
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

3/24/2014

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 1060-7285 REVISION 4
SRP SECTION: 03.07.02 – SEISMIC SYSTEM ANALYSIS
APPLICATION SECTION: 3.7.2
DATE OF RAI ISSUE: 11/15/2013

QUESTION NO. 03.07.02-240:

Section 02.5.1.1, "Development of the Reactor Building Complex Dynamic FE Model," of MUAP-10006, "Soil-Structure Interaction Analysis and Results for the US-APWR Standard Plant," Revision 3, states:

"The global origin is located at the center of the PCCV and top of the basement with the X axis pointing North, Y axis point West, and Z axis pointing upward. Once the model is translated into SASSI format, the global coordinate system is rotated 180 degrees about the Z axis so that the X axis is pointing South and the Y axis pointing East."

The use of two different coordinate systems in the models creates confusion in interpreting the results and can potentially become a source for misapplication of the data in detailed design certification (DC) design and combined operating license (COL) applications. Therefore, the applicant is requested to revise MUAP-10006, Revision 3, to provide clarification of the orientation of the coordinate system used in the figures and tables. The clarification should address whether the coordinate system shown on each figure relates to either the ANSYS or SASSI coordinate system

ANSWER:

The following Table provides the Key to the orientations of the various models depicted throughout MUAP-10006, Revision 3. The Key is divided into two parts: 1) Validation models, and 2) the Integrated Dynamic FE Model of the R/B Complex. The validation models, presented in Part 2 of MUAP-10006 R3 are created separately before being combined into the integrated model. The coordinate system for each individual model is shown in the Table along with the combined model. The Integrated Dynamic FE Model which is presented in Part 3 for both ANSYS and ACS SASSI utilize the global coordinate system shown in the Table. The results for displacements, frequencies, in-structure response spectra, and seismic loads follow the global coordinates shown in the Table for their respective purpose.

Validation Models				Integrated Dynamic FE Model R/B Complex		
Model	Coordinate	Direction		Model	Coordinate	Direction
		Dynamic	Detailed			
R/B	+X	North	North	ANSYS	+X	South
	+Y	West	West		+Y	East
	+Z	Up	Up		+Z	Up
PCCV	+X	North	North	ACS SASSI SSI	+X	South
	+Y	West	West		+Y	East
	+Z	Up	Up		+Z	Up
CIS	+X	South	South	ACS SASSI SSSI	+X	South
	+Y	East	East		+Y	East
	+Z	Up	Up		+Z	Up
East PS/B	+X	South	South	Notes: 1) Validation models are applicable only in Part 2 of this Report, and use the Validation Models coordinate system as indicated in this Table. 2) The RCL model described in Part 2 of this Report uses the CIS Validation Model coordinate system as indicated in this Table. 3) The results presented in Part 3 of this Report use the global coordinate system of the Integrated Dynamic FE Model of the R/B Complex as indicated in this Table.		
	+Y	East	East			
	+Z	Up	Up			
West PS/B	+X	South	South			
	+Y	East	East			
	+Z	Up	Up			
A/B	+X	South	North			
	+Y	East	West			
	+Z	Up	Up			
Combined R/B Complex	+X	South	North			
	+Y	East	West			
	+Z	Up	Up			

Impact on DCD

There is no impact on the DCD.

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

MUAP–10006, Revision 3, is revised as shown in Attachment 1. Table is inserted in the following locations: 1) after the List of Acronyms and Abbreviations and before Page 01-I; 2) on Page 02-xx after the Part 2 List of Tables; 3) on Page 03-ix after the Part 3 List of Tables.

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

Model Coordinate System Key

The following defines the coordinate systems of the models used in this document.

Validation Models				Integrated Dynamic FE Model R/B Complex		
Model	Coordinate	Direction		Model	Coordinate	Direction
		Dynamic	Detailed			
R/B	+X	North	North	ANSYS	+X	South
	+Y	West	West		+Y	East
	+Z	Up	Up		+Z	Up
PCCV	+X	North	North	ACS SASSI SSI	+X	South
	+Y	West	West		+Y	East
	+Z	Up	Up		+Z	Up
CIS	+X	South	South	ACS SASSI SSSI	+X	South
	+Y	East	East		+Y	East
	+Z	Up	Up		+Z	Up
East PS/B	+X	South	South	Notes: 1) Validation models are applicable only in Part 2 of this Report, and use the Validation Models coordinate system as indicated in this Table. 2) The RCL model described in Part 2 of this Report uses the CIS Validation Model coordinate system as indicated in this Table. 3) The results presented in Part 3 of this Report use the global coordinate system of the Integrated Dynamic FE Model of the R/B Complex as indicated in this Table.		
	+Y	East	East			
	+Z	Up	Up			
West PS/B	+X	South	South			
	+Y	East	East			
	+Z	Up	Up			
A/B	+X	South	North			
	+Y	East	West			
	+Z	Up	Up			
Combined R/B Complex	+X	South	North			
	+Y	East	West			
	+Z	Up	Up			

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	+Z	Up	Up		+Z	Up
PCCV	+X	North	North	ACS SASSI SSI	+X	South
	+Y	West	West		+Y	East
	+Z	Up	Up		+Z	Up
CIS	+X	South	South	ACS SASSI SSSI	+X	South
	+Y	East	East		+Y	East
	+Z	Up	Up		+Z	Up
East PS/B	+X	South	South	Notes: 1) Validation models are applicable only in Part 2 of this Report, and use the Validation Models coordinate system as indicated in this Table. 2) The RCL model described in Part 2 of this Report uses the CIS Validation Model coordinate system as indicated in this Table. 3) The results presented in Part 3 of this Report use the global coordinate system of the Integrated Dynamic FE Model of the R/B Complex as indicated in this Table.		
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	+Z	Up	Up			
West PS/B	+X	South	South			
	+Y	East	East			
	+Z	Up	Up			
A/B	+X	South	North			
	+Y	East	West			
	+Z	Up	Up			
Combined R/B Complex	+X	South	North			
	+Y	East	West			
	+Z	Up	Up			

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PCCV	+X	North	North	ACS SASSI SSI	+X	South
	+Y	West	West		+Y	East
	+Z	Up	Up		+Z	Up
CIS	+X	South	South	ACS SASSI SSSI	+X	South
	+Y	East	East		+Y	East
	+Z	Up	Up		+Z	Up
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	+Z	Up	Up			
West PS/B	+X	South	South			
	+Y	East	East			
	+Z	Up	Up			
A/B	+X	South	North			
	+Y	East	West			
	+Z	Up	Up			
Combined R/B Complex	+X	South	North			
	+Y	East	West			
	+Z	Up	Up			