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NOTE:

This document reports site-specific seismic Soil-Structure Interaction (SSI) analyses of the Reactor Building/Fuel Building Complex & Control Building for the Detroit Edison Fermi 3 site conditions.

These analyses were performed using the direct method of SASSI2000 computer program based on the design inputs provided by the following documents.

TODI LC1-3-A25-TDI-0003, Revision 1
TODI LC1-3-A25-TDI-0004, Revision 0

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LIST OF ACRONYM

ESBWR	Economic Simplified Boiling Water Reactor
DCD	Design Control Document
FSAR	Final Safety Analysis Report
SRP	Standard Review Plan
RB/FB	Reactor Building/Fuel Building
CB	Control Building
RCCV	Reinforced Concrete Containment Vessel
RSW	Reactor Shield Wall
RPV	Reactor Pressure Vessel
CSDRS	Certified Seismic Design Response Spectra
FIRS	Foundation Input Response Spectra
SSE	Safe Shutdown Earthquake
BE	Best Estimate subsurface condition
LB	Lower Bound subsurface condition
UB	Upper Bound subsurface condition
SSI	Soil-Structure Interaction
FRS	Floor Response Spectra
SRSS	Square Root of Sum of Squares
EB	Energy Balance methods
MEB	Modified Energy Balance methods
Sa	Spectral Acceleration
TB	Turbine Building

1. INTRODUCTION AND PURPOSE

This report presents site-specific soil-structure interaction (SSI) analyses performed for the ESBWR Reactor Building/Fuel Building (RB/FB) and the Control Building (CB) using the Fermi 3 site conditions. The site-specific SSI analyses were performed to address the following:

1) To demonstrate that the referenced Design Control Document (DCD, Reference 2-c) requirements for the backfill adjacent to Seismic Category I structures can be neglected for the Fermi 3 site.
2) The referenced DCD (Reference 2-c) does not consider a case where Seismic Category I structures are partially embedded in the bedrock.

The site-specific Foundation Input Response Spectra (FIRS) ground motion at the foundation level, which is also the Safe Shutdown Earthquake (SSE), for Fermi 3 site conditions used in the SSI analyses were generated by enveloping two FIRS as follows:

1) The FIRS from the Fermi 3 FSAR developed using a truncated subsurface column, with the subsurface layers above the foundation level (bottom of the basemat) removed.
2) The FIRS based on the full subsurface column with no truncation.

Site-specific ground motion time histories in three orthogonal directions (2 horizontal and 1 vertical) for the RB/FB and the CB were developed in accordance with SRP 3.7.1. The ground motion time histories in three orthogonal directions were compatible to the enveloping FIRS.

The Fermi 3 site-specific SSI analysis follows the methodology presented in the referenced DCD using the direct method of SASSI2000 computer program. The SASSI2000 structural models are developed from the referenced DCD stick models coupled with site-specific strain compatible dynamic subsurface properties. In the site-specific SASSI2000 SSI model, the subsurface below the top of the in-situ bedrock adjacent to Seismic Category I structures are modeled by neglecting the effect of overburden above the top of the bedrock. Fill concrete is used for backfill into the gap between the building and excavated bedrock up to the top of the in-situ bedrock. The gap between the RB/FB complex and the CB structure is also filled with fill concrete up to the top of the in-situ bedrock.

In accordance with SRP 3.7.2, three subsurface profiles are considered in the SSI analyses, namely, a best estimate (BE) profile, a lower bound (LB) profile, and an upper bound (UB) profile to account for the effects of the potential variability in the properties of the soils and rock at the Fermi 3 site. The analysis results are compared with the referenced DCD seismic design envelopes to confirm the applicability of the ESBWR design to the Fermi 3 site.

In addition, the foundation stability and the dynamic soil bearing pressures are evaluated for the RB/FB and CB based on the site-specific SSI analysis results.

2. REFERENCES

a. TODI LC1-3-A25-TDI-0003, Revision 1
b. TODI LC1-3-A25-TDI-0004, Revision 0
c. 26A6642, ESBWR Design Control Document
d. Fermi 3 Final Safety Analysis Report
e. U71-5040(26A6647), Seismic Analysis of Reactor/Fuel Building Complex
f. U73-5030(26A6648), Seismic Analysis of Control Building
g. U71-5020(26A6652), Stability Analysis of Reactor/Fuel Building Complex
h. U73-5020(26A6654), Stability Analysis of Control Building
i. NUREG-0800 "USNRC Standard Review Plan for Review of Safety Analysis Reports for Nuclear Power Plants - LWR Edition".
j. Tseng, W.S. and Liou, D.D., Simplified Methods for Predicting Seismic Basemat Uplift of Nuclear Power Plant Structures, Transactions of the 6th International Conference on SMIRT, Paris, France, August 1981.
k. Department of the Navy, Naval Facilities Engineering Command, Foundations & Earth Structures. Design Manual 7.02, Alexandria, VA, 1986.
l. NUREG-0800 Standard Review Plan, Section 3.8.5

3. CONDITIONS

3.1 Site Conditions

For the SSI analyses of the RB/FB and the CB at the Fermi 3 site, BE, LB, and UB subsurface profiles were considered. The site-specific strain compatible dynamic subsurface properties based on the soil column truncated at the estimated top of in-situ bedrock (Elevation 552.0 ft NAVD 88 in accordance with Subsection 2.5.4.5.2 of Reference 2-d) were provided in Reference 2-a and are listed in Tables 3.1-1 through 3.1-3.

3.2 Input Motion

Three orthogonal ground motion time history components were developed for use in the SSI analyses of the RB/FB and CB for the BE, LB, and UB subsurface profiles. They were provided in Reference 2-a. These ground motion time histories are the in-column motions at the foundation level, which are compatible with the outcrop FIRS. They are used directly in the Fermi 3 site-specific SSI analyses.

4. SOIL-STRUCTURE INTERACTION ANALYSIS

4.1 Analysis Method

The Fermi 3 site-specific SSI analysis follows the methodology presented in DCD Section 3A.5.2 using the direct method of SASSI2000 computer program. The SASSI2000 program uses finite elements with complex moduli for modeling the structure and foundation properties and is based on the frequency domain complex response method. The lumped mass-beam model described in DCD Section 3A.5.1 is coupled with the finite element soil model using site-specific strain compatible dynamic subsurface properties in SASSI2000. The model details are described in References 2-e, 2-f and Subsection 4.3 of this report. Structural responses in terms of accelerations, forces, and moments are computed directly. Floor response spectra are obtained from the calculated response acceleration time histories.

The SSI analyses for the three directional ground motion time history components are performed separately. The maximum co-directional responses for each of the three ground motion time history components are combined using the algebraic sum in the time domain considering both plus and minus directions.

In the seismic analysis, using the complex response method in the frequency domain, material damping can be included in the formulation of the complex stiffness matrix as indicated in the following equation:

$$[k_j^*] = [k_j](1 + 2i\lambda_j)$$ (Equation 3.7-16 of DCD)

where

$[k_j*]$ = complex stiffness matrix of element j
$[k_j]$ = stiffness matrix of element j
λ_j = material damping ratio of element j
i = $\sqrt{-1}$

The calculated co-directional floor response spectra (FRS) in the X-, Y-, and Z-directions are combined using the SRSS method to obtain FRS at the building edges.

The structural damping value used in the seismic analysis is 7% in accordance with SSE damping specified in Regulatory Guide 1.61. The use of this value is validated in the report, SER-DTF-009.

4.2 Soil-Structure Interaction Analysis Cases

The site-specific SSI analysis cases are summarized in Tables 4.2-1 and 4.2-2 for the RB/FB and CB, respectively.

4.3 Analysis Models

The analysis model is a three-dimensional lumped mass-beam model used in the DCD, which considers shear, bending, torsion and axial deformations. For the RB/FB, the structural elements of the RB outside containment and the FB are reduced to one set of stick models. Figure 4.3-1 shows the major components inside containment. The Reinforced Concrete Containment Vessel (RCCV) and the containment internal structures including the reactor pressure vessel (RPV) are modeled as separate interconnected sticks. For the CB, the structural elements of the CB are modeled as one set of stick models considering vertical and horizontal eccentricity.

The exterior walls below grade and the foundation basemat are modeled using plate elements in the same manner as for the DCD SSI analysis model. However, because the soil medium between the top of bedrock and the foundation basemat are modeled in the Fermi 3 site-specific SSI analysis, the vertical spacing of the wall nodes is adjusted for a closer match with the site-specific subsurface layers. For this adjustment, the plate element height was determined so as to satisfy SASSI2000 requirement that the soil layer thicknesses be limited to 20 percent of the shear wave length of the material the wave is passing through at highest frequency, f_n, of analysis. In the SASSI2000 analyses, the soil above the bedrock was not included to eliminate the backfill requirements. For this SSI analysis, 50Hz is the highest frequency of interest. This modeling procedure is common for both the RB/FB and CB.

The referenced building stick seismic models are shown in DCD Figures 3A.7-4 and 3A.7-6 for the RB/FB and the CB, respectively. The overall site-specific SASSI2000 models are shown in Figures 4.3-2 through 4.3-4 for the RB/FB, and Figures 4.3-5 through 4.3-7 for the CB. Analysis model X-direction and Y-direction represent plant NS direction and EW direction of Fermi 3 site. Z-direction represents a vertical direction.

As shown in Figures 4.3-2 through 4.3-7, the excavated volume is modeled from the top of the in-situ bedrock (EL -6870 mm) to the bottom of the mat foundation. For the RB/FB, the bottom of the mat foundation is EL -15500 mm and for the CB, the bottom of the mat foundation is EL -10400 mm.

As indicated in Figures 4.3-4 and 4.3-7, the RB/FB stick model is connected to the basemat and side walls at floor EL -11500 mm, -6400 mm, -1000 mm and 4500 mm by a set of rigid links. The CB stick model is connected to the basemat and side walls at floor EL -7400 mm, -2000 mm and 4500 mm by a set of rigid links. At the base of the each model at EL -11500 mm and EL -7400 mm, respectively for the RB/FB and CB, a rigid link is used to connect all the stick models to the center of the each basemat.

5. ANALYSIS RESULTS

In this section, typical SSI results are presented to show the effect of different soil properties on seismic responses at selected locations in terms of acceleration response spectra, seismic forces, transfer functions and lateral soil pressures.

It is found from the comparison with the DCD response spectra (Figures 5.1-1 through 5.1-6) that the response spectra are enveloped by the DCD spectra at all the site conditions.

The Fermi 3 SSI results for the BE, LB, and UB subsurface conditions in terms of seismic forces are compared in Tables 5.1-1 and 5.1-2, respectively for X-direction and Y-direction.

The enveloping seismic forces and moments are compared with the DCD values in Section 6.

5.1 Acceleration Response Spectra

For comparison, the acceleration response spectra at 5% damping are shown for the following locations:

Location	Node Number
RB/FB Refueling Floor	109
RCCV Top Slab	208
Vent Wall Top	701
RSW Top	707
RPV Top	801
RB/FB Basemat	2
CB Top	6
CB Basemat	2

For the BE, LB, and UB subsurface conditions, the calculated co-directional floor response spectra (FRS) in the X-, Y-, and Z-directions are combined using the SRSS method to obtain FRS at the building edges. The FRS were calculated considering the coupling effects between vertical and rocking, and between lateral and torsion motions. The moment arm lengths for the calculation of coupling effect for each building are provided in Appendix A.

It is found from the comparison with the DCD response spectra (Figures 5.1-1 through 5.1-6) that the response spectra are enveloped by the DCD spectra at all the site conditions.

5.2 Seismic Forces

The seismic forces are presented at the following locations:

Location	Connecting Nodes	Element
RPV Support	815 - 711	871
RSW Base	710 - 711	710
Vent Wall Base	704 - 705	704
Pedestal Base	301 - 2	1301
RCCV Base	201 - 2	1201
RB/FB Base	101 - 2	1101
CB Base	3-2	3

The Fermi 3 SSI results for the BE, LB, and UB subsurface conditions in terms of seismic forces are compared in Tables 5.1-1 and 5.1-2, respectively for X-direction and Y-direction.

The enveloping seismic forces and moments are compared with the DCD values in Section 6.

5.3 Transfer Function

The transfer functions obtained by the SASSI2000 direct method are plotted on Figures 5.3-1 through 5.3-3 and Figure 5.3-4 thorough 5.3-6, respectively for the RB/FB and CB locations listed in the table in Section 5.1.

Figures 5.3-1 through 5.3-3 show that there are some spikes in the transfer functions for the RB/FB as follows;

Figures 5.3-1d plot (b): RSW top at BE subsurface profile, Y-direction input, near 9Hz
Figures 5.3-1e plot (b): RPV top at BE subsurface profile, Y-direction input, near 9Hz
Figures 5.3-3d plot (b): RSW top at UB subsurface profile, Y-direction input, near 9Hz

It can be found from the Figures that they are from the interpolate process of SASSI2000 computer program. They are very narrow and not real transfer functions. Their effect does not appear in the FRS in Section 5.1, which is calculated at intervals of about 0.5Hz around 9Hz.

5.4 Lateral Soil Pressures

The lateral soil pressures obtained by the SASSI2000 direct method are plotted on Figures 5.4-1 and 5.4-2, respectively for the RB/FB and CB. These pressures are compared with the lateral soil pressures computed from the equivalent static pressure analysis listed in ASCE 4-98. The soil pressure loads for the exterior walls are calculated by averaging soil pressure which each wall is subjected to. The averaged soil pressure is calculated by averaging the soil pressure along each wall height which is a floor height excluding the thickness of slabs. The calculated lateral soil pressures are summarized in Tables 5.4-1 and 5.4-2, respectively for the RB/FB and CB, comparing between the SASSI2000 soil pressures and the DCD design soil pressures.

For the RB/FB, it is found from Table 5.4-1 that the SASSI2000 soil pressures exceed the DCD design soil pressures at each wall. However, the SASSI2000 pressures are less than the DCD wall capacity passive pressures along the embedded exterior walls, which are considered for the stability evaluation. The DCD wall capacity passive pressure is a part of the passive soil pressure accounted as lateral resistance pressure to maintain the sliding factor of safety to be 1.1 minimum. As described in Section 3G.1.5.5 of the ESBWR DCD, the stress check has been performed to confirm that the stresses of the exterior walls against the wall capacity passive pressure are within the allowable stress.

For the CB, it is found from Table 5.4-2 that the SASSI2000 soil pressures are less than the DCD design soil pressures at each wall.

6. SITE ENVELOPE SEISMIC RESPONSES

The site-envelope seismic loads are established from the envelopes of all analysis results from SSI cases shown in Tables 4.2-1 and 4.2-2.

6.1 Enveloping Maximum Structural Loads

The results of Fermi 3 SSI seismic forces for all members and locations are shown in Appendix A. The results for the BE, UB, and LB subsurface profiles are used to obtain the enveloping results.

The Fermi 3 site-enveloping maximum shear and moment distributions along the RB/FB walls, RCCV, vent wall/pedestal, RSW, and RPV/internals are shown in Tables 6.1-1a through 6.1-1e for all cases. Table 6.1-2 shows the enveloping maximum response for the CB. These results are compared with the design envelopes specified in DCD Section 3A.9. They are enveloped by the DCD design loads for all the site conditions. Although their design margins vary depending on the locations, at least 40 % margin is available when the referenced DCD design is used at the Fermi 3 site.

6.2 Enveloping Maximum Absolute Acceleration

The results of Fermi 3 SSI maximum absolute accelerations are shown in Appendix A. The vertical loads are expressed in terms of enveloping absolute acceleration. The enveloping maximum acceleration values are shown in Tables 6.2-1a through 6.2-1e for RB/FB walls, RCCV, vent wall/pedestal, RSW, and RB/FB flexible slabs. Table 6.2-2 shows enveloping maximum absolute acceleration responses for the CB. According to the comparison with the design envelopes specified in DCD Section 3A.9, it is confirmed that they are enveloped by the DCD design values for all the site conditions. Although their design margins vary depending on the locations, at least 40 % margin is available when the referenced DCD design is used at the Fermi 3 site.

7. FOUNDATION STABILITY EVALUATION

7.1 Foundation Stability

The stabilities of the RB/FB and CB are evaluated against overturning, sliding and floatation. The stability calculations are executed according to the procedure shown in DCD Subsection 3.8.5.5. The factor of safety against overturning due to earthquake loading is determined by the energy approach described in DCD Subsection 3.7.2.14. The factor of safety against sliding is determined considering the condition that excavation below the top of bedrock is backfilled with fill concrete. Detail of foundation stability evaluation is shown in Appendix B.

The obtained factors of safety against overturning, sliding and floatation are summarized in Tables 7-1 and 7-2 for the RB/FB and the CB respectively. The calculated Factor of Safety

(FS) for the RB/FB are 1923, 3.90 and 3.48 against overturning, sliding and floatation, respectively. The calculated Factor of Safety (FS) for the CB are 1715, 2.59 and 1.85 against overturning, sliding and floatation, respectively, Thus, all of the FS are no less than 1.1, which is the acceptance criteria given in SRP 3.8.5, it is concluded that the RB/FB and CB have enough foundation stability.

7.2 Soil Bearing Pressures

The maximum soil dynamic bearing pressure demand at the Fermi 3 site for the BE, LB and UB subsurface profiles using the Fermi 3 FIRS are evaluated using the Modified Energy Balance Method (Reference 2-j). Details are provided in Appendix B.

The obtained maximum soil dynamic bearing pressure demand at the Fermi 3 site are summarized in Tables 7-3 and 7-4 for the RB/FB and the CB, respectively. As described in Section 6, the site-specific seismic load is lower than the DCD standard plant seismic load. However, the maximum soil bearing pressures for the LB and UB subsurface profile cases for the RB/FB and for the all subsurface profile cases for the CB are larger than the DCD maximum dynamic bearing demands shown in DCD Table 2.0-1. The reason is considered as follows. The DCD SSI analysis model considers the full embedment up to the finished ground level grade, while the site-specific SSI analysis model for the Fermi 3 site considers the partial embedment condition without taking credit for the granular backfill above the top of the bedrock. Therefore, the structure overturning moments become larger than the DCD SSI analysis results. Then, the soil bearing pressure calculated for the Fermi 3 site provides the larger values. However, it is confirmed that site-specific maximum soil dynamic bearing pressure demands for the RB/FB and CB are still less than the allowable dynamic bearing capacity in Section 2.5.4.10 in the Fermi 3 FSAR.

8. CONCLUSION

The results from the SSI analyses using the BE, LB and UB subsurface profiles show that the seismic forces in all members, floor response spectra, and acceleration at all nodes are bounded by the referenced DCD values for both the RB/FB and CB. In addition, it is demonstrated that the actual factors of safety for overturning, sliding and floatation are greater than the required factors of safety.

The site-specific soil dynamic bearing pressures based on the SSI analyses are greater than the referenced DCD dynamic bearing capacity demands for the LB and UB subsurface conditions for the RB/FB and for the all subsurface conditions for the CB. However, the site-specific dynamic bearing pressure demands for the RB/FB and CB are less than the allowable dynamic bearing capacity in Section 2.5.4.10 in the Fermi 3 FSAR.

It is concluded that the following apply to the Fermi 3 site:

- The referenced DCD standard plant design is applicable to the Fermi 3 site for the Seismic Category I structures which are partially embedded into bedrock.

- The dynamic responses based on the SSI FIRS, which is the SSE, are less than the dynamic responses in the referenced DCD using the Certified Seismic Design Response Spectra (CSDRS).
- For the sliding stability evaluation, it is demonstrated that base friction itself is adequate to resist the entire seismic load for the RB/FB and CB to maintain sliding factor of safety significantly greater than the required factor of safety of 1.1 in SRP 3.8.5.
- The dynamic bearing demands from the Fermi 3 SSI are all below the allowable dynamic bearing capacities at the Fermi 3 site.

Table 3.1-1 Site-Specific Strain Compatible Dynamic Subsurface Properties – Best Estimate (BE) Soil Profile Based on the Soil Column Truncated at the Top of In-Situ Bedrock (Elevation 552.0 ft NAVD 88)

Layer	Thickness (ft)	Unit Weight (pcf)	Shear Wave Velocity (ft/sec)	Damping Ratio (%)	Compression Wave Velocity (ft/sec)	Elevation at Top of Layer (ft)	Elevation at Top of Layer (m)
1	10	150.0	6689	0.95	13202	552.0	-6.87
2	2	150.0	6592	0.95	13202	542.0	-9.92
3	8	150.0	6592	0.95	13202	540.0*	-10.40
4	8	150.0	6745	0.95	13202	532.0	-12.97
5	2	150.0	6745	0.95	13202	524.0*	-15.50
6	10.2	150.0	6825	0.95	13202	522.0	-16.01
7	11	150.0	6790	0.95	13202	511.8	-19.12
8	11.9	150.0	6853	0.95	13202	500.8	-22.48
9	11.7	150.0	6609	0.95	13202	488.9	-26.10
10	15	150.0	4752	1.37	9835	477.2	-29.67
11	20	150.0	3309	1.91	7889	462.2	-34.24
12	19.9	150.0	3252	1.91	7889	442.2	-40.34
13	19.9	150.0	3235	1.91	7889	422.3	-46.40
14	21.3	150.0	3218	1.91	7889	402.4	-52.47
15	21.1	150.0	4072	1.91	9537	381.1	-58.96
16	21.1	150.0	4132	1.91	9537	360.0	-65.39
17	9.9	150.0	5650	0.73	10477	338.9	-71.82
18	19.7	150.0	9523	0.73	17679	329.0	-74.84
19	21	150.0	9439	0.73	17679	309.3	-80.85
20	20.5	150.0	9525	0.73	17679	288.3	-87.25
21	22.1	150.0	9491	0.73	17679	267.8	-93.49
22	45	160.0	8943	0.73	16282	245.7	-100.23
23	44.6	160.0	9049	0.73	16282	200.7	-113.95
24	Half Space	169.0	9494	0.10	17100	156.1	-127.54

* : The layers at the building basemat are adjusted to match the ESBWR DCD, per Reference 2-b.

CB : 540.0ft → 540.4ft (EL-10.4m)

RB : 524.0ft → 523.7ft (EL-15.5m)

The randomization process of profile development allows for such adjustments.

Table 3.1-2 Site-Specific Strain Compatible Dynamic Subsurface Properties – Lower Bound (LB) Soil Profile Based on the Soil Column Truncated at the Top of In-Situ Bedrock (Elevation 552.0 ft NAVD 88)

Layer	Thickness (ft)	Unit Weight (pcf)	Shear Wave Velocity (ft/sec)	Damping Ratio (%)	Compression Wave Velocity (ft/sec)	Elevation at Top of Layer (ft)	Elevation at Top of Layer (m)
1	10	150.0	5462	1.51	10779	552.0	-6.87
2	2	150.0	5383	1.51	10779	542.0	-9.92
3	8	150.0	5383	1.51	10779	540.0*	-10.40
4	8	150.0	5507	1.51	10779	532.0	-12.97
5	2	150.0	5507	1.51	10779	524.0*	-15.50
6	10.2	150.0	5573	1.51	10779	522.0	-16.01
7	11	150.0	5544	1.51	10779	511.8	-19.12
8	11.9	150.0	5596	1.51	10779	500.8	-22.48
9	11.7	150.0	5396	1.51	10779	488.9	-26.10
10	15	150.0	3880	2.18	8030	477.2	-29.67
11	20	150.0	2616	2.88	6441	462.2	-34.24
12	19.9	150.0	2529	2.88	6441	442.2	-40.34
13	19.9	150.0	2611	2.88	6441	422.3	-46.40
14	21.3	150.0	2478	2.88	6441	402.4	-52.47
15	21.1	150.0	3111	2.88	7787	381.1	-58.96
16	21.1	150.0	3189	2.88	7787	360.0	-65.39
17	9.9	150.0	4613	1.12	8554	338.9	-71.82
18	19.7	150.0	7776	1.12	14435	329.0	-74.84
19	21	150.0	7707	1.12	14435	309.3	-80.85
20	20.5	150.0	7777	1.12	14435	288.3	-87.25
21	22.1	150.0	7750	1.12	14435	267.8	-93.49
22	45	160.0	7302	1.12	13294	245.7	-100.23
23	44.6	160.0	7388	1.12	13294	200.7	-113.95
24	Half Space	169.0	7752	0.10	13962	156.1	-127.54

* : The layers at the building basemat are adjusted to match the ESBWR DCD, per Reference 2-b.

CB : 540.0ft → 540.4ft (EL-10.4m)

RB : 524.0ft → 523.7ft (EL-15.5m)

The randomization process of profile development allows for such adjustments.

Table 3.1-3 Site-Specific Strain Compatible Dynamic Subsurface Properties – Upper Bound (UB) Soil Profile Based on the Soil Column Truncated at the Top of In-Situ Bedrock (Elevation 552.0 ft NAVD 88)

Layer	Thickness (ft)	Unit Weight (pcf)	Shear Wave Velocity (ft/sec)	Damping Ratio (%)	Compression Wave Velocity (ft/sec)	Elevation at Top of Layer (ft)	Elevation at Top of Layer (m)
1	10	150.0	8192	0.48	16169	552.0	-6.87
2	2	150.0	8074	0.48	16169	542.0	-9.92
3	8	150.0	8074	0.48	16169	540.0*	-10.40
4	8	150.0	8261	0.48	16169	532.0	-12.97
5	2	150.0	8261	0.48	16169	524.0*	-15.50
6	10.2	150.0	8359	0.48	16169	522.0	-16.01
7	11	150.0	8316	0.48	16169	511.8	-19.12
8	11.9	150.0	8393	0.48	16169	500.8	-22.48
9	11.7	150.0	8094	0.48	16169	488.9	-26.10
10	15	150.0	5820	0.68	12046	477.2	-29.67
11	20	150.0	4221	0.95	9662	462.2	-34.24
12	19.9	150.0	4042	0.95	9662	442.2	-40.34
13	19.9	150.0	4041	0.95	9662	422.3	-46.40
14	21.3	150.0	4033	0.95	9662	402.4	-52.47
15	21.1	150.0	4987	0.95	11681	381.1	-58.96
16	21.1	150.0	5061	0.95	11681	360.0	-65.39
17	9.9	150.0	6920	0.36	12831	338.9	-71.82
18	19.7	150.0	11664	0.36	21653	329.0	-74.84
19	21	150.0	11560	0.36	21653	309.3	-80.85
20	20.5	150.0	11666	0.36	21653	288.3	-87.25
21	22.1	150.0	11625	0.36	21653	267.8	-93.49
22	45	160.0	10953	0.36	19941	245.7	-100.23
23	44.6	160.0	11082	0.36	19941	200.7	-113.95
24	Half Space	169.0	11628	0.10	20943	156.1	-127.54

* : The layers at the building basemat are adjusted to match the ESBWR DCD, per Reference 2-b.

CB : 540.0ft → 540.4ft (EL-10.4m)

RB : 524.0ft → 523.7ft (EL-15.5m)

The randomization process of profile development allows for such adjustments.

Table 4.2-1
RB/FB SSI Analysis Cases

Building	Case ID No.	Model * (DCD)	Input Motion	Site Condition		
				BE	LB	UB
RB/FB	RFI-1	Base	FIRS	✓	--	--
	RFI-2			--	✓	--
	RFI-3			--	--	✓

Note *: As shown in DCD Table 3A.6-1, there are some models with minor modifications to evaluate the modeling effects. For this Fermi 3 SSI analysis, the most basic model, "Base" is applied.

Table 4.2-2
CB SSI Analysis Cases

Building	Case ID No.	Model * (DCD)	Input Motion	Site Condition		
				BE	LB	UB
CB	CFI-1	Base	FIRS	✓	--	--
	CFI-2			--	✓	--
	CFI-3			--	--	✓

Note *: As shown in DCD Table 3A.6-1, there are some models with minor modifications to evaluate the modeling effects. For this Fermi 3 SSI analysis, the most basic model, "Base" is applied.

Table 5.1-1 Maximum Forces - X Direction

Location	Response Type	Subsurface Profile		
		BE	LB	UB
RPV Support	Shear	9	8	9
	Moment	55	51	56
RSW Base	Shear	5	5	5
	Moment	69	69	72
Vent Wall Base	Shear	8	8	9
	Moment	60	57	59
Pedestal Base	Shear	11	11	11
	Moment	348	305	340
RCCV Base	Shear	29	29	29
	Moment	3472	2864	3446
RB/FB Base	Shear	116	117	122
	Moment	4883	4340	5286
CB Base	Shear	34	31	38
	Moment	404	422	446

Units: Shear Forces in MN; Moment in MN-m

Note: The enveloping seismic forces and moments are compared with the DCD values in Section 6.

Table 5.1-2 Maximum Forces - Y Direction

Location	Response Type	Subsurface Profile BE	LB	UB
RPV Support	Shear	7	6	7
	Moment	43	37	39
RSW Base	Shear	4	4	4
	Moment	46	47	46
Vent Wall Base	Shear	7	7	7
	Moment	63	59	69
Pedestal Base	Shear	8	9	8
	Moment	326	312	362
RCCV Base	Shear	24	24	24
	Moment	3570	3235	3858
RB/FB Base	Shear	88	85	97
	Moment	3645	3452	3743
CB Base	Shear	31	31	33
	Moment	388	344	435

Units: Shear Forces in MN; Moment in MN-m

Note: The enveloping seismic forces and moments are compared with the DCD values in Section 6.

Table 5.4-1 Comparison of Lateral Soil Pressure – RB/FB

Floor Level	R1 and F3 Averaged Soil Pressure (MPa)			RA and RG Averaged Soil Pressure (MPa)			Envelope (MPa)		DCD Design Soil Pressure (MPa)		DCD Wall Capacity Passive Pressure (MPa)	
(m)	RFI-1 (BE)	RFI-2 (LB)	RFI-3 (UB)	RFI-1 (BE)	RFI-2 (LB)	RFI-3 (UB)	R1 and F3 Wall	RA and RG Wall	R1 and F3 Wall	RA and RG Wall	R1 and F3 Wall	RA and RG Wall
4.65												
Slab												
3.65 -1.00	---	---	---	---	---	---	---	---	0.30	0.33	0.19	0.12
Slab												
-2.00 -6.40	---	---	---	---	---	---	---	---	0.29	0.29	0.51	0.33
Slab												
-7.40 -11.50	0.42	0.41	0.39	0.41	0.37	0.39	0.42	0.41	0.25	0.23	0.82	0.53

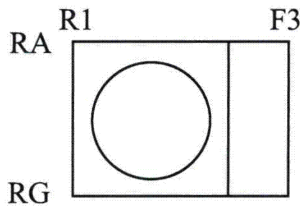


Table 5.4-2 Comparison of Lateral Soil Pressure – CB

Floor Level	C1 and C5 Averaged Soil Pressure* (MPa)			CA and CD Averaged Soil Pressure* (MPa)			Envelope* (MPa)		DCD Design Soil Pressure (MPa)	
(m)	CFI-1 (BE)	CFI-2 (LB)	CFI-3 (UB)	CFI-1 (BE)	CFI-2 (LB)	CFI-3 (UB)	C1 and C5 Wall	CA and CD Wall	C1 and C5 Wall	CA and CD Wall
4.65										
Slab										
3.95 -2.00	---	---	---	---	---	---	---	---	0.22	0.22
Slab										
-2.50 -7.40	0.12	0.12	0.11	0.10	0.10	0.10	0.12	0.10	0.18	0.18

Note *: The CB SSI model, CFI, is embedded only 0.53 m above the top of basemat into the bedrock. To evaluate the wall stress level due to the locally concentrated load, the average soil pressure was calculated along a half of wall height which is a floor height excluding the thickness of slabs for comparison with the DCD design soil pressures, which are calculated by averaging the soil pressure along each wall height.

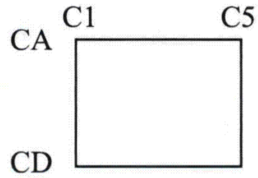


Table 6.1-1a Ratio with DCD Enveloping Seismic Loads: RB/FB Stick

(a) Enveloping Seismic Loads

Elev. (m)	Elem No.	Node No.	Shear X-Dir. (MN)	Shear Y-Dir. (MN)	Moment X-Dir. (MN-m)	Moment Y-Dir. (MN-m)	Torsion (MN-m)
52.40*	1110	110			701.5	703.7	
		109	63.1	59.8	1612.6	1653.9	441.2
34.00	1109	109			2108.3	2171.5	
		108	73.4	59.7	2571.8	2557.2	665.0
27.00	1108	108			2869.6	2958.5	
		107	177.4	137.8	3530.0	3493.0	1287.9
22.50	1107	107			3853.5	3745.0	
		106	198.2	156.6	4719.7	4380.4	2433.8
17.50	1106	106			5109.0	4580.2	
		105	206.6	186.0	5853.9	5137.2	2061.2
13.57	1105	105			6078.0	5279.5	
		104	216.2	196.7	6977.0	5950.8	2176.5
9.06	1104	104			7129.7	6069.0	
		103	233.0	205.5	8039.8	6751.4	2368.5
4.65	1103	103			5255.2	3920.8	
		102	259.2	188.8	6511.3	4584.7	2882.3
-1.00	1102	102			6764.6	4940.4	
		101	279.1	208.8	8107.4	5654.3	3209.1
-6.40	1101	101			4766.1	3592.4	
-11.50		2	122.2	96.7	5286.3	3743.2	1861.8

(b) Ratio with DCD ((a)/DCD Loads)

Elev. (m)	Elem No.	Node No.	Shear X-Dir.	Shear Y-Dir.	Moment X-Dir.	Moment Y-Dir.	Torsion
52.40*	1110	110			43%	39%	
		109	42%	38%	37%	37%	32%
34.00	1109	109			38%	39%	
		108	38%	39%	40%	40%	28%
27.00	1108	108			37%	42%	
		107	42%	34%	39%	41%	39%
22.50	1107	107			39%	41%	
		106	41%	34%	41%	39%	40%
17.50	1106	106			41%	38%	
		105	39%	33%	42%	37%	41%
13.57	1105	105			43%	37%	
		104	38%	33%	42%	36%	41%
9.06	1104	104			42%	35%	
		103	38%	31%	41%	34%	40%
4.65	1103	103			28%	19%	
		102	31%	22%	28%	19%	25%
-1.00	1102	102			29%	20%	
		101	32%	22%	29%	19%	28%
-6.40	1101	101			17%	12%	
-11.50		2	13%	9%	16%	11%	16%

Note: Total torsional moments are obtained by the absolute sum of the accidental torsional moments and the values of the geometric torsional moments shown. The accidental torsional moment is the product of the horizontal force component and an eccentricity of 5% of the larger horizontal dimension at various elevations.

* : The difference between the modeled elevation 52.4 m and the actual elevation 52.7 m at the RB roof is negligibly small.

Table 6.1-1b Ratio with DCD Enveloping Seismic Loads: RCCV Stick

(a) Enveloping Seismic Loads

Elev. (m)	Elem No.	Node No.	Shear X-Dir. (MN)	Shear Y-Dir. (MN)	Moment X-Dir. (MN-m)	Moment Y-Dir. (MN-m)	Torsion (MN-m)
34.00	1209	209			67.0	163.5	
		208	61.6	67.5	433.4	591.0	10.0
27.00	1208	208			573.8	899.5	
		206	70.5	80.5	1114.7	1591.8	752.3
17.50	1206	206			1206.3	1743.0	
		205	93.8	81.8	1507.7	2024.7	815.3
13.57	1205	205			1546.5	2110.4	
		204	102.9	88.4	1956.1	2446.1	910.8
9.06	1204	204			1999.4	2550.5	
		203	110.0	97.0	2438.3	2879.2	1040.5
4.65	1203	203			2554.6	3005.1	
		202	57.4	54.7	2829.0	3189.3	773.9
-1.00	1202	202			2948.6	3345.5	
		201	78.0	69.8	3311.9	3717.9	813.7
-6.40	1201	201			3387.7	3766.1	
-11.50		2	29.3	23.8	3472.4	3857.5	312.5

(b) Ratio with DCD ((a)/DCD Loads)

Elev. (m)	Elem No.	Node No.	Shear X-Dir.	Shear Y-Dir.	Moment X-Dir.	Moment Y-Dir.	Torsion
34.00	1209	209			34%	28%	
		208	45%	37%	41%	40%	28%
27.00	1208	208			34%	36%	
		206	43%	32%	38%	36%	41%
17.50	1206	206			36%	37%	
		205	41%	28%	36%	35%	41%
13.57	1205	205			36%	35%	
		204	39%	27%	36%	34%	42%
9.06	1204	204			36%	34%	
		203	36%	27%	36%	32%	40%
4.65	1203	203			37%	33%	
		202	25%	19%	36%	30%	27%
-1.00	1202	202			37%	31%	
		201	29%	21%	35%	30%	28%
-6.40	1201	201			36%	30%	
-11.50		2	11%	8%	32%	27%	16%

Note: Total torsional moments are obtained by the absolute sum of the accidental torsional moments and the values of the geometric torsional moments shown. The accidental torsional moment is the product of the horizontal force component and an eccentricity of 5% of the larger horizontal dimension at various elevations.

Table 6.1-1c Ratio with DCD Enveloping Seismic Loads: Vent Wall/Pedestal Stick

(a) Enveloping Seismic Loads

Elev. (m)	Elem No.	Node No.	Shear X-Dir. (MN)	Shear Y-Dir. (MN)	Moment X-Dir. (MN-m)	Moment Y-Dir. (MN-m)	Torsion (MN-m)
17.50	701	701			22.9	18.1	
		702	6.5	6.7	26.0	21.4	12.4
14.50	702	702			28.0	27.8	
		703	7.4	6.4	34.5	40.6	13.1
11.50	703	703			38.5	43.2	
		704	8.1	7.1	52.0	60.0	14.0
8.50	704	704			53.7	61.7	
		705	8.9	7.3	60.1	68.6	14.3
7.4625	705	705			65.4	58.0	
		706,303	5.6	4.8	75.2	68.9	7.2
4.65	1303	303			163.8	148.7	
		377	12.0	10.8	176.9	167.9	38.2
2.4165	1377	377			218.2	206.2	
		302	17.6	15.9	246.3	262.5	46.4
-1.00	1302	302			228.3	237.0	
		376	23.1	20.1	257.9	266.8	40.6
-2.75	1376	376			258.0	266.8	
		301	23.3	20.2	326.4	334.3	40.6
-6.40	1301	301			307.9	332.5	
-11.50		2	11.1	8.5	348.3	362.4	18.8

(b) Ratio with DCD ((a)/DCD Loads)

Elev. (m)	Elem No.	Node No.	Shear X-Dir.	Shear Y-Dir.	Moment X-Dir.	Moment Y-Dir.	Torsion
17.50	701	701			30%	21%	
		702	19%	18%	23%	16%	11%
14.50	702	702			24%	19%	
		703	20%	16%	15%	16%	11%
11.50	703	703			17%	16%	
		704	22%	17%	15%	15%	12%
8.50	704	704			16%	16%	
		705	24%	16%	16%	16%	12%
7.4625	705	705			18%	13%	
		706,303	14%	12%	16%	13%	7%
4.65	1303	303			28%	24%	
		377	37%	24%	30%	25%	27%
2.4165	1377	377			30%	25%	
		302	36%	24%	32%	28%	27%
-1.00	1302	302			27%	25%	
		376	35%	25%	28%	25%	28%
-2.75	1376	376			28%	25%	
		301	35%	25%	29%	25%	28%
-6.40	1301	301			27%	25%	
-11.50		2	11%	7%	21%	18%	16%

Note: Total torsional moments are obtained by the absolute sum of the accidental torsional moments and the values of the geometric torsional moments shown. The accidental torsional moment is the product of the horizontal force component and an eccentricity of 5% of the larger horizontal dimension at various elevations.

Table 6.1-1d Ratio with DCD Enveloping Seismic Loads: RSW Stick

(a) Enveloping Seismic Loads

Elev. (m)	Elem No.	Node No.	Shear X-Dir. (MN)	Shear Y-Dir. (MN)	Moment X-Dir. (MN-m)	Moment Y-Dir. (MN-m)	Torsion (MN-m)
24.18	707	707			0.61	0.68	
			0.84	0.67	3.94	3.34	0.15
20.20	708	708			5.91	5.65	
			4.86	3.17	26.45	17.01	0.51
15.775	709	709			27.63	17.74	
			5.30	3.50	51.21	32.71	0.72
11.35	710	710			51.56	32.83	
			5.49	4.14	72.11	47.27	0.74
7.4625	711	711			61.40	53.29	
			14.43	12.48	86.62	83.18	7.59
4.65	712	712			34.94	30.29	
			5.26	4.63	40.46	38.19	8.17
2.4165	713	713			1.18	1.02	
			0.44	0.37	0.97	0.86	0.06
1.96	714	714			0.90	0.75	
-0.80		715	0.29	0.23	0.18	0.14	0.03

(b) Ratio with DCD ((a)/DCD Loads)

Elev. (m)	Elem No.	Node No.	Shear X-Dir.	Shear Y-Dir.	Moment X-Dir.	Moment Y-Dir.	Torsion
24.18	707	707			29%	40%	
			28%	25%	30%	27%	37%
20.20	708	708			32%	34%	
			33%	26%	33%	25%	37%
15.775	709	709			34%	25%	
			31%	24%	32%	24%	38%
11.35	710	710			32%	24%	
			28%	25%	31%	24%	31%
7.4625	711	711			31%	29%	
			35%	35%	30%	33%	32%
4.65	712	712			28%	23%	
			37%	24%	30%	25%	27%
2.4165	713	713			33%	32%	
			29%	29%	33%	32%	24%
1.96	714	714			33%	32%	
-0.80		715	33%	31%	34%	27%	25%

Note: Total torsional moments are obtained by the absolute sum of the accidental torsional moments and the values of the geometric torsional moments shown. The accidental torsional moment is the product of the horizontal force component and an eccentricity of 5% of the larger horizontal dimension at various elevations.

Table 6.1-1e Ratio with DCD Enveloping Seismic Loads: RPV Stick

(a) Enveloping Seismic Loads

Elevation (m)	Elem No.	Node No.	Shear X-dir. (MN)	Shear Y-dir. (MN)	Moment X-dir. (MN·m)	Moment Y-dir. (MN·m)
27.64	801	801			0.0	0.0
26.792		802	0.2	0.1	0.2	0.1
26.792	802	802			0.2	0.1
25.944		803	0.6	0.4	0.7	0.4
25.944	803	803			0.7	0.4
25.03		804	1.2	0.7	1.8	1.1
25.03	804	804			1.8	1.1
24.3188		805	1.5	1.0	2.9	1.8
24.3188	805	805			2.9	1.8
22.276		806	2.2	1.4	7.4	4.6
22.276	806	806			7.4	4.6
21.8247		807	3.0	1.8	8.7	5.5
21.8247	807	807			8.7	5.5
20.2		808	3.3	2.0	14.1	8.7
20.2	808	808			14.1	8.7
19.5278		809	1.1	0.7	14.8	9.1
19.5278	809	809			14.8	9.1
17.2677		810	1.8	1.0	18.8	11.0
17.2677	810	810			18.8	11.0
16.365		811	2.2	1.5	20.7	12.1

(b) Ratio with DCD ((a)/DCD Loads)

Elevation (m)	Elem No.	Node No.	Shear X-dir.	Shear Y-dir.	Moment X-dir.	Moment Y-dir.
27.64	801	801				
26.792		802	37%	25%	37%	25%
26.792	802	802			37%	25%
25.944		803	37%	25%	37%	25%
25.944	803	803			37%	25%
25.03		804	37%	24%	37%	25%
25.03	804	804			37%	25%
24.3188		805	35%	23%	36%	24%
24.3188	805	805			36%	24%
22.276		806	36%	23%	36%	24%
22.276	806	806			36%	24%
21.8247		807	37%	23%	36%	24%
21.8247	807	807			36%	24%
20.2		808	37%	23%	36%	23%
20.2	808	808			36%	23%
19.5278		809	30%	23%	36%	24%
19.5278	809	809			36%	24%
17.2677		810	35%	25%	37%	24%
17.2677	810	810			37%	24%
16.365		811	36%	29%	37%	24%

Table 6.1-1e Ratio with DCD Enveloping Seismic Loads: RPV Stick (Continued)

(a) Enveloping Seismic Loads

Elevation (m)	Elem No.	Node No.	Shear X-dir. (MN)	Shear Y-dir. (MN)	Moment X-dir. (MN·m)	Moment Y-dir. (MN·m)
16.365	811	811			20.7	12.1
14.51		812	3.9	2.2	27.2	16.0
14.51	812	812			27.2	16.0
12.491		813	3.6	2.2	34.1	20.3
12.491	813	813			34.1	20.3
10.472		814	3.5	2.3	40.4	24.2
10.472	814	814			40.4	24.2
8.453		815	4.2	2.8	45.0	28.2
8.453	815	815			31.8	23.0
7.8071		816	5.6	4.0	28.1	20.6
7.8071	816	816			28.1	20.6
7.111		817	5.6	3.7	24.1	18.1
7.111	817	817			24.1	18.1
6.401		818	5.5	3.3	20.4	15.7
6.401	818	818			20.4	15.7
5.691		819	5.3	3.0	17.4	13.4
5.691	819	819			17.4	13.4
4.981		820	5.3	2.8	15.4	11.5
4.981	820	820			15.4	11.5
4.2713		821	4.9	2.7	13.4	9.8

(b) Ratio with DCD ((a)/DCD Loads)

Elevation (m)	Elem No.	Node No.	Shear X-dir.	Shear Y-dir.	Moment X-dir.	Moment Y-dir.
16.365	811	811			37%	24%
14.51		812	43%	28%	40%	25%
14.51	812	812			40%	25%
12.491		813	37%	27%	40%	26%
12.491	813	813			40%	26%
10.472		814	34%	30%	39%	27%
10.472	814	814			39%	27%
8.453		815	41%	31%	36%	26%
8.453	815	815			44%	38%
7.8071		816	44%	35%	44%	38%
7.8071	816	816			44%	38%
7.111		817	44%	33%	44%	38%
7.111	817	817			44%	38%
6.401		818	45%	30%	43%	39%
6.401	818	818			43%	39%
5.691		819	45%	28%	42%	40%
5.691	819	819			42%	40%
4.981		820	47%	27%	42%	42%
4.981	820	820			42%	42%
4.2713		821	46%	27%	41%	44%

Table 6.1-1e Ratio with DCD Enveloping Seismic Loads: RPV Stick (Continued)

(a) Enveloping Seismic Loads

Elevation (m)	Elem No.	Node No.	Shear		Moment	
			X-dir. (MN)	Y-dir. (MN)	X-dir. (MN·m)	Y-dir. (MN·m)
4.2713	821	821			13.4	9.8
3.7593		822	4.7	2.6	12.4	8.6
3.7593	822	822			12.4	8.6
3.215		823	4.6	2.5	11.6	7.7
3.215	823	823			11.6	7.7
2.365		824	4.5	2.4	11.3	6.6
2.365	824	824			3.4	2.8
1.785		825	2.4	1.8	2.1	1.7
1.785	825	825			2.1	1.7
1.2		826	2.1	1.7	0.8	0.7
1.2	826	826			0.8	0.7
0.7657		827	1.9	1.5	0.2	0.2
0.7657	827	827			0.2	0.2
-0.1315		828	1.4	1.1	1.4	1.0

(b) Ratio with DCD ((a)/DCD Loads)

Elevation (m)	Elem No.	Node No.	Shear		Moment	
			X-dir.	Y-dir.	X-dir.	Y-dir.
4.2713	821	821			41%	44%
3.7593		822	47%	27%	41%	41%
3.7593	822	822			41%	41%
3.215		823	48%	27%	42%	38%
3.215	823	823			42%	38%
2.365		824	49%	26%	46%	31%
2.365	824	824			40%	43%
1.785		825	41%	41%	40%	43%
1.785	825	825			40%	43%
1.2		826	42%	43%	39%	38%
1.2	826	826			39%	38%
0.7657		827	43%	44%	38%	35%
0.7657	827	827			35%	36%
-0.1315		828	44%	46%	45%	49%

Table 6.1-1e Ratio with DCD Enveloping Seismic Loads: RPV Stick (Continued)

(a) Enveloping Seismic Loads

Elevation (m)	Elem No.	Node No.	Shear		Moment	
			X-dir. (MN)	Y-dir. (MN)	X-dir. (MN·m)	Y-dir. (MN·m)
21.8247	828	829			0.0	0.0
20.2		830	0.1	0.1	0.2	0.1
20.2	829	830			0.2	0.1
19.5278		831	0.3	0.2	0.7	0.4
19.5278	830	831			0.7	0.4
17.2677		832	0.4	0.2	1.3	0.6
17.2677	831	832			1.3	0.6
16.365		833	0.5	0.2	1.7	0.8
16.365	832	833			1.7	0.8
14.51		834	2.2	1.2	4.1	2.3
14.51	833	834			4.1	2.3
12.491		835	1.6	0.7	6.9	3.5
12.491	834	835			6.9	3.5
10.472		836	0.6	0.5	8.1	3.9
10.472	835	836			8.1	3.9
8.453		837	1.3	0.9	6.1	2.5
8.453	836	837			6.1	2.5
7.8071		838	1.7	1.0	5.2	2.5
7.8071	837	838			5.2	2.5
7.111		839	1.9	1.2	4.3	2.2

(b) Ratio with DCD ((a)/DCD Loads)

Elevation (m)	Elem No.	Node No.	Shear		Moment	
			X-dir.	Y-dir.	X-dir.	Y-dir.
21.8247	828	829				
20.2		830	29%	17%	29%	17%
20.2	829	830			29%	17%
19.5278		831	33%	20%	56%	26%
19.5278	830	831			56%	26%
17.2677		832	34%	15%	32%	15%
17.2677	831	832			32%	15%
16.365		833	35%	14%	32%	15%
16.365	832	833			32%	15%
14.51		834	44%	24%	44%	23%
14.51	833	834			44%	23%
12.491		835	52%	22%	47%	24%
12.491	834	835			47%	24%
10.472		836	38%	23%	50%	23%
10.472	835	836			50%	23%
8.453		837	50%	42%	42%	17%
8.453	836	837			42%	17%
7.8071		838	46%	32%	39%	17%
7.8071	837	838			39%	17%
7.111		839	48%	30%	38%	17%

Table 6.1-1e Ratio with DCD Enveloping Seismic Loads: RPV Stick (Continued)

(a) Enveloping Seismic Loads

Elevation (m)	Elem No.	Node No.	Shear X-dir. (MN)	Shear Y-dir. (MN)	Moment X-dir. (MN·m)	Moment Y-dir. (MN·m)
7.111	838	839			4.3	2.2
6.401		840	2.2	1.2	3.6	2.4
6.401	839	840			3.6	2.4
5.691		841	2.5	1.2	2.9	2.6
5.691	840	841			2.9	2.6
4.981		842	2.8	1.2	3.8	2.8
4.981	841	842			3.8	2.8
4.2713		843	3.5	1.3	4.9	3.1
4.2713	842	843			4.9	3.1
3.7593		844	3.5	1.4	6.2	3.6
3.7593	843	844			6.2	3.6
3.215		845	3.1	1.7	7.3	3.8
3.215	844	845			7.3	3.8
2.365		846	3.2	1.7	10.2	4.6

(b) Ratio with DCD ((a)/DCD Loads)

Elevation (m)	Elem No.	Node No.	Shear X-dir.	Shear Y-dir.	Moment X-dir.	Moment Y-dir.
7.111	838	839			38%	17%
6.401		840	49%	26%	34%	22%
6.401	839	840			34%	22%
5.691		841	49%	24%	28%	25%
5.691	840	841			28%	25%
4.981		842	50%	22%	41%	26%
4.981	841	842			41%	26%
4.2713		843	55%	23%	44%	29%
4.2713	842	843			44%	29%
3.7593		844	54%	23%	45%	29%
3.7593	843	844			45%	29%
3.215		845	44%	26%	45%	27%
3.215	844	845			45%	27%
2.365		846	44%	24%	48%	27%

Table 6.1-1e Ratio with DCD Enveloping Seismic Loads: RPV Stick (Continued)

(a) Enveloping Seismic Loads

Elevation (m)	Elem No.	Node No.	Shear		Moment	
			X-dir. (MN)	Y-dir. (MN)	X-dir. (MN·m)	Y-dir. (MN·m)
0.7657	859	827			0.1	0.0
-0.788		861	0.1	0.1	0.1	0.1
-0.788	861	861			0.1	0.1
-1.443		863	0.0	0.0	0.1	0.1
-1.443	863	863			0.1	0.1
-2.098		865	0.0	0.0	0.1	0.1
-2.098	865	865			0.1	0.1
-2.753		867	0.1	0.1	0.1	0.1
-2.753	867	867			0.1	0.1
-3.4715		869	0.1	0.1	0.0	0.0
-3.4715	869	869			0.0	0.0
-4.2237		871	0.1	0.0	0.0	0.0
8.453	871	815			56.0	43.5
7.4625		711	8.7	7.2	56.4	43.4

(b) Ratio with DCD ((a)/DCD Loads)

Elevation (m)	Elem No.	Node No.	Shear		Moment	
			X-dir.	Y-dir.	X-dir.	Y-dir.
0.7657	859	827			30%	18%
-0.788		861	43%	32%	41%	36%
-0.788	861	861			41%	36%
-1.443		863	37%	25%	45%	39%
-1.443	863	863			45%	39%
-2.098		865	37%	26%	52%	33%
-2.098	865	865			52%	33%
-2.753		867	36%	27%	51%	30%
-2.753	867	867			51%	30%
-3.4715		869	50%	31%	51%	29%
-3.4715	869	869			51%	29%
-4.2237		871	51%	29%	0%	0%
8.453	871	815			39%	32%
7.4625		711	47%	40%	40%	32%

Table 6.1-1e Ratio with DCD Enveloping Seismic Loads: RPV Stick (Continued)

(a) Enveloping Seismic Loads

Elevation (m)	Elem No.	Node No.	Shear X-dir. (MN)	Shear Y-dir. (MN)	Moment X-dir. (MN·m)	Moment Y-dir. (MN·m)
7.896	845	847			0.0	0.0
7.8071		848	0.4	0.6	0.0	0.1
7.8071	846	848			0.0	0.1
7.111		849	0.4	0.6	0.3	0.4
7.111	847	849			0.3	0.4
6.401		850	0.3	0.3	0.5	0.7
6.401	848	850			0.5	0.7
5.691		851	0.1	0.1	0.5	0.7
5.691	849	851			0.5	0.7
4.981		852	0.3	0.3	0.3	0.4
4.981	850	852			0.3	0.4
4.2713		853	0.4	0.5	0.0	0.0
4.2713	851	853			0.0	0.0
4.1784		854	0.4	0.5	0.0	0.0

(b) Ratio with DCD ((a)/DCD Loads)

Elevation (m)	Elem No.	Node No.	Shear X-dir.	Shear Y-dir.	Moment X-dir.	Moment Y-dir.
7.896	845	847				
7.8071		848	35%	52%	35%	52%
7.8071	846	848			35%	52%
7.111		849	41%	54%	40%	53%
7.111	847	849			40%	53%
6.401		850	45%	53%	42%	54%
6.401	848	850			42%	54%
5.691		851	47%	37%	42%	53%
5.691	849	851			42%	53%
4.981		852	45%	53%	40%	52%
4.981	850	852			40%	52%
4.2713		853	41%	52%	39%	46%
4.2713	851	853			39%	46%
4.1784		854	39%	46%	2%	4%

Table 6.1-1e Ratio with DCD Enveloping Seismic Loads: RPV Stick (Continued)

(a) Enveloping Seismic Loads

Elevation (m)	Elem No.	Node No.	Shear X-dir. (MN)	Shear Y-dir. (MN)	Moment X-dir. (MN·m)	Moment Y-dir. (MN·m)
4.1784	852	854			0.0	0.0
4.065		855	0.5	0.4	0.1	0.0
4.065	853	855			0.1	0.0
3.215		856	0.4	0.3	0.4	0.3
3.215	854	856			0.4	0.3
2.365		857	0.1	0.1	0.5	0.4
2.365	855	857			0.5	0.4
1.785		858	0.3	0.2	0.4	0.3
1.785	856	858			0.4	0.3
1.2		859	0.6	0.5	0.0	0.0
1.2	857	859			0.0	0.0
0.7657		860	0.9	0.7	0.4	0.3
0.7657	858	860			0.4	0.3
-0.1315		828	1.0	0.8	1.3	1.0

(b) Ratio with DCD ((a)/DCD Loads)

Elevation (m)	Elem No.	Node No.	Shear X-dir.	Shear Y-dir.	Moment X-dir.	Moment Y-dir.
4.1784	852	854				
4.065		855	47%	50%	47%	50%
4.065	853	855			47%	50%
3.215		856	46%	50%	46%	50%
3.215	854	856			46%	50%
2.365		857	47%	44%	46%	49%
2.365	855	857			46%	49%
1.785		858	46%	50%	46%	49%
1.785	856	858			46%	49%
1.2		859	46%	49%	27%	22%
1.2	857	859			2%	2%
0.7657		860	46%	49%	46%	49%
0.7657	858	860			46%	49%
-0.1315		828	46%	50%	46%	50%

Table 6.1-1e Ratio with DCD Enveloping Seismic Loads: RPV Stick (Continued)

(a) Enveloping Seismic Loads

Elevation (m)	Elem No.	Node No.	Shear		Moment	
			X-dir. (MN)	Y-dir. (MN)	X-dir. (MN·m)	Y-dir. (MN·m)
-0.1315	860	828			0.1	0.1
-0.788		862	0.1	0.1	0.1	0.1
-0.788	862	862			0.1	0.1
-1.443		864	0.0	0.0	0.1	0.1
-1.443	864	864			0.1	0.1
-2.098		866	0.0	0.0	0.1	0.1
-2.098	866	866			0.1	0.1
-2.753		868	0.1	0.1	0.1	0.1
-2.753	868	868			0.1	0.1
-3.4715		870	0.1	0.1	0.0	0.0
-3.4715	870	870			0.0	0.0
-4.2237		872	0.1	0.0	0.0	0.0

(b) Ratio with DCD ((a)/DCD Loads)

Elevation (m)	Elem No.	Node No.	Shear		Moment	
			X-dir.	Y-dir.	X-dir.	Y-dir.
-0.1315	860	828			38%	34%
-0.788		862	40%	26%	43%	37%
-0.788	862	862			43%	37%
-1.443		864	33%	25%	44%	38%
-1.443	864	864			44%	38%
-2.098		866	37%	26%	46%	33%
-2.098	866	866			46%	33%
-2.753		868	42%	27%	47%	30%
-2.753	868	868			47%	30%
-3.4715		870	48%	30%	45%	29%
-3.4715	870	870			45%	29%
-4.2237		872	45%	29%	0%	0%

Table 6.1-2 Ratio with DCD Enveloping Seismic Loads: CB Stick

(a) Enveloping Seismic Loads

Elev. (m)	Node No.	Elem No.	Shear X-Dir. (MN)	Shear Y-Dir. (MN)	Moment X-Dir. (MN-m)	Moment Y-Dir. (MN-m)	Torsion (MN-m)
13.80	6				52.1	33.5	
		6	12.4	13.4	87.1	73.5	9.0
9.06	5				118.2	90.7	
		5	23.9	25.2	209.3	195.2	19.9
4.65	4				124.8	61.4	
		4	33.0	31.5	314.9	270.2	17.1
-2.00	3				269.2	269.0	
-7.40	2	3	37.6	33.2	446.1	434.9	18.5

(b) Ratio with DCD ((a)/DCD Loads)

Elev. (m)	Node No.	Elem No.	Shear X-Dir.	Shear Y-Dir.	Moment X-Dir.	Moment Y-Dir.	Torsion
13.80	6				33%	27%	
		6	37%	46%	35%	37%	12%
9.06	5				33%	33%	
		5	45%	46%	37%	44%	16%
4.65	4				17%	11%	
		4	44%	39%	28%	27%	10%
-2.00	3				22%	26%	
-7.40	2	3	30%	33%	28%	29%	7%

Note: Total torsional moments are obtained by the absolute sum of the accidental torsional moments and the values of the geometric torsional moments shown. The accidental torsional moment is the product of the horizontal force component and an eccentricity of 5% of the larger horizontal dimension at various elevations.

Table 6.2-1a Ratio with DCD Maximum Vertical Acceleration: RB/FB

(a) Enveloping Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
52.40*	110	RB/FB	0.38
34.00	109	RB/FB	0.31
27.00	108	RB/FB	0.29
22.50	107	RB/FB	0.25
17.50	106	RB/FB	0.24
13.57	105	RB/FB	0.23
9.06	104	RB/FB	0.21
4.65	103	RB/FB	0.20
-1.00	102	RB/FB	0.20
-6.40	101	RB/FB	0.20
-11.50	2	RB/FB	0.18
-15.50	1	RB/FB	0.18

(b) Ratio with DCD ((a)/DCD Acceleration)

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
52.40*	110	RB/FB	30%
34.00	109	RB/FB	38%
27.00	108	RB/FB	39%
22.50	107	RB/FB	34%
17.50	106	RB/FB	33%
13.57	105	RB/FB	31%
9.06	104	RB/FB	29%
4.65	103	RB/FB	26%
-1.00	102	RB/FB	27%
-6.40	101	RB/FB	29%
-11.50	2	RB/FB	29%
-15.50	1	RB/FB	36%

Note: For structural design use only. Unit: g

* : The difference between the modeled elevation 52.4 m and the actual elevation 52.7 m at the RB roof is negligibly small.

Table 6.2-1b Ratio with DCD Enveloping Maximum Vertical Acceleration: RCCV

(a) Enveloping Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
34.00	209	RCCV	0.31
27.00	208	RCCV	0.30
17.50	206	RCCV	0.25
13.57	205	RCCV	0.23
9.06	204	RCCV	0.23
4.65	203	RCCV	0.22
-1.00	202	RCCV	0.21
-6.40	201	RCCV	0.20

Note: For structural design use only. Unit: g

(b) Ratio with DCD ((a)/DCD Acceleration)

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
34.00	209	RCCV	34%
27.00	208	RCCV	34%
17.50	206	RCCV	35%
13.57	205	RCCV	30%
9.06	204	RCCV	36%
4.65	203	RCCV	32%
-1.00	202	RCCV	36%
-6.40	201	RCCV	34%

Table 6.2-1c Ratio with DCD Enveloping Maximum Vertical Acceleration: VW/Pedestal

(a) Enveloping Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
17.50	701	VW	0.26
14.50	702	VW	0.26
11.50	703	VW	0.26
8.50	704	VW	0.25
7.4625	705	VW	0.24
4.65	706,303	Pedestal	0.23
-1.00	302	Pedestal	0.20
-6.40	301	Pedestal	0.19

Note: For structural design use only. Unit: g

(b) Ratio with DCD ((a)/DCD Acceleration)

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
17.50	701	VW	24%
14.50	702	VW	25%
11.50	703	VW	28%
8.50	704	VW	33%
7.4625	705	VW	34%
4.65	706,303	Pedestal	34%
-1.00	302	Pedestal	35%
-6.40	301	Pedestal	38%

Table 6.2-1d Ratio with DCD Enveloping Maximum Vertical Acceleration: RSW

(a) Enveloping Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
24.18	707	RSW	0.31
20.20	708	RSW	0.31
15.775	709	RSW	0.29
11.35	710	RSW	0.27
7.4625	711	RSW	0.24
4.65	712	RSW	0.23
2.4615	713	RSW	0.21
1.96	714	RSW	0.21
-0.80	715	RSW	0.22

Note: For structural design use only. Unit: g

(b) Ratio with DCD ((a)/DCD Acceleration)

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
24.18	707	RSW	32%
20.20	708	RSW	33%
15.775	709	RSW	35%
11.35	710	RSW	36%
7.4625	711	RSW	34%
4.65	712	RSW	34%
2.4615	713	RSW	33%
1.96	714	RSW	33%
-0.80	715	RSW	34%

Table 6.2-1e Ratio with DCD Enveloping Maximum Vertical Acceleration: RB/FB Flexible Slab Oscillators

(a) Enveloping Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
52.40*	9101	Oscillator	0.33
	9102	Oscillator	0.73
	9103	Oscillator	1.04
	9104	Oscillator	0.69
	9105	Oscillator	0.51
	9106	Oscillator	0.70
	9107	Oscillator	0.66
	9108	Oscillator	0.56
34.00	9091	Oscillator	0.41
	9092	Oscillator	0.39
27.00	9081	Oscillator	0.37
	9082	Oscillator	0.37
	9083	Oscillator	0.36
	9084	Oscillator	0.39
	9085	Oscillator	0.34
22.50	9071	Oscillator	0.62
	9072	Oscillator	0.72
	9073	Oscillator	0.77
	9074	Oscillator	0.42
	9075	Oscillator	0.35
17.50	9061	Oscillator	0.60
	9062	Oscillator	0.52
	9063	Oscillator	0.29
	9064	Oscillator	0.63
	9065	Oscillator	0.36

(b) Ratio with DCD ((a)/DCD Acceleration)

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
52.40*	9101	Oscillator	28%
	9102	Oscillator	40%
	9103	Oscillator	33%
	9104	Oscillator	28%
	9105	Oscillator	22%
	9106	Oscillator	23%
	9107	Oscillator	24%
	9108	Oscillator	21%
34.00	9091	Oscillator	32%
	9092	Oscillator	36%
27.00	9081	Oscillator	32%
	9082	Oscillator	37%
	9083	Oscillator	33%
	9084	Oscillator	29%
	9085	Oscillator	35%
22.50	9071	Oscillator	39%
	9072	Oscillator	55%
	9073	Oscillator	38%
	9074	Oscillator	32%
	9075	Oscillator	30%
17.50	9061	Oscillator	33%
	9062	Oscillator	35%
	9063	Oscillator	36%
	9064	Oscillator	34%
	9065	Oscillator	26%

Note: For structural design use only. Unit: g

* : The difference between the modeled elevation 52.4 m and the actual elevation 52.7 m at the RB roof is negligibly small.

Table 6.2-1e Ratio with DCD Enveloping Maximum Vertical Acceleration: RB/FB Flexible Slab Oscillators (Continued)

(a) Enveloping Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
13.57	9051	Oscillator	0.28
	9052	Oscillator	0.35
9.06	9041	Oscillator	0.26
	9042	Oscillator	0.35
4.65	9031	Oscillator	0.47
	9032	Oscillator	0.31
	9033	Oscillator	0.43
	9034	Oscillator	0.51
	9035	Oscillator	0.34
-1.00	9021	Oscillator	0.43
	9022	Oscillator	0.50
	9023	Oscillator	0.38
	9024	Oscillator	0.29
	9025	Oscillator	0.37
	9026	Oscillator	0.55
	9027	Oscillator	0.26
-6.40	9011	Oscillator	0.39
	9012	Oscillator	0.34
	9013	Oscillator	0.41

Note: For structural design use only. Unit: g

(b) Ratio with DCD ((a)/DCD Acceleration)

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
13.57	9051	Oscillator	34%
	9052	Oscillator	24%
9.06	9041	Oscillator	30%
	9042	Oscillator	25%
4.65	9031	Oscillator	40%
	9032	Oscillator	32%
	9033	Oscillator	42%
	9034	Oscillator	34%
	9035	Oscillator	25%
-1.00	9021	Oscillator	39%
	9022	Oscillator	35%
	9023	Oscillator	38%
	9024	Oscillator	33%
	9025	Oscillator	28%
	9026	Oscillator	35%
	9027	Oscillator	30%
-6.40	9011	Oscillator	42%
	9012	Oscillator	37%
	9013	Oscillator	31%

Table 6.2-2 Ratio with DCD Enveloping Maximum Vertical Acceleration: CB

(a) Enveloping Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	X-dir. (g)	Y-dir. (g)	Max. Vertical Acceleration
13.80	6	CB	0.47	0.51	0.30
9.06	5	CB	0.41	0.43	0.29
4.65	4	CB	0.33	0.31	0.26
-2.00	3	CB	0.25	0.24	0.21
-7.40	2	CB	0.21	0.17	0.18
-10.40	1	CB	0.21	0.18	0.18
13.80	9001	Oscillator	---	---	0.87
	9002	Oscillator	---	---	0.49
	9003	Oscillator	---	---	0.48
9.06	9101	Oscillator	---	---	0.81
	9102	Oscillator	---	---	0.55
	9103	Oscillator	---	---	0.46
4.65	9201	Oscillator	---	---	0.45
	9202	Oscillator	---	---	0.44
-2.00	9301	Oscillator	---	---	0.50

Note: For structural design use only. Unit: g

(b) Ratio with DCD ((a)/DCD Acceleration)

Elevation (m)	Node No.	Stick Model	X-dir. (g)	Y-dir. (g)	Max. Vertical Acceleration
13.80	6	CB	37%	46%	30%
9.06	5	CB	46%	48%	34%
4.65	4	CB	38%	38%	35%
-2.00	3	CB	32%	34%	37%
-7.40	2	CB	39%	32%	36%
-10.40	1	CB	39%	34%	36%
13.80	9001	Oscillator	---	---	40%
	9002	Oscillator	---	---	37%
	9003	Oscillator	---	---	34%
9.06	9101	Oscillator	---	---	41%
	9102	Oscillator	---	---	44%
	9103	Oscillator	---	---	32%
4.65	9201	Oscillator	---	---	35%
	9202	Oscillator	---	---	31%
-2.00	9301	Oscillator	---	---	36%

Table 7-1 Factors of safety for RB/FB Foundation Stability

Load Combination	Overturning		Sliding		Floatation	
	SRP 3.8.5 Required FS	Calculated FS	SRP 3.8.5 Required FS	Calculated FS	SRP 3.8.5 Required FS	Calculated FS
D + H + E'	1.1	1923	1.1	3.90	--	--
D + F'	--	--	--	--	1.1	3.48

Where,
D = Dead Load
H = Lateral soil pressure
E' = Safe Shutdown Earthquake
F' = Buoyant forces of design basis flood
FS = Factor of Safety

Table 7-2 Factors of safety for CB Foundation Stability

Load Combination	Overturning		Sliding		Floatation	
	SRP 3.8.5 Required FS	Calculated FS	SRP 3.8.5 Required FS	Calculated FS	SRP 3.8.5 Required FS	Calculated FS
D + H + E'	1.1	1715	1.1	2.59	--	--
D + F'	--	--	--	--	1.1	1.85

Where,
D = Dead Load
H = Lateral soil pressure
E' = Safe Shutdown Earthquake
F' = Buoyant forces of design basis flood
FS = Factor of Safety

Table 7-3 Maximum Soil Dynamic Bearing Pressure Demand for RB/FB (Unit: KPa)

	Site Conditions		
Dynamic (Static + FIRS)	LB	BE	UB
	1160	1040	1260

Table 7-4 Maximum Soil Dynamic Bearing Pressure Demand for CB (Unit: KPa)

	Site Conditions		
Dynamic (Static + FIRS)	LB	BE	UB
	490	520	540

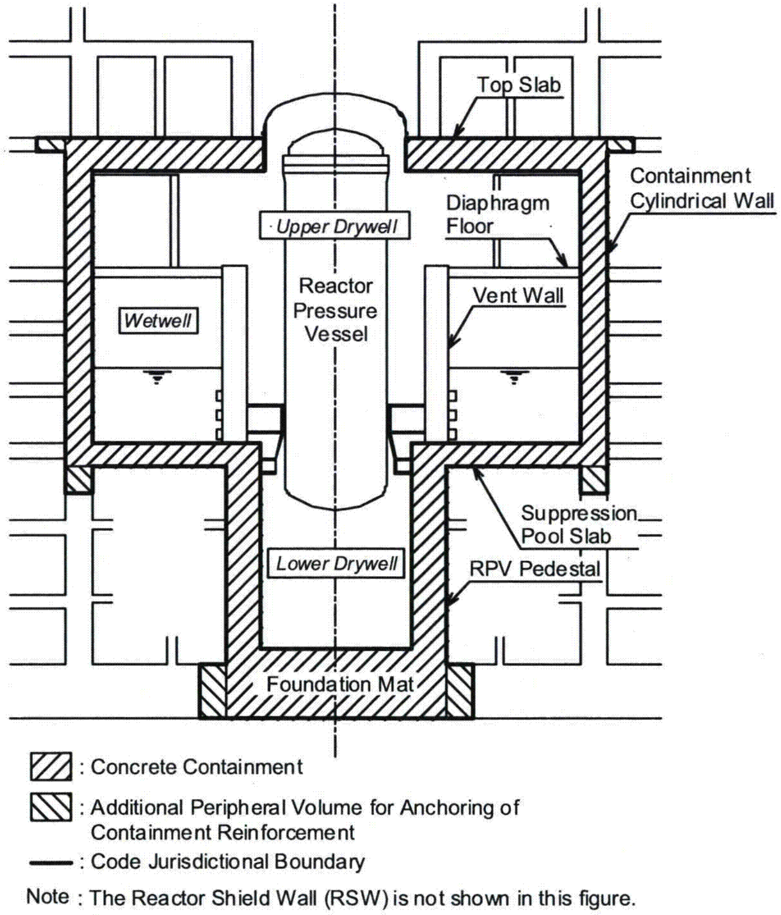


Figure 4.3-1 Major Structural Components inside Containment

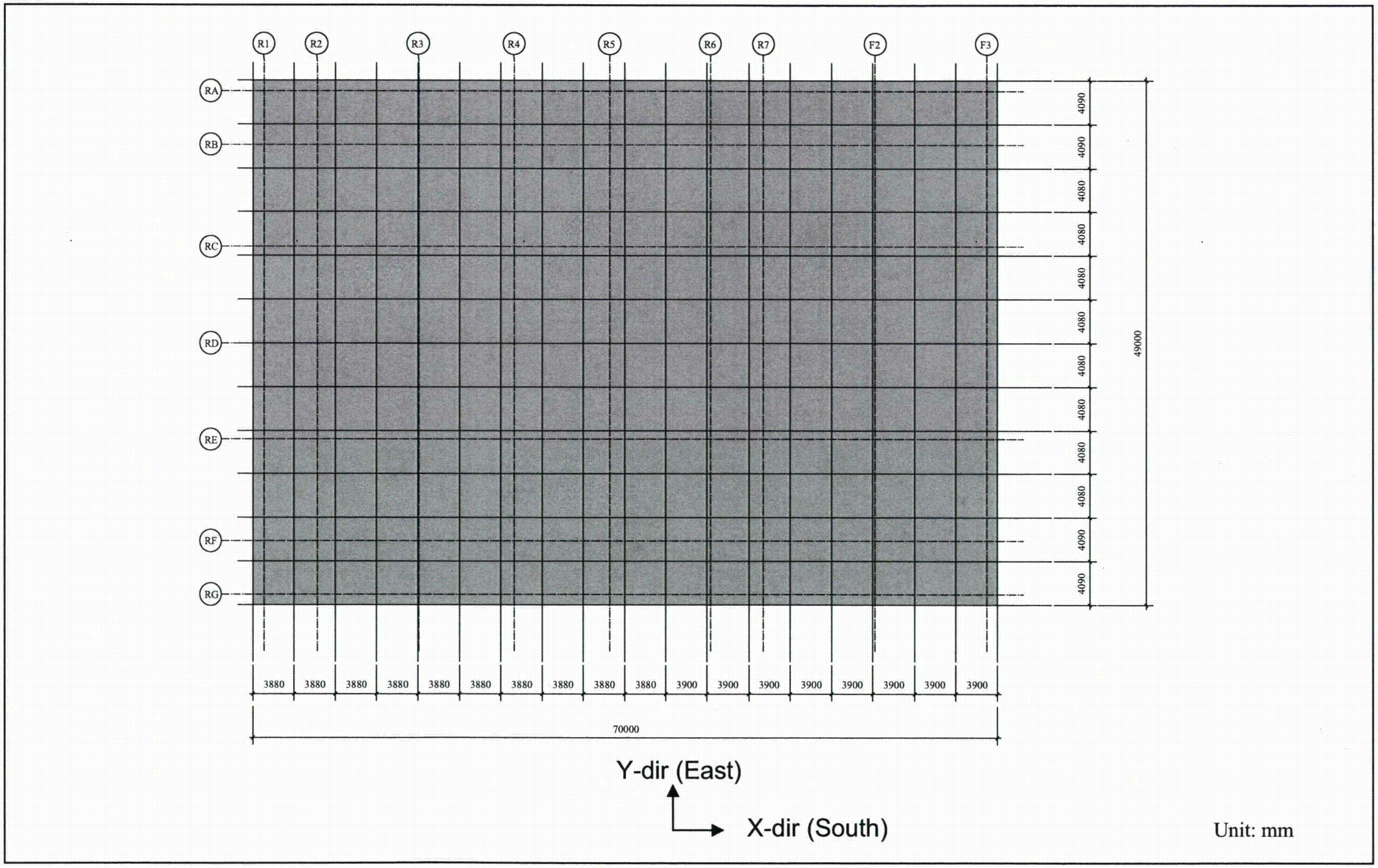
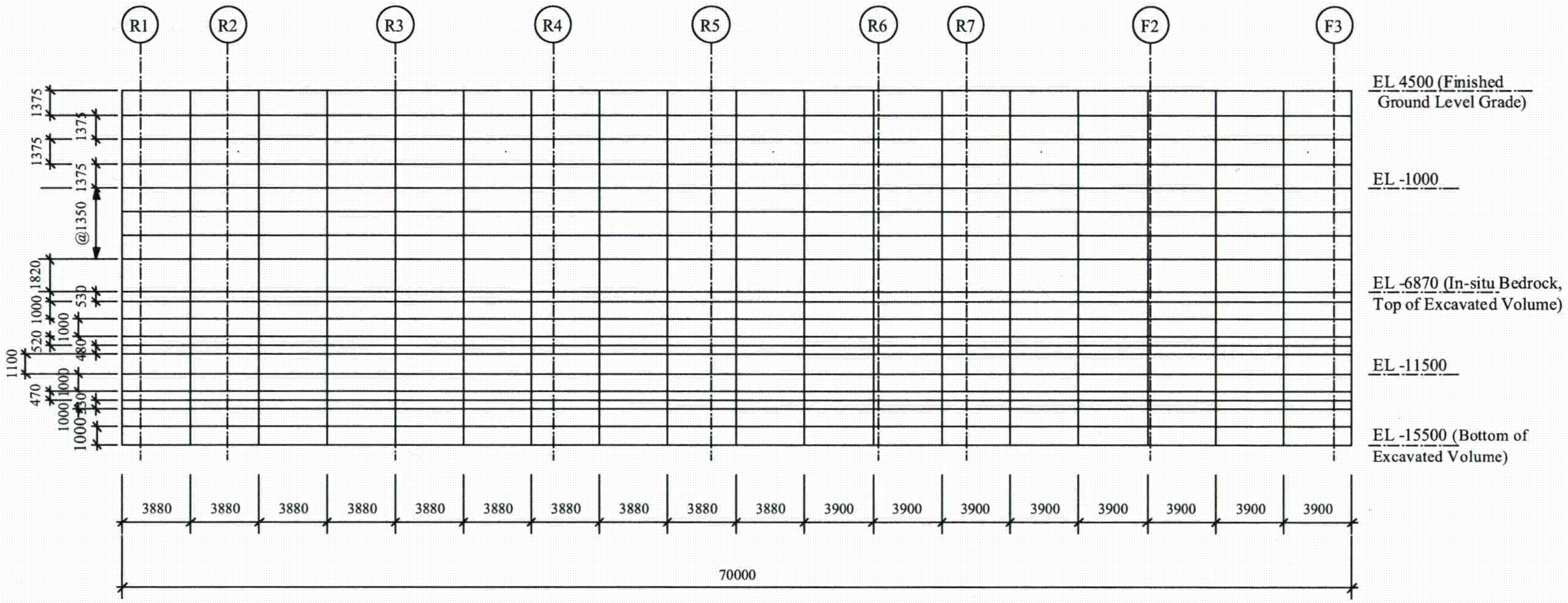


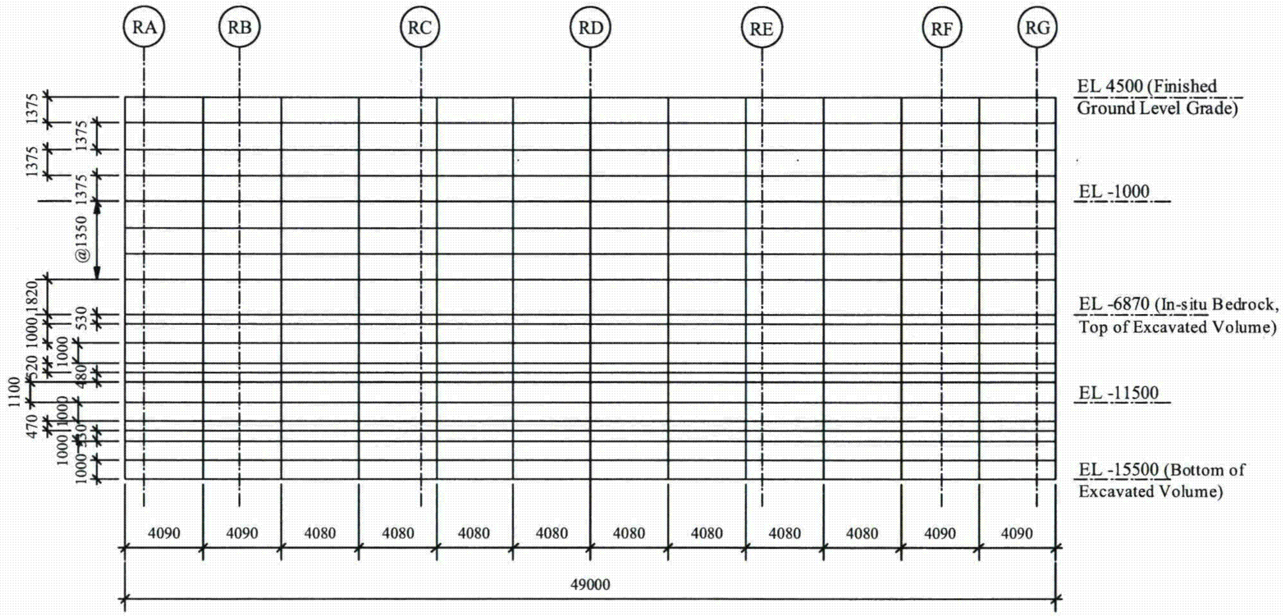
Figure 4.3-2 SASSI2000 Plate Elements for RB/FB Basemat



(a) Walls on Column Rows RA and RG

Unit: mm

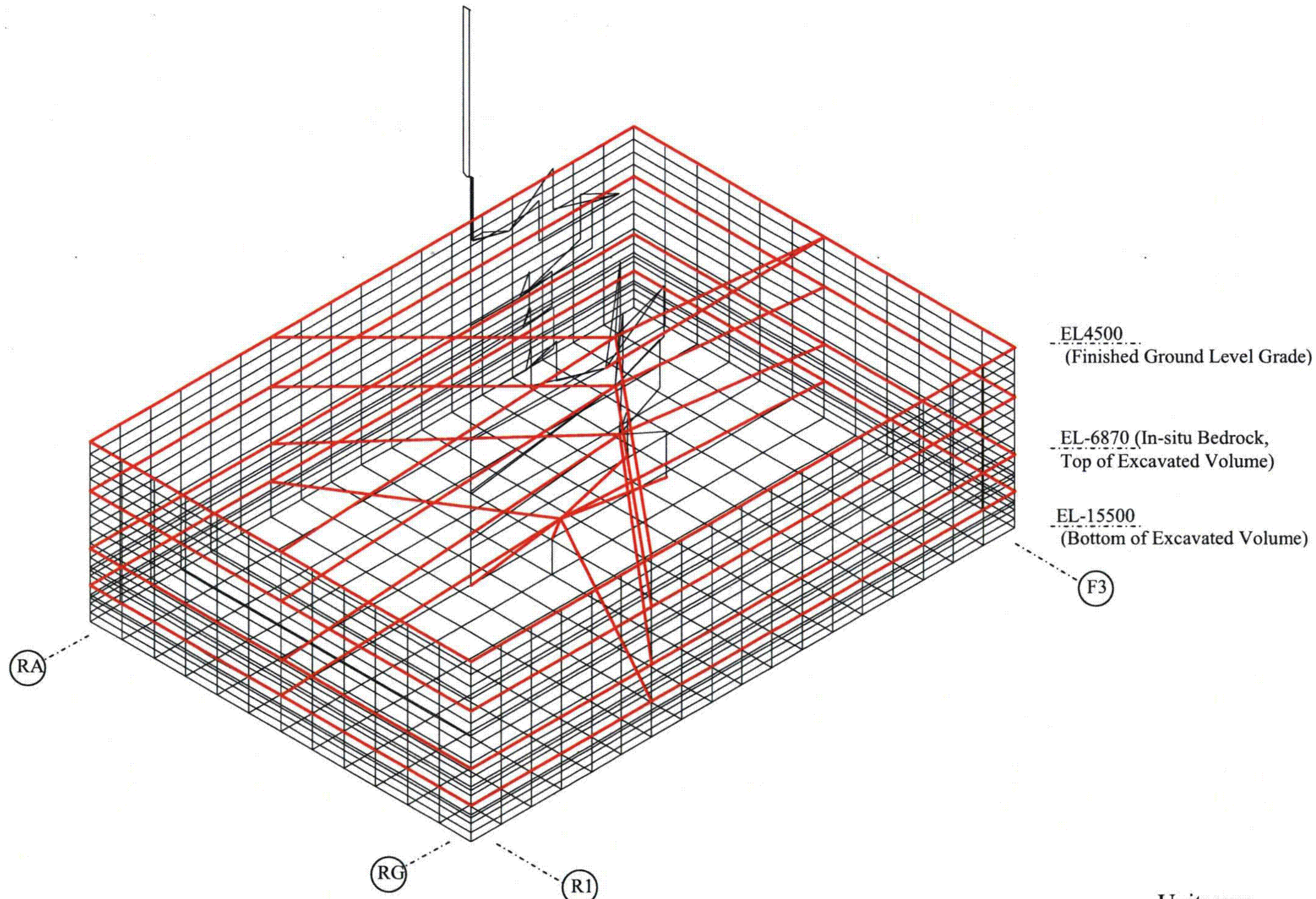
Figure 4.3-3 SASSI2000 Plate Elements for RB/FB Exterior Walls



(b) Walls on Column Rows R1 and F3

Unit: mm

Figure 4.3-3 SASSI2000 Plate Elements for RB/FB Exterior Walls (Continued)



Note: 1) Wall and basemat are modeled with shell element without mass.
2) Rigid beams indicated in red are installed at the floor levels.

Figure 4.3-4 Overview of SASSI2000 SSI RB/FB Model

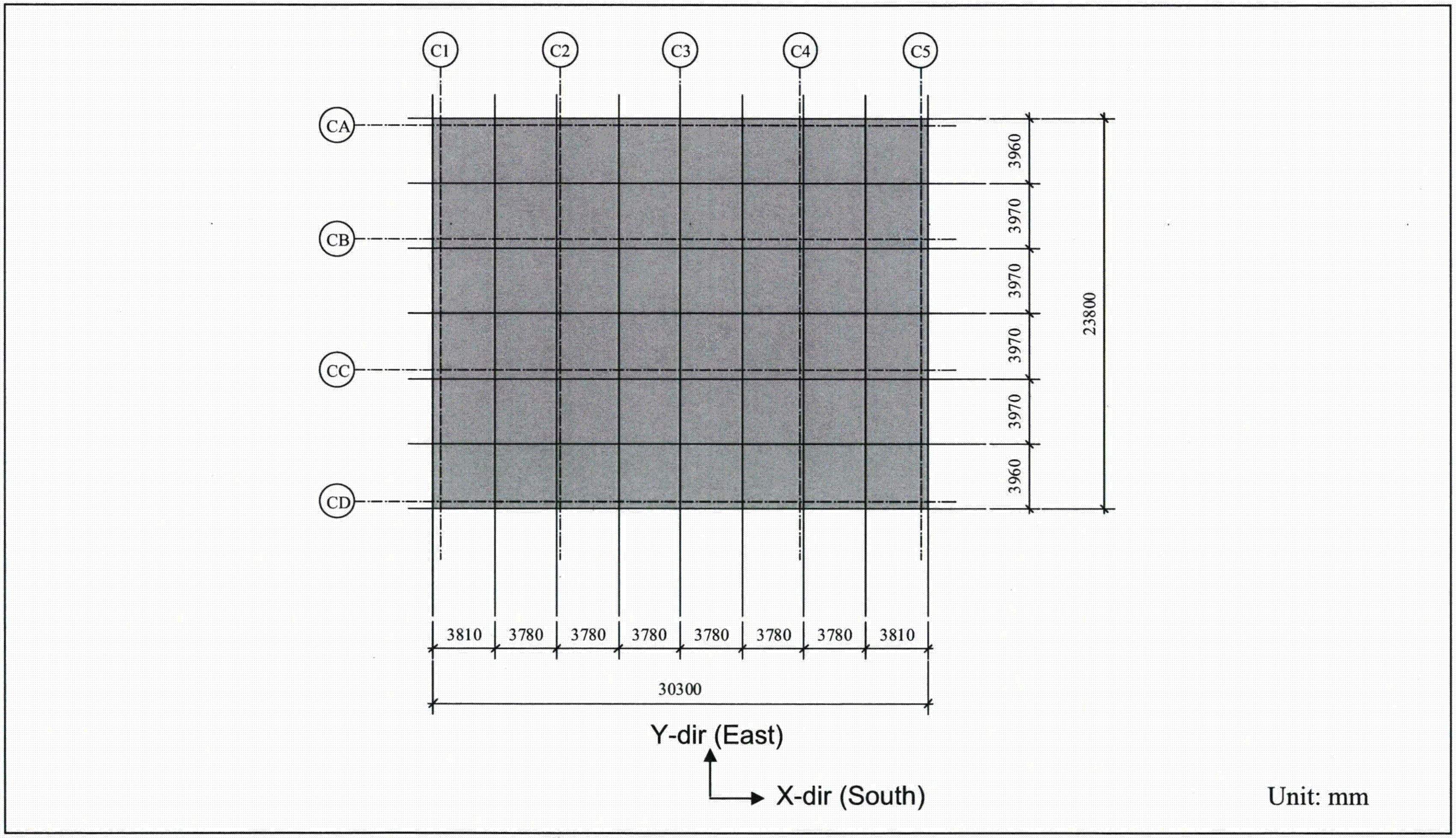
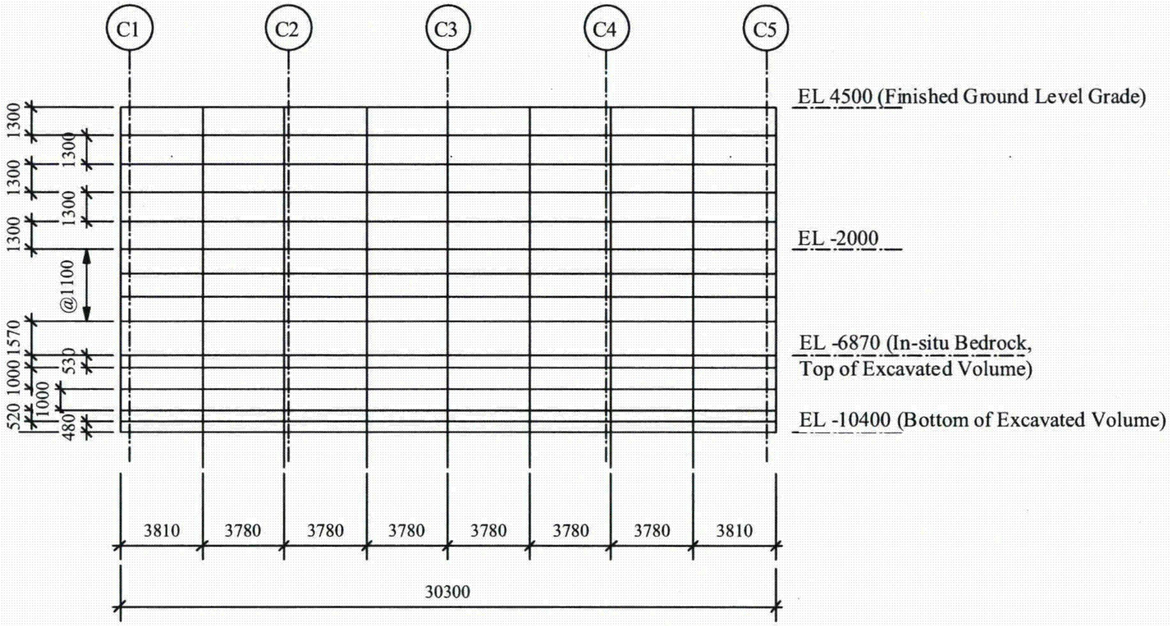


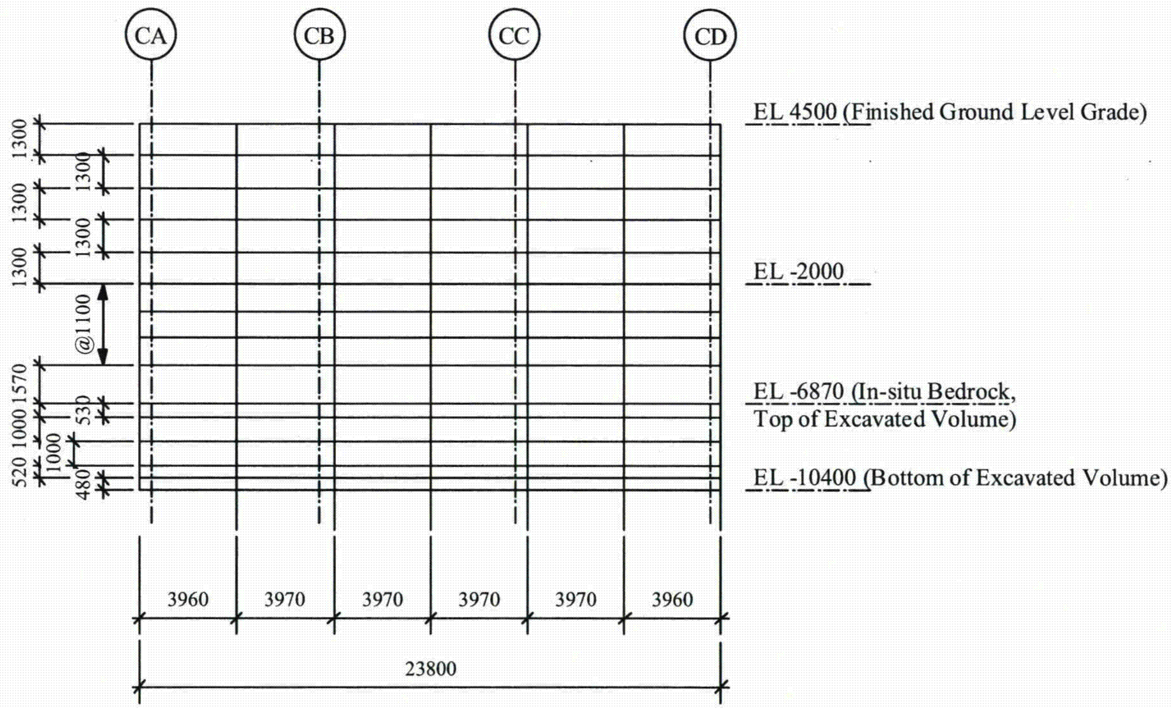
Figure 4.3-5 SASSI2000 Plate Elements for CB Basemat



(a) Walls on Column Rows CA and CD

Unit: mm

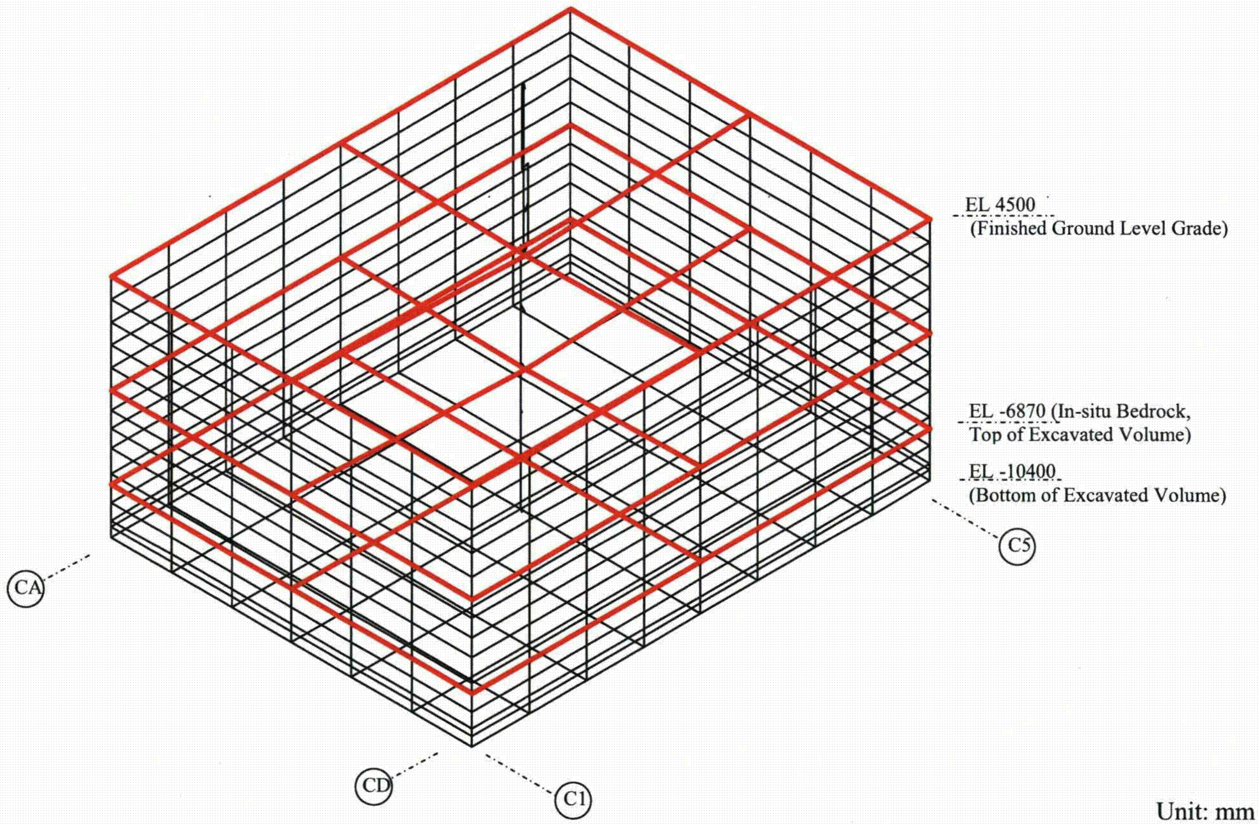
Figure 4.3-6 SASSI2000 Plate Elements for CB Exterior Walls



(b) Walls on Column Rows C1 and C5

Unit: mm

Figure 4.3-6 SASSI2000 Plate Elements for CB Exterior Walls (Continued)



Note: 1) Wall and basemat are modeled with shell element without mass.
2) Rigid beams indicated in red are installed at the floor levels.

Figure 4.3-7 Overview of CB SASSI2000 SSI Model

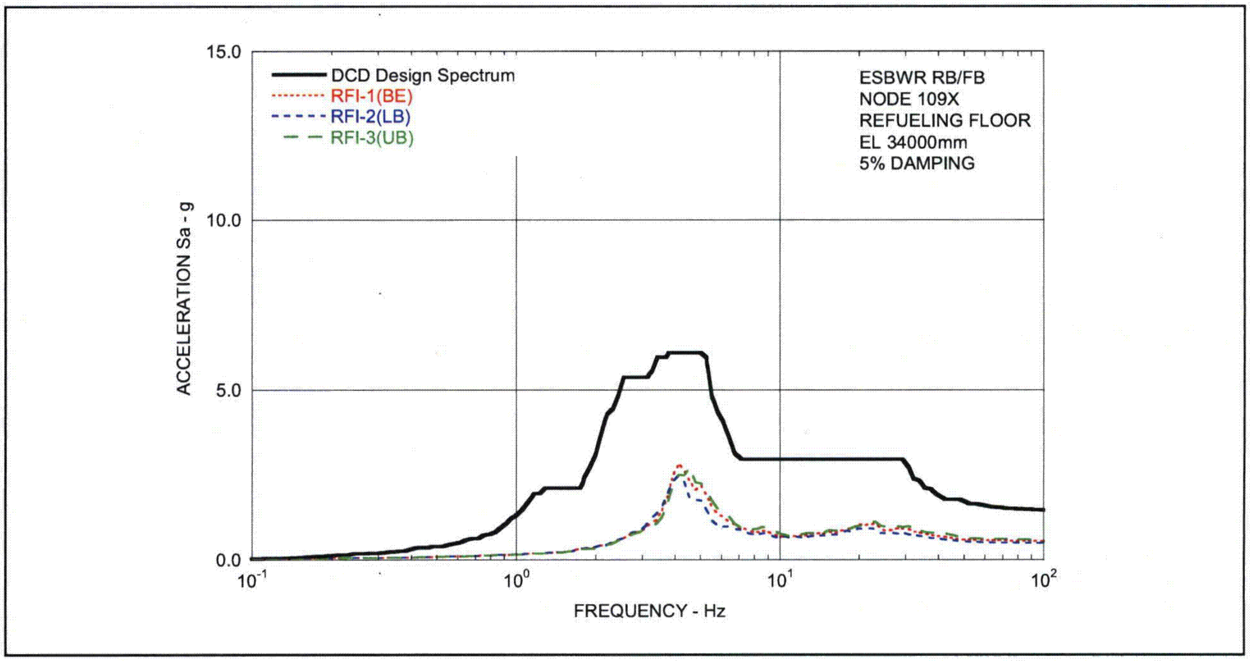


Figure 5.1-1a Comparison of Floor Response Spectra - RB/FB Refueling Floor in X-Direction

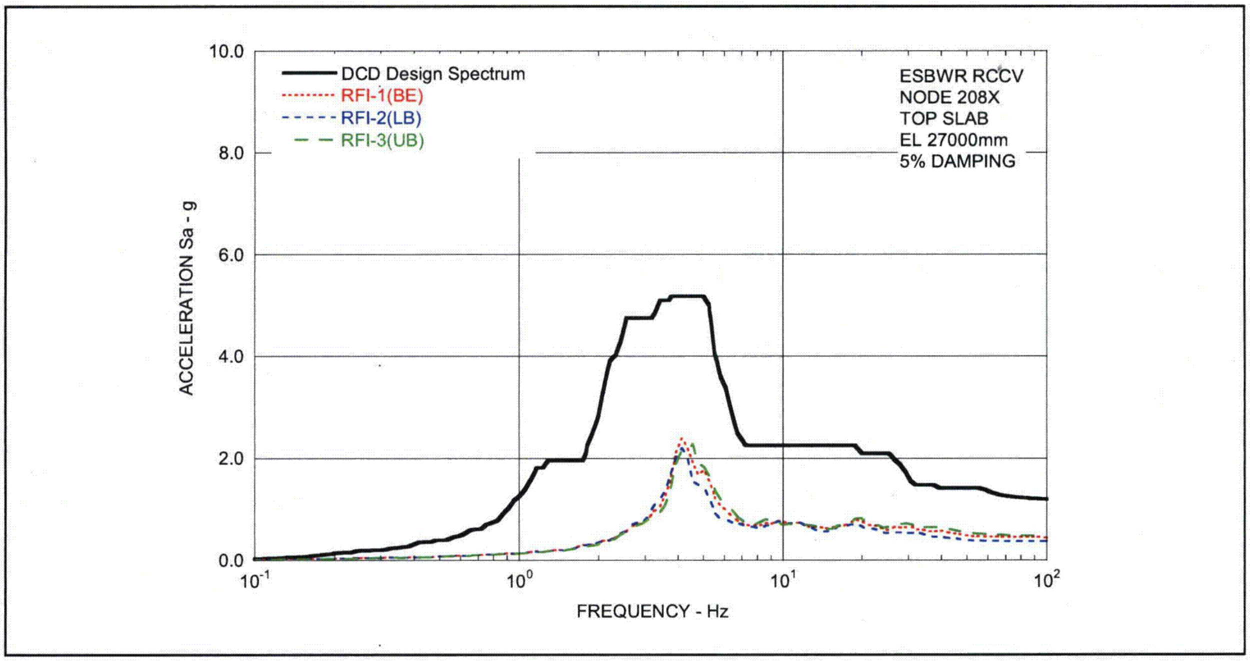


Figure 5.1-1b Comparison of Floor Response Spectra - RCCV Top Slab in X-Direction

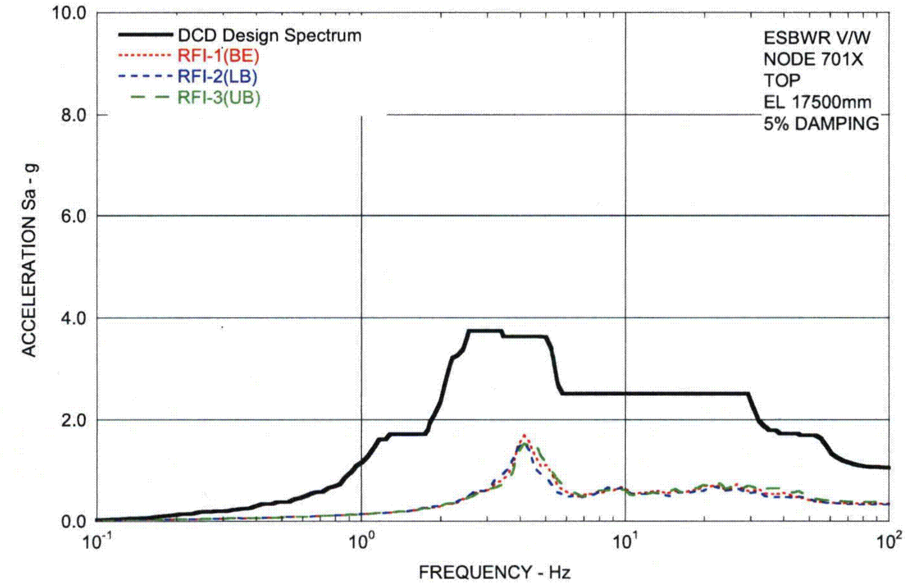


Figure 5.1-1c Comparison of Floor Response Spectra - Vent Wall Top in X-Direction

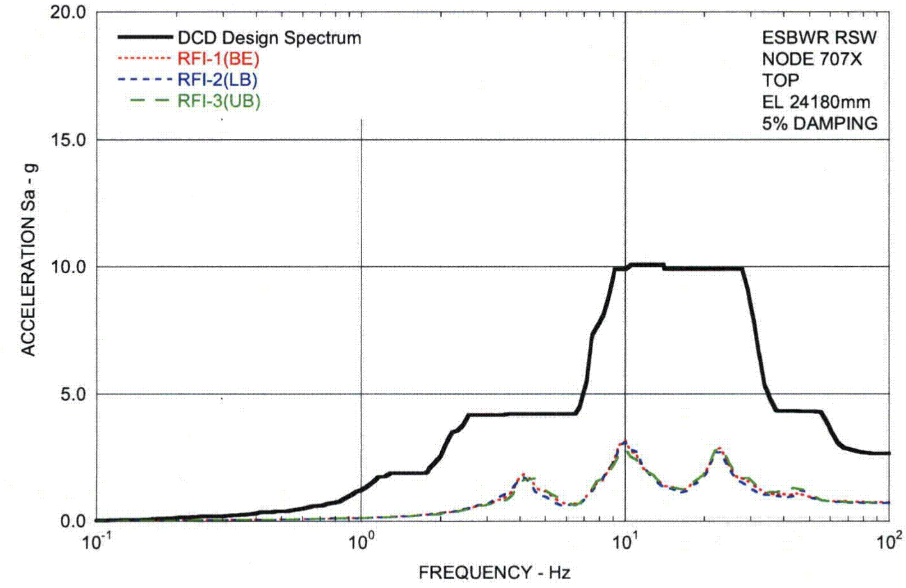


Figure 5.1-1d Comparison of Floor Response Spectra - RSW Top in X-Direction

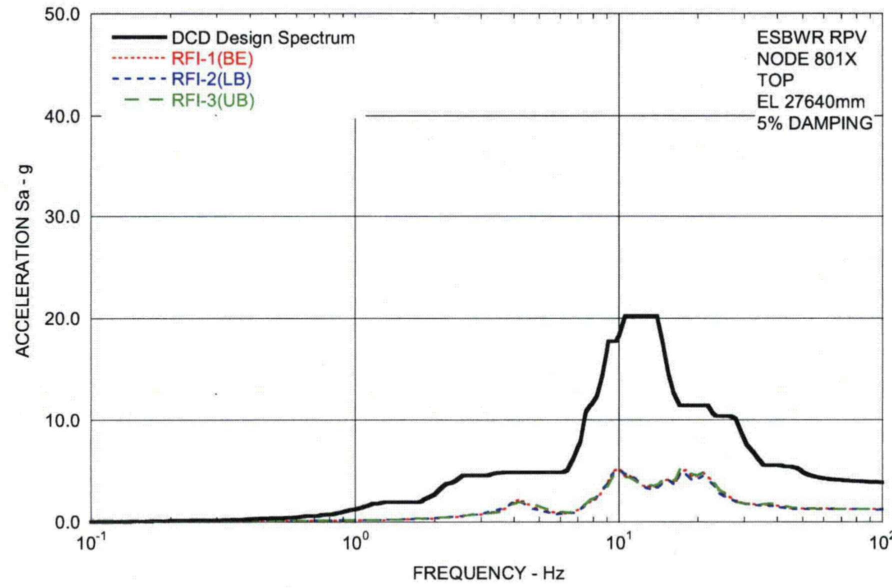


Figure 5.1-1e Comparison of Floor Response Spectra - RPV Top in X-Direction

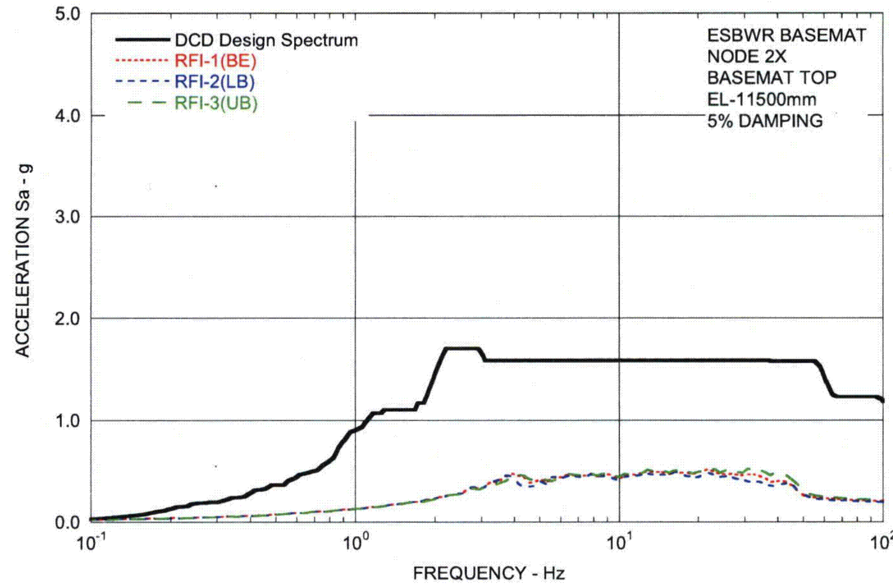


Figure 5.1-1f Comparison of Floor Response Spectra - RB/FB Basemat in X-Direction

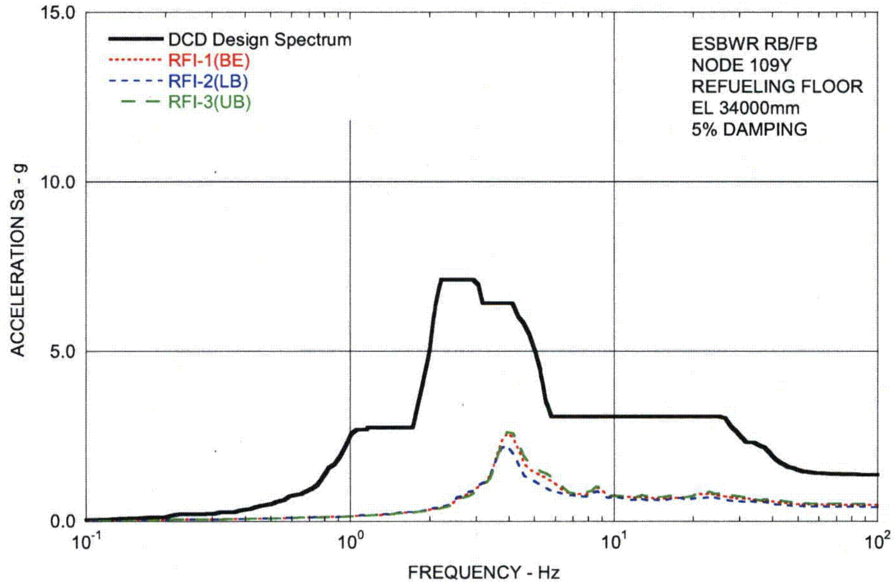


Figure 5.1-2a Comparison of Floor Response Spectra - RB/FB Refueling Floor in Y-Direction

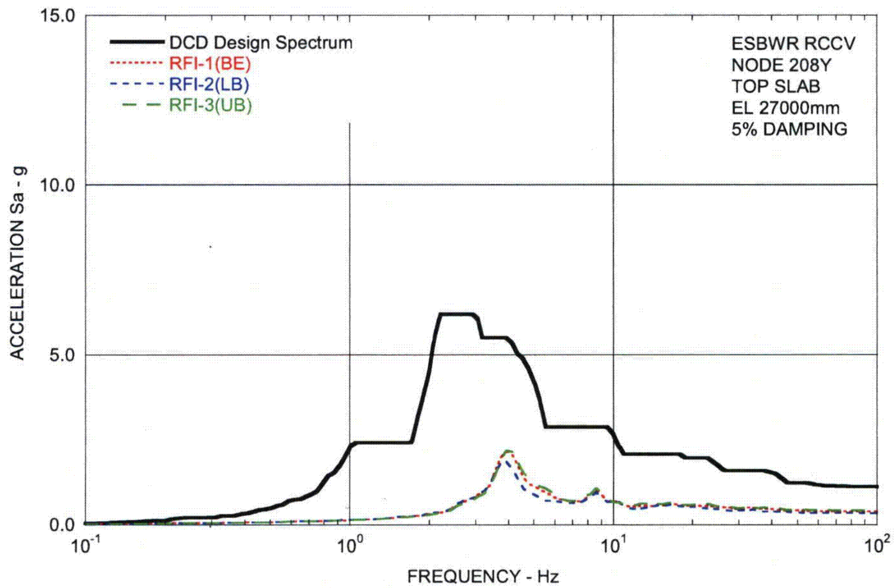


Figure 5.1-2b Comparison of Floor Response Spectra - RCCV Top Slab in Y-Direction

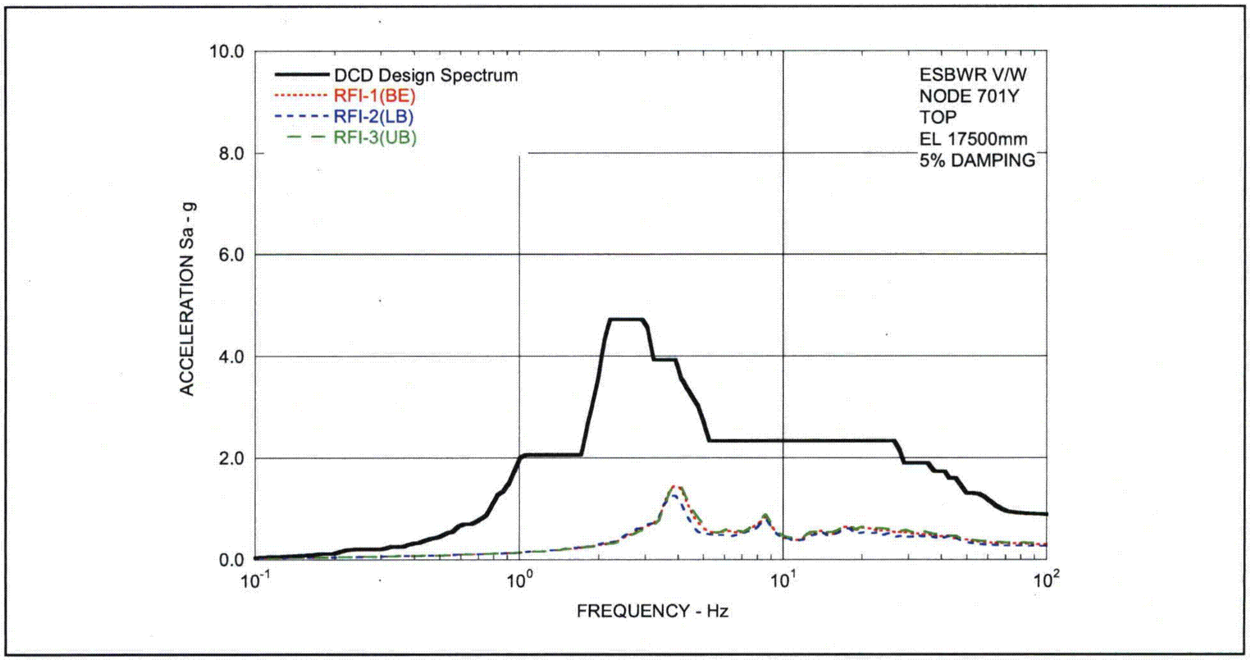


Figure 5.1-2c Comparison of Floor Response Spectra - Vent Wall Top in Y-Direction

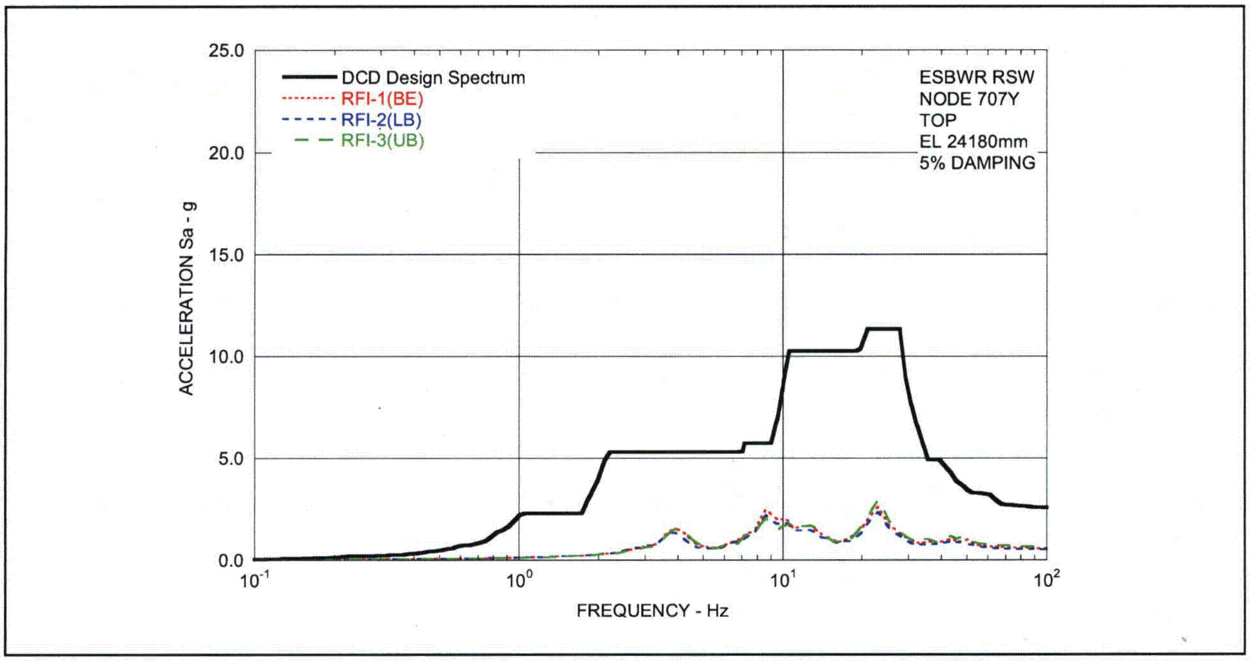


Figure 5.1-2d Comparison of Floor Response Spectra - RSW Top in Y-Direction

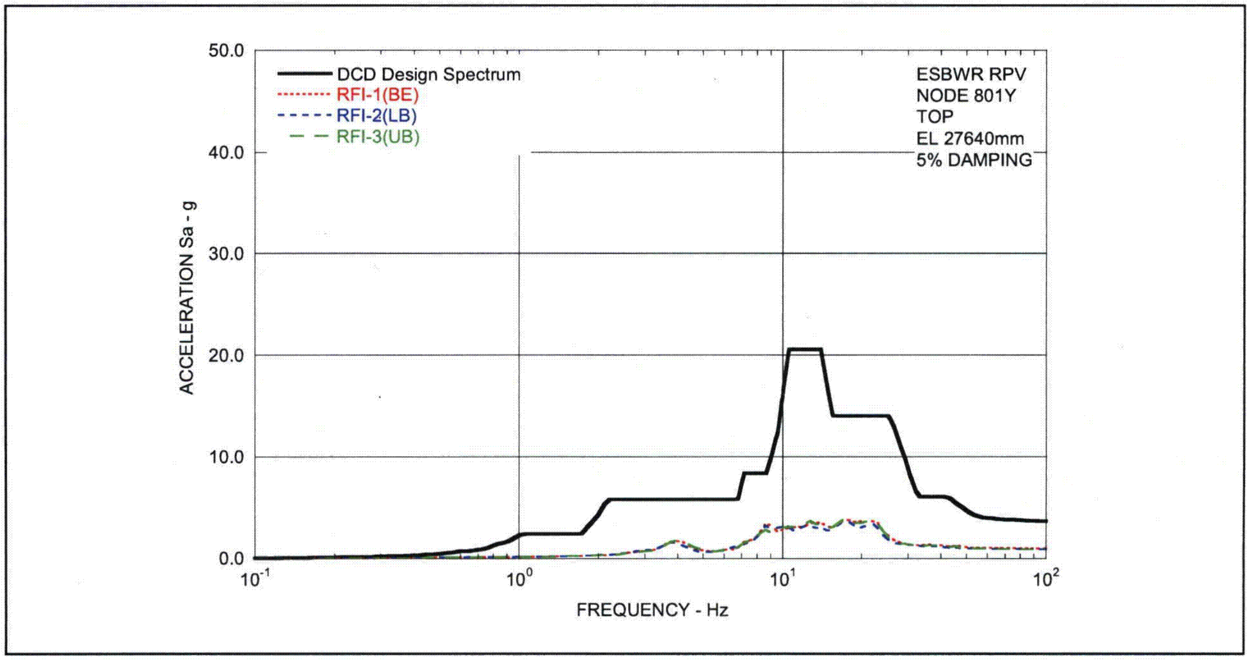


Figure 5.1-2e Comparison of Floor Response Spectra - RPV Top in Y-Direction

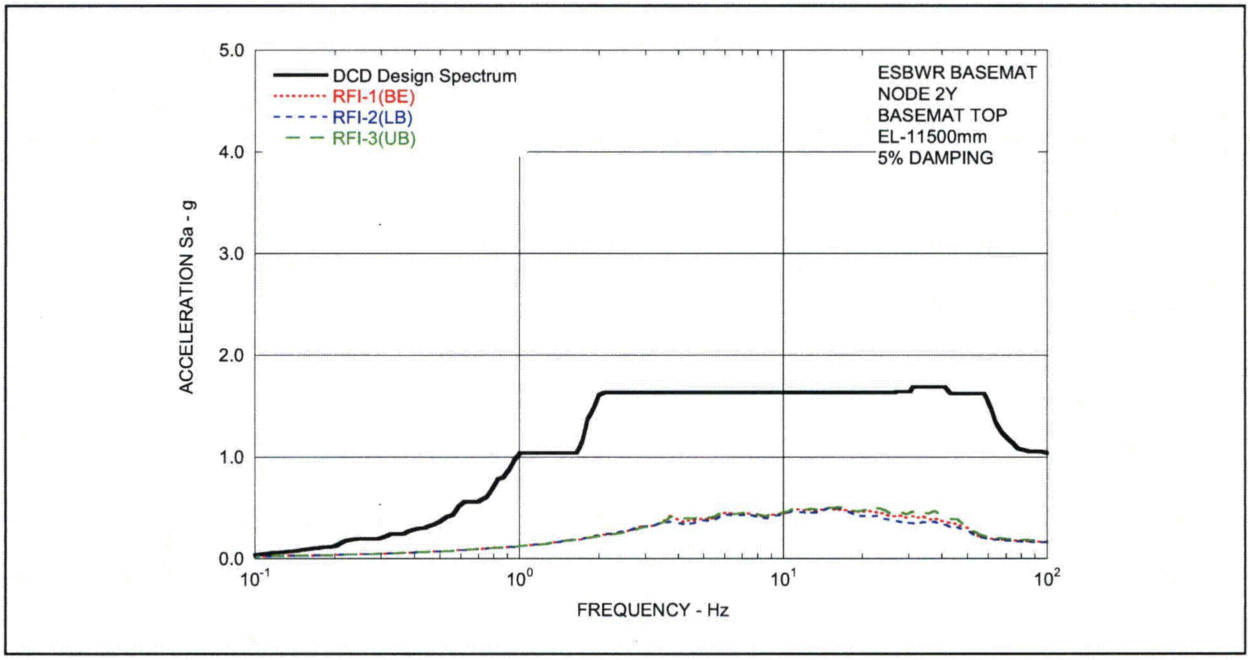


Figure 5.1-2f Comparison of Floor Response Spectra - RB/FB Basemat in Y-Direction

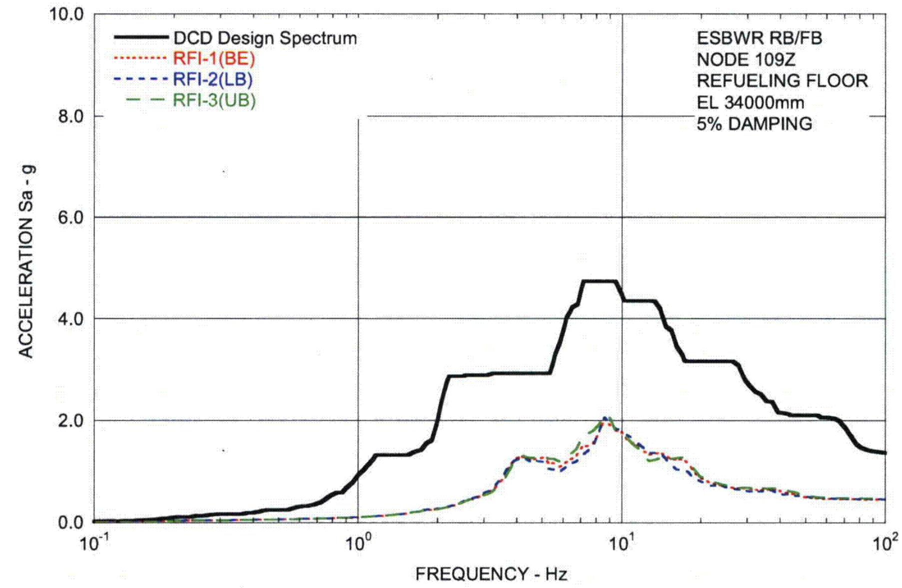


Figure 5.1-3a Comparison of Floor Response Spectra - RB/FB Refueling Floor in Z-Direction

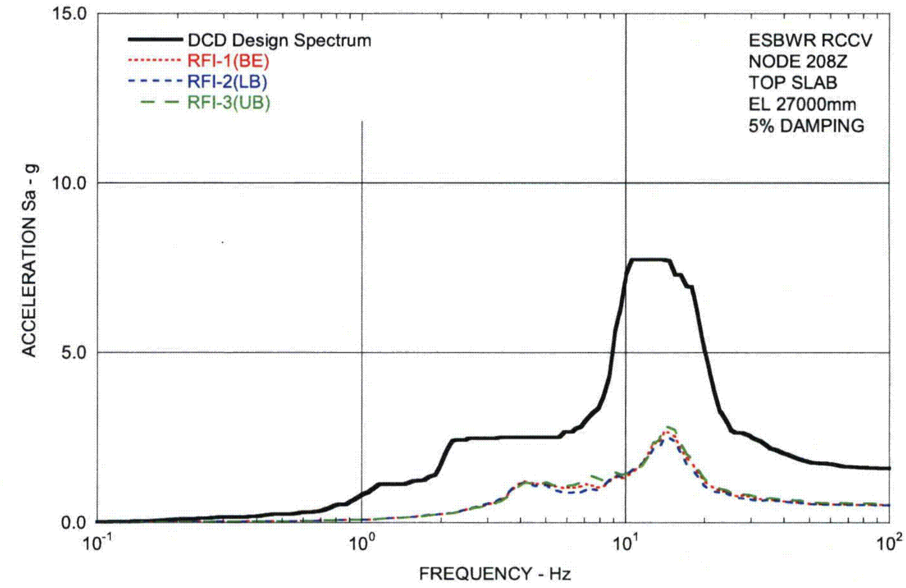


Figure 5.1-3b Comparison of Floor Response Spectra - RCCV Top Slab in Z-Direction

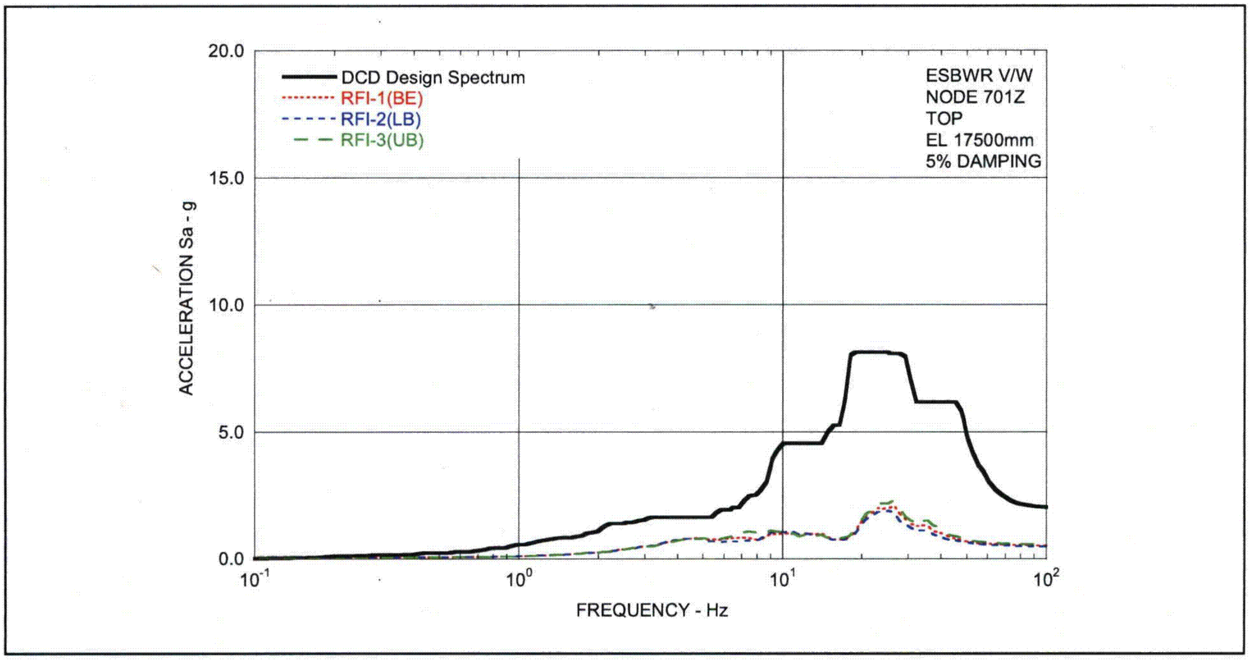


Figure 5.1-3c Comparison of Floor Response Spectra - Vent Wall Top in Z-Direction

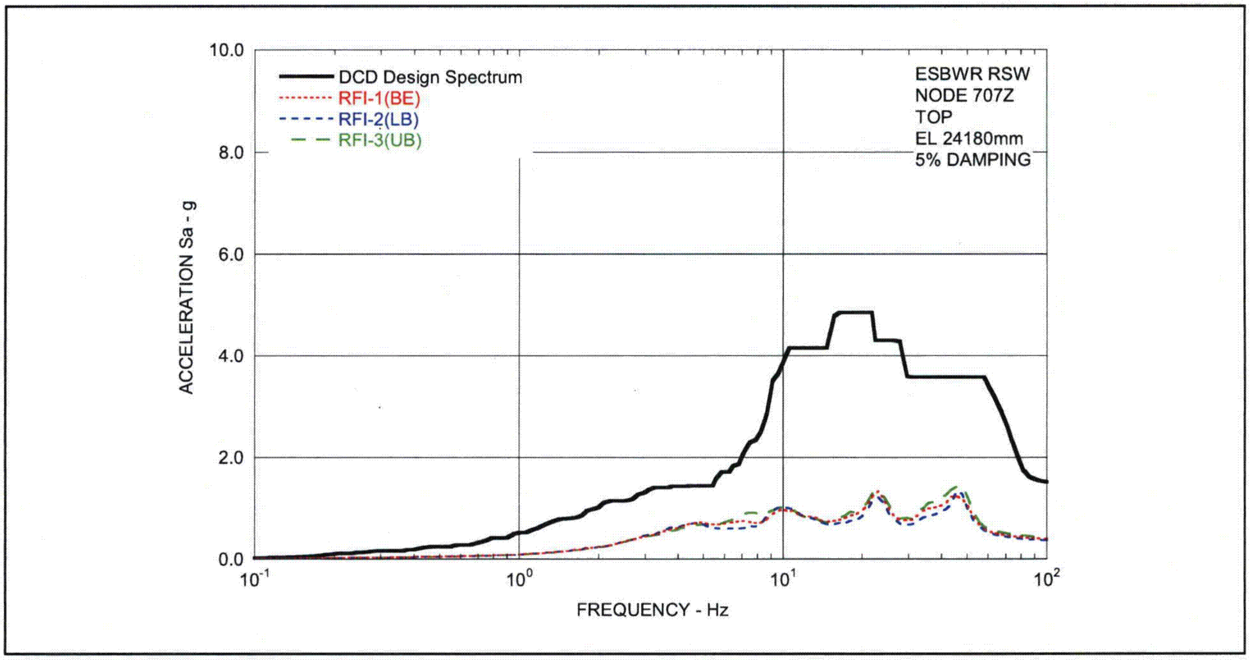


Figure 5.1-3d Comparison of Floor Response Spectra - RSW Top in Z-Direction

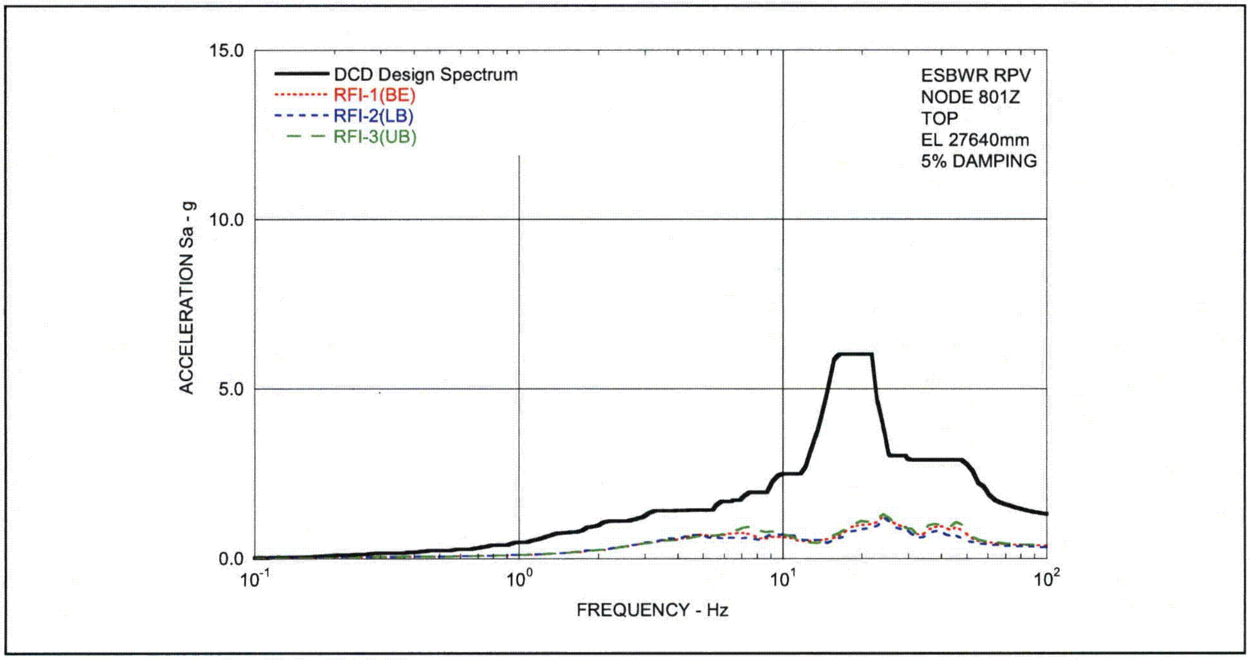


Figure 5.1-3e Comparison of Floor Response Spectra - RPV Top in Z-Direction

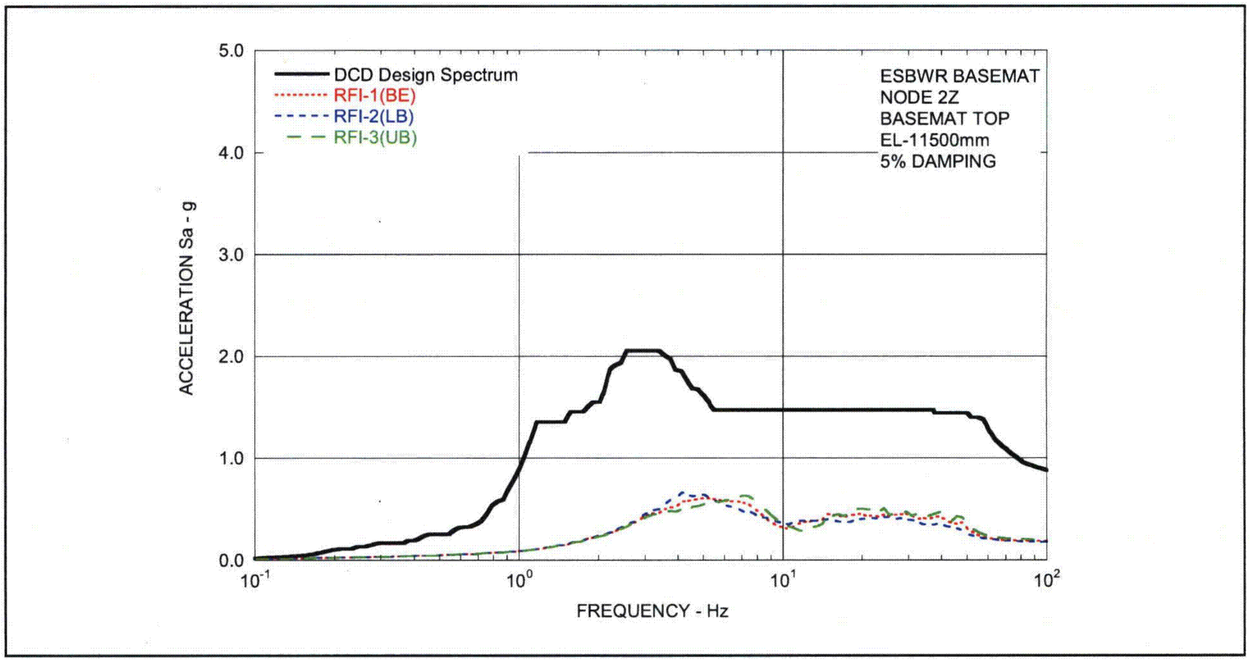


Figure 5.1-3f Comparison of Floor Response Spectra - RB/FB Basemat in Z-Direction

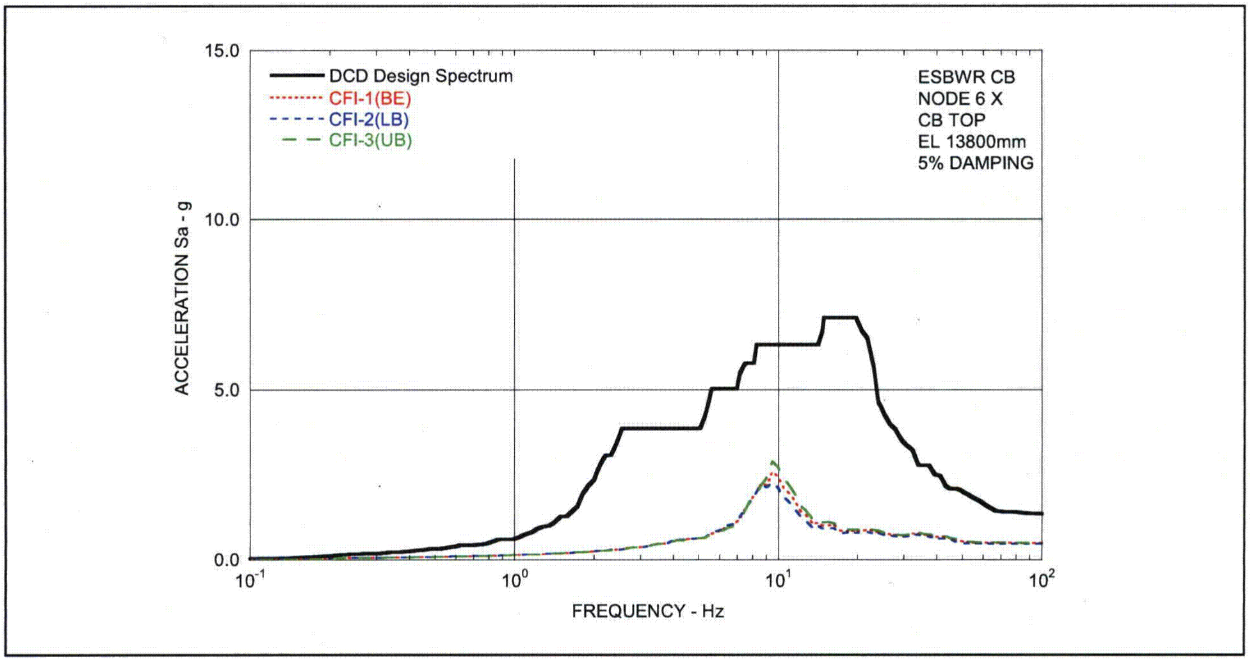


Figure 5.1-4a Comparison of Floor Response Spectra - CB Top in X-Direction

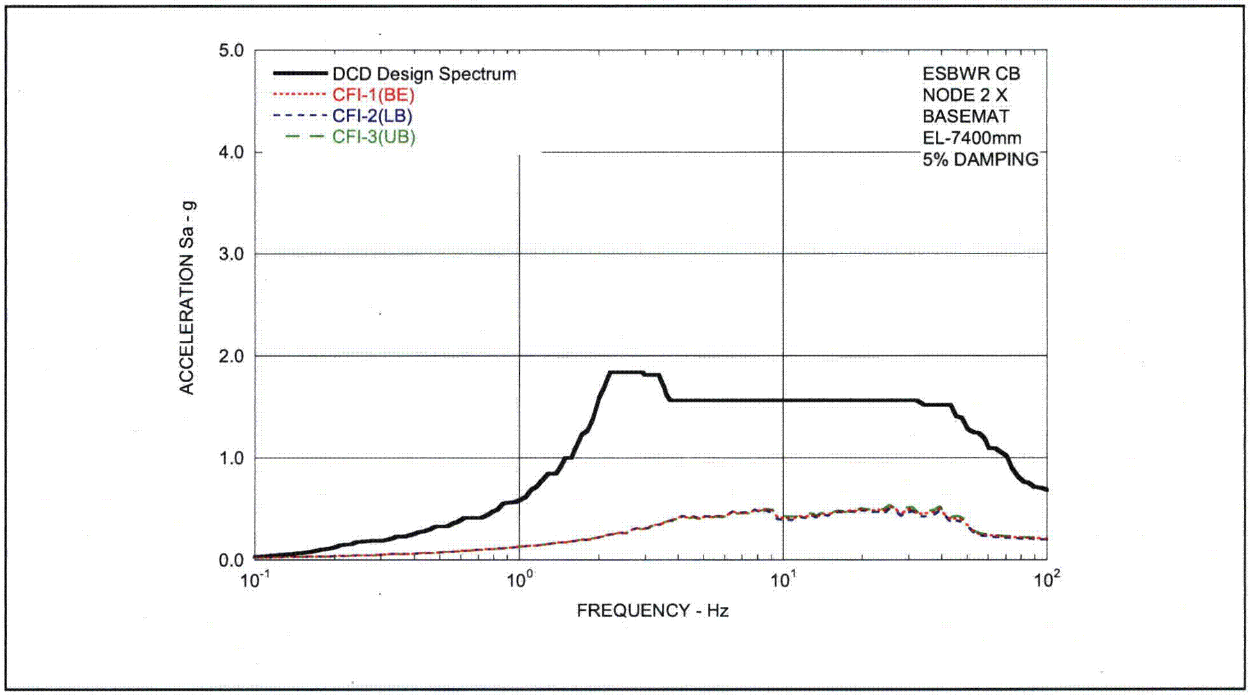


Figure 5.1-4b Comparison of Floor Response Spectra - CB Basemat in X-Direction

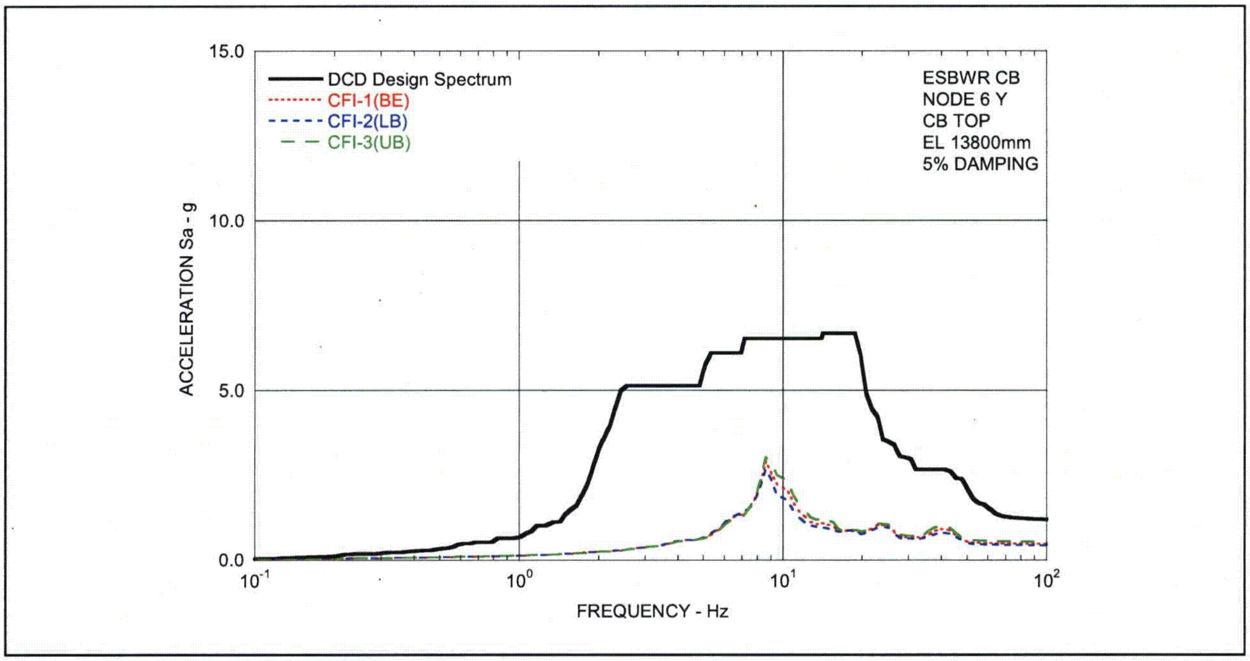


Figure 5.1-5a Comparison of Floor Response Spectra - CB Top in Y-Direction

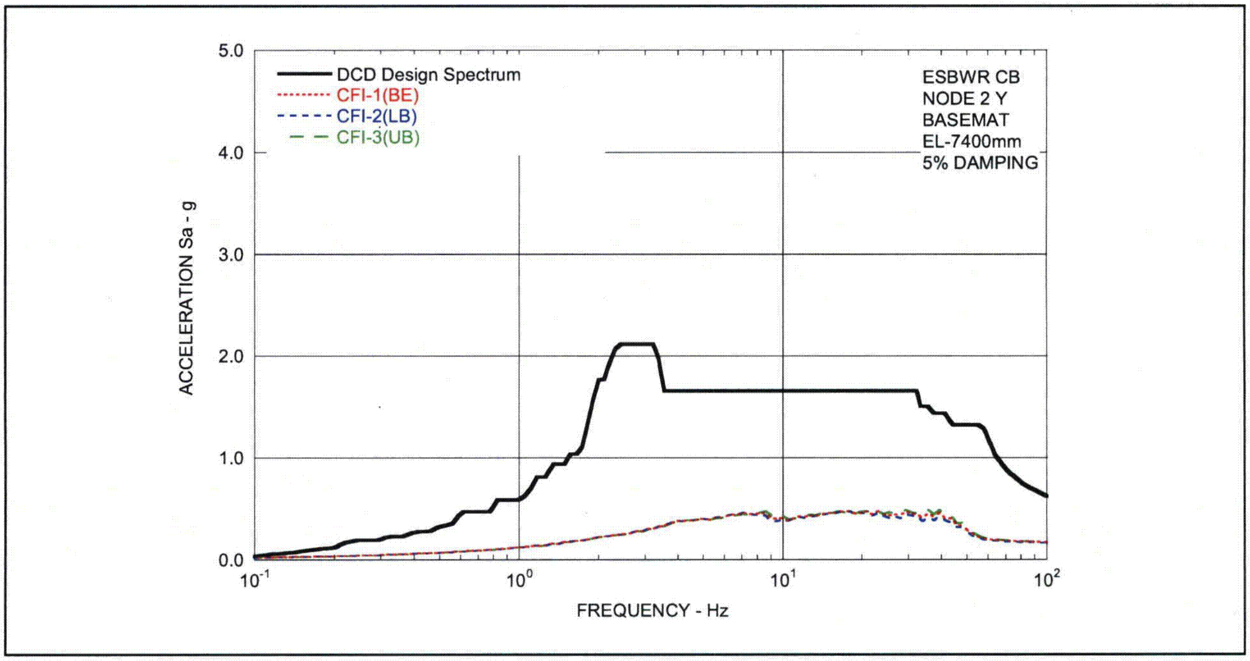


Figure 5.1-5b Comparison of Floor Response Spectra - CB Basemat in Y-Direction

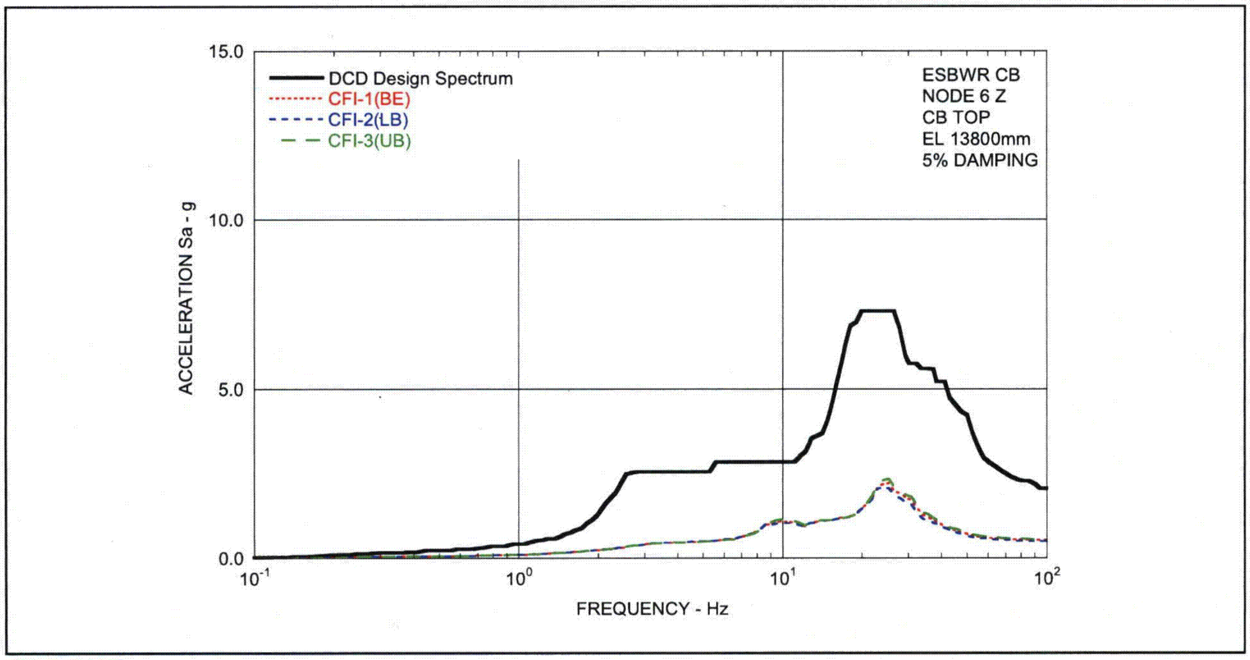


Figure 5.1-6a Comparison of Floor Response Spectra - CB Top in Z-Direction

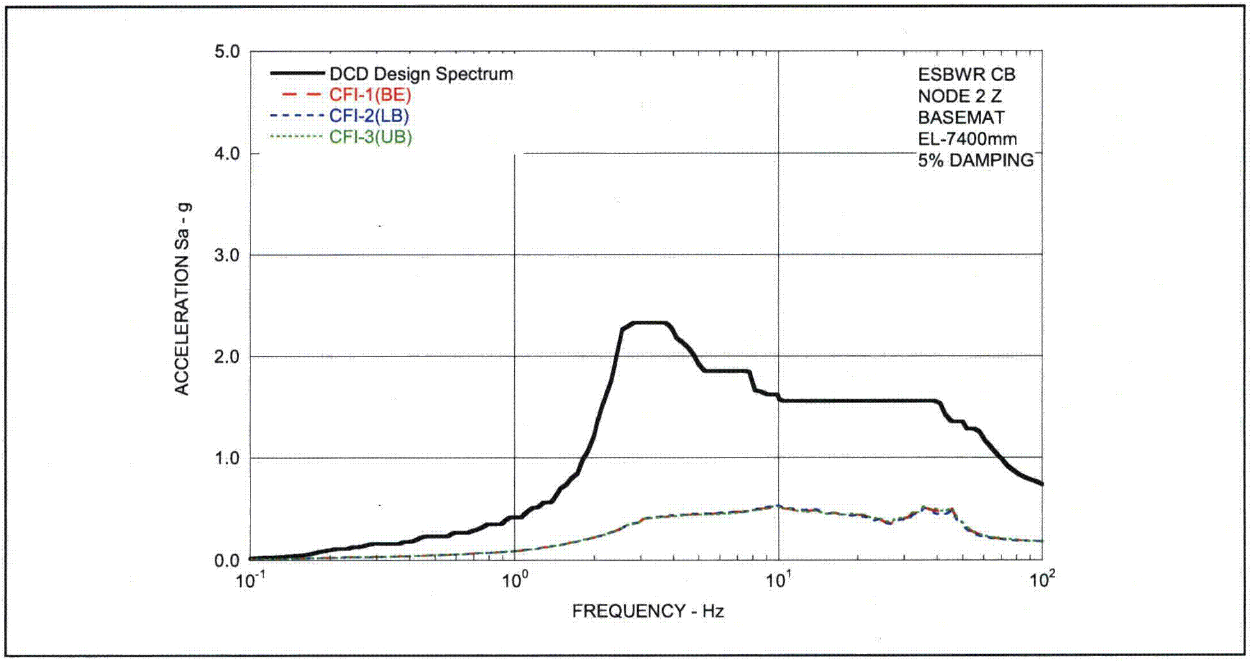
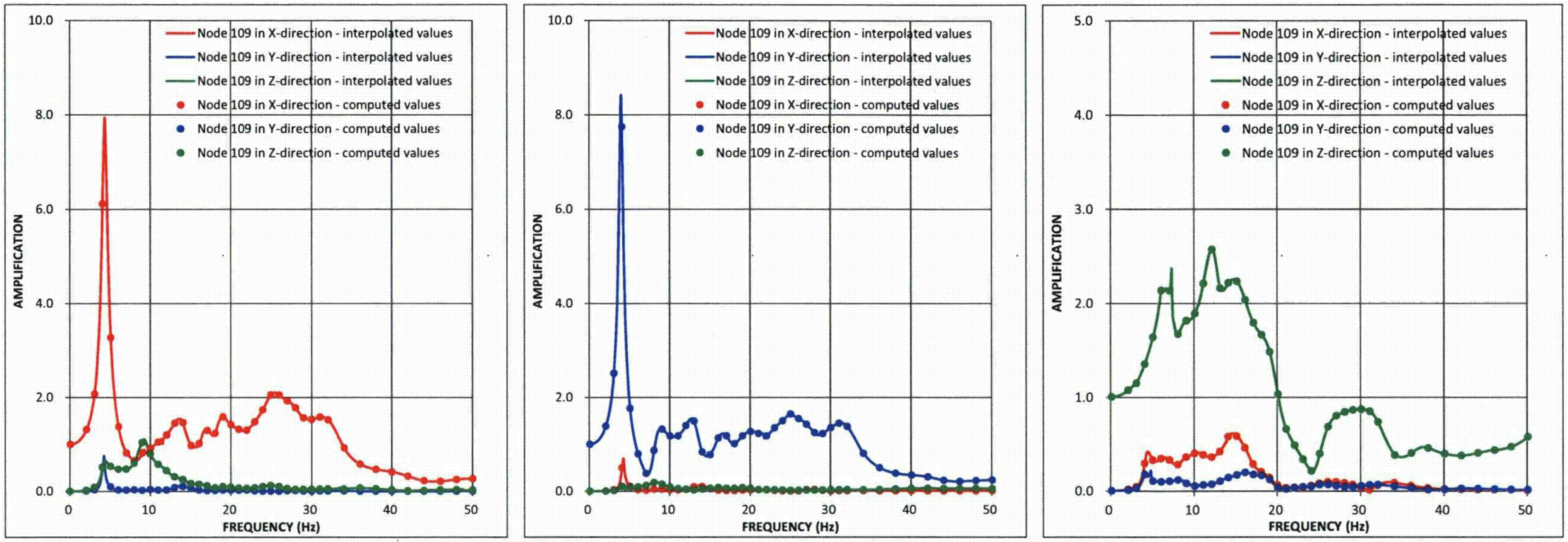
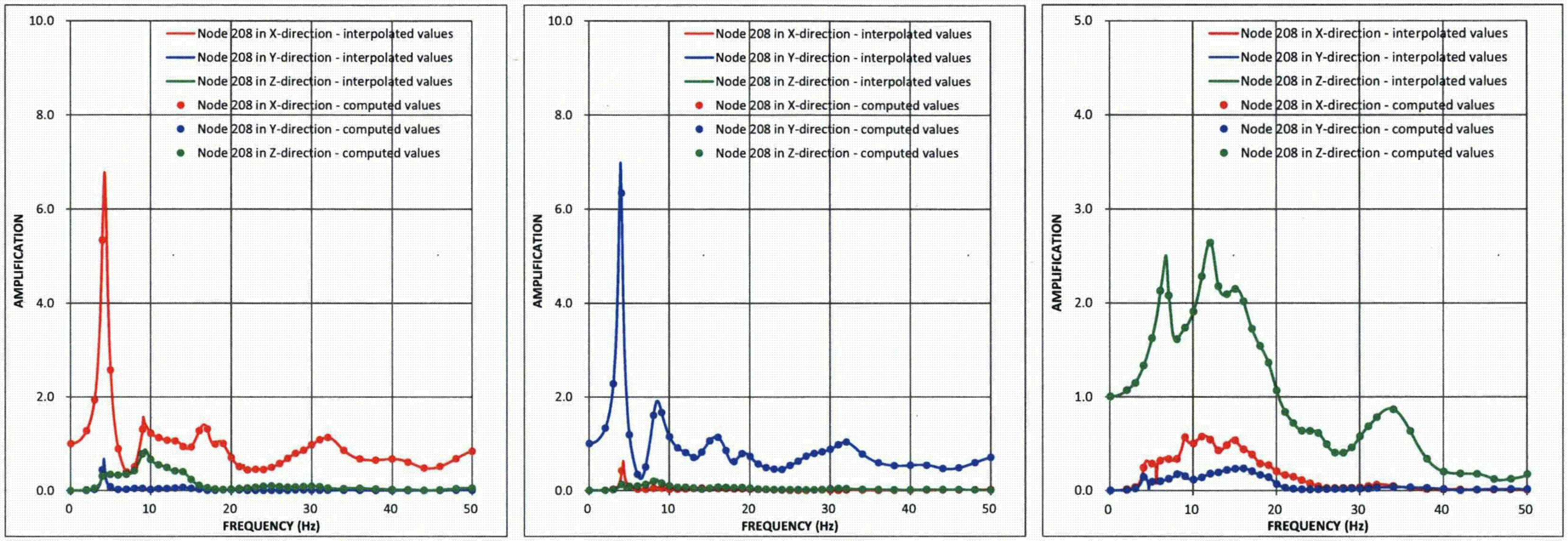


Figure 5.1-6b Comparison of Floor Response Spectra - CB Basemat in -Z-Direction



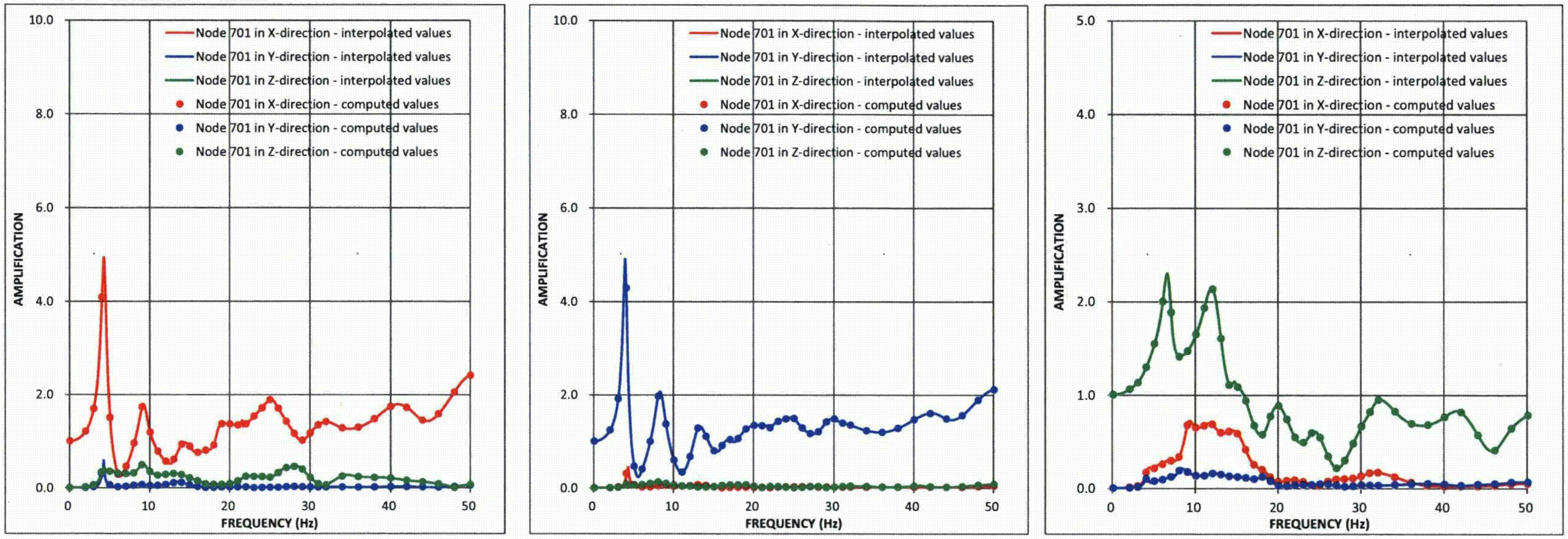
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.2-1a Transfer functions – RB/FB Refueling Floor at Best Estimate Subsurface Profile



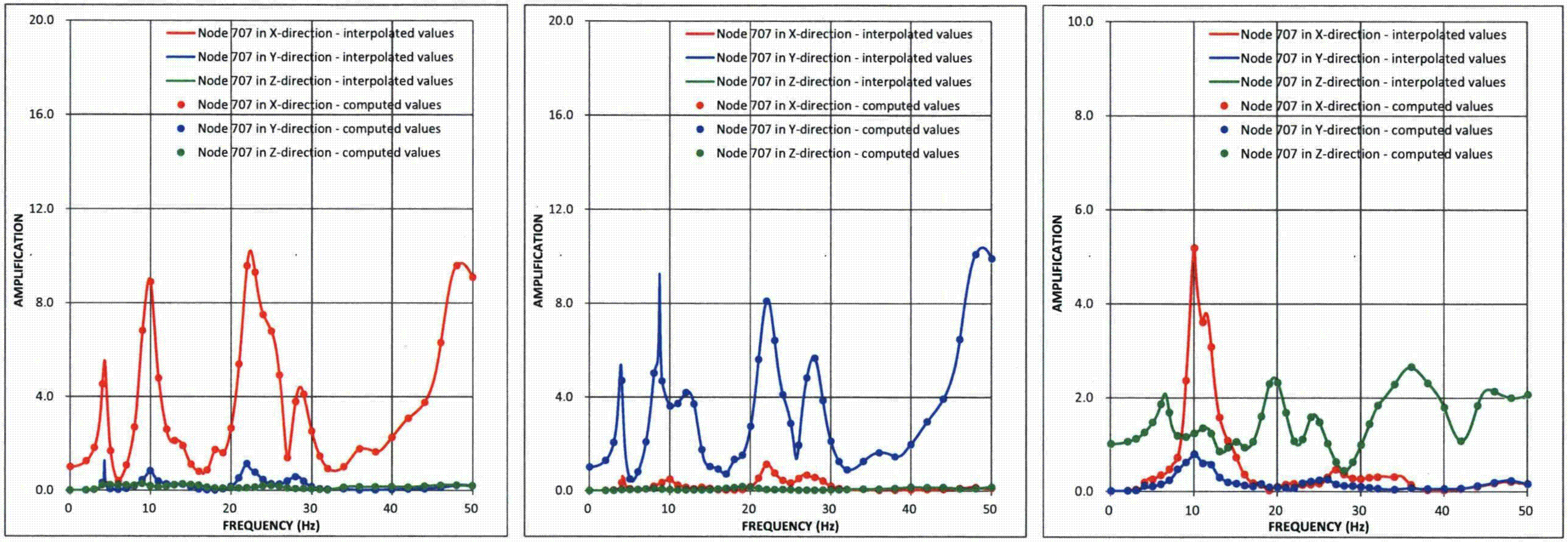
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-1b Transfer functions – RCCV Top Slab at Best Estimate Subsurface Profile



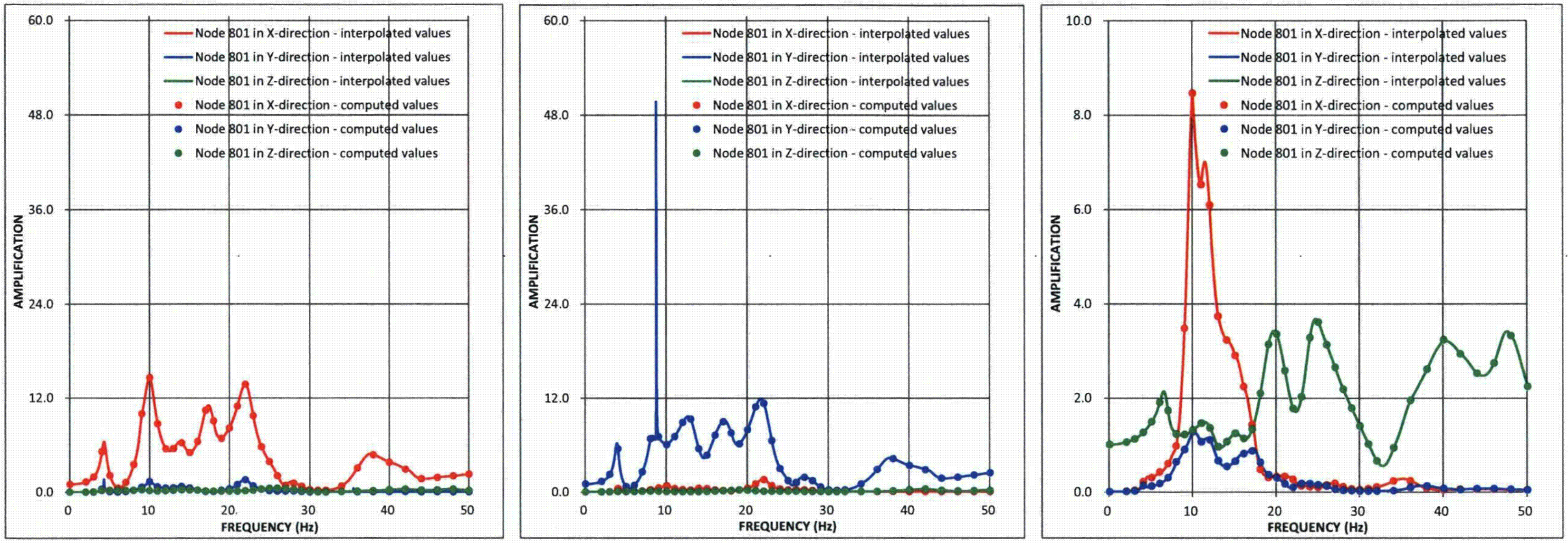
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-1c Transfer functions – Vent Wall Top at Best Estimate Subsurface Profile



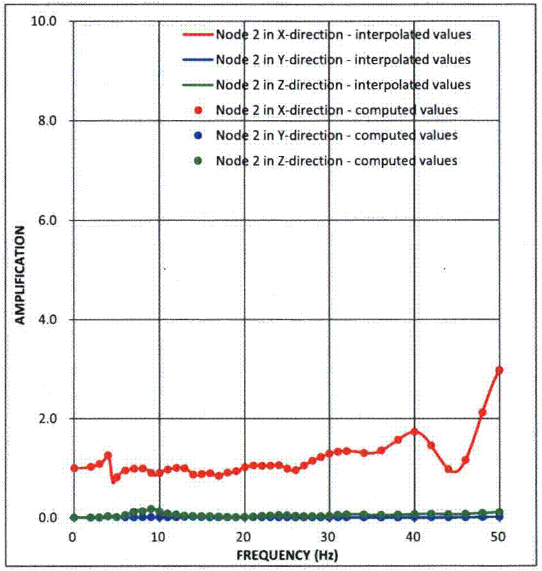
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-1d Transfer functions – RSW Top at Best Estimate Subsurface Profile

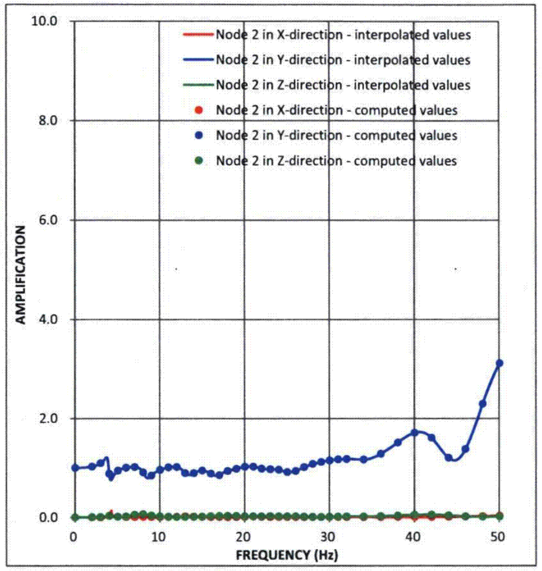


(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

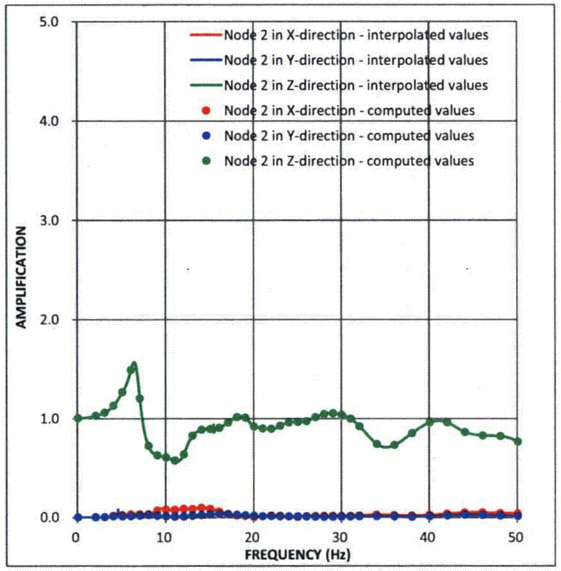
Figure 5.3-1e Transfer functions – RPV Top at Best Estimate Subsurface Profile



(a) X-Direction Input

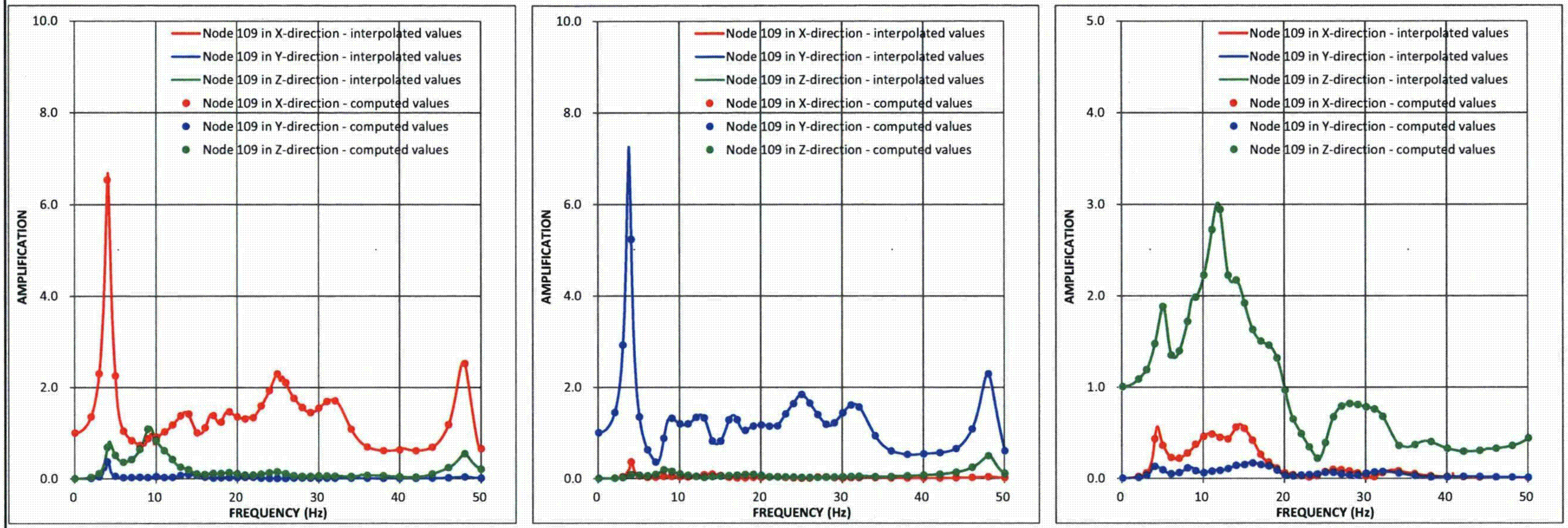


(b) Y-Direction Input



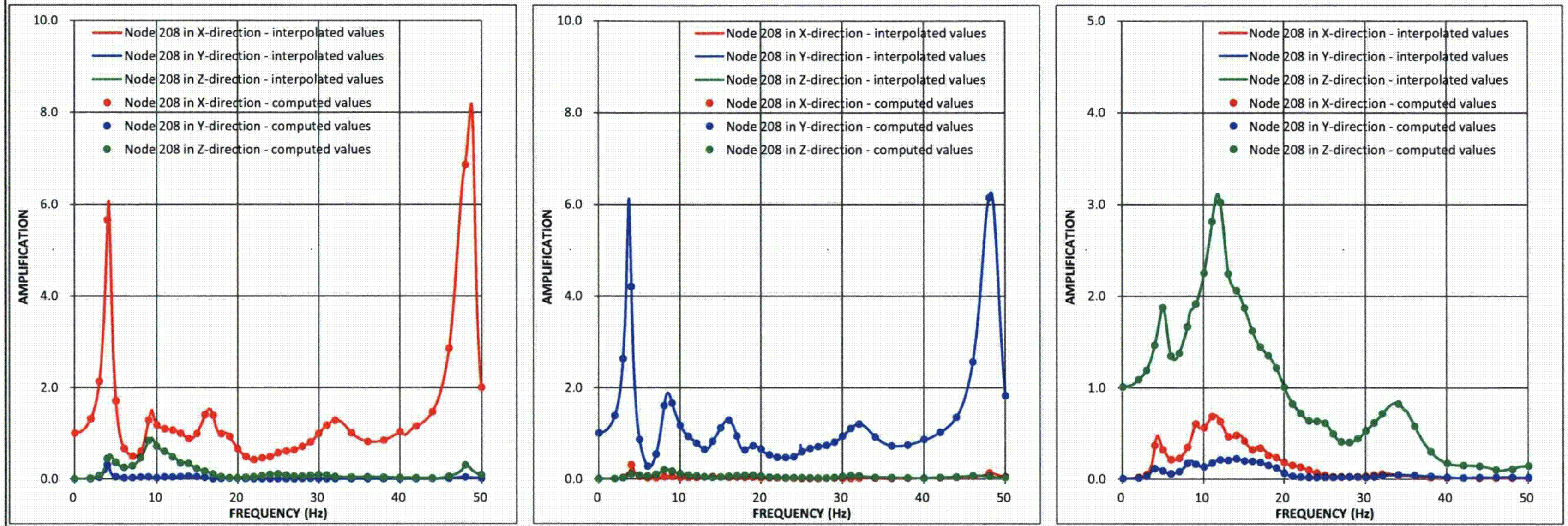
(c) Z-Direction Input

Figure 5.3-1f Transfer functions – RB/FB Basemat at Best Estimate Subsurface Profile



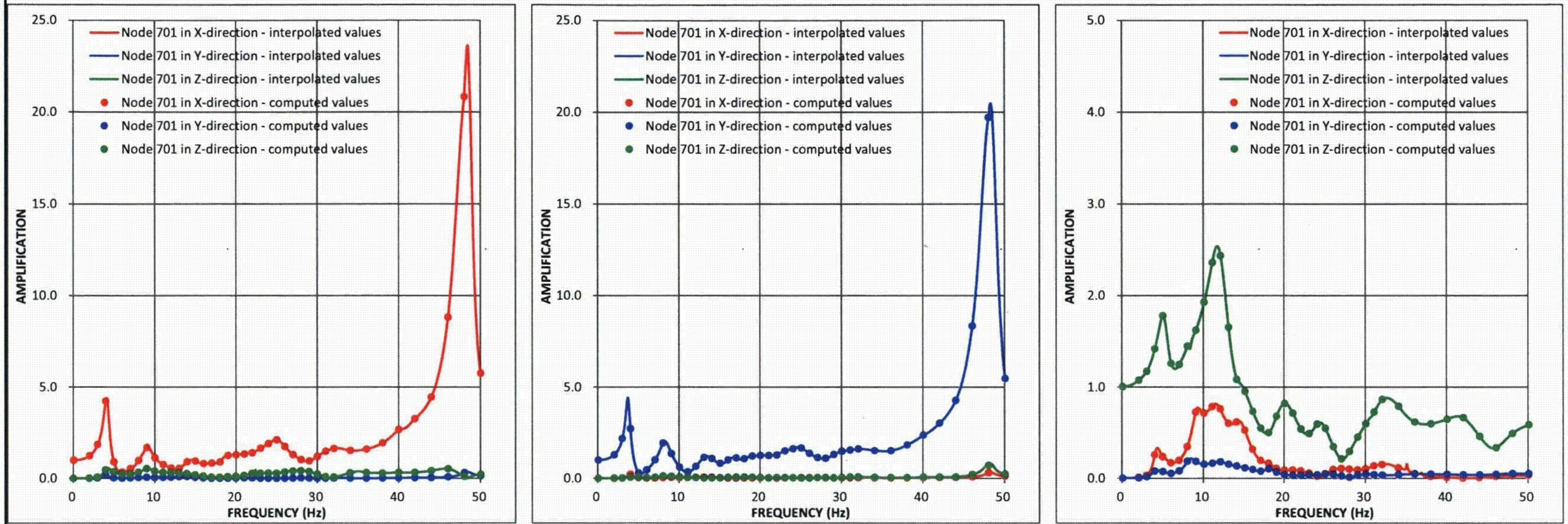
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-2a Transfer functions – RB/FB Refueling Floor at Lower Bound Subsurface Profile



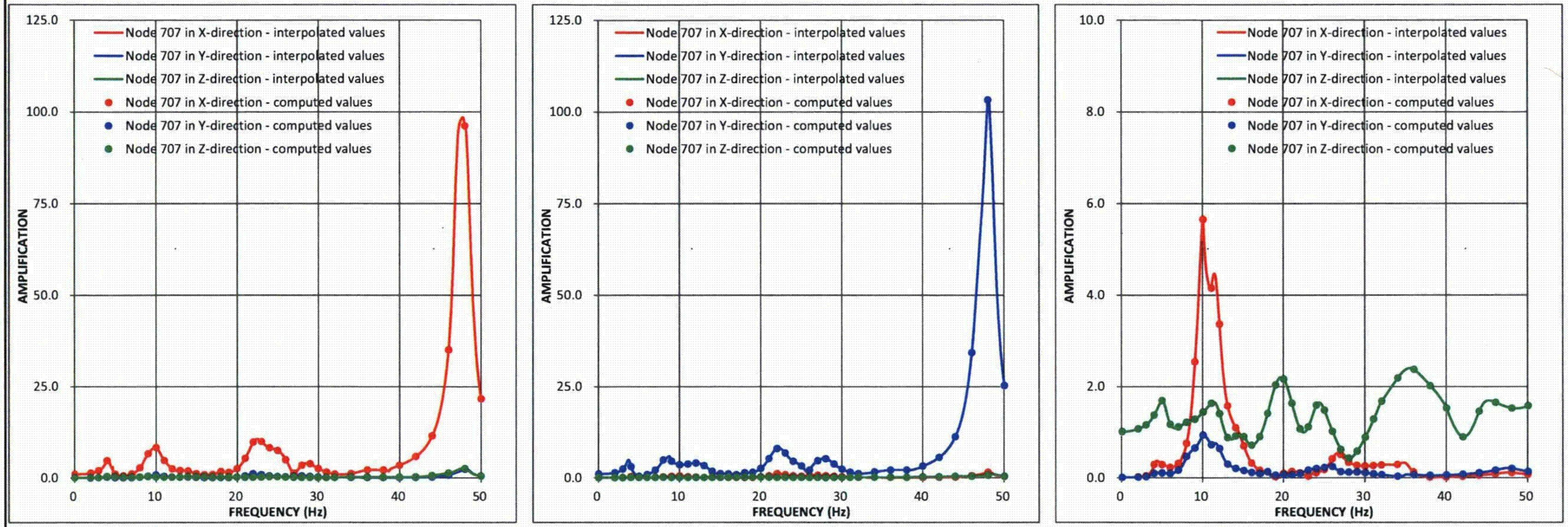
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-2b Transfer functions – RCCV Top Slab at Lower Bound Subsurface Profile



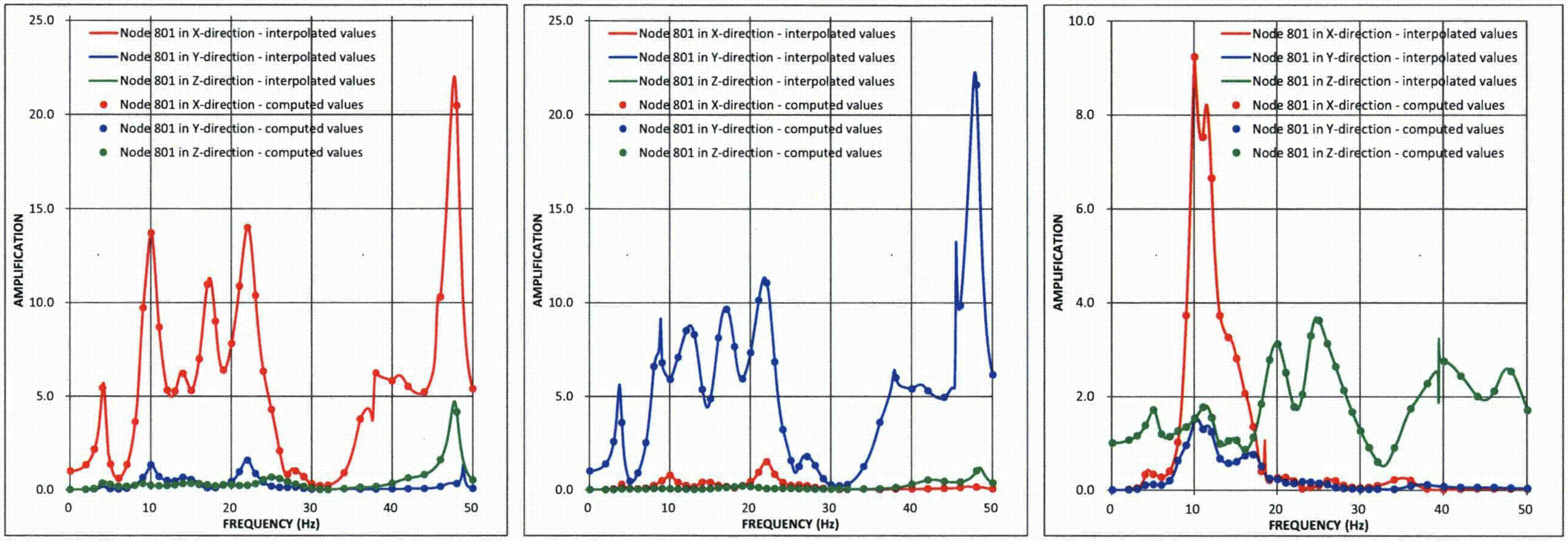
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-2c Transfer functions – Vent Wall Top at Lower Bound Subsurface Profile



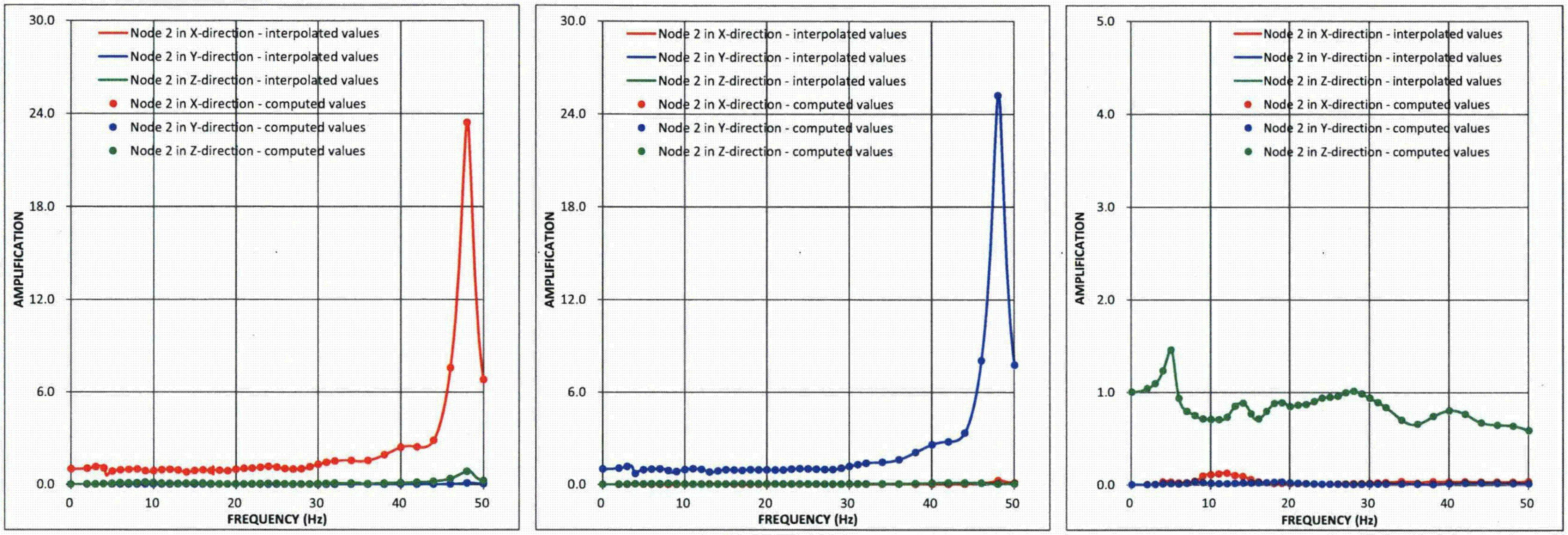
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-2d Transfer functions – RSW Top at Lower Bound Subsurface Profile



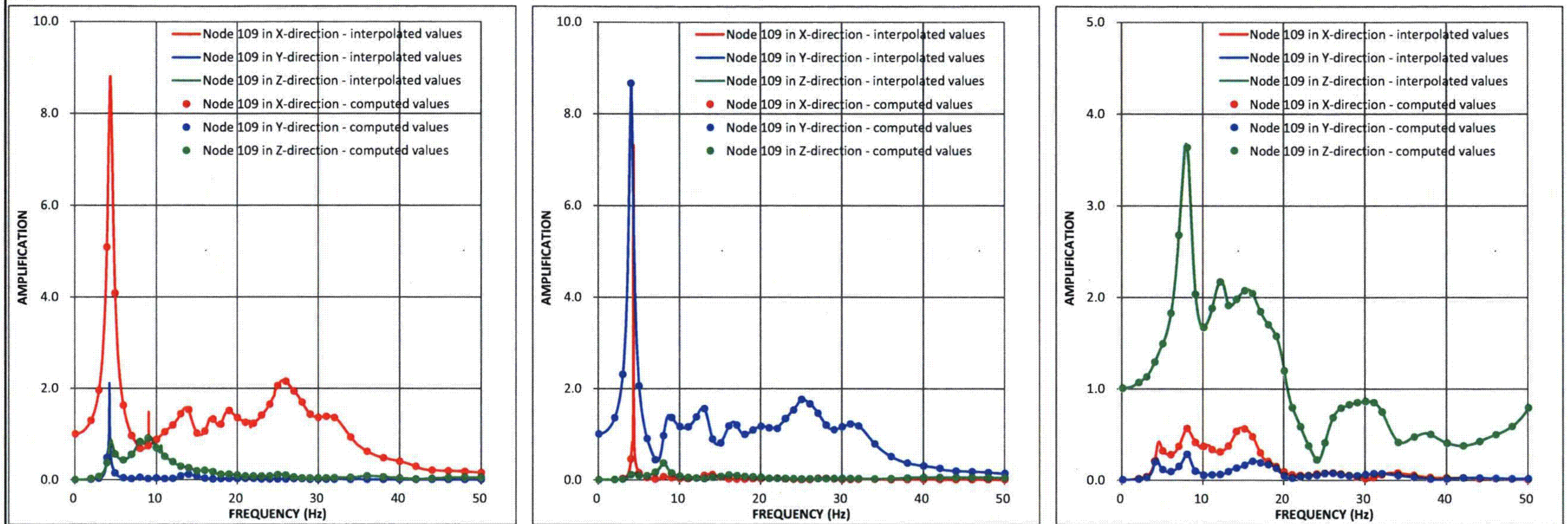
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-2e Transfer functions – RPV Top at Lower Bound Subsurface Profile



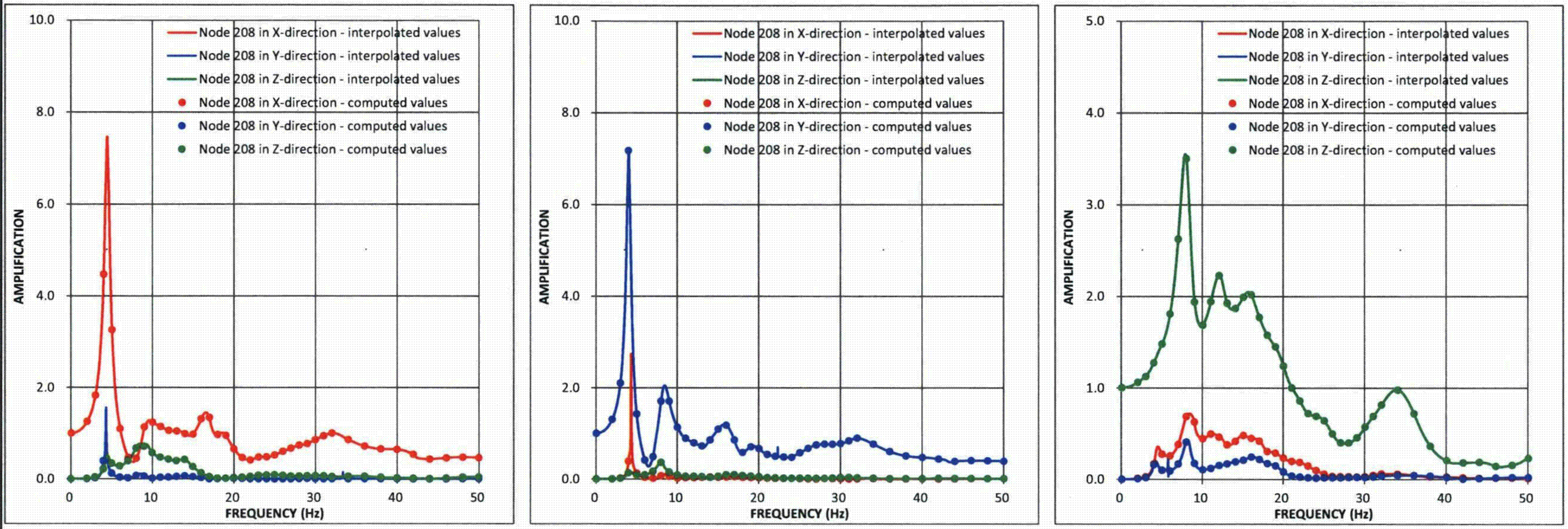
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-2f Transfer functions – RB/FB Basemat at Lower Bound Subsurface Profile



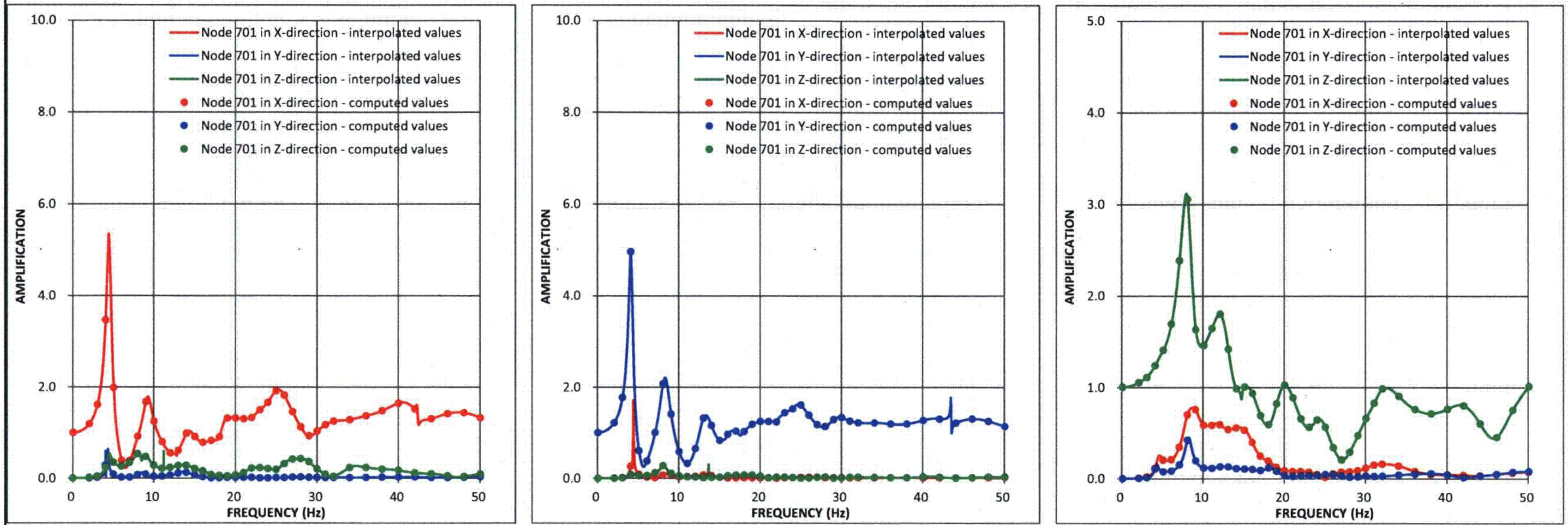
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-3a Transfer functions – RB/FB Refueling Floor at Upper Bound Subsurface Profile



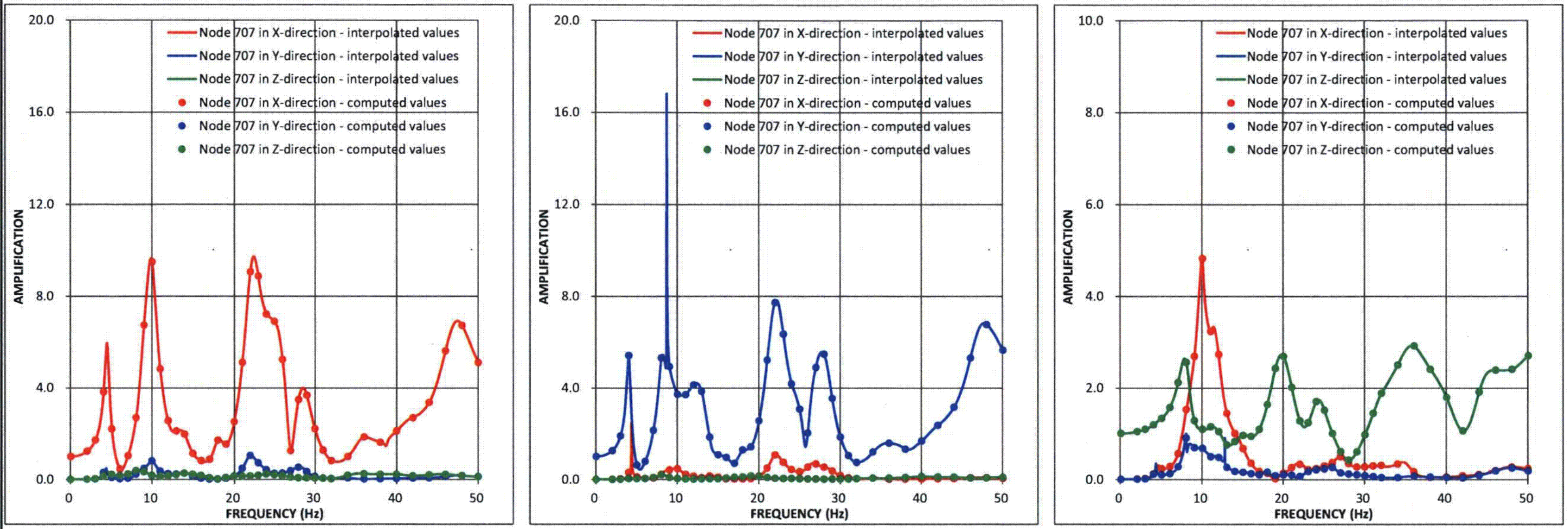
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-3b Transfer functions – RCCV Top Slab at Upper Bound Subsurface Profile



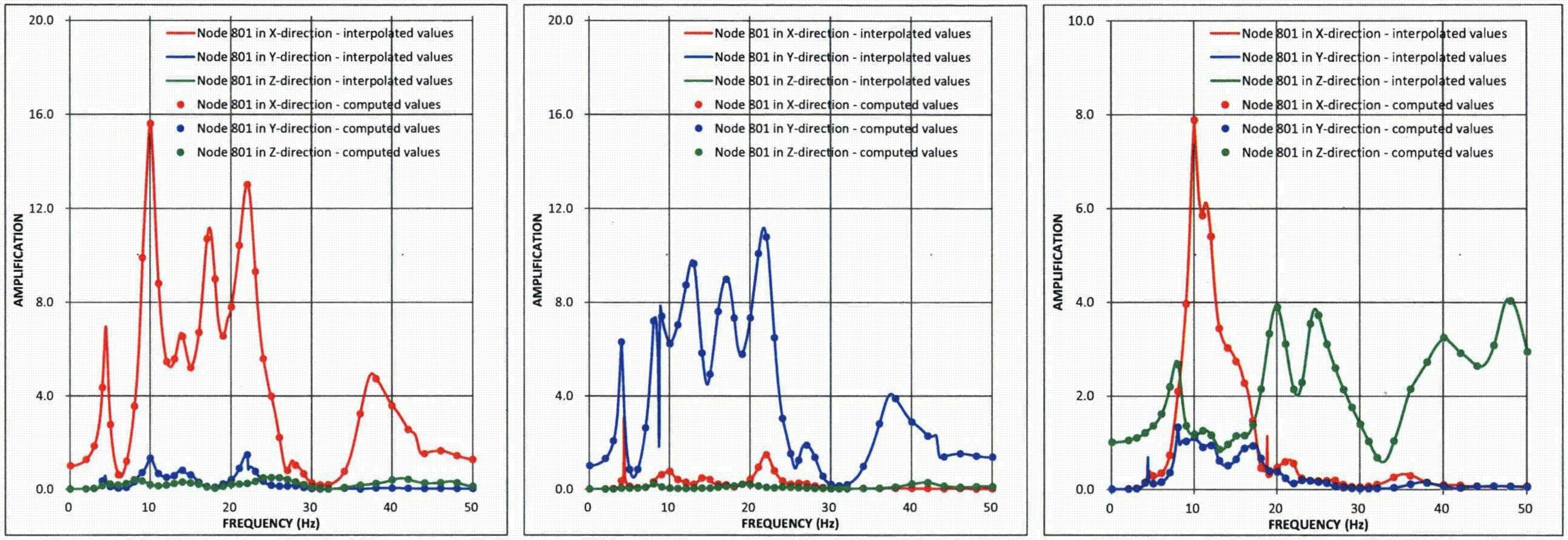
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-3c Transfer functions – Vent Wall Top at Upper Bound Subsurface Profile



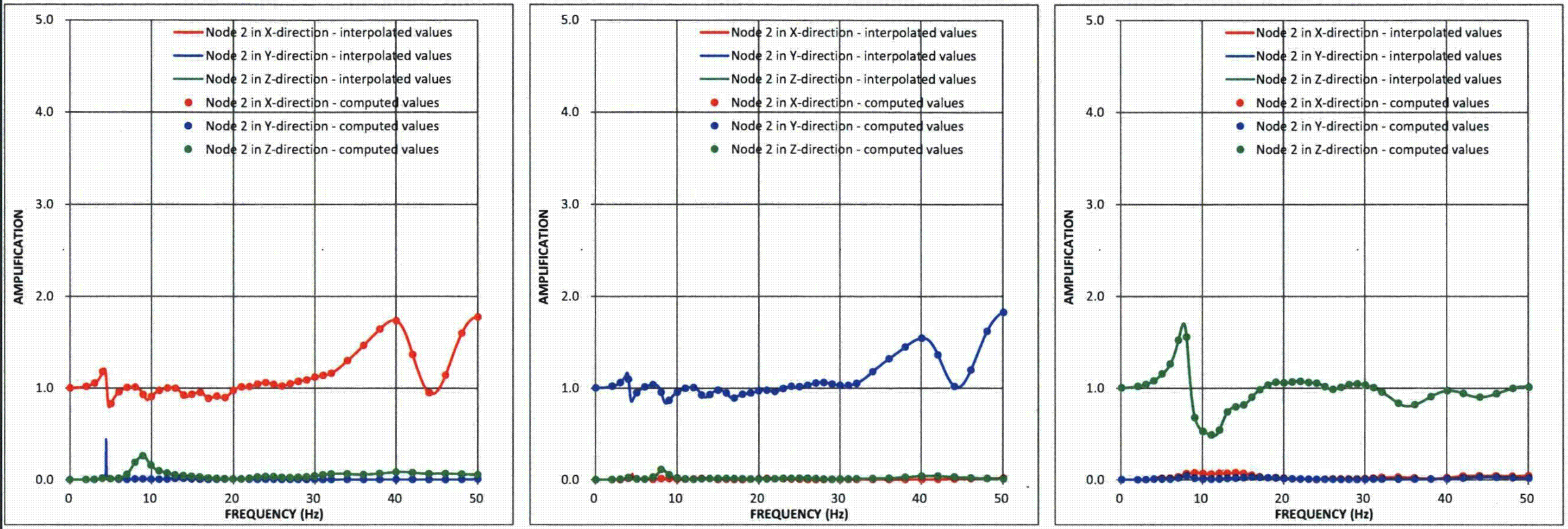
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-3d Transfer functions – RSW Top at Upper Bound Subsurface Profile



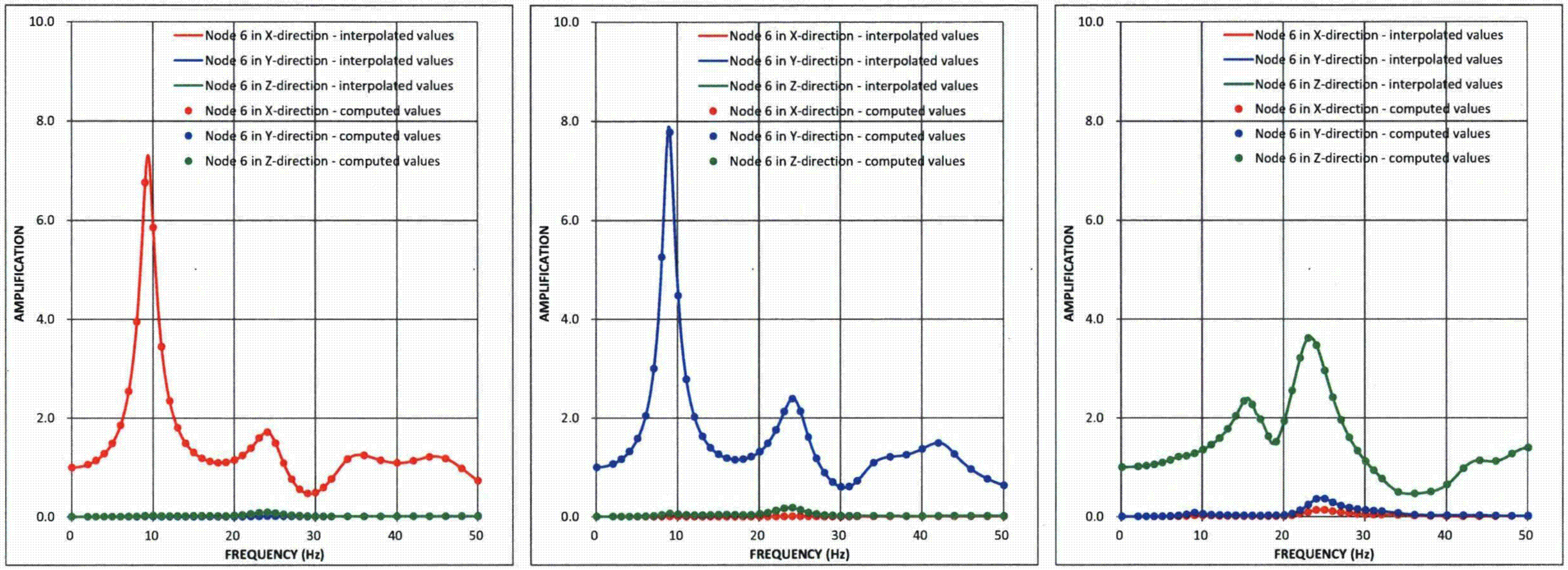
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-3e Transfer functions – RPV Top at Upper Bound Subsurface Profile



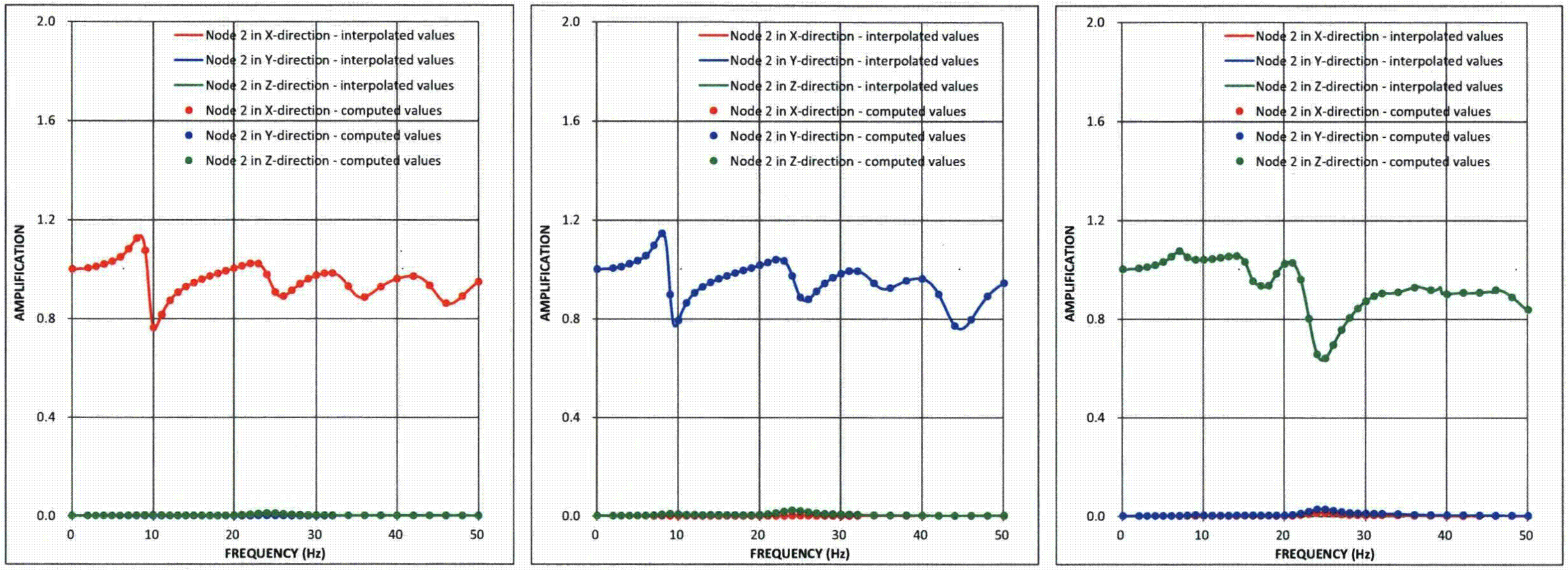
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-3f Transfer functions – RB/FB Basemat at Upper Bound Subsurface Profile



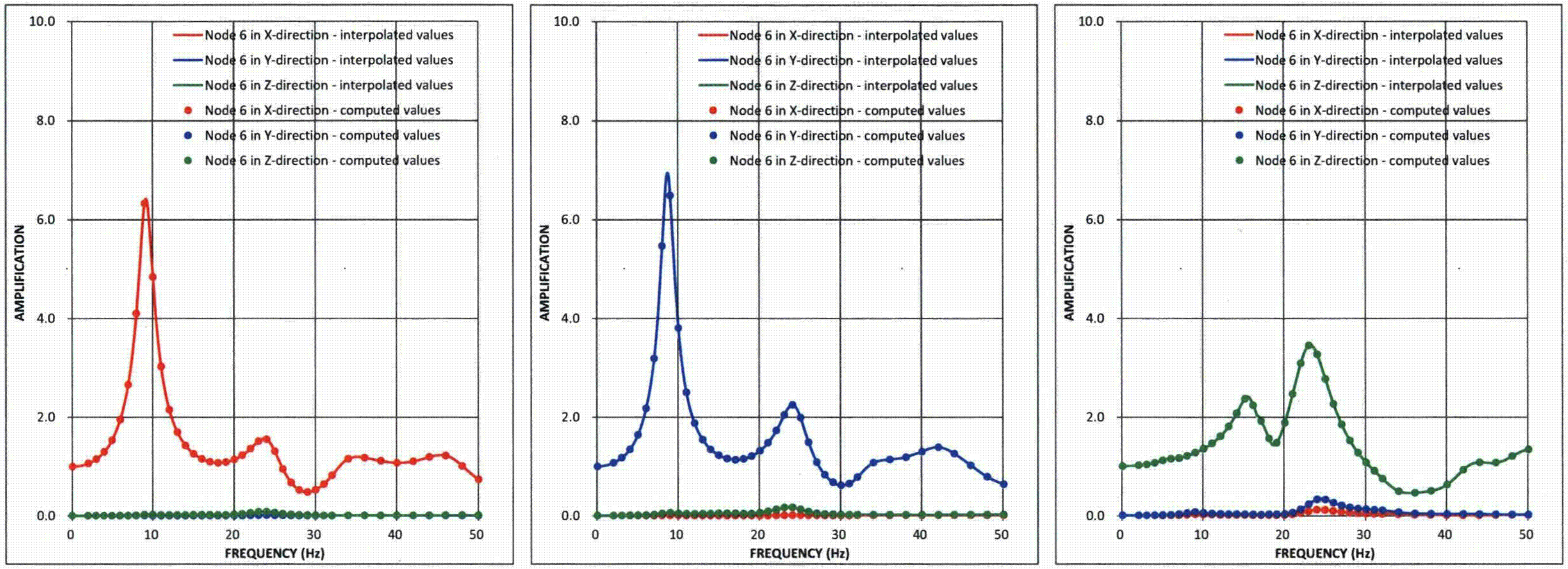
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-4a Transfer functions - CB Top at Best Estimate Subsurface Profile



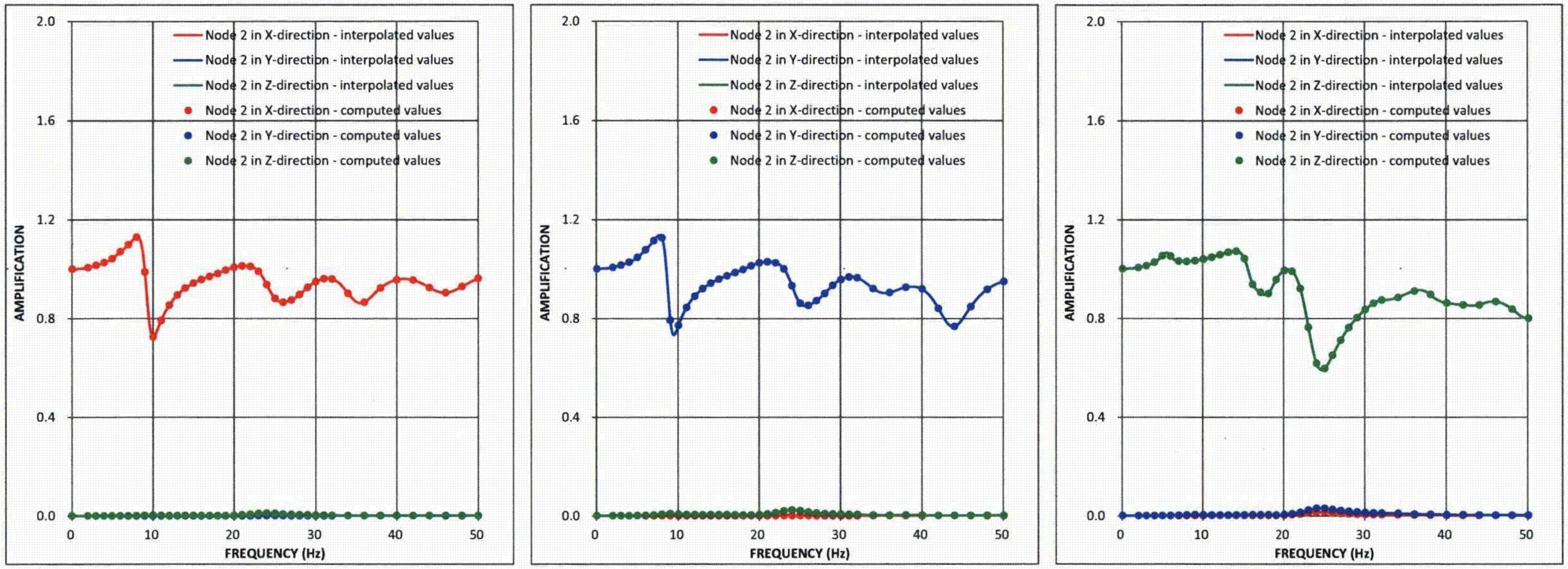
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-4b Transfer functions - CB Basemat at Best Estimate Subsurface Profile



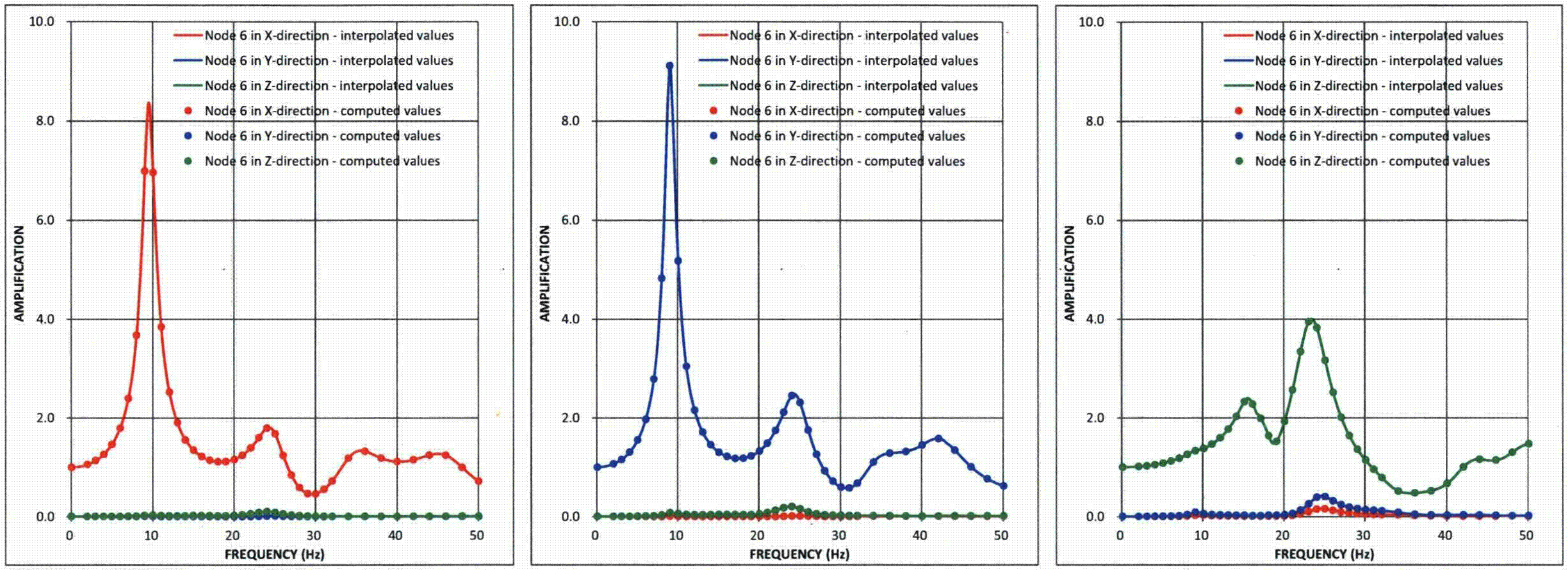
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-5a Transfer functions - CB Top at Lower Bound Subsurface Profile



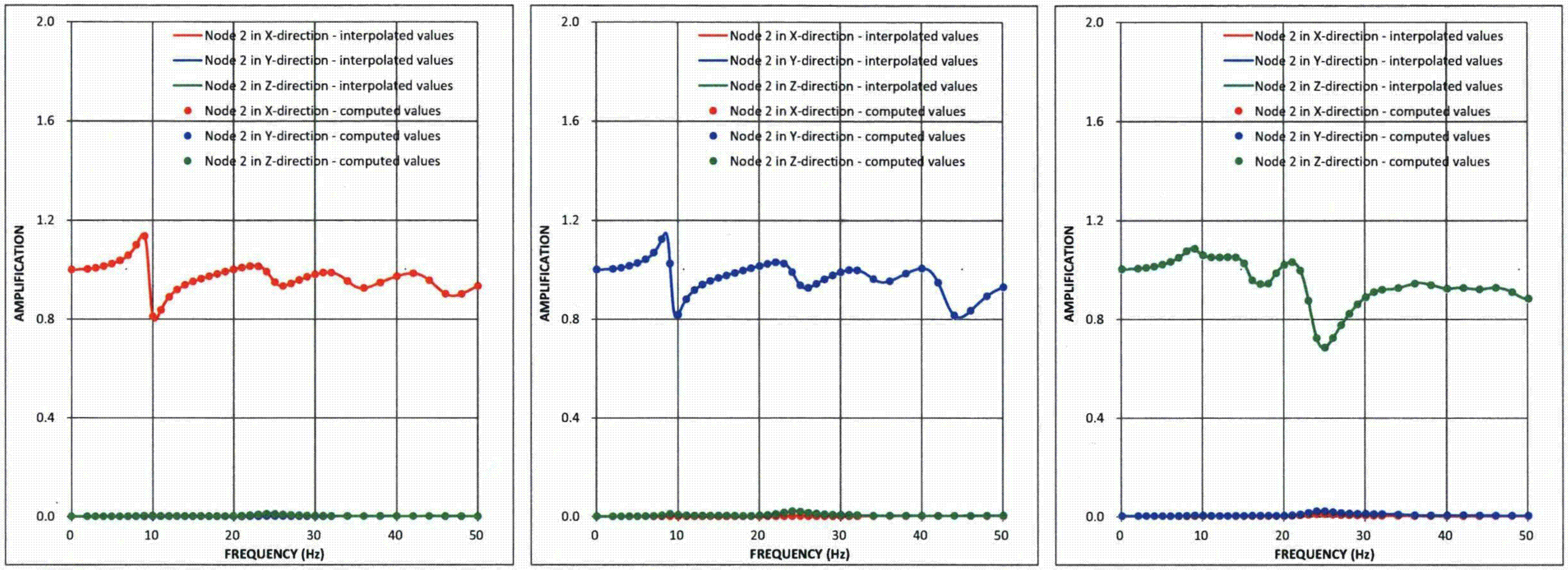
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-5b Transfer functions - CB Basemat at Lower Bound Subsurface Profile



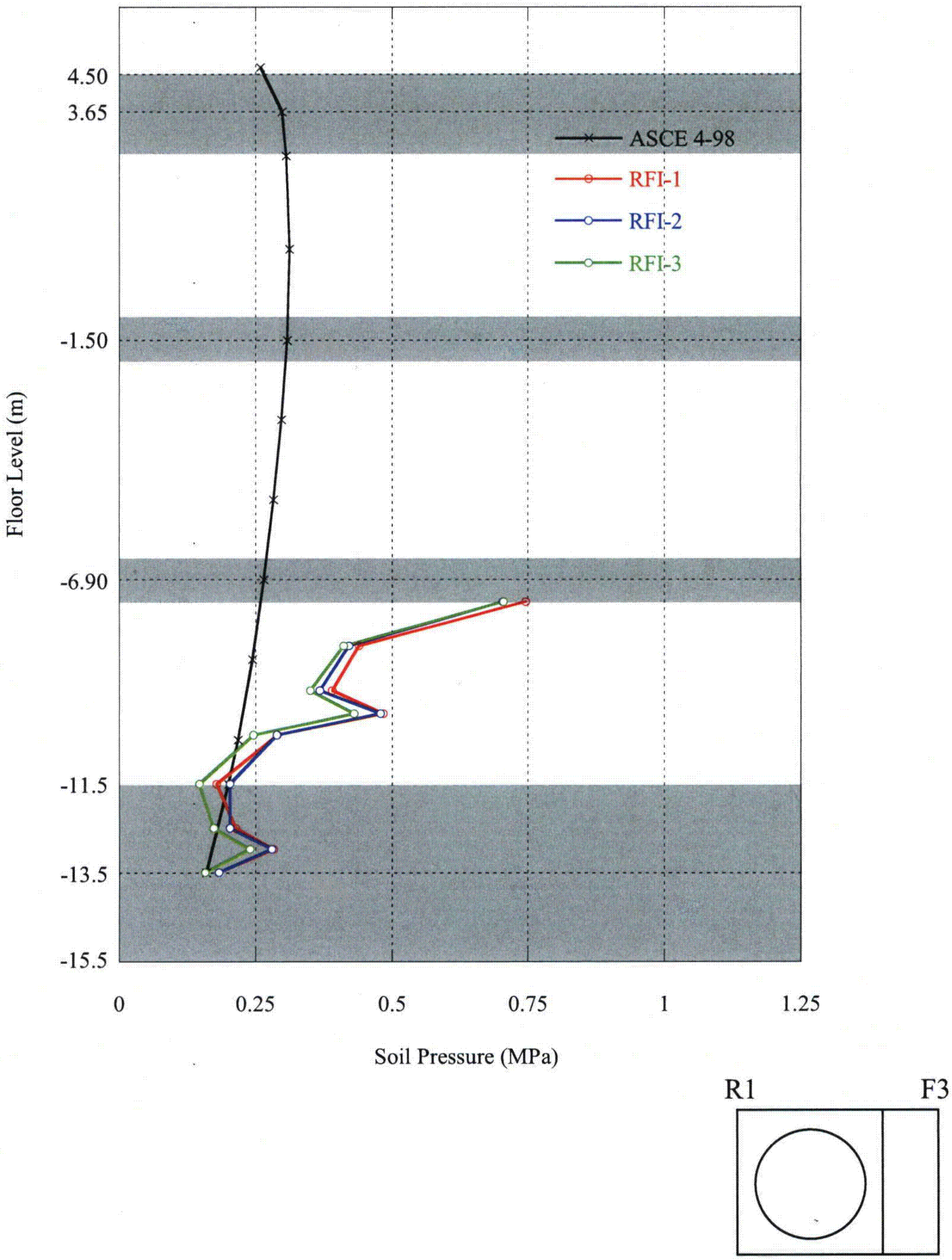
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-6a Transfer functions - CB Top at Upper Bound Subsurface Profile



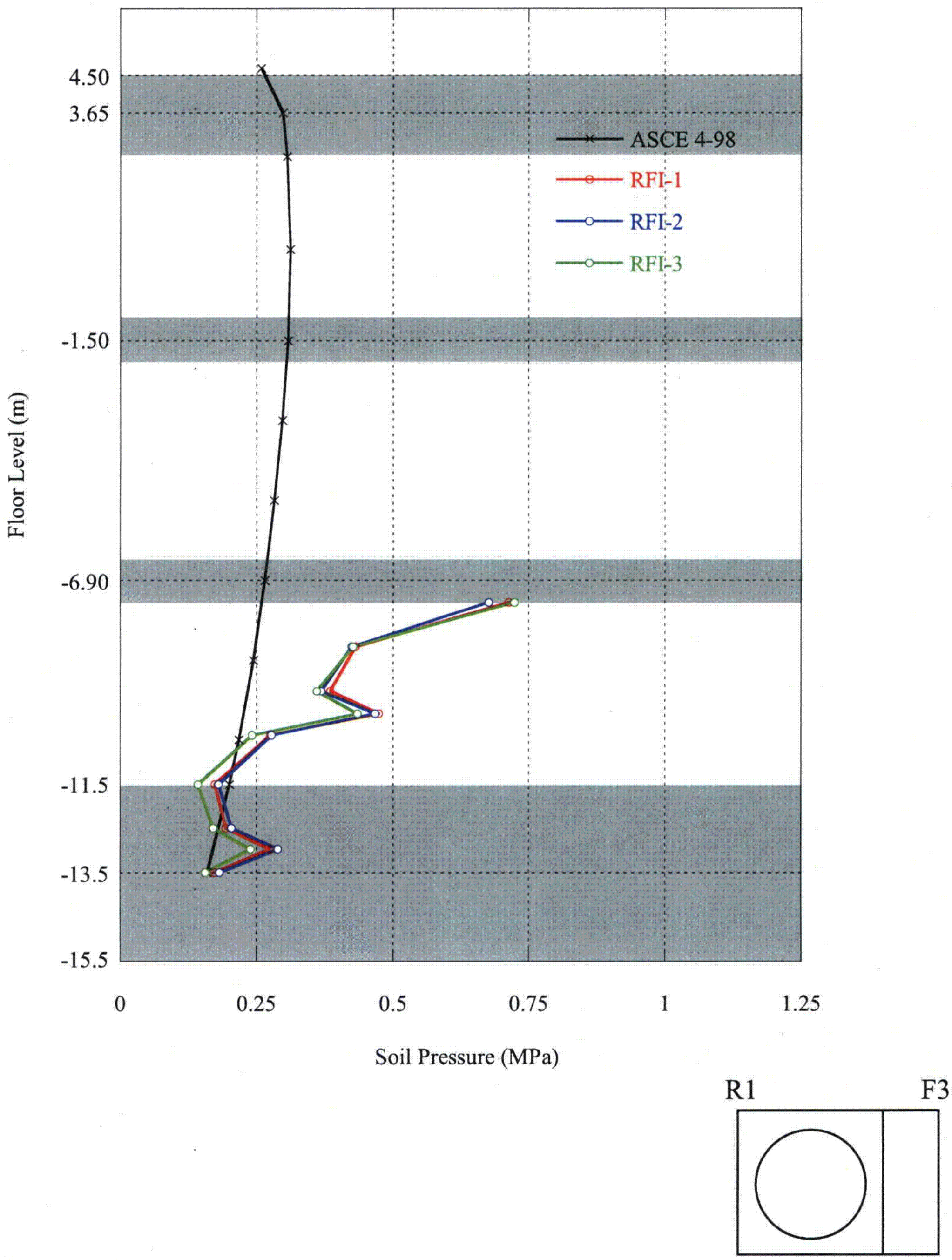
(a) X-Direction Input (b) Y-Direction Input (c) Z-Direction Input

Figure 5.3-6b Transfer functions - CB Basemat at Upper Bound Subsurface Profile



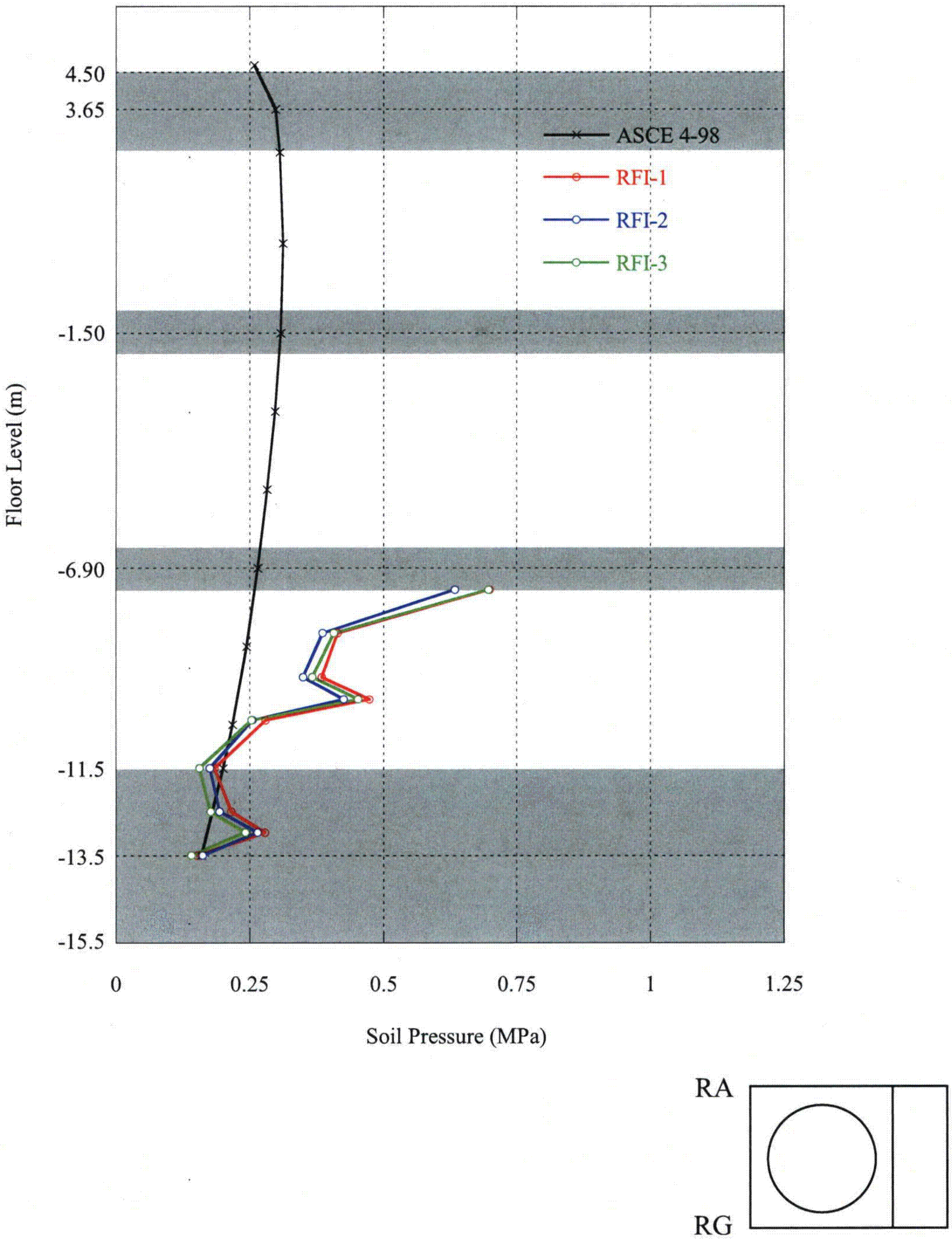
Note: The shaded area shows thickness of the floor slabs and basemat.

Figure 5.4-1a Lateral Soil Pressure - RB/FB R1 Wall



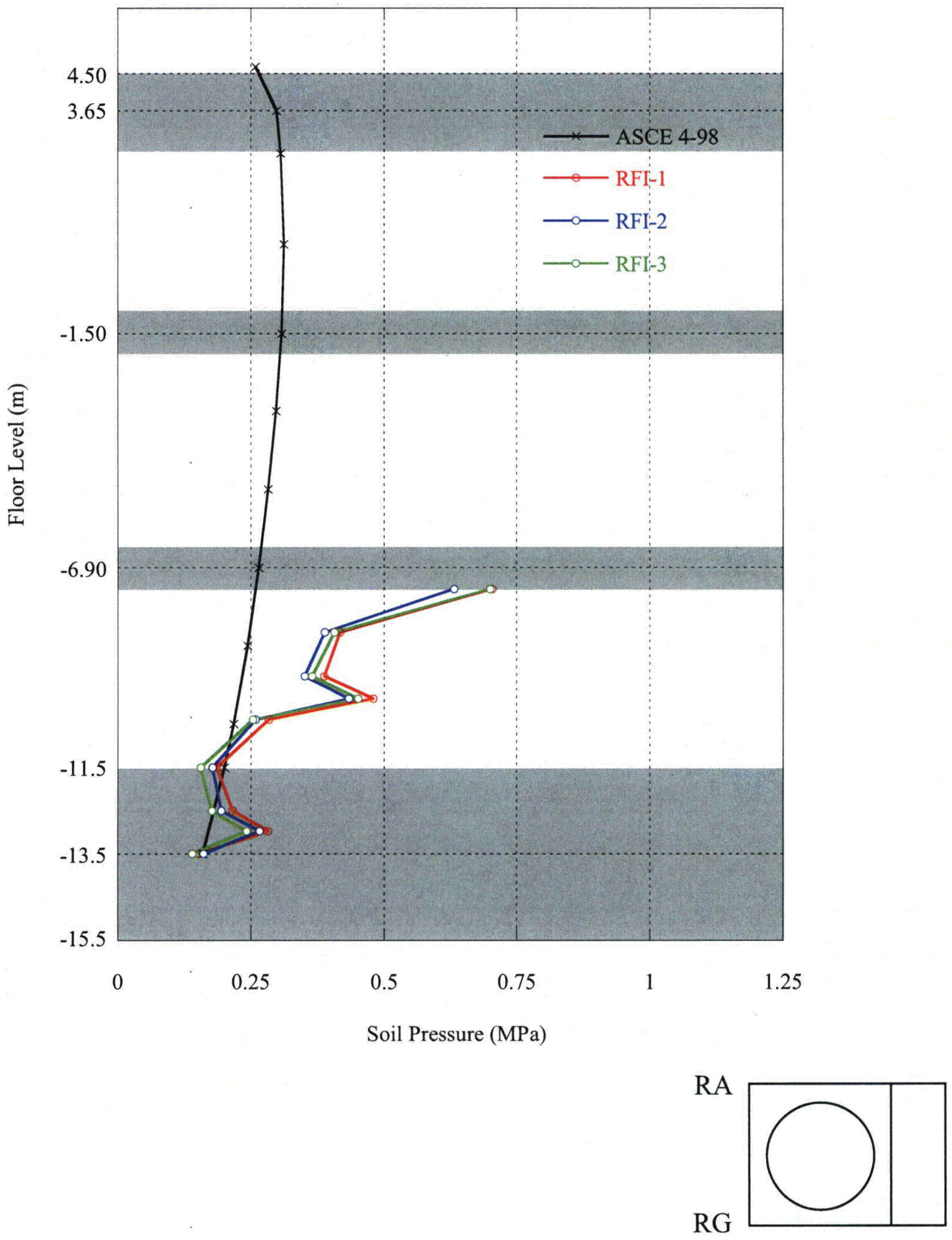
Note: The shaded area shows thickness of the floor slabs and basemat.

Figure 5.4-1b Lateral Soil Pressure - RB/FB F3 Wall



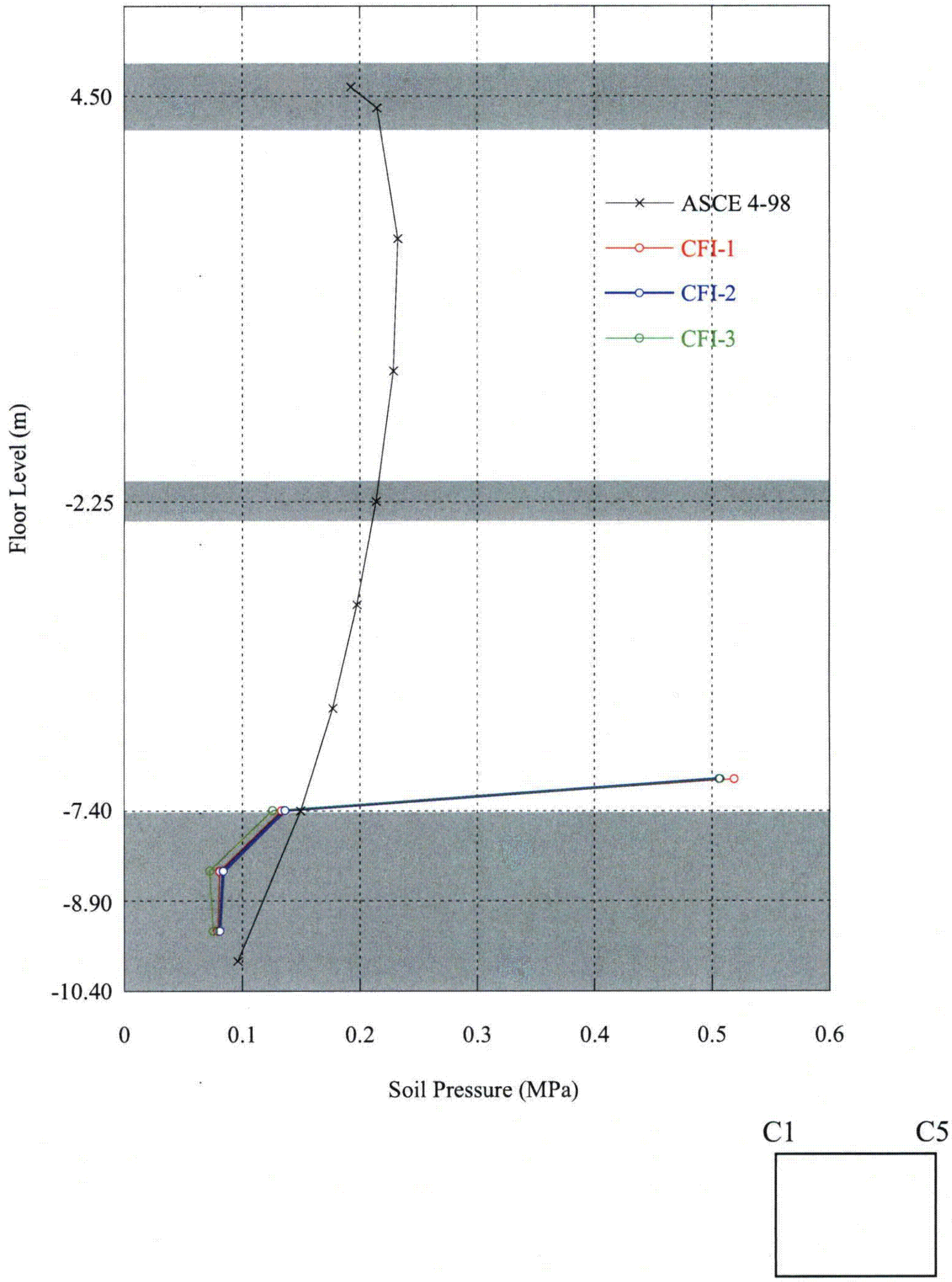
Note: The shaded area shows thickness of the floor slabs and basemat.

Figure 5.4-1c Lateral Soil Pressure - RB/FB RA Wall



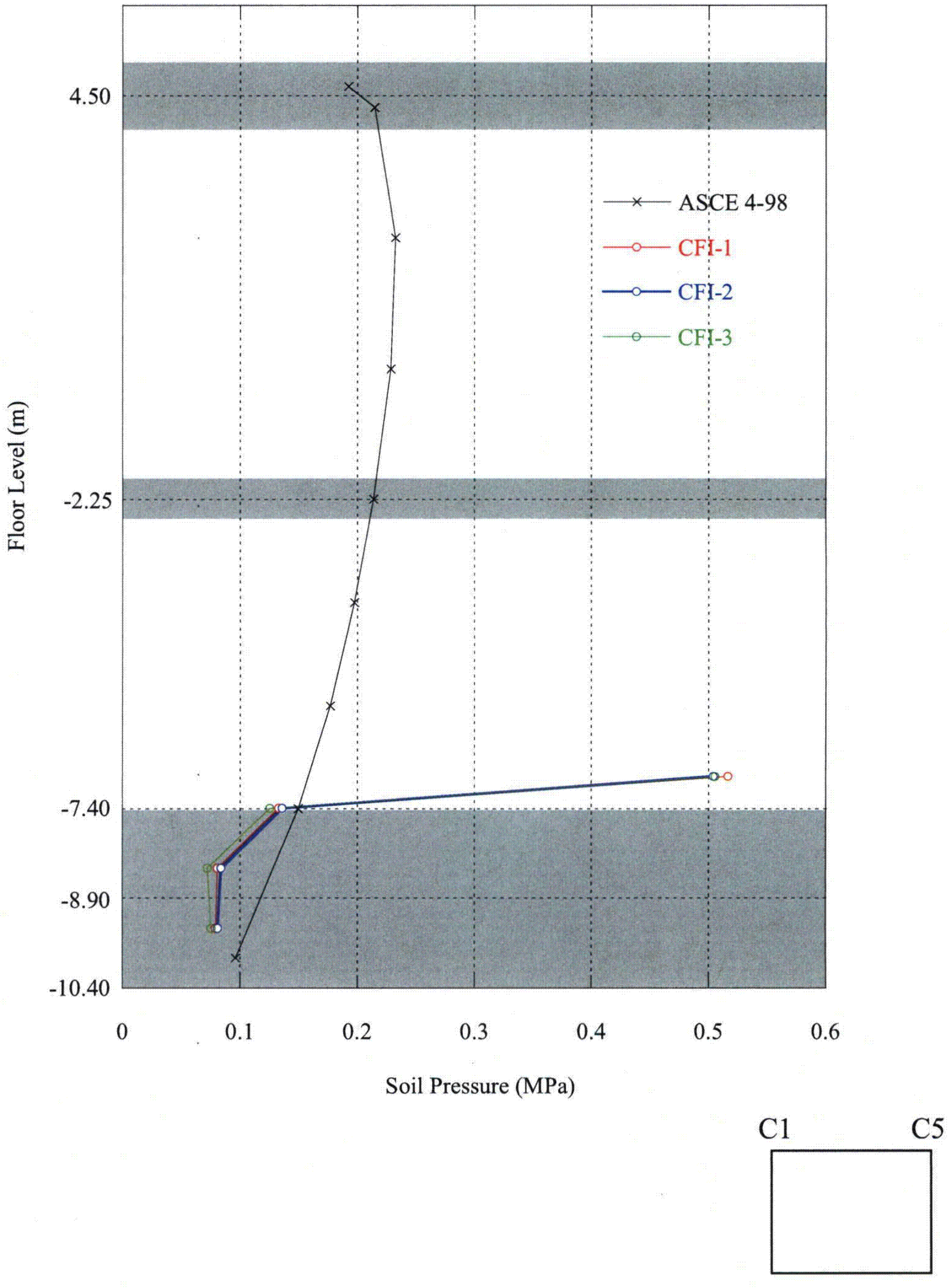
Note: The shaded area shows thickness of the floor slabs and basemat.

Figure 5.4-1d Lateral Soil Pressure - RB/FB RG Wall



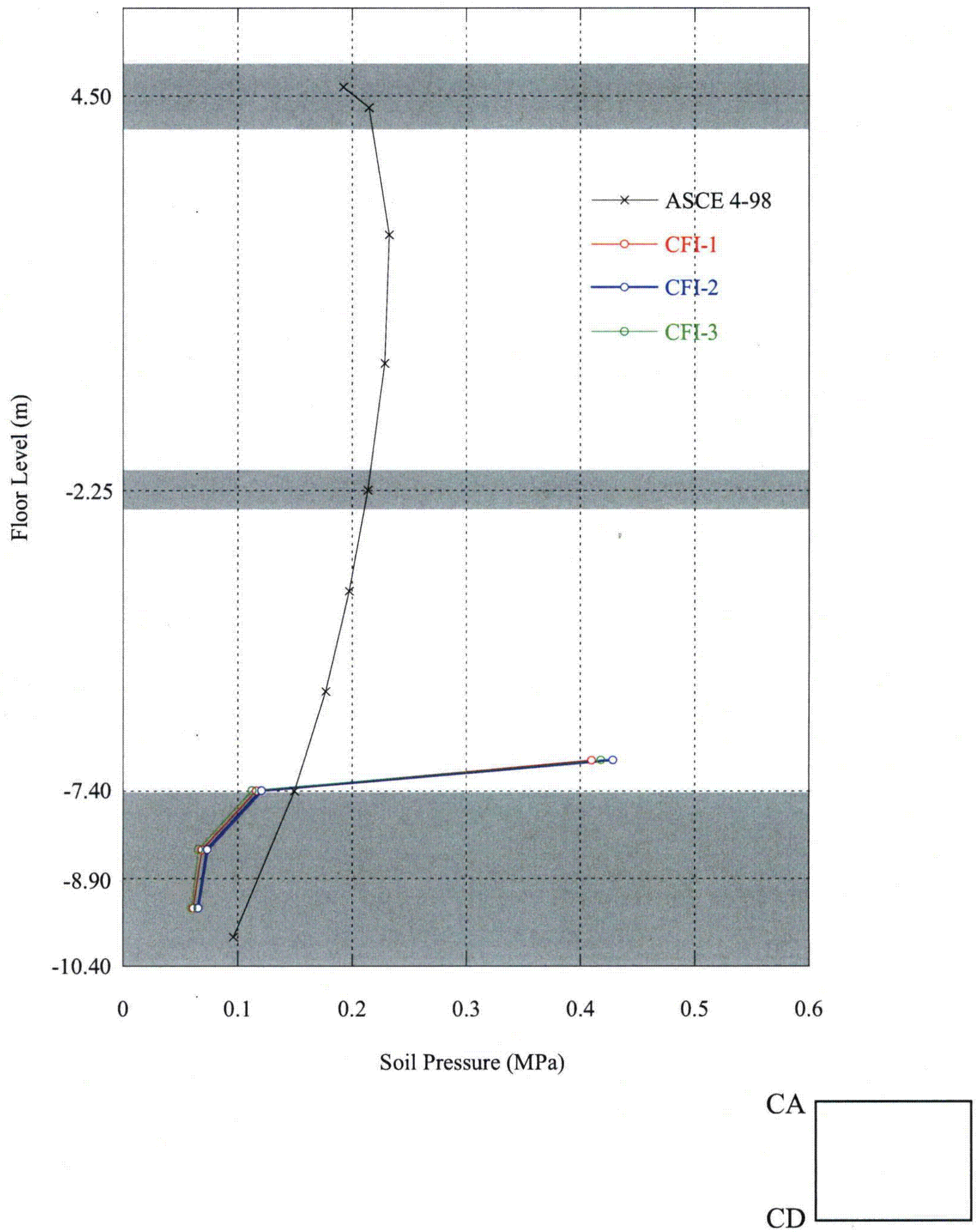
Note: The shaded area shows thickness of the floor slabs and basemat.

Figure 5.4-2a Lateral Soil Pressure - CB C1 Wall



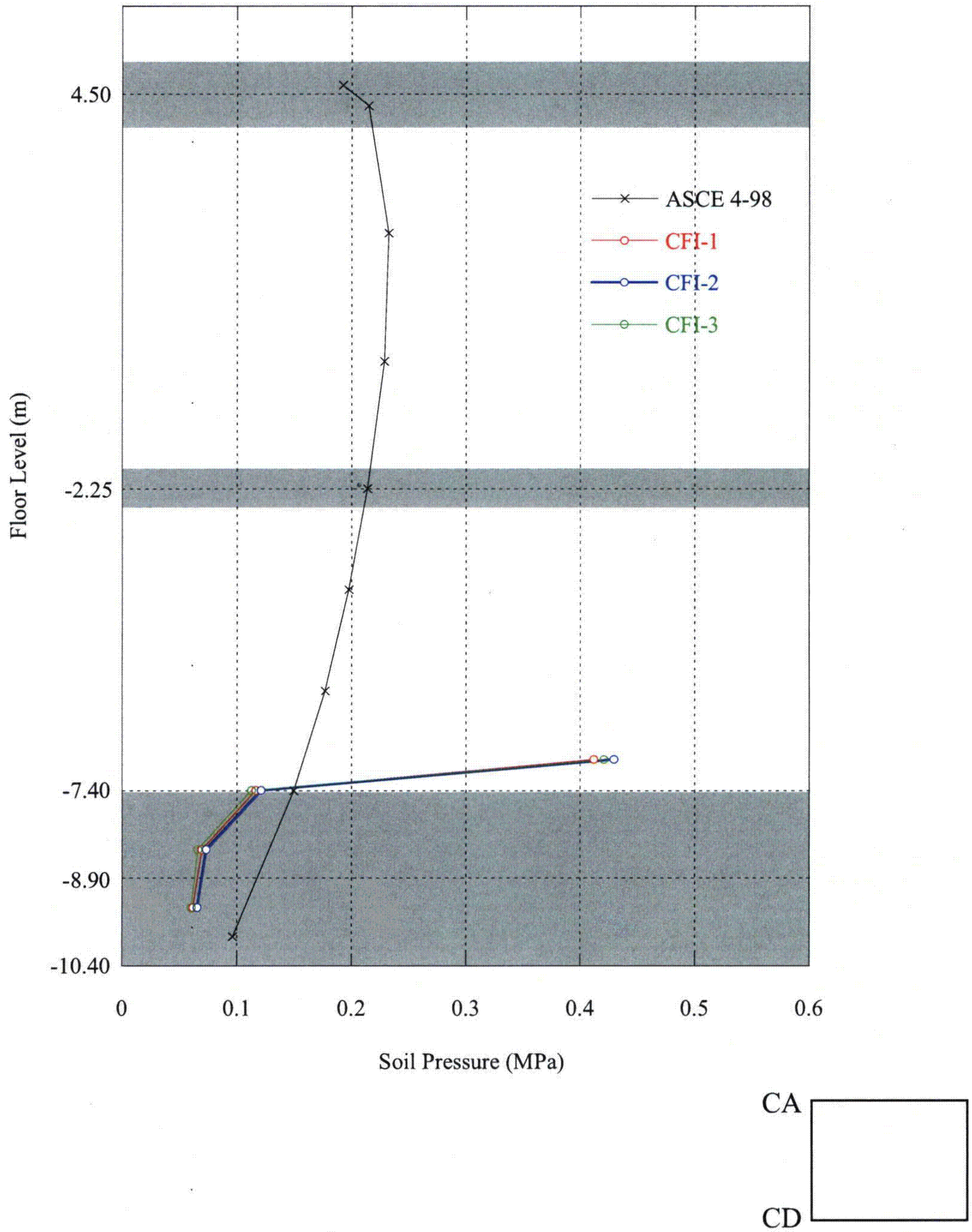
Note: The shaded area shows thickness of the floor slabs and basemat.

Figure 5.4-2b Lateral Soil Pressure - CB C5 Wall



Note: The shaded area shows thickness of the floor slabs and basemat.

Figure 5.4-2c Lateral Soil Pressure - CB CA Wall



Note: The shaded area shows thickness of the floor slabs and basemat.

Figure 5.4-2d Lateral Soil Pressure - CB CD Wall