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TOKYO, JAPAN

October 19, 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-09487

**Subject: Amended MHI's Response to US-APWR DCD RAI No. 354-2585
Revision 0**

Reference: [1] "Request for Additional Information No. 354-2585 Revision 0, SRP Section: 06.02.02 – Containment Heat Removal System – Design Certification and New License Applicants, Application Section: 6.2.2 and 6.3," dated May 7, 2009.
[2] "UAP-HF-09365, MHI's Responses to US-APWR DCD RAI No. 354-2585 Revision 0" dated July 7, 2009
[3] "UAP-HF-09382, MHI's Second Response to US-APWR DCD RAI No. 354-2585 Revision 0" dated July 17, 2009
[4] "UAP-HF-09483, Amended MHI's Responses to US-APWR DCD RAI No. 354-2585 Revision 0" dated October 6, 2009

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "MHI's Responses to US-APWR DCD RAI No. 354-2585 Revision 0". This amended response is submitted to address additional clarification for not establishing debris interceptor on the refueling cavity to ensure the refueling cavity drain function, which was discussed in a conference call on September 30, 2009.

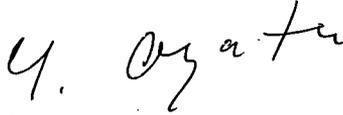
Enclosure 1 and 2 are the amended response to Question No. 06.02.02-24 - 4) of the RAI contained within Reference 1. The initial response was provided in Reference 2. MHI replaces the previous letters (Reference 2) with this amended response letter.

The RAI Response is being submitted in two versions. One version (Enclosure 1) includes certain information, designated pursuant to the Commission guidance as sensitive unclassified non-safeguards information, referred to as security-related information ("SRI"), that is to be withheld from public disclosure under 10 CFR 2.390. The information that is SRI is identified by brackets. The second version (Enclosure 2) omits the SRI and is suitable for public disclosure. In the public version, the SRI is replaced by the designation "[Security-Related Information - Withheld Under 10 CFR 2.390]".

D081
NRO

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,



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

Enclosure:

1. Amended Response to Request for Additional Information No. 354-2858 Revision 0 (SRI included version)
2. Amended Response to Request for Additional Information No. 354-2858 Revision 0 (SRI excluded version)

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

Contact Information

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Enclosure 2

UAP-HF-09487
Docket No. 52-021

Amended Response to Request for Additional Information
No. 354-2858 Revision 0

October 2009

(Security Related Information Excluded)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

10/16/2009

**US-APWR Design Certification
Mitsubishi Heavy Industries, Ltd.
Docket No. 52-021**

RAI NO.: NO. 354-2585 REVISION 0
SRP SECTION: 06.02.02 – Containment Heat Removal System
APPLICATION SECTION: 6.2.2 & 6.3
DATE OF RAI ISSUE: 05/07/2009

QUESTION NO.: 06.02.02-24

MUAP 08001-NP (R2) Section 3.7.1 states, "In the refueling cavity, there are two 8 inches drain pipes which are communicated to bottom portion of the containment...and it is quite unlikely that a large amount of fibrous debris will blow down on the cavity, and block the drain path." The NRC staff requests that MHI provide the following information regarding upstream effects associated with these two 8 inch drain pipes:

- 1) Please describe what "communicated to bottom portion of containment" means? Do they go directly to RWSP? Are these drains depicted in the DCD (for example, DCD Figure 6.2.1-9)?
- 2) If the drain pipes were to fully block flow, how much water holdup would occur and what would the impact be on cooling the core and cooling containment?
- 3) What amount of water holdup (expressed in gallons or cubic meters and height in refueling cavity as well as height in RWSP) would result in challenging head loss across strainer (submergence etc) and/or NPSHa?
- 4) Operating plants with similar drain configurations have installed debris interceptors to ensure the drains remain functional during an accident. What is the APWR justification for not establishing debris interceptors?

ANSWER:

- 1) The phrase, "communicated to bottom portion of containment", means that reactor cavity drain piping is connected directly to the RWSP. Refer the Figure 6.2.1-13 in the DCD.
- 2) If the refueling cavity drain pipes were to fully blocked, containment spray water dropped on there may not be drained from refueling cavity. In the result, safety pumps required for long term cooling may not be operated in safely because the RWSP minimum water level will be lowered than design basis.
- 3) The amount of water in the refueling cavity accounted for "in-effective pool (i.e., 70.7 m³)" was provided in Table 3-10 of the technical report MUAP-08001. In addition, 2 in height of water stream on the refueling cavity floor (i.e., 6.9m³) were included in "water stream on the floor"

(i.e., 185.0m³, See Table 3-10). No further additional hold up volume due to fully blockage of cavity drains was accounted in the upstream effect evaluation. Given the additional hold up volumes beyond the design basis, the RWSP water level will be lowered approximately 5.3 cm per each 100m³ of entrapped water.

4) As per interaction with staff in the conference call on September 30 2009, MHI is to clarify how the US-APWR prevents the refueling cavity drains from blocking by large debris. If MHI is going to crediting the gratings, discussion will be needed to identify which grating is important and how the grating will be maintained during plant operation. Following is the updated response to the question:

- The US-APWR will be categorized as low-fiber plant. The amount of debris, as provided in the response to Question 06.02.02-19, may be relatively lower than operating plants. In general, the US-APWR has relatively low risk for potential blockage.
- Since the US-APWR credits several gratings as large debris blockage for considering upstream effects, there is no "large" debris which potentially blocks the cavity drains.
- Given that pipe break inside secondary shield walls, layer of gratings at elevation 55'-1" and 73'-1" (See Figure-1), The grating at 55'-1" prevent large debris from blowing out through opening on the floor opening at 76'-1", which is located just above the reactor coolant pump. The grating at 73'-1" prevent large debris, except the fibrous insulation installed on main steam pipe support at top of secondary shield wall, from blowing out through steam generator compartment opening. Therefore, only "small" debris, except fibrous insulation on main steam pipe support at top of secondary shield wall, can be transported on the operating floor or refueling cavity.
- Given that pipe break outside secondary shield walls, only the large debris generated by main steam pipe break at steam generator top nozzle can be reachable to refueling cavity. The large debris may come from fibrous insulation installed on main steam pipe support at top of secondary shield wall.
- The debris come from a main steam pipe support will be quite low amount. Based on the past experience, the amount of fibrous insulation on main steam pipe support is approximately 3 (ft³). In accordance with the guidance for debris sizing in NEI 04-07, 40% of fibrous insulation debris is considered as "large", and therefore only 1.2 (ft³) of large debris is credible to reach to the cavity drain.
- To cope with the credible large debris, two design enhancements were considered: a) the refueling cavity drains were moved to bottom of "Upper core internal laydown pit", and b) a grating with approximately 120(ft²) of horizontal area will be provided in the pit to prevent credible large debris from reaching to refueling cavity drains. (See Figure-2)
- Given that the pieces of large fibrous debris is equal or larger than 1" x 4" x 4", the credible large debris (i.e., 1.2 ft³) will be converted up to 14.4 ft² of penalty area against the grating surface area (i.e., 120 ft²). Therefore, the grating will have sufficient horizontal to credible large debris blockage and the refueling cavity drains will maintain the drain function.

In conclusion, following gratings are important to prevent the credible large debris from block the refueling cavity drains, and shall be maintained during plant operation:

- Grating inside secondary shield wall at EL. 55'-1" (Roop-A,B,C, and D)
- Grating inside secondary shield wall at EL. 73'-1" (Roop-A,B,C, and D)
- Grating at upper core internal laydown pit (in refueling cavity)

MHI will revise MAUP-08001(R2) Section 3.7 "Upstream Effect" to add the above discussion for potential blockage of refueling cavity, and Figure 3-8 in the report will be replaced with Figure-2 attached in this response.

The gratings are classified as non safety-related, and designed as seismic category II structure. As discussed in response to RAI 06.02.02-31, design change control procedures, procedures for conduct of maintenance activities, and administrative procedures for maintaining the cited gratings will also be established. These processes will ensure that the gratings are maintained within the bounds of the analyses and design bases that support Emergency Core Cooling (ECC) and Containment Spray (CS) recirculation functions and ensure the long term core cooling requirements of 10 CFR 50.46 will be accomplished.

Impact on DCD

DCD Tier 2 subsections 6.2.2.3 will be revised to identify the gratings important to prevent the credible large debris from block the refueling cavity drains, and to add a description for the conduct of maintenance activities including temporary changes for maintaining the gratings during plant operation.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA.

Security-Related Information – Withheld Under 10CFR2.390

SRI

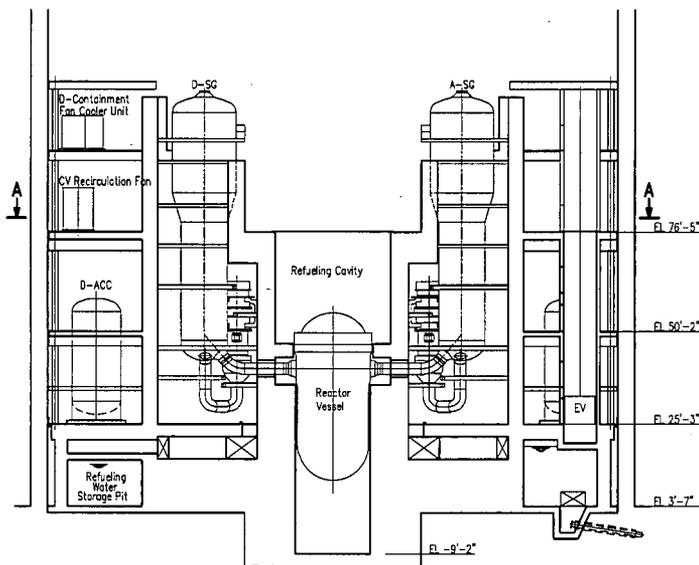


Figure-1 Gratings important to prevent the credible large debris from block the refueling cavity drains (inside secondary shield wall)

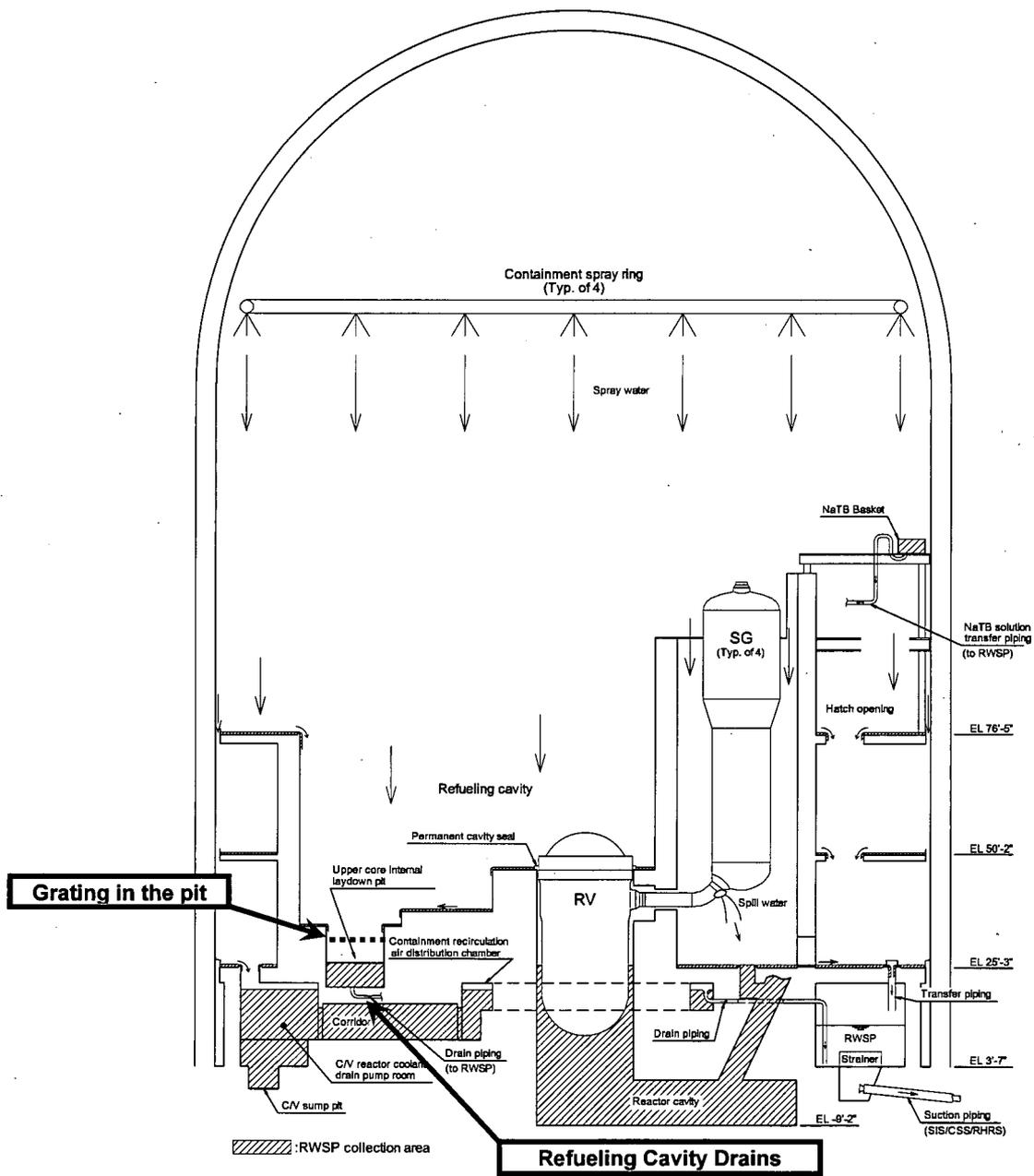


Figure-2 Grating important to prevent the credible large debris from block the refueling cavity drains (refueling cavity)