

PMSTPCOL PEmails

From: Tai, Tom
Sent: Wednesday, May 27, 2009 2:16 PM
To: John Price (jeprice@stpegs.com)
Cc: STPCOL
Subject: RAI 2926 (3.7.2) and 2928 (3.7.3) Draft
Attachments: RAI 2928 03.07.03-xx.doc; RAI 2926 03.07.02-xx.doc

John,

Attached for your use are two eRAIs we plan to issue on Chapter 3.7. They are eRAI 2926 for Chapter 3.7.2 and eRAI 2928 for Chapter 3.7.3.

Please share with your staff and let me know if you need a conference call to discuss.

Regards

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Hearing Identifier: SouthTexas34Public_EX
Email Number: 1265

Mail Envelope Properties (C56E360E9D804F4B95BC673F886381E71FB9344AB2)

Subject: RAI 2926 (3.7.2) and 2928 (3.7.3) Draft
Sent Date: 5/27/2009 2:16:13 PM
Received Date: 5/27/2009 2:16:15 PM
From: Tai, Tom

Created By: Tom.Tai@nrc.gov

Recipients:
"STPCOL" <STP.COL@nrc.gov>
Tracking Status: None
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Tracking Status: None

Post Office: HQCLSTR02.nrc.gov

Files	Size	Date & Time
MESSAGE	336	5/27/2009 2:16:15 PM
RAI 2928 03.07.03-xx.doc	29690	
RAI 2926 03.07.02-xx.doc	40954	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Request for Additional Information No. 2928 Revision 2

South Texas Project Units 3 and 4
South Texas Project Nuclear Operating Co
Docket No. 52-012 and 52-013
SRP Section: 03.07.03 - Seismic Subsystem Analysis
Application Section: 03.07.03

QUESTIONS for Structural Engineering Branch 2 (ESBWR/ABWR Projects) (SEB2)

03.07.03-***

STD DEP 1.2-1 established a new non-seismic Category 1 Control Building Annex (CBA) adjacent to the control building. FSAR Section 3.7.3.16 specified the analysis procedure for non-seismic structures which requires the use of SSE ground acceleration where a non-seismic structure is required to be designed to withstand a SSE using IBC code. Because of the proximity of Reactor Building (RB), Control Building (CB), and Turbine Building (TB) to the CBA, the seismic response of CBA may be affected by the surrounding buildings due to structure-to-structure interaction effect. As such, the applicant is requested to address whether the effects of structure-to-structure interaction are considered in establishing the acceleration level at the foundation of the CBA during an SSE event and, if not, what is the justification for not including them and what impact could this have on the seismic interaction evaluation of CBA.

03.07.03-***

FSAR Appendix 3H.6.5 does not include procedures for seismic subsystem analysis of site-specific seismic Category I substructures (e.g., platforms, support frame structures, buried piping, tunnels, above ground tanks, etc). In accordance with the guidance specified in SRP 3.7.3, provide in the FSAR in sufficient detail comparable to ABWR DCD Section 3.7.3, the procedures used in analyzing the site-specific subsystems.

Request for Additional Information No. 2926 Revision 2

South Texas Project Units 3 and 4
South Texas Project Nuclear Operating Co
Docket No. 52-012 and 52-013
SRP Section: 03.07.02 - Seismic System Analysis
Application Section: 03.07.02

QUESTIONS for Structural Engineering Branch 2 (ESBWR/ABWR Projects) (SEB2)

03.07.02-***

ABWR DCD Section 3.7.2.8, concerning Interaction of Non-Category I Structures with Seismic Category I Structures, is incorporated by reference in the FSAR with supplemental COL License Information presented in FSAR 3.7.5.4. ABWR DCD Section 3.7.2.8 specified that all non-Category I structures will meet one of the three requirements as specified in DCD Section 3.7.2.8. Additional information is needed to determine implementation of these criteria for non-seismic Category I structures having the potential to interact with Category I structures. As such, the applicant is requested to provide the following information in the FSAR:

- (a) A Figure or a Table that includes identification and locations of each Category I and non-seismic Category I structures, including the separation distance between these structures and the height of each structure.
- (b) Identify the specific criteria of DCD 3.7.2.8 that each non-Category I structure is designed to meet.
- (c) Describe how the non-Category I structures having the potential to interact with Category I structures are evaluated for sliding and overturning potential (including the coefficient of friction used and its basis) during an SSE and also provide the calculated factors of safety against sliding and overturning for the applicable non-Category I structures.
- (d) State whether or not any non-Category I structure is designed to meet the criterion (2) of DCD 3.7.2.8, and if designed, provide the technical basis for the determination that collapse of the non-Category I structure will not compromise the integrity of seismic Category I structure.

03.07.02-***

The applicant is requested to provide in FSAR Appendix 3H6.5.2.1 per guidelines of SRP Acceptance Criteria 3.7.2.II.1 the actual seismic analysis methods used for site-specific Category I structures (including Ultimate Heat Sink and Reactor Service Water Piping Tunnel) in sufficient detail comparable to ABWR DCD Section 3.7.2.1

03.07.02-***

The applicant is requested to provide in FSAR Appendix 3H6.5.2.2 the information specified per guidelines of SRP Acceptance Criteria 3.7.2.II.2 corresponding to the actual seismic analysis performed for site-specific Category I structures (including Ultimate Heat Sink and Reactor Service Water Piping Tunnel) in sufficient detail comparable to ABWR DCD Section 3.7.2.2.

03.07.02-***

The applicant is requested to provide in FSAR Appendix 3H6.5.2.3 the procedures used for analytical modeling per guidelines of SRP Acceptance Criteria 3.7.2.II.3 corresponding to the actual seismic analysis performed for site-specific Category I structures (including Ultimate Heat Sink (UHS) and Reactor Service Water (RSW) Piping Tunnel). Specifically, the information should include:

1. The criteria and procedures used in modeling for the seismic system analyses (including structural material properties, modeling of member stiffness, modeling of mass [structural masses, live loads, floor loads, and equipment loads], modeling of damping, modeling of hydrodynamic effects, etc.);
2. The type of Finite Element model, the effect of element mesh size, shape, and aspect ratio on solution accuracy, time steps used in the time history analysis if applicable
3. The criteria and bases for determining whether a structure is analyzed as part of a structural system analysis or independently as a subsystem, decoupling criteria for subsystems;
4. The method used to address floor and wall flexibility in the structural modeling;
5. The analytical models used for dynamic analysis of UHS and RWS Piping Tunnel;
6. Special considerations such as addressing wave passage effects, lateral earth pressures, and groundwater effects for RSW Piping Tunnel analysis.

03.07.02-***

The applicant is requested to provide in FSAR Appendix 3H6.5.2.4 soil-structure interaction analysis performed for the site-specific structures including Ultimate Heat Sink (UHS) basin, UHS cooling tower enclosures, Reactor Service Water (RSW) pump house, and RSW piping tunnel in accordance with guidelines of SRP Acceptance Criteria 3.7.2.II.4. The information should include in sufficient detail comparable to ABWR DCD Appendix 3.A but not limited to the following:

1. Model of structure and supporting soil including the backfill material
2. Model boundaries and location of input ground motion
3. Procedure for addressing strain dependent soil & backfill properties in the SSI analysis
4. Method of accounting for the effects of the potential variability in the soil and backfill properties at the site.
5. Potential effect of any side soil-wall separation during a seismic event
6. The SSI analysis methods (e.g., time domain and/or frequency domain analysis, consideration of soil and structural damping, etc.) and results in the

form of site-enveloped seismic response (including in-structure response spectra) at key locations of the site-specific structures.

03.07.02-***

The applicant is requested to provide in FSAR Appendix 3H6.5.2.5 the procedure used in developing in-structure response spectra (ISRS) for the site-specific Category I structures in accordance with the guidelines of SRP Acceptance Criteria 3.7.2.II.5. The information should include but not limited to the following:

1. Method of combining the three ISRS in a given direction developed from separate analysis of the three directions of input motion
2. Frequency increments for calculation of ISRS
3. Spectrum smoothing and broadening to account for uncertainty in soil and structural parameters

03.07.02-***

The applicant is requested to provide in FSAR Appendix 3H6.5.2.6 the procedure used for combining the responses due to three components of earthquake motion for the site-specific Category I structures in accordance with the guidelines of SRP Acceptance Criteria 3.7.2.II.6. The applicant is requested to state in this FSAR Section which acceptable methods of RG 1.92 were used in analyzing the site-specific Category I structures.

03.07.02-***

The applicant is requested to provide in FSAR Appendix 3H6.5.2.9 the procedure used and the amount of peak broadening in accounting the effects of expected variations of structural properties (including effect of potential concrete cracking on structural stiffness), damping values, soil properties, and SSI effects for site-specific Category I structures in accordance with the guidelines of SRP Acceptance Criteria 3.7.2.II.9.

03.07.02-***

The applicant is requested to provide in FSAR Appendix 3H6.5.2.11 further clarification of the procedure used to account for torsional effects (including how accidental torsional moment at a particular location is calculated) in the seismic analysis of site-specific Category I structures in accordance with the guidelines of SRP Acceptance Criteria 3.7.2.II.11. How are the torsional effects combined with other seismic forces of the structure?

03.07.02-***

The applicant is requested to provide in FSAR Appendix 3H6.5.2.14 further clarification of the procedure used in determining seismic overturning moments and sliding forces for site-specific Category I structures in accordance with the guidelines of SRP Acceptance Criteria 3.7.2.II.14. Also include in the FSAR the calculated factor of safety against overturning and sliding and the coefficient of friction used in the calculation and its basis.