RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

08/01/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 1040-7139 REVISION 3**
SRP SECTION:	**03.08.01 – Concrete Containment**
APPLICATION SECTION:	**3.8.1**
DATE OF RAI ISSUE:	**07/01/2013**

QUESTION NO. 03.08.01-15:

On April 3, 2013, the applicant submitted a markup of DCD Tier 2 Section 3.8 to provide updated information related to a seismic design change.

In Subsection 3.8.1.3.4, "Liner Plate Loads and Load Combinations," the second paragraph states, "During construction, the liner plate functions as the inner concrete form and as such it is subject to pressure from concrete placement as a primary load. This pressure can be treated as a hydraulic load with a maximum pressure determined as follows: the head height is the sum of the placement rate plus one foot for vibration plus one foot for miscellaneous factors."

The applicant is requested to add in the appropriate DCD sections, (1) the support provisions to liner plates and (2) a deflection monitoring program.

ANSWER:

(1) The liner plate functioning as the inner concrete form is supported with WT5x11s running vertically at approximately 25 in. spacing along the inside face of the PCCV shell. The liner plate and WT5x11 vertical anchors are also stiffened with ½ in. by 6 in. rib plates running horizontally in the hoop direction.

(2) Inspection requirements and tolerances are defined in the concrete installation specifications. Concrete forming tolerances (including steel liner plate forming tolerances) are defined in accordance with ASME Code Section III Division 2. Tolerances provided in concrete installation specifications are maintained with sufficient margin to satisfy Tier 1 commitments. Refer to Table 1 below for a comparison of the ASME Construction Specification values to those which are defined in Tier 1.

Table 1: Comparison of the ASME Construction Specification values to those which are defined in Tier 1

Component Description	Tier 1 (Table 2.11.1-2)	ASME Construction Specification
Deviation in Cross-Sectional Dimensions – Members such as buttress, shell, or dome with thickness of 36 in. dimension or less	+3.0/-3.0 inches	+ 1/2 in. or –3/8 in.
Over 3 ft dimension (Including dimension t1, t2 and t3 on Fig. 4.1)	+3.0/-3.0 inches	+ 1 in. or –3/4 in.

A deflection monitoring program for the PCCV liner plate system serving as formwork is conducted during construction. The deflection monitoring and other ISI programs for pre-operational and continued monitoring are the responsibility of the COL applicant. Refer to COL item 3.8 (14) provided in DCD Section 3.8.6.

Impact on DCD

DCD Subsection 3.8.1.3.4, "Liner Plate Loads and Load Combination," is revised to include the changes described in Attachment 1 of this response.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical/Topical Report

There is no impact on the Technical/Topical Report.

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

P_g1 = Pressure resulting from an accident that releases hydrogen generated from 100% fuel clad metal-water reaction = 46.7 psia ~~from Reference 3.8-55~~ MIC-03-03-00057

P_g2 = Pressure resulting from uncontrolled hydrogen burning (if applicable) = 127 psia ~~from Reference 3.8-55~~ MIC-03-03-00057

P_g3 = Pressure resulting from post-accident inerting assuming carbon dioxide is the inerting agent (Not applicable to US-APWR)

The factored load design of the US-APWR PCCV complies with the guidance of RG 1.136 (Reference 3.8-3). MHI Technical Report MUAP-10018 “US-APWR Containment Performance for Pressure Loads” (Reference 3.8-55) documents the methodology used to determine the pressure effects of an accident that releases hydrogen generated from 100% fuel clad metal-water reaction and uncontrolled hydrogen burning on the PCCV. The maximum pressure considered in the analysis in MUAP-10018 (Reference 3.8-55) is $P_g1 + P_g2$ = 173.7 psia = 159 psig. The analysis also includes effects of dead load D.

3.8.1.3.3 Load Combinations

Load combinations and applicable load factors are presented in Table 3.8.1-2, ~~which includes the worst case load combination of dead load, operating live load, and maximum load values of extreme environmental conditions~~for which the containment structure is designed. MIC-03-03-00057

3.8.1.3.4 Liner Plate Loads and Load Combinations

Liner plate strains are evaluated for the same loads and load combinations as those used to design the PCCV shell, which are presented in Table 3.8.1-2, except that all load factors for the liner plate are 1.0 in accordance with Subarticle CC-3720 of the ASME Code, Section III (Reference 3.8-2). In general, load cases that are shown to be less severe than other cases do not receive a full design analysis.

Liner plate stresses are evaluated for the construction load category and for the mechanical loads applied to attachments on the liner plate. During construction, the liner plate functions as the inner concrete form and as such it is subject to pressure from concrete placement as a primary load. This pressure can be treated as a hydraulic load with a maximum pressure determined as follows: the head height is the sum of the placement rate plus one foot for vibration plus one foot for miscellaneous factors. The liner is supported with WT5x11s running vertically at approximately 25 in. spacing along the inside face of the PCCV shell. The liner plate and WT5x11 vertical anchors are also stiffened with 1/2 in. by 6 in. rib plates running horizontally in the hoop direction. Concrete form ties are spaced at 5'-0" maximum and are attached to horizontal hoop stiffeners and/or vertical anchors. After the concrete sets, this load on the liner is no longer a real mechanical load; therefore, it is not combined with other primary loads. Displacement monitoring of concrete formed surfaces is performed in the field to verify that final as built design dimensions meet Tier 1 acceptance criteria defined in Table 2.2-4, item 5, and Table 2.11.1-2, item 3. DCD_03.08.01-15