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April 23, 2009

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

Attention: Mr. Jeffery A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-09193

Subject: MHI's Responses to US-APWR DCD RAI No. 220-2058

Reference: 1) "Request for Additional Information No. 220-2058 Revision 1, SRP Section: 03.04.01 – Internal Flood Protection for Onsite Equipment Failures, Application Section: 3.4.1," dated 2/26/2009.
2) "MHI's Responses to US-APWR DCD RAI No. 220-2058, UAP-HF-09152, dated 4/8/2009.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Responses to Request for Additional Information No. 220-2058, Revision 1."

Enclosed are the responses to the remaining 15 RAIs contained within Reference 1. Five additional RAI responses contained within Reference 1 were previously provided in Reference 2.

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

Sincerely,

Y. Ogata

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

Enclosure:

1. Responses to Request for Additional Information No. 220-2058, Revision 1

D081
NRO

CC: J. A. Ciocco
C. K. Paulson

Contact Information

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Enclosure 1

UAP-HF-09193
Docket No. 52-021

Responses to Request for Additional Information No. 220-2058, Revision 1

April, 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

4/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 220-2058 REVISION 1

SRP SECTION: 03.04.01 – Internal Flood Protection for Onsite Equipment Failures

APPLICATION SECTION: 03.04.01

DATE OF RAI ISSUE: 02/26/09

QUESTION NO. RAI 3.4.1-02:

DCD Tier 1, Table 2.2-3, "Main Components Protected against External Floods, Internal Floods and Internal Fires," and DCD Tier 2, Sections 3.4.1.3 and 3.4.1.5.1 identify SSCs that require protection from internal flood according to specific buildings or building areas, including SSCs located inside the prestressed concrete containment vessel (PCCV). It is not clear that the DCD has identified a complete set of SSCs located inside the PCCV that must be protected from flood. For example, the DCD does not identify SSCs inside the PCCV that provide safety-related electrical power, monitoring, and actuation functions.

GDC 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." SRP Section 3.4.1, Acceptance Criteria 1 states that acceptable guidance for meeting the seismic design and classification requirements of GDC 2 is provided in Regulatory Guide (RG) 1.29, "Seismic Design Classification," Revision 4, March 2007, Position C.1 for safety-related SSCs and Position C.2 for nonsafety-related SSCs. For example, equipment required for monitoring and actuating systems important to safety should be protected as indicated in Position C.1 of RG 1.29, Item (k). Also, Class 1E electrical systems that provide emergency power for functioning of plant features should be protected as indicated in Position C.1 of RG 1.29, Item (q). In addition, per SRP 3.4.1, Item I.1, the set of SSCs that must be protected from flooding should be reviewed, and therefore, should be identified in the DCD.

Provide a complete list of SSCs located within the PCCV that require protection from internal flooding. Include this information in the DCD and provide a markup in your response.

ANSWER:

A complete list of SSCs located within the PCCV that require protection from internal flooding will be provided in DCD Revision 2.

Impact on DCD

DCD Section 3.4, Revision 2, will incorporate the following changes:

- A complete list of SSCs located within the PCCV that require protection from internal flooding will be provided in the DCD.

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

4/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 220-2058 REVISION 1

SRP SECTION: 03.04.01 – Internal Flood Protection for Onsite Equipment Failures

APPLICATION SECTION: 03.04.01

DATE OF RAI ISSUE: 02/26/09

QUESTION NO. RAI 3.4.1-04:

DCD Tier 1, Table 2.2-3, "Main Components Protected against External Floods, Internal Floods and Internal Fires," and DCD Tier 2, Sections 3.4.1.3 and 3.4.1.5.2.1 identify SSCs that require protection from internal flooding according to specific buildings or building areas, including SSCs located inside the Radiological Controlled Area (RCA) of the Reactor Building (R/B). It is not clear that the DCD has identified a complete set of SSCs located inside the RCA portion of the R/B that must be protected from flooding.

For example, the DCD does not identify SSCs inside the RCA that provide safety-related monitoring and actuation functions.

GDC 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." SRP Section 3.4.1, Acceptance Criteria 1 states that acceptable guidance for meeting the seismic design and classification requirements of GDC 2 can be based on meeting Regulatory Guide (RG) 1.29, "Seismic Design Classification," Revision 4, March 2007, Position C.1 for safety-related SSCs and Position C.2 for nonsafety-related SSCs. For example, systems required for monitoring and actuating systems important to safety should be protected as indicated in Position C.1 of RG 1.29, Item (k). Also, per SRP 3.4.1, Item I.1, the set of SSCs that must be protected from flooding should be reviewed, and therefore, should be identified in the DCD.

Provide a complete list of SSCs located within the RCA portion of the R/B that require protection from internal flooding. Include this information in the DCD and provide a markup in your response.

ANSWER:

A complete list of SSCs located within the RCA portion of the R/B that require protection from internal flooding will be provided in DCD Revision 2.

Impact on DCD

DCD Section 3.4, Revision 2, will incorporate the following changes:

- A complete list of SSCs located within the RCA portion of the R/B that require protection from internal flooding will be provided in the DCD.

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

4/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 220-2058 REVISION 1

SRP SECTION: 03.04.01 – Internal Flood Protection for Onsite Equipment Failures

APPLICATION SECTION: 03.04.01

DATE OF RAI ISSUE: 02/26/09

QUESTION NO. RAI 3.4.1-05:

DCD Tier 1, Table 2.2-3, "Main Components Protected against External Floods, Internal Floods and Internal Fires," and DCD Tier 2, Sections 3.4.1.3 and 3.4.1.5.2.2 identify SSCs that require protection from internal flood according to specific buildings or building areas, including SSCs located inside the Non-Radiological Controlled Area (NRCA) of the Reactor Building (R/B). It is not clear that the DCD has identified a complete set of SSCs located inside the NRCA portion of the R/B that must be protected from flood. For example, the DCD does not appear to identify all circuitry between the process and input terminals of actuator systems involved in protective actions.

GDC 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." SRP Section 3.4.1, Acceptance Criteria 1 states that acceptable guidance for meeting the seismic design and classification requirements of GDC 2 can be based on meeting Regulatory Guide (RG) 1.29, "Seismic Design Classification," Revision 4, March 2007, Position C.1 for safety-related SSCs and Position C.2 for nonsafety-related SSCs. For example, all circuitry between the process and input terminals of actuator systems involved in protective actions should be protected as indicated in Position C.1 of RG 1.29, Item (j). Also, per SRP 3.4.1, Item I.1, the set of SSCs that must be protected from flooding should be reviewed, and therefore, should be identified in the DCD.

Provide a complete list of SSCs located within the NRCA portion of the R/B that require protection from internal flood. Include this information in the DCD and provide a markup in your response.

ANSWER:

A complete list of SSCs located within the NRCA portion of the R/B that require protection from internal flooding will be provided in DCD Revision 2.

Impact on DCD

DCD Section 3.4, Revision 2, will incorporate the following changes:

- A complete list of SSCs located within the NRCA portion of the R/B that require protection from internal flooding will be provided in the DCD.

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

4/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 220-2058 REVISION 1**

SRP SECTION: **03.04.01 – Internal Flood Protection for Onsite Equipment Failures**

APPLICATION SECTION: **03.04.01**

DATE OF RAI ISSUE: **02/26/09**

QUESTION NO. RAI 3.4.1-06:

The DCD does not explicitly identify systems and components located within the power source buildings (PS/B) that require protection from internal flood. Per DCD Tier 2 Table 3.2-2, the PS/B contains some seismic Category I SSCs, including essential service water (ESW) valves, essential chiller pumps, and miscellaneous equipment related to the emergency gas turbines. The PS/B is included as part of the standard plant design.

GDC 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." SRP Section 3.4.1, Acceptance Criteria 1 states that acceptable guidance for meeting the seismic design and classification requirements of GDC 2 can be based on meeting Regulatory Guide (RG) 1.29, "Seismic Design Classification," Revision 4, March 2007, Position C.1 for safety-related SSCs and Position C.2 for nonsafety-related SSCs. Also, per SRP 3.4.1, Item I.1, the set of SSCs that must be protected from flooding should be reviewed, and therefore, should be identified in the DCD.

Provide a complete list of SSCs located within the PS/B that require protection from internal flood. Include this information in the DCD and provide a markup in your response.

ANSWER:

A complete list of SSCs located within the PS/B that require protection from internal flooding will be provided in DCD Revision 2.

Impact on DCD

DCD Section 3.4, Revision 2, will incorporate the following changes:

- A complete list of SSCs located within the PS/B that require protection from internal flooding will be provided in the DCD.

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

4/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 220-2058 REVISION 1**

SRP SECTION: **03.04.01 – Internal Flood Protection for Onsite Equipment Failures**

APPLICATION SECTION: **03.04.01**

DATE OF RAI ISSUE: **02/26/09**

QUESTION NO. RAI 3.4.1-07:

The DCD does not explicitly identify systems and components located within the containment annulus that require protection from internal flood. The containment annulus is an element of the standard plant design. The containment annulus houses penetrations, including penetrations for piping systems. Flooding might occur following a break in these piping systems.

GDC 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." SRP Section 3.4.1, Acceptance Criteria 1 states that acceptable guidance for meeting the seismic design and classification requirements of GDC 2 can be based on meeting Regulatory Guide (RG) 1.29, "Seismic Design Classification," Revision 4, March 2007, Position C.1 for safety-related SSCs and Position C.2 for nonsafety-related SSCs. Also, per SRP 3.4.1, Item I.1, the set of SSCs that must be protected from flooding should be reviewed, and therefore, should be identified in the DCD.

Provide a complete list of SSCs located within the containment annulus that require protection from internal flood. Include this information in the DCD and provide a markup in your response.

ANSWER:

Piping and electrical penetration rooms are located in the containment annulus. These rooms are included in the RCA of the R/B. Therefore, the evaluation of SSCs located within the containment annulus, and which require protection from internal flooding, are included in the complete list of SSCs located within the RCA portion of the R/B, as discussed in RAI 3.4.1-04.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

4/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 220-2058 REVISION 1**

SRP SECTION: **03.04.01 – Internal Flood Protection for Onsite Equipment Failures**

APPLICATION SECTION: **03.04.01**

DATE OF RAI ISSUE: **02/26/09**

QUESTION NO. RAI 3.4.1-08:

The DCD does not explicitly identify the SSCs associated with spent fuel pit cooling that require protection from internal flood.

GDC 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." SRP Section 3.4.1, Acceptance Criteria 1 states that acceptable guidance for meeting the seismic design and classification requirements of GDC 2 can be based on meeting Regulatory Guide (RG) 1.29, "Seismic Design Classification," Revision 4, March 2007, Position C.1 for safety-related SSCs and Position C.2 for nonsafety-related SSCs. Also, per SRP 3.4.1, Item I.1, the set of SSCs that must be protected from flooding should be reviewed, and therefore, should be identified in the DCD.

Provide a complete list of SSCs associated with spent fuel pit cooling that require protection from internal flood. Include this information in the DCD and provide a markup in your response

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ANSWER:

The A and B train spent fuel pit (SFP) pumps are components associated with spent fuel pit cooling that require protection from internal flooding.

The A and B train SFP pumps are located within the RCA of the R/B at elevation 3 ft, 7 in., therefore, these are included in a complete list of SSCs located within the RCA portion of the R/B that require protection from internal flood as discussed in RAI 3.4.1-04.

Impact on DCD

There is no impact on the DCD.

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

4/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 220-2058 REVISION 1**

SRP SECTION: **03.04.01 – Internal Flood Protection for Onsite Equipment Failures**

APPLICATION SECTION: **03.04.01**

DATE OF RAI ISSUE: **02/26/09**

QUESTION NO. RAI 3.4.1-09:

The PCCV flooding analysis evaluates the maximum flooding event, which is identified as a LOCA. However, the DCD does not explain how the worst case flooding source was determined. There appear to be other potential sources of flood water inside the PCCV, for example component cooling water (CCW) and fire water as indicated in DCD Tier 2 Table 6.2.4-3, "List of Containment Penetrations and System Isolation Positions."

In accordance with SRP 3.4.1, Section I, Item 6, and Section III, Item 3, potential flooding sources should be reviewed, and therefore, should be identified in the DCD.

Explain how the worst case flooding source for the PCCV was determined. Include this information in the DCD and provide a markup in your response

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ANSWER:

There are piping systems inside the PCCV such as the CCW system and fire protection water supply system (fire water) that are connected to large-volume water sources, however a significant accidental release of water into the PCCV from these sources are not plausible for the following reasons:

- All CCW piping inside the PCCV is classified as seismic category I.
- Containment isolation valves outside the PCCV for the fire protection water supply system are normally closed. Therefore, there is no water released by a pipe break of the fire protection water supply system inside PCCV.
- The RCP purge water head tank and C/V reactor coolant drain tank are non-seismic components which contain water inside the PCCV. The total amount of water contained within these tanks is 106 ft^3, which is significantly less than the volume of water from a LOCA.

Based on the above, a LOCA is determined as the worst case flooding source for the PCCV. The DCD will be revised to document this conclusion.

Impact on DCD

See Attachment 1 for the mark-up of DCD Section 3.4, Revision 2, changes to be incorporated.

- Insert the following as the seventh paragraph in Subsection 3.4.1.5.1:

  "There are piping systems inside the PCCV such as the CCW system and fire protection water supply system (fire water) that are connected to large-volume water sources, however a significant accidental release of water into the PCCV from these sources are not plausible for the following reasons:

  - All CCW piping inside the PCCV is classified as seismic category I.
  - Containment isolation valves outside the PCCV for the fire protection water supply system are normally closed. Therefore, there is no water released by a pipe break of the fire protection water supply system inside PCCV.
  - The RCP purge water head tank and C/V reactor coolant drain tank are non-seismic components which contain water inside the PCCV. The total amount of water contained within these tanks is 106 ft^3, which is significantly less than the volume of water from a LOCA."

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

4/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 220-2058 REVISION 1**

SRP SECTION: **03.04.01 – Internal Flood Protection for Onsite Equipment Failures**

APPLICATION SECTION: **03.04.01**

DATE OF RAI ISSUE: **02/26/09**

QUESTION NO. RAI 3.4.1-10:

With regard to the PCCV flooding analysis, the DCD states that components sensitive to flooding that are required to function are located above the flood elevation. However, the DCD does not identify the locations of safety-related SSCs relative to the internal flood level.

In accordance with SRP 3.4.1, Item I.2, the locations of safety-related SSCs relative to the internal flood level should be reviewed, and therefore, should be identified in the DCD.

Identify the locations of safety-related SSCs relative to the internal flood level. Include this information in the DCD and provide a markup in your response.

ANSWER:

The DCD Revision 2 will provide the locations within the PCCV, relative to the internal flood level, of those safety-related SSCs that are sensitive to flooding and are required to remain functional.

Impact on DCD

DCD Section 3.4, Revision 2, will incorporate the following changes:

- The DCD will provide the locations within the PCCV, relative to the internal flood level, of those safety-related SSCs that are sensitive to flooding and are required to remain functional.

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

4/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 220-2058 REVISION 1**
SRP SECTION:	**03.04.01 – Internal Flood Protection for Onsite Equipment Failures**
APPLICATION SECTION:	**03.04.01**
DATE OF RAI ISSUE:	**02/26/09**

QUESTION NO. RAI 3.4.1-11:

The containment annulus houses containment electrical and mechanical penetration areas. Mechanical penetrations include piping systems containing water. Flooding might occur following a break in these piping systems. However, the DCD does not describe how internal flood protection is achieved for safety-related SSCs located in the containment annulus.

As discussed in SRP 3.4.1, Section II, "Acceptance Criteria," GDC 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." Meeting the requirements of GDC 2 includes evaluating the effects of flooding from full circumferential failures of non-seismic, moderate-energy piping. As also discussed in SRP 3.4.1, Section II, "Acceptance Criteria," the requirements of GDC 4 relate to SSCs important to safety being designed to accommodate the effects of environmental conditions associated with postulated accidents, including loss-of-coolant accidents. Meeting the requirements of GDC 4 includes ensuring that SSCs important to safety are protected from potential flooding from liquid-carrying components in the plant.

Demonstrate how safety-related SSCs located in the containment annulus are protected from internal flood, including a description of instrumentation for flood detection, in accordance with the acceptance criteria of SRP 3.4.1. Include this information in the DCD and provide a markup in your response.

ANSWER:

The DCD Revision 2 will demonstrate how safety-related SSCs located in the containment annulus are protected from internal flooding, including a description of instrumentation for flood detection, in accordance with the acceptance criteria of SRP 3.4.1.

Impact on DCD

DCD Section 3.4, Revision 2, will incorporate the following changes:

- Protection of safety-related SSCs located in the containment annulus from internal flooding, including a description of instrumentation for flood detection, will be demonstrated in the DCD.

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

4/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 220-2058 REVISION 1**

SRP SECTION: **03.04.01 – Internal Flood Protection for Onsite Equipment Failures**

APPLICATION SECTION: **03.04.01**

DATE OF RAI ISSUE: **02/26/09**

QUESTION NO. RAI 3.4.1-12:

DCD Tier 2 Sections 3.4.1.5.2.1 and 3.4.1.5.2.2 provide a series of flooding analyses were performed for both the RCA and NRCA portions of the R/B. In each case, the DCD states that equipment to be protected from flooding is "located at heights above the level of flood water." However, this statement could not be confirmed. While the DCD provides elevation data for selected safety-related components located in the RCA that are to be protected from flooding, the cited equipment elevations are nominally below the maximum RCA flood levels (see DCD Tier 2 Section 3.4.1.5.2.1). Similarly, cited equipment elevations for safety-related components located in the NRCA that are to be protected from flooding are nominally below the maximum NRCA flood levels (see DCD Tier 2 Section 3.4.1.5.2.2).

As discussed in SRP 3.4.1, Section II, "Acceptance Criteria," GDC 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." Meeting the requirements of GDC 2 includes evaluating the effects of flooding from full circumferential failures of non-seismic, moderate-energy piping. As also discussed in SRP 3.4.1, Section II, "Acceptance Criteria," the requirements of GDC 4 relate to SSCs important to safety being designed to accommodate the effects of environmental conditions associated with postulated accidents, including loss-of-coolant accidents. Meeting the requirements of GDC 4 includes ensuring that SSCs important to safety are protected from potential flooding from liquid-carrying components in the plant. Also, per SRP 3.4.1, Item I.2, the locations of safety-related SSCs relative to the internal flood level should be reviewed, and therefore, should be identified in the DCD.

Demonstrate that safety-related SSCs inside the RCA and NRCA portions of the R/B are located above internal flood levels. Include this information in the DCD and provide a markup in your response.

ANSWER:

The DCD Revision 2 will demonstrate that safety-related SSCs inside the RCA and NRCA portions of the R/B are located above internal flood levels.

Impact on DCD

DCD Section 3.4, Revision 2, will incorporate the following changes:

- The DCD will demonstrate that the locations of safety-related SSCs inside the RCA and NRCA portions of the R/B are above internal flood level.

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

4/23/2009

US-APWR Design Certification

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SRP SECTION: **03.04.01 – Internal Flood Protection for Onsite Equipment Failures**

APPLICATION SECTION: **03.04.01**

DATE OF RAI ISSUE: **02/26/09**

QUESTION NO. RAI 3.4.1-13:

As discussed in DCD Tier 2 Section 3.4.1.5.2.1, floor drains in the east and west areas of the RCA portion of the R/B are isolated by means of a normally closed valve or check valve in individual drainage pathways prior to connecting into a common sump tank system. This design is used to prevent flood waters from the east (or west) from passing into the west (or east) side of the building via the floor drain system. Per DCD Tier 2 Section 3.4.1.5.2.2, a similar arrangement is used within the NRCA portion of the R/B to preclude cross-flow of floor drain water. As discussed in DCD Tier 2 Section 9.3.3.1.1, normally closed manual isolation valves installed in individual drainage pathways of Engineered Safety Feature (ESF) equipment rooms preclude backflow of water into these rooms via the sump system. However, the DCD does not explain how it is ensured that manual valves used to prevent cross-divisional flooding are aligned and maintained in the closed position.

As discussed in SRP 3.4.1, Section II, "Acceptance Criteria," GDC 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." Meeting the requirements of GDC 2 includes evaluating the effects of flooding from full circumferential failures of non-seismic, moderate-energy piping. As also discussed in SRP 3.4.1, Section II, "Acceptance Criteria," the requirements of GDC 4 relate to SSCs important to safety being designed to accommodate the effects of environmental conditions associated with postulated accidents, including loss-of-coolant accidents. Meeting the requirements of GDC 4 includes ensuring that SSCs important to safety are protected from potential flooding from liquid-carrying components in the plant. Also, in accordance with SRP 3.4.1, Item I.4, the staff is to review the adequacy of isolating safety-related systems and equipment in redundant trains.

Where manual isolation valves are relied upon to preclude cross-divisional flooding via the R/B drain and sump systems, demonstrate how it is ensured that these valves are aligned and maintained in the closed position. Include this information in the DCD and provide a markup in your response.

ANSWER:

Isolation and leak rate tests are carried out as preservice and inservice testing for isolation valves. DCD Tier 1, Subsection 2.7.6.8 outlines the preservice testing, and the IST Program described in DCD Subsection 3.9.6 provides the details of the inservice testing and safety positions. The floor drain valves will be added to the IST Program described in Subsection 3.9.6 during Revision 2 of the DCD.

Impact on DCD

DCD Section 3.9, Revision 2, will incorporate the following changes:

- The floor drain valves will be added to the IST Program described in DCD Subsection 3.9.6.

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

4/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 220-2058 REVISION 1**

SRP SECTION: **03.04.01 – Internal Flood Protection for Onsite Equipment Failures**

APPLICATION SECTION: **03.04.01**

DATE OF RAI ISSUE: **02/26/09**

QUESTION NO. RAI 3.4.1-14:

The Main Control Room (MCR) and Remote Shutdown Room (RSR) are located in the NRCA portion of the R/B. Per DCD Tier 2 Section 3.4.1.5.2.2, the MCR is isolated from the adjacent R/B corridor by concrete walls and a watertight door. However, the DCD does not discuss whether there are any internal sources of water inside the MCR, and if so, how the MCR is protected from these internal water sources. Furthermore, the DCD does not appear to address flood protection for the RSR.

As discussed in SRP 3.4.1, Section II, "Acceptance Criteria," GDC 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." Meeting the requirements of GDC 2 includes evaluating the effects of flooding from full circumferential failures of non-seismic, moderate-energy piping. As also discussed in SRP 3.4.1, Section II, "Acceptance Criteria," the requirements of GDC 4 relate to SSCs important to safety being designed to accommodate the effects of environmental conditions associated with postulated accidents, including loss-of-coolant accidents. Meeting the requirements of GDC 4 includes ensuring that SSCs important to safety are protected from potential flooding from liquid-carrying components in the plant.

Identify any internal sources of water inside the MCR, and if there are, demonstrate how the MCR is protected from these internal water sources. Also, demonstrate how the RSR is protected from internal flood, in accordance with SRP 3.4.1. Include this information in the DCD and provide a markup in your response.

ANSWER:

The remote shutdown console is installed in the remote shutdown room. There is no piping and therefore no flooding sources inside the remote shutdown room. In addition, the remote shutdown room is protected from in-flow of water from flood sources by a water-tight door. The DCD will be changed to clarify this information.

Internal sources of water inside the MCR are limited to sanitary piping. These water lines are less than or equal to 1B, and therefore countermeasures for this water source are not required.

Impact on DCD

See Attachment 1 for the mark-up of DCD Section 3.4, Revision 2, changes to be incorporated.

- Change the third paragraph under "**Elevation 76 ft, 5 in.**" in Subsection 3.4.1.5.2.2 to the following:

  "The equipment to be protected in the subject area, except the MS/FW piping area, is the instrumentation of the EFW pit, and the remote shutdown console within the remote shutdown room."

- Add the following at the end of the last paragraph in Subsection 3.4.1.5.2.2:

  "The remote shutdown console is installed in the remote shutdown room. There is no piping and therefore no flooding sources inside the remote shutdown room. In addition, the remote shutdown room is protected from in-flow of water from flood sources by a water-tight door."

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

4/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 220-2058 REVISION 1

SRP SECTION: 03.04.01 – Internal Flood Protection for Onsite Equipment Failures

APPLICATION SECTION: 03.04.01

DATE OF RAI ISSUE: 02/26/09

QUESTION NO. RAI 3.4.1-15:

The DCD does not describe how internal flood protection is achieved for SSCs used to provide spent fuel pit cooling.

As discussed in SRP 3.4.1, Section II, "Acceptance Criteria," GDC 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." Meeting the requirements of GDC 2 includes evaluating the effects of flooding from full circumferential failures of non-seismic, moderate-energy piping. As also discussed in SRP 3.4.1, Section II, "Acceptance Criteria," the requirements of GDC 4 relate to SSCs important to safety being designed to accommodate the effects of environmental conditions associated with postulated accidents, including loss-of-coolant accidents. Meeting the requirements of GDC 4 includes ensuring that SSCs important to safety are protected from potential flooding from liquid-carrying components in the plant.

Demonstrate how SSCs used to provide spent fuel pit cooling are protected from internal flood, in accordance with SRP 3.4.1. Include this information in the DCD and provide a markup in your response.

ANSWER:

The height (top of concrete) of A and B train SFP pump foundations are 1.0 ft above the floor elevation of 3 ft, 7 in. The water height at elevation 3 ft, 7 in., based on the flood events described in DCD Subsection 3.4.1.5.2.1, is 0.67 ft above elevation 3 ft, 7 in. and 0.87 ft above elevation 3 ft, 7 in. for the east side and west side, respectively. Therefore, the SFP pumps are not flooded.

Impact on DCD

See Attachment 1 for the mark-up of DCD Section 3.4, Revision 2, changes to be incorporated.

- Change the second paragraph under "**Elevation 3 ft, 7 in.**" in Subsection 3.4.1.5.2.1 to the following:

  "The equipment to be protected in the east area of RCA at elevation 3 ft, 7 in. are the A and B train CS/RHR heat exchanger (HX), the A and B train safeguard component area air handling unit, and the A train SFP pump. The equipment to be protected in the west area of RCA at elevation 3 ft, 7 in. are the C and D train CS/RHR HX, the C and D train safeguard component area air handling unit, and B train SFP pump."

- Add the following as the last paragraph under "**Elevation 3 ft, 7 in.**" in Subsection 3.4.1.5.2.1:

  "The height (top of concrete) of A and B train SFP pump foundations are 1.0 ft above the floor elevation 3 ft, 7 in. Therefore, the SFP pumps are not flooded."

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

4/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 220-2058 REVISION 1**

SRP SECTION: **03.04.01 – Internal Flood Protection for Onsite Equipment Failures**

APPLICATION SECTION: **03.04.01**

DATE OF RAI ISSUE: **02/26/09**

QUESTION NO. RAI 3.4.1-16:

The DCD does not describe how internal flood protection is achieved for safety-related SSCs located inside the power source buildings (PS/B). However, as indicated in DCD Tier 2 Table 3.2-2, the PS/B contains some seismic Category I SSCs, including essential service water (ESW) valves, essential chiller pumps, and miscellaneous equipment related to the emergency gas turbines.

As discussed in SRP 3.4.1, Section II, "Acceptance Criteria," GDC 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." Meeting the requirements of GDC 2 includes evaluating the effects of flooding from full circumferential failures of non-seismic, moderate-energy piping. As also discussed in SRP 3.4.1, Section II, "Acceptance Criteria," the requirements of GDC 4 relate to SSCs important to safety being designed to accommodate the effects of environmental conditions associated with postulated accidents, including loss-of-coolant accidents. Meeting the requirements of GDC 4 includes ensuring that SSCs important to safety are protected from potential flooding from liquid-carrying components in the plant.

Demonstrate how safety-related SSCs located in the PS/B are protected from internal flood, including a description of instrumentation for flood detection, in accordance with SRP 3.4.1. Include this information in the DCD and provide a markup in your response.

ANSWER:

The DCD Revision 2 will demonstrate how safety-related SSCs located in the PS/Bs are protected from internal flooding, including a description of instrumentation for flood detection, in accordance with the acceptance criteria of SRP 3.4.1.

Impact on DCD

DCD Section 3.4, Revision 2, will incorporate the following changes:

- Protection of safety-related SSCs located in the PS/Bs from internal flooding, including a description of instrumentation for flood detection, will be demonstrated in the DCD.

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

4/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 220-2058 REVISION 1

SRP SECTION: 03.04.01 – Internal Flood Protection for Onsite Equipment Failures

APPLICATION SECTION: 03.04.01

DATE OF RAI ISSUE: 02/26/09

QUESTION NO. RAI 3.4.1-17:

As described in DCD Tier 2 Section 3.4.1, the US-APWR design utilizes watertight doors as an important element of the overall flood protection strategy. However, there is no mention of methods used for assuring the functionality of these watertight doors, for example position indicators, door seals, aging degradation, testing, and maintenance procedure requirements for the door seals.

In accordance with SRP 3.4.1, Item III.2, the staff is to review the adequacy of techniques used to prevent flooding, including the use of watertight doors.

Describe how the functionality of the watertight doors is assured. Specifically address the means used to determine and assure door position, integrity of door seals, aging degradation, testing, and maintenance procedure requirements for the door seals. Include this information in the DCD and provide a markup in your response.

ANSWER:

The functionality of water-tight doors is assured through various elements of the design, operation and maintenance of the doors. The door seals are designed such that they will provide positive leak tightness in case of flooding conditions. Remote position indication is provided to the operators for verification that the doors are in the proper position for the plant condition. Inspections of the water-tight doors will be performed periodically to ensure that the integrity of the door seals is maintained and any aging-related degradation is identified and corrected. These inspections will entail a visual inspection and functional test of the door to validate sealing functionality. Procedures for performing the periodic maintenance will be provided that detail the specific door subcomponents and inspection attributes (such as loose or missing parts, excessive wear, damage, sealing surface imperfections, binding, looseness, deterioration, etc.).

Impact on DCD

See Attachment 1 for the mark-up of DCD Section 3.4, Revision 2, changes to be incorporated.

- Insert the following as the fourth paragraph in Subsection 3.4.1.3:

  "Water-tight doors are used as protective barriers to prevent flood waters from spreading to adjacent divisions in various buildings and elevations. Water-tight doors have position indication for closure verification and are periodically inspected and tested to ensure proper functionality."

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

This completes MHI's responses to the NRC's questions.

ATTACHMENT 1
to RAI 220-2058

- Fire fighting operations
- Pump mechanical seal failures

The combination of events is not considered. However, an earthquake event followed by fire fighting operations for an earthquake induced fire is considered.

For flood events caused by an earthquake, equipment or pipe (not classified as seismic category I) in the R/B are assumed to be fully compromised and the total volume of the fluid contained within the subject equipment or pipe contributes to the flood volume. Equipment or piping not classified as seismic category I in areas outside of the area of concern is also assumed to be fully compromised, and if the discharge fluids can not be demonstrated to be excluded from the area of concern, their volume is included in the flood volume. The US-APWR is designed for maximum water levels created by internal flooding sources. The internal flood design accommodates the effects of, and is compatible with, environmental conditions associated with normal operations, maintenance, testing, and postulated accidents, including LOCAs.

Water-tight doors are used as protective barriers to prevent flood waters from spreading to adjacent divisions in various buildings and elevations. Water-tight doors have position indication for closure verification and are periodically inspected and tested to ensure proper functionality.

Open pits are isolated within water tight compartments using water tight doors, penetration seals, and normally closed floor drains. In this manner, flooding effects caused by open pit water sloshing are considered.

For flood events caused by the postulated failure of piping, defined in Section 3.6, the rupture of the single worst-case piping in the area of concern is assumed in the flood analysis for each area of concern. The discharge volume is calculated according to “Subcompartment Pressure and Temperature Transient Analysis in Light Water Reactors”, American National Standards Institute (ANSI)/American Nuclear Society (ANS) 56.10-1987, Section 3 (Reference 3.4-6), and is included in the pipe break and cracks flood evaluation. The structures adjacent to the postulated pipe rupture locations are also designed for the maximum associated hydrodynamic loads due to a pipe failure as discussed in Section 3.6. The loads and load combinations are addressed in detail in Section 3.8.

In the flooding effects from fire fighting operations, water discharged from only fire hose stations is assumed. In fire fighting operations, a discharge rate of 125 gpm is assumed for a period of 2 hours from two hose stations.

Pump mechanical seal failures of concern are limited to the active pumps identified in Section 3.9. Seal failure is a low probability event based on the use of robust pump mechanical seals. Additionally, monitoring of mechanical seal water temperature, pressure, and flow rate across the pump mechanical seals provides the means of limiting the effects of pump seal failure through early detection and timely corrective action. As such, pump mechanical seal failure presents a sufficiently low probability of occurrence and flood volume that it can be credibly ignored.

ATTACHMENT 1
to RAI 220-2058

- Water at the pressurizer compartment flows to the SG compartment by way of the inlet/outlet to the SG compartment.
- Water in the regenerative heat exchanger room, the letdown heat exchanger room, and the excess letdown heat exchanger room flow out their respective entrance doorways. The flow path from there is to the respective level floor drains or through the alternate paths.
- Water flowing onto the elevation 25 ft, 3 in. floor flows to the RWSP through the 18 in. transfer piping provided at 10 places on the floor surface and into the flow to the PCCV drain pump room through the stair opening on the floor surface. Water also flows into the HVAC header compartment from the PCCV drain pump room by way of a walkway through the lower primary shield wall.

Thus, flood waters in the containment reaches the RWSP, the HVAC header compartment, the PCCV drain pump room, and the reactor cavity.

Inside the containment, the largest water retaining components are the refueling cavity, and the RWSP. The RWSP and the refueling cavity are robust reinforced concrete seismic category I structures with thick walls which have been designed for all applicable loads, including the potential in-containment missile loads and hydrodynamic loads. Due to their robust design, a postulated failure of these structures is not credible. Additionally, the combined fuel transfer canal/reactor cavity pit during all but refueling operations is dry. Since a LOCA represents the worst case flooding event, sloshing is not a factor in PCCV flooding.

There are piping systems inside the PCCV such as the CCW system and fire protection water supply system (fire water) that are connected to large-volume water sources, however a significant accidental release of water into the PCCV from these sources are not plausible for the following reasons:

- All CCW piping inside the PCCV is classified as seismic category I.
- Containment isolation valves outside the PCCV for the fire protection water supply system are normally closed. Therefore, there is no water released by a pipe break of the fire protection water supply system inside PCCV.
- The RCP purge water head tank and C/V reactor coolant drain tank are non-seismic components which contain water inside the PCCV. The total amount of water contained within these tanks is 106 ft^3, which is significantly less than the volume of water from a LOCA.

The maximum flooding event in the containment is therefore a result of a LOCA. During a LOCA, water held in the RCS and water from the accumulator tanks is injected into the RCS, and flows from the damaged main coolant pipe. Additionally, spray and injection of the RWSP volume is assumed.

The volume of water from a LOCA is conservatively assumed to be equal to the volume of the RCS volume, the four accumulator tank volumes, and the volume of the RWSP for a total volume of 113,000 ft^3.

- Fire Fighting Operations

  Flooding contribution from fire-fighting operations is based on the full operation of two hose stations for 2 hours. The flow rate from 1 hose station is 125 gpm. With two stations operating for 2 hours, the total volume of water is 4,010 ft^3.

Based on the above, the worst case flooding on the west side of the R/B is a HELB at 11,570 ft^3. On the east side of the plant, the worst case flooding is an earthquake followed by fire fighting operations due to an earthquake induced fire at 5,070 ft^3.

The square footage of floor area subject to flooding at elevation -26 ft, 4 in. is as follows:

- East side: 3,400 ft^2
- West side: 4,150 ft^2

Based on these values, the maximum water levels are as follows:

- East side: 1.49 ft above elevation -26 ft, 4 in.
- West side: 2.79 ft above elevation -26 ft, 4 in.

The SI pump and CS/RHR pump are installed in a room which prevents flow-in water by water-tight door, and floor drains of these rooms are separated by closed valve or check valve for each trains. Therefore, the pumps are not flooded. Instrumentation of the SI pump and CS/RHR pump are installed above the flood water level.

Elevation 3 ft, 7 in.

Flood waters occurring above elevation -26 ft, 4 in. drain to floor elevation -26 ft, 4 in. through floor drains, stairwell, elevator shaft and/or equipment hatch. However, the evaluation above elevation -26 ft, 4 in. conservatively assumes that the flooding water is not drained.

The equipment to be protected in the east area of RCA at elevation 3 ft, 7 in. are the A and B train CS/RHR heat exchanger (HX), ~~and~~ the A and B train safeguard component area air handling unit, and the A train SFP pump. The equipment to be protected in the west area of RCA at elevation 3 ft, 7 in. are the C and D train CS/RHR HX, ~~and~~ the C and D train safeguard component area air handling unit, and B train SFP pump.

The CS/RHR HX and the safeguard component area air handling unit are isolated by concrete walls and water-tight door. Moreover, floor drains of these rooms are separated from floor drains outside of these rooms and are also separated for each train. Therefore, flood water is assumed to run across the area except the CS/RHR HX and the safeguard component area air handling unit rooms.

Flood Events are considered as follows:

- Earthquake

  The total water volume from the earthquake event is same as that of elevation -26 ft, 4 in.

- HELB/MELB

  HELB event is not a concern, because the postulated pipe break at the discharge nozzle of the CVCS charging pump occurs at a location on a lower floor level.

- Fire Fighting Operations

  The total water volume from the fire fighting operation events is same as that of elevation -26 ft, 4 in.

Based on the flood events described above, the worst case results are from a combination of earthquake and fire fighting operations. The total volume of flood water caused by this combination is 5,070 ft^3 in both the east and west area.

The footage of subject area and the water level are as follows:

- East side: 7,550 ft^2 area, 0.67 ft water height above elevation 3 ft, 7 in.

- West side: 5,850 ft^2 area, 0.87 ft water height above elevation 3 ft, 7 in.

CS/RHR HX and safeguard component area air handling unit are installed in the room which prevents flow-in water by water-tight door, and floor drains of these rooms are separated from floor drains outside of these rooms and are also separated for each trains. Therefore, components are not flooded. The instrumentation of the CS/RHR HX and safeguard component area air handling unit are installed above the flood water level.

The height (top of concrete) of A and B train SFP pump foundations are 1.0 ft above the floor elevation 3 ft, 7 in. Therefore, the SFP pumps are not flooded.

Elevation 25 ft, 3 in.

The equipment to be protected in the east and west area of RCA elevation 25 ft, 3 in. are the containment isolation valves in piping penetration room.

Flood Events are considered as follows:

- Earthquake

  The total water volume from the earthquake event is same as that of elevation -26 ft, 4 in.

- HELB/MELB

  HELB event is not a concern, because the postulated pipe break at the discharge nozzle of the CVCS charging pump occurs at a location on a lower floor level.

- Fire Fighting Operations

  The total water volume from the fire fighting operation events is same as that of elevation -26 ft, 4 in.

Based on the flood events described above, the worst case results are from a combination of earthquake and fire fighting operations. The total volume of flood water caused by this combination is 5,070 ft^3 in both the east and west area.

The air handling unit foundations (top of concrete) height is 1.0 foot above floor elevation 50 ft, 2 in. As such, the air handling units are not flooded.

Elevation 76 ft, 5 in.

Elevation 76 ft, 5 in. of the NRCA is divided into the MS/FW piping area and other areas by concrete walls and water-tight doors. Moreover, the MS/FW piping area is divided into the two areas, east and west, by the concrete wall.

The equipment to be protected in the MS/FW piping area is the MS isolation valve, main feedwater isolation valve (MFIV), and MS depressurization valve.

The equipment to be protected in the subject area, except the MS/FW piping area, is the instrumentation of the EFW pit, and the remote shutdown console within the remote shutdown room.

Flood events in the MS/FW piping area are considered as follows:

- Earthquake

  The total water volume from the earthquake event is same as that of elevation -26 ft, 4 in.

- HELB/MELB

  In the flooding events caused by the postulated failure of piping, the high energy piping consists of main steam, feedwater, and SG blowdown piping, within the MS/FW piping area. A rupture of the feedwater piping in this area represents the worst case flooding scenario for this area. This is based on a 1.0 ft^2 break, as defined in Section 3.6, in the feedwater piping upstream of the feedwater check valve. The rupture at this point results in feedwater from the SG and from within the associated feedwater piping flow back into and flooding the compartment. In addition, the main feedwater pump is assumed be pumping at the maximum flowrate. As a result of this scenario, the water level in the SG would decline resulting in a low level alarm/signal from the SG water level indication instrumentation. The low water signal initiates the feedwater isolation circuit. Based on actuation of the feedwater isolation circuit, the main feedwater pump is tripped, which stops the main feedwater pump. The volume of water which floods the main steam/feedwater pipe/relief valve compartment, based on the time required to reach the low water level set point, is 12,180 ft^3. The flood water occurring in the main steam/feed water piping room is drained to the T/B sump through the floor drain. Conservatively assuming that the drain line is clogged, the flood water will not be discharged by way of the floor drain.

- Fire Fighting Operations

  The total water volume from the fire fighting operation events is same as that of elevation -26 ft, 4 in.

Based on the above, the worst case flooding in the MS/FW piping area is a piping rupture at 12,180 ft^3. The floor area of the MS/FW piping area is 2,640 ft^2; therefore the water level caused by piping rupture area is 4.6 ft above elevation 65 ft, 0 in, the bottom of the MS/FW piping area. The actuators of valve to be protected are designed to be located at heights above the level of flood water. In addition, the bottom of doorways to the MS/FW piping area is at elevation 76 ft, 5 in. This is 11 ft, 5 in. above the floor at elevation 65 ft, 0 in, and the doorways located level is higher than the level of flood water. Therefore, the flood water flow from the MS/FW piping area to the balance of the NRCA portion of the R/B is not a consideration.

Flood events in the subject area except MS/FW piping room are considered as follows;

- Earthquake

  The total water volume from the earthquake event is same as that of elevation -26 ft, 4 in. The EFW pit is isolated by installing the water-tight doors to doorway to prevent flood water by sloshing of EFW pit spilling to other area.

- HELB/MELB

  HELB event is not a concern, because maximum flood level within the MS/FW piping area is well below the door elevation as described above.

- Fire Fighting Operations

  The total water volume from the fire fighting operation events is same as that of elevation -26 ft, 4 in.

Based on the flood events described above, the worst case results are from a combination of earthquake and fire fighting operations. The total volume of flood water caused by this combination is 4,710 ft^3 in both the east and west area.

The footage of subject area and the water level are as follows;

- East side: 3,500 ft^2 area, 1.35 ft above elevation 76 ft, 5 in.

- West side:4,100 ft^2 area, 1.15 ft above elevation 76 ft, 5 in.

The instrumentation of the EFW pit is designed to be located at heights above the level of flood water. <u>The remote shutdown console is installed in the remote shutdown room. There is no piping and therefore no flooding sources inside the remote shutdown room. In addition, the remote shutdown room is protected from in-flow of water from flood sources by a water-tight door.</u>

3.4.2 Analysis Procedures

The static and dynamic effects of the design-basis flood or groundwater conditions, which are identified in Section 2.4, are applied to seismic category I structures. Section 3.8 specifies the applicable codes, standards, and specifications used in the design of seismic category I structures. The loads and load combination subsections of Section 3.8 take into consideration the static and dynamic loadings on seismic category I structures including hydrostatic loading as the result of the design-basis flood and/or ground conditions identified in Section 2.4. Section 3.8 also provides the design and analysis procedures used to transform the static and dynamic effects of the DBFL and ground water levels applied to seismic category I structures to assure their design meet the applicable acceptance criteria.