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August 2, 2010

Subject: AP1000 Response to Request for Additional Information (SRP 23)

Westinghouse is submitting a response to the NRC request for additional information (RAI) on SRP Section 23. This RAI response is submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in this response is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

Enclosure 1 provides the response for the following RAI(s):

RAI-DCP-CN01-SBP-COLP-01

Questions or requests for additional information related to the content and preparation of this response should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,

for/ John J DeBlasio

Robert Sisk, Manager
Licensing and Customer Interface
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/Enclosure

1. Response to Request for Additional Information on SRP Section 23

D063
NRO

| | | | | |
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ENCLOSURE 1

Response to Request for Additional Information on SRP Section 23

RAI Response Number: RAI-DCP-CN01-SBP-COLP-01
Revision: 0

***Question:***

The NRC has completed its review of the final information on proposed changes for the AP1000 Design Control Document (DCD), Revision 18, dated April 26, 2010. Based on a review of the information that was provided, additional information is needed to address the following considerations related to change number 1 for the potable water system:

1. A figure was not provided so the staff is unable to ensure the adequacy of the potable water control room boundary isolation provisions that are proposed. Provide a diagram showing the safety related portions of the potable water system, including valve designations and sizes, line designations and sizes, loop seal dimensions, and other associated equipment. Show the location of these components with relation to the main control room, and indicate the boundary between safety related and non-safety related equipment. Include this figure in the DCD.

2. A loop seal is proposed to maintain main control room (MCR) isolation in until manual potable water isolation valves can be closed by the operators. Describe the basis for sizing the loop seal and in particular, what the loop seal dimensions are and how they were determined. Explain how the loop seal will be kept full by the design or include a COL item to ensure that the loop seal will be properly maintained during plant operation. Include this information in the DCD.

3. The DCD needs to be revised to provide a description of the safety related portions of the potable water system in Tier 1, including a functional diagram that shows the relative locations of important components and the dimensions of the loop seal. Tier 1 inspections, tests, analyses, and acceptance criteria (ITAAC) also need to be established to ensure that the as-built configuration of the safety related portions of the potable water system satisfy design requirements. Likewise, the description in Tier 2 Section 9.2.5 needs to be revised to reflect the changes that are being made to the potable water system.

4. Additional information is needed to explain how the vacuum breaker satisfies single failure considerations.

5. Explain the event sequence that establishes the minimum response time for manually shutting the potable water isolation valves. Explain how a failure of potable water piping will be identified by the operators and what indications will be used to initiate the manual action. Explain how the operator manual action can be reliably and correctly accomplished within the required time period. Please confirm the manual operator actions have been included in the Human Reliability Analysis. State specifically whether the manual actions are "Risk Important Human actions." These considerations need to be addressed and the DCD needs to be revised to include this information.

6. The impact of potable water pipe failure in the control room on equipment important to safety needs to be addressed for both water spray/flooding effects and the consequences of non-safety-related parts of the potable water system impacting control room equipment due to failure of non-seismic supports. If these considerations are already addressed in the DCD, provide reference to where this information is provided.

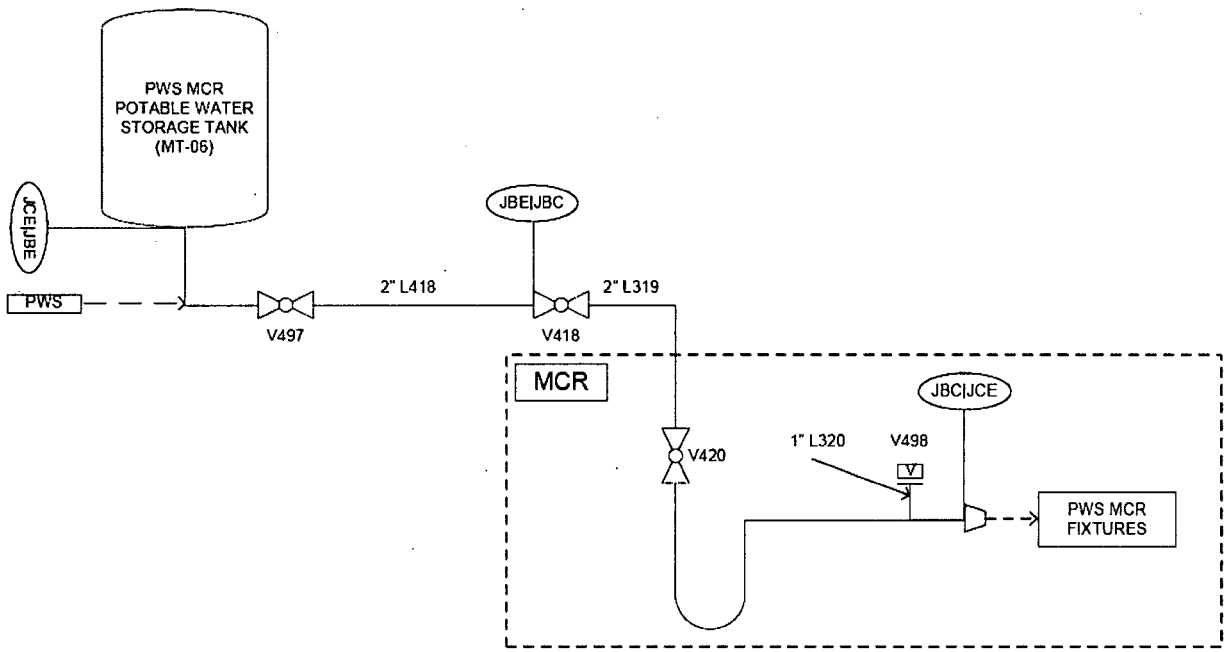
7. The initial test program needs to be revised to include provisions for testing the potable water isolation design features.

8. Additional information is needed to explain how the AP1000 Technical Specifications address operability requirements for the potable water system safety-related isolation function.

9. Tier 2 Section 3.2 of the DCD, Revision 17, indicates that the sanitary drainage system is classified as "Class P. This classification is used for plumbing equipment and complies with the National Plumbing Code. Based on the information provided in Tier 2 Section 9.2.6 of the DCD, it is unclear if the sanitary drain piping and associated vents penetrate the control room boundary and if provisions similar to those that were established for the potable water system are also needed for the sanitary drainage system and vents. Additional information is needed to explain how the integrity of the control room boundary is ensured for any sanitary drain penetrations and vents that exist. Similarly, describe to what extent any other vents and drains and other fluid systems penetrate the control room boundary and explain how the integrity of the control room is ensured for these other penetrations.

**Westinghouse Response:**

1. The figure below is provided to clarify the safety-related design changes to the potable water system to ensure the main control room pressure boundary is maintained. This figure is representative of the valve designations and sizes, line designations and sizes, and other associated equipment. A modified version of this figure will be added to the DCD Tier 2 (see attached Figure 9.2.5-1). The potable water system has no safety-related functions other than to prevent in-leakage into the main control room envelope during VES operation.




The following pipe material, pipe class, and valve changes were made to the potable water system:

- Change L418 to 2" JBE from 1"JCB
- Change L319 to 2" JBC from 1"JCE
- Add maintenance isolation valve (V497)
- Change V418 from a 1" check valve to a 2"JBC ball valve
- Add seismically qualified loop seal to L319
- Add vacuum relief V498 after loop seal
- Add 1" L320 for vacuum breaker
- Add reducer at intersection between 2" JBC (L319) and 1" JCE (L420)
- V420 change from 1" JCB to 2" JBC
- Safety-related (seismic) boundary starts at V418 (JBC), penetrates the main control room with L319 (JBC) and ends at the concentric reducer downstream of the vacuum relief valve (V498) in the main control room.

2. The potable water system loop seal is added to maintain main control room (MCR) isolation in the event that the non-seismic PWS piping would break during an event. The loop seal supports the 1/8-inch VES pressurization of the main control room and provides sufficient time for the operators to manually close either of the redundant potable water isolation valves. In the event that the non-safety-related portion of the potable water supply line would rupture following a seismic event, the water remaining in the loop seal would be lost relatively slowly only due to evaporation. This relatively slow process provides sufficient time for operators to take manual action to locate and isolate small amounts of air leakage that might begin to occur as the water evaporates over time.

   The basis for sizing the loop seal was determined by the requirements of the Main Control Room Emergency Habitability System (VES). The VES shall be capable of maintaining pressure in the MCR of at least 1/8-inchWater Gauge between the MCR pressure boundary and the surrounding areas. The loop seal is routed so that it has a depth of 6-inches. This depth provides assurance that the loop seal will perform its function to maintain the MCR pressure boundary while the VES is in operation following a seismic event. The potable water tank on the elevation above the MCR area (el. 135'-7") provides water to the fixtures in the MCR area and is always in service, therefore the daily operation of the main control room potable water fixtures keeps the loop seal full by design prior to the initiation of a plant event.

3. DCD Tier 1 changes are provided below. Previously, RAI-SRP 6.4-SPCV-03 transmitted changes to the non-radioactive ventilation system ITAAC tables. These changes captured design changes to the potable water, sanitary drainage, and waste water systems to ensure the main control room envelope. In addition, the markup of Tier 1 subsection 2.7.1 in this RAI (provided below) now implements all the design changes to the potable water system, as well as including the sanitary drainage and waste water system changes necessary to provide the main control room envelope integrity.

4. The function of the vacuum breaker is to help ensure that a break in the non-safety-related potable water supply piping, during a seismic event, would not cause water to siphon from the loop seal. Vacuum breakers, which are classified in a common group with pressure and vacuum relief devices by the ASME Code as discussed in DCD Section 3.9.6.2.2, are spring-loaded relief valves and are active components included in DCD Tables 3.9-12 and 3.9-16.

   These pressure / vacuum relief devices are not required to consider single active failures, consistent with the DCD approach for active failures as discussed in DCD Sections 15.0.12 and 6.3.2.5.1. This design approach is consistent with the implementation of single vacuum relief device (vacuum breaker RCS-PL-V010A or -V010B in DCD Figure 5.1-5, Sheet 2 of 3) in each Automatic Depressurization System discharge header for the Reactor Coolant System, or the implementation of a single pressure relief device (relief valve VES-PL-V040A, -V040B, -V041A, or –V041B in DCD Figure 6.4-2, Sheet 1 of 2) for each of the four VES air storage banks. In both of these

examples, single active failure is not considered as a credible postulated failure for either a pressure or vacuum relief device. This same approach is applicable for this additional vacuum relief device added to the PWS supply line.

5. The safety–related potable water loop seal assures main control room pressure boundary integrity after a design basis event. Since a seismic event does not occur simultaneously with another design basis event, there are no radiological conditions or other hazards such as toxic gases that would challenge MCR habitability. (For example, PGS hydrogen tank leakage has been evaluated and does not challenge MCR habitability or present a flammability hazard if it leaks following a seismic event.) VES actuation occurs only assuming the sustained loss of electrical power, and for this situation, the design basis for VES actuation is to provide breathable air for the MCR occupants, which also helps to prevent the buildup of CO2.

   The pressurization aspect, while part of the design basis, is not the primary priority for this event without an external challenge to MCR habitability. The potable water system loop seal is designed to remain intact following a seismic event and has been designed to provide a1/8-inch water seal in conjunction with the vacuum breaker operation, following an event.

   Following longer-term evaporation of the water in the loop seal, or for a deterministic beyond-design-basis approach simply considering the loop seal to not be available, the MCR occupants still have a supply of breathable air for 72 hours and the MCR would remain habitable. The operators would be alerted of a loss of air through the loop seal piping by the low differential pressure alarm for the MCR and would take actions to locate the source of leakage of the MCR pressurization air flow. The operators would correct it by closing either of the redundant potable water manual isolations (since single failure of manual isolation valves is assumed as discussed in DCD Section 15.0.12).

   Therefore, even with a slight loss of pressurization, which is not expected for design basis events, the MCR occupants still have breathable air and a slight loss of pressurization while they are identifying and correcting this situation. This situation is not a challenge to habitability because there are no radiological or toxic chemical hazards that would exist for a seismic event.

6. DCD Tier 2 Section 3.4.1.2.2 Internal Flooding discusses a postulated pipe and potable water storage tank (150 gallons) rupture in the Auxiliary Building Level 5 (Elevation 135'-3"). This section states "Water from fire fighting, postulated pipe, or potable water storage tank (150 gallons) ruptures in the main mechanical HVAC equipment rooms drains to the turbine building via floor drains or to the annex building via flow under the doors. Therefore, no significant accumulation of water occurs in this room. Floor penetrations are sealed and a 6 inch platform is provided at the elevator and stairwell such that flooding in these rooms does not propagate to levels below."

The potable water system penetrates the main control area and serves the main control area kitchen and bathroom areas. The 1" non-seismic lines of the potable water lines are limited to the kitchen and bathroom areas. DCD Tier 2 Subsection 3.4.1.2.2.2 Auxiliary Building Flooding Events, Auxiliary Building Level 4 (117'-6") states: "While the main control room kitchen and restroom are provided with potable water, the lines are 1-inch and smaller, and are not evaluated for pipe ruptures." In addition, there are no safety-related components that would be adversely affected by a rupture of the 1" non-seismic potable water system piping in the MCR kitchen and bathroom areas.

7. The initial test program including the design changes to the potable water system ensures the integrity of the MCR pressure boundary. In the Main Control Room Emergency Habitability System General Test Acceptance Criteria and Methods subsection of the DCD (Tier 2 Subsection 14.2.9.1.6), it is stated that the proper operation of safety-related valves is verified by the performance of baseline in-service tests as described in subsection 3.9.6. Subsection 3.9.6 "Inservice Testing of Pumps and Valves" further directs that Table 3.9-16 identifies the components subject to the preservice and the inservice test program. DCD Tier 2 Subsection 14.2.9.1.6 and Table 3.9-16 have been updated below.

8. This information was transmitted to the NRC by RAI-SRP 6.4-SPCV-03. Subsection 3.7.6 of the Technical Specifications addresses the Main Control Room Habitability System (VES) and has been updated to include the safety-related isolation function of the potable water system.

9. RAI-SRP 6.4-SPCV-03 provided additional information regarding the AP1000 Main Control Room (MCR) boundary. The response included DCD markups relating to the MCR habitability. In addition to the nuclear island nonradioactive ventilation system (VBS) and the main control room emergency habitability system (VES), the sanitary drain system (SDS), the potable water system (PWS) and the waste water system (WWS) also penetrate the MCR boundary. Isolation of each of these system's penetrations through MCR boundary are described in RAI-SRP 6.4-SPCV-03 and as modified in this response.

**Design Control Document (DCD) Revision:**

See DCD markups below.

**PRA Revision:**

None

**Technical Report (TR) Revision:**

None

Tier 1 changes:

**2.7.1 Nuclear Island Nonradioactive Ventilation System**

**Design Description**

The nuclear island nonradioactive ventilation system (VBS) serves the main control room (MCR), control support area (CSA), Class 1E dc equipment rooms, Class 1E instrumentation and control (I&C) rooms, Class 1E electrical penetration rooms, Class 1E battery rooms, remote shutdown room (RSR), reactor coolant pump trip switchgear rooms, adjacent corridors, and passive containment cooling system (PCS) valve room during normal plant operation. The VBS consists of the following independent subsystems: the main control room/control support area HVAC subsystem, the class 1E electrical room HVAC subsystem, and the passive containment cooling system valve room heating and ventilation subsystem. The VBS provides heating, ventilation, and cooling to the areas served when ac power is available. The system provides breathable air to the control room and maintains the main control room and control support area areas at a slightly positive pressure with respect to the adjacent rooms and outside environment during normal operations. The VBS monitors the main control room supply air for radioactive particulate and iodine concentrations and provides filtration of main control room/control support area air during conditions of abnormal (high) airborne radioactivity. In addition, the VBS isolates the HVAC penetrations in the main control room boundary on "high-high" particulate or iodine radioactivity in the main control room supply air duct or on a loss of ac power for more than 10 minutes. The Sanitary Drainage System (SDS) also isolates a penetration in the main control room boundary on "high-high" particulate or iodine radioactivity in the main control room supply air duct or on a loss of ac power for more than 10 minutes. Additional penetrations from the SDS and Potable Water System (PWS) into the main control room boundary are maintained leak tight using a loop seal in the piping, and the Waste Water System (WWS) is isolated using a normally closed safety related manual isolation valve. These features support operation of the main control room emergency habitability system (VES) and have been included in Tables 2.7.1-1 and 2.7.1-2.

The VBS is as shown in Figure 2.7.1-1 and the component locations of the VBS are as shown in Table 2.7.1-5.

1. The functional arrangement of the VBS is as described in the Design Description of this subsection 2.7.1.

2. a) The components identified in Table 2.7.1-1 as ASME Code Section III are designed and constructed in accordance with ASME Code Section III requirements.

   b) The piping identified in Table 2.7.1-2 as ASME Code Section III is designed and constructed in accordance with ASME Code Section III requirements.

3. a) Pressure boundary welds in components identified in Table 2.7.1-1 as ASME Code Section III meet ASME Code Section III requirements.

b) Pressure boundary welds in piping identified in Table 2.7.1-2 as ASME Code Section III meet ASME Code Section III requirements.

4. a) The components identified in Table 2.7.1-1 as ASME Code Section III retain their pressure boundary integrity at their design pressure.

   b) The piping identified in Table 2.7.1-2 as ASME Code Section III retains its pressure boundary integrity at its design pressure.

5. The seismic Category I equipment identified in Table 2.7.1-1 can withstand seismic design basis loads without loss of safety function.

6. a) The Class 1E components identified in Table 2.7.1-1 are powered from their respective Class 1E division.

   b) Separation is provided between VBS Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.

7. The VBS provides the safety-related function to isolate the pipes that penetrate the MCR pressure boundary.

8. The VBS provides the following nonsafety-related functions:

   a) The VBS provides cooling to the MCR, CSA, RSR, and Class 1E electrical rooms.

   b) The VBS provides ventilation cooling to the Class 1E battery rooms.

   c) The VBS maintains MCR and CSA habitability when radioactivity is detected.

   d) The VBS provides ventilation cooling via the ancillary equipment in Table 2.7.1-3 to the MCR and the division B&C Class 1E I&C rooms.

9. Safety-related displays identified in Table 2.7.1-1 can be retrieved in the MCR.

10. a) Controls exist in the MCR to cause the remotely operated valves identified in Table 2.7.1-1 to perform their active functions.

    b) The valves identified in Table 2.7.1-1 as having protection and safety monitoring system (PMS) control perform their active safety function after receiving a signal from the PMS.

11. After loss of motive power, the valves identified in Table 2.7.1-1 assume the indicated loss of motive power position.

12. Controls exist in the MCR to cause the components identified in Table 2.7.1-3 to perform the listed function.

13. Displays of the parameters identified in Table 2.7.1-3 can be retrieved in the MCR.

14. The background noise level in the MCR and RSR does not exceed 65 dB(A) when the VBS is operating.

**Inspections, Tests, Analyses, and Acceptance Criteria**

Table 2.7.1-4 specifies the inspections, tests, analyses, and associated acceptance criteria for the VBS.

TABLE 2.7.1-1

| 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[1] | Active Function | Loss of Motive Power Position |
|---|---|---|---|---|---|---|---|---|---|
| MCR Supply Air Isolation Valve | VBS-PL-V186 | Yes | Yes | Yes | Yes/No | Yes (Valve Position) | Yes/No | Transfer Closed | Closed |
| MCR Supply Air Isolation Valve | VBS-PL-V187 | Yes | Yes | Yes | Yes/No | Yes (Valve Position) | Yes/No | Transfer Closed | Closed |
| MCR Return Air Isolation Valve | VBS-PL-V188 | Yes | Yes | Yes | Yes/No | Yes (Valve Position) | Yes/No | Transfer Closed | Closed |
| MCR Return Air Isolation Valve | VBS-PL-V189 | Yes | Yes | Yes | Yes/No | Yes (Valve Position) | Yes/No | Transfer Closed | Closed |
| MCR Exhaust Air Isolation Valve | VBS-PL-V190 | Yes | Yes | Yes | Yes/No | Yes (Valve Position) | Yes/No | Transfer Closed | Closed |
| MCR Exhaust Air Isolation Valve | VBS-PL-V191 | Yes | Yes | Yes | Yes/No | Yes (Valve Position) | Yes/No | Transfer Closed | Closed |

TABLE 2.7.1-1

| 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[1] | Active Function | Loss of Motive Power Position |
|---|---|---|---|---|---|---|---|---|---|
| PWS MCR Isolation Valve | PWS-PL-V418 | Yes | Yes | No | -/- | No | No | Transfer Closed | - |
| PWS MCR Isolation Valve | PWS-PL-V420 | Yes | Yes | No | -/- | No | No | Transfer Closed | - |
| PWS MCR Vacuum Relief | PWS-PL-V498 | Yes | Yes | No | -/- | No | No | Transfer Open | - |
| MCR SDS (Vent) Isolation Valve | SDS-PL-V001 | Yes | Yes | Yes | Yes/No | Yes (Valve Position) | Yes/No | Transfer Closed | As Is |
| MCR SDS (Vent) Isolation Valve | SDS-PL-V002 | Yes | Yes | Yes | Yes/No | Yes (Valve Position) | Yes/No | Transfer Closed | As Is |
| MCR WWS Isolation Valve | WWS-PL-V506 | Yes | Yes | No | -/- | No | No | - | - |

1. DAS = diverse actuation system

| TABLE 2.7.1-2 | | | | |
|---|---|---|---|---|
| **Line Name** | **Line Number** | **ASME Code Section III** | **Leak Before Break** | **Functional Capability Required** |
| Main Control Room Supply | VBS-L311 | Yes | No | No |
| Main Control Room Exhaust | VBS-L312 | Yes | No | No |
| Main Control Room Toilet Exhaust | VBS-L313 | Yes | No | No |
| Main Control Room Sanitary Vent Line | SDS-PL-L035 | Yes | No | No |
| Main Control Room Sanitary Drain Line | SDS-PL-L030 | Yes | No | No |
| Main Control Room Water Line | PWS-PL-L319 | Yes | No | No |
| Main Control Room Water Line | PWS-PL-L320 | Yes | No | No |
| Main Control Room Waste Water Line | WWS-PL-L808 | Yes | No | No |
| Main Control Room Water Line | WWS-PL-L851 | Yes | No | No |

| TABLE 2.7.1-4<br>INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA | | |
|---|---|---|
| **Design Commitment** | **Inspections, Tests, Analyses** | **Acceptance Criteria** |
| 1. The functional arrangement of the VBS is as described in the Design Description of this subsection 2.7.1 | Inspection of the as-built system will be performed. | The as-built VBS conforms with the functional arrangement described in the Design Description of this subsection 2.7.1. |
| 2.a) The components identified in Table 2.7.1-1 as ASME Code Section III are designed and constructed in accordance with ASME Code Section III requirements. | Inspection will be conducted of the as-built components as documented in the ASME design reports. | The ASME Code Section III design reports exist for the as-built components identified in Table 2.7.1-1 as ASME Code Section III. |
| 2.b) The piping identified in Table 2.7.1-2 as ASME Code Section III is designed and constructed in accordance with ASME Code Section III requirements. | Inspection will be conducted of the as-built components as documented in the ASME design reports. | The ASME code Section III design reports exist for the as-built piping identified in Table 2.7.1-2 as ASME Code Section III. |
| 3.a) Pressure boundary welds in components identified in Table 2.7.1-1 as ASME Code Section III meet ASME Code Section III requirements. | Inspection of the as-built pressure boundary welds will be performed in accordance with the ASME Code Section III. | A report exists and concludes that the ASME Code Section III requirements are met for nondestructive examination of pressure boundary welds. |
| 3.b) Pressure boundary welds in piping identified in Table 2.7.1-2 as ASME Code Section III meet ASME Code Section III requirements. | Inspection of the as-built pressure boundary welds will be performed in accordance with the ASME Code Section III. | A report exists and concludes that the ASME Code Section III requirements are met for nondestructive examination of pressure boundary welds. |
| 4.a) The components identified in Table 2.7.1-1 as ASME Code Section III retain their pressure boundary integrity at their design pressure. | A pressure test will be performed on the components required by the ASME Code Section III to be pressure tested. | A report exists and concludes that the results of the pressure test of the components identified in Table 2.7.1-1 as ASME Code Section III conform with the requirements of the ASME Code Section III. |

| TABLE 2.7.1-4<br>INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA | | |
|---|---|---|
| **Design Commitment** | **Inspections, Tests, Analyses** | **Acceptance Criteria** |
| 4.b) The piping identified in Table 2.7.1-2 as ASME Code Section III retains its pressure boundary integrity at its design pressure. | A pressure test will be performed on the piping required by the ASME Code Section III to be pressure tested. | A report exists and concludes that the results of the pressure test of the piping identified in Table 2.7.1-2 as ASME Code Section III conform with the requirements of the ASME Code Section III. |
| 5. The seismic Category I equipment identified in Table 2.7.1-1 can withstand seismic design basis loads without loss of safety function. | i) Inspection will be performed to verify that the seismic Category I equipment identified in Table 2.7.1-1 is located on the Nuclear Island.<br><br>ii) Type tests, analyses, or a combination of type tests and analyses of seismic Category I equipment will be performed.<br><br>iii) Inspection will be performed for the existence of a report verifying that the as-installed equipment including anchorage is seismically bounded by the tested or analyzed conditions. | i) The seismic Category I equipment identified in Table 2.7.1-1 is located on the Nuclear Island.<br><br>ii) A report exists and concludes that the seismic Category I equipment can withstand seismic design basis loads without loss of safety function.<br><br>iii) A report exists and concludes that the as-installed equipment including anchorage is seismically bounded by the tested or analyzed conditions. |
| 6.a) The Class 1E components identified in Table 2.7.1-1 are powered from their respective Class 1E division. | Testing will be performed on the VBS by providing a simulated test signal in each Class 1E division. | A simulated test signal exists at the Class 1E equipment identified in Table 2.7.1-1 when the assigned Class 1E division is provided the test signal. |
| 6.b) Separation is provided between VBS Class 1E divisions, and between Class 1E divisions and non-Class 1E cable. | See Tier 1 Material, Table 3.3-6, item 7.d. | See Tier 1 Material, Table 3.3-6, item 7.d. |
| 7. The VBS and SDS provides the safety-related function to | See item 10.b in this table. | See item 10.b in this table. |

| TABLE 2.7.1-4<br>INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA | | |
|---|---|---|
| **Design Commitment** | **Inspections, Tests, Analyses** | **Acceptance Criteria** |
| isolate the pipe that penetrates the MCR pressure boundary. | | |

Tier 2 changes:

Table 3.2-3 (Sheet 14 of 65)

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

| **Potable Water System (PWS)** | | | | | Location: Various |
|---|---|---|---|---|---|
| PWS-PL-V418 | PWS MCR Isolation Valve | C | I | ASME III-3 | |
| PWS-PL-V420 | PWS MCR Isolation Valve | C | I | ASME III-3 | |
| PWS-PL-V498 | PWS MCR Vacuum Relief | C | I | ASME III-3 | |
| Balance of system components are Class E | | | | | |

Table 3.9-12 (Sheet 2 of 7)

**LIST OF ASME CLASS 1, 2, AND 3 ACTIVE VALVES**

| **Valve No.** | **Description** | **Function[(a)]** |
|---|---|---|
| **Potable Water System** | | |
| PWS-PL-V418 | PWS MCR Isolation Valve | 3 |
| PWS-PL-V420 | PWS MCR Isolation Valve | 3 |
| PWS-PL-V498 | PWS MCR Vacuum Relief | 3 |

Table 3.9-16 (Sheet 7 of 23)

VALVE INSERVICE TEST REQUIREMENTS

| Valve Tag Number | Description[1] | Valve Type | Safety-Related Missions | Safety Functions[2] | ASME Class/ IST Category | Inservice Testing Type and Frequency | IST Notes |
|---|---|---|---|---|---|---|---|
| PWS-PL-V418 | PWS MCR Isolation Valve | Manual | Transfer Close<br>Maintain Close | Active | Class 3<br>Category B | Exercise Full Stroke/2 years | |
| PWS-PL-V420 | PWS MCR Isolation Valve | Manual | Transfer Close<br>Maintain Close | Active | Class 3<br>Category B | Exercise Full Stroke/2 years | |
| PWS-PL-V498 | PWS MCR Vacuum Relief | Relief | Transfer Open | Active | Class 3<br>Category C | Vacuum Relief/2 Years | |

Table 3.11-1 (Sheet 21 of 50)

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) |
|---|---|---|---|---|---|
| PWS MCR Isolation | PWS-PL-V418 | 3 | ISOL | 5 min | M |
| PWS MCR Isolation | PWS-PL-V420 | 3 | ISOL | 5 min | M |
| PWS MCR Vacuum Relief | PWS-PL-V498 | 3 | ISOL | 5 min | M |

Table 3I.6-3 (Sheet 5 of 32)

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

| Description | AP1000 Tag Number | Comment |
|---|---|---|
| PWS MCR Isolation | PWS-PL-V418 | 2 |
| PWS MCR Isolation | PWS-PL-V420 | 2 |
| PWS MCR Vacuum Relief | PWS-PL-V498 | 2 |

DCD Tier 2 Subsection 9.2.5 has been updated and the changes were shown in RAI-SRP-6.4-SPCV-03 as shown below.

### 9.2.5 Potable Water System

#### 9.2.5.1 Design Basis

The potable water system (PWS) is designed to furnish water for domestic use and human consumption. It complies with the following standards:

- Bacteriological and chemical quality requirements as referenced in EPA "National Primary Drinking Water Standards," 40 CFR Part 141.
- The distribution of water by the system is in compliance with 29 CFR 1910, Occupational Safety and Health Standards, Part 141.

##### 9.2.5.1.1 Safety Design Basis

The potable water system penetrates the main control room envelope boundary. A safety related loop seal in the PWS piping that penetrates the main control room envelope boundary prevents in-leakage into the main control room envelope during VES operation.

##### 9.2.5.1.2 Power Generation Design Basis

- Potable water is supplied to provide a quantity of 50 gallons/person/day for the largest number of persons expected to be at the station during a 24-hour period during normal plant power generation or outages.

- Water heaters provide a storage capacity equal to the probable hourly demand for potable hot water usage and provide hot water for the main lavatory, shower areas, and other locations where needed.

- A minimum pressure of 20 psig is maintained at the furthermost point in the distribution system.

- No interconnections exist between the potable water system and any potentially radioactive system or any system using water for purposes other than domestic water service.

**9.2.5.2 System Description**

**9.2.5.2.1 General Description**

Classification of components and equipment for the potable water system is given in Section 3.2.

The source of water for the potable water system is a site-specific water system. The potable water system consists of a distribution header around the power block, hot water storage heaters, and necessary interconnecting piping and valves. All other components of the potable water system outside the power block are site-specific and will be addressed in accordance with subsection 9.2.11.

**9.2.5.2.2 Component Description**

**Hot Water Heaters**

Electric immersion heating elements located inside the potable water hot water tank are used to produce hot water. This hot water is routed to the shower and toilet areas and to other plumbing fixtures and equipment requiring domestic hot water service. Point of use, inline electric water heating elements are used to generate hot water for the main control room and the turbine building secondary sampling laboratory.

**9.2.5.3 System Operation**

Filtered water is supplied from a site-specific water source for the potable water distribution system.

The onsite water supply system will maintain an appropriate pressure throughout the distribution system.

Potable water is supplied to areas that have the potential to be contaminated radioactively. Where this potential for contamination exists, the potable water system is protected by a reduced pressure zone type backflow prevention device.

No interconnections exist between the potable water system and any system using water for purposes other than domestic water service including any potentially radioactive system. The common supply from the onsite raw water system is designed to use an air gap to prevent contamination of the potable water system from other systems supplied by the raw water system.

### 9.2.5.4 Safety Evaluation

The potable water system has a safety-related function to prevent in-leakage into the main control room envelope during VES operation. A loop seal in the safety-related PWS piping that penetrates the main control room envelope boundary prevents in-leakage into the main control room envelope.

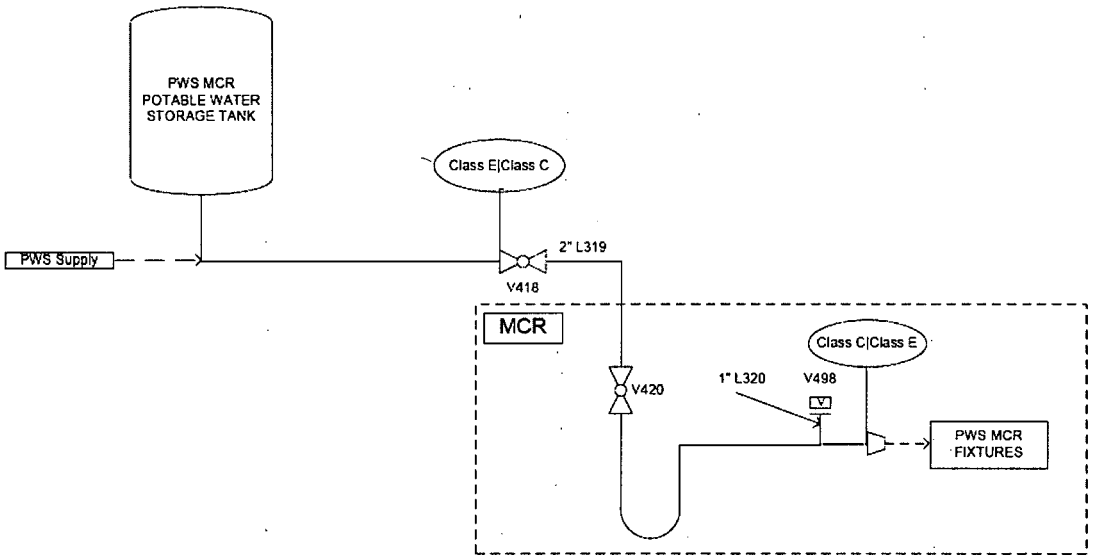
### 9.2.5.5 Tests and Inspections

The potable water system is hydrostatically tested for leak-tightness in accordance with the Uniform Plumbing Code. Inspection of the system is in compliance with the Uniform Plumbing Code or governing codes having jurisdiction. The system is then disinfected, flushed with potable water, and placed in service. The presence of residual chlorine can be confirmed through laboratory tests of samples at sampling points as required. Tests for microbiological and bacteria presence in potable water are conducted periodically.

### 9.2.5.6 Instrumentation Applications

Thermostats, high-temperature limit controls, and temperature indication are installed on the potable water system hot water tank. Thermostats and high-temperature limit controls are installed on the inline water heaters. Pressure regulators are employed in those parts of the distribution system where pressure restrictions are imposed.

Figure 9.2.5-1 Main Control Room Potable Water System Isolation



### 14.2.9.1.6 Main Control Room Emergency Habitability System Testing

**Purpose**

The purpose of the main control room emergency habitability system testing is to verify that the as-installed components properly perform the safety-related functions described in Section 6.4, including the following:

- Provide sufficient breathable quality air to the main control room
- Maintain the main control room at positive pressure
- Provide passive cooling of designated equipment

In addition, the following safety-related functions performed by the nuclear island nonradioactive ventilation system described in subsection 9.4.1 are tested:

- Provide isolation of the main control room from the surrounding areas and outside environment during a design basis accident if the nuclear island nonradioactive ventilation system becomes inoperable.

- Monitor the radioactivity in the main control room normal air supply and provide signals to isolate the incoming air and actuate the main control room emergency habitability system.

In addition, the following safety-related functions performed by the potable water system described in subsection 9.2.5, the sanitary drainage system described in subsection 9.2.6, and the waste water system in subsection 9.2.9 are tested:

- Provide isolation of the main control room from the surrounding areas and outside environment during a design basis accident.

**Prerequisites**

The construction testing of the main control room habitability system has been successfully completed. The required preoperational testing of the compressed and instrument air system, Class 1E electrical power and uninterruptible power supply systems, normal control room ventilation system, and other interfacing systems required for operation of the above systems is available as needed to support the specified testing and system configurations. The main control room air supply tanks are filled with air acceptable for breathing. The main control room construction is complete and its leak-tight barriers are in place.

**General Test Acceptance Criteria and Methods**

Performance of the main control room habitability system is observed and recorded during a series of individual component and integrated system testing. The following testing

demonstrates that the habitability system operates as specified in Section 6.4 and as specified in the appropriate design specifications:

a) Proper operation of safety-related valves is verified by the performance of baseline in-service tests as described in subsection 3.9.6.

b) Proper calibration and operation of safety-related and system readiness instrumentation, controls, actuation signals and interlocks is verified. This testing includes the following:

- Air storage tank pressure
- Refill line connection pressure
- Main control room differential pressure
- Air supply line flow rate
- Controls for the main control room pressure relief valves
- Controls for the air supply isolation valves
- Controls for the main control room air inlet isolation valves
- Air intake radiation
- Sanitary drainage system vent isolation valves

c) The proper flow rate of emergency air to the main control room is verified, demonstrating proper sizing of each air flow limiting orifice, proper operation of each air supply pressure regulator, and the ability to maintain proper control room air quality.

d) The ability of the emergency air supply to maintain the main control room at the proper positive pressure is demonstrated, verifying proper operation of the main control room pressure relief dampers.

e) The ability of the emergency air supply to limit air in-leakage to the main control room is verified by in-leakage testing as specified in subsection 6.4.5.4.

f) The ability to maintain the main control room environment within specified limits for 72 hours (Reference subsection 6.4.3.2) is verified with a test simulating a loss of the nuclear island nonradioactive ventilation system. This testing demonstrates the control room heatup from 0 to 6 hours with the actual heat loads from the battery powered equipment and personnel specified for this time period. This testing period includes the high 0 to 3 hour heat load and subsequent control room temperature changes versus time that occur when the equipment heat load is decreased when the 2 hour batteries are expended, for the 3 to 6 hour testing time period. The control room temperature versus time versus heat load data are used to verify the analysis basis used to assure that the control room conditions remain within specified limits for the 72 hour time period. Periodic grab samples will be taken of the control room air environment to support analyses to confirm that specified limits would not be exceeded for 72 hours.

g) The ability to maintain temperatures in the protection and safety monitoring system cabinet and emergency switchgear rooms within specified limits for 72 hours (Reference subsection 6.4.3.2) is verified with a test simulating a loss of the nuclear island nonradioactive ventilation system. This testing demonstrates the room heatup from 0 to 6 hours with the actual heat loads from battery powered equipment. The room temperature versus time versus heat load data are used to verify the analysis basis used to assure that the room temperature will not exceed the specified limit for the 72 hour time period.

k) Operation of the qualified data processing equipment is verified by monitoring outputs and qualified display indications generated in response to simulated inputs representing data from the integrated protection cabinets and sensor inputs to the qualified data processing I/O cabinets.

l) Operation of the isolated data links and data highways used for communication between the engineered safety features actuation cabinets, main control room multiplexer cabinets, remote workstation multiplexer cabinets and protection logic cabinets is verified.

m) Preoperational testing of plant sensors used to provide data related to plant equipment monitored by the protection and safety monitoring system is performed in conjunction with testing of the respective systems in which these sensors are located.

n) The capability of the protection and safety monitoring system to provide data from the safety-related sensors to the plant control system is verified by injecting reference signals into the integrated protection cabinets and monitoring the plant control system signal selector outputs.