

## PMSTPCOL PEmails

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**From:** Tai, Tom  
**Sent:** Thursday, July 23, 2009 3:27 PM  
**To:** John Price (jeprice@stpegs.com)  
**Cc:** STPCOL; Mookhoek, William; Abeywickrama, Bernadette  
**Subject:** STP Letter 157 - RAIs for Ch 3.7 and 3.8  
**Attachments:** ML0920204220 Ch 3.7&3.8 RAIs.pdf

John,

Attached for your information and use is an advanced copy of Letter 157 transmitting RAIs (6) from Chapters 3.7 and 3.8.

Regards

Tom Tai  
DNRL/NRO  
(301) 415-8484  
[Tom.Tai@NRC.GOV](mailto:Tom.Tai@NRC.GOV)

**Hearing Identifier:** SouthTexas34Public\_EX  
**Email Number:** 1490

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**Subject:** STP Letter 157 - RAIs for Ch 3.7 and 3.8  
**Sent Date:** 7/23/2009 3:26:50 PM  
**Received Date:** 7/23/2009 3:26:52 PM  
**From:** Tai, Tom

**Created By:** Tom.Tai@nrc.gov

**Recipients:**

"STPCOL" <STP.COL@nrc.gov>

Tracking Status: None

"Mookhoek, William" <wemookhoek@STPEGS.COM>

Tracking Status: None

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Tracking Status: None

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Tracking Status: None

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**Reply Requested:** No

**Sensitivity:** Normal

**Expiration Date:**

**Recipients Received:**

July 21, 2009

Mr. Scott Head, Manager  
Regulatory Affairs  
STP Nuclear Operating Company  
P. O. Box 289  
Wadsworth, TX 77483

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 157 RELATED TO  
SRP SECTIONS 03.07 and 03.08 FOR THE SOUTH TEXAS PROJECT  
COMBINED LICENSE APPLICATION

Dear Mr. Head

By letter dated September 20, 2007, STP Nuclear Operating Company (STP) submitted for approval a combined license application pursuant to 10 CFR Part 52. The U. S. Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed application.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosure to this letter.

To support the review schedule, you are requested to respond within **30** days of the date of this letter. However, STP requested that 45 days are allowed to respond to these RAIs. The Phase 2 schedule will be adjusted accordingly. If changes are needed to the safety analysis report, the staff requests that the RAI response include the proposed wording changes.

S. Head

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If you have any questions or comments concerning this matter, I can be reached at 301-415-8484 or by e-mail at [Tom.Tai@nrc.gov](mailto:Tom.Tai@nrc.gov) or you may contact George Wunder at 301-415-1494 or [George.Wunder@nrc.gov](mailto:George.Wunder@nrc.gov).

Sincerely,

**/RA/**

Tom M. Tai, Senior Project Manager  
ABWR Projects Branch  
Division of New Reactor Licensing  
Office of New Reactors

Docket Nos. 52-012  
52-013

eRAI Tracking No. 2924, 2926, 2928, 2962, 2964, and 2965

Enclosure:  
Request for Additional Information

cc: William Mookhoek  
John Price

S. Head

-2-

If you have any questions or comments concerning this matter, I can be reached at 301-415-8484 or by e-mail at [Tom.Tai@nrc.gov](mailto:Tom.Tai@nrc.gov) or you may contact George Wunder at 301-415-1494 or [George.Wunder@nrc.gov](mailto:George.Wunder@nrc.gov).

Sincerely,

**/RA/**

Tom M. Tai, Senior Project Manager  
ABWR Projects Branch  
Division of New Reactor Licensing  
Office of New Reactors

Docket Nos. 52-012  
52-013

eRAI Tracking No. 2924, 2926, 2928, 2962, 2964, and 2965

Enclosure:  
Request for Additional Information

cc: William Mookhoek  
John Price

Distribution:  
PUBLIC  
NGE 1/2 R/F  
GWunder, NRO  
BAbeywickrama, NRO  
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SKirkwood, OGC  
RidsNroDeSeb2  
RidsNroDnrINge2

**ADAMS Accession No. ML092020422**

NRO-002

OFFICE	SEB2/TR	SEB2/BC	NGE2/PM	OGC	NGE2/L-PM
NAME	MChakravorty	SChakrabarti	TTai	SKirkwood	GWunder
DATE	5/26/09	5/28/09	7/21/09	6/11/09	6/12/09

**\*Approval captured electronically in the electronic RAI system.**

**OFFICIAL RECORD COPY**

**Request for Additional Information No. 2924 Revision 2**

**South Texas Project Units 3 and 4  
South Texas Project Nuclear Operating Co  
Docket No. 52-012 and 52-013  
SRP Section: 03.07.01 - Seismic Design Parameters  
Application Section: 03.07.01**

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

**03.07.01-1**

FSAR Section 3.7 "Seismic Design" specifically listed only two departures, STD DEP 1.8-1 and STD T1 2.15-1. The applicant is requested to provide justification for not listing STP Departure, STP DEP T1 5.0-1, under FSAR Section 3.7 regarding not meeting the DCD minimum shear wave velocity requirement at the site since shear wave velocity parameter is an input for Soil Structure Interaction (SSI) analysis.

**03.07.01-2**

10 CFR 50 Appendix S specifies that the Safe Shutdown Earthquake (SSE) Ground Motion for the site is characterized by both horizontal and vertical free-field ground motion response spectra at the free ground surface. As such, site-specific SSE ground motion should be established as free-field ground motion response spectra together with site-specific design time histories. Per guidance of SRP Acceptance Criteria 3.7.1 II.1.A & B, the applicant is requested to provide the following in the FSAR:

1. Site-specific SSE design response spectra for all applicable damping values (include specific figures) used for seismic reconciliation with the standard plant results as well as for site-specific seismic analysis and design of applicable site-specific structures (Ultimate Heat Sink, and Reactor Service Water (RSW) Piping Tunnel.)
2. Site-specific statistically independent three components of SSE design time histories and their bases that apply for the site-specific analysis
3. Site-specific Operating Basis Earthquake (OBE) to be used for setting up the seismic instrumentation (FSAR Section 3.7.4).

**03.07.01-3**

Section 3.7.1 states that a site-specific Soil Structure Interaction (SSI) analysis will be performed to confirm that standard plant results included in the ABWR DCD envelop the results of the site-specific SSI analysis. With regard to this seismic reconciliation analysis, the applicant is requested to address the following:

1. A comparison of site-specific SSE design response spectra with ABWR DCD Certified Seismic Design Response Spectra (CSDRS).
2. Consistent with the site-specific SSE design response spectra established for the site, the applicant is requested to provide in the FSAR a description of how were the Foundation Input Response Spectra (FIRS) in the free field at the foundation level were determined (including the soil model, soil properties, computer programs, and analysis assumptions)? Provide also FIRS in the free field at the foundation levels of all Category I structures that demonstrate meeting the requirement of 10 CFR 50 Appendix S (i.e. the horizontal component of the SSE ground motion

in the free field at the foundation level of the structures must be an appropriate response spectrum with a peak ground acceleration of at least 0.1g.).

#### **03.07.01-4**

The applicant should describe in the FSAR in detail the confirmatory SSI analysis performed including the results. Provide a figure in the FSAR depicting the SSI model for the Reactor Building (RB) and the Control Building (CB) including the model of the supporting subgrade. In addition, the applicant is requested to provide the following information:

1. State whether or not embedment effects are considered in this analysis and, if not, what is the justification for not including them and what impact could this have on the analysis results?
2. Describe the properties of the structural backfill and how is the backfill material modeled in the SSI analysis?
3. As the groundwater table is high, how are groundwater effects treated in the SSI confirmatory analysis?
4. For the applicable Category I structures covered by ABWR DCD, provide in the FSAR a comparison of the results (e.g., seismic displacements, accelerations, floor response spectra at the mat foundation, top of the building including some peripheral locations of the building, and major equipment locations, polar crane support, etc) of site-specific SSI analysis using the site-specific design SSE ground motion as input with the results documented in the ABWR DCD.

#### **03.07.01-5**

The shear wave velocity at the STP 3 & 4 varies both horizontally in a soil stratum and vertically with elevation and is lower than the 1000 ft/sec minimum stated in the DCD (STP DEP T1 5.0-1). In addressing the departure, STP has committed to perform a site-specific confirmatory Soil Structure Interaction (SSI) analysis. While this analysis would address the potential effect of SSI on the seismic response, it may not address the potential effect of structure-to-structure interaction due to STP DEP T1 5.0-1 unless the SSI model includes site-specific soil foundation model (including backfill material) combined with Reactor Building (RB), Control Building (CB), and Turbine Building (TB) models. As such, the applicant is requested to address how the effects of structure-to-structure interaction are considered in this confirmatory analysis and, if not, what is the justification for not including them and what impact could this have on the analysis results?

#### **03.07.01-6**

Per guidance in SRP acceptance criteria 3.7.1.II.3, the applicant is requested to provide the following information or provide reference to the appropriate subsections and figures in Section 3.7.1.4 of the FSAR. This includes the following information:

1. Description of supporting media for each Category I structures and dimensions of the structural foundation, and total structural height.
2. Depth of soil over bedrock, soil layering characteristics, ground water elevation, and soil properties such as shear wave velocity, shear modulus, Poisson's ratios, and density as a function of depth.
3. Since the minimum shear wave velocity parameter may be less than 1000 fps, quantitative results of additional studies performed which consider the actual site specific shear wave velocity (including its degree of variability) addressing potential impact on soil-structure interaction, settlement calculations, and design of foundation elements.

### **03.07.01-7**

In the supplementary information provided in Section 3.7.1 under the heading Other Analysis, it is stated that:

“In the development of settlement estimates, the representative shear wave velocity value for intervals within a soil column is only one input used in the derivation of the elastic modulus for layers within that column. Since this derived elastic modulus value is first adjusted for strain and then weighted with estimated values derived from either SPT tests (for granular material) or undrained shear strength tests (for cohesive soils) the effect of variability of shear wave velocity upon settlement calculations is significantly attenuated. The foundation spring constants for mat design are based on settlement calculations and therefore the effect of shear wave velocity variation is similarly attenuated.

Based on above discussion, it is concluded that the shear wave velocities at the plant site do not impact the plant design.”

However, note that while FSAR Appendix 3H Section 3H.1.5.2 listed shear wave velocity, unit weight, shear modulus, and Poisson’s ratio as the basis of calculating the spring constants, it does not include elastic modulus as one of the soil parameters for calculating foundation soil springs. Accordingly, the applicant is requested to provide the following information:

- (a) A comparison of estimated spring constant value (and its potential degree of variability) under the mat foundations of Category I structures for actual STP site conditions and the corresponding ABWR DCD parameter used in the certified design.
- (b) Justify any differences between the calculated site-specific spring constant values and the ABWR DCD parameter as to their effect on mat design forces.

### **03.07.01-8**

FSAR Appendix 3C lists the computer programs used in the design and analysis of seismic Category I structures. While the extent of application for SSDP-2D (3C.6) included Reactor Building (RB) and Control Building (CB), Ultimate Heat Sink (UHS) was not listed. As such, what computer program was used for section design of UHS? The applicant is requested to include in this Appendix appropriate computer programs used for UHS analysis and design as well as list in this Appendix the computer programs used for analysis and design of Reactor Service Water (RSW) Piping Tunnel.

### **03.07.01-9**

FSAR Appendix 3C Section 3C.7.1 states that a GE in-house version of NASTRAN was used for the static and Eigen value analysis of the concrete containment, RB, and CB. Please confirm that the program validation document available at MSC-Software Corporation includes the GE in-house version. The applicant is requested to include this confirmation in FSAR section 3C.7.2.

### **03.07.01-10**

For seismic Category I site specific structures, the applicant is requested to provide in FSAR Appendix Section 3H.6.5.1.1.1, “Design Response Spectra,” the following information either directly or by reference to applicable Figures:

1. Two levels (SSE and OBE) of horizontal and vertical design earthquake ground motions response spectra for damping ratios of 2, 3, 4, 5, and 7% at the finished grade in the free field. Also specify the maximum vertical and horizontal SSE and OBE level ground accelerations.
2. Consistent with the site-specific SSE design response spectra established above, the applicant is requested to provide in this FSAR Section a description of how were the Foundation Input Response Spectra (FIRS) in the free field at the foundation levels of site-specific Category I structures (UHS basin, RSW Pump House, and RSW Piping Tunnels) were determined (including the soil model, soil properties, computer programs, and analysis assumptions)?
3. Demonstrate that FIRS in the free field at the foundation levels of site-specific Category I structures meet the requirement of 10 CFR 50 Appendix S (i.e. the horizontal component of the SSE ground motion in the free field at the foundation level of the structures must be an appropriate response spectrum with a peak ground acceleration of at least 0.1g.).

### **03.07.01-11**

For seismic Category I site-specific structures, the applicant is requested to provide (per guidance of SRP Acceptance Criteria 3.7.1.II.1B) in FSAR Appendix Section 3H.6.5.1.1.2, "Design Time Histories," the following information either directly or by reference to applicable Figures:

1. Design ground motion time histories for three orthogonal directions that comply with the design response spectra (see SRP acceptance criteria 3.7.1.II.1B for guidance)
2. Demonstrate that each pair of time histories are statistically independent
3. Demonstrate that design time histories have adequate strong motion duration and appropriate  $V/A$  and  $AD/V^2$  ratios consistent with characteristic values for the magnitude and distance of the controlling seismic events defining the uniform hazard.

### **03.07.01-12**

The applicant is requested to provide in FSAR Appendix 3H.6.5.1.2 the following information:

1. A Table containing the percentages of critical damping values used in the seismic analysis of site-specific Category I structures, systems, and components (SSCs).
2. Justifications, if any exceptions were taken from RG 1.61
3. A plant-specific technical basis (see regulatory position C1.2 of RG 1.61) for use of damping values higher than the OBE damping values specified in Table 2 of RG 1.61, but not greater than the SSE damping values specified in Table 1 of RG 1.61, in the generation of In-Structure Response Spectra (ISRS).
4. The material soil damping value used in the analysis

### **03.07.01-13**

FSAR Appendix 3H.6.5.1.3 states that soil conditions at the STP 3 & 4 site are described in Subsection 2.5S.4. The applicant is requested to provide the information per guidance of SRP Acceptance Criteria 3.7.1.II.3 either in this Section or by specific reference to specific Tables or Figures for all site-specific Category I structures (including UHS and RSW Piping Tunnel).

**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)

**03.07.02-1**

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.

**03.07.02-2**

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

**03.07.02-3**

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.

**03.07.02-4**

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.

### **03.07.02-5**

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.

### **03.07.02-6**

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

### **03.07.02-7**

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.

**03.07.02-8**

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.

**03.07.02-9**

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?

**03.07.02-10**

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.

**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)

**03.07.03-1**

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.

**03.07.03-2**

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. 2962 Revision 2

**South Texas Project Units 3 and 4  
South Texas Project Nuclear Operating Co  
Docket No. 52-012 and 52-013  
SRP Section: 03.08.01 - Concrete Containment  
Application Section: 3.8.1**

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

### **03.08.01-1**

In FSAR Section 3.8, page 3.8-1, the applicant references the departure STD DEP 1.8-1, "Tier 2\* Codes, Standards, and Regulatory Guide Edition Changes." One of the changes included in this departure updates Tier 2 to refer to the 2006 International Building Code (IBC) in place of the 1991 Uniform Building Code (UBC). These building codes are not endorsed by the NRC in their entirety, and use of these codes is evaluated by the staff on a case by case basis. The staff had previously evaluated only the use of 1991 UBC for the ABWR standard design. Therefore, the applicant is requested to provide a detailed comparison of the differences between these two codes as they apply to the ABWR standard design, and provide justification for any differences in order for the staff to evaluate the use of the 2006 IBC. Also, Section 3.8.1.3.1, item (2)(b), has been revised to read "Section 9.3 of ASCE Standards 7-88 and Section 1613 of the International Building Code (IBC) specify that ..." This has created an apparent inconsistency, since IBC Section 1613 does not refer to Section 9.3 of the ASCE standard for relevant information. The applicant is requested to clarify the inconsistency.

### **03.08.01-2**

In FSAR Appendix 3H, page 3H-1, the applicant references (site specific) departure STP DEP 1.8-1. However, no such departures could be located in Part 7, Departures Report, which instead included STD DEP 1.8-1. This appears to be an error. The applicant is requested to correct the error, or clarify this.

### **03.08.01-3**

In FSAR Appendix 3H, Section 3H.1.4.2, sub-item (3), the applicant stated that the maximum flood level for STP units 3 & 4 site is 442 cm above grade against the corresponding ABWR standard design value of 0.305 m below grade (departure STP DEP T1 5.0-1). In Part 7 of the application, the applicant performed an evaluation of this departure, and stated that STP 3 & 4 safety-related SSCs are designed for or protected from this flooding event by watertight doors to prevent the entry of water into the Reactor Buildings and the Control Buildings in case of a flood. The applicant also stated that the exterior doors located on the 12300 floor of the Reactor Building and Control Building are revised to be watertight doors. Since these doors play a significant role in protecting safety-related SSCs and constitutes a special design feature, the staff requests the applicant to include in the FSAR sufficient design information about these doors including locations, seismic and other design criteria, seismic classification, redundancy features, if any, and if these doors will be used for normal access and egress to and from the Reactor Building and the Control Building.

#### **3.08.01-4**

In FSAR Appendix 3H, Section 3H.1.6, "Site Specific Structural Evaluation," the applicant addressed the effect of increased maximum flood level (STP DEP T1 5.0-1) for STP units 3 & 4 on the design of the Reactor Building (RB). In this section the applicant stated that "the load due to the revised flood level on the RB is less than the ABWR Standard Plant RB seismic load, and hence it doesn't effect the Standard Plant RB structural design." The staff considers this evaluation to be very qualitative, and the evaluation does not adequately address all issues associated with increased flood level. Therefore, the staff requests the applicant to provide a quantitative evaluation considering all effects due to the increased flood level including wave effects, if any, potential loadings due to flow and drag, overall stability of the structure considering floatation, etc. Also, it is not understood why the factor of safety for foundation stability considering buoyant forces from design basis flood reported in Table 3H.1-23 of the ABWR Standard Plant is not considered affected by the increased flood level. The same issue applies to the site specific structural evaluation of the control Building presented in Section 3H.2.6, and factor of safety for foundation stability reported in Table 3H.2-5 of the ABWR Standard Plant.

#### **03.08.01-5**

In FSAR Section 3G, "Response of Structures to Containment Loads," the applicant stated that the information in this section is incorporated by reference to the ABWR DCD. However, a review of Appendix 3B, "Containment Hydrodynamic Loads," Table 3B-1, "Pool Swell Calculated Values," indicate that there has been significant increase in pool swell height and pressure loads for STP units 3 & 4 compared to those reported in the ABWR DCD. Therefore, the applicant is requested to confirm that the results of response of structures to containment loads reported in ABWR DCD, Appendix 3G, are unaffected by the containment hydrodynamic loads reported in Appendix 3B of STP units 3 & 4, and is appropriate to be incorporated by reference.

## **Request for Additional Information No. 2964 Revision 2**

### **South Texas Project Units 3 and 4 South Texas Project Nuclear Operating Co Docket No. 52-012 and 52-013 SRP Section: 03.08.04 - Other Seismic Category I Structures Application Section: 3.8.4, Appendix 3H**

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

#### **03.08.04-1**

ABWR Standard Plant Design Control Document Section 3H.2.4.3.1.4 and STP units 3 & 4 RCOLA Section 3H.2.4.3.1.4 state that shear wave velocity is one of the parameters used in computation of lateral soil pressures. However, Section 3H.2.6 of the application states that “Shear wave velocity is not used as an input in the calculation of lateral soil pressures. Therefore, change in shear wave velocity has no impact on calculation of lateral soil pressures.” The staff requests the applicant to clarify this apparent inconsistency, and describe how lateral soil pressures were calculated for STP units 3 & 4, and how the calculated lateral pressures compare with those used in the ABWR Standard Plant design.

#### **03.08.04-2**

In FSAR Section 3.8.4, page 3.8-2, the applicant references the departure STD DEP T1 2.15-1 that reclassified the Radwaste Building Substructure from seismic category I to non-seismic, and removed all design information from FSAR Section 3.8.4 and Appendix 3H.3. While the staff agrees with the reclassification of the Radwaste Building Substructure as stated in the FSAR, the staff believes that the design information for this building still needs to be included in the FSAR in order for the staff to ensure that the design of the Radwaste Building Substructure has been performed in accordance with the guidance provided in RG 1.143 to meet the regulatory requirements contained in the General Design Criteria 2, and 60 of 10 CFR 50, Appendix A.

#### **03.08.04-3**

FSAR Section 3H.5.3 has removed the Seismic Category I Tunnels from the items to be included in the Structural Analysis Reports. The only departure referenced in Section 3H.5 (STD DEP T1 2.15-1) does not address this removal. Therefore, the applicant is requested to explain removal of Seismic Category I Tunnels from the Structural Analysis Reports, or identify in this Section where in the application this information may be found.

#### **03.08.04-4**

ABWR Standard Plant Design Control Document Section 3H.5.5 was titled “Structural Analysis Report For The Turbine Building,” and contained references to the Uniform Building Code (UBC) for design requirements. In FSAR Section 3H.5.5, the applicant changed the title to read “Structural Analysis Report For The Radwaste Building and The Turbine Building,” and did not identify any departure addressing the change. Further, the subsection refers to the UBC (changed to International Building Code (IBC) via STD DEP 1.8-1) for design requirements for both buildings. However, in the description of departure STD DEP T1 2.15-1 in Part 7 of the application, the applicant stated that “The detailed guidance for the design of the radwaste processing systems, structures, and components is provided in

Regulatory Guide 1.143. This departure commits to follow the guidance of Regulatory Guide 1.143.”  
The staff requests the applicant to explain this apparent inconsistency.

**Request for Additional Information No. 2965 Revision 2**

**South Texas Project Units 3 and 4  
South Texas Project Nuclear Operating Co  
Docket No. 52-012 and 52-013  
SRP Section: 03.08.04 - Other Seismic Category I Structures  
Application Section: 3.8.6**

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

**03.08.04-5**

In FSAR Section 3.8.6.1, page 3.8-4, the applicant addressed the COL License Information Item 3.23, and stated that foundation waterproofing is done by placing a chemical agent on the exposed concrete surface of the mudmat, and the concrete foundation is poured directly onto the concrete mudmat. Also, in FSAR Section 3H.6.6.4 the applicant stated that a chemical waterproofing agent will be applied to the exposed concrete surface of the mudmat for site-specific category I structures, and, in addition, a waterproof membrane will be installed on the walls up to one foot below grade, with a waterproof coating being applied from that level up to the flood level. The staff requests the applicant to provide the following information in order to understand the effectiveness of the proposed foundation waterproofing:

- (a) Provide details of the chemical agent proposed to be used, how it will be applied, and how it will accommodate any potential cracking of the mudmat due to placement of the massive concrete foundation and still be effective as foundation waterproofing. Provide information to support that this type of waterproofing is adequate to protect the concrete foundations against degradation due to aggressive soil/groundwater.
- (b) Provide the value of the coefficient of friction assumed between the concrete foundation and the mudmat with the chemical agent applied on top, the basis for the assumed value, and how it compares with the coefficient of friction assumed in the standard ABWR design in determining the factor of safety against sliding.
- (c) Describe in detail the type of waterproofing membrane proposed to be used including operating experience with use of such membranes at the site or elsewhere, and vendor or operating experience data which demonstrate that the type of waterproofing membrane retains adequate water-retarding properties under aggressive soil conditions comparable to the site for long period of time without degrading.

**03.08.04-6**

In FSAR Section 3.8.6.3 the applicant addressed the COL License Information Item 3.25 regarding the Structural Integrity Test (SIT), and stated that the details of the test and instrumentation, as required for such test, will be provided to NRC for approval. The applicant is requested to include this information in this section, or provide information about when this will be available for review, and what tracking mechanism is established to ensure compliance.

**03.08.04-7**

In FSAR Section 3H.6.1, the applicant stated that the site specific seismic category I structures are shown in Figures 1.2-32 through 1.2-37. The staff has the following questions regarding these figures:

- (a) Figures 1.2-32 and 1.2-33 show the arrangement drawing for the Turbine Building, which is not a seismic category I structure. The applicant needs to correct the reference to the figures.
- (b) Figures 1.2-34 through 1.2-37 are not legible. The applicant needs to provide legible copies of these drawings.

#### **03.08.04-8**

In FSAR Section 3H.6.4.1, the applicant described the design codes and standards to be used for site-specific seismic category I structures. The list appears to be incomplete, since it does not contain any steel code, welding code, and the regulatory guides that are usually listed in this section. Therefore, the applicant is requested to confirm that the list provided includes all major codes and standards which will be used for design of site-specific seismic category I structures.

#### **03.08.04-9**

In FSAR Section 3H.6.4.3.1.2, the applicant stated that “for computation of global seismic loads and the definition of load combinations that include seismic loads, the live load is limited to the expected live load present during normal plant operation,  $L_o$ . This load has been defined as 25% of the operating floor and roof live loads.” SRP 3.7.2, SRP Acceptance Criteria 3.D, recognizes the use of 25% of the floor design live load in the dynamic model for computation of global seismic loads only. Therefore, the applicant is requested to provide detailed justification as to why seismic load combinations for design of seismic category I structures need to consider only the normal plant operating condition when only 25% of the design live load is assumed to be present. Also, the applicant is requested to describe the basis for the assumption that only 25% of the design live load would be present during normal plant operation, and demonstrate that the assumption meets industry standards for consideration of minimum live load to be used for design of seismic category I structures.

#### **03.08.04-10**

In FSAR Section 3H.6.4.3.3, “Extreme Environmental Load,” the applicant included the tornado loads and the seismic loads. According to the guidance provided in the Interim Staff Guidance ISG-7 recently issued for public comments, the snow load due to the extreme winter precipitation event should also be considered as an extreme environmental load. Therefore, the applicant is requested to include the snow load due to the extreme winter precipitation event in this section, or provide justification for not doing so.

#### **03.08.04-11**

In FSAR Section 3H.6.4.3.3.1, “Tornado Loads ( $W_t$ ),” item 3(b), the applicant stated that “the global overall damage prediction will be performed during the detailed design phase in accordance with Section 3.5.3.2.” Since all seismic category I structures must be designed for the effects due to the design basis tornado to meet the requirements of the General Design Criterion 2 of Appendix A to 10CFR50, the staff expects to see this evaluation performed before licensing. Please submit the evaluation for Staff review, or justify why it need not be provided.

#### **03.08.04-12**

In FSAR Section 3H.6.4.3, “Design Loads and Load Combinations,” the applicant described the various loads and load combinations that will be used for design of site-specific seismic category I structures. However, this section does not include any description of the thermal loads, loads due to the probable maximum flood, hydrostatic loads, and calculated lateral soil pressures used for the design of site

specific structures. Therefore, the applicant is requested to include the above information in this section, or provide justification for not doing so.

**03.08.04-13**

In FSAR Section 3H.6.6.1, "Structural Analysis and Design Summary," the applicant stated that "the structural analysis of the UHS Basin, UHS cooling tower enclosures, and RSW pump houses will be performed using a three-dimensional finite element model of the structures... A separate model will be developed for use in the evaluation of the RSW piping tunnels ..." The applicant has not performed these analyses yet, and has not provided any final design details and results for these structures in the application. Therefore, the applicant is requested to include structural analysis and design information for all site-specific seismic category I structures in the FSAR using the guidance provided in SRP 3.8.4, and other applicable SRP sections and guidance documents.