Chapter 3 Design of Structures, Components, Equipment, and Systems

3.1 Conformance with NRC General Design Criteria

This section of the referenced DCD is incorporated by reference with no departures or supplements.

3.2 Classification of Structures, Systems and Components

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Add the following sentence at the end of Section 3.2.

STD CDI

There are no site-specific safety related or non-safety related RTNSS systems beyond the scope of the DCD.

Table 3.2-1 Classification Summary

Replace the note for System P73 with the following.

STD CDI

The site-specific plant design includes the HWCS. See Section 9.3.9 for further details

Replace the note for System P74 with the following.

NAPS CDI

The site-specific plant design includes the Zinc Injection System. See Section 9.3.11 for further details.

Replace the note for System U78 with the following.

NAPS CDI

The site-specific plant design does not include the cold machine shop.

3.3 Wind and Tornado Loadings

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

NAPS SUP 3.3-1

3.3.2.4 Extreme Hurricane Winds

Section 2.3 defines the site-specific extreme hurricane wind speed in accordance with RG 1.221, “Design-Basis Hurricane and Hurricane Missiles for Nuclear Power Plants.” The site-specific extreme hurricane wind speed is less than the maximum tornado wind speed listed in Table 2.0-201.

3.4 Water Level (Flood) Design

This section of the referenced DCD is incorporated by reference with no departures or supplements.

3.5 Missile Protection

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

3.5.1.4 Missiles Generated by Natural Phenomena

Add the following paragraph after the fourth paragraph.

NAPS SUP 3.5-3

Section 2.3 defines the site-specific extreme hurricane winds in accordance with RG 1.221, "Design-Basis Hurricane and Hurricane Missiles for Nuclear Power Plants." The site-specific extreme hurricane wind speed is less than the maximum tornado wind speed listed in Table 2.0-201. Potential missiles generated by the extreme hurricane wind are not considered to be more severe than the missiles generated by a tornado.

3.5.1.5 Site Proximity Missiles (Except Aircraft)

Add the following sentence after the first sentence in the first paragraph.

STD SUP 3.5-1

Site-specific missile sources are addressed in Section 2.2.

3.5.1.6 Aircraft Hazards

Add the following at the end of the first paragraph.

STD SUP 3.5-2

Site-specific aircraft hazard analysis and the site-specific critical areas are addressed in Section 2.2.

3.6 Protection Against Dynamic Effects Associated with the Postulated Rupture of Piping

This section of the referenced DCD is incorporated by reference with no departures or supplements.

3.7 Seismic Design

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

3.7.1 Seismic Design Parameters

Replace the last four sentences of this section with following.

NAPS DEP 3.7-1

SSE design ground motion for purposes of seismic design, analysis, and qualification of Unit 3 plant structures, systems, and components, is defined by two sets of ground motion acceleration response spectra:

- the single envelope design ground motion response spectra or Certified Seismic Design Response Spectra (CSDRS) described in Section 3.7.1.1.3 that defines the SSE design motion for seismic design of ESBWR Standard Plant, and
- the site-specific FIRS described in Section 3.7.1.1.4.2, representative of the Unit 3 site specific seismological and geological conditions.

Figures 2.0-201 through 2.0-204 present these 5 percent damped acceleration response spectra that define the site-specific design ground motion as a free-field outcrop motion at the foundation bottom of each Seismic Category I structure. DCD Figures 2.0-1 and 2.0-2 present the standard design CSDRS.

For each structure and each equipment location within the buildings, in-structure response spectra (ISRS) are developed. The site-specific ISRS that exceed the standard design ISRS, are used in conjunction with the standard design ISRS for seismic design and qualification of equipment and components.

This approach applies to SSCs that are required to withstand SSE loads. Similarly, other SSCs that are specifically required to meet SSE seismic demands are designed, analyzed, and qualified using the process in Sections 3.7.1 and 3.7.2 for applying the CSDRS and site-specific FIRS. The same approach is applied for the Seismic Category II and Radwaste Building structures.

The plant shutdown OBE is defined as 1/3 of the SSE. The following two sets of horizontal and vertical OBE response spectra at grade serve as

the reference against which OBE exceedance checks are performed for the purpose of plant shutdown:

(a) 1/3 of the CSDRS presented in Figures 2.0-201 and 2.0-202 that define the free field ground motion at bottom of the RB/FB and CB foundations;

(b) 1/3 of the performance-based surface response spectra (PBSRS) presented in Figure 2.5.2-311 that define the Unit 3 site specific free field ground motion at grade.

The use of CSDRS in (a) above as the basis for defining the OBE at grade for the purpose of plant shutdown is conservative since it neglects to consider the amplifications of the standard design ground motion as it propagates from the bottom of the RB/FB and CB foundations to the plant grade. Plant shutdown is required only if there is an exceedance of both OBE spectra. See Section 3.7.4.4 for discussion on seismic monitoring instrumentation.

3.7.1.1 Design Ground Motion

Add the following at the end of this section.

NAPS SUP 3.7-7

As shown in Figures 2.0-201 through 2.0-204, the site-specific FIRS calculated for Seismic Category I structures of Unit 3 exceed the CSDRS. Therefore, site-specific SSI analyses of these structures are carried out using the site-specific seismic design parameters described in this section. The site-specific seismic design parameters are developed as described in detail in Sections 3.7.1.1.4 and 3.7.1.1.5. These design parameters include the SSI input strain compatible soil profiles, SSI input response spectra, and SSI input acceleration time histories for the following Seismic Category I structures:

- Reactor Building/Fuel Building
- Control Building
- Fire Water Service Complex

The development of the site-dependent SSE at-grade and the OBE at-grade spectra are described in Section 3.7.1.1.6.

3.7.1.1.3 Single Envelope Ground Motion

Add the following at the beginning of this section.

NAPS DEP 3.7-1

This section provides information regarding the single envelope ground response spectra used for seismic design of the ESBWR Standard Plant. The comparisons in Figures 2.0-201 through 2.0-204 show that Unit 3 sites-specific FIRS exceed these single envelope ground response spectra, thus indicating that it is necessary to perform the site-specific SSI analysis presented in Section 3.7.2.4.1, using the site-specific design parameters described in Sections 3.7.1.1.4 and 3.7.1.1.5. Structures, systems, and components are seismically designed, analyzed, and qualified to multiple response spectra for both generic and site-specific seismic and subgrade conditions, as described in Section 3.7.2, and for equipment seismic qualification as described in Section 3.10. The CSDRS is one of two spectra used for ensuring that SSCs meet the requirements for seismic design adequacy.

DCD Table 3.7-2 provides the single envelope design ground motion at foundation level for the structures that are designed to meet Seismic Category I requirements and which is referred to as the CSDRS for the ESBWR Standard Plant. The site-specific SSI analyses indicate that additional ground motion response spectra apply, as described in Section 3.7.2.

The information below relates to the CSDRS used for seismic design of the ESBWR Standard Plant. These design ground motion response spectra are used in conjunction with the site-specific ground motion response spectra, as described in Section 3.7.1.1.4.2.

NAPS SUP 3.7-1

3.7.1.1.4 Site-Specific Design Ground Motion Response Spectra

3.7.1.1.4.1 SSI Strain-Compatible Soil Profiles

Best estimate (BE), lower bound (LB), and upper bound (UB) soil properties are calculated consistent with the FIRS for each Seismic Category I structure from their corresponding probabilistic full column site response analysis results and are presented in the following sections. The details of the site response analysis are described in Section 2.5.2.5.

3.7.1.1.4.1.1 SSI Strain-Compatible Soil Profiles for the RB/FB

From the probabilistic full column site response analyses of the RB/FB soil column set (presented in Section 2.5.2.5), a set of 60

strain-compatible soil properties is obtained for each of the 4 input rock cases (10^{-4} and 10^{-5} annual-frequency-of-exceedance (1E-4 and 1E-5 hazard level) low frequency (LF) and high frequency (HF) as described in Section 2.5.2.4). The log-mean (μ_{ln}) and log-standard deviation (log-SD, μ_{ln}) for each of the 4 sets of shear wave velocity (V_s) and damping ratios are calculated. These values are used to establish the log-mean and log-SD of the strain compatible properties that are consistent to FIRS motions using A_R and DF factors (described in Section 2.5.2.6), calculated for the acceleration response spectra (ARS) at the ground surface.

The simulated (randomized) profiles described in Section 2.5.2.5 include a variation in the thickness of different strata (a stratum is defined as a thickness of rock or soil having the same initial dynamic and static properties). For deterministic SSI analysis, the strain-compatible soil profiles are obtained from the strain-compatible soil properties of the simulated profiles using the data for each soil layer type within the profile. The stratum log-mean and log-standard deviation strain compatible properties are used with the BE thicknesses for each stratum to obtain the LB, BE, and UB SSI input strain-compatible soil profiles.

The log-mean values of the FIRS-consistent strain-compatible damping ratios are used to determine the BE damping ratio profile. The LB and UB values for the strain compatible damping ratios are calculated as plus/minus one log-standard deviation from the log-mean values by applying Equations 3.7.1.1-1 and 3.7.1.1-2.

Lower bound and upper bound V_s corresponding to FIRS are calculated by applying Equations 3.7.1.1-1 and 3.7.1.1-2 in conjunction with the FIRS-consistent log-mean and log-standard deviation as described above. However, lower bound shear wave velocity profiles are calculated as the minimum resulting from Equation 3.7.1.1-1 and $(V_S)_{FIRS}/(\sqrt{1.5})$, and upper bound shear wave velocity profiles are calculated as the maximum resulting from Equation 3.7.1.1-2 and $(V_S)_{FIRS} \times \sqrt{1.5}$ to satisfy the minimum variation requirements of ASCE 4-98.

$$M_{LB} = \exp(\ln(\mu_{ln}) - \sigma_{ln}) \quad (3.7.1.1\text{-}1)$$

$$M_{UB} = \exp(\ln(\mu_{ln}) + \sigma_{ln}) \quad (3.7.1.1\text{-}2)$$

Primary (P- or compression) wave velocity V_P is calculated using Equation 3.7.1.1-3 (Reference 3.7-201), where Poisson's ratio ν values, at different depths, are provided in Section 2.5.4.

$$V_P = V_S\sqrt{\frac{2-2\nu}{1-2\nu}} \tag{3.7.1.1-3}$$

For soil layers below water table, a minimum shear wave velocity of 4800 ft/sec is maintained and, as needed, the Poisson's ratio is adjusted to obtain the minimum P-wave velocity. The maximum value of Poisson's ratio used is 0.48 to avoid numerical instability.

Figure 3.7.1-201 presents the SSI shear wave velocity profiles for the RB/FB. SSI damping and P-wave velocity profiles for this structure are presented in Figures 3.7.1-202 and 3.7.1-203, respectively. The lower shear wave and P-wave velocities are used in conjunction with the higher damping values to form the LB profile, and vice versa for the UB profile. Table 3.7.1-201 presents the digital values for the RB/FB SSI input strain-compatible soil profiles. The provided soil profiles correspond to the fully embedded SSI analysis of the RB/FB. The top 17 ft of this profile (the top 7 layers in Table 3.7.1-201) correspond to saprolite and are removed in the partially embedded SSI analysis of the RB/FB.

As described in Section 2.5.4, adjacent to the structure, the in-situ saprolite is replaced by structural fill and Zone III rock is replaced by concrete fill. These features are explicitly included in the SSI model of the RB/FB. The strain-compatible properties for the structural fill for the RB/FB are obtained following the steps described above for the in-situ profile and applied to a companion fill profile for the RB/FB. The companion RB/FB profile is identical to the in-situ profile except that randomized saprolite and Zone III rock properties are replaced with randomized structural fill and concrete fill properties, respectively.

Finally, the lower bound and upper bound shear wave velocities, P-wave velocities, and damping ratios for the structural fill compatible with FIRS are calculated following the methodology described above and presented in Table 3.7.1-202. The same table provides the LB, BE, and UB values for the concrete fill to be used in the SSI analysis model. The concrete fill

is considered as linear material for the purpose of site response and SSI analyses.

3.7.1.1.4.1.2 **SSI Strain-Compatible Soil Profiles for the CB**

The SSI strain-compatible soil profiles for the CB are calculated from the probabilistic full column site response analyses of the CB soil column set (presented in Section 2.5.2.5) following the same approach as described above for the RB/FB structure.

Figure 3.7.1-204 presents the SSI shear wave velocity profiles for the CB. SSI damping and P-wave velocity profiles for this structure are presented in Figures 3.7.1-205 and 3.7.1-206, respectively. The lower shear wave and P-wave velocities are used in conjunction with the higher damping values to form the LB profile, and vice versa for the UB profile. Table 3.7.1-203 presents the digital values for the CB SSI input strain-compatible soil profiles.

As described in Section 2.5.4, adjacent to the structure, the in-situ saprolite is replaced by structural fill and Zone III rock is replaced by concrete fill. These features are explicitly included in the SSI model of the CB. The strain compatible properties for the structural fill for the CB are similarly obtained as those for the RB/FB and presented in Table 3.7.1-204. The same table provides the LB, BE, and UB values for the concrete fill to be used in the SSI analysis model. The concrete fill is considered as linear material for the purpose of site response and SSI analyses.

3.7.1.1.4.1.3 **SSI Strain-Compatible Soil Profiles for the FWSC**

The SSI strain-compatible soil profiles for the FWSC are calculated from the probabilistic full column site response analyses of the FWSC soil column set (presented in Section 2.5.2.5) following the same approach as described above for the RB/FB structure.

Figure 3.7.1-207 presents the SSI shear wave velocity profiles for the FWSC. SSI damping and P-wave velocity profiles for this structure are presented in Figures 3.7.1-208 and 3.7.1-209, respectively. The lower shear wave and P-wave velocities are used in conjunction with the higher damping values to form the LB profile, and vice versa for the UB profile. Table 3.7.1-205 presents the digital values for the FWSC SSI input strain-compatible soil profiles.

As described in Section 2.5.4, for the FWSC, the foundation of the structure is supported by concrete fill situated on Zone III-IV rock. Adjacent to the structure, the in-situ saprolite is replaced by structural fill and Zone III rock is replaced by concrete fill. These features are explicitly included in the SSI model of the FWSC. The strain compatible properties for the structural fill for the FWSC are similarly obtained as those for the RB/FB and presented in Table 3.7.1-206. The same table provides the LB, BE, and UB values for the concrete fill to be used in the SSI analysis model. The concrete fill is considered as linear material for the purpose of site response and SSI analyses.

3.7.1.1.4.2 **Site-Specific SSI Input Response Spectra**

The FIRS for all Seismic Category I structures are presented in Section 2.5.2.6. For each Seismic Category I structure, the site-specific SSI input response spectra are obtained from its corresponding FIRS by ensuring that the requirements of ISG-17 (Reference 3.7-202) with regards to the adequacy of the input motion for embedded SSI analyses are met. This verification is referred to as the NEI check in reference to the Nuclear Energy Institute (NEI) white paper (Reference 3.7-203). Once the NEI check is done for a given FIRS and any necessary adjustments are made, the resulting spectra is termed the “SSI input response spectra.”

In addition, the site-specific SSI input response spectra are augmented by the broadband horizontal and vertical response spectra defined in RG 1.60 anchored at 0.1g to satisfy the minimum design ground motion requirements of 10 CFR 50, Appendix S. The resulting ARS are labeled as “Final SSI Input Response Spectra.” The development of these spectra for all Seismic Category I structures is described in the following sections.

3.7.1.1.4.2.1 **SSI Input Response Spectra for the RB/FB**

The site-specific SSI input response spectra are calculated for SSI analysis of the RB/FB structure as partially embedded (only considering embedment in rock) and as fully embedded. The corresponding partial column outcrop FIRS and full column outcrop FIRS for this structure as well as the performance-based surface response spectra (PBSRS) are presented in Section 2.5.2.6.

The NEI check is conducted for the RB/FB by convolving the full column and partial column outcrop FIRS (at the foundation level, Elevation 224 ft

NAVD88) through the LB, BE, and UB strain compatible soil profiles of the RB/FB (Section 3.7.1.1.4.1), and comparing the envelope of the resulting top-of-the-column ARS with the PBSRS. The horizontal FIRS are convolved to the top of the soil column using vertically propagating shear waves and the vertical FIRS are convolved to the surface through vertically propagating P-waves. Shear wave damping is used for both horizontal and vertical analyses. The analyses are carried out linearly with no further degradation of the strain-compatible profiles. The horizontal and vertical 5 percent damped ARS at the top of the soil columns corresponding to each SSI input soil profile are determined and the horizontal and vertical envelope resulting from the LB, BE, and UB soil columns for the structure is compared to the horizontal and vertical PBSRS.

For each direction (horizontal or vertical) and each embedment configuration (fully or partially embedded FIRS), if the envelope of the LB, BE, and UB ARS (at the top of the SSI input soil column) does not envelope the corresponding PBSRS, the FIRS must be adjusted. The frequency dependent adjustment factor is either unity or the ratio of PBSRS to the envelope of LB, BE, and UB ARS, whichever is greater. In order to satisfy the NEI check, this adjustment factor is applied to the computed FIRS at the foundation level to yield the full column and partial column horizontal and vertical SSI input response spectra for the RB/FB.

Figures 3.7.1-210 and 3.7.1-211 present the envelope of the ground surface ARS for the horizontal and vertical full column FIRS, respectively. Figures 3.7.1-212 and 3.7.1-213 present the horizontal and vertical envelope ARS at surface as well as their corresponding FIRS and PBSRS. For the RB/FB full column FIRS, the adjustment occurs for the horizontal FIRS below 6.6 Hz with the largest adjustment factor being 1.27. For the vertical FIRS, the adjustment is much more significant, especially between frequencies of 1 Hz and 20 Hz with the maximum adjustment factor being 1.73. The adjusted full column FIRS for RB/FB are referred to as the SSI input response spectra for RB/FB and are also presented in Figures 3.7.1-212 and 3.7.1-213.

The NEI check for the partial column FIRS for RB/FB are carried out in a similar manner. The corresponding figures are provided in Figures 3.7.1-214 through 3.7.1-217. The necessary adjustment factors for RB/FB partial column FIRS are less than 1.01 for both horizontal and vertical directions. The adjusted partial column FIRS are referred to as

the partial column SSI input response spectra for RB/FB and are presented in Figures 3.7.1-216 and 3.7.1-217.

For the full column analyses (applicable to fully embedded SSI analyses), the final horizontal and vertical SSI input response spectra are calculated as the envelope of the full column SSI input response spectra and the minimum required response spectra which are adopted from the horizontal and vertical broadband spectra defined in RG 1.60 and anchored at 0.1g. Similarly, for the partial soil column analyses (applicable to SSI analyses of the structures as partially embedded), the final horizontal and vertical SSI input motions are calculated as the envelope of the partial column SSI input response spectra and the minimum required response spectra. These final SSI input response spectra are presented in Figures 3.7.1-218 through 3.7.1-220 and tabulated in Table 3.7.1-207. These spectra are used as target ARS for development of SSI input time histories in subsequent analyses.

3.7.1.1.4.2.2 **SSI Input Response Spectra for the CB**

The site-specific SSI input response spectra are calculated for SSI analysis of the CB structure as partially embedded (only considering embedment in rock) and as fully embedded. The corresponding partial column outcrop FIRS and full column outcrop FIRS for this structure as well as the PBSRS are presented in Section 2.5.2.6.

The SSI input response spectra for the CB are obtained after adjusting the FIRS as necessary for the NEI check following the same approach as described for RB/FB. For the CB, Figures 3.7.1-221 and 3.7.1-222 present the envelope of the ground surface ARS for the horizontal and vertical full column FIRS, respectively. Figures 3.7.1-223 and 3.7.1-224 present the horizontal and vertical envelope ARS at surface as well as their corresponding FIRS and PBSRS. Where the PBSRS exceed the envelope of surface ARS, the FIRS is adjusted (upward adjustment only, i.e., adjustment factor is always larger than one) by the ratio of the PBSRS to the envelope of surface ARS at each frequency. For the CB full column FIRS, the adjustment occurs for the horizontal FIRS below 3.7 Hz with the largest adjustment factor being 1.03. For the vertical full column FIRS, the adjustment is much more significant, especially between frequencies of 2 Hz and 13 Hz with the maximum adjustment factor being 1.37. The adjusted full column FIRS for CB are referred to as the SSI input response spectra for CB and are presented in Figures 3.7.1-223 and 3.7.1-224.

The NEI check for the partial column FIRS for the CB is carried out in a similar manner. The corresponding figures are provided in Figures 3.7.1-225 through 3.7.1-228. The necessary adjustment factors for the CB partial column FIRS are less than 1.08 for horizontal and less than 1.16 for vertical directions. The adjusted partial column FIRS are referred to as the partial column SSI input response spectra for CB and are presented in Figures 3.7.1-227 and 3.7.1-228.

For the full column analyses (applicable to fully embedded SSI analyses), the final horizontal and vertical SSI input response spectra are calculated as the envelope of the full column SSI input response spectra and the minimum required response spectra which are adopted from the horizontal and vertical broadband spectra defined in RG 1.60 and anchored at 0.1g. Similarly, for the partial soil column analyses (applicable to SSI analyses of the structures as partially embedded), the final horizontal and vertical SSI input motions are calculated as the envelope of the partial column SSI input response spectra and the minimum required response spectra. These final SSI input response spectra are presented in Figures 3.7.1-229 through 3.7.1-231 and tabulated in Table 3.7.1-208. These spectra are used as target ARS for development of SSI input time histories in subsequent analyses.

3.7.1.1.4.2.3 **SSI Input Response Spectra for the FWSC**

The site-specific SSI input response spectra are calculated for SSI analysis of the FWSC structure as a surface structure. Since embedment of the structure is not considered, the NEI check is not applicable for the development of the SSI input response spectra for this structure. Accordingly, the geologic outcrop FIRS for the FWSC are determined at its foundation level (Elevation 282 ft NAVD88) and presented in Section 2.5.2.6.

The final horizontal and vertical SSI input response spectra for FWSC are calculated as the envelope of the geologic outcrop FIRS and the minimum required response spectra which are adopted from the horizontal and vertical broadband spectra defined in RG 1.60 and anchored at 0.1g. These final SSI input response spectra are presented in Figures 3.7.1-232 through 3.7.1-234 and tabulated in Table 3.7.1-209. These spectra are used as target ARS for development of SSI input time histories in subsequent analyses.

NAPS SUP 3.7-2

3.7.1.1.5 Site-Specific Design Ground Motion Time History

3.7.1.1.5.1 SSI Input Acceleration Time Histories

Corresponding to each set of horizontal and vertical final SSI input response spectra, described in Section 3.7.1.1.4.2, a three component set (two horizontal and one vertical) of spectrum compatible acceleration time histories is developed for use as input time histories for SSI analysis. The starting seed time histories are selected from the database of acceleration time histories in NUREG/CR-6728 (Reference 3.7-204). The candidate time histories were considered from the CEUS rock database bin with magnitudes between moment magnitude (**M**) 6 and **M**7 and distances between 10 km and 50 km. This magnitude-distance bin was selected based on the high frequency deaggregation of the PSHA having mean magnitude and distance values of **M**5.9 and 21 km for the 10^{-4} hazard level, and **M**6.2 and 15 km for the 10^{-5} hazard level (Section 2.5.2.4). For the low frequency hazard deaggregation, the results are a magnitude of **M**7.4 and a distance of 540 km for the 10^{-4} and **M**7.5 and a distance of 480 km for the 10^{-5} hazard levels (Section 2.5.2.4). Based on the large distance associated with the low frequency controlling event, the selected seed input acceleration time history for the spectral matching procedure was governed by the high frequency controlling events.

In selecting a candidate acceleration time history set from the applicable magnitude-distance bin from NUREG/CR-6728, the following aspects of a given time history set were considered:

- Similarity between the spectral shape of the candidate acceleration time history and the target spectrum
- Total time history duration of at least 20 seconds
- Zero-lag cross-correlation coefficient between any two components of acceleration time histories should be less than 0.16
- Appropriate magnitude and distance values relative to the controlling event values
- Non-stationary phasing consistent with seismological principals.
- Uniform normalized Arias intensity curves

Following these selection guidelines, the strong ground motion time history from the 1984 **M**6.2 Morgan Hill earthquake recorded at the station Gilroy–Gavilan College was selected as the seed input time

history set for the spectral matching presented here. This selected time history from the CEUS magnitude-distance database bin of NUREG/CR-6728 is based on the original empirical recording from the Morgan Hill earthquake at the Gilroy–Gavilan College station with the additional modification of the empirical time history to adjust for more CEUS hard rock conditions.

3.7.1.1.5.1.1 **SSI Input Acceleration Time Histories for the RB/FB**

Two sets of three statistically independent acceleration time histories of motions (i.e., two horizontal and one vertical component) are developed for the full column and partial column final SSI input motion spectra. These time histories are modified to be spectrum compatible following Option 1, Approach 2 of SRP 3.7.1. Additionally, the power spectrum density (PSD) of the spectrum matched time histories are compared to reference PSDs developed consistent with the target response spectra using the site response analysis, the methodology and data provided in Appendix B of SRP 3.7.1, and the deaggregation information from the probabilistic seismic hazard analysis for the site. For each spectrum matched time history, it is confirmed that its PSD does not fall below 80 percent of its corresponding reference PSD.

The input seed time histories are modified to be spectrum compatible using the computer program RSPM. The baseline correction program BLINE, a component program of RSPM, is also used in the process after each iteration of RSPM.

For each time history, the average ratio between the acceleration time history response spectrum and the corresponding target acceleration response spectrum (both at a spectral damping of 5 percent) was greater than 1.0. In addition, the spectral matching criteria given in SRP 3.7.1 for Option 1, Approach 2 were satisfied in each spectral matching case.

For the RB/FB partial column spectrally matched time histories, the comparisons between the scaled spectrum compatible acceleration response spectra and the target spectra and boundary range are plotted in Figures 3.7.1-235 through 3.7.1-237 for the first horizontal direction (H1), second horizontal direction (H2) and the vertical direction (UP), respectively. Similar plots for the RB/FB full column spectrally matched time histories are presented in Figures 3.7.1-238 through 3.7.1-240.

The zero-lag cross-correlation for each three component sets of spectrum compatible acceleration time histories are computed to verify

the acceptability of the acceleration time histories. The zero-lag cross-correlations for the partial column and full column RB/FB cases are listed in Table 3.7.1-210. These computed values are all less than the required minimum value of 0.16.

In addition to the cross-correlation values, the peak ground motion parameters and associated ratios are listed in Table 3.7.1-211. Based on the target spectra used in the spectral matching procedure being a composite of both the high frequency and low frequency cases (i.e., the deaggregation values are bi-modal), the resulting PGV/PGA and PGA*PGD/PGV^2 ratios do not fall within the bin values reported in NUREG/CR-6728. The PGA, PGV, and PGD refer to the peak ground acceleration, peak ground velocity, and peak ground displacement, respectively. This observed deviation from the reported bin values is caused by the relatively large PGA value from the high frequency case (i.e., small magnitude event at relative close distances) compared to the intermediate and longer spectral period range PGV and PGD which is controlled by the low frequency case (i.e., large magnitude event at a relatively large distance). Given this understanding of the composite nature of the target spectra used in the spectral matching procedure, the peak ground motion parameter values and associated ratios are acceptable.

The total duration of the time histories is approximately 30 seconds, which is greater than the required minimum of 20 seconds. In addition, the Arias durations (5-75% Duration) given in Table 3.7.1-211, are longer than the minimum value of 6 seconds defined in SRP 3.7.1.

The acceleration, velocity, and displacement time histories for the H1, H2, and UP spectrally matched to the RB/FB partial column final SSI input response spectra are respectively provided in Figures 3.7.1-241 through 3.7.1-243. Similar figures for the RB/FB full column case are presented in Figures 3.7.1-244 through 3.7.1-246.

The input time histories needed for SSI analysis of the RB/FB with embedded foundation (for both partially embedded and fully embedded cases) are in-column (within) motions corresponding to each of the SSI strain-compatible soil profiles. As such, for each case (partially embedded or fully embedded), each of the outcrop acceleration time histories (H1, H2, and UP), is used as input at the foundation level of the RB/FB to a SHAKE2000 soil column model of the SSI strain compatible soil profiles (LB, BE and UB), and their corresponding in-column time

histories are obtained at the same horizon. The horizontal acceleration time histories are applied using strain compatible shear wave velocities and the vertical acceleration time history is applied using corresponding P-wave velocities. The strain-compatible shear wave damping is used for both vertical and horizontal analyses. The analyses are carried out linearly with no further degradation of the strain-compatible shear modulus and damping profiles. These analyses result in a total of 18 in-column SSI input time histories corresponding to the three SSI strain compatible profiles (LB, BE, and UB), the three time history components (H1, H2, and UP), and two embedment cases (full column or partial column). These time histories are used as input in the subsequent SSI analyses of the structure.

3.7.1.1.5.1.2 **SSI Input Acceleration Time Histories for the CB**

Two sets of three statistically independent acceleration time histories of motions (i.e., two horizontal and one vertical component) are developed for the full column and partial column final SSI input motion spectra for the CB. The same methodology described in Section 3.7.1.1.5.1.1 for the RB/FB is used to develop these time histories.

For the CB partial column spectrally matched time histories, the comparisons between the scaled spectrum compatible acceleration response spectra and the target spectra and boundary range are plotted in Figures 3.7.1-247 through 3.7.1-249 for the H1, H2 and UP directions, respectively. Similar plots for the CB full column spectrally matched time histories are presented in Figures 3.7.1-250 through 3.7.1-252.

The zero-lag cross-correlations for the partial column and full column CB cases are listed in Table 3.7.1-212. These computed values are all less than the required minimum value of 0.16.

In addition to the cross-correlation values, the peak ground motion parameters and associated ratios are listed in Table 3.7.1-213. Since the discussion provided for the RB/FB in Section 3.7.1.1.5.1.1 regarding the composite nature of the target spectra used in the spectral matching procedure is also applicable to the CB, the peak ground motion parameter values and associated ratios are acceptable.

The total duration of the time histories is approximately 30 seconds, which is greater than the required minimum of 20 seconds. In addition, the Arias durations (5-75% Duration), given in Table 3.7.1-213 are longer than the minimum value of 6 seconds defined in SRP 3.7.1.

The acceleration, velocity and displacement time histories for the H1, H2, and UP spectrally matched to the CB partial column final SSI input response spectra are respectively provided in Figures 3.7.1-253 through 3.7.1-255. Similar figures for the CB full column case are presented in Figures 3.7.1-256 through 3.7.1-258.

The input time histories needed for SSI analysis of the CB with embedded foundation (for both partially embedded and fully embedded cases) are in-column (within) motions corresponding to each of the SSI strain-compatible soil profiles. As such, for each case (partially embedded or fully embedded), each of the outcrop acceleration time histories (H1, H2, and UP), is used as input at the foundation level of the CB to a SHAKE2000 soil column model of the SSI strain-compatible soil profiles (LB, BE and UB), and their corresponding in-column time histories are obtained at the same horizon. The horizontal acceleration time histories are applied using strain-compatible shear wave velocities and the vertical acceleration time history is applied using corresponding P-wave velocities. The strain-compatible shear wave damping is used for both vertical and horizontal analyses. The analyses are carried out linearly with no further degradation of the strain-compatible shear modulus and damping profiles. These analyses result in a total of 18 in-column SSI input time histories corresponding to the three SSI strain compatible profiles (LB, BE, and UB), the three time history components (H1, H2, and UP), and two embedment cases (full column or partial column). These time histories are used as input in the subsequent SSI analyses of the structure.

3.7.1.1.5.1.3 **SSI Input Acceleration Time Histories for the FWSC**

One set of three statistically independent acceleration time histories of motions (i.e., two horizontal and one vertical component) is developed for the final SSI input motion spectra for the FWSC. The same methodology described in Section 3.7.1.1.5.1.1 for the RB/FB is used to develop these time histories.

For the FWSC spectrally matched time histories, the comparisons between the scaled spectrum compatible acceleration response spectra and the target spectra and boundary range are plotted in Figures 3.7.1-259 through 3.7.1-261 for the H1, H2 and UP directions, respectively.

The zero-lag cross-correlations for the FWSC spectrally matched time histories are listed in Table 3.7.1-214. These computed values are all less than the required minimum value of 0.16.

In addition to the cross-correlation values, the peak ground motion parameters and associated ratios are listed in Table 3.7.1-215. Since the discussion provided for the RB/FB in Section 3.7.1.1.5.1.1 regarding the composite nature of the target spectra used in the spectral matching procedure is also applicable to the FWSC, the peak ground motion parameter values and associated ratios are acceptable.

The total duration of the time histories is approximately 30 seconds, which is greater than the required minimum of 20 seconds. In addition, the Arias durations (5-75% Duration), given in Table 3.7.1-215 are longer than the minimum value of 6 seconds defined in SRP 3.7.1.

The acceleration, velocity and displacement time histories for the H1, H2, and UP spectrally matched to the FWSC final SSI input response spectra are provided in Figures 3.7.1-262 through 3.7.1-264, respectively. These time histories are used as the SSI input time histories for the SSI analysis of the FWSC as a surface structure.

3.7.1.1.6 Site-Dependent At-Grade SSE and OBE Response Spectra

The site-dependent SSE at grade is defined by enveloping the following two spectra:

1. PBSRS calculated at grade (Elevation 290 ft) from full soil column analyses for RB/FB and CB and,

2. The minimum required response spectra defined as the RG 1.60 broadband horizontal and vertical response spectra at 5 percent damping anchored to 0.1g at PGA to satisfy the requirements of SRP 3.7.1.

The site-dependent OBE at grade is defined as one-third of the site-dependent SSE at grade. The site-dependent OBE response spectra at grade will serve as one reference against which OBE exceedance checks are to be performed for the purpose of plant shutdown. Section 3.7.4.4 includes the criteria that are used to determine whether a plant shutdown is required following a seismic event.

The horizontal and vertical PBSRS at grade is presented in Section 2.5.2.6. The horizontal and vertical 5 percent damped

site-dependent SSE spectra at grade are presented in Figures 3.7.1-265 and 3.7.1-266, respectively.

The horizontal and vertical free-field site-dependent OBE at grade are calculated as one-third of the site-dependent SSE at grade and presented in Figure 3.7.1-267.

The 5 percent damped pseudo velocity response spectra (VRS) for site-dependent OBE at grade is determined by dividing the ARS values at each frequency point (f) by $2\pi f$. The digital values for the site-dependent SSE and OBE at grade are presented in Tables 3.7.1-216 and 3.7.1-217, respectively.

3.7.1.2 Percentage of Critical Damping Values

Add the following at the end of the first paragraph.

NAPS DEP 3.7-1

OBE structural damping values consistent with RG 1.61 Revision 1 are used in the Unit 3 site-specific SSI analyses unless SSE damping in DCD Table 3.7-1 is justified by stress demand.

3.7.1.3 Supporting Media for Seismic Category I Structures

Add the following at the end of the first paragraph.

NAPS SUP 3.7-3

The Seismic Category I structures for Unit 3 have concrete mat foundations founded on rock or concrete fill on rock.

NAPS SUP 3.7-1

Table 3.7.1-201 Strain-Compatible SSI Input Properties for RB/FB (In-situ Material)

Layer #	Thickness (ft)	Top-Depth (ft)	Unit Weight (kcf)	BE-RB/FB			LB-RB/FB			UB-RB/FB		
				Vs (ft/sec)	Vp (ft/sec)	D (%)	Vs (ft/sec)	Vp (ft/sec)	D (%)	Vs (ft/sec)	Vp (ft/sec)	D (%)
1	2.00	0	0.125	900	2203	2.21	604	1480	3.84	1339	3280	1.27
2	2.50	2	0.125	850	2427	3.74	505	1441	7.90	1432	4085	1.77
3	2.50	4.5	0.125	850	2427	3.74	505	1441	7.90	1432	4085	1.77
4	2.50	7	0.13	1273	5352	3.20	779	3973	6.26	2081	8747	1.63
5	2.50	9.5	0.13	1273	5352	3.20	779	3973	6.26	2081	8747	1.63
6	2.50	12	0.13	1857	4999	2.76	1219	4800	5.00	2828	7616	1.52
7	2.50	14.5	0.13	1857	4999	2.76	1219	4800	5.00	2828	7616	1.52
8	3.00	17	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
9	3.00	20	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
10	3.00	23	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
11	3.00	26	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
12	3.00	29	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
13	3.00	32	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
14	3.00	35	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
15	2.00	38	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
16	3.00	40	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
17	3.00	43	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
18	3.00	46	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
19	4.00	49	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
20	3.00	53	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33

NAPS SUP 3.7-1

Table 3.7.1-201 Strain-Compatible SSI Input Properties for RB/FB (In-situ Material)

Layer #	Thickness (ft)	Top-Depth (ft)	Unit Weight (kcf)	BE-RB/FB Vs (ft/sec)	BE-RB/FB Vp (ft/sec)	BE-RB/FB D (%)	LB-RB/FB Vs (ft/sec)	LB-RB/FB Vp (ft/sec)	LB-RB/FB D (%)	UB-RB/FB Vs (ft/sec)	UB-RB/FB Vp (ft/sec)	UB-RB/FB D (%)
21	3.00	56	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
22	3.00	59	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
23	4.00	62	0.145	4321	10584	0.58	3207	7856	1.02	5821	14260	0.33
24	3.00	66	0.163	5449	13347	1.00	4037	9888	1.82	7355	18017	0.55
25	4.00	69	0.163	5449	13347	1.00	4037	9888	1.82	7355	18017	0.55
26	4.00	73	0.163	5449	13347	1.00	4037	9888	1.82	7355	18017	0.55
27	4.00	77	0.163	5449	13347	1.00	4037	9888	1.82	7355	18017	0.55
28	4.00	81	0.163	5449	13347	1.00	4037	9888	1.82	7355	18017	0.55
29	4.00	85	0.163	5178	12682	1.00	3471	8501	1.82	7724	18920	0.55
30	4.00	89	0.163	5178	12682	1.00	3471	8501	1.82	7724	18920	0.55
31	4.00	93	0.163	5178	12682	1.00	3471	8501	1.82	7724	18920	0.55
32	4.00	97	0.163	5178	12682	1.00	3471	8501	1.82	7724	18920	0.55
33	5.00	101	0.163	5178	12682	1.00	3471	8501	1.82	7724	18920	0.55
34	4.00	106	0.164	8800	15678	1.00	7185	12801	1.82	10778	19201	0.55
35	5.00	110	0.164	8800	15678	1.00	7185	12801	1.82	10778	19201	0.55
36	5.00	115	0.164	8800	15678	1.00	7185	12801	1.82	10778	19201	0.55
37	5.00	120	0.164	8800	15678	1.00	7185	12801	1.82	10778	19201	0.55
38	5.00	125	0.164	8800	15678	1.00	7185	12801	1.82	10778	19201	0.55
39	5.00	130	0.164	8800	15678	1.00	7185	12801	1.82	10778	19201	0.55
40	5.00	135	0.164	8800	15678	1.00	7185	12801	1.82	10778	19201	0.55

NAPS SUP 3.7-1

Table 3.7.1-201 Strain-Compatible SSI Input Properties for RB/FB (In-situ Material)

Layer #	Thickness (ft)	Top-Depth (ft)	Unit Weight (kcf)	BE-RB/FB Vs (ft/sec)	BE-RB/FB Vp (ft/sec)	BE-RB/FB D (%)	LB-RB/FB Vs (ft/sec)	LB-RB/FB Vp (ft/sec)	LB-RB/FB D (%)	UB-RB/FB Vs (ft/sec)	UB-RB/FB Vp (ft/sec)	UB-RB/FB D (%)
41	5.00	140	0.164	8800	15678	1.00	7185	12801	1.82	10778	19201	0.55
42	5.00	145	0.164	8800	15678	1.00	7185	12801	1.82	10778	19201	0.55
43	5.00	150	0.164	8800	15678	1.00	7185	12801	1.82	10778	19201	0.55
44		155	0.164	9200	16390	1.00	7512	13383	1.82	11268	20074	0.55

The top 7 layers correspond to saprolite and are removed in the partially embedded SSI analysis of the RB/FB.

NAPS SUP 3.7-1

Table 3.7.1-202 Strain-Compatible SSI Input Properties for RB/FB (Structural Fill and Concrete Fill)

Layer #	Thickness (ft)	Top-Depth (ft)	Unit Weight (kcf)	BE-RB/FB			LB-RB/FB			UB-RB/FB		
				Vs (ft/sec)	Vp (ft/sec)	D (%)	Vs (ft/sec)	Vp (ft/sec)	D (%)	Vs (ft/sec)	Vp (ft/sec)	D (%)
1	2.00	0	0.130	720	1347	2.36	517	967	3.43	1003	1876	1.63
2	2.50	2	0.130	620	1160	4.86	391	732	8.00	982	1836	2.95
3	2.50	4.5	0.130	620	1160	4.86	391	732	8.00	982	1836	2.95
4	2.50	7	0.130	671	3423	5.95	410	2089	9.65	1100	4800	3.67
5	2.50	9.5	0.130	671	3423	5.95	410	2089	9.65	1100	4800	3.67
6	2.50	12	0.130	692	3530	6.72	431	2196	10.67	1113	4800	4.23
7	2.50	14.5	0.130	692	3530	6.72	431	2196	10.67	1113	4800	4.23
Concrete Fill		17	0.145	7000	10909	1.00	6000	9350	1.80	8000	12467	0.55

NAPS SUP 3.7-1

Table 3.7.1-203 Strain-Compatible SSI Input Properties for CB (In-situ Material)

Layer #	Thickness (ft)	Top-Depth (ft)	Unit Weight (kcf)	BE-CB Vs (ft/sec)	BE-CB Vp (ft/sec)	BE-CB D (%)	LB-CB Vs (ft/sec)	LB-CB Vp (ft/sec)	LB-CB D (%)	UB-CB Vs (ft/sec)	UB-CB Vp (ft/sec)	UB-CB D (%)
1	2.50	0	0.125	858	1743	3.05	570	1158	5.42	1292	2623	1.71
2	2.50	2.5	0.125	858	1743	3.05	570	1158	5.42	1292	2623	1.71
3	2.50	5	0.125	968	4067	4.48	570	2395	8.59	1643	6906	2.34
4	2.50	7.5	0.125	968	4800	4.48	570	2906	8.59	1643	6906	2.34
5	2.50	10	0.125	968	4800	4.48	570	2906	8.59	1643	6906	2.34
6	2.50	12.5	0.125	968	4800	4.48	570	2906	8.59	1643	6906	2.34
7	2.50	15	0.13	1378	5793	4.32	938	4785	7.51	2024	8508	2.48
8	2.50	17.5	0.13	1378	5793	4.32	938	4785	7.51	2024	8508	2.48
9	2.50	20	0.13	1378	5793	4.32	938	4785	7.51	2024	8508	2.48
10	2.50	22.5	0.13	1378	5793	4.32	938	4785	7.51	2024	8508	2.48
11	2.50	25	0.145	2021	6175	0.62	1540	4800	1.06	2652	8101	0.36
12	2.50	27.5	0.145	2021	6175	0.62	1540	4800	1.06	2652	8101	0.36
13	2.50	30	0.145	2021	6175	0.62	1540	4800	1.06	2652	8101	0.36
14	2.50	32.5	0.145	2021	6175	0.62	1540	4800	1.06	2652	8101	0.36
15	2.50	35	0.145	2471	7548	0.63	1835	5607	1.14	3326	10160	0.35
16	2.50	37.5	0.145	2471	7548	0.63	1835	5607	1.14	3326	10160	0.35
17	2.50	40	0.145	2471	7548	0.63	1835	5607	1.14	3326	10160	0.35
18	2.50	42.5	0.145	2471	7548	0.63	1835	5607	1.14	3326	10160	0.35
19	2.50	45	0.145	2471	7548	0.63	1835	5607	1.14	3326	10160	0.35
20	1.50	47.5	0.145	2471	7548	0.63	1835	5607	1.14	3326	10160	0.35

NAPS SUP 3.7-1

Table 3.7.1-203 Strain-Compatible SSI Input Properties for CB (In-situ Material)

Layer #	Thickness (ft)	Top-Depth (ft)	Unit Weight (kcf)	BE-CB			LB-CB			UB-CB		
				Vs (ft/sec)	Vp (ft/sec)	D (%)	Vs (ft/sec)	Vp (ft/sec)	D (%)	Vs (ft/sec)	Vp (ft/sec)	D (%)
21	3.50	49	0.145	2471	7548	0.63	1835	5607	1.14	3326	10160	0.35
22	2.50	52.5	0.145	2471	7548	0.63	1835	5607	1.14	3326	10160	0.35
23	2.50	55	0.145	2657	8118	0.53	2170	6628	0.96	3254	9942	0.29
24	2.50	57.5	0.145	2657	8118	0.53	2170	6628	0.96	3254	9942	0.29
25	2.50	60	0.145	2657	8118	0.53	2170	6628	0.96	3254	9942	0.29
26	2.50	62.5	0.145	2657	8118	0.53	2170	6628	0.96	3254	9942	0.29
27	1.00	65	0.163	6483	13861	1.00	5293	11318	1.82	7940	16976	0.55
28	3.00	66	0.163	6483	13861	1.00	5293	11318	1.82	7940	16976	0.55
29	3.00	69	0.163	6483	13861	1.00	5293	11318	1.82	7940	16976	0.55
30	3.00	72	0.163	6483	13861	1.00	5293	11318	1.82	7940	16976	0.55
31	3.00	75	0.163	6983	14018	1.00	5701	11445	1.82	8552	17168	0.55
32	2.00	78	0.163	6983	14018	1.00	5701	11445	1.82	8552	17168	0.55
33	5.00	80	0.163	6983	14018	1.00	5701	11445	1.82	8552	17168	0.55
34	5.00	85	0.163	6983	14018	1.00	5701	11445	1.82	8552	17168	0.55
35	5.00	90	0.163	6983	14018	1.00	5701	11445	1.82	8552	17168	0.55
36	5.00	95	0.163	7942	15135	1.00	6485	12358	1.82	9727	18536	0.55
37	5.00	100	0.163	7942	15135	1.00	6485	12358	1.82	9727	18536	0.55
38	5.00	105	0.164	8655	15657	1.00	7067	12784	1.82	10600	19176	0.55
39	5.00	110	0.164	8655	15657	1.00	7067	12784	1.82	10600	19176	0.55
40	5.00	115	0.164	8242	15707	1.00	6730	12824	1.82	10094	19236	0.55

NAPS SUP 3.7-1

Table 3.7.1-203 Strain-Compatible SSI Input Properties for CB (In-situ Material)

Layer #	Thickness (ft)	Top-Depth (ft)	Unit Weight (kcf)	BE-CB			LB-CB			UB-CB		
				Vs (ft/sec)	Vp (ft/sec)	D (%)	Vs (ft/sec)	Vp (ft/sec)	D (%)	Vs (ft/sec)	Vp (ft/sec)	D (%)
41	5.00	120	0.164	8242	15707	1.00	6730	12824	1.82	10094	19236	0.55
42	5.00	125	0.164	8658	16198	1.00	7069	13225	1.82	10604	19838	0.55
43	5.00	130	0.164	8658	16198	1.00	7069	13225	1.82	10604	19838	0.55
44	5.00	135	0.164	8822	15491	1.00	7203	12648	1.82	10805	18972	0.55
45	5.00	140	0.164	8822	15491	1.00	7203	12648	1.82	10805	18972	0.55
46	5.00	145	0.164	9340	16897	1.00	7626	13796	1.82	11439	20694	0.55
47	5.00	150	0.164	9340	16897	1.00	7626	13796	1.82	11439	20694	0.55
48	5.00	155	0.164	9198	17208	1.00	7510	14050	1.82	11265	21075	0.55
49	5.00	160	0.164	9198	17208	1.00	7510	14050	1.82	11265	21075	0.55
50		165	0.164	9200	15729	1.00	7512	12843	1.82	11268	19264	0.55

The top 10 layers correspond to saprolite and are removed in the partially embedded SSI analysis of the CB.

NAPS SUP 3.7-1

Table 3.7.1-204 Strain-Compatible SSI Input Properties for CB (Structural Fill and Concrete Fill)

Layer #	Thickness (ft)	Top-Depth (ft)	Unit Weight (kcf)	BE-CB			LB-CB			UB-CB		
				Vs (ft/sec)	Vp (ft/sec)	D (%)	Vs (ft/sec)	Vp (ft/sec)	D (%)	Vs (ft/sec)	Vp (ft/sec)	D (%)
1	2.50	0	0.130	628	1174	3.50	419	784	5.58	939	1758	2.19
2	2.50	2.5	0.130	628	1174	3.50	419	784	5.58	939	1758	2.19
3	2.50	5	0.130	714	1336	5.09	455	851	8.25	1121	2096	3.14
4	2.50	7.5	0.130	714	3641	5.09	455	2320	8.25	1121	4800	3.14
5	2.50	10	0.130	710	3623	6.04	441	2249	9.63	1144	4800	3.79
6	2.50	12.5	0.130	710	3623	6.04	441	2249	9.63	1144	4800	3.79
7	2.50	15	0.130	712	3631	6.88	449	2292	10.48	1128	4800	4.52
8	2.50	17.5	0.130	712	3631	6.88	449	2292	10.48	1128	4800	4.52
9	2.50	20	0.130	762	3888	6.63	470	2396	10.38	1237	4800	4.24
10	2.50	22.5	0.130	762	3888	6.63	470	2396	10.38	1237	4800	4.24
Concrete Fill		25	0.145	7000	10909	1.00	6000	9350	1.80	8000	12467	0.55

NAPS SUP 3.7-1

Table 3.7.1-205 Strain-Compatible SSI Input Properties for FWSC (In-situ Material)

Layer #	Thickness (ft)	Top-Depth (ft)	Unit Weight [kcf]	BE-FWSC			LB-FWSC			UB-FWSC		
				Vs (ft/sec)	Vp (ft/sec)	D (%)	Vs (ft/sec)	Vp (ft/sec)	D (%)	Vs (ft/sec)	Vp (ft/sec)	D (%)
1	3.00	0	0.125	711	3625	4.68	450	2293	7.44	1124	4800	2.95
2	3.00	3	0.125	711	3625	4.68	450	2293	7.44	1124	4800	2.95
3	3.00	6	0.125	711	3625	4.68	450	2293	7.44	1124	4800	2.95
4	3.00	9	0.125	711	3625	4.68	450	2293	7.44	1124	4800	2.95
5	3.00	12	0.125	927	4725	5.81	553	2819	9.62	1553	6529	3.51
6	3.00	15	0.125	927	4725	5.81	553	2819	9.62	1553	6529	3.51
7	3.00	18	0.125	927	4725	5.81	553	2819	9.62	1553	6529	3.51
8	4.00	21	0.125	927	4725	5.81	553	2819	9.62	1553	6529	3.51
9	4.00	25	0.125	927	4725	5.81	553	2819	9.62	1553	6529	3.51
10	4.00	29	0.13	1370	5758	4.61	965	4800	7.14	1945	8175	2.97
11	3.00	33	0.13	1911	5839	3.31	1375	4800	5.14	2657	8118	2.14
12	2.00	36	0.13	1911	5839	3.31	1375	4800	5.14	2657	8118	2.14
13	4.00	38	0.145	2499	7635	0.64	1901	5808	1.14	3285	10036	0.36
14	4.00	42	0.145	2499	7635	0.64	1901	5808	1.14	3285	10036	0.36
15	4.00	46	0.145	2499	7635	0.64	1901	5808	1.14	3285	10036	0.36
16	4.00	50	0.145	2499	7635	0.64	1901	5808	1.14	3285	10036	0.36
17	4.00	54	0.145	2690	8219	0.53	2145	6554	0.94	3373	10306	0.30
18	4.00	58	0.145	2690	8219	0.53	2145	6554	0.94	3373	10306	0.30
19	3.00	62	0.163	6483	13861	1.00	4803	10269	1.82	8751	18711	0.55
20	3.00	65	0.163	6483	13861	1.00	4803	10269	1.82	8751	18711	0.55

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Table 3.7.1-205 Strain-Compatible SSI Input Properties for FWSC (In-situ Material)

Layer #	Thickness (ft)	Top-Depth (ft)	Unit Weight [kcf]	BE-FWSC			LB-FWSC			UB-FWSC		
				Vs (ft/sec)	Vp (ft/sec)	D (%)	Vs (ft/sec)	Vp (ft/sec)	D (%)	Vs (ft/sec)	Vp (ft/sec)	D (%)
21	3.00	68	0.163	6983	14018	1.00	5701	11445	1.82	8552	17168	0.55
22	4.00	71	0.163	6983	14018	1.00	5701	11445	1.82	8552	17168	0.55
23	4.00	75	0.163	6983	14018	1.00	5701	11445	1.82	8552	17168	0.55
24	3.00	79	0.164	7942	15135	1.00	6485	12358	1.82	9727	18536	0.55
25	4.00	82	0.164	7942	15135	1.00	6485	12358	1.82	9727	18536	0.55
26	4.00	86	0.164	7942	15135	1.00	6485	12358	1.82	9727	18536	0.55
27	3.00	90	0.164	8655	15657	1.00	7067	12784	1.82	10600	19176	0.55
28	4.00	93	0.164	8655	15657	1.00	7067	12784	1.82	10600	19176	0.55
29	4.00	97	0.164	8655	15657	1.00	7067	12784	1.82	10600	19176	0.55
30	3.00	101	0.164	8242	15707	1.00	6730	12824	1.82	10094	19236	0.55
31	4.00	104	0.164	8242	15707	1.00	6730	12824	1.82	10094	19236	0.55
32	4.00	108	0.164	8242	15707	1.00	6730	12824	1.82	10094	19236	0.55
33	3.00	112	0.164	8658	16198	1.00	7069	13225	1.82	10604	19838	0.55
34	4.00	115	0.164	8658	16198	1.00	7069	13225	1.82	10604	19838	0.55
35	4.00	119	0.164	8658	16198	1.00	7069	13225	1.82	10604	19838	0.55
36	3.00	123	0.164	8822	15491	1.00	7203	12648	1.82	10805	18972	0.55
37	4.00	126	0.164	8822	15491	1.00	7203	12648	1.82	10805	18972	0.55
38	4.00	130	0.164	8822	15491	1.00	7203	12648	1.82	10805	18972	0.55
39	3.00	134	0.164	9340	16897	1.00	7626	13796	1.82	11439	20694	0.55
40	4.00	137	0.164	9340	16897	1.00	7626	13796	1.82	11439	20694	0.55

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Table 3.7.1-205 Strain-Compatible SSI Input Properties for FWSC (In-situ Material)

Layer #	Thickness (ft)	Top-Depth (ft)	Unit Weight [kcf]	BE-FWSC Vs (ft/sec)	BE-FWSC Vp (ft/sec)	BE-FWSC D (%)	LB-FWSC Vs (ft/sec)	LB-FWSC Vp (ft/sec)	LB-FWSC D (%)	UB-FWSC Vs (ft/sec)	UB-FWSC Vp (ft/sec)	UB-FWSC D (%)
41	4.00	141	0.164	9340	16897	1.00	7626	13796	1.82	11439	20694	0.55
42	3.00	145	0.164	9198	17208	1.00	7510	14050	1.82	11265	21075	0.55
43	4.00	148	0.164	9198	17208	1.00	7510	14050	1.82	11265	21075	0.55
44	4.00	152	0.164	9198	17208	1.00	7510	14050	1.82	11265	21075	0.55
45		156	0.164	9200	15729	1.00	7512	12843	1.82	11268	19264	0.55

Depth is measured with respect to the bottom of the foundation at Elevation 282 ft.

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Table 3.7.1-206 Strain-Compatible SSI Input Properties for FWSC (Structural Fill and Concrete Fill)

Layer #	Thickness (ft)	Top-Depth (ft)	Unit Weight [kcf]	BE-FWSC Vs (ft/sec)	BE-FWSC Vp (ft/sec)	BE-FWSC D (%)	LB-FWSC Vs (ft/sec)	LB-FWSC Vp (ft/sec)	LB-FWSC D (%)	UB-FWSC Vs (ft/sec)	UB-FWSC Vp (ft/sec)	UB-FWSC D (%)
1	3.00	0	0.130	712	3630	5.42	448	2283	8.36	1132	4800	3.51
2	3.00	3	0.130	722	3680	5.60	456	2327	8.67	1142	4800	3.62
3	3.00	6	0.130	741	3779	5.80	464	2365	9.16	1184	4800	3.68
4	3.00	9	0.130	736	3755	6.24	466	2375	9.71	1165	4800	4.02
5	3.00	12	0.130	798	4069	6.06	484	2468	9.37	1315	4800	3.92
6	3.00	15	0.130	780	3977	6.42	465	2371	9.95	1308	4800	4.15
7	3.00	18	0.130	777	3959	6.67	472	2407	10.04	1277	4800	4.43
8	4.00	21	0.130	797	4066	6.69	474	2419	10.36	1341	4800	4.32
9	4.00	25	0.130	789	4023	7.07	464	2368	10.77	1340	4800	4.64
10	4.00	29	0.130	833	4249	6.82	498	2541	10.32	1393	4800	4.51
11	3.00	33	0.130	828	4223	7.03	479	2443	10.93	1432	4800	4.52
12	2.00	36	0.130	828	4223	7.03	479	2443	10.93	1432	4800	4.52
Concrete Fill		38	0.145	7000	10909	1.00	6000	9350	1.82	8000	12467	0.55

Depth is measured with respect to the bottom of the foundation at Elevation 282 ft.

NAPS SUP 3.7-1

Table 3.7.1-207 5% Damped Final SSI Input Response Spectra for RB/FB

	Final Full Column SSI Input Response Spectra		Final Partial Column SSI Input Response Spectra	
Frequency (Hz)	**Horizontal (g)**	**Vertical (g)**	**Horizontal (g)**	**Vertical (g)**
100	0.671	0.671	0.699	0.699
90	0.702	0.729	0.732	0.760
80	0.774	0.844	0.808	0.880
70	0.920	1.037	0.952	1.074
60	1.135	1.291	1.181	1.343
50	1.348	1.515	1.393	1.566
45	1.425	1.571	1.492	1.644
40	1.506	1.570	1.555	1.621
35	1.563	1.533	1.615	1.584
30	1.641	1.537	1.634	1.530
25	1.636	1.440	1.641	1.444
20	1.530	1.263	1.575	1.301
15	1.428	1.386	1.535	1.210
12.5	1.367	1.462	1.471	1.134
10	1.226	1.425	1.279	0.959
9	1.159	1.400	1.169	0.877
8	1.076	1.326	1.046	0.785
7	0.967	1.214	0.902	0.676
6	0.906	1.062	0.756	0.567
5	0.851	0.887	0.624	0.468
4	0.676	0.642	0.490	0.367
3	0.457	0.403	0.363	0.272
2.5	0.351	0.301	0.312	0.224
2	0.261	0.217	0.261	0.185
1.5	0.206	0.153	0.206	0.145
1.25	0.177	0.124	0.177	0.124
1	0.147	0.103	0.147	0.103

NAPS SUP 3.7-1

Table 3.7.1-207 5% Damped Final SSI Input Response Spectra for RB/FB

	Final Full Column SSI Input Response Spectra		Final Partial Column SSI Input Response Spectra	
Frequency (Hz)	Horizontal (g)	Vertical (g)	Horizontal (g)	Vertical (g)
0.9	0.135	0.0938	0.135	0.0938
0.8	0.123	0.0848	0.123	0.0848
0.7	0.110	0.0757	0.110	0.0757
0.6	0.0969	0.0664	0.0969	0.0664
0.5	0.0834	0.0578	0.0834	0.0569
0.4	0.0694	0.0470	0.0694	0.0470
0.3	0.0548	0.0368	0.0548	0.0368
0.2	0.0306	0.0229	0.0302	0.0220
0.167	0.0255	0.0191	0.0245	0.0184
0.125	0.0191	0.0143	0.0183	0.0138
0.1	0.0154	0.0116	0.0147	0.0110

NAPS SUP 3.7-1

Table 3.7.1-208 5% Damped Final SSI Input Response Spectra for CB

	Final Full Column SSI Input Response Spectra		Final Partial Column SSI Input Response Spectra	
Frequency (Hz)	**Horizontal (g)**	**Vertical (g)**	**Horizontal (g)**	**Vertical (g)**
100	0.895	0.895	0.957	1.011
90	0.936	0.972	0.992	1.091
80	1.027	1.119	1.082	1.254
70	1.210	1.365	1.260	1.498
60	1.498	1.704	1.586	1.903
50	1.756	1.975	1.863	2.274
45	1.862	2.052	1.975	2.349
40	1.947	2.030	2.096	2.404
35	2.054	2.014	2.203	2.386
30	2.158	2.021	2.208	2.264
25	2.143	1.887	2.249	2.133
20	1.990	1.643	2.295	1.999
15	1.867	1.488	2.315	1.887
12.5	1.803	1.542	2.179	1.721
10	1.621	1.481	1.750	1.334
9	1.544	1.447	1.499	1.140
8	1.430	1.365	1.230	0.933
7	1.280	1.243	0.993	0.752
6	1.087	1.083	0.807	0.609
5	0.885	0.903	0.656	0.494
4	0.638	0.652	0.510	0.384
3	0.441	0.408	0.376	0.283
2.5	0.346	0.304	0.312	0.232
2	0.270	0.220	0.261	0.186
1.5	0.206	0.154	0.206	0.145
1.25	0.177	0.124	0.177	0.124
1	0.147	0.103	0.147	0.103

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Table 3.7.1-208 5% Damped Final SSI Input Response Spectra for CB

	Final Full Column SSI Input Response Spectra		Final Partial Column SSI Input Response Spectra	
Frequency (Hz)	**Horizontal (g)**	**Vertical (g)**	**Horizontal (g)**	**Vertical (g)**
0.9	0.135	0.0938	0.135	0.0938
0.8	0.123	0.0848	0.123	0.0848
0.7	0.110	0.0757	0.110	0.0757
0.6	0.0969	0.0664	0.0969	0.0664
0.5	0.0834	0.0578	0.0834	0.0569
0.4	0.0694	0.0470	0.0694	0.0470
0.3	0.0548	0.0368	0.0548	0.0368
0.2	0.0306	0.0229	0.0302	0.0222
0.167	0.0255	0.0192	0.0246	0.0185
0.125	0.0191	0.0143	0.0185	0.0138
0.1	0.0154	0.0115	0.0148	0.0111

NAPS SUP 3.7-1

Table 3.7.1-209 5% Damped Final SSI Input Response Spectra for FWSC

Frequency (Hz)	Final SSI Input Response Spectra Horizontal (g)	Final SSI Input Response Spectra Vertical (g)
100	0.800	0.772
90	0.811	0.819
80	0.834	0.895
70	0.879	0.986
60	0.955	1.091
50	1.078	1.231
45	1.168	1.288
40	1.284	1.330
35	1.418	1.391
30	1.593	1.493
25	1.787	1.573
20	1.914	1.580
15	1.924	1.516
12.5	1.846	1.423
10	1.751	1.313
9	1.753	1.315
8	1.725	1.293
7	1.628	1.221
6	1.459	1.094
5	1.249	0.936
4	0.973	0.730
3	0.670	0.502
2.5	0.512	0.384
2	0.377	0.283
1.5	0.244	0.183
1.25	0.184	0.138
1	0.147	0.103

NAPS SUP 3.7-1

Table 3.7.1-209 5% Damped Final SSI Input Response Spectra for FWSC

Frequency (Hz)	Final SSI Input Response Spectra Horizontal (g)	Final SSI Input Response Spectra Vertical (g)
0.9	0.135	0.0938
0.8	0.123	0.0848
0.7	0.110	0.0767
0.6	0.0969	0.0682
0.5	0.0834	0.0589
0.4	0.0694	0.0470
0.3	0.0548	0.0368
0.2	0.0309	0.0232
0.167	0.0258	0.0194
0.125	0.0194	0.0145
0.1	0.0156	0.0117

NAPS SUP 3.7-2

Table 3.7.1-210 Zero-Lag Cross Correlation Coefficients for the Final Scaled Spectrum Compatible Acceleration Time-Histories for the RB/FB

RB/FB Full Profile

Components	Zero-Lag Cross-Correlation Coefficient of Final Matched Time Histories
H1 – H2	0.018
H1 – UP	0.015
H2 – UP	-0.014

RB/FB Partial Profile

Components	Zero-Lag Cross-Correlation Coefficient of Final Matched Time Histories
H1 – H2	0.023
H1 – UP	0.036
H2 – UP	-0.019

NAPS SUP 3.7-2

Table 3.7.1-211 Peak Ground Motion Parameters, Associated Ratios, and Strong Motion Duration Values for the Final Scaled Spectrum Compatible Acceleration Time-Histories for the RB/FB

Parameter	H1	H2	UP
RB/FB Full Profile			
PGA (g)	0.690	0.700	0.699
PGV (cm/sec)	23.264	16.347	15.839
PGD (cm)	10.982	10.285	8.375
PGV/PGA (cm/sec/g)	33.710	23.351	22.659
PGA*PGD/PGV^2	13.731	26.418	22.879
5-75% Duration (sec)	7.610	11.780	6.345
5% Duration Time (sec)	1.050	1.260	0.955
75% Duration Time (sec)	8.660	13.040	7.300
0% Extrapolated Duration Time (sec)	0.506	0.419	0.502
100% Extrapolated Duration Time (sec)	11.378	17.247	9.566
0-100% Extrapolated Duration Time (sec)	10.871	16.829	9.064
RB/FB Partial Profile			
PGA (g)	0.708	0.715	0.714
PGV (cm/sec)	23.115	15.078	13.577
PGD (cm)	11.387	9.972	8.076
PGV/PGA (cm/sec/g)	32.656	21.082	19.022
PGA*PGD/PGV^2	14.791	30.761	30.662
5-75% Duration (sec)	7.620	11.915	7.335
5% Duration Time (sec)	1.045	1.240	0.940
75% Duration Time (sec)	8.665	13.155	8.275
0% Extrapolated Duration Time (sec)	0.501	0.389	0.416
100% Extrapolated Duration Time (sec)	11.386	17.410	10.895
0-100% Extrapolated Duration Time (sec)	10.886	17.021	10.479

NAPS SUP 3.7-2

Table 3.7.1-212 Zero-Lag Cross Correlation Coefficients for the Final Scaled Spectrum Compatible Acceleration Time-Histories for the CB

CB Full Profile

Components	Zero-Lag Cross-Correlation Coefficient of Final Matched Time Histories
H1 – H2	0.020
H1 – UP	0.015
H2 – UP	-0.013

CB Partial Profile

Components	Zero-Lag Cross-Correlation Coefficient of Final Matched Time Histories
H1 – H2	0.025
H1 – UP	0.012
H2 – UP	-0.021

NAPS SUP 3.7-2

Table 3.7.1-213 Peak Ground Motion Parameters, Associated Ratios, and Strong Motion Duration Values for the Final Scaled Spectrum Compatible Acceleration Time-Histories for the CB

Parameter	H1	H2	UP
CB Full Profile			
PGA (g)	0.916	0.907	0.932
PGV (cm/sec)	22.920	16.838	15.622
PGD (cm)	10.907	8.043	7.279
PGV/PGA (cm/sec/g)	25.021	18.557	16.768
PGA*PGD/PGV^2	18.647	25.239	27.246
5-75% Duration (sec)	7.030	10.645	6.055
5% Duration Time (sec)	1.040	1.220	0.940
75% Duration Time (sec)	8.070	11.865	6.995
0% Extrapolated Duration Time (sec)	0.538	0.460	0.508
100% Extrapolated Duration Time (sec)	10.581	15.667	9.158
0-100% Extrapolated Duration Time (sec)	10.043	15.207	8.650
CB Partial Profile			
PGA (g)	0.955	0.960	1.028
PGV (cm/sec)	24.107	14.954	13.594
PGD (cm)	11.100	7.950	6.611
PGV/PGA (cm/sec/g)	25.232	15.569	13.224
PGA*PGD/PGV^2	17.893	33.485	36.056
5-75% Duration (sec)	6.880	10.555	6.060
5% Duration Time (sec)	1.025	1.175	0.930
75% Duration Time (sec)	7.905	11.730	6.990
0% Extrapolated Duration Time (sec)	0.534	0.421	0.497
100% Extrapolated Duration Time (sec)	10.362	15.500	9.154
0-100% Extrapolated Duration Time (sec)	9.829	15.079	8.657

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Table 3.7.1-214 Zero-Lag Cross Correlation Coefficients for the Final Scaled Spectrum Compatible Acceleration Time-Histories for the FWSC

FWSC

Components	Zero-Lag Cross-Correlation Coefficient of Final Matched Time Histories
H1 – H2	0.006
H1 – UP	-0.017
H2 – UP	0.014

NAPS SUP 3.7-2

Table 3.7.1-215 Peak Ground Motion Parameters, Associated Ratios, and Strong Motion Duration Values for the Final Scaled Spectrum Compatible Acceleration Time-Histories for the FWSC

FWSC

Parameter	H1	H2	UP
PGA (g)	0.823	0.786	0.775
PGV (cm/sec)	23.088	20.676	18.511
PGD (cm)	8.950	8.961	6.302
PGV/PGA (cm/sec/g)	28.068	26.302	23.898
PGA*PGD/PGV^2	13.542	16.157	13.969
5-75% Duration (sec)	6.720	8.850	6.045
5% Duration Time (sec)	1.095	1.365	0.955
75% Duration Time (sec)	7.815	10.215	7.000
0% Extrapolated Duration Time (sec)	0.615	0.733	0.523
100% Extrapolated Duration Time (sec)	10.215	13.376	9.159
0-100% Extrapolated Duration Time (sec)	9.600	12.643	8.636

NAPS SUP 3.7-2

Table 3.7.1-216 Site-Dependent SSE and OBE 5% Damping Acceleration Response Spectra at Grade

Frequency (Hz)	Horizontal SSE at Grade (g)	Vertical SSE at Grade (g)	Horizontal OBE at Grade (g)	Vertical OBE at Grade (g)
100	1.044	1.008	0.348	0.336
90	1.083	1.093	0.361	0.364
80	1.168	1.254	0.389	0.418
70	1.332	1.495	0.444	0.498
60	1.578	1.803	0.526	0.601
50	1.831	2.090	0.610	0.697
45	2.016	2.224	0.672	0.741
40	2.232	2.312	0.744	0.771
35	2.333	2.288	0.778	0.763
30	2.421	2.268	0.807	0.756
25	2.443	2.150	0.814	0.717
20	2.378	1.964	0.793	0.655
15	2.376	1.872	0.792	0.624
12.5	2.375	1.831	0.792	0.610
10	2.235	1.676	0.745	0.559
9	2.147	1.610	0.716	0.537
8	1.996	1.497	0.665	0.499
7	1.794	1.346	0.598	0.449
6	1.544	1.158	0.515	0.386
5	1.272	0.954	0.424	0.318
4	0.909	0.682	0.303	0.227
3	0.564	0.423	0.188	0.141
2.5	0.419	0.314	0.140	0.105
2	0.302	0.226	0.101	0.0755
1.5	0.212	0.159	0.0705	0.0529
1.25	0.177	0.126	0.0590	0.0419
1	0.147	0.103	0.0491	0.0342

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Table 3.7.1-216 Site-Dependent SSE and OBE 5% Damping Acceleration Response Spectra at Grade

Frequency (Hz)	Horizontal SSE at Grade (g)	Vertical SSE at Grade (g)	Horizontal OBE at Grade (g)	Vertical OBE at Grade (g)
0.9	0.135	0.0938	0.0451	0.0313
0.8	0.123	0.0848	0.0409	0.0283
0.7	0.110	0.0757	0.0367	0.0252
0.6	0.0969	0.0665	0.0323	0.0222
0.5	0.0834	0.0578	0.0278	0.0193
0.4	0.0694	0.0470	0.0231	0.0157
0.3	0.0548	0.0368	0.0183	0.0123
0.2	0.0306	0.0229	0.0102	0.00764
0.167	0.0255	0.0191	0.00851	0.00638
0.125	0.0191	0.0144	0.00638	0.00478
0.1	0.0154	0.0115	0.00513	0.00385

NAPS SUP 3.7-2

Table 3.7.1-217 Site-Dependent SSE and OBE 5% Damping Pseudo Velocity Response Spectra at Grade

Frequency (Hz)	Horizontal SSE at Grade (in/sec)	Vertical SSE at Grade (in/sec)	Horizontal OBE at Grade (in/sec)	Vertical OBE at Grade (in/sec)
100	0.642	0.620	0.214	0.207
90	0.740	0.747	0.247	0.249
80	0.898	0.964	0.299	0.321
70	1.17	1.31	0.390	0.438
60	1.62	1.85	0.539	0.616
50	2.25	2.57	0.751	0.857
45	2.76	3.04	0.918	1.01
40	3.43	3.55	1.14	1.18
35	4.10	4.02	1.37	1.34
30	4.96	4.65	1.65	1.55
25	6.01	5.29	2.00	1.76
20	7.31	6.04	2.44	2.01
15	9.74	7.68	3.25	2.56
12.5	11.7	9.01	3.90	3.00
10	13.7	10.3	4.58	3.44
9	14.7	11.0	4.89	3.67
8	15.3	11.5	5.11	3.84
7	15.8	11.8	5.25	3.94
6	15.8	11.9	5.27	3.96
5	15.6	11.7	5.22	3.91
4	14.0	10.5	4.66	3.49
3	11.6	8.67	3.85	2.89
2.5	10.3	7.73	3.43	2.58
2	9.28	6.96	3.09	2.32
1.5	8.68	6.51	2.89	2.17
1.25	8.71	6.18	2.90	2.06
1	9.06	6.31	3.02	2.10

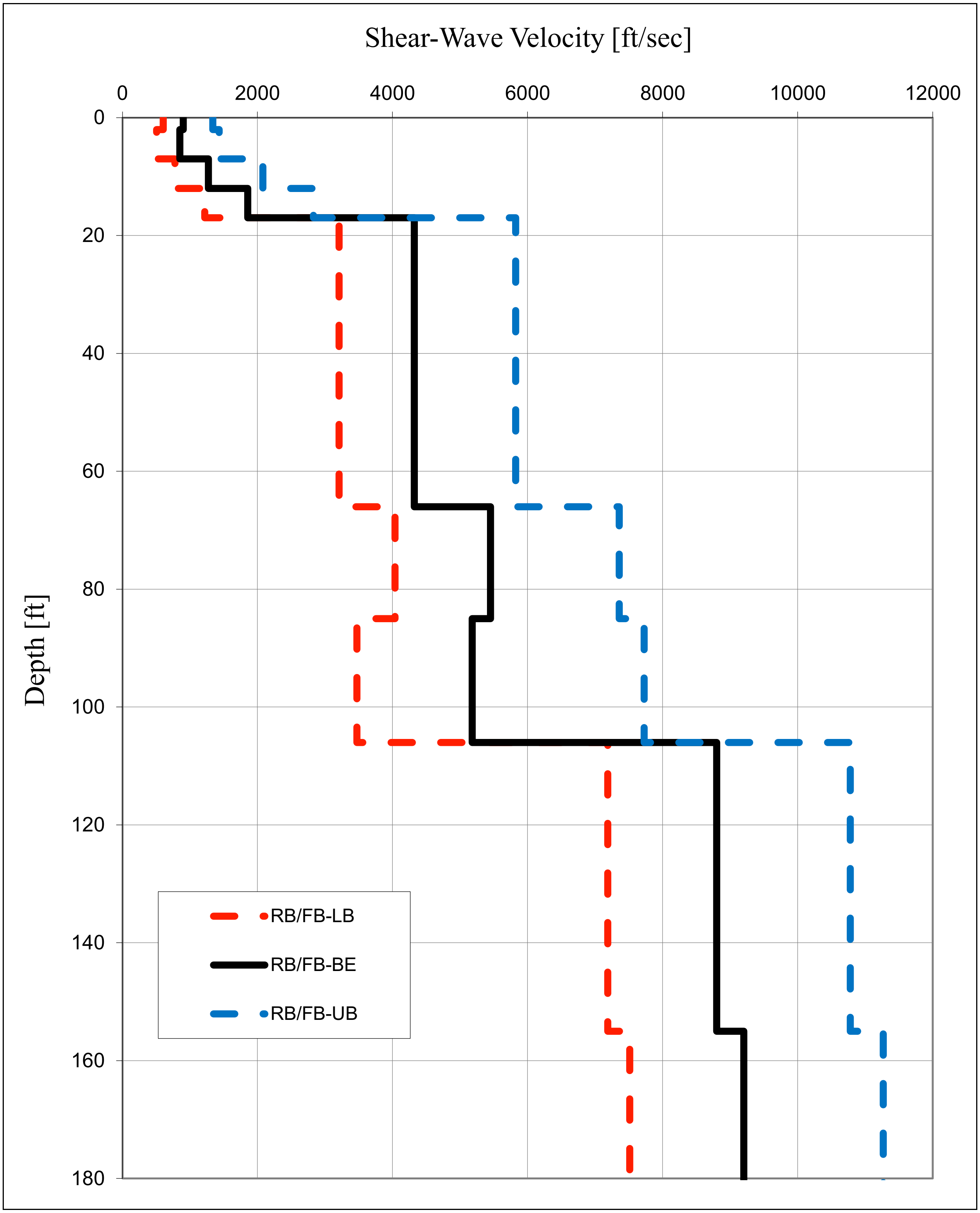
NAPS SUP 3.7-2

Table 3.7.1-217 Site-Dependent SSE and OBE 5% Damping Pseudo Velocity Response Spectra at Grade

Frequency (Hz)	Horizontal SSE at Grade (in/sec)	Vertical SSE at Grade (in/sec)	Horizontal OBE at Grade (in/sec)	Vertical OBE at Grade (in/sec)
0.9	9.24	6.41	3.08	2.14
0.8	9.43	6.52	3.14	2.17
0.7	9.66	6.65	3.22	2.22
0.6	9.93	6.82	3.31	2.27
0.5	10.3	7.11	3.42	2.37
0.4	10.7	7.23	3.56	2.41
0.3	11.2	7.55	3.74	2.52
0.2	9.41	7.05	3.14	2.35
0.167	9.40	7.05	3.13	2.35
0.125	9.42	7.06	3.14	2.35
0.1	9.46	7.10	3.15	2.37

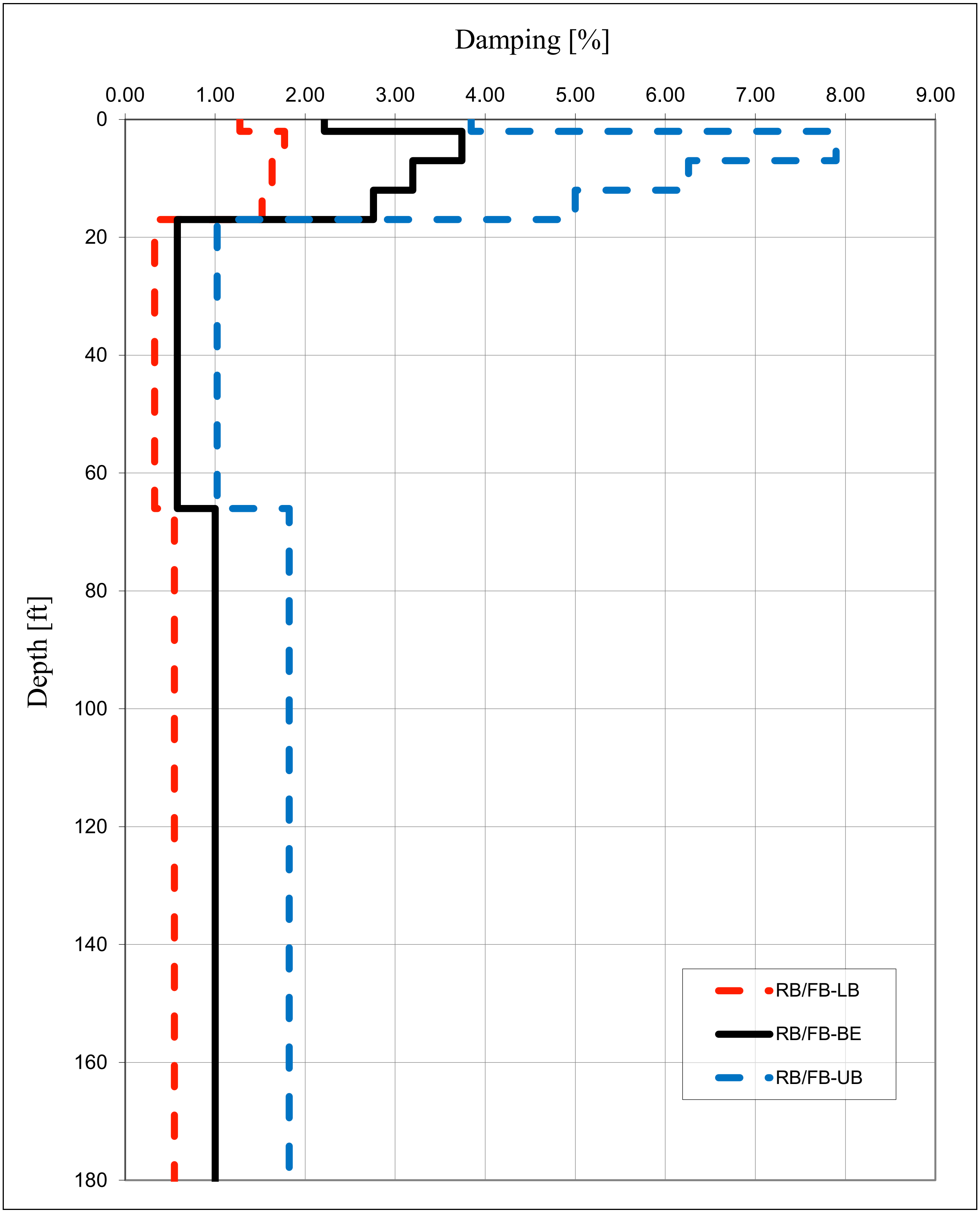
NAPS SUP 3.7-1

Figure 3.7.1-201 SSI Input Strain Compatible Shear-Wave Velocity Profiles – RB/FB

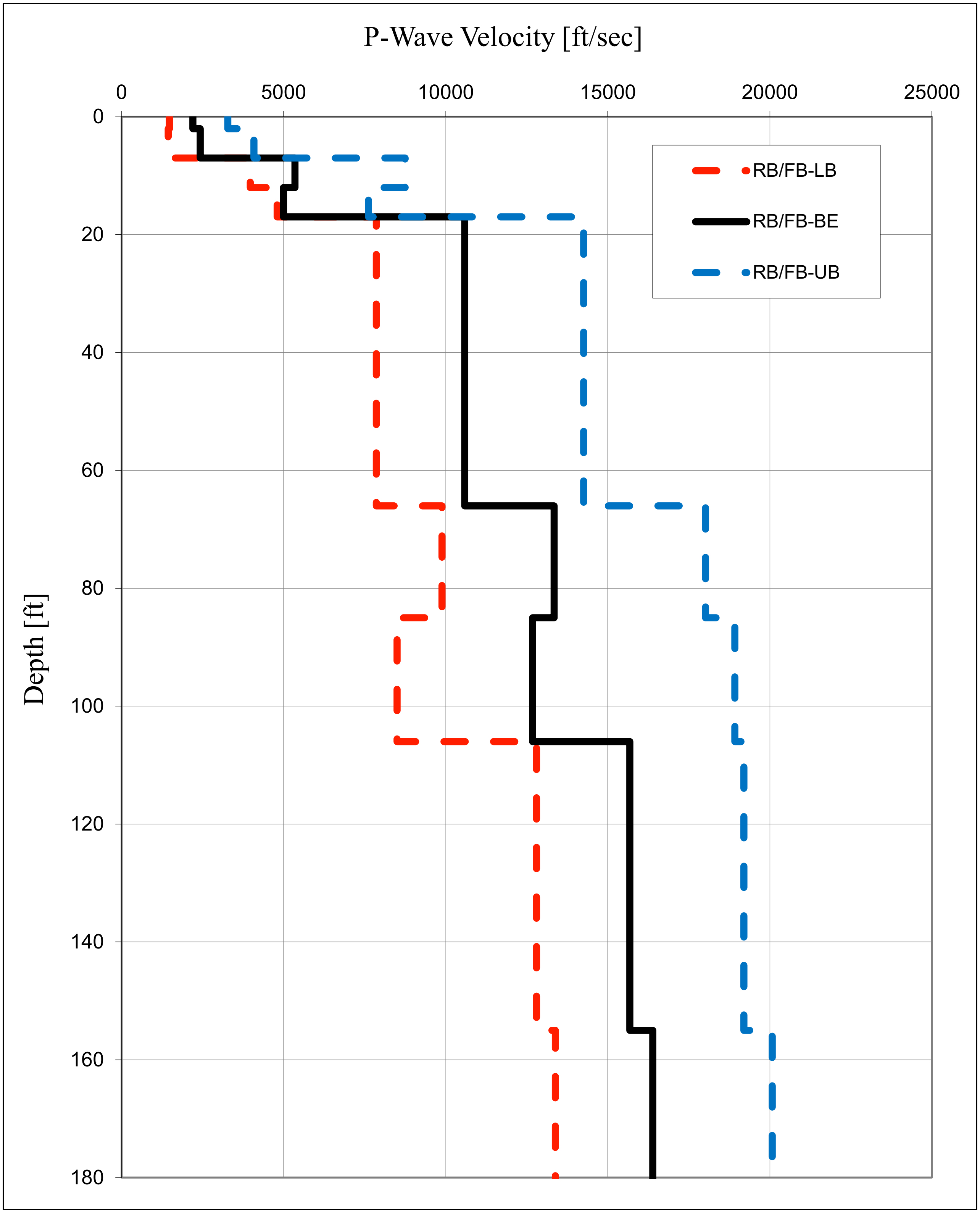


NAPS SUP 3.7-1

Figure 3.7.1-202 SSI Input Strain Compatible Shear-Wave Damping Profiles – RB/FB

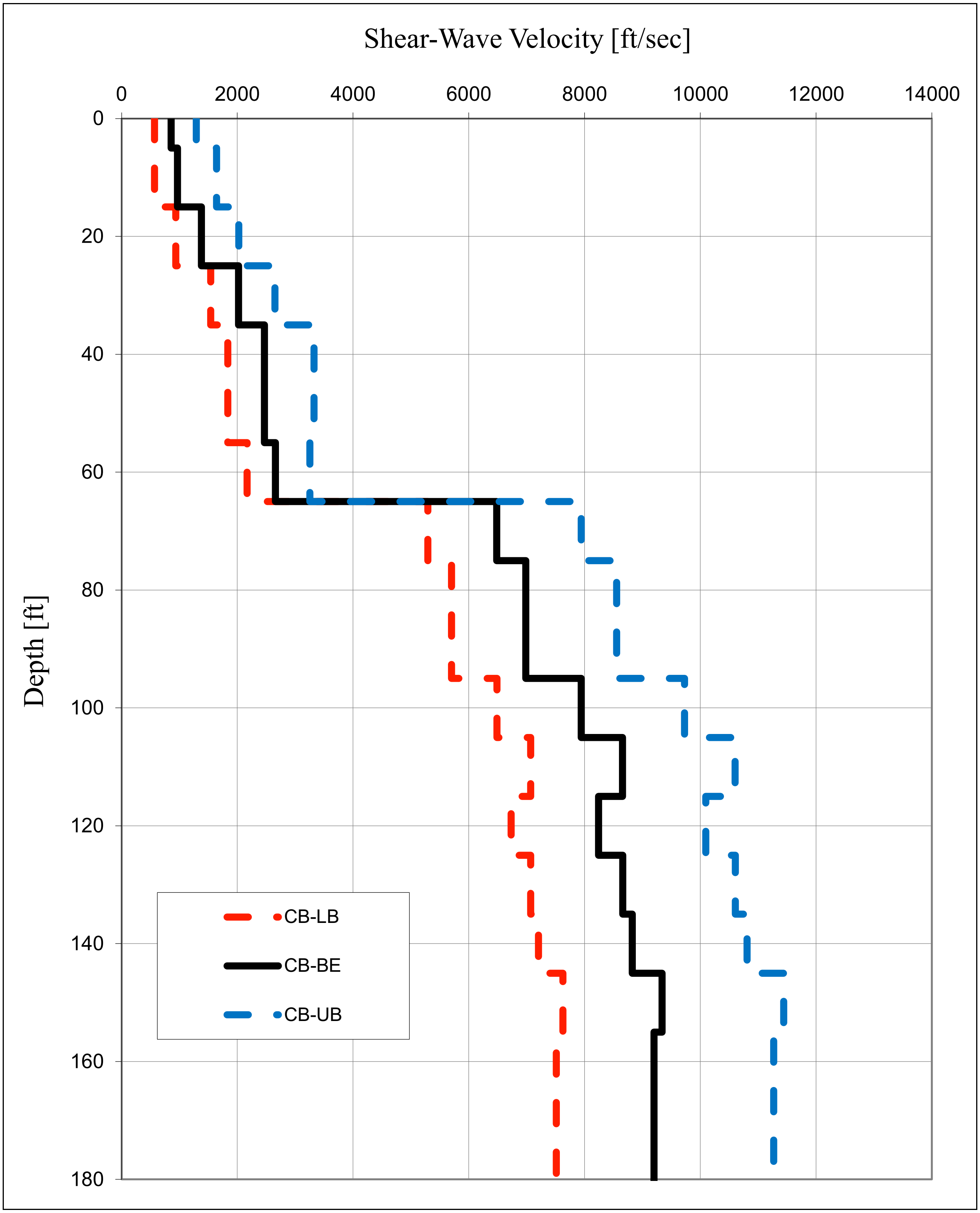


NAPS SUP 3.7-1 **Figure 3.7.1-203 SSI Input Strain Compatible P-Wave Velocity Profiles – RB/FB**



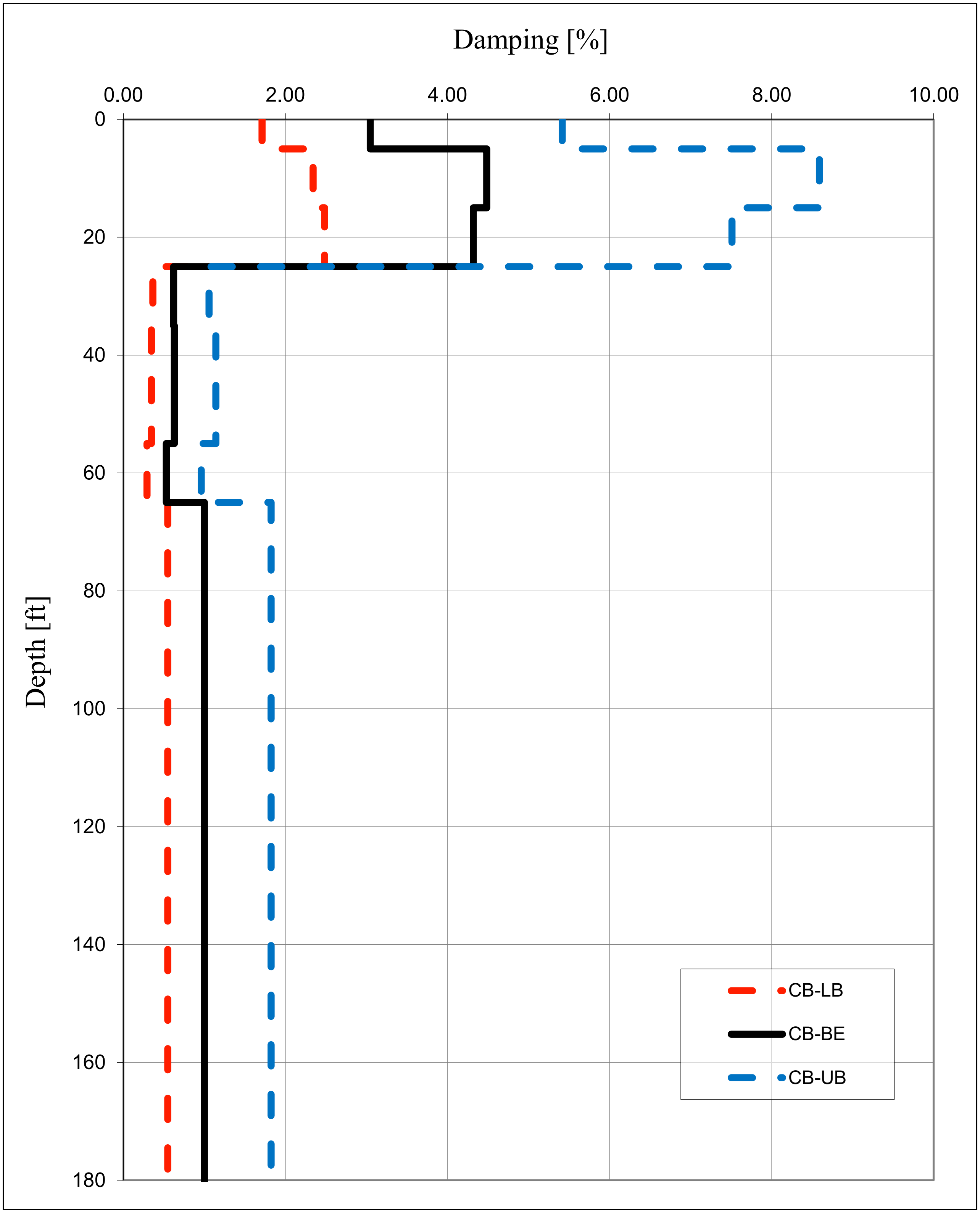
NAPS SUP 3.7-1

Figure 3.7.1-204 SSI Input Strain Compatible Shear-Wave Velocity Profiles – CB

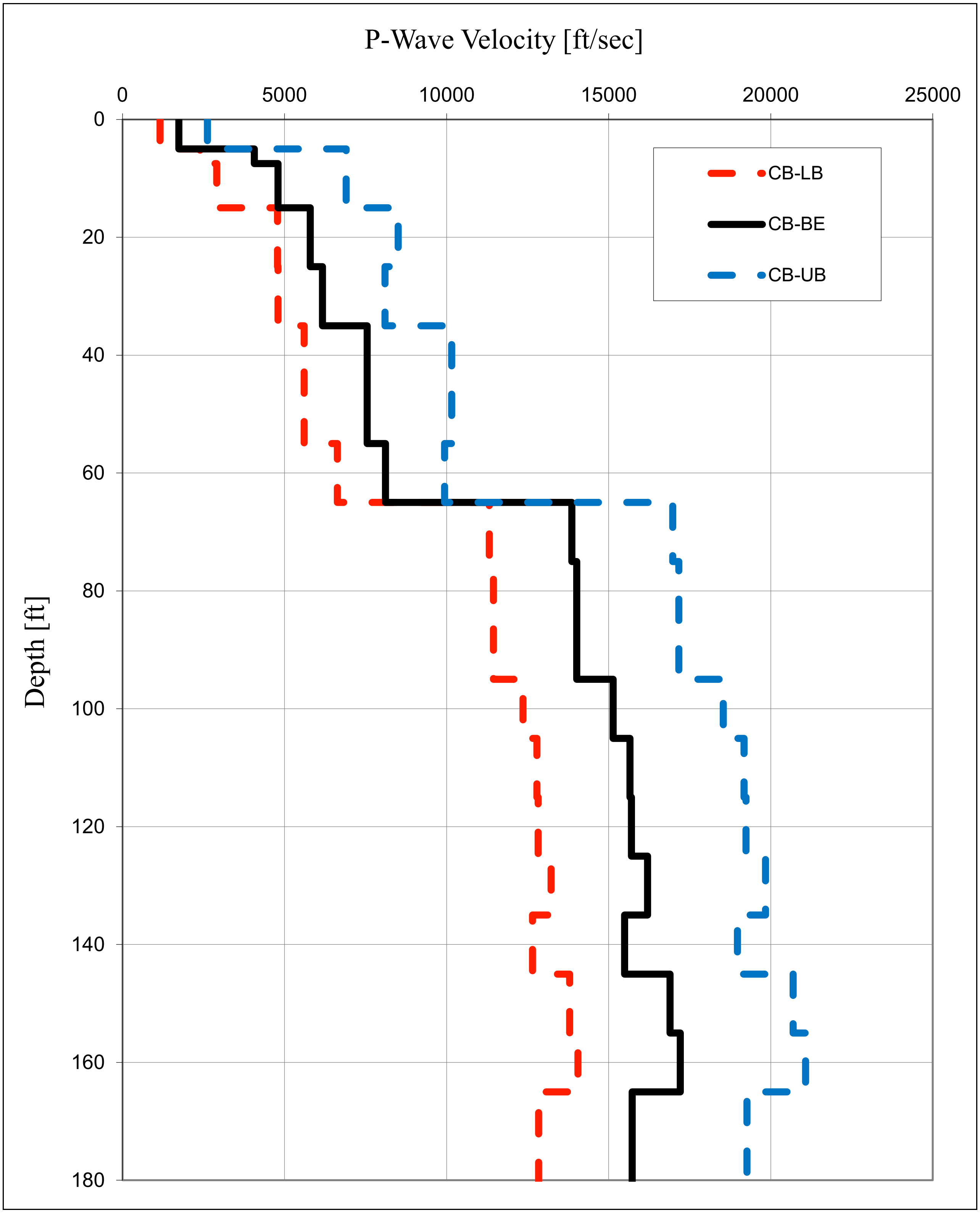


NAPS SUP 3.7-1

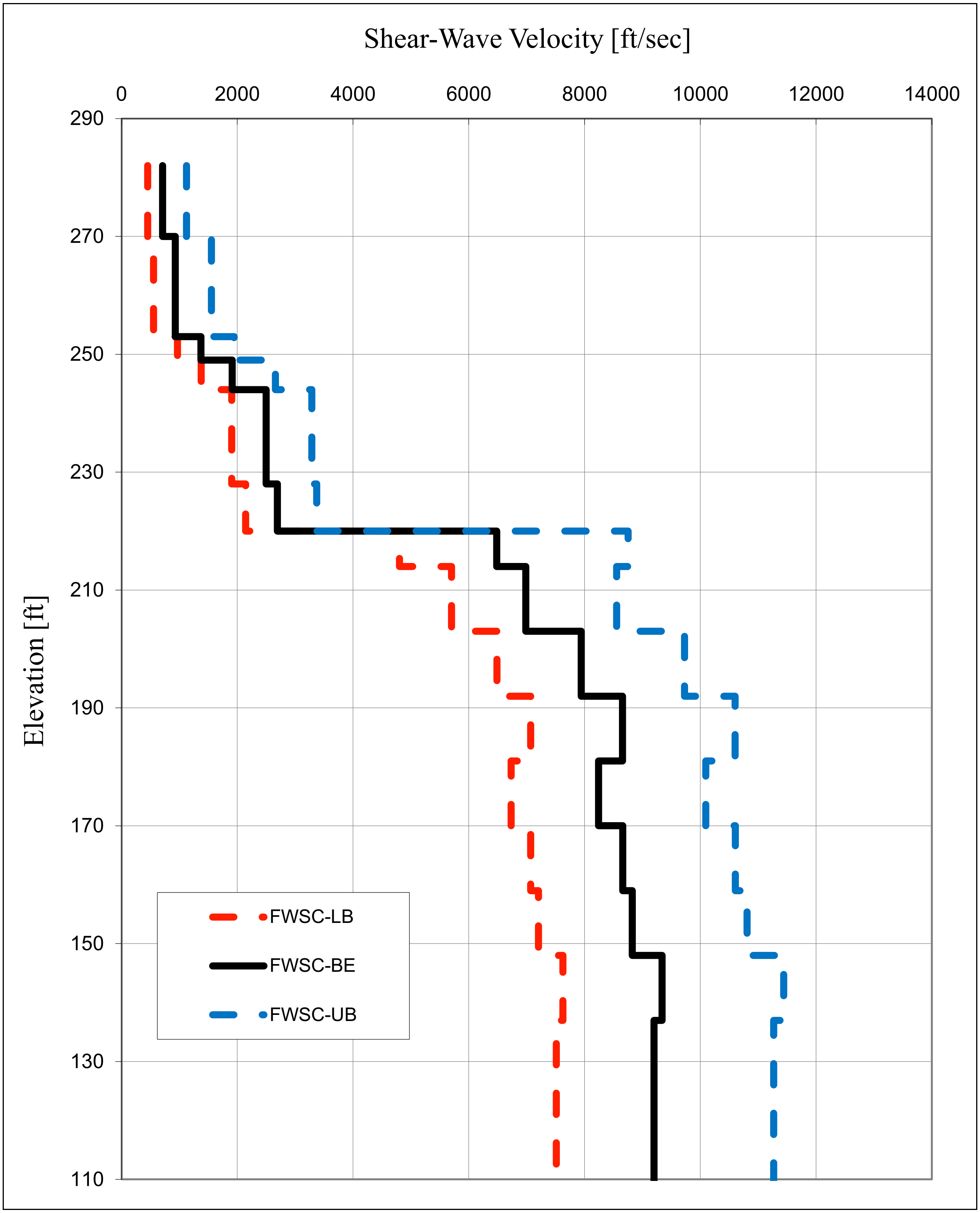
Figure 3.7.1-205 SSI Input Strain Compatible Shear-Wave Damping Profiles – CB



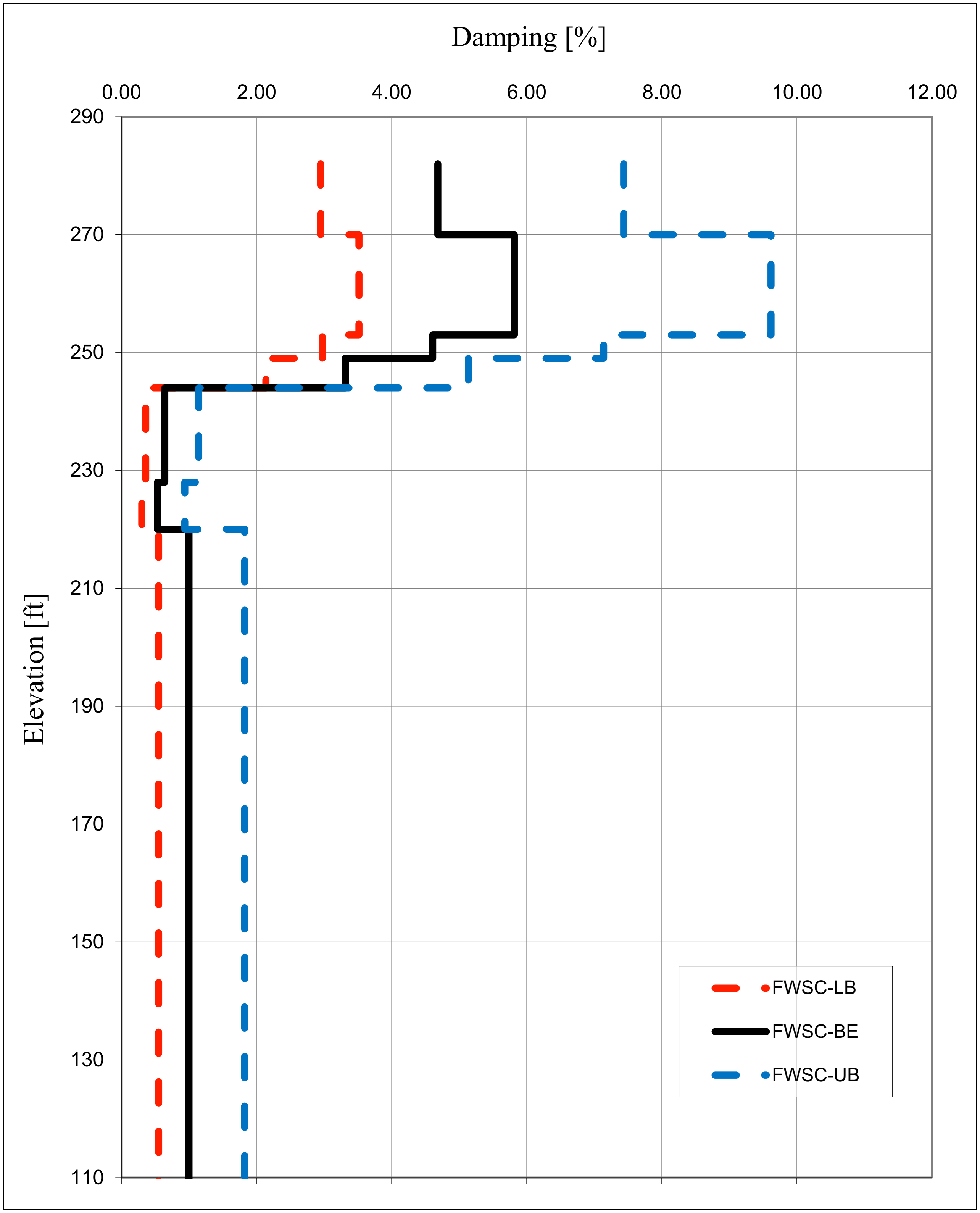
NAPS SUP 3.7-1 **Figure 3.7.1-206 SSI Input Strain Compatible P-Wave Velocity Profiles – CB**



NAPS SUP 3.7-1 **Figure 3.7.1-207 SSI Input Strain Compatible Shear-Wave Velocity Profiles – FWSC**

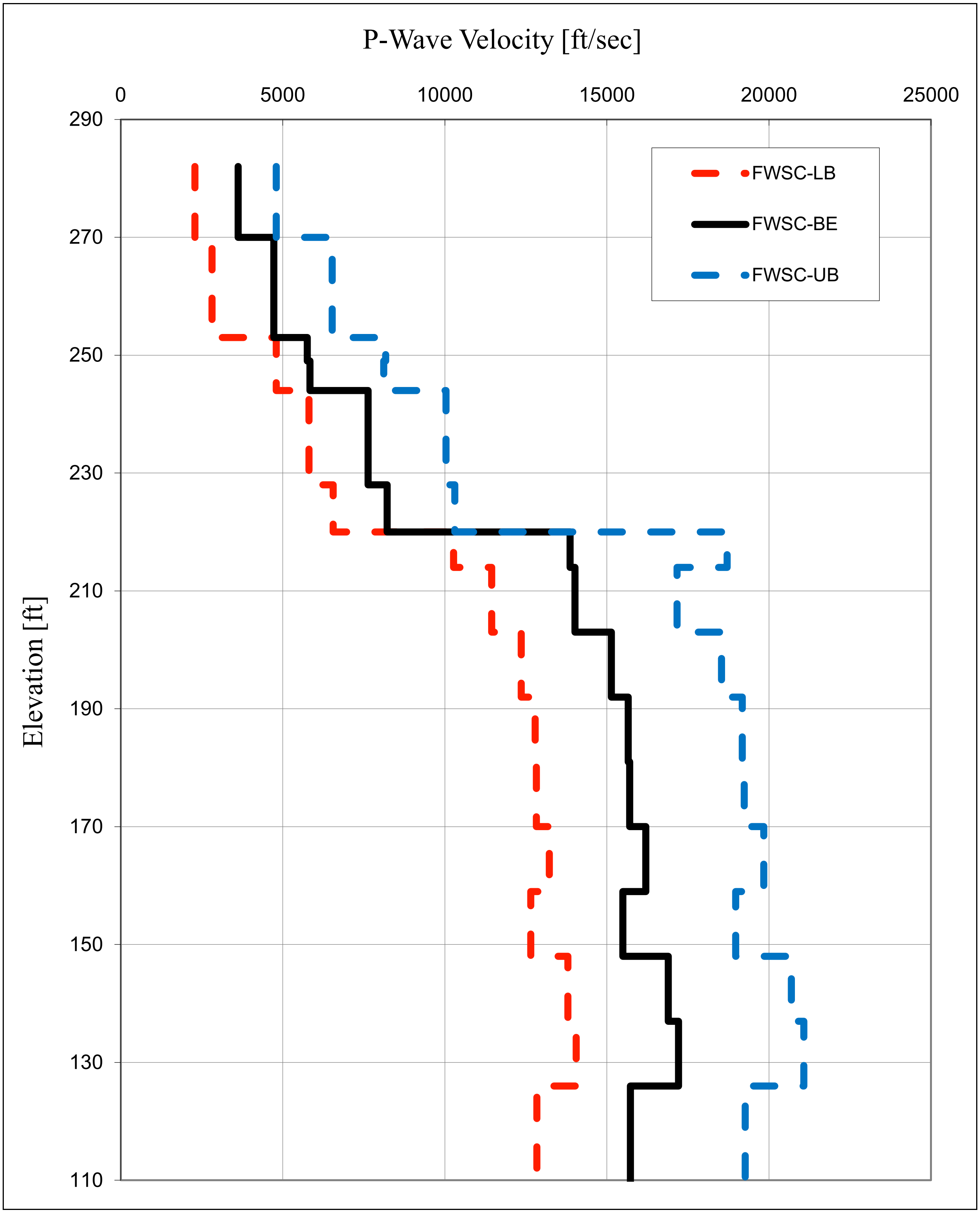


NAPS SUP 3.7-1 **Figure 3.7.1-208 SSI Input Strain Compatible Shear-Wave Damping Profiles – FWSC**

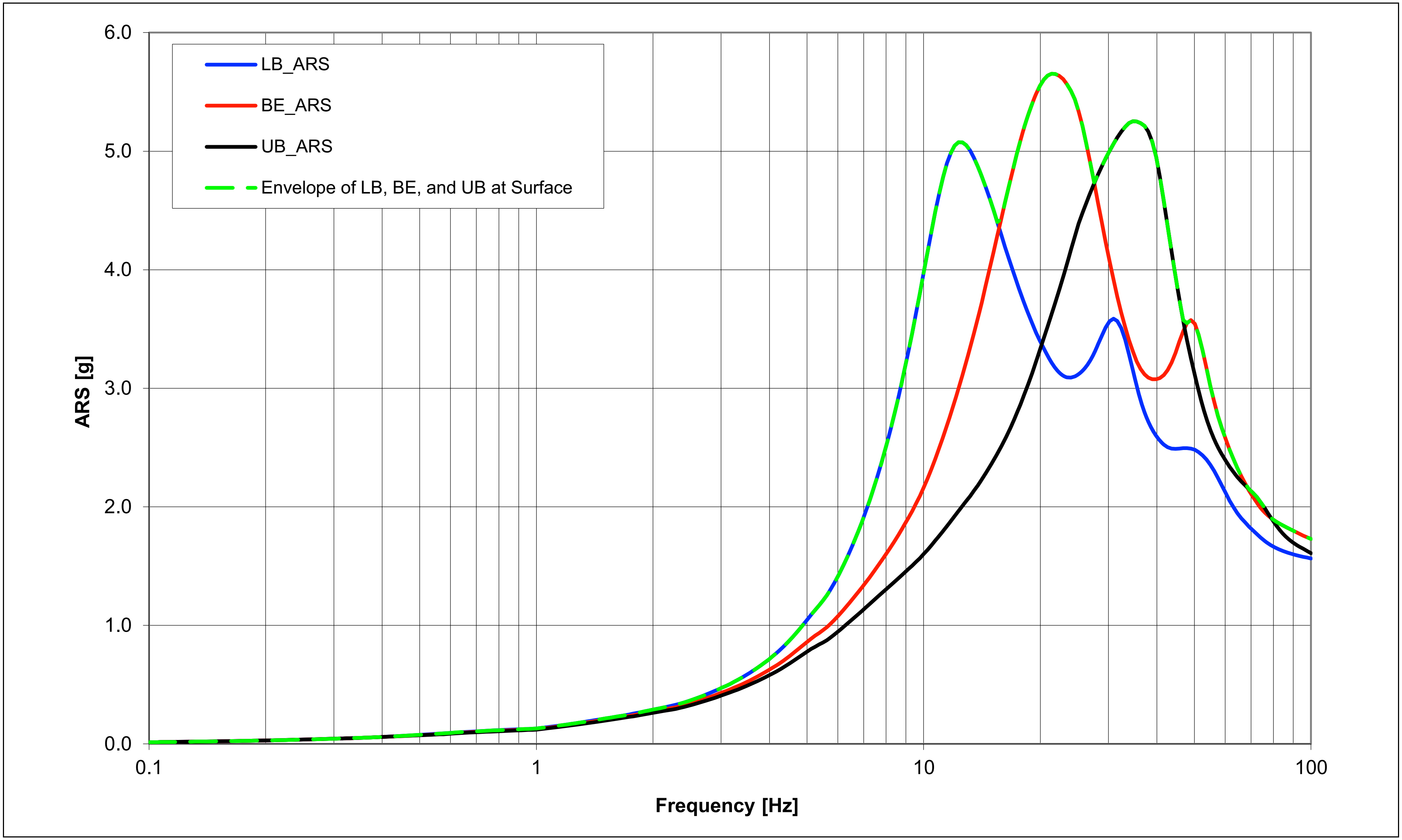


NAPS SUP 3.7-1

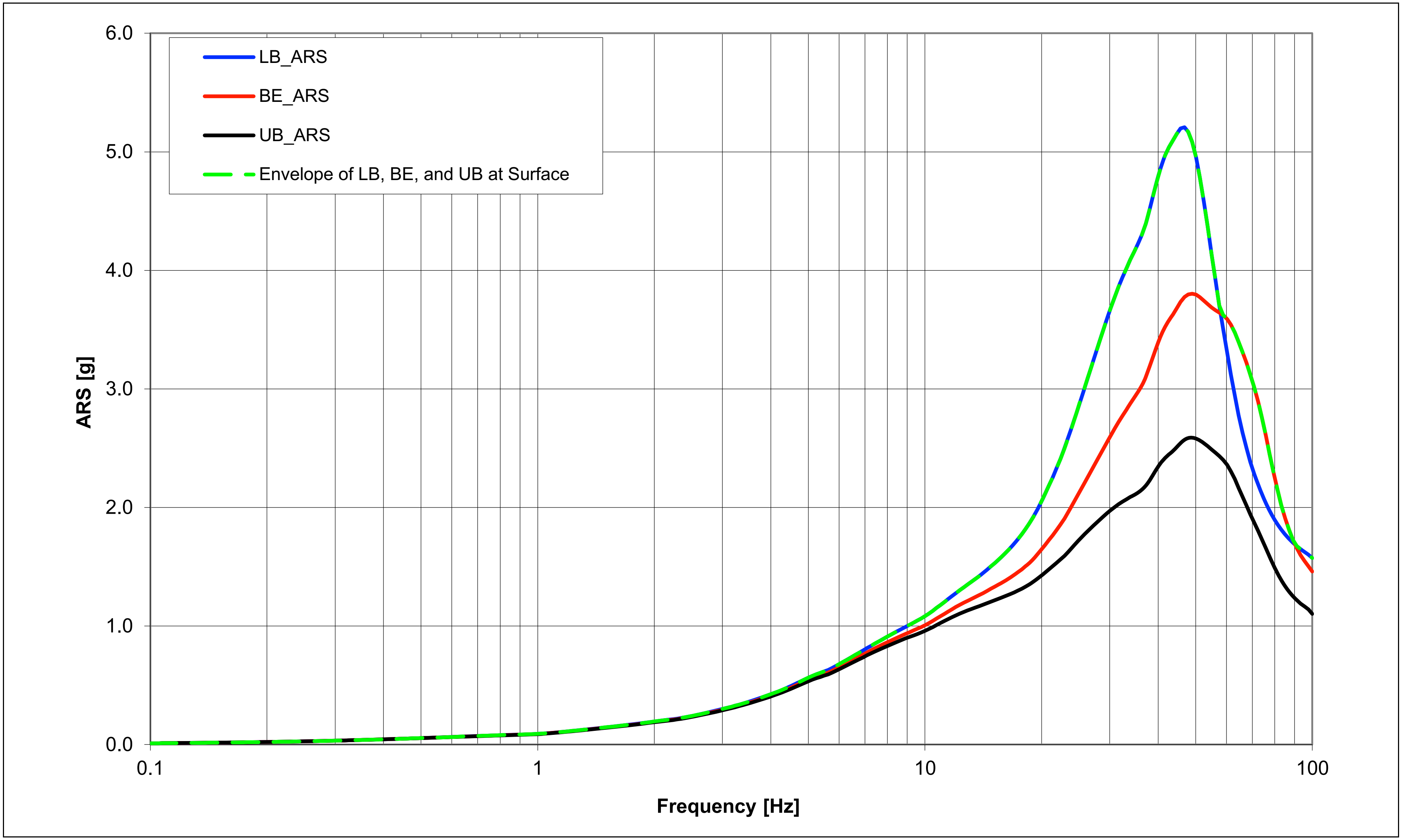
Figure 3.7.1-209 SSI Input Strain Compatible P-Wave Velocity Profiles – FWSC



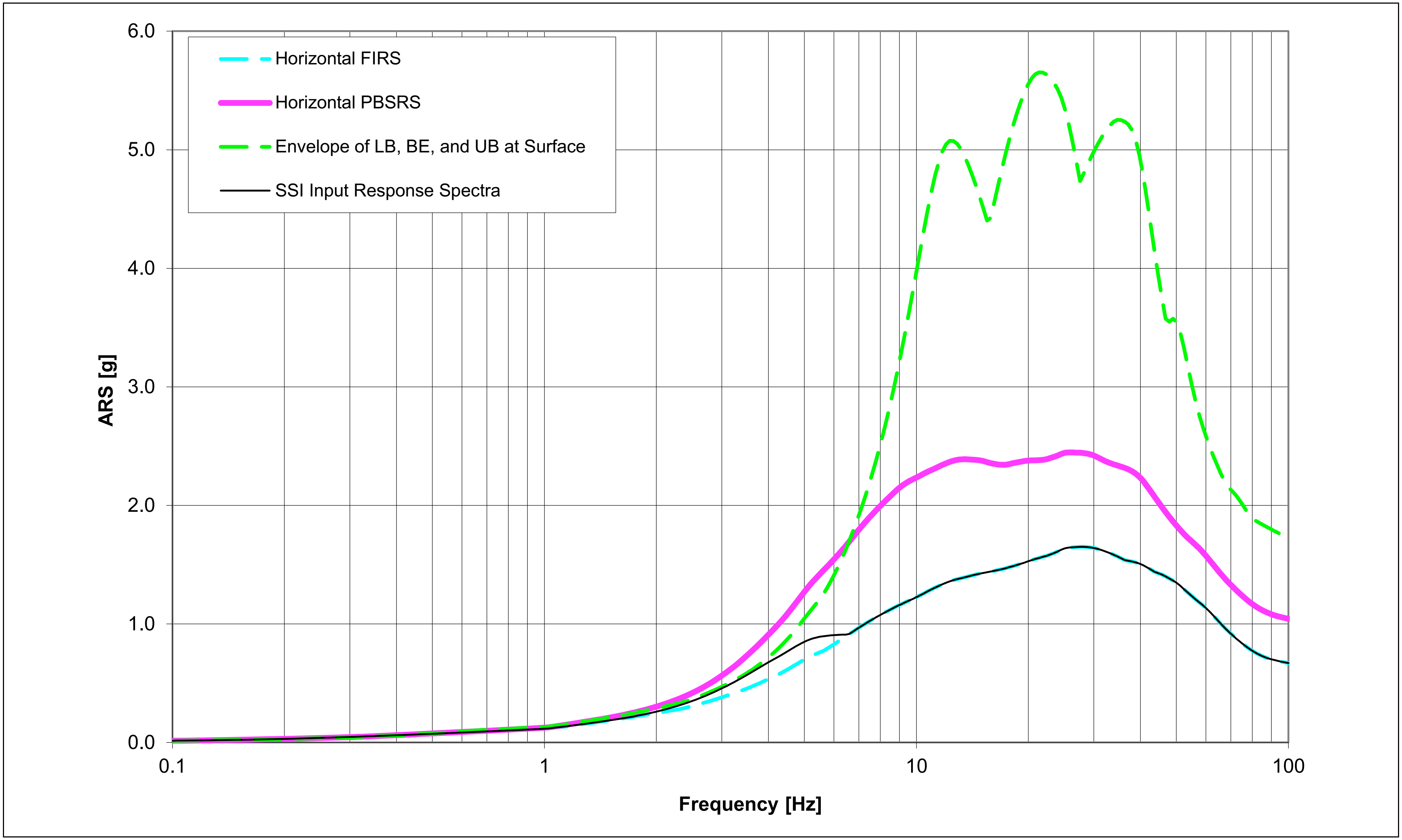
NAPS SUP 3.7-1 **Figure 3.7.1-210 Envelope of Horizontal FIRS Propagated to the Ground Surface through Full Column SSI Input Profiles – RB/FB**



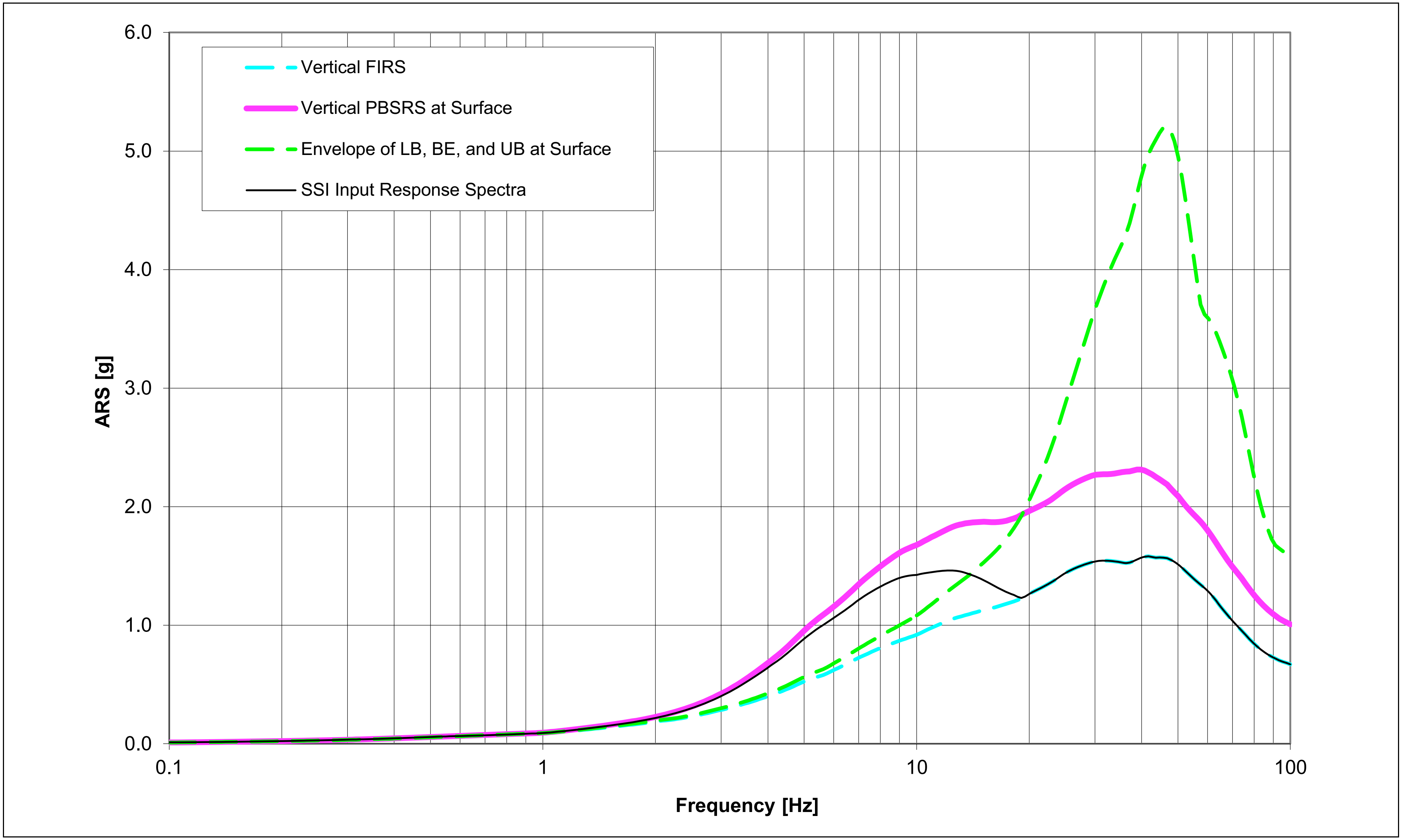
NAPS SUP 3.7-1 **Figure 3.7.1-211 Envelope of Vertical FIRS Propagated to the Ground Surface through Full Column SSI Input Profiles – RB/FB**



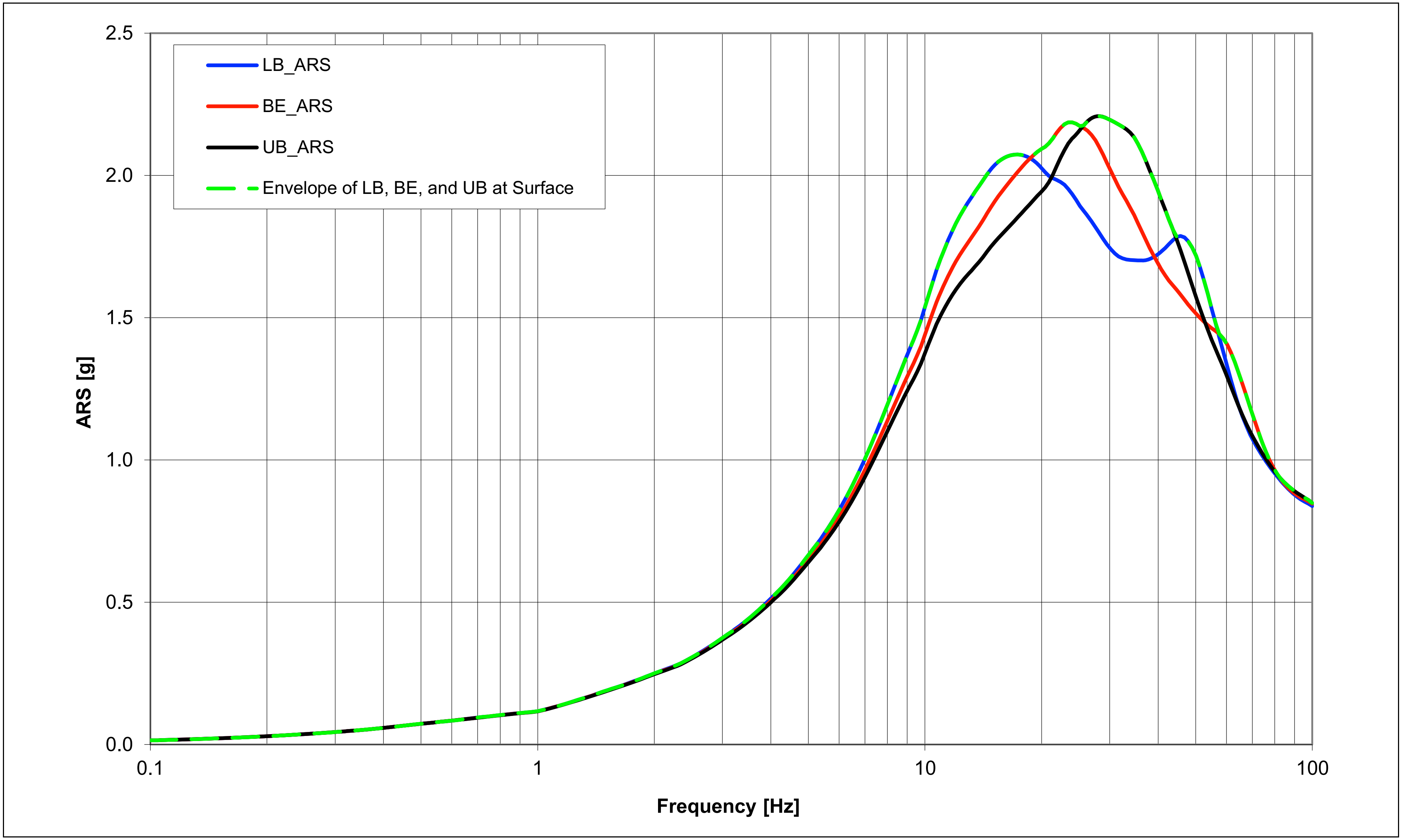
NAPS SUP 3.7-1 **Figure 3.7.1-212 NEI Check and SSI Input Response Spectra for Horizontal Full Column FIRS – RB/FB**



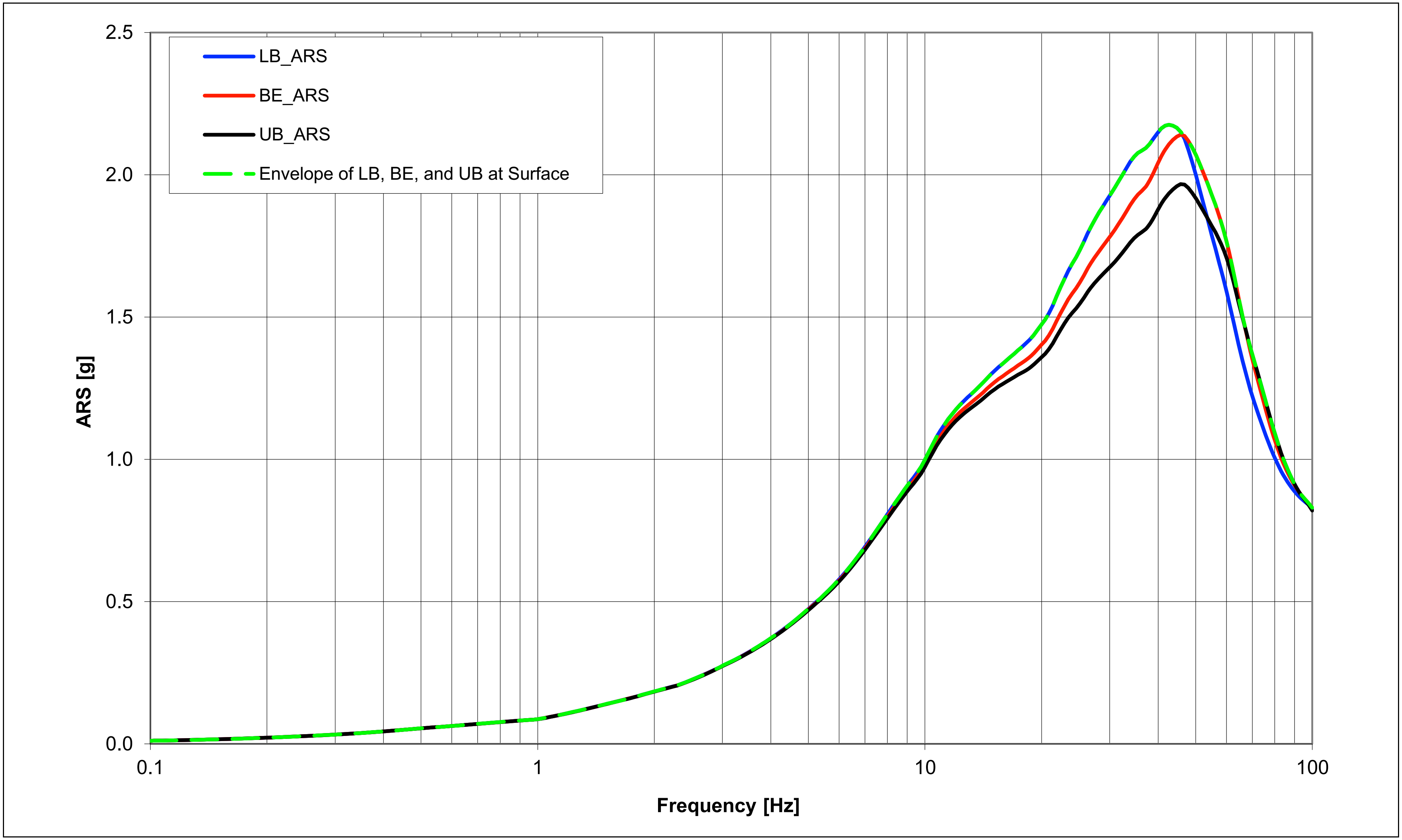
NAPS SUP 3.7-1 **Figure 3.7.1-213 NEI Check and SSI Input Response Spectra for Vertical Full Column FIRS – RB/FB**



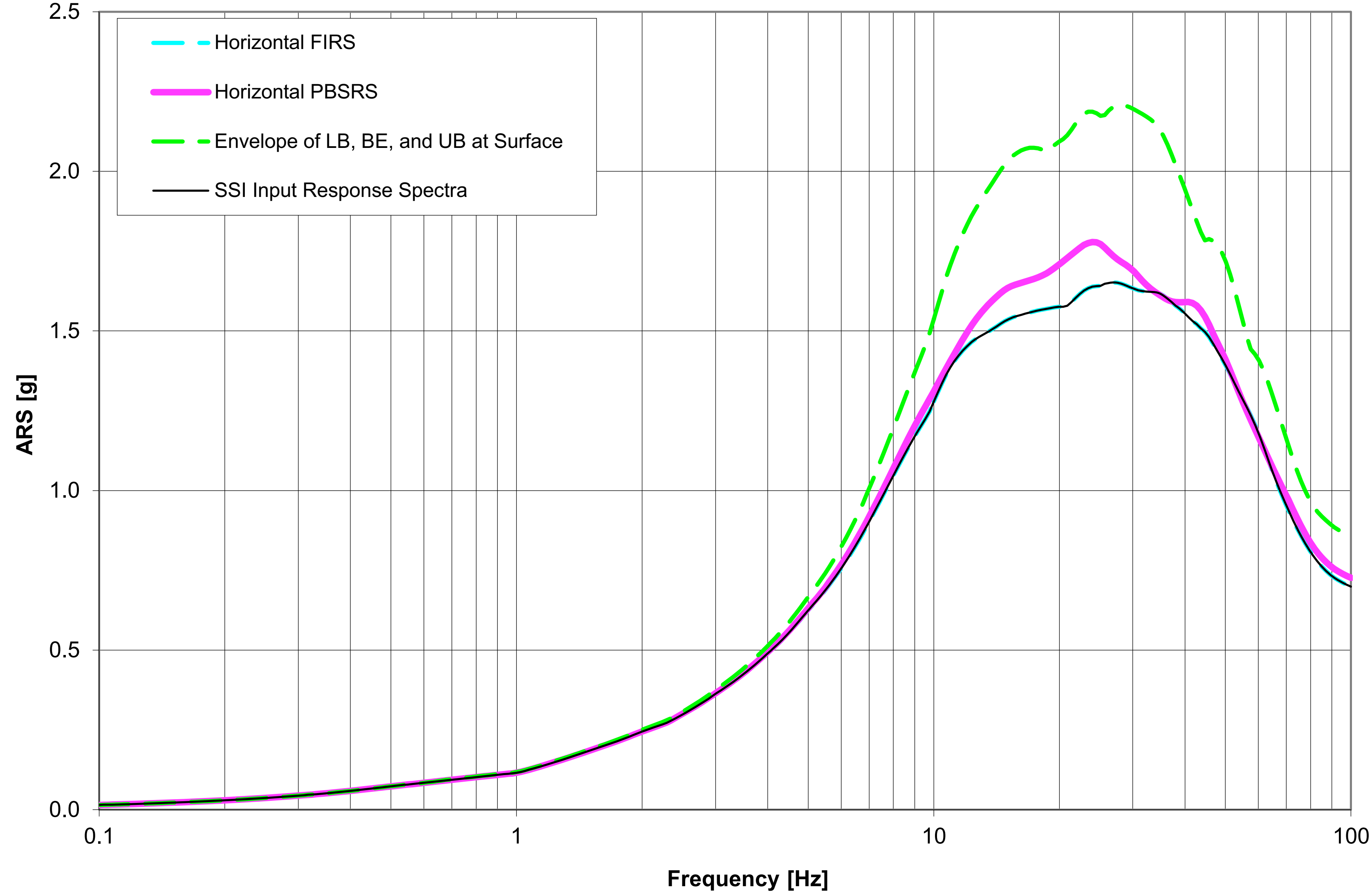
NAPS SUP 3.7-1 **Figure 3.7.1-214 Envelope of Horizontal FIRS Propagated to the Ground Surface through Partial Column SSI Input Profiles – RB/FB**



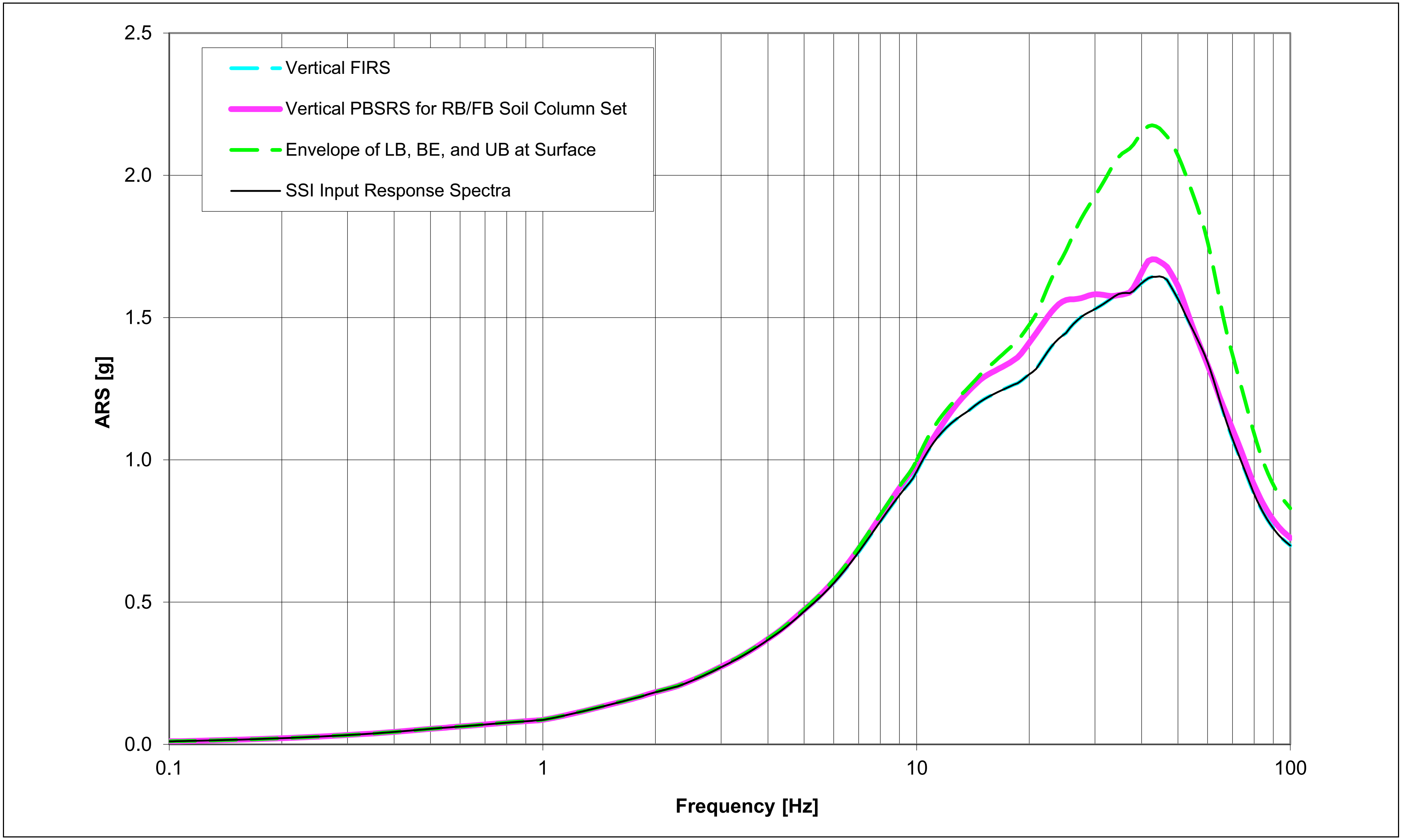
NAPS SUP 3.7-1 **Figure 3.7.1-215 Envelope of Vertical FIRS Propagated to the Ground Surface through Partial Column SSI Input Profiles – RB/FB**



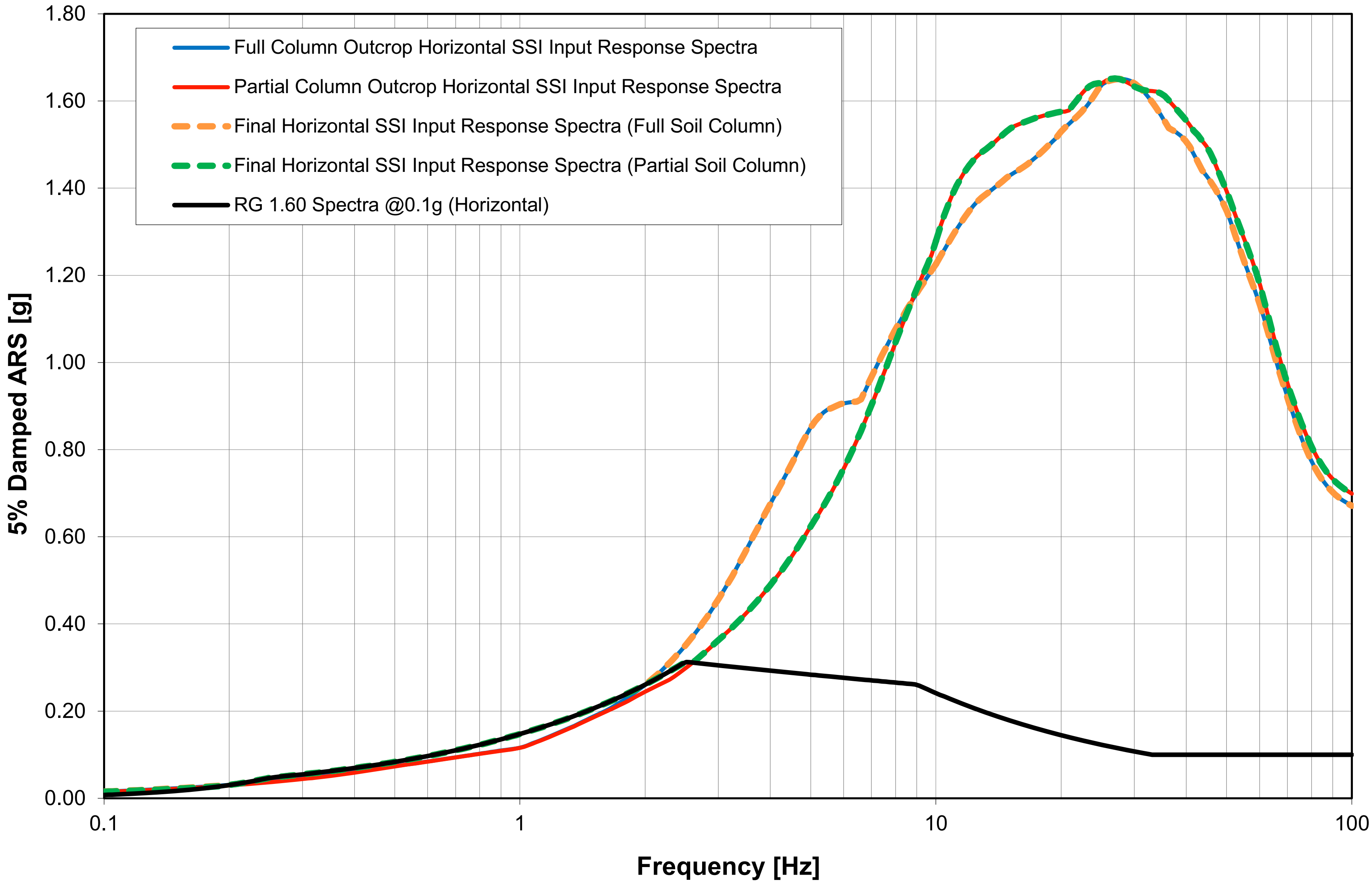
NAPS SUP 3.7-1 **Figure 3.7.1-216 NEI Check and SSI Input Response Spectra for Horizontal Partial Column FIRS – RB/FB**



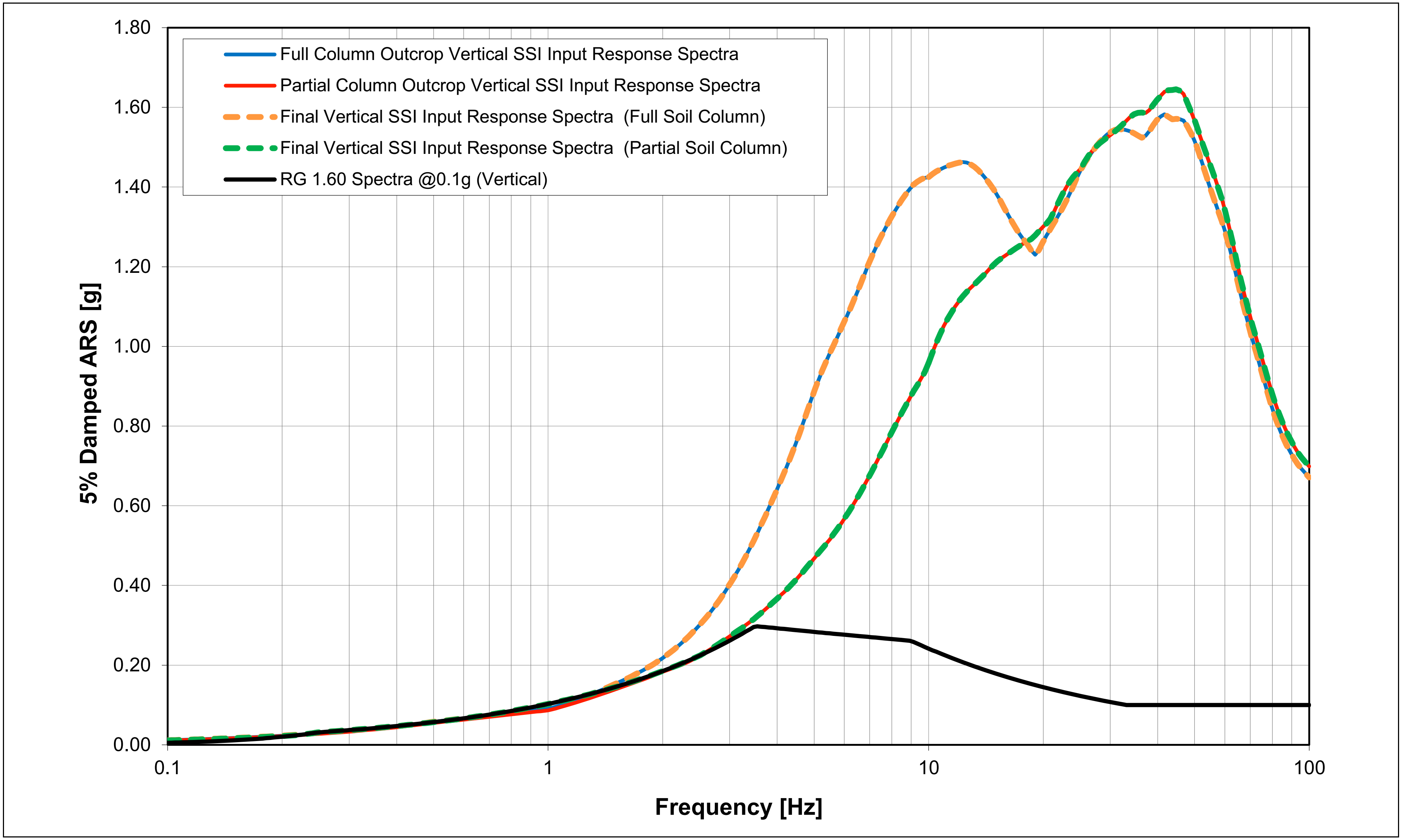
NAPS SUP 3.7-1 **Figure 3.7.1-217 NEI Check and SSI Input Response Spectra for Vertical Partial Column FIRS – RB/FB**



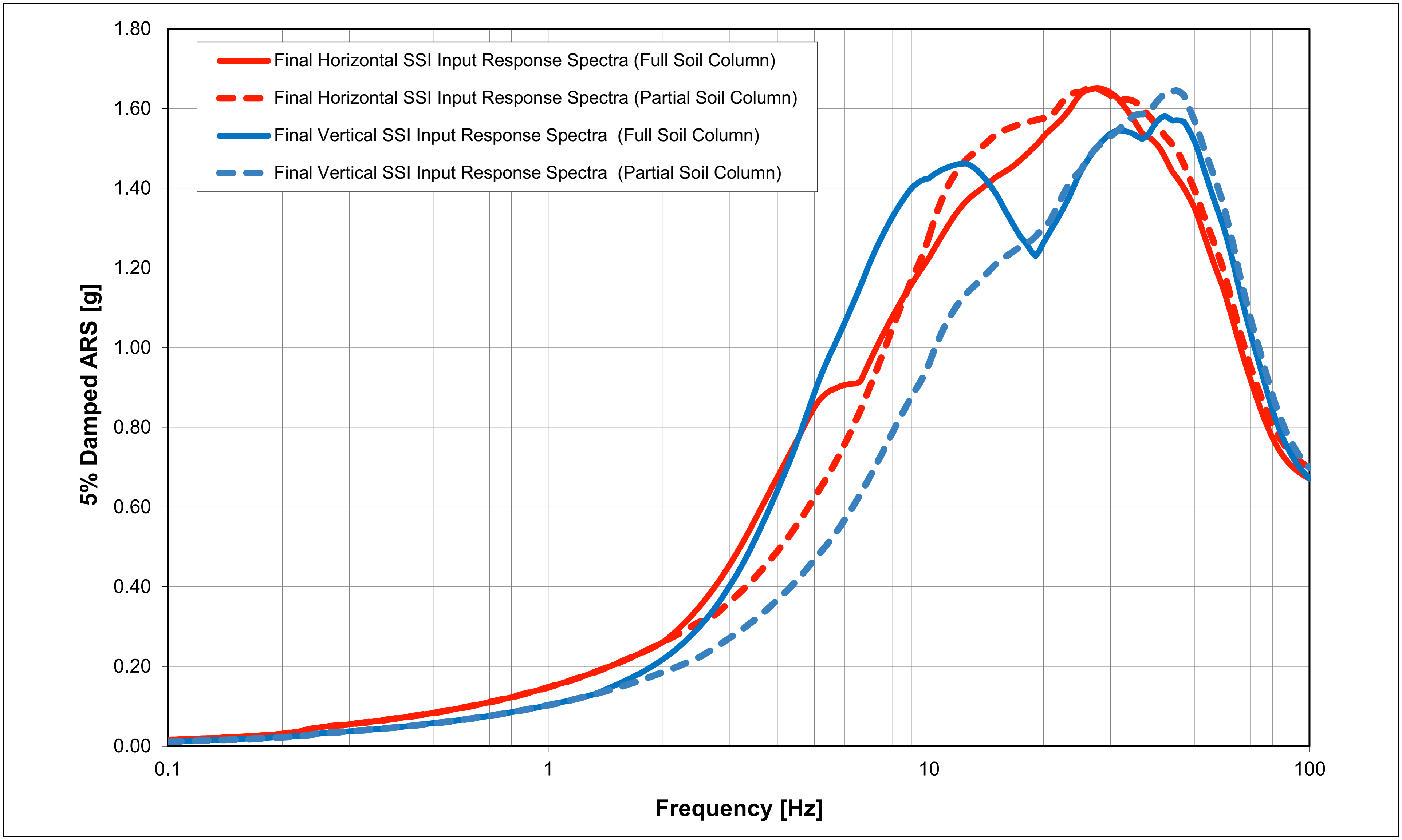
NAPS SUP 3.7-1 Figure 3.7.1-218 Development of 5% Damped Final Horizontal SSI Input Response Spectra for RB/FB



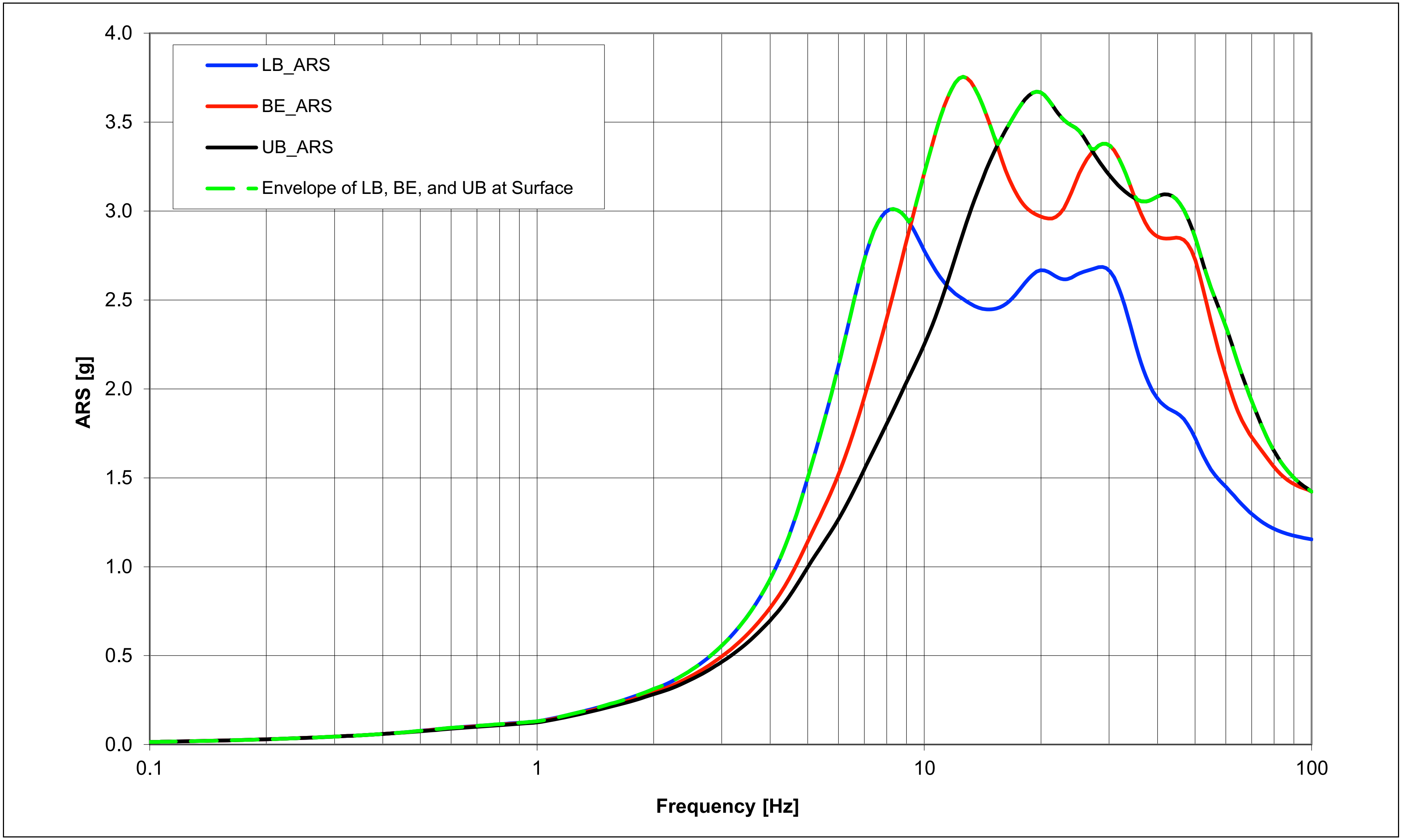
NAPS SUP 3.7-1 **Figure 3.7.1-219 Development of 5% Damped Final Vertical SSI Input Response Spectra for RB/FB**



NAPS SUP 3.7-1 **Figure 3.7.1-220 5% Damped Final SSI Input Response Spectra for RB/FB**

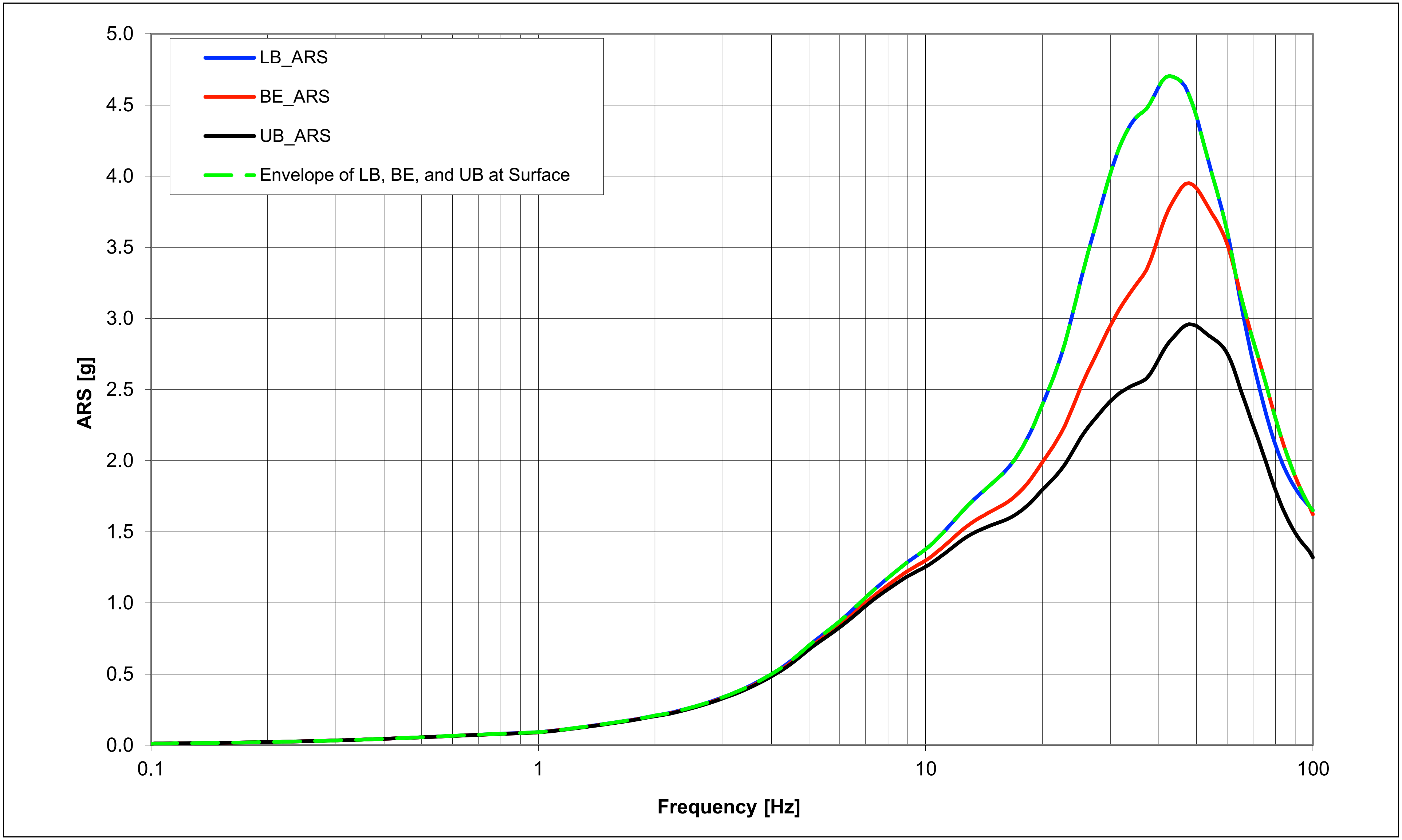


NAPS SUP 3.7-1 **Figure 3.7.1-221 Envelope of Horizontal FIRS Propagated to the Ground Surface through Full Column SSI Input Profiles – CB**

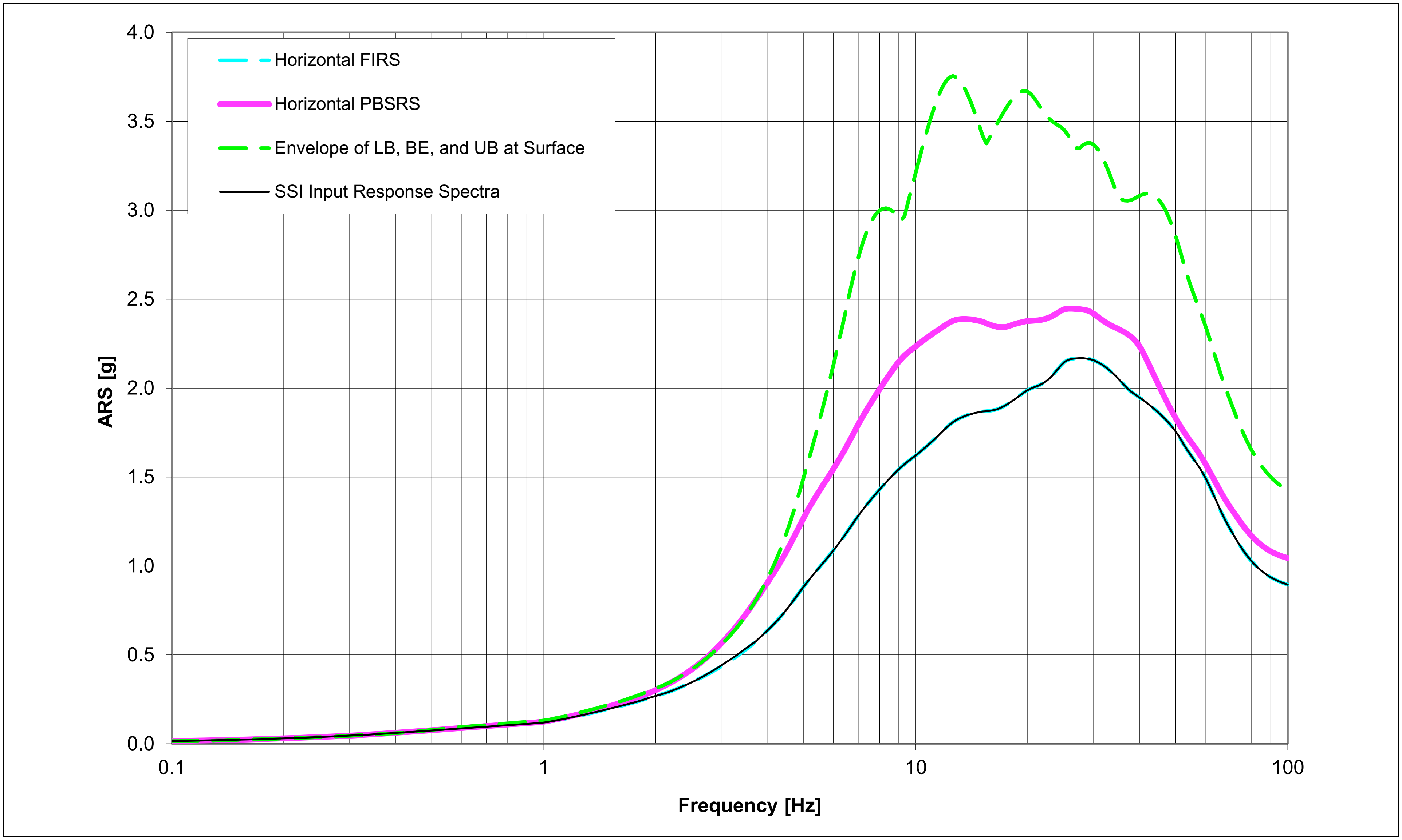


BASIS: ESBWR COLA

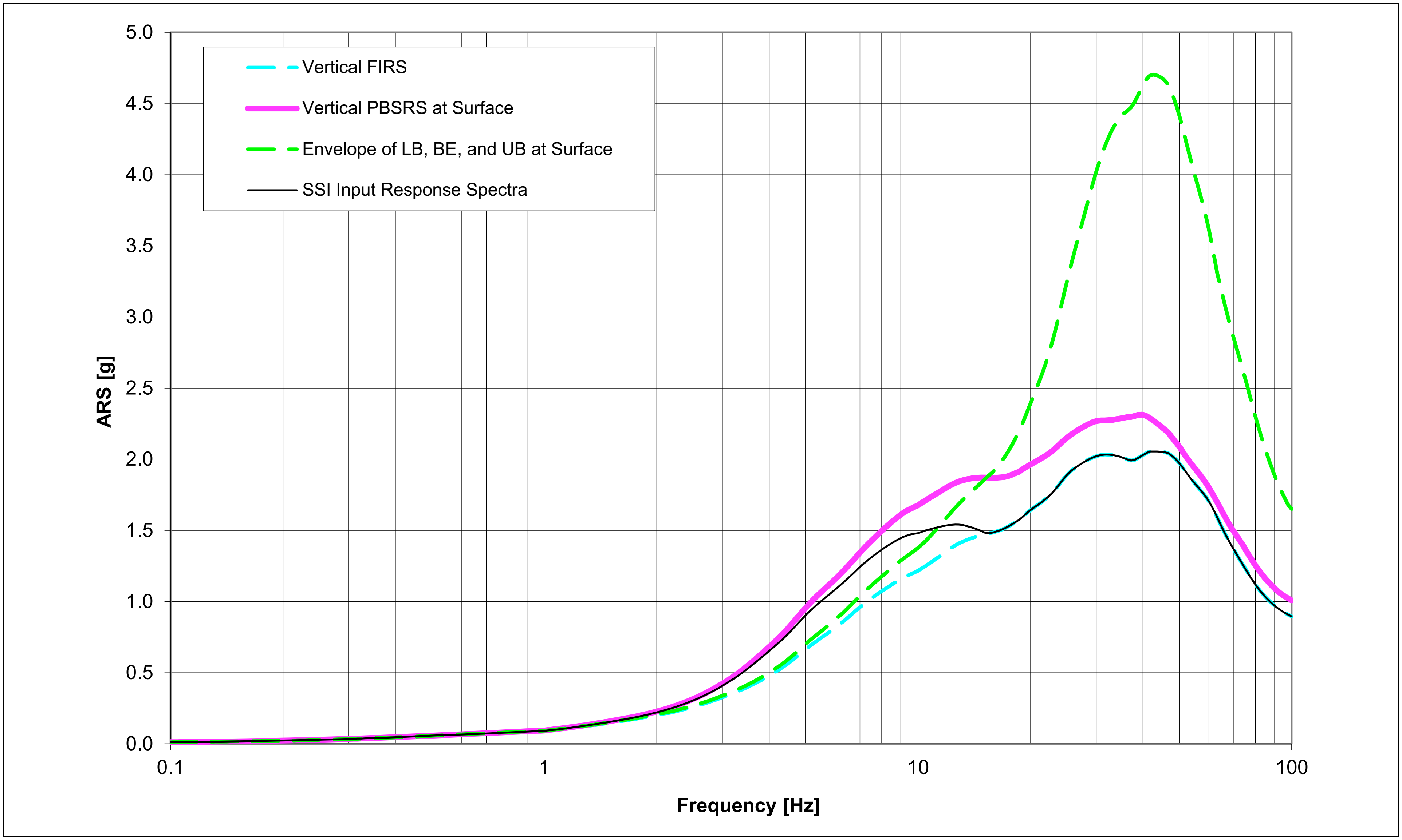
NAPS SUP 3.7-1 **Figure 3.7.1-222 Envelope of Vertical FIRS Propagated to the Ground Surface through Full Column SSI Input Profiles – CB**



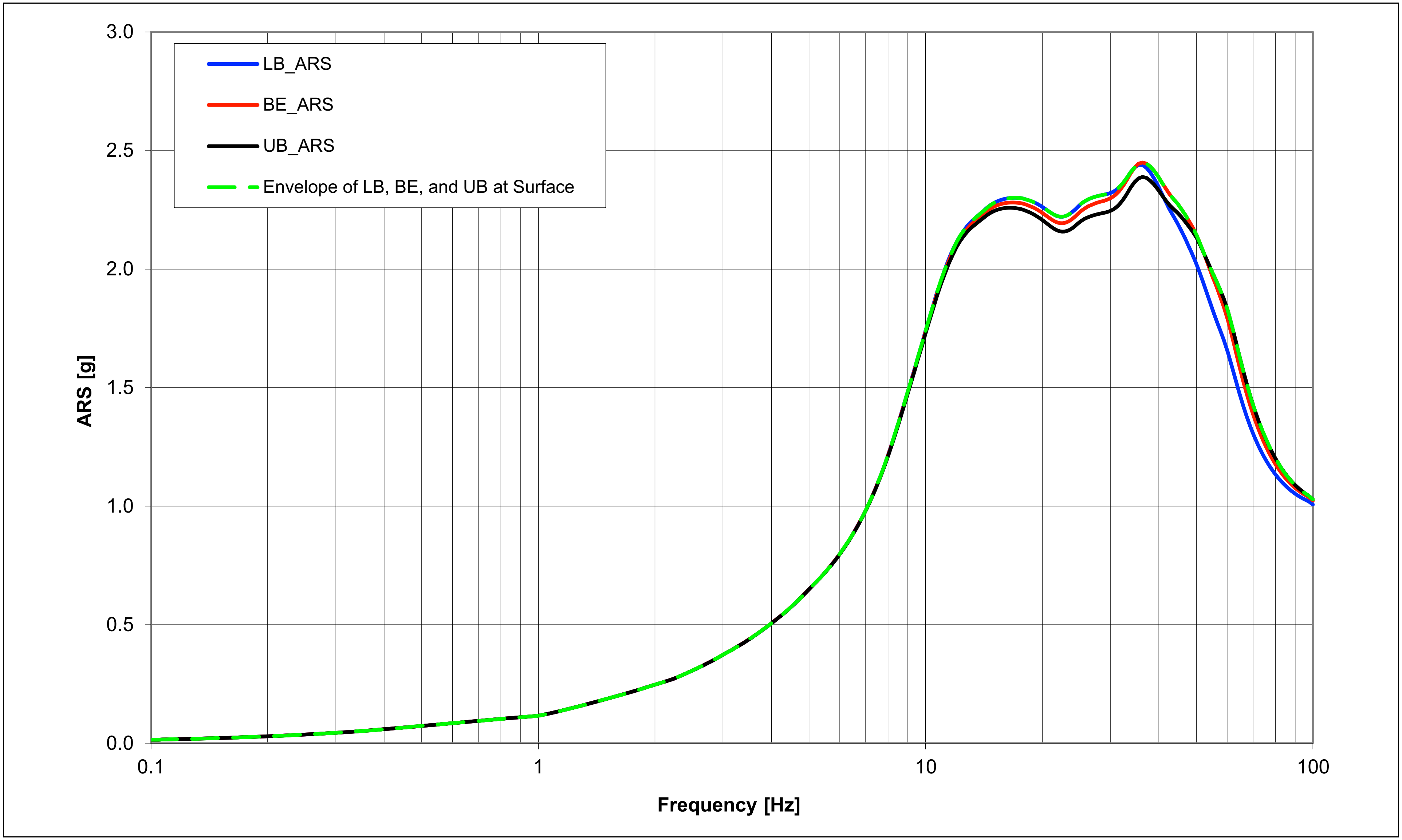
NAPS SUP 3.7-1 Figure 3.7.1-223 NEI Check and SSI Input Response Spectra for Horizontal Full Column FIRS – CB



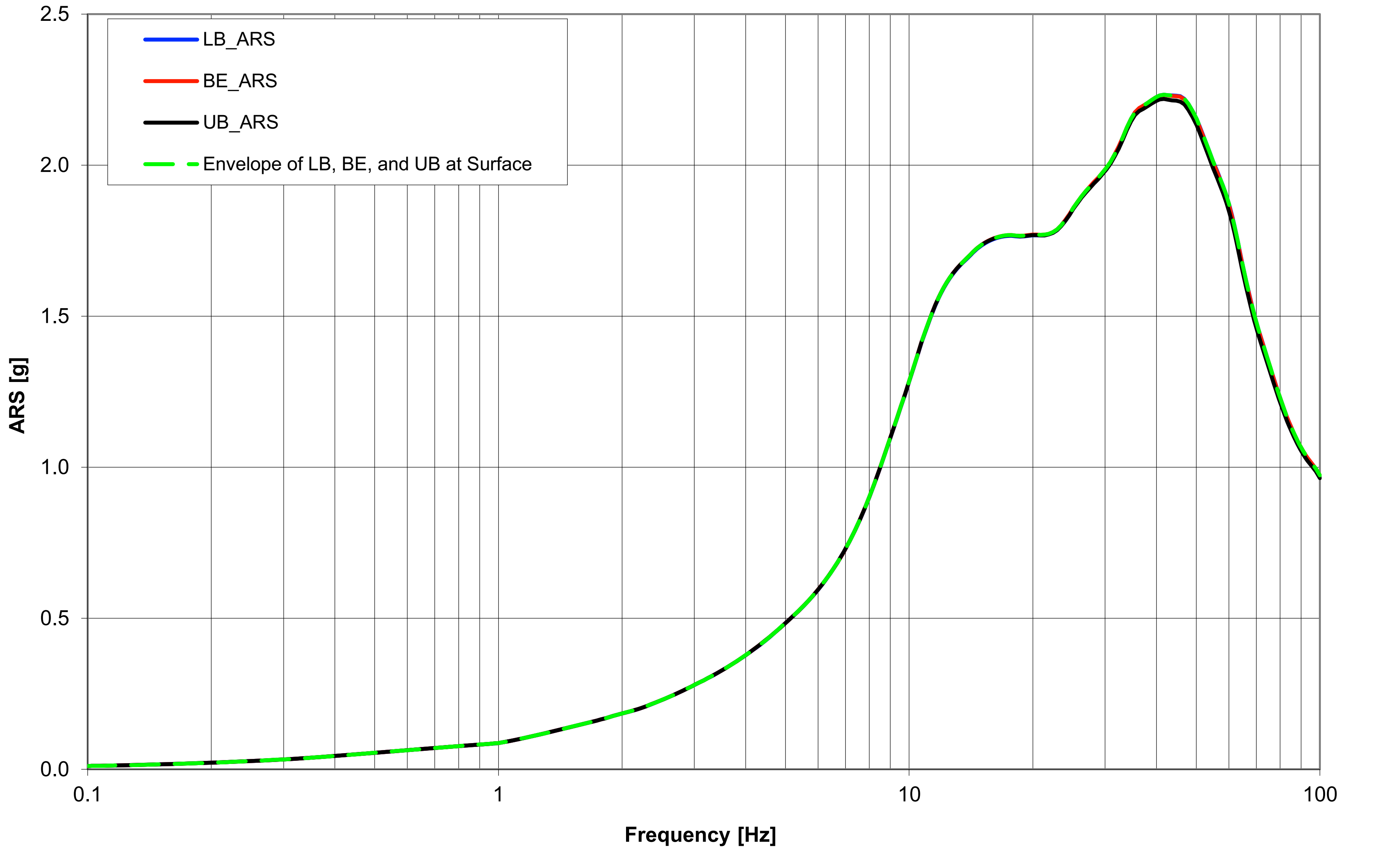
NAPS SUP 3.7-1 **Figure 3.7.1-224 NEI Check and SSI Input Response Spectra for Vertical Full Column FIRS – CB**



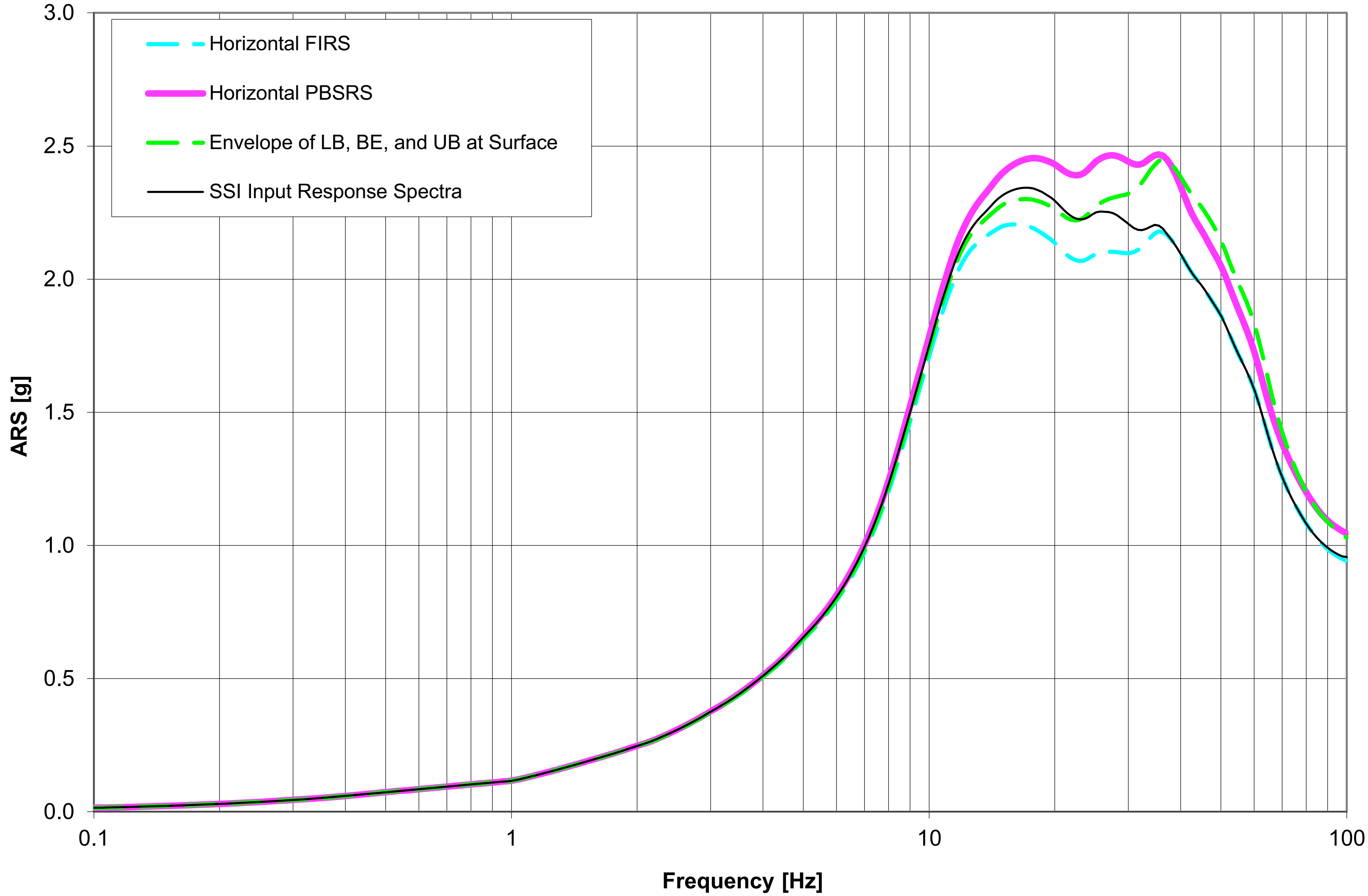
NAPS SUP 3.7-1 **Figure 3.7.1-225 Envelope of Horizontal FIRS Propagated to the Ground Surface through Partial Column SSI Input Profiles – CB**



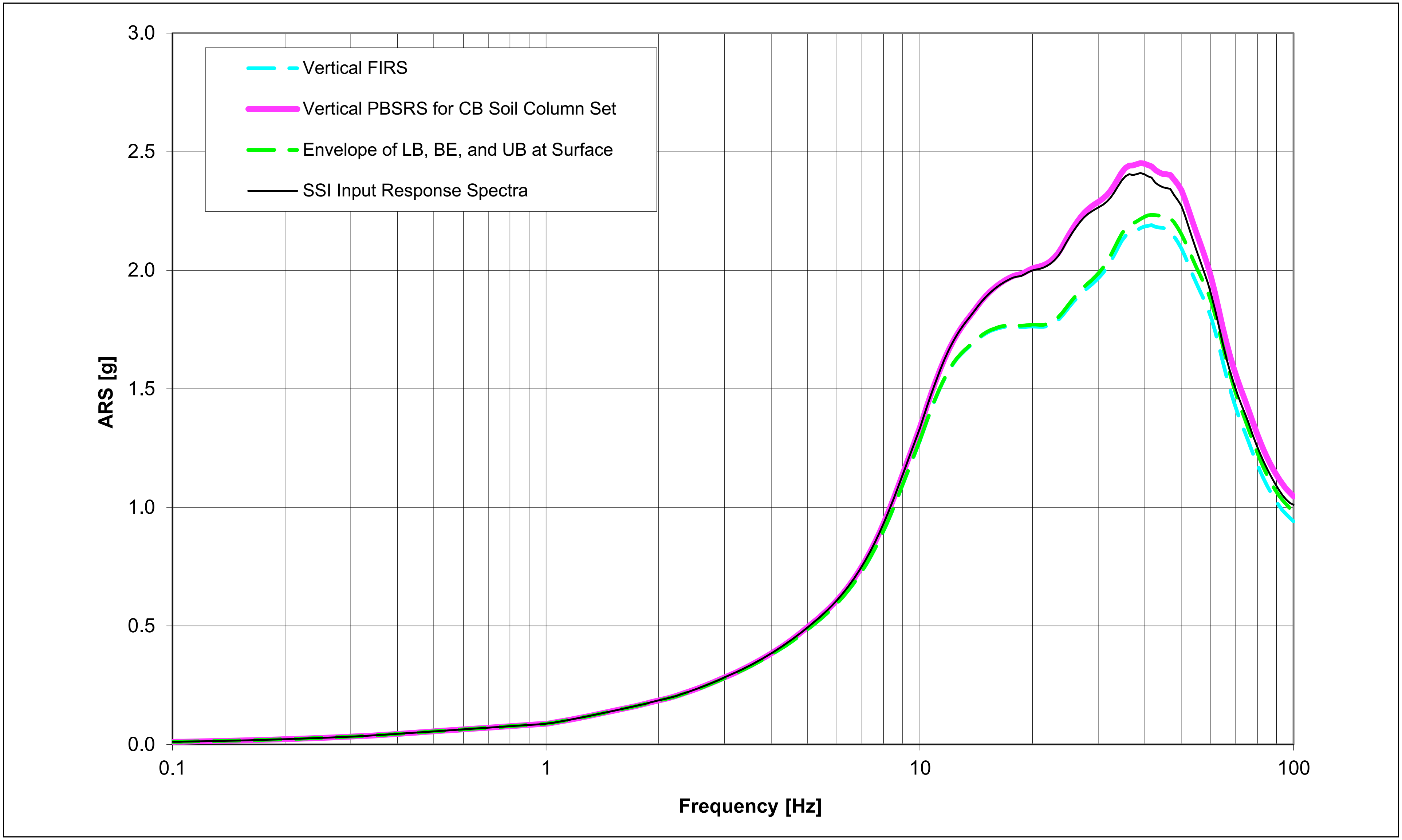
NAPS SUP 3.7-1 **Figure 3.7.1-226 Envelope of Vertical FIRS Propagated to the Ground Surface through Partial Column SSI Input Profiles – CB**



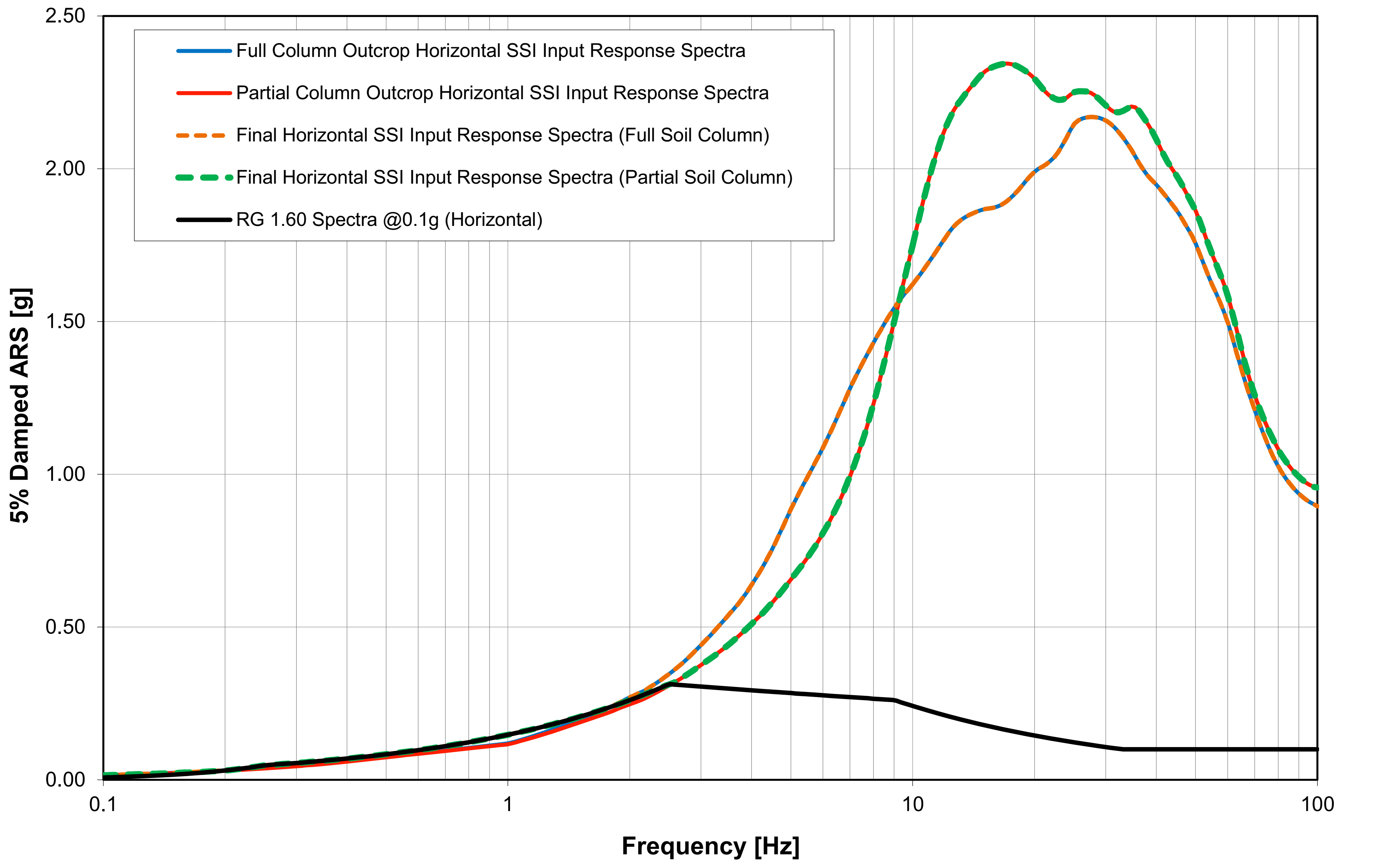
NAPS SUP 3.7-1 **Figure 3.7.1-227 NEI Check and SSI Input Response Spectra for Horizontal Partial Column FIRS – CB**



NAPS SUP 3.7-1 **Figure 3.7.1-228 NEI Check and SSI Input Response Spectra for Vertical Partial Column FIRS – CB**



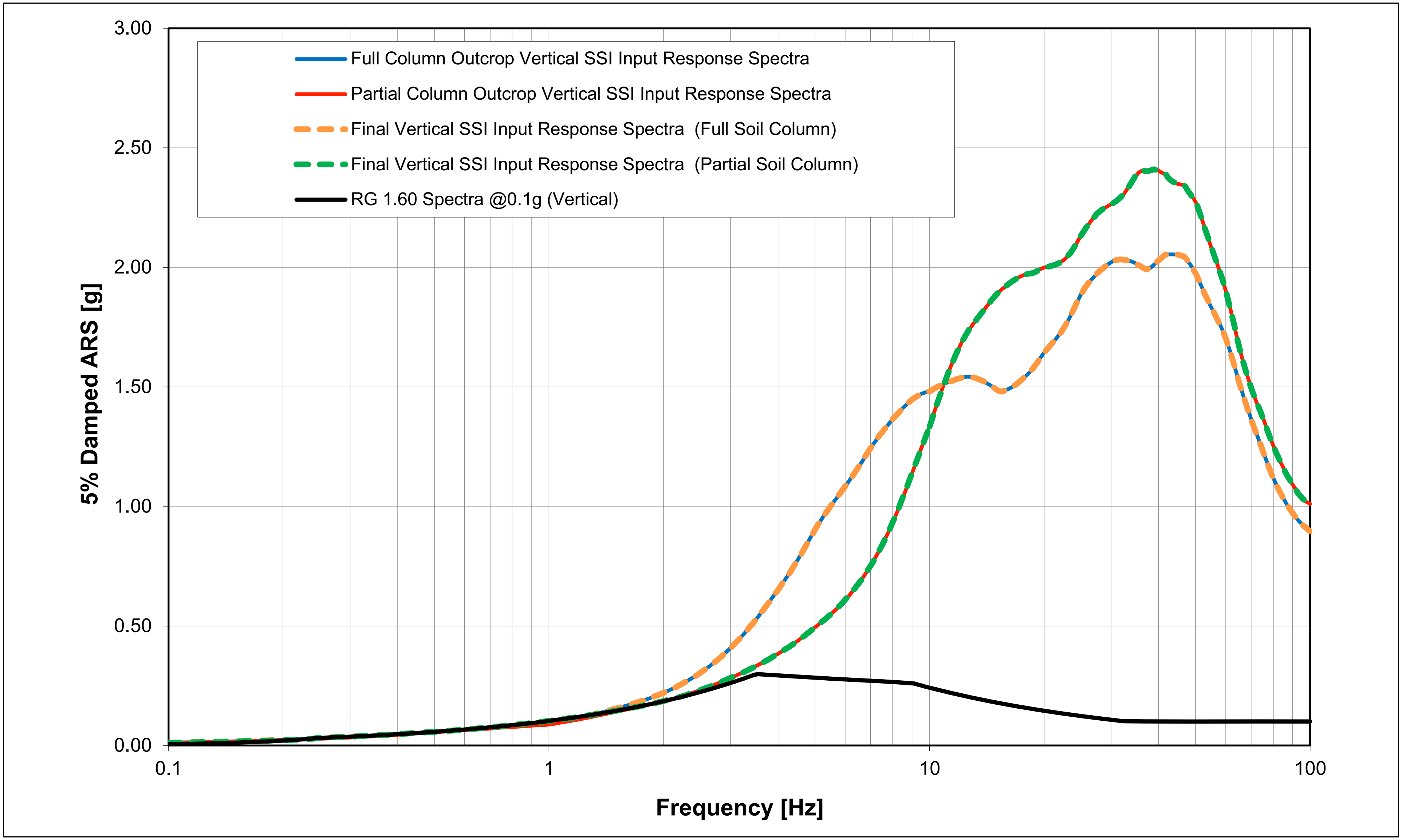
NAPS SUP 3.7-1 **Figure 3.7.1-229 Development of 5% Damped Final Horizontal SSI Input Response Spectra for CB**



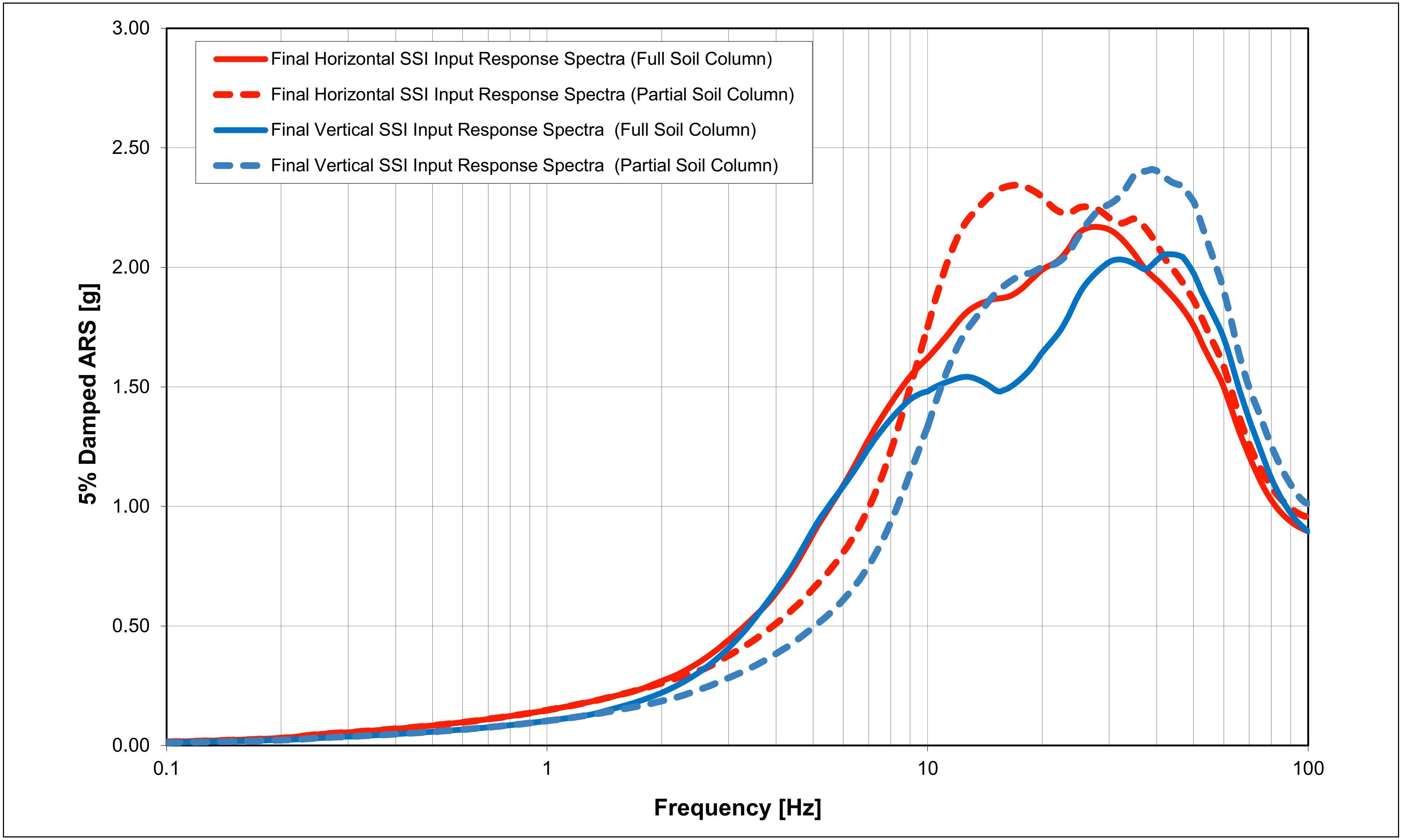
BASIS: ESBWR COLA

NAPS SUP 3.7-1

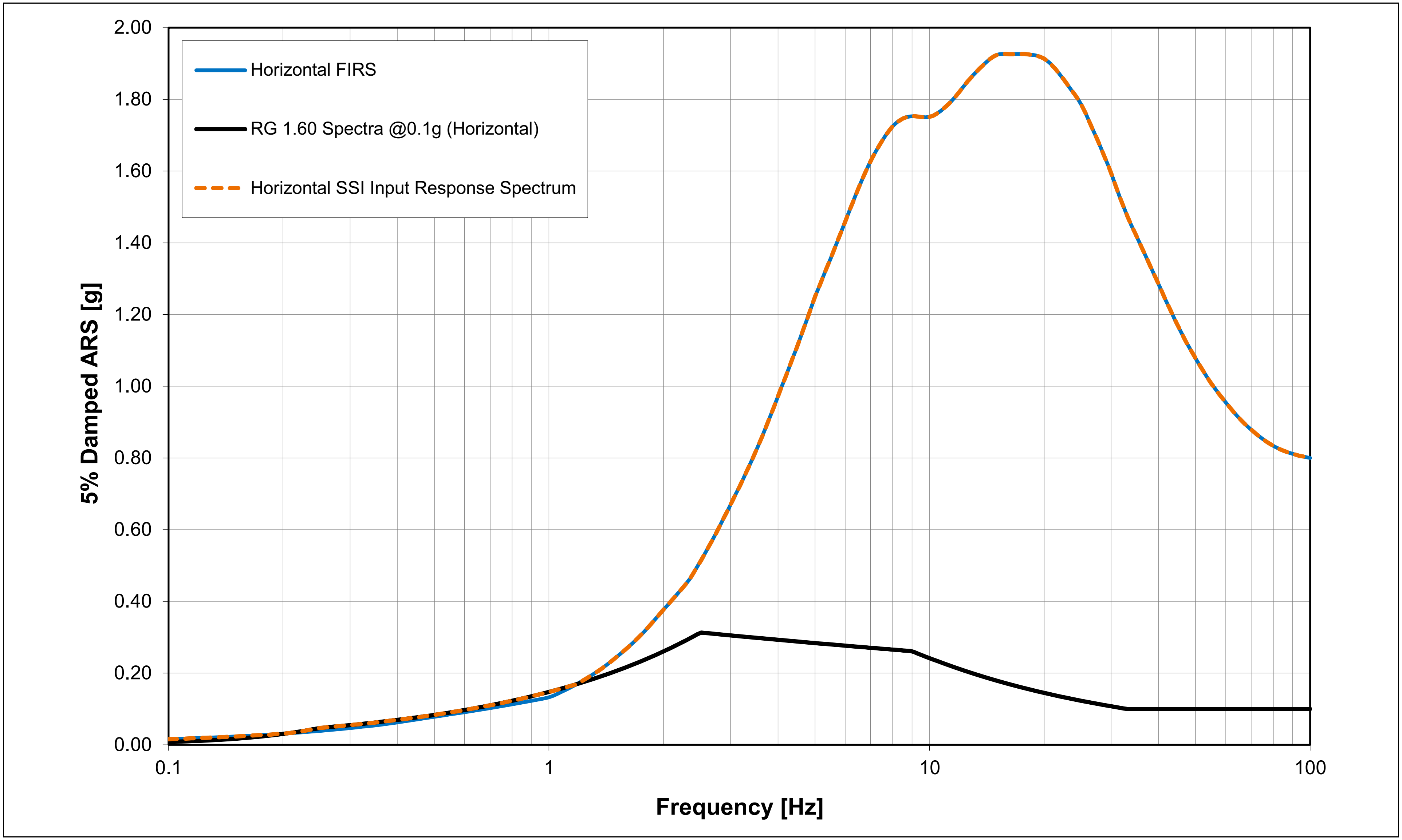
Figure 3.7.1-230 Development of 5% Damped Final Vertical SSI Input Response Spectra for CB



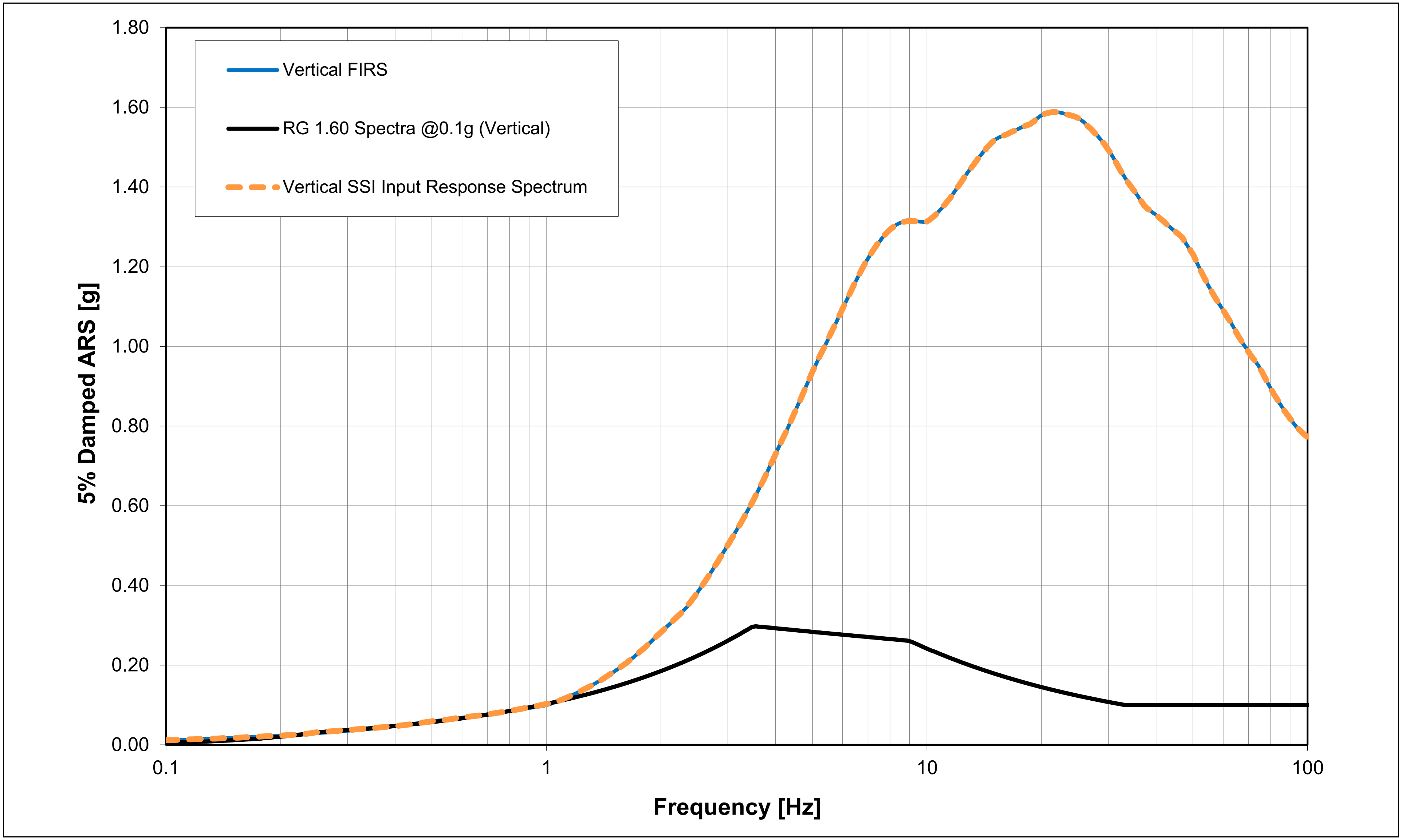
NAPS SUP 3.7-1 **Figure 3.7.1-231 5% Damped Final SSI Input Response Spectra for CB**



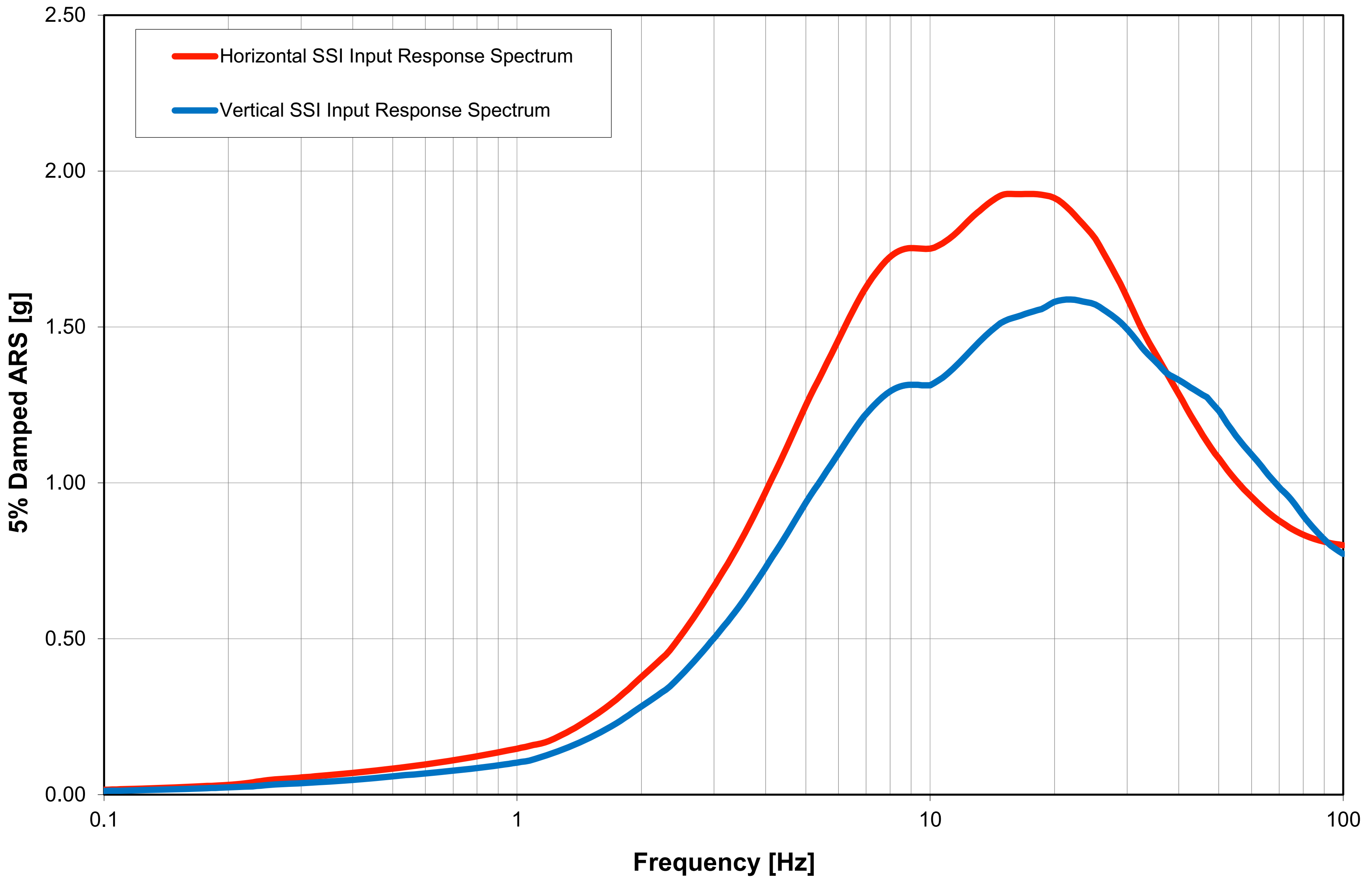
NAPS SUP 3.7-1 **Figure 3.7.1-232 Development of 5% Damped Final Horizontal SSI Input Response Spectrum for FWSC**



NAPS SUP 3.7-1 **Figure 3.7.1-233 Development of 5% Damped Final Vertical SSI Input Response Spectrum for FWSC**

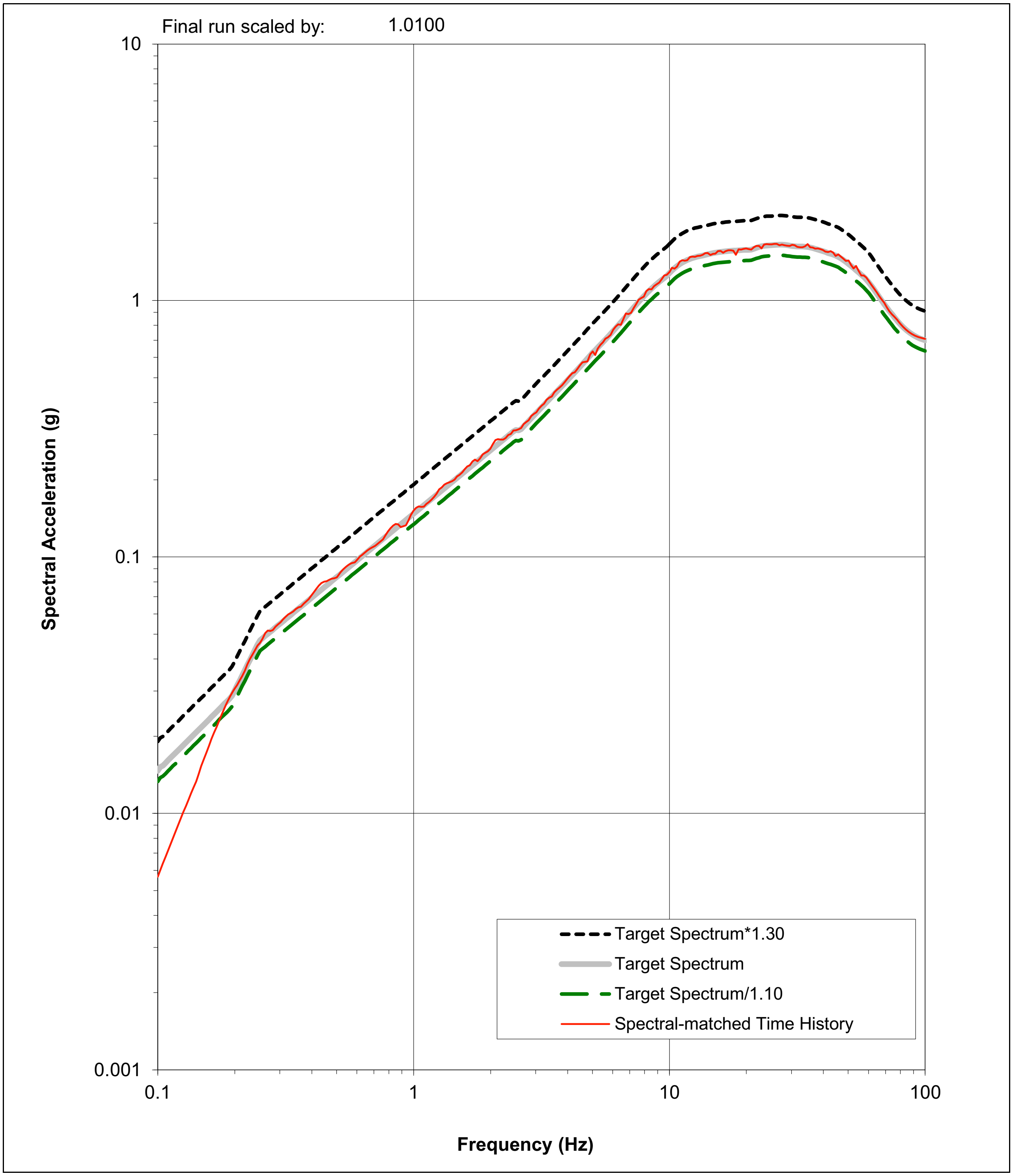


NAPS SUP 3.7-1 **Figure 3.7.1-234 5% Damped Final SSI Input Response Spectra for FWSC**

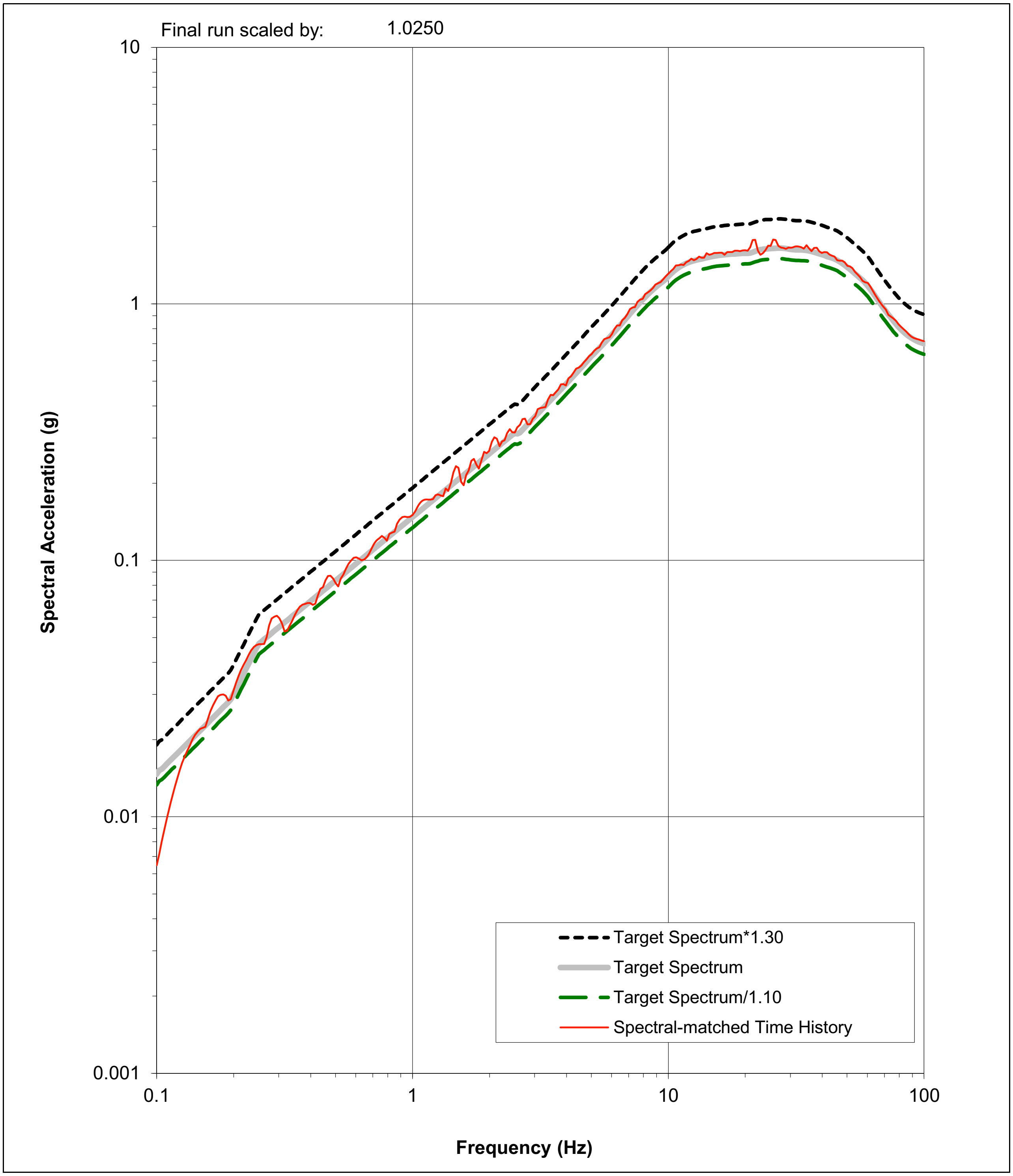


NAPS SUP 3.7-2

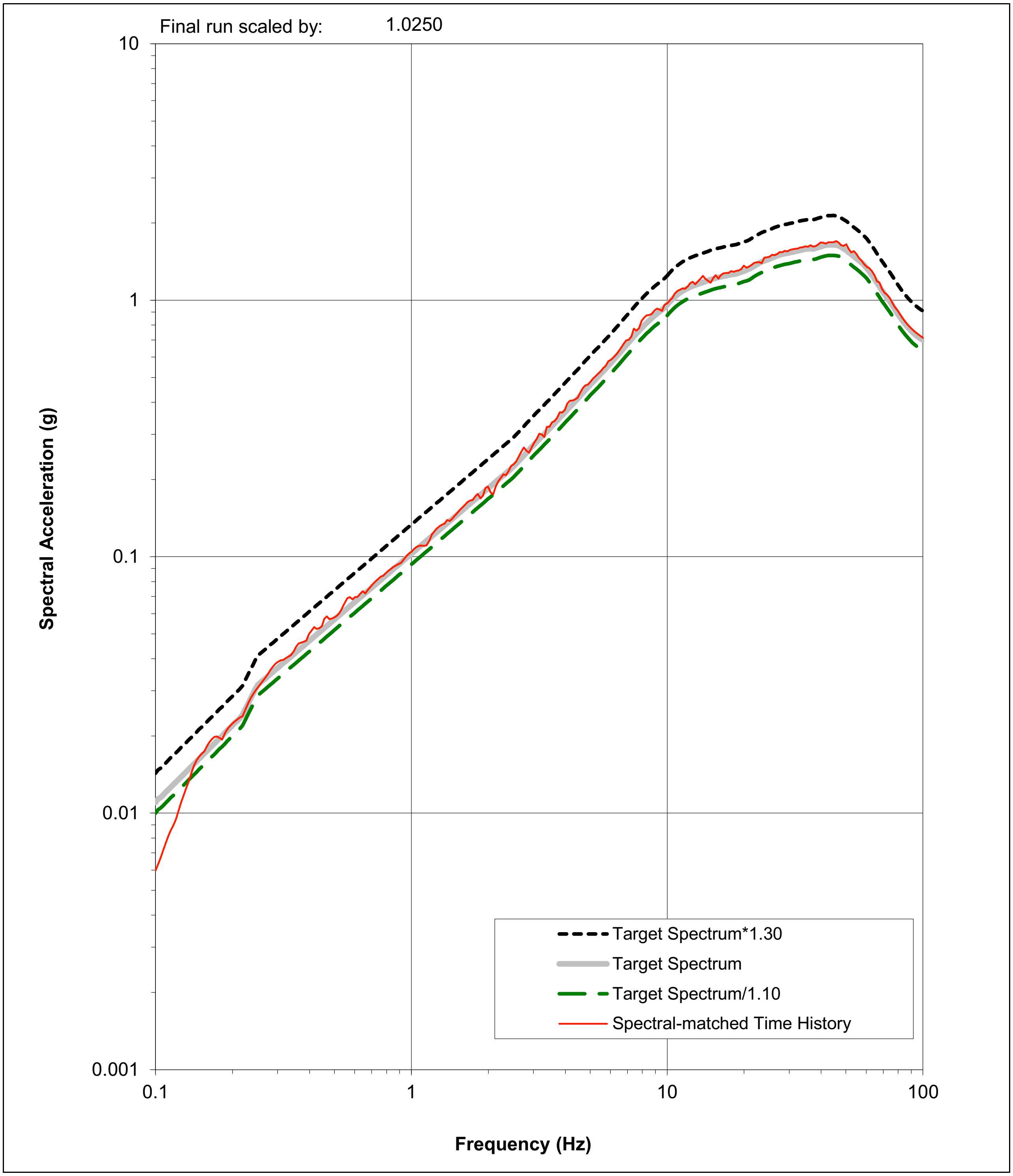
Figure 3.7.1-235 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the Partial Column RB/FB case, H1 Component



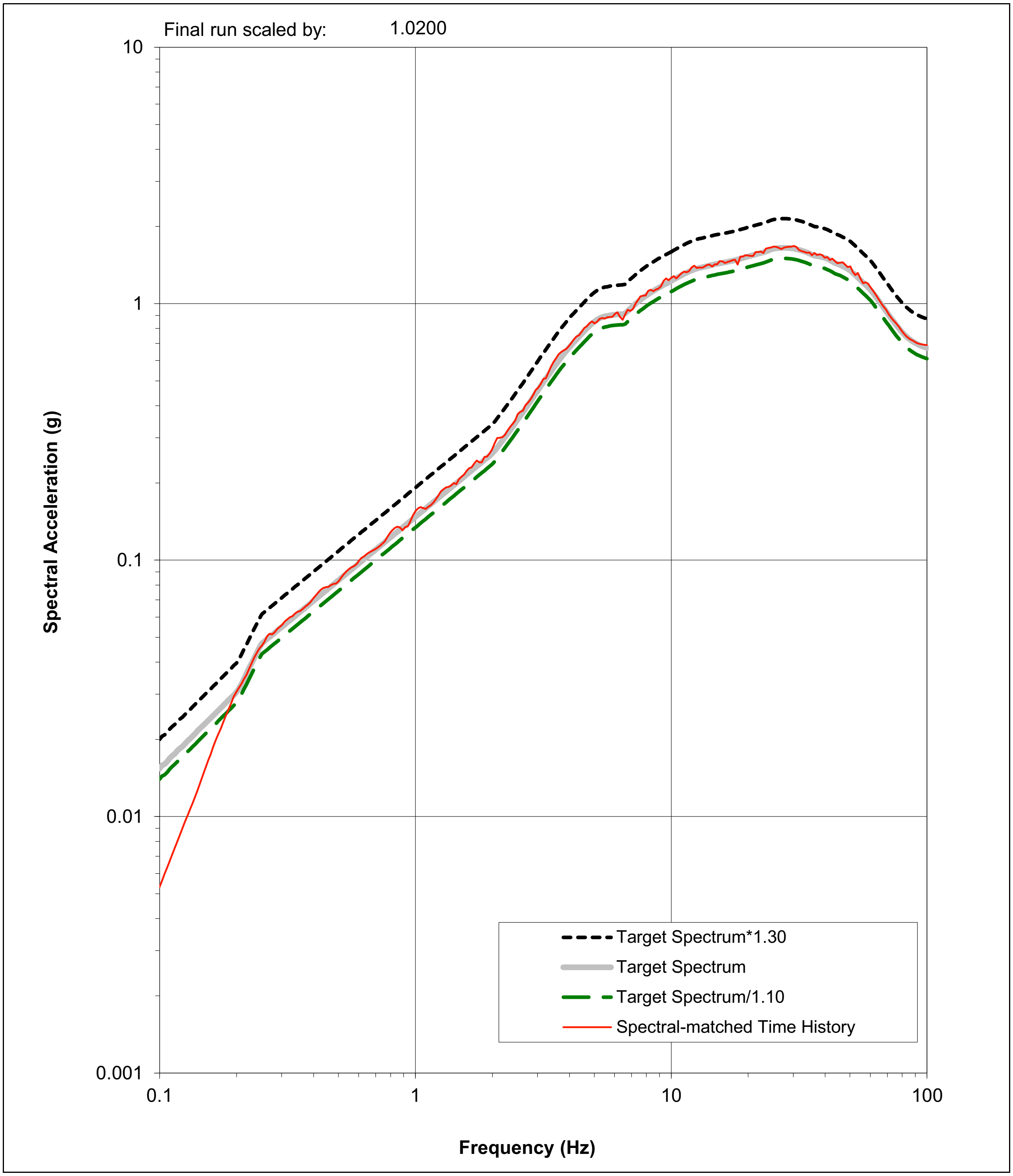
NAPS SUP 3.7-2 **Figure 3.7.1-236 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the Partial Column RB/FB case, H2 Component**



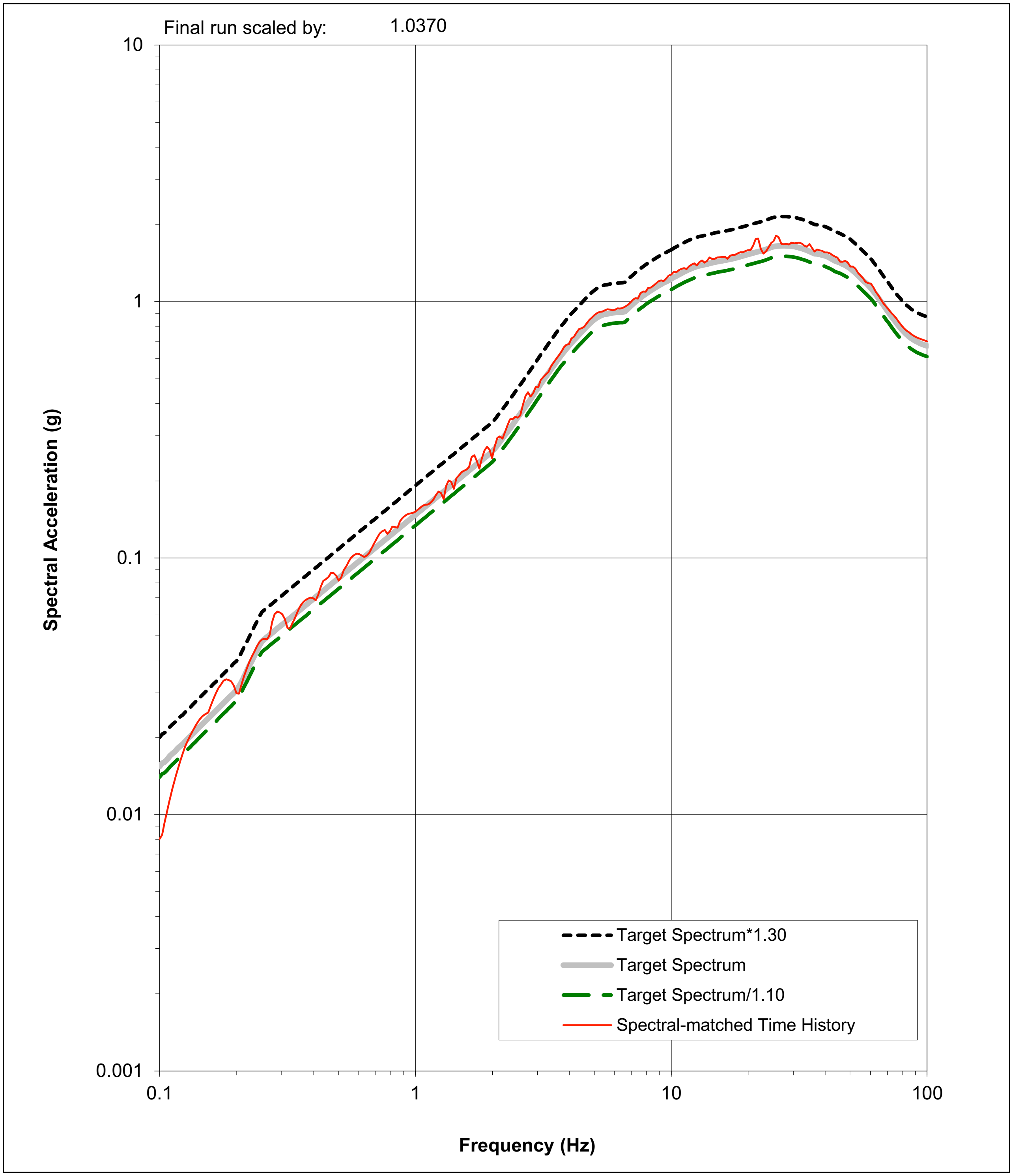
NAPS SUP 3.7-2 **Figure 3.7.1-237 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the Partial Column RB/FB case, UP Component**



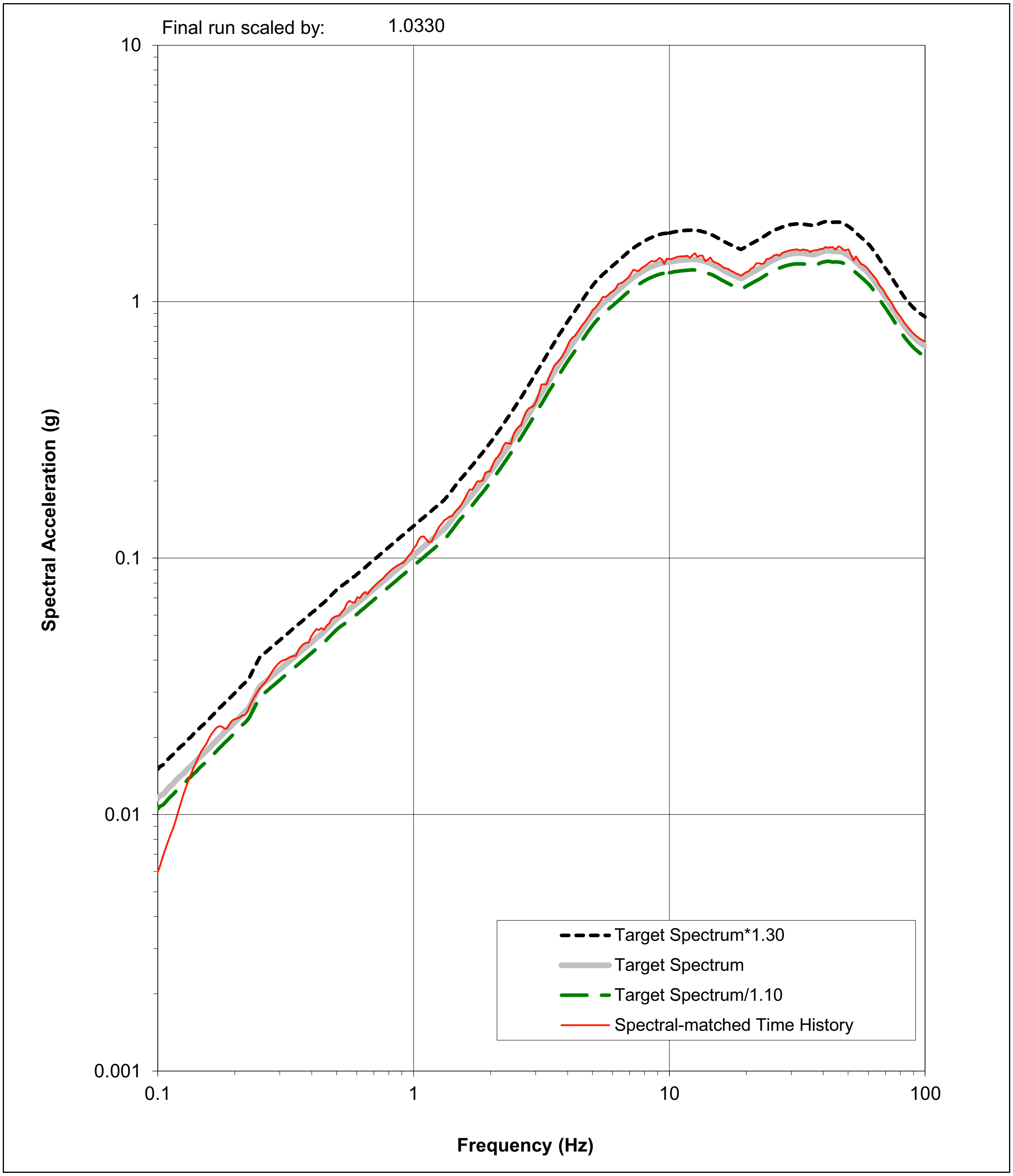
NAPS SUP 3.7-2 **Figure 3.7.1-238 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the Full Column RB/FB case, H1 Component**



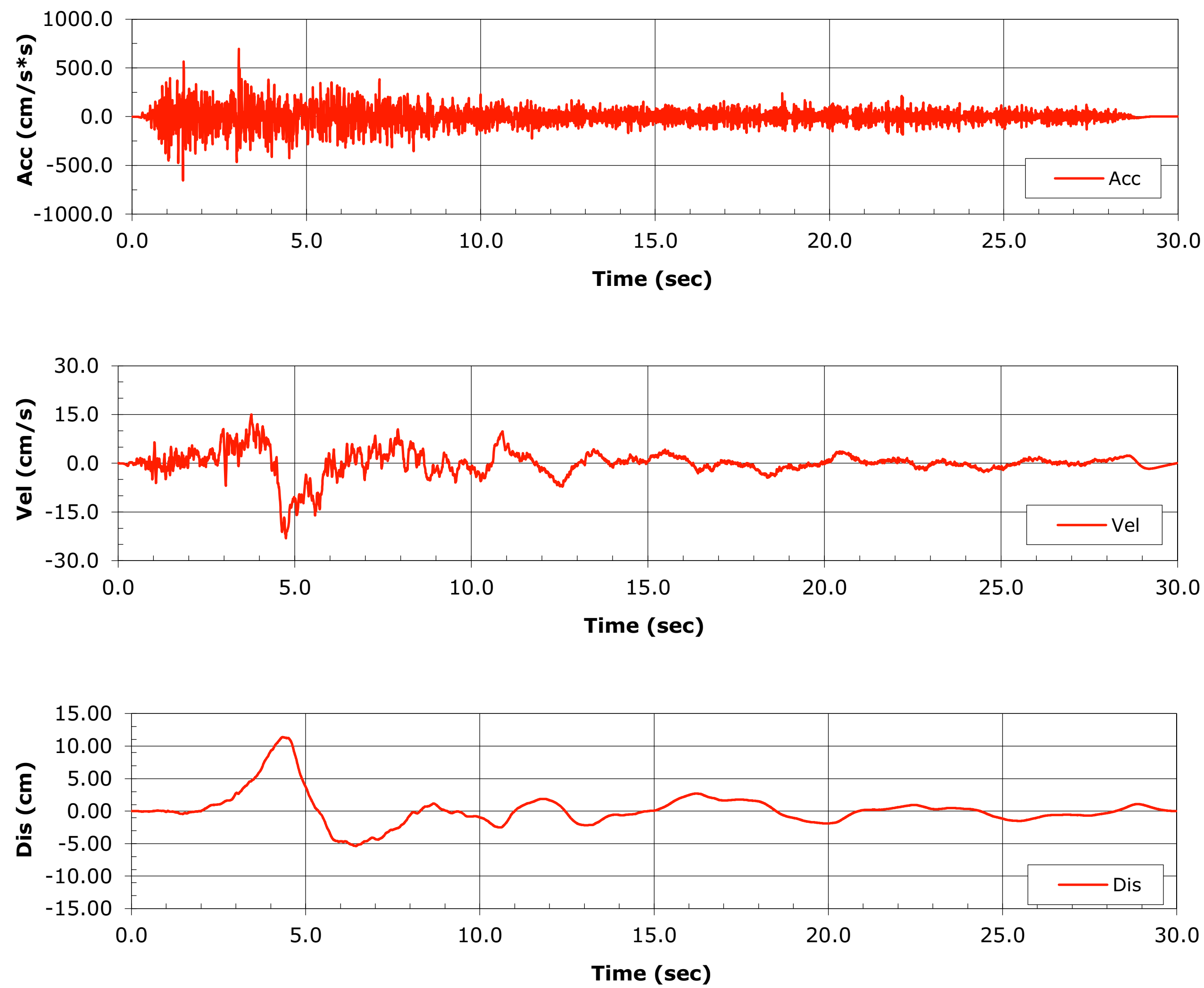
NAPS SUP 3.7-2 **Figure 3.7.1-239 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the Full Column RB/FB case, H2 Component**



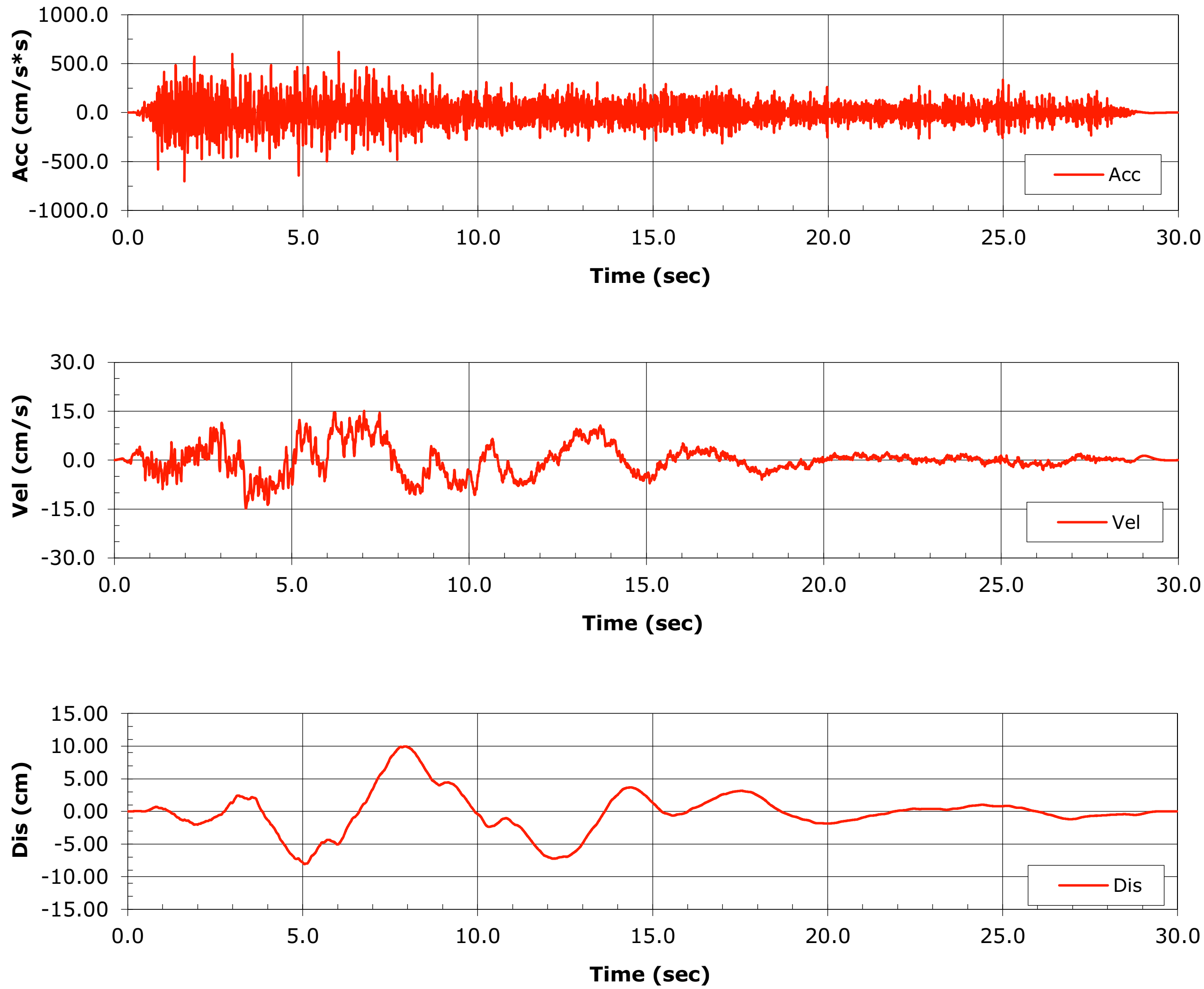
NAPS SUP 3.7-2 **Figure 3.7.1-240 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the Full Column RB/FB case, UP Component**



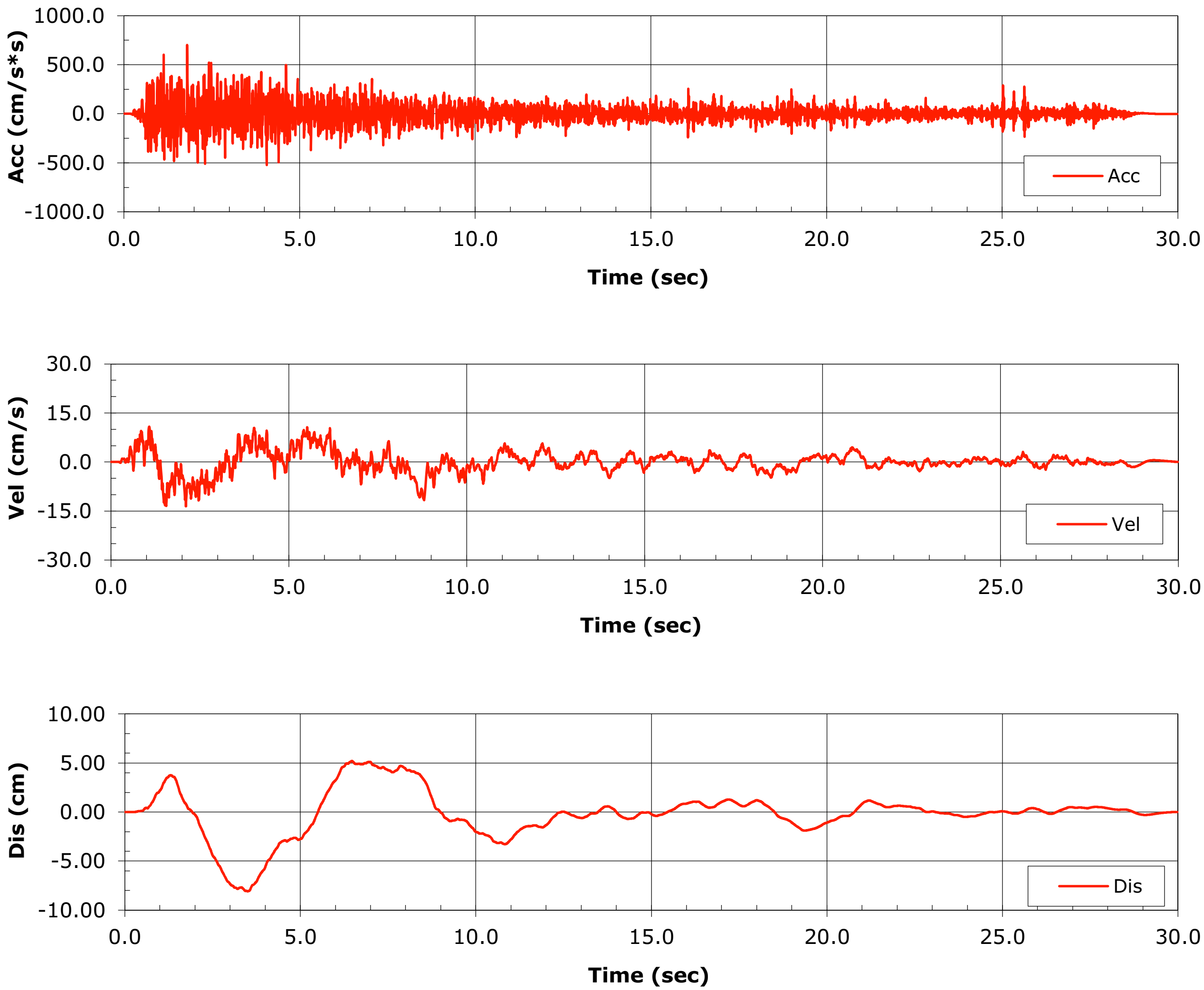
NAPS SUP 3.7-2 **Figure 3.7.1-241 Acceleration, Velocity, and Displacement Spectrally Matched Partial Column Outcrop Time-Histories for RB/FB, H1 Component**



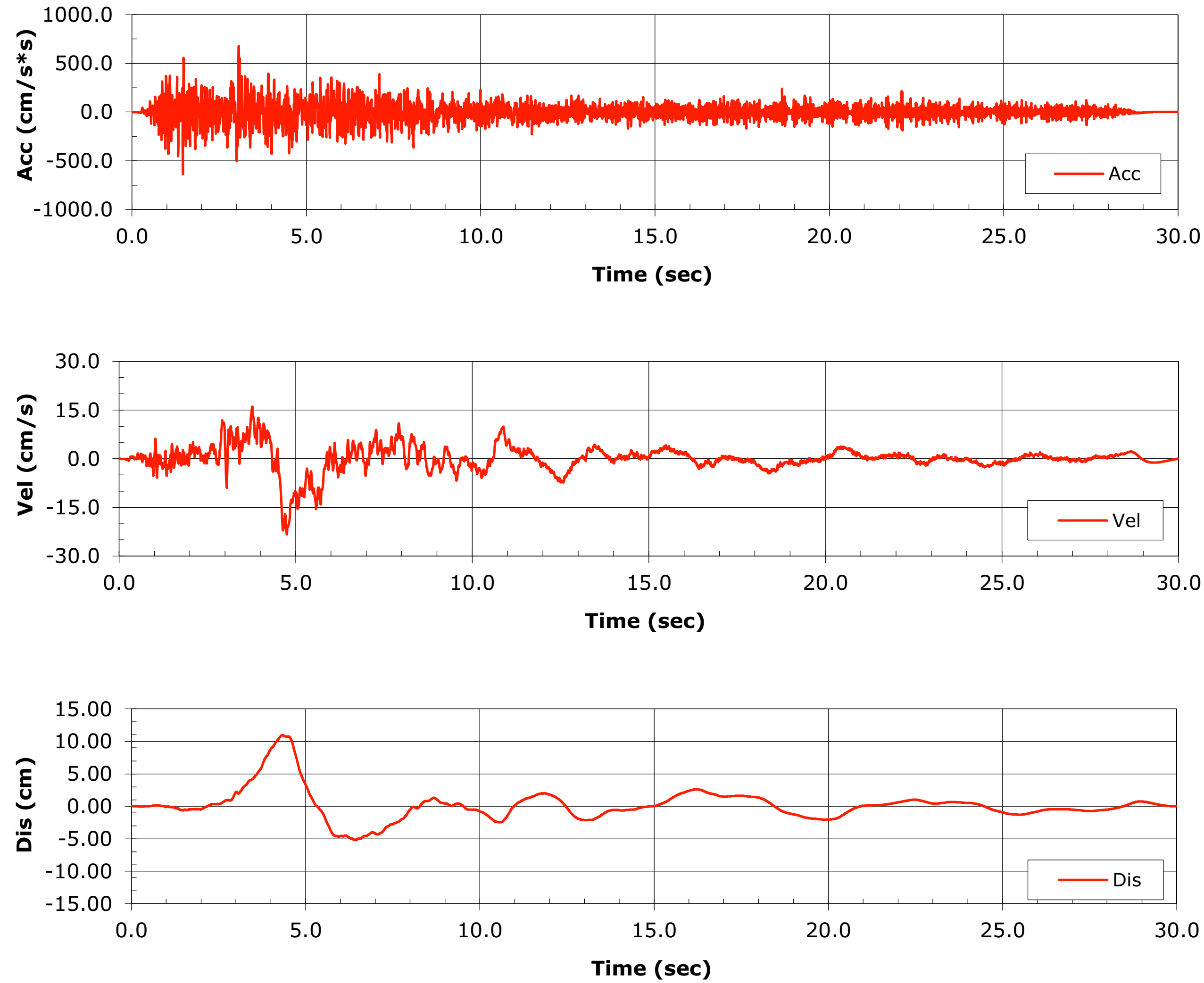
NAPS SUP 3.7-2 **Figure 3.7.1-242 Acceleration, Velocity, and Displacement Spectrally Matched Partial Column Outcrop Time-Histories for RB/FB, H2 Component**



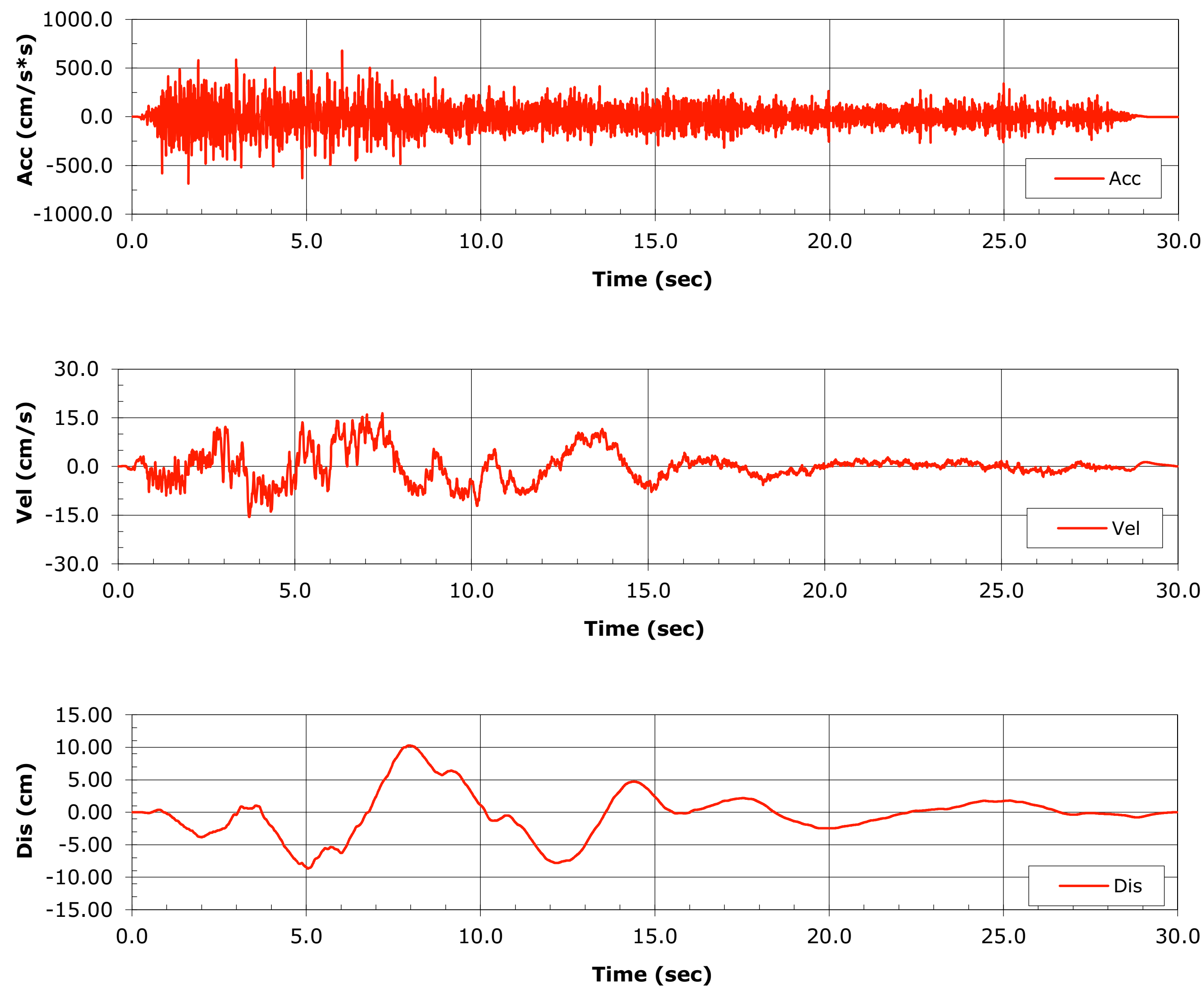
NAPS SUP 3.7-2 **Figure 3.7.1-243 Acceleration, Velocity, and Displacement Spectrally Matched Partial Column Outcrop Time-Histories for RB/FB, UP Component**



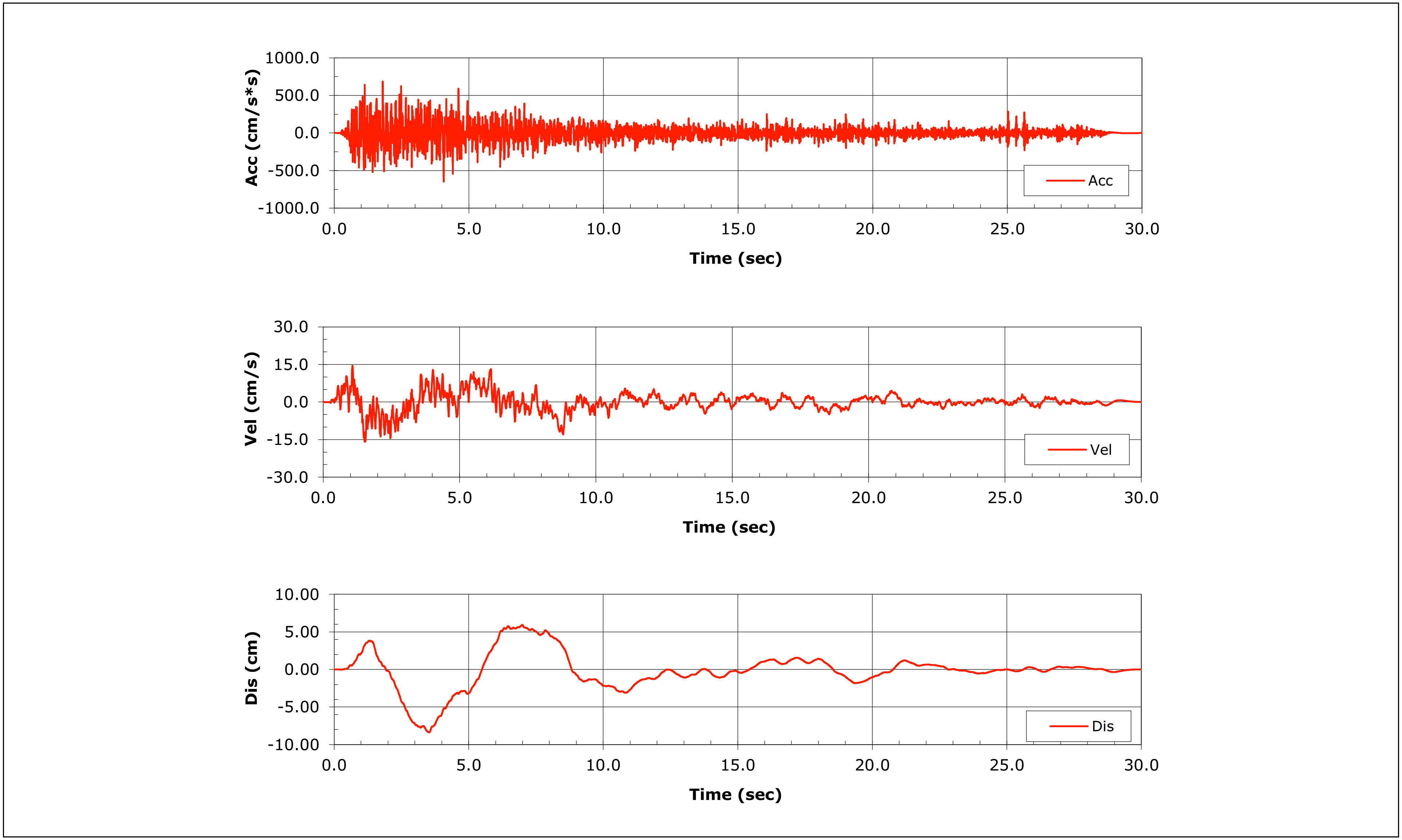
NAPS SUP 3.7-2 **Figure 3.7.1-244 Acceleration, Velocity, and Displacement Spectrally Matched Full Column Outcrop Time-Histories for RB/FB, H1 Component**



NAPS SUP 3.7-2 **Figure 3.7.1-245 Acceleration, Velocity, and Displacement Spectrally Matched Full Column Outcrop Time-Histories for RB/FB, H2 Component**

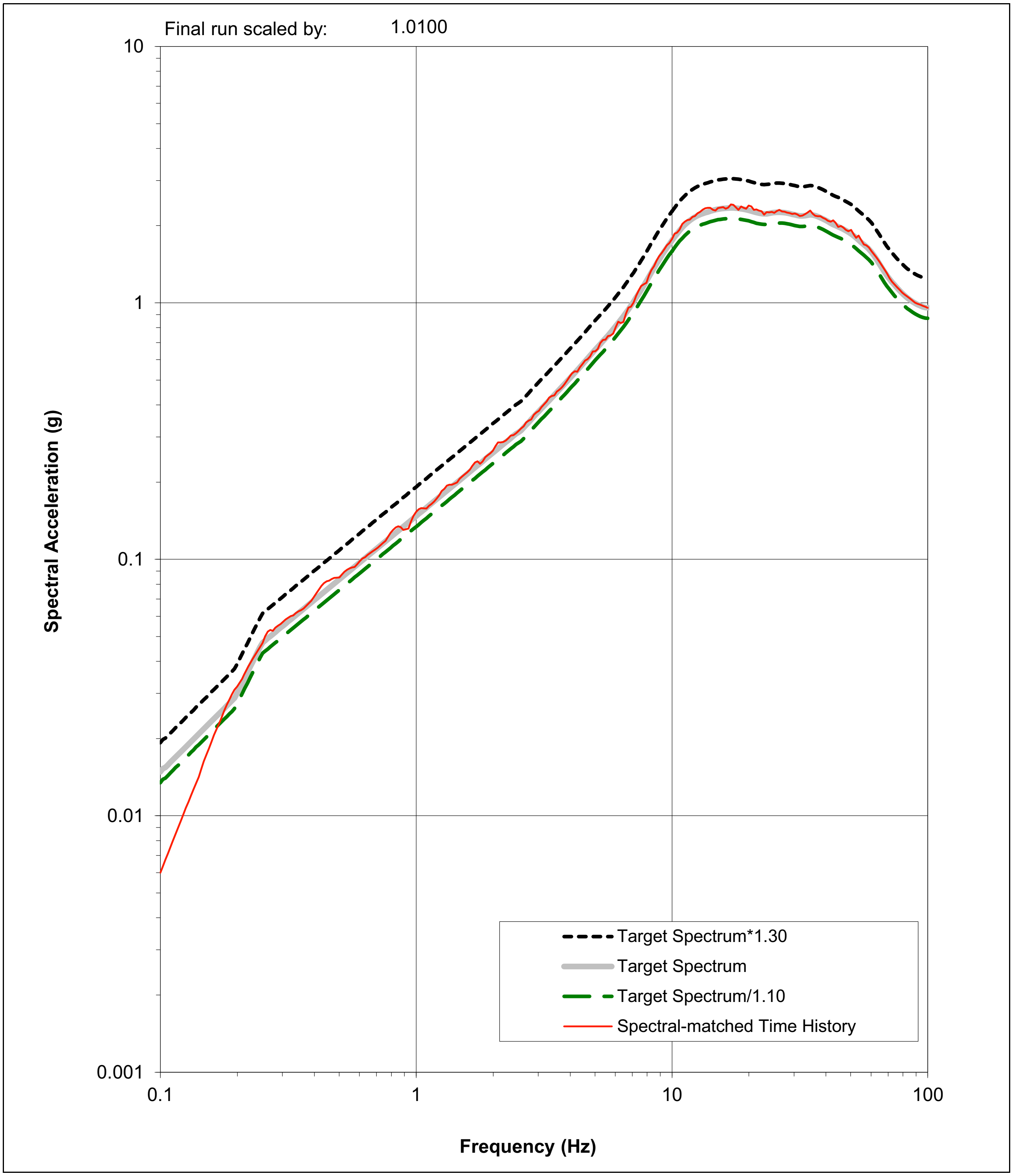


NAPS SUP 3.7-2 **Figure 3.7.1-246 Acceleration, Velocity, and Displacement Spectrally Matched Full Column Outcrop Time-Histories for RB/FB, UP Component**



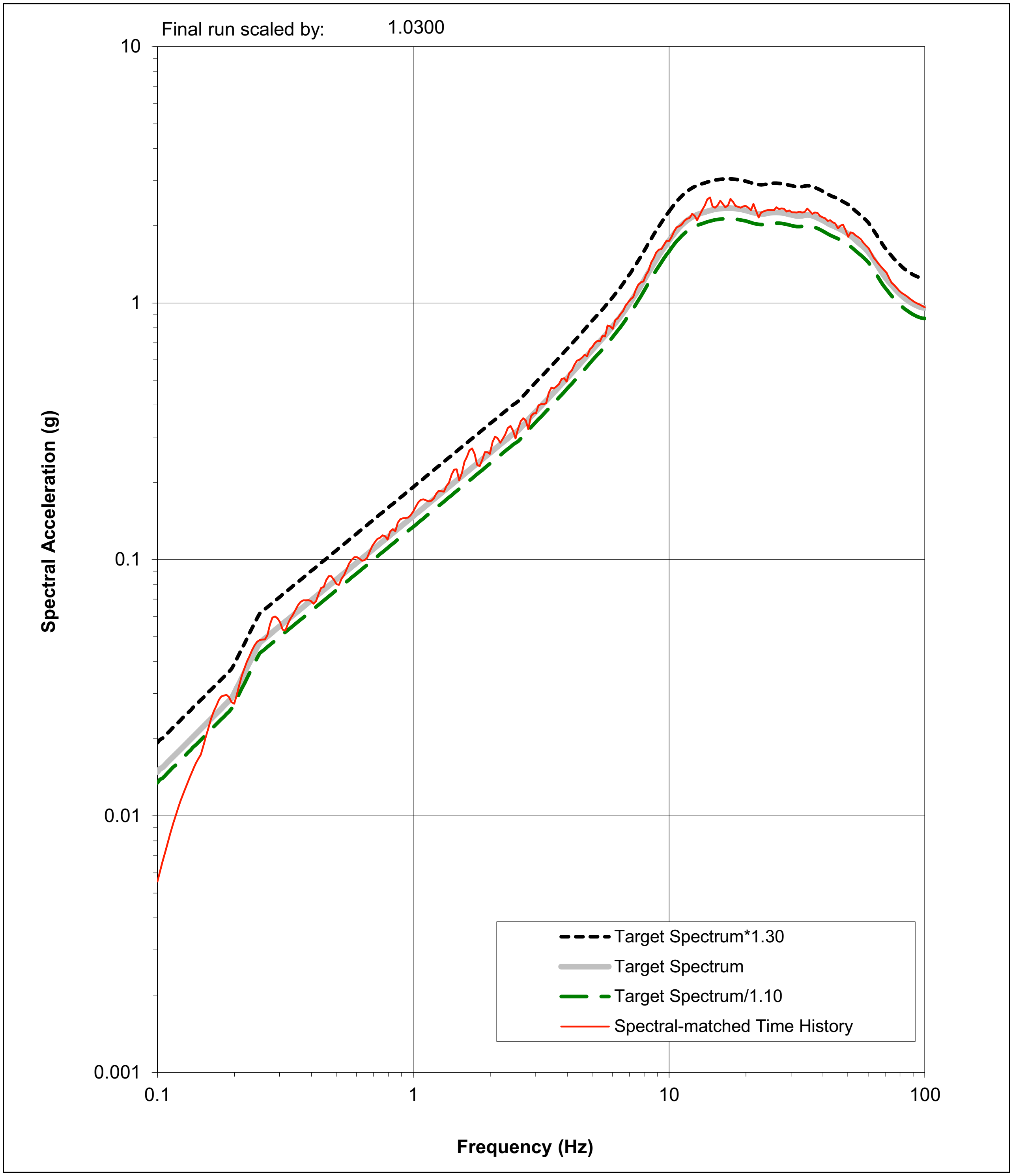
NAPS SUP 3.7-2

Figure 3.7.1-247 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the Partial Column CB case, H1 Component



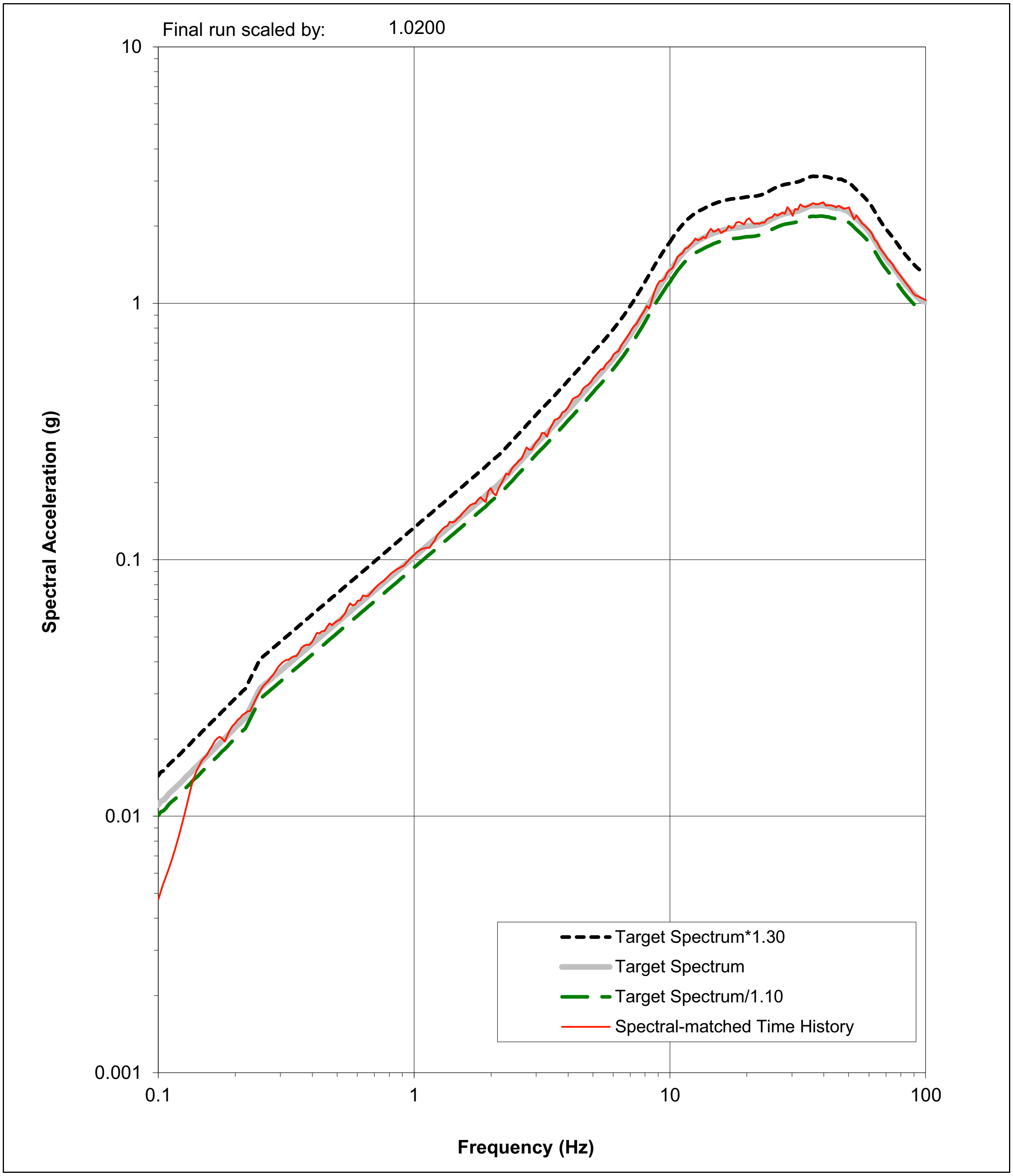
NAPS SUP 3.7-2

Figure 3.7.1-248 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the Partial Column CB case, H2 Component

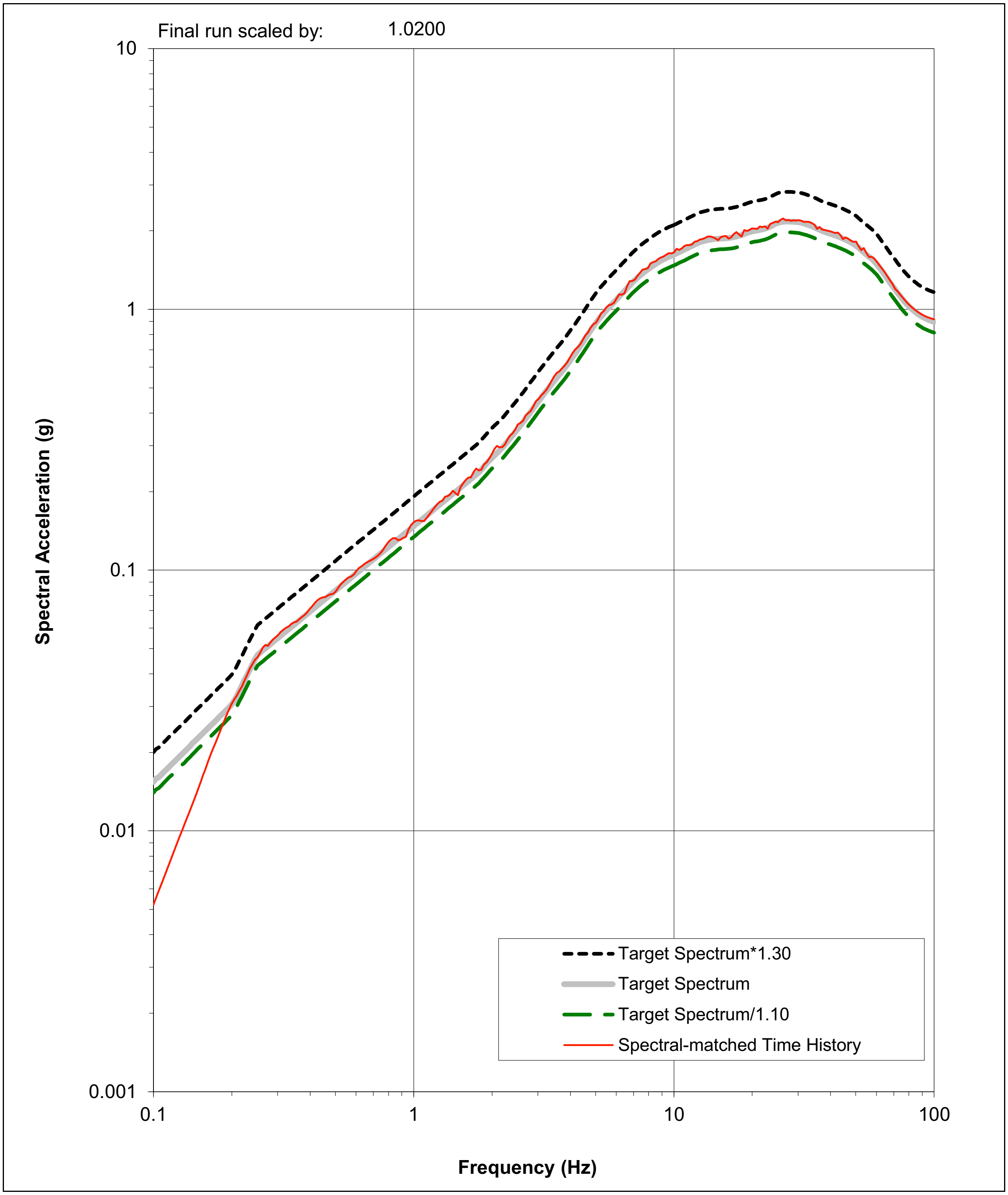


NAPS SUP 3.7-2

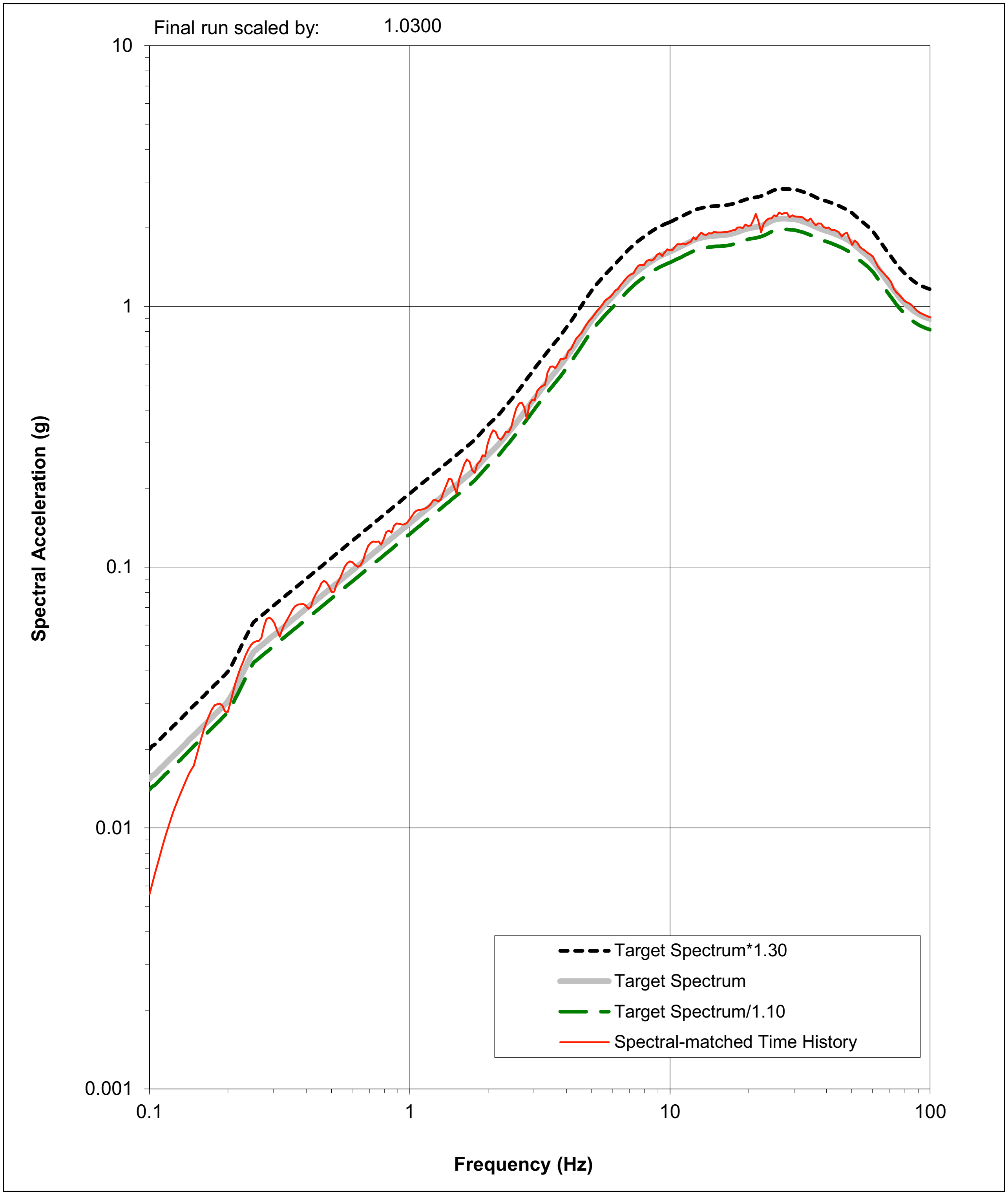
Figure 3.7.1-249 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the Partial Column CB case, UP Component



NAPS SUP 3.7-2 **Figure 3.7.1-250 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the Full Column CB case, H1 Component**

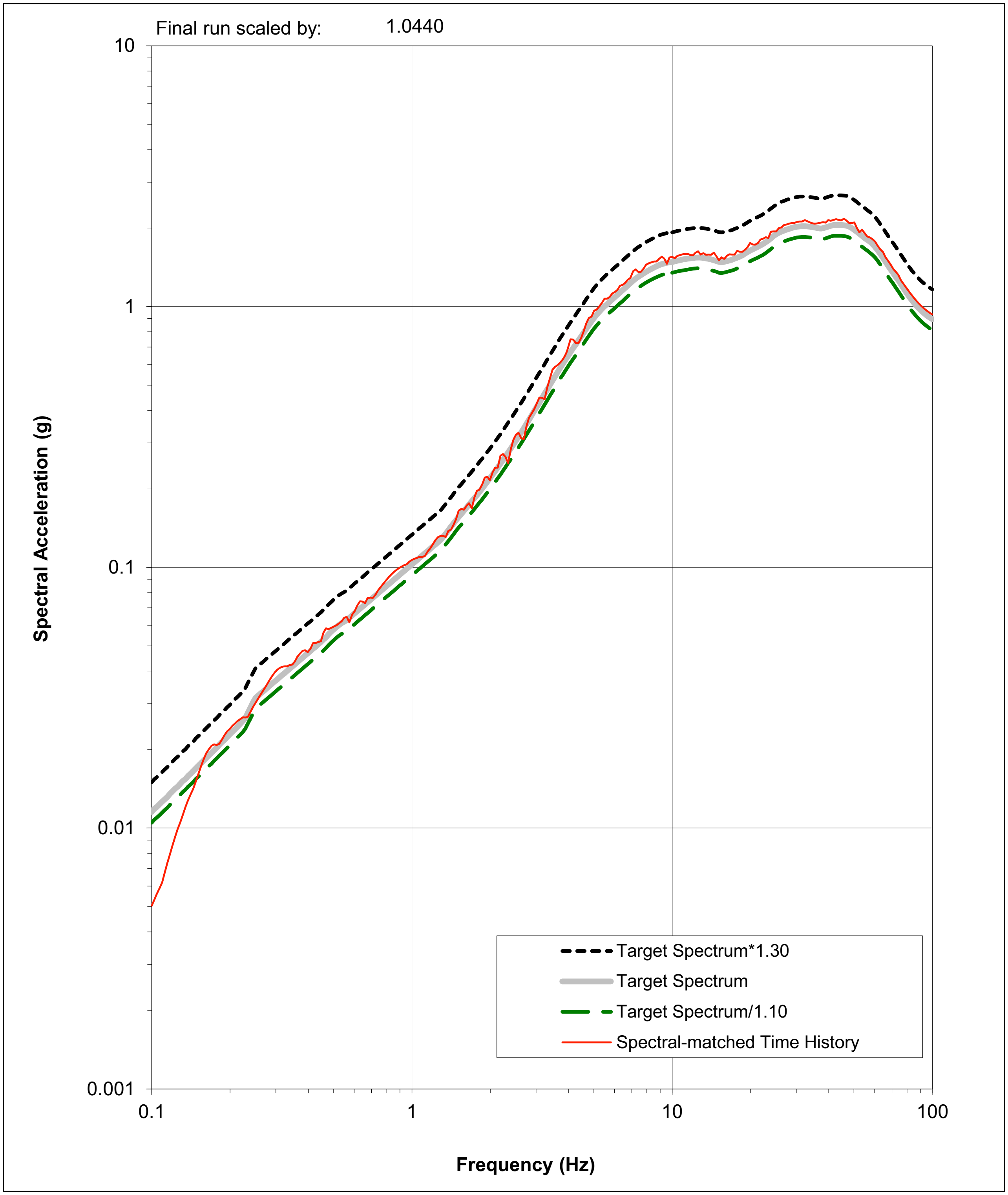


NAPS SUP 3.7-2 **Figure 3.7.1-251 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the Full Column CB case, H2 Component**

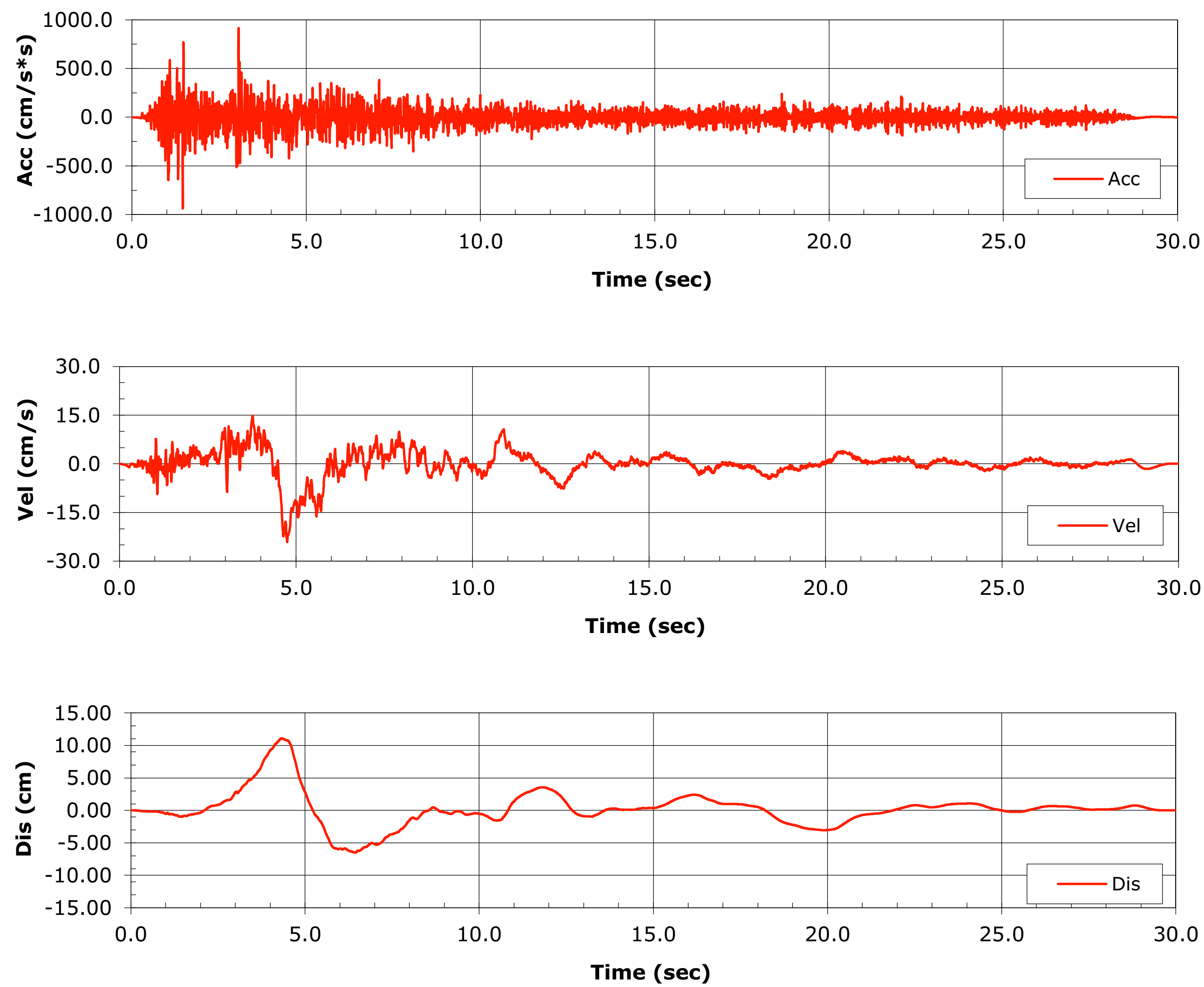


NAPS SUP 3.7-2

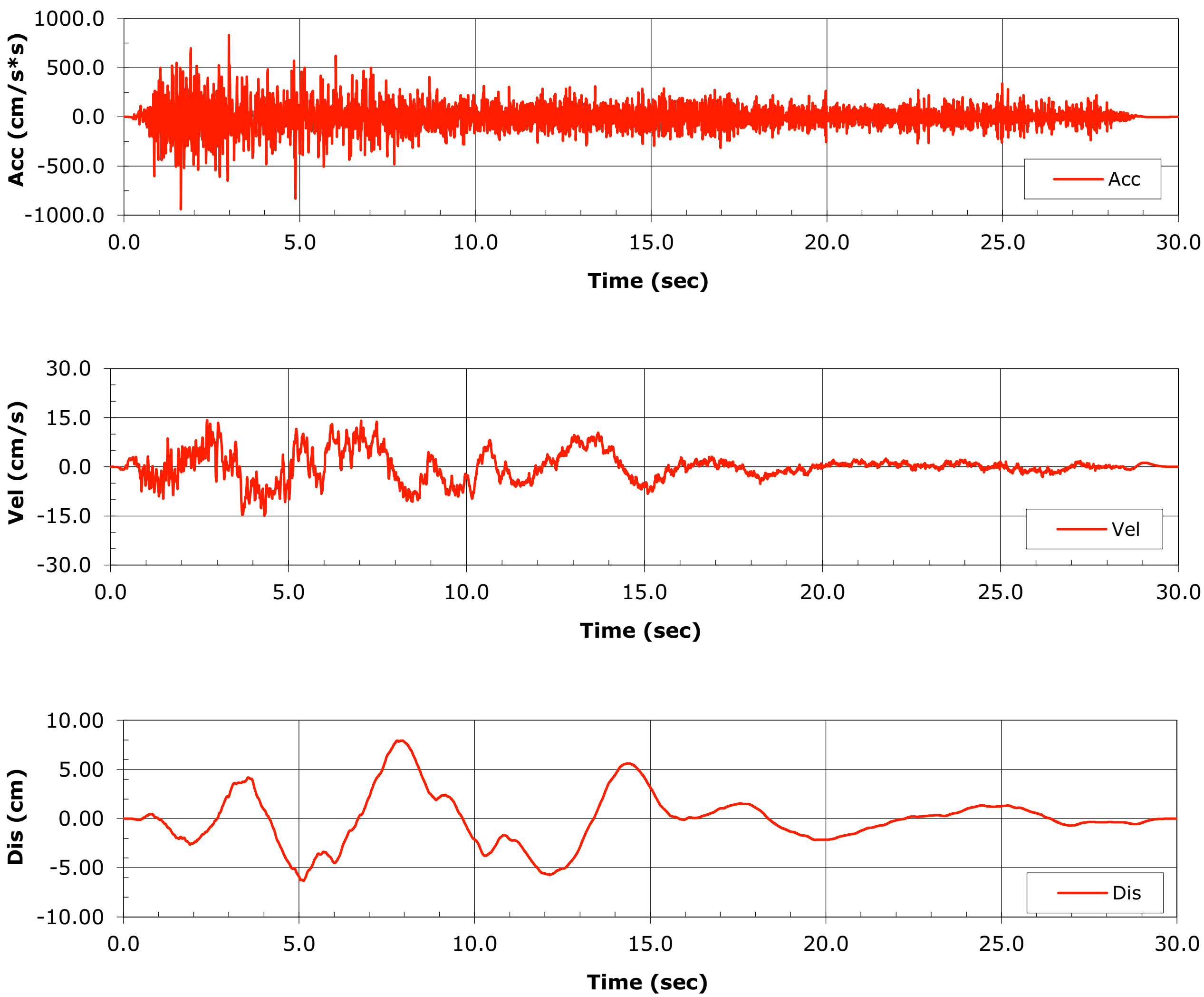
Figure 3.7.1-252 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the Full Column CB case, UP Component



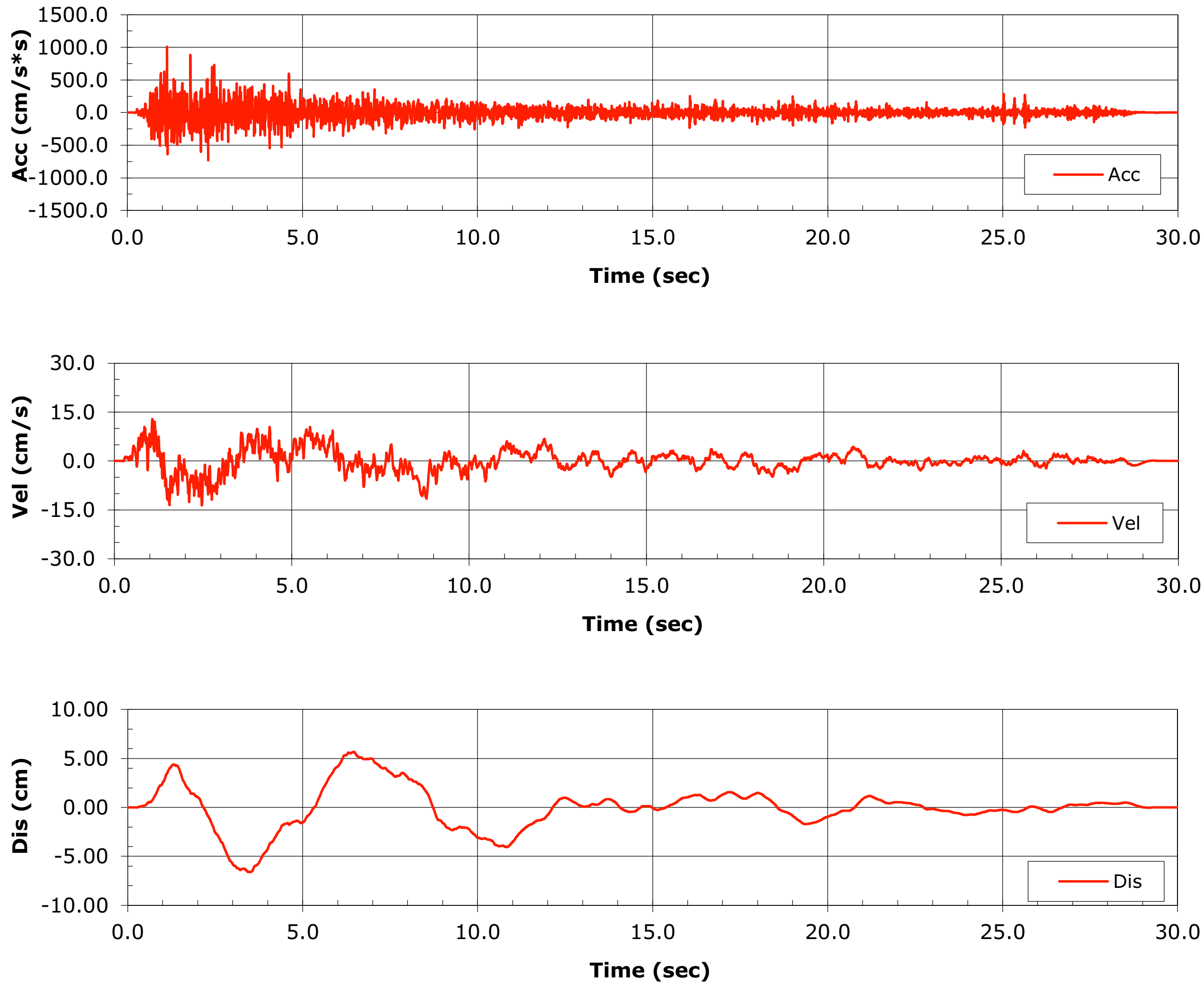
NAPS SUP 3.7-2 **Figure 3.7.1-253 Acceleration, Velocity, and Displacement Spectrally Matched Partial Column Outcrop Time-Histories for CB, H1 Component**



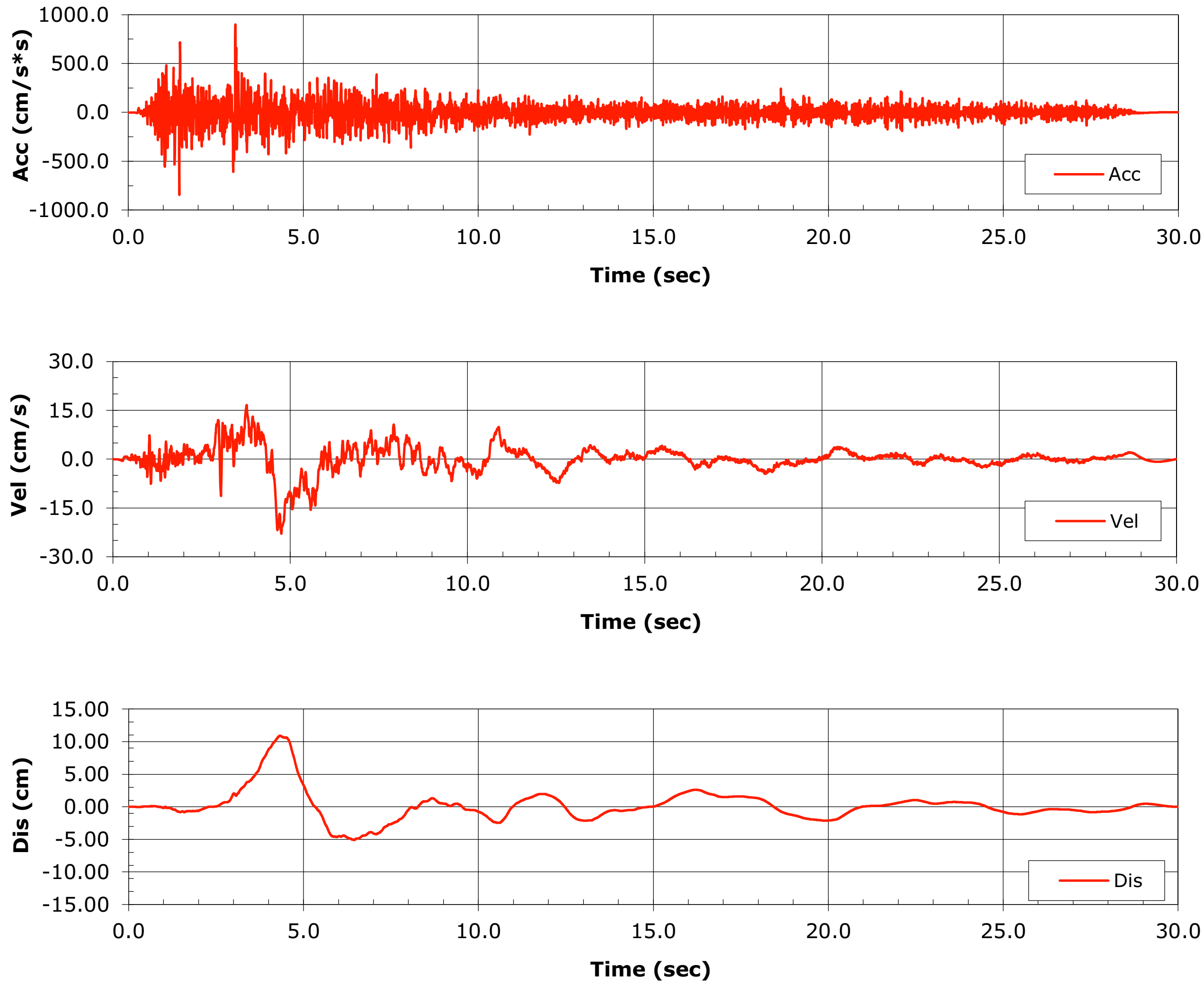
NAPS SUP 3.7-2 **Figure 3.7.1-254 Acceleration, Velocity, and Displacement Spectrally Matched Partial Column Outcrop Time-Histories for CB, H2 Component**



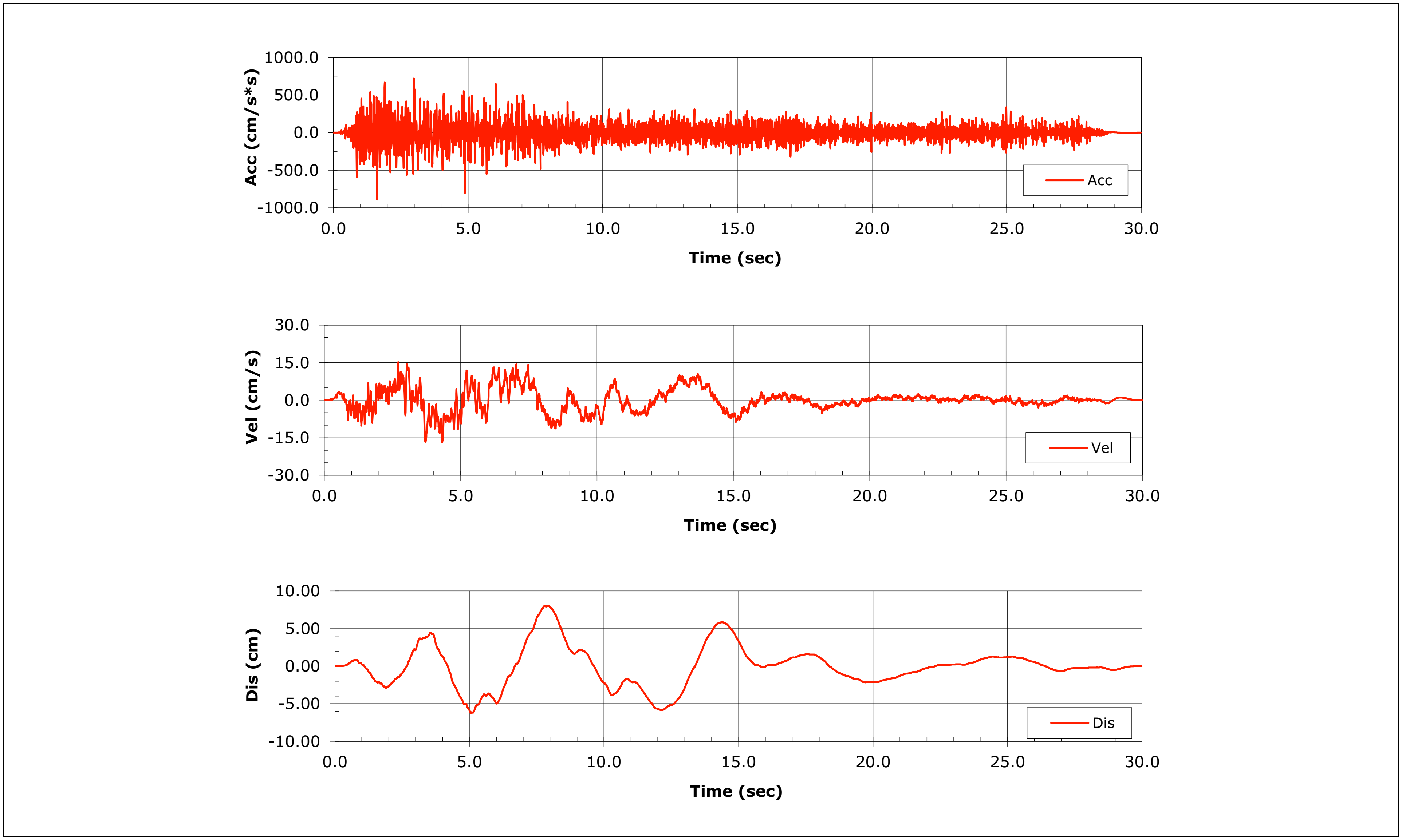
NAPS SUP 3.7-2 **Figure 3.7.1-255 Acceleration, Velocity, and Displacement Spectrally Matched Partial Column Outcrop Time-Histories for CB, UP Component**



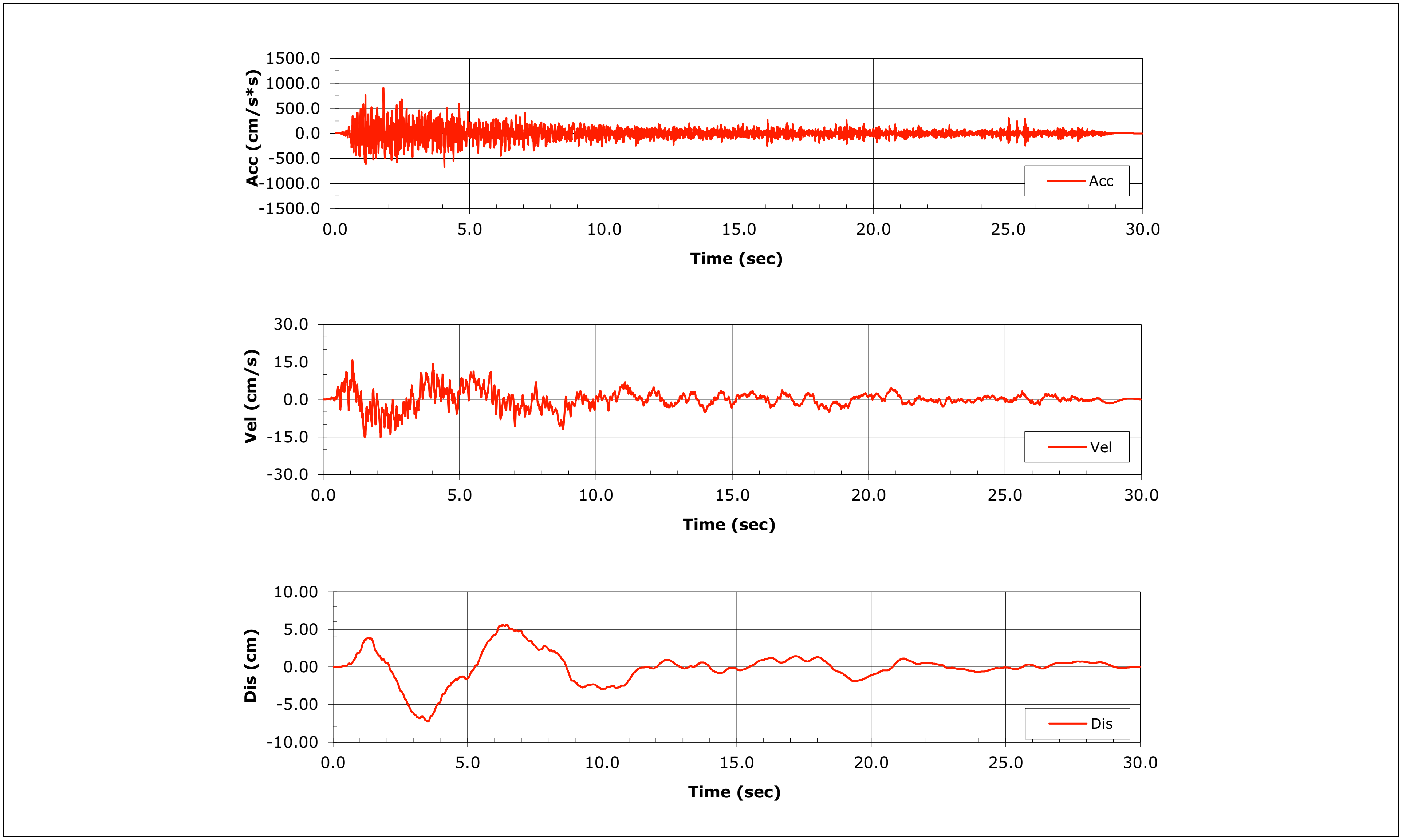
NAPS SUP 3.7-2 **Figure 3.7.1-256 Acceleration, Velocity, and Displacement Spectrally Matched Full Column Outcrop Time-Histories for CB, H1 Component**



NAPS SUP 3.7-2 **Figure 3.7.1-257 Acceleration, Velocity, and Displacement Spectrally Matched Full Column Outcrop Time-Histories for CB, H2 Component**

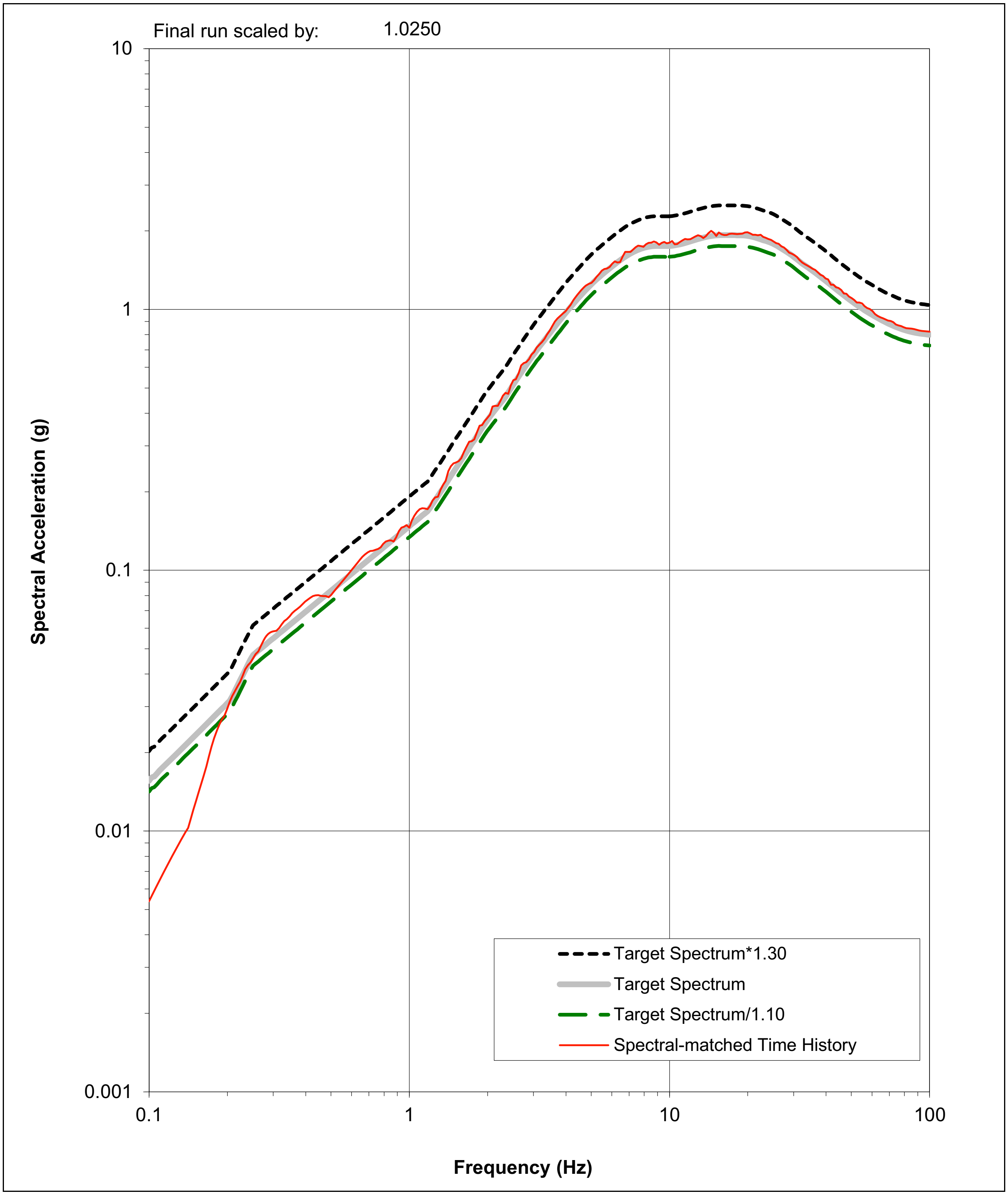


NAPS SUP 3.7-2 **Figure 3.7.1-258 Acceleration, Velocity, and Displacement Spectrally Matched Full Column Outcrop Time-Histories for CB, UP Component**



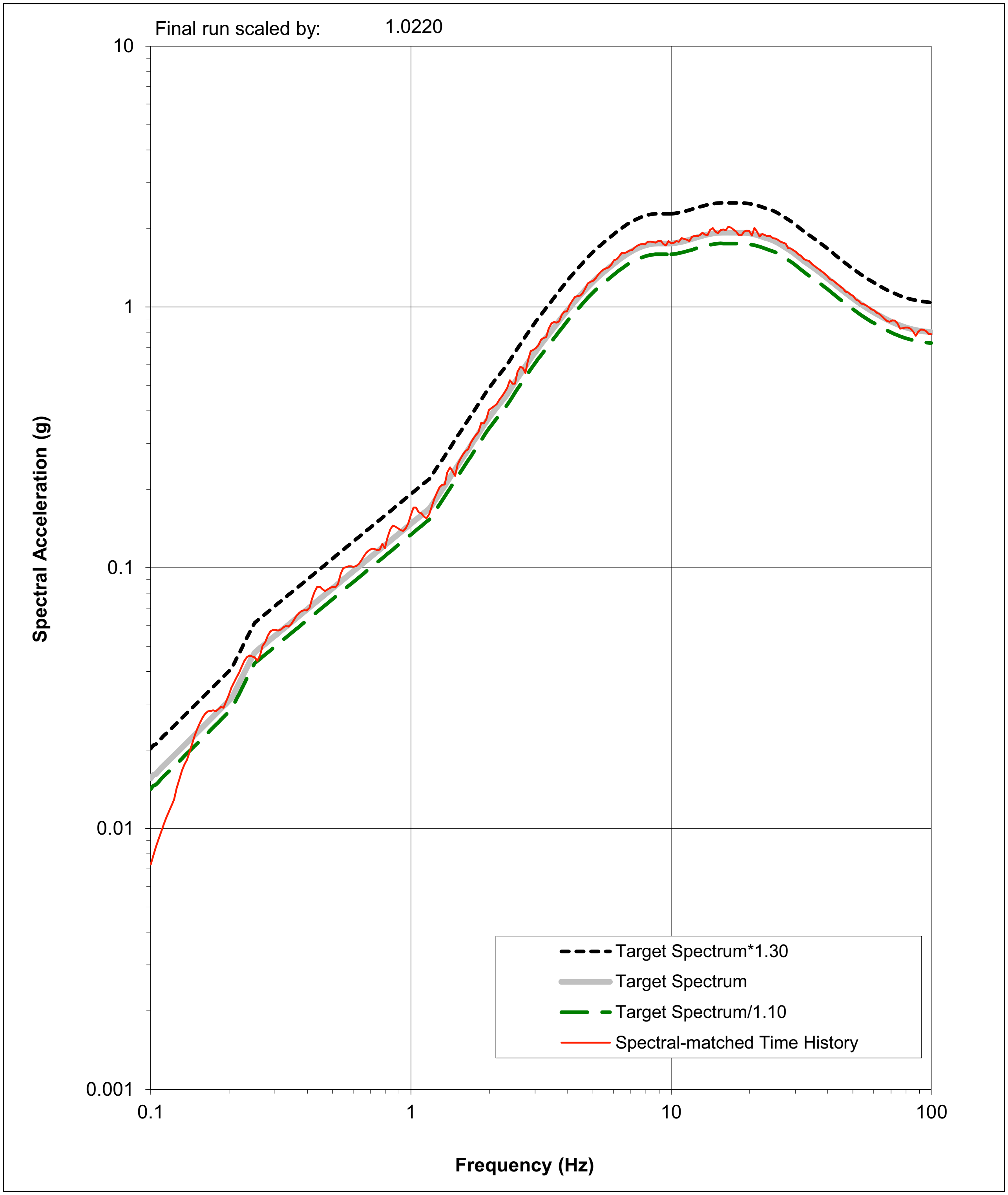
NAPS SUP 3.7-2

Figure 3.7.1-259 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the FWSC, H1 Component



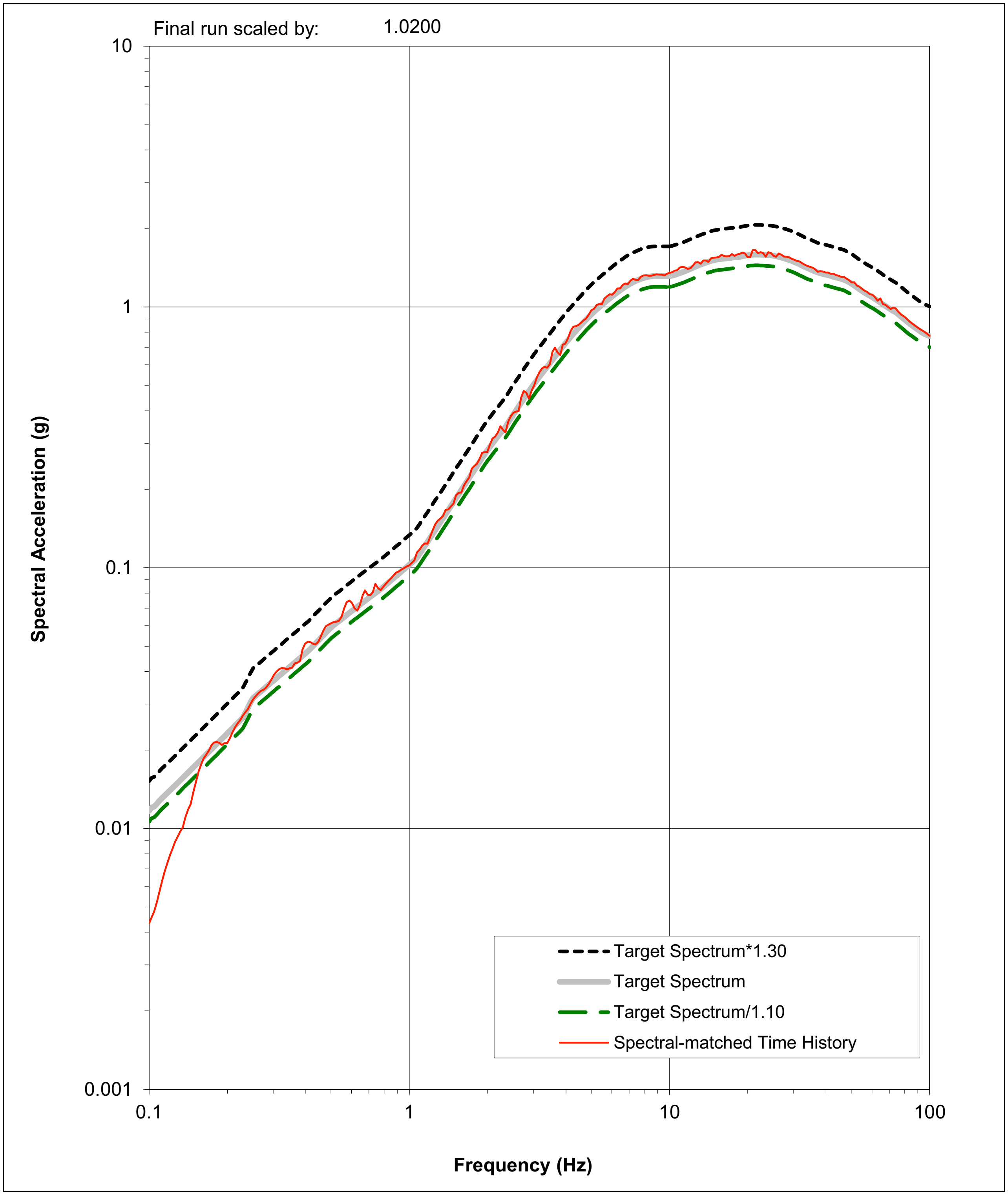
NAPS SUP 3.7-2

Figure 3.7.1-260 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the FWSC, H2 Component

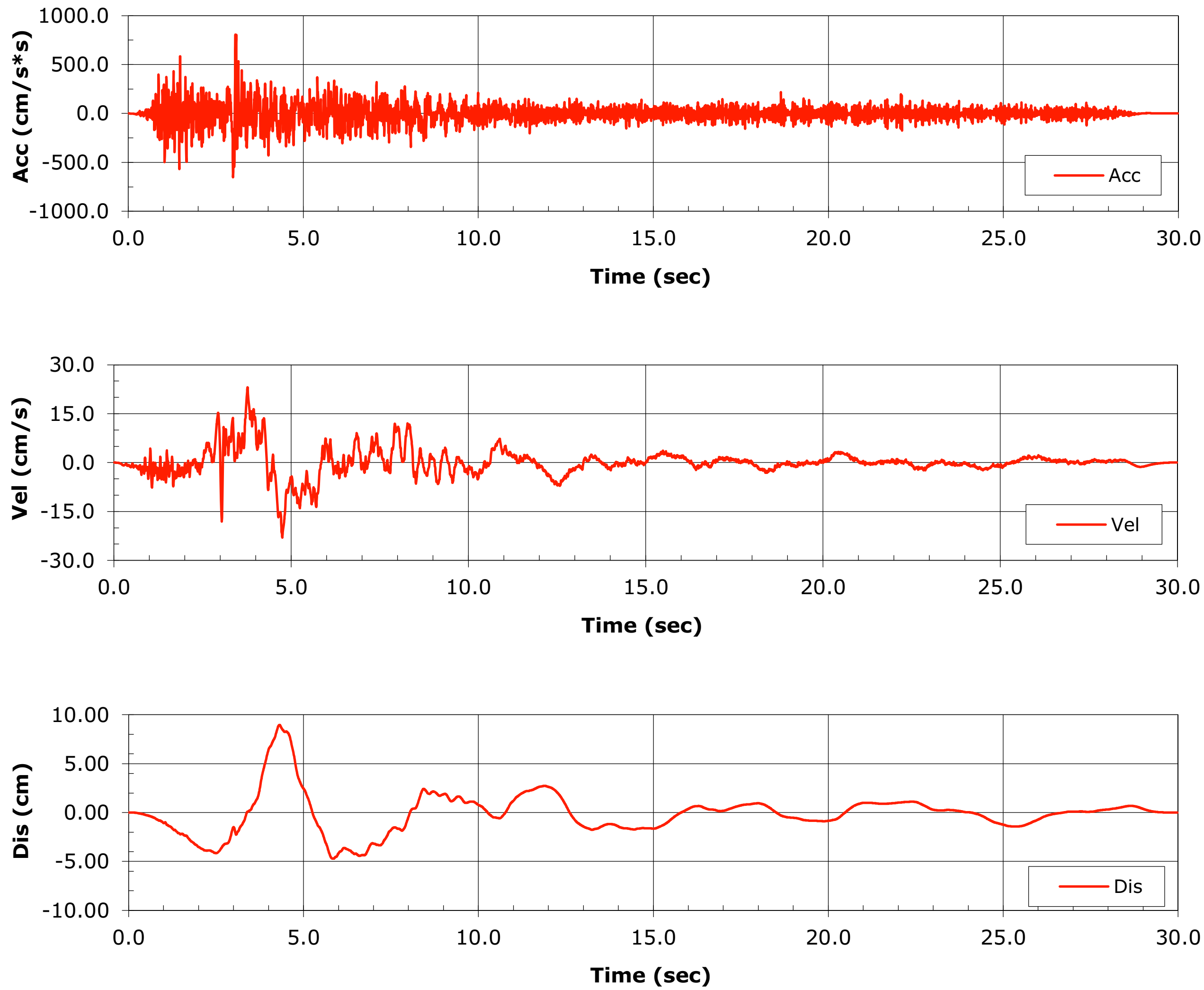


NAPS SUP 3.7-2

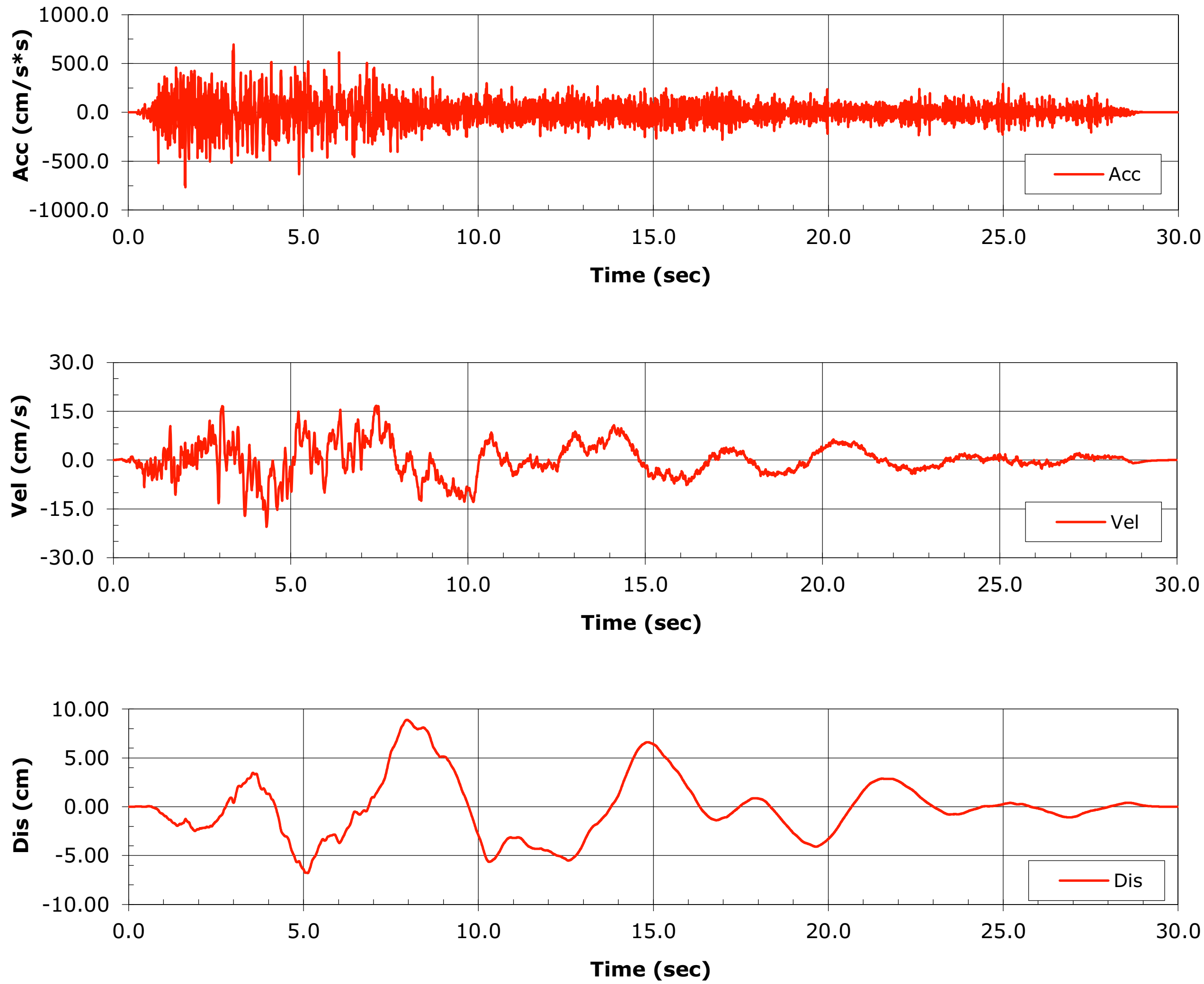
Figure 3.7.1-261 Comparison between the Final Scaled Spectrum Compatible Response Spectrum, the Target Spectrum, and Upper and Lower Target Spectrum Bounds for the FWSC, UP Component



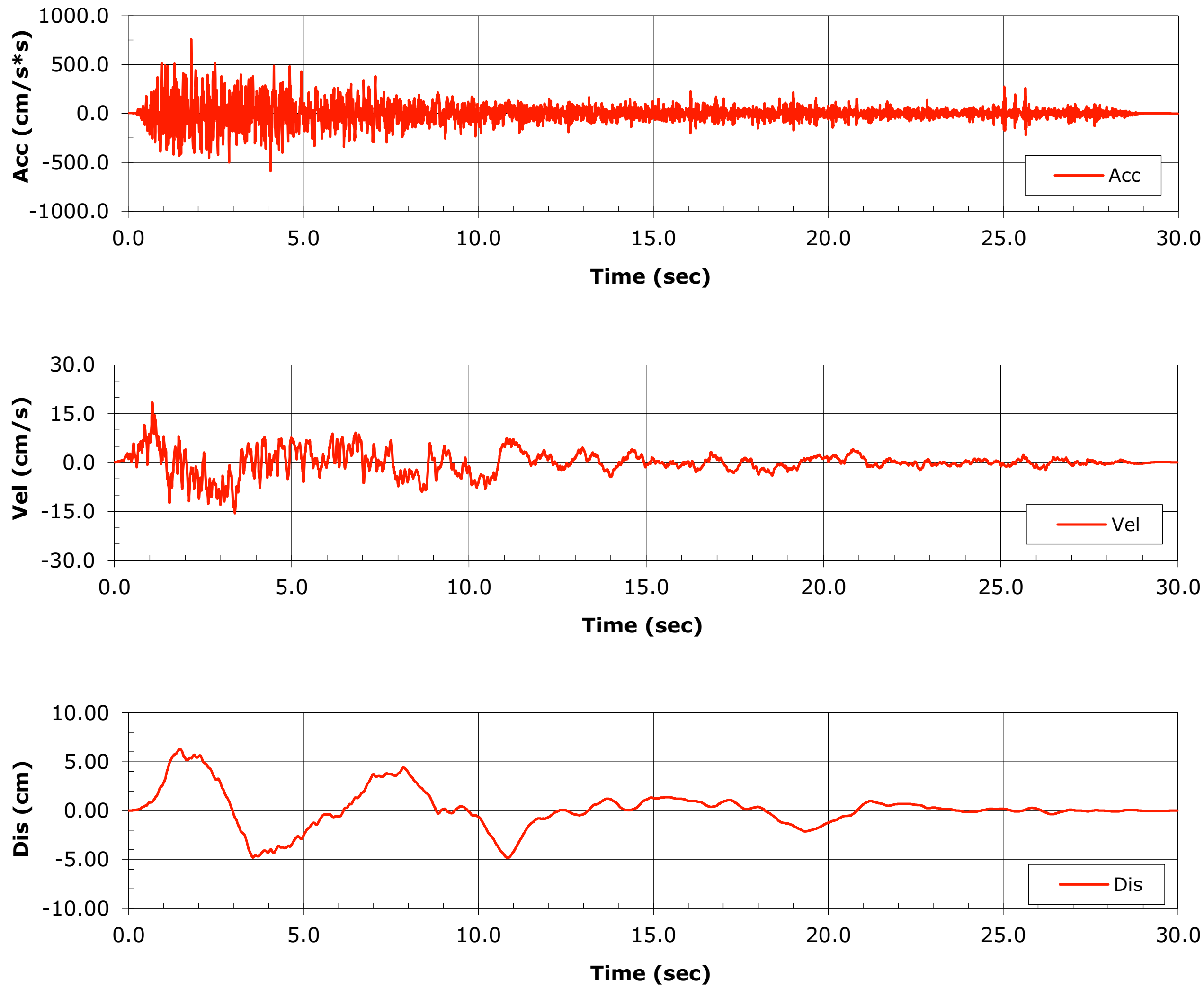
NAPS SUP 3.7-2 **Figure 3.7.1-262 Acceleration, Velocity, and Displacement Spectrally Matched Partial Column Outcrop Time-Histories for the FWSC, H1 Component**



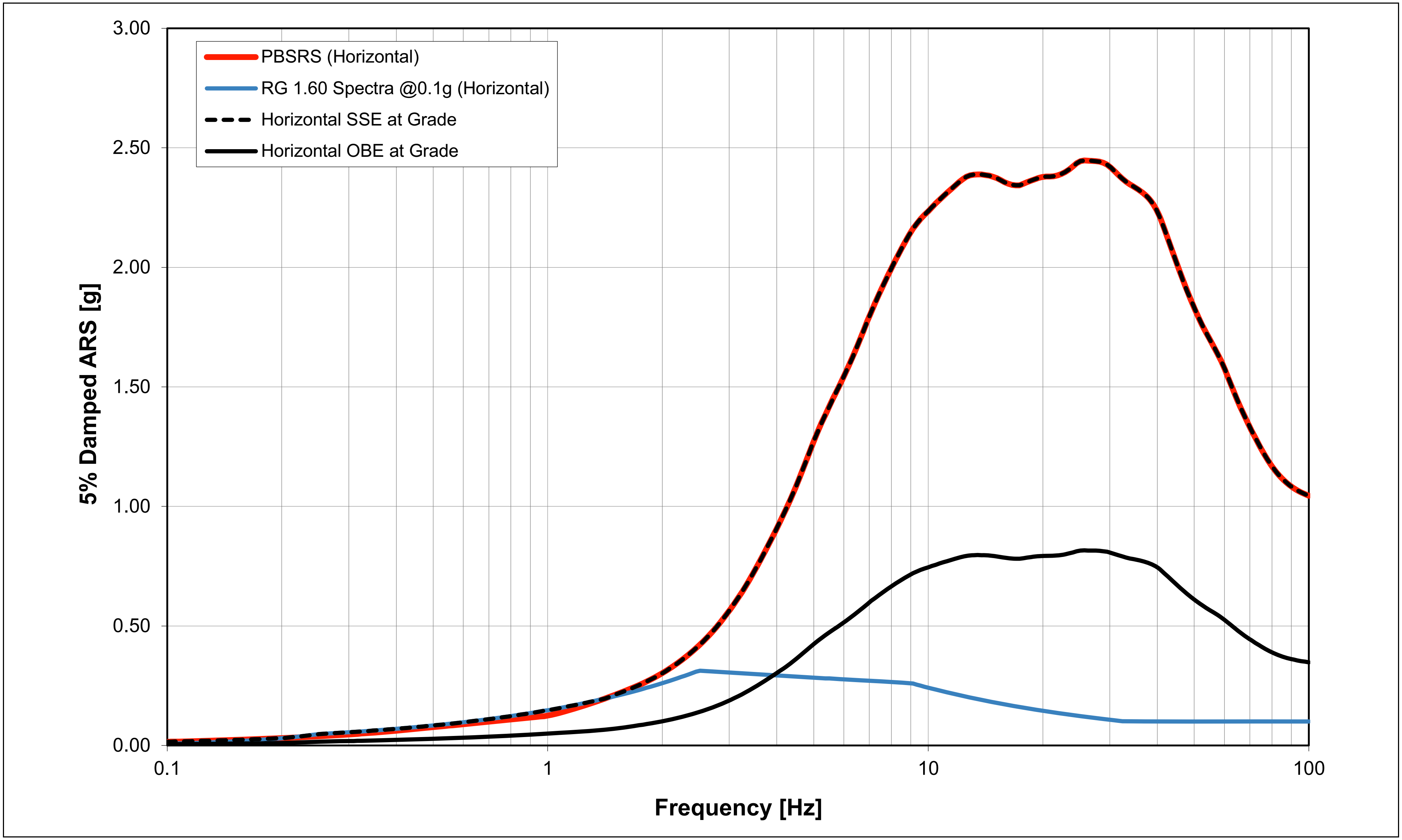
NAPS SUP 3.7-2 **Figure 3.7.1-263 Acceleration, Velocity, and Displacement Spectrally Matched Partial Column Outcrop Time-Histories for the FWSC, H2 Component**



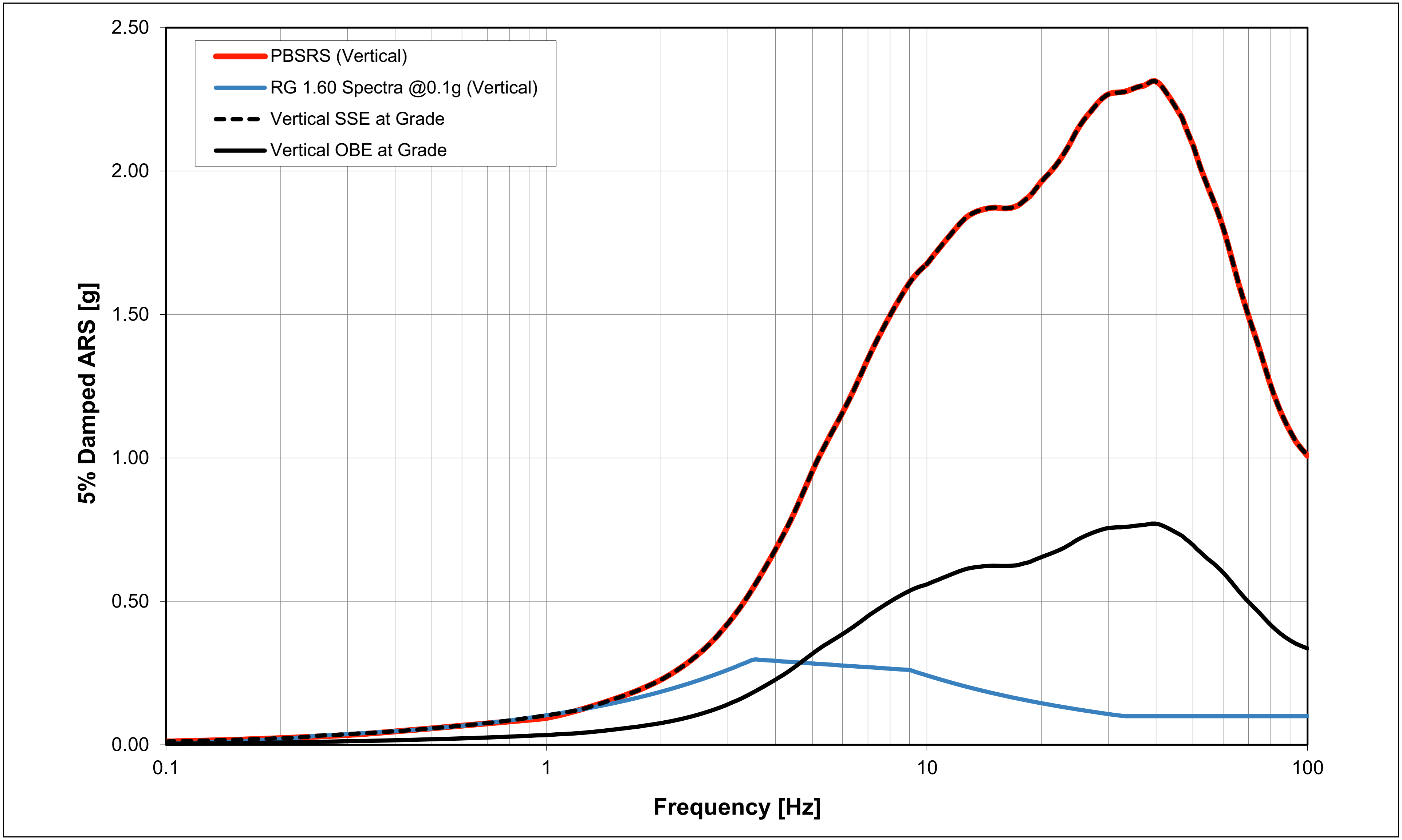
NAPS SUP 3.7-2 **Figure 3.7.1-264 Acceleration, Velocity, and Displacement Spectrally Matched Partial Column Outcrop Time-Histories for the FWSC, UP Component**



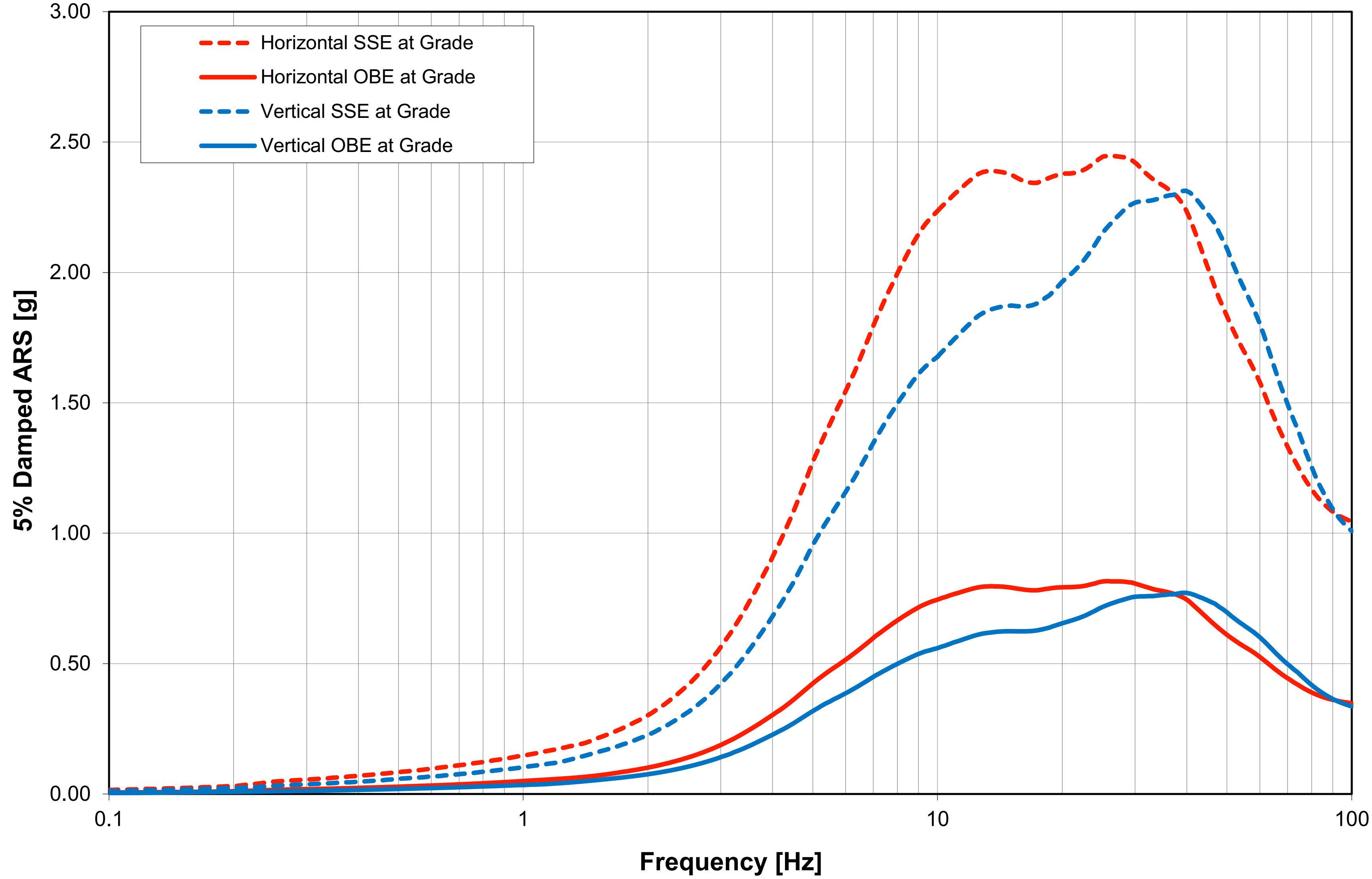
NAPS SUP 3.7-2 **Figure 3.7.1-265 Development of Horizontal Site-Dependent SSE and OBE at Grade**



NAPS SUP 3.7-2 **Figure 3.7.1-266 Development of Vertical Site-Dependent SSE and OBE at Grade**



NAPS SUP 3.7-2 **Figure 3.7.1-267 Site-Dependent SSE and OBE at Grade**



3.7.2 Seismic System Analysis

3.7.2.2 Natural Frequencies and Responses

Replace the first sentence in this paragraph with the following.

NAPS DEP 3.7-1

Natural frequencies and SSI responses of Seismic Category I buildings obtained from the seismic response analyses forming the basis for seismic design of ESBWR Standard Plant are presented in DCD Appendix 3A. The site-specific SSI responses specific for Unit 3 site-specific conditions are provided in Section 3.7.2.4.

3.7.2.4 Soil-Structure Interaction

Add the following at the end of the first paragraph.

NAPS DEP 3.7-1

This section of the DCD, including associated DCD Appendix 3A in its entirety, is incorporated by reference with the following supplemental information for the Unit 3 site-specific soil-structure interaction (SSI) analyses for the RB/FB, CB, and FWSC. DCD Appendix 3A provides the SSI analysis approach and results for the standard design based on the CSDRS and generic soil conditions described in Section 3.7.1.

The site-specific SSI analysis considers SSI effects by following an approach that is consistent with those used for standard design. The structural models used for the site-specific SSI analyses have the same configuration and the mass inertia properties as the standard design basis structural models presented in DCD Appendix 3A. Only the stiffness properties and the meshing of the building basements are adjusted for Unit 3 site-specific conditions as discussed below.

As described in Section 2.0, the site-specific horizontal and vertical FIRS have been compared to the corresponding CSDRS used for design of ESBWR standard plant. These comparisons show that there are ranges of frequencies where both the horizontal and vertical site-specific FIRS exceed the CSDRS. In accordance with the requirements of DCD Tier 1, Section 5.1, to address these exceedances, site-specific SSI analyses are performed for Unit 3 Seismic Category I RB/FB, CB, and FWSC structures using the Unit 3 site-specific ground motion and strain compatible soil properties.

The results of these analyses serve to demonstrate the applicability of the seismic design of the ESBWR Standard Plant for the Unit 3 site-specific conditions. The responses obtained from the site-specific

SSI analyses serve as basis for development of Unit 3 site-specific ISRS for all locations in the Seismic Category I buildings.

This section presents the approach and methodology used for the site-specific SSI analyses and the reconciliation of the ESBWR standard plant design for the Unit 3 site-specific conditions. Site-specific ISRS are also presented in this section for representative locations.

Add the following at the end of Section 3.7.2.4.

NAPS DEP 3.7-1

3.7.2.4.1 Site-Specific Soil-Structure Interaction Analysis

This section presents the site-specific SSI analyses of the Seismic Category I RB/FB, CB, and FWSC. The site-specific SSI analyses are performed to address the Unit 3 site-specific conditions.

The methodology used for site-specific SSI analyses is consistent with the methodology used for the SSI analyses for the ESBWR Standard Plant design. The site-specific SSI analysis is performed using the SASSI2010 computer program that is an updated version of the SASSI2000 computer program used for the standard plant SSI analysis. The structural dynamic models used for the site-specific SSI analyses are developed based on the standard design basis models described in DCD Appendix 3A and are coupled with the Unit 3 site-specific strain compatible dynamic subsurface properties developed in Section 3.7.1.

The site-specific SSI analyses consider the RB/FB embedded into the Zone III rock and include the surrounding concrete fill. The effect of the structural fill above the top of the Zone III rock at DCD Elevation -0.68 m (273 ft NAVD88) on the seismic response of RB/FB is neglected as of minor importance (the DCD Elevation value is relative to the standard plant finished ground level grade EL 4.5 m per DCD Table 3.4-1, while the value following in parentheses is the corresponding elevation at the NA3 site for which EL 289.5 ft NAVD88 is the finished ground level grade). Concrete fill used to fill the gap between the RB/FB and adjacent buildings and excavated in-situ rock up to the top of Zone III rock is included in the SASSI structural model.

The site-specific SSI analyses of the CB consider the building embedded into the Zone III rock and include the surrounding concrete fill in the SASSI structural model. The CB is founded on concrete fill layer resting on the surface of the Zone III/IV rock. The effect of the structural fill above the top of the Zone III rock at DCD Elevation -3.12 m (265 ft NAVD88) on

the seismic response of CB is neglected as of minor importance. Concrete fill is used to fill the gap between the CB and adjacent buildings and excavated in-situ rock up to the top of Zone III rock. The input control motion is applied to the SSI model at the bottom of the CB foundation resting on the concrete fill layer.

The site-specific SSI analyses consider the FWSC as a surface founded structure at DCD Elevation 2.15 m (282 ft NAVD88) where the input control motion is applied. The SASSI structural model also includes the concrete fill layer placed on the surface of the Zone III/IV rock up to the bottom of the FWSC basemat. The concrete fill has the same width of the basemat and is surrounded by structural fill with properties similar to the properties of the excavated in-situ soil material.

The site-specific SSI analyses results are presented and compared with the seismic responses obtained from the standard design SSI analysis presented in DCD Appendix 3A in the following subsections. These comparisons serve as basis for validation of the applicability of the ESBWR Standard Plant for the Unit 3 site-specific conditions as shown in Section 3.7.2.4.1.6. The responses obtained from the site-specific SSI analyses serve as basis for development of Unit 3 site-specific ISRS. In addition, the foundation stability and the dynamic bearing pressure demands are evaluated in Section 3.8.5 for the RB/FB, CB and FWSC based on the site-specific SSI analyses results.

3.7.2.4.1.1 Strain Compatible Dynamic Subsurface Material Properties

The geology of the Unit 3 site is discussed in detail in Section 2.5.1. The subsurface materials encountered at the Unit 3 and the engineering properties of these subsurface materials site are discussed in detail in Section 2.5.4.

Three subsurface material profiles, a best estimate (BE) profile, a lower bound (LB) profile, and an upper bound (UB) profile, are used in the SSI analyses to account for variability in the subsurface materials properties at the Unit 3 site. The development of the site-specific strain compatible dynamic subsurface material properties associated with the BE, LB, and UB profiles are discussed in Section 3.7.1.1.4 and are in accordance with requirements of ISG-017. The strain compatible dynamic properties used for the BE, LB, and UB subsurface profiles used in the site-specific SSI analyses are provided in Table 3.7.1-201 for RB/FB, Table 3.7.1-203 for

CB, and Table 3.7.1-205 for FWSC. The concrete fill is included in the SSI analyses structural model as 3-D solid elements as shown in Figures 3.7.2-202 and 3.7.2-203 for RB/FB, in Figures 3.7.2-205 and 3.7.2-206 for CB, and in Figures 3.7.2-208 and 3.7.2-209 for FWSC.

3.7.2.4.1.2 SSI Input Response Spectra Compatible Ground Motion Time Histories

Section 3.7.1.1.5 describes development of the site-specific ground motion time histories used as input control motion in the site-specific SSI analyses. Each site-specific SSI analysis is performed using a single set of three ground motion time histories for the three orthogonal components (two horizontal and one vertical) that are applied to the SSI model as free field ground motion at the corresponding foundation bottom elevations. In accordance with ISG-017, the NEI method serves as basis for the development of in-column motion acceleration time histories used as input control motion for the site-specific SSI analyses of RB/FB and CB. The in-column motion time histories at the basemat bottom elevation are developed for each subsurface profile. The site-specific SSI analysis of the FWSC surface mounted model uses a single set of time histories for the three components of the out-crop motion at plant grade. The duration of time history is 29.98 seconds and the time step is 0.005 seconds.

3.7.2.4.1.3 Soil-Structure Interaction Analysis Method

The SSI analysis is performed using the SASSI2010 computer program, an updated version of SASSI2000 computer program used for the standard design SSI analysis described in DCD Appendix 3A. The explicit direct (excavated volume) method is used for the computation of the foundation impedance of the embedded RB/FB and CB models. The same method is also used for the surface founded FWSC including concrete fill underneath. The effects of the ground motion incoherency that reduce the responses at higher frequencies are conservatively neglected by considering coherent input ground motion. As shown in Table 3.7.2-201, the cut-off frequency of 50 Hz is used for all site-specific SSI analyses except for the SSI analysis of FWSC with LB profile that uses cut-off frequency of 29 Hz. This LB cutoff frequency is sufficient to capture low and intermediate frequency range of significance that is

typically associated with softer subsurface profiles. The number of FFT points is 8192.

3.7.2.4.1.4 SSI Analysis Structural Models

The site-specific SSI structural models for the RB/FB, CB and FWSC are constructed from the building stick models coupled with the foundation finite element model following the methodology described in DCD Section 3A.7.3. The RB/FB, CB and FWSC stick models are shown in DCD Figures 3A.7-4, 3A.7-6, and 3A.7-7, respectively. The plate elements for basemat and basement exterior walls, and overall site-specific SSI structural models are shown in Figures 3.7.2-201 through 3.7.2-203 for the RB/FB, Figures 3.7.2-204 through 3.7.2-206 for the CB, and Figures 3.7.2-207 through 3.7.2-209 for the FWSC. These figures also present the excavated soil volume elements that are part of the SASSI structural models. The excavated soil volumes have mesh that is consistent with the FE mesh of the basemats and basement exterior walls finite elements. The excavated soil elements are assigned with in-situ strain compatible soil properties as the ones used in the site profile models.

SASSI2010 criteria that the size of the elements shall be at least one fifth of the wave length to be able to accurately pass the seismic wave is used to determine the mesh size of the site and excavated volume models. The passing and cut-off frequencies are shown in Table 3.7.2-201. The meshes of the foundation finite element models used for site-specific SSI analyses of the RB/FB and CB are refined enough to ensure passage of seismic waves with 50 Hz frequency in all directions for all subsurface profiles. The mesh of the FWSC foundation model is sized to pass waves with 50 Hz frequency in all directions for the UB subsurface profile. Based on the SASSI2010 criteria, the FWSC models used for the SSI analyses of LB and BE soil profiles are capable of transmitting frequencies up to 19 Hz and 33 Hz, respectively. The SSI analyses for these two soil profiles are performed for frequencies up to 50 Hz and 29 Hz that are 50 percent higher than the SASSI2010 criteria. The review of the transfer function results from these two analyses indicate that the use of frequencies of analysis beyond those specified in the SASSI2010 manual does not compromise the accuracy of the results. The in-situ subgrade in the SSI models is represented by horizontally infinite layers resting on surface of elastic half space. The site models used for the SSI analyses of the RB/FB, CB and FWSC model consist of 13, 17 and

22 layers, respectively. These layers are developed to match the original site profile using the equivalent wave travel time procedure for adjusted shear and compression wave velocities as shown below.

$$Vs_{ave} = \frac{H}{\sum_i d_i / Vs_i} \qquad Vp_{ave} = \frac{H}{\sum_i d_i / Vp_i}$$

where: H is the thickness of the adjusted layer, d_i, Vs_i and Vp_i are the thickness, shear wave and compression wave velocities of the layers in the original site profiles. The unit weight and damping ratios of the adjusted layers are determined as weighted averages with respect to the layer thickness.

The top of the half space in the RB/FB, CB and FWSC models is established at DCD elevation -42.7 m (135 ft NAVD88), -45.8 m (125 ft NAVD88) and -45.5 m (126 ft NAVD88), respectively. Consistent with SASSI manual recommendations, the half-space simulation consists of additional ten layers with viscous dashpots added at the base of the site finite element model to account for the dissipation of energy at the model lower boundary. The half-space model has a thickness of 1.5 V_S/ f, where Vs is the shear wave velocity of the halfspace and f is the frequency of the analysis. The total depth of the site model used for SSI analyses of RB/FB, CB and FWSC is more than 95.9 m, 104.1 m and 116.3 m, respectively, which is close or exceeds two times the footprint dimension of the analyzed structure.

Reduced cracked concrete stiffness properties are assigned to the lumped mass stick model elements based on the SASSI stress results for in-plane shear and out-of-plane bending moment. The shear stiffness of the stick elements is reduced based on the cracking criteria (shear stress of rupture of concrete: $3 \times f_c'^{0.5}$ psi, where f_c' is specified compressive strength of concrete, psi). The cracking criteria defined in ACI 349-01, Section 9.5.2.3, is used as basis for reduction of the out-of-plane bending stiffness based on comparison with the bending moment results. The stress check to determine the state of cracking is performed for the response corresponding to the BE profile. This is to maintain consistency with best estimate properties considered in structural models.

Figure 3.7.2-210 shows in red the elements of the RB/FB lumped mass stick model that are assigned with reduced cracked concrete stiffness properties and SSE damping. The RB/FB SDOF oscillators that are

shown in red are also assigned with reduced cracked concrete stiffness properties and SSE damping. Reduced cracked concrete stiffness properties and SSE damping are assigned to all stick elements of the CB lumped mass stick. The FWSC model is assigned full (uncracked concrete) stiffness properties and OBE damping.

The concrete fill surrounding the RB/FB, CB and FWSC is included in the structural models. In the site-specific SSI analyses, the concrete fill surrounding the RB/FB, CB, and FWSC is modeled consistent with the mesh size of plate elements for basemat and exterior walls. 3-D spring elements are established at the interface between the concrete fill solid elements and the building shell elements. These spring elements are assigned global stiffness properties high enough to ensure they do not affect the dynamic properties of the analyzed SSI system. The interface spring elements provide spring force results that serve as input for calculation of the site-specific wall lateral pressure and foundation bearing pressure demands in Sections 3.8.4.5.6 and 3.8.5.5.2, respectively. The spring forces results also serve as input for calculation of seismic driving forces for the site-specific stability evaluations in Section 3.8.5.5.1.

The SASSI2010 model X-direction and Y-direction represent plant north-south (NS) and east-west (EW) directions, respectively. The positive X-axis is oriented to the south. The positive Y-axis is oriented to the east. The positive Z- axis is oriented upward.

3.7.2.4.1.5 **Soil-Structure Interaction Analysis Cases**

The site-specific SSI analyses cases are summarized in Table 3.7.2-202 for the RB/FB, Table 3.7.2-203 for the CB, and Table 3.7.2-204 for the FWSC. To account for variability in the subsurface material properties, BE, LB, and UB profiles are considered.

Each analysis case consists of three directions of excitation (two horizontal and one vertical) applied independently to the SSI model. The calculated resulting co-directional ISRS in the X-, Y-, and Z directions are combined using the SRSS method, taking into account coupling effects between vertical and rocking and between lateral and torsion motions. The co-directional response structural loads from each direction of excitation for each case are combined using the algebraic sum method in the time domain to obtain the total response. The ISRS in the BE, LB and UB profiles are enveloped to have the maximum amplitude for each

frequency. The structural responses obtained from the SSI analyses of BE, LB, and UB profiles are enveloped to obtain the site-specific design basis values for the maximum member forces, accelerations and displacements.

3.7.2.4.1.6 **Soil-Structure Interaction Analysis Results**

The following sections present the results of the site-specific SSI analyses for the BE, LB, and UB subsurface profiles. The site-specific SSI analyses results for response at key locations are compared herein with the standard seismic design envelopes presented in DCD Appendix 3A. Comparisons are provided for maximum seismic structural loads and ISRS.

The results of the SSI analyses for the spring contact forces at the foundation bottom are used to evaluate the potential loss of contact with the subgrade due to foundation uplift. The plots of the contact pressures at the bottom of the foundation at the critical instances of time show that the contact ratio remains above 80 percent thus demonstrating that the potential uplift of the foundations have a negligible effect on the results of the SSI analyses.

3.7.2.4.1.6.1 **SSI Enveloping Maximum Structural Loads**

For the RB/FB model, the enveloping seismic loads from the site-specific SSI analyses based on the BE, LB, and UB subsurface profiles (herein called Unit 3 site-specific SSI enveloping seismic loads) are presented in Tables 3.7.2-205 through 3.7.2-209.

The site-specific SSI enveloping seismic loads for the RB/FB are presented in Table 3.7.2-205. The site-specific SSI enveloping seismic loads are compared with the enveloping seismic loads provided in DCD Table 3A.9-1a for the RB/FB stick model. Table 3.7.2-205 also presents the percentage ratio of the site-specific SSI enveloping seismic loads to the seismic loads used for the standard design of RB/FB structures. Table 3.7.2-205 shows that the site-specific seismic loads for the RB/FB are partially larger than the corresponding standard design loads. Table 3.7.2-216(a) shows the result of stress checks using a scale factor for RB/FB Wall. Scale factors are calculated as the maximum value of the ratios of site-specific to standard design structural load components. This is a conservative approach since not all load components contributing to stresses experience the same degree of increase. The calculated scale factors are then applied to the worst stress ratio of the standard design

governing seismic load combination to Code allowable stress. This approach provides upper bound estimate for Unit 3 stresses since the scale factor determined from the seismic load alone is applied to the combined stress of seismic plus other loads. The estimates of site-specific stresses ratio would be smaller if the scale factor is applied to the seismic stress component only. All values of Unit 3 stress ratio are confirmed to be within the code allowable stress limits which demonstrate the applicability of the standard design of RB/FB structures for Unit 3 site conditions.

The site-specific SSI seismic loads for the Reinforced Concrete Containment Vessel (RCCV) stick model are presented in Table 3.7.2-206. The site-specific SSI seismic loads are compared with the corresponding standard design seismic loads provided in DCD Table 3A.9-1b. Table 3.7.2-206 also presents the percentage ratio of the site-specific SSI seismic loads to the seismic loads used for standard design of the RCCV. Table 3.7.2-206 shows that the site-specific seismic loads for the RCCV are partially larger than the standard design seismic loads. Table 3.7.2-216(b) shows the result of stress check using a scale factor for RCCV Wall. All values of stress are confirmed to be within allowable stress, thus demonstrating the applicability of the standard design of the RCCV structures for Unit 3 site conditions.

The site-specific seismic loads for the Vent Wall/Pedestal stick model are presented in Table 3.7.2-207. The site-specific seismic loads are compared with the corresponding seismic loads provided in DCD Table 3A.9-1c and used for the standard design of Vent Wall/Pedestal structural members. Table 3.7.2-207 also presents the percentage ratio of the site-specific seismic loads to the seismic loads used for standard design of the Vent Wall/Pedestal structural members. Table 3.7.2-207 shows that the site-specific seismic loads for the Vent Wall/Pedestal are partially larger than the corresponding standard design seismic loads. Table 3.7.2-216(c) and (d) shows the result of the stress check using a scale factor for the Vent Wall/Pedestal Wall. All the values of stress are confirmed to be within stress allowables, thus demonstrating the applicability of the standard design of the Vent Wall/Pedestal wall for Unit 3 site conditions.

The site-specific seismic loads for the Reactor Shield Wall (RSW) are presented in Table 3.7.2-208. The site-specific seismic loads are compared with the corresponding RSW standard design seismic loads

provided in DCD Table 3A.9-1d. Table 3.7.2-208 also presents for the RSW the percentage ratio of the site-specific seismic loads to the standard design enveloping seismic loads. Table 3.7.2-208 shows that the RSW site-specific seismic loads are partially larger than the corresponding seismic loads in DCD Table 3A.9-1d. Table 3.7.2-216(e) shows the result of a stress check using a scale factor. The RSW stress exceeds the allowable stress when the scale factor is applied to the combined stress of seismic plus others. However, when the scale factor is applied to seismic stress alone the combined stress of the RSW structure is confirmed to be within stress allowables, thus demonstrating the applicability of the standard design of the RSW structure for Unit 3 site conditions.

As described in DCD Sections 3.7.2 and 3.7.2.3, the reactor pressure vessel (RPV) is not a primary structural component. A lumped mass stick model of the RPV is included in the SSI model to capture its dynamic interaction with the supporting structure. Although this model is not used for the design of the RPV, the responses obtained from the RPV lumped mass stick model are considered for the purpose of this site-specific evaluation. The site-specific SSI enveloping loads for the RPV stick model are presented in Table 3.7.2-209. The site-specific SSI enveloping seismic loads are compared with the standard design seismic loads provided in DCD Table 3A.9-1e for the RPV lumped mass stick model. Table 3.7.2-209 presents the percentage ratio of the site-specific SSI enveloping seismic loads to the standard design SSI analysis enveloping seismic loads for the RPV stick model. Table 3.7.2-209 shows that the site-specific SSI enveloping seismic loads for the RPV stick model exceed the DCD standard design SSI analysis enveloping seismic loads. To address these exceedances of the RPV seismic loads, a decoupled model of the RPV subsystem is analyzed using input SSE loads based on the results of the site-specific SSI analysis.

The site-specific seismic loads for CB stick model are presented in Table 3.7.2-217. The site-specific seismic loads are compared with the corresponding CB standard design seismic loads provided in DCD Table 3A.9-1f. Table 3.7.2-217 also presents the percentage ratio of the site-specific seismic loads to the corresponding seismic loads used for standard design of the CB structure. Table 3.7.2-217 shows that the CB site-specific seismic loads are partially larger than the corresponding standard design seismic loads. Table 3.7.2-219 shows the result of the

stress check using a scale factor. As shown in Table 3.7.2-219, it is confirmed that all stresses are lower than stress allowables, thus demonstrating the applicability of the standard design of the CB structure for Unit 3 site conditions.

For the FWSC model, the site-specific seismic loads obtained from site-specific SSI analyses of the Fire Water Storage Tank (FWS) and Fire Pump Enclosure (FPE) stick models are presented in Tables 3.7.2-220 and 3.7.2-221 respectively. These site-specific seismic loads are compared with the corresponding FWSC standard design seismic loads provided in DCD Tables 3A.9-1g and 3A.9-1h. Table 3.7.2-220 and Table 3.7.2-221 also presents the percentage ratio of the site-specific seismic loads to the seismic loads used for the standard design of the FWSC structure. Tables 3.7.2-220 and 3.7.2-221 show that the site-specific FWSC seismic loads are lower than the corresponding standard design seismic loads except for torsion. The structural design considers seismic torsion loads that include both torsion loads due to eccentricities of the SSI analysis model and accidental torsion that is calculated as a product of 5 percent of the largest plan dimension of the building and the floor horizontal load. The comparisons in Table 3.7.2-222 demonstrate that the total torsion loads used in the standard design envelope the site-specific total torsion loads. The comparisons in Tables 3.7.2-220, 3.7.2-221, and 3.7.2-222 demonstrate the applicability of the standard design of the FWSC structures for Unit 3 site conditions.

The Unit 3 site-specific SSI enveloping maximum vertical accelerations for the RB/FB stick model are presented in Table 3.7.2-210. The Unit 3 site-specific SSI enveloping maximum vertical accelerations are compared with the enveloping maximum vertical accelerations provided in DCD Table 3A.9-3a, for the RB/FB stick model. Table 3.7.2-210 also presents the percentage ratio of the site-specific SSI enveloping maximum vertical accelerations to the enveloping maximum vertical accelerations of the DCD for the RB/FB stick model. Table 3.7.2-210 shows that the Unit 3 site-specific SSI enveloping maximum vertical accelerations for the RB/FB stick model are partially larger than the DCD enveloping maximum vertical accelerations. Table 3.7.2-216(a) shows the result of the stress check using a scale factor for RB/FB Wall. All values of stress are confirmed to be within stress allowables.

The Unit 3 site-specific SSI enveloping maximum vertical accelerations for the RCCV stick model are presented in Table 3.7.2-211. The Unit 3 site-specific SSI enveloping maximum vertical accelerations are compared with the enveloping maximum vertical accelerations provided in DCD Table 3A.9-3b, for the RCCV stick model. Table 3.7.2-211 also presents the percentage ratio of the Unit 3 site-specific SSI enveloping maximum vertical accelerations to the DCD enveloping maximum vertical accelerations for the RCCV stick model. Table 3.7.2-211 shows that the site-specific SSI enveloping maximum vertical accelerations for the RCCV stick model are partially larger than the DCD enveloping maximum vertical accelerations. Table 3.7.2-216(b) shows the result of the stress check using a scale factor for RCCV Wall. All values of stress are confirmed to be within stress allowables.

The site-specific SSI enveloping maximum vertical accelerations for the Vent Wall/Pedestal stick model are presented in Table 3.7.2-212. The site-specific SSI enveloping maximum vertical accelerations are compared with the enveloping maximum vertical accelerations provided in DCD Table 3A.9-3c, for the Vent Wall/Pedestal stick model. Table 3.7.2-212 also presents the percentage ratio of the site-specific SSI enveloping maximum vertical accelerations to the DCD enveloping maximum vertical accelerations for the Vent Wall/Pedestal stick model. Table 3.7.2-212 shows that the site-specific SSI enveloping maximum vertical accelerations for the Vent Wall/Pedestal stick model are partially larger than the DCD enveloping maximum vertical accelerations. Table 3.7.2-216(c) and (d) shows the result of the stress check using a scale factor for Vent Wall/Pedestal. All values of stress are confirmed to be within stress allowables.

The site-specific SSI enveloping maximum vertical accelerations for the RSW stick model are presented in Table 3.7.2-213. The Unit 3 site-specific SSI enveloping maximum vertical accelerations are compared with the enveloping maximum vertical accelerations provided in the DCD Table 3A.9-3d, for the RSW stick model. Table 3.7.2-213 also presents the percentage ratio of the Unit 3 site-specific SSI enveloping maximum vertical accelerations to the DCD enveloping maximum vertical accelerations for the RSW stick model. Table 3.7.2-213 shows that the Unit 3 site-specific SSI enveloping maximum vertical accelerations for the RSW stick model are larger than the DCD enveloping maximum vertical accelerations. Table 3.7.2-216(e) shows the result of a stress

check using a scale factor. The RSW stress exceeds the allowable stress when the scale factor is applied to the combined stress of seismic plus others. However, when the scale factor is applied to seismic stress alone, the combined stress of the RSW structure is confirmed to be within stress allowables, thus demonstrating the applicability of the standard design of the RSW structure for Unit 3 site conditions.

The site-specific SSI enveloping maximum vertical accelerations for the RB/FB Flexible Slab Oscillators are presented in Table 3.7.2-214. The site-specific SSI enveloping maximum vertical accelerations are compared with the enveloping maximum vertical accelerations provided in the DCD Table 3A.9-3e, for the RB/FB Flexible Slab Oscillators. Table 3.7.2-214 also presents the percentage ratio of the site-specific SSI enveloping maximum vertical accelerations to the DCD enveloping maximum vertical accelerations for the RB/FB Flexible Slab Oscillators. Table 3.7.2-214 shows that the site-specific SSI enveloping maximum vertical accelerations for the RB/FB Flexible Slab Oscillators are partially larger than the DCD enveloping seismic loads. Table 3.7.2-216(f) shows the result of the stress check using a scale factor. Only the Suppression Pool (S/P) slab is larger than allowable stress. However, when the scale factor is applied to seismic stress alone, the combined stress of the S/P slab is only 6 percent larger than allowable. Because the strains under combined primary and secondary forces meet the ASME Code Section CC-3422.1(d) requirements, the design adequacy of the S/P is confirmed.

The site-specific SSI enveloping maximum horizontal accelerations for the RB/FB Wall Out-of-Plane Oscillators are presented in Table 3.7.2-215. The site-specific SSI enveloping maximum horizontal accelerations are compared with the enveloping maximum horizontal accelerations provided in DCD Table 3A.9-3f, for the RB/FB Wall Out-of-Plane Oscillators. Table 3.7.2-215 also presents the percentage ratio of the Unit 3 site-specific SSI enveloping maximum horizontal accelerations to the DCD enveloping maximum horizontal accelerations for the RB/FB Wall Out-of-Plane Oscillators. Table 3.7.2-215 shows that the Unit 3 site-specific SSI enveloping maximum horizontal accelerations for the RB/FB Wall Out-of-plane Oscillators are partially larger than the standard design values with a maximum exceedance of approximately 84 percent. These exceedances of the oscillator accelerations affect only the magnitude of the out-of plane loads related to the mass participation

of the particular flexible mode of vibration of the wall. The design of the wall is performed using a total out of plane load that include the contribution of all flexible modes of vibrations represented by the oscillators and the remaining rigid mass response of the wall. The site-specific stress evaluations of the RB/FB walls based on the total out-of-plane loads conformed that the combined stresses are within the stress allowables.

The Unit 3 site-specific SSI enveloping maximum vertical accelerations for the CB stick model are presented in Table 3.7.2-218. The SSI enveloping maximum vertical accelerations are compared with the enveloping maximum vertical accelerations provided in the DCD Table 3A.9-3g, for the CB stick model. Table 3.7.2-218 also presents the percentage ratio of the site-specific SSI enveloping maximum vertical accelerations to the DCD enveloping maximum vertical accelerations for the CB stick model. Table 3.7.2-218 shows that the site-specific SSI enveloping maximum vertical accelerations for the CB stick model are partially larger than the DCD enveloping seismic loads. The stress checks in Table 3.7.2-219(a) performed using scale factors conservatively applied on the total load show that the stresses in all walls but one are below the stress allowable. Only the stresses in the wall between DCD elevations -7.4 m and -2.0 m are larger than allowable stresses. However, further evaluation with the scale factor applied to seismic load alone confirms that the combined stress in this wall also remains within stress allowable. The stress checks in Table 3.7.2-219(b) using scale factors applied on the total slab load confirm that the stress in the CB slabs are all lower than the stress allowable thus demonstrating the applicability of the standard design of the CB slabs for Unit 3 site.

The results of Unit 3 site-specific SSI analysis of FWSC stick model for enveloping maximum vertical accelerations at FWS and FPE lumped mass locations are presented in Tables 3.7.2-223 and 3.7.2-224 respectively. These site-specific enveloping maximum vertical accelerations are compared with those provided in the DCD Tables 3A.9-3h and 3A.9-3i. The percentage ratio of the FWSC site-specific enveloping maximum vertical accelerations to the DCD enveloping maximum vertical accelerations in Tables 3.7.2-223 and 3.7.2-224 show that the site-specific accelerations are lower than the DCD values thus demonstrating the applicability of standard design of FWS and FPE slabs for the Unit 3 conditions.

3.7.2.4.1.6.2 Comparison of the Site-Specific SSI Floor Response Spectra

The 5 percent damping ISRS obtained from the site-specific SSI analyses of RB/FB, CB and FWSC models for the BE, LB, and UB subsurface profiles are compared with the standard design enveloping ISRS presented in DCD Section 3A.9.2. The site-specific ISRS are developed following the same methodology as the standard design ISRS.

Figures 3.7.2-211 through 3.7.2-228 compare the 5 percent damping site-specific ISRS obtained from the site-specific SSI analysis of the RB/FB model with the corresponding standard design ISRS in DCD Section 3A.9.2. The comparisons show that the site-specific ISRS exceed the standard design ISRS for a range of frequencies. Peak broadened site-specific design ISRS are developed as envelope of the results obtained from the SSI analyses of RB/FB for the three site-specific subgrade conditions following the same methodology as the standard design. The RB/FB site-specific SSE design floor response spectra at selected locations for critical damping ratios of 2, 3, 4, 5, 7, 10 and 20 percent are shown in Figures 3.7.2-229 through 3.7.2-246.

Figures 3.7.2-247 through 3.7.2-252 present the comparisons of, the 5 percent damping site-specific SSI ISRS obtained from the site-specific SSI analyses of the CB with the corresponding standard design ISRS presented in DCD Section 3A.9.2. The comparisons show that the CB site-specific SSI ISRS exceed the standard design ISRS for a range of frequencies. Peak broadened site-specific design ISRS are developed as envelope of the results obtained from the SSI analyses of CB for the three site-specific subgrade conditions following the same methodology as the standard design. The CB site-specific SSE design floor response spectra at selected locations for critical damping ratios of 2, 3, 4, 5, 7, 10 and 20 percent are shown in Figures 3.7.2-253 through 3.7.2-258.

Figure 3.7.2-259 through 3.7.2-270 present the comparison of the 5 percent damping site-specific ISRS obtained from the site-specific SSI analysis of the FWSC model with the corresponding standard design ISRS presented in DCD Section 3A.9.2. The comparisons show that FWSC site-specific ISRS exceed the standard design ISRS for a range of frequencies. Peak broadened site-specific design ISRS are developed as envelope of the results obtained from the SSI analyses of FWSC for the three site-specific subgrade conditions following the same methodology as the standard design. The FWSC site-specific SSE design floor

response spectra at selected locations for critical damping ratios of 2, 3, 4, 5, 7, 10 and 20 percent are shown in Figures 3.7.2-271 through 3.7.2-282.

3.7.2.4.1.7 Site-Specific SSI Analyses Conclusions

Based on the site-specific SSI analyses, the following conclusions apply to the Unit 3 site:

- The structural design of the ESBWR Standard Plant based on the CSDRS ground motion and generic subgrade conditions, is applicable to the RB/FB, CB and FWSC Seismic Category I structures at the Unit 3 site.
- Site-specific ISRS are developed and adopted for the design for all locations of RB/FB, CB and FWSC since the site-specific ISRS exceed the standard plant design basis ISRS at some locations. Site-specific seismic qualification and analyses are performed for the equipment and components at these locations to demonstrate that their standard design is applicable for Unit 3 site-specific conditions.

3.7.2.4.1.8 Site-Specific Seismic Design and Analysis of Structures, Systems, and Components

The Unit 3 seismic design and analysis of structures, systems, and components (SSCs), are based on SSE defined by the following two sets of the free-field outcrop spectra at the foundation level (bottom of the base slab):

1) the CSDRS shown in the DCD Figures 2.0-1 and 2.0-2; and

2) the site-specific FIRS for each individual structure (RB/FB, CB, and FWSC) defined in Figures 2.5.2-307, 2.5.2-308, and 2.5.2-312

Thus, where a SSC is required to meet Seismic Category I requirements or to withstand SSE, the two sets of spectra define the SSE for design and analysis of these SSCs for Unit 3.

However, as specified in DCD Section 2.0, liquefaction potential and slope stability evaluations are exceptions for each site and use the site-specific SSE.

The seismic design of systems and components is evaluated to both the ISRS input from the standard design CSDRS and the ISRS input from the Unit 3 FIRS. As described in Section 3.7.2.4.1.6.2, the ISRS obtained from the site-specific SSI analyses exceed the standard design ISRS at

certain locations within the building for a range of frequencies. Peak broadened site-specific design floor response spectra are developed for these locations and used for seismic design and qualification of substructure, components and equipment. Since PCCS Condenser site-specific floor response spectra exceed the standard design spectra, additional analyses are performed using the methodology described in DCD Section 3G.1.5.4.1.5 to confirm that the acceptance criteria in DCD Tier 1 ITAAC 5 in Table 2.15.4-2 are met. The site-specific ISRS also exceed the standard design floor response spectra at the locations of the new fuel storage rack and spent fuel storage rack in the deep pit. Additional analyses are also performed for these nuclear fuel racks using the methodology described in DCD Reference 9.1-1 to confirm that the acceptance criteria in DCD Tier 1 ITAAC 1 and 2 in Table 2.5.6-1 are met.

Table 3.7.2-219 shows that the site-specific SSI analysis yield enveloping seismic loads for the RPV that exceed the corresponding DCD standard design enveloping seismic loads. The seismic capability of the RPV subsystem is verified through the DCD Tier 1, Table 2.1.1-3, ITAAC 6 based on the results of seismic analysis of a decoupled model of the RPV subsystem that use input SSE loads developed from the results of site-specific SSI analysis of the RB/FB model.

Based on the results of the site-specific SSI analysis for enveloping, seismic loads, it is demonstrated in Section 3.7.2.4.1.6.1 that the standard design of Seismic Category I structures envelops the Unit 3 site-specific structural demands. The site-specific SSE loads for the Seismic Category II, and Radwaste Building structures are developed in the same manner as for the Category I structures based on the results of site specific SSI analyses. The SSI analyses for the Seismic Category II and Radwaste Building structures are identified as site-specific ITAAC in COLA Part 10.

3.7.2.8 Interaction of Non-Category I Structures with Seismic Category I Structures

Add the following at the end of this section.

NAPS SUP 3.7-5 The locations of structures are provided in Figure 2.1-201.

NAPS DEP 3.7-1 The locations of structures around the Unit 3 power block area are depicted in the plant layout provided in Figure 2.1-201. All Non-Seismic Category I structures that are within the scope of the standard design are

addressed in this section. Each other Non-Seismic Category structure that is outside the scope of the DCD is at least a distance of its height above grade from Seismic Category I structures. Thus, the collapse of any site-specific non-Seismic Category I SSC will not cause the non-Seismic Category I SSC to compromise the structural integrity and/or the functions of any Seismic Category I SSC.

Two sets of site-specific seismic response analyses are performed using the Unit 3 site-specific design ground motion and subgrade dynamic properties to demonstrate the adequacy of the standard plant:

- Site-specific SSI analyses of the stand alone TB, RW, SB, and Ancillary Diesel Building (ADB) structures following methodology consistent with the site-specific seismic SSI analyses of the Seismic Category I structures presented in Section 3.7.2.4.
- Site-specific seismic structure-soil-structure interaction (SSSI) analyses to evaluate any adverse effects of seismic interaction between the TB, RW, SB, and ADB structures and adjacent Seismic Category I structures, as necessary.

Results of these site-specific seismic SSI and seismic SSSI analyses will be discussed as part of the ITAAC completion package for the TB, RW, SB, and ADB structures to demonstrate that acceptance criteria in ITAAC Tables 2.4.15-1, 2.4.16-1, 2.4.17-1, and 2.4.18-1, respectively, are met.

3.7.2.8.1 Turbine Building

Replace the second paragraph with the following.

NAPS DEP 3.7-1

[*The site-specific SSI analysis and seismic evaluation of the Turbine Building are performed following the same methodology as the one used for the Seismic Category I buildings in Section 3.7.2.4.1. A seismic design motion is used that is compatible to site-specific FIRS that are developed considering the site-specific subgrade conditions under the Turbine Building. The development of these FIRS follows the same methodology as the one used for the FIRS for Seismic Category I buildings in Section 2.5.2. The site-specific SSI analysis uses subgrade dynamic properties that are compatible to the strains generated by the site-specific ground motion and are developed using the methodology described in Section 3.7.1.1.3. The site-specific effects of structure-soil-structure interaction with adjacent Seismic Category I structures are evaluated, if necessary, following an approach consistent*

with the one used for the standard design that is described in DCD Section 3A.8.11.

The Turbine Building location is shown in Figure 2.1-201. The seismic gaps between the Turbine Building and the RB are less than the calculated maximum relative displacements between the two buildings during site-specific SSE event.]*

3.7.2.8.2 Radwaste Building

Replace the second paragraph with the following.

NAPS DEP 3.7-1

[*The site-specific SSI analysis and seismic evaluation of the Radwaste Building (RW) are performed following the same methodology as the one used for the Seismic Category I buildings in Section 3.7.2.4.1. A seismic design motion is used that is compatible to site-specific FIRS that are developed considering the site-specific subgrade conditions under the RW foundation. The development of these FIRS follows the same methodology as the one used for the development of the FIRS for Seismic Category I buildings in Section 2.5.2. The site-specific SSI analysis of RW uses subgrade dynamic properties that are compatible to the strains generated by the site-specific ground motion and are developed using the methodology described in Section 3.7.1.1.3. The site-specific effects of structure-soil-structure interaction with adjacent Seismic Category I structures are evaluated, if necessary, following an approach consistent with the one used for the standard design that is described in DCD Section 3A.8.11.*

The RW location is shown in Figure 2.1-201. It is at least 10 meters from the RB. The building height is shown in DCD Figure 1.2-25.]*

3.7.2.8.3 Service Building

Replace the second paragraph with the following.

NAPS DEP 3.7-1

[*The site-specific SSI analysis and seismic evaluation of the Service Building are performed following the same methodology as the one used for the Seismic Category I buildings in Section 3.7.2.4.1. A seismic design motion is used that is compatible to site-specific FIRS that are developed considering the site-specific subgrade conditions under the*

* Text sections that are bracketed and italicized with an asterisk following the brackets are designated as Tier 2*. Prior NRC approval is required to change.

Service Building. The development of these FIRS follows the same methodology as the one used for the FIRS for Seismic Category I buildings in Section 2.5.2. The site-specific SSI analysis uses subgrade dynamic properties that are compatible to the strains generated by the site-specific ground motion and are developed using the methodology described in Section 3.7.1.1.3.

The site-specific effects of structure-soil-structure interaction with adjacent Seismic Category I structures are evaluated, if necessary, following an approach consistent with the one used for the standard design that is described in DCD Section 3A.8.11.

The Service Building location is shown in Figure 2.1-201. The seismic gaps between the Service Building and the RB are less than the calculated maximum relative displacements between the two buildings during site-specific SSE event.]*

3.7.2.8.4 Ancillary Diesel Building

Replace the second paragraph with the following:

NAPS DEP 3.7-1

[*The site-specific SSI analysis and seismic evaluation of the Ancillary Diesel Building are performed following the same methodology as the one used for the Seismic Category I buildings in Section 3.7.2.4.1. A seismic design motion is used that is compatible to site-specific FIRS that are developed considering the site-specific subgrade conditions under the Ancillary Diesel Building. The development of these FIRS follows the same methodology as the one used for the FIRS for Category I buildings in Section 2.5.2. The site-specific SSI analysis uses subgrade dynamic properties that are compatible to the strains generated by the site-specific ground motion and are developed using the methodology described in Section 3.7.1.1.3. The site-specific effects of structure-soil-structure interaction with adjacent Seismic Category I structures are evaluated, if necessary, following an approach consistent with the one used for the standard design that is described in DCD Section 3A.8.11.*

The Ancillary Diesel Building location is shown in Figure 2.1-201. It is at least 15.2 meters from the Fuel Building.]*

* Text sections that are bracketed and italicized with an asterisk following the brackets are designated as Tier 2*. Prior NRC approval is required to change.

Table 3.7.2-201 The passing and cut-off frequencies

Building	RB/FB			CB			FWSC		
Site Condition	BE	UB	LB	BE	UB	LB	BE*)	UB	LB*)
Passing Frequency	83 Hz	112 Hz	61 Hz	72 Hz	95 Hz	55 Hz	33 Hz	53 Hz	19 Hz
Cut-off Frequency	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	29 Hz

Note: *) Cut-off frequency is determined to be 1.5 times of passing frequency

Table 3.7.2-202 RB/FB SSI Analysis Cases

Building	Case ID No.	Structural Damping	Concrete Cracking	Site Condition		
				BE	UB	LB
RB/FB	RBFB-1a	SSE and OBE	Partially Cracked	X	—	—
	RBFB-2a			—	X	—
	RBFB-3a			—	—	X

Table 3.7.2-203 CB SSI Analysis Cases

Building	Case ID No.	Structural Damping	Concrete Cracking	Site Condition		
				BE	UB	LB
CB	CB-1a	SSE	Cracked	X	—	—
	CB-2a			—	X	—
	CB-3a			—	—	X

Table 3.7.2-204 FWSC SSI Analysis Cases

Building	Case ID No.	Structural Damping	Concrete Cracking	Site Condition		
				BE	UB	LB
FWSC	FWSC-1	OBE	Uncracked	X	—	—
	FWSC-2			—	X	—
	FWSC-3			—	—	X

BASIS: NEW

Table 3.7.2-205 Ratio with DCD Enveloping Seismic Loads: RB/FB

(a) Site-Specific 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			2329	2419	
		109	135.5	102.5	4443	3867	1129
34.00	1109	109			5824	4200	
		108	108.9	84.8	6019	4285	1564
27.00	1108	108			10417	4472	
		107	254.5	184.0	6261	4690	1892
22.50	1107	107			7107	4981	
		106	271.8	209.4	7718	5264	3060
17.50	1106	106			8339	5546	
		105	290.4	233.1	8945	6033	2357
13.57	1105	105			9415	6287	
		104	300.9	236.5	10121	6780	2498
9.06	1104	104			10395	6922	
		103	295.0	256.8	11040	7391	2763
4.65	1103	103			7414	4392	
		102	393.6	362.3	8426	5167	3309
-1.00	1102	102			6053	3761	
		101	232.9	198.3	6459	3907	1778
-6.40	1101	101			4384	2839	
-11.50		2	205.2	241.5	4489	2815	1349

(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			142%	134%	
		109	89%	65%	103%	87%	82%
34.00	1109	109			104%	76%	
		108	57%	55%	93%	68%	65%
27.00	1108	108			136%	63%	
		107	60%	46%	70%	55%	57%
22.50	1107	107			72%	54%	
		106	56%	45%	67%	47%	50%
17.50	1106	106			67%	46%	
		105	54%	42%	65%	44%	47%
13.57	1105	105			66%	44%	
		104	53%	39%	61%	41%	48%
9.06	1104	104			61%	40%	
		103	48%	39%	57%	38%	46%
4.65	1103	103			39%	22%	
		102	47%	42%	36%	21%	29%
-1.00	1102	102			26%	15%	
		101	27%	21%	23%	13%	15%
-6.40	1101	101			16%	9%	
-11.50		2	22%	23%	14%	8%	12%

BASIS: NEW

Table 3.7.2-206 Ratio with DCD Enveloping Seismic Loads: RCCV

(a) Site-Specific 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			222	555	
		208	112.2	97.6	886	1006	23
27.00	1208	208			1698	1794	
		206	126.1	114.0	2017	2136	1020
17.50	1206	206			2383	2493	
		205	145.9	110.6	2520	2685	931
13.57	1205	205			2791	2883	
		204	157.9	122.3	3046	3161	1044
9.06	1204	204			3396	3614	
		203	162.7	134.1	3678	3856	1210
4.65	1203	203			3970	4102	
		202	55.2	62.9	3872	4081	472
-1.00	1202	202			4000	4133	
		201	65.4	74.9	3958	4099	452
-6.40	1201	201			4061	4209	
-11.50		2	61.8	68.3	4059	4162	227

(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			114%	96%	
		208	82%	53%	84%	67%	65%
27.00	1208	208			99%	71%	
		206	76%	46%	68%	49%	56%
17.50	1206	206			72%	53%	
		205	63%	38%	61%	47%	47%
13.57	1205	205			65%	48%	
		204	60%	37%	56%	44%	48%
9.06	1204	204			60%	48%	
		203	53%	37%	54%	43%	46%
4.65	1203	203			57%	45%	
		202	24%	22%	49%	39%	16%
-1.00	1202	202			50%	38%	
		201	24%	23%	42%	33%	15%
-6.40	1201	201			43%	33%	
-11.50		2	24%	22%	37%	29%	12%

BASIS: NEW

Table 3.7.2-207 Ratio with DCD Enveloping Seismic Loads: Vent Wall/Pedestal

(a) Site-Specific 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			99	98	
		702	25.8	27.7	102	119	34
14.50	702	702			113	141	
		703	25.6	26.7	175	207	32
11.50	703	703			178	211	
		704	28.1	28.1	228	278	37
8.50	704	704			234	278	
		705	28.1	27.7	251	299	39
7.4625	705	705			256	216	
4.65		706,303	14.0	17.1	272	233	20
4.65	1303	303			495	446	
		377	20.6	21.8	469	409	28
2.4165	1377	377			571	500	
		302	32.4	35.3	510	481	34
-1.00	1302	302			455	412	
		376	21.8	24.4	444	397	23
-2.75	1376	376			444	397	
		301	21.5	25.1	417	385	23
-6.40	1301	301			396	373	
-11.50		2	27.3	25.5	432	422	14

(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			128%	114%	
14.50		702	74%	75%	89%	87%	29%
14.50	702	702			95%	95%	
11.50		703	70%	68%	77%	79%	27%
11.50	703	703			78%	78%	
8.50		704	76%	67%	67%	71%	30%
8.50	704	704			69%	70%	
7.4625		705	74%	62%	66%	68%	32%
7.4625	705	705			71%	49%	
4.65		706,303	34%	42%	60%	44%	20%
4.65	1303	303			85%	72%	
		377	63%	49%	78%	61%	20%
2.4165	1377	377			78%	61%	
		302	67%	53%	65%	52%	20%
-1.00	1302	302			54%	43%	
		376	33%	30%	48%	38%	15%
-2.75	1376	376			48%	38%	
		301	33%	31%	37%	29%	15%
-6.40	1301	301			34%	28%	
-11.50		2	26%	21%	26%	21%	12%

BASIS: NEW

Table 3.7.2-208 Ratio with DCD Enveloping Seismic Loads: RSW

(a) Site-Specific 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			2	3	
		708	3.46	3.82	16	18	1
20.20	708	708			23	24	
		709	15.87	17.44	88	98	3
15.775	709	709			91	102	
		710	17.90	19.96	170	189	4
11.35	710	710			173	194	
		711	18.79	22.07	246	275	5
7.4625	711	711			232	194	
		712	32.30	39.51	268	232	19
4.65	712	712			111	101	
		713	8.93	9.39	100	89	6
2.4165	713	713			5	5	
1.96		714	1.92	2.18	4	4	0
1.96	714	714			3	4	
-0.80		715	1.13	1.27	1	1	0

(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			115%	159%	
20.20		708	114%	140%	122%	142%	235%
20.20	708	708			123%	142%	
15.775		709	109%	142%	111%	144%	232%
15.775	709	709			111%	144%	
11.35		710	104%	139%	107%	142%	225%
11.35	710	710			109%	142%	
7.4625		711	94%	133%	104%	139%	203%
7.4625	711	711			118%	106%	
4.65		712	78%	111%	92%	92%	81%
4.65	712	712			88%	76%	
2.4165		713	63%	48%	75%	59%	20%
2.4165	713	713			128%	161%	
1.96		714	128%	171%	128%	159%	83%
1.96	714	714			127%	164%	
-0.80		715	128%	171%	121%	132%	82%

Table 3.7.2-209 Ratio with DCD Enveloping Seismic Loads: RPV

(a) Site-Specific 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)
3.215	844	845			32	39
2.365		846	18.0	31.2	41	55
8.453	871	815			198	168
7.4625		711	28.96	31.71	193	169

(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.
3.215	844	845			199%	275%
2.365		846	250%	446%	192%	318%
8.453	871	815			138%	124%
7.4625		711	156%	177%	137%	123%

BASIS: NEW

Table 3.7.2-210 Ratio with DCD Max. Vertical Acceleration: RB/FB

(a) Site-Specific Enveloping Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration (g)
52.40	110	RB/FB	1.38
34.00	109	RB/FB	0.99
27.00	108	RB/FB	0.77
22.50	107	RB/FB	0.70
17.50	106	RB/FB	0.68
13.57	105	RB/FB	0.67
9.06	104	RB/FB	0.66
4.65	103	RB/FB	0.71
-1.00	102	RB/FB	0.72
-6.40	101	RB/FB	0.67
-11.50	2	RB/FB	0.57
-15.50	1	RB/FB	0.56

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

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
52.40	110	RB/FB	109%
34.00	109	RB/FB	120%
27.00	108	RB/FB	105%
22.50	107	RB/FB	96%
17.50	106	RB/FB	92%
13.57	105	RB/FB	91%
9.06	104	RB/FB	91%
4.65	103	RB/FB	91%
-1.00	102	RB/FB	95%
-6.40	101	RB/FB	98%
-11.50	2	RB/FB	90%
-15.50	1	RB/FB	110%

Table 3.7.2-211 Ratio with DCD Enveloping Maximum Vertical Acceleration: RCCV

(a) Site-Specific Enveloping Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration (g)
34.00	209	RCCV	1.00
27.00	208	RCCV	0.98
17.50	206	RCCV	0.73
13.57	205	RCCV	0.74
9.06	204	RCCV	0.69
4.65	203	RCCV	0.64
-1.00	202	RCCV	0.57
-6.40	201	RCCV	0.58

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

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
34.00	209	RCCV	111%
27.00	208	RCCV	112%
17.50	206	RCCV	101%
13.57	205	RCCV	95%
9.06	204	RCCV	106%
4.65	203	RCCV	90%
-1.00	202	RCCV	97%
-6.40	201	RCCV	98%

BASIS: NEW

Table 3.7.2-212 Ratio with DCD Enveloping Maximum Vertical Acceleration: VW/Pedestal

(a) Site-Specific Enveloping Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration (g)
17.50	701	VW	0.82
14.50	702	VW	0.82
11.50	703	VW	0.83
8.50	704	VW	0.84
7.4625	705	VW	0.83
4.65	706,303	Pedestal	0.81
-1.00	302	Pedestal	0.58
-6.40	301	Pedestal	0.58

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

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
17.50	701	VW	75%
14.50	702	VW	79%
11.50	703	VW	90%
8.50	704	VW	109%
7.4625	705	VW	118%
4.65	706,303	Pedestal	121%
-1.00	302	Pedestal	99%
-6.40	301	Pedestal	114%

Table 3.7.2-213 Ratio with DCD Enveloping Maximum Vertical Acceleration: RSW

(a) Site-Specific Enveloping Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration (g)
24.18	707	RSW	1.01
20.20	708	RSW	1.00
15.775	709	RSW	0.96
11.35	710	RSW	0.89
7.4625	711	RSW	0.83
4.65	712	RSW	0.81
2.4615	713	RSW	0.75
1.96	714	RSW	0.75
-0.80	715	RSW	0.75

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

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
24.18	707	RSW	105%
20.20	708	RSW	107%
15.775	709	RSW	114%
11.35	710	RSW	117%
7.4625	711	RSW	118%
4.65	712	RSW	121%
2.4615	713	RSW	117%
1.96	714	RSW	117%
-0.80	715	RSW	117%

BASIS: NEW

Table 3.7.2-214 Ratio with DCD Enveloping Maximum Vertical Acceleration: RB/FB Flexible Slab Oscillators

(a) Site-Specific Enveloping Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration (g)
52.40	9101	Oscillator	0.37
	9102	Oscillator	1.31
	9103	Oscillator	3.57
	9104	Oscillator	3.34
	9105	Oscillator	3.13
	9106	Oscillator	3.40
	9107	Oscillator	2.69
	9108	Oscillator	1.62
34.00	9091	Oscillator	1.80
	9092	Oscillator	1.49
27.00	9081	Oscillator	1.66
	9082	Oscillator	1.51
	9083	Oscillator	1.40
	9084	Oscillator	1.74
	9085	Oscillator	1.37
22.50	9071	Oscillator	0.96
	9072	Oscillator	2.00
	9073	Oscillator	3.18
	9074	Oscillator	1.68
	9075	Oscillator	1.91
17.50	9061	Oscillator	1.34
	9062	Oscillator	3.65
	9063	Oscillator	1.26
	9064	Oscillator	1.64
	9065	Oscillator	1.42
13.57	9051	Oscillator	1.27
	9052	Oscillator	1.17

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

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
52.40	9101	Oscillator	31%
	9102	Oscillator	72%
	9103	Oscillator	114%
	9104	Oscillator	136%
	9105	Oscillator	135%
	9106	Oscillator	114%
	9107	Oscillator	96%
	9108	Oscillator	62%
34.00	9091	Oscillator	140%
	9092	Oscillator	138%
27.00	9081	Oscillator	143%
	9082	Oscillator	152%
	9083	Oscillator	129%
	9084	Oscillator	132%
	9085	Oscillator	142%
22.50	9071	Oscillator	60%
	9072	Oscillator	152%
	9073	Oscillator	157%
	9074	Oscillator	128%
	9075	Oscillator	165%
17.50	9061	Oscillator	75%
	9062	Oscillator	245%
	9063	Oscillator	153%
	9064	Oscillator	89%
	9065	Oscillator	100%
13.57	9051	Oscillator	156%
	9052	Oscillator	81%

BASIS: NEW

Table 3.7.2-214 Ratio with DCD Enveloping Maximum Vertical Acceleration: RB/FB Flexible Slab Oscillators *(continued)*

(a) Site-Specific Enveloping Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration (g)
9.06	9041	Oscillator	1.31
	9042	Oscillator	1.15
4.65	9031	Oscillator	2.25
	9032	Oscillator	1.24
	9033	Oscillator	1.33
	9034	Oscillator	2.58
	9035	Oscillator	1.36
-1.00	9021	Oscillator	1.57
	9022	Oscillator	3.16
	9023	Oscillator	1.31
	9024	Oscillator	1.58
	9025	Oscillator	1.70
	9026	Oscillator	2.04
	9027	Oscillator	0.97
-6.40	9011	Oscillator	1.18
	9012	Oscillator	1.67
	9013	Oscillator	2.20

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

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
9.06	9041	Oscillator	148%
	9042	Oscillator	81%
4.65	9031	Oscillator	192%
	9032	Oscillator	128%
	9033	Oscillator	129%
	9034	Oscillator	170%
	9035	Oscillator	99%
-1.00	9021	Oscillator	141%
	9022	Oscillator	218%
	9023	Oscillator	130%
	9024	Oscillator	178%
	9025	Oscillator	127%
	9026	Oscillator	130%
	9027	Oscillator	110%
-6.40	9011	Oscillator	127%
	9012	Oscillator	182%
	9013	Oscillator	163%

BASIS: NEW

Table 3.7.2-215 Ratio with DCD Enveloping Maximum Horizontal Acceleration: RB/FB Flexible Wall Oscillators

(a) Site-Specific Enveloping Maximum Horizontal Acceleration

Elev. (m)	Node No.	Stick Model	Max. Horizontal Acceleration (g)
42.00	99981	Oscillator	1.79
(X-dir)	99982	Oscillator	1.10
42.00	99983	Oscillator	1.17
(Y-dir)	99984	Oscillator	0.97
	99985	Oscillator	0.81
13.57	99971	Oscillator	1.22
(X-dir)	99972	Oscillator	2.08
	99973	Oscillator	1.92
	99974	Oscillator	1.83
13.57	99975	Oscillator	1.30
(Y-dir)	99976	Oscillator	1.60

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

Elev. (m)	Node No.	Stick Model	Max. Horizontal Acceleration
42.00	99981	Oscillator	116%
(X-dir)	99982	Oscillator	84%
42.00	99983	Oscillator	68%
(Y-dir)	99984	Oscillator	62%
	99985	Oscillator	65%
13.57	99971	Oscillator	88%
(X-dir)	99972	Oscillator	151%
	99973	Oscillator	167%
	99974	Oscillator	184%
13.57	99975	Oscillator	102%
(Y-dir)	99976	Oscillator	164%

BASIS: NEW

Table 3.7.2-216 Stress Check for RB/FB

(a) RB/FB Walls

RB	Concrete	Rebar	NA3 Stress Estimate							
Wall Elevations (m)	DCD/ Allowable	DCD/ Allowable	Ratio of NA3 to DCD						Max Ratio of NA3 to DCD	Ratio of NA3 to Allowable
			X-Shear	Y-Shear	X-Moment	Y-Moment	Torsion	Acceler- ation		
El. -11.5 to -10.5	0.69	0.96	0.22	0.23	0.14	0.08	0.12	0.90	0.90	0.86
El. 4.65 to 6.60	0.45	0.96	0.48	0.39	0.57	0.38	0.46	0.91	0.91	0.87
El. 22.5 to 24.6	0.37	0.82	0.60	0.46	0.70	0.55	0.57	0.96	0.96	0.78

(b) RCCV Wall

RCCV	Concrete	Rebar	NA3 Stress Estimate							
Wall Elevations (m)	DCD/ Allowable	DCD/ Allowable	Ratio of NA3 to DCD						Max Ratio of NA3 to DCD	Ratio of NA3 to Allowable
			X-Shear	Y-Shear	X-Moment	Y-Moment	Torsion	Acceler- ation		
Below RCCV bot	0.72	0.89	0.24	0.22	0.37	0.29	0.12		0.37	0.33
Below RCCV mid	0.46	0.73	0.24	0.23	0.42	0.33	0.15	0.98	0.98	0.72
Below RCCV top	0.82	0.59	0.24	0.22	0.49	0.39	0.16	0.97	0.97	0.79
Wetwell bot	0.63	0.63	0.53	0.37	0.54	0.43	0.46	0.90	0.90	0.57
Wetwell mid	0.42	0.66	0.60	0.37	0.56	0.44	0.48	1.06	1.06	0.70
Drywell-Wetwell	0.66	0.88	0.63	0.38	0.61	0.47	0.47	0.95	0.95	0.84
Drywell	0.47	0.77	0.76	0.46	0.68	0.49	0.56	1.01	1.01	0.78

(c) Pedestal Wall

Pedestal	Concrete	Rebar	NA3 Stress Estimate							
Wall Elevations (m)	DCD/ Allowable	DCD/ Allowable	Ratio of NA3 to DCD						Max Ratio of NA3 to DCD	Ratio of NA3 to Allowable
			X-Shear	Y-Shear	X-Moment	Y-Moment	Torsion	Acceler- ation		
Pedestal bot	0.70	0.87	0.26	0.21	0.34	0.28	0.12	1.14	1.14	0.99
Pedestal mid	0.51	0.46	0.33	0.30	0.54	0.43	0.15	0.99	0.99	0.50
Pedestal top	0.78	0.73	0.63	0.49	0.85	0.72	0.20	1.21	1.21	0.94

BASIS: NEW

Table 3.7.2-216 Stress Check for RB/FB *(continued)*

(d) Vent Wall

Vent Wall	Steel	NA3 Stress Estimate							
		Ratio of NA3 to DCD						Max Ratio of NA3 to DCD	Ratio of NA3 to Allowable
Wall Elevations (m)	DCD/ Allowable	X-Shear	Y-Shear	X-Moment	Y-Moment	Torsion	Acceler-ation		
Vent Wall	0.71	0.76	0.75	1.28	1.14	0.32	1.18	1.28	0.91

(e) RSW Wall

RSW	Steel	NA3 Stress Estimate							
		Ratio of NA3 to DCD						Max Ratio of NA3 to DCD	Ratio of NA3 to Allowable
Wall Elevations (m)	DCD/ Allowable	X-Shear	Y-Shear	X-Moment	Y-Moment	Torsion	Acceler-ation		
RSW	0.71	4.47	1.42	1.22	1.59	2.35	1.21	4.47	3.17

Note: The RSW stress ratio to the allowable stress is less than 1.0 from a refined evaluation in which the scale factor is applied to the seismic stress alone.

BASIS: NEW

Table 3.7.2-216 Stress Check for RB/FB *(continued)*

(f) Slab

		Concrete	Rebar	NA3 Stress Estimate										
Slab Elevations (m)	**Location**	**DCD/ Allowable**	**DCD/ Allowable**	**sWi**	**Oscillator**	**Acceleration**	**sAeq**	**wW**	**Acceleration**	**wAeq**	**NA3 sAave**	**DCD sAave**	**Ratio of NA3 to DCD**	**Ratio of NA3 to Allowable**
El. 4.65	RCCV	0.69	0.78	51608	9032	1.24	1.25	16193	0.71	0.68	1.06	0.95	1.12	0.87
				5579	9035	1.36		11812	0.64					
	S/P	0.88	0.94	32416	9033	1.33	1.33	48175	0.81	0.81	1.02	0.80	1.27	1.20
El. 17.5	MS Tunnel	0.28	0.59	5798	9061	1.34	1.81	12732	0.68	0.68	1.09	1.10	0.99	0.59
				1465	9062	3.65								
	RCCV	0.69	0.74	9707	9063	1.26	1.31	12732	0.68	0.72	0.83	0.78	1.06	0.78
				3877	9065	1.42		46092	0.73					
	D/F	0.97		33373	9064	1.64	1.64				1.64	1.84	0.89	0.86
El. 27.0	Topslab	0.52	0.72	39043	9081	1.66	1.56	69949	0.98	0.98	1.31	0.98	1.34	0.96
				52533	9082	1.51								
				5413	9085	1.37								
	RCCV	0.46	0.41	8768	9083	1.40	1.40	66452	0.77	0.77	0.84	0.77	1.10	0.50
	MS Tunnel	0.26	0.44	9163	9084	1.74	1.74	48004	0.77	0.77	0.93	0.82	1.13	0.50

sWi : Weight of the i-th mass in the dynamic analysis model

sAeq : Equivalent slab acceleration

wW : Slab weights included in the RB/FB and RCCV masses

wAeq : Maximum accelerations of the RB/FB and RCCV masses

sAave : Average acceleration

Note: The S/P stress ratio to the allowable stress is reduced to 1.06 when the scale factor is applied to the seismic stress alone. Since the strains under combined primary and secondary forces meet the ASME Code Section CC-3422.1(d) requirements, the design adequacy of the S/P is confirmed.

BASIS: NEW

Table 3.7.2-217 Ratio with DCD Enveloping Seismic Loads: CB Stick

(a) Site-Specific Envelop 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				140	106	
		6	43.5	33.0	264	185	32.0
9.06	5				332	235	
		5	76.2	61.2	617	476	54.9
4.65	4				356	173	
		4	95.8	77.1	983	547	52.0
-2.00	3				472	376	
-7.40	2	3	29.2	27.9	558	509	20.4

(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				88%	86%	
		6	131%	113%	106%	94%	44%
9.06	5				92%	86%	
		5	143%	112%	108%	108%	43%
4.65	4				49%	32%	
		4	127%	96%	87%	66%	29%
-2.00	3				38%	36%	
-7.40	2	3	23%	28%	36%	33%	8%

BASIS: NEW

Table 3.7.2-218 Ratio with DCD Enveloping Maximum Vertical Acceleration: CB

(a) Site-Specific Envelop Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration (g)
13.80	6	CB	1.22
9.06	5	CB	1.14
4.65	4	CB	1.02
-2.00	3	CB	0.79
-7.40	2	CB	0.77
-10.40	1	CB	0.77
13.80	9001	Oscillator	3.31
	9002	Oscillator	1.80
	9003	Oscillator	1.78
9.06	9101	Oscillator	3.80
	9102	Oscillator	1.74
	9103	Oscillator	1.76
4.65	9201	Oscillator	1.51
	9202	Oscillator	1.59
-2.00	9301	Oscillator	1.75

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

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
13.80	6	CB	122%
9.06	5	CB	133%
4.65	4	CB	137%
-2.00	3	CB	140%
-7.40	2	CB	153%
-10.40	1	CB	151%
13.80	9001	Oscillator	151%
	9002	Oscillator	135%
	9003	Oscillator	125%
9.06	9101	Oscillator	190%
	9102	Oscillator	138%
	9103	Oscillator	123%
4.65	9201	Oscillator	115%
	9202	Oscillator	111%
-2.00	9301	Oscillator	126%

BASIS: NEW

Table 3.7.2-219 Stress Check for CB

(a) Walls

Wall Elevations (m)	Concrete DCD/ Allowable	Rebar DCD/ Allowable	NA3 Stress Estimate: Ratio of NA3 to DCD: X-Shear	Y-Shear	X-Moment	Y-Moment	Torsion	Acceleration	Max Ratio of NA3 to DCD	Ratio of NA3 to Allowable
El. -7.4 to -2.0	0.49	0.77	0.23	0.28	0.38	0.36	0.08	1.53	1.53	1.18
El. -2.0 to 4.65	0.29	0.51	1.27	0.96	0.87	0.66	0.29	1.40	1.40	0.71
El. 4.65 to 9.06	0.58	0.57	1.43	1.12	1.08	1.08	0.43	1.37	1.43	0.83
El. 9.06 to 13.8	0.60	0.63	1.31	1.13	1.06	0.94	0.44	1.33	1.33	0.84

(b) Slabs

Slab Elevations (m)	Concrete DCD/ Allowable	Rebar DCD/ Allowable	NA3 Stress Estimate: sWi	Oscillator	Acceleration	sAeq	wW	Acceleration	NA3 sAave	DCD sAave	Ratio of NA3 to DCD	Ratio of NA3 to Allowable
El. -2.0	0.40	0.46	4325	9301	1.26	1.26	32570	0.79	0.85	0.66	1.28	0.59
El. 4.65	0.67	0.45	8022	9201	1.15	1.16	27986	1.02	1.05	0.87	1.21	0.81
			227	9202	1.59							
El. 9.06	0.60	0.46	3494	9101	3.8	2.71	19785	1.14	1.64	1.08	1.52	0.91
			4907	9102	1.74							
			850	9103	3.8							
El. 13.8	0.56	0.48	5478	9001	3.31	2.45	10745	1.22	1.89	1.39	1.36	0.76
			6390	9002	1.80							
			781	9003	1.78							

BASIS: NEW

Table 3.7.2-220 Ratio with DCD Enveloping Seismic Loads: FWS

(a) Site-Specific Envelop 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)
19.70	9	10			2.3	2.2	
17.25		9	4.0	3.7	11.7	11.1	0.9
17.25	8	9			16.0	15.4	
15.53		8	9.9	9.1	32.5	30.9	2.8
15.53	7	8			36.9	35.2	
13.81		7	13.9	12.7	60.2	57.0	4.6
13.81	6	7			64.1	61.2	
12.10		6	17.6	15.9	94.0	88.5	6.3
12.10	5	6			96.8	91.8	
11.00		5	20.3	18.3	119.1	111.9	7.5
11.00	4	5			121.2	114.3	
9.90		4	22.2	20.0	145.7	136.3	8.4
9.90	3	4			147.7	138.7	
8.81		3	24.0	21.6	173.9	162.1	9.2
8.81	2	3			176.6	165.3	
6.73		2	41.4	36.9	262.6	240.0	10.2
6.73	1	2			265.4	243.6	
4.65		1	43.8	39.0	356.5	324.6	11.0

(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
19.70	9	10			53%	31%	
17.25		9	87%	72%	82%	58%	133%
17.25	8	9			72%	58%	
15.53		8	89%	75%	83%	66%	128%
15.53	7	8			81%	62%	
13.81		7	90%	77%	85%	68%	129%
13.81	6	7			84%	66%	
12.10		6	91%	79%	87%	71%	129%
12.10	5	6			87%	71%	
11.00		5	89%	77%	89%	73%	130%
11.00	4	5			89%	73%	
9.90		4	90%	79%	89%	74%	131%
9.90	3	4			89%	74%	
8.81		3	92%	81%	90%	75%	133%
8.81	2	3			90%	75%	
6.73		2	96%	81%	94%	81%	135%
6.73	1	2			94%	82%	
4.65		8002	97%	81%	97%	86%	136%

Table 3.7.2-221 Ratio with DCD Enveloping Seismic Loads: FPE

(a) Site-Specific Envelop 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)
8.25	405	402			1.0	4.6	
4.65	404	401	2.9	4.2	9.0	16.0	4.0

(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
8.25	405	402			47%	48%	
4.65	404	401	36%	56%	32%	59%	26%

Table 3.7.2-222 Ratio with DCD Enveloping Seismic Loads considering Accidental Torsion: FWSC Stick

(a) Site-Specific Envelop Seismic Loads

Elev. (m)	Elem No.	Node No.	Torsion (kN-m)		
			Calculated	Accidental Torsion	Design Torsion
19.70 17.25	9	10 9	0.9	3.5	4.4
17.25 15.53	8	9 8	2.8	8.7	11.5
15.53 13.81	7	8 7	4.6	12.2	16.8
13.81 12.10	6	7 6	6.3	15.4	21.7
12.10 11.00	5	6 5	7.5	17.7	25.3
11.00 9.90	4	5 4	8.4	19.5	27.9
9.90 8.81	3	4 3	9.2	21.0	30.2
8.81 6.73	2	3 2	10.2	36.2	46.4
6.73 4.65	1	2 1	11.0	38.3	49.3

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

Elev. (m)	Elem No.	Node No.	Torsion		
			Calculated	Accidental Torsion	Design Torsion
19.70 17.25	9	10 9	133%	78%	86%
17.25 15.53	8	9 8	128%	82%	90%
15.53 13.81	7	8 7	129%	84%	93%
13.81 12.10	6	7 6	129%	87%	96%
12.10 11.00	5	6 5	130%	85%	95%
11.00 9.90	4	5 4	131%	88%	98%
9.90 8.81	3	4 3	133%	91%	100%
8.81 6.73	2	3 2	135%	91%	98%
6.73 4.65	1	2 1	136%	91%	98%

BASIS: NEW

Table 3.7.2-223 Ratio with DCD Enveloping Max. Vertical Acceleration: FWS

(a) Site-Specific Envelop Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration (g)
19.70	10	FWS	0.8
17.25	9	FWS	0.7
15.53	8	FWS	0.7
13.81	7	FWS	0.7
12.10	6	FWS	0.7
11.00	5	FWS	0.7
9.90	4	FWS	0.7
8.81	3	FWS	0.7
6.73	2	FWS	0.7
4.65	8002	FWSC	0.6
2.15	8001	FWSC	0.7
19.70	11	Oscillator	1.8

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

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
19.70	10	FWS	44%
17.25	9	FWS	46%
15.53	8	FWS	47%
13.81	7	FWS	46%
12.10	6	FWS	50%
11.00	5	FWS	58%
9.90	4	FWS	62%
8.81	3	FWS	65%
6.73	2	FWS	66%
4.65	8002	FWSC	81%
2.15	8001	FWSC	88%
19.70	11	Oscillator	57%

Table 3.7.2-224 Ratio with DCD Enveloping Max. Vertical Acceleration: FPE

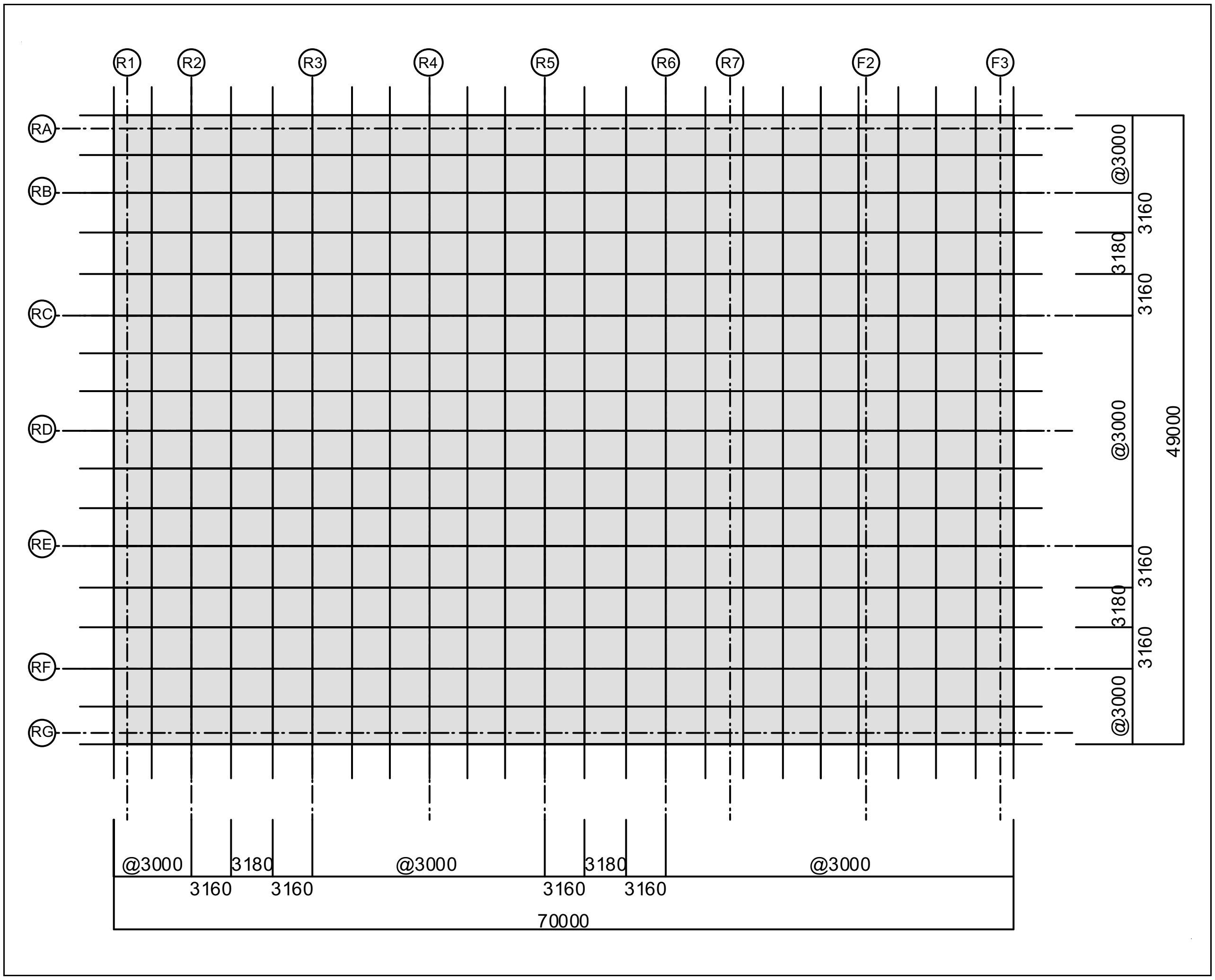
(a) Site-Specific Envelop Maximum Vertical Acceleration

Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration (g)
8.25	405	FPE	0.6
6.45	402	FPE	0.6

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

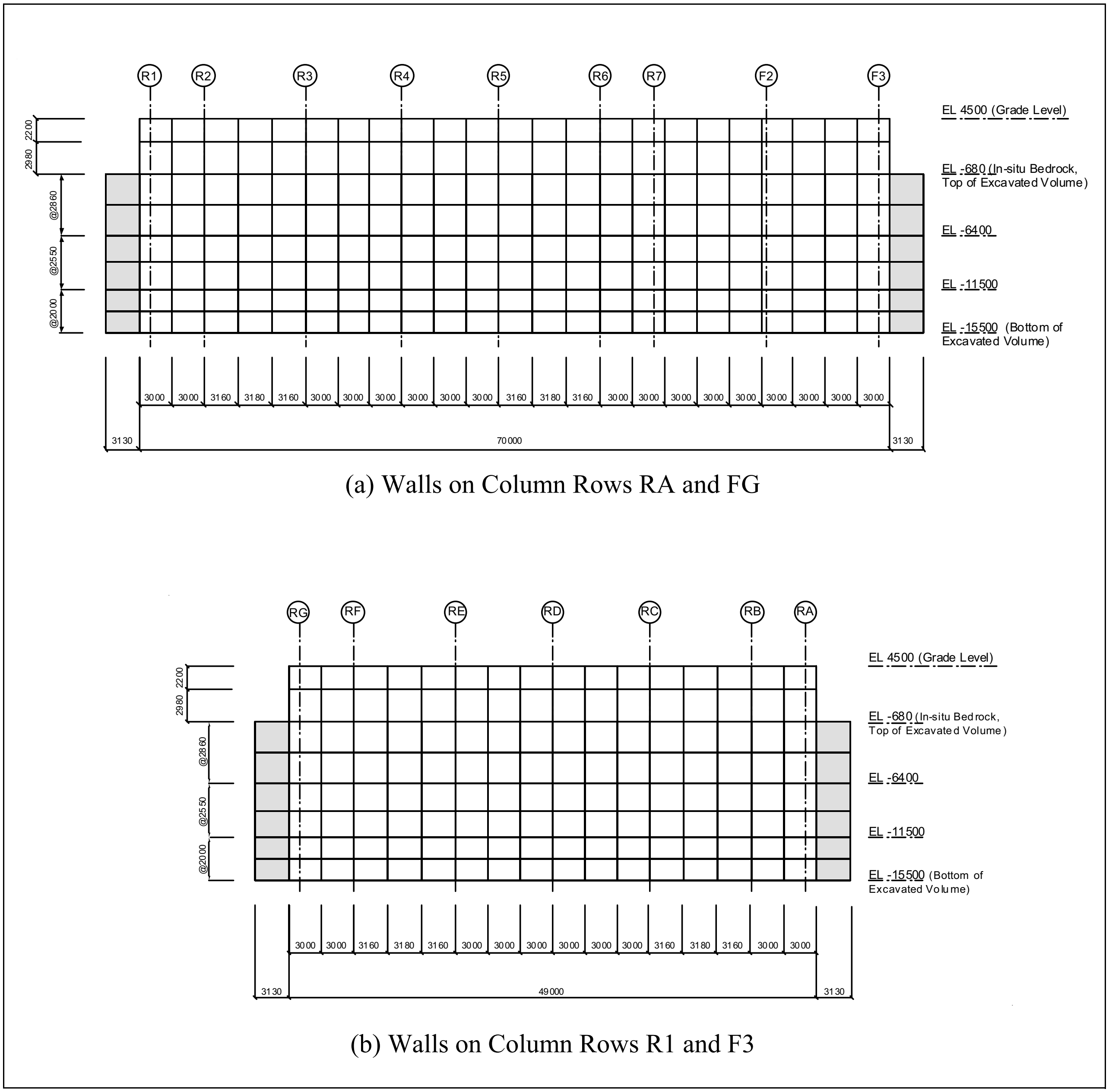
Elev. (m)	Node No.	Stick Model	Max. Vertical Acceleration
8.25	405	FPE	54%
6.45	402	FPE	55%

Figure 3.7.2-201 SASSI2010 Plate Elements for RB/FB Basemat



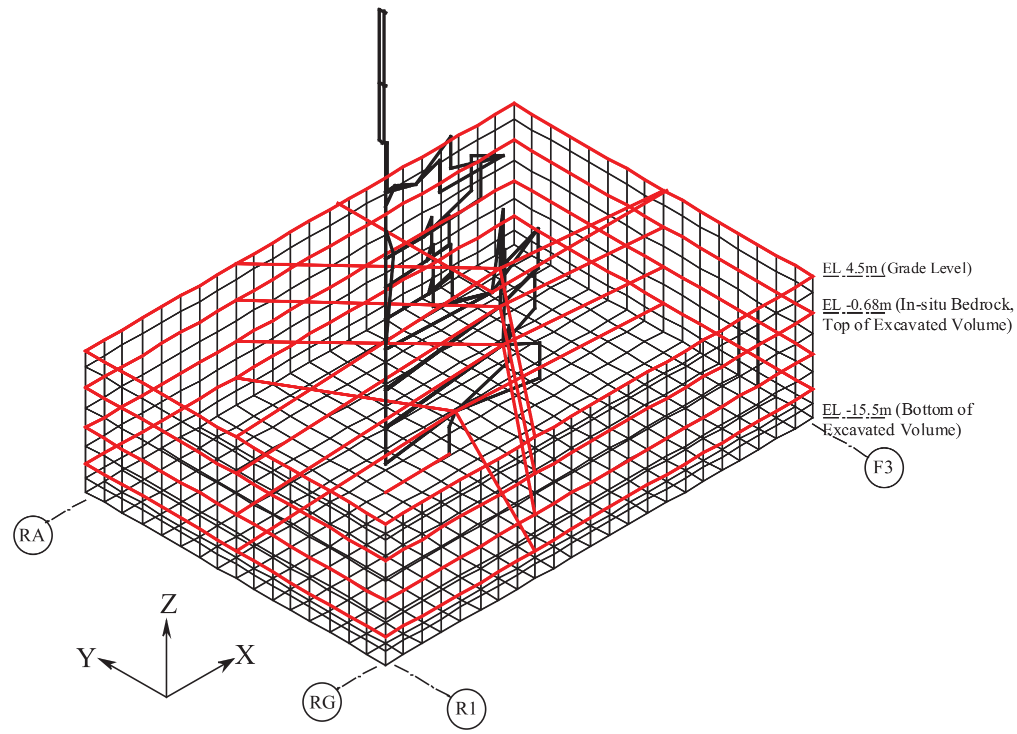
(Dimensions are shown in millimeters)

Figure 3.7.2-202 SASSI2010 Plate Elements for RB/FB Exterior Wall and Solid Element for Concrete Fill

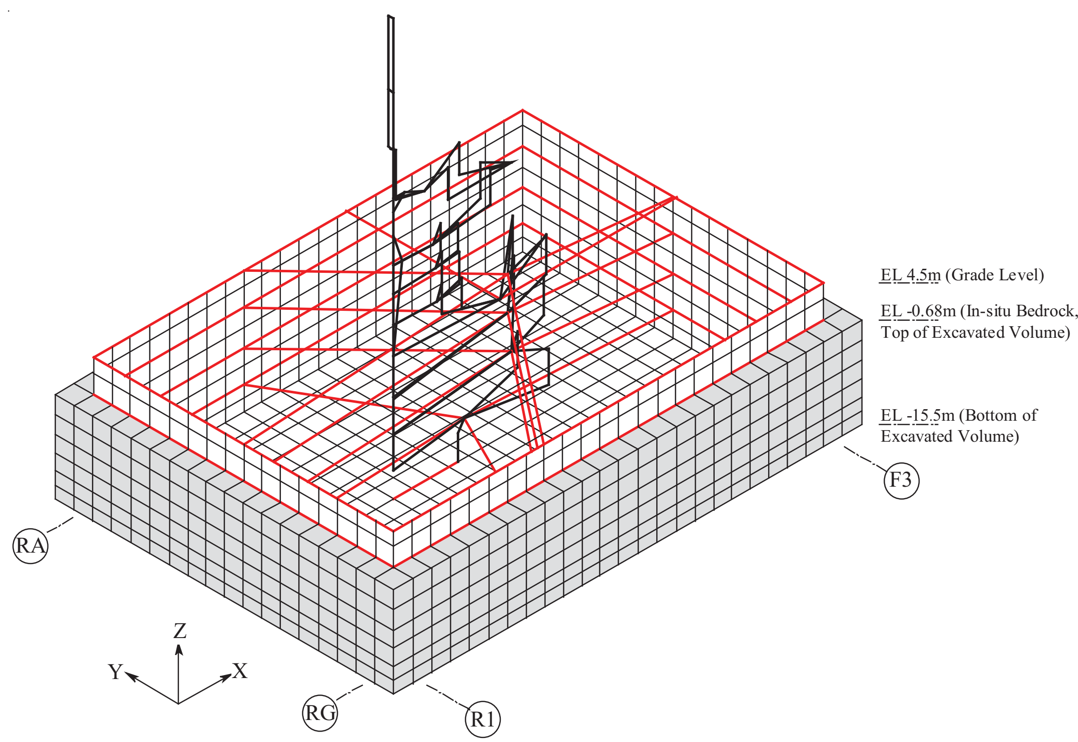


(Dimensions are shown in millimeters)

Figure 3.7.2-203 Overview of RB/FB SASSI2010 Model

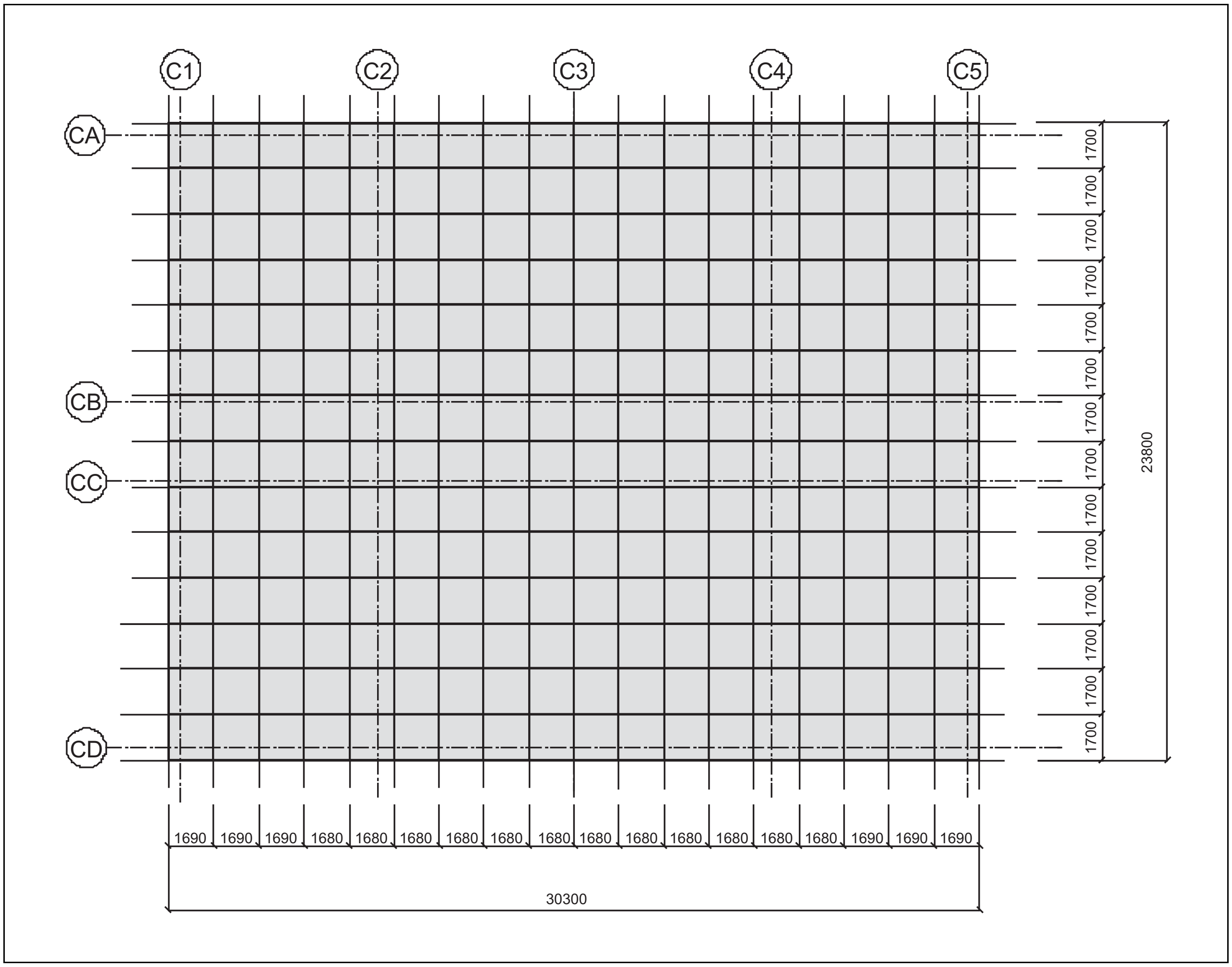


(a) Overview without Concrete Fill



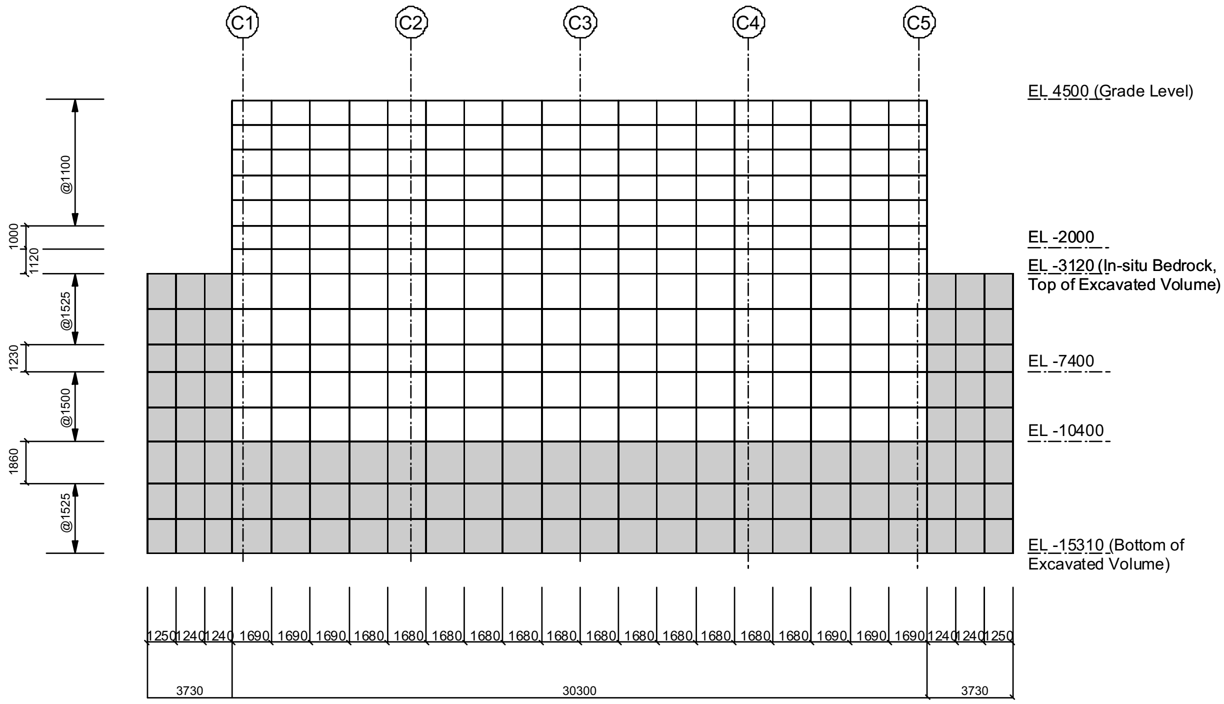
(b) Overview with Concrete Fill

Figure 3.7.2-204 SASSI2010 Plate Elements for CB Basemat

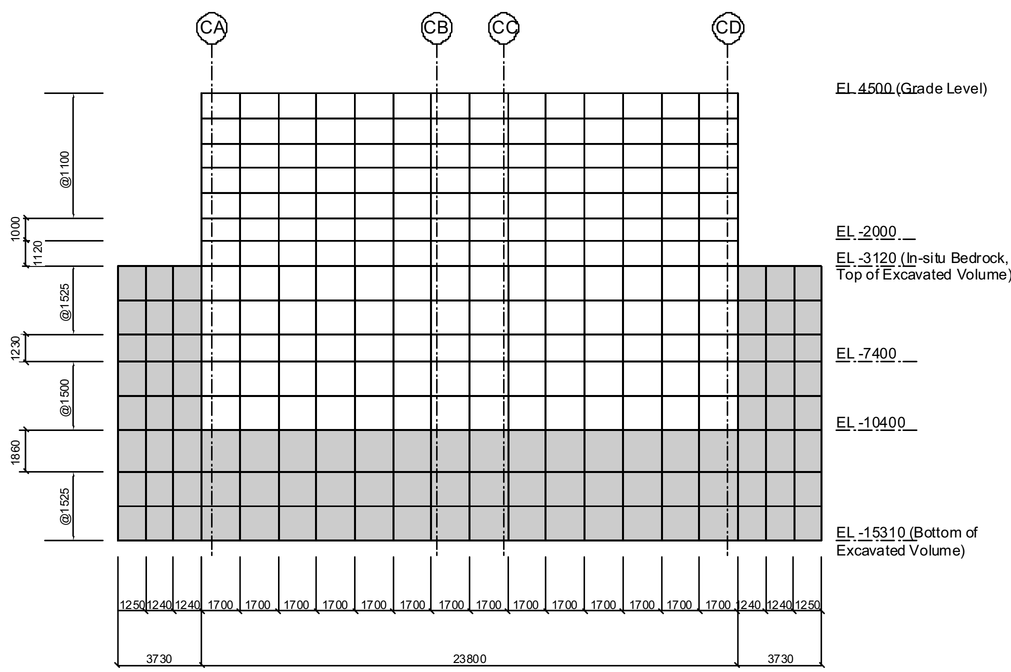


(Dimensions are shown in millimeters)

Figure 3.7.2-205 Plate Elements for CB Exterior Wall and Solid Element for Concrete Fill



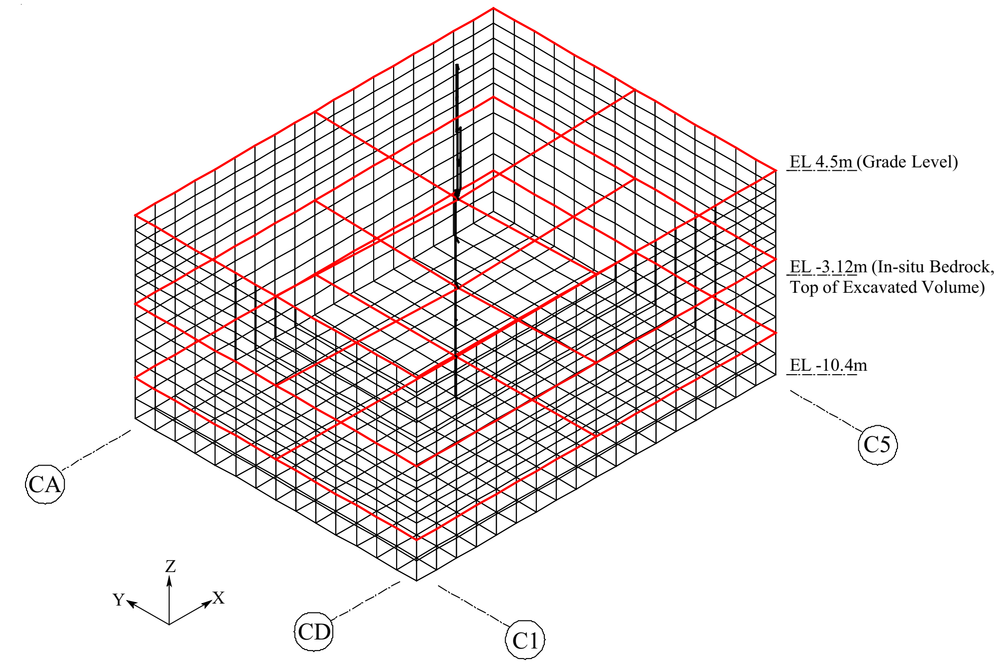
(a) Walls on Column Rows CA and CD



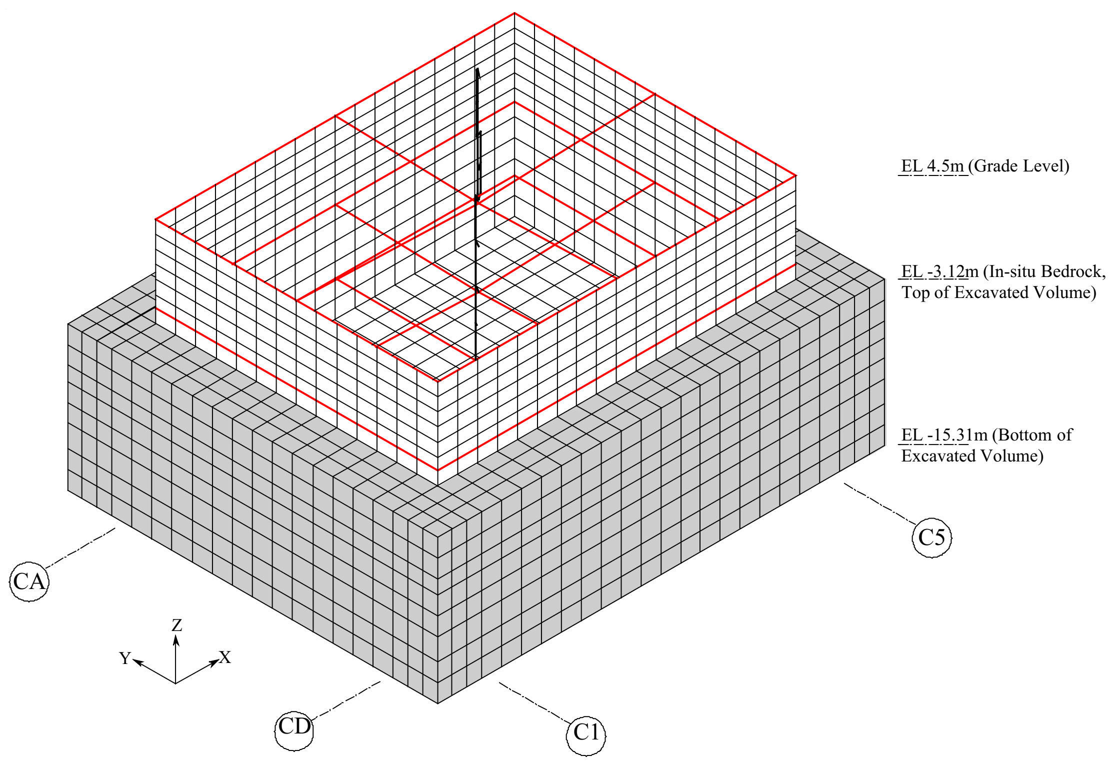
(b) Walls on Column Rows C1 and C5

(Dimensions are shown in millimeters)

Figure 3.7.2-206 Overview of CB SASSI2010 Model

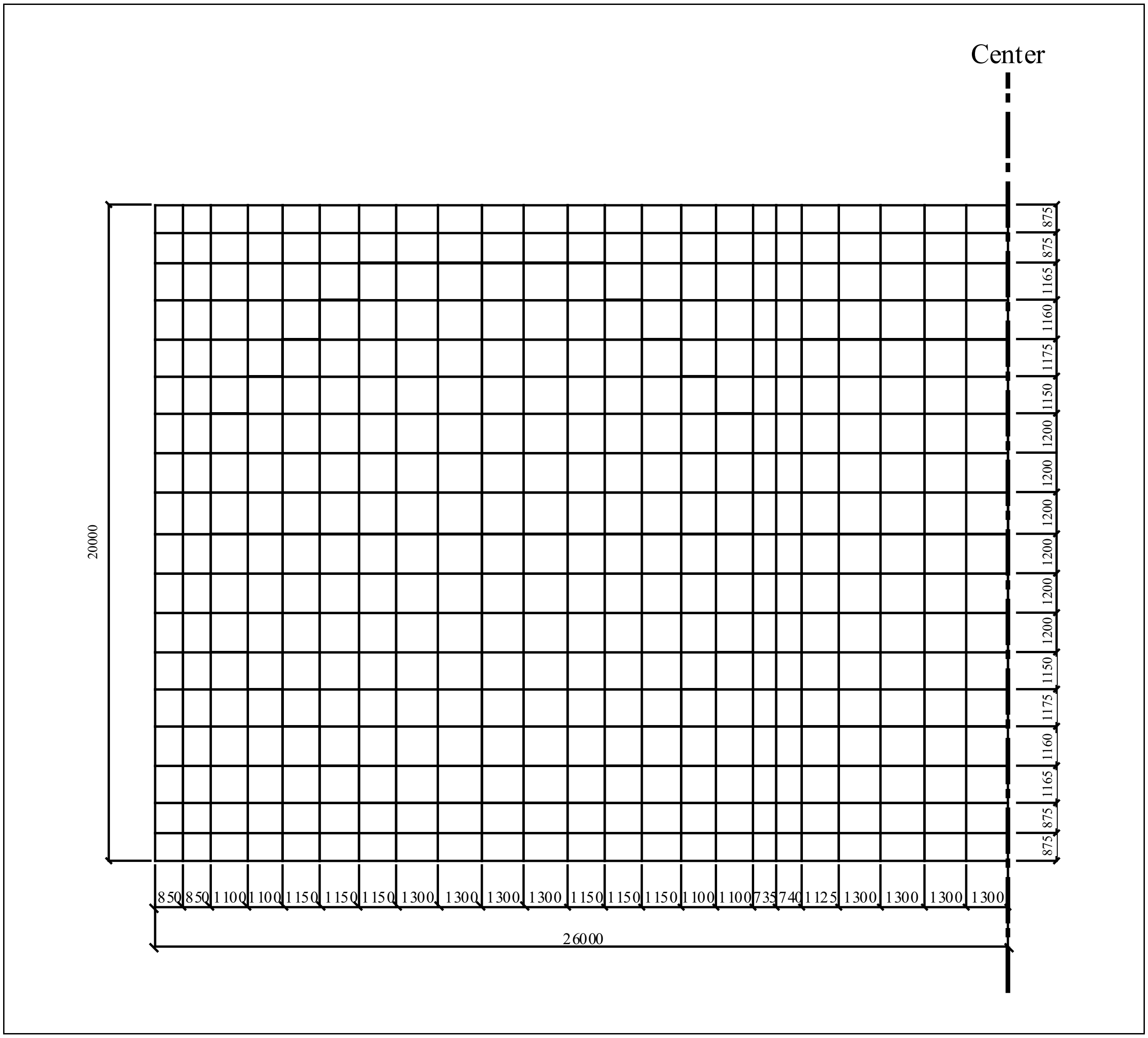


(a) Overview without Concrete Fill



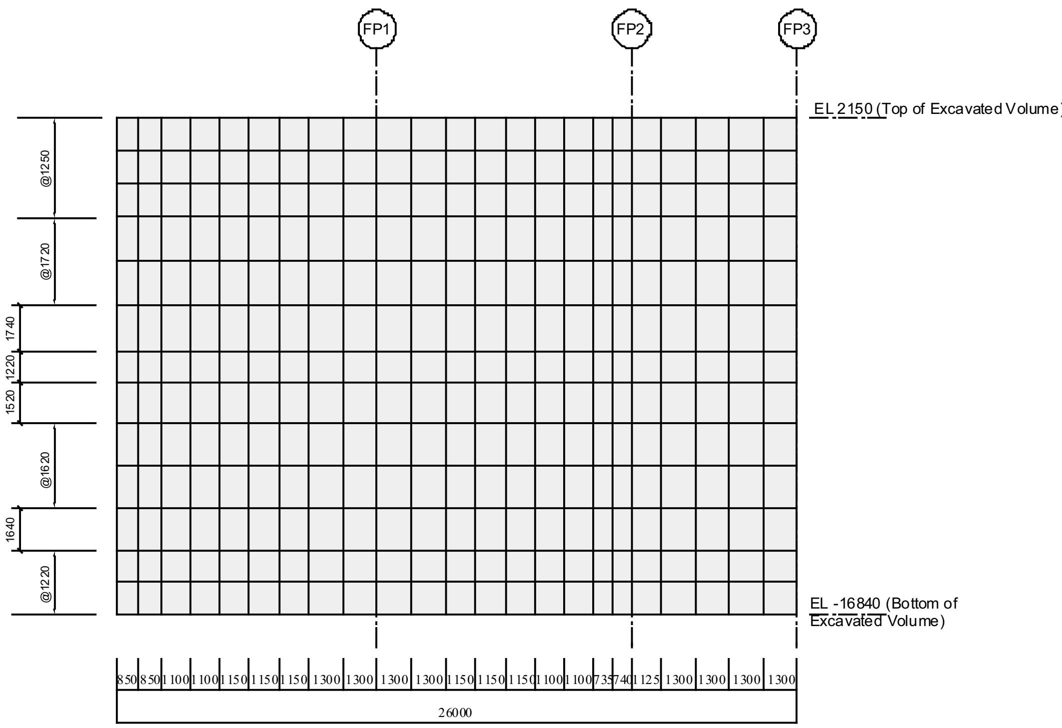
(b) Overview with Concrete Fill

Figure 3.7.2-207 SASSI2010 Plate Elements for FWSC Basemat

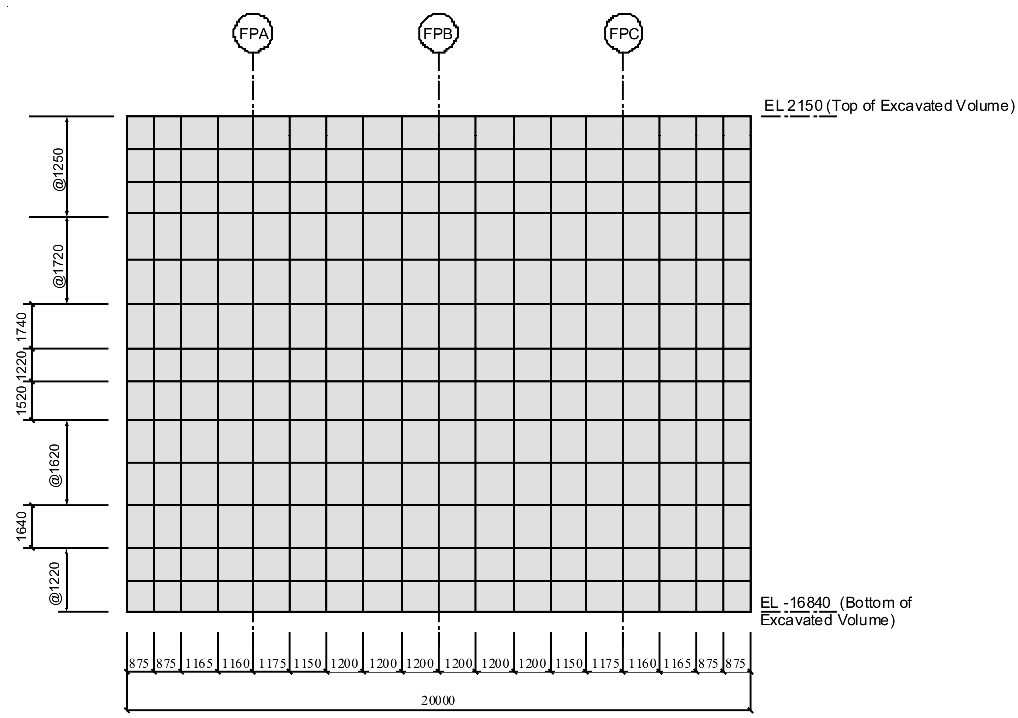


(Dimensions are shown in millimeters)

Figure 3.7.2-208 SASSI2010 Solid Elements for FWSC Concrete Fill



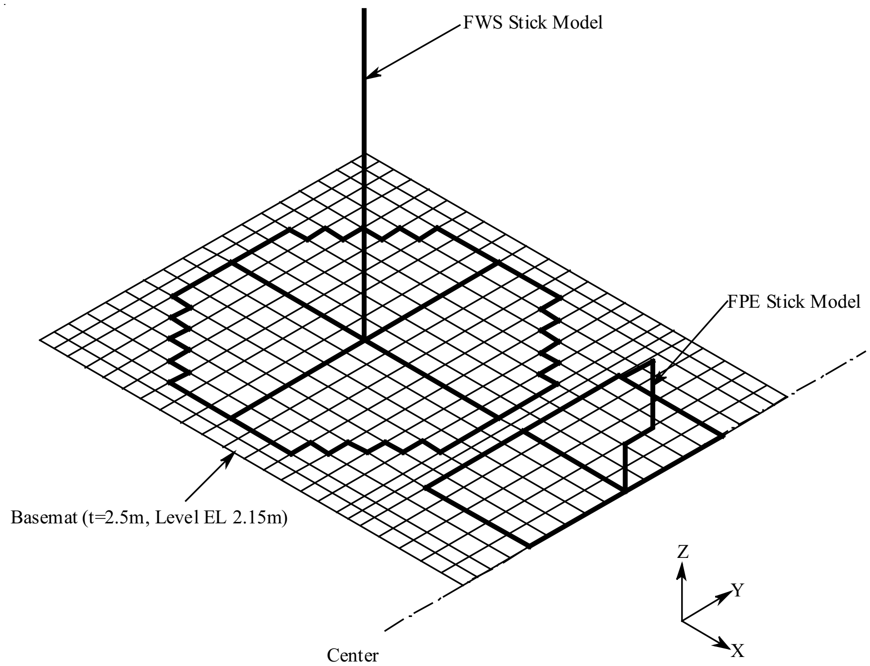
(a) Backfill on Column Rows FPA and FPC



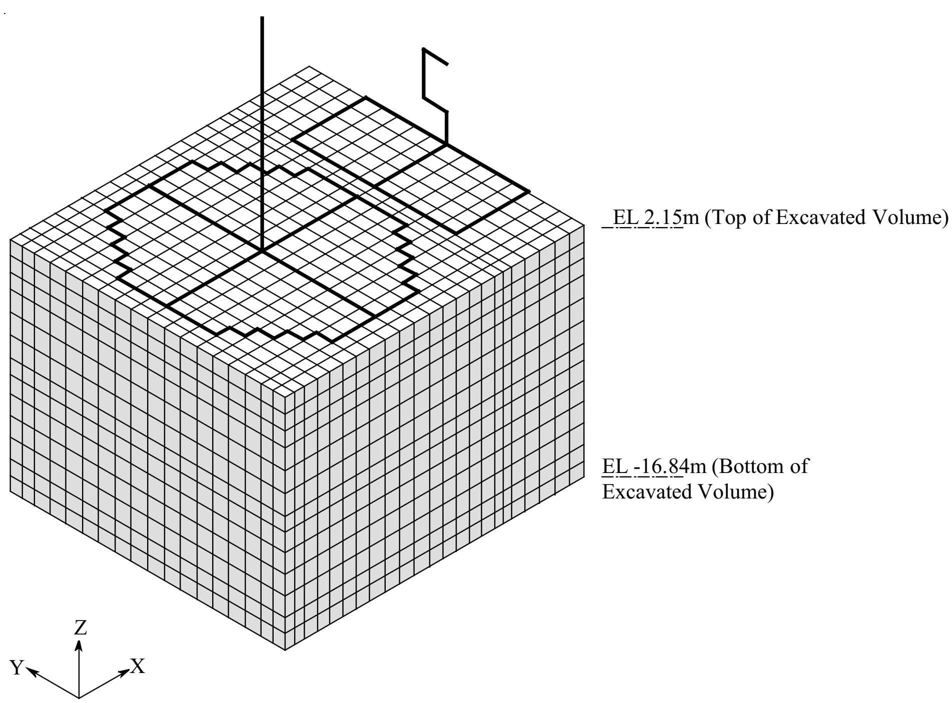
(b) Backfill on Column Rows FP1 and FP3

(Dimensions are shown in millimeters)

Figure 3.7.2-209 Overview of FWSC SASSI2010 Model

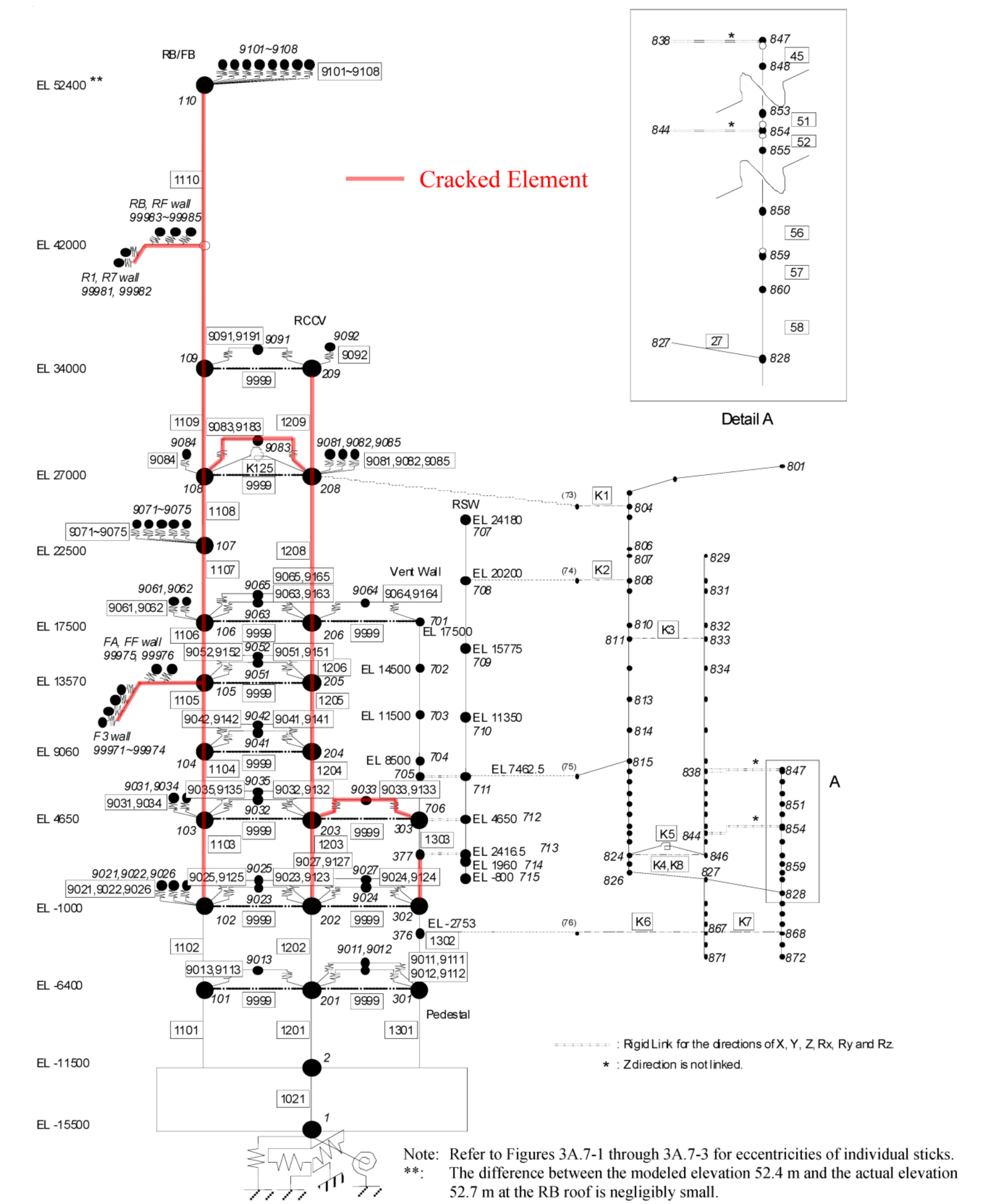


(a) Overview without Concrete Fill



(b) Overview with Concrete Fill

Figure 3.7.2-210 RB/FB Complex Seismic Model with Cracked Elements



Note: Refer to Figures 3A.7-1 through 3A.7-3 for eccentricities of individual sticks.
**: The difference between the modeled elevation 52.4 m and the actual elevation 52.7 m at the RB roof is negligibly small.

Figure 3.7.2-211 Comparison of ISRS - RB/FB Refueling Floor in XDirection

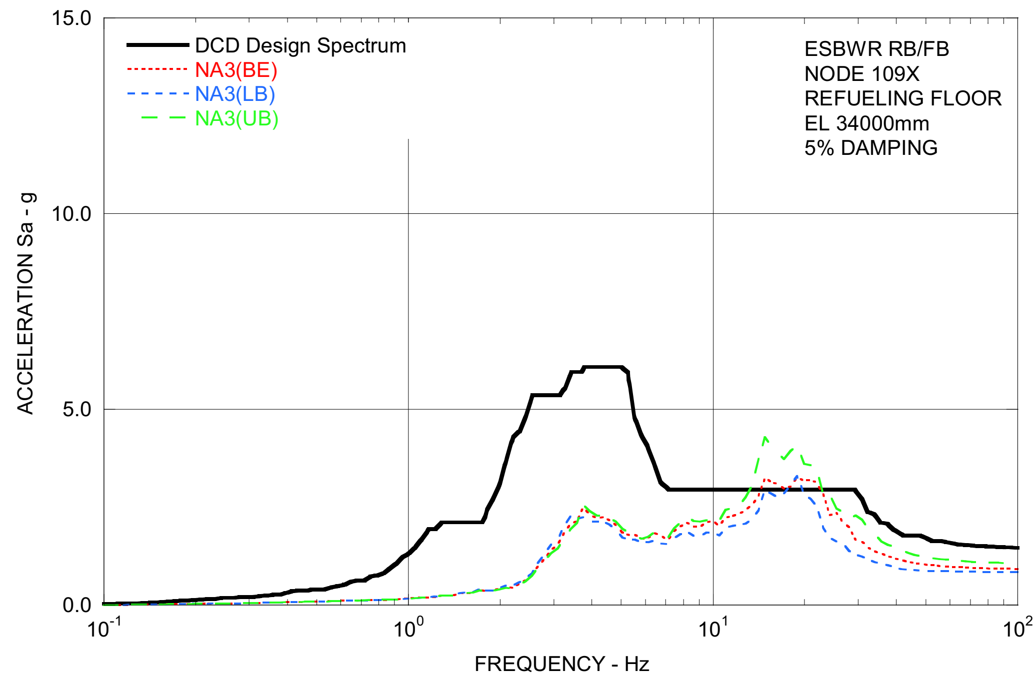


Figure 3.7.2-212 Comparison of ISRS - RCCV Top Slab in X-Direction

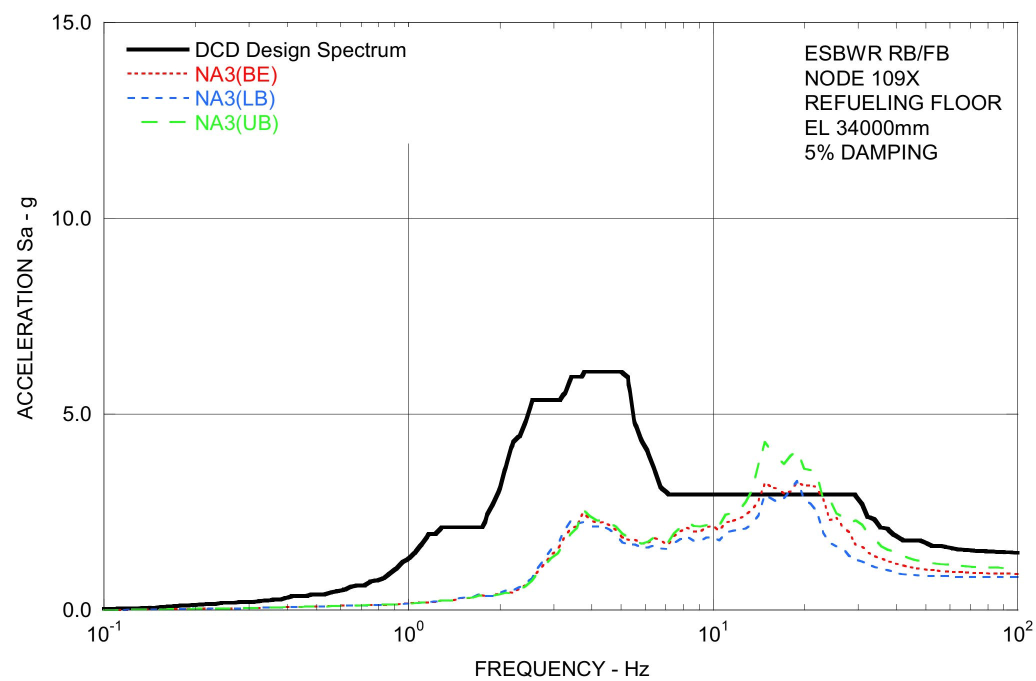


Figure 3.7.2-213 Comparison of ISRS - Vent Wall Top in X-Direction

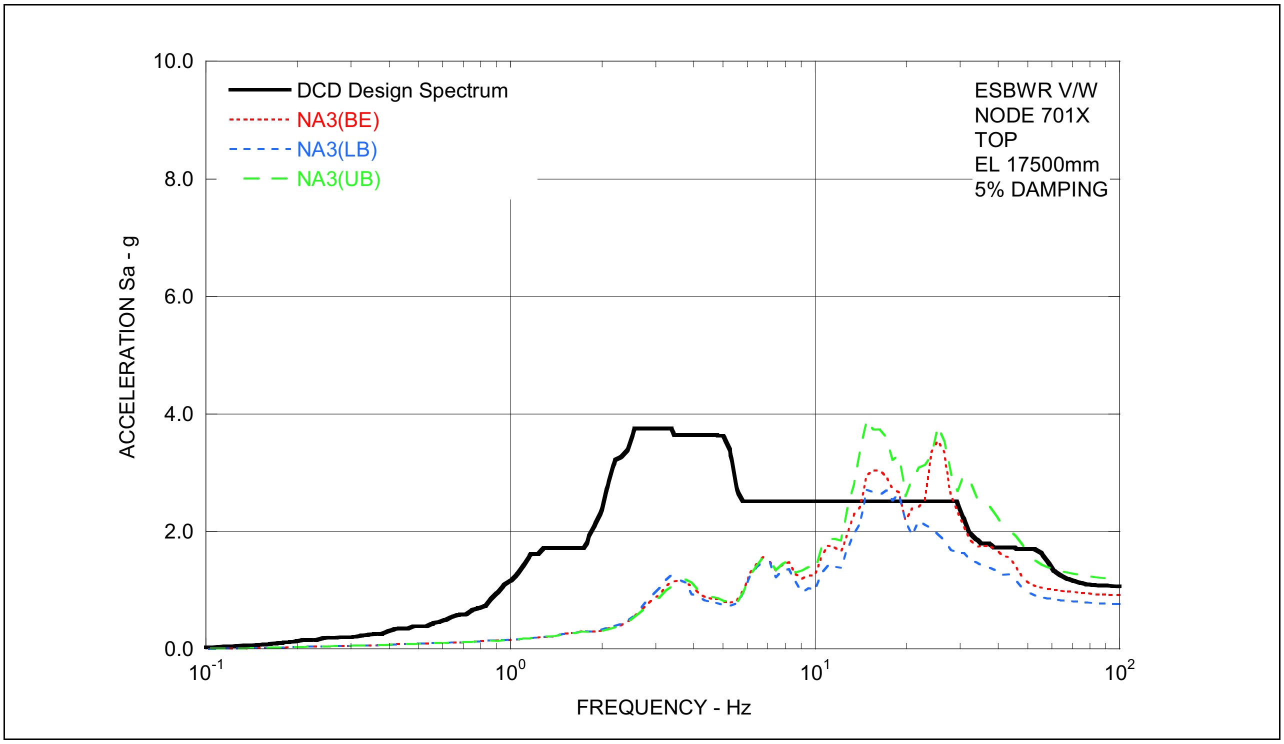


Figure 3.7.2-214 Comparison of ISRS - RSW Top in X-Direction

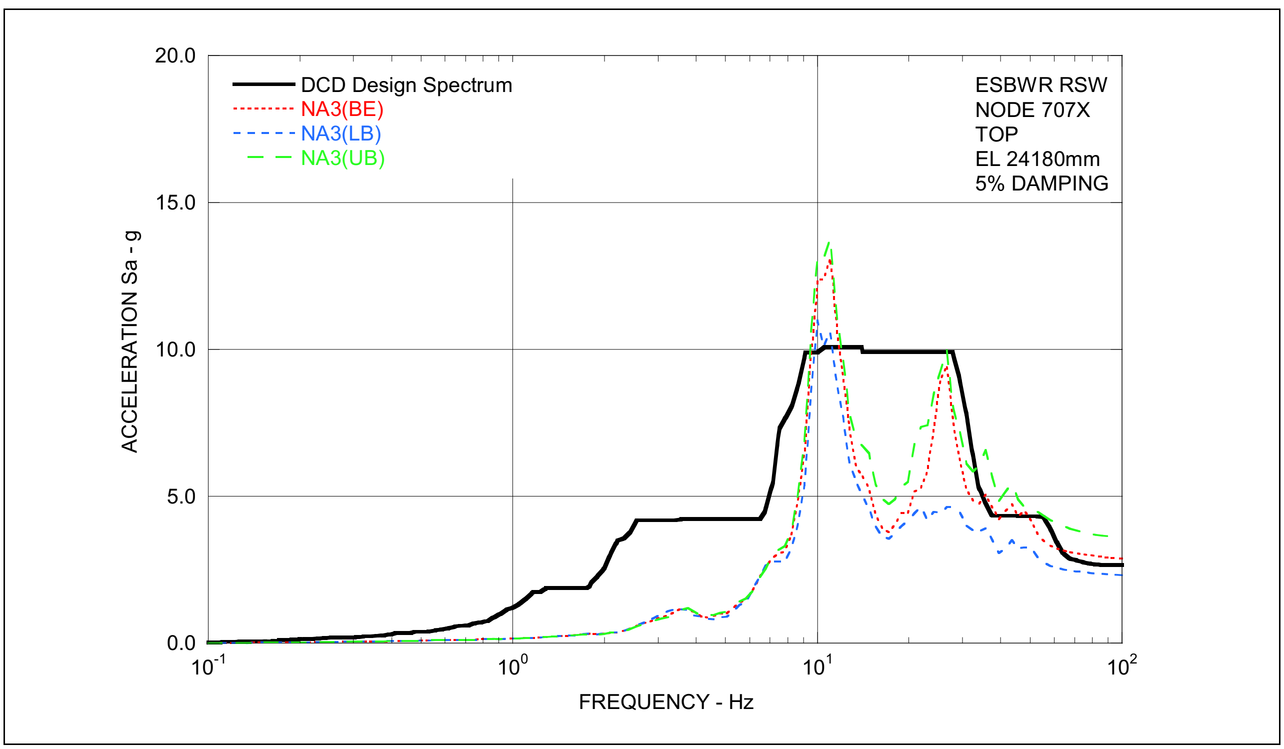


Figure 3.7.2-215 Comparison of ISRS - RPV Top in X-Direction

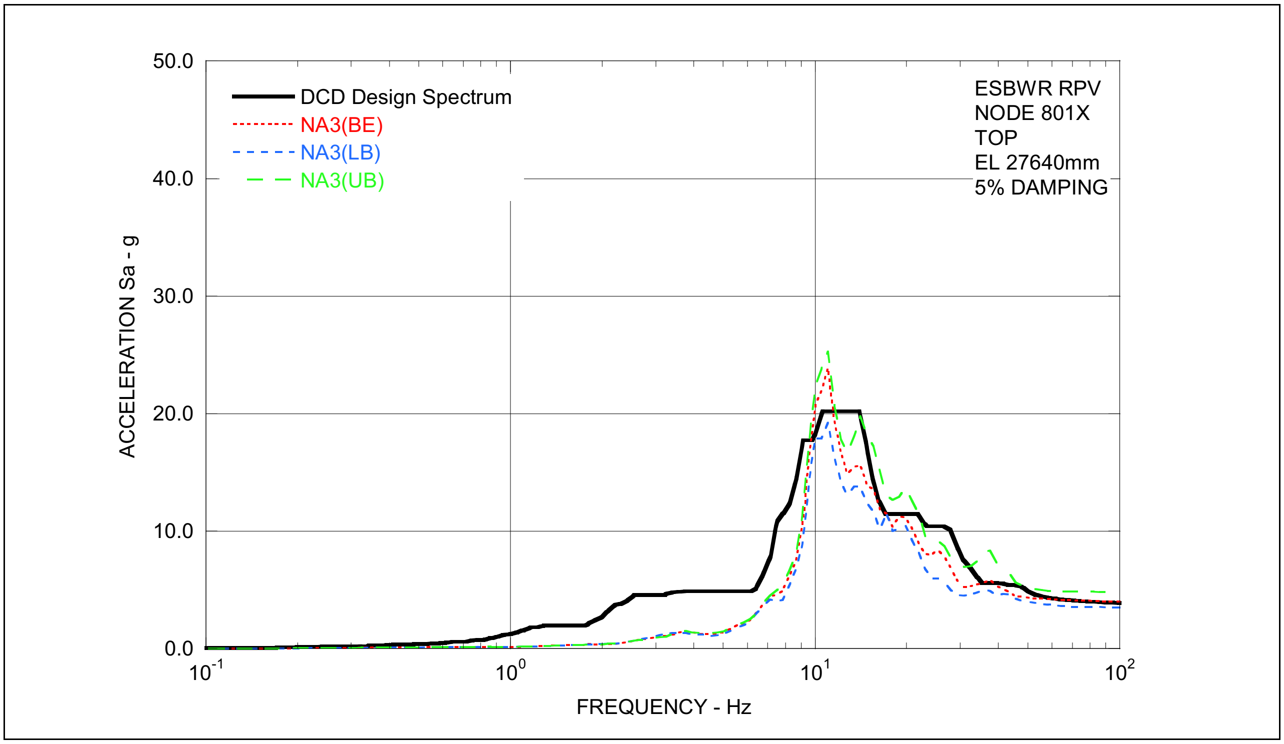


Figure 3.7.2-216 Comparison of ISRS - RB/FB Basemat in X-Direction

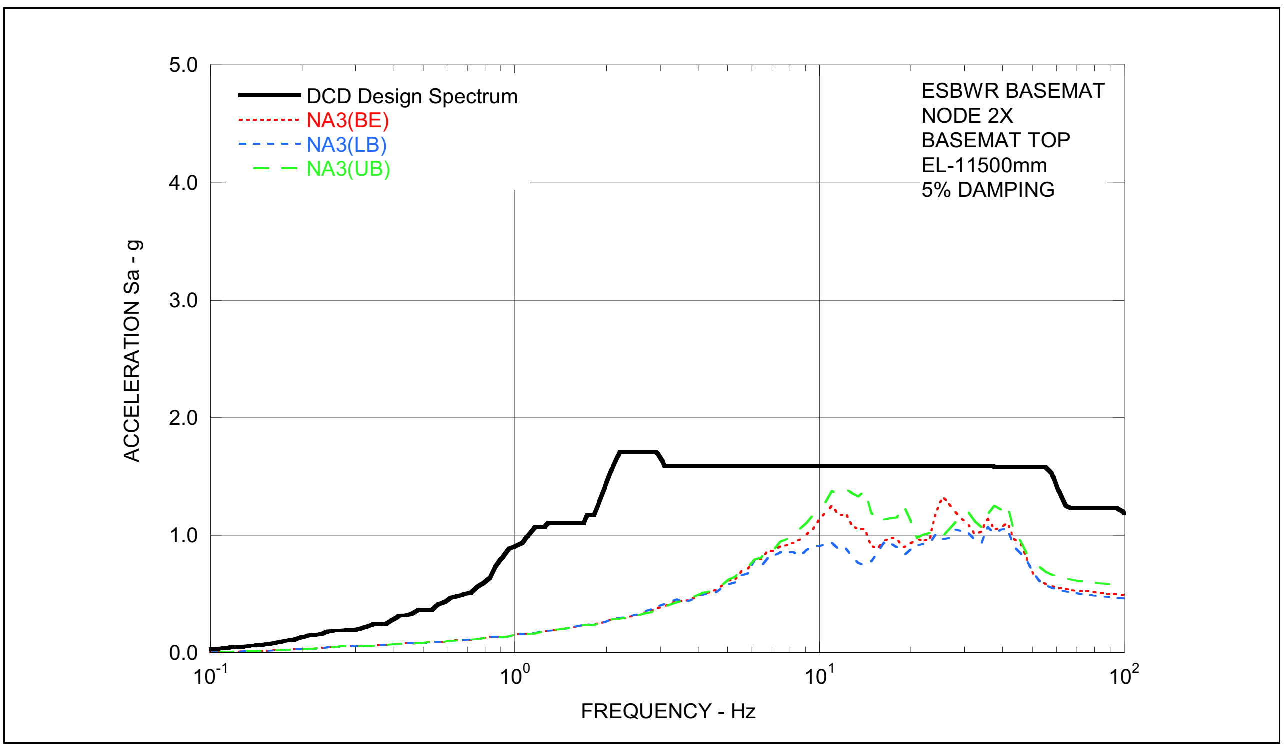


Figure 3.7.2-217 Comparison of ISRS - RB/FB Refueling Floor in Y-Direction

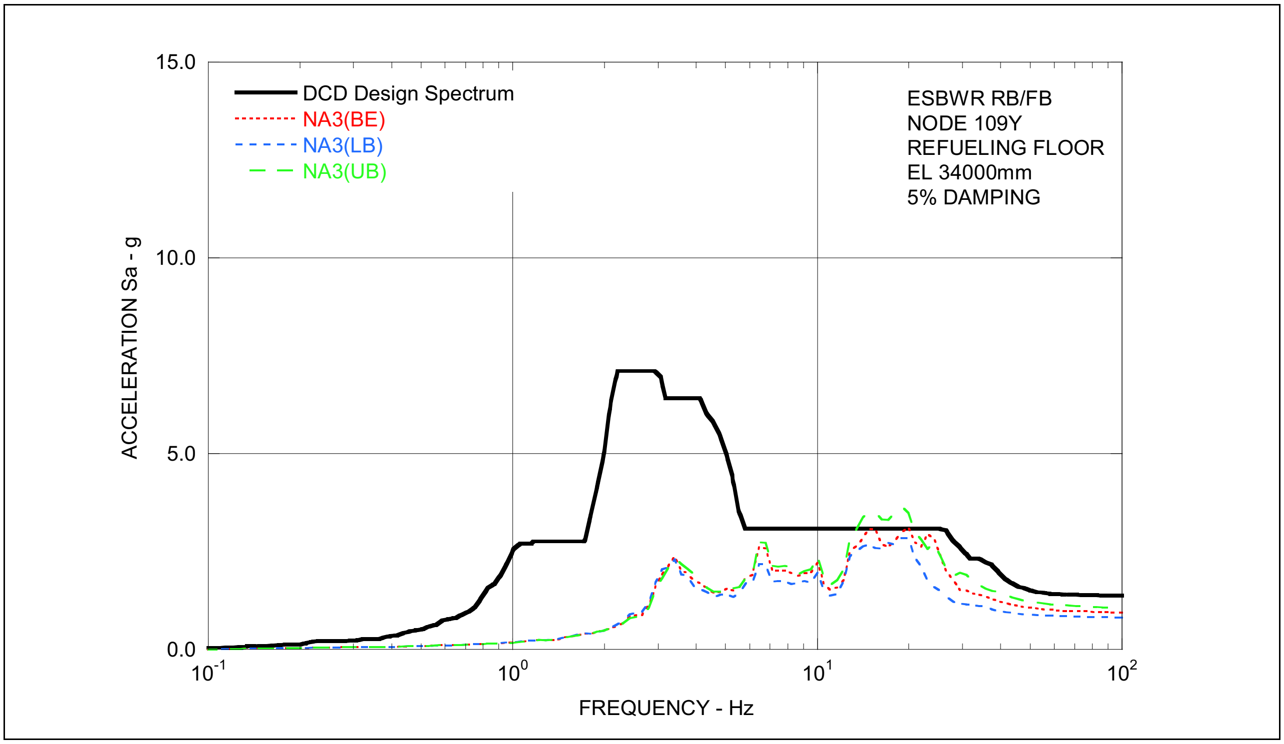


Figure 3.7.2-218 Comparison of ISRS - RCCV Top Slab in Y-Direction

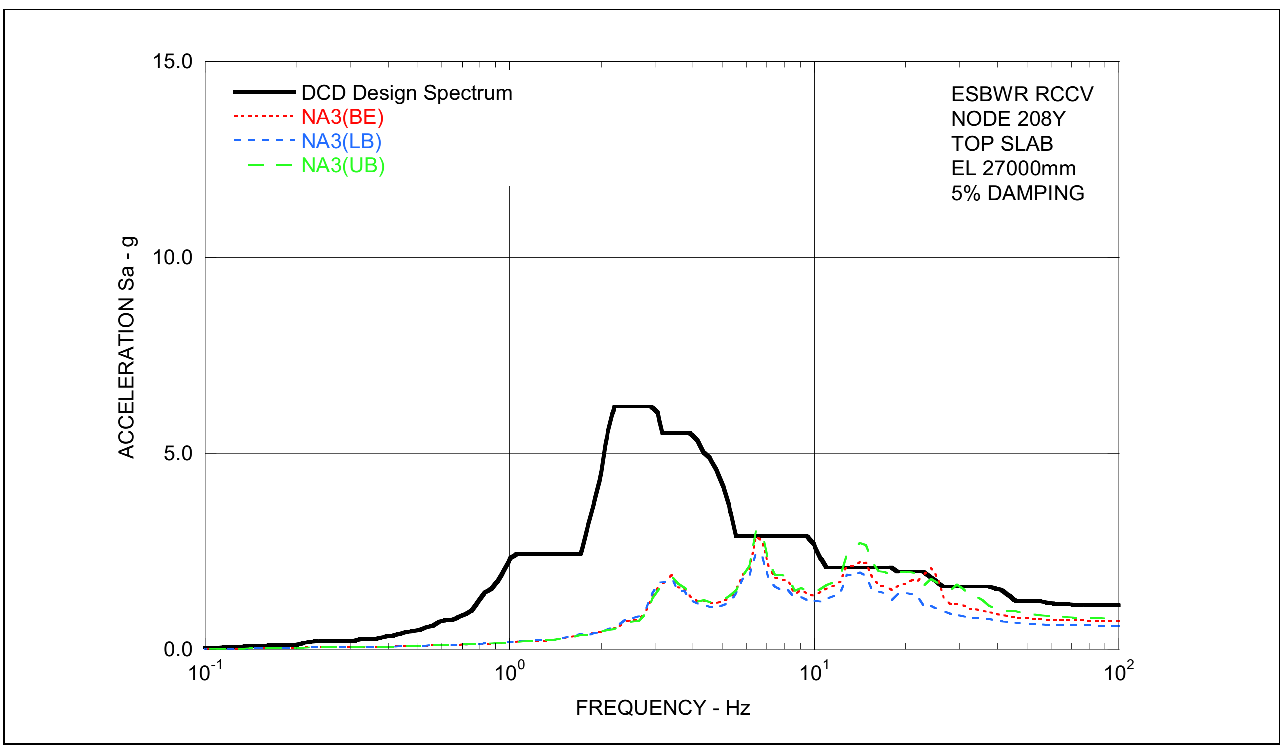


Figure 3.7.2-219 Comparison of ISRS - Vent Wall Top in Y-Direction

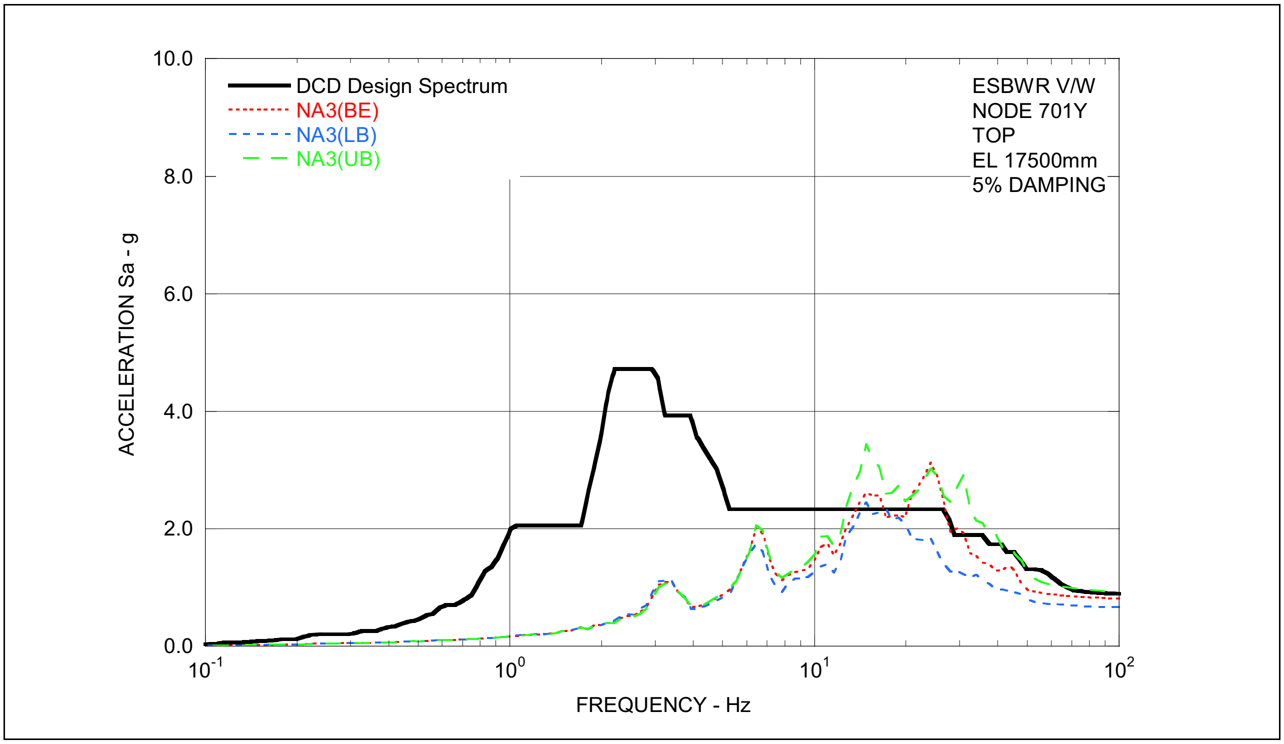


Figure 3.7.2-220 Comparison of ISRS - RSW Top in Y-Direction

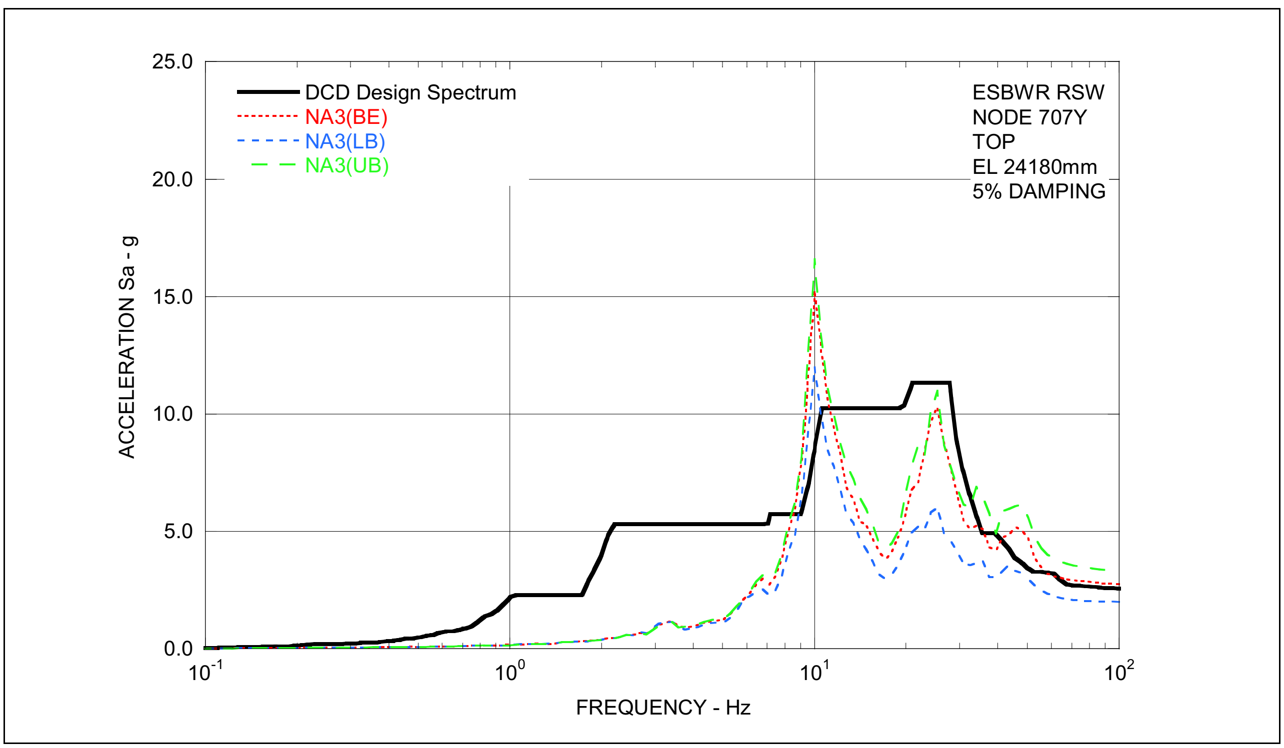


Figure 3.7.2-221 Comparison of ISRS - RPV Top in Y-Direction

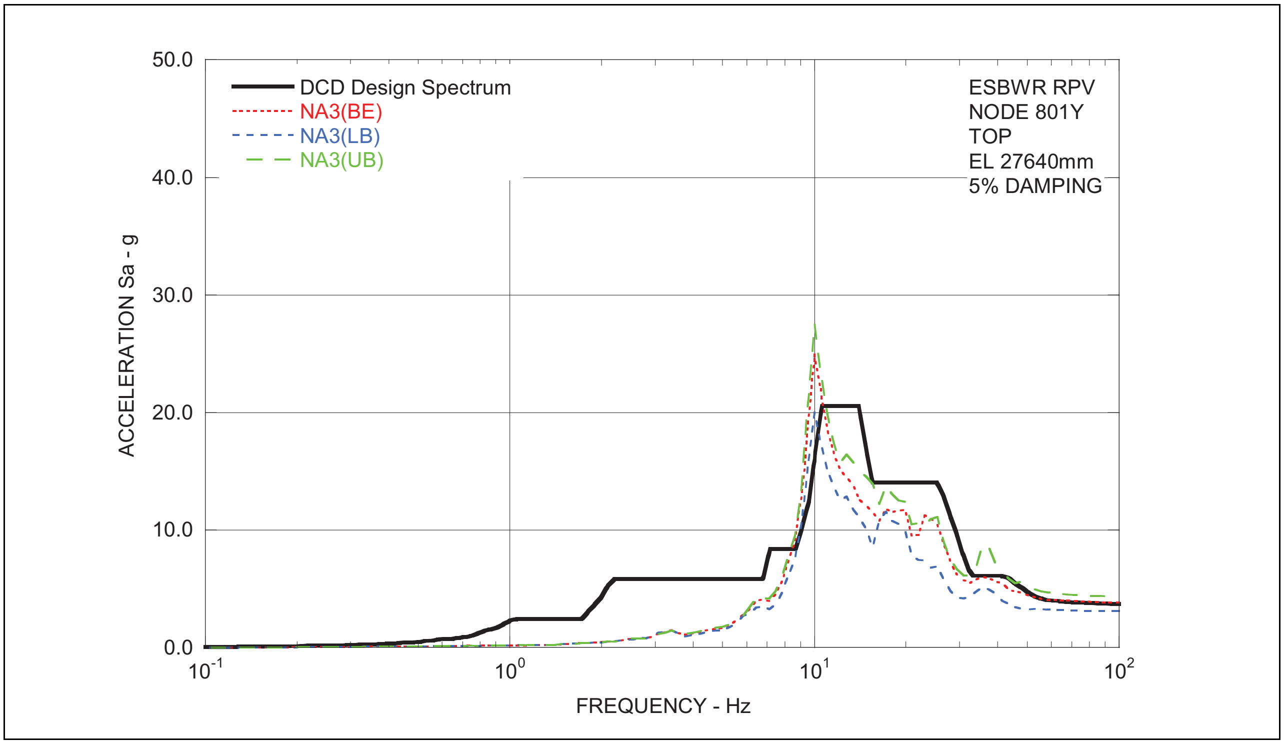


Figure 3.7.2-222 Comparison of ISRS - RB/FB Basemat in Y-Direction

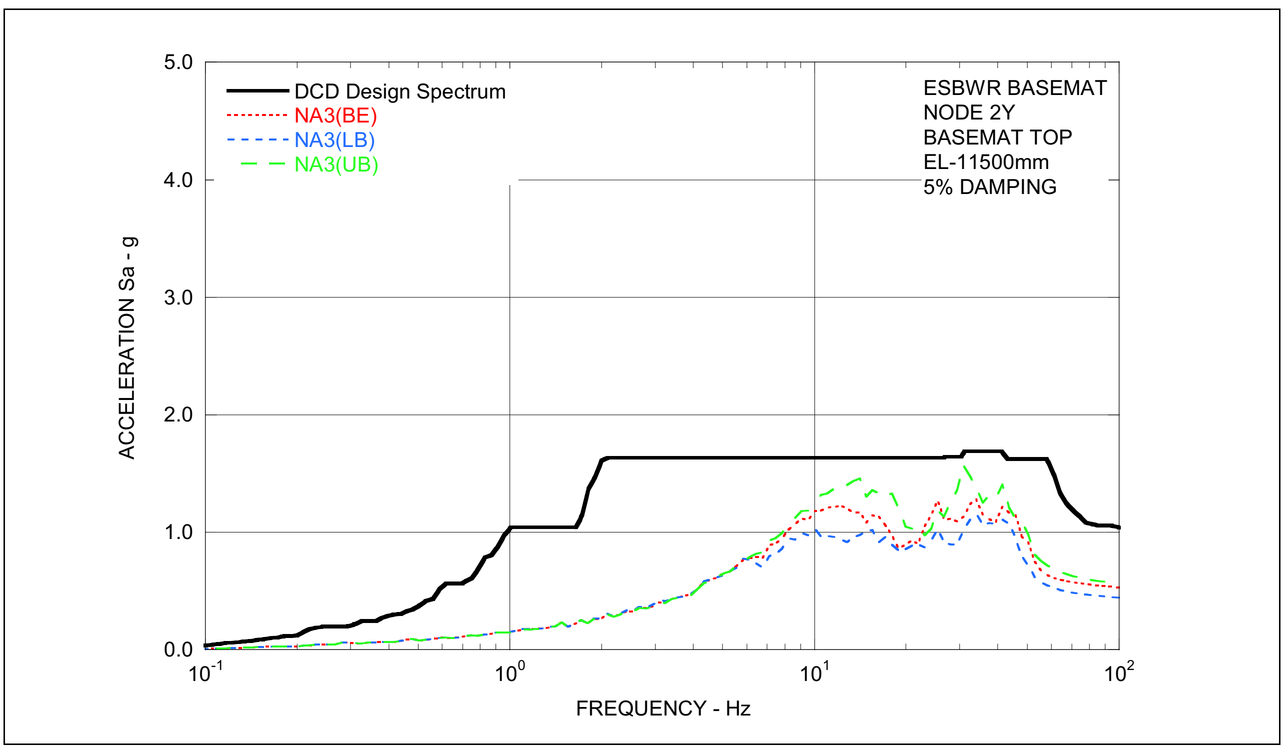


Figure 3.7.2-223 Comparison of ISRS - RB/FB Refueling Floor in Z-Direction

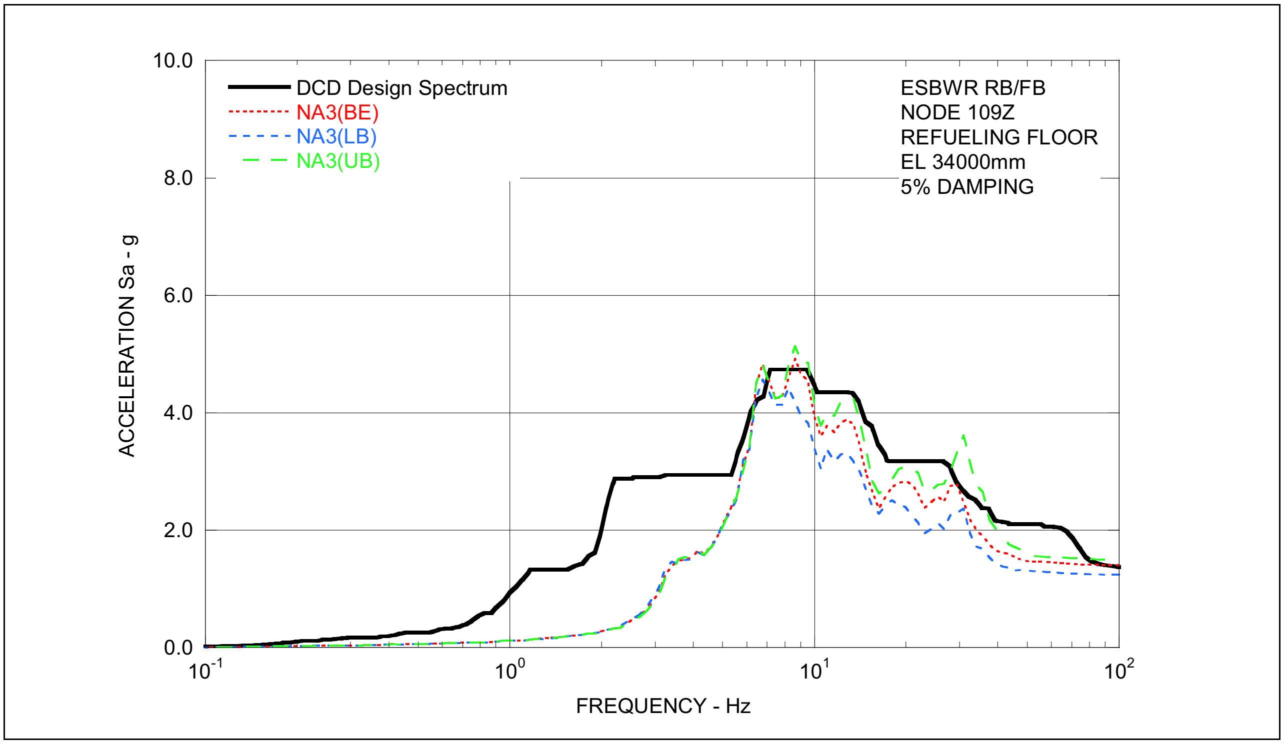


Figure 3.7.2-224 Comparison of ISRS - RCCV Top Slab in Z-Direction

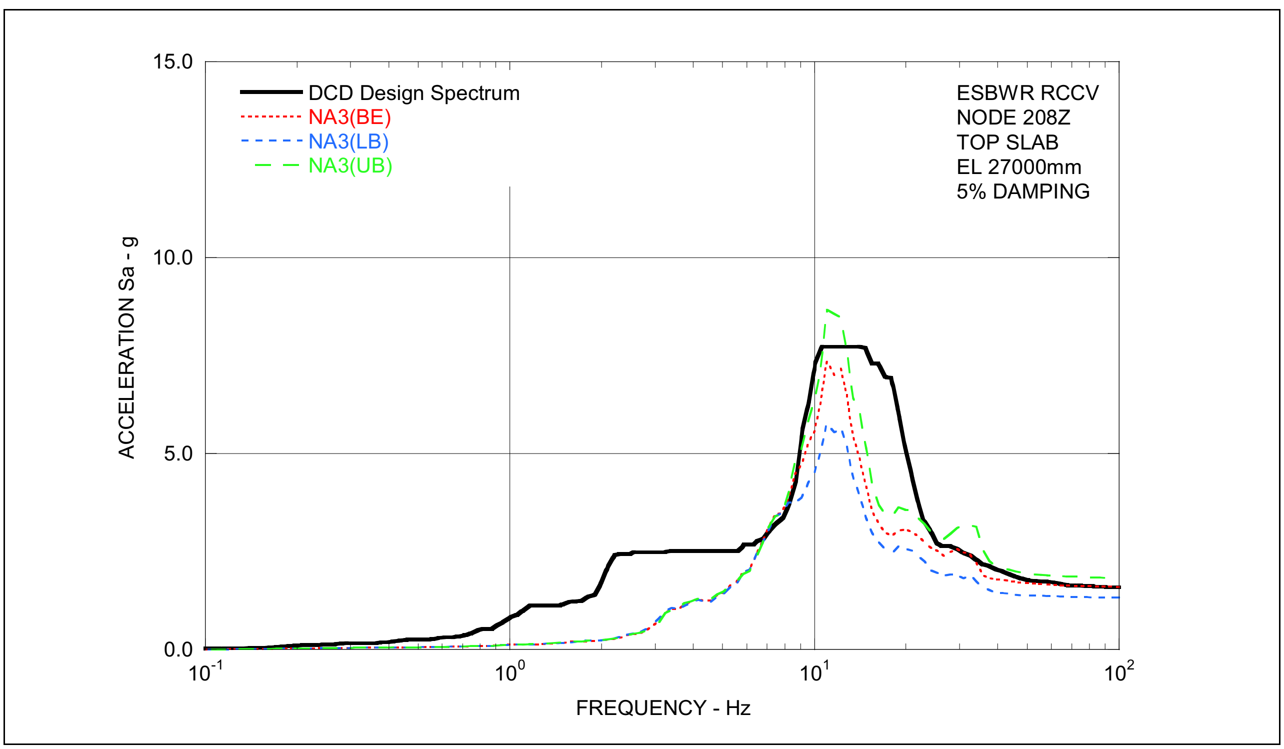


Figure 3.7.2-225 Comparison of ISRS - Vent Wall Top in Z-Direction

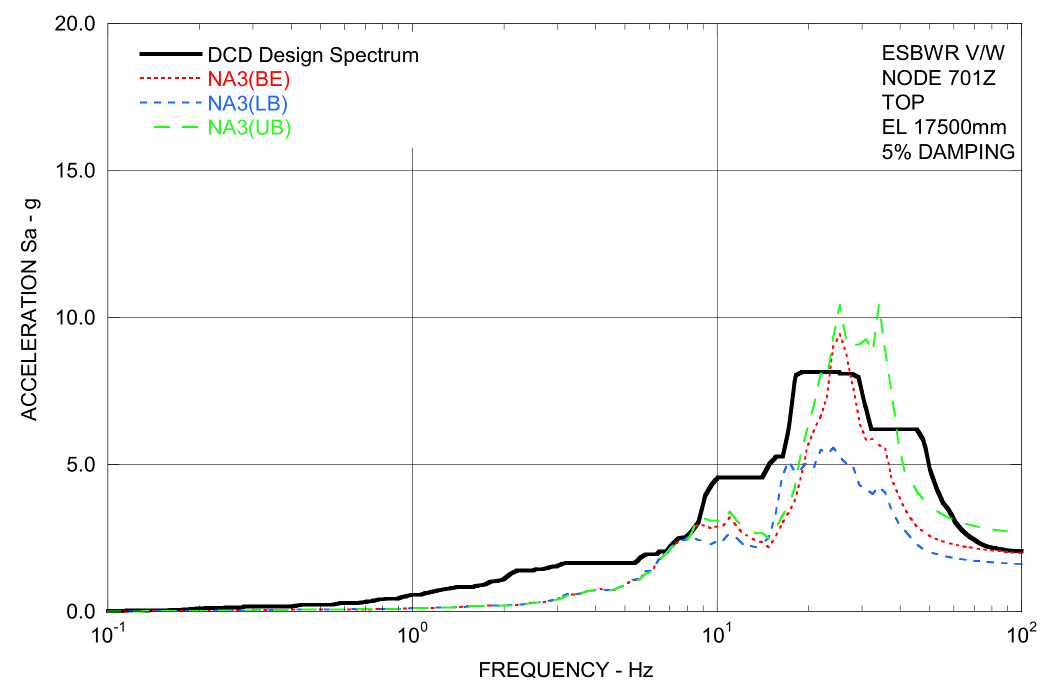


Figure 3.7.2-226 Comparison of ISRS - RSW Top in Z-Direction

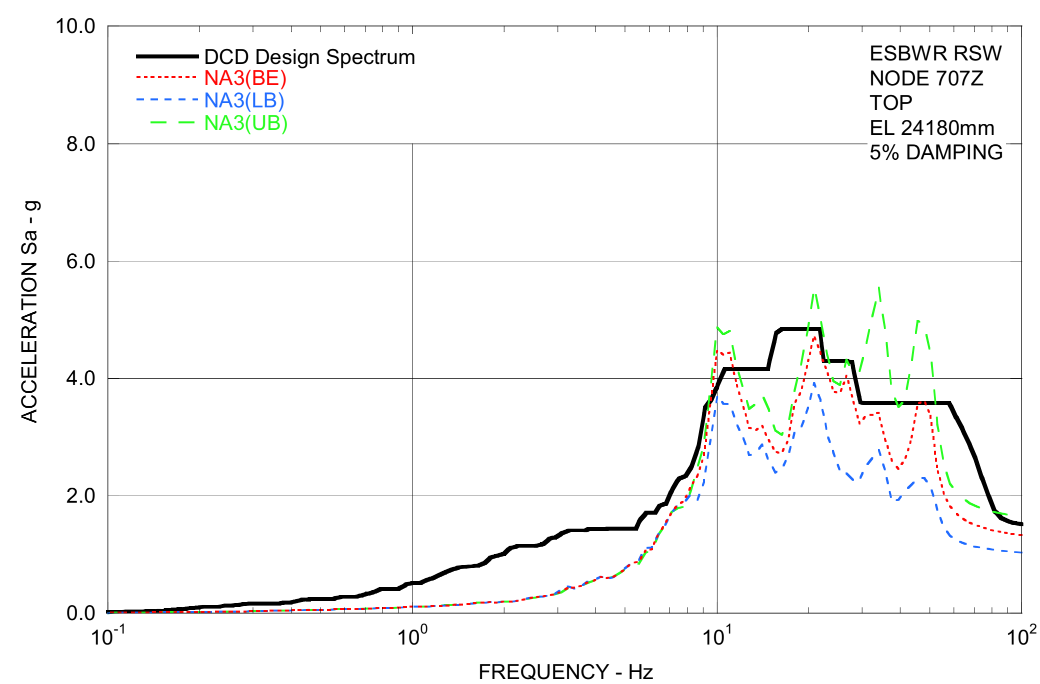


Figure 3.7.2-227 Comparison of ISRS - RPV Top in Z-Direction

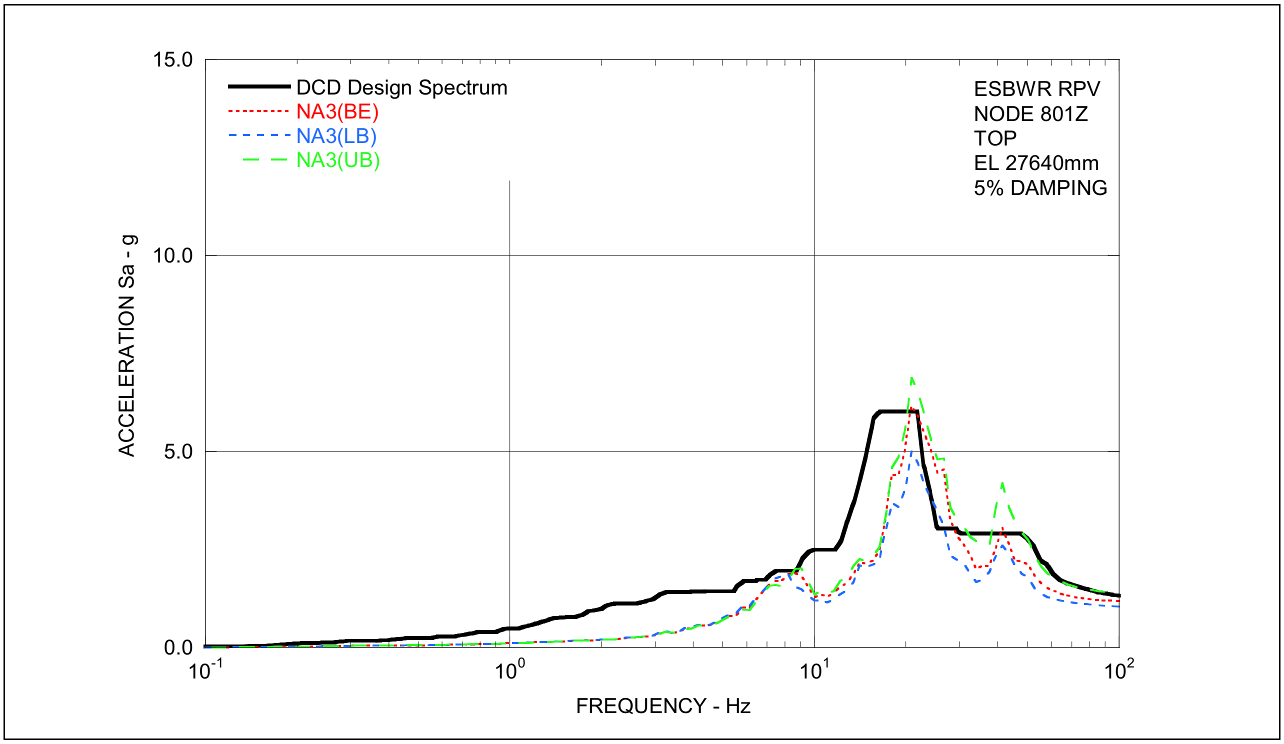


Figure 3.7.2-228 Comparison of ISRS - RB/FB Basemat in Z-Direction

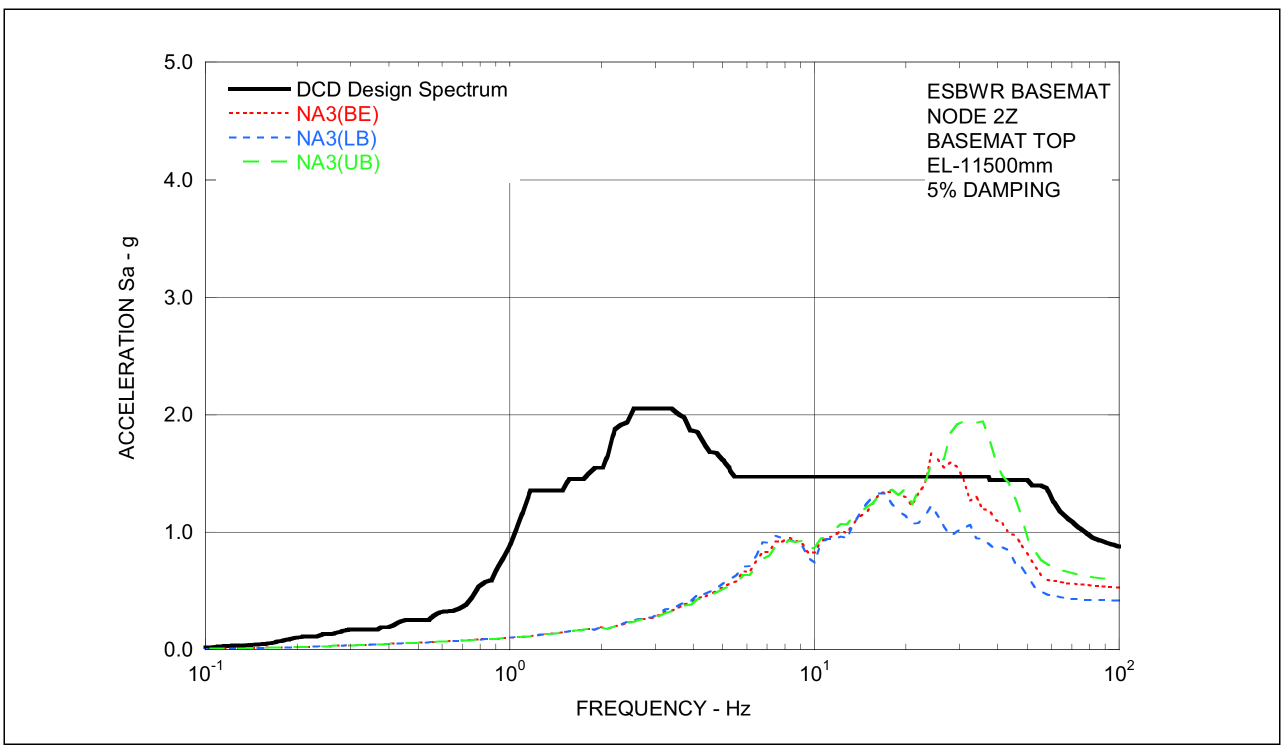


Figure 3.7.2-229 Unit 3 Site-Specific SSE ISRS - RB/FB Refueling Floor in X-Direction

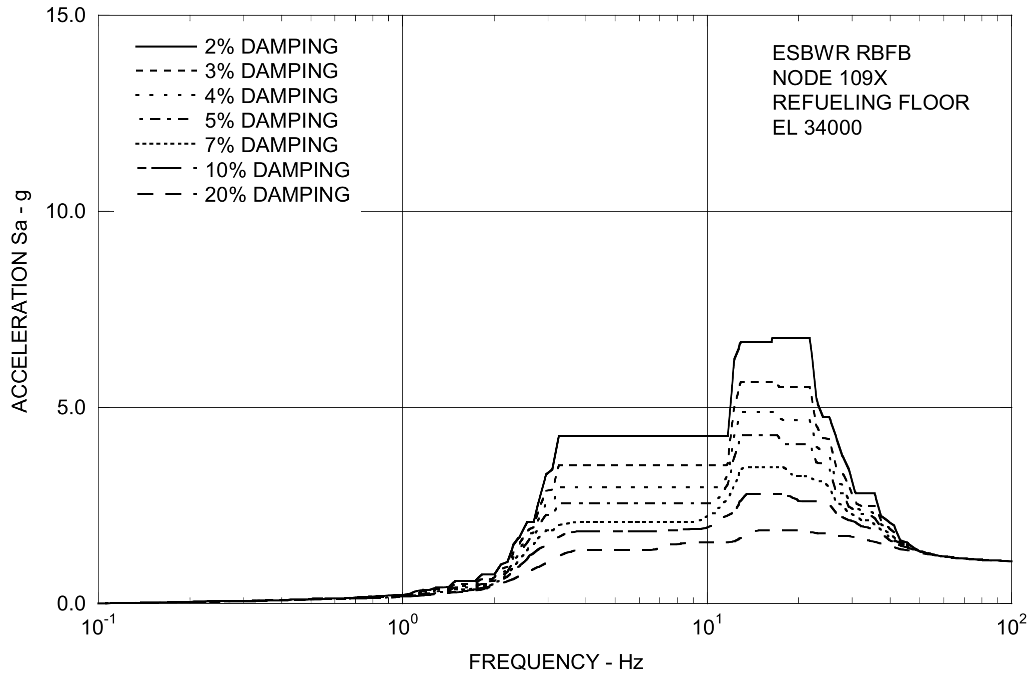


Figure 3.7.2-230 Unit 3 Site-Specific SSE ISRS - RCCV Top Slab in X-Direction

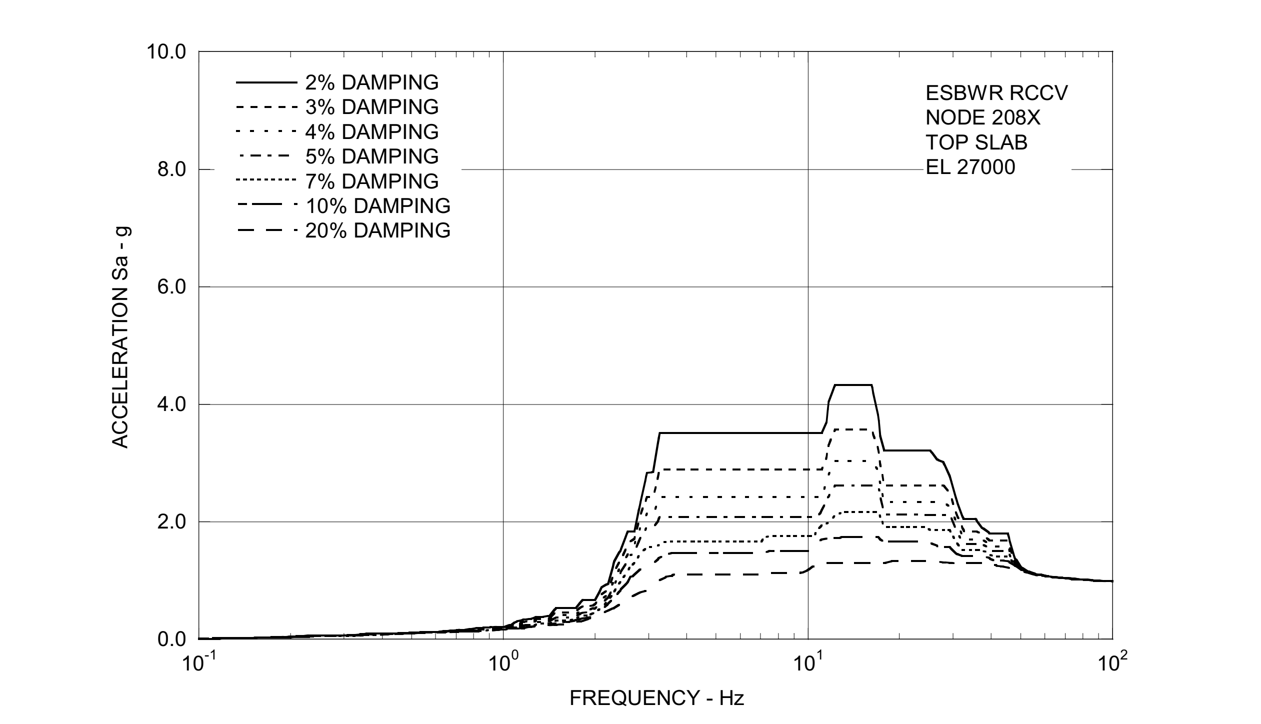


Figure 3.7.2-231 Unit 3 Site-Specific SSE ISRS - Vent Wall Top in X-Direction

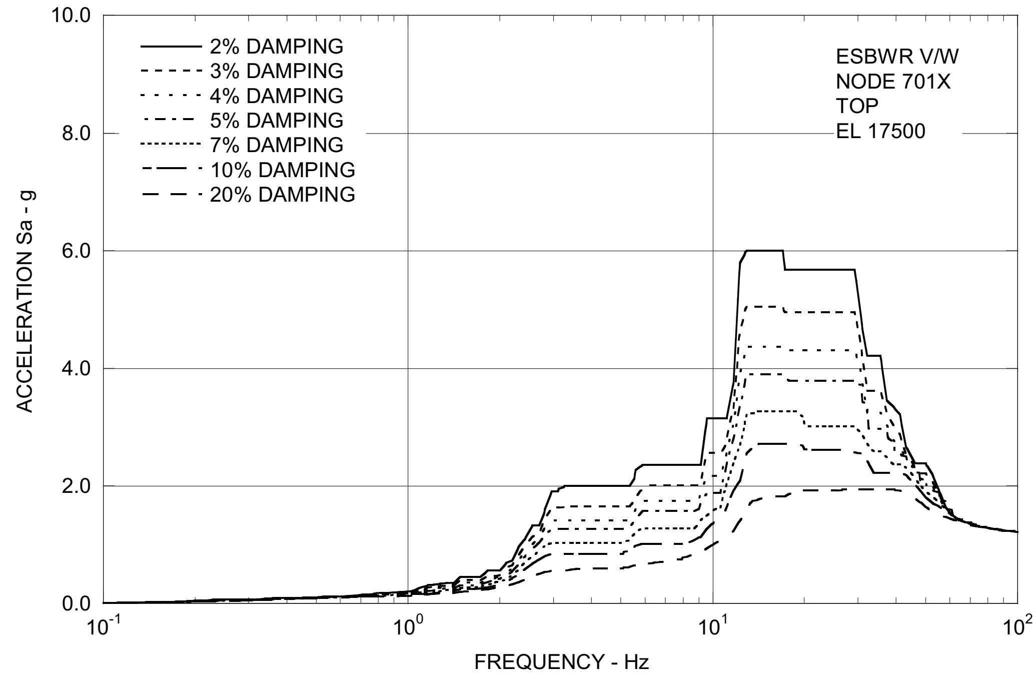


Figure 3.7.2-232 Unit 3 Site-Specific SSE ISRS - RSW Top in X-Direction

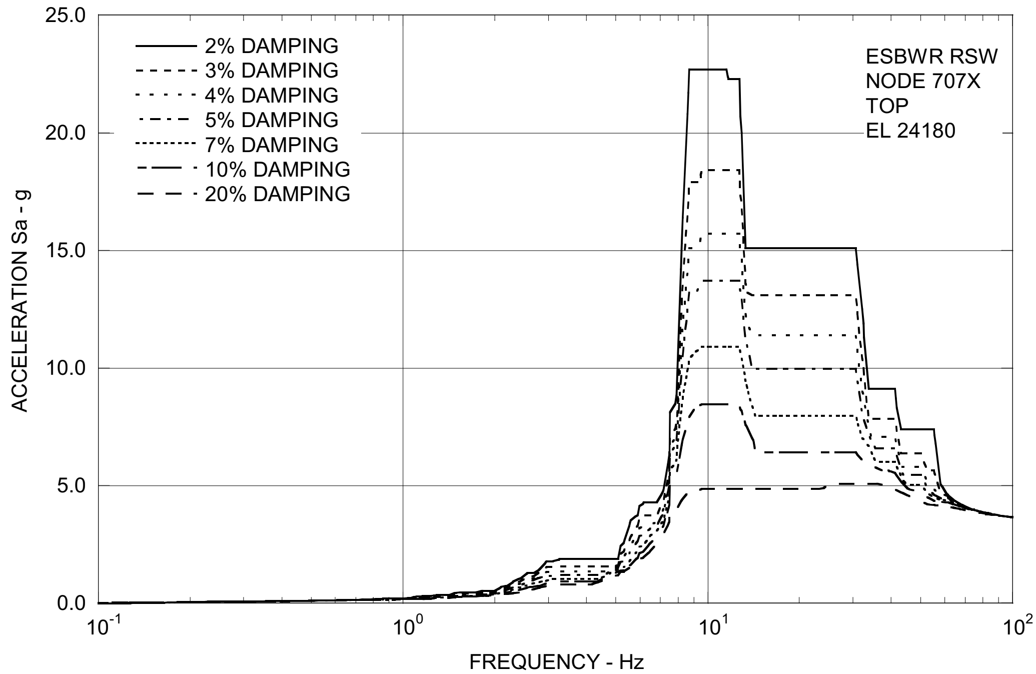


Figure 3.7.2-233 Unit 3 Site-Specific SSE ISRS - RPV Top in X-Direction

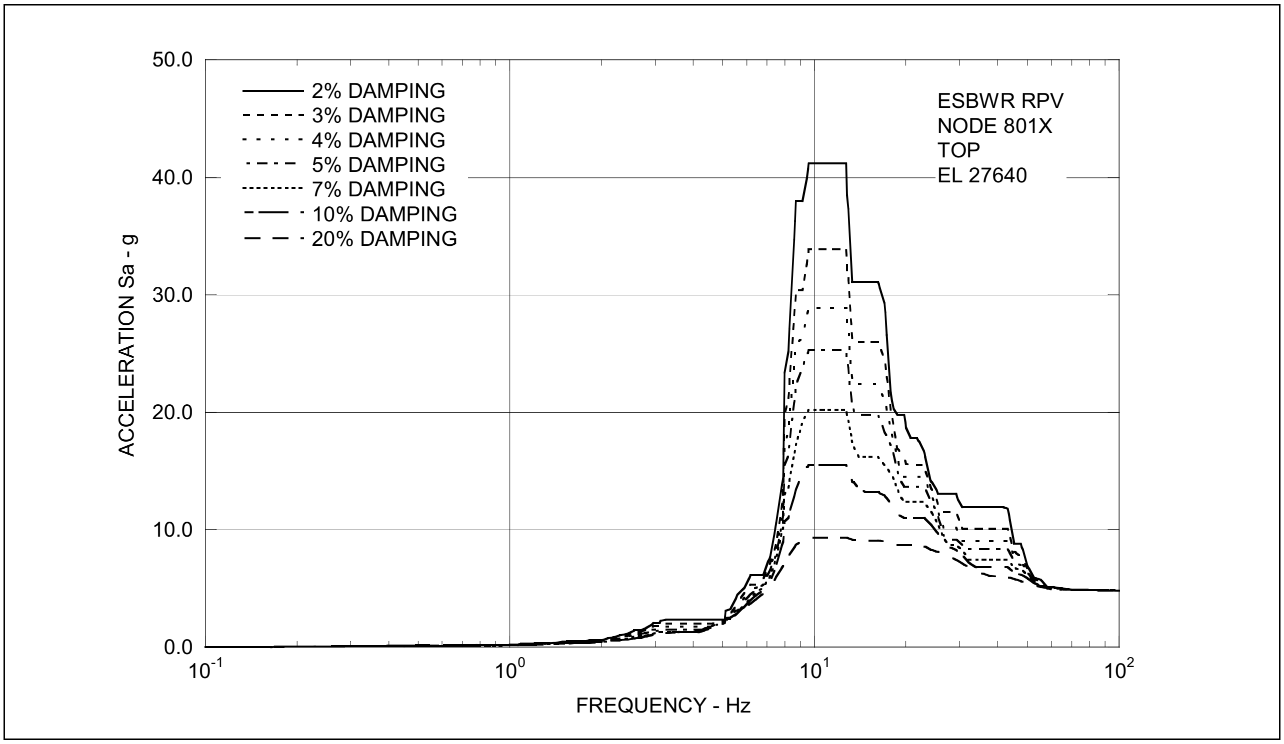


Figure 3.7.2-234 Unit 3 Site-Specific SSE ISRS - Basemat in X-Direction

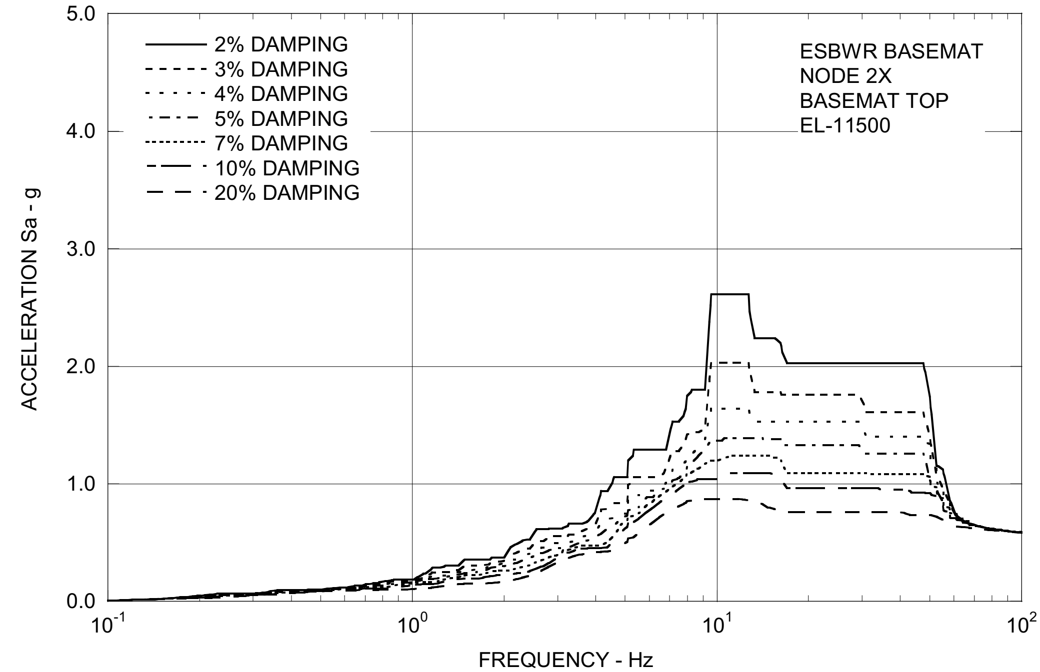


Figure 3.7.2-235 Unit 3 Site-Specific SSE ISRS - RB/FB Refueling Floor in Y-Direction

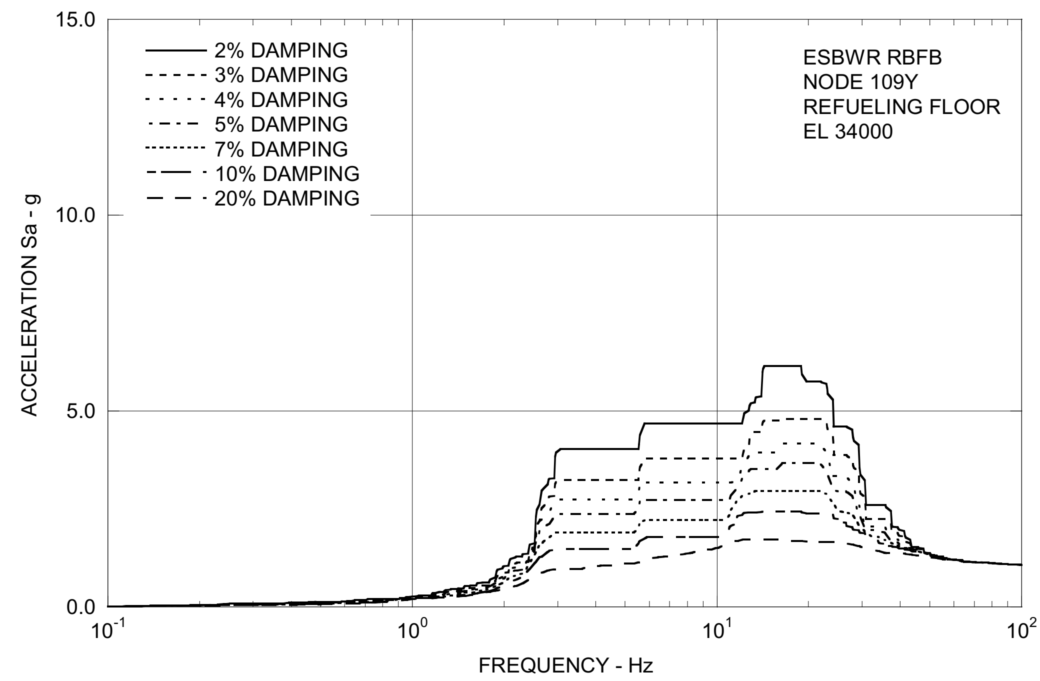


Figure 3.7.2-236 Unit 3 Site-Specific SSE ISRS - RCCV Top Slab in Y-Direction

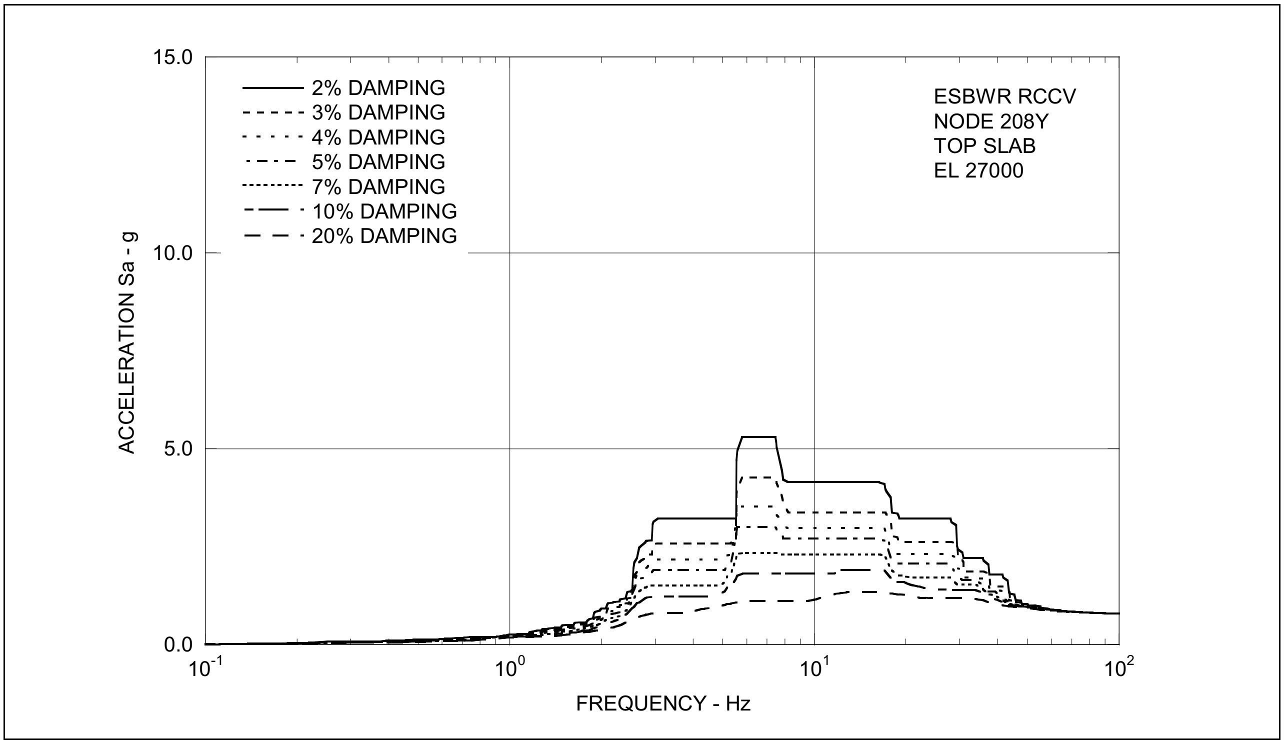


Figure 3.7.2-237 Unit 3 Site-Specific SSE ISRS - Vent Wall Top in Y-Direction

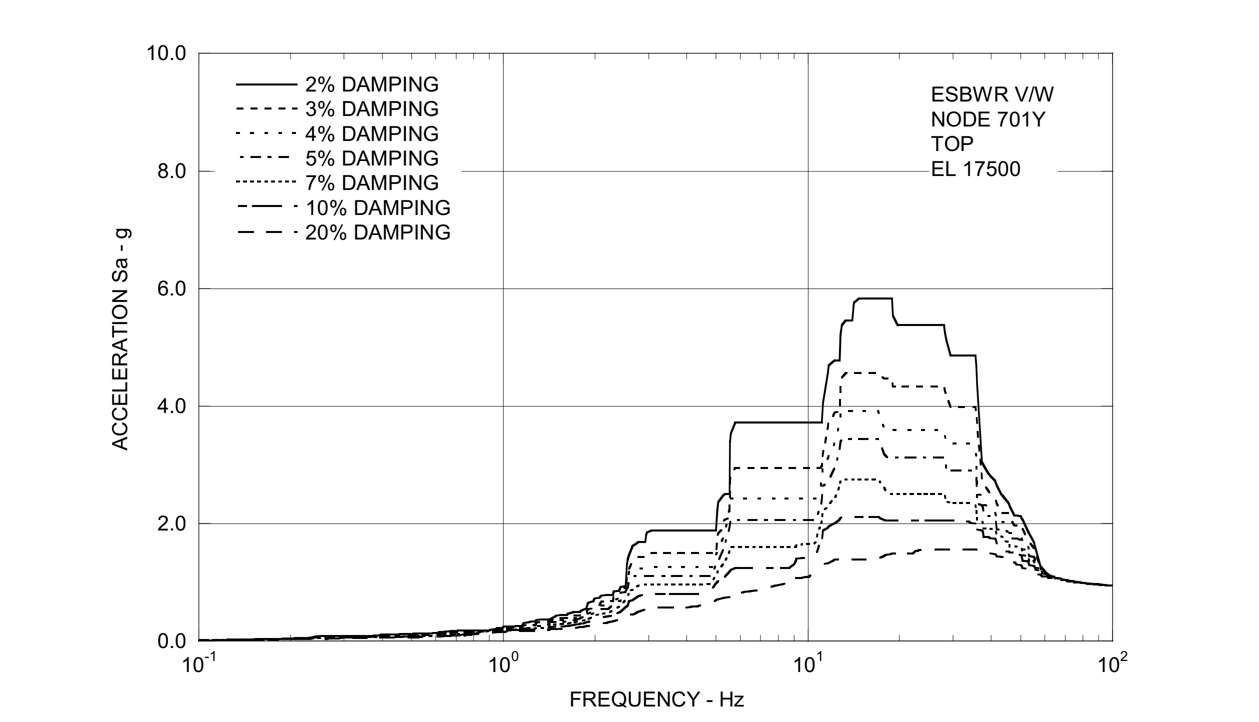


Figure 3.7.2-238 Unit 3 Site-Specific SSE ISRS - RSW Top in Y-Direction

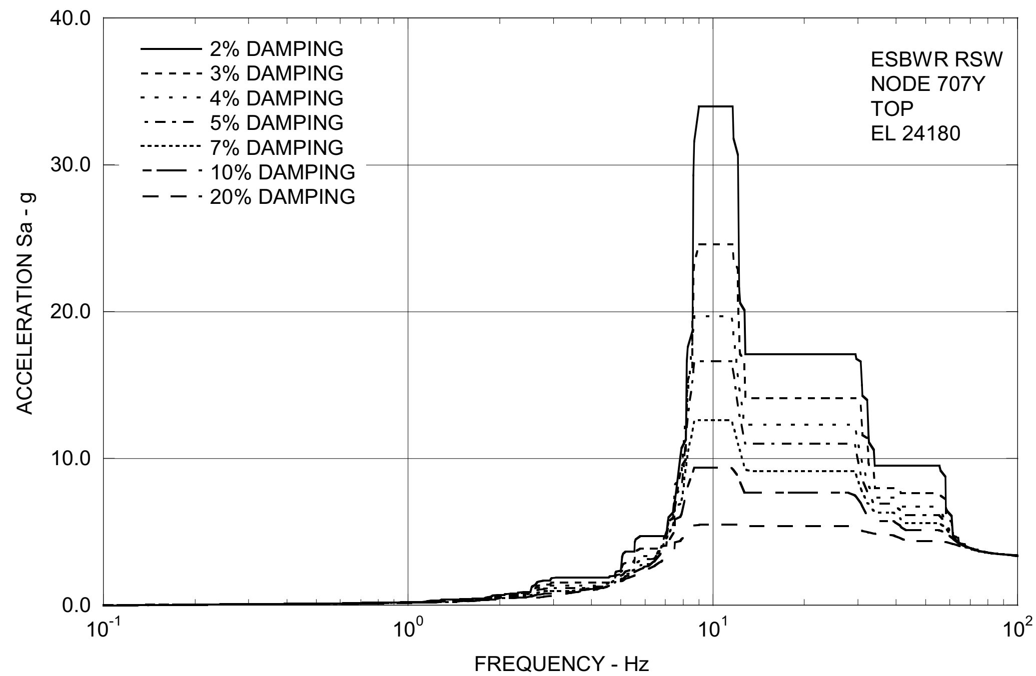


Figure 3.7.2-239 Unit 3 Site-Specific SSE ISRS - RPV Top in Y-Direction

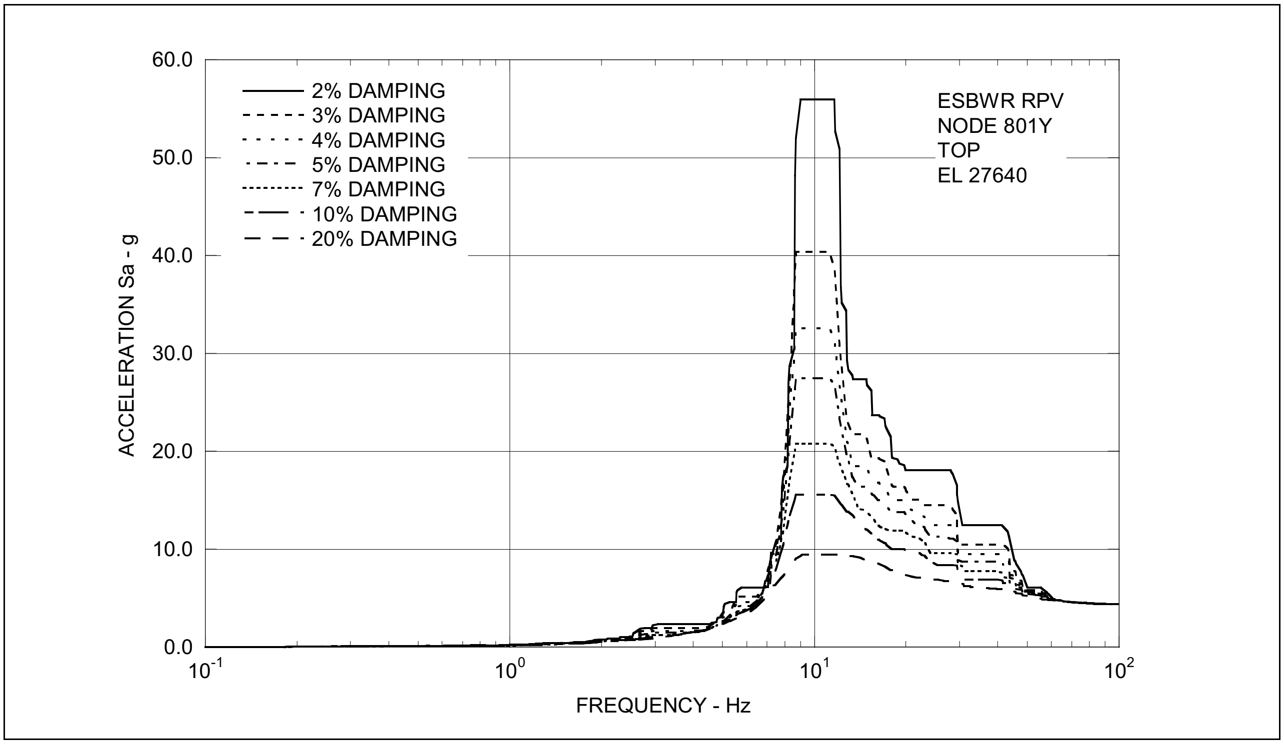


Figure 3.7.2-240 Unit 3 Site-Specific SSE ISRS - Basemat in Y-Direction

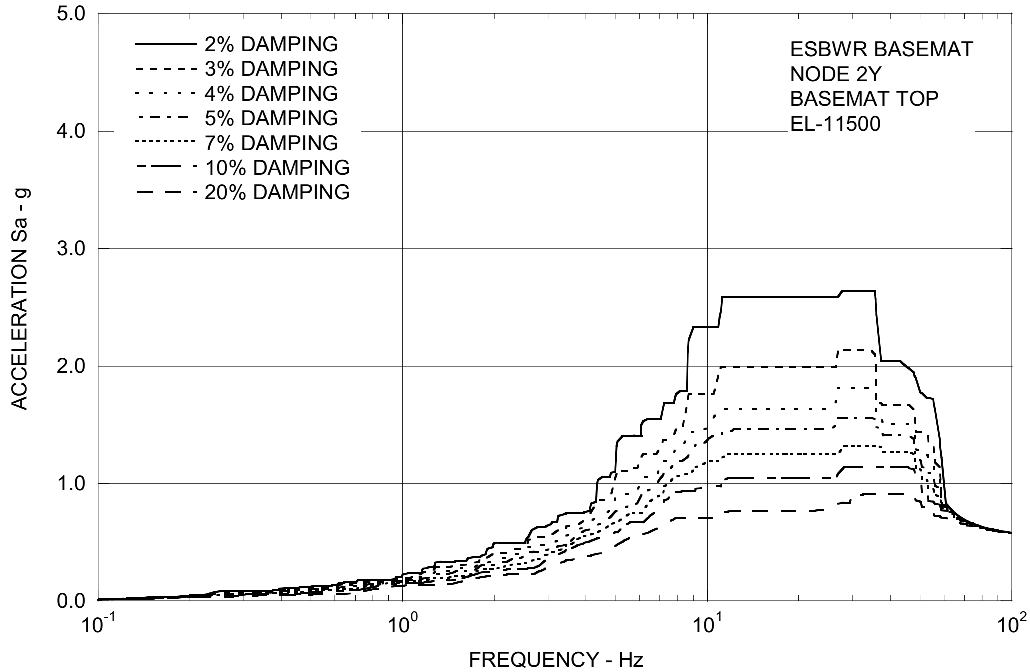


Figure 3.7.2-241 Unit 3 Site-Specific SSE ISRS - RB/FB Refueling Floor in Z-Direction

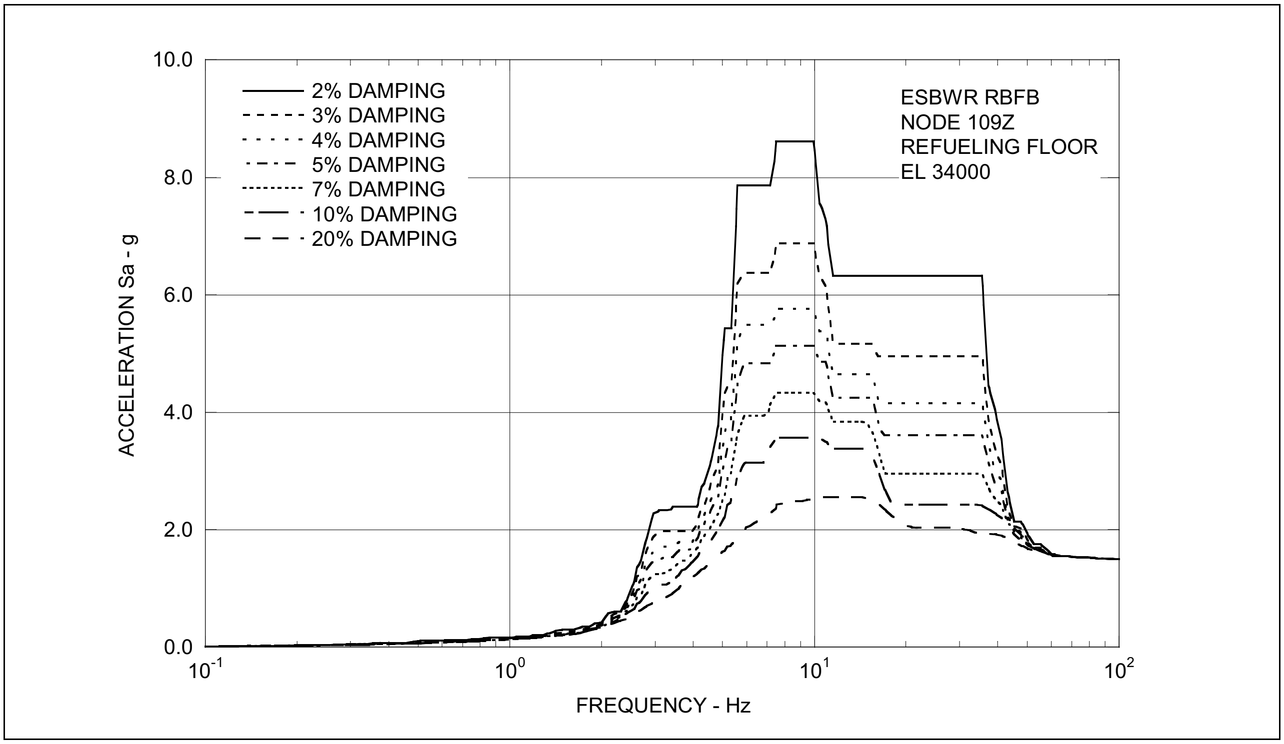


Figure 3.7.2-242 Unit 3 Site-Specific SSE ISRS - RCCV Top Slab in Z-Direction

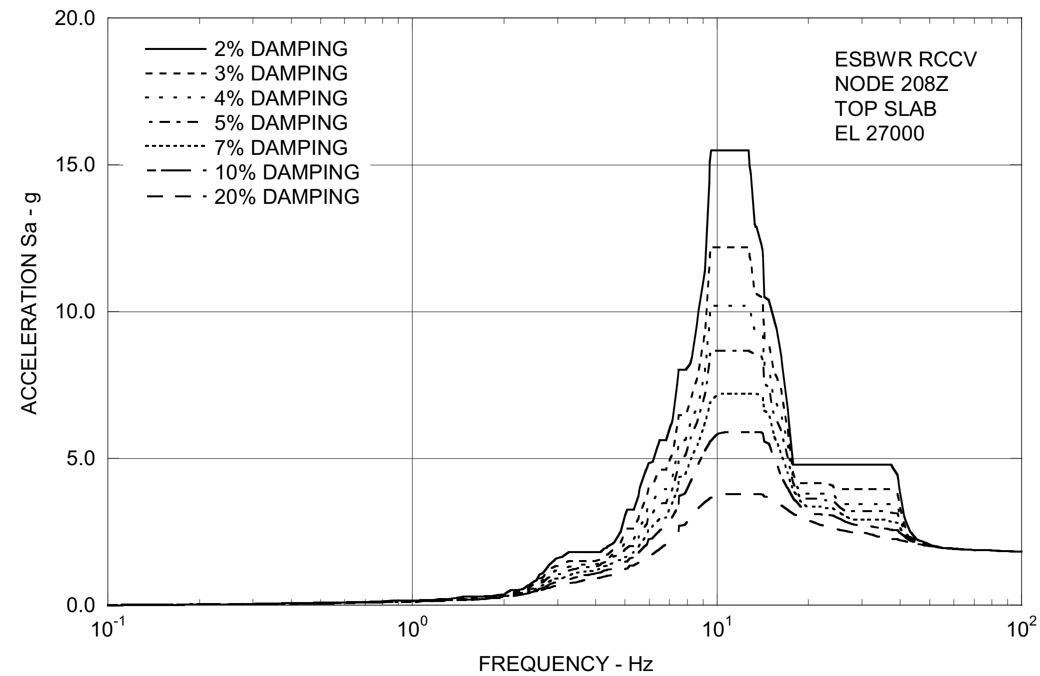


Figure 3.7.2-243 Unit 3 Site-Specific SSE ISRS - Vent Wall Top in Z-Direction

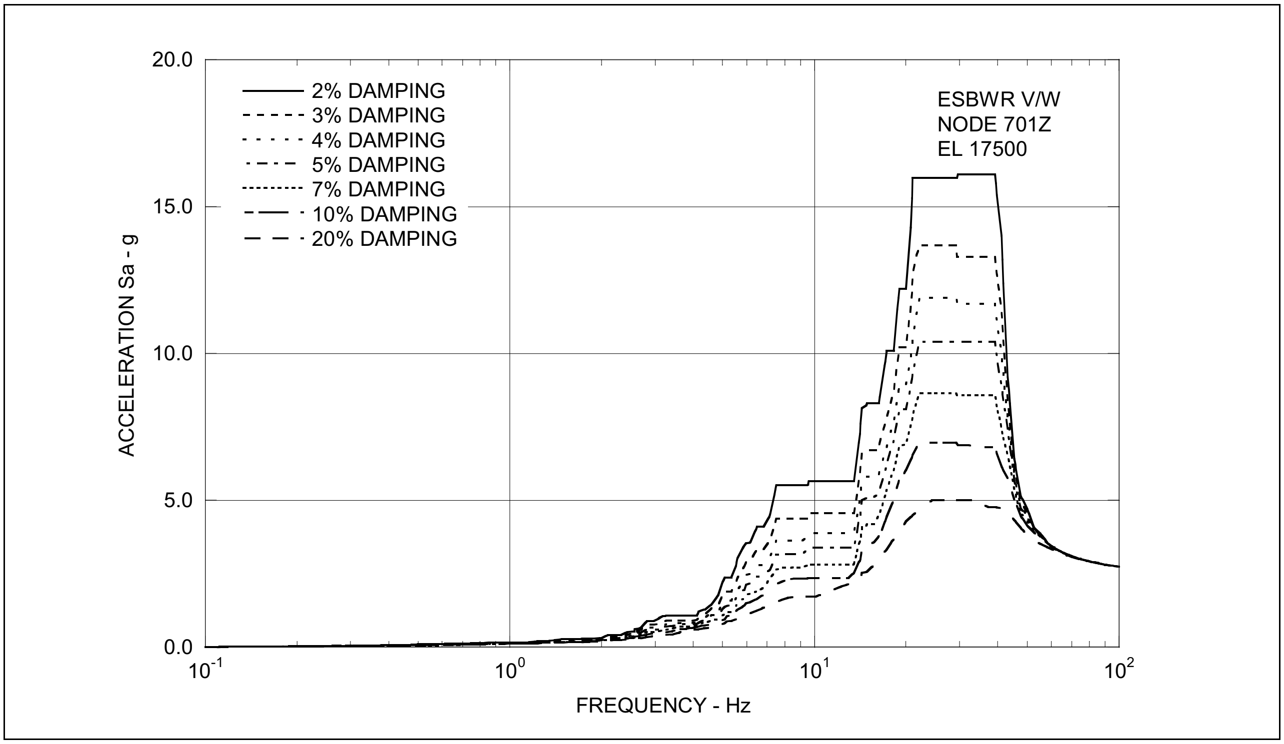


Figure 3.7.2-244 Unit 3 Site-Specific SSE ISRS - RSW Top in Z-Direction

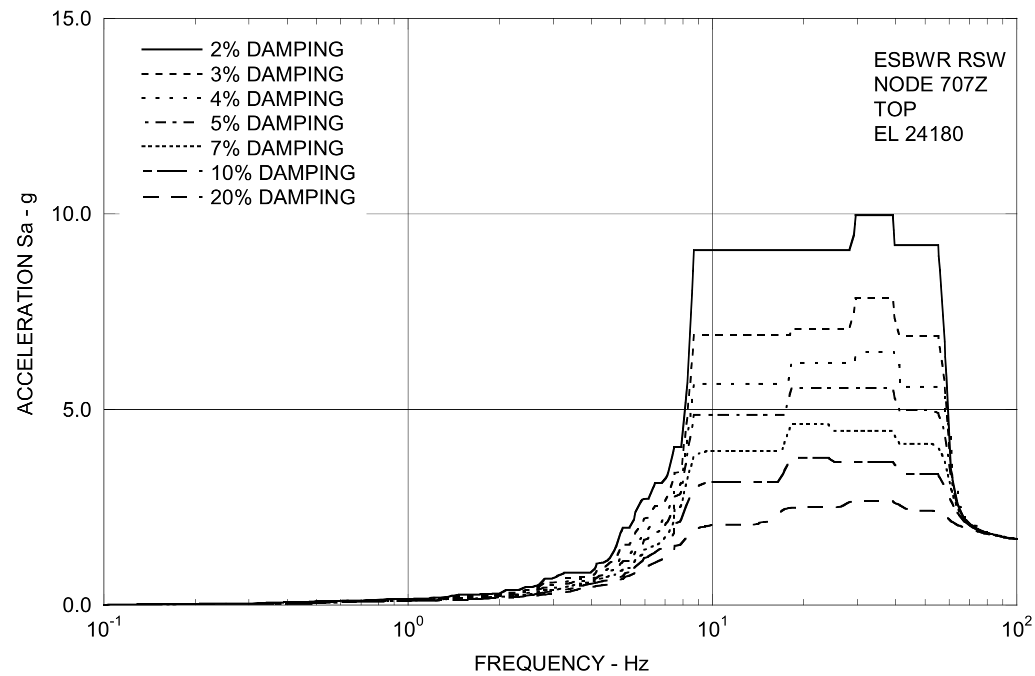


Figure 3.7.2-245 Unit 3 Site-Specific SSE ISRS - RPV Top in Z-Direction

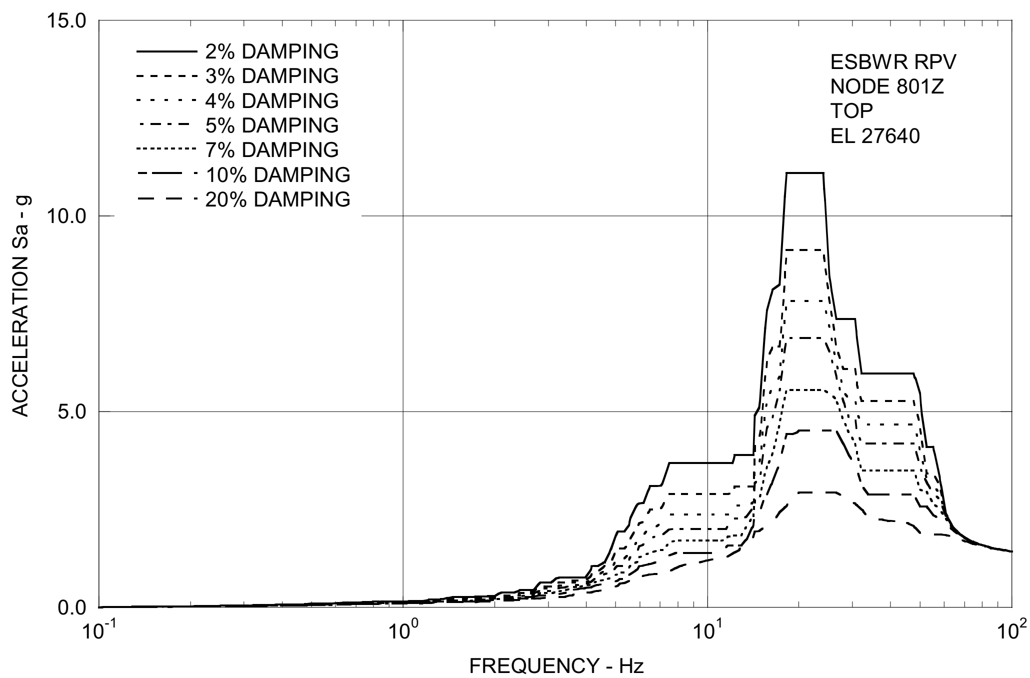


Figure 3.7.2-246 Unit 3 Site-Specific SSE ISRS - Basemat Top in Z-Direction

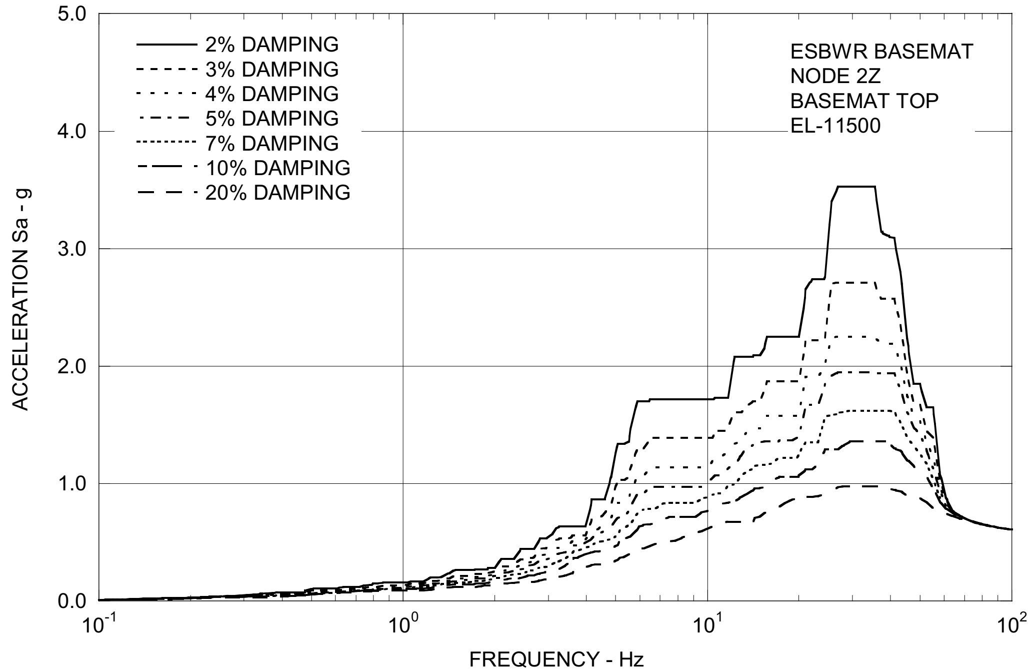


Figure 3.7.2-247 Comparison of ISRS - CB Top in X-Direction

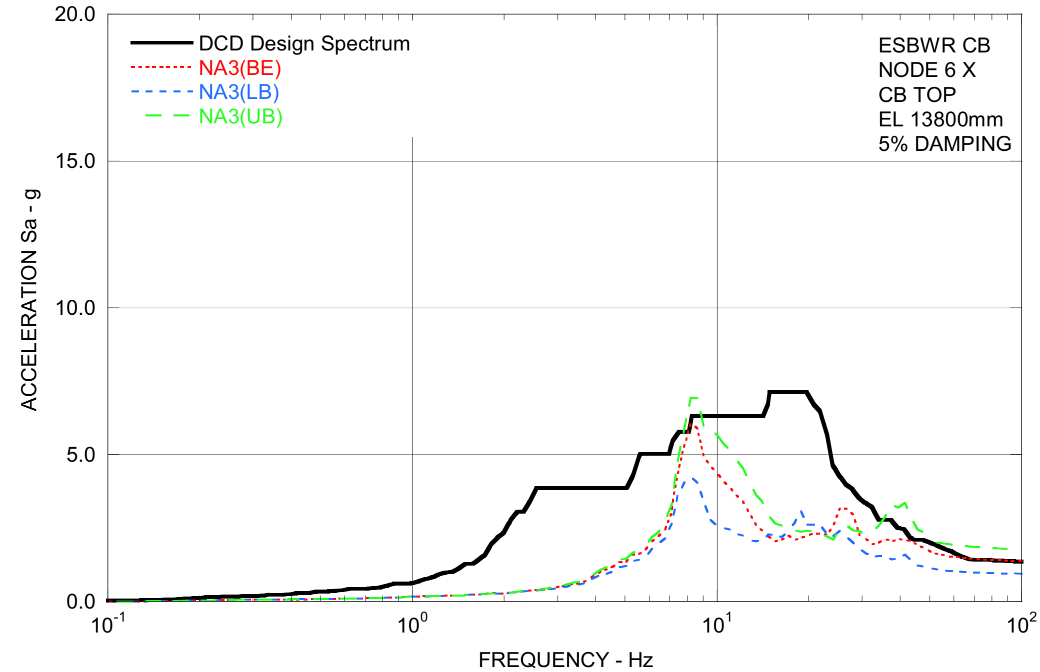


Figure 3.7.2-248 Comparison of ISRS - CB Basemat in X-Direction

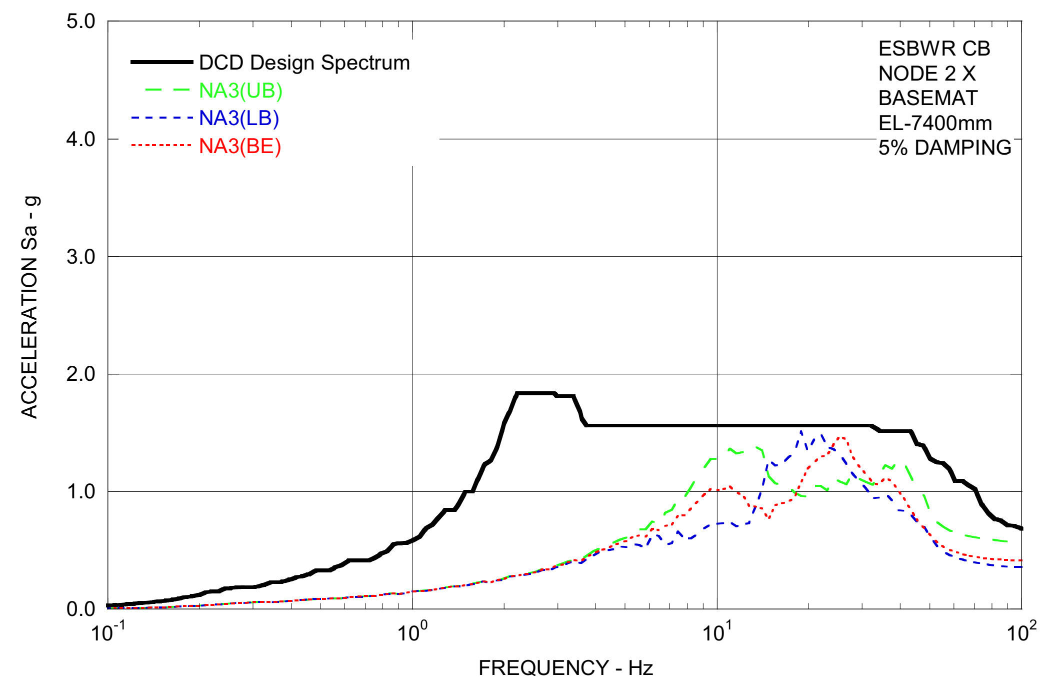


Figure 3.7.2-249 Comparison of ISRS - CB Top in Y-Direction

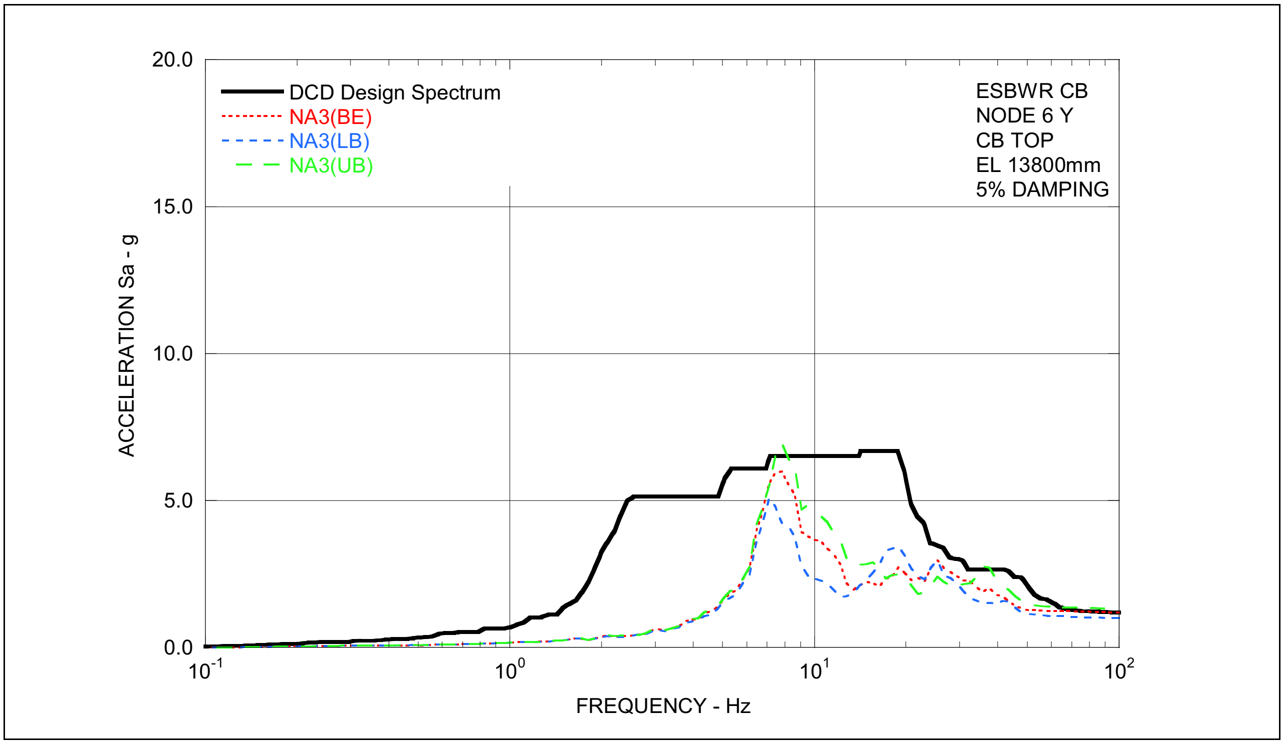


Figure 3.7.2-250 Comparison of ISRS - CB Basemat in Y-Direction

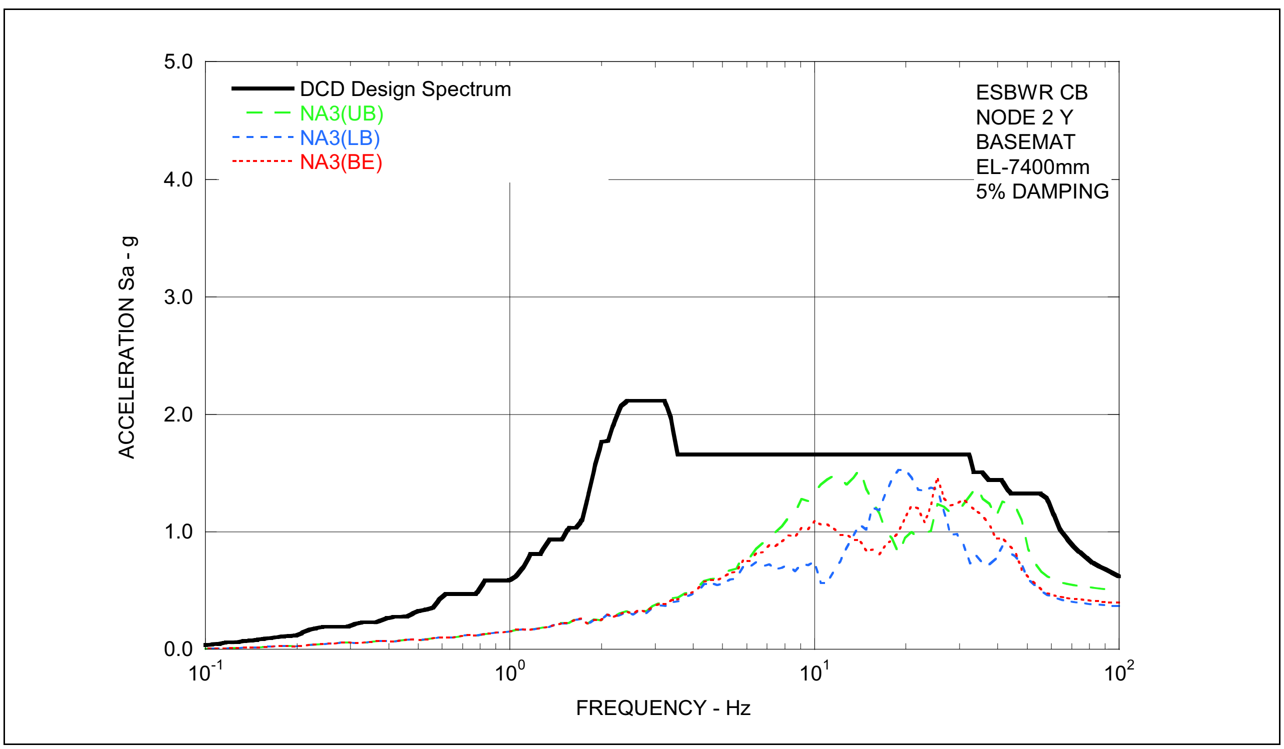


Figure 3.7.2-251 Comparison of ISRS - CB Top in Z-Direction

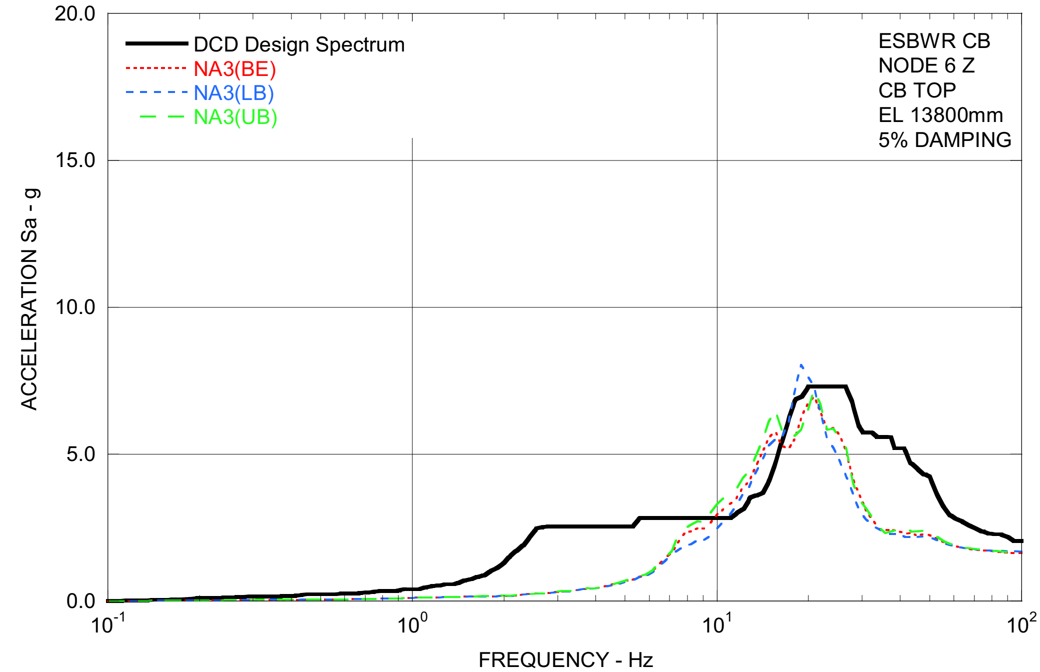


Figure 3.7.2-252 Comparison of ISRS - CB Basemat in Z-Direction

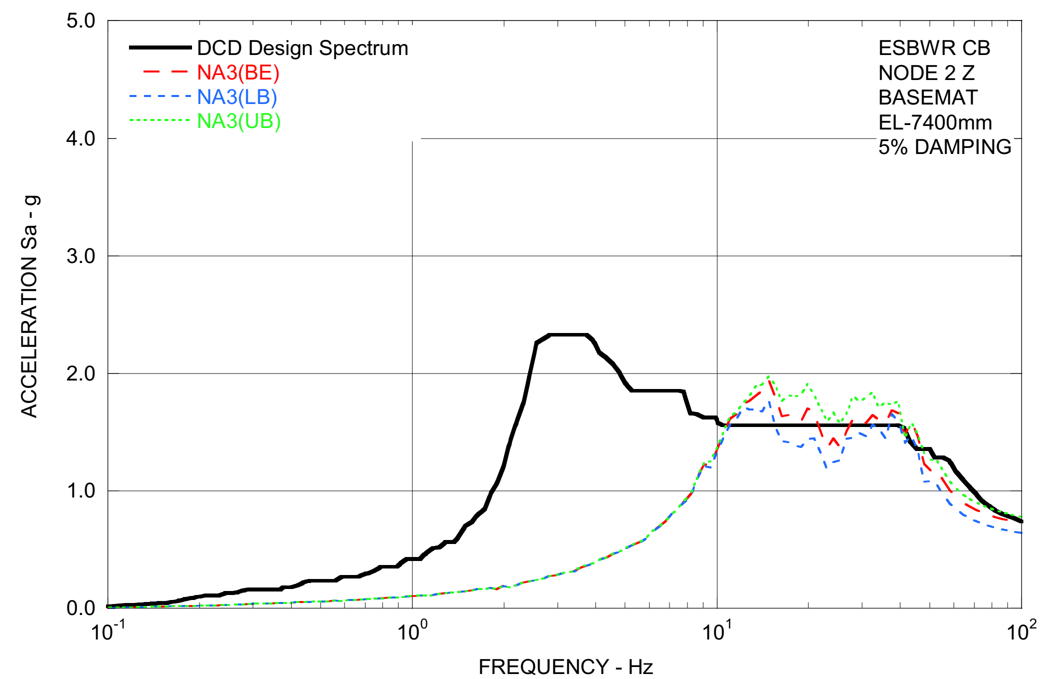


Figure 3.7.2-253 Unit 3 Site-Specific SSE ISRS - CB Top in X-Direction

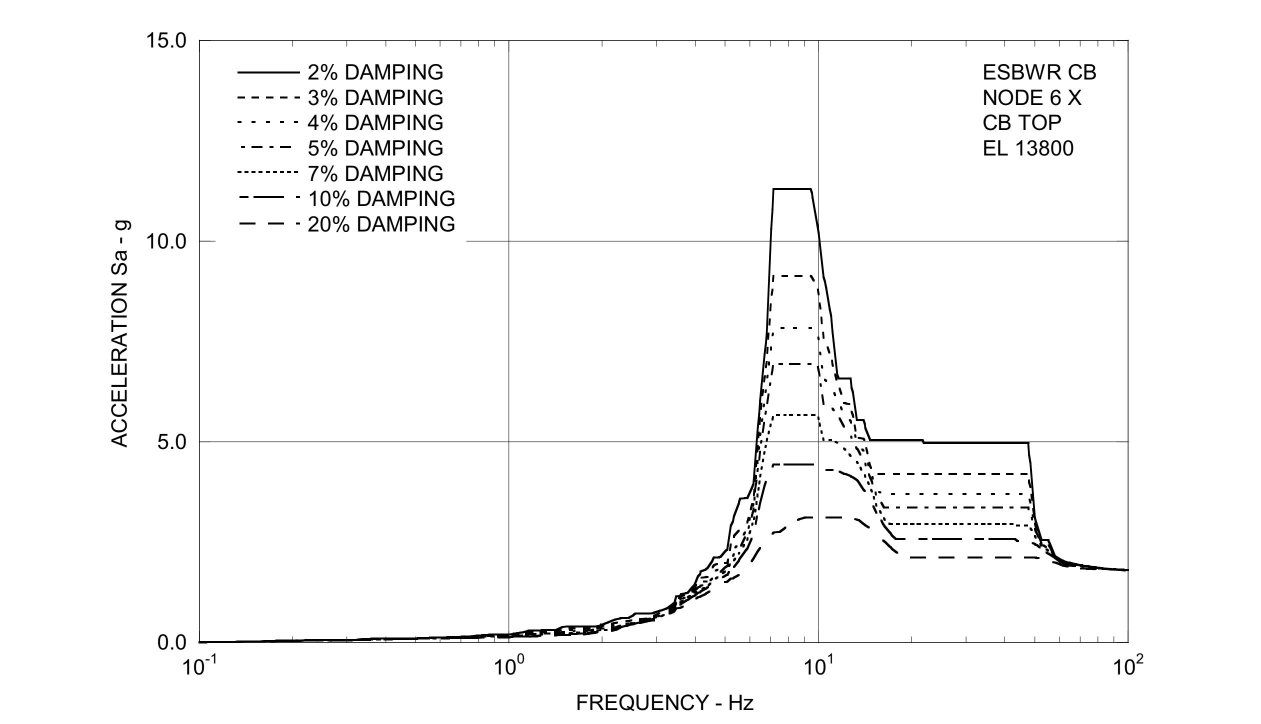


Figure 3.7.2-254 Unit 3 Site-Specific SSE ISRS - CB Basemat in X-Direction

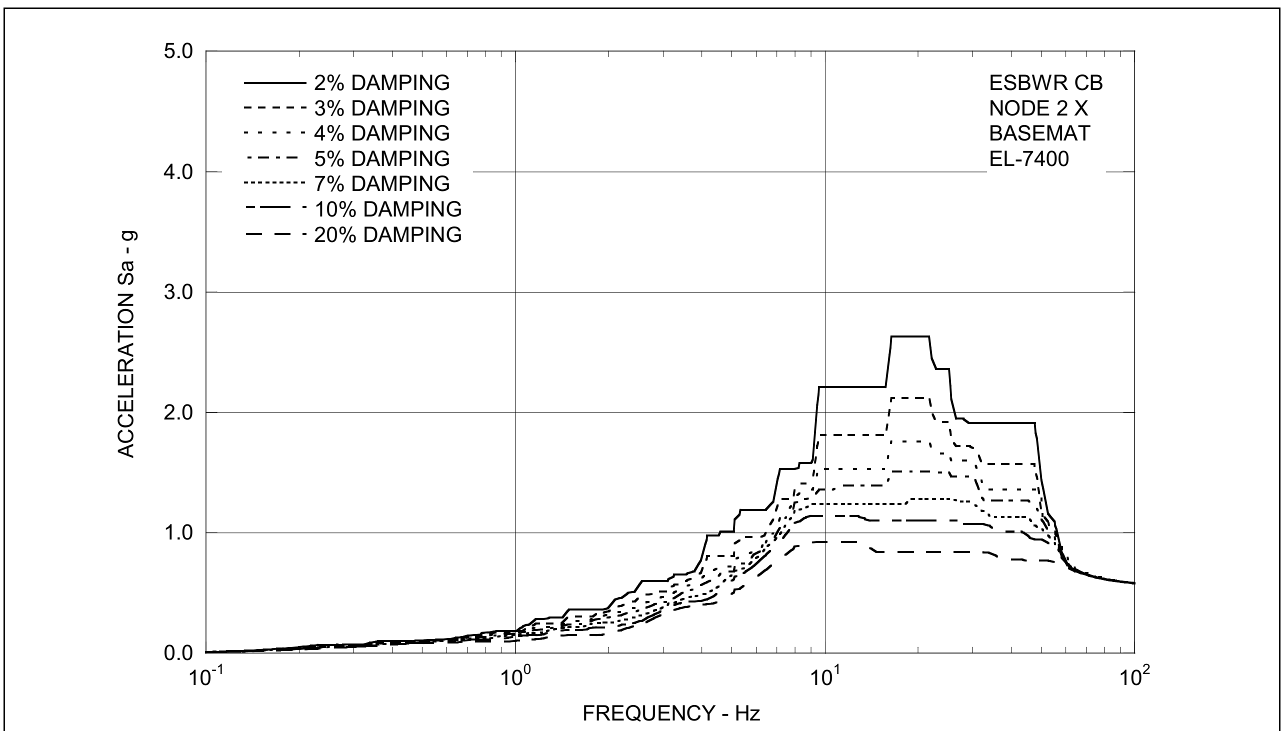


Figure 3.7.2-255 Unit 3 Site-Specific SSE ISRS - CB Top in Y-Direction

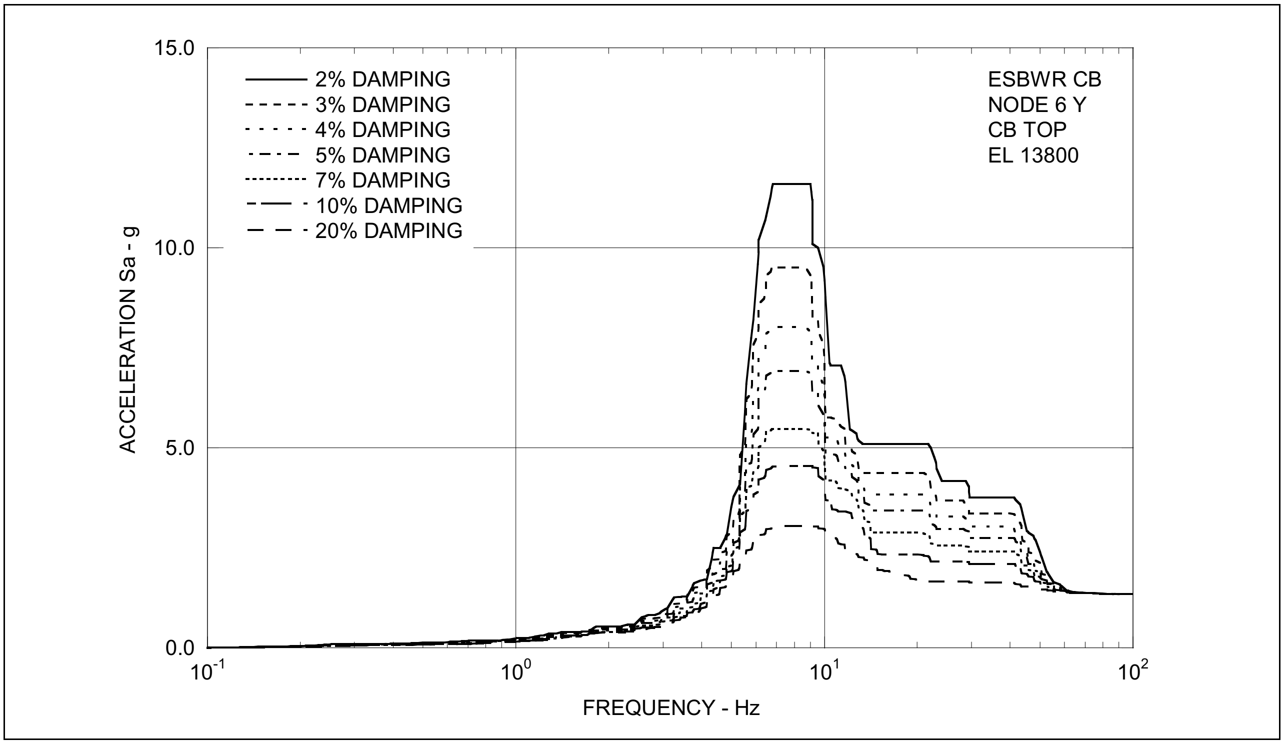


Figure 3.7.2-256 Unit 3 Site-Specific SSE ISRS - CB Basemat in Y-Direction

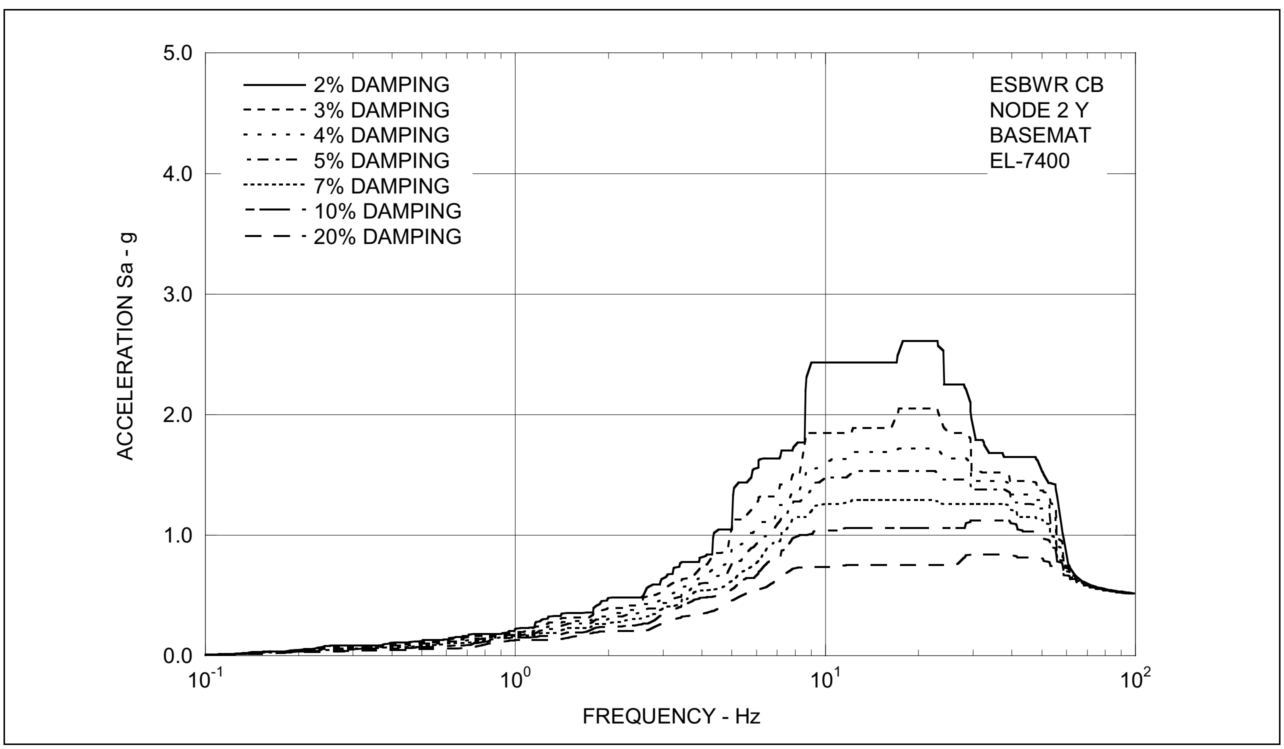


Figure 3.7.2-257 Unit 3 Site-Specific SSE ISRS - CB Top in Z-Direction

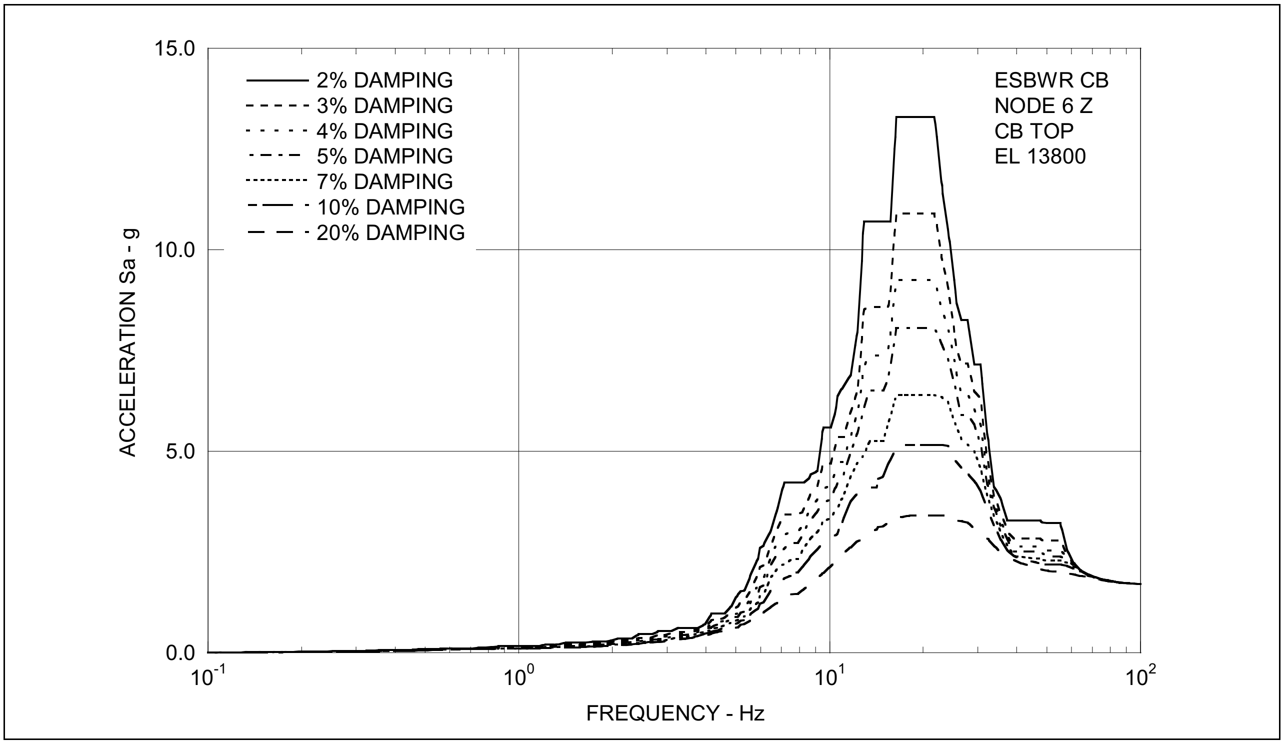


Figure 3.7.2-258 Unit 3 Site-Specific SSE ISRS - CB Basemat in Z-Direction

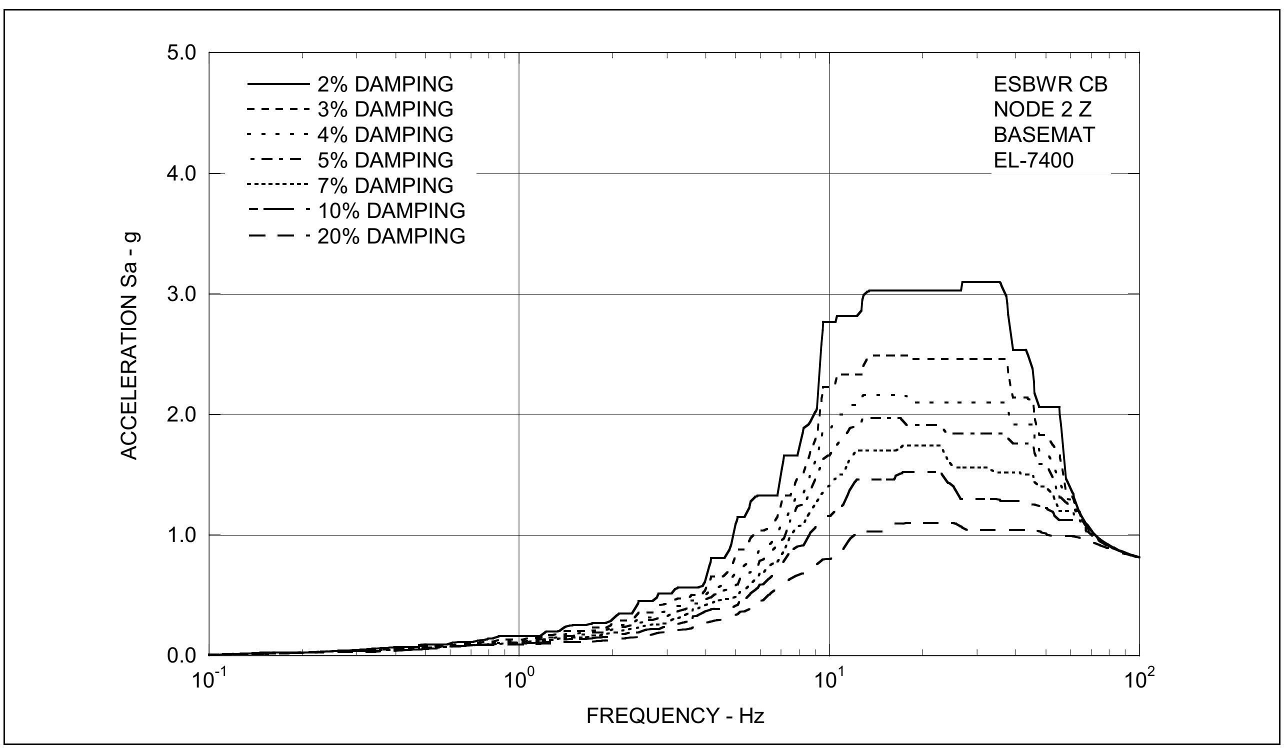


Figure 3.7.2-259 Comparison of ISRS - FWS Wall Top in X-Direction

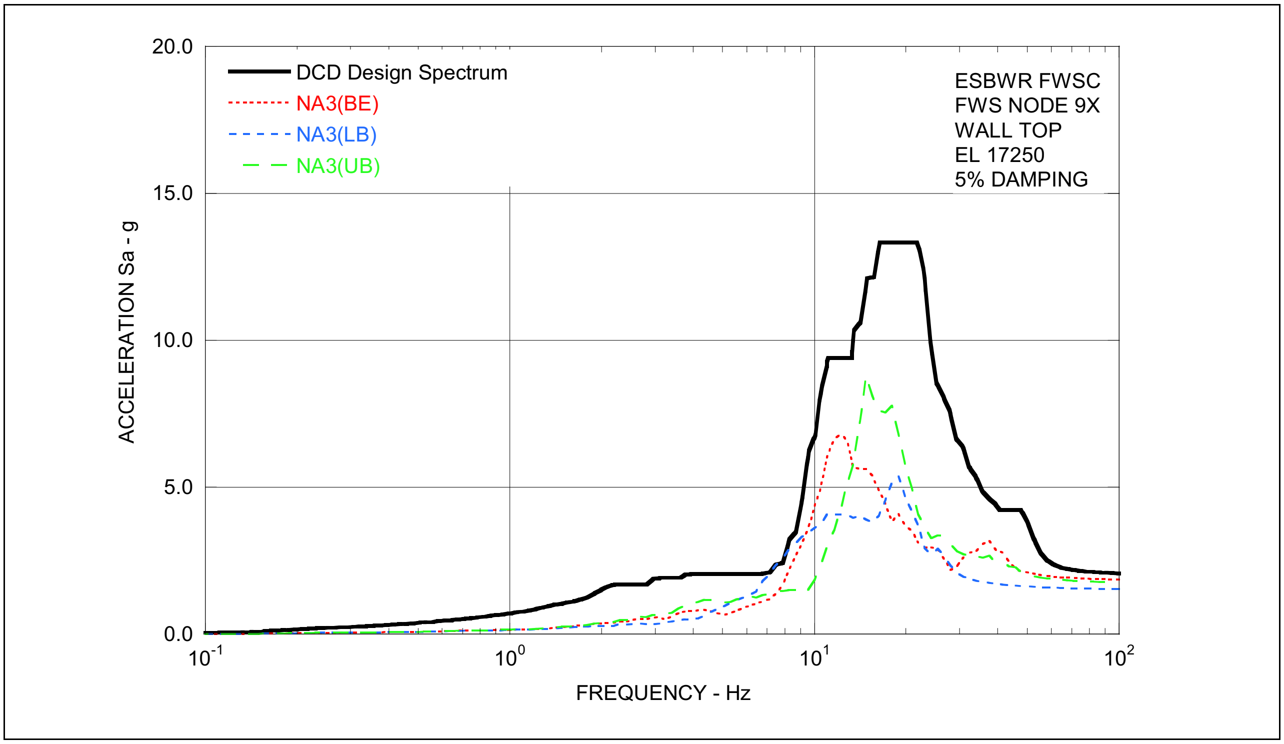


Figure 3.7.2-260 Comparison of ISRS - FWS Basemat in X-Direction

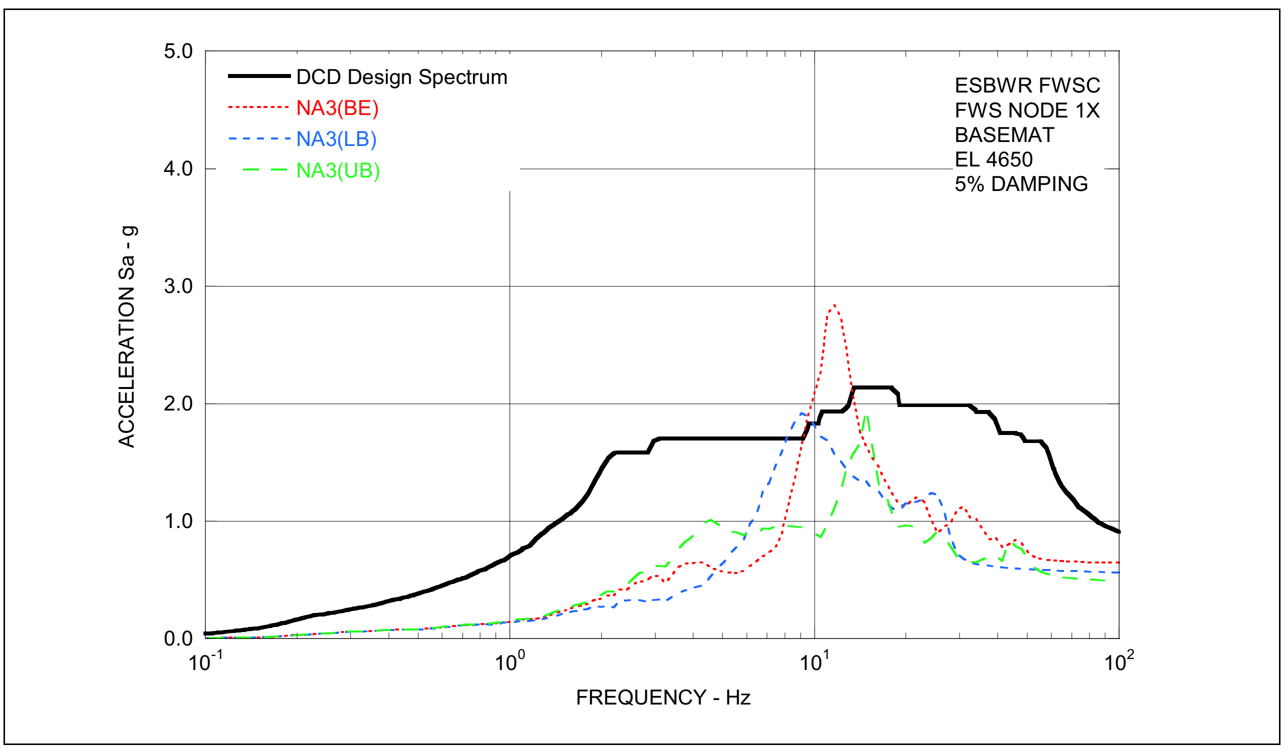


Figure 3.7.2-261 Comparison of ISRS - FPE Top in X-Direction

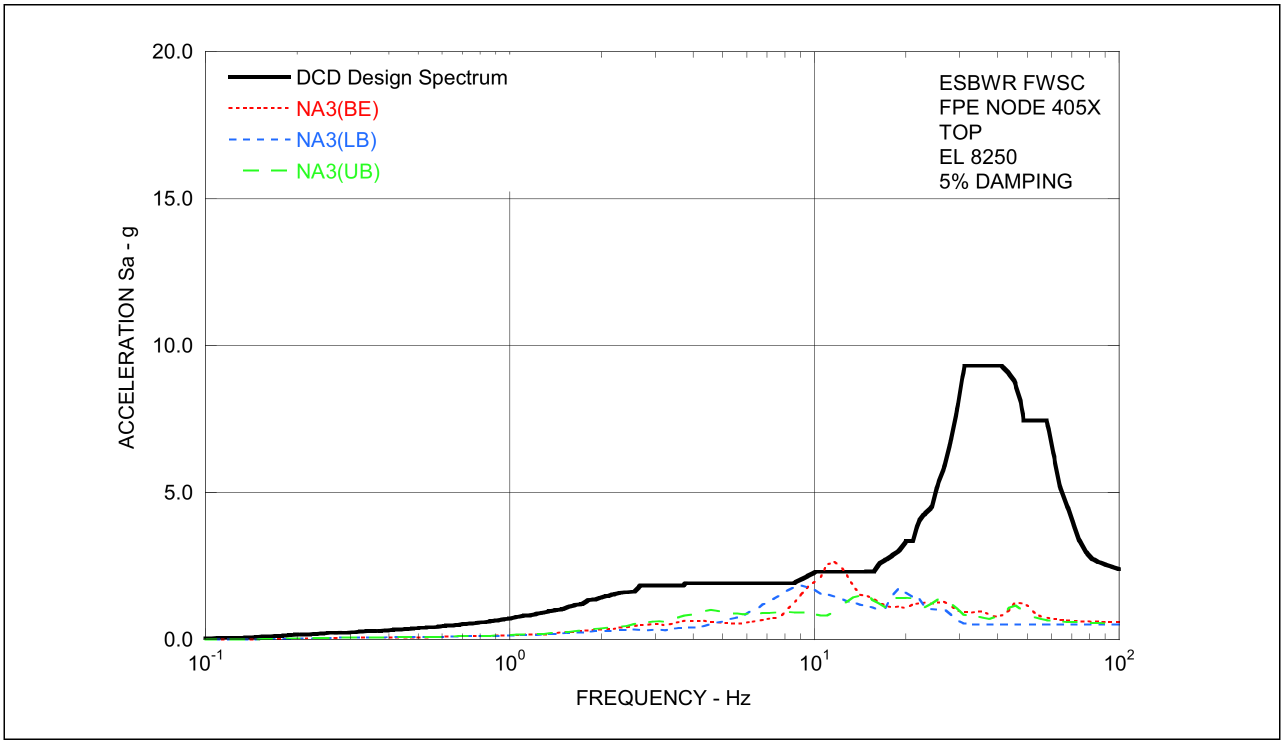


Figure 3.7.2-262 Comparison of ISRS - FPE Basemat in X-Direction

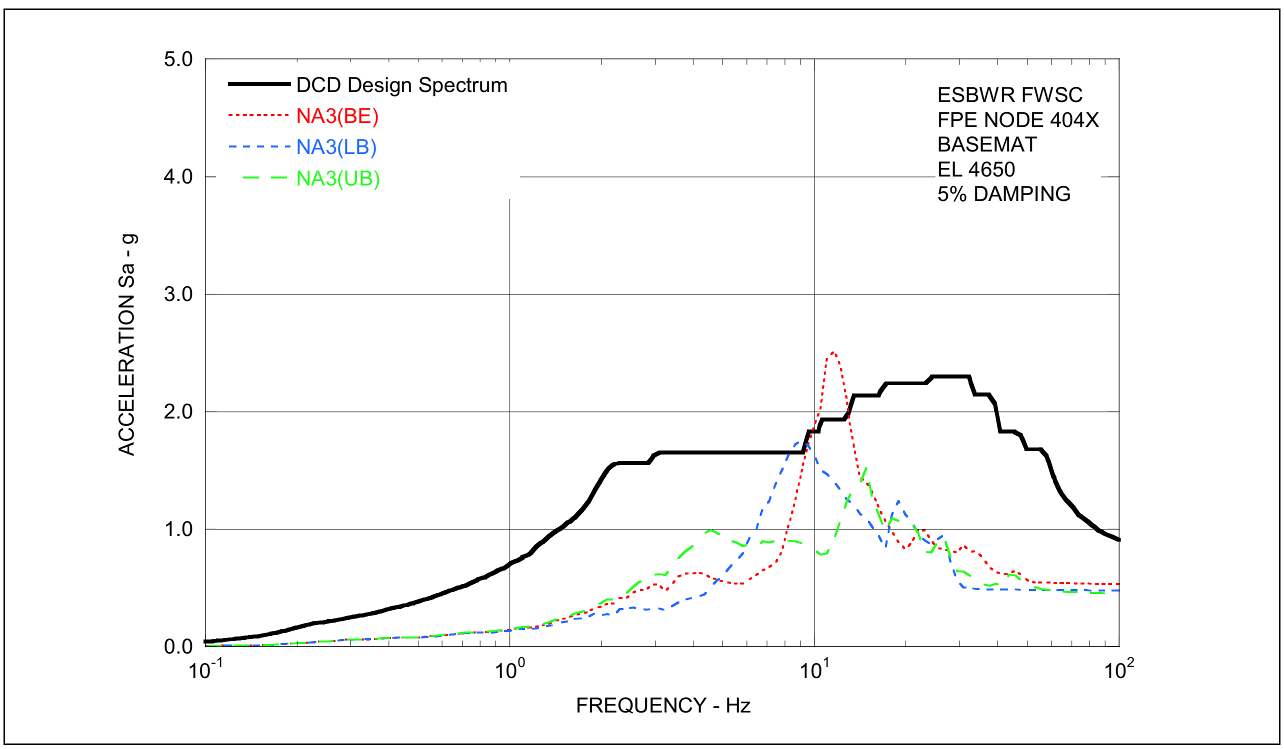


Figure 3.7.2-263 Comparison of ISRS - FWS Wall Top in Y-Direction

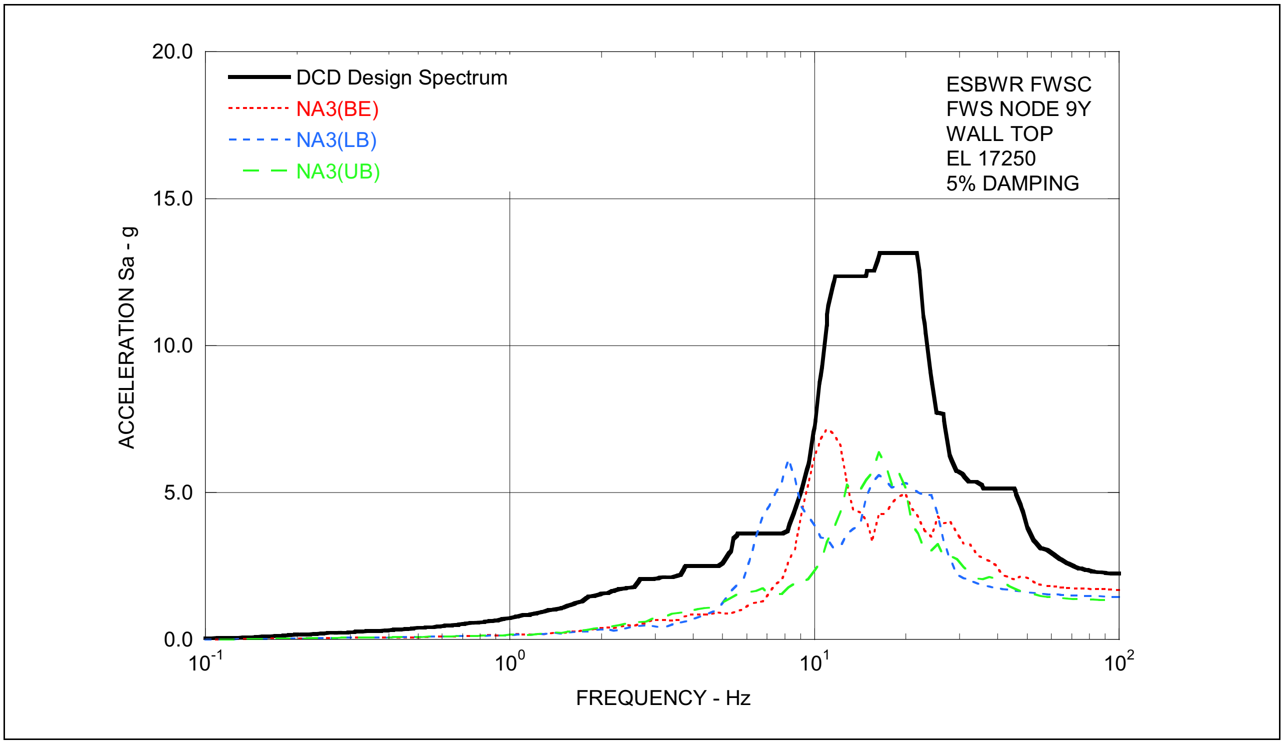


Figure 3.7.2-264 Comparison of ISRS - FWS Basemat in Y -Direction

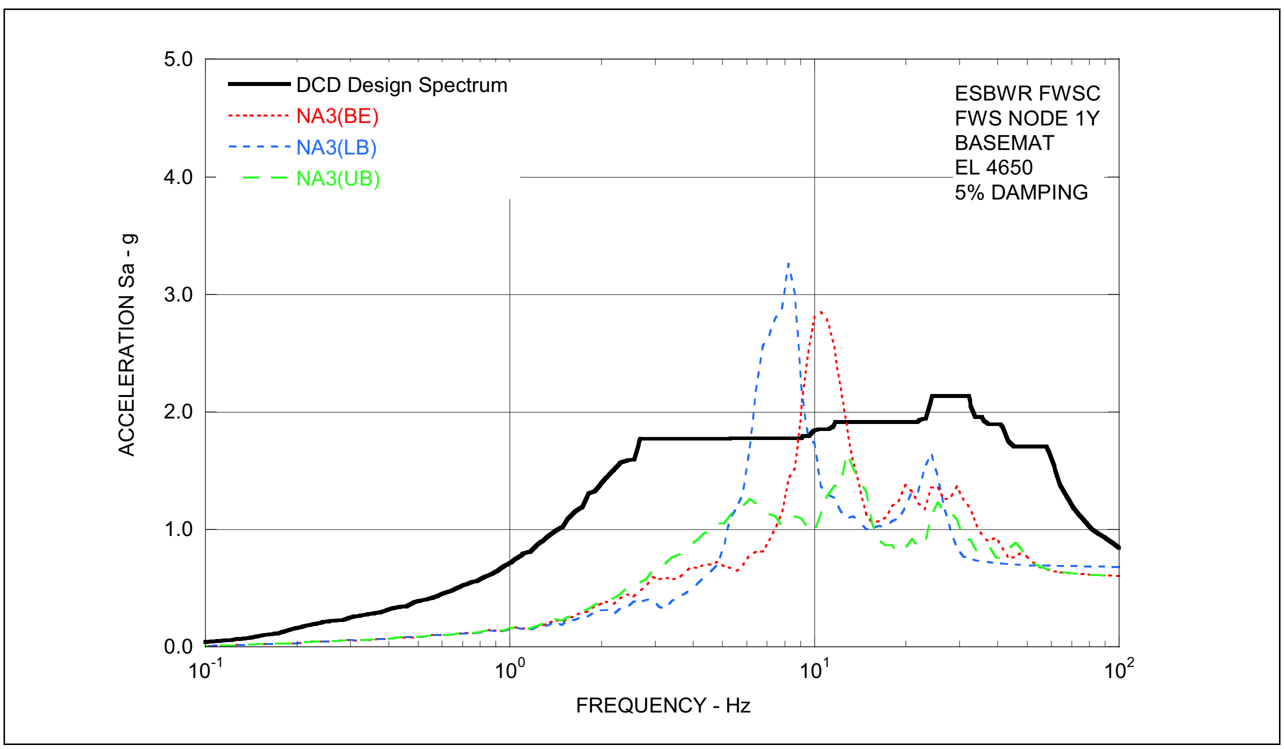


Figure 3.7.2-265 Comparison of ISRS - FPE Top in Y -Direction

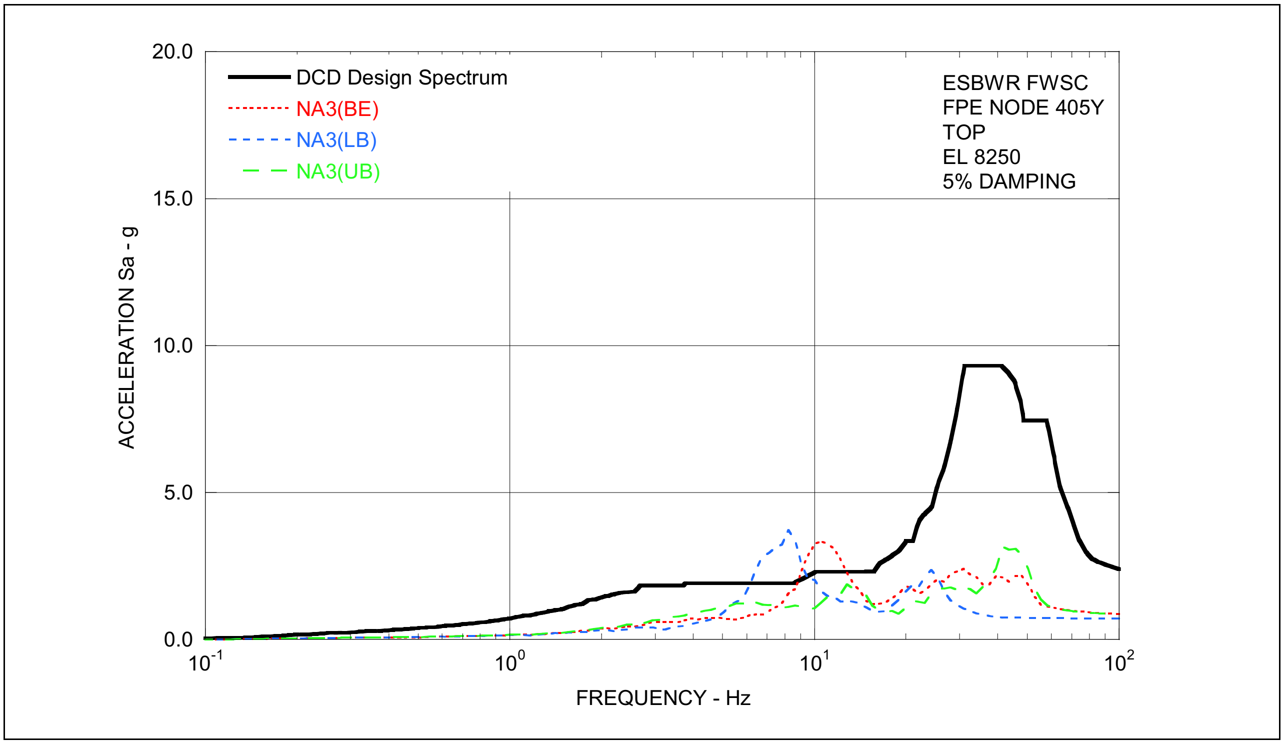


Figure 3.7.2-266 Comparison of ISRS - FPE Basemat in Y -Direction

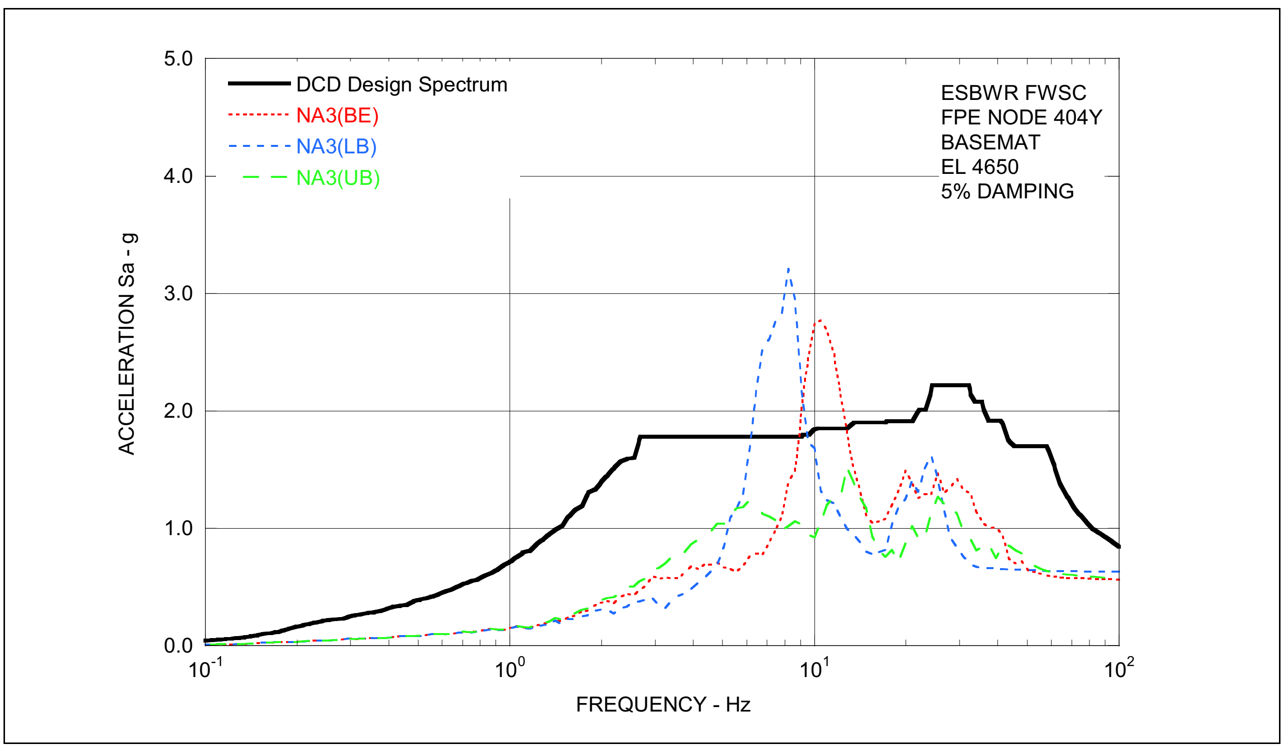


Figure 3.7.2-267 Comparison of ISRS - FWS Wall Top in Z-Direction

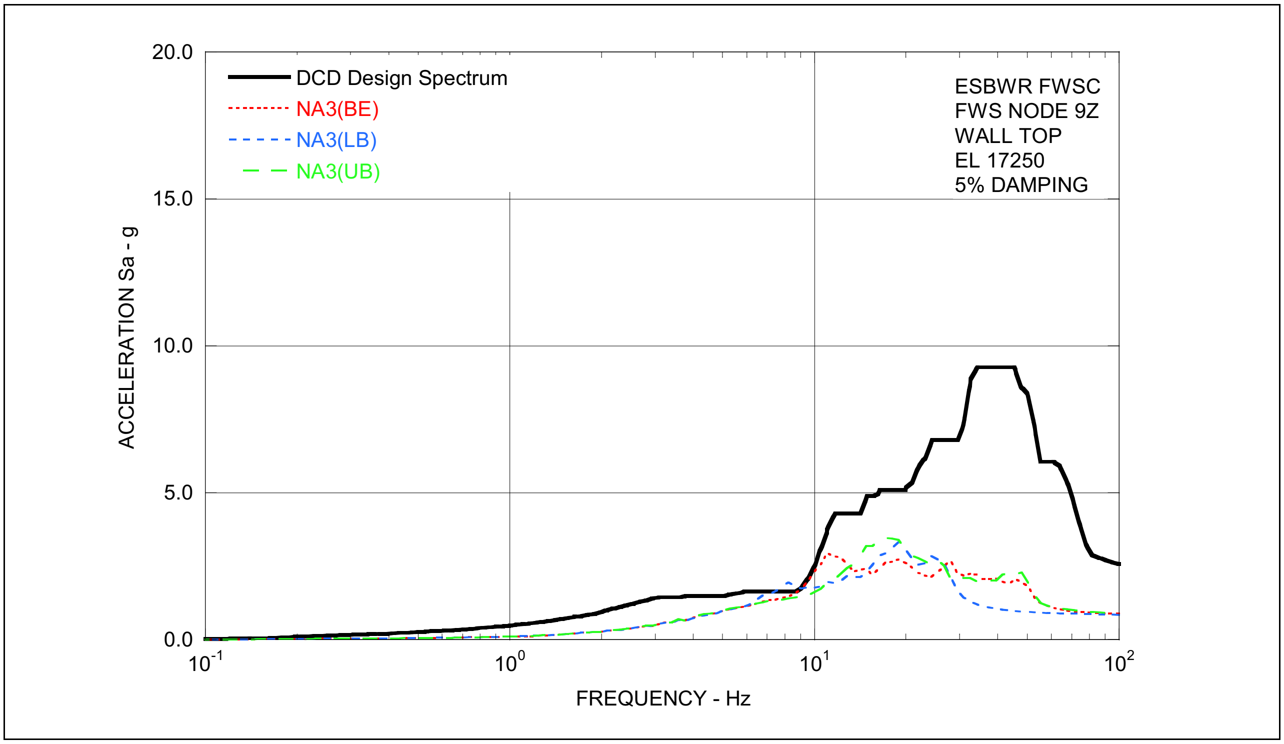


Figure 3.7.2-268 Comparison of ISRS - FWS Basemat in Z-Direction

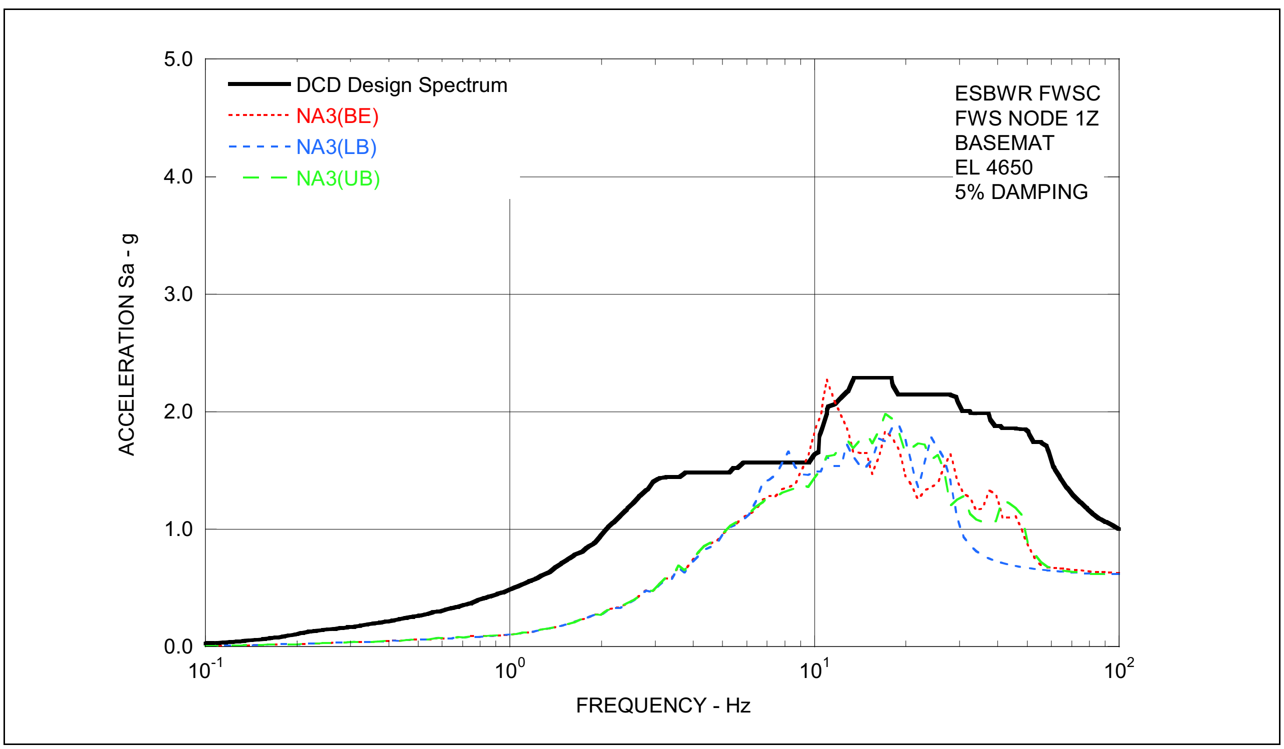


Figure 3.7.2-269 Comparison of ISRS - FPE Top in Z-Direction

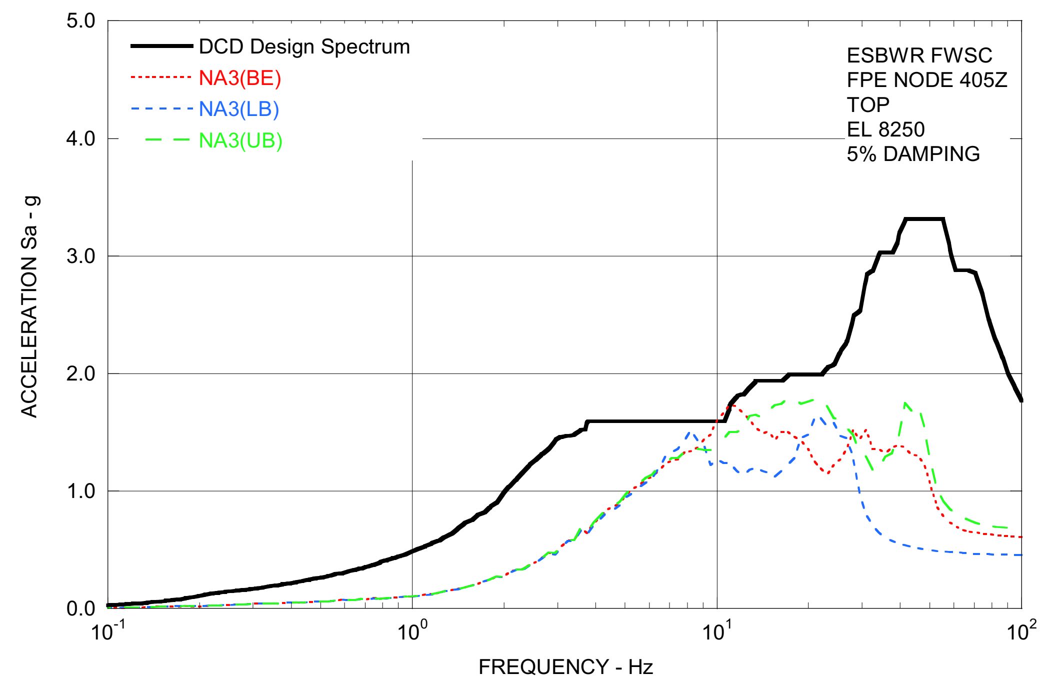


Figure 3.7.2-270 Comparison of ISRS - FPE Basemat in Z-Direction

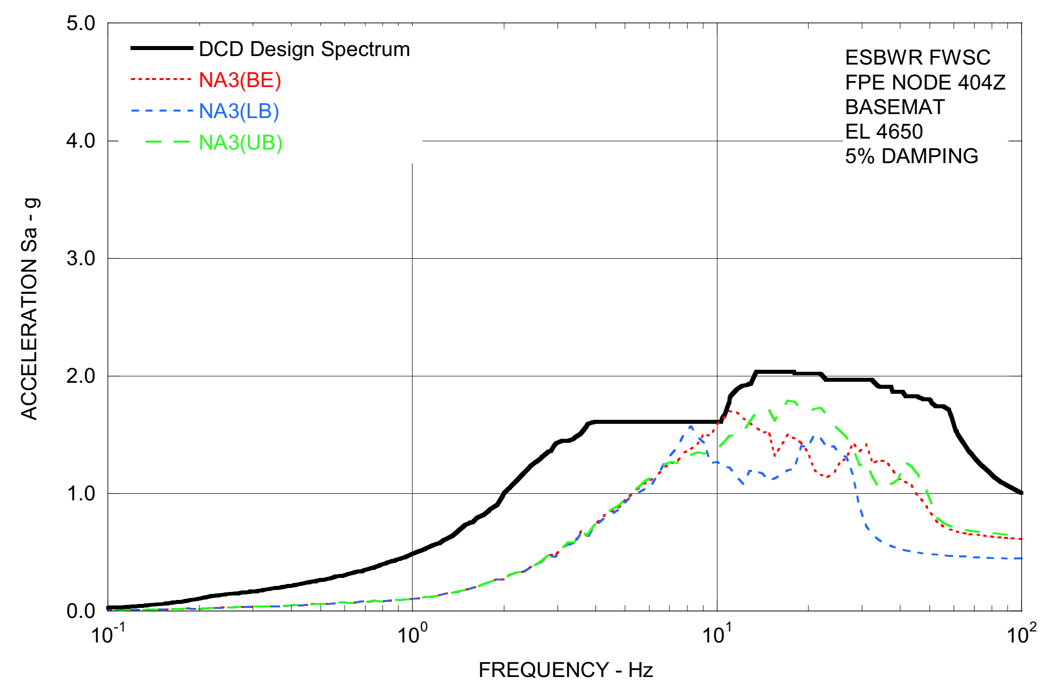


Figure 3.7.2-271 Unit 3 Site-Specific SSE ISRS - FWS Wall Top in X-Direction

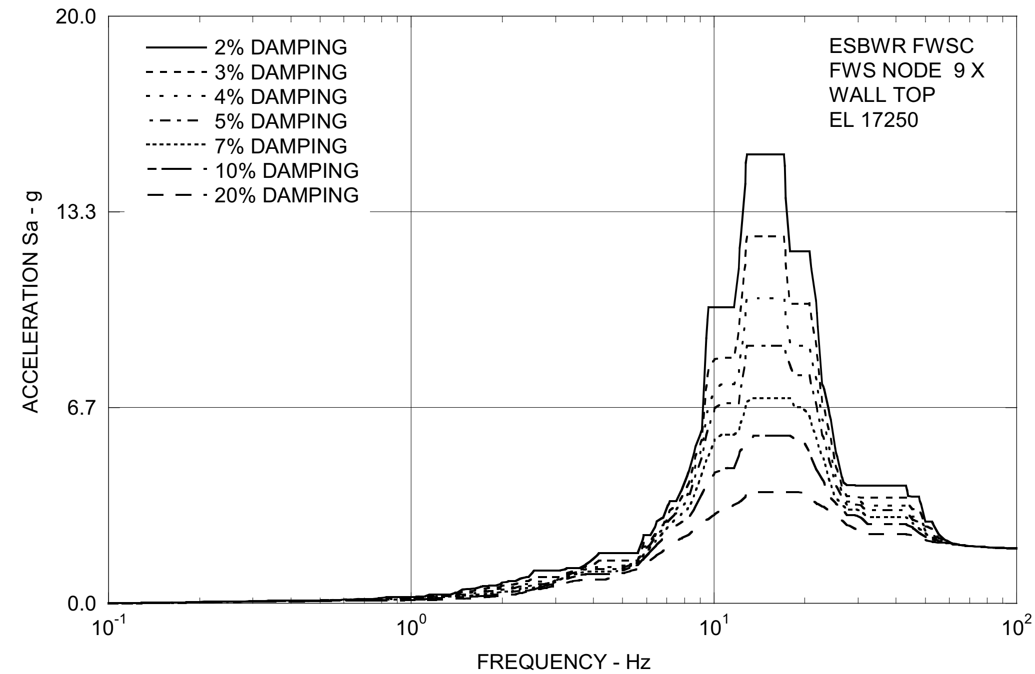


Figure 3.7.2-272 Unit 3 Site-Specific SSE ISRS - FWS Basemat in X-Direction

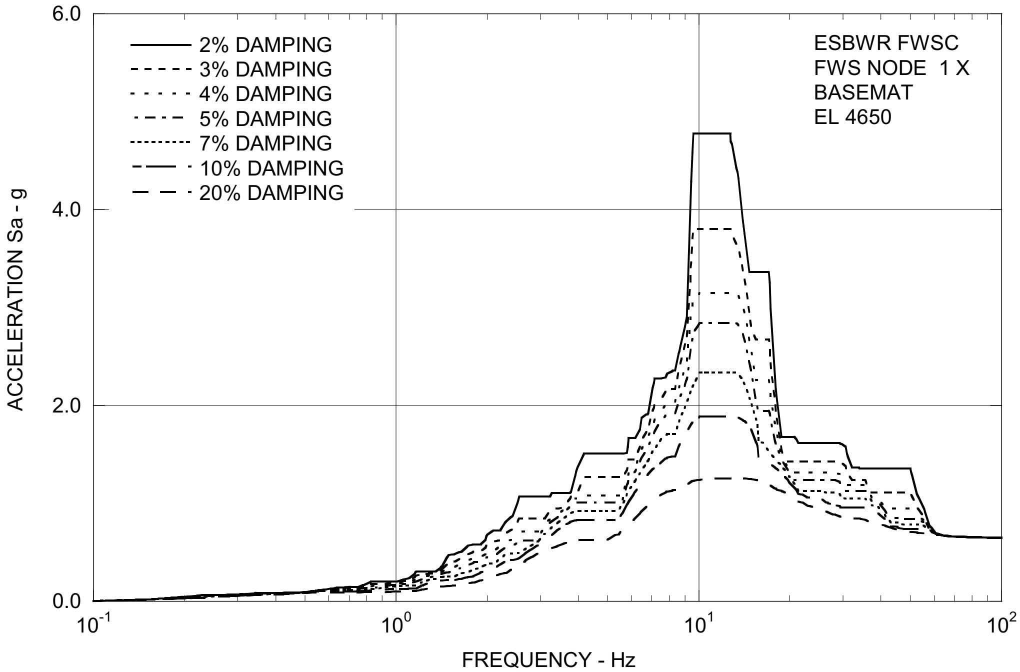


Figure 3.7.2-273 Unit 3 Site-Specific SSE ISRS - FPE Top in X-Direction

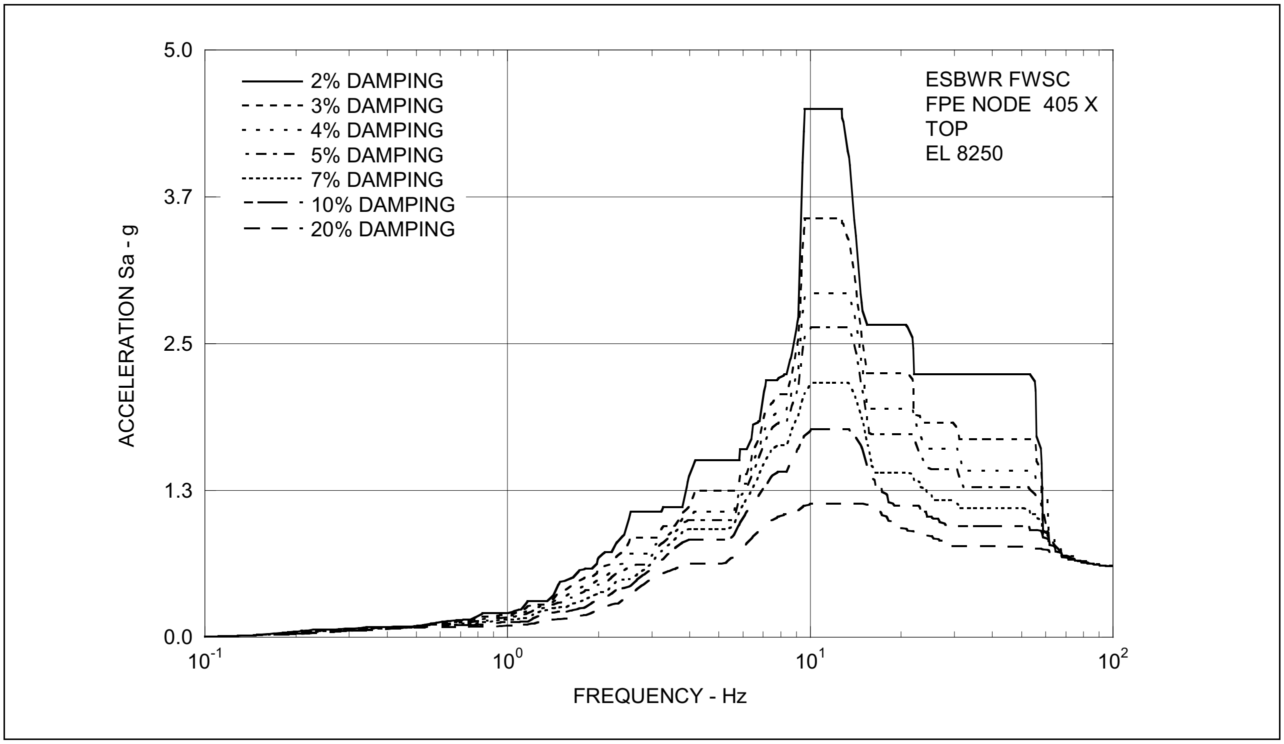


Figure 3.7.2-274 Unit 3 Site-Specific SSE ISRS - FPE Basemat in X-Direction

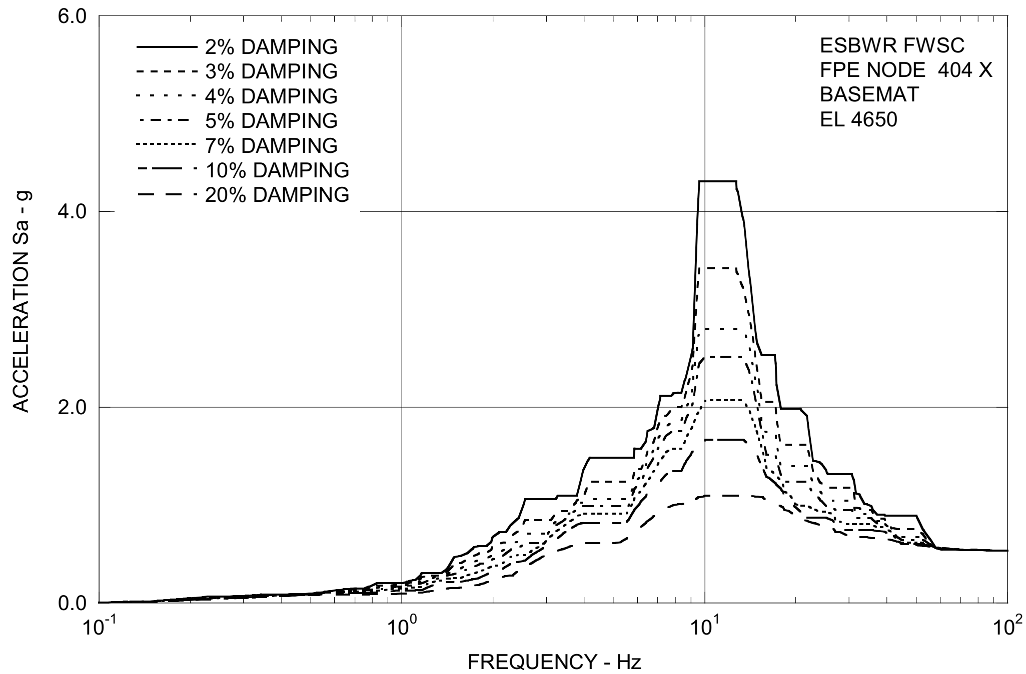


Figure 3.7.2-275 Unit 3 Site-Specific SSE ISRS - FWS Wall Top in Y-Direction

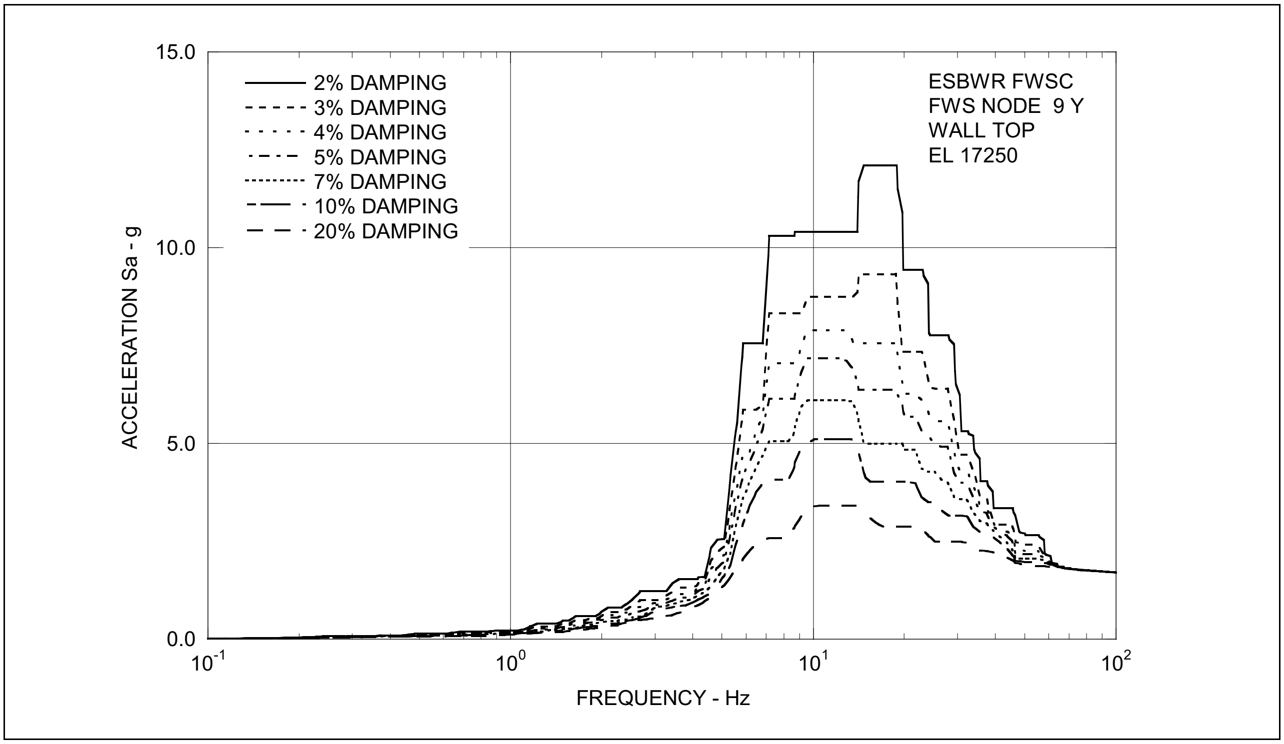


Figure 3.7.2-276 Unit 3 Site-Specific SSE ISRS - FWS Basemat in Y-Direction

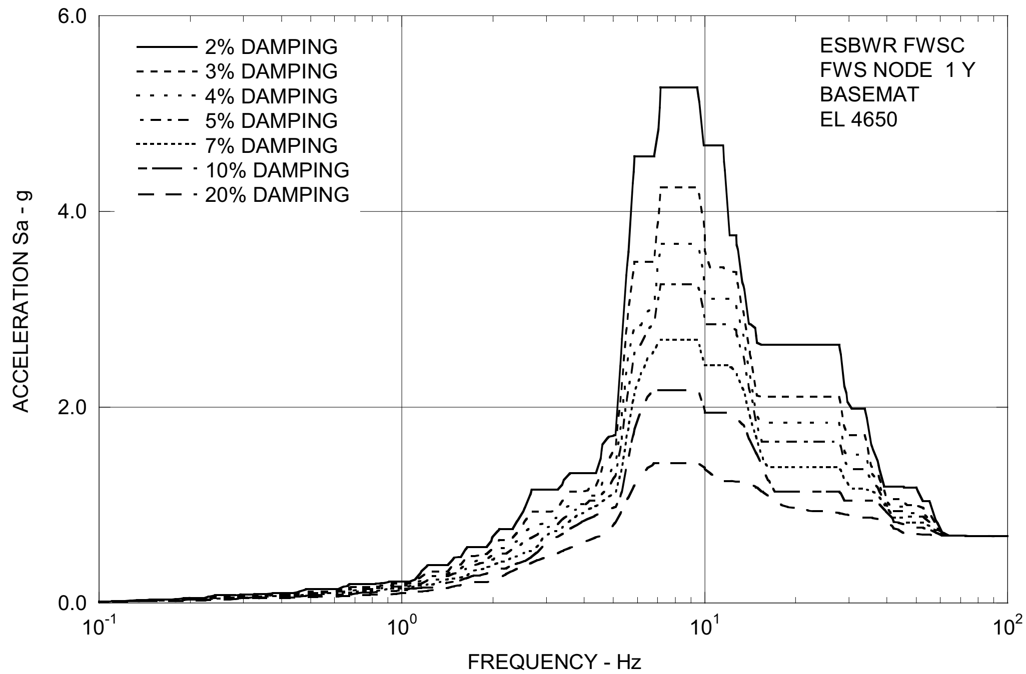


Figure 3.7.2-277 Unit 3 Site-Specific SSE ISRS - FPE Top in Y-Direction

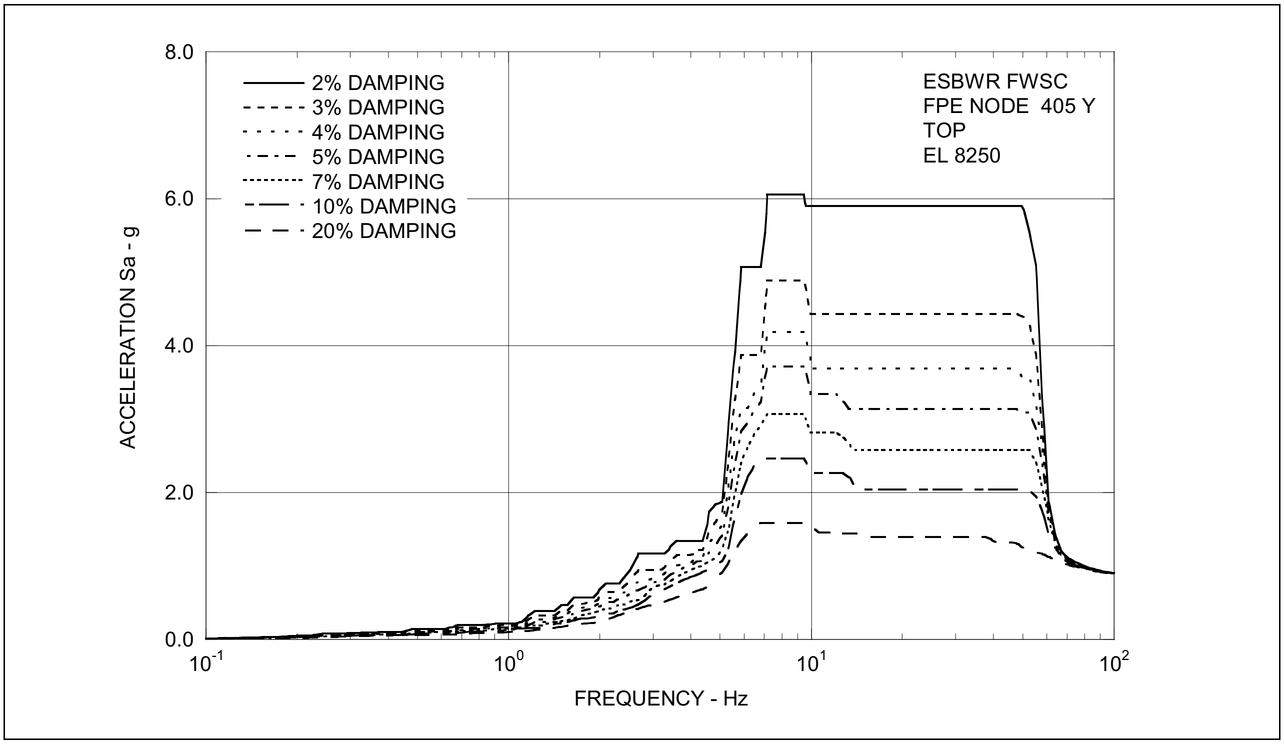


Figure 3.7.2-278 Unit 3 Site-Specific SSE ISRS - FPE Basemat in Y-Direction

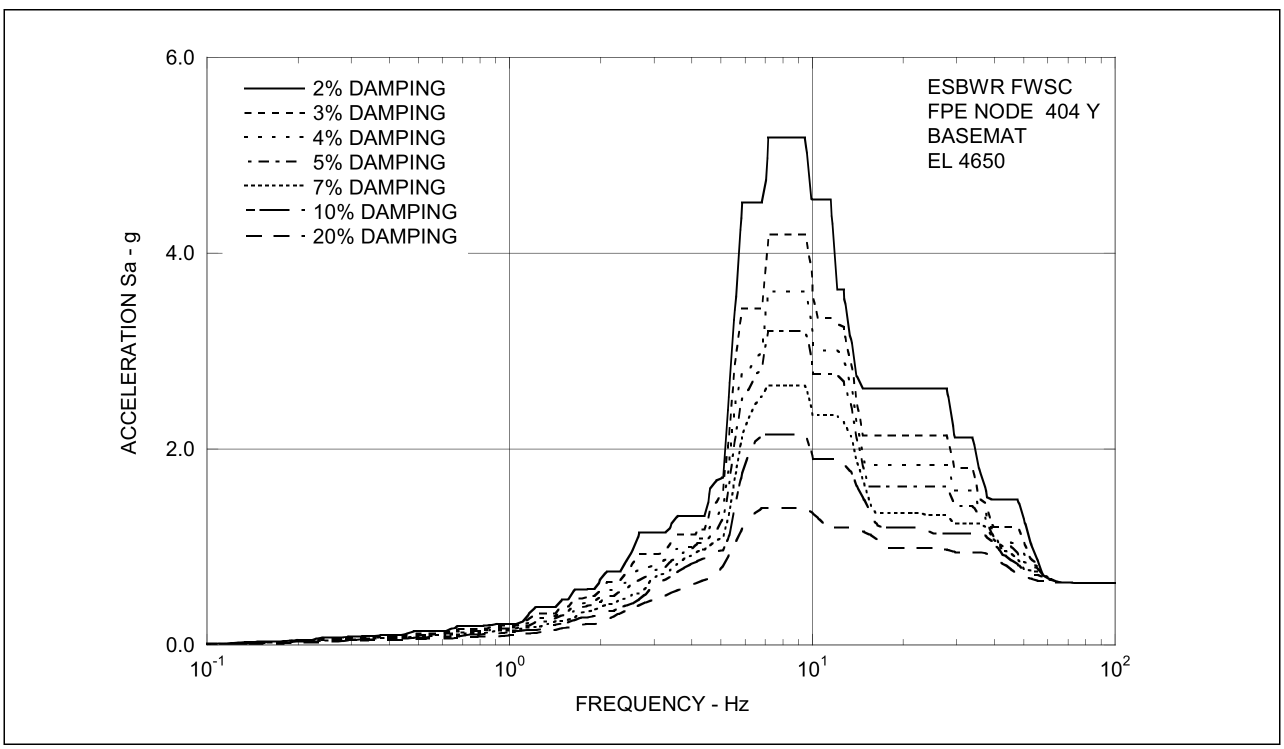


Figure 3.7.2-279 Unit 3 Site-Specific SSE ISRS - FWS Wall Top in Z-Direction

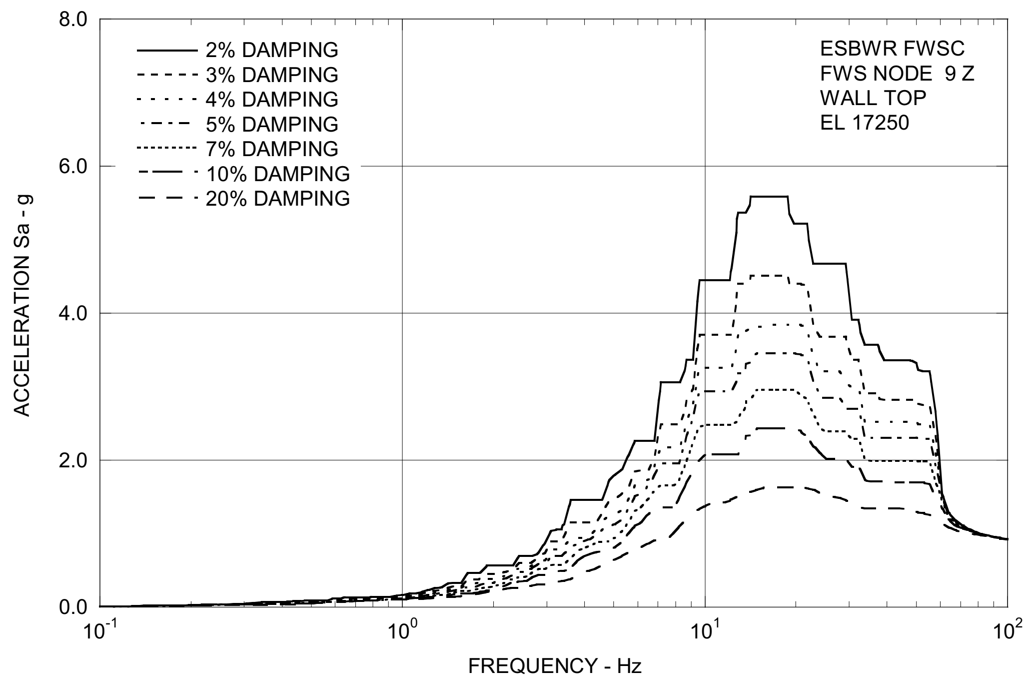


Figure 3.7.2-280 Unit 3 Site-Specific SSE ISRS - FWS Basemat in Z-Direction

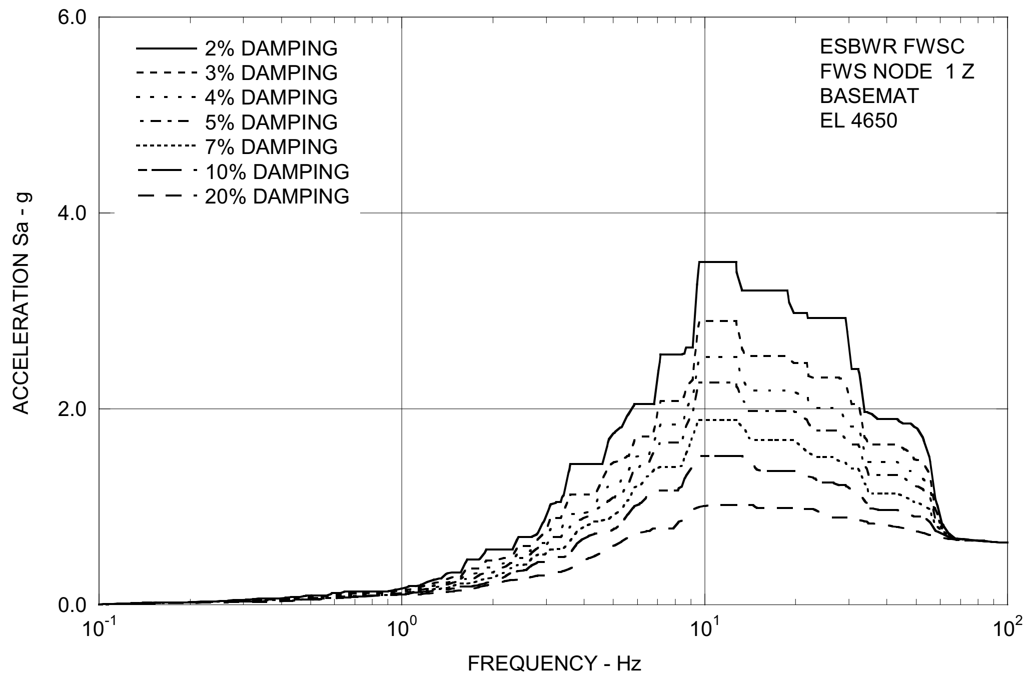


Figure 3.7.2-281 Unit 3 Site-Specific SSE ISRS - FPE Top in Z-Direction

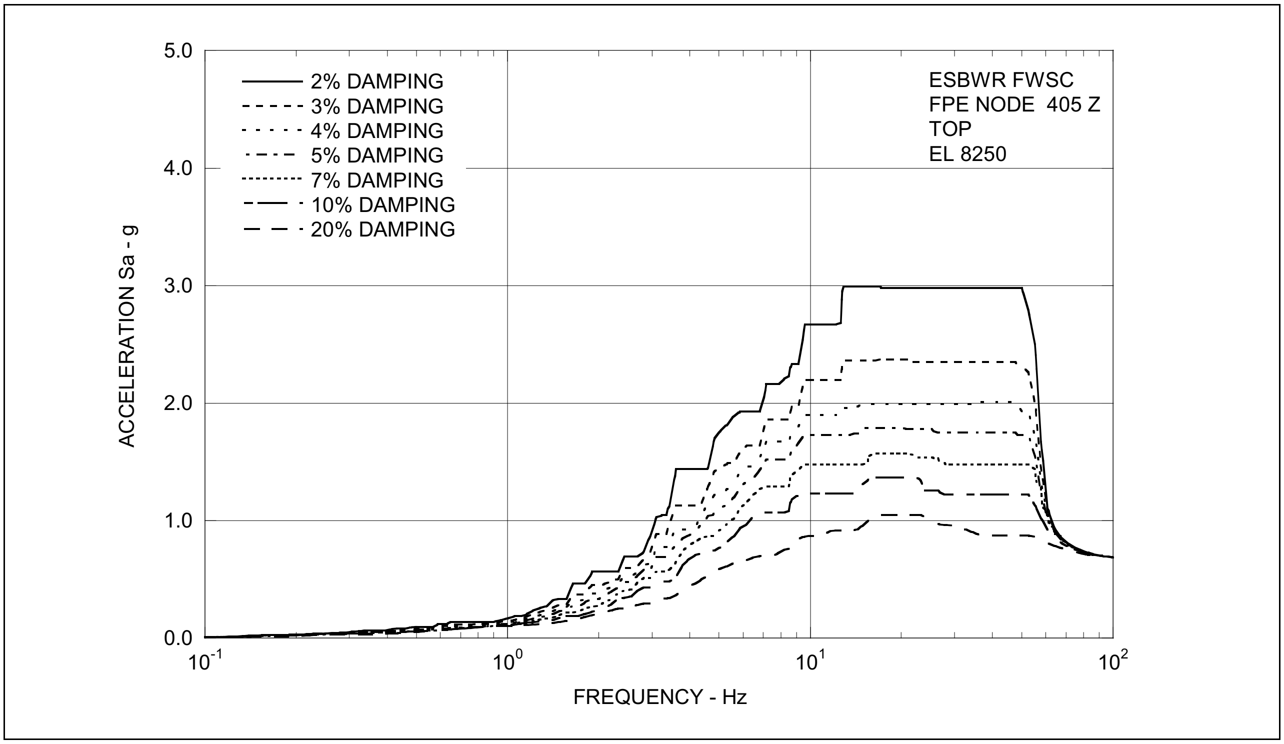
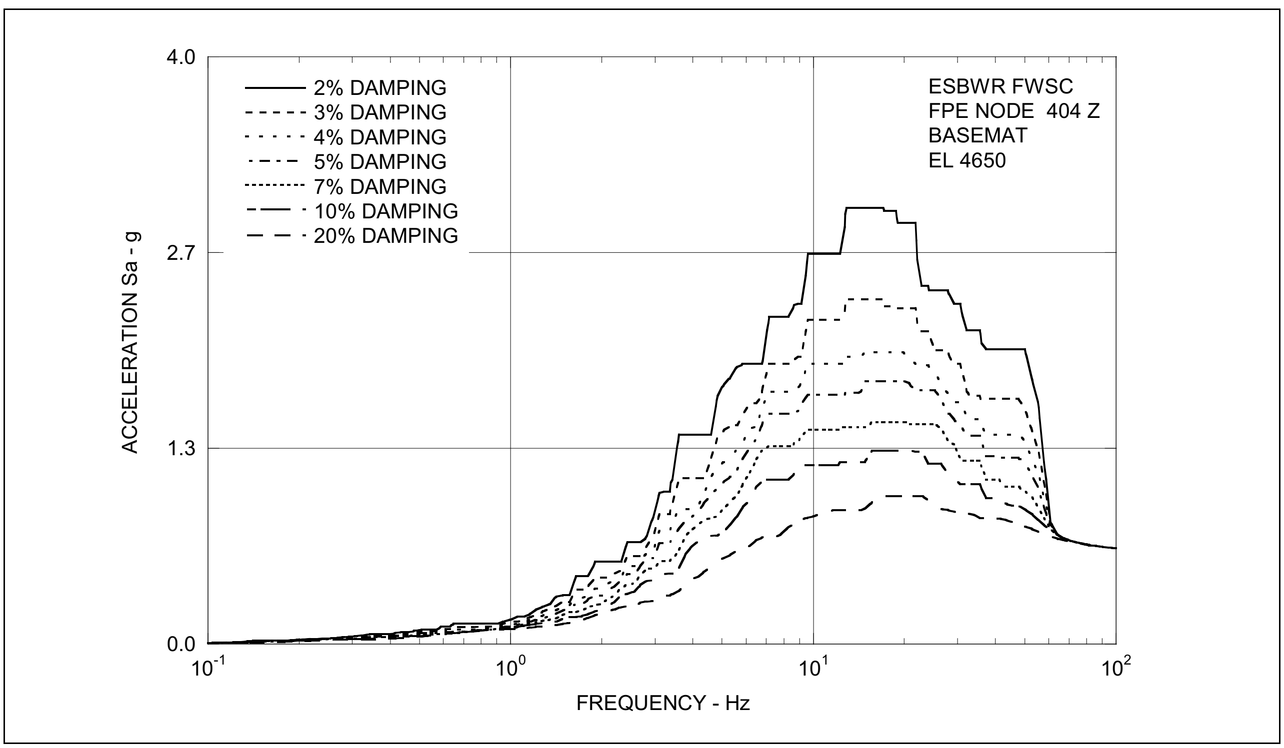


Figure 3.7.2-282 Unit 3 Site-Specific SSE ISRS - FPE Basemat in Z-Direction



3.7.3.13 Seismic Category I Buried Piping, Conduits and Tunnels

Replace the sixth paragraph sixth bullet as follows.

NAPS DEP 3.7-1

- Seismic input motions are based on the single envelope design response spectra as defined in DCD Table 3.7-2, using the applicable scale factor, and site-specific SSE FIRS.

Replace the seventh paragraph as follows.

Seismic Category I utilities and Safety Class RW-IIa radwaste piping installed in trenches or tunnels are analyzed in accordance with the standard requirements of DCD Section 3.7.3. Seismic input motions for the portions located below ground are based on the single envelope design response spectra as defined in DCD Table 3.7-2, using applicable scale factors, and site-specific SSE FIRS.

3.7.4 Seismic Instrumentation

Add the following at the end of the first paragraph.

NAPS SUP 3.7-6

The seismic monitoring program described in this subsection, including the necessary test and operating procedures, will be implemented prior to receipt of fuel on site.

3.7.4.4 Comparison of Measured and Predicted Responses

Add the following after the first paragraph.

NAPS DEP 3.7-1

Based on the definition of the SSE for Unit 3 in Section 3.7.1 using two spectra for seismic design, analysis, and qualification of SSCs, the OBE for purposes of plant shutdown (referred to herein as the "plant-shutdown OBE") is similarly based on two spectra defining the OBE design ground motion at grade. The first plant-shutdown OBE spectrum is 1/3 of the CSDRS, and the second plant-shutdown OBE spectrum is the site-dependent OBE described in Section 3.7.1.1.6. The two sets of horizontal and vertical OBE response spectra derived from the SSE spectra at grade serve as the reference against which OBE exceedance checks are performed for the purpose of plant shutdown. Plant shutdown is required only if there is an exceedance of both OBE spectra.

3.7.5 Site-Specific Information

Replace DCD Section 3.7.5 with the following.

NAPS DEP 3.7-1

(1) [*See Table 2.0-201 and Section 3.7.1 for seismology requirements of site-specific SSE ground response spectra.*

(2) *See Table 2.0-201 for soil properties requirements of site-specific foundation bearing capacities, minimum shear wave velocity and liquefaction potential. For sites not meeting the soil property requirements, a site-specific analysis is required to demonstrate the adequacy of the standard plant design. Site-specific SSI analyses for the Seismic Category I RB/FB, CB, and FWSC structures are described in Section 3.7.2 to demonstrate the adequacy of the standard plant design of these buildings.*]*

Text sections that are bracketed and italicized with an asterisk following the brackets are designated as Tier 2. Prior NRC approval is required to change.

3.7.6 References

3.7-201 Kramer, Steven L. (1996), Geotechnical Earthquake Engineering, Prentice-Hall, ISBN 0-13-374943-6.

3.7-202 U.S. Nuclear Regulatory Commission (2010), Interim Staff Guidance on Ensuring Hazard-Consistent Seismic Input for Site Response and Soil Structure Interaction Analyses, DC/COL-ISG-17, March 2010.

3.7-203 NEI White Paper, “Consistent Site-Response/Soil-Structure Interaction Analysis and Evaluation,” NEI, June 2009.

3.7-204 McGuire, R. K., W. J. Silva, and C. J. Costantino (2001), “Technical Basis for Revision of Regulatory Guidance on Design Ground Motions, Hazard- and Risk-consistent Ground Motion Spectra Guidelines,” prepared for Nuclear Regulatory Commission, NUREG/CR-6728.

3.7-205 American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) Standard 43-05, “Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities.”

3.7-206 DC/COL-ISG-017, “Interim Staff Guidance on Ensuring Hazard-Consistent Seismic Input for Site Response and Soil Structure Interaction Analyses,” March 24, 2010.

3.8 Seismic Category I Structures

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Add the following at the end of this section.

The evaluations in Section 3.7.2.4.1.6.1 demonstrate the adequacy of the standard plant design of RB/FB, CB and FWSC structural members for Unit 3 site-specific seismic load demands. The evaluations are based on comparison of stress results from site-specific SSI analysis with the standard design seismic loads and structural member capacities. Section 3.8.4.5.6 demonstrates that the Unit 3 site-specific lateral pressure loads on below grade exterior walls are also enveloped by the standard design.

3.8.4 Other Seismic Category I Structures

3.8.4.5 Structural Acceptance Criteria

Add the following at the end of this section.

NAPS DEP 3.7-1

3.8.4.5.6 Below Grade Exterior Wall Design

Unit 3 exterior wall designs for the RB/FB and CB are evaluated through comparison of site-specific lateral pressure demands with the lateral loads used for standard design. The results of the Unit 3 site-specific SSI analyses for the RB/FB and CB presented in Section 3.7.2.4.1 provide the Unit 3 site-specific seismic lateral pressure loads applied from the rock and concrete fill to the below grade exterior walls of RB/FB and CB. Section 2.5.4.10.3 provides the site-specific static earth pressure and hydrostatic loads that are calculated using the properties of the Unit 3 structural fill and in situ materials and the Unit 3 site-specific nominal maximum ground water level for RB/FB, CB, and FWSC. The applicability of the standard design of below grade exterior walls is demonstrated by showing that the lateral loads used for standard design envelope the site-specific lateral load demands.

Figures 3.8.4-201 through 3.8.4-204 show the Unit 3 site-specific lateral soil pressure demands on each of the four exterior walls of the RB/FB. The distributions of the site-specific total lateral pressures that include the site-specific hydrostatic pressure, the static lateral pressure and the dynamic lateral pressure obtained from Unit 3 site-specific SSI analyses

are presented. The figures also present the distribution of the site-specific passive resistance pressures on the walls that are required for the sliding stability of the Unit 3 RB/FB as discussed in Section 3.8.5.5. These site-specific lateral pressure demands are compared with the corresponding standard design lateral pressure loads, the standard design total soil pressure load and the passive pressure load considered for the standard design wall capacity check. The RB/FB wall capacity check for the standard design is performed conservatively considering the maximum passive resistance pressures required to meet the sliding stability of the building for the different generic soil conditions in conjunction with the static lateral pressure loads.

As shown in Figures 3.8.4-201 through 3.8.4-204, the Unit 3 lateral pressure demands on the walls of the RB/FB are bounded by the Referenced DCD design soil pressures and DCD wall capacity passive pressures except at the top of the Zone III rock. These sharp exceedances of the site-specific lateral pressures are due to SASSI calculations of the site-specific seismic lateral pressures at the top of the concrete fill model. Their effects on the out-of-plane bending moments and shear forces in the walls are small and are bounded by the standard design.

Figures 3.8.4-205 through 3.8.4-208 show the site-specific lateral pressure demands on the exterior walls of the CB. The total lateral pressure demands include the site-specific hydrostatic pressure, the static lateral pressure and the dynamic lateral pressure obtained from site-specific SSI analyses of CB. The site-specific passive resistance pressures are required for the sliding stability of the Unit 3 CB as discussed in Section 3.8.5.5. These site-specific lateral pressure demands are compared with the corresponding standard design lateral pressure loads, the standard design total soil pressure load and the passive pressure load considered for the standard design wall capacity check. The CB wall capacity check for the standard design is performed conservatively considering the maximum passive resistance pressures required to meet the sliding stability of the building for the different generic soil conditions in conjunction with the static lateral pressure loads.

As shown in Figures 3.8.4-205 through 3.8.4-208, the Unit 3 lateral pressure demands on the CB exterior walls are bounded by the lateral pressure loads considered for the standard design of the CB structure

except at the top of the Zone III rock. These sharp exceedances of the site-specific lateral pressures are due to SASSI calculations of the site-specific seismic lateral pressures at the top of the concrete fill model. Their effects on the out-of-plane bending moments and shear forces in the CB walls are small and are bounded by the standard design.

3.8.5 Foundations

3.8.5.5 Structural Acceptance Criteria

Add the following at the end of this section.

NAPS DEP 3.7-1

3.8.5.5.1 Foundation Stability

Unit 3 site-specific foundation stability for the RB/FB, CB, and FWSC are evaluated against overturning and sliding based on the results from the Unit 3 site-specific SSI analyses for the RB/FB, CB, and FWSC presented in Section 3.7.2.4.1. The stability evaluation for overturning and sliding follow the methodology in DCD Section 3.8.5.5.

The sliding stability of the building is evaluated on time step basis by calculating safety factor for different instances of time. The minimum value obtained during the duration of the site-specific ground motion is adopted as the safety factor for sliding stability of the building. A 0.03 second moving average window is applied on these time histories to obtain the lateral resistance force demands for the RB/FB, CB, and FWSC foundation. The applied moving average window helps to filter out the spurious peak in the vertical reaction time history when the magnitude of the upward seismic force is near or exceeds the effective weight of the building.

The factor of safety against overturning due to earthquake loading is determined by the energy approach method for both NS and EW direction as described in DCD Section 3.7.2.14. The calculated site-specific factors of safety against overturning based on Unit 3 site-specific SSI for the RB/FB, CB, and FWSC are shown in Tables 3.8.5-201, 3.8.5-202, and 3.8.5-203, respectively. The Unit 3 site-specific factors of safety against overturning for the RB/FB, CB, and FWSC are 529, 559, and 902, respectively, and are larger than the required minimum factor of safety of 1.1.

Unit 3 site-specific sliding evaluation is performed using driving forces calculated from the results of the site-specific SSI analyses, which neglects the effect of the structural fill placed above the top of the Zone III

rock. The sliding shear resistance forces (F_{ub}) are calculated using the Unit 3 site-specific value for static sliding coefficient of friction of 0.60 for the critical sliding planes located at interface of the RB/FB, CB, and FWSC foundations with the underlying concrete fill and/or Zone III-IV rock. The base shear resistance values are calculated considering the effect of vertical component of the input earthquake motion and the ground water buoyancy forces that are calculated based on the Unit 3 nominal maximum ground water level for RB/FB, CB, and FWSC. The site-specific sliding evaluations for the Unit 3 RB/FB and CB also consider the lateral resistance provided by the concrete fill and Zone III rock. The stability evaluations neglect to consider the resistance provided by the following skin friction resistance forces:

1. F_{us} = Skin friction resistance force provided by basemat side parallel to the direction of motion (i.e., F_{us} = 0)

2. F_{us}' = Skin friction resistance force provided by shear key side parallel to the direction of motion (when shear keys are used (i.e., F_{us}' = 0).

The calculated Unit 3 site-specific factors of safety against sliding for the RB/FB and CB are shown in Tables 3.8.5-201 and 3.8.5-202, respectively. The table lists the maximum values of the lateral resistance forces and pressures along the RB/FB and CB embedded exterior walls and basemat opposite to the direction of motion that are needed to achieve a minimum factor of safety of 1.1 against sliding. The corresponding maximum required lateral passive resistance pressures are 0.20 MPa for RB/FB and 0.50 MPa for CB. These site-specific passive resistance pressures are well within the allowable bearing pressure of the concrete fill, Zone III rock and the lateral pressure capacity of the buildings below grade walls as shown in Figures 3.8.4-205 through 3.7.2-208. These lateral passive resistance forces are associated with very small deformation of the concrete fill that will not result in motion of the foundation relative to the supporting subgrade. Therefore, the use of static coefficient of friction to calculate the base shear resistance against sliding is adequate.

The sliding of the FWSC is evaluated using driving seismic forces obtained from the Unit 3 site-specific SSI analyses. The site-specific sliding evaluations for the Unit 3 FWSC also consider the lateral resistance provided by the concrete fill. The calculated Unit 3 site-specific

factors of safety against sliding for the FWSC are shown in Table 3.8.5-203. The table lists the maximum values of the lateral resistance forces and pressures along the FWSC embedded basemat and shear key opposite to the direction of motion that are needed to achieve a minimum factor of safety of 1.1 against sliding. The corresponding maximum required lateral passive resistance pressure is 0.54 MPa. This site-specific passive resistance pressure is well within the allowable bearing pressure of structural fill, Zone II rock and the lateral pressure capacity of the shear key.

3.8.5.5.2 **Foundation Dynamic Bearing Pressures**

The maximum soil dynamic bearing pressure demands for the RB/FB, CB and FWSC foundation basemats at Unit 3 site are calculated using the Energy Balance Method/Modified Energy Balance Method described in DCD Section 3G.1.5.5. The results of the Unit 3 site-specific SSI analyses for BE, UB, and LB subsurface profiles presented in Section 3.7.2.4.1, provide time histories of the vertical seismic force and overturning seismic moment base reactions for each one of the three Seismic Category I foundations. A 0.03 second moving average window is applied on these time histories to obtain the bearing pressure demands under the CB foundation. The applied moving average window helps to filter out the spurious peak in the vertical reaction time history when the magnitude of the upward seismic force is near or exceeds the effective weight of the building. At this instance of time, the corresponding rotation angle of the basemat predicted by the soil-structure interaction model is extremely small. The same moving average window approach is used to calculate the contact ratio of the CB foundation directly from the results of SSI analysis as described in Section 3.7.2.4.1.6. The maximum values of the dynamic pressures calculated for the whole duration of the site-specific ground motion are selected to represent the maximum site-specific bearing pressure demands under the RB/FB, CB, and FWSC basemats.

The Unit 3 site-specific maximum dynamic soil bearing pressure demands for the RB/FB, CB, and FWSC foundations are shown in Tables 3.8.5-204, 3.8.5-205 and 3.8.5-206, respectively.

Table 3.8.5-201 Factors of safety for RB/FB Foundation Stability

	Overturning		Sliding	
Load Combination	SRP 3.8.5 Required FS	Calculated FS	SRP 3.8.5 Required FS	Calculated FS
D + H + E'	1.1	529	1.1	>1.1

Where,
D = Dead Load
H = Lateral soil pressure
E' = Safe Shutdown Earthquake
Note: The maximum required lateral resistance force is 104 MN.
The maximum required lateral pressure is 0.20 MPa

Table 3.8.5-202 Factors of safety for CB Foundation Stability

	Overturning		Sliding	
Load Combination	SRP 3.8.5 Required FS	Calculated FS	SRP 3.8.5 Required FS	Calculated FS
D + H + E'	1.1	559	1.1	>1.1

Where,
D = Dead Load
H = Lateral soil pressure
E’ = Safe Shutdown Earthquake
Note: The maximum required lateral resistance force is 53 MN.
The maximum required lateral pressure is 0.50 MPa

Table 3.8.5-203 Factors of safety for FWSC Foundation Stability

	Overturning		Sliding	
Load Combination	SRP 3.8.5 Required FS	Calculated FS	SRP 3.8.5 Required FS	Calculated FS
D + H + E'	1.1	902	1.1	>1.1

Where,
D = Dead Load
H = Lateral soil pressure
E' = Safe Shutdown Earthquake
Note: The maximum required lateral resistance force is 43 MN.
The maximum required lateral pressure is 0.54 MPa

Table 3.8.5-204 Maximum Soil Dynamic Bearing Pressure Demand for RB/FB (Unit: KPa)

Site Conditions	Lower Bound Subsurface Profile	Best Estimate Subsurface Profile	Upper Bound Subsurface Profile
Dynamic (Static + Seismic)	1120	1130	1130

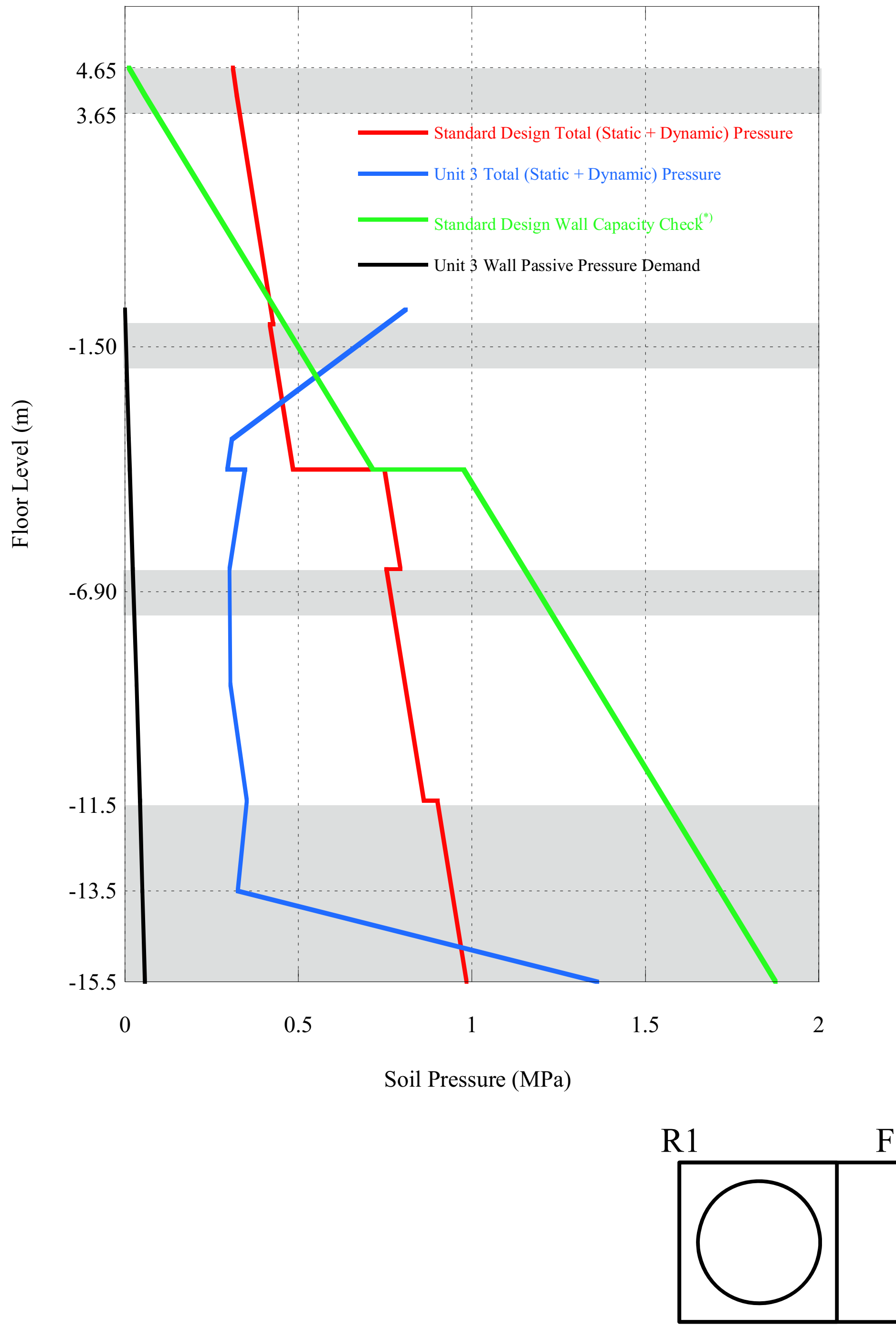
Table 3.8.5-205 Maximum Soil Dynamic Bearing Pressure Demand for CB (Unit: KPa)

Site Conditions	Lower Bound Subsurface Profile	Best Estimate Subsurface Profile	Upper Bound Subsurface Profile
Dynamic (Static + Seismic)	480	500	510

Table 3.8.5-206 Maximum Soil Dynamic Bearing Pressure Demand for FWSC (Unit: KPa)

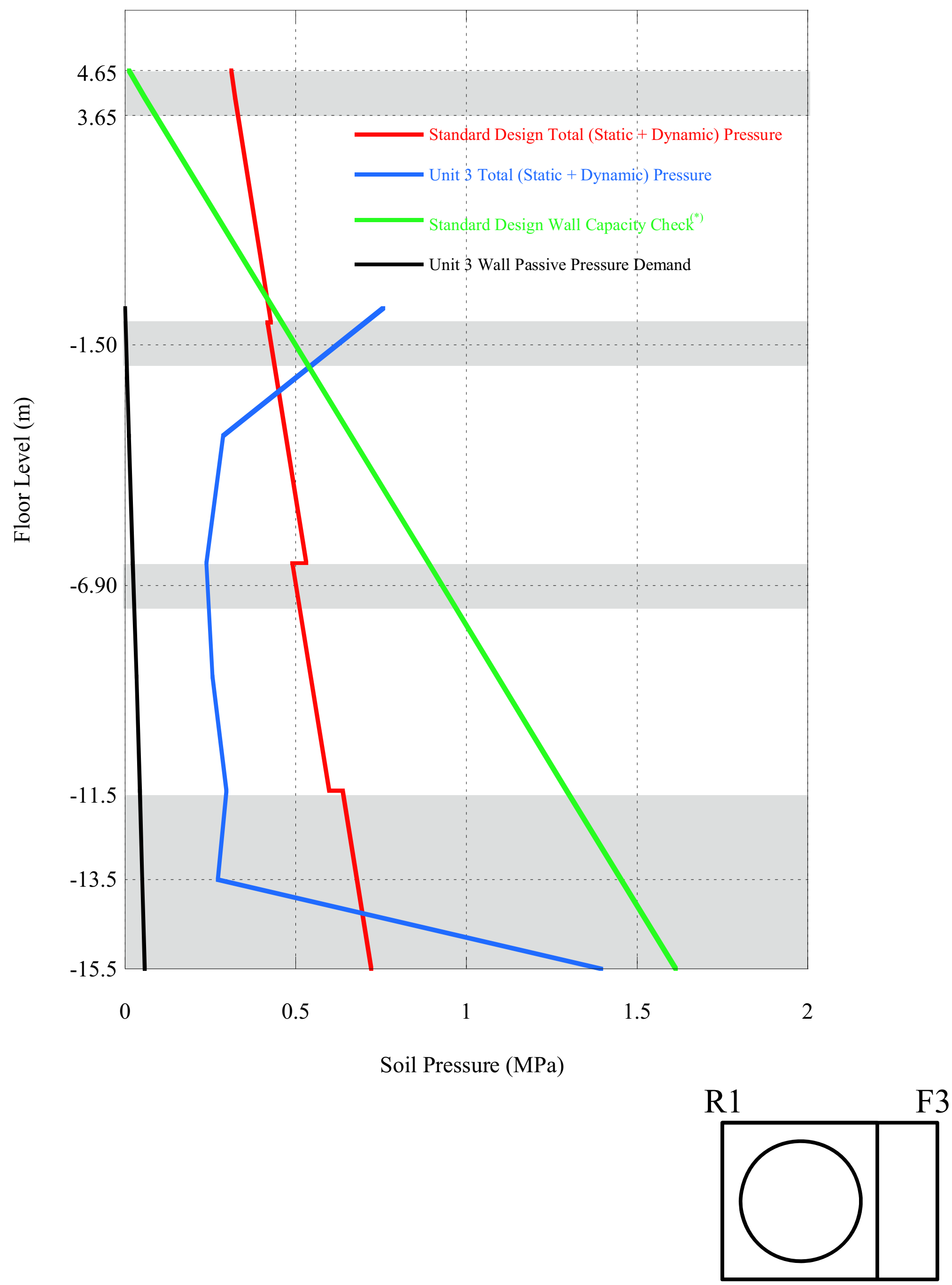
Site Conditions	Lower Bound Subsurface Profile	Best Estimate Subsurface Profile	Upper Bound Subsurface Profile
Dynamic (Static + Seismic)	410	410	390

Figure 3.8.4-201 Lateral Soil Pressure - RB/FB R1 Wall



Note: (*) Wall capacity check for the standard design is performed conservatively considering passive pressures required to meet for the sliding stability of the building + static lateral pressure loads.
The shaded area shows thickness of the floor slabs and basemat.

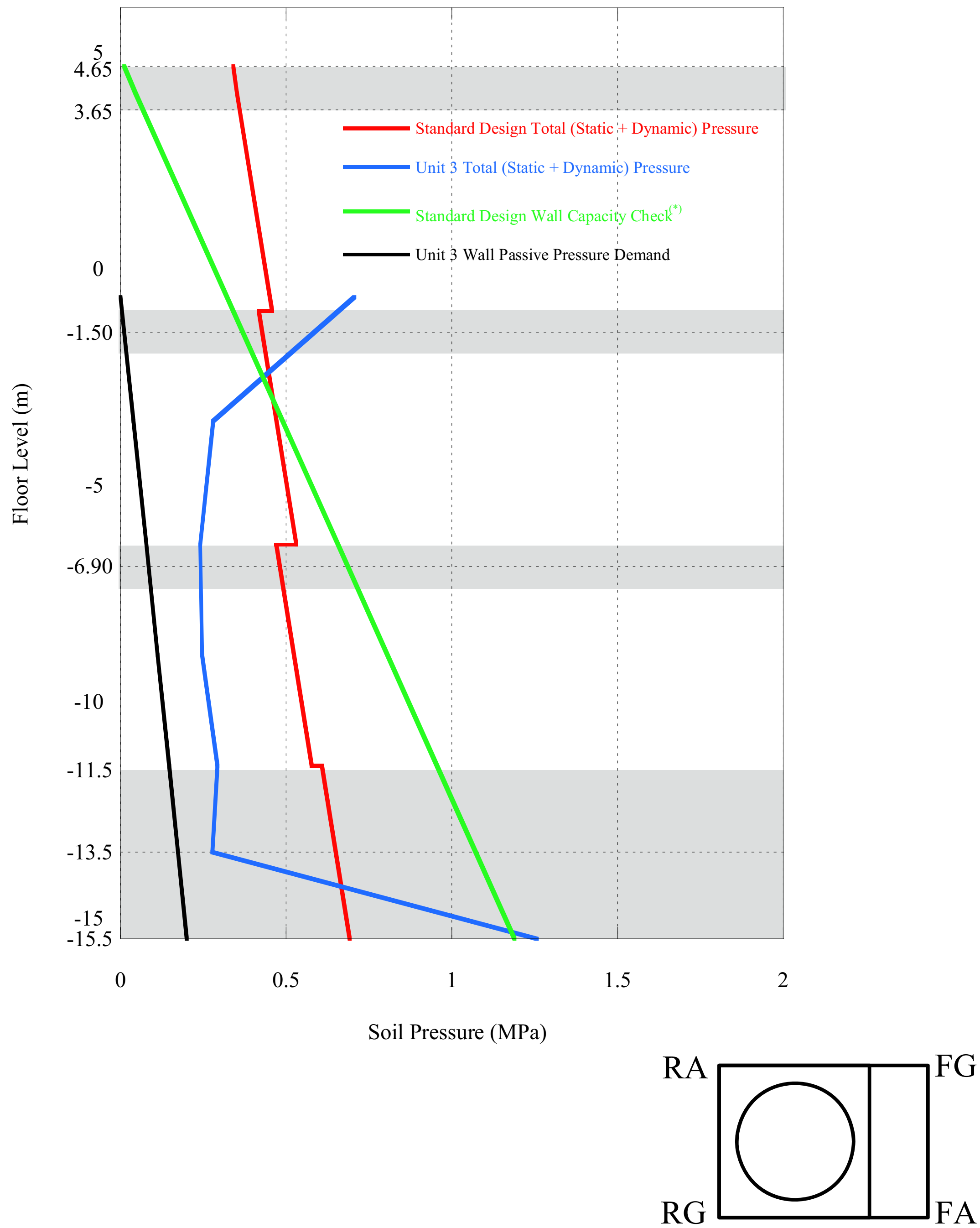
Figure 3.8.4-202 Lateral Soil Pressure - RB/FB F3 Wall



Note: (*) Wall capacity check for the standard design is performed conservatively considering passive pressures required to meet for the sliding stability of the building + static lateral pressure loads.

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

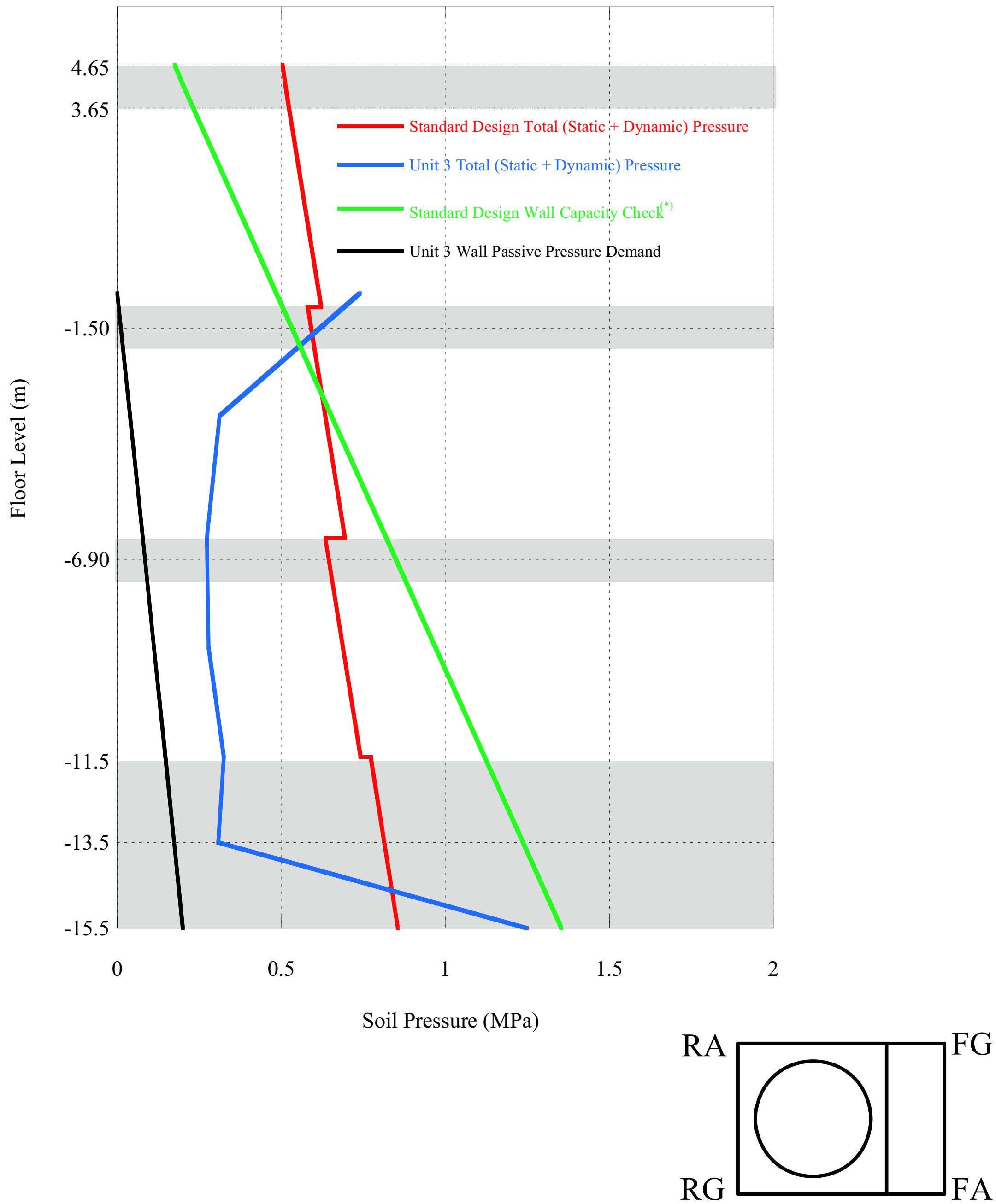
Figure 3.8.4-203 Lateral Soil Pressure - RB/FB RA/RG/FG Wall



Note: (*) Wall capacity check for the standard design is performed conservatively considering passive pressures required to meet for the sliding stability of the building + static lateral pressure loads.

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

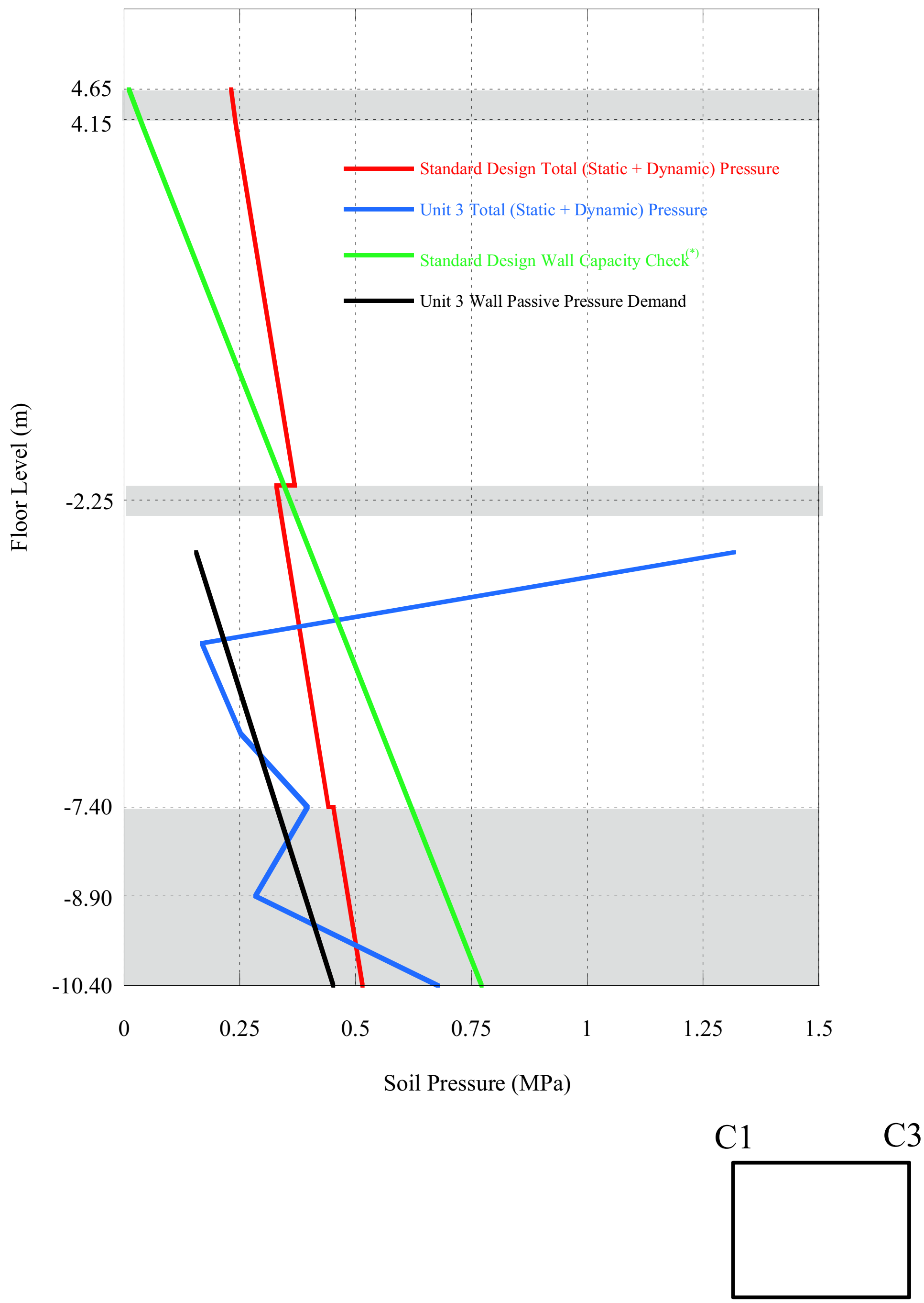
Figure 3.8.4-204 Lateral Soil Pressure - RB/FB FA Wall



Note: (*) Wall capacity check for the standard design is performed conservatively considering passive pressures required to meet for the sliding stability of the building + static lateral pressure loads.

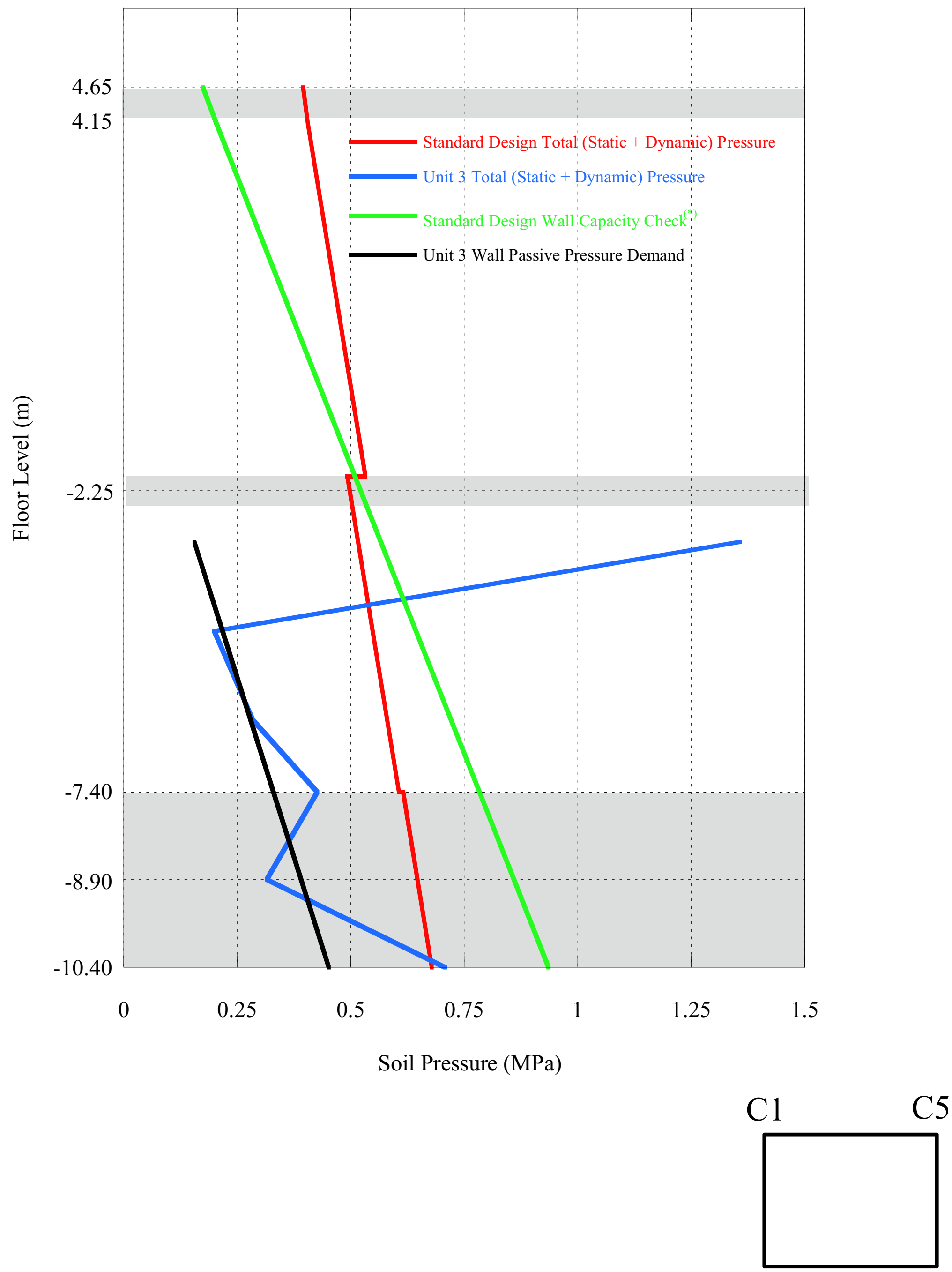
The shaded area shows thickness of the floor slabs and basemat.

Figure 3.8.4-205 Lateral Soil Pressure - CB C1 Wall



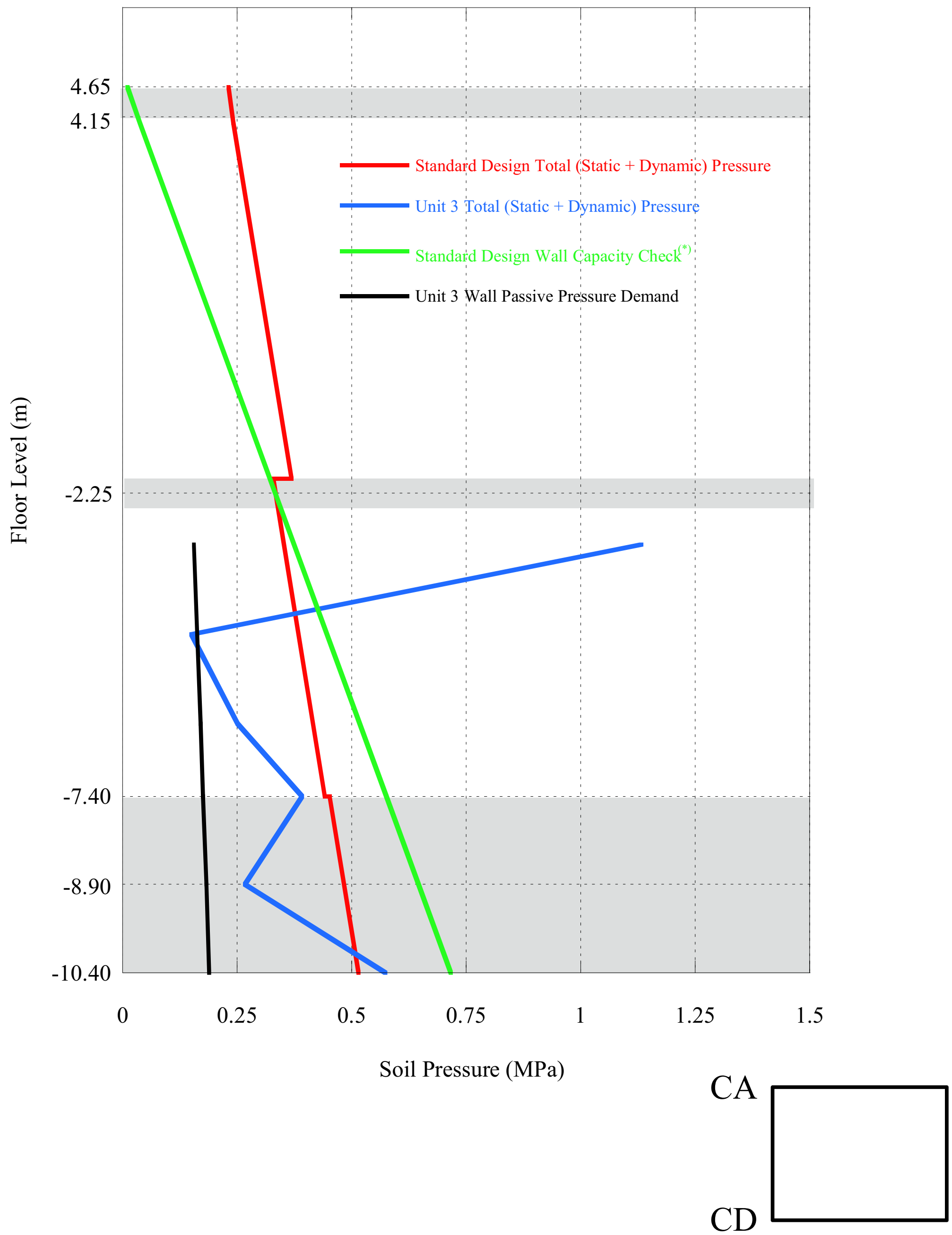
Note: (*) Wall capacity check for the standard design is performed conservatively considering passive pressures required to meet for the sliding stability of the building + static lateral pressure loads.
The shaded area shows thickness of the floor slabs and basemat.

Figure 3.8.4-206 Lateral Soil Pressure - CB C5 Wall



Note: (*) Wall capacity check for the standard design is performed conservatively considering passive pressures required to meet for the sliding stability of the building + static lateral pressure loads.
The shaded area shows thickness of the floor slabs and basemat.

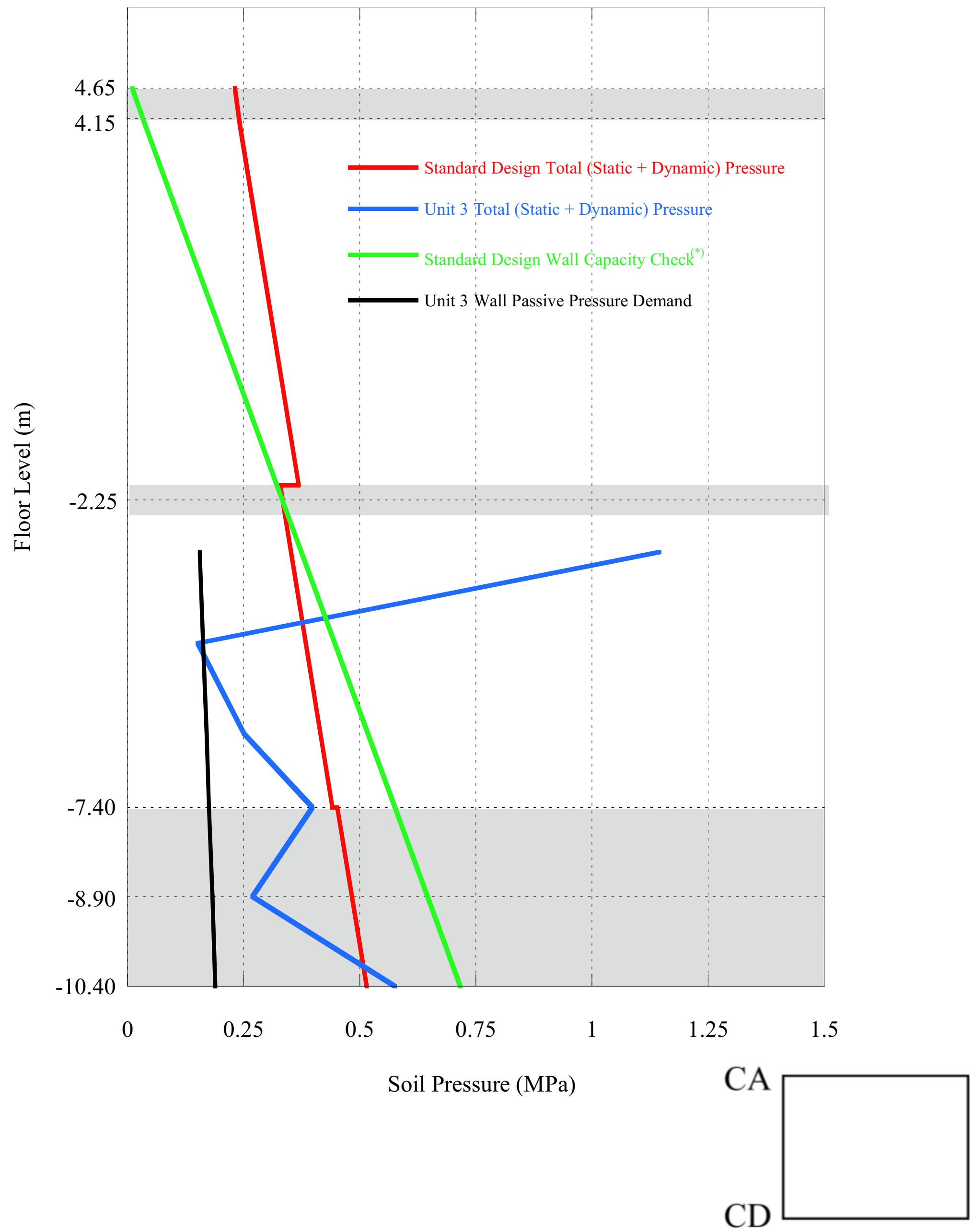
Figure 3.8.4-207 Lateral Soil Pressure - CB CA Wall



Note: (*) Wall capacity check for the standard design is performed conservatively considering passive pressures required to meet for the sliding stability of the building + static lateral pressure loads.

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

Figure 3.8.4-208 Lateral Soil Pressure - CB CD Wall



Note: (*) Wall capacity check for the standard design is performed conservatively considering passive pressures required to meet for the sliding stability of the building + static lateral pressure loads.
The shaded area shows thickness of the floor slabs and basemat.

3.9 Mechanical Systems and Components

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

3.9.2.4 Initial Startup Flow-Induced Vibration Testing of Reactor Internals

Replace the last paragraph with the following.

CWR COL 3.9.9-1-A

A vibration assessment program as specified in RG 1.20 is provided in DCD Appendix 3L and the following referenced GEH Reports.

- NEDE-33259P, "ESBWR Reactor Internals Flow Induced Vibration Program"
- NEDE-33312P, "Steam Dryer Acoustic Load Definition"
- NEDE-33313P, "Steam Dryer Structural Evaluation"
- NEDC-33408P, "ESBWR Steam Dryer Plant Based Load Evaluation Methodology"
- NEDC-33408P, Supplement 1, "ESBWR Steam Dryer - Plant Based Load Evaluation Methodology Supplement 1"

The classification of the Unit 3 reactor internals in accordance with RG 1.20 is dependent on ESBWR status, i.e., if Unit 3 is the initial ESBWR to perform testing of the reactor internals, or if testing is performed at another reactor prior to Unit 3 testing. There are two different scenarios:

1. A valid prototype for the Unit 3 reactor internals does not exist. Under this scenario, Unit 3 reactor internals is classified as a prototype per Regulatory Guide 1.20.

2. A valid prototype for Unit 3 reactor internals does exist. If the prototype testing is performed outside the United States, the guidance in Regulatory Guide 1.20, Revision 3, Regulatory Position 1.2 would need to be satisfied in order for this reactor to be considered a "valid prototype." Assuming that Unit 3 reactor internals are substantially similar to the valid prototype and that the valid prototype does not experience inservice problems that result in component or operational modifications, Unit 3 reactor internals will be classified as non-prototype category I. If any changes to classification for Unit 3 reactor internals are later determined to be

necessary, the classification change will be addressed at the time the change is proposed with proper evaluation/justification and documented in a revision to the FSAR.

The comprehensive vibration assessment program will be developed and implemented as described in DCD Appendix 3L with no departures. The vibration measurement and inspection programs will comply with the guidance specified in RG 1.20, Revision 3, consistent with the Unit 3 reactor internals classification. A summary of the vibration analysis program and description of the vibration measurement (including measurement locations and analysis predictions) and inspection phases of the comprehensive vibration inspection program will be submitted to the NRC six months prior to implementation.

The preliminary and final reports (as necessary), which together summarize the results of the vibration analysis, measurement and inspection programs will be submitted to the NRC within 60 and 180 days, respectively, following the completion of the programs.

3.9.3.1 Loading Combinations, Design Transients and Stress Limits

Replace the fifth paragraph with the following.

STD COL 3.9.9-2-A

The piping stress reports identified in this DCD section will be completed within six months of completion of DCD ITAAC Table 3.1-1. The FSAR will be revised as necessary in a subsequent update to address the results of this analysis.

3.9.3.7.1(3)e Snubber Preservice and Inservice Examination and Testing

Preservice Examination and Testing

Add the following at the end of this section.

STD COL 3.9.9-4-A

A preservice thermal movement examination is also performed; during initial system heatup and cooldown, for systems whose design operating temperature exceeds 121°C (250°F), snubber thermal movement is verified.

Additionally, preservice operational readiness testing is performed on all snubbers. The operational readiness test is performed to verify the parameters of ISTD-5120. Snubbers that fail the preservice operational

readiness test are evaluated to determine the cause of failure, and are retested following completion of corrective action(s).

Snubbers that are installed incorrectly or otherwise fail preservice testing requirements are re-installed correctly, adjusted, modified, repaired or replaced, as required. Preservice examination and testing is re-performed on installation-corrected, adjusted, modified, repaired or replaced snubbers as required.

The preservice inspection and testing programs for snubbers will be completed in accordance with milestones described in Section 13.4.

Inservice Examination and Testing

Add the following at the beginning of this section.

STD COL 3.9.9-4-A

Inservice examination and testing of all safety-related snubbers is conducted in accordance with the requirements of the ASME OM Code, Subsection ISTD. Inservice examination is initially performed not less than two months after attaining 5 percent reactor power operation and will be completed within 12 calendar months after attaining 5 percent reactor power. Subsequent examinations are performed at intervals defined by ISTD-4252 and Table ISTD-4252-1. Examination intervals, subsequent to the third interval, are adjusted based on the number of unacceptable snubbers identified in the then current interval.

An inservice visual examination is performed on all snubbers to identify physical damage, leakage, corrosion, degradation, indication of binding, misalignment or deformation and potential defects generic to a particular design. Snubbers that do not meet visual examination requirements are evaluated to determine the root cause of the unacceptability, and appropriate corrective actions (e.g., snubber is adjusted, repaired, modified, or replaced) are taken. Snubbers evaluated as unacceptable during visual examination may be accepted for continued service by successful completion of an operational readiness test.

Snubbers are tested inservice to determine operational readiness during each fuel cycle, beginning no sooner than 60 days before the scheduled start of the applicable refueling outage. Snubber operational readiness tests are conducted with the snubber in the as-found condition, to the extent practical, either in place or on a test bench, to verify the test parameters of ISTD-5210. When an in-place test or bench test cannot be performed, snubber subcomponents that control the parameters to be

verified are examined and tested. Preservice examinations are performed on snubbers after reinstallation when bench testing is used (ISTD-5224), or on snubbers where individual subcomponents are reinstalled after examination (ISTD-5225).

Defined test plan groups (DTPG) are established and the snubbers of each DTPG are tested according to an established sampling plan each fuel cycle. Sample plan size and composition are determined as required for the selected sample plan, with additional sampling as may be required for that sample plan based on test failures and failure modes identified. Snubbers that do not meet test requirements are evaluated to determine root cause of the failure, and are assigned to failure mode groups (FMG) based on the evaluation, unless the failure is considered unexplained or isolated. The number of unexplained snubber failures not assigned to an FMG determines the additional testing sample. Isolated failures do not require additional testing. For unacceptable snubbers, additional testing is conducted for the DTPG or FMG until the appropriate sample plan completion criteria are satisfied.

Unacceptable snubbers are adjusted, repaired, modified, or replaced. Replacement snubbers meet the requirements of ISTD-1600. Post-maintenance examination and testing, and examination and testing of repaired snubbers, is done to ensure that test parameters that may have been affected by the repair or maintenance activity are verified acceptable.

Service life for snubbers is established, monitored and adjusted as required by ISTD-6000 and the guidance of ASME OM Code Nonmandatory Appendix F.

The inservice inspection and testing programs for snubbers will be completed in accordance with milestones described in Section 13.4.

Delete the last two sentences of the last paragraph.

3.9.3.7.1(3)e Snubber Support Data

Replace the first sentence with the following.

STD COL 3.9.9-4-A

For the ASME Class 1, 2, and 3 systems listed in DCD Tier 1, Section 3.1, that contain snubbers, a plant-specific table will be prepared in conjunction with the closure of the system-specific ITAAC for piping

and component design and will include the following specific snubber information.

Add the following at the end of this section.

STD COL 3.9.9-4-A

This information will be included in the FSAR as part of a subsequent FSAR update.

3.9.6 Inservice Testing of Pumps and Valves

Replace the last sentence of the last paragraph with the following.

STD COL 3.9.9-3-A

Milestones for implementation of the ASME OM Code preservice and inservice testing programs are defined in Section 13.4.

3.9.6.1 Inservice Testing of Valves

Add the following before the last paragraph.

STD COL 3.9.9-3-A

Each valve subject to inservice testing is also tested during the preservice test (PST) period. Preservice tests are conducted under conditions as near as practicable to those expected during subsequent inservice testing. Valves (or the control system) that have undergone maintenance that could affect performance, or valves that are repaired or replaced, are re-tested to verify performance parameters that could have been affected are within acceptable limits. Safety and relief valves and nonreclosing pressure relief devices are preservice tested in accordance with the requirements of the ASME OM Code, Mandatory Appendix I.

3.9.6.1.4 Valve Testing

Add the following at the end of the introduction to this section.

STD COL 3.9.9-3-A

Other specific testing requirements for power-operated valves include stroke-time testing and, as applicable, diagnostic testing to evaluate valve condition and to verify the valve will continue to function under design-basis conditions.

(1) Valve Exercise Tests

Add the following after the second sentence of the first paragraph.

NAPS COL 3.9.9-3-A

Valves are tested by full-stroke exercising, during operation at power, to the positions required to fulfill their functions.

Add the following after the third sentence of the first paragraph.

STD COL 3.9.9-3-A If full-stroke exercising is not practicable, part-stroke exercising is performed during operation at power or during cold shutdown.

Add the following new paragraph after the first paragraph.

STD COL 3.9.9-3-A During extended shutdowns, valves that are required to be operable must remain capable of performing their intended safety function. Exercising valves during cold shutdown commences within 48 hours of achieving cold shutdown and continues until testing is complete or the plant is ready to return to operation at power. Valve testing required to be performed during a refueling outage is completed before returning the plant to operation at power.

Add the following after the first sentence of the second paragraph.

STD COL 3.9.9-3-A Valve testing uses reference values determined from the results of PST or IST. These tests that establish reference values are performed under conditions as near as practicable to those expected during the IST. Stroke time is measured and compared to the reference value, except for valves classified as fast-acting (e.g., solenoid-operated valves (SOVs) with stroke time less than 2 seconds), for which a stroke time limit of 2 seconds is assigned.

Add the following after the third paragraph.

STD COL 3.9.9-3-A SOVs are tested to confirm the valves move to their energized positions and are maintained in those positions, and to confirm that the valves move to the appropriate failure mode positions when de-energized.

Pre-conditioning of valves or their associated actuators or controls prior to IST undermines the purpose of IST and is prohibited. Pre-conditioning includes manipulation, pre-testing, maintenance, lubrication, cleaning, exercising, stroking, operating, or disturbing the valve to be tested in any way, except as may occur in an unscheduled, unplanned, and unanticipated manner during normal operation.

(4) Special Tests

Add the following after the second paragraph under the second bullet.

STD COL 3.9.9-3-A

Industry and regulatory guidance is considered in development of IST program for explosively actuated valves. In addition, the IST program for explosively actuated valves incorporates lessons learned from the design and qualification process for these valves such that surveillance activities provide reasonable assurance of the operational readiness of explosively actuated valves to perform their safety functions.

3.9.6.1.5 Specific Valve Test Requirements

(1) Power-Operated Valve Tests

Replace the last paragraph with the following.

STD COL 3.9.9-3-A

Section 3.9.6.8 describes additional (non-Code) testing of power-operated valves as discussed in Regulatory Issue Summary 2000-03.

(3) Check Valve Exercise Tests

Add the following as the first sentence of the second paragraph.

STD COL 3.9.9-3-A

Check valve testing requires verification that obturator movement is in the direction required for the valve to perform its safety function.

Add the following before the last paragraph.

STD COL 3.9.9-3-A

Acceptance criteria for this testing consider the specific system design and valve application. For example, a valve's safety function may require obturator movement in both open and closed directions. A mechanical exerciser may be used to operate a check valve for testing. Where a mechanical exerciser is used, acceptance criteria are provided for the force or torque required to move the check valve's obturator. Exercise tests also detect missing, sticking, or binding obturators.

If these test methods are impractical for certain check valves, or if sufficient flow cannot be achieved or verified, a sample disassembly examination program verifies valve obturator movement. The sample disassembly examination program groups check valves by category of similar design, application, and service condition.

During the disassembly process, the full-stroke motion of the obturator is verified. Nondestructive examination is performed on the hinge pin to assess wear, and seat contact surfaces are examined to verify adequate contact. Full-stroke motion of the obturator is re-verified immediately prior to completing reassembly. At least one valve from each group is disassembled and examined at each refueling outage, and all the valves in each group are disassembled and examined at least once every eight years. Before being returned to service, valves disassembled for examination or valves that received maintenance that could affect their performance are exercised with a full- or part-stroke. Details and bases of the sampling program are documented and recorded in the test plan.

When operating conditions, valve design, valve location, or other considerations prevent direct observation or measurements by use of conventional methods to determine adequate check valve function, diagnostic equipment and nonintrusive techniques are used to monitor internal conditions. Nonintrusive tests used are dependent on system and valve configuration, valve design and materials, and include methods such as ultrasonic (acoustic), magnetic, radiography, and use of accelerometers to measure system and valve operating parameters (e.g., fluid flow, disk position, disk movement, disk impact, and the presence or absence of cavitation and back-tapping). Nonintrusive techniques also detect valve degradation. Diagnostic equipment and techniques used for valve operability determinations are verified as effective and accurate under the PST program.

Testing is performed, to the extent practical, under normal operation, cold shutdown, or refueling conditions applicable to each check valve. Testing includes effects created by sudden starting and stopping of pumps, if applicable, or other conditions, such as flow reversal. When maintenance that could affect valve performance is performed on a valve in the IST program, post-maintenance testing is conducted prior to returning the valve to service.

Preoperational testing is performed during the initial test program (refer to Section 14.2) to verify that valves are installed in a configuration that allows correct operation, testing, and maintenance. Preoperational testing verifies that piping design features accommodate check valve testing requirements. Tests also verify disk movement to and from the seat and determine, without disassembly, that the valve disk positions correctly, fully opens or fully closes as expected, and remains stable in

the open position under the full spectrum of system design-basis fluid flow conditions.

Data acquired during check valve testing and inspections, and the maintenance history of a valve or group of valves is collected and maintained in order to establish the basis for specifying inservice testing, examination, and preventive maintenance activities that will identify and/or mitigate the failure of the check valves or groups of check valves tested. This data is also used to determine if certain check valve condition monitoring tests, such as nonintrusive tests, are feasible and effective in monitoring for these identified failure mechanisms, whether periodic disassembly and examination activities would be effective in monitoring for these failure mechanisms, as well as to determine possible valve groupings to implement in a future check valve condition monitoring program as allowed by ISTC-5222, the requirements of which are described in ASME OM Code, Appendix II.

3.9.6.5 Valve Replacement, Repair and Maintenance

Add the following to the end of the paragraph.

STD COL 3.9.9-3-A

When a valve or its control system has been replaced, repaired, or has undergone maintenance that could affect valve performance, a new reference value is determined, or the previous value is reconfirmed by an inservice test. This test is performed before the valve is returned to service, or immediately if the valve is not removed from service. Deviations between the previous and new reference values are identified and analyzed. Verification that the new values represent acceptable operation is documented.

3.9.6.6 10 CFR 50.55a Relief Requests and Code Cases

Add the following at the end of the first paragraph.

STD SUP 3.9-1

No relief from or alternative to the ASME OM Code is being requested.

3.9.6.7 Inservice Testing Program Implementation

Delete the last paragraph.

3.9.6.8 Non-Code Testing of Power-Operated Valves

Replace the second sentence of the first paragraph with the following.

STD COL 3.9.9-3-A

These tests, which are typically performed under static (no flow or pressure) conditions, also document the "baseline" performance of the valves to support maintenance and trending programs.

Replace the fifth sentence of the first paragraph with the following.

STD COL 3.9.9-3-A

Uncertainties associated with performance of these tests and use of the test results (including those associated with measurement equipment and potential degradation mechanisms) are addressed appropriately.

Replace the last sentence of the first paragraph with the following.

STD COL 3.9.9-3-A

Uncertainties affecting both valve function and structural limits are addressed.

Replace the second paragraph with the following.

STD COL 3.9.9-3-A

Additional testing is performed as part of the air-operated valve (AOV) program, which includes the key elements for an AOV Program as identified in the JOG AOV program document, Joint Owners Group Air Operated Valve Program Document, Revision 1, December 13, 2000 (References 3.9.201 and 3.9.202). The AOV program incorporates the attributes for a successful power-operated valve long-term periodic verification program, as discussed in RIS 2000-03, Resolution of Generic Safety Issue 158: Performance of Safety-related Power-Operated Valves Under Design Basis Conditions, (Reference 3.9.203) by incorporating lessons learned from previous nuclear power plant operations and research programs as they apply to the periodic testing of air- and other power-operated valves included in the IST program. For example, key lessons learned addressed in the AOV program include:

- Valves are categorized according to their safety significance and risk ranking.
- Setpoints for AOVs are defined based on current vendor information or valve qualification diagnostic testing, such that the valve is capable of performing its design-basis function(s).

- Periodic static testing is performed, at a minimum on high risk (high safety significance) valves, to identify potential degradation, unless those valves are periodically cycled during normal plant operation under conditions that meet or exceed the worst case operating conditions within the licensing basis of the plant for the valve, which would provide adequate periodic demonstration of AOV capability. If required based on valve qualification or operating experience, periodic dynamic testing is performed to re-verify the capability of the valve to perform its required functions.
- Sufficient diagnostics are used to collect relevant data (e.g., valve stem thrust and torque, fluid pressure and temperature, stroke time, operating and/or control air pressure, etc.) to verify the valve meets the functional requirements of the qualification specification.
- Test frequency is specified, and is evaluated each refueling outage based on data trends as a result of testing. Frequency for periodic testing is in accordance with References 3.9.201 and 3.9.202, with a minimum of 5 years (or 3 refueling cycles) of data collected and evaluated before extending test intervals.
- Post-maintenance procedures include appropriate instructions and criteria to ensure baseline testing is re-performed as necessary when maintenance on the valve, valve repair or replacement, have the potential to affect valve functional performance.
- Guidance is included to address lessons learned from other valve programs in procedures and training specific to the AOV program.
- Documentation from AOV testing, including maintenance records and records from the corrective action program are retained and periodically evaluated as a part of the AOV program.

The attributes of the AOV testing program described above, to the extent that they apply to and can be implemented on other safety-related power-operated valves, such as electro-hydraulic valves, are applied to those other power-operated valves.

3.9.7 Risk-Informed Inservice Testing

Replace this section with the following.

STD SUP 3.9-2

Risk informed inservice testing is not being utilized.

3.9.8 Risk-Informed Inservice Inspection of Piping

Replace this section with the following.

STD SUP 3.9-3

Risk informed inservice inspection is not being utilized.

3.9.9 COL Information

3.9.9-1-A Reactor Internals Vibration Analysis, Measurement and Inspection Program

CWR COL 3.9.9-1-A

This COL item is addressed in Section 3.9.2.4.

3.9.9-2-A ASME Class 2 or 3 or Quality Group D Components with 60 Year Design Life

STD COL 3.9.9-2-A

This COL item is addressed in Section 3.9.3.1.

3.9.9-3-A Inservice Testing Programs

STD COL 3.9.9-3-A
NAPS COL 3.9.9-3-A

This COL item is addressed in Section 3.9.6.

3.9.9-4-A Snubber Inspection and Test Program

STD COL 3.9.9-4-A

This COL item is addressed in Section 3.9.3.7.1(3)e and Section 3.9.3.7.1(3)e.

3.9.10 References

3.9.201 Joint Owners Group Air Operated Valve Program Document, Revision 1, December 13, 2000.

3.9.202 USNRC, Eugene V. Imbro, letter to Mr. David J. Modeen, Nuclear Energy Institute, Comments On Joint Owners' Group Air Operated Valve Program Document, October 8, 1999.

3.9.203 Regulatory Issue Summary 2000-03, Resolution of Generic Safety Issue 158: Performance of Safety-related Power-Operated Valves Under Design Basis Conditions, March 15, 2000.

3.10 Seismic and Dynamic Qualification of Mechanical and Electrical Equipment

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

3.10.1.4 Dynamic Qualification Report

Replace the last paragraph with the following.

STD COL 3.10.4-1-A

An implementation schedule for completing ITAAC will be provided to the NRC no later than 1 year after issuance of the combined license or at the start of construction as defined in 10 CFR 50.10(a), whichever is later. Dominion shall submit updates to the ITAAC schedules every 6 months thereafter and, within 1 year of its scheduled date for initial loading of fuel, and shall submit updates to the ITAAC schedules every 30 days until the final notification is provided to the NRC under paragraph 10 CFR 52.99(c)(1).

The Dynamic Qualification Report and documentation that describe the seismic and dynamic qualification methods will be made available for NRC staff review, inspection, and audit. Information that verifies the seismic and dynamic qualification will be made available to the NRC to facilitate reviews, inspections, and audits throughout the process. FSAR information will be revised, as necessary, as part of a subsequent FSAR update.

STD SUP 3.10-1

Section 17.5 defines the Quality Assurance Program requirements that are applied to equipment qualification files, including requirements for handling safety-related quality records, control of purchased material, equipment and services, test control, and other quality related processes.

3.10.4 COL Information

3.10.4-1-A **Dynamic Qualification Report**

STD COL 3.10.4-1-A

This COL item is addressed in Section 3.10.1.4.

3.11 Environmental Qualification of Mechanical and Electrical Equipment

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

3.11.4.4 Environmental Qualification Documentation

Replace the last paragraph with the following.

STD COL 3.11-1-A

The documentation necessary to support the continued qualification of the equipment installed in the plant that is within the Environmental Qualification (EQ) Program scope is available in accordance with 10 CFR 50 Appendix A, General Design Criterion 1. EQ files are maintained for equipment and certain post-accident monitoring devices that are subject to a harsh environment. The files are maintained for the operational life of the plant.

Central to the EQ Program is the EQ Master Equipment List (EQMEL). The EQMEL identifies the electrical and mechanical equipment or components that must be environmentally qualified for use in a harsh environment. The EQMEL consists of equipment that is essential to emergency reactor shutdown, containment isolation, reactor core cooling, or containment and reactor heat removal, or that is otherwise essential in preventing a significant release of radioactive material to the environment. This list is developed from the equipment list provided in DCD Table 3.11-1. The EQMEL and a summary of equipment qualification results are maintained as part of the equipment qualification file for the operational life of the plant.

Administrative programs are in place to control revision to the EQ files and the EQMEL. When adding or modifying components in the EQ Program, EQ files are generated or revised to support qualification. The EQMEL is revised to reflect these new components. To delete a component from the EQ Program requires a deletion justification to be prepared that demonstrates why the component can be deleted. This justification consists of an analysis of the component, an associated circuit review if appropriate, and a safety evaluation. The justification is released and/or referenced on an appropriate change document.

For changes to the EQMEL, supporting documentation is completed and approved prior to issuing the changes. This documentation includes safety reviews and new or revised EQ files. Plant modifications and

design basis changes are subject to change process reviews, e.g., reviews in accordance with 10 CFR 50.59 or the change control requirements of the ESBWR-specific appendix to 10 CFR Part 52, in accordance with appropriate plant procedures. These reviews address EQ issues associated with the activity. Any changes to the EQMEL that are not the result of a modification or design basis change are subject to a separate review that is accomplished and documented in accordance with plant procedures.

Engineering change documents or maintenance documents generated to document work performed on an EQ component are reviewed against the current revision of the EQ files for potential impact. Changes to EQ documentation may be due to, but not limited to, plant modifications, calculations, corrective maintenance, or other EQ concerns.

The operational aspects of the EQ program include:

- Evaluation of EQ results for design life to establish activities to support continued EQ
- Determination of surveillance and preventive maintenance activities based on EQ results
- Consideration of EQ maintenance recommendations from equipment vendors
- Evaluation of operating experience in developing surveillance and preventive maintenance activities for specific equipment
- Development of plant procedures that specify individual equipment identification, appropriate references, installation requirements, surveillance and maintenance requirements, post-maintenance testing requirements, condition monitoring requirements, replacement part identification, and applicable design changes and modifications
- Development of plant procedures for reviewing equipment performance and EQ operational activities, and for trending the results to incorporate lessons learned through appropriate modifications to the operational EQ program
- Development of plant procedures for the control and maintenance of EQ records

Implementation of the environmental qualification program, including development of the plant specific Environmental Qualification Document (EQD), will be in accordance with the milestone defined in Section 13.4.

3.11.7 COL Information

3.11-1-A Environmental Qualification Document

STD COL 3.11-1-A

This COL item is addressed in Section 3.11.4.4.

STD SUP 3.12-1

3.12 Piping Design Review

Information on seismic Category I and II, and nonseismic piping analysis and their associated supports is presented in DCD Sections 3.7, 3.9, 3D, 3K, 5.2 and 5.4.

STD SUP 3.13-1

3.13 Threaded Fasteners - ASME Code Class 1, 2, and 3

Criteria applied to the selection of materials, design, inspection and testing of threaded fasteners (i.e., threaded bolts, studs, etc.) are presented in DCD Section 3.9.3.9, with supporting information in DCD Sections 4.5.1, 5.2.3, and 6.1.1.

Appendix 3A Seismic Soil-Structure Interaction Analysis

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

3A.1 Introduction

Add at the beginning of this section.

NAPS DEP 3.7-1
NAPS CDI

The information in DCD Appendix 3A is the basis for the ESBWR Standard Plant SSI analyses. Chapters 2 and 3 contain updated site-specific information that interfaces with DCD Appendix 3A. The site-specific SSI analyses and results are provided in Sections 3.7.2, 3.8.4, and 3.8.5. Site-specific geotechnical data is described in Chapter 2. The site plan is shown in Figure 2.1-201. Where the North Anna 3 Early Site Permit site-specific information is discussed in DCD Appendix 3A, it is related to the basis for the ESBWR Standard Design SSI analyses and is updated in Chapters 2 and 3 for site-specific applicability. The information in DCD Appendix 3A is maintained and applies to the extent that it establishes methods for performing analyses and provides the basis for the ESBWR Standard Plant SSI analysis.

3A.2 ESBWR Standard Plant Site Plan

Replace the first two sentences of the first paragraph with the following.

NAPS CDI

The site plan is shown in Figure 2.1-201. The plan orientation is denoted on the figure.

Appendix 3B Containment Hydrodynamic Load Definitions

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 3C Computer Programs Used in the Design and Analysis of Seismic Category I Structures

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Add the following at the end of Appendix 3C.

NAPS CDI

3C.7.4 Site-Specific Dynamic Soil-Structure Interaction Analysis Program – SASSI2010

3C.7.4.1 Description

SASSI2010 is used to solve a wide range of dynamic SSI problems in two or three dimensions.

3C.7.4.2 Validation

SASSI version 2010 was obtained from Isatis LLC under the contract with the Regents of the University of California and implemented by Shimizu Corporation of Tokyo, Japan on HP Z420 Workstation computer using Windows 7 OS. Program validation documentation is available at Shimizu Corporation.

3C.7.5 Free-Field Site Response Analysis – P-SHAKE

A model comparable to the free-field site response analysis SHAKE method described in the DCD Section 3C.7.3 is the PSHAKE method described in Section 2.5.2 (Reference 2.5-222) and Section 3.7.1. P-SHAKE is a Bechtel proprietary modified version of SHAKE.

3C.7.5.1 Description

P-SHAKE is a Bechtel proprietary modified version of SHAKE. P-SHAKE generates the same design earthquake-induced strain-compatible soil properties and site response motions as generated by SHAKE and the input files of the two programs for the most part are compatible. P-SHAKE is, however, built on a different program logic that allows the site response analysis to be performed with acceleration response spectrum as input instead of acceleration time histories used by SHAKE.

3C.7.5.2 Validation

The P-SHAKE program validation documents are located in Bechtel's Computation Service Library.

3C.7.5.3 Extent of Application

P-SHAKE is used to provide the site-specific earthquake-induced design ground motions and the associated strain-compatible soil properties for the Seismic Category I structures (RB/FB, CB, and FWSC).

Appendix 3D Computer Programs Used in the Design of Components, Equipment, and Structures

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 3E [Deleted]

Appendix 3F Response of Structures to Containment Loads

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 3G Design Details and Evaluation Results of Seismic Category I Structures

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 3H Equipment Qualification Design Environmental Conditions

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 3I Designated NEDE-24326-1-P Material Which May Not Change Without Prior NRC Approval

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 3J Evaluation of Postulated Ruptures in High Energy Pipes

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 3K Resolution of Intersystem Loss of Coolant Accident

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 3L Reactor Internals Flow Induced Vibration Program

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Chapter 4 Reactor

4.1 Summary Description

This section of the referenced DCD is incorporated by reference with no departures or supplements.

4.2 Fuel System Design

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

4.2.4.2 Seismic

Add the following at the end of this section.

NAPS DEP 3.7-1

A site-specific dynamic and seismic analysis for the control rods to be used in the initial core will be performed in accordance with the same methodology described in DCD Reference 4.2-8, using the site-specific SSE as defined in Section 3.7.1. Adequacy of the dynamic and seismic design is verified through site-specific ITAAC in COLA Part 10, Section 2.4.19.

4.3 Nuclear Design

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

4.3.3.1 Nuclear Design Description

Replace the last paragraph with the following.

STD COL 4.3-1-A

There are no changes to the fuel, control rod, or core design from that described in the referenced certified design.

4.3.5 COL Information

4.3-1-A Variances from Certified Design

STD COL 4.3-1-A

This COL Item is addressed in Section 4.3.3.1.

4.4 Thermal and Hydraulic Design

This section of the referenced DCD is incorporated by reference with no departures or supplements.

4.5 Reactor Materials

This section of the referenced DCD is incorporated by reference with no departures or supplements.

4.6 Functional Design of Reactivity Control System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 4A Typical Control Rod Patterns and Associated Power Distribution for ESBWR

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

4A.1 Introduction

Replace the third paragraph with the following.

STD COL 4A-1-A

There are no changes to the fuel, control rod, or core design from that described in the referenced certified design.

4A.3 COL Information

4A-1-A **Variances from Certified Design**

STD COL 4A-1-A

This COL item is addressed in Section 4A.1.

Appendix 4B Fuel Licensing Acceptance Criteria

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 4C Control Rod Licensing Acceptance Criteria

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 4D Stability Evaluation

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Chapter 5 Reactor Coolant System and Connected Systems

5.1 Summary Description

This section of the referenced DCD is incorporated by reference with no departures or supplements.

5.2 Integrity of Reactor Coolant Pressure Boundary

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

5.2.1 Compliance with Codes and Code Cases

5.2.1.1 Compliance with 10 CFR 50.55a

Add the following at the end of this section.

STD SUP 5.2-2

As described in Section 5.2.4, preservice and inservice inspection of the reactor coolant pressure boundary is conducted in accordance with the applicable edition and addenda of the ASME Boiler and Pressure Vessel Code, Section XI, required by 10 CFR 50.55a. As described in DCD Section 3.9.6 for pumps and valves, and in DCD Section 3.9.3.7.1 for dynamic restraints, preservice and inservice testing of the reactor coolant pressure boundary components is in accordance with the edition and addenda of the ASME OM Code required by 10 CFR 50.55a.

5.2.4 Preservice and Inservice Inspection and Testing of Reactor Coolant Pressure Boundary

Replace the second sentence in the second paragraph with the following.

STD COL 5.2-3-A

All Class 1 austenitic or dissimilar metal welds are included in the referenced certified design.

Replace the second sentence and subsequent parenthetical sentence in the fourth paragraph with the following.

STD COL 5.2-1-A

The initial inservice inspection program incorporates the latest edition and addenda of the ASME Boiler and Pressure Vessel Code approved in 10 CFR 50.55a(b) on the date 12 months before initial fuel load.

5.2.4.2 Accessibility

Replace the last sentence in the second paragraph with the following.

STD COL 5.2-3-A

During the construction phase of the project, anomalies and construction issues are addressed using change control procedures. Procedures require that changes to approved design documents, including field changes and modifications, are subject to the same review and approval process as the original design. Accessibility and inspectability are key components of the design process. Control of accessibility for inspectability and testing during licensee design activities affecting Class I components is provided via procedures for design control and plant modifications.

Ultrasonic techniques (UT) will be the preferred NDE method for all PSI and ISI volumetric examinations; radiographic techniques (RT) will be used as a last resort only if UT cannot achieve the necessary coverage. The same NDE method used during PSI will be used for ISI to the extent possible to assure a baseline point of reference. If a different NDE method is used for ISI than was used for PSI, equivalent coverage will be achieved as required by code.

5.2.4.3.4 Qualification of Personnel and Examination Systems for Ultrasonic Examination

Add the following at the end of the paragraph.

STD COL 5.2-1-A

Certification of NDE personnel shall be in accordance with ASME Section XI, IWA-2300, as modified by 10 CFR 50.55a(b)(2)(xviii).

5.2.4.6 System Leakage and Hydrostatic Pressure Tests

Revise the second sentence of the first paragraph as follows.

STD COL 5.2-1-A

Regardless of which test method is chosen, system leakage and hydrostatic pressure tests will meet all requirements of ASME Code Section XI, IWA-5000 and IWB-5000 for Class I components, including the limitation of 10 CFR 50.55a(b)(2)(xxvi).

Add the following paragraph at the end of this section.

STD SUP 5.2-1

System pressure tests and correlated technical specification requirements are provided in the plant Technical Specifications 3.4.4,

"RCS Pressure and Temperature (P/T) Limits," and 3.10.1, "Inservice Leak and Hydrostatic Testing Operation."

5.2.4.11 COL Information for Preservice and Inservice Inspection and Testing of Reactor Coolant Pressure Boundary

Replace the first sentence of the first paragraph with the following and delete the last sentence.

STD COL 5.2-1-A

DCD Section 5.2.4 fully describes the Preservice and Inservice Inspection and Testing Programs for the RCPB. The implementation milestones for the Preservice and Inservice Inspection and Testing Programs are provided in Section 13.4.

5.2.5 Reactor Coolant Pressure Boundary Leakage Detection

STD COL 5.2-2-A

Delete the parenthetical statement in the first sentence of the first paragraph.

Replace DCD Section 5.2.5.9 with the following.

STD COL 5.2-2-A

5.2.5.9 Leak Detection Monitoring

Operators are provided with procedures for detecting, monitoring, recording, trending, and determining the sources of reactor coolant pressure boundary leakage. Examples of parameters that are monitored are sump pump run time, sump level, condensate transfer rate, and process chemistry/radioactivity.

The procedures are used for converting different parameter indications for identified and unidentified leakage into common leak rate equivalents (volumetric or mass flow) and leak rate rate-of-change values, including indications from: 1) the drywell floor drain high conductivity water sump monitoring system, 2) the drywell air coolers condensate flow monitoring system, and 3) the drywell fission product monitoring system.

The procedures are used to monitor leakage at levels well below Technical Specifications limits and provide guidance for evaluating potential corrective action plans to prevent the plant from exceeding a Technical Specifications limit.

An unidentified leakage rate-of-change alarm provides an early alert to the operators to initiate corrective actions prior to reaching a Technical Specifications limit.

A description of the plant procedures program and implementation milestones are provided in Section 13.5.

5.2.6 COL Information

5.2-1-A Preservice and Inservice Inspection Program Description

STD COL 5.2-1-A

This COL Item is addressed in Sections 5.2.4, 5.2.4.3.4, 5.2.4.6, 5.2.4.11, and 6.6.

5.2-2-A Leak Detection Monitoring

STD COL 5.2-2-A

This COL Item is addressed in Sections 5.2.5 and 5.2.5.9.

5.2-3-A Preservice and Inservice Inspection NDE Accessibility Plan Description

STD COL 5.2-3-A

This COL Item is addressed in Section 5.2.4 and 5.2.4.2.

5.3 Reactor Vessel

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

5.3.1.5 Fracture Toughness

Compliance with 10 CFR 50, Appendix G

Replace the last sentence in the first paragraph with the following.

STD COL 16.0-1-A 5.6.4-1

The pressure-temperature limit curves are developed in accordance with the Pressure and Temperature Limits Report, as discussed in the Technical Specifications Section 5.6.4. Prior to fuel load, the pressure-temperature limit curves will be updated to reflect plant-specific material properties, if required.

5.3.1.6 Material Surveillance

NAPS COL 5.3-2-A

Delete the parenthetical statement in the first sentence of the first paragraph.

5.3.1.8 COL Information for Reactor Vessel Material Surveillance Program

Replace this section with the following.

STD COL 5.3-2-A

The description of the reactor vessel material surveillance program provided in DCD Section 5.3.1.6 is supplemented as follows.

A complete reactor vessel material surveillance program will be developed as described above in accordance with the implementation schedule provided in Section 13.4.

5.3.1.8.1 Locations of Capsules in Core Beltline Region

A total of four irradiation exposure specimen sets containing the required specimens are located near the vessel wall slightly above the core midplane. The irradiation exposure specimen sets are contained in specimen holders that are welded to the inner diameter of the core beltline forging. Each specimen holder houses two specimen containers that form the irradiation exposure set. The elevation and azimuth locations of the exposure specimen sets align with the maximum calculated fluence within the core beltline. Based on the location of the samples relative to the shell forging and their placement at the peak fluence location, the lead factors for the samples will be greater than 1.0. The lead factor for the specimens when placed at the peak location has been estimated to be 1.17.

5.3.1.8.2 Preparation of Capsule Specimens

As stated in DCD Section 5.3.1.6.1, the reactor vessel materials specimens are provided in accordance with the requirements of ASTM E 185 and 10 CFR 50, Appendix H. The surveillance specimen materials are prepared from full thickness samples taken from the actual core beltline forging and from the adjacent forgings and weld materials. The materials include the base metal and weld metal that have the highest adjusted reference temperature at end-of-life. The fabrication or heat treatment history (austenitizing, quench and tempering, and post-weld heat treatment) of the test material is fully representative of the fabrication history of the materials in the beltline of the RPV.

The base metal sample blocks from which the specimens are taken are located at least one “T” from any quenched edge of the block, where “T”

is the material thickness, and at least 25 mm from a flame cut edge or weld fusion line.

The weld metal sample blocks are fabricated using the same welding procedure and process as the vessel shell weld they represent. The welding materials (electrodes, flux, or gas) are from the same heat and lot as the material used to make the production weld. The welder is qualified to ASME Section IX. The weld must satisfy the same examination and inspection requirements as the production weld. The weld or HAZ samples are taken at least one “T” from any quenched edge of the block, at least 25 mm from a flame cut edge, and at least 13 mm from the root of the weld.

Base Metal Samples

The longitudinal axes of tensile specimens are located 1/4T from the as-quenched vessel surface. The specimens are oriented so that the longitudinal axis is parallel to the forging and normal to the major working direction of the forging.

Charpy V-notch specimens are removed 1/4T from the as-quenched vessel surface. The longitudinal axes of specimens are oriented parallel to the forging surface and normal to the major working direction.

Weld Metal Samples

The longitudinal axes of tensile specimens are located in the approximate center of the weld metal and at least 13 mm from the final weld surface and the root of the weld. The axis is parallel to the plate or forging surface.

The roots of the notch of Charpy V-notch specimens are in the approximate center of the weld metal. The specimens are taken at least 13 mm from the final weld surface and the root of the weld. The notch is perpendicular to the plate or forging surface.

All tensile specimens and Charpy V-notch specimens correspond to the allowable specimen types, as defined in ASTM E 185.

Fracture Toughness Samples

Fracture toughness specimens are provided from the limiting base and weld metals and are consistent with the guidelines in ASTM E 1820 and ASTM E 1921.

5.3.1.8.3 Number and Type of Specimens

The number of specimens in each exposure set satisfies or exceeds the requirements of ASTM E 185. Additional fracture toughness specimens of the limiting materials are included as shown in Table 5.3-201. Four sets of specimens are provided for the 60-year life of the ESBWR. The quantities of specimens per irradiation exposure set are provided in Table 5.3-201.

5.3.1.8.4 Report of Test Results

A summary technical report, including test results, is submitted as specified in 10 CFR 50.4, for the contents of each capsule withdrawn, within one year of the date of capsule withdrawal unless an extension is granted by the Director, Office of Nuclear Reactor Regulation. The report includes the data required by ASTM E185-82, as specified in Paragraph III.B.1 of 10 CFR 50, Appendix H, and includes the results of the fracture toughness tests conducted on the beltline materials in the irradiated and unirradiated conditions. If the test results indicate a change in the Technical Specifications is required, the expected date for submittal of the revised Technical Specification will be provided with the report.

5.3.3.6 Operating Conditions

Add the following after the first sentence.

STD SUP 5.3-1

Development of plant operating procedures is addressed in Section 13.5. These procedures require compliance with the Technical Specifications. The Technical Specifications (which are developed by the methodology also identified in the Technical Specifications) are intended to ensure that the P-T limits identified in DCD Section 5.3.2 are not exceeded during normal operating conditions and anticipated plant transients.

5.3.4 COL Information

5.3-2-A Materials and Surveillance Capsule

STD COL 5.3-2-A
NAPS COL 5.3-2-A

This COL Item is addressed in Sections 5.3.1.6 and 5.3.1.8.

5.4 Component and Subsystem Design

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

5.4.8 Reactor Water Cleanup/Shutdown Cooling System

Add the following paragraph at the end of this section.

STD SUP 5.4-1

Operating procedures provide guidance to prevent severe water hammer caused by mechanisms such as voided lines.

5.4.12 Reactor Coolant System High Point Vents

Add the following paragraph at the end of this section.

STD SUP 5.4-2

A human factors analysis of the control room displays and controls for the RCS vents is included as part of the overall human factors analysis of the control room displays and controls described in DCD Chapter 18. This analysis considers:

- The use of this information by an operator during both normal and abnormal plant conditions;
- Integration into emergency procedures;
- Integration into operator training; and
- Other alarms during an emergency and the need for prioritization of alarms.

5.4.12.1 Operation of RPV Head Vent System

Add the following paragraph at the end of this section.

STD SUP 5.4-3

Operating procedures for the reactor vent system address considerations regarding when venting is needed and when it is not needed, including a variety of initial conditions for which venting may be required. The development of operating procedures is addressed in Section 13.5.

STD COL 5.3-2-A

Table 5.3-201 Quantities of Reactor Vessel Materials Specimens per Irradiation Exposure Set

Material	Specimen Type	No. of Specimens per Irradiation Exposure Set	Comments
Base Metal	Charpy	45	15 samples from each of three forgings in accordance with ASTM E 185-02.
	Tensile	9	3 samples from each of three forgings in accordance with ASTM E 185-02.
	Fracture Toughness	8	Taken from most limiting material in accordance with ASTM E 185-02.
Weld Metal	Charpy	30	15 specimens per weld in accordance with ASTM E 185-02.
	Tensile	6	3 specimens per weld in accordance with ASTM E 185-02.
	Fracture Toughness	8	Taken from most limiting material in accordance with ASTM E 185-02.
HAZ	Charpy	12	In accordance with ASTM E 185-82.

Chapter 6 Engineered Safety Features

6.0 General

This section of the referenced DCD is incorporated by reference with no departures or supplements.

6.1 Design Basis Accident Engineered Safety Feature Materials

This section of the referenced DCD is incorporated by reference with no departures or supplements.

6.2 Containment Systems

This section of the referenced DCD is incorporated by reference with no departures or supplements.

6.3 Emergency Core Cooling Systems

This section of the referenced DCD is incorporated by reference with no departures or supplements.

6.4 Control Room Habitability Systems

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

6.4.4 System Operation Procedures

Replace the second paragraph with the following.

STD COL 6.4-1-A

Operators are provided with training and procedures for control room habitability that address the applicable aspects of NRC Generic Letter 2003-01 and are consistent with the intent of Generic Issue 83. Training and procedures are developed and implemented in accordance with Sections 13.2 and 13.5, respectively. The implementation milestones for training and procedures are provided in Sections 13.4 and 13.5, respectively.

6.4.5 Design Evaluations

System Safety Evaluation

Add the following after the second paragraph.

NAPS SUP 6.4-1

The impact of a postulated design basis accident (DBA) in Units 1 or 2 on the Unit 3 control room was evaluated. The bounding case is a release from the Unit 2 RB to the Unit 3 Control Building receptor based on a minimum distance criterion. The evaluation was performed as follows:

- Atmospheric dispersion factors, χ/Qs, at the Unit 3 MCR intakes were conservatively calculated assuming a point source, a distance of approximately 400 m (1312 ft), and a release height of 10 m (32.8 ft). Meteorological data used for cross-unit impact is consistent with that used for the χ/Q values presented in Section 2.3. A nominal "receptor to source" direction of 60 degrees was assumed (clockwise with respect to "true north"). The χ/Q values are presented in Table 2.3-207.
- The Unit 2 LOCA as described in Section 15.4.1.8 of the Units 1 and 2 UFSAR was reviewed. The resultant dose at the Unit 3 MCR intake was determined by adjusting the LPZ dose consequences by the ratio of the χ/Q values, and the ratio of the breathing rates (BR) for the LPZ versus the control room values. Detailed modeling of the Unit 3 control room was not performed because the doses are bounded by a postulated Unit 3 LOCA. No credit was taken for the reduced control room occupancy factor, the Unit 3 control room emergency filtration units, or the "finite cloud" model allowed per RG 1.194.

Based on this conservative analysis, the resultant dose is bounded by the control room operator dose from a postulated Unit 3 DBA, and is less than GDC 19 limits.

Replace DCD Table 6.4-2 with Table 2.2-202, replace the third paragraph with the following, and delete the last paragraph.

NAPS COL 6.4-2-A

Potential toxic gas sources are evaluated to confirm that an external release of hazardous chemicals does not impact control room habitability. These sources include: 1) offsite industrial facilities and transportation routes; 2) Units 1 and 2; and 3) Unit 3.

Evaluation of potentially hazardous off-site chemicals within 8 km (5 miles) of the control room is addressed in Section 2.2. As described

therein, there are no manufacturing plants, chemical plants, storage facilities, major water transportation routes, oil pipelines or gas pipelines within 8 km (5 miles) of the control room. There are also no significant control room habitability impacts due to chemicals being transported along offsite routes within 8 km (5 miles) of the plant.

Toxic gas analysis for potentially hazardous chemicals stored on site is performed in accordance with the guidelines of RG 1.78 and on the basis of no action being taken by the control room operator. On-site locations with potentially toxic chemicals are identified in Table 2.2-202. The results of the analysis, shown in Tables 2.2-203 and 2.2-205, when compared to the toxicity limits given in RG 1.78, show hazardous concentrations of toxic gas in the control room are not reached. Based on this analysis, toxic gas monitoring instrumentation is not required.

6.4.9 COL Information

6.4-1-A CRHA Procedures and Training

STD COL 6.4-1-A This COL item addressed in Section 6.4.4.

6.4-2-A Toxic Gas Analysis

NAPS COL 6.4-2-A This COL item addressed in Section 6.4.5 and Tables 2.2-203 and 2.2-205.

6.5 Atmosphere Cleanup Systems

This section of the referenced DCD is incorporated by reference with no departures or supplements.

6.6 Preservice and Inservice Inspection and Testing of Class 2 and 3 Components and Piping

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

STD COL 6.6-2-A Delete the second sentence in the third paragraph.

Replace the last three sentences and the parenthetical statement of the fourth paragraph with the following.

STD COL 6.6-1-A The PSI/ISI program description for Class 2 and 3 components and piping is provided in DCD Section 6.6.

6.6.2 Accessibility

Replace the last sentence in the second paragraph with the following.

STD COL 6.6-2-A

All Class 2 or 3 austenitic or dissimilar metal welds are included in the referenced certified design.

During the construction phase of the project, anomalies and construction issues are addressed using change control procedures. Procedures require that changes to approved design documents, including field changes and modifications, are subject to the same review and approval process as the original design.

Accessibility and inspectability are key components of the design process. Control of accessibility for inspectability and testing during licensee design activities affecting Class 2 and 3 components is provided via procedures for design control and plant modifications.

UT will be the preferred NDE method for all PSI and ISI volumetric examinations; RT will be used as a last resort only if UT cannot achieve the necessary coverage. The same NDE method used during PSI will be used for ISI to the extent possible to assure a baseline point of reference. If a different NDE method is used for ISI than was used for PSI, equivalent coverage will be achieved as required by code.

6.6.6 System Pressure Tests

Revise the second sentence of the first paragraph as follows.

STD COL 5.2-1-A

Regardless of which test method is chosen, system leakage and hydrostatic pressure tests will meet all applicable requirements of ASME Code Section XI, IWA-5000 and IWC-5000 for Class 2 components; and IWD-5000 for Class 3 components, including the limitations of 10 CFR 50.55a(b)(2)(xx) and 10 CFR 50.55a(b)(2)(xxvi).

6.6.7 Augmented Inservice Inspections

STD COL 6.6-1-A

6.6.7.1 Flow Accelerated Corrosion Program Description

The flow accelerated corrosion (FAC) monitoring program analyzes, inspects, monitors, and trends nuclear power plant piping and components that are susceptible to FAC damage. The FAC program is based on EPRI NSAC-202L (Reference 6.6-201).

Prior to start-up, a comprehensive FAC-susceptibility screening will be performed to identify any plant systems that may be susceptible to FAC degradation. Should any plant systems remain susceptible, a FAC program will be implemented as described below. Program implementation milestones are provided in Section 13.4. Pre-service baseline nondestructive examination (NDE) inspections will be performed and material constituency identified for each as-fabricated piping component in the susceptible systems.

6.6.7.1.1 Analysis

A program similar to that described in EPRI NSAC-202L is used to identify the most susceptible components and to evaluate the rate of wall thinning for components and piping potentially susceptible to FAC. Each susceptible component is tracked in a database and is inspected, based on susceptibility. For each piping component, the program predicts the wear, and the estimated time until it must be re-inspected, repaired, or replaced.

6.6.7.1.2 Industry Experience

Industry experience provides a valuable supplement to plant analysis and associated inspections. Reviews of industry experience are performed to identify generic plant problem areas and determine differences in similar types of components. This information is used to update the FAC program.

6.6.7.1.3 Inspections

Wall thickness measurements establish the extent of wear in a given component, provide data to help evaluate trends, and provide data to refine the predictive model. Components are inspected for wear using ultrasonic techniques (UT), radiography techniques (RT), or by visual observation. The preservice inspections are used as a baseline for later inspections. Therefore, the preservice inspections use grid locations and measurement methods most likely to be used for inservice inspections according to industry guidelines. Each subsequent inspection determines the wear rate for the piping and components and the need for inspection frequency adjustment for those components.

6.6.7.1.4 Training and Engineering Judgement

The FAC program is administered by trained and experienced personnel. Task-specific training is provided for plant personnel that implement the monitoring program. Specific NDE is carried out by personnel qualified in the given NDE method. Inspection data is analyzed by engineers or other experienced personnel to determine the overall effect on the system or component.

6.6.7.1.5 Long-Term Strategy

The FAC program includes a long-term strategy that focuses on reducing wear rates, using improved water chemistry, and optimizing the inspection planning process.

6.6.7.1.6 FAC Program Documentation

A procedure documents the overall program description and its implementation.

Governing Program Description

A governing program description defines the overall program and associated responsibilities. This program description addresses the following elements:

- A corporate commitment to monitor and control FAC.
- Identification of the tasks to be performed (including implementing procedures) and associated responsibilities.
- Identification of the position that has overall responsibility for the FAC program.
- Communication requirements between the lead position and other departments that have responsibility for performing support tasks.
- Quality assurance requirements.
- Identification of long-term goals and strategies for reducing high FAC wear.
- A method for evaluating plant performance against long-term goals.

Program Implementation

The implementation of each specific task conducted as part of the FAC program is described in one or more procedures, including:

- Identifying susceptible systems

- Developing FAC inspection drawings
- Developing a FAC inspection database
- Performing FAC analysis
- Selecting and scheduling components for initial inspection
- Performing inspections
- Evaluating inspection data
- Evaluating worn components
- Identifying components for repair and replacement when necessary
- Selecting and scheduling locations for follow-on inspections

6.6.7.1.7 Documentation

The results of inspections are documented in accordance with the requirements of the implementing documents. Periodically, reports are prepared that identify the components inspected, justify the basis for their selection (i.e., predictive ranking, industry experience, engineering judgment), document the results of the inspections, and evaluate and disposition worn components.

6.6.10 Plant Specific PSI/ISI Program Information

6.6.10.1 Relief Requests

Add the following at the end of this section.

STD COL 6.6-1-A No relief requests for the PSI/ISI program have been identified.

6.6.10.2 Code Edition

Replace the second sentence with the following.

STD COL 6.6-1-A The initial ISI program incorporates the latest edition and addenda of the ASME Code approved in 10 CFR 50.55a(b) on the date 12 months before initial fuel load.

STD COL 6.6-1-A

6.6.10.3 Program Implementation

The milestones for preservice and inservice inspection program implementation are provided in Section 13.4.

6.6.11 COL Information

6.6-1-A PSI/ISI Program Description

STD COL 6.6-1-A This COL item is addressed in Section 6.6.

6.6-2-A PSI/ISI NDE Accessibility Plan Description

STD COL 6.6-2-A This COL item is addressed in Section 6.6.2.

6.6.12 References

6.6-201 Electric Power Research Institute, “Recommendations for an Effective Flow-Accelerated Corrosion Program,” NSAC-202L-R2.

Appendix 6A TRACG Application for Containment Analysis

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 6B Evaluation of the TRACG Nodalization for the ESBWR Licensing Analysis

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 6C Evaluation of the Impact of Containment Back Pressure On the ECCS Performance

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 6D Containment Passive Heat Sink Details

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 6E TRACG LOCA Containment Response Analysis

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 6F Break Spectrums of Break Sizes and Break Elevations

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 6G TRACG LOCA SER Confirmation Items

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 6H Additional TRACG Outputs and Parametrics Cases

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 6I Results of the Containment Design Basis Calculations With Suppression Pool Bypass Leakage Assumption of 1 cm^2 (1.08E-03 ft^2)

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Chapter 7 Instrumentation and Control Systems

This chapter of the referenced DCD is incorporated by reference with no departures or supplements.

Chapter 8 Electric Power

8.1 Introduction

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

8.1.2.1 Utility Power Grid Description

Add the following to the end of the first paragraph.

NAPS SUP 8.1-1

The output of Unit 3 is delivered to a main 500/230 kV switchyard through the unit main step-up transformers, and an intermediate switchyard as described in Sections 8.2 and 8.3. The main switchyard serves four 500 kV lines and one 230 kV line. The plant is connected to the main switchyard by a 500 kV normal preferred transmission line, and a 230 kV alternate preferred transmission line that supplies power to the two reserve auxiliary transformers. The 500 kV lines go to the Ladysmith, Morrisville, and Midlothian substations. The 230 kV line goes to the Gordonsville substation. These intra-system ties transit from the NAPS main switchyard to the east, west, north, and south as shown in Figure 8.2-203. Dominion's transmission system and intra-system ties are further described in Section 8.2.

8.1.5.2.4 Regulatory Requirements – NRC Regulatory Guides:

Add the following after Regulatory Guide 1.204.

NAPS DEP 8.1-2

Exception: The switchyard surge protection system is not designed to the guidelines of IEEE C62.23. The switchyard surge protection system is designed to Dominion transmission system standards that provide similar protection.

Table 8.1-1R Onsite Power System SRP Criteria Applicability Matrix

Applicable Criteria		IEEE Standard	Notes	Offsite Power System	AC (Onsite) Power System	DC (Onsite) Power System
GDC	2		7			X
GDC	4		7			X
GDC	5		1			
GDC	17		7, 8	X	X	X
GDC	18		7	X	X	X
GDC	50				X	X
10 CFR	50.34(f)(2)(v)		6			
10 CFR	50.34(f)(2)(xiii)		2			
10 CFR	50.34(f)(2)(xx)		2			
10 CFR	50.63		7			X
RG	1.6			X	X	X
RG	1.9		3			
RG	1.32	308	7			X
RG	1.47		7			X
RG	1.53	379, 603	7			X
RG	1.63	242, 317, 741			X	X
RG	1.75	384	7			X
RG	1.81		1			
RG	1.106					
RG	1.118	338, 603	7			X

Table 8.1-1R Onsite Power System SRP Criteria Applicability Matrix

	Applicable Criteria		IEEE Standard	Notes	Offsite Power System	AC (Onsite) Power System	DC (Onsite) Power System
	RG	1.128	485, 344, 323, 484				X
	RG	1.129	450				X
	RG	1.153	603	7			X
	RG	1.155 (NUMARC 8700)		7, 9			X
	RG	1.160 (NUMARC 93-01)			X	X	X
NAPS DEP 8.1-2	RG	1.204	665, 666, 1050, C62.23	10	X	X	
	BTP	ICSB 4		2			
	BTP	ICSB 8		3			
	BTP	ICSB 11			X		
	BTP	ICSB 18					
	BTP	ICSB 21		7			X
	BTP	PSB 1				X	
	BTP	PSB 2		3			
	NUREG-0718			6			
	NUREG-0737			5			
	NUREG/CR-0660			3			
	TMI Action Item II.E.3.1			2			
	TMI Action Item II.G.1			2			

Table 8.1-1R Onsite Power System SRP Criteria Applicability Matrix

Notes:

(1) Noted criteria are applicable to multiple unit plants only, and are not applicable to the single-unit ESBWR.

(2) The criterion is only applicable to PWRs, and thus, is not applicable to the ESBWR.

(3) The ESBWR Standard Plant does not have safety-related diesel generators, and thus, this criterion is not applicable to the ESBWR.

(4) (Deleted)

(5) Covered by 10 CFR 50.34(f)(2)(xiii) and 50.34(f)(2)(xx).

(6) Not applicable to the ESBWR:

- 10 CFR 50.34 (f)(2)(v); and
- NUREG 0718 (applied only to the pending applications at February 16, 1982).

(7) The safety-related UPS system and the safety-related 480 VAC isolation power centers are included in the DC onsite applicability column.

(8) Refer to Subsection 8.1.5.2.4, GDC 17, for electric power source availability requirements.

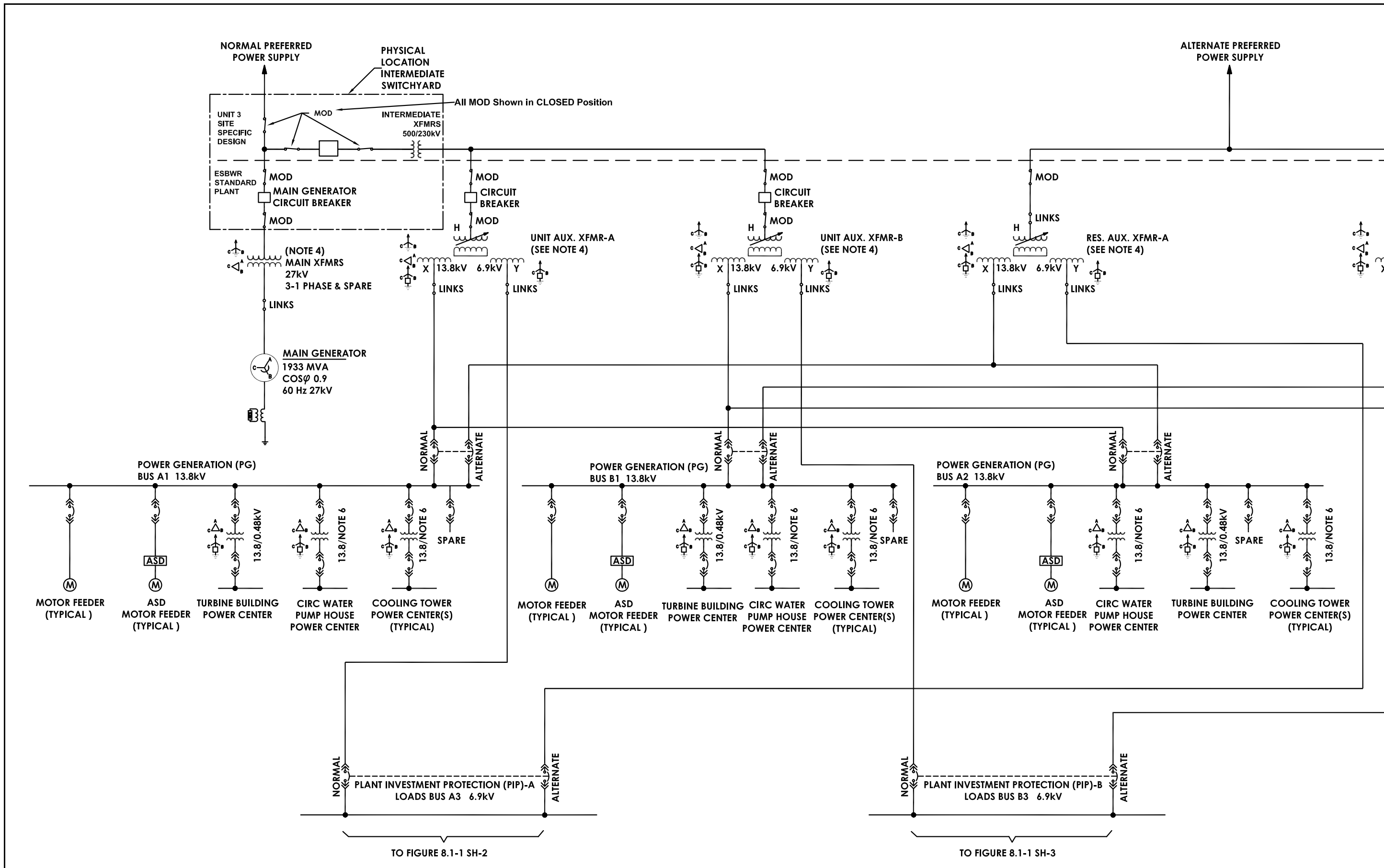
(9) Procedures and training for SBO Response Guidelines, AC Power Restoration, and Severe Weather Guidelines are developed per Sections 13.2 and 13.5.

NAPS DEP 8.1-2

(10) Exception is taken to the following subclauses of IEEE C62.23 for the North Anna switchyard lightning protection design: 4.3.5, 5.3.2, 5.3.2.1, 5.3.3.1, 5.3.3.2, 5.3.3.3, 5.3.4.1, 5.3.4.2, 5.3.5.2 and 5.3.5.6.2 a).

NAPS COL 8.2.4-1-A
NAPS COL 8.2.4-2-A
NAPS DEP 8.1-1

Figure 8.1-1R Electrical Power Distribution System (Sh 1 of 3)



NOTES

1. DELETED

2. THE BREAKERS SHALL BE CONTROLLED TO AUTO TRANSFER FROM NORMAL TO ALTERNATE. TRANSFER BACK TO NORMAL IS A MANUAL TRANSFER.

3. THE SYMBOL ⬡ DENOTES AN ELECTRICAL CONNECTION BETWEEN HEXAGON BEARING THE SAME NUMBER.

4. PRIMARY (HIGH) WINDING VOLTAGE OF UAT, RAT & MAIN XFMRS ARE DISCUSSED IN SUBSECTION 8.2.1.2.

5. ALL COMPONENTS OF THIS SYSTEM ARE NONSAFETY-RELATED EXCEPT FOR THE SAFETY-RELATED COMPONENTS MARKED WITH NOTE 5.

6. TYPICAL SECONDARY VOLTAGE FOR COOLING TOWER , PUMP HOUSE AND WATER TREATMENT POWER CENTERS MAY RANGE FROM 480V TO 6.9kV.

8.2 Offsite Power Systems

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

8.2.1.1 Transmission System

Replace this section with the following.

NAPS COL 8.2.4-1-A
NAPS COL 8.2.4-10-A

NAPS, that is, Units 1, 2 and 3, is connected to the Dominion transmission system by four 500 kV lines (three of which were constructed for Units 1 and 2) and one 230 kV line. The lines are designed and located to minimize the likelihood of simultaneous failure.

The Unit 3 main generator feeds electric power through a 27 kV isolated-phase bus to a bank of three single-phase transformers, stepping the generator voltage up to the transmission voltage of 500 kV. Figure 8.2-201 provides a one-line diagram of the electric system from the switchyard to the onsite system. The physical arrangement of power lines from offsite power sources is shown in Figure 8.2-202. Figure 8.2-203 maps the offsite transmission lines.

The transmission lines and towers connecting the switchyard to the transmission system are as follows:

- Two 500 kV overhead lines to the Ladysmith substation (approximately 15 miles)
- A 500 kV overhead line to the Midlothian substation (approximately 41 miles)
- A 500 kV overhead line to the Morrisville substation (approximately 33 miles)
- A 230 kV overhead line to the Gordonsville substation (approximately 31 miles)

The two Ladysmith lines (one of which was constructed for Units 1 and 2) utilize a common right-of-way. Each of the other lines utilizes separate rights-of-way. The 230 kV Gordonsville line crosses under the 500 kV Morrisville line and one of the Ladysmith lines near the switchyard.

Transmission tower separation, line installation, and clearances are consistent with the National Electric Safety Code (NESC) and Dominion transmission line standards. Basic tower structural design parameters, including the number of conductors, height, materials, color, and finish

are consistent with Dominion transmission line design standards. Adequate clearance exists between wire galloping ellipses to minimize conductor or structure damage. (Reference 8.2-202)

Dominion has established a Switchyard Interface Agreement and protocols for Maintenance, Communications, Switchyard Control, and System Analysis sufficient to safely operate and maintain the power station interconnection to the transmission system.

8.2.1.2 Offsite Power System

Replace the first and second paragraphs with the following.

NAPS COL 8.2.4-3-A
NAPS COL 8.2.4-4-A

The offsite power system is a nonsafety-related system. Power is supplied to the plant from multiple independent and physically separate offsite power sources. The normal preferred power source is any one of the four 500 kV lines, and the alternate preferred power source is any one of the other three 500 kV lines.

The normal preferred power source is supplied to the UATs through the intermediate transformer, MODs and isolation circuit breakers. The normal preferred power interface with the offsite power system occurs at the high voltage terminals of the main generator circuit breaker MOD and UAT MODs. The MOD feeding a faulted UAT will be opened after the UAT high voltage breaker opens.

Delete the last paragraph and add the following paragraph.

Underground cables connect the normal and alternate preferred power sources to the UATs and RATs, respectively. The underground cables have a metallic sheath to prevent moisture ingress into the cable insulation. The metallic sheath is machine applied to the cable core and mechanically sealed to form a continuous barrier against moisture. To maintain their independence from each other, the underground cables are routed in duct banks and are physically and electrically separate from each other. Manholes associated with these duct banks are inspected every six months for excessive accumulation of water.

Control, instrumentation, and miscellaneous power cables associated with the normal and alternate preferred circuits are routed in duct bank between the power block and the Intermediate Switchyard. Adequate separation is ensured by either routing cables associated with the normal preferred circuit in a separate duct bank from cables associated with the

alternate preferred circuit, or by routing these cables in separate conduits within the same duct bank.

8.2.1.2.1 Switchyard

Replace the last paragraph with the following.

NAPS COL 8.2.4-2-A
NAPS COL 8.2.4-6-A
NAPS COL 8.2.4-7-A
NAPS COL 8.2.4-8-A
NAPS DEP 8.1-2

The NAPS switchyard, prior to the point of interconnection with Unit 3, is a 500/230 kV, air-insulated, breaker-and-a-half bus arrangement. Unit 3 is connected to this switchyard by an overhead conductor circuit.

The physical location and electrical interconnection of the switchyard is shown on Figure 8.2-201 and Figure 8.2-202.

AC Power is fed to the 500 kV and 230 kV switchyard control houses from four switchyard service transformers. Each switchyard service transformer is a 19.9 kV/120-240V transformer and is aligned using manual throw switches. Multiple switchyard service transformers can be aligned to both the 500 kV and 230 kV control houses.

DC power for the 500 kV switchyard controls is provided by two systems from separate and completely independent batteries and chargers. Each DC system in the 500 kV control house consists of a single lead-acid storage battery maintained by two chargers (one as normal and one as backup). The batteries are located in separate, ventilated rooms of the control house. The chargers are located in the same room in the central part of the control house and are separated to minimize interaction. The 500 kV control house battery chargers can be fed from any of the AC power sources supplying the 500 kV control house, but are typically powered from separate sources.

DC power for the 230 kV switchyard controls is provided by a separate system located in the 230 kV switchyard control house. This system consists of a single lead-acid storage battery maintained by two chargers (one as normal and one as backup). The 230 kV control house battery chargers are fed from the AC power source supplying the 230 kV control house.

Switchyard batteries are 125 VDC and have an 8-hour duty cycle. The batteries are sized in accordance with Dominion substation engineering standards and the sizing is verified using the manufacturer’s sizing program that adheres to battery sizing methodologies found in IEEE 485 (Reference 8.2-203). Battery charger sizing is verified in accordance with Dominion substation engineering standards.

The switchyard grounding system, which overlays an older grounding system, was designed and installed in accordance with the Dominion Substation Engineering Manual and IEEE 80 (Reference 8.2-204). In accordance with IEEE 80, the switchyard ground grid resistance is less than 1 ohm. The switchyard grounding grid is connected to the station grounding grid.

The North Anna switchyard uses surge suppressors on the high and low sides of Transformers 1, 2, 3, 5, and 6 to protect equipment from voltage surges, including lightning events. The insulation coordination and surge protective devices are applied in compliance with IEEE 1313.2 (Reference 8.2-205) and IEEE C62.22 (Reference 8.2-206). The surge protective devices are maintained according to NEMA requirements and manufacturer's recommendations.

A shield wire arrangement is designed for lightning abatement in the switchyard in accordance with IEEE C62.22, IEEE 988 (Reference 8.2-207), and reference book entitled "Insulation Coordination for Power Systems" (Reference 8.2-208).

The capacity and electrical characteristics for switchyard equipment are as follows:

Transformers	**Voltage Rating**	**MVA Rating**
1 and 2	500/36.5 kV	60/80/100/112
3	500/36.5 kV	67.2/89.6/112
5 and 6	500/230 kV	67.2/89.6/112

Breakers	**Max Design**	**Rated Current**	**Interrupting Current at Max kV**
500 kV	550 kV	3000A	50 kAIC
230 kV	242 kV	2000A	40 kAIC

Disconnect Switch	**Maximum Voltage**	**Basic Impulse Insulation Level**	**Continuous Current Rating**
500 kV	550 kV	1550 kV	3000A
230 kV	242 kV	900 kV	2000A

Transmission Lines	Rated Current at 100ºF
500 kV	3954A
230 kV	2190A

Bus	Rated Current at 100ºF	Short Circuit Current (Bus Bracing Limit)
500 kV	3891A	50 kA
230 kV	2750A	40 kA

NAPS COL 8.2.4-5-A

8.2.1.2.2 Protective Relaying

The 500 kV transmission lines are protected with redundant high-speed relay schemes with re-closing and communication equipment to minimize line outages. The 500 kV switchyard buses have redundant bus differential protection using separate and independent current and control circuits. Generating unit tie-lines and auxiliary transformer underground cable circuits are protected with redundant high-speed relay schemes. Transformers 1, 2, 3, 5, and 6 are protected with sudden pressure relays and differential relays.

Dominion is responsible for engineering, constructing, operating, and maintaining its electric transmission system, and for interfacing with PJM, the Regional Transmission Organization (RTO). Dominion's responsibility includes designing, maintaining, and operating all switchyard protective relaying associated with connecting Unit 3 to the North Anna switchyard. PJM studied the interconnection of Unit 3 to the North Anna switchyard and recommended no additional design requirements above those typically used by Dominion in the design of the protective relaying scheme at the switchyard.

The 500 kV circuit breakers are equipped with dual trip coils. Each redundant protection circuit that supplies a trip signal is powered from its redundant DC power load group and connected to a separate trip coil. Equipment and cabling associated with each redundant system is physically separated from its redundant counterpart. Breakers are provided with a breaker failure scheme that isolates a breaker that fails to trip due to a malfunction.

NAPS SUP 8.2-2

8.2.1.2.3 Testing and Inspection

Transmission lines are inspected via an aerial inspection program approximately twice per year. The inspection focuses on such items as right-of-way encroachment, vegetation management, conductor and line hardware condition, and the condition of supporting structures.

Routine switchyard inspection activities include, but are not necessarily limited to, the following:

- Daily transformer inspections
- Periodic inspections of circuit breakers and batteries
- Quarterly infrared scans
- Semi-annual infrared scans (relay panels)
- Quarterly inspection of substation equipment
- Annual infrared scans
- Annual corona camera scan

Routine switchyard testing activities include, but are not necessarily limited to, the following:

- Transformers – dissolved gas analysis every 5 months
- Electromechanical Relay testing (500 kV) –every 2 years
- Electromechanical Relay testing (230 kV) – every 3 years
- Microprocessor Relay testing (500 kV and 230 kV) – every 4 years
- Transformer Load Tap Changers – dissolved gas analysis every 4 years
- Battery Discharge testing – every 5 years
- Circuit Breakers – maintenance and inspection every 6 years
- CT maintenance – every 6 years
- Disconnect Switches (line zone) – maintenance and inspection every 6 years
- Ground Grid testing – every 8 years
- Disconnect Switches (bus zone) – maintenance and inspection every 10 years
- PT testing – every 10 years
- CCVT testing – every 10 years

- Arrester testing (bus zone) – every 10 years
- Wave Trap testing – every 12 years

Switchyard protection system monitoring, maintenance, and testing are performed in accordance with North American Electric Reliability Corporation (NERC) Standard PRC-005-1 (Reference 8.2-209), Standard PRC-008-0 (Reference 8.2-210), and Standard PRC-017-0 (Reference 8.2-211).

8.2.2.1 Reliability and Stability Analysis

Replace this section with the following.

NAPS COL 8.2.4-9-A

A system impact study was performed to assess the effects of interconnection of the 1933 MVA ESBWR on the transmission system in the areas of load flow, import/export capability, short circuit analysis, system stability, and voltage sensitivity. (Reference 8.2-201) The study was prepared using the 2013 summer light load base case and the 2013 summer peak load case projections. The analysis was performed using Power Technology International Software PSS/E for load flow, import/export capability and stability evaluation, and ASPEN One-liner for short circuit evaluation.

The equipment considered is from the point of interconnection of Unit 3 at the switchyard out to the 500 kV transmission system. This includes the 230 kV buses and interconnections. The 34.5 kV portion of the North Anna switchyard is not modeled separately, but the 34.5 kV loads are considered at the 500 kV level.

The system was studied for stability and voltage sensitivity based on the following scenarios:

- Close in 3 phase faults cleared in primary time
- Close in 3 phase faults cleared in primary time with prior outage of selected transmission lines
- Close in breaker failure faults with delayed clearing
- Loss of largest generating unit
- Loss of most limiting transmission line
- Sequential loss of all generating units at North Anna
- Loss of Unit 3 with North Anna Units 1 and 2 in refueling
- Accident on Unit 3 with normal shutdown of North Anna Units 1 and 2

- Sudden simultaneous loss of North Anna Units 1 and 2 with Unit 3 operating

The study concluded in all cases analyzed that the generator rotor angles and system voltage recover to acceptable operating points, with no unstable frequency deviations during the transients.

Short circuit analyses were performed to verify the interrupting capability of the 500 kV breakers. The study results show that symmetrical short circuit current does not exceed 40 kA and asymmetrical short circuit current does not exceed 47 kA. The 500 kV breakers are rated to interrupt at 50 kA and are, therefore, adequately sized. Results of the study also showed that symmetrical and asymmetrical short circuit currents did not exceed the 40 kA rating of the 230 kV circuit breakers.

Maximum and minimum switchyard voltage limits have been established for the 500 kV switchyard at 540 kV and 505 kV, respectively. Normal operating and abnormal procedures exist to maintain the switchyard voltage schedule and address challenges to the maximum and minimum limits. Upon approaching or exceeding a limit, these procedures verify the availability of required and contingency equipment and materials, and direct notifications to outside agencies, until the normal voltage schedule can be maintained.

The TSO provides analysis capabilities for both Long Term Planning and Real Time Operations. System conditions are evaluated to ensure a bounding analysis and model parameters are selected that are influential in determining the system's ability to provide offsite power adequacy. Elements included in the analysis are system load forecasts (including sufficient margin to ensure a bounding analysis over the life of the study), system generator dispatch (including outages of generators known to be particularly influential in offsite power adequacy of affected nuclear units), outage schedules for transmission elements that have significant influence on offsite power adequacy, cross-system power transfers and power imports/exports, and system modification plans and schedules. A Real Time State Estimator is used to assist in the evaluation of actual system conditions. These capabilities are described in the System Analysis Protocol of the Switchyard Interface Agreement.

The reliability of the overall system design is indicated by the fact that there have been no widespread system interruptions. Failure rates of

individual facilities are low. Transmission lines are designed to have less than one lightning flashover per 100 miles per year, and the record shows much better performance, indicating conservative designs. Most lightning-caused outages are momentary, with few instances of line damage. Other facilities do fail occasionally, but these are random occurrences, and experience has shown that equipment specifications are adequate.

Grid availability in the region over the past 20 years was also examined and it was confirmed that the system has been highly reliable with minimal outages due to equipment failures.

Grid stability is evaluated on an ongoing basis based on load growth, the addition of new transmission lines, or new generation capacity.

NAPS SUP 8.2-3

8.2.2.3 Failure Modes and Effects Analysis

8.2.2.3.1 Introduction

There are no single failures that can prevent the NAPS offsite power system from performing its function to provide power to Unit 3. (Reference 8.2-201)

8.2.2.3.2 Transmission System Evaluation

Unit 3 is connected to the Dominion transmission system via four 500 kV and one 230 kV overhead transmission lines. The normal preferred power source is any one of the four 500 kV lines. The alternate preferred power source is any one of the other three 500 kV lines. (See Section 8.2.1.1 and Section 8.2.1.2.)

Each transmission line occupies a separate right-of-way, except the two parallel Ladysmith lines, which share the same right-of-way. The 500 kV towers provide clearances consistent with the NESC. The towers are grounded with either ground rods or a counterpoise ground system. Failure of any one tower due to structural failure can at most disrupt and cause a loss of power distribution to itself and the adjacent line.

Failure of a line conductor would cause the loss of one of the four 500 kV lines, with the other three lines remaining available as normal and alternate preferred power sources.

8.2.2.3.3 Switchyard Evaluation

A breaker-and a-half scheme is incorporated in the design of the switchyard. The equipment in the switchyard is rated and positioned

within the bus configuration according to the following criteria in order to maintain incoming and outgoing load flow from Unit 3.

- Equipment continuous current ratings are such that no single contingency in the switchyard (e.g., a breaker being out of service for maintenance) results in current exceeding 100 percent of the continuous current rating of the equipment.
- Interrupting duties are such that no faults occurring on the system exceed the equipment rating.
- Momentary ratings are such that no fault occurring on the system exceeds the equipment momentary rating.
- Voltage ratings for the equipment are specified to be greater than the maximum expected operating voltage.

The breaker-and-a-half switchyard arrangement offers the following flexibility to control a failed condition within the switchyard:

- Any faulted transmission line into the switchyard can be isolated without affecting any other transmission line.
- Either bus can be isolated without interruption of any transmission line or other bus.
- Relay schemes used for protection of the offsite power circuits and the switchyard equipment, with the exception of the 230 kV bus, include primary and backup protection features. The relay scheme used for protection of the 230 kV bus includes primary protection features. All 500 kV breakers are equipped with dual trip coils. Each protection circuit that supplies a trip signal is connected to a separate trip coil.

8.2.2.3.4 **Intermediate Switchyard**

The intermediate switchyard is an integral part of the normal preferred power supply. The failure of any component within the intermediate switchyard may disrupt the normal preferred power supply. However, the alternate preferred power supply will remain available to supply the load.

The equipment in the intermediate switchyard is rated according to the following criteria:

- Interrupting duties are specified such that no faults occurring on the system exceed the equipment rating.
- Momentary ratings are specified such that no faults occurring on the system exceed the equipment momentary rating.

- Voltage ratings are specified to be greater than the maximum expected operating voltage.
- Circuit breaker continuous current ratings are chosen such that no single contingency will result in a load exceeding 100 percent of the nameplate continuous current rating of the breaker.

The normal preferred and alternate preferred power supplies are electrically independent and are physically separate from each other.

Therefore, a minimum of one preferred source of power remains available to supply the load during all plant conditions.

8.2.4 COL Information

8.2.4-1-A Transmission System Description

NAPS COL 8.2.4-1-A This COL item is addressed in Section 8.2.1.1.

8.2.4-2-A Switchyard Description

NAPS COL 8.2.4-2-A This COL item is addressed in Section 8.2.1.2.1.

8.2.4-3-A Normal Preferred Power

NAPS COL 8.2.4-3-A This COL item is addressed in Section 8.2.1.2.

8.2.4-4-A Alternate Preferred Power

NAPS COL 8.2.4-4-A This COL item is addressed in Section 8.2.1.2.

8.2.4-5-A Protective Relaying

NAPS COL 8.2.4-5-A This COL item is addressed in Section 8.2.1.2.2.

8.2.4-6-A Switchyard DC Power

NAPS COL 8.2.4-6-A This COL item is addressed in Section 8.2.1.2.1.

8.2.4-7-A Switchyard AC Power

NAPS COL 8.2.4-7-A This COL item is addressed in Section 8.2.1.2.1.

8.2.4-8-A Switchyard Transformer Protection

NAPS COL 8.2.4-8-A This COL item is addressed in Section 8.2.1.2.1.

8.2.4-9-A Stability and Reliability of the Offsite Transmission Power Systems

NAPS COL 8.2.4-9-A This COL item is addressed in Section 8.2.2.1.

8.2.4-10-A Interface Requirements

NAPS COL 8.2.4-10-A This COL item is addressed in Section 8.2.1.1.

8.2.5 References

8.2-201 PJM Generator Interconnection Q65 North Anna 500 kV (1570 MW Capacity/1594 Energy) Revised System Impact Study & Facilities Study Report Resulting from Necessary Studies Agreement, September 2013.

8.2-202 VA PJM Design and Application of Overhead Transmission Lines 69kV and above, May 20, 2002.

8.2-203 Institute of Electrical and Electronics Engineers, “IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications,” IEEE 485-1997.

8.2-204 Institute of Electrical and Electronics Engineers, “IEEE Guide for Safety in AC Substation Grounding,” IEEE 80-2000.

8.2-205 Institute of Electrical and Electronics Engineers, “IEEE Guide for the Application of Insulation Coordination,” IEEE 1313.2-1999 (R2005).

8.2-206 Institute of Electrical and Electronics Engineers, “IEEE Guide for the Application of Metal Oxide Surge Arrester for Alternating Current Systems,” IEEE C62.22-2009.

8.2-207 Institute of Electrical and Electronics Engineers, “IEEE Guide for Direct Lightning Stroke Shielding of Substations,” IEEE 998-1996 (R2002).

8.2-208 Hileman, A. R.: “Insulation Coordination for Power Systems,” Taylor & Francis, Inc., Boca Raton, FL, 1999.

8.2-209 NERC, “Transmission and Generation Protection System Maintenance and Testing,” NERC Standard PRC-005-1, May 1, 2006.

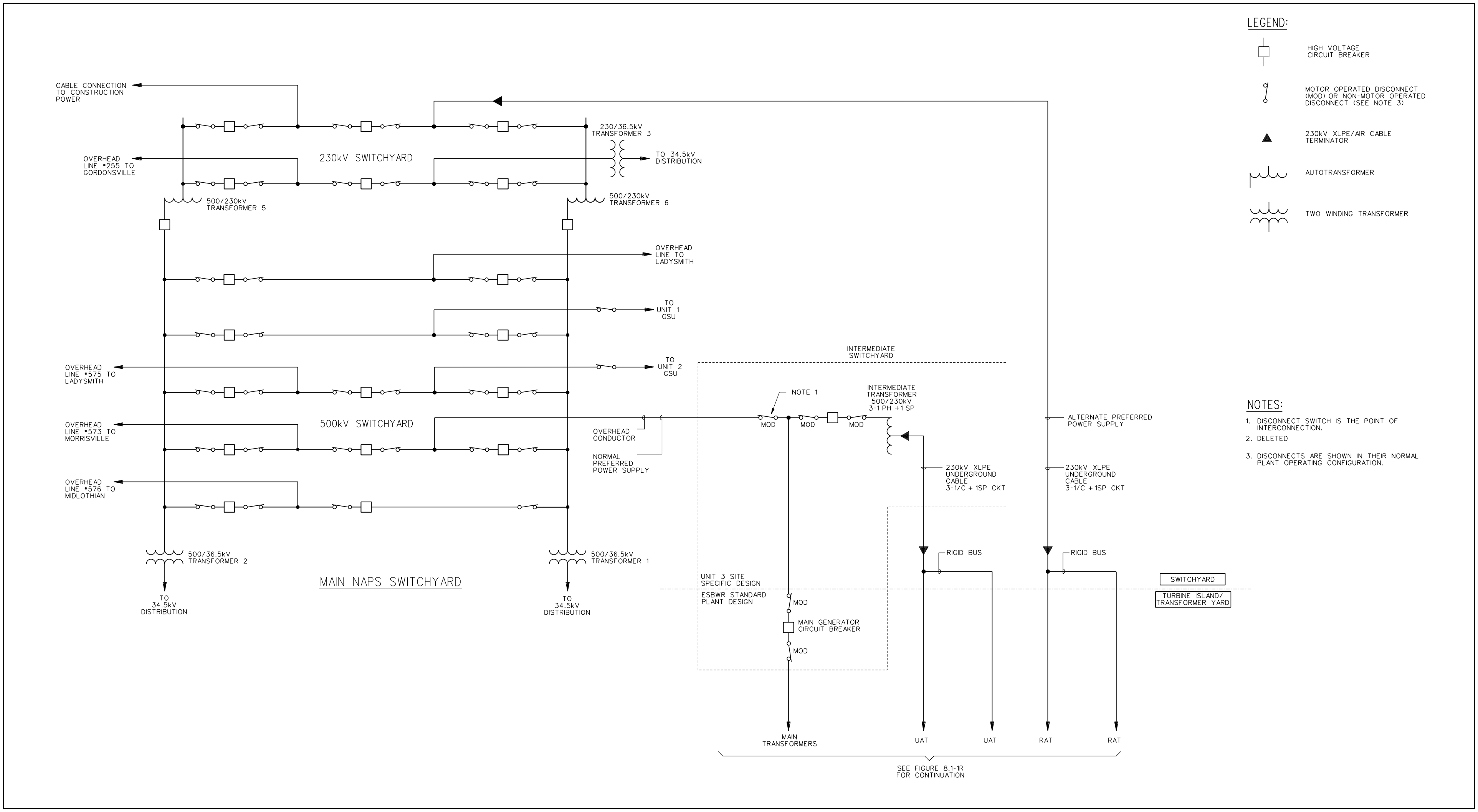
8.2-210 NERC, “Implementation and Documentation of Underfrequency Load Shedding Equipment Maintenance Program,” NERC Standard PRC-008-0, April 1, 2005.

8.2-211 NERC, “Special Protection System Maintenance and Testing,” NERC Standard PRC-017-0, April 1, 2005.

BASIS: ESBWR COLA

NAPS COL 8.2.4-1-A
NAPS COL 8.2.4-2-A

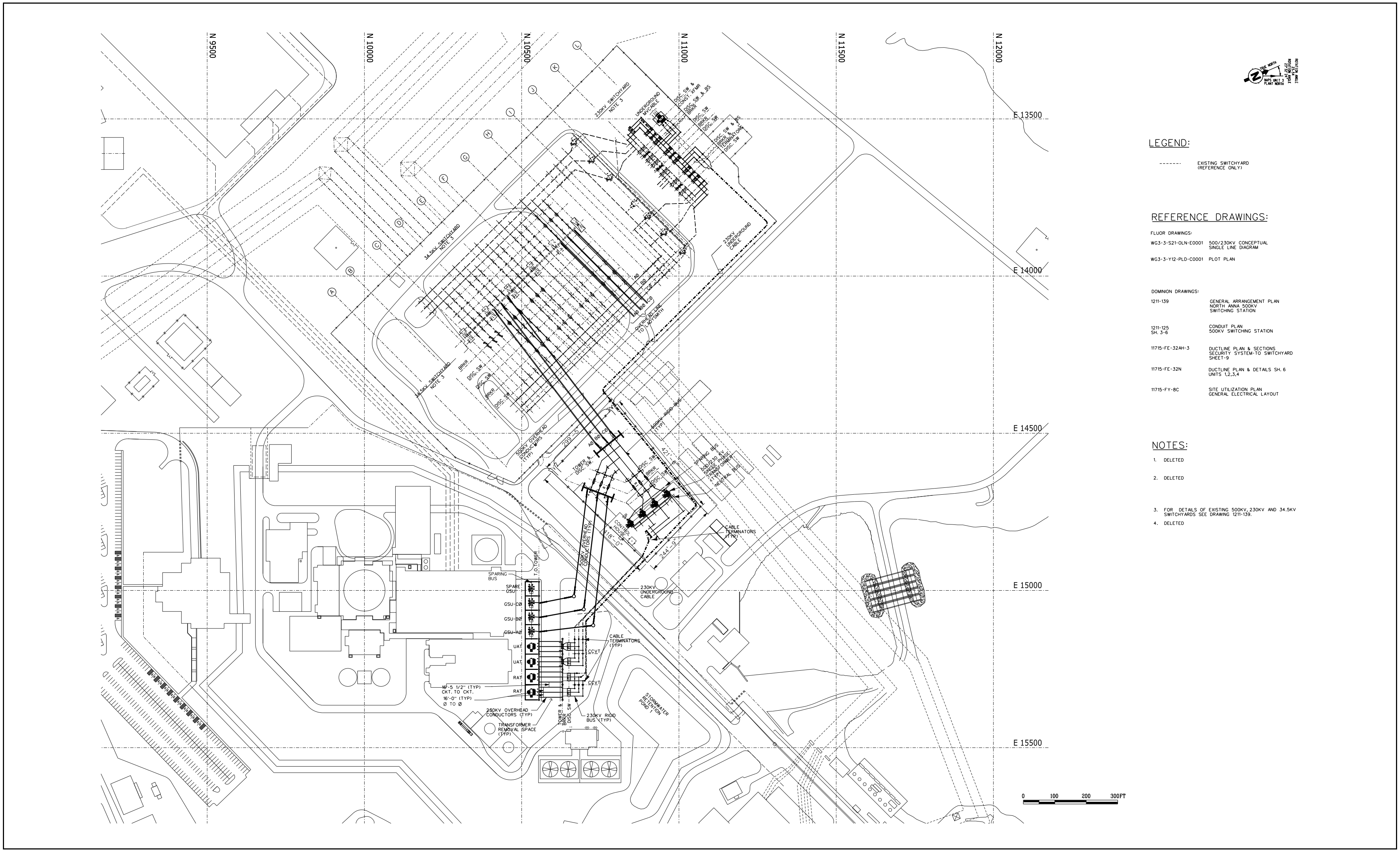
Figure 8.2-201 500/230 kV Switchyard Single-Line Diagram



BASIS: ESBWR COLA

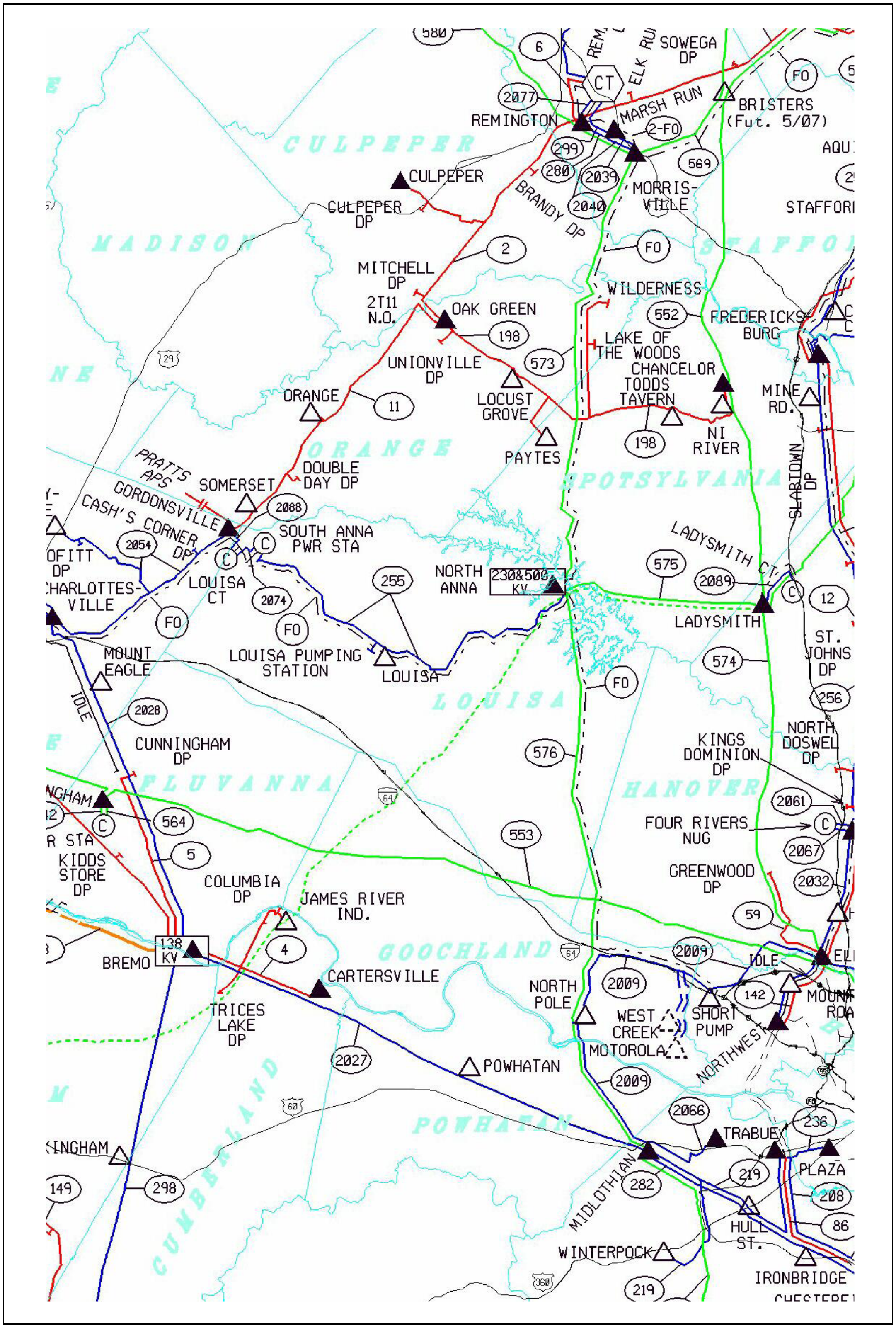
NAPS COL 8.2.4-1-A

Figure 8.2-202 500/230 kV Switchyard Arrangement



NAPS SUP 8.1-1

Figure 8.2-203 Dominion Transmission Line Map



8.3 Onsite Power Systems

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

8.3.1.1 Description

Insert the following as the first paragraph.

NAPS SUP 8.3-1

An intermediate switchyard is utilized to transition off-site power from the NAPS switchyard to the Unit 3 main power transformers, and unit auxiliary transformers (UATs). This intermediate switchyard contains the main generator circuit breaker, and a supply circuit breaker, which provides power to 500/230 kV intermediate transformers used to supply power to the UATs. These intermediate transformers consist of three single phase transformers and include an installed spare transformer. Also included in the intermediate switchyard is a transmission tower which supports a 500 kV disconnect switch that is identified as the point of interconnection between the onsite power sources and the offsite power sources. This point of interconnection is the demarcation between Unit 3 and the NAPS switchyard and transmission system. (See Figure 8.2-201)

8.3.2.1.1 Safety-Related Station Batteries and Battery Chargers

Safety-Related Batteries

Replace the fourth paragraph of this section with the following.

NAPS COL 8.3.4-1-A

In Divisions 1, 2, 3, and 4, the two 250 volt safety-related batteries per division are sized together so that their total rated capacity will exceed the required battery capacity per division for 72-hour station blackout conditions. The DC system minimum battery terminal voltage at the end of the discharge period is 210 VDC (1.75 volts per cell). The maximum equalizing charge voltage for safety-related batteries is specified by the battery vendor and is as allowed by the voltage rating of the connected loads (UPS inverters). The UPS inverters are designed to supply 120 VAC power with DC input less than the minimum discharge voltage (210 VDC) and greater than the maximum equalizing charge voltage. The safety-related battery float voltage and maximum equalizing charge voltage values are included in Table 8.3-4R.

Station Blackout

Add the following paragraph at the end of this section.

NAPS SUP 8.3-2

Training and procedures to mitigate an SBO event are implemented in accordance with Sections 13.2 and 13.5, respectively. As recommended by NUMARC 87-00 (Reference 8.3-201), SBO event mitigation procedures address SBO response (e.g., restoration of on-site standby power sources), AC power restoration (e.g., coordination with transmission system load dispatcher), and severe weather guidance (e.g., identification of site-specific actions to prepare for the onset of severe weather such as an impending tornado), as applicable. The ESBWR is a passive design and does not rely on offsite or onsite AC sources of power for at least 72 hours after an SBO event, as described in DCD Section 15.5.5, Station Blackout. In addition, there are no nearby large power sources, such as a gas turbine or black start fossil fuel plant, that can directly connect to the station to mitigate the SBO event. Restoration from an SBO event will be contingent upon power being made available from any one of the following sources:

- Any of the standby or ancillary diesel generators.
- Restoration of any one of the four 500 kV transmission lines described in Section 8.2.
- Restoration of the 230 kV transmission line described in Section 8.2.

8.3.3.2 Cables and Raceways

In this section replace the last sentence in the last paragraph with the following.

NAPS COL 8.3.4-2-A

Underground or inaccessible power and control cable runs to the PSWS and DG Fuel Oil Transfer System that have accident mitigating functions and are susceptible to protracted exposure to wetted environments or submergence as a result of seasonal or weather event water intrusion are adequately identified and monitored for appropriate corrective actions under the Maintenance Rule (MR) program described in Section 17.6.4.

8.3.4 COL Information

8.3.4-1-A Safety Related Battery Float and Equalizing Voltage values

NAPS COL 8.3.4-1-A This COL item is addressed in Section 8.3.2.1.1.

8.3.4-2-A Identification and Monitoring of Underground or Inaccessible Power and Control Cables to the PSWS and DG Fuel Oil Transfer System Equipment That Have Accident Mitigating Functions.

NAPS COL 8.3.4-2-A This COL item is addressed in Section 8.3.3.2.

8.3.5 References

8.3-201 Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors, NUMARC 87-00, Revision 1, August 1991.

NAPS
COL 8.3.4-1-A

Table 8.3-4R Safety-Related DC and UPS Nominal Component Data

a. Batteries

Two 250 VDC batteries per division, (two parallel strings of 120 lead acid cells per string and 240 cells per battery) 6000 Ah. per battery, 12,000 Ah per division (8 hour rate to 1.75 V/cell @77°F) and qualified to a 72 hour duty cycle.

b. Charger

AC input - 480 VAC, 3-phase, 60 Hz
DC output - 250 VDC, 500 A continuous
~~- float voltage is a site specific value @77°F (COL 8.3.4-1-A)~~
- float voltage @77°F - 267.6 VDC at the battery terminals
~~- maximum equalizing charge voltage is a site specific value @77°F (COL 8.3.4-1-A)~~
- maximum equalizing charge voltage @77°F - 288 VDC at the battery terminals

c. Uninterruptible Power Supply (UPS)

i) Inverter
- 40 kVA with 250 VDC input and 120 VAC, 60 Hz output
- AC output voltage regulation of ±1% steady state
- output frequency variation within ±0.1% of nominal 60 Hz
- total harmonic distortion <5%

(Deleted)
(Deleted)

Notes:
(1) See DCD Figures 8.1-3 and 8.1-4 for the configurations of the safety-related DC and UPS systems.

Appendix 8A Miscellaneous Electrical Systems

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

8A.2.1 Description

Replace DCD Section 8A.2.1 with the following.

NAPS COL 8A.2.3-1-A

A cathodic protection system is provided to the extent required. The system is designed in accordance with the requirements of the National Association of Corrosion Engineers (NACE) Standards (DCD Reference 8A-5).

8A.2.3 COL Information

8A.2.3-1-A Cathodic Protection System

NAPS COL 8A.2.3-1-A

This COL item is addressed in Section 8A.2.1.

Chapter 9 Auxiliary Systems

9.1 Fuel Storage and Handling

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.1.1.7 Safety Evaluation

Structural Design

STD COL 9.1-4-A

Delete the last sentence of the third paragraph.

Protection Features of the New Fuel Storage Facilities

STD COL 9.1-4-A

Delete the last sentence of the third paragraph.

9.1.4 Light Load Handling System (Related to Refueling)

9.1.4.13 Refueling Operations

Add the following at the end of this section.

STD COL 9.1-4-A

Section 13.5 requires development of fuel handling procedures. Fuel handling procedures address the status of plant systems required for refueling; inspection of replacement fuel and control rods; designation of proper tools; proper conditions for spent fuel movement and storage; proper conditions to prevent inadvertent criticality; proper conditions for fuel cask loading and movement; and status of interlocks, reactor trip circuits and mode switches. These procedures provide instructions for use of refueling equipment, actions for core alterations, monitoring core criticality status, and accountability of fuel for refueling operations. Fuel handling procedures are developed six months before fuel receipt to allow sufficient time for plant staff familiarization, to allow NRC staff adequate time to review the procedures, and to develop operator licensing examinations.

Personnel qualifications and training for fuel handlers are addressed in Section 13.2.

9.1.4.18 Safety Evaluation of Fuel Handling Systems

Replace the second sentence of the fifth paragraph with the following.

STD COL 9.1-4-A

Fuel handling procedures provided to prevent inadvertent criticality are discussed in Subsection 9.1.4.13.

9.1.4.19 Inspection and Testing Requirements

Add the following at the end of this section.

STD COL 9.1-4-A

Section 17.5 describes the QA program that is applied to monitoring, implementing, and ensuring compliance with fuel handling procedures. As part of normal plant operations, the fuel-handling equipment is inspected for operating conditions before each refueling operation. During the operational testing of this equipment, procedures are followed that will affirm the correct performance of the fuel-handling system interlocks. Other maintenance and test procedures are developed based on manufacturer's requirements.

9.1.5 Overhead Heavy Load Handling Systems (OHLHS)

9.1.5.6 Other Overhead Load Handling System

Add the following at the end of this section.

STD COL 9.1-5-A

Special Lifting Devices

Testing and inspection of special lifting devices follow the guidelines of ANSI N14.6.

Other Lifting Devices

Slings used for heavy load lifts meet the requirements specified for slings in ANSI B30.9 and the guidance specified in NUREG-0612, Section 5.1.1(5).

9.1.5.8 Operational Responsibilities

Replace this section with the following.

STD COL 9.1-5-A

Procedures

Section 13.5 requires the development of administrative procedures to control heavy loads prior to fuel load to allow sufficient time for plant staff familiarization, to allow NRC staff adequate time to review the procedures, and to develop operator licensing examinations. Heavy loads handling procedures address:

- Equipment identification
- Required equipment inspections and acceptance criteria prior to performing lift and movement operations

- Approved safe load paths and exclusion areas
- Safety precautions and limitations
- Special tools, rigging hardware, and equipment required for the heavy load lift
- The use of slings constructed from metallic material where the single-failure-proof features of the handling system are credited in achieving a very low probability of a load drop as described in Regulatory Information Summary (RIS) 2005-25, Supplement 1, Clarification of NRC Guidelines for Control of Heavy Loads
- Rigging arrangement for the load
- Adequate job steps and proper sequence for handling the load

Safe load paths are defined for movement of heavy loads to minimize the potential for a load drop on irradiated fuel in the reactor vessel or spent fuel pool or on safe shutdown equipment. Paths are defined in procedures and equipment layout drawings. Safe load path procedures address the following general requirements:

- When heavy loads must be carried directly over the spent fuel pool, reactor vessel or safe shutdown equipment, procedures will limit the height of the load and the time the load is carried.
- When heavy loads could be carried (i.e., no physical means to prevent) but are not required to be carried directly over the spent fuel pool, reactor vessel or safe shutdown equipment, procedures will define an area over which loads shall not be carried so that if the load is dropped, it will not result in damage to spent fuel or operable safe shutdown equipment or compromise reactor vessel integrity.
- Where intervening structures are shown to provide protection, no load travel path is required.
- Defined safe load paths will follow, to the extent practical, structural floor members.
- When heavy loads movement is restricted by design or operational limitation, no safe load path is required.
- Supervision is present during heavy load lifts to enforce procedural requirements.

Inspection and Testing

Cranes addressed in this section are inspected, tested, and maintained in accordance with Section 2-2 of ANSI B30.2, Section 11.2 of ANSI B30.11, or Sections 16-1.2.1 and 16-1.2.3 of ANSI B30.16 with the exception that tests and inspections may be performed prior to use for infrequently used cranes. Prior to making a heavy load lift, an inspection of the crane is made in accordance with the above applicable standards.

Training and Qualification

Training and qualification of operators of cranes addressed in this section meet the requirements of ANSI B30.2, and include the following:

- Knowledge testing of the crane to be operated in accordance with the applicable ANSI crane standard.
- Practical testing for the type of crane to be operated.
- Supervisor signatory authority on the practical operating examination.
- Applicable physical requirements for crane operators as defined in the applicable crane standard.

Quality Assurance

Procedures for control of heavy loads are developed in accordance with Section 13.5. In accordance with Section 17.5 and DCD Section 9.1.5.2, other specific quality program controls are applied to the heavy loads handling program, targeted at those characteristics or critical attributes that render the equipment a significant contributor to plant safety.

9.1.5.9 Safety Evaluations

Add the following at the end of this section.

STD COL 9.1-5-A

No heavy loads are identified that are outside the scope of the certified design. In addition, there is no heavy load handling equipment, nor interlocks associated with heavy load handling equipment, outside the scope of the certified design.

9.1.6 COL Information

9.1-4-A Fuel Handling Operations

STD COL 9.1-4-A

This COL item is addressed in Sections 9.1.1.7, 9.1.4.13, 9.1.4.18, and Section 9.1.4.19.

9.1-5-A Handling of Heavy Loads

STD COL 9.1-5-A

This COL item is addressed in Section 9.1.5.6, Section 9.1.5.8, and Section 9.1.5.9.

9.1.7 References

9.1-201 Regulatory Information Summary (RIS) 2005-25, Supplement 1, Clarification of NRC Guidelines for Control of Heavy Loads.

9.2 Water Systems

9.2.1 Plant Service Water System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.2.1.2 System Description

Summary Description

Replace the second, third, and fourth sentences of the first paragraph with the following.

NAPS CDI

The source of cooling water to the PSWS is from the auxiliary heat sink (AHS), while the heat removed is rejected to the AHS. The AHS utilizes mechanical draft plume abated cooling towers.

Replace the second paragraph with the following.

NAPS CDI

A simplified diagram of the PSWS is shown in Figure 9.2-1R.

Delete the third paragraph.

Detailed System Description

Replace the fourth and fifth sentences of the second paragraph with the following.

NAPS CDI

The plant service water is returned via a common header to the mechanical draft plume abated cooling tower (AHS) in each train. Remote operated isolation valves and a crosstie line permit routing of the plant service water to either cooling tower.

NAPS COL 9.2.1-1-A

Delete the first sentence of the fifth paragraph.

Replace the first sentence of the sixth paragraph with the following.

NAPS CDI

The AHS provided for each PSWS train is a separate multi-celled, 100 percent capacity mechanical draft plume abated cooling tower, with the fans in the tower from each train supplied by one of the two redundant electrical buses.

Replace the eighth sentence of the sixth paragraph with the following.

NAPS COL 9.2.1-1-A

PSWS basin water is treated for biofouling, scaling, and suspended matter with biocides, anti-scalants, and dispersants, respectively. In addition, PSWS is treated with corrosion inhibitors, as appropriate. These chemicals are injected directly into the cooling tower basin or service water pump intake bay. This water treatment regime mitigates the long-term effects of fouling and corrosion within the PSWS.

PSWS materials are compatible with the PSWS water treatment regime. Based on the selected regime, carbon steel that meets ASTM standards is used as the pipe material for above-grade portions of the PSWS. Valve hard seats are not required for system valves based on the water quality and service conditions. Significant operating experience has demonstrated that resilient-seated valves perform satisfactorily in similar water service.

Fiberglass pressure pipe that meets the requirements of ASME B31.1, Power Piping Code, Nonmandatory Appendix III, Rules for Nonmetallic Piping and Piping Lined with Nonmetals, including applicable ASTM and AWWA standards, is used for below-grade piping. Fiberglass pressure pipe is not susceptible to internal corrosion from the chemically treated water or to external corrosion from ground contact.

Replace the second sentence of the eighth paragraph with the following.

NAPS CDI
NAPS SUP 9.2.1-1

The PSWS component design characteristics are shown in Table 9.2-2R.

Replace the tenth paragraph with the following.

NAPS CDI

Analysis of routine PSWS basin grab samples will detect RCCWS leakage, which may contain low levels of radioactivity, into the PSWS. This provides the action required by NRC Inspection and Enforcement Bulletin No. 80-10.

Delete the twelfth paragraph.

Operation

Replace the last sentence of the second paragraph with the following.

NAPS CDI

Heat removed from the RCCWS and TCCWS is rejected to the auxiliary heat sink.

9.2.1.6 COL Information

9.2.1-1-A Material Selection

NAPS COL 9.2.1-1-A

This COL item is addressed in Section 9.2.1.2.

9.2.2 Reactor Component Cooling Water System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.2.3 Makeup Water System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.2.3.2 System Description

Replace the introductory text and the Demineralization Subsystem portions of this section with the following.

NAPS CDI

The MWS consists of two subsystems: 1) the demineralization subsystem and 2) the storage and transfer subsystem. The makeup water transfer pumps and the demineralization subsystem are sized to meet the demineralized water needs of all operational conditions except for shutdown/refueling/startup. During the shutdown/refueling/startup mode, the increases in plant water consumption require use of a temporary demineralization subsystem and temporary makeup water transfer pumps to be used as a supplemental water source.

The MWS major equipment is housed entirely in the Makeup Water Building except for the demineralized water storage tank (which is outdoors and adjacent to this building) and the distribution piping to the interface systems. Freeze protection is provided for the demineralized water storage tank and piping exposed to freezing conditions.

The MWS equipment and associated piping in contact with demineralized water are fabricated from corrosion resistant materials such as stainless steel to prevent contamination of the makeup water.

Table 9.2-9R lists the major MWS components.

Demineralization Subsystem

Feedwater for the demineralization subsystem is provided by the SWS. Production of demineralized water by the demineralization subsystem can be initiated and shut down either automatically (based on the

demineralized water storage tank level) or manually. Feedwater is treated in the following sequence:

1. Activated carbon filters
2. Reverse osmosis modules
3. Mixed bed demineralizers

Activated carbon bed filters are the first step in the demineralization process. These beds are used to remove naturally occurring organics that would tend to foul the membrane processes (i.e., reverse osmosis) downstream. They also eliminate oxidizing chemicals (e.g., peroxide) that would damage the reverse osmosis membranes.

Each reverse osmosis module includes cartridge filters. The reverse osmosis modules are separated by an inter-stage break tank. Chemical addition is provided upstream of the reverse osmosis module cartridge filters as required. High pressure pumps provide the pressure required for flow through the reverse osmosis unit membranes. The reverse osmosis unit reject flow is sent to the waste heat treatment facility (WHTF). The reverse osmosis product water is temporarily stored in a reverse osmosis product water storage tank before being pumped by one of the forwarding pumps to the mixed bed demineralizer unit. Operation of the reverse osmosis high-pressure pumps is interlocked with that of the forwarding pumps. The mixed bed demineralizer consists of both strong cation and anion resins in the same vessel that polishes the reverse osmosis product water. The mixed bed unit effluent is monitored for water quality. This effluent is automatically recirculated to the station water storage tank until the water quality requirements are met. Makeup water is then delivered to the MWS demineralized water storage tank. The modular design of the system allows continuous demineralized water production. Cleaning, back flushing, or module removal are manual operations based on elevated differential pressure across the module or total flow through the system. No regeneration of mixed bed modules is performed on-site.

9.2.4 Potable and Sanitary Water Systems

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Delete the first paragraph and replace the last paragraph with the following.

NAPS CDI

9.2.4.1 Design Bases

Safety Design Basis

The Potable Water System (PWS) and Sanitary Waste Discharge System (SWDS) do not perform any safety-related function. Therefore, the PWS and SWDS have no safety design bases.

Power Generation Design Basis

The PWS and SWDS are designed to provide potable water supplies and sewage collection and treatment necessary for normal plant operation and shutdown periods. The PWS provides sufficient supply and is designed to supply up to 12.6 liters per second (200 gallons per minute) of potable water during peak demand periods.

The potable water system supplies the quality of water required by the authorities having jurisdiction.

The sanitary waste discharge system is designed to produce a waste water effluent quality required by Federal, state, and local regulations and permits.

9.2.4.2 System Description

Potable Water System

The PWS consists of ground wells at various locations on site. As shown on Figure 9.2-202, for each well house there is a pump, compressor, hydro-pneumatic tank, and interconnecting piping and valves. Combined potable water volume of the hydro-pneumatic tanks is 50,000 liters (13,200 gallons). Potable water from hydro-pneumatic tanks flows to a common potable water header for supply to Unit 3 facilities. The Unit 3 PWS underground header is connected to the Unit 1 and 2 domestic water header via a normally-closed isolation valve. This cross-tie connection is provided for operational flexibility and ease of system maintenance. In addition to non-radiological areas, potable water is provided to areas where inadvertent backflow into the system could

result in radiological contamination of the potable water. For those PWS branches with outlets in areas where the potential for radiological contamination exists, backflow prevention is provided through the installation of backflow preventers.

Sanitary Waste Discharge System

The sanitary waste generated by Unit 3 is collected by a network of sumps and is pumped to the Unit 3 Sewage Treatment Plant (STP). The Unit 3 STP consists of two state-of-the-art units, each rated for a minimum capacity of 94,500 liters per day (25,000 gallons per day). The two units in parallel can treat a minimum of 189,000 liters per day (50,000 gallons per day) of sanitary sewage. During normal plant operation only one of the units is required and, during periods of high demand, both units can be operated to serve additional demand. The effluent is discharged to the WHTF.

Analysis of routine STP sludge tank grab samples will detect events that might contaminate the STP downstream of the sludge tank. This provides the action required by Inspection and Enforcement Bulletin No. 80-10. The quality of effluent meets, at a minimum, the standards established by Federal, state, and local regulations and permits. Sewage sludge is transferred to a truck for off-site disposal. A simplified diagram of the SWDS is shown in Figure 9.2-203.

9.2.4.3 Safety Evaluation

Potable Water System

The PWS has no safety-related function and is not connected to any safety-related system or component. Failure of the system does not compromise any safety-related equipment or component and does not prevent safe shutdown of the plant. The PWS does not handle radioactive fluids. It is neither connected to, nor does it interface with any system that may contain radioactive fluids.

Sanitary Waste Discharge System

The SWDS has no safety-related function and is not connected to any safety-related system or component. Failure of the system does not compromise any safety-related equipment or component and does not prevent safe shutdown of the plant.

The SWDS is not designed to handle radioactive fluids. It is neither connected to, nor does it interface with, any system that may contain

radioactive fluids. As a precautionary measure, the STP sludge tank is grab sampled on a batch basis for potential radiological contamination. In the event radioactivity is detected above predetermined limits, controls are in place to initiate treatment and prevent unmonitored, uncontrolled radioactive releases to the environment.

9.2.4.4 Testing and Inspection Requirements

The PWS and SWDS are proven operable by their use during normal plant operation.

9.2.4.5 Instrumentation Requirements

The PWS and SWDS are furnished with instrumentation that permit local and/or remote monitoring, and local control of each of the respective processes. This instrumentation includes meters, switches, indicators, pressure gauges, flow switches, transmitters, controllers, and valves as required for service, operation, and protection of plant personnel and equipment.

9.2.5 Ultimate Heat Sink

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Replace the second to last sentence, including the two bullets, in the seventh paragraph with the following.

STD COL 9.2.5-1-A

Procedures that identify and prioritize available makeup sources seven days after an accident, and provide instructions for establishing necessary connections, will be developed in accordance with the procedure development milestone in Section 13.5.

9.2.5.1 COL Information

9.2.5-1-A Post Seven Day Makeup to UHS

STD COL 9.2.5-1-A

This COL Item is addressed in Section 9.2.5.

9.2.6 Condensate Storage and Transfer System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.2.6.2 System Description

Add the following at the end of the first paragraph.

STD SUP 9.2.6-1

Freeze protection is provided for the CS&TS.

9.2.7 Chilled Water System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.2.8 Turbine Component Cooling Water System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.2.9 Hot Water System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.2.10 Station Water System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.2.10.2 System Description

Replace the Detailed System Description portion of this section with the following.

NAPS CDI

Detailed System Description

The SWS consists of the following subsystems:

- Plant Cooling Tower Makeup System (PCTMS)
- Pretreated Water Supply System (PWSS)

The PCTMS provides makeup water to the cooling tower basins for both the PSWS (Section 9.2.1) and CIRC (Section 10.4). The supply of water makes up for losses resulting from evaporation, drift and blowdown from the cooling towers. In addition, the PCTMS provides makeup water to replace water used for strainer backwashes. The PCTMS consists of a water source, pumps, strainers, connecting piping, valves and instrumentation. See Figure 9.2-204 for a simplified system diagram and Table 9.2-203 for component design parameters for the PCTMS.

The PWSS chemically conditions and filters the water supplied to the Makeup Water System (MWS) (Section 9.2.3) for further treatment for use as demineralized water. The PWSS also supplies water to the Fire Protection System (FPS) (Section 9.5.1) for filling the primary firewater tanks. In addition, the PWSS provides PSWS cooling tower makeup as an alternate to the PCTMS. The PWSS also provides water for the strainers and filter backwashes. The PWSS consists of a water source, pumps, strainers, filters, chemical injection equipment, station water storage tank, connecting piping, valves and instrumentation. See Figure 9.2-205 for a simplified diagram and Table 9.2-204 for component design parameters for the PWSS.

NAPS CDI
NAPS SUP 9.2.1-1

Table 9.2-2R PSWS Component Design Characteristics

	PSWS Pumps	
	Type	Vertical, wet-pit, centrifugal turbine
	Quantity	4
	Capacity Each	1.262 m^3/s (20,000 gpm)
	Plant Service Water System [1]	
NAPS CDI	Flow (AHS)	2.524 m^3/s (40,000 gpm)
	PSWS Cooling Towers and Basins	
NAPS CDI	Type	Mechanical draft, multi-cell, adjustable speed reversible fans, plume abated
	Quantity	2
	Heat Load Each [2]	83.5 MW (2.85 × 10^8 BTU/hr)
	Flow Rate (Water) Each	2.524 m^3/s (40,000 gpm)
NAPS CDI	Ambient Wet Bulb Temperature [3]	26.1°C (79°F)
	Approach Temperature	5.0°C (9°F)
	Cold Leg Temperature	31.1°C (88°F)
NAPS SUP 9.2.1-1	Basin Reserve Storage Capacity [1]	2.6 million gallons
	Strainers	
	Type	Automatic cleaning basket
	Quantity	4

1. PSWS required to remove 2.02 × 10^7 MJ (1.92 × 10^{10} BTU) for period of 7 days without active makeup.

NAPS CDI

2. ~~Conceptual Design Information~~ Minimum heat load cooling towers need to be able to reject
3. ~~Minimum heat load cooling towers need to be able to reject~~ Ambient wet bulb temperature includes a 0.5°C (1°F) recirculation allowance

NAPS CDI

Table 9.2-9R Major Makeup Water System Components

Two activated carbon filter feed pumps

One activated carbon filter unit consisting of multiple modules

Four 5 micron cartridge filters

Two first pass reverse osmosis high-pressure pumps

Two second pass reverse osmosis booster pumps

Two second pass reverse osmosis high-pressure pumps

One reverse osmosis system consisting of multiple modules

One reverse osmosis break tank

One chemical treatment system that provides chemical conditioning for the reverse osmosis system

One chemical cleaning system for the reverse osmosis membranes

Mixed bed demineralizer units

NAPS CDI

Table 9.2-203 Station Water System - Plant Cooling Tower Makeup System Component Design Parameters

Pumps	
Type	Vertical, wet pit, centrifugal turbine
Quantity	$3 \times 50\%$
Capacity each	Approximately 2,700 m^3/hr (11,888 gpm)
Strainers	
Type	Duplex, basket
Quantity	3

NAPS CDI

Table 9.2-204 Station Water System – Pretreated Water Supply System Component Design Parameters

PWSS Pumps	
Type	Vertical, wet pit, centrifugal turbine
Quantity	2 × 100%
Capacity each	Approximately 170 m^3/hr (750 gpm)
FWS Makeup Pumps	
Type	Horizontal, centrifugal
Quantity	2 × 100%
Capacity each	Approximately 170 m^3/hr (750 gpm)
Miscellaneous Users Supply Pumps	
Type	Horizontal, centrifugal
Quantity	2 × 100%
Capacity each	Approximately 25 m^3/hr (110 gpm)
Storage Tank capacity	Approximately 1,100 m^3 (290,000 gallons)
Strainers	
Type	Duplex, basket
Quantity	2
PWSS Filtration System	
Quantity	1 Lot
PWSS Chemical Injection System	
Quantity	1 Lot

Figure 9.2-1R Plant Service Water System Simplified Diagram

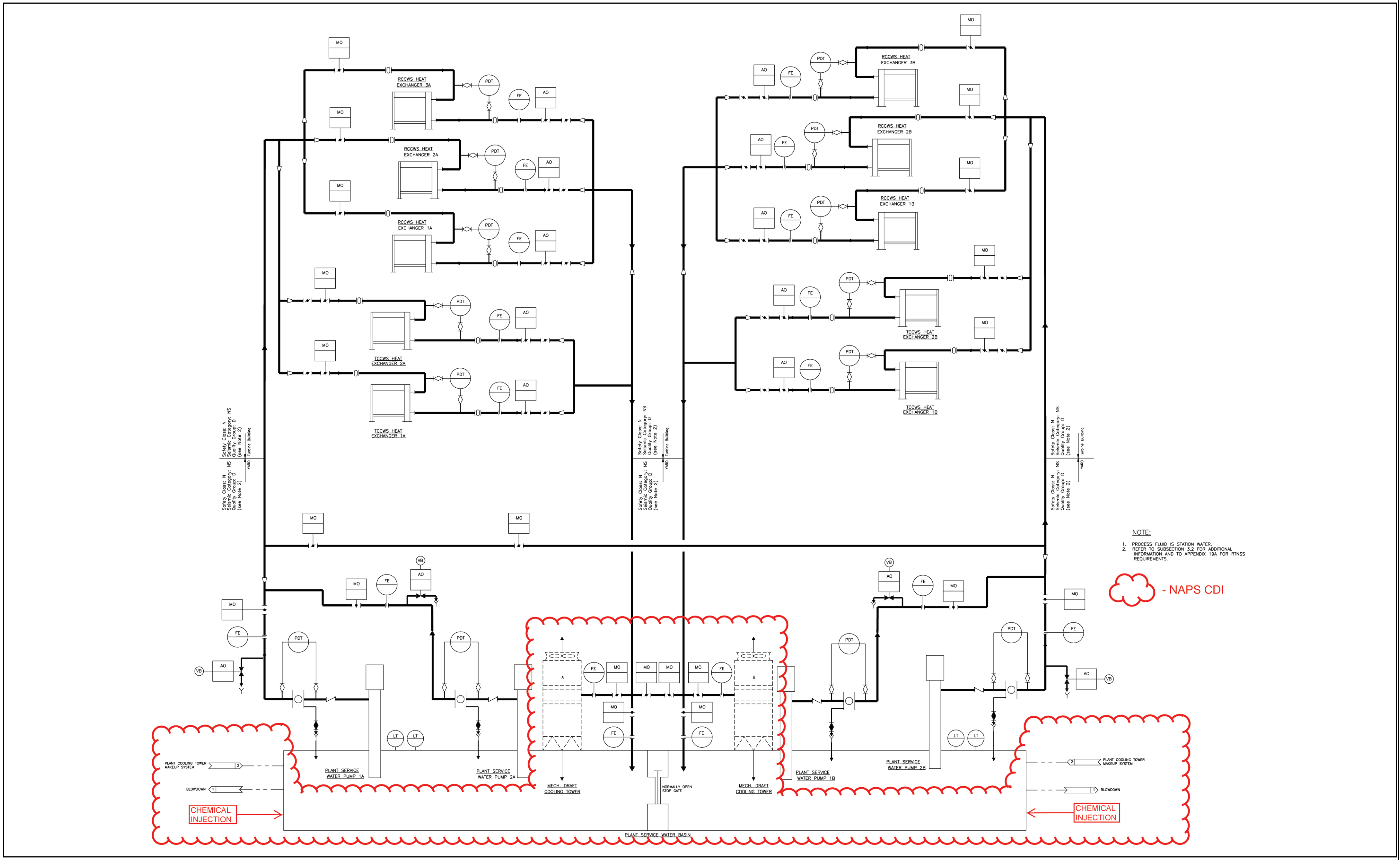
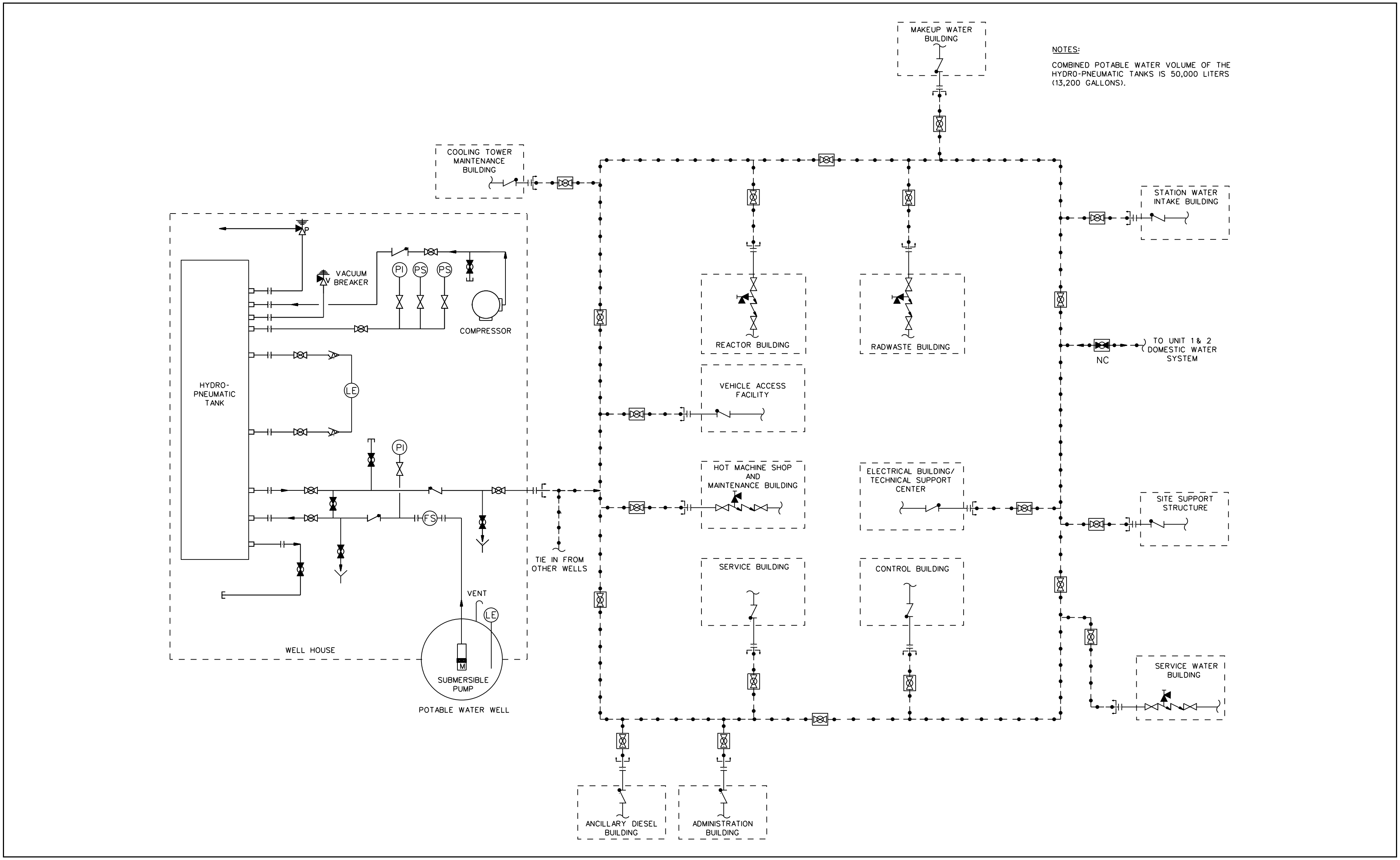
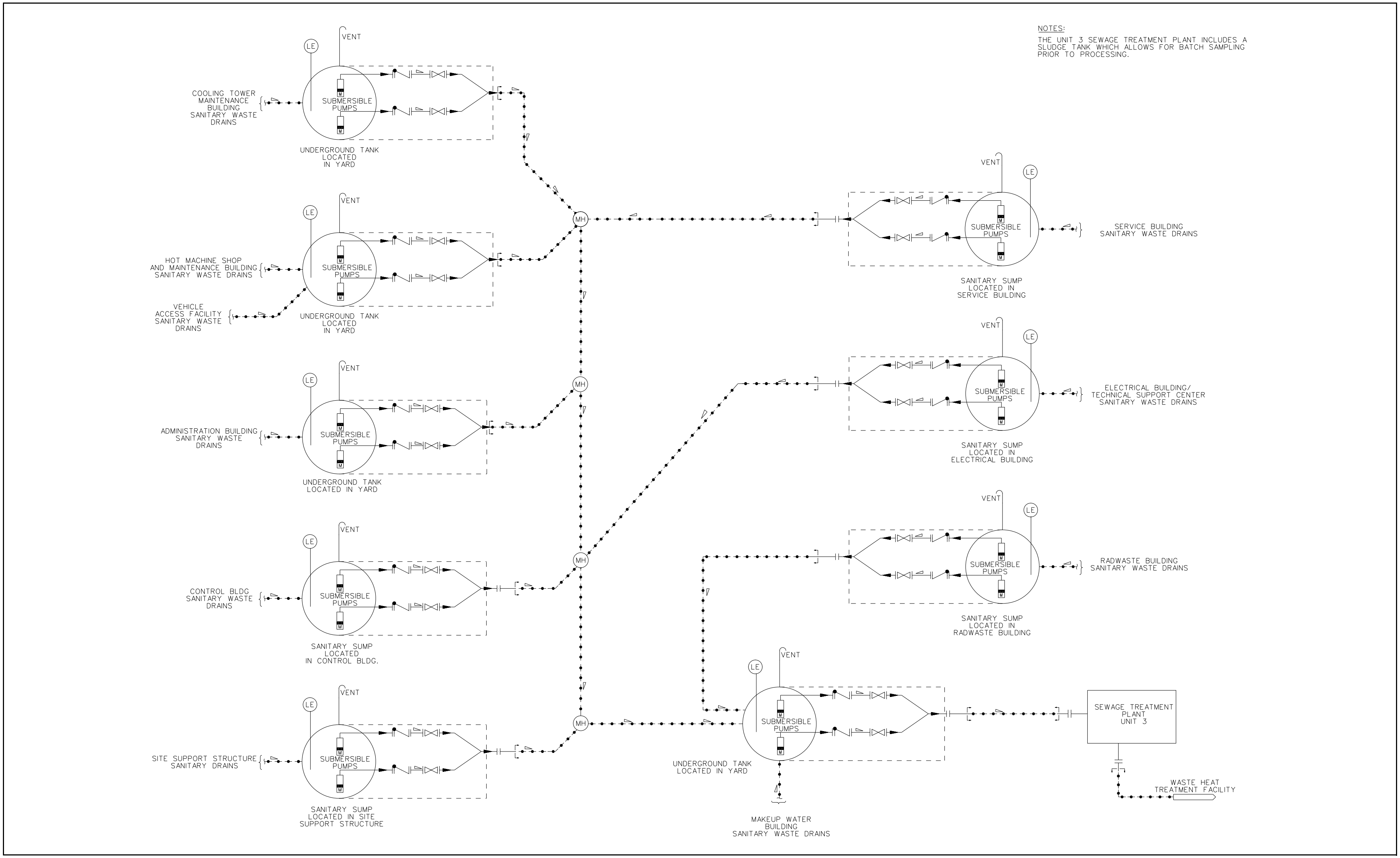


Figure 9.2-202 Potable Water System Simplified Diagram



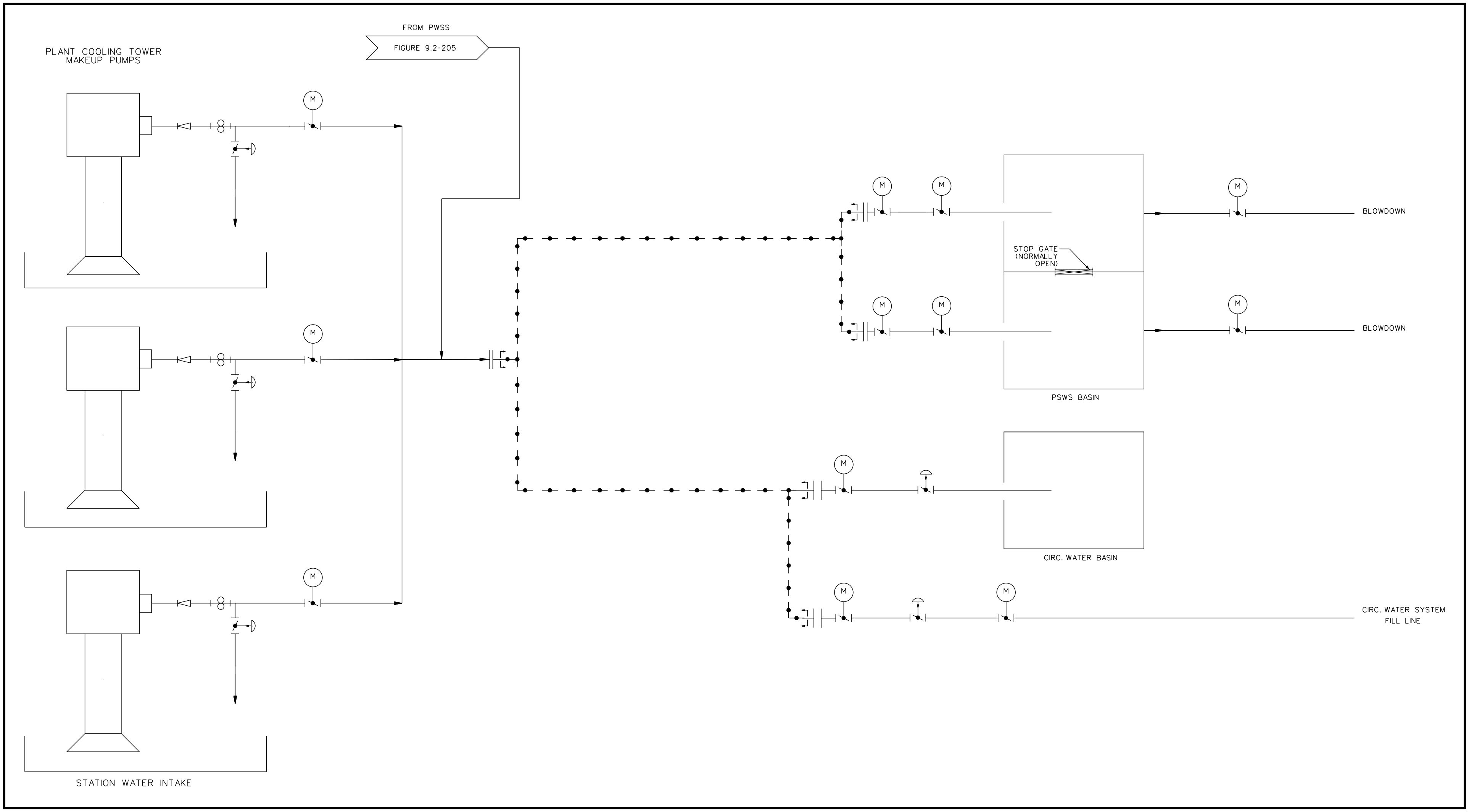
NAPS CDI

Figure 9.2-203 Sanitary Waste Discharge System Simplified Diagram



NAPS CDI

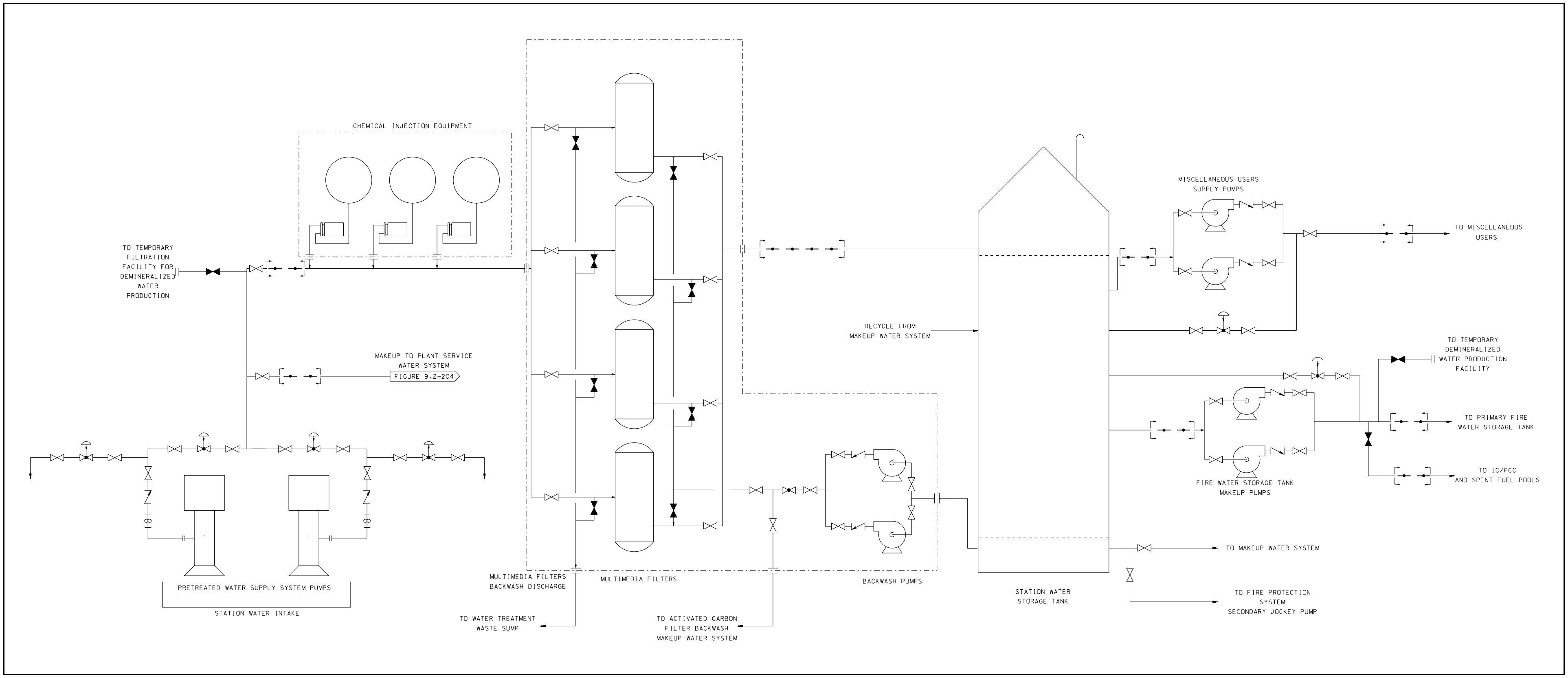
Figure 9.2-204 Station Water System - Plant Cooling Tower Makeup System (PCTMS)



BASIS: ESBWR COLA

NAPS CDI

Figure 9.2-205 Station Water System - Pretreated Water Supply System (PWSS)



9.3 Process Auxiliaries

9.3.1 Compressed Air Systems

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.3.2 Process Sampling System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.3.2.2 System Description

Add the following at the end of this section.

STD COL 9.3.2-1-A

Post-Accident Sampling Program

The post-accident sampling program consists of the following:

- Emergency Operating Procedures that rely on Emergency Action Levels, defined in the Emergency Plan, are used to classify fuel damage events. These procedures rely on installed post-accident radiation monitoring instrumentation described in DCD Section 7.5 and do not require the capability to obtain and analyze highly radioactive coolant samples although sample analyses may be used for classification as well.
- Plant procedures contain instructions for obtaining highly radioactive grab samples from the following:

  Reactor Coolant - from the RWCU/SDC sample line using the Reactor Building Sample Station. These samples can be analyzed for the parameters indicated in DCD Table 9.3-1. If coolant activity is greater than 1.0 Ci/ml, handling of the samples is delayed to avoid overexposure of personnel.

  Suppression Pool - from FAPCS sample line at the Reactor Building Sample Station. These samples can be analyzed for the parameters indicated in DCD Table 9.3-1. If coolant activity is greater than 1.0 Ci/ml, handling of the samples is delayed to avoid overexposure of personnel.

  Containment Atmosphere - may be taken as described in DCD Section 11.5.3.2.11 and analyzed for fission products.

- DCD Section 7.5.2.2 describes Containment Monitoring System operation in post-LOCA mode for gaseous sampling for O_2 and H_2.
- Effluent radiation monitoring is described in DCD Section 7.5. Field sampling and monitoring capability is maintained in accordance with the Emergency Plan.
- Post accident monitoring is adequate to implement the Emergency Plan without reliance on post accident sampling capability; therefore, the absence of a dedicated Post-Accident Sampling System does not reduce the effectiveness of the Emergency Plan.
- The post-accident sampling program meets the requirements of NUREG-0800, Section 9.3.2 for actions required in lieu of a Post Accident Sampling System.

9.3.2.6 COL Information

9.3.2-1-A Post-Accident Sampling Program

STD COL 9.3.2-1-A

This COL item is addressed in Section 9.3.2.2.

9.3.3 Equipment and Floor Drain System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.3.4 Chemical and Volume Control System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.3.5 Standby Liquid Control System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.3.5.2 System Description

Detailed System Description

Add the following to the end of the fifth paragraph.

STD SUP 9.3.5-1

The above provisions adequately prevent loss of solubility of borated solutions (sodium pentaborate).

9.3.6 Instrument Air System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.3.7 Service Air System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.3.8 High Pressure Nitrogen Supply System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.3.9 Hydrogen Water Chemistry System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Replace the first paragraph with the following.

STD COL 9.3.9-1-A

The site specific design includes HWCS.

9.3.9.1 Design Basis

Power Generation Design Basis

Replace the first sentence with the following.

STD CDI

Hydrogen is added into the feedwater at the suction of the feedwater pumps and oxygen into the offgas system.

9.3.9.2 System Description

Replace this section with the following.

NAPS CDI

The HWCS, illustrated in DCD Figure 9.3-5, is composed of hydrogen and oxygen supply systems to inject hydrogen in the feedwater and oxygen in the offgas and several monitoring systems to track the effectiveness of the HWCS. Storage requirements are based on the HWC system usage, ESBWR generator usage and estimated losses.

The hydrogen supply system is integrated with the generator hydrogen supply system (as described in DCD Section 10.2.2.2.8).

NAPS CDI
NAPS COL 9.3.9-2-A

9.3.9.2.1 Hydrogen Storage Facility

The bulk hydrogen storage facility stores liquid hydrogen in two independent 6000 gallon vacuum-jacketed pressure vessels. The storage facility is located within a fenced area outside the plant protected area and is open to prevent the accumulation of hydrogen and meets the requirements of DCD References 9.3.9-1 and 9.3.9-2. The hydrogen

storage facility consists of cryogenic tanks, cryogenic pumps, atmospheric vaporizers, a compressor, a high-pressure gas storage tubes bank, a hydrogen supply line, pressure regulating valves, an excess flow check valve, and relief valves. The cryogenic tanks meet ASME Section VIII, Division 1, requirements for unfired pressure vessels. The pressure regulating valves limit the supply pressure of hydrogen; a relief valve is provided downstream of the regulating valve station to protect the downstream piping in case of regulating valve failure. The excess flow check valve ensures that a large release is limited to the storage facility location. The relief valves provide protection for the storage tank and each isolable liquid hydrogen filled piping section.

Separate skid mounted gaseous bulk hydrogen storage bottles ensure hydrogen supply for generator cooling as a backup for the liquid hydrogen supply for Unit 3.

The HWCS is implemented with On-line Noble Chem™. Plant personnel conduct the OLNC process while the plant is operating.

The Oxygen Storage Facility is described in Section 9.3.10.2.

9.3.9.4 Inspection and Testing Requirements

Replace this section with the following.

STD CDI

The connections for the HWCS are tested and inspected with the feedwater and offgas piping.

Major components of the HWCS are tested and inspected as separate components prior to installation. The system is tested in accordance with vendor requirements after installation to ensure proper performance.

9.3.9.5 Instrumentation and Controls

Replace the first sentence with the following.

STD CDI

Instrumentation is provided to control the injection of hydrogen and augment the injection of oxygen.

9.3.9.6 COL Information

9.3.9-1-A Implementation of Hydrogen Water Chemistry

STD COL 9.3.9-1-A

This COL item is addressed in Section 9.3.9.

9.3.9-2-A Hydrogen and Oxygen Storage and Supply

NAPS COL 9.3.9-2-A

This COL item is addressed in Section 9.3.9.2.1.

9.3.10 Oxygen Injection System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.3.10.2 System Description

Replace the last paragraph with the following.

NAPS COL 9.3.10-1-A

The bulk oxygen storage facility is located outside the plant fenced area. The facility consists of a 34 m^3 (9,000 gal) cryogenic tank, atmospheric vaporizers, an oxygen supply line, a pressure regulating valve, an excess flow check valve, and relief valves. The pressure regulating valve limits the oxygen supply pressure. The excess flow check valve ensures that large releases are limited to the storage facility. The redundant relief valves provide protection for the storage tank and each isolable liquid oxygen filled piping section. The piping carrying gaseous oxygen from the storage facility to the turbine building is routed underground. The storage tank meets ASME Code Section VIII, Division 1, requirements for unfired pressure vessels, and DCD References 9.3.9-1 and 9.3.9-2.

9.3.10.6 COL Information

9.3.10-1-A Oxygen Storage Facility

NAPS COL 9.3.10-1-A

This COL item is addressed in Section 9.3.10.2.

9.3.11 Zinc Injection System

NAPS CDI

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Replace the sentence with the following.

NAPS COL 9.3.11-1-A

The site-specific design includes the Zinc Injection System (ZNIS).

9.3.11.1 Design Bases

Power Generation Design Bases

Replace the sentence with the following.

NAPS COL 9.3.11-1-A The ZNIS includes a passive Zinc Injection Passivation (GEZIP) System which connects to the feedwater system to inject depleted zinc oxide into the reactor feedwater during power operations as required.

9.3.11.2 System Description

Replace the first and second paragraphs with the following.

NAPS COL 9.3.11-2-A The ZNIS is available at startup to provide defense-in-depth with HWCS and On-line Noble Chem^{TM}. A passive GEZIP system is provided which consists of a simple recirculation loop around the feedwater pumps, that continuously injects small amounts of depleted zinc oxide into the reactor feedwater through the dissolution of depleted zinc oxide pellets contained in the GEZIP vessel. The presence of trace quantities of zinc reduces occupational exposure to plant personnel by promoting the formation of a thin, protective oxide layer on stainless steel piping and components. This corrosion inhibition effect results in reduced soluble Co-60 buildup, and is a primary factor in reducing shutdown dose rates on piping and components in low flowrate areas, like the vessel lower plenum, and in primary piping like the RWCU/SDC System.

Instrumentation is provided to control the manual injection of depleted zinc oxide.

9.3.11.4 Test and Inspections

Replace the first and second paragraphs with the following.

NAPS COL 9.3.11-2-A The ZNIS connections are tested and inspected with the feedwater piping. Major components of the ZNIS are tested and inspected as separate components prior to installation. The system is tested in accordance with vendor requirements after installation to ensure proper performance.

Periodic testing includes verification of proper operation of controls, trips, interlocks, and component alarm functions.

9.3.11.6 COL Information

9.3.11-1-A Determine Need for Zinc Injection System

NAPS COL 9.3.11-1-A This COL item is addressed in Sections 9.3.11 and 9.3.11.1.

9.3.11-2-A Provide System Description for Zinc Injection System

NAPS COL 9.3.11-2-A This COL item is addressed in Sections 9.3.11.2 and 9.3.11.4.

9.3.12 Auxiliary Boiler System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.4 Heating, Ventilation, and Air Conditioning

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.5 Other Auxiliary Systems

9.5.1 Fire Protection System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.5.1.1 Design Bases

Codes, Standards, and Regulatory Guidance

Add the following at the end of this section.

NAPS SUP 9.5.1-1

Table 9.5-201 supplements DCD Table 9.5-1 for those portions outside the DCD and operational aspects of the fire detection and suppression systems.

9.5.1.2 System Description

Add the following after the first sentence in the first paragraph.

NAPS COL 9.5.1-4-A

Figures 9.5-201, 9.5-202, and 9.5-203 provide simplified diagrams of the site-specific firewater supply piping.

9.5.1.4 Fire Protection Water Supply System

Add the following at the end of the first paragraph.

NAPS COL 9.5.1-4-A

Figures 9.5-201, 9.5-202, and 9.5-203 provide simplified diagrams of the site-specific secondary firewater supply piping.

Water Sources

Replace the first paragraph with the following.

NAPS COL 9.5.1-4-A

Water for the Fire Protection System is supplied from a minimum of two sources: i) at least one “primary” source to the suctions of primary fire pumps and corresponding jockey fire pump and, ii) one “secondary” source to suctions of secondary fire pumps and corresponding jockey fire pump. The primary source is two dedicated, Seismic Category I, firewater storage tanks. Each primary firewater storage tank has sufficient capacity to meet the maximum firewater demand of the system for a period of 120 minutes.

NAPS COL 9.5.1-1-A

The secondary firewater source is Lake Anna. This large body of water has a capacity well in excess of the 2082 m^3 (550,000 gal) required by NFPA 804.

NAPS SUP 9.5.1-1

Primary Firewater Source

The Pretreated Water Supply System (PWSS) provides treated and filtered water to the firewater storage tanks. PWSS pumps are located in the Station Water Intake Building. Hydrogen Peroxide is injected at the discharge of the PWSS pumps to preclude biofouling or microbiologically induced corrosion from Lake Anna water. Strainers are installed at the discharge of the PWSS pumps to preclude large-size foreign materials. The water is also preconditioned to facilitate filtering through multimedia filters before being stored in the station water storage tank and supplied to the firewater storage tanks.

Secondary Firewater Source

The secondary fire pumps are also located in the Station Water Intake Building and draw water from the intake bay. Hypochlorite is injected at the discharge of the secondary fire pumps to preclude biofouling or microbiologically induced corrosion from Lake Anna water. Strainers are installed at the discharge of secondary firewater pumps to preclude large-size foreign materials. Filtering is not required because of the small amount of total suspended solids in the lake water.

Sampling and monitoring is performed, as required, to ensure an acceptable level of quality of firewater. Periodic system flushes and flow tests are performed to maintain and verify firewater supply system capability.

Water sources that are used for multiple purposes ensure that the required quantity of firewater is dedicated for fire protection use only.

Fire Pumps

Replace the sixth sentence in the first paragraph with the following.

NAPS COL 9.5.1-2-A

Testing will be performed to demonstrate that the secondary fire protection pump circuit supplies a minimum of 484 m^3/hr (2130 gpm) with sufficient discharge pressure to develop a minimum of 107 psig line pressure at the Turbine Building/yard interface boundary. This cannot be

performed until the system is built. This activity will be completed prior to fuel receipt.

9.5.1.5 Firewater Supply Piping, Yard Piping, and Yard Hydrants

Delete the last paragraph and add the following at the end of the first paragraph.

NAPS COL 9.5.1-4-A

Figures 9.5-201, 9.5-202, and 9.5-203 provide simplified diagrams of the site-specific firewater supply piping.

9.5.1.10 Fire Barriers

Replace the last paragraph with the following.

STD COL 9.5.1-5-A

Mechanical and electrical penetration seals and electrical raceway fire barrier systems are qualified to the requirements delineated in RG 1.189 by a recognized testing laboratory in accordance with the applicable guidance of NFPA 251 and/or ASTM E-119. Detailed design in this area is not complete. Specific design and certification test results for penetration seal designs and electrical raceway fire barrier systems will be available for review at least six months prior to fuel receipt.

9.5.1.11 Building Ventilation

Replace the last sentence in the third paragraph with the following.

STD COL 9.5.1-6-A

Procedures for manual smoke control will be developed as part of the Fire Protection Program implementation. The required elements of the Fire Protection Program are fully operational prior to receipt of new fuel for buildings storing new fuel and adjacent fire areas that could affect the fuel storage area. Other required elements of the Fire Protection Program described in this section are fully operational prior to initial fuel loading per Section 13.4.

9.5.1.12 Safety Evaluation

Replace the first sentence of the fifth paragraph with the following.

STD COL 9.5.1-7-A

A compliance review of the final as-built design against the assumptions and requirements stated in the FHA will be completed prior to fuel load. Based on this review, the FHA will be updated as necessary.

9.5.1.15 Fire Protection Program

Replace the last sentence of the first paragraph of this section with the following.

STD COL 9.5.1-8-A

The elements of the Fire Protection Program necessary to support receipt and storage of fuel onsite for buildings storing new fuel and adjacent fire areas that could affect the fuel storage area are fully operational prior to receipt for new fuel. Other required elements of the Fire Protection Program described in this section are fully operational prior to initial fuel loading per Section 13.4.

9.5.1.15.1 Fire Protection Program Criteria

Add the following at the end of this section.

NAPS SUP 9.5.1-1

Table 9.5-201 supplements DCD Table 9.5-1.

9.5.1.15.2 Organization and Responsibilities

Replace the first paragraph of this section with the following.

STD COL 13.4-1-A

A description of the Fire Protection Program is provided in Subsection 9.5.1.15 and DCD Section 9.5.1.15.

9.5.1.15.3 Fire Protection Program Staffing Requirements

Replace this section with the following.

NAPS COL 13.1-1-A

Fire protection staffing and organization of the fire brigade are described in Section 13.1.

9.5.1.15.4 Onsite Fire Operations Training

Replace the first paragraph of this section with the following.

NAPS COL 9.5.1-10-A

Implementation of the fire brigade will be in accordance with the milestones in Section 13.4 for the Fire Protection Program.

9.5.1.15.6 Control of Combustible Materials, Hazardous Materials and Ignition Sources

Add the following at the end of this section.

STD SUP 9.5.1-3

- In rooms adjacent to the main control room and in computer rooms that are not part of the control room complex:
  - •• Transient combustible materials are not left unattended during lunch breaks, shift changes, or other similar periods unless stored in approved containers.
  - •• Electrical appliances and other potential ignition sources are controlled.
- Prohibit the storage of transient combustibles below the raised floor in the main control complex.
- Prohibit the storage of hazardous chemicals in areas that contain or expose equipment important to safety.

9.5.1.15.9 Quality Assurance

Replace this section with the following.

STD COL 9.5.1-11-A

Quality assurance controls are applied to the activities involved in the design, procurement, installation, and testing and the administrative controls of fire protection systems, in accordance with the measures outlined in Chapter 17.

For the operational fire protection program, the Quality Assurance Program implements the requirements of RG 1.189 through site-specific administrative controls procedures. The procedures will be developed six months prior to fuel receipt and will be fully implemented prior to fuel receipt.

9.5.1.16 COL Information

9.5.1-1-A Secondary Firewater Storage Source

NAPS COL 9.5.1-1-A

This COL item is addressed in Section 9.5.1.4 and DCD Table 9.5-2.

9.5.1-2-A Secondary Firewater Capacity

NAPS COL 9.5.1-2-A

This COL item is addressed in Section 9.5.1.4.

9.5.1-4-A Piping and Instrument Diagrams

NAPS COL 9.5.1-4-A This COL item is addressed in Sections 9.5.1.2, 9.5.1.4, 9.5.1.5, and Figures 9.5-201, 9.5-202, and 9.5-203.

9.5.1-5-A Fire Barriers

STD COL 9.5.1-5-A This COL item is addressed in Section 9.5.1.10.

9.5.1-6-A Smoke Control

STD COL 9.5.1-6-A This COL item is addressed in Section 9.5.1.11.

9.5.1-7-A FHA Compliance Review

STD COL 9.5.1-7-A This COL item is addressed in Section 9.5.1.12.

9.5.1-8-A FP Program Description

STD COL 9.5.1-8-A This COL item is addressed in Section 9.5.1.15.

9.5.1-9-A [Deleted]

9.5.1-10-A Fire Brigade

NAPS COL 9.5.1-10-A This COL item is addressed in Sections 9.5.1.15.4 and 13.1.2.1.5.

9.5.1-11-A Quality Assurance

STD COL 9.5.1-11-A This COL item is addressed in Section 9.5.1.15.9.

DCD Table 9.5-2

NAPS COL 9.5.1-1-A Delete the "*" and "**" footnotes.

9.5.2 Communications System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.5.2.2 System Description

Emergency Communication Systems

Replace the parenthetical "(COL 9.5.2.5-1-A)" in the first bullet with the following.

NAPS COL 9.5.2.5-1-A The North Anna Emergency Notification System (ENS) is provided in the plant Emergency Plan. The ENS phone lines are routed directly to the local telephone company central office via fiber-optic phone lines through a telephone utility switch that is located on site in the telephone equipment building. The normal power for this device is non-safety

related station power. The telephone system will lose its normal power supply during a loss of offsite power; however, the phone system is battery backed for a period of approximately eight hours. This design ensures that the ENS located at the site is fully operable from the site in the event of a loss of offsite power at the site and is in compliance with the requirements of NRC Bulletin 80-15 for the ENS. Automatic Ringdown Circuits (described in the plant Emergency Plan) connect the plant to the local and state emergency offices, and are also normally powered from the nonsafety-related station power and backed with approximately eight hours of battery backup power. In addition to the connections to the local telephone company, a separate Company-owned and maintained fiber-optic network exists which provides communication between the station, the system operations center, and the NRC. This Company network is also capable of external long distant and local telephone calls.

Replace the parenthetical “(COL 9.5.2.5-3-A)” in the second bullet with the following.

NAPS COL 9.5.2.5-3-A The health physics network is described in the Emergency Plan.

Replace the parenthetical “(COL 9.5.2.5-4-A)” in the third bullet with the following.

NAPS COL 9.5.2.5-4-A Communication from the Control Room, TSC, and EOF to NRC headquarters including establishment of Emergency Response Data Systems (ERDS) is described in the Emergency Plan.

Replace the parenthetical “(COL 9.5.2.5-3-A)” in the fourth bullet with the following.

NAPS COL 9.5.2.5-3-A The crisis management radio system is part of the plant radio system described in DCD Section 9.5.2.2.

Replace the parenthetical “(COL 9.5.2.5-5-A)” in the fifth bullet with the following.

NAPS COL 9.5.2.5-5-A The Fire Brigade Radio System is part of the plant radio system as described above and complies with RG 1.189, Position 4.1.7.

Replace the last bullet with the following.

NAPS COL 9.5.2.5-2-A

- Transmission System Operator Communications Link: Voice communications with the grid operator are provided via a Company-owned and -maintained fiber optic transmission system that allows telephone communications with the entire Corporate System. Access to this mode of transmission is made via the plant telephone system. A dedicated handset is provided between the Control Room and the power system operator.

Add the following after the last bullet.

NAPS COL 9.5.2.5-3-A

- Insta-Phone System - The primary method for notification of State and local authorities is the Insta-phone, which is accessible from the Control Room, TSC, and EOF. The Insta-phone is described in the Emergency Plan.

9.5.2.5 COL Information

9.5.2.5-1-A Emergency Notification System

NAPS COL 9.5.2.5-1-A

This COL item is addressed in Section 9.5.2.2.

9.5.2.5-2-A Grid Transmission Operator

NAPS COL 9.5.2.5-2-A

This COL item is addressed in Section 9.5.2.2 and Emergency Plan Section II.F.1.

9.5.2.5-3-A Offsite Interfaces (1)

NAPS COL 9.5.2.5-3-A

This COL item is addressed in Section 9.5.2.2 and Emergency Plan Sections II.E.1 and II.F.1.

9.5.2.5-4-A Offsite Interfaces (2)

NAPS COL 9.5.2.5-4-A

This COL item is addressed in Section 9.5.2.2 and Emergency Plan Sections II.E.1 and II.F.1.

9.5.2.5-5-A Fire Brigade Radio System

NAPS COL 9.5.2.5-5-A

This COL item is addressed in Section 9.5.2.2.

9.5.3 Lighting System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.5.4 Diesel Generator Fuel Oil Storage and Transfer System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.5.4.2 System Description

Detailed System Description

Standby Diesel Generators

Replace the third to last sentence in the first paragraph with the following.

STD COL 9.5.4-1-A

Procedures require that the quantity of diesel fuel oil in the standby diesel generator (SDG) fuel oil storage tanks is monitored on a periodic basis. The diesel fuel oil usage is tracked against planned deliveries. Regular transport replenishes the diesel fuel oil inventory during periods of high demand and ensures continued supply in the event of adverse weather conditions. These procedures ensure sufficient diesel fuel oil inventory is available on site so that the SDGs can operate continually for seven days with each operating at its calculated design load, with margin added to account for usable fuel in the tank, level instrument uncertainty, and the potential for future load growth. The procedures will be developed in accordance with the milestone and processes described in Section 13.5.

Replace the third paragraph with the following.

NAPS COL 9.5.4-2-A

The only underground component of the SDGs fuel oil storage and transfer system is carbon steel piping. A corrosion protection system consistent with the guidance contained in ASME B31.1, Power Piping Code, Nonmandatory Appendix IV, Corrosion Control for ASME B31.1 Power Piping Systems, and American Petroleum Institute (API) Recommended Practice 1632 is provided for external surfaces of buried piping systems. The buried sections of the piping are provided with waterproof protective coating and an impressed current type cathodic protection to control external corrosion.

STD COL 9.5.4-1-A

Delete the parenthetical "(COL 9.5.4-1-A)" at the end of the last paragraph.

Ancillary Diesel Generators

Replace the third to last sentence in the first paragraph with the following.

STD COL 9.5.4-1-A Procedures require that the quantity of diesel fuel in the ancillary diesel generator (ADG) fuel oil storage tanks is monitored on a periodic basis. The diesel fuel oil usage is tracked against planned deliveries. Regular transport replenishes the fuel oil inventory during periods of high demand and ensures continued supply in the event of adverse weather conditions. These procedures ensure sufficient diesel fuel oil inventory is available on site so that the ADGs can operate continually for seven days with each operating at its calculated design load, with margin added to account for usable fuel in the tank, level instrument uncertainty, and the potential for future load growth. The procedures will be developed in accordance with the milestone and processes described in Section 13.5.

Replace the third paragraph with the following.

NAPS COL 9.5.4-2-A The only underground component of the ADGs fuel oil storage and transfer system is carbon steel piping. A corrosion protection system consistent with the guidance contained in ASME B31.1, Power Piping Code, Nonmandatory Appendix IV, Corrosion Control for ASME B31.1 Power Piping Systems, and American Petroleum Institute (API) Recommended Practice 1632 is provided for external surfaces of buried piping systems. The buried sections of the piping are provided with waterproof protective coating and an impressed current type cathodic protection to control external corrosion.

System Operation

Standby Diesel Generators

STD COL 9.5.4-1-A Delete the parenthetical "(COL 9.5.4-1-A)" at the end of the paragraph.

Ancillary Diesel Generators

STD COL 9.5.4-1-A Delete the parenthetical "(COL 9.5.4-1-A)" at the end of the paragraph.

9.5.4.6 COL Information

9.5.4-1-A Fuel Oil Capacity

STD COL 9.5.4-1-A This COL item is addressed in Section 9.5.4.2.

9.5.4-2-A Protection of Underground Portion

NAPS COL 9.5.4-2-A This COL item is addressed in Section 9.5.4.2.

9.5.5 Diesel Generator Jacket Cooling Water System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.5.6 Diesel Generator Starting Air System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.5.7 Diesel Generator Lubrication System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

9.5.8 Diesel Generator Combustion Air Intake and Exhaust System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

NAPS SUP 9.5.1-1
NAPS SUP 9A-01

Table 9.5-201 Codes and Standards

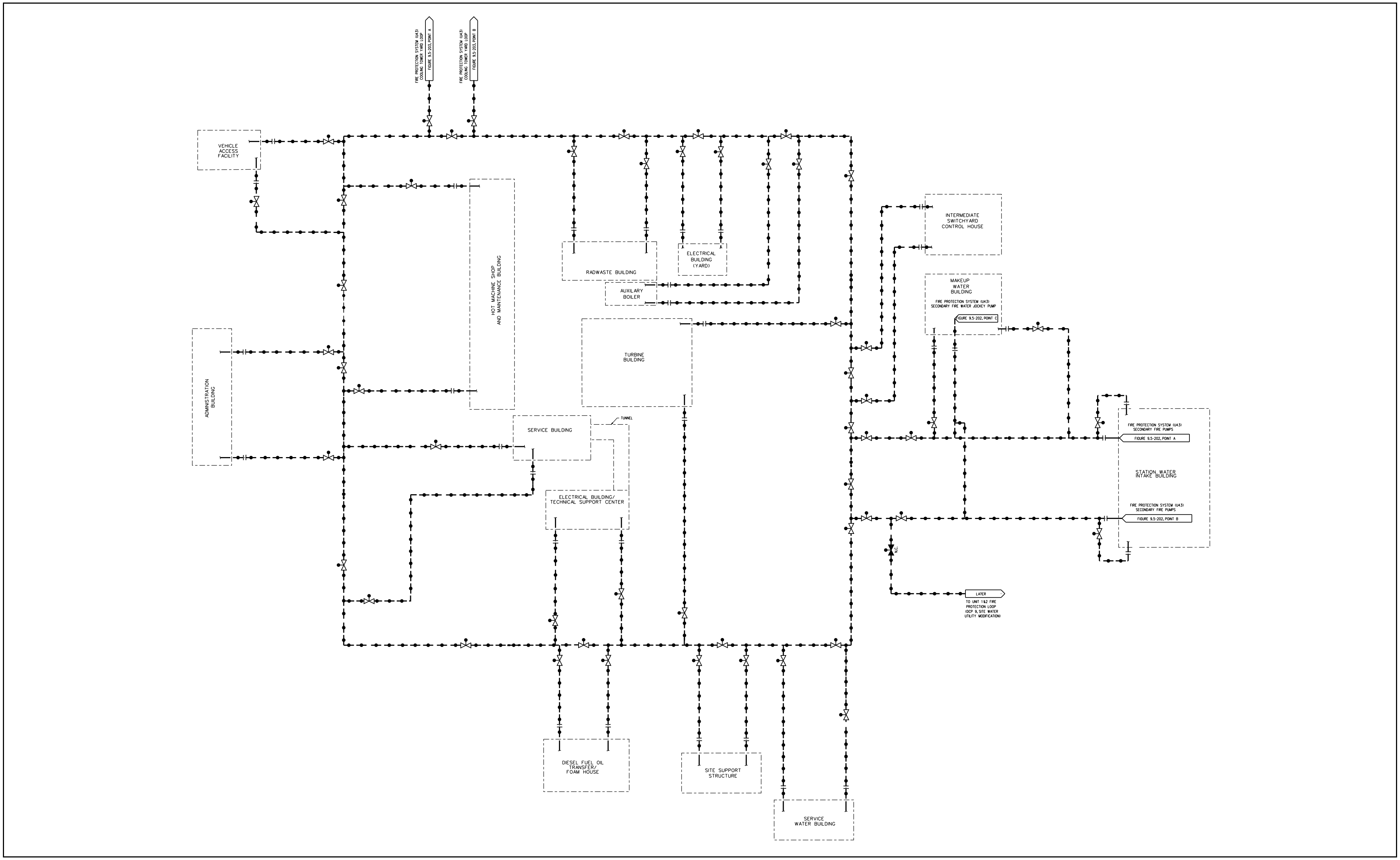
American Petroleum Institute (API)	
API Recommended Practice 1632	Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems
American Society of Mechanical Engineers (ASME)	
Boiler and Pressure Vessel Code	Section IX, Qualification Standard for Welding and Brazing Procedures, Welder, Brazers and Welding and Brazing Operators
Applicable Building Codes	
Virginia Uniform Statewide Building Code	Virginia Uniform Statewide Building Code, Part I (Virginia Construction Code) As defined in the Virginia Uniform Statewide Building Code edition of record.
National Fire Protection Association (NFPA)	
NFPA 1	Uniform Fire Code
NFPA 25	Recommended Practices for Inspection, Testing, and Maintenance of Standpipes and Hose Systems
NFPA 55	Standard for Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks
NFPA 259	Standard Test Method for Potential Heat of Building Materials
NFPA 703	Standard for Fire-Retardant Treated Wood and Fire Retardant Coatings for Building Materials
NFPA 750	Standard for Water Mist Fire Protection Systems
NFPA 1144	Standard for Reducing Structure Ignition Hazards from Wildland Fire
NFPA 1410	Standard on Training for Initial Emergency Scene Operations
NFPA 1620	Recommended Practice for Pre-Incident Planning
NFPA 2001	Standard for Clean Agent Fire Extinguishing
Environmental Protection Agency (EPA)	
Environmental Protection Agency (EPA)	EPA Standards of Performance for Stationary Compression Ignition Internal Combustion Engines; Final Rule (40 CFR Parts 60, 85 et al.)

NAPS SUP 9.5.1-1
NAPS SUP 9A-01

Table 9.5-201 Codes and Standards *(continued)*

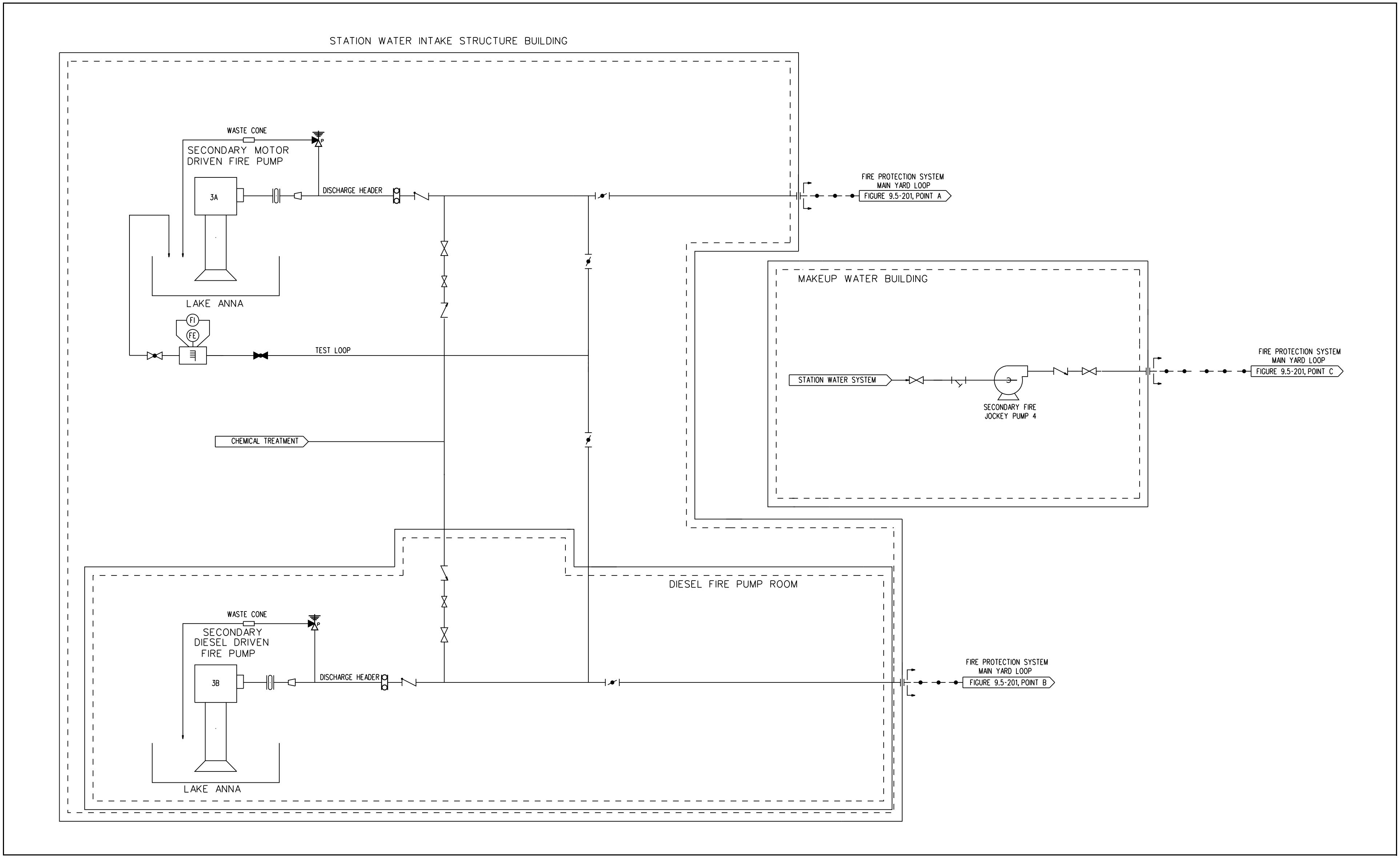
Listing/Approval Agencies
Nuclear Electric Insurance Limited (NEIL)

NAPS COL 9.5.1-4-A **Figure 9.5-201 Fire Protection System; Main Yard Loop**



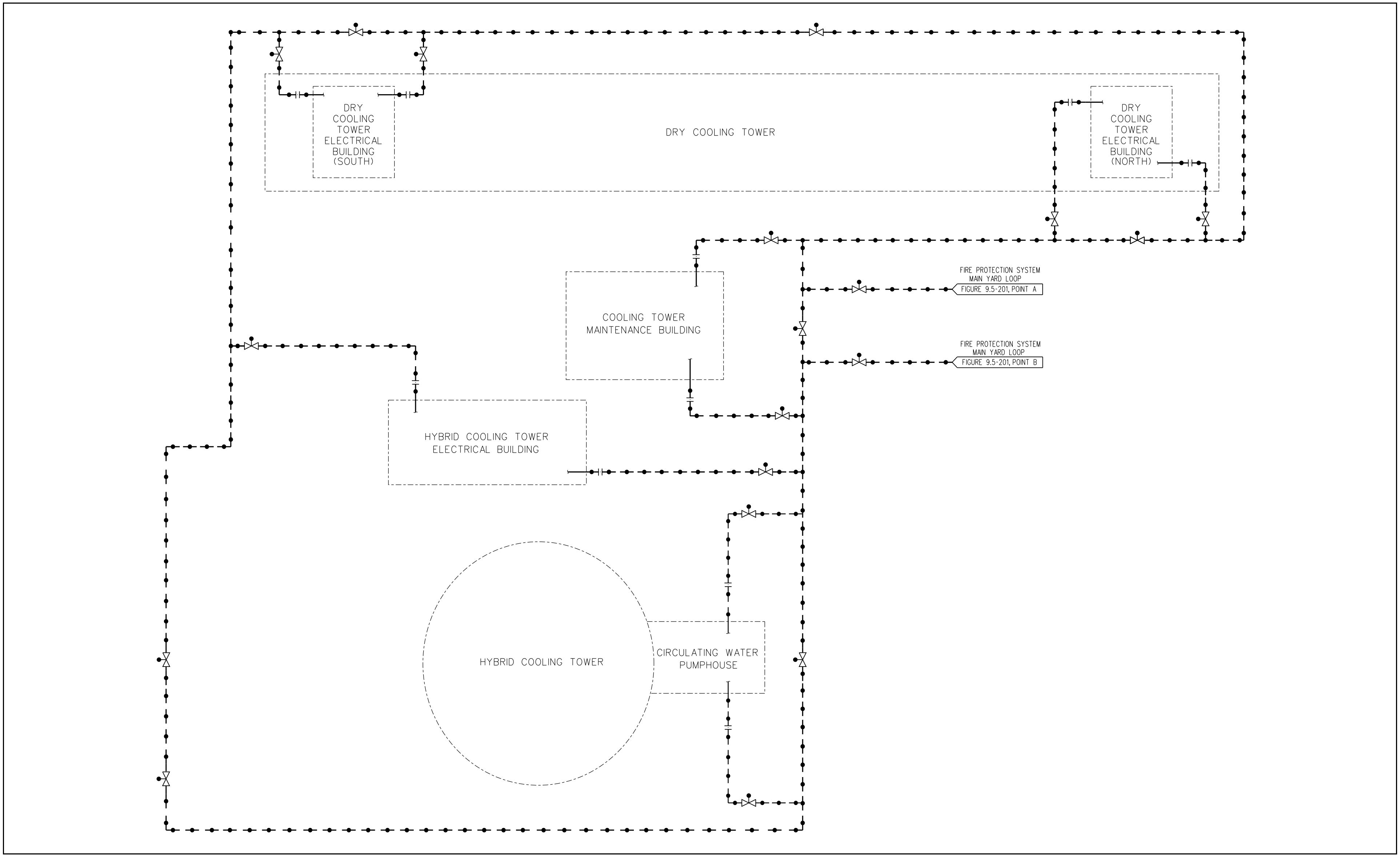
BASIS: ESBWR COLA

NAPS COL 9.5.1-4-A **Figure 9.5-202 Fire Protection System Secondary Fire Pumps**



BASIS: ESBWR COLA

NAPS COL 9.5.1-4-A **Figure 9.5-203 Fire Protection System; Cooling Tower Yard Loop**



Appendix 9A Fire Hazards Analysis

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Contents

NAPS CDI

Replace 9A.4.9 Service Water/Water Treatment Building with 9A.4.9 Service Water Building.

Add 9A.4.12, Makeup Water Building

Replace 9A.5.9 Service Water/Water Treatment Building with 9A.5.9 Service Water Building.

Add 9A.5.12, Water Treatment Building

9A.1 Introduction

Replace the first sentence of the first paragraph with the following.

NAPS CDI

This fire hazards analysis (FHA) establishes and evaluates distinct fire areas for the Reactor Building, Fuel Building, Control Building, Turbine Building, Radwaste Building, Electrical Building and the Yard, which includes the Circulating Water Pump House, Vehicle Access Facility, Hot Machine Shop and Maintenance Building, Service Water Building, Station Water Intake Building, Makeup Water Building, Service Building, Auxiliary Boiler Building, Fire Pump Enclosure, Diesel Fuel Oil Transfer/Foam House, Ancillary Diesel Building and Administration Building, and other Yard structures.

9A.2.1 Codes and Standards

Add the following second paragraph.

NAPS SUP 9A-01

The codes and standards that are applicable to the design of the site-specific portions of the yard are listed in Table 9.5-201. Table 1.9-204 identifies the relevant editions for each applicable code and standard. These codes and standards also apply to the operational aspects of the fire detection and suppression systems.

9A.3.1 Review Data

Replace the first sentence of the second paragraph with the following.

NAPS CDI

The analysis is based on a review of every room for the RB/FB, CB, Turbine Building, Radwaste Building and Electrical Building, as well as the overall design acceptance criteria for the Yard, which includes the Circulating Water Pump House, Vehicle Access Facility, Hot Machine Shop and Maintenance Building, Service Water Building, Station Water Intake Building, Makeup Water Building, Service Building, Auxiliary Boiler Building, Fire Pump Enclosure, Diesel Fuel Oil Transfer/Foam House, Ancillary Diesel Building and Administration Building, and other Yard structures.

9A.4.7 Yard

Replace the first paragraph with the following.

NAPS COL 9A.7-1-A

The Yard includes all portions of the plant site external to the RB/FB, CB, Turbine Building, Radwaste Building, and Electrical Building. The fire zone drawings for the site-specific portions of the yard are provided in Figures 9A.2-201 through 9A.2-206.

NAPS CDI

Replace the first sentence of the third paragraph with the following.

This FHA includes an evaluation of the Circulating Water Pump House, Vehicle Access Facility, Hot Machine Shop and Maintenance Building, Service Water Building (see Section 9A.4.9), Makeup Water Building (see Section 9A.4.12), Station Water Intake Building, Service Building (see DCD Section 9A.4.8), Fire Pump Enclosure (see DCD Section 9A.4.11), Diesel Fuel Oil Transfer/Foam House, Ancillary Diesel Building (see DCD Section 9A.4.10), Site Support Structure, Electrical Building (yard), Dry and Hybrid Cooling Tower Electrical Buildings, Intermediate Switchyard Control House, Well Houses, Auxiliary Boiler Building, and Administration Building.

Replace the last sentence of the third paragraph with the following.

NAPS COL 9A.7-2-A

A detailed fire hazards analysis of the yard area that is outside the scope of the certified design can not be completed until cable routing is performed during final design. This information will be provided six

months prior to fuel load. The FSAR will be revised to include this information, as appropriate, as part of a subsequent FSAR update.

NAPS CDI

Delete the eighth paragraph.

Delete the ninth paragraph.

9A.4.9 Service Water/Water Treatment Building

NAPS CDI

Replace the title with "Service Water Building."

In the first sentence of the first paragraph, replace "Service Water/Water Treatment Building (SF/WT)" with "Service Water Building."

Replace "SF/WT" with "Service Water Building" in the first, second, and third paragraphs.

Replace the second and third sentence of the second paragraph with the following.

One hour fire walls are provided to separate Group H-4 and Group F-1 Occupancies in accordance with the International Building Code.

Replace the first sentence of the fourth paragraph with the following.

Class ABC dry chemical portable fire extinguishers are located at or near the hose stations and alarm pull boxes.

Replace the first bullet of the fifth paragraph with the following.

Location of the manual suppression systems outside of rooms containing electrical components to avoid spray water damage to electrical components;

9A.4.12 Makeup Water Building

NAPS CDI

The Makeup Water Building does not contain any system or perform any function that could affect the operation or shutdown of the reactor, nor does it contain any significant hazards. The Makeup Water Building does not contain any safety-related or safe shutdown components, and as such, a fire in Makeup Water Building does not affect any of the four divisions used to achieve and maintain safe shutdown. The basic fire protection features are presented in a method similar to that used for other buildings.

The Makeup Water Building is a stand-alone non-seismic structure. One hour fire walls are provided to separate Group H-4 and Group F-1 Occupancies in accordance with the International Building Code.

Fire detection is provided throughout the Makeup Water Building with the use of Class A supervised product-of-combustion detection systems. Alarms, both trouble and fire, report to the MCR.

Class ABC dry chemical portable fire extinguishers are located at or near the hose stations and alarm pull boxes. Additional portable fire extinguishers are provided in various locations for convenience, or where increased human activity is anticipated.

To prevent damage from inadvertent or careless operation, as well as rupture of the fire suppression system, the following design features are included:

- Location of the manual suppression systems outside of rooms containing electrical components to avoid spray water damage to electrical components; and
- Provision of adequately sized floor drains, curbs, equipment bases, and flood containment boundaries to handle the suppression flow

9A.5.7 Yard

Replace the last two sentences with the following.

NAPS COL 9A.7-2-A

A detailed fire hazards analysis of the yard area that is outside the scope of the certified design can not be completed until cable routing is performed during final design. This information will be provided six months prior to fuel load. The FSAR will be revised to include this information, as appropriate, as part of a subsequent FSAR update.

9A.5.8 Service Building

Replace the last two sentences with the following.

NAPS CDI
NAPS COL 9A.7-2-A

A detailed fire hazards analysis of the yard area that is outside the scope of the certified design, which includes the Service Building, can not be completed until cable routing is performed during final design. This information will be provided six months prior to fuel load. The FSAR will be revised to include this information, as appropriate, as part of a subsequent FSAR update.

9A.5.9 Service Water/Water Treatment Building

NAPS CDI

Replace the title with “Service Water Building.”

Replace this section with the following.

NAPS COL 9A.7-2-A

The Service Water Building is protected in accordance with applicable codes. The Service Water Building contains redundant service water equipment. A detailed fire hazards analysis of the yard area that is outside the scope of the certified design, which includes the Service Water Building, can not be completed until cable routing is performed during final design. This information will be provided six months prior to fuel load. The FSAR will be revised to include this information, as appropriate, as part of a subsequent FSAR update.

NAPS CDI
NAPS COL 9A.7-2-A

9A.5.12 Makeup Water Building

The Makeup Water Building is protected in accordance with applicable NFPA Codes. The Makeup Water Building is site specific.

A detailed fire hazards analysis of the yard area that is outside the scope of the certified design, which includes the Makeup Water Building, can not be completed until cable routing is performed during final design. This information will be provided six months prior to fuel load. The FSAR will be revised to include this information, as appropriate, as part of a subsequent FSAR update.

9A.7 COL Information

9A.7-1-A Yard Fire Zone Drawings

NAPS COL 9A.7-1-A

This COL item is addressed in Section 9A.4.7.

9A.7-2-A FHA for Site-Specific Areas

NAPS COL 9A.7-2-A

This COL item is addressed in Sections 9A.4.7, 9A.5.7, 9A.5.8, 9A.5.9, and 9A.5.12.

Table 9A.5-5 Revisions

NAPS DEP 11.4-1

Replace Fire Area F6101 with F6101R.

Delete Fire Area F6102.

Add Fire Area F6170.

Replace Fire Area F6193 with F6193R.

Replace Fire Area F6270 with F6270R.

Delete Fire Area F6290.

Replace Fire Area F6301 with F6301R.

Table 9A.5-7 Revisions

NAPS COL 9A.7-2-A

Delete Fire Area F4202.

Replace Fire Area F5159 with F5159R.

Replace Fire Area F5169 with F5169R.

Delete Fire Area F7100.

Add Fire Areas F7151, F7152, F7153, F7154, F7161, F7162, F7163, F7164, F7174, F7165, and F7155.

Add Fire Area F7180.

Add Fire Area F7188.

Delete Fire Area F7200.

Delete Fire Area F7300.

Add Fire area F7301, F7302, F7303, and F7304.

Add Fire Area F7305.

Delete Fire Area F7400.

Delete Fire Area F7500.

Delete Fire Area F7600.

Replace Fire Area F7700 with F7700R.

Replace Fire Area F7900 with F7900R.

Add Fire Areas F8101, F8102, and F8103.

Add Fire Areas F8104, F8105, F8106, F8108, F8110 and F8111.

Add Fire Areas F8181, F8282, F8183, F8184, F8185, F8186, F8187, F8188, and F8283.

Add Fire Areas F8200, F8201, F8107, F8109 and F8189.

Add Fire Areas for:

Site Support Structure

Electrical Building (yard)

Intermediate Switchyard Control House

Well House U3-2 (Future)

Well House U3-3 (Future)

Well House U3-4 (Future)

Delete all fire areas designated as “site specific.”

NAPS DEP 11.4-1

Table 9A.5-5R Radwaste Building

Fire Area	F6101R
Description	Radwaste Handling Equipment
Building	Radwaste
Fire Zone Dwg	9A.2-20R, 21R, 22R, 23R, 24R
Applicable Codes	IBC; Reg Guide 1.189; NFPA 10, 13, 14, 72, 90A, 101, 804
Building code occupancy classification	F-1
Electrical classification	None
Safety-related divisional equipment or cables	None
Nonsafety-related trains or equipment or cables	None
Surrounded by fire barriers rated at	3 hours
Except	Basemat (non-rated); Exterior underground walls (non-rated)

Consisting of the following rooms:

EL	Room #	Potential Combustibles	Fire Detection		Fire Suppression	
			Primary	Backup	Primary	Backup
-9350	6100, 6102, 6103, 6104, 6105, 6106, 6107, 6108, 6109, 6150, 6160, 6161, 6171, 6172, 6173, 6174, 6175, 6176, 6177, 6180, 6182, 6183, 6185, 6186, 6187, 6188, 6189	Class IIIB lubricants Cable insulation Transient combustibles Class A combustibles	Suppression flowswitch	Manual pulls (outside stairwell at each landing)	Wet-pipe sprinkler 8.1 L/min per m^2 over 140 m^2	Hose racks (in nearby stairwells) ABC fire extinguishers
-2350	6103, 6104, 6105, 6106, 6107, 6108, 6109, 6150, 6160, 6161, 6171, 6200, 6201, 6202, 6251, 6271, 6272, 6273, 6274, 6275, 6276, 6277, 6278, 6281, 6282, 6283, 6284					
4650	6381, 6382, 6383, 6390, 6391, 6392, 6393, 6394, 6395, 6396					

Anticipated combustible load, MJ/m^2	> 700
Non-sprinkled combustible load limit, MJ/m^2	700

NAPS
DEP 11.4-1

Table 9A.5-5R Radwaste Building *(continued)*

Fire Area	F6101R *(continued)*
Assuming operation of fire suppression systems, effect of fire upon:	
Plant operation	None; restoration required before handling radwaste
Radiological release	Contained within building
Life safety	Travel distance limits to EXITs meet NFPA 101
Manual firefighting	Access via stairwells and exterior doors
Property loss	Moderate
Assuming automatic and manual FP equipment does not function, impact of design basis fire on safe shutdown:	
Complete burnout of all equipment and cables within this Fire Area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both redundant trains A and B are operable.	

NAPS
DEP 11.4-1

Table 9A.5-5R Radwaste Building *(continued)*

Fire Area	F6170					
Description	Electrical Equipment					
Building	Radwaste					
Fire Zone Dwg	9A.2-20R					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 10, 13, 14, 72, 101, 804					
Building code occupancy classification	F-1					
Electrical classification	None					
Safety-related divisional equipment or cables	None					
Nonsafety-related trains or equipment or cables	None					
Surrounded by fire barriers rated at	3 hours					
Except	Basemat (non-rated); Elevator doors (1.5 hr rated); Exterior underground walls (non-rated)					
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
EL	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
-9350	6170	Electrical equipment Cable insulation	Area-wide ionization	Manual pulls (outside stairwell at each landing)	CO_2 fire extinguishers	Hose racks (in nearby stairwells)
Anticipated combustible load, MJ/m^2	> 1400					
Non-sprinkled combustible load limit, MJ/m^2	1400					
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None; restoration required before handling radwaste					
Radiological release	None; no radiological materials present					
Life safety	Travel distance limits to EXITs meet NFPA 101					
Manual firefighting	Access via stairwells					
Property loss	Moderate					
Assuming automatic and manual FP equipment does not function, impact of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this Fire Area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both redundant trains A and B are operable.						

NAPS DEP 11.4-1

Table 9A.5-5R Radwaste Building *(continued)*

<table>
<tr><td colspan="3">Fire Area</td><td colspan="4">F6193R</td></tr>
<tr><td colspan="3">Description</td><td colspan="4">Stairwell C</td></tr>
<tr><td colspan="3">Building</td><td colspan="4">Radwaste</td></tr>
<tr><td colspan="3">Fire Zone Dwg</td><td colspan="4">9A.2-20R, 21R, 22R, 23R</td></tr>
<tr><td colspan="3">Applicable Codes</td><td colspan="4">IBC; Reg Guide 1.189; NFPA 10, 14, 72, 101, 804</td></tr>
<tr><td colspan="4">Building code occupancy classification</td><td colspan="3">F-1</td></tr>
<tr><td colspan="4">Electrical classification</td><td colspan="3">None</td></tr>
<tr><td colspan="4">Safety-related divisional equipment or cables</td><td colspan="3">None</td></tr>
<tr><td colspan="4">Nonsafety-related trains or equipment or cables</td><td colspan="3">None</td></tr>
<tr><td colspan="4">Surrounded by fire barriers rated at</td><td colspan="3">3 hours</td></tr>
<tr><td colspan="4">Except</td><td colspan="3">Basemat (non-rated)</td></tr>
<tr><td colspan="7">Consisting of the following rooms:</td></tr>
<tr><td rowspan="2">EL</td><td rowspan="2">Room #</td><td rowspan="2">Potential Combustibles</td><td colspan="2">Fire Detection</td><td colspan="2">Fire Suppression</td></tr>
<tr><td>Primary</td><td>Backup</td><td>Primary</td><td>Backup</td></tr>
<tr><td>-9350</td><td rowspan="4">6193</td><td rowspan="4">None</td><td rowspan="4">Area-wide ionization</td><td rowspan="4">Manual pulls (outside stairwell at each landing)</td><td rowspan="4">Hose racks</td><td rowspan="4">ABC fire extinguishers</td></tr>
<tr><td>-2350</td></tr>
<tr><td>-4650</td></tr>
<tr><td>10650</td></tr>
<tr><td colspan="5">Anticipated combustible load, MJ/m^2</td><td colspan="2">negligible</td></tr>
<tr><td colspan="5">Non-sprinkled combustible load limit, MJ/m^2</td><td colspan="2">700</td></tr>
<tr><td colspan="7">Assuming operation of fire suppression systems, effect of fire upon:</td></tr>
<tr><td colspan="3">Plant operation</td><td colspan="4">None</td></tr>
<tr><td colspan="3">Radiological release</td><td colspan="4">None; no radiological materials present</td></tr>
<tr><td colspan="3">Life safety</td><td colspan="4">Travel distance limits to EXITs meet NFPA 101</td></tr>
<tr><td colspan="3">Manual firefighting</td><td colspan="4">Access via stairwells and exterior doors</td></tr>
<tr><td colspan="3">Property loss</td><td colspan="4">Negligible</td></tr>
<tr><td colspan="7">Assuming automatic and manual FP equipment does not function, impact of design basis fire on safe shutdown:</td></tr>
<tr><td colspan="7">Complete burnout of all equipment and cables within this Fire Area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both redundant trains A and B are operable.</td></tr>
</table>

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Table 9A.5-5R Radwaste Building *(continued)*

Fire Area	F6270R					
Description	Radwaste Control Room Complex					
Building	Radwaste					
Fire Zone Dwg	9A.2-21R, 22R					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 10, 14, 72, 101, 804					
Building code occupancy classification				B		
Electrical classification				None		
Safety-related divisional equipment or cables				None		
Nonsafety-related trains or equipment or cables				None		
Surrounded by fire barriers rated at				3 hours		
Except				Elevator doors (1.5 hr rated); Basemat for 6287 (non-rated)		
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
EL	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
-2350	6270	Electrical equipment Cable insulation Class A combustibles	Area-wide ionization	Manual pulls (outside stairwell at each landing)	CO_2 fire extinguishers	Hose racks (in nearby stairwells)
	6270 below floor	Cable insulation			Hose racks (in nearby stairwells)	ABC fire extinguishers
	6287, 6288, 6289	Electrical equipment Cable insulation Class A combustibles				
Anticipated combustible load, MJ/m^2					> 1400	
Non-sprinkled combustible load limit, MJ/m^2					1400	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None; no radiological materials present					
Life safety	Travel distance limits to EXITs meet NFPA 101					
Manual firefighting	Access via stairwells					
Property loss	Moderate					
Assuming automatic and manual FP equipment does not function, impact of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this Fire Area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both redundant trains A and B are operable.						

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Table 9A.5-5R Radwaste Building *(continued)*

Fire Area	F6301R					
Description	HVAC Equipment					
Building	Radwaste					
Fire Zone Dwg	9A.2-22R, 23R					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 10, 14, 72, 90A, 101, 804					
Building code occupancy classification				F-1		
Electrical classification				None		
Safety-related divisional equipment or cables				None		
Nonsafety-related trains or equipment or cables				None		
Surrounded by fire barriers rated at				3 hours		
Except				Elevator doors (1.5 hr rated)		
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
EL	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
4650	6380	Class IIIB lubricants Cable insulation Filter media	Area-wide ionization	Manual pulls (outside stairwell at each landing)	Hose racks	ABC Fire Extinguishers
	6270 below floor					
Anticipated combustible load, MJ/m^2					> 700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None; restoration required before handling radwaste					
Radiological release	None; no radiological materials present					
Life safety	Travel distance limits to EXITs meet NFPA 101					
Manual firefighting	Access via stairwells					
Property loss	Minor					
Assuming automatic and manual FP equipment does not function, impact of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this Fire Area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both redundant trains A and B are operable.						

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Table 9A.5-7R Yard

Fire Area	F5159R					
Description	Fuel Oil Storage Tank A					
Building	Diesel Tanks					
Fire Zone Dwg	9A.2-33R					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 11, 16, 24, 30, 72, 804					
Building code occupancy classification	U					
Electrical classification	N/A					
Safety-related divisional equipment or cables	N/A					
Non-safety-related redundant trains or equipment or cables	A					
Surrounded by fire barriers rated at	N/A					
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	215,400 gal Class II Fuel Oil	Spot Heat Inside Tank	Manual Pulls	Foam Injection - Manual Release	Foam Hose Stations
Anticipated combustible load, MJ/m^2	> 700					
Non-sprinkled combustible load limit, MJ/m^2	700					
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	N/A					
Manual firefighting	Access all around					
Property loss	Moderate					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and/or cables in this fire area will not affect any safety-related, safe shutdown, or redundant nonsafety-related equipment and/or cables outside of this fire area.						

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

<table>
<tr><td colspan="3" align="right">Fire Area</td><td colspan="5">F5169R</td></tr>
<tr><td colspan="3" align="right">Description</td><td colspan="5">Fuel Oil Storage Tank B</td></tr>
<tr><td colspan="3" align="right">Building</td><td colspan="5">Diesel Tanks</td></tr>
<tr><td colspan="3" align="right">Fire Zone Dwg</td><td colspan="5">9A.2-33R</td></tr>
<tr><td colspan="3" align="right">Applicable Codes</td><td colspan="5">IBC; Reg Guide 1.189; NFPA 11, 16, 24, 30, 72, 804</td></tr>
<tr><td colspan="6" align="right">Building code occupancy classification</td><td colspan="2">U</td></tr>
<tr><td colspan="6" align="right">Electrical classification</td><td colspan="2">N/A</td></tr>
<tr><td colspan="6" align="right">Safety-related divisional equipment or cables</td><td colspan="2">N/A</td></tr>
<tr><td colspan="6" align="right">Non-safety-related redundant trains or equipment or cables</td><td colspan="2">B</td></tr>
<tr><td colspan="6" align="right">Surrounded by fire barriers rated at</td><td colspan="2">N/A</td></tr>
<tr><td colspan="6" align="right">Except</td><td colspan="2"></td></tr>
<tr><td colspan="8">Consisting of the following rooms:</td></tr>
<tr><td rowspan="2">Elevation</td><td rowspan="2">Room #</td><td rowspan="2">Potential Combustibles</td><td colspan="2">Fire Detection</td><td colspan="3">Fire Suppression</td></tr>
<tr><td>Primary</td><td>Backup</td><td colspan="2">Primary</td><td>Backup</td></tr>
<tr><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>215,400 gal Class II Fuel Oil</td><td>Spot Heat Inside Tank</td><td>Manual Pulls</td><td colspan="2">Foam Injection - Manual Release</td><td>Foam Hose Stations</td></tr>
<tr><td colspan="6" align="right">Anticipated combustible load, MJ/m²</td><td colspan="2">> 700</td></tr>
<tr><td colspan="6" align="right">Non-sprinkled combustible load limit, MJ/m²</td><td colspan="2">700</td></tr>
<tr><td colspan="8">Assuming operation of fire suppression systems, effect of fire upon:</td></tr>
<tr><td colspan="3" align="right">Plant operation</td><td colspan="5">None</td></tr>
<tr><td colspan="3" align="right">Radiological release</td><td colspan="5">None, no radiological materials present</td></tr>
<tr><td colspan="3" align="right">Life safety</td><td colspan="5">N/A</td></tr>
<tr><td colspan="3" align="right">Manual firefighting</td><td colspan="5">Access all around</td></tr>
<tr><td colspan="3" align="right">Property loss</td><td colspan="5">Moderate</td></tr>
<tr><td colspan="8">Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:</td></tr>
<tr><td colspan="8">Complete burnout of all equipment and/or cables in this fire area will not affect any safety-related, safe shutdown, or redundant nonsafety-related equipment and/or cables outside of this fire area.</td></tr>
</table>

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F7151					
Description	Pump Room Train A					
Building	Service Water Building					
Fire Zone Dwg	9A.2-204					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					A	
Surrounded by fire barriers rated at					3-hour	
Except					Exterior walls and against Electrical Room Train A (non-rated)	
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation	Manual Pulls (at EXITs)	None	ABC Fire Extinguishers	Yard Hydrants
Anticipated combustible load, MJ/m^2					LATER	
Non-sprinkled combustible load limit, MJ/m^2					LATER	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and/or cables in this fire area will not affect any safety-related, safe shutdown, or redundant nonsafety-related equipment and/or cables outside of this fire area.						

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F7152					
Description	Electrical Room Train A					
Building	Service Water Building					
Fire Zone Dwg	9A.2-204					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					A	
Surrounded by fire barriers rated at					3-hour wall against Electrical Room Train B	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation	Smoke	Manual Pulls (at EXITs)	Preaction Sprinkler LATER L/min per m^2	CO_2 Fire Extinguishers Yard Hydrants
Anticipated combustible load, MJ/m^2					> 700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and/or cables in this fire area will not affect any safety-related, safe shutdown, or redundant nonsafety-related equipment and/or cables outside of this fire area.						

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F7153					
Description	Cooling Tower Train A					
Building	Service Water Building					
Fire Zone Dwg	9A.2-204					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					A	
Surrounded by fire barriers rated at					3-hour wall against Cooling Tower Train B	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation Fill Material	Manual Pulls (at EXITs)	None	ABC Fire Extinguishers	Yard Hydrants
Anticipated combustible load, MJ/m^2					LATER	
Non-sprinkled combustible load limit, MJ/m^2					LATER	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and/or cables in this fire area will not affect any safety-related, safe shutdown, or redundant nonsafety-related equipment and/or cables outside of this fire area.						

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F7154					
Description	Transfer Pump Room A					
Building	Diesel Fuel Oil Transfer/Foam House					
Fire Zone Dwg	9A.2-202					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					A	
Surrounded by fire barriers rated at					3-hour	
Except					Exterior walls (non-rated)	
Consisting of the following rooms:						
		Potential	Fire Detection		Fire Suppression	
Elevation	Room #	Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	No. 2 Diesel Fuel Oil Cable Insulation Electrical Equipment	Manual Pulls (at EXITS)	None	Foam Hose Racks	ABC Fire Extinguishers
Anticipated combustible load, MJ/m^2					LATER	
Non-sprinkled combustible load limit, MJ/m^2					LATER	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and/or cables in this fire area will not affect any safety-related, safe shutdown, or redundant nonsafety-related equipment and/or cables outside of this fire area.						

NAPS
COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F7155					
Description	Electrical Room A					
Building	Diesel Fuel Oil Transfer/Foam House					
Fire Zone Dwg	9A.2-202					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					A	
Surrounded by fire barriers rated at					3-hour	
Except					Exterior Walls (non-rated)	
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Electrical Equipment	Area Wide Ionization	Manual Pulls	CO_2 Fire Extinguishers	Hose Racks
Anticipated combustible load, MJ/m^2					< 1400	
Non-sprinkled combustible load limit, MJ/m^2					1400	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and/or cables in this fire area will not affect any safety-related, safe shutdown, or redundant nonsafety-related equipment and/or cables outside of this fire area.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F7161					
Description	Pump Room Train B					
Building	Service Water Building					
Fire Zone Dwg	9A.2-204					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					B	
Surrounded by fire barriers rated at					3-hour wall against Pump Room Train A; 1-hour wall against Chemical Storage Room	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation	Manual Pulls (at EXITS)	None	ABC Fire Extinguishers	Yard Hydrants
Anticipated combustible load, MJ/m^2					LATER	
Non-sprinkled combustible load limit, MJ/m^2					LATER	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and/or cables in this fire area will not affect any safety-related, safe shutdown, or redundant nonsafety-related equipment and/or cables outside of this fire area.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F7162					
Description	Electrical Room Train B					
Building	Service Water Building					
Fire Zone Dwg	9A.2-204					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					B	
Surrounded by fire barriers rated at					3-hour	
Except					Exterior walls (non-rated)	
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation	Manual Pulls (at EXITS)	None	Preaction Sprinkler LATER L/min per m^2	CO_2 Fire Extinguishers Yard Hydrants
Anticipated combustible load, MJ/m^2					<1400	
Non-sprinkled combustible load limit, MJ/m^2					1400	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and/or cables in this fire area will not affect any safety-related, safe shutdown, or redundant nonsafety-related equipment and/or cables outside of this fire area.						

NAPS
COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F7163					
Description	Cooling Tower Train B					
Building	Service Water Building					
Fire Zone Dwg	9A.2-204					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					B	
Surrounded by fire barriers rated at					3-hour wall against Cooling Tower Train A	
Except						
Consisting of the following rooms:						
Elevation	Room #	Potential Combustibles	Fire Detection		Fire Suppression	
			Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation Fill Material	Manual Pulls (at EXITS)	None	ABC Fire Extinguishers	Yard Hydrants
Anticipated combustible load, MJ/m^2					LATER	
Non-sprinkled combustible load limit, MJ/m^2					LATER	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and/or cables in this fire area will not affect any safety-related, safe shutdown, or redundant nonsafety-related equipment and/or cables outside of this fire area.						

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F7164					
Description	Transfer Pump Room B					
Building	Diesel Fuel Oil Transfer/Foam House					
Fire Zone Dwg	9A.2-202					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					B	
Surrounded by fire barriers rated at					3-hour	
Except					Exterior walls (non-rated)	
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	No. 2 Diesel Fuel Oil Cable Insulation Electrical Equipment	Manual Pulls (at EXITS)	None	Foam Hose Racks	ABC Fire Extinguishers
Anticipated combustible load, MJ/m^2					LATER	
Non-sprinkled combustible load limit, MJ/m^2					LATER	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and/or cables in this fire area will not affect any safety-related, safe shutdown, or redundant nonsafety-related equipment and/or cables outside of this fire area.						

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F7165					
Description	Electrical Room B					
Building	Diesel Fuel Oil Transfer/Foam House					
Fire Zone Dwg	9A.2-202					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					B	
Surrounded by fire barriers rated at					3-hour	
Except					Exterior Walls and interior wall between Foam Room and B Electrical Room (non-rated)	
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Electrical Equipment	Area Wide Ionization	Manual Pulls	CO_2 Fire Extinguishers	Hose Racks
Anticipated combustible load, MJ/m^2					< 1400	
Non-sprinkled combustible load limit, MJ/m^2					1400	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and/or cables in this fire area will not affect any safety-related, safe shutdown, or redundant nonsafety-related equipment and/or cables outside of this fire area.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F7174					
Description	Foam House					
Building	Diesel Fuel Oil Transfer/Foam House					
Fire Zone Dwg	9A.2-202					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 10, 13, 72, 75, 90A, 101, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					3-hour	
Except					Exterior wall and interior wall between Foam Room and B Electrical Room (non-rated)	
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	LATER	Manual Pulls (at EXITS)	None	ABC Fire Extinguisher	Foam Hose Rack
Anticipated combustible load, MJ/m^2					< 700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both on-site and off-site Power Supplies A and B are unaffected by fire and are operable.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F7301					
Description	General Area					
Building	Makeup Water Building					
Fire Zone Dwg	9A.2-201					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					H-4	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					1-hour walls against Lab, Control Room and Electrical Room	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation Plastic Filter Membranes Corrosive/ Toxic Chemicals	Manual Pulls (at EXITS)	None	Wet-Pipe Sprinkler LATER L/min per m^2	Hose Racks ABC Fire Extinguishers
Anticipated combustible load, MJ/m^2					>700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None, but may affect makeup water chemistry					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment, but could affect nonsafety-related equipment including equipment which could be used for make-up to IC/PCCS pools or spent fuel pool if 7 days post accident; all safety divisions and both on-site and off-site power supplies are unaffected by fire and are operable.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F7302					
Description	Electrical Room					
Building	Makeup Water Building					
Fire Zone Dwg	9A.2-201					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					1 hour	
Except					Exterior walls (non-rated)	
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation Electrical Equipment	Smoke	Manual Pulls (at EXITs)	Pre-Action Sprinkler LATER L/min per m^2	Hose Racks CO_2 Fire Extinguishers
Anticipated combustible load, MJ/m^2					>1400	
Non-sprinkled combustible load limit, MJ/m^2					1400	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None, but may affect makeup water chemistry					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment, but could affect nonsafety-related equipment including equipment which could be used for make-up to IC/PCCS pools or spent fuel pool 7 days post accident; all safety divisions and both on-site and off-site power supplies are unaffected by fire and are operable.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F7303					
Description	Control Room					
Building	Makeup Water Building					
Fire Zone Dwg	9A.2-201					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					1 hour	
Except					Exterior walls (non-rated)	
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation Electrical Equipment	Smoke	Manual Pulls (at EXITs)	Pre-Action Sprinkler LATER L/min per m^2	Hose Racks ABC Fire Extinguishers
Anticipated combustible load, MJ/m^2					>700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None, but may affect makeup water chemistry					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment, but could affect nonsafety-related equipment including equipment which could be used for make-up to IC/PCCS pools or spent fuel pool 7 days post accident; all safety divisions and both on-site and off-site power supplies are unaffected by fire and are operable.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F7304					
Description	Lab					
Building	Makeup Water Building					
Fire Zone Dwg	9A.2-201					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification	F-1					
Electrical classification	N/A					
Safety-related divisional equipment or cables	N/A					
Non-safety-related redundant trains or equipment or cables	N/A					
Surrounded by fire barriers rated at	1 hour					
Except	Exterior walls (non-rated)					
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Electrical Equipment Cable Insulation	Smoke	Manual Pulls (at EXITs)	Pre-Action Sprinkler LATER L/min per m^2	Hose Racks ABC Fire Extinguishers
Anticipated combustible load, MJ/m^2	>700					
Non-sprinkled combustible load limit, MJ/m^2	700					
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None, but may affect makeup water chemistry					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment, but could affect nonsafety-related equipment including equipment which could be used for make-up to IC/PCCS pools or spent fuel pool 7 days post accident; all safety divisions and both on-site and off-site power supplies are unaffected by fire and are operable.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F7305					
Description	Circulating Water Pump House					
Building	Circulating Water Pump House					
Fire Zone Dwg	9A.2-33R					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					N/A	
Except					N/A	
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	LATER	Manual Pulls (at EXITs)	None	LATER	LATER
Anticipated combustible load, MJ/m^2					< 700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F7180					
Description	Vehicle Access Facility					
Building	Vehicle Access Facility					
Fire Zone Dwg	9A.2-33R					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 10, 24, 72, 90A, 101, 804					
Building code occupancy classification					B	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					N/A	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation	Smoke	Manual Pulls (at EXITs)	Wet-Pipe Sprinkler LATER L/min per m^2	ABC Fire Extinguishers
Anticipated combustible load, MJ/m^2					> 700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F7188					
Description	Chemical Storage Area					
Building	Service Water Building					
Fire Zone Dwg	9A.2-204					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification	H-4					
Electrical classification	N/A					
Safety-related divisional equipment or cables	N/A					
Non-safety-related redundant trains or equipment or cables	N/A					
Surrounded by fire barriers rated at	1-hour					
Except	Exterior Walls (non-rated)					
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Corrosive/ Toxic Chemicals	Manual Pulls (at EXITs)	None	Wet-Pipe Sprinkler LATER L/min per m^2	ABC Fire Extinguishers Yard Hydrants
Anticipated combustible load, MJ/m^2	>700					
Non-sprinkled combustible load limit, MJ/m^2	700					
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both on-site and off-site Power Supplies A and B are unaffected by fire and are operable.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F7700R
Description	Service Building
Building	Service Building
Fire Zone Dwg	9A.2-33R
Applicable Codes	IBC; Reg Guide 1.189; NFPA 10, 13, 72, 90A, 101, 804; 28 CFR 36
Building code occupancy classification	B
Electrical classification	N/A
Safety-related divisional equipment or cables	N/A
Non-safety-related redundant trains or equipment or cables	N/A
Surrounded by fire barriers rated at	3-hour
Except	South, East, North Walls (non-rated)

Consisting of the following rooms:

Elevation	Room #	Potential Combustibles	Fire Detection		Fire Suppression	
			Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Class A Combustibles Cable Insulation	Smoke	Manual Pulls (at EXITs)	Wet-Pipe Sprinkler LATER L/min per m^2	ABC Fire Extinguisher

Anticipated combustible load, MJ/m^2	> 700
Non-sprinkled combustible load limit, MJ/m^2	700

Assuming operation of fire suppression systems, effect of fire upon:

Plant operation	None
Radiological release	None, no radiological materials present
Life safety	To be determined during detailed design
Manual firefighting	To be determined during detailed design
Property loss	To be determined during detailed design

Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:

Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment.

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Table 9A.5-7R Yard *(continued)*

Fire Area	F7900R					
Description	Administration Building					
Building	Administration Building					
Fire Zone Dwg	9A.2-33R					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 10, 13, 72, 90A, 101, 804					
Building code occupancy classification					B	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					N/A	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Class A Combustibles Cable Insulation	Suppression Flowswitch	Manual Pulls (at EXITs)	Wet-Pipe Sprinkler LATER L/min per m^2	ABC Fire Extinguishers Hose Racks
Anticipated combustible load, MJ/m^2					> 700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F8101					
Description	Motor Driven Fire Pump (Intake Area)					
Building	Station Water Intake Building					
Fire Zone Dwg	9A.2-203					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 10, 13, 20, 24, 30, 37, 72, 101, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					3-hour wall against Diesel Pump Room	
Except					Exterior Walls (non-rated) and against Electrical Room (non-rated)	
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation	Suppression Flowswitch	Manual Pulls (at EXITs)	Wet-Pipe Sprinkler LATER L/min per m^2	ABC Fire Extinguishers Yard Hydrants
Anticipated combustible load, MJ/m^2					>700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	Via exterior door					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both on-site and off-site Power Supplies A and B are unaffected by fire and are operable.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F8102					
Description	Diesel Driven Fire Pump Room					
Building	Station Water Intake Building					
Fire Zone Dwg	9A.2-203					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					3-hour	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation No. 2 Diesel Fuel Oil	Smoke	Manual Pulls (at EXITs)	Wet-Pipe Sprinkler LATER L/min per m^2	ABC Fire Extinguishers Yard Hydrants
Anticipated combustible load, MJ/m^2					>700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both on-site and off-site Power Supplies A and B are unaffected by fire and are operable.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F8103					
Description	Electrical Room					
Building	Station Water Intake Building					
Fire Zone Dwg	9A.2-203					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					3-hour wall against diesel pump room	
Except					Exterior walls (non-rated)	
Consisting of the following rooms:						
Elevation	Room #	Potential Combustibles	Fire Detection		Fire Suppression	
			Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable insulation Electrical Equipment	Area Wide Ionization	Manual pulls (at EXIT)	Preaction sprinkler LATER L/min per m^2	CO_2 Fire Extinguishers Yard Hydrants
Anticipated combustible load, MJ/m^2					>1400	
Non-sprinkled combustible load limit, MJ/m^2					1400	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	Via EXIT Door					
Property loss	Minor					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both on-site and off-site Power Supplies A and B are unaffected by fire and are operable.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F8104					
Description	Nitrogen Storage Area					
Building	Nitrogen Storage Area					
Fire Zone Dwg	9A.2-33R					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 101, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					N/A	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	LATER	Manual Pulls	None	Yard Hydrants	ABC Fire Extinguisher
Anticipated combustible load, MJ/m^2					LATER	
Non-sprinkled combustible load limit, MJ/m^2					LATER	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F8105					
Description	Hydrogen Storage Area					
Building	Hydrogen Storage Area					
Fire Zone Dwg	9A.2-33R					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
				Building code occupancy classification	F-1	
				Electrical classification	N/A	
				Safety-related divisional equipment or cables	N/A	
				Non-safety-related redundant trains or equipment or cables	N/A	
				Surrounded by fire barriers rated at	N/A	
				Except		
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Two 6,000 gal liquid storage tanks One gaseous tube trailer (45,000 scf)	H_2 System Instrumentation	Manual Pull	Yard Hydrants	ABC Fire Extinguishers
				Anticipated combustible load, MJ/m^2	>700	
				Non-sprinkled combustible load limit, MJ/m^2	700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F8106					
Description	Oxygen Storage Area					
Building	Oxygen Storage Area					
Fire Zone Dwg	9A.2-33R					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					N/A	
Except						
Consisting of the following rooms:						
Elevation	Room #	Potential Combustibles	Fire Detection		Fire Suppression	
			Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	LATER	LATER	LATER	Yard Hydrants	ABC Fire Extinguishers
Anticipated combustible load, MJ/m^2					LATER	
Non-sprinkled combustible load limit, MJ/m^2					LATER	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment.						

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Table 9A.5-7R Yard *(continued)*

Fire Area	F8107					
Description	Dry Cooling Tower Electrical Building (South)					
Building	Dry Cooling Tower Electrical Building (South)					
Fire Zone Dwg	9A.2-33R					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					N/A	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Electrical Equipment	Area Wide Ionization	Manual Pulls	CO_2 Fire Extinguisher	Hose Rack
Anticipated combustible load, MJ/m^2					< 1400	
Non-sprinkled combustible load limit, MJ/m^2					1400	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment.						

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Table 9A.5-7R Yard *(continued)*

<table>
<tr><td colspan="3">Fire Area</td><td colspan="4">F8109</td></tr>
<tr><td colspan="3">Description</td><td colspan="4">Dry Cooling Tower</td></tr>
<tr><td colspan="3">Building</td><td colspan="4">Dry Cooling Tower</td></tr>
<tr><td colspan="3">Fire Zone Dwg</td><td colspan="4">9A.2-33R</td></tr>
<tr><td colspan="3">Applicable Codes</td><td colspan="4">IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804</td></tr>
<tr><td colspan="5">Building code occupancy classification</td><td colspan="2">F-1</td></tr>
<tr><td colspan="5">Electrical classification</td><td colspan="2">N/A</td></tr>
<tr><td colspan="5">Safety-related divisional equipment or cables</td><td colspan="2">N/A</td></tr>
<tr><td colspan="5">Non-safety-related redundant trains or equipment or cables</td><td colspan="2">N/A</td></tr>
<tr><td colspan="5">Surrounded by fire barriers rated at</td><td colspan="2">N/A</td></tr>
<tr><td colspan="5">Except</td><td colspan="2"></td></tr>
<tr><td colspan="7">Consisting of the following rooms:</td></tr>
<tr><td rowspan="2">Elevation</td><td rowspan="2">Room #</td><td rowspan="2">Potential Combustibles</td><td colspan="2">Fire Detection</td><td colspan="2">Fire Suppression</td></tr>
<tr><td>Primary</td><td>Backup</td><td>Primary</td><td>Backup</td></tr>
<tr><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>LATER</td><td>LATER</td><td>LATER</td><td>Yard Hydrants</td><td>Yard Hydrants</td></tr>
<tr><td colspan="5">Anticipated combustible load, MJ/m^2</td><td colspan="2">LATER</td></tr>
<tr><td colspan="5">Non-sprinkled combustible load limit, MJ/m^2</td><td colspan="2">LATER</td></tr>
<tr><td colspan="7">Assuming operation of fire suppression systems, effect of fire upon:</td></tr>
<tr><td colspan="3">Plant operation</td><td colspan="4">To be determined during detailed design</td></tr>
<tr><td colspan="3">Radiological release</td><td colspan="4">None, no radiological materials present</td></tr>
<tr><td colspan="3">Life safety</td><td colspan="4">To be determined during detailed design</td></tr>
<tr><td colspan="3">Manual firefighting</td><td colspan="4">To be determined during detailed design</td></tr>
<tr><td colspan="3">Property loss</td><td colspan="4">To be determined during detailed design</td></tr>
<tr><td colspan="7">Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:</td></tr>
<tr><td colspan="7">Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment.</td></tr>
</table>

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F8110					
Description	Dry Cooling Tower Electrical Building (North)					
Building	Dry Cooling Tower Electrical Building (North)					
Fire Zone Dwg	9A.2-33R					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					N/A	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Electrical Equipment	Area Wide Ionization	Manual Pulls	CO_2 Fire Extinguisher	Hose Rack
Anticipated combustible load, MJ/m^2					< 1400	
Non-sprinkled combustible load limit, MJ/m^2					1400	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment.						

NAPS
COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

<table>
<tr><td colspan="2">Fire Area</td><td colspan="4">F8181</td></tr>
<tr><td colspan="2">Description</td><td colspan="4">Hot Machine Shop</td></tr>
<tr><td colspan="2">Building</td><td colspan="4">Hot Machine Shop and Maintenance Building</td></tr>
<tr><td colspan="2">Fire Zone Dwg</td><td colspan="4">9A.2-205, 9A.2-206</td></tr>
<tr><td colspan="2">Applicable Codes</td><td colspan="4">IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804</td></tr>
<tr><td colspan="5">Building code occupancy classification</td><td>F-1</td></tr>
<tr><td colspan="5">Electrical classification</td><td>N/A</td></tr>
<tr><td colspan="5">Safety-related divisional equipment or cables</td><td>N/A</td></tr>
<tr><td colspan="5">Non-safety-related redundant trains or equipment or cables</td><td>N/A</td></tr>
<tr><td colspan="5">Surrounded by fire barriers rated at</td><td>1-hour wall against HVAC Room; 3-hour wall against office area and stairwells</td></tr>
<tr><td colspan="5">Except</td><td>Exterior walls (non-rated)</td></tr>
<tr><td colspan="6">Consisting of the following rooms:</td></tr>
</table>

Elevation	Room #	Potential Combustibles	Fire Detection		Fire Suppression	
			Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Flammable Solvents Oil	Manual Pulls (at EXITs)	None	Hose Racks	ABC Fire Extinguishers Yard Hydrants

Anticipated combustible load, MJ/m^2	LATER
Non-sprinkled combustible load limit, MJ/m^2	LATER

Assuming operation of fire suppression systems, effect of fire upon:

Plant operation	To be determined during detailed design
Radiological release	None, no radiological materials present
Life safety	To be determined during detailed design
Manual firefighting	To be determined during detailed design
Property loss	To be determined during detailed design

Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:

Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment. All safety divisions and both onsite and offsite Power Supplies A and B are unaffected by fire and are operable.

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F8282					
Description	Electrical Work Area					
Building	Hot Machine Shop and Maintenance Building					
Fire Zone Dwg	9A.2-205					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification	F-1					
Electrical classification	N/A					
Safety-related divisional equipment or cables	N/A					
Non-safety-related redundant trains or equipment or cables	N/A					
Surrounded by fire barriers rated at	3-hour wall against office area					
Except	Exterior walls (non-rated)					
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Flammable Solvents Oil	Manual Pulls (at EXITs)	None	Hose Racks	ABC Fire Extinguishers Yard Hydrants
Anticipated combustible load, MJ/m^2	< 1400					
Non-sprinkled combustible load limit, MJ/m^2	1400					
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both on-site and off-site Power Supplies A and B are unaffected by fire and are operable.						

NAPS
COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F8183					
Description	Office Area (First Floor)					
Building	Hot Machine Shop and Maintenance Building					
Fire Zone Dwg	9A.2-206					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					B	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					3-hour	
Except					Stairwell/Elevator 2 hour Elevator 1.5 hour South exterior wall (non-rated)	
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation Office Supplies	Smoke	Manual Pulls (at EXITs)	Wet-Pipe Sprinklers LATER L/min per m^2	ABC Fire Extinguishers Yard Hydrants
Anticipated combustible load, MJ/m^2					>700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both on-site and off-site Power Supplies A and B are unaffected by fire and are operable.						

NAPS
COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F8184					
Description	Stairwell (South)					
Building	Hot Machine Shop and Maintenance Building					
Fire Zone Dwg	9A.2-205, 9A.2-206					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					2-hour	
Except					3-hour wall against Hot Machine Shop	
Consisting of the following rooms:						
Elevation	Room #	Potential Combustibles	Fire Detection		Fire Suppression	
			Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation	Area Wide Ionization	Manual Pulls (at EXITs)	Hose Rack	ABC Fire Extinguishers
Anticipated combustible load, MJ/m^2					< 700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both on-site and off-site Power Supplies A and B are unaffected by fire and are operable.						

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F8185
Description	Stairwell (North)
Building	Hot Machine Shop and Maintenance Building
Fire Zone Dwg	9A.2-205, 9A.2-206
Applicable Codes	IBC; Reg Guide 1.189; NFPA 10, 14, 72, 75, 101, 804
Building code occupancy classification	F-1
Electrical classification	N/A
Safety-related divisional equipment or cables	N/A
Non-safety-related redundant trains or equipment or cables	N/A
Surrounded by fire barriers rated at	2 hour
Except	3-hour against hot machine shop and east exterior wall

Consisting of the following rooms:

Elevation	Room #	Potential Combustibles	Fire Detection		Fire Suppression	
			Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation	Area Wide Ionization	Manual Pulls (at EXITs)	Hose Racks	ABC Fire Extinguishers

Anticipated combustible load, MJ/m^2	<700
Non-sprinkled combustible load limit, MJ/m^2	700

Assuming operation of fire suppression systems, effect of fire upon:

Plant operation	None
Radiological release	None, no radiological materials present
Life safety	To be determined during detailed design
Manual firefighting	To be determined during detailed design
Property loss	To be determined during detailed design

Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:

Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both on-site and off-site Power Supplies A and B are unaffected by fire and are operable.

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F8186					
Description	Elevator					
Building	Hot Machine Shop and Maintenance Building					
Fire Zone Dwg	9A.2-205, 9A.2-206					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 10, 12, 13, 14, 72, 75, 101, 804; ASME A17.1					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					2-hour walls	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation Electrical Equipment Class III B Lubricant	Area Wide Ionization	Manual Pulls (at EXITs)	CO_2 Fire Extinguishers ABC Fire Extinguishers (outside elevator at each floor)	Hose Rack
Anticipated combustible load, MJ/m^2					<700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both on-site and off-site Power Supplies A and B are unaffected by fire and are operable.						

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F8187					
Description	HVAC Equipment Room					
Building	Hot Machine Shop and Maintenance Building					
Fire Zone Dwg	9A.2-205, 9A.2-206					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					B	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					1-hour	
Except					Exterior Walls	
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation	Smoke	Manual Pulls (at EXITs)	Wet-Pipe Sprinklers LATER L/min per m^2	ABC Fire Extinguishers Yard Hydrants
Anticipated combustible load, MJ/m^2					>700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both on-site and off-site Power Supplies A and B are unaffected by fire and are operable.						

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COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F8188					
Description	Elevator Maintenance Access					
Building	Hot Machine Shop and Maintenance Building					
Fire Zone Dwg	9A.2-205, 9A.2-206					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 10, 14, 72, 101, 804; ASME A17.1					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					2 hours	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation Electrical Equipment Class IIIB Lubricants	Area Wide Ionization	Manual Pulls (at EXITs)	CO_2 Fire Extinguisher	ABC Fire Extinguishers Yard Hydrants
Anticipated combustible load, MJ/m^2					<700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both on-site and off-site Power Supplies A and B are unaffected by fire and are operable.						

NAPS
COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F8189					
Description	Mechanics Work Area					
Building	Hot Machine Shop and Maintenance Building					
Fire Zone Dwg	9A.2-206					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					3 hour	
Except					Exterior Walls (non-rated)	
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Flammable Solvents Oil	Manual Pulls (at EXITs)	None	Hose Racks	ABC Fire Extinguishers Yard Hydrants
Anticipated combustible load, MJ/m^2					< 700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both on-site and off-site Power Supplies A and B are unaffected by fire and are operable.						

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COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F8200					
Description	Cooling Tower Maintenance Building					
Building	Cooling Tower Maintenance Building					
Fire Zone Dwg	9A.2-33R					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					N/A	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	LATER	Manual Pulls (at EXITs)	None	LATER	LATER
Anticipated combustible load, MJ/m^2					LATER	
Non-sprinkled combustible load limit, MJ/m^2					LATER	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	To be determined during detailed design					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment.						

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COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area		F8201				
Description		Hybrid Cooling Tower Electrical Building				
Building		Hybrid Cooling Tower Electrical Building				
Fire Zone Dwg		9A.2-33R				
Applicable Codes		IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804				
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					N/A	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Electrical Equipment	Area Wide Ionization	Manual Pulls	CO_2 Fire Extinguishers	Hose Racks
Anticipated combustible load, MJ/m^2					< 1400	
Non-sprinkled combustible load limit, MJ/m^2					1400	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation		None				
Radiological release		None, no radiological materials present				
Life safety		To be determined during detailed design				
Manual firefighting		To be determined during detailed design				
Property loss		To be determined during detailed design				
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment.						

NAPS
COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F8283					
Description	Office Area (Second Floor)					
Building	Hot Machine Shop and Maintenance Building					
Fire Zone Dwg	9A.2-205					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					B	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					3-hour	
Except					Stairwell/Elevator 2 hour Elevator Door 1.5 hour South exterior wall (non-rated)	
Consisting of the following rooms:						
		Potential	Fire Detection		Fire Suppression	
Elevation	Room #	Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	Cable Insulation Office Supplies	Smoke	Manual Pulls (at EXITs)	Wet-Pipe Sprinklers LATER L/min per m^2	ABC Fire Extinguishers
Anticipated combustible load, MJ/m^2					>700	
Non-sprinkled combustible load limit, MJ/m^2					700	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment; all safety divisions and both on-site and off-site Power Supplies A and B are unaffected by fire and are operable.						

NAPS
COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	F8108					
Description	CO_2 Storage Area					
Building	CO_2 Storage Area					
Fire Zone Dwg	9A.2-33R					
Applicable Codes	IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804					
Building code occupancy classification					F-1	
Electrical classification					N/A	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					N/A	
Surrounded by fire barriers rated at					N/A	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	LATER	LATER	LATER	Yard Hydrants	ABC Fire Extinguishers
Anticipated combustible load, MJ/m^2					LATER	
Non-sprinkled combustible load limit, MJ/m^2					LATER	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment.						

NAPS
COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

<table>
<tr><td colspan="3" align="right">Fire Area</td><td colspan="5"></td></tr>
<tr><td colspan="3" align="right">Description</td><td colspan="5">Hybrid Cooling Tower</td></tr>
<tr><td colspan="3" align="right">Building</td><td colspan="5">Hybrid Cooling Tower</td></tr>
<tr><td colspan="3" align="right">Fire Zone Dwg</td><td colspan="5">9A.2-33R</td></tr>
<tr><td colspan="3" align="right">Applicable Codes</td><td colspan="5">IBC; Reg Guide 1.189; NFPA 15, 45, 72, 75, 804</td></tr>
<tr><td colspan="6" align="right">Building code occupancy classification</td><td colspan="2">F-1</td></tr>
<tr><td colspan="6" align="right">Electrical classification</td><td colspan="2">N/A</td></tr>
<tr><td colspan="6" align="right">Safety-related divisional equipment or cables</td><td colspan="2">N/A</td></tr>
<tr><td colspan="6" align="right">Non-safety-related redundant trains or equipment or cables</td><td colspan="2">N/A</td></tr>
<tr><td colspan="6" align="right">Surrounded by fire barriers rated at</td><td colspan="2">N/A</td></tr>
<tr><td colspan="6" align="right">Except</td><td colspan="2"></td></tr>
<tr><td colspan="8">Consisting of the following rooms:</td></tr>
<tr><td rowspan="2">Elevation</td><td rowspan="2">Room #</td><td rowspan="2">Potential Combustibles</td><td colspan="2">Fire Detection</td><td colspan="3">Fire Suppression</td></tr>
<tr><td>Primary</td><td>Backup</td><td colspan="2">Primary</td><td>Backup</td></tr>
<tr><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>Electrical</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td colspan="2">To be determined during detailed design</td><td>To be determined during detailed design</td></tr>
<tr><td colspan="6" align="right">Anticipated combustible load, MJ/m^2</td><td colspan="2">< 1400</td></tr>
<tr><td colspan="6" align="right">Non-sprinkled combustible load limit, MJ/m^2</td><td colspan="2">1400</td></tr>
<tr><td colspan="8">Assuming operation of fire suppression systems, effect of fire upon:</td></tr>
<tr><td colspan="3" align="right">Plant operation</td><td colspan="5">None</td></tr>
<tr><td colspan="3" align="right">Radiological release</td><td colspan="5">None, no radiological materials present</td></tr>
<tr><td colspan="3" align="right">Life safety</td><td colspan="5">To be determined during detailed design</td></tr>
<tr><td colspan="3" align="right">Manual firefighting</td><td colspan="5">To be determined during detailed design</td></tr>
<tr><td colspan="3" align="right">Property loss</td><td colspan="5">To be determined during detailed design</td></tr>
<tr><td colspan="8">Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:</td></tr>
<tr><td colspan="8">Complete burnout of all equipment and cables within this fire area affects no safety-related or safe shutdown divisional equipment.</td></tr>
</table>

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

<table>
<tr><td colspan="3" align="right">Fire Area</td><td colspan="4">Later</td></tr>
<tr><td colspan="3" align="right">Description</td><td colspan="4">Later</td></tr>
<tr><td colspan="3" align="right">Building</td><td colspan="4">Electrical Building (Yard)</td></tr>
<tr><td colspan="3" align="right">Fire Zone Dwg</td><td colspan="4">9A.2-33R</td></tr>
<tr><td colspan="3" align="right">Applicable Codes</td><td colspan="4">To be determined during detailed design</td></tr>
<tr><td colspan="5" align="right">Building code occupancy classification</td><td colspan="2">To be determined during detailed design</td></tr>
<tr><td colspan="5" align="right">Electrical classification</td><td colspan="2">To be determined during detailed design</td></tr>
<tr><td colspan="5" align="right">Safety-related divisional equipment or cables</td><td colspan="2">N/A</td></tr>
<tr><td colspan="5" align="right">Non-safety-related redundant trains or equipment or cables</td><td colspan="2">To be determined during detailed design</td></tr>
<tr><td colspan="5" align="right">Surrounded by fire barriers rated at</td><td colspan="2">To be determined during detailed design</td></tr>
<tr><td colspan="5" align="right">Except</td><td colspan="2"></td></tr>
<tr><td colspan="7">Consisting of the following rooms:</td></tr>
<tr><td rowspan="2">Elevation</td><td rowspan="2">Room #</td><td rowspan="2">Potential Combustibles</td><td colspan="2">Fire Detection</td><td colspan="2">Fire Suppression</td></tr>
<tr><td>Primary</td><td>Backup</td><td>Primary</td><td>Backup</td></tr>
<tr><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td></tr>
<tr><td colspan="5" align="right">Anticipated combustible load, MJ/m^2</td><td colspan="2">LATER</td></tr>
<tr><td colspan="5" align="right">Non-sprinkled combustible load limit, MJ/m^2</td><td colspan="2">LATER</td></tr>
<tr><td colspan="7">Assuming operation of fire suppression systems, effect of fire upon:</td></tr>
<tr><td colspan="3" align="right">Plant operation</td><td colspan="4">None</td></tr>
<tr><td colspan="3" align="right">Radiological release</td><td colspan="4">None, no radiological materials present</td></tr>
<tr><td colspan="3" align="right">Life safety</td><td colspan="4">To be determined during detailed design</td></tr>
<tr><td colspan="3" align="right">Manual firefighting</td><td colspan="4">To be determined during detailed design</td></tr>
<tr><td colspan="3" align="right">Property loss</td><td colspan="4">To be determined during detailed design</td></tr>
<tr><td colspan="7">Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:</td></tr>
<tr><td colspan="7">To be determined during detailed design</td></tr>
</table>

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	Later					
Description	Later					
Building	Site Support Structure					
Fire Zone Dwg	9A.2-33R					
Applicable Codes	To be determined during detailed design					
Building code occupancy classification					To be determined during detailed design	
Electrical classification					To be determined during detailed design	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					To be determined during detailed design	
Surrounded by fire barriers rated at					To be determined during detailed design	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	To be determined during detailed design	To be determined during detailed design	To be determined during detailed design	To be determined during detailed design	To be determined during detailed design
Anticipated combustible load, MJ/m^2					LATER	
Non-sprinkled combustible load limit, MJ/m^2					LATER	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
To be determined during detailed design						

NAPS
COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

<table>
<tr><td colspan="3" align="right">Fire Area</td><td colspan="4">Later</td></tr>
<tr><td colspan="3" align="right">Description</td><td colspan="4">Later</td></tr>
<tr><td colspan="3" align="right">Building</td><td colspan="4">Intermediate Switchyard Control House</td></tr>
<tr><td colspan="3" align="right">Fire Zone Dwg</td><td colspan="4">9A.2-33R</td></tr>
<tr><td colspan="3" align="right">Applicable Codes</td><td colspan="4">To be determined during detailed design</td></tr>
<tr><td colspan="5" align="right">Building code occupancy classification</td><td colspan="2">To be determined during detailed design</td></tr>
<tr><td colspan="5" align="right">Electrical classification</td><td colspan="2">To be determined during detailed design</td></tr>
<tr><td colspan="5" align="right">Safety-related divisional equipment or cables</td><td colspan="2">N/A</td></tr>
<tr><td colspan="5" align="right">Non-safety-related redundant trains or equipment or cables</td><td colspan="2">To be determined during detailed design</td></tr>
<tr><td colspan="5" align="right">Surrounded by fire barriers rated at</td><td colspan="2">To be determined during detailed design</td></tr>
<tr><td colspan="5" align="right">Except</td><td colspan="2"></td></tr>
<tr><td colspan="7">Consisting of the following rooms:</td></tr>
<tr><td rowspan="2">Elevation</td><td rowspan="2">Room #</td><td rowspan="2">Potential Combustibles</td><td colspan="2">Fire Detection</td><td colspan="2">Fire Suppression</td></tr>
<tr><td>Primary</td><td>Backup</td><td>Primary</td><td>Backup</td></tr>
<tr><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td></tr>
<tr><td colspan="5" align="right">Anticipated combustible load, MJ/m^2</td><td colspan="2">LATER</td></tr>
<tr><td colspan="5" align="right">Non-sprinkled combustible load limit, MJ/m^2</td><td colspan="2">LATER</td></tr>
<tr><td colspan="7">Assuming operation of fire suppression systems, effect of fire upon:</td></tr>
<tr><td colspan="3" align="right">Plant operation</td><td colspan="4">None</td></tr>
<tr><td colspan="3" align="right">Radiological release</td><td colspan="4">None, no radiological materials present</td></tr>
<tr><td colspan="3" align="right">Life safety</td><td colspan="4">To be determined during detailed design</td></tr>
<tr><td colspan="3" align="right">Manual firefighting</td><td colspan="4">To be determined during detailed design</td></tr>
<tr><td colspan="3" align="right">Property loss</td><td colspan="4">To be determined during detailed design</td></tr>
<tr><td colspan="7">Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:</td></tr>
<tr><td colspan="7">To be determined during detailed design</td></tr>
</table>

NAPS
COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

<table>
<tr><td colspan="3" align="right">Fire Area</td><td colspan="5">Later</td></tr>
<tr><td colspan="3" align="right">Description</td><td colspan="5">Later</td></tr>
<tr><td colspan="3" align="right">Building</td><td colspan="5">Well House U3-2</td></tr>
<tr><td colspan="3" align="right">Fire Zone Dwg</td><td colspan="5">9A.2-33R</td></tr>
<tr><td colspan="3" align="right">Applicable Codes</td><td colspan="5">To be determined during detailed design</td></tr>
<tr><td colspan="6" align="right">Building code occupancy classification</td><td colspan="2">To be determined during detailed design</td></tr>
<tr><td colspan="6" align="right">Electrical classification</td><td colspan="2">To be determined during detailed design</td></tr>
<tr><td colspan="6" align="right">Safety-related divisional equipment or cables</td><td colspan="2">N/A</td></tr>
<tr><td colspan="6" align="right">Non-safety-related redundant trains or equipment or cables</td><td colspan="2">To be determined during detailed design</td></tr>
<tr><td colspan="6" align="right">Surrounded by fire barriers rated at</td><td colspan="2">To be determined during detailed design</td></tr>
<tr><td colspan="6" align="right">Except</td><td colspan="2"></td></tr>
<tr><td colspan="8">Consisting of the following rooms:</td></tr>
<tr><td rowspan="2">Elevation</td><td rowspan="2">Room #</td><td rowspan="2">Potential Combustibles</td><td colspan="2">Fire Detection</td><td colspan="3">Fire Suppression</td></tr>
<tr><td>Primary</td><td>Backup</td><td>Primary</td><td colspan="2">Backup</td></tr>
<tr><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td>To be determined during detailed design</td><td colspan="2">To be determined during detailed design</td></tr>
<tr><td colspan="6" align="right">Anticipated combustible load, MJ/m^2</td><td colspan="2">LATER</td></tr>
<tr><td colspan="6" align="right">Non-sprinkled combustible load limit, MJ/m^2</td><td colspan="2">LATER</td></tr>
<tr><td colspan="8">Assuming operation of fire suppression systems, effect of fire upon:</td></tr>
<tr><td colspan="3" align="right">Plant operation</td><td colspan="5">None</td></tr>
<tr><td colspan="3" align="right">Radiological release</td><td colspan="5">None, no radiological materials present</td></tr>
<tr><td colspan="3" align="right">Life safety</td><td colspan="5">To be determined during detailed design</td></tr>
<tr><td colspan="3" align="right">Manual firefighting</td><td colspan="5">To be determined during detailed design</td></tr>
<tr><td colspan="3" align="right">Property loss</td><td colspan="5">To be determined during detailed design</td></tr>
<tr><td colspan="8">Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:</td></tr>
<tr><td colspan="8">To be determined during detailed design</td></tr>
</table>

NAPS
COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

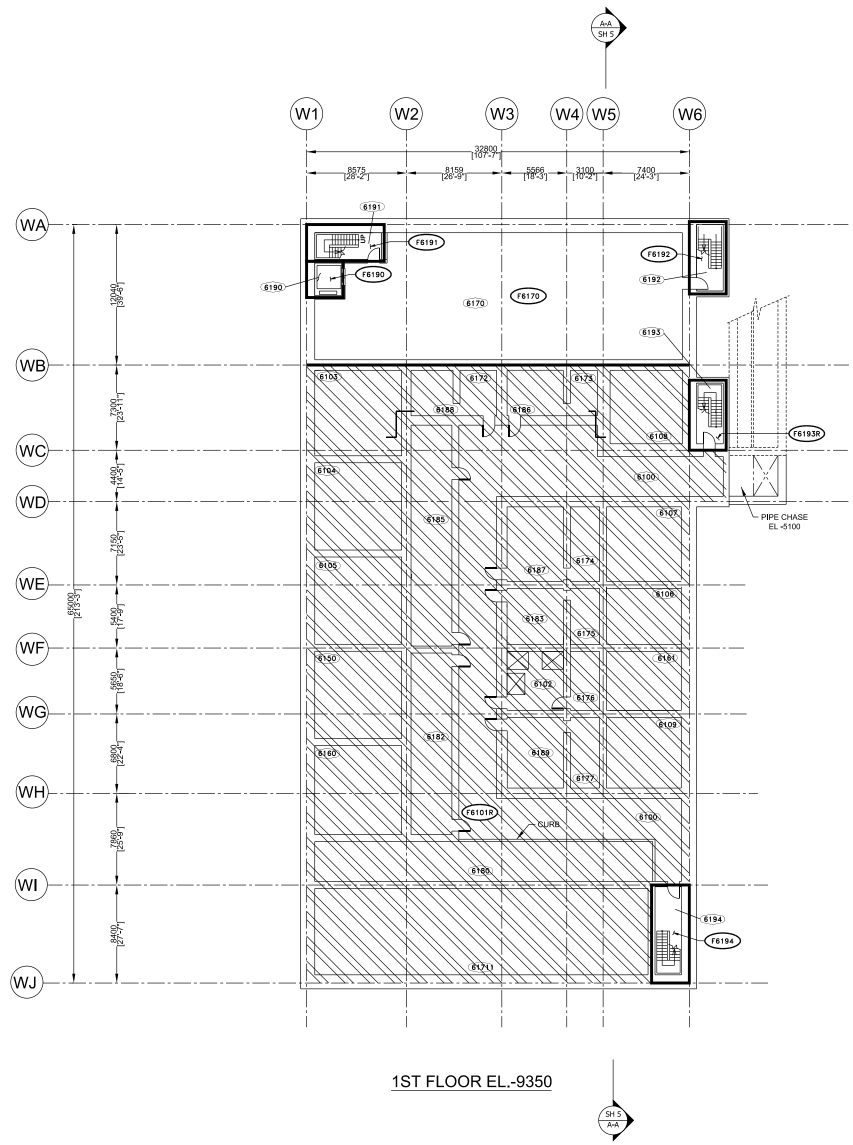
Fire Area	Later					
Description	Later					
Building	Well House U3-3					
Fire Zone Dwg	9A.2-33R					
Applicable Codes	To be determined during detailed design					
Building code occupancy classification					To be determined during detailed design	
Electrical classification					To be determined during detailed design	
Safety-related divisional equipment or cables					N/A	
Non-safety-related redundant trains or equipment or cables					To be determined during detailed design	
Surrounded by fire barriers rated at					To be determined during detailed design	
Except						
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	To be determined during detailed design	To be determined during detailed design	To be determined during detailed design	To be determined during detailed design	To be determined during detailed design
Anticipated combustible load, MJ/m^2					LATER	
Non-sprinkled combustible load limit, MJ/m^2					LATER	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
To be determined during detailed design						

NAPS COL 9A.7-2-A

Table 9A.5-7R Yard *(continued)*

Fire Area	Later					
Description	Later					
Building	Well House U3-4					
Fire Zone Dwg	9A.2-33R					
Applicable Codes	To be determined during detailed design					
				Building code occupancy classification	To be determined during detailed design	
				Electrical classification	To be determined during detailed design	
				Safety-related divisional equipment or cables	N/A	
				Non-safety-related redundant trains or equipment or cables	To be determined during detailed design	
				Surrounded by fire barriers rated at	To be determined during detailed design	
				Except		
Consisting of the following rooms:						
			Fire Detection		Fire Suppression	
Elevation	Room #	Potential Combustibles	Primary	Backup	Primary	Backup
To be determined during detailed design	To be determined during detailed design	To be determined during detailed design	To be determined during detailed design	To be determined during detailed design	To be determined during detailed design	To be determined during detailed design
				Anticipated combustible load, MJ/m^2	LATER	
				Non-sprinkled combustible load limit, MJ/m^2	LATER	
Assuming operation of fire suppression systems, effect of fire upon:						
Plant operation	None					
Radiological release	None, no radiological materials present					
Life safety	To be determined during detailed design					
Manual firefighting	To be determined during detailed design					
Property loss	To be determined during detailed design					
Assuming all fire suppression systems inoperable, effect of design basis fire on safe shutdown:						
To be determined during detailed design						

Figure 9A.2-20R Radwaste Building Fire Protection Zones EL -9350



ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6100	CORRIDOR
6102	HCW, LCW AND DETERGENT SUMP ROOM
6103	EQUIPMENT DRAIN COLLECTION TANK ROOM A
6104	EQUIPMENT DRAIN COLLECTION TANK ROOM B
6105	EQUIPMENT DRAIN COLLECTION TANK ROOM C
6106	LOW ACTIVITY RESIN HOLDUP TANK ROOM
6107	CONDENSATE RESIN HOLDUP TANK ROOM
6108	HIGH ACTIVITY RESIN HOLDUP TANK ROOM
6109	CONCENTRATED WASTE TANK ROOM
6150	FLOOR DRAIN COLLECTION TANK ROOM A
6160	FLOOR DRAIN COLLECTION TANK ROOM B
6161	LOW ACTIVITY PHASE SEPARATOR ROOM
6170	ELECTRICAL EQUIPMENT ROOM
6171	FLOOR & EQUIPMENT DRAIN SAMPLE TANK ROOM
6172	HIGH ACTIVITY DECANT PUMP VALVE GALLERY
6173	HIGH ACTIVITY RESIN HOLUP TANK VALVE GALLERY
6174	CONDENSATE RESIN HOLDUP TANK VALVE GALLERY
6175	LOW ACTIVITY RESIN HOLDUP TANK VALVE GALLERY
6176	LOW ACTIVITY PHASE SEPARATOR VALVE GALLERY
6177	CONCENTRATED WASTE TANK VALVE GALLERY
6180	FLOOR AND EQUIPMENT DRAIN SAMPLE PUMP AREA
6182	FLOOR DRAIN COLLECTION PUMP ROOM
6183	LOW ACTIVITY CIRCULATION PUMP ROOM
6185	EQUIPMENT DRAIN COLLECTION PUMP ROOM
6186	HIGH ACTIVITY CIRCULATION PUMP ROOM
6187	LOW ACTIVITY DECANT PUMP ROOM
6188	HIGH ACTIVITY DECANT PUMP ROOM
6189	CONCENTRATED WASTE PUMP ROOM
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D

NOTES:

1. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING;

3-HR RATED FIRE BARRIER (WALL)

F6XXX FIRE AREA DESIGNATION

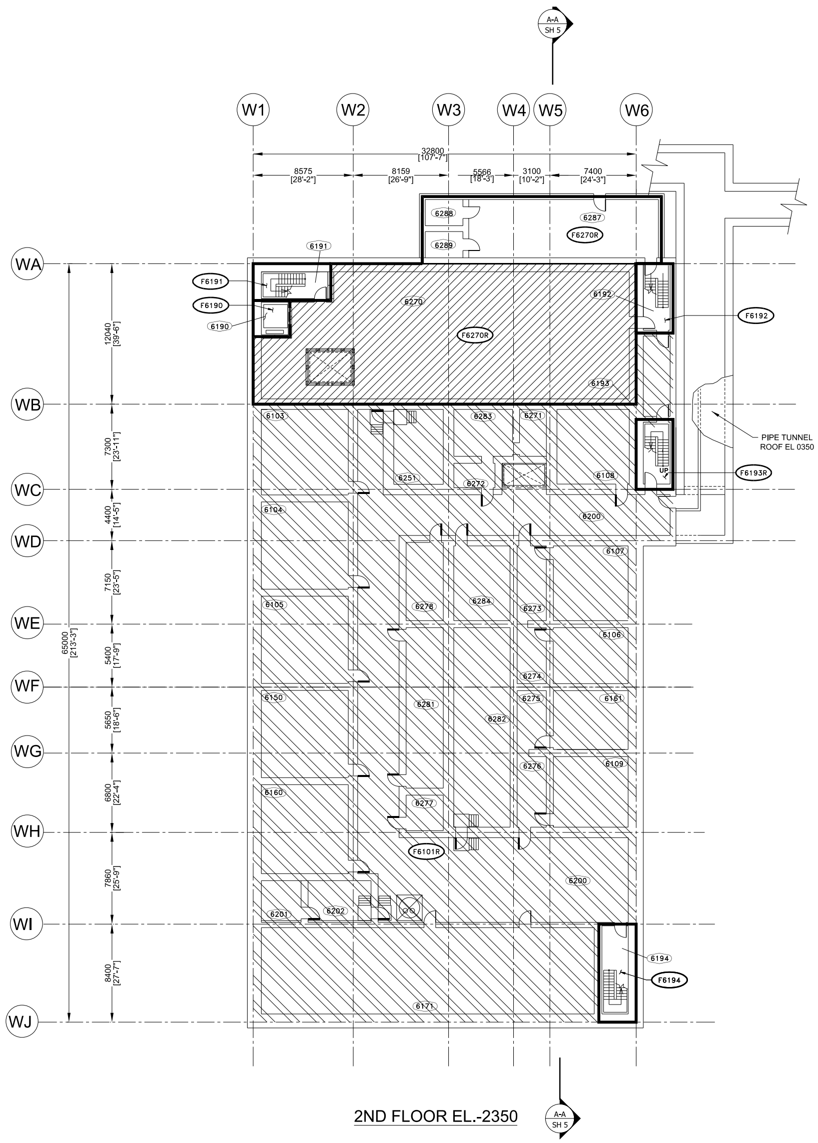
WET-PIPE SPRINKLER COVERAGE

FIRE RATED DOOR

1.5-HR FIRE RATED ELEVATOR DOOR

BASIS: ESBWR COLA

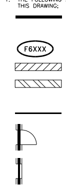
NAPS DEP 11.4-1 **Figure 9A.2-21R Radwaste Building Fire Protection Zones EL -2350**



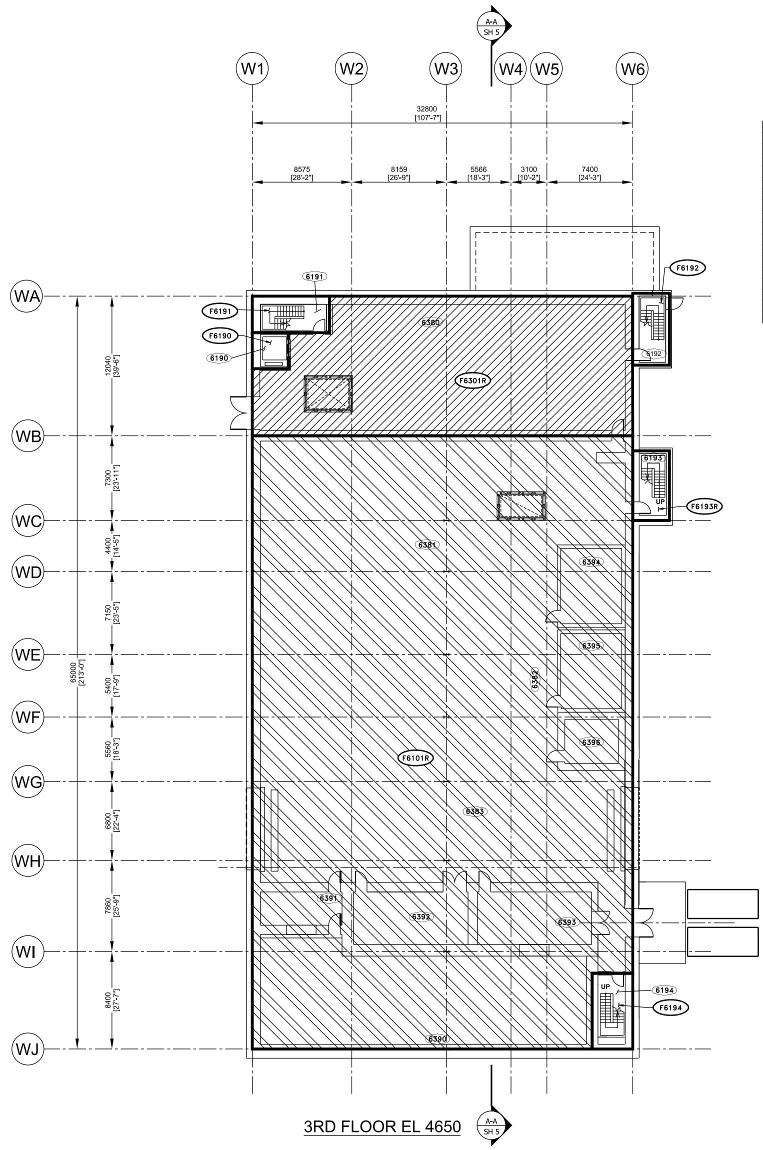
ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6103	EQUIPMENT DRAIN COLLECTION TANK ROOM A
6104	EQUIPMENT DRAIN COLLECTION TANK ROOM B
6105	EQUIPMENT DRAIN COLLECTION TANK ROOM C
6106	LOW ACTIVITY RESIN HOLDUP TANK ROOM
6107	CONDENSATE RESIN HOLDUP TANK ROOM
6108	HIGH ACTIVITY RESIN HOLDUP TANK ROOM
6109	CONCENTRATED WASTE TANK ROOM
6150	FLOOR DRAIN COLLECTION TANK ROOM A
6160	FLOOR DRAIN COLLECTION TANK ROOM B
6161	LOW ACTIVITY PHASE SEPARATOR ROOM
6171	FLOOR & EQUIPMENT DRAIN SAMPLE TANK ROOM
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D
6200	CORRIDOR
6201	CHEMICAL DRAIN COLLECTION TANK ROOM
6202	CHEMICAL DRAIN COLLECTION PUMP ROOM
6251	HIGH ACTIVITY PHASE SEPARATOR ROOM
6270	CONTROL ROOM
6271	HIGH ACTIVITY RESIN HOLDUP TANK VALVE GALLERY
6272	HIGH ACTIVITY PHASE SEPARATOR VALVE GALLERY
6273	CONDENSATE RESIN HOLDUP TANK VALVE GALLERY
6274	LOW ACTIVITY RESIN HOLDUP TANK VALVE GALLERY
6275	LOW ACTIVITY PHASE SEPARATOR VALVE GALLERY
6276	CONCENTRATED WASTE TANK VALVE GALLERY
6277	FLOOR DRAIN COLLECTION & CHEMICAL DRAIN TANKS VALVE GALLERY
6278	EQUIPMENT DRAIN COLLECTION TANK VALVE GALLERY
6281	DETERGENT DRAIN COLLECTION AND SAMPLE PUMP ROOM
6282	DETERGENT DRAIN COLLECTION & SAMPLE TANK ROOM
6283	HIGH ACTIVITY TRANSFER PUMPS ROOM
6284	LOW ACTIVITY TRANSFER PUMPS ROOM
6287	FOYER
6288	TOILET
6289	LOCKER ROOM

NOTES:

1. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING;



NAPS DEP 11.4-1 **Figure 9A.2-22R Radwaste Building Fire Protection Zones EL 4650**



ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D
6380	AIR EXHAUST FACILITIES ROOM
6381	PROCESSING SUBSYSTEMS AREA
6382	CORRIDOR
6383	TRAILER ACCESS
6390	CLASS B/C STORAGE AREA
6391	CLASS A STORAGE AREA
6392	DRY ACTIVE WASTE STORAGE AREA
6393	SORTING ROOM
6394	SWMS PROCESSING SUBSYSTEM – DEWATERING SKID A
6395	SWMS PROCESSING SUBSYSTEM – DEWATERING SKID B
6396	CRANE CCTV AND DEWATERING CONTROL ROOM

NOTES:

1. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING:

3-HR RATED FIRE BARRIER (WALL)

F6XXX FIRE AREA DESIGNATION

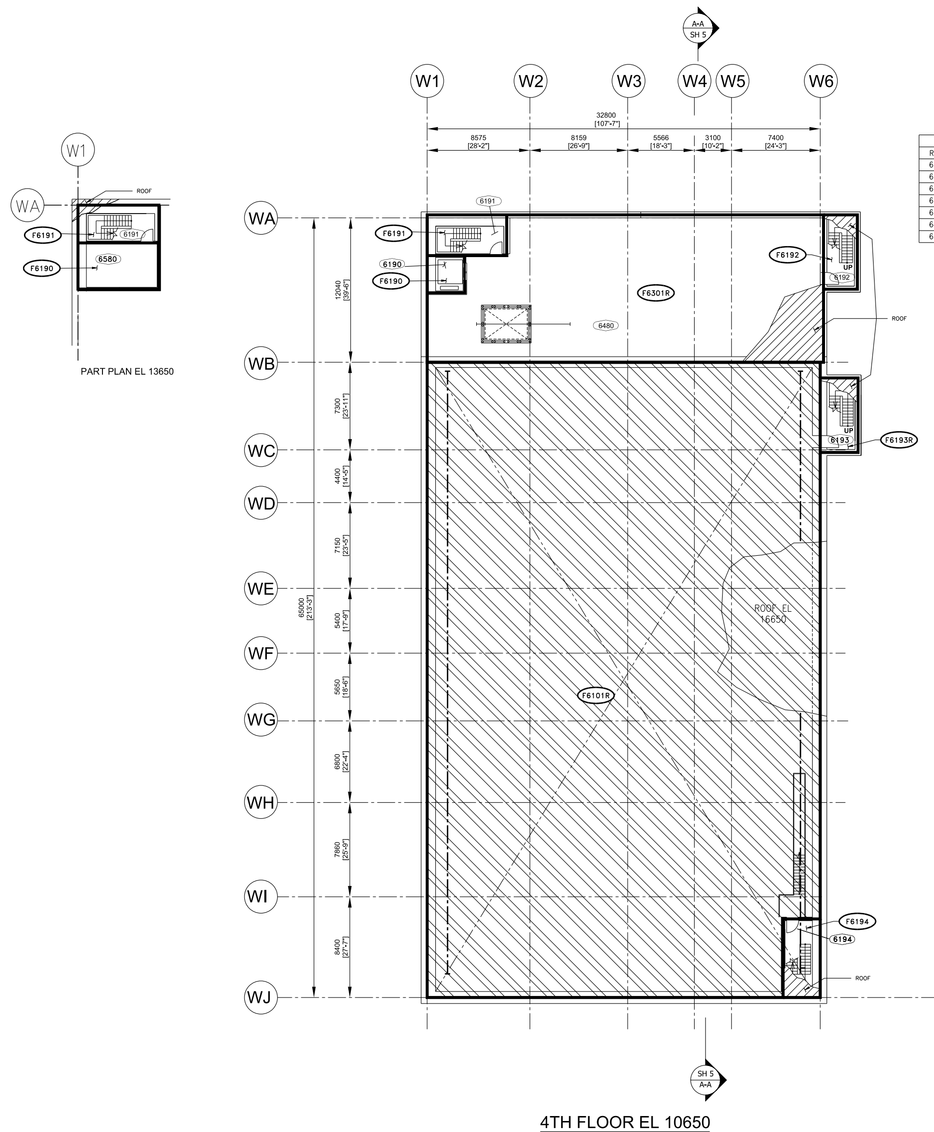
3-HR FIRE RATED FLOOR

WET-PIPE SPRINKLER COVERAGE

FIRE RATED DOOR

1.5-HR FIRE RATED ELEVATOR DOOR

NAPS DEP 11.4-1 **Figure 9A.2-23R Radwaste Building Fire Protection Zones EL 1065077**



ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D
6480	AIR CONDITIONING ROOM
6580	ELEV MACHINE ROOM

NOTES:

1. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING;

3-HR RATED FIRE BARRIER (WALL)

F6XXX FIRE AREA DESIGNATION

3-HR FIRE RATED FLOOR

WET-PIPE SPRINKLER COVERAGE

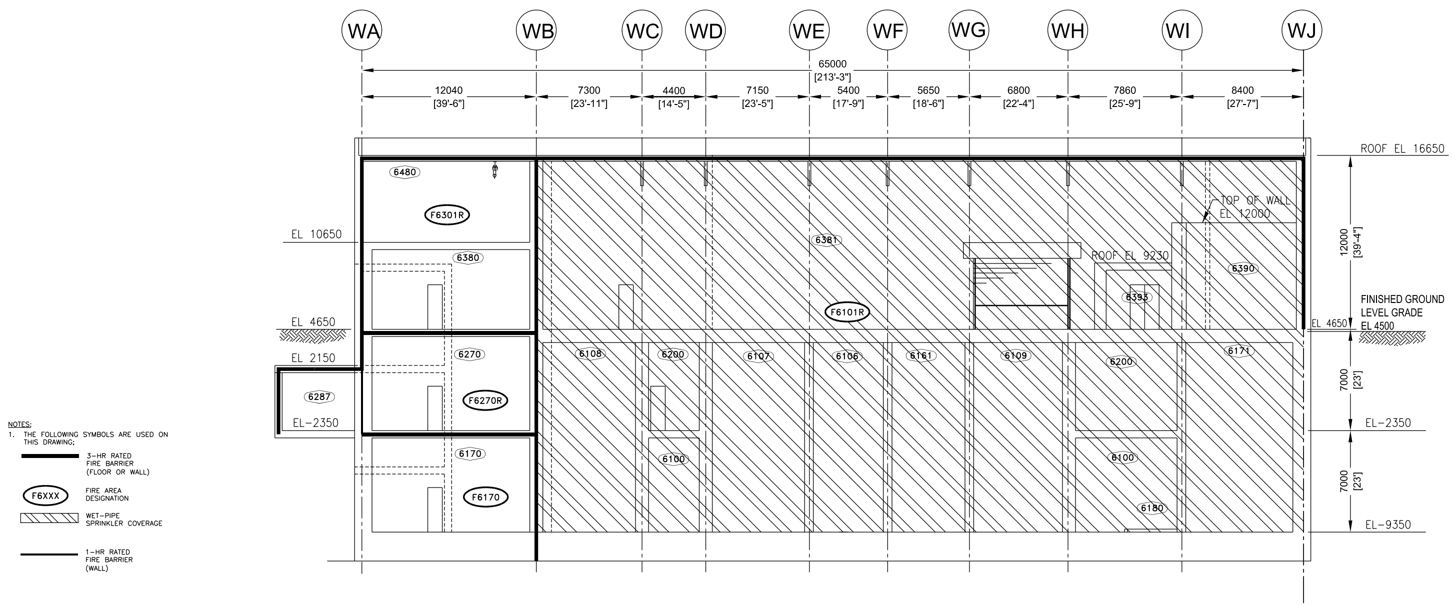
FIRE RATED DOOR

1.5-HR FIRE RATED ELEVATOR DOOR

NAPS DEP 11.4-1 **Figure 9A.2-24R Radwaste Building Fire Protection Section A-A**

ROOM IDENTIFICATION LIST

ROOM	DESCRIPTION
6100	CORRIDOR
6106	LOW ACTIVITY RESIN HOLDUP TANK ROOM
6107	CONDENSATE RESIN HOLDUP TANK ROOM
6108	HIGH ACTIVITY RESIN HOLDUP TANK ROOM
6109	CONCENTRATED WASTE TANK ROOM
6161	LOW ACTIVITY PHASE SEPARATOR ROOM
6170	ELECTRICAL EQUIPMENT ROOM
6171	FLOOR AND EQUIPMENT DRAIN SAMPLE TANK ROOM
6180	FLOOR AND EQUIPMENT DRAIN SAMPLE PUMP AREA
6200	CORRIDOR
6270	CONTROL ROOM
6287	FOYER WITH PERSONNEL CONTAMINATION MONITORS
6380	AIR EXHAUST FACILITIES ROOM
6381	PROCESSING SUBSYSTEMS AREA
6390	CLASS B/C STORAGE AREA
6393	SORTING ROOM
6480	AIR CONDITIONING ROOM



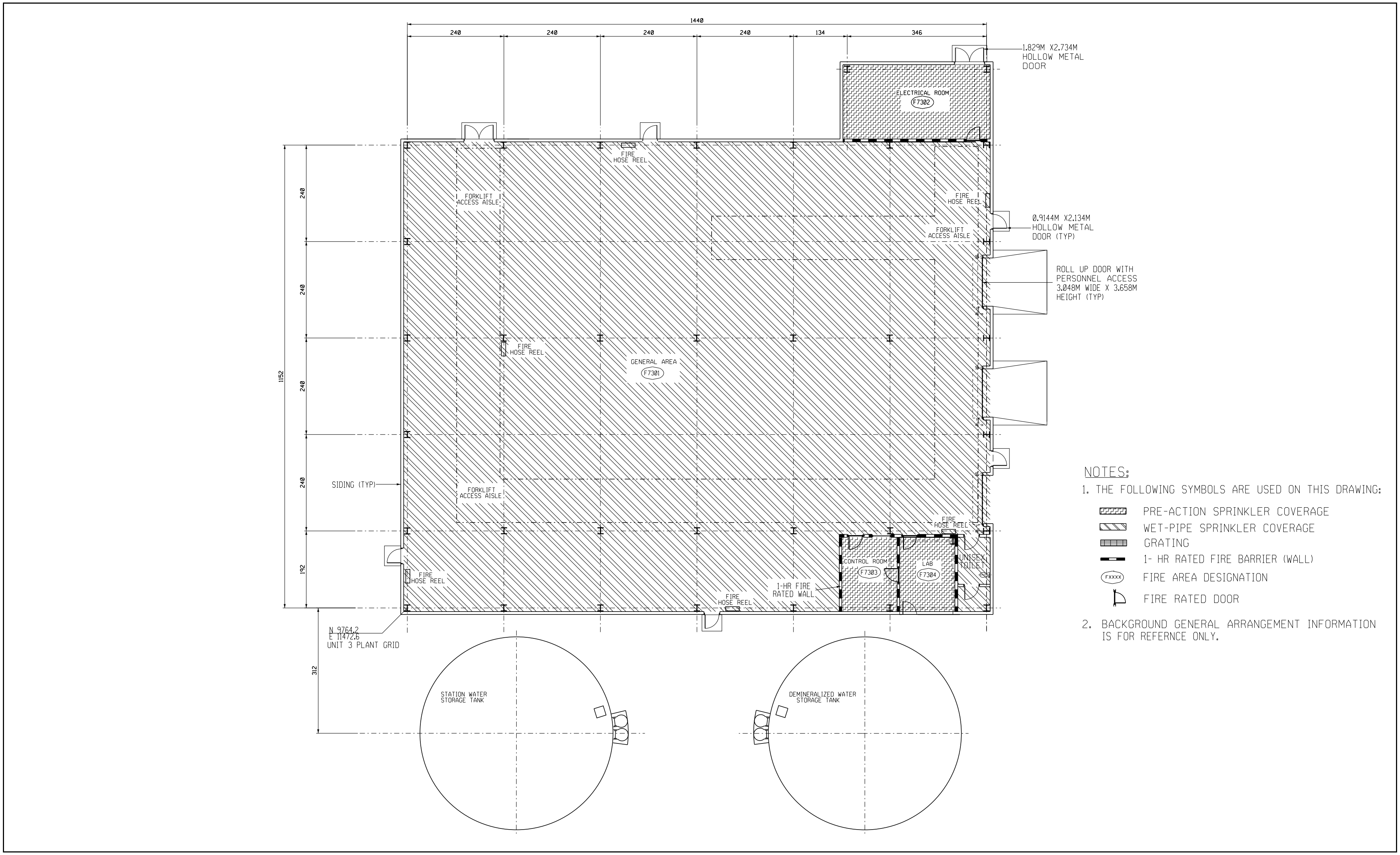
SECTION A-A

NAPS COL 9A.7-1-A **Figure 9A.2-33R Site Fire Protection Zone ESBWR Plot Plan**

BASIS: ESBWR COLA

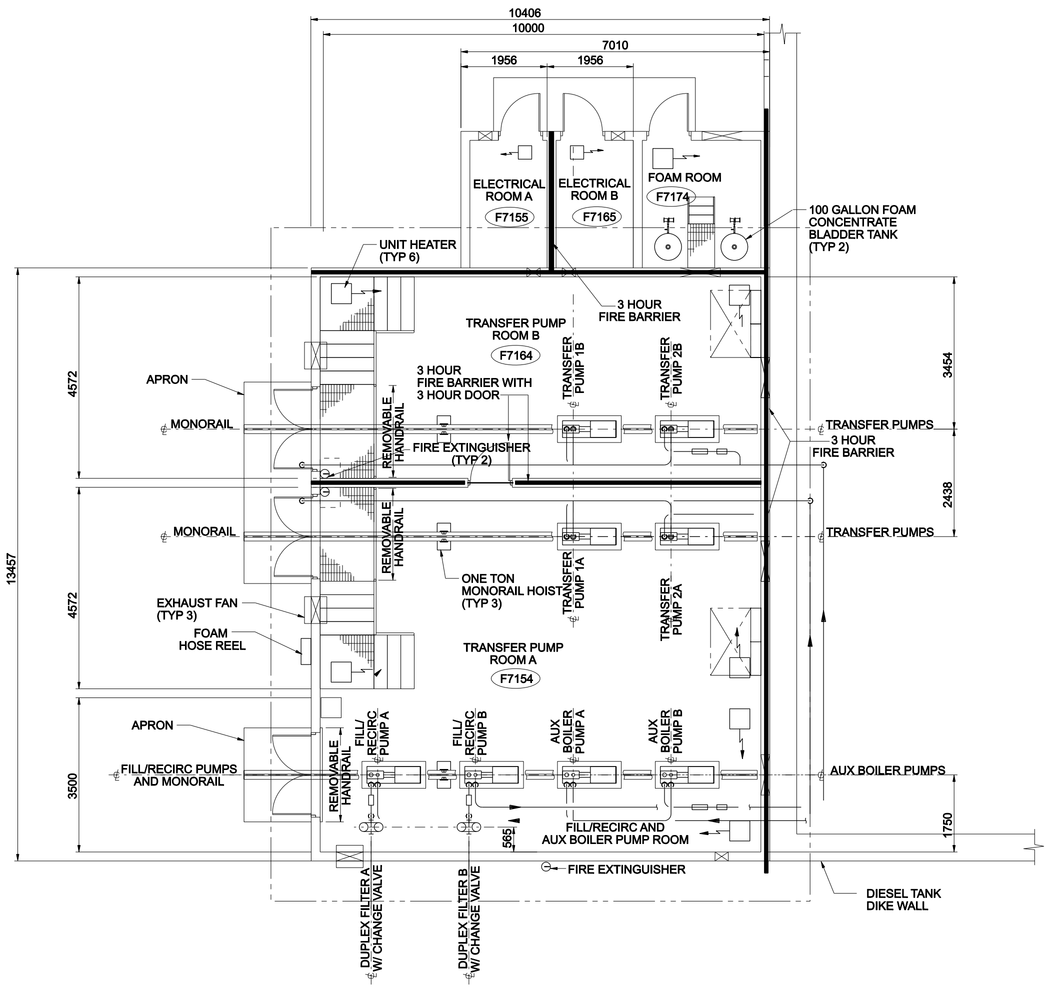
STD COL 9A.7-1-A

Figure 9A.2-201 Fire Zones - Makeup Water Building



BASIS: ESBWR COLA

STD COL 9A.7-1-A **Figure 9A.2-202 Fire Zones - Diesel Fuel Oil Transfer/Foam House**



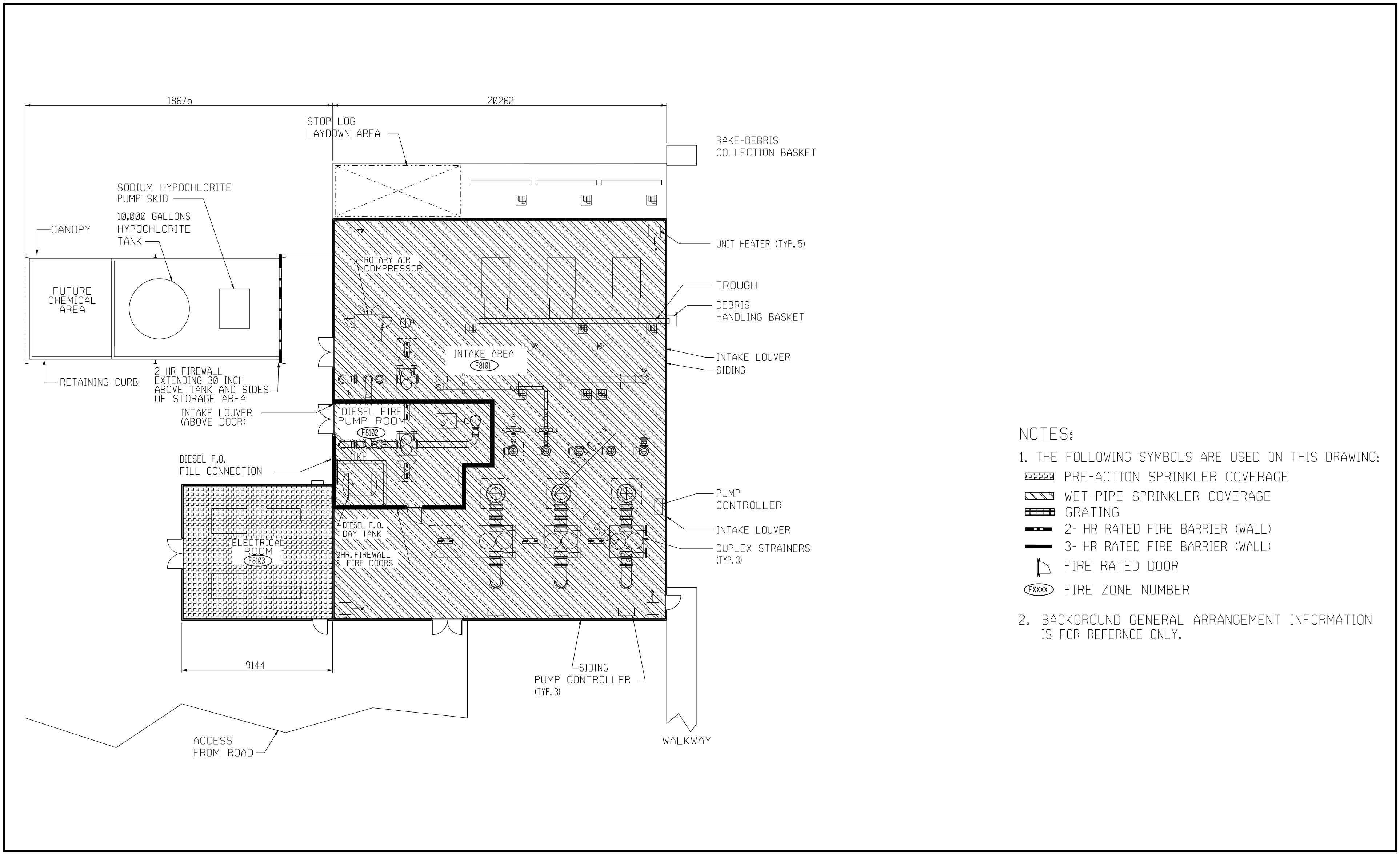
NOTES:

1. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING:

   - GRATING
   - 1- HR RATED FIRE BARRIER (WALL)
   - 2- HR RATED FIRE BARRIER (WALL)
   - 3- HR RATED FIRE BARRIER (WALL)
   - FIRE RATED DOOR
   - FXXXX FIRE AREA DESIGNATION

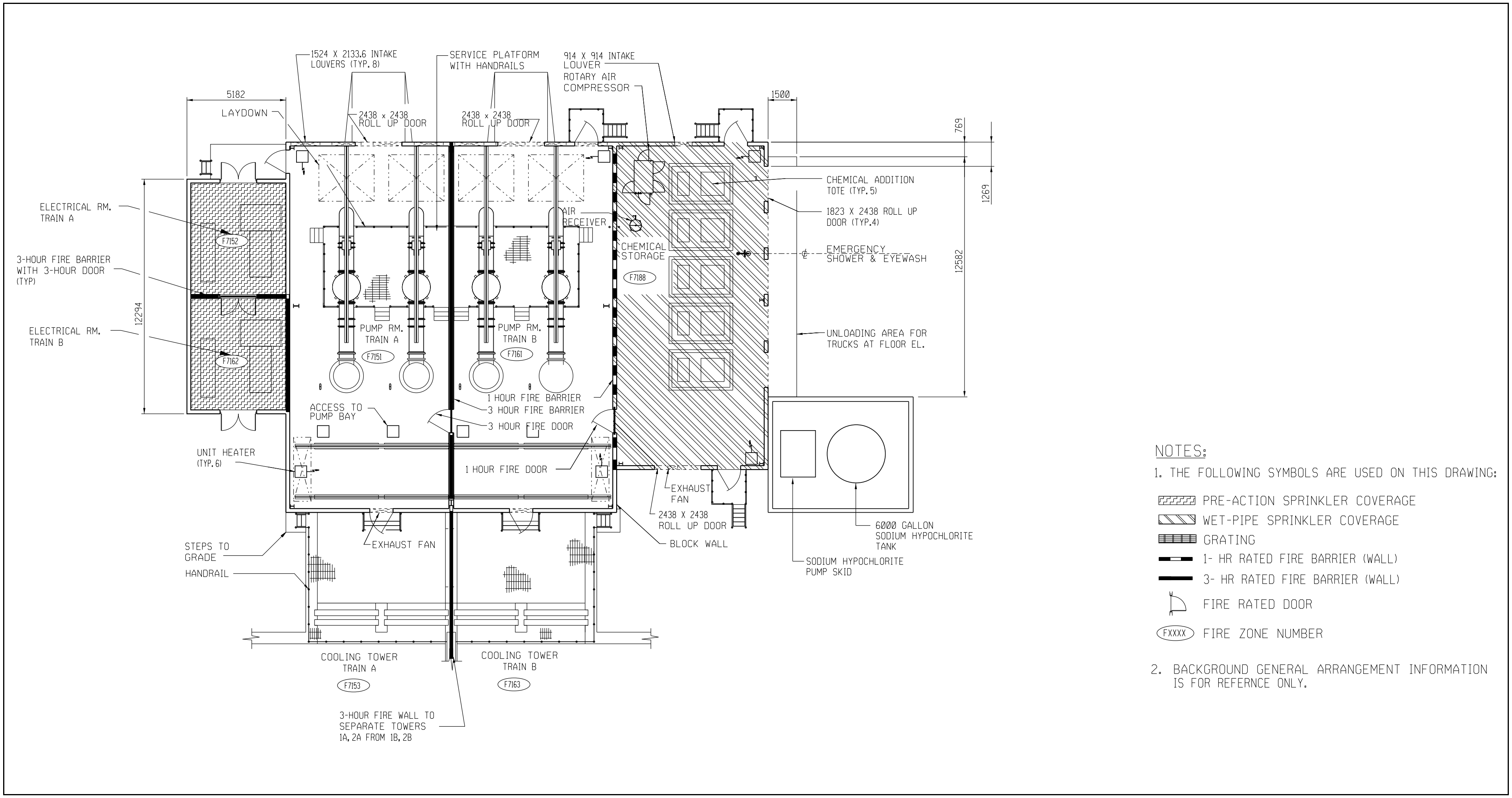
2. BACKGROUND GENERAL ARRANGEMENT INFORMATION IS FOR REFERNCE ONLY.

STD COL 9A.7-1-A **Figure 9A.2-203 Fire Zones - Station Water Intake Building**

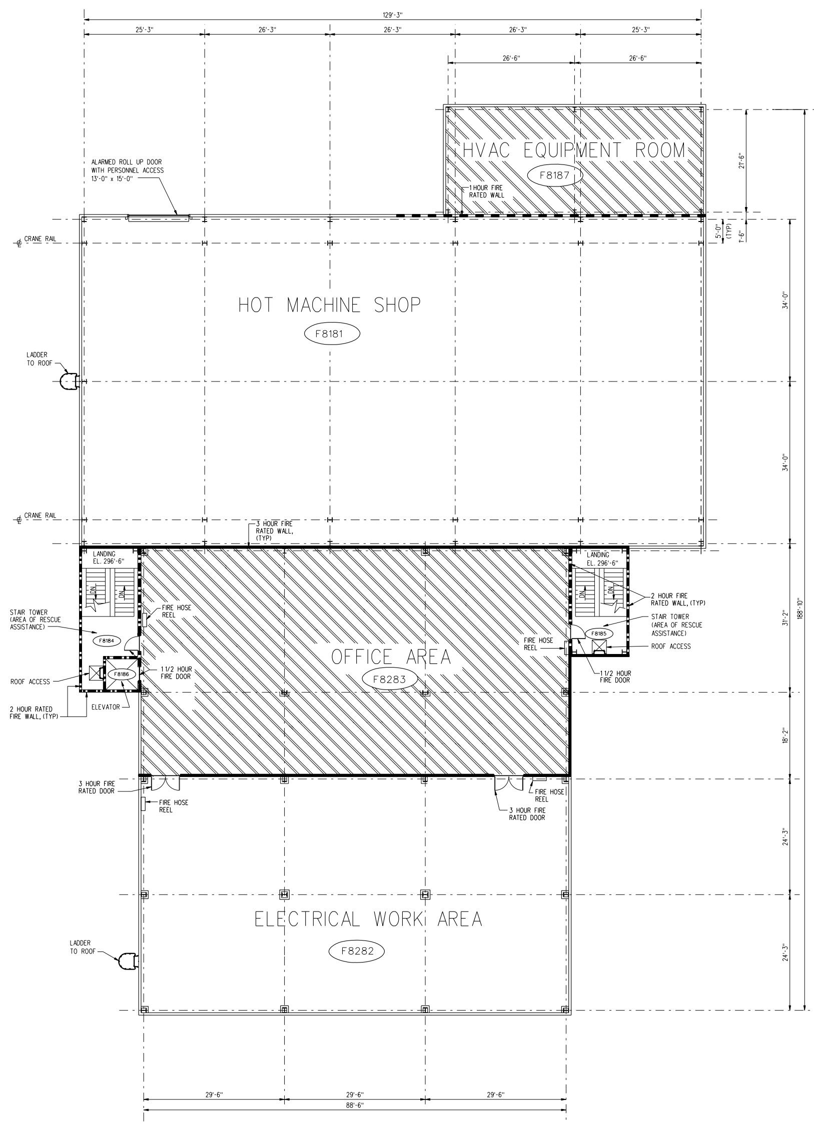


BASIS: ESBWR COLA

STD COL 9A.7-1-A **Figure 9A.2-204 Fire Zones - Service Water Building**



STD COL 9A.7-1-A **Figure 9A.2-205 Fire Zones - Hot Machine Shop and Maintenance Building Second Floor**

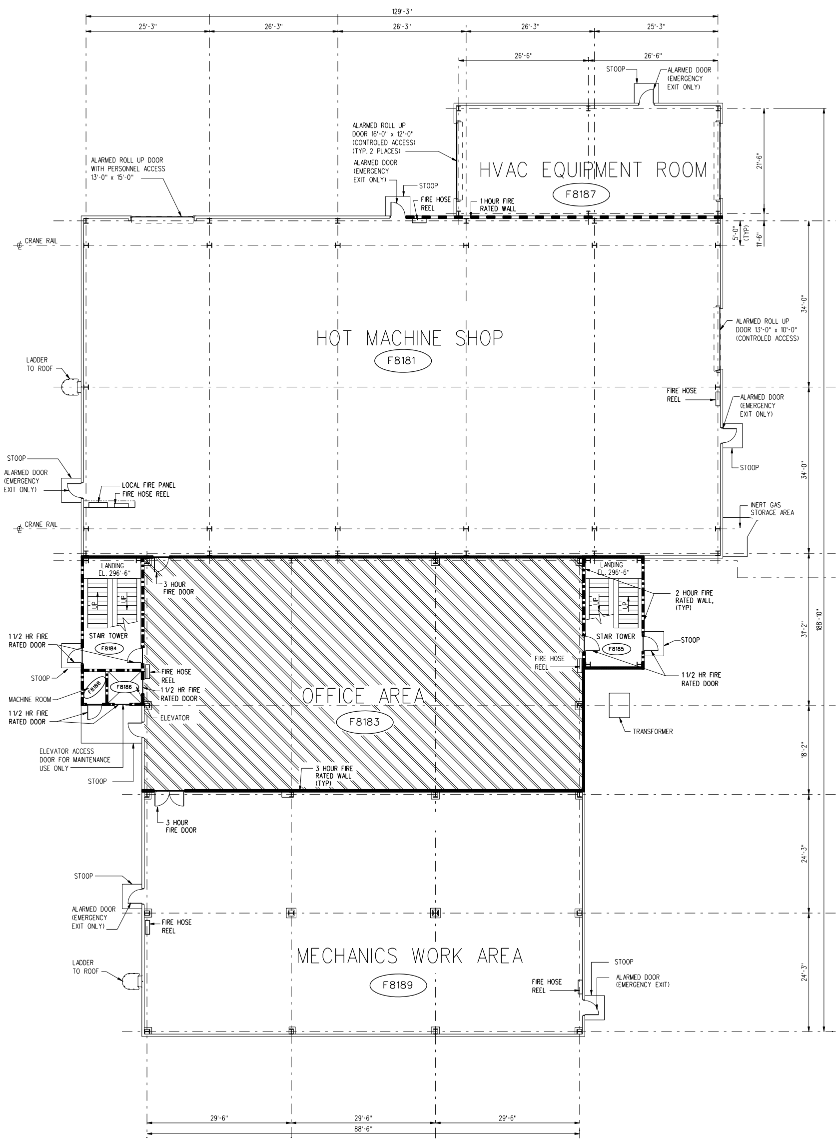


NOTES:

1. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING:
   - WET-PIPE SPRINKLER COVERAGE
   - GRATING
   - 1- HR RATED FIRE BARRIER (WALL)
   - 2- HR RATED FIRE BARRIER (WALL)
   - 3- HR RATED FIRE BARRIER (WALL)
   - FIRE AREA DESIGNATION
   - FIRE RATED DOOR
2. BACKGROUND GENERAL ARRANGEMENT INFORMATION IS FOR REFERNCE ONLY.

BASIS: ESBWR COLA

STD COL 9A.7-1-A **Figure 9A.2-206 Fire Zones - Hot Machine Shop and Maintenance Building First Floor**



NOTES:

1. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING:
   - WET-PIPE SPRINKLER COVERAGE
   - GRATING
   - 1- HR RATED FIRE BARRIER (WALL)
   - 2- HR RATED FIRE BARRIER (WALL)
   - 3- HR RATED FIRE BARRIER (WALL)
   - FXXXX FIRE AREA DESIGNATION
   - FIRE RATED DOOR
2. BACKGROUND GENERAL ARRANGEMENT INFORMATION IS FOR REFERNCE ONLY.

Appendix 9B Summary of Analysis Supporting Fire Protection Design Requirements

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Chapter 10 Steam and Power Conversion System

10.1 Summary Description

This section of the referenced DCD is incorporated by reference with no departures or supplements.

10.2 Turbine Generator

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

10.2.2.4 Turbine Overspeed Protection System

Replace the last sentence in the thirteenth paragraph with the following.

STD COL 10.2-1-A

Inspection programs required by the turbine missile probability analysis and implementation of the inspection, maintenance, and testing programs discussed in Sections 10.2.3.6 and 10.2.3.7 ensure operability.

10.2.2.7 Testing

Replace the last sentence in the second paragraph with the following.

STD COL 10.2-1-A

Non-return valves are inspected and tested in accordance with vendor recommendations as discussed in Section 10.2.3.7.

10.2.3.4 Turbine Design

Add the following at the beginning of this section.

STD SUP 10.2-1

The General Electric Company manufactures the turbine and generator. The model N3R-6F52 turbine is from General Electric's N series nuclear steam turbines.

10.2.3.6 Inservice Maintenance and Inspection of Turbine Rotors

Replace the last paragraph with the following.

STD COL 10.2-1-A

The turbine maintenance and inspection program that supports the Original Equipment Manufacturer's turbine missile generation probability calculation is described in DCD Sections 10.2.2.7, 10.2.3.5, and 10.2.3.6, and in GE-ST, "ESBWR Steam Turbine - Low Pressure Rotor Missile Generation Probability Analysis," ST-56834/P, Revision 4. The associated turbine maintenance and inspection frequencies are

established in the bounding missile probability analysis in GE-ST, “ESBWR Steam Turbine - Low Pressure Rotor Missile Generator Probability Analysis,” ST-56834/P, Revision 4.

10.2.3.7 Inservice Maintenance and Inspection of Turbine Valves

Replace the last paragraph with the following.

STD COL 10.2-1-A

Inspections of all valves of one functional type or size (i.e., stop, control, intercept, non-return) are conducted for any detrimental unusual condition (as defined by the turbine valve inspection program), if one is discovered during the inspection of any single valve.

Add the following at the end of this section.

The turbine valve inspection program, including valve and control system maintenance, inspections, testing, and associated frequencies, is described in GE-ST, “ESBWR Steam Turbine - Low Pressure Rotor Missile Generator Probability Analysis,” ST-56834/P, Revision 4.

10.2.3.8 Turbine Missile Probability Analysis

Replace the last paragraph with the following.

STD COL 10.2-2-A

The probability of turbine missile generation has been calculated based on bounding material property values in GE-ST, “ESBWR Steam Turbine - Low Pressure Rotor Missile Generator Probability Analysis,” ST-56834/P, Revision 4.

10.2.5 COL Information

10.2-1-A Turbine Maintenance and Inspection Program

STD COL 10.2-1-A

This COL Item is addressed in Sections 10.2.2.4, 10.2.2.7, 10.2.3.6, and 10.2.3.7.

10.2-2-A Turbine Missile Probability Analysis

STD COL 10.2-2-A

This COL Item is addressed in Section 10.2.3.8.

10.3 Turbine Main Steam System

This section of the referenced DCD is incorporated by reference with no departures or supplements.

10.4 Other Features of Steam and Power Conversion System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

10.4.5.2.1 General Description

Replace the text with the following.

NAPS CDI

The CIRC is depicted in Figures 10.4-201 through 10.4-203. The CIRC consists of the following components:

- Condenser water boxes, piping, and valves
- Condenser tube cleaning equipment
- Water box drain subsystem
- Four 25 percent capacity pumps and pump discharge valves
- A removable assembly of coarse and fine screens that separate the pump forebay (suction) from the hybrid cooling tower basin
- An array of dry, mechanical draft cooling tower cells arranged in banks
- One combination (hybrid) wet/dry, mechanical draft cooling tower

Table 10.4-3R includes the temperature range of the water delivered by the CIRC pumps to the main condenser.

The CIRC water is normally circulated by four motor-driven pumps through the condenser and back to the cooling towers. Depending on ambient conditions, system configuration, and heat load, one CIRC pump may be taken out of operation with the flow of the remaining three CIRC pumps providing sufficient water for condenser heat removal.

The four pumps are arranged in parallel. Discharge lines combine into two parallel main circulating water supply lines to the main condenser. Each main circulating water supply line connects to a low pressure condenser inlet water box.

Two interconnecting lines are provided between the two main circulating water supply lines. The first interconnecting line is located near the discharge of the circulating water pumps and is used for flow balancing. The second interconnecting line is near the location where the CIRC pipes enter the turbine building and is used as a blowdown point. A motor operated isolation valve is provided on the flow balancing line. Two motor operated valves are located on the blowdown cross-connect line, one on

either side of the blowdown line. These valves allow operation of the CIRC with one main circulating water supply line out of service.

The discharge of each pump is fitted with a remotely operated valve. This arrangement permits isolation and maintenance of any one pump while the others remain in operation and minimizes the backward flow through an out-of-service pump.

The CIRC and condenser are designed to permit isolation of half of the three series connected tube bundles to permit repair of leaks and cleaning of water boxes while operating at reduced power.

The CIRC includes water box vents to help fill the condenser water boxes during startup and remove accumulated air and other gases from the water boxes during normal operation.

The CIRC system incorporates design provisions that minimize the effect of hydraulic transients upon the functional capability and the integrity of the system components. These design features include slow-stroke motor-operated valves (MOVs), air release valves to fill and keep the system full, vacuum release valves that minimize pressure transients, valve control and interlock features that ensure correct valve line-up prior to pump start, and discharge isolation valves that open and close with pump start and stop signals.

Circulating water chemistry is maintained by the Chemical Storage and Transfer System and with blowdown. Circulating water chemical equipment injects the required chemicals into the circulating water pump forebay before entering the circulating water pumps or into the circulating water cooling tower basin.

10.4.5.2.2 Component Description

Replace the last paragraph with the following.

NAPS CDI

Table 10.4-3R provides reference parameters for the major components of the CIRC.

10.4.5.2.2.1 CIRC Chemical Injection

Circulating water chemistry is maintained by the Chemical Storage and Transfer System. Chemical feed equipment injects the required chemicals into the circulating water at the pump forebay before water enters the circulating water pumps or into the circulating water cooling tower basin.

Chemical injection maintains a non-corrosive, non-scale-forming condition and limits the biological film formation that reduces the heat transfer rate in the condenser and cooling towers.

Plant chemistry specifies the required chemicals used within the system. The chemicals can be divided into five categories based upon function: biocide, algaecide, pH adjuster, corrosion inhibitor, and scale inhibitor. The pH adjuster, corrosion inhibitor, and scale inhibitor are metered into the system continuously or as required to maintain proper concentrations. Biocide application frequency may vary with seasons. Algaecide is applied, as necessary, to control algae formation in the cooling towers. Chemicals that are injected in the CIRC include, as a minimum, biocides, dispersants, corrosion inhibitors and scale inhibitors. Specific chemicals are listed in Table 2.2-202.

Circulating water chemistry is also controlled as required with blowdown.

Chemicals selected are compatible with selected materials or components used in the CIRC.

10.4.5.2.3 System Operation

Add the following at the end of this section.

NAPS CDI

The four circulating water pumps take suction from the pump forebay and circulate the water through the main condenser. Circulating water returns through the condenser discharge to the cooling towers. The operating configuration of the cooling towers and CIRC is modified depending on desired configuration, heat load, and ambient conditions.

Circulating water discharged from the condenser first passes through the dry cooling tower arrays where sensible heat is removed. The water then passes through the dry section of the hybrid tower, where additional sensible heat is removed prior to entering the wet section of the hybrid tower. In the wet section, the water is distributed through nozzles in the hybrid cooling tower’s distribution headers. The water then falls through film-type fill material to the basin beneath the tower. In the process, the water rejects additional heat to the atmosphere through direct contact with the air and evaporation of a small amount of water.

Provisions are made to vary the operation of the CIRC and cooling towers during specific ambient conditions such as hot and cold weather and in response to specific environmental conditions such as periods of low water level in Lake Anna. Various configurations are utilized where

select mechanical draft fans are started, operated at reduced speed, or stopped, select portions or all of the NPHS is bypassed, and condenser halves are isolated. These alternate and transitional configurations are utilized to provide benefits such as freeze protection, water conservation, energy conservation, plume minimization, and isolation of portions of the CIRC and other systems for maintenance.

Selected components may be taken out of service during power operation. These alternate configurations normally change plant thermal performance. In some configurations, reactor power reduction may be required to avoid a turbine trip on decreasing condenser vacuum.

The SWS supplies makeup water to the circulating water pump forebay to replace water losses due to evaporation, drift, and blowdown. Blowdown from the CIRC is taken from the cross-connect near the turbine building. The blowdown flow is discharged to the plant discharge canal at a maximum of 37.8°C (100°F).

A condenser tube cleaning subsystem cleans the circulating water side of the main condenser tubes.

Leakage of condensate from the main condenser into the CIRC via a condenser tube leak is not likely during power operation, since the CIRC normally operates at a greater pressure than the shell (condensate) side of the condenser. Analysis of routine CIRC cooling tower grab samples will detect events that could lead to unmonitored, uncontrolled radioactive releases to the environment. This provides the action required by NRC Inspection and Enforcement Bulletin No. 80-10.

10.4.5.5 Instrumentation Applications

Insert the following between the fourth and fifth paragraphs.

NAPS CDI

Level instrumentation provided in the circulating water pump forebay controls makeup flow from the SWS to the pump forebay via the N-DCIS. Level instrumentation in the pump forebay initiates alarms in the MCR on abnormally low or high water level.

Pressure indication is provided on the circulating water pump discharge. Differential pressure instrumentation is provided across the inlet and outlet to the condenser and is used to determine the frequency of operating the condenser tube cleaning system.

Local grab samples are used to periodically test the circulating water quality.

Replace the last paragraph with the following.

The temperature in each condenser cooling water supply line is indicated in the MCR. Based on these indications, warm water recirculation is controlled to maintain a minimum inlet temperature of approximately 5°C (41°F).

10.4.5.6 Flood Protection

Add the following at the end of this section.

NAPS CDI

Failure of a pipe or component in the CIRC hybrid cooling tower or elsewhere in CIRC in the yard would not have an adverse impact on the intended design functions of safety-related SSCs.

For the hybrid cooling tower, the largest components are the two vertical large-bore CIRC pipes that connect to the hybrid cooling tower's distribution headers. It is conservatively assumed that these large CIRC underground pipes surface outside the confines of the hybrid cooling tower basin.

A postulated rupture of one of these pipes would result in water flow in the area of the yard with the cooling towers. The yard in this area slopes to the west. Water discharged from such a break would flow down to the drainage ditch along the west side of the cooling tower area and drain away from Unit 3 toward Lake Anna.

Depending on the size and orientation of the break, some discharging water may flow eastward toward a drainage ditch along the east side of the cooling tower area or toward the access road leading to Unit 3. Water reaching the access road would flow into the ditches along the plant access road. The flow-rate in the ditches past the power block area would be less than that considered for the local PMP event. Therefore, safety-related SSCs would not be subjected to flooding as a result of a failure of the largest hybrid cooling tower component.

The failure of this vertical large-bore CIRC pipe bounds other failures of piping and components in the CIRC. The remainder of the system is either underground or has a smaller diameter. Failures of these underground and smaller diameter components would have lower

flow-rates than a postulated failure of a vertical, above-ground, large-bore CIRC pipe. Also, flow from such failures would be either in the cooling tower area or toward the plant access road ditches and to either the storm water basin or the make-up water intake area.

Failure of the CIRC hybrid cooling tower basin has also been considered. Because the basin is an in-ground structure, the maximum water level elevation in the hybrid cooling tower basin is lower than the elevations of the surrounding areas. This design and the selected location ensure that failure of the basin results in no water discharge to the surface. However, should any discharge occur, the water would flow toward the lake rather than toward the plant.

10.4.5.8 Normal Power Heat Sink

Replace the text with the following.

NAPS CDI

The cooling tower arrangement includes a dry cooling tower array and a round, wet/dry (hybrid) cooling tower that may operate independently or in series. The towers may be bypassed or partially or fully utilized as required, depending on desired operating configuration, heat load, and ambient conditions.

The dry tower array is arranged in rectangular banks of multiple cells. Each cell includes air cooled heat exchange surfaces, a motor-driven mechanical draft fan, and inlet and outlet isolation valves. The round, hybrid cooling tower includes a dry upper section and a wet lower section. Both the wet and dry sections of the hybrid tower include mechanical draft fans to provide air flow. The combination of dry and hybrid cooling tower arrangements supports a condenser maximum cold water temperature of 37.8ºC (100ºF).

Both the dry and hybrid cooling towers are located at least a distance equal to their height away from any seismic Category 1 or 2 structures. Thus, if there were any structural failure of the cooling towers, no Seismic Category 1 or 2 structures or any safety-related systems or components would be affected or damaged.

Both the dry and hybrid cooling towers have multiple fans with associated motors, couplings, and gearboxes. The fans rotate at relatively slow speeds and the fan blades are made of relatively low-density material. A failure of a fan could result in the generation of missiles. However, due to the site arrangement and construction of the respective towers, any

damage would be confined to the cooling towers. Therefore, there would be no damage to any Seismic Category 1 or 2 structures or any safety-related systems or components.

10.4.6.3 Evaluation

Replace the second sentence in the third paragraph with the following.

STD COL 10.4-1-A A table summarizing the manufacturer's recommended threshold values of key chemistry parameters and associated operator actions is provided as Table 10.4-201.

10.4.10 COL Information

10.4-1-A Leakage (of Circulating Water Into the Condenser)

STD COL 10.4-1-A This COL Item is addressed in Section 10.4.6.3.

NAPS CDI

Table 10.4-3R Circulating Water System

Parameter	Value
Circulating Water Pumps	
Number of pumps	4
Pump type	Vertical, wet pit, turbine
Unit flow capacity**, m^3/hr (gpm)	Approx. 38,800 (171,000)
Driver Type	Electric motor
Normal Power Heat Sink	
Normal Heat Removal Duty @35°C (95°F) CIRC Supply Temperature, MW (BTU/hr)	2930 (1.00×10^{10})
Dry Cooling Tower Array	
Array Length*, m (ft)	223 (731)
Array Width*, m (ft)	114 (375)
Array Height*, m (ft)	20 (65)
Wet/Dry (Hybrid) Cooling Tower	
Outside Base Diameter*, m (ft)	150 (492)
Height*, m (ft)	55 (180)
Operating Temperatures	
Temperature range of water delivered to the main condenser, °C (°F)	5*** to 37.8 (41 to 100)
CIRC temperature for rated turbine performance, °C (°F)	30 (86)
Maximum CIRC temperature to accommodate the bypass flow resulting from a turbine trip, 100% load reject, or island mode, in conjunction with the power reduction resulting from SRI/SCRRI function, °C (°F)	35.6 (96)

* Cooling tower dimensions and specifications are approximate.

** This capacity is for condenser cooling and blowdown at design temperature of 37.8°C (100°F).

*** If the Normal Power Heat Sink does not maintain temperatures above the minimum temperature, then the minimum temperature is maintained by warm water recirculation and cooling tower bypass.

STD COL 10.4-1-A

Table 10.4-201 Recommended Water Quality and Action Levels

Reactor Water Quality-Power Operation

	Action Levels			
Control Parameter	0	1	2	3
Conductivity, μS/cm at 25ºC*	$\leq$ 0.100	> 0.300	> 1	$\geq$ 2
Chloride, ppb	$\leq$ 0.3	> 5	> 50	$\geq$ 200
Silica, ppb	$\leq$ 200	> 500	N/A	N/A
Sulfate, ppb	$\leq$ 2	> 5	> 50	$\geq$ 200

Feedwater Quality—Power Operation***

	Action Levels		
Control Parameter	0	1	2
Conductivity, μS/cm at 25ºC**	< 0.057	> 0.065	> 0.100
Dissolved Oxygen, ppb as O_2**	30-50	< 20 or > 200	N/A

* Value depends on Hydrogen Water Chemistry System operation
** Applicable when Reactor Power >10%
*** Also Condensate Purification System Effluent

Action Level 0: Target Value. The parameter may be outside the Action Level 0 value and not in Action Level 1, 2, or 3. In this case, efforts should be made to return the parameter to the Action Level 0 value.

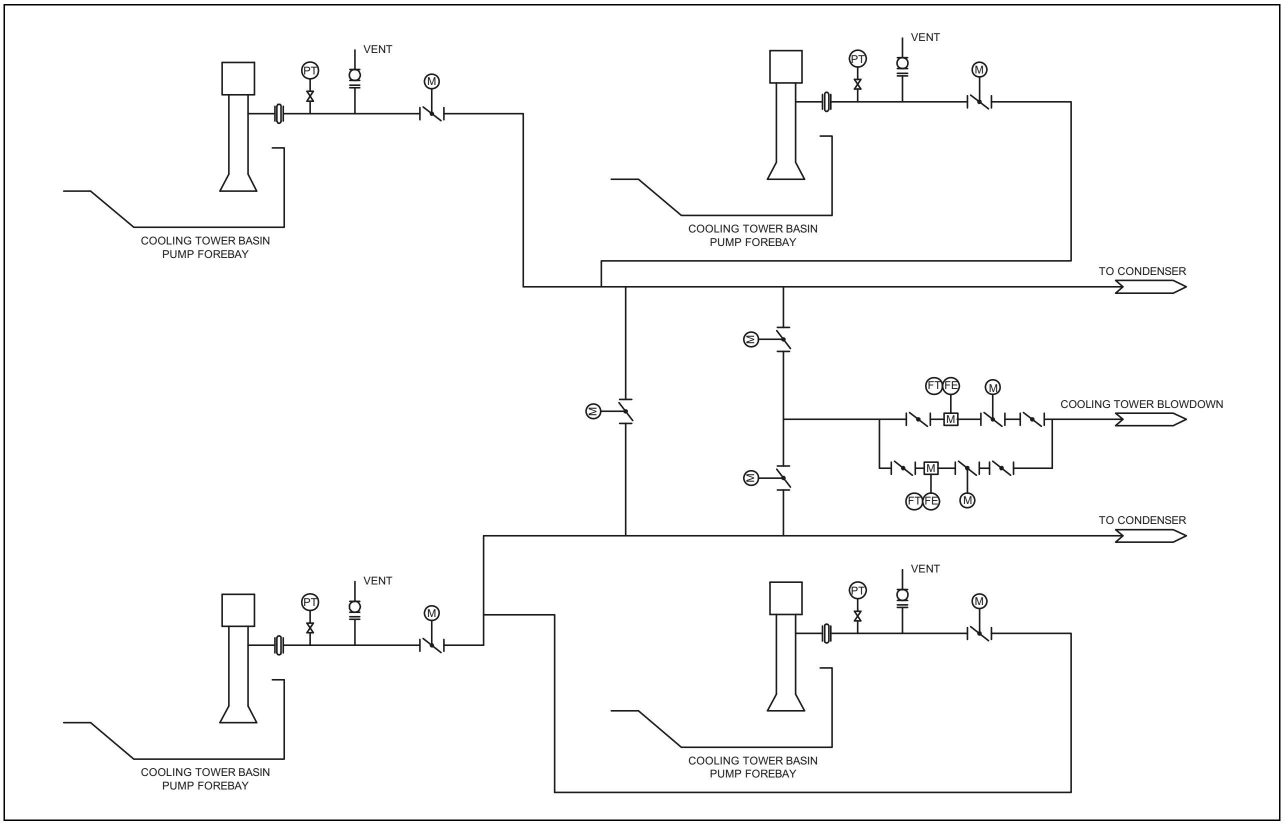
Action Level 1: Lowest Severity. The parameter should be brought below this value within 96 hours. A technical review should be performed to determine the appropriate response.

Action Level 2: Moderate Severity. If the parameter is not reduced below this level within 24 hours, an orderly shutdown should be initiated.

Action Level 3: Highest Severity. If the parameter is not reduced below this level within 6 hours, an orderly shutdown should be initiated.

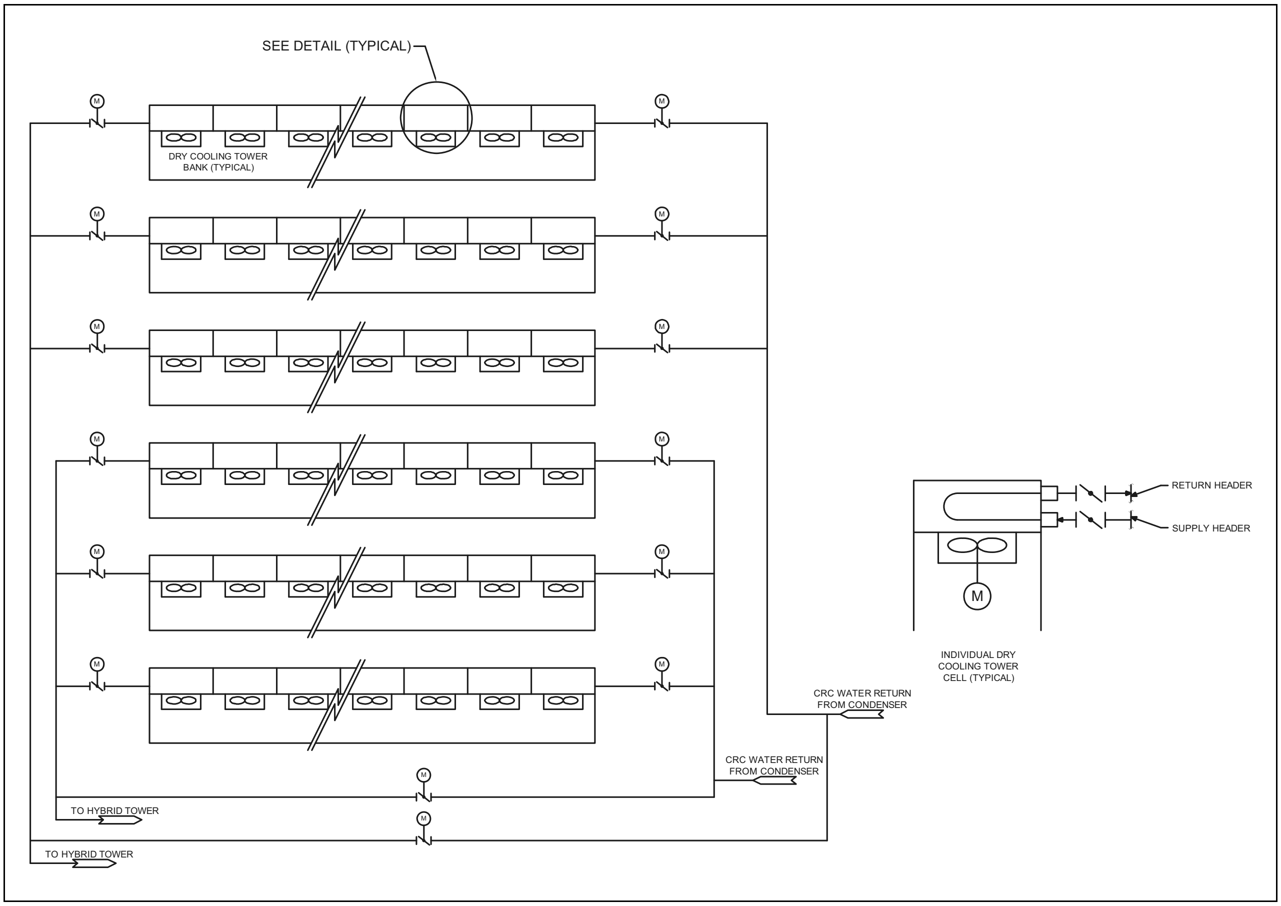
NAPS CDI

Figure 10.4-201 Circulating Water Pumps



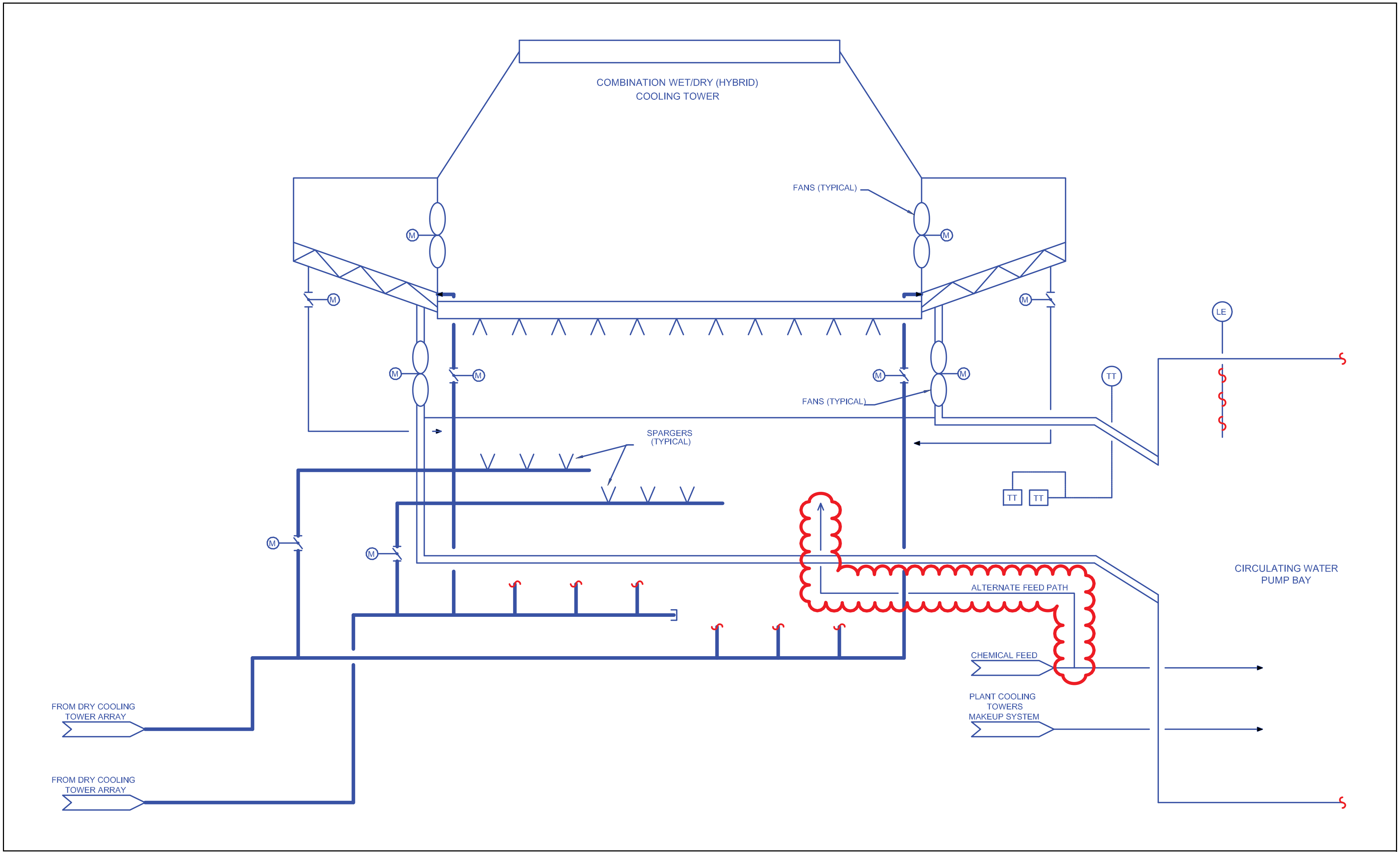
NAPS CDI

Figure 10.4-202 Dry Cooling Tower Array



BASIS: ESBWR COLA

Figure 10.4-203 Hybrid Cooling Tower



Chapter 11 Radioactive Waste Management

11.1 Source Terms

This section of the referenced DCD is incorporated by reference with no departures or supplements.

11.2 Liquid Waste Management System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

11.2.1 Design Basis

Safety Design Bases

Add the following at the end of this section.

NAPS SUP 11.2-1

RG 1.110 methodology was applied to satisfy the cost-benefit analysis requirements of 10 CFR 50, Appendix I, Section II.D, for the system augments compatible with BWR plant design features. Cost parameters used to calculate the Total Annual Cost (TAC) for each applicable radwaste treatment system augment listed in RG 1.110 are taken without exception from RG 1.110, Appendix A. These costs are Annual Operating Cost (AOC) (Table A-2), Annual Maintenance Cost (AMC) (Table A-3), Direct Cost of Equipment and Materials (DCEM) (Table A-1), and Direct Labor Cost (DLC) (Table A-1). Other cost parameters used to determine TAC are as follows:

- Capital Recovery Factor (CRF) - Obtained from RG 1.110, Table A-6, this factor reflects the cost of money for capital expenditures. A cost-of-money value of 7 percent per year is assumed in this analysis, consistent with “Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs” (OMB Circular A-94) (Reference 11.2-202). Based on a 30-year service life, Table A-6 gives a CRF of 0.0806.
- Indirect Cost Factor (ICF) - Obtained from RG 1.110, Table A-5, this factor takes into account whether the radwaste system is unitized or shared (in the case of a multi-unit site). Because this is a single ESBWR unit site, this analysis is for a single unit, which gives an ICF of 1.75.

- Labor Cost Correction Factor (LCCF) - Obtained from RG 1.110, Table A-4, this factor takes into account the relative labor cost differences among geographical regions. A factor of 1 (the lowest value) is assumed in this analysis.

A value of $1,000 per person-rem is prescribed in 10 CFR 50, Appendix I.

If it is conservatively assumed that each radwaste treatment system augment is a “perfect” technology that reduces the effluent dose by 100 percent, the annual cost of the augment can be determined and the lowest annual cost can be considered a threshold value. The lowest-cost option for augments is a 20 gpm cartridge filter at $11,380 per year, which yields a threshold value of 11.38 person-rem whole body or thyroid dose from liquid effluents.

The total body and thyroid doses to the population for the liquid effluents from Unit 3 are given in Section 12.2.2.4.2. None of the augments provided in RG 1.110 is found to be cost beneficial in reducing the annual population doses of 0.84 person-rem total body and 0.99 person-rem thyroid.

The lowest cost liquid radwaste augment is $11,380/year. The maximum benefit of reducing the doses is $840 per year for total body and $990 per year for thyroid. These benefits are lower than the annual cost of $11,380 per person-rem in thyroid dose reduction. Therefore, even this lowest-cost augment is not cost beneficial.

11.2.2.3 Detailed System Component Description

11.2.2.3.3 Processing Systems

Replace the first two paragraphs with the following.

STD COL 11.2-1-A

Specific equipment connection configuration and plant sampling procedures are used to implement the guidance in Inspection and Enforcement (IE) Bulletin 80-10 (DCD Reference 11.2-10). The non-radioactive systems, which are connected to radioactive or potentially radioactive portions of process LWMS, are protected from contamination with an arrangement of double check valves in each line. The configuration of each line is also equipped with a tell-tale connection, which permits periodic checks to confirm the integrity of the line and its check valve arrangement. Plant procedures describe sampling of

non-radioactive systems that could become contaminated by cross-connection with systems that contain radioactive material. In accordance with the guidance in RG 1.109, exposure pathways that may arise due to unique conditions are considered for incorporation into the plant-specific ODCM if they are likely to contribute significantly to the total dose.

STD COL 11.2-2-A

Section 12.3 discusses how ESBWR design features and procedures for operation will minimize contamination of the facility and environment, facilitate decommissioning, and minimize the generation of radioactive wastes, in compliance with 10 CFR 20.1406. Section 13.5 describes the requirement for procedures for operation of radioactive waste processing system. Operating procedures for LWMS process systems required by Section 12.3, Section 12.4, Section 12.5, and Section 13.5 address the requirements of 10 CFR 20.1406.

11.2.3.2 Radioactive Releases

Replace the first sentence of the second paragraph with the following.

NAPS DEP 12.3-1

Liquid radioactive releases will be discharged using the liquid radwaste effluent discharge pipeline.

Add the following after the end of the first sentence of the second paragraph.

NAPS SUP 11.2-2

The radwaste effluent discharge pipeline runs underground from the Radwaste Building to the Unit 3 discharge structure and into the discharge canal. Dilution flow is provided by North Anna Units 1 and 2 circulating water system or independent dilution pump. The mixed stream flows through the discharge canal into the WHTF. A release point dilution factor of 1000 (minimum) is maintained.

The piping associated with this line is designed to preclude inadvertent or unidentified leakage to the environment. The buried portion of the piping is enclosed within a guard pipe and monitored for leakage. The other portion is accessible for visual inspection via a tunnel. Threaded and flanged connections are kept to a minimum. Other joints are welded or otherwise permanently bonded depending on piping material. Furthermore, fittings are kept to a minimum and no in-line components (e.g., valves) are incorporated into this line outside of the power block.

These features substantially reduce the potential for unmonitored and uncontrolled releases to the environment. Monitoring for leakage downstream of LWMS connection is per NEI 08-08A, “Generic FSAR Template Guidance for Life Cycle Minimization of Contamination,” as described in Section 12.3.1.5.2. This monitoring is implemented as part of the groundwater monitoring program.

11.2.6 COL Information

11.2-6-A Implementation of IE Bulletin 80-10

STD COL 11.2-1-A This COL item is addressed in Section 11.2.2.3.

11.2-6-B Implementation of Part 20.1406

STD COL 11.2-2-A This COL item is addressed in Section 11.2.2.3.

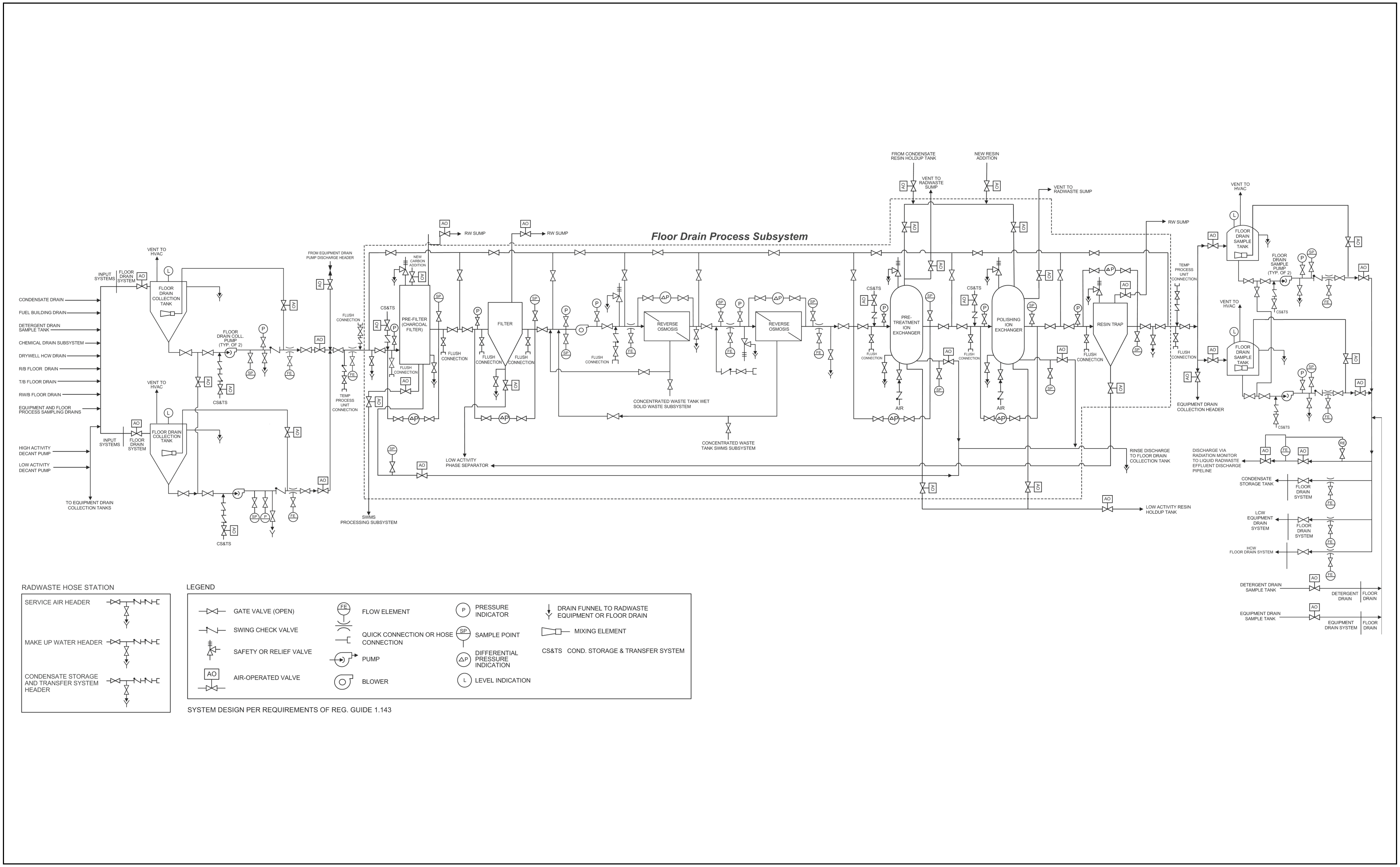
11.2.7 References

11.2-201 [Deleted]

11.2-202 OMB Circular A-94, “Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs,” October 29, 1992, Office of Management and Budget.

BASIS: ESBWR COLA

NAPS DEP 12.3-1 Figure 11.2-1bR Floor Drain



11.3 Gaseous Waste Management System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

11.3.1 Design Basis

Add the following at the end of this section.

NAPS ESP COL 11.1-1

The methodology for performing cost-benefit analysis for the radwaste system is presented in Section 11.2.1.

The annual costs for augments for the gaseous radwaste treatment system were determined and the lowest annual cost was considered a threshold value. The lowest-cost option for a gaseous radwaste treatment system augment that applies to BWRs is the 1000 cfm Charcoal/HEPA Filtration System at $7,960 per year, which yields a threshold value of 7.96 person-rem whole body or thyroid from gaseous effluents for BWRs.

As shown in Table 12.2-204, the Unit 3 annual whole body dose from gaseous effluents is 4.3 person-rem/yr, which is below the 7.96 person-rem/yr threshold value. Based on this comparison, no gaseous radwaste treatment system augment is cost-beneficial in reducing annual whole body dose and the cost-benefit analysis demonstrates compliance with 10 CFR 50, Appendix I, Section II.D, for this type of dose.

As shown in the table below, the Unit 3 thyroid dose from gaseous effluents is 25 person-rem/yr, which exceeds the 7.96 person-rem/yr threshold value for a BWR. Because the Unit 3 estimate exceeds this threshold value, further analysis is provided below.

Source	Thyroid Dose (person-rem/year)	% of Total
Iodines	2.1E+01	84.1
Particulates	7.9E-01	3.2
Noble gases	4.9E-01	2.0
C-14	2.1E+00	8.4
H-3	6.0E-01	2.4
Total	2.5E+01	100.0

The cost-benefit analysis described in Section 11.2.1 is based on RG 1.110, which provides the gaseous radwaste augments applicable to a BWR to be considered for Unit 3. Based on the estimated 25 person-rem/year thyroid dose, those augments with a TAC less than $25,000 are considered below. In some cases, the system augments less than $25,000 per year have insufficient capacity. System augments with greater capacities were considered but eliminated because they had TAC values greater than $25,000. The gaseous radwaste system augments in RG 1.110 applicable to a BWR were considered.

15,000 cfm HEPA Filtration System (If in Auxiliary Building)

For Unit 3, the gaseous effluent releases “from the Auxiliary Building” were considered as follows because an ESBWR does not have an Auxiliary Building. Two ventilation systems that service contaminated air in the Reactor Building are combined: the Contaminated Area HVAC Subsystem (CONAVS) and the Refueling and Pool Area HVAC Subsystem (REPAVS). Per DCD Figure 9.4-10, the normal flow through the CONAVS exhaust fan is 9,975 l/sec (21,136 cfm). Per DCD Figure 9.4-11, the normal flow through the REPAVS exhaust fan is 32,050 l/sec (67,910 cfm). In both cases, the normal flow rates exceed the proposed 7079 l/sec (15,000 cfm) HEPA filtration system. Therefore, this augment is not effective for Unit 3 and is eliminated from further consideration.

15,000 cfm HEPA Filtration System (If in Turbine Building)

The Turbine Building HVAC System (TBVS) services the Turbine Building. DCD Figure 9.4-8 shows that the Turbine Building exhaust goes through the Turbine Building Air Exhaust Subsystem (TBE). Per DCD Table 9.4-15, the 100 percent capacity flow through TBE is 52,800 l/sec (111,877 cfm). Based on this design capacity, it is assumed that the normal flow exceeds 7079 l/sec (15,000 cfm), which is much less than the design capacity. Therefore, this augment is not effective for Unit 3 and is eliminated from further consideration.

3-Ton Charcoal Adsorber

Per DCD Table 11.3-1, the total mass of charcoal in the offgas system is 237 metric tons (523,000 lb), or approximately 262 tons. Addition of a 2.7 metric ton (3-ton) charcoal adsorber only provides an additional 1.1 percent capacity to the existing offgas system. DCD Table 12.2-16 shows that the annual airborne releases from the offgas system

represent only about 4 percent of the total annual airborne releases from Unit 3. Additional charcoal adsorbers would improve the holdup times of the noble gases and C-14, but those only contribute approximately 10 percent to the thyroid dose. Therefore, the maximum improvement in the thyroid dose would be approximately 0.4 percent of 25 person-rem/year or 0.12 person-rem/year, equivalent to a benefit of $120 per year. As this annual benefit is less than the annual cost of $9,450 for the 3-ton charcoal adsorber, this augment is eliminated from further consideration.

Main Condenser Vacuum Pump (MCVP) Charcoal/HEPA Filtration System

DCD Table 12.2-16 shows that the annual airborne iodine releases from the MCVP represent approximately 0.7 percent of the total annual airborne iodine releases from Unit 3. Therefore, the maximum improvement in the thyroid dose would be 0.7 percent of 25 person-rem/year or approximately 0.17 person-rem/year, equivalent to a benefit of $170 per year. As this annual benefit is less than the annual cost of $8,170 for the MCVP charcoal/HEPA filtration system, this augment is eliminated from further consideration.

600-ft^3 Gas Decay Tank

It is assumed that the gas decay tank is an augment to the offgas system. The flow rate through the offgas system is 54 m^3/hr (31.8 cfm) per DCD Table 12.2-15. As a result, the average residence time in a 600 ft^3 gas decay tank is approximately 19 minutes. While this decay time will have a negligible effect on iodines, particulates, C-14, and H-3, it will mitigate the dose consequences of short-lived noble gases. Because the noble gases contribute 0.49 person-rem/year to the thyroid dose, even complete elimination of the noble gases represents a maximum improvement in the thyroid dose of only 0.49 person-rem/year. This is equivalent to a benefit of $490 per year. As this annual benefit is less than the annual cost of $8,040 for the 600 ft^3 gas decay tank, this augment is eliminated from further consideration.

1000 cfm Charcoal/HEPA Filtration System

As discussed above for 15,000 cfm HEPA filtration systems, the Unit 3 building exhaust system flow rates greatly exceed 472 l/sec (1000 cfm). Therefore, this augment is not effective for Unit 3 and is eliminated from further consideration.

Conclusion

None of the gaseous radwaste augments are cost-beneficial in reducing the annual thyroid dose from gaseous effluents for Unit 3.

11.4 Solid Waste Management System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Replace the third and fourth sentences of the third paragraph with the following.

NAPS DEP 11.4-1

The SWMS component capacities are provided in Table 11.4-1R. The estimated annual waste generated from the SWMS Subsystem is provided in Table 11.4-2R. Table 11.4-2R also identifies Class A, B, and C waste in accordance with 10 CFR 61.55 (DCD Reference 11.4-16) and the quantities of waste that would be shipped or stored in the long-term storage area of the Radwaste Building if a licensed disposal facility is not available.

11.4.1 SWMS Design Bases

Replace the seventh bullet of the first paragraph with the following.

NAPS DEP 11.4-1
NAPS COL 11.4-4-A

- The Radwaste Building provides storage space sized to hold the total combined volume of packaged Class A, B, and C low-level radioactive waste estimated to be generated during six months of plant operations. Such waste is normally promptly disposed of at licensed offsite processing and disposal facilities. In the event that an offsite facility is not available to accept Class B and C waste, the Radwaste Building has been configured to accommodate at least 10 years of packaged Class B and C waste and approximately three months (up to three shipments) of packaged Class A waste, considering routine operations and anticipated operational occurrences. This Class B and C waste storage capacity is based on a conservative estimate of the annual generation of low-level waste, without credit for potential waste minimization techniques and methods other than dewatering. In the event that an offsite facility is not available to accept Class B and C waste, a waste minimization plan will also be implemented. This plan will consider strategies to reduce generation of Class B and C waste, including reducing the in-service run length of resin beds, as well as resin selection, short-loading, and point of generation

segregation techniques. Implementation of these techniques could substantially extend the capacity of the Class B and C storage area in the Radwaste Building. If additional storage capacity for Class B and C waste is required, further temporary storage would be developed in accordance with NUREG-0800, Standard Review Plan 11.4, Appendix 11.4-A.

Add the following after the second paragraph.

STD SUP 11.4-1

The LWMS offsite dose calculations, which are described in Section 12.2.2.4, include the offsite doses from the SWMS liquid effluents, as they are processed by the LWMS. Similarly, the GWMS offsite dose calculations, which are described in Section 12.2.2.2, include the offsite doses from the SWMS gaseous effluents, as they are inputs processed by the GWMS. The cost-benefit analyses in Section 11.2.1 for the LWMS and in Section 11.3.1 for the GWMS address the liquid and gaseous effluents that are generated from solid waste processing by the SWMS. Because these two cost-benefit analyses include the liquid and gaseous effluents from the SWMS, the augments considered for the LWMS and GWMS apply to the SWMS, which provides inputs to those systems. As described in Sections 11.2.1 and 11.3.1, no augments are needed for the LWMS and GWMS to comply with 10 CFR 50, Appendix I, Section II.D. Therefore, no augments are needed for the SWMS to comply with 10 CFR 50, Appendix I, Section II.D.

Replace the fourth sentence of the fourth paragraph with the following:

STD COL 11.4-5-A

Section 12.3.1.5 discusses how the ESBWR design features and procedures for operation will minimize contamination of the facility and environment, facilitate decommissioning, and minimize the generation of radioactive wastes, in compliance with 10 CFR 20.1406. Section 13.5 describes the requirement for procedures for operation of the radioactive waste processing system. Operating procedures for SWMS Processing Subsystems required by Sections 12.4, 12.5, and 13.5 address requirements of 10 CFR 20.1406.

11.4.2.2 System Operation

11.4.2.2.1 SWMS Collection Subsystems

Replace the fourth paragraph with the following.

NAPS DEP 11.4-1

When sufficient bead resins have been collected in the high or low activity resin holdup tanks, they are mixed via the high or low activity circulation pump and sent to the SWMS Processing Subsystem via the high or low activity transfer pump. When sufficient bead resins have been collected in the condensate resin holdup tank, they are mixed via the low activity circulation pump and sent to the LWMS pre-treatment ion-exchanger for reuse or the SWMS Processing Subsystem via the low activity transfer pump.

Replace the last two sentences of the fifth paragraph with the following.

The suspended solids are allowed to settle and the residual water is transferred by the respective decant pump to the equipment drain collector tanks or the floor drain collector tanks for further processing. When sufficient sludges have been collected in the tank, the sludges are normally mixed by the low activity circulation pump and sent to the SWMS Processing Subsystem by the low activity transfer pump.

11.4.2.2.2 SWMS Processing Subsystem

Replace the last paragraph with the following.

NAPS DEP 11.4-1

The estimated annual waste generated from the SWMS Subsystems is provided in Table 11.4-2R. Table 11.4-2R also identifies Class A, B, and C waste in accordance with 10 CFR 61.55 (DCD Reference 11.4-16) and the quantities of waste that would be shipped (Class A) or stored (Class B/C) in the long-term temporary storage area of the Radwaste Building if a licensed disposal facility is not available.

Typically, HICs of approximately 120 cubic feet each will be used for packaging Class B and C spent resins and sludge and HICs of approximately 215 cubic feet each will be used for packaging Class A spent resins and sludge. The larger containers can be used for Class A waste because radionuclide concentrations are lower so more waste can be placed in one container without exceeding radiation levels for transportations or disposal.

11.4.2.2.4 Container Storage Subsystem

Replace the first paragraph with the following.

NAPS DEP 11.4-1

The Radwaste Building is configured to accommodate at least 10 years of packaged Class B and C waste and approximately three months (up to three shipments) of packaged Class A waste, considering routine operations and anticipated operational occurrences.

Containers used for packaged waste include the following:

- HICs (approximately 215 cubic feet each for Class A and approximately 120 cubic feet each for Class B/C) used for spent resins and sludge
- 55-gallon drums (approximately 7.65 cubic feet each) used for DAW
- B-25 Boxes (metal boxes approximately 96 cubic feet each) used for DAW and miscellaneous parts
- Other approved shipping containers as necessary

See Figures 1.2-23R and 11.4-1R for container storage schemes and sequencing.

Hydrogen and biogas can be generated in packaged and stored waste. The hydrogen is a result of the radiolytic decomposition of the resin beads (i.e., styrene). The biogas is a result of microorganisms and other materials necessary to support growth and metabolism of the microorganisms (i.e., nutrients) introduced into the waste stream from the environment.

HICs are provided with a passive vent equipped with a high efficiency particulate air (HEPA) filter. The HICs vent to the general area in which they are stored. The HICs are provided with shield “bells.” A shield bell is a steel, vertical right circular cylinder with an open bottom. It is capable of venting to the general area. Shield bells are placed over HICs to provide radiation shielding. Shield bells also provide structural integrity to permit stacking of HICs. The HICs must be stacked two levels high to accommodate the storage needs. The Radwaste Building HVAC System provides continuous ventilation to this general area. Furthermore, the general storage area is monitored with hydrogen/explosive gas detectors that alarm in the Radwaste Control Room.

The filters on the containers’ vents prevent migration of radioactive particulate. Should a filter break-through, the Radwaste Building’s HVAC

controls any contamination and directs it through the system's filters and exhausts the air through the Radwaste Building Ventilation Stack, which is a radiologically monitored release point.

HICs are equipped with a dewatering stone (i.e., filter) to permit verification/final dewatering after removal from storage and prior to shipment for disposal. The verification/final dewatering is accomplished in a Dewatering Station at design plant grade of the Radwaste Building or at an approved alternate facility (e.g., off-site vendor). Reprocessing/repackaging of stored wastes prior to shipment for final disposal is performed as needed.

11.4.2.3 Detailed System Component Description

11.4.2.3.1 Pumps

Replace Section 11.4.2.3.1 with the following.

NAPS DEP 11.4-1

Three types of pumps are utilized in the SWMS. The decant and concentrated waste pumps are centrifugal pumps. Air operated diaphragm type pumps are utilized in dewatering stations and for circulation pumps; and the transfer pumps are progressing cavity type pumps. All pumps are constructed of materials suitable for the intended service. Pump codes are per the noted requirements of DCD Table 3.2-1 for K20 Solid Waste Management Systems and DCD Table 11.2-1.

11.4.2.3.5 SWMS Processing Subsystem

Replace the last three sentences of the second paragraph with the following.

STD COL 11.4-1-A

Testing of the SWMS includes testing specified in Table 1 of RG 1.143. Implementation of the programs described in Section 12.1, for maintaining occupational dose ALARA, and Section 12.5, Radiation Protection Program, ensure that operation, maintenance, and testing of the SWMS satisfy the guidance contained in RG 8.8.

STD COL 11.4-2-A

Specific equipment connection configuration and plant sampling procedures are used to implement the guidance in Inspection and Enforcement (IE) Bulletin 80-10 (DCD Reference 11.4-19). The permanent and mobile/portable non-radioactive systems, which are connected to radioactive or potentially radioactive portions of SWMS, are protected from contamination with an arrangement of double check

valves in each line. The configuration of each line is also equipped with a tell-tale connection, which permits periodic checks to confirm the integrity of the line and its check valve arrangement. Plant procedures describe sampling of non-radioactive systems that could potentially become contaminated by cross-connection with systems that contain radioactive material. In accordance with the guidance in RG 1.109, exposure pathways that may arise due to unique conditions are considered for incorporation into the plant-specific ODCM if they are likely to contribute significantly to the total dose.

STD COL 11.4-3-A Waste classification and process controls are described in the PCP. NEI 07-10A, "Generic FSAR Template Guidance for Process Control Program (PCP)," is incorporated by reference (Reference 11.4-201). The milestone for development and implementation of the PCP is addressed in Section 13.4.

11.4.6 COL Information

11.4-1-A SWMS Processing Subsystem Regulatory Guide Compliance

STD COL 11.4-1-A This COL item is addressed in Section 11.4.2.3.5.

11.4-2-A Compliance with IE Bulletin 80-10

STD COL 11.4-2-A This COL item is addressed in Section 11.4.2.3.5.

11.4-3-A Process Control Program

STD COL 11.4-3-A This COL item is addressed in Section 11.4.2.3.5.

11.4-4-A Temporary Storage Facility

NAPS COL 11.4-4-A This COL item is addressed in Section 11.4.1.

11.4-5-A Compliance with Part 20.1406

STD COL 11.4-5-A This COL item is addressed in Section 11.4.1.

11.4.7 References

11.4-201 NEI 07-10A, Generic FSAR Template Guidance for Process Control Program (PCP).

NAPS DEP 11.4-1

Table 11.4-1R SWMS Component Capacities

Equipment Description	Type	Quantity	Nominal Capacity* Liter (Gal)
Tanks			
High Activity Resin Holdup Tank	Vertical, Cylindrical	1	70,000 (18,494)
Low Activity Resin Holdup Tank	Vertical, Cylindrical	1	70,000 (18,494)
Condensate Resin Holdup Tank	Vertical, Cylindrical	1	70,000 (18,494)
Low Activity Phase Separator	Vertical, Cylindrical	1	55,000 (14,531)
High Activity Phase Separator	Vertical, Cylindrical	1	12,000 (3,170)
Concentrated Waste Tank	Vertical, Cylindrical	1	60,000 (15,852)
Pumps			
High Activity Decant Pump	Horizontal, Centrifugal	2	333L/min (88gpm)
Low Activity Decant Pump	Horizontal, Centrifugal	2	333L/min (88gpm)
High Activity ~~Resin~~ Transfer Pump	Horizontal, ~~Centrifugal~~ Progressing Cavity	2	379L/min (100gpm)
Low Activity ~~Resin~~ Transfer Pump	Horizontal, ~~Centrifugal~~ Progressing Cavity	2	379L/min (100gpm)
High Activity Circulation Pump	Diaphragm	2	833L/min (220gpm)
Low Activity Circulation Pump	Diaphragm	2	833L/min (220gpm)
Concentrated Waste Pump	Horizontal, Centrifugal	2	1,333L/min (352gpm)
~~Condensate Resin Transfer Pump~~	~~Horizontal, Centrifugal~~	~~2~~	~~379L/min (100gpm)~~

NAPS DEP 11.4-1

Table 11.4-1R SWMS Component Capacities

Equipment Description	Type	Quantity	Nominal Capacity* Liter (Gal)
Process Equipment			
Dewatering Equipment Fill Head	N/A	2	-
Dewatering Pump	Diaphragm	2	75L/min (20gpm)

*For tanks, nominal capacity refers to the operating tank capacity. Nominal capacity for pumps is in liters/min (gallons/min).

BASIS: ESBWR COLA

NAPS DEP 11.4-1 **Table 11.4-2R Annual ~~Shipped~~ Waste Volumes**[*][1,4 & 5]

Waste Type	Waste Class per 10 CFR 61.55	Estimated Annual Waste Generation m^3/yr (ft^3/yr)	Estimated Shipped Volume[*][2] m^3/yr (ft^3/yr)	Estimated Annual Volume Subject to Long Term Storage m^3/yr (ft^3/yr)
Dry Active Wastes (DAW)				
Combustible waste:	A	225 (7,951)	225 (7,951)	-
Compactable waste:	A	38 (1,343)	38 (1,343)	-
Other waste:	A	100 (3,534)	100 (3,534)	-
DAW Total	A	363 (12,827)	363 (12,827)	-
Wet Solid Wastes				
RWCU Spent Bead Resin:	B/C	7.6 (269)	~~7.6 (269)~~	7.6 (269)
FAPCS Spent Bead Resin:	B/C	8.0 (283)	~~8.0 (283)~~	8.0 (283)
Condensate Purification System Spent Bead Resin:	A	33.8 (1,194)	33.8 (1,194)	-
LWMS Spent Bead Resin:	A	5.4 (191)	5.4 (191)	-
Condensate Purification System Filter Sludge:	A	5.2 (184)	5.2 (184)	-
LWMS Filter Sludge:	A	0.8 (28.3)	0.8 (28.3)	-
LWMS Concentrated Waste[◊][3]	A	50 (1,766)	25 (883)	-
Wet Solid Waste Total	A	110.8 (3,915)	~~85.8 (3,032)~~ 70.2 (2480)	15.6 (552)
Mixed Waste:	-	0.416 (14.71)	0.416 (14.71)	-

NAPS DEP 11.4-1

Table 11.4-2R Annual ~~Shipped~~ Waste Volumes *1,4 & 5

*1 If waste is compacted using a third party service, the estimated annual shipped waste volume provided in Table ~~11.4-2~~ 11.4-2R may be reduced depending on the type and level of waste and the waste compacting equipment and resulting compaction performance.

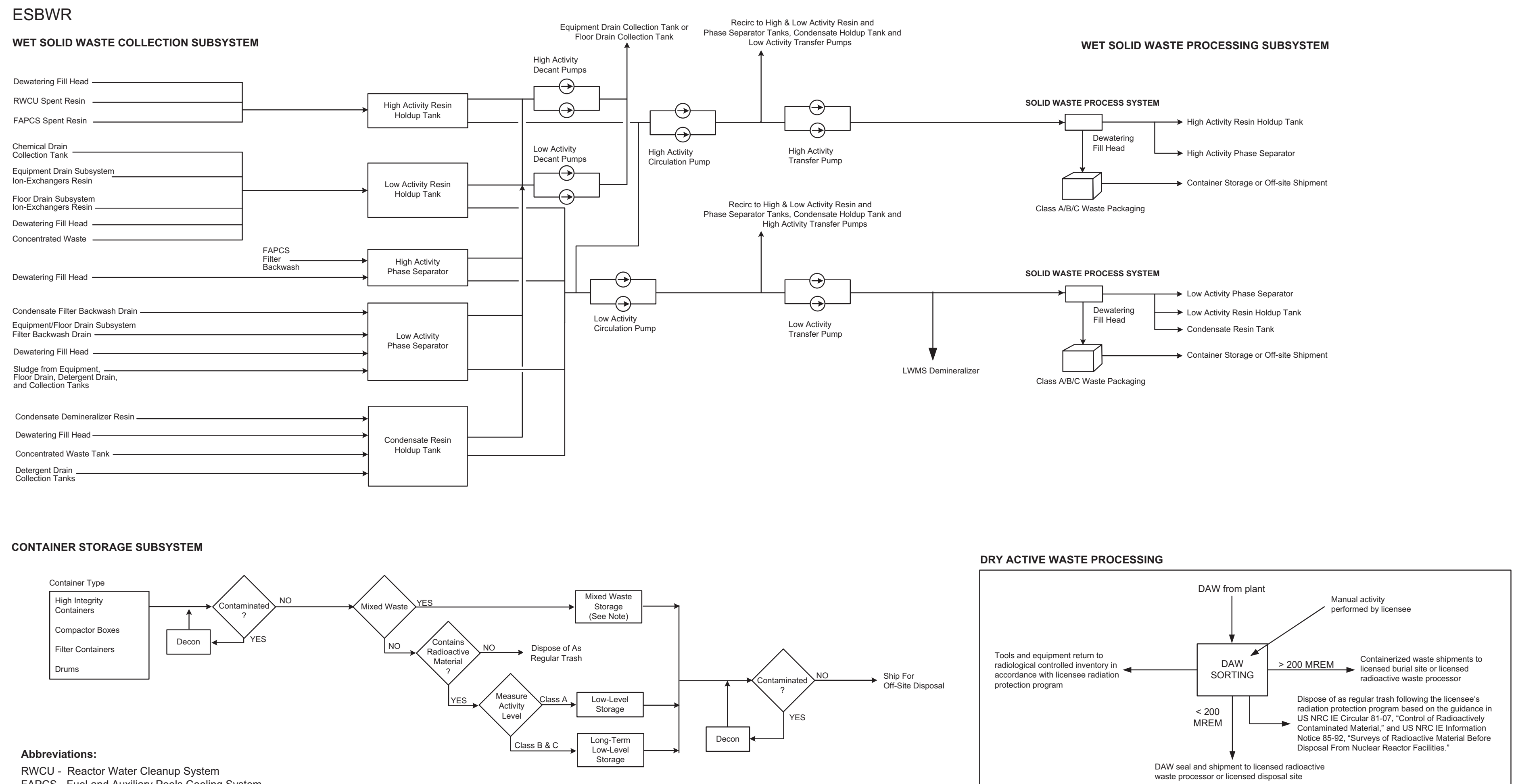
*2 Value is a long-term average of resins and sludges in the dewatered condition and all other wastes packaged for shipment. The values for resins and sludges in the above table are volumes packaged for shipment.

◊3 The volume reduction is based on LWMS Concentrated Waste moisture removal. An estimate of 50% volume reduction is thought to be conservative based on current moisture removal technologies, such as drying and membrane-based operations.

4 There will be a small amount of filter sludge generated. The amount will be minimal and can be accommodated in the long term temporary storage capacity.

5 Irradiated hardware is not addressed here. It will be addressed on a case-by-case basis.

NAPS DEP 11.4-1 **Figure 11.4-1R Solid Waste Management System Process Diagram**

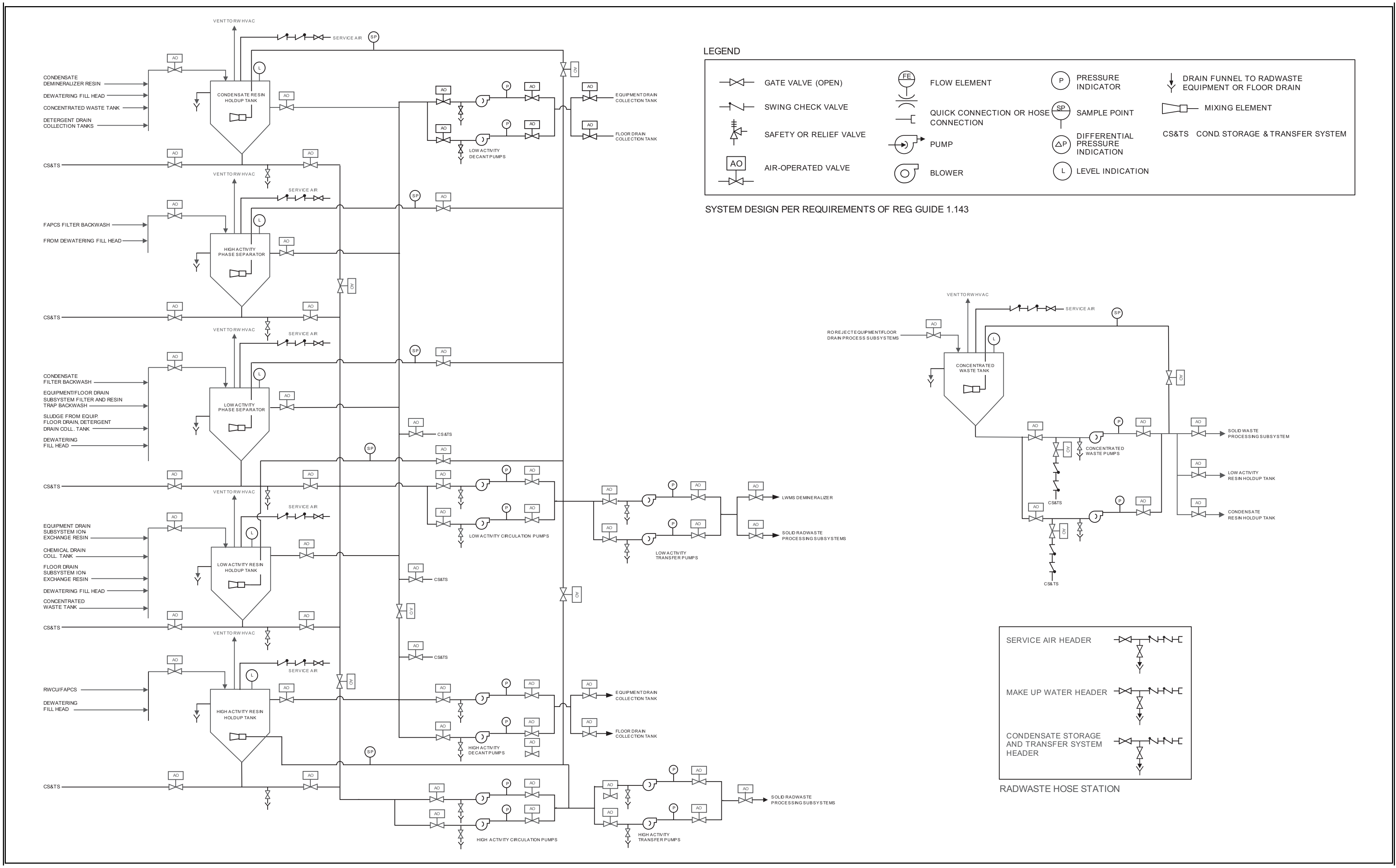


Abbreviations:

RWCU - Reactor Water Cleanup System
FAPCS - Fuel and Auxiliary Pools Cooling System
RO - Reverse Osmosis System
HCW – High Conductivity Waste

Note: EPA Requirements set forth in 40 CFR may also apply to this particular waste.

Figure 11.4-2R SWMS Collection Subsystem



11.5 Process Radiation Monitoring System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Add the following paragraph at the end of this section.

STD COL 11.5-3-A

Replace text references to DCD Table 11.5-5 with Table 11.5-201.

11.5.4.4 Setpoints

Replace the first sentence in this section with the following.

STD COL 11.5-2-A

The derivation of setpoints used for offsite dose monitors are described in the ODCM. Refer to Section 11.5.4.5 for a discussion regarding ODCM development and implementation.

11.5.4.5 Offsite Dose Calculation Manual

Replace this section with the following.

NAPS COL 11.5-2-A

The methodology and parameters used for calculation of offsite dose and monitoring are described in the ODCM. NEI 07-09A, Generic FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description, is incorporated by reference (Reference 11.5-201). The milestone for development and implementation of the ODCM is addressed in Section 13.4. The provisions for sampling liquid and gaseous waste streams identified in Table 11.5-201 and DCD Table 11.5-6, and the provisions for batch liquid releases identified in DCD Table 11.5-7, will be included in the ODCM.

11.5.4.6 Process and Effluent Monitoring Program

Replace this section with the following.

STD COL 11.5-3-A

The program for process and effluent monitoring and sampling is described in the ODCM. Refer to Section 11.5.4.5 for a discussion regarding ODCM development and implementation.

11.5.4.7 Sensitivity or Subsystem Lower Limit of Detection

Replace this section with the following.

STD COL 11.5-1-A

The ODCM describes the methodology for deriving the lower limit of detection for each effluent monitor. Refer to Section 11.5.4.5 for a discussion regarding ODCM development and implementation. The estimated sensitivities (i.e., the dynamic detection ranges) of process radiation monitors are described in DCD Tables 11.5-2 and 11.5-4. The bases for these values are provided in DCD Table 11.5-9. These ranges are adjusted according to unique plant configurations and radiation background in accordance with written procedures. The processes described in these procedures are consistent with the bases defined in DCD Table 11.5-9. If changes to the values in DCD Tables 11.5-2 or 11.5-4 are necessary, the FSAR is updated to reflect these new values.

11.5.4.8 Site Specific Offsite Dose Calculation

Replace this section with the following.

STD COL 11.5-4-A

10 CFR 50, Appendix I guidelines are addressed in the ODCM. Refer to Section 11.5.4.5 for a discussion regarding ODCM development and implementation.

Site-specific evaluations for dose to members of the public are addressed in Section 12.2.

11.5.4.9 Instrument Sensitivities

Replace this section with the following.

STD COL 11.5-5-A

The sensitivities, sampling and analytical frequencies and bases for each gaseous and liquid sample are described in the ODCM. Refer to Section 11.5.4.5 for a discussion regarding ODCM development and implementation.

11.5.5.8 Setpoints

Replace this section with the following:

STD COL 11.5-2-A

Refer to Section 11.5.4.4.

Replace DCD Table 11.5-5 with Table 11.5-201.

11.5.7 COL Information

11.5-1-A Sensitivity or Subsystem Lower Limit of Detection

STD COL 11.5-1-A

This COL item is addressed in Section 11.5.4.7.

11.5-2-A Offsite Dose Calculation Manual

STD COL 11.5-2-A

This COL item is addressed in Sections 11.5.4.4, 11.5.4.5, and 11.5.5.8.

11.5-3-A Process and Effluent Monitoring Program

STD COL 11.5-3-A

This COL item is addressed in Section 11.5 and Subsection 11.5.4.6, Table 11.5-201, Subsection DCD Table 11.5-2 and Subsection DCD Table 11.5-4.

11.5-4-A Site Specific Offsite Dose Calculation

STD COL 11.5-4-A

This COL item is addressed in Section 11.5.4.8.

11.5-5-A Instrument Sensitivities

STD COL 11.5-5-A

This COL item is addressed in Section 11.5.4.9.

11.5.8 References

11.5-201 NEI 07-09A, "Generic FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description"

DCD Table 11.5-2

Replace the Note 2 wording with the following.

STD COL 11.5-3-A

Activity levels are expected to be at the subsystem's lower limit of detection (LLD). Applicable values are included in the plant-specific ODCM. See Section 12.2 for expected activity of various processes and effluents.

DCD Table 11.5-4

Replace the Note 2 wording with the following.

STD COL 11.5-3-A

Activity levels are expected to be at the subsystem's LLD. Applicable values are included in the plant-specific ODCM. See Section 12.2 for expected activity of various processes and effluents.

STD COL 11.5-3-A

Table 11.5-201 Provisions for Sampling Liquid Streams

No.	Process Systems as listed in NUREG-0800, SRP 11.5 Table 2 (Draft Rev. 4)	ESBWR System (s) that Perform the Equivalent SRP 11.5 Function (Note 1)	In Process	In Effluent	
			Grab Notes 2 & 7	Grab Notes 2 & 7	Continuous Notes 2 & 7
1.	Liquid Radwaste (Batch) Effluent System Note 3	Equipment (Low Conductivity) Drain Subsystem Floor (High Conductivity) Drain Subsystem Detergent Drain Subsystem	S&A	S&A, H3 Note 4	-
2.	Service Water System and/or Circulating Water System	Plant Service Water System and Circulating Water System	-	S&A, H3 Note 9	-
3.	Component Cooling Water System	Reactor Component Cooling Water System	S&A	S&A H3	(S&A) Notes 6 & 8
4.	Spent Fuel Pool Treatment System	Spent Fuel Pool Treatment System	S&A	S&A H3	(S&A) Notes 6 & 8
5.	Equipment & Floor Drain Collection and Treatment Systems	LCW Drain Subsystem HCW Drain Subsystem Detergent Drain Subsystem Chemical Waste Drain Subsystem Reactor Component Cooling Water System (RCCWS) Drain Subsystem	-	S&A H3	(S&A) Notes 6 & 8
6.	Phase Separator Decant & Holding Basin Systems	Equipment (Low Conductivity) Drain Subsystem Floor (High) Drain Subsystem	-	S&A H3	(S&A) Notes 6 & 8
7.	Chemical & Regeneration Solution Waste Systems	Chemical Waste Drain Subsystem	-	S&A H3	(S&A) Notes 6 & 8
8.	Laboratory & Sample System Waste Systems	Chemical Waste Drain Subsystem	-	S&A H3	(S&A) Notes 6 & 8

STD COL 11.5-3-A

Table 11.5-201 Provisions for Sampling Liquid Streams

No.	Process Systems as listed in NUREG-0800, SRP 11.5 Table 2 (Draft Rev. 4)	ESBWR System (s) that Perform the Equivalent SRP 11.5 Function (Note 1)	In Process	In Effluent	
			Grab Notes 2 & 7	Grab Notes 2 & 7	Continuous Notes 2 & 7
9.	Laundry & Decontamination Waste Systems	Detergent Drain Subsystem	-	S&A H3	(S&A) Notes 6 & 8
10.	Resin Slurry, Solidification & Baling Drain Systems	Equipment (Low Conductivity) Drain Subsystem, Floor (High) Drain Subsystem	-	S&A H3	(S&A) Notes 6 & 8
11.	Storm & Underdrain Water System	Storm Drains	-	S&A, H3 Notes 3 & 10	-
12.	Tanks and Sumps Inside Reactor Building	Equipment (Low Conductivity) Drain Subsystem Floor (High) Drain Subsystem Chemical Waste Drain Subsystem Detergent Drain Subsystem	-	S&A H3	(S&A) Notes 6 & 8
13.	Ultrasonic Resin Cleanup Waste Systems	Note 5	-	Note 5	Note 5
14.	Non-Contaminated Waste Water System	Sanitary Waste Discharge System	-	S&A, H3 Note 11	-
15.	Liquid Radioactive Waste Processing Systems (Includes Reverse Osmosis Systems)	Liquid Radioactive Waste Processing Systems (Includes Reverse Osmosis Systems)	S&A	(S&A, H3)	(S&A) Notes 6 & 8

STD COL 11.5-3-A

Table 11.5-201 Provisions for Sampling Liquid Streams

Notes for Table 11.5-201:

1. Table 11.5-201 addresses sampling provisions for ESBWRs, as recommended in Table 2 of SRP 11.5 for BWRs. For process systems identified for BWRs in SRP 11.5 Table 2, but not shown in Table 11.5-201, those systems are not applicable to ESBWR. In some cases, there are multiple subsystems that are used to perform the overall equivalent SRP function and are listed as such in the column.
2. S&A = Sampling & Analysis of radionuclides, to include gross radioactivity, identification and concentration of principal radionuclides and concentration of alpha emitters; H3 = Tritium.
3. Liquid Radwaste is processed on a batch-wise basis. The Liquid Waste Management System sample tanks can be sampled for analysis of the batch. See DCD Section 11.2.2.2 for more information on Liquid Radwaste Management.
4. Monitoring of effluents from the Equipment, Floor, and Detergent Drain Subsystems is included in the Offsite Dose Calculation Manual.
5. The ESBWR does not include ultrasonic resin cleanup waste system at this time. Should one be installed, the Liquid Waste Management System would provide sampling and monitoring provisions.
6. The use of parenthesis indicates that these provisions are required only for the systems not monitored, sampled, or analyzed (as indicated) prior to release by downstream provisions.
7. The sensitivity of detection, also defined here as the Lower Limit of Detection (LLD), for each indicated measured variable, is based on the applicable radionuclide (or collection of radionuclides as applicable) as given in ANSI/IEEE N42.18.
8. Processed through radwaste Liquid Waste Management System (LWMS) prior to discharge. Therefore, this process system is monitored, sampled, or analyzed prior to release by downstream provisions. See Note 6 above. Depending on Utility's discretion, additional sampling lines may be installed. Continuous Effluent sampling is not required per Standard Review Plan 11.5 Draft Rev. 4, April 1996, Table 2 for this system function.
9. Grab samples can be obtained from a cooling tower basin. See Section 9.2.1.2 for the PSWS cooling tower basin and Section 10.4.5.2.3 for the Circulating Water System cooling tower basin.
10. Grab samples can be obtained from the Condensate Storage Tank (CST) basin sump. See DCD Section 9.2.6.2.
11. Grab samples can be obtained from the sewage treatment plant. See Section 9.2.4.2.

Chapter 12 Radiation Protection

12.1 Ensuring That Occupational Radiation Exposures Are ALARA

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Add the following at the beginning of this section.

STD SUP 12.1-1 The ALARA program is addressed in Appendices 12AA and 12BB.

12.1.1.3.1 Compliance with Regulatory Guide 8.8

Replace the first paragraph of this section with the following.

STD COL 12.1-4-A Compliance with Regulatory Guide 8.8 is addressed in Appendices 12AA and 12BB.

12.1.1.3.2 Compliance with Regulatory Guide 8.10

Replace this section with the following.

STD COL 12.1-1-A Compliance with Regulatory Guide 8.10 is addressed in Appendices 12AA and 12BB.

12.1.1.3.3 Compliance with Regulatory Guide 1.8

Replace this section with the following.

STD COL 12.1-2-A Compliance with Regulatory Guide 1.8 is addressed in Appendices 12AA and 12BB.

12.1.3 Operational Considerations

Replace this section with the following.

STD COL 12.1-3-A ALARA program implementation is addressed in Appendices 12AA and 12BB.

12.1.4 COL Information

12.1-1-A Regulatory Guide 8.10

STD COL 12.1-1-A This COL item is addressed in Section 12.1.1.3.2.

12.1-2-A Regulatory Guide 1.8

STD COL 12.1-2-A

This COL item is addressed in Section 12.1.1.3.3.

12.1-3-A Operational Considerations

STD COL 12.1-3-A

This COL item is addressed in Section 12.1.3.

12.1-4-A Regulatory Guide 8.8

STD COL 12.1-4-A

This COL item is addressed in Section 12.1.1.3.1.

12.2 Plant Sources

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

12.2.1.1.2 Other Radioactive Sources

Add the following at the end of this section.

NAPS SUP 12.2-1

The Cf-252 reactor startup source is a sealed source. Each source capsule contains 0.5 to 0.822 mg Cf-252. Six sources are required, resulting in a total of 3 to 5 mg (1.6 to 2.7 Ci) Cf-252.

12.2.1.5 Other Contained Sources

Replace this section with the following.

CWR COL 12.2-4-A

In addition to the contained sources identified above, additional contained sources which contain by-product, source, or special nuclear materials may be maintained on site. These contained sources are used as calibration, check, or radiography sources. These sources are not part of the permanent plant design, and their control and use are governed by plant procedures. The procedures consider the guidance provided in RG 8.8 to ensure that occupational doses from the control and use of the sources are as low as is reasonably achievable (ALARA).

Various types and quantities of radioactive sources are employed to calibrate the process and effluent radiation monitors, the area radiation monitors, and portable and laboratory radiation detectors. Check sources that are integral to the area, process, and effluent monitors consist of small quantities of by-product material and do not require special handling, storage, or use procedures for radiation protection purposes. The same consideration applies to solid and liquid radionuclide sources

of exempt quantities or concentrations which are used to calibrate or check the portable and laboratory radiation measurement instruments.

Instrument calibrators are normally used for calibrating gamma dose rate instrumentation. These may be self-contained, heavily shielded, multiple source calibrators. Beta and alpha radiation sources are also available for instrument calibration. Calibration sources are traceable to the National Institute of Standards and Technology, or equivalent.

Radiography sources are surveyed upon entry to the site. Radiation protection personnel maintain copies of the most recent leak test records for owner-controlled sources. Contractor radiography personnel provide copies of the most recent leak test records upon radiation protection personnel request. Radiography is conducted in accordance with approved procedures.

During the period prior to the implementation of the Emergency Plan (in preparation for the initial fuel loading following the 10 CFR 52.103(g) finding), no specific byproduct, source, or special nuclear material related emergency plan will be necessary because:

1. No by-product material will be received, possessed, or used in a physical form that is “in unsealed form, on foils or plated sources, or sealed in glass,” that exceeds the quantities in Schedule C in 10 CFR 30.72;

2. No 10 CFR 40 specifically licensed material, including natural uranium, depleted uranium, and uranium hexafluoride, will be received, possessed, or used during this period; and

3. The special nuclear material to be received, possessed, or used does not involve enriched uranium for which a criticality accident alarm system is required, uranium hexafluoride in excess of 50 kilograms in a single container or 1000 kilograms total, or in excess of 2 curies of plutonium in unsealed form or on foils or plated sources.

Table 12.2-206 identifies radioactive sources that will be used for the Radiation Monitoring System and laboratory/portable monitoring instrumentation.

In accordance with the regulatory requirements of 10 CFR 70.22(a)(4), each application for a 10 CFR 70 Special Nuclear Material (SNM)

License shall include the name, amount, and specifications (including the chemical and physical form and, where applicable, isotopic content) of the special nuclear material the applicant proposes to use or produce. The radioactive material identified in Table 12.2-207 represents nominal values of known non-fuel special nuclear material specifically required for use at Unit 3.

NAPS COL 12.2-4-A

The Condensate Storage Tank (CST) potentially contains radioactive fluids. Estimated conservative radionuclide inventories in the CST are provided in Table 12.2-205. Sufficient shielding is provided for the CST to ensure an exposure rate of less than 5 mrem/hr at 30 cm from the CST; hence, it would not be considered a radiation area per 10 CFR 20.1003.

12.2.2.1 Airborne Releases Offsite

Replace this section with the following.

NAPS COL 12.2-2-A

Design basis noble gas, iodine, and other fission product concentrations are taken from the tables in Chapter 11. Airborne sources for normal operating releases are calculated using the source terms given in DCD Section 11.1.

The bases for the airborne sources calculations are provided in Table 12.2-15R. The bases include values used in calculating the annual airborne release source terms provided in DCD Table 12.2-16. The methodology of NUREG-0016 was used in determining the annual airborne release values presented in DCD Table 12.2-16.

Annual Releases

Based on the inputs and criteria described above, the annual airborne releases for Unit 3 normal operations and the Unit 3 airborne concentrations at the site boundary are provided in Table 12.2-17R. This table also shows the maximum activity concentration for each nuclide at the site boundary from the combined operation of Units 1, 2, and 3, and the corresponding concentration limit for the NAPS site from 10 CFR 20, Appendix B, Table 2, Column 1.

12.2.2.2 Airborne Dose Evaluation Offsite

Replace this section with the following.

NAPS COL 12.2-2-A

The bases for the calculation of Unit 3-specific airborne offsite doses are provided in Table 12.2-18aR. The annual gaseous pathway doses are provided in Table 12.2-18bR. The methodology of RG 1.109 was used in determining the annual airborne dose values. The bases include values that are default parameters in RG 1.109 and other values that are Unit 3 site-specific inputs.

The results of the Unit 3 gaseous pathway dose analysis are given in Table 12.2-18bR.

12.2.2.2.1 Compliance with 10 CFR 50, Appendix I, Sections II.B and II.C

Table 12.2-201 demonstrates that offsite doses due to Unit 3 radioactive airborne effluents comply with the regulatory dose limits in 10 CFR 50, Appendix I, Sections II.B and II.C.

NAPS ESP COL 11.1-1

12.2.2.2.2 Compliance with 10 CFR 50, Appendix I, Section II.D

Population dose is determined for the gaseous effluent releases from Unit 3 for both total body dose and thyroid dose. The total body dose is 4.3 person-rem/yr as shown in Table 12.2-204. The thyroid dose is 25 person-rem/yr. The cost-benefit analysis performed to consider gaseous radwaste augments to reduce doses due to gaseous effluents is presented in Section 11.3. Based on the results from the cost-benefit analysis, no augments are cost-beneficial. Therefore, Unit 3 complies with 10 CFR 50, Appendix I, Section II.D.

12.2.2.2.3 Compliance with 10 CFR 20, Appendix B, Table 2, Column 1

Table 12.2-17R provides the gaseous effluent concentrations in comparison to the 10 CFR 20, Appendix B, Table 2, Column 1 limits. The Unit 3 gaseous effluent concentrations comply with 10 CFR 20, Appendix B, Table 2, Column 1.

12.2.2.2.4 Compliance with 10 CFR 20.1301 and 20.1302

NAPS ESP VAR 12.2-4

Compliance with 10 CFR 20.1301 and 20.1302 is demonstrated in Sections 12.2.2.4.4 and 12.2.2.4.5, respectively. Compliance with 10 CFR 20.1301(e) and 40 CFR 190 is described in Section 12.2.2.4.4.

NAPS ESP COL 11.1-1

12.2.2.2.5 Comparison of ESP Application to Unit 3 Gaseous Effluent Concentrations

NAPS ESP VAR 12.2-5

As described in Section 12.2.2.1, the radioactive gaseous effluent concentrations for Unit 3 are provided in Table 12.2-17R.

The radioactive gaseous effluent concentrations for the ESPA are included in ESP-ER Table 5.4-7. That table presents the composite annual release activities and activity concentrations of gaseous effluents for a single unit, but is based on a composite of possible radionuclide releases from many reactor designs. The values in that table are the maximum annual activity and corresponding concentration for each radionuclide from the many reactor designs considered.

ESP-ER Table 5.4-7 contains more radionuclides than Table 12.2-17R due to the use of the composite set of nuclides.

For most radionuclides in the Unit 3 gaseous effluent, the maximum activity is bounded by the activity for that nuclide in the ESP-ER. Annual release activities in bold print in Table 12.2-17R indicate those radionuclides for which the estimated Unit 3 release activity is greater than the composite release activity as presented in the ESP-ER. Although not every radionuclide is bounded, the total gaseous effluent release activity of Unit 3 is less than the total composite release activity presented in the ESP-ER. Also, for every nuclide in Table 12.2-17R, the Unit 3 concentration is within the corresponding ESP-ER value.

12.2.2.2.6 Comparison of ESPA to Unit 3 Gaseous Effluent Doses

As described in Section 12.2.2.2, the calculated radioactive gaseous effluent doses for Unit 3 are provided in Table 12.2-18bR.

The radioactive gaseous effluent doses for the ESP Application are included in ESP-ER Table 5.4-9. The results from that table are reproduced in Table 12.2-18bR.

For both the composite releases used in the ESP-ER, and the Unit 3 normal operating releases, Table 12.2-18bR presents doses to the maximally exposed adult, teenager, child, and infant for the following pathways:

- Nearest site boundary
- Nearest vegetable garden
- Nearest residence

- Nearest meat animal

For the milk pathway, no milk animals are within 8 km (5 miles) of Unit 3.

As noted in Section 2.3.5, the distance to the site boundary has been measured using GIS and although it is known to be farther than the value used in the ESP-ER, the ESP-ER value is conservatively used in calculating Unit 3 gaseous effluent doses at the site boundary.

The locations of the nearest vegetable garden, residence, and meat animal were updated since the ESP-ER and closer locations than addressed in the ESP-ER were identified. For these pathways, the closest location from all three of the pathways was used for the distance to the MEI for each pathway.

NAPS ESP VAR 12.2-1

While the total activity in the gaseous radioactive effluents for Unit 3 is much less than that estimated in the ESP-ER, the calculated doses for some of the pathways shown in Table 12.2-18bR are not lower due to the reductions in the distances to the MEI receptor locations as described above. Values in Table 12.2-18bR in bold print indicate pathways for which the estimated Unit 3 ESBWR dose to the MEI is larger than the corresponding ESP-ER composite release dose to the MEI.

Although some pathways in Table 12.2-18bR show slight increases in thyroid doses to the MEI from the changes in MEI locations, Table 12.2-18bR summarizes the annual total body, thyroid, and skin doses to the MEI for the garden, residence, and meat animal pathways, and Table 12.2-201 shows that the Unit 3 doses are lower than those calculated and presented in ESP-ER Table 5.4-10.

12.2.2.4 Liquid Doses Offsite

Replace this section with the following.

NAPS COL 12.2-3-A

Liquid pathway doses were calculated based on the criteria specified in DCD Section 12.2.2.3 for compliance with 10 CFR 50, Appendix I. Dose conversion factors and methodologies consistent with RGs 1.109 and 1.113 were used as described in DCD References 12.2-7 and 12.2-4, respectively.

The liquid effluent pathway offsite dose calculation bases are provided in Table 12.2-20aR. The bases include values that are default parameters in RG 1.109 and other values that are Unit 3 site-specific inputs.

Based on the annual liquid release offsite values in DCD Table 12.2-19b, which are repeated in Table 12.2-19bR, the Unit 3 annual liquid release concentrations were calculated based upon the criteria specified in DCD Section 12.2.2.3 and the Unit 3-specific input values shown in Table 12.2-20aR. Table 12.2-19bR also shows the maximum activity concentration for each nuclide at the end of the discharge canal from the combined operation of Units 1, 2, and 3, and the corresponding concentration limit for the NAPS site from 10 CFR 20, Appendix B, Table 2, Column 2.

The LADTAP II code is used to perform the liquid effluent dose analysis (DCD Reference 12.2-3). The results of the dose calculation are given in Table 12.2-20bR.

12.2.2.4.1 Compliance with 10 CFR 50, Appendix I, Section II.A

Table 12.2-202 demonstrates that offsite doses due to Unit 3 radioactive liquid effluents comply with the regulatory dose limits in 10 CFR 50, Appendix I, Section II.A.

NAPS ESP COL 11.1-1

12.2.2.4.2 Compliance with 10 CFR 50, Appendix I, Section II.D

Population dose is determined for the liquid effluent releases from Unit 3 for both total body dose and thyroid dose. The total body dose is 0.84 person-rem/yr as shown in Table 12.2-204. The thyroid dose is 0.99 person-rem/yr. The cost-benefit analysis performed to consider liquid radwaste augments to reduce doses due to liquid effluents is presented in Section 11.2. Based on the above liquid effluent dose estimate values and the threshold value from the cost-benefit analysis, no augments are cost-beneficial. Therefore, Unit 3 complies with 10 CFR 50, Appendix I, Section II.D.

12.2.2.4.3 Compliance with 10 CFR 20, Appendix B, Table 2, Column 2

Compliance with 10 CFR 20, Appendix B, Table 2, Column 2 is demonstrated in Table 12.2-19bR.

12.2.2.4.4 Compliance with 10 CFR 20.1301 and 20.1302

This section demonstrates that offsite doses due to Unit 3, combined with offsite doses due to Units 1 and 2 and the NAPS independent spent fuel storage installation (ISFSI), comply with the regulatory limits in 10 CFR 20.1301 for doses to members of the public.

Using the Unit 3-specific gaseous effluent release activities identified in Table 12.2-17R, and the Unit 3-specific liquid effluent release activities identified in Table 12.2-19bR, the total annual doses to the MEI and the population resulting from Unit 3 liquid and gaseous effluents are calculated and presented in Tables 12.2-203 and 12.2-204, respectively.

The direct radiation contribution due to contained sources from operation of Unit 3 is negligible. The direct dose contribution due to Turbine Building skyshine from Unit 3 at two distances is provided in DCD Table 12.2-21. That table shows the annual dose at 1000 m (0.62 mi) to be 1.66E-06 mSv/yr (1.66E-04 mrem/yr). Section 9.3.9 shows that Unit 3 uses hydrogen water chemistry, and DCD Section 12.2.1.3 explains that the direct dose contribution takes into account hydrogen water chemistry. The distance from Unit 3 to the nearest residence is assumed to be 0.74 mi in the NW direction, as described in Section 2.3.5.1. The distance from Unit 3 to the location on the site boundary with the highest gaseous effluent annual dose is 1416 m (0.88 mile) in the NNE direction. This is the distance from Unit 3 to the site boundary, that is, the exclusion area boundary (EAB) in the direction of maximum annual χ/Q, as shown in Table 2.3-16R. These distances from Unit 3 to each type of receptor location are greater than those presented in the DCD, so the Unit 3 direct radiation dose rate at each location is even lower than the very low rate cited above for 1000 m (0.62 mi).

The total annual doses to the MEI resulting from North Anna Units 1 and 2 liquid and gaseous effluents are provided in Table 12.2-203. The values shown are representative based on review of Units 1 and 2 annual radiological environmental operating reports (e.g., Reference 12.2-203).

The direct radiation contribution from operation of Units 1 and 2 is negligible. An evaluation of operating plants by the NRC states that:

> "…because the primary coolant of an LWR is contained in a heavily shielded area, dose rates in the vicinity of light water reactors are generally undetectable and are less than 1 mrem/year at the site boundary."

The NRC concludes that the direct radiation from normal operation results in "small contributions at site boundaries" (Reference 12.2-204, Section 4.6.1.2). For the NAPS site, the nearest residence is at a distance typical of a site boundary evaluated by NRC. An assumed value

of 1 mrem/yr is included in Table 12.2-203 to account for the dose to the MEI at the nearest residence from operation of Units 1 and 2.

Discharged fuel assemblies from NAPS Units 1 and 2 are stored in the NAPS ISFSI (Reference 12.2-205). The direct radiation contribution from operation of the NAPS ISFSI is small, both at the residence nearest to the ISFSI, which is south and slightly east of the ISFSI at about 870 m (0.54 mi), and at the closest point to the site boundary, which is south and slightly west of the ISFSI at approximately 760 m (0.47 mi). The annual contribution at the site boundary from the ISFSI is no more than 3.6E-02 mSv/yr (3.6 mrem/yr). This value is based on a conservatively estimated peak dose rate from a fully-filled ISFSI with 84 casks/modules, which bounds the planned 68 casks, containing NAPS Units 1 and 2 fuel assemblies and the distance from the ISFSI to the site boundary, which is shorter than that to the residence nearest the ISFSI. This ISFSI dose contribution is then conservatively applied to the MEI for the nearest residence from Unit 3, which is assumed to be 0.74 mi in the NW direction and even further from the ISFSI.

Table 12.2-203 shows that the total NAPS site doses resulting from the normal operation of Units 1, 2, and 3 and applied at the nearest residence meet 10 CFR 20.1301(e) and are well within the regulatory limits of 40 CFR 190. These doses are applied at the distance to the nearest residence from Unit 3, which is assumed to be 0.74 mi. These doses bound those at the site boundary.

NAPS ESP VAR 12.2-4

While the regulatory limits are met, the doses for total body, thyroid, and bone due to the existing units, as shown in bold in Table 12.2-203, do not fall within (are greater than) the corresponding values in ESP-ER Table 5.4-11. Also, the total body and bone doses for the site, as shown in bold in Table 12.2-203, do not fall within (are greater than) the corresponding values in ESP-ER Table 5.4-11.

Table 12.2-204 shows the total body doses from liquid and gaseous effluents doses attributable to Unit 3 for the population within 50 miles of the NAPS site.

12.2.2.4.5 Compliance with 10 CFR 20.1302

Surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas are conducted to demonstrate compliance with the dose limits given in 10 CFR 20.1302 for individual members of the public.

Compliance with the annual dose limit in 10 CFR 20.1302 is demonstrated by showing that the calculated total effective dose equivalent (TEDE) to the individual likely to receive the highest dose does not exceed the annual dose limit.

NAPS ESP COL 11.1-1

12.2.2.4.6 Comparison of ESPA to NAPS Site with Unit 3 Liquid Effluent Concentrations

As described in Section 12.2.2.4, the radioactive liquid effluent concentrations for Unit 3 are provided in Table 12.2-19bR. This table also shows the maximum activity concentration for each nuclide at the end of the discharge canal from the combined operation of Units 1, 2, and 3, and the corresponding concentration limit for the NAPS site.

The radioactive liquid effluent concentrations for the NAPS site from the combined operation of the two new units and the existing units as presented in the ESPA are included in ESP-ER Table 5.4-6. That table presents the composite annual release activities of liquid effluents for a single new unit, but based on a composite of possible radionuclide releases from many reactor designs. For all isotopes except tritium, the maximum annual activity for each radionuclide is the maximum from the many different types of reactor designs considered. ESP-ER Table 5.4-6 contains more radionuclides than Table 12.2-19bR due to the use of the composite set of nuclides in the ESP-ER.

NAPS ESP VAR 12.2-3

For most radionuclides in the Unit 3 liquid effluent, the maximum activity is bounded by the activity for that nuclide in the ESP-ER. Annual release activities in bold print in Table 12.2-19bR indicate those radionuclides for which the estimated Unit 3 release activity is greater than the composite release activity as presented in the ESP-ER.

Although not every radionuclide is bounded, the total liquid effluent release activity of Unit 3 is less than the total composite release activity presented in the ESP-ER.

Table 12.2-19bR shows the total activity concentrations at the site release point for the nuclides in radioactive liquid effluent for Units 1, 2, and 3. For every nuclide, the maximum activity concentration is equal to or less than the corresponding value in ESP-ER Table 5.4-6.

12.2.2.4.7 Comparison of ESPA to Unit 3 Liquid Effluent Doses

As described in Section 12.2.2.4, the calculated radioactive liquid effluent doses for Unit 3 are provided in Table 12.2-20bR.

The radioactive liquid effluent doses for the ESPA are included in ESP-ER Table 5.4-8. The results from that table are reproduced in Table 12.2-20bR. The dose for each liquid radioactive effluent pathway for Unit 3 is less than the corresponding estimate in the ESP-ER. Table 12.2-202 summarizes the annual total body and bone doses to the MEI and shows that the Unit 3 doses are lower than those calculated and presented in ESP-ER Table 5.4-10.

As indicated in Tables 12.2-203 and 12.2-204, the annual total site doses to the MEI and the population within 50 miles of Unit 3 are lower than those calculated and presented in ESP-ER.

12.2.4 COL Information

12.2-2-A Airborne Effluents and Doses

NAPS COL 12.2-2-A This COL item is addressed in Sections 12.2.2.1 and 12.2.2.2.

12.2-3-A Liquid Effluents and Doses

NAPS COL 12.2-3-A This COL item is addressed in Section 12.2.2.4.

12.2-4-A Other Contained Sources

STD COL 12.2-4-A This COL item is addressed in Section 12.2.1.5.

12.2.5 References

12.2-201 [Deleted]

12.2-202 [Deleted]

12.2-203 Virginia Electric and Power Company, North Anna Units 1 & 2 and Independent Spent Fuel Storage Installation (ISFSI) Annual Radiological Environmental Operating Report, April 17, 2006.

12.2-204 NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, U. S. Nuclear Regulatory Commission, May 1996.

12.2-205 Virginia Electric and Power Company, North Anna Independent Spent Fuel Storage Installation, Final Safety Analysis Report, Revision 6, Docket No. 72-16, License No. 2507, June 2008.

12.2-206 North Anna Power Station Updated Final Safety Analysis Report, Revision 45.

NAPS COL 12.2-2-A
NAPS ESP COL 11.1-1

Table 12.2-15R Airborne Sources Calculation

Calculation Bases

Methodology	Appendix 12B
Noble Gas Source at t=30 min	740 MBq/sec (20,000 μCi/sec)
I-131 Release Rate	3.7 MBq/sec (100 μCi/sec)
Meteorology χ/Q	
RB/FB Ventilation Stack	~~1.5E-07 s/m³~~ See Tables 2.3-16R, 2.3-209, 2.3-211, 2.3-213
TB Ventilation Stack	~~1.2E-07 s/m³~~ See Tables 2.3-16R, 2.3-209, 2.3-211, 2.3-213
RW Ventilation Stack	~~5.0E-06 s/m³~~ See Tables 2.3-16R, 2.3-209, 2.3-211, 2.3-213
Circulating Water Cooling Tower	See Tables 2.3-16R, 2.3-217, 2.3-219, 2.3-221
Meteorology D/Q	
RB/FB Ventilation Stack	~~4.8E-09 m⁻²~~ See Tables 2.3-16R and 2.3-215
TB Ventilation Stack	~~3.5E-09 m⁻²~~ See Tables 2.3-16R and 2.3-215
RW Ventilation Stack	~~1.9E-08 m⁻²~~ See Tables 2.3-16R and 2.3-215
Circulating Water Cooling Tower	See Tables 2.3-16R and 2.3-223
Plant Availability Factor	0.92
Offgas System	
Offgas stream temperature	100°F
Flow rate at 100°F	54 m^3/hr
K_d (Kr)	18.5 cm^3/g
K_d (Xe)	330 cm^3/g
K_d (Ar)	6.4 cm^3/g
Guard tank charcoal mass	7,500 kg (single tank)
Adsorber tank charcoal mass	27,750 kg (each)
Adsorber tank arrangement	2 parallel trains of 4 tanks each

NAPS COL 12.2-2-A
NAPS ESP COL 11.1-1

Table 12.2-15R Airborne Sources Calculation

Calculation Bases	
Turbine Gland Sealing System Exhaust	
I-131 release	0.81 Ci/yr per μCi/g of I-131 in coolant
I-133 release	0.22 Ci/yr per μCi/g of I-133 in coolant

NAPS COL 12.2-2-A
NAPS ESP COL 11.1-1
NAPS ESP VAR 12.2-5

Table 12.2-17R Comparison of Airborne Release Concentrations with 10 CFR 20 Limit

	Unit 3 ~~Airborne~~ Annual Release		~~Concentration~~	Unit 3 Concentration		Units 1, 2 & 3 Concentration	~~10 CFR 20~~	ECL	Units 1, 2, & 3 Fraction
Nuclide	MBq/yr	Ci/yr	~~Bq/m³~~	Bq/m³	µCi/ml	µCi/ml	~~Bq/m³~~	µCi/ml	of ECL
Kr-83m	**8.5E+01**	**2.3E-03**	~~4.0E-07~~	1.9E-07	5.2E-18	5.2E-18	~~2.E+06~~	5.0E-05	1.0E-13
Kr-85m	6.6E+05	1.8E+01	~~2.6E-03~~	1.1E-03	3.1E-14	7.0E-11	~~4.E+03~~	1.0E-07	7.0E-04
Kr-85	5.2E+06	1.4E+02	~~2.0E-02~~	8.6E-03	2.3E-13	1.3E-09	~~3.E+04~~	7.0E-07	1.8E-03
Kr-87	1.4E+06	3.9E+01	~~5.4E-03~~	2.4E-03	6.5E-14	4.0E-11	~~7.E+02~~	2.0E-08	2.0E-03
Kr-88	2.1E+06	5.7E+01	~~8.2E-03~~	3.5E-03	9.5E-14	1.3E-10	~~3.E+02~~	9.0E-09	1.4E-02
Kr-89	1.4E+07	3.7E+02	~~1.5E-01~~	3.8E-02	1.0E-12	1.0E-12	~~4.E+01~~	1.0E-09	1.0E-03
Xe-131m	1.5E+05	4.1E+00	~~5.6E-04~~	2.5E-04	6.7E-15	1.8E-12	~~7.E+04~~	2.0E-06	8.9E-07
Xe-133m	1.9E+02	5.2E-03	~~9.2E-07~~	4.3E-07	1.2E-17	1.0E-10	~~2.E+04~~	6.0E-07	1.7E-04
Xe-133	4.1E+07	1.1E+03	~~9.3E-01~~	1.9E-01	5.1E-12	9.2E-09	~~2.E+04~~	5.0E-07	1.8E-02
Xe-135m	2.2E+07	6.1E+02	~~1.9E+00~~	3.3E-01	8.8E-12	1.6E-11	~~1.E+03~~	4.0E-08	3.9E-04
Xe-135	2.8E+07	7.5E+02	~~1.1E+00~~	2.0E-01	5.4E-12	2.1E-10	~~3.E+03~~	7.0E-08	3.1E-03
Xe-137	2.8E+07	7.8E+02	~~4.0E-01~~	9.6E-02	2.6E-12	2.6E-12	~~4.E+01~~	1.0E-09	2.6E-03
Xe-138	2.3E+07	6.3E+02	~~9.4E-02~~	3.9E-02	1.1E-12	2.3E-11	~~7.E+02~~	2.0E-08	1.2E-03
I-131	1.8E+04	5.0E-01	~~1.8E-04~~	4.9E-05	1.3E-15	2.3E-13	~~7.E+00~~	2.0E-10	1.2E-03
I-132	**9.4E+04**	**2.5E+00**	~~1.1E-03~~	2.8E-04	7.6E-15	5.4E-14	~~7.E+02~~	2.0E-08	2.7E-06
I-133	**8.9E+04**	**2.4E+00**	~~1.1E-03~~	2.6E-04	7.2E-15	2.9E-13	~~4.E+01~~	1.0E-09	2.9E-04
I-134	1.5E+05	4.0E+00	~~1.8E-03~~	4.4E-04	1.2E-14	2.9E-14	~~2.E+03~~	6.0E-08	4.8E-07

NAPS COL 12.2-2-A
NAPS ESP COL 11.1-1
NAPS ESP VAR 12.2-5

Table 12.2-17R Comparison of Airborne Release Concentrations with 10 CFR 20 Limit

	Unit 3 ~~Airborne~~ Annual Release		~~Concen-tration~~	Unit 3 Concentration		Units 1, 2 & 3 Concen-tration	~~10 CFR 20~~	ECL	Units 1, 2, & 3 Fraction of ECL
Nuclide	MBq/yr	Ci/yr	~~Bq/m^3~~	Bq/m^3	µCi/ml	µCi/ml	~~Bq/m^3~~	µCi/ml	
I-135	**1.2E+05**	**3.2E+00**	~~1.4E-03~~	3.5E-04	9.5E-15	1.2E-13	~~2.E+02~~	6.0E-09	2.1E-05
H-3	~~2.8E+06~~ 9.3E+06	2.5E+02	~~1.2E-02~~	1.4E+00	3.7E-11	3.7E-11	~~4.E+03~~	1.0E-07	3.7E-04
C-14	**5.3E+05**	**1.4E+01**	~~2.0E-03~~	8.7E-04	2.4E-14	2.4E-14	~~1.E+02~~	3.0E-09	7.9E-06
Na-24	5.9E+00	1.6E-04	~~2.8E-08~~	1.3E-08	3.6E-19	3.6E-19	~~3.E+02~~	7.0E-09	5.1E-11
P-32	1.5E+00	4.1E-05	~~7.1E-09~~	3.4E-09	9.1E-20	9.1E-20	~~2.E+01~~	5.0E-10	1.8E-10
Ar-41	1.4E+03	3.8E-02	~~5.4E-06~~	2.3E-06	6.2E-17	6.2E-17	~~4.E+02~~	1.0E-08	6.2E-09
Cr-51	2.7E+02	7.2E-03	~~6.6E-06~~	1.4E-06	3.8E-17	3.8E-17	~~1.E+03~~	3.0E-08	1.3E-09
Mn-54	**3.0E+02**	**8.2E-03**	~~3.2E-05~~	5.3E-06	1.4E-16	1.4E-16	~~4.E+01~~	1.0E-09	1.4E-07
Mn-56	1.2E+01	3.2E-04	~~5.6E-08~~	2.7E-08	7.3E-19	7.3E-19	~~7.E+02~~	2.0E-08	3.7E-11
Fe-55	5.1E+01	1.4E-03	~~2.4E-07~~	1.1E-07	3.1E-18	3.1E-18	~~1.E+02~~	3.0E-09	1.0E-09
Fe-59	**4.1E+01**	**1.1E-03**	~~2.5E-06~~	4.4E-07	1.2E-17	1.2E-17	~~2.E+01~~	5.0E-10	2.4E-08
Co-58	8.0E+01	2.2E-03	~~1.9E-06~~	3.8E-07	1.0E-17	1.0E-17	~~4.E+01~~	1.0E-09	1.0E-08
Co-60	**6.6E+02**	**1.8E-02**	~~5.7E-05~~	9.7E-06	2.6E-16	2.6E-16	~~2.E+00~~	5.0E-11	5.2E-06
Ni-63	5.2E-02	1.4E-06	~~2.5E-10~~	1.2E-10	3.2E-21	3.2E-21	~~4.E+01~~	1.0E-09	3.2E-12
Cu-64	7.5E+00	2.0E-04	~~3.6E-08~~	1.7E-08	4.6E-19	4.6E-19	~~1.E+03~~	3.0E-08	1.5E-11
Zn-65	**6.2E+02**	**1.7E-02**	~~5.0E-06~~	1.6E-06	4.2E-17	4.2E-17	~~1.E+01~~	4.0E-10	1.1E-07
Rb-89	2.0E-01	5.4E-06	~~9.5E-10~~	4.5E-10	1.2E-20	1.2E-20	~~7.E+03~~	2.0E-07	6.1E-14

NAPS COL 12.2-2-A
NAPS ESP COL 11.1-1
NAPS ESP VAR 12.2-5

Table 12.2-17R Comparison of Airborne Release Concentrations with 10 CFR 20 Limit

	Unit 3 ~~Airborne~~ Annual Release		~~Concentration~~	Unit 3 Concentration		Units 1, 2 & 3 Concentration	~~10 CFR 20~~		Units 1, 2, & 3
Nuclide	MBq/yr	Ci/yr	~~Bq/m^3~~	Bq/m^3	µCi/ml	µCi/ml	~~Bq/m^3~~	ECL µCi/ml	Fraction of ECL
Sr-89	**3.1E+02**	**8.3E-03**	~~1.2E-06~~	5.1E-07	1.4E-17	1.4E-17	~~7.E+00~~	2.0E-10	6.9E-08
Sr-90	1.9E+00	5.0E-05	~~7.9E-09~~	3.6E-09	9.7E-20	9.7E-20	~~2.E-01~~	6.0E-12	1.6E-08
Y-90	8.9E-02	2.4E-06	~~4.2E-10~~	2.0E-10	5.4E-21	5.4E-21	~~3.E+01~~	9.0E-10	6.0E-12
Sr-91	7.5E+00	2.0E-04	~~3.6E-08~~	1.7E-08	4.6E-19	4.6E-19	~~2.E+02~~	5.0E-09	9.1E-11
Sr-92	4.9E+00	1.3E-04	~~2.3E-08~~	1.1E-08	3.0E-19	3.0E-19	~~3.E+02~~	9.0E-09	3.3E-11
Y-91	1.9E+00	5.1E-05	~~9.2E-09~~	4.3E-09	1.2E-19	1.2E-19	~~7.E+00~~	2.0E-10	5.8E-10
Y-92	3.8E+00	1.0E-04	~~1.8E-08~~	8.6E-09	2.3E-19	2.3E-19	~~4.E+02~~	1.0E-08	2.3E-11
Y-93	8.1E+00	2.2E-04	~~3.8E-08~~	1.8E-08	4.9E-19	4.9E-19	~~1.E+02~~	3.0E-09	1.6E-10
Zr-95	**9.2E+01**	**2.5E-03**	~~6.6E-06~~	1.1E-06	3.1E-17	3.1E-17	~~1.E+01~~	4.0E-10	7.7E-08
Nb-95	**5.0E+02**	**1.4E-02**	~~2.4E-06~~	1.1E-06	3.1E-17	3.1E-17	~~7.E+01~~	2.0E-09	1.5E-08
Mo-99	**3.4E+03**	**9.3E-02**	~~1.6E-05~~	7.7E-06	2.1E-16	2.1E-16	~~7.E+01~~	2.0E-09	1.0E-07
Tc-99m	2.4E+00	6.5E-05	~~1.2E-08~~	5.4E-09	1.5E-19	1.5E-19	~~7.E+03~~	2.0E-07	7.3E-13
Ru-103	**2.1E+02**	**5.8E-03**	~~1.0E-06~~	4.8E-07	1.3E-17	1.3E-17	~~3.E+01~~	9.0E-10	1.4E-08
Rh-103m	3.8E-03	1.0E-07	~~1.8E-11~~	8.6E-12	2.3E-22	2.3E-22	~~7.E+04~~	2.0E-06	1.2E-16
Ru-106	1.6E-01	4.3E-06	~~7.4E-10~~	3.6E-10	9.7E-21	9.7E-21	~~7.E-01~~	2.0E-11	4.9E-10
Rh-106	5.2E-06	1.4E-10	~~2.5E-14~~	1.2E-14	3.2E-25	3.2E-25	~~4.E+01~~	1.0E-09	3.2E-16
Ag-110m	**1.7E-01**	**4.6E-06**	~~8.1E-10~~	3.8E-10	1.0E-20	1.0E-20	~~4.E+00~~	1.0E-10	1.0E-10
Sb-124	**1.1E+01**	**3.0E-04**	~~5.9E-07~~	1.0E-07	2.8E-18	2.8E-18	~~1.E+01~~	3.0E-10	9.3E-09
Te-129m	1.8E+00	4.9E-05	~~8.6E-09~~	4.1E-09	1.1E-19	1.1E-19	~~1.E+01~~	3.0E-10	3.7E-10

NAPS COL 12.2-2-A
NAPS ESP COL 11.1-1
NAPS ESP VAR 12.2-5

Table 12.2-17R Comparison of Airborne Release Concentrations with 10 CFR 20 Limit

	Unit 3 ~~Airborne~~ Annual Release		~~Concentration~~	Unit 3 Concentration		Units 1, 2 & 3 Concentration	~~10 CFR 20~~	ECL	Units 1, 2, & 3 Fraction of ECL
Nuclide	MBq/yr	Ci/yr	~~Bq/m^3~~	Bq/m^3	µCi/ml	µCi/ml	~~Bq/m^3~~	µCi/ml	
Te-131m	6.0E-01	1.6E-05	~~2.9E-09~~	1.4E-09	3.7E-20	3.7E-20	~~4.E+01~~	1.0E-09	3.7E-11
Te-132	1.5E-01	4.1E-06	~~7.3E-10~~	3.4E-10	9.1E-21	9.1E-21	~~3.E+01~~	9.0E-10	1.0E-11
Cs-134	**3.7E+02**	**1.0E-02**	~~2.0E-05~~	3.6E-06	9.8E-17	9.8E-17	~~7.E+00~~	2.0E-10	4.9E-07
Cs-136	**3.1E+01**	**8.3E-04**	~~1.4E-07~~	6.6E-08	1.8E-18	1.8E-18	~~3.E+01~~	9.0E-10	2.0E-09
Cs-137	**5.5E+02**	**1.5E-02**	~~3.3E-05~~	5.9E-06	1.6E-16	1.6E-16	~~7.E+00~~	2.0E-10	8.0E-07
Cs-138	8.5E-01	2.3E-05	~~4.0E-09~~	1.9E-09	5.2E-20	5.2E-20	~~3.E+03~~	8.0E-08	6.5E-13
Ba-140	**1.6E+03**	**4.4E-02**	~~7.2E-06~~	3.3E-06	9.0E-17	9.0E-17	~~7.E+01~~	2.0E-09	4.5E-08
La-140	1.4E+01	3.8E-04	~~6.8E-08~~	3.2E-08	8.5E-19	8.5E-19	~~7.E+01~~	2.0E-09	4.3E-10
Ce-141	**5.5E+02**	**1.5E-02**	~~2.2E-06~~	9.4E-07	2.5E-17	2.5E-17	~~3.E+01~~	8.0E-10	3.2E-08
Ce-144	1.6E-01	4.3E-06	~~7.4E-10~~	3.6E-10	9.7E-21	9.7E-21	~~7.E-01~~	2.0E-11	4.9E-10
Pr-144	1.8E-04	4.9E-09	~~8.6E-13~~	4.1E-13	1.1E-23	1.1E-23	~~7.E+00~~	2.0E-07	5.5E-17
W-187	1.4E+00	3.8E-05	~~6.6E-09~~	3.2E-09	8.5E-20	8.5E-20	~~4.E+02~~	1.0E-08	8.5E-12
Np-239	9.0E+01	2.4E-03	~~4.3E-07~~	2.0E-07	5.5E-18	5.5E-18	~~1.E+02~~	3.0E-09	1.8E-09
Total	1.8E+08	4.8E+03		2.3E+00	6.1E-11	1.1E-08		NA	4.7E-02

Note: Concentrations for Units 1 and 2 are based on the activity releases in NAPS UFSAR (Reference 12.2-206) Table 11.3-2. Effluent concentration limits (ECLs) are from 10 CFR 20, Appendix B, Table 2, Column 1. The H-3 release includes a contribution from the circulating water hybrid cooling tower evaporation of 180 Ci/yr (6.7E6 MBq/yr).

NAPS COL 12.2-2-A
NAPS ESP COL 11.1-1

Table 12.2-18aR Airborne Offsite Dose Calculation Bases

NAPS COL 12.2-2-A	Meteorology χ/Q	Table 12.2-15R
NAPS COL 12.2-2-A	Meteorology D/Q	Table 12.2-15R
	Airborne Release Source Term	DCD Table 12.2-16
	Calculation Methodology	RG 1.109
	Computer Code Utilized	GASPAR II (NUREG/CR-4653)
	Individual Consumption Rates	Table E-5 of RG 1.109
	Misc. Calculation Inputs (other than RG 1.109 default values):	
NAPS COL 12.2-2-A	Midpoint of plant operating life	20 years
NAPS COL 12.2-2-A	Fraction of year that leafy vegetables are grown	0.5
NAPS COL 12.2-2-A	Fraction of year that animals graze on pasture	0.67
NAPS COL 12.2-2-A	Fraction of daily feed that is pasture grass when the animal grazes on pasture	1.0
NAPS COL 12.2-2-A	Animal milk considered for milk pathway	None – no milk animal within 8 km (5 mi)
NAPS COL 12.2-2-A	Annual Average Doses from Airborne Releases	Table 12.2-18bR

NAPS COL 12.2-2-A
NAPS ESP COL 11.1-1
NAPS ESP VAR 12.2-1

Table 12.2-18bR Gaseous Pathway Doses to the MEI (mrem/yr)

		ESP			Unit 3		
Location	**Pathway**	**Total Body**	**Thyroid**	**Skin**	**Total Body**	**Thyroid**	**Skin**
Site Boundary (1416 m (0.88 mi) ESE for ESP-ER and NNE for FSAR)	Plume	2.1E+00	NA	6.2E+00	1.3E-01	**1.3E-01**	2.1E-01
	Inhalation						
	Adult	3.0E-01	1.6E+00	NA	2.7E-02	6.2E-02	NA
	Teen	3.1E-01	2.0E+00	NA	2.7E-02	7.3E-02	NA
	Child	2.7E-01	2.3E+00	NA	2.4E-02	8.1E-02	NA
	Infant	1.6E-01	2.0E+00	NA	1.4E-02	6.6E-02	NA
Nearest Garden (1513 m (0.94 mi) NE for ESP-ER; 1191 m (0.74 mi) NNE for FSAR)	Vegetable						
	Adult	4.4E-01	4.9E+00	NA	6.6E-02	1.5E+00	NA
	Teen	5.7E-01	6.6E+00	NA	7.7E-02	1.9E+00	NA
	Child	1.1E+00	1.3E+01	NA	1.2E-01	3.7E+00	NA
Nearest Residence (1545 m (0.96 mi) NNE for ESP-ER; 1191 m (0.74 mi) NNE for FSAR)	Plume	1.4E+00	NA	4.0E+00	1.2E-01	**1.2E-01**	2.1E-01
	Inhalation						
	Adult	2.0E-01	1.0E+00	NA	2.6E-02	6.3E-02	NA
	Teen	2.0E-01	1.3E+00	NA	2.6E-02	7.5E-02	NA
	Child	1.8E-01	1.5E+00	NA	2.3E-02	8.2E-02	NA
	Infant	1.0E-01	1.3E+00	NA	1.3E-02	6.7E-02	NA
Nearest Meat Animal (2205 m (1.37 mi) SE for ESP-ER; 1191 m (0.74 mi) NNE for FSAR)	Meat						
	Adult	6.7E-02	1.5E-01	NA	1.0E-02	5.8E-02	NA
	Teen	4.9E-02	1.1E-01	NA	6.5E-03	4.2E-02	NA
	Child	7.9E-02	1.7E-01	NA	8.6E-03	6.2E-02	NA

NAPS COL 12.2-2-A
NAPS ESP COL 11.1-1
NAPS ESP VAR 12.2-1

Table 12.2-18bR Gaseous Pathway Doses to the MEI (mrem/yr)

		ESP			Unit 3		
Location	**Pathway**	**Total Body**	**Thyroid**	**Skin**	**Total Body**	**Thyroid**	**Skin**
Nearest Garden/ Residence/ Meat Animal (Varies for ESP-ER; 1191 m (0.74 mi) NNE for FSAR)	All						
	Adult	1.6E+00	4.9E+00	4.0E+00	2.2E-01	1.7E+00	2.1E-01
	Teen	1.6E+00	6.6E+00	4.0E+00	2.3E-01	2.2E+00	2.1E-01
	Child	1.6E+00	1.3E+01	4.0E+00	2.7E-01	4.0E+00	2.1E-01
	Infant	1.5E+00	1.3E+00	4.0E+00	1.3E-01	1.9E-01	2.1E-01

Notes:

1. There are no infant doses for the vegetable and meat pathways because infants do not consume these foods.
2. “NA” denotes “not applicable.”
3. 1 mrem = 0.01 msv
4. For Unit 3, the doses shown for “nearest garden/residence/meat animal” location are the sum of garden, residence, and meat animal doses at 1191 m NNE. For ESP, these doses are the maximum of garden, residence, and meat animal doses at 1513 m NE, 1545 m NNE, and 2205 m SE, respectively. The site boundary and residence plume doses include ground shine contribution.
5. The maximum (child) bone dose for Unit 3 from all gaseous effluent pathways is shown in Table 12.2-203.

NAPS COL 12.2-3-A
NAPS ESP COL 11.1-1
NAPS ESP VAR 12.2-3

Table 12.2-19bR Comparison of Annual Liquid Release Concentrations with 10 CFR 20 Limit

	Unit 3 Annual Release		~~Concen-tration~~	Unit 3 Concentration		Units 1, 2 & 3 Concen-tration	~~10 CFR 20 MPC~~	ECL	Units 1, 2, & 3 Fraction of ECL
Nuclide	**MBq/yr**	**Ci/yr**	~~**Bq/m^3**~~	**Bq/m^3**	**µCi/ml**	**µCi/ml**	~~**Bq/m^3**~~	**µCi/ml**	
I-131	2.29E+02	6.2E-03	~~2.18E-05~~	1.2E-06	3.1E-11	5.6E-08	~~3.70E-02~~	1.0E-06	5.6E-02
I-132	3.44E+01	9.3E-04	~~3.27E-06~~	1.7E-07	4.7E-12	8.5E-09	~~3.70E+00~~	1.0E-04	8.5E-05
I-133	**1.11E+03**	**3.0E-02**	~~1.06E-04~~	5.6E-06	1.5E-10	6.2E-08	~~2.59E-01~~	7.0E-06	8.9E-03
I-134	1.48E+00	4.0E-05	~~1.41E-07~~	7.4E-09	2.0E-13	1.2E-09	~~1.48E+01~~	4.0E-04	3.0E-06
I-135	2.63E+02	7.1E-03	~~2.50E-05~~	1.3E-06	3.6E-11	3.6E-09	~~1.11E+00~~	3.0E-05	1.2E-04
H-3	5.18E+05	1.4E+01	~~4.92E-02~~	4.4E-03	1.2E-07	5.6E-06	~~3.70E+01~~	1.0E-03	5.6E-03
Na-24	**1.55E+02**	**4.2E-03**	~~1.48E-05~~	7.8E-07	2.1E-11	2.1E-11	~~1.85E+00~~	5.0E-05	4.2E-07
P-32	1.30E+01	3.5E-04	~~1.23E-06~~	6.6E-08	1.8E-12	1.8E-12	~~3.33E-01~~	9.0E-06	2.0E-07
Cr-51	4.07E+02	1.1E-02	~~3.87E-05~~	2.1E-06	5.6E-11	7.9E-11	~~1.85E+01~~	5.0E-04	1.6E-07
Mn-54	4.81E+00	1.3E-04	~~4.57E-07~~	3.1E-08	8.3E-13	4.0E-11	~~1.11E+00~~	3.0E-05	1.3E-06
Mn-56	3.70E+01	1.0E-03	~~3.52E-06~~	1.9E-07	5.0E-12	5.0E-12	~~2.59E+00~~	7.0E-05	7.2E-08
Fe-55	7.03E+01	1.9E-03	~~6.68E-06~~	5.3E-07	1.4E-11	1.4E-11	~~3.70E+00~~	1.0E-04	1.4E-07
Fe-59	2.22E+00	6.0E-05	~~2.11E-07~~	1.2E-08	3.1E-13	2.6E-11	~~3.70E-01~~	1.0E-05	2.6E-06
Co-58	1.37E+01	3.7E-04	~~1.30E-06~~	7.3E-08	2.0E-12	7.4E-10	~~7.40E-01~~	2.0E-05	3.7E-05
Co-60	2.78E+01	7.5E-04	~~2.64E-06~~	2.2E-07	6.1E-12	6.6E-11	~~1.11E-01~~	3.0E-06	2.2E-05
Cu-64	**3.70E+02**	**1.0E-02**	~~3.52E-05~~	1.9E-06	5.0E-11	5.0E-11	~~7.40E+00~~	2.0E-04	2.5E-07
Zn-65	1.37E+01	3.7E-04	~~1.30E-06~~	8.5E-08	2.3E-12	2.3E-12	~~1.85E-01~~	5.0E-06	4.6E-07
Zn-69m	**2.78E+01**	**7.5E-04**	~~2.64E-06~~	1.4E-07	3.8E-12	3.8E-12	~~2.22E+00~~	6.0E-05	6.3E-08

NAPS COL 12.2-3-A
NAPS ESP COL 11.1-1
NAPS ESP VAR 12.2-3

Table 12.2-19bR Comparison of Annual Liquid Release Concentrations with 10 CFR 20 Limit

	Unit 3 Annual Release		~~Concentration~~	Unit 3 Concentration		Units 1, 2 & 3 Concentration	~~10 CFR 20 MPC~~	ECL	Units 1, 2, & 3 Fraction of ECL
Nuclide	MBq/yr	Ci/yr	~~Bq/m^3~~	Bq/m^3	μCi/ml	μCi/ml	~~Bq/m^3~~	μCi/ml	
Br-83	**3.70E+00**	**1.0E-04**	~~3.52E-07~~	1.9E-08	5.0E-13	5.0E-13	~~3.33E+01~~	9.0E-04	5.6E-10
Sr-89	7.03E+00	1.9E-04	~~6.68E-07~~	3.7E-08	9.9E-13	1.1E-10	~~2.96E-01~~	8.0E-06	1.4E-05
Sr-90	3.70E-01	1.0E-05	~~3.52E-08~~	3.2E-09	8.6E-14	1.2E-11	~~1.85E-02~~	5.0E-07	2.4E-05
Sr-91	3.52E+01	9.5E-04	~~3.34E-06~~	1.8E-07	4.8E-12	2.4E-11	~~7.40E-01~~	2.0E-05	1.2E-06
Y-91	4.44E+00	1.2E-04	~~4.22E-07~~	2.3E-08	6.3E-13	1.3E-10	~~2.96E-01~~	8.0E-06	1.6E-05
Sr-92	8.51E+00	2.3E-04	~~8.09E-07~~	4.3E-08	1.2E-12	1.2E-12	~~1.48E+00~~	4.0E-05	2.9E-08
Y-92	**3.22E+01**	**8.7E-04**	~~3.06E-06~~	1.6E-07	4.4E-12	4.4E-12	~~1.48E+00~~	4.0E-05	1.1E-07
Y-93	**3.70E+01**	**1.0E-03**	~~3.52E-06~~	1.9E-07	5.0E-12	5.0E-12	~~7.40E-01~~	2.0E-05	2.5E-07
Zr-95	3.70E-01	1.0E-05	~~3.52E-08~~	2.0E-09	5.3E-14	2.1E-11	~~7.40E-01~~	2.0E-05	1.1E-06
Nb-95	3.70E-01	1.0E-05	~~3.52E-08~~	1.9E-09	5.1E-14	2.2E-11	~~1.11E+00~~	3.0E-05	7.4E-07
Mo-99	9.25E+01	2.5E-03	~~8.79E-06~~	4.6E-07	1.3E-11	9.9E-08	~~7.40E-01~~	2.0E-05	5.0E-03
Tc-99m	1.70E+02	4.6E-03	~~1.62E-05~~	8.5E-07	2.3E-11	8.5E-08	~~3.70E+01~~	1.0E-03	8.5E-05
Ru-103	1.48E+00	4.0E-05	~~1.41E-07~~	7.6E-09	2.1E-13	2.1E-13	~~1.11E+00~~	3.0E-05	6.9E-09
Ru-105	**4.81E+00**	**1.3E-04**	~~4.57E-07~~	2.4E-08	6.5E-13	6.5E-13	~~2.59E+00~~	7.0E-05	9.3E-09
Te-129m	2.59E+00	7.0E-05	~~2.46E-07~~	1.3E-08	3.6E-13	3.6E-13	~~2.59E-01~~	7.0E-06	5.1E-08
Te-131m	2.96E+00	8.0E-05	~~2.81E-07~~	1.5E-08	4.0E-13	4.0E-13	~~2.96E-01~~	8.0E-06	5.0E-08
Te-132	3.70E-01	1.0E-05	~~3.52E-08~~	1.9E-09	5.0E-14	4.8E-09	~~3.33E-01~~	9.0E-06	5.3E-04
Cs-134	2.11E+01	5.7E-04	~~2.00E-06~~	1.5E-07	4.2E-12	1.8E-08	~~3.33E-02~~	9.0E-07	2.0E-02

NAPS COL 12.2-3-A
NAPS ESP COL 11.1-1
NAPS ESP VAR 12.2-3

Table 12.2-19bR Comparison of Annual Liquid Release Concentrations with 10 CFR 20 Limit

	Unit 3 Annual Release		~~Concen-tration~~	Unit 3 Concentration		Units 1, 2 & 3 Concen-tration	~~10 CFR 20 MPC~~	ECL	Units 1, 2, & 3 Fraction of ECL
Nuclide	**MBq/yr**	**Ci/yr**	~~**Bq/m³**~~	**Bq/m³**	**µCi/ml**	**µCi/ml**	~~**Bq/m³**~~	**µCi/ml**	
Cs-136	1.30E+01	3.5E-04	~~1.23E-06~~	6.6E-08	1.8E-12	2.6E-09	~~2.22E-01~~	6.0E-06	4.3E-04
Cs-137	5.55E+01	1.5E-03	~~5.28E-06~~	4.8E-07	1.3E-11	1.2E-07	~~3.70E-02~~	1.0E-06	1.2E-01
Ba-139	**1.11E+00**	**3.0E-05**	~~1.06E-07~~	5.6E-09	1.5E-13	1.5E-13	~~7.40E+00~~	2.0E-04	7.5E-10
Ba-140	2.55E+01	6.9E-04	~~2.43E-06~~	1.3E-07	3.5E-12	9.5E-11	~~2.96E-01~~	8.0E-06	1.2E-05
Ce-141	2.22E+00	6.0E-05	~~2.11E-07~~	1.1E-08	3.1E-13	3.1E-13	~~1.11E+00~~	3.0E-05	1.0E-08
La-142	7.40E-01	2.0E-05	~~7.03E-08~~	3.7E-09	1.0E-13	1.0E-13	~~3.70E+00~~	1.0E-04	1.0E-09
Ce-143	1.11E+00	3.0E-05	~~1.06E-07~~	5.6E-09	1.5E-13	1.5E-13	~~7.40E-01~~	2.0E-05	7.5E-09
Pr-143	2.59E+00	7.0E-05	~~2.46E-07~~	1.3E-08	3.5E-13	3.5E-13	~~7.40E-01~~	2.0E-05	1.8E-08
W-187	7.40E+00	2.0E-04	~~7.03E-07~~	3.7E-08	1.0E-12	1.0E-12	~~1.11E+00~~	3.0E-05	3.4E-08
Np-239	3.44E+02	9.3E-03	~~3.27E-05~~	1.7E-06	4.7E-11	4.7E-11	~~7.40E-01~~	2.0E-05	2.3E-06
Total w/o H-3	3.66E+03	9.9E-02		1.9E-05	5.1E-10	4.6E-07		NA	2.1E-01
Total w/ H-3	5.22E+05	1.4E+01		4.4E-03	1.2E-07	6.1E-06		NA	2.2E-01

Note: Concentrations for Units 1 and 2 are obtained from NAPS UFSAR (Reference 12.2-206) Table 11.2-14. ECLs are from 10 CFR 20, Appendix B, Table 2, Column 2.

NAPS COL 12.2-3-A
NAPS ESP COL 11.1-1

Table 12.2-20aR Liquid Pathway Offsite Dose Calculation Bases**

	Calculation Methodology	Regulatory Guide 1.109
	Computer Code Utilized	LADTAP II (NUREG/CR-4013)
	Individual Consumption/Exposure Rates	Table E-5 of Reg. Guide 1.109
	Site Water Type	Freshwater
NAPS COL 12.2-3-A	Discharge Canal Flow Rate	~~2.0E+04 liters/min~~ 3.8E+02 liters/min (0.223 ft^3/sec)
NAPS COL 12.2-3-A	Shore-Width Factor	~~0.2~~ 0.3
NAPS COL 12.2-3-A	Dilution Factor	~~10~~ 1000
NAPS COL 12.2-3-A	Transit times from discharge to the receiving water body to exposure location	All pathways ~~except drinking water:~~ instantaneous ~~Drinking water: 12 hours~~ ~~Irrigated foods: instantaneous~~
NAPS COL 12.2-3-A	Irrigation rate	~~0.001 m^3/m^2-day~~ None - lake water is not used for irrigation
NAPS COL 12.2-3-A	Fraction of year that leafy vegetables are grown	~~0.75~~ Not used in liquid pathway dose calculation
NAPS COL 12.2-3-A	Fraction of year that animals graze on pasture	~~0.5~~ Not used in liquid pathway dose calculation
NAPS COL 12.2-3-A	Fraction of daily feed that is pasture grass when the animal grazes on pasture	~~0.75~~ Not used in liquid pathway dose calculation
NAPS COL 12.2-3-A	Animal milk considered for milk pathway	~~Cow~~ Not used in liquid pathway dose calculation
NAPS COL 12.2-3-A	Liquid Pathway Offsite Annual Doses	~~Table 12.2-20b~~ Table 12.2-20bR

** There is no capacity factor input card in the GALE-86 code. A capacity factor of 0.8 is an internal default value. In the liquid effluent release module of the GALE-86 code, a capacity factor of 0.8 is only used for the tritium calculations; specifically, to calculate the tritium discharges via the “processed liquid regenerant waste” stream (and not for other streams). If an ESBWR capacity factor of 0.92 is applied to the GALE-86 code, the tritium discharges would change from 14.47 Ci/yr (5.354E+11 Bq/yr) to 14.65 Ci/yr (5.420E+11 Bq/yr) (note: the GALE-86 code presents the results rounded to the whole number). This change would mean a negligible dose increase for a maximum increase of 1.1% for infant, total body, and 1.2% for infant, lung. This slight increase still maintains the doses due to liquid effluents well below the 10 CFR 50 Appendix I limits.

NAPS COL 12.2-3-A
NAPS ESP COL 11.1-1

Table 12.2-20bR Liquid Pathway Doses from Unit 3 for Maximally Exposed Individuals at Lake Anna

	ESP-ER Dose (mrem/yr)			Unit 3 Dose (mrem/yr)		
Pathway	**Total Body**	**Thyroid**	**Bone**	**Total Body**	**Thyroid**	**Bone**
Fish	5.1E-01	NA	2.3E-00	6.5E-02	NA	1.0E+00
Invertebrate	6.6E-02	NA	1.5E-01	6.9E-03	NA	5.4E-02
Drinking	2.0E-01	6.5E-01	2.7E-02	4.0E-03	2.5E-01	4.5E-03
Shoreline	3.0E-02	3.0E-02	3.0E-02	2.5E-03	2.5E-03	2.5E-03
Swimming	3.2E-04	3.2E-04	3.2E-04	1.2E-04	1.2E-04	1.2E-04
Boating	4.0E-04	4.0E-04	4.0E-04	1.5E-04	1.5E-04	1.5E-04
Total	8.1E-01	6.8E-01	2.5E-00	7.9E-02	2.6E-01	1.1E+00
Age group receiving maximum dose	Adult	Infant	Child	Adult	Infant	Child

Notes: 1. Bone of the child is the organ receiving the maximum dose.
2. There are no infant doses for the fish and invertebrate pathways because infants do not consume these foods.
3. "NA" denotes "not applicable."
4. 1 mrem = 0.01 mSv

NAPS DEP 11.4-1

Table 12.2-22R Radiation Sources Parameters

		Assumed Shielding Source							
		Source Approx Geometry Rt. Cylinder (r, l)		Source Characteristics					
Component	Room	Length (m)	Radius (m)	Type	Material	Density (g/cm^3)	Equipment Self-Shielding	Quantity
RWCU/SDC (RB)								
Non regenerative Heat Exchanger Tube side	1151/1250 1161/1260	7.00	0.16	Homogeneous	Water	0.967	Steel 2cm thick	Three
Regenerative Heat Exchanger Tube side Shell side	 1151/1250 1161/1260	 7.00 7.00	 0.16 0.25	 Homogeneous Homogeneous	 Water Water	 0.836 0.990	 Steel 2cm thick	 Two
Demineralizer	1251/52/61/62	4.12	0.48	Homogeneous	Resins	0.69	Steel 1cm thick	Four
FAPCS (FB)								
Heat Exchanger	2150/2160	0.96	0.30	Homogeneous	Water	1.00	Steel 2cm thick	Two
Filter / Demineralizer	2251/2261	2.06	1.12	Homogeneous	Resins	0.69	Steel 1cm thick	Two
Backwash Receiving Tank	2102	1.00	0.56	Homogeneous	Water	1.00	Steel 1cm thick	One
OFF-GAS System (TB)								
Steam Jet Air Ejectors	4206/4207			Homogeneous	Offgas	5.95E-05	Steel 1cm thick	Two
Preheater/Recombiner/ Condenser	4381/4382	10.45m^3		Homogeneous	Offgas	6.5E-04	Steel 1cm thick	Two
Cooler Condenser	4381/4382	0.12 m^3		Homogeneous	Offgas	1.04E-03	Steel 1cm thick	Two
Dryer		5.81 m^3		Homogeneous	Offgas	1.02E-03	Steel 1cm thick	Two
Guard Bed	4108	1.4	2.1	Homogeneous	Offgas	1.02E-03	Steel 1cm thick	Two
Delay Bed	4108	7.5	1.5	Homogeneous	Offgas	1.02E-03	Steel 1cm thick	Eight

NAPS DEP 11.4-1

Table 12.2-22R Radiation Sources Parameters

Component	Room	Assumed Shielding Source: Source Approx Geometry Rt. Cylinder (r, l) Length (m)	Radius (m)	Source Characteristics: Type	Material	Density (g/cm^3)	Equipment Self-Shielding	Quantity
CPS (TB)								
Condensate Demineralizer	42F1A to F1H	0.92	1.75	Homogeneous	Resins	0.69	Steel 2cm thick	Eight
Turbine Condenser (TB)								
Main Condenser Shell Well	4186	 1284 m^3 2136 m^3		 Homogeneous Homogeneous	 Water Water	 7.21E-04 1	 Steel 1cm thick Steel 1cm thick	Three (Bodies)
LWMS (RW)								
Equipment Drain Collection Tank	6103/4/5	140 m^3		Homogeneous	Water	1	Steel 1cm thick	Three
Floor Drain Collection Tank	6150/6160	130 m^3		Homogeneous	Water	1	Steel 1cm thick	Two
Chemical Drain Collection Tank	6201	4 m^3		Homogeneous	Water	1	Steel 1cm thick	One
Detergent Drain Collection Tank	~~6184~~ 6282	15 m^3		Homogeneous	Water	1	Steel 1cm thick	Two
Equipment Drain Sample Tank	~~6172~~ 6171	140 m^3		Homogeneous	Water	1	Steel 1cm thick	Two
Floor Drain Sample Tank	6171	130 m^3		Homogeneous	Water	1	Steel 1cm thick	Two
Detergent Drain Sample Tank	6282	15 m^3		Homogeneous	Water	1	Steel 1cm thick	Two
SWMS (RW)								
High Activity Resin Holdup Tank	6108	3.26	2.00	Homogeneous	Resins	0.69	Steel 1cm thick	One
Low Activity Resin Holdup Tank	~~6107~~ 6106	0.48	2.00	Homogeneous	Water	0.69	Steel 1cm thick	One

NAPS DEP 11.4-1

Table 12.2-22R Radiation Sources Parameters

Component	Room	Assumed Shielding Source: Source Approx Geometry Rt. Cylinder (r, l)		Source Characteristics				
		Length (m)	Radius (m)	Type	Material	Density (g/cm^3)	Equipment Self-Shielding	Quantity
High/Low Activity Phase Separator Room	~~6151/6161~~ 6251/6161	0.48	2.00	Homogeneous	Water	1.00	Steel 1cm thick	Two
Condensate Resin Holdup Tank	~~6106~~ 6107	2.70	2.00	Homogeneous	Resins	0.69	Steel 1cm thick	One
Concentrate Waste Tank	6109	3.98	2.00	Homogeneous	Water	1.03	Steel 1cm thick	One

1m = 3.28 ft, $1m^3 = 35.3\ ft^3$

NAPS COL 12.2-2-A
NAPS ESP COL 11.1-1

Table 12.2-201 Comparison of Annual Doses to the MEI from Gaseous Effluents Per Unit

Type of Dose	Location	ESP (Single Unit)	Unit 3	10 CFR 50 Limit
Gamma Air (mrad/yr)	Residence	3.2	0.078	10
Beta Air (mrad/yr)	Residence	4.8	0.078	20
Total Body (mrem/yr)	Site Boundary	2.4	0.13	5
Skin (mrem/yr)	Site Boundary	6.2	0.21	15
Iodines and Particulates - Thyroid (mrem/yr)	Garden/ Residence/ Meat Animal	12	3.8	15

1 mrad = 0.01 mGy
1 mrem = 0.01 mSv

NAPS COL 12.2-3-A
NAPS ESP COL 11.1-1

Table 12.2-202 Comparison of Annual Doses to MEI from Liquid Effluents Per Unit

Type of Dose	Location	ESP (Single Unit)	Unit 3	10 CFR 50 Limit
Total Body (mrem/yr)	Lake Anna	0.81	0.079	3
Bone (mrem/yr)	Lake Anna	2.5	1.1	10

1 mrem = 0.01 msv

NAPS COL 12.2-2-A
NAPS COL 12.2-3-A
NAPS ESP COL 11.1-1
NAPS ESP VAR 12.2-4

Table 12.2-203 Comparison of Site Doses to the MEI

Type of Dose	ESP Site Total(1)	Unit 3 (ESBWR) Liquid	Unit 3 (ESBWR) Gaseous	Unit 3 (ESBWR) Total (5)	Existing Units(2)	Site Total(3)	40 CFR 190 Limit
Total Body (mrem/yr)	6.8	0.079	0.27	0.35	**5.0**	5.3	25
Thyroid (mrem/yr)	27	0.26	4.0	4.2	**5.1**	9.4	75
Bone (mrem/yr)	12	1.1	0.31	1.4	**5.1**	6.5	25

Notes:

1. The ESP site total doses are for two new units and two existing units, and do not include a dose contribution from the ISFSI.
2. The doses from existing units include ISFSI contribution and an assumed dose of 1 mrem/yr due to direct radiation from the existing units.
3. This site total dose includes the Unit 3 total dose and the dose from the existing units.
4. 1 mrem = 0.01 mSv
5. Unit 3 total annual doses include a Turbine Building skyshine contribution of less than 1.66E-04 mrem/yr.

NAPS COL 12.2-2-A
NAPS COL 12.2-3-A
NAPS ESP COL 11.1-1

Table 12.2-204 Collective Total Body (Population) Doses Within 50 Miles

	Units in person-rem/yr	
	ESP (Single Unit)	**Unit 3**
Liquid	8.6	0.84
Noble Gases (Gaseous)	3.5	0.49
Iodines and Particulates (Gaseous)	1.4	1.1
H-3 and C-14 (Gaseous)	14	2.7
Gaseous Total	19	4.3
Total	28	5.1

Notes:

1. 1 rem = 0.01 Sv
2. ESP doses are based on data from ESP-ER Tables 2.5-8, 5.4-1, and 5.4-3.
3. The corresponding collective thyroid doses for Unit 3 are 0.99 person-rem/year from liquid effluents and 25 person-rem/year from gaseous effluents.
4. The long-term χ/Q and D/Q values used in deriving Unit 3 collective doses from routine gaseous effluent releases within 50 miles of the plant are shown in Tables 2.3-208 to 2.3-223.

NAPS COL 12.2-4-A

Table 12.2-205 Bounding Radionuclide Concentration and Inventory in the Condensate Storage Tank

Nuclide	Concen-tration MBq/m^3	Inventory MBq	Inventory Ci
I-131	1.7E+00	8.3E+03	2.2E-01
I-132	1.2E+01	5.9E+04	1.6E+00
I-133	1.1E+01	5.4E+04	1.5E+00
I-134	1.9E+01	9.3E+04	2.5E+00
I-135	1.5E+01	7.3E+04	2.0E+00
Rb-89	3.5E-01	1.7E+03	4.6E-02
Cs-134	8.1E-01	4.0E+03	1.1E-01
Cs-136	7.1E-02	3.5E+02	9.4E-03
Cs-137	2.3E+00	1.1E+04	3.0E-01
Cs-138	7.0E-01	3.4E+03	9.2E-02
Ba-137m	1.3E-03	6.4E+00	1.7E-04
H-3	3.7E+02	1.8E+06	4.9E+01
Na-24	3.5E-02	1.7E+02	4.6E-03
P-32	7.3E-04	3.6E+00	9.6E-05
Cr-51	5.5E-02	2.7E+02	7.3E-03
Mn-54	6.4E-04	3.1E+00	8.4E-05
Mn-56	4.0E-01	2.0E+03	5.3E-02
Fe-55	1.8E-02	8.8E+01	2.4E-03
Fe-59	5.5E-03	2.7E+00	7.3E-05
Co-58	1.8E-03	8.8E+00	2.4E-04
Co-60	3.6E-03	1.8E+01	4.8E-04
Ni-63	1.8E-05	8.8E-02	2.4E-06
Cu-64	5.2E-02	2.5E+02	6.9E-03
Zn-65	1.8E-02	8.8E+01	2.4E-03
Sr-89	1.5E-01	7.3E+02	2.0E-02
Sr-90	2.5E-02	1.2E+02	3.3E-03

NAPS COL 12.2-4-A

Table 12.2-205 Bounding Radionuclide Concentration and Inventory in the Condensate Storage Tank

Nuclide	Concen-tration MBq/m^3	Inventory	
		MBq	Ci
Y-90	4.4E-04	2.1E+00	5.8E-05
Sr-91	6.9E-02	3.4E+02	9.1E-03
Sr-92	1.6E-01	7.8E+02	2.1E-02
Y-91	7.3E-04	3.6E+00	9.6E-05
Y-92	9.8E-02	4.8E+02	1.3E-02
Y-93	6.9E-02	3.4E+02	9.1E-03
Zr-95	1.5E-04	7.3E-01	2.0E-05
Nb-95	1.5E-04	7.3E-01	2.0E-05
Mo-99	1.3E-01	6.4E+02	1.7E-02
Tc-99m	3.6E-02	1.8E+02	4.8E-03
Ru-103	3.6E-04	1.8E+00	4.8E-05
Rh-103m	3.6E-04	1.8E+00	4.8E-05
Ru-106	5.5E-05	2.7E-01	7.3E-06
Rh-106	5.5E-05	2.7E-01	7.3E-06
Ag-110m	1.8E-05	8.8E-02	2.4E-06
Te-129m	4.5E-02	2.2E+02	5.9E-03
Te-131m	1.8E-03	8.8E+00	2.4E-04
Te-132	8.4E-04	4.1E+00	1.1E-04
Ba-140	1.7E-01	8.3E+02	2.2E-02
La-140	7.3E-03	3.6E+01	9.6E-04
Ce-141	5.5E-04	2.7E+00	7.3E-05
Ce-144	5.5E-05	2.7E-01	7.3E-06
Pr-144	5.3E-03	2.7E-01	7.3E-06
W-187	5.3E-03	2.6E+01	7.0E-04
Np-239	4.2E-01	2.1E+03	5.5E-02
Total		2.1E+06	5.7E+01

CWR COL 12.2-4-A

Table 12.2-206 Radioactive Sources Used for Radiation Monitoring and Laboratory and Portable Monitoring Instrumentation[1]

Radioactive Licensee Material (Element and Mass Number)[1]	Chemical and/or Physical Form[1]	Maximum Quantity that Licensee May Possess at Any One Time[1]
Any byproduct material with atomic numbers 1 through 93	Sealed Sources[2]	No single source to exceed 100 millicuries 5 Curies total
Americium – 241	Sealed Sources[2]	No single source to exceed 300 millicuries 500 millicuries total

1. This information remains in effect between issuance of the COL and 10 CFR 52.103(g) finding and will be designated historical information after that time.
2. Includes calibration and reference sources.

CWR COL 12.2-4-A

Table 12.2-207 Non-Fuel Special Nuclear Material for Use

The radioactive material identified below represents nominal values of known non-fuel special nuclear material specifically required for use at Unit 3.

(a) Element and Mass Number	(b) Chemical or Physical Form	(c) Maximum Amount
U-234 (approx. 78%) U-235 (approx. 22%)	Local Power Range Monitor Assemblies – Each Assembly includes Four Fission Chambers - (64 assemblies and 4 spares)	0.0104 grams of Uranium per assembly. Total of approx. 0.71 grams
U-234 (approx. 78%) U-235 (approx. 22%)	Startup Range Nuclear Monitor Assemblies – Fission Chambers (12 installed assemblies and 1 spare)	0.0129 grams of Uranium per assembly. Total of approx. 0.17 grams

12.3 Radiation Protection

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

NAPS DEP 11.4-1 Insert the following at the beginning of this section.

As described in Section 11.4, the Radwaste Building is reconfigured from the standard plant layout to accommodate increased storage capacity of Class B and C solid waste. Specifically, the waste storage capacity of the Radwaste Building Class B and C waste is increased to approximately 10 years.

Equipment locations were revised to provide an enhanced arrangement. However, tank sizes, tank contents and source terms are the same as those in the DCD. The thicknesses for Radwaste Building walls presented in Table 12.3-8R were evaluated against those same walls in DCD Table 12.3-8 and revised if necessary to maintain the same radiation zones as those identified in the DCD. As such, radiation levels and required shielding remain the same regardless of tank location.

A qualitative evaluation of each wall in the Radwaste Building was performed. The evaluation consisted of comparing the thickness and function of a wall in Table 12.3-8R to the same wall in the DCD. If the value in Table 12.3-8R was equal to or greater than that shown in DCD Table 12.3-8, the value in Table 12.3-8R is more conservative and no further evaluation is required. If the value in Table 12.3-8R is less than that shown in the DCD table, then the function of the wall was identified and the thickness compared to the corresponding function in the DCD; the wall thickness was updated as needed. In this manner, the radiation zones are maintained the same as those in the DCD.

12.3.1.4.5 Radwaste Building

Add the following two bullet items at the end of the bulleted list of the first paragraph.

NAPS DEP 11.4-1

- Provision for control of fluids exiting high activity rooms, including provision to isolate floor drains, and remote operation of control valves from the RW control room.

- Piping from high activity rooms (process and drain piping) are arranged to minimize exposure to normally occupied areas, and are designed to maintain radiation levels in the RWB process system area as shown in Figures 12.3-19R through 12.3-22R.

12.3.1.5 Minimization of Contamination and Radioactive Waste Generation

CWR COL 12.3-4-A

Replace the second sentence in the second paragraph with the following.

Section 12.3.1.5.2 describes operational procedures and program concepts associated with the Regulatory Position.

12.3.1.5.1 Design Considerations

Replace the first sentence and four subbullets of the fourteenth bullet of the third paragraph with the following.

NAPS DEP 12.3-1

- The following piping contain segments that will have to run underground:
  - •• Condensate Storage Tank (CST) Piping and CST Retention Area Drain
  - •• Radwaste Effluent Discharge Pipeline
  - •• Hot Machine Shop and Maintenance Building Drain

Add the following after the bullets in the third paragraph:

CWR COL 12.3-4-A

There are no other underground piping segments that require features to minimize contamination or monitoring to ensure that the potential for unmonitored, uncontrolled releases of radioactivity to the environment is minimized.

12.3.1.5.2 Operational/Programmatic Considerations

Replace the DCD section with the following

CWR COL 12.3-4-A

Programs and procedures are implemented consistent with NEI 08-08A, “Generic FSAR Template Guidance for Life Cycle Minimization of Contamination,” to meet the operational and post-construction objectives

of Regulatory Guide 4.21 and the requirements of 10 CFR 20.1406. These include:

- Operational practices are periodically reviewed to ensure operating procedures reflect the installation of new or modified equipment, personnel qualification and training are kept current, and facility personnel are following the operating procedures.
- Decommissioning is facilitated by maintenance of records relating to facility design and construction, facility design changes, site conditions before and after construction, onsite waste disposal and contamination and results of radiological surveys.
- A conceptual site model (based on site characterization and facility design and construction) that aids in the understanding of the interface with environmental systems and the features that control the movement of contamination in the environment is maintained.
- The final site configuration will be evaluated after construction to assist in preventing the migration of radionuclides offsite via unmonitored pathways.
- An onsite contamination monitoring program is implemented along the potential pathways from the release sources to the receptor points.

Measures are implemented in operating procedures to minimize contamination. Appendix 12BB establishes contamination control measures to ensure compliance with 10 CFR 20.1406. Practical measures to prevent the spread of contamination are employed, including:

- Engineering controls, such as portable ventilation or filtration units to reduce concentrations of radioactivity in air or fluids, are used where practical.
- Criteria for selecting tools, material, and equipment for use in contaminated areas include minimizing the use of porous or other materials that are difficult to decontaminate.
- Leaks and spills are contained promptly and repaired or cleaned up as soon as practical.
- Containments, caches, and enclosures are used during maintenance, repairs, and testing, when practical, to contain spills or releases.
- Contaminated tools and equipment are segregated from clean tools and equipment.

- Potentially contaminated systems, equipment, and components are surveyed for the presence of contamination when opened or prior to removal.
- Procedures ensure that equipment performs and is operated in accordance with the design requirements.
- Temporary and permanent design modifications require compensatory measures be taken to prevent and limit the spread of contamination.

12.3.4 Area Radiation and Airborne Radioactivity Monitoring Instrumentation

Replace the last bullet with the following.

STD COL 12.3-2-A

The radiation instrumentation that monitors airborne radioactivity is classified as nonsafety-related. Airborne radiation monitoring operational considerations, such as the procedures for operation and calibration of the monitors, as well as the placement of the portable monitors, are discussed in Section 12.5.

12.3.7 COL Information

12.3-2-A Operational Considerations

STD COL 12.3-2-A

This COL item is addressed in Section 12.3.4.

12.3-4-A Compliance with 10 CFR 20.1406

STD COL 12.3-4-A

This COL item is addressed in Section 12.3.1.5.2.

12.3.8 References

12.3-201 Nuclear Energy Institute, Generic FSAR Template Guidance for Life Cycle Minimization of Contamination, NEI 08-08A, Rev. 0.

NAPS DEP 11.4-1

Table 12.3-8R Shielding Geometry (Nominal)

Elev.	Room	Room Name	North	East	South	West	Floor	Ceiling
		Nuclear Island			**cm (in)**			
-11500	1151	RWCU/SDC Heat Exchanger Room A	75 (30)	110 (43)	100 (39)	100/75 (39/30)	Ground	70 (28)
-11500	1152	RWCU/SDC Pump Room A	60 (24)	55 (22)	55 (22)	60/40 (24/16)	Ground	110 (43)
-11500	1161	RWCU/SDC Heat Exchanger Room B	75 (30)	100 (39)	100/75 (39/30)	110 (43)	Ground	70 (28)
-11500	1162	RWCU/SDC Pump Room B	60 (24)	60 (24)	70 (28)	35 (14)	Ground	70 (28)
-11500	2102	FAPC Backwash Tank Room	70 (28)	80 (31)	90 (35)	Exterior Below Grade	Ground	90 (35)
-11500	2150	FAPC Pump/Heat Exchanger Room A	35 (14)	70 (28)	Exterior Below Grade	30 (12)	Ground	70 (28)
-11500	2151	Backwash Transfer Pump Room A	90 (35)	105 (41)	70 (28)	Exterior Below Grade	Ground	70 (28)
-11500	2160	FAPC Pump/Heat Exchanger Room B	35 (14)	30 (12)	Exterior Below Grade	35 (14)	Ground	70 (28)
-11500	2161	Backwash Transfer Pump Room B	70 (28)	105 (41)	70 (28)	Exterior Below Grade	Ground	70 (28)
-6400	1250	RWCU/SDC Heat Exchanger Room A	110(43)	110 (43)	100 (39)	100 (39)	70 (28)	70 (28)
-6400	1251	RWCU/SDC Filter/Demineralizer Vault A1	135 (53)	150 (59)	80 (31)	135 (53)	110 (43)	110 (43)
-6400	1252	RWCU/SDC Filter/Demineralizer Vault A2	80 (31)	150 (59)	80 (31)	135 (53)	110 (43)	110 (43)

NAPS DEP 11.4-1

Table 12.3-8R Shielding Geometry (Nominal)

Elev.	Room	Room Name	North	East	South	West	Floor	Ceiling
		Nuclear Island (continued)			**cm (in)**			
-6400	1260	RWCU/SDC Heat Exchanger Room B	110(43)	100 (39)	100 (39)	100 (39)	70 (28)	70 (28)
-6400	1261	RWCU/SDC Filter/Demineralizer Vault B1	135(53)	110 (43)	150 (59)	100 (39)	110 (43)	110 (43)
-6400	1262	RWCU/SDC Filter/Demineralizer Vault B2	135(53)	110 (43)	150 (59)	100 (39)	110 (43)	110 (43)
-6400	2251	FAPC Filter/Demineralizer Vault 1	90 (35)	80 (31)	60 (24)	90 (35)	80 (31)	80 (31)
-6400	2261	FAPC Filter/Demineralizer Vault 2	60 (24)	80 (31)	Exterior Below Grade	90 (35)	80 (31)	80 (31)
		Radwaste Building			**cm (in)**			
-9350	6103	Equipment Drain Collection Tank Room A	~~70 (28)~~ 120 (47)	~~60 (24)~~ 90 (35)	~~60 (24)~~ 80 (31)	60 (24)	Ground	~~80 (31)~~ 91 (36)
-9350	6104	Equipment Drain Collection Tank Room B	~~70 (28)~~ 120 (47)	60 (24)	~~60 (24)~~ 80 (31)	~~80 (31)~~ 60 (24)	Ground	~~80 (31)~~ 91 (36)
-9350	6105	Equipment Drain Collection Tank Room C	~~60 (24)~~ 120 (47)	60 (24)	80 (31)	~~80 (31)~~ 60 (24)	Ground	~~80 (31)~~ 91 (36)
-9350	6106	~~Condensate~~ Low Activity Resin Holdup Tank Room	~~Exterior Below Grade~~ 60 (24)	~~40 (16)~~ 60 (24)	~~80 (31)~~ 130 (51)	60 (24)	Ground	~~80 (31)~~ 91 (36)
-9350	6107	~~Low Activity~~ Condensate Resin Holdup Tank Room	~~Exterior Below Grade~~ 60 (24)	~~80 (31)~~ 90 (35)	~~60 (24)~~ 130 (51)	~~Exterior Below Grade~~ 60 (24)	Ground	~~80 (31)~~ 91 (36)

NAPS DEP 11.4-1

Table 12.3-8R Shielding Geometry (Nominal)

Elev.	Room	Room Name	North	East	South	West	Floor	Ceiling
		Radwaste Building (continued)			**cm (in)**			
-9350	6108	High Activity Resin Holdup Tank Room	~~80 (31)~~ 110 (43)	100 (39)	~~80 (31)~~ 130 (51)	~~Exterior Below Grade~~ 110 (43)	Ground	~~80 (31)~~ 91 (36)
-9350	6109	Concentrated Waste Tank Room	~~70 (28)~~ 60 (24)	~~90 (35)~~ 60 (24)	~~90 (35)~~ 130 (51)	~~Exterior Below Grade~~ 90 (35)	Ground	~~80 (31)~~ 91 (36)
-9350	6150	Floor Drain Collection Tank Room A	~~70 (28)~~ 120 (47)	~~80 (31)~~ 60 (24)	~~60 (24)~~ 80 (31)	60 (24)	Ground	~~80 (31)~~ 91 (36)
~~-9350~~	~~6151~~	~~High Activity Phase Separator Room~~	~~Exterior Below Grade~~	~~90 (35)~~	~~100 (39)~~	~~70 (28)~~	~~Ground~~	~~80 (31)~~
-9350	6160	Floor Drain Collection Tank Room B	~~60 (24)~~ 120 (47)	~~80 (31)~~ 60 (24)	80 (31)	60 (24)	Ground	~~80 (31)~~ 91 (36)
-9350	6161	Low Activity Phase Separator Room	~~Exterior Below Grade~~ 60 (24)	70 (28)	~~100 (39)~~ 130 (51)	60 (24)	Ground	~~80 (31)~~ 91 (36)
-9350	6171	Floor & Equipment Drain Sample Tank Room	~~Exterior Below Grade~~ 120 (47)	~~35 (14)~~ 60 (24)	~~30 (12)~~ 60 (24)	~~30 (12)~~ 120 (47)	Ground	~~80 (31)~~ 91 (36)
~~-9350~~	~~6172~~	~~Equipment Drain Sample Tank Room~~	~~30 (12)~~	~~35 (14)~~	~~30 (12)~~	~~30 (12)~~	~~Ground~~	~~80 (31)~~
-2350	6103	Equipment Drain Collection Tank Room A	~~70 (28)~~ 120 (47)	~~60 (24)~~ 90 (35)	~~60 (24)~~ 80 (31)	60 (24)	~~Ground~~ N/A	~~80 (31)~~ 91 (36)

NAPS DEP 11.4-1

Table 12.3-8R Shielding Geometry (Nominal)

Elev.	Room	Room Name	North	East	South	West	Floor	Ceiling
		Radwaste Building (continued)			**cm (in)**			
-2350	6104	Equipment Drain Collection Tank Room B	~~70 (28)~~ 120 (47)	60 (24)	~~60 (24)~~ 80 (31)	~~80 (31)~~ 60 (24)	~~Ground~~ N/A	~~80 (31)~~ 91 (36)
-2350	6105	Equipment Drain Collection Tank Room C	~~60 (24)~~ 120 (47)	60 (24)	80 (31)	~~80 (31)~~ 60 (24)	~~Ground~~ N/A	~~80 (31)~~ 91 (36)
-2350	6106	~~Condensate~~ Low Activity Resin Holdup Tank Room	~~Exterior Below Grade~~ 60 (24)	~~40 (16)~~ 60 (24)	~~80 (31)~~ 130 (51)	60 (24)	~~Ground~~ N/A	~~80 (31)~~ 91 (36)
-2350	6107	~~Low Activity~~ Condensate Resin Holdup Tank Room	~~Exterior Below Grade~~ 60 (24)	~~80 (31)~~ 90 (35)	~~60 (24)~~ 130 (51)	~~Exterior Below Grade~~ 60 (24)	~~Ground~~ N/A	~~80 (31)~~ 91 (36)
-2350	6108	High Activity Resin Holdup Tank Room	~~80 (31)~~ 110 (43)	100 (39)	~~80 (31)~~ 130 (51)	~~Exterior Below Grade~~ 110 (43)	~~Ground~~ N/A	~~80 (31)~~ 91 (36)
-2350	6109	Concentrated Waste Tank Room	~~70 (28)~~ 60 (24)	~~90 (35)~~ 60 (24)	~~90 (35)~~ 130 (51)	~~Exterior Below Grade~~ 90 (35)	~~Ground~~ N/A	~~80 (31)~~ 91 (36)
-2350	6150	Floor Drain Collection Tank Room A	~~70 (28)~~ 120 (47)	~~80 (31)~~ 60 (24)	~~60 (24)~~ 80 (31)	60 (24)	~~Ground~~ N/A	~~80 (31)~~ 91 (36)
-2350	~~6151~~ 6251	High Activity Phase Separator Room	~~Exterior Below Grade~~ 100 (39)	100 (39)	~~100 (39)~~ 90 (35)	~~70 (28)~~ 100 (39)	~~Ground~~ 90 (35)	~~80 (31)~~ 91 (36)

NAPS DEP 11.4-1

Table 12.3-8R Shielding Geometry (Nominal)

Elev.	Room	Room Name	North	East	South	West	Floor	Ceiling
		Radwaste Building (continued)			**cm (in)**			
-2350	6160	Floor Drain Collection Tank Room B	~~60 (24)~~ 120 (47)	~~80 (31)~~ 60 (24)	80 (31)	60 (24)	~~Ground~~ N/A	~~80 (31)~~ 91 (36)
-2350	6161	Low Activity Phase Separator Room	~~Exterior Below Grade~~ 60 (24)	70 (28)	~~100 (39)~~ 130 (31)	60 (24)	~~Ground~~ N/A	~~80 (31)~~ 91 (36)
-2350	6171	Floor & Equipment Drain Sample Tank Room	~~Exterior Below Grade~~ 120 (47)	~~35 (14)~~ 60 (24)	~~30 (12)~~ 60 (24)	~~30 (12)~~ 120 (47)	~~Ground~~ N/A	~~80 (31)~~ 91 (36)
~~-2350~~	~~6172~~	~~Equipment Drain Sample Tank Room~~	~~30 (12)~~	~~35 (14)~~	~~30 (12)~~	~~30 (12)~~	~~Ground~~	~~80 (31)~~
		Turbine Building			**cm (in)**			
-1400	4196	Off-Gas Charcoal Absorber Vessel Vault	150 (59)	150 (59)	120 (47)	120 (47)	Ground	-
-1400	4197	Main Condenser Vault	110 (43)	110 (43)	70 (28)	120 (47)	Ground	
-1400	4182A	Condensate Pleated Filter Vault A	50 (20)	60 (24)	50 (20)	110 (43)	Ground	100 (39)
-1400	4182B-E	Condensate Pleated Filter Vault B-E	50 (20)	60 (24)	50 (20)	110 (43)	Ground	100 (39)
-1400	4182F	Condensate Pleated Filter Vault F	50 (20)	60 (24)	55 (22)	110 (43)	Ground	100 (39)
-1400	4183	Condensate Filter Backwash Receiving Tank Vault	60 (24)	65 (26)	85 (33)	95 (37)	Ground	100 (39)
-1400	4180	Condensate Demin. Resin Receiving Tank Vault	100 (39)	100 (39)	80 (31)	90 (35)	Ground	100 (39)
4650	4206B	Condensate Drain Tank and Steam Jet Air Ejector/H2 Recombiner & Cooler Room B	150 (59)	150 (59)	120 (47)	150 (59)	100 (39)	120 (47)

NAPS DEP 11.4-1

Table 12.3-8R Shielding Geometry (Nominal)

Elev.	Room	Room Name	North	East	South	West	Floor	Ceiling
		Turbine Building (continued)	cm (in)					
4650	4206A	Steam Jet Air Ejector/H2 Recombiner & Cooler Room A	120 (47)	150 (59)	120 (47)	150 (59)	100 (39)	120 (47)
4650	4281A	Condensate Deep Bed Demineralizer Vault A	35 (14)	90 (35)	35 (14)	60 (24)	100 (39)	100 (39)
4650	4281B-G	Condensate Deep Bed Demineralizer Vault B-G	35 (14)	90 (35)	35 (14)	60 (24)	100 (39)	100 (39)
4650	4281H	Condensate Deep Bed Demineralizer Vault H	35 (14)	90 (35)	90 (35)	60 (24)	100 (39)	100 (39)
12000	4301A	Feedwater Heater 5Aand 6A Room	155 (61)	155 (61)	155 (61)	100 (39)	155 (61)	100 (39)
12000	4301B	Feedwater Heater 5B and 6B Room	155 (61)	155 (61)	155 (61)	100 (39)	155 (61)	100 (39)
12000	4391	Turbine Building Steam Tunnel	150 (59)	150 (59)	150 (59)	150 (59)	-	
20000	4402A	Feedwater Heater 7A Room	155 (61)	155 (61)	155 (61)	110 (43)	155 (45)	100 (39)
20000	4402B	Feedwater Heater 7B Room	155 (61)	155 (61)	155 (61)	110 (43)	155 (45)	100 (39)
28000	4504	Feedwater Heater 4 and Feedwater Storage Tank Room	150 (59)	150 (59)	150 (59)	110 (43)	115 (45)	115 (45)
28000	4505	Moisture Separator and Reheater/HP and LP Turbine Room	150 (59)	110 (43)	150 (59)	150 (59)	110 (43)	150 (59)

NAPS DEP 12.3-1

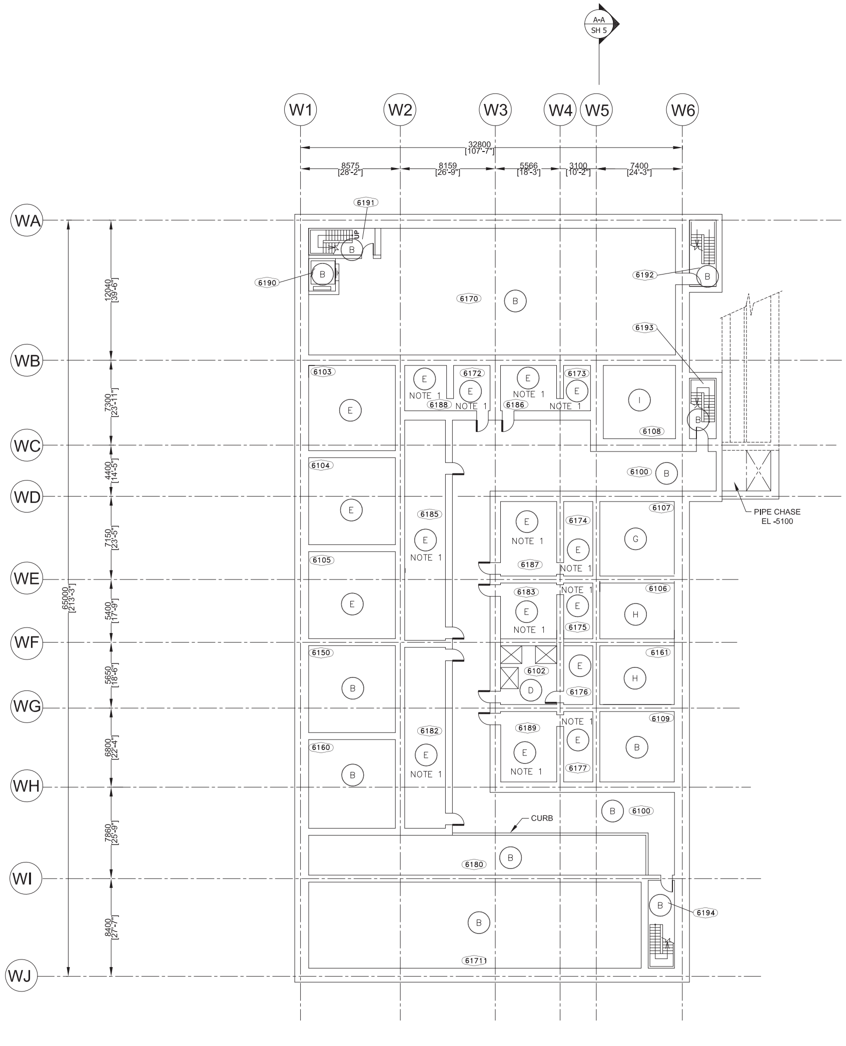
Table 12.3-18R Regulatory Guide 4.21 Design Objective and Applicable DCD Subsection Information

Design Objective 3: Use leak detection methods (e.g., instrumentation, automated samplers) capable of early detection of leaks in areas where it is difficult or impossible to conduct regular inspections (such as for spent fuel pools, tanks that are in contact with the ground and buried, embedded, or subterranean piping) to avoid release of contamination from undetected leaks and to minimize contamination of the environment.

DCD Chapter Section/Subsection	Description of design feature in DCD to meet design objective
10.4 Steam and Power Conversion System: Other Features of Steam and Power Conversion System	
10.4.2.2 Main Condenser Evacuation System Description	Process Radiation Monitoring System (PRMS) radiation detectors in the TBCE system and vent stack produce an alarm in the MCR if abnormal radioactivity is detected (DCD Section 11.5). Radiation monitors are provided on the main steam lines, to trip and isolate the mechanical vacuum pump(s) if abnormal radioactivity is detected in the steam being supplied to the condenser.
10.4.3.5.1.4 Turbine Gland Seal System Effluent Monitoring	The TGSS effluents are normally monitored by a system-dedicated radiation monitor installed on the gland steam condenser exhauster blower discharge. High monitor readings are alarmed in the MCR. The system effluents are then discharged to the TBCE subsystem and the vent stack, where further effluent radiation monitoring is performed (DCD Section 12.2 for the radiological analysis of the TGSS effluents).
10.4.5.6 Circulating Water System Flood Protection	Level switches are provided in the Turbine Building to trip the CIRC pumps and close the required valves in case of a CIRC system component failure. The flooding signal initiates from a high water level detection. In the hypothetical situation of a circulating water system pipe or expansion joint failure, if not detected and isolated, the water discharged would cause internal Turbine Building flooding above grade level, with excess water potentially spilling over on site. If a failure occurred within a condensate system (condenser shell side), the resulting flood level would be below grade level due to the relatively small hotwell inventory relative to the Turbine Building capacity.
11.2 Radioactive Waste Management: Liquid Waste Management System	
11.2.2.1 Liquid Waste Management System Summary Description	Provisions for sampling at important process points are included. Protection against accidental discharge is provided by detection and alarm of abnormal conditions and by administrative controls.
11.2.3.2 Liquid Waste Management System Radioactive Releases	~~All~~ Liquid radioactive releases will be discharged ~~to the circulating water system~~ using the liquid radwaste effluent discharge pipeline. Prior to discharging to the environment, the contents of the tank being released are sampled and analyzed to ensure that the activity concentration is consistent with the discharge criteria of 10 CFR 20 App. B (DCD Reference 11.2-2) and dose commitment in 10 CFR 50, Appendix I (DCD Reference 11.2-6). A radiation monitor provides an automatic closure signal to the discharge line isolation valve.

BASIS: NEW

Figure 12.3-19R Radwaste Building Radiation Zones EL -9350



1ST FLOOR EL.-9350

ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6100	CORRIDOR
6102	HCW, LCW AND DETERGENT SUMP ROOM
6103	EQUIPMENT DRAIN COLLECTION TANK ROOM A
6104	EQUIPMENT DRAIN COLLECTION TANK ROOM B
6105	EQUIPMENT DRAIN COLLECTION TANK ROOM C
6106	LOW ACTIVITY RESIN HOLDUP TANK ROOM
6107	CONDENSATE RESIN HOLDUP TANK ROOM
6108	HIGH ACTIVITY RESIN HOLDUP TANK ROOM
6109	CONCENTRATED WASTE TANK ROOM
6150	FLOOR DRAIN COLLECTION TANK ROOM A
6160	FLOOR DRAIN COLLECTION TANK ROOM B
6161	LOW ACTIVITY PHASE SEPARATOR ROOM
6170	ELECTRICAL EQUIPMENT ROOM
6171	FLOOR & EQUIPMENT DRAIN SAMPLE TANK ROOM
6172	HIGH ACTIVITY DECANT PUMP VALVE GALLERY
6173	HIGH ACTIVITY RESIN HOLUP TANK VALVE GALLERY
6174	CONDENSATE RESIN HOLDUP TANK VALVE GALLERY
6175	LOW ACTIVITY RESIN HOLDUP TANK VALVE GALLERY
6176	LOW ACTIVITY PHASE SEPARATOR VALVE GALLERY
6177	CONCENTRATED WASTE TANK VALVE GALLERY
6180	FLOOR AND EQUIPMENT DRAIN SAMPLE PUMP AREA
6182	FLOOR DRAIN COLLECTION PUMP ROOM
6183	LOW ACTIVITY CIRCULATION PUMP ROOM
6185	EQUIPMENT DRAIN COLLECTION PUMP ROOM
6186	HIGH ACTIVITY CIRCULATION PUMP ROOM
6187	LOW ACTIVITY DECANT PUMP ROOM
6188	HIGH ACTIVITY DECANT PUMP ROOM
6189	CONCENTRATED WASTE PUMP ROOM
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D

LEGEND

A. PLANT RADIATION ZONES:

DESIGNATION DOSE RATE

A $\leqslant$ 6 μSv/hr (0.6 mRem/hr): UNCONTROLLED AND UNLIMITED ACCESS

B $\leqslant$ 10 μSv/hr (1.0 mRem/hr): CONTROLLED AND UNLIMITED ACCESS

C $\leqslant$ 50 μSv/hr (5.0 mRem/hr): CONTROLLED AND LIMITED ACCESS (20 hr/wk)

D $\leqslant$ 250 μSv/hr (25 mRem/hr): CONTROLLED AND LIMITED ACCESS (4hr/wk)

E $\leqslant$ 1 mSv/hr (100 mRem/hr): CONTROLLED AND LIMITED ACCESS (1hr/wk)

F $\leqslant$ 10 mSv/hr (1 Rem/hr): CONTROLLED AND INFREQUENT ACCESS
SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)

G $\leqslant$ 100 mSv/hr (10 Rem/hr): CONTROLLED AND INFREQUENT ACCESS
SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)

H $\leqslant$ 1 Sv/hr (100 Rem/hr): CONTROLLED AND INFREQUENT ACCESS
SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)

I $\leqslant$ 5 Sv/hr (500 Rem/hr): UNCONTROLLED AND INFREQUENT ACCESS
SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)

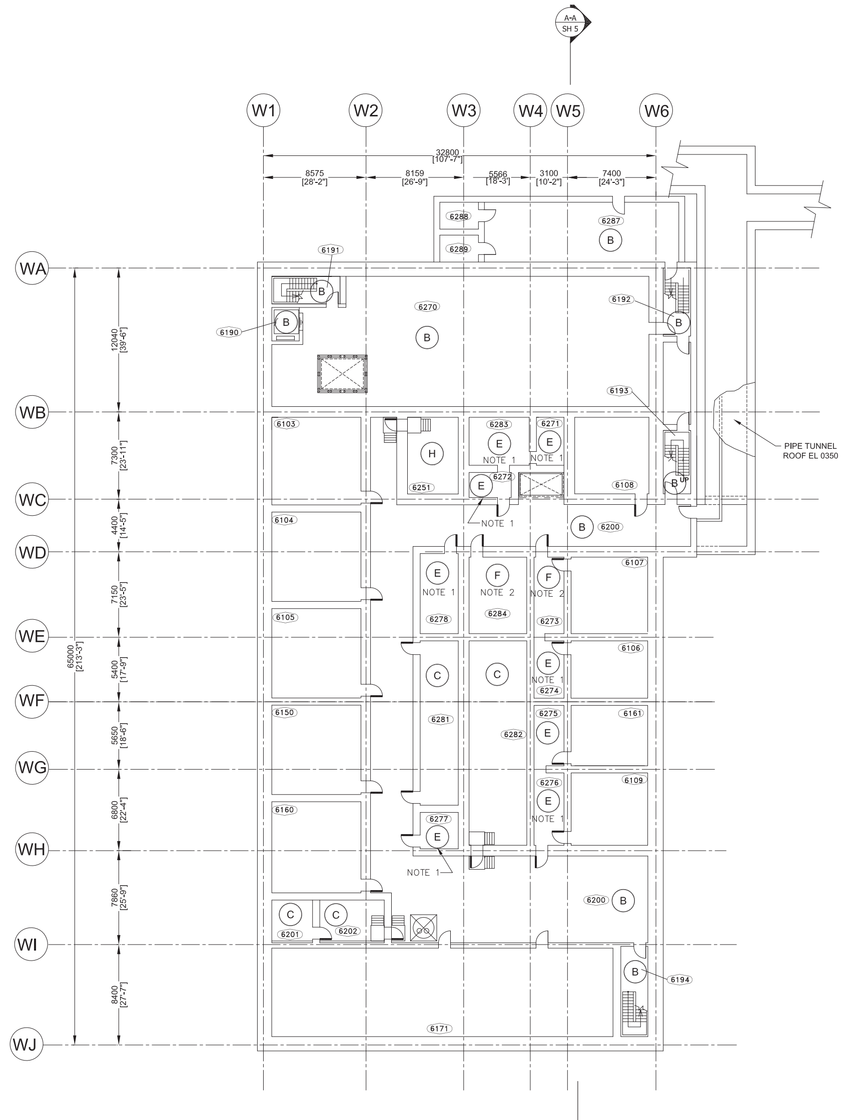
J > 5 Sv/hr (500 Rem/hr): INACCESSIBLE ZONE (VERY HIGH RADIATION ZONE)

C. DRAWING NOTES:

1– ZONE "C" WHEN THE EQUIPMENT IS OFF

BASIS: NEW

Figure 12.3-20R Radwaste Building Radiation Zones EL -2350



2ND FLOOR EL.-2350

ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6103	EQUIPMENT DRAIN COLLECTION TANK ROOM A
6104	EQUIPMENT DRAIN COLLECTION TANK ROOM B
6105	EQUIPMENT DRAIN COLLECTION TANK ROOM C
6106	LOW ACTIVITY RESIN HOLDUP TANK ROOM
6107	CONDENSATE RESIN HOLDUP TANK ROOM
6108	HIGH ACTIVITY RESIN HOLDUP TANK ROOM
6109	CONCENTRATED WASTE TANK ROOM
6150	FLOOR DRAIN COLLECTION TANK ROOM A
6160	FLOOR DRAIN COLLECTION TANK ROOM B
6161	LOW ACTIVITY PHASE SEPARATOR ROOM
6171	FLOOR & EQUIPMENT DRAIN SAMPLE TANK ROOM
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D
6200	CORRIDOR
6201	CHEMICAL DRAIN COLLECTION TANK ROOM
6202	CHEMICAL DRAIN COLLECTION PUMP ROOM
6251	HIGH ACTIVITY PHASE SEPARATOR ROOM
6270	CONTROL ROOM
6271	HIGH ACTIVITY RESIN HOLDUP TANK VALVE GALLERY
6272	HIGH ACTIVITY PHASE SEPARATOR VALVE GALLERY
6273	CONDENSATE RESIN HOLDUP TANK VALVE GALLERY
6274	LOW ACTIVITY RESIN HOLDUP TANK VALVE GALLERY
6275	LOW ACTIVITY PHASE SEPARATOR VALVE GALLERY
6276	CONCENTRATED WASTE TANK VALVE GALLERY
6277	FLOOR DRAIN COLLECTION & CHEMICAL DRAIN TANKS VALVE GALLERY
6278	EQUIPMENT DRAIN COLLECTION TANK VALVE GALLERY
6281	DETERGENT DRAIN COLLECTION AND SAMPLE PUMP ROOM
6282	DETERGENT DRAIN COLLECTION & SAMPLE TANK ROOM
6283	HIGH ACTIVITY TRANSFER PUMPS ROOM
6284	LOW ACTIVITY TRANSFER PUMPS ROOM
6287	FOYER
6288	TOILET
6289	LOCKER ROOM

LEGEND

A. PLANT RADIATION ZONES:

DESIGNATION DOSE RATE

- A $\leqslant$ 6 µSv/hr (0.6 mRem/hr): UNCONTROLLED AND UNLIMITED ACCESS
- B $\leqslant$ 10 µSv/hr (1.0 mRem/hr): CONTROLLED AND UNLIMITED ACCESS
- C $\leqslant$ 50 µSv/hr (5.0 mRem/hr): CONTROLLED AND LIMITED ACCESS (20 hr/wk)
- D $\leqslant$ 250 µSv/hr (25 mRem/hr): CONTROLLED AND LIMITED ACCESS (4hr/wk)
- E $\leqslant$ 1 mSv/hr (100 mRem/hr): CONTROLLED AND LIMITED ACCESS (1hr/wk)
- F $\leqslant$ 10 mSv/hr (1 Rem/hr): CONTROLLED AND INFREQUENT ACCESS SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)
- G $\leqslant$ 100 mSv/hr (10 Rem/hr): CONTROLLED AND INFREQUENT ACCESS SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)
- H $\leqslant$ 1 Sv/hr (100 Rem/hr): CONTROLLED AND INFREQUENT ACCESS SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)
- I $\leqslant$ 5 Sv/hr (500 Rem/hr): UNCONTROLLED AND INFREQUENT ACCESS SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)
- J > 5 Sv/hr (500 Rem/hr): INACCESSIBLE ZONE (VERY HIGH RADIATION ZONE)

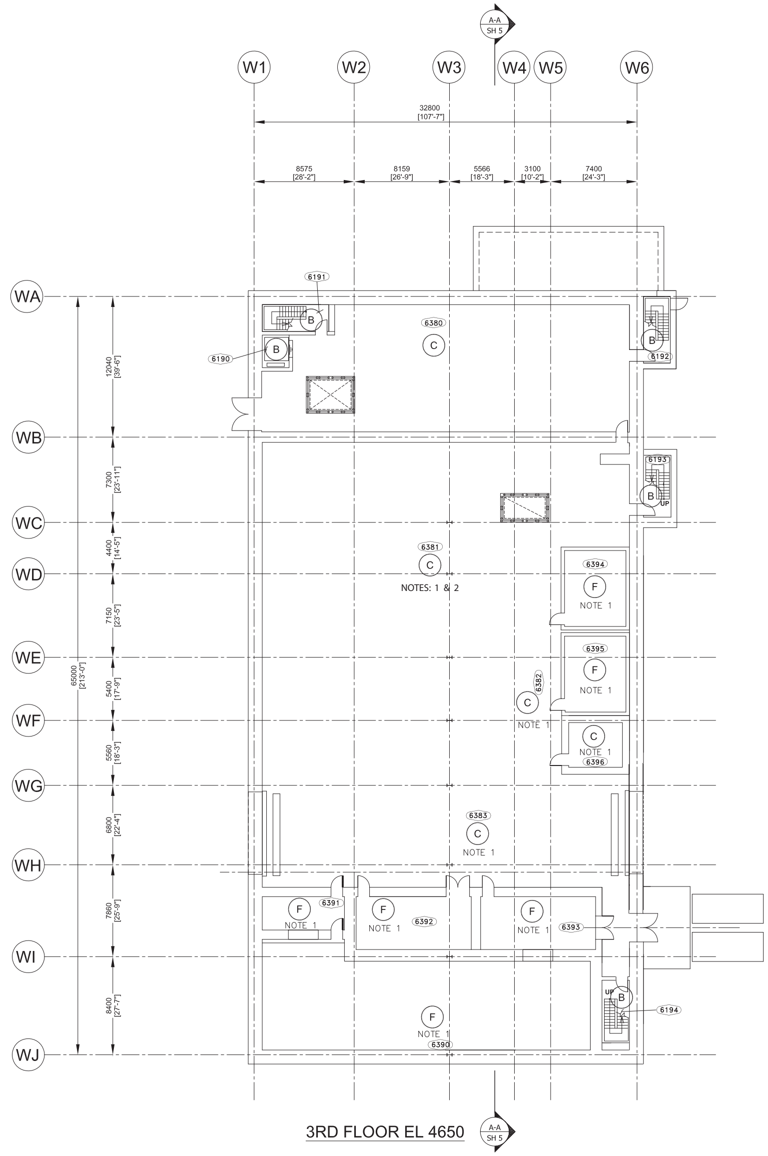
C. DRAWING NOTES:

1- ZONE "C" WHEN THE EQUIPMENT IS OFF

2- ZONE "E" WHEN THE EQUIPMENT IS OFF

BASIS: NEW

NAPS DEP 11.4-1 **Figure 12.3-21R Radwaste Building Radiation Zones EL 4650**



3RD FLOOR EL 4650

ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D
6380	AIR EXHAUST FACILITIES ROOM
6381	PROCESSING SUBSYSTEMS AREA
6382	CORRIDOR
6383	TRAILER ACCESS
6390	CLASS B/C STORAGE AREA
6391	CLASS A STORAGE AREA
6392	DRY ACTIVE WASTE STORAGE AREA
6393	SORTING ROOM
6394	SWMS PROCESSING SUBSYSTEM – DEWATERING SKID A
6395	SWMS PROCESSING SUBSYSTEM – DEWATERING SKID B
6396	CRANE CCTV AND DEWATERING CONTROL ROOM

LEGEND

A. PLANT RADIATION ZONES:

DESIGNATION DOSE RATE

- A $\leqslant$ 6 μSv/hr (0.6 mRem/hr): UNCONTROLLED AND UNLIMITED ACCESS
- B $\leqslant$ 10 μSv/hr (1.0 mRem/hr): CONTROLLED AND UNLIMITED ACCESS
- C $\leqslant$ 50 μSv/hr (5.0 mRem/hr): CONTROLLED AND LIMITED ACCESS (20 hr/wk)
- D $\leqslant$ 250 μSv/hr (25 mRem/hr): CONTROLLED AND LIMITED ACCESS (4hr/wk)
- E $\leqslant$ 1 mSv/hr (100 mRem/hr): CONTROLLED AND LIMITED ACCESS (1hr/wk)
- F $\leqslant$ 10 mSv/hr (1 Rem/hr): CONTROLLED AND INFREQUENT ACCESS
SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)
- G $\leqslant$ 100 mSv/hr (10 Rem/hr): CONTROLLED AND INFREQUENT ACCESS
SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)
- H $\leqslant$ 1 Sv/hr (100 Rem/hr): CONTROLLED AND INFREQUENT ACCESS
SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)
- I $\leqslant$ 5 Sv/hr (500 Rem/hr): UNCONTROLLED AND INFREQUENT ACCESS
SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)
- J > 5 Sv/hr (500 Rem/hr): INACCESSIBLE ZONE (VERY HIGH RADIATION ZONE)

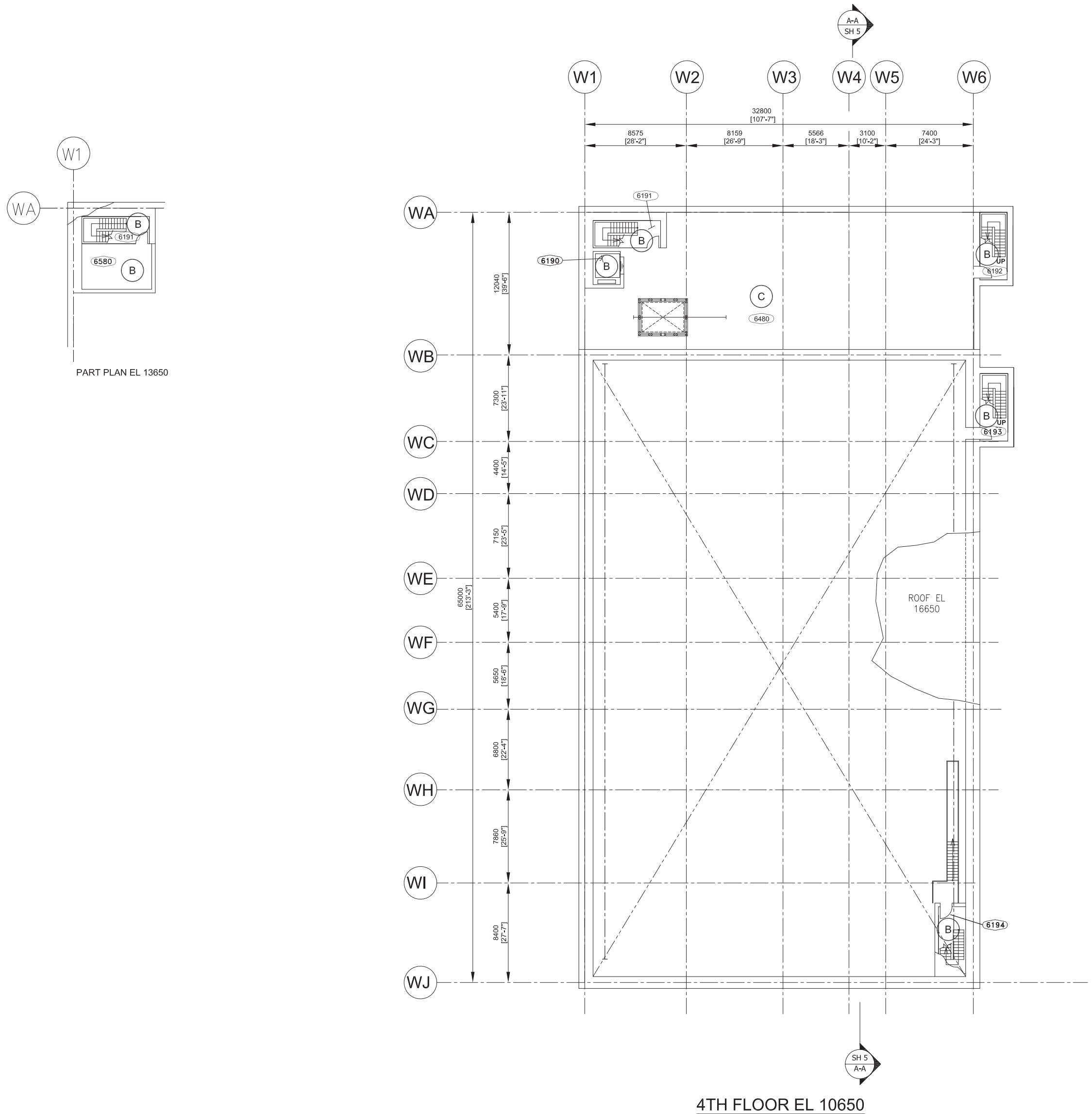
C. DRAWING NOTES:

1 - RADIAT ION ZONE LEVEL MAY BE REDUCED WHEN TREATMENT SYSTEM IS OFF BASED ON ACTUAL SURVEY RESULTS

2 - THE SKID-MOUNTED PROCESSING SUBSYSTEMS, LOCATED IN ROOM 6381, ARE INDIVIDUALLY SHIELDED TO ALLOW PERSONNEL ACCESS TO THE ROOM, WHICH IS CLASSIFIED AS RADIATION ZONE C

BASIS: NEW

Figure 12.3-22R Radwaste Building Radiation Zones EL 10650



ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D
6480	AIR CONDITIONING ROOM
6580	ELEV MACHINE ROOM

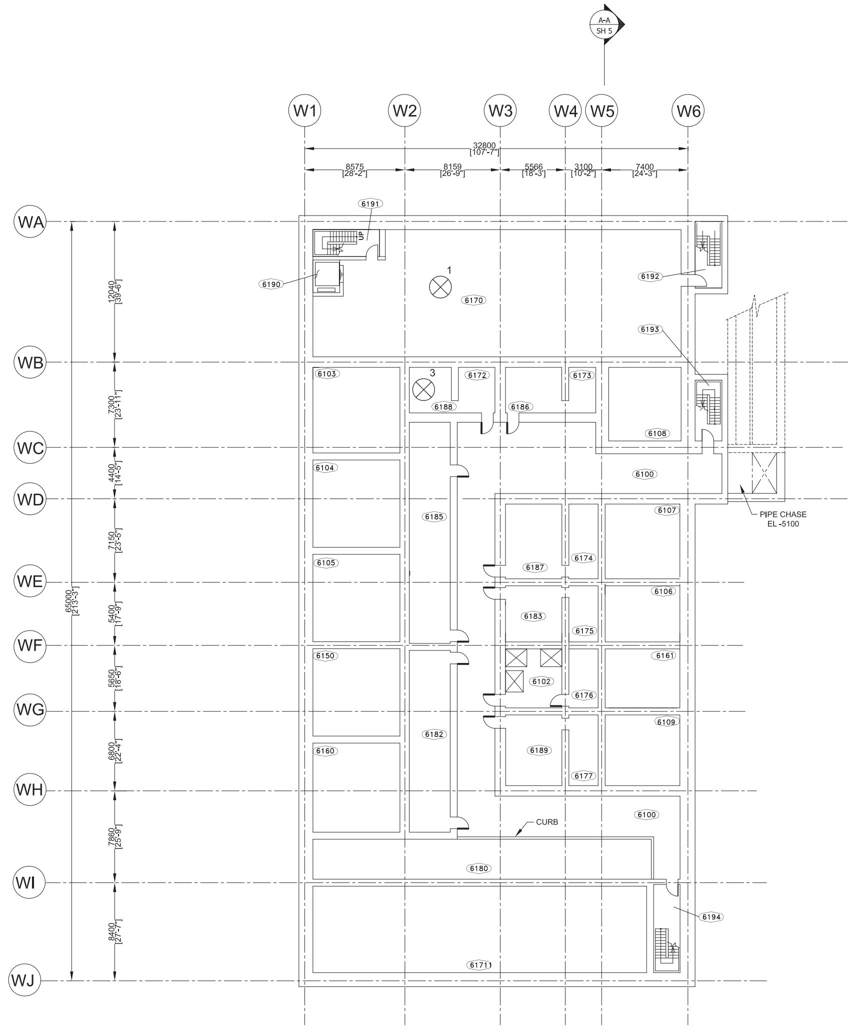
LEGEND

A. PLANT RADIATION ZONES:

DESIGNATION DOSE RATE

- A $\leqslant$ 6 μSv/hr (0.6 mRem/hr): UNCONTROLLED AND UNLIMITED ACCESS
- B $\leqslant$ 10 μSv/hr (1.0 mRem/hr): CONTROLLED AND UNLIMITED ACCESS
- C $\leqslant$ 50 μSv/hr (5.0 mRem/hr): CONTROLLED AND LIMITED ACCESS (20 hr/wk)
- D $\leqslant$ 250 μSv/hr (25 mRem/hr): CONTROLLED AND LIMITED ACCESS (4hr/wk)
- E $\leqslant$ 1 mSv/hr (100 mRem/hr): CONTROLLED AND LIMITED ACCESS (1hr/wk)
- F $\leqslant$ 10 mSv/hr (1 Rem/hr): CONTROLLED AND INFREQUENT ACCESS SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)
- G $\leqslant$ 100 mSv/hr (10 Rem/hr): CONTROLLED AND INFREQUENT ACCESS SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)
- H $\leqslant$ 1 Sv/hr (100 Rem/hr): CONTROLLED AND INFREQUENT ACCESS SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)
- I $\leqslant$ 5 Sv/hr (500 Rem/hr): UNCONTROLLED AND INFREQUENT ACCESS SPECIAL AUTHORIZATION IS REQUIRED (HIGH RADIATION ZONE)
- J > 5 Sv/hr (500 Rem/hr): INACCESSIBLE ZONE (VERY HIGH RADIATION ZONE)

NAPS DEP 11.4-1 **Figure 12.3-39R Radwaste Building Radiation Monitors EL -9350**



1ST FLOOR EL.-9350

ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6100	CORRIDOR
6102	HCW, LCW AND DETERGENT SUMP ROOM
6103	EQUIPMENT DRAIN COLLECTION TANK ROOM A
6104	EQUIPMENT DRAIN COLLECTION TANK ROOM B
6105	EQUIPMENT DRAIN COLLECTION TANK ROOM C
6106	LOW ACTIVITY RESIN HOLDUP TANK ROOM
6107	CONDENSATE RESIN HOLDUP TANK ROOM
6108	HIGH ACTIVITY RESIN HOLDUP TANK ROOM
6109	CONCENTRATED WASTE TANK ROOM
6150	FLOOR DRAIN COLLECTION TANK ROOM A
6160	FLOOR DRAIN COLLECTION TANK ROOM B
6161	LOW ACTIVITY PHASE SEPARATOR ROOM
6170	ELECTRICAL EQUIPMENT ROOM
6171	FLOOR & EQUIPMENT DRAIN SAMPLE TANK ROOM
6172	HIGH ACTIVITY DECANT PUMP VALVE GALLERY
6173	HIGH ACTIVITY RESIN HOLUP TANK VALVE GALLERY
6174	CONDENSATE RESIN HOLDUP TANK VALVE GALLERY
6175	LOW ACTIVITY RESIN HOLDUP TANK VALVE GALLERY
6176	LOW ACTIVITY PHASE SEPARATOR VALVE GALLERY
6177	CONCENTRATED WASTE TANK VALVE GALLERY
6180	FLOOR AND EQUIPMENT DRAIN SAMPLE PUMP AREA
6182	FLOOR DRAIN COLLECTION PUMP ROOM
6183	LOW ACTIVITY CIRCULATION PUMP ROOM
6185	EQUIPMENT DRAIN COLLECTION PUMP ROOM
6186	HIGH ACTIVITY CIRCULATION PUMP ROOM
6187	LOW ACTIVITY DECANT PUMP ROOM
6188	HIGH ACTIVITY DECANT PUMP ROOM
6189	CONCENTRATED WASTE PUMP ROOM
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D

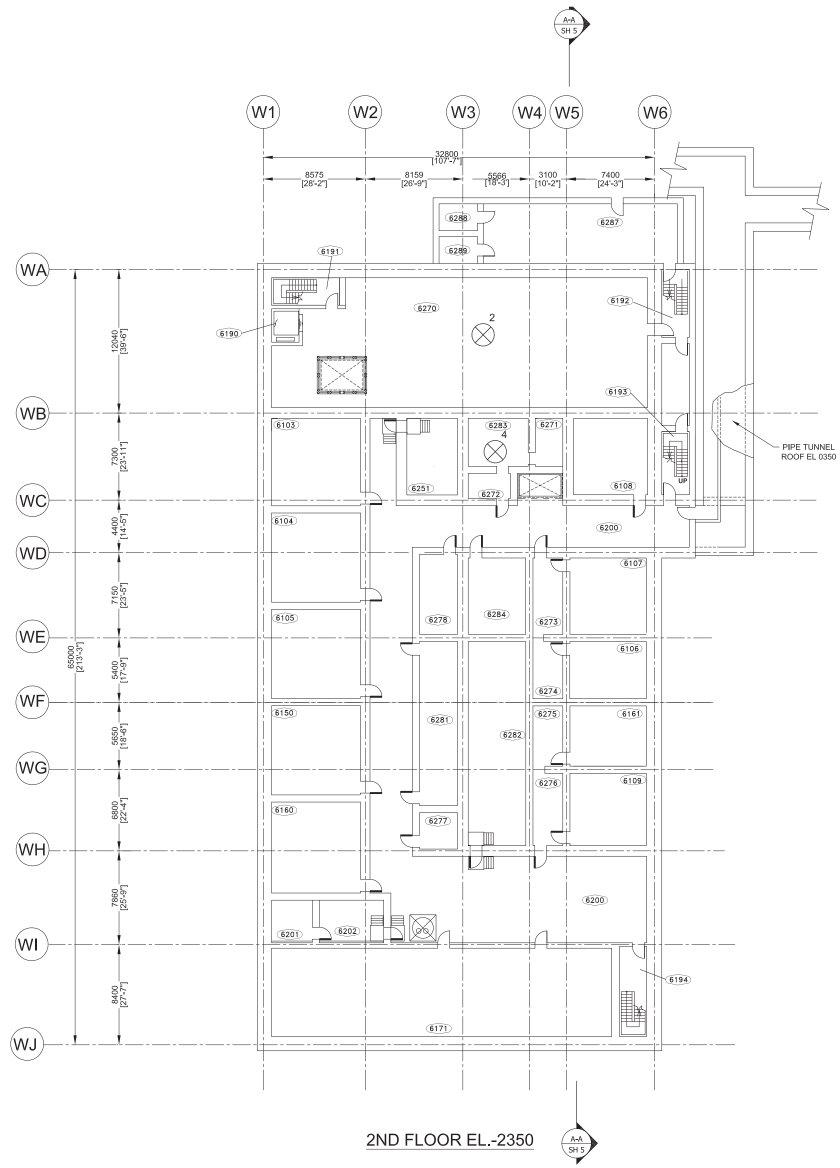
AREA RADIATION MONITOR SYMBOL

N

N:MONITOR ASSIGNED NUMBER

1– RW ELECTRICAL EQUIPMENT ROOM
3– RW HIGH ACTIVITY DECANT PUMP ROOM

Figure 12.3-40R Radwaste Building Radiation Monitors EL -2350



2ND FLOOR EL.-2350

ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6103	EQUIPMENT DRAIN COLLECTION TANK ROOM A
6104	EQUIPMENT DRAIN COLLECTION TANK ROOM B
6105	EQUIPMENT DRAIN COLLECTION TANK ROOM C
6106	LOW ACTIVITY RESIN HOLDUP TANK ROOM
6107	CONDENSATE RESIN HOLDUP TANK ROOM
6108	HIGH ACTIVITY RESIN HOLDUP TANK ROOM
6109	CONCENTRATED WASTE TANK ROOM
6150	FLOOR DRAIN COLLECTION TANK ROOM A
6160	FLOOR DRAIN COLLECTION TANK ROOM B
6161	LOW ACTIVITY PHASE SEPARATOR ROOM
6171	FLOOR & EQUIPMENT DRAIN SAMPLE TANK ROOM
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D
6200	CORRIDOR
6201	CHEMICAL DRAIN COLLECTION TANK ROOM
6202	CHEMICAL DRAIN COLLECTION PUMP ROOM
6251	HIGH ACTIVITY PHASE SEPARATOR ROOM
6270	CONTROL ROOM
6271	HIGH ACTIVITY RESIN HOLDUP TANK VALVE GALLERY
6272	HIGH ACTIVITY PHASE SEPARATOR VALVE GALLERY
6273	CONDENSATE RESIN HOLDUP TANK VALVE GALLERY
6274	LOW ACTIVITY RESIN HOLDUP TANK VALVE GALLERY
6275	LOW ACTIVITY PHASE SEPARATOR VALVE GALLERY
6276	CONCENTRATED WASTE TANK VALVE GALLERY
6277	FLOOR DRAIN COLLECTION & CHEMICAL DRAIN TANKS VALVE GALLERY
6278	EQUIPMENT DRAIN COLLECTION TANK VALVE GALLERY
6281	DETERGENT DRAIN COLLECTION AND SAMPLE PUMP ROOM
6282	DETERGENT DRAIN COLLECTION & SAMPLE TANK ROOM
6283	HIGH ACTIVITY TRANSFER PUMPS ROOM
6284	LOW ACTIVITY TRANSFER PUMPS ROOM
6287	FOYER
6288	TOILET
6289	LOCKER ROOM

AREA RADIATION MONITOR SYMBOL

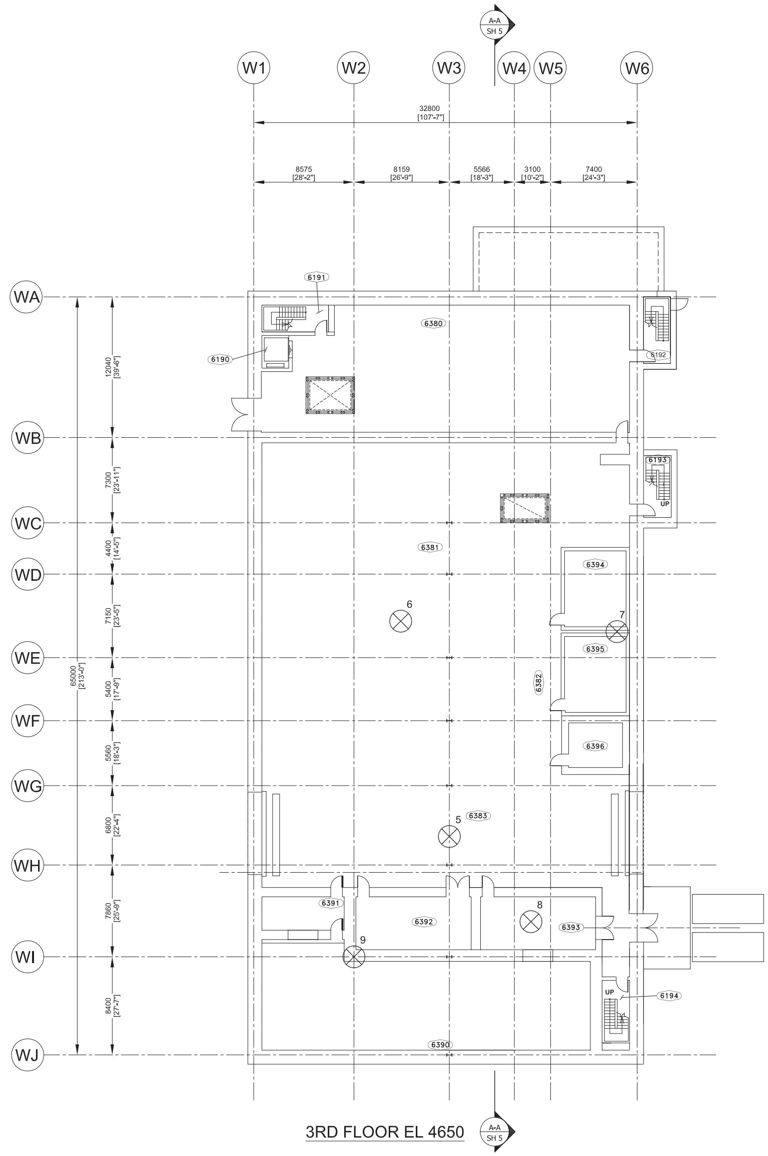
N

N:MONITOR ASSIGNED NUMBER

2– RW CONTROL ROOM
4– RW HIGH ACTIVITY TRANSFER PUMP ROOM

BASIS: NEW

Figure 12.3-41R Radwaste Building Radiation Monitors EL 4650



ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D
6380	AIR EXHAUST FACILITIES ROOM
6381	PROCESSING SUBSYSTEMS AREA
6382	CORRIDOR
6383	TRAILER ACCESS
6390	CLASS B/C STORAGE AREA
6391	CLASS A STORAGE AREA
6392	DRY ACTIVE WASTE STORAGE AREA
6393	SORTING ROOM
6394	SWMS PROCESSING SUBSYSTEM – DEWATERING SKID A
6395	SWMS PROCESSING SUBSYSTEM – DEWATERING SKID B
6396	CRANE CCTV AND DEWATERING CONTROL ROOM

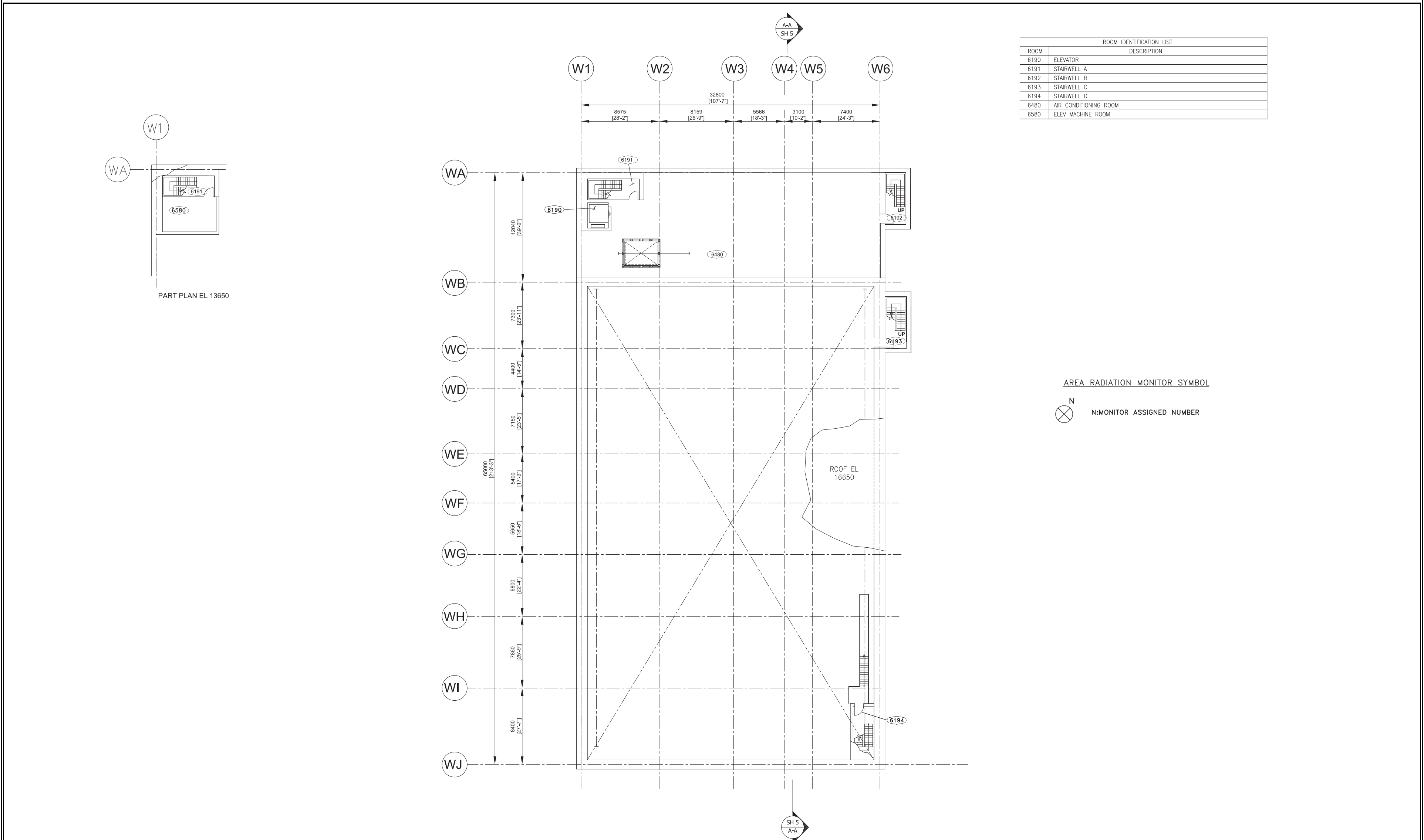
AREA RADIATION MONITOR SYMBOL

N

N:MONITOR ASSIGNED NUMBER

5– RW TRAILER ACCESS AREA
6– RW LIQUID RADIAOACTIVE WASTE TREATMENT PROCESSING SYSTEMS AREA
7– RW WET SOLID RADIOACTIVE WASTE TREATMENT PROCESSING AREA
8– RW DRY SOLID WASTE TREATMENT AREA (SORTING AREA)
9– RW PACKAGED WASTE STORAGE AREA

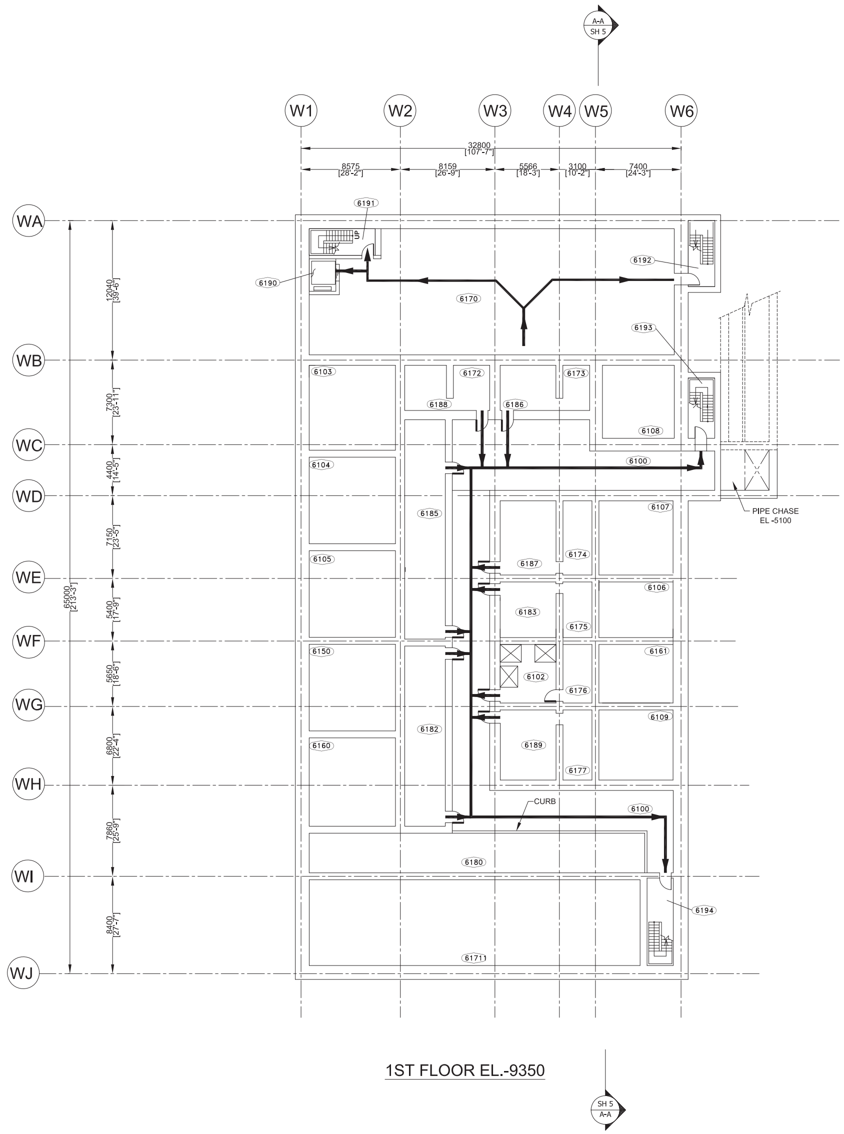
NAPS DEP 11.4-1 **Figure 12.3-42R Radwaste Building Radiation Monitors EL 10650**



ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D
6480	AIR CONDITIONING ROOM
6580	ELEV MACHINE ROOM

BASIS: NEW

Figure 12.3-61R Radwaste Building Personnel Access and Egress Routes EL -9350



ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6100	CORRIDOR
6102	HCW, LCW AND DETERGENT SUMP ROOM
6103	EQUIPMENT DRAIN COLLECTION TANK ROOM A
6104	EQUIPMENT DRAIN COLLECTION TANK ROOM B
6105	EQUIPMENT DRAIN COLLECTION TANK ROOM C
6106	LOW ACTIVITY RESIN HOLDUP TANK ROOM
6107	CONDENSATE RESIN HOLDUP TANK ROOM
6108	HIGH ACTIVITY RESIN HOLDUP TANK ROOM
6109	CONCENTRATED WASTE TANK ROOM
6150	FLOOR DRAIN COLLECTION TANK ROOM A
6160	FLOOR DRAIN COLLECTION TANK ROOM B
6161	LOW ACTIVITY PHASE SEPARATOR ROOM
6170	ELECTRICAL EQUIPMENT ROOM
6171	FLOOR & EQUIPMENT DRAIN SAMPLE TANK ROOM
6172	HIGH ACTIVITY DECANT PUMP VALVE GALLERY
6173	HIGH ACTIVITY RESIN HOLUP TANK VALVE GALLERY
6174	CONDENSATE RESIN HOLDUP TANK VALVE GALLERY
6175	LOW ACTIVITY RESIN HOLDUP TANK VALVE GALLERY
6176	LOW ACTIVITY PHASE SEPARATOR VALVE GALLERY
6177	CONCENTRATED WASTE TANK VALVE GALLERY
6180	FLOOR AND EQUIPMENT DRAIN SAMPLE PUMP AREA
6182	FLOOR DRAIN COLLECTION PUMP ROOM
6183	LOW ACTIVITY CIRCULATION PUMP ROOM
6185	EQUIPMENT DRAIN COLLECTION PUMP ROOM
6186	HIGH ACTIVITY CIRCULATION PUMP ROOM
6187	LOW ACTIVITY DECANT PUMP ROOM
6188	HIGH ACTIVITY DECANT PUMP ROOM
6189	CONCENTRATED WASTE PUMP ROOM
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D

NOTES:

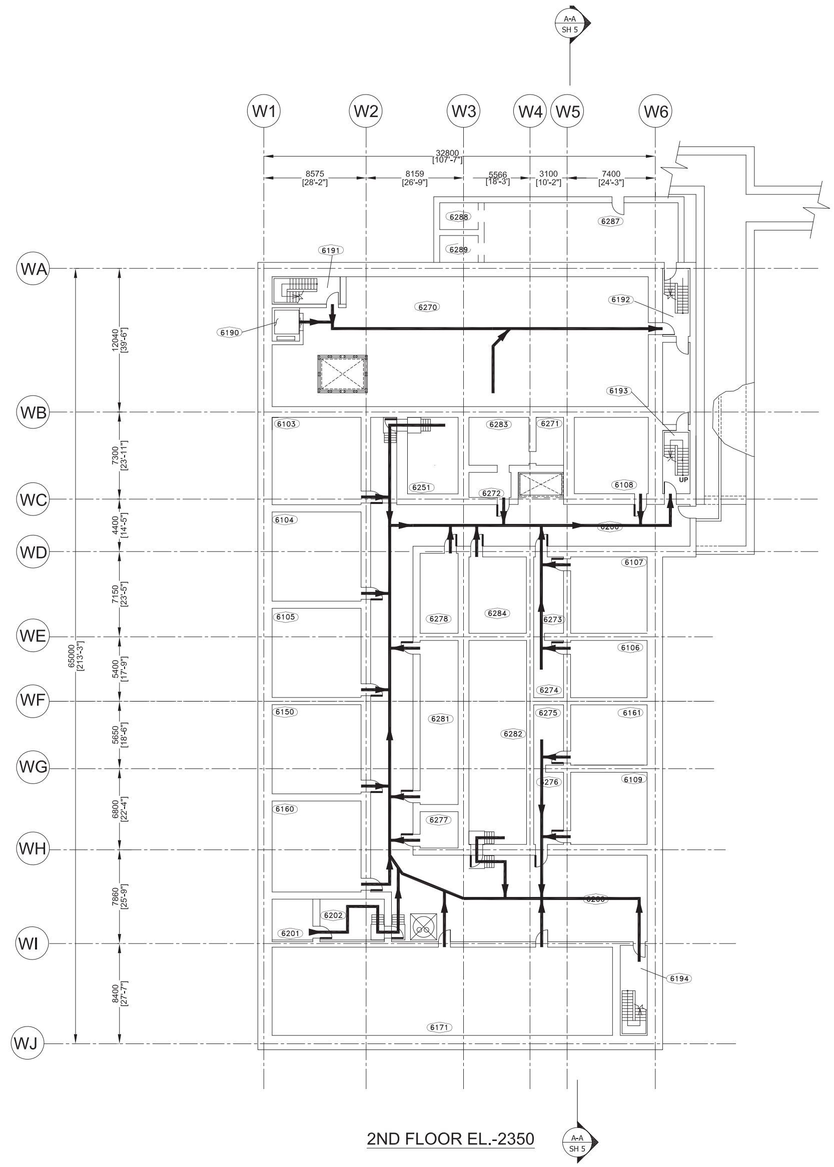
1. ACCESS/EGRESS ROUTES DURING SHUTDOWN ARE THE SAME AS DURING NORMAL OPERATION.
2. ACCESS/EGRESS TO HIGH RADIATION AREAS/ROOMS WILL BE THROUGH THE CONTROLLED ACCESS WAYS.
3. ADDITIONAL RP CONTROLS WILL BE DEFINED BY COL APPLICANT.

→ PERSONNEL EGRESS AND ACCESS ROUTES

⊗ DOOR/ACCESS NOT ACCESSIBLE DURING NORMAL OPERATION, ACCESS ALLOWED AND CONTROLLED DURING SHUTDOWN.

BASIS: NEW

NAPS DEP 11.4-1 **Figure 12.3-62R Radwaste Building Personnel Access and Egress Routes EL -2350**



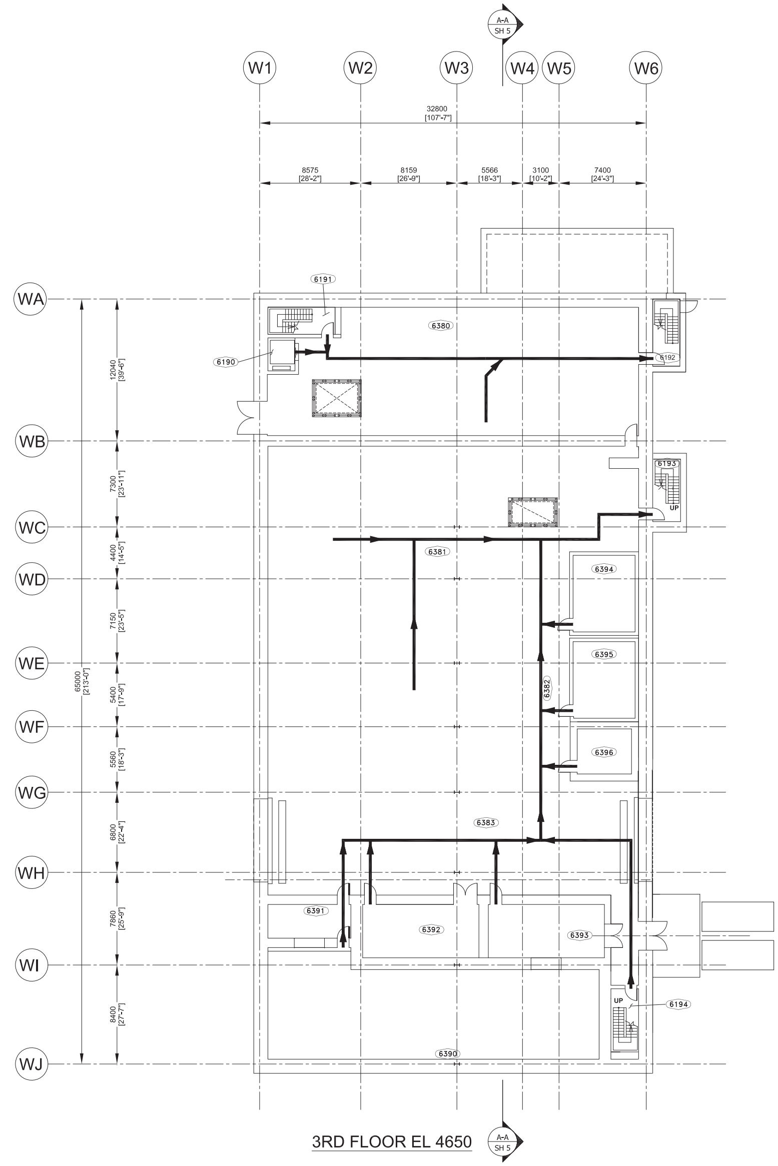
ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6103	EQUIPMENT DRAIN COLLECTION TANK ROOM A
6104	EQUIPMENT DRAIN COLLECTION TANK ROOM B
6105	EQUIPMENT DRAIN COLLECTION TANK ROOM C
6106	LOW ACTIVITY RESIN HOLDUP TANK ROOM
6107	CONDENSATE RESIN HOLDUP TANK ROOM
6108	HIGH ACTIVITY RESIN HOLDUP TANK ROOM
6109	CONCENTRATED WASTE TANK ROOM
6150	FLOOR DRAIN COLLECTION TANK ROOM A
6160	FLOOR DRAIN COLLECTION TANK ROOM B
6161	LOW ACTIVITY PHASE SEPARATOR ROOM
6171	FLOOR & EQUIPMENT DRAIN SAMPLE TANK ROOM
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D
6200	CORRIDOR
6201	CHEMICAL DRAIN COLLECTION TANK ROOM
6202	CHEMICAL DRAIN COLLECTION PUMP ROOM
6251	HIGH ACTIVITY PHASE SEPARATOR ROOM
6270	CONTROL ROOM
6271	HIGH ACTIVITY RESIN HOLDUP TANK VALVE GALLERY
6272	HIGH ACTIVITY PHASE SEPARATOR VALVE GALLERY
6273	CONDENSATE RESIN HOLDUP TANK VALVE GALLERY
6274	LOW ACTIVITY RESIN HOLDUP TANK VALVE GALLERY
6275	LOW ACTIVITY PHASE SEPARATOR VALVE GALLERY
6276	CONCENTRATED WASTE TANK VALVE GALLERY
6277	FLOOR DRAIN COLLECTION & CHEMICAL DRAIN TANKS VALVE GALLERY
6278	EQUIPMENT DRAIN COLLECTION TANK VALVE GALLERY
6281	DETERGENT DRAIN COLLECTION AND SAMPLE PUMP ROOM
6282	DETERGENT DRAIN COLLECTION & SAMPLE TANK ROOM
6283	HIGH ACTIVITY TRANSFER PUMPS ROOM
6284	LOW ACTIVITY TRANSFER PUMPS ROOM
6287	FOYER
6288	TOILET
6289	LOCKER ROOM

PERSONNEL EGRESS AND ACCESS ROUTES

CESSIBLE DURING NORMAL OPERATION, ACCESS ALLOWED AND CONTROLLED DURING SHUTDOWN.

BASIS: NEW

NAPS DEP 11.4-1 **Figure 12.3-63R Radwaste Building Personnel Access and Egress Routes EL 4650**



ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D
6380	AIR EXHAUST FACILITIES ROOM
6381	PROCESSING SUBSYSTEMS AREA
6382	CORRIDOR
6383	TRAILER ACCESS
6390	CLASS B/C STORAGE AREA
6391	CLASS A STORAGE AREA
6392	DRY ACTIVE WASTE STORAGE AREA
6393	SORTING ROOM
6394	SWMS PROCESSING SUBSYSTEM – DEWATERING SKID A
6395	SWMS PROCESSING SUBSYSTEM – DEWATERING SKID B
6396	CRANE CCTV AND DEWATERING CONTROL ROOM

NOTES:

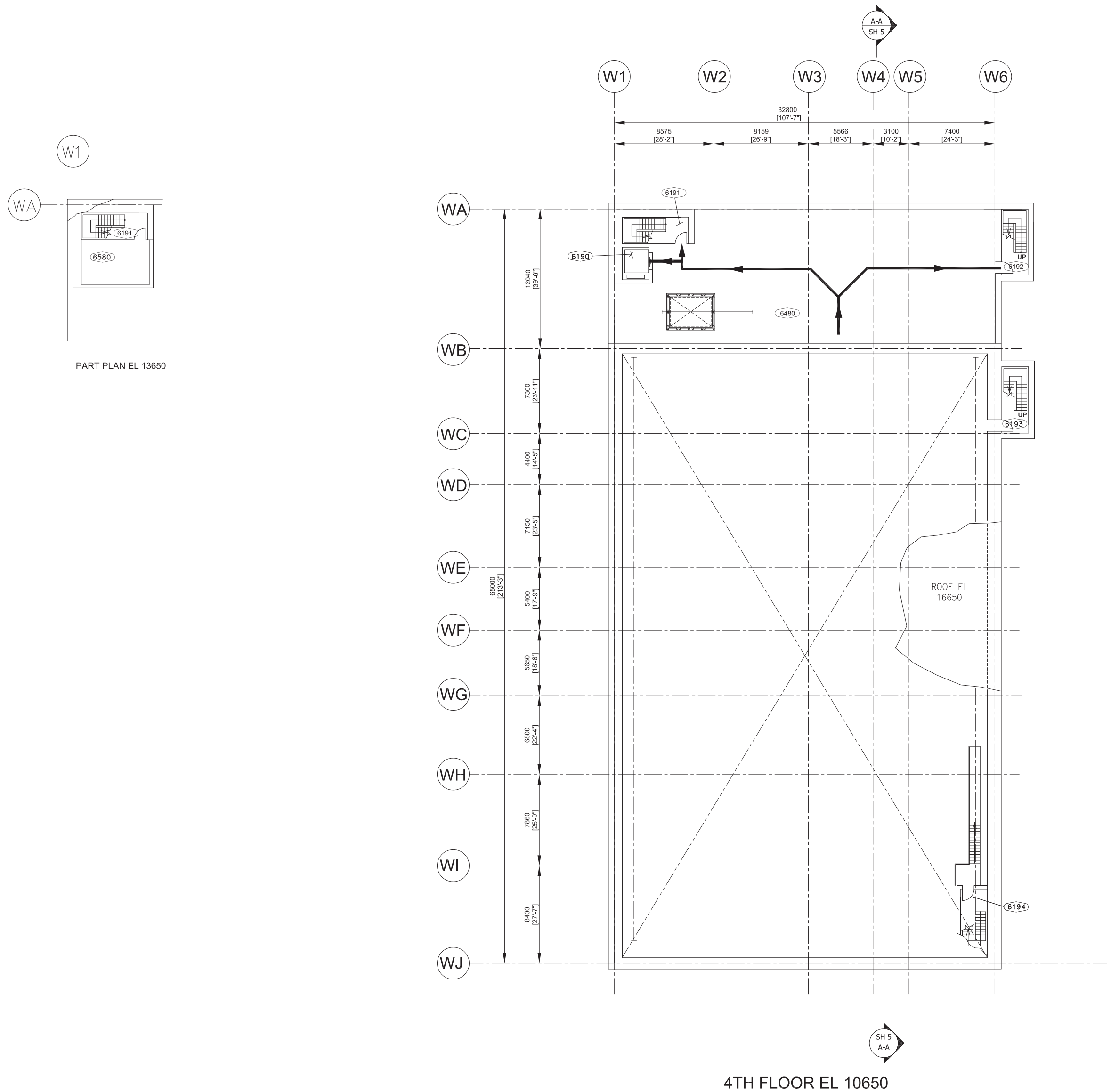
1. ACCESS/EGRESS ROUTES DURING SHUTDOWN ARE THE SAME AS DURING NORMAL OPERATION.
2. ACCESS/EGRESS TO HIGH RADIATION AREAS/ROOMS WILL BE THROUGH THE CONTROLLED ACCESS WAYS.
3. ADDITIONAL RP CONTROLS WILL BE DEFINED BY COL APPLICANT.

PERSONNEL EGRESS AND ACCESS ROUTES

DOOR/ACCESS NOT ACCESSIBLE DURING NORMAL OPERATION, ACCESS ALLOWED AND CONTROLLED DURING SHUTDOWN.

BASIS: NEW

Figure 12.3-64R Radwaste Building Personnel Access and Egress Routes EL 10650



ROOM IDENTIFICATION LIST	
ROOM	DESCRIPTION
6190	ELEVATOR
6191	STAIRWELL A
6192	STAIRWELL B
6193	STAIRWELL C
6194	STAIRWELL D
6480	AIR CONDITIONING ROOM
6580	ELEV MACHINE ROOM

NOTES:

1. ACCESS/EGRESS ROUTES DURING SHUTDOWN ARE THE SAME AS DURING NORMAL OPERATION.
2. ACCESS/EGRESS TO HIGH RADIATION AREAS/ROOMS WILL BE THROUGH THE CONTROLLED ACCESS WAYS.
3. ADDITIONAL RP CONTROLS WILL BE DEFINED BY COL APPLICANT.

PERSONNEL EGRESS AND ACCESS ROUTES

DOOR/ACCESS NOT ACCESSIBLE DURING NORMAL OPERATION, ACCESS ALLOWED AND CONTROLLED DURING SHUTDOWN.

12.4 Dose Assessment

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

12.4.7.1 Annual Doses to Construction Workers

NAPS SUP 12.4-1

12.4.7.1.1 Site Layout

Unit 3 is west of the Units 1 and 2 protected area, as shown on Figure 2.1-201. Unit 3 construction activities take place outside the protected area, but inside the site restricted area boundary.

12.4.7.1.2 Radiation Sources

During the construction of Unit 3, the construction workers may be exposed to radiation sources from the routine operation of Units 1 and 2 as described in the following paragraphs.

12.4.7.1.2.1 Direct Radiation Sources

The boron recovery tanks and the low-level contaminated storage area are among the principal sources from Units 1 and 2 contributing to direct radiation exposure at the construction site. The design basis radiation source term for the boron recovery tank is listed in the North Anna Units 1 and 2 UFSAR, Table 11.2-4. The UFSAR also indicates that the low-level contaminated storage area contains the equivalent of less than 1 Ci of Co-60 (Reference 12.4-201).

Another source of direct radiation is the independent spent fuel storage installation (ISFSI), which is located south of the construction area. The source terms for the ISFSI are provided in the ISFSI FSAR (Reference 12.4-202, Tables 7-1 through 7-4).

12.4.7.1.2.2 Gaseous Effluent Sources

Sources of gaseous releases at Units 1 and 2 include the waste decay tanks, boron recovery and high-level waste tanks, containment purge system, auxiliary building vent, main condenser air ejector vents, auxiliary steam drain receiver, Turbine Building ventilation exhaust, and gland seal ejector vent. The annual radioactive effluent release reports for the years 2001 to 2011 indicate average annual gaseous releases of 48 Ci of fission and activation gases and 55 Ci of tritium (References 12.4-203 through 12.4-213).

12.4.7.1.2.3 **Liquid Effluent Sources**

Effluents from the liquid waste disposal system of Units 1 and 2 produce small amounts of radioactivity in the North Anna Reservoir and the WHTF. The annual effluent reports for the years 2001 to 2011 indicate average annual liquid releases of 0.2 Ci of fission and activation products and 966 Ci of tritium (References 12.4-203 through 12.4-213).

12.4.7.1.3 **Measured and Calculated Dose Rates**

The measured or calculated dose rates used to estimate worker doses are presented below.

12.4.7.1.3.1 **Direct Radiation Dose Rates**

Thermo-luminescent dosimeter (TLD) measurements at the west protected area fence of Units 1 and 2 from 2001 to 2011 indicate an average annual dose of 72 mrem, which equates to a continuous dose rate of 8.22E-3 mrem/hr. This location is along the eastern edge of the Unit 3 construction area.

TLD readings taken along the ISFSI perimeter fence for the two-year period third quarter 2010 to third quarter 2012 indicate a maximum quarterly dose of 192 mrem during the fourth quarter of 2011, when there were 27 casks on Pad One and 13 on Pad Two for a total of 40 casks. The plan for the ISFSI is to load 28 casks on Pad One and 40 on Pad Two for a total of 68 casks. The maximum TLD reading of 192 mrem may be multiplied by 68/40 to estimate the dose from a fully loaded ISFSI. For conservatism, however, a factor of two is applied. Based on 91 days per quarter and 24 hours per day, 192 mrem/quarter is equivalent to a dose rate of 8.79E-2 mrem/hr. Multiplying by the factor of two yields a dose rate of 0.176 mrem/hr at the ISFSI fence from a fully loaded ISFSI.

The dose rate at the construction area boundary near the ISFSI may be estimated by dividing the ISFSI fence dose rate by a distance reduction factor. The distance from the ISFSI to the ISFSI fence is 203 ft (Reference 12.4-202, Figure 7-1). The distance from the ISFSI to the nearest point of the construction area is approximately 500 ft (Figure 2.1-201). A Monte Carlo calculation was performed to assess the dose rate as a function of distance from the ISFSI when loaded with 84 casks (a previous full ISFSI estimate), which bounds the planned 68 casks. This calculation shows dose rates of 1.39 mrem/hr at 203 ft and 0.24 mrem/hr at 500 ft, yielding a reduction factor of 5.8. Dividing the

ISFSI fence dose rate of 0.176 mrem/hr by 5.8 yields a dose rate of 3.04E-2 mrem/hr at the construction area boundary nearest the ISFSI.

The same method is used to estimate the ISFSI dose rate in the center of the construction area. The distance from the ISFSI to the center of the construction area is approximately 1600 ft (Figure 2.1-201). The distance reduction factor for this distance is 294. Dividing the ISFSI fence dose rate of 0.176 mrem/hr by 294 yields a dose rate of 5.98E-4 mrem/hr at the center of the construction area.

12.4.7.1.3.2 **Gaseous Effluent Dose Rates**

The annual radioactive effluent release reports for 2001 to 2011 indicate average dose rates of 1.01E-2 mrem/yr for the whole body and 0.129 mrem/yr for the critical organ of the maximally exposed member of the public due to the release of gaseous effluents from Units 1 and 2, calculated in accordance with the Offsite Dose Calculation Manual (ODCM) for Units 1 and 2.

According to the ODCM, gaseous effluent doses to the members of the public are calculated at or beyond the site boundary (Reference 12.4-214, Section 6.3). The construction area is closer to the effluent release point than is the site boundary. A review of the atmospheric dispersion factors (χ/Q values) for Units 1 and 2 indicates that the ratio of χ/Q a few hundred feet from these units to that at the site boundary is no more than a factor of ten (Reference 12.4-201, Section 2.3.5). Hence, the dose rates for the maximally exposed member of the public are multiplied by ten, yielding 0.101 mrem/yr for the whole body and 1.29 mrem/yr for the critical organ of the construction worker.

12.4.7.1.3.3 **Liquid Effluent Dose Rates**

The annual radioactive effluent release reports for 2001 to 2011 indicate average dose rates of 0.357 mrem/yr for the whole body and 0.435 mrem/yr for the critical organ of the maximally exposed member of the public due to the release of liquid effluents from Units 1 and 2, calculated in accordance with the ODCM for Units 1 and 2.

12.4.7.1.4 **Construction Worker Doses**

Construction worker doses are conservatively estimated using the following information:

- The estimated maximum dose rate for each exposure pathway
- An exposure time of 2500 hours per year per worker

- A peak loading of 4088 construction workers per year

Using the above worker occupancy time and workforce size, annual doses to the maximally exposed worker as well as the peak workforce are calculated due to direct radiation and gaseous and liquid effluents.

12.4.7.1.4.1 **Direct Radiation Doses**

The TLD at the west protected area fence of Units 1 and 2 is along the eastern edge of the construction area while the maximum dose from the ISFSI occurs along the southern edge of the construction area. Although these two locations are separated by more than 1000 ft (Figure 2.1-201), the direct radiation dose rates at the two locations are conservatively added, yielding a total dose rate of 3.86E-2 mrem/hr. Multiplying by the worker exposure time of 2500 hr yields a maximum annual dose of 96.4 mrem due to direct radiation.

While the maximum dose occurs at the southern edge of the construction area, the center of the construction area is representative of the location of the average member of the construction workforce over the course of a year. Adding the west protected area fence dose rate to the ISFSI dose rate at the center of the construction area yields a total dose rate of 8.82E-3 mrem/hr. Multiplying by the worker exposure time of 2500 hr yields an annual worker dose of 22.0 mrem at this location.

12.4.7.1.4.2 **Gaseous Effluent Doses**

The gaseous effluent dose rates in Section 12.4.7.1.3.2 are multiplied by the ratio of expected hours worked per year per worker by the number of hours in a year (2500/8760) to account for the fraction of the year that workers are exposed, resulting in doses of 2.89E-2 mrem to the whole body and 0.368 mrem to the critical organ. These doses are converted into total effective dose equivalent (TEDE) by applying a weighting factor of 0.3 to the critical organ dose (Reference 12.4-215) and adding the product to the whole body dose, yielding an annual dose of 0.139 mrem TEDE.

12.4.7.1.4.3 **Liquid Effluent Doses**

Although construction workers are not expected to be exposed to liquid effluents from Units 1 and 2, it is assumed that they receive the same dose rates as the maximally exposed member of the public. The liquid effluent dose rates in Section 12.4.7.1.3.3 are multiplied by 2500/8760 to account for the fraction of the year that workers are exposed, resulting in

doses of 0.102 mrem to the whole body and 0.124 mrem to the critical organ. Applying a weighting factor of 0.3 to the organ dose and adding the product to the whole body dose, an annual dose of 0.139 mrem TEDE is estimated.

12.4.7.1.4.4 **Total Doses**

Adding the doses from the preceding subsections of 96.4 mrem TEDE due to direct radiation, 0.14 mrem TEDE due to gaseous effluents, and 0.14 mrem TEDE due to liquid effluents, the total annual dose to the maximally exposed construction worker is estimated as 97 mrem TEDE. As indicated in Section 12.4.7.1.4.1, the maximum dose rate in the construction area is less than 0.04 mrem/hr. These doses are within the limits of 10 CFR 20.1301. Since the calculated doses meet the public dose limits of 10 CFR 20.1301, the workers would not need to be classified as radiation workers.

Adding the doses from the preceding subsections of 22.0 mrem TEDE due to direct radiation, 0.14 mrem TEDE due to gaseous effluents, and 0.14 mrem TEDE due to liquid effluents, the total annual dose to the average member of the construction workforce is estimated as 22 mrem TEDE. Multiplying by 4088 workers yields a collective dose of 91 person-rem.

The calculated doses are based on available dose rate measurements for the site. It is possible that these dose rates would increase in the future as site conditions change. However, the construction area would be continually monitored during the construction period and appropriate actions would be taken as necessary to ensure that doses to the construction workers are as low as is reasonably achievable (ALARA).

12.4.9 References

12.4-201 North Anna Power Station Updated Final Safety Analysis Report, Revision 45.

12.4-202 North Anna Independent Spent Fuel Storage Installation Safety Analysis Report, Revision 6.

12.4-203 Annual Radioactive Effluent Release Report, North Anna Power Station (January 01, 2001 to December 31, 2001).

12.4-204 Annual Radioactive Effluent Release Report, North Anna Power Station (January 01, 2002 to December 31, 2002).

12.4-205 Annual Radioactive Effluent Release Report, North Anna Power Station (January 01, 2003 to December 31, 2003).

12.4-206 Annual Radioactive Effluent Release Report, North Anna Power Station (January 01, 2004 to December 31, 2004).

12.4-207 Annual Radioactive Effluent Release Report, North Anna Power Station (January 01, 2005 to December 31, 2005).

12.4-208 Annual Radioactive Effluent Release Report, North Anna Power Station (January 01, 2006 to December 31, 2006).

12.4-209 Annual Radioactive Effluent Release Report, North Anna Power Station (January 01, 2007 to December 31, 2007).

12.4-210 Annual Radioactive Effluent Release Report, North Anna Power Station (January 01, 2008 to December 31, 2008).

12.4-211 Annual Radioactive Effluent Release Report, North Anna Power Station (January 01, 2009 to December 31, 2009).

12.4-212 Annual Radioactive Effluent Release Report, North Anna Power Station (January 01, 2010 to December 31, 2010).

12.4-213 Annual Radioactive Effluent Release Report, North Anna Power Station (January 01, 2011 to December 31, 2011).

12.4-214 Offsite Dose Calculation Manual (North Anna), Procedure Number VPAP-2103N, Revision 16.

12.4-215 Limits for Intake of Radionuclides by Workers, ICRP Publication 30, Part 1, International Commission on Radiological Protection, Pergamon Press, 1979.

12.5 Operational Radiation Protection Program

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

12.5.3 Operational Considerations

Replace this section with the following.

STD COL 12.5-1-A
STD COL 12.5-2-A
STD COL 12.5-3-A

The operational program for radiation protection is addressed in Appendix 12BB.

NEI report No. NEI 07-08A, "Generic FSAR Template Guidance for Ensuring that Occupational Radiation Exposures are as Low as is Reasonably Achievable (ALARA)" provides additional operating policy and consideration guidance for developing and implementing an ALARA program. As described in Appendix 12AA, NEI 07-08A is incorporated by reference.

12.5.4 COL Information

12.5-1-A Equipment, Instrumentation, and Facilities

STD COL 12.5-1-A

This COL item is addressed in Appendix 12BB.

12.5-2-A Compliance with 10 CFR Part 50.34(f)(2)(xxvii) and NUREG-0737 Item III.D.3.3

STD COL 12.5-2-A

This COL item is addressed in Appendix 12BB.

12.5-3-A Radiation Protection Program

STD COL 12.5-3-A

This COL item is addressed in Appendix 12BB.

Appendix 12A Calculation of Airborne Radionuclides

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 12B Calculation of Airborne Releases

This section of the referenced DCD is incorporated by reference with no departures or supplements.

STD SUP 12.1-1

Appendix 12AA ALARA Program

NEI 07-08A, Generic FSAR Template Guidance for Ensuring that Occupational Radiation Exposures Are As Low As Is Reasonably

Achievable (ALARA), is incorporated by reference with the following supplemental information. (Reference 12AA-201)

12.1.2 **Regulatory Compliance**

Replace the bracketed text in the first paragraph with Section 17.5.

12AA.1 **References**

12AA-201 Nuclear Energy Institute (NEI), Generic FSAR Template Guidance for Ensuring that Occupational Radiation Exposures Are As Low As Is Reasonably Achievable (ALARA), NEI 07-08A.

STD COL 12.1-1-A
STD COL 12.1-2-A
STD COL 12.1-3-A
STD COL 12.1-4-A
STD COL 12.5-1-A
STD COL 12.5-2-A
STD COL 12.5-3-A

Appendix 12BB Radiation Protection

NEI 07-03A, Generic FSAR Template Guidance for Radiation Protection Program Description, is incorporated by reference with the following supplemental information. (Reference 12BB-201)

12.5.2.4 **Radiation Protection Technicians**

Delete the third paragraph.

12.5.3.1 **Facilities**

Delete the first and second paragraphs.

12.5.3.2 **Monitoring Instrumentation and Equipment**

Delete the third paragraph.

12.5.3.3 **Personal Protective Clothing and Equipment**

Delete the second paragraph.

12.5.4.2 **Methods to Maintain Exposures ALARA**

Delete the second paragraph.

12.5.4.4 **Access Control**

Replace the third paragraph with the following.

Table 12BB-201 identifies the Very High Radiation Areas (VHRA). The areas identified are only VHRA during the conditions specified in the table. It is anticipated that these areas are seldom if ever accessed when in a VHRA condition. In the unlikely event that access is required, entry

into a VHRA is controlled in accordance with the requirements of a specific (Special) radiation work permit.

With the reactor at power, the containment upper and lower drywells are VHRA and administrative procedures prohibit personnel access. Drywells can only be accessed via airlocks. Opening an airlock causes an MCR alarm, further protecting personnel from accidental exposure.

DCD Sections 9.1.4.12 and 12.3.1.4.4 identify access controls for areas immediately adjacent to the IFTS. Barriers to these areas are verified via ITAAC as identified in DCD Tier 1 Table 2.5.10-1.

12.5.4.12 Quality Assurance

Replace the bracketed text in the first paragraph with Section 17.5.

12BB.1 References

12BB-201 Nuclear Energy Institute (NEI), Generic FSAR Template Guidance for Radiation Protection Program Description, NEI 07-03A.

STD COL 12.5-3-A

Table 12BB-201 Very High Radiation Areas (VHRA)[1]

Zone	VHRA Name	VHRA Condition	DCD Drawings
1170	Lower Drywell	During power operation	12.3-1, 12.3-2, 12.3-3, 12.3-4, 12.3-10, 12.3-11
1570	Upper Drywell	During power operation	12.3-5, 12.3-6, 12.3-7, 12.3-10, 12.3-11
1702	Inclined Fuel Transfer Tube Room	During spent fuel transfer	12.3-7, 12.3-10
	Other areas adjacent to Inclined Fuel Transfer tube	During spent fuel transfer	12.3-10

1. Table shows dry areas only. Other areas identified as VHRA in DCD Section 12.3 drawings are submerged areas in the vicinity of spent fuel.

Chapter 13 Conduct of Operations

The introductory paragraph of this chapter of the referenced DCD is incorporated by reference with no departures or supplements.

13.1 Organizational Structure of Applicant

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

DCD Section 13.1.1, Combined License Information, is renumbered in this FSAR as Section 13.1.4 for administrative purposes to allow section numbering to be consistent with RG 1.206 and the Standard Review Plan.

Replace the first paragraph with the following.

NAPS COL 13.1-1-A

This section describes the organization of Unit 3. The organizational structure is described in this section and is consistent with the Human System Interface (HSI) design assumptions used in the design of the ESBWR as described in DCD Chapter 18. The organizational structure is consistent with the ESBWR HFE design requirements and complies with the requirements of 10 CFR 50.54(i) through (m).

13.1.1 Management and Technical Support Organization

Dominion has over 35 years of experience in the design, construction, and operation of nuclear generating stations. Dominion and its affiliates currently operates six nuclear units at three sites located in Virginia and Connecticut.

Corporate offices provide support for the nuclear stations. Figure 13.1-205 illustrates the relationship of the nuclear organization to other divisions of Dominion. This support includes executive level management to provide strategic and financial support for plant initiatives, coordination of functional efforts division-wide, and functional level management in areas such as training, security, emergency planning, and engineering analysis.

Figure 13.1-204 provides a high-level illustration of the nuclear organization. More detailed charts and position descriptions, including qualification requirements and staffing numbers for corporate support staff, are maintained in corporate offices.

Changes to the organization described herein are reviewed under the provisions of 10 CFR 50.54(a) to ensure that any reduction in commitments in the QAPD (as accepted by the NRC) are submitted to, and approved by the NRC, prior to implementation.

13.1.1.1 **Design, Construction, and Operating Responsibilities**

The president and chief nuclear officer (CNO) has overall responsibility for functions involving planning, design, construction, and operation of Dominion's nuclear units. Line responsibilities for those functions are passed to the executives in charge of nuclear operations, engineering and technical services, planning, development, and oversight, who maintain direct control of nuclear plant activities.

The first priority and responsibility of each member of the nuclear staff throughout the life of the plant is nuclear safety. Decision making for station activities is performed in a conservative manner with expectations of this core value regularly communicated to appropriate personnel by management interface, training, and station directives.

Lines of authority and communication clearly and unambiguously establish that utility management directs the project.

At key project milestones, including beginning of construction, fuel load, and commercial operation, senior management will determine if there are sufficient numbers of qualified personnel available to move the project forward.

The construction management organization is shown in Figure 13.1-201.

13.1.1.1.1 **Design and Construction Responsibilities**

This section is included in Appendix 13AA for future designation as historical information.

13.1.1.2 **Technical Support for Plant Operations**

This section describes the functional groups that will be activated before fuel load. The executive management position for facility operations will establish the organization of managers, functional managers, supervisors, and staff sufficient to perform required functions for support of safe plant operation. These functions include the following:

- Nuclear, mechanical, structural, electrical, thermal-hydraulic, metallurgical and material, and instrumentation and controls engineering

- Plant chemistry
- Radiation protection
- Fueling and refueling operations support
- Maintenance support
- Operations support
- Quality assurance
- Training
- Safety review
- Fire protection
- Emergency organization
- Outside contractual assistance

In the event that station personnel are not qualified to deal with a specific problem, the services of qualified individuals from other functions within the company or outside consultants are engaged. Figure 13.1-204 illustrates the nuclear operating organization. Table 13.1-201 shows the estimated number of positions required for each function.

13.1.1.2.1 Facility Engineering and Technical Support

The facility engineering and technical support department consists of system engineering, design engineering, and engineering technical support. These groups are responsible for performing the classical design activities as well as providing engineering expertise for programs such as fire protection, inservice inspection (ISI), inservice testing (IST), snubbers, and maintenance rule. The corporate engineering organization provides support for engineering projects, safety and engineering analysis, and nuclear fuels engineering. They are responsible for probabilistic safety assessment and other safety issues, plant system reliability analysis, performance and technical support, core management, and periodic reactor testing.

Each of the site engineering groups has a functional manager who reports to the site senior manager facility engineering and technical support.

The facility engineering and technical support department is responsible for:

- Support of plant operations in the engineering areas of mechanical, structural, electrical, thermal-hydraulic, metallurgy and materials, electronic, instrument and control, and fire protection. Priorities for support activities are established based on input from the senior manager operations and maintenance with emphasis on issues affecting safe operation of the plant.
- Support of procurement, chemical and environmental analysis, and maintenance activities in the plant as requested by the senior manager operations and maintenance
- Performance of design engineering of plant modifications
- Maintaining the design basis by updating the record copy of design documents as necessary to reflect the actual as-built configuration of the plant
- Human Factors Engineering design process

Reactor engineering, led by the functional manager reactor engineering, provides technical assistance in the areas of core operations, core thermal limits, and core thermal hydraulics. The functional manager reactor engineering reports to the manager nuclear fuel analysis and design.

Design work may be contracted to and performed by outside companies in accordance with Appendix 17AA, Sections 2 and 2.2.

13.1.1.2.2 **Plant Chemistry**

A chemistry program is established to monitor and control the chemistry of various plant systems such that corrosion of components and piping is minimized and radiation from corrosion by-products is kept to levels that allow operations and maintenance with radiation doses as low as is reasonably achievable.

The functional manager radiation protection and chemistry is responsible for maintaining chemistry programs and for monitoring and maintaining the water chemistry of plant systems. The staff of the radiation protection and chemistry department consists of laboratory technicians, support personnel, and supervisors who report to the functional manager radiation protection and chemistry.

13.1.1.2.3 Radiation Protection

A radiation protection (RP) program is established to protect the health and welfare of the surrounding public and personnel working at the plant. The RP program is described in Chapter 12.

The RP department is staffed by radiation protection technicians, support personnel, and supervisors who report to the functional manager radiation protection and chemistry. To provide sufficient organizational freedom from operating pressures, the functional manager radiation protection and chemistry reports directly to the senior manager safety and licensing.

13.1.1.2.4 Fueling and Refueling Operations Support

The function of fueling and refueling is performed by a combination of personnel from various departments including operations, maintenance, radiation protection, engineering, and reactor technology vendor or other contractor staff. Initial fueling is a function of the startup management organization discussed in Appendix 13AA. Refueling operations are a function of the operations organization.

13.1.1.2.5 Maintenance Support

The maintenance department includes mechanical maintenance, electrical maintenance, and instrumentation and control (I&C) groups. Each group includes supervisors, foremen, and technicians in sufficient numbers to provide for the safe and efficient operation of the plant during all phases of plant life.

In support of maintenance activities, planners, schedulers, and parts specialists prepare work packages, acquire proper parts, and develop procedures that provide for the successful completion of maintenance tasks. Maintenance tasks are integrated into the station schedule for evaluation of operating or safe shutdown risk elements and to provide for efficient and safe performance. Functional managers in charge of planning and scheduling report to the manager outage and planning.

13.1.1.2.6 Operations Support

The operations support function is provided under the direction of the operations manager, and includes the following programs:

- Operations procedures
- Operations surveillances

- Equipment tagging preparation
- Fuel handling

13.1.1.2.7 **Quality Assurance**

Safety-related activities associated with the operation of the plant are governed by the quality assurance (QA) program established in Chapter 17. QA includes:

- Maintenance of the QAPD
- Coordinating the development of audit schedules
- Audit, surveillance, and evaluation of Nuclear Division suppliers
- Quality control (QC) inspection/testing activities

QA management is independent of the station management line organization. The manager nuclear oversight reports to the corporate-stationed senior manager nuclear oversight.

13.1.1.2.8 **Training**

The training department is responsible for providing training programs that are established, maintained, and implemented in accordance with applicable plant administrative directives, regulatory requirements, and company operating policies so that station personnel can meet the performance requirements of their jobs in operations, maintenance, technical support, emergency response, and other areas. The training department's responsibilities encompass operator initial license training, requalification training, and plant staff training as well as the plant access training (general employee training) course and radiation worker training. To maintain independence from operating pressures, the functional manager training reports to the senior manager safety and licensing. Nuclear plant training programs are described in Section 13.2.

13.1.1.2.9 **Safety Review**

Review and audit activities are addressed in Chapter 17.

Oversight of station programs, procedures, and activities is performed by the Facilities Safety Review Committee (FSRC), a corporate independent review committee (IRC), and an organizational effectiveness department, which is responsible for corrective actions and assessments. The functional manager organizational effectiveness reports to the senior manager safety and licensing who reports to the executive management position for facility operations.

In the event of an unplanned reactor trip or significant power reduction, the FSRC is responsible for determining the circumstances, analyzing the cause, and determining that operations can proceed safely before the reactor is returned to power.

13.1.1.2.10 **Fire Protection**

The station is committed to maintaining a fire protection program as described in DCD Section 9.5.1.15. The executive management position for facility operations has overall responsibility for the fire protection program. Assigning the responsibility at that level provides the authority to obtain the resources and assistance necessary to meet fire protection program objectives, resolve conflicts, and delegate appropriate responsibility to fire protection staff. Fire protection for the facility is organized and administered by fire protection engineer. The fire protection engineer is responsible for development and implementation of the fire protection program, including development of fire protection procedures, and inspections of fire protection systems and functions. The fire protection engineer reports to the functional manager design engineering. Functional descriptions for all responsible positions are included in appropriate procedures. Station personnel are responsible for adhering to the fire protection/prevention requirements detailed in Section 9.5.1. The fire brigade is described in Section 13.1.2.1.5.

During construction:

- The executive responsible for Nuclear Development is ultimately responsible for fire protection on Unit 3.
- Construction workers will receive fire protection training as part of their indoctrination to the site.
- Periodic fire drills will be conducted on Unit 3.

13.1.1.2.11 **Emergency Organization**

The emergency organization is a matrixed organization composed of personnel who have the experience, training, knowledge, and ability necessary to implement actions to protect the public in the case of emergencies. Managers and station personnel assigned to positions in the emergency organization are responsible for supporting the emergency preparedness organization and the emergency plan as required. The staff members of the emergency planning organization administer and orchestrate drills and training to maintain qualification of

station staff members, and develop procedures to guide and direct the emergency organization during an emergency. The manager emergency preparedness reports to the executive management for support services via the senior manager protection services. The site emergency plan organization is described in the Emergency Plan.

13.1.1.2.12 **Outside Contractual Assistance**

Contract assistance with vendors and outside suppliers is provided by the materials, procurement, and contracts organization. The functional manager procurement control reports to the senior manager supply chain management.

Resources and management of the supply chain organization are shared between units.

13.1.1.3 **Organizational Arrangement**

Organizational arrangement for corporate offices and site organizations reporting directly to corporate offices is presented below.

13.1.1.3.1 **Executive/Management Organization**

Executive management is ultimately responsible for execution of activities and functions for Unit 3. Executive management establishes expectations such that a high level of quality, safety, and efficiency is achieved in aspects of plant operations and support activities through an effective management control system and an organization selected and trained to meet the above expectations. The executives with direct line of authority for activities associated with the design, construction, and operation of the plant are shown in Figure 13.1-204. Responsibilities of those executives are discussed below.

13.1.1.3.1.1 **President and Chief Nuclear Officer**

The CNO has the ultimate responsibility for the safe and reliable operation of each nuclear station owned and/or operated by the utility. It is the responsibility of the CNO to provide guidance and direction such that safety-related activities under his/her direction including engineering, construction, operations, operations support, maintenance, and planning are performed following the guidelines of the quality assurance program. During the operational phase, the CNO is responsible for appointing an IRC chair and assuring the IRC functions as described in the quality assurance program.

The CNO delegates authority and responsibility for operation and support of the site through the executive management position for facility operations, the executive management position for nuclear engineering, the executive management for support services, and the senior manager nuclear oversight. The CNO has no ancillary responsibilities that might detract attention from nuclear safety matters.

13.1.1.3.1.2 **[Deleted]**

13.1.1.3.1.3 **Executive Management Position for Nuclear Engineering**

The executive management position for nuclear engineering is responsible to provide support for Unit 3. These support functions include but are not limited to transient and accident analyses and reactor engineering. This position reports to the CNO.

13.1.1.3.1.4 **Executive Management for Support Services**

The executive management for support services is responsible for ensuring that nuclear regulatory requirements for operating plants are implemented, and for maintaining lines of communication with the nuclear regulatory authority. This position is also responsible for the operating plant support functions of emergency planning, training and development, and security. The direct reports of the executive management for support services include managers responsible for security, emergency preparedness, and supply chain services for Unit 3. This position reports to the CNO.

13.1.1.3.1.5 **[Deleted]**

13.1.1.3.1.6 **Senior Manager Nuclear Oversight**

The senior manager nuclear oversight is responsible for the verification of effective company and supplier QA program development, documentation, and implementation. This position is independent of cost and scheduling concerns associated with construction, operations, maintenance, modification, and decommissioning activities for performing quality assurance program verification. Where implementation of any or all of these functions is delegated to suppliers, procedures require the establishment of interface documents including defining lines of communication and authorities as appropriate for the delegated functions. However, this senior management position retains

responsibility for the scope and effective implementation of the quality assurance program for those functions.

This management position has the necessary authority and responsibility for verifying quality achievement; identifying quality problems, recommending solutions and verifying implementation of the solutions, and escalating quality problems to higher management levels. This position has the authority to suspend unsatisfactory work and control further processing or installation of non-conforming materials. The authority to stop work delegated to Nuclear Oversight personnel is delineated in procedures. The senior manager nuclear oversight reports to the CNO.

13.1.1.3.1.7 **Senior Manager Nuclear Analysis and Fuel**

The senior manager nuclear analysis and fuel is responsible for providing nuclear fuel and related business and technical support consistent with the operational needs of the plant. The senior manager nuclear analysis and fuel is assisted by functional managers of fuel procurement, safety analysis, core design, probabilistic risk assessment, spent fuel storage and handling, fuel performance, accident and transient analysis, and reactor engineering. The senior manager nuclear analysis and fuel reports to the executive management position for nuclear engineering.

13.1.1.3.1.8 **[Deleted]**

13.1.1.3.1.9 **[Deleted]**

13.1.1.3.2 **Site Organization (Operating)**

13.1.1.3.2.1 **Executive Management Position for Facility Operations**

The executive management position for facility operations reports to the CNO. This position is directly responsible for management and direction of activities associated with the efficient, safe, and reliable operation of the nuclear station, except for those functions delegated to the executive management position for nuclear engineering, the executive management for support services, and the senior manager nuclear oversight. The executive management position for facility operations is assisted in management and technical support activities by the senior manager operations and maintenance, the senior manager facility engineering and technical support and the senior manager safety and

licensing. This position is responsible for the site fire protection program through the fire protection engineer.

13.1.1.3.2.2 Senior Manager Facility Engineering and Technical Support

The senior manager facility engineering and technical support is the on-site lead position for engineering and reports to the executive management position for facility operations. The senior manager facility engineering and technical support is responsible for engineering activities related to design engineering, system engineering, project engineering, program engineering, and component engineering. The senior manager facility engineering and technical support directs functional managers responsible for each of these engineering areas.

13.1.1.3.2.2.1 Functional Manager System Engineering

The functional manager system engineering supervises a technical staff of engineers and other engineering specialists and coordinate their work with that of other groups. The functional manager system engineering reports to the senior manager facility engineering and technical support and is responsible for providing direction and guidance to system engineers as follows:

- Monitoring the efficiency and proper operation of balance of plant and reactor systems.
- Planning programs for improving equipment performance, reliability, or work practices.
- Conducting operational tests and analyzing the results.
- Identification of plant spare parts for systems within his/her cognizance.

The functional manager system engineering is supported by a staff of experts in specialized areas including pumps, AOVs, MOVs and safety and relief valves. The staff provides support to the maintenance department and to other engineering groups.

13.1.1.3.2.2.2 Functional Manager Design Engineering

The functional manager design engineering reports to the senior manager facility engineering and technical support and is responsible for:

- Resolution of design issues.

- On-site development of design related change packages and plant modifications.
- Management of contractors who may perform modification or construction activities.
- Maintaining configuration control program.
- Fire Protection

The functional manager design engineering is also responsible for:

- Development and maintenance programs and specifications of selected plant equipment.
- Planned upgrades to equipment such as turbine rotors and major component replacement.
- Implementation of effective project management of contractors.
- Implementation of effective project management methods and procedures, including cost controls, for implementation of modifications and construction activities.

13.1.1.3.2.2.3 **Functional Manager Engineering Technical Support**

The functional manager engineering technical support report to the site director of nuclear engineering and is responsible for programs such as:

- Materials engineering
- Performance/ISI engineering
- Valve engineering
- Maintenance rule tracking and trending
- Piping erosion corrosion
- In-service testing
- NDE
- Predictive Analysis

13.1.1.3.2.2.4 **Fire Protection Engineer**

The fire protection engineer is responsible for:

- Fire Protection Program requirements, including consideration of potential hazards associated with postulated fires, knowledge of building layout, and system design.
- Post-fire shutdown capability.

- Design, maintenance, surveillance, and quality assurance of fire protection features (e.g., detection systems, suppression systems, barriers, dampers, doors, penetration seals, and fire brigade equipment.
- Fire prevention activities (administrative controls).
- Pre-fire planning, including review and updating of pre-fire plans at least every two years.

The fire protection engineer reports to the executive management position for facility operations through the senior manager facility engineering and technical support and the functional manager design engineering.

Additionally, the fire protection engineer works with the operations department to coordinate activities and program requirements.

In accordance with RG 1.189, the fire protection engineer is an individual who has been delegated authority commensurate with the responsibilities of the position, and who has available staff personnel knowledgeable in fire protection and nuclear safety.

13.1.1.3.2.2.5 **[Deleted]**

13.1.1.3.2.3 Functional Manager Organizational Effectiveness

The responsibilities of the functional manager organizational effectiveness include establishing processes and procedures to facilitate identification and correction of conditions adverse to quality and implementing corrective actions. The functional manager organizational effectiveness reports to the senior manager safety and licensing.

13.1.1.3.2.4 Functional Manager Licensing

The functional manager licensing is responsible for providing a coordinated focus for interface with the NRC, and for technical direction and administrative guidance to the licensing staff for the following activities:

- Developing licensee event reports (LERs) and responding to notices of violations.
- Preparing/submitting license amendments and updating the FSAR.
- Tracking commitments and answering generic letters.
- Analyzing operating experience data and monitoring industry issues.

- Preparing the station for special NRC inspections, interfacing with NRC inspectors, and interpreting NRC regulations.
- Maintaining the licensing basis.

The functional manager licensing reports to the senior manager safety and licensing.

13.1.1.3.2.5 **Manager Emergency Preparedness**

The manager emergency preparedness is responsible for:

- Coordinating and implementing the plant emergency response plan with state and local emergency plans.
- Developing, planning, and executing emergency drills and exercises.
- Emergency action level development.
- NRC reporting associated with 10 CFR 50.54(q).

The manager emergency preparedness reports to the executive management for support services through the senior manager protection services.

13.1.1.3.2.6 **Functional Manager Training**

The functional manager training is responsible for training programs at the site required for the safe and proper operation and maintenance of the plant as described in Section 13.1.1.2.8. The functional manager training supervises a staff of training supervisors who coordinate the development, preparation, and presentation of training programs for nuclear plant personnel and reports to the executive management position for facility operations through the senior manager safety and licensing.

13.1.1.3.2.7 **Functional Manager Procurement Control**

The functional manager procurement control is responsible for providing sufficient and proper materials to support the material needs of the plant and performing related activities including:

- Procedure development
- Materials storage
- Supply system database maintenance
- Meeting quality assurance and internal audit requirements

The functional manager procurement control is also responsible for site purchasing. This position reports to the executive management for support services through the senior manager supply chain management.

13.1.1.3.2.8 **Manager Nuclear Security**

The manager nuclear security is responsible for:

- Implementation and enforcement of security directives, procedures, and instructions received from appropriate authorities.
- Day-to-day supervision of the security guard force.
- Administration of the security program.
- Training the security force.
- Implementing the fitness-for-duty program.

The manager nuclear security reports to the executive management for support services via protection services management.

13.1.1.3.2.9 **Manager Nuclear Oversight**

The manager nuclear oversight is responsible for those functions listed in Section 13.1.1.2.7. The manager nuclear oversight reports to the senior manager nuclear oversight.

13.1.1.4 **Qualifications of Technical Support Personnel**

Personnel of the technical support organization meet the education and experience qualifications for those described in ANSI/ANS-3.1 (Reference 13.1-201) as endorsed and amended by RG 1.8.

13.1.2 **Operating Organization**

13.1.2.1 **Plant Organization**

The plant management, technical support, and plant operating organizations are shown in Figure 13.1-204. The operating organization is described in Sections 13.1.1.3 and 13.1.2. The on-shift organization is shown in Figure 13.1-203. Additional personnel are required to augment normal staff during outages.

Nuclear plant employees are responsible for reporting problems with plant equipment and facilities. They are required to identify and document equipment problems in accordance with the QA program. QA program requirements as they apply to the operating organization are described in Section 17.5.

Rules of practice are met through administrative controls as described in Section 17.5. These controls include:

- Establishment of a quality assurance program for the operational phase
- Preparation of procedures necessary to carry out an effective quality assurance program
- A program for review and audit of activities affecting plant safety
- Programs and procedures for rules of practice

Managers and supervisors within the plant operating organization are responsible for establishing goals and expectations for their organization and to reinforce behaviors that promote radiation protection. Specifically, managers and supervisors are responsible for the following, as applicable to their position within the plant organization:

- Interfacing directly with radiation protection staff to integrate radiation protection measures into plant procedures and designing documents into the planning, scheduling, conduct, and assessment of operations and work.
- Notifying radiation protection personnel promptly when radiation protection problems occur or are identified, taking corrective actions, and resolve deficiencies associated with operations, procedures, systems, equipment, and work practices.
- Training site personnel on radiation protection and providing periodic retraining in accordance with 10 CFR 19 so that personnel are properly instructed and briefed for entry into restricted areas.
- Periodically observing and correcting, as necessary, radiation worker practices.
- Supporting radiation protection management in implementing the radiation protection program.
- Maintaining exposures to site personnel ALARA.

13.1.2.1.1 **Executive Management Position for Facility Operations**

The executive management position for facility operations is directly responsible for management and direction of activities associated with the efficient, safe, and reliable operation of the nuclear station, except those functions delegated to the executive management position for nuclear engineering, the executive management for support services,

and the senior manager nuclear oversight. This position is assisted in management and technical support activities by the senior manager facility engineering and technical support, and the senior manager safety and licensing. Executive management establishes expectations such that a high level of quality, safety, and efficiency is achieved in aspects of plant operations and support activities through an effective management control system and an organization selected and trained to meet the above objectives.

Additionally, this position has overall responsibility for occupational and public radiation safety. Radiation protection responsibilities of the executive management position for facility operations are consistent with the guidance in RG 8.8 and RG 8.10, including the following:

- Providing management radiation protection policy throughout the plant organization
- Providing an overall commitment to radiation protection by the plant organization
- Interacting with and supporting the functional manager radiation protection and chemistry on implementation of the radiation protection program
- Supporting identification and implementation of cost-effective modifications to plant equipment, facilities, procedures and processes to improve radiation protection controls and reduce exposures
- Establishing plant goals and objectives for radiation protection
- Maintaining exposures to site personnel ALARA
- Supporting timely identification, analysis, and resolution of radiation protection problems (e.g., through the plant corrective action program)
- Providing training to site personnel on radiation protection in accordance with 10 CFR 19
- Establishing an ALARA Committee with delegated authority from the site that includes the operations manager, maintenance manager, senior manager facility engineering and technical support, and functional manager radiation protection and chemistry to help provide for effective implementation of line organization responsibilities for maintaining worker doses ALARA

The executive management position for facility operations is responsible for the site fire protection program through the fire protection engineer.

The succession of responsibility for overall plant instructions or special orders in the event of absences, incapacitation of personnel, or other emergencies is as follows, unless otherwise designated in writing:

1. The executive management position for facility operations
2. The senior manager operations and maintenance
3. The operations manager

The succession of authority includes the authority to issue standing or special orders as required.

13.1.2.1.1.1 **Senior Manager Operations and Maintenance**

The senior manager operations and maintenance reports to the executive management position for facility operations, is responsible for safe operation of the plant, and has control over onsite activities necessary for safe operation and maintenance of the plant including the following:

- Operations
- Maintenance
- Outage and planning management
- Site services

13.1.2.1.1.2 **Senior Manager Safety & Licensing**

The senior manager safety and licensing reports to the executive management position for facility operations, is responsible for safe operation of the plant, and has control over onsite activities necessary for safe operation and maintenance of the plant including the following:

- Procedures and records
- Licensing
- Radiation protection
- Chemistry and radiochemistry
- Organizational effectiveness
- Training

13.1.2.1.1.3 **Maintenance Manager**

Maintenance of the plant is performed by the maintenance department mechanical, electrical, and instrumentation and control disciplines. The functions of this department are to perform preventive and corrective

maintenance, equipment testing, and to implement modifications as necessary.

The maintenance manager is responsible for the performance of preventive and corrective maintenance and modification activities required to support operations, including compliance with applicable standards, codes, specifications, and procedures. The maintenance manager is responsible for the development of maintenance programs. The maintenance manager reports to the senior manager operations and maintenance and provides direction and guidance to the maintenance discipline functional managers and maintenance support staff.

13.1.2.1.1.4 **Maintenance Discipline Functional Managers**

The functional managers of each maintenance discipline (mechanical, electrical, instrumentation and control, and support) are responsible for maintenance activities within their discipline including plant modifications. They provide guidance in maintenance planning and craft supervision. They establish the necessary manpower levels and equipment requirements to perform both routine and emergency type maintenance activities, seeking the services of others in performing work beyond the capabilities of the plant maintenance group. Each discipline functional manager is responsible for liaison with other plant staff organizations to facilitate safe operation of the station. These functional managers report to the maintenance manager.

13.1.2.1.1.5 **Maintenance Discipline Supervisors**

The maintenance discipline supervisors and assistant supervisors (mechanical, electrical, and instrumentation and control) supervise maintenance activities, assist in the planning of future maintenance efforts, and guide the efforts of the craft within their discipline. The maintenance discipline supervisors report to the appropriate maintenance discipline functional managers.

13.1.2.1.1.6 **Maintenance Mechanics, Electricians, and Instrumentation and Control Technicians**

The discipline craft perform electrical and mechanical maintenance and I&C tasks as assigned by the discipline supervisors. They troubleshoot, inspect, repair, maintain, and modify plant equipment and perform Technical Specification surveillances on equipment for which they have cognizance. They perform these tasks in accordance with approved procedures and work packages.

13.1.2.1.1.7 Manager Outage and Planning

The manager outage and planning is responsible for the support functions described in Section 13.1.1.2.5. This manager safely fulfills the responsibilities of planning and scheduling all plant work through a staff which includes a functional manager in each area of planning, scheduling, and outages. The manager outage and planning reports to the senior manager operations and maintenance.

13.1.2.1.1.8 Functional Manager Radiation Protection and Chemistry

The functional manager radiation protection and chemistry has the direct responsibility for providing adequate protection of the health and safety of personnel working at the plant and members of the public during activities covered within the scope and extent of the license. This manager's radiation protection responsibilities are consistent with the guidance in RG 8.8 and RG 8.10. They include:

- Managing the radiation protection organization
- Establishing, implementing, and enforcing the radiation protection program
- Providing radiation protection input to facility design and work planning
- Tracking and analyzing trends in radiation work performance and taking necessary actions to correct adverse trends
- Supporting the plant emergency preparedness program and assigning emergency duties and responsibilities within the radiation protection organization
- Delegating authority to appropriate radiation protection staff to stop work or order an area evacuated (in accordance with approved procedures) when, in his or her judgment, the radiation conditions warrant such an action and such actions are consistent with plant safety
- Managing the radioactive waste programs
- Managing programs that address radioactive liquid and gaseous effluent releases and associated offsite doses

The functional manager radiation protection and chemistry is responsible for development, implementation and direction and coordination of the chemistry, radiochemistry, and non-radiological environmental monitoring

programs. This area includes overall operation of the hot lab, cold lab, emergency offsite facility lab, and non-radiological environmental monitoring. The functional manager radiation protection and chemistry is responsible for the development, administration, and implementation of procedures and programs that provide for effective compliance with environmental regulations. The functional manager radiation protection and chemistry is responsible for assuring that a chemistry technician is on site whenever the unit is in modes other than cold shutdown or refueling.

The functional manager radiation protection and chemistry reports to the senior manager safety and licensing and is assisted by the supervisors radiation protection and the supervisors chemistry.

13.1.2.1.1.9 **Supervisors Radiation Protection**

The supervisors radiation protection are responsible for carrying out the day-to-day operations and programs of the radiation protection department as listed in Section 13.1.1.2.3, to promote safe and efficient plant operation.

Supervisors radiation protection report to the functional manager radiation protection and chemistry.

13.1.2.1.1.10 **Radiation Protection Technicians**

Radiation protection technicians (RPTs) directly carry out responsibilities defined in the radiation protection program and procedures. In accordance with Technical Specifications, an RPT is on site whenever there is fuel in the vessel.

The following are some of the duties and responsibilities of the RPTs:

- In accordance with authority delegated by the manager in charge of radiation protection, stop work or order an area evacuated (in accordance with approved procedures) when, in his or her judgment, the radiation conditions warrant such an action and such actions are consistent with plant safety
- Provide coverage and monitor radiation conditions for jobs potentially involving significant radiation exposure
- Conduct surveys, assess radiation conditions, and establish radiation protection requirements for access to and work within restricted, radiation, high radiation, very high radiation, airborne radioactivity areas, and areas containing radioactive materials

- Provide control over the receipt, storage, movement, use, and shipment of licensed radioactive materials, including radioactive wastes destined for offsite processing, storage, and disposal
- Review work packages, proposed design modifications, and operations and maintenance procedures to facilitate integration of adequate radiation protection controls and dose-reduction measures
- Review and oversee implementation of plans for the use of process or other engineering controls to limit the concentrations of radioactive materials in the air
- Provide personnel monitoring and bioassay services
- Maintain, prescribe, and oversee the use of respiratory protection equipment
- Perform assigned emergency response duties
- Manage radioactive liquid and gaseous effluent releases and conduct radiological environmental monitoring in assessing offsite doses to members of the public

13.1.2.1.1.11 **[Deleted]**

13.1.2.1.1.12 **[Deleted]**

13.1.2.1.2 **Operations Department**

All operations activities are conducted with safety of personnel, the public, and equipment as the overriding priority. Management personnel of the operations department are responsible for:

- Operation of station equipment
- Monitoring and surveillance of safety- and non-safety-related equipment
- Fuel loading
- Providing the nucleus of emergency and fire-fighting teams

The operations department maintains sufficient licensed and senior licensed operators to staff the MCR continuously using a crew rotation system. The operations department is under the authority of the operations manager who, through the functional manager shift operations, directs the day-to-day operation of the plant.

Specific duties, functions, and responsibilities of key shift members are discussed in Section 13.1.2.1.2.5 through Section 13.1.2.1.2.9 and in

plant administrative procedures and the Technical Specifications. The minimum shift manning requirements are shown in Table 13.1-202. Expected staffing levels are provided in Table 13.1-201.

For activities that do not require an operator's license, resources of the operations organization may be shared between units. These activities may include administrative functions and tagging. To operate or supervise the operation of more than one unit, an operator (SRO or RO) must hold an appropriate, current license for each unit.

The operations support group is staffed with sufficient personnel to provide support activities for the operating shifts and overall operations department. The following is an overview of the operations organization.

13.1.2.1.2.1 **Operations Manager**

The operations manager has overall responsibility for the day-to-day operation of the plant. The operations manager reports to the senior manager operations and maintenance and is assisted by the functional managers shift operations, operations support, and operations maintenance support. Either the operations manager or the functional manager shift operations is SRO licensed.

13.1.2.1.2.2 **Functional Manager Shift Operations**

The functional manager shift operations, under the direction of the operations manager, is responsible for:

- Shift plant operations in accordance with the operating license, Technical Specifications, and written procedures
- Providing supervision of operating shift personnel for operational shift activities including those of emergency and firefighting teams
- Coordinating with the functional manager operations support and other plant staff sections
- Verifying that nuclear plant operating records and logs are properly prepared, reviewed, evaluated and turned over to the functional manager of operations support

The functional manager shift operations is assisted in these areas by the operations shift manager who directs the operating shift personnel. The functional manager shift operations may assume the duties of the operations manager in the event of an absence.

13.1.2.1.2.3 Functional Manager Operations Support

The functional manager operations support, under the direction of the operations manager is responsible for:

- Directing and guiding plant operations support activities in accordance with the operating license, Technical Specifications, and written procedures
- Providing supervision of operating support personnel and operations support activities, and coordination of support activities
- Providing for nuclear plant operating records and logs to be turned over to the nuclear records group for maintenance as quality records
- Supervising operating procedure maintenance

The functional manager operations support is assisted by specialists in the areas of work management, radwaste operations, operations procedures, and other support personnel. In the absence of the operations manager, the functional manager operations support may assume the duties and responsibilities of the operations manager.

13.1.2.1.2.4 Functional Manager Operations Maintenance Support

The functional manager operations maintenance support is a licensed SRO reporting directly to the operations manager. Responsibilities of this position include:

- Valve lineups for maintenance and testing activities.
- Equipment tagging
- Review and authorization of maintenance, surveillance, or other work or testing.
- Keeping the operations shift manager and other operations personnel informed of activities for which they need to be cognizant.
- Verifying that work and testing is safe and appropriate for the existing conditions of the plant.
- Tracking the work and testing to provide assurance that any LCOs or other requirements will not be exceeded.

13.1.2.1.2.5 Operations Shift Manager

The operations shift manager is a licensed senior reactor operator (SRO) responsible for the control room command function, and is the direct management representative of the executive management for facility

operations for the conduct of operations. The operations shift manager has the responsibility and authority to direct the activities and personnel onsite as required to:

- Protect the health and safety of the public, the environment, and personnel on the plant site
- Prevent damage to site equipment and structures
- Comply with the operating license

The operations shift manager retains this responsibility and authority until formally relieved of operating responsibilities by a licensed SRO. Additional responsibilities of the operations shift manager include:

- Directing nuclear plant employees to report to the plant for response to potential and real emergencies
- Seeking the advice and guidance of the shift technical advisor and others in executing his duties whenever in doubt as to the proper course of action
- Promptly informing responsible supervisors of significant actions affecting their responsibilities
- Participating in operator training, retraining, and requalification activities from the standpoint of providing guidance, direction, and instruction to shift personnel

The operations shift manager is assisted in carrying out the above duties by the on-shift senior operator and the operating shift personnel. As shown on Figure 13.1-203, the operations shift manager reports to the functional manager shift operations.

13.1.2.1.2.6 On-Shift Senior Operator

The on-shift senior operator is a licensed SRO. The main functions of the on-shift senior operator are to administratively support the operations shift manager such that the “command function” is not overburdened with administrative duties and to supervise the licensed and non-licensed operators in carrying out the activities directed by the operations shift manager. Other duties and responsibilities include:

- Being aware of maintenance and testing performed during the shift
- Directing reactor shutdown if conditions warrant this action

- Informing the operations shift manager and other station management in a timely manner of conditions which may affect public safety, plant personnel safety, plant capacity or reliability, or cause a hazard to equipment
- Initiating immediate corrective action as directed by the operations shift manager in any upset situation until assistance, if required, arrives
- Participating in operator training, retraining, and requalification activities from the standpoint of providing guidance, direction, and instruction to shift personnel
- Responding conservatively to instrument indications unless they are proved to be incorrect
- Adhering to the plant's technical specifications
- Reviewing routine operating data to assure safe operation

As shown on Figure 13.1-203, the on-shift senior operator reports directly to the operations shift manager.

13.1.2.1.2.7 **Reactor Operator**

Reactor operators (RO) are licensed personnel and normally report to the on-shift senior operator. They are responsible for routine plant operations and performance of major evolutions at the direction of the on-shift senior operator. The RO duties and responsibilities include:

- Monitoring control room instrumentation
- Responding to plant or equipment abnormalities in accordance with approved plant procedures
- Directing the activities of non-licensed operators
- Documenting operational activities, plant events, and plant data in shift logs
- Responding conservatively to instrument indications unless they are proved to be incorrect
- Adhering to the plant's technical specifications
- Reviewing routine operating data to assure safe operation

- Initiating plant shutdowns or scrams or other compensatory actions when:
  - •• Observation of plant conditions indicates a nuclear safety hazard exists
  - •• Approved procedures so direct
  - •• The RO determines that the safety of the reactor is in jeopardy
  - •• Operating parameters exceed any of the reactor protection system setpoints and automatic shutdown does not occur

Whenever there is fuel in the reactor vessel, at least one reactor operator is in the control room monitoring the status of the unit at the main control panel. The RO assigned to the main control panel is designated the Operator-At-The Controls (OATC) and conducts monitoring and operating activities in accordance with the guidance set forth in RG 1.114, which is further described in Section 13.1.2.1.3.

13.1.2.1.2.8 **Non-Licensed Operator**

The non-licensed operators perform routine duties outside the control room as necessary for continuous, safe plant operation including:

- Assisting in plant startup, shutdown, surveillance, and emergency response by manually or remotely changing equipment operating conditions, placing equipment in service, or securing equipment from service at the direction of the RO
- Performing assigned tasks in procedures and checklists such as valve manipulations for plant startup or data sheets on routine equipment checks, and making accurate entries according to the applicable procedure, data sheet, or checklist
- Assisting in training of new employees and improving and upgrading their own performance by participating in the applicable sections of the training program

13.1.2.1.2.9 **Shift Technical Advisor**

The station is committed to meeting NUREG-0737 TMI Action Plan item I.A.1.1 for shift technical advisors (STAs). The STA reports directly to the operations shift manager and provides advanced technical assistance to the operating shift complement during normal and abnormal operating conditions. The STA's responsibilities are detailed in

plant administrative procedures as required by TMI Action Plan I.A.1.1 and NUREG-0737, Appendix C. These responsibilities include:

- Monitoring core power distribution and critical parameters
- Assisting the operating shift with technical expertise during normal and emergency conditions
- Evaluating technical specifications, special reports, and procedural issues

The STA contributes to operations safety by independently observing plant status and advising shift supervision of conditions that could compromise plant safety. During transients or accident situations, the STA independently assesses plant conditions and provides technical assistance and advice to mitigate the incident and minimize the effect on personnel, the environment, and plant equipment.

An SRO on shift who meets the qualifications for the combined SRO/STA position specified for Option 1 of Generic Letter 86-04 (Reference 13.1-202) may also serve as the STA. If this option is used for a shift, the separate STA position may be eliminated for that shift.

13.1.2.1.3 **Conduct of Operations**

Station operations are controlled and coordinated through the control room. Maintenance activities, surveillances, and removal from/return to service of SSCs affecting the operation of the plant may not commence without the authority of the operations shift manager or designee. The rules of practice for control room activities, as described by administrative procedures, which are based on RG 1.114, address the following:

- Position/placement of the workstation for the operator at the controls and the expected area of the control room where the on-shift senior operator or operations shift manager should spend the majority of on-shift time
- Definition and outline of “surveillance area” and requirement for continuous surveillance by the operator at the controls
- Relief requirements for operator at the controls and the on-shift senior operator or operations shift manager

In accordance with 10 CFR 50.54 (i), (j), (k), (l), and (m):

- Reactivity controls may be manipulated only by licensed operators and senior operators except as allowed for training under 10 CFR 55

- Apparatus and mechanisms other than controls which may affect reactivity or power level of the reactor shall be operated only with the consent of the operator at the controls or the on-shift senior operator or operations shift manager
- An RO or SRO shall be present at the controls at all times during the operation of the facility
- For each shift, operations shift manager designates one or more SROs to be responsible for directing the licensed activities of licensed operators
- An SRO shall be present at the facility or readily available on call at all times during its operation, and shall be present at the facility during initial start-up and approach to power, recovery from an unplanned or unscheduled shut-down or significant reduction in power, and refueling, or as otherwise prescribed in the facility license
- Minimum shift staffing for operations personnel is shown in Table 13.1-202
- With the unit in modes other than cold shutdown or refueling, there shall be one SRO in the control room at all times. In addition, there shall be one RO or one SRO at the controls whenever there is fuel in the reactor vessel

13.1.2.1.4 **Operating Shift Crews**

Plant administrative procedures implement the required shift staffing. These provisions establish crews with sufficient qualified plant personnel to staff the operational shifts and be readily available in the event of an abnormal or emergency situation. The objective is to operate the plant with the required staff and to develop work schedules that minimize overtime for plant staff members who perform safety-related functions. Work hour limitations and shift manning requirements defined by TMI Action Plan I.A.1.3 are addressed in station procedures. Shift crew staffing plans may be modified during refueling outages to accommodate safe and efficient completion of outage work in accordance with work hour limitations established in administrative procedures.

The minimum composition of an operating shift depends on the operational mode, as shown in Table 13.1-202. Reporting relationships for these positions are shown in Figure 13.1-203.

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13.1.2.1.5 Fire Brigade

The plant is designed, and the fire brigade organized, to be self-sufficient with respect to fire fighting activities. The fire brigade is organized to deal with fires and related emergencies that could occur. It consists of a fire brigade leader and a sufficient number of team members to be consistent with the equipment that must be put in service during a fire emergency. The fire brigade leader has ready access to keys to any locked doors. A sufficient number of trained and physically qualified fire brigade members are available on site during each shift. The fire brigade consists of at least five members on each shift. Members of the fire brigade are knowledgeable of building layout and system design. The assigned fire brigade members for any shift do not include the operations shift manager nor any other members of the minimum shift operating crew necessary for safe shutdown of the unit, nor do they include any other personnel required for other essential functions during a fire emergency. Fire brigade members for a shift are designated in accordance with established procedures at the beginning of the shift. The fire brigade for Unit 3 does not include personnel assigned to Units 1 and 2.

The brigade leader and at least two brigade members have sufficient training in, or knowledge of, plant systems to understand the effects of fire and fire suppressents on safe-shutdown capability. The brigade leader has training or experience necessary to assess the potential safety consequences of a fire and advise control room personnel, as evidenced by possession of an operator’s license or equivalent knowledge of plant systems. The qualification of fire brigade members includes an annual physical examination to determine their ability to perform strenuous firefighting activities.

13.1.3 Qualification Requirements of Nuclear Plant Personnel

13.1.3.1 Minimum Qualification Requirements

Qualifications of managers, supervisors, operators, and technicians of the operating organization meet the requirements for education and experience described in ANSI/ANS-3.1 (Reference 13.1-201), as endorsed and amended by RG 1.8. For operators and SROs, these requirements are modified in Section 13.2.

13.1.3.2 **Qualification Documentation**

Resumes and other documentation of qualification and experience of initial appointees to appropriate management and supervisory positions are available for review by regulators upon request after position vacancies are filled.

13.1.4 **COL Information**

13.1-1-A **Organizational Structure**

NAPS COL 13.1-1-A
CWR COL 13.1-1-A

This COL item is addressed in Sections 9.5.1.15.3, 13.1.1 through 13.1.3.

13.1.5 **References**

13.1-201 American Nuclear Society, "American National Standard for Selection, Qualification, and Training of Personnel for Nuclear Power Plant," ANSI/ANS -3.1.

13.1-202 U.S. Nuclear Regulatory Commission, "Generic Letter 86-04, Policy Letter, Engineering Expertise on Shift."

NAPS COL 13.1-1-A **Table 13.1-201 Generic Position/Site Specific Position Cross Reference**

Nuclear Function	Generic Position	ANS-3.1-1993 section	Nuclear Plant Position (Site-Specific)	Operational Phase
Executive management	president and chief nuclear officer	n/a	President & CNO Dominion Nuclear	1**
	executive management position for facility operations	4.2.1	Site Vice President - North Anna 3	1
Nuclear support	executive management for support services	n/a	Vice President - Nuclear Support Services	1**
	executive management position for nuclear engineering	n/a	Vice President - Nuclear Engineering	1**
Plant management	senior manager operations and maintenance	4.2.1	Plant Manager (Nuclear)	1
	senior manager safety and licensing	4.2.4	Director Nuclear Station Safety & Licensing	1
operations	operations manager	4.2.2	Manager Nuclear Operations	1
operations, plant	functional manager shift operations	4.3.8	Supervisor Nuclear Shift Operations	1
operations, admin	functional manager operations support	4.3.8	Supervisor Nuclear Operations Support	1
	functional manager operations maintenance support	4.3.8	Nuclear Operations Maintenance Advisor	1
	senior operator	4.4.2	Unit Supervisor	1
on-shift operations	operations shift manager	4.4.1	Shift Manager	6
	senior operator	4.4.2	Unit Supervisor	8
	shift technical advisor	4.6.2	STA****	5
	reactor operator	4.5.1	Control Room Operator (Licensed)	10
	non-licensed operator	4.5.2	Control Room Operator	30
	rad waste operator	4.5.2	Control Room Operator	2

NAPS COL 13.1-1-A **Table 13.1-201 Generic Position/Site Specific Position Cross Reference**

Nuclear Function	Generic Position	ANS-3.1-1993 section	Nuclear Plant Position (Site-Specific)	Operational Phase
Engineering	senior manager facility engineering and technical support	4.2.4	Director Nuclear Engineering	1
technical support	functional manager engineering technical support	4.3.9	Manager Nuclear Engineering	1
	programs engineer	4.6.1	Nuclear Engineer	12
system engineering	functional manager system engineering	4.3.9	Manager Nuclear Site Engineering	4
	system engineer	4.6.1	Nuclear Engineer	16
design engineering	functional manager design engineering	4.3.9	Manager Nuclear Design Engineering	1
	Projects engineer	4.6.1	Nuclear Engineer	3
	design engineer	4.6.1	Nuclear Engineer	10
safety and engineering analysis	functional manager nuclear fuel analysis and design	4.3.9	Manager Nuclear Engineering	1**
	analysis engineer	4.6.1	Nuclear Engineer	3
reactor engineering	functional manager reactor engineering	4.3.9	Supervisor Nuclear Engineering	1
	reactor engineer	4.6.1	Nuclear Engineer	3
Chemistry	functional manager chemistry	4.3.2	Manager Radiation Protection & Chemistry	1
	supervisor chemistry	4.4.5	Chemistry Supervisor Nuclear Chemistry	2
	technician chemistry	4.5.3.1	Nuclear Chemistry Technician	10

NAPS COL 13.1-1-A **Table 13.1-201 Generic Position/Site Specific Position Cross Reference**

Nuclear Function	Generic Position	ANS-3.1-1993 section	Nuclear Plant Position (Site-Specific)	Operational Phase
Radiation Protection	functional manager radiation protection	4.3.3	Manager Radiation Protection & Chemistry	1
	supervisor radiation protection	4.4.6	Health Physics Supervisor	8
	radiation protection technician	4.5.3.2	Health Physics Technician	18
	ALARA specialist	n/a	Health Physicist	3
	decon technician	n/a	Radiation Decontamination Technician	6
Maintenance	maintenance manager	4.2.3	Manager Nuclear Maintenance	1
instrumentation and control	functional manager I&C	4.3.4	Supervisor I&C	1
	supervisor I&C	4.4.7	Assistant Supervisor, I&C	2
	I&C technician	4.5.3.3	Nuclear Instrument Technician	30
mechanical	functional manager mechanical maintenance	4.3.6	Supervisor Nuclear Maintenance	1
	supervisor mechanical	4.4.9	Nuclear Maintenance Supervisor	2
	mechanical technician	4.5.7.2	Mechanic	30
electrical	functional manager electrical	4.3.5	Supervisor Nuclear Maintenance	1
	supervisor electrical	4.4.8	Nuclear Maintenance Supervisor	2
	electrical technician	4.5.7.1	Electrician	30
Planning and scheduling and outage	manager outage and planning	4.2.4	Manager Nuclear Outage & Planning	1
	functional manager outage	4.3.9	Supervisor Nuclear Planning	1
	functional manager scheduling	4.3.9	Supervisor Nuclear Scheduling	1
	functional manager planning	4.3.9	Supervisor Nuclear Planning	1
Purchasing and contracts	functional manager procurement control	4.3.9	Manager, Supply Chain Services	1
	procurement engineer	4.6.1	Procurement Engineer	2

NAPS COL 13.1-1-A **Table 13.1-201 Generic Position/Site Specific Position Cross Reference**

Nuclear Function	Generic Position	ANS-3.1-1993 section	Nuclear Plant Position (Site-Specific)	Operational Phase
QA	senior manager nuclear oversight	QAPD, Part II, Section 2.6	Director Nuclear Oversight	1**
	manager nuclear oversight	QAPD, Part II, Section 2.6	Manager Nuclear Oversight	1
	QA internal auditor	QAPD, Part II, Section 2.7	Nuclear Quality Specialist	7
	QC inspector	QAPD, Part II, Section 2.7	Nuclear Quality Specialist	6
	supplier auditor	QAPD, Part II, Section 2.7	Nuclear Quality Inspector	7**
	vendor surveillance QC inspector	QAPD, Part II, Section 2.7	Vendor Quality Specialist	4**
	nuclear fuel inspector	QAPD, Part II, Section 2.7	Nuclear Technical Specialist	3**

NAPS COL 13.1-1-A **Table 13.1-201 Generic Position/Site Specific Position Cross Reference**

Nuclear Function	Generic Position	ANS-3.1-1993 section	Nuclear Plant Position (Site-Specific)	Operational Phase
Training	functional manager training	4.3.1	Manager Nuclear Training	1
	supervisor operations training	4.4.4	Supervisor Nuclear Training	1
	supervisor, simulator	4.4.4	Supervisor Nuclear Training	1
	operations training instructor	4.5.4	Instructor	10
	supervisor technical staff training	4.4.4	Supervisor Nuclear Training	1
	supervisor maintenance training	4.4.4	Supervisor Nuclear Training	1
	technical staff/maintenance instructors	4.5.4	Instructor	7
Nuclear safety assurance	functional manager licensing	4.3.9	Supervisor Nuclear Engineering	1
	licensing engineer	n/a	Nuclear Engineer	2
	functional manager organizational effectiveness	4.3.9	Supervisor Station Nuclear Safety	1
	corrective action engineer	n/a	Nuclear Engineer	1
Nuclear Protection Services				
emergency preparedness	manager emergency preparedness	4.3.9	Manager Nuclear Emergency Planning	1
	EP planner	n/a	Emergency Preparedness Specialist	2
security	manager nuclear security	4.3.9	Manager, Security	1***
	supervisor security	n/a	Supervisor, Nuclear Security	10***
	security officer	n/a	Nuclear Security Officer	100***

BASIS: ESBWR COLA

NAPS COL 13.1-1-A

Table 13.1-201 Generic Position/Site Specific Position Cross Reference

Nuclear Function	Generic Position	ANS-3.1-1993 section	Nuclear Plant Position (Site-Specific)	Operational Phase
Startup testing	manager	4.4.12	Startup Test Manager	1
	supervisor	4.4.12	Startup Test Supervisor	2
	startup test engineer	n/a*****	Startup Test Engineer	12
	manager	4.4.11	Preop Test Manager	—
	supervisor	4.4.11	Preop Testing Supervisor	—
	preop test engineer (n/a)	n/a*****	Preop Test Engineer	—

** The number in this block indicates total positions in the nuclear organization.

*** Shared position with other North Anna units.

**** A senior reactor operator on shift who meets the qualifications for the combined SRO/STA position specified for Option 1 of Generic Letter 86-04 (Reference 13.1-202) may also serve as the STA. If this option is used for a shift, the separate STA position may be eliminated for that shift.

***** Level II inspection and test personnel, as defined in ASME NQA-1, Part 1, Basic Requirement 2 and Supplement 2S-1; and Part III, Subpart 3.1, Appendix 2A-1.

NAPS COL 13.1-1-A

Table 13.1-202 Minimum Shift Staffing for Unit 3

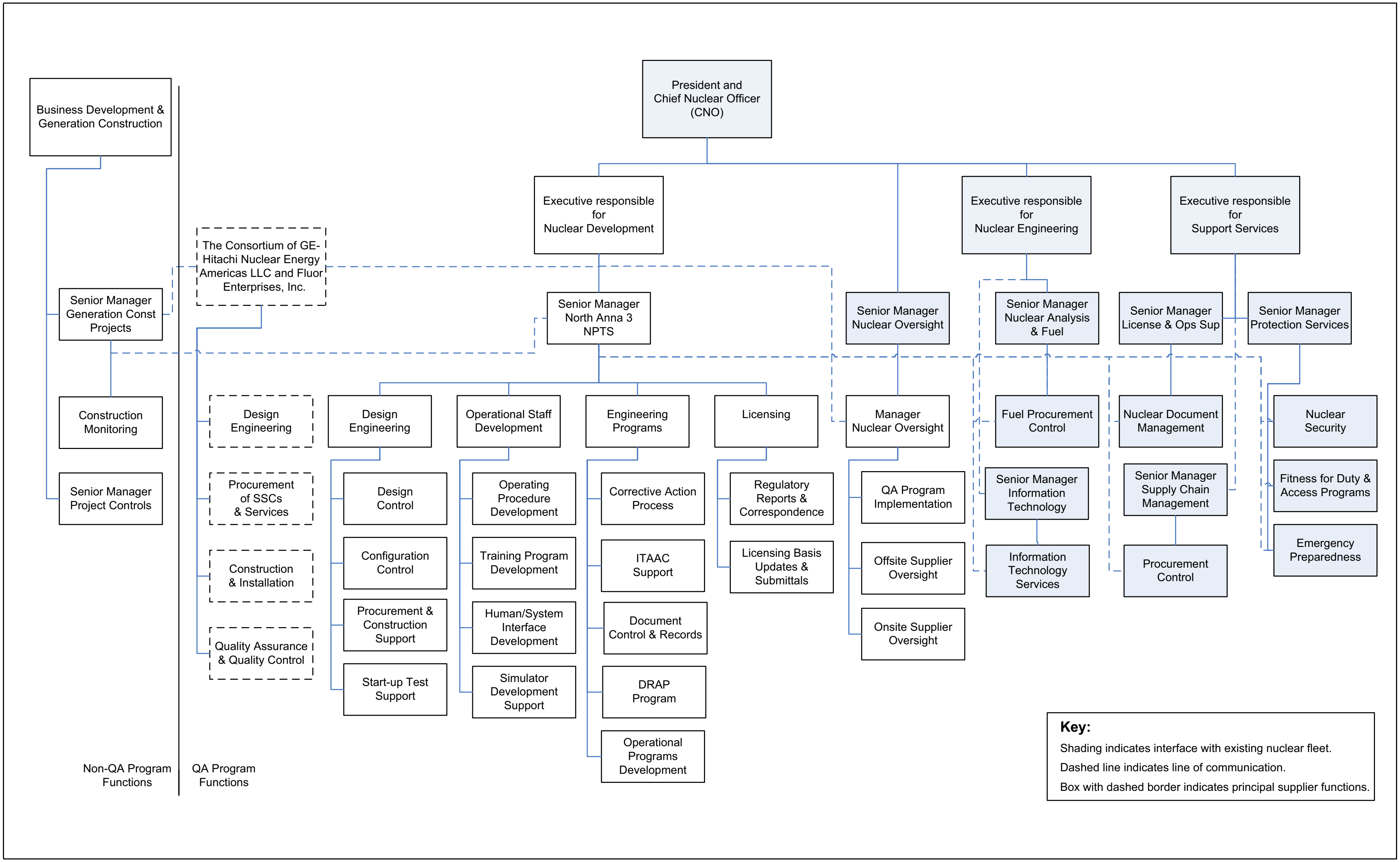
Unit Shutdown	1 SM (SRO) 1 RO 1 NLO
Unit Operating*	1 SM (SRO) 1 SRO 2 RO 2 NLO
SM – shift manager SRO – Licensed Senior Reactor Operator	RO – Licensed Reactor Operator NLO – non-licensed operator

Notes:

1) In addition, one Shift Technical Advisor (STA) is assigned during plant operation in modes other than cold shutdown or refueling. A shift manager or another SRO on shift, who meets the qualifications for the combined Senior Reactor Operator/Shift Technical Advisor (SRO/STA) position, as specified for option 1 of Generic Letter 86-04 (Reference 13.1-202), the commission's policy statement on engineering expertise on shift, may also serve as the STA. If this option is used for a shift, then the separate STA position may be eliminated for that shift.
2) In addition to the minimum shift organization above, during refueling a licensed senior reactor operator or senior reactor operator limited (fuel handling only) is required to directly supervise any core alteration activity.
3) A shift manager/supervisor (licensed SRO), is on site at all times when fuel is in the reactor.
4) A health physics technician is on site at all times where there is fuel in the reactor.
5) A chemistry technician is on site during plant operation in modes other than cold shutdown or refueling.
6) Procedures contain guidance for shift staffing that meet the requirements of this table, the Technical Specifications, the Emergency Plan and Fire Brigade staffing.

* Operating modes other than cold shutdown or refueling.

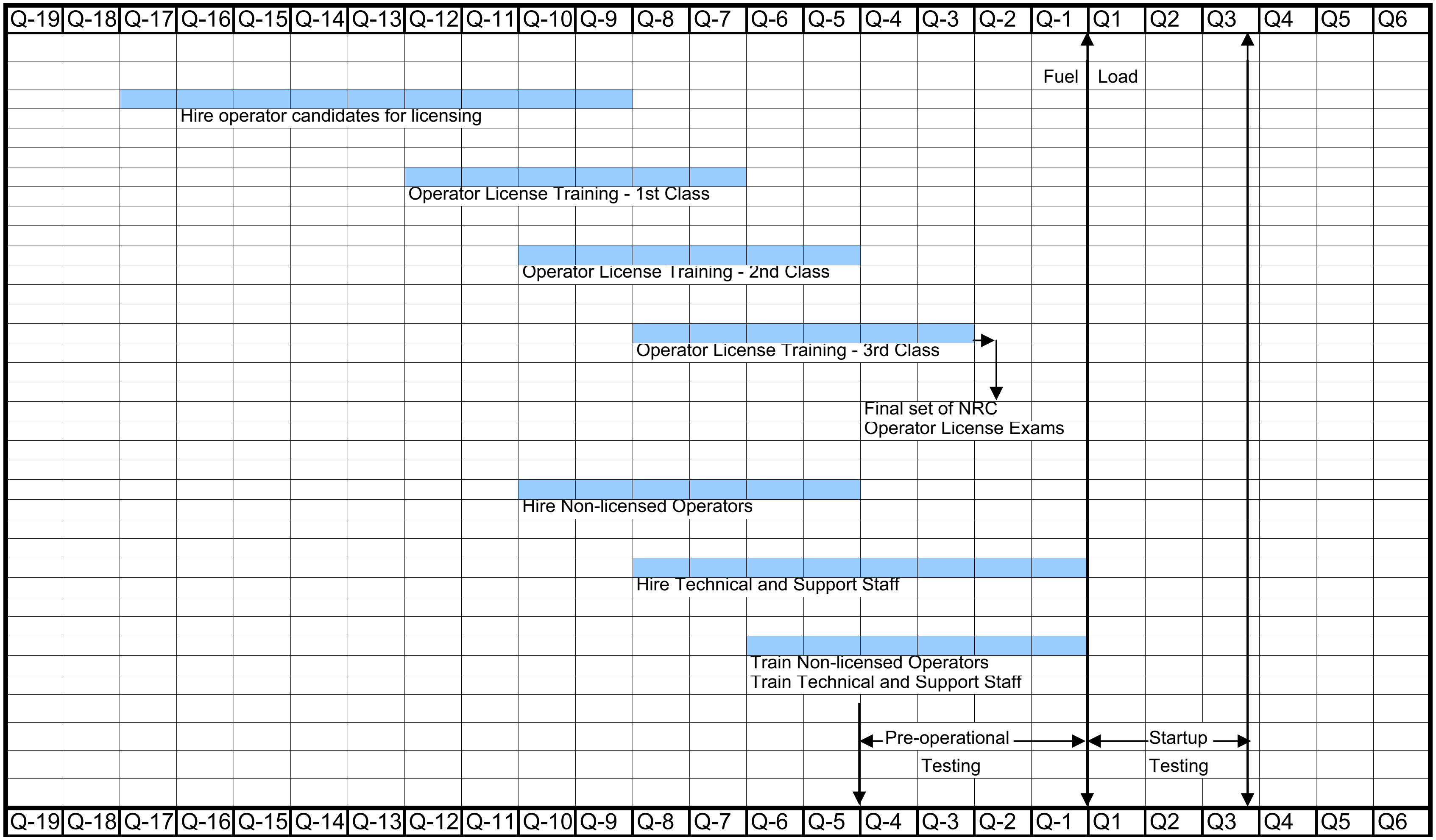
NAPS COL 13.1-1-A **Figure 13.1-201 Construction Organization**



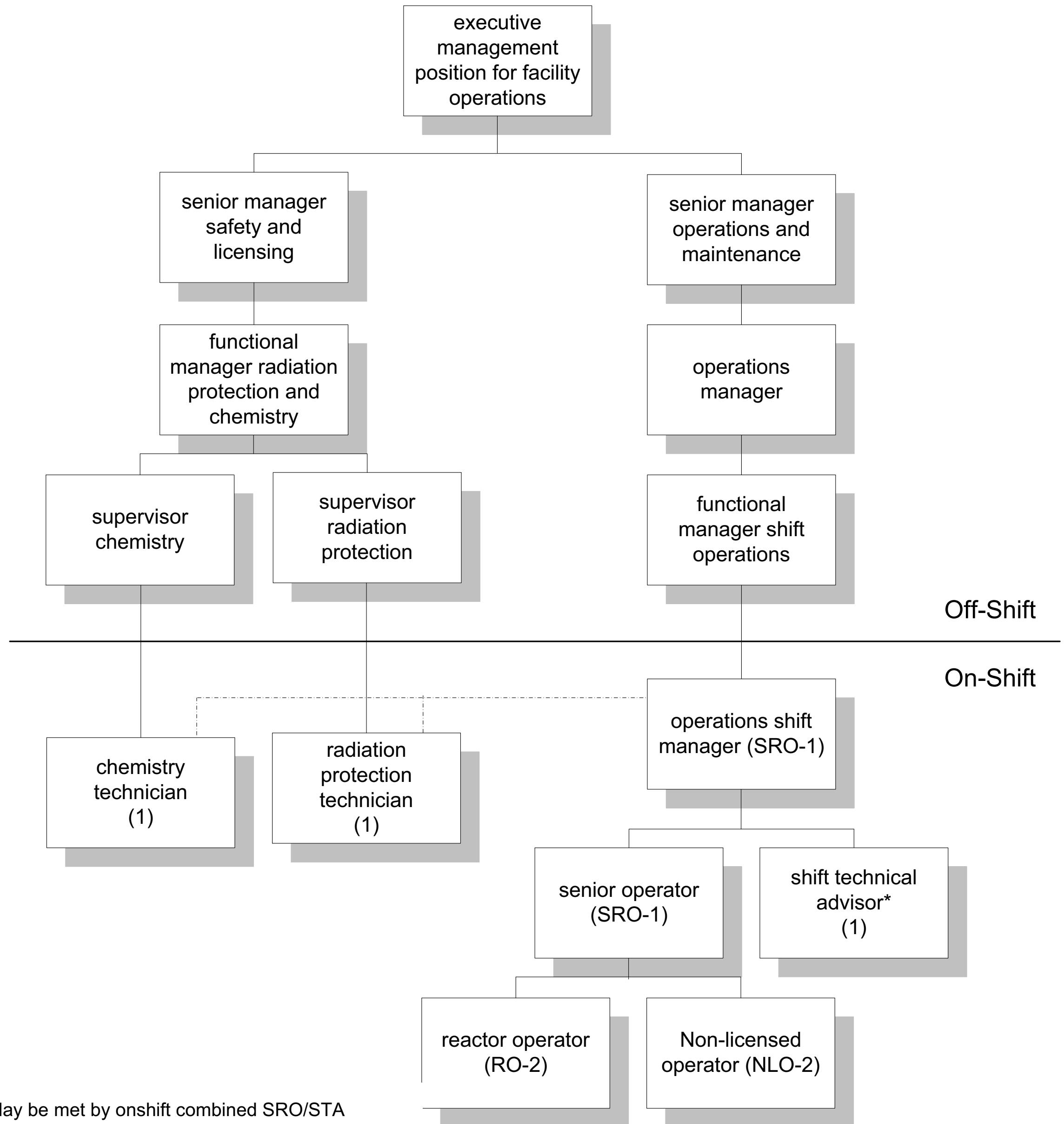
BASIS: ESBWR COLA

CWR COL 13.1-1-A

Figure 13.1-202 Nominal Plant Staff Hiring and Training Schedule



NAPS COL 13.1-1-A **Figure 13.1-203 Shift Operation**

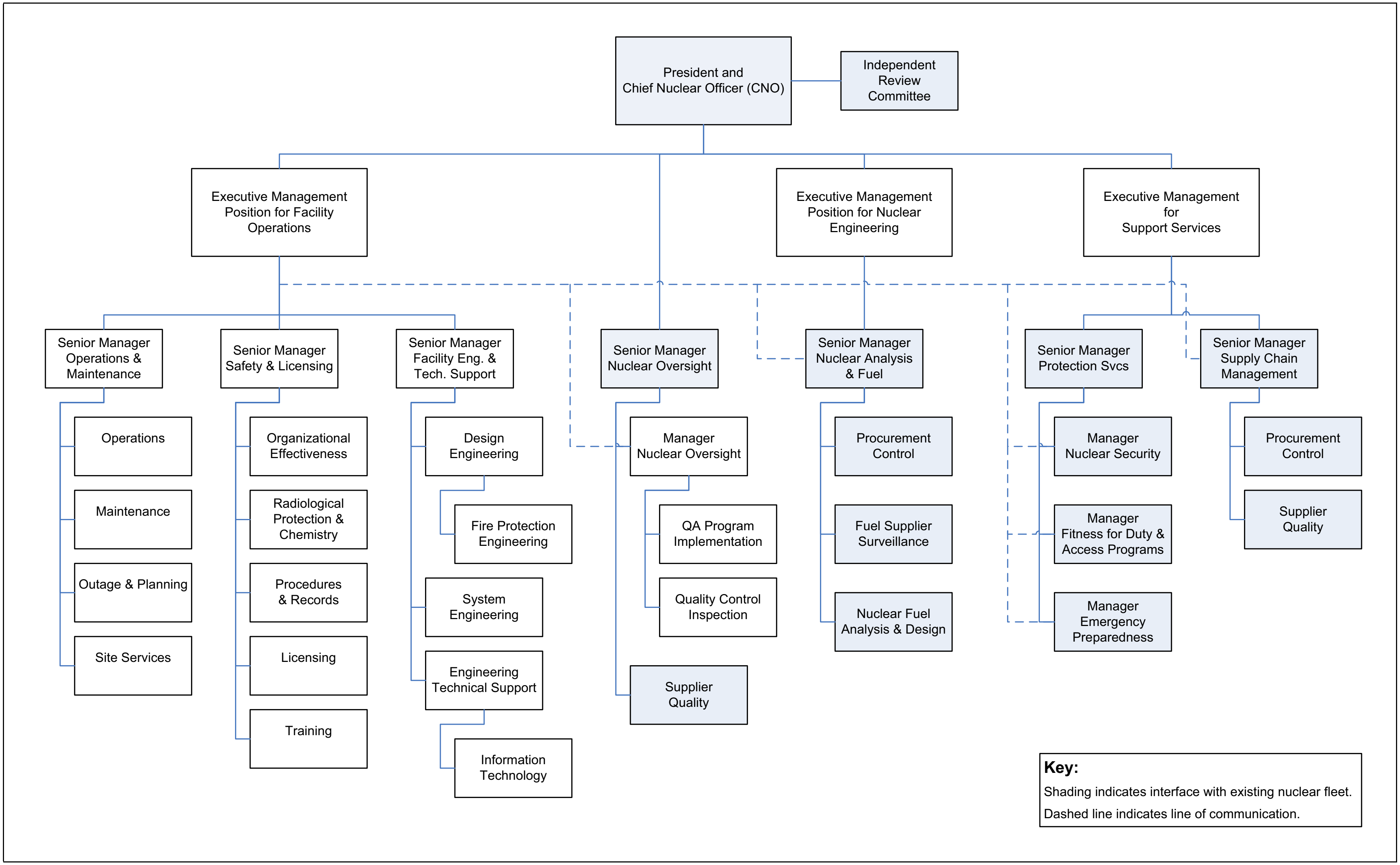


* May be met by onshift combined SRO/STA
SRO - licensed senior reactor operator
RO - licensed reactor operator
NLO - non-licensed operator

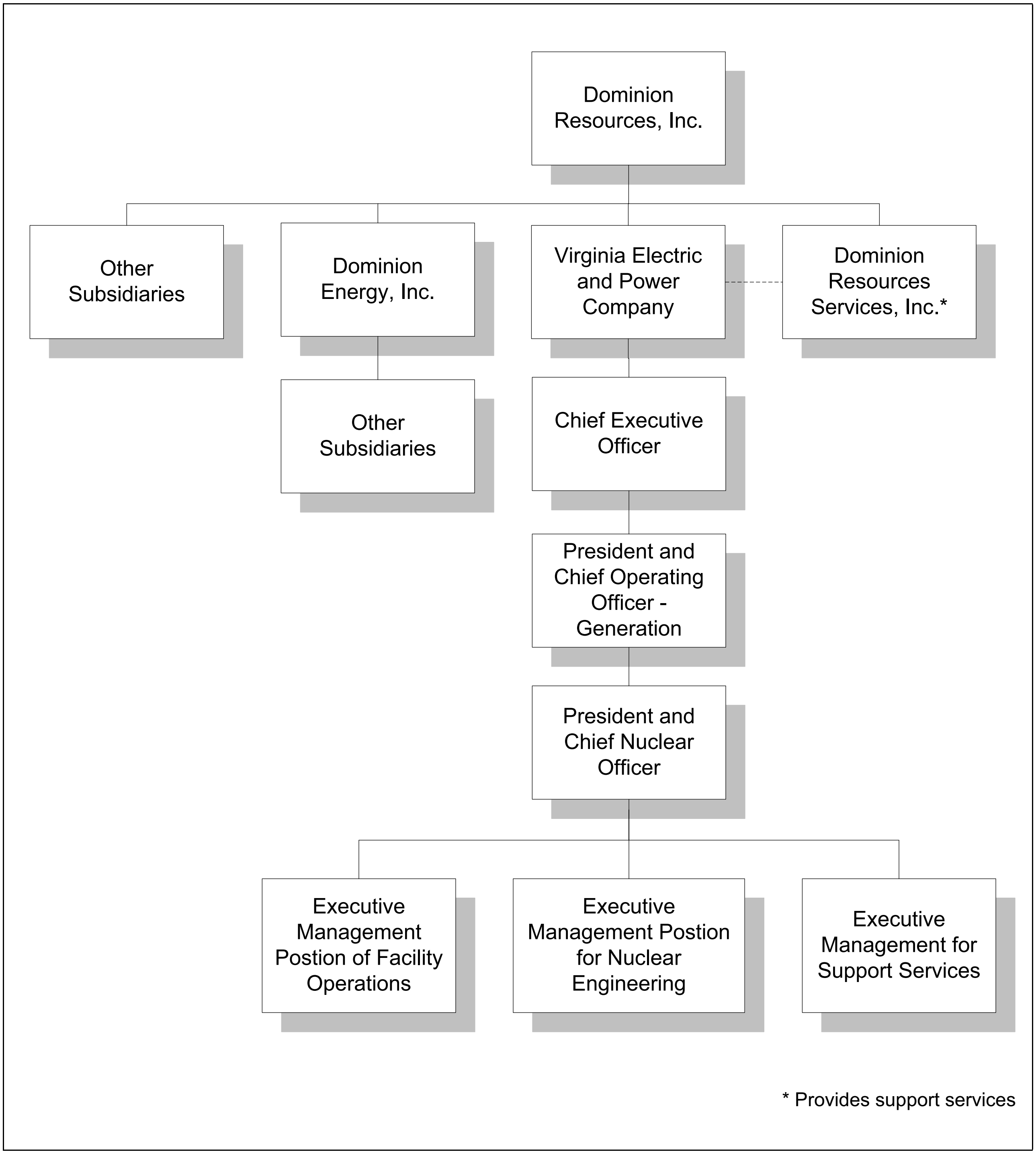
Shift Manning - 5 shifts (minimum)
(No.) - Indicates number of positions per shift

Procedures contain guidance for shift staffing that meets the requirements of this figure, the Technical Specifications, the Emergency Plan, and Fire Brigade staffing.

NAPS COL 13.1-1-A **Figure 13.1-204 Operating Organization**



NAPS COL 13.1-1-A **Figure 13.1-205 Corporate Structure**



13.2 Training

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Add the following as introductory material under Section 13.2:

STD SUP 13.2-1 Training programs are addressed in Appendix 13BB. Implementation milestones are addressed in Section 13.4.

13.2.1 Reactor Operator Training

Replace the second sentence of the second paragraph with the following:

STD COL 13.2-1-A Descriptions of the training program and licensed operator requalification program for reactor operators and senior reactor operators are addressed in Appendix 13BB. A schedule showing approximate timing of initial licensed operator training relative to fuel loading is addressed in Section 13.1. Requalification training is implemented in accordance with Section 13.4.

13.2.2 Training for Non-Licensed Plant Staff

Replace the second sentence of the second paragraph with the following:

STD COL 13.2-2-A A description of the training program for non-licensed plant staff is addressed in Appendix 13BB. A schedule showing approximate timing of initial training for non-licensed plant staff relative to fuel load is addressed in Section 13.1.

13.2.5 COL Information

13.2-1-A Reactor Operator Training

STD COL 13.2-1-A This COL item is addressed in Section 13.2.1 and Appendix 13BB.

13.2-2-A Training for Non-Licensed Plant Staff

STD COL 13.2-2-A This COL item is addressed in Section 13.2.2 and Appendix 13BB.

13.3 Emergency Planning

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Replace the fifth through ninth paragraphs with the following.

STD COL 13.3-1-A

As addressed in the emergency plan, the TSC is provided with reliable voice and data communication with the MCR and Emergency Operations Facility (EOF) and reliable voice communications with the Operational Support Center (OSC), NRC, and state and local operations centers.

The OSC communications system has at least one dedicated telephone extension to the control room, and one dedicated telephone extension to the TSC, and one telephone capable of reaching on-site and off-site locations, as a minimum.

Replace the second sentence in the tenth paragraph with the following.

STD COL 13.3-3-A

Supplies are provided in the service building adjacent to the main change rooms for decontamination of on-site individuals.

13.3.2 Emergency Plan

STD COL 13.3-1-A
STD COL 13.3-2-A
STD COL 13.3-3-A

The emergency plan, prepared in accordance with 10 CFR 52.79(d), is maintained as a separate document.

13.3.3 COL Information

13.3-1-A Identification of OSC and Communication Interfaces with Control Room and TSC

STD COL 13.3-1-A

This COL Item is addressed in Section 13.3 and in Emergency Plan Sections II-F and II-H.

13.3-2-A Identification of EOF and Communication Interfaces with Control Room and TSC

STD COL 13.3-2-A

This COL item is addressed in Section 13.3 and in Emergency Plan Sections II-F and II-H.

13.3-3-A Decontamination Facilities

STD COL 13.3-3-A

This COL item is addressed in Section 13.3 and in Emergency Plan Section II-J.

13.3.5 ESP Information

SSAR Section 13.3 is incorporated by reference for historical purposes.

13.4 Operational Program Implementation

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Replace this section with the following.

STD COL 13.4-1-A
STD COL 13.4-2-A

Table 13.4-201 lists each operational program, the regulatory source for the program, the associated implementation milestone(s), and the section of the FSAR in which the operational program is fully described as required by RG 1.206, Combined License Applications for Nuclear Power Plants (LWR edition).

13.4.1 COL Information

13.4-1-A Operation Programs

STD COL 13.4-1-A

This COL item is addressed in Sections 9.5.1.15.2. and 13.4

13.4-2-A Implementation Milestones

STD COL 13.4-2-A

This COL item is addressed in Section 13.4.

13.4.2 References

13.4-201 American Society of Mechanical Engineers (ASME), "Boiler and Pressure Vessel Code (B&PVC), Rules for Inservice Inspection of Nuclear Power Plant Components," BPVC Section XI.

13.4-202 American Society of Mechanical Engineers (ASME), "Code for the Operation and Maintenance of Nuclear Power Plants," OM Code.

STD COL 13.4-1-A
STD COL 13.4-2-A

Table 13.4-201 Operational Programs Required by NRC Regulations

Item	Program Title	Program Source (Required by)	Section	Implementation Milestone	Implementation Requirement
1.	Inservice Inspection Program	10 CFR 50.55a(g) 10 CFR 50.55a(b)(3)(v)	5.2.4 6.6 3.8.1.7.3	Prior to commercial service	10 CFR 50.55a(g) ASME XI IWA 2430(b) (Reference 13.4-201)
	Flow-Accelerated Corrosion Program	10 CFR 50.55a(g)(6)(ii)	6.6.7	Prior to commercial service	License Condition
2.	Inservice Testing Program	10 CFR 50.55a(f)	3.9.6	After generator online on nuclear heat	10 CFR 50.55a(f) ASME OM Code (Reference 13.4-202)
3.	Environmental Qualification Program	10 CFR 50.49(a)	3.11	Prior to fuel load	License Condition
4.	Preservice Inspection Program	10 CFR 50.55a(g)	5.2.4 6.6 3.8.1.7.3	Completion prior to initial plant startup	10 CFR 50.55a(g) ASME Code Section XI IWB/IWC/IWD/IWF-2200(a) (Reference 13.4-201)
5.	Reactor Vessel Material Surveillance Program	10 CFR 50.60 10 CFR 50, Appendix H	5.3.1	Prior to fuel load	License Condition
6.	Preservice Testing Program	10 CFR 50.55a(f)	3.9.6	Prior to fuel load	License Condition
7.	Containment Leakage Rate Testing Program	10 CFR 50.54(o) 10 CFR 50, Appendix J	6.2.6	Prior to fuel load	10 CFR 50, Appendix J Option B – Section III.a

STD COL 13.4-1-A
STD COL 13.4-2-A

Table 13.4-201 Operational Programs Required by NRC Regulations

Item	Program Title	Program Source (Required by)	Section	Implementation Milestone	Implementation Requirement
8.	Fire Protection Program	10 CFR 50.48	9.5.1.15	Prior to fuel receipt for elements of the Fire Protection Program necessary to support receipt and storage of fuel onsite. Prior to fuel load for elements of the Fire Protection Program necessary to support fuel load and plant operation.	License Condition
	(portions applicable to radioactive material)	10 CFR 30.32 10 CFR 40.31 10 CFR 70.22		Prior to initial receipt of byproduct source, or special nuclear materials (excluding Exempt Quantities as described in 10 CFR 30.18)	10 CFR 30.32(a) 10 CFR 40.31(a) 10 CFR 70.22(a)

STD COL 13.4-1-A
STD COL 13.4-2-A

Table 13.4-201 Operational Programs Required by NRC Regulations

Item	Program Title	Program Source (Required by)	Section	Implementation	
				Milestone	Requirement
9.	Process and Effluent Monitoring and Sampling Program:				
	Radiological Effluent Technical Specifications/Standard Radiological Effluent Controls	10 CFR 20.1301 and 20.1302 10 CFR 50.34a 10 CFR 50.36a 10 CFR 50, Appendix I, Section II and IV	11.5.4.6	Prior to fuel load	License Condition
	Offsite Dose Calculation manual	Same as above	11.5.4.5 11.5.4.8	Prior to fuel load	License Condition
	Radiological Environmental Monitoring Program	Same as above	11.5.4.5	Prior to fuel load	License Condition
	Process Control Program	10 CFR 20.1301 and 20.1302 10 CFR 50.34a 10 CFR 61.55 and 61.56 10 CFR 71	11.4.2.3	Prior to fuel load	License Condition

STD COL 13.4-1-A
STD COL 13.4-2-A

Table 13.4-201 Operational Programs Required by NRC Regulations

Item	Program Title	Program Source (Required by)	Section	Implementation	
				Milestone	Requirement
10.	Radiation Protection Program	10 CFR 20.1101	12.5	Prior to initial receipt of by-product, source, or special nuclear materials (excluding Exempt Quantities as described in 10 CFR 30.18) for those elements of the Radiation Protection (RP) Program necessary to support such receipt Prior to fuel receipt for those elements of the RP Program necessary to support receipt and storage of fuel onsite Prior to fuel load for those elements of the RP Program necessary to support fuel load and plant operation Prior to first shipment of radioactive waste for those elements of the RP Program necessary to support shipment of radioactive waste	License Condition

STD COL 13.4-1-A
STD COL 13.4-2-A

Table 13.4-201 Operational Programs Required by NRC Regulations

Item	Program Title	Program Source (Required by)	Section	Implementation Milestone	Implementation Requirement
11.	Non Licensed Plant Staff Training Program	10 CFR 50.120	13.2.2	18 months prior to scheduled fuel load	10 CFR 50.120(b)
	(portions applicable to radioactive material)	10 CFR 30.32 10 CFR 40.31 10 CFR 70.22		Prior to initial receipt of byproduct source, or special nuclear materials (excluding Exempt Quantities as described in 10 CFR 30.18)	10 CFR 30.32(a) 10 CFR 40.31(a) 10 CFR 70.22(a)
12.	Reactor Operator Training Program	10 CFR 55.13 10 CFR 55.31 10 CFR 55.41 10 CFR 55.43 10 CFR 55.45	13.2.1	18 months prior to scheduled fuel load	License Condition
13.	Reactor Operator Requalification Program	10 CFR 50.34(b) 10 CFR 50.54(i) 10 CFR 55.59	13.2	Within 3 months after issuance of an operating license or the date the Commission makes the finding under 10 CFR 52.103(g)	10 CFR 50.54(i-1)

STD COL 13.4-1-A
STD COL 13.4-2-A

Table 13.4-201 Operational Programs Required by NRC Regulations

				Implementation	
Item	**Program Title**	**Program Source (Required by)**	**Section**	**Milestone**	**Requirement**
14.	Emergency Planning	10 CFR 50.47 10 CFR 50, Appendix E	13.3	Full participation exercise conducted within 2 years prior to scheduled date for initial loading of fuel	10 CFR Part 50, Appendix E, Section IV.F.2.a(ii)
				Onsite exercise conducted within 1 year prior to the schedule date for initial loading of fuel	10 CFR 50, Appendix E, Section IV.F.2.a(ii)
				Licensee's detailed implementing procedures for its emergency plan submitted at least 180 days prior to scheduled date for initial loading of fuel	10 CFR 50, Appendix E, Section V
				The licensee shall submit a fully developed set of site-specific Emergency Action Levels (EALs) to the NRC in accordance with the NRC-endorsed version of NEI 07-01, Rev. 0, with no deviations. The fully developed site-specific EAL scheme shall be submitted to the NRC for confirmation at least 180 days prior to initial fuel load.	License Condition

STD COL 13.4-1-A
STD COL 13.4-2-A

Table 13.4-201 Operational Programs Required by NRC Regulations

Item	Program Title	Program Source (Required by)	Section	Implementation	
				Milestone	Requirement
15.	Security Program:	10 CFR 52.79(a)(35) 10 CFR 52.79(a)(36)			
	Physical Security Program	10 CFR 73.55 10 CFR 73.56 10 CFR 73.57	13.6	Prior to fuel onsite (protected area)	10 CFR 73.55(a)(4)
	Safeguards Contingency Program	10 CFR 52.79(a)(36) 10 CFR 73.55 10 CFR 73, Appendix C	13.6	Prior to fuel onsite (protected area)	10 CFR 73.55(a)(4)
	Training and Qualification Program	10 CFR 73, Appendix B	13.6	Prior to fuel onsite (protected area)	10 CFR 73.55(a)(4)
	Cyber Security Plan	10 CFR 73.54 10 CFR 73.55 10 CFR 52.79(a)(36)	13.6	Prior to fuel onsite (protected area)	10 CFR 73.55(a)(4)
	Special Nuclear Material Physical Protection Program	10 CFR 73.1 10 CFR 73.67	13.5.2.2.8 13.6	Prior to initial receipt of special nuclear materials of low strategic significance	10 CFR 73.1(a) 10 CFR 73.67(f)

STD COL 13.4-1-A
STD COL 13.4-2-A

Table 13.4-201 Operational Programs Required by NRC Regulations

Item	Program Title	Program Source (Required by)	Section	Implementation Milestone	Implementation Requirement
15. c'td	FFD Program for Construction (Workers and First Line Supervisors)	10 CFR 26.4(f)	13.7	Prior to initiating 10 CFR 26 construction activities	10 CFR 26, Subpart K
	FFD Program for Construction (Management and Oversight Personnel)	10 CFR 26.4(e)	13.7	Prior to initiating 10 CFR 26 construction activities	10 CFR 26, Subparts A through H, N and O
	FFD Program for Security Personnel	10 CFR 26.4(e)(1)	13.7	Prior to initiating 10 CFR 26 construction activities	10 CFR 26, Subparts A through H, N and O
		10 CFR 26.4(a)(5)		Prior to the earlier of: a. Receipt of SNM in the form of fuel assemblies, b. Establishment of a PA, or c. 10 CFR 52.103(g) finding	10 CFR 26, Subparts A through I, N and O
	FFD Program for FFD Program Personnel	10 CFR 26.4(g)	13.7	Prior to initiating 10 CFR 26 construction activities	10 CFR 26, Subparts A, B, D through H, N, O and C per licensee's discretion
	FFD Program for Individuals Required to Physically Report to the TSC or EOF	10 CFR 26.4(c)	13.7	Prior to the conduct of the first full participation emergency preparedness exercise under 10 CFR 50, Appendix E, Section F.2.a	10 CFR 26, Subparts A through I, N and O, except for 10 CFR 26.205 through 10 CFR 26.209

STD COL 13.4-1-A
STD COL 13.4-2-A

Table 13.4-201 Operational Programs Required by NRC Regulations

Item	Program Title	Program Source (Required by)	Section	Implementation Milestone	Implementation Requirement
15. c'td	FFD Program for Operation	10 CFR 26.4(a) and 10 CFR 26.4(b)	13.7	Prior to the earlier of: a. Receipt of SNM in the form of fuel assemblies b. Establishment of a PA, or c. 10 CFR 52.103(g) finding	10 CFR 26 Subparts A through I, N and O, except for individuals listed in 10 CFR 26.4(b) who are not subject to 10 CFR 26.205 through 10 CFR 26.209
16.	Quality Assurance Program – Operation	10 CFR 50.54(a) 10 CFR 50, Appendix A (GDC 1) 10 CFR 50, Appendix B	17.5	30 days prior to scheduled date for initial loading of fuel	10 CFR 50.54(a)(1)
17.	Maintenance Rule	10 CFR 50.65	17.6	Prior to fuel load authorization per 10 CFR 52.103(g)	10 CFR 50.65(a)(1)
18.	Motor-Operated Valve Testing	10 CFR 50.55a(b)(3)(ii)	N/A	There are no safety-related MOVs	
19.	Initial Test Program	10 CFR 50.34 10 CFR 52.79(a)(28)	14.2	60 days prior to the scheduled date of the first preoperational test for the Preoperational Test Program 60 days prior to the scheduled date of initial fuel loading for the Startup Test Program	License Condition

STD COL 13.4-1-A
STD COL 13.4-2-A

Table 13.4-201 Operational Programs Required by NRC Regulations

Item	Program Title	Program Source (Required by)	Section	Implementation: Milestone	Implementation: Requirement
20.	Snubber Testing and Inspection Program				
	Preservice Inspection Program	10 CFR 50.55a(g) 10 CFR 50.55a(b)(3)(v)	3.9.3.7.1(3)e	Completion prior to initial plant startup	10 CFR 50.55a(g)
	Inservice Inspection Program	10 CFR 50.55a(g) 10 CFR 50.55a(b)(3)(v)	3.9.3.7.1(3)e	Prior to commercial service [a]	10 CFR 50.55a(g) ASME OM Code, ISTD (Reference 13.4-202)
	Inservice Testing Program	10 CFR 50.55a(g) 10 CFR 50.55a(b)(3)(v)	3.9.3.7.1(3)e	After generator online on nuclear heat [a]	10 CFR 50.55a(g) ASME OM Code, ISTD (Reference 13.4-202)
	Preservice Thermal Movement Inspection	10 CFR 50.55a(g) 10 CFR 50.55a(b)(3)(v)	3.9.3.7.1(3)e	During initial heatup and cooldown	10 CFR 50.55a(g) ASME OM Code, ISTD (Reference 13.4-202)
	Preservice Testing Program	10 CFR 50.55a(g) 10 CFR 50.55a(b)(3)(v)	3.9.3.7.1(3)e	Prior to fuel load	License Condition
Notes: a. Snubber inservice examination is initially performed not less than two months after attaining 5% reactor power operation and will be completed within 12 calendar months after attaining 5% reactor power.					
21.	Mitigative Strategies Descriptions and Plans	10 CFR 50.54(hh)(2) 10CFR 52.80	19.6	Prior to fuel load authorization per 10 CFR 52.103(g)	License Condition
22.	Lifecycle Minimization of Contamination	10 CFR 20.1406	12.3	Prior to fuel load	License Condition
23.	SNM Material Control and Accounting Program	10 CFR 74 Part B (74.11-74.19, excl. 74.17)	13.5.2.2.11	Prior to receipt of SNM	License Condition

13.5 Plant Procedures

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

STD SUP 13.5-1

This section describes the administrative and operating procedures that the operating organization (plant staff) uses to conduct routine operating, abnormal, and emergency activities in a safe manner.

STD SUP 13.5-2

The QAPD describes procedural document control, record retention, adherence, assignment of responsibilities, and changes.

STD SUP 13.5-3

Procedures are identified in this section by topic, type, or classification in lieu of the specific title, and represent general areas of procedural coverage.

STD SUP 13.5-4

Procedures are developed prior to fuel load to allow sufficient time for plant staff familiarization and to allow NRC staff adequate time to review the procedures and to develop operator licensing examinations.

CWR COL 13.5-4-A

Industry guidance for the appropriate format, content, and typical activities delineated in written procedures is implemented, as appropriate. Guidance is based on ASME NQA-1, "Quality Assurance Requirements for Nuclear Facility Applications" (Reference 13.5-202).

STD SUP 13.5-5

The format and content of procedures are controlled by administrative procedure(s). Procedures are organized to include the following components, as necessary:

- Title Page
- Table of Contents
- Scope and Applicability
- Responsibilities
- Prerequisites
- Precautions and Limitations
- Main Body
- Acceptance Criteria
- Check-off Lists
- References

- Attachments and Data Sheets

STD SUP 13.5-6

Each procedure is sufficiently detailed for an individual to perform the required function without direct supervision, but does not provide a complete description of the system or plant process. The level of detail contained in the procedure is commensurate with the qualifications of the individual normally performing the function.

STD SUP 13.5-7

Procedures are developed consistent with guidance described in DCD Section 18.9, Procedure Development, and with input from the human factors engineering process and evaluations.

The bases for procedure development include:

- Plant design bases
- System-based technical requirements and specifications
- Task analyses results
- Risk-important human actions identified in the HRA/PRA
- Initiating events considered in the Emergency Operating Procedures (EOPs), including those events in the design bases
- Generic Technical Guidelines (GTGs) for EOPs

Procedure verification and validation includes the following activities, as appropriate:

- A review to verify they are correct and can be carried out.
- A final validation in a simulation of the integrated system as part of the verification and validation activities as described in DCD Section 18.11, Human Factors Verification and Validation.
- A verification of modified procedures for adequate content, format, and integration. The procedures are assessed through validation if a modification substantially changes personnel tasks that are significant to plant safety. The validation verifies that the procedures correctly reflect the characteristics of the modified plant and can be performed effectively to restore the plant.

STD SUP 13.5-8

Procedures for shutdown management are developed consistent with the guidance described in NUMARC 91-06, “Guidelines for Industry Actions to Assess Shutdown Management,” to reduce the potential for loss of reactor coolant system (RCS) boundary and inventory during shutdown conditions. (Reference 13.5-203)

13.5.1 Administrative Procedures

Replace the first sentence of the first paragraph with the following:

STD SUP 13.5-9

This section describes administrative procedures that provide administrative control over activities that are important to safety for the operation of the facility.

Replace the second paragraph with the following:

STD COL 13.5-1-A

Administrative procedures are developed in accordance with the nominal schedule presented in Table 13.5-202.

CWR SUP 13.5-10

Procedures outline the essential elements of the administrative programs and controls as described in ASME NQA-1 and Section 17.5. These procedures are organized such that the program elements are prescribed in documents normally referred to as administrative procedures.

Administrative procedures contain adequate programmatic controls to provide effective interface between organizational elements. This includes contractor and owner organizations providing support to the station operating organization.

CWR SUP 13.5-11

Procedure control is discussed in the QAPD. Type and content of procedures are discussed throughout Section 13.5.

STD SUP 13.5-12

A procedure style (writer's) guide promotes the standardization and application of human factors engineering principles to procedures. The writer's guide establishes the process for developing procedures that are complete, accurate, consistent, and easy to understand and follow. The guide provides objective criteria so that procedures are consistent in organization, style, and content. The writer's guide includes criteria for procedure content and format including the writing of action steps and the specification of acceptable acronym lists and acceptable terms to be used.

STD SUP 13.5-13

Procedure maintenance and control of procedure updates are performed in accordance with the QAPD.

STD SUP 13.5-14

The administrative programs and associated procedures developed in the pre-COL phase are described in Table 13.5-201 (for future designation as historical information).

STD SUP 13.5-15

13.5.1.1 Administrative Procedures-General

This section describes those procedures that provide administrative controls with respect to procedures, including those that define and provide controls for operational activities of the plant staff.

STD SUP 13.5-16

Plant administrative procedures provide procedural instructions for the following:

- Procedures review and approval
- Procedure adherence
- Scheduling for surveillance tests and calibration
- Log entries
- Record retention
- Containment access
- Bypass of safety function and jumper control
- Communication systems
- Equipment control procedures - These procedures provide for control of equipment, as necessary, to maintain personnel and reactor safety, and to avoid unauthorized operation of equipment
- Control of maintenance and modifications
- Fire Protection Program procedures
- Crane Operation Procedures - Crane operators who operate cranes over fuel pools are qualified and conduct themselves in accordance with ANSI B30.2 (Chapter 2-3), “Overhead and Gantry Cranes” (Reference 13.5-201).
- Temporary changes to procedures
- Temporary procedure issuance and control
- Special orders of a temporary or self-canceling nature
- Standing orders to shift personnel including the authority and responsibility of the shift manager, senior reactor operator in the control room, control room operator, and shift technical advisor
- Manipulation of controls and assignment of shift personnel to duty stations per the requirements of 10 CFR 50.54 (i), (j), (k), (l), and (m) including delineation of the space designated for the “At the Controls” area of the Control Room

- Shift relief and turnover procedures
- Fitness for Duty
- Control Room access
- Working hour limitations
- Feedback of design, construction, and applicable important industry and operating experience
- Shift Manager administrative duties
- Verification of correct performance of operational activities
- A vendor interface program that provides vendor information for safety related components is incorporated into plant documentation

13.5.2 Operating and Maintenance Procedures

Replace the third paragraph with the following:

STD COL 13.5-2-A Operating Procedures are developed in accordance with Section 13.5.2.1 and Maintenance Procedures are developed in accordance with Section 13.5.2.2.6.1.

Replace the fifth paragraph with the following:

CWR COL 13.5-4-A A Plant Operating Procedures Development Plan is established in accordance with Section 13.5.2.1.

Replace the second sentence of "Procedures for Calibration, Inspection and Testing" with the following:

STD COL 13.5-6-A Procedures for calibration, inspection and testing are included in the Plant Operating Procedures Development Plan.

Replace the second paragraph with the heading "Procedures Related to Refueling Cavity Integrity" with the following:

STD COL 13.5-5-A The scope of procedures in the Plant Operating Procedures Development Plan is addressed in Section 13.5.2.1.

Replace the last sentence of Section 13.5.2 with the following:

STD COL 13.5-3-A Emergency Procedures are developed in accordance with Section 13.5.2.1.4.

STD COL 13.5-6-A

13.5.2.1 Operating and Emergency Operating Procedures

This section describes the operating procedures used by the operating organization (plant staff) to conduct routine operating, abnormal, and emergency activities in a safe manner.

Operating procedures are developed at least six months prior to fuel load to allow sufficient time for plant staff familiarization and to allow NRC staff adequate time to review the procedures and to develop operator licensing examinations.

STD SUP 13.5-18

The classifications of operating procedures are:

- System Operating Procedures
- General Operating Procedures
- Abnormal (Off-Normal) Operating Procedures
- Emergency Operating Procedures
- Alarm Response Procedures

STD COL 13.5-2-A

The Plant Operating Procedures Development Plan establishes:

- A scope that includes those operating procedures defined below, which direct operator actions during normal, abnormal, and emergency operations, and considers plant operations during periods when plant systems/equipment are undergoing test, maintenance, or inspection.
- The methods and criteria for the development, verification and validation, implementation, maintenance, and revision of procedures. The methods and criteria are in accordance with NUREG-0737 TMI Items I.C.1 and I.C.9.

STD COL 13.5-5-A

The following procedures are included in the scope of the Plant Operating Procedures Development Plan:

- System operating procedures
- General operating procedures
- Abnormal (off-normal) or alarm response procedures
- Procedures for combating emergencies and other significant events
- Procedures for maintenance and modification
- Procedures for radiation monitoring and control
- Fuel handling procedures

- Temporary procedures
- Procedures for handling of heavy loads

STD COL 13.5-5-A
STD COL 13.5-6-A

- Procedures Related to Refueling Cavity Integrity
- Procedures for calibration, inspection, and testing

CWR COL 13.5-4-A

Implementation of the Plant Operating Procedures Development Plan establishes:

- Procedures that are consistent with the requirements of 10 CFR 50 and the TMI requirements in NUREG-0737 and Supplement 1 to NUREG-0737
- Requirements that the procedures developed include, as necessary, the elements described in the QAPD
- Bases for specifying plant operating procedures including:
  - Operator actions identified in the vendor's task analysis and PRA efforts in support of the design certification
  - Standardized plant emergency procedure guidelines
  - Consideration of plant-specific equipment selection and site specific elements such as the station water intake structure
- The definition of the methods through which specific operator skills and training needs, as may be considered necessary for reliable execution of the procedures, are identified and documented
- Requirements that the procedures specified above are made available for the purposes of the Human Factors V&V Implementation Plan described in GE Report NEDO-33276, ESBWR Verification & Validation Implementation Plan (DCD Reference 18.11-2).
- Procedures for the incorporation of the results of operating experience and the feedback of pertinent information into plant procedures in accordance with the provisions of TMI Item I.C.5 (NUREG-0737)

STD SUP 13.5-19

13.5.2.1.1 **System Operating Procedures**

Instructions for energizing, filling, venting, draining, starting up, shutting down, changing modes of operation, returning to service following testing or maintenance (if not contained in the applicable procedure), and other instructions appropriate for operation of systems are delineated in system procedures.

System procedures contain check-off lists, where appropriate, which are prepared in sufficient detail to provide an adequate verification of the status of the system.

STD SUP 13.5-20

13.5.2.1.2 General Operating Procedures

General operating procedures provide instructions for performing integrated plant operations involving multiple systems such as plant startup and shutdown. These procedures provide a coordinated means of integrating procedures together to change the mode of plant operation or achieve a major plant evolution. Check-off lists are used for the purpose of confirming completion of major steps in proper sequence.

Typical types of general operating procedures are described as follows:

- Startup procedures provide instruction for starting the reactor from cold or hot conditions, establishing power operation, and recovery from reactor trips.
- Shutdown procedures guide operations during and following controlled shutdown or reactor trips, and include instructions for establishing or maintaining hot standby and safe or cold shutdown conditions, as applicable.
- Power operation and load changing procedures provide instruction for steady-state power operation and load changing.

STD SUP 13.5-21

13.5.2.1.3 Abnormal (Off-Normal) Operating Procedures

Abnormal operating procedures for correcting abnormal conditions are developed for those events where system complexity might lead to operator uncertainty. Abnormal operating procedures describe actions to be taken during other than routine operations, which if continued, could lead to either material failure, personnel harm, or other unsafe conditions.

Abnormal procedures are written so that a trained operator knows in advance the expected course of events or indications that identify an abnormal situation and the immediate action to be taken.

CWR SUP 13.5-22

13.5.2.1.4 Emergency Operating Procedures

EOPs are procedures that direct actions necessary for the operators to mitigate the consequences of transients and accidents that cause plant parameters to exceed reactor protection system or ESF actuation setpoints.

Emergency operating procedures include appropriate guidance for the operation of plant post-72-hour equipment, and are developed as appropriate per the guidance of:

- NUREG-0737, "Clarification of TMI Action Plan Requirements," Items I.C.1 and I.C.9
- The QAPD

STD COL 13.5-3-A

The emergency operating procedure program (e.g., the procedures generation package (PGP)) describes the objectives of the emergency procedure development process, the program for developing EOPs and the required content of the EOPs.

The procedure development program, as described in the PGP for EOPs, is submitted to the NRC at least three months prior to the planned date to begin formal operator training on the EOPs. The PGP includes:

- GTGs, which are guidelines based on analysis of transients and accidents that are specific to the plant design and operating philosophy. The submitted documentation includes: a) a description of the process used to develop plant-specific technical guidelines (P-STGs) from the GTGs, b) identification of significant deviations from the generic guidelines (including identification of additional equipment beyond that identified in the generic guidelines), along with necessary engineering evaluations or analyses to support the adequacy of each deviation, and c) a description of the process used for identifying operator information and control requirements.
- A plant-specific writer's guide (P-SWG) that details the specific methods used in preparing EOPs based on P-STGs. The writer's guide contains objective criteria that require that the emergency procedures developed are consistent in organization, style, content, and usage of terms.
- A description of the program for verification and validation (V&V) of EOPs.
- A description of the program for training operators on EOPs.
- The objectives of the emergency procedure development.
- Discussion of any design change recommendations and/or negative implications that the current design may have on safe operation as noted during implementation of the emergency procedures development plan.

STD SUP 13.5-23

13.5.2.1.5 Alarm Response Procedures

Procedures are provided for annunciators (alarm signals) identifying the proper operator response actions to be taken. Each of these procedures normally contains: a) the meaning of the annunciator or alarm, b) the source of the signal, c) any automatic plant responses, d) any immediate operator action, and e) the long range actions. When corrective actions are very detailed and/or lengthy, the alarm response may refer to another procedure.

CWR SUP 13.5-24

13.5.2.1.6 Temporary Procedures

Temporary procedures are issued during the operational phase only when permanent procedures do not exist for the following activities: to direct operations during testing, refueling, maintenance, and modifications; to provide guidance in unusual situations not within the scope of the normal procedures; and to provide orderly and uniform operations for short periods when the plant, a system, or a component of a system is performing in a manner not covered by existing detailed procedures, or has been modified or extended in such a manner that portions of existing procedures do not apply.

Temporary operating procedures are developed under established administrative guidelines. They include designation of the period of time during which they may be used and adhere to the QAPD and Technical Specifications, as applicable.

STD SUP 13.5-25

13.5.2.1.7 Fuel Handling Procedures

Fuel handling operations, including fuel receipt, identification, movement, storage, and shipment, are performed in accordance with written procedures. Fuel handling procedures address, for example, the status of plant systems required for refueling; inspection of replacement fuel and control rods; designation of proper tools; proper conditions for spent fuel movement and storage; proper conditions to prevent inadvertent criticality; proper conditions for fuel cask loading and movement; and status of interlocks, reactor trip circuits, and mode switches. These procedures provide instructions for use of refueling equipment, actions for core alterations, monitoring core criticality status, accountability of fuel, and partial or complete refueling operations.

STD SUP 13.5-26

13.5.2.2 Maintenance and Other Operating Procedures

The QAPD provides guidance for procedural adherence.

STD SUP 13.5-27

13.5.2.2.1 Plant Radiation Protection Procedures

The plant radiation protection program is contained in procedures. Procedures are developed and implemented for such things as: maintaining personnel exposures, plant contamination levels, and plant effluents ALARA; monitoring both external and internal exposures of workers, considering industry-accepted techniques; performing routine radiation surveys; performing environmental monitoring in the vicinity of the plant; monitoring radiation levels during maintenance and special work activities; evaluating radiation protection implications of proposed modifications; management of radioactive wastes for offsite shipment, disposal, and treatment; and maintaining radiation exposure records of workers and others.

STD SUP 13.5-28

13.5.2.2.2 Emergency Preparedness Procedures

A discussion of emergency preparedness procedures can be found in the Emergency Plan. A list of implementing procedures is maintained in the Emergency Plan.

STD SUP 13.5-29

13.5.2.2.3 Instrument Calibration and Test Procedures

The QAPD provides a description of procedural requirements for instrumentation calibration and testing.

STD SUP 13.5-30

13.5.2.2.4 Chemistry Procedures

Procedures provided for chemical and radiochemical control activities include the nature and frequency of sampling and analyses; instructions for maintaining fluid quality within prescribed limits; the use of control and diagnostic parameters; and limitations on concentrations of agents that could cause corrosive attack, foul heat transfer surfaces or become sources of radiation hazards due to activation.

Procedures are also provided for the control, treatment, and management of radioactive wastes and control of radioactive calibration sources.

STD SUP 13.5-31

13.5.2.2.5 Radioactive Waste Management Procedures

Procedures for the operation of the radwaste processing systems provide for the control, treatment, and management of on-site radioactive wastes. These procedures are addressed in Section 13.5.2.1.1, System Operating Procedures.

STD SUP 13.5-32
STD COL 13.5-2-A

13.5.2.2.6 Maintenance, Inspection, Surveillance, and Modification Procedures

13.5.2.2.6.1 Maintenance Procedures

Maintenance procedures describe maintenance planning and preparation activities. Maintenance procedures are developed considering the potential impact on the safety of the plant, license limits, availability of equipment required to be operable, and possible safety consequences of concurrent or sequential maintenance, testing, or operating activities.

Maintenance procedures contain sufficient detail to permit the maintenance work to be performed correctly and safely. Procedures include provisions for conducting and recording results of required tests and inspections, if not performed and documented under separate test and inspection procedures. References are made to vendor manuals, plant procedures, drawings, and other sources, as applicable.

Instructions are included, or referenced, for returning the equipment to its normal operating status. Testing is commensurate with the maintenance that has been performed. Testing may be included in the maintenance procedure or be covered in a separate procedure.

Where appropriate sections of related documents, such as vendor manuals, equipment operating and maintenance instructions, or approved drawings with acceptance criteria, provide adequate instructions to provide the required quality of work, the applicable sections of the related documents are referenced in the procedure, or may, in some cases, constitute adequate procedures in themselves. Such documents receive the same level of review and approval as maintenance documents.

The preventive maintenance program, including preventive and predictive procedures, as appropriate, prescribes the frequency and type of maintenance to be performed. An initial program based on service conditions, experience with comparable equipment and vendor recommendations is developed prior to fuel loading. The program is revised and updated as experience is gained with the equipment. To facilitate this, equipment history files are created and maintained. The files are organized to provide complete and easily retrievable equipment history.

STD SUP 13.5-33

13.5.2.2.6.2 Inspection Procedures

The QAPD provides a description of procedural requirements for inspections.

13.5.2.2.6.3 Surveillance Testing Procedures

The QAPD provides a description of procedural requirements for surveillance testing. Surveillance testing procedures are written in a manner that adequately tests all portions of safety-related logic circuitry as described in Generic Letter 96-01, "Testing of Safety Related Logic Circuits."

STD SUP 13.5-34

13.5.2.2.6.4 Modification Procedures

Plant modifications and changes to setpoints are developed in accordance with approved procedures. These procedures control necessary activities associated with the modifications such that they are carried out in a planned, controlled, and orderly manner. For each modification, design documents such as drawings, equipment and material specifications, and appropriate design analyses are developed, or the as-built design documents are utilized. Separate reviews are conducted by individuals knowledgeable in both technical and QA requirements to verify the adequacy of the design effort.

Proposed modifications that involve a license amendment or a change to Technical Specifications are processed as proposed license amendment request.

Plant procedures impacted by modifications are changed to reflect revised plant conditions prior to declaring the system operable and cognizant personnel who are responsible for operating and maintaining the modified equipment are adequately trained.

STD SUP 13.5-35

13.5.2.2.6.5 Heavy Load Handling Procedures

This topic is discussed in Section 9.1.5.8.

STD SUP 13.5-36

13.5.2.2.7 Material Control Procedures

The QAPD provides a description of procedural requirements for material control.

STD SUP 13.5-37

13.5.2.2.8 **Security Procedures**

A discussion of security procedures is provided in the Security Plan.

The Special Nuclear Material (SNM) Physical Protection Program is the 10 CFR 70 required protection program in effect for the period during which SNM is received and stored in a controlled access area (CAA), in accordance with the requirements of 10 CFR 73.67.

The New Fuel Shipping Plan addresses the applicable 10 CFR 73.67 requirements in the event that unirradiated new fuel assemblies or components are returned to the supplying fuel manufacturer(s) facility.

STD SUP 13.5-38

13.5.2.2.9 **Refueling and Outage Planning Procedures**

Procedures provide guidance for the development of refueling and outage plans, and as a minimum address the following elements:

- An outage philosophy which includes safety as a primary consideration in outage planning and implementation
- Separate organizations responsible for scheduling and overseeing the outage and provisions for an independent safety review team that would be assigned to perform final review and grant approval for outage activities
- Control procedures, which address both the initial outage plan and safety-significant changes to schedule
- Provisions that activities receive adequate resources
- Provisions that defense-in-depth during shutdown and margins are not reduced or provisions that an alternate or backup system must be available if a safety system or a defense-in-depth system is removed from service
- Provisions that personnel involved in outage activities are adequately trained including operator simulator training to the extent practicable, and training of other plant personnel, including temporary personnel, commensurate with the outage tasks they are to perform
- The guidance described in NUMARC 91-06, “Guidelines for Industry Actions to Assess Shutdown Management,” to reduce the potential for loss of reactor coolant system boundary and inventory during shutdown conditions (Reference 13.5-203)

STD SUP 13.5-40

13.5.2.2.10 Procedure related to Refueling Cavity Integrity

Procedures will be established and implemented for:

- Monitoring refueling cavity seal leakage,
- Responding to refueling cavity and buffer pool drain down events, and
- Performing periodic maintenance and inspection of the refueling cavity seal and the Main Steam and Isolation Condenser System plugs in accordance with vendor recommendations.

STD SUP 13.5-41

13.5.2.2.11 Special Nuclear Material (SNM) Material Control and Accounting Procedures

A material control and accounting system consisting of special nuclear material accounting procedures is utilized to delineate the requirements, responsibilities, and methods of special nuclear material control from the time special nuclear material is received until it is shipped from the plant. These procedures provide detailed steps for SNM shipping and receiving, inventory, accounting, and preparing records and reports. The Special Nuclear Material (SNM) Material Control and Accounting (MC&A) Program description is provided in Appendix 13CC.

13.5.3 COL Information

13.5-1-A Administrative Procedures Development Plan

STD COL 13.5-1-A

This COL item is addressed in Section 13.5.1.

13.5-2-A Plant Operating Procedures Development Plan

STD COL 13.5-2-A

This COL item is addressed in Section 13.5.2.

13.5-3-A Emergency Procedures Development

STD COL 13.5-3-A

This COL item is addressed in Section 13.5.2.

13.5-4-A Implementation of the Plant Procedures Plan

CWR COL 13.5-4-A

This COL item is addressed in Section 13.5 and Section 13.5.2.

13.5-5-A Procedures Included in Scope of Plan

STD COL 13.5-5-A

This COL item is addressed in Section 13.5.2.

13.5-6-A Procedures for Calibration, Inspection, and Testing

STD COL 13.5-6-A

This COL item is addressed in Section 13.5.2.

13.5.4 References

13.5-201 American National Standards Institute, Overhead and Gantry Cranes, ANSI B30.2- 2001.

13.5-202 American Society of Mechanical Engineers, Quality Assurance Requirements for Nuclear Facility Applications, NQA-1-1994.

13.5-203 Nuclear Utilities Management and Resources Council, Guidelines for Industry Actions to Assess Shutdown Management, NUMARC 91-06, December 1991.

13.5-204 Deleted

STD SUP 13.5-39

Table 13.5-201 Pre-COL Phase Administrative Programs and Procedures

(This table is included for future designation as historical information.)

Design/Construction Quality Assurance Program
Reporting of Defects and Noncompliance,10 CFR 21 Program
Construction License Fitness for Duty Programs, 10 CFR 26
Design Reliability Assurance Program

STD COL 13.5-1-A

Table 13.5-202 Nominal Procedure Development Schedule

(This table is included for future designation as historical information.)

Category A: Controls

Group	Procedure Type	Preparation Milestone
1	Procedures review and approval	6 months before first license class
2	Equipment control procedures	18 months before fuel load
3	Control of maintenance and modifications	18 months before fuel load
4	Fire Protection procedures	1. 6 months before fuel receipt for elements of the program supporting fuel onsite 2. 6 months before fuel load for elements supporting fuel load and plant operation
5	Crane operation procedures	6 months before fuel receipt
6	Temporary changes to procedures	6 months before first license class
7	Temporary procedures	6 months before first license class
8	Special orders of a transient or self-canceling character	6 months before first license class

Category B: Specific Procedures

Group	Procedure Type	Preparation Milestone
1	Standing orders to shift personnel including the authority and responsibility of the shift supervisor, licensed senior reactor operator in the control room, control room operator, and shift technical advisor	6 months before first license class
2	Assignment of shift personnel to duty stations and definition of “surveillance area”	6 months before first license class
3	Shift relief and turnover	6 months before fuel load
4	Fitness for duty	1. Construction FFD program: 6 months before on-site construction of safety- or security-related SSCs 2. Operational FFD program: 6 months before fuel load
5	Control room access	6 months before fuel load
6	Limitations on work hours	6 months before fuel load

STD COL 13.5-1-A

Table 13.5-202 Nominal Procedure Development Schedule

7	Feedback of design, construction, and applicable important industry and operating experience	6 months before fuel load
8	Shift supervisor administrative duties	6 months before fuel load
9	Verification of correct performance of operating activities	6 months before first license class

13.6 Physical Security

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

13.6.1.1.3 Detection Aids

Replace the last sentence in the third paragraph with the following.

STD COL 13.6-9-A Operating alarm response procedures will be developed and implemented in accordance with milestone defined in Section 13.5.2.1.

Replace the last sentence in the fourth paragraph with the following.

STD COL 13.6-13-A This action will be completed prior to the milestone for Physical Security Plan implementation (Table 13.4-201).

13.6.1.1.5 Access Controls

Replace the first sentence in the third paragraph with the following.

STD COL 13.6-6A A key control program will be developed and implemented prior to the milestone for Physical Security Plan implementation (Table 13.4-201).

Replace the fifth paragraph with the following.

STD COL 13.6-14-A Administrative procedures will be developed prior to the milestone for Physical Security Plan implementation (Table 13.4-201) to control work being performed in cabinets containing the control circuitry (contact elements) for the systems listed in Table 4-1 of NEDE-33391. (DCD Reference 13.6-6).

Replace the last sentence in the sixth paragraph with the following.

STD COL 13.6-15-A Administrative procedures will be developed prior to the milestone for Physical Security Plan implementation (Table 13.4-201) that will require two persons, each of whom are qualified to perform the intended work, to be present during the performance of any work on systems listed in Table 4-1 of NEDE-33391.

13.6.1.1.8 Testing

Replace the last sentence in the first paragraph with the following.

STD COL 13.6-10-A

The establishment of these surveillance test procedures and frequencies will be completed in accordance with the milestone for Physical Security Plan implementation (Table 13.4-201).

Replace the last sentence in the second paragraph with the following.

STD COL 13.6-11-A

The establishment of these testing and maintenance milestones will be completed in accordance with the milestone for Physical Security Plan implementation (Table 13.4-201).

13.6.2 Security Plan

Replace this section with the following.

STD SUP 13.6-1

The Security Plan consists of the Physical Security Plan, Training and Qualification Plan, Safeguards Contingency Plan, and Cyber Security Plan. The Security Plan is submitted to the Nuclear Regulatory Commission as separate licensing documents in order to fulfill the requirements of 10 CFR 52.79(a)(35) and (36). The Security Plan meets the requirements contained in 10 CFR 26 and 10 CFR 73 and will be maintained in accordance with the requirements of 10 CFR 52.98. The Security Plan, except for the Cyber Security Plan, is categorized as Security Safeguards Information and is withheld from public disclosure pursuant to 10 CFR 73.21. The Cyber Security Plan is categorized as Security-Related Information and is withheld from public disclosure pursuant to 10 CFR 2.390.

The Special Nuclear Material (SNM) Physical Protection Program implements the requirements of 10 CFR 73.67(f) and (g) during the period beginning prior to receipt of SNM and ending after relocation of the SNM to an operational protected area. It is submitted as a separate licensing document which is categorized as Security-Related Information and is withheld from public disclosure pursuant to 10 CFR 2.390.

NAPS ESP COL 13.6-1

The design requirements for protected area barriers are described in the Physical Security Plan. The barriers will be designed and located to support the security response strategy timelines. The specific designs for

protected area barriers will be completed as part of detailed plant design before the milestone for Physical Security Plan implementation (Table 13.4-201).

STD COL 13.6-12-A As part of the Security Plan, the licensee will develop an integrated response strategy to a confirmed security event that provides for manual actuation of plant systems by the operators to an evolving scenario necessitating escalating operator response. This action will be completed prior to the milestone for Physical Security Plan implementation (Table 13.4-201).

NAPS COL 13.6-8-A The design of the security system precludes any single postulated security event resulting in an unacceptable degradation of the site security staff's ability to monitor and direct the response to a security event from either the CAS or Secondary Alarm Station. A description of the design of the CAS and Secondary Alarm Station (SAS) and analysis of single act security events is contained in the report "Evaluation of CAS/SAS Design for No Single Act."

NAPS COL 13.6-16-A A site arrangement drawing that shows the location of the external Bullet Resisting Enclosures and indicates the fields of fire from these locations is provided in COLA Part 8: Security, drawing NA3 COL 13.6-16-A, Security Site Arrangement - Fields of Fire. A description of the level of protection provided to security personnel stationed in Bullet Resisting Enclosures (BREs) from the effects of the equipment available to the adversaries utilizing the Design Basis Threat (DBT) toolkit (defined in DCD Reference 13.6-8) is also provided in COLA Part 8: Security, drawing NA3 COL 13.6-16-A, Security Site Arrangement - Fields of Fire.

NAPS COL 13.6-17-A A site arrangement drawing that shows the location of the Protected Area (PA) fence, the isolation zone on either side of the PA fence, the Vehicle Barrier System (VBS), any Red Zone or Delay Fences, and any buildings or structures inside the PA that are not part of the Certified Design is provided in Figure 13.6-201, Security Site Arrangement - Physical Layout. Prior to the milestone for Physical Security Plan implementation (Table 13.4-201), a demonstration that the security strategy described in the ESBWR Safeguards Assessment Report (DCD Reference 13.6-6) remains valid will be conducted.

STD COL 13.6-18-A Prior to the milestone for Physical Security Plan implementation (Table 13.4-201), the security plan will be updated with an analysis to determine if armed responders require ammunition greater than the amount normally carried to provide reasonable assurance of successful engagement of adversaries from various engagement positions, including the development of necessary procedures to assure adequate ammunition is available.

STD COL 13.6-19-A Prior to the milestone for Physical Security Plan implementation (Table 13.4-201), the security plan will be updated with an analysis of the ESBWR Safeguards Assessment Report (DCD Reference 13.6-6) reflecting site-specific locations of engagement positions including fields of fire. This applies for the external Bullet Resisting Enclosures as well as any internal positions that have external engagement responsibilities. This will include an implementation analysis of the Security Strategy described in the report, focusing on the effectiveness of neutralization of adversaries before significant radiological sabotage can occur.

STD COL 13.6-20-A Features of the physical security system are covered, in part, by the standard ESBWR design, while other features are plant and site specific. Accordingly, the ESBWR standard ITAAC cover the physical plant security system and address those features that are part of the standard design. NRC guidance provides suggested ITAAC that cover both the standard design and the plant and site specific features. The plant and site-specific Physical Security ITAAC not covered by the ESBWR Tier 1, Section 2.19, are contained in Part 10: Tier 1/ITAAC/Proposed License Conditions, Section 2.2.1, Site Specific Physical Security ITAAC.

CWR SUP-13.6-2 Administrative procedures have been implemented that meet the requirements of 10 CFR 73.58 for managing the safety/security interface.

13.6.3 COL Information

13.6-6-A Key Control

STD COL 13.6-6-A This COL item is addressed in Section 13.6.1.1.5.

13.6-7-A Redundancy and Equivalency of the CAS and Secondary Alarm Station

STD COL 13.6-7-A This COL item is addressed in the Evaluation of CAS/SAS Design for No Single Act.

13.6-8-A No Single Act Requirement for CAS and Secondary Alarm Station

STD COL 13.6-8-A This COL item is addressed in Evaluation of CAS/SAS Design for No Single Act.

13.6-9-A Operational Alarm Response Procedures

STD COL 13.6-9-A This COL item is addressed in Section 13.6.1.1.3.

13.6-10-A Operational Surveillance Test Procedures

STD COL 13.6-10-A This COL item is addressed in Section 13.6.1.1.8.

13.6-11-A Maintenance Test Procedures

STD COL 13.6-11-A This COL item is addressed in Section 13.6.1.1.8.

13.6-12-A Operational Response Procedures to Security Events

STD COL 13.6-12-A This COL item is addressed in Section 13.6.2.

13.6-13-A Operational Alarm Response Procedures

STD COL 13.6-13-A This COL item is addressed in Section 13.6.1.1.3.

13.6-14-A Administrative Controls to Sensitive Cabinets

STD COL 13.6-14-A This COL item is addressed in Section 13.6.1.1.5.

13.6-15-A Administrative Controls to Sensitive Equipment

STD COL 13.6-15-A This COL item is addressed in Section 13.6.1.1.5.

13.6-16-A External Bullet Resisting Enclosures

NAPS COL 13.6-16-A This COL item is addressed in Subsection 13.6.2.

13.6-17-A Site-Specific Locations of Security Barriers

NAPS COL 13.6-17-A This COL item is addressed in Subsection 13.6.2.

13.6-18-A Ammunition for Armed Responders

STD COL 13.6-18-A This COL item is addressed in Subsection 13.6.2.

13.6-19-A Site-Specific Update of the ESBWR Safeguards Assessment Report

STD COL 13.6-19-A This COL item is addressed in Subsection 13.6.2.

13.6-20-A Physical Security ITAAC

STD COL 13.6-20-A This COL item is addressed in Subsection 13.6.2.

NAPS SUP 13.6-2

13.6.5 ESP Information

SSAR Section 13.6 is incorporated by reference.

NAPS COL 13.6-17-A **Figure 13.6-201 Security Site Arrangement - Physical Layout**

CWR SUP 13.7-1

13.7 Fitness For Duty

The Fitness for Duty (FFD) Program is implemented and maintained in multiple and progressive phases dependent on the activities, duties, or access afforded to certain individuals at the construction site. In general, two different FFD programs will be implemented: a construction phase FFD program and an operating phase FFD program. The construction and operating phase programs are implemented as identified in Table 13.4-201.

The construction phase FFD program is consistent with NEI 06-06 (Reference 13.7-201). NEI 06-06 applies to persons constructing or directing the construction of safety- and security-related structures, systems, or components performed onsite where the new reactor will be installed and operated. Management and oversight personnel, as further described in NEI 06-06, and security personnel prior to the receipt of special nuclear material in the form of fuel assemblies (with certain exceptions) will be subject to the operating phase FFD program that meets the requirements of 10 CFR Part 26, Subparts A through H, N, and O. Following the receipt of special nuclear material onsite in the form of fuel assemblies, security personnel as described in 10 CFR 26.4(a)(5) will meet the requirements of an operating phase FFD program. Prior to the issuance of a Combined License for Unit 3, Dominion will review and revise, as necessary, the Unit 3 construction phase FFD program, should substantial revisions occur to either NEI 06-06 following NRC endorsement, or to the requirements of 10 CFR Part 26.

The following site-specific information is provided:

- The construction site area will be defined in the Construction Security Plan and will be under the control of the Engineering, Procurement and Construction (EPC) Contractor. The 10 CFR Part 26 requirements will be implemented for the construction site area based on the descriptions provided in Table 13.4-201.
- Construction Workers & First Line Supervisors (EPC Contractor employees and subcontractors) are covered by a Dominion approved EPC Contractor FFD Program (elements Subpart K).
- Dominion employees and Dominion subcontractor’s construction management and oversight personnel are covered by a North Anna Units 1 and 2 Operations FFD Program and EPC Contractor

employees and subcontractors, construction management, and oversight personnel will be covered by a Dominion approved EPC Contractor FFD Program (elements Subpart A through H, N and O).

- Dominion security personnel are covered by a North Anna Units 1 and 2 Operations FFD Program and the EPC Contractor security personnel are covered by a Dominion approved EPC Contractor FFD Program (elements Subpart A through H, N and O). This coverage is applicable from the start of construction activities to the earlier of (1) the receipt of Special Nuclear Material (SNM) in the form of fuel assemblies, or (2) the establishment of a Protected Area (PA), or (3) the 10 CFR 52.103(g) finding.
- Dominion FFD Program personnel are covered by a North Anna Units 1 and 2 Operations FFD Program and the EPC Contractor's FFD Program personnel will be covered by a Dominion approved EPC Contractor FFD Program (elements Subpart A through H, N and O).
- Personnel required to physically report to the Technical Support Center (TSC) or Emergency Operations Facility (EOF) when that requirement is in effect are covered by a North Anna Units 1 and 2 Operations FFD Program.

The operations phase FFD program is consistent with all applicable subparts of 10 CFR Part 26.

13.7.1 **References**

13.7-201 Nuclear Energy Institute (NEI) "Fitness for Duty Program Guidance for New Nuclear Power Plant Construction Sites," NEI 06-06.

13.7-202 Deleted

NAPS COL 13.1-1-A

Appendix 13AA Design and Construction Responsibilities

13AA.1 Design and Construction Activities

Dominion has substantial experience in the design, construction, and operation of nuclear power plants and substantial experience in activities of similar scope and complexity. Dominion was responsible for the design and construction activities associated with two existing nuclear power stations in Virginia, Surry and North Anna, both of which Dominion currently operates. Dominion oversaw the activities of Westinghouse Electric Company and Stone & Webster Engineering Corporation in the design and construction of those stations.

In addition, Dominion has been responsible for the design, construction, and operation of several large fossil stations, activities of similar scope and complexity. One example is Chesterfield Power Station in Virginia. Dominion oversaw the activities of Combustion Engineer, General Electric Co. and Stone & Webster in the design and construction of the station. Dominion currently operates Chesterfield Power Station. The station generates over 1700 MWe.

Dominion's management, engineering, and technical support organization for the construction and operation of Unit 3 are described in Chapters 17 and 13, respectively. As described in Section 1.4.3.1, Dominion has selected The Consortium of GE-Hitachi Nuclear Energy Americas LLC and Fluor Enterprises, Inc. to develop and implement the Unit 3 construction project (i.e., the EPC contractor).

Other design and construction activities will be contracted to qualified suppliers of such services. Implementation or delegation of design and construction responsibilities is described in the sections below. Quality Assurance aspects are described in Chapter 17.

13AA.1.1 Principal Site-Related Engineering Work

The principal site engineering activities accomplished towards the construction and operation of the plant are:

Meteorology

Information concerning local (site) meteorological parameters is developed and applied by station and contract personnel to assess the impact of the station on local meteorological conditions. An onsite meteorological measurements program is employed by station personnel to produce data for the purpose of making atmospheric dispersion

estimates for postulated accidental and expected routine airborne releases of effluents. A maintenance program is established for surveillance, calibration, and repair of instruments. More information regarding the study and meteorological program is found in Section 2.3.

Geology

Information relating to site and regional geotechnical conditions is developed and evaluated by utility and contract personnel to determine if geologic conditions could present a challenge to safety of the plant. Items of interest include geologic structure, seismicity, geological history, and ground water conditions. The excavation for safety-related structures will be geologically mapped and photographed by experienced geologists. Unforeseen geologic features that are encountered will be evaluated. Section 2.5 provides details of these investigations.

Seismology

Information relating to seismological conditions is developed and evaluated by utility and contract personnel to determine if the site location and area surrounding the site is appropriate from a safety standpoint for the construction and operation of a nuclear power plant. Information regarding tectonics, seismicity, correlation of seismicity with tectonic structure, characterization of seismic sources, and ground motion are assessed to estimate the potential for strong earthquake ground motions or surface deformation at the site. Section 2.5 provides details of these investigations.

Hydrology

Information relating to hydrological conditions at the plant site and the surrounding area is developed and evaluated by utility and contract personnel. The study includes hydrologic characteristics of streams, lakes, shore regions, the regional and local groundwater environments, and existing or proposed water control structures that could influence flood control and plant safety. Section 2.4 includes more detailed information regarding this subject.

Demography

Information relating to local and surrounding area population distribution is developed and evaluated by utility and contract personnel. The data is used to determine if requirements are met for establishment of exclusion area, low population zone, and population center distance. Section 2.1

includes more detailed information regarding population around the plant site.

Environmental Effects

Monitoring programs are developed to enable the collection of data necessary to determine possible impact on the environment due to construction, startup, and operational activities and to establish a baseline from which to evaluate future environmental monitoring. This program is described in the ESP-ER and in COLA Part 3.

13AA.1.2 Design of Plant and Ancillary Systems

Design and construction of systems outside the power block such as circulating water, service water, switchyard, and secondary fire protection systems are performed by the EPC contractor or qualified contractors, as assigned.

13AA.1.3 Review and Approval of Plant Design Features

Design engineering review and approval is performed in accordance with Chapter 17. The EPC contractor is responsible for design control of Unit 3. Design work is performed in accordance with the design and construction QA manual including the reviews necessary to verify the adequacy of the design. Verification is performed by competent individuals or groups other than those who performed the original design. Design issues arising during construction are addressed and implemented by the EPC contractor. As systems are tested and approved for turnover and operation, control of design is turned over to plant staff. The senior manager facility engineering and technical support along with functional managers and staff, assumes responsibility for review and approval of modifications, additions, or deletions in plant design features, as well as control of design documentation, in accordance with the Operational QA Program. Design control becomes the responsibility of the senior manager facility engineering and technical support prior to loading fuel. During construction, startup, and operation, changes to human-system interfaces of control room design are approved using a Human Factors Engineering evaluation addressed within DCD Chapter 18. See Figure 13.1-201, Construction Organization and the QAPD (incorporated into Section 17.5) for reporting relationships.

13AA.1.4 Environmental Effects

Impact to the surrounding environment from construction and operating activities is fully addressed in COLA Part 3, Applicants' Environmental Report - Combined License Stage.

13AA.1.5 Security Provisions

The Physical Security Plan is designed with provisions that meet the applicable NRC regulations. See Section 13.6 and the Security Plan, which was submitted under separate transmittal.

13AA.1.6 Development of Safety Analysis Reports

Information regarding the development of the FSAR is found in Chapter 1.

13AA.1.7 Review and Approval of Material and Component Specifications

Safety-related material and component specifications of SSCs designed by the EPC contractor are reviewed and approved in accordance with the EPC contractor quality assurance program and Section 17.1. Review and approval of items not designed by the EPC contractor are controlled for review and approval by Section 17.5 and the QAPD.

13AA.1.8 Procurement of Materials and Equipment

Procurement of materials during construction phase is the responsibility of the EPC contractor. The process is controlled by the construction QA programs of these organizations. Oversight of the inspection and receipt of materials process is the responsibility of the senior manager nuclear oversight.

13AA.1.9 Management and Review of Construction Activities

Management and responsibility for construction activities is assigned to the executive responsible for nuclear development who is accountable to the CNO. See Figure 13.1-201, Construction Organization.

Monitoring and review of construction activities by utility personnel is a continuous process at the plant site. Contractor performance is monitored to provide objective data to utility management in order to identify problems early and develop solutions. Monitoring of construction activities verifies that the contractors are in compliance with contractual obligations for quality, schedule, and cost. To maintain independence

from the construction organization, the oversight organization reports directly to the CNO.

Monitoring and review of construction activities is divided functionally across the various disciplines of the utility construction staff, i.e. electrical, mechanical, instrument and control, etc., and tracked by schedule based on system and major plant components/areas.

The executive responsible for nuclear development and the North Anna Units 1 and 2 Site Executive have reporting responsibilities to the CNO. Site organizations coordinate construction plans and Units 1 and 2 impact assessments. Communications and interactions ensure organizational coordination and authorization for construction activities with potential Units 1 and 2 impacts as needed, as well as implementation plans for mitigation controls identified. Periodic assessment involving both the Unit 3 and the Units 1 and 2 organizations identify Units 1 and 2 SSCs that could reasonably be expected to be impacted by scheduled construction activities. Appropriate administrative and managerial controls are then established as necessary. Assessments are performed to facilitate an implementation schedule for the administrative and managerial controls that correspond with scheduled construction activities. Specific hazards, impacted SSCs, and managerial and administrative controls are reviewed on a recurring basis and, if necessary, controls are enveloped, revised, implemented, and maintained current as work progresses on Unit 3. For example, prior to construction activities that involve the use of large construction equipment such as cranes, managerial and administrative controls are in place to prevent adverse impacts on any operating unit(s) overhead power lines, switchyard, security boundary, etc., by providing the necessary restrictions on the use of large construction equipment.

After each system is turned over to plant staff the construction organization relinquishes responsibility for that system. At that time the construction organization will be responsible for completion of construction activities as directed by plant staff and available to provide support for start-up testing as necessary.

13AA.2 Preoperational Activities

This section describes the activities required to transition the unit from the construction phase to the operational phase. These activities include turnover of systems from construction, preoperational testing, schedule

management, test procedure development, fuel load, integrated startup testing, and turnover of systems to plant staff.

13AA.2.1 Development of Human Factors Engineering Design Objectives and Design Phase Review of Proposed Control Room Layouts

HFE design objectives are initially developed by the reactor vendor in accordance with DCD Chapter 18. As a collaborative team, personnel from the reactor vendor design staff and personnel, including licensed operators, engineers, and instrumentation and control technicians from owner and other organizations in the nuclear industry, assess the design of the control room and man-machine interfaces to attain safe and efficient operation of the plant. See DCD Section 18.2 for additional details of HFE program management.

Modifications to the certified design of the control room or man-machine interface described in the DCD are reviewed per engineering procedures, as required by DCD Section 18.2, to evaluate the impact to plant safety. The senior manager facility engineering and technical support is responsible for the human factors engineering design process and for the design commitment to HFE during construction and throughout the life of the plant. The HFE program is established in accordance with the description and commitments in DCD Chapter 18.

13AA.2.2 Preoperational and Startup Testing

The Initial Test Program consists of a series of test categorized as pre-operational or startup tests. Preoperational tests are those tests normally completed prior to readiness for fuel load to demonstrate the capability of Unit 3 systems and structures to meet performance requirements. Startup tests begin following the NRC 10 CFR 52.103(g) finding and demonstrate the capability of Unit 3 to meet safety and performance requirements.

Plant staff supports the EPC Contractor during the preoperational testing phase, including placement of plant staff personnel in designated positions in the EPC Contractor preoperational test organization. Plant staff personnel follow applicable EPC Contractor procedures and Quality Assurance program requirements. Structures and systems for which preoperational testing has been completed undergo review and evaluation to verify that the EPC Contractor has completed installation, pre-operational testing, ITAAC closure, outstanding maintenance work,

and walkdowns of systems or structures. When review and evaluation is complete, the structure or system is protected in accordance with EPC Contractor procedures to ensure further construction activities do not occur, and that maintenance or testing is controlled to assure that plant configuration and completed ITAAC are not adversely impacted.

Startup testing begins after pre-operational testing is complete, the transfer of care, custody and control from the EPC Contractor to Unit 3 staff has occurred, and readiness for fuel load has been achieved. During the startup testing phase, systems are under Unit 3 staff control, and work is controlled using Unit 3 procedures and work control processes. Functional managers reporting to the senior manager operations and maintenance are assigned responsibility for organizing and developing the startup test organization. The functional managers in charge of startup testing are assisted by other station organizations including operations, plant maintenance, and engineering. These assisting organizations provide support in developing test procedures, conducting the test program and in reviewing the results. The startup testing organization is staffed by testing engineers, procedure writers, and planner/schedulers. The qualification of requirements of testing engineers in the startup testing organization meets those established in ANSI/ANS 3.1 (Reference 13.1-201). The EPC Contractor provides final design information, recommended testing methodology, draft startup testing procedures and technical support as required.

Test engineers are responsible for integrated testing of systems to prove functionality of system design requirements. They provide guidance and supervision to procedure writers and communicate closely with operations personnel and other supporting staff to facilitate safe and efficient performance of preoperational and startup tests. The scope of testing to be accomplished is presented in Chapter 14. Sufficient numbers of personnel are assigned to perform pre-operational and startup testing to facilitate safe and efficient implementation of the testing program. Plant-specific training provides instruction on the administrative controls of the test program. The qualification requirements of testing engineers in the preoperational and startup testing organization meet those established in ANSI/ANS 3.1 (Reference 13.1-201). The startup test program provides data and experience useful during the operational phase.

Procedures are written to describe organizational responsibilities and interfaces between Unit 3 staff and the EPC Contractor, and to establish direction in writing, reviewing and performing tests. The construction organization, depicted in figure 13.1-201, includes the preoperational and startup testing functional groups.

13AA.2.3 **Development and Implementation of Staff Recruiting and Training Programs**

Staffing plans are developed with input from the reactor vendor for safe operation of the plant as determined by HFE. See DCD Section 18.6. These plans are developed under the direction and guidance of the executive responsible for nuclear development (see Table 13.1-201 and Figure 13.1-201). Staffing plans will be completed and manager level positions filled prior to start of preoperational testing. Personnel selected to be licensed reactor operators and senior reactor operators along with other staff necessary to support the safe operation of the plant are hired with sufficient time available to complete appropriate training programs and become qualified and licensed (if required) prior to fuel being loaded in the reactor vessel. See Figure 13.1-202 for hiring and training requirements for operator and technical staff relative to fuel load.

Table 13.1-201 includes the initial estimated number of staff for selected positions that will be filled at the time of initial fuel load. Recruiting of personnel to fill positions is the shared responsibility of the manager in charge of human resources and the various heads of departments. The training program is described in Section 13.2.

13AA.2.4 **Transition to Operating Phase**

The construction executive (executive responsible for nuclear development) is responsible for developing and implementing a plan for the organizational transition from the construction phase to the operating phase. The plan is fully implemented and transition completed prior to commencement of commercial operations with operational responsibility then fully under the direction of the CNO.

Appendix 13BB Training Program

STD SUP 13.2-1
STD COL 13.2-1-A
STD COL 13.2-2-A

NEI 06-13A (Reference 13BB-201), Technical Report on a Template for an Industry Training Program Description, is incorporated by reference.

13BB References

13BB-201 Nuclear Energy Institute (NEI), "Technical Report on a Template for an Industry Training Program Description," NEI 06-13A.

CWR SUP 13CC-1

Appendix 13CC Special Nuclear Material (SNM) Control and Accounting Program Description

13CC.1 Scope

The Special Nuclear Material (SNM) Material Control and Accounting Program establishes guidelines concerning control of and accounting for SNM at Unit 3.

The criteria prescribed in the SNM Material Control and Accounting Program are applicable to SNM and various material mixtures containing SNM. Generally, the SNM involved is plutonium, ^{233}U or uranium enriched in the isotope ^{235}U. The ^{235}U content will vary depending on various reactor parameters. SNM is typically in the form of pellets encapsulated in fuel rods. Criteria are established for the SNM control and accounting system, including criteria for the receipt, internal control, physical inventory, and shipment of SNM.

In addition to the information provided in this program description, the following Unit 3 licensing basis documents provide the regulatory basis that describes how the applicable requirements for material control and accounting under 10 CFR 74 will be met:

- Information related to amounts of SNM as reactor fuel required for reactor operation is provided in Section 4.1.
- Information related to storage of SNM as reactor fuel is provided in Section 9.1.
- Information related to the organizational structure of the applicant, including those responsible for SNM material control and accounting, is provided in Section 13.1.
- Information related to training of personnel, including those responsible for SNM material control and accounting, is provided in Section 13.2.

- Information related to implementation of this SNM MC&A Program is provided in Table 13.4-201.
- Information related to plant procedures, including those used to control special nuclear material, is provided in Section 13.5.

13CC.2 Definitions

In this program description, the following definitions shall apply:

13CC.2.1 Book Inventory (inventory of record)

A master database or listing of all SNM currently possessed, reflecting the input of all material control records.

13CC.2.2 Dry Storage Canister

The smallest structurally discrete item containing fuel assemblies or fuel components, which is stored on an ISFSI pad within the area controlled by the owner.

13CC.2.3 Fuel Assembly

The grouping of fuel components combined as an integral unit for use in a nuclear reactor.

13CC.2.4 Fuel Component

The smallest structurally discrete part of a fuel assembly that contains SNM. This is normally a fuel rod for intact components, but includes rod fragments, or pellets (or significant fraction thereof) if the rod structural integrity is not maintained.

13CC.2.5 Fuel Component Container

A container that provides protection to fuel components comparable to that afforded by an intact fuel assembly and that is held to the same accounting standards as a fuel assembly, in that the container has the following attributes:

- The container is specifically designed to contain rods/rod fragments;
- The container is stored in the fuel storage racks or as authorized in dry fuel storage containers; and
- The use of specialized handling tools and equipment is required to access the SNM stored in the container.

13CC.2.6 Independent Spent Fuel Storage Installation (ISFSI)

A complex designed and constructed for dry interim storage of spent nuclear fuel.

13CC.2.7 Item

Fuel assembly, fuel component container, non-fuel SNM container, sealed container, reassembled reactor vessel, dry storage canister, or a discrete piece of SNM (fuel or non-fuel) that is not stored in a container.

13CC.2.8 Item Control Area (ICA)

A defined area within the owner controlled area for which the SNM (fuel assemblies, fuel components, or non-fuel SNM) is maintained in such a way that, at any time, an item count and related SNM quantities can be obtained from the records for the SNM located within the area. ICAs have defined physical boundaries; these generally comprise fresh and irradiated fuel storage areas, including ISFSIs, reactor vessels, spent fuel pools, and non-fuel SNM storage areas.

13CC.2.9 Item Count (piece count)

Visual verification that an item is in the location documented in the material control records. Verification of an item's identification number is not necessary for a piece count.

13CC.2.10 Material Control Records

Records of SNM receipt, internal transfer, reconstitution, acquisition, inventory, and shipment (including disposal).

13CC.2.11 Non-Fuel SNM

Items containing SNM that are not intended for use as fuel, e.g., fission detectors.

13CC.2.12 Non-Fuel SNM Container

A container used to store non-fuel SNM items, which has the following attributes:

- The container is specifically designed or evaluated for storage of SNM;
- The container is stored in an area with controlled access; and
- The use of specialized handling tools and equipment is required to access the SNM stored in the container.

13CC.2.13 **Physical Inventory**

Determination on a measured basis of the quantity of SNM on hand at a given time; a complete check of all material on hand. The methods of physical inventory and associated measurements will vary depending on the material to be inventoried and the process involved. The typical physical inventory at a power reactor plant consists of an item count (piece count) of SNM in each ICA.

13CC.2.14 **Sealed Container**

Container storing SNM that has been sealed with a tamper-safing device or other mechanical means, e.g., welding.

13CC.2.15 **Special Nuclear Material (SNM)**

Plutonium, uranium-233, uranium enriched in the isotope ^{233}U or in the isotope ^{235}U, and any other material which the Nuclear Regulatory Commission (NRC), pursuant to the provisions of Section 51 of the Atomic Energy Act of 1954, as amended, determines to be SNM.

13CC.2.16 **Tamper-Safing**

The use of a device on a container in a manner and at a time that ensures a clear indication of any violation of the integrity of the contents of the container.

13CC.3 Organizational Requirements

13CC.3.1 **Delegation of Responsibilities and Authority**

Material control functional and organizational relationships are set forth in writing in organizational directives, instructions, procedures, manuals, and other documents. Documentation includes position qualification requirements and definitions of authority, responsibilities, and duties. The assignment of SNM material control and accounting functions is such that the activities of one person or unit serve as a control over and a check of the activities of other persons or units. Activities involving handling, accounting, or control of SNM are verified by a second person. Specific assignments of responsibilities are prescribed for all facets of the SNM control system. Delegation of material control responsibilities and authority are in writing. Material control functions are assigned in accordance with 13CC.3.1.1 through 13CC.3.1.3.

Titles assigned to the positions are intended to be descriptive only. Organizations, specific titles, and related functions may vary.

13CC.3.1.1 Site VP

The site VP has overall physical control and physical inventory responsibilities for SNM at the plant site.

13CC.3.1.2 Plant Manager

The plant manager has overall responsibility for implementation of the SNM control and accounting function.

13CC.3.1.3 SNM Custodian

The SNM custodian is responsible for the performance of the functions that relate to the control of SNM.

13CC.3.2 Experience or Training

Personnel responsible for SNM control and accounting have experience or training applicable to their functions.

13CC.3.3 Accounting Group

The SNM accounting group maintains records for the SNM in the plant's possession as required in 10 CFR 74.19(b).

13CC.3.4 Vendor/Contractor Oversight

A program is established to provide adequate oversight of vendors/contractors conducting activities involving handling, accounting, and control of SNM.

13CC.4 Material Control and Accounting Program

13CC.4.1 Procedures

Written procedures are prepared and maintained covering the SNM control and accounting system, as required in 10 CFR 74.19(b). These procedures shall address, as a minimum, the following topics:

(1) Organization and personnel responsibilities and authorities;

(2) Designation and description of ICAs;

(3) Material control records and reporting;

(4) Notification for events concerning SNM;

(5) Receiving and shipping SNM;

(6) Internal transfer of SNM;

(7) Physical inventory of SNM;

(8) SNM element and isotopic calculation method; and

(9) Characterization and identification of items as SNM or non-SNM to preclude loss of control of SNM items.

13CC.4.2 **Configuration Control**

Provisions are made for written approval of revisions to the contents of the SNM material control and accounting procedures by the appropriate plant personnel, such as the plant manager.

13CC.4.3 **Corrective Action Program**

Discrepancies or program deficiencies are documented, investigated, reported, as required in 10 CFR 74.11 and 10 CFR 20.2201, and resolved using the plant corrective action program.

13CC.5 Input Control

13CC.5.1 **Review of Fuel Supplier's Values**

Nuclear Analysis and Fuels (NAF) reviews the adequacy of the fuel supplier's material control and accounting system used in establishing the quantities and assays of SNM. In the event of a significant discrepancy between the fuel supplier's values for SNM quantities and assays and those determined by NAF, the cause of such discrepancies are investigated with the fuel supplier and the differences are resolved and reconciled expeditiously.

13CC.5.2 **Receipt of SNM**

For SNM received at the plant site, NAF:

(1) Contacts the shipping vendor in the event the SNM does not arrive as scheduled; initiates an investigation and resolves, as required in 10 CFR 73.67 and 10 CFR 74.11;

(2) Verifies the integrity of the shipping container and tamper-safing devices and resolves any problems identified, as required in 10 CFR 73.67 and 10 CFR 74.11;

(3) Verifies that the quantity (item count) and unique identification numbers are in agreement with those indicated on the shipper's documents;

(4) Takes appropriate steps to resolve and reconcile any differences in quantities or identification numbers, as required in 10 CFR 73.67 and 10 CFR 74.11; and

(5) Notifies the regulatory body, as required in 10 CFR 73.67 and 10 CFR 74.11.

13CC.5.3 **Documentation**

The SNM custodian reports the receipt of each item containing SNM, by serial number or other unique identifier, to the accounting group. The receipt of SNM is documented in the material control records and the book inventory updated for the applicable ICA, as required in 10 CFR 74.19(a). A Nuclear Material Transaction Report is completed, as required in 10 CFR 74.15.

13CC.6 Internal Control

13CC.6.1 **Unit of Control**

Units of SNM that require control are the items defined in 13CC.2.7. Each of these units are identified in the material control records by its serial number or other unique identifier (e.g., a physical description of the item) and location, as required in 10 CFR 74.19(a).

13CC.6.2 **Item Control Areas**

ICAs are established for physical and administrative control of SNM. The number of ICAs is sufficient to establish control.

13CC.6.3 **Internal Transfers**

Transfers of SNM into, out of, or within an ICA are accomplished only upon written authorization of the SNM custodian or other individual(s) at the plant site responsible for the SNM program. Written authorization is obtained prior to the movement. All transfers of SNM are documented using a material control record by the responsible person involved in each operation, and the book inventory is updated for the applicable ICA.

13CC.6.4 **Non-SNM Items**

Non-SNM items stored with items containing SNM are clearly identified as such to preclude SNM items from being mistaken for non-SNM items.

13CC.6.5 **Sealed Containers**

A container with a tamper-safing device can be treated as a single item for inventory purposes; however, before the container is closed and the tamper-safing device is installed, the contents are physically inventoried. If the contents of a sealed container are accessed, the contents will be physically reinventoried or administrative procedures will be in place to establish the integrity of the contents before it can be treated as a single item for inventory purposes.

13CC.6.6 **Damaged Cladding**

Severe damage to cladding, where rod structural integrity has not been maintained, has the potential to result in inadvertent physical separation and dispersal of fuel components from the fuel rod. Upon visual identification of inadvertent physical separation, an estimate of the SNM quantity and an engineering judgment concerning the origin of the SNM will be made and documented. The amount of irretrievable or inadvertent loss will be reported, if the quantity is reportable, as required in 10 CFR 74.13. Methods used to estimate SNM quantities include, for example, engineering calculation, engineering judgment, physical measurement of length, destructive or non-destructive measurement, and count of the number of pellets retrieved or missing.

13CC.7 Physical Inventory

13CC.7.1 **Conduct**

Physical inventory is taken at intervals not to exceed 12 months, as required in 10 CFR 74.19(c). Physical inventory is conducted according to written inventory procedures, as required in 10 CFR 74.19(b).

13CC.7.2 **Coverage**

Physical inventory includes all SNM possessed under license and is conducted in all ICAs, including:

(1) New fuel storage areas;

(2) Irradiated fuel storage areas;

(3) Reactors;

(4) ISFSIs; and

(5) Areas containing non-fuel SNM.

13CC.7.3 Inventory Method

An item count is conducted of all SNM, as required in 10 CFR 74.19(c).

13CC.7.3.1 Assemblies and Fuel Component Containers

For fuel assemblies and fuel component containers, an item count is sufficient. If the contents of an assembly or a fuel component container are accessed, the contents are physically reinventoried before the assembly or container can be treated as a single item for inventory purposes.

13CC.7.3.2 Fuel Components

For fuel components that are not part of an intact assembly, physically captured in an assembly, stored in a sealed container, or stored in a fuel component container, each component is inventoried.

13CC.7.3.3 Sealed Containers

For sealed containers, verification of the integrity of the tamper-safing device is sufficient.

13CC.7.3.4 Reactor

Whenever fuel assemblies are loaded into a reactor, the unique identifier and location of each item is visually verified. When the reactor vessel is reassembled, the reactor is considered one item for inventory purposes.

13CC.7.3.5 Non-Fuel SNM

For non-fuel SNM, the method of physical inventory depends on the method of storage and use:

- For installed components, verification is performed at the time of installation, and administrative procedures and controls are established so that records concerning the location and unique identity are accurate.
- For non-installed components stored in primary containment, administrative procedures and controls are established so that records concerning the location and unique identity are accurate when the reactor is at power, and verification is performed during refueling outages.

- For non-fuel SNM containers, item count of the containers is sufficient. If the contents of the container are accessed, the contents are physically re-inventoried or administrative procedures are in place to ensure the integrity of the contents before the container can be treated as a single item for inventory purposes.

13CC.7.4 Reconciliation and Resolution

The physical inventory is reconciled to the book inventory. Discrepancies between the physical inventory and the book inventory are investigated and addressed expeditiously. The book inventory shall be adjusted to agree with the result of the physical inventory.

13CC.7.5 Documentation

The results of the physical inventory of SNM are documented in the material control records of the applicable ICA and utilized as input to the isotopic calculations. A Material Balance Report and Physical Inventory Listing Report are completed, as required in 10 CFR 74.13.

13CC.8 SNM Calculations

13CC.8.1 Element and Isotopic Computations

Methods of computation are established and utilized for determining the total element and isotopic composition of SNM in irradiated nuclear fuel assemblies and fuel components. The computed values are the basis for shipment documents, as required in 10 CFR 74.15, and material status reports, as required in 10 CFR 74.13.

13CC.8.2 Analysis of Results

Refinement of the element and isotopic computations used in determining the SNM content of irradiated fuel are considered as new technologies evolve. For reprocessed fuel, this may include a collection and comparison of reprocessing plant measurement data with computed data for fuel assemblies.

13CC.9 Output Control

13CC.9.1 Shipment

Procedures are established, as required by 10 CFR 74.19(b), to provide for:

(1) Verification and recording of the serial number or unique identifier of each item containing SNM;

(2) Recording of the quantities of SNM contained in each item;

(3) Reporting the quantity of SNM shipped, if the quantity is reportable, as required in 10 CFR 74.15;

(4) Verification of compliance with regulations, including licensing, transportation, and security requirements for shipment; and

(5) Reporting the completion of each shipment to the accounting group

Care is taken to assure that SNM contained in fuel is not shipped inadvertently with shipments of nonfuel SNM waste.

13CC.9.2 Documentation

The shipment of fuel assemblies, fuel components, or non-fuel SNM is documented in the material control records and the book inventory updated for the applicable ICA. Nuclear Material Transaction Reports are completed, as required in 10 CFR 74.15.

13CC.9.3 Review and Audit of Reprocessing (Recycling) Measurements

For SNM being reprocessed, Dominion or its representative:

(1) Reviews the adequacy of the reprocessor's material control system used in establishing the quantities and assays of SNM, including written procedures;

(2) Audits the implementation of the reprocessor's material control system used in establishing the quantities and assays of SNM, including observation of measurement and material control activities;

(3) Audits the reprocessor's accounting activities, measurements, analyses, computations, and records affecting the determination of SNM quantities and assays; and

(4) In the event of a significant discrepancy between the reprocessor's values for SNM quantities and assays and those determined by audit, investigates and reconciles any differences expeditiously.

13CC.10 Records and Reports

Records are created and retained, as required in 10 CFR 74.19(a). The accounting records are the basis for the material control and accounting program. Quantitative data generated by calculation of changes in quantities and isotopic composition due to irradiation and decay are recorded and reported in accordance with standard recording and reporting procedures. The records and reports system include:

(1) An accounting system for maintaining the book inventory;

(2) Material control records maintained for each ICA;

(3) Reconciliation of the results of physical inventories to the book inventory;

(4) Recording the transfer of SNM into or out of each ICA;

(5) Recording movement of SNM between locations within an ICA, for ICAs where locations have been established;

(6) Recording the creation of items containing SNM, such as creation of a rod fragment;

(7) Recording the estimated quantity and origin of SNM which has been inadvertently separated from fuel upon the discovery of the separation;

(8) Reporting to the accounting group the transfer of SNM into, within, or out of an ICA, if applicable;

(9) Perpetual inventory records of each ICA, including the serial number or other unique identifier and location of each item in the ICA that contains SNM;

(10) Historical data of SNM in each nuclear fuel assembly, fuel component, or non-fuel SNM item while in Dominion's possession; and

(11) Retention as required in 10 CFR 72 and 74.

13CC.11 System Review and Assessment

Reviews of the SNM program are conducted periodically. The results of the review of the reviews are documented and reported in accordance with the requirements of the quality assurance or self assessment program.

13CC.12 Physical Security

Protection of SNM is in accordance with the requirements of 10 CFR 73.67 and the Physical Security Plan.

CWR SUP 13DD-1

Appendix 13DD New Fuel Shipping Plan

13DD.1 Scope of New Fuel Shipping Plan

The reactor licensee on occasion may have to arrange for shipment of new fuel assemblies to the fuel manufacturer. Such shipments are infrequent and would require the reactor licensee to be subject to the regulations in 10 CFR 73.67 (Reference 13DD.5-201), as clarified by guidance provided in NRC Regulatory Issue Summary (RIS) 2005-22 (Reference 13DD.5-202). In lieu of the reactor licensee developing and submitting its own transportation security plan (TSP), arrangements may be made for a special nuclear material (SNM) qualified licensee to accept delivery of the fuel at the reactor licensee's site and for the SNM qualified licensee to perform the return shipment under its TSP.

This New Fuel Shipping Plan summarizes the procedures and the written agreement the reactor licensee shall have in place prior to a shipment of new fuel back to the fuel manufacturer. A written agreement acknowledges the responsibility of the reactor licensee and the SNM qualified licensee.

13DD.2 Definitions

In this plan the following definitions apply:

13DD.2.1 New Fuel Assembly

A group of fuel rods containing pellets of fissionable material that has not been irradiated in the nuclear reactor core.

13DD.2.2 In-Transit Physical Protection

Protection provided by a licensee in accordance with a transportation security plan for special nuclear material that meets the requirements of 10 CFR 73.67(g)(3).

13DD.2.3 SNM Qualified Licensee

An entity that is licensed pursuant to the regulations in 10 CFR Part 70 to transport, deliver to a carrier, or take delivery of a single shipment and has received NRC approval of a TSP addressing the physical protection of special nuclear material in transit pursuant to 10 CFR 73.67(c).

13DD.2.4 Receiver

The SNM qualified licensee that receives delivery of new fuel assemblies returned from the reactor licensee.

13DD.3 Reactor Licensee Responsibility

13DD.3.1 The reactor licensee shall have a written agreement in place that arranges for the physical protection of special nuclear material in transit to and from the reactor licensee's facility that meets the requirements of 10 CFR 73.67(g)(3).

The in-transit physical protection starts at the free on board (F.O.B.) point at which the new fuel is delivered to a carrier for transport. The agreement shall include acknowledgement by the SNM qualified licensee that its TSP includes in-transit physical protection from the reactor licensee's site to the receiver's facility.

13DD.3.2 Reactor licensee procedures shall provide guidance regarding advance notification to the receiver of the new fuel shipment, confirmation the receiver is ready to accept shipment, performance of container integrity checks, and placement of tamper-safing devices prior to the commencement of planned shipment in accordance with 10 CFR 73.67(g)(1).

13DD.3.3 When the reactor licensee receives SNM from a shipper, procedures shall include inspections for the container integrity and tamper-safing devices and notifications to the shipper as required by 10 CFR 73.67(g)(2).

13DD.4 Documentation

The records created as a result of this plan activity shall be retained in accordance with reactor licensee records administration and applicable requirements of 10 CFR 73.67(g). Records that would be created and

retained under this plan, in the event of new fuel return shipments, include:

- Written agreements between the reactor licensee and the shipper/receiver for in-transit physical protection of the new fuel shipment,
- Documentation of advance notifications and receipt,
- Documentation of container integrity and tamper-safing device checks, and
- Copies of superseded response procedure materials.

13DD.5 References

13DD.5-201 10 CFR 73.67 – Licensee fixed site and in-transit requirements for the physical protection of special nuclear material of moderate and low strategic significance

13DD.5-202 NRC Regulatory Issue Summary (RIS) 2005-22 Requirements for the Transportation of Special Nuclear Material of Moderate and Low Strategic Significance: 10 CFR Part 73 vs. Regulatory Guide 5.59 (1983)

Chapter 14 Initial Test Program

14.1 Initial Test Program for Preliminary Safety Analysis Reports

This section of the referenced DCD is incorporated by reference with no departures or supplements.

14.2 Initial Plant Test Program for Final Safety Analysis Reports

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

14.2.1.4 Organization and Staffing

Add the following at the end of this section.

NAPS SUP 14.2-1

Section 13.1 provides additional information regarding responsibilities, qualifications, and organization for implementing the pre-operational and startup testing program.

14.2.2.1 Startup Administrative Manual

Replace the first two paragraphs with the following.

STD COL 14.2-1-A
STD COL 14.2-2-A

A description of the Initial Test Program (ITP) administration is provided in Appendix 14AA. The Startup Administrative Manual (SAM) will be developed and made available for review 60 days prior to scheduled start of the preoperational test program.

14.2.2.2 Test Procedures

Replace the last sentence in this section with the following.

CWR COL 14.2-3-A

Approved test procedures for satisfying this section will be developed and available for review no later than 60 days prior to their intended use for preoperational tests and no later than 60 days prior to scheduled fuel loading for power ascension tests.

14.2.2.5 Test Records

Add the following at the end of this section.

STD SUP 14.2-2

Startup test reports are prepared in accordance with RG 1.16.

14.2.7 Test Program Schedule and Sequence

Replace the last paragraph with the following.

STD COL 14.2-4-A

The detailed testing schedule will be developed and made available for review prior to actual implementation. The schedule may be updated and continually optimized to reflect actual progress and subsequent revised projections.

The implementation milestones for the Initial Test Program are provided in Section 13.4.

14.2.8.1.36 AC Power Distribution System Preoperational Test

General Test Methods and Acceptance Criteria

Add the following at the end of this section.

STD-SUP-14.2-4

- Proper operation of the automatic transfer capability of the normal preferred power source to the alternate preferred power source.

14.2.8.1.51 Plant Service Water System Preoperational Test

Purpose

Replace the first paragraph with the following.

NAPS SUP 14.2-4

The objective of this test is to verify proper operation of the PSWS including the AHS and its ability to supply design quantities of cooling water to the RCCWS and TCCWS heat exchangers.

General Test Methods and Acceptance Criteria

Add the following after the last bullet.

NAPS SUP 14.2-4

- Proper operation of control interlocks and equipment protective devices in AHS fans, motors and valves;
- Proper operation of the AHS fans, motors, and valves in all design operating modes;
- Automatic transfer between PSWS trains and components in response to Anticipated Operational Occurrences (AOOs); and
- Proper operation of water hammer mitigating design features.

Replace the second sentence of the last paragraph with the following.

NAPS SUP 14.2-4

However, due to insufficient heat loads during the preoperational test phase, the heat exchanger and the AHS performance verification is deferred until the startup phase.

14.2.8.2.18 Plant Service Water System Performance Test

Purpose

Replace the first paragraph with the following.

NAPS SUP 14.2-5

The objective of this test is to verify performance of the PSWS including the AHS along with the RCCWS, and the TCCWS under expected reactor power operation load conditions.

Description

Replace the second sentence with the following.

NAPS SUP 14.2-5

Pertinent parameters shall be monitored in order to provide a verification of proper system flow balancing and heat exchanger and AHS performance under near design or special conditions, as appropriate.

14.2.9 Site-Specific Preoperational and Startup Tests

Replace the second and third paragraphs with the following.

NAPS COL 14.2-5-A

This section describes the site specific pre-operational and initial startup tests not addressed in DCD Section 14.2.8.

NAPS COL 14.2-6-A

Specific testing to be performed and the applicable acceptance criteria for each preoperational and startup test are documented in test procedures to be made available to the NRC approximately 60 days prior to their intended use for preoperational tests, and not less than 60 days prior to scheduled fuel load for initial startup tests. Site-specific preoperational tests are in accordance with the system specifications and associated equipment specifications for equipment in those systems provided by the licensee that are not part of the standard plant described in DCD Section 14.2.8. The tests demonstrate that the installed equipment and systems perform within the limits of these specifications.

14.2.9.1 Site-specific Pre-Operational Tests

Replace this section with the following.

NAPS SUP 14.2-3

14.2.9.1.1 Station Water System Pre-Operation Test

Purpose

The objective of this test is to verify proper operation of the SWS and its ability to supply design quantities and quality of water to the CIRC, PSWS cooling tower basin, MWS, and FPS.

Prerequisites

The construction tests have been successfully completed and the SCG has reviewed the test procedure and approved the initiation of testing. Electrical power, the CIRC, PSWS, MWS and FPS, instrument air, Chemical Storage and Transfer System, and other required interfacing systems are available, as needed, to support the specified testing.

General Test Methods and Acceptance Criteria

Performance is observed and recorded during a series of individual component and integrated system tests to demonstrate the following:

- Proper operation of instrumentation and equipment in appropriate design combinations of logic and instrument channel trip;
- Proper functioning of instrumentation and alarms used to monitor system operation and availability;
- Proper operation of pumps, motors, and valves in all design operating modes;
- Proper operation of traveling screens and motorized self-cleaning strainers;
- Proper system flow paths and flow rates, including pump capacity and discharge head;
- Proper operation of interlocks and equipment protective device in pump, motor, and valve controls;
- Proper operation of freeze protection methods and devices, where installed; and
- Acceptability of pump/motor vibration levels.

14.2.9.1.2 Cooling Tower Preoperational Test

Purpose

The objective of this test is to verify proper operation of the waste heat rejection portion of the CIRC (i.e., the dry cooling array and the hybrid cooling tower and basin.) Testing of the balance of the CIRC is addressed in DCD Section 14.2.8.1.50.

Prerequisites

The construction tests have been successfully completed and the SCG has reviewed the test procedure and approved the initiation of testing. Electrical power, the CIRC, SWS, Instrument Air System, Chemical Storage and Transfer System, and other required interfacing systems are available, as needed, to support the specific testing.

General Test Methods and Acceptance Criteria

Because of insufficient heat loads during the preoperational test phase, cooling tower performance evaluations are performed during the startup phase with the turbine generator on line.

Operation is observed and recorded during a series of individual component and integrated system tests to demonstrate the following:

- Proper operation of instrumentation and equipment in appropriate design combinations of logic and instrument channel trip;
- Proper functioning of instrumentation and alarms used to monitor system operation and availability;
- Proper operation of pumps, fans, motors, and valves in all design operating modes;
- Proper system flow paths and flow rates, including pump capacity and discharge head;
- Proper operation of interlocks and equipment protective devices in pump, motor, and valve controls;
- Proper operation of freeze protection methods and devices, where installed; and
- Acceptability of pump/motor vibration levels.

14.2.9.1.3 **[Deleted]**

14.2.9.1.4 **[Deleted]**

14.2.9.2 Site-Specific Startup Tests

Replace this section with the following.

NAPS SUP 14.2-2

14.2.9.2.1 Cooling Tower Performance Test

Purpose

The objective of this test is to demonstrate acceptable performance of the waste heat rejection portion of the CIRC (i.e., the dry cooling array and the hybrid cooling tower and basin), particularly its ability to cool design quantities of circulating water to design temperature under expected operational load conditions.

Prerequisites

The preoperational tests are complete and plant management has reviewed the test procedure and approved the initiation of testing. The plant is in the appropriate operational configuration for the scheduled testing. The necessary instrumentation is checked or calibrated.

Description

Power ascension phase testing of the waste heat rejection portions of the CIRC is necessary to the extent that fully loaded conditions could not be approached during the preoperational phase. Pertinent parameters are monitored in order to provide a verification of proper system flow balancing and performance of both the dry cooling array and hybrid-cooling tower.

Criteria

System performance is consistent with design requirements.

14.2.10 COL Information

14.2-1-A Description - Initial Test Program Administration

STD COL 14.2-1-A
NAPS COL 14.2-1-A

This COL Item is addressed in Section 14.2.2.1 and Appendix 14AA.

14.2-2-A Startup Administrative Manual

STD COL 14.2-2-A

This COL Item is addressed in Section 14.2.2.1.

14.2-3-A Test Procedures

CWR COL 14.2-3-A

This COL Item is addressed in Section 14.2.2.2.

14.2-4-A Test Program Schedule and Sequence

NAPS COL 14.2-4-A

This COL Item is addressed in Section 14.2.7.

14.2-5-A Site Specific Tests

NAPS COL 14.2-5-A

This COL Item is addressed in Section 14.2.9.

14.2-6-A Site Specific Test Procedures

NAPS COL 14.2-6-A

This COL Item is addressed in Section 14.2.9.

14.3 Inspections, Tests, Analyses, and Acceptance Criteria

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

14.3.8 Overall ITAAC Content for Combined License Applications

Replace the last paragraph with the following.

STD COL 14.3-1-A

The requirements for inclusion of Emergency Planning ITAAC (EP-ITAAC) in a COLA are provided in 10 CFR 52.80(a). In SRM-SECY-05-0197, the NRC approved generic EP-ITAAC for use in COL and ESP applications. This set of EP-ITAAC was considered in the development of the plant-specific EP-ITAAC, which are tailored to the ESBWR design. The plant-specific EP-ITAAC are included in a separate part of the COLA.

14.3.9 Site-Specific ITAAC

Delete the last sentence of the first paragraph and add the following at the end of this section.

CWR COL 14.3-2-A

The selection criteria and methodology provided in this section of the referenced DCD were utilized as the site-specific selection criteria and methodology for ITAAC. These criteria and methodology were applied to those site-specific (SS) systems that were not evaluated in the referenced DCD. The entire set of ITAAC for the facility, including DC-ITAAC, EP-ITAAC, PS-ITAAC, and SS-ITAAC, is included in a separate part of the COLA.

14.3.10 COL Information

14.3-1-A Emergency Planning ITAAC

STD COL 14.3-1-A

This COL item is addressed in Section 14.3.8.

14.3-2-A Site-Specific ITAAC

CWR COL 14.3-2-A

This COL item is addressed in Section 14.3.9.

Appendix 14.3A Design Acceptance Criteria ITAAC Closure Process

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

14.3A.1 Design Acceptance Criteria ITAAC Closure Options

Replace the last two sentences of the second paragraph with the following.

NAPS COL 14.3A-1-1

Dominion shall submit to the NRC, no later than 1 year after issuance of the combined license or at the start of construction as defined in 10 CFR 50.10(a), whichever is later, its implementation schedules for completion of the following ITAAC. Dominion shall submit updates to the ITAAC schedules every 6 months thereafter and, within 1 year of its scheduled date for initial loading of fuel, shall submit updates to the ITAAC schedules every 30 days until the final notification is provided to the NRC under paragraph (c)(1) of 10 CFR 52.99.

For piping Design Acceptance Criteria (DAC) ITAAC, 1) the as-designed Pipe Break Analysis Report will be completed per DCD ITAAC Table 3.1-1 and 2) the ASME Code design reports for safety-related piping packages will be completed for DAC ITAAC Tables 2.1.2-3 (2b1), 2.2.2-7 (2b1), 2.4.4-6 1 (10b1), 2.4.1-3 (2b1), 2.4.2-3 (2b1), 2.6.1-1 (8b1), 2.6.2-2 (2b1), 2.11.1-1 (9a), 2.15.1-2 (2a3), and 2.15.4-2 (2b1) for the applicable systems in order to support the closure of the DAC ITAAC. Information will be made available for NRC review, inspection, and audit on a system basis. Information will be made available to the NRC to facilitate reviews, inspections, and audits throughout the process.

For human factors engineering (HFE), HFE DAC ITAAC consists of a series of results summary reports which verify that the specific associated Design Commitment is met. The summary reports will be made available at each stage for NRC review, inspection, and audit on an element-by-element basis. Information (procedures and test programs) will be made available to the NRC to facilitate reviews, inspections, and audits throughout the process.

For instrumentation and controls, the set of ESBWR digital instrumentation and control DAC ITAAC establishes a phased closure process. Procedures and test programs necessary to demonstrate that the DAC ITAAC requirements are met will be used at each phase to certify to the NRC that the design is in compliance with the certified design. Information will be made available for NRC review, inspection, and audit on a system basis. Information will be made available to the NRC to facilitate reviews, inspections, and audits throughout the process.

14.3A.5 COL Information

14.3A-1-1 Establish a Schedule for Design Acceptance Criteria ITAAC Closure

NAPS COL 14.3A-1-1 This COL item is addressed in Section 14.3A.1.

NAPS COL 14.2-1-A

Appendix 14AA Description of Initial Test Program Administration

14AA.1 Summary of Test Program and Objectives

14AA.1.1 Applicability

This appendix provides the requirements to be included in the Startup Administrative Manual (SAM), as discussed in DCD Sections 14.2.2.1 and 14.2.2.3. The information in and referenced in this appendix meets the ITP criteria of NUREG-0800 and is formatted to follow RG 1.206, Section C.I.14.2.

The ITP is applied to structures, systems, and components that perform the functions described in the RG 1.68 evaluation in Section 1.9. The ITP is also applied to other structures, systems, and components that meet any of the following criteria, even if not included in RG 1.68, Appendix A:

- Will be used for shutdown and cool down of the reactor under normal plant conditions, and for maintaining the reactor in a safe condition for an extended shutdown period.
- Will be used for shutdown and cool down of the reactor under transient (infrequent or moderately frequent events) conditions and postulated accident conditions, and for maintaining the reactor in a safe condition for an extended shutdown period following such conditions.
- Will be used to establish conformance with safety limits or limiting conditions for operation that will be included in the facility's Technical Specifications.
- Are classified as engineered safety features or will be relied on to support or ensure the operation of engineered safety features within design limits.
- Are assumed to function, or for which credit is taken, in the accident analysis of the facility, as described in the FSAR.
- Will be used to process, store, control, or limit the release of radioactive materials.

The SAM includes a list of the ESBWR structures, systems, and components to which the ITP is applied.

14AA.1.2 Phases of the Initial Test Program

The ITP (per RG 1.68) has the following five phases:

1. Preoperational Testing
2. Initial Fuel Loading and Pre-Criticality Tests
3. Initial Criticality
4. Low-Power Tests
5. Power Ascension Tests

These phases are described in further detail in DCD Section 14.2 and in Section 14.2, and are referred to collectively as Startup Tests.

14AA.1.3 Objectives of Preoperational and Startup Testing

Objectives of Preoperational Testing are in DCD Section 14.2.1.2. Objectives of Startup Testing are in DCD Section 14.2.1.3.

14AA.1.4 Testing of First of a Kind Design Features

First of a kind (FOAK) testing may occur in any of the phases depending on the nature of the testing and required sequencing of the tests. When testing FOAK design features, applicable operating experience from previous test performance on other ESBWR plants is reviewed where available and the ITP modified as needed based on those lessons learned.

14AA.1.5 Credit for Previously Performed Testing of First of a Kind Design Features

In some cases, FOAK testing is required only for the first of a new design or for the first few plants of a standard design. In such cases, credit may be taken for the previously performed tests. A discussion is included in the startup test reports of the results of those tests that are credited.

14AA.2 Organization and Staffing

Administration of the ITP is governed by procedures in the SAM.

14AA.2.1 Organizational Description

The Plant Staff organization is described in Section 13.1. General preoperational responsibilities and a description of preoperational and

startup testing are provided in Section 13AA.2. DCD Section 14.2.1.4 provides a description of the Startup Group organization.

The (DCD) Startup Group (the Unit 3 ITP organization) is comprised of two separate groups: the Preoperational Test Group, which is responsible for conducting and documenting preoperational tests; and the Startup Test Group, which is responsible for conducting and documenting initial startup testing. Both groups consist of personnel drawn from various organizations such as plant staff and engineering, procurement and construction (EPC) contractor personnel.

The Commissioning Manager is in charge of the Preoperational Test Group and is separated from the construction organization. The Commissioning Manager reports directly to the EPC Contractor Site Manager and has the qualifications of Preoperational Test Supervisor as set forth in Table 13.1-201.

The Startup Test Manager is in charge of the Startup Test Group and reports to the senior manager operations and maintenance.

The Preoperational Test Group consists of a Preoperational Test Manager and Preoperational Test Supervisors responsible for completion of test activities. The Preoperational Test Manager reports to the Commissioning Manager and the Preoperational Test Supervisors report to the Preoperational Test Manager. Preoperational Test Engineers are assigned to this group and report to one of the Preoperational Test Supervisors. Qualifications of Preoperational Test Manager, Supervisors and Engineers are set forth in Table 13.1-201.

The Startup Test Group consists of Startup Test Supervisors who report to the Startup Test Manager. Startup Test Engineers are assigned to this group and report directly to one of the Startup Test Supervisors. Qualifications of Startup Test Manager, Supervisors and Engineers are set forth in Table 13.1-201. Figure 14AA-201 illustrates the organizational structure of the Startup Group.

14AA.2.2 **Responsibilities**

The senior manager operations and maintenance coordinates with the Commissioning Manager to provide plant operations, engineering and maintenance personnel to support, maintain and participate in preoperational testing.

Following the NRC 10 CFR 52.103(g) finding, the Startup Test Manager is responsible for completion of the startup test program.

14AA.2.2.1 **Commissioning Manager**

The Commissioning Manager is responsible for:

- Staffing within the Preoperational Test Group.
- Developing preoperational test procedures associated with ITP.
- Developing and managing the preoperational testing schedule.
- Documenting completion of ITAAC testing.
- Operating and maintaining the plant.
- Establishing and maintaining the Preoperational Test Group measuring and test equipment (M&TE) program.
- Acting as Chairman of the Joint Test Group (JTG) prior to NRC issuance of the 10 CFR 52.103(g) finding.
- Managing contracts associated with the ITP.
- Coordinating with station and construction department heads for assignment of staff personnel to accomplish the test program objectives.

14AA.2.2.2 **Startup Test Manager**

The Startup Test Manager is responsible for:

- Staffing within the Startup Test Group.
- Developing startup test procedures associated with ITP.
- Acting as Chairman of the JTG following the NRC 10 CFR 52.103(g) finding.
- Acting as an advisor to the Facility Safety Review Committee (FSRC) for all matters associated with startup testing.
- Managing contracts associated with the ITP.
- Coordinating with station and construction department heads for assignment of staff personnel to accomplish the test program objectives.

14AA.2.2.3 **GEH Site Representative**

The GEH site representative is responsible for technical direction during the ITP. Qualifications of the GEH site representative are equivalent to

the qualifications described in ANSI/ANS-3.1-1993 for a Preoperational Test Supervisor. Specific responsibilities are:

- Acting as liaison with EPC Contractor personnel on testing matters involving EPC Contractor-supplied equipment.
- Reviewing preoperational and startup test procedures, with emphasis on plant design and operations.
- Assisting in data reduction, analysis, and evaluation for completed tests.
- Acting as a voting member of JTG.

14AA.2.2.4 **Vendor Site Representative**

A vendor site representative is responsible for technical direction during the preoperational phase of the test program. This position is filled as needed based on the scope of non-GEH supplied equipment that requires preoperational or startup testing. Specific responsibilities are:

- Acting as liaison with vendor on testing matters involving vendor supplied equipment.
- Reviewing preoperational tests with emphasis on vendor-supplied equipment.
- Assisting in data reduction, analysis, and evaluation for preoperational tests.

14AA.2.2.5 **Preoperational Test Manager**

The Preoperational Test Manager is responsible for:

- Supervising the Preoperational Test Supervisors and Engineers.
- Coordinating and implementing test preparation and test activities.
- Acting as voting member of JTG during the preoperational testing phase.
- Reviewing preoperational test results and making recommendations based on the results.
- Resolving deficiencies identified during preoperational inspection and test activities.
- Ensuring Preoperational Test Engineers are not the same personnel who designed or are responsible for satisfactory performance of the system(s) or design features(s) being tested.

14AA.2.2.6 **Preoperational Test Supervisor**

Preoperational Test Supervisors are responsible for:

- Supervising the Preoperational Test Engineers assigned to them.
- Coordinating and scheduling test preparation and test activities.
- Preparing, reviewing, and performing preoperational test procedures.
- Reviewing preoperational test results and making recommendations based on the results.
- Resolving deficiencies identified during preoperational inspection and test activities.
- Ensuring Preoperational Test Engineers are not the same personnel who designed or are responsible for satisfactory performance of the system(s) or design features(s) being tested.

14AA.2.2.7 **Startup Test Supervisor**

Startup Test Supervisors are responsible for:

- Supervising the Startup Test Engineers assigned to them.
- Coordinating and scheduling test preparation and test activities.
- Coordinating and directing testing for their shift via the Operations Shift Supervisor for the startup test phase.
- Assisting with preparing, reviewing, and performing startup test procedures.
- Reviewing, analyzing, and evaluating test results and data.
- Assisting in the resolution of deficiencies identified during startup testing activities.
- Coordinating with the planning and scheduling group for startup test activities.
- Expediting testing progress as necessary to support project schedule.
- Ensuring Startup Test Engineers are not the same personnel who designed or are responsible for satisfactory performance of the system(s) or design features(s) being tested.

14AA.2.2.8 **Preoperational Test Engineer**

Preoperational Test Engineers are responsible for:

- Determining the nature and degree of testing required for assigned systems.
- Developing test activity milestones, target dates, and manpower requirements.
- Following construction progress to support test program requirements.
- Ensuring that the required detailed preoperational test procedures are available for review and approval.
- Identifying special or temporary equipment or services needed to support testing.
- Assuring test identification tagging and station tagging are implemented as necessary to support testing and turnover.
- Directing all participating groups during preparation for the execution of assigned tasks.
- Identifying and assisting in the resolution of deficiencies and problems found during the construction and testing of assigned systems and areas.
- Reviewing and evaluating test results and preparing test summaries.

14AA.2.2.9 **Startup Test Engineer**

Startup Test Engineers are responsible for:

- Preparing the required detailed startup test procedures and making them available for review and approval.
- Identifying special or temporary equipment or services needed to support testing.
- Directing all participating groups during preparation for the execution of assigned tasks.
- Identifying and assisting in the resolution of deficiencies found during the construction and testing of assigned systems.
- Reviewing and evaluating the test results and data.
- Coordinating with Operations during the execution of assigned tasks.

14AA.2.2.10 **Joint Test Group**

The JTG is the primary review and approval organization during the preoperational test phase of the test program and is equivalent to the group referred to in DCD Section 14.2.1.4 as the Startup Coordinating Group (SCG). During the preoperational test phase, the JTG is chaired by the Commissioning Manager, and the senior manager of operations and maintenance is a voting member. The required JTG quorum during this phase is described in an administrative procedure in the SAM. The JTG is responsible for:

- Performing duties delineated in the SAM.
- Reviewing and approving all preoperational test procedures prior to testing.
- Reviewing and approving all major changes or revisions to JTG-approved test procedures.
- Reviewing and approving the overall preoperational test schedule and sequence.
- Reviewing and approving the results of preoperational tests.
- Recommending the disposition of test deficiencies.
- Recommending retests or supplemental tests as required.
- Determining system readiness for turnover to operations.

During the startup test phase, the JTG is a technical review and advisory group supporting the FSRC. During the startup test phase, the JTG is chaired by the operations manager, and the GEH site representative or designee is a voting member. The required JTG quorum during the startup test phase is described in an administrative procedure in the SAM. The JTG is responsible for:

- Performing duties delineated in the SAM.
- Providing detailed technical review of all startup test procedures prior to testing and providing recommendations to the FSRC for approval.
- Reviewing and approving all major changes or revisions to FSRC-approved test procedures.
- Reviewing the overall startup test schedule and sequence.
- Providing detailed technical review and recommending approval of the results of startup tests.
- Recommending the disposition of test deficiencies.

- Recommending retests or supplemental tests as required.

14AA.2.2.11 **Document Control Coordinator**

During the preoperational test phase, a document control coordinator reports to the Commissioning Manager and has the qualifications described in ANSI/ANS-3.I-1993 for a Preoperational Test Engineer. The document control coordinator is responsible for:

- Tracking test procedure changes.
- Reviewing, approving and tracking document changes (including drawings, vendor tech manuals, procedures, design changes, etc.).
- Verifying that the test schedules are up to date with regard to latest testing results.
- Processing final test packages through review and approval by the JTG.

During the startup phase, a document control coordinator reports to the senior manager of facility engineering and technical support and has the qualifications described in ANSI/ANS-3.I-1993 for a Startup Test Engineer. The document control coordinator is responsible for:

- Tracking test procedure changes.
- Reviewing, approving and tracking document changes (including drawings, vendor technical manuals, procedures, design changes, etc.).
- Processing final test packages through review and approval by the FSRC.

14AA.2.2.12 **Facility Safety Review Committee**

Upon initial fuel load, the FSRC assumes responsibility for tasks previously assigned to the JTG. The FSRC is responsible for review of all procedures that require a regulatory evaluation under 10 CFR 50.59 and 10 CFR 72.48, as well as all tests and modifications that affect nuclear safety. The FSRC is responsible for review of all startup test procedures. The JTG is a technical advisory body to the FSRC.

The organizational structure, functions, and responsibilities of FSRC are described in Appendix 17AA. During the startup test phase, the FSRC is advised by the Startup Test Manager and the GEH site representative. The FSRC may be addressed by other titles such as Plant Operations Review Committee (PORC) or On-site Safety Review Committee.

14AA.2.3 Operating and Technical Staff Participation

Operating and technical staff qualifications and experience requirements are:

- Plant staff qualification and experience requirements are in Chapter 13 and in this appendix.
- EPC contractor staff qualification and experience requirements are in this appendix and in approved EPC contractor procedures.

Plant staff participates in all phases of the ITP. Plant staff groups that participate include but are not limited to: Quality Assurance staff, Quality Control staff, Operations staff, Maintenance staff, Engineering staff, Planning, Scheduling and Outage planning staff, and Work Management staff, including work planners and schedulers. Operations staff participates in preoperational testing as part of gaining experience as described in Appendix 13BB. Refer to Figure 14AA-201 for identification of organizations that have one or more participants in the ITP.

14AA.2.4 Conflict of Interest

Members of the Preoperational Test Group and the Startup Test Group responsible for formulating and conducting preoperational and startup tests are not the same individuals who designed or are responsible for satisfactory performance of the systems or design features being tested. This does not preclude members of the design organizations from participating in test activities.

14AA.2.5 Training Requirements

Training on the overall test program is conducted prior to scheduled preoperational and initial startup testing and as new employees are added to the test groups. A training program for each functional group in the organization is developed, with regard to the scheduled preoperational and startup testing, to ensure that the necessary plant staff is ready for commencement of the ITP. Additional discussion on staff training is found in Section 13.2, Appendices 13AA and 13BB, and Figure 13.1-202. The training program includes:

- Systems to be tested.
- Training by selected major equipment vendors (e.g., turbine, plant control).
- A review of test program administration.

- Content of test procedures, including acceptance criteria review.
- Test sequence.
- Test conduct and closure.

Specific Just-In-Time (JIT) training is conducted for operating crews and other personnel conducting certain startup tests. This JIT training may involve simulator training. Criteria to be considered when determining if JIT is used for a test include complexity of the test and plant response, such as tests that result in plant trips or other transients, or where they may occur. Accredited training program procedures describe the process for determining training topics to be conducted. The intention is to be as well prepared as possible to operate the plant safely.

14AA.3 Test Procedures

14AA.3.1 Procedure Development

DCD Sections 14.2.2.2 and 14.2.2.4 provide a general discussion concerning test procedure development and review. Section 13.5 provides detailed requirements for developing, reviewing, and scheduling administrative procedures.

Test procedures are written in accordance with a technical procedure writer's guide. This writer's guide provides for procedure validation. This validation may, in some cases, be through the use of an available plant reference simulator. The suitability of using the simulator to validate a test procedure is evaluated on a case by case basis. It may not be suitable, for example, to use the simulator to validate a procedure whose results are required to validate the simulator modeling.

Test procedures maximize the use of plant operating and maintenance procedures for test tasks. This can take the form of referencing a plant procedure to perform a task, or extracting the steps from the plant procedure for use in the preoperational and startup test procedures. This includes the use of emergency procedures for verifying appropriate emergency actions as described in DCD Section 14.2.5. Step-by-step instructions on how to conduct the applicable test are described and are coordinated with plant procedures wherever applicable in the test procedure. Test procedures contain cautions, warnings, and notes, using criteria established in the technical procedure writer's guide.

14AA.3.2 **Procedure Format and Content Requirements**

DCD Section 14.2.8.1 discusses technical information to be provided by GEH and others that form the technical basis for test procedure objectives and acceptance criteria.

Each preoperational and startup test procedure includes the following:

- Cover page

  The cover page provides approval signatures and effective dates (signatures may be maintained on file and may not appear on the cover page). The title and the unit designator water mark appear on the cover page. If the test is considered an infrequently performed test, this would appear on the cover page.

- Table of Contents
- Purpose and Test Objectives Section

  This section identifies the goal of the specific preoperational/startup test. This is established by stating those systems, subsystems, or components that are included in the test, and a series of summarized specific functions to be demonstrated during the test. Objectives of the test are stated. Many systems tests are intended to demonstrate that each of several initiating events produces one or more expected responses. These initiating events and the corresponding responses are identified.

- Description Section

  This section describes the power plateau, specific testing activities, operability impacts, systems affected, RPS trips, containment isolation, etc.

- Reference Section

  This section lists documents used to prepare or revise the pre-operational or startup test procedure and any documents used or referred to while performing the procedure.

- Special Tools and Equipment (Temporary Equipment Installations) Section

  This section lists test equipment and special tools not routinely carried, plus any unusual expendable items recommended to perform the procedure. This section also identifies temporary test equipment installations and test equipment instructions.

- Precautions and Limitations Section

  The test procedure highlights and clearly describes any and all precautions needed to ensure a reliable test or the safety of personnel or equipment including termination criteria for the test. Included are any special actions to be taken if the test is terminated at critical points in the test.

- Initial Conditions Section

  This section lists the plant conditions required to perform the test. Example: verify that the plant is operating at the 75 percent (+0, –5 percent) rod line. Each test of the operation of a system requires that certain other activities be performed first (e.g., completion of construction, construction and/or preliminary tests, inspections, and certain other preoperational tests or operations). Where appropriate, instructions are given pertaining to the system configuration, components that should or should not be operating, and other pertinent conditions that might affect the operation of the given system. The preoperational testing procedures include, as appropriate, these specific prerequisites, as illustrated by the following examples:

  - Confirm that construction activities associated with the system have been completed and documented.
  - Field inspections have been conducted to ensure that the equipment is ready for operation, including inspection for proper fabrication and cleanliness, checkout of wiring continuity and electrical protective devices, adjustment of settings on torque-limiting devices and calibration of instruments, verification that all instrument loops are operable and respond within required response times, and adjustment and settings of temperature controllers and limit switches.
  - Confirm that test equipment is operable and properly calibrated.
  - Confirm communications systems are functional for conducting the test.
  - Access control is in place for personnel safety.
  - Support or interface systems are functional.

- •• Confirm that prerequisite tests are conducted on individual components or subsystems to demonstrate that they meet their functional requirements.

  Special environmental conditions are included in this section. Test procedures include provisions to test the equipment under environmental conditions as close as practical to those the equipment will experience in both normal and accident situations. However, many tests are conducted at ambient conditions due to the impracticality of achieving normal and accident conditions during preoperational testing.

- System Testing Section

  This section provides detailed step-by-step instructions for each test. To the extent practical, the test procedures use approved normal plant operating procedures. Expected plant result is explicitly or implicitly stated in the instructions through verification or measurement steps. Each procedure requires necessary nonstandard arrangements to be restored to their normal status after the test is completed. Control measures such as jumper logs and check-off lists are specified. Nonstandard bypasses, valve configurations, and instrument settings are identified and highlighted for return to normal. Nonstandard arrangements are carefully examined to ensure that temporary arrangements do not invalidate the test by interfering with proper testing of the as-built system.

- Data Collection Section

  The test procedures prescribe the data to be collected and the form in which the data are to be recorded. All entries are permanent. The administrative controls include an acceptable method for correcting an entry.

- Acceptance Criteria Section

  The test procedures clearly identify the criteria against which the success or failure of the test is judged, and account for measurement errors and uncertainties. In some cases, these are qualitative criteria. Where applicable, quantitative values with appropriate tolerances are designated as acceptance criteria. This section includes acceptance criteria for judgment of plant and system performance (as described in the applicable test specification). Those test criteria that show compliance with the Combined License ITAAC are identified in this

section. When a test criterion for a preoperational test is not met, the Preoperational Test Engineer documents the failure through the corrective action process and contacts the applicable preoperational test supervisor to determine actions to take (e.g., submitting a work request).

For the startup test program, criteria are divided into three categories, depending on the significance of the parameter or function. The following paragraphs describe each kind of test criterion, and the actions to be taken by the Startup Test Engineer after an individual test criterion is not satisfied.

- Level I Criteria: Level I criteria relate to the values of process variables assigned in the design or analysis of the plant and component systems or associated equipment. Violation of these Level I criteria may have plant operational or plant safety implications. If a Level I test criterion is not satisfied, the plant must be placed in a suitable hold condition that is judged to be satisfactory to safety based on the results of prior testing. The Startup Test Engineer notifies the on-shift SRO, (who may declare the equipment inoperable), notifies the Startup Test Manager/Startup Test Supervisor, enters the condition in the corrective action program, and issues work requests as needed. Plant operating or test procedures or the Technical Specifications guide the decision on the direction to be taken. Startup tests compatible with this hold condition may be continued. Resolution of the problem must be documented and pursued by appropriate equipment adjustments or through engineering support personnel. Following resolution, the applicable test portion must be repeated to verify that the Level I requirement is ultimately satisfied. A description of the problem resolution shall be included in the report documenting the successful test.
- Level 2 Criteria: Level 2 criteria are specified as key plant performance requirements that are equipment design specification values or requirements for the measured response. The expected plant response is predicted by best estimate computer code and the desired trip avoidance margins. Level 2 failures that occur during tuning and system adjustment must be documented in the test report and following resolution, the applicable test portion must be repeated (retesting could occur at a higher power level with

FSRC approval) to verify that the Level 2 criterion requirement is satisfied. If a Level 2 criterion requirement is not satisfied after a reasonable effort, then the cognizant design and engineering organization shall document the results in the corrective action program with a full explanation of their recommendations. In order for the system as a whole to be acceptable, all Level 2 requirements must be satisfied or documentation provided that either modifies Level 2 requirements or changes specific design criteria.

  - •• Level 3 Criteria: Level 3 criteria are associated with specifications on the expected or desired performance of individual control loop components. Meeting Level 3 criteria helps assure that overall system and plant response requirements are satisfied. Therefore, Level 3 criteria are to be viewed as highly desirable rather than required to be satisfied. Good engineering judgment is appropriate in the application of these rules. Since overall system performance is a mathematical function of its individual components, one component whose performance is slightly worse than specified can be accepted provided that a system adjustment elsewhere will positively overcome the deficiency. Large deviations from Level 3 performance requirements are not allowable. If a Level 3 criterion requirement is not satisfied, the subject component or inner loop shall be analyzed closely. However, if all Level I and Level 2 criteria are satisfied, then it is not required to repeat the transient test to satisfy the Level 3 performance requirements. The occurrence of this Level 3 criterion failure shall be documented in the test report and entered into the corrective action program.

- Follow-on Task Section

  This section includes activities that must be performed to complete the test procedure.

  - •• Completion Notification

    This section is included to identify persons to be notified that the procedure has been satisfactorily or unsatisfactorily completed.

  - •• Procedure Reviews

    This section is included to specify required reviews and comments by various personnel.

- Records Disposition

  Records disposition guidance is described in site-specific procedures.

- Attachments

  Test procedure attachments provide supporting information and equations and evaluation methods to be used to analyze the obtained data. This attachment lists the signals to be recorded by the data collection equipment. Analysis and evaluation attachments outline the calculations to be performed and provide for an evaluation of the test.

  Upon completion of a given test, a preliminary evaluation is performed which confirms acceptability for continued testing. Smaller transient changes are performed initially, gradually increasing to larger transient changes. Test results at lower powers are extrapolated to higher power levels to determine acceptability of performing the test at higher powers.

- Documentation of Test Results

  Records identify each observer and/or data recorder participating in the test, as well as the type of observation, identifying numbers of test or measuring equipment, results, acceptability, and action taken to correct any deficiencies. Administrative procedures specify the retention period of test result summaries, and require permanent retention of documented summaries and evaluations.

14AA.3.3 **Other Startup Test Procedures**

The need for special startup tests may arise due to unplanned conditions. The format and content requirements for preoperational and startup tests apply to these procedures.

14AA.3.4 **Test Procedure Changes**

If it is determined that procedure corrections (including changes in test sequence) are required before or during the conduct of the test, the test engineer suspends testing and notifies operations and test personnel of the required change. For all such corrections, the test engineer prepares and processes a procedure change request as delineated in a site-specific procedure for processing procedure changes. Revisions are classified into two categories based on the intent of the change. The intent of a procedure is the specific task or goal that is to be accomplished by the procedure.

Intent changes are changes to:

- Purpose.
- Initial conditions (or prerequisites).
- Acceptance criteria or tolerances.
- Scaling or setpoints.
- The method for meeting a commitment identified in the procedure.
- Step verification (independent or concurrent).
- System/component as-left condition(s).
- Reactivity management (changes that impact the operator's ability to monitor, control, or manipulate the reactor).
- Add or delete a subsection.
- Decrease personnel safety or fire protection effectiveness.
- Delete, relocate, or add a hold point.
- Caution or warning statements.
- Startup test procedure testing sequence.

Non-intent changes and revisions do not change the intent of the procedure (e.g., typographical error corrections). Review and approval requirements for procedure changes that do not change the intent are established in administrative procedures in the SAM.

Procedure changes that change the intent of the procedure receive the same level of review and approval as the original procedure. All test procedure intent changes will be revised against the following criteria (consistent with 10 CFR 50.59 and the design certification rule):

- Departure from Tier 1 information.
- Departure from Tier 2 information that significantly decreases the level of safety in accordance with 10 CFR 50.59(c)(1) and meets any one of eight criteria in 10 CFR 50.59(c)(2)(i) through (viii) or 10 CFR 52, Design Certification Appendix, Section VIII.B.5.b.
- Departure from Tier 2* information.
- Departure from Technical Specifications.

Preoperational test procedure intent changes involving Tier 1, Tier 2*, Technical Specifications, or Tier 2 that require a license amendment must be approved by the NRC prior to procedure completion and approval. Startup test procedure intent changes involving Tier 1, Tier 2*, Technical

Specifications, or Tier 2 that require a license amendment must be approved by the NRC prior to procedure use. Timely notification of the NRC is made when procedures are changed that have been sent to the NRC.

14AA.4 Conduct of the Initial Test Program

14AA.4.1 Administrative Controls

ITP conduct is described in DCD Section 14.2.2.3. The SAM governs the ITP and will be issued no later than 60 days prior to the beginning of the pre-operational phase. Testing during all phases of the test program is conducted using approved test procedures.

14AA.4.2 Procedure Verification

Because procedures may be approved for implementation weeks or months in advance of the scheduled test date, a review of the approved test procedure is required before commencement of testing. The test engineer is responsible for ensuring:

- Drawing and document revision numbers listed in the reference section of the test procedure agree with the latest revisions.
- The procedure text reflects any design change(s) made since the procedure was originally approved for implementation in the areas of acceptance criteria, FSAR, Technical Specifications, piping changes, etc.
- Any new Operating Experience lessons learned (since preparation of the procedure) are incorporated into individual test procedures.

Procedures require signoff of verification for prerequisites and instruction steps. This signoff includes identification of the person doing the signoff and the date and time of completion.

Test engineers maintain chronological logs of test status to facilitate turnover and aid in maintaining operational configuration control. These logs become part of the test documentation.

There is a documented turnover process to ensure that test status and equipment configuration are known when personnel transfer responsibilities, such as during a shift change.

Test briefings are conducted for each test in accordance with administrative procedures. When a shift change occurs before test

completion, another briefing occurs before resumption or continuation of the test.

Data collected is marked or identified with test, date, and person collecting data. This data becomes part of the test documentation.

The corrective action program is used to document all deficiencies, discrepancies, exceptions, nonconformances and failures (collectively known as test exceptions) identified in the ITP. The corrective action documentation becomes part of the test documentation. GEH and/or other design organizations participate in the resolution of design-related problems that result in, or contribute to, a failure to meet test acceptance criteria.

During preoperational testing the Commissioning Manager approves the testing sequence and process. During startup testing, the senior manager operations and maintenance approves proceeding from one test phase to the next. Approvals are documented in an overall ITP governance document.

Administrative procedures detail the test documentation review and approval. Review and approval of test documentation includes the test engineer, test supervisor, group manager, GEH site representative or appropriate vendor site representative, and JTG or FSRC. Final approval is by the Commissioning Manager for preoperational tests and the senior manager operations and maintenance for startup tests.

Plant readiness reviews are conducted to assure that the plant staff and equipment are ready to proceed to the next test phase or plateau.

14AA.4.3 **Work Control**

The appropriate ITP group is responsible for preparing work requests when assistance is required to correct a maintenance or construction issue. Work requests are issued in accordance with a site-specific procedure governing the work management process. Following the NRC 10 CFR 52.103(g) finding, the plant staff, upon identifying a need for Construction organization assistance, coordinates their requirements through the appropriate Startup Test Engineer.

During all phases of the ITP, tagging procedures shall be used for protection of personnel and equipment and for jurisdictional or custodial conditions that have been turned over in accordance with the turnover procedure. During preoperational testing, tagging requests are governed

by a site-specific procedure for equipment clearance. Activities requiring Construction organization work efforts are performed under the plant tagging procedures following the NRC 10 CFR 52.103(g) finding.

The appropriate ITP group is responsible for supervising minor repairs and modifications, changing equipment settings, and disconnecting and reconnecting electrical terminations as stipulated in a specific test procedure. Test engineers may perform independent verification of changes made in accordance with approved test procedures.

14AA.4.4 **Measuring and Test Equipment (M&TE)**

During the preoperational test program, as well as the startup test program, most activities that lead to plant commercial operation involve design value verifications. M&TE used during these activities are properly controlled, calibrated, and adjusted at specified intervals to maintain accuracy within necessary limits. M&TE is governed by a site-specific procedure for control of M&TE. M&TE includes portable tools, gauges, instruments, and other measuring and testing devices not permanently installed, for example, test instruments prepared by the Preoperational Test Group as well as those provided by the Construction organization or by vendors.

A calibration program is implemented. For standard M&TE equipment, calibration procedures are prepared for each type of M&TE calibrated onsite. Calibration intervals are established for each item of M&TE. However, if the calibration requirement of a particular piece of M&TE is beyond the capabilities or resources of the onsite staff, this M&TE is sent to an offsite certified calibration or testing agency. If special test equipment is necessary only for the ITP, the responsible vendor provides this equipment with the appropriate calibration documentation.

During the preoperational test phase, the Commissioning Manager is responsible for establishing and maintaining the M&TE program. Following the NRC 10 CFR 52.103(g) finding, the maintenance manager is responsible for this function.

14AA.4.5 **System Turnover**

There are two phases of system turnover. The first phase occurs upon completion of construction and construction testing when the systems, subsystems and equipment are transferred to the control of the Preoperational Test Group. During this phase, systems, subsystems, and

equipment are completed and turned over in an orderly and well-coordinated manner. Guidelines are established to define the boundary and interface between related system/subsystem and are used to generate boundary scope documents; for example, marked-up piping and instrument diagrams (P&IDs), electrical schematic diagrams, for scheduling and subsequent development of component and system turnover packages. The system turnover process includes requirements for the following:

- Documenting inspections performed by the construction organization (e.g., highlighted drawings showing areas inspected).
- Documenting results of construction testing.
- Determining the construction-related inspections and tests that need to be completed before preoperational testing begins. Any open items are evaluated for acceptability of commencing preoperational testing.
- Developing and implementing plans for correcting adverse conditions and open items, and means for tracking such conditions and items.
- Verifying completeness of construction and documentation of incomplete items.

Systems, subsystems, and equipment for which preoperational testing has been completed undergo review and evaluation to verify that mechanical completion has been achieved. Mechanical completion is achieved when the EPC Contractor has completed installation, preoperational testing, ITAAC closure testing and documentation, outstanding maintenance work, and walkdowns of systems, subsystems, and equipment. When mechanical completion is complete, the systems, subsystems, and equipment will be protected in accordance with EPC Contractor procedures to ensure further construction activities do not occur, and that maintenance or testing are controlled to assure that plant configuration and completed ITAAC are not impacted.

Following mechanical completion of all systems, subsystems, and equipment and following the NRC 10 CFR 52.103(g) finding, jurisdictional care, custody and control of the plant will transition to the plant staff.

14AA.4.6 Preoperational Testing

During preoperational testing, it may be necessary to return system control to Construction organization to repair or modify the system or to correct new problems. Administrative procedures include direction for:

- Means of releasing control of systems and or components to construction.
- Methods used for documenting actual work performed and determining impact on testing.
- Identification of required testing to restore the system to operability/functionality/availability status, and to identify tests to be re-performed based on the impact of the work performed.
- Authorizing and tracking operability and unavailability determinations.
- Verifying retests stay in compliance with ITAAC.

14AA.4.7 Startup Testing

The startup testing program is based on increasing power in discrete steps. Major testing is performed at discrete power levels as described in DCD Section 14.2.7. The first tests during power ascension testing that verify movements and expansion of equipment are in accordance with design, and are conducted at a power level as low as practical (not in excess of 5 percent).

The governing power ascension test plan requires the following operations to be performed at appropriate steps in the power-ascension test phase:

- Conduct any tests that are scheduled at the test condition or power plateau.
- Confirm core performance parameters (core power distribution) are within expectations.
- Determine reactor power by heat balance, calibrate nuclear instruments accordingly, and confirm the existence of adequate instrumentation overlap between the startup range and power range detectors.
- Reset high-flux trips, just prior to ascending to the next level, to a value no greater than 20 percent beyond the power of the next level unless Technical Specification limits are more restrictive.

- Perform general surveys of plant systems and equipment to confirm that they are operating within expected values.
- Check for unexpected radioactivity in process systems and effluents.
- Perform reactor coolant leak checks.
- Review the completed testing program at each plateau; perform preliminary evaluations, including extrapolation core performance parameters for the next power level; and obtain the required management approvals before ascending to the next power level or test condition.

Upon completion of a given test, a preliminary evaluation is performed that confirms acceptability for continued testing. Smaller transient changes are performed initially, gradually increasing to larger transient changes. Test results at lower powers are extrapolated to higher power levels to determine acceptability of performing the test at higher powers. This extrapolation is included in the analysis section of the lower power procedure.

Surveillance test procedures may be used to document portions of tests, and ITP tests or portions of tests may be used to satisfy Technical Specifications surveillance requirements in accordance with administrative procedures. At Startup Test Program completion, a plant capacity warranty test is performed to satisfy the contract warranty and to confirm safe and stable plant operation.

14AA.4.8 **Conduct of Modifications during the Initial Test Program**

Temporary modifications may be required to conduct certain tests. These modifications are documented in the test procedure. The test procedures contain restoration steps and retesting required to confirm satisfactory restoration to required configuration. Modifications may be performed by the Construction organization or the plant staff processes prior to the NRC 10 CFR 52.103(g) finding. If the modification invalidates a previously completed ITAAC, then that ITAAC is re-performed. Each modification is reviewed to determine the scope of post-modification testing that is to be performed. Testing is conducted and documented to ensure that preoperational testing and ITAAC remain valid. Modifications made following the NRC 10 CFR 52.103(g) finding are in accordance with plant staff processes and meet license conditions. Modifications that require change of ITAAC require NRC approval of the ITAAC change.

14AA.4.9 Conduct of Maintenance during the Initial Test Program

All corrective or preventive maintenance activities are reviewed to determine the scope of post-maintenance testing to be performed. Prior to the NRC 10 CFR 52.103(g) finding, post-maintenance testing is conducted and documented to ensure that associated preoperational testing and ITAAC remain valid. Maintenance performed following the NRC 10 CFR 52.103(g) finding is in accordance with plant staff processes and meets license conditions.

14AA.4.10 Audits

A comprehensive system of planned and periodic audits is carried out to verify compliance with the ITP in accordance with the Quality Assurance Program Description. Follow-up actions, including re-audit of deficient areas, are taken where indicated.

14AA.5 Review, Evaluation and Approval of Test Results

14AA.5.1 Review and Approval Responsibilities

EPC Contractor representatives review and approve the results of all tests of supplied equipment. Other vendors' representatives review and approve the results of tests of supplied equipment as needed. Plant staff review and approval responsibilities are in Section 14AA.2. Final approval of individual test completion is by the Site Manager, or senior manager operations and maintenance after approval by the JTG or FSRC.

14AA.5.2 Technical Evaluation

Each completed test package is reviewed by technically qualified personnel to confirm satisfactory demonstration of plant, system or component performance and compliance with design and license criteria.

14AA.6 Test Records

Records retention requirements are in DCD Section 14.2.2.5 and in the Quality Assurance Program Description.

14AA.6.1 Startup Test Reports

Startup test reports are generated describing and summarizing the completion of tests performed during the ITP. A startup report is required per RG 1.16 at the earliest of: 1) 9 months following initial criticality, 2) 90 days after completion of the ITP, or 3) 90 days after start of

commercial operations. If one report does not cover all three events, then supplemental reports are submitted every three months until all three events are completed. These reports:

- Address each ITP test described in the FSAR.
- Provide a general description of measured values of operating conditions or characteristics obtained from the ITP as compared to design or specification values.
- Describe any corrective actions that were required to achieve satisfactory operation.
- Include any other information required to be reported by license conditions due to regulatory guide commitments.

14AA.7 Test Program Conformance with Regulatory Guides

Section 1.9 provides the evaluation of ITP conformance with the following RGs:

- RG 1.30, "Quality Assurance Requirements for Installation, Inspection and Testing of Instrumentation and Electrical Equipment (Safety Guide 30)."
- RG 1.37, "Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water-Cooled Nuclear Power Plants."
- RG 1.68, "Initial Test Program For Water-Cooled Nuclear Power Plants."
- RG 1.78, "Evaluating the Habitability of a Nuclear Power Plant Control Room during a Postulated Hazardous Chemical Release."
- RG 1.116, "Quality Assurance Requirements for Installation, Inspection, and Testing of Mechanical Equipment and Systems."
- RG 1.139, "Guidance for Residual Heat Removal."
- RG 1.152, "Criteria for Digital Computers in Safety Systems of Nuclear Power Plants."
- RG 1.168, "Verification, Validation, Reviews, and Audits for Digital Computer Software Used in Safety Systems of Nuclear Power Plants."

These RGs contain guidance that is included in the content of test procedures.

14AA.8 Utilization of Operating Experience

Administrative procedures provide methodologies for evaluating and initiating action for operating experience information (OE). DCD Section 14.2.4 describes the general use of operating experience by GEH in the development of the ITP.

14AA.8.1 Sources and Types of Information Reviewed for ITP Development

Multiple sources of operating experience were reviewed to develop this description of the ITP administration program. These included:

- INPO Operating Experience Reports.
- INPO 06-001, “Operating Experience.”
- INPO 06-001 Addendum.
- INPO 07-003, “INPO/ Utility Benchmarking for New Plant Deployment.”
- INPO 07-003 Addendum.
- INPO 86-023, “Guidelines for Nuclear Power Construction Projects.”
- INPO 94-005, “Standard Operation Support of Nuclear Plants.”
- INPO 94-03, “Review of Commercial Nuclear Power Industry Standardization Experience.”
- INPO Document AP-909, “Construction of Standard Nuclear Plants.”
- INPO NX-1067, “Browns Ferry Nuclear Plant Unit I Restart Operational Readiness Lessons Learned.”
- NRC RG 1.68, “Initial Test Programs For Water-Cooled Nuclear Power Plants.”
- SER 24-85, “Xenon Tilt Oscillation Following Control Rod Insertion Test (05-24-1985).”
- SER 29-86, “Inadvertent Rapid Cooldown and Depressurization During a Remote Shutdown Test (08-12-1986).”
- SOER 87-01, “Core Damaging Accident Following an Improperly Conducted Test (03-06-1987).”
- SOER 91-01, “Conduct of Infrequently Performed Tests or Evolutions.”

14AA.8.2 Conclusions from Review

The following conclusions are a result of the OE review conducted to develop this ITP administration program description:

- The test procedures should provide guidance as to the expected plant response and instructions concerning what conditions warrant aborting the test. Errors and problems with the procedures should be anticipated. A means for prompt but controlled approval of changes to test procedures is needed. Critical test procedures should provide specific criteria for test termination and specific steps to ensure termination is conducted in a safe and orderly manner. Providing procedural guidance for aborting the test could prevent delays in plant restoration. Conservative guidance for actions to be taken should be included in the procedures.
- Plant simulators may prove useful in preparing for special tests and verifying procedures.
- Appropriate component/system operability should be verified prior to critical tests.
- The need to perform physics tests that can produce severe power tilts should be evaluated, particularly if tests at other similar reactors have provided sufficient data to verify the adequacy of the nuclear physics analysis.
- Implement compensatory measures in accordance with guidance for infrequently performed tests or evolutions where appropriate.

14AA.8.3 Summary of Test Program Features Influenced by the Review

The conclusions from the preceding section were incorporated in Sections 14AA.3.1 and 14AA.3.2.

14AA.8.4 Use of OE during Test Procedure Preparation

Administrative procedures require review of recent internal and external operating experience when preparing test procedures.

14AA.8.5 Use of OE during Conduct of ITP

Administrative procedures require discussion of operating experience when performing pre-job briefs immediately prior to the conduct of a test.

14AA.9 Trial Use of Plant Operating Procedures and Emergency Procedures

14AA.9.1 Use of Plant Procedures during Initial Test Program

Whenever practical, plant procedures are used to perform system and component operation during the conduct of a test.

14AA.9.2 Operator Training and Participation during Certain Initial Tests (TMI Action Plan Item I.G.1, NUREG-0737)

The objectives of operator participation are to increase the capability of shift crews to operate facilities in a safe and competent manner by assuring that training for plant changes and off-normal events is conducted.

The major objective of TMI Action Plan Task I.G.1 was to use the preoperational and startup test programs as a training exercise for operating crews. NUREG-0933 contains a discussion of the proposed actions and the conclusions made. NUREG-0800, Section 14 was revised to address the original issue of this action item. NUREG-0933 discusses three anticipated operational occurrences applicable to the ESBWR. These are pressure controller failed high, pressure controller failed low, and stuck-open safety/relief valve. These events are addressed in the abnormal operating procedures. Operators receive training on them as part of their initial training. Operators participate in preoperational and startup testing.

Operators are trained on the specifics of the ITP schedule, administrative requirements and tests. Specific JIT training is conducted for selected startup tests.

The ITP may result in discovery of acceptable plant or system response differing from expected response. Test results are reviewed to identify these differences and the training for operators is changed to reflect them. Training is conducted as soon as is practicable in accordance with training procedures.

14AA.10 Initial Fuel Loading and Initial Criticality

14AA.10.1 Prerequisites for Fuel Loading

- Preoperational tests are completed or justification is documented and approved for test exceptions and tests that have not been performed.

- All ITAAC are complete and the NRC has made the 10 CFR 52.103(g) finding.
- Technical Specifications required for fuel load are met.
- License Conditions are met to allow fuel load.
- Licensed operators are stationed in the control room and for supervision of core alterations.
- Composition, duties, and emergency procedure responsibilities of the fuel handling crew are specified.
- Persons are technically qualified in accordance with plant procedures.
- Radiation monitors, nuclear instrumentation, manual initiation, and other devices are tested and verified to be operable to actuate the building evacuation alarm and ventilation control.
- Status of each system required for fuel loading is specified.
- Inspections of fuel and control rods are complete and all identified issues with installed fuel and control rods are resolved.
- Nuclear instruments are calibrated, operable and properly located (source-fuel-detector geometry). One operating channel has audible indication or annunciation in the control room.
- A response check of nuclear instruments to a neutron source consistent with the Technical Specifications surveillance frequency for source range nuclear instruments in the refueling mode is complete.
- Required status of containment is specified and met.
- Required status of the reactor vessel is specified and met.
- Components are either in place or out of the vessel, as specified, to be capable of receiving fuel.
- Vessel water level is established, and the minimum level for fuel loading and unloading is specified.
- The standby liquid control system is operable.
- Fuel handling equipment is confirmed functional and operable through surveillance and other tests, including dry runs.
- The status of protection systems, interlocks, mode switches, alarms, and radiation protection equipment is prescribed and verified.
- Water quality is established within prescribed limits.

14AA.10.2 **Fuel Loading Procedure Details**

The fuel loading procedure includes instructions or information for the following areas:

- Loading sequence and pattern for fuel, control rods, and other components, with guidance regarding fuel addition increments so that the reactivity worth of added individual fuel assemblies becomes less as the core is assembled.
- Maintenance of a display for indicating the status of the core and fuel pool, as well as appropriate records of core loading.
- Proper seating and orientation of fuel and components (the procedure specifies a visual check of each assembly in each core position).
- Functional testing of each control rod immediately following fuel loading.
- Nuclear instrumentation and neutron source requirements for monitoring subcritical multiplication, including source or detector relocation and normalization of count rate after relocation.
- Flux monitoring, including counting times and frequencies and rules for plotting inverse multiplication and interpreting plots (the counting period for count rates is specified, and an inverse multiplication plot is maintained).
- The expected subcritical multiplication behavior.
- The minimum shutdown margin is proved periodically during loading and at the completion of loading. Shutdown margin verifications do not involve planned approach to criticality using nonstandard rod patterns or with operational interlocks bypassed.
- Actions (especially those pertaining to flux monitoring) for periods when fuel loading is interrupted.
- Maintenance of continuous voice communication between the control room and loading station.
- Minimum crew required to load fuel (the procedure requires the presence of at least two persons at any location where fuel handling is taking place, and a senior reactor operator with no other concurrent duties be in charge).
- Crew work time limits per 10 CFR 26 are in effect.
- Approvals required for changing the procedure.

14AA.10.3 **Fuel Loading Procedure Limitations and Actions**

The fuel loading procedure includes the following limits and instructions:

- Established criteria for stopping fuel loading. Some circumstances that might warrant this are unexpected subcritical multiplication behavior, loss of communications between the control room and fuel loading station, inoperable source-range detector, and inoperability of the emergency boration system.
- Established criteria for emergency boron injection.
- Established criteria for containment evacuation.
- Actions to be performed in the event of fuel damage.
- Actions to be performed and/or approvals to be obtained before routine loading may resume after one of the above limitations has been reached or invoked.

14AA.10.4 **Initial Criticality Procedure Requirements**

The format and content requirements for preoperational tests apply to the initial criticality procedure. Plant operations are in accordance with plant operating procedures to the maximum extent possible. This procedure includes steps to ensure that the startup proceeds in a deliberate and orderly manner, changes in reactivity are continuously monitored, and inverse multiplication plots are maintained and interpreted.

The initial criticality procedure includes the following requirements:

- A critical rod position is predicted so that any anomalies may be noted and evaluated.
- All systems needed for startup are aligned and in proper operation.
- The standby liquid control system is operable.
- Procedural, license and Technical Specification requirements are met for initial criticality.
- Nuclear instruments are calibrated. A neutron count rate (of at least one-half count per second) should register on neutron monitoring channels before the startup begins, and the signal-to-noise ratio should be known to be greater than two. A conservative startup rate limit (no shorter than approximately a 30-second period) is established.

14AA.11 Plant Procedure Development Schedule

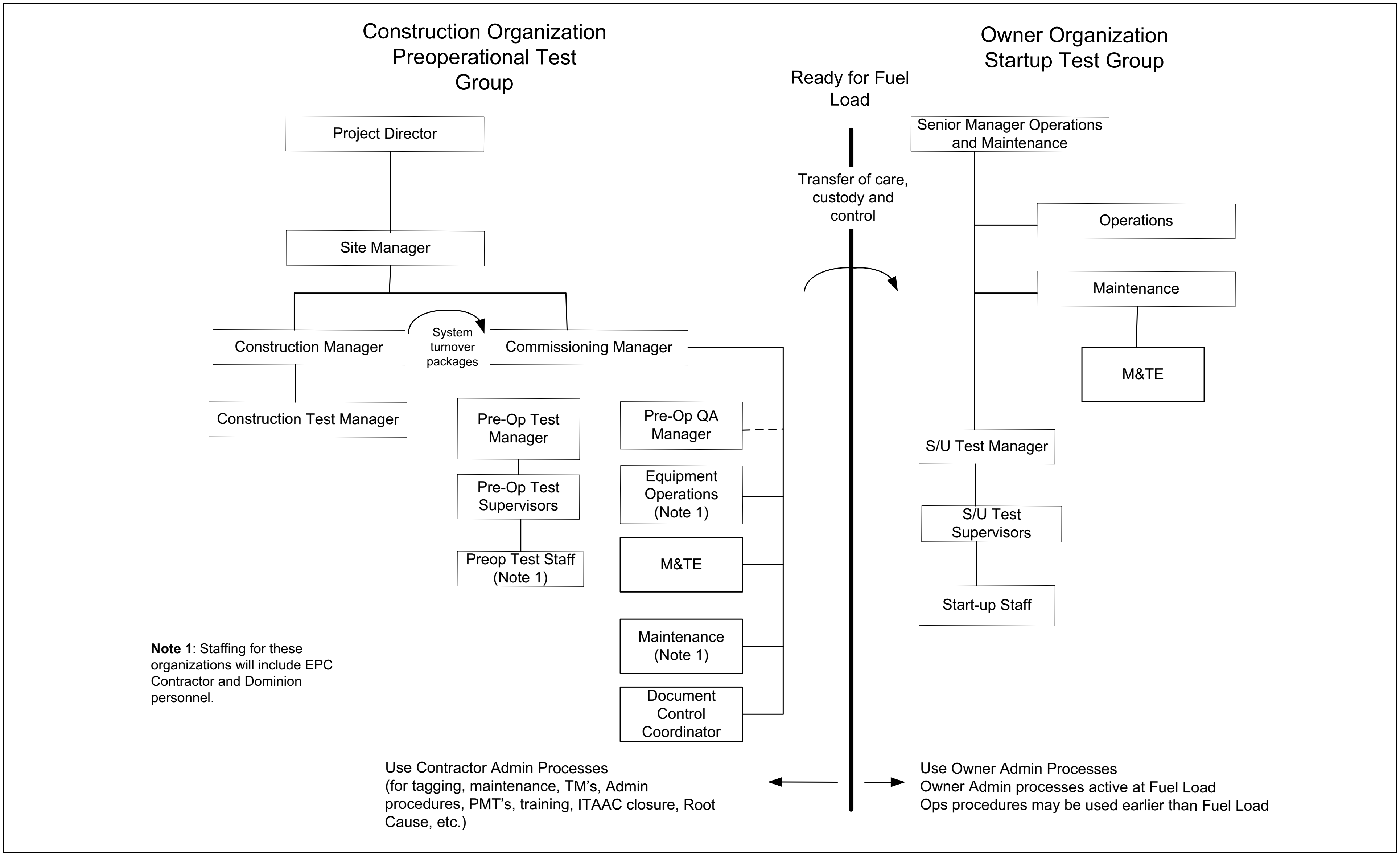
The milestone schedule for developing plant operating procedures is presented in Table 13.5-202 and discussed in Section 13.5.2.1. The operating and emergency procedures are available prior to start of licensed operator training and, therefore, are available for use during the ITP. Required or desired procedure changes may be identified during their use. Administrative procedures describe the process for revising plant operating procedures.

14AA.12 Individual Test Descriptions

Individual test descriptions can be found in DCD Section 14.2.8 and in Section 14.2.9.

BASIS: ESBWR COLA

Figure 14AA-201 Preoperational and Startup Test Organization (Typical)



Chapter 15 Safety Analyses

This chapter of the referenced DCD is incorporated by reference with the following departures and/or supplements.

15.3 Analysis of Infrequent Events

15.3.10.5 Radiological Consequences

Add the following sentence at the end of this section.

STD SUP 15.3-1

In addition, procedures discuss the use of nuclear instrumentation to aid in detecting a possible mislocated fuel bundle after fueling operations.

NAPS SUP 15.3-2

15.6 ESP Information

NAPS ESP VAR 2.0-6

SSAR Chapter 15 is incorporated by reference except that information related to the ESBWR is replaced by DCD Chapter 15.

Chapter 16 Technical Specifications

16.0 Introduction

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

STD SUP 16.0-1 The Technical Specifications and the Technical Specification Bases are maintained as separate documents.

16.0.1 COL Information

16.0-1-A COL Applicant Bracketed Items

STD COL 16.0-1-A This COL item is addressed in the Technical Specifications and Technical Specification Bases.

Chapter 17 Quality Assurance

17.0 Introduction

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Add the following after the last paragraph.

NAPS SUP 17.0-1

The QAPD applicable to the COL licensee is described in Section 17.5. The licensee's QAPD describes the basis of the program, its scope of activities, and the control of work performed by suppliers.

17.1 Quality Assurance During Design

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Add the following after the first paragraph.

NAPS SUP 17.1-1

Quality Assurance (QA) applied during the preparation of the ESPA is described in SSAR Chapter 17, which is incorporated by reference.

NAPS SUP 17.1-2

QA applied during COL application preparation and site specific design activities is addressed in Section 17.5.

17.2 Quality Assurance During Construction and Operations

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Replace the first paragraph with the following.

NAPS COL 17.2-1-A
NAPS COL 17.2-2-A

The licensee's Quality Assurance Program in place during the construction and operations phases, including adapting the design to specific plant implementation, is described in Section 17.5.

17.2.1 COL Information

17.2-1-A QA Program for the Construction and Operations Phases

NAPS COL 17.2-1-A

This COL Item is addressed in Section 17.2.

17.2-2-A QA Program for Design Activities

NAPS COL 17.2-2-A

This COL Item is addressed in Section 17.2.

17.3 Quality Assurance Program Description

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Replace the first and second sentences with the following.

NAPS COL 17.3-1-A

The Quality Assurance Program Document applicable to the licensee is described in Section 17.5.

17.3.1 COL Information

17.3-1-A Quality Assurance Program Document

NAPS COL 17.3-1-A

This COL Item is addressed in Section 17.3.

17.4 Reliability Assurance Program During Design Phase

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

17.4.1 Introduction

Replace the third paragraph with the following.

STD COL 17.4-1-A

There are no site specific SSCs within the scope of the Reliability Assurance Program (RAP). The quality elements for all SSCs within the scope of the Design Reliability Assurance Program (D-RAP) are in accordance with the Quality Assurance Program Description (QAPD).

Replace the fourth paragraph and subsequent bulleted list with the following.

STD COL 17.4-2-A

The objectives of reliability assurance during the operations phase are integrated into the Quality Assurance Program (Section 17.5), the Maintenance Rule (MR) Program (Section 17.6), and other operational programs. Specific reliability assurance activities are addressed within operational programs (e.g., maintenance rule, surveillance testing, inservice testing, inservice inspection, and quality assurance) and the maintenance programs.

The MR Program incorporates the following aspects of operational reliability assurance (refer to Section 17.6):

- Use of PRA importance measures, the expert panel process, and deterministic methods to determine the list of risk-significant SSCs

- Evaluation and maintenance of the reliability of SSCs in the scope of the D-RAP
- Monitoring the effectiveness of maintenance activities needed for operational reliability assurance
- Classifying, initially, as high-safety-significant, all SSCs that are in the scope of the D-RAP, or applying expert panel review for any exceptions
- Use of historical data and industry operating experience on equipment performance as available
- Use of specific criteria to establish the level of performance or condition being maintained for SSCs within the scope of the MR Program; and use of monitoring to identify declining trends between surveillances and to minimize the likelihood of undetected performance or condition degradation to unacceptable levels, to the extent possible
- Use of maintenance programs to determine the nature and frequency of maintenance activities to be performed on plant equipment, including SSCs within the scope of the MR Program

17.4.6 SSC Identification/Prioritization

Add the following new paragraph at the end of this section.

STD COL 17.4-1-A
STD COL 17.4-2-A

The list of risk-significant SSCs will be confirmed via ITAAC (see DCD Tier 1 Table 3.6-1).

17.4.9 Operational Reliability Assurance Activities

Replace the second paragraph with the following.

STD COL 17.4-2-A

Refer to Section 17.4.1 for the implementation of reliability assurance during the operations phase.

17.4.10 Owner/Operator's Reliability Assurance Program

Replace the fifth bullet with the following.

STD COL 17.4-2-A

- **MR Program:** The MR Program is described in Section 17.6.

Replace the last sentence in this section with the following.

Refer to Section 17.4.1 for the implementation of reliability assurance activities.

17.4.13 COL Information

17.4-1-A Identification of Site-Specific SSCs Within the Scope of the RAP

STD COL 17.4-1-A This COL Item is addressed in Sections 17.4.1 and 17.4.6.

17.4-2-A Operation Reliability Assurance Activities

STD COL 17.4-2-A This COL Item is addressed in Sections 17.4.1, 17.4.6, 17.4.9, 17.4.10, and 17.6.

NAPS COL 17.3-1-A

17.5 Quality Assurance Program Description - Design Certification, Early Site Permits, and New License Applicants

QA applied to the DC activities is described in DCD Section 17.1.

QA applied during the preparation of the ESP application is described in SSAR Chapter 17.

NAPS SUP 17.5-2 QA applied to safety-related activities performed prior to start of construction (e.g., site investigation, design and safety analysis, early procurements) is described in the Dominion Nuclear Facility QAPD (Reference 17.5-201) topical report for the Dominion operating nuclear plants as supplemented by COL Project procedures.

NAPS COL 17.2-1-A
NAPS COL 17.2-2-A QA applied to activities to adapt the design to specific plant implementation, construction, and operations is addressed in the Dominion QAPD (Appendix 17AA). The QAPD is based on NEI 06-14A. (Reference 17.5-202)

The implementation milestones for the Operational Quality Assurance Program are provided in Section 13.4.

17.5.1 References

17.5-201 DOM-QA-1, Dominion Nuclear Facility Quality Assurance Program Description.

17.5-202 Nuclear Energy Institute, “Quality Assurance Program Description,” NEI 06-14A.

STD COL 17.4-2-A

17.6 Maintenance Rule Program

NEI 07-02A, "Generic FSAR Template Guidance for Maintenance Rule Program Description for Plants Licensed Under 10 CFR Part 52," (Reference 17.6-201) is incorporated by reference with the following supplemental information:

STD SUP 17.6-1

The text of the template provided in NEI 07-02A is generically numbered as "17.X." When the template is incorporated by reference into this section, numbering is changed from "17.X" to "17.6."

STD SUP 17.6-3

17.6.1.1 Maintenance Rule Scoping per 10 CFR 50.65(b)

In Paragraph 17.6.1.1.b, replace "(DRAP - see FSAR Section 17.Y)" with the following.

(See Section 17.4)

17.6.3 Maintenance Rule Program Relationship with Reliability Assurance Activities

Replace with the following.

STD SUP 17.6-2

Reliability during the operations phase is assured through the implementation of operational programs, i.e., the MR program (Section 17.6), the Quality Assurance Program (Section 17.5), the Inservice Inspection Program (Sections 5.2.4 and 6.6, and DCD Section 3.8.1.7.3), and the Inservice Testing Program (Sections 3.9.6 and 3.9.3.7.1(3)e), as well as the Technical Specifications Surveillance Requirements (Chapter 16), and maintenance programs.

17.6.4 Maintenance Rule Program Relationship with Industry Operating Experience Activities

Add the following at the end of this section.

CWR SUP 17.6-4

Condition monitoring of underground or inaccessible cables is incorporated into the maintenance rule program. The cable condition monitoring program incorporates lessons learned from industry operating experience, addresses regulatory guidance, and utilizes information from detailed design procurement documents to determine the appropriate inspections, tests and monitoring criteria for underground and inaccessible cables within the scope of the maintenance rule (10 CFR 50.65).

17.6.6 References

17.6-201 Nuclear Energy Institute, “Generic FSAR Template Guidance for Maintenance Rule Program Description for Plants Licensed Under 10 CFR Part 52,” NEI 07-02A.

NAPS SUP 17.5-3

Appendix 17AA North Anna Power Station Unit 3 Quality Assurance Program Description

North Anna Unit 3 Quality Assurance Program Description

Topical Report
DOM-QA-2

Revision 6

Policy
Quality Assurance During Construction and Operation

Dominion Virginia Power (Dominion) shall design, procure, construct and operate the North Anna Unit 3 nuclear plant in a manner that will ensure the health and safety of the public and workers. These activities shall be performed in compliance with the requirements of the Code of Federal Regulations (CFR), the applicable Nuclear Regulatory Commission (NRC) Facility Operating Licenses, and applicable laws and regulations of the state and local governments.

The Dominion North Anna Unit 3 Quality Assurance Program (QAP) is the Quality Assurance Program Description (QAPD) provided in this document and the associated implementing documents. Together they provide for control of Dominion activities that affect the quality of safety-related nuclear plant structures, systems, and components (SSCs) and include all planned and systematic activities necessary to provide adequate confidence that such SSCs will perform satisfactorily in service. The QAPD may also be applied to certain equipment and activities that are not safety-related, but support safe plant operations, or where other NRC guidance establishes program requirements.

The QAPD is the top-level policy document that establishes the manner in which quality is to be achieved and presents Dominion's overall philosophy regarding achievement and assurance of quality. Implementing documents assign more detailed responsibilities and requirements and define the organizational interfaces involved in conducting activities within the scope of the QAP. Compliance with the QAPD and implementing documents is mandatory for personnel directly or indirectly associated with implementation of the Dominion North Anna Unit 3 QAP.

Signed *Signature on file*

David A. Heacock

President and Chief Nuclear Officer

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Part I Introduction

Section 1 General

Dominion's North Anna Unit 3 (North Anna 3) Quality Assurance Program Description (QAPD) is the top-level policy document that establishes the quality assurance policy and assigns major functional responsibilities for combined construction and operating license (COL) activities conducted by or for Dominion. The QAPD describes the methods and establishes quality assurance (QA) and administrative control requirements that meet 10 CFR 50, Appendix B, and 10 CFR 52. The QAPD is based on the requirements and recommendations of ASME NQA-1-1994, "Quality Assurance Requirements for Nuclear Facility Applications," Parts I, II and III, as specified in this document.

The QA program (QAP) is defined by the NRC-approved regulatory document that describes the QA elements (i.e., the QAPD), along with the associated implementing documents. Procedures and instructions that control North Anna 3 activities will be developed prior to commencement of those activities. Dominion policies establish high-level responsibilities and authority for carrying out important administrative functions. Procedures establish practices for certain activities that are common to all Dominion nuclear business unit organizations performing those activities so that the activity is controlled and carried out in a manner that meets QAPD requirements. Procedures specific to a site, organization, or group establish detailed implementation requirements and methods, and may be used to implement policies or be unique to particular functions or work activities.

1.1 Scope/Applicability

The QAPD applies to COL, construction/pre-operation and operations, activities affecting the quality and performance of safety-related structures, systems, and components, including, but not limited to:

Designing	Cleaning
Siting	Testing
Training	Inspecting
Constructing	Preoperational activities (including ITAAC*)
Procuring	Startup
Receiving	Operating
Storing	Maintaining
Handling	Repairing
Shipping	Refueling
Erecting	Modifying
Installing	
Fabricating	

* ITAAC are those Inspections, Tests, Analyses, and Acceptance Criteria the applicant must satisfy as determined by the Commission in accordance with 10 CFR Part 52.

Safety-related SSCs, under the control of the QAPD, are identified by design documents. The technical aspects of these items are considered when determining program applicability, including, as appropriate, the item's design safety function. The QAPD may be applied to certain activities where regulations other than 10 CFR 50 and 10 CFR 52 establish QA requirements for activities within their scope.

The policy of Dominion is to assure a high degree of availability and reliability of the nuclear plant while ensuring the health and safety of its workers and the public. To this end, selected elements of the QAPD are also applied to certain equipment and activities that are not safety-related, but support safe, economic, and reliable plant operations, or where other NRC guidance establishes quality assurance requirements. Implementing documents establish program element applicability.

The definitions provided in ASME NQA-1-1994, Part 1, Section 1.4, apply to select terms as used in this document.

Part II QAPD Details

Section 1 Organization

This section describes the Dominion organizational structure, functional responsibilities, levels of authority and interfaces for establishing, executing, and verifying QAPD implementation. The organizational structure includes corporate support and onsite functions for North Anna 3 including interface responsibilities for multiple organizations that perform quality-related functions. Implementing documents assign more specific responsibilities and duties, and define the organizational interfaces involved in conducting activities and duties within the scope of the QAPD. Management gives careful consideration to the timing, extent and effects of organizational structure changes.

Dominion's senior manager of nuclear oversight is responsible to size the Quality Assurance staff commensurate with the duties and responsibilities assigned.

The following sections describe the reporting relationships, functional responsibilities and authorities for organizations implementing and supporting the North Anna 3 QA Program. Titles used herein are generic functional descriptions. Administrative documents are maintained to relate the generic titles to the Dominion specific titles. The Dominion organizations for the North Anna 3 developmental (preconstruction), construction and operational phases are shown in Figures II-1, II-2, and II-3, respectively.

1.1 Chief Nuclear Officer

The Chief Nuclear Officer (CNO) has overall responsibility and authority for implementing all activities associated with the safe and reliable design, construction, operation, and decommissioning of Dominion's nuclear facilities. The CNO establishes the North Anna 3 quality assurance policy and provides guidance regarding its implementation. The CNO has delegated the responsibility and authority for approval of the QAPD to the senior manager of the group responsible for nuclear oversight. The CNO has the authority to resolve disputes related to implementation of the QAPD for which resolution is not achieved at lower levels within the organization. There are three primary phases for the North Anna 3 COL activities: (1) nuclear development where the COL application is submitted and updated to lead to the eventual license issuance; (2) nuclear plant construction where the engineering, procurement, and construction (EPC) contract is in place for the final design and construction activities; and (3) nuclear operations where the nuclear fuel is loaded, plant start-up testing is conducted, and the plant is taken to commercial operation. During the operational phase, the CNO is responsible for appointing an Independent Review Committee (IRC) chair and assuring the IRC functions as described in Part V, Section 2.2. Throughout the three phases there are six functional organizations reporting to the CNO that affect the safety of the nuclear facilities. Three of these functional groups exist during

specific phases of the project: Nuclear Development, Nuclear Plant Construction, and North Anna 3 Operations. The remaining three have functions during each of the three phases of the project: Nuclear Oversight, Engineering Services, and Nuclear Support Services.

1.2 Nuclear Development

An executive management position is responsible for the development of new nuclear power plants. This includes activities associated with new nuclear plant engineering, analysis, design, procurement, pre-construction preparation, preparing applications, and obtaining permits and licenses for potential construction. Where implementation of any or all of these functions is delegated to organizations outside Dominion, procedures require the establishment of interface documents including defining lines of communication and authorities as appropriate for the delegated functions. However, this executive management position retains responsibility for the scope and effective implementation of the quality assurance program for those functions. While in this developmental phase of the North Anna 3 Project, this portion of the organization will be structured as depicted in Figure II-1, later to be integrated into the Nuclear Plant Construction Organization, Figure II-2.

NOTE: Dominion's Business Development and Generation Construction (BDGC) organization will be responsible for managing the project schedule and budget for construction of North Anna 3. To support this responsibility, lines of communication are established between this group, the North Anna 3 Nuclear Project Technical Support organization, and the principal supplier, The Consortium of GE-Hitachi Nuclear Energy Americas LLC and Fluor Enterprises, Inc. (GEH/FLUOR). The BDGC organization does not have any duties or authorities in implementing the North Anna 3 QA program.

1.2.1 Nuclear Project Technical Support

The senior manager of North Anna 3 Nuclear Project Technical Support (NPTS) is responsible for the COL application and interfacing with suppliers regarding design information necessary to support the application. This manager also interfaces as necessary with Dominion fleet organizations for support in developing the content of the application and establishing procurement documents for the engineering, procurement, and construction of the facility. As described below, four functional groups report to this management position and one principal supplier is contracted to provide engineering support.

1.2.1.1 Design Engineering

The North Anna 3 design engineering group is responsible for the technical aspects of the COL application that affect nuclear safety. This group establishes interfaces with suppliers and other Dominion groups as necessary. Engineering develops the technical requirements for the procurement of items and services, including the

engineering, procurement, and construction (EPC) contract for North Anna 3. This group also is responsible for the document control and records functions within the project through an interface with the responsible Dominion fleet organization.

1.2.1.2 **Engineering Programs**

The North Anna 3 engineering programs group is responsible for the development of operational programs specified in the FSAR, Chapter 13.4. This group also manages the corrective action program for the project, interfaces with the construction experience program in accordance with INPO guidelines, and manages the development of the ITAAC closure plans and the Design Reliability Assurance Program. This group interfaces with the existing North Anna units regarding engineering and design control for implementation of site modifications necessary to support construction of the North Anna 3 unit.

1.2.1.3 **Licensing**

The North Anna 3 licensing group is responsible for developing, maintaining. changing, and controlling the COL Application, including interfacing with the NRC on the review of the application. The licensing group is responsible for ensuring NRC reporting requirements for the project are met, including 10 CFR Part 21 and 10 CFR 50.55(e). This group maintains and interprets the licensing basis for North Anna 3 and develops and manages the licensing commitment program. Additional licensing functions include developing and implementing a process for communicating with the NRC regarding ITAAC closure, and ensuring project personnel meet the training requirements consistent with the QAP requirements.

1.2.1.4 **Operational Staff Development**

The North Anna 3 operational staff development group is responsible for the development of the 10 CFR 50.120 training program. This group works with the selected reactor vendor and industry groups in performing this function. This group also interfaces with the reactor supplier in the development of the human-system interface (HSI) and control room design.

1.2.1.5 **Engineering Support Services**

Dominion has contracted with GEH/FLUOR as the principal supplier to provide the necessary services for developing license application information, including design information necessary to support the safety analysis, and planning construction activities. Dominion has delegated the responsibility of establishing and executing quality assurance measures for these activities to GEH/FLUOR in accordance with their approved quality assurance program.

1.3 Nuclear Plant Construction

An executive management position is responsible for construction of the North Anna 3 nuclear power plant in accordance with the COL and the QA program. This position assists in establishing procurement contracts, and provides technical oversight and coordination of design engineering and construction activities. Suppliers will be used to perform the majority of engineering, procurement, and construction (EPC) activities. The suppliers will be delegated, through contractual means, the necessary duties and authorities for achieving and assuring quality of the SSCs, however, Dominion retains the overall responsibility for quality.

NOTE: Dominion’s BDGC organization will monitor the North Anna 3 construction project, including managing the project schedule and budget for construction of North Anna 3. To support this responsibility, lines of communication are established between this group, the NPTS organization, and GEH/FLUOR. Although present at the site, this organization does not have any duties or authorities in implementing the North Anna 3 QA program.

1.3.1 Nuclear Project Technical Support

The senior manager of North Anna 3 Nuclear Project Technical Support (NPTS) is responsible for interfacing with contractors to assure the quality of work is achieved while the project cost and schedule are maintained. The senior manager North Anna 3 NPTS ensures a process is developed and implemented to identify and resolve construction interferences so that changes are reflected back to the design and as-built configuration of the plant. The senior manager North Anna 3 NPTS establishes appropriate interface documents to address coordination of work between the Dominion project personnel and suppliers. The senior manager of North Anna 3 NPTS may use the services of other suppliers (e.g. an Owner’s Engineer) to provide advice on the design and construction efforts of the EPC suppliers.

1.3.1.1 Design Engineering

The design engineering group is responsible for design control of the North Anna 3 project activities. This group is also responsible for maintaining configuration control of design and construction documents. Design engineering provides support in resolving technical issues related to procurement and construction including concurrence with resolution to nonconformances that are dispositioned accept-as-is or repair. This group provides technical support for start-up testing.

1.3.1.2 Engineering Programs

The engineering programs group is responsible for managing the North Anna 3 project corrective action process (including evaluation of construction experience), supporting long-lead procurements, supporting the completion of ITAAC, and

managing the Design Reliability Assurance Program. Engineering programs is responsible for developing the operational programs specified in the FSAR, Chapter 13.4. This group also provides support for configuration management for the project.

1.3.1.3 Licensing

The licensing group is responsible for maintaining and updating the North Anna 3 licensing basis, corresponding with the NRC or other government agencies regarding license and permit actions such as revisions to licenses or permits, completion of ITAAC, and supporting NRC inspection activities. This group is also responsible for preparing necessary reports such as for 10 CFR Part 21 or 10 CFR 50.55(e), and submitting them in accordance with regulatory requirements.

1.3.1.4 Operational Staff Development

The operational staff development group is responsible for developing the operational training program that meets the requirements of 10 CFR 50.120, including development of training material for the operators (senior, licensed, and non-licensed), maintenance personnel, radiation protection technicians, chemistry technicians, and engineering support personnel. This group is also responsible for supporting the development of the simulator and its inclusion in the training program. This group supports the reactor plant supplier in development of the Human/System interface. The operational staff development group also is responsible for the development of operating procedures and validating their usage through system walkdowns, training, and participation in the preoperational and start-up test programs.

1.3.2 The Consortium of GE-Hitachi Nuclear Energy Americas LLC and Fluor Enterprises, Inc.

Dominion will procure the services of The Consortium of GE-Hitachi Nuclear Energy Americas LLC and Fluor Enterprises, Inc. to develop and implement the North Anna 3 construction project (i.e., the EPC contractor). GEH-FLUOR is delegated the duties and authorities to construct an Economic Simplified Boiling Water Reactor (ESBWR) at the North Anna site. This includes developing detailed design and construction engineering, procuring necessary items and services, and the construction and installation of SSCs for the facility. Dominion delegates through appropriate procurement documents the duties of and authorities for establishing and executing a QA program for the design, final siting, construction, procurement, receipt, storage, handling, shipping, erection, fabrication, installation, inspection, cleaning, and testing of SSCs for the North Anna 3 facility.

GEH-FLUOR may use qualified suppliers in accordance with their QA Program to accomplish these duties.

1.4 North Anna 3 Operations

An executive management position is responsible for overall operating activities of the North Anna 3 nuclear facility. This executive is responsible for implementing the quality assurance program during operating activities.

The necessary responsibility and authority for the management and direction of all activities related to safe and efficient operation has been delegated by the CNO. This responsibility includes ensuring quality through implementation of the QAPD in all the activities related to operation such as maintenance, testing, start-up and shutdown, refueling, fuel storage, and modification.

1.4.1 Facility Operations and Maintenance

A senior management position is responsible for safe operations and maintenance of the nuclear facilities including those activities necessary for initial plant preoperational and start-up testing. The position responsibilities include: directing the operations, maintenance, planning, and site services groups; implementing facility modifications; and maintaining compliance with requirements of the operating license, Technical Specifications, and applicable federal, state, and local laws, regulations, and codes.

1.4.1.1 Operations

Operations is responsible for operating the facility in accordance with the applicable license. Overall facility operation is directed by a management position responsible for operating activities.

Operating activities include the performance of preoperational and start-up testing; monitoring and controlling day-to-day operation of the nuclear facility; responding to alarms; manipulating facility equipment; performing technical specification surveillances; coordinating facility operations to manage work such as maintenance, testing, and modifications; and moving nuclear fuel. The operations organization contains supervision and staff for shift operations, including shift managers, unit supervisors, licensed control room operators, and non-licensed operators. Operations is also responsible for the shift technical advisor function. Operations is also responsible for oversight of fire protection measures.

1.4.1.2 Maintenance

Maintenance is responsible for directing and coordinating facility maintenance activities including on-line maintenance, installation, alterations, adjustment,

calibration, replacement and repair of plant electrical and mechanical equipment, and instruments and controls. The responsibilities include performance of surveillances required by Technical Specifications, establishing standards and frequency of calibration for instrumentation and control devices, and ensuring instrumentation and related testing equipment are properly used, inspected and maintained.

1.4.1.3 Outage and Planning

Outage and planning is responsible for planning and scheduling online-maintenance and outage activities.

1.4.1.4 Site Services

Site services is responsible for facility construction and/or modification support, including project management and project controls.

1.4.2 Safety and Licensing

A senior management position is responsible for ensuring that facility safety and licensing requirements are implemented. This position is responsible for directing and coordinating training, radiological protection, chemistry, and assessment of nuclear safety issues at the facility. The responsibilities also include managing licensing activities; interfacing with corporate management on operating experience and licensing issues, managing facility procedures, and administering the facility environmental compliance program. This position is independent of cost and scheduling concerns associated with operations, maintenance, and modification activities.

1.4.2.1 Organizational Effectiveness

Organizational effectiveness is responsible for the corrective action program and the operating experience program.

1.4.2.2 Radiological Protection and Chemistry

Radiological protection and chemistry carries out health physics and chemistry functions and maintains sufficient organizational freedom and independence from operating pressures as required by the facility Technical Specifications. A qualified supervisor or manager is assigned to fulfill the radiological protection manager position described in ANS-3.1-1993. The radiological protection responsibilities include scheduling and conducting radiological surveys, contamination sample collection, determining contamination levels, assigning work restrictions through radiation work permits, administering the personnel monitoring program, and maintaining required records in accordance with federal and state codes. The

chemistry responsibilities include maintaining primary and secondary plant chemistry in accordance with established program requirements.

1.4.2.3 Procedures and Records

The procedures and records group is responsible for ensuring that procedures are prepared in accordance with applicable regulatory requirements, industry quality standards, and the QAPD. This group manages the document control system and is responsible for the collection and storage of North Anna 3 QA Records.

1.4.2.4 Licensing

The licensing group is responsible for corresponding with the NRC on license related matters and supporting arrangements for NRC inspections.

1.4.2.5 Training

The training group is responsible for the development and implementation of a training program for the operating unit that meets the requirements of 10 CFR 50.120.The training group maintains sufficient organizational freedom and independence from operating pressures as required by the facility Technical Specifications. Certain functional groups may be assigned responsibility for the development and conduct of their own training programs provided these groups are not required to have a systems approach to training under 10 CFR 50.120.

1.4.3 Facility Engineering and Technical Support

A senior management position is responsible for managing engineering resources providing day-to-day technical support for facility operations and maintenance. The functions include engineering and technical support at a system and component level to ensure optimum design basis performance, system reliability, and optimum component performance and reliability. Support is also provided in developing and implementing testing programs, tracking and scheduling test performance, and evaluating test results. The test programs include inservice inspections, Technical Specification surveillances, post-modification and post-maintenance testing, and nondestructive examinations.

1.4.3.1 Design Engineering

The design engineering group is responsible for maintaining the North Anna 3 design basis. This responsibility includes design and configuration control for modifications to the facility, evaluating design problems and proposing solutions, and maintaining the setpoint control program. This group also provides technical support for preoperational and startup testing.

1.4.3.1.1 Fire Protection Engineering

Fire protection engineering is responsible for maintaining the fire protection design basis and assisting with the resolution of problems related to fire protection at the site.

1.4.3.2 System Engineering

The system engineering group is responsible for monitoring plant systems and components to ensure reliable operation. The responsibilities include monitoring Maintenance Rule equipment performance, evaluating and proposing solutions for system and equipment problems, providing reactor engineering functions, and supporting evaluations of equipment operability. This group also provides support in the development of operating and maintenance procedures, and the performance of technical specification surveillances.

1.4.3.3 Engineering Technical Support

The engineering technical support group is responsible for managing the inservice inspection and testing (ISI/IST) program and performance of the nondestructive examination (NDE) program. This group also provides advice to the maintenance group regarding the preventive and corrective maintenance programs and scheduling support for periodic technical specification surveillance compliance.

1.5 Nuclear Oversight

The senior manager of nuclear oversight is responsible for the verification of effective Dominion and supplier QA program development, documentation, and implementation. This position is independent of cost and scheduling concerns associated with construction, operations, maintenance, and modification activities for performing quality assurance program verification. Where implementation of any or all of these functions is delegated to suppliers, procedures require the establishment of interface documents including defining lines of communication and authorities as appropriate for the delegated functions. However, this senior management position retains responsibility for the scope and effective implementation of the quality assurance program for those functions. This management position has the necessary authority and responsibility for verifying quality achievement; identifying quality problems, recommending solutions and verifying implementation of the solutions; and escalating quality problems to higher management levels. This position has the authority to suspend unsatisfactory work and control further processing or installation of non-conforming materials. The authority to stop work delegated to nuclear oversight personnel is delineated in procedures. Nuclear oversight is responsible for the development and implementation of training to qualify and maintain qualification of department personnel in their assigned functions.

1.5.1 Nuclear Development and Construction Phases

Nuclear oversight is responsible for QA oversight of the North Anna 3 project. The oversight includes activities in development of the license application, design, procurement, construction, and related activities that affect the quality of SSCs.

1.5.1.1 QA Program Development

This group is responsible for development and maintenance of the QAPD. This group is responsible for verification of the development of the construction QA program through review of and concurrence in quality-related procedures for design, construction, and installation. This group also performs audits of the effectiveness of the North Anna 3 QA program implementation within Dominion.

1.5.1.2 Site QA/QC

This group is responsible for quality oversight of supplier conducted activities at the North Anna 3 construction site through a system of planned audits, surveillances, and inspections as appropriate to the activity and based on the importance of the item or activity to the safety of the plant. This group is responsible for performance of inspections for Dominion activities on SSCs that have been turned over to Dominion for operation.

1.5.1.3 Supplier QA/QC

This group is responsible for quality oversight of suppliers, except for activities conducted at the North Anna 3 site, and is performed through a system of audits, surveillances, and inspections as appropriate to the activity and based on the importance of the item or activity to the safety of the plant. This oversight is typically conducted at supplier facilities. In performance of the oversight, this group may interface with Dominion's existing systems and groups for qualifying suppliers and performing verification activities.

1.5.2 Operations Phase

Nuclear oversight is responsible for the evaluation of suppliers’ quality programs through a system of external audits, evaluations, and reviews of supplier performance in accordance with quality assurance requirements. A list of approved suppliers is maintained. Nuclear oversight is responsible for assuring Dominion compliance with the QAPD through administration of a comprehensive and systematic internal audit program.

Nuclear oversight is responsible for developing and maintaining an appropriate quality verification inspection program for the facility operating organization functions.

1.5.2.1 Facility Oversight

A management position is responsible for the effective performance of nuclear oversight activities. This position performs independent assessment through a system of planned and systematic audits and surveillances of facility operations related to quality and safety with lines of communication to the Vice President North Anna 3.

1.5.2.1.1 Quality Control Inspection

The quality control inspection group plans and conducts inspections of operating facility maintenance and modification activities to ensure quality in accordance with the requirements of the QA program.

1.6 Nuclear Engineering

An executive management position is responsible to provide support for the Dominion fleet of nuclear facilities with design engineering functions and other technical activities. The responsibilities include, as needed, performing independent design checks and reviews, developing and maintaining engineering programs, including those for nondestructive examination (NDE), and the facility inservice inspection and test (ISI/IST) programs; configuration management including design and configuration control, and developing and revising facility drawings; and engineering technical support at the operating facilities.

1.6.1 Nuclear Analysis and Fuel

A senior management position is responsible for activities related to safety and management of nuclear fuel. Nuclear Analysis and Fuel (NAF) is a Dominion corporate Support group that is responsible for engineering activities, evaluation, and analysis of: core design, fuel and reactor performance, probabilistic risk assessment, spent fuel storage, and radiological effects. NAF provides reactor-engineering support for the operating power stations. NAF is responsible for nuclear fuel procurement, assurance of nuclear fuel quality through surveillances and inspections at Dominion and supplier facilities, and special nuclear material accountability. This position has the authority to control further processing or installation of nonconforming materials. The authority delegated to inspection and surveillance personnel is delineated in procedures.

1.6.2 Information Technology

A senior management position is responsible for direction and support of information technology for the nuclear organizations and facilities. Responsibilities include: network infrastructure maintenance and upgrade, network and application security, network operations; automation strategy, application development and support, automation

training; development and maintenance of the software control program; and oversight, maintenance, and repair of the Emergency Response Facility Computer System.

1.7 Support Services

An executive management position is responsible to provide support for the Dominion fleet of nuclear facilities in the areas of security, emergency preparedness, training, and procurement, as needed. Where implementation of any or all of these functions is delegated to organizations outside Dominion, procedures require the establishment of interface documents including defining lines of communication and authorities as appropriate for the delegated functions. However, this executive management position retains responsibility for the scope and effective implementation of the quality assurance program for those functions.

1.7.1 Protection Services and Emergency Preparedness

A senior management position is responsible for providing nuclear facility security, and overall management of nuclear emergency preparedness activities.

1.7.1.1 Protection Services

Protection services is responsible for facility protective services, including physical security, nuclear facility access programs, and fitness for duty programs. Protection Services is also responsible for industrial safety and loss prevention including oversight of fire protection measures.

1.7.1.2 Emergency Preparedness

Emergency preparedness is responsible for development and maintenance of Dominion radiological emergency plans and coordination with required off-site radiological emergency response groups for the nuclear facilities. This includes managing the overall scheduling and coordination of emergency plan testing, training and exercises with federal, state, and local agencies, and working with corporate and facility personnel to ensure emergency plans meet all the requirements and commitments.

1.7.2 Supply Chain Management

A senior management position is responsible for purchasing and procurement engineering during all phases. During the operations phase, the responsibilities also include supplier surveillance functions, material management, and source and receipt inspection. This position has the authority to control further processing or installation of nonconforming materials. This authority is delegated to inspection and surveillance personnel as delineated in procedures.

1.7.3 Nuclear Document Management

Nuclear document management is responsible for the collection, retention, and preservation of quality assurance records.

1.8 Authority to Stop Work

Quality assurance and inspection personnel have the authority, and the responsibility, to stop work in progress which is not being done in accordance with approved procedures or where safety or SSC integrity may be jeopardized. This extends to offsite work performed by suppliers that furnish safety-related materials and services to Dominion.

1.9 Quality Assurance Organizational Independence

For the COL construction activities, independence shall be maintained between the organization or organizations performing the checking (quality assurance and control) functions and the organizations performing the functions. This provision is not applicable to design review/verification.

1.10 NQA-1-1994 Commitment

In establishing its organizational structure, Dominion commits to compliance with NQA-1-1994, Basic Requirement 1 and Supplement 1S-1.

Figure II-1 Nuclear Developmental QA Organization

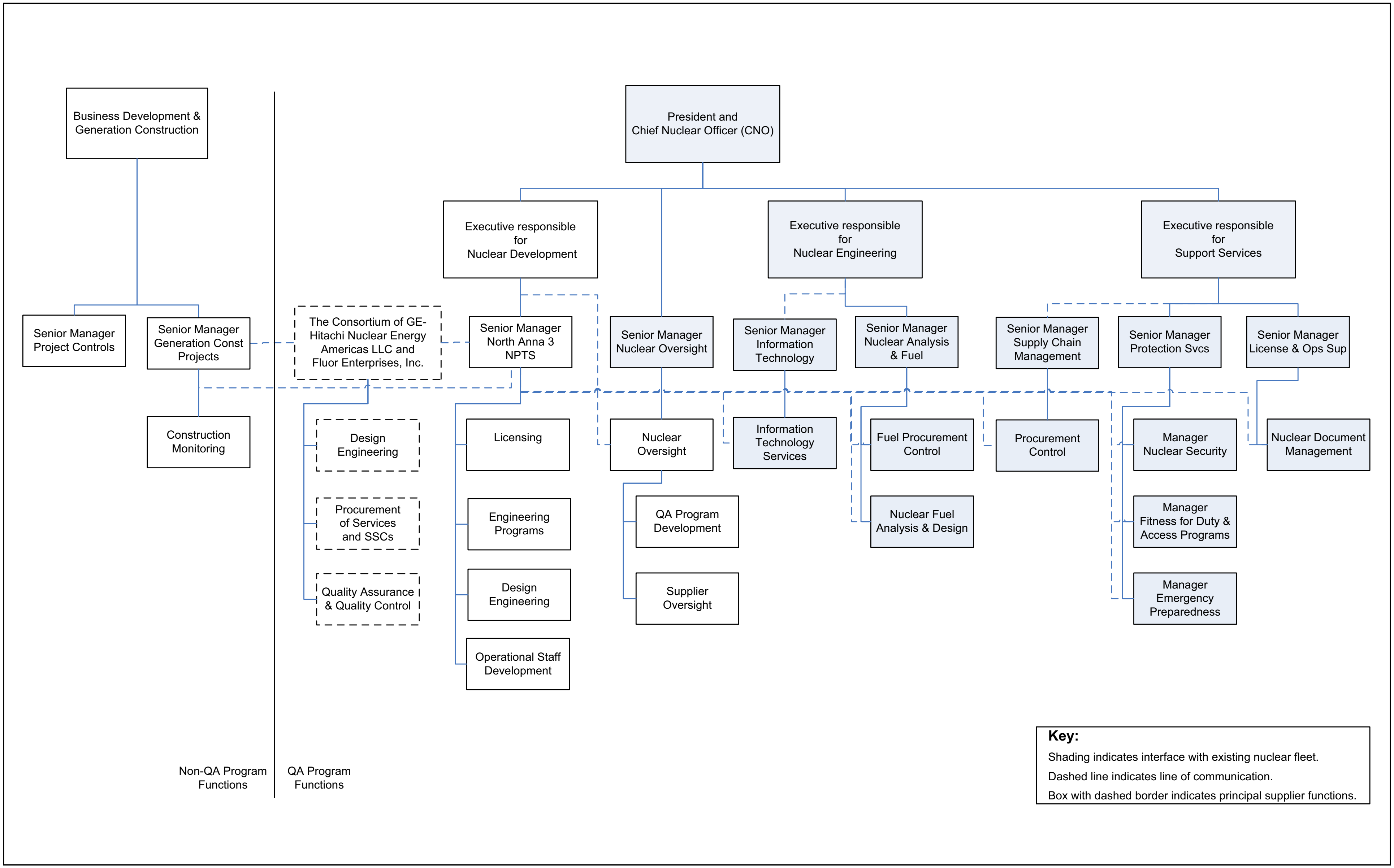


Figure II-2 Nuclear Construction QA Organization

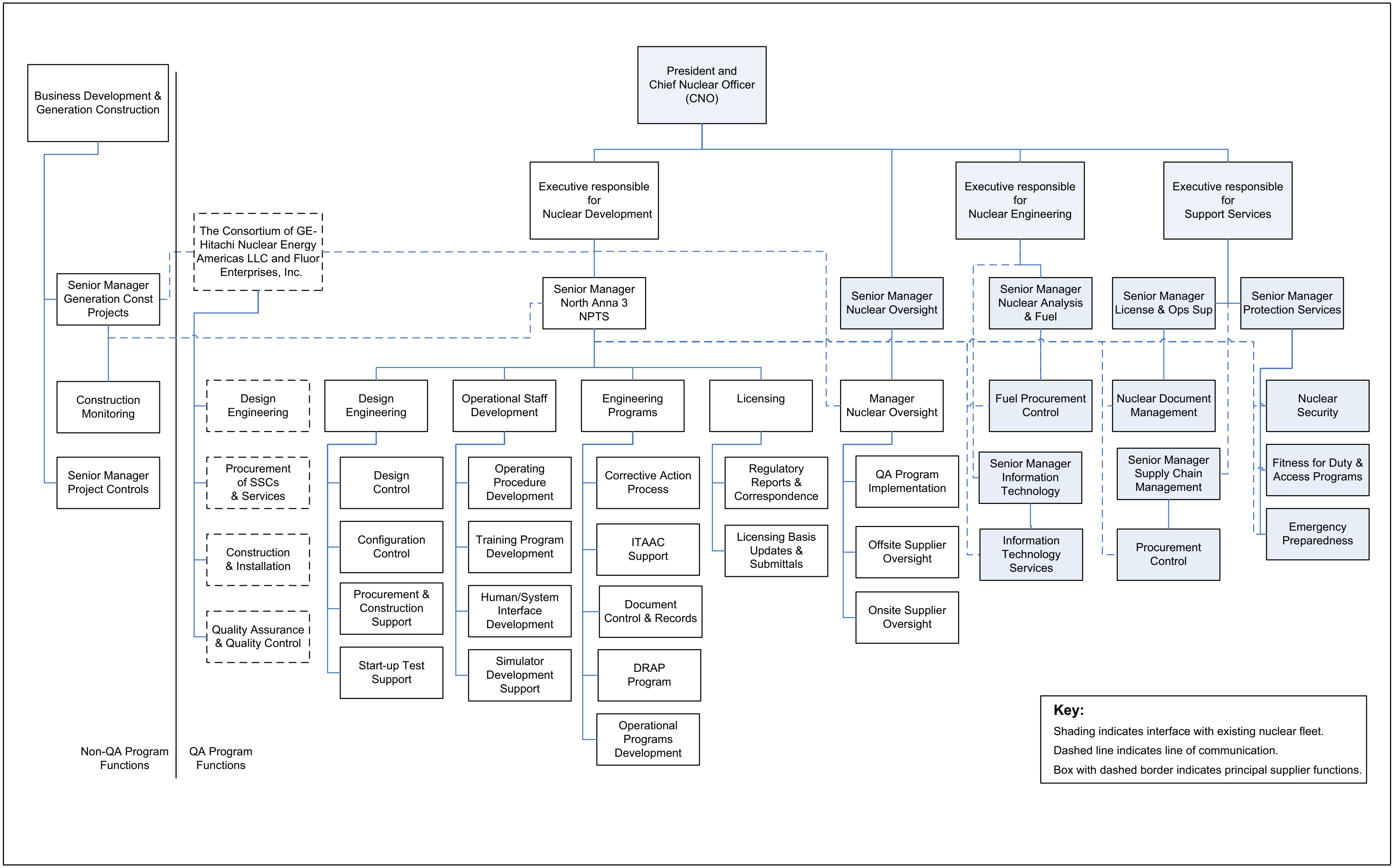
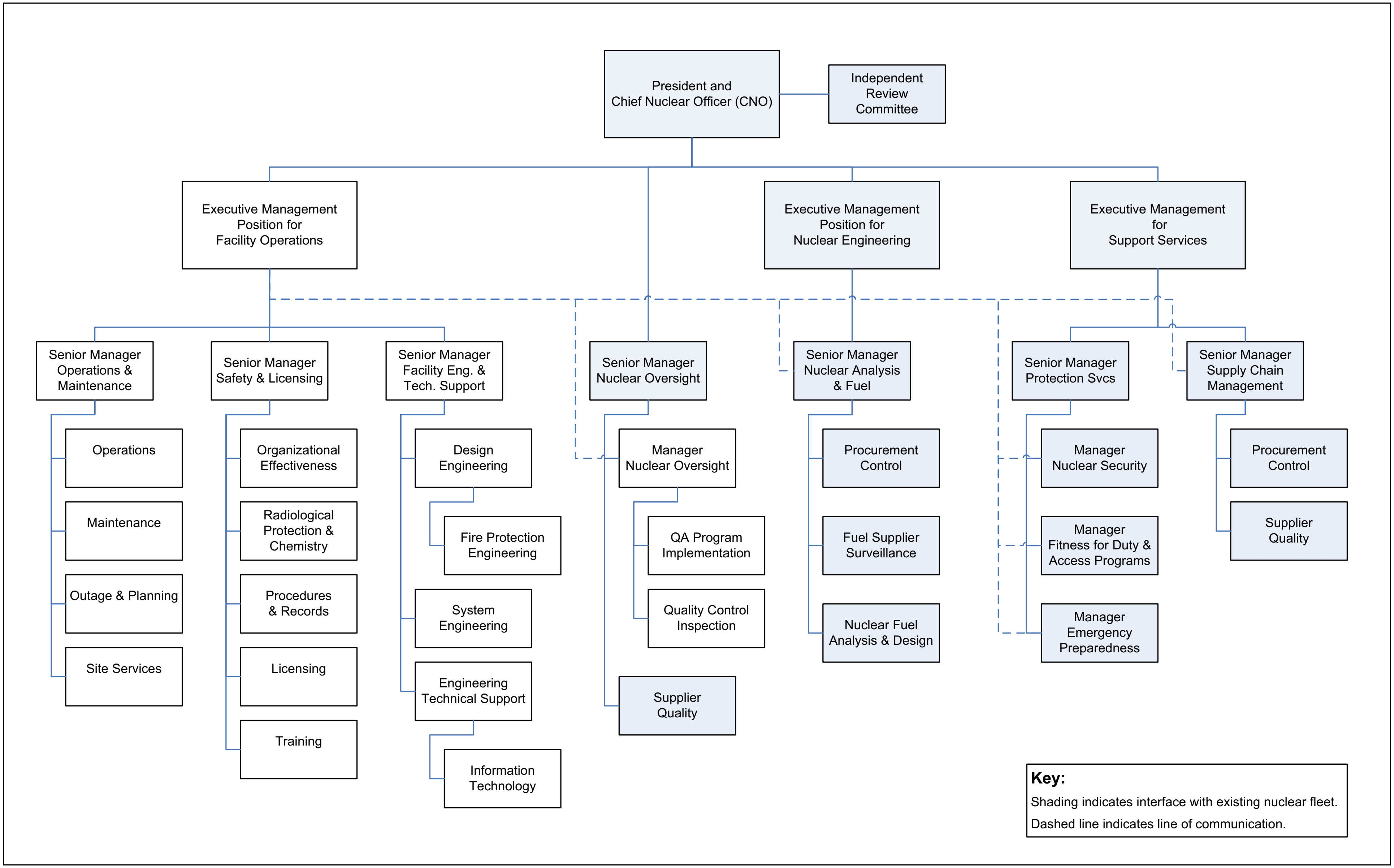


Figure II-3 Nuclear Operational QA Organization



Section 2 Quality Assurance Program

Dominion has established the necessary measures and governing procedures to implement the QAP as described in the QAPD. Dominion is committed to implementing the QAP in all aspects of work that are important to the safety of the nuclear plant as described and to the extent delineated in the QAPD. Further, Dominion ensures through the systematic process described herein that its suppliers of safety-related equipment or services meet the applicable requirements of 10 CFR 50, Appendix B. Senior management is regularly apprised of the adequacy of implementation of the QAP through the audit functions described in Part II, Section 18.

The objective of the QAP is to assure that the North Anna 3 nuclear generating plant is designed, constructed, and operated in accordance with governing regulations and license requirements. The program is based on the requirements of ASME NQA-1-1994, "Quality Assurance Requirements for Nuclear Facility Applications," as further described in this document. The QAP applies to those quality-related activities that involve the functions of safety-related SSCs associated with the design (excluding Design Certification activities), fabrication, construction, and testing of the facility SSCs, and to the managerial and administrative controls used to assure safe operations. Examples of COL safety-related activities include, but are not limited to, site-specific engineering related to safety-related SSCs, site geotechnical investigations, site engineering analysis, seismic analysis, and meteorological analysis. A list or system that identifies SSCs and activities to which this program applies is maintained at the appropriate facility. The Design Certification Document is used as the basis for this list or system. Cost and scheduling functions do not prevent proper implementation of the QAP.

As described in Part III of the QAPD, specific program controls are applied to nonsafety-related SSCs, for which 10 CFR 50, Appendix B, is not applicable, that are significant contributors to plant safety. The specific program controls consistent with applicable sections of the QAPD are applied to those items in a selected manner, targeted at those characteristics or critical attributes that render the SSC a significant contributor to plant safety.

Delegated responsibilities may be performed under a supplier's or principal contractor's QAP provided that the supplier or principal contractor has been approved as a supplier in accordance with the QAPD. Periodic audits and assessments of supplier QA programs are performed to assure compliance with the supplier's or principal contractor's QAPD and implementing procedures. In addition, routine interfaces with supplier's personnel provide added assurance that quality expectations are met.

For the COL application, the QAPD applies to those North Anna 3 and Dominion activities that can affect either directly or indirectly the safety-related site characteristics or analysis of those characteristics. In addition, the QAPD applies to engineering activities that are used to characterize the site or analyze that characterization.

New nuclear plant construction will be the responsibility of Dominion's North Anna 3 organization. Detailed engineering specifications and construction procedures will be developed to implement the QAPD and EPC QA programs prior to commencement of construction (COL) activities. Examples of Limited Work Authorization (LWA) activities that could impact safety-related SSCs include impacts of construction to existing facilities and for construction of new plants, the interface between nonsafety-related and safety-related SSCs, and the placement of seismically-designed backfill.

In general, the program requirements specified herein are detailed in implementing procedures that are either Dominion/North Anna 3 implementing procedures, or supplier implementing procedures governed by a supplier quality assurance program.

A grace period of 90 days may be applied to provisions that are required to be performed on a periodic basis unless otherwise noted. Annual evaluations and audits that must be performed on a triennial basis are examples where the 90 day grace period could be applied. The grace period does not allow the "clock" for a particular activity to be reset forward. The "clock" for an activity is reset backwards by performing the activity early. Audit schedules are based on the month in which the audit starts.

2.1 Responsibilities

Personnel who work directly or indirectly for Dominion are responsible for achieving acceptable quality in the work covered by the QAPD. This includes those activities delineated in Part I, Section 1.1. Dominion personnel performing verification activities are responsible for verifying the achievement of acceptable quality. Activities governed by the QAPD are performed as directed by documented instructions, procedures, and drawings that are of a detail appropriate for the activity's complexity and effect on safety. Instructions, procedures, and drawings specify quantitative or qualitative acceptance criteria, as applicable or appropriate for the activity, and verification is against these criteria. Provisions are established to designate or identify the proper documents to be used in an activity, and to ascertain that such documents are being used. The North Anna 3 nuclear oversight manager is responsible to verify that processes and procedures comply with the QAPD and other applicable requirements, that such processes or procedures are implemented, and that management appropriately ensures compliance.

2.2 Delegation of Work

Dominion retains and exercises the responsibility for the scope and implementation of an effective QAP. Positions identified in Part II, Section 1, may delegate all or part of the activities of planning, establishing, and implementing the program for which they are responsible to others, but retain the responsibility for the program's effectiveness. Decisions

affecting safety are made at the level appropriate for its nature and effect, and with any necessary technical advice or review.

2.3 Site-Specific Safety-Related Design Basis Activities

Site-specific safety-related design basis activities are defined as those activities, including sampling, testing, data collection, and supporting engineering calculations and reports, that will be used to determine the bounding physical parameters of the site. Appropriate quality assurance measures are applied.

2.4 Periodic Review of the Quality Assurance Program

Management of those organizations implementing the QA program, or portions thereof, assess the adequacy of that part of the program for which they are responsible to assure its effective implementation at least once each year or at least once during the life of the activity, whichever is shorter. However, the period for assessing QA programs during the operations phase may be extended to once every two years.

2.5 Issuance and Revision to Quality Assurance Program

Administrative control of the QAPD will be in accordance with 10 CFR 50.55(f) and 10 CFR 50.54(a), as appropriate. Changes to the QAPD are evaluated by the nuclear oversight manager to ensure that such changes do not degrade previously approved quality assurance controls specified in the QAPD. This document shall be revised as appropriate to incorporate additional QA commitments, that may be established during the COL application development process. New revisions to the document will be reviewed, at a minimum, by the Dominion manager responsible for North Anna 3 nuclear oversight and approved by the senior manager responsible for Dominion’s nuclear oversight group.

Regulations require that the SAR include, among other things, the managerial and administrative controls to be used to assure safe operation, including a discussion of how the applicable requirements of Appendix B will be satisfied. In order to comply with this requirement, the SAR references the QAPD and, as a result, the requirements of 10 CFR 50.54(a) are satisfied by and apply to the QAPD.

2.6 Personnel Qualifications

Personnel assigned to implement elements of the QAPD shall be capable of performing their assigned tasks. To this end, Dominion establishes and maintains formal indoctrination and training programs for personnel performing, verifying, or managing activities within the scope of the QAPD to assure that suitable proficiency is achieved and maintained. Plant and support staff minimum qualification requirements are as delineated in the unit Technical Specifications. Other qualification requirements may be established but will not reduce those

required by Technical Specifications. Sufficient managerial depth is provided to cover absences of incumbents. When required by code, regulation, or standard, specific qualification and selection of personnel is conducted in accordance with those requirements as established in the applicable Dominion procedures. Indoctrination includes the administrative and technical objectives, requirements of the applicable codes and standards, and the QAPD elements to be employed. Training for positions identified in 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implement a systematic approach to training. Records of personnel training and qualification are maintained.

The minimum qualifications of the senior manager of nuclear oversight and the manager of nuclear oversight for North Anna 3 are that each holds an engineering or related science degree and a minimum of four years of related experience including two years of nuclear power plant experience, one year of supervisory or management experience, and one year of the experience is in performing quality verification activities. Special requirements shall include management and supervisory skills and experience or training in leadership, interpersonal communication, management responsibilities, motivation of personnel, problem analysis and decision making, and administrative policies and procedures. Individuals who do not possess these formal education and minimum experience requirements should not be eliminated automatically when other factors provide sufficient demonstration of their abilities. These other factors are evaluated on a case-by-case basis and approved and documented by senior management.

The minimum qualifications for the individuals responsible for supervising QA or QC personnel are that each has: a high school diploma or equivalent, at least 1 year of nuclear plant experience, and a minimum of 1 year of experience performing quality verification activities. Individuals who do not possess these formal education and experience requirements should not be eliminated automatically when other factors provide sufficient demonstration of their abilities. These other factors are evaluated on a case-by-case basis and approved and documented by senior management.

The minimum qualifications of the individuals responsible for planning, implementing, and maintaining the QAPD are that each has a high school diploma or equivalent and a minimum of one year of related experience. Individuals who do not possess these formal education and minimum experience requirements should not be eliminated automatically when other factors provide sufficient demonstration of their abilities. These other factors are evaluated on a case-by-case basis and approved and documented by senior management.

2.7 NQA-1-1994 Commitment/Exceptions

In establishing qualification and training programs, Dominion commits to compliance with NQA-1-1994, Basic Requirement 2 and Supplements 2S-1, 2S-2, 2S-3 and 2S-4, with the following clarifications and exceptions:

- NQA-1-1994, Supplement 2S-1
  - Supplement 2S-1 will include use of the guidance provided in Appendix 2A-1 the same as if it were part of the Supplement. During the operations phase, the following two alternatives may be applied to the implementation of this Supplement and Appendix:
    - (1) In lieu of being certified as Level I, II, or III in accordance with NQA-1-1994, personnel that perform independent quality verification inspections, examinations, measurements, or tests of material, products, or activities will be required to possess qualifications equal to or better than those required for performing the task being verified; and the verification is within the skills of these personnel and/or is addressed by procedures. These individuals will not be responsible for the planning of quality verification inspections and tests (i.e., establishing hold points and acceptance criteria in procedures, and determining who will be responsible for performing the inspections), evaluating inspection training programs, nor certifying inspection personnel.
    - (2) A qualified engineer may be used to plan inspections, evaluate the capabilities of an inspector, or evaluate the training program for inspectors. For the purpose of these functions, a qualified engineer is one who has a baccalaureate in engineering in a discipline related to the inspection activity (such as electrical, mechanical, civil) and has a minimum of five years engineering work experience with at least two years of this experience related to nuclear facilities.
- NQA-1-1994, Supplement 2S-2
  - In lieu of Supplement 2S-2, for qualification of nondestructive examination personnel, North Anna 3 will follow the applicable standard cited in the version(s) of Section III and Section XI of the ASME Boiler and Pressure Vessel Code approved by the NRC for use at the North Anna 3 site.
- NQA-1-1994, Supplement 2S-3

- The requirement that prospective Lead Auditors have participated in a minimum of five (5) audits in the previous three (3) years is replaced by the following, “The prospective lead auditor shall demonstrate his/her ability to properly implement the audit process, as implemented by Dominion, to effectively lead an audit team, and to effectively organize and report results, including participation in at least one nuclear audit within the year preceding the date of qualification.”

Section 3 Design Control

Dominion has established and implements a process to control the design, design changes, and temporary modifications (e.g., temporary bypass lines, electrical jumpers and lifted wires, and temporary setpoints) of items that are subject to the provisions of the QAPD. The design process includes provisions to control design inputs, outputs, changes, interfaces, records, and organizational interfaces within Dominion and with suppliers. These provisions assure that design inputs (such as design bases and the performance, regulatory, quality, and quality verification requirements) are correctly translated into design outputs (such as analyses, specifications, drawings, procedures, and instructions) so that the final design output can be related to the design input in sufficient detail to permit verification. Design change processes and the division of responsibilities for design-related activities are detailed in North Anna 3 and supplier procedures. The design control program includes interface controls necessary to control the development, verification, approval, release, status, distribution, and revision of design inputs and outputs. Design changes and disposition of nonconforming items as “use as is” or “repair” are reviewed and approved by the North Anna 3 design organization or by other organizations so authorized by Dominion.

Design documents are reviewed by individuals knowledgeable in QA to ensure the documents contain the necessary QA requirements.

3.1 Design Verification

Dominion design processes provide for design verification to ensure that items and activities subject to the provisions of the QAPD are suitable for their intended application, consistent with their effect on safety. Design changes are subjected to these controls, which include verification measures commensurate with those applied to original plant design.

Design verifications are performed by competent individuals or groups other than those who performed the original design but who may be from the same organization. The verifier shall not have taken part in the selection of design inputs, the selection of design considerations, or the selection of a singular design approach, as applicable. This verification may be performed by the originator’s supervisor provided the supervisor did not specify a singular design approach, rule out certain design considerations, and did not establish the design inputs used in the design, or if the supervisor is the only individual in the organization competent to perform the verification. If the verification is performed by the originator’s supervisor, the justification of the need is documented and approved in advance by management.

The extent of the design verification required is a function of the importance to safety of the item under consideration, the complexity of the design, the degree of standardization, the state-of-the-art, and the similarity with previously proven designs. This includes design inputs, design outputs, and design changes. Design verification procedures are established and

implemented to assure that an appropriate verification method is used, the appropriate design parameters to be verified are chosen, the acceptance criteria are identified, and the verification is satisfactorily accomplished and documented. Verification methods may include, but are not limited to, design reviews, alternative calculations and qualification testing. Testing used to verify the acceptability of a specific design feature demonstrates acceptable performance under conditions that simulate the most adverse design conditions expected for the item’s intended use.

Dominion normally completes design verification activities before the design outputs are used by other organizations for design work, and before they are used to support other activities such as procurement, manufacture, or construction. When such timing cannot be achieved, the design verification is completed before relying on the item to perform its intended design or safety function.

3.2 Design Records

Dominion maintains records sufficient to provide evidence that the design was properly accomplished. These records include the final design output and any revisions thereto, as well as record of the important design steps (e.g., calculations, analyses and computer programs) and the sources of input that support the final output.

Plant design drawings reflect the properly reviewed and approved configuration of the plant.

3.3 Computer Application and Digital Equipment Software

The QAPD governs the development, procurement, testing, maintenance, and use of computer application and digital equipment software when used in safety-related applications and designated nonsafety-related applications. Dominion and suppliers are responsible for developing, approving, and issuing procedures, as necessary, to control the use of such computer application and digital equipment software. The procedures require that the application software be assigned a proper quality classification and that the associated quality requirements be consistent with this classification. Each application software and revision thereto is documented and approved by the code manager as delineated in the software control procedures. The QAPD is also applicable to the administrative functions associated with the maintenance and security of computer hardware where such functions are considered essential in order to comply with other QAPD requirements such as QA records.

3.4 Setpoint Control

Instrument and equipment setpoints that could affect nuclear safety shall be controlled in accordance with written instructions. As a minimum, these written instructions shall:

(1) Identify responsibilities and processes for reviewing, approving, and revising setpoints and setpoint changes originally supplied by the reactor plant supplier, the A/E, and the plant's technical staff.

(2) Ensure that setpoints and setpoint changes are consistent with design and accident analysis requirements and assumptions.

(3) Provide for documentation of setpoints, including those determined operationally.

(4) Provide for access to necessary setpoint information for personnel who write or revise plant procedures, operate or maintain plant equipment, develop or revise design documents, or develop or revise accident analyses.

3.5 NQA-1-1994 Commitment/Exceptions

In establishing its program for design control and verification, Dominion commits to compliance with NQA-1-1994, Basic Requirement 3, and Supplement 3S-1, the subsurface investigation requirements in Subpart 2.20, and the standards for computer software in Subpart 2.7.

Section 4 Procurement Document Control

Dominion has established the necessary measures and governing procedures to assure that purchased items and services are subject to appropriate quality and technical requirements. Procurement document changes shall be subject to the same degree of control as utilized in the preparation of the original documents. These controls include provisions such that:

- Where original technical or quality assurance requirements cannot be determined, an engineering evaluation is conducted and documented by qualified staff to establish appropriate requirements and controls to assure that interfaces, interchangeability, safety, fit and function, as applicable, are not adversely affected or contrary to applicable regulatory requirements.
- Applicable technical, regulatory, administrative, quality and reporting requirements (such as specifications, codes, standards, tests, inspections, special processes, and 10 CFR 21) are invoked for procurement of items and services. 10 CFR 21 requirements for posting, evaluating, and reporting will be followed and imposed on suppliers when applicable. Applicable design bases and other requirements necessary to assure adequate quality shall be included or referenced in documents for procurement of items and services. To the extent necessary, procurement documents shall require suppliers to have a documented QA program that is determined to meet the applicable requirements of 10 CFR 50, Appendix B, as appropriate to the circumstances of procurements (or the supplier may work under Dominion's North Anna 3 approved QA program).

Reviews of procurement documents shall be performed by personnel who have access to pertinent information and who have an adequate understanding of the requirements and intent of the procurement documents.

4.1 NQA-1-1994 Commitment/Exceptions

In establishing controls for procurement, Dominion commits to compliance with NQA-1-1994, Basic Requirement 4 and Supplement 4S-1, with the following clarifications and exceptions:

- NQA-1-1994, Supplement 4S-1
  - Section 2.3 of this Supplement 4S-1 includes a requirement that procurement documents require suppliers to have a documented QAP that implements NQA-1-1994, Part 1. In lieu of this requirement, Dominion may require suppliers to have a documented supplier QAP that is determined to meet the applicable requirements of 10 CFR 50, Appendix B, as appropriate to the circumstances of the procurement.
  - With regard to service performed by a supplier, Dominion procurement documents may allow the supplier to work under the North Anna 3 QAP, including implementing procedures, in lieu of the supplier having its own QAP.

- Section 3 of this Supplement 4S-1 requires procurement documents to be reviewed prior to bid or award of contract. The quality assurance review of procurement documents is satisfied through review of the applicable procurement specification, including the technical and quality procurement requirements, prior to bid or award of contract. Procurement document changes (e.g., scope, technical or quality requirements) will also receive the quality assurance review.
- Procurement documents for Commercial Grade Items that will be procured by Dominion for North Anna 3 for use as safety-related items shall contain technical and quality requirements such that the procured item can be appropriately dedicated.

Section 5 Instructions, Procedures, and Drawings

Dominion has established the necessary measures and governing procedures to ensure that activities affecting quality are prescribed by and performed in accordance with instructions, procedures, or drawings of a type appropriate to the circumstances and which, where applicable, include quantitative or qualitative acceptance criteria to implement the QAP as described in the QAPD. Such documents are prepared and controlled according to Part II, Section 6. In addition, means are provided to disseminate to the staff instructions of both general and continuing applicability, as well as those of short-term applicability. Provisions are included for reviewing, updating, and canceling such procedures.

5.1 Procedure Adherence

Dominion's policy is that procedures are followed, and the requirements for use of procedures have been established in administrative procedures. Where procedures cannot be followed as written, provisions are established for making changes in accordance with Part II, Section 6. Requirements are established to identify the manner in which procedures are to be implemented, including identification of those tasks that require: (1) the written procedure to be present and followed step-by-step while the task is being performed, (2) the user to have committed the procedure steps to memory, (3) verification of completion of significant steps, by initials or signatures or use of check-off lists. Procedures that are required to be present and referred to directly are those developed for extensive or complex jobs where reliance on memory cannot be trusted, tasks that are infrequently performed, and tasks where steps must be performed in a specified sequence.

In cases of emergency, personnel are authorized to depart from approved procedures when necessary to prevent injury to personnel or damage to the plant. Such departures are recorded describing the prevailing conditions and reasons for the action taken.

5.2 Procedure Content

The established measures address the applicable content of procedures as described in the introduction to Part II of NQA-1-1994. In addition, procedures governing tests, inspections, operational activities and maintenance will include as applicable, initial conditions and prerequisites for the performance of the activity.

5.3 NQA-1-1994 Commitment

In establishing procedural controls, Dominion commits to compliance with NQA-1-1994, Basic Requirement 5.

Section 6 Document Control

Dominion has established the necessary measures and governing procedures to control the preparation of, issuance of, and changes to documents that specify quality requirements or prescribe how activities affecting quality, including organizational interfaces, are controlled to assure that correct documents are being employed. The control systems (including electronic systems used to make documents available) are documented and provide for the following:

a. identification of documents to be controlled and their specified distribution;

b. a method to identify the correct document (including revision) to be used and control of superseded documents;

c. identification of assignment of responsibility for preparing, reviewing, approving, and issuing documents;

d. review of documents for adequacy, completeness, and correctness prior to approval and issuance;

e. a method for providing feedback from users to continually improve procedures and work instructions; and

f. coordinating and controlling interface documents and procedures.

The types of documents to be controlled include:

a. drawings such as design, construction, installation, and as-built drawings;

b. engineering calculations;

c. design specifications;

d. purchase orders and related documents;

e. vendor-supplied documents;

f. audit, surveillance, and quality verification/inspection procedures;

g. inspection and test reports;

h. instructions and procedures for activities covered by the QAPD including design, construction, installation, operating (including normal and emergency operations), maintenance, calibration, and routine testing;

i. technical specifications; and

j. nonconformance reports and corrective action reports.

During the operational phase, where temporary procedures are used, they shall include a designation of the period of time during which it is acceptable to use them.

6.1 Review and Approval of Documents

Documents are reviewed for adequacy by qualified persons other than the preparer. During the construction phase, procedures for design, construction, and installation are also reviewed by the nuclear oversight group to ensure quality assurance measures have been appropriately applied. The documented review signifies concurrence.

During the operations phase, documents affecting the configuration or operation of the station as described in the SAR are screened to identify those that require review by the IRC prior to implementation as described in Part V, Section 2.2.

To ensure effective and accurate procedures during the operational phase, applicable procedures are reviewed, and updated as necessary, based on the following conditions:

a. following any modification to a system;

b. following an unusual incident, such as an accident, significant operator error, or equipment malfunction;

c. when procedure discrepancies are found;

d. prior to use if not used in the previous two years; or

e. results of QA audits conducted in accordance with Part II, Section 18.1.

Prior to issuance or use, documents including revisions thereto, are approved by the designated authority. A listing of all controlled documents identifying the current approved revision, or date, is maintained so personnel can readily determine the appropriate document for use.

6.2 Changes to Documents

Changes to documents, other than those defined in implementing procedures as minor changes, are reviewed and approved by the same organizations that performed the original review and approval unless other organizations are specifically designated. The reviewing organization has access to pertinent background data or information upon which to base their approval. Where temporary procedure changes are necessary during the operations phase, changes that clearly do not change the intent of the approved procedure may be implemented provided they are approved by two members of the staff knowledgeable in the areas affected by the procedures. Minor changes to documents, such as inconsequential editorial corrections, do not require that the revised documents receive the same review and approval as the original documents. To avoid a possible omission of a required review, the

type of minor changes that do not require such a review and approval and the persons who can authorize such a classification are clearly delineated in implementing procedures.

6.3 NQA-1-1994 Commitment

In establishing provisions for document control, Dominion commits to compliance with NQA-1-1994, Basic Requirement 6 and Supplement 6S-1.

Section 7 Control of Purchased Material, Equipment, and Services

Dominion has established the necessary measures and governing procedures to control the procurement of items and services to assure conformance with specified requirements. Such control provides for the following as appropriate: source evaluation and selection, evaluation of objective evidence of quality furnished by the supplier, source inspection, audit, and examination of items or services.

7.1 Acceptance of Item or Service

Dominion establishes and implements measures to assess the quality of purchased items and services, whether purchased directly or through contractors, at intervals and to a depth consistent with the item's or service's importance to safety, complexity, quantity, and the frequency of procurement. Verification actions include testing, as appropriate, during design, fabrication, construction, and operation activities. Verifications occur at the appropriate phases of the procurement process, including, as necessary, verification of activities of suppliers below the first tier.

Measures to assure the quality of purchased items and services include the following, as applicable:

- Items are inspected, identified, and stored to protect against damage, deterioration, or misuse.
- Prospective suppliers of safety-related items and services are evaluated to assure that only qualified suppliers are used. Qualified suppliers are audited on a triennial basis. In addition, if a subsequent contract or a contract modification significantly enlarges the scope of, or changes the methods or controls for activities performed by the same supplier, an audit of the modified requirements is conducted, thus starting a new triennial period. North Anna 3 may utilize audits conducted by outside organizations for supplier qualification provided that the scope and adequacy of the audits meet North Anna 3 requirements. Documented annual evaluations are performed for qualified suppliers to assure they continue to provide acceptable products and services. Industry programs, such as those applied by ASME, Nuclear Procurement Issues Committee (NUPIC), or other established utility groups, are used as input or the basis for supplier qualification whenever appropriate. The results of the reviews are promptly considered for effect on a supplier's continued qualification and adjustments made as necessary (including corrective actions, adjustments of supplier audit plans, and input to third party auditing entities, as warranted). In addition, results are reviewed periodically to determine if, as a whole, they constitute a significant condition adverse to quality requiring additional action.

- Provisions are made for accepting purchased items and services, such as source verification, receipt inspection, pre- and post-installation tests, certificates of conformance, and document reviews (including Certified Material Test Report/Certificate). Acceptance actions/documents should be established by the Purchaser with appropriate input from the Supplier and be completed to ensure that procurement, inspection, and test requirements, as applicable, have been satisfied before relying on the item to perform its intended safety function.
- Controls are imposed for the selection, determination of suitability for intended use (critical characteristics), evaluation, receipt and acceptance of commercial-grade services or items to assure they will perform satisfactorily in service in safety-related applications.
- If there is insufficient evidence of implementation of a QA program, the initial evaluation is of the existence of a QA program addressing the scope of services to be provided. The initial audit is performed after the supplier has completed sufficient work to demonstrate that its organization is implementing a QA program.

7.2 NQA-1-1994 Commitment/Exceptions

In establishing procurement verification controls, North Anna 3 commits to compliance with NQA-1-1994, Basic Requirement 7 and Supplement 7S-1, with the following clarifications and exceptions:

- NQA-1-1994, Supplement 7S-1
  - North Anna 3 considers that other 10 CFR 50 licensees, Authorized Nuclear Inspection Agencies, National Institute of Standards and Technology, or other State and Federal agencies which may provide items or services to the Dominion North Anna 3 plant are not required to be evaluated or audited.
  - When purchasing commercial grade calibration services from a calibration laboratory, procurement source evaluation and selection measures need not be performed provided each of the following conditions are met:
    - (1) The purchase documents impose any additional technical and administrative requirements, as necessary, to comply with the North Anna 3 QA program and technical provisions. At a minimum, the purchase document shall require that the calibration certificate/report include identification of the laboratory equipment/standard used.
    - (2) The purchase documents require reporting as-found calibration data when calibrated items are found to be out-of-tolerance.
    - (3) A documented review of the supplier’s accreditation will be performed and will include a verification of each of the following:

- The calibration laboratory holds a domestic (United States) accreditation by any one of the following bodies, which are recognized by the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA):
    - National Voluntary Laboratory Accreditation Program (NVLAP), administered by the National Institute of Standards & Technology;
    - American Association for Laboratory Accreditation (A2LA);
    - ACLASS Accreditation Services (ACLASS);
    - International Accreditation Service (IAS);
    - Laboratory Accreditation Bureau (L-A-B);
    - Other NRC-approved laboratory accrediting body.
- The accreditation encompasses ANS/ISO/IEC 17025, “General Requirements for the Competence of Testing and Calibration Laboratories.”
- The published scope of accreditation for the calibration laboratory covers the necessary measurement parameters, range, and uncertainties.

•• For Section 8.1, Dominion considers documents that may be stored in approved electronic media under Dominion or vendor control, not physically located on the plant site, but are accessible from the respective nuclear facility site, as meeting the NQA-1 requirement for documents to be available at the site. When construction is complete, sufficient as-built documentation will be turned over to Dominion to support operations. The Dominion records management system will provide for timely retrieval of necessary records.

•• In lieu of the requirements of Section 10, Commercial Grade Items, controls for commercial grade items and services are established in North Anna 3 documents using 10 CFR 21 and the guidance of EPRI NP-5652 as discussed in Generic Letter 89-02 and Generic Letter 91-05.

– For commercial grade items, special quality verification requirements are established and described in Dominion documents to provide the necessary assurance an item will perform satisfactorily in service. The Dominion documents address determining the critical characteristics that ensure an item is suitable for its intended use, technical evaluation of the item, receipt requirements, and quality evaluation of the item.

– Dominion will also use other appropriate approved regulatory means and controls to support Dominion commercial grade dedication activities. Dominion will assume 10 CFR 21 reporting responsibility for all items that Dominion dedicates as safety-related.

Section 8 Identification and Control of Materials, Parts, and Components

Dominion has established the necessary measures and governing procedures to identify and control items to prevent the use of incorrect or defective items. This includes controls for consumable materials and items with limited shelf life. The identification of items is maintained throughout fabrication, erection, installation and use so that the item can be traced to its documentation, consistent with the item's effect on safety. Identification locations and methods are selected so as not to affect the function or quality of the item.

8.1 NQA-1-1994 Commitment

In establishing provisions for identification and control of items, Dominion commits to compliance with NQA-1-1994, Basic Requirement 8 and Supplement 8S-1.

Section 9 Control of Special Processes

Dominion has established the necessary measures and governing procedures to assure that special processes that require interim process controls to assure quality, such as welding, heat treating, and nondestructive examination, are controlled. These provisions include assuring that special processes are accomplished by qualified personnel using qualified procedures and equipment. Personnel are qualified and special processes are performed in accordance with applicable codes, standards, specifications, criteria or other specially established requirements. Special processes are those where the results are highly dependent on the control of the process or the skill of the operator, or both, and for which the specified quality cannot be fully and readily determined by inspection or test of the final product.

9.1 NQA-1-1994 Commitment

In establishing measures for the control of special processes, Dominion commits to compliance with NQA-1-1994, Basic Requirement 9 and Supplement 9S-1.

Section 10 Inspection

Dominion has established the necessary measures and governing procedures to implement inspections that assure items, services, and activities affecting safety meet established requirements and conform to applicable documented specifications, instructions, procedures, and design documents. Inspection may also be applied to items, services, and activities affecting plant reliability and integrity. Types of inspections may include those verifications related to procurement, such as source, in-process, final, and receipt inspection, as well as construction, installation, maintenance, modification, inservice, and operations activities. Inspections are carried out by properly qualified persons independent of those who performed or directly supervised the work. Inspection results are documented.

10.1 Inspection Program

The inspection program establishes inspections (including surveillance of processes), as necessary to verify quality: (1) at the source of supplied items or services, (2) in-process during fabrication at a supplier's facility or at a Company facility, (3) for final acceptance of fabricated and/or installed items during construction, (4) upon receipt of items for a facility, and (5) during maintenance, modification, inservice, and operating activities.

The inspection program establishes requirements for planning inspections, such as the group or discipline responsible for performing the inspection, where inspection hold points are to be applied, determining applicable acceptance criteria, the frequency of inspection to be applied, and identification of special tools needed to perform the inspection. Inspection planning is performed by personnel qualified in the discipline related to the inspection and includes qualified inspectors or engineers. Inspection plans are based on, as a minimum, the importance of the item to the safety of the facility, the complexity of the item, technical requirements to be met, and design specifications. Where significant changes in inspection activities for the facilities are to occur, management responsible for the inspection programs evaluate the resource and planning requirements to ensure effective implementation of the inspection program.

Inspection program documents establish requirements for performing the planned inspections, and documenting required inspection information such as rejection, acceptance, and reinspection results, and the person(s) performing the inspection.

Inspection results are documented by the inspector, reviewed by authorized personnel qualified to evaluate the technical adequacy of the inspection results, and controlled by instructions, procedures, and drawings.

10.2 Inspector Qualification

Dominion has established qualification programs for personnel performing quality inspections. The qualification program requirements are described in Part II, Section 2.6. These qualification programs are applied to individuals performing quality inspections regardless of the functional group where they are assigned.

10.3 NQA-1-1994 Commitment/Exceptions

In establishing inspection requirements, Dominion commits to compliance with NQA-1-1994, Basic Requirement 10, Supplement 10S-1 and Subpart 2.4, with the following clarification. In addition, Dominion commits to compliance with the requirements of Subparts 2.5 and 2.8 for establishing appropriate inspection requirements.

- Subpart 2.4 commits Dominion to IEEE Std. 336-1985. IEEE Std. 336 1985 refers to IEEE Std. 498-1985. Both IEEE Std. 336-1985 and IEEE Std. 498-1985 use the definition of “Safety Systems” from IEEE Std. 603-1980. North Anna 3 commits to the definition of Safety Systems in IEEE Std. 603 1980, but does not commit to the balance of that standard. This definition is only applicable to equipment in the context of Subpart 2.4.
- An additional exception to Subpart 2.4 is addressed in Part II, Section 12 of the QAPD.
- Where inspections at the operating facility are performed by persons within the same organization (e.g., Maintenance group), Dominion takes exception to the requirements of NQA-1-1994, Supplement 10S-1, Section 3.1, in that the inspectors report to the site’s Senior Manager for Safety and Licensing while performing those inspections.

Section 11 Test Control

Dominion has established the necessary measures and governing procedures to demonstrate that items subject to the provisions of the QAPD will perform satisfactorily in service, that the plant can be operated safely and as designed, and that the coordinated operation of the plant as a whole is satisfactory. These programs include criteria for determining when testing is required, such as proof tests before installation, pre-operational tests, post-maintenance tests, post-modification tests, in-service tests, and operational tests (such as surveillance tests required by Plant Technical Specifications), to demonstrate that the performance of plant systems is in accordance with design. Programs also include provisions to establish and adjust test schedules, and to maintain status for periodic or recurring tests. Tests are performed according to applicable procedures that include, consistent with the effect on safety: (1) instructions and prerequisites to perform the test, (2) use of proper test equipment, (3) acceptance criteria, and (4) mandatory verification points as necessary to confirm satisfactory test completion. Test results are documented and evaluated by the organization performing the test and reviewed by a responsible authority to assure that the test requirements have been satisfied. If acceptance criteria are not met, retesting is performed as needed to confirm acceptability following correction of the system or equipment deficiencies that caused the failure.

The initial start-up test program is planned and scheduled to permit safe fuel loading and start-up; to increase power in safe increments; and to perform major testing at specified power levels. If tests require the variation of operating parameters outside of their normal range, the limits within which such variation is permitted will be prescribed. The scope of the testing demonstrates, insofar as practicable, that the plant is capable of withstanding the design transients and accidents. For new facility construction, the suitability of facility operating procedures is checked to the maximum extent possible during the preoperational and initial start-up test programs.

Tests are performed and results documented in accordance with applicable technical and regulatory requirements, including those described in the Technical Specifications and SAR. Test programs ensure appropriate retention of test data in accordance with the records requirements of the QAPD. Personnel that perform or evaluate tests are qualified in accordance with the requirements established in Part II, Section 2.6.

11.1 NQA-1-1994 Commitment

In establishing provisions for testing, Dominion commits to compliance with NQA-1-1994, Basic Requirement 11 and Supplement 11S-1.

11.2 NQA-1-1994 Commitment for Computer Program Testing

Dominion establishes and implements provisions to assure that computer software used in applications affecting safety is prepared, documented, verified and tested, and used such that

the expected output is obtained and configuration control maintained. To this end, Dominion commits to compliance with the requirements of NQA-1-1994, Supplement 11S-2 and Subpart 2.7 to establish the appropriate provisions.

Section 12 Control of Measuring and Test Equipment

Dominion has established the necessary measures and governing procedures to control the calibration, maintenance, and use of measuring and test equipment (M&TE) that provides information important to safe plant operation. The provisions of such procedures cover equipment such as indicating and actuating instruments and gages, tools, reference and transfer standards, and nondestructive examination equipment. The suppliers of commercial-grade calibration services are controlled as described in Part II, Section 7.

12.1 Installed Instrument and Control Devices

For the operations phase of the facilities, Dominion has established and implements procedures for the calibration and adjustment of instrument and control devices installed in the facility. The calibration and adjustment of these devices is accomplished through the facility maintenance programs to ensure the facility is operated within design and technical requirements. Appropriate documentation will be maintained for these devices to indicate the control status, when the next calibration is due, and identify any limitations on use of the device.

12.2 NQA-1-1994 Commitment/Exceptions

In establishing provisions for control of measuring and test equipment, Dominion commits to compliance with NQA-1-1994, Basic Requirement 12 and Supplement 12S-1 with the following clarification and exception:

- The out of calibration conditions described in paragraph 3.2 of Supplement 12S-1 refers to when the M&TE is found out of the required accuracy limits (i.e., out of tolerance) during calibration.
- Measuring and test equipment are not required to be marked with the calibration status where it is impossible or impractical due to equipment size or configuration (such as the label will interfere with operation of the device) provided the required information is maintained in suitable documentation traceable to the device. This exception also applies to the calibration labeling requirement stated in NQA-1-1994, Subpart 2.4, Section 7.2.1 (ANSI/IEEE Std. 336-1985).

Section 13 Handling, Storage, and Shipping

Dominion has established the necessary measures and governing procedures to control the handling, storage, packaging, shipping, cleaning, and preservation of items to prevent inadvertent damage or loss, and to minimize deterioration. These provisions include specific procedures, when required to maintain acceptable quality of the items important to the safe operations of the plant. Items are appropriately marked and labeled during packaging, shipping, handling and storage to identify, maintain, and preserve the item's integrity and indicate the need for special controls. Special controls (such as containers, shock absorbers, accelerometers, inert gas atmospheres, specific moisture content levels and temperature levels) are provided when required to maintain acceptable quality.

Special or additional handling, storage, shipping, cleaning and preservation requirements are identified and implemented as specified in procurement documents and applicable procedures. Where special requirements are specified, the items and containers (where used) are suitably marked.

Special handling tools and equipment are used and controlled as necessary to ensure safe and adequate handling. Special handling tools and equipment are inspected and tested at specified time intervals and in accordance with procedures to verify that the tools and equipment are adequately maintained.

Operators of special handling and lifting equipment are experienced or trained in the use of the equipment. During the operational phase, Dominion establishes and implements controls over hoisting, rigging and transport activities to the extent necessary to protect the integrity of the items involved, as well as potentially affected nearby structures and components. Where required, Dominion complies with applicable hoisting, rigging and transportation regulations and codes.

13.1 Housekeeping

Housekeeping practices are established to account for conditions or environments that could affect the quality of structures, systems and components within the plant. This includes control of cleanness of facilities and materials, fire prevention and protection, disposal of combustible material and debris, control of access to work areas, protection of equipment, radioactive contamination control and storage of solid radioactive waste. Housekeeping practices help assure that only proper materials, equipment, processes and procedures are used and that the quality of items is not degraded. Necessary procedures or work instructions, such as for electrical bus and control center cleaning, cleaning of control consoles, and radioactive decontamination are developed and used.

13.2 NQA-1-1994 Commitment/Exceptions

In establishing provisions for handling, storage and shipping, Dominion commits to compliance with NQA-1-1994, Basic Requirement 13 and Supplement 13S-1. Dominion also commits, during the construction and operational phases of the plant, to compliance with the requirements of NQA-1-1994, Subpart 2.1, Subpart 2.2, Subpart 2.3, and Subpart 3.2, Appendix 2.1, with the following clarifications and exceptions:

- NQA -1-1994, Subpart 2.1
  - Subpart 2.1, Sections 3.1 and 3.2 establish criteria for classifying items into cleanness classes and requirements for each class. During the operational phase, instead of using the cleanness level system of Subpart 2.1, Dominion may establish cleanness requirements on a case-by-case basis, consistent with the other provisions of Subpart 2.1. Dominion establishes appropriate cleanliness controls for work on safety-related equipment to minimize introduction of foreign material and maintain system/component cleanliness throughout maintenance or modification activities, including documented verification of absence of foreign material prior to system closure.
- NQA -1-1994, Subpart 2.2
  - Subpart 2.2, Section 2.2 establishes criteria for classifying items into protection levels. Instead of classifying items into protection levels during the operational phase, Dominion may establish controls for the packaging, shipping, handling, and storage of such items on a case-by-case basis with due regard for the item's complexity, use, and sensitivity to damage. Prior to installation or use, the items are inspected and serviced as necessary to assure that no damage or deterioration exists which could affect their function.
  - Subpart 2.2, Section 6.6, “Storage Records:” This section requires written records be prepared containing information on personnel access. As an alternative to this requirement, North Anna 3 documents establish controls for storage areas that describe those authorized to access areas and the requirements for recording access of personnel. However, these records of access are not considered quality records and will be retained in accordance with the administrative controls of the applicable plant.
  - Subpart 2.2, Section 7.1 refers to Subpart 2.15 for requirements related to handling of items. The scope of Subpart 2.15 includes hoisting, rigging and transporting of items for the nuclear power plant during construction.
- NQA-1-1994, Subpart 2.3

- - Subpart 2.3, Section 2.3 requires the establishment of five zone designations for housekeeping cleanliness controls. During the operational phase, instead of the five-level zone designation, Dominion bases its control over housekeeping activities on a consideration of what is necessary and appropriate for the activity involved. The controls are implemented through procedures or instructions which, in the case of maintenance or modification work, are developed on a case-by-case basis. Factors considered in developing the procedures and instructions include cleanliness control, personnel safety, fire prevention and protection, radiation control and security. The procedures and instructions make use of standard janitorial and work practices to the extent possible.

- NQA-1-1994, Subpart 3.2
  - Subpart 3.2, Appendix 2.1: Only Section 3 precautions are being committed to in accordance with RG 1.37. In addition, a suitable chloride stress-cracking inhibitor should be added to the fresh water used to flush systems containing austenitic stainless steels.

Section 14 Inspection, Test, and Operating Status

Dominion has established the necessary measures and governing procedures to identify the inspection, test, and operating status of items and components subject to the provisions of the QAPD in order to maintain personnel and reactor safety and avoid inadvertent operation of equipment. Where necessary to preclude inadvertent bypassing of inspections or tests, or to preclude inadvertent operation, these measures require the inspection, test, or operating status be verified before release, fabrication, receipt, installation, test, or use. These measures also establish the necessary authorities and controls for the application and removal of status indicators or labels.

In addition, temporary design changes (temporary modifications), such as temporary bypass lines, electrical jumpers and lifted wires, and temporary trip-point settings, are controlled by procedures that include requirements for appropriate installation and removal, independent/concurrent verifications, and status tracking.

Administrative procedures also describe the measures taken to control altering the sequence of required tests, inspections, and other operations. Review and approval for these actions is subject to the same control as taken during the original review and approval of tests, inspections, and other operations.

14.1 NQA-1-1994 Commitment

In establishing measures for control of inspection, test, and operating status, Dominion commits to compliance with NQA-1-1994, Basic Requirement 14.

Section 15 Nonconforming Materials, Parts, or Components

Dominion has established the necessary measures and governing procedures to control items, including services, that do not conform to specified requirements to prevent inadvertent installation or use. Instructions require that the individual discovering a nonconformance identify, describe, and document the nonconformance in accordance with the requirements of Part II, Section 16. Controls provide for identification, documentation, evaluation, segregation when practical, and disposition of nonconforming items, and for notification to affected organizations. Controls are provided to address conditional release of nonconforming items for use on an at-risk basis prior to resolution and disposition of the nonconformance, including maintaining identification of the item and documenting the basis for such release. Conditional release of nonconforming items for installation requires the approval of the designated management. Nonconformances are corrected or resolved prior to depending on the item to perform its intended safety function. Nonconformances are evaluated for impact on operability of quality structures, systems, and components to assure that the final condition does not adversely affect safety, operation, or maintenance of the item or service. Nonconformances to design requirements dispositioned repair or use-as-is are subject to design control measures commensurate with those applied to the original design. Nonconformance dispositions are reviewed for adequacy, analysis of quality trends, and reports provided to the designated management. Significant trends are reported to management in accordance with Dominion procedures, regulatory requirements, and industry standards.

15.1 Interface with the Reporting Program

Dominion has appropriate interfaces between the QAP for identification and control of nonconforming materials, parts, or components and the non-QA reporting program to satisfy the requirements of 10 CFR 52, 10 CFR 50.55 and/or 10 CFR 21 during COL design and construction, and 10 CFR 21 during operations.NQA-1-1994 Commitment

In establishing measures for nonconforming materials, parts, or components, Dominion commits to compliance with NQA-1-1994, Basic Requirement 15, and Supplement 15S-1.

Section 16 Corrective Action

Dominion has established the necessary measures and governing procedures to promptly identify, control, document, classify, and correct conditions adverse to quality. Dominion procedures assure that corrective actions are documented and initiated following the determination of conditions adverse to quality in accordance with regulatory requirements and applicable quality standards. Dominion procedures require personnel to identify known conditions adverse to quality. When complex issues arise where it cannot be readily determined if a condition adverse to quality exists, Dominion documents establish the requirements for documentation and timely evaluation of the issue. Reports of conditions adverse to quality are analyzed to identify trends. Significant conditions adverse to quality and significant adverse trends are documented and reported to responsible management. In the case of a significant condition adverse to quality, the cause is determined and actions to preclude recurrence are taken.

In the case of suppliers working on safety-related activities, or other similar situations, Dominion may delegate specific responsibilities for corrective actions but Dominion maintains responsibility for the effectiveness of corrective action measures.

16.1 Interface with the Reporting Program

Dominion has appropriate interfaces between the QAP for corrective actions and the non-QA reporting program to satisfy the requirements of 10 CFR 52, 10 CFR 50.55 and/or 10 CFR Part 21, during COL design and construction, and 10 CFR 21 during operations.

16.2 NQA-1-1994 Commitment

In establishing provisions for corrective action, Dominion commits to compliance with NQA-1-1994, Basic Requirement 16.

Section 17 Quality Assurance Records

Dominion has the necessary measures and governing procedures to ensure that sufficient records of items and activities affecting quality are developed, reviewed, approved, issued, used, and revised to reflect completed work. The provisions of such procedures establish the scope of the records retention program for Dominion and include requirements for records administration, including receipt, preservation, retention, storage, safekeeping, retrieval, access controls, user privileges, and final disposition.

17.1 Record Retention

Measures are established that ensure that sufficient records of completed items and activities affecting quality are appropriately stored. Records of activities for design, engineering, procurement, manufacturing, construction, inspection and test, installation, pre-operation, startup, operations, maintenance, modification, and audits and their retention times are defined in appropriate procedures. The records and retention times are based on Regulatory Position C.2 and Table 1 of Regulatory Guide 1.28, Revision 3, for design, construction and initial startup. Retention times for operations phase records are based on construction records that are similar in nature. In all cases where state, local, or other agencies have more restrictive requirements for record retention, those requirements will be met.

17.2 Electronic Records

When using optical disks for electronic records storage and retrieval systems, Dominion complies with the NRC guidance in Generic Letter 88-18, “Plant Record Storage on Optical Disks.” Dominion will manage the storage of QA Records in electronic media consistent with the intent of RIS 2000-18 and associated NIRMA Guidelines TG 11-1998, TG15-1998, TG16-1998, and TG21-1998.

17.3 NQA-1-1994 Commitment/Exceptions

In establishing provisions for records, Dominion commits to compliance with NQA-1-1994, Basic Requirement 17 and Supplement 17S-1, with the following clarifications and exceptions:

- NQA-1-1994, Supplement 17S-1
    - Supplement 17S-1, Section 4.2(b) requires records to be firmly attached in binders or placed in folders or envelopes for storage in steel file cabinets or on shelving in containers. For hard-copy records maintained by Dominion, the records are suitably stored in steel file cabinets or on shelving in containers, except that methods other than binders, folders, or envelopes may be used to organize the records for storage.

Section 18 Audits

Dominion has established the necessary measures and governing procedures to implement audits to verify that activities covered by the QAPD are performed in conformance with the requirements established. The audit programs are themselves reviewed for effectiveness as a part of the overall audit process.

18.1 Performance of Audits

Internal audits of selected aspects of design, construction and operating activities are performed with a frequency commensurate with safety significance and in a manner which assures that audits of safety-related activities are completed. During the early portions of North Anna 3 COL activities, audits will focus on areas including, but not limited to, site investigation, procurement, and corrective action. Functional areas of an organization's QA program for auditing include, at a minimum, verification of compliance and effectiveness of implementation of internal rules, procedures (e.g., operating, design, procurement, maintenance, modification, refueling, surveillance, and test), Technical Specifications, regulations and license conditions, programs for training, retraining, qualification and performance of operating staff, corrective actions, and observation of performance of operating, refueling, maintenance and modification activities, including associated recordkeeping.

The audits are scheduled on a formal preplanned audit schedule. The audit system is reviewed periodically and revised as necessary to assure coverage commensurate with current and planned activities. Additional audits may be performed as deemed necessary by management. The scope of the audit is determined by the quality status and safety importance of the activities being performed. These audits are conducted by trained personnel not having direct responsibilities in the area being audited and in accordance with preplanned and approved audit plans or checklists, under the direction of a qualified lead auditor and the cognizance of the manager for the North Anna Unit 3 nuclear oversight group.

Dominion is responsible for conducting periodic internal and external audits. Internal audits are conducted to determine the adequacy of programs and procedures (by representative sampling), and to determine if they are meaningful and comply with the overall QAPD. External audits determine the adequacy of supplier and contractor quality assurance program.

The results of each audit are reported in writing to the CNO, and the executives responsible for the area audited. Additional internal distribution is made to other concerned management levels in accordance with approved procedures.

Management responds to all audit findings and initiates corrective action where indicated. Where corrective action measures are indicated, documented follow-up of applicable areas

through inspections, review, re-audits, or other appropriate means is conducted to verify implementation of assigned corrective action.

Audits of suppliers of safety-related components and/or services are conducted as described in Section 7.1.

18.2 Internal Audits

Internal audits of organization and facility activities, conducted prior to placing the facility in operation, should be performed in such a manner as to assure that an audit of all applicable QA program elements is completed for each functional area at least once each year or at least once during the life of the activity, whichever is shorter.

Internal audits of activities, conducted after placing the facility in operation, should be performed in such a manner as to assure that an audit of all applicable QA program elements is completed for each functional area within a period of two years. Internal audit frequencies of well established activities, conducted after placing the facility in operation, may be extended one year at a time beyond the above two-year interval based on the results of an annual evaluation of the applicable functional area and objective evidence that the functional area activities are being satisfactorily accomplished. The evaluation should include a detailed performance analysis of the functional area based upon applicable internal and external source data and due consideration of the impact of any functional area changes in responsibility, resources. or management. However, the internal audit frequency interval should not exceed a maximum of four years. If an adverse trend is identified in the applicable functional area, the extension of the internal audit frequency interval should be rescinded and an audit scheduled as soon as practicable.

During the operations phase, audits are performed at a frequency commensurate with the safety significance of the activities and in such a manner to assure audits of all applicable QA program elements are completed within a period of two years. These audits will include, as a minimum, activities in the following areas:

(1) The conformance of facility operation to provisions contained within the Technical Specifications and applicable license conditions including administrative controls.

(2) The performance, training, and qualifications of the facility staff.

(3) The performance of activities required by the QAPD to meet the criteria of 10 CFR 50, Appendix B.

(4) The Fire Protection Program and implementing procedures. A fire protection equipment and program implementation inspection and audit are conducted utilizing either a qualified offsite licensed fire protection engineer or an outside qualified fire protection consultant.

(5) Other activities and documents considered appropriate by the corporate executive for nuclear operations, or the CNO.

Audits may also be used to meet the periodic review requirements of the code for the Security, Emergency Preparedness, and Radiological Protection programs within the provisions of the applicable code.

Internal audits include verification of compliance and effectiveness of the administrative controls established for implementing the requirements of the QAPD; regulations and license provisions; provisions for training, retraining, qualification, and performance of personnel performing activities covered by the QAPD; corrective actions taken following abnormal occurrences; and, observation of the performance of construction, fabrication, operating, refueling, maintenance and modification activities including associated record keeping.

18.3 NQA-1-1994 Commitment

In establishing the independent audit program, Dominion commits to compliance with NQA-1-1994, Basic Requirement 18 and Supplement 18S-1.

Part III Nonsafety-Related SSC Quality Control

Section 1 Nonsafety-Related SSCs - Significant Contributors to Plant Safety

Specific program controls are applied to nonsafety-related SSCs, for which 10 CFR 50, Appendix B is not applicable, that are significant contributors to plant safety. The specific program controls consistent with applicable sections of the QAPD are applied to those items in a selected manner, targeted at those characteristics or critical attributes that render the SSC a significant contributor to plant safety.

The following clarify the applicability of the QA Program to the nonsafety-related SSCs and related activities, including the identification of exceptions to the QA Program described in Part II, Sections 1 through 18 taken for nonsafety-related SSCs.

1.1 Organization

Verification activities described in this part may be performed by the Dominion line organization, the QA organization described in Part II is not required to perform these functions.

1.2 QA Program

Dominion QA requirements for nonsafety-related SSCs are established in the QAPD and appropriate procedures. Suppliers of these SSCs or related services describe the quality controls applied in appropriate procedures. A new or separate QA program is not required.

1.3 Design Control

Dominion has design control measures to ensure that the contractually established design requirements are included in the design. These measures ensure that applicable design inputs are included or correctly translated into the design documents, and deviations from those requirements are controlled. Design verification is provided through the normal supervisory review of the designer's work.

1.4 Procurement Document Control

Procurement documents for items and services obtained by or for Dominion include or reference documents describing applicable design bases, design requirements, and other requirements necessary to ensure component performance. The procurement documents are controlled to address deviations from the specified requirements.

1.5 Instructions, Procedures, and Drawings

Dominion provides documents such as, but not limited to, written instructions, plant procedures, drawings, vendor technical manuals, and special instructions in work orders, to direct the performance of activities affecting quality. The method of instruction employed provides an appropriate degree of guidance to the personnel performing the activity to achieve acceptable functional performance of the SSC.

1.6 Document Control

Dominion controls the issuance and change of documents that specify quality requirements or prescribe activities affecting quality to ensure that correct documents are used. These controls include review and approval of documents, identification of the appropriate revision for use, and measures to preclude the use of superseded or obsolete documents.

1.7 Control of Purchased Items and Services

Dominion employs measures, such as inspection of items or documents upon receipt or acceptance testing, to ensure that all purchased items and services conform to appropriate procurement documents.

1.8 Identification and Control of Purchased Items

Dominion employs measures where necessary, to identify purchased items and preserve their functional performance capability. Storage controls take into account appropriate environmental, maintenance, or shelf life restrictions for the items.

1.9 Control of Special Processes

Dominion employs process and procedure controls for special processes, including welding, heat treating, and nondestructive testing. These controls are based on applicable codes, standards, specifications, criteria, or other special requirements for the special process.

1.10 Inspection

Dominion uses documented instructions to ensure necessary inspections are performed to verify conformance of an item or activity to specified requirements or to verify that activities are satisfactorily accomplished. These inspections may be performed by knowledgeable personnel in the line organization. Knowledgeable personnel are from the same discipline and have experience related to the work being inspected.

1.11 Test Control

Dominion employs measures to identify required testing that demonstrates that equipment conforms to design requirements. These tests are performed in accordance with test

instructions or procedures. The test results are recorded, and authorized individuals evaluate the results to ensure that test requirements are met.

1.12 Control of Measuring and Test Equipment (M&TE)

Dominion employs measures to control M&TE use, and calibration and adjustment at specific intervals or prior to use.

1.13 Handling, Storage, and Shipping

Dominion employs measures to control the handling, storage, cleaning, packaging, shipping, and preservation of items to prevent damage or loss, and to minimize deterioration. These measures include appropriate marking or labels, and identification of any special storage or handling requirements.

1.14 Inspection, Test, and Operating Status

Dominion employs measures to identify items that have satisfactorily passed required tests and inspections and to indicate the status of inspection, test, and operability as appropriate.

1.15 Control of Nonconforming Items

Dominion employs measures to identify and control items that do not conform to specified requirements to prevent their inadvertent installation or use.

1.16 Corrective Action

Dominion employs measures to ensure that failures, malfunctions, deficiencies, deviations, defective components, and nonconformances are properly identified, reported, and corrected.

1.17 Records

Dominion employs measures to ensure records are prepared and maintained to furnish evidence that the above requirements for design, procurement, document control, inspection, and test activities have been met.

1.18 Audits

Dominion employs measures for line management to periodically review and document the adequacy of the process, including taking any necessary corrective action. Audits independent of line management are not required. Line management is responsible for determining whether reviews conducted by line management or audits conducted by any organization independent of line management are appropriate. If performed, audits are conducted and documented to verify compliance with design and procurement documents, instructions, procedures, drawings, and inspection and test activities. Where the measures of

this part (Part III) are implemented by the same programs, processes, or procedures as the comparable activities of Part II, the audits performed under the provisions of Part II may be used to satisfy the review requirements of this Section (Part III, Section 1.18).

Section 2 Nonsafety-Related SSCs Credited for Regulatory Events

The following criteria apply to fire protection (10 CFR 50.48), anticipated transients without scram (ATWS) (10 CFR 50.62), and the station blackout (SBO) (10 CFR 50.63) SSCs that are not safety-related:

Dominion implements quality requirements for the fire protection system in accordance with Regulatory Position 1.7, “Quality Assurance,” in Regulatory Guide 1.189, “Fire Protection for Operating Nuclear Power Plants,” as identified in SAR Chapter 1 and as described in Chapter 9, Section 9.5.

Dominion implements the quality requirements for ATWS equipment in accordance with Part III, Section 1.

Dominion implements quality requirements for SBO equipment in accordance with Part III, Section 1.

Part IV Regulatory Commitments

Section 1 NRC Regulatory Guides and Quality Assurance Standards

This section identifies the NRC Regulatory Guides and the other quality assurance standards which have been selected to supplement and support the Dominion North Anna Unit 3 QAPD. Dominion commits to compliance with these standards to the extent described herein. Commitment to a particular Regulatory Guide or other QA standard does not constitute a commitment to the Regulatory Guides or QA standards that may be referenced therein.

1.1 Regulatory Guides

Regulatory Guide 1.8, Rev. 3, May 2000 - Qualification and Training of Personnel for Nuclear Power Plants

Regulatory Guide 1.8 provides guidance that is acceptable to the NRC staff regarding qualifications and training for nuclear power plant personnel. Dominion commits to the applicable regulatory position guidance provided in this regulatory guide during the operational phase of North Anna 3 with the clarifications and exceptions for the applicable regulatory position guidance below.

- Regulatory Position C.2 states that the qualification criteria described in Section 4 of ANSI/ANS-3.1-1993 are acceptable to the NRC staff with some exceptions delineated in subsections that follow the paragraph. Dominion commits to the identified exceptions with the clarification that in lieu of the plant manager approval discussed in paragraphs 2.1.1 and 2.1.3, the following alternative requirement for approval of the equivalents will be used by replacing the second sentence in each of the above paragraphs with the following sentence:

  These other factors are to be evaluated on a case-by-case basis and approved and documented by the plant manager or the responsible executive.

- Where reference is made to the training and qualification requirements of ANSI/ASME NQA-1-1983, Dominion commits to the applicable equivalent requirements of NQA-1-1994 as clarified in Part II, Section 2.
- Regarding the qualification requirements for independent review personnel discussed in Regulatory Positions C.2.14 and C.2.15, Dominion commits to the qualification requirements described in Part V, Section 2.2.
- As a further alternative to the selection and qualification requirements for licensed operators contained in ANS-3.1-1993, the requirements of NEI 06-13-A, Rev. 1 may be used for cold-licensing of operators.

Regulatory Guide 1.26, Revision 4, March 2007- Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants

Regulatory Guide 1.26 defines classification of systems and components.

Dominion commits to the applicable regulatory position guidance provided in this regulatory guide for North Anna 3 components outside the scope of the DCD.

Regulatory Guide 1.28, Revision 3, August 1985 - Quality Assurance Program Requirements (Design and Construction)

Regulatory Guide 1.28 describes a method acceptable to the NRC staff for complying with the provisions of Appendix B to 10 CFR Part 50 with regard to establishing and implementing the requisite quality assurance program for the design and construction of nuclear power plants.

Dominion identifies conformance and exceptions for the applicable regulatory position guidance provided in this regulatory guide in the following paragraphs.

- Regulatory Guide 1.28, Rev. 3 identifies that the basic and supplementary requirements included in ANSI/ASME NQA-1-1983 and the NQA-1a-1983 Addenda provide an adequate basis for complying with the pertinent QA requirements of Appendix B during the design and construction phases of nuclear plants. Dominion commits to the basic and supplementary requirements of NQA-1-1994 in lieu of the 1983 edition and addendum of NQA-1 subject to the clarifications contained in Parts II, IV, and V.
- Regulatory Position C.1 addresses the qualification requirements for inspection and test personnel. Dominion commits to these requirements subject to the clarifications identified in Part II, Section 2.7.
- Regulatory Position C.2 addresses the retention of Quality Assurance Records. Dominion commits to these requirements and the record types and retention times listed in Table 1 of the Regulatory Guide as clarified in Part II, Section 17.
- Regulatory Position C.3 addresses requirements for audits. Dominion commits to these requirements as clarified in Part II, Sections 7 and 18.

Regulatory Guide 1.29, Revision 4, March 2007- Seismic Design Classification

Regulatory Guide 1.29 defines systems required to withstand a safe shutdown earthquake (SSE).

Dominion commits to the applicable regulatory position guidance provided in this regulatory guide for North Anna 3 systems outside the scope of the DCD.

Regulatory Guide 1.30 (Safety Guide 30), Revision 0, August 1972 - Quality Assurance Requirements for the Installation, Inspection, and Testing of Instrumentation and Electric Equipment

Regulatory Guide 1.30 found ANSI N45.2.4-1972 to be acceptable in establishing QA requirements for the installation, inspection, and testing of nuclear power plant instrumentation and electric equipment.

In lieu of a commitment to Regulatory Guide 1.30, Dominion commits to the QA requirements of NQA-1-1994, Subpart 2.4 (ANSI/IEEE Std. 336-1985), IEEE Standard Installation, Inspection, and

Testing Requirements for Power, Instrumentation, and Control Equipment at Nuclear Facilities, as clarified in Part II, Section 10.

Regulatory Guide 1.33, Revision 2, February 1978 - Quality Assurance Program Requirements (Operations)

Regulatory Guide 1.33 describes a method acceptable to the NRC staff for complying with the Commission's regulations with regard to overall quality assurance program requirements for the operational phase of nuclear power plants.

Dominion identifies conformance and exceptions for the applicable regulatory position guidance provided in this regulatory guide in the following paragraphs.

- Regulatory Guide 1.33 identifies that the overall quality assurance program requirements for the operational phase that are included in ANSI N18.7-1976/ANS-3.2 are acceptable to the NRC staff and provide an adequate basis for complying with the quality assurance program requirements of Appendix B to 10 CFR Part 50, subject to the clarifications and supplementary guidance provided in the regulatory positions. In lieu of a commitment to ANSI N18.7-1976/ANS-3.2, Dominion commits to implementing the QA program requirements contained in NQA-1-1994 as clarified in the QAPD as well as the additional requirements specified in the QAPD.
- In meeting the intent of Regulatory Position C.1, Dominion prepares and controls procedures for the operational phase of the plant as described in Part II, Sections 5 and 6, and Part V, Section 3. The guidance of Reg. Guide 1.33, Appendix A is utilized to help determine the types of activities that affect the quality of safe operation of SSCs subject to the QAPD and, thus, are to be performed in accordance with approved procedures.
- In meeting the intent of Regulatory Position C.2, Dominion's commitment to Regulatory Guides governing QA is specified in Parts II, IV, and V.
- In meeting the intent of Regulatory Position C.3, Dominion describes the requirements for independent review of technical specification changes and license amendments by the IRC in Part V, Section 2.2.
- In meeting the intent of Regulatory Position C.4, Dominion describes the internal audit function, scheduling, and frequency in Part II, Section 18. Program elements for corrective action are included in each audit. The audit scheduling process takes into consideration the need for increased auditing in areas that indicate ineffective performance.
- In meeting the intent of Regulatory Position C.5, Dominion has included comparable requirements in the QAPD to govern the operating phase QA program.

Regulatory Guide 1.37, Revision 1, March 2007 - Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water-Cooled Nuclear Power Plants

Regulatory Guide 1.37 provides guidance on specifying water quality and precautions related to the use of alkaline cleaning solutions and chelating agents.

Dominion commits to the applicable regulatory position guidance provided in this regulatory guide for North Anna 3 as clarified in Part II, Section 13.

Regulatory Guide 1.38, Revision 2, May 1977 - Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage and Handling of Items for Water-Cooled Nuclear Power Plants

Regulatory Guide 1.38 provides guidance on assuring the quality of items to be used in safety-related applications of a nuclear power plant during shipping, storage, and handling of items including provisions for packaging, receipt, and maintenance while in storage. This Regulatory Guide identified that the provisions of ASME N45.2.2-1972 are acceptable to the NRC staff subject to certain specific regulatory positions.

In lieu of a commitment to Regulatory Guide 1.38, Dominion commits to the QA requirements of NQA-1-1994, Subpart 2.2, as clarified in Part II, Section 13.

Regulatory Guide 1.39, Revision 1, October 1976 - Housekeeping Requirements for Water-Cooled Nuclear Power Plants

Regulatory Guide 1.39 found the requirements on the control of work activities, conditions, and environments at water-cooled nuclear power plant sites in ANSI N45.2.3-1973 to be acceptable to the NRC staff with certain provisions.

In lieu of a commitment to Regulatory Guide 1.39, Dominion commits to the QA requirements of NQA-1-1994, Subpart 2.3, as clarified in Part II, Section 13.

Regulatory Guide 1.54, Revision 1, July 2000 - Service Level I, II, and III Protective Coatings applied to Nuclear Power Plants

Regulatory Guide 1.54 provides guidance on the application of protective coatings within nuclear power plants to protect surfaces from corrosion, contamination from radionuclides, and for wear protection. Dominion commits to the guidance provided in this Regulatory Guide.

Regulatory Guide 1.94, Revision 1, April 1976 - Quality Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete and Structural Steel During the Construction Phase of Nuclear Power Plants

Regulatory Guide 1.94 found that the requirements and guidelines in ANSI N45.2.5-1974 for installation, inspection, and testing of structural concrete and structural steel during the construction phase of nuclear power plants are generally acceptable to the NRC staff subject to certain specific regulatory positions.

In lieu of a commitment to Regulatory Guide 1.94, Dominion commits to the requirements of NQA-1-1994, Subpart 2.5, subject to the clarifications in the following paragraphs.

- Where important to safety structures other than concrete reactor vessels and containments are constructed or modified, other appropriate industry codes and standards may be invoked in place of ACI 359 as specified by the responsible design organization so long as they meet any current licensing commitments.
- With regard to Section 7.7, “Curing,” ASTM C 1315 is added to the first paragraph as another applicable standard for test methods for curing compounds.

Regulatory Guide 1.116, Revision 0-R, June 1976, Quality Assurance Requirements for Installation, Inspection, and Testing of Mechanical Equipment and Systems

Regulatory Guide 1.116 found the requirements for installation, inspection, and testing of mechanical equipment and systems of water-cooled nuclear power plants that are included in ANSI N45.2.8 to be acceptable to the NRC staff subject to certain specific regulatory positions.

In lieu of a commitment to Regulatory Guide 1.116, Dominion commits to the requirements of NQA-1-1994, Subpart 2.8 as identified in Part II, Section 10.

1.2 Standards

ASME NQA-1-1994 Edition - Quality Assurance Requirements for Nuclear Facility Applications

Dominion commits to NQA-1-1994, Parts I, II, and III, as described in Parts II, IV, and V of this document.

Nuclear Information and Records Management Association, Inc. (NIRMA) Technical Guides (TGs)

Dominion commits to NIRMA TGs as described in Part II, Section 17.

Part V Additional Quality Assurance and Administrative Controls for the Plant Operational Phase

Dominion includes the requirements of Part V that follow when establishing the necessary measures and governing procedures for the operations phase of the plant.

Section 1 Definitions

Dominion uses the definitions of terms as provided in Section 4 of the Introduction of NQA-1-1994 in interpreting the requirements of NQA-1-1994 and the other standards to which the QAPD commits. In addition, definitions are provided for the following terms not covered in NQA-1-1994:

administrative controls: rules, orders, instructions, procedures, policies, practices and designations of authority and responsibility

experiments: performance of plant operations carried out under controlled conditions in order to establish characteristics or values not previously known

nuclear power plant: any plant using a nuclear reactor to produce electric power, process steam or space heating

independent review: review completed by personnel not having direct responsibility for the work function under review regardless of whether they operate as a part of an organizational unit or as individual staff members (see review)

on-site operating organization: on-site personnel concerned with the operation, maintenance and certain technical services

operating activities: work functions associated with normal operation and maintenance of the plant, and technical services routinely assigned to the on-site operating organization

operational phase: that period of time during which the principal activity is associated with normal operation of the plant. This phase of plant life is considered to begin formally with commencement of initial fuel loading, and ends with plant decommissioning

review: a deliberately critical examination, including observation of plant operation, evaluation of assessment results, procedures, certain contemplated actions, and after-the-fact investigations of abnormal conditions

supervision: direction of personnel activities or monitoring of plant functions by an individual responsible and accountable for the activities they direct or monitor

surveillance testing: periodic testing to verify that safety related structures, systems, and components continue to function or are in a state of readiness to perform their functions

system: an integral part of nuclear power plant comprising components which may be operated or used as a separate entity to perform a specific function

Section 2 Review of Activities Affecting Safe Plant Operation

2.1 Onsite Operating Organization Review

The Dominion onsite organization employs reviews, both periodic and as situations demand, to evaluate plant operations and plan future activities. The important elements of the reviews are documented and subjects of potential concern for the independent review described below are brought to the attention of the Vice President North Anna 3. The reviews are part of the normal duties of plant supervisory personnel in order to provide timely and continuing monitoring of operating activities in order to assist the Vice President North Anna 3 in keeping abreast of general plant conditions and to verify that day-to-day operations are conducted safely in accordance with the established administrative controls. The Vice President North Anna 3 ensures the timely referral of the applicable matters discussed in the reviews to appropriate management and independent reviewers.

2.2 Independent Review

Activities occurring during the operational phase shall be independently reviewed on a periodic basis. The independent review program shall be functional prior to initial core loading.

The Independent Review Committee (IRC) is assigned independent review responsibilities.

- The IRC reports to the CNO.
- The IRC is composed of no less than 5 persons and no more than a minority of members are from the on-site operating organization.

  For example, at least 3 of the 5 members must be from off-site if there are 5 members on the committee. A minimum of the chairman or alternative chairman and 2 members must be present for all meetings.

- During the period of initial operation, meetings are conducted no less frequently than once per calendar quarter. Afterwards meetings are conduced no less than twice a year.
- Results of the meeting are documented and recorded.
- Consultants and contractors are used for the review of complex problems beyond the expertise of the IRC.
- Persons on the IRC are qualified as follows:
  - Chairman of the IRC
    - Education:
      - Baccalaureate in engineering or related science
    - Minimum experience:

- Six (6) years combined managerial and technical support

•• IRC members

– Education:

- Baccalaureate in engineering or related science for those IRC members who are required to review problems in
  - ∞ nuclear power plant operations,
  - ∞ nuclear engineering,
  - ∞ chemistry and radiochemistry,
  - ∞ metallurgy,
  - ∞ nondestructive testing,
  - ∞ instrumentation and control,
  - ∞ radiological safety,
  - ∞ mechanical engineering, and electrical engineering.
- High school diploma for those members who are required to review problems in administrative control and quality assurance practices, training, and emergency plans and related procedures and equipment.

– Minimum experience:

- Five (5) years experience in their own area of responsibility (nuclear power plant operations, nuclear engineering, chemistry and radiochemistry, metallurgy, nondestructive testing, instrumentation and control, radiological safety, mechanical engineering, and electrical engineering, administrative control and quality assurance practices, training, and emergency plans and related procedures and equipment).

The independent review function performs the following:

- Reviews proposed changes to the facility as described in the safety analysis report (SAR). The IRC also verifies that changes do not adversely affect safety and if a technical specification change or NRC review is required.
- Reviews proposed tests and experiments not described in the SAR prior to implementation. Verifies the determination of whether changes to proposed tests and experiments not described in the SAR require a technical specification change or license amendment.

- Reviews proposed technical specification changes and license amendments relating to nuclear safety prior to NRC submittal and implementation, except in those cases where the change is identical to a previously approved change.
- Reviews violations, deviations, and events that are required to be reported to the NRC. This review includes the results of investigations and recommendations resulting from such investigations to prevent or reduce the probability of recurrence of the event.
- Reviews any matter related to nuclear safety that is requested by the CNO, the Vice President North Anna 3, or any IRC member.
- Reviews corrective actions for significant conditions adverse to quality.
- Reviews internal audit reports.
- Reviews the adequacy of the audit program every 24 months.

Section 3 Operational Phase Procedures

The following is a description of the various types of procedures used by Dominion to govern the design, operation, and maintenance of its nuclear generating plants. Dominion follows the guidance of Appendix A to Regulatory Guide 1.33 in identifying the types of activities that should have procedures or instructions to control the activity. Each procedure shall be sufficiently detailed for a qualified individual to perform the required function without direct supervision, but need not provide a complete description of the system or plant process.

3.1 Format and Content

Procedure format and content may vary from one location to the other. However, procedures include the following elements as appropriate to the purpose or task to be described.

- **Title/Status**

Each procedure is given a title descriptive of the work or subject it addresses, and includes a revision number and/or date and an approval status.

- Purpose/Statement of Applicability/Scope

  The purpose for which the procedure is intended is clearly stated (if not clear from the title). The systems, structures, components, processes or conditions to which the procedure applies are also clearly described.

- References

  Applicable references, including reference to appropriate Technical Specifications, are required. References are included within the body of the procedure when the sequence of steps requires other tasks to be performed (according to the reference) prior to or concurrent with a particular step.

- **Prerequisites/Initial Conditions**

  Prerequisites/initial conditions identify those independent actions or procedures that must be accomplished and plant conditions which must exist prior to performing the procedure. A prerequisite applicable to only a specific portion of a procedure is so identified.

- **Precautions**

  Precautions alert the user to those important measures to be used to protect equipment and personnel, including the public, or to avoid an abnormal or emergency situation during performance of the procedure. Cautionary notes applicable to specific steps are included in the main body of the procedure and are identified as such.

- **Limitations and Actions**

  Limitations on the parameters being controlled and appropriate corrective measures to return the parameter to the normal control band are specified.

- **Main Body**

  The main body of the procedure contains the step-by-step instructions in the degree of detail necessary for performing the required function or task.

- **Acceptance Criteria**

  The acceptance criteria provide the quantitative or qualitative criteria against which the success or failure (as of a test-type activity) of the step or action would be judged.

- **Checklists**

  Complex procedures utilize checklists which may be included as part of the procedure or appended to it.

3.2 Procedure Types

Administrative Control Procedures

These include administrative procedures, directives, policies, standards, and similar documents that control the programmatic aspects of facility activities. These administrative documents ensure that the requirements of regulatory and license commitments are implemented. Several levels of administrative controls are applied ranging from those affecting the entire Company to those prepared at the implementing group level. These documents establish responsibilities, interfaces, and standard methods (rules of practice) for implementing programs. In addition to the administrative controls described throughout this QAPD, instructions governing the following activities are provided:

- **Operating Orders/Procedures**

  Instructions of general and continuing applicability to the conduct of business to the plant staff are provided. Examples where these are applied include, but are not limited to, job turnover and relief, designation of confines of control room, definition of duties of operators and others, transmittal of operating data to management, filing of charts, limitations on access to certain areas and equipment, shipping and receiving instructions. Provisions are made for periodic review and updating of these documents, where appropriate.

- **Special Orders**

  Management instructions, which have short-term applicability and require dissemination, are issued to encompass special operations, housekeeping, data taking, publications and their distribution, plotting process parameters, personnel actions, or other similar matters.

Provisions are made for periodic review, updating, and cancellation of these documents, where appropriate.

- **Plant Security and Visitor Control**

  Procedures or instructions are developed to supplement features and physical barriers designed to control access to the plant and, as appropriate, to vital areas within the plant. Information concerning specific design features and administrative provisions of the plant security program is confidential and thus accorded limited distribution. The security and visitor control procedures consider, for example, physical provisions, such as: fences and lighting; lock controls for doors, gates and compartments containing sensitive equipment; and provisions for traffic and access control. Administrative provisions, such as: visitor sign-in and sign-out procedures; escorts and badges for visitors; emphasis on inspection, observation and challenging of strangers by operating crews; and a program of pre-employment screening for potential employees are also considered.

- **Temporary Procedures**

  Temporary procedures may be used to direct operations during testing, refueling, maintenance, and modifications to provide guidance in unusual situations not within the scope of the normal procedures. These procedures ensure orderly and uniform operations for short periods when the plant, a system, or a component of a system is performing in a manner not covered by existing detailed procedures or has been modified or extended in such a manner that portions of existing procedures do not apply. Temporary Procedures include designation of the period of time during which they may be used and are subject to the procedure review process as applicable.

Engineering Procedures

These documents provide instructions for the preparation of engineering documents, engineering analysis, and implementation of engineering programs. This includes activities such as designs; calculations; fabrication, equipment, construction, and installation specifications; drawings; analysis and topical reports; and testing plans or procedures. They include appropriate references to industry codes and standards, design inputs, and technical requirements.

Installation Procedures

These documents provide instructions for the installation of components generally related to new construction and certain modification activities. They include appropriate reference to industry standards, installation specifications, design drawings, and supplier and technical manuals for the performance of activities. These documents include provisions, such as hold or witness points, for conducting and recording results of required inspections or tests. These

documents may include applicable inspection and test instructions subject to the requirements for test and inspection procedures below.

System Procedures

These documents contain instructions for energizing, filling, venting, draining, starting up, shutting down, changing modes of operation, and other instructions appropriate for operations of systems related to the safety of the plant. Actions to correct off-normal conditions are invoked following an operator observation or an annunciator alarm indicating a condition which, if not corrected, could degenerate into a condition requiring action under an emergency procedure. Separate procedures may be developed for correcting off-normal conditions for those events where system complexity may lead to operator uncertainty. Appropriate procedures will also be developed for the fire protection program.

Start-up Procedures

These documents contain instructions for starting the reactor from cold or hot conditions and establishing power operation. This includes documented determination that prerequisites have been met, including confirmation that necessary instruments are operable and properly set; valves are properly aligned, necessary system procedures, tests and calibrations have been completed; and required approvals have been obtained.

Shutdown Procedures

These documents contain guidance for operations during controlled shutdown and following reactor trips, including instructions for establishing or maintaining hot shutdown/standby or cold shutdown conditions, as applicable. The major steps involved in shutting down the plant are specified, including instructions for such actions as monitoring and controlling reactivity, load reduction and cooldown rates, sequence for activating or deactivating equipment, requirements for prompt analysis for causes of reactor trips or abnormal conditions requiring unplanned controlled shutdowns, and provisions for decay heat removal.

Power Operation and Load Changing Procedures

These documents contain instructions for steady-state power operation and load changing. These type documents include, as examples, provisions for use of control rods, chemical shim, coolant flow control, or any other system available for short-term or long-term control of reactivity, making deliberate load changes, responding to unanticipated load changes, and adjusting operating parameters.

Process Monitoring Procedures

These documents contain instructions for monitoring performance of plant systems to assure that core thermal margins and coolant quality are maintained in acceptable status at all times, that integrity of fission product barriers is maintained, and that engineered safety features and emergency equipment are in a state of readiness to keep the plant in a safe condition if

needed. Maximum and minimum limits for process parameters are appropriately identified. Operating procedures address the appropriate nature and frequency of this monitoring.

Fuel Handling Procedures

These documents contain instructions for core alterations, accountability of fuel and partial or complete refueling operations that include, for example, continuous monitoring of neutron flux throughout core loading, periodic data recording, audible annunciation of abnormal flux increases, and evaluation of core neutron multiplication to verify safety of loading increments. Procedures are also provided for receipt and inspection of new fuel, and for fuel movements in the spent fuel storage areas. Fuel handling procedures include prerequisites to verify the status of systems required for fuel handling and movement; inspection of replacement fuel and control rods; designation of proper tools, proper conditions for spent fuel movement, proper conditions for fuel cask loading and movement; and status of interlocks, reactor trip circuits and mode switches. These procedures provide requirements for refueling, including proper sequence, orientation and seating of fuel and components, rules for minimum operable instrumentation, actions for response to fuel damage, verification of shutdown margin, communications between the control room and the fuel handling station, independent verification of fuel and component locations, criteria for stopping fuel movements, and documentation of final fuel and component serial numbers (or other unique identifiers) and locations.

Maintenance Procedures

These documents contain instructions in sufficient detail to permit maintenance work to be performed correctly and safely, and include provisions, such as hold or witness points, for conducting and recording results of required inspections or tests. These documents may include applicable inspection or test instructions subject to the requirements for test and inspection procedures below. Appropriate referencing to other procedures, standards, specifications, or supplier manuals is provided. When not provided through other documents, instructions for equipment removal and return to service, and applicable radiation protection measures (such as protective clothing and radiation monitoring) will be included. Additional maintenance procedure requirements are addressed in NQA-1-1994, Subpart 2.18, Section 2.2, Procedures.

Radiation Control Procedures

These documents contain instructions for implementation of the radiation control program requirements necessary to meet regulatory commitments, including acquisition of data and use of equipment to perform necessary radiation surveys, measurements and evaluations for the assessment and control of radiation hazards. These procedures provide requirements for monitoring both external and internal exposures of employees, utilizing accepted techniques; routine radiation surveys of work areas; effluent and environmental monitoring in the vicinity

of the plant; radiation monitoring of maintenance and special work activities, and for maintaining records demonstrating the adequacy of measures taken to control radiation exposures to employees and others.

Calibration and Test Procedures

These documents contain instructions for periodic calibration and testing of instrumentation and control systems, and for periodic calibration of measuring and test equipment used in activities affecting the quality of these systems. These documents provide for meeting surveillance requirements and for assuring measurement accuracy adequate to keep safety-related parameters within operational and safety limits.

Chemical and Radiochemical Control Procedures

These documents contain instructions for chemical and radiochemical control activities and include: the nature and frequency of sampling and analyses; instructions for maintaining coolant quality within prescribed limits; and limitations on concentrations of agents that could cause corrosive attack, foul heat transfer surfaces, or become sources of radiation hazards due to activation. These documents also provide for the control, treatment and management of radioactive wastes, and control of radioactive calibration sources.

Emergency Operating Procedures

These documents contain instructions for response to potential emergencies so that a trained operator will know in advance the expected course of events that will identify an emergency and the immediate actions that are taken in response. Format and content of emergency procedures are based on NUREG and Owner’s Group(s) guidance that identify potential emergency conditions and require such procedures to include, as appropriate, a title, symptoms to aid in identification of the nature of the emergency, automatic actions to be expected from protective systems, immediate operator actions for operation of controls or confirmation of automatic actions, and subsequent operator actions to return the reactor to a normal condition or provide for a safe extended shutdown period under abnormal or emergency conditions.

Emergency Plan Implementing Procedures

These documents contain instructions for activating the Emergency Response Organization and facilities, protective action levels, organizing emergency response actions, establishing necessary communications with local, state and federal agencies, and for periodically testing the procedures, communications and alarm systems to assure they function properly. Format and content of such procedures are such that requirements of each facility’s NRC approved Emergency Plan are met.

Test and Inspection Procedures

These documents provide the necessary measures to assure quality is achieved and maintained for the nuclear facilities. The instructions for tests and inspections may be included within other procedures, such as installation and maintenance procedures, but will contain the objectives, acceptance criteria, prerequisites for performing the test or inspection, limiting conditions, and appropriate instructions for performing the test or inspection, as applicable. These procedures also specify any special equipment or calibrations required to conduct the test or inspection and provide for appropriate documentation and evaluation by responsible authority to assure test or inspection requirements have been satisfied. Where necessary, hold or witness points are identified within the procedures and require appropriate approval for the work to continue beyond the designated point. These procedures provide for recording the date, identification of those performing the test or inspection, as-found condition, corrective actions performed (if any), and as-left condition, as appropriate for the subject test or inspection.

Section 4 Control of Systems and Equipment in the Operational Phase

Permission to release systems and equipment for maintenance or modification is controlled by designated operating personnel and documented. Measures, such as installation of tags or locks and releasing stored energy, are used to ensure personnel and equipment safety. When entry into a closed system is required, Dominion has established control measures to prevent entry of extraneous material and to assure that foreign material is removed before the system is reclosed.

Administrative procedures require the designated operating personnel to verify that the system or equipment can be released and determine the length of time it may be out of service. In making this determination, attention is given to the potentially degraded degree of protection where one subsystem of a redundant safety system is not available for service. Conditions to be considered in preparing equipment for maintenance include, for example: shutdown margin; method of emergency core cooling; establishment of a path for decay heat removal; temperature and pressure of the system; valves between work and hazardous material; venting, draining and flushing; entry into closed vessels; hazardous atmospheres; handling hazardous materials; and electrical hazards.

When systems or equipment are ready to be returned to service, designated operating personnel control placing the items in service and document its functional acceptability. Attention is given to restoration of normal conditions, such as removal of jumpers or signals used in maintenance or testing, or actions such as returning valves, breakers or switches to proper start-up or operating positions from "test" or "manual" positions. Where necessary, the equipment placed into service receives additional surveillance during the run-in period.

Independent verifications, where appropriate, are used to ensure that the necessary measures have been implemented correctly. The minimum requirements and standards for using independent verification are established in company documents.

Section 5 Plant Maintenance

Dominion establishes controls for the maintenance or modification of items and equipment subject to the QAPD to ensure quality at least equivalent to that specified in original design bases and requirements, such that safety-related structures, systems and components are maintained in a manner that assures their ability to perform their intended safety function(s). Maintenance activities (both corrective and preventive) are scheduled and planned so as not to unnecessarily compromise the safety of the plant.

In establishing controls for plant maintenance, Dominion commits to compliance with NQA-1-1994, Subpart 2.18, with the following clarifications:

- Where Subpart 2.18 refers to the requirements of ANS-3.2, it shall be interpreted to mean the applicable standards and requirements established within the North Anna 3 QAPD
- Section 2.3 requires cleanliness during maintenance to be in accordance with Subpart 2.1. The commitment to Subpart 2.1 is described in the QAPD, Part II, Section 13.2.

Chapter 18 Human Factors Engineering

This chapter of the referenced DCD is incorporated by reference with no departures or supplements.

18.13 Human Performance Monitoring

18.13.3 Elements of Human Performance Monitoring Process

Delete the first sentence in the fourth paragraph. Add the following to the end of this section:

STD COL 18.13-1-A The HPM program will be implemented prior to the beginning of the first licensed operator training class.

18.13.5 COL Information

18.13-1-A Milestone for HPM Implementation

STD COL 18.13-1-A This COL item is addressed in Section 18.13.3.

Chapter 19 Probabilistic Risk Assessment and Severe Accidents

19.1 Introduction

This section of the referenced DCD is incorporated by reference with no departures or supplements.

19.2 PRA Results and Insights

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

19.2.3.2.4 Evaluation of External Event Seismic

Introduction to Evaluation of External Event Seismic

Replace the third and fourth sentences of the first paragraph of this section with the following.

NAPS DEP 3.7-1

The seismic margin earthquake for the PRA-based seismic margin assessment for Unit 3 is the SSE for each Seismic Category I structure as provided in Section 3.7.1. The Unit 3 seismic margins High Confidence, Low Probability of Failures (HCLPF) accident sequence analysis will show that Unit 3 is inherently capable of safe shutdown in response to beyond design basis earthquakes and has a plant level HCLPF of at least 1.67 times the peak ground acceleration of a safe shutdown earthquake (SSE), where the SSE for each Seismic Category I structure is provided in Section 3.7.1, in compliance with SECY 93-087 (DCD Reference 19.2-7) requirement “PRA insights will be used to support a margins-type assessment of seismic events. A PRA-based seismic margins analysis will consider sequence-level HCLPFs and fragilities for all sequences leading to core damage or containment failures up to approximately one and two-thirds the ground motion acceleration of the Design Basis SSE.”

Significant Core Damage Sequences of External Event Seismic

Replace the second, third and fourth sentences of the first paragraph with the following.

NAPS COL 19.2.6-1-A

As-built SSC HCLPFs will be compared to those assumed in the ESBWR seismic margin analysis shown in Table 19.2-4R. Deviations from the HCLPF values or other assumptions in the seismic margins evaluation

will be analyzed to determine if any new vulnerabilities have been introduced. This comparison and analysis will be completed prior to fuel load. A minimum HCLPF value of 1.67*SSE will be met for the SSCs identified in Table 19.2-4R.

19.2.6 COL Information

19.2.6-1-A Seismic High Confidence Low Probability of Failure Margins

NAPS COL 19.2.6-1-A This COL Item is addressed in Section 19.2.3.2.4.

NAPS COL 19.2.6-1-A

Table 19.2-4R ESBWR Systems and Structures in Seismic Margins Analysis with Plant Level HCLPF not less than 1.67*SSE(1)

PLANT STRUCTURES

- Reactor Building
- Containment
- RPV Pedestal
- Control Building
- RPV Support Brackets
- Firewater Service Complex

DC POWER

- Batteries
- Cable trays
- Motor control centers

REACTIVITY CONTROL SYSTEM

- Fuel assembly
- CRD Guide tubes
- Shroud support
- CRD Housing
- Hydraulic control unit

SRV

- SRV

STANDBY LIQUID CONTROL

- Accumulator Tank
- Check valve
- Squib valve
- Piping
- Valve (motor operated)

ISOLATION CONDENSER

- Piping
- Heat exchanger
- Valve (motor operated)
- Valve (nitrogen operated)

DPV

- DPV

GRAVITY-DRIVEN COOLING

- Check valve
- Squib valve
- Piping

VACUUM BREAKERS

- Vacuum breaker valve

PASSIVE CONTAINMENT COOLING

- Heat Exchanger
- Piping

NAPS COL 19.2.6-1-A

Table 19.2-4R ESBWR Systems and Structures in Seismic Margins Analysis with Plant Level HCLPF not less than 1.67*SSE(1)

IC/PCCS POOL INTERCONNECTION

- Valve (motor operated)

FIRE PROTECTION WATER SYSTEM

- Pump (diesel driven)
- Tank
- Piping

NAPS DEP 3.7-1

Note: 1. ~~A minimum HCLPF value of 1.67*SSE will be met for the structures and equipment shown. SSE is the ESBWR Certified Seismic Design Response Spectra (CSDRS) as provided in Figures 2.0-1 and 2.0-2. Where applicable, differential building displacement is part of piping failure modes evaluation.~~

A minimum HCLPF value of 1.67*SSE for each Seismic Category I structure will be met for the structures and equipment shown. The SSE for each Seismic Category I structure is provided in Section 3.7.1. Where applicable, differential building displacement is part of piping failure modes evaluation.

19.3 Severe Accident Evaluations

This section of the referenced DCD is incorporated by reference with no departures or supplements.

19.4 PRA Maintenance

This section of the referenced DCD is incorporated by reference with no departures or supplements.

19.5 Conclusions

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

NAPS SUP 19.5-1

In accordance with 10 CFR 52.79(a)(46), this report is required to contain a description of the plant-specific PRA and its results. As part of the development of the certified design PRA, site and plant-specific information were reviewed to determine if any changes from the certified design PRA were warranted. This review included consideration of site-specific information such as site meteorological data and site-specific population distributions, as well as plant-specific design information that replaced conceptual design information described in the DCD. Section 1.8.5 was also reviewed to determine if there were any departures affecting the PRA results. This review is summarized in Appendix 19AA.

The review of site-specific information and plant-specific design information determined that, with one exception, the DCD PRA bounds site-specific and plant-specific design parameters and design features. One departure has been identified due to the site-specific exceedance of the CSDRS for seismic margins analysis of the standard plant design. This exceedance is accounted for in the plant-specific PRA by requiring a minimum HCLPF value of 1.67*SSE for each Seismic Category I and II structure. Also, for non-seismic structures housing RTNSS Class C systems, the SSE ground input motion is correspondingly increased as described in Section 19A.8.3. Thus, none of the Unit 3 parameters and features have a significant impact on the DCD PRA results and insights. Therefore, based on this review, it is concluded that there is no significant change from the certified design PRA. In that there are no significant changes from the certified design PRA, incorporation of DCD Chapter 19

into the FSAR satisfies the requirement of 10 CFR 52.79(a)(46) for a description of the plant-specific PRA and its results.

19.6 Mitigative Strategies Description and Plans

STD SUP 19.6-1

The Mitigative Strategies Description and Plans are submitted to the Nuclear Regulatory Commission as a separate licensing document in order to fulfill the requirements of 10 CFR 52.80(d). The Mitigative Strategies Description and Plans meet the requirements contained in 10 CFR 50.54(hh)(2) and will be maintained in accordance with the requirements of 10 CFR 52.98. The Mitigative Strategies Description and Plans is categorized as Security-Related Information and is withheld from public disclosure pursuant to 10 CFR 2.390.

Appendix 19A Regulatory Treatment of Non-Safety Systems (RTNSS)

This chapter of the referenced DCD is incorporated by reference with the following departures and/or supplements.

19A.8.3 Augmented Design Standards

Replace the third sentence of the eighth paragraph with the following.

NAPS DEP 3.7-1

Non-seismic structures that house RTNSS Criterion C systems are seismically designed using a dynamic analysis method with the SSE ground input motion equal to two-thirds of the Unit 3 site-specific SSE as defined in Section 3.7.1.

BASIS: NEW

NAPS SUP 19A-1

Table 19A-4R Capability of RTNSS Related Structures(1)(2)

System Location	A. (Internal Flooding)	B. (External Flooding)	C. (Internal Missiles)	D. (Extreme Wind and Missiles)
Reactor Bldg. (RB) Control Bldg. (CB) Fuel Bldg. (FB) Fire Pump Enclosure Bldg. (FPE)	The design/installation of RTNSS equipment includes protection from the effects of internal flooding.	Seismic Category I structures are designed to withstand the flood level and groundwater level specified in ~~Table 2.0-1~~ Table 2.0-201 and described in Subsection 3.4.1.2. All exterior access openings are above flood level and exterior penetrations below design flood and groundwater levels are appropriately sealed as described in Subsection 3.4.1.1. On-site storage tanks are designed and constructed to minimize the risk of catastrophic failure and are located to allow drainage without damage to site facilities in the event of a	There are no credible sources of internal missiles per Section 3.5.	Seismic Category I structures designed for tornado and extreme wind phenomena are described in Section 3.3 and Subsection 3.5.1.4.
Ancillary DG Building		The Ancillary DG Building is designed to withstand external flooding with the same acceptance criteria as a Seismic Category I Structure.		The Ancillary DG Building is designed for tornado wind loads. RTNSS systems in the Ancillary Diesel Building are protected from Category 5 hurricane missiles.

BASIS: NEW

NAPS SUP 19A-1

Table 19A-4R Capability of RTNSS Related Structures[(1)(2)]

System Location	A. (Internal Flooding)	B. (External Flooding)	C. (Internal Missiles)	D. (Extreme Wind and Missiles)
Electrical Bldg. (EB) Service Water Bldg. (SF) Turbine Bldg. (TB)	The design/installation of RTNSS equipment includes protection from the effects of internal flooding.	All exterior access openings are above flood level and exterior penetrations below design flood and groundwater levels are appropriately sealed; basemat and walls are designed for hydrostatic loading, therefore protected from external flooding.	N/A	The EB and SF are RTNSS Structures designed for Category 5 hurricane winds. RTNSS systems in the EB and SF are protected from Category 5 hurricane wind and missiles. The TB structure is designed for tornado wind loads. The design/installation of the RTNSS systems in the TB includes protection to comply with the requirement of Subsection 19A.8.3 to withstand missiles generated from Category 5 hurricanes.
PSW System located Outdoors Onsite	N/A	The design/installation of the RTNSS system includes protection from the effects of flooding.	N/A	The design/installation of the RTNSS system complies with the requirement of Subsection 19A.8.3 to withstand winds and missiles generated from Category 5 hurricanes.

Notes:

(1) Seismic Category NS structures and PSW System located outdoors onsite that house RTNSS equipment are designed to withstand hurricane Category 5 wind velocity at 87.2 m/s (195 mph), 3-second gust. Seismic Category I and II structures that house RTNSS equipment are not required to be designed to withstand hurricane Category 5 wind velocity at 87.2 m/s (195 mph), 3-second gust but are required to be designed to withstand 100-year wind velocity at 67.1 m/s (150 mph) identified in Table 2.0-1.

(2) ~~The hurricane missile spectrum for Seismic Category NS, PSW System located outdoors onsite and Seismic Category II structures that house RTNSS equipment is consistent with the tornado missile spectrum identified in Table 2.0-1. The design criteria associated with hurricane missile protection follows Section 3.5 for missiles generated by natural phenomenon. The tornado wind speed is substituted with hurricane wind speed to design the concrete or steel barriers for missile impact.~~
The hurricane missile spectrum for Seismic Category NS, PSW System located outdoors onsite and Seismic Category II structures that house RTNSS equipment is consistent with the tornado missile spectrum identified in Table 2.0-201. The design criteria associated with hurricane missile protection follows Section 3.5 for missiles generated by natural phenomenon. The tornado wind speed is substituted with hurricane wind speed to design the concrete or steel barriers for missile impact. The site specific tornado missile spectrum for these structures is adjusted for hurricanes in accordance with RG 1.221.

Appendix 19ACM Availability Controls Manual

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 19B Deterministic Analysis for Containment Pressure Capability

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 19C Probabilistic Analysis for Containment Pressure Fragility

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 19D Assessment of Malevolent Aircraft Impact

This section of the referenced DCD is incorporated by reference with no departures or supplements.

NAPS SUP 19.5-1

Appendix 19AA Summary of Plant-Specific PRA Review

19AA.1 Introduction

In accordance with 10 CFR 52.79(a)(46), this appendix provides a summary of the plant-specific PRA and its results.

19AA.2 Development of the ESBWR and Plant-Specific PRAs

- Loss of Preferred Power (LOPP) frequency - to determine if the site has unusual off-site power availability problems. The LOPP frequency is divided into plant-centered, switchyard, grid-related, and weather-related initiating events.
- Loss of Service Water frequency - to determine if any unusual characteristics would apply to a particular site, with consideration to loss of ultimate heat sink, and the effects of extreme seasonal temperatures.
- Seismic fragilities - to determine whether the site-specific design response spectra affects the ESBWR Seismic Margins Analysis (SMA) or the PRA. Note that High Confidence Low Probability of Failure (HCLPF) values will be confirmed as described in Section 19.2.3.2.4.

- Other Known Site-Specific Issues - to identify site-specific initiating events that are not identified in the ESBWR PRA, such as unique offsite consequence issues.

These parameters represent site-specific features that have the potential to affect the PRA. To ensure that the ESBWR PRA is a bounding standard design, the site-specific values for these parameters were reviewed.

The ESBWR LOPP frequencies are based on NUREG/CR-6890, “Reevaluation of Station Blackout Risk at Nuclear Power Plants Analysis of Loss of Offsite Power Events: 1986-2004.” The North Anna LOPP frequencies were compared to the ESBWR frequencies to identify any outliers. The data shows that grid-related losses of power are significantly more frequent than plant-centered, switchyard, or weather-related losses of power. Although there is a variance in the values for the LOPP frequencies, their range is acceptable. The conclusions in ESBWR DCD Section 19.2.3.1, Risk from Internal Events, remain valid for the minor variances in LOPP frequencies.

The ESBWR Loss of Service Water frequency is based on NUREG/CR-5750, “Rates of Initiating Events at U. S. Nuclear Power Plants: 1987-1995.” Loss of Service Water contributes less than one percent to the ESBWR Core Damage Frequency (CDF). Variances between the reported values depend on the design configuration (e.g., redundancy) of the current plants versus the ESBWR design, or external influences such as loss or degradation of heat sink. A review of the Unit 3 design did not identify any site-specific vulnerabilities that would cause the Loss of Service Water frequency to be higher than assumed in the ESBWR PRA. The Unit 3 Plant Service Water System (PSWS) is designed so that neither a single active nor single passive failure results in a complete loss of plant component cooling and/or plant dependence on any safety-related system. This is achieved through the use of redundant components, automatic valves and piping cross-connects for increased reliability. Additional PSWS design features to improve system reliability include:

- The PSWS is designed for remote operation from the MCR, for ease of restoration of its function after a component failure without a plant operating mode or power level change, and to operate even during a LOPP.

- The PSWS is designed to take suction from a closed-cycle treated water system and is not susceptible to raw water failure mechanisms (e.g., intake blockage). During normal operation, the Plant Cooling Tower Makeup System supplies water to the PSWS from Lake Anna. The PSWS is designed to operate for up to 7 days without makeup.
- The PSWS heat load is rejected to the PSWS mechanical draft plume abated cooling towers (auxiliary heat sink) during normal operation.
- During normal operation, one of two PSWS pumps per train is operating. The standby pump will automatically start upon detection of low PSWS pressure, loss of power to the operating pump, or a trip of the operating pump.
- The PSWS pumps each have a self-cleaning strainer which operates automatically. The pump discharge strainers have a remote manual override feature for their automatic cleaning cycle.

These items would reduce the Loss of Service Water frequency because of the redundant features included in the design. The conclusions in DCD Section 19.2.3.1, Risk from Internal Events, remain valid for the minor variances in Loss of Service Water frequencies.

The ESBWR design incorporates a seismic response spectrum that bounds most potential U.S. sites. For the Unit 3 site, the seismic exceedance is accounted for in the plant-specific PRA by requiring a minimum HCLPF value of 1.67*SSE for each Seismic Category I structure. Also, for non-seismic structures housing RTNSS Class C systems, the SSE ground input motion is correspondingly increased as described in Section 19A.8.3. The site-specific seismic evaluation will assess the as-built structures, systems and components listed in Table 19.2-4R to ensure no site-specific vulnerabilities have been introduced. Therefore, the conclusions in DCD Section 19.2.3.2.4, Evaluation of External Event Seismic, remain valid for site-specific differences in seismic response.

There are no unusual terrain features that would affect meteorological data or plume dispersion. The conclusions in DCD Section 19.2.5 for offsite consequences remain valid for any potential differences between site features.

In addition to the bounding treatment of PRA parameters, there are no changes from the standard design in any systems considered in the PRA model. Therefore, there are no site-specific design features that affect the

PRA because the boundary of the certified design covers all of the SSCs necessary for the PRA.

19AA.3 Internal Flooding

19AA.3.1 Internal Flooding Associated with the Yard Area

The yard flood zone is essentially all outside areas of the site, and thus the site plot drawing (FSAR Figure 2.1-201) illustrates the areas of concern. In addition DCD Section 3.4.1.2 stipulates that the plant grade level is above the design flood level. The only components located in the yard that support a safety function are the manual fire hose connections to the Reactor Building and Fuel Building. These connections are also above design flood level. These connections provide the capability to connect another source of water to the Isolation Condenser/Passive Containment Cooling System (IC/PCCS) pools and the Spent Fuel Pool after seven days following a postulated accident. This timeframe is beyond the time required to be considered for the PRA; therefore, external flooding in the yard does not affect PRA equipment.

19AA.3.2 Internal Flooding Associated with the Service Water Building

The Service Water Structure is a site-specific design feature. It is treated in a bounding manner in the ESBWR PRA to demonstrate that site-specific differences in Service Water Structure design do not have a significant effect on the PRA results. The Service Water Structure houses the four Service Water pumps and their associated power supplies and controls. Because Service Water is a RTNSS function, in accordance with DCD Table 19A-4, the design and installation of the Service Water Structure is required to include protection from the effects of external and internal flooding.

In the ESBWR PRA model, the Service Water Structure is conservatively considered to be one flood zone. All four pumps are assumed to fail in an internal flood. Thus, the ESBWR PRA is bounding for design differences in the Service Water Structure. In addition, the ESBWR PRA model does not credit operator actions to mitigate a Service Water Structure flooding event, so differences in building location are not significant.

The conclusion in DCD Section 19.2.3.2.2 is that there are no significant flood-initiated accident sequences due to the low CDF. Overall, the potential effects of Service Water Structure design differences are

accounted for by using a bounding analysis, and therefore, are not significant to the ESBWR PRA.

In summary, the ESBWR PRA provides a reasonable representation of the parameters and conditions that are specific to the North Anna site.