICAL EQUIPMENT NOT HIGH FREQUENCY SENSITIVE

Description	AP1000 Tag Number	Comment
PRHR HX Outlet Head Drain	PXS-PL-V103B	2
PRHR HX Flow Transmitter A Isolation	PXS-PL-V104A	2
PRHR HX Flow Transmitter B Isolation	PXS-PL-V104B	2
PRHR HX Flow Transmitter A Isolation	PXS-PL-V105A	2
PRHR HX Flow Transmitter B Isolation	PXS-PL-V105B	2
Containment Recirculation A Highpoint Vent	PXS-PL-V106	2
Containment Recirculation A Highpoint Vent	PXS-PL-V107	2
PRHR HX/RCS Return Isolation	PXS-PL-V109	2
PRHR HX Highpoint Vent	PXS-PL-V111A	2
PRHR HX Highpoint Vent	PXS-PL-V111B	2
PRHR HX PZR Transmitter Isolation	PXS-PL-V113	2
Containment Recirculation A Drain	PXS-PL-V115A	2
Containment Recirculation B Drain	PXS-PL-V115B	2
Containment Recirculation A Drain	PXS-PL-V116A	2
Containment Recirculation B Drain	PXS-PL-V116B	2
Recirc Sump A Isolation	PXS-PL-V117A	2
Recirc Sump B Isolation	PXS-PL-V117B	2
IRWST Line A Isolation	PXS-PL-V121A	2
IRWST Line B Isolation	PXS-PL-V121B	2
IRWST Injection Check Test	PXS-PL-V126A	2
IRWST Injection Check Test	PXS-PL-V126B	2
IRWST Injection Line A Drain	PXS-PL-V127	2
IRWST Injection Check Test	PXS-PL-V128A	2

IRWST Injection Check Test	PXS-PL-V128B	2
IRWST Injection Check Test	PXS-PL-V129A	2
IRWST Injection Check Test	PXS-PL-V129B	2

Table 3I.6-3 (Sheet 18 of 32)

LIST OF AP1000 SAFETY-RELATED ELECTRICAL AND MECHANICAL EQUIPMENT NOT HIGH FREQUENCY SENSITIVE

Description	AP1000 Tag Number	Comment
IRWST Injection Line A Drain	PXS-PL-V131A	2
IRWST Injection Line B Drain	PXS-PL-V131B	2
IRWST Injection Line A Drain	PXS-PL-V132A	2
IRWST Injection Line B Drain	PXS-PL-V132B	2
IRWST Injection Line A Highpoint Vent	PXS-PL-V133A	2
IRWST Injection Line B Highpoint Vent	PXS-PL-V133B	2
IRWST Injection Line A Highpoint Vent	PXS-PL-V134A	2
IRWST Injection Line B Highpoint Vent	PXS-PL-V134B	2
IRWST Injection Line A Highpoint Vent Isolation	PXS-PL-V135A	2
IRWST Injection Line B Highpoint Vent Isolation	PXS-PL-V135B	2
RNS Suction Pump Line Drain	PXS-PL-V149	2
IRWST Level Transmitter A Isolation	PXS-PL-V150A	2
IRWST Level Transmitter B Isolation	PXS-PL-V150B	2
IRWST Level Transmitter C Isolation	PXS-PL-V150C	2
IRWST Level Transmitter D Isolation	PXS-PL-V150D	2
IRWST Level Transmitter A Isolation	PXS-PL-V151A	2
IRWST Level Transmitter B Isolation	PXS-PL-V151B	2
IRWST Level Transmitter C Isolation	PXS-PL-V151C	2
IRWST Level Transmitter D Isolation	PXS-PL-V151D	2
Accumulator A Leak Test	PXS-PL-V201A	2
Accumulator B Leak Test	PXS-PL-V201B	2
Accumulator A Leak Test	PXS-PL-V202A	2
Accumulator B Leak Test	PXS-PL-V202B	2

Table 3I.6-3 (Sheet 20 of 32)

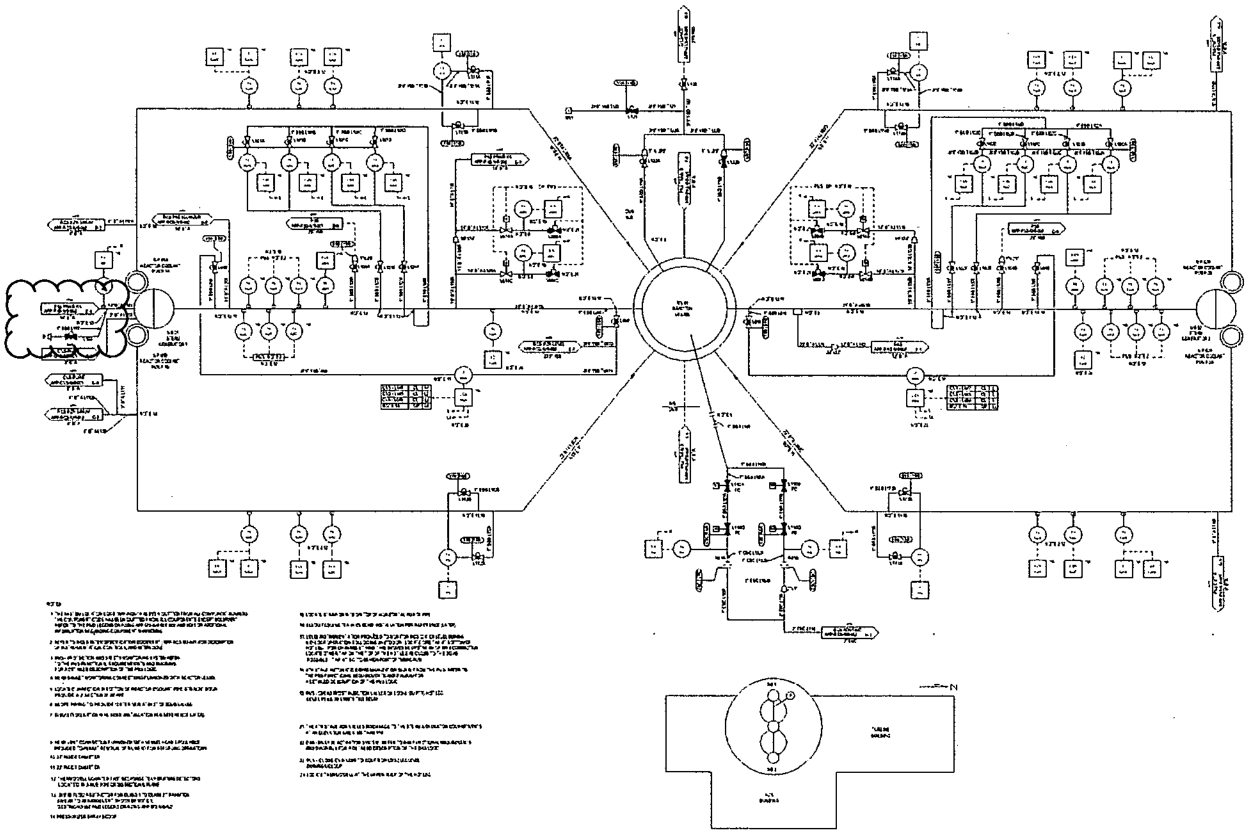
LIST OF AP1000 SAFETY-RELATED ELECTRICAL AND MECHANICAL EQUIPMENT NOT HIGH FREQUENCY SENSITIVE

Description	AP1000 Tag Number	Comment
Hot Leg 1 Level Instrument Root	RCS-PL-V097	2
Hot Leg 1 Level Instrument Root	RCS-PL-V098	2
Hot Leg 1 Flow Instrument Root	RCS-PL-V101A	2
Hot Leg 1 Flow Instrument Root	RCS-PL-V101B	2
Hot Leg 1 Flow Instrument Root	RCS-PL-V101C	2
Hot Leg 1 Flow Instrument Root	RCS-PL-V101D	2
Hot Leg 1 Flow Instrument Root	RCS-PL-V101E	2
Hot Leg 1 Flow Instrument Root	RCS-PL-V101F	2
Hot Leg 2 Flow Instrument Root	RCS-PL-V102A	2
Hot Leg 2 Flow Instrument Root	RCS-PL-V102B	2
Hot Leg 2 Flow Instrument Root	RCS-PL-V102C	2
Hot Leg 2 Flow Instrument Root	RCS-PL-V102D	2
Hot Leg 2 Flow Instrument Root	RCS-PL-V102E	2
Hot Leg 2 Flow Instrument Root	RCS-PL-V102F	2
PRHR HX Outlet Line Drain	RCS-PL-V103	2
Hot Leg 1 Sample Isolation	RCS-PL-V108A	2
Hot Leg 2 Sample Isolation	RCS-PL-V108B	2
PZR Spray Valve	RCS-PL-V110A	2
PZR Spray Valve	RCS-PL-V110B	2
PZR Spray Block Valve	RCS-PL-V111A	2
PZR Spray Block Valve	RCS-PL-V111B	2
Cold Leg 1A Bend Instrument Root	RCS-PL-V171A	2
Cold Leg 1A Bend Instrument Root	RCS-PL-V171B	2
Cold Leg 1B Bend Instrument Root	RCS-PL-V172A	2
Cold Leg 1B Bend Instrument Root	RCS-PL-V172B	2

Table 3I.6-3 (Sheet 23 of 32)

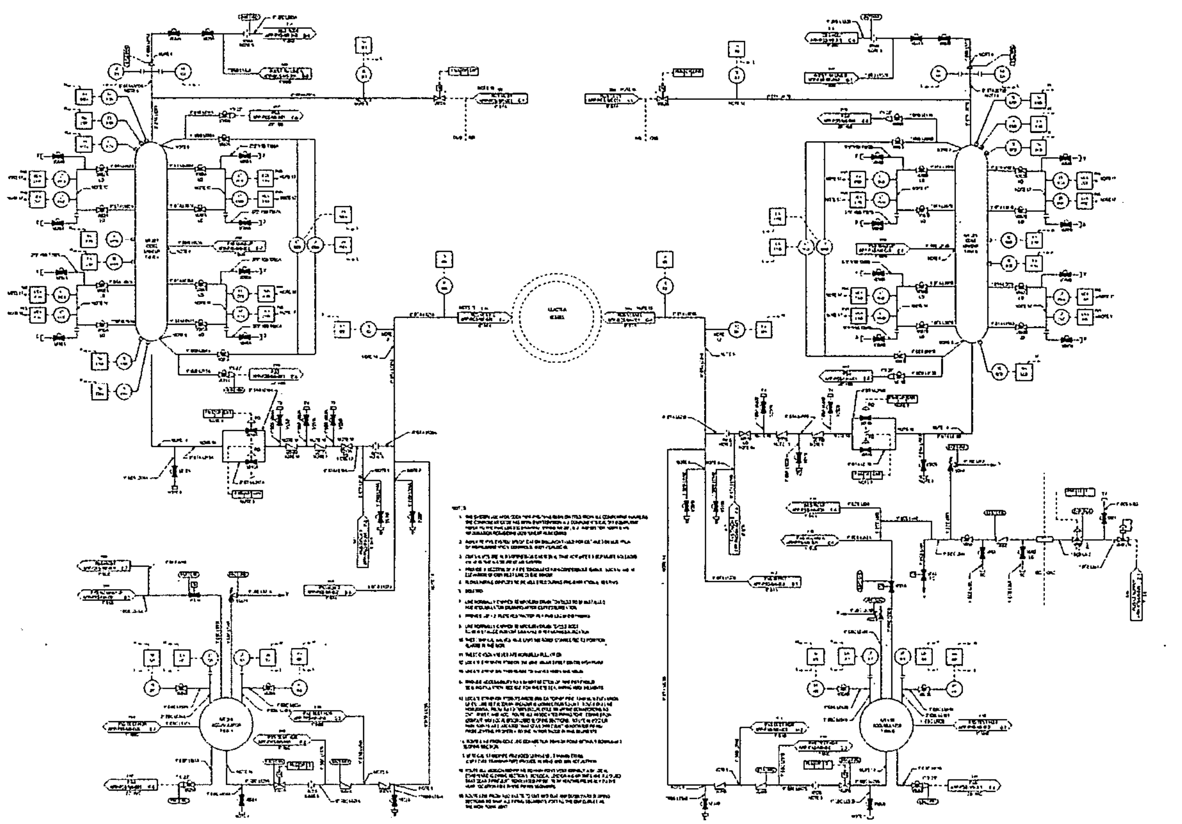
LIST OF AP1000 SAFETY-RELATED ELECTRICAL AND MECHANICAL EQUIPMENT NOT HIGH FREQUENCY SENSITIVE

Description	AP1000 Tag Number	Comment
RNS Pump B Suction Pressure Instrument Isolation	RNS-PL-V033B	2
RNS Pump A Discharge Pressure Instrument Isolation	RNS-PL-V034A	2
RNS Pump B Discharge Pressure Instrument Isolation	RNS-PL-V034B	2
RNS Pump A Suction Piping Drain Isolation	RNS-PL-V036A	2
RNS Pump B Suction Piping Drain Isolation	RNS-PL-V036B	2
RNS HX A Channel Head Drain Isolation	RNS-PL-V046A	2
RNS HX B Channel Head Drain Isolation	RNS-PL-V046B	2
RNS Pump A Casing Drain Isolation	RNS-PL-V050	2
RNS Pump B Casing Drain Isolation	RNS-PL-V051	2
RNS Suction from SFP Isolation	RNS-PL-V052	2
RNS Discharge to SFP Isolation	RNS-PL-V053	2
RNS Suction from Cask Loading Pit Isolation Valve	RNS-PL-V055	2
RNS Pump Suction to Cask Loading Pit Isolation	RNS-PL-V056	2
RNS Train A Miniflow Isolation Valve	RNS-PL-V057A	2
RNS Train B Miniflow Isolation Valve	RNS-PL-V057B	2
RNS Pump Suction Containment Isolation Test Connection	RNS-PL-V059	2
RNS Discharge to DVI Line A Drain	RNS-PL-V066A	2
RNS Discharge to DVI Line B Drain	RNS-PL-V066B	2
RNS Discharge to DVI Line A Drain	RNS-PL-V067A	2
RNS Discharge to DVI Line B Drain	RNS-PL-V067B	2
RNS Discharge to IRWST Drain	RNS-PL-V068	2
LT019A Root Isolation Valve	SFS-PL-V024A	2
LT019B Root Isolation Valve	SFS-PL-V024B	2
LT019C Root Isolation Valve	SFS-PL-V024C	2
LT020 Root Isolation Valve	SFS-PL-V028	2
SFS Refueling Cavity Drain To SGS Compartment Isolation	SFS-PL-V031	2



Inside Reactor Containment
Figure 5.1-5 (Sheet 1 of 3)

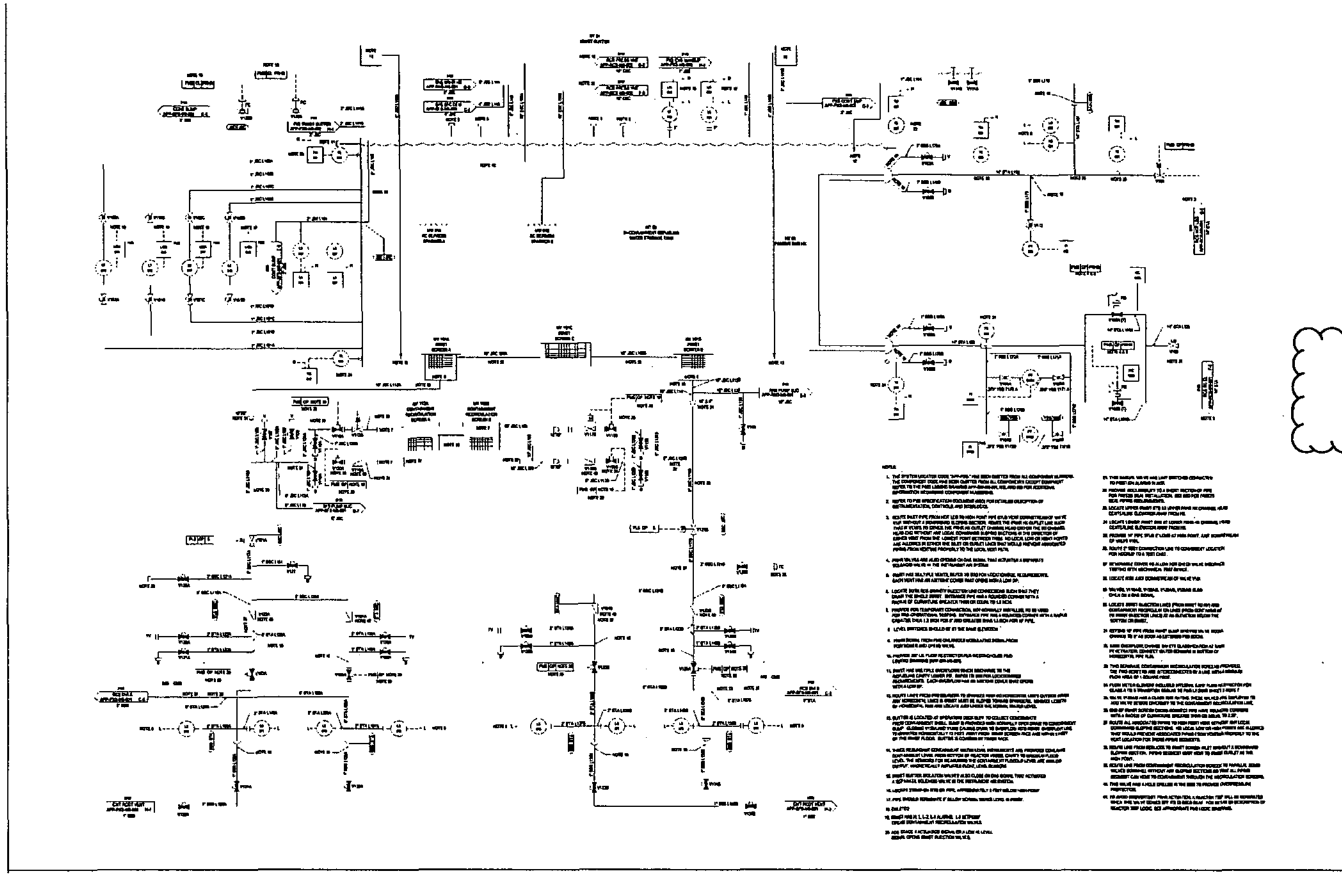
Reactor Coolant System
Piping and Instrumentation Diagram



Information on DCD changes found in enclosure 6.

Figure 6.3-1

Passive Core Cooling System
Piping and Instrumentation Diagram (Sheet 1)



Information on DCD changes found in enclosure 6.

Figure 6.3-2

Passive Core Cooling System
Piping and Instrumentation Diagram (Sheet 2)

3.5 PASSIVE CORE COOLING SYSTEM (PXS)

3.5.6 In-containment Refueling Water Storage Tank (IRWST) – Operating

LCO 3.5.6 The IRWST, with two injection flow paths and two containment recirculation flow paths, shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One IRWST injection line actuation valve flow path inoperable. OR One containment recirculation line actuation valve flow path inoperable.	A.1 Restore the inoperable actuation valve flow path to OPERABLE status.	72 hours
B. One IRWST injection line inoperable due to presence of noncondensible gases in one high point vent.	B.1 Vent noncondensible gases.	72 hours
C. One IRWST injection line inoperable due to presence of noncondensible gases in both high point vents.	C.1 Vent noncondensible gases from one high point vent.	24 hours
~~B~~ D. IRWST boron concentration not within limits. OR IRWST borated water temperature not within limits. OR	~~B~~D.1 Restore IRWST to OPERABLE status.	8 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
IRWST borated water volume < 100% and > 97% of limit.		
~~C~~ E. One motor operated IRWST isolation valve not fully open. OR Power is not removed from one or more motor operated IRWST isolation valves.	~~C~~E.1 Restore motor operated IRWST isolation valve to fully open condition with power removed from both valves.	1 hour
~~D~~ F. Required Action and associated Completion Time not met. OR LCO not met for reasons other than A, B, C, D, or ~~C~~E.	~~D~~F.1 Be in MODE 3. AND ~~D~~F.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.6.1	Verify the IRWST water temperature is < 120°F.	24 hours
SR 3.5.6.2	Verify the IRWST borated water volume is > 73,100 cu. ft.	24 hours
SR 3.5.6.3	Verify the volume of noncondensible gases in each of the four IRWST injection squib valve outlet line pipe stubs is ≤ 0.2 ft^3.	24 hours

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.6.~~3~~4	Verify the IRWST boron concentration is ≥ 2600 ppm and ≤ 2900 ppm.	31 days AND Once within 6 hours after each solution volume increase of 15,000 gal
SR 3.5.6.~~4~~5	Verify each motor operated IRWST isolation valve is fully open.	12 hours
SR 3.5.6.~~5~~6	Verify power is removed from each motor operated IRWST isolation valve.	31 days
SR 3.5.6.~~6~~7	Verify each motor operated containment recirculation isolation valve is fully open.	31 days
SR 3.5.6.~~7~~8	Verify each IRWST injection and containment recirculation squib valve is OPERABLE in accordance with the Inservice Testing Program.	In accordance with the Inservice Testing Program
SR 3.5.6.~~8~~9	Verify by visual inspection that the IRWST screens and the containment recirculation screens are not restricted by debris.	24 months
SR 3.5.6.~~9~~10	Verify IRWST injection and recirculation system flow performance in accordance with the System Level OPERABILITY Testing Program.	10 years

3.5 PASSIVE CORE COOLING SYSTEM (PXS)

3.5.7 In-containment Refueling Water Storage Tank (IRWST) – Shutdown, MODE 5

LCO 3.5.7 The IRWST, with one injection flow path and one containment recirculation flow path, shall be OPERABLE.

APPLICABILITY: MODE 5.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required motor operated containment recirculation isolation valve not fully open.	A.1 Open required motor operated containment recirculation isolation valve.	72 hours
B. Required IRWST injection line inoperable due to presence of noncondensible gases in one high point vent.	B.1 Vent noncondensible gases.	24 hours
C. Required IRWST injection line inoperable due to presence of noncondensible gases in both high point vents.	C.1 Vent noncondensible gases from one high point vent.	8 hours
B. D. IRWST boron concentration not within limits. OR IRWST borated water temperature not within limits. OR IRWST borated water volume < 100% and > 97% of limit.	BD.1 Restore IRWST to OPERABLE status.	8 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~C~~ E. Required motor operated IRWST isolation valve not fully open. OR Power is not removed from required motor operated IRWST isolation valve.	~~C~~E.1 Restore required motor operated IRWST isolation valve to fully open condition with power removed.	1 hour
~~D~~ F. Required Action and associated Completion Time not met. OR LCO not met for reasons other than A, B, ~~or~~ C, D, or E.	~~D~~F.1 Initiate action to be in MODE 5 with the RCS pressure boundary intact and ≥ 20% pressurizer level. AND ~~D~~F.2 Suspend positive reactivity additions.	Immediately Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.7.1	For the IRWST and flow paths required to be OPERABLE, the SRs of Specification 3.5.6, "In-containment Refueling Water Storage Tank (IRWST) – Operating" are applicable.	In accordance with applicable SRs

3.5 PASSIVE CORE COOLING SYSTEM (PXS)

3.5.8 In-containment Refueling Water Storage Tank (IRWST) – Shutdown, MODE 6

LCO 3.5.8 The IRWST, with one injection flow path and one containment recirculation flow path, shall be OPERABLE.

APPLICABILITY: MODE 6.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required motor operated containment recirculation isolation valve not fully open.	A.1 Open required motor operated containment recirculation isolation valve.	72 hours
B. Required IRWST injection line inoperable due to presence of noncondensible gases in one high point vent.	B.1 Vent noncondensible gases.	24 hours
C. Required IRWST injection line inoperable due to presence of noncondensible gases in both high point vents.	C.1 Vent noncondensible gases from one high point vent.	8 hours
B D. IRWST and refueling cavity boron concentration not within limits. OR IRWST and refueling cavity borated water temperature not within limits. OR IRWST and refueling cavity borated water volume < 100% and > 97% of limit.	BD.1 Restore IRWST to OPERABLE status.	8 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~C~~ E. Required motor operated IRWST isolation valve not fully open. OR Power is not removed from required motor operated IRWST isolation valve.	~~C~~E.1 Restore required motor operated IRWST isolation valve to fully open condition with power removed.	1 hour
~~D~~ F. Required Action and associated Completion Time not met. OR LCO not met for reasons other than A, B, ~~or~~ C, D, or E.	~~D~~F.1 Initiate action to be in MODE 6 with the water level ≥ 23 feet above the top of the reactor vessel flange. AND ~~D~~F.2 Suspend positive reactivity additions.	Immediately Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.8.1	Verify the IRWST and refueling cavity water temperature is < 120°F.	24 hours
SR 3.5.8.2	Verify the IRWST and refueling cavity water total borated water volume is > 73,100 cu. ft.	24 hours
SR 3.5.8.3	Verify the IRWST and refueling cavity boron concentration is ≥ 2600 ppm and ≤ 2900 ppm.	31 days AND Once within 6 hours after each solution volume increase of 15,000 gal

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.8.4	For the IRWST and flow paths required to be OPERABLE, the following SRs of Specification 3.5.6, "In-containment Refueling Water Storage Tank (IRWST) – Operating" are applicable: SR 3.5.6.43 SR 3.5.6.6 SR 3.5.6.8 SR 3.5.6.10 SR 3.5.6.5 SR 3.5.6.7 SR 3.5.6.9	In accordance with applicable SRs

BASES

APPLICABLE SAFETY ANALYSES (continued)

boiling. The steam generated in the IRWST enters the containment through the IRWST vents. Most of the steam generated in the IRWST condenses on the inside of the containment vessel and drains back to the IRWST.

For events which involve a loss of primary coolant inventory, such as a large break LOCA, or other events involving automatic depressurization, the IRWST provides low pressure safety injection (Ref. 2). The IRWST drain down time is dependent on several factors, including break size, location, and the return of steam condensate from the passive containment cooling system. During drain down, when the water in the IRWST reaches the Low 5 level, the containment sump will be sufficiently flooded, to initiate containment sump recirculation. This permits continued cooling of the core by recirculation of the spilled water in the containment sumps via the sump recirculation flow paths. In this situation, core cooling can continue indefinitely.

When the plant is in midloop operation, the pressurizer Automatic Depressurization System (ADS) valves are open, and the RNS is used to cool the RCS. The RNS is not a safety related system, so its failure must be considered. In this situation, with the RCS drained and the pressure boundary open, the PRHR HX cannot be used. In such a case, core cooling is provided by gravity injection from the IRWST, venting the RCS through the ADS. Injection from the IRWST provides core cooling until the tank empties and gravity recirculation from the containment starts. With the containment closed, the recirculation can continue indefinitely, with the decay heat generated steam condensing on the containment vessel and draining back into the IRWST.

The IRWST satisfies Criteria 2 and 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The IRWST requirements ensure that an adequate supply of borated water is available to act as a heat sink for PRHR and to supply the required volume of borated water as safety injection for core cooling and reactivity control.

To be considered OPERABLE, the IRWST must meet the water volume, boron concentration, and temperature limits defined in the surveillance requirements. The motor operated injection isolation valves must be open with power removed, and the motor operated sump recirculation isolation valves must be open. The absence of noncondensible gases in the high point vents is necessary for system OPERABILITY.

BASES

APPLICABILITY

In MODES 1, 2, 3, and 4, a safety related function of the IRWST is to provide a heat sink for PRHR. In MODES 1, 2, 3, 4, and 5, a second safety related function is the low head safety injection of borated water following a LOCA for core cooling and reactivity control. Both of these functions must be available to meet the initial assumptions of the safety analyses. These assumptions require the specified boron concentration, the minimum water volume, and the maximum water temperature.

The requirements for the IRWST in MODES 5 and 6 are specified in LCO 3.5.7, In-containment Refueling Water Storage Tank (IRWST) – Shutdown, MODE 5 and LCO 3.5.8, In-containment Refueling Water Storage Tank (IRWST) – Shutdown, MODE 6.

ACTIONS

A.1

If an IRWST injection line actuation valve flow path or a containment recirculation line actuation valve flow path is inoperable, then the valve actuation flow path must be restored to OPERABLE status within 72 hours. In this condition, three other IRWST injection or containment sump recirculation flow paths are available and can provide 100% of the required flow assuming a break in the direct vessel injection line associated with the other injection train, but with no single failure of the actuation valve flow path in the same injection or sump recirculation flow path. The 72 hour Completion Time is consistent with times normally applied to degraded two train ECCS systems which can provide 100% of the required flow without a single failure.

B.1

Excessive amounts of noncondensible gases in one of the high point vents in one IRWST injection line may interfere with the passive injection of IRWST water into the reactor vessel from the associated parallel flow path in the affected injection line. Analyses have shown that with enough noncondensible gas accumulation, IRWST injection through the affected flow path could be delayed. However, the presence of some noncondensible gases does not mean that the IRWST injection capability is immediately inoperable, but that gases are collecting and should be vented. The venting of these gases requires containment entry to manually operate the vent valves. In this Condition, the parallel flow path in the affected injection line is capable of providing 100% of the required injection flow and the other IRWST injection line remains fully OPERABLE. These IRWST flow paths can provide the credited flow in the event of a DVI line break downstream of the fully OPERABLE injection line, provided a single failure of the remaining parallel isolation

BASES

ACTIONS (continued)

valve does not occur. A Completion Time of 72 hours is acceptable for two train ECCS systems, which are capable of performing their safety function without a single failure.

C.1

Excessive amounts of noncondensible gases in both of the high point vents in one IRWST injection line may interfere with the passive injection of IRWST water into the reactor vessel from the affected injection line. Analyses have shown that with enough noncondensible gas accumulation, IRWST injection could be delayed long enough to cause core uncover. However, the presence of some noncondensible gases does not mean that the IRWST injection capability is immediately inoperable, but that gases are collecting and should be vented. The venting of these gases requires containment entry to manually operate the vent valves. Considering the slow rate of gas accumulation, venting within 24 hours should normally prevent accumulation of amounts of noncondensible gases that could interfere with IRWST injection. A Completion Time of 24 hours is permitted for venting noncondensible gases and is acceptable since the injection capability of the other IRWST injection line is adequate to ensure event mitigation. If only one of the affected high point vents is vented, then Condition B will apply to the remaining high point vent with noncondensible gas accumulation.

~~B~~D.1

If the IRWST water volume, boron concentration, or temperature are not within limits, the core cooling capability from injection or PRHR HX heat transfer and the reactivity benefit of injection assumed in safety analyses may not be available. Due to the large volume of the IRWST, online monitoring of volume and temperature, and frequent surveillances, the deviation of these parameters is expected to be minor. The allowable deviation of the water volume is limited to 3%. This limit prevents a significant change in boron concentration and is consistent with the long-term cooling analysis performed to justify PRA success criteria (Ref. 3), which assumed multiple failures with as many as 3 CMTs/Accum not injecting. This analysis shows that there is significant margin with respect to the water supplies that support containment recirculation operation. The 8-hour Completion Time is acceptable, considering that the IRWST will be fully capable of performing its assumed safety function in response to DBAs with slight deviations in these parameters.

BASES

ACTIONS (continued)

~~C~~E.1

If the motor operated IRWST isolation valves are not fully open or valve power is not removed, injection flow from the IRWST may be less than assumed in the safety analysis. In this situation, the valves must be restored to fully open with valve power removed in 1 hour. This Completion Time is acceptable based on risk considerations.

~~D~~F.1 and ~~D~~F.2

If the IRWST cannot be returned to OPERABLE status within the associated Completion Times or the LCO is not met for reasons other than Conditions A, B, or C, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.5.6.1

The IRWST borated water temperature must be verified every 24 hours to ensure that the temperature is within the limit assumed in the accident analysis. This Frequency is sufficient to identify a temperature change that would approach the limit and has been shown to be acceptable through operating experience.

SR 3.5.6.2

Verification every 24 hours that the IRWST borated water volume is above the required minimum level will ensure that a sufficient initial supply is available for safety injection and floodup volume for recirculation and as the heat sink for PRHR. During shutdown with the refueling cavity flooded with water from the IRWST, this Surveillance requires that the combined volume of borated water in the IRWST and refueling cavity meet the specified limit. Since the IRWST volume is normally stable, and is monitored by redundant main control indication and alarm, a 24 hour Frequency is appropriate.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.6.3

Verification that excessive amounts of noncondensible gases are not present in the four IRWST injection line squib valve lines is required every 24 hours. The 8x8x8 inch tee after the outlet of the IRWST injection line squib valve lines has a vertical section of pipe which serves as a high point collection point for noncondensible gases. Control room indication of the water level in this high point collection point is available to verify that noncondensible gases have not collected to the extent that the water level is depressed below the allowable level. The 24 hour Frequency is based on the expected low rate of gas accumulation and the availability of control room indication.

SR 3.5.6.~~3~~4

Verification every 31 days that the boron concentration of the IRWST is greater than the required limit, ensures that the reactor will remain subcritical following a LOCA. Since the IRWST volume is large and normally stable, the 31 day Frequency is acceptable, considering additional verifications are required within 6 hours after each solution volume increase of 15,000 gal. In addition, the relatively frequent surveillance of the IRWST water volume provides assurance that the IRWST boron concentration is not changed.

SR 3.5.6.~~4~~5

This surveillance requires verification that each motor operated isolation valve is fully open. This surveillance may be performed with available remote position indication instrumentation. The 12 hour Frequency is acceptable, considering the redundant remote indication and alarms and that power is removed from the valve operator.

SR 3.5.6.~~5~~6

Verification is required to confirm that power is removed from each motor operated IRWST isolation valve each 31 days. Removal of power from these valves reduces the likelihood that the valves will be inadvertently closed. The 31 day Frequency is acceptable considering frequent surveillance of valve position and that the valve has a confirmatory open signal.

SR 3.5.6.~~6~~7

Each motor operated containment recirculation isolation valve must be verified to be fully open. This valve is required to be open to improve containment recirculation reliability. The 31 day Frequency is acceptable

BASES

SURVEILLANCE REQUIREMENTS (continued)

considering the valve has a confirmatory open signal. This surveillance may be performed with available remote position indication instrumentation.

SR 3.5.6.~~7~~8

This Surveillance requires verification that each IRWST injection and each containment recirculation squib valve is OPERABLE in accordance with the Inservice Testing Program. The Surveillance Frequency for verifying valve OPERABILITY references the Inservice Testing Program.

The squib valves will be tested in accordance with the ASME OM Code. The applicable ASME OM Code squib valve requirements are specified in paragraph 4.6, Inservice Tests for Category D Explosively Actuated Valves. The requirements include actuation of a sample of the installed valves each 2 years and periodic replacement of charges.

SR 3.5.6.~~8~~9

Visual inspection is required each 24 months to verify that the IRWST screens and the containment recirculation screens are not restricted by debris. A Frequency of 24 months is adequate, since there are no known sources of debris with which the gutters could become restricted.

SR 3.5.6.~~9~~10

This SR requires performance of a system inspection and performance test of the IRWST injection and recirculation flow paths to verify system flow capabilities. The system inspection and performance test demonstrates that the IRWST injection and recirculation capabilities assumed in accident analyses is maintained. Although the likelihood that system performance would degrade with time is low, it is considered prudent to periodically verify system performance. The System Level Operability Testing Program provides specific test requirements and acceptance criteria.

REFERENCES

1. Section 6.3, "Passive Core Cooling."
2. Section 15.6, "Decrease in Reactor Coolant Inventory."
3. AP1000 PRA.

B 3.5 PASSIVE CORE COOLING SYSTEM (PXS)

B 3.5.7 In-containment Refueling Water Storage Tank (IRWST) – Shutdown, MODE 5

BASES

BACKGROUND	A description of the IRWST is provided in LCO 3.5.6, "In-containment Refueling Water Storage Tank – Operating."
APPLICABLE SAFETY ANALYSES	For postulated shutdown events in MODE 5 with the Reactor Coolant System (RCS) pressure boundary intact, the primary protection is Passive Residual Heat Removal (PRHR), where the IRWST serves as the initial heat sink for the PRHR heat exchanger (PRHR HX). For events in MODE 5 with the RCS pressure boundary open, PRHR is not available and RCS heat removal is provided by IRWST injection and containment sump recirculation. IRWST injection could be required to mitigate some events by providing RCS inventory makeup. No loss of coolant accidents (LOCAs) are postulated during plant operation in MODE 5; therefore, the rupture of the direct vessel injection line (DVI) is not assumed. Since the DVI rupture is not assumed, only one train of IRWST injection and recirculation flow paths is required to mitigation postulated events, assuming a single failure. The IRWST satisfies Criteria 2 and 3 of 10 CFR 50.36(c)(2)(ii).
LCO	The IRWST requirements ensure that an adequate supply of borated water is available to act as a heat sink for PRHR and to supply the required volume of borated water as safety injection for core cooling and reactivity control. To be considered OPERABLE, the IRWST must meet the water volume, boron concentration, and temperature limits defined in the Surveillance Requirements, and one path of injection and recirculation must be OPERABLE (the motor operated injection isolation valve must be open with power removed, and the motor operated sump recirculation isolation valves must be open). The absence of noncondensible gases in the high point vents is necessary for system OPERABILITY.
APPLICABILITY	In MODE 5 with the RCS pressure boundary intact or with the RCS open with pressurizer level ≥ 20%, the IRWST is an RCS injection source of borated water for core cooling and reactivity control. Additionally, in MODE 5 with the RCS pressure boundary intact, the IRWST provides the heat sink for PRHR.

BASES

APPLICABILITY (continued)

The requirements for the IRWST in MODES 1, 2, 3, and 4 are specified in LCO 3.5.6, In-containment Refueling Water Storage Tank (IRWST) – Operating. The requirements for the IRWST in MODE 6 are specified in LCO 3.5.8, In-containment Refueling Water Storage Tank (IRWST) – Shutdown, MODE 6.

ACTIONS

A.1

If a motor operated containment sump isolation valve in ~~one~~ the required sump recirculation flow path is not fully open, the valve must be fully opened within 72 hours. The 72 hour Completion Time is consistent with times normally applied to degraded two train ECCS systems which can provide 100% of the required flow without a single failure.

B.1

Excessive amounts of noncondensible gases in one of the high point vents in the required IRWST injection line may interfere with the passive injection of IRWST water into the reactor vessel from the associated parallel flow path in the affected injection line. Analyses have shown that with enough noncondensible gas accumulation, IRWST injection through the affected flow path could be delayed. However, the presence of some noncondensible gases does not mean that the IRWST injection capability is immediately inoperable, but that gases are collecting and should be vented. Venting of these gases requires containment entry to manually operate the vent valves. In this Condition the parallel flow path in the affected injection line is capable of providing 100% of the required injection. A DVI line break is not postulated in MODE 5. A Completion Time of 24 hours is acceptable since the IRWST is capable of performing the safety function without a single failure of the remaining parallel isolation valve.

C.1

Excessive amounts of noncondensible gases in both of the high point vents in the required IRWST injection line may interfere with the passive injection of IRWST water into the reactor vessel from the affected injection line. Analyses have shown that with enough noncondensible gas accumulation, IRWST injection could be delayed long enough to cause core uncover. However, the presence of some noncondensible gases does not mean that the IRWST injection capability is immediately inoperable, but that gases are collecting and should be vented. Venting of these gases requires containment entry to manually operate the vent valves. Considering the slow rate of gas accumulation, venting within 8 hours should normally prevent accumulation of amounts of noncondensible gases that could interfere with IRWST injection. A

BASES

ACTIONS (continued)

Completion Time of 8 hours is permitted for venting noncondensible gases and is acceptable since the injection capability is not significantly affected. If only one of the affected high point vents is vented, then Condition B will apply to the remaining high point vent with noncondensible gas accumulation.

BD.1

If the IRWST water volume, boron concentration, or temperature are not within limits, the core cooling capability from injection or PRHR heat transfer and the reactivity benefit of injection assumed in safety analyses may not be available. Due to the large volume of the IRWST, online monitoring of volume and temperature, and frequent surveillances, the deviation of these parameters is expected to be minor. The allowable deviation of the water volume is limited to 3%. This limit prevents a significant change in boron concentration and is consistent with the long-term cooling analysis performed to justify PRA success criteria (Ref. 3), which assumed multiple failures with as many as 3 CMTs/Accum not injecting. This analysis shows that there is significant margin with respect to the water supplies that support containment recirculation operation. The 8-hour Completion Time is acceptable, considering that the IRWST will be fully capable of performing its assumed safety function in response to DBAs with slight deviations in these parameters.

CE.1

If the required motor operated IRWST isolation valves areis not fully open or valve power is not removed, injection flow from the IRWST may be less than assumed in the safety analysis. In this situation, the valves must be restored to fully open with valve power removed in 1 hour. This Completion Time is acceptable based on risk considerations.

DF.1 and DF.2

If the IRWST cannot be returned to OPERABLE status within the associated Completion Times or the LCO is not met for reasons other than Conditions A, B, or C, the plant must be placed in a condition in which the probability and consequences of an event are minimized to the extent possible. This is done by immediately initiating action to place the plant in MODE 5 with the RCS intact with ≥ 20% pressurizer level. The time to RCS boiling is maximized by maintaining RCS inventory at ≥ 20% pressurizer level and maintaining RCS temperature as low as practical. With the RCS intact, the availability of the PRHR HX is maintained. Additionally, action to suspend positive reactivity additions is required to ensure that the SDM is maintained. Sources of positive reactivity addition include boron dilution, withdrawal of reactivity control assemblies, and excessive cooling of the RCS.

BASES

SURVEILLANCE REQUIREMENTS	SR 3.5.7.1 The LCO 3.5.6 Surveillance Requirements and Frequencies (SR 3.5.6.1 through 3.5.6.~~7~~10) are applicable to the IRWST and the flow paths required to be OPERABLE. Refer to the corresponding Bases for LCO 3.5.6 for a discussion of each SR.
REFERENCES	None.

B 3.5 PASSIVE CORE COOLING SYSTEM (PXS)

B 3.5.8 In-containment Refueling Water Storage Tank (IRWST) – Shutdown, MODE 6

BASES

BACKGROUND

A description of the IRWST is provided in LCO 3.5.6, "In-containment Refueling Water Storage Tank (IRWST) – Operating."

APPLICABLE SAFETY ANALYSES

For MODE 6, heat removal is provided by IRWST injection and containment sump recirculation.

IRWST injection could be required to mitigate some events by providing RCS inventory makeup.

One line with redundant, parallel valves is required to accommodate a single failure (to open) of an isolation valve.

The IRWST satisfies Criteria 2 and 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The IRWST requirements ensure that an adequate supply of borated water is available to supply the required volume of borated water as safety injection for core cooling and reactivity control.

To be considered OPERABLE, the IRWST in combination with the refueling cavity must meet the water volume, boron concentration, and temperature limits defined in the Surveillance Requirements, and one path of injection and recirculation must be OPERABLE. The motor operated injection isolation valve must be open and power removed, and the motor operated sump recirculation isolation valves must be open~~closed~~ and OPERABLE. Any cavity leakage should be estimated ~~and made up with borated water such that the volume in the IRWST plus the refueling cavity will meet the IRWST volume requirement.~~ The absence of noncondensible gases in the high point vents is necessary for system OPERABILITY.

APPLICABILITY

In MODE 6, the IRWST is an RCS injection source of borated water for core cooling and reactivity control.

The requirements for the IRWST in MODES 1, 2, 3, and 4 are specified in LCO 3.5.6, In-containment Refueling Water Storage Tank (IRWST) – Operating. The requirements for the IRWST in MODE 5 are specified in LCO 3.5.7, In-containment Refueling Water Storage Tank (IRWST) – Shutdown, MODE 5.

BASES

ACTIONS

A.1

With the required ~~one~~ motor operated containment sump isolation valve not fully open, the valve must be fully opened within 72 hours. The 72 hour Completion Time is consistent with times normally applied to degraded two train ECCS systems which can provide 100% of the required flow without a single failure.

B.1

Excessive amounts of noncondensible gases in one of the high point vents in the required IRWST injection line may interfere with the passive injection of IRWST water into the reactor vessel from the associated parallel flow path in the affected injection line. Analyses have shown that with enough noncondensible gas accumulation, IRWST injection through the affected flow path could be delayed. However, the presence of some noncondensible gases does not mean that the IRWST injection capability is immediately inoperable, but that gases are collecting and should be vented. Venting of these gases requires containment entry to manually operate the vent valves. In this Condition, the parallel flow path in the affected injection line is capable of providing 100% of the required injection. A DVI line break is not postulated in MODE 6. A Completion Time of 24 hours is acceptable since the IRWST is capable of performing the safety function without a single failure of the remaining parallel isolation valve.

C.1

Excessive amounts of noncondensible gases in both of the high point vents in the required IRWST injection line may interfere with the passive injection of IRWST water into the reactor vessel from the affected injection line. Analyses have shown that with enough noncondensible gas accumulation, IRWST injection could be delayed long enough to cause core uncover. However, the presence of some noncondensible gases does not mean that the IRWST injection capability is immediately inoperable, but that gases are collecting and should be vented. Venting of these gases requires containment entry to manually operate the vent valves. Considering the slow rate of gas accumulation, venting within 8 hours should normally prevent accumulation of amounts of noncondensible gases that could interfere with IRWST injection. A Completion Time of 8 hours is permitted for venting noncondensible gases and is acceptable since the injection capability is not significantly affected. If only one of the affected high point vents is vented, then Condition B will apply to the remaining high point vent with noncondensible gas accumulation.

~~B~~D.1

If the IRWST and refueling cavity water volume, boron concentration, or temperature are not within limits, the core cooling capability from injection or PRHR HX heat transfer and the reactivity benefit of injection assumed

BASES

ACTIONS (continued)

in safety analyses may not be available. Due to the large volume of the IRWST, online monitoring of volume and temperature, and frequent surveillances, the deviation of these parameters is expected to be minor. The allowable deviation of the water volume is limited to 3%. This limit prevents a significant change in boron concentration and is consistent with the long-term cooling analysis performed to justify PRA success criteria (Ref. 3), which assumed multiple failures with as many as 3 CMTs/Accum not injecting. This analysis shows that there is significant margin with respect to the water supplies that support containment recirculation operation. The 8-hour Completion Time is acceptable, considering that the IRWST will be fully capable of performing its assumed safety function in response to DBAs with slight deviations in these parameters.

~~C~~E.1

If the required motor operated IRWST isolation valves ~~are~~is not fully open or valve power is not removed, injection flow from the IRWST may be less than assumed in the safety analysis. In this situation, the valve~~s~~ must be restored to fully open with valve power removed in 1 hour. This Completion Time is acceptable based on risk considerations.

~~D~~F.1 and ~~D~~F.2

If the IRWST cannot be returned to OPERABLE status within the associated Completion Times or the LCO is not met for reasons other than Conditions A, B, C, or D, the plant must be placed in a Condition in which the probability and consequences of an event are minimized to the extent possible. In MODE 6, action must be immediately initiated to be in MODE 6 with the cavity water level ≥ 23 feet above the top of the reactor vessel flange.

The time to RCS boiling is maximized by maximizing the RCS inventory and maintaining RCS temperature as low as practical. With the RCS intact, another means of removing decay heat is available (the PRHR HX). Additionally, action to suspend positive reactivity additions is required to ensure that the SDM is maintained. Sources of positive reactivity addition include boron dilution, withdrawal of reactivity control assemblies, and excessive cooling of the RCS. These Actions place the plant in a condition which maximizes the time to IRWST injection, thus providing time for repairs or application of alternative cooling capabilities.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.8.1

The IRWST and refueling cavity borated water temperature must be verified every 24 hours to ensure that the temperature is within the limit assumed in accident analysis. This Frequency is sufficient to identify a temperature change that would approach the limit and has been shown to be acceptable through operating experience.

SR 3.5.8.3

Verification every 31 days that the boron concentration of the IRWST and refueling cavity is greater than the required limit ensures that the reactor will remain subcritical following shutdown events. Since the IRWST volume is large and normally stable, the 31 day Frequency is acceptable, considering additional verifications are required within 6 hours after each solution volume increase of 15,000 gal.

SR 3.5.8.4

LCO 3.5.6 Surveillance Requirements and Frequencies SR 3.5.6.43 and 3.5.6.5 through 3.5.6.810 are applicable to the IRWST and the flow paths required to be OPERABLE. Refer to the corresponding Bases for LCO 3.5.6 for a discussion of each SR.

REFERENCES

None.

ENCLOSURE 7

Amplifying Information for Figures 6.3-1 and 6.3-2, Non-Proprietary

Amplifying Information for

Figure 6.3-1 (Non-Proprietary Class 3)

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Amplifying Information for

Figure 6.3-2 (Non-Proprietary Class 3)

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