**MITSUBISHI HEAVY INDUSTRIES, LTD.**
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TOKYO, JAPAN

May 14, 2009

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

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-09242

**Subject: MHI's Response to US-APWR DCD RAI No. 299-2036 REVISION 1**

**Reference:** 1) "Request for Additional Information 299-2060 Revision 1, SRP Section: 09.03.03 - Equipment and Floor Drainage System, Application Section: 9.3.3" dates April 1, 2009.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Response to Request for Additional Information No. 299-2036 Revision 1."

Enclosed is the response to the RAI contained within Reference 1.

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

Sincerely,

Y. Ogata

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

Enclosure:

1. Response to Request for Additional Information No. 299-2036 Revision 1

CC: J. A. Ciocco
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Docket No. 52-021
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Enclosure 1

UAP-HF-09242
Docket Number 52-021

Response to Request for Additional Information
No. 299-2036 Revision 1

May 2009

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**5/13 /2009**

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

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|---|---|
| **RAI NO.:** | **NO. 299-2036 REVISION 1** |
| **SRP Section:** | **09.03.03 – Equipment and Floor Drainage System** |
| **APPLICATION SECTION:** | **9.3.3** |
| **DATE OF RAI ISSUE:** | **4/1/2009** |

**QUESTION NO. : RAI 09.03.03-1**

All safety-related components must be identified for the design to be evaluated. DCD Tier 2 Section 9.3.3.1.3, "Codes and Standards," states that all components are designed to meet the applicable codes and standards in DCD Table 3.2-2, "Classification of Mechanical and Fluid Systems, Components, and Equipment." The staff was unable to confirm that the EFDS is designed to these codes and standards. The staff reviewed DCD Figure 9.3.3-1, "Equipment and Floor Drain System Flow Schematics," and found that there is no information about piping classification and quality groups. Further, the staff found inadequate piping (flow paths and connections) and instrumentation (e.g., radiation monitors, level indicators) in Figure 9.3.3-1. For example, the drain line from C/V sump in Figure 9.3.3-1 (sheet 1 of 2) disconnects from the components outside C/V. These missing portions of the EFDS include containment penetration piping and containment isolation valves, which should be safety-related.

The staff determined that Figure 9.3.3-1 does not contain sufficient details for the staff to perform its review. The staff requests the applicant to provide P&IDs or drawings in the DCD that contain sufficient details including the piping and instrumentation, components classification, and quality group.

**ANSWER:**

The transfer line from C/V sump to the Waste Holdup Tanks (WHTs) that are located outside the C/V is included in the Liquid Waste Management System. The containment penetration piping and containment isolation valves on this line are included as Item 15 of Table 3.2-2. The EFDS components classification and quality group are discussed in Item 25 of Table 3.2-2.

Figure 9.3.3-1 will be revised to show leak detection instrumentation for the safeguard equipment area and the transfer line from C/V sump. In addition, the transfer line from R/B non-radioactive sump will be revised in shape to connect to the T/B sump directly.

**Impact on DCD**

DCD Figure 9.3.3-1 "Equipment and Floor Drain System Flow Schematic" will be replaced with the attachment 1 to add additional information.

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**5/13 /2009**

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

| | |
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| **APPLICATION SECTION:** | **9.3.3** |
| **DATE OF RAI ISSUE:** | **4/1/2009** |

**QUESTION NO. : RAI 09.03.03-2**

All safety-related components must be identified for the DCD to be evaluated. Table 3.2-2 lists the EFDS sections and their respective equipment class, location, quality group, etc. The staff requests that the entry for the isolation valves be modified to clarify that all the isolation valves are included and to indicate how many isolation valves exist.

In Table 3.2-2 (sheet 39 of 53) under the components "Drain piping valves related to ESF rooms drain isolation...," the valves being identified - "DS-VLV 001A through DSVLV 002 and DS-VLV-100 through DS VLV-102" – need to be clarified. "DS-VLV 001A through DS-VLV 002" is confusing; three is no sequence number between 001A and 002. A more clear entry would make it clear that there are 8 isolation valves: "DS-VLV 100A through DS-LVL-100D, DS-VLV-002, and DS-VLV-100 through 102." The staff requests the applicant modify this table to ensure all the isolation valves are explicitly included.

**ANSWER:**

The statement in Item 25 of Table 3.2-2, "Drain piping valves related to ESF rooms drain isolation DS-VLV-001A through DS-VLV-002,and DS-VLV-100 through 102" will be revised to read "Drain piping valves related to ESF rooms drain isolation DS-VLV-001A through DS-LVL-001D, DS-VLV-002, and DS-VLV-100 through 102."

**Impact on DCD**

The statement in Item 25 of Table 3.2-2 will be changed to read:

"Drain piping valves related to ESF rooms drain isolation ~~DS-VLV-001A through DS-VLV-002, and DS-VLV-100 through 102~~ DS-VLV-001A through DS-LVL-001D, DS-VLV-002, and DS-VLV-100 through 102"

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**5/13 /2009**

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

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| **SRP Section:** | **09.03.03 – Equipment and Floor Drainage System** |
| **APPLICATION SECTION:** | **9.3.3** |
| **DATE OF RAI ISSUE:** | **4/1/2009** |

**QUESTION NO. : RAI 09.03.03-3**

Section 9.3.3 of the DCD Tier 2 refers to Figure 9.3.3-1, "Equipment and Floor Drain System Flow Schematic." This figure shows buildings and the respective sumps, sump pumps, and isolation valves, which are included in the EFDS DCD Tier 2 description. The system description in Section 9.3.3.2 of the DCD does not mention the containment vessel (C/V) or the power source building (PS/B). As discussed in RAI 09.03.03-1, the missing portions of the system may be safety-related. The staff requests the "System Description," Section 9.3.3.2, be revised to include the C/V and the PS/B, since these buildings are depicted in Figure 9.3.3-1, included in Table 3.3-2, and mentioned in Tier 1 of the DCD.

**ANSWER:**

The words "C/V" and "PS/B" will be added to the system description first paragraph in Section 9.3.3.2.

In addition, the following descriptions are added in DCD Section 9.3.3.2.2:

- Equipment and floor drains in the containment except the reactor coolant drain are collected in the C/V sump via the drain piping.

- PS/B equipment and floor drains are collected in the R/B non-radioactive sump.

**Impact on DCD**

DCD Section 9.3.3, Revision 2, will incorporate the following changes:

- Change the first paragraph in section 9.3.3.2 to the following:

"The equipment and floor drains include the drains of A/B, R/B, T/B, C/V, PS/B and access building. Liquid waste drains by gravity and collects to tanks or sumps in each building. The waste is then transferred to the waste holdup tank for processing. The

radioactive waste is ~~discharged to~~ processed in the LWMS ~~for further processing~~ before being discharged to the environment."

- Add the following at the end of the last paragraph in section 9.3.3.2.2:

  "7. Equipment and floor drains in the containment, except the reactor coolant drain, are collected ~~to~~ in the C/V sump via the drain piping. PS/B equipment and floor drains are collected ~~to~~ in the R/B non-radioactive sump."

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**5/13 /2009**

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

| | |
|---|---|
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| **SRP Section:** | **09.03.03 – Equipment and Floor Drainage System** |
| **APPLICATION SECTION:** | **9.3.3** |
| **DATE OF RAI ISSUE:** | **4/1/2009** |

**QUESTION NO. : RAI 09.03.03-4**

GDC 2 requires all safety-related components of the EFDS to be able to withstand the effects of natural phenomena. The applicant states that the safety-related isolation valves are built to codes and standards to withstand appropriate structural loads, flooding and seismic events. The staff agrees with the applicant on its safety determination of the isolation valves. However, the applicant does not explain how the isolation valves will function to prevent flooding in the ESF equipment rooms. For example, what are the isolation signals and the instrumentation associated with the signals? Is the related instrumentation safety-related? Can the valves be re-opened unintentionally during an accident or transient? The applicant is requested to clarify the above information in the DCD.

**ANSWER:**

ESF equipment rooms requiring the prevention of flow-in water, described in DCD Section 3.4.1, have normally closed isolation valves installed in the drainage piping that prevents flood water from entering the rooms via the floor drain. Flow-in water via access opening is prevented by water-tight door.

All isolation valves are manually operated and normally closed as described in DCD Section 9.3.3.2.2. Therefore, there is no instrumentation for operating and monitoring these isolation valves, and these valves are not re-opened unintentionally. These valves are opened when detergent water used by maintenance is drained out from the room.

**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 response to the NRC's question.

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**5/13 /2009**

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

| | |
|---|---|
| **RAI NO.:** | **NO. 299-2036 REVISION 1** |
| **SRP Section:** | **09.03.03 – Equipment and Floor Drainage System** |
| **APPLICATION SECTION:** | **9.3.3** |
| **DATE OF RAI ISSUE:** | **4/1/2009** |

**QUESTION NO. : RAI 09.03.03-5**

In reviewing the potential drain backflow of the EFDS in accordance with SRP Section 9.3.3, Review Procedure (III.1.B). The staff found that DCD Section 9.3.3.1.1 states that the drain system from ESF equipment rooms are designed to prevent flooding due to backflow by the virtue of the difference in elevation between the ESF rooms and the collection sumps. The staff could not verify if the EFDS is capable of preventing flooding by virtue of elevation without using check valves, because there is no information provided about the elevation of the rooms, the drain capability, size of the pipes, or the capacity of the sumps, or a consideration of the design basis of the EFDS of the entire spectrum of flooding events. The applicant is requested to provide the above information in the DCD to demonstrate that the EFDS design is capable of preventing flooding by virtue of elevation for the whole spectrum of flooding events, not just the normal operation.

**ANSWER:**

The R/B is divided into two sections, east and west, which are separated by concrete walls and water tight doors. Penetrations into the area (eg. HVAC duct, electrical conduit, cable trays, etc.) are above the maximum flood level. This division is provided to prevent water from flooding all safety trains. Although there are equipment (SI and CS/RHR pumps) below the flood level in the basement, they are protected by concrete walls and water tight doors that form individual rooms. The rooms all have drains in them, which are separated by a closed valve for each train. Therefore water can flood the basement without affecting any safety related equipment.

This information can be found in DCD Section 3.4.1.5.2.1 and Power Block GA (1/12) El. -26'4".

**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 response to the NRC's question.

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**5/13 /2009**

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

| | |
|---|---|
| **RAI NO.:** | **NO. 299-2036 REVISION 1** |
| **SRP Section:** | **09.03.03 – Equipment and Floor Drainage System** |
| **APPLICATION SECTION:** | **9.3.3** |
| **DATE OF RAI ISSUE:** | **4/1/2009** |

**QUESTION NO. : RAI 09.03.03-6**

In reviewing the potential blockage of the EFDS in accordance with SRP Section 9.3.3, Review Procedure (III.1.B), the staff found that DCD Section 5.2.5.7 states that periodic inspection of the floor draining system to the containment sump is conducted to check for blockage and ensure unobstructed pathways. This periodic inspection is acceptable for addressing the potential blockage concern. However, the staff found this inspection as described in DCD Section 5.2.5.7 is limited to the floor drain to the containment sump only. The applicant is requested to address in the DCD the potential blockage of floor drains to all other sumps in the EFDS.

**ANSWER:**

DCD Section 9.3.3.4.1 is revised to add a statement to refer to a new preoperational test "Equipment and Drainage System Preoperational Test", in Subsection 14.2.12.1. The changes were described to the NRC in RAI No. 243-2044, Revision 0, Question No 14.02-109. After performing the testing during construction, the formal testing of the Equipment and Floor Drainage System is unnecessary since the operability and integrity of this system is checked during normal periodic inspections.

**Impact on DCD**

Section 9.3.3.4.1 is revised to add the following statement:

"Chapter 14, Section 14.2 "Initial Plant Test Program," discusses testing to verify component installation and initial operation, as well as integrated system testing. After performing the testing during construction, the formal testing of the Equipment and Floor Drainage System is unnecessary since the operability and integrity of this system is checked during normal periodic inspections."

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**5/13 /2009**

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

| | |
|---|---|
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| **SRP Section:** | **09.03.03 – Equipment and Floor Drainage System** |
| **APPLICATION SECTION:** | **9.3.3** |
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**QUESTION NO. : RAI 09.03.03-7**

The SRP Section 9.3.3, Section III.1.B states that if a failure or malfunction in a portion of the EFDS could affect safety-related (including accident mitigation) SSCs adversely, then that portion is safety-related. The applicant states that the only safety-related components in the EFDS are the isolation valves. If the floor drains, drainage pipes, or sump pump were to fail or become blocked, the safety-related SSCs in the ESF equipment room may become susceptible to flooding. The staff requests more information about how the isolation valves are used to prevent flooding in RAI 09.03.03-4. In addition, the staff requests an explanation of how the failure of the connecting components (drains, pipes, sump pumps) will not prevent the isolation valves from performing their function. Furthermore, SRP Section 9.3.3, Section III.3.a states that the failure of any non-safety-related portions of the system should not preclude the safe operation of the safety-related Seismic Category 1 EFDS portions. The DCD states that the safety-related isolation valves are the only components designed to Seismic Category 1. The staff requests for the applicant to provide more details in the DCD to explain how the failure of components that house and are in close proximity to the isolation valves will not adversely affect the function of isolation valves.

**ANSWER:**

If the failure of any non-safety-related component (such as drain piping, sump tanks and sump pumps) has the potential to result in damage to safety-related components during an earthquake,, that non-safety related component is designed as Seismic Category II.

There is no impact if a sump pump fails, as the sump pumps are redundant. Sump pumps are not used as measure to mitigate internal flooding in section 3.4.1.

Safety-related components are protected against physical impacts from outside (e.g., pipe whip, internal missile) by locating the source away from the components, or installing a physical barrier.

**Impact on DCD**

DCD Section 9.3.3, Revision 2, will incorporate the following changes:

- Add the following as the tenth bullet in section 9.3.3.1.2:

"If the failure of any non-safety-related component (such as drain piping, sump tanks and sump pumps) has the potential to result in damage to safety-related components by an earthquake, that non-safety related component is designed as Seismic Category II."

- Change the first bullet in section 9.3.3.3 to the following:

  "Drain piping is designed to non-seismic categories except in cases where failure of drain piping damages to safety-related components by an earthquake as noted in Chapter 9, Section 9.3.3.1.2. The safety class of the drain piping and valves is discussed in Chapter 3, Section 3.2."

- Add the following as the third bullet in section 9.3.3.3:

  "There is no impact if a sump pump fails, as the sump pumps are redundant. Sump pumps are not used as measure to mitigate internal flooding in section 3.4.1."

- Add the following as the forth bullet in section 9.3.3.3:

  "Safety-related EFDS components are protected against internally and externally generated missiles and pipe rupture by locating the source away from the components, or installing a physical barrier."

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**5/13 /2009**

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

| | |
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| **RAI NO.:** | **NO. 299-2036 REVISION 1** |
| **SRP Section:** | **09.03.03 – Equipment and Floor Drainage System** |
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| **DATE OF RAI ISSUE:** | **4/1/2009** |

**QUESTION NO. : RAI 09.03.03-8**

GDC 4 acceptance is based on the system being able to prevent flooding that could adversely affect structures, systems, and components (SSCs) important-to-safety. SRP Section 9.3.3 Subsection II, "Acceptance Criteria," Technical Rationale Number 2 clarifies the acceptance of GDC 4 for the equipment and floor drain system (EFDS). It states that for the EFDS the purpose of GDC 4 is to assure the capability to provide the required drainage capability to accommodate unanticipated flooding from pipe breaks, tank leaks, discharge from fire suppression systems, and other potential flooding sources. Therefore, the staff determined that the drainage capability of the EFDS for the flood protection should be addressed in the DCD Section 9.3.3 for EFDS to meet GDC 4 criterion. DCD Section 3.4.1, "Flood Protection," Section 3.4.1.3, "Flood Protection from Internal Sources," and Section 3.4.1.5, "Evaluation of Internal Flood Protection," discuss the flood protection design to withstand the effects of and to be compatible with the internal flooding of normal operation, maintenance, testing, and postulated accidents (pipe break, tank ruptures). The staff reviewed DCD Section 9.3.3 in connection with Section 3.4.1, Section 3.4.1.3, and Section 3.4.1.5 and found that the EFDS has been used in the flood protection design. However, the staff could not find the information as related to the required drainage capability to accommodate unanticipated flooding from pipe breaks, tank leaks, discharge from fire suppression systems, and other potential flooding sources.

Based on the above review, the applicant is requested to (1) clarify in the DCD what drainage capability is assumed in the flood analysis, and to substantiate the assumption by calculations for flood analysis, which are not available in the DCD. Furthermore, (2) revise FSAR Section 9.3.3 to address GDC 4 compliance in accordance with SRP Section 9.3.3 regarding drainage capability. 3) If components are needed for flood protection, these components may need to be identified as being safety-related and subject to GDC 2 requirements.

**ANSWER:**

DCD Tier 2 Section 3.4.1 sub-sections 3.4.1.5.2.1 and 3.4.1.5.2.2 state the following at regarding 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."

Also, the second and third paragraph in sub-section 3.4.1.5.2.1 states the following regarding elevations 3 ft. 7 in.:
"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. 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.

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."

Therefore, GDC 4 compliance in accordance with SRP Section 9.3.3 regarding drainage capability is not required for EFDS.

DCD Tier 2 section 9.3.3.1.1, "Safety Design Bases" will be updated to include section 3.4 as a reference for flood protection.

**Impact on DCD**

In DCD Tier 2 section 9.3.3.1.1 replace the seventh bullet will the following:

"The equipment and floor drainage systems are designed to be protected against flood (Refer to Chapter 3, Section 3.4), internally and externally generated missiles (Refer to Chapter 3, Section 3.5) and pipe ruptures (Refer to Chapter 3, Section 3.6)."

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

5/13 /2009

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

| | |
|---|---|
| **RAI NO.:** | **NO. 299-2036 REVISION 1** |
| **SRP Section:** | **09.03.03 – Equipment and Floor Drainage System** |
| **APPLICATION SECTION:** | **9.3.3** |
| **DATE OF RAI ISSUE:** | **4/1/2009** |

**QUESTION NO. : RAI 09.03.03-9**

SRP 9.3.3 Section 1, "Areas of Review," states that the EFDS is "designed to ensure that waste liquid, valve, and pump leak-offs, and tank drains are directed to proper areas for processing or disposal and that excessive water accumulation and flooding is prevented in accordance with plant design basis." The applicant's system description in the DCD does not explicitly identify prevention of flooding and water accumulation as an important EFDS function. Provide additional information regarding the flood protection function of the EFDS and associated components and equipment in the DCD.

**ANSWER:**

The important function of the Equipment and Floor Drainage System (EFDS) to prevent flooding and excess water accumulation is indicated in Impact on the DCD section in the RAI No. 299-2036 question number 09.03.03-13 response. The EFDS by its nature will function to prevent flooding and water accumulation for the volume being drained. This function will be added in the DCD next revision.

**Impact on DCD**

The following will be added as the first bullet in the DCD section 9.3.3.1.1, "Safety Design Bases":

- The equipment and flood drainage systems functions to prevent flooding and water accumulation for the volume being drained."

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**5/13 /2009**

**US-APWR Design Certification**

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|---|---|
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| **SRP Section:** | **09.03.03 – Equipment and Floor Drainage System** |
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| **DATE OF RAI ISSUE:** | **4/1/2009** |

**QUESTION NO. : RAI 09.03.03-10**

According to the SRP Section 9.3.3 Section III.1.C, "Review Procedures," a component is safety-related if it is connected in such a way that inadvertent contamination of nonradioactive portions of the EFDS can occur. The applicant states that under normal operating conditions the turbine building (T/B) sump's non-radioactive contents are routed to the waste water system (WWS). If the T/B sump contents become contaminated, the contaminated fluid can be detected by radiation monitors, and routed by automatic flow diverters to the liquid waste management system (LWMS). During the review, the staff found that an inadvertent transfer of radioactive effluent is possible if the T/B discharge valve fails to close. Also, if the radiation monitor fails the T/B sump discharge valve will not receive the signal to shut off. The staff requests the applicant to explain in the DCD how the radiation monitors and the T/B sump discharge valve will operate and prevent inadvertent contamination if an active component fails.

In addition, the staff also requests that the applicant include the radiation monitoring instruments in DCD Section 9.3.3.5, "Instrumentation Requirements." Justify the components discussed above need not be classified as safety-related, otherwise classify these components as safety-related.

**ANSWER:**

Detection of radiation up to a predetermined setpoint by radiation monitor initiates an alarm in the MCR for operator action, turns off the T/B sump pump, and closes the transfer valves. After confirming the sump content, the operator can manually initiate a transfer of the fluid, to either the WWS (if non-radioactive), or to the A/B floor drain sump (if radioactive) from which it will be transferred to the LWMS for treatment. This monitor initiates an alarm if the monitor has a malfunction and is periodically inspected and calibrated, if required. The transfer valves located on the piping to the WWS and to the A/B sump are set to fail close to further prevent cross contamination. Also, other monitors can be used to detect the secondary system contamination and provide information for operator action to prevent inadvertent contamination. The DCD is revised to state above design features.

**Impact on DCD**

DCD Figure 9.3.3-1 is revised to show the valves on the piping to the A/B sump and the WWS and the routing to the A/B floor drain sump (see attachement1).

DCD Section 9.3.3.1.2 Power Generation Design Bases is revised as follows:
"The T/B drain system collects the non-radioactive floor and equipment drains in the non-radioactive drain sump. The liquid waste is sent to the WWS. In the unlikely event, that the fluid becomes radioactive, radiation monitor determine the level of radioactive contamination ~~and the waste is then sent to the LWMS~~. A measured concentration exceeding the predetermined setpoint activates an alarm in the MCR for operator actions and also activates the closure of the transfer valves. Following operator initiation, the contaminated waste is then sent to the A/B floor drain sump to be transferred to the LWMS."

DCD Section 9.3.3.2.2 Component Description is revised as follows:
"6. Turbine building equipment and floor drains. The non-radioactive liquid wastes generated in the T/B, including equipment and floor drains and leakages are generally collected in the non-radioactive drain sump in the T/B.

Turbine building sump pumps discharge to the WWS prior to discharge to the environment. When radioactive contamination in the discharge from the sump is detected and alarmed in the MCR, the transfer valve to the WWS is closed. Following operator initiation, the discharge from the sump is ~~diverted~~ sent to the A/B floor drain sump from which it is transferred to the LWMS for processing prior to discharge to the environment."

DCD Section 9.3.3.2.3 System Operation is revised as follows:
"Sumps are provided with duplex pumps or with simplex pumps. The T/B sump pumps are aligned to discharge to the waste water system for treatment prior to discharge to the environment. If the radiation level detected in the fluid by the radiation monitors is above a predetermined set point, the discharge from the sump is ~~diverted~~ sent, following operator initiation, to the A/B floor drain sump to be sent to the LWMS for processing."

DCD Section 9.3.3.2.3 System Operation, Section D, Turbine building sump is revised as follows:
"The T/B drain sump collects drain from all equipment and floor drainage in the T/B and non-radioactive drain sump. This sump normally discharges to the WWS for treatment. However, if ~~it~~ the liquid drainage should become contaminated, the ~~discharge is automatically diverted to LWMS. Radiation monitor located in the Turbine building sump, which alarms in the MCR when a pre-determined contamination level is reached. Upon receipt of a radiation signal the discharge valve is automatically shutoff and the waste water of the sump is pumped to the LWMS for treatment, as discribed in Chapter 11 Section 11.2.~~ radiation monitor will detect a concentration exceeding the predetermined setpoint which will activate an alarm in the MCR for operator actions and will also activate the closure of the transfer valves. Following operator initiation, the contaminated waste is then sent to the A/B floor drain sump to be transferred to the LWMS."

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

5/13 /2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

| | |
|---|---|
| **RAI NO.:** | **NO. 299-2036 REVISION 1** |
| **SRP Section:** | **09.03.03 – Equipment and Floor Drainage System** |
| **APPLICATION SECTION:** | **9.3.3** |
| **DATE OF RAI ISSUE:** | **4/1/2009** |

**QUESTION NO. : RAI 09.03.03-11**

SRP Section 9.3.3 Review Procedure (III.1.C) states that a system is safety-related if the system is connected in such a way that inadvertent transfer of contaminated fluids to non-contaminated drainage systems can occur. DCD Section 9.3.3.1.2, "Power Generation Design Bases," states that there are no interconnections between the radioactive and non-radioactive portions of the system. From reviewing the DCD Section 9.3.3 and Figure 9.3.3-1, it appears that some portions of the radioactive EFDS are connected to non-radioactive portions. The discharge from T/B sump appears to be connected to both the waste hold up tanks which direct flow to the LWMS (radioactive portion of the EFDS) and to the non-radioactive WWS outside the T/B. Also, in Figure 9.3.3-1, there are connections between the non-radioactive R/B sump and "Radioactive Area CCW Drains." The applicant is requested to clarify in the DCD the above inconsistency with respect to the statement: "The systems are designed with no cross-connection between the radioactive and non-radioactive drainages system..."

**ANSWER:**

The Equipment and Floor Drain System (EFDS) includes separated sub-systems for handling radioactive and potentially radioactive drainage and for handling non-radioactive drainage. Potentially radioactive drainage from the equipment and floor drains from the containment vessel, reactor building, auxiliary building, and access building is collected separately in an equipment drain sump and a floor drain sump and sent from these sumps to the LWMS for treatment. Because floor drains contain a higher concentration of suspended solids and may also contain solvents from maintenance and decontamination activities, the drains are first collected in the floor drain sump for the removal of solids, sludge, and oily substances. T/B drains are normally non-radioactive but may contain small amounts of oily materials resulting from engine lubrication. Hence, during normal operation, the liquid drainage collected in the T/B sump is sent to the Waste Water System (WWS) for processing for re-use or release. However, the T/B drains have the potential of becoming contaminated from primary to secondary leakage. The EFDS design provides the flexibility to send the T/B drains to the LWMS for treatment, by means of the A/B floor drain sump. This design minimizes the spread of radioactive contamination to the WWS.

The CCW drain, shown as two streams exiting two heat exchangers on DCD Figure 9.3.3-1 (Sheet 1), contains non-radioactive liquid. These streams are therefore sent to the "R/B Non-

Radioactive Sump" as indicated in the figure. Figure 9.3.3-1 (Sheet 2) shows two input streams into the R/B Non-Radioactive Sump labeled as "Radioactive Area CCW Drain." These streams should instead indicate the equipment drainage from the CCW system. DCD Figure 9.3.3-1 will be revised in order to show the correct separation of non-radioactive streams and radioactive streams from the various buildings' floor and equipment drains.

Please refer to RAI 09.03.03-10 for additional information.

**Impact on DCD**

DCD Figure 9.3.3-1 (Sheet 2 of 2) is revised so that the two input streams to the R/B Non-Radioactive Sump currently labeled "Radioactive Area CCW Drain" are changed to read "Non-Radioactive CCW Drain" (see attachment1).

DCD Section 9.3.3.1.2 Power Generation Design Bases is revised with the removal of the first bulleted item:
"~~The systems are designed with no cross-connection between the radioactive and non-radioactive drainage system to prevent contamination due to possible backflow~~."

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**5/13 /2009**

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

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| **RAI NO.:** | **NO. 299-2036 REVISION 1** |
| **SRP Section:** | **09.03.03 – Equipment and Floor Drainage System** |
| **APPLICATION SECTION:** | **9.3.3** |
| **DATE OF RAI ISSUE:** | **4/1/2009** |

**QUESTION NO. : RAI 09.03.03-12**

In DCD Tier 2 Section 9.3.3.4.1, "Testing during Construction," the applicant discusses the testing for the equipment and floor drain piping in the auxiliary building (A/B), reactor building (R/B), and T/B. The staff reviewed the inspection and testing and found an inconsistency that the testing of the equipment and floor drain piping in the C/V and PS/B is not addressed. The applicant is requested to add to the DCD the discussion of the tests being required during construction for the equipment and floor drains in the PS/B and C/V.

**ANSWER:**

The statement in Section 9.3.3.4.1 will be revised to add the PS/B and C/V.

Impact on DCD

Section 9.3.3.4.1 will be revised to read:

"Equipment and floor drain piping in the A/B, access building, R/B, C/V, PS/B and T/B are hydrostatically tested with the static leak test method by filling the lines with water under atmospheric pressure."

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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| **APPLICATION SECTION:** | **9.3.3** |
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**QUESTION NO. : RAI 09.03.03-13**

Tier 1 of the DCD Section 2.7.6.8, "Equipment and Floor Drainage Systems," contains brief descriptions of the EFDS and includes ITAAC items in DCD Tier 1 Table 2.7.6.8-1. The staff reviewed the sections of DCD Tier 1 to ensure it is consistent with the Tier 2 DCD Section 9.3.3. The staff notes that the following areas need clarification.

1. The "System Purpose and Function" section needs to state that an important function of the EFDS is to prevent flooding and excess water accumulation.

2. "Location and Functional Arrangements" section needs to clarify that the WWS is for non-radioactive effluents and the LWMS is to handle radioactive effluents. In addition, it needs to emphasize that the WWS and LWMS are not connected to each other to prevent cross-contamination.

3. "Key Design Features" needs to include a schematic or diagram showing important system, components, and interconnections.

4. DCD Tier 1, Table 2.7.6.8-1 needs to include a Design Commitment to ensure the safety-related isolations valves are built according to ASME Code standards outlined in DCD Tier 2, Table 3.2-2. There should be an ITAAC to ensure the isolation valves are built to the requirements and standards listed in Table 3.2-2.

**ANSWER:**

DCD Tier 1 Section 2.7.6.8 "Equipment and Floor Drainage Systems" will be revised in order to add clarification and maintain consistency with DCD Tier 2 Section 9.3.3.

**Impact on DCD**

1. DCD Tier 1, Section 2.7.6.8.1 "System purpose and functions" will be modified as follows to add the important function of preventing flooding and excess water accumulation:

"The equipment and floor drainage systems are not safety-related systems except for the isolation valves installed in the drainage piping from engineered safety features (ESF) equipment rooms. The equipment and floor drainage systems collect liquid waste from equipment and floor drains during all modes of operation and separate the contaminated effluents and transfer them to the proper processing and disposal systems. The systems are designed to prevent flooding and excess water accumulation due to backflow."

2. DCD Tier 1, Section 2.7.6.8.1 "Location and Functional Arrangement" will be modified as follows to specify the separation of non-radioactive and radioactive drainage:

"The equipment and floor drains include drains of the containment vessel (C/V), the auxiliary building (A/B), the reactor building (R/B), the power source building (PS/B), the turbine building (T/B), and the access building (AC/B). Floor drains and equipment drains are piped from plant equipment to the collection sumps, where sump pumps, piping, and instrumentation connect to the waste water system (WWS), for non-radioactive drainage, and the liquid waste management system (LWMS), for radioactive drainage."

3. DCD Tier 1, Section 2.7.6.8.1 "Key Design Features" will be modified to include a schematic of the Equipment and Floor Drain System (see attachment 2).

4. DCD Tier 1, Section 2.7.6.8.1, Table 2.7.6.8-1 will have an ITAAC item added for the Equipment and Floor Drainage System which will incorporate the requirements for the drain isolation valves. The changes were described to the NRC in the response to RAI No. 242-2153, Revision 0, Question No. 14.03.03-16.

**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 response to the NRC's question.

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

5/13 /2009

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

| | |
|---|---|
| **RAI NO.:** | **NO. 299-2036 REVISION 1** |
| **SRP Section:** | **09.03.03 – Equipment and Floor Drainage System** |
| **APPLICATION SECTION:** | **9.3.3** |
| **DATE OF RAI ISSUE:** | **4/1/2009** |

**QUESTION NO. : RAI 09.03.03-14**

The staff noted that the DCD is inconsistent with using the term of "PCCV" in Chapter 3, Table 3.3-1, "Classification of Mechanical and Fluid Systems, Components, and Equipment," and the term of "C/V" in Section 9.3.3 to represent the same "location" of containment. The applicant is requested to clarify this inconsistency in the DCD.

**ANSWER:**

As shown in "ACRONYMS AND ABBREVIATIONS", PCCV is the acronym for "prestressed concrete containment vessel" while C/V represents "containment vessel." Thus there is no inconsistency. When referring to systems and components inside the containment vessel, C/V was used similar to the usage for the other buildings (e.g., R/B, T/B).

**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 response to the NRC's question.

**ATTACHMENT 1**
to RAI 299-2036

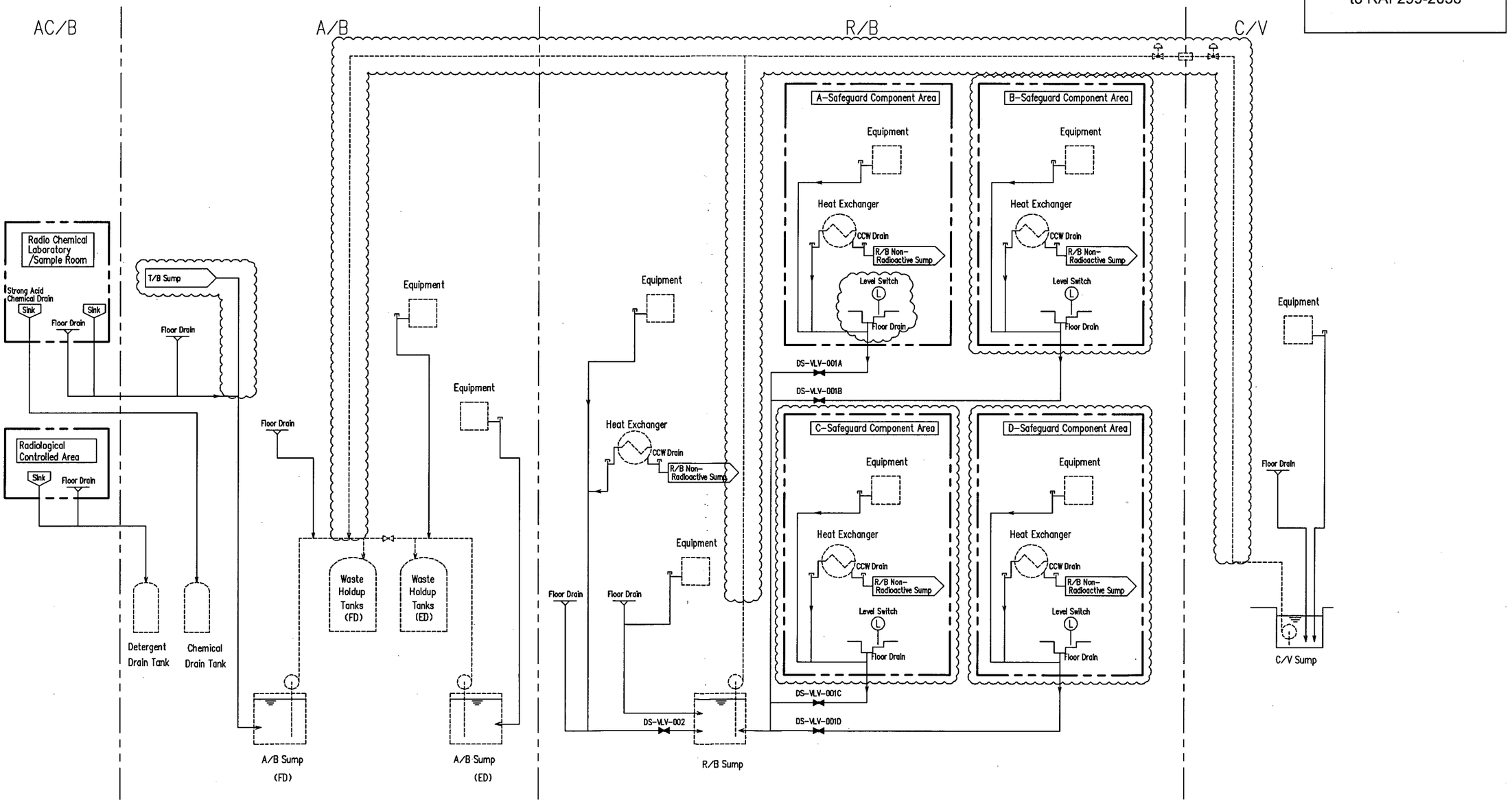


**Figure 9.3.3-1 Equipment and Floor Drain System Flow Schematic (Sheet 1 of 2)**

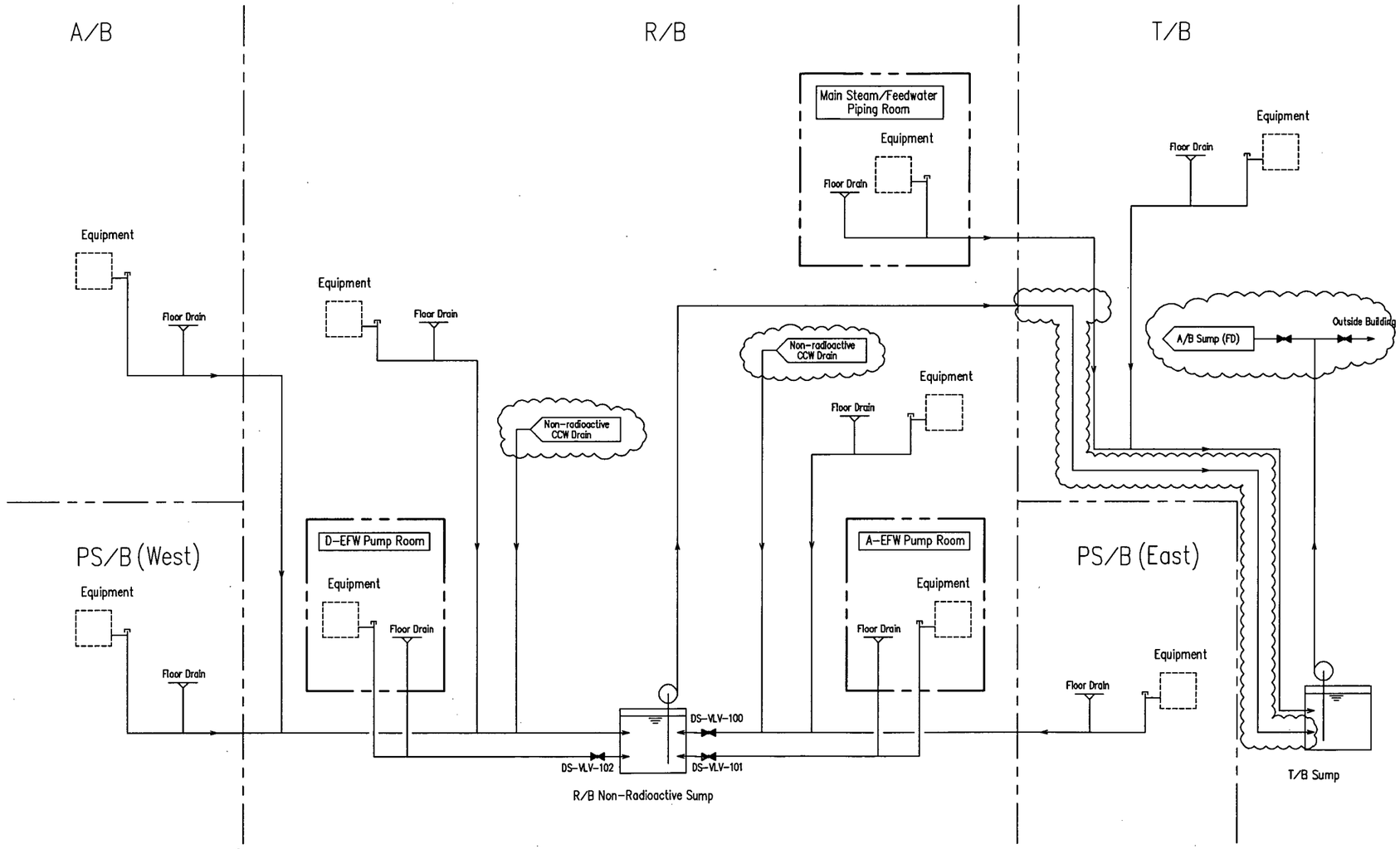


**Figure 9.3.3-1 Equipment and Floor Drain System Flow Schematic (Sheet 2 of 2)**

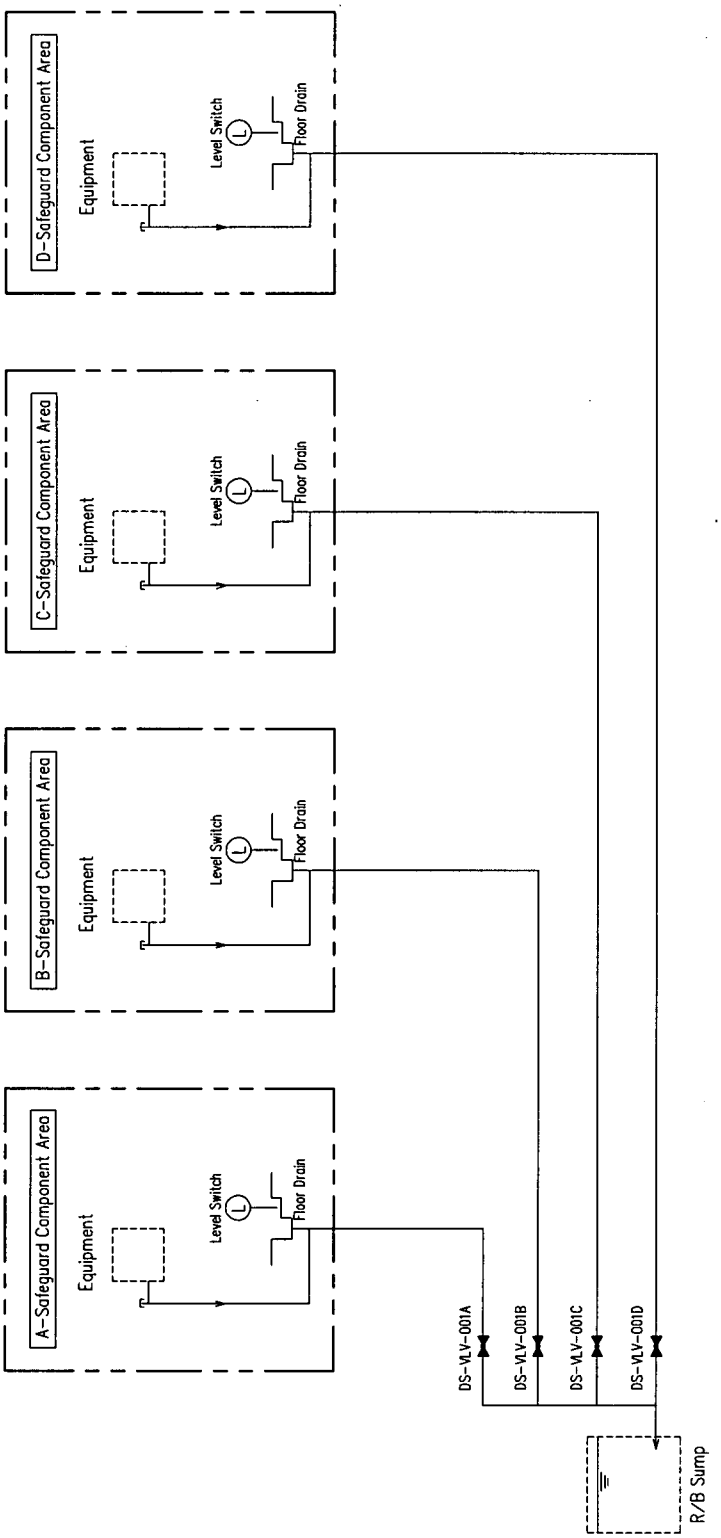


Figure 2.7.6.8-1 Equipment and Floor Drain System Flow Schematic