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April 8, 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-09152

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.

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 5 RAIs contained within Reference 1. Of the RAIs in Reference 1, 15 will not be answered within this package. They are;

RAI 3.4.1-02, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

RAI 3.4.1-04, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

RAI 3.4.1-05, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

RAI 3.4.1-06, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

RAI 3.4.1-07, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

RAI 3.4.1-08, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

RAI 3.4.1-09, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

RAI 3.4.1-10, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

RAI 3.4.1-11, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

RAI 3.4.1-12, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

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RAI 3.4.1-13, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

RAI 3.4.1-14, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

RAI 3.4.1-15, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

RAI 3.4.1-16, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

RAI 3.4.1-17, which has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

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

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

Contact Information
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Enclosure 1

UAP-HF-09152
Docket No. 52-021

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

April, 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

4/8/2009

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 3.4.1-01:

It is stated in DCD Tier 1 Sections 1.2 and 3.1, that the standard plant design includes the following set of buildings and structures: reactor building (R/B), which includes the prestressed concrete containment vessel (PCCV) and containment internal structure (CIS); power source buildings (PS/Bs); auxiliary building (A/B); turbine building (T/B); access building (AC/B); power source fuel storage vaults (PSFSVs); and essential service water pipe tunnel (ESWPT). However, DCD Tier 2 Section 3.8.4 states that the PSFSVs, the ESWPT, and the ultimate heat sink related structures (UHSRS) are not part of the standard design. Thus, DCD Tier 1 Sections 1.2 and 3.1, and Tier 2 Section 3.8.4 appear to provide conflicting information as to whether the PSFSVs and the ESWPT are included in the standard plant design. To support the staff's review of internal flood protection for the US-APWR, it is necessary that the applicant clearly identify the set of structures, systems, and components (SSCs) associated with the standard plant design.

Clearly identify the set of buildings and SSCs associated with the standard plant design. Include this information in the DCD and provide a markup in your response.

ANSWER:

DCD Tier 1, Section 1.2 lists buildings and structures that comprise the main power block of the US-APWR standard design. The PSFSVs and ESWPT are included as structures that perform a functional requirement for the main power block. DCD Tier 1, Section 3.1, reiterates that the US-APWR standard plant design consists of several buildings, components, and structures, including the PSFSVs and ESWPT.

Unlike DCD Tier 1, the intention of DCD Tier 2, Subsection 3.8.4 is to identify the responsibility of the seismic design of standard plant and non-standard plant structures. Non-standard plant structures may serve a functional requirement for the main power block as described above, however a non-standard plant structure will be configured and structurally designed to satisfy unique plant conditions such as subgrade conditions and structure placement. It is not intended to re-classify PSFSVs and ESWPT as not performing a system function relating to the main power block of the US-APWR standard design.

However, MHI agrees the discussion in DCD Tier 1, Sections 1.2 and 3.1, and DCD Tier 2, Subsection 3.8.4 can be misinterpreted, and will clarify the responsibilities for functional design and seismic design of the PSFSVs and ESWPT in the next revision of the DCD.

Impact on DCD

See Attachment 1 for the mark-up of DCD Tier 1, Section 1.0, Revision 2, changes to be incorporated.

- Insert the following as the third paragraph in Section 1.2:

  "Although the system descriptions of the PSFSVs and ESWPT are within the scope of the US-APWR standard design, the structural design of the PSFSVs and ESWPT, including seismic and dynamic qualification as applicable, are to be finalized based on the site-specific arrangement."

See Attachment 2 for the mark-up of DCD Tier 1, Section 3.0, Revision 2, changes to be incorporated.

- Insert the following as the third paragraph in Section 3.1:

  "Although the system descriptions of the PSFSVs and ESWPT are within the scope of the US-APWR standard design, the structural design of the PSFSVs and ESWPT, including seismic and dynamic qualification as applicable, are to be finalized based on the site-specific arrangement."

See Attachment 3 for the mark-up of DCD Tier 2, Section 3.8, Revision 2, changes to be incorporated.

- Change the fourth paragraph in Subsection 3.8.4 to the following:

  "The COL Applicant is responsible for the seismic design of those seismic category I and seismic category II SSCs not seismically designed as part of the US-APWR standard plant, including the following seismic category I structures designed to the site-specific SSE:

    - ESWPT
    - UHSRS
    - PSFSVs"

- Insert the following as the fifth paragraph in Subsection 3.8.4:

  "Note that the system descriptions of PSFSVs and ESWPT are within the scope of the US-APWR standard plant design."

- Change COL 3.8(15) in Subsection 3.8.6 to the following:

"COL 3.8(15) *The COL Applicant is responsible for the seismic design of those seismic category I and seismic category II SSCs not seismically designed as part of the US-APWR standard plant, including the following seismic category I structures designed to the site-specific SSE:*

- *ESWPT*
- *UHSRS*
- *PSFSVs"*

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

4/8/2009

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 3.4.1-03:

In DCD Tier 2, Section 3.4.1.5.2.1, p. 3.4-15, it is stated that equipment items to be protected in the radiological controlled area (RCA) of the reactor building (R/B) at elevation 76 ft, 5 in. are "junction boxes and cables in electrical penetration room isolation valves." This statement is not clear.

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." 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. The DCD has not clearly identified this information for the staff to review.

Clarify the DCD statement quoted above. Include this information in the DCD and provide a markup in your response.

ANSWER:

Section 3.4.1.5.2.1 will be changed in Revision 2 of the DCD to clarify the equipment to be protected from internal flooding on elevation 76 ft, 5 in. of the RCA are junction boxes and cables related to the isolation valves in the east and west electrical penetration areas.

Impact on DCD

See Attachment 4 for the mark-up of DCD Section 3.4, Revision 2, changes to be incorporated.

- Change the second paragraph under **Elevation 76 ft, 5 in.** in Subsection 3.4.1.5.2.1 to the following:

  "The equipment to be protected from internal flooding on elevation 76 ft, 5 in. of the RCA are junction boxes and cables connected to the PCCV penetrations in the east and west electrical penetration areas."

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

4/8/2009

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 3.4.1-18:

DCD Tier 2, Section 3.4.1.1 states the following: "In general, SSCs are mounted above the flood level. However, if safety-related SSCs are located below flood level, their safety function is assured, as described in Section 3.11." DCD Tier 2 Table 3D-2, "USAPWR Environmental Qualification Equipment List," lists components subject to graded environmental conditions. However, this table does not indicate which components, if any, are credited for operation while being submerged. The staff could not determine whether the applicant intends to include the option of submerged SSCs in the DC stage or in the Combined License (COL) application stage.

Per SRP Section 3.4.1, Item III.5, safety-related SSCs being located below the flood level should be reviewed, and therefore, should be identified in the DCD. Also, it must be demonstrated that these SSCs are capable of their normal function while submerged.

Clarify whether the US-APWR flood protection design intends to include the option of submerged SSCs operation in the design certification (DC) stage or in the COL application stage. If it is in the DC stage, list the safety-related SSCs that could be located below potential flood levels, and demonstrate how these SSCs will retain their normal function while submerged. If submerged SSCs are to be credited in the COL stage, explain how the DCD will ensure that the COL applicant will address the operability of these SSCs in accordance with SRP 3.4.1. Include this information in the DCD and provide a markup in your response.

ANSWER:

In the US-APWR flood protection design, components requiring active operation to achieve their safety function are not to be submerged. Therefore, there are no safety-related components located below flood level in the DC stage and the COLA stage.

The DCD will be revised to clarify that the option to environmentally protect safety-related SSCs located below potential flood levels is not applicable, because the components requiring active operation to achieve their intended safety function are not located below the potential flood level.

Impact on DCD

See Attachment 4 for the mark-up of DCD Section 3.4, Revision 2, changes to be incorporated.

- Change the fourth bullet of the fourth paragraph in Subsection 3.4.1.1 to the following:
  - "SSCs are mounted above the flood level. While safety-related SSCs that are environmentally protected in accordance with Section 3.11 are permitted below the potential flood level, no components requiring active operation to achieve their intended safety function are located below the potential 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

4/8/2009

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 3.4.1-19:

ITAAC Acceptance Criteria No. 11 in DCD Tier 1, Table 2.2.4, includes the following wording: "...equipment are located at sufficient height the floor surface against the design flood level." This statement is not clear.

10 CFR 52.47(b)(1) requires that a DC application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations. 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.

Clarify the wording associated with the Acceptance Criteria for ITAAC Item No. 11 in DCD Tier 1, Table 2.2-4 so that it explicitly requires equipment to be positioned sufficiently high above the design flood level. Include this information in the DCD and provide a markup in your response

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ANSWER:

The Acceptance Criteria for ITAAC Item No. 11 in DCD Tier 1, Table 2.2-4, will be clarified that the as-built safety-related electrical, instrumentation, and control equipment are located at sufficient height above the design flood level, or are otherwise protected against flooding to assure their intended safety function as indicated in DCD Tier 2, Subsection 3.4.1.1. The inspection of the as-built equipment will be performed utilizing approved design documents to determine the acceptable locations of the safety-related SSCs relative to the internal flood level.

Impact on DCD

See Attachment 5 for the mark-up of DCD Tier 1, Section 2.2, Revision 2, changes to be incorporated.

- Change the Acceptance Criteria (3rd column) for ITAAC Item No. 11 in Table 2.2-4, Sheet 2, in DCD Tier 1, Section 2.2 to the following: "The as-built safety-related electrical, instrumentation, and control equipment are located at sufficient height above the design flood level."

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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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 3.4.1-20:

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 staff could not find an ITAAC entry or DCD Tier 1 discussion that specifically addresses the check valves and manual valves that are used to prevent cross-divisional flooding via floor drain and sump systems.

10 CFR 52.47(b)(1) requires that a DC application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations. Tier 1 Design Descriptions (DD), figures, and ITAAC for fluid systems should include special features used to protect against flood hazards, as indicated in SRP 3.4.1 Appendix C, Items I.A(7), I.B.ix, and II.B.i .

Include, as part of the ITAAC process, check valves and manual valves used to prevent cross-divisional flooding via R/B floor drain and sump systems, consistent with SRP 14.3, Appendix C, Items I.A(7), I.B.ix, and II.B.i. Include this information in the DCD and provide a markup in your response.

ANSWER:

DCD Tier 1, Section 2.7.6.8 describes the equipment and floor drainage systems. As noted in the Key Design Features, isolation valves are provided on the ESF equipment rooms drainage piping in order to protect against flooding due to backflow.

ITAAC Item No. 1 in Table 2.7.6.8-1 provides the design commitment for the functional arrangement of the equipment and floor drainage systems to be as described in the Design Description of DCD Tier 1 Subsection 2.7.6.8. As noted by direct reference in the Design Description, isolation valves are a part of the functional arrangement of the ESF equipment rooms drainage piping, and will therefore be confirmed along with other as-built equipment and floor drainage systems using the Acceptance Criteria for ITAAC Item No. 1. DCD Tier 1 therefore specifically discusses valves that are used to prevent cross-divisional flooding via floor drain and sump systems, and is captured by the ITAAC of the floor drainage systems.

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.

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

ATTACHMENT 1
to RAI 220-2058

1.0 INTRODUCTION

This chapter identifies the purpose and scope of this Tier 1 document; defines various terms used; identifies general provisions associated with design descriptions and inspections, tests, analyses, and acceptance criteria (ITAAC); and provides a legend for symbols used in the Tier 1 figures.

1.1 PURPOSE

The purpose of this document is to provide information on the design of the US-APWR to support approval and certification of this standard nuclear power plant by the U.S. Nuclear Regulatory Commission (NRC) under the provisions of 10 Code of Federal Regulations (CFR) Part 52.

1.2 SCOPE

The US-APWR is an advanced light-water reactor plant with reactor thermal power of 4451 MWt designed by Mitsubishi Heavy Industries, Ltd. (MHI). Figure 1-1 shows a typical US-APWR plant site.

The main power block of the US-APWR standard design is comprised of the following buildings and structures:

- The reactor building (R/B), including the prestressed concrete containment vessel (PCCV) and the containment internal structure
- The power source buildings (PS/Bs)
- The power source fuel storage vaults (PSFSVs)
- The essential service water pipe tunnel (ESWPT)
- The auxiliary building (A/B)
- The turbine building (T/B)
- The access building (AC/B)

Although the system descriptions of the PSFSVs and ESWPT are within the scope of the US-APWR standard design, the structural design of the PSFSVs and ESWPT, including seismic and dynamic qualification as applicable, are to be finalized based on the site-specific arrangement.

The information in this document comprises the design information related to the US-APWR standard nuclear power plant that is to be certified by the NRC. This technical information is commonly referred to as the certified design material or Tier 1 material.

The US-APWR Design Control Document (DCD) is divided into two parts.

The Tier 1 document provides top-level information on the plant design, including the principal performance characteristics and safety functions of the structures, systems, and components (SSCs). It provides ITAAC to be used to provide reasonable

ATTACHMENT 2
to RAI 220-2058

3.0 INTERFACE REQUIREMENTS

3.1 Design Description

This section identifies the safety significant interfaces between the US-APWR standard plant design and the Combined License (COL) applicant.

The US-APWR standard plant design consists of several buildings (reactor building including the prestressed concrete containment vessel and containment internal structure, power source buildings, auxiliary building, turbine building and access building); the equipment located in those buildings, and structures (power source fuel storage vaults and essential service water pipe tunnel). As allowed by the regulations, conceptual designs for systems that are not part of the US-APWR standard design are included in the DCD for purposes of allowing the NRC to evaluate the overall acceptability of the design. However, the final details of these conceptual designs are subject to change due to site-specific conditions.

Although the system descriptions of the PSFSVs and ESWPT are within the scope of the US-APWR standard design, the structural design of the PSFSVs and ESWPT, including seismic and dynamic qualification as applicable, are to be finalized based on the site-specific arrangement.

An interface requirement as specified in this section is the portion of a system that must be added to the standard design package to complete the design of the US-APWR at a specific site.

3.2 Interface Requirements

Ultimate Heat Sink

Ultimate heat sink (UHS) is a safety-related system and is site-specific. The maximum supply water temperature is 95 °F under the peak heat loads condition to provide sufficient cooling capacity to ESWS.

The UHS keeps the water level at a net positive suction head (NPSH) greater than the pump's required NPSH.

Fire Protection System

The seismic standpipe system can be supplied from a safety-related water source which capacity is at least 18,000 gallons.

COL applicant referencing the certified design is responsible to assure that the site-specific design meets the interface requirement and verify the conformance in the ITAAC process that is similar to those provided in the certified design.

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- East and west PS/Bs

Discussion of design methodology, applicable loads, load combinations and acceptance criteria within this subsection is applicable for the R/B structures and the east and west PS/Bs, which are part of the US-APWR standard plant.

The COL Applicant is responsible for the seismic design of those seismic category I and seismic category II SSCs not seismically designed as part of the US-APWR standard plant, including the following ~~non-standard~~ seismic category I structures designed to the site-specific SSE:

- ESWPT
- UHSRS
- PSFSVs

Note that the system descriptions of PSFSVs and ESWPT are within the scope of the US-APWR standard plant design.

Non-standard seismic category I SSCs are site-specific, and are designed for the site specific or more conservative SSE based on the ground motion response spectra, the site-specific foundation input response spectra, and the minimum response spectrum as described in Subsection 3.7.1.1.

3.8.4.1 Description of the Structures

Seismic category I buildings, except the R/B, PCCV, and containment internal structure, are free standing on separate concrete basemats and are primarily reinforced concrete structures. The R/B, PCCV, and containment internal structure share a common basemat; however, they are otherwise independent of each other. Adjoining building basemats are structurally separated by a 4 in. gap at and below the grade. This requirement does not apply to engineered mat fill concrete that is designed to be part of the basemat subgrade for the interface between the R/B, and east and west PS/Bs. To be consistent with seismic modeling requirements of Section 3.7, no 4 in. gap is permitted in the fill concrete between these buildings.

The minimum gaps between building superstructures is two times the absolute sum of the maximum displacement of each building under the most unfavorable load combination, or a minimum of 4 in.

3.8.4.1.1 R/B

The R/B has five main floors. The building contains the PCCV and containment internal structure at its center, and is founded on a common basemat. The outer perimeter of the R/B is nearly square, and is constructed of reinforced concrete walls, floors, and roofs. The roof of the R/B varies between elevations 101 ft, 0 in. to 124 ft, 0 in., except the PCCV dome which extends to elevation 232 ft, 0 in.

The R/B consists of the following five areas, defined by their functions.

- PCCV and containment internal structure
- Safety system pumps and heat exchangers area

COL 3.8(10) *The prestressing system is designed as a strand system, however the system material may be switched to a wire system at the choice of the COL Applicant. If this is done, the COL Applicant is to adjust the US-APWR standard plant tendon system design and details on a site-specific basis.*

COL 3.8(11) *Deleted*

COL 3.8(12) *It is the responsibility of the COL Applicant to produce a site-specific specification that covers the material requirements for the Prestressing System.*

COL 3.8(13) *It is the responsibility of the COL Applicant to produce a site-specific specification to define the material and special material testing requirements for the reinforcing steel system including bars and splices, and all material is to conform to Article CC-2300 of the ASME Code, Section III.*

COL 3.8(14) *It is the responsibility of the COL Applicant to establish a site-specific program for testing and ISI of the PCCV, including periodic inservice surveillance and inspection of the PCCV liner and prestressing tendons in accordance with ASME Code Section XI, Subsection IWL.*

COL 3.8(15) *The COL Applicant is responsible for the seismic design of those seismic category I and seismic category II SSCs not seismically designed as part of the US-APWR standard plant, including the following ~~non-standard~~ seismic category I structures designed to the site-specific SSE:*

- *ESWPT*
- *UHSRS*
- *PSFSVs*

COL 3.8(16) *Deleted*

COL 3.8(17) *Deleted*

COL 3.8(18) *Deleted*

COL 3.8(19) *The design and analysis of the ESWPT, UHSRS, PSFSVs, and other site-specific structures are to be provided by the COL Applicant based on site-specific seismic criteria.*

COL 3.8(20) *The COL Applicant is to identify any applicable externally generated loads. Such site-specific loads include those induced by floods, potential non-terrorism related aircraft crashes, explosive hazards in proximity to the site, and projectiles and missiles generated from activities of nearby military installations.*

ATTACHMENT 4
to RAI 220-2058

(c) The capability to prevent or mitigate the consequences of plant conditions that could result in potential offsite exposures that are comparable to the guideline exposures of 10 CFR 100, "Reactor Site Criteria" (Reference 3.4-1)

In addition, the US-APWR plant design assures control room habitability and operator access to areas requiring local actuation of equipment required to achieve or maintain the conditions described in the preceding paragraph.

The SSCs required to be protected from flooding are discussed in this section. Additional information is provided in Sections 3.2 and 3.11 of this chapter.

Safety-related SSCs are protected from flooding by external and internal sources. The US-APWR design includes the following:

- The separation of redundant trains of safety-related SSCs as addressed in Chapters 1
- Protective barriers and enclosures, where necessary, as addressed in this section
- The placement of essential SSCs above internal flood levels
- ~~In general,~~ SSCs are mounted above the flood level. ~~However, if~~ While safety-related SSCs that are environmentally protected in accordance with Section 3.11 are permitted below the potential flood level, no components requiring active operation to achieve their intended safety function are located below the potential flood level~~, their safety function is assured, as described in Section 3.11~~.

Protection from flooding of non safety-related SSCs is considered when the impact of the flooding on a non safety-related SSC could be a contributing factor to the flooding of safety-related SSCs or could result in an uncontrolled release of significant radioactivity.

3.4.1.2 Flood Protection from External Sources

The US-APWR is designed for maximum water levels caused by external flooding. The design basis for external flooding complies with 10 CFR 50, Appendix A (Reference 3.4-2), specifically General Design Criterion 2, "Design Bases for Natural Phenomena." This compliance is accomplished by designing SSCs to withstand the effects of natural phenomena such as floods, tsunami, and seiches without the loss of capability to perform their safety functions. Additionally, the design reflects the following considerations:

- The determination of the most severe natural phenomena, which has been historically recorded, is addressed in Section 2.4.
- The effects of the most severe natural phenomena have been considered to occur during both normal and accident conditions in the plant.
- The importance of the safety functions to be performed.

If PMP were to occur, US-APWR safety-related SSCs would not be jeopardized. US-APWR seismic category I building roofs are designed as a drainage system capable of handling the PMP, including allowance for primary roof drainage issues caused by

ATTACHMENT 4
to RAI 220-2058

by installing the water-tight doors to walkway and/or doorways of stairwell to prevent flood water by sloshing of SFP spilling to other area.

The equipment to be protected ~~in the east and west area of RCA~~ from internal flooding on elevation 76 ft, 5 in. of the RCA are junction boxes and cables connected to the PCCV penetrations in the east and west electrical penetration ~~room isolation valves~~ areas.

There is no equipment to be protected in the fuel handling area.

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 both east and west areas are isolated by concrete walls and the fireproof doors and/or air-tight doors which are not water-tight. Therefore, flood water is assumed to run across the each area.

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

- East side: 5,850 ft^2 area, 0.87 ft above elevation 76 ft, 5 in.

- West side: 5,100 ft^2 area, 0.99 ft above elevation 76 ft, 5 in.

The junction boxes and cables in the electrical penetration rooms is designed to be located at heights above the level of flood water.

NRCA

The NRCA is arranged into rooms/compartments to provide a physical separation of the water containing components from the electrical components. This separation, along with the associated physical barriers (concrete walls and floors), minimizes the probability of component leaks affecting the electrical components.

All floors in the NRCA of the R/B are divided into the two areas, east and west, by concrete walls and/or water-tight doors. The concrete walls are designed to prevent flood water migration from one safety train to another. This is accomplished by installing

Table 2.2-4 Structural and Systems Engineering Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 2 of 3)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. The ASME Code, Section III, Class 2 or 3 piping systems and components are designed to retain their pressure integrity and functional capability under internal design and operating pressures and design-basis loads.	8. Refer to Section 2.3 ITAAC #5	8. Refer to Section 2.3 ITAAC #5
9.a Divisional flood barriers are provided in the R/B and the PS/B to protect against the internal and external flooding.	9.a An inspection will be performed to verify that the as-built divisional flood barriers exist in the R/B and the PS/B.	9.a The as-built divisional flood barriers exist at the appropriate locations in the R/B and the PS/B against the internal and external flooding.
9.b Water-tight doors are provided in the R/B to protect against the internal and external flooding.	9.b An inspection of the as-built water- tight doors will be performed.	9.b The as-built water-tight doors exist at the appropriate locations in the R/B against the internal and external flooding.
10. Penetrations in the divisional walls of the R/B and the PS/B, except for water-tight doors, are provided appropriately against the internal and external flooding.	10. An inspection of the as-built penetrations will be performed.	10. The as-built penetrations in the divisional walls of the R/B and the PS/B are installed at an acceptable level above the floor, and are sealed up to the internal and external design flood levels.
11. Safety-related electrical, instrumentation, and control equipment are located to protect against the design flood level.	11. An inspection of the as-built equipment will be performed.	11. The as-built safety-related electrical, instrumentation, and control equipment are located at sufficient height ~~the floor surface against~~ above the design flood level.
12. For the R/B and the PS/B, external wall thickness below flood level are provided to protect against water seepage.	12. An inspection of the as-built external wall thickness for the R/B and the PS/B will be performed.	12. For the R/B and the PS/B, the as-built external wall below flood level are provided with adequate thickness to protect against water seepage.
13a. Flood barriers of the R/B and the PS/B are installed up to the finished plant grade level to protect against water seepage.	13a. Inspections of the as-built flood barriers will be performed.	13a. The as-built flood barriers are installed up to the finished plant grade level for the R/B and the PS/B to protect against water seepage.