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TOKYO, JAPAN

May 18, 2009

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Mr. Jeffrey A. Ciocco,

Docket No. 52-021
MHI Ref: UAP-HF-09248

Subject: MHI's Responses to US-APWR DCD RAI No. 337-2398

Reference: 1) "Request for Additional Information No. 337-2398 Revision 0, SRP Section: 14.02 – Initial Plant Test Program – Design Certification and New License Applicants, Application Section: 14.2 Initial Test Program" dated April 13, 2009.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Response to Request for Additional Information No. 337-2398 Revision 0".

Enclosed is the response to Questions 14.02-115 and 14.02-116 that is contained within Reference 1.

Please contact Dr. C. Keith Paulson, Senior Technical Manager, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of the submittals. His contact information is below.

Sincerely,

Y. Ogata

Yoshiki Ogata,
General Manager- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosure:

1. Responses to Request for Additional Information No. 337-2398 Revision 0

CC: J. A. Ciocco
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Docket No. 52-021
MHI Ref: UAP-HF-09248

Enclosure 1

UAP-HF-09248
Docket No. 52-021

Responses to Request for Additional Information No. 337-2398
Revision 0

May 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

5/18/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 337-2398 REVISION 0**
SRP SECTION:	**14.02 – Initial Plant Test Program – Design Certification and New License Applicants**
APPLICATION SECTION:	**14.2**
DATE OF RAI ISSUE:	**4/13/2009**

QUESTION NO.: 14.02-115

Section 14.2.12.1.87 of the US-APWR DCD DCD does not adequately document testing of the components listed below:

- Testing of radiation alarms and active functions to close the surge tank valve need to be specifically defined in the preoperational test.
- Testing of coolant flow to the thermal barrier via cross-tie needs to be specifically defined in the preoperational test.
- Flow verification backup water sources including from safety related sources need to be specifically defined.
- Testing of the thermal barrier high flow logic and isolation valves closure needs to be specifically defined.

Please revise Section 14.2.12.1.87 accordingly.

(Technical Branch Chapter 9 Review)

ANSWER:

MHI will revise Subsection 14.2.12.1.87 to incorporate the specific test attributes identified.
Note: Verification of radiation alarm annunciation is included in Subsection 14.2.12.1.78.

Impact on DCD

This revision impacts Revision 1 of the DCD, in subsection 14.2.12.1.87, Component Cooling Water System Preoperational Test, as follows.

NOTE: Revisions to subsection 14.2.12.1.87 identified in MHI's response to RAI No. 33, Question No. 14.02-77 are included in italics in the text below for clarity.

A. Objectives

1. To verify the operation, interlock and alarm of CCW surge tank.

2. To demonstrate the capability of the CCW system to provide cooling water during normal operation, normal cooldown, and postulated loss-of-coolant accident (LOCA) modes of operation.
3. To verify operation of system valves and control circuitry.
4. To demonstrate the operation and verify the operating characteristics of the CCW pumps.

B. Prerequisites

1. Required construction testing is completed.
2. Component testing and instrument calibration is completed.
3. Test instrumentation is available and calibrated.
4. Required support systems are available.
5. Demineralized water is available for system makeup.
6. The CCW is aligned to cool the CCW pump motors.
7. The ESWS is available to CCW heat exchangers.

C. Test Method

1. The control circuitry of the CCW pumps, surge tanks, and valves is verified.
2. The CCW system pumps are operated, and performance characteristics verified.
3. System flows are balanced, as required, and then verified in each mode of operation. Testing includes verification of coolant flow to the thermal barrier via cross-tie.
4. *The cooling ability of the CCW system is verified during RCS heatup and cooldown in conjunction with the RHRS during the hot functional test. [RAI 33 response to Question 14.02-77]*
5. CCW surge tank vent valve closure logic is verified using a simulated high CCW radiation monitor condition.
6. The thermal barrier heat exchanger cooling water return line isolation valve logic is verified using a simulated reactor coolant pump thermal barrier heat exchanger cooling water high flow condition.
7. Demonstrate the ability to provide makeup water and verify flow to each pressurized CCW surge tank using DWS, PMWS and RWS supplies.

D. Acceptance Criteria

1. The tank alarms and interlocks operate as designed.
2. The performance characteristics of the CCW pumps are within design specifications (Subsection 9.2.2)
3. Components that are supplied with CCW receive flows that are within the design specifications in each of the operating modes including the supply of coolant flow to the thermal barrier via cross-tie.
4. The pump control and interlocks operate as designed.
5. *CCW system performance characteristics are within design specifications. [RAI 33 response to Question 14.02-77]*

6. CCW surge tank vent valve high radiation logic operates as described in Subsection 9.2.2.5.2.

7. The thermal barrier heat exchanger cooling water return line isolation valve logic operates as described in Subsection 9.2.2.5.5.

8. The ability to provide makeup water to each pressurized CCW surge tank using DWS, PMWS and RWS supplies is demonstrated.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

5/18/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 337-2398 REVISION 0**
SRP SECTION:	**14.02 – Initial Plant Test Program – Design Certification and New License Applicants**
APPLICATION SECTION:	**14.2**
DATE OF RAI ISSUE:	**4/13/2009**

QUESTION NO.: 14.02-116

RAI 14.02-116 follows up MHI's 12/18/2008 response to Question 14.02-102. Question 14.02-102 followed up MHI's original responses to Questions 14.02-78 and 14.02-79. Question 14.02-102 had 9 parts, and MHI's response to the majority of the question was acceptable. However, the staff requests that MHI revise its original responses to parts 1, 2, 3, 6, 7 and 9 of Question 14.02-102, as discussed below.

1. Questions 14.02-78 and 14.02-79 addressed the testing of the Instrument Air (IA), Service Air (SA), and Compressed Gas (CG) Systems. IA and SA testing is described in DCD Subsections 14.2.12.1.91 and 14.2.12.1.92, respectively. There is currently no test to address the CG System. The RAI responses and the DCD commit to RG 1.68.3 for the IA System but not for the SA and CG Systems.
The NRC staff maintains that RG 1.68.3 should be addressed for all three air/gas systems, since these air/gas systems are included within the scope of preoperational testing via RG 1.68, Item C.1 and RG 1.68.3, Item A and footnote 1, page 1. These RG requirements include testing of systems used for "normal plant conditions," and "compressed gas systems that ..... supply loads that could affect the overall safety and performance of the plant."
Therefore, the staff request that MHI revise its original response to part 1 of Question 14.02-102 to test the IA, SA, and CG Systems to the requirements of RG 1.68.3, except for Subsection C.7 of the RG, since Subsection C.7 is not applicable to the US-APWR.

2. The staff notes that, as documented in the DCD, IA, SA and CG are not safety-related. Key loads supplied by these systems are as follows. IA supplies many safety-related air-operated valves (see DCD Table 9.3.1-1), HVAC dampers, and pneumatic instruments and controls. As documented in the DCD, all safety-related air-operated valves fail safe and IA is not needed to ensure their transition to this safe position. SA serves as a backup to IA and also provides breathing air. CG provides nitrogen to the SI accumulators and other loads. CG provides hydrogen to the VCT in the CVCS System and the waste management system. RG 1.68.3 does not have a separate scope section, but Sections A and B and footnote 1 discuss air systems to which the RG applies. These are generally all systems that supply air or other compressed gases to operate various loads important to safety, or ITS (not the more stringent safety-related).
MHI is testing IA to the RG. As discussed above the staff concludes that the IA, SA, and CG Systems fall within the ITS scope of the RG and hence should be tested to the requirements of the RG.

Therefore, the staff requests that MHI revise its original responses to parts 2, 3, 6, 7, and 9 of Question 14.02-102 to be consistent with its revised response to part 1 of Question 14.02-102.

(Follow up to BNL Question 14.02-102)

ANSWER:

1. MHI concurs with the NRC position relative to the applicability of RG 1.68.3. DCD Subsection 14.2.12.1 will be revised to add the Compressed Gas System Preoperational Test as DCD Subsection 14.2.12.1.117 in accordance with RG 1.68.3 except for Regulatory Position C.7. Therefore, the original responses to parts 1, and 3 of Question 14.02-102 are hereby overwritten and superseded by this answer.

2. MHI concurs with the NRC position in item 2 of the RAI question. With respect to the Station Service Air System (SSAS), DCD Subsection 14.2.12.1.92 will be revised to be in accordance with RG 1.68.3 except for Regulatory Position C.7. Therefore, the original responses to parts 1, 2, 6, 7, and 9 of RAI 102-1391, Question 14.02-102 are hereby overwritten and superseded by this answer.

3. MHI will revise the wording of Instrument Air System Preoperational Test, DCD Subsection 14.2.12.1.91 Acceptance Criteria, D. 5 to clarify the RAI 102 response to question 14.02.102, part 4, and make it more accurate in complying with Regulatory Position C.9 of RG 1.68.3. When instrument air is provided from SSAS, the intention is to have the unqualified SSAS air passed through the IAS filter and dryer systems such that it meets the standards required by the IAS components and loads.

MHI will also revise the wording of Acceptance Criteria, D.7 to clarify the RAI 102 response to question 14.02.102, part 8, such that Test Method C.6 and Acceptance Criteria, D.7 are better aligned.

Impact on DCD

This revision impacts Revision 1 of the DCD.

1. Revise Subsection 14.2.12.1 as follows:
1) Add a new test abstract to Subsection 14.2.12.1 as follows:

14.2.12.1.117 Compressed Gas System Preoperational Test

A. Objective
1. To demonstrate operation of the compressed gas system (nitrogen gas subsystems and hydrogen gas subsystem only) to supply compressed gases to various loads that are important to safety.
2. To demonstrate that operation of components requiring large quantities of compressed gases does not cause excessive gas system pressure transients.

B. Prerequisites
1. Required construction testing is completed.
2. Component testing and instrument calibration is completed.
3. Test instrumentation is available and calibrated.
4. Required support systems are available.
5. Required ac and dc power sources are available.

C. Test Method

1. Simulate pressure signals to verify alarms.
2. Operate the compressed gas system to verify operation while recording pressure.
3. Loads that are a part of (or support the operation of) portions of various loads that are important to safety, which are identified as susceptible to changes in state or loss of operability upon increases in pressure due to component malfunction or failure, are evaluated and tested, as determined appropriate, without exceeding allowable component pressure ratings.

D. Acceptance Criteria

1. The compressed gas system (nitrogen gas subsystems and hydrogen gas subsystem only) meets design requirements relating to the supply gas pressure.
2. Loads that are a part of (or support the operation of) portions of various loads that are important to safety respond to pressure transients in accordance with design.

2) Add the following line in Table 14.2-1 (Sheet 3 of 5):

Table 14.2-1 Comprehensive Listing of Tests (Sheet 3 of 5)

Section	Test
14.2.12.1.117	Compressed Gas System Preoperational Test

2. Revise Subsection 14.2.12.1.92 as follows:

1) Revise the following sentence to item A., Objectives:

1. To demonstrate operation of air compressors, air receivers and air dryers and associated controls.

2) Add the following to item A., Objectives:

2. To assure that the air supply equipment is able to maintain the quality of air supplied within design requirements.
3. To verify that the system responds appropriately to both normal operation of the plant and upset, faulted, or emergency conditions including increases in pressure due to component malfunction or failure; and to verify appropriate response of various loads that are important to safety during and following such upset, faulted or emergency conditions (e.g., fail open, fail closed, or fail-as-is).
4. To demonstrate that operation of components requiring large quantities of air does not cause excessive station service air system pressure transients.

Tests are in accordance with RG 1.68.3 except for C.7.

3) Revise subsection C., Test Method, item 2 as follows:

2. ~~Operate compressors to verify operation.~~
Operate station service air system to verify operation while recording flow, pressure, and temperature.

a. Air dryer units are tested for proper functioning. Air dryer testing includes verification of acceptable operation at maximum flow rates.
b. The automatic and manual start and stop circuits of standby compressors are checked. Relief valve settings are verified.
c. Proper operation of inlet/air filter/silencer, compressors, intercoolers, aftercoolers and moisture separators are verified according to system design.

4) Add the following to subsection C., Test Method:

3. Sample and analyze the air at the end of each feeder line using continuous flow techniques or by analyzing a discrete sample.
4. Simultaneously operate large users of station service air and monitor the station service air system pressures.
5. Loads that are a part of (or support the operation of) portions of various loads that are important to safety, which are identified as susceptible to changes in state or loss of operability upon increases in pressure due to component malfunction or failure are evaluated and tested, as determined appropriate, without exceeding allowable component pressure ratings.

5) Add the following subsection D., Acceptance Criteria:

2. The station service air systems meets system design specifications relating to flow, pressure, and temperature of the product air.
3. Air quality meets the design specification of the station service air system.
4. Loads that are a part of (or support the operation of) portions of various loads that are important to safety respond to pressure transients in accordance with design.
5. Operation of supplied loads is continued in response to credible failures that result in an increase in the supply system pressure.

3. Revise Subsection 14.2.12.1.91 as follows:

1) Add the phrase "... without meeting the air quality requirements of ANSI/ISA S7.3-1975." to the end of Acceptance Criteria, D.5.

D. Acceptance Criteria
5. Plant equipment designated by design to be supplied by the instrument air system is not being supplied by other compressed air supplies (such as station air) that may have less restrictive air quality requirements without meeting the air quality requirements of ANSI/ISA S7.3-1975 (Reference 14.2-22).

2) Add the words "The fail-safe positions ..." to the beginning and delete the words "... the same ..." from the middle of Acceptance Criteria, D.7 to better match Test Method C.6.

D. Acceptance Criteria
7. The fail-safe positions of safety-related air-operated components are as shown in Table 9.3.1-1 for sudden loss of instrument air or gradual loss of pressure.
[RAI 102 response to Question 14.02-102]

4. Changes to DCD Table 1.9.1-1 to provide the revised entry for the MHI position to RG 1.68.3, as follows:

Reg Guide Number	Title	Status	Corresponding Chapter/Section/ Subsection
1.68.3	Preoperational Testing of Instrument and Control Air Systems (Rev. 0, April 1982)	Conformance with exceptions. C.7~~, C.11~~: This criterion applies to instrument and control air systems important safety. US-APWR~~ does not have the~~ instrument and control air system is not important to safety. ~~C.8.b: US-APWR does not perform the gradual reduction pressure test because suddenly air pressure shutoff test can be verified that the affected components respond properly.~~	9.3.1.4, 14.2.7

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

Attachment 1

US-APWR DCD Chapter 14 Mark-up

RESPONSE TO RAI No. 337-2398 Revision 0

Table 14.2-1 Comprehensive Listing of Tests
(Sheet 3 of 5)

Section	Test
14.2.12.1.80	Liquid Waste Management System Preoperational Test
14.2.12.1.81	Gaseous Waste Management System Preoperational Test
14.2.12.1.82	Solid Waste Management System Preoperational Test
14.2.12.1.83	Steam Generator Blowdown System Preoperational Test
14.2.12.1.84	Sampling System Preoperational Test
14.2.12.1.85	Spent Fuel Pit Cooling and Purification System (SFPCS) Preoperational Test
14.2.12.1.86	Fuel Handling System Preoperational Test
14.2.12.1.87	Component Cooling Water System Preoperational Test
14.2.12.1.88	Turbine Component Cooling Water System Preoperational Test
14.2.12.1.89	Secondary Side Chemical Injection System Preoperational Test
14.2.12.1.90	Fire Protection System Preoperational Test
14.2.12.1.91	Instrument Air System Preoperational Test
14.2.12.1.92	Station Service Air System Preoperational Test
14.2.12.1.93	Boron Recycle System Preoperational Test
14.2.12.1.94	Offsite Communication System Preoperational Test
14.2.12.1.95	Inplant Communication System Preoperational Test
14.2.12.1.96	Safeguard Component Area Heating, Ventilation, and Air Conditioning (HVAC) System Preoperational Test
14.2.12.1.97	Emergency Feedwater Pump Area HVAC System Preoperational Test
14.2.12.1.98	Class 1E Electrical Room HVAC System Preoperational Test
14.2.12.1.99	Auxiliary Building HVAC System Preoperational Test
14.2.12.1.100	Main Steam/Feedwater Piping Area HVAC System Preoperational Test
14.2.12.1.101	Main Control Room (MCR) HVAC System Preoperational Test (including MCR Habitability)
14.2.12.1.102	Non-Class 1E Electrical Room HVAC System Preoperational Test
14.2.12.1.103	Technical Support Center HVAC System Preoperational Test
14.2.12.1.104	Non-Essential Chilled Water System Preoperational Test
14.2.12.1.105	Vessel Servicing Preoperational Test
14.2.12.1.106	Safety-Related Component Area HVAC System Preoperational Test
14.2.12.1.107	Pressurizer Heater and Spray Capability and Continuous Spray Flow Verification Test
14.2.12.1.108	Non-Essential Service Water (non-ESW) System Preoperational Test
14.2.12.1.109	Condensate Storage Facilities System Preoperational Test
14.2.12.1.110	Turbine Building Area Ventilation System (General Mechanical Area) Preoperational Test
14.2.12.1.111	Turbine Building Area Ventilation System (Electric Equipment Area) Preoperational Test
14.2.12.1.112	Reserved
14.2.12.1.113	Reserved
14.2.12.1.114	Reserved
14.2.12.1.115	RCPB Leak Detection Systems Preoperational Test
14.2.12.1.116	Equipment and Floor Drainage System Preoperational Test
14.2.12.1.117	Compressed Gas System Preoperational Test

5. Refueling machine, new fuel elevator, and fuel handling machine testing demonstrates compliance with test requirements specified by ASME NOG-1 (Reference 14.2-30) and ASME B30.20-2006 (Reference 14.2-31) as applicable.

6. Spent fuel cask handling building crane testing demonstrates compliance with test requirements specified by NUREG-0554 (Reference 14.2-24), ASME NOG-1 (Reference 14.2-30) and NUREG-0612 (Reference 14.2-21) as applicable.

7. Fuel handling tools perform their intended design function as identified in Subsection 9.1.4.2.1.

14.2.12.1.87 Component Cooling Water System Preoperational Test

A. Objectives

1. To verify the operation, interlock and alarm of CCW surge tank.

2. To demonstrate the capability of the CCW system to provide cooling water during normal operation, normal cooldown, and postulated loss-of-coolant accident (LOCA) modes of operation.

3. To verify operation of system valves and control circuitry.

4. To demonstrate the operation and verify the operating characteristics of the CCW pumps.

B. Prerequisites

1. Required construction testing is completed.

2. Component testing and instrument calibration is completed.

3. Test instrumentation is available and calibrated.

4. Required support systems are available.

5. Demineralized water is available for system makeup.

6. The CCW is aligned to cool the CCW motors.

7. The ESWS is available to CCW heat exchangers.

C. Test Method

1. The control circuitry of the CCW pumps, surge tanks, and valves is verified.

2. The CCW system pumps are operated, and performance characteristics verified.

3. System flows are balanced, as required, and then verified in each mode of operation. Testing includes verification of coolant flow to the thermal barrier via cross-tie.

4. The cooling ability of the CCW system is verified during RCS heatup and cooldown in conjunction with the RHRS during the hot functional test.

5. CCW surge tank vent valve closure logic is verified using a simulated high CCW radiation monitor condition.

6. The thermal barrier heat exchanger cooling water return line isolation valve logic is verified using a simulated reactor coolant pump thermal barrier heat exchanger cooling water high flow condition.

7. Demonstrate the ability to provide makeup water and verify flow to each pressurized CCW surge tank using DWS, PMWS and RWS supplies.

D. Acceptance Criteria

1. The tank alarms and interlocks operate as designed.

2. The performance characteristics of the CCW pumps are within design specifications (Subsection 9.2.2)

3. Components that are supplied with CCW receive flows that are within the design specifications in each of the operating modes including the supply of coolant flow to the thermal barrier via cross-tie.

4. The pump control and interlocks operate as designed.

5. CCW system performance characteristics are within design specifications.

6. CCW surge tank vent valve high radiation logic operates as described in Subsection 9.2.2.5.2.

7. The thermal barrier heat exchanger cooling water return line isolation valve logic operates as described in Subsection 9.2.2.5.5.

8. The ability to provide makeup water to each pressurized CCW surge tank using DWS, PMWS and RWS supplies is demonstrated.

14.2.12.1.88 Turbine Component Cooling Water System Preoperational Test

A. Objective

1. To verify that the system components perform their function of supplying adequate cooling water to the designated turbine building components, as described in Subsection 9.2.8.

B. Prerequisites

1. Required construction testing is completed.

2. Component testing and instrument calibration is completed.

D. Acceptance Criterion

1. The fire protection system operates as described in Subsection 9.5.1 and Appendix 9A.

14.2.12.1.91 Instrument Air System Preoperational Test

A. Objectives

1. To demonstrate operation of the instrument air system, including compressors, coolers, reservoirs, and dryers and associated controls.

2. To assure that the air supply equipment is able to maintain the quality of air supplied within design requirements.

3. To verify that the system responds appropriately to both normal operation of the plant and upset, faulted, or emergency conditions including increases in pressure due to component malfunction or failure, and to verify appropriate response of air-operated valves and other components during and following such upset, faulted or emergency conditions (e.g., fail open, fail closed, fail-as-is).

4. To demonstrate that operation of components requiring large quantities of air does not cause excessive instrument air system pressure transients.

~~Verification of safety-related containment isolation valve position on loss of pressure is described in Subsection 14.2.12.1.62.~~Tests are in accordance with RG 1.68.3 except for C.7.

B. Prerequisites

1. Required construction testing is completed.

2. Component testing and instrument calibration is completed.

3. Test instrumentation is available and calibrated.

4. Required support systems are available.

5. Required ac and dc power sources are available.

C. Test Method

1. Simulate pressure signals to verify alarms.

2. Operate instrument air system to verify operation while recording flow, pressure, and temperature.

   a. Air dryer units are tested for proper functioning, and the units are operated through at least one regeneration cycle. Air dryer testing includes verification of acceptable operation at maximum flow rates.

b. The appropriate differential pressures and the proper operation of pressure switches, high and low-pressure alarms, safety and relief valves, bypass valves, and alarms and resets are verified.

c. The operation of compressor unloaders, automatic and manual start and stop circuits of standby compressors, high, and low pressure alarms, pressure indications, and temperature indications are checked. Relief valve settings are verified.

d. Compressors, aftercoolers, oil separator units, air receivers, and pressure-reducing stations are tested to verify proper operation according to system design.

3. Sample and analyze the air at the end of each feeder line using continuous flow techniques or by analyzing a discrete sample.

4. Simultaneously operate large users of instrument air and monitor the instrument air system pressures.

5. Loads that are a part of (or support the operation of) portions of the facility important to safety, which are identified as susceptible to changes in state or loss of operability upon increases in pressure due to component malfunction or failure are evaluated and tested as determined appropriate, without exceeding allowable component pressure ratings.

6. Test is performed to verify the fail-safe position of safety-related air-operated components for sudden loss of instrument air or gradual loss of pressure as described in Table 9.3.1-1.

D. Acceptance Criteria

1. The instrument air system performs as described in Subsection 9.3.1.

2. The Instrument air systems meets system design specifications relating to flow, pressure, and temperature of the product air. The total air demand at normal steady-state conditions, including leakage from the system, is in accordance with design.

3. Air quality meets the requirements of American National Standards Institute (ANSI) / Instrumentation, Systems, and Automation Society (ISA) S73-1975, "Quality Standard for Instrument Air," (Reference 14.2-22) with respect to oil, water, and particulate matter contained in the product air.

4. Loads that are a part of (or support the operation of).portions of the facility important to safety respond to pressure transients in accordance with design.

5 Plant equipment designated by design to be supplied by the instrument air system is not being supplied by other compressed air supplies (such as station air) that may have less restrictive air quality requirements without meeting the air quality requirements of ANSI/ISA S7.3-1975 (Reference 14.2-22).

6. Operation of supplied loads is continued in response to credible failures that result in an increase in the supply system pressure.

7. The fail-safe positions of safety-related air-operated components are same as shown in Table 9.3.1-1 for sudden loss of instrument air or gradual loss of pressure.

14.2.12.1.92 Station Service Air System Preoperational Test

A. Objective

1. To demonstrate operation of air compressors, air receivers and air dryers and associated controls.

2. To assure that the air supply equipment is able to maintain the quality of air supplied within design requirements.

3. To verify that the system responds appropriately to both normal operation of the plant and upset, faulted, or emergency conditions including increases in pressure due to component malfunction or failure; and to verify appropriate response of various loads that are important to safety during and following such upset, faulted or emergency conditions (e.g., fail open, fail closed, or fail-as-is).

4. To demonstrate that operation of components requiring large quantities of air does not cause excessive station service air system pressure transients.

Tests are in accordance with RG 1.68.3 except for C.7.

B. Prerequisites

1. Required construction testing is completed.

2. Component testing and instrument calibration is completed.

3. Test instrumentation is available and calibrated.

4. Required support systems are available.

5. Turbine component cooling water system is available.

6. Appropriate ac and dc power sources are available.

C. Test Method

1. Simulate temperature and pressure signals to verify alarms.

2. ~~Operate compressors to verify operation.~~ Operate station service air system to verify operation while recording flow, pressure, and temperature.

   a. Air dryer units are tested for proper functioning. Air dryer testing includes verification of acceptable operation at maximum flow rates.

b. The automatic and manual start and stop circuits of standby compressors are checked. Relief valve settings are verified.

c. Proper operation of inlet/air filter/silencer, compressors, intercoolers, aftercoolers and moisture separators are verified according to system design.

3. Sample and analyze the air at the end of each feeder line using continuous flow techniques or by analyzing a discrete sample.

4. Simultaneously operate large users of station service air and monitor the station service air system pressures.

5. Loads that are a part of (or support the operation of) portions of various loads that are important to safety, which are identified as susceptible to changes in state or loss of operability upon increases in pressure due to component malfunction or failure are evaluated and tested, as determined appropriate, without exceeding allowable component pressure ratings.

D. Acceptance Criterion

1. Compressors and air dryers perform as described in Subsection 9.3.1.

2. The station service air systems meets system design specifications relating to flow, pressure, and temperature of the product air.

3. Air quality meets the design specification of the station service air system.

4. Loads that are a part of (or support the operation of) portions of various loads that are important to safety respond to pressure transients in accordance with design.

5. Operation of supplied loads is continued in response to credible failures that result in an increase in the supply system pressure.

14.2.12.1.93 Boron Recycle System Preoperational Test

A. Objectives

1. To demonstrate the operability of the boron recycle system, including the recycle evaporator and its associated pumps, valves, tanks, and control circuits.

2. To verify the capability of the recycle evaporator to produce the required distillate output.

B. Prerequisites

1. Required construction testing is completed.

2. Component testing and instrument calibration is completed.

3. Test instrumentation is available and calibrated.

14.2.12.1.116 Equipment and Floor Drainage System Test

A. Objective

1. To demonstrate the correct routing of the drain lines.

2. To demonstrate the operation of the sump level instrumentation including alarms and indications.

Note: This test may be performed in conjunction with subsection 14.2.12.1.80, "Liquid Waste Management System Preoperational Test."

B. Prerequisites

1. Required construction testing is completed.

2. Test instrumentation is available and calibrated.

3. Required support systems are available.

4. Water is available for flow paths to be checked.

C. Test Method

1. The control circuitry and operation of system pumps and valves is verified.

2. The system is operated and performance characteristics are verified.

3. Reactor building floor drain and sump systems operation is demonstrated by water addition or pressurized air (where appropriate) to show system functionality that prevents backflow in order to prevent cross-divisional flooding between areas.

D. Acceptance Criteria

1. The equipment and floor drainage system operates as described in Subsection 9.3.3.

2. The pump and valve controls and interlocks operate as designed.

3. The containment and reactor and auxiliary buildings drain subsystems function as described in subsection 9.3.3 and as designed.

4. Reactor building floor drain and sump systems operation demonstrates that the system piping and valves prevent backflow to prevent cross-divisional flooding between areas as described in subsection 3.4.1.5.2.

14.2.12.1.117 Compressed Gas System Preoperational Test

A. Objective

1. To demonstrate operation of the compressed gas system (nitrogen gas subsystems and hydrogen gas subsystem only) to supply compressed gases to various loads that are important to safety.

2. To demonstrate that operation of components requiring large quantities of compressed gases does not cause excessive gas system pressure transients.

B. Prerequisites

1. Required construction testing is completed.

2. Component testing and instrument calibration is completed.

3. Test instrumentation is available and calibrated.

4. Required support systems are available.

5. Required ac and dc power sources are available.

C. Test Method

1. Simulate pressure signals to verify alarms.

2. Operate the compressed gas system to verify operation while recording pressure.

3. Loads that are a part of (or support the operation of) portions of various loads that are important to safety, which are identified as susceptible to changes in state or loss of operability upon increases in pressure due to component malfunction or failure, are evaluated and tested, as determined appropriate, without exceeding allowable component pressure ratings.

D. Acceptance Criteria

1. The compressed gas system (nitrogen gas subsystems and hydrogen gas subsystem only) meets design requirements relating to the supply gas pressure.

2. Loads that are a part of (or support the operation of) portions of various loads that are important to safety respond to pressure transients in accordance with design.