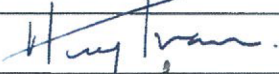
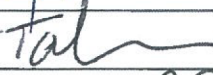
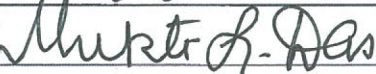


 ENERCON <i>Excellence—Every project. Every day.</i>		CALCULATION COVER SHEET		CALC NO. NAC004-CALC-04	
				REV. 01	
				PAGE NO. 1 of 74	
Title:	Soil Structure Interaction Analysis of Independent Spent Fuel Storage Installation (ISFSI) Concrete Pad at Andrews, TX			Client: NAC International	
				Project Identifier: NAC-004	
Item	Cover Sheet Items	Yes	No		
1	Does this calculation contain any open assumptions, including preliminary information, that require confirmation? (If YES , identify the assumptions.)	☐	☒		
2	Does this calculation serve as an "Alternate Calculation"? (If YES , identify the design verified calculation.) Design Verified Calculation No. _____	☐	☒		
3	Does this calculation supersede an existing Calculation? (If YES , identify the design verified calculation.) Superseded Calculation No. _____	☐	☒		
Scope of Revision: Change in soil profile inputs: LB and UB soil damping values re-assigned to corresponding soil profiles.					
Revision Impact on Results: No changes in conclusions are reported between Rev. 0 and Rev. 1. The change in damping associated with the soil profiles generates zero period pad and cask accelerations less than or equal to zero period accelerations presented in Rev 0. The peak cask and pad acceleration response spectra are shown to be marginally higher than reported in Rev. 0. Updated input tables, results figures, results tables, and file attachments.					
Study Calculation ☐ Final Calculation ☒					
Safety-Related ☐ Non-Safety-Related* ☒					
<i>*ISFSI pad is important-to-safety with ENERCON QA requirements and design verification invoked.</i>					
<i>(Print Name and Sign)</i>					
Originator: Huy Tran (SC Solutions Inc.) / 				Date: 6/6/2016	
Design Verifier: Iman Talebinejad (SC Solutions Inc.) / 				Date: 6/6/2016	
Approver: Mukti Das (ENERCON Services Inc.) / 				Date: 6/8/2016	

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			REV. 01		
			PAGE NO. 2 of 74		
<u>CALCULATION REVISION STATUS</u>					
<u>REVISION</u> 00 01		<u>DATE</u> 3/28/2016 5/27/2016		<u>DESCRIPTION</u> Initial Issue Revision to Soil Damping Input	
<u>PAGE REVISION STATUS</u>					
<u>PAGE NO.</u> 5 thru 7, 9 thru 13, 15 thru 16, 18 thru 24, 33 thru 41, 65, 74 1 thru 4, 8, 14, 17, 25 thru 32, 42 thru 73		<u>REVISION</u> 00 01		<u>PAGE NO.</u> 	
<u>APPENDIX/ATTACHMENT REVISION STATUS</u>					
<u>APPENDIX NO.</u> A	<u>NO. OF PAGES</u> 18	<u>REVISION NO.</u> 00	<u>ATTACHMENT NO.</u> 1 2 3	<u>NO. OF PAGES</u> 2 2 23	<u>REVISION NO.</u> 01 01 01

 ENERCON Excellence—Every project. Every day.	DESIGN VERIFICATION PLAN AND SUMMARY SHEET		PAGE NO. 3 of 74
Safety-Related ☐ Non-Safety-Related ☒	Document Verified: NAC004-CALC-04		Rev. 01
	Design Verification Number: N/A		Rev. N/A
Design Verification Method and Scope: Method: Design Review Method. Scope: Independent detailed review of the document including inputs, scope, methodology, calculations, references, etc.			
Design Verification Summary: Changes in the soil profile in revision 01 were noted and verified. Other design inputs were correctly selected and properly referenced. Applicable codes, standards and regulatory requirements were correctly identified and their requirements were satisfied. Appropriate methodology was chosen and properly applied to satisfy the study objectives. The study outputs correspond directly with the objectives. The conclusions were clearly stated.			
Based on the above summary, the design document is determined to be acceptable.			
<i>(Print Name and Sign)</i>			
Design Verifier: Iman Talebinejad (SC Solutions Inc.) / 		Date: 6/6/2016	
Approver: Mukti Das (ENERCON Services Inc.) / 		Date: 6/8/2016	

Document Verified: NAC004-CALC-04 Rev. 01
Design Verification Number: N/A Rev. N/A

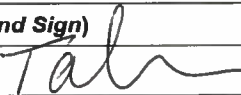
Item	CHECKLIST ITEMS	Yes	No	N/A
1	Design Inputs – Were the design inputs correctly selected, referenced (latest revision), consistent with the design basis and incorporated in the Design Document?	☒	☐	☐
2	Assumptions – Were the assumptions reasonable and adequately described, justified and/or verified, and documented?	☒	☐	☐
3	Quality Assurance – Were the appropriate QA classification and requirements assigned to the Design Document?	☒	☐	☐
4	Codes, Standards, and Regulatory Requirements – Were the applicable codes, standards and regulatory requirements, including issue and addenda, properly identified and their requirements satisfied?	☒	☐	☐
5	Construction and Operating Experience – Have applicable construction and operating experience been considered?	☐	☐	☒
6	Interfaces – Have the design interface requirements been satisfied, including interactions with other Design Documents?	☒	☐	☐
7	Methods – Was the Design Document methodology appropriate and properly applied to satisfy the Design Document objective?	☒	☐	☐
8	Design Outputs – Was the conclusion of the Design Document clearly stated, did it correspond directly with the objectives and are the results reasonable compared to the inputs?	☒	☐	☐
9	Acceptance Criteria – Are the acceptance criteria incorporated in the Design Document sufficient to allow verification that the design requirements have been satisfactorily accomplished?	☒	☐	☐
10	Computer Software – If a computer program or software is used, have the requirements of CSP 3.03 for calculations or the applicable process CSP and CSP 3.09 been met?	☒	☐	☐
11	Open Assumptions – Is the Design Document free of open assumptions or preliminary information that shall be confirmed at a later date?	☒	☐	☐
12	Lessons Learned – Have problems with this design known from prior application been considered and resolved?	☒	☐	☐

COMMENTS:

none

(Print Name and Sign)

Design Verifier: Iman Talebinejad (SC Solutions Inc.) /


Date:

6/6/2016

Comment and Resolution Form

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Document Reviewed: : NAC004-CALC-04 Revision: 00						
Design Verification Number (if applicable): N/A Revision: N/A						
Project No.:						
Reviewed By: Iman Talebinejad - 01/22/2016				Resolved By: Huy Tran – 1/26/2016		
No.	Page/ Section	Comment	Incorp (Y/N)	Resolution	Accept (Y/N)	Explanation
1	17	Table 2-7 of reference 10 suggests Poisson's ratio of 0.3-0.4. Why are you using 0.4 and not 0.35	Y	Changed Poisson's Ratio to be consistent with literature and references.	Y	
2	57	Governing case should be selected based on the SRSS of x and y acceleration	Y	The time history method to determine the instantaneous coefficient of friction and overturning factor of safety was used, which incorporates the SRSS of X and Y Acceleration at each time step.	Y	

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1.0 Purpose and Scope

This calculation documents the Soil Structure Interaction (SSI) analysis to support a concrete pad design for the US NRC licensed and operational away-from-reactor Interim Spent Fuel Storage Installation (ISFSI) located at the Waste Control Specialists, LLC (WCS) site in Andrews Country, Texas. The analysis is conducted in accordance with NUREG-0800 [7].

The SSI analysis will consider the concrete pad design with the MAGNASTOR storage cask, which envelopes the NAC-UMS and NAC-MPC storage casks to be stored at the site, for 4 cask load configurations, 3 soil cases, and 3 time histories, totaling 36 analysis cases to obtain enveloping maximum accelerations at the storage cask center of gravities, the concrete pad center of gravity, and an evaluation for sliding and overturning of the storage casks. The SSI analysis supports structural design of the ISFSI pad system.

The analysis is “Important to Safety” and is performed in accordance with the requirements and controls of ENERCON’s Quality Assurance Program using SC-SASSI version 2.1.7 program as part of commercial grade dedication plan no. CGDP-SC/SASSI-V2.1.7, Rev. 0.

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2.0 Summary of Results and Conclusions

Following SSI analysis of 36 analysis cases it was found that the enveloping maximum accelerations at the MAGNASTOR Cask center of gravity are as follows:

- 0.45g in the X/E-W Direction for Case 30, Coyote Lake earthquake on UB soil at cask CG B1 for cask configuration 4
- 0.42g in the Y/N-S Direction for Case 30, Coyote Lake earthquake on UB at cask CG A2 for cask configuration 4
- 0.28g in the Z/Vertical Direction for Case 22, Norcia earthquake on LB soil at cask CG B3 for cask configuration 3

The MAGNASTOR cask envelopes all other storage cask types to be stored at the site.

Through examining the instantaneous coefficient of friction demand, it is deemed that cask sliding is likely to occur for at least 1 cask due to a maximum coefficient of friction demand of 0.46, which is greater than the coefficient of friction of 0.35 for cask steel-to-concrete contact for a light broom finish on the concrete pad.

Through examining the instantaneous factor of safety against overturning following evaluation of the cask CG accelerations obtained from deterministic SSI analysis, it is deemed that overturning will not occur for any casks with a minimum observed overturning factor of safety of 1.22 which is greater than the required factor of safety against overturning of 1.1.

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3.0 References

1. SC-SASSI Manual, Version 2.1.7, SC Solutions, Inc., November 6, 2015.
2. Drawing NAC004-C-001, Rev. 0, "ISFSI Pad Licensing Design General Arrangement & Geotechnical"
3. Drawing NAC004-C-002, Rev. 0, "ISFSI Pad Licensing Structural Concrete Plan, Sections, & Details"
4. MAGNASTOR FSAR, Rev. 7, "MAGNASTOR Final Safety Analysis Report," July 2015
5. NAC-UMS FSAR, Rev. 10, "Final Safety Analysis Report for the UMS Universal Storage System," October 2012
6. NAC-MPC FSAR, Rev. 10, "Final Safety Analysis Report for the NAC Multi-Purpose Cask," January 2014
7. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," December 2014
8. ASCE/SEI 43-05, "Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities"
9. WCS-12-05-100-001, Rev. A, "WCS Centralized Interim Storage Facility Project: Site-Specific Seismic Hazard Evaluation and Development of Seismic Design Ground Motions," March 3, 2016
10. Geoservices, LLC, Project No. 31-151247, "Report of Geotechnical Exploration: Consolidated Interim Storage Facility (CISF) Andrews, Texas," August 20, 2015
11. Bowles, J.E. (1996). *Foundation Analysis and Design*, 5th Edition, McGraw-Hill

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12. Nuclear Energy Institute (NEI), “Consistent Site-Response/Soil-Structure Interaction Analysis and Evaluation,” June 2009
13. Regulatory Guide 1.61, Rev. 1, “Damping Values for Seismic Design of Nuclear Power Plants”

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4.0 **Assumptions**

No assumptions.

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5.0 Design Inputs

The inputs used to prepare and execute the SSI analysis are as follows

Finite Element Model Inputs:

- SC-SASSI Manual, Version 2.1.7, SC Solutions, Inc., November 6, 2015. [1]
- Drawing NAC004-C-001, Rev. 0, “ISFSI Pad Licensing Design General Arrangement & Geotechnical” [2]
- Drawing NAC004-C-002, Rev. 0, “ISFSI Pad Licensing Structural Concrete Plan, Sections, & Details” [3]
- MAGNASTOR FSAR, Rev. 7, “MAGNASTOR Final Safety Analysis Report,” July 2015 [4]
- SRP 3.7.2, NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants,” March 2007 [7]
- ASCE/SEI 43-05, “Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities” [8]
- Regulatory Guide 1.61, Rev. 1, “Damping Values for Seismic Design of Nuclear Power Plants”

Soil Model Inputs:

- PSHA Report, Appendix C of WCS-12-05-100-001 [9]
- Appendix A of Geoservices, LLC, Project No. 31-151247, “Report of Geotechnical Exploration: Consolidated Interim Storage Facility (CISF) Andrews, Texas,” August 20, 2015 [10] Table 2-7, page 123 of Bowles, J.E. (1996). *Foundation Analysis and Design*, 5th Edition, McGraw-Hill [11]

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Time History Inputs:

- PSHA Report, Appendix B of WCS-12-05-100-001 [9]

SSI Analysis Inputs:

- NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants,” March 2007 [7]
- ASCE/SEI 43-05, “Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities” [8]
- Nuclear Energy Institute (NEI), “Consistent Site-Response/Soil-Structure Interaction Analysis and Evaluation,” June 2009 [12]

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6.0 Methodology

To support the concrete ISFSI pad design, the SSI analysis was performed using a deterministic approach following guidelines presented in SRP 3.7.2 [7].

To account for potential effects of variability in the rock and soil present at the ISFSI pad site in Andrews, TX, three rock/soil profiles are considered for SSI analysis, namely a best estimate (BE) profile, a lower bound (LB) profile, and an upper bound (UB) profile. The median and +/- 1 sigma strain compatible soil properties for the analysis are provided in WCS-12-05-100-001 [9]. A sufficient number of site response analyses have been performed to ensure a stable value of sigma. The BE soil profile is determined from the median strain compatible properties obtained through probabilistic site response analysis while the LB and UB soil profiles are determined from the -1 sigma and +1 sigma profiles respectively, which also comply with the minimum coefficient of variation (COV) of no less than 0.5 for the LB profile and at least 1.0 for the UB profile per SRP 3.7.2. The minimum COV's result in an LB soil profile with a factor of at least 0.5 times the BE shear modulus and an UB soil profile with a factor of at least 2.0 times the BE shear modulus. The LB soil profile is assigned +1 sigma damping and the UB soil profile is assigned -1 sigma damping per SRP 3.7.2.

Three time earthquake histories are considered for SSI analysis, namely Coyote Lake, Norcia (Italy) and North Palm Springs, each with 3 components (two horizontal and one vertical). The 3 components are applied to the SSI analysis simultaneously to generate the combined response outputs via algebraic summation. The input time histories for SSI analysis are provided in WCS-12-05-100-001 [9] and each time history is developed in accordance with SRP 3.7.1 I.1.B, Option 1 for the use of a single set of time histories [7]. For SSI analysis, 3 sets of single time histories are used and results enveloped to conservatively account for variability between ground motions. The application of each time history is shown in Table 6.1.

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Due to variability in which the concrete ISFSI pad could be loaded, four storage cask configurations are considered for analysis ranging from fully loaded (3 rows x 8 columns of Storage casks) to eccentrically loaded with four storage casks to represent the bounding cases of response due to any potential load configuration.

The finite element model representing the concrete pad is generated with 4-node shell elements and the storage casks are modeled using rigid beam and spring elements with the cask mass lumped at the storage cask center of gravity (CG). The rigid members are configured to minimize any finite element stiffening effects on the concrete pad.

The concrete pad is analyzed as surface founded at the bottom of the excavation depth using corresponding surface input motions compatible with the strain compatible soil profiles. SC-SASSI version 2.1.7 computer program is used for SSI analysis.

A total of 36 analysis cases (4 cask configurations x 3 soil cases x 3 time histories) are considered for SSI analysis, from which the governing cases are determined by obtaining the envelope of the instantaneous coefficient of friction demand and overturning factor of safety to determine the likelihood of cask sliding and overturning. The 36 analysis cases are presented in Table 6.1. The calculations of the inputs for the soil cases, time histories, and cask configurations are presented in Section 7.

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Table 6.1: SSI Analysis Cases

Case Number	Time History	Soil Case	Cask Configuration
1	Coyote Lake	LB	1
2	Coyote Lake	BE	1
3	Coyote Lake	UB	1
4	Norcia	LB	1
5	Norcia	BE	1
6	Norcia	UB	1
7	N. Palm Springs	LB	1
8	N. Palm Springs	BE	1
9	N. Palm Springs	UB	1
10	Coyote Lake	LB	2
11	Coyote Lake	BE	2
12	Coyote Lake	UB	2
13	Norcia	LB	2
14	Norcia	BE	2
15	Norcia	UB	2
16	N. Palm Springs	LB	2
17	N. Palm Springs	BE	2
18	N. Palm Springs	UB	2
19	Coyote Lake	LB	3
20	Coyote Lake	BE	3
21	Coyote Lake	UB	3
22	Norcia	LB	3
23	Norcia	BE	3
24	Norcia	UB	3
25	N. Palm Springs	LB	3
26	N. Palm Springs	BE	3
27	N. Palm Springs	UB	3
28	Coyote Lake	LB	4
29	Coyote Lake	BE	4
30	Coyote Lake	UB	4
31	Norcia	LB	4
32	Norcia	BE	4
33	Norcia	UB	4
34	N. Palm Springs	LB	4
35	N. Palm Springs	BE	4
36	N. Palm Springs	UB	4

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7.0 Calculations

The following sections detail the calculations of the inputs for the SSI analysis.

7.1 SSI Soil Model

The SSI analysis approach for the WCS ISFSI concrete pad will be to treat the concrete pad as surface founded at the bottom of the excavation depth per drawing NAC004-C-001 [2].

The site response analysis to generate the strain compatible site profiles considers a truncated site profile with the top 4ft of in-situ (backfill) material removed, down to the Precambrian basement, hard rock layer placed 8,000ft below the surface for EPRI (2013) ground motion models and down to the Trujillo sandstone, firm rock layer starting at about 600ft below the surface based on NGA-West2 ground motion models [9]. Three strain compatible soil profiles with shear wave velocities (V_s), unit weight, and shear wave velocity damping are provided for deterministic SSI analysis, consistent with the site response analysis [9].

The median, -1 standard deviation ($-\sigma$), and +1 standard deviation ($+\sigma$) strain compatible soil properties down to 1043ft below the surface are presented in Appendix C of WCS-12-05-100-001 [9] and are assigned as Best Estimate (BE), Lower Bound (LB) and Upper Bound (UB) soil profiles respectively. The $-\sigma$ and $+\sigma$ damping properties are assigned to the UB and LB soil profiles respectively. The soil layers are averaged to reduce the number of layers for SSI analysis from 522 to 135 soil layers, by adding soil layers and averaging the soil properties across the added soil layers. The layer thickness of the added soil layers allow for a minimum passing frequency of $>50\text{Hz}$ for the BE, LB, and UB soil profiles according to the following relationship:

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$$h_{max} = \frac{V_s}{5 \times f}$$

Where V_s is the minimum shear wave velocity in the soil layer; f is the passing frequency; h_{max} is the maximum layer thickness corresponding to f .

The halfspace for SSI analysis is placed at 1043ft below surface based on the depth of the provided strain compatible soil profiles, generally consistent with Trujillo sandstone, firm rock horizon. The location of the halfspace is deemed appropriate considering that the large depth to the hard rock boundary is greater than 8000ft below the surface per the site response analysis, and is therefore sufficiently far away to not expect any wave reflection through the SSI system. Incorporation of a viscoelastic halfspace produces seismic wave propagation behavior as it relates to SSI effects consistent with consideration of basement rock at large depths.

No compression wave velocities (V_p) were measured during the site investigation. To calculate the V_p , Poisson's ratios were assigned based on soil layer classifications from geotechnical site investigations for the area in which the WCS ISFSI pad will be located. The first 40ft is classified as Silty Sand per site specific geotechnical investigations [10], with the subsequent layers consisting of clay and rock per the generalized geological profile as shown in Figure 7.1.1 [9]. The Poisson's ratios were assigned based on published values of Poisson's ratios for common soil types [11]. The first 40ft were assigned a Poisson's ratio of 0.35 for sand while the remaining clay/rock layers were assigned a Poisson's ratio of 0.25, consistent with published values for rock. Poisson's ratios are not adjusted for water content in the soil profile as the water bearing zone is below 225ft below grade which consists of rock.

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The V_p values for each layer was calculated via the following relationship:

$$V_p = V_s \left(\frac{2 - 2\nu}{1 - 2\nu} \right)^{1/2}$$

Where V_s is the minimum shear wave velocity in the soil layer; ν is the Poisson's Ratio.

V_p damping ratio is taken equal to V_s damping [12].

The BE, LB and UB soil profiles used as input for the SSI analyses are presented in Tables 7.1.1, 7.1.2, and 7.1.3 respectively.

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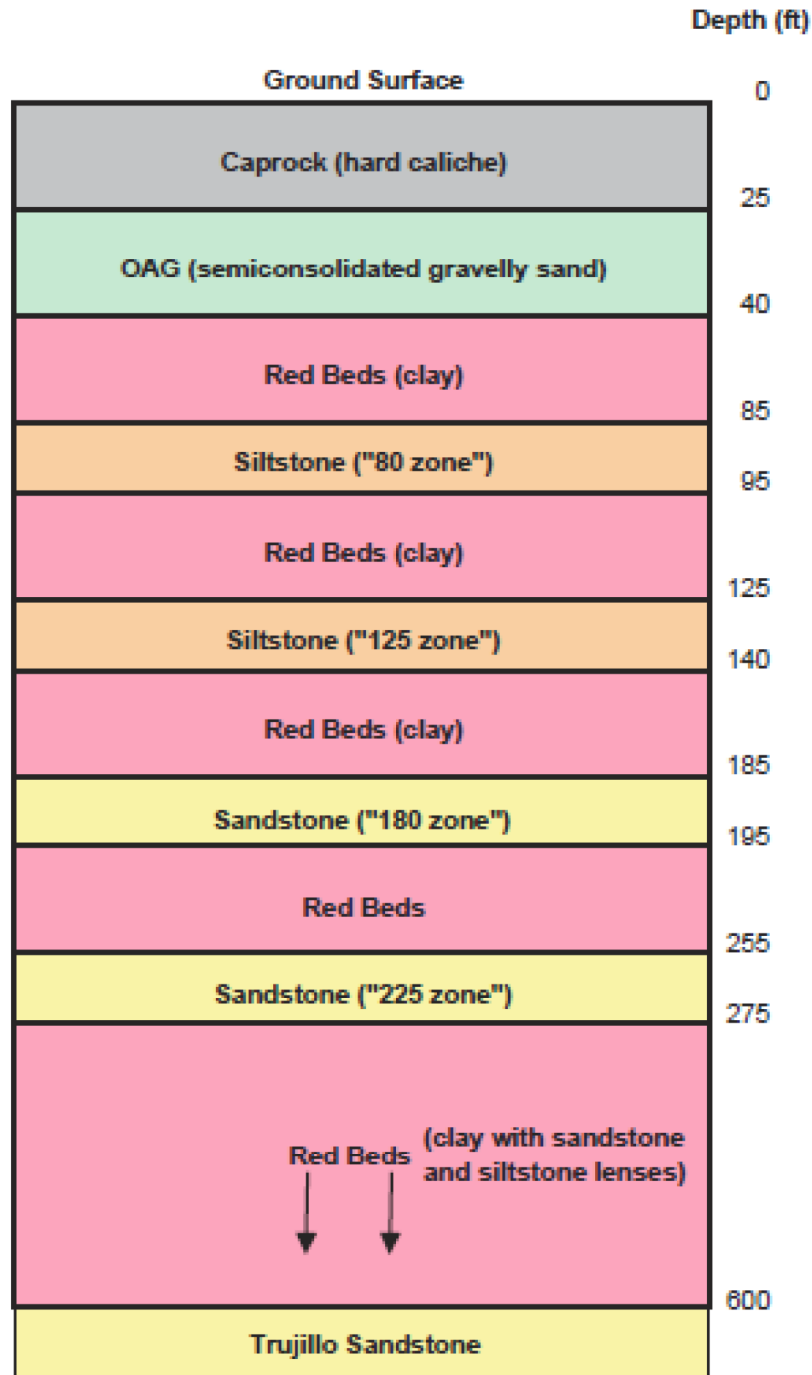


Figure 7.1.1: Generalized Geologic Profile at WCS Site [9]

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TABLE 7.1.1: BE SSI Soil Profile

Layer No.	Thickness (ft)	Unit Wt (k/ft ³)	Vs (ft/s)	Vp (ft/s)	Vs Dmp (%)	Vp Dmp (%)
1	1.000	0.120	861.950	1794.292	1.667	1.667
2	2.000	0.120	917.120	1909.138	1.796	1.796
3	2.000	0.120	991.680	2064.347	1.973	1.973
4	2.000	0.120	1046.700	2178.880	2.105	2.105
5	2.000	0.120	1056.200	2198.656	2.262	2.262
6	2.000	0.120	1072.600	2232.795	2.379	2.379
7	2.000	0.120	1105.800	2301.906	2.445	2.445
8	2.000	0.120	1213.600	2526.310	2.376	2.376
9	2.000	0.120	1318.100	2743.844	2.299	2.299
10	2.000	0.120	1406.300	2927.447	2.113	2.113
11	4.000	0.120	1508.250	3139.673	1.900	1.900
12	4.000	0.120	1649.200	3433.084	1.843	1.843
13	4.000	0.120	1734.400	3610.442	1.837	1.837
14	4.000	0.120	1783.300	3712.235	1.854	1.854
15	4.000	0.120	1810.150	3768.128	1.882	1.882
16	6.000	0.120	1839.267	3398.782	1.904	1.904
17	6.000	0.121	1882.067	3259.835	1.612	1.612
18	6.000	0.122	1968.400	3409.369	1.235	1.235
19	6.000	0.122	2058.100	3564.734	1.221	1.221
20	6.000	0.122	2112.900	3659.650	1.219	1.219
21	6.000	0.122	2170.533	3759.474	1.215	1.215
22	6.000	0.122	2196.767	3804.911	1.221	1.221
23	6.000	0.122	2201.833	3813.687	1.235	1.235
24	6.000	0.122	2194.233	3800.524	1.252	1.252
25	6.000	0.122	2189.800	3792.845	1.267	1.267
26	6.000	0.123	2192.400	3797.348	1.278	1.278
27	6.000	0.124	2212.533	3832.220	1.272	1.272
28	6.000	0.125	2220.933	3846.769	1.266	1.266
29	6.000	0.125	2226.267	3856.007	1.232	1.232
30	6.000	0.125	2231.767	3865.533	1.199	1.199
31	6.000	0.125	2233.600	3868.709	1.197	1.197
32	6.000	0.125	2233.700	3868.882	1.200	1.200
33	6.000	0.125	2231.100	3864.379	1.208	1.208
34	6.000	0.125	2244.167	3887.011	1.210	1.210
35	6.000	0.125	2260.067	3914.550	1.212	1.212
36	6.000	0.125	2257.533	3910.162	1.220	1.220
37	6.000	0.125	2250.400	3897.807	1.229	1.229
38	6.000	0.125	2249.700	3896.595	1.236	1.236

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TABLE 7.1.1: BE SSI Soil Profile

Layer No.	Thickness (ft)	Unit Wt (k/ft ³)	Vs (ft/s)	Vp (ft/s)	Vs Dmp (%)	Vp Dmp (%)
39	6.000	0.125	2250.700	3898.327	1.242	1.242
40	6.000	0.125	2253.333	3902.888	1.247	1.247
41	6.000	0.125	2256.700	3908.719	1.252	1.252
42	6.000	0.125	2263.933	3921.248	1.255	1.255
43	6.000	0.125	2285.200	3958.083	1.252	1.252
44	6.000	0.125	2309.133	3999.536	1.247	1.247
45	6.000	0.125	2332.400	4039.835	1.243	1.243
46	6.000	0.125	2382.533	4126.669	1.229	1.229
47	6.000	0.125	2478.700	4293.234	1.200	1.200
48	6.000	0.126	2581.567	4471.405	1.168	1.168
49	6.000	0.127	2636.567	4566.667	1.144	1.144
50	6.000	0.127	2670.067	4624.691	1.111	1.111
51	6.000	0.127	2699.700	4676.018	1.074	1.074
52	6.000	0.127	2728.633	4726.132	1.040	1.040
53	6.000	0.127	2748.633	4760.773	1.023	1.023
54	6.000	0.127	2763.633	4786.753	1.013	1.013
55	6.000	0.127	2764.733	4788.659	1.014	1.014
56	8.000	0.127	2761.700	4783.405	1.017	1.017
57	8.000	0.127	2758.200	4777.343	1.021	1.021
58	8.000	0.127	2754.825	4771.497	1.025	1.025
59	8.000	0.127	2750.000	4763.140	1.029	1.029
60	8.000	0.127	2738.000	4742.355	1.035	1.035
61	8.000	0.127	2731.475	4731.053	1.040	1.040
62	8.000	0.127	2725.500	4720.704	1.045	1.045
63	8.000	0.127	2725.150	4720.098	1.048	1.048
64	8.000	0.127	2725.475	4720.661	1.050	1.050
65	8.000	0.127	2724.100	4718.280	1.053	1.053
66	8.000	0.127	2728.900	4726.593	1.054	1.054
67	8.000	0.127	2736.625	4739.974	1.055	1.055
68	8.000	0.127	2752.650	4767.730	1.053	1.053
69	8.000	0.127	2797.800	4845.932	1.045	1.045
70	8.000	0.127	2841.550	4921.709	1.038	1.038
71	8.000	0.127	2885.125	4997.183	1.031	1.031
72	8.000	0.127	2928.175	5071.748	1.024	1.024
73	8.000	0.127	2951.800	5112.668	1.021	1.021
74	8.000	0.127	2955.900	5119.769	1.023	1.023
75	8.000	0.127	2961.075	5128.732	1.024	1.024
76	8.000	0.127	2968.450	5141.506	1.024	1.024

TABLE 7.1.1: BE SSI Soil Profile

Layer No.	Thickness (ft)	Unit Wt (k/ft ³)	Vs (ft/s)	Vp (ft/s)	Vs Dmp (%)	Vp Dmp (%)
77	8.000	0.127	2975.800	5154.237	1.024	1.024
78	8.000	0.127	2981.550	5164.196	1.025	1.025
79	8.000	0.127	2989.400	5177.793	1.024	1.024
80	8.000	0.127	2997.525	5191.866	1.024	1.024
81	8.000	0.127	3006.550	5207.497	1.018	1.018
82	8.000	0.127	3030.975	5249.803	0.929	0.929
83	8.000	0.127	3060.600	5301.115	0.824	0.824
84	8.000	0.127	3090.025	5352.080	0.732	0.732
85	8.000	0.127	3119.275	5402.743	0.652	0.652
86	8.000	0.127	3139.300	5437.427	0.606	0.606
87	8.000	0.127	3159.225	5471.938	0.600	0.600
88	8.000	0.127	3181.950	5511.299	0.600	0.600
89	8.000	0.127	3204.500	5550.357	0.600	0.600
90	8.000	0.127	3226.900	5589.155	0.600	0.600
91	8.000	0.127	3250.400	5629.858	0.600	0.600
92	8.000	0.127	3275.950	5674.112	0.600	0.600
93	8.000	0.127	3302.975	5720.921	0.600	0.600
94	8.000	0.127	3331.375	5770.111	0.600	0.600
95	8.000	0.127	3359.650	5819.084	0.600	0.600
96	8.000	0.127	3395.550	5881.265	0.600	0.600
97	8.000	0.127	3489.400	6043.818	0.600	0.600
98	8.000	0.127	3595.800	6228.108	0.600	0.600
99	8.000	0.127	3689.575	6390.531	0.600	0.600
100	8.000	0.127	3778.100	6543.861	0.600	0.600
101	8.000	0.127	3867.550	6698.793	0.600	0.600
102	8.000	0.127	3950.000	6841.601	0.600	0.600
103	8.000	0.127	3967.475	6871.868	0.600	0.600
104	8.000	0.127	3971.150	6878.234	0.600	0.600
105	8.000	0.127	3974.100	6883.343	0.600	0.600
106	12.000	0.127	3975.233	6885.306	0.600	0.600
107	12.000	0.127	3976.450	6887.413	0.600	0.600
108	12.000	0.127	3974.983	6884.873	0.600	0.600
109	12.000	0.127	3969.233	6874.914	0.600	0.600
110	12.000	0.127	3960.083	6859.066	0.600	0.600
111	12.000	0.127	3948.483	6838.974	0.600	0.600
112	12.000	0.127	3938.100	6820.989	0.600	0.600
113	12.000	0.127	3935.500	6816.486	0.600	0.600
114	12.000	0.127	3935.517	6816.515	0.600	0.600

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TABLE 7.1.1: BE SSI Soil Profile

Layer No.	Thickness (ft)	Unit Wt (k/ft ³)	Vs (ft/s)	Vp (ft/s)	Vs Dmp (%)	Vp Dmp (%)
115	12.000	0.127	3938.983	6822.519	0.600	0.600
116	12.000	0.127	3942.517	6828.639	0.600	0.600
117	12.000	0.127	3950.950	6843.246	0.600	0.600
118	12.000	0.127	3963.650	6865.243	0.600	0.600
119	12.000	0.127	3979.100	6892.003	0.600	0.600
120	12.000	0.127	3995.350	6920.149	0.600	0.600
121	12.000	0.127	4028.450	6977.480	0.600	0.600
122	12.000	0.127	4127.117	7148.376	0.600	0.600
123	12.000	0.127	4230.050	7326.662	0.600	0.600
124	12.000	0.127	4330.133	7500.011	0.600	0.600
125	12.000	0.127	4431.150	7674.977	0.600	0.600
126	12.000	0.127	4482.817	7764.466	0.600	0.600
127	12.000	0.127	4490.017	7776.937	0.600	0.600
128	12.000	0.127	4498.850	7792.237	0.600	0.600
129	12.000	0.127	4507.833	7807.796	0.600	0.600
130	12.000	0.127	4516.617	7823.010	0.600	0.600
131	12.000	0.127	4522.667	7833.488	0.600	0.600
132	12.000	0.127	4524.100	7835.971	0.600	0.600
133	12.000	0.127	4523.850	7835.538	0.600	0.600
134	12.000	0.127	4523.533	7834.990	0.600	0.600
135	14.000	0.127	4522.514	7833.225	0.600	0.600
Halfspace		0.127	4520.300	7829.389	0.600	0.600

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Table 7.1.2: LB SSI Soil Profile

Layer No.	Thickness (ft)	Unit Wt (k/ft ³)	Vs (ft/s)	Vp (ft/s)	Vs Dmp (%)	Vp Dmp (%)
1	1.000	0.120	645.480	1343.674	3.329	3.329
2	2.000	0.120	699.180	1455.459	3.607	3.607
3	2.000	0.120	766.450	1595.493	3.998	3.998
4	2.000	0.120	809.220	1684.526	4.293	4.293
5	2.000	0.120	810.590	1687.378	4.638	4.638
6	2.000	0.120	817.480	1701.720	4.896	4.896
7	2.000	0.120	835.160	1738.524	5.040	5.040
8	2.000	0.120	911.900	1898.271	4.887	4.887
9	2.000	0.120	981.810	2043.800	4.710	4.710
10	2.000	0.120	1045.000	2175.341	4.219	4.219
11	4.000	0.120	1134.700	2362.066	3.707	3.707
12	4.000	0.120	1278.750	2661.930	3.587	3.587
13	4.000	0.120	1364.650	2840.746	3.571	3.571
14	4.000	0.120	1414.700	2944.933	3.604	3.604
15	4.000	0.120	1448.450	3015.189	3.660	3.660
16	6.000	0.120	1483.967	2741.827	3.708	3.708
17	6.000	0.121	1524.967	2641.320	3.228	3.228
18	6.000	0.122	1600.233	2771.685	2.598	2.598
19	6.000	0.122	1670.000	2892.525	2.567	2.567
20	6.000	0.122	1719.467	2978.204	2.561	2.561
21	6.000	0.122	1768.967	3063.940	2.551	2.551
22	6.000	0.122	1790.833	3101.814	2.565	2.565
23	6.000	0.122	1794.967	3108.973	2.594	2.594
24	6.000	0.122	1789.533	3099.563	2.633	2.633
25	6.000	0.122	1786.300	3093.962	2.667	2.667
26	6.000	0.123	1788.467	3097.715	2.693	2.693
27	6.000	0.124	1804.567	3125.601	2.670	2.670
28	6.000	0.125	1811.800	3138.130	2.648	2.648
29	6.000	0.125	1816.667	3146.559	2.534	2.534
30	6.000	0.125	1821.400	3154.757	2.430	2.430
31	6.000	0.125	1822.867	3157.298	2.419	2.419
32	6.000	0.125	1822.700	3157.009	2.419	2.419
33	6.000	0.125	1820.533	3153.256	2.437	2.437
34	6.000	0.125	1831.467	3172.193	2.442	2.442
35	6.000	0.125	1844.400	3194.595	2.444	2.444
36	6.000	0.125	1842.400	3191.130	2.461	2.461
37	6.000	0.125	1836.633	3181.142	2.481	2.481
38	6.000	0.125	1836.000	3180.045	2.496	2.496

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Table 7.1.2: LB SSI Soil Profile

Layer No.	Thickness (ft)	Unit Wt (k/ft ³)	Vs (ft/s)	Vp (ft/s)	Vs Dmp (%)	Vp Dmp (%)
39	6.000	0.125	1836.767	3181.373	2.509	2.509
40	6.000	0.125	1838.867	3185.010	2.520	2.520
41	6.000	0.125	1841.533	3189.629	2.530	2.530
42	6.000	0.125	1847.500	3199.964	2.536	2.536
43	6.000	0.125	1864.533	3229.466	2.529	2.529
44	6.000	0.125	1883.033	3261.509	2.519	2.519
45	6.000	0.125	1900.433	3291.647	2.510	2.510
46	6.000	0.125	1937.200	3355.329	2.480	2.480
47	6.000	0.125	2000.967	3465.776	2.420	2.420
48	6.000	0.126	2067.200	3580.495	2.355	2.355
49	6.000	0.127	2110.000	3654.627	2.299	2.299
50	6.000	0.127	2137.900	3702.951	2.212	2.212
51	6.000	0.127	2161.567	3743.943	2.117	2.117
52	6.000	0.127	2184.500	3783.665	2.032	2.032
53	6.000	0.127	2197.400	3806.008	1.992	1.992
54	6.000	0.127	2205.567	3820.154	1.971	1.971
55	6.000	0.127	2207.300	3823.156	1.972	1.972
56	8.000	0.127	2207.300	3823.156	1.979	1.979
57	8.000	0.127	2207.150	3822.896	1.986	1.986
58	8.000	0.127	2206.925	3822.506	1.993	1.993
59	8.000	0.127	2205.000	3819.172	2.001	2.001
60	8.000	0.127	2191.925	3796.525	2.014	2.014
61	8.000	0.127	2179.900	3775.698	2.024	2.024
62	8.000	0.127	2168.300	3755.606	2.034	2.034
63	8.000	0.127	2163.000	3746.426	2.041	2.041
64	8.000	0.127	2159.375	3740.147	2.047	2.047
65	8.000	0.127	2155.175	3732.873	2.053	2.053
66	8.000	0.127	2158.325	3738.329	2.055	2.055
67	8.000	0.127	2165.000	3749.890	2.056	2.056
68	8.000	0.127	2174.800	3766.864	2.052	2.052
69	8.000	0.127	2190.425	3793.927	2.038	2.038
70	8.000	0.127	2199.725	3810.035	2.027	2.027
71	8.000	0.127	2206.875	3822.420	2.016	2.016
72	8.000	0.127	2211.850	3831.037	2.006	2.006
73	8.000	0.127	2210.900	3829.391	2.003	2.003
74	8.000	0.127	2205.425	3819.908	2.007	2.007
75	8.000	0.127	2201.450	3813.023	2.010	2.010
76	8.000	0.127	2200.450	3811.291	2.012	2.012

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Table 7.1.2: LB SSI Soil Profile

Layer No.	Thickness (ft)	Unit Wt (k/ft ³)	Vs (ft/s)	Vp (ft/s)	Vs Dmp (%)	Vp Dmp (%)
77	8.000	0.127	2199.450	3809.559	2.013	2.013
78	8.000	0.127	2200.200	3810.858	2.015	2.015
79	8.000	0.127	2207.350	3823.242	2.014	2.014
80	8.000	0.127	2214.875	3836.276	2.012	2.012
81	8.000	0.127	2223.225	3850.739	1.999	1.999
82	8.000	0.127	2244.850	3888.194	1.798	1.798
83	8.000	0.127	2270.750	3933.054	1.572	1.572
84	8.000	0.127	2296.450	3977.568	1.384	1.384
85	8.000	0.127	2321.975	4021.779	1.227	1.227
86	8.000	0.127	2335.175	4044.642	1.140	1.140
87	8.000	0.127	2339.450	4052.046	1.128	1.128
88	8.000	0.127	2344.100	4060.100	1.128	1.128
89	8.000	0.127	2348.525	4067.765	1.128	1.128
90	8.000	0.127	2352.750	4075.083	1.128	1.128
91	8.000	0.127	2358.450	4084.955	1.128	1.128
92	8.000	0.127	2366.800	4099.418	1.128	1.128
93	8.000	0.127	2375.250	4114.054	1.128	1.128
94	8.000	0.127	2383.750	4128.776	1.128	1.128
95	8.000	0.127	2392.025	4143.109	1.128	1.128
96	8.000	0.127	2410.125	4174.459	1.128	1.128
97	8.000	0.127	2502.600	4334.630	1.128	1.128
98	8.000	0.127	2611.825	4523.814	1.128	1.128
99	8.000	0.127	2720.775	4712.521	1.128	1.128
100	8.000	0.127	2829.825	4901.401	1.128	1.128
101	8.000	0.127	2939.575	5091.493	1.128	1.128
102	8.000	0.127	3039.475	5264.525	1.128	1.128
103	8.000	0.127	3057.125	5295.096	1.128	1.128
104	8.000	0.127	3057.400	5295.572	1.128	1.128
105	8.000	0.127	3057.500	5295.745	1.128	1.128
106	12.000	0.127	3056.833	5294.591	1.128	1.128
107	12.000	0.127	3056.083	5293.292	1.128	1.128
108	12.000	0.127	3051.933	5286.104	1.128	1.128
109	12.000	0.127	3042.467	5269.707	1.128	1.128
110	12.000	0.127	3032.150	5251.838	1.128	1.128
111	12.000	0.127	3021.317	5233.074	1.128	1.128
112	12.000	0.127	3011.983	5216.908	1.128	1.128
113	12.000	0.127	3012.400	5217.630	1.128	1.128
114	12.000	0.127	3014.933	5222.018	1.128	1.128

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Table 7.1.2: LB SSI Soil Profile

Layer No.	Thickness (ft)	Unit Wt (k/ft³)	Vs (ft/s)	Vp (ft/s)	Vs Dmp (%)	Vp Dmp (%)
115	12.000	0.127	3018.383	5227.993	1.128	1.128
116	12.000	0.127	3021.783	5233.882	1.128	1.128
117	12.000	0.127	3031.333	5250.423	1.128	1.128
118	12.000	0.127	3046.067	5275.942	1.128	1.128
119	12.000	0.127	3061.417	5302.529	1.128	1.128
120	12.000	0.127	3076.917	5329.376	1.128	1.128
121	12.000	0.127	3113.400	5392.567	1.128	1.128
122	12.000	0.127	3230.683	5595.708	1.128	1.128
123	12.000	0.127	3352.667	5806.989	1.128	1.128
124	12.000	0.127	3469.417	6009.206	1.128	1.128
125	12.000	0.127	3580.750	6202.041	1.128	1.128
126	12.000	0.127	3635.450	6296.784	1.128	1.128
127	12.000	0.127	3643.417	6310.583	1.128	1.128
128	12.000	0.127	3652.250	6325.883	1.128	1.128
129	12.000	0.127	3661.083	6341.182	1.128	1.128
130	12.000	0.127	3669.667	6356.049	1.128	1.128
131	12.000	0.127	3675.567	6366.268	1.128	1.128
132	12.000	0.127	3678.083	6370.627	1.128	1.128
133	12.000	0.127	3679.400	6372.908	1.128	1.128
134	12.000	0.127	3680.617	6375.015	1.128	1.128
135	14.000	0.127	3681.157	6375.951	1.128	1.128
Halfspace		0.127	3679.800	6373.601	1.128	1.128

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Table 7.1.3: UB SSI Soil Profile

Layer No.	Thickness (ft)	Unit Wt (k/ft ³)	Vs (ft/s)	Vp (ft/s)	Vs Dmp (%)	Vp Dmp (%)
1	1.000	0.120	1151.000	2395.998	0.835	0.835
2	2.000	0.120	1203.000	2504.244	0.894	0.894
3	2.000	0.120	1283.100	2670.986	0.974	0.974
4	2.000	0.120	1353.800	2818.159	1.032	1.032
5	2.000	0.120	1376.100	2864.581	1.103	1.103
6	2.000	0.120	1407.300	2929.529	1.156	1.156
7	2.000	0.120	1464.300	3048.184	1.186	1.186
8	2.000	0.120	1615.000	3361.891	1.155	1.155
9	2.000	0.120	1769.500	3683.508	1.123	1.123
10	2.000	0.120	1892.500	3939.553	1.058	1.058
11	4.000	0.120	2005.000	4173.740	0.973	0.973
12	4.000	0.120	2127.050	4427.808	0.947	0.947
13	4.000	0.120	2204.300	4588.616	0.945	0.945
14	4.000	0.120	2247.850	4679.273	0.954	0.954
15	4.000	0.120	2262.200	4709.145	0.968	0.968
16	6.000	0.120	2279.633	4213.146	0.978	0.978
17	6.000	0.121	2322.867	4023.323	0.806	0.806
18	6.000	0.122	2421.367	4193.930	0.587	0.587
19	6.000	0.122	2536.367	4393.116	0.581	0.581
20	6.000	0.122	2596.367	4497.039	0.580	0.580
21	6.000	0.122	2663.167	4612.740	0.579	0.579
22	6.000	0.122	2694.667	4667.300	0.582	0.582
23	6.000	0.122	2700.967	4678.211	0.588	0.588
24	6.000	0.122	2690.433	4659.967	0.595	0.595
25	6.000	0.122	2684.433	4649.575	0.602	0.602
26	6.000	0.123	2687.600	4655.060	0.606	0.606
27	6.000	0.124	2712.667	4698.476	0.606	0.606
28	6.000	0.125	2722.400	4715.335	0.606	0.606
29	6.000	0.125	2728.200	4725.381	0.599	0.599
30	6.000	0.125	2734.533	4736.351	0.591	0.591
31	6.000	0.125	2736.967	4740.565	0.593	0.593
32	6.000	0.125	2737.333	4741.200	0.595	0.595
33	6.000	0.125	2734.267	4735.889	0.599	0.599
34	6.000	0.125	2749.800	4762.793	0.600	0.600
35	6.000	0.125	2769.333	4796.626	0.601	0.601
36	6.000	0.125	2766.300	4791.372	0.604	0.604
37	6.000	0.125	2757.467	4776.072	0.609	0.609
38	6.000	0.125	2756.600	4774.571	0.612	0.612

Table 7.1.3: UB SSI Soil Profile

Layer No.	Thickness (ft)	Unit Wt (k/ft ³)	Vs (ft/s)	Vp (ft/s)	Vs Dmp (%)	Vp Dmp (%)
39	6.000	0.125	2757.933	4776.881	0.615	0.615
40	6.000	0.125	2761.200	4782.539	0.617	0.617
41	6.000	0.125	2765.400	4789.813	0.620	0.620
42	6.000	0.125	2774.300	4805.229	0.621	0.621
43	6.000	0.125	2800.800	4851.128	0.619	0.619
44	6.000	0.125	2831.633	4904.533	0.617	0.617
45	6.000	0.125	2862.633	4958.226	0.615	0.615
46	6.000	0.125	2930.300	5075.428	0.609	0.609
47	6.000	0.125	3070.467	5318.204	0.595	0.595
48	6.000	0.126	3223.967	5584.074	0.580	0.580
49	6.000	0.127	3294.467	5706.184	0.569	0.569
50	6.000	0.127	3334.700	5775.870	0.558	0.558
51	6.000	0.127	3371.867	5840.244	0.545	0.545
52	6.000	0.127	3408.333	5903.407	0.532	0.532
53	6.000	0.127	3438.133	5955.022	0.525	0.525
54	6.000	0.127	3462.933	5997.976	0.521	0.521
55	6.000	0.127	3462.933	5997.976	0.521	0.521
56	8.000	0.127	3455.300	5984.755	0.523	0.523
57	8.000	0.127	3446.800	5970.033	0.525	0.525
58	8.000	0.127	3438.700	5956.003	0.527	0.527
59	8.000	0.127	3429.775	5940.545	0.529	0.529
60	8.000	0.127	3420.050	5923.700	0.532	0.532
61	8.000	0.127	3422.550	5928.030	0.534	0.534
62	8.000	0.127	3425.900	5933.833	0.536	0.536
63	8.000	0.127	3433.350	5946.737	0.538	0.538
64	8.000	0.127	3439.925	5958.125	0.539	0.539
65	8.000	0.127	3443.200	5963.797	0.540	0.540
66	8.000	0.127	3450.300	5976.095	0.541	0.541
67	8.000	0.127	3459.200	5991.510	0.541	0.541
68	8.000	0.127	3484.000	6034.465	0.540	0.540
69	8.000	0.127	3573.600	6189.657	0.536	0.536
70	8.000	0.127	3670.750	6357.926	0.531	0.531
71	8.000	0.127	3771.900	6533.122	0.527	0.527
72	8.000	0.127	3876.550	6714.382	0.523	0.523
73	8.000	0.127	3941.000	6826.012	0.521	0.521
74	8.000	0.127	3961.750	6861.952	0.521	0.521
75	8.000	0.127	3982.825	6898.455	0.521	0.521
76	8.000	0.127	4004.550	6936.084	0.521	0.521

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Table 7.1.3: UB SSI Soil Profile

Layer No.	Thickness (ft)	Unit Wt (k/ft ³)	Vs (ft/s)	Vp (ft/s)	Vs Dmp (%)	Vp Dmp (%)
77	8.000	0.127	4026.150	6973.496	0.521	0.521
78	8.000	0.127	4040.425	6998.221	0.521	0.521
79	8.000	0.127	4048.600	7012.381	0.521	0.521
80	8.000	0.127	4056.750	7026.497	0.521	0.521
81	8.000	0.127	4065.825	7042.215	0.519	0.519
82	8.000	0.127	4092.425	7088.288	0.480	0.480
83	8.000	0.127	4125.200	7145.056	0.432	0.432
84	8.000	0.127	4157.850	7201.607	0.387	0.387
85	8.000	0.127	4190.350	7257.899	0.346	0.346
86	8.000	0.127	4220.300	7309.774	0.322	0.322
87	8.000	0.127	4266.250	7389.362	0.319	0.319
88	8.000	0.127	4319.275	7481.204	0.319	0.319
89	8.000	0.127	4372.450	7573.306	0.319	0.319
90	8.000	0.127	4425.800	7665.710	0.319	0.319
91	8.000	0.127	4479.700	7759.068	0.319	0.319
92	8.000	0.127	4534.325	7853.681	0.319	0.319
93	8.000	0.127	4593.025	7955.353	0.319	0.319
94	8.000	0.127	4655.775	8064.039	0.319	0.319
95	8.000	0.127	4718.700	8173.028	0.319	0.319
96	8.000	0.127	4783.900	8285.958	0.319	0.319
97	8.000	0.127	4865.425	8427.163	0.319	0.319
98	8.000	0.127	4950.525	8574.561	0.319	0.319
99	8.000	0.127	5003.425	8666.186	0.319	0.319
100	8.000	0.127	5044.150	8736.724	0.319	0.319
101	8.000	0.127	5088.600	8813.714	0.319	0.319
102	8.000	0.127	5133.375	8891.266	0.319	0.319
103	8.000	0.127	5148.950	8918.243	0.319	0.319
104	8.000	0.127	5157.900	8933.745	0.319	0.319
105	8.000	0.127	5165.475	8946.865	0.319	0.319
106	12.000	0.127	5169.567	8953.952	0.319	0.319
107	12.000	0.127	5174.033	8961.689	0.319	0.319
108	12.000	0.127	5177.217	8967.202	0.319	0.319
109	12.000	0.127	5178.333	8969.136	0.319	0.319
110	12.000	0.127	5172.017	8958.196	0.319	0.319
111	12.000	0.127	5160.167	8937.671	0.319	0.319
112	12.000	0.127	5149.017	8918.358	0.319	0.319
113	12.000	0.127	5141.450	8905.253	0.319	0.319
114	12.000	0.127	5137.183	8897.863	0.319	0.319

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Table 7.1.3: UB SSI Soil Profile

Layer No.	Thickness (ft)	Unit Wt (k/ft ³)	Vs (ft/s)	Vp (ft/s)	Vs Dmp (%)	Vp Dmp (%)
115	12.000	0.127	5140.283	8903.232	0.319	0.319
116	12.000	0.127	5143.767	8909.265	0.319	0.319
117	12.000	0.127	5149.500	8919.196	0.319	0.319
118	12.000	0.127	5157.583	8933.196	0.319	0.319
119	12.000	0.127	5171.867	8957.936	0.319	0.319
120	12.000	0.127	5188.017	8985.908	0.319	0.319
121	12.000	0.127	5212.467	9028.257	0.319	0.319
122	12.000	0.127	5272.383	9132.036	0.319	0.319
123	12.000	0.127	5337.133	9244.186	0.319	0.319
124	12.000	0.127	5404.417	9360.724	0.319	0.319
125	12.000	0.127	5483.550	9497.787	0.319	0.319
126	12.000	0.127	5527.633	9574.142	0.319	0.319
127	12.000	0.127	5533.300	9583.957	0.319	0.319
128	12.000	0.127	5541.700	9598.506	0.319	0.319
129	12.000	0.127	5550.400	9613.575	0.319	0.319
130	12.000	0.127	5559.033	9628.528	0.319	0.319
131	12.000	0.127	5565.000	9638.863	0.319	0.319
132	12.000	0.127	5564.750	9638.430	0.319	0.319
133	12.000	0.127	5562.067	9633.782	0.319	0.319
134	12.000	0.127	5559.517	9629.365	0.319	0.319
135	14.000	0.127	5556.171	9623.571	0.319	0.319
Halfspace		0.127	5552.700	9617.559	0.319	0.319

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7.3 SSI Finite Element Models

Concrete Pad

The concrete ISFSI pad is modeled using 4-node shell finite elements, modeled at the center of the pad thickness, with the 135ft dimension modeled along the X-axis, the 55ft dimensions along the Y-axis, and the vertical direction along the Z-axis in the global Cartesian coordinate system with the pad center at coordinates (0, 0, 0). The N-S direction is parallel with the Y-axis and the E-W direction is parallel with the X-axis. The pad is modeled with the following properties:

- Dimensions: 135ft (X, E-W) x 55ft (Y, N-S) [2]
- Thickness: 3ft [2, 3]
- Average element length: 1.78ft
- Concrete 28 day compressive strength, f'_c : 4000psi [3]
- Concrete elastic modulus, E_c : 3605ksi/519120ksf per Table 3-1 of ASCE 43-05/ACI349-06 [8]
- Concrete unit weight: 0.150kcf (typ.)
- Concrete Poison's ratio: G_c = concrete shear modulus = $0.4E_c$, $\nu = 0.25$ per Table 3-1 of ASCE 43-05/ACI349-06 [8]
- Uncracked Concrete Damping: 4% per RG 1.61 Table 2 for uncracked concrete properties consistent with the expected state of stress of the concrete pad for SSI analysis with site-specific hazard spectra [13]

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Storage casks

There are 3 storage cask types that will be housed at the WCS ISFSI site. The cask types are provided by NAC International and are the NAC MAGNASTOR [4], NAC-UMS [5], and NAC-MPC [6] storage casks. Based on drawing NAC004-C-001 [2], the MAGNASTOR cask envelopes the 3 cask types in weight and size and is therefore chosen as the bounding cask for the SSI analysis.

The storage casks have a natural frequency of 138Hz per Section 3.7.3.4 of the MAGNASTOR FSAR [4] and are considered to be rigid for this SSI analysis up to 50Hz. The storage casks are represented with a single vertical rigid beam element with the cask mass lumped at its CG and 8 horizontal rigid beam elements representing the contact area with the concrete pad. The rigid beam elements representing the cask are connected to the pad with 9 vertical stiff springs having length of half the pad thickness to locate the casks at the pad surface. The horizontal rigid beam ends connected to the vertical springs have rotational end releases. This configuration minimizes the effect of stiffening of the concrete pad due to the connection of the rigid beam members to the concrete pad shell elements and is verified in Appendix A. The MAGNASTOR casks are modeled with the following properties:

- Maximum cask height: 225.3in, taken as 226in (18.8333ft) per FSAR drawing 562 [4]
- Maximum cask diameter: 136in (11.3333ft) per FSAR drawing 562 [4]
- Cask footprint diameter on pad: 128in (10.6667ft) per FSAR drawing 561 [4]
- Maximum cask center of gravity: 113in (9.4167ft) per FSAR table 3.2.1-1 [4]
- Maximum cask translational weight: 335.5kip per FSAR table 3.2.1-1 [4]

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- Maximum cask mass moment of inertia: $I_{zz} = 167.2869 \text{kp-ft}^2$, $I_{xx} = I_{yy} = 391.6144 \text{kp-ft}^2$ calculated assuming uniformly distributed cylindrical mass with maximum cask dimensions:

$$I_{zz} = \frac{mr^2}{2}, I_{xx} = I_{yy} = \frac{m}{12}(3r^2 + h^2)$$

Where m is the cask translational mass; r is the cask radius taken as half the cask diameter; and h is the cask height.

- Cask rigid beam properties:

Table 7.3.1: Cask Rigid Beam Properties

Material Properties				
Unit Wt (kcf)	E (ksf)	ν	Vs Dmp	Vp Dmp
0	1.00E+12	0.25	0	0
Section Properties				
Area (ft ²)	S2, S3 (ft ²)	T (ft ⁴)	I2 (ft ⁴)	I3 (ft ⁴)
1000	1000	1.00E+12	1.00E+06	1.00E+06

Where S2 and S3 are the shear areas associated with the beam local 2- and 3-axis; T is the torsional inertia; and I2 and I3 are the beam flexural inertias in the local beam 2- and 3-axis.

- Rigid Spring properties: 1.00E+12k/ft applied to all global degrees of freedom (Ux, Uy, Uz, Rx, Ry, Rz).

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Cask Configurations

To account for different concrete pad loading conditions, four cask configurations are considered for SSI analysis:

1. Fully loaded pad (Cask No. A1 to A8, B1 to B8, C1 to C8, 24 Casks Total)
2. Quarter loaded pad (Cask No. A1 to A2, B1 to B2, C1 to C2, 8 Casks Total)
3. Half loaded pad (Cask No. A1 to A4, B1 to B4, C1 to C4, 12 Casks Total)
4. Eccentric loaded pad (Cask No. A1 to A2, B1, C1, 4 Casks Total)

The cask labels and cask configuration 1 (fully loaded) pad is shown in Figure 7.3.1. An overview of all 4 cask configurations is shown in Figure 7.3.2, and the finite element model of the concrete pad and casks for configuration 1 are shown in Figure 7.3.3. The cask labels for all cases will follow the naming convention as shown in Figure 7.3.1. The node numbers at the location of the cask CG's and pad CG are given in Table 7.3.2.

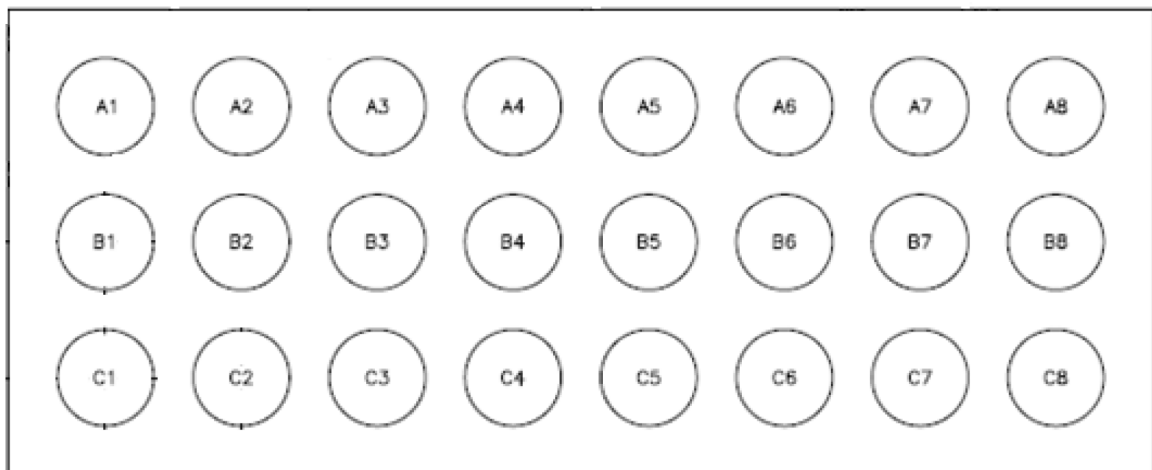


Figure 7.3.1: Cask configuration 1

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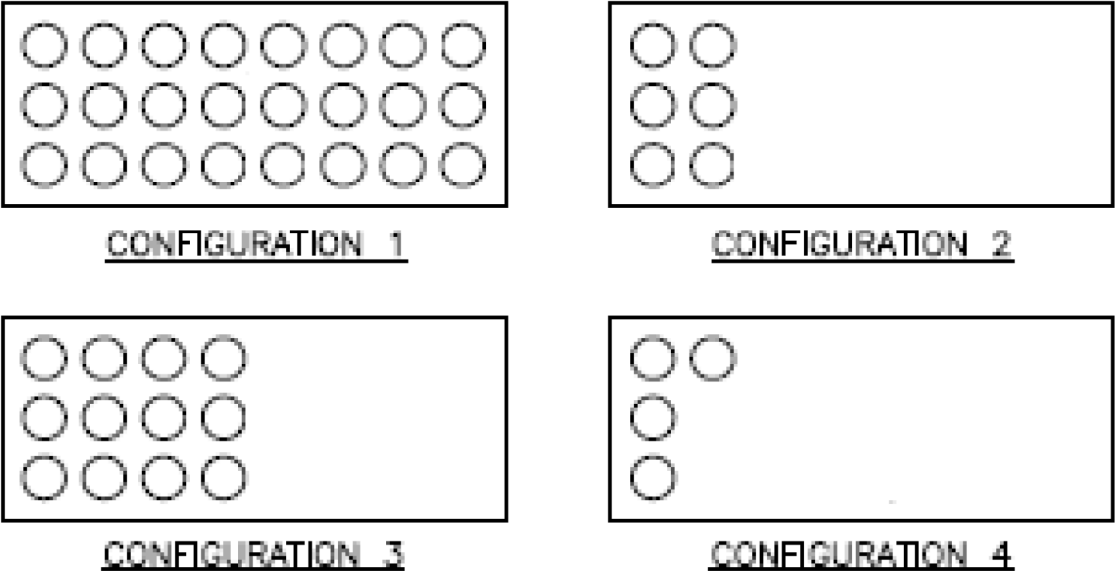


Figure 7.3.2: Cask configuration Overview

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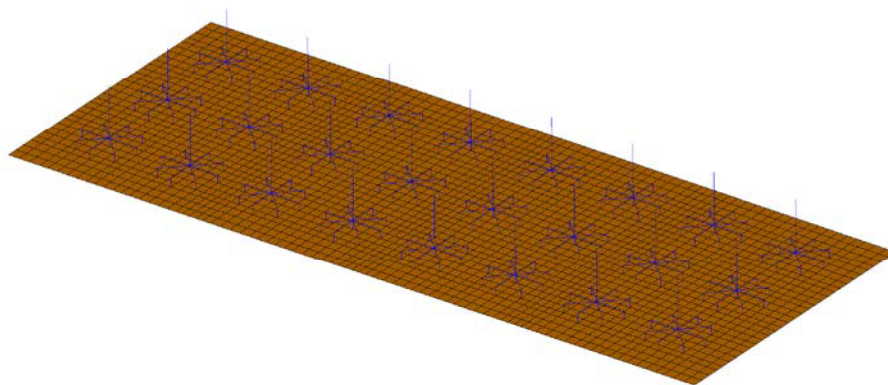


Figure 7.3.3: ISFSI Pad and Cask FEM

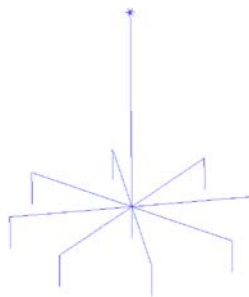


Figure 7.3.4: Cask FEM (typ.)

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Table 7.3.2: Cask and Pad CG FEM Node Numbers

FEM Node No.	Cask No.
2459	A1
2469	A2
2479	A3
2489	A4
2499	A5
2509	A6
2519	A7
2529	A8
2539	B1
2549	B2
2559	B3
2569	B4
2579	B5
2589	B6
2599	B7
2609	B8
2619	C1
2629	C2
2639	C3
2649	C4
2659	C5
2669	C6
2679	C7
2689	C8
154	Center of Pad

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7.4 SSI Analysis

The SSI analysis was performed for the surface founded model using the Direct Method with 2450 interaction nodes for 3 simultaneous input directions (X, Y, and Z).

As discussed in the definition of the soil profiles in Section 7.1, the soil model will allow a passing frequency of >50Hz based on the LB soil profile. The average shell element length of 1.78ft also transmits a passing frequency of >50Hz. For SSI analysis, 72 equally spaced frequencies are solved up to 50Hz. The transfer functions at the CG of cask B1 is shown for BE, LB, and UB soil cases in Figure 7.4.1 through Figure 7.4.12, illustrating the SSI frequencies for each configuration and showing no structural amplification leading up to 50Hz, justifying the cut off frequency.

From Section 7.2, the average element length of the concrete pad foundation is 1.78ft, resulting in a $0.9 \times 1.78 = 1.60\text{ft}$ POINT radius.

The analysis specifies vertically propagating SV waves, SH waves and P waves for the X, Y and Z-directions respectively.

SSI analysis is performed for 36 cases as shown in Table 6.1.

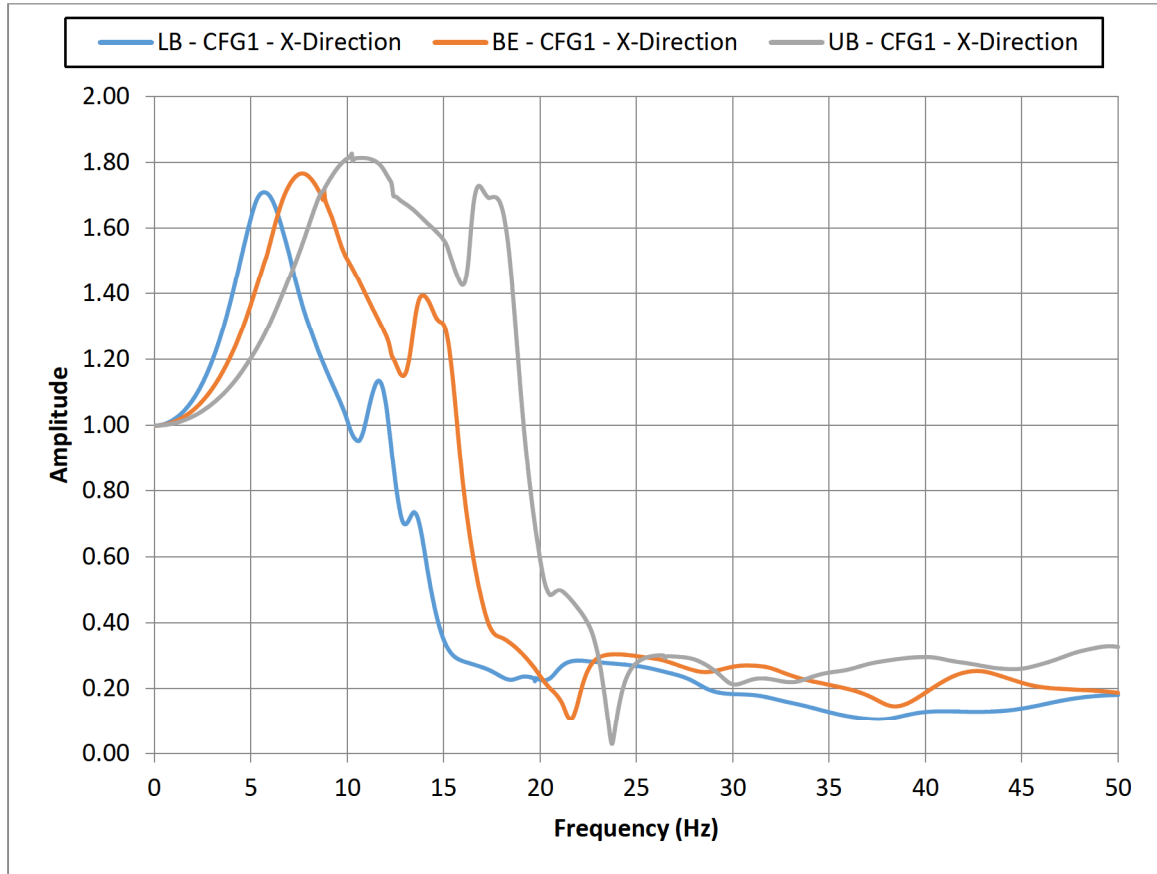
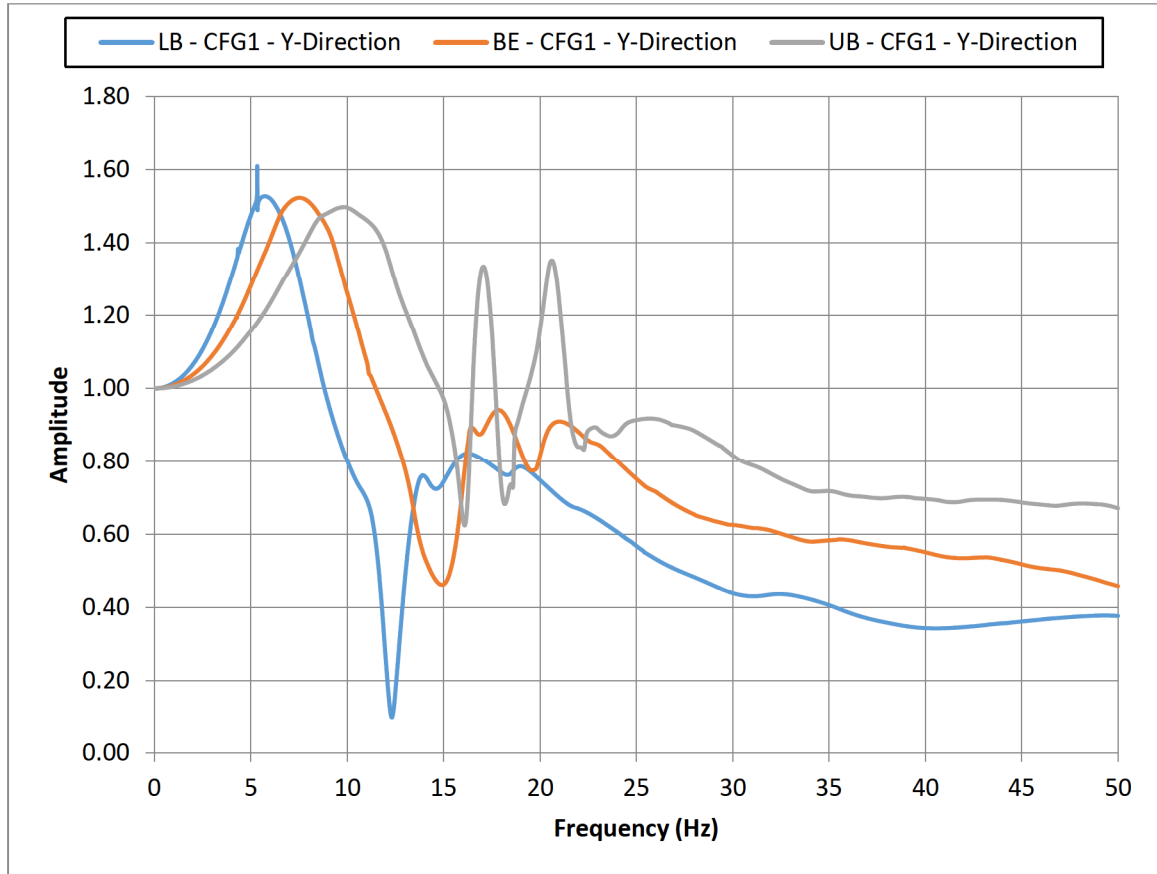


Figure 7.4.1: Cask B1 CG Transfer Functions for Configuration 1 – X/EW-Direction Response due to X/E-W-Direction Input Motion



**Figure 7.4.2: Cask B1 CG Transfer Functions for Configuration 1 – Y/N-S-
Direction Response due to Y/N-S Direction Input Motion**

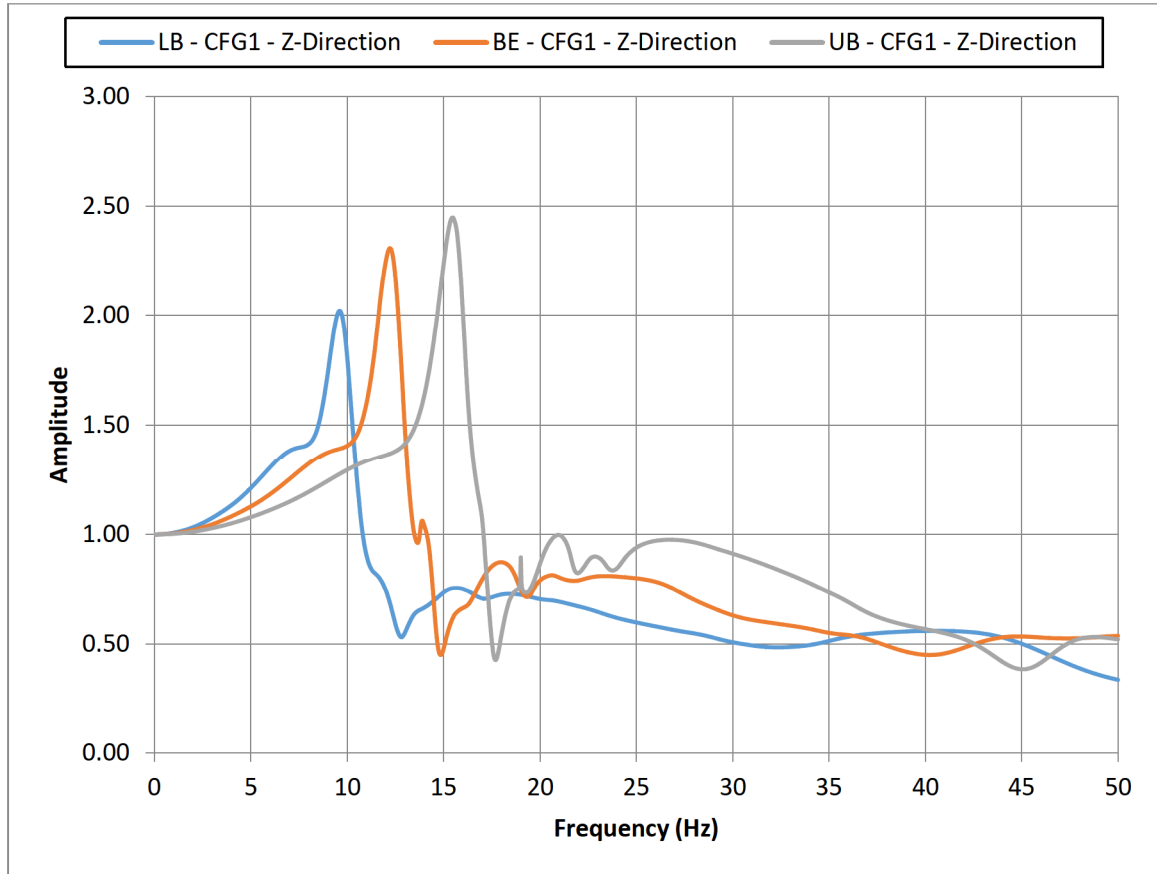


Figure 7.4.3: Cask B1 CG Transfer Functions for Configuration 1 – Y/N-S-Direction Response due to Y/N-S Direction Input Motion

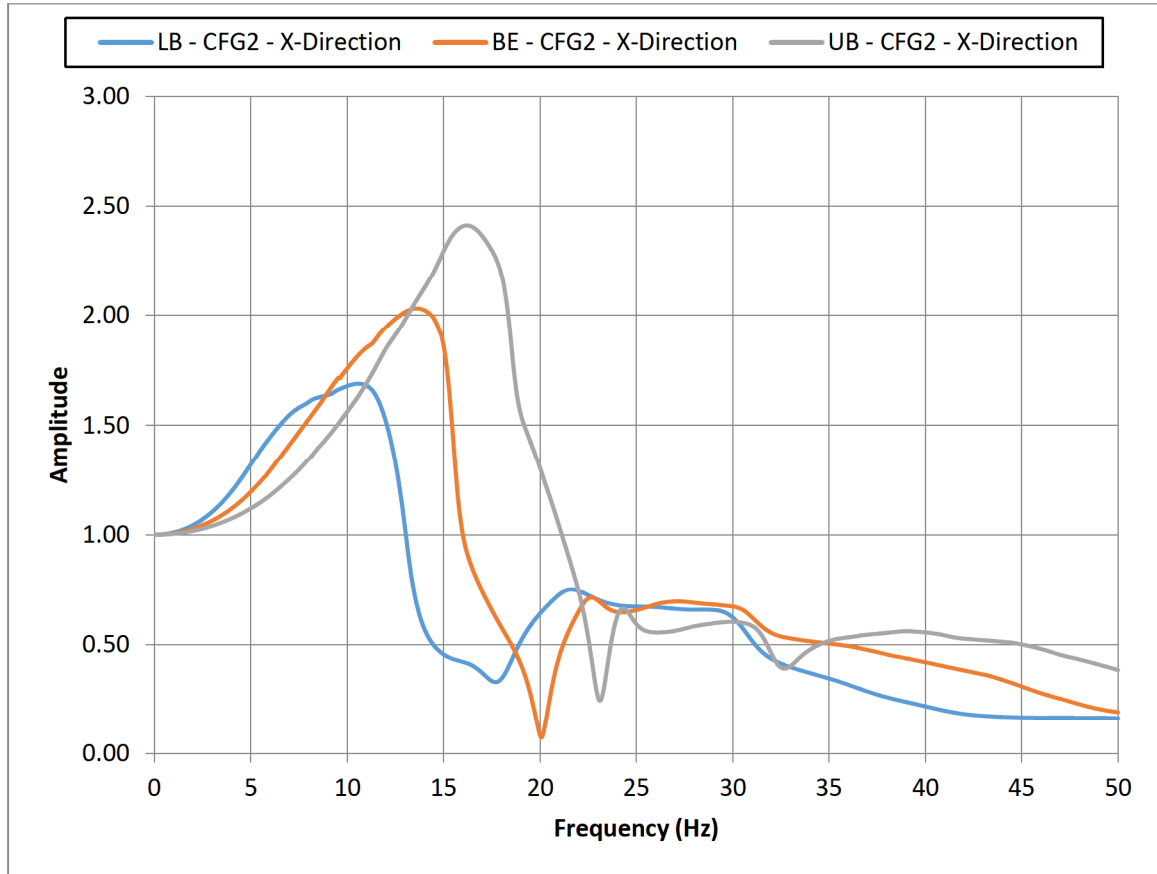


Figure 7.4.4: Cask B1 CG Transfer Functions for Configuration 2 – X/EW-Direction Response due to X/E-W-Direction Input Motion

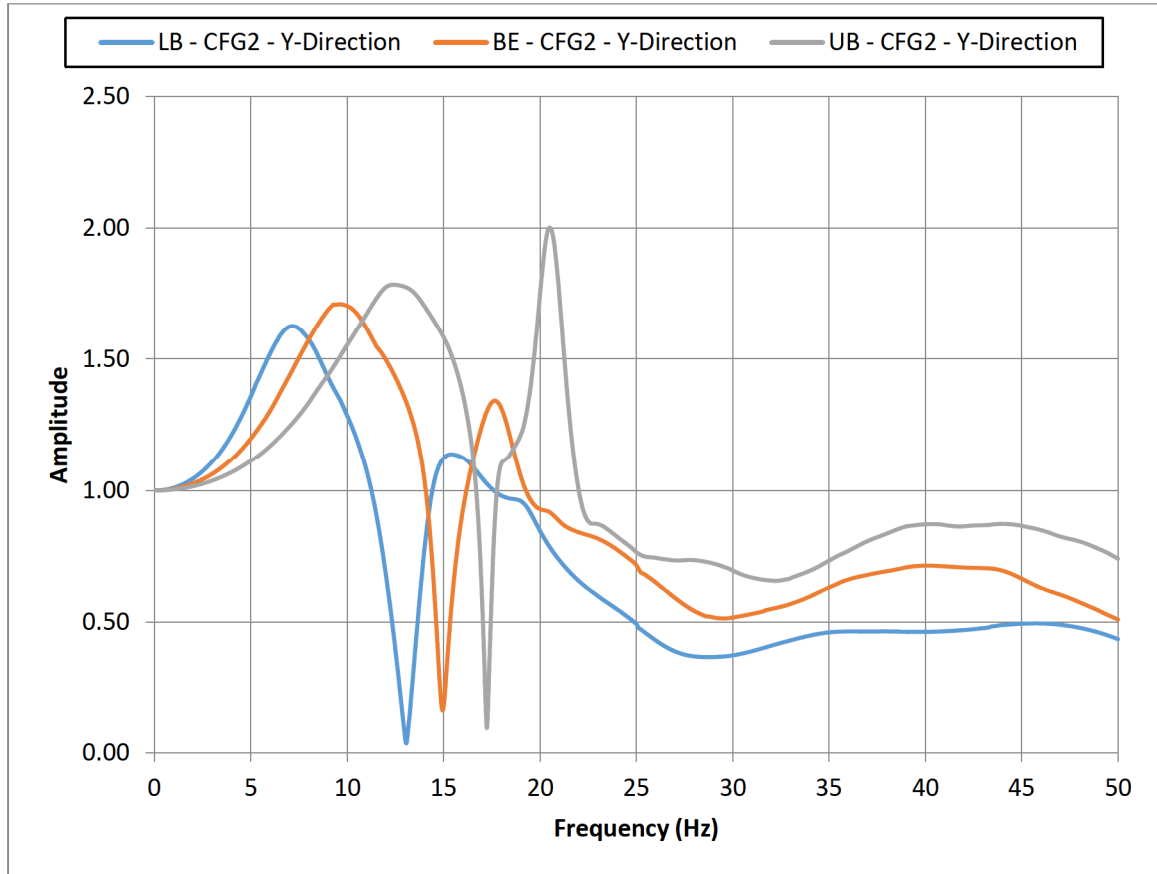


Figure 7.4.5: Cask B1 CG Transfer Functions for Configuration 2 – Y/N-S-Direction Response due to Y/N-S Direction Input Motion

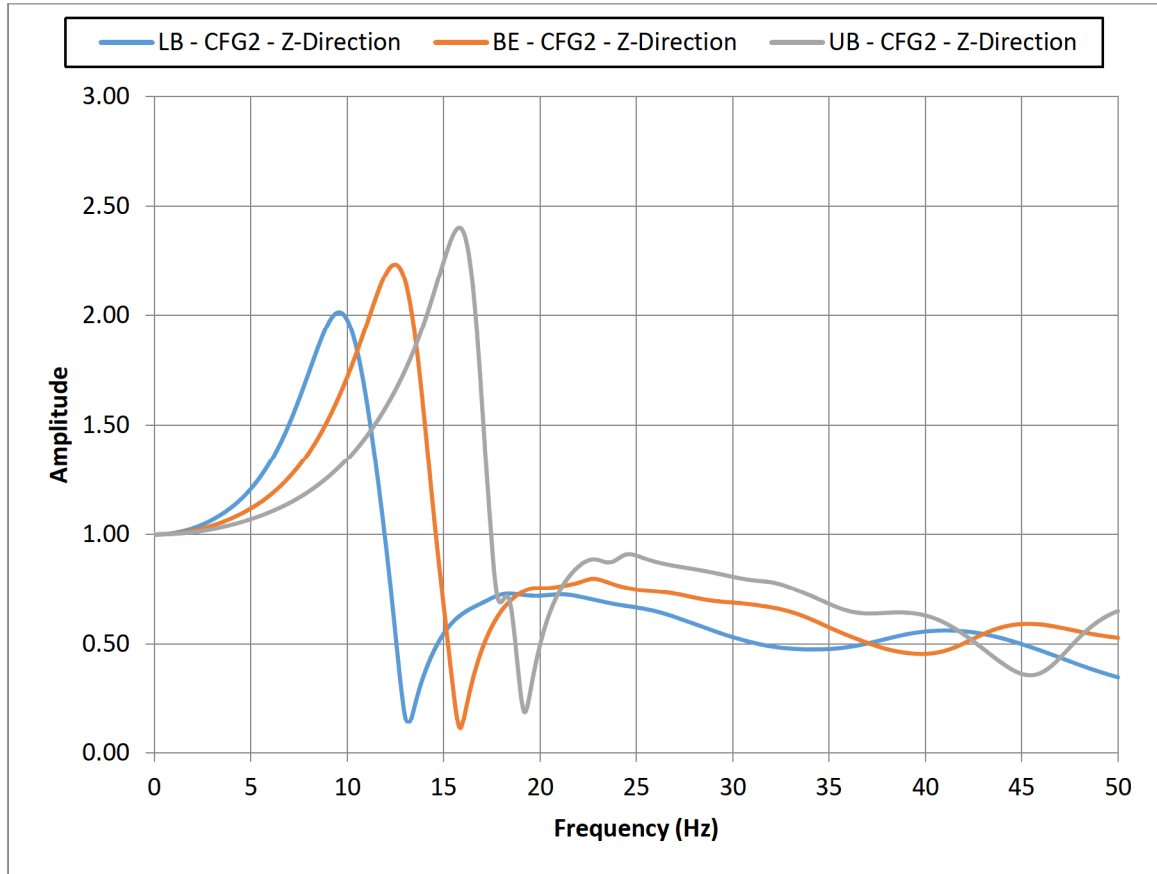


Figure 7.4.6: Cask B1 CG Transfer Functions for Configuration 2 – Z/Vertical-Direction Response due to Z/Vertical Direction Input Motion

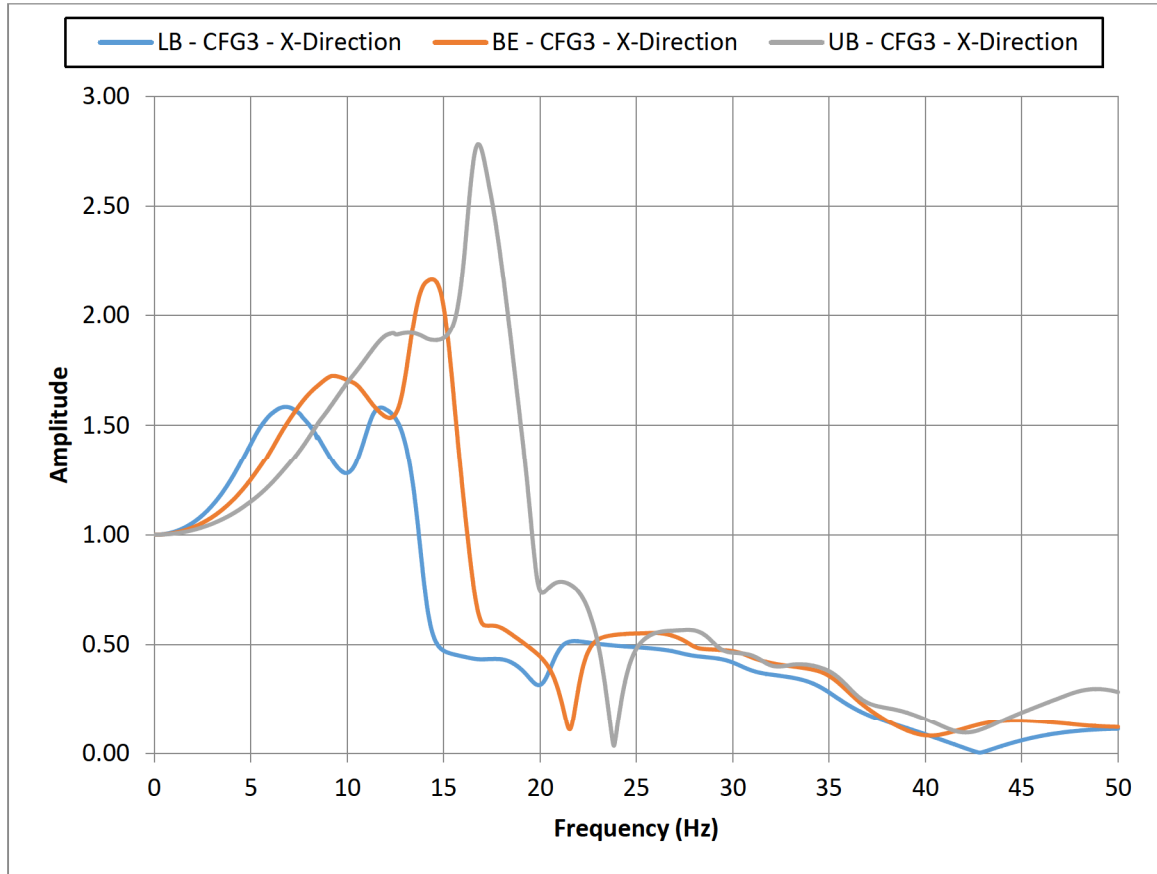


Figure 7.4.7: Cask B1 CG Transfer Functions for Configuration 3 – X/EW-Direction Response due to X/E-W-Direction Input Motion

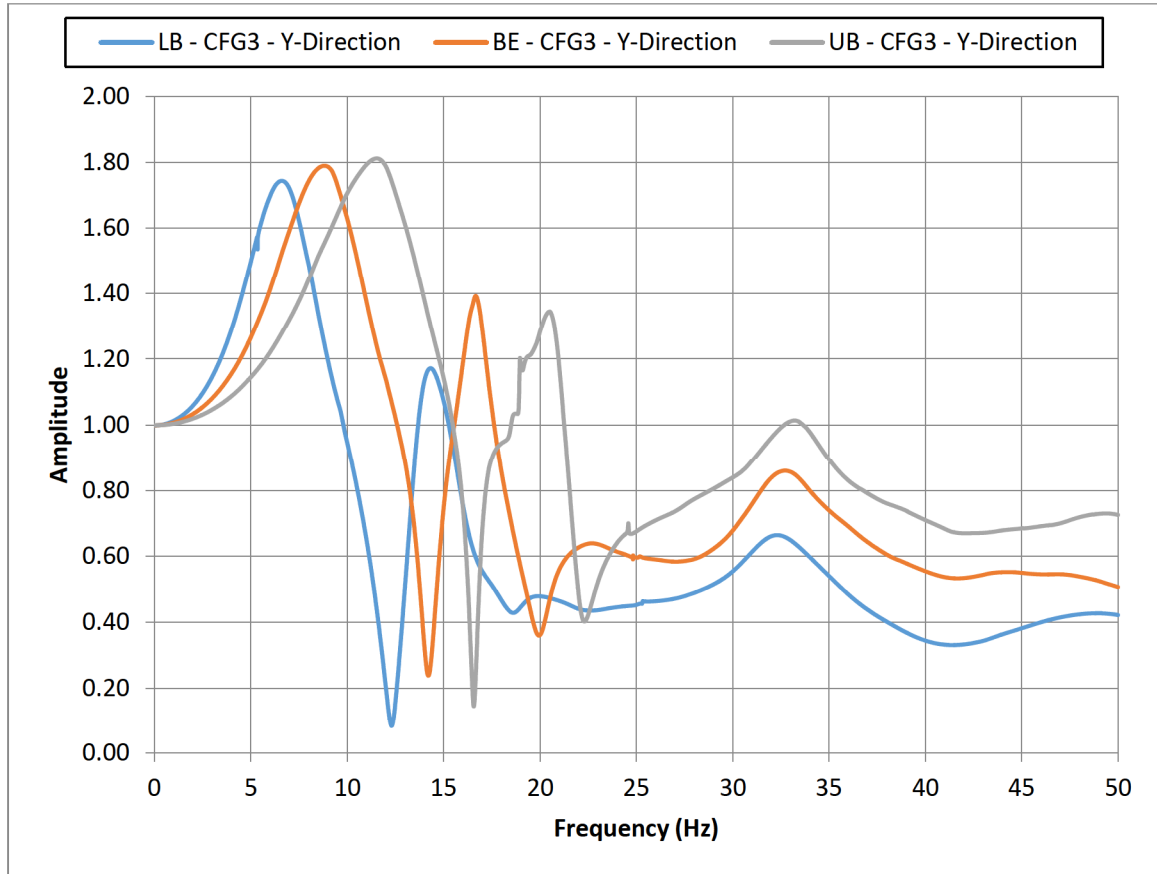
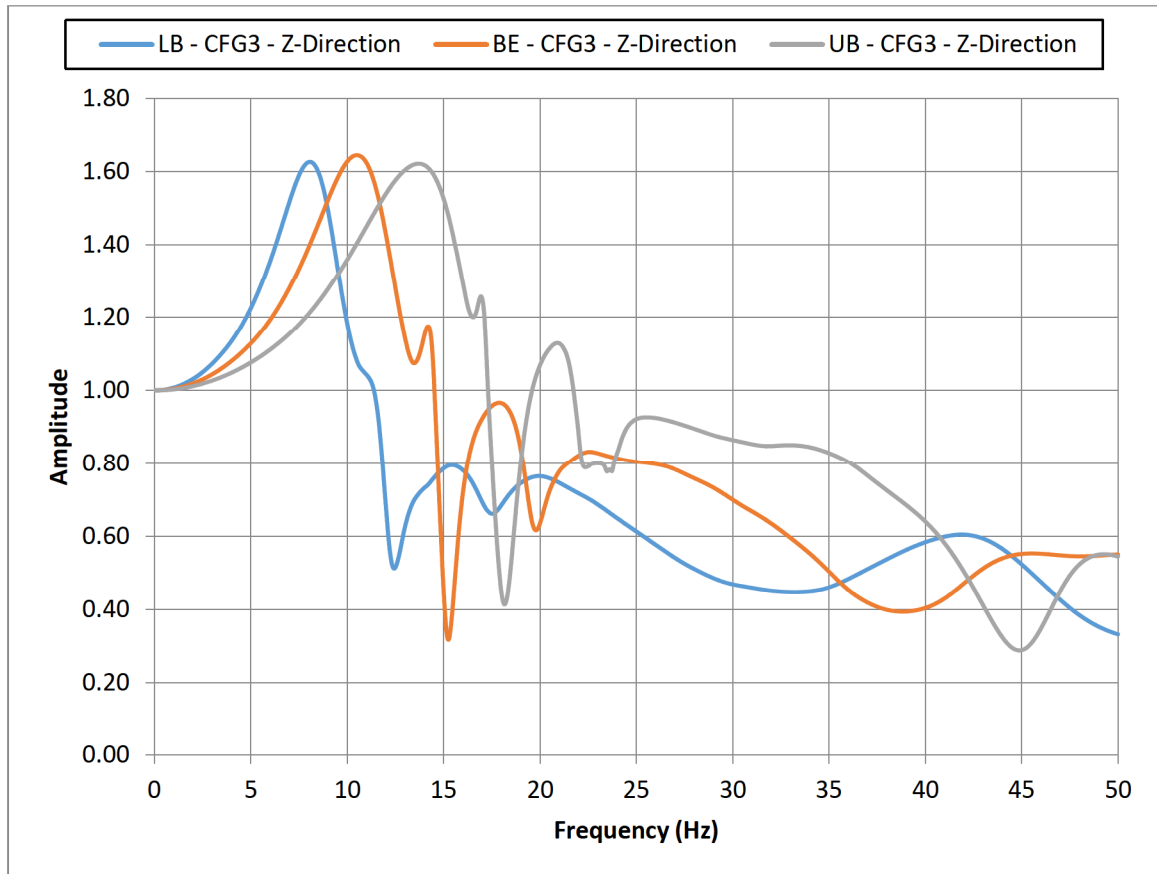


Figure 7.4.8: Cask B1 CG Transfer Functions for Configuration 3 – Y/N-S-Direction Response due to Y/N-S Direction Input Motion



**Figure 7.4.9: Cask B1 CG Transfer Functions for Configuration 3 –
Z/Vertical-Direction Response due to Z/Vertical Direction Input Motion**

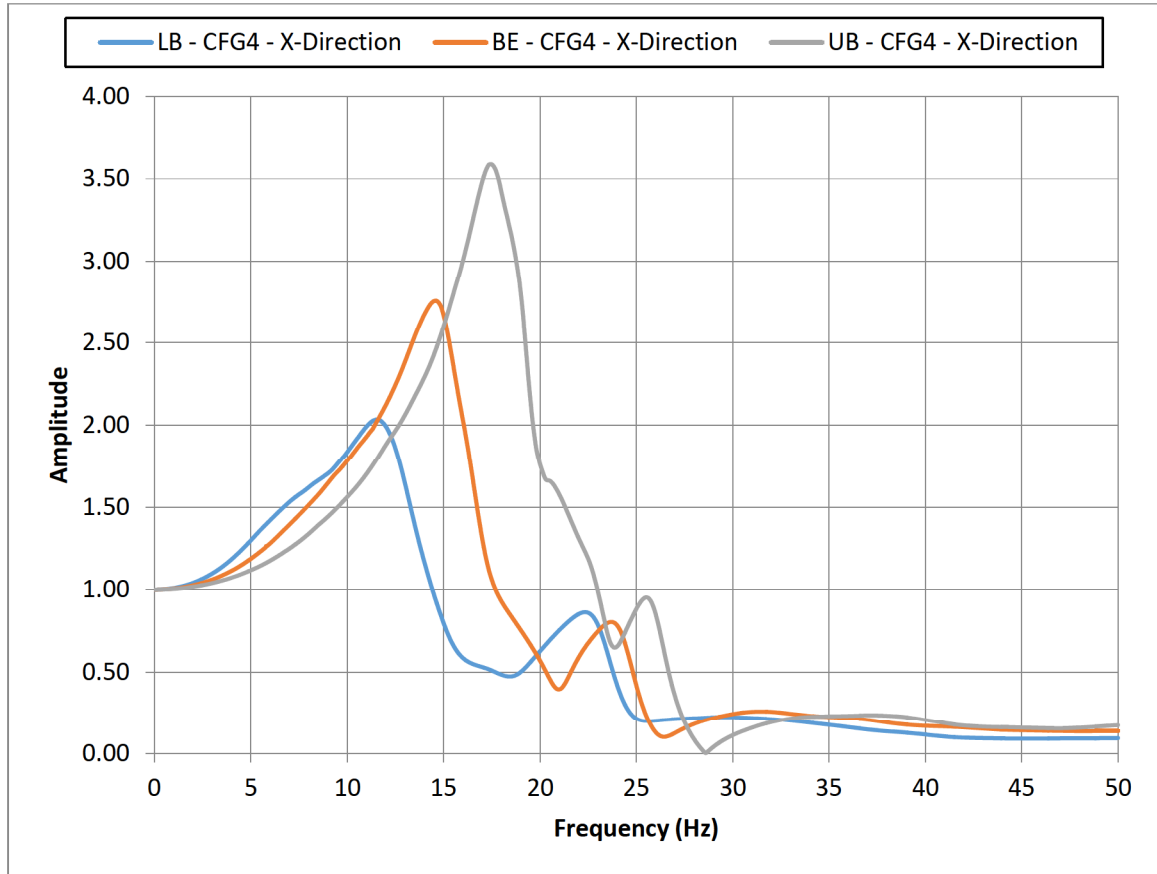


Figure 7.4.10: Cask B1 CG Transfer Functions for Configuration 4 – X/EW-Direction Response due to X/E-W-Direction Input Motion

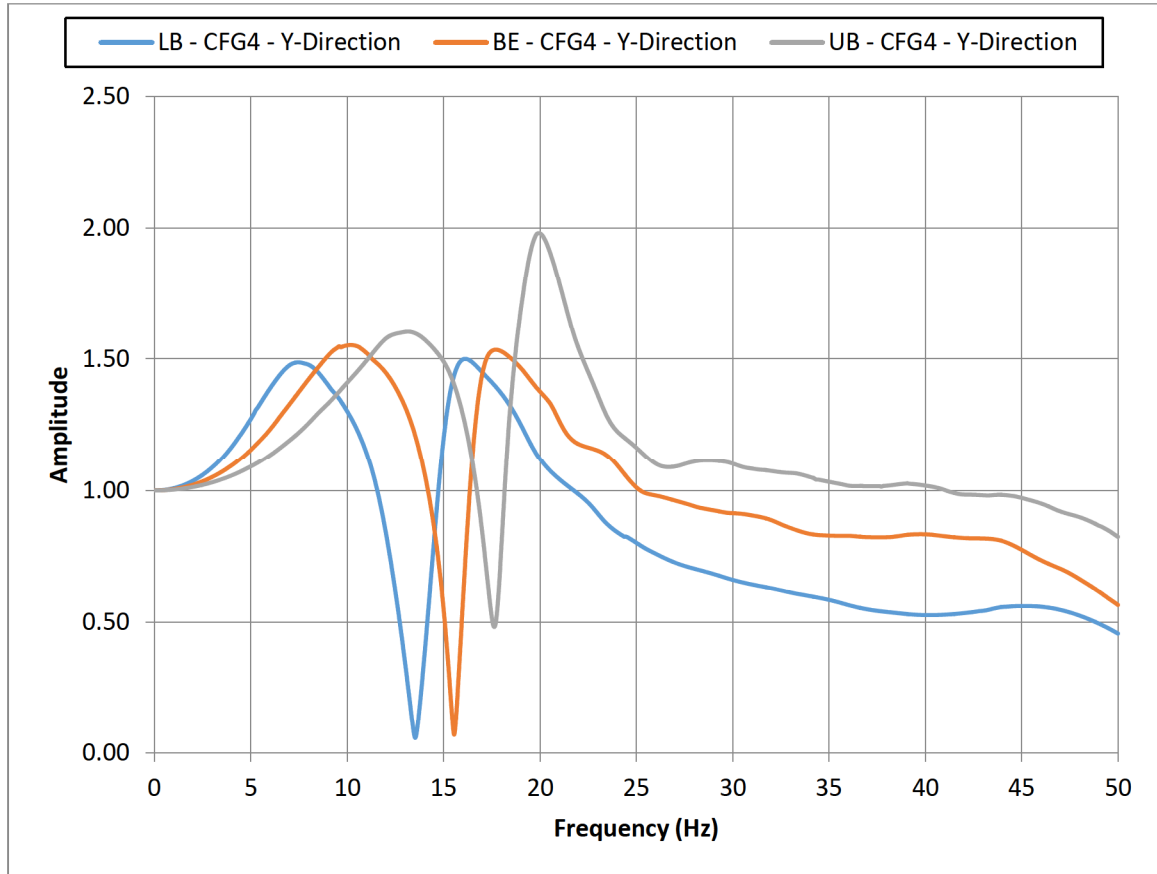


Figure 7.4.11: Cask B1 CG Transfer Functions for Configuration 4 – Y/N-S-Direction Response due to Y/N-S Direction Input Motion

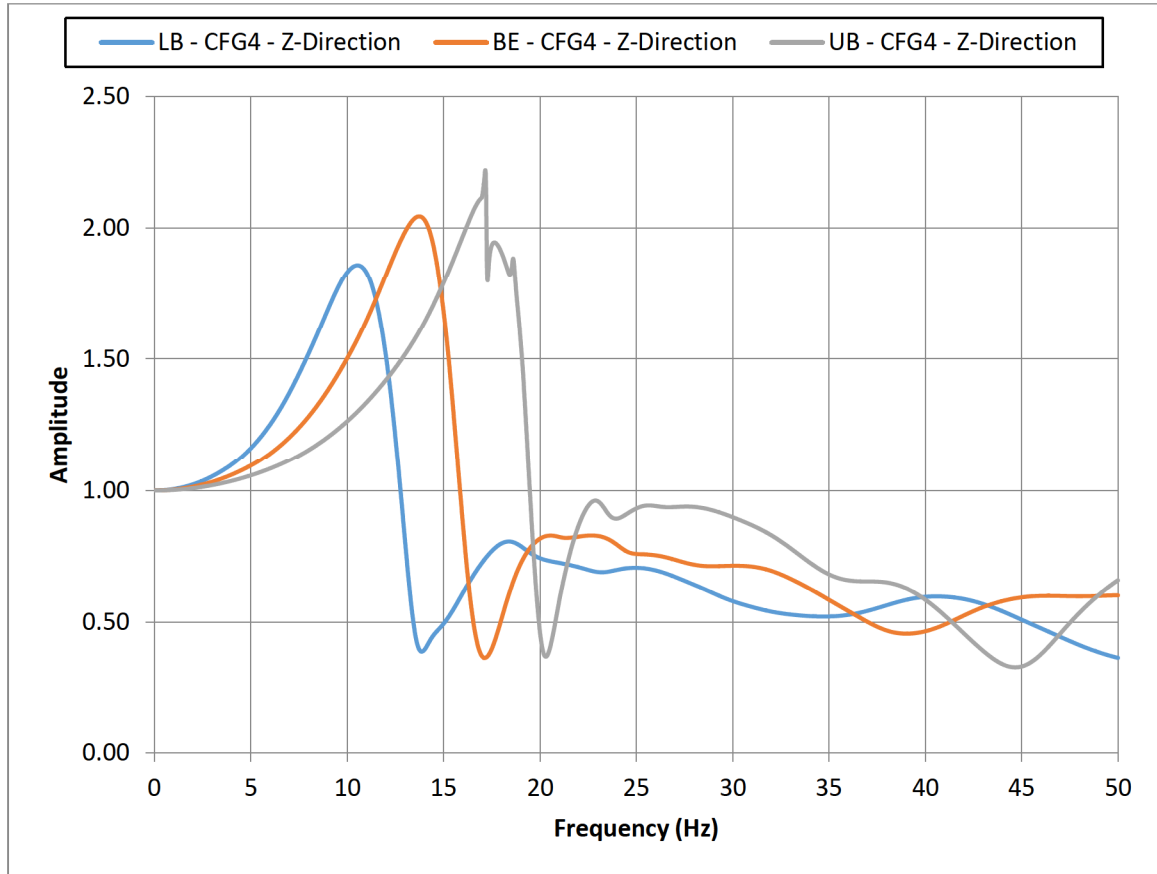


Figure 7.4.12: Cask B1 CG Transfer Functions for Configuration 4 – Z/Vertical-Direction Response due to Z/Vertical Direction Input Motion

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7.5 SSI Analysis Results

The 36 analysis cases are examined to determine the maximum cask CG accelerations and determine the sliding and overturning potential for each analysis case. In addition, the envelopes of the cask CG and center of pad acceleration response spectra are also presented for 4, 5, 7, and 10 percent damping for all analysis cases

Maximum Cask Accelerations

The maximum accelerations at the cask CG's for all analysis cases are shown in Table 7.5.1. The maximum accelerations, along with the cask configurations and soil cases are:

- 0.45g in the X/E-W Direction for Case 30, Coyote Lake earthquake on UB soil at cask CG B1 for cask configuration 4
- 0.42g in the Y/N-S Direction for Case 30, Coyote Lake earthquake on UB soil at cask CG A2 for cask configuration 4
- 0.28g in the Z/Vertical Direction for Case 22, Norcia earthquake on LB soil at cask CG B3 for cask configuration 3

Figures 7.5.1 through 7.5.9 show the maximum accelerations for each cask configuration for the BE, LB, and UB soil cases and their respective time histories. The digitized acceleration time histories for each cask and center of pad, for all analysis cases are included in Attachment 1.

Table 7.5.1: Maximum Cask CG Accelerations

Case No.	Time History	Soil Case	Cask Cfg	Maximum Cask CG Acceleration (g)					
				Cask	Ax	Cask	Ay	Cask	Az
1	Coyote Lake	LB	1	B8	0.270	C4	0.245	A1	0.216
2	Coyote Lake	BE	1	B1	0.355	C2	0.274	B2	0.242
3	Coyote Lake	UB	1	B1	0.423	C7	0.318	C8	0.243
4	Norcia	LB	1	B8	0.291	A4	0.368	B2	0.268
5	Norcia	BE	1	B8	0.320	A5	0.355	B4	0.251
6	Norcia	UB	1	B8	0.320	A4	0.337	B3	0.236
7	N. Palm Springs	LB	1	B8	0.227	C2	0.287	A5	0.206
8	N. Palm Springs	BE	1	B8	0.257	C2	0.318	A8	0.200
9	N. Palm Springs	UB	1	B1	0.292	C2	0.366	B1	0.210
10	Coyote Lake	LB	2	C2	0.333	C1	0.258	A1	0.221
11	Coyote Lake	BE	2	B1	0.402	A1	0.305	B2	0.242
12	Coyote Lake	UB	2	B1	0.428	C1	0.385	B2	0.245
13	Norcia	LB	2	B1	0.303	A1	0.356	B1	0.265
14	Norcia	BE	2	B1	0.310	A1	0.338	B1	0.245
15	Norcia	UB	2	B1	0.310	A1	0.324	B1	0.231
16	N. Palm Springs	LB	2	C1	0.297	C1	0.313	A2	0.167
17	N. Palm Springs	BE	2	B2	0.275	C1	0.337	A2	0.188
18	N. Palm Springs	UB	2	B1	0.314	C1	0.374	B2	0.221
19	Coyote Lake	LB	3	C1	0.317	C3	0.267	A1	0.224
20	Coyote Lake	BE	3	B1	0.392	C2	0.273	B2	0.257
21	Coyote Lake	UB	3	B1	0.440	C3	0.360	B2	0.238
22	Norcia	LB	3	B1	0.302	A2	0.366	B3	0.278
23	Norcia	BE	3	B1	0.319	C2	0.350	B2	0.258
24	Norcia	UB	3	B1	0.316	A2	0.334	B2	0.238
25	N. Palm Springs	LB	3	C1	0.260	C1	0.299	A2	0.192
26	N. Palm Springs	BE	3	B2	0.293	A3	0.329	A1	0.189
27	N. Palm Springs	UB	3	B1	0.309	C2	0.371	B1	0.206
28	Coyote Lake	LB	4	B1	0.384	A2	0.251	A1	0.213
29	Coyote Lake	BE	4	B1	0.451	A2	0.356	C1	0.236
30	Coyote Lake	UB	4	B1	0.454	A2	0.417	B1	0.260
31	Norcia	LB	4	B1	0.318	A2	0.347	B1	0.252
32	Norcia	BE	4	B1	0.322	A2	0.334	B1	0.236
33	Norcia	UB	4	B1	0.317	A2	0.322	B1	0.224
34	N. Palm Springs	LB	4	B1	0.310	C1	0.323	A2	0.176
35	N. Palm Springs	BE	4	B1	0.299	C1	0.358	C1	0.211
36	N. Palm Springs	UB	4	B1	0.372	A2	0.369	C1	0.218

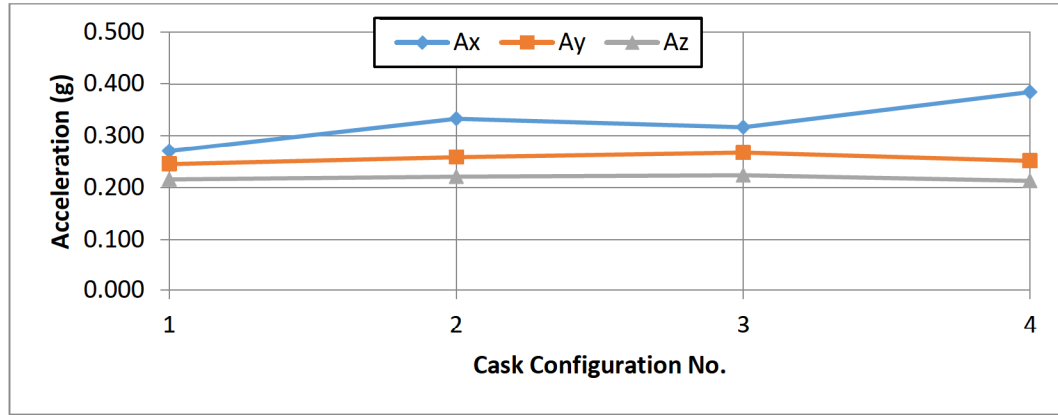


Figure 7.5.1: Maximum CG Accelerations for Coyote Lake EQ – LB Soil

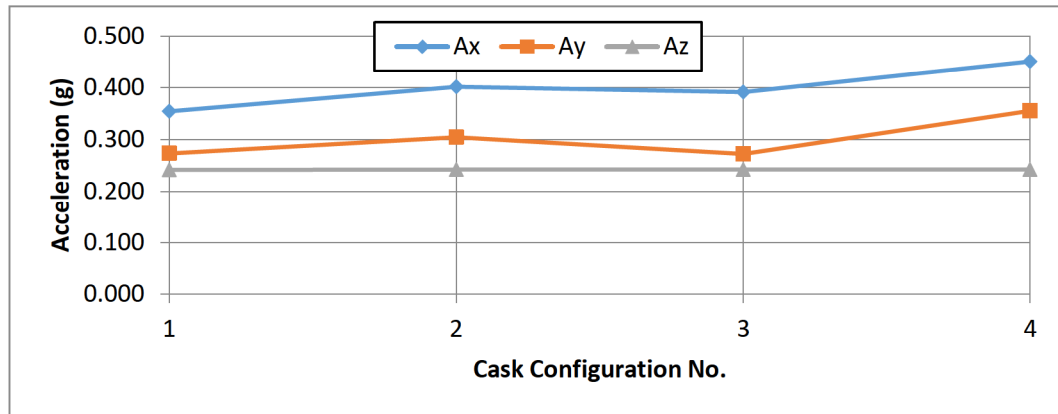


Figure 7.5.2: Maximum CG Accelerations for Coyote Lake EQ – BE Soil

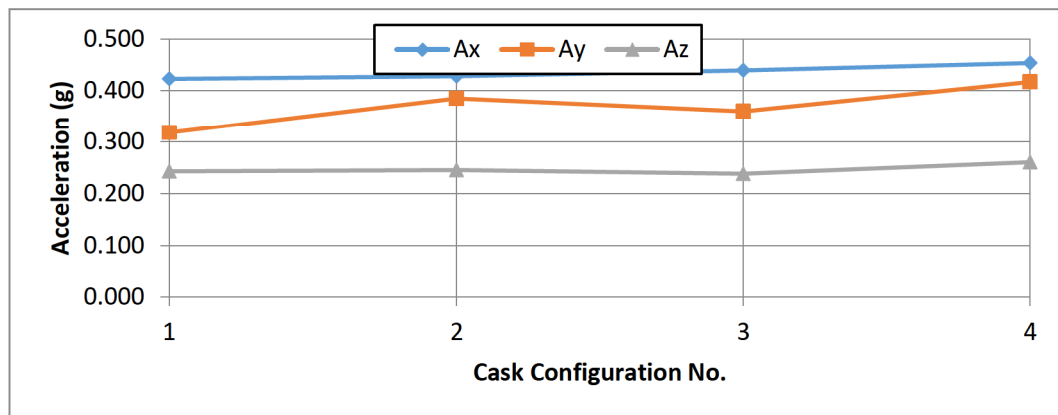


Figure 7.5.3: Maximum CG Accelerations for Coyote Lake EQ – UB Soil

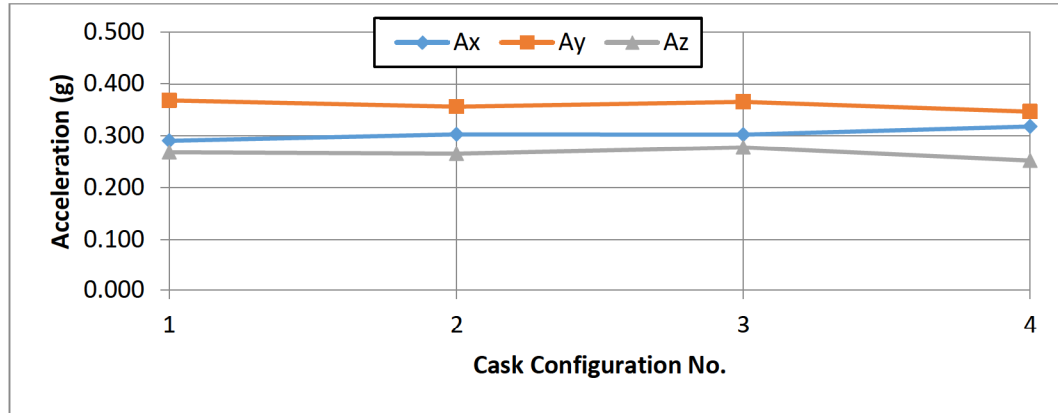


Figure 7.5.4: Maximum CG Accelerations for Norcia EQ – LB Soil

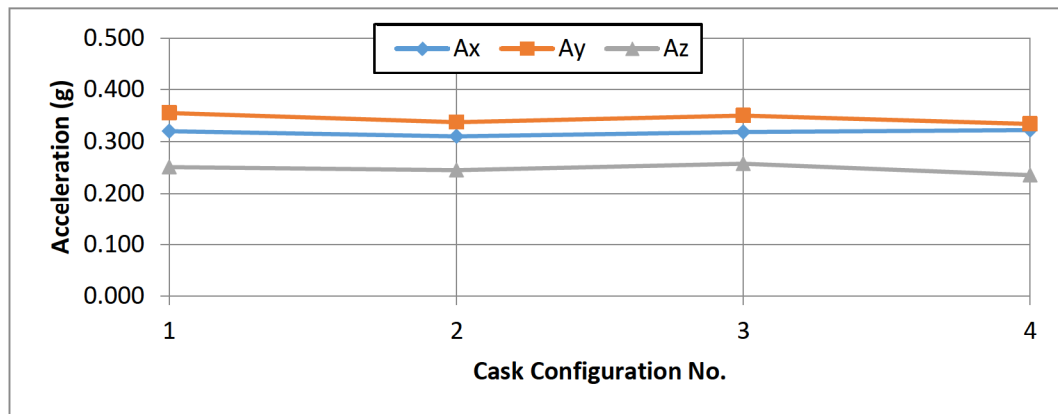


Figure 7.5.5: Maximum CG Accelerations for Norcia EQ – BE Soil

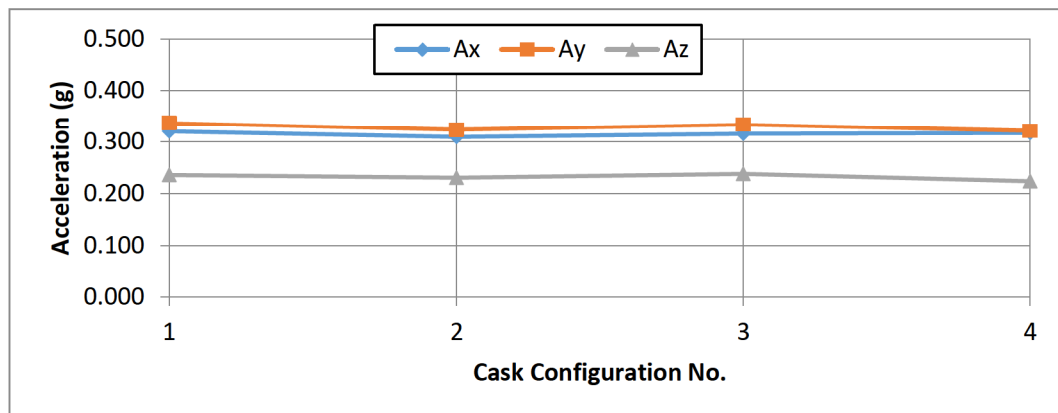


Figure 7.5.6: Maximum CG Accelerations for Norcia EQ – UB Soil

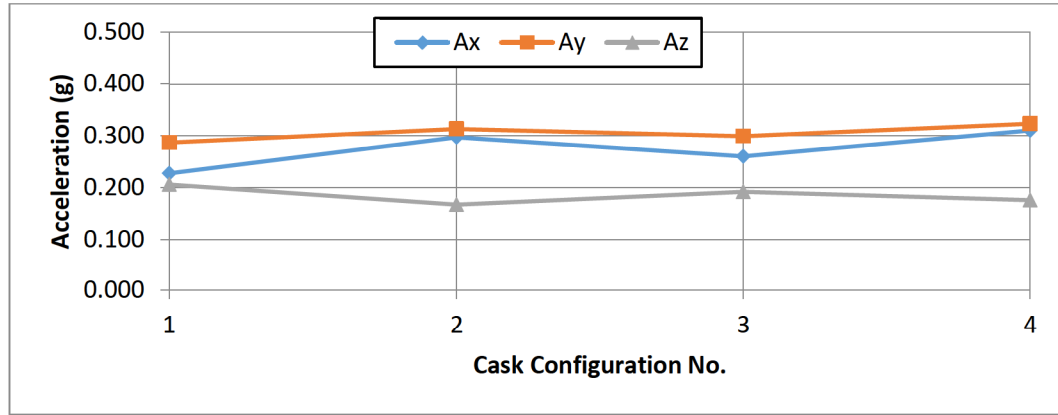


Figure 7.5.7: Maximum CG Accelerations for N. Palm Springs EQ – LB Soil

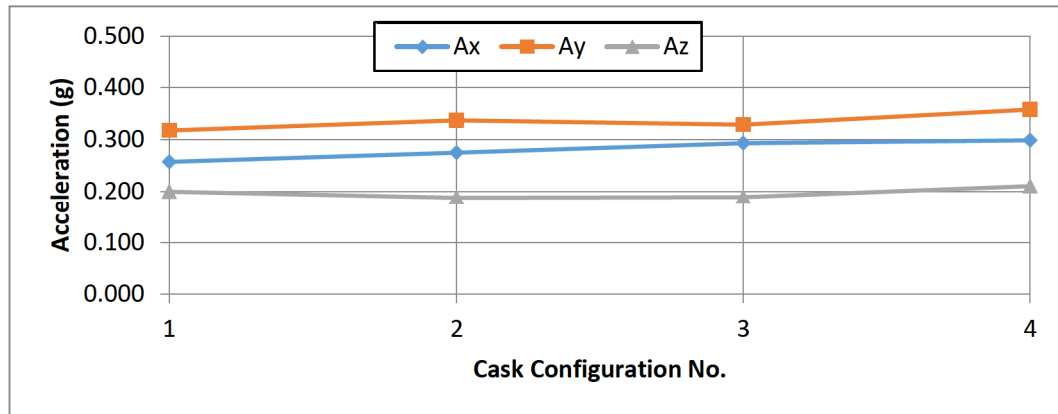


Figure 7.5.8: Maximum CG Accelerations for N. Palm Springs EQ – BE Soil

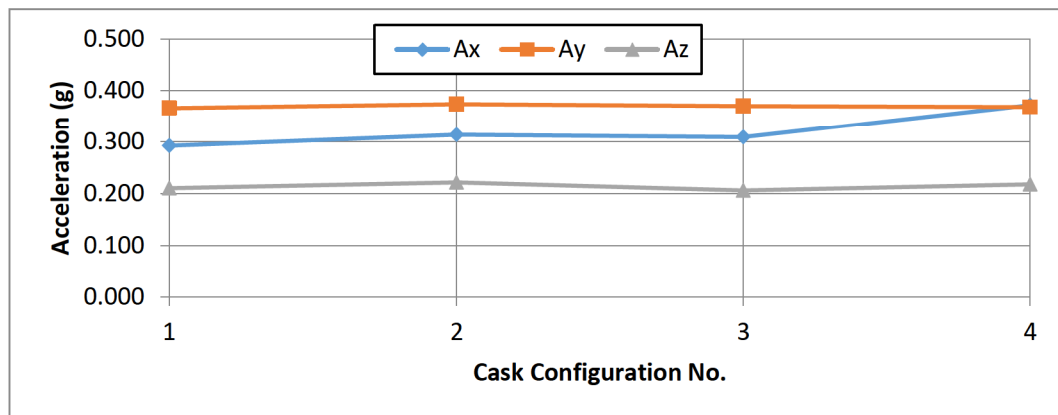


Figure 7.5.9: Maximum CG Accelerations for N. Palm Springs EQ – UB Soil

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Cask Sliding Potential

The sliding potential is quantified through evaluating the maximum coefficient of friction (CoF) demand for every cask in all 36 analysis cases at each time step via the following relationships:

$$F_{smax} = \sqrt{Ax(t)^2 + Ay(t)^2} * W_{cask} \text{ and } Fr_{max} = \mu(1 - Az(t)) * W_{cask}$$

Where F_{smax} is the sliding force due to horizontal acceleration response at time (t) at the cask CG (Ax and Ay) and Fr_{max} is the resisting force due to vertical acceleration response at time (t) at the cask CG. The weight of the casks, W_{cask} , is included in the cask accelerations (g) from the SSI analysis. Setting $F_{smax} = Fr_{max}$ we get the following relationship for coefficient of friction demand:

$$CoF \text{ Demand}, \mu(t) = \frac{\sqrt{Ax(t)^2 + Ay(t)^2}}{(1 - Az(t))}$$

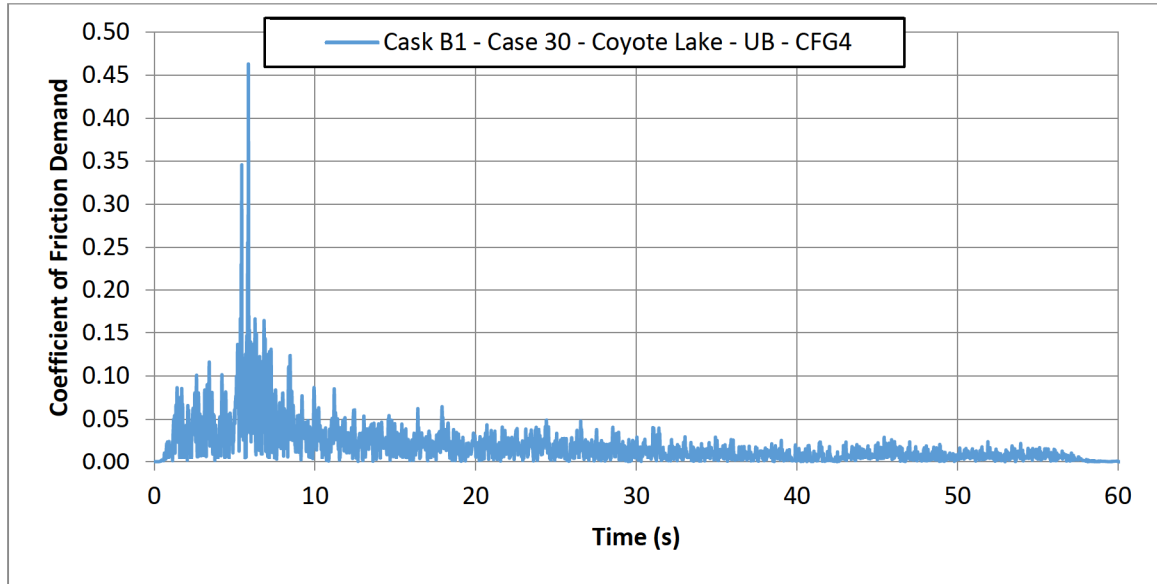
The enveloping maximum coefficient of friction demand is tabulated for each case in Table 7.5.2. The analysis case with the maximum sliding potential is case 30 with a CoF of 0.46 corresponding to cask B1. The time history of the instantaneous coefficient of friction demand for case 30, cask B1 is shown in Figure 7.5.10.

The maximum coefficient of friction demand of 0.46 for cask B1 in case 30 is greater than the coefficient of friction of 0.35 specified for the steel-to-concrete contact per the MAGNASTOR FSAR, section 12.2.9.2 [4]. Sliding is therefore likely to occur with the specified light broom finish of the concrete pad surface [3].

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Table 7.5.2: Maximum Coefficient of Friction Demand

Case No.	Time History	Soil Case	Cask Cfg	Coefficient of Friction Demand
1	Coyote Lake	LB	1	0.289
2	Coyote Lake	BE	1	0.366
3	Coyote Lake	UB	1	0.431
4	Norcia	LB	1	0.368
5	Norcia	BE	1	0.362
6	Norcia	UB	1	0.360
7	N. Palm Springs	LB	1	0.354
8	N. Palm Springs	BE	1	0.378
9	N. Palm Springs	UB	1	0.389
10	Coyote Lake	LB	2	0.356
11	Coyote Lake	BE	2	0.424
12	Coyote Lake	UB	2	0.450
13	Norcia	LB	2	0.363
14	Norcia	BE	2	0.354
15	Norcia	UB	2	0.352
16	N. Palm Springs	LB	2	0.341
17	N. Palm Springs	BE	2	0.366
18	N. Palm Springs	UB	2	0.403
19	Coyote Lake	LB	3	0.345
20	Coyote Lake	BE	3	0.414
21	Coyote Lake	UB	3	0.456
22	Norcia	LB	3	0.371
23	Norcia	BE	3	0.364
24	Norcia	UB	3	0.358
25	N. Palm Springs	LB	3	0.352
26	N. Palm Springs	BE	3	0.360
27	N. Palm Springs	UB	3	0.393
28	Coyote Lake	LB	4	0.401
29	Coyote Lake	BE	4	0.459
30	Coyote Lake	UB	4	0.463
31	Norcia	LB	4	0.358
32	Norcia	BE	4	0.358
33	Norcia	UB	4	0.354
34	N. Palm Springs	LB	4	0.346
35	N. Palm Springs	BE	4	0.382
36	N. Palm Springs	UB	4	0.396



**Figure 7.5.10: Instantaneous Coefficient of Friction Demand for Cask B1,
Case 30, Coyote lake EQ, UB Soil, Configuration 4**

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Cask Overturning Potential

The overturning potential is quantified through evaluating the minimum factor of safety against overturning for every cask in all 36 analysis cases at each time step via the following relationships:

$$Mr = W_{cask} * Rcask(1 - Az(t)) \text{ and } M_{OT} = W_{cask} * Hcg * \sqrt{(Ax(t))^2 + Ay(t)^2}$$

Where Mr is the resisting moment due to vertical acceleration response at time (t) and M_{OT} is the overturning moment due horizontal acceleration response at time (t) at the cask CG (Ax and Ay). $Rcask$ is the radius of the cask footing and Hcg is the height at the cask CG. The weight of the casks, W_{cask} , is included in the cask accelerations (g) from the SSI analysis. Setting $FS_{OT}(t) = \frac{Mr}{M_{OT}}$ we get the following relationship for overturning factor of safety:

$$FS_{OT}(t) = \frac{Rcask(1 - Az(t))}{Hcg * \sqrt{(Ax(t))^2 + Ay(t)^2}}$$

The minimum factors of safety against overturning are tabulated for each case in Table 7.5.3. The analysis case with the highest overturning potential is case 30 with a factor of safety of 1.22 against overturning corresponding to cask B1. The time history of the instantaneous overturning factory of safety for case 30, cask B1 is shown in Figure 7.5.11 and 7.5.12

The minimum overturning factor of safety for cask B1 in case 30 is 1.22 and is greater than the factor of safety for overturning of 1.1 per Section 7.2.2 of ASCE 43-05 [8]. Cask overturning is therefore deemed unlikely.

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Table 7.5.3: Minimum Overturning Factors of Safety

Case No.	Time History	Soil Case	Cask Cfg	Overturning Factor of Safety
1	Coyote Lake	LB	1	1.96
2	Coyote Lake	BE	1	1.55
3	Coyote Lake	UB	1	1.31
4	Norcia	LB	1	1.54
5	Norcia	BE	1	1.57
6	Norcia	UB	1	1.58
7	N. Palm Springs	LB	1	1.60
8	N. Palm Springs	BE	1	1.50
9	N. Palm Springs	UB	1	1.46
10	Coyote Lake	LB	2	1.59
11	Coyote Lake	BE	2	1.34
12	Coyote Lake	UB	2	1.26
13	Norcia	LB	2	1.56
14	Norcia	BE	2	1.60
15	Norcia	UB	2	1.61
16	N. Palm Springs	LB	2	1.66
17	N. Palm Springs	BE	2	1.55
18	N. Palm Springs	UB	2	1.40
19	Coyote Lake	LB	3	1.64
20	Coyote Lake	BE	3	1.37
21	Coyote Lake	UB	3	1.24
22	Norcia	LB	3	1.53
23	Norcia	BE	3	1.56
24	Norcia	UB	3	1.58
25	N. Palm Springs	LB	3	1.61
26	N. Palm Springs	BE	3	1.57
27	N. Palm Springs	UB	3	1.44
28	Coyote Lake	LB	4	1.41
29	Coyote Lake	BE	4	1.23
30	Coyote Lake	UB	4	1.22
31	Norcia	LB	4	1.58
32	Norcia	BE	4	1.58
33	Norcia	UB	4	1.60
34	N. Palm Springs	LB	4	1.64
35	N. Palm Springs	BE	4	1.48
36	N. Palm Springs	UB	4	1.43

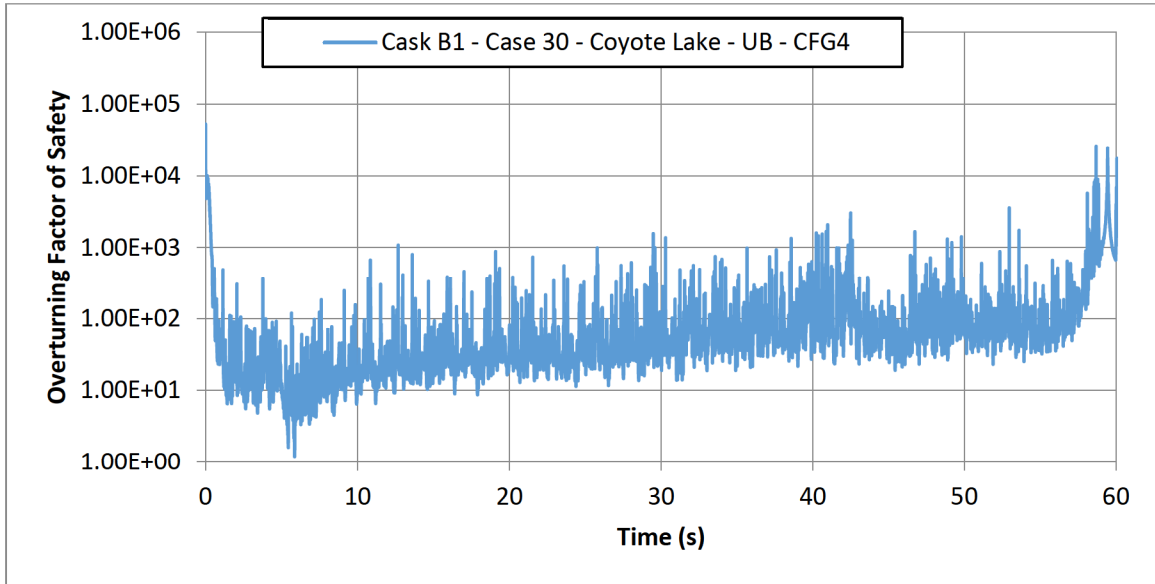


Figure 7.5.11: Instantaneous Factor of Safety for Cask B1, Case 30, Coyote lake EQ, UB Soil, Configuration 4

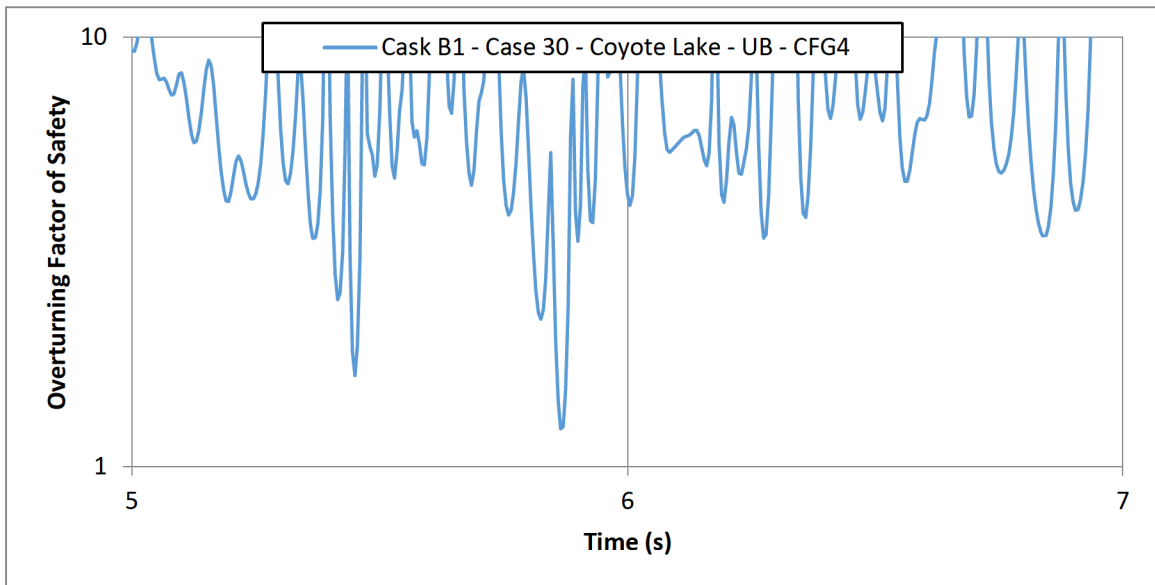
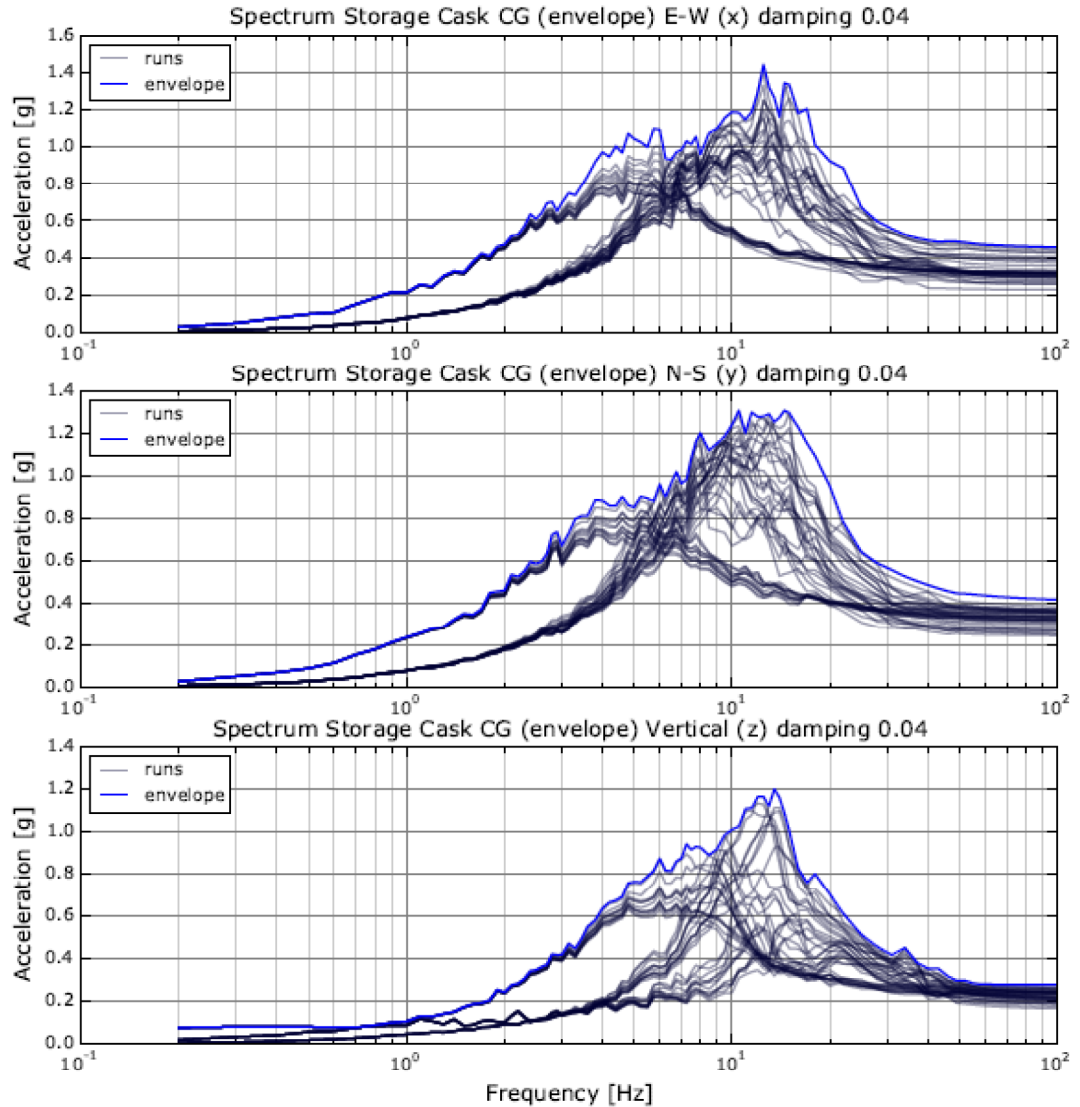


Figure 7.5.12: Instantaneous Factor of Safety for Cask B1, Case 30, Coyote lake EQ, UB Soil, Configuration 4 – Detail between 5 and 7 seconds

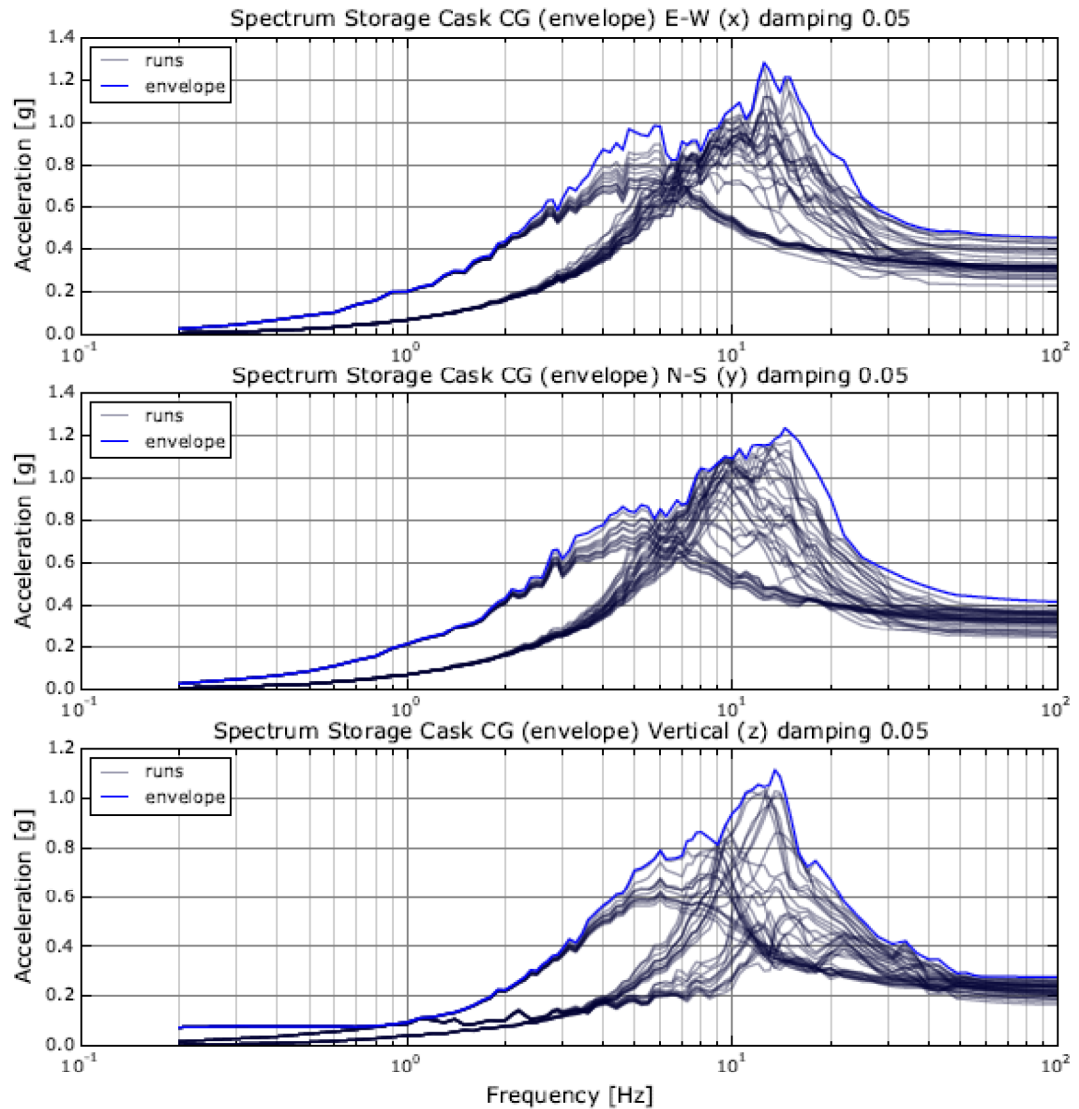
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Cask Acceleration Response Spectra Envelopes

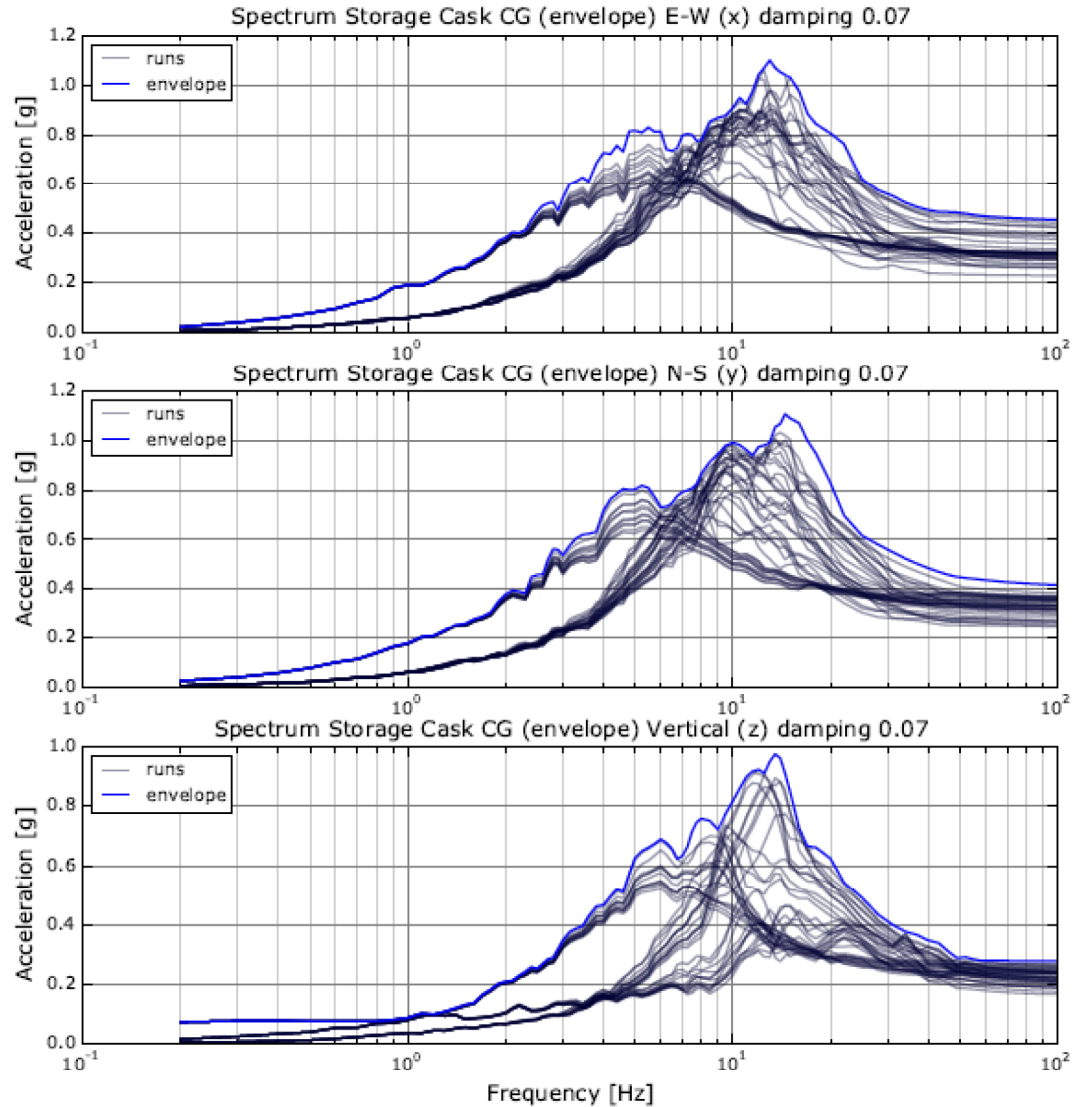
The acceleration response spectra (ARS) are calculated for all 36 analysis cases for 4, 5, 7 and 10 percent damping up to 100Hz. The ARS is calculated at the Cask CG for all 36 analysis cases and presented in Figures 7.5.13 through 7.5.16. In addition, the ARS is also calculated for the CG (center) of the concrete pad and enveloped for the 36 analysis cases and presented in Figures 7.5.17 through 7.5.20. The digitized spectra for the individual casks for each analysis case, the envelopes of the cask spectra of each analysis cases, and the envelopes of all 36 analysis cases are included in Attachment 2.



**Figure 7.5.13: ARS SSI Analysis Envelope 36 Cases – Cask CG – 4%
Damping**



**Figure 7.5.14: ARS SSI Analysis Envelope 36 Cases – Cask CG – 5%
Damping**



**Figure 7.5.15: ARS SSI Analysis Envelope 36 Cases – Cask CG – 7%
Damping**

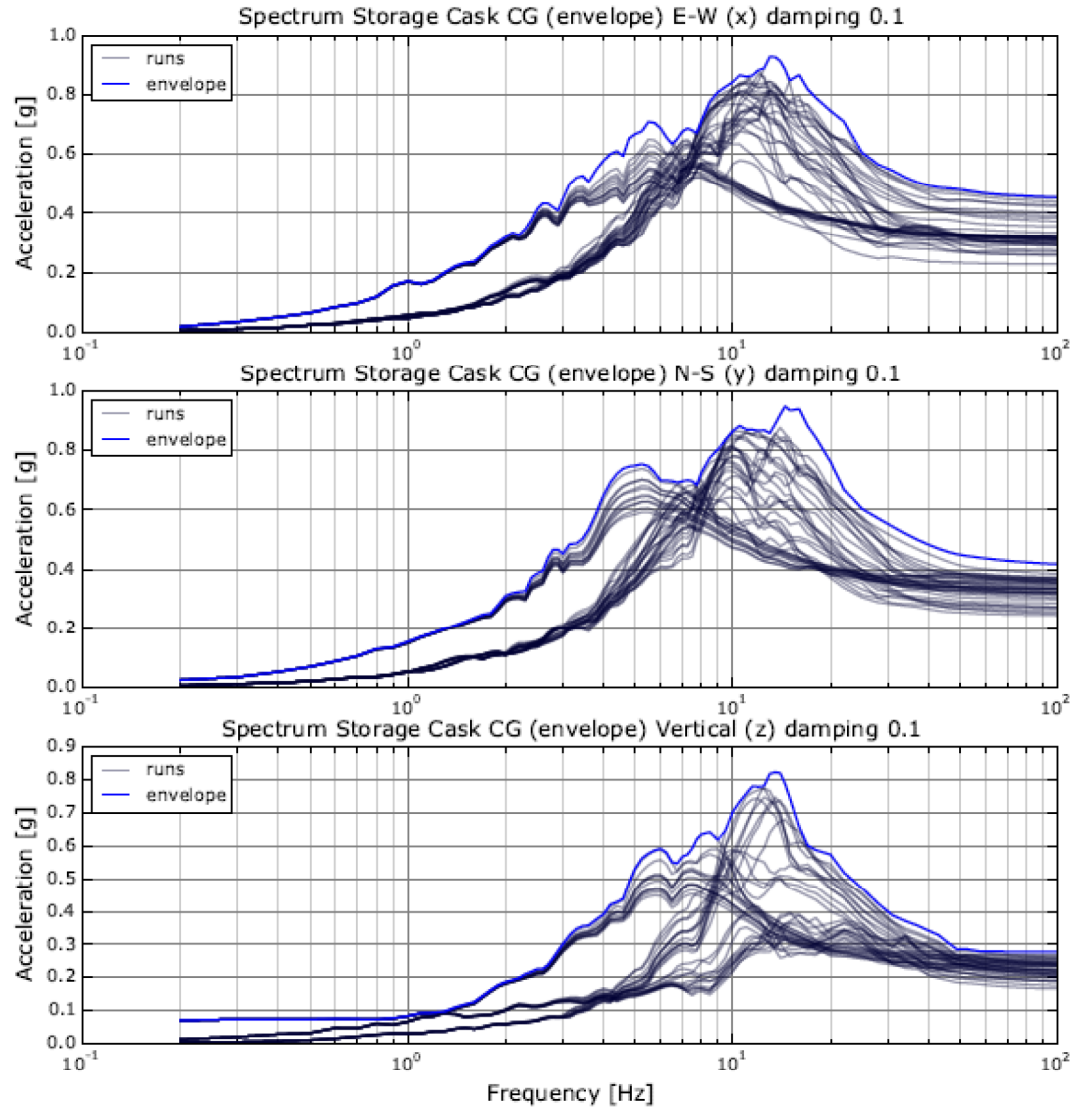
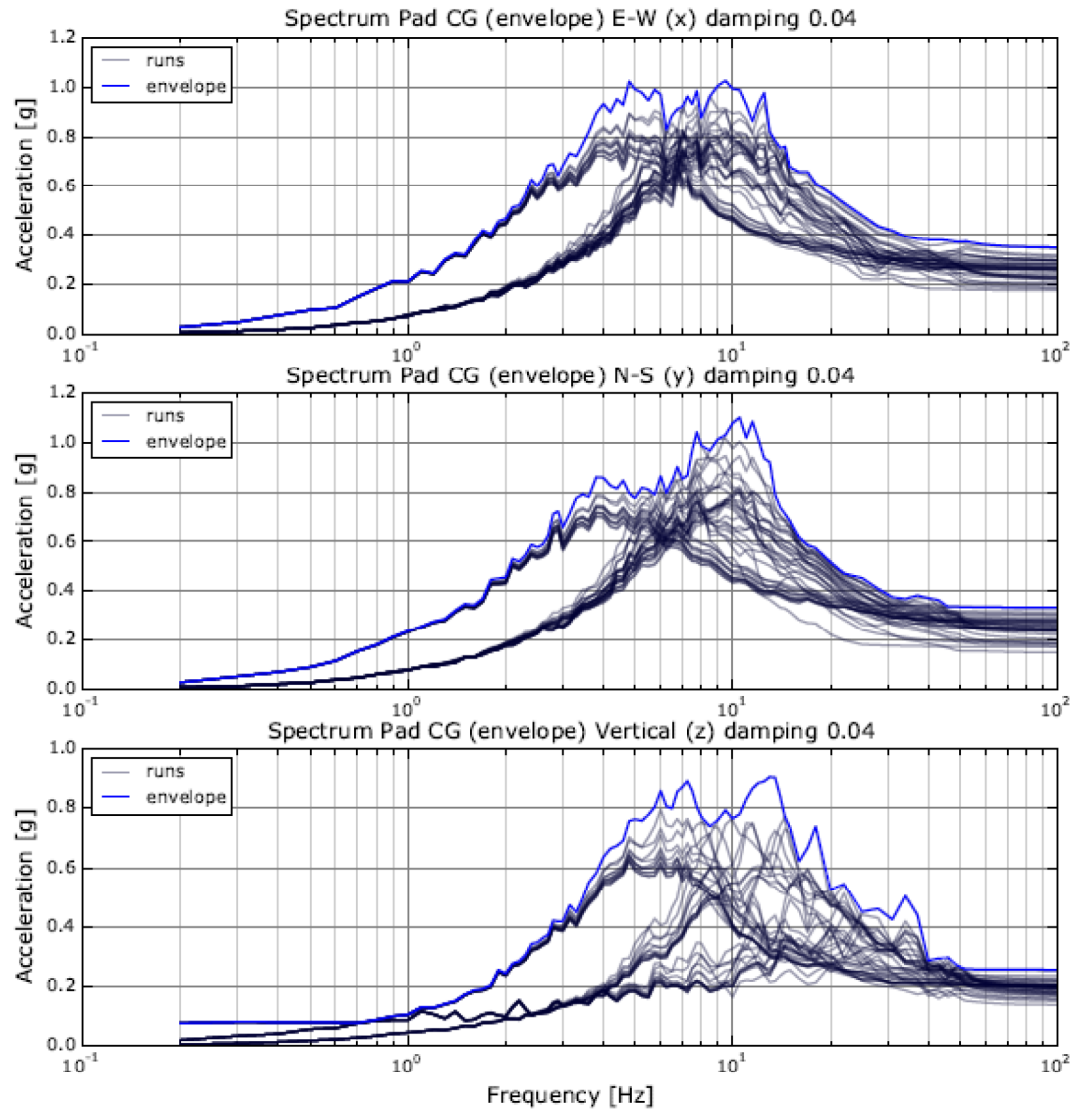
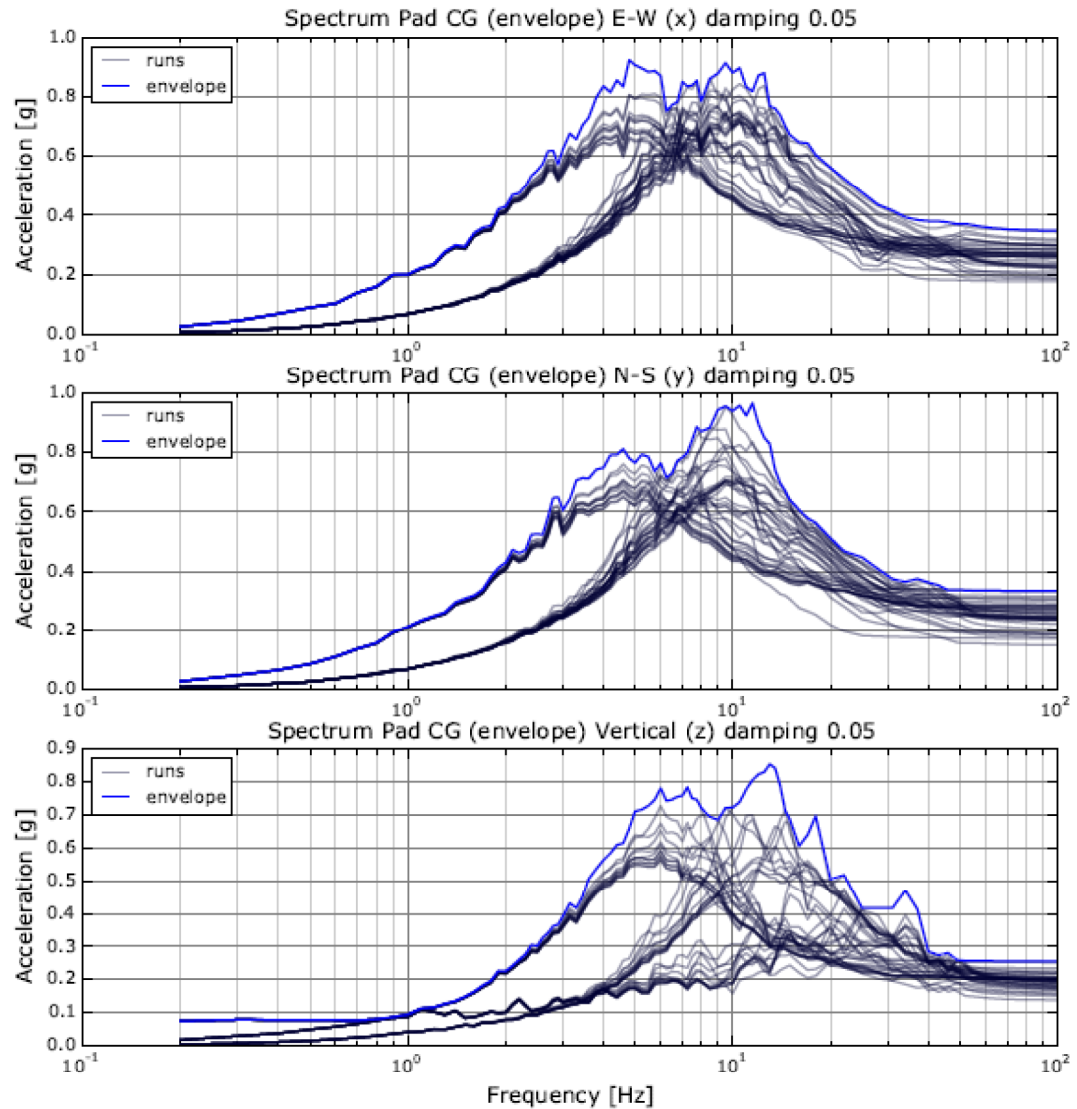


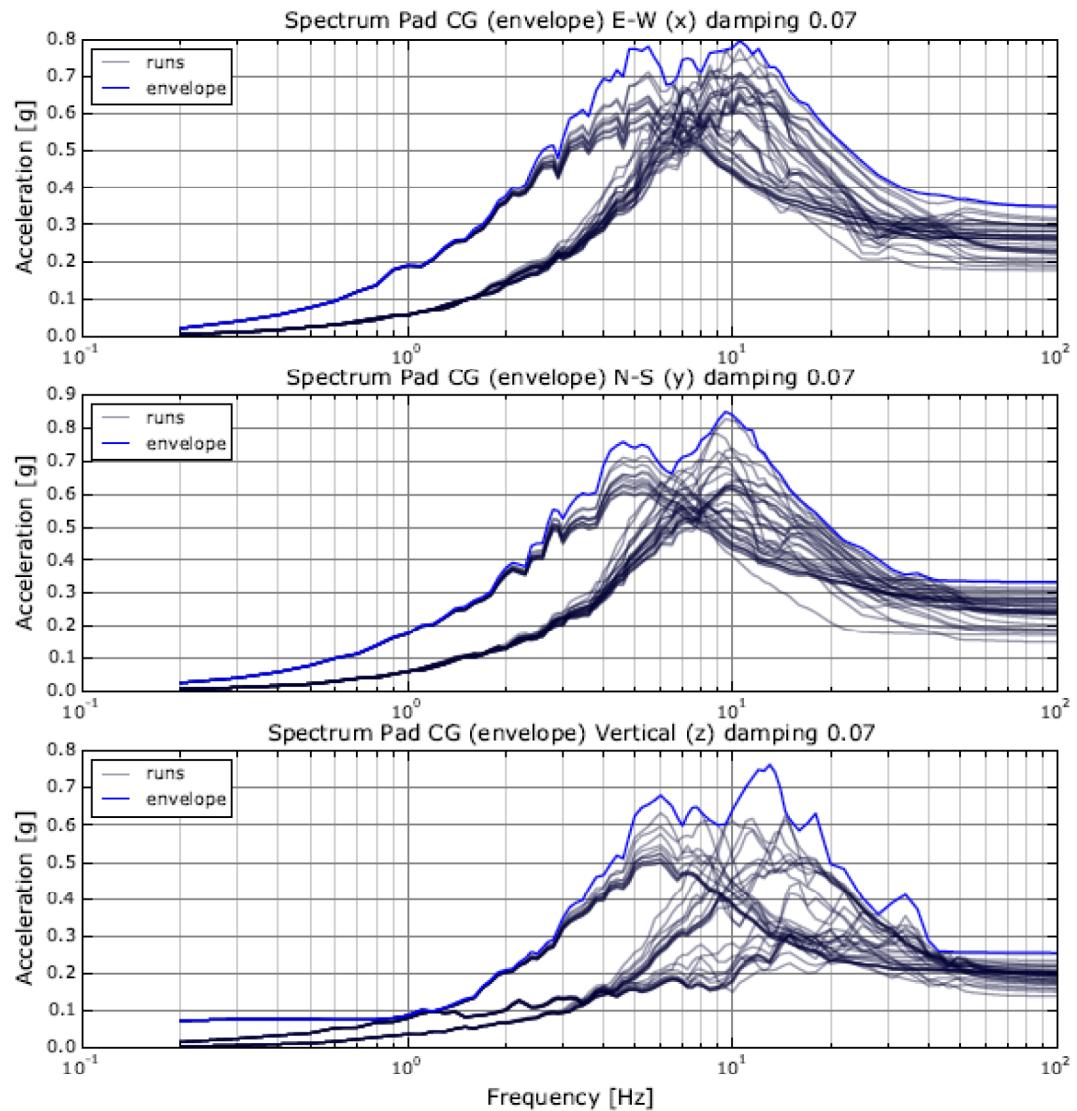
Figure 7.5.16: ARS SSI Analysis Envelope 36 Cases – Cask CG – 10% Damping



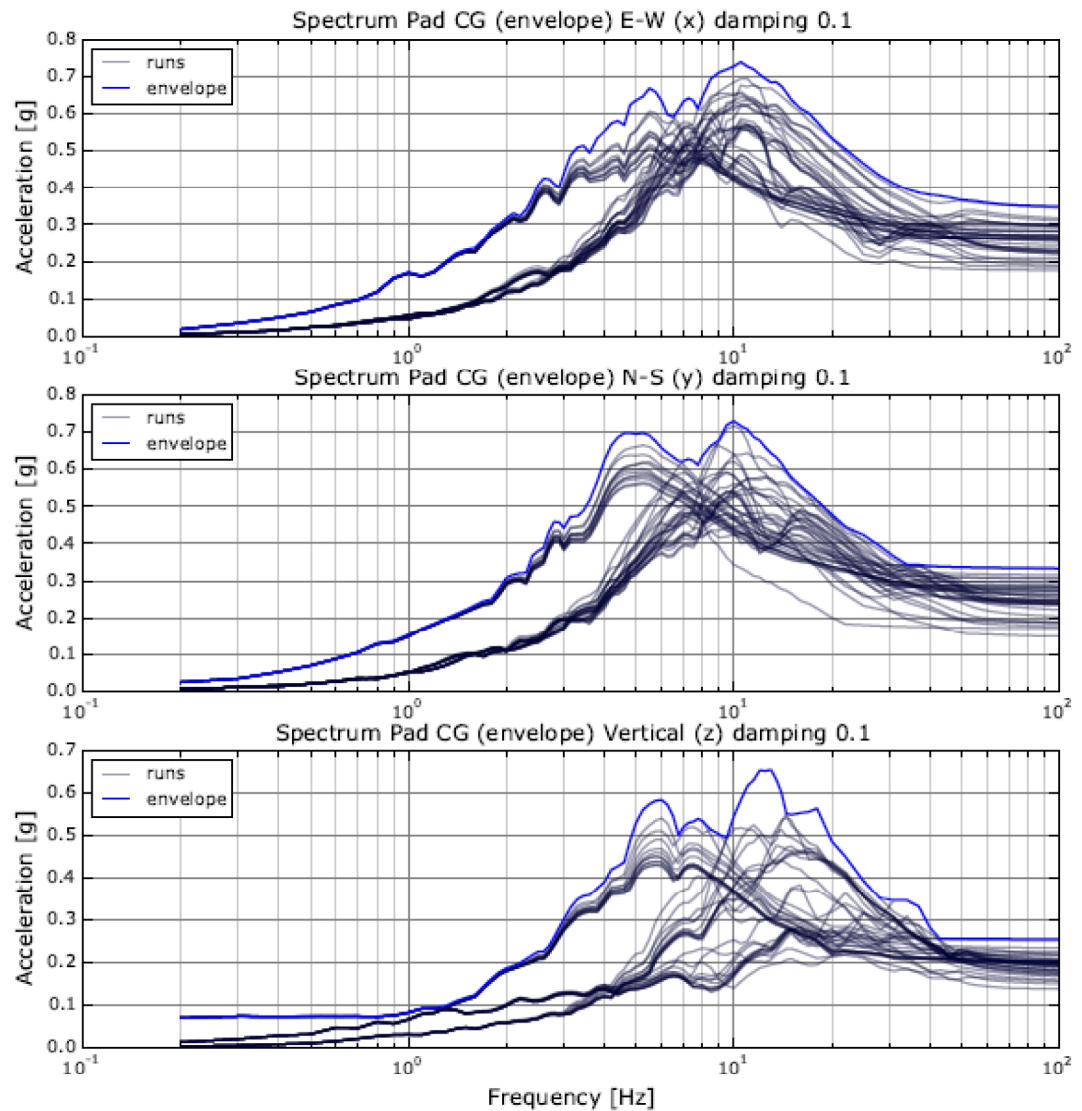
**Figure 7.5.17: ARS SSI Analysis Envelope 36 Cases – Pad CG – 4%
Damping**



**Figure 7.5.18: ARS SSI Analysis Envelope 36 Cases – Pad CG – 5%
Damping**



**Figure 7.5.19: ARS SSI Analysis Envelope 36 Cases – Pad CG – 7%
Damping**



**Figure 7.5.20: ARS SSI Analysis Envelope 36 Cases – Pad CG – 10%
Damping**

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8.0 Computer Software

The computer program SASSI, a System for Analysis of Soil-Structure Interaction, is a computer program comprised of various modules that can be used to solve dynamic soil-structure interaction (SSI) problems of surface founded or embedded structures in 3 dimensions and has been approved for use on the WCS ISFSI project per commercial grade dedication plan no. CGDP-SC/SASSI-V2.1.7, Rev. 0.

SSI analysis using SC-SASSI version 2.1.7 has been performed on SC-Solutions, Inc. in-house workstations featuring the following hardware and software environment:

- Host Name: SC1191
- Host Specifications: Intel Xeon CPU E5-4640 0 @ 2.40 GHz (4 Processors), 512 GB RAM
- Host OS: Windows Server 2008 R2 Enterprise 64-bit

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Appendix A: Verification of Concrete Pad Stiffness due to Inclusion of Rigid Finite Elements

The storage casks have a natural frequency of 138Hz per Section 3.7.3.4 of the MAGNASTOR FSAR [4] and are considered to be rigid for this SSI analysis up to 50Hz. The storage casks are represented with a single vertical rigid beam element with the cask mass lumped at its CG and 8 horizontal rigid beam elements representing the contact area with the concrete pad. The rigid beam elements representing the cask are connected to the pad with 9 vertical stiff springs having length of half the pad thickness to locate the casks at the pad surface. The horizontal rigid beam ends connected to the vertical springs have rotational end releases. The MAGNASTOR cask properties are given in Section 7.3 and the MAGNASTOR FEM is shown in Figure A.1.

To verify the cask-to-pad connection, 2 study models were generated from SSI analysis case 4 featuring the highest vertical cask acceleration response from the SSI analysis and utilizing pad configuration 1 which has the most casks/rigid members. The model from case 4 was modified by removing the cask masses, but retaining the rigid members representing the cask and cask-to-pad connections (Model A) and by removing the cask models and masses completely (Model B).

The transfer functions from Models A and B were compared at the center of the concrete pad, the corner of the concrete pad, and at the center of cask B2, the cask location with the highest vertical acceleration from SSI analysis case 4. The transfer functions are nearly identical for both models in both X and Y directions and show slight differences in the vertical direction, but still providing a good visual match between both models. The transfer functions are shown in Figures A.2 to A.10.

To further investigate if the vertical response of the pad is significantly affected

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by the rigid cask-to-pad connections, the vertical acceleration response spectra were compared at the output locations between model a and b and are nearly identical as shown in Figures A.11 to A.13.

An equivalent fixed base analysis is performed with Model A using very stiff soil properties to study if the rigid links are properly constrained with the addition of rotational beam end releases. The transfer functions at the CG of cask B2 of Model A-fixed base analysis shows no numerical issues due to model instability with transfer function amplitudes of unity for the entire frequency range of interest, and are presented in Figures A.14 to A.16.

From the comparisons of the models with and without rigid finite elements representing the storage casks and cask-to-pad connections, it can be concluded that the rigid members do not significantly affect the slab flexibility and stiffness, and are thus appropriate for use in the SSI analysis of the subject ISFSI cask/pad system.

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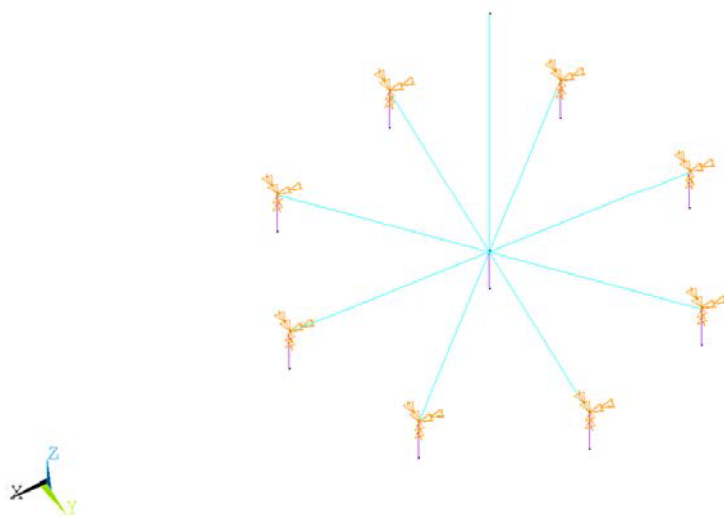


Figure A.1: Storage Cask Rigid Members and Springs (purple) showing Rotational End Releases

Table A.1: Analysis Case used for Slab Flexibility Study

Case No.	Time History	Soil Case	Cask Cfg	Maximum Cask CG Acceleration (g)					
				Cask	Ax	Cask	Ay	Cask	Az
4	Norcia	LB	1	B8	0.297	A4	0.380	B2	0.277

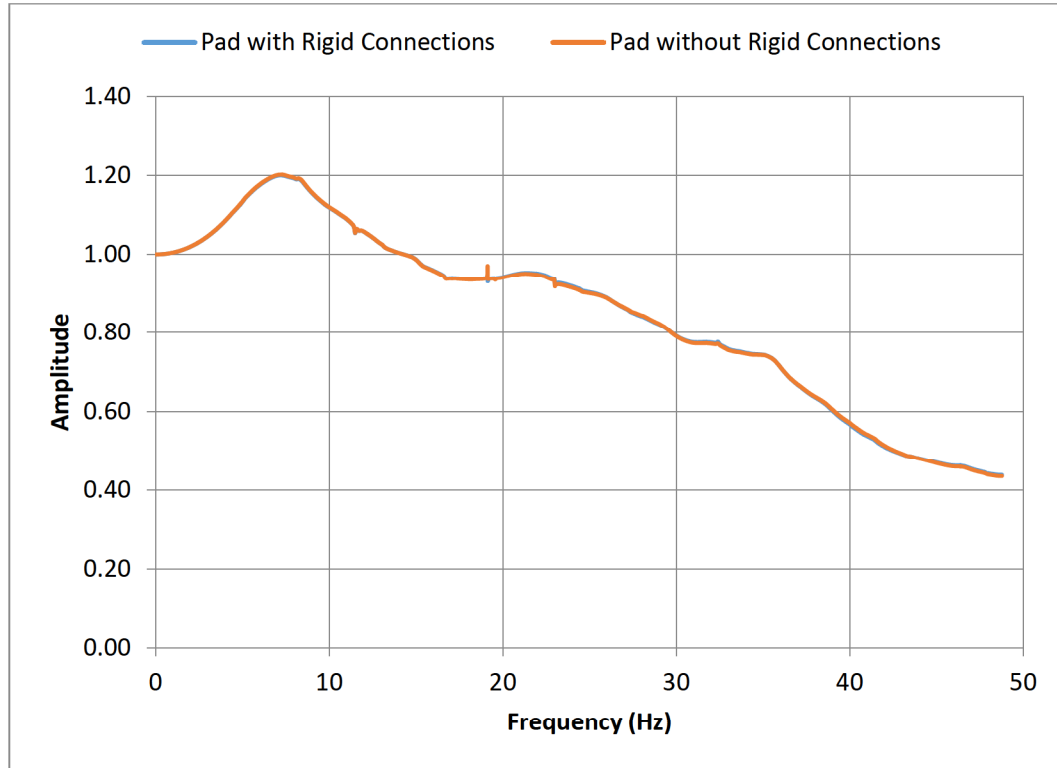


Figure A.2: Center of Pad Transfer Functions – X-Direction

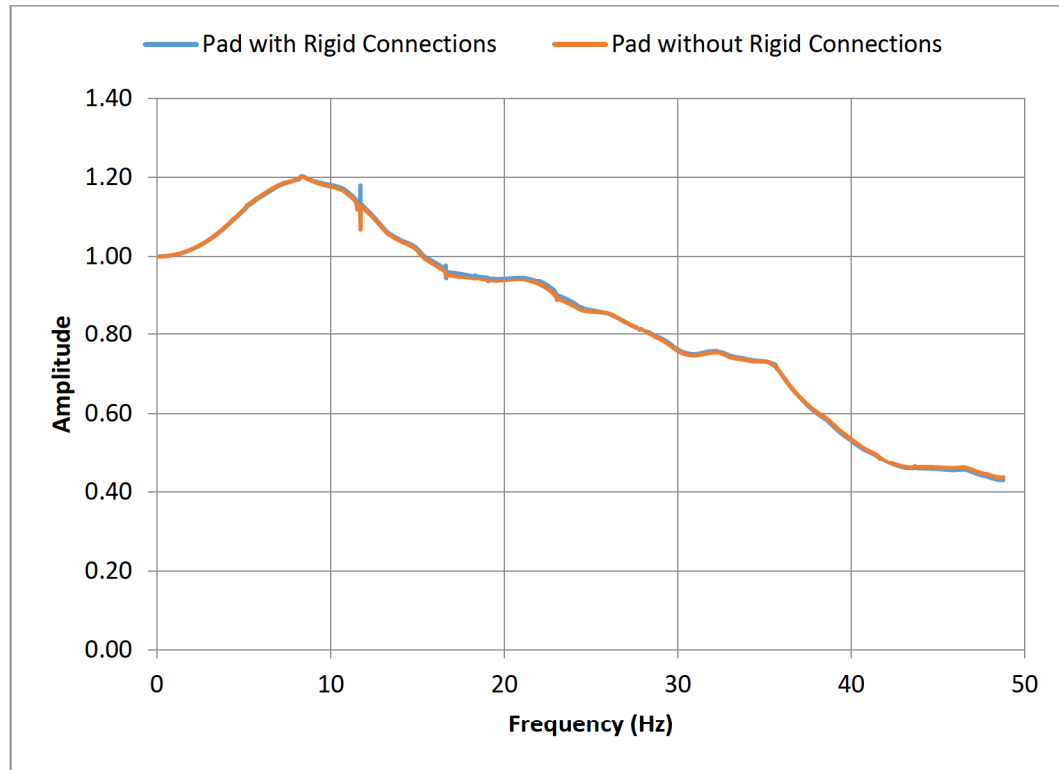


Figure A.3: Center of Pad Transfer Functions – Y-Direction

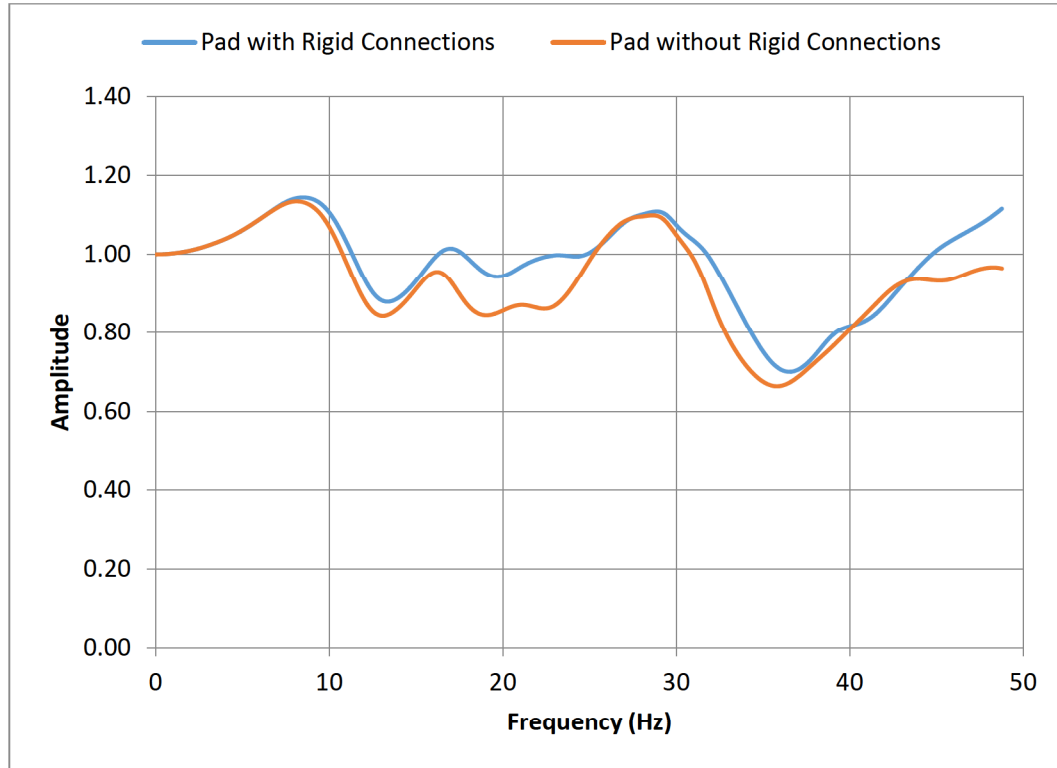


Figure A.4: Center of Pad Transfer Functions – Z-Direction

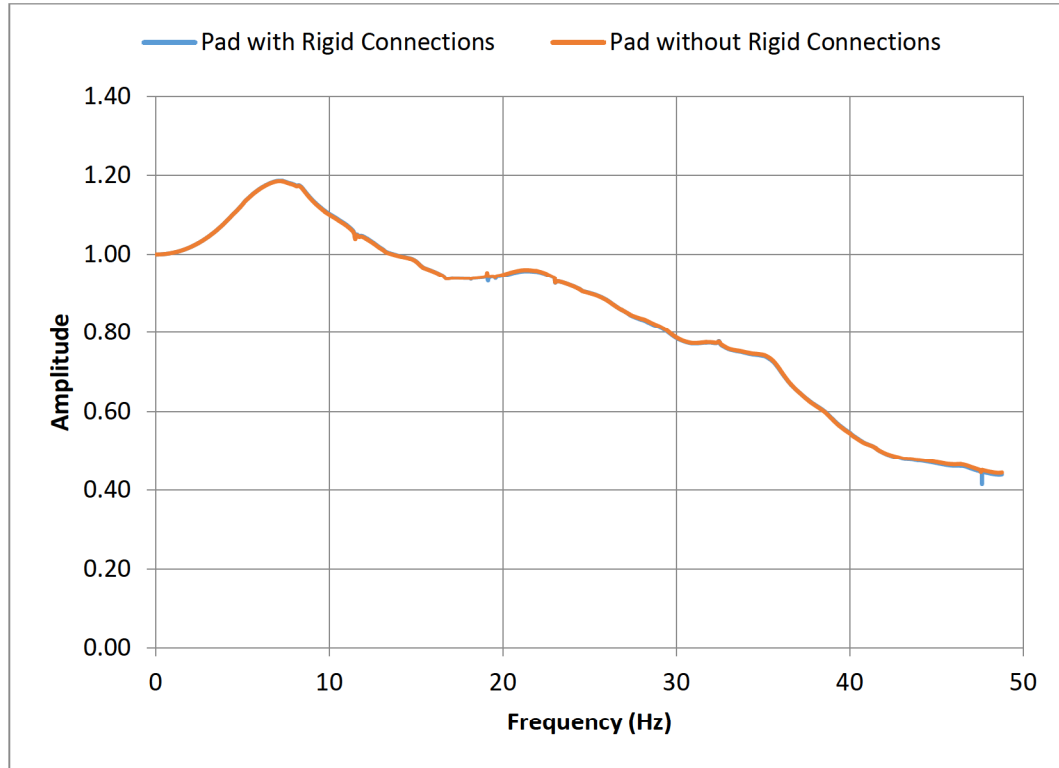


Figure A.5: Corner of Pad Transfer Functions – X-Direction

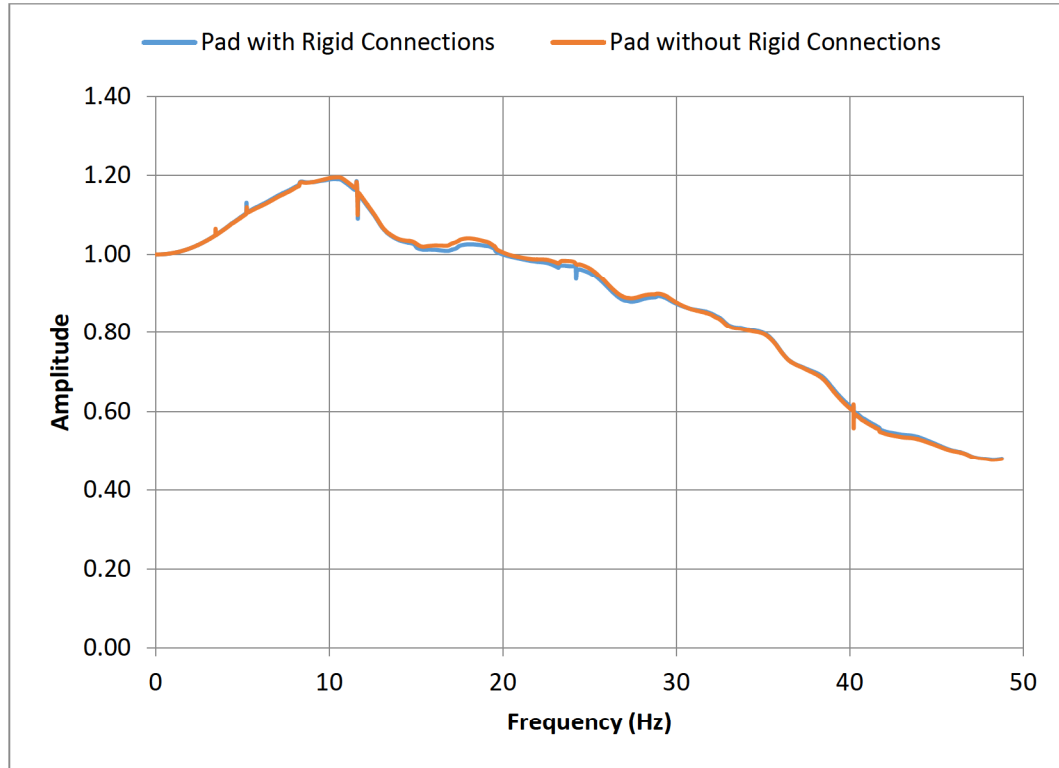


Figure A.6: Corner of Pad Transfer Functions – Y-Direction

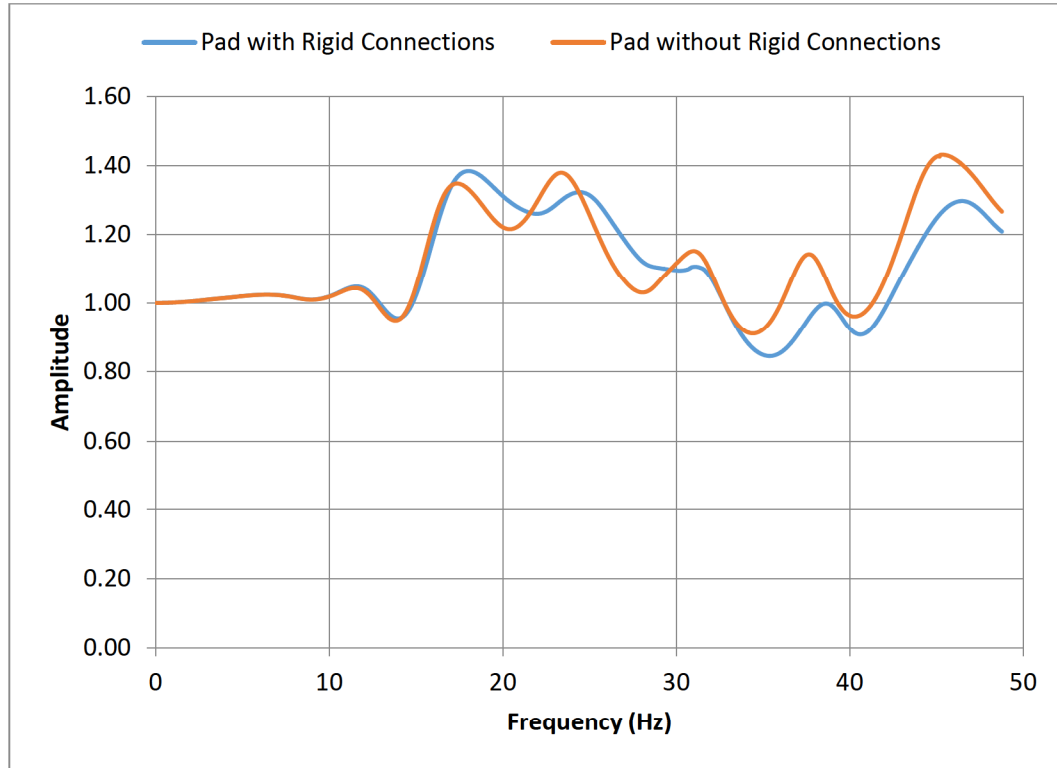


Figure A.7: Corner of Pad Transfer Functions – Z-Direction

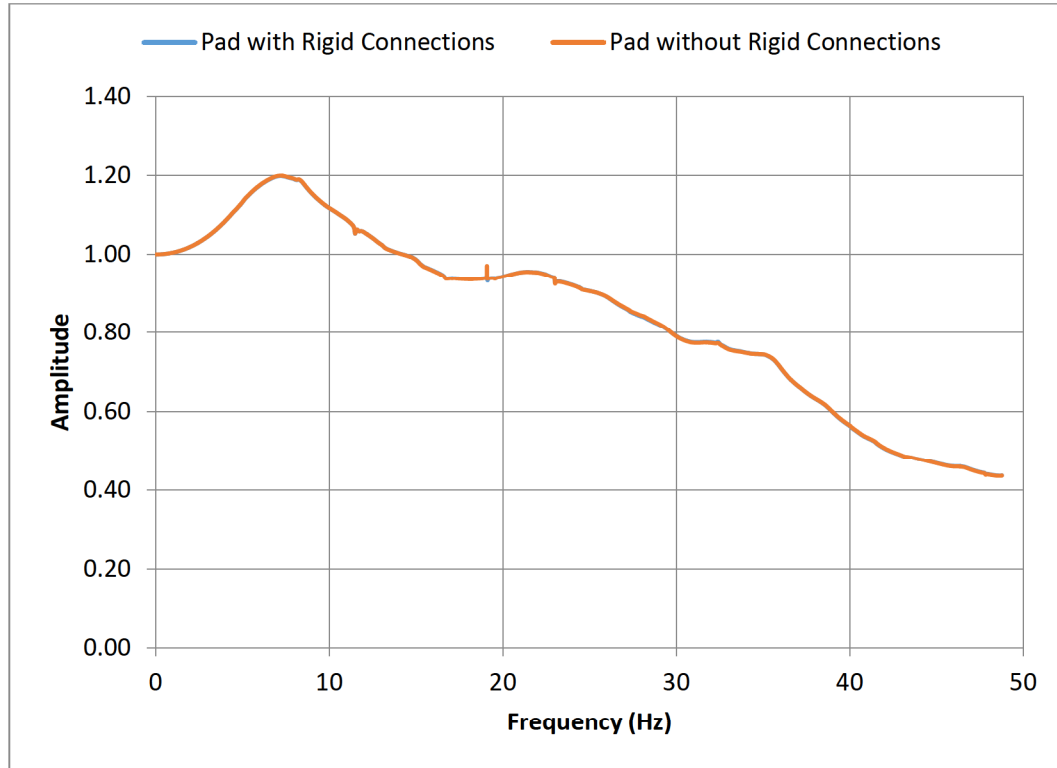


Figure A.8: Center of Cask B2 Transfer Functions – X-Direction

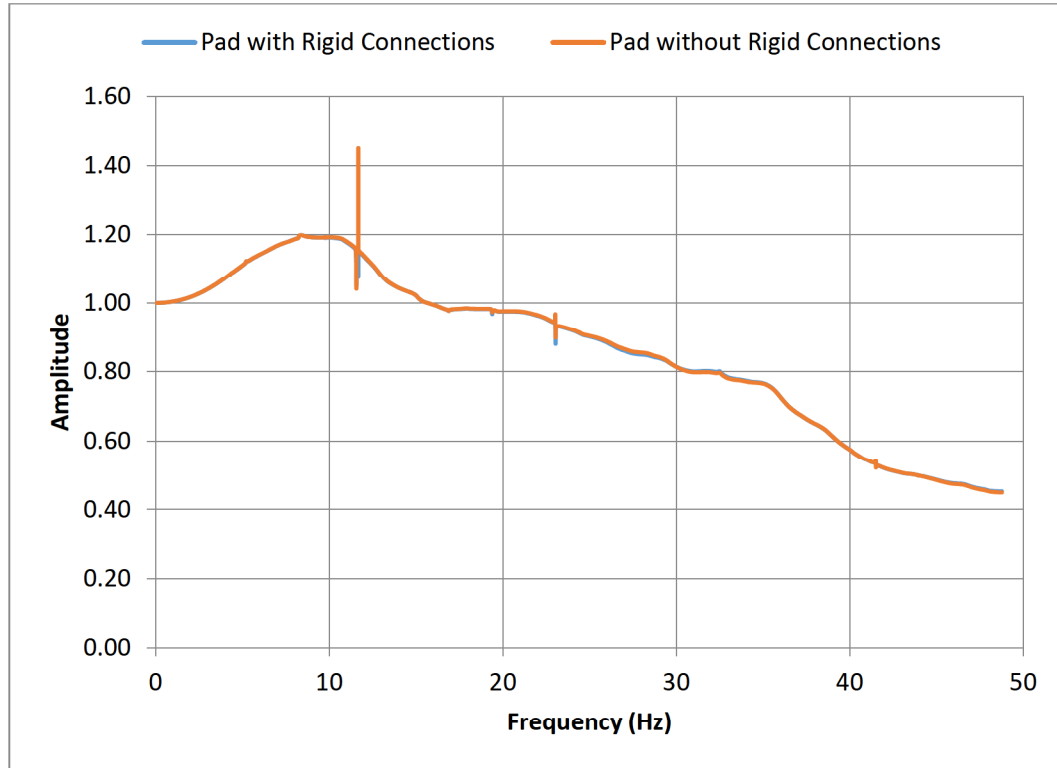


Figure A.9: Center of Cask B2 Transfer Functions – Y-Direction

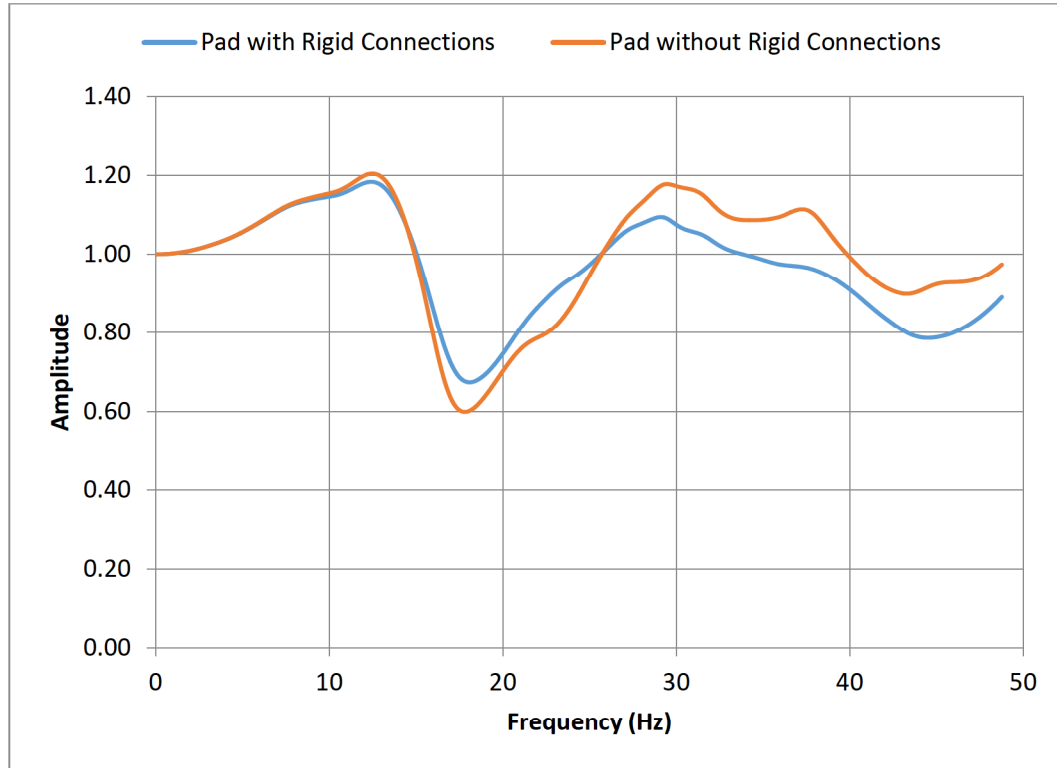


Figure A.10: Center of Cask B2 Transfer Functions – Z-Direction

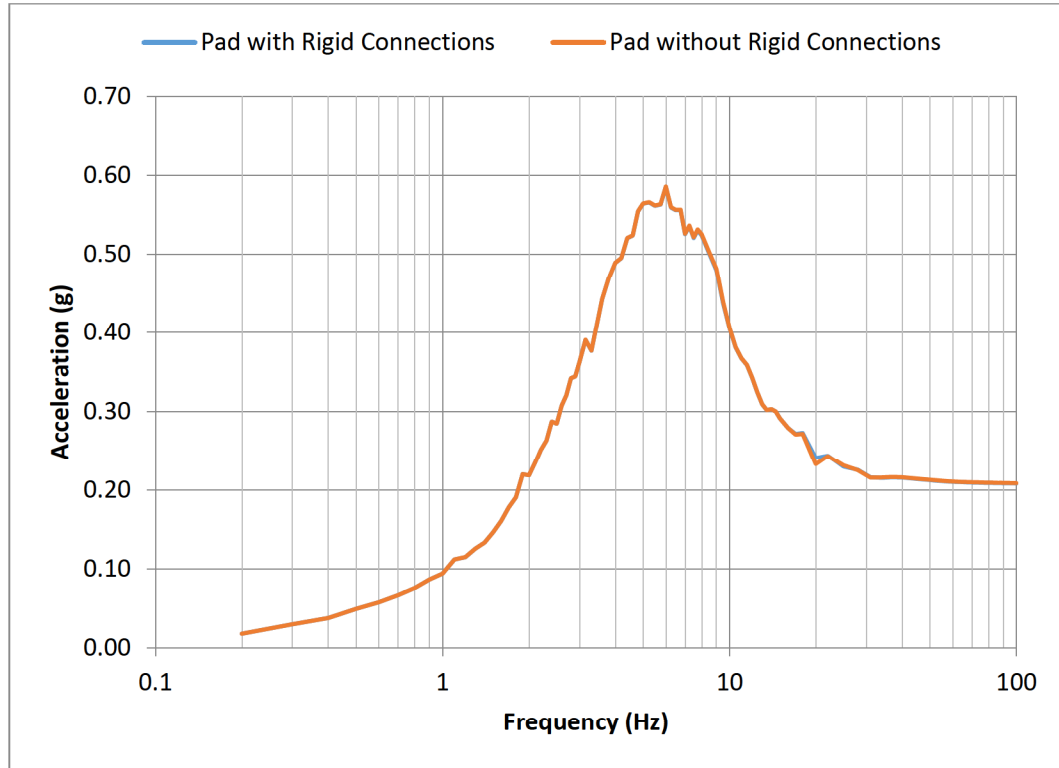


Figure A.11: Center of Pad 5% Acceleration Response Spectra – Z-Direction

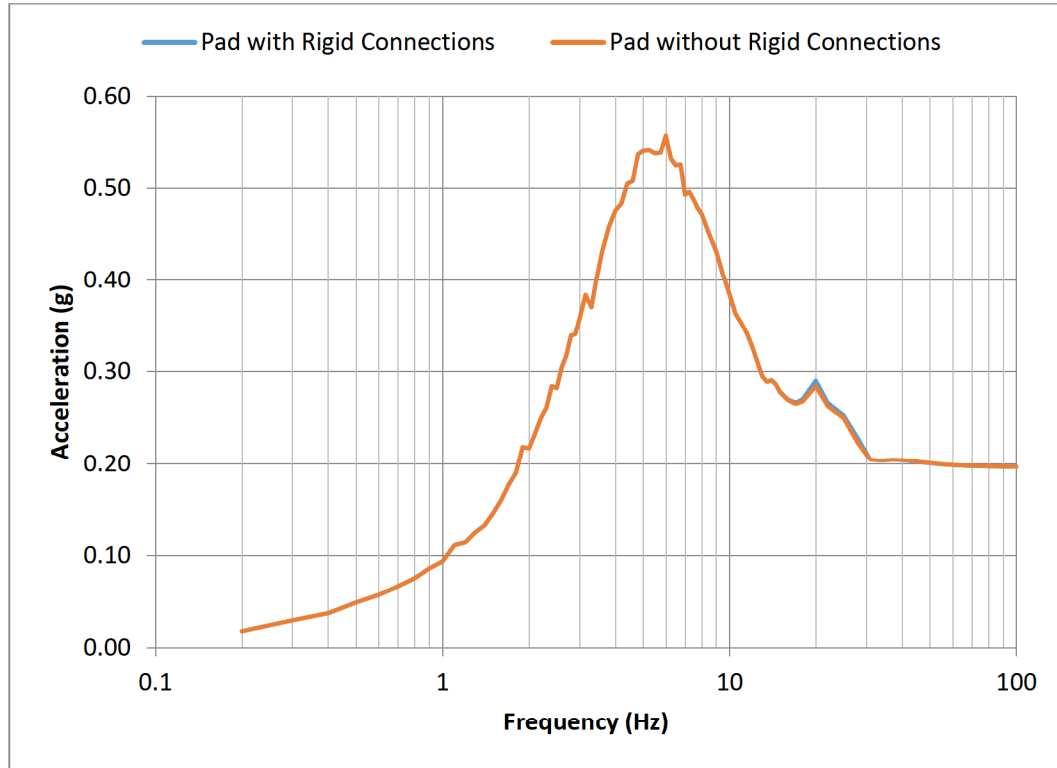


Figure A.12: Corner of Pad 5% Acceleration Response Spectra – Z-Direction

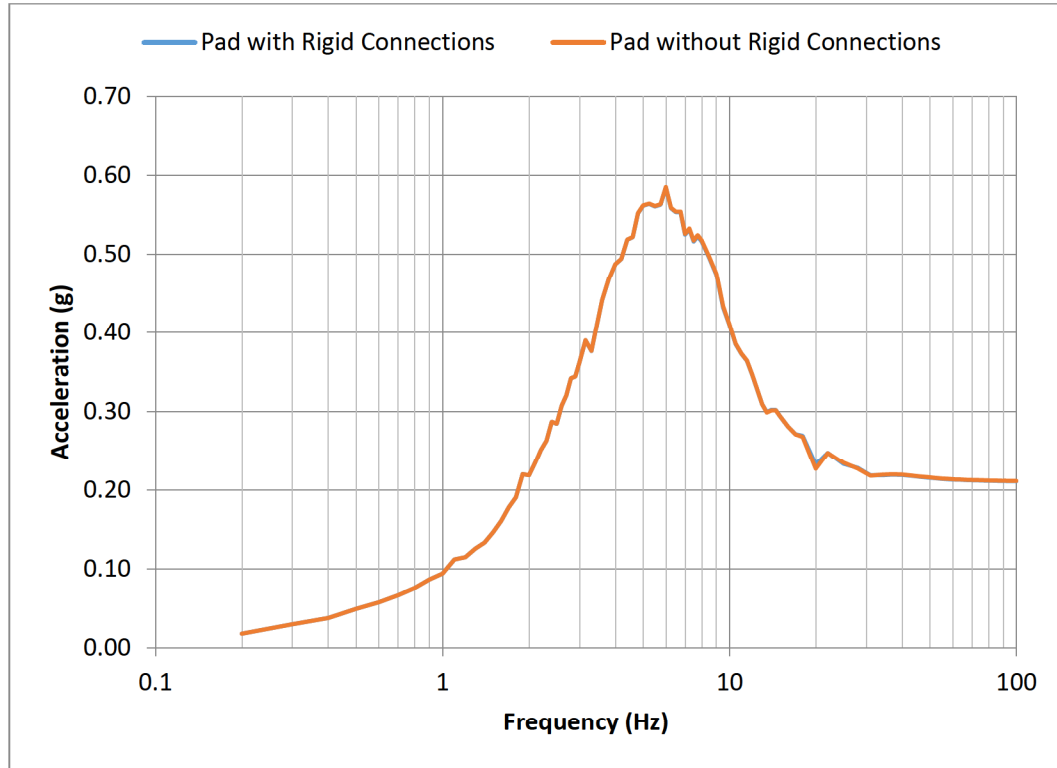
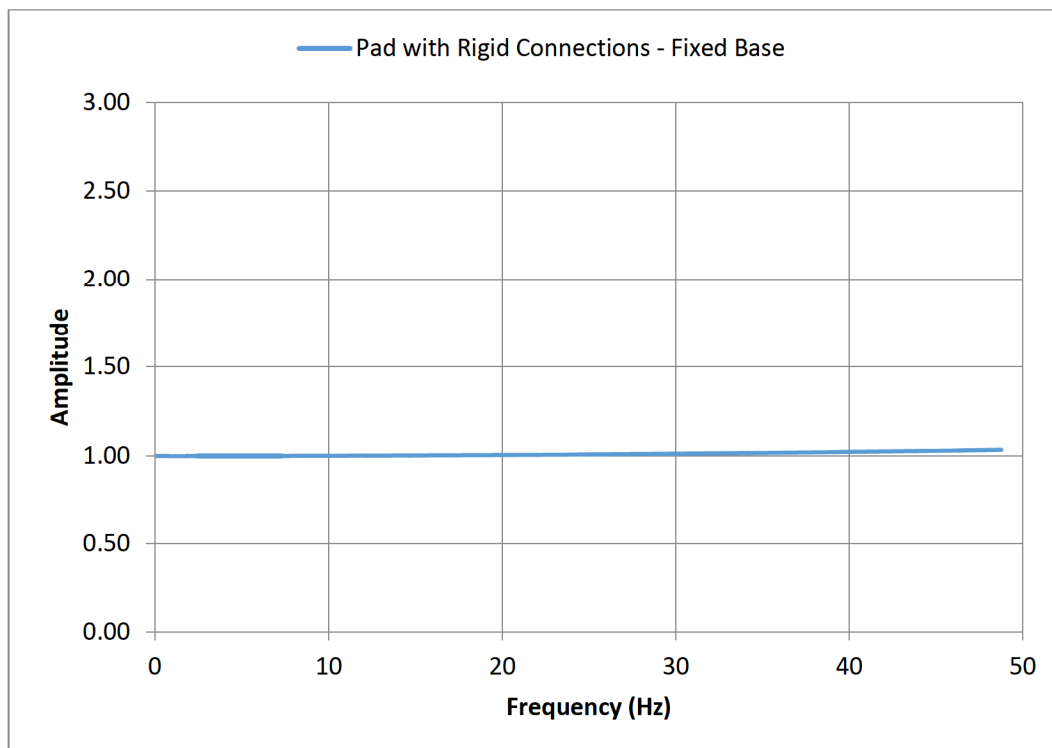


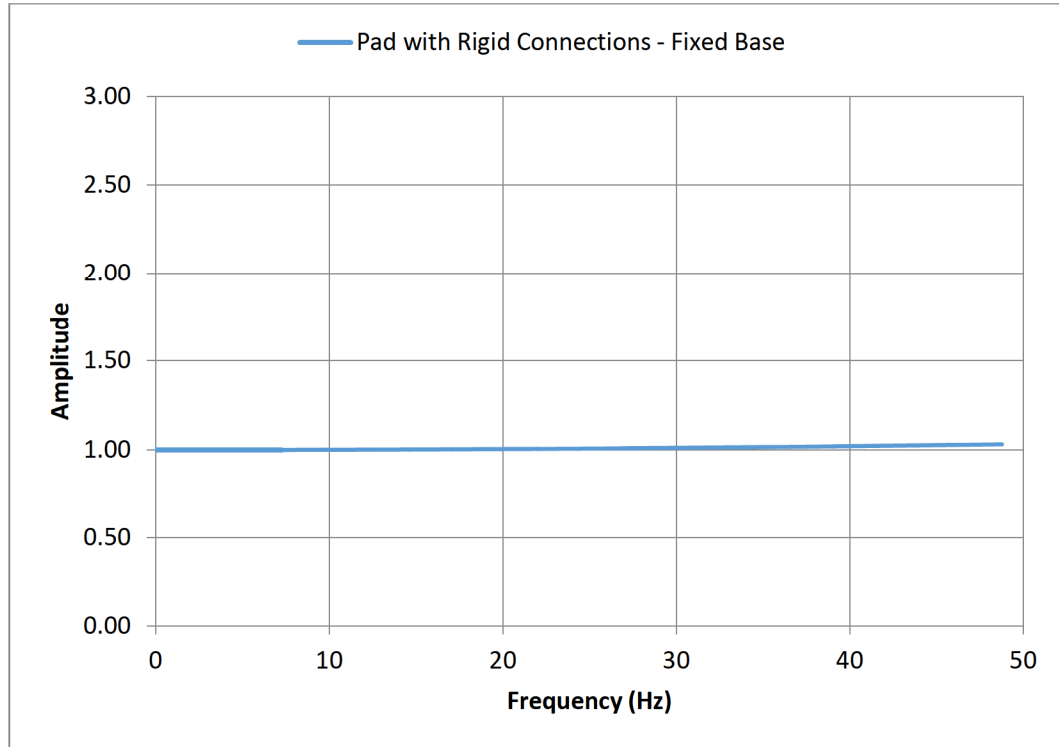
Figure A.13: Center of Cask B2 5% Acceleration Response Spectra – Z-Direction

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**Figure A.14: CG of Cask B2 Transfer Functions due to Fixed Base
Analysis – X-Direction**

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**Figure A.15: CG of Cask B2 Transfer Functions due to Fixed Base
Analysis – Y-Direction**

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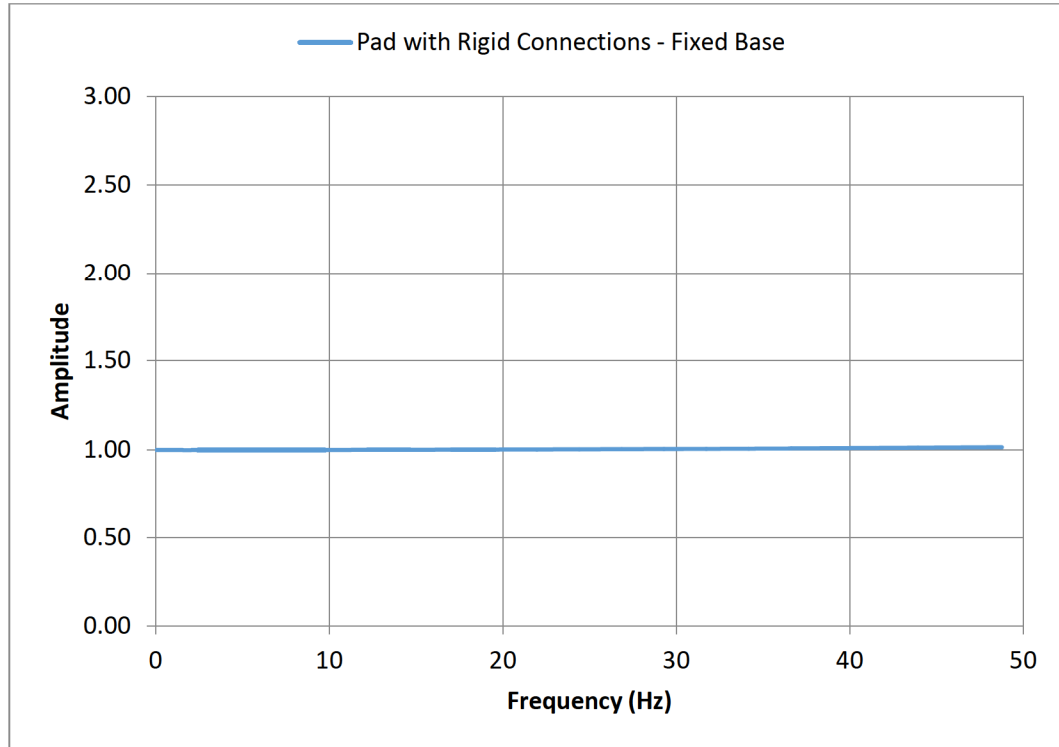


Figure A.16: CG of Cask B2 Transfer Functions due to Fixed Base Analyses – Z-Direction

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Attachment 1: Digitized Acceleration Time History Output Files

Digitized acceleration time histories for 3 output directions (X, Y, Z) for 36 SSI analysis cases due to combined (X, Y, and Z) input directions. Each file contains the individual cask CG and center of pad acceleration time histories:

Name	Date modified	Time modified	Size KB
..\Attachment_1\			
1_151_LB_CFG1_th_s_accel.csv	11.05.2016	14:11:52	18976.79
2_151_BE_CFG1_th_s_accel.csv	11.05.2016	14:11:52	18976.79
3_151_UB_CFG1_th_s_accel.csv	11.05.2016	14:11:52	18976.79
4_155_LB_CFG1_th_s_accel.csv	11.05.2016	14:11:52	18976.79
5_155_BE_CFG1_th_s_accel.csv	11.05.2016	14:11:53	18976.79
6_155_UB_CFG1_th_s_accel.csv	11.05.2016	14:11:53	18976.79
7_522_LB_CFG1_th_s_accel.csv	11.05.2016	14:11:53	18976.79
8_522_BE_CFG1_th_s_accel.csv	11.05.2016	14:11:53	18976.79
9_522_UB_CFG1_th_s_accel.csv	11.05.2016	14:11:53	18976.79
10_151_LB_CFG2_th_s_accel.csv	11.05.2016	14:11:53	6016.26
11_151_BE_CFG2_th_s_accel.csv	11.05.2016	14:11:53	6016.26
12_151_UB_CFG2_th_s_accel.csv	11.05.2016	14:11:53	6016.26
13_155_LB_CFG2_th_s_accel.csv	11.05.2016	14:11:53	6016.26
14_155_BE_CFG2_th_s_accel.csv	11.05.2016	14:11:53	6016.26
15_155_UB_CFG2_th_s_accel.csv	11.05.2016	14:11:53	6016.26
16_522_LB_CFG2_th_s_accel.csv	11.05.2016	14:11:53	6016.26
17_522_BE_CFG2_th_s_accel.csv	11.05.2016	14:11:53	6016.26
18_522_UB_CFG2_th_s_accel.csv	11.05.2016	14:11:53	6016.26
19_151_LB_CFG3_th_s_accel.csv	11.05.2016	14:11:53	10336.43
20_151_BE_CFG3_th_s_accel.csv	11.05.2016	14:11:53	10336.43
21_151_UB_CFG3_th_s_accel.csv	11.05.2016	14:11:53	10336.43
22_155_LB_CFG3_th_s_accel.csv	11.05.2016	14:11:53	10336.43
23_155_BE_CFG3_th_s_accel.csv	11.05.2016	14:11:53	10336.43
24_155_UB_CFG3_th_s_accel.csv	11.05.2016	14:11:54	10336.43
25_522_LB_CFG3_th_s_accel.csv	11.05.2016	14:11:54	10336.43
26_522_BE_CFG3_th_s_accel.csv	11.05.2016	14:11:54	10336.43
27_522_UB_CFG3_th_s_accel.csv	11.05.2016	14:11:54	10336.43
28_151_LB_CFG4_th_s_accel.csv	11.05.2016	14:11:54	4576.2
29_151_BE_CFG4_th_s_accel.csv	11.05.2016	14:11:54	4576.2

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30_151_UB_CFG4_th_s_accel.csv	11.05.2016	14:11:54	4576.2	
31_155_LB_CFG4_th_s_accel.csv	11.05.2016	14:11:54	4576.2	
32_155_BE_CFG4_th_s_accel.csv	11.05.2016	14:11:54	4576.2	
33_155_UB_CFG4_th_s_accel.csv	11.05.2016	14:11:54	4576.2	
34_522_LB_CFG4_th_s_accel.csv	11.05.2016	14:11:54	4576.2	
35_522_BE_CFG4_th_s_accel.csv	11.05.2016	14:11:54	4576.2	
36_522_UB_CFG4_th_s_accel.csv	11.05.2016	14:11:54	4576.2	

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Attachment 2: Digitized Acceleration Response Spectra Output Files

Digitized acceleration response spectra for 3 output directions (X, Y, Z) for 36 SSI analysis cases due to combined (X, Y, and Z) input directions and acceleration response spectra for 3 output directions (X, Y, Z) for the envelope of 36 SSI analysis cases. The files labeled with SSI analysis case numbers contain the individual acceleration response spectra for each cask CG and center of pad. The files labeled as “envelope” contain the envelope of acceleration response spectra for each analysis case as well as the envelope of all 36 analysis cases:

Name	Date modified	Time modified	Size KB
..\Attachment_2\			
1_151_LB_CFG1_sp_s_accel.csv	11.05.2016	14:11:54	457.07
2_151_BE_CFG1_sp_s_accel.csv	11.05.2016	14:11:54	457.07
3_151_UB_CFG1_sp_s_accel.csv	11.05.2016	14:11:54	457.07
4_155_LB_CFG1_sp_s_accel.csv	11.05.2016	14:11:54	457.07
5_155_BE_CFG1_sp_s_accel.csv	11.05.2016	14:11:54	457.07
6_155_UB_CFG1_sp_s_accel.csv	11.05.2016	14:11:54	457.07
7_522_LB_CFG1_sp_s_accel.csv	11.05.2016	14:11:54	457.07
8_522_BE_CFG1_sp_s_accel.csv	11.05.2016	14:11:54	457.07
9_522_UB_CFG1_sp_s_accel.csv	11.05.2016	14:11:54	457.07
10_151_LB_CFG2_sp_s_accel.csv	11.05.2016	14:11:54	141.72
11_151_BE_CFG2_sp_s_accel.csv	11.05.2016	14:11:54	141.72
12_151_UB_CFG2_sp_s_accel.csv	11.05.2016	14:11:54	141.72
13_155_LB_CFG2_sp_s_accel.csv	11.05.2016	14:11:54	141.72
14_155_BE_CFG2_sp_s_accel.csv	11.05.2016	14:11:54	141.72
15_155_UB_CFG2_sp_s_accel.csv	11.05.2016	14:11:54	141.72
16_522_LB_CFG2_sp_s_accel.csv	11.05.2016	14:11:54	141.72
17_522_BE_CFG2_sp_s_accel.csv	11.05.2016	14:11:54	141.72
18_522_UB_CFG2_sp_s_accel.csv	11.05.2016	14:11:54	141.72
19_151_LB_CFG3_sp_s_accel.csv	11.05.2016	14:11:54	246.83
20_151_BE_CFG3_sp_s_accel.csv	11.05.2016	14:11:54	246.83
21_151_UB_CFG3_sp_s_accel.csv	11.05.2016	14:11:54	246.83
22_155_LB_CFG3_sp_s_accel.csv	11.05.2016	14:11:54	246.83
23_155_BE_CFG3_sp_s_accel.csv	11.05.2016	14:11:54	246.83
24_155_UB_CFG3_sp_s_accel.csv	11.05.2016	14:11:54	246.83

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25_522_LB_CFG3_sp_s_accel.csv	11.05.2016	14:11:54	246.83
26_522_BE_CFG3_sp_s_accel.csv	11.05.2016	14:11:54	246.83
27_522_UB_CFG3_sp_s_accel.csv	11.05.2016	14:11:54	246.83
28_151_LB_CFG4_sp_s_accel.csv	11.05.2016	14:11:54	106.68
29_151_BE_CFG4_sp_s_accel.csv	11.05.2016	14:11:54	106.68
30_151_UB_CFG4_sp_s_accel.csv	11.05.2016	14:11:54	106.68
31_155_LB_CFG4_sp_s_accel.csv	11.05.2016	14:11:54	106.68
32_155_BE_CFG4_sp_s_accel.csv	11.05.2016	14:11:54	106.68
33_155_UB_CFG4_sp_s_accel.csv	11.05.2016	14:11:54	106.68
34_522_LB_CFG4_sp_s_accel.csv	11.05.2016	14:11:55	106.68
35_522_BE_CFG4_sp_s_accel.csv	11.05.2016	14:11:55	106.68
36_522_UB_CFG4_sp_s_accel.csv	11.05.2016	14:11:55	106.68

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Attachment 3: SSI Analysis Input/Output Files

Input files and output files for 36 SSI analysis cases. Naming convention of analysis directories as follows; [case number]_[time history rsn]_[soil case]_[cask configuration]:

Name	Date modified	Time modified	Size KB
..\Attachment_3\			
..\Attachment_3\1_151_LB_CFG1\			
output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	09.05.2016	15:37:18	149.43
WCS_ISFSI_CFG1_ans.dat	09.05.2016	10:41:31	571.67
WCS_ISFSI_CFG1_h.dat	22.01.2016	20:02:05	432.45
WCS_ISFSI_CFG1_h.out	09.05.2016	10:41:32	759.93
WCS_ISFSI_CFG1_r.log	09.05.2016	15:42:07	5.1
WCS_ISFSI_LB_s.dat	09.05.2016	10:01:22	9.37
WCS_ISFSI_LB_s.out	09.05.2016	10:41:43	25.17
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	09.05.2016	10:43:27	24.16
WCS_ISFSI_resp.py	19.01.2016	9:04:53	3.29
WCS_ISFSI_x_a.out	09.05.2016	15:37:19	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	09.05.2016	10:43:31	21.7
WCS_ISFSI_y_a.out	09.05.2016	15:37:19	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	09.05.2016	10:43:31	21.57
WCS_ISFSI_z_a.out	09.05.2016	15:37:20	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	09.05.2016	10:43:35	21.7
..\Attachment_3\2_151_BE_CFG1\			
output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	09.05.2016	20:27:52	149.43
WCS_ISFSI_BE_s.dat	22.01.2016	20:35:56	9.37
WCS_ISFSI_BE_s.out	09.05.2016	15:42:21	25.17
WCS_ISFSI_CFG1_ans.dat	09.05.2016	15:42:08	571.67

WCS_ISFSI_CFG1_h.dat	22.01.2016	20:02:05	432.45
WCS_ISFSI_CFG1_h.out	09.05.2016	15:42:10	759.93
WCS_ISFSI_CFG1_r.log	09.05.2016	20:32:30	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	09.05.2016	15:43:58	24.16
WCS_ISFSI_resp.py	19.01.2016	9:04:53	3.29
WCS_ISFSI_x_a.out	09.05.2016	20:27:54	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	09.05.2016	15:44:09	21.7
WCS_ISFSI_y_a.out	09.05.2016	20:27:55	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	09.05.2016	15:44:09	21.57
WCS_ISFSI_z_a.out	09.05.2016	20:27:55	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	09.05.2016	15:44:13	21.7

..\Attachment_3\3_151_UB_CFG1

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	23:14:53	149.43
WCS_ISFSI_BE_s.dat	15.01.2016	14:55:41	9.43
WCS_ISFSI_CFG1_ans.dat	10.05.2016	18:34:11	571.67
WCS_ISFSI_CFG1_h.dat	22.01.2016	20:02:05	432.45
WCS_ISFSI_CFG1_h.out	10.05.2016	18:34:12	759.93
WCS_ISFSI_CFG1_r.log	10.05.2016	23:20:09	5.1
WCS_ISFSI_LB_s.dat	15.01.2016	14:56:33	9.43
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	18:36:06	24.16
WCS_ISFSI_resp.py	19.01.2016	9:04:53	3.29
WCS_ISFSI_UB_s.dat	10.05.2016	16:58:54	9.37
WCS_ISFSI_UB_s.out	10.05.2016	18:34:24	25.17
WCS_ISFSI_x_a.out	10.05.2016	23:14:54	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	10.05.2016	18:36:10	21.7
WCS_ISFSI_y_a.out	10.05.2016	23:14:54	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	10.05.2016	18:36:10	21.57
WCS_ISFSI_z_a.out	10.05.2016	23:14:55	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12

WCS_ISFSI_z_s.out	10.05.2016	18:36:14	21.7
..\Attachment_3\4_155_LB_CFG1\			
output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	4:38:04	149.4
WCS_ISFSI_CFG1_ans.dat	09.05.2016	23:38:03	571.67
WCS_ISFSI_CFG1_h.dat	22.01.2016	20:02:05	432.45
WCS_ISFSI_CFG1_h.out	09.05.2016	23:38:06	759.93
WCS_ISFSI_CFG1_r.log	10.05.2016	4:43:13	5.1
WCS_ISFSI_LB_s.dat	09.05.2016	10:06:31	9.37
WCS_ISFSI_LB_s.out	09.05.2016	23:38:18	25.17
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	09.05.2016	23:40:33	24.16
WCS_ISFSI_resp.py	19.01.2016	9:04:18	3.29
WCS_ISFSI_x_a.out	10.05.2016	4:38:05	198.24
WCS_ISFSI_X_s.dat	15.01.2016	14:40:41	0.11
WCS_ISFSI_x_s.out	09.05.2016	23:40:37	21.7
WCS_ISFSI_y_a.out	10.05.2016	4:38:05	198.24
WCS_ISFSI_Y_s.dat	15.01.2016	14:41:02	0.11
WCS_ISFSI_y_s.out	09.05.2016	23:40:37	21.57
WCS_ISFSI_z_a.out	10.05.2016	4:38:06	198.24
WCS_ISFSI_Z_s.dat	15.01.2016	14:42:58	0.12
WCS_ISFSI_z_s.out	09.05.2016	23:40:41	21.7
..\Attachment_3\5_155_BE_CFG1\			
output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	9:31:51	149.4
WCS_ISFSI_BE_s.dat	22.01.2016	20:39:27	9.37
WCS_ISFSI_BE_s.out	10.05.2016	4:43:28	25.17
WCS_ISFSI_CFG1_ans.dat	10.05.2016	4:43:15	571.67
WCS_ISFSI_CFG1_h.dat	22.01.2016	20:02:05	432.45
WCS_ISFSI_CFG1_h.out	10.05.2016	4:43:16	759.93
WCS_ISFSI_CFG1_r.log	10.05.2016	9:37:29	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	4:45:06	24.16
WCS_ISFSI_resp.py	19.01.2016	9:04:18	3.29
WCS_ISFSI_x_a.out	10.05.2016	9:31:52	198.24

WCS_ISFSI_X_s.dat	15.01.2016	14:40:41	0.11
WCS_ISFSI_x_s.out	10.05.2016	4:45:10	21.7
WCS_ISFSI_y_a.out	10.05.2016	9:31:53	198.24
WCS_ISFSI_Y_s.dat	15.01.2016	14:41:02	0.11
WCS_ISFSI_y_s.out	10.05.2016	4:45:10	21.57
WCS_ISFSI_z_a.out	10.05.2016	9:31:54	198.24
WCS_ISFSI_Z_s.dat	15.01.2016	14:42:58	0.12
WCS_ISFSI_z_s.out	10.05.2016	4:45:14	21.7

..\Attachment_3\6_155_UB_CFG1

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	11.05.2016	3:59:36	149.4
WCS_ISFSI_CFG1_ans.dat	10.05.2016	23:20:11	571.67
WCS_ISFSI_CFG1_h.dat	22.01.2016	20:02:05	432.45
WCS_ISFSI_CFG1_h.out	10.05.2016	23:20:13	759.93
WCS_ISFSI_CFG1_r.log	11.05.2016	4:04:49	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	23:22:05	24.16
WCS_ISFSI_resp.py	19.01.2016	9:04:18	3.29
WCS_ISFSI_UB_s.dat	10.05.2016	17:00:17	9.37
WCS_ISFSI_UB_s.out	10.05.2016	23:20:24	25.17
WCS_ISFSI_x_a.out	11.05.2016	3:59:37	198.24
WCS_ISFSI_X_s.dat	15.01.2016	14:40:41	0.11
WCS_ISFSI_x_s.out	10.05.2016	23:22:09	21.7
WCS_ISFSI_y_a.out	11.05.2016	3:59:38	198.24
WCS_ISFSI_Y_s.dat	15.01.2016	14:41:02	0.11
WCS_ISFSI_y_s.out	10.05.2016	23:22:09	21.57
WCS_ISFSI_z_a.out	11.05.2016	3:59:39	198.24
WCS_ISFSI_Z_s.dat	15.01.2016	14:42:58	0.12
WCS_ISFSI_z_s.out	10.05.2016	23:22:13	21.7

..\Attachment_3\7_522_LB_CFG1

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	18:28:43	149.43
WCS_ISFSI_CFG1_ans.dat	10.05.2016	13:27:28	571.67
WCS_ISFSI_CFG1_h.dat	22.01.2016	20:02:05	432.45
WCS_ISFSI_CFG1_h.out	10.05.2016	13:27:30	759.93

WCS_ISFSI_CFG1_r.log	10.05.2016	18:33:42	5.1
WCS_ISFSI_LB_s.dat	09.05.2016	10:12:52	9.37
WCS_ISFSI_LB_s.out	10.05.2016	13:27:41	25.17
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	13:29:22	24.16
WCS_ISFSI_resp.py	19.01.2016	9:07:28	3.29
WCS_ISFSI_x_a.out	10.05.2016	18:28:44	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	10.05.2016	13:29:26	21.7
WCS_ISFSI_y_a.out	10.05.2016	18:28:45	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	10.05.2016	13:29:26	21.57
WCS_ISFSI_z_a.out	10.05.2016	18:28:45	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	10.05.2016	13:29:30	21.7
..\\Attachment_3\\8_522_BE_CFG1\\			
output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	11.05.2016	13:12:09	149.43
WCS_ISFSI_BE_s.dat	22.01.2016	20:35:56	9.37
WCS_ISFSI_BE_s.out	11.05.2016	8:43:18	25.17
WCS_ISFSI_CFG1_ans.dat	11.05.2016	8:43:05	571.67
WCS_ISFSI_CFG1_h.dat	22.01.2016	20:02:05	432.45
WCS_ISFSI_CFG1_h.out	11.05.2016	8:43:06	759.93
WCS_ISFSI_CFG1_r.log	11.05.2016	13:16:32	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	11.05.2016	8:44:56	24.16
WCS_ISFSI_resp.py	19.01.2016	9:07:28	3.29
WCS_ISFSI_x_a.out	11.05.2016	13:12:09	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	11.05.2016	8:45:05	21.7
WCS_ISFSI_y_a.out	11.05.2016	13:12:10	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	11.05.2016	8:45:05	21.57
WCS_ISFSI_z_a.out	11.05.2016	13:12:11	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	11.05.2016	8:45:09	21.7

..\Attachment_3\9_522_UB_CFG1

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	11.05.2016	8:38:21	149.43
WCS_ISFSI_CFG1_ans.dat	11.05.2016	4:04:51	571.67
WCS_ISFSI_CFG1_h.dat	22.01.2016	20:02:05	432.45
WCS_ISFSI_CFG1_h.out	11.05.2016	4:04:53	759.93
WCS_ISFSI_CFG1_r.log	11.05.2016	8:43:04	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	11.05.2016	4:06:47	24.16
WCS_ISFSI_resp.py	19.01.2016	9:07:28	3.29
WCS_ISFSI_UB_s.dat	10.05.2016	17:01:17	9.37
WCS_ISFSI_UB_s.out	11.05.2016	4:05:05	25.17
WCS_ISFSI_x_a.out	11.05.2016	8:38:22	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	11.05.2016	4:06:51	21.7
WCS_ISFSI_y_a.out	11.05.2016	8:38:22	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	11.05.2016	4:06:51	21.57
WCS_ISFSI_z_a.out	11.05.2016	8:38:23	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	11.05.2016	4:06:55	21.7

..\Attachment_3\10_151_LB_CFG2

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	09.05.2016	15:35:17	149.43
WCS_ISFSI_CFG2_ans.dat	09.05.2016	10:43:58	541.23
WCS_ISFSI_CFG2_h.dat	22.01.2016	19:55:06	401.28
WCS_ISFSI_CFG2_h.out	09.05.2016	10:44:00	693.57
WCS_ISFSI_CFG2_r.log	09.05.2016	15:38:02	5.1
WCS_ISFSI_LB_s.dat	09.05.2016	10:01:22	9.37
WCS_ISFSI_LB_s.out	09.05.2016	10:44:11	25.17
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	09.05.2016	10:45:48	24.16
WCS_ISFSI_resp.py	19.01.2016	9:07:44	3.29
WCS_ISFSI_x_a.out	09.05.2016	15:35:18	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	09.05.2016	10:45:52	21.7

WCS_ISFSI_y_a.out	09.05.2016	15:35:19	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	09.05.2016	10:45:52	21.57
WCS_ISFSI_z_a.out	09.05.2016	15:35:20	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	09.05.2016	10:45:56	21.7

..\Attachment_3\11_151_BE_CFG2\

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	09.05.2016	20:17:18	149.43
WCS_ISFSI_BE_s.dat	22.01.2016	20:35:56	9.37
WCS_ISFSI_BE_s.out	09.05.2016	15:38:18	25.17
WCS_ISFSI_CFG2_ans.dat	09.05.2016	15:38:03	541.23
WCS_ISFSI_CFG2_h.dat	22.01.2016	19:55:06	401.28
WCS_ISFSI_CFG2_h.out	09.05.2016	15:38:04	693.57
WCS_ISFSI_CFG2_r.log	09.05.2016	20:20:11	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	09.05.2016	15:40:28	24.16
WCS_ISFSI_resp.py	19.01.2016	9:07:44	3.29
WCS_ISFSI_x_a.out	09.05.2016	20:17:18	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	09.05.2016	15:40:32	21.7
WCS_ISFSI_y_a.out	09.05.2016	20:17:19	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	09.05.2016	15:40:33	21.57
WCS_ISFSI_z_a.out	09.05.2016	20:17:20	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	09.05.2016	15:40:37	21.7

..\Attachment_3\12_151_UB_CFG2\

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	22:21:57	149.43
WCS_ISFSI_CFG2_ans.dat	10.05.2016	17:51:12	541.23
WCS_ISFSI_CFG2_h.dat	22.01.2016	19:55:06	401.28
WCS_ISFSI_CFG2_h.out	10.05.2016	17:51:14	693.57
WCS_ISFSI_CFG2_r.log	10.05.2016	22:24:44	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07

WCS_ISFSI_p.out	10.05.2016	17:53:07	24.16
WCS_ISFSI_resp.py	19.01.2016	9:07:44	3.29
WCS_ISFSI_UB_s.dat	10.05.2016	16:58:54	9.37
WCS_ISFSI_UB_s.out	10.05.2016	17:51:25	25.17
WCS_ISFSI_x_a.out	10.05.2016	22:21:57	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	10.05.2016	17:53:11	21.7
WCS_ISFSI_y_a.out	10.05.2016	22:21:58	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	10.05.2016	17:53:11	21.57
WCS_ISFSI_z_a.out	10.05.2016	22:21:59	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	10.05.2016	17:53:15	21.7

..\Attachment_3\13_155_LB_CFG2\

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	4:07:07	149.4
WCS_ISFSI_CFG2_ans.dat	09.05.2016	23:16:31	541.23
WCS_ISFSI_CFG2_h.dat	22.01.2016	19:55:06	401.28
WCS_ISFSI_CFG2_h.out	09.05.2016	23:16:32	693.57
WCS_ISFSI_CFG2_r.log	10.05.2016	4:10:19	5.1
WCS_ISFSI_LB_s.dat	09.05.2016	10:06:31	9.37
WCS_ISFSI_LB_s.out	09.05.2016	23:16:47	25.17
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	09.05.2016	23:18:28	24.16
WCS_ISFSI_resp.py	19.01.2016	9:07:59	3.29
WCS_ISFSI_x_a.out	10.05.2016	4:07:07	198.24
WCS_ISFSI_X_s.dat	15.01.2016	14:40:41	0.11
WCS_ISFSI_x_s.out	09.05.2016	23:18:33	21.7
WCS_ISFSI_y_a.out	10.05.2016	4:07:08	198.24
WCS_ISFSI_Y_s.dat	15.01.2016	14:41:02	0.11
WCS_ISFSI_y_s.out	09.05.2016	23:18:33	21.57
WCS_ISFSI_z_a.out	10.05.2016	4:07:09	198.24
WCS_ISFSI_Z_s.dat	15.01.2016	14:42:58	0.12
WCS_ISFSI_z_s.out	09.05.2016	23:18:37	21.7

..\Attachment_3\14_155_BE_CFG2\

output_nodes.txt	12.01.2016	10:28:30	0.15
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WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	8:49:27	149.4
WCS_ISFSI_BE_s.dat	22.01.2016	20:39:27	9.37
WCS_ISFSI_BE_s.out	10.05.2016	4:10:34	25.17
WCS_ISFSI_CFG2_ans.dat	10.05.2016	4:10:20	541.23
WCS_ISFSI_CFG2_h.dat	22.01.2016	19:55:06	401.28
WCS_ISFSI_CFG2_h.out	10.05.2016	4:10:23	693.57
WCS_ISFSI_CFG2_r.log	10.05.2016	8:52:10	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	4:12:13	24.16
WCS_ISFSI_resp.py	19.01.2016	9:07:59	3.29
WCS_ISFSI_x_a.out	10.05.2016	8:49:27	198.24
WCS_ISFSI_X_s.dat	15.01.2016	14:40:41	0.11
WCS_ISFSI_x_s.out	10.05.2016	4:12:22	21.7
WCS_ISFSI_y_a.out	10.05.2016	8:49:28	198.24
WCS_ISFSI_Y_s.dat	15.01.2016	14:41:02	0.11
WCS_ISFSI_y_s.out	10.05.2016	4:12:22	21.57
WCS_ISFSI_z_a.out	10.05.2016	8:49:29	198.24
WCS_ISFSI_Z_s.dat	15.01.2016	14:42:58	0.12
WCS_ISFSI_z_s.out	10.05.2016	4:12:27	21.7
..\\Attachment_3\\15_155_UB_CFG2\\			
output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	11.05.2016	2:55:37	149.4
WCS_ISFSI_CFG2_ans.dat	10.05.2016	22:24:45	541.23
WCS_ISFSI_CFG2_h.dat	22.01.2016	19:55:06	401.28
WCS_ISFSI_CFG2_h.out	10.05.2016	22:24:46	693.57
WCS_ISFSI_CFG2_r.log	11.05.2016	2:58:21	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	22:26:40	24.16
WCS_ISFSI_resp.py	19.01.2016	9:07:59	3.29
WCS_ISFSI_UB_s.dat	10.05.2016	17:00:17	9.37
WCS_ISFSI_UB_s.out	10.05.2016	22:24:57	25.17
WCS_ISFSI_x_a.out	11.05.2016	2:55:38	198.24
WCS_ISFSI_X_s.dat	15.01.2016	14:40:41	0.11
WCS_ISFSI_x_s.out	10.05.2016	22:26:50	21.7
WCS_ISFSI_y_a.out	11.05.2016	2:55:39	198.24
WCS_ISFSI_Y_s.dat	15.01.2016	14:41:02	0.11

WCS_ISFSI_y_s.out	10.05.2016	22:26:50	21.57
WCS_ISFSI_z_a.out	11.05.2016	2:55:39	198.24
WCS_ISFSI_Z_s.dat	15.01.2016	14:42:58	0.12
WCS_ISFSI_z_s.out	10.05.2016	22:26:54	21.7

..\Attachment_3\16_522_LB_CFG2\

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	17:29:09	149.43
WCS_ISFSI_CFG2_ans.dat	10.05.2016	12:34:56	541.23
WCS_ISFSI_CFG2_h.dat	22.01.2016	19:55:06	401.28
WCS_ISFSI_CFG2_h.out	10.05.2016	12:35:03	693.57
WCS_ISFSI_CFG2_r.log	10.05.2016	17:31:52	5.1
WCS_ISFSI_LB_s.dat	09.05.2016	10:12:52	9.37
WCS_ISFSI_LB_s.out	10.05.2016	12:35:14	25.17
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	12:36:54	24.16
WCS_ISFSI_resp.py	19.01.2016	9:08:16	3.29
WCS_ISFSI_x_a.out	10.05.2016	17:29:10	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	10.05.2016	12:36:58	21.7
WCS_ISFSI_y_a.out	10.05.2016	17:29:10	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	10.05.2016	12:36:59	21.57
WCS_ISFSI_z_a.out	10.05.2016	17:29:11	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	10.05.2016	12:37:03	21.7

..\Attachment_3\17_522_BE_CFG2\

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	11.05.2016	12:03:54	149.43
WCS_ISFSI_BE_s.dat	22.01.2016	20:35:56	9.37
WCS_ISFSI_BE_s.out	11.05.2016	7:31:03	25.17
WCS_ISFSI_CFG2_ans.dat	11.05.2016	7:30:50	541.23
WCS_ISFSI_CFG2_h.dat	22.01.2016	19:55:06	401.28
WCS_ISFSI_CFG2_h.out	11.05.2016	7:30:52	693.57
WCS_ISFSI_CFG2_r.log	11.05.2016	12:06:21	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07

WCS_ISFSI_p.out	11.05.2016	7:32:49	24.16
WCS_ISFSI_resp.py	19.01.2016	9:08:16	3.29
WCS_ISFSI_x_a.out	11.05.2016	12:03:54	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	11.05.2016	7:32:53	21.7
WCS_ISFSI_y_a.out	11.05.2016	12:03:57	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	11.05.2016	7:32:53	21.57
WCS_ISFSI_z_a.out	11.05.2016	12:03:58	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	11.05.2016	7:33:03	21.7

..\Attachment_3\18_522_UB_CFG2

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	11.05.2016	7:28:12	149.43
WCS_ISFSI_CFG2_ans.dat	11.05.2016	2:58:22	541.23
WCS_ISFSI_CFG2_h.dat	22.01.2016	19:55:06	401.28
WCS_ISFSI_CFG2_h.out	11.05.2016	2:58:23	693.57
WCS_ISFSI_CFG2_r.log	11.05.2016	7:30:49	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	11.05.2016	3:00:46	24.16
WCS_ISFSI_resp.py	19.01.2016	9:08:16	3.29
WCS_ISFSI_UB_s.dat	10.05.2016	17:01:17	9.37
WCS_ISFSI_UB_s.out	11.05.2016	2:58:37	25.17
WCS_ISFSI_x_a.out	11.05.2016	7:28:13	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	11.05.2016	3:00:50	21.7
WCS_ISFSI_y_a.out	11.05.2016	7:28:15	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	11.05.2016	3:00:50	21.57
WCS_ISFSI_z_a.out	11.05.2016	7:28:15	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	11.05.2016	3:00:54	21.7

..\Attachment_3\19_151_LB_CFG3

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	09.05.2016	15:22:57	149.43

WCS_ISFSI_CFG3_ans.dat	09.05.2016	10:46:23	551.39
WCS_ISFSI_CFG3_h.dat	22.01.2016	20:00:58	411.68
WCS_ISFSI_CFG3_h.out	09.05.2016	10:46:24	715.69
WCS_ISFSI_CFG3_r.log	09.05.2016	15:26:03	5.1
WCS_ISFSI_LB_s.dat	09.05.2016	10:01:22	9.37
WCS_ISFSI_LB_s.out	09.05.2016	10:46:36	25.17
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	09.05.2016	10:48:40	24.16
WCS_ISFSI_resp.py	19.01.2016	9:08:44	3.29
WCS_ISFSI_x_a.out	09.05.2016	15:22:58	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	09.05.2016	10:48:49	21.7
WCS_ISFSI_y_a.out	09.05.2016	15:22:59	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	09.05.2016	10:48:49	21.57
WCS_ISFSI_z_a.out	09.05.2016	15:22:59	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	09.05.2016	10:48:53	21.7
..\\Attachment_3\\20_151_BE_CFG3\\			
output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	09.05.2016	19:50:41	149.43
WCS_ISFSI_BE_s.dat	22.01.2016	20:35:56	9.37
WCS_ISFSI_BE_s.out	09.05.2016	15:26:24	25.17
WCS_ISFSI_CFG3_ans.dat	09.05.2016	15:26:03	551.39
WCS_ISFSI_CFG3_h.dat	22.01.2016	20:00:58	411.68
WCS_ISFSI_CFG3_h.out	09.05.2016	15:26:05	715.69
WCS_ISFSI_CFG3_r.log	09.05.2016	19:53:46	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	09.05.2016	15:28:45	24.16
WCS_ISFSI_resp.py	19.01.2016	9:08:44	3.29
WCS_ISFSI_x_a.out	09.05.2016	19:50:43	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	09.05.2016	15:28:49	21.7
WCS_ISFSI_y_a.out	09.05.2016	19:50:44	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	09.05.2016	15:28:49	21.57
WCS_ISFSI_z_a.out	09.05.2016	19:50:45	198.24

WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	09.05.2016	15:28:53	21.7
..\Attachment_3\21_151_UB_CFG3\			
output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	22:18:03	149.43
WCS_ISFSI_CFG3_ans.dat	10.05.2016	18:02:26	551.39
WCS_ISFSI_CFG3_h.dat	22.01.2016	20:00:58	411.68
WCS_ISFSI_CFG3_h.out	10.05.2016	18:02:28	715.69
WCS_ISFSI_CFG3_r.log	10.05.2016	22:21:24	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	18:04:19	24.16
WCS_ISFSI_resp.py	19.01.2016	9:08:44	3.29
WCS_ISFSI_UB_s.dat	10.05.2016	16:58:54	9.37
WCS_ISFSI_UB_s.out	10.05.2016	18:02:39	25.17
WCS_ISFSI_x_a.out	10.05.2016	22:18:04	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	10.05.2016	18:04:23	21.7
WCS_ISFSI_y_a.out	10.05.2016	22:18:05	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	10.05.2016	18:04:23	21.57
WCS_ISFSI_z_a.out	10.05.2016	22:18:06	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	10.05.2016	18:04:27	21.7
..\Attachment_3\22_155_LB_CFG3\			
output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	3:14:24	149.4
WCS_ISFSI_CFG3_ans.dat	09.05.2016	22:38:59	551.39
WCS_ISFSI_CFG3_h.dat	22.01.2016	20:00:58	411.68
WCS_ISFSI_CFG3_h.out	09.05.2016	22:39:00	715.69
WCS_ISFSI_CFG3_r.log	10.05.2016	3:17:46	5.1
WCS_ISFSI_LB_s.dat	09.05.2016	10:06:31	9.37
WCS_ISFSI_LB_s.out	09.05.2016	22:39:11	25.17
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	09.05.2016	22:41:00	24.16
WCS_ISFSI_resp.py	19.01.2016	9:08:56	3.29

WCS_ISFSI_x_a.out	10.05.2016	3:14:25	198.24
WCS_ISFSI_X_s.dat	15.01.2016	14:40:41	0.11
WCS_ISFSI_x_s.out	09.05.2016	22:41:04	21.7
WCS_ISFSI_y_a.out	10.05.2016	3:14:26	198.24
WCS_ISFSI_Y_s.dat	15.01.2016	14:41:02	0.11
WCS_ISFSI_y_s.out	09.05.2016	22:41:04	21.57
WCS_ISFSI_z_a.out	10.05.2016	3:14:26	198.24
WCS_ISFSI_Z_s.dat	15.01.2016	14:42:58	0.12
WCS_ISFSI_z_s.out	09.05.2016	22:41:08	21.7

..\Attachment_3\23_155_BE_CFG3\

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	7:41:44	149.4
WCS_ISFSI_BE_s.dat	22.01.2016	20:39:27	9.37
WCS_ISFSI_BE_s.out	10.05.2016	3:18:00	25.17
WCS_ISFSI_CFG3_ans.dat	10.05.2016	3:17:47	551.39
WCS_ISFSI_CFG3_h.dat	22.01.2016	20:00:58	411.68
WCS_ISFSI_CFG3_h.out	10.05.2016	3:17:48	715.69
WCS_ISFSI_CFG3_r.log	10.05.2016	7:44:56	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	3:19:43	24.16
WCS_ISFSI_resp.py	19.01.2016	9:08:56	3.29
WCS_ISFSI_x_a.out	10.05.2016	7:41:44	198.24
WCS_ISFSI_X_s.dat	15.01.2016	14:40:41	0.11
WCS_ISFSI_x_s.out	10.05.2016	3:19:55	21.7
WCS_ISFSI_y_a.out	10.05.2016	7:41:45	198.24
WCS_ISFSI_Y_s.dat	15.01.2016	14:41:02	0.11
WCS_ISFSI_y_s.out	10.05.2016	3:19:55	21.57
WCS_ISFSI_z_a.out	10.05.2016	7:41:46	198.24
WCS_ISFSI_Z_s.dat	15.01.2016	14:42:58	0.12
WCS_ISFSI_z_s.out	10.05.2016	3:19:59	21.7

..\Attachment_3\24_155_UB_CFG3\

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	11.05.2016	2:36:39	149.4
WCS_ISFSI_CFG3_ans.dat	10.05.2016	22:21:25	551.39
WCS_ISFSI_CFG3_h.dat	22.01.2016	20:00:58	411.68

WCS_ISFSI_CFG3_h.out	10.05.2016	22:21:26	715.69
WCS_ISFSI_CFG3_r.log	11.05.2016	2:39:55	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	22:23:33	24.16
WCS_ISFSI_resp.py	19.01.2016	9:08:56	3.29
WCS_ISFSI_UB_s.dat	10.05.2016	17:00:17	9.37
WCS_ISFSI_UB_s.out	10.05.2016	22:21:47	25.17
WCS_ISFSI_x_a.out	11.05.2016	2:36:41	198.24
WCS_ISFSI_X_s.dat	15.01.2016	14:40:41	0.11
WCS_ISFSI_x_s.out	10.05.2016	22:23:37	21.7
WCS_ISFSI_y_a.out	11.05.2016	2:36:42	198.24
WCS_ISFSI_Y_s.dat	15.01.2016	14:41:02	0.11
WCS_ISFSI_y_s.out	10.05.2016	22:23:37	21.57
WCS_ISFSI_z_a.out	11.05.2016	2:36:42	198.24
WCS_ISFSI_Z_s.dat	15.01.2016	14:42:58	0.12
WCS_ISFSI_z_s.out	10.05.2016	22:23:41	21.7

..\Attachment_3\25_522_LB_CFG3\ output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	15:51:01	149.43
WCS_ISFSI_CFG3_ans.dat	10.05.2016	11:14:45	551.39
WCS_ISFSI_CFG3_h.dat	22.01.2016	20:00:58	411.68
WCS_ISFSI_CFG3_h.out	10.05.2016	11:14:47	715.69
WCS_ISFSI_CFG3_r.log	10.05.2016	15:54:11	5.1
WCS_ISFSI_LB_s.dat	09.05.2016	10:12:52	9.37
WCS_ISFSI_LB_s.out	10.05.2016	11:14:59	25.17
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	11:16:43	24.16
WCS_ISFSI_resp.py	19.01.2016	9:09:09	3.29
WCS_ISFSI_x_a.out	10.05.2016	15:51:02	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	10.05.2016	11:16:48	21.7
WCS_ISFSI_y_a.out	10.05.2016	15:51:03	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	10.05.2016	11:16:48	21.57
WCS_ISFSI_z_a.out	10.05.2016	15:51:03	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	10.05.2016	11:16:52	21.7

..\Attachment_3\26_522_BE_CFG3\

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	11.05.2016	11:22:47	149.43
WCS_ISFSI_BE_s.dat	22.01.2016	20:35:56	9.37
WCS_ISFSI_BE_s.out	11.05.2016	6:58:37	25.17
WCS_ISFSI_CFG3_ans.dat	11.05.2016	6:58:23	551.39
WCS_ISFSI_CFG3_h.dat	22.01.2016	20:00:58	411.68
WCS_ISFSI_CFG3_h.out	11.05.2016	6:58:26	715.69
WCS_ISFSI_CFG3_r.log	11.05.2016	11:25:47	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	11.05.2016	7:00:15	24.16
WCS_ISFSI_resp.py	19.01.2016	9:09:09	3.29
WCS_ISFSI_x_a.out	11.05.2016	11:22:47	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	11.05.2016	7:00:19	21.7
WCS_ISFSI_y_a.out	11.05.2016	11:22:48	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	11.05.2016	7:00:19	21.57
WCS_ISFSI_z_a.out	11.05.2016	11:22:49	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	11.05.2016	7:00:23	21.7

..\Attachment_3\27_522_UB_CFG3\

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	11.05.2016	6:55:18	149.43
WCS_ISFSI_CFG3_ans.dat	11.05.2016	2:39:56	551.39
WCS_ISFSI_CFG3_h.dat	22.01.2016	20:00:58	411.68
WCS_ISFSI_CFG3_h.out	11.05.2016	2:39:58	715.69
WCS_ISFSI_CFG3_r.log	11.05.2016	6:58:22	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	11.05.2016	2:41:53	24.16
WCS_ISFSI_resp.py	19.01.2016	9:09:09	3.29
WCS_ISFSI_UB_s.dat	10.05.2016	17:01:17	9.37
WCS_ISFSI_UB_s.out	11.05.2016	2:40:09	25.17
WCS_ISFSI_x_a.out	11.05.2016	6:55:19	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11

WCS_ISFSI_x_s.out	11.05.2016	2:41:57	21.7
WCS_ISFSI_y_a.out	11.05.2016	6:55:20	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	11.05.2016	2:41:57	21.57
WCS_ISFSI_z_a.out	11.05.2016	6:55:21	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	11.05.2016	2:42:01	21.7

..\Attachment_3\28_151_LB_CFG4

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	09.05.2016	15:45:42	149.43
WCS_ISFSI_CFG4_ans.dat	09.05.2016	10:55:08	537.84
WCS_ISFSI_CFG4_h.dat	22.01.2016	20:02:02	397.82
WCS_ISFSI_CFG4_h.out	09.05.2016	10:55:10	686.2
WCS_ISFSI_CFG4_r.log	09.05.2016	15:48:01	5.1
WCS_ISFSI_LB_s.dat	09.05.2016	10:01:22	9.37
WCS_ISFSI_LB_s.out	09.05.2016	10:55:21	25.17
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	09.05.2016	10:57:12	24.16
WCS_ISFSI_resp.py	19.01.2016	9:09:26	3.29
WCS_ISFSI_x_a.out	09.05.2016	15:45:43	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	09.05.2016	10:57:16	21.7
WCS_ISFSI_y_a.out	09.05.2016	15:45:43	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	09.05.2016	10:57:16	21.57
WCS_ISFSI_z_a.out	09.05.2016	15:45:44	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	09.05.2016	10:57:20	21.7

..\Attachment_3\29_151_BE_CFG4

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	09.05.2016	20:26:59	149.43
WCS_ISFSI_BE_s.dat	22.01.2016	20:35:56	9.37
WCS_ISFSI_BE_s.out	09.05.2016	15:48:15	25.17
WCS_ISFSI_CFG4_ans.dat	09.05.2016	15:48:02	537.84
WCS_ISFSI_CFG4_h.dat	22.01.2016	20:02:02	397.82

WCS_ISFSI_CFG4_h.out	09.05.2016	15:48:04	686.2
WCS_ISFSI_CFG4_r.log	09.05.2016	20:29:18	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	09.05.2016	15:49:56	24.16
WCS_ISFSI_resp.py	19.01.2016	9:09:26	3.29
WCS_ISFSI_x_a.out	09.05.2016	20:27:00	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	09.05.2016	15:50:00	21.7
WCS_ISFSI_y_a.out	09.05.2016	20:27:00	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	09.05.2016	15:50:00	21.57
WCS_ISFSI_z_a.out	09.05.2016	20:27:01	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	09.05.2016	15:50:04	21.7

..\Attachment_3\30_151_UB_CFG4\ output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	22:34:16	149.43
WCS_ISFSI_CFG4_ans.dat	10.05.2016	18:03:00	537.84
WCS_ISFSI_CFG4_h.dat	22.01.2016	20:02:02	397.82
WCS_ISFSI_CFG4_h.out	10.05.2016	18:03:02	686.2
WCS_ISFSI_CFG4_r.log	11.05.2016	13:11:56	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	18:04:56	24.16
WCS_ISFSI_resp.py	19.01.2016	9:09:26	3.29
WCS_ISFSI_UB_s.dat	10.05.2016	16:58:54	9.37
WCS_ISFSI_UB_s.out	10.05.2016	18:03:17	25.17
WCS_ISFSI_x_a.out	10.05.2016	22:34:17	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	10.05.2016	18:05:00	21.7
WCS_ISFSI_y_a.out	10.05.2016	22:34:18	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	10.05.2016	18:05:00	21.57
WCS_ISFSI_z_a.out	10.05.2016	22:34:18	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	10.05.2016	18:05:04	21.7

..\Attachment_3\31_155_LB_CFG4\

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	4:17:30	149.4
WCS_ISFSI_CFG4_ans.dat	09.05.2016	23:26:04	537.84
WCS_ISFSI_CFG4_h.dat	22.01.2016	20:02:02	397.82
WCS_ISFSI_CFG4_h.out	09.05.2016	23:26:05	686.2
WCS_ISFSI_CFG4_r.log	10.05.2016	4:20:01	5.1
WCS_ISFSI_LB_s.dat	09.05.2016	10:06:31	9.37
WCS_ISFSI_LB_s.out	09.05.2016	23:26:17	25.17
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	09.05.2016	23:27:54	24.16
WCS_ISFSI_resp.py	19.01.2016	9:09:43	3.29
WCS_ISFSI_x_a.out	10.05.2016	4:17:31	198.24
WCS_ISFSI_X_s.dat	15.01.2016	14:40:41	0.11
WCS_ISFSI_x_s.out	09.05.2016	23:27:59	21.7
WCS_ISFSI_y_a.out	10.05.2016	4:17:32	198.24
WCS_ISFSI_Y_s.dat	15.01.2016	14:41:02	0.11
WCS_ISFSI_y_s.out	09.05.2016	23:27:59	21.57
WCS_ISFSI_z_a.out	10.05.2016	4:17:32	198.24
WCS_ISFSI_Z_s.dat	15.01.2016	14:42:58	0.12
WCS_ISFSI_z_s.out	09.05.2016	23:28:03	21.7

..\Attachment_3\32_155_BE_CFG4\

output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	9:00:05	149.4
WCS_ISFSI_BE_s.dat	22.01.2016	20:39:27	9.37
WCS_ISFSI_BE_s.out	10.05.2016	4:20:13	25.17
WCS_ISFSI_CFG4_ans.dat	10.05.2016	4:20:01	537.84
WCS_ISFSI_CFG4_h.dat	22.01.2016	20:02:02	397.82
WCS_ISFSI_CFG4_h.out	10.05.2016	4:20:02	686.2
WCS_ISFSI_CFG4_r.log	10.05.2016	9:02:42	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	4:21:58	24.16
WCS_ISFSI_resp.py	19.01.2016	9:09:43	3.29
WCS_ISFSI_x_a.out	10.05.2016	9:00:06	198.24
WCS_ISFSI_X_s.dat	15.01.2016	14:40:41	0.11
WCS_ISFSI_x_s.out	10.05.2016	4:22:02	21.7
WCS_ISFSI_y_a.out	10.05.2016	9:00:09	198.24

WCS_ISFSI_Y_s.dat	15.01.2016	14:41:02	0.11
WCS_ISFSI_y_s.out	10.05.2016	4:22:02	21.57
WCS_ISFSI_z_a.out	10.05.2016	9:00:10	198.24
WCS_ISFSI_Z_s.dat	15.01.2016	14:42:58	0.12
WCS_ISFSI_z_s.out	10.05.2016	4:22:06	21.7

..\Attachment_3\33_155_UB_CFG4\			
output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	11.05.2016	3:08:02	149.4
WCS_ISFSI_CFG4_ans.dat	10.05.2016	22:36:55	537.84
WCS_ISFSI_CFG4_h.dat	22.01.2016	20:02:02	397.82
WCS_ISFSI_CFG4_h.out	10.05.2016	22:36:59	686.2
WCS_ISFSI_CFG4_r.log	11.05.2016	3:10:34	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	22:38:51	24.16
WCS_ISFSI_resp.py	19.01.2016	9:09:43	3.29
WCS_ISFSI_UB_s.dat	10.05.2016	17:00:17	9.37
WCS_ISFSI_UB_s.out	10.05.2016	22:37:10	25.17
WCS_ISFSI_x_a.out	11.05.2016	3:08:03	198.24
WCS_ISFSI_X_s.dat	15.01.2016	14:40:41	0.11
WCS_ISFSI_x_s.out	10.05.2016	22:38:55	21.7
WCS_ISFSI_y_a.out	11.05.2016	3:08:04	198.24
WCS_ISFSI_Y_s.dat	15.01.2016	14:41:02	0.11
WCS_ISFSI_y_s.out	10.05.2016	22:38:55	21.57
WCS_ISFSI_z_a.out	11.05.2016	3:08:05	198.24
WCS_ISFSI_Z_s.dat	15.01.2016	14:42:58	0.12
WCS_ISFSI_z_s.out	10.05.2016	22:38:59	21.7

..\Attachment_3\34_522_LB_CFG4\			
output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	10.05.2016	17:38:54	149.43
WCS_ISFSI_CFG4_ans.dat	10.05.2016	12:45:36	537.84
WCS_ISFSI_CFG4_h.dat	22.01.2016	20:02:02	397.82
WCS_ISFSI_CFG4_h.out	10.05.2016	12:45:37	686.2
WCS_ISFSI_CFG4_r.log	10.05.2016	17:41:26	5.1
WCS_ISFSI_LB_s.dat	09.05.2016	10:12:52	9.37
WCS_ISFSI_LB_s.out	10.05.2016	12:45:48	25.17

WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	10.05.2016	12:48:11	24.16
WCS_ISFSI_resp.py	19.01.2016	9:09:57	3.29
WCS_ISFSI_x_a.out	10.05.2016	17:38:55	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	10.05.2016	12:48:15	21.7
WCS_ISFSI_y_a.out	10.05.2016	17:38:56	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	10.05.2016	12:48:15	21.57
WCS_ISFSI_z_a.out	10.05.2016	17:38:56	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	10.05.2016	12:48:19	21.7
..\Attachment_3\35_522_BE_CFG4\			
output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14
WCS_ISFSI_a.log	11.05.2016	12:26:15	149.43
WCS_ISFSI_BE_s.dat	22.01.2016	20:35:56	9.37
WCS_ISFSI_BE_s.out	11.05.2016	7:45:56	25.17
WCS_ISFSI_CFG4_ans.dat	11.05.2016	7:45:43	537.84
WCS_ISFSI_CFG4_h.dat	22.01.2016	20:02:02	397.82
WCS_ISFSI_CFG4_h.out	11.05.2016	7:45:45	686.2
WCS_ISFSI_CFG4_r.log	11.05.2016	12:28:24	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	11.05.2016	7:48:03	24.16
WCS_ISFSI_resp.py	19.01.2016	9:09:57	3.29
WCS_ISFSI_x_a.out	11.05.2016	12:26:16	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	11.05.2016	7:48:08	21.7
WCS_ISFSI_y_a.out	11.05.2016	12:26:16	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	11.05.2016	7:48:08	21.57
WCS_ISFSI_z_a.out	11.05.2016	12:26:18	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	11.05.2016	7:48:12	21.7
..\Attachment_3\36_522_UB_CFG4\			
output_nodes.txt	12.01.2016	10:28:30	0.15
WCS_ISFSI_a.dat	11.01.2016	20:25:15	0.14

WCS_ISFSI_a.log	11.05.2016	7:43:30	149.43
WCS_ISFSI_CFG4_ans.dat	11.05.2016	3:10:35	537.84
WCS_ISFSI_CFG4_h.dat	22.01.2016	20:02:02	397.82
WCS_ISFSI_CFG4_h.out	11.05.2016	3:10:37	686.2
WCS_ISFSI_CFG4_r.log	11.05.2016	7:45:43	5.1
WCS_ISFSI_p.dat	15.01.2016	13:25:25	0.07
WCS_ISFSI_p.out	11.05.2016	3:13:06	24.16
WCS_ISFSI_resp.py	19.01.2016	9:09:57	3.29
WCS_ISFSI_UB_s.dat	10.05.2016	17:01:17	9.37
WCS_ISFSI_UB_s.out	11.05.2016	3:10:48	25.17
WCS_ISFSI_x_a.out	11.05.2016	7:43:31	198.24
WCS_ISFSI_X_s.dat	11.01.2016	21:16:10	0.11
WCS_ISFSI_x_s.out	11.05.2016	3:13:10	21.7
WCS_ISFSI_y_a.out	11.05.2016	7:43:32	198.24
WCS_ISFSI_Y_s.dat	08.06.2015	21:42:47	0.11
WCS_ISFSI_y_s.out	11.05.2016	3:13:10	21.57
WCS_ISFSI_z_a.out	11.05.2016	7:43:32	198.24
WCS_ISFSI_Z_s.dat	08.06.2015	21:43:01	0.12
WCS_ISFSI_z_s.out	11.05.2016	3:13:14	21.7
..\Attachment_3\Worksheets\			
~\$Design_Calc_Check.xlsx	11.05.2016	8:04:40	0.16
Appendix_A.xlsx	25.01.2016	12:11:26	4198.84
Design_Calc_Check.xlsx	11.05.2016	8:04:40	28.09
Section_7-1.xlsx	09.05.2016	11:15:18	509.2
Section_7-2.xlsx	01.02.2016	21:57:00	7087.73
Section_7-3.xlsx	02.02.2016	8:36:46	9.78
Section_7-4.xlsx	11.05.2016	13:16:54	9446.26
Section_7-5.xlsx	11.05.2016	13:52:39	242780.3
..\Attachment_3\Worksheets\Sliding_Overturning_Calc\			
1_WCS_ISFSI_CFG1_th_s_accel.xlsx	10.05.2016	16:31:35	57299.08
2_WCS_ISFSI_CFG1_th_s_accel.xlsx	10.05.2016	16:34:17	57844.23
3_WCS_ISFSI_CFG1_th_s_accel.xlsx	11.05.2016	5:27:18	57777.28
4_WCS_ISFSI_CFG1_th_s_accel.xlsx	10.05.2016	16:37:07	57178.97
5_WCS_ISFSI_CFG1_th_s_accel.xlsx	10.05.2016	16:39:20	57059.13
6_WCS_ISFSI_CFG1_th_s_accel.xlsx	11.05.2016	5:35:09	56717.84
7_WCS_ISFSI_CFG1_th_s_accel.xlsx	10.05.2016	18:35:57	58386.33
8_WCS_ISFSI_CFG1_th_s_accel.xlsx	11.05.2016	13:26:52	58516.69

9_WCS_ISFSI_CFG1_th_s_accel.xlsx	11.05.2016	9:50:46	58356.45
10_WCS_ISFSI_CFG2_th_s_accel.xlsx	10.05.2016	17:13:41	17077.51
11_WCS_ISFSI_CFG2_th_s_accel.xlsx	10.05.2016	17:14:57	17103.19
12_WCS_ISFSI_CFG2_th_s_accel.xlsx	11.05.2016	5:37:06	17106.38
13_WCS_ISFSI_CFG2_th_s_accel.xlsx	10.05.2016	17:15:54	16863.08
14_WCS_ISFSI_CFG2_th_s_accel.xlsx	10.05.2016	17:17:20	16827.79
15_WCS_ISFSI_CFG2_th_s_accel.xlsx	11.05.2016	5:38:39	16749.41
16_WCS_ISFSI_CFG2_th_s_accel.xlsx	10.05.2016	17:47:16	17191.99
17_WCS_ISFSI_CFG2_th_s_accel.xlsx	11.05.2016	13:27:43	17172.61
18_WCS_ISFSI_CFG2_th_s_accel.xlsx	11.05.2016	9:51:53	17217.94
19_WCS_ISFSI_CFG3_th_s_accel.xlsx	10.05.2016	17:19:33	30694.11
20_WCS_ISFSI_CFG3_th_s_accel.xlsx	10.05.2016	17:20:30	31028.59
21_WCS_ISFSI_CFG3_th_s_accel.xlsx	11.05.2016	5:40:04	31023.18
22_WCS_ISFSI_CFG3_th_s_accel.xlsx	10.05.2016	17:22:02	30736.87
23_WCS_ISFSI_CFG3_th_s_accel.xlsx	10.05.2016	17:23:03	30598.12
24_WCS_ISFSI_CFG3_th_s_accel.xlsx	11.05.2016	5:44:51	30416.9
25_WCS_ISFSI_CFG3_th_s_accel.xlsx	10.05.2016	17:24:47	31327.57
26_WCS_ISFSI_CFG3_th_s_accel.xlsx	11.05.2016	13:29:27	31265.88
27_WCS_ISFSI_CFG3_th_s_accel.xlsx	11.05.2016	9:53:08	31229.48
28_WCS_ISFSI_CFG4_th_s_accel.xlsx	10.05.2016	17:26:02	12382.28
29_WCS_ISFSI_CFG4_th_s_accel.xlsx	10.05.2016	17:26:56	13447.12
30_WCS_ISFSI_CFG4_th_s_accel.xlsx	11.05.2016	13:52:00	14125.92
31_WCS_ISFSI_CFG4_th_s_accel.xlsx	10.05.2016	17:27:35	12294.62
32_WCS_ISFSI_CFG4_th_s_accel.xlsx	10.05.2016	17:28:17	12248.04
33_WCS_ISFSI_CFG4_th_s_accel.xlsx	11.05.2016	5:47:09	12214.34
34_WCS_ISFSI_CFG4_th_s_accel.xlsx	10.05.2016	17:46:21	12489.22
35_WCS_ISFSI_CFG4_th_s_accel.xlsx	11.05.2016	13:30:16	12492.92
36_WCS_ISFSI_CFG4_th_s_accel.xlsx	11.05.2016	9:54:20	12534.52

	CALCULATION PREPARATION CHECKLIST	CALC NO. NAC004-CALC-04
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CHECKLIST ITEMS ¹		YES	NO	N/A
GENERAL REQUIREMENTS				
1.	If the calculation is being performed to a client procedure, is the procedure being used the latest revision?	☒	☐	☐
2.	Are the proper forms being used and are they the latest revision?	☒	☐	☐
3.	Have the appropriate client review forms/checklists been completed?	☒	☐	☐
4.	Are all pages properly identified with a calculation number, calculation revision and page number consistent with the requirements of the client's procedure?	☒	☐	☐
5.	Is all information legible and reproducible?	☒	☐	☐
6.	Is the calculation presented in a logical and orderly manner?	☒	☐	☐
7.	Is there an existing calculation that should be revised or voided?	☐	☐	☒
No existing calculation.				
8.	Is it possible to alter an existing calculation instead of preparing a new calculation for this situation?	☐	☐	☒
No existing calculation.				
9.	If an existing calculation is being used for design inputs, are the key design inputs, assumptions and engineering judgments used in that calculation valid and do they apply to the calculation revision being performed.	☐	☐	☒
No existing calculation.				
10.	Is the format of the calculation consistent with applicable procedures and expectations?	☒	☐	☐
11.	Were design input/output documents properly updated to reference this calculation?	☒	☐	☐
12.	Can the calculation logic, methodology and presentation be properly understood without referring back to the originator for clarification?	☒	☐	☐
OBJECTIVE AND SCOPE				
13.	Does the calculation provide a clear concise statement of the problem and objective of the calculation?	☒	☐	☐
14.	Does the calculation provide a clear statement of quality classification?	☒	☐	☐
15.	Is the reason for performing and the end use of the calculation understood?	☒	☐	☐
16.	Does the calculation provide the basis for information found in the plant's license basis?	☐	☐	☒
Does not apply.				
17.	If so, is this documented in the calculation?	☐	☐	☒
Does not apply.				

	CALCULATION PREPARATION CHECKLIST	CALC NO. NAC004-CALC-04
		REV. 01
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18.	Does the calculation provide the basis for information found in the plant's design basis documentation?	☐	☐	☒
Does not apply.				
19.	If so, is this documented in the calculation?	☐	☐	☒
Does not apply				
20.	Does the calculation otherwise support information found in the plant's design basis documentation?	☐	☐	☒
Does not apply.				
21.	If so, is this documented in the calculation?	☐	☐	☒
Does not apply.				
22.	Has the appropriate design or license basis documentation been revised, or has the change notice or change request documents being prepared for submittal?	☐	☐	☒
Does not apply.				
DESIGN INPUTS				
23.	Are design inputs clearly identified?	☒	☐	☐
24.	Are design inputs retrievable or have they been added as attachments?	☒	☐	☐
25.	If Attachments are used as design inputs or assumptions are the Attachments traceable and verifiable?	☒	☐	☐
26.	Are design inputs clearly distinguished from assumptions?	☐	☐	☒
No assumptions.				
DESIGN INPUTS (Continued)				
27.	Does the calculation rely on Attachments for design inputs or assumptions? If yes, are the attachments properly referenced in the calculation?	☒	☐	☐
28.	Are input sources (including industry codes and standards) appropriately selected and are they consistent with the quality classification and objective of the calculation?	☒	☐	☐
29.	Are input sources (including industry codes and standards) consistent with the plant's design and license basis?	☐	☐	☒
Does not apply.				
30.	If applicable, do design inputs adequately address actual plant conditions?	☒	☐	☐
31.	Are input values reasonable and correctly applied?	☒	☐	☐
32.	Are design input sources approved?	☒	☐	☐
33.	Does the calculation reference the latest revision of the design input source?	☒	☐	☐
34.	Were all applicable plant operating modes considered?	☐	☐	☒
Does not apply.				
ASSUMPTIONS				

	CALCULATION PREPARATION CHECKLIST	CALC NO. NAC004-CALC-04
		REV. 01
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35.	Are assumptions reasonable/appropriate to the objective?	☐	☐	☒
No assumptions.				
36.	Is adequate justification/basis for all assumptions provided?	☐	☐	☒
No assumptions.				
37.	Are any engineering judgments used?	☐	☐	☒
Not used.				
38.	Are engineering judgments clearly identified as such?	☐	☐	☒
Not used.				
39.	If engineering judgments are utilized as design inputs, are they reasonable and can they be quantified or substantiated by reference to site or industry standards, engineering principles, physical laws or other appropriate criteria?	☐	☐	☒
Not used.				
METHODOLOGY				
40.	Is the methodology used in the calculation described or implied in the plant's licensing basis?	☐	☐	☒
Does not apply.				
41.	If the methodology used differs from that described in the plant's licensing basis, has the appropriate license document change notice been initiated?	☐	☐	☒
Does not apply.				
42.	Is the methodology used consistent with the stated objective?	☒	☐	☐
43.	Is the methodology used appropriate when considering the quality classification of the calculation and intended use of the results?	☒	☐	☐
BODY OF CALCULATION				
44.	Are equations used in the calculation consistent with recognized engineering practice and the plant's design and license basis?	☒	☐	☐
45.	Is there reasonable justification provided for the use of equations not in common use?	☐	☐	☒
No uncommon equations used.				
46.	Are the mathematical operations performed properly and documented in a logical fashion?	☒	☐	☐
47.	Is the math performed correctly?	☒	☐	☐
48.	Have adjustment factors, uncertainties and empirical correlations used in the analysis been correctly applied?	☐	☐	☒
Not used.				
49.	Has proper consideration been given to results that may be overly sensitive to very small changes in input?	☒	☐	☐
SOFTWARE/COMPUTER CODES				
50.	Are computer codes or software languages used in the preparation of the calculation?	☒	☐	☐

	CALCULATION PREPARATION CHECKLIST	CALC NO. NAC004-CALC-04
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51.	Have the requirements of CSP 3.09 for use of computer codes or software languages, including verification of accuracy and applicability been met?	☒	☐	☐
SOFTWARE/COMPUTER CODES (Continued)				
52.	Are the codes properly identified along with source vendor, organization, and revision level?	☒	☐	☐
53.	Is the computer code applicable for the analysis being performed?	☒	☐	☐
54.	If applicable, does the computer model adequately consider actual plant conditions?	☐	☐	☒
Does not apply.				
55.	Are the inputs to the computer code clearly identified and consistent with the inputs and assumptions documented in the calculation?	☒	☐	☐
56.	Is the computer output clearly identified?	☒	☐	☐
57.	Does the computer output clearly identify the appropriate units?	☒	☐	☐
58.	Are the computer outputs reasonable when compared to the inputs and what was expected?	☒	☐	☐
59.	Was the computer output reviewed for ERROR or WARNING messages that could invalidate the results?	☒	☐	☐
RESULTS AND CONCLUSIONS				
60.	Is adequate acceptance criteria specified?	☒	☐	☐
61.	Are the stated acceptance criteria consistent with the purpose of the calculation, and intended use?	☒	☐	☐
62.	Are the stated acceptance criteria consistent with the plant's design basis, applicable licensing commitments and industry codes, and standards?	☐	☐	☒
Does not apply.				
63.	Do the calculation results and conclusions meet the stated acceptance criteria?	☒	☐	☐
64.	Are the results represented in the proper units with an appropriate tolerance, if applicable?	☒	☐	☐
65.	Are the calculation results and conclusions reasonable when considered against the stated inputs and objectives?	☒	☐	☐
66.	Is sufficient conservatism applied to the outputs and conclusions?	☒	☐	☐
67.	Do the calculation results and conclusions affect any other calculations?	☒	☐	☐

	CALCULATION PREPARATION CHECKLIST	CALC NO. NAC004-CALC-04
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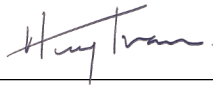
68.	If so, have the affected calculations been revised?	☒	☐	☐
69.	Does the calculation contain any conceptual, unconfirmed or open assumptions requiring later confirmation?	☐	☒	☐
No assumptions.				
70.	If so, are they properly identified?	☐	☐	☒
No assumptions.				
DESIGN REVIEW				
71.	Have alternate calculation methods been used to verify calculation results?	☒	☐	☐

Note:

- Where required, provide clarification/justification for answers to the questions in the space provided below each question. An explanation is required for any questions answered as "No" or "N/A".

Originator:

Huy Tran (SC Solutions Inc.) /



6/6/2016

Print Name and Sign

Date