MITSUBISHI HEAVY INDUSTRIES, LTD.
16-5, KONAN 2-CHOME, MINATO-KU
TOKYO, JAPAN

May 29, 2012

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-12131

Subject: **MHI's 2nd Amended Response to US-APWR DCD RAI No. 815-5986 Revision 3 (SRP 06.03)**

References:
[1] "Request for Additional Information No. 815-5986 Revision 3, SRP Section: 06.03 – Emergency Core Cooling System –Application Section: 6.3," dated August 23, 2011 (ML112360641).
[2] MHI Letter UAP-HP-11322, "MHI's Response to US-APWR DCD RAI No. 815-5986 Revision 3 (SRP 06.03)," dated September 22, 2011 (ML11269A036).
[3] MHI Letter UAP-HF-12019, "MHI's Amended Response to US-APWR DCD RAI No. 815-5986 Revision 3 (SRP 06.03)," dated January 31, 2012 (ML12034A062).

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") the documents listed in the Enclosure.

Enclosed is the 2nd amended response to the RAI contained in Reference 1, as well as some additional supporting information related to the response. This response supersedes the previous responses that were transmitted in References 2 and 3 in their entirety.

The enclosed RAI response and supplemental information are related to GSI-191. The supplemental document titled "Design Description of Design Change in Recirculation Flow Path" (Enclosures 2 and 4) provides additional details of the design change. The 2nd amended response to RAI 815-5986 (Enclosures 3 and 5) reflects the effect of this design change on the evaluation of the debris transport time to the core.

As indicated in the enclosed materials, the RAI response and associated supplementary information document contains information that MHI considers proprietary, and therefore should be withheld from public disclosure pursuant to 10 C.F.R. § 2.390 (a)(4) as trade secrets and commercial or financial information which is privileged or confidential. A non-proprietary version of each document is also being submitted with the information identified as proprietary redacted and replaced by the designation "[ ]".

This letter includes a proprietary version of the design change (Enclosure 2) and the response (Enclosure 3), a copy of the non-proprietary version of the design change (Enclosure 4) and the response (Enclosure 5), and the Affidavit of Yoshiki Ogata (Enclosure 1) which identifies the reasons MHI respectfully requests that all materials designated as "Proprietary" in Enclosures 2 and 3 be withheld from public disclosure pursuant to 10 C.F.R. § 2.390 (a)(4).

D081
NRO

Please contact Mr. Joseph Tapia, General Manager of Licensing Department, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of this submittal. His contact information is below.

Sincerely,

Y. Ogata

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

Enclosures:

1. Affidavit of Yoshiki Ogata

2. Design Description of the Design Change for the Recirculation Flow Path (proprietary version)

3. MHI's 2nd Amended Response to Request for Additional Information No. 815-5986 Revision 3 (proprietary version)

4. Design Description of the Design Change for the Recirculation Flow Path (non-proprietary version)

5. MHI's 2nd Amended Response to Request for Additional Information No. 815-5986 Revision 3 (non-proprietary version)

CC: J. A. Ciocco
J. Tapia

Contact Information
Joseph Tapia, General Manager of Licensing Department
Mitsubishi Nuclear Energy Systems, Inc.
1001 19th Street North, Suite 710
Arlington, VA 22209
E-mail: joseph_tapia@mnes-us.com
Telephone: (703) 908 – 8055

Enclosure 1

Docket No. 52-021
MHI Ref: UAP-HF-12131

MITSUBISHI HEAVY INDUSTRIES, LTD.

AFFIDAVIT

I, Yoshiki Ogata, state as follows:

1. I am Director, APWR Promoting Department, of Mitsubishi Heavy Industries, LTD ("MHI"), and have been delegated the function of reviewing MHI's US-APWR documentation to determine whether it contains information that should be withheld from public disclosure pursuant to 10 C.F.R. § 2.390 (a)(4) as trade secrets and commercial or financial information which is privileged or confidential.

2. In accordance with my responsibilities, I have reviewed the enclosed document entitled "MHI's 2nd Amended Response to Request for Additional Information No. 815-5986 Revision 3 (SRP 06.03)" and "Design Description of the Design Change for the Recirculation Flow Path" dated May 2012, and have determined that portions of the document contain proprietary information that should be withheld from public disclosure. Those pages containing proprietary information are identified with the label "Proprietary" on the top of the page and the proprietary information has been bracketed with an open and closed bracket as shown here "[ ]". The first page of the document indicates that all information identified as "Proprietary" should be withheld from public disclosure pursuant to 10 C.F.R. § 2.390 (a)(4).

3. The information identified as proprietary in the enclosed document has in the past been, and will continue to be, held in confidence by MHI and its disclosure outside the company is limited to regulatory bodies, customers and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and is always subject to suitable measures to protect it from unauthorized use or disclosure.

4. The basis for holding the referenced information confidential is that it describes the unique design and methodology developed by MHI for performing the nuclear design of the US-APWR reactor.

5. The referenced information is being furnished to the Nuclear Regulatory Commission ("NRC") in confidence and solely for the purpose of information to the NRC staff.

6. The referenced information is not available in public sources and could not be gathered readily from other publicly available information. Other than through the provisions in paragraph 3 above, MHI knows of no way the information could be lawfully acquired by organizations or individuals outside of MHI.

7. Public disclosure of the referenced information would assist competitors of MHI in their design of new nuclear power plants without incurring the costs or risks associated with the design of the subject systems. Therefore, disclosure of the information contained in the referenced document would have the following negative impacts on the competitive position of MHI in the U.S. nuclear plant market:

A. Loss of competitive advantage due to the costs associated with development of methodology related to the analysis.

B. Loss of competitive advantage of the US-APWR created by benefits of modeling information.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information and belief.

Executed on this 29th day of May, 2012.

Y. Ogata

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

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Enclosure 4

UAP-HF-12131
Docket No. 52-021

Design Description of the Design Change for the Recirculation Flow Path

May 2012
(Non-Proprietary)

Design Description of the Design Change for the Recirculation Flow Path

1. Purpose of Design Change

1.1 Purpose

The US-APWR design incorporates an internal RWSP to improve the long term core cooling performance following a Loss of Coolant Accident (LOCA). The recirculation flow path has been designed to ensure the RCS break flow and the CV spray water systematically returns to the RWSP. In the current design, two flow paths are formed early after a LOCA initiation. A portion of RCS break flow and CV spray is transported into dry compartments such as Reactor Cavity through openings in the floor of the SG Compartments, and the remaining water flows outside of SG Compartments returning to RWSP directly through the transfer piping. After the dry compartments are filled with the drain water, recirculation flow travels toward the transfer pipes or overflow lines. Although the current configuration would meet all regulatory requirements, determining the relative contributions from each of the recirculation flow paths is difficult.

In order to confirm these relative contributions to the recirculation, the return water flow paths have been simplified. There is no impact to current ITAAC or COL Items (e.g. cleanliness, housekeeping and foreign materials exclusion program).

1.2 Approach

Fig. 1 provides a representation of the approach to be used to simplify the flow paths for recirculation. Debris-laden water is directed to dry areas first, and then returns to the RWSP through overflow pipes from the dry areas. All 10 transfer pipes arranged vertically in the second floor outside the SG Compartments have been removed and new floor openings have been installed in the SG Compartments. The debris contaminated RCS break flow is transported directly into the Reactor Cavity, the Header Compartment and the CV Drain Pump Room, which are dry during normal operation. New overflow pipes have been installed in the Reactor Cavity and the Header Compartment to direct the RCS break and CV spray water into the RWSP. The second floor area outside the SG Compartments no longer has a direct recirculation flow path to the RWSP. The portion of the CV spray water that falls outside the SG Compartments now flows into the SG Compartments and mixes with the break flow from the RCS. Additionally, the nominal water level of the RWSP will be raised slightly to increase the initial water inventory to account for additional holdup volume due to revised recirculation flow path.

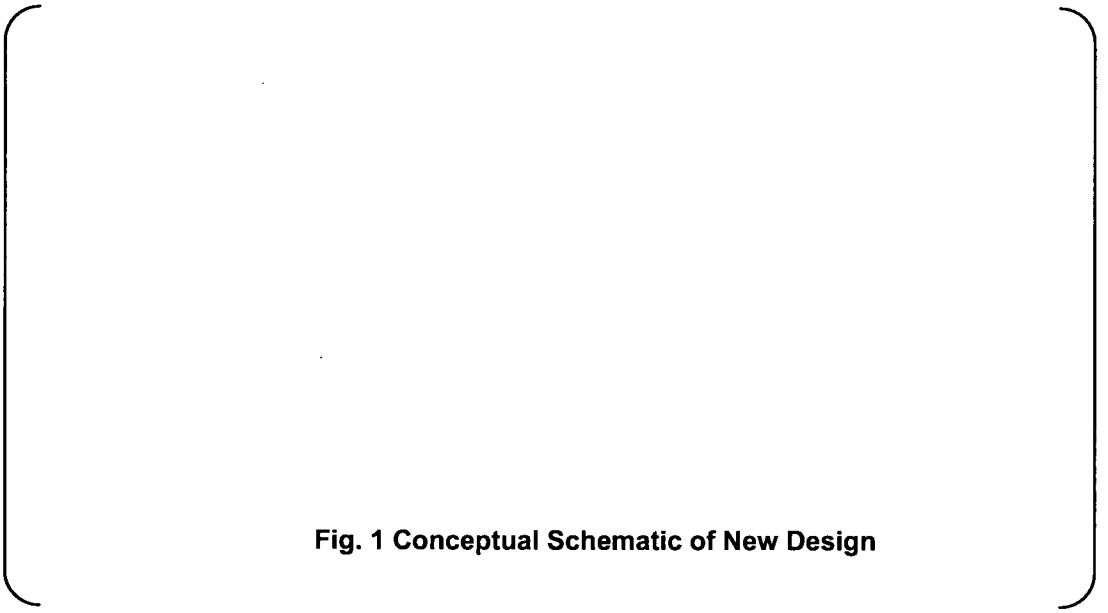

Fig. 1 Conceptual Schematic of New Design

2. Scope of Design Change

Fig. 2-1 compares the current design and the new design. Fig.2-2 through 2-5 shows the arrangement of the new design.

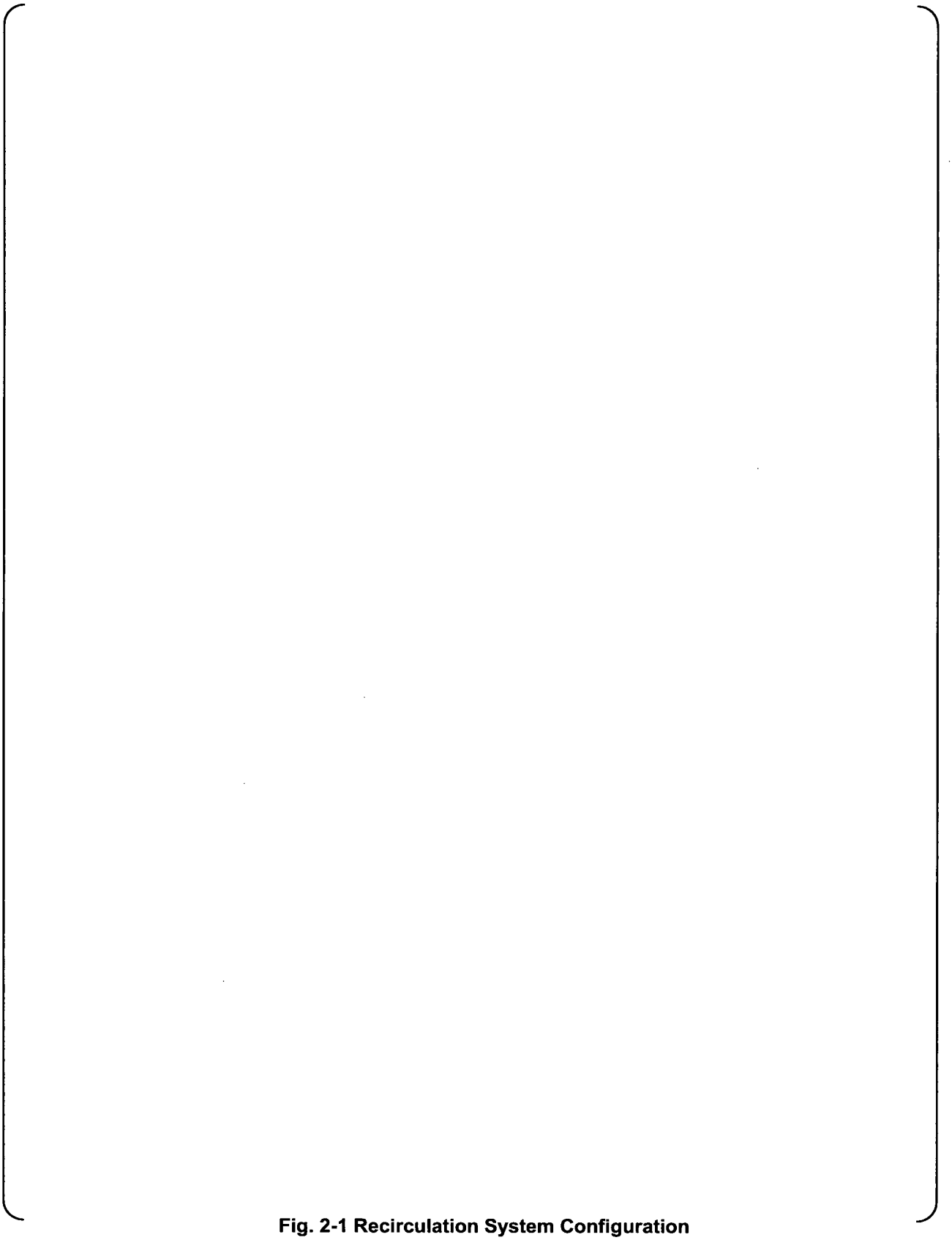

Fig. 2-1 Recirculation System Configuration

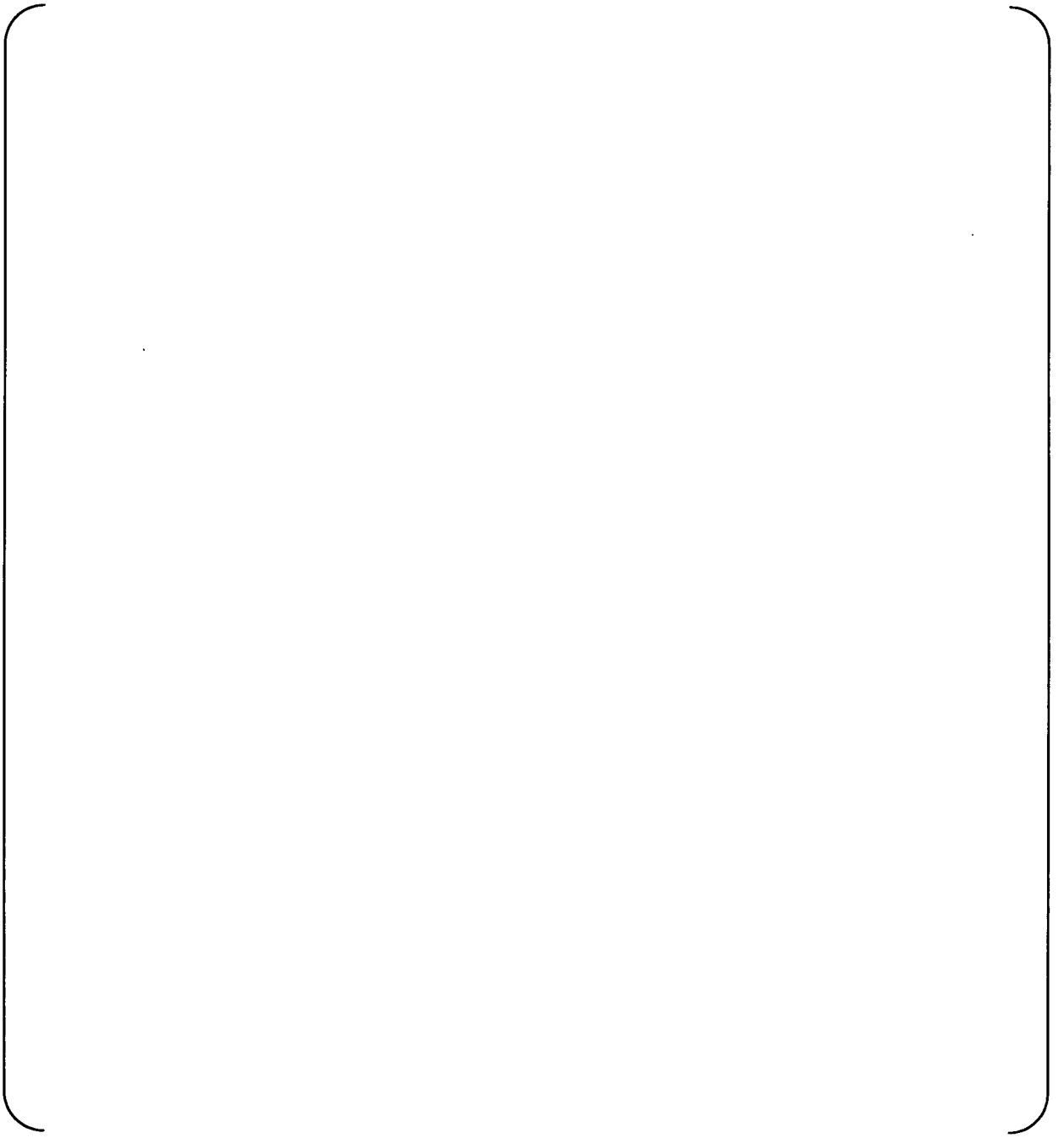

Fig. 2-2 Floor Opening Arrangement (2F Level)

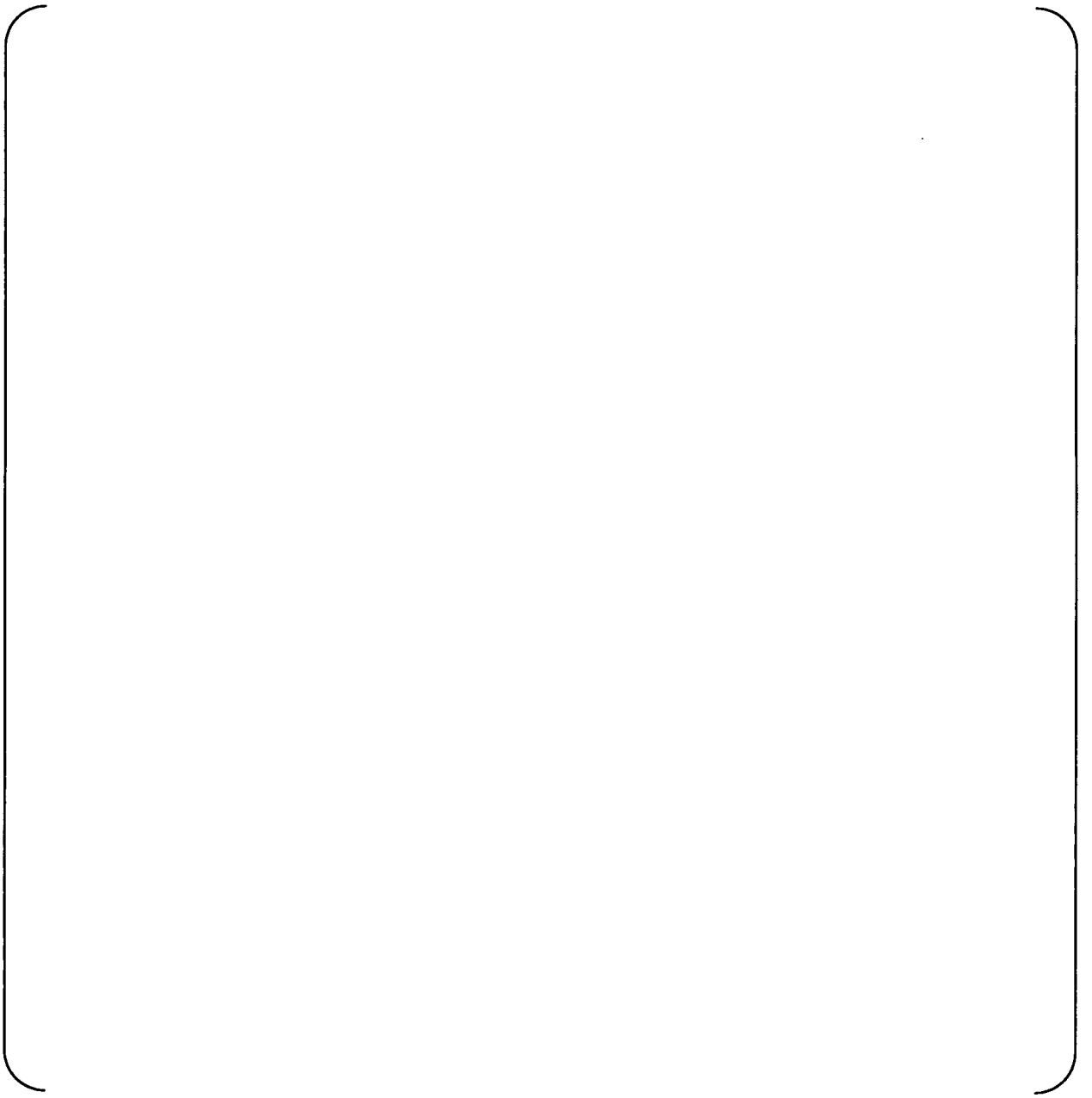

Fig. 2-3 Overflow Piping Arrangement (1F Level)

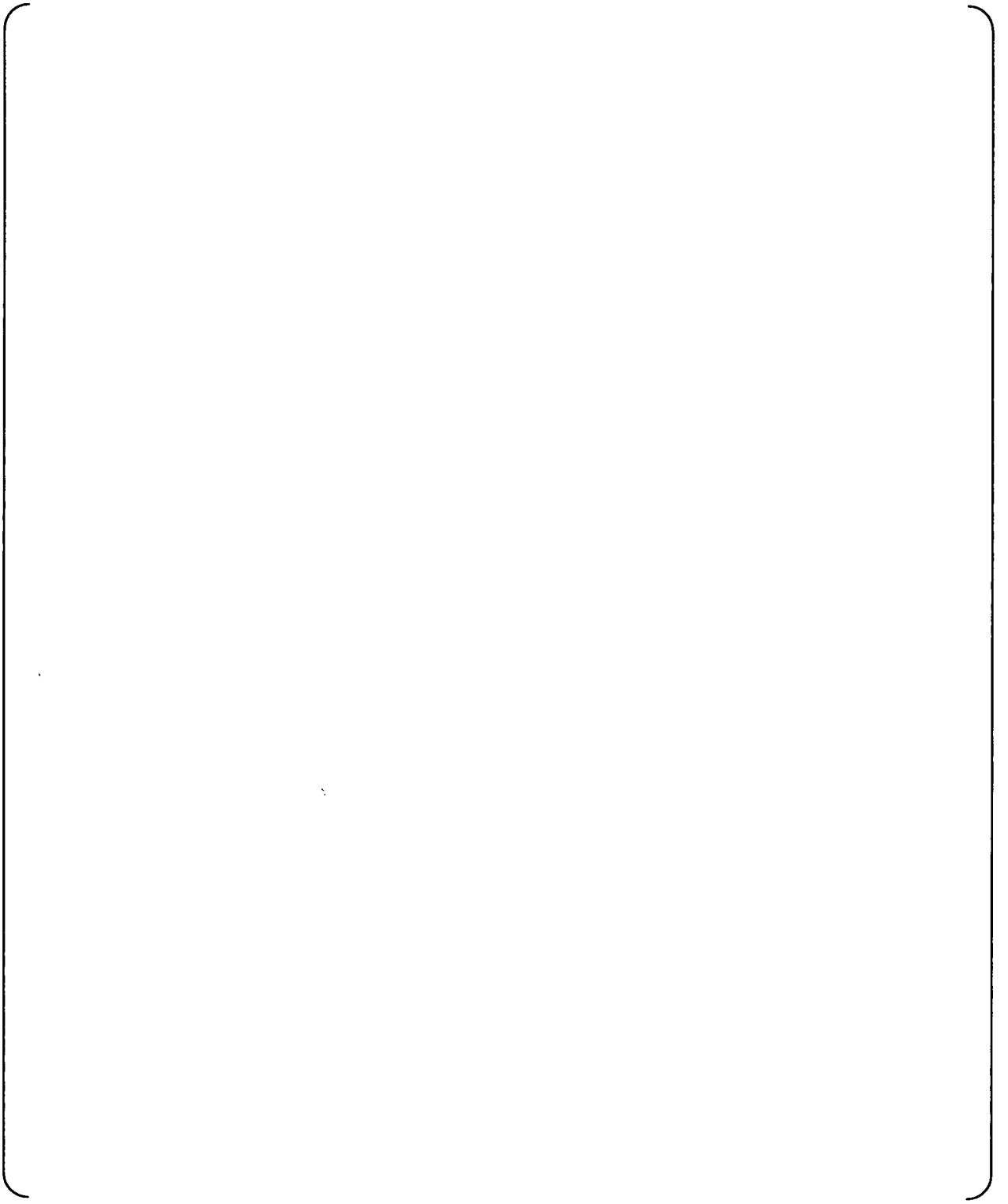

Fig. 2-4 Overflow Piping Arrangement Section View (1/2)

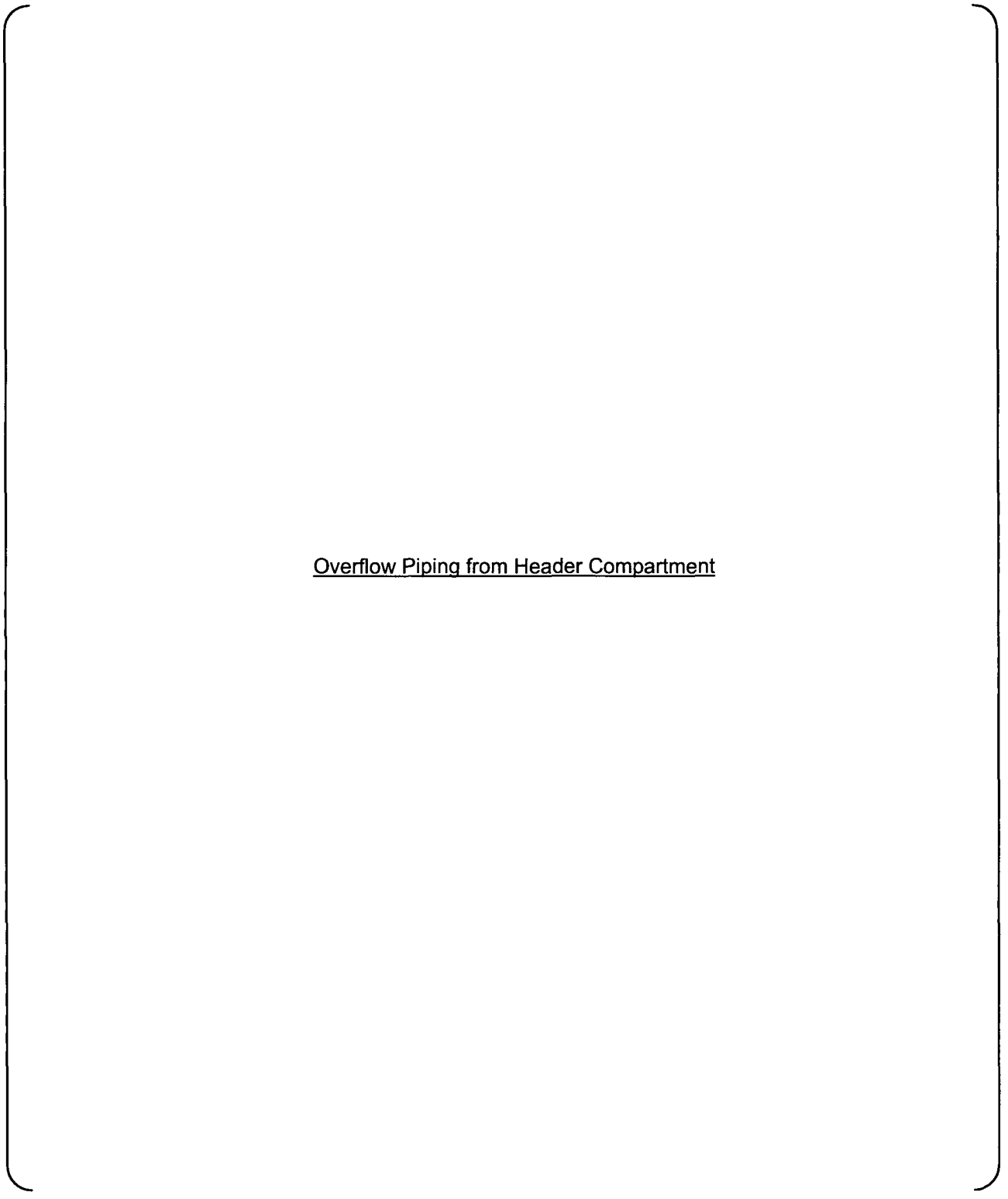

Fig. 2-5 Overflow Piping Arrangement Section View (2/2)

3. Design Considerations

4. Design Criteria

5. Feasibility of New Design

The feasibility of the new design has been confirmed from the view points of safety and functional requirements, interface with other systems and components, and impact on the various evaluations that use the design value around the RWSP, etc.

Table 5-1 through 5-4 show the summary of evaluation results.

Table 5-1 Effect on function for normal and refueling operation

Table 5-2 Effect on functions for accidents

Table 5-3 Effect on functions for seismic event

Table 5-4 Effect on function s for severe accident

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Enclosure 5

UAP-HF-12131
Docket No. 52-021

MHI's 2nd Amended Response to Request for Additional Information
No. 815-5986 Revision 3

May 2012
(Non-Proprietary)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

5/29/2012

US-APWR Design Certification

Mitsubishi Heavy Industries, Ltd.

Docket No. 52-021

RAI NO.:	**NO. 815-5986 Revision 3**
SRP SECTION:	**06.03 – EMERGENCY CORE COOLING SYSTEM**
APPLICATION SECTION:	**6.3**
DATE OF RAI ISSUE:	**8/23/2011**

QUESTION NO.: 06.03-102

The calculation for the delay time for debris reaching the RWSP in Appendix E of MUAP-08013 Rev. 1 has the following seeming non-conservatisms: neglecting the RCS and accumulator volumes, the possibility of not filling or bypassing ineffective pools, the possibility of reduced return flow to the RWSP and the inclusion of minimum water level (margin for design basis). In light of these seeming non-conservatisms, justify the calculational methodology used for determining the delay time.

Answer:

1. Introduction

This RAI response incorporates the RCS and accumulator volumes. The possibility of not filling or bypassing ineffective pools, and the possibility of reduced return flow to the RWSP into the calculation for the delay time for debris reaching the core is described in the following section.

It is noted that markup of the revised portion is not provided, because the entire response is revised.

2. Calculation approach of debris transportation time

Fig. 1. Schematic of Recirculation Water Return Path

(1) T1 calculation

Table 1 Capacity of the Buffer Area

Table 2 Released Water Volume

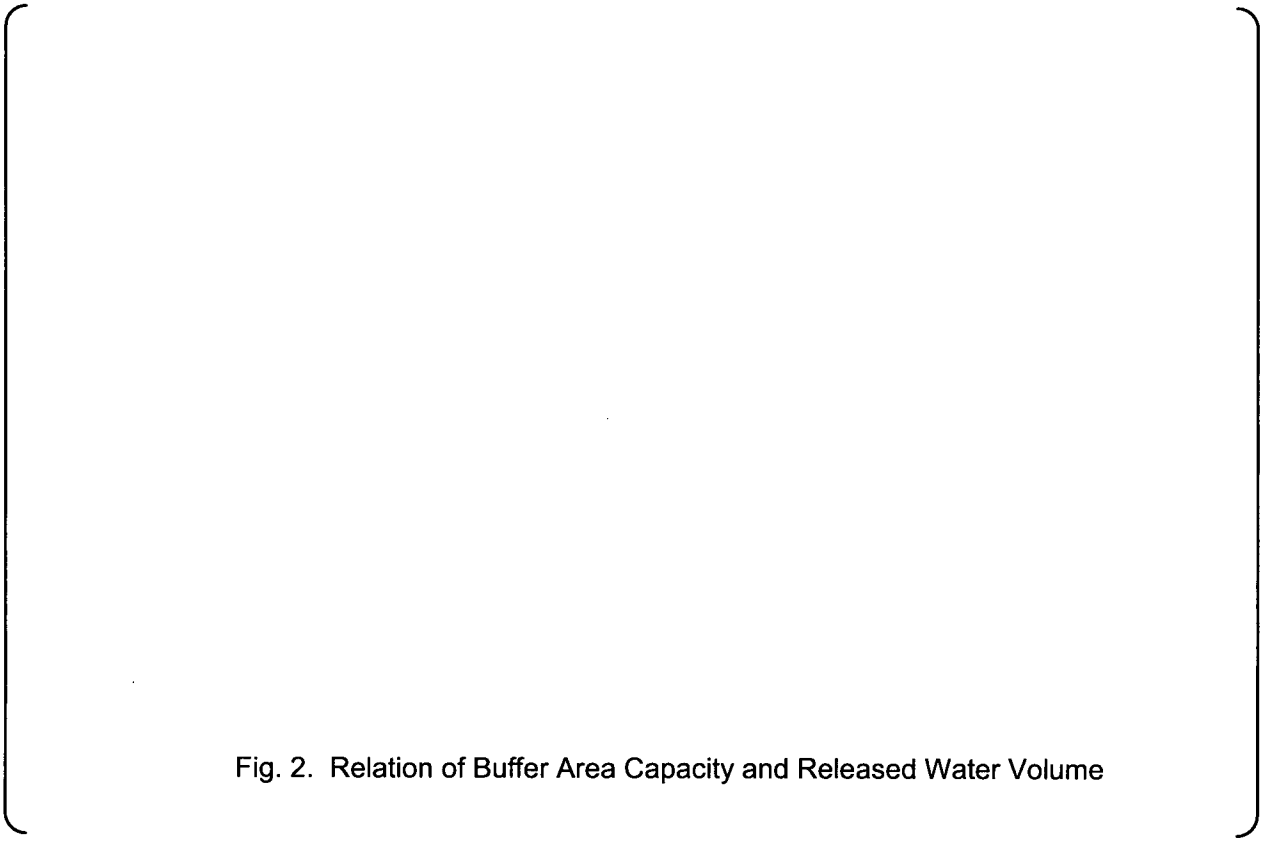

Fig. 2. Relation of Buffer Area Capacity and Released Water Volume

(2) T2 calculation

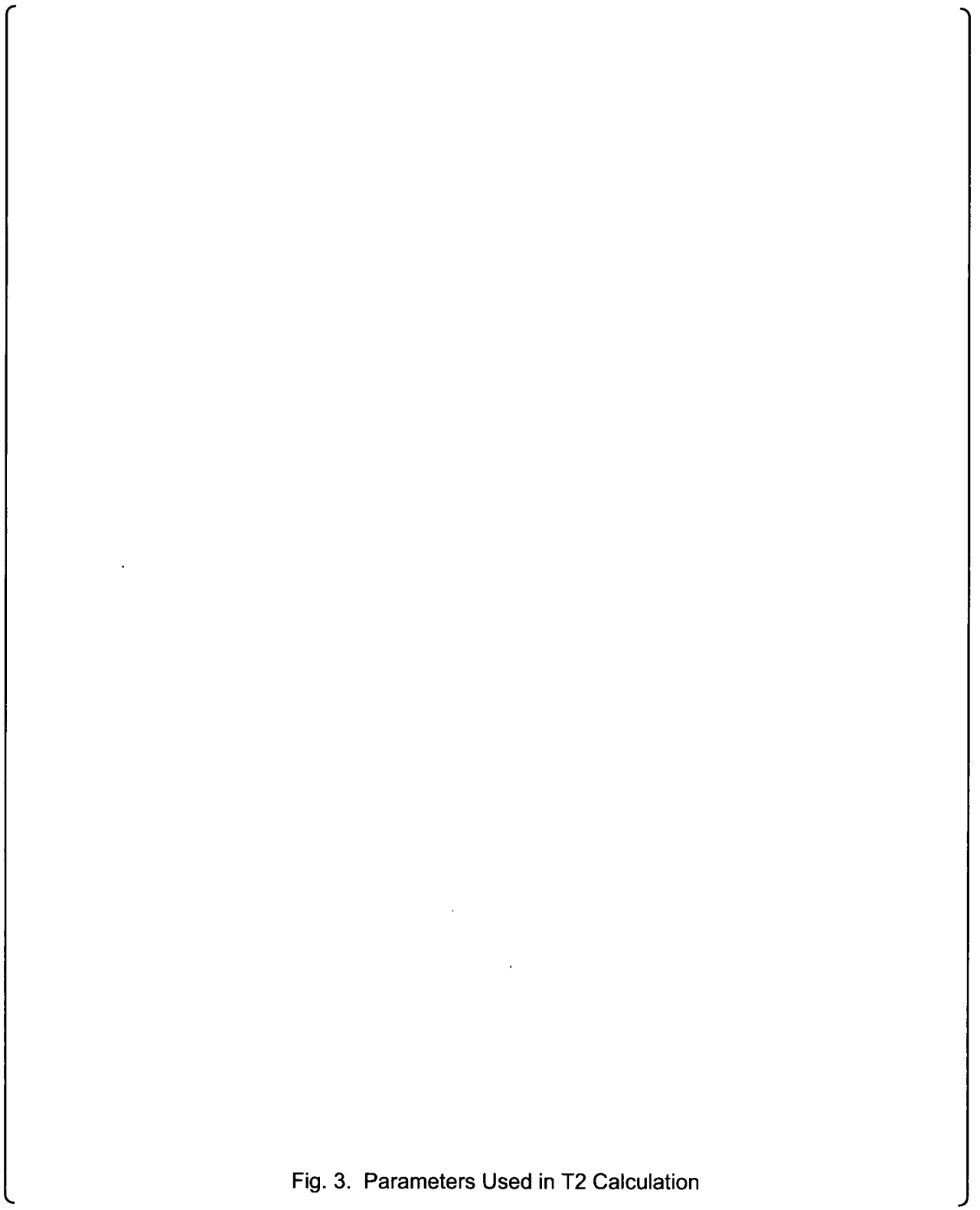

Fig. 3. Parameters Used in T2 Calculation

(3) T3 calculation

4. References

1) Mitsubishi Heavy Industries, LTD., LOCA Mass and Energy Release Analysis Code Applicability Report for US-APWR, MUAP-07012-P-A Rev. 2 and MUAP-07012-NP Rev. 2, June 2009.
2) MHI Letter No. UAP-HF-12135, "US-APWR DCD GSI-191 Tracking Report", dated May 2012.
3) MHI Letter No. UAP-HF-12140, MUAP-08013 Revision 3, "US-APWR Sump Strainer Downstream Effects", May 2012.

Impact on DCD

See note below.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on S-COLA

There is no impact on the S-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical/Topical Report

Appendix E of MUAP-08013 "US-APWR Sump Strainer Downstream Effects" (Reference 3) will be entirely revised according to the above RAI response.

Note
Impacts of the response on the DCD due to this response are reflected to the GSI-191 DCD Tracking Report (Reference 2).