September 06, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission
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SUBJECT: NuScale Power, LLC Replacement and Supplemental Responses to NRC Request for Additional Information No. 133 (eRAI No. 8936) on the NuScale Design Certification Application

REFERENCES:
1. U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 133 (eRAI No. 8936)," dated August 05, 2017
2. NuScale Power, LLC Response to NRC "Request for Additional Information No. 133 (eRAI No. 8936)," dated June 25, 2018

The purpose of this letter is to provide the NuScale Power, LLC (NuScale) replacement and supplemental responses to the referenced NRC Request for Additional Information (RAI), as discussed at a teleconference on August 7, 2018.

The Enclosure to this letter contains NuScale's replacement and supplemental responses to the following RAI Question from NRC eRAI No. 8936:

- 03.07.02-10

This replacement response replaces the response provided in Reference 2.

This letter and the enclosed response make no new regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions on this response, please contact Marty Bryan at 541-452-7172 or at mbryan@nuscalepower.com.

Sincerely,

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Enclosure 1: NuScale Replacement and Supplemental Responses to NRC Request for Additional Information eRAI No. 8936

Enclosure 1:

NuScale Replacement and Supplemental responses to NRC Request for Additional Information eRAI No. 8936

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Response to Request for Additional Information
Docket No. 52-048

eRAI No.: 8936
Date of RAI Issue: 08/05/2017

NRC Question No.: 03.07.02-10

10 CFR 50 Appendix S requires that the safety functions of structures, systems, and components (SSCs) must be assured during and after the vibratory ground motion associated with the Safe Shutdown Earthquake (SSE) through design, testing, or qualification methods.

On Page 3A-1 of the FSAR, the staff noted that a detailed dynamic analysis of the NPM subsystem is performed using a more detailed NPM model and the input time histories obtained from the SSI analysis of the reactor building which included a simplified NPM to account for the coupling of NPMs and the reactor building. The applicant is requested to provide in the FSAR a comparison of the seismic demands (forces and moments) at the NPM upper and bottom support locations interfacing with the RXB obtained from the SASSI analysis of the RXB system model and from the ANSYS analysis of the detailed 3D NPM system model. The applicant should explain any significant differences and confirm that the loads used for the NPM support designs are conservative.

NuScale Response:

As discussed in NRC Public meetings on 7/24/2018 and 8/7/2018, the NRC provided supplemental questions to eRAI 8936 Question 03.07.02-10 as follows:

NRC Supplemental Questions:

1. The applicant provided Table 1 in the RAI response that summarizes the comparison of maximum reaction forces between the 3D detailed model and simplified beam model. However, in its proposed markup, the applicant did not indicate that this table will be included in the FSAR. Currently, FSAR Table 3B-27 includes only the force demands from the SASSI beam model and associated D/C ratios. Since the envelop of the 3D and beam model results is intended to be used as the design basis demands for NPM support design, Table 1 should be included in the FSAR or existing Table 3B-27 should be expanded to include ANSYS 3D results.

2. In the RAI response, the applicant states that three analysis cases (involving different combinations of concrete cracking and NPM frequency shifting) are considered in the enveloping of SASSI and ANSYS analysis results.

   a) Based on the RAI response, it appears that the design-basis seismic demands for NPM skirt and lug supports are determined by enveloping the results from the SASSI and ANSYS analyses for the 3 analysis cases described in the RAI response. Each ANSYS analysis case covers two different NPM configurations (NPM1 and NPM6). Please confirm if that is a correct understanding. FSAR Table 3.7.2-34 provides “seismic analysis identification codes” for key Category I SSCs. Since the NPM supports are important structural elements and its seismic demands are determined in a manner distinctive from other structural elements, the applicant should consider expanding Table 3.7.2-34 to include the NPM supports (skirt and lug restraints).

   b) The third analysis case (Case 3) introduced in the RAI response involves the frequency of NPM reduced by 15%. Staff understands that design-basis RXB SASSI analysis cases discussed in FSAR Section 3.7.2 all use an NPM beam model with its nominal frequency (100%) and no analysis cases involved an NPM with reduced frequency. Please clarify if the applicant ran SASSI analysis with a 15% reduced-frequency NPM beam model in establishing the seismic demand envelope for NPM support design.

   c) Please provide a comparison of the SASSI results from analysis Case 1 (cracked concrete and 100% NPM frequency) and Case 3 (cracked concrete and 85% NPM frequency) introduced in the RAI response.

   d) If the comparison in (c) indicates significant differences, please discuss potential impact of a reduced-frequency NPM beam model on RXB design-basis seismic demand calculations discussed in FSAR Section 3.7.2.4.

   e) Staff notes that FSAR Table 3B-52 indicates NPM stiffness reduction to 77%, which would correspond to 12% reduction in frequency (compared to 15% mentioned in the RAI response). Please check for consistency.

3. In an FSAR markup (Section 3.7.2.1.2.2, Page 3.7-118, Draft Revision 2), the applicant proposed to include a statement, “At the interface between the NPM and the RXB, the design loads for the skirt and lug supports are defined as the envelope between the SASSI2010 building model and the 3-D model discussed in Appendix 3A.” Staff notes that the analysis cases considered in the enveloping are not specified in this statement. In the context of Section 3.7.2, “SASSI2010 building model” could imply the 612 analysis cases considered in establishing the RXB design basis envelope. The applicant should include an adequate qualifier indicating what analysis cases are involved in the enveloping; e.g., the three analysis cases described in the RAI response could be included or referred to in the markup statement.

4. In the RAI response and associated FSAR markups, the applicant indicated that the design loads for the CNV skirt support and NPM bay wall lug restraints are defined as the envelop between the SASSI2010 building model and the 3-D model discussed in Appendix A. While the RAI response provided updated D/C ratios for both the CNV skirt support and NPM bay wall lug restraints, only the updated D/C ratios for the CNV skirt support were addressed in the FSAR markups. The staff request the applicant to provide FSAR markups addressing the updated D/C ratios for all modes of failure of the NPM bay wall lug restraints based on the aforementioned envelop design loads.

5. The staff requests the applicant to clarify whether the updated seismic demands and associated D/C ratios have been considered in the seismic margin evaluation discussed in FSAR Chapter 19 and describe associated updates or provide the basis for the seismic margin evaluation remaining unaffected as applicable.

6. In the RAI response, the applicant provided a proposed markup for TR-0916-51502-P (Page 26, Pages 168-169; Draft Revision 1). However, it appears that page(s) are missing after Page 26 in the markup. Please check.

NuScale Response to Supplemental Questions:

1. FSAR Tier 2, Table 3B-27 has been deleted and Table 3B-28 has been added to include the enveloped reaction forces between the ANSYS and SASSI models run for the three cases. The table now includes the results for lug support and NPM skirt support reaction forces used for design.

2. The following comments have been addressed:

   a) It is confirmed that the design basis for the NPM skirt support is an envelope of the SASSI and ANSYS results for the three cases. However, the design basis for the NPM lug supports is described in FSAR Appendix 3B.2.7.4 through a detailed submodel analysis. FSAR Tier 2, Table 3.7.2-34 has been expanded to include a subsection definition for the RXB NPM skirt and lug supports.

   b) The SASSI analysis has been run for the reduced NPM stiffness case. FSAR, Tier 2 Section 3.7.2.1.2.2 has been updated to include a description of the SASSI model used for design of the NPM skirt and lug supports. FSAR Appendix 3B.3.7.3 and Appendix 3B.3.7.4 have been updated to include the specific cases used for design.

   c) Table 2 has been added to the RAI response to provide a reaction force comparison between SASSI Cases 1 and 3.

   d) The comparison in Table 2 shows that there is minimal impact on the building side when reducing the stiffness of the NPM.

e) For consistency, the descriptions of the three cases has been changed in the FSAR, and now reference Appendix 3A for the detailed description of the analyses. The wording in the RAI response has been updated to be consistent with the FSAR Table 3B-52 (see below).

3. FSAR Table 3.7.2-34 has been expanded to include a subsection definition for the RXB NPM skirt and lug supports.

4. FSAR Table 3B-27 has been deleted and FSAR Table 3B-28 has been added to include the enveloped reaction forces between the ANSYS and SASSI models run for the three cases. The modes of failure of the NPM bay wall lug restraints are addressed in RAI 8973 question 03.08.04-21S3.

5. Updates to seismic demands and associated demand to capacity (D/C) ratios have been considered for the seismic margin assessment discussed in FSAR Chapter 19 and there are no impacts to applicable fragility calculations. The updated seismic demands impact the design-level D/C ratios used for fragility evaluations of the NuScale Power Module (NPM) base supports. The increase in D/C ratios associated with these updated seismic demands is primarily caused by a reduction in structural damping, from 7% to 4%. To evaluate the fragility of the NPM base supports in support of the development of the seismic margin assessment, conservatisms in the design-level D/C ratios are removed such that the analysis represents a best-estimate (median-centered) evaluation of demand and capacity. Per EPRI TR-103959, Methodology for Developing Seismic Fragilities, the NPM base supports consider median-centered structural damping of 7% for welded steel near yielding and 10% for prestressed concrete near yielding. As a result, any conservatism associated with structural damping for design-level analysis, whether 7% or 4%, is removed so that the fragility is median-centered. Consequently, while changes to structural damping impact seismic demands and the evaluation of design-level D/C ratios, fragility calculations remain dependent on a median-centered structural damping level, which is unchanged from previous analyses. Thus, the change in design-level D/C ratios due to updated seismic demands has no impact on the NPM base support fragility calculations supporting the seismic margin assessment.

6. The applicable revised FSAR pages have been included.

NuScale Updated RAI Response:

The simplified model provides an approximate static and dynamic representation of the NuScale Power Module (NPM) within the Reactor Building (RXB) structure. The simplified beam model is developed because of the computational limitations of the soil-structure interaction (SSI) software used for the building seismic analysis. Three SSI analysis cases have been prepared in order to compare reaction forces from the 3-D NPM (ANSYS) model with the simplified NPM beam (SASSI) model. The cases have been selected because, typically, they are the bounding for design:

- Case 1: Soil Type 7, cracked concrete, 4% concrete damping, nominal NPM stiffness, Capitola input.
- Case 2: Soil Type 7, uncracked concrete, 4% concrete damping, nominal NPM stiffness, Capitola input.
- Case 3: Soil Type 7, cracked concrete, 4% concrete damping, 77% of nominal NPM stiffness, Capitola input.

There are two key differences between the simplified beam model and the 3-D detailed model, which may account for slight variations in reaction forces at the building support locations:

	3D Detailed Model	**Simplified Beam Model**
1.	Incorporates non-linear behavior at the skirt location, allowing a more realistic representation of module uplift.	Assumes linear-elastic connection at the base of the NPM, separation is not allowed at the skirt location.
2.	RXB pool water geometry and mass distribution is modeled explicitly using ANSYS fluid elements with contact surfaces.	The dynamic behavior of RXB pool water is approximated using distributed point masses at structural node locations.

Although the detailed 3-D model provides an accurate representation of the NPM and reaction forces on the NPM bay walls and basemat, an envelope of reaction forces is used to provide a conservative design.

A summary of the maximum reaction forces at the NPM1 and NPM6 locations in the 3D ANSYS model, and at all twelve NPM locations in the SASSI model, is provided in Table 1. The two horizontal force components are combined using SRSS for the design of the containment vessel (CNV) skirt and skirt support. An envelope of the demand forces is used as the minimum design input for the CNV skirt, skirt support and NPM bay wall lug restraints. Additionally, Table 1 includes the seismic reaction force used for the design calculation.Modeling the NPM at 77% of the nominal stiffness has minimal impact on the RXB building side of the analysis. The results of the Case 1 and Case 3 from the SASSI RXB building analyses are provided in Table 2. The nominal stiffness case envelops the reduced stiffness for the NPM skirt reaction forces, and the lug reaction forces are within 4%. The maximum lug reaction is bounded by the ANSYS seismic model results.

The ANSYS results of the parametric studies have been added to the technical report TR-0916-51502, referenced in FSAR Appendix 3A. The envelope of SASSI and ANSYS results are provided in the FSAR Section 3.7.2, while the demand/capacity ratios have been added to Appendix 3B.2.7.3 and Appendix 3B.2.7.4.

Table 1: Summary comparison between 3-D detailed model and simplified NPM beam model of maximum reaction forces at the concrete interface with skirt and lug restraints, 4% damping.

NPM Model	SRSS Skirt Horizontal	Vertical Skirt	East Lug	West Lug	North Lug
	($x10^3$ kips)	($x10^3$ kips)	($x10^3$ kips)	($x10^3$ kips)	($x10^3$ kips)
3D Detailed ANSYS	1.20	1.62	3.15	2.24	3.68
Simplified Beam SASSI	1.59	1.86	2.18	2.3	2.82

Table 2: Results comparison between nominal NPM stiffness and 77% NPM stiffness for SASSI RXB analyses.

SASSI Analysis	SRSS Skirt Horizontal	Vertical Skirt	Maximum Lug
	($x10^3$ kips)	($x10^3$ kips)	($x10^3$ kips)
Case 1	1.55	1.86	2.71
Case 3	1.30	1.48	2.82
% Difference	19%	26%	-4%

Impact on DCA:

FSAR Tier 2, Section 3.7.2.1.2.2, Appendices 3B.3.7.3 and 3B.3.7.4, and Tables 3.7.2-34 and 3B-28 have been revised as described in the response above and as shown in the markup provided in this response.

Figure 3.7.2-26 shows a view of the RXB model with twelve NPMs within the support walls. The lug restraints can be seen near the mid-height of the NPMs in the figure. Figure 3.7.2-27 shows a single NPM. In this figure, the lug restraint can be seen at the upper part of the NPM and the support skirt can be seen at the base of the NPM.

NuScale Power Module Model Included in the Reactor Building SASSI2010 Model

RAI 03.07.02-10S1, RAI 03.07.02-20, RAI 03.07.02-20S1, RAI 03.07.02-31S1, RAI 03.07.02-31S2

Within the SASSI2010 building model, the NPM is represented by a beam model as shown in Figure 3.7.2-28. The beam model was developed to have similar dynamic characteristics as a 3-D ANSYS model of a single NPM bay. To validate the NPM beam model, a modal analysis in three directions was performed in order to tune the simplified model to match the detailed 3-D model response~~, shown in Table 3.7.2-38~~. The skirt support at the base of the containment restricts horizontal and vertical movements. Eight rigid beams arranged like the legs of a spider are modeled to connect the NPM model containment skirt to nodes in the building model located at the interface of the skirt and pool floor. ~~The RXB analysis produces local acceleration time histories that are used as input to the NPM seismic analysis. The seismic analysis of the NPM is discussed in Appendix 3A.~~ Table 3.7.2-36 and Table 3.7.2-37 outline the NPM beam model to RXB model interface boundary conditions for the SASSI2010 and ANSYS models, respectively.

RAI 03.07.02-10S1

Detailed NuScale Power Module Model Included in the Reactor Building SASSI2010 Model

RAI 03.07.02-10S1

The RXB-NPM interface and NPM specific analyses replace the simplified beam model with a more detailed NPM beam model. The reactor building is structurally similar to the SASSI2010 model previously described. The NPM beam models are replaced with the detailed beam models for selected SSI analyses to evaluate the RXB-NPM interactions. The development and validation of the detailed beam model and the SASSI2010 reactor building model with detailed beam model are provided in Appendix 3A. The RXB analysis produces local acceleration time histories that are used as input to the NPM seismic analysis. The seismic analysis of the NPM is discussed in Appendix 3A.

RAI 03.07.02-10, RAI 03.07.02-10S1

At the interface between the NPM and the RXB, the design loads for the skirt supports are defined as the envelope of the SASSI2010 building model and the 3-D model discussed in Appendix 3A and Appendix 3B.2.7. The lug supports are designed for a generic capacity in a detailed submodel and checked against the design loads from the SASSI2010 building model and 3-D model. This is described in more detail in Appendix 3B.2.7.

RAI 03.07.02-10S1, RAI 03.07.02-24

Table 3.7.2-34: SSC Seismic Analysis Identification Code Assignments

SSC	Description	Identification Code
CNTS	containment system	5
SGS	steam generator system	5
RXC	reactor core	5
CRDS	control rod drive system	5
CRA	control rod assembly	5
NSA	neutron source assembly	5
RCS	reactor coolant system	5
CVCS	chemical and volume control system	5
ECCS	emergency core cooling system	5
DHRS	decay heat removal system	5
CRHS	control room habitability system	6
CRVS	normal control room HVAC system	6
MAEB	Module Assembly Equipment - Bolting	3, 4
FHE	fuel handling equipment	3
SFSS	spent fuel storage system	3
RPCS	reactor pool cooling system	3, 4
UHS	ultimate heat sink	3, 4
CES	containment evacuation system	5
MSS	main steam system	5
FWS	feedwater system	5
EDSS	highly reliable DC power system	3[1], 4[1], 6[2]
MPS	module protection system	3[1], 4[1], 6[2]
NMS	neutron monitoring system	3, 4
SDIS	safety display and indication system	6
ICIS	in-core instrumentation system	5
PPS	plant protection system	3[1], 4[1], 6[2]
RMS	radiation monitoring system	3[1], 4[1], 6[2]
RXB	Reactor Building (including Lug Support)	1, 2
RXB	Reactor Building - NPM Skirt Support	5
RBC	Reactor Building crane	3
RBCM	Reactor Building Components - Pool Liner	1, 2
RBCM	Reactor Building Components - Bioshield	3, 4
CRB	Control Building	7, 8
SMS	seismic monitoring system	3[1], 4[1], 6[2]

[1]Design for SSC located in the Reactor Building

[2]Design for SSC located in the Control Building

operation. If the NPM impacts the passive support ring, the resulting upward vertical load will be resisted by the concrete anchors. Figure 3B-48 and Figure 3B-49 show the details of the passive support ring.

RAI 03.07.02-10, RAI 03.08.04-31

NuScale Power Module Model:

RAI 03.07.02-10S1

A SASSI building model with a detailed NPM beam model, described in Section 3.7.2, is used to perform dynamic analyses on the RXB and extract results at the NPM to RXB interface locations. The RXB analysis produces local acceleration time histories that are used as input to the NPM seismic analysis discussed in Appendix 3A.

RAI 03.07.02-10S1

A separate ANSYS model is used to perform a non-linear dynamic analysis of the NPM. This model only includes the pool water and one NPM (1 or 6). The analysis results are based on the envelope of the six runs shown in Table 3B-53. The static reaction force, including the dead weight and the static buoyancy, is 1,090.4 kips in the vertical direction. ~~The maximum vertical seismic reaction force, which does not include the static reaction force is 3,231 kips.~~ The maximum uplift displacement, due to seismic, of the module from the floor is less than 0.125 inch. The enveloping reaction forces between the ANSYS and SASSI models are provided in Table 3B-28 and used for the design basis in the following subsections.

Envelope Loads:

RAI 03.07.02-10, RAI 03.07.02-20, RAI 03.08.04-31

- Vertical downward load, P = ~~5,227~~3,859 kips. This load includes dead load, fluid pressure load, and seismic load. Dead load is the static buoyancy load described above and is equal to 1,090.4 kips. The fluid pressure load is determined by the product of the baseplate area (14.5' x 14.5'), the fluid density (62.4 pcf), and the normal operating reactor pool depth (69') and is equal to 905.3 kips. The enveloping downward seismic load is ~~3,231~~1,863 kips~~, as stated above~~.

RAI 03.07.02-20

- The vertical displacement is less than 0.125 inch. The passive support ring is 4.5 inches thick below the bevel, therefore, there will always be lateral support from the passive support ring.

RAI 03.07.02-10, RAI 03.07.02-20

- Lateral load:
  - East-West seismic load = ~~703~~1,144 kips
  - North-South seismic load = ~~1,164~~1,103 kips
  - Square Root Sum of Squares horizontal seismic load =

    $$\sqrt{(1{,}144^2 + 1{,}103^2)} = 1{,}589 \text{ kips}$$

RAI 03.07.02-20

In this local model, an assumed horizontal load of 3500 kips is applied to determine the stresses in components of the support. Modes of failure for lug components are checked, including tensile capacity of through bolts, punching shear and concrete bearing, and bending stresses on the liner plate. The most controlling mode of failure is bearing against concrete with a D/C=0.777. Refer to Table 3B-57 for details. Because this D/C occurs for an applied load of 3500 kips, the true capacity of the lug assembly, where D/C would reach a value of 1.0, occurs for a load of 3500 kips/0.777=4500 kips.

RAI 03.07.02-10, RAI 03.07.02-10S1, RAI 03.08.04-21S2

To check the adequacy of the lugs, the maximum seismic reaction on a lug from the NPM Seismic Analysis model is compared against the lug capacity calculated from the local lug model.

RAI 03.07.02-10, RAI 03.07.02-10S1, RAI 03.08.04-21S2

The RXB analysis produces local acceleration time histories that are used as input to the NPM seismic analysis, as described in Appendix 3A. The maximum lug reaction from the NPM Seismic Analysis model is provided in Table 8-6 of TR-0916-51502, "NuScale Power Module Seismic Analysis" (Reference 3B-6). The envelope of the maximum lug reaction forces from the ANSYS and SASSI dynamic analyses are provided in Table 3B-28. The design demand is less than the lug capacity of 4500 kips. This shows that the lugs are structurally qualified.

RAI 03.08.04-21,

~~A separate local SAP2000 model is used to analyze the support system for an assumed demand of 3500 kips. The NPM lug restraint model is a comprehensive finite element model of half of a single NPM wing wall. The wall is 2.5' thick and has one support lug for analysis. The load is distributed as point loads to one of the lugs. The wing wall is modeled with solid elements, the liner plate and the stainless steel lug are modeled with shell elements. The stiffeners are also modeled with shell elements.~~

The NPM bay walls and location of the NPM lugs is shown in Figure 3B-52. The NPM lug restraint model is shown in Figure 3B-53 and Figure 3B-54. The liner plate and shear lugs are modeled as shell elements and are shown in Figure 3B-55 and Figure 3B-56. In Figure 3B-57, the outside of the bumper is removed in order to display the stiffener plates inside.

RAI 03.08.04-21, RAI 03.08.04-21S1, RAI 03.08.04-21S2

~~The demand reactions are based on two cases of Soil Type 7 (CSDRS) and Soil Type 9 (CSDRS-HF). These two cases, in general, provide the highest structural responses. The capacity is based on the assumed value of 3500 kips, that the lugs are designed for, however, due to the extra margin in the design, the actual strength is 4500 kips which is higher than the maximum demand of 3726 kips. The demand to capacity ratios in calculations for the lug components are derived and shown to be less than one, which shows the lugs are qualified.~~

RAI 03.08.04-021S3

~~The through-bolt is 2.5" in diameter and fabricated from ASTM A193 GR B7 Steel. The through-bolt tensile D/C ratio (assuming a design load of 3500 kips) is 0.51. This D/C ratio is from the most highly stressed fin in tension. Therefore the through-bolts are acceptable and will exhibit ductile behavior.~~

RAI 03.08.04-21S3

~~The D/C ratio for punching shear on the wing wall has been determined to be 0.26. For the pool wall, this ratio is 0.20. The D/C ratio for the concrete bearing strength is 0.40.~~

The bending stress in the 2" thick liner plate can be bounded by considering the moment at the base of highest loaded shear lug as an upper bound moment in the liner plate.

RAI 03.08.04-21S3, RAI 03.08.04-36

From Table 3B-26, the maximum moment on the plate occurs at the shear lug at Y = 88.2" for lug load in the +Y direction. Please see Table 3B-57, which provides D/C ratios for the various lug component stress checks. The D/C ratios listed in Table 3B-57 are for the individual modes of failure for components of the lug assembly. In this table, the demand is the load that is resisted by each component, due to an applied total load of 3500 kips in the SAP2000 model.~~This moment produces a bending stress in the liner of 23.12 ksi. This is much less than the 100.8 ksi yield strength of the liner. The resulting D/C is 0.23.~~

RAI 03.08.04-21S3

The highest D/C ratio is for concrete bearing against the shear lugs at 0.777. Since this maximum ratio is due to the 3500 kips load, the maximum capacity of the lug assembly is 3500 kips/0.777=4500 kips.

3B.2.7.4.2 Overall Lug Restraint Reaction

RAI 03.07.02-10, RAI 03.07.02-10S1, RAI 03.08.04-36

Table 3B-28 presents the ~~maximum~~envelope lug reactions, for all twelve bays, using the three analysis cases with Soil Type 7 for Capitola input motion~~CSDRS and Soil Type 9 for CSDRS-HF using the cracked RXB model~~ with 4 percent structural damping of the SASSI RXB model and the equivalent analysis performed on the NPM detailed seismic model (Reference TR-0916-51502). Since the~~se~~ maximum lug reactions are below the lug support design capacity of ~~3,500~~4,500 kips, the design is acceptable.

3B.3 Control Building

3B.3.1 Design Report

Structural Description and Geometry

The CRB is a Seismic Category I concrete structure at elevation 120'-0" and below, except as noted in Section 1.2.2.2. Above EL 120'-0" the CRB is a Seismic Category II

RAI 03.07.02-10, RAI 03.07.02-10S1

Table 3B-27: Not Used~~SASSI Maximum Lug Reactions for RXB Cracked Model using Soil Type 7 (CSDRS) and Soil Type 9 (CSDRS-HF)~~

~~Input Case~~	~~East Wing Wall N-S Lug Reaction (kips)~~	~~Pool Wall E-W Lug Reaction (kips)~~	~~West Wing Wall N-S Lug Reaction (kips)~~
~~Soil Type 7 CSDRS~~	~~1,819~~	~~2,320~~	~~1,957~~
~~D/C ratio (to 3500 kip load)~~	~~0.52~~	~~0.66~~	~~0.56~~
~~Soil Type 9 CSDRS-HF~~	~~1,784~~	~~2,249~~	~~1,930~~
~~D/C ratio (to 3500 kip load)~~	~~0.51~~	~~0.64~~	~~0.55~~

RAI 03.07.02-10S1

Table 3B-28: Enveloped NPM Lug Support and Skirt Support Reaction Forces Using Soil Type 7 (CSDRS)

Enveloped Input Case	SRSS Horizontal Skirt Reaction ($x10^3$ kips)	Vertical Skirt Reaction ($x10^3$ kips)	East Wing Wall N-S Lug Reaction ($x10^3$ kips)	Pool Wall E-W Lug Reaction ($x10^3$ kips)	West Wing Wall N-S Lug Reaction ($x10^3$ kips)
NPM Seismic Analysis	1.20	1.62	3.15	3.68	2.24
SASSI Building Seismic Analysis	1.59	1.86	2.18	2.82	2.30

Pending CP2-1332