US-APWR
Outline of Proposed Resolution Plan

March 29, 2012

Mitsubishi Heavy Industries, Ltd.

Mitsubishi Nuclear Energy Systems, Inc.

Outline of Proposed Resolution Plan

- Identification of the twelve topics in March 31, 2011 NRC Public Meeting

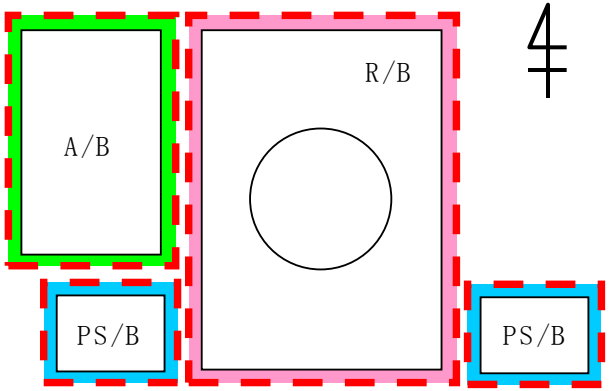
Segment ID	Topic
B	**Seismic Design Basis Models**
C	Effect of Concrete Cracking
D	**Soil Profiles**
E	**Structure-Soil-Structure Interaction (SSSI)**
F	**Water Table Effects**
G	**Embedment Effects on Seismic Response**
H	High Frequency Consideration in CSDRS
I	**Foundation Analysis**
J	**Sliding Stability**
K	**Gap Between Structures**
L	Steel Concrete (SC) Modules
M	Steel Liner Plate Strains Near PCCV Penetrations

Outline of Proposed Resolution Plan

Combined Nuclear Island Structure

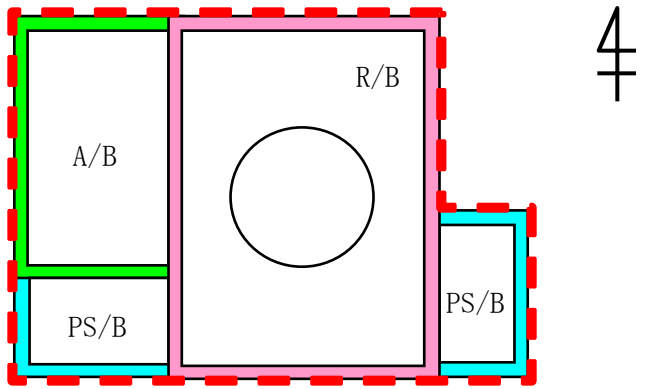
One of resolutions since November, 2011 is to combine structures with a common basemat

March 2011



Stand Alone Structures

Current



Combined Structure (FEM)

Outline of Proposed Resolution Plan

Seismic Conditions

		Seismic Category	Seed	Embedment	Soil Profile
NI	R/B	SCI	Northridge	0-side	6 soil cases (270-200 270-500 560-500 900-100 900-200 2032-100)
	A/B	SCII*			
	E-PS/B	SCI			
	W-PS/B	SCI			
TI	T/B	SCII			
	E/R	SCII			

*** Boundary between SCI and SCII structures is inside the face of the A/B at common walls between the A/B and the R/B or PS/Bs, as well as inside the face of the A/B above the basemat**

Outline of Proposed Resolution Plan

Methodology of Seismic Analysis

		Response	Sliding	Overturning	Bearing Pressure
NI	R/B	SSI and SSSI Analysis	Non Linear Sliding Analysis	Stability Analysis (Static)	
	A/B				
	E-PS/B				
	W-PS/B				
TI	T/B	SSI Analysis			
	E/R				

Outline of Proposed Resolution Plan

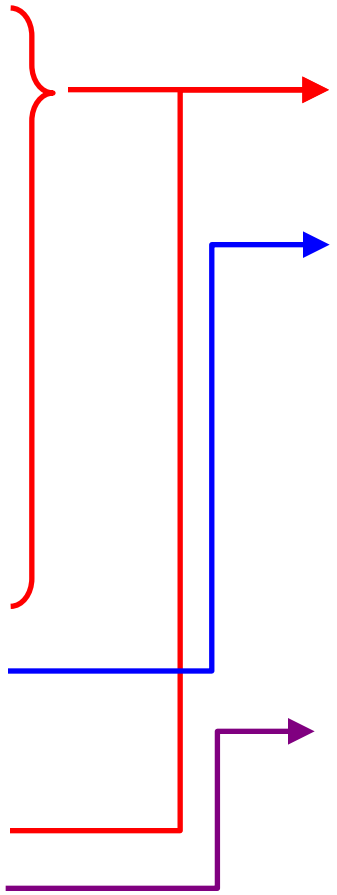
Summary of Seismic & Stability Analysis Cases

	Buildings	Embedment	CR/UNCR	Seismic Seed	Soil Profile
SSI Analysis	FEM	0-side	CR/UNCR	Northridge	6
SSSI Analysis			CR/UNCR		6
SSI Analysis for Sliding			CR/UNCR	5	6
Seismic Stability - NI Complex					
=> Non linear sliding analysis (ANSYS)	Structure: LMSM +Basemat: FEM	0-side	CR/UNCR	5	6
	Structure: FEM +Basemat: FEM		5		
=> Overturning, Bearing Pressure (ANSYS)	FEM		CR/UNCR	Northridge	6
Seismic Stability - TI Complex					
=> Non linear sliding analysis (ANSYS)	Structure: LMSM +Basemat: FEM	0-side	CR	5	6
	Structure: FEM +Basemat: FEM		5		
=> Overturning, Bearing Pressure (ANSYS)	FEM		CR	Northridge	6

Outline of Proposed Resolution Plan

Submittal Plan of Technical Reports

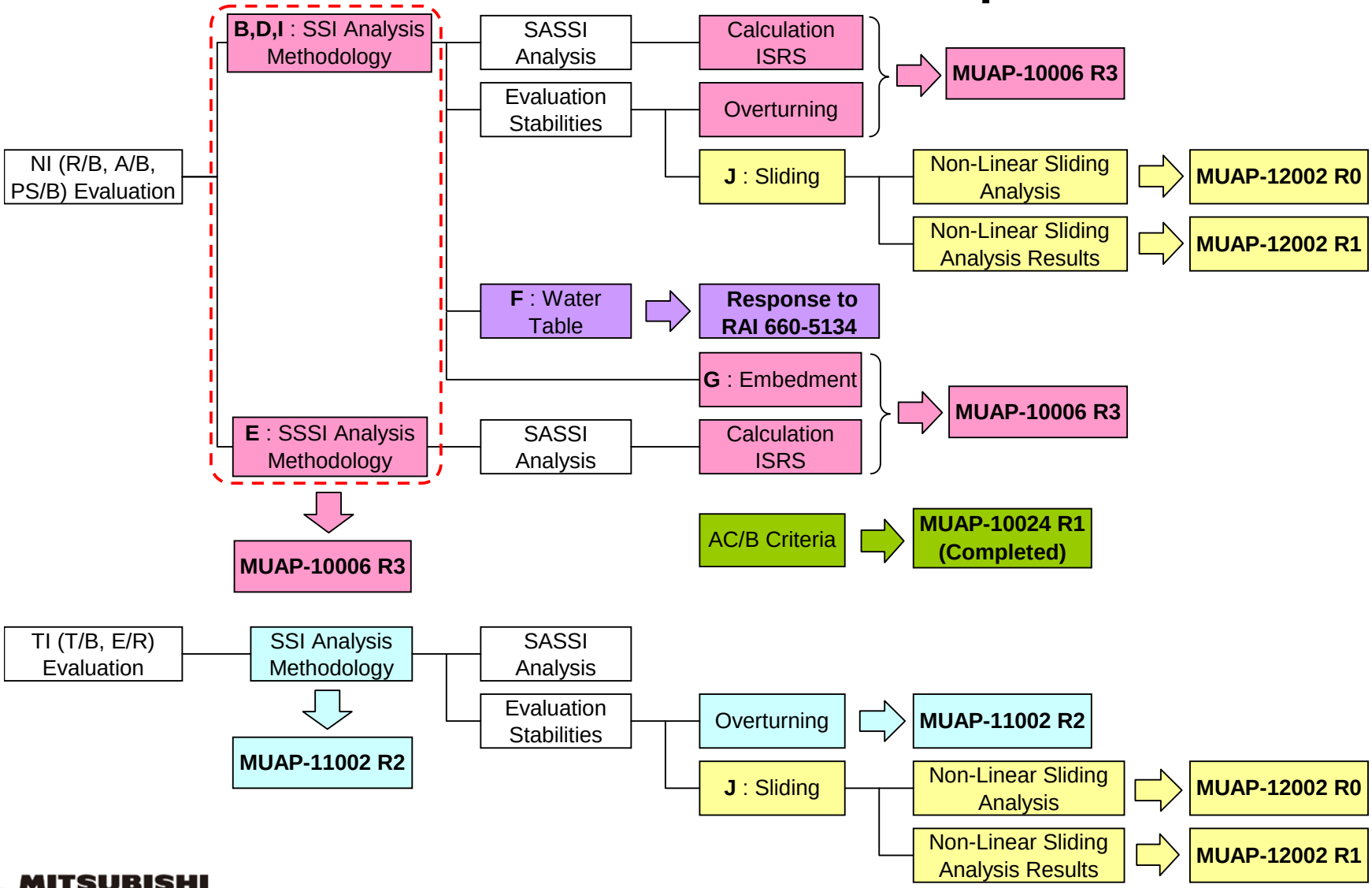
Current Documents
MUAP-10001 (R4) ✓Methodology of SSI Analysis for R/B complex
MUAP-10006 (R2) ✓Results of SSI Analysis for R/B complex
MUAP-11001 (R1) ✓SSI Analysis for A/B
MUAP-11011 (R0) ✓SSSI Analysis
MUAP-11002 (R1) ✓SSI Analysis for TI
MUAP-11007 (R1) ✓Embedment Effect ✓Water Table Effect



Submittal Documents
MUAP-10006 (R3): ✓SSI and SSSI Analysis for NI ✓Embedment Effect (0-side)
MUAP-11002 (R2): ✓SSI Analysis for TI
MUAP-12002 (R0): ✓Methodology of Non-Linear Sliding Analysis
MUAP-12002 (R1): ✓Methodology and Results of Non-Linear Sliding Analysis
Response to RAI 660-5134 (R1) ✓Water Table Effect

Outline of Proposed Resolution Plan

Submittal Plan of Technical Reports



Outline of Proposed Resolution Plan

Summary

- Combine R/B complex (R/B, PCCV, & CIS), A/B, and east & west PS/Bs to contribute to the solution of the following issues:
  - ✓ E: Structure-Soil-Structure Interaction (SSSI)
  - ✓ I: Foundation
  - ✓ K: Gap Between Structures
- Response to RAI 886-6202 reinstates Northridge Mt. Baldy set of time history seed records (contributes to issue B)
- A gap of 16 inches accommodates differential settlements and differential tilt between NI and TI (contributes to issue K)
- Non-linear analysis is to be carried out to demonstrate the actual sliding displacement is small, and to determine displacements for use in design of connections and and interface of adjacent structures (contributes to issue J)
  - ✓ Five sets of input seismic motion are to be used and they are to be amplified by 1.1 factor
  - ✓ Friction coefficient of 0.5 (sliding) is to be used at foundation-subgrade interface