Department of Energy
Washington, DC 20585

December 29, 2010

The Honorable Peter S. Winokur
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004-2901

Dear Mr. Chairman:

In the Defense Nuclear Facilities Safety Board's (Board) letter to me on December 2, 2009, the Board requested that they be kept apprised of the status of the Peer Review Team's (PRT) efforts on a quarterly basis through a list of issues developed and their status and resolution until all identified issues with the Waste Treatment and Immobilization Plant (WTP) structure have been resolved. This PRT was focused on structural aspects of the WTP facilities, and is referred to as the Structural Peer Review Team in this letter. Enclosed is the list of activities of an Equipment Qualification Peer Review Team (EQPRT) that has been established and their status that the Board requested. In addition, this letter also discusses the WTP project.

The PRT activities for this quarter included continuation of reviews with both the Structural PRT and the EQPRT.

Structural Review

On November 1-2, 2010, the Structural PRT reviewed the following items associated with Soil Structure Interaction (SSI):

1) SSI analysis for the Pretreatment Facility (PTF) Control Building – Review of SSI analysis for the PTF Control Building did not identify any significant issues.

2) High-Level Waste (HLW) SSI analysis to assure that recently identified issues with the Systems for Analysis of Soil-Structure Interaction (SASSI) software did not cause spurious results - Bechtel National, Inc., presented studies that support the contention that the existing HLW SSI results were not corrupted by the SASSI software issues. The PRT will review the presentation material and their conclusions will be included in its Structural PRT Report scheduled to be issued in January 2011. In addition to the review by the PRT, the SASSI issues are being reviewed by the Structural Advisory Panel, under the sponsorship of the Chief of Nuclear Safety, and a report will be issued early next year. Furthermore, recommendations by DOE-EM will require demonstration of the acceptability of the existing SASSI analysis for HLW.

3) Review of calculation and drawings - The Structural PRT also reviewed specific calculations and structural drawings issued since the last review. No programmatic issues have been or were identified. Detailed comments will be provided in the January 2011 Structural PRT report.

During this review, the Structural PRT concurred with 22 comment responses. Eighteen comments remain open from previous reviews and are documented in Enclosure A. New items, not included in Enclosure A, from the November 2010 review, will be documented in the January 2011 Structural PRT Report.

Equipment Qualification Review

On November 1-2, 2010, the EQPRT reviewed Equipment Seismic Qualification. The EQPRT focused on the analysis of the Plant Wash Vessel (PWD-VSL-00044). The review resulted in comments; however, none were categorized as violations of code requirements or programmatic failures. At the request of the DOE Waste Treatment Plant (WTP) Project Office, Appendix L of the WTP Safety Requirements Document, Volume II, was included in the review. The EQPRT recommended that quarterly reviews be instituted because of the importance of the equipment and the maturing state of equipment procurement, analysis, and qualification.

During this review, the EQPRT concurred with 24 comment responses. Fourteen comments remain open and are included as Enclosure B. New items, not included in Enclosure B from the November 1-2, 2010, review will be documented in the January 2011 PRT Report. The next PRT reviews are scheduled to take place in the first quarter of calendar year 2011.

If you have any questions, please contact me or Kenneth G. Picha, Jr., Acting Deputy Assistant Secretary for Safety and Security Program at (202) 586-5151.

Sincerely,

Inés R. Triay
Assistant Secretary for
Environmental Management

Enclosures

SEPARATION

PAGE

Document: 24590-PTF-SSC-S15T-00202, PTF Design Steel Framing 98-ft to 120-ft Elevation, Rev. A			
Item	Section	Page	Comment
12			Section 5.2 of Calculation 24590-PTF-SSC-S15T-00202 discusses column design and the situation where the bottom chords of the roof trusses between column lines E.1 and H.1 at column lines 11 to 22 are 18 inches lower than the bottom chords of the adjacent trusses. These bottom chords were assumed at the same elevation in the Structural Analysis Program (SAP) model. The detail shown is a fine way to deal with this eccentricity in the connection. But the eccentricity creates a moment of the chord force times the eccentricity which must be manually cranked into these connections and resisted by weak way bending of column and chords. For clarity, draw a free body diagram around and beyond the connection and this moment becomes quite clear. Revised calculations of the columns and bottom chords of the trusses are required.
20			The calculation of the roof purlins in Section 7.4 of Calculation 24590-PTF-SSC-S15T-00202 considers only W12 x 58 and W12 x 72 purlins with D/C ratios of 0.78 and 0.84 with torsion as discussed in comment 31. Drawings 24590-PTF-SS-S15T-00072, 00073, 00076 and 00077 at Elevation 98 specify "All purlins to be W12 x 40". A calculation is needed to justify this W12 x 40 purlins or the size on the drawings needs to be consistent with the calculation

Document: 24590-PTF-SOC-S15T-00062, PTF Roof Steel Structure Response Spectrum Analysis, Rev. A			
Item	Section	Page	Comment
19			The design of the PTF purlins is based on a response spectrum analysis contain in Appendix E of Calculation 24590-PTF-SOC-S15T-00062. Demands are summarized in Table E-8.1. The terms M2 and M3 seem to be weak-way purlin bending and the vertical bending load. Torsion is given as zero for all cases. The purlins are reportedly designed for 2% of the roof diagonal axial load as the purlins brace these roof diaphragm diagonals. Fine in theory, but the roof diagonal brace is at an approximate 45 degree angle from the purlin, so the component of the 2% brace force parallel to the purlin provides some of the M3 bending moment. The component of the 2% brace force perpendicular to the purlin provides some M2 bending plus torsion in the purlin due to the 18 inch eccentricity from the center of diagonal brace to the purlin. This torsion is not included in the purlin analysis. Furthermore, Detail 1 on Drawings 24590-PTF-SS-S15T-00431 shows the connection includes no stiffener in the purlin, so this twisting torsion and horizontal weak-axis force is applied to the bottom flange of the unstiffened purlin, requiring a detailed analysis. Typically the end connection of the purlin stiffened, which helps resist the purlin torsion. A calculation is needed to verify that the purlin can resist the torsion. A calculation is also needed to verify that this diagonal brace lateral brace with torsion in the purlin is stiff enough to be an effective lateral brace.

Document: 24590-HLW-SSC-S15T-00133, Rev. A Melter 1 Decontamination Crane Runway			
Item	Section	Page	Comment
18		5 10	Section BB a single plate is used to laterally brace the top flange of the crane support beam to the wall at a location without vertical support. The plate design on Sheet 10 doesn't appear to consider bending moments induced in the plate due to the vertical translation of the crane support beam. The magnitude of these stresses should be evaluated in light of the expected 43,800 loading cycles. If this detail is used on other crane runways then those runways should also be examined to determine if the vertical translation induced stresses are acceptable. Note: use of an alternate detail which accommodates vertical deformation is preferred.

Document: 24590-HLW-SSC-S15T-00074, Rev B, "Lower Canister Handling Crane Runway"			
Item	Section	Page	Comment
21		I-2 I-11	The acceleration for the NS direction is shown as 0.525g for a crane frequency of 13.1 HZ. On sheet I-11 the NS spectrum for 4% damping shows an acceleration of approximately 2g at 13.11Hz. Bechtel National, Inc. (BNI) should justify the value of 0.525g used in the calculation.

Document: 24590-HLW-S0C-S15T-00025, Rev 0C Structural Model with Equipment Seismic Loads			
Item	Section	Page	Comment
22		3	The Executive Summary states that "the scope of this calculation is to develop a finite-element model (FEM) of the HLW Building using GTSTRUDL and to generate the solutions required for section forces (moments and shears) in the HLW base mat, walls, slabs on grade and elevated slabs." This is inconsistent with the implemented process where a SAP2000 model is being used for the development of member forces and moments. It is also stated in the Executive Summary that "the FEM solution has been determined and is available for determining sections forces needed in the design of the reinforcing in the concrete structural elements such as walls and slabs." It would be consistent with the BNI process used to develop the member and element forces and moments used for design to state that this model is being a basis to translate geometry and boundary conditions to alternative software that will meet the meshing criteria.

Document: 24590-HLW-S0C-S15T-00025, Rev 0C Structural Model with Equipment Seismic Loads			
Item	Section	Page	Comment
23		10	The mesh criteria in this calculation as listed on Sheet 10 differ with 24590-WTP-DC-ST-01-001 Rev 10, Structural Design Criteria., which is Reference Structural Design Criteria (SDC) in this calculation. There is no mention that the model mesh will not meet the referenced criteria. It should be stated in the calculation the reasons for not meeting the criteria. It is stated elsewhere in the calculation that the size of the mode restricts the number of nodes and elements, but in the scope of the calculation it is stated in the executive summary, then further explanation is necessary. Perhaps stating that this will be resolved by performing the analysis using alternative software.
26		40	In Section 8.1.7 it states: "Lateral seismic soil springs have been reduced as discussed above to achieve the displayed demands. Since the recommended design friction coefficient is 0.5 (Table 10, Ref SDC), the analysis needs to be rerun with reduced lateral springs for the south part of the export area." Was the analysis rerun, or were modifications made to the model before it was transformed into a SAP model?
27		41	Section 8.1.9 states: "In conclusion, proper finite element solutions with basic loadings have been obtained for post processing to obtain data necessary for concrete rebar design and evaluation in the base mat of the building, subject to resolution of two items: (1) Significance of the excessive friction demand by the south section of the Export slab on grade; (2) Significance of the uplift in slabs on grade" Have these items been resolved, and if so, how?

Document: 24590-HLW-SSC-S15T-00231, Horizontal Bracing Connection Design for HLW Building Steel Framing At EL 72'-0" and the Roof, Rev. A			
Item	Section	Page	Comment
5	7.2, 7.3, 7.4, 7.15, 7.17 and 7.18		For the connections in Section 7.2, 7.3, 7.4, 7.15, 7.17 and 7.18, the calculations in this part connect the diagonal brace to a gusset that connects the web of two steel beams adjacent to the beam column connection. Where is the adequacy of the beam to column connection verified to be adequate for the additional horizontal load from the diagonal brace?

Document: HLW-SSC-S15T-00232, Vertical Bracing Connection Design for HLW Building Steel Framing between EL 58'-0" and Roof, Rev. A			
Item	Section	Page	Comment
17	7.24 through 7.29		In connections like 7.24 where one diagonal brace and a beam connect to the column, gravity load from the beam seems to have been overlooked in this connection design.

Document: HLW-SSC-S15T-00232, Vertical Bracing Connection Design for HLW Building Steel Framing between EL 58'-0" and Roof, Rev. A			
Item	Section	Page	Comment
18	7.3 through 7.9		In connections like Section 7.3 where two diagonal braces and a beam connect to the column, the only loads considered are the axial forces in the braces. Why are gravity loads from the beam not included in this calculation for connection to the column?

Open Comments PTF Control Building Structural Calculations

Document: 24590-PTF-S0C-S15T-00022, PTF Control Building – Generation of In-Structure Response Spectra, Rev. A			
Item	Section	Page	Comment
16		14 C49	Inspection of the response spectra show that there is a lot of response in the high frequency regions of the spectra, for example the spectra on page C-49, where the 5% damped spectra is greater than 4g between about 9 Hz and 15 Hz. There are several similar spectra at other locations. This could be a problem in equipment qualification, particularly for functionality and possibly some structural qualification problems. Suggest that a conclusion be included to discuss this potential qualification issue in Section 8 of the report.

Open Comments PTF Control Building Structural Calculations

Document: 24590-PTF-S0C-S15T-00022, PTF Control Building – Generation of In-Structure Response Spectra, Rev. A			
Item	Section	Page	Comment
16		14 C49	Inspection of the response spectra show that there is a lot of response in the high frequency regions of the spectra, for example the spectra on page C-49, where the 5% damped spectra is greater than 4g between about 9 Hz and 15 Hz. There are several similar spectra at other locations. This could be a problem in equipment qualification, particularly for functionality and possibly some structural qualification problems. Suggest that a conclusion be included to discuss this potential qualification issue in Section 8 of the report.

SEPARATION

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Enclosure B – Open Comments DOE-WTP Equipment PEER Review

Document: WTP-DC-PS-03-001, Jumper Stress Design Criteria Revision 0	
Item	**Comment**
2	A-09-WED-AMWTP-RPT-006–A003 There is no evidence that the allowable loads on the Purex and Grayloc connectors can be correlated to achievable torque/tightness levels of the connectors. The time vs. applied torque method used to tighten the remote connectors inherently has a large variability on the final torque level of the connector. This variability needs to be addressed in determining the allowable loads on the connectors It is recommended that testing be completed to determine allowable loads on the Purex and Grayloc connectors. In preparation for the test, the torque wrench that will be used in the installation of the jumpers must be evaluated in its operating configuration to determine minimum torque levels.
4	A-09-WED-AMWTP-RPT-006–A004 There appears to be no structural design criteria for electrical jumpers. Even if qualified power is not required, there needs to be structural design criteria to address II/I interactions.

Document: QL-POA-MKHO-00001-06-00005, Generic Seismic Qualification Report for Four Pack Safe Change HEPA Filter Housing Revision 00C	
Item	**Comment**
5	A-09-WED-AMWTP-RPT-006–A006 It is not clear if the validation problems test all the features being used in the finite element analysis. The model uses plate elements under unsymmetrical loading and the only test problem is a spherical cap under uniform pressure. This is not deemed as an adequate set of validation problems for the specific application. Recommend including a validation problem with unsymmetrical loading on the plate elements.

Document: WTP-3PS-FB01-T0001, Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks, Revision 4	
Item	**Comment**
12	A-09-WED-AMWTP-RPT-006–A018 The specification notes that in general the vertical test-response spectra may be taken as two-thirds of the given horizontal input motion. This may not be conservative, and for certain component mounting locations (i.e., near the center of floor slabs) will almost certainly be unconservative. The test response spectra should be based on a scale factor of 1.1 per STD-1020 times the mean centered in-structure response spectra developed for the component mounting location (for PC1 and PC2 components). Please provide clarification on the basis for the vertical test response spectra criteria.

Document: WTP-3PS-MV00-T0003, Engineering Specification for Pressure Vessel Fatigue Analysis Revision 2	
Item	**Comment**
15	A-09-WED-AMWTP-RPT-006–A021 The hydrodynamic loads from the Pulse Jet Mixers (PJM) are extremely complex and it is not assured that they can be accurately described analytically. The Equipment Qualification Peer Review Team (EQPRT) recommends that an in-situ test be performed on a completed vessel with PJM's as a final verification that the stress levels at critical locations are bounded by the analysis.
16	A-09-WED-AMWTP-RPT-006–A021 The version of the Division 2 Code that is being used for fatigue criteria contains only a single method for fatigue analysis, which is based on smooth bar fatigue test. The current version of Division 2, current fitness for service codes and European vessels codes based fatigue analysis on tests that account for weld defects. Because the limiting conditions for the life of vessels are the fatigue critical locations at welds the EQPRT recommends that a sample of the vessels be checked using a fracture mechanics based fatigue approach accounting for the residual stress due to welding and forming and maximum possible initial weld defect size.

Document: WTP-3PS-MV00-T0003, Calculation UFP-VSL-00001A/B Ultrafiltration feed Preparation Vessel, Stress Analysis, Revision 2	
Item	**Comment**
18	A-09-WED-AMWTP-RPT-006–A028
19	The section providing a discussion of the analysis results needs to be augmented. There is no way, with the information provided, that the critical loading condition and the maximum stress location in the vessel can be determined. The EQPRT recommends that margins to code allowable stresses be provided for the critical components in the vessel for each load case including the locations of the maximum stress in the Revision 0 of calculation. A-09-WED-AMWTP-RPT-006–A029 There was a response spectrum analysis performed for an envelope response spectra bases on the Revised Ground Motion spectra. Section 5.3.3 of the calculation required that 90% of the total mass be accounted for in active modes in the analysis. The EQPRT recommends that in Revision 0 to this calculation that the frequencies and associated mass participation factors be provided to identify in what frequency range the vessel is responding and the percentage of mass participating in the seismically flexible region and that 90% of the mass is included.

Document: WTP-DC-PS-03-001 Jumper Stress Design Criteria, Revision 0	
Item	**Comment**
22	A-09-WED-AMWTP-RPT-006-O001 If post seismic leakage criteria are imposed on the Purex and Grayloc connectors, additional testing will be required to determine allowable loads. WTP-DC-PS-03-001 0 Jumper Stress Design Criteria Therefore it is recommended that the post seismic function of the jumpers be completed and documented.

Document: LAW-SSC-S15T-00028 C5 Fan Anchorage at (-) 21' , Revision 0	
Item	**Comment**
23	A-09-WED-AMWTP-RPT-006–A022 The reference for the tension and shear on the bolt is a D+0p+E combination. Since there is no breakdown, in the reference calculation 6p the total load is treated as the seismic load and the Allowable Stress Design (ASD) factor for 6p (D+Op+E)/1.4 is used for full load combination for tension, rather than D+E/1.4. This is likely to be conservative, but not always, for example if 6p the tension from the seismic overturning much greater than the 6p compression from the weight of the structure, then applying the ASD factor 6p to the total load could be unconservative. It is also possible that the operating load associated with internal pressure adds additional tension 6p and this would also be an unconservative contribution. The reference calculation should be examined to assure that the design 6p load used is not unconservative.

Documents: **WTP-3PS-FB01-T0001, Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks, Revision 3** **WTP-3PS-FB01-T0001, Engineering Specification Engineering Specification for Seismic Qualification of Seismic Category I Control and Electrical Systems and Components, Revision 4**	
Item	**Comment**
28	A-09-WED-AMWTP-RPT-006-O007 This comment really goes to all three of the qualification specifications (seismic qualification of category I/II tanks and equipment, seismic qualification of pressure vessels, structural design loads for seismic category III and IV equipment and tanks, and seismic qualification of Seismic Category I Control and Electrical Systems and Components): Of the four qualification specifications only 24590-WTP-3PS-JQ06-T0003 "Seismic Qualification of Seismic Category 1 Control and Electrical Systems and Components" considers the use of experience data ("similarity to previously qualified equipment" as stated in Section 6) as an acceptable method for qualifying active electrical and mechanical components. The use of experience data may be a more cost effective method for qualifying some components and probably should not be excluded. Please provide clarification on why the use of experience data methods is not emphasized and encouraged in some of the specifications that will be transmitted with material requisitions. The EQPRT recommends that the use of experience data methods be explicitly included in the appropriate specifications that are transmitted with material requisitions.

Document: QL-POA-MKH0-00001-06-00005, Generic Seismic Qualification Report for Four Pack Safe Change HEPA Filter Housings, Revision 00C	
Item	**Comment**
29	A-09-WED-AMWTP-RPT-006-O008 Distributing the weight associated with elements not modeled to the density of the remaining elements could be an unconservative approach, but likely of a minor consequence. If the revised weight distribution increases the cg or increases the lateral offset then the implemented method would be unconservative. It is not discussed how much weigh is redistributed other than to increase the density so that the total weight is 3575 pounds. If the cg of the missing weight is above the cg of the structure, then the assumption could be non-conservative with respect to the anchors. While adding the weights where they are located is more appropriate, at least some discussion on why the redistribution as implemented is reasonable should be provided. It is recommended in using simplified assumptions that a statement be included in the calculations justifying that the assumption does not lead to an unconservative design.

Documents: **PTF-MVD-HLP-00007 Mechanical Data Sheet (MDS) HLW Lag Storage Vessel, Revision 7** **PTF-MVD-HLP-00008 MDS HLW Lag Storage Vessel** **QL-POC-MVA0-00001-19-00011 00D, Finite Element Analysis Calculation from Harris Thermal for HLW Lag Storage Vessel, Revision 00D**	
Item	**Comment**
37	A-09-WED-AMWTP-RPT-006-O017 The document does not make it clear how to apply the load data provided for the PJM's. For example is the negative pressure intended to impose a stress range or how to apply the vertical pressure load? The EQPRT recommends that the MDS be revised to provide specific direction to apply the load data.

Document: WTP-DC-PS-03-001 Jumper Stress Design Criteria, Revision 0	
Item	**Comment**
39	A-09-WED-AMWTP-RPT-006-O022 The valves in the jumpers connecting the waste process vessels to the process pumps must close following a seismic event to maintain the safety envelope for the facility. In several positions multiple jumpers using a combination of both Purex and Grayloc connectors are used. The analysis cannot account of all possible interactions between the different components in these complex assembles. Examples of these interactions would include misalignment during remote jumper placement and variability in tightness of the connectors. Operability that cannot be confirmed by analysis alone requires testing or through similarity with experience based qualification. It is recommended that one generic jumper assembly including all active valves be tested using IEEE 344 subject to amplified input spectra (to address rack amplification) as verification of post seismic function of the valves.