3H Details and Evaluation Results of Seismic Category 1 Structures

The information in this appendix of the reference ABWR DCD, including all subsections, tables, and figures as modified by the STP Nuclear Operating Company Application to Amend the Design Certification rule for the U.S. Advanced Boiling Water Reactor (ABWR), "ABWR STP Aircraft Impact Assessment (AIA) Amendment Revision 3," dated September 23, 2010 is incorporated by reference with the following departures and supplement.

STD DEP T1 2.15-1

STP DEP T1 5.0-1

STD DEP 1.8-1

STD DEP 3H-1

STP DEP Admin

3H.1 Reactor Building

3H.1.4.2 Site Design Parameters

STP DEP T1 5.0-1

(1) Soil Parameters:

—Minimum static bearing capacity demand: Š718.20 kPa

—In addition for the load combinations involving seismic/dynamic loads, the dynamic bearing capacity demand shall also be met.

—Minimum shear wave velocity: ~~305 m/s~~(See FSAR Subsections 2.5S.4.4 and 2.5S.4.7)

—Poisson's Ratio: 0.30 to 0.38

—Unit Weight: 1.9 to 2.2 t/m^3

(3) *~~Maximum~~* Design Basis *Flood Level*

~~—0.305 m~~ 182.9 cm *~~below~~* above *grade*

(9) *Maximum Rainfall*

*—Design rainfall is ~~493~~*503 mm/h. *Roof parapets are furnished with scuppers to supplement roof drains, or are designed without parapets so that excessive ponding of water cannot occur. Such roof design meets the provision of ASCE 7-88 Section 8.*

3H.1.4.4.3 Liner Plate

STD DEP 3H-1

- *Liner plate for RCCV in the wetted area shall be stainless steel conforming to ASME SA-240, Type 304L.*
- *Liner plate for the RCCV in the non-wetted area shall be 6.35 mm thick and conform to ASME SA-516 GR. 70.*
- *Liner Anchors: ~~ASTM A-633 GR. C~~* ASME SA-36.
- *Stainless steel cladding to conform to ASME SA-264.*

3H.1.5.2 Foundation Soil Springs

STP DEP T1 5.0-1

The foundation soil is represented by soil springs. The spring constants for rocking and translations are determined based on the following soil parameters:

- *Shear wave velocity ~~305 m/s~~*(See FSAR Subsections 2.5S.4.4 and 2.5S.4.7)
- *Unit weight ~~1.92 t/m³~~* 121 pcf (1.94 t/m^3) to 140 pcf (2.24 t/m^3)
- *Shear modulus ~~1.8 x 10⁴ t/m³~~* 3,011 ksf (1.47x10^4 t/m^2) to 9,324 ksf (9.55x10^4 t/m^2)
- *Poisson's Ratio ~~0.38~~* 0.46 to 0.48

For the undrained condition (i.e. Poisson's Ratio 0.46 to 0.48, the calculated vertical spring constant under the mat foundation of the Reactor Building (RB) for STP site conditions ranges from 132 kips/ft^3 to 288 kips/ft^3 with 197 kips/ft^3 for best estimate case. The calculated horizontal spring constant for the STP site conditions ranges from 94 kips/ft^3 to 211 kips/ft^3 with minimum of 141 kips/ft^3 for best estimate case. The potential degree of variability is indicated by the spread of values from lower range to upper range. The soil properties used to compute these spring constants are strain-compatible and were developed from the site response analyses described in Section 2.5S.2.5. Soil depths for the vertical and horizontal mode spring calculations are 2500 ft and 1300 ft, respectively. Soil layers at depths greater than these depths were ignored due to their insignificant contribution to the spring values.

The above calculated STP site-specific soil spring constants are higher than the soil spring constants used for the ABWR DCD design. For the drained condition with Poisson's Ratio of 0.15, the lower range site-specific spring constants are nearly the same as those for the standard design with a maximum difference of about 5%. Considering that the layer weighted Poisson's Ratio is between 0.15 for clay layers and 0.30 for sand layers, even for the drained condition the STP site-specific spring constants will be either the same or higher than the spring constants for the standard design. Higher soil spring constants at the STP site will result in mat design forces smaller than those used for the ABWR DCD design. Therefore, the ABWR DCD mat design is adequate for the STP site.

3H.1.6 Site Specific Structural Evaluation

The following site specific supplement addresses the structural evaluation of the site specific design parameters for STP 3 & 4.

As documented in Section 3.3 the ABWR Standard Plant Reactor Building (RB) wind loads, and tornado loads bound these site parameters for STP 3 & 4.

As documented in Subsections 2.5S.4.4 and 2.4S.4.7, the shear wave velocity at STP 3&4 site varies both horizontally in a soil stratum and vertically with elevation, and is lower than the 1,000 ft/sec minimum stated in the DCD. A site specific soil-structure interation (SSI) analysis has been performed using the measured values of shear wave velocity, with appropriate variation to represent the variability at the site, and site specific SSE, to demonstrate that the results of the site-specific SSI are bounded by the standard plant results included in the DCD. This SSI analysis is described in Appendix 3A.

The foundation spring constants for mat design are based on settlement calculations. In the development of settlement estimates, the representative shear wave velocity value for intervals within a soil column is only one input used in the derivation of the elastic modulus for layers within that column. Since this derived elastic modulus value is first adjusted for strain and then weighted with estimated values derived from either SPT tests (for garanular material) or undrained shear strength tests (for cohesive soils) the effect of variability of shear wave velocity upon settlement calculations is significantly attenuated.

Impact of shear wave velocity on foundation spring constants and mat design is described in Section 3H.1.5.2 where it is concluded that the standard ABWR mat design is adequate for the STP site.

The effect of settlement due to the flexibility of the structure/basemat and supporting soil is accounted for through the use of finite element analysis in conjunction with foundation soil springs, as described in Section 3H.6.6.4. The resulting maximum calculated ratio of differential foundation settlements (between adjacent points in the mat finite element model) within the boundary of the RB is 1/1697.

As documented in Subsection 3.4, the STP 3 & 4 site has a design basis flood elevation that is 182.9 cm (6 ft) above grade. This results in an increase in the flood level over what was used in the ABWR Standard Plant, however the load due to the revised flood level, including hydrodynamic drag load due to flood water flow and hydrodynamic load due to wind generated wave action as described in Section 3.4.2, on the exterior RB walls is less than the ABWR Standard Plant RB seismic or tornado loads. The design of above grade RB exterior walls for design basis tornado loading per Tier 1 Table 5.0, including tornado generated missiles, bounds the design for flood loading including impact due to floating debris. The design of below grade RB exterior walls for design basis seismic loading bounds the design for flood loading.

Hence the increased flood loading it doesn't affect the Standard Plant RB structural design. Increased flood level also increases the buoyancy force resulting in a revised flotation factor of safety of 2.24. This factor exceeds required factor of safety of 1.1.

The factor of safety against floatation has been calculated and is shown in revised Table 3H.1-23.

Therefore the STP 3 & 4 RB utilizing the Standard Plant design is structurally adequate.

3H.2 Control Building

STP DEP T1 5.0-1

3H.2.4.2.1 Soil Parameters

▪ *Minimum shear wave velocity:*	▪ ~~*305 m/s*~~See FSAR Subsections 2.5S4.4 and 2.5S.4.7
▪ *Poisson ratio:*	▪ *0.3 to 0.38*
▪ *Unit weight*	▪ *1.9 to 2.2 t/m^3*
▪ *Liquefaction potential:*	▪ *None*
▪ *Minimum Static Soil Bearing Capacity Demand:*	▪ *Š 718.20 KPa*

3H.2.4.2.3 Design Basis Flood Level

Design basis *flood level is at* ~~*0.305m*~~ 182.9 cm ~~*below*~~ above *grade level*.

3H.2.4.2.5 Maximum Rainfall

Design rainfall is ~~*493*~~ 503 *mm/h. Roof parapets are furnished with scuppers to supplement roof drains, or are designed without parapets so that excessive ponding of water cannot occur. Such roof design meets the provision of ASCE 7-88 Section 8.*

3H.2.4.3.1.4 Lateral Soil Pressures (H and H')

The following parameters are used in the computation of lateral soil pressures:

▪ *Dry unit weight:*	▪ *1.9 to 2.2 t/m^3*
▪ *Shear wave velocity:*	▪ ~~*305 m/s*~~ See FSAR Subsections 2.5S.4.4 and 2.5S.4.7
▪ *Internal friction angle:*	▪ *30° to 40°*

3H.2.6 Site Specific Structural Evaluation

The following site specific supplement addresses the structural evaluation of the site specific design parameters for STP 3 & 4.

As documented in Subsection 3.3, the ABWR Standard Plant Control Building (CB), wind loads, and tornado loads bound these site specific parameters for STP 3 & 4.

Soil spring constants for the undrained condition (i.e. Poisson's Ratio 0.46 to 0.48) are higher than spring constants for drained condition (i.e. Poisson's ratio of 0.15 for clay layers and 0.30 for sand layers). The calculated vertical spring constant under the mat foundation of the Control Building (CB) for STP site conditions using drained Poisson's ratio of 0.15 ranges from 113 kips/ft^3 to 251 kips/ft^3 with 169 kips/ft^3 for best estimate case. The calculated horizontal spring constant for the STP site conditions using drained Poisson's ratio of 0.15 ranges from 101 kips/ft^3 to 241 kips/ft^3 with minimum of 152 kips/ft^3 for best estimate case. The potential degree of variability is indicated by the spread of values from lower range to upper range. The soil properties used to compute these spring constants are strain-compatible and were developed from the site response analyses described in Section 2.5S.2.5. Soil depths for the vertical and horizontal mode spring calculations are 1500 ft and 700 ft, respectively. Soil layers at depths greater than these depths were ignored due to their insignificant contribution to the spring values.

While the calculated best estimate and upper range STP site-specific soil spring constants are higher than the best estimate calculated DCD soil spring constants, the lower range STP site-specific vertical and horizontal soil spring constants are lower by about 20% and 30%, respectively.

Considering the size and geometry of the CB, arrangement of the exterior and interior shear walls, thickness of shear walls, and the basemat thickness, the CB basemat is quite rigid and not significantly sensitive to the soil spring constant values. To demonstrate this, a three dimensional parametric study was performed where the CB was subjected to its dead load along with significant seismic moments about the two horizontal axes and vertical excitation. The CB model was analyzed for two cases, once with best estimate calculated DCD soil spring constants and the second time with calculated lower range STP site-specific soil spring constants. Comparison of the resulting out-of-plane shears and moments from these two analyses show that there is no significant change in basemat design forces. Based on this parametric study and the fact that STP site-specific SSE is less than half the standard design SSE, the ABWR DCD mat design is adequate for the STP site.

As documented in Subsections 2.5S.4.4 and 2.5S.4.7, the shear wave velocity at STP 3&4 site varies both horizontally in a soil stratum and vertically with elevation, and is lower than the 1,000 ft/sec minimum stated in the DCD. A site specific soil-structure interaction (SSI) analysis has been performed using the measured values of shear wave velocity, with appropriate variation to represent the variability at the site, and site specfic SSE, to demonstrate that the results of the site-specific SSI are bounded by the standard plant results included in the DCD. This SSI analysis is described in Appendix 3A.

At-rest seismic lateral earth pressure on the Control Building exterior walls are determined using the method described in Section 2.5S.4.10.5.2. In this method, the at-rest seismic lateral earth pressure computation will utilize site-specific shear wave velocity. The impact of site-specific shear wave velocity on the design of exterior walls is expected to be insignificant because their designs are controlled by the combination of requirements for in-plane and out-of-plane loads. The at-rest seismic lateral earth pressure only affects the out-of-plane loads. Also, the at-rest pressure includes the effect of hydrostatic load, surcharge load etc, in addition to the dynamic pressure caused by the earthquake.

As noted in Section 2.5S.4.10.5.4, actual surcharge loads, structural fill properties, and final configurations of structures are not known at this time. Final earth pressure calculations are prepared at the project detailed design stage based on the actual design conditions at each structure, on a case-by-case basis. STP commits to include the final earth pressure calculations, including actual surcharge loads, structural fill properties, and final configuration of structures, following completion of the project detailed design in an update to the FSAR in accordance with 10CFR 50.71(e) (COM 2.5S-3).

The effect of settlement due to the flexibility of the structure/basemat and supporting soil is accounted for through the use of finite element analysis in conjunction with foundation soil springs, as described in Section 3H.6.6.4. The resulting maximum calculated ratio of differential foundation settlements (between adjacent points in the mat finite element model) within the boundary of the CB is 1/928.

As documented in Subsection 3.4, the STP 3 & 4 site has a basis flood elevation that is 182.9 cm (6 ft) above grade. This results in an increase in the flood level over what was used in the ABWR Standard Plant, however the load due to the revised flood level, including hydrodynamic drag load due to flood water flow and hydrodynamic load due to wind generated wave action as described in Section 3.4.2, on the exterior CB walls is less than the ABWR Standard Plant seismic or tornado loads. The design of above grade CB exterior walls for design basis tornado loading per Tier 1 Table 5.0, including tornado generated missiles bounds the design for flood loading including impact due to floating debris. The design of below grade CB exterior walls for design basis seismic loading bounds the design for flood loading. Hence the increased flood loading does not affect the Standard Plant CB structural design. Increased flood level also increases the buoyancy force resulting in a revised flotation factor of safety of 1.3. This factor exceeds required factor of safety of 1.1.

The factor of safety against floatation has been calculated and is shown in revised Table 3H.2-5.

Therefore the STP 3 & 4 CB utilizing the Standard Plant design is structurally adequate.

3H.3 Radwaste Building

This section of the reference ABWR DCD including all subsections, figures, and tables is replaced completely. This is due to departures taken in the design of the liquid and solid radioactive waste system.

STD DEP T1 2.15-1
STD DEP 11.2-1
STD DEP 11.4-1
STD DEP 3.8-1

The Radwaste Building is a reinforced concrete structure located about 20 feet west of the Reactor building. It is designed in accordance with the requirements of RG 1.143. Also, since the above grade height of this building exceeds the distance to the Reactor Building, to ensure that the integrity of the Reactor Building is maintained, the Radwaste Building design shall satisfy II/I requirements (i.e. it can not collapse or come in contact with the Reactor Building under SSE and tornado loads).

The RWB is classified as RW-IIb (Hazardous) in accordance with RG 1.143. A summary of the extreme environmental design parameters is presented in Table 3H.9-1.

The analysis and design of the Radwaste building are based on the following:

A) Criteria for Design Basis:

- Design basis analysis and design are per requirements of Revision 2 of RG 1.143 for RW-IIb classification.
- Loads, load combinations, codes & standards, and capacity criteria are in accordance with Tables 1, 2, 3, and 4 of RG 1.143.
- Design of structural components is per ACI 349-97 and AISC/N690 (1984).

B) Criteria for II/I evaluation:

- The II/I evaluations are performed for both SSE and Tornado.
- The II/I evaluations are based on elastic design.
- The seismic response spectra are the envelop of 0.3g RG 1.60 response spectra and the resulting SSE response spectra at the foundation level of the Radwaste Building considering the effect of presence of the Reactor Building when subjected to site-specific SSE. This satisfies the requirement noted in item (3) of DCD Tier 2 Section 3.7.2.8.
- Tornado design parameters will be those for the Standard Plant Seismic Category I structures (i.e. 300 mph tornado).

3H.3.1 Objective and Scope

The scope of this subsection is to document the structural design and analysis of the Radwaste Building (RWB) for STP Units 3 & 4. The RWB is a not a Seismic Category I structure. The RWB is classified as RW-IIb (Hazardous) for STP 3 & 4 site per Section 5 of Regulatory Guide (RG) 1.143 Revision 2 and designed to meet or exceed applicable requirements of RG 1.143 Revision 2. The determination of the RWB classification is based on an evaluation of an unmitigated release from the RWB. The unmitigated release results in an annual dose outside the protected area of less than 500 mrem/yr and an annual dose to site personnel of less than 5 rem/yr. This results in a RW-IIb classification for the structure in accordance with Section 5.2 of RG 1.143. Although, the RWB is classified as RW-IIb, it is designed conservatively for earthquake, tornado and wind loadings based on the requirements for RW-IIa classification. Design for other loads is based on the requirements for RW-IIb classification.

Due to its close proximity to safety-related seismic category I structures, the RWB structure is also designed to meet Seismic II/I requirements to ensure that the building does not collapse on the nearby safety-related buildings.

3H.3.2 Summary

The following are the major summary conclusions on the design and analysis of the Radwaste Building:

- The provided concrete reinforcement listed in Tables 3H.3-3 and 3H.3-4 meet the requirements of the design codes and standards listed in Section 3H.3.4.
- The provided structural steel listed in Table 3H.3-5 meets the requirements of the design codes and standards listed in Section 3H.3.4.
- The factors of safety against flotation, sliding, and overturning of the structure under various loading combinations are higher than the required minimum factors of safety as shown in Table 3H.6-14.

3H.3.3 Structural Description

The Radwaste Building (RWB) for each STP unit houses the liquid and solid radwaste treatment and storage facilities, and radwaste processing and handling areas. The RWB is a reinforced concrete structure consisting of walls and slabs supported by a mat foundation. Liquid radwaste storage tanks are housed inside concrete cubicles located below grade at basement level. These cubicles are lined with steel liner plates to eliminate migration of any liquid outside the concrete cubicles. Metal decking supported by steel framing is used as form work to support the slabs during construction.

3H.3.4 Structural Design Criteria

3H.3.4.1 Design Codes and Standards

The RWB is designed to meet the design requirements of RG 1.143 Revision 2 and also satisfy the Seismic II/I requirements that it does not collapse on the adjacent safety related structures in the proximity of the RWB under seismic and tornado loadings. The following codes, standards, and regulatory documents are applicable for the design of the RWB.

- ASCE 4-98, “Seismic Analysis of Safety-Related Nuclear Structures and Commentary”
- ACI 349-97, “Code Requirements for Nuclear Safety-Related Concrete Structures and Commentary”
- ANSI/AISC N690, 1984 “Specifications for the Design, Fabrication and Erection of Steel Safety-Related Structures for Nuclear Facilities”
- AWS D1.1 “Steel Structural Welding Code”, 2000
- ASCE 7-95, “Minimum Design Loads for Buildings and Other Structures”
- NRC RG 1.143, “Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants,” Rev. 2, November 2001
- NUREG-0800 SRP 3.3.2, “Tornado Loadings,” Rev. 2, July 1981
- NRC RG 1.142, “Safety-Related Concrete Structures for Nuclear Power Plants (Other Than Reactor Vessels and Containments),” Rev 2, November 2001
- NRC RG 1.76, “Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants,” Rev 1, March 2007.

3H.3.4.2 Site Design Parameters

3H.3.4.2.1 Soil Parameters

- Poisson’s ratio (above groundwater).. 0.42
- Poisson’s ratio (below groundwater).. 0.47
- Unit Weight (moist)..120 pcf
- Unit Weight (saturated) ....140 pcf
- Liquefaction potential ....None
- Static Soil Bearing Pressure (plus weight of 2 ft of fill concrete):….................9.8 ksf

- Ultimate Static Soil Bearing Capacity……………………………………….91.1 ksf
- Static Soil Bearing Capacity Factor of Safety.. ≥ 9.3
- Dynamic Soil Bearing Pressure:...11.0 ksf
- Ultimate Dynamic Soil Bearing Capacity…………………………………….71.4 ksf
- Dynamic Soil Bearing Capacity Factor of Safety.. ≥ 6.5

The soil bearing pressure capacities noted above are determined using the methodology described in Section 2.5S.4.

3H.3.4.2.2 Design Ground Water Level

Design groundwater level is at elevation 32 feet MSL, as shown in DCD, Tier 1, Table 5.0. This value bounds the groundwater elevations discussed in Section 2.4S.12.

3H.3.4.2.3 Design Flood Level

Design flood level is 33 feet MSL, as shown in DCD, Tier 1, Table 5.0. This flood level is above the level derived from ASCE 7-95 (RG 1.143 requirement) for the STP 3 & 4 site.

3H.3.4.2.4 Maximum Snow Load

Roof snow load is 50 psf (2.39 kPa) as shown in DCD Tier 1 Table 5.0. This snow load is above the value derived from ASCE 7-95 (RG 1.143 requirement) for the STP 3 & 4 site. This load is not combined with normal roof live load.

3H.3.4.2.5 Maximum Rainfall

Design rainfall is 19.4 in/hr (50.3 cm/hr) as shown in COLA Part 2 Tier 1 Table 5.0. This load is not combined with normal roof live load.

3H.3.4.3 Design Load and Load Combinations

The RWB is not subjected to any accident temperature or pressure loading.

3H.3.4.3.1 Normal Loads

Normal loads are those that are encountered during normal plant startup, operation, and shutdown.

3H.3.4.3.1.1 Dead Loads (D)

Dead loads include the weight of the structure, permanent equipment, and other permanent static loads. An additional 50 psf (2.39 kPa) uniform load is considered to account for dead loads due to piping, raceways, grating, and HVAC duct work.

3H.3.4.3.1.2 Live Loads (L)

Live loads include floor and roof area live loads, movable loads, and laydown loads. A minimum normal floor live load of 200 psf (9.6 kPa) is considered for all floors of the RWB. A normal live load of 50 psf (2.39 kPa) is considered for the roof. The floor area live load shall be omitted from areas occupied by equipment whose weight is included in the dead load.

For the computation of global seismic loads, the live load is limited to the expected live load present during normal plant operation which is defined as 25% of the normal floor and roof live loads. However, design of local elements such as beams and slabs is based on consideration of full normal live load.

3H.3.4.3.1.3 Snow Loads

The normal roof snow load is 50 psf. This load is not combined with normal roof live load.

3H.3.4.3.1.4 Lateral Soil Pressures (H)

Lateral soil pressures are calculated using the following soil properties.

- Unit weight (moist):... 120 pcf (1.92 t/m^3)
- Unit weight (saturated): ....140 pcf (2.24 t/m^3)
- Internal friction angle: ....30°
- Poisson’s ratio (above groundwater)... 0.42
- Poisson’s ratio (below groundwater) 0.47

Figure 3H.3-1 shows the at-rest lateral soil pressures. Figure 3H.3-2 shows the dynamic at-rest lateral soil pressures. Figure 3H.3-3 shows the active lateral earth pressures. Figure 3H.3-4 shows the passive lateral earth pressures.

The RWB east and west walls are also designed for lateral seismic soil pressures shown in Figures 3H.3-50 and 3H.3-51, respectively. These soil pressures consider the structure-soil-structure interaction (SSSI) between the RWB, RSW piping Tunnel, and RB. For details of this SSSI analysis, see Section 3H.6.5.3.

3H.3.4.3.2 Severe Environmental Load

Severe environmental loads consist of loads generated by wind and earthquake.

3H.3.4.3.2.1 Wind Load (W)

The following parameters are used in the computation of the wind loads.

- Basic wind speed (50 year recurrence interval, 3-second gust)................ 126 mph (203 km/h), as shown in Table 2.0-2. This value envelops the value derived from ASCE 7-95 (RG 1.143 requirement) for STP 3 & 4 site.
- Exposure: ....D
- Importance factor: 1.15
- Velocity pressure exposure coefficient per ASCE 7 Table 6-3, but ≥ 0.87
- Topographic factor 1.0
- Wind directionality factor 1.0

Wind loads are calculated in accordance with the provisions of Chapter 6 of ASCE 7-95.

3H.3.4.3.2.2 Earthquake (E_o)

The earthquake loads are those due to one-half of the Safe Shutdown Earthquake (SSE) defined in DCD Tier 1, Table 5.0. This corresponds to the Regulatory Guide 1.60 response spectra anchored to 0.15g. The earthquake loads are applied in all three orthogonal directions. The total structural response is predicted by combining the applicable maximum co-directional responses by the square root of the sum of the squares (SRSS) method.

3H.3.4.3.2.3 Flood Load (FL)

The flood level is at 33 feet MSL, as stated in Section 3H.3.4.2.3 above.

3H.3.4.3.3 Extreme Environmental Load

Extreme environmental loads consist of loads generated by tornado.

3H.3.4.3.3.1 Tornado Loads

The tornado load effects consist of wind pressure, differential pressure, and tornado generated missile loads. The tornado parameters are as follows:

- Tornado parameters are equal to three-fifths of the Region 1 tornado parameters defined in Table 1 of RG 1.76, Rev. 1. The Region 1 maximum tornado wind speed and pressure drop per Table 1 of RG 1.76, Rev. 1 are 230 mph and 1.2 psi, respectively. Three-fifths of 230 mph equals 138 mph and three-fifths of 1.2 psi equals 0.72 psi.
- Tornado missile parameters are in accordance with Table 2 of RG 1.143 Revision 2 for RW-IIa classification

3H.3.4.3.4 Load Combinations

3H.3.4.3.4.1 Notations

S = Normal allowable stress for allowable stress design method

U = Required strength for strength design method

D = Dead load

F = Load due to weight and pressure of fluid with well-defined density and controllable maximum height

FL = Hydrostatic and hydrodynamic load due to flood

L = Live load

R_o = Piping and equipment reaction under normal operating condition (excluding dead load, thermal expansion and seismic)

T_o = Normal operating thermal expansion loads from piping and equipment

T_b = Upset thermal expansion loads from piping and equipment

H = Lateral soil pressure and groundwater effects

H' = Lateral soil pressure and groundwater effects, including dynamic effects

W = Wind load

W_t = Total tornado load, including missile effects

E_o = Earthquake load

3H.3.4.3.4.2 Structural Steel Load Combinations

$S = D + L + F + H + R_o + T_o$

$1.33S = D + L + F + H + R_o + T_b$

$1.33S = D + L + F + H + R_o + T_o + W$

$1.33S = D + L + F + H' + R_o + T_o + E_o$

$1.33S = D + L + F + H + R_o + T_o + FL$

$1.6S^{\text{(Note 1)}} = D + L + F + H + R_o + T_o + W_t$

For the computation of global seismic loads, the live load is limited to the expected live load present during normal plant operation which is defined as 25% of the normal floor and roof live loads. However, design of local elements such as beams and slabs is based on consideration of full normal live load.

Note 1: The stress limit coefficient in shear shall not exceed 1.4 in members and bolts.

3H.3.4.3.4.3 ~~3H.3.4.3.5.3~~ Reinforced Concrete Load Combinations

$U = 1.4D + 1.7L + 1.4F + 1.7H + 1.7R_o + 1.7T_o$

$U = 1.4D + 1.7L + 1.4F + 1.7H + 1.7R_o + 1.7T_b$

$U = 1.4D + 1.7L + 1.4F + 1.7H + 1.7R_o + 1.7T_o + 1.7W$

$U = 1.4D + 1.7L + 1.4F + 1.7H' + 1.7R_o + 1.7T_o + 1.7E_o$

$U = D + L + F + H + R_o + T_o + FL$

$U = D + L + F + H + R_o + T_o + W_t$

For the computation of global seismic loads, the live load is limited to the expected live load present during normal plant operation which is defined as 25% of the normal floor and roof live loads. However, design of local elements such as beams and slabs is based on consideration of full normal live load

3H.3.4.4 Materials

Structural materials used in the design of RWB are as follows:

3H.3.4.4.1 Reinforced Concrete

Concrete conforms to the requirements of ACI 349. Its design properties are:

- Compressive strength .... 4.0 ksi (27.6 MPa)
- Modulus of elasticity .... 3,597 ksi (24.8 GPa)
- Shear modulus .... 1,537 ksi (10.6 GPa)
- Poisson's ratio 0.17

3H.3.4.4.2 Reinforcement

Deformed billet steel reinforcing bars are considered in the design. Reinforcement conforms to the requirements of ASTM A615. Its design properties are:

- Yield strength .... 60 ksi (414 MPa)
- Tensile strength .... 90 ksi (621 MPa)

3H.3.4.4.3 Structural Steel

High strength, low-alloy structural steel conforming to ASTM A572, Grade 50 is considered in the design for wide-flange sections. The steel design properties are:

- Yield strength .... 50 ksi (345 MPa)
- Tensile strength .... 65 ksi (448 MPa)

3H.3.4.4.4 Steel Grating

Bearing bars conforming to ASTM A1011 are considered in the design. The design property is:

- Yield strength .... 30 to 50 ksi (207 to 345 MPa)

3H.3.4.4.5 Anchor Bolts

Material for anchor bolts conforms to the requirements of ASTM F1554, Grade 36. Its design properties are:

- Yield strength .... 36 ksi (248 MPa)
- Tensile strength .... 58 ksi (400 MPa)

3H.3.5 Structural Design and Analysis Summary

3H.3.5.1 Seismic Analysis

Two types of seismic analyses are performed for the RWB. The analysis and design of the RWB as well as the II/I design is performed using response spectrum analysis of a SAP2000 3D finite element model described in Section 3H.3.5.2. The II/I stability evaluation of the RWB is performed using the base shears and moments obtained from response spectrum analysis of a fixed base stick model described below. This fixed base stick model is also used for obtaining the seismic in-plane shears and moments of the exterior walls reported in Table 3H.3-1 and the structural frequencies reported in Table 3H.3-2.

~~The seismic analysis of the RWB is performed using a fixed base stick model. The~~ In the fixed base stick model, the structure is represented by a lumped-mass model consisting of structural masses lumped at selected nodes which are connected by massless elements representing the stiffness properties of the shear walls between the nodes. The building masses are lumped at elevations where the building weights are concentrated such as the floors and roof.

For modeling reinforced concrete shear wall elements, the shear walls in each particular vibration direction are identified. The stiffness of a shear wall along its length consists of a combination of its shear stiffness and its flexural stiffness, both of which are calculated individually and combined to obtain the stiffness of the wall.

~~The input motion of the seismic analysis is the Regulatory Guide 1.60 response spectra for 0.15g.~~

~~The RWB seismic design loads are shown in Table 3H.3-1. The RWB structural frequencies are shown in Table 3H.3-2.~~

3H.3.5.2 Analysis and Design

The analysis and design of the RWB is performed using a SAP2000 3D finite element model with shell and frame elements, as shown in Figures 3H.3-5 through 3H.3-7. The seismic loads are obtained from response spectrum analysis of this model. The input motion for this response spectrum analysis is the Regulatory Guide 1.60 response spectra for 0.15g.

Per Table 1 of RG 1.143 Revision 2, all concrete and steel designs are in accordance with the ACI 349-97 and ANSI/AISC N690, 1984 code requirements, respectively. ~~Also, for II/I design, the structure is conservatively designed to remain elastic.~~

The forces and moments at critical locations in the Radwaste Building along with the provided longitudinal and transverse reinforcement are included in Table 3H.3-3 for the exterior walls and Table 3H.3-4 for the basemat, roof slab, and operating floor (elevation 35'-0") slab. Figures 3H.3-8 through 3H.3-27 show the location of the reinforcement zones listed in Table 3H.3-3 for the exterior walls. Figures 3H.3-28 through 3H.3-42 show the location of the reinforcement zones listed in Table 3H.3-4 for the basemat, roof slab, and operating floor slab.

The structural steel member sizes, critical forces, safety margins, and governing load combinations for the operating floor beams, roof truss members, and roof purlins are shown in Table 3H.3-5. The layout of the operating floor steel beams is shown in Figures 3H.3-43 through 3H.3-46. The layout of the roof truss members and roof purlins are shown in Figure 3H.3-47. The typical east-west spanning truss and typical north-south spanning truss are shown in Figures 3H.3-48 and 3H.3-49, respectively.

3H.3.5.3 Seismic II/I Evaluation

The seismic II/I evaluation for the RWB is performed to ensure that the RWB will not collapse on the nearby Category I structures. ~~The structure is conservatively designed to remain elastic for this evaluation.~~The analysis and design for II/I is performed using a SAP2000 3D finite element model with shell and frame elements, as shown in Figures 3H.3-5 through 3H.3-7. The seismic loads are obtained from response spectrum analysis of this model. The earthquake input used at the foundation level is the envelope of 0.3g RG 1.60 response spectrum and the induced acceleration response spectrum due to site-specific SSE that is determined from an SSI analysis which accounts for the impact of the nearby Reactor Building (RB). In this SSI analysis, five interaction nodes at ~~the depth corresponding to the bottom elevation of the RWB foundation~~ground surface are added to the three dimensional SSI model of the RB. These five interaction nodes correspond to the four corners and the center of the RWB foundation. The average response of these five interaction nodes is enveloped with the 0.3g RG 1.60 spectra to determine the SSE input at the foundation level. The structure is conservatively designed to remain elastic for this evaluation.

For tornado parameters, including the missiles, the same parameters as those defined in DCD Tier 1 Table 5.0 are used. For flood, the extreme flood level of 40 ft (12.2 m) MSL is used, which is caused by the Main Cooling Reservoir dike breach. The evaluation requirements for this flood, including hydrodynamic and flooding debris loading, are included in Section 3.4.2.

The II/I stability evaluations for sliding and overturning are performed using the ~~site-specific SSE~~seismic input motion described in Section 3.7.2.8 and 3.7.3.16 and other site-specific parameters such as soil properties. The seismic demands for II/I stability evaluation are determined by response spectrum analysis of the fixed base stick model described in Section 3H.3.5.1. Figure 3H.3-52 outlines the methodology followed for the seismic II/I stability evaluation of the RWB.

3H.3.5.3.1 Load Combinations

The following load combinations, in addition to the extreme environmental load combinations from Sections 3H.3.4.3.4 are used for Seismic II/I considerations.

3H.3.5.3.1.1 Notations

E' = Safe Shutdown Earthquake load (as discussed in Section 3H.3.5.3 above) Other loads are as defined in Section 3H.3.4.3.4.1.

3H.3.5.3.1.2 Structural Steel Load Combinations

1.6S (Note 1) = D + L + F + H' + Ro + To + E'

For the computation of global seismic loads, the live load is limited to the expected live load present during normal plant operation which is defined as 25% of the normal floor and roof live loads.

Note 1: The stress limit coefficient in shear shall not exceed 1.4 in members and bolts.

3H.3.5.3.1.3 Reinforced Concrete Load Combinations

U = D + L + F + H' + Ro + To + E'

For the computation of global seismic loads, the live load is limited to the expected live load present during normal plant operation which is defined as 25% of the normal floor and roof live loads.

3H.5 Structural Analysis Reports

STD DEP T1 2.15-1

3H.5.3 Structural Analysis Report for the Reactor Building~~,~~ and Control Building ~~*and Radwaste Building Substructure (Including Seismic Category 1 Tunnels)*~~ (Including Seismic Category I Tunnels)

3H.5.4 Structural Analysis Report For the Reactor Building~~,~~ and Control Building ~~*and Radwaste Building*~~ Foundation

3H.5.5 Structural Analysis Report For The Radwaste Building (Including Radwaste Tunnels) and TheTurbine Building

STD DEP 1.8-1

STD DEP T1 2.15-1

The RW/B (including Radwaste Tunnels) and *T/B ~~is~~*are *not classified as ~~a~~ Seismic Category 1 structures.* ~~*However, the buildings*~~The T/B ~~*is*~~are *designed such that damage to safety-related functions does not occur under seismic loads corresponding to the safe shutdown earthquake (SSE) ground acceleration.* The RW/B (including Radwaste Tunnels) is designed per Regulatory Guide 1.143.

For material properties and dimensions, assess compliance of the as-built structure with design requirements in Section 3.7.3.16, Table 3.2-1 and *the* International Building Code (IBC)~~*Uniform Building Code (UBC)*~~ for the Turbine Building and Regulatory Guide 1.143 for the Radwaste Building (including Radwaste Tunnels)~~*and in the Table 3.2-1 and paragraph 3.7.3.16*~~*.*

Construction deviations and design changes will be assessed to determine appropriate disposition.

This disposition will be accepted "as-is," provided the following acceptance criteria are met:

- *The structural design meets the acceptance criteria and load combinations of* Section 3.7.3.16 and *the* IBC~~*UBC*~~ *code* for the Turbine Building and Regulatory Guide 1.143 for the Radwaste Building (including Radwaste Tunnels)*.*

~~*The* RW/B (including Radwaste Tunnels) and *T/B is*are *not classified as a Seismic Category 1 structures. However, the buildings is*are *designed such that damage to safety-related functions does not occur under seismic loads corresponding to the safe shutdown earthquake (SSE) ground acceleration.*~~

3H.5.6 Structural Analysis Report For The Ultimate Heat Sink/ Reactor Service Water Pump House Structure, Reactor Service Water Piping Tunnel and Diesel Generator Fuel Oil Storage Vault

A structural analysis report will be prepared. It will document the following activities associated to the construction materials and as-built dimensions of the structures:

(1) Review of construction records for material properties used in construction (i.e., in-process testing of concrete properties and procurement specifications for structural steel and reinforcing bars).

(2) Inspection of as-built structure dimensions.

For material properties and dimensions, assess compliance of the as-built structure with design requirements in the Subsection 3H.6 and in the detail design documents.

Construction deviations and design changes will be assessed to determine appropriate disposition.

This disposition will be accepted "as-is," provided the following acceptance criteria are met:

- The structural design meets the acceptance criteria and load combinations of Appendix 3H, Section 3H.6.
- The dynamic responses (i.e., spectra, shear forces, axial forces and moments) of the as-built structure are bounded by the spectra in Appendix 3H, Section 3H.6.

Depending upon the extent of the deviation or design changes, compliance with the acceptance criteria can be determined by either:

(a) Analyses or evaluations of construction deviations and design changes, or

(b) The design basis analyses will be repeated using the as-built condition.

3H.6 Site-Specific Seismic Category I Structures

The following site-specific supplement addresses site specific Seismic Category I structures.

3H.6.1 Objective and Scope

The objective of this appendix is to describe the structural analysis and design of the STP 3 & 4 site-specific seismic Category I structures that are identified below.

(1) Ultimate Heat Sink (UHS) for each unit consists of a water retaining basin with enclosed cooling towers situated above the basin and a Reactor Service Water (RSW) pump house that is integral with the UHS basin.

(2) RSW piping tunnel for each unit.

(3) Diesel Generator Fuel Oil Storage Vault for each unit.

The details of analysis and design for Items (1) and (2) are provided in Sections 3H.6.2 through 3H.6.6. The details for Item (3) are provided in Section 3H.6.7.

3H.6.2 Summary

A summary of the extreme environmental design parameters is presented in Table 3H.9-1.

For the design of the UHS basin and the pump house of each unit, the seismic effects were determined by performing a soil-structure interaction (SSI) analysis, as described in Subsection 3H.6.5. The free-field ground response spectra used in the analysis are described in Subsection 3H.6.5.1.1.1. The resulting seismic loads were used in combination with other applicable loads to develop designs of the structures. Hydrodynamic effects of the water in the basin were considered. The following results for the UHS/RSW Pump House are presented in tables and figures, as indicated. Results for the RSW Piping Tunnel are presented in Sections 3H.6.5.3 and 3H.6.6.2.2.

- Natural frequencies (Table 3H.6-3).

- Seismic accelerations (Table 3H.6-4).
- Seismic displacements (Table 3H.6-4).
- Floor response spectra (Figures 3H.6-16 through 3H.6-39).
- Factors of safety against sliding, overturning, and flotation (Table 3H.6-5).
- Combined forces and moments at critical locations in the structures along with required and provided rebar (Tables 3H.6-7 through 3H.6-9 and Figures 3H.6-51 through 3H.6-136).
- Lateral soil pressures for design (Figures 3H.6-41 through 3H.6-43, Figures 3H.6-218 through 3H.6-220, and Figures 3H.6-232 through 3H.6-240).
- Lateral soil pressures for stability evaluation during normal operation (Figures 3H.6-45 through 3H.6-50)
- Tornado evaluation results (Table 3H.6-10)

The final combined responses are used to evaluate the designs against the following criteria:

- Stresses in concrete and reinforcement are less than the allowable stresses in accordance with the applicable codes listed in Subsection 3H.6.4.1.
- The factors of safety against flotation, sliding, and overturning of the structures under various loading combinations are higher than the required minimum values identified in Subsection 3H.6.4.5.
- The calculated static and dynamic soil bearing pressures/displacements are less than the allowable values.
- The thickness of the roof slabs and exterior walls are more than the minimum required to preclude penetration, perforation, or spalling resulting from impact of design basis tornado missiles. In addition, the passage of tornado missiles through openings in the roof slabs and exterior walls is prevented by the use of missile-proof covers and doors, or the trajectory of missiles through ventilation openings is limited by labyrinth walls configured to prevent safety-related substructures and components from being impacted.

The RSW piping tunnel seismic analysis has been performed using SSI analysis, as discussed in Section 3H.6.5.3.

3H.6.3 Structural Descriptions

The site-specific Seismic Category I structures at STP 3 & 4 consist of one set of the following for each unit: UHS basin, enclosed UHS cooling towers located on top of the basin, RSW pump house contiguous with and adjacent to the UHS basin, and buried RSW piping tunnels and access shafts to the tunnels (see Figures 1.2-34 through

1.2-36). Each UHS basin and RSW pump house has a 10-ft (3.05-m) thick foundation mat and are connected at a common wall; and the RSW piping tunnels extend from the pump house to the Control Buildings. Each of these structures is described in more detail in the following subsections.

3H.6.3.1 Ultimate Heat Sink Basin

The UHS basin is a rectangular reinforced concrete structure with inner dimensions of 280 ft (85.34 m) by 132 ft (40.23 m) and serves as the reservoir for the RSW system. The walls of the basin are 6 ft (1.83 m) thick and extend from an elevation of 97.5 ft (29.72 m) MSL down to an elevation of 14 ft (4.27 m) MSL. The walls are braced by buttresses spaced at a maximum of 50 ft (15.24 m) and are supported on a 312 ft (95.10 m) by 164 ft (49.99 m) by 10 ft (3.05 m) thick mat foundation, poured on a lean concrete mud mat. The mud mat is poured directly on the in-situ soil. Each UHS includes three independent divisions of mechanical cooling towers, with two dedicated cooling towers in each division . The pump house is contiguous with the UHS basin and its walls extend from an elevation of -18 ft (-5.49 m) MSL to an elevation of 50 ft (15.24 m) MSL.

As noted in Subsection 9.2.5.5.2, the seepage loss estimated during the 30 days of operation following a design basis accident, with no makeup available, is within the acceptance criteria for standard hydrostatic test HST-025, as defined in ACI 350.1.

3H.6.3.2 Ultimate Heat Sink Cooling Tower Enclosures

The cooling tower enclosure for each unit is a reinforced concrete structure housing the equipment used to cool the water for the RSW system. The enclosure is located above the UHS basin and is supported by reinforced concrete columns anchored to the basin mat foundation. The enclosure is 292 ft (89.0 m) long by 52 ft (15.85 m) wide and extends from the top of the UHS basin walls to elevation 153 ft (46.63 m) MSL. Each enclosure is divided into six compartments or cells, with each compartment housing a fan and associated equipment. Openings are provided at the base of each compartment to allow for the flow of water. Each compartment includes a common basin at the base of the structure, air intake, and substructures and components used to cool the water (fill, drift eliminators, spray system piping and nozzles, and the associated concrete support beams). The air intakes for each compartment are located at the bottom of the enclosures and are configured to eliminate the trajectory of tornado missiles into the enclosures, thereby preventing damage to safety-related components. In addition, each compartment includes a reinforced concrete fan deck that supports the fan and the associated motor. Finally, heavy steel grating, which is supported by structural steel beams, is installed at the top of each compartment. This grating allows for the passage of air out of the compartment and prevents the intrusion of tornado wind-borne missiles.

3H.6.3.3 Reactor Service Water Pump Houses

The two RSW pump houses are reinforced concrete structures that are continguous with the UHS basins and house the RSW pumps (six pumps per pump house, with three RSW divisions, and two pumps per division) and their associated auxiliaries.

Each set of pumps extracts water for the RSW system from the basin. The operating floor of each pump house is divided into three separate rooms (one per RSW division), each containing two pump drivers and associated equipment, including self-cleaning strainers. There is also an access tunnel through which the RSW system piping is routed to and from the corresponding control building.

The exterior walls of each pump house and the interior walls dividing the pump bay are integral with the UHS basin walls. The pump bay for each pump house measures approximately 44 ft (13.41 m) by 72 ft (21.95 m) in plan with the top of the bay slab being located at elevation -18ft (-5.49 m). The operating floor is at elevation 14 ft (4.27 m) and measures 138 ft (42.06 m) by 72 ft (21.95 m) in plan. Covered openings are provided in the roof of each pump house, which is located at elevation 50 ft (15.24 m), to allow for the removal of the six pumps.

3H.6.3.4 Reactor Service Water Piping Tunnels

The three RSW piping tunnels, one for each RSW division, are reinforced concrete structures configured in a stacked arrangement. The tunnel is 17’-0” (5.18 m) wide and has an overall height of 40’-0” (12.2 m) high. They extend from each pump room to the control building. The three tunnels are separated by reinforced concrete slabs, which serve to isolate the supply and return lines and associated equipment for each of the three divisions. Access to the tunnels from the surface, for inspections and maintenance activities, is provided by reinforced concrete personnel access shafts. The interfaces between the tunnels and the pump houses and control buildings are configured to allow relative movement between the tunnels and structures.

3H.6.4 Structural Design Criteria

3H.6.4.1 Design Codes and Standards

- Code Requirements for Nuclear Safety-Related Concrete Structures (ACI 349), as supplemented by RG 1.142
- Code Requirements for Environmental Engineering Concrete Structures (ACI 350)
- American National Standard Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities (ANSI/AISC N690)
- Tightness Testing of Environmental Engineering Concrete Structures (ACI 350.1)
- Minimum Design Loads for Buildings and Other Structures (ASCE/SEI 7)
- Seismic Analysis of Safety-Related Nuclear Structures and Commentary (ASCE 4)
- Structural Welding Code – Steel (AWS D1.1)
- Regulatory Guide 1.76, Design Basis Tornado and Tornado Missiles for Nuclear Power Plants

- Regulatory Guide 1.61 – Damping Values for Seismic Design of Nuclear Power Plants

3H.6.4.2 Site Design Parameters

3H.6.4.2.1 Soil Parameters

- Poisson's ratio (above groundwater): 0.42
- Poisson's ratio (below groundwater): 0.47
- Unit weight (moist): ....120 pcf (1.92 t/m^3)
- Unit weight (saturated): ....140 pcf (2.24 t/m^3)
- Liquefaction potential: ....None
- Static Soil Bearing Capacity: .... See FSAR Subsection 2.5S.4.10
- *Dynamic Soil Bearing Capacity: .... See FSAR Subsection 2.5S.4.10

3H.6.4.2.2 Design Groundwater Level

Design groundwater level is at elevation 28 (8.53 meters) MSL. This elevation bounds the groundwater elevation defined in FSAR Subsection 2.4S.12.

3H.6.4.2.3 Design Flood Level

Design flood basis level is at 12.2 meters MSL. This elevation is defined in Subsection 2.4S.2.2.

3H.6.4.2.4 Maximum Snow Load

Normal roof snow load is 6.6 psf. Extreme roof snow load is 13.2 psf.

3H.6.4.2.5 Maximum Rainfall

Design rainfall is 19.8 in/hr (503 mm/hour) in accordance with Subsection 2.3S.1.3.4. The roof of each pump house is designed without parapets so that excessive ponding of water cannot occur. Such roof design meets the provisions of RG 1.102.

3H.6.4.3 Design Loads and Load Combinations

3H.6.4.3.1 Normal Loads

Normal loads are those that are encountered during normal plant startup, operation, and shutdown.

3H.6.4.3.1.1 Dead Loads (D)

Dead loads include the weight of the structure, permanent equipment, and other permanent static loads. An additional 50 psf (2.39 kPa) uniform load is considered to account for dead loads due to piping, raceways, grating, and HVAC duct work.

3H.6.4.3.1.2 Live Loads (L and L_o)

Live loads include floor and roof area loads, movable loads, and laydown loads. The only areas of the site-specific Category I structures requiring consideration of a live load are the floors of RSW Tunnels and the operating floor and roof of the pump houses. While a normal live load of 200 psf (9.6 kPa) is defined for the floors of RSW Tunnels and the operating floor of pump houses, a live load of 50 psf (2.4 kPa) is defined for the roof of pump houses.

For the computation of global seismic loads, the live load is limited to the expected live load present during normal plant operation, L_o. This load has been defined as 25% of the operating floor and roof live loads. However, design of local elements such as beams and slabs is based on consideration of full normal live load.

3H.6.4.3.1.3 Snow Loads

The normal roof snow load is 6.6 psf.

3H.6.4.3.1.4 Lateral Soil Pressures (H)

Lateral soil pressures are calculated using the following soil properties.

- Unit weight (moist):..120 pcf (1.92 t/m^3)
- Unit weight (saturated): ....140 pcf (2.24 t/m^3)
- Internal friction angle: ....30°
- Poisson’s ratio (above groundwater).. 0.42
- Poisson’s ratio (below groundwater) 0.47
- Surcharge load including the effect of adjacent structures, where applicable.

The calculated lateral soil pressures are presented in figures as indicated:

- Lateral soil pressures for design of UHS/RSW Pump House: Figures 3H.6-232 through 3H.6-240.
- Lateral Soil pressures for design of RSW Piping Tunnels: Figure 3H.6-44 and Figures 3H.6-245 through 3H.6-247.
- Lateral soil pressures for stability evaluation of UHS/RSW Pump House during normal operation: Figures 3H.6-45 through 3H.6-50.

3H.6.4.3.1.5 Thermal Loads (T_o)

The RSW piping tunnels are not subjected to any thermal loads. Thermal gradient loads and thermal axial loads are applied to the UHS/RSW Pump House finite element model for six (6) separate thermal conditions.

The following temperature values are applicable to all six (6) thermal conditions:

- Reference concrete placement temperature ....60°F
- Soil temperature ....70°F
- Pump house inside air temperature..90°F

The basin water temperature and the outside air temperature for the six (6) thermal conditions are as follows:

(1) Winter – Accident Basin Water Temperature

- Basin water temperature ....95°F
- Outside air temperature...24°F

(2) Winter – Minimum Basin Water Temperature

- Basin water temperature ....50°F
- Outside air temperature...24°F

(3) Winter - Typical Operating Temperatures

- Basin water temperature ....55°F
- Outside air temperature...45°F

This thermal condition is applicable only for the basin basemat and basin walls below the 71 ft maximum water level with ACI 350-01 durability factors. Per Section 9.2.7 of ACI 350-01, estimation of contraction, expansion, and temperature change should be based on realistic assessment of such effects occurring in service. Section R.9.2.7 of ACI 350-01 specifically states that the term “realistic assessment” is used to indicate the most probable values rather than the upper bound values.

(4) Summer - Accident Basin Water Temperature

- Basin water temperature ....95°F
- Outside air temperature...90°F

(5) Summer – Minimum Basin Water Temperature

- Basin water temperature ....60°F
- Outside air temperature..90°F

(6) Summer – Typical Operating Temperatures

- Basin water temperature ....95°F
- Outside air temperature..90°F

This thermal condition is applicable only for the basin basemat and basin walls below the 71 ft maximum water level with ACI 350-01 durability factors. Conservatively, the summer accident temperatures are considered as the typical summer operating temperatures.

3H.6.4.3.1.6 Hydrostatic Loads(F)

This load is only applicable to UHS/RSW Pump House. The hydrostatic load due to water inside the UHS basin is calculated considering the maximum water height of 71 ft above the top of the UHS basin basemat. The maximum hydrostatic pressure is 4.43 ksf at the top of UHS basin basemat elevation. An empty basin case is also considered with the UHS basin conservatively considered completely empty.

3H.6.4.3.2 Severe Environmental Load

The severe environmental load considered in the design is that generated by wind. The following parameters are used in the computation of the wind loads:

- Basic wind speed (100 year recurrence interval, 3-second gust):............. 134 mph (215 km/h)
- Exposure: C
- Importance factor: 1.0

  (Importance Factor of 1.15 is used to convert the velocity pressure due to 50-year wind speed to the velocity pressure due to the 100-year wind speed of 134 mph in accordance with the requirements of ASCE 7-05. In calculating the velocity pressure with the ASCE 7-05 Equation 6-15, Importance Factor of 1.0 is used with the 100-year wind speed of 134 mph.)

- Velocity pressure exposure coefficient as per ASCE 7 Table 6-3, but $\geq$ 0.87
- Topographic factor 1.0
- Wind directionality factor 1.0

Wind loads will be calculated in accordance with the provisions of Chapter 6 of ASCE 7.

3H.6.4.3.3 Extreme Environmental Load

Extreme environmental loads consist of loads generated by the tornado, extreme snow load, flooding and safe shutdown earthquake (SSE).

3H.6.4.3.3.1 Tornado Loads (Wt)

The following tornado load effects are considered in the design:

- Wind speed .... (W_w)
- Differential pressure .... (W_p)
- Missile impact .... (W_m)

Parameters used in computation of tornado loads are as follows (see Tables 1 and 2 of RG 1.76, for Region II):

- Maximum wind speed: .... 200 mph (322 km/h)
- Maximum rotational speed: .... 160 mph (257 km/h)
- Maximum translational speed: .... 40 mph (64 km/h)
- Radius of maximum rotational speed: .... 150 ft (45.7 m)
- Differential pressure: .... 0.9 psi (6.2 kPa)
- Pressure differential rate: .... 0.4 psi/s (2.8 kPa/s)
- Missile spectrum: .... (See Table 2 of RG 1.76)

(1) Tornado Wind Pressure (W_w)

With the exception of the RSW piping tunnel, which does not require the consideration of a tornado wind pressure, tornado wind pressures are computed using the procedure described in Chapter 6 of ASCE 7, in conjunction with the maximum wind speed defined above and the following parameters:

- Importance factor 1.15
- Velocity pressure exposure coefficient 0.87
- Topographic factor 1.0
- Wind directionality factor 1.0

(2) Tornado Differential Pressure (W_p)

The designs of the UHS basin, UHS cooling tower, and the RSW piping tunnel do not require the consideration of a tornado differential pressure. RSW pump house and RSW piping tunnel access shafts are evaluated for the specified differential pressure.

(3) Tornado Missile Impact (W_m)

All structures are evaluated for the effects of missile impact.

Tornado missile impact effects on the UHS basin and cooling tower enclosures, RSW pump houses, and RSW tunnels including access shafts are evaluated for the following two conditions:

(a) For concrete barriers, local damage in terms of penetration, perforation, and spalling, is evaluated using the TM 5-855-1 formula (Reference 3H.6-1). For steel barriers, local damage prediction is performed using the Ballistic Research Laboratory (BRL) formula (Reference 3H.6-2).

(b) Global overall damage evaluations are performed in accordance with Revision 3 of SRP 3.5.3. In these evaluations, the tornado loads (i.e. W_t) to be included in combination with other applicable loads are per combination $W_t = W_w + 0.5W_p + W_m$.

For any critical missile hit location considered, the structure is analyzed for the resulting equivalent static load due to tornado missile impact in conjunction with tornado wind pressure and 50% of tornado differential pressure. The resulting induced forces and moments from this analysis are combined with the induced forces and moments due to other applicable loads within the load combination to determine the total demand for design of the structural elements.

(4) Tornado Load Combinations

Tornado load effects are combined as follows:

$$W_t = W_p$$

$$W_t = W_w + 0.5W_p + W_m$$

3H.6.4.3.3.2 Safe Shutdown Earthquake Loads (E')

The SSE loads are applied in three mutually orthogonal directions— two horizontal directions and the vertical direction. The total structural response is predicted by combining the applicable maximum co-directional responses in accordance with RG 1.92.

The SSE loads are based on seismic analysis using the ground motion response spectra defined in Subsection 3H.6.5.1.1.1. The loads consist of vertical forces, horizontal forces, torsional moments, and overturning moments.

The SSE induced loads also include the hydrodynamic effect of the water in the UHS basin. This hydrodynamic effect was calculated based on the methodology included in Section 3.1.6.3 of ASCE 4 and TID 7024, referenced in the commentary section of ASCE 4.

3H.6.4.3.3.3 Lateral Soil Pressures Including the Effects of SSE (H')

The calculated lateral soil pressures including the effects of SSE are presented in figures as indicated:

- Lateral soil pressures for design of UHS/RSW Pump House: Figures 3H.6-41 through 3H.6-43 and Figures 3H.6-218 through 3H.6-220.
- Lateral Soil pressures for design of RSW Piping Tunnels: Figure 3H.6-44 and Figures 3H.6-212 through 3H.6-217.
- Lateral soil pressures for stability evaluation of UHS/RSW Pump House during normal operation: Figures 3H.6-45 through 3H.6-50.

3H.6.4.3.3.4 Extreme Environmental Flood (FL)

The design basis flood level is 40.0 ft MSL, in accordance with Subsections 2.4S.2.2 and 3H.6.4.2.3. The flood water unit weight, considering maximum sediment concentration, is 63.85 pcf per Section 2.4S.4.2.2.4.3. The design requirements for this flood, including hydrostatic, hydrodynamic, and floating debris loading, are included in Section 3.4.2.

3H.6.4.3.3.5 Extreme Snow Load (S_E)

Per FSAR Section 2.3S.1.3.4, the ground snow load for both normal winter precipitation event and extreme frozen winter precipitation is 5.5 psf. ISG-7 provides guidance for converting the ground snow load to roof snow load using methodology provided in ASCE 7-05. ASCE 7-05 utilizes an exposure factor (C_e), a thermal factor (C_t), and an importance factor (I) as multipliers for converting ground snow load to roof snow load using Equation 7-1 in Section 7.3. ISG-7 also provides recommended values for these three coefficients to be used in Equation 7-1. As noted in ISG-7, pages 9 and 10, the coefficients to be used in Equation 7-1 of ASCE 7-05 are (C_e=1.1), (C_t=1.0), and (I=1.2). Using these values for the coefficients in Equation 7-1 of ASCE 7-05, and the limitation for minimum value provided in Section 7.3 of ASCE 7-05, the roof snow load is determined to be 6.6 psf, corresponding to a ground snow load of 5.5 psf.

Per ISG-7, the extreme winter precipitation shall be the larger of the following two cases:

Case 1: Normal winter precipitation + Extreme frozen winter precipitation

Case 2: Normal winter precipitation + Extreme liquid winter precipitation

Per FSAR Section 2.3S.1.3.4, the extreme liquid winter precipitation is 34 inches (or 177 psf). Assuming that both the roof drains and scuppers are clogged, Case 1 will yield a loading of 6.6 + 6.6 = 13.2 psf and Case 2 will yield a loading of 6.6 + 177 = 183.6 psf. However, since the roofs of site-specific structures are designed without parapets (see Section 3H.6.4.2.5), for site-specific Category I structures, the extreme winter precipitation can not exceed Case 1 loading of 13.2 psf

3H.6.4.3.3.6 Accident Temperature (T_a)

UHS Basin Water temperature (95°F) during accident condition.

3H.6.4.3.4 Load Combinations

The load combinations and structural acceptance criteria used to evaluate the site-specific Category I concrete structures are consistent with the provisions of ACI 349, as supplemented by RG 1.142 as well as ACI 350. Loads R_a, P_a, Y_r, Y_j, and Ym, as defined in ACI 349, are not applicable to the evaluation of the site-specific seismic Category I structures since there are no high energy line breaks associated with the site-specific Category I concrete structures; therefore these loads are not included in the load combinations defined below.

3H.6.4.3.4.1 Notation

S	=	Allowable stress for allowable stress design method
U	=	Required strength for strength design method
D	=	Dead load
F	=	Hydrostatic load
L	=	Live load
L_o	=	Live load concurrent with SSE
FL	=	Static and dynamic effects due to extreme environmental flood
S_E	=	Extreme snow load
H	=	Lateral soil pressure and groundwater effects
H'	=	Lateral soil pressure and groundwater effects, including dynamic effects of SSE
W	=	Wind load
Wt	=	Tornado load
E'	=	SSE load, including associated hydrodynamic loads

R_o = Piping and equipment reactions

T_o = Internal moments and forces caused by temperature distributions

T_a = Accident temperature

3H.6.4.3.4.2 Structural Steel Load Combinations

S = $D + L + H + F + R_o + T_o$

S = $D + L + W + R_o + H + F + T_o$

1.6S = $D + L + Wt + H + R_o + F + T_o$

1.6S = $D + L + FL + H + R_o + F + T_o$

1.6S = $D + L + E' + H' + R_o + F + T_o$

1.6S = $D + L + S_E + R_o + H + F + T_o$

For the computation of global seismic loads the live load is limited to the expected live load present during normal plant operation which is defined as 25% of the operating floor and roof live loads. However, design of local elements such as beams and slabs is based on consideration of full normal live load.

3H.6.4.3.4.3 Reinforced Concrete Load Combinations

U = $1.4D + 1.4F + 1.7L + 1.7H + 1.7\ R_o$

U = $1.4D + 1.4F + 1.7L + 1.7H + 1.7W + 1.7\ R_o$

U = $D + F + L + H' + T_a + E'$

U = $D + F + L + H + T_o + R_o + W_t$

U = $D + F + L + H' + T_o + R_o + E'$

U = $1.05D + 1.05F + 1.3L + 1.3H + 1.2T_o + 1.3R_o$

U = $1.05D + 1.05F + 1.3L + 1.3H + 1.3W + 1.2T_o + 1.3R_o$

U = $D + F + L + H + T_o + R_o + FL$

U = $D + F + L + H + T_o + R_o + S_E$

For the computation of global seismic loads the live load is limited to the expected live load present during normal plant operation which is defined as 25% of the operating floor and roof live loads. However, design of local elements such as beams and slabs is based on consideration of full normal live load.

3H.6.4.3.4.4 ACI 350 Reinforced Concrete Load Combinations for UHS Basin Design

ACI 350 requirements are applicable to portions of environmental engineering concrete structures where durability, liquid-tightness, or similar serviceability are considerations. Therefore, the ACI 350 requirements and load combinations listed in this section are applicable only to the UHS basemat and basin walls below the maximum water level elevation.

Per ACI 350, although fluid densities and heights are usually well known, the load factor for fluid loads should be taken as 1.7 as part of the concept of environmental durability and long-term serviceability. ACI 350 states that the required strength from ACI 350 load combinations shall be multiplied by the following environment durability factors:

- Flexural strength.. 1.3
- Axial tension (including hoop tension)... 1.65
- Excess shear strength carried by shear reinforcement..................................... 1.3

In addition to the reinforced concrete load combinations listed in Section 3H.6.4.3.4.3, the UHS basemat and basin walls below the maximum water level elevation are also designed for the load combinations listed below with ACI 350 durability factors applied. Except durability factors need not be applied for the hydrostatic leak-tightness testing condition, which is a temporary loading where environmental durability and long term serviceability are not required. The hydrostatic leak-tightness testing load combination uses a load factor of 1.4 on the fluid load because it is not a long-term serviceability condition that requires a load factor of 1.7. Per ACI 350, durability factors need not be applied to load combinations that include earthquake loads. As stated in Section 3H.6.4.3.1.5, the design thermal loads used in ACI 350 load combinations should be based on most probable temperature values, rather than the upper bound temperature values.

$U = 1.4D + 1.7F + 1.7L + 1.7H$

$U = 1.4D + 1.7F + 1.7L + 1.7H + 1.7W$

$U = 1.4D + 1.4F + 1.7W$ (Hydrostatic leak-tightness testing)

$U = 1.4D + 1.7F + 1.4\ T_o + 1.3H$

3H.6.4.4 Materials

Structural materials used in the design of the site-specific Category I structures are as follows:

3H.6.4.4.1 Reinforced Concrete

Concrete conforms to the requirements of ACI 349. Its design properties are:

- Compressive strength .... 4.0 ksi (27.6 MPa)
- Modulus of elasticity .... 3,597 ksi (24.8 GPa)
- Shear modulus .... 1,537 ksi (10.6 GPa)
- Poisson's ratio 0.17

3H.6.4.4.2 Reinforcement

Deformed billet steel reinforcing bars are considered in the design. Reinforcement conforms to the requirements of ASTM A615. Its design properties are:

- Yield strength .... 60 ksi (414 MPa)
- Tensile strength .... 90 ksi (621 MPa)

3H.6.4.4.3 Structural Steel

High strength, low-alloy structural steel conforming to ASTM A572, Grade 50 is considered in the design. The steel design properties are:

- Yield strength .... 50 ksi (345 MPa)
- Tensile strength .... 65 ksi (448 MPa)

3H.6.4.4.4 Steel Grating

Bearing bars conforming to ASTM A1011 are considered in the design. The design property is:

- Yield strength .... 30 to 50 ksi (207 to 345 MPa)

3H.6.4.4.5 Anchor Bolts

Material for anchor bolts conforms to the requirements of ASTM F1554, Grade 36. Its design properties are:

- Yield strength .... 36 ksi (248 MPa)
- Tensile strength .... 58 ksi (400 MPa)

3H.6.4.5 Stability Requirements

The following minimum factors of safety are required against overturning, sliding, and flotation:

Load Combination	Overturning	Sliding	Flotation
D + F'	–	–	1.1
D + H + W	1.5	1.5	–
D + H + W_t	1.1	1.1	–
D + H' + E'	1.1	1.1	–

Loads D, H, H', W, W_t, and E' are defined in Subsection 3H.6.4.3.4.1. F' is the buoyant force corresponding to the flood water level.

3H.6.5 Seismic Analysis

3H.6.5.1 Seismic Design Parameters

3H.6.5.1.1 Design Ground Motion

3H.6.5.1.1.1 Design Response Spectra

Site-specific horizontal and vertical ground motion response spectra (GMRS) for the SSE are developed for the STP 3 & 4 site. The development of these spectra is documented in Subsection 2.5S.2.

For the seismic analysis of the site-specific structures, free field ground surface response spectra (Input Spectra) were developed, in the horizontal and vertical directions, by modifying the 0.13g Regulatory Guide 1.60 response spectra. The Input Spectra are the same as the 0.13g Regulatory Guide 1.60 spectra for frequencies equal to and higher than 2.5 Hz for the horizontal spectrum, and 3.5 Hz for the vertical spectrum. For frequencies lower than 2.5 Hz for the horizontal spectrum, and 3.5 Hz for the vertical spectrum, the Regulatory Guide spectra were increased to envelop the GMRS. These Input Spectra are defined as the site specific design SSE spectra (see Section 3.7.1) and were developed to meet the following requirements:

a. The Input Spectra shall envelop the GMRS. See Figures 3H.6-1 and 3H.6-2 showing that the Input Spectrum envelops the GMRS in the horizontal and vertical directions, respectively.

b. When a deconvolution analysis is performed in the SHAKE program with the Input Spectrum applied at the free field ground surface, the resulting response spectrum at the outcrop of each Seismic Category I foundation will envelop the foundation input response spectrum (FIRS) developed using the same probabilistic approach and model which was used to develop the GMRS. A detailed description of the seismic wave transmission of the site, and the procedure used to calculate the GMRS, which is the same for the development of FIRS, is provided in FSAR Sections 2.5S.2.5 and 2.5S.2.6, respectively. See Figures 3H.6-3 through 3H.6-11 for a comparison of the outcrop response spectra, resulting from the application of the time histories consistent with the Input Spectra at the free field ground surface in SHAKE, and the FIRS for the UHS basin, RSW tunnel, and RSW pump house foundations, in the two horizontal and vertical directions. These figures show that the FIRS are enveloped by the foundation outcrop spectra in all cases.

c. The response spectrum at the SHAKE outcrop of each Seismic Category I foundation envelops a broad band spectrum anchored at 0.1g. This is the minimum requirement as stated in SRP 3.7.1 and Appendix S to 10 CFR 50, “Earthquake Engineering Criteria for Nuclear Power Plants”. The broad band spectrum used in our analysis is conservatively defined as the Regulatory Guide 1.60 spectrum anchored at 0.1g. See Figures 3H.6-3 through 3H.6-11, which demonstrate that this requirement is met for the UHS basin, RSW tunnel, and RSW pump house foundations, in the two horizontal and vertical directions.

It should be noted that the embedment depths shown in Section 3H.6.5.1.3 for the RSW Pump House and RSW Piping Tunnel are based on the current design. For the SSI analysis of UHS/RSW Pump House these elevations were used. However, the comparisons shown in Figures 3H.6-3 through 3H.6-11 are at elevations based on the design when the FIRS were developed. Although there is some difference in these elevations, from the review of Figures 3H.6-3 through 3H.6-11, and Figures 3A-233 through 3A-250 in Appendix 3A, it is evident that the requirements stated in (b) and (c) above are met for a wide range of elevations, starting from the deepest embedment of the Reactor Building to the shallowest embedment of the UHS Basin. Therefore, it is concluded that these two requirements are also met for the current embedment depths for the RSW Pump House and RSW Piping Tunnel, shown in Section 3H.6.5.1.3.

3H.6.5.1.1.2 Design Time Histories

Synthetic acceleration time histories consistent with the Input Spectra defined and discussed in Subsection 3H.6.5.1.1.1 were developed, using the 1952 Taft Earthquake Time Histories as seed, for use as input to the seismic analysis. A single set of time histories (two horizontal and one vertical) was developed satisfying the enveloping requirements of Option 1, Approach 2 of SRP 3.7.1, Section II (Acceptance Criteria), Revision 3. Per paragraph 2(d) of Approach 2, in lieu of the power spectrum density requirement, the requirement that the computed 5% damped response spectrum of the Synthetic time history does not exceed the target response spectrum at any frequency by more than 30% was met. In the time history method of analysis, the two horizontal and the vertical time histories were applied separately (not applied simultaneously) and the maximum responses were combined using the square-root-of-the-sum-of-the-squares (SRSS) or the 100-40-40 percent spatial combination rule. Therefore, per Regulatory Guide 1.92, Revision 2, statistical independence of the three time histories (cross-correlation coefficient requirement) is not required.

Figures 3H.6-12 through 3H.6-14 show the comparison of the response spectrum for the Synthetic time history, the Input Spectrum, and 1.3 times the Input Spectrum, in the two horizontal and vertical directions. The response spectra of synthetic time histories were calculated for comparison with target spectra at 275 frequency points with spacing as shown in Tables 3H.6-2d through 3H.6-2f. As shown in Tables 3H.6-2d through 3H.6-2f, the 5% damped response spectra of the synthetic time histories do not fall more than 10% below the target response spectrum at any frequency.

The time step and duration of the synthetic time histories are 0.005 seconds and 22 seconds, respectively. When the time histories are input in SSI analysis using SASSI2000 program, trailing zeros are added at the end of 22 seconds to yield a total duration of 40.96 seconds (the time step of trailing zeros is also 0.005 seconds).

The duration of the time histories for Arias Intensity to rise from 5% to 75% is 11.2 seconds for the two horizontal design time histories and 12.2 seconds for the vertical design time history. For the characteristic earthquake time history this duration is calculated to be 20 to 45 seconds. The shorter duration for the design time histories is acceptable because:

(a) The SRP requires that synthetic time histories be derived from recorded time histories from recorded earthquakes. Strong motion recorded earthquake with a 20 – 45 seconds duration of the time histories for Arias Intensity to rise from 5% to 75% are not readily available to be used for the seed time histories to generate the synthetic time histories.

(b) The time histories are being used for linear elastic analyses. For linear analysis, the duration of the time histories is not critical provided the duration is comparable to recorded strong motion earthquakes and the time history spectra closely matches the target response spectra. For the design time histories, the duration is consistent with the Taft Earthquake and the time history closely matches the target response spectra.

For the characteristic earthquake V/A is calculated as 52 to115 cm/sec/g and AD/V^2 is calculated as 2.03 to 5.28. For the design time histories, the V/A is 230, 288, and 167 cm/sec/g for the two horizontal and the vertical time histories respectively and the AD/V^2 values are 2.08, 1.89, and 3.02 respectively. This variation between the design time histories and the characteristic earthquake is due to the conservative design response spectra described in Section 3H.6.5.1.1.1. The design response spectra is a 0.13g RG 1.60 spectra with enhanced low frequency content to account for the very deep soil site. The comparison of the V/A and the AD/V^2 value of the characteristic earthquake and the conservative design response spectra shows that the design response spectra has a higher energy (greater maximum Velocity).

3H.6.5.1.2 Percentage of Critical Damping Values

The percentages of critical damping values considered in the seismic analysis for site-specific seismic Category I structures and associated systems and components are the same as listed in DCD Table 3.7-1. The damping values are the same as in Regulatory Guides 1.61 and 1.84, except for the cable trays and conduits, as explained in DCD Section 3.7.1.3. The OBE damping values were used for the generation of in-structure response spectra (ISRS) for all site-specific seismic Category I structures. The only exception is the cracked case SSI analysis for the Reactor Service Water (RSW) Piping Tunnels where SSE damping (i.e. 7%) was used because of high stress levels. All other SSI analysis cases of RSW Piping Tunnels used OBE damping (i.e. 4%) damping.

The strain-compatible, soil-damping values considered in the seismic analysis are discussed in Subsection 3H.6.5.2.4.

3H.6.5.1.3 Supporting Media for Seismic Category I Structures

Soil conditions at the STP 3 & 4 site are described in Subsection 2.5S.4. The soil at the site extends down several thousand feet and consists of alternating layers of clay, silt, and sand. Soil layering characteristics, geophysical shear wave velocity, unit weight, and Poisson's ratio are included in Table 2.5S.4-27. Based on the site groundwater conditions originally described in Section 2.4S.12, the groundwater elevation of approximately 8 ft below grade (26 feet MSL) was used in computing soil properties for the SSI analysis. Subsection 2.4S.12 and Table 2.0-2 now state the groundwater elevation as 28 feet MSL. ~~Therefore, a sensitivity analysis of this change in groundwater elevation was performed, which showed no significant effect on the analysis results.~~The implementation of this change in the seismic analysis is discussed in Sections 3H.6.5.2.4.3 and 3H.6.5.3.

The SASSI2000 soil model, for the UHS basin and RSW pump house, included soil down to a minimum of two times the maximum plan dimension of the building below the basemat. The bottom boundary of the model was considered to have an elastic half space condition.

The characteristic dimensions of the above grade site-specific seismic Category I structures are summarized below:

Structure	Embedment Depth to Bottom of Foundation Mat [1]	Maximum Height[1]	Base Dimensions
UHS Basin	32 ft (9.75 m)	95.5 ft (29.1 m)	312 ft (95.10 m) x 164 ft (49.99 m) x 10 ft (3.05 m) thick foundation
UHS Cooling Towers	[2]	151 ft (46.0 m)	N/A
RSW Pump Houses Pump Bays	64 ft (19.5 m)	80 ft (24.4 m)	94 ft (28.65 m) x 170 ft (51.82 m)
RSW Piping Tunnel	44 ft (13.4 m)	42 ft (12.8 m) [3]	17 ft (5.2 m) wide

[1] As measured from the bottom of the foundation mudmat.

[2] Located above the basin and supported on columns.

[3] The access shafts for the tunnels extends to a maximum height of approximately 66 ft above the bottom of the foundation mudmat.

3H.6.5.2 Seismic System Analysis

The following Subsections 3H.6.5.2.1 through 3H.6.5.2.14 describe the seismic analysis of the UHS and RSW pump house structures. Subsection 3H.6.5.3 describes the seismic analysis of the RSW piping tunnel.

3H.6.5.2.1 Seismic Analysis Methods

The seismic analysis of the UHS basin and RSW pump house structures was performed using a frequency-domain time history analysis as described in DCD Appendix 3A using SASSI2000. Analyses were performed for three orthogonal (two horizontal and one vertical) directions and account for the translational, rocking, and torsional responses of the structures and foundations.

3H.6.5.2.2 Natural Frequencies and Responses

The natural frequencies up to 33 Hz for the UHS/RSW Pump House are presented in Table 3H.6-3. Accelerations and displacements at key locations are provided in Table 3H.6-4. The SSE loads at select locations are provided in Table 3H.6-4a. Response spectra at the major equipment elevations and support points are provided in Figures 3H.6-16 through 3H.6-39. Combined forces and moments at critical locations, along with required and provided reinforcements, are provided in Tables 3H.6-7 through 3H.6 9.

The analysis of RSW Piping Tunnels is presented in Section 3H.6.6.2.2.

3H.6.5.2.3 Procedures for Analytical Modeling

The seismic analysis of the UHS basin and enclosed cooling tower as well as RSW pump house for each unit was performed using a three-dimensional finite element model presented in Figure 3H.6-40. The material properties for concrete elements of the model are presented in Section 3H.6.4.4.1. Uncracked concrete section was used for member stiffness. Another case with cracked concrete section properties was analyzed. The section modulus of the cracked concrete was based on 50% of the uncracked section modulus. For structural steel elements the Young's Modulus of $29x10_6$ psi and Poisson's ratio of 0.3 was used. The model consists primarily of plate elements that represent the reinforced concrete walls, buttresses, and foundation as well as the walls and slabs of the basin, cooling towers, and pump house. Beam elements were used to represent concrete columns and beams. Finally, solid elements were used to represent the basin and pump houses house basemat. The floor and wall flexibility was modeled in the finite element model. The structural model mesh size is detailed enough to model the principal features of the structure and transmit frequencies of at least 33 Hz. The analysis was performed in the frequency domain as described in DCD Appendix 3A. The input time histories were defined at a time step of 0.005 seconds. The same time step was used for generation of the in-structure response spectra.

The mass of the structures was represented primarily by the density of the plate, beam, and solid elements comprising the model. The dead load of the structures and major equipment (fans and pumps) was included along with a 50 psf load to account for the attached piping, grating, electrical cable trays and conduits, HVAC duct work etc., as described in Section 3H.6.4.3.1.1. In addition, as described in Section 3H.6.4.3.1.2, 25% of the floor live load was also included. The damping values consistent with Regulatory Guide 1.61 were used as described in Section 3H.6.5.1.2. The impulsive water mass was calculated using the procedure described in Commentary Subsection C3.5.4 of ASCE 4-98, and was included in the model.

3H.6.5.2.4 Soil-Structure Interaction

The following describes the soil-structure-interaction (SSI) analysis for the UHS/RSW Pump House.

SSI effects were accounted for by the use of the SASSI2000 computer program using subtraction method of analysis, in conjunction with time histories described in Subsection 3H.6.5.1.1.2 and the structural model described in Subsection 3H.6.5.2.3 and shown in Figure 3H.6-15. For resolution of issues with the subtraction method of analysis identified by the Defense Nuclear Facilities Safety Board (DNFSB) see Section 3H.10. The input ground motion time histories described in Section 3H.6.5.1.1.2 were applied at the finished grade in the free field. SASSI2000 implicitly considers transmitting boundaries in the formulation of impedance calculation. SASSI2000 sub-structuring method was used and no boundary condition besides the standard SASSI2000 elastic half space at the bottom of the site soil layering was used. The SASSI2000 analysis addresses the embedment of the structure, groundwater effects, the layering of the soil, and variations of the strain-dependent soil properties. A separate SSI analysis for effects of side soil-wall separation during the seismic event was performed for mean in-situ soil profile using the method in Section 3.3.1.9 of ASCE 4-98. Results of this analysis were enveloped with other SSI analyses.

The strain-compatible soil shear wave velocity and damping values for the SSI analysis were obtained from the same site response analysis which was used to develop the GMRS, as described in Section 2.5S.2.5. The seismic site response analysis was conducted using P-SHAKE computer program, which also provided the strain-compatible soil properties for the SSI analysis. A set of mean strain-compatible shear wave velocity and damping profiles along with the associated standard deviations was calculated. The calculated mean properties and associated standard deviations were used to develop the best estimate (BE), upper bound (UB), and lower bound (LB) profiles. While the BE profile is the mean profile, the UB and LB profiles are the median +/- one standard deviation, respectively, maintaining the minimum variation of 1.5 on soil shear modulus, per the guidance provided in SRP 3.7.2. The corresponding compression wave velocity profiles were calculated using the shear wave velocity and the Poisson's ratio.

For saturated soil, the Poisson's ratio was capped at 0.48 to avoid any potential numerical instability that might be caused if a larger value is used in soil-structure interaction analysis using the SASSI2000 program. A sensitivity study was performed to assess the effect of capping the Poisson's ratio in the seismic SSI results. Control Building (CB) SSI model was used to perform this sensitivity study. SSI analysis results using Poisson's ratio limit of 0.495 were compared with the analyses results which used the Poisson's ratio limit of 0.48. The responses compared were (a) transfer functions, (b) total seismic forces, (c) maximum nodal accelerations and (d) response spectra. The comparisons were performed for the lower bound soil and the upper bound soil.

Based on these comparisons, it was concluded that the results obtained from Poisson's ratio capped at 0.495 are in general close to the corresponding enveloped responses obtained from the Poisson's ratio capped at 0.48, except for some of the responses in the vertical direction, especially for the vertical responses of the floor slabs. The following considerations apply to these exceedances.

- For the Control and Reactor Buildings, where the original site-specific SSI analyses used 0.48 as the Poisson's ratio cut-off, as described in Appendix 3A, it was shown that the DCD responses were higher than the site-specific responses. Even the modified responses, with 0.495 as the Poisson's ratio cut-off, show similar margins in comparison to the DCD responses. Therefore, the increases in vertical responses shown in this sensitivity study, as discussed above, are not significant to the conclusion that the DCD responses significantly envelop the site-specific responses for the Reactor and Control Buildings.
- For the new SSI analyses of the site-specific structures, a Poisson's ratio of 0.495 has been used. Therefore, the conclusions derived from the new analyses include the effect of higher Poisson's ratio cut-off.

The resulting strain-compatible properties for the three profiles, which were used in the SSI analysis, are presented in Table 3H.6-1. The soil layer thicknesses used in the SSI model were sufficiently small to transmit frequencies up to 33 Hz for mean soil properties in the vertical direction (i.e. SASSI2000 interaction nodes spacing in the vertical direction).

The layer thicknesses used for both in-situ soil and back fill soil, in the SSI model, were modified from those shown in Tables 3H.6-1 and 3H.6-2 to have thicknesses sufficiently small enough to conservatively transmit frequencies up to 33 Hz in the vertical direction for the corresponding mean soil properties. Tables 3H.6-1a, b, and c provide the actual layer thicknesses, along with the strain-compatible soil properties data and passing frequency values for the three in-situ soil profiles, i.e., mean, upper bound, and lower bound, respectively. Similar data for the backfill are provided in Tables 3H.6-2a, b, and c. The layer thicknesses, H, were computed using the following equation:

$$H = V_s/(5*F_{t-s})$$

where V_s is the shear wave velocity and F_{t-s} is the transmittal frequency.

In the SSI model, the layer thicknesses used for the mean soil case were also used for the lower bound in-situ and back fill soil. Based on the above equation, the transmittal frequencies for the lower bound soil layers are 26 Hz or higher in the vertical direction. ASCE 4-98, Section 3.3.3.5 recommends that “The cutoff frequency may be taken as twice the highest dominant frequency of the coupled soil-structure system for the direction under consideration, but not less than 10 Hz.” The dominant frequency of coupled soil-structure system has been calculated using the procedure recommended in ASCE 4-98, Section 3.3.3.5. Based on this calculation the highest frequency of the coupled soil-structure system is less than 6 Hz. Thus, the cutoff frequency is required to be at least 12 Hz. The lower bound soil model’s lowest transmittal frequency of 26 Hz is larger than the required 12 Hz, and therefore is acceptable.

In order to account for the backfill placed adjacent to the walls, an additional set of SSI analyses was performed by modeling the backfill as the soil horizon above the foundation level in the SASSI2000 model. The soil layer thicknesses used for the back fill were sufficiently small to transmit the required frequencies as explained in the above paragraph. The responses obtained from this set of SSI analyses and the analyses using in-situ soil as the horizon were enveloped.

The following properties were used for the backfill to obtain shear wave and compression wave velocities, and damping ratios used in the SSI analysis:

- Unit Weight:..120 pcf (1,922 kg/m^3)
- Compaction: ....95% Modified Proctor
- Poisson’s Ratio:.............................0.42 above water table, 0.47 below water table

Based on the physical properties of the backfill described above, its strain compatible dynamic soil properties are estimated using the following steps:

(1) Determine SSE compatible soil shear strains in the backfill

It is assumed that the strains in the backfill are same as in the surrounding soil (in-situ soil). This assumption is reasonable because the extent of the backfill is small as compared to the surrounding soil and the primary motion of the backfill will be about the same as the surrounding soil. The strain in the in-situ soil is calculated using the following steps:

(a) The ratio G / Gmax for an in-situ stratum is calculated using the mean strain compatible shear wave velocity ($V_{-\ strain}$) in layers (from Table 3H.6 1) within the stratum and the average field measured shear wave velocity (V_{-field}, from Table 2.5S.4-27) in the following equation:

$G / Gmax = [V_{-\ strain} \ / \ V_{-field} \ ]^2$

(b) Using the shear modulus degradation curve (see Table 2.5S.4-32) of the soil stratum and the above calculated G / Gmax ratio, the SSE induced shear strain is calculated for the stratum.

(c) An average value of shear strain is calculated for the entire backfill depth by averaging the strain values for all the strata.

(2) Determine the strain compatible shear modulus and damping values of the backfill

The backfill is granular soil compacted to 95% Modified Proctor (85% relative density). Based on this, shear modulus degradation curve for the 85% relative density sand from Earthquake Engineering Research Center (EERC) Report 70–10 (Soil Moduli and Damping Factors for Dynamic Response Analysis, by Seed and Idriss) is used for calculating the strain compatible shear modulus, for the strain calculated in Step 1. The strain compatible shear modulus of the backfill , $G_{backfill}$ is calculated using the following equation:

$G_{backfill} = 1000\ K_2\ \sigma_m^{1/2}$ psf (EERC Report 70-10)

Where the coefficient K_2 is from the EERC Report 70-10 degradation curve for the calculated shear strain, and σ_m is the effective mean principal stress in the soil.

The damping value of the backfill is estimated using the sand strain dependent damping curve provided in EERC Report 70-10.

The above strain compatible shear modulus is the best estimate values (G_m). To consider the variability in shear modulus values, the lower bound (G_{LB}) and upper bound (G_{UB}) values are calculated using SRP Section 3.7.2 criteria.

$G_{LB} = G_m / 1.5$

$G_{UB} = 1.5 \times G_m$

The corresponding strain compatible shear wave velocities (V_S) and compression wave velocities (V_P) are calculated using the general equations:

$V_S = [G / \rho]^{1/2}$ where G is the shear modulus and ρ is the mass density of soil.

$V_P = V_S\ [\ (2 - 2\ v\ ) / (\ 1 - 2\ v\ )\ ]^{1/2}$

Where, v is the Poisson's Ratio values equal to 0.42 and 0.47 for the backfill above groundwater and below groundwater table, respectively.

The strain-compatible shear wave and compression wave velocities, and damping ratios calculated as above are used in the three backfill models (mean, upper bound, and lower bound) are shown in Table 3H.6-2.

3H.6.5.2.4.1 Soil-Structure Interaction Analysis for Empty UHS Basin

Section 3H.6.5.2.4 describes the SSI analysis for the full UHS basin case. An additional SSI analysis was performed for the empty UHS basin case. This analysis uses the same model and methodology as the analysis described in Section 3H.6.5.2.4 except that analyses for mean and lower bound backfill soil cases were excluded because their properties are bounded by the lower and upper bound in-situ soil cases. Also Poisson's ratio limit was set at 0.495 for calculation of compression wave velocity for soil layers below the ground water table. Results of this analysis and the analysis for the full basin case were enveloped.

3H.6.5.2.4.2 Additional Sensitivity Analysis for Refined Mesh

Additional SSI analyses were performed using a refined mesh for the soil and structural model. These analyses are described below.

Two additional UHS/RSW Pump House SSI analyses were performed for the upper bound soil profile case (UB soil case) considering both full and empty UHS basin, with a refined model shown in Figure 3H.6-15h.

The refined SSI model used for these analyses has the following passing frequency capability (passing frequency, f = V_s / 5 h, where Vs is the shear wave velocity of the soil layer and h is the vertical or horizontal distance between the adjacent interaction nodes):

Vertical direction: 40.4 Hz

Horizontal direction: 23.5 Hz

For soil layers below groundwater level, the Poisson's ratio was capped at 0.495 for determining the compression wave velocity. A cut-off frequency of 33 Hz was used in these analyses for transfer function calculation.

The passing frequency of about 24 Hz in the horizontal direction was selected since the site has a deep soil profile and the SSI frequencies are below 6 Hz. Also, as noted in SRP 3.7.1 Revision 3, Appendix A, the energy content of the earthquake time histories above 24 Hz is inconsequential.

Based on the results of the above refined SSI analyses, and additional structural mesh sensitivity analyses, envelope modification factors were determined for increase of the following in-structure response spectra obtained from the SSI analyses described in Section 3H.6.5.2.4 and 3H.6.5.2.4.1~~ were modified by multiplying them with the modification factors shown in Table 3H.6-17. Then, the results of the full and empty basin analyses were enveloped~~.

- Vertical direction spectra at the center of the Pump House Roof

- Vertical direction spectra at the center of the Pump House Operating Floor
- Vertical direction spectra of the Cooling Tower Walls
- Out-of-plane horizontal spectra of the Basin Walls

~~The final in-structure response spectra are shown in Figures 3H.6-16 through 3H.6-39.~~

3H.6.5.2.4.3 Final In-Structure Response Spectra

In response to issues with the subtraction method of analysis identified by the Defense Nuclear Facilities Board (DNFSB) discussed in Section 3H.10, the SSI analysis for the upper bound in-situ soil case was repeated for both full and empty basin cases using the modified subtraction method of analysis. Also, in these analyses the groundwater table was changed to 6 ft below grade. Based on comparison of the resulting response spectra from these analyses to those from the subtraction method of analysis additional modification factors were determined for increase of in-structure response spectra from the subtraction method of analysis to account for the effect of using the modified subtraction method. The product of these modification factors and those described in Section 3H.6.5.2.4.2 as shown in Table 3H.6-17 were used to increase the in-structure response spectra described in Sections 3H.6.5.2.4 and 3H.6.5.2.4.1. Then, the results of the full and empty basin analyses were enveloped.

The final in-structure response spectra are shown in Figures 3H.6-16 through 3H.6-39.

3H.6.5.2.5 Development of In-Structure Response Spectra

In-structure response spectra (ISRS), shown in Figures 3H.6-16 through 3H.6-39 were developed as part of the SSI analysis in accordance with RG 1.122. The ISRS in a given direction was obtained by combining the three ISRS in that direction (developed from the separate analyses of the three directions of input motion) by the square-root-of-the-sum-of-the-squares (SRSS) method. The frequency increment for the calculation of ISRS was either smaller than or the same as provided in Table 1 of Regulatory Guide 1.122. The ISRS were broadened by ±15% based on the guidance provided in Regulatory Guide 1.122. See Section 3H.6.5.2.9 for the treatment of the effects due to concrete cracking.

3H.6.5.2.6 Three Components of Earthquake Motion

Separate analyses were performed in three orthogonal (two horizontal and one vertical) directions. Total structural responses (accelerations, displacements, and forces) were calculated by combining the co-directional responses as described in Subsection 3H.6.5.1.1.2.

3H.6.5.2.7 Combination of Modal Responses

Since a frequency-domain seismic analysis was performed, there were no modal responses to be combined.

3H.6.5.2.8 Interaction of Non-Category I Structures with Category I SSCs

There are no non-Category I structures near the site-specific seismic Category I structures. Consequently, there is no interaction between non-Category I and the site-specific seismic Category I structures.

3H.6.5.2.9 Effects of Parameter Variations on Floor Responses

The soil property variation described in Subsection 3H.6.5.2.4 is accounted for in the generation of the ISRS. In addition, the impact of variations in the input parameters to the seismic analysis is accounted for by broadening the FRS in accordance with RG 1.122. To account for concrete cracking, in addition to other uncertainties, the ISRS are developed with structural properties based on cracked concrete stiffness and the mean soil properties. These spectra are enveloped with the spectra from the uncracked analysis and, then, widened by ±15% to obtain final ISRS for use in design.

3H.6.5.2.10 Use of Equivalent Vertical Static Factors

Since a separate seismic analysis was performed for the vertical direction, equivalent static factors were not used to define the vertical seismic responses.

3H.6.5.2.11 Methods Used to Account for Torsional Effects

Inherent torsion (i.e. torsion resulting from eccentricity between the locations of the center of mass and the center of rigidity) is accounted for in the seismic analysis. Note that the structural model in the SSI analysis of the UHS/RSW pump house is a detailed 3-D finite element model which incorporates torsional degrees of freedom and eccentricities. The SSI analysis does not account for accidental torsion.

The accidental torsion is computed in accordance with the SRP Acceptance Criteria 3.7.2.II.11 considering an additional eccentricity of ±5% of the maximum building dimension for both horizontal directions. The magnitude and location of the eccentricities in the two horizontal directions are determined separately at each floor elevation. The induced member forces due to this accidental torsion are obtained from static analysis of the structure and are added to the induced forces due to other applicable loads whether the analysis predicts positive or negative results (i.e. absolute sum).

3H.6.5.2.12 Comparison of Responses

Since only a frequency-domain analysis is performed, comparison of responses is presented.

3H.6.5.2.13 Analysis Procedure for Damping

The SSI analysis accounts for the structural and soil-damping described in Subsection 3H.6.5.1.2.

3H.6.5.2.14 Determination of Seismic Overturning Moments and Sliding Forces for Seismic Category I Structures

The evaluation of seismic overturning moments and sliding accounts for the simultaneous application of seismic forces in three directions using 100%, 40%, 40% combination rule as shown below:

±100% X-excitation ±40% Y-excitation +40% Z-excitation
±40% X-excitation ±100% Y-excitation +40% Z-excitation

(Note: X & Y are horizontal axes and Z is vertical axis. Positive Z is upward. Also, ±40% X-excitation ±40% Y-excitation ±100% Z-excitation is not critical for the UHS/RSW Pump House).

The resisting forces and moments due to dead load are calculated using a reduction factor of 0.90. Resisting forces and moments due to soil are based on at-rest soil pressure, or passive soil pressure, as appropriate. The friction coefficients used for the sliding evaluation are 0.30 under the RSW Pump House and 0.40 under the UHS Basin. See Figure 3H.6-137 for formulations used for calculation of factors of safety against sliding and overturning. The calculated stability safety factors for the UHS/RSW Pump House are provided in Table 3H.6-5.

3H.6.5.2.15 Plant Shutdown Criteria

The plant shutdown criteria described in DCD Section 3.7.4.4 will be used based on the site-specific SSE response spectra shown in Figures 3.7-1a and 3.7-2a.

3H.6.5.2.16 Seismic Category I Substructures

Analysis and design of site-specific Seismic Category I substructures (e.g., platforms, support frame structures, buried piping, tunnels, etc.) are in accordance with DCD Tier 2 Section 3.7.3, except that the site-specific SSE is used as seismic input. There is no site-specific Seismic Category I above ground tank at STP 3 & 4.

3H.6.5.3 Seismic Analysis of RSW Piping Tunnels

The RSW Piping Tunnel runs north from the UHS/RSW Pump House to Control Building (CB) and passes between the Reactor Building (RB) and Radwaste Building (RWB). Since, the tunnel is a long structure, two dimensional (2D) SSI analyses have been performed for this tunnel. The following three sections of the RSW Tunnel have been used in the SSI analyses:

- An east-west typical 2D section of the tunnel between the UHS/RSW Pump House and the RB for SSI analysis of the RSW tunnel.
- An east-west 2D section of the tunnel between the RWB and RB, for structure-soil-structure interaction (SSSI) analysis to determine the SSSI effect on the seismic soil pressures.

- A north-south 2D section of the tunnel between the Diesel Generator Fuel Oil Storage Vault (DGFOSV) and the UHS/RSW Pump House, for SSSI analysis to determine the SSSI effect on the seismic soil pressures.

All of the above SSI analyses have been performed using SASSI2000 computer program. The following summarizes the details of the above stated SSI and SSSI analyses.

SSI Analysis of the Typical 2D Section of RSW Tunnel (using the direct method of analysis)

Figure 3H.6-209 shows the structural part of the 2D plane-strain model of the reinforced concrete RSW Piping Tunnel with 2 ft thick mud mat under the base slab. The top of the tunnel is 1.75 ft below grade. The model uses 4-node plane-strain elements to model the 3 ft thick exterior walls, 3 ft thick base slab, two 2 ft thick intermediate floors, 2 ft thick mud mat and the 1.75 ft soil above the tunnel. As shown in Figure 3H.6-209, spring elements are added on the side walls of the tunnel to calculate the seismic soil pressures on the tunnel walls.

The Specifics of this 2D SSI model are as follows:

- The structural properties (i.e. mass and stiffness) for the 2D model correspond to per unit depth (1 ft dimension in the out-of-plane direction) of the tunnel.
- Layered soil is modeled up to 124 ft depth with half space below it (more than two times the horizontal dimension of RSW Piping Tunnel plus its embedment depth).
- Six cases of strain dependent soil properties representing in-situ lower bound, mean and upper bound; and backfill lower bound, mean and upper bound are considered.
- Analysis cases also include one case with cracked concrete (50% concrete modulus value) and one case with soil separation (20 ft depth). Backfill upper bound soil case was used in these analyses.
- Concrete and mud mat damping are assigned 4% for all cases, except 7% damping is assumed for the cracked case.
- Groundwater was considered at 8 ft depth (26 feet MSL). Subsection 2.4S.12 and Table 2.0-2 now state the site groundwater elevation as 28 feet MSL. Therefore, a sensitivity analysis of this change in groundwater elevation was performed using the Diesel Generator Fuel Oil Storage Vault SSI model, which showed no significant effect on the analysis results. The ground water effect is included by using minimum P-wave velocity of 5000 ft/sec except for cases where use of this minimum P-wave velocity results in Poisson's ratio in excess of 0.495.

- Model is capable of passing frequencies for both vertical and horizontal directions at least up to 32.9 Hz.
- Cut-off frequency for transfer function calculation is 33 Hz.
- Input motion is the amplified site specific SSE motion considering the effect of nearby heavy RB and UHS/RSW Pump House structures. These amplified motions were obtained from three dimensional (3D) SSI analyses of the RB and UHS/RSW PH SSI analyses as described below. For resolution of issues with the subtraction method of analysis identified by the Defense Nuclear Facilities Safety Board (DNFSB) see Section 3H.10.
- In the three dimensional SSI analysis of the RB for site-specific SSE, one interaction node at the ground surface and one interaction node at the depth corresponding to the bottom elevation of the RSW Piping Tunnel were located at six locations along the centerline of the RSW Piping Tunnel.
- In the three dimensional SSI analysis of the UHS/RSW Pump House for site-specific SSE, one interaction node at the ground surface and one interaction nodeat the depth corresponding to the bottom elevation of the RSW Piping Tunnel were located at one location at centerline of the Tunnel.
- The resulting amplified response spectra at the interaction nodes, representing the response of the RSW Piping Tunnel, from the above SSI analyses of RB and UHS/RSW Pump House were obtained. In order to find a reasonable envelop of these response spectra, to be used in the SSI analysis of the RSW Piping Tunnels, these spectra were compared to 1.15 x site-specific SSE to identify those exceeding 1.15 x site-specific SSE. Figures 3H.6-209a through 3H.6-209d include the response spectra which exceed 1.15 x site-specific SSE.
- Based on the comparison of the response spectra shown in Figures 3H.6-209a through 3H.6-209d, six motions were selected as envelop amplified motions for SSI analysis. These six motions correspond to 1.15 x site-specific SSE andamplified motion time histories for Nodes 29378, 29379, 29390, 29392, and 15129.
- SSI analyses of the RSW Piping Tunnel were performed, for each soil case, using 1.15 x site-specific SSE input and acceleration time histories for the five nodes, noted above, obtained from the RB and UHS/RSW Pump House SSI analyses for the corresponding soil cases.
- The horizontal direction and vertical direction input motions were applied at the grade elevation.
- The responses from the horizontal and vertical direction excitations were combined using square root of sum of square (SRSS) method.

- The responses from all SSI analyses from the six soil cases, concrete cracked case and soil separation case were enveloped.
- The in-structure response spectra were peak widened by ± 15% at frequency scale.
- Envelope of the resulting response spectra for the base slab, intermediate floors and the roof slab shown in Figures 3H.6-138 and 3H.6-139 are used as the design in-structure response spectra for the RSW Piping Tunnel.

SSSI Analysis of the East-West 2D section of the RSW piping tunnel between the RWB and RB

Figure 3H.6-210 shows the structural part of the 2D plane-strain model of RB + RSW Piping Tunnel + RWB. Specifics of this SSSI analysis are as follows:

- Subtraction method of analysis is used. For resolution of issues with the subtraction method of analysis identified by the Defense Nuclear Facilities Safety Board (DNFSB) see Section 3H.10.
- The structural properties (mass and stiffness) for the 2D model of the individual structures correspond to per unit depth (1 ft dimension in the out-of-plane direction) of the respective structure.
- Layered soil is modeled up to 551 ft depth with halfspace below it (more than two times the maximum horizontal dimension of any of the buildings plus their embedment depth).
- Lower bound in-situ, upper bound in-situ, and upper bound in-situ with upper bound backfill strain-dependent soil properties were used in the SSSI analysis.
- The damping of structural part of the model is 4%.
- Groundwater was considered at 8 ft depth (26 feet MSL). Subsection 2.4S.12 and Table 2.0-2 now state the site groundwater elevation as 28 feet MSL. Therefore, a sensitivity analysis of this change in groundwater elevation was performed using the Diesel Generator Fuel Oil Storage Vault SSI model, which showed no significant effect on the analysis results. The ground water effect is included by using minimum P-wave velocity of 5000 ft/sec except for cases where use of this minimum P-wave velocity results in Poisson's ratio in excess of 0.495.
- Model is capable of passing frequencies of at least up to 35.9 Hz in the vertical direction and 61.6 Hz in the horizontal direction.
- Cut-off frequency for transfer function calculation is 33 Hz.
- Input motion is site specific SSE motion.
- The horizontal (E-W) input motion is applied at the grade elevation.

- Figures 3H.6-212 and 3H.6-213 show the resulting soil pressures.

SSSI Analysis of the North-South 2D section of the RSW piping tunnel between the DGFOSV and UHS/RSW PH

Figure 3H.6-211 shows the structural part of the 2D plane-strain model of RB + two DGFOSVs + RSW Piping Tunnel (adjacent to UHS/RSW Pump House) + UHS/RSW PH. Specifics of this SSI analysis are as follows:

- Subtraction method of analysis is used. For resolution of issues with the subtraction method of analysis identified by the Defense Nuclear Facilities Safety Board (DNFSB) see Section 3H.10.
- The structural properties (mass and stiffness) for the 2D model of the individual structures correspond to per unit depth (1 ft dimension in the out-of-plane direction) of the respective structure.
- Layered soil is modeled up to 546 ft depth with halfspace below it (more than two times the maximum horizontal dimension of any of the buildings plus their embedment depth).
- Lower bound in-situ and upper bound in-situ strain-dependent soil properties were used in the SSSI analysis.
- The damping of structural part of the model is 4%.
- Groundwater was considered at 8 ft depth (26 feet MSL). Subsection 2.4S.12 and Table 2.0-2 now state the site groundwater elevation as 28 feet MSL. Therefore, a sensitivity analysis of this change in groundwater elevation was performed using the Diesel Generator Fuel Oil Storage Vault SSI model, which showed no significant effect on the analysis results. The ground water effect is included by using minimum P-wave velocity of 5000 ft/sec except for cases where use of this minimum P-wave velocity results in Poisson's ratio in excess of 0.495.
- Model is capable of passing frequencies of at least up to 35.9 Hz in the vertical direction and 61.6 Hz in the horizontal direction.
- Cut-off frequency for transfer function calculation is 33 Hz.
- Input motion is site specific SSE motion.
- The horizontal (N-S) input motion is applied at the grade elevation.
- Figures 3H.6-214 and 3H.6-215 show the resulting soil pressures.

3H.6.6 Structural Analysis and Design Summary

3H.6.6.1 Analytical Models

The structural analysis and design of the UHS basin and the RSW pump house was performed using a finite element model (FEM). The FEM model is shown in Figure 3H.6-40. Two SAP2000 3D FEA models are used to calculate the element design forces; one model for short term loading (seismic) and one model for long term loading (non-seismic). The only differences between the two FEA models are the loading and soil springs applied in the global Z (i.e. vertical) direction. The stiffness of the soil springs for both the short term loading and long term loading models are determined by multiplying the corresponding foundation subgrade modulus for the short term and long term loading by the tributary area of mat elements for each spring.

The resulting element forces from the short term loading model for X, Y, and Z seismic loads are combined by the SRSS method. These SRSS'd element forces constitute the E' term in the third and fifth load combinations in Section 3H.6.4.3.4.3. The element forces that comprise the E' term are added and subtracted from the other applicable resulting element forces from the long term loading model in the load combinations defined in Section 3H.6.4.3.4.3, in a database outside of the FEA model to determine final element design forces for each load combination. Since both the accidental torsional moment and soil loads (H') are directional in nature, they are added algebraically to the seismic load combinations.

The envelope of the seismic accelerations from the refined and original SSI models considering both the full basin and the empty basin were used in the short term loading model. The enveloping SSI nodal accelerations in the global X, Y, and Z directions for both the full basin case and the empty basin case were averaged by group for each of nine groups based on the locations in the UHS / RSW pump house. The final group accelerations used in the full basin seismic load case and the empty basin seismic load case represent the envelope of the original mesh accelerations and the refined mesh accelerations.

The mass of the structure, equipment weights, seismic live loads, and hydrodynamic forces were normalized by a factor of 1 g in the equivalent static seismic FEA model. Depending on their location in the structure, these loads were multiplied by the group acceleration corresponding to their location in the structure and combined with other seismic loads by first adding the seismic loads in each direction and then combining the X, Y, and Z components by the SRSS method. Forces and moments determined from horizontal section cuts from the equivalent static FEA model are compared to similar forces and moments determined from the horizontal section cuts from the SSI analysis model to ensure that the design forces used in the equivalent static FEA model envelope the maximum SSI analysis forces.

For the portions of the UHS basin where liquid-tightness is required (i.e., exterior walls and basemat of the basin), in addition to satisfying ACI 349 strength requirements, the required strength was increased by the environmental durability factors noted in Subsection 3H.6.4.3.4.3 per Section 9.2.8 of ACI 350-01. Detailed stability evaluations were performed for sliding, overturning, and flotation for normal operating cases and for the case of an empty UHS basin. For sliding and overturning evaluations, the 100%, 40%, 40% rule was used for consideration of the X, Y, and Z seismic excitations.

3H.6.6.2 Analytical Approach

3H.6.6.2.1 UHS Basin, UHS Cooling Tower Enclosure, and RSW Pump House

The analysis described in Subsection 3H.6.6.1 considers the following loads, combined in accordance with Subsection 3H.6.4.3.4:

- Dead and live loads on the UHS basin, UHS cooling tower enclosures, and RSW pump houses as specified in Subsection 3H.6.4.3.1, plus the weight of the UHS cooling tower fill, equipment and commodities in the RSW pump house.
- Hydrostatic and hydrodynamic (impulsive and convective) loads corresponding to the water in the basin, and on the walls and the piers of the UHS basin. The hydrodynamic loads are calculated in accordance with Subsection C3.5.4 of ASCE 4 and meet the guidance provided in SRP 3.7.3, Acceptance Criterion 14.
- Specifically the “Housner method” described in TID-7024 is used to determine the hydrodynamic impulsive and convective masses.
- The impulsive masses are applied to the walls of the UHS Soil-Structure Interaction (SSI) model. Therefore, the horizontal impulsive-mode spectral acceleration is based on consideration of the flexibility of the tank.
- The seismically induced hydrodynamic pressures on the tank walls are determined by the modal and spatial combination methods outlined in SRP Section 3.7.2 including the effects of soil-structure interaction.
- Since the fundamental sloshing (convective) frequency is so low (0.135 cycles per second in the N-S direction and 0.078 cycles per second in the E-W direction), the convective mass is not included in the SSI model but is considered in the design by employing the spectral acceleration of the horizontal convective frequency at 0.5 percent damping.
- The hydrodynamic pressure is added to the hydrostatic pressure to account for the induced tension and compression forces on basin walls in the design.
- At-rest lateral soil pressure on the walls of the UHS basin and RSW pump houses.
- Hydrostatic pressures on the walls of the UHS basin and RSW pump houses due to groundwater.
- Envelope of dynamic lateral soil pressures on the walls of the UHS basin and RSW pump houses due to an SSE, calculated from (a) methodology defined in Subsection 3.5.3.2.2 of ASCE 4, (b) SSI analysis, and (c) structure-soil-structure (SSSI) analysis. At rest lateral soil pressures are presented in Figures 3H.6-41 through 3H.6-43. Figures 3H.6-218 through 3H.6-220 provide a comparison of

lateral soil pressures from SSI and SSSI analysis to those from ASCE 4 methodology.

- Surcharge pressure of 300 psf (14.4 kPa) is applied to the UHS basin and RSW pump houses.
- SSE forces corresponding to the weight of the structures being acted on by the accelerations established by the SSI analysis.
- Wind loads on the UHS basin, UHS cooling tower enclosures, and RSW pump houses calculated as indicated in Subsection 3H.6.4.3.2.
- Tornado wind and pressure loads on the UHS basin, UHS cooling tower enclosures, and RSW pump houses calculated as specified in Subsection 3H.6.4.3.3.1.
- The design flood loads on the RSW pump houses and tunnels are as stated in Subsection 3H.6.4.2.3.

3H.6.6.2.2 RSW Piping Tunnels

The individual components of the RSW Piping Tunnels (roof slab, intermediate slabs, base mat and walls) have out-of-plane frequency in excess of 33 Hz and their out-of-plane seismic loads are determined using a conservative acceleration of 0.21g which exceeds the maximum Zero Period Acceleration (ZPA) of response spectra Figures 3H.6-138 and 3H.6-139. Manual calculations are used for the analysis and design of individual components of the RSW Piping Tunnels (roof slab, intermediate slab, base mat, walls) considering all applicable loads and load combinations including dead load, live load, earth pressure loads, wind and tornado loads, SSE seismic loads, internal flood loads and external flood loads.

In general the walls and slabs are designed as one-way slabs with walls spanning in the vertical direction and the slabs spanning in the East-West direction (normal to the tunnel axis). All connections are conservatively considered pinned except for those connecting to the base mat, which are considered fixed. The resulting moments and shears from this simplified analysis along with any induced axial tension or compression due to dead load and/or reactions from adjoining elements are used to determine the required rebar in accordance with the requirements of ACI 349-97. Table 3H.6-6 provides the design summary for RSW Piping Tunnels.

The tensile axial strain on the RSW Tunnel due to Safe Shutdown Earthquake (SSE) wave propagation is determined based on the equations and commentary outlined in Section 3.5.2.1 of ASCE 4-98. Equation 3.5-1 of ASCE 4-98 is used to compute the axial strain. As this equation gives the upper bound, Equation 3.5-2 from Section 3.5.2.1.2 of ASCE 4-98 is conservatively neglected.

The maximum curvature is computed based on Equation 3.5-3 in Section 3.5.2.1.3 of ASCE 4 98. The maximum curvature is then converted into additional axial strain by multiplying the curvature by the distance from the centroid of the RSW Piping Tunnels to the extreme fiber of the RSW Tunnel. For these computations, the following parameters are considered:

- An apparent wave velocity of 3,000 ft/sec (as recommended in appendix C3.5.2.1 of ASCE 4-98)
- A maximum ground velocity of 6.24 in/sec (which is based on 48 in/sec/g and site-specific SSE maximum ground acceleration of 0.13g)
- A triangular soil pressure distribution on the transverse leg of the tunnel near the bend which is limited by the maximum passive pressure using passive pressure coefficient Kp = 3

The tensile axial strain and strain due to maximum curvature are conservatively added together to obtain the actual strain in the longitudinal direction of the RSW Tunnel. The actual strain is then compared to the cracking strain of concrete and maximum allowable strain of the reinforcing. The maximum computed tensile axial strain is 1.8×10^{-4} in/in which is about 9% of the rebar yield strain of 2.069×10^{-3} in/in. The design also accounts for the induced forces at tunnel bends due to SSE wave propagation. These forces are determined in accordance with Section 3.5.2.2 of ASCE 4-98 by considering the structure as a beam on elastic foundation. To determine the required reinforcement, the induced forces at the tunnel bends are considered to act simultaneously with all other applicable loads (including dynamic soil pressures) in the seismic load combinations.

This analysis considered the loads identified below, combined in accordance with Subsection 3H.6.4.3.4.

- Dead load of the tunnel walls and the soil above the tunnel.
- Live load of 200 psf (9.6 kPa) applied to the floor of the tunnels.
- At-rest lateral soil pressure on the tunnel walls.
- Hydrostatic pressures on the tunnel walls due to groundwater.
- Envelope of dynamic lateral soil pressures on the tunnel walls, due to an SSE, calculated from: (a) using the methodology defined in Subsection 3.5.3.2.2 of ASCE 4-98, (b) soil-structure interaction (SSI) analysis, and (c) the structure-soil-structure interaction (SSSI) analysis. At rest lateral soil pressures for typical section of the RSW Piping Tunnels using ASCE 4-98 methodology are presented in Figure 3H.6-44. Figures 3H.6-212 through 3H.6-215 provide comparison of lateral seismic soil pressures from SSSI analysis described in Section 3H.6.5.3 to those from ASCE 4-98 methodology.
- Surcharge pressure of 500 psf (23.9 kPa) applied to the ground above the tunnels.
- SSE forces corresponding to the weight of the tunnels being acted on by the accelerations established by the SSI analysis.

3H.6.6.3 Structural Design

The strength design criteria defined in ACI 349 as supplemented by RG 1.142 as well as ACI 350 (note: ACI 350 is applicable only to the exterior walls below the 71 ft maximum water level and basemat of UHS basin), was used to design the reinforced concrete elements making up the UHS basin and cooling tower enclosures as well as the RSW pump houses and piping tunnels. Concrete with a compressive strength of 4.0 ksi (27.6 MPa) and reinforcing steel with a yield strength of 60 ksi (414 MPa) are considered in the design.

3H.6.6.3.1 UHS Basin/UHS Cooling Tower/RSW Pump House Concrete Wall and Slab Design

The design forces and provided reinforcement for UHS basin, UHS cooling tower, and RSW pump house walls and slabs are shown in Tables 3H.6-7 and 3H.6-8. Each face and each direction of each wall and slab has a corresponding longitudinal reinforcement zone figure. Each wall and slab also has a corresponding transverse shear reinforcement zone figure when transverse shear reinforcement is required. The reinforcement zone figures (Figures 3H.6-51 through 3H.6-136) show the various zones used to define the provided reinforcement based on the finite element analysis results. Actual provided reinforcement, based on final rebar layout, may exceed the reported provided reinforcement and the zones with higher reinforcement may be extended beyond their reported zone boundaries.

The shell forces from every element for every load combination in the finite element analysis were evaluated to determine the provided reinforcement in each reinforcement zone. For each reinforcement zone, the following out-of-plane moment and axial force couples with the corresponding load combination are reported in Tables 3H.6-7 and 3H.6-8:

- The maximum tension axial force with the corresponding moment acting simultaneously from the same load combination.
- The maximum compression axial force with the corresponding moment acting simultaneously from the same load combination.
- The maximum moment that has a corresponding axial tension acting simultaneously in the same load combination.
- The maximum moment that has a corresponding axial compression in the same load combination.

For each reinforcement zone, the ~~following~~ in-plane ~~and transverse shears~~shear with the corresponding load combination are reported in Tables 3H.6-7 and 3H.6-8~~:~~. The in-plane shear is the maximum average in-plane shear along a plane that crosses the longitudinal reinforcement zone. The shell forces from every element for every load combination in the finite element model were evaluated to determine the required transverse reinforcement. The transverse shear and axial force reported in Tables

3H.6-7 and 3H.6-8 correspond to the maximum required transverse reinforcement for an element within that transverse reinforcement zone.

- ~~The in-plane shear is the maximum average in-plane shear along a plane that crosses the longitudinal reinforcement zone.~~
- ~~The transverse shear is the maximum average transverse shear along a plane in that transverse reinforcement zone.~~

The provided longitudinal reinforcing for each face and each direction is determined based on the out-of-plane moments, axial forces, and in-plane shears occurring simultaneously for every load combination.

The provided transverse shear reinforcing (as required) is determined based on the transverse shears and axial forces perpendicular to the shear plane occurring simultaneously for every load combination. The UHS basin and RSW pump house basemats were also evaluated for punching shear at critical locations under buttresses and columns.

The forces in the structure caused by differential settlements due to the flexibility of the basin and pump house basemats and supporting soil were accounted for through the use of foundation soil springs in the finite element model. The soil spring stiffness values used in the finite element model were based on the calculated soil subgrade modulus, which is a function of the foundation settlement.

The UHS basin basemat is supported by area springs with the following uniform spring constants in the finite element model:

Vertical springs (with static loads) .... 30 kips/ft/ft^2

Vertical springs (with seismic loads) .... 80 kips/ft/ft^2

North-south springs (with static and seismic loads) .... 33 kips/ft/ft^2

East-west springs (with static and seismic loads) .... 30 kips/ft/ft^2

The RSW pump house basemat is supported by area springs with the following uniform spring constants in the finite element model:

Vertical springs (with static loads) .... 60 kips/ft/ft^2

Vertical springs (with seismic loads) .... 170 kips/ft/ft^2

North-south springs (with static and seismic loads) .... 112 kips/ft/ft^2

East-west springs (with static and seismic loads) .... 104 kips/ft/ft^2

The RSW pump house operating floor and roof were designed with composite steel beams and concrete slabs for vertical loading. The composite beams span in the east-west direction with the concrete slab designed as spanning one-way between the composite beams. The operating floor and roof slabs also act as diaphragms to transfer lateral loads. The provided reinforcing for the operating floor and roof slabs is reported in Table 3H.6-8.

3H.6.6.3.2 UHS Basin Beam and Column Design

The beams and columns in the UHS basin were represented with frame elements in the finite element model. The frame forces for every load combination in the finite element model were evaluated to determine the provided reinforcement for each beam and column in Table 3H.6-9. For each beam and column, the following forces and the corresponding load combination are reported in Table 3H.6-9:

- The maximum axial compression force with the corresponding biaxial bending moments (M2 and M3) acting simultaneously from the same load combination.
- The maximum axial tension force with the corresponding biaxial bending moments (M2 and M3) acting simultaneously from the same load combination. Note that the columns do not have an axial tension case.
- The maximum M2 bending moment with the corresponding M3 bending moment and axial force acting simultaneously from the same load combination.
- The maximum M3 bending moment with the corresponding M2 bending moment and axial force acting simultaneously from the same load combination.
- The maximum shear V2.
- The maximum shear V3.
- The maximum torsion.

The provided longitudinal reinforcing in Table 3H.6.9 is determined based on the axial force, biaxial moments (M2 and M3), and torsion. The provided stirrup reinforcing is determined based on the axial force, shears (V2 and V3), and torsion.

3H.6.6.4 Foundations

The foundations for the UHS basin, cooling towers, and pump house consist of a reinforced concrete mat and a lean concrete mud mat supported on undisturbed soil. The RSW piping tunnels, which extend from each pump house to the corresponding control building locations, are provided with flexible connections at the building interfaces that prevent any potential movement of the buildings from creating forces or moments in the tunnels.

The loads and load combinations considered in the design of the common foundation mat are as defined in Subsection 3H.6.4.3. The design is in accordance with the strength design criteria defined in ACI 349 as supplemented by RG 1.142 as well as ACI 350, and considered concrete with a compressive strength of 4.0 ksi (27.6 MPa) and reinforcing steel with a yield strength of 60 ksi (414 MPa).

The effect of settlement due to the flexibility of the structure/basemat and supporting soil is accounted for through the use of finite element analysis in conjunction with foundation soil springs. The most common approach for this analysis is the Winkler Method. In this approach, the soil is considered to have a uniform subgrade modulus under the entire mat and the springs representing the soil are considered to be linear and act independently. In this method, the uniform subgrade modulus is calculated as the average of the subgrade moduli calculated using the settlements for nine points presented in Table 2.5S.4-42. Using the Winkler Method, a uniformly loaded flexible mat foundation will exhibit uniform settlement under the entire mat. Whereas, in reality, due to overlapping stress bulbs beneath the foundation, the springs representing the soil are not independent of each other and thus the settlement at the center of the mat will be greater than the settlement along the mat edges. To account for this effect a "Coupled Method" may be used where dependence of adjacent soil springs is represented by additional springs. Since implementation of this approach is rather complicated and may require development of custom software, use of alternate methods such as the "Pseudo-Coupled Method", described in Section 10.2 of Reference 3H.6-3, where different subgrade modulus values are assigned to different areas (zones) of the mat foundation, have been found to yield acceptable results.

For design, both the Winkler Method and the "Pseudo-Coupled Method" were used and the results were enveloped.

The resulting maximum calculated ratio of differential foundation settlements (between adjacent points in the mat finite element model) within the boundary of the UHS, Pump House, and the RSW Piping Tunnel are as follows:

- Ultimate Heat Sink basin foundation 1/860
- Reactor Service Water Pump House foundation 1/1200
- Reactor Service Water Piping Tunnel foundation 1/3900

To prevent seepage of groundwater through the common foundation or through the walls of the basin and pump houses, a waterproofing membrane is applied to the exposed concrete surface of the mudmat. In addition, a waterproof membrane is installed on the walls up to one foot below grade, with a water proof coating being applied from that level up to the flood level. While, as indicated in FSAR Subsection 3.8.6.1, the waterproofing of the mudmat will not reduce the ability of the foundation to transfer horizontal shear forces to the underlying soil, the waterproof membrane will protect the walls from any possible deleterious effects from aggressive groundwater. To prevent seepage of groundwater into the tunnels, a waterproof membrane is used.

3H.6.6.5 Stability Evaluations

The factors of safety of the combined UHS basin and RSW pump house against sliding, overturning, and flotation are provided in Table 3H.6-5. The factors of safety of the RSW Piping tunnel against sliding, overturning and flotation are provided in Table 3H.6-16.

3H.6.7 Diesel Generator Fuel Oil Storage Vaults (DGFOSV)

The Diesel Generator Fuel Oil Storage Vaults (DGFOSV) are reinforced concrete structures, located below grade with an access room above grade. The DGFOSV house fuel oil tanks and transfer pumps. The DGFOSV are buried in the structural back-fill. The embedment depth to the bottom of the 2 ft thick mudmat is approximately 45 ft, the maximum height from the bottom of the mudmat is approximately 61 ft, and the basemat dimensions are approximately 81.5 ft by 48 ft. Properties of the backfill are described in Section 3H.6.5.2.4.

A summary of the extreme environmental design parameters is presented in Table 3H.9-1.

Two DGFOSV are located about 53 feet away from the south face of the Reactor Building (RB), which is a heavy multistory structure. The third DGFOSV is located approximately 40 feet away from the north face of the Reactor Service Water (RSW) Pump House. Figure 3H.6-221 shows the DGFOSV locations relative to other structures. Considering the soil profile at the STP Units 3 & 4 site, the induced acceleration at the foundation level of the DGFOSV during a safe-shutdown earthquake (SSE) event may be amplified due to their close proximity to the RB (for the two) or the RSW Pump House (for the third). To establish the input motion for the soil-structure interaction (SSI) analysis of the DGFOSV, considering the impact of the nearby heavy RB (for the two) and RSW Pump House (for the third) structures, an analysis as described below was performed.

Five interaction nodes at the ground surface and five at the depth corresponding to the bottom elevation of the DGFOSV foundations are added to the three dimensional SSI SASSI2000 model of the RB for obtaining free field responses for the three DGFOSV. These five nodes correspond to the four corners and the center of the DGFOSV. This RB SSI model is analyzed for the STP site-specific SSE. For each of these three DGFOSV, first an average of the spectra at five nodes at the surface and foundation each is calculated and then envelope of the two average spectra is calculated. Similarly, in the SSI analysis for the RSW Pump House, interaction nodes are added in the model and amplified motion for the DGFOSV close to the RSW Pump House is obtained. Since the diesel oil tank is a standard plant equipment, the input motion for the SSI analysis also considers the 0.3g Regulatory Guide 1.60 response spectra. Therefore, the envelope of the envelope average spectra for the three DGFOSV and the 0.3g Regulatory Guide 1.60 response spectra are used as the input response spectra for the SSI analysis of the DGFOSV. As shown in Figures 3H.6-222a through 3H.6-222 c, the 0.3g Regulatory Guide 1.60 response spectra were found to be the bounding spectra. The DGFOSV and the equipment and components inside the vault are designed using the results of the SSI analysis.

The comparison of response spectra (the minimum required 0.1g Regulatory Guide 1.60 spectra, the FIRS, and the deconvolved SHAKE outcrop spectra) at the foundation level of the DGFOSV is presented in Figures 3H.6-11d through 3H.6-11L. As can be seen from these figures, the deconvolved SHAKE outcrop spectra envelop the minimum required spectra and FIRS for the three sets of soil properties.

The following two types of soil-structure interaction (SSI) analyses are performed for DGFOSV:

- 3D SSI analyses of DGFOSV alone for calculating in-structure response spectra and design accelerations/forces of the structure. These analyses were performed considering both full and empty fuel oil tanks.
- 2D structure-soil-structure interaction (SSSI) analysis of DGFOSV and adjacent structures to obtain seismic soil pressures.

3D SSI Analysis

The SSI analyses of the 3D model of DGFOSV are performed using SASSI2000 computer program (using the modified subtraction method).

Structural Model:

The structural part of the model consists of shell elements to model the exterior walls, and the roof slabs and 3D solid elements to model the basemat and the mud mat. Structure self weight and other applicable weights of equipment, live load, piping, metal decking, missile barrier cover are included in the structural model. The fuel tank is modeled with the fuel and tank weight lumped at the center of gravity of the tank and the tank lumped weight rigidly connected to the base mat at tank saddle locations. The fuel tank procurement specification will require that the fuel tank with fuel in it should have predominant frequencies greater than 33 Hz in horizontal and vertical directions. The fuel tank portion of the model has been assigned a damping value of 0.5%. For the other parts of the structure two damping values are used; 7% damping and 4% damping. The results from the 7% structural damping are used for design of the DGFOSV. The results from the 4% damping are used for generation of in-structure response spectra. Both full and empty fuel oil tank conditions are considered in the analysis. Figure 3H.6-222 shows the typical 3D structural model of the DGFOSV for various SSI analyses. The following provides the details of the SSI model and method of analysis.

Strain Dependent Soil Properties Used in SSI Analyses:

The strain dependent soil properties used in the model are in accordance with the properties provided in Table 3H.6-1 for the in-situ soil and Table 3H.6-2 for the backfill soil, with the exception that the groundwater table is changed to 6 ft below grade and for soil layers below the ground water table, the Poisson's ratio is capped at 0.495 for determining the compression wave velocity. The shear wave velocities in backfill are also adjusted as described in Section 3H.6.5.2.4 for groundwater table at 6 ft below grade. The thickness of soil layers are adjusted to provide a vertical direction passing frequency of at least 33 Hz (based on one fifth of shear wave length criterion).

Analysis Cases, Passing Frequency and Cutoff Frequency for the SSI Analyses:

- The following cases are analyzed for both 4% and 7% structural damping cases:

  For full fuel oil tank case:

  – Lower Bound (LB) in-situ soil

  – Mean in-situ Soil

  – Upper Bound (UB) in-situ soil

  – LB backfill over LB in-situ soil

  – Mean backfill over mean in-situ soil

  – UB backfill over UB backfill

  – UB in-situ soil with soil separation

  – UB in-situ soil with cracked concrete

  For Empty fuel oil tank case:

  – UB in-situ soil with empty fuel tank

  Note: For soil separation, cracked concrete and empty fuel oil tank cases, the UB in-situ soil is used because the UB in-situ soil case in general governed.

- A cut-off frequency of ~~35~~33 Hz was used for all SSI analyses for transfer function calculation.

- Vertical direction passing frequencies (based on one fifth of shear wave length criterion and considering lower bound in-situ soil) are equal to or greater than 33 Hz.

- Horizontal direction passing frequencies are equal to or greater than 33 Hz, except at following locations:

  – For LB in-situ soil, the passing frequency for the top 4 ft soil layer is 30.3 Hz.

  – ~~At the foundation toe, the passing frequencies for in-situ soil are 20 Hz for LB, 25.8 Hz for mean, 31.6 Hz for UB; and for backfill are 23.1 Hz for LB, 28.3 Hz for mean and 34.7 Hz for UB.~~

~~To evaluate the effect of 20 Hz passing frequency for LB in-situ case, the foundation toe was divided into two elements, thus increasing the passing frequency to 40 Hz. This refined model with LB in-situ soil properties was analyzed and 5% damped spectra from this model were compared with the~~

~~spectra from the original model with passing frequency of 20 Hz. The comparison shows that:~~

- ~~In the X direction, there is insignificant difference between the response spectra from the two models~~
- ~~In the Y direction, the response spectra from the two models matched well except at frequency of about 3.8 Hz where the refined model produced higher spectra. However, spectra from both the models are enveloped by the spectra for UB in-situ soil case~~
- ~~In the vertical direction, the spectra from the two models matched well (insignificant difference)~~

~~Based on the above evaluation it is concluded that the horizontal direction passing frequencies are acceptable.~~

Input Motion:

In the SSI analysis, acceleration time histories, consistent with 0.3g Regulatory Guide 1.60, are used as input at the grade elevation. The response spectra from these time histories envelop the amplified response spectra at the DGFOSV locations considering the effect of nearby heavy RB and UHS/RSW Pump House structures.

Response Combination, Enveloping and Spectra Peak Widening:

For all analysis cases, the responses due to two horizontal directions and vertical direction input motions are combined using square-root sum of squares (SRSS) method. Then, the responses from all analysis cases and all locations considered for spectra generation are enveloped to determine one set of un-widened horizontal and vertical response spectra. Finally, per Regulatory Guide 1.122, the enveloped un-widened response spectra are peak widened by plus-minus 15% on the frequency scale to obtain the final response spectra for DGFOSV. The resulting enveloping response spectra for DGFOSV are shown in Figures 3H.6-223 and 3H.6-224.

2D SSSI Analysis

Two 2D SSSI models are developed and analyzed to evaluate the effects of nearby structures on the three DGFOSV and to calculate the seismic soil pressures on the structures.

The first SSSI model is for a section cut in the North-South direction, consisting of UHS/RSW Pump house, RSW Piping Tunnel, DGFOSV 1B, DGFOSV 1C and RB. The details of this SSSI analysis are provided in Section 3H.6.5.3.

The second SSSI model is for a section cut in the East-West direction consisting of diesel generator fuel oil tunnel (DGFOT), DGFOSV 1A and the Crane Foundation Retaining Wall. The model for this SSSI analysis is shown in Figure 3H.6-225 and the details of the model are provided below.

Structural Models:

DGFOSV Model:

East-West direction of 2D DGFOSV model is idealized by a stick model of beam elements. Axial, flexural, and shear deformation effects are included in beam element stiffness. The fuel oil tank is also modeled using beam elements and its mass is lumped at its CG. The basemat and the mud mat are modeled using four node plain strain elements. The model properties (stiffness and mass) for the 2D plane analysis correspond to per unit depth (one foot dimension in the out-of-plane direction) of the DGFOSV.

DGFOT Model:

Four node plane strain elements are used to model the exterior walls, base slab, the top slab and the mud mat. Applicable weights are included at appropriate locations in the model. The structural model properties (stiffness and mass), for the 2D plane strain model correspond to per unit depth (one foot dimension in out-of-plane direction).

Crane Wall:

The Crane Wall is modeled using beam elements with nodes located 17 ft away from the DGFOSV east wall (clear distance between the DGFOSV 1A exterior wall face and the west face of the Crane Wall). Beam section properties (stiffness and mass), for the 2D plane strain model correspond to per unit depth (one foot dimension in out-of-plane direction).

The SSSI analysis of the 2D model of DGFOSV with other structures, which affects the DGFOSV in the East-West direction is performed using SASSI2000 computer program, using subtraction method. For resolution of issues with the subtraction method of analysis identified by the Defense Nuclear Facilities Safety Board (DNFSB) see Section 3H.10. The following provides the details of this SSSI analysis.

Strain Dependent Soil Properties Used in SSSI Model:

The strain dependent soil properties used in the model are in accordance with the properties provided in Table 3H.6-1 for the in-situ soil, and Table 3H.6-2 for the backfill soil, with the exception that for soil layers below the ground water table, the Poisson's ratio is capped at 0.495 for determining the compression wave velocity. The thickness of soil layers are adjusted to provide a vertical direction passing frequency of at least 33 Hz (based on one fifth of shear wave length criterion).

Based on the site groundwater conditions originally described in FSAR Subsection 2.4S.12, the groundwater elevation of approximately eight feet below grade (26 feet MSL) was used in the analysis to determine the soil properties. Subsection 2.4S.12 and Table 2.0-2 now state the groundwater elevation as 28 feet MSL. Therefore, a sensitivity analysis of this change in groundwater elevation was performed using the Diesel Generator Fuel Oil

Storage Vault SSI model, which showed no significant effect on the analysis results.

To evaluate the effects of the soil variation, six soil cases are considered:

- UB in-situ soil
- UB in-situ soil with UB backfill between the structures.
- LB in-situ soil with LB backfill between the structures.
- Mean in-situ soil with Mean backfill between the structures.
- Mean in-situ soil with LB backfill between the structures.
- Mean in-situ soil with UB backfill between the structures.

Passing Frequency and Cut-off Frequency for SSSI Model:

- Cut-off frequency of 33 Hz is used in the analysis.
- Vertical direction passing frequencies are equal to or greater than 33.5 Hz.
- Horizontal direction passing frequencies are equal to or greater than 30.48 Hz.

Input Motion:

STP 3&4 site specific SSE motion, as described in Subsection 3H.6.5.1.1.2, is applied at the grade elevation, in the East-West direction.

The incremental seismic soil pressures used in design, which envelope the incremental seismic soil pressures from the SSSI analyses and those computed per Subsection 3.5.3.2 of ASCE 4-98, are shown in Figures 3H.6-226 through 3H.6-231.

The settlement information on the DGFOSV is included in Section 2.5S.4.10.

The effect of settlement due to the flexibility of the structure/basemat and supporting soil is accounted for through the use of finite element analysis in conjunction with foundation soil springs, as described in Section 3H.6.6.4. The resulting maximum calculated ratio of differential foundation settlements (between adjacent points in the mat finite element model) within the boundary of the DGFOSV is 1/4860.

Stability evaluations were performed for sliding, overturning, and flotation. For sliding and overturning evaluations, the 100%, 40%, 40% rule was used for consideration of the X, Y, and Z seismic excitations. Since the orientation of the DGFOSVs in the horizontal plane can be along the East-West or North-South axes, the horizontal seismic values used in the stability calculation envelope the SSI accelerations in the X and Y directions. The calculated factors of safety against sliding, overturning, and flotation for the DGFOSV are included in Table 3H.6-12.

The tornado missile impact evaluation results for the DGFOSV are included in Table 3H.6-13.

Lateral soil pressures used in design are shown in Figures 3H.6-241 through 3H.6-244.

The Large Equipment Access Building Foundation will be designed such that the surcharge load on the walls of the adjacent DGFOSV is insignificant.

3H.6.7.1 Applicable Codes, Standards, Specifications and Load Combinations and Materials

The applicable codes, standards, and specifications from Section 3H.6.4 are used for analysis and design of the DGFOSV.

The DGFOSV are designed to the applicable loads and load combinations specified in Section 3H.6.4.

The structural materials used in the design of the DGFOSV are specified in Section 3H.6.4.4.

3H.6.7.2 Structural Design

The structural analysis and design of the Diesel Generator Fuel Oil Storage Vault (DGFOSV) was performed using a finite element analysis (FEA). The finite element model (FEM) for this FEA is Figure 3H.6-140. The analysis for the seismic loads was performed using equivalent static seismic loads. The maximum nodal accelerations from the SSI analysis in the X, Y, and Z direction for the subgrade and above grade roofs were averaged and used as the accelerations in the X, Y, and Z directions for the entire structure to obtain the equivalent static seismic loads. The induced forces due to the X, Y, and Z seismic excitations were combined using the square-root-sum-of squares (SRSS) method.

Comparison of the seismic in-plane shear forces, axial forces and in-plane moments for the shear walls of this structure from the equivalent static method and those from the SSI analyses at a section cut just above the basemat shows that the forces and moments from the equivalent static method are in excess of those from the SSI analyses.

The strength design criteria of ACI 349, as supplemented by RG 1.142, were used for the design of the reinforced concrete elements of the DGFOSV. Concrete with minimum compressive strength of 4.0 ksi (27.6 MPa) and reinforcing steel with yield strength of 60 ksi (414 MPa) are considered in the design.

Due to difference in soil spring constants for seismic and non-seismic loads, the FEA analyses for the non-seismic loads and equivalent static seismic loads were run on different FEA models and the results from these models were combined and adjusted per Section 3H.6.7.3.1 outside the SAP2000 model to obtain the combined total design forces and moments for the seismic load combinations.

3H.6.7.2.1 Wall and Slab Design

The revised design forces and provided reinforcement for the DGFOSV walls and slabs are shown in Table 3H.6-11. Each face and each direction of each wall and slab has a corresponding longitudinal reinforcement zone figure. Each wall and slab also has a corresponding transverse shear reinforcement zone figure where transverse shear reinforcement is required. The reinforcement zone figures (Figure 3H.6-142 through 3H.6-208) show the various zones used to define the provided reinforcement based on the finite element analysis results. Actual provided reinforcement, based on final rebar layout, may exceed the reported provided reinforcement and the zones with higher reinforcement may be extended beyond their reported zone boundaries.

The shell forces from every element for every load combination in the finite element analysis were evaluated to determine the provided reinforcement in each reinforcement zone. For each reinforcement zone, the following out-of-plane moment and axial force coupled with the corresponding load combination are reported in Table 3H.6-11:

- The maximum tension axial force with the corresponding moment acting simultaneously from the same load combination.
- The maximum compression axial force with the corresponding moment acting simultaneously from the same load combination.
- The maximum moment that has a corresponding axial tension acting simultaneously in the same load combination.
- The maximum moment that has a corresponding axial compression acting simultaneously in the same load combination.

For each reinforcement zone, the ~~following~~ in-plane ~~and transverse shears~~shear with the corresponding load combination are reported in Table 3H.6-11~~:~~. The in-plane shear is the maximum average in-plane shear along a plane that crosses the longitudinal reinforcement zone.

The shell forces from every element for every load combination in the finite element model were evaluated to determine the required transverse reinforcement. The transverse shear and axial force reported in Tables 3H.6-11 correspond to the maximum required transverse reinforcement for an element within that transverse reinforcement zone.

- ~~The in-plane shear is the maximum average in-plane shear along a plane that crosses the longitudinal reinforcement zone.~~
- ~~The transverse shear is the maximum average transverse shear along a plane in that transverse reinforcement zone.~~

The provided longitudinal reinforcing for each face and each direction is determined based on the out-of-plane moments, axial forces, and in-plane shears occurring simultaneously for every load combination.

The provided transverse shear reinforcing (as required) is determined based on the transverse shears and axial forces perpendicular to the shear plane occurring simultaneously for every load combination.

The DGFOSV below grade roof was designed with composite steel beams and concrete slabs for vertical loading. The composite beams span in the SAP2000 model Y-direction with the concrete slab designed as spanning one-way between the composite beams. The below grade roof slab acts as a diaphragm to transfer lateral loads. The provided reinforcing for the below grade roof slab is reported in Table 3H.6-11.

3H.6.7.3 Foundation

The foundation for the DGFOSV consists of a reinforced concrete mat and a lean concrete mud mat. The basemat deflections due to the flexibility of the basemat and supporting soil were accounted for through the use of foundation soil springs in the SAP2000 FEA models. Both the Winkler and the Pseudo-Coupled Methods were used to model the foundation soil springs, and the results of the two analyses were enveloped for design purposes.

Two different subgrade reactions (soil spring constants) are used, one for seismic loads and one for non-seismic loads. The following soil spring constants were used in the FEA models of the DGFOSVs:

Vertical springs (with static loads)…………………………………………..60 kips/ft/ft^2

Vertical springs (with seismic loads)……………………………….……..314 kips/ft/ft^2

North-south springs (with static and seismic loads)………………….....229 kips/ft/ft^2

East-west springs (with static and seismic loads)………………………...213 kips/ft/ft^2

3H.6.7.3.1 Uplift Analysis

The SAP2000 finite element models were checked for uplift effects by reviewing the joint reaction at the basemat. It was determined that under seismic loading the DGFOSV experiences uplift. Using the 100%, 40%, 40% rule for combination of three seismic excitations, non-linear analysis was run on each model with uniform Winkler soil springs and pseudo-coupled soil springs to determine an enveloping adjustment factor for forces and moments from the linear analysis for the foundation mat and the connecting walls. The non-linear analysis iterates multiple times removing soil springs that go into tension during each iteration until no soil springs are in tension. For the directional earthquake loading required for the nonlinear analysis, the DGFOSV critical loading, a safe shutdown earthquake (SSE) from the southwest in combination with static active and passive loads for SSE, is considered.

Comparing resultant foundation mat and wall reactions from the linear analysis with mat and wall reactions from the nonlinear analysis, there is a maximum reaction increase of approximately ~~67~~221% for the foundation mat out-of-plane shear forces, 0.1% increase for the foundation mat in-plane shear and axial forces, ~~17~~212% increase for the foundation mat bending moments, 4% increase for the connecting walls shear forces and axial forces, and ~~6~~10% increase for the connecting walls ~~shear forces, axial forces, and~~ bending moments (enveloping cases with Winkler and pseudo-coupled soil springs) in the nonlinear analysis. To account for this, the resulting forces and moments from the linear analyses were adjusted by applying an increase factor of ~~1.67~~3.21 to ~~all~~out-of-plane shear forces in the foundation mat, an increase factor of 1.1 to in-plane shear and axial forces in the foundation mat, an increase factor of ~~1.17~~3.12 to all moments in the foundation mat, an increase factor 1.07 to all forces in the connecting walls, and an increase factor ~~1.06~~1.1 to all ~~forces and~~ moments in the connecting walls for the DGFOSV design.

3H.6.8 Seismic Gaps at the Interface of Site-Specific Seismic Category I Structures and the Adjoining Structures

The joints (i.e. separation gaps) at the interface of site-specific seismic category I structures (Reactor Service Water Tunnels and Diesel Generator Fuel Oil Storage Vaults) with the adjoining structures (Control Buildings, Reactor Service Water Pump Houses, and Diesel Generator Fuel Oil Tunnels) are designed to accommodate the expected movements without transmitting significant forces. These separation gaps are sized at least 50% larger than the absolute sum of the maximum calculated displacements due to seismic movements and long term settlement. The joint material used as flexible filler will be polyurethane foam impregnated with a waterproofing sealing compound, or a similar material, capable of being compressed to 1/3 of its thickness without subjecting the structures to more than 25 psi. The walls of the Reactor Service Water Pump House and the Diesel Generator Fuel Oil Storage Vaults have been evaluated and found to be adequate for this out-of-plane load.

Table 3H.6.15 provides summary of the required and provided gaps at the interface of site-specific seismic category I structures with adjoining structures.

3H.6.9 References

3H.6-1 US Department of Army, Fundamentals of Protective Design for Conventional Weapons, TM 5-855-1, November 1986.

3H.6-2 C. R Russell, “Reactor Safeguards,” published by MacMillian, New York, 1962.

3H.6-3 Coduto, Donald P., “Foundation Design Principles and Practices”, Second Edition, Prentice Hall: New Jersey, 2001.

3H.7 Diesel Generator Fuel Oil Tunnel

3H.7.1 Objective and Scope

The scope of this section is to document the structural design and analysis of the Diesel Generator Fuel Oil Tunnels (DGFOTs) for STP Units 3 & 4.

3H.7.2 Summary

The following are the major summary conclusions on the design and analysis of the DGFOT:

- The provided concrete reinforcement listed in Table 3H.7-1 meets the requirements of the design codes and standards listed in Section 3H.7.4.1.
- The factors of safety against flotation, sliding and overturning of the structure under various loading combinations as shown in Table 3H.7-2 are higher than the required minimum factors of safety.
- The thickness of the exterior walls and roof slabs are more than the minimum required to preclude penetration, perforation, or spalling due to impact of design basis tornado missiles.

3H.7.3 Structural Description

The layout of the Diesel Generator Fuel Oil Tunnels (DGFOTs) is as shown in Figure 3H.6-221. There are three (3) reinforced concrete DGFOTs approximately 50 ft, 200 ft, and 220 ft long for each unit. Each DGFOT is connected at one end to the Reactor Building (RB) and at the other end to a Diesel Generator Fuel Oil Storage Vault (DGFOSV). There is a seismic gap between each of the DGFOT and the adjoining RB and DGFOSV. Table 3H.6-15 provides the magnitude of the required and provided seismic gaps at interface of DGFOTs and the adjoining RB and DGFOSVs.

Each DGFOT has two access regions which extend above grade; one access region is located where the tunnel interfaces with the DGFOSV and another where the tunnel interfaces with the RB. The access regions provide access to the below grade portions of the DGFOTs during maintenance and inspection. The overall above grade dimensions of the access regions are approximately 7.5 ft wide by 7.5 ft long and 15 ft high.

The top of the DGFOT is located approximately at grade. The DGFOT No. 1B, which is the shortest tunnel, running approximately 50 ft between the RB and DGFOSV No. 1B, has a wall thickness of 2'-0" on both sides. The interior below grade dimensions of this tunnel are approximately 7 ft high by 3.5 ft wide. The other two longer DGFOTs (approximately 200 ft and 220 ft long) have a wall thickness of 2'-0" on one side and 2'-6" on the other side to allow for placement of embedded conduits. The interior below grade dimensions of these tunnels are approximately 7 ft high by 3 ft wide. Any fuel leak from the fuel oil lines or water infiltration within the tunnels will be collected in a sump and removed by pumps. The tunnels slope away from the DGFOSV and the RB towards the sump located at the center of the tunnel runs.

3H.7.4 Structural Design Criteria

3H.7.4.1 3H.7.4.1 Design Codes and Standards

The DGFOTs are designed to meet the design requirements of standard plant structures. The following codes, standards, and regulatory documents are applicable for the design of the DGFOT.

- ASCE 4-98, "Seismic Analysis of Safety-Related Nuclear Structures and Commentary"
- ACI 349-97, "Code Requirements for Nuclear Safety-Related Concrete Structures and Commentary"
- ASCE 7-88, "Minimum Design Loads for Buildings and Other Structures"
- NUREG-0800 SRP 3.3.2, "Tornado Loadings," Rev. 2, July 1981
- NRC RG 1.142, "Safety-Related Concrete Structures for Nuclear Power Plants (Other Than Reactor Vessels and Containments)," Rev 2, November 2001
- NRC RG 1.76, "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants," Rev 0, April 1974
- NUREG 0800 SRP 3.5.3 "Barrier Design Procedure", Revision 1, July 1981
- NUREG 0800 SRP 3.5.1.4 "Missiles Generated by Natural Phenomena", Rev. 2, July 1981

3H.7.4.2 Site Design Parameters

3H.7.4.2.1 Soil Parameters

- Poisson's ratio (above groundwater)……………………………………………0.42
- Poisson's ratio (below groundwater)…………………………………….….…0.47
- Unit Weight (moist)………………………………………………………….…120 pcf
- Unit Weight (saturated)……………………………………………………..….140 pcf
- Liquefaction potential ………………………………………………..………….None

3H.7.4.2.2 Design Ground Water Level

Consistent with the DCD Tier 1, Table 5.0, design groundwater level is at elevation 32 feet MSL. This value bounds the site groundwater elevations discussed in Section 2.4S.12.

3H.7.4.2.3 Design Flood Level

Design flood level is 33 feet MSL, as shown in DCD, Tier 1, Table 5.0. The external flood level due to MCR breach is shown in 3H.7.4.3.3.3.

3H.7.4.2.4 Maximum Snow Load

Roof snow load is 50 psf as shown in DCD Tier 1 Table 5.0. This snow load is above the value derived from ASCE 7-88 for the STP 3&4 site. This load is not combined with normal roof live load.

3H.7.4.2.5 Maximum Rainfall

Design rainfall is 19.4 in/hr (50.3 cm/hr) as shown in DCD Tier 1 Table 5.0. This load is not combined with normal roof live load.

3H.7.4.3 Design Load and Load Combinations

The DGFOT is not subjected to any accident temperature or pressure loading.

3H.7.4.3.1 Normal Loads

Normal loads are those that are encountered during normal plant startup, operation, and shutdown.

3H.7.4.3.1.1 Dead Loads (D)

Dead loads include the weight of the structure and other permanent static loads. An additional 50 psf uniform load is considered to account for dead loads due to piping on the DGFOT and access region walls.

3H.7.4.3.1.2 Live Loads (L)

Live loads include floor and roof area live loads and movable loads. A minimum normal floor live load of 200 psf is considered for the floor of the DGFOT. A normal live load of 50 psf is considered for the roof.

For the computation of global seismic loads, the live load is limited to the expected live load present during normal plant operation which is defined as 25% of the normal floor and roof live loads. However, design of local elements such as beams and slabs is based on consideration of full normal live load.

A surcharge load of 500 psf is applied to the top of the DGFOT at grade and the ground on either side of the tunnel for lateral soil pressure calculation.

3H.7.4.3.1.3 Lateral Soil Pressures (H)

Lateral soil pressures are calculated using the following soil properties.

- Unit weight (moist):.. 120 pcf (1.92 t/m^3)
- Unit weight (saturated):... ……140 pcf (2.24 t/m^3)

- Internal friction angle: ……………………………………………………….….30°
- Poisson's ratio (above groundwater) ………….………………..…………...0.42
- Poisson's ratio (below groundwater) ………….…………………….………….0.47

Lateral soil pressure values are shown in Figures 3H.7-2 through 3H.7-4.

3H.7.4.3.1.4 Internal Flood Load

The DGFOT contains sump pumps to keep the structure from flooding. The internal flooding condition is not applicable for the structural design of the DGFOT.

3H.7.4.3.2 Severe Environmental Load

Severe environmental loads consist of loads generated by wind.

3H.7.4.3.2.1 Wind Load (W)

The following parameters are used in the computation of the wind loads.

- Basic wind speed (50 year recurrence interval, fastest mile)……110 mph (177 km/h)
- Exposure:...D
- Importance factor I:...1.11
- Velocity pressure exposure: …………………………………….0.00256Kz $(IV)^2$

Wind loads are calculated in accordance with the provisions of Chapter 6 of ASCE 7-88.

3H.7.4.3.3 Extreme Environmental Load

Extreme environmental loads consist of loads generated by tornado, SSE earthquake, extreme snow and flooding.

3H.7.4.3.3.1 Tornado Loads (W_t)

The following tornado load effects are considered in the design:

- Wind pressure: ……………………………………………………………....W_w
- Differential pressure: ……………………………………………………..……..W_p
- Missile Impact: ……………………………………………………………..W_m

The tornado parameters used in the calculations of tornado loads are as follows:

- Maximum wind speed: …………………………………………………300 mph

- Pressure differential: ……………………………………………………………2 psi
- Radius of maximum rotational speed: ……………………………………150 feet
- Pressure differential rate: ………………………………….……………1.2 psi/sec
- Missile spectrum (per DCD Tier 2 Table 2.0-1) :

  A: 4000 lbs automobile (16.4ft x 6.6ft x 4.3ft)

  B: 276 lbs, 8" diameter armor piercing artillery shell

  C: 1" diameter solid steel sphere

Notes:

(1) Tornado wind pressure (W_w)

(a). Wind velocity and wind pressure are constant with height.

(b) Wind velocity and wind pressure vary with horizontal distance from the center of the tornado.

(2) Tornado differential pressure (W_p)

The differential pressure is applied to the top of the tunnel slab and access region. The differential pressure causes suction on the exterior walls.

(3) Tornado missile impact (W_m)

Tornado missile impact effects on the structure are assessed as noted below:

(a) Local damage in terms of penetration, perforation, and spalling.

(b) Structural response in terms of deformation limits, strain energy capacity, structural integrity and structural stability.

(c) All missiles are considered to impact at 35% of the maximum horizontal tornado wind speed horizontally and 70% of horizontal impact velocity vertically.

(d) Barrier design is evaluated assuming a normal impact at the surface for the schedule 40 pipe and automobile missiles.

(e) The automobile missile is considered to impact at all attitudes less than 30 feet above grade level.

(4) Table 3H.7-3 contains the results of the tornado missile impact evaluation.

- Tornado load combinations

Tornado load effects are combined per USNRC Standard Review Plan, NUREG-0800 Section 3.3.2 as follows:

$W_t = W_w$

$W_t = W_p$

$W_t = W_m$

$W_t = W_w + 0.5\ W_p$

$W_t = W_w + W_m$

$W_t = W_w + 0.5\ W_p + W_m$

3H.7.4.3.3.2 Earthquake (E')

The Safe Shutdown Earthquake (E') loads are applied in three mutually orthogonal directions - two horizontal directions and the vertical direction. The total structural response is predicted by combining the applicable maximum co-directional responses by the SRSS method.

3H.7.4.3.3.3 Extreme Environmental Flood (FL)

The design basis flood level is 40 feet, in accordance with Subsection 2.4S.2.2. The flood water unit weight, considering maximum sediment concentration, is 63.85 pcf per Section 2.4S.4.2.2.4.3. The design requirements for this flood, including hydrostatic, hydrodynamic, and floating debris loading, are included in Section 3.4.2.

3H.7.4.3.3.4 Lateral Soil Pressures Including the Effects of SSE (H')

The calculated lateral soil pressures including the effects of SSE are presented in Figures 3H.7-5 through 3H.7-8.

3H.7.4.3.3.5 Accident Temperature

There are no accident scenarios for the DGFOT which would cause consideration of an accident temperature.

3H.7.4.3.4 Load Combinations

3H.7.4.3.4.1 Notations

U = Required strength for strength design method

D = Dead load

F' = Hydrostatic and hydrodynamic load due to flood

L = Live load

H = Lateral soil pressure and groundwater effects

H' = Lateral soil pressure and groundwater effects, including dynamic effects

W = Wind load

W_t = Total tornado load, including missile effects

E' = SSE seismic load

FL = Extreme environmental flood

3H.7.4.3.4.2 Reinforced Concrete Load Combinations

U = 1.4D + 1.7L + 1.7H

U = 1.4D + 1.7L + 1.7H + 1.7W

U = D + L + H + FL

U = D + L + H + W_t

U = D + L + H + E'

U = 1.05D + 1.3L +1.3H

U = 1.05D + 1.3L +1.3H + 1.3 W

For the computation of global seismic loads, the live load is limited to the expected live load present during normal plant operation which is defined as 25% of the normal floor and roof live loads. However, design of local elements such as beams and slabs is based on consideration of full normal live load

3H.7.4.4 Materials

Structural materials used in the design of DGFOT are as follows:

3H.7.4.4.1 Reinforced Concrete

Concrete conforms to the requirements of ACI 349. Its design properties are:

- Compressive strength..……………………………………….…4.0 ksi (27.6 MPa)
- Modulus of elasticity....……………………….…………..…..3,597 ksi (24.8 GPa)
- Shear modulus..………………………………………………1,537 ksi (10.6 GPa)
- Poisson's ratio...…………………………………………………………….... 0.17

3H.7.4.4.2 Reinforcement

Deformed billet steel reinforcing bars are considered in the design. Reinforcement conforms to the requirements of ASTM A615. Its design properties are:

- Yield strength...60 ksi (414 MPa)
- Tensile strength..90 ksi (621 MPa)

3H.7.4.4.3 Structural Steel

High strength, low-alloy structural steel conforming to ASTM A572, Grade 50 is considered in the design for wide-flange sections. The steel design properties are:

- Yield strength...50 ksi (345 MPa)
- Tensile strength..65 ksi (448 MPa)

3H.7.4.5 Stability Requirements

The following minimum factors of safety are required against overturning, sliding, and flotation:

Load Combination	Overturning	Sliding	Flotation
$D + F_b$	-	-	1.1
D + H + W	1.5	1.5	-
$D + H + W_t$	1.1	1.1	-
D + H' + E'	1.1	1.1	-

Loads D, H, H', W, W_t, and E' are defined in Subsection 3H.7.4.3.4.1. F_b is the buoyant force corresponding to the flood water level.

3H.7.5 Structural Analysis and Design Summary

3H.7.5.1 Analytical Model Analysis and Design

The DGFOTs are Seismic Category I structures. The structural analysis and design of the DGFOT is performed using a three-dimensional (3D) SAP 2000 finite element analysis (FEA) with shell elements representing the walls, slabs and mat. The foundation soil is represented by vertical and horizontal springs. The FEA finite element model (FEM) is shown in Figure 3H.7-1.

The DGFOT No. 1B, which is the shortest tunnel, running approximately 50 ft between the RB and the DGFOSV No. 1B, has a wall thickness of 2'-0" on both sides. The interior below grade dimensions of this tunnel are approximately 7 ft high by 3.5 ft wide. The other two longer DGFOTs (approximately 200 ft and 220 ft long) have a wall thickness of 2'-0" on one side and 2'-6" on the other side to allow for placement of embedded conduits. The interior below grade dimensions of these tunnels are approximately 7 ft high by 3 ft wide. The DGFOT No. 1B, with a wall thickness of 2'-0" on both sides and shorter tunnel length for resisting torsion effects, is selected as the critical tunnel for the FEA.

The Safe Shutdown Earthquake (SSE) design forces (E') are conservatively determined using equivalent static seismic loads. The mass of the structure, equipment weights, and seismic live loads are excited in the X, Y, and Z directions using the enveloping maximum nodal accelerations in the X, Y, and Z directions from the soil-structure interaction (SSI) analysis. A comparison between the maximum accelerations from the SSI analysis and the design accelerations for the DGFOT shows the design accelerations envelope the SSI analysis accelerations. The resulting element forces and moments due to X, Y, and Z excitations are combined using the SRSS method.

Figures 3H.7-5 through 3H.7-8 show a comparison of the SSI soil pressures, the SSSI soil pressures, the ASCE 4-98 soil pressures and the total enveloping soil pressure used in design on the walls of the DGFOT.

The forces at tunnel bends due to SSE wave propagation are determined per Section 3H.7.5.2.4 and are included as additional loads in the SAP2000 models.

Multiple SAP2000 FEA models were created to represent different conditions and load combinations for the DGFOTs. The following is a breakdown of the different FEA models:

(1) Normal (Operating Condition, Heavy Load Condition, and Flood Load Condition):

The purpose of these models is to consider the effects of operating load conditions (i.e. dead loads, minimum live loads, etc.), the heavy load condition (when heavy vehicles and cargo are moved across the top of the tunnel), and the flood load condition (the extreme flood loads due to a MCR breach).

(2) SSE (SSE loads without SSE Wave Propagation):

The purpose of these models is to consider the effects of SSE loads without the effects of the SSE wave propagation, which are considered in a separate model. The dead loads, live loads, soil loads, and accidental eccentricity loads are applied to the static (non-seismic) model. The SSE loads are combined using the SRSS method in the dynamic (seismic) model.

(3) SSE (SSE loads with SSE Wave Propagation per ASCE 4-98):

The purpose of these models is to consider the effects of SSE loads with the effects of the SSE wave propagation and additional forces and moments due to bends in the tunnel per ASCE 4-98. The dead loads, live loads, soil loads, accidental eccentricity loads, SSE wave propagation loads and additional forces and moments due to bends in the tunnel are applied to the static (non-seismic) model. The SSE loads are combined using the SRSS method in the dynamic (seismic) model.

(4) Tornado Missile:

The purpose of these models is to consider the effects of vertical tornado missiles. The full tornado load combinations, outlined in Section 3H.7.4.3.4.2, are applied to the model considering a vertical tornado missile. The results of this SAP2000 model are combined with those from a manual calculation which considers the full tornado load combination and a horizontal tornado missile.

(5) Effect of Uplift:

The purpose of this model is to consider the effects of uplift on the basemat during a seismic event. All loads are simultaneously applied to a single static model. The models described above are developed to determine the reinforcement required for their specific loading conditions. The results are post-processed as described in Section 3H.7.5.3.1.

The required reinforcement (longitudinal, in-plane shear and transverse) reported in Table 3H.7-1 is based on the envelop of the required reinforcement determined from all the SAP2000 FEA analyses and the required reinforcement determined via the manual calculation for the full tornado load combination.

3H.7.5.2 Analysis

3H.7.5.2.1 Seismic Analysis

The DGFOTs are long reinforced concrete tunnels with above grade access regions at the two ends of each tunnel. The widened envelop spectra of the resulting in-structure response spectra from the following two seismic analyses are used as the final in-structure response spectra for these tunnels and their access regions.

- Two-dimensional (2D) soil-structure-interaction (SSI) analysis of a typical cross section of the DGFOT
- Three-dimensional (3D) fixed base seismic analysis of the DGFOT No. 1B (approximately 50 ft long) including its access regions at the two ends of the tunnel.

The details of the above two seismic analyses are provided below.

A. 2D SSI Analysis of a Typical Cross section of DGFOT

SASSI2000 computer code is used for the SSI analysis, using the direct method. Figure 3H.7-20 shows the structural part of the 2D plane-strain model of the DGFOT with 2 ft thick mud mat under the base mat. The top of the tunnel is at the grade elevation. The specifics of the 2D SSI model are as follows:

- The structural properties (i.e. mass and stiffness) for the 2D model correspond to per unit depth (1 ft dimension in out-of-plane direction) of the tunnel.

- Layered soil is modeled up to 74 ft depth (more than two times the horizontal cross section dimension of the tunnel plus its embedment depth) with halfspace below it.
- Sixteen cases of strain dependent soil properties representing the in-situ lower bound, mean and upper bound; lower bound backfill over in-situ lower bound, mean backfill over in-situ mean and upper bound backfill over in-situ upper bound; cracked concrete wall with in-situ upper bound soil, soil separation with in-situ upper bound soil; ABWR DCD/Tier 2 generic soil profiles UB1D, VP3D, VP4D, VP5D, VP7D, R, R with soil separation and R with cracked wall.
- Concrete and mud mat damping are assigned 4% for all cases (conservatively 4% damping is also used for cracked concrete cases).
- ~~Groundwater~~In accordance with Subsection 2.4S.12 and Table 2.0-2 groundwater was considered at ~~8~~6 ft depth (~~26~~28 feet MSL) for site-specific soil and backfill cases. ~~Subsection 2.4S.12 and Table 2.0-2 now state the site groundwater elevation as 28 feet MSL. Therefore, a sensitivity analysis of this change in groundwater elevation was performed, which showed no significant effect on the analysis results.~~ Groundwater was considered at 2 ft depth for DCD cases. In site-specific and backfill cases, the groundwater effect is included by using a minimum P-wave velocity of 5000 ft/sec, as explained in Section 3A.15, except that Poisson's ratio is capped at 0.495. In DCD cases, the groundwater effect is similarly included, except that, consistent with DCD Section 3A.3.3, a minimum P-wave velocity of 4800 ft/sec is used.
- The models are capable of passing frequencies up to at least 33 Hz, in both the vertical and horizontal directions.
- For all SSI cases analyzed, a cut-off frequency of 35 Hz is used for transfer function calculations.
- Acceleration time histories consistent with Regulatory Guide 1.60 response spectra anchored at 0.3g peak ground acceleration are used as input at the grade elevation.

  The foundation input response spectra (FIRS) for the DGFOT were calculated and were compared to the outcrop spectra at the foundation level of the DGFOT. The outcrop spectra were calculated from a deconvolution analysis performed in the SHAKE program with the site-specific SSE motion applied at the free field ground surface. Figures 3H.7-22 through 3H.7-30 show the comparison of the outcrop response spectra and the FIRS, in the two horizontal directions and the vertical direction for the lower bound, mean and upper bound in-situ soil properties. These figures show that the FIRS are enveloped by the foundation outcrop spectra in all cases. The figures also show that the response spectra at the SHAKE outcrop of DGFOT foundation level also envelop a broad band spectrum anchored at 0.1g. This is the minimum requirement as stated in SRP 3.7.1 and Appendix S to 10 CFR 50. The broadband spectrum used in this comparison is conservatively defined as the Regulatory Guide 1.60 spectrum anchored at 0.1g.

- Since the tunnels run along both East-West and North-South directions, the horizontal input motions from both East-West and North-South time histories are considered. East-West input motion is applied to the tunnel sections running North-South and North-South input motion is applied to the tunnel sections running East-West. To account for the impact of nearby heavy RB, in the three dimensional SSI analysis of the RB for site-specific SSE, one interaction node at the ground surface and one interaction node at the depth corresponding to the bottom elevation of the DGFOT are located at several locations along each of the three DGFOTs. The envelope of the amplified motions at these interaction nodes and 0.3g Regulatory Guide 1.60 response spectra are used for SSI analysis of the DGFOT. As shown in Figures 3H.7-30a through 3H.7-30c, the 0.3g Regulatory Guide 1.60 response spectra are found to be the bounding spectra.
- In-structure response spectra are generated at the top of floor slab (middle of span), at the top of the roof slab (middle of span) and at the mid-height of two walls of the tunnel cross-section.
- The responses from the horizontal and vertical directions are combined using the square-root-of-sum-of-square (SRSS) method.
- The responses from all SSI analyses cases are enveloped.
- The in-structure response spectra at the top of the floor slab (middle of span), at the roof of slab (middle of span) and at the mid-height of two walls of the tunnel cross-section are enveloped to conservatively provide the in-structure response spectra for the entire 2D cross-section of the tunnel.

B. 3D Fixed Base Analysis of DGFOT No. 1B Including its Two Access Regions

A 3D fixed base seismic (basemat fixed) analysis of the DGFOT No. 1B running between the RB and DGFOSV No. 1B is performed. The following provides the details of this fixed base analysis:

- SAP2000 computer code is used to perform the seismic analysis.
- Modal time history method of analysis is used.
- Shell elements are used for modeling the reinforced concrete tunnel section and the access regions at the two end of the tunnel.
- 4% damping is used for the shell elements.

- Acceleration time histories (two horizontal directions and a vertical direction) consistent with Regulatory Guide 1.60 response spectra anchored at 0.3g peak ground acceleration are used as input motions.
- Nodal acceleration time history responses obtained from the SAP2000 analysis are processed using the RSG computer code to calculate in-structure response spectra at selected nodes. The nodes selected for the in-structure response spectra generation are; four nodes on top of each access regions (middle of four walls) and three nodes at the top of tunnel (middle of the tunnel).
- The maximum co-directional responses from each of the three directions of excitations are combined using the SRSS method.
- The in-structure response spectra at the selected nodes are enveloped to conservatively provide the in-structure response spectra from fixed base analysis, for the entire tunnel and the access regions.

The corresponding in-structure response spectra obtained from the 2D SSI analysis and in-structure response spectra obtained from the 3D fixed base analysis described in parts A and B above are enveloped and peak widened by + 30%. The 30% peak widening is used to cover any frequency shift due to the foundation soil flexibility, which is not included in the fixed base seismic analysis. The final widened in-structure response spectra for the horizontal and vertical directions of the DGFOTs and their access regions are provided in Figures 3H.7-31 and 3H.7-32, respectively. The spectra in Figures 3H.7-31 and 3H.7-32 provide the in-structure response spectra for the entire SDGFOTs and their access towers at the two ends.

3H.7.5.2.2 Structure-Soil-Structure Interaction (SSSI) Analysis for Seismic Soil Pressures

Two 2D section cuts are taken for site-specific SSSI analyses; one East-West section cut through DGFOT No. 1C, DGFOSV No. 1A and the Crane Foundation Retaining Wall (CFRW) and one East-West section cut through the RB, DGFOT No. 1A and the CFRW. These SSSI analyses are used to obtain seismic soil pressures on the walls of DGFOT considering the effect of nearby structures.

The SSSI model and analyses details for the section cut through DGFOT No. 1C, DGFOSV No. 1A and the CFRW are provided in Section 3H.6.7.

The structural part of SSSI model for the section cut through the RB, DGFOT No. 1A and the CFRW is shown in Figure 3H.7-21. The methodology for the SSSI model including strain dependent soil properties; soil cases analyzed; and method of analyses are same as those for the section cut through DGFOT No. 1C, DGFOSV No. 1A and the CFRW described in Section 3H.6.7. This SSSI model is capable of passing frequencies up to at least 33 Hz in both the vertical and horizontal directions and the analysis uses a cut-off frequency 33 Hz for calculation of transfer functions.

Figures 3H.7-5 through 3H.7-8 show a comparison of the SSI, SSSI, ASCE 4-98 seismic soil pressures and the enveloping seismic soil pressures used for the design of the DGFOT walls.

The design of the DGFOTs also accounts for the axial tensile strain and the seismic induced forces at the tunnel bends due to SSE wave propagation as described in section 3H.7.5.2.4.

3H.7.5.2.3 Torsional Effects

The accidental torsion is computed in accordance with ASCE 4-98 considering an additional eccentricity of +/- 5% of the maximum building dimension for both horizontal directions. The induced member forces due to this accidental torsion are obtained from static analysis of the structure and are added to the induced forces to other applicable loads whether the analysis predicts positive or negative results (ie: absolute sum).

3H.7.5.2.4 SSE Wave Propagation Effects

The design of the DGFOT accounts for the axial tensile strain and induced forces at tunnel bends due to SSE wave propagation. The axial strain on the DGFOT due to SSE wave propagation is determined based on the equations and commentary outlined in Section 3.5.2.1 of ASCE 4-98. The maximum curvature is computed based on Equation 3.5-3 in Section 3.5.2.1.3 of ASCE 4-98.

For SSE wave propagation computations, the following parameters are considered:

- An apparent wave velocity of 3,000 ft/sec (as recommended in Section C3.5.2.1 of ASCE 4-98)
- A maximum ground velocity of 6.24 in/sec (which is based on 48 in/sec/g and site-specific SSE maximum ground acceleration of 0.13g)
- Soil pressure distribution on the transverse leg of the tunnel near the bend is limited by the maximum passive pressure using passive pressure coefficient Kp = 3

The tensile axial strain and strain due to maximum curvature are conservatively added together to obtain the actual strain in the longitudinal direction of the DGFOT. The actual strain is then compared to the cracking strain of concrete and maximum allowable strain of the reinforcing. The maximum computed tensile axial strain is 1.75 x 10^{-4} in/in which is about 8.5% of the rebar yield strain of 2.069 x 10^{-3} in/in. The design also accounts for the induced forces at tunnel bends due to SSE wave propagation. These forces are determined in accordance with Section 3.5.2.2 of ASCE 4-98 by considering the structure as a beam on elastic foundation. To determine the required reinforcement, the induced forces at the tunnel bends are considered to act simultaneously with all other applicable loads (including dynamic soil pressures) in the seismic load combinations.

3H.7.5.3 Structural Design

3H.7.5.3.1 Reinforced Concrete Elements

The strength design criteria defined in ACI 349, as supplemented by RG 1.142, was used to design the reinforced concrete elements making up the DGFOT. Concrete with a compressive strength of 4.0 ksi and reinforcing steel with a yield strength of 60 ksi are considered in the design. All loads and load combinations listed in Section 3H.7.4 are considered in the design.

The design forces and provided longitudinal and transverse reinforcement for the DGFOT and access region walls and slabs are shown in Table 3H.7-1.

The shell forces from every element for every load combination in the finite element analysis were evaluated to determine the required reinforcement. The following out-of-plane moment and axial force coupled with the corresponding load combination are reported in Table 3H.7-1 when the governing forces, moments and reinforcement is from the SAP2000 models:

- The maximum tension axial force with the corresponding moment acting simultaneously from the same load combination.
- The maximum compression axial force with the corresponding moment acting simultaneously from the same load combination.
- The maximum moment that has corresponding axial tension acting simultaneously in the same load combination.
- The maximum moment that has corresponding axial compression acting simultaneously in the same load combination.

For each surface, the ~~following~~ in-plane ~~and transverse shears~~shear with the corresponding load combination are reported in Table 3H.7-1 when the governing forces, moments and reinforcement is from the SAP2000 models~~:~~. The in-plane shear is the maximum average in-plane shear along a plane that crosses the longitudinal reinforcement zone. The shell forces from every element for every load combination in the finite element model were evaluated to determine the required transverse reinforcement. The transverse shear and axial force reported in Table 3H.7-1 correspond to the maximum required transverse reinforcement for an element within that transverse reinforcement zone.

- ~~The in-plane shear is the maximum average in-plane shear along a plane that crosses the longitudinal reinforcement zone.~~
- ~~The transverse shear is the maximum average transverse shear along a plane in that transverse reinforcement zone.~~

The provided longitudinal reinforcing for each face and each direction is determined based on the out-of-plane moments, axial forces, and in-plane shears occurring simultaneously for every load combination.

The provided transverse shear reinforcing (as required) is determined based on the transverse shears and axial forces perpendicular to the shear plane occurring simultaneously for every load combination.

3H.7.5.3.2 Foundation Design

The foundation for the DGFOT consists of a reinforced concrete mat and a lean concrete mud mat. The basemat deflections due to the flexibility of the basemat and supporting soil were accounted for through the use of foundation soil springs in the SAP2000 finite element analysis models. Both the Winkler and the Pseudo-Coupled Methods were used to model the foundation soil springs. The results of the two analyses were enveloped for design purposes.

Two different subgrade reactions (soil spring constants) are used, one for seismic loads and one for non-seismic loads. The following soil spring constants were used in the FEA models of the DGFOTs:

Vertical springs (with static loads)………………………………………..260 kips/ft/ft^2

Vertical springs (with seismic loads)……………………………………..531 kips/ft/ft^2

North-south springs (with static and seismic loads)……………………...318 kips/ft/ft^2

East-west springs (with static and seismic loads)………………………...318 kips/ft/ft^2

3H.7.5.3.3 Uplift Analysis

The effect of uplift on the basemat during a seismic event was considered through the use of a SAP2000 design model which simulated the uplift condition. The seismic design accelerations applied to the SAP2000 design uplift model are adjusted by a scale factor which scales the seismic forces to the maximum level possible during an uplift condition of the DGFOT. The scaled seismic accelerations along with applicable loads described in Section 3H.7.4 are then combined. The results of the uplift model and the design models were enveloped for design purposes.

3H.7.5.3.4 Stability Evaluation

The DGFOT stability evaluations are performed for the various load combination listed in Section 3H.7.4.5. The DGFOT factors of safety against sliding, overturning, and flotation are provided in Table 3H.7-2. For sliding and overturning evaluations, the 100%, 40%, 40% rule was used for combination of the X, Y, and Z seismic excitations.

Restraints are provided around the Access Regions to limit movement and rotation due to a tornado missile.

3H.8 Development of Standard Plant SSE Time Histories

The seismic analysis of the Diesel Generator Fuel Oil Storage Vaults and Diesel Generator Fuel Oil Tunnels use the SSE ground motion included in Tier 1 Table 5.0, in addition to the site-specific SSE ground motion, as described in Sections 3H.6.7 and 3H.7, respectively. Since the DCD does not include the digitized information for the SSE time histories, new time histories consistent with Regulatory Guide 1.60 response spectra anchored to peak ground acceleration of 0.3g were developed for use in these analyses. Acceleration time history records obtained from 1994 Northridge Earthquake were used as seed time histories in generating these synthetic time histories. The time histories were developed in accordance with the criteria described in Section 3.7.1.2, using computer programs SYNQKE-R, HIST, and QUAKE described in Appendix 3C.

The plots of the acceleration, velocity, and displacement time histories of the two horizontal and the vertical components are shown in Figures 3H.8-1 through 3H.8-3. The plots of response spectra for 2%, 3%, 4%, 5%, and 7% damping, showing the comparison of the target response spectra (Regulatory Guide 1.60 spectra) with the spectra of the synthetic time histories, are shown in Figures 3H.8-4 through 3H.8-18. The plots of power spectral density functions (PSD) showing the comparison of the target PSD, corresponding to the Regulatory Guide 1.60 spectra, with the PSD of the synthetic time histories are shown in Figures 3H.8-19 through 3H.8-21.

3H.9 Extreme Environmental Design Parameters for Seismic Analysis, Design, Stability Evaluation and Seismic Category II/I Design

Table 3H.9-1 shows the extreme environmental design parameters used for seismic analysis, structural design, stability evaluation, and Seismic Category II/I design for the Ultimate Heat Sink/Reactor Service Water Pump House, Reactor Service Water Piping Tunnel, Diesel Generator Fuel Oil Storage Vault, Diesel Generator Fuel Oil Tunnel, Radwaste Building, Control Building Annex, Turbine Building, and Service Building.

3H.10 STP 3 & 4 Resolution of Issues with Subtraction Method of Analysis Identified by DNFSB

The Defense Nuclear Facilities Safety Board (DNFSB) in its letter from Peter S. Winokur to Daniel B. Poneman of DOE, dated April 8, 2011, has identified a technical issue in SASSI that when the Subtraction Method (SM) is used to analyze embedded structures, the results may be non-conservative. To address this issue an extensive evaluation was performed and, where required, in-structure response spectra and/or structural designs based on SM were modified to ensure STP 3 & 4 designs are conservative. This evaluation took into account the recommendations for reviewing past SASSI SM analyses, and advice on avoiding SM errors in future analyses that DOE provided in a letter from Daniel B. Poneman to Peter S. Winokur dated July 29, 2011, responding to the DNFSB. The following is a summary of this evaluation.

Modified Subtraction Method:

For new analyses where use of the Direct Method (DM) of analysis is not feasible, in its July 29, 2011 letter to the DNFSB, DOE has recommended using the Modified Subtraction Method (MSM) of analysis. For analyses performed for STP 3 & 4, the interaction nodes for MSM are comprised of all those at the soil-structure interface and all those at the top of excavated soil elements. Based on a project specific validation and verification, in-structure response spectra, maximum accelerations, and forces from MSM were verified against those from DM.

Generation of In-structure Response Spectra (ISRS):

- Reactor Service Water (RSW) Piping Tunnel ISRS were generated using DM. Initially the amplified site specific SSE motions considering the effect of nearby heavy structures were obtained from SSI analyses of the Reactor Building (RB) and Ultimate Heat Sink (UHS)/RSW Pump House using SM. The SSI analyses of the RB (for all soil cases) and UHS/RSW Pump House (for upper bound in-situ soil case) were repeated using MSM. Based on the comparison of the RSW Piping Tunnel ISRS obtained from SSI analysis of RSW Piping Tunnel using amplified site specific SSE motions from MSM analyses to those from SM, increase scale factors were determined to account for the effect of MSM on amplified site specific SSE motions. The ISRS based on amplified site specific SSE motions from SM analyses were increased by these increase scale factors to obtain the final RSW Piping Tunnel ISRS.
- Diesel Generator Fuel Oil Tunnel (DGFOT) ISRS were generated using DM.
- Diesel Generator Fuel Oil Storage Vault (DGFOSV) ISRS were initially generated using SM. DGFOSV ISRS have been revised based on new SSI analysis using MSM.
- Ultimate Heat Sink (UHS)/RSW Pump House ISRS were initially generated using SM. The SSI analysis for the upper bound in-situ soil case was repeated using MSM. The ISRS from MSM were compared to the corresponding ISRS from SM to determine modification factors (only increases were considered, reductions were ignored) to account for MSM effect. The product of the modification factors for MSM and envelope of the modification factors accounting for the cumulative effect of structural and SSI mesh refinements discussed in Section 3H.6.5.2.4.2 were used as the final modification factors for adjusting the ISRS from SM to obtain the final UHS/RSW Pump House ISRS.

SSSI Soil Pressures used in Structural Design:

Based on an extensive SSSI study, the following were concluded:

- The method of SSSI analysis (SM, MSM, or DM) has negligible impact on the total force due to seismic soil pressure.
- The method of SSSI analysis (SM, MSM, or DM) has negligible impact on location (i.e. C.G.) of the total force due to seismic soil pressure.
- DM analytical results show some changes in the distribution of seismic soil pressure for exterior walls.

- The method of SSSI analysis (SM, MSM, or DM) has negligible impact on the soil pressure distribution for interior walls (walls facing adjacent structure).

Considering the above and the available margins between the seismic soil pressures used for design and those from SM, the designs based on SM were found to be adequate for possible changes in soil pressure distribution due to use of DM.

SSI Soil Pressures used in Structural Design:

- RSW Piping Tunnel SSI soil pressures were obtained from DM.
- DGFOT SSI soil pressures were obtained from DM.
- DGFOSV SSI soil pressures were obtained from MSM. Based on available margin between the seismic soil pressures used for design and SSI soil pressures from MSM, the design was found to be adequate for possible changes in soil pressure distribution due to use of DM.
- UHS/RSW Pump House SSI soil pressures were obtained from SM. MSM SSI soil pressures for upper bound in-situ soil case were found to be comparable to those from SM. Based on available margin between the seismic soil pressures used for design and SSI soil pressures from SM, the design was found to be adequate for possible changes in soil pressure distribution due to use of DM.

Maximum Accelerations / Section Cut Forces used in Structural Design:

- RSW Piping Tunnel SSI is based on DM.
- DGFOT SSI is based on DM.
- DGFOSV SSI is based on MSM.
- UHS/RSW Pump House SSI is based on SM. The maximum accelerations from MSM SSI analysis for upper bound in-situ soil case were used for evaluation of design which is based on SM. Based on the results of this evaluation, the conservative UHS/RSW Pump House design, using equivalent static method for determination of seismic loads, was found to have adequate margin to account for possible changes in maximum accelerations from MSM SSI analysis for all soil cases.

Table 3H.1-23 Factors of Safety for Foundation Stability*

	Overturning		Sliding		Floatation	
Load Combination	**Req'd.**	**Actual**	**Req'd.**	**Actual**	**Req'd.**	**Actual**
D + F'					*1.1*	~~*2.43*~~ **2.24**
$D + L_o + F + H + E_{ss}$	*1.1*	*490*	*1.1*	*1.11*		

Here:

F = Buoyant Forces from Design Ground Water (0.61m Below Grade)

F' = Buoyant Forces from Design Basis Flood (~~0.3m Below~~ 1.83m Above Grade)

H = Lateral Soil Pressure

L_o = Live Load Acting During an Earthquake (Zero Live Load is Considered).

E_{ss} = SSE Load

D = Dead Load

* *Based on the calculation for shear forces due to tornado loads, it was found that it is less than 10% of the shear forces due to the seismic effects. Hence it was concluded that the load combinations comprising of wind and tornado loadings will not be the governing load combinations for the evaluation of overturning and sliding effects of the R/B stability and therefore, were not evaluated.*

Table 3H.2-5 Stability Evaluation–Factors of Safety

Load Combination	Overturning		Sliding		Flotation	
	Required	Actual	Required	Actual	Required	Actual
D+F’	-	-	-	-	*1.1*	~~*1.42*~~ **1.30**
D+F+H+W	*1.5*	*2.79*	*1.5*	*2.74*	-	-
D+F+H+W_t	*1.1*	*2.66*	*1.1*	*2.69*	-	-
*D+L_o+F+H’+E’***	*1.1*	*123**	*1.1*	*1.14*	-	-

** Based on the energy technique*

*** Zero live load is considered.*

F’ = Buoyant Forces from Design Basis Flood (1.83m Above Grade)

Table 3H.3-1 Radwaste Building Design Seismic Loads

Wall	Elevation (ft)	In-Plane Forces(1) 1/2 SSE (0.15g) (kips)	In-Plane Moments(1) 1/2 SSE (0.15g) (kips-ft)
North Wall	95’-0”	5963	0
	35’-0”	4133	351845
	(-)11’-0”	9328	770605
South Wall	95’-0”	5351	0
	35’-0”	2888	315719
	(-)11’-0”	7186	635566
East Wall	95’-0”	4555	0
	35’-0”	3276	268725
	(-)11’-0”	7282	595912
West Wall	95’-0”	5481	0
	35’-0”	4362	323390
	(-)11’-0”	9125	732302

~~Vertical Direction: Maximum Acceleration~~	
~~Elevation (ft)~~	~~Acceleration (g)~~
~~(-)11’-0”~~	~~0.150~~
~~35’-0”~~	~~0.151~~
~~95’-0”~~	~~0.331~~

Notes:

(1) The forces and moments reported are the maximum calculated for all time steps. Therefore, the summation of the forces at Elevation 35’-0” and Elevation 95’-0” is not equal to the force at Elevation (-)11’-0”.

Table 3H.3-2 Natural Frequencies of the Radwaste Building - Fixed Base Condition

Mode No.	Frequency (Hz)	Direction
1	2.60	Vertical
2	8.44	Vertical
3	9.10	North-South
4	10.84	East-West
5	12.39	East-West
6	15.48	North-South
7	18.40	East-West
8	23.01	North-South
9	23.95	Vertical
10	27.90	Vertical

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane Shear (5) (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
North Wall	Near Side	Horizontal	3H.3-8	3	1-H-L	MTCM	29421	1.4D + 1.7L + 1.7H' + 1.7Eo	51	-60	1.4D + 1.7L + 1.7H' + 1.7Eo	72	1.56	-	-	-	-	-	-	-
						MCCM	30216	1.4D + 1.7L + 1.7H' + 1.7Eo	-101	-57										
						MMAT	29728	1.4D + 1.7L + 1.7H' + 1.7Eo	13	-102										
						MMAC	29971	1.4D + 1.7L + 1.7H	-38	-104										
					2-H-L	MTCM	26467	1.4D + 1.7L + 1.7H' + 1.7Eo	112	-19	1.4D + 1.7L + 1.7H' + 1.7Eo	133	3.12	-	-	-	-	-	-	-
						MCCM	34323	1.4D + 1.7L + 1.7H' + 1.7Eo	-207	-22										
						MMAT	30238	1.4D + 1.7L + 1.7H' + 1.7Eo	1	-244										
						MMAC	26476	D + L + H' + E'	-96	-291										
					3-H-L	MTCM	32312	1.4D + 1.7L + 1.7H' + 1.7Eo	118	-103	1.4D + 1.7L + 1.7H' + 1.7Eo	89	4.68	-	-	-	-	-	-	-
						MCCM	26429	1.4D + 1.7L + 1.7H' + 1.7Eo	-255	-107										
						MMAT	26429	1.4D + 1.7L + 1.7H' + 1.7Eo	6	-274										
						MMAC	26461	D + L + H' + E'	-201	-370										
				4	4-H-L	MTCM	23479	1.4D + 1.7L + 1.7H' + 1.7Eo	118	-46	1.4D + 1.7L + 1.7H' + 1.7Eo	140	3.12	-	-	-	-	-	-	(8)
						MCCM	34327	1.4D + 1.7L + 1.7H' + 1.7Eo	-228	-65										
						MMAT	23468	D + L + H' + E'	6	-134										
						MMAC	23468	1.4D + 1.7L + 1.7H' + 1.7Eo	-44	-230										
					5-H-L	MTCM	23456	1.4D + 1.7L + 1.7H' + 1.7Eo	76	-223	1.4D + 1.7L + 1.7H' + 1.7Eo	140	4.68	-	-	-	-	-	-	-
						MCCM	23447	1.4D + 1.7L + 1.7H' + 1.7Eo	-198	-466										
						MMAT	23448	D + L + H' + E'	1	-399										
						MMAC	23447	1.4D + 1.7L + 1.7H' + 1.7Eo	-198	-466										
					6-H-L	MTCM	11709	D + L + H' + E'	124	-434	1.4D + 1.7L + 1.7H' + 1.7Eo	140	6.24	-	-	-	-	-	-	-
						MCCM	23440	1.4D + 1.7L + 1.7H' + 1.7Eo	-292	-519										
						MMAT	19506	D + L + H' + E'	12	-697										
						MMAC	19507	D + L + H' + E'	-159	-780										
					7-H-L	MTCM	23472	1.4D + 1.7L + 1.7H' + 1.7Eo	75	-258	1.4D + 1.7L + 1.7H' + 1.7Eo	119	9.36	-	-	-	-	-	-	-
						MCCM	23472	1.4D + 1.7L + 1.7H' + 1.7Eo	-193	-794										
						MMAT	23472	1.4D + 1.7L + 1.7H' + 1.7Eo	11	-739										
						MMAC	23472	D + L + H' + E'	-163	-1000										
				5.5	8-H-L	MTCM	4565	1.4D + 1.7L + 1.7H' + 1.7Eo	27	-46	1.4D + 1.7L + 1.7H' + 1.7Eo	133	3.12	-	-	-	-	-	-	-
						MCCM	8902	D + L + H' + E'	-272	-536										
						MMAT	8194	1.4D + 1.7L + 1.7H' + 1.7Eo	7	-148										
						MMAC	8902	D + L + H' + E'	-272	-540										
					9-H-L	MTCM	2717	1.4D + 1.7L + 1.7H' + 1.7Eo	46	-70	1.4D + 1.7L + 1.7H' + 1.7Eo	164	4.68	-	-	-	-	-	-	-
						MCCM	8940	1.4D + 1.7L + 1.7H' + 1.7Eo	-233	-695										
						MMAT	2724	1.4D + 1.7L + 1.7H' + 1.7Eo	0	-296										
						MMAC	8940	D + L + H' + E'	-216	-804										
					10-H-L	MTCM	2716	1.4D + 1.7L + 1.7H' + 1.7Eo	53	-76	1.4D + 1.7L + 1.7H' + 1.7Eo	164	6.24	-	-	-	-	-	-	-
						MCCM	8901	D + L + H' + E'	-205	-763										
						MMAT	2716	D + L + H' + E'	5	-358										
						MMAC	7183	D + L + H' + E'	-177	-846										
					11-H-L	MTCM	2787	1.4D + 1.7L + 1.7H' + 1.7Eo	57	-97	1.4D + 1.7L + 1.7H' + 1.7Eo	164	7.8	-	-	-	-	-	-	-
						MCCM	8972	D + L + H' + E'	-314	-1406										
						MMAT	2772	1.4D + 1.7L + 1.7H' + 1.7Eo	4	-442										
						MMAC	8972	D + L + H' + E'	-307	-1430										

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
North Wall	Near Side	Vertical	3H.3-9	3	1-V-L	MTCM	27258	1.4D + 1.7L + 1.7H' + 1.7Eo	70	-18	1.4D + 1.7L + 1.7H' + 1.7Eo	74	1.56	-	-	-	-	-	-	-
						MCCM	27258	1.4D + 1.7L + 1.7H' + 1.7Eo	-260	-39										
						MMAT	27002	D + L + H' + E'	21	-94										
						MMAC	27002	D + L + H' + E'	-141	-99										
					2-V-L	MTCM	26405	1.4D + 1.7L + 1.7H' + 1.7Eo	109	-53	1.4D + 1.7L + 1.7H' + 1.7Eo	107	3.12	-	-	-	-	-	-	-
						MCCM	26405	1.4D + 1.7L + 1.7H' + 1.7Eo	-306	-24										
						MMAT	27520	1.4D + 1.7L + 1.7H' + 1.7Eo	28	-218										
						MMAC	29969	1.4D + 1.7L + 1.7H	-134	-258										
					3-V-L	MTCM	34324	1.4D + 1.7L + 1.7H' + 1.7Eo	110	-15	1.4D + 1.7L + 1.7H' + 1.7Eo	266	4.68	-	-	-	-	-	-	-
						MCCM	34323	1.4D + 1.7L + 1.7H' + 1.7Eo	-357	-15										
						MMAT	26417	1.4D + 1.7L + 1.7H' + 1.7Eo	22	-335										
						MMAC	26417	1.4D + 1.7L + 1.7H' + 1.7Eo	-117	-335										
					4-V-L	MTCM	26445	D + L + H' + E'	56	-265	1.4D + 1.7L + 1.7H' + 1.7Eo	83	6.24	-	-	-	-	-	-	-
						MCCM	27219	1.4D + 1.7L + 1.7H	-209	-97										
						MMAT	26429 / 26430	1.4D + 1.7L + 1.7H' + 1.7Eo	4	-466										
						MMAC	26429 / 26430	1.4D + 1.7L + 1.7H' + 1.7Eo	-131	-478										
					5-V-L	MTCM	26437	D + L + H' + E'	43	-472	1.4D + 1.7L + 1.7H' + 1.7Eo	75	7.8	-	-	-	-	-	-	-
						MCCM	26436	1.4D + 1.7L + 1.7H	-170	-171										
						MMAT	26436	1.4D + 1.7L + 1.7H' + 1.7Eo	22	-548										
						MMAC	26436	1.4D + 1.7L + 1.7H' + 1.7Eo	-75	-551										
					6-V-L	MTCM	26428 / 26429	1.4D + 1.7L + 1.7H' + 1.7Eo	99	-579	1.4D + 1.7L + 1.7H' + 1.7Eo	68	12.48	-	-	-	-	-	-	(8),(9)
						MCCM	26428 / 26429	1.4D + 1.7L + 1.7H' + 1.7Eo	-285	-680										
						MMAT	26428 / 26429	1.4D + 1.7L + 1.7H' + 1.7Eo	25	-702										
						MMAC	26428 / 26429	1.4D + 1.7L + 1.7H' + 1.7Eo	-245	-705										
					7-V-L	MTCM	26685	D + L + H' + E'	111	-399	1.4D + 1.7L + 1.7H' + 1.7Eo	78	12.48	-	-	-	-	-	-	(8),(9)
						MCCM	28574	1.4D + 1.7L + 1.7H' + 1.7Eo	-313	-179										
						MMAT	26685	1.4D + 1.7L + 1.7H' + 1.7Eo	103	-465										
						MMAC	26685	1.4D + 1.7L + 1.7H' + 1.7Eo	-133	-465										
				4	8-V-L	MTCM	12452	1.4D + 1.7L + 1.7H' + 1.7Eo	118	-20	1.4D + 1.7L + 1.7H' + 1.7Eo	184	3.12	-	-	-	-	-	-	-
						MCCM	12452	1.4D + 1.7L + 1.7H' + 1.7Eo	-433	-62										
						MMAT	23420	D + L + H' + E'	8	-245										
						MMAC	23420	1.4D + 1.7L + 1.7H' + 1.7Eo	-297	-326										
					9-V-L	MTCM	11724	1.4D + 1.7L + 1.7H' + 1.7Eo	126	-58	1.4D + 1.7L + 1.7H' + 1.7Eo	239	4.68	-	-	-	-	-	-	-
						MCCM	11655	1.4D + 1.7L + 1.7H' + 1.7Eo	-437	-132										
						MMAT	23433	1.4D + 1.7L + 1.7H' + 1.7Eo	15	-385										
						MMAC	23468	1.4D + 1.7L + 1.7H' + 1.7Eo	-272	-495										
					10-V-L	MTCM	13208	1.4D + 1.7L + 1.7H' + 1.7Eo	117	-28	1.4D + 1.7L + 1.7H' + 1.7Eo	226	6.24	-	-	-	-	-	-	-
						MCCM	11654	1.4D + 1.7L + 1.7H' + 1.7Eo	-455	-118										
						MMAT	23455	D + L + H' + E'	5	-401										
						MMAC	23451	1.4D + 1.7L + 1.7H' + 1.7Eo	-167	-515										
					11-V-L	MTCM	22806	1.4D + 1.7L + 1.7H' + 1.7Eo	88	-216	1.4D + 1.7L + 1.7H' + 1.7Eo	239	7.8	-	-	-	-	-	-	-
						MCCM	21630	1.4D + 1.7L + 1.7H' + 1.7Eo	-265	-92										
						MMAT	23447	D + L + H' + E'	1	-626										
						MMAC	23447	1.4D + 1.7L + 1.7H' + 1.7Eo	-97	-706										

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in²/ ft)	Transverse Shear Design Loads (6)					Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads			Load Combination	Horizontal Section		Vertical Section			
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)			Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)		
North Wall	Near Side	Vertical	3H.3-9	4	12-V-L	MTCM	23439	1.4D + 1.7L + 1.7H' + 1.7Eo	79	-332	1.4D + 1.7L + 1.7H' + 1.7Eo	230	9.36	-	-	-	-	-	-	-
						MCCM	23439	1.4D + 1.7L + 1.7H' + 1.7Eo	-261	-470										
						MMAT	23440	1.4D + 1.7L + 1.7H' + 1.7Eo	2	-777										
						MMAC	23440	1.4D + 1.7L + 1.7H' + 1.7Eo	-163	-823										
				5.5	13-V-L	MTCM	4552	1.4D + 1.7L + 1.7H' + 1.7Eo	111	-74	1.4D + 1.7L + 1.7H' + 1.7Eo	173	3.12	-	-	-	-	-	-	-
						MCCM	8190	1.4D + 1.7L + 1.7H' + 1.7Eo	-399	-33										
						MMAT	4524	1.4D + 1.7L + 1.7H' + 1.7Eo	72	-134										
						MMAC	4524	1.4D + 1.7L + 1.7H' + 1.7Eo	-213	-134										
					14-V-L	MTCM	4498	1.4D + 1.7L + 1.7H' + 1.7Eo	227	-84	1.4D + 1.7L + 1.7H' + 1.7Eo	216	4.68	-	-	-	-	-	-	-
						MCCM	4498	1.4D + 1.7L + 1.7H' + 1.7Eo	-665	-76										
						MMAT	8901	1.4D + 1.7L + 1.7H' + 1.7Eo	151	-214										
						MMAC	8901	D + L + H' + E'	-484	-307										
					15-V-L	MTCM	2716	1.4D + 1.7L + 1.7H' + 1.7Eo	308	-307	1.4D + 1.7L + 1.7H' + 1.7Eo	238	6.24	-	-	-	-	-	-	-
						MCCM	2716	1.4D + 1.7L + 1.7H' + 1.7Eo	-738	-368										
						MMAT	2725	D + L + H' + E'	53	-880										
						MMAC	2725	D + L + H' + E'	-245	-880										
					16-V-L	MTCM	2771	1.4D + 1.7L + 1.7H' + 1.7Eo	133	-436	1.4D + 1.7L + 1.7H' + 1.7Eo	238	7.8	-	-	-	-	-	-	-
						MCCM	2756	1.4D + 1.7L + 1.7H' + 1.7Eo	-439	-438										
						MMAT	2755	D + L + H' + E'	57	-796										
						MMAC	2755	D + L + H' + E'	-279	-796										
					17-V-L	MTCM	2787	1.4D + 1.7L + 1.7H' + 1.7Eo	339	-278	1.4D + 1.7L + 1.7H' + 1.7Eo	216	9.36	-	-	-	-	-	-	-
						MCCM	2787	1.4D + 1.7L + 1.7H' + 1.7Eo	-744	-430										
						MMAT	2780	D + L + H' + E'	42	-1331										
						MMAC	2780	D + L + H' + E'	-260	-1331										
					18-V-L	MTCM	2778	1.4D + 1.7L + 1.7H' + 1.7Eo	86	-301	1.4D + 1.7L + 1.7H' + 1.7Eo	171	10.92	-	-	-	-	-	-	-
						MCCM	2778	1.4D + 1.7L + 1.7H' + 1.7Eo	-364	-630										
						MMAT	2778	D + L + H' + E'	43	-1322										
						MMAC	2778	D + L + H' + E'	-250	-1322										
	Far Side	Horizontal	3H.3-10	3	1-H-L	MTCM	36041	1.4D + 1.7L + 1.7H' + 1.7Eo	45	55	1.4D + 1.7L + 1.7H' + 1.7Eo	72	1.56	-	-	-	-	-	-	-
						MCCM	36041	1.4D + 1.7L + 1.7H' + 1.7Eo	-105	60										
						MMAT	29132	1.4D + 1.7L + 1.7H' + 1.7Eo	10	107										
						MMAC	29132	1.4D + 1.7L + 1.7H' + 1.7Eo	-10	107										
					2-H-L	MTCM	31787	1.4D + 1.7L + 1.7H' + 1.7Eo	97	82	1.4D + 1.7L + 1.7H' + 1.7Eo	133	3.12	-	-	-	-	-	-	-
						MCCM	34323	1.4D + 1.7L + 1.7H' + 1.7Eo	-224	70										
						MMAT	31545	1.4D + 1.7L + 1.7H' + 1.7Eo	11	191										
						MMAC	31545	1.4D + 1.7L + 1.7H' + 1.7Eo	-67	191										
					3-H-L	MTCM	32312	1.4D + 1.7L + 1.7H' + 1.7Eo	118	180	1.4D + 1.7L + 1.7H' + 1.7Eo	89	4.68	-	-	-	-	-	-	-
						MCCM	26429	1.4D + 1.7L + 1.7H' + 1.7Eo	-255	82										
						MMAT	32070	1.4D + 1.7L + 1.7H' + 1.7Eo	14	326										
						MMAC	32070	1.4D + 1.7L + 1.7H' + 1.7Eo	-78	326										
					4-H-L	MTCM	26467	1.4D + 1.7L + 1.7H' + 1.7Eo	142	179	1.4D + 1.7L + 1.7H' + 1.7Eo	89	6.24	-	-	-	-	-	-	-
						MCCM	26468	1.4D + 1.7L + 1.7H' + 1.7Eo	-77	60										
						MMAT	26467	D + L + H' + E'	119	233										
						MMAC	26467	D + L + H' + E'	-6	233										

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
North Wall	Far Side	Horizontal	3H.3-10	4	5-H-L	MTCM	23472	1.4D + 1.7L + 1.7H' + 1.7Eo	75	118	1.4D + 1.7L + 1.7H' + 1.7Eo	140	3.12	-	-	-	-	-	-	-
						MCCM	34327	1.4D + 1.7L + 1.7H' + 1.7Eo	-244	144										
						MMAT	23446	1.4D + 1.7L + 1.7H' + 1.7Eo	30	177										
						MMAC	34328	D + L + H' + E'	-143	372										
					6-H-L	MTCM	23440	1.4D + 1.7L + 1.7H' + 1.7Eo	89	308	1.4D + 1.7L + 1.7H' + 1.7Eo	140	4.68	-	-	-	-	-	-	-
						MCCM	23440	1.4D + 1.7L + 1.7H' + 1.7Eo	-292	130										
						MMAT	23440	1.4D + 1.7L + 1.7H' + 1.7Eo	80	321										
						MMAC	15538	D + L + H' + E'	-152	485										
					7-H-L	MTCM	23479	1.4D + 1.7L + 1.7H' + 1.7Eo	118	147	1.4D + 1.7L + 1.7H' + 1.7Eo	119	6.24	-	-	-	-	-	-	-
						MCCM	34326	1.4D + 1.7L + 1.7H' + 1.7Eo	-250	137										
						MMAT	23478	D + L + H' + E'	4	543										
						MMAC	23478	D + L + H' + E'	-162	544										
				5.5	8-H-L	MTCM	8953	1.4D + 1.7L + 1.7H' + 1.7Eo	25	51	1.4D + 1.7L + 1.7H' + 1.7Eo	133	3.12	-	-	-	-	-	-	-
						MCCM	8902	D + L + H' + E'	-266	226										
						MMAT	8927	1.4D + 1.7L + 1.7H + 1.7W	1	177										
						MMAC	5568	D + L + H' + E'	-159	535										
					9-H-L	MTCM	2787	1.4D + 1.7L + 1.7H' + 1.7Eo	57	27	1.4D + 1.7L + 1.7H' + 1.7Eo	164	4.68	-	-	-	-	-	-	-
						MCCM	3515	1.4D + 1.7L + 1.7H' + 1.7Eo	-153	211										
						MMAT	8937	1.4D + 1.7L + 1.7H + 1.7W	4	241										
						MMAC	8937	D + L + H' + E'	-63	545										
					10-H-L	MTCM	4565	1.4D + 1.7L + 1.7H' + 1.7Eo	27	82	1.4D + 1.7L + 1.7H' + 1.7Eo	133	6.24	-	-	-	-	-	-	-
						MCCM	7251	D + L + H' + E'	-171	438										
						MMAT	8962	1.4D + 1.7L + 1.7H' + 1.7Eo	5	221										
						MMAC	8964	D + L + H' + E'	-84	970										
		Vertical	3H.3-11	3	1-V-L	MTCM	27258	1.4D + 1.7L + 1.7H' + 1.7Eo	70	15	1.4D + 1.7L + 1.7H' + 1.7Eo	74	1.56	-	-	-	-	-	-	-
						MCCM	27258	1.4D + 1.7L + 1.7H' + 1.7Eo	-250	35										
						MMAT	26997	D + L + H' + E'	5	71										
						MMAC	26997	D + L + H' + E'	-188	73										
					2-V-L	MTCM	26405	1.4D + 1.7L + 1.7H' + 1.7Eo	109	70	1.4D + 1.7L + 1.7H' + 1.7Eo	107	3.12	-	-	-	-	-	-	-
						MCCM	26405	1.4D + 1.7L + 1.7H' + 1.7Eo	-306	103										
						MMAT	26446	1.4D + 1.7L + 1.7H' + 1.7Eo	25	220										
						MMAC	31507	1.4D + 1.7L + 1.7H' + 1.7Eo	-68	249										
					3-V-L	MTCM	34324	1.4D + 1.7L + 1.7H' + 1.7Eo	110	47	1.4D + 1.7L + 1.7H' + 1.7Eo	266	4.68	-	-	-	-	-	-	-
						MCCM	34323	1.4D + 1.7L + 1.7H' + 1.7Eo	-387	81										
						MMAT	26430	1.4D + 1.7L + 1.7H' + 1.7Eo	30	335										
						MMAC	26430	1.4D + 1.7L + 1.7H' + 1.7Eo	-99	345										
					4-V-L	MTCM	32318	1.4D + 1.7L + 1.7H' + 1.7Eo	54	446	1.4D + 1.7L + 1.7H' + 1.7Eo	85	6.24	-	-	-	-	-	-	-
						MCCM	26420	1.4D + 1.7L + 1.7H	-192	119										
						MMAT	32319	1.4D + 1.7L + 1.7H' + 1.7Eo	53	447										
						MMAC	32319	1.4D + 1.7L + 1.7H' + 1.7Eo	-37	447										
					5-V-L	MTCM	32306	1.4D + 1.7L + 1.7H' + 1.7Eo	59	462	1.4D + 1.7L + 1.7H' + 1.7Eo	97	7.8	-	-	-	-	-	-	-
						MCCM	32053	1.4D + 1.7L + 1.7H' + 1.7Eo	-117	448										
						MMAT	32306	1.4D + 1.7L + 1.7H' + 1.7Eo	59	463										
						MMAC	32306	1.4D + 1.7L + 1.7H' + 1.7Eo	-35	463										

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
North Wall	Far Side	Vertical	3H.3-11	3	6-V-L	MTCM	26428 / 26429	1.4D + 1.7L + 1.7H' + 1.7Eo	99	465	1.4D + 1.7L + 1.7H' + 1.7Eo	68	12.48	-	-	-	-	-	-	(8),(9)
						MCCM	26428 / 26429	1.4D + 1.7L + 1.7H' + 1.7Eo	-285	473										
						MMAT	26428 / 26429	1.4D + 1.7L + 1.7H' + 1.7Eo	56	540										
						MMAC	26428 / 26429	1.4D + 1.7L + 1.7H' + 1.7Eo	-181	540										
					7-V-L	MTCM	26685	D + L + H' + E'	111	286	1.4D + 1.7L + 1.7H' + 1.7Eo	78	12.48	-	-	-	-	-	-	(8),(9)
						MCCM	28574	1.4D + 1.7L + 1.7H' + 1.7Eo	-313	211										
						MMAT	26685	1.4D + 1.7L + 1.7H' + 1.7Eo	25	348										
						MMAC	26685	1.4D + 1.7L + 1.7H' + 1.7Eo	-210	348										
				4	8-V-L	MTCM	11656	1.4D + 1.7L + 1.7H' + 1.7Eo	123	51	1.4D + 1.7L + 1.7H' + 1.7Eo	184	3.12	-	-	-	-	-	-	-
						MCCM	11655	1.4D + 1.7L + 1.7H' + 1.7Eo	-430	9										
						MMAT	20149	D + L + H' + E'	0	259										
						MMAC	20149	D + L + H' + E'	-183	261										
					9-V-L	MTCM	11724	1.4D + 1.7L + 1.7H' + 1.7Eo	126	55	1.4D + 1.7L + 1.7H' + 1.7Eo	239	4.68	-	-	-	-	-	-	-
						MCCM	11724	1.4D + 1.7L + 1.7H' + 1.7Eo	-423	68										
						MMAT	13698	D + L + H' + E'	3	365										
						MMAC	13698	D + L + H' + E'	-226	365										
					10-V-L	MTCM	13208	1.4D + 1.7L + 1.7H' + 1.7Eo	117	22	1.4D + 1.7L + 1.7H' + 1.7Eo	239	6.24	-	-	-	-	-	-	-
						MCCM	11654	1.4D + 1.7L + 1.7H' + 1.7Eo	-435	44										
						MMAT	23441	1.4D + 1.7L + 1.7H' + 1.7Eo	6	415										
						MMAC	11694	1.4D + 1.7L + 1.7H' + 1.7Eo	-227	440										
					11-V-L	MTCM	23439	1.4D + 1.7L + 1.7H' + 1.7Eo	79	235	1.4D + 1.7L + 1.7H' + 1.7Eo	230	7.8	-	-	-	-	-	-	-
						MCCM	23439	1.4D + 1.7L + 1.7H' + 1.7Eo	-261	45										
						MMAT	23440	1.4D + 1.7L + 1.7H' + 1.7Eo	12	532										
						MMAC	23440	1.4D + 1.7L + 1.7H' + 1.7Eo	-121	532										
				5.5	12-V-L	MTCM	2742	1.4D + 1.7L + 1.7H' + 1.7Eo	85	66	1.4D + 1.7L + 1.7H' + 1.7Eo	172	3.12	-	-	-	-	-	-	-
						MCCM	2742	1.4D + 1.7L + 1.7H' + 1.7Eo	-410	149										
						MMAT	5517	D + L + H' + E'	2	337										
						MMAC	6436	D + L + H' + E'	-280	366										
					13-V-L	MTCM	3514	1.4D + 1.7L + 1.7H' + 1.7Eo	203	83	1.4D + 1.7L + 1.7H' + 1.7Eo	212	4.68	-	-	-	-	-	-	-
						MCCM	3514	1.4D + 1.7L + 1.7H' + 1.7Eo	-610	225										
						MMAT	7248	D + L + H' + E'	1	623										
						MMAC	7248	D + L + H' + E'	-284	623										
					14-V-L	MTCM	2716	1.4D + 1.7L + 1.7H' + 1.7Eo	308	103	1.4D + 1.7L + 1.7H' + 1.7Eo	238	6.24	-	-	-	-	-	-	-
						MCCM	2716	1.4D + 1.7L + 1.7H' + 1.7Eo	-738	158										
						MMAT	7242	D + L + H' + E'	29	660										
						MMAC	7242	D + L + H' + E'	-287	662										
					15-V-L	MTCM	2787	1.4D + 1.7L + 1.7H' + 1.7Eo	339	60	1.4D + 1.7L + 1.7H' + 1.7Eo	171	7.8	-	-	-	-	-	-	-
						MCCM	3584	1.4D + 1.7L + 1.7H' + 1.7Eo	-676	186										
						MMAT	8961	D + L + H' + E'	37	704										
						MMAC	8961	D + L + H' + E'	-267	712										
	-	Transverse (Horizontal and Vertical)	3H.3-12	3	1-T	-	-	-	-	-	-	-	-	D + L + H' + E'	48	-46	77	-96	0.20 (#4@12)	-
					2-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	-62	83	-2	9	0.31 (#5@12)	-
				4	3-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-9	-8	-95	-69	0.20 (#4@12)	-
					4-T	-	-	-	-	-	-	-	-	D + L + H' + E'	34	-32	106	43	0.31 (#5@12)	-
					5-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-11	-65	-130	-89	0.44 (#6@12)	-
					6-T	-	-	-	-	-	-	-	-	D + L + H' + E'	100	53	102	-30	0.60 (#7@12)	-
					7-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-143	-45	143	-191	1.76 (#6@6)	-

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
North Wall	-	Transverse (Horizontal and Vertical)	3H.3-12	5.5	8-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-121	45	3	-44	0.20 (#4@12)	-
					9-T	-	-	-	-	-	-	-	-	D + L + H' + E'	15	-131	166	-120	0.31 (#5@12)	-
					10-T	-	-	-	-	-	-	-	-	D + L + H' + E'	0	-44	194	-95	0.44 (#6@12)	-
					11-T	-	-	-	-	-	-	-	-	D + L + H' + E'	154	-18	226	-316	0.79 (#8@12)	-
South Wall	Near Side	Horizontal	3H.3-13	3	1-H-L	MTCM	34675	1.4D + 1.7L + 1.7H' + 1.7Eo	52	-8	1.4D + 1.7L + 1.7H' + 1.7Eo	67	1.56	-	-	-	-	-	-	-
						MCCM	34147	1.4D + 1.7L + 1.7H' + 1.7Eo	-109	-48										
						MMAT	29252	1.4D + 1.7L + 1.7H' + 1.7Eo	10	-113										
						MMAC	29252	1.4D + 1.7L + 1.7H' + 1.7Eo	-11	-113										
					2-H-L	MTCM	31645	1.4D + 1.7L + 1.7H' + 1.7Eo	103	-83	1.4D + 1.7L + 1.7H' + 1.7Eo	124	3.12	-	-	-	-	-	-	-
						MCCM	28431	1.4D + 1.7L + 1.7H' + 1.7Eo	-198	-52										
						MMAT	31092	1.4D + 1.7L + 1.7H' + 1.7Eo	11	-243										
						MMAC	31092	1.4D + 1.7L + 1.7H' + 1.7Eo	-9	-243										
					3-H-L	MTCM	34156	1.4D + 1.7L + 1.7H' + 1.7Eo	122	-66	1.4D + 1.7L + 1.7H' + 1.7Eo	124	4.68	-	-	-	-	-	-	-
						MCCM	34156	1.4D + 1.7L + 1.7H' + 1.7Eo	-259	-66										
						MMAT	26246	1.4D + 1.7L + 1.7H' + 1.7Eo	11	-318										
						MMAC	26246	1.4D + 1.7L + 1.7H' + 1.7Eo	-104	-322										
					4-H-L	MTCM	26237	1.4D + 1.7L + 1.7H' + 1.7Eo	111	-210	1.4D + 1.7L + 1.7H' + 1.7Eo	112	6.24	-	-	-	-	-	-	-
						MCCM	26237	1.4D + 1.7L + 1.7H' + 1.7Eo	-270	-200										
						MMAT	26238	1.4D + 1.7L + 1.7H' + 1.7Eo	20	-295										
						MMAC	26238	1.4D + 1.7L + 1.7H' + 1.7Eo	-229	-332										
				4	5-H-L	MTCM	23291	1.4D + 1.7L + 1.7H' + 1.7Eo	70	-118	1.4D + 1.7L + 1.7H' + 1.7Eo	135	3.12	-	-	-	-	-	-	-
						MCCM	14586	1.4D + 1.7L + 1.7H' + 1.7Eo	-194	-252										
						MMAT	23316	1.4D + 1.7L + 1.7H' + 1.7Eo	38	-196										
						MMAC	19367	D + L + H' + E'	-97	-362										
					6-H-L	MTCM	11561	1.4D + 1.7L + 1.7H' + 1.7Eo	39	-49	1.4D + 1.7L + 1.7H' + 1.7Eo	135	4.68	-	-	-	-	-	-	-
						MCCM	14323	1.4D + 1.7L + 1.7H' + 1.7Eo	-186	-282										
						MMAT	11561	D + L + H' + E'	7	-382										
						MMAC	11570	D + L + H' + E'	-92	-579										
					7-H-L	MTCM	23297	1.4D + 1.7L + 1.7H' + 1.7Eo	113	-344	1.4D + 1.7L + 1.7H' + 1.7Eo	115	6.24	-	-	-	-	-	-	-
						MCCM	23297	1.4D + 1.7L + 1.7H' + 1.7Eo	-296	-491										
						MMAT	23305	1.4D + 1.7L + 1.7H' + 1.7Eo	2	-630										
						MMAC	23305	1.4D + 1.7L + 1.7H' + 1.7Eo	-97	-677										
				5.5	8-H-L	MTCM	4126	1.4D + 1.7L + 1.7H' + 1.7Eo	27	-56	1.4D + 1.7L + 1.7H' + 1.7Eo	135	3.12	-	-	-	-	-	-	-
						MCCM	8521	1.4D + 1.7L + 1.7H' + 1.7Eo	-224	-215										
						MMAT	7748	1.4D + 1.7L + 1.7H + 1.7W	1	-148										
						MMAC	6003	D + L + H' + E'	-73	-425										
					9-H-L	MTCM	2345	1.4D + 1.7L + 1.7H' + 1.7Eo	47	-87	1.4D + 1.7L + 1.7H' + 1.7Eo	160	4.68	-	-	-	-	-	-	-
						MCCM	3142	1.4D + 1.7L + 1.7H' + 1.7Eo	-168	-241										
						MMAT	2288	1.4D + 1.7L + 1.7H' + 1.7Eo	4	-198										
						MMAC	3085	D + L + H' + E'	-109	-303										
					10-H-L	MTCM	2346	1.4D + 1.7L + 1.7H' + 1.7Eo	62	-82	1.4D + 1.7L + 1.7H' + 1.7Eo	160	6.24	-	-	-	-	-	-	-
						MCCM	8531	D + L + H' + E'	-355	-1157										
						MMAT	2287	D + L + H' + E'	8	-403										
						MMAC	8531	D + L + H' + E'	-355	-1165										

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads – Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6) – Load Combination	Horizontal Section – Transverse Shear Force (kip / ft)	Horizontal Section – Corresponding Axial Force (kip / ft)	Vertical Section – Transverse Shear Force (kip / ft)	Vertical Section – Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
South Wall	Near Side	Vertical	3H.3-14	3	1-V-L	MTCM	26214	1.4D + 1.7L + 1.7H' + 1.7Eo	93	-51	1.4D + 1.7L + 1.7H' + 1.7Eo	130	3.12	-	-	-	-	-	-	(8)
						MCCM	26584	1.4D + 1.7L + 1.7H' + 1.7Eo	-269	-29										
						MMAT	31135	1.4D + 1.7L + 1.7H' + 1.7Eo	7	-231										
						MMAC	31135	1.4D + 1.7L + 1.7H' + 1.7Eo	-48	-231										
					2-V-L	MTCM	34164	1.4D + 1.7L + 1.7H' + 1.7Eo	79	-203	1.4D + 1.7L + 1.7H' + 1.7Eo	97	4.68	-	-	-	-	-	-	-
						MCCM	34156	1.4D + 1.7L + 1.7H' + 1.7Eo	-187	-190										
						MMAT	32162	1.4D + 1.7L + 1.7H' + 1.7Eo	51	-287										
						MMAC	32162	1.4D + 1.7L + 1.7H' + 1.7Eo	-41	-287										
					3-V-L	MTCM	26220	1.4D + 1.7L + 1.7H' + 1.7Eo	42	-216	1.4D + 1.7L + 1.7H' + 1.7Eo	89	6.24	-	-	-	-	-	-	-
						MCCM	27076	1.4D + 1.7L + 1.7H	-197	-91										
						MMAT	26238 / 26239	1.4D + 1.7L + 1.7H' + 1.7Eo	19	-466										
						MMAC	26238 / 26239	1.4D + 1.7L + 1.7H' + 1.7Eo	-156	-493										
					4-V-L	MTCM	26229	D + L + H' + E'	24	-423	1.4D + 1.7L + 1.7H' + 1.7Eo	87	7.8	-	-	-	-	-	-	-
						MCCM	27377	1.4D + 1.7L + 1.7H	-190	-74										
						MMAT	26229	1.4D + 1.7L + 1.7H' + 1.7Eo	4	-509										
						MMAC	26229	1.4D + 1.7L + 1.7H' + 1.7Eo	-120	-511										
					5-V-L	MTCM	26237	1.4D + 1.7L + 1.7H' + 1.7Eo	112	-852	1.4D + 1.7L + 1.7H' + 1.7Eo	69	12.48	-	-	-	-	-	-	(8),(9)
						MCCM	26237	1.4D + 1.7L + 1.7H' + 1.7Eo	-351	-904										
						MMAT	26237	1.4D + 1.7L + 1.7H' + 1.7Eo	31	-899										
						MMAC	26237	1.4D + 1.7L + 1.7H' + 1.7Eo	-351	-904										
					6-V-L	MTCM	26237 / 26238	D + L + H' + E'	70	-680	1.4D + 1.7L + 1.7H' + 1.7Eo	73	12.48	-	-	-	-	-	-	(8),(9)
						MCCM	26548 / 26549	1.4D + 1.7L + 1.7H	-262	-681										
						MMAT	26237 / 26238	1.4D + 1.7L + 1.7H' + 1.7Eo	17	-820										
						MMAC	26237 / 26238	1.4D + 1.7L + 1.7H' + 1.7Eo	-261	-825										
					7-V-L	MTCM	26542	D + L + H' + E'	112	-485	1.4D + 1.7L + 1.7H' + 1.7Eo	82	7.8	-	-	-	-	-	-	(8),(9)
						MCCM	28431	1.4D + 1.7L + 1.7H' + 1.7Eo	-303	-204										
						MMAT	26556 / 26557	1.4D + 1.7L + 1.7H' + 1.7Eo	5	-567										
						MMAC	26556 / 26557	1.4D + 1.7L + 1.7H' + 1.7Eo	-14	-568										
				4	8-V-L	MTCM	11512	1.4D + 1.7L + 1.7H' + 1.7Eo	102	-62	1.4D + 1.7L + 1.7H' + 1.7Eo	183	3.12	-	-	-	-	-	-	(8)
						MCCM	11513	1.4D + 1.7L + 1.7H' + 1.7Eo	-389	-65										
						MMAT	11518	D + L + H' + E'	19	-218										
						MMAC	16496	D + L + H' + E'	-152	-280										
					9-V-L	MTCM	23273	1.4D + 1.7L + 1.7H' + 1.7Eo	109	-72	1.4D + 1.7L + 1.7H' + 1.7Eo	223	4.68	-	-	-	-	-	-	-
						MCCM	16528	1.4D + 1.7L + 1.7H' + 1.7Eo	-357	-66										
						MMAT	22077	1.4D + 1.7L + 1.7H' + 1.7Eo	8	-411										
						MMAC	22078	1.4D + 1.7L + 1.7H' + 1.7Eo	-149	-471										
					10-V-L	MTCM	11569	1.4D + 1.7L + 1.7H' + 1.7Eo	115	-97	1.4D + 1.7L + 1.7H' + 1.7Eo	277	6.24	-	-	-	-	-	-	-
						MCCM	11570	1.4D + 1.7L + 1.7H' + 1.7Eo	-425	-209										
						MMAT	23304	1.4D + 1.7L + 1.7H' + 1.7Eo	7	-632										
						MMAC	23304	1.4D + 1.7L + 1.7H' + 1.7Eo	-151	-699										
					11-V-L	MTCM	22631	1.4D + 1.7L + 1.7H' + 1.7Eo	81	-365	1.4D + 1.7L + 1.7H' + 1.7Eo	157	7.8	-	-	-	-	-	-	-
						MCCM	22631	1.4D + 1.7L + 1.7H' + 1.7Eo	-308	-533										
						MMAT	23297	D + L + H' + E'	6	-732										
						MMAC	23297	1.4D + 1.7L + 1.7H' + 1.7Eo	-236	-823										

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads – Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6) – Load Combination	Horizontal Section – Transverse Shear Force (kip / ft)	Horizontal Section – Corresponding Axial Force (kip / ft)	Vertical Section – Transverse Shear Force (kip / ft)	Vertical Section – Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
South Wall	Near Side	Vertical	3H.3-14	5.5	12-V-L	MTCM	4073	1.4D + 1.7L + 1.7H' + 1.7Eo	100	-129	1.4D + 1.7L + 1.7H' + 1.7Eo	164	3.12	-	-	-	-	-	-	-
						MCCM	3100	1.4D + 1.7L + 1.7H' + 1.7Eo	-347	-111										
						MMAT	3123	D + L + H' + E'	6	-275										
						MMAC	3102	D + L + H' + E'	-237	-281										
					13-V-L	MTCM	4069	1.4D + 1.7L + 1.7H' + 1.7Eo	218	-88	1.4D + 1.7L + 1.7H' + 1.7Eo	235	4.68	-	-	-	-	-	-	-
						MCCM	4069	1.4D + 1.7L + 1.7H' + 1.7Eo	-650	-121										
						MMAT	3124	D + L + H' + E'	15	-292										
						MMAC	3124	D + L + H' + E'	-213	-292										
					14-V-L	MTCM	2287	1.4D + 1.7L + 1.7H' + 1.7Eo	301	-291	1.4D + 1.7L + 1.7H' + 1.7Eo	285	6.24	-	-	-	-	-	-	-
						MCCM	2287	1.4D + 1.7L + 1.7H' + 1.7Eo	-747	-323										
						MMAT	2292	D + L + H' + E'	18	-874										
						MMAC	2292	D + L + H' + E'	-268	-874										
					15-V-L	MTCM	2330	1.4D + 1.7L + 1.7H' + 1.7Eo	114	-249	1.4D + 1.7L + 1.7H' + 1.7Eo	224	7.8	-	-	-	-	-	-	-
						MCCM	2330	1.4D + 1.7L + 1.7H' + 1.7Eo	-346	-254										
						MMAT	2328	D + L + H' + E'	33	-551										
						MMAC	2328	D + L + H' + E'	-217	-551										
					16-V-L	MTCM	2346	1.4D + 1.7L + 1.7H' + 1.7Eo	296	-224	1.4D + 1.7L + 1.7H' + 1.7Eo	285	9.36	-	-	-	-	-	-	-
						MCCM	2346	1.4D + 1.7L + 1.7H' + 1.7Eo	-697	-600										
						MMAT	2343	D + L + H' + E'	20	-816										
						MMAC	2343	D + L + H' + E'	-277	-816										
	Far Side	Horizontal	3H.3-15	3	1-H-L	MTCM	34675	1.4D + 1.7L + 1.7H' + 1.7Eo	52	18	1.4D + 1.7L + 1.7H' + 1.7Eo	67	1.56	-	-	-	-	-	-	-
						MCCM	34147	1.4D + 1.7L + 1.7H' + 1.7Eo	-109	56										
						MMAT	29252	1.4D + 1.7L + 1.7H' + 1.7Eo	11	104										
						MMAC	29252	1.4D + 1.7L + 1.7H' + 1.7Eo	-11	104										
					2-H-L	MTCM	31123	1.4D + 1.7L + 1.7H' + 1.7Eo	98	100	1.4D + 1.7L + 1.7H' + 1.7Eo	124	3.12	-	-	-	-	-	-	-
						MCCM	28431	1.4D + 1.7L + 1.7H' + 1.7Eo	-198	53										
						MMAT	29564	1.4D + 1.7L + 1.7H' + 1.7Eo	31	207										
						MMAC	29564	1.4D + 1.7L + 1.7H' + 1.7Eo	-38	207										
					3-H-L	MTCM	26237	1.4D + 1.7L + 1.7H' + 1.7Eo	111	172	1.4D + 1.7L + 1.7H' + 1.7Eo	124	4.68	-	-	-	-	-	-	-
						MCCM	26237	1.4D + 1.7L + 1.7H' + 1.7Eo	-270	161										
						MMAT	30873	1.4D + 1.7L + 1.7H' + 1.7Eo	25	250										
						MMAC	30873	1.4D + 1.7L + 1.7H' + 1.7Eo	-141	251										
					4-H-L	MTCM	32170	1.4D + 1.7L + 1.7H' + 1.7Eo	120	77	1.4D + 1.7L + 1.7H' + 1.7Eo	46	6.24	-	-	-	-	-	-	-
						MCCM	31909	1.4D + 1.7L + 1.7H' + 1.7Eo	-200	321										
						MMAT	31900	1.4D + 1.7L + 1.7H' + 1.7Eo	58	361										
						MMAC	31900	1.4D + 1.7L + 1.7H' + 1.7Eo	-187	361										
					5-H-L	MTCM	34156	1.4D + 1.7L + 1.7H' + 1.7Eo	122	63	1.4D + 1.7L + 1.7H' + 1.7Eo	67	7.8	-	-	-	-	-	-	-
						MCCM	34156	1.4D + 1.7L + 1.7H' + 1.7Eo	-259	64										
						MMAT	34162	1.4D + 1.7L + 1.7H' + 1.7Eo	54	196										
						MMAC	34162	1.4D + 1.7L + 1.7H' + 1.7Eo	-71	196										
				4	6-H-L	MTCM	23291	1.4D + 1.7L + 1.7H' + 1.7Eo	70	108	1.4D + 1.7L + 1.7H' + 1.7Eo	135	3.12	-	-	-	-	-	-	-
						MCCM	11557	1.4D + 1.7L + 1.7H' + 1.7Eo	-199	114										
						MMAT	23278	D + L + H' + E'	0	186										
						MMAC	11516	D + L + H' + E'	-162	292										
					7-H-L	MTCM	23297	1.4D + 1.7L + 1.7H' + 1.7Eo	113	306	1.4D + 1.7L + 1.7H' + 1.7Eo	115	6.24	-	-	-	-	-	-	-
						MCCM	23297	1.4D + 1.7L + 1.7H' + 1.7Eo	-296	190										
						MMAT	23305	1.4D + 1.7L + 1.7H' + 1.7Eo	34	485										
						MMAC	23305	1.4D + 1.7L + 1.7H' + 1.7Eo	-35	485										

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
South Wall	Far Side	Horizontal	3H.3-15	5.5	8-H-L	MTCM	8514	1.4D + 1.7L + 1.7H' + 1.7Eo	32	23	1.4D + 1.7L + 1.7H' + 1.7Eo	135	3.12	-	-	-	-	-	-	-
						MCCM	8521	1.4D + 1.7L + 1.7H' + 1.7Eo	-224	126										
						MMAT	8518	1.4D + 1.7L + 1.7H + 1.7W	8	190										
						MMAC	8529	D + L + H' + E'	-125	545										
					9-H-L	MTCM	2345	1.4D + 1.7L + 1.7H' + 1.7Eo	47	65	1.4D + 1.7L + 1.7H' + 1.7Eo	160	4.68	-	-	-	-	-	-	-
						MCCM	3141	1.4D + 1.7L + 1.7H' + 1.7Eo	-153	250										
						MMAT	8475	1.4D + 1.7L + 1.7H' + 1.7Eo	7	164										
						MMAC	8477	D + L + H' + E'	-55	627										
		Vertical	3H.3-16	3	1-V-L	MTCM	26214	1.4D + 1.7L + 1.7H' + 1.7Eo	93	63	1.4D + 1.7L + 1.7H' + 1.7Eo	130	3.12	-	-	-	-	-	-	-
						MCCM	26584	1.4D + 1.7L + 1.7H' + 1.7Eo	-269	58										
						MMAT	29788	1.4D + 1.7L + 1.7H' + 1.7Eo	0	233										
						MMAC	29788	1.4D + 1.7L + 1.7H' + 1.7Eo	-88	252										
					2-V-L	MTCM	34164	1.4D + 1.7L + 1.7H' + 1.7Eo	79	224	1.4D + 1.7L + 1.7H' + 1.7Eo	97	4.68	-	-	-	-	-	-	-
						MCCM	27076	1.4D + 1.7L + 1.7H	-200	65										
						MMAT	29803	1.4D + 1.7L + 1.7H' + 1.7Eo	6	359										
						MMAC	31628	1.4D + 1.7L + 1.7H' + 1.7Eo	-46	379										
					3-V-L	MTCM	32181	1.4D + 1.7L + 1.7H' + 1.7Eo	42	463	1.4D + 1.7L + 1.7H' + 1.7Eo	97	6.24	-	-	-	-	-	-	-
						MCCM	26239	1.4D + 1.7L + 1.7H	-192	104										
						MMAT	31634	1.4D + 1.7L + 1.7H' + 1.7Eo	1	485										
						MMAC	31634	1.4D + 1.7L + 1.7H' + 1.7Eo	-90	485										
					4-V-L	MTCM	32162	1.4D + 1.7L + 1.7H' + 1.7Eo	56	560	1.4D + 1.7L + 1.7H' + 1.7Eo	97	7.8	-	-	-	-	-	-	-
						MCCM	26244	1.4D + 1.7L + 1.7H	-161	86										
						MMAT	32162	1.4D + 1.7L + 1.7H' + 1.7Eo	56	560										
						MMAC	32162	1.4D + 1.7L + 1.7H' + 1.7Eo	-36	560										
					5-V-L	MTCM	26542	D + L + H' + E'	112	375	1.4D + 1.7L + 1.7H' + 1.7Eo	82	12.48	-	-	-	-	-	-	(8),(9)
						MCCM	28431	1.4D + 1.7L + 1.7H' + 1.7Eo	-303	237										
						MMAT	26542	1.4D + 1.7L + 1.7H' + 1.7Eo	10	437										
						MMAC	26542	1.4D + 1.7L + 1.7H' + 1.7Eo	-195	437										
					6-V-L	MTCM	26237 / 26238	1.4D + 1.7L + 1.7H' + 1.7Eo	70	563	1.4D + 1.7L + 1.7H' + 1.7Eo	69	12.48	-	-	-	-	-	-	(8),(9)
						MCCM	26548 / 26549	1.4D + 1.7L + 1.7H' + 1.7Eo	-262	484										
						MMAT	26237 / 26238	1.4D + 1.7L + 1.7H' + 1.7Eo	69	644										
						MMAC	26237 / 26238	1.4D + 1.7L + 1.7H' + 1.7Eo	-181	644										
				4	7-V-L	MTCM	11512	1.4D + 1.7L + 1.7H' + 1.7Eo	111	63	1.4D + 1.7L + 1.7H' + 1.7Eo	213	3.12	-	-	-	-	-	-	-
						MCCM	11513	1.4D + 1.7L + 1.7H' + 1.7Eo	-389	80										
						MMAT	22079	1.4D + 1.7L + 1.7H' + 1.7Eo	11	247										
						MMAC	22079	1.4D + 1.7L + 1.7H' + 1.7Eo	-114	247										
					8-V-L	MTCM	16528	1.4D + 1.7L + 1.7H' + 1.7Eo	90	7	1.4D + 1.7L + 1.7H' + 1.7Eo	277	4.68	-	-	-	-	-	-	-
						MCCM	16528	D + L + H' + E'	-315	25										
						MMAT	23304	1.4D + 1.7L + 1.7H' + 1.7Eo	3	509										
						MMAC	23304	1.4D + 1.7L + 1.7H' + 1.7Eo	-110	509										
					9-V-L	MTCM	11569	1.4D + 1.7L + 1.7H' + 1.7Eo	115	67	1.4D + 1.7L + 1.7H' + 1.7Eo	213	6.24	-	-	-	-	-	-	-
						MCCM	11569	1.4D + 1.7L + 1.7H' + 1.7Eo	-425	42										
						MMAT	23297	1.4D + 1.7L + 1.7H' + 1.7Eo	43	520										
						MMAC	23297	1.4D + 1.7L + 1.7H' + 1.7Eo	-154	520										

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6)					Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads				Horizontal Section		Vertical Section			
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)		
South Wall	Far Side	Vertical	3H.3-16	5.5	10-V-L	MTCM	3085	1.4D + 1.7L + 1.7H' + 1.7Eo	196	60	1.4D + 1.7L + 1.7H' + 1.7Eo	224	4.68	-	-	-	-	-	-	-
						MCCM	2288	1.4D + 1.7L + 1.7H' + 1.7Eo	-594	172										
						MMAT	6762	D + L + H' + E'	16	682										
						MMAC	6019	D + L + H' + E'	-233	718										
					11-V-L	MTCM	2287	1.4D + 1.7L + 1.7H' + 1.7Eo	301	67	1.4D + 1.7L + 1.7H' + 1.7Eo	203	6.24	-	-	-	-	-	-	-
						MCCM	2287	1.4D + 1.7L + 1.7H' + 1.7Eo	-747	221										
						MMAT	6761	D + L + H' + E'	19	711										
						MMAC	6761	D + L + H' + E'	-263	739										
					12-V-L	MTCM	2346	1.4D + 1.7L + 1.7H' + 1.7Eo	296	161	1.4D + 1.7L + 1.7H' + 1.7Eo	285	7.8	-	-	-	-	-	-	-
						MCCM	3143	1.4D + 1.7L + 1.7H' + 1.7Eo	-663	103										
						MMAT	7762	D + L + H' + E'	20	671										
						MMAC	7762	D + L + H' + E'	-257	671										
	-	Transverse (Horizontal and Vertical)	3H.3-17	3	1-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	-54	48	-29	18	0.20 (#4@12)	-
					2-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-59	57	-20	-16	0.31 (#5@12)	-
					3-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	-48	208	-13	135	0.44 (#6@12)	-
					4-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	-149	3	-101	-64	1.76 (#6@6)	-
					5-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	-178	14	-125	-83	2.40 (#7@6)	-
				4	6-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	91	-60	5	-81	0.20 (#4@12)	-
					7-T	-	-	-	-	-	-	-	-	D + L + H' + E'	103	52	-4	-90	0.31 (#5@12)	-
					8-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	136	-58	8	-89	0.44 (#6@12)	-
					9-T	-	-	-	-	-	-	-	-	D + L + H' + E'	116	-7	94	-17	0.60 (#7@12)	-
					10-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	236	-43	90	-84	1.24 (#5@6)	-
					11-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	196	-59	168	-86	1.76 (#6@6)	-
				5.5	12-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-132	-16	0	-17	0.20 (#4@12)	-
					13-T	-	-	-	-	-	-	-	-	D + L + H' + E'	145	-40	18	-28	0.31 (#5@12)	-
					14-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-191	-22	0	-13	0.44 (#6@12)	-
					15-T	-	-	-	-	-	-	-	-	D + L + H' + E'	180	-30	132	-71	0.60 (#7@12)	-
East Wall	Near Side	Horizontal	3H.3-18	3	1-H-L	MTCM	32259	1.4D + 1.7L + 1.7H' + 1.7Eo	81	-12	1.4D + 1.7L + 1.7H' + 1.7Eo	67	1.56	-	-	-	-	-	-	-
						MCCM	29086	1.4D + 1.7L + 1.7H' + 1.7Eo	-73	-13										
						MMAT	29393	1.4D + 1.7L + 1.7H' + 1.7Eo	11	-114										
						MMAC	27191	D + L + H' + E'	-24	-134										
					2-H-L	MTCM	31453	1.4D + 1.7L + 1.7H' + 1.7Eo	124	-22	1.4D + 1.7L + 1.7H' + 1.7Eo	121	3.12	-	-	-	-	-	-	-
						MCCM	26384	D + L + H' + E'	-92	-17										
						MMAT	34107	1.4D + 1.7L + 1.7H' + 1.7Eo	23	-210										
						MMAC	34107	1.4D + 1.7L + 1.7H' + 1.7Eo	-13	-210										
					3-H-L	MTCM	31192	1.4D + 1.7L + 1.7H' + 1.7Eo	168	-37	1.4D + 1.7L + 1.7H' + 1.7Eo	121	4.68	-	-	-	-	-	-	-
						MCCM	31192	1.4D + 1.7L + 1.7H' + 1.7Eo	-126	-53										
						MMAT	32281	1.4D + 1.7L + 1.7H' + 1.7Eo	21	-263										
						MMAC	26404	D + L + H' + E'	-81	-306										
				4	4-H-L	MTCM	23407	1.4D + 1.7L + 1.7H' + 1.7Eo	33	-80	1.4D + 1.7L + 1.7H' + 1.7Eo	160	3.12	-	-	-	-	-	-	-
						MCCM	11576	D + L + H' + E'	-181	-287										
						MMAT	23407	1.4D + 1.7L + 1.7H' + 1.7Eo	28	-95										
						MMAC	11576	D + L + H' + E'	-175	-295										
					5-H-L	MTCM	23408	1.4D + 1.7L + 1.7H' + 1.7Eo	47	-97	1.4D + 1.7L + 1.7H' + 1.7Eo	178	4.68	-	-	-	-	-	-	-
						MCCM	11649	D + L + H' + E'	-199	-289										
						MMAT	23411	1.4D + 1.7L + 1.7H' + 1.7Eo	3	-177										
						MMAC	11649	D + L + H' + E'	-199	-289										

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane Shear (5) (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
East Wall	Near Side	Horizontal	3H.3-18	4	6-H-L	MTCM	22108	1.4D + 1.7L + 1.7H' + 1.7Eo	22	-40	1.4D + 1.7L + 1.7H' + 1.7Eo	178	6.24	-	-	-	-	-	-	-
						MCCM	13553	D + L + H' + E'	-111	-391										
						MMAT	22108	1.4D + 1.7L + 1.7H' + 1.7Eo	3	-188										
						MMAC	14597	D + L + H' + E'	-104	-418										
					7-H-L	MTCM	22750	1.4D + 1.7L + 1.7H' + 1.7Eo	21	-209	1.4D + 1.7L + 1.7H' + 1.7Eo	178	7.8	-	-	-	-	-	-	-
						MCCM	11651	D + L + H' + E'	-225	-209										
						MMAT	23415	D + L + H' + E'	9	-588										
						MMAC	16659	D + L + H' + E'	-146	-722										
				5	8-H-L	MTCM	5470	1.4D + 1.7L + 1.7H' + 1.7Eo	12	-57	1.4D + 1.7L + 1.7H' + 1.7Eo	148	3.12	-	-	-	-	-	-	-
						MCCM	8125	D + L + H' + E'	-240	-464										
						MMAT	5470	1.4D + 1.7L + 1.7H' + 1.7Eo	10	-83										
						MMAC	8125	D + L + H' + E'	-235	-473										
					9-H-L	MTCM	2352	1.4D + 1.7L + 1.7H' + 1.7Eo	48	-34	1.4D + 1.7L + 1.7H' + 1.7Eo	181	4.68	-	-	-	-	-	-	-
						MCCM	8890	D + L + H' + E'	-246	-509										
						MMAT	2352	1.4D + 1.7L + 1.7H + 1.7W	5	-98										
						MMAC	8890	D + L + H' + E'	-243	-510										
					10-H-L	MTCM	2348	1.4D + 1.7L + 1.7H' + 1.7Eo	55	-67	1.4D + 1.7L + 1.7H' + 1.7Eo	181	6.24	-	-	-	-	-	-	-
						MCCM	7768	D + L + H' + E'	-254	-1005										
						MMAT	2348	D + L + H' + E'	0	-393										
						MMAC	6815	D + L + H' + E'	-242	-1009										
					11-H-L	MTCM	2715	1.4D + 1.7L + 1.7H' + 1.7Eo	55	-82	1.4D + 1.7L + 1.7H' + 1.7Eo	181	9.36	-	-	-	-	-	-	-
						MCCM	8895	D + L + H' + E'	-286	-816										
						MMAT	2715	1.4D + 1.7L + 1.7H' + 1.7Eo	2	-377										
						MMAC	8135	D + L + H' + E'	-270	-1221										
		Vertical	3H.3-19	3	1-V-L	MTCM	26586	1.4D + 1.7L + 1.7H' + 1.7Eo	75	-27	1.4D + 1.7L + 1.7H' + 1.7Eo	74	1.56	-	-	-	-	-	-	-
						MCCM	26586	1.4D + 1.7L + 1.7H' + 1.7Eo	-268	-19										
						MMAT	28234	1.4D + 1.7L + 1.7H' + 1.7Eo	6	-104										
						MMAC	28234	1.4D + 1.7L + 1.7H' + 1.7Eo	-150	-161										
					2-V-L	MTCM	26384	D + L + H' + E'	95	-29	1.4D + 1.7L + 1.7H' + 1.7Eo	85	3.12	-	-	-	-	-	-	-
						MCCM	26393	1.4D + 1.7L + 1.7H' + 1.7Eo	-338	-34										
						MMAT	26306	D + L + H' + E'	10	-216										
						MMAC	26306	1.4D + 1.7L + 1.7H' + 1.7Eo	-227	-291										
					3-V-L	MTCM	32279	1.4D + 1.7L + 1.7H' + 1.7Eo	190	-53	1.4D + 1.7L + 1.7H' + 1.7Eo	85	4.68	-	-	-	-	-	-	-
						MCCM	26310	1.4D + 1.7L + 1.7H' + 1.7Eo	-225	-303										
						MMAT	33710	D + L + H' + E'	5	-270										
						MMAC	33710	1.4D + 1.7L + 1.7H' + 1.7Eo	-115	-351										
				4	4-V-L	MTCM	11576	1.4D + 1.7L + 1.7H' + 1.7Eo	129	-26	1.4D + 1.7L + 1.7H' + 1.7Eo	188	3.12	-	-	-	-	-	-	-
						MCCM	11576	1.4D + 1.7L + 1.7H' + 1.7Eo	-484	-128										
						MMAT	16173	D + L + H' + E'	23	-195										
						MMAC	22706	1.4D + 1.7L + 1.7H' + 1.7Eo	-241	-282										
					5-V-L	MTCM	11651	1.4D + 1.7L + 1.7H' + 1.7Eo	145	-29	1.4D + 1.7L + 1.7H' + 1.7Eo	188	4.68	-	-	-	-	-	-	-
						MCCM	11651	1.4D + 1.7L + 1.7H' + 1.7Eo	-474	-151										
						MMAT	14356	D + L + H' + E'	31	-394										
						MMAC	14364	1.4D + 1.7L + 1.7H' + 1.7Eo	-320	-436										

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6)					Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads			Load Combination	Horizontal Section		Vertical Section			
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)			Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)		
East Wall	Near Side	Vertical	3H.3-19	5	6-V-L	MTCM	8632	1.4D + 1.7L + 1.7H' + 1.7Eo	33	-9	1.4D + 1.7L + 1.7H' + 1.7Eo	187	3.12	-	-	-	-	-	-	-
						MCCM	4258	1.4D + 1.7L + 1.7H' + 1.7Eo	-386	-51										
						MMAT	4259	1.4D + 1.7L + 1.7H' + 1.7Eo	21	-118										
						MMAC	4258	1.4D + 1.7L + 1.7H' + 1.7Eo	-176	-118										
					7-V-L	MTCM	4474	1.4D + 1.7L + 1.7H' + 1.7Eo	111	-85	1.4D + 1.7L + 1.7H' + 1.7Eo	235	4.68	-	-	-	-	-	-	-
						MCCM	4474	1.4D + 1.7L + 1.7H' + 1.7Eo	-400	-116										
						MMAT	4451	D + L + H' + E'	16	-199										
						MMAC	4451	D + L + H' + E'	-228	-199										
					8-V-L	MTCM	4497	1.4D + 1.7L + 1.7H' + 1.7Eo	223	-27	1.4D + 1.7L + 1.7H' + 1.7Eo	225	6.24	-	-	-	-	-	-	-
						MCCM	4130	1.4D + 1.7L + 1.7H' + 1.7Eo	-619	-68										
						MMAT	4138	D + L + H' + E'	24	-194										
						MMAC	8895	D + L + H' + E'	-363	-205										
					9-V-L	MTCM	2715	1.4D + 1.7L + 1.7H' + 1.7Eo	321	-95	1.4D + 1.7L + 1.7H' + 1.7Eo	187	7.8	-	-	-	-	-	-	-
						MCCM	2715	1.4D + 1.7L + 1.7H' + 1.7Eo	-691	-165										
						MMAT	2531	D + L + H' + E'	1	-1107										
						MMAC	2531	D + L + H' + E'	-196	-1108										
					10-V-L	MTCM	2348	1.4D + 1.7L + 1.7H' + 1.7Eo	291	-143	1.4D + 1.7L + 1.7H' + 1.7Eo	235	9.36	-	-	-	-	-	-	-
						MCCM	2348	1.4D + 1.7L + 1.7H' + 1.7Eo	-671	-244										
						MMAT	2583	D + L + H' + E'	10	-1068										
						MMAC	2583	D + L + H' + E'	-199	-1072										
	Far Side	Horizontal	3H.3-20	3	1-H-L	MTCM	32260	1.4D + 1.7L + 1.7H' + 1.7Eo	74	13	1.4D + 1.7L + 1.7H' + 1.7Eo	67	1.56	-	-	-	-	-	-	-
						MCCM	33752	1.4D + 1.7L + 1.7H' + 1.7Eo	-65	19										
						MMAT	28549	1.4D + 1.7L + 1.7H' + 1.7Eo	0	121										
						MMAC	28549	1.4D + 1.7L + 1.7H' + 1.7Eo	-23	121										
					2-H-L	MTCM	31453	1.4D + 1.7L + 1.7H' + 1.7Eo	124	40	1.4D + 1.7L + 1.7H' + 1.7Eo	121	3.12	-	-	-	-	-	-	-
						MCCM	26384	D + L + H' + E'	-92	39										
						MMAT	34108	1.4D + 1.7L + 1.7H' + 1.7Eo	8	237										
						MMAC	34108	1.4D + 1.7L + 1.7H' + 1.7Eo	-19	237										
					3-H-L	MTCM	31192	1.4D + 1.7L + 1.7H' + 1.7Eo	168	61	1.4D + 1.7L + 1.7H' + 1.7Eo	60	4.68	-	-	-	-	-	-	-
						MCCM	31192	1.4D + 1.7L + 1.7H' + 1.7Eo	-126	62										
						MMAT	34107	1.4D + 1.7L + 1.7H' + 1.7Eo	14	272										
						MMAC	34107	1.4D + 1.7L + 1.7H' + 1.7Eo	-22	272										
				4	4-H-L	MTCM	23408	1.4D + 1.7L + 1.7H' + 1.7Eo	47	62	1.4D + 1.7L + 1.7H' + 1.7Eo	160	3.12	-	-	-	-	-	-	-
						MCCM	11576	D + L + H' + E'	-175	200										
						MMAT	23408	1.4D + 1.7L + 1.7H' + 1.7Eo	1	109										
						MMAC	13561	D + L + H' + E'	-102	314										
					5-H-L	MTCM	14415	1.4D + 1.7L + 1.7H + 1.7W	10	17	1.4D + 1.7L + 1.7H' + 1.7Eo	178	4.68	-	-	-	-	-	-	-
						MCCM	14407	D + L + H' + E'	-152	22										
						MMAT	14380	1.4D + 1.7L + 1.7H' + 1.7Eo	1	23										
						MMAC	14345	D + L + H' + E'	-91	162										
					6-H-L	MTCM	14334	1.4D + 1.7L + 1.7H + 1.7W	17	28	1.4D + 1.7L + 1.7H' + 1.7Eo	178	6.24	-	-	-	-	-	-	-
						MCCM	14338	D + L + H' + E'	-102	175										
						MMAT	14601	1.4D + 1.7L + 1.7H' + 1.7Eo	4	71										
						MMAC	14605	D + L + H' + E'	-86	382										

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6)					Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads				Horizontal Section		Vertical Section			
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)		
East Wall	Far Side	Horizontal	3H.3-20	5	7-H-L	MTCM	5190	1.4D + 1.7L + 1.7H' + 1.7Eo	14	39	1.4D + 1.7L + 1.7H' + 1.7Eo	148	3.12	-	-	-	-	-	-	-
						MCCM	6823	D + L + H' + E'	-198	214										
						MMAT	5446	1.4D + 1.7L + 1.7H' + 1.7Eo	8	69										
						MMAC	5189	D + L + H' + E'	-168	387										
					8-H-L	MTCM	2715	1.4D + 1.7L + 1.7H' + 1.7Eo	55	25	1.4D + 1.7L + 1.7H' + 1.7Eo	181	4.68	-	-	-	-	-	-	-
						MCCM	8537	D + L + H' + E'	-230	163										
						MMAT	3149	1.4D + 1.7L + 1.7H' + 1.7Eo	1	70										
						MMAC	8591	D + L + H' + E'	-160	409										
		Vertical	3H.3-21	3	1-V-L	MTCM	26849	1.4D + 1.7L + 1.7H' + 1.7Eo	69	26	1.4D + 1.7L + 1.7H' + 1.7Eo	74	1.56	-	-	-	-	-	-	-
						MCCM	26849	1.4D + 1.7L + 1.7H' + 1.7Eo	-241	34										
						MMAT	30916	1.4D + 1.7L + 1.7H' + 1.7Eo	3	110										
						MMAC	26895	1.4D + 1.7L + 1.7H' + 1.7Eo	-151	163										
					2-V-L	MTCM	26384	D + L + H' + E'	95	73	1.4D + 1.7L + 1.7H' + 1.7Eo	85	3.12	-	-	-	-	-	-	-
						MCCM	26393	1.4D + 1.7L + 1.7H' + 1.7Eo	-340	40										
						MMAT	30920	1.4D + 1.7L + 1.7H' + 1.7Eo	9	206										
						MMAC	26626	1.4D + 1.7L + 1.7H' + 1.7Eo	-151	240										
					3-V-L	MTCM	32279	1.4D + 1.7L + 1.7H' + 1.7Eo	190	64	1.4D + 1.7L + 1.7H' + 1.7Eo	79	4.68	-	-	-	-	-	-	-
						MCCM	32279	1.4D + 1.7L + 1.7H' + 1.7Eo	-191	80										
						MMAT	29615	1.4D + 1.7L + 1.7H' + 1.7Eo	56	198										
						MMAC	29615	1.4D + 1.7L + 1.7H' + 1.7Eo	-138	198										
				4	4-V-L	MTCM	11651	1.4D + 1.7L + 1.7H' + 1.7Eo	129	21	1.4D + 1.7L + 1.7H' + 1.7Eo	188	3.12	-	-	-	-	-	-	(8)
						MCCM	13564	1.4D + 1.7L + 1.7H' + 1.7Eo	-390	114										
						MMAT	13564	D + L + H' + E'	14	199										
						MMAC	14637	1.4D + 1.7L + 1.7H' + 1.7Eo	-271	235										
					5-V-L	MTCM	11576	1.4D + 1.7L + 1.7H' + 1.7Eo	129	34	1.4D + 1.7L + 1.7H' + 1.7Eo	188	4.68	-	-	-	-	-	-	-
						MCCM	11576	1.4D + 1.7L + 1.7H' + 1.7Eo	-476	44										
						MMAT	11614	D + L + H' + E'	28	426										
						MMAC	11614	D + L + H' + E'	-193	426										
				5	6-V-L	MTCM	4481	1.4D + 1.7L + 1.7H' + 1.7Eo	137	44	1.4D + 1.7L + 1.7H' + 1.7Eo	190	4.68	-	-	-	-	-	-	-
						MCCM	4481	1.4D + 1.7L + 1.7H' + 1.7Eo	-461	201										
						MMAT	3495	D + L + H' + E'	24	263										
						MMAC	2699	1.4D + 1.7L + 1.7H' + 1.7Eo	-453	298										
					7-V-L	MTCM	4497	1.4D + 1.7L + 1.7H' + 1.7Eo	223	12	1.4D + 1.7L + 1.7H' + 1.7Eo	235	6.24	-	-	-	-	-	-	-
						MCCM	4130	1.4D + 1.7L + 1.7H' + 1.7Eo	-614	86										
						MMAT	6938	D + L + H' + E'	22	731										
						MMAC	6938	D + L + H' + E'	-268	739										
					8-V-L	MTCM	2715	1.4D + 1.7L + 1.7H' + 1.7Eo	321	89	1.4D + 1.7L + 1.7H' + 1.7Eo	225	7.8	-	-	-	-	-	-	-
						MCCM	2715	1.4D + 1.7L + 1.7H' + 1.7Eo	-691	23										
						MMAT	6909	D + L + H' + E'	30	718										
						MMAC	6909	D + L + H' + E'	-271	725										
	-	Transverse (Horizontal and Vertical)	3H.3-22	3	1-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	9	82	13	230	0.20 (#4@12)	-
					2-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	50	31	42	103	0.31 (#5@12)	-
					3-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	87	-63	0	-18	0.44 (#6@12)	-
				4	4-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-2	-25	91	-105	0.20 (#4@12)	-
					5-T	-	-	-	-	-	-	-	-	D + L + H' + E'	103	28	-1	-57	0.31 (#5@12)	-
					6-T	-	-	-	-	-	-	-	-	D + L + H' + E'	125	30	-1	-61	0.44 (#6@12)	-
					7-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-120	-34	-102	-120	0.60 (#7@12)	-
					8-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-191	-74	-160	-185	1.24 (#5@6)	-

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number(2)	Maximum Forces(3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in²/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear(7) Reinforcement Provided (in²/ft²)	Remarks
East Wall	-	Transverse (Horizontal and Vertical)	3H.3-22	5	9-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-7	-36	123	-124	0.20 (#4@12)	-
					10-T	-	-	-	-	-	-	-	-	D + L + H' + E'	14	-63	151	-202	0.31 (#5@12)	-
					11-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-166	12	0	-22	0.44 (#6@12)	-
					12-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-205	10	0	-21	0.60 (#7@12)	-
					13-T	-	-	-	-	-	-	-	-	D + L + H' + E'	107	-24	-212	-184	0.79 (#8@12)	-
West Wall	Near Side	Horizontal	3H.3-23	3	1-H-L	MTCM	31715	1.4D + 1.7L + 1.7H' + 1.7Eo	46	-41	1.4D + 1.7L + 1.7H' + 1.7Eo	75	1.56	-	-	-	-	-	-	-
						MCCM	31715	1.4D + 1.7L + 1.7H' + 1.7Eo	-65	-48										
						MMAT	31426	1.4D + 1.7L + 1.7H' + 1.7Eo	21	-91										
						MMAC	31426	1.4D + 1.7L + 1.7H' + 1.7Eo	-29	-91										
					2-H-L	MTCM	32204	1.4D + 1.7L + 1.7H' + 1.7Eo	61	-173	1.4D + 1.7L + 1.7H' + 1.7Eo	108	3.12	-	-	-	-	-	-	-
						MCCM	32243	1.4D + 1.7L + 1.7H' + 1.7Eo	-87	-153										
						MMAT	31152	1.4D + 1.7L + 1.7H' + 1.7Eo	25	-210										
						MMAC	31152	1.4D + 1.7L + 1.7H' + 1.7Eo	-42	-210										
				4	3-H-L	MTCM	22696	1.4D + 1.7L + 1.7H' + 1.7Eo	25	-46	1.4D + 1.7L + 1.7H' + 1.7Eo	143	3.12	-	-	-	-	-	-	-
						MCCM	11573	D + L + H' + E'	-278	-461										
						MMAT	11573	1.4D + 1.7L + 1.7H' + 1.7Eo	3	-142										
						MMAC	11573	D + L + H' + E'	-274	-484										
					4-H-L	MTCM	23343	1.4D + 1.7L + 1.7H' + 1.7Eo	87	-24	1.4D + 1.7L + 1.7H' + 1.7Eo	143	4.68	-	-	-	-	-	-	-
						MCCM	11633	D + L + H' + E'	-166	-112										
						MMAT	23333	1.4D + 1.7L + 1.7H' + 1.7Eo	8	-136										
						MMAC	13167	D + L + H' + E'	-116	-557										
				5	5-H-L	MTCM	4184	1.4D + 1.7L + 1.7H' + 1.7Eo	29	-79	1.4D + 1.7L + 1.7H' + 1.7Eo	135	3.12	-	-	-	-	-	-	-
						MCCM	8891	D + L + H' + E'	-240	-419										
						MMAT	8711	1.4D + 1.7L + 1.7H' + 1.7Eo	6	-111										
						MMAC	8587	D + L + H' + E'	-181	-527										
					6-H-L	MTCM	2353	1.4D + 1.7L + 1.7H' + 1.7Eo	45	-26	1.4D + 1.7L + 1.7H' + 1.7Eo	164	4.68	-	-	-	-	-	-	-
						MCCM	3199	1.4D + 1.7L + 1.7H' + 1.7Eo	-176	-324										
						MMAT	8628	1.4D + 1.7L + 1.7H + 1.7W	6	-270										
						MMAC	8794	D + L + H' + E'	-116	-678										
					7-H-L	MTCM	2711	1.4D + 1.7L + 1.7H' + 1.7Eo	53	-75	1.4D + 1.7L + 1.7H' + 1.7Eo	164	6.24	-	-	-	-	-	-	-
						MCCM	8534	D + L + H' + E'	-241	-658										
						MMAT	8532	D + L + H' + E'	3	-807										
						MMAC	8663	D + L + H' + E'	-73	-896										
		Vertical	3H.3-24	3	1-V-L	MTCM	26402	1.4D + 1.7L + 1.7H' + 1.7Eo	111	-39	1.4D + 1.7L + 1.7H' + 1.7Eo	90	3.12	-	-	-	-	-	-	-
						MCCM	26402	1.4D + 1.7L + 1.7H' + 1.7Eo	-303	-28										
						MMAT	26341	1.4D + 1.7L + 1.7H' + 1.7Eo	0	-217										
						MMAC	32226	1.4D + 1.7L + 1.7H' + 1.7Eo	-23	-243										
					2-V-L	MTCM	32241	D + L + H' + E'	6	-101	1.4D + 1.7L + 1.7H' + 1.7Eo	90	4.68	-	-	-	-	-	-	-
						MCCM	32243	1.4D + 1.7L + 1.7H' + 1.7Eo	-32	-341										
						MMAT	32243	D + L + H' + E'	4	-273										
						MMAC	32243	1.4D + 1.7L + 1.7H' + 1.7Eo	-32	-341										
				4	3-V-L	MTCM	11647	1.4D + 1.7L + 1.7H' + 1.7Eo	112	-9	1.4D + 1.7L + 1.7H' + 1.7Eo	177	3.12	-	-	-	-	-	-	-
						MCCM	13129	1.4D + 1.7L + 1.7H' + 1.7Eo	-411	-37										
						MMAT	21538	D + L + H' + E'	1	-176										
						MMAC	21538	D + L + H' + E'	-120	-196										

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
West Wall	Near Side	Vertical	3H.3-24	4	4-V-L	MTCM	11573	1.4D + 1.7L + 1.7H' + 1.7Eo	178	-63	1.4D + 1.7L + 1.7H' + 1.7Eo	212	4.68	-	-	-	-	-	-	-
						MCCM	11573	1.4D + 1.7L + 1.7H' + 1.7Eo	-589	-314										
						MMAT	23385	D + L + H' + E'	3	-376										
						MMAC	23385	D + L + H' + E'	-128	-411										
					5-V-L	MTCM	22696	D + L + H' + E'	46	-55	1.4D + 1.7L + 1.7H' + 1.7Eo	212	6.24	-	-	-	-	-	-	-
						MCCM	22131	1.4D + 1.7L + 1.7H' + 1.7Eo	-204	-129										
						MMAT	23361	D + L + H' + E'	0	-349										
						MMAC	23367	1.4D + 1.7L + 1.7H' + 1.7Eo	-165	-377										
				5	6-V-L	MTCM	5196	1.4D + 1.7L + 1.7H' + 1.7Eo	71	-29	1.4D + 1.7L + 1.7H' + 1.7Eo	152	3.12	-	-	-	-	-	-	-
						MCCM	4195	1.4D + 1.7L + 1.7H' + 1.7Eo	-309	-25										
						MMAT	4195	D + L + H' + E'	12	-139										
						MMAC	4312	D + L + H' + E'	-168	-158										
					7-V-L	MTCM	4132	1.4D + 1.7L + 1.7H' + 1.7Eo	183	-35	1.4D + 1.7L + 1.7H' + 1.7Eo	205	4.68	-	-	-	-	-	-	-
						MCCM	4132	1.4D + 1.7L + 1.7H' + 1.7Eo	-559	-36										
						MMAT	8535	1.4D + 1.7L + 1.7H' + 1.7Eo	18	-215										
						MMAC	8535	1.4D + 1.7L + 1.7H' + 1.7Eo	-418	-270										
					8-V-L	MTCM	4129	1.4D + 1.7L + 1.7H' + 1.7Eo	208	-19	1.4D + 1.7L + 1.7H' + 1.7Eo	149	6.24	-	-	-	-	-	-	-
						MCCM	4129	1.4D + 1.7L + 1.7H' + 1.7Eo	-623	-103										
						MMAT	8534	1.4D + 1.7L + 1.7H' + 1.7Eo	5	-211										
						MMAC	8534	D + L + H' + E'	-332	-351										
					9-V-L	MTCM	2347	1.4D + 1.7L + 1.7H' + 1.7Eo	312	-63	1.4D + 1.7L + 1.7H' + 1.7Eo	205	7.8	-	-	-	-	-	-	-
						MCCM	2347	1.4D + 1.7L + 1.7H' + 1.7Eo	-741	-178										
						MMAT	2443	D + L + H' + E'	55	-750										
						MMAC	2582	D + L + H' + E'	-184	-775										
	Far Side	Horizontal	3H.3-25	3	1-H-L	MTCM	31715	1.4D + 1.7L + 1.7H' + 1.7Eo	46	22	1.4D + 1.7L + 1.7H' + 1.7Eo	75	1.56	-	-	-	-	-	-	-
						MCCM	31715	1.4D + 1.7L + 1.7H' + 1.7Eo	-65	16										
						MMAT	31159	1.4D + 1.7L + 1.7H' + 1.7Eo	25	94										
						MMAC	31159	1.4D + 1.7L + 1.7H' + 1.7Eo	-32	94										
					2-H-L	MTCM	26287	1.4D + 1.7L + 1.7H' + 1.7Eo	63	53	1.4D + 1.7L + 1.7H' + 1.7Eo	108	3.12	-	-	-	-	-	-	-
						MCCM	32243	1.4D + 1.7L + 1.7H' + 1.7Eo	-87	49										
						MMAT	31152	1.4D + 1.7L + 1.7H' + 1.7Eo	29	171										
						MMAC	31152	1.4D + 1.7L + 1.7H' + 1.7Eo	-38	171										
				4	3-H-L	MTCM	22696	1.4D + 1.7L + 1.7H' + 1.7Eo	25	14	1.4D + 1.7L + 1.7H' + 1.7Eo	143	3.12	-	-	-	-	-	-	-
						MCCM	11650	D + L + H' + E'	-225	178										
						MMAT	11625	1.4D + 1.7L + 1.7H + 1.7W	2	142										
						MMAC	11625	D + L + H' + E'	-70	303										
					4-H-L	MTCM	23343	1.4D + 1.7L + 1.7H' + 1.7Eo	87	146	1.4D + 1.7L + 1.7H' + 1.7Eo	143	6.24	-	-	-	-	-	-	-
						MCCM	23343	D + L + H' + E'	-86	126										
						MMAT	23343	1.4D + 1.7L + 1.7H' + 1.7Eo	39	221										
						MMAC	23343	1.4D + 1.7L + 1.7H' + 1.7Eo	-68	221										
				5	5-H-L	MTCM	4190	1.4D + 1.7L + 1.7H' + 1.7Eo	26	34	1.4D + 1.7L + 1.7H' + 1.7Eo	135	3.12	-	-	-	-	-	-	(8)
						MCCM	8891	D + L + H' + E'	-239	176										
						MMAT	8730	1.4D + 1.7L + 1.7H' + 1.7Eo	9	99										
						MMAC	8604	D + L + H' + E'	-174	500										
					6-H-L	MTCM	2711	1.4D + 1.7L + 1.7H' + 1.7Eo	53	14	1.4D + 1.7L + 1.7H' + 1.7Eo	164	4.68	-	-	-	-	-	-	-
						MCCM	3199	1.4D + 1.7L + 1.7H' + 1.7Eo	-169	143										
						MMAT	3205	D + L + H' + E'	7	64										
						MMAC	3205	D + L + H' + E'	-139	258										

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6)					Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads			Load Combination	Horizontal Section		Vertical Section			
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)			Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)		
West Wall	Far Side	Vertical	3H.3-26	3	1-V-L	MTCM	29048	1.4D + 1.7L + 1.7H' + 1.7Eo	62	46	1.4D + 1.7L + 1.7H' + 1.7Eo	77	1.56	-	-	-	-	-	-	-
						MCCM	29050	1.4D + 1.7L + 1.7H' + 1.7Eo	-121	33										
						MMAT	32206	1.4D + 1.7L + 1.7H' + 1.7Eo	3	101										
						MMAC	32206	1.4D + 1.7L + 1.7H' + 1.7Eo	-11	101										
					2-V-L	MTCM	26402	1.4D + 1.7L + 1.7H' + 1.7Eo	111	30	1.4D + 1.7L + 1.7H' + 1.7Eo	90	3.12	-	-	-	-	-	-	-
						MCCM	26402	1.4D + 1.7L + 1.7H' + 1.7Eo	-303	38										
						MMAT	26890	D + L + H' + E'	4	196										
						MMAC	26890	1.4D + 1.7L + 1.7H' + 1.7Eo	-55	220										
					3-V-L	MTCM	26300	1.4D + 1.7L + 1.7H' + 1.7Eo	43	122	1.4D + 1.7L + 1.7H' + 1.7Eo	90	4.68	-	-	-	-	-	-	-
						MCCM	26377	1.4D + 1.7L + 1.7H' + 1.7Eo	-143	164										
						MMAT	26344	1.4D + 1.7L + 1.7H' + 1.7Eo	9	282										
						MMAC	26344	1.4D + 1.7L + 1.7H' + 1.7Eo	-57	309										
				4	4-V-L	MTCM	13204	1.4D + 1.7L + 1.7H' + 1.7Eo	126	39	1.4D + 1.7L + 1.7H' + 1.7Eo	177	3.12	-	-	-	-	-	-	-
						MCCM	13204	1.4D + 1.7L + 1.7H' + 1.7Eo	-467	64										
						MMAT	14385	D + L + H' + E'	8	253										
						MMAC	14385	D + L + H' + E'	-180	254										
					5-V-L	MTCM	11573	1.4D + 1.7L + 1.7H' + 1.7Eo	178	97	1.4D + 1.7L + 1.7H' + 1.7Eo	212	4.68	-	-	-	-	-	-	-
						MCCM	11573	1.4D + 1.7L + 1.7H' + 1.7Eo	-529	67										
						MMAT	11623	D + L + H' + E'	2	288										
						MMAC	11597	D + L + H' + E'	-232	334										
				5	6-V-L	MTCM	2350	1.4D + 1.7L + 1.7H' + 1.7Eo	214	74	1.4D + 1.7L + 1.7H' + 1.7Eo	205	4.68	-	-	-	-	-	-	-
						MCCM	2350	1.4D + 1.7L + 1.7H' + 1.7Eo	-587	50										
						MMAT	5196	D + L + H' + E'	6	340										
						MMAC	6247	D + L + H' + E'	-188	369										
					7-V-L	MTCM	2402	1.4D + 1.7L + 1.7H' + 1.7Eo	112	27	1.4D + 1.7L + 1.7H' + 1.7Eo	179	6.24	-	-	-	-	-	-	-
						MCCM	3199	1.4D + 1.7L + 1.7H' + 1.7Eo	-405	190										
						MMAT	5191	D + L + H' + E'	10	307										
						MMAC	4190	D + L + H' + E'	-281	309										
					8-V-L	MTCM	2347	1.4D + 1.7L + 1.7H' + 1.7Eo	312	86	1.4D + 1.7L + 1.7H' + 1.7Eo	149	7.8	-	-	-	-	-	-	-
						MCCM	2347	1.4D + 1.7L + 1.7H' + 1.7Eo	-735	58										
						MMAT	8534	1.4D + 1.7L + 1.7H' + 1.7Eo	5	219										
						MMAC	8534	1.4D + 1.7L + 1.7H' + 1.7Eo	-251	219										
	-	Transverse (Horizontal and Vertical)	3H.3-27	3	1-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	18	20	21	116	0.20 (#4@12)	-
					2-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	47	10	44	28	0.31 (#5@12)	-
				4	3-T	-	-	-	-	-	-	-	-	D + L + H' + E'	6	-63	-91	-89	0.20 (#4@12)	-
					4-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-1	-68	-115	-110	0.31 (#5@12)	-
					5-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-1	-66	120	-99	0.44 (#6@12)	-
					6-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-135	-35	126	-366	0.79 (#8@12)	-
					7-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-188	-66	-171	-259	1.76 (#6@6)	-
				5	8-T	-	-	-	-	-	-	-	-	D + L + H' + E'	18	-40	84	-110	0.20 (#4@12)	-
					9-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-135	31	-12	-15	0.31 (#5@12)	-
					10-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-165	-6	-2	-17	0.44 (#6@12)	-
					11-T	-	-	-	-	-	-	-	-	D + L + H' + E'	-92	-56	-122	185	0.60 (#7@12)	-
					12-T	-	-	-	-	-	-	-	-	D + L + H' + E'	147	-22	-229	-251	1.24 (#5@6)	-

Table 3H.3-3 Results of Radwaste Building Concrete Wall Design (Continued)

Notes:

(1) The reinforcement layout drawings show the various zones used to define the minimum reinforcement that will be provided based on finite element analysis results. Actual provided reinforcement based on final rebar layout and including development length may exceed the reported provided reinforcement and the zones with higher reinforcement may be extended beyond their reported boundaries. The dimensions in the reinforcement drawings are based on the dimensions of the SAP2000 shell elements, which are modeled at the centerline of the walls and slabs. Therefore, the reinforcement drawing dimensions do not match actual building dimensions.

(2) Each reinforcement layout drawing is divided into reinforcement zones. The reinforcement zone naming convention is as follows: "H" = horizontal, "V" = vertical, "L" = longitudinal reinforcement, "T" = transverse reinforcement. For slabs, vertical corresponds to North-South direction and horizontal corresponds to East-West direction.

(3) The maximum tension (MTCM) and compression (MCCM) axial forces are provided with the corresponding moment from the same load combination. The maximum moment that has a corresponding tension (MMAT) in the same load combination and the maximum moment that has a corresponding compression (MMAC) in the same load combination are also provided. For the roof, the maximum tension and maximum moment (MTMM) are reported.

(4) Negative axial load is compression and positive axial load is tension. Negative moment applies tension to the top face of the shell element and positive moment applies tension to the bottom face of the shell element. For walls or slabs where the same reinforcement is provided on both faces, the moment is shown as absolute value. The axial and flexural loads reported in the table are the average of the 2 node pairs that form the 4 edges of the critical rectangular shell element. If the 2 node pairs on the shell element edges parallel to the reinforcement direction do not satisfy P&M interaction criteria, then only the 2 node pairs on the shell element edges perpendicular to the reinforcement direction are used for design (effective width considered). The element mesh is sufficiently refined for this design approach.

(5) The reported in-plane shear is the maximum average in-plane shear along a plane that crosses the longitudinal reinforcement zone.

(6) The transverse shear reinforcement loads are reported for the critical element requiring the largest area of steel for transverse reinforcement within the zone. The shear force and the corresponding axial force in the same load combination for each direction is reported for the critical element.

(7) The reported transverse shear reinforcement is the summation of the requried shear reinforcement in the horizontal direction and the required shear reinforcement in the vertical direction.

(8) For certain areas of the structure, the standard element post-processing methods were too conservative. For such cases, detailed manual design was performed and the design forces determined by the detailed manual design are provided in the table.

(9) The longitudinal reinforcement shown is required to be tied

(10) The reported forces are from the FEM analysis. The provided longitudinal reinforcement includes additional reinforcement required due to manual one-way design calculations

(11) The reported axial and in-plane forces are from the FEM analysis. The reported flexural forces are from manual one-way design calculations.

Table 3H.3-4 Results of Radwaste Building Concrete Slab Design

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
Foundation Mat	Near Side	Horizontal	3H.3-28	12	1-H-L	MTCM	1269	D + L + H' + E'	79	-218	1.4D + 1.7L + 1.7H' + 1.7Eo	68	6.24	-	-	-	-	-	-	-
						MCCM	1073	1.4D + 1.7L + 1.7H' + 1.7Eo	-126	-54										
						MMAT	277	1.4D + 1.7L + 1.7H' + 1.7Eo	1	-1162										
						MMAC	514	1.4D + 1.7L + 1.7H' + 1.7Eo	-25	-1480										
					2-H-L	MTCM	26158	1.4D + 1.7L + 1.7H' + 1.7Eo	86	-403	1.4D + 1.7L + 1.7H' + 1.7Eo	75	7.8	-	-	-	-	-	-	-
						MCCM	26186	1.4D + 1.7L + 1.7H' + 1.7Eo	-102	-273										
						MMAT	29850	1.4D + 1.7L + 1.7H' + 1.7Eo	21	-1377										
						MMAC	29850	1.4D + 1.7L + 1.7H' + 1.7Eo	-28	-1377										
		Vertical	3H.3-29	12	1-V-L	MTCM	944	1.4D + 1.7L + 1.7H' + 1.7Eo	42	-179	1.4D + 1.7L + 1.7H' + 1.7Eo	66	6.24	-	-	-	-	-	-	-
						MCCM	880	D + L + H' + E'	-189	-126										
						MMAT	880	1.4D + 1.7L + 1.7H' + 1.7Eo	67	-1136										
						MMAC	26810	1.4D + 1.7L + 1.7H' + 1.7Eo	-26	-1059										
					2-V-L	MTCM	27828	1.4D + 1.7L + 1.7H' + 1.7Eo	125	-1615	1.4D + 1.7L + 1.7H' + 1.7Eo	62	7.8	-	-	-	-	-	-	-
						MCCM	27828	1.4D + 1.7L + 1.7H' + 1.7Eo	-166	-643										
						MMAT	27828	1.4D + 1.7L + 1.7H' + 1.7Eo	125	-1615										
						MMAC	27828	1.4D + 1.7L + 1.7H' + 1.7Eo	-63	-1615										
	Far Side	Horizontal	3H.3-30	12	1-H-L	MTCM	29586	1.4D + 1.7L + 1.7H' + 1.7Eo	83	1105	1.4D + 1.7L + 1.7H' + 1.7Eo	68	6.24	-	-	-	-	-	-	-
						MCCM	933	1.4D + 1.7L + 1.7H' + 1.7Eo	-72	1593										
						MMAT	415	1.4D + 1.7L + 1.7H' + 1.7Eo	26	1579										
						MMAC	933	1.4D + 1.7L + 1.7H' + 1.7Eo	-67	1623										
					2-H-L	MTCM	603	1.4D + 1.7L + 1.7H' + 1.7Eo	63	1642	1.4D + 1.7L + 1.7H' + 1.7Eo	75	7.8	-	-	-	-	-	-	-
						MCCM	645	D + L + H' + E'	-18	480										
						MMAT	463	1.4D + 1.7L + 1.7H' + 1.7Eo	1	2329										
						MMAC	604	1.4D + 1.7L + 1.7H' + 1.7Eo	-87	2510										
					3-H-L	MTCM	27384	D + L + H' + E'	114	1049	1.4D + 1.7L + 1.7H' + 1.7Eo	68	9.36	-	-	-	-	-	-	-
						MCCM	27348	1.4D + 1.7L + 1.7H' + 1.7Eo	-227	2252										
						MMAT	29849	1.4D + 1.7L + 1.7H' + 1.7Eo	34	2642										
						MMAC	27347	1.4D + 1.7L + 1.7H' + 1.7Eo	-207	3199										
					4-H-L	MTCM	26185	1.4D + 1.7L + 1.7H' + 1.7Eo	91	634	1.4D + 1.7L + 1.7H' + 1.7Eo	75	10.92	-	-	-	-	-	-	-
						MCCM	26159	1.4D + 1.7L + 1.7H' + 1.7Eo	-168	1429										
						MMAT	26185	1.4D + 1.7L + 1.7H' + 1.7Eo	15	3252										
						MMAC	26185	1.4D + 1.7L + 1.7H' + 1.7Eo	-134	3259										
		Vertical	3H.3-31	12	1-V-L	MTCM	880	1.4D + 1.7L + 1.7H' + 1.7Eo	67	1062	1.4D + 1.7L + 1.7H' + 1.7Eo	66	6.24	-	-	-	-	-	-	-
						MCCM	880	1.4D + 1.7L + 1.7H' + 1.7Eo	-190	2096										
						MMAT	880	1.4D + 1.7L + 1.7H' + 1.7Eo	35	1666										
						MMAC	880	1.4D + 1.7L + 1.7H' + 1.7Eo	-190	2096										
					2-V-L	MTCM	1261	D + L + H' + E'	93	1051	1.4D + 1.7L + 1.7H' + 1.7Eo	36	7.8	-	-	-	-	-	-	-
						MCCM	32363	1.4D + 1.7L + 1.7H' + 1.7Eo	-171	1458										
						MMAT	32362	1.4D + 1.7L + 1.7H' + 1.7Eo	7	2039										
						MMAC	32363	1.4D + 1.7L + 1.7H' + 1.7Eo	-163	2104										
					3-V-L	MTCM	28433	D + L + H' + E'	92	437	1.4D + 1.7L + 1.7H' + 1.7Eo	66	9.36	-	-	-	-	-	-	-
						MCCM	72	D + L + H' + E'	-228	2034										
						MMAT	32371	1.4D + 1.7L + 1.7H' + 1.7Eo	29	3045										
						MMAC	20	1.4D + 1.7L + 1.7H' + 1.7Eo	-144	2912										
					4-V-L	MTCM	27828	1.4D + 1.7L + 1.7H' + 1.7Eo	125	1572	1.4D + 1.7L + 1.7H' + 1.7Eo	62	10.92	-	-	-	-	-	-	-
						MCCM	27828	1.4D + 1.7L + 1.7H' + 1.7Eo	-224	3713										
						MMAT	27828	1.4D + 1.7L + 1.7H' + 1.7Eo	6	3675										
						MMAC	27828	1.4D + 1.7L + 1.7H' + 1.7Eo	-224	3713										
	-	Transverse (Horizontal and Vertical)	3H.3-32	12	1-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	21	32	288	0	0.20 (#4@12)	-
					2-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	178	41	288	-31	0.31 (#5@12)	-

Table 3H.3-4 Results of Radwaste Building Concrete Slab Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6)					Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads			Load Combination	Horizontal Section		Vertical Section			
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)			Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)		
El. 35'-0"	Near Side	Horizontal	3H.3-33	5	1-H-L	MTCM	37891	1.4D + 1.7L + 1.7H' + 1.7Eo	99	-45	1.4D + 1.7L + 1.7H' + 1.7Eo	122	3.12	-	-	-	-	-	-	-
						MCCM	37891	1.4D + 1.7L + 1.7H' + 1.7Eo	-291	-110										
						MMAT	36339	1.4D + 1.7L + 1.7H' + 1.7Eo	1	-266										
						MMAC	38166	1.4D + 1.7L + 1.7H' + 1.7Eo	-190	-354										
					2-H-L	MTCM	35329	1.4D + 1.7L + 1.7H' + 1.7Eo	64	-298	1.4D + 1.7L + 1.7H' + 1.7Eo	107	4.68	-	-	-	-	-	-	-
						MCCM	36144	1.4D + 1.7L + 1.7H' + 1.7Eo	-224	-390										
						MMAT	35340	1.4D + 1.7L + 1.7H' + 1.7Eo	19	-405										
						MMAC	38231	1.4D + 1.7L + 1.7H' + 1.7Eo	-70	-366										
					3-H-L	MTCM	37838	1.4D + 1.7L + 1.7H' + 1.7Eo	67	-144	1.4D + 1.7L + 1.7H' + 1.7Eo	73	6.24	-	-	-	-	-	-	-
						MCCM	37838	1.4D + 1.7L + 1.7H' + 1.7Eo	-302	-627										
						MMAT	37838	D + L + H' + E'	13	-428										
						MMAC	37838	1.4D + 1.7L + 1.7H' + 1.7Eo	-273	-634										
				4	4-H-L	MTCM	38193	1.4D + 1.7L + 1.7H' + 1.7Eo	81	-8	1.4D + 1.7L + 1.7H' + 1.7Eo	97	3.12	-	-	-	-	-	-	-
						MCCM	37895	1.4D + 1.7L + 1.7H' + 1.7Eo	-203	-188										
						MMAT	37773	1.4D + 1.7L + 1.7H' + 1.7Eo	3	-308										
						MMAC	37788	1.4D + 1.7L + 1.7H' + 1.7Eo	-89	-347										
				2	5-H-L	MTCM	25335	1.4D + 1.7L + 1.7H' + 1.7Eo	73	-19	1.4D + 1.7L + 1.7H' + 1.7Eo	102	3.12	-	-	-	-	-	-	(8),(10)
						MCCM	25335	1.4D + 1.7L + 1.7H' + 1.7Eo	-195	-30										
						MMAT	39029	1.4D + 1.7L + 1.7H' + 1.7Eo	6	-115										
						MMAC	39029	1.4D + 1.7L + 1.7H' + 1.7Eo	-44	-115										
		Vertical	3H.3-34	5	1-V-L	MTCM	35934	1.4D + 1.7L + 1.7H' + 1.7Eo	50	-66	1.4D + 1.7L + 1.7H' + 1.7Eo	72	3.12	-	-	-	-	-	-	-
						MCCM	38394	D + L + H' + E'	-143	-143										
						MMAT	38395	1.4D + 1.7L + 1.7H' + 1.7Eo	27	-160										
						MMAC	38395	1.4D + 1.7L + 1.7H' + 1.7Eo	-114	-223										
					2-V-L	MTCM	36062	1.4D + 1.7L + 1.7H' + 1.7Eo	145	-180	1.4D + 1.7L + 1.7H' + 1.7Eo	52	4.68	-	-	-	-	-	-	-
						MCCM	37024	D + L + H' + E'	-184	-164										
						MMAT	34304	1.4D + 1.7L + 1.7H' + 1.7Eo	2	-371										
						MMAC	37023	1.4D + 1.7L + 1.7H' + 1.7Eo	-177	-531										
					3-V-L	MTCM	35810	1.4D + 1.7L + 1.7H' + 1.7Eo	160	-135	1.4D + 1.7L + 1.7H' + 1.7Eo	72	6.24	-	-	-	-	-	-	-
						MCCM	35810	1.4D + 1.7L + 1.7H' + 1.7Eo	-319	-37										
						MMAT	35273	1.4D + 1.7L + 1.7H' + 1.7Eo	34	-590										
						MMAC	37824	1.4D + 1.7L + 1.7H' + 1.7Eo	-167	-764										
				4	4-V-L	MTCM	38187	1.4D + 1.7L + 1.7H' + 1.7Eo	62	-79	D + L + H' + E'	66	3.12	-	-	-	-	-	-	-
						MCCM	38161	1.4D + 1.7L + 1.7H' + 1.7Eo	-185	-256										
						MMAT	38302	1.4D + 1.7L + 1.7H' + 1.7Eo	7	-275										
						MMAC	38258	1.4D + 1.7L + 1.7H' + 1.7Eo	-38	-344										
					5-V-L	MTCM	38143	1.4D + 1.7L + 1.7H' + 1.7Eo	44	-240	D + L + H' + E'	66	4.68	-	-	-	-	-	-	-
						MCCM	38143	1.4D + 1.7L + 1.7H' + 1.7Eo	-189	-412										
						MMAT	38143	D + L + H' + E'	9	-473										
						MMAC	38143	1.4D + 1.7L + 1.7H' + 1.7Eo	-97	-693										
					6-V-L	MTCM	38165	1.4D + 1.7L + 1.7H' + 1.7Eo	66	-211	1.4D + 1.7L + 1.7H' + 1.7Eo	52	6.24	-	-	-	-	-	-	-
						MCCM	38165	1.4D + 1.7L + 1.7H' + 1.7Eo	-236	-747										
						MMAT	38165	1.4D + 1.7L + 1.7H' + 1.7Eo	1	-701										
						MMAC	38165	1.4D + 1.7L + 1.7H' + 1.7Eo	-211	-786										
				2	7-V-L	MTCM	25310	1.4D + 1.7L + 1.7H' + 1.7Eo	33	-19	1.4D + 1.7L + 1.7H' + 1.7Eo	41	1.56	-	-	-	-	-	-	(10)
						MCCM	25333	D + L + H' + E'	-64	-27										
						MMAT	39027	1.4D + 1.7L + 1.7H' + 1.7Eo	1	-50										
						MMAC	39027	1.4D + 1.7L + 1.7H' + 1.7Eo	-21	-50										
					8-V-L	MTCM	34573	1.4D + 1.7L + 1.7H' + 1.7Eo	41	-25	1.4D + 1.7L + 1.7H' + 1.7Eo	50	3.12	-	-	-	-	-	-	(10)
						MCCM	34574	D + L + H' + E'	-80	-15										
						MMAT	34573	1.4D + 1.7L + 1.7H' + 1.7Eo	20	-52										
						MMAC	34573	1.4D + 1.7L + 1.7H' + 1.7Eo	-69	-52										

Table 3H.3-4 Results of Radwaste Building Concrete Slab Design (Continued)

Location	Face	Direction	Reinforcement Layout Drawing Number (1)	Thickness (ft)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in²/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
El. 35'-0"	Far Side	Horizontal	3H.3-35	5	1-H-L	MTCM	38359	1.4D + 1.7L + 1.7H' + 1.7Eo	44	50	1.4D + 1.7L + 1.7H' + 1.7Eo	122	3.12	-	-	-	-	-	-	-
						MCCM	38398	1.4D + 1.7L + 1.7H' + 1.7Eo	-194	78										
						MMAT	36138	1.4D + 1.7L + 1.7H' + 1.7Eo	5	252										
						MMAC	36353	1.4D + 1.7L + 1.7H' + 1.7Eo	-23	165										
					2-H-L	MTCM	38230	1.4D + 1.7L + 1.7H' + 1.7Eo	98	68	1.4D + 1.7L + 1.7H' + 1.7Eo	107	4.68	-	-	-	-	-	-	-
						MCCM	37817	1.4D + 1.7L + 1.7H' + 1.7Eo	-195	46										
						MMAT	38224	1.4D + 1.7L + 1.7H' + 1.7Eo	6	374										
						MMAC	38224	1.4D + 1.7L + 1.7H' + 1.7Eo	-99	416										
				4	3-H-L	MTCM	38193	1.4D + 1.7L + 1.7H' + 1.7Eo	81	58	1.4D + 1.7L + 1.7H' + 1.7Eo	97	3.12	-	-	-	-	-	-	-
						MCCM	38193	1.4D + 1.7L + 1.7H' + 1.7Eo	-239	173										
						MMAT	38195	1.4D + 1.7L + 1.7H' + 1.7Eo	1	227										
						MMAC	38509	1.4D + 1.7L + 1.7H' + 1.7Eo	-139	237										
				2	4-H-L	MTCM	25335	1.4D + 1.7L + 1.7H' + 1.7Eo	96	15	1.4D + 1.7L + 1.7H' + 1.7Eo	102	3.12	-	-	-	-	-	-	(10)
						MCCM	25335	1.4D + 1.7L + 1.7H' + 1.7Eo	-247	11										
						MMAT	39021	1.4D + 1.7L + 1.7H' + 1.7Eo	24	61										
						MMAC	39021	1.4D + 1.7L + 1.7H' + 1.7Eo	-11	61										
		Vertical	3H.3-36	5	1-V-L	MTCM	38119	1.4D + 1.7L + 1.7H' + 1.7Eo	54	73	1.4D + 1.7L + 1.7H' + 1.7Eo	72	3.12	-	-	-	-	-	-	-
						MCCM	37849	D + L + H' + E'	-230	129										
						MMAT	36053	1.4D + 1.7L + 1.7H' + 1.7Eo	34	208										
						MMAC	37645	1.4D + 1.7L + 1.7H' + 1.7Eo	-139	308										
					2-V-L	MTCM	37131	1.4D + 1.7L + 1.7H' + 1.7Eo	17	82	1.4D + 1.7L + 1.7H' + 1.7Eo	72	4.68	-	-	-	-	-	-	-
						MCCM	37074	D + L + H' + E'	-144	231										
						MMAT	37559	1.4D + 1.7L + 1.7H' + 1.7Eo	11	104										
						MMAC	37809	1.4D + 1.7L + 1.7H' + 1.7Eo	-149	557										
					3-V-L	MTCM	35810	1.4D + 1.7L + 1.7H' + 1.7Eo	160	173	1.4D + 1.7L + 1.7H' + 1.7Eo	43	6.24	-	-	-	-	-	-	-
						MCCM	35810	1.4D + 1.7L + 1.7H' + 1.7Eo	-319	240										
						MMAT	35282	1.4D + 1.7L + 1.7H' + 1.7Eo	76	536										
						MMAC	35282	1.4D + 1.7L + 1.7H' + 1.7Eo	-103	536										
				4	4-V-L	MTCM	38165	1.4D + 1.7L + 1.7H' + 1.7Eo	66	89	D + L + H' + E'	66	3.12	-	-	-	-	-	-	-
						MCCM	38165	D + L + H' + E'	-191	40										
						MMAT	37764	1.4D + 1.7L + 1.7H' + 1.7Eo	21	201										
						MMAC	38553	1.4D + 1.7L + 1.7H' + 1.7Eo	-135	408										
					5-V-L	MTCM	38157	1.4D + 1.7L + 1.7H' + 1.7Eo	20	85	1.4D + 1.7L + 1.7H' + 1.7Eo	52	4.68	-	-	-	-	-	-	-
						MCCM	38157	1.4D + 1.7L + 1.7H' + 1.7Eo	-159	395										
						MMAT	38155	1.4D + 1.7L + 1.7H' + 1.7Eo	7	121										
						MMAC	38153	1.4D + 1.7L + 1.7H' + 1.7Eo	-147	441										
				2	6-V-L	MTCM	25310	1.4D + 1.7L + 1.7H' + 1.7Eo	33	6	1.4D + 1.7L + 1.7H' + 1.7Eo	41	1.56	-	-	-	-	-	-	(10)
						MCCM	25314	D + L + H' + E'	-64	6										
						MMAT	39021	1.4D + 1.7L + 1.7H' + 1.7Eo	3	31										
						MMAC	39021	1.4D + 1.7L + 1.7H' + 1.7Eo	-3	31										
					7-V-L	MTCM	34573	1.4D + 1.7L + 1.7H' + 1.7Eo	41	21	1.4D + 1.7L + 1.7H' + 1.7Eo	50	3.12	-	-	-	-	-	-	(10)
						MCCM	34821	1.4D + 1.7L + 1.7H' + 1.7Eo	-79	10										
						MMAT	34525	1.4D + 1.7L + 1.7H' + 1.7Eo	5	45										
						MMAC	34576	1.4D + 1.7L + 1.7H' + 1.7Eo	-47	57										
	-	Transverse (Horizontal and Vertical)	3H.3-37a	5	1-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	94	-35	-3	-1	0.20 (#4@12)	-
					2-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	53	123	54	120	0.31 (#5@12)	-
					3-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	117	169	68	115	0.80 (#4@6)	-
				2	4-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7H' + 1.7Eo	26	26	62	48	0.80 (#4@6)	-
Roof	Near Side	Horizontal	3H.3-38	1	1-H-L	MTMM	-	1.4D + 1.7L + 1.7H' + 1.7Eo	27	-	1.4D + 1.7L + 1.7H' + 1.7Eo	-	0.79	-	-	-	-	-	-	(11)
		Vertical	3H.3-39	1	1-V-L	MTMM	-	1.4D + 1.7L + 1.7H' + 1.7Eo	22	16	1.4D + 1.7L + 1.7H' + 1.7Eo	61	1.20	-	-	-	-	-	-	
	Far Side	Horizontal	3H.3-40	1	1-H-L	MTMM	-	1.4D + 1.7L + 1.7H' + 1.7Eo	27	-	1.4D + 1.7L + 1.7H' + 1.7Eo	-	0.79	-	-	-	-	-	-	
		Vertical	3H.3-41	1	1-V-L	MTMM	-	1.4D + 1.7L + 1.7H' + 1.7Eo	22	16	1.4D + 1.7L + 1.7H' + 1.7Eo	61	1.20	-	-	-	-	-	-	

Table 3H.3-4 Results of Radwaste Building Concrete Slab Design (Continued)

Notes:

(1) The reinforcement layout drawings show the various zones used to define the minimum reinforcement that will be provided based on finite element analysis results. Actual provided reinforcement based on final rebar layout and including development length may exceed the reported provided reinforcement and the zones with higher reinforcement may be extended beyond their reported boundaries. The dimensions in the reinforcement drawings are based on the dimensions of the SAP2000 shell elements, which are modeled at the centerline of the walls and slabs. Therefore, the reinforcement drawing dimensions do not match actual building dimensions.

(2) Each reinforcement layout drawing is divided into reinforcement zones. The reinforcement zone naming convention is as follows: "H" = horizontal, "V" = vertical, "L" = longitudinal reinforcement, "T" = transverse reinforcement. For slabs, vertical corresponds to North-South direction and horizontal corresponds to East-West direction.

(3) The maximum tension (MTCM) and compression (MCCM) axial forces are provided with the corresponding moment from the same load combination. The maximum moment that has a corresponding tension (MMAT) in the same load combination and the maximum moment that has a corresponding compression (MMAC) in the same load combination are also provided. For the roof, the maximum tension and maximum moment (MTMM) are reported.

(4) Negative axial load is compression and positive axial load is tension. Negative moment applies tension to the top face of the shell element and positive moment applies tension to the bottom face of the shell element. For walls or slabs where the same reinforcement is provided on both faces, the moment is shown as absolute value. The axial and flexural loads reported in the table are the average of the 2 node pairs that form the 4 edges of the critical rectangular shell element. If the 2 node pairs on the shell element edges parallel to the reinforcement direction do not satisfy P&M interaction criteria, then only the 2 node pairs on the shell element edges perpendicular to the reinforcement direction are used for design (effective width considered). The element mesh is sufficiently refined for this design approach.

(5) The reported in-plane shear is the maximum average in-plane shear along a plane that crosses the longitudinal reinforcement zone.

(6) The transverse shear reinforcement loads are reported for the critical element requiring the largest area of steel for transverse reinforcement within the zone. The shear force and the corresponding axial force in the same load combination for each direction is reported for the critical element.

(7) The reported transverse shear reinforcement is the summation of the requried shear reinforcement in the horizontal direction and the required shear reinforcement in the vertical direction.

(8) For certain areas of the structure, the standard element post-processing methods were too conservative. For such cases, detailed manual design was performed and the design forces determined by the detailed manual design are provided in the table.

(9) The longitudinal reinforcement shown is required to be tied

(10) The reported forces are from the FEM analysis. The provided longitudinal reinforcement includes additional reinforcement required due to manual one-way design calculations

(11) The reported axial and in-plane forces are from the FEM analysis. The reported flexural forces are from manual one-way design calculations.

Table 3H.3-5 Summary of Structural Steel Design

Elevation 35'-0" Floor Steel Beams

Location[6]	Figure Number	Size[2,3,4]	Safety Margin = Capacity/Demand	Max. Moment (kip-ft)	Governing Load Combination[5]
Elevation 35'-0" Formwork Steel Beams	3H.3-39 3H.3-40 3H.3-41 3H.3-42	W10X54	2.0	81.7	D+L
		W14X193	1.5	565.8	D+L
		W14X283	1.8	700.4	D+L
Elevation 35'-0" Composite Steel Beams		W14x82	1.5	629.5	D+L+E'
		W36x210	1.3	577.4	Construction
		W36x231	1.2	4540.4	D+L+E'
		W36x262	1.1	5511.0	D+L+E'

Roof Truss Members

Location	Figure Number	Size[2,3,4]	Safety Margin = Capacity/Demand	Max. Axial Load[1] (kip)	Governing Load Combination[5]
North-South Spanning Truss Top Chord Member	3H.3-43 3H.3-44	W14X120	1.6 1.6	705.0 -962.0	D+L+E' D+L+E'
North-South Spanning Truss Bottom Chord Member		W14X311	1.4 4.3	2161.0 -908.0	D+L+E' D+E'
North-South Spanning Truss Outer Diagonal Members		W12X136	1.4 4.5	910.0 -329.0	D+L+E' D+E'
North-South Spanning Truss Outer Vertical Members		2L8X8X1	2.6 1.3	241.0 -667.0	D+E' D+L+E'
North-South Spanning Truss Inner Diagonal Members		2L8X6X3/4LLBB	1.4 3.7	284.0 -139.0	D+L+E' D+E'
North-South Spanning Truss Inner Vertical Members		2L5X5X1/2	2.0 1.3	91.0 -185.0	D+E' D+L+E'
North-South Spanning Truss Lateral Bracing Members		2L8X4X1LLBB	1.1 1.1	386.0 -316.0	D+L+E' D+L+E'
East-West Spanning Truss Top Chord Member	3H.3-43 3H.3-45	2L5X5X1/2	3.8 1.9	47.0 -152.0	0.9D+E' D+L+E'
East-West Spanning Truss Bottom Chord Member		2L8X4X1LLBB	1.4 7.1	316.0 -94.0	D+L+E' 0.9D+E'
East-West Spanning Truss Outer Diagonal Members		L8X8X7/8	1.3 8.3	208.0 -51.0	D+L+E' 0.9D+E'
East-West Spanning Truss Outer Vertical Members		L6X6X1/2	3.3 1.3	35.0 -143.0	D+L+E' D+L+E'
East-West Spanning Truss Inner Diagonal Members		L4X4X3/8	4.3 11.1	14.0 -7.0	D+L+E' 0.9D+E'
East-West Spanning Truss Inner Vertical Members		L6X6X1/2	5.0 2.9	23.0 -63.0	0.9D+E' D+L+E'
East-West Spanning Truss Lateral Bracing Members		L5X5X3/8	3.8 2.6	18.0 -21.0	D+L+E' D+L+E'

Roof Purlins

Location	Figure Number	Size[2,3,4]	Safety Margin = Capacity/Demand	Max. Axial Load[1] (kip)	Max. Moment[7] (kip-ft)	Governing Load Combination[5]
North-South Spanning Roof Purlins	3H.3-43	W12X210	1.3	-1299.3	-13.2	D+L+E'
East-West Spanning Roof Purlins		W8X67	1.8	-269.6	-2.5	D+L+E'

Notes:

1. Positive axial load is tension and negative axial load is compression.
2. W-shapes : ASTM A572 Gr. 50 (Fy = 50ksi)
3. Angles and Double Angles : ASTM A36 Gr. 36 (Fy = 36ksi)
4. Member sizes reported are based on analysis results.
   Actual member sizes used will have the same or greater capacity, but size and shape may vary based on connection design requirements.
5. E_0 is the design basis earthquake load (1/2 SSE). E' is the II/I earthquake load (SSE).
6. The steel beams located between column lines W1-W7 and WA-WE are required for concrete formwork only. Once the concrete cures, the concrete alone is designed for all design basis loading. The formwork steel will remain in-place unless commodity routing required the formwork steel to be removed.
7. Maximum moment for governing load combination is based on bending about the minor-axis.

Table 3H.6-1 Strain-Compatible Soil Properties Used in SSI Analysis

Soil Layers			Lower Bound			Mean			Upper Bound		
Layer No.	Thickness (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)
1	4.00	0.124	419.1	1128.4	1.6698	548.1	1475.9	1.2224	677.2	1823.4	0.7749
2	5.00	0.124	474.4	1277.4	1.9487	600.1	1615.8	1.4113	735.0	1979.0	0.8738
3	5.00	0.124	470.6	2399.5	2.1614	596.5	3041.5	1.5678	730.5	3725.1	0.9743
4	5.00	0.124	470.0	2396.7	2.3119	599.2	3055.2	1.6698	733.8	3741.9	1.0277
5	5.00	0.124	466.9	2380.6	2.4295	598.3	3050.9	1.7540	732.8	3736.6	1.0785
6	5.00	0.121	578.1	2947.9	2.8987	730.0	3722.5	2.0647	894.1	4559.1	1.2307
7	5.00	0.121	581.3	2964.2	3.0535	733.4	3739.4	2.1657	898.2	4579.8	1.2778
8	5.00	0.122	606.6	3093.0	2.1873	778.2	3968.1	1.4972	953.1	4859.9	0.8072
9	5.00	0.122	602.2	3070.6	2.3098	774.6	3949.6	1.5804	948.7	4837.3	0.8509
10	5.00	0.122	598.1	3049.7	2.4308	771.2	3932.2	1.6566	944.5	4816.0	0.8824
11	5.00	0.122	600.0	3059.2	2.5321	771.9	3935.9	1.7154	945.4	4820.4	0.8986
12	5.00	0.122	719.8	3670.5	2.2554	924.5	4714.1	1.6695	1132.3	5000.0	1.0836
13	5.00	0.122	720.6	3674.4	2.2824	925.0	4716.5	1.6893	1132.9	5000.0	1.0962
14	5.00	0.122	719.8	3670.4	2.3079	924.3	4712.9	1.7112	1132.0	5000.0	1.1145
15	5.00	0.122	719.1	3666.7	2.3275	923.6	4709.5	1.7260	1131.2	5000.0	1.1245
16	5.00	0.123	827.3	4218.4	2.0584	1013.2	5000.0	1.4280	1241.0	5215.9	0.7975
17	5.00	0.123	825.7	4210.5	2.1082	1011.3	5000.0	1.4603	1238.6	5206.1	0.8123
18	5.00	0.123	824.2	4202.7	2.1636	1009.5	5000.0	1.4988	1236.3	5196.6	0.8340
19	5.00	0.123	822.8	4195.2	2.2125	1007.7	5000.0	1.5321	1234.1	5187.3	0.8516
20	5.00	0.125	850.3	4335.6	2.2666	1041.4	5000.0	1.6792	1275.4	5360.8	1.0917
21	5.00	0.125	849.9	4333.5	2.2780	1040.9	5000.0	1.6904	1274.8	5358.3	1.1027
22	5.00	0.125	849.5	4331.5	2.2969	1040.4	5000.0	1.7027	1274.2	5355.8	1.1085
23	5.00	0.125	874.5	4459.3	2.0113	1085.2	5000.0	1.4063	1329.1	5586.6	0.8014
24	5.00	0.125	873.3	4452.8	2.0424	1084.2	5000.0	1.4290	1327.9	5581.2	0.8157
25	5.00	0.125	872.1	4446.7	2.0761	1083.2	5000.0	1.4485	1326.6	5576.1	0.8209
26	7.00	0.125	914.5	4663.0	2.3111	1120.0	5000.0	1.6966	1371.7	5765.6	1.0822
27	7.00	0.125	914.0	4660.8	2.3253	1119.5	5000.0	1.7081	1371.1	5762.9	1.0909
28	7.00	0.125	911.5	4647.8	2.3428	1117.8	5000.0	1.7197	1369.1	5754.5	1.0966

Table 3H.6-1 Strain-Compatible Soil Properties Used in SSI Analysis (Continued)

Soil Layers			Lower Bound			Mean			Upper Bound		
Layer No.	Thickness (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)
29	7.00	0.125	910.9	4644.9	2.3545	1117.4	5000.0	1.7287	1368.5	5751.9	1.1029
30	7.00	0.125	910.4	4642.2	2.3693	1116.9	5000.0	1.7403	1367.9	5749.4	1.1114
31	5.00	0.125	883.7	4506.2	2.2271	1102.4	5000.0	1.5420	1350.1	5674.8	0.8568
32	5.00	0.125	881.5	4494.7	2.2467	1101.0	5000.0	1.5575	1348.4	5667.5	0.8683
33	5.00	0.125	880.6	4490.3	2.2764	1100.2	5000.0	1.5770	1347.4	5663.6	0.8775
34	9.00	0.125	919.6	4689.0	2.3842	1126.3	5000.0	1.7519	1379.4	5797.7	1.1196
35	9.00	0.125	919.1	4686.8	2.3984	1125.7	5000.0	1.7608	1378.7	5795.0	1.1231
36	9.00	0.125	922.5	4703.8	2.4066	1129.8	5000.0	1.7673	1383.7	5816.1	1.1281
37	9.00	0.125	922.8	4705.5	2.4195	1130.2	5000.0	1.7795	1384.2	5818.2	1.1394
38	9.00	0.125	919.2	4687.1	2.4362	1125.8	5000.0	1.7917	1378.8	5795.4	1.1472
39	9.00	0.124	921.5	4698.6	2.4066	1146.4	5000.0	1.7870	1404.0	5901.3	1.1674
40	9.00	0.124	931.4	4749.0	2.4129	1157.6	5000.0	1.7862	1417.8	5959.3	1.1595
41	5.00	0.127	986.2	5000.0	2.2903	1222.6	5138.7	1.5360	1497.4	6293.7	0.7818
42	5.00	0.127	985.7	5000.0	2.2989	1222.1	5136.6	1.5447	1496.7	6291.0	0.7905
43	5.00	0.127	985.1	5000.0	2.3165	1221.6	5134.5	1.5554	1496.1	6288.4	0.7943
44	5.00	0.127	984.6	5000.0	2.3275	1221.1	5132.4	1.5619	1495.5	6285.9	0.7963
45	5.00	0.127	984.0	5000.0	2.3410	1220.6	5130.4	1.5697	1494.9	6283.4	0.7984
46	5.00	0.125	1025.7	5000.0	2.3496	1256.3	5280.3	1.7372	1538.6	6467.1	1.1247
47	15.00	0.127	1010.5	5000.0	2.1171	1237.7	5202.1	1.5316	1515.8	6371.2	0.9461
48	11.80	0.123	1034.4	5000.0	2.3607	1266.9	5324.9	1.7527	1551.6	6521.6	1.1447
49	11.80	0.123	1034.0	5000.0	2.3685	1266.4	5323.0	1.7581	1551.0	6519.3	1.1477
50	11.80	0.123	1033.7	5000.0	2.3815	1266.0	5321.2	1.7665	1550.5	6517.1	1.1516
51	11.80	0.123	1037.2	5000.0	2.3948	1270.3	5339.2	1.7726	1555.8	6539.1	1.1505
52	11.80	0.123	1036.9	5000.0	2.4048	1269.9	5337.6	1.7792	1555.3	6537.2	1.1536
53	17.00	0.128	1252.4	5264.0	1.8381	1575.1	6620.6	1.2897	1929.1	8108.5	0.7413
54	8.00	0.123	1301.7	5471.3	2.1463	1607.2	6755.4	1.6064	1968.4	8273.7	1.0664
55	16.50	0.128	1310.3	5507.2	1.7999	1604.7	6744.9	1.2702	1965.4	8260.8	0.7405
56	16.50	0.128	1309.5	5503.9	1.8246	1603.7	6740.8	1.2855	1964.2	8255.8	0.7465

Table 3H.6-1 Strain-Compatible Soil Properties Used in SSI Analysis (Continued)

Soil Layers			Lower Bound			Mean			Upper Bound		
Layer No.	Thickness (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)
57	8.00	0.123	1290.5	5424.1	2.2004	1580.5	6643.2	1.6357	1935.7	8136.2	1.0711
58	19.00	0.128	1156.1	5000.0	2.0671	1417.2	5956.7	1.4716	1735.7	7295.4	0.8761
59	15.00	0.123	995.4	5000.0	2.5251	1219.2	5124.3	1.8573	1493.2	6276.0	1.1895
60	15.00	0.123	995.2	5000.0	2.5283	1218.9	5123.3	1.8597	1492.8	6274.7	1.1910
61	8.00	0.128	970.0	4946.2	2.6235	1188.1	5000.0	1.8389	1455.1	6115.9	1.0543
62	18.00	0.123	990.9	5000.0	2.5359	1213.6	5101.1	1.8669	1486.4	6247.5	1.1980
63	18.00	0.123	990.6	5000.0	2.5391	1213.3	5099.7	1.8706	1486.0	6245.8	1.2021
64	18.00	0.123	999.5	5000.0	2.5358	1224.1	5145.1	1.8672	1499.2	6301.4	1.1986
65	18.00	0.123	1196.2	5027.7	2.0970	1465.0	6157.6	1.4997	1794.2	7541.5	0.9024
66	14.60	0.123	1172.4	5000.0	2.3353	1435.9	6035.4	1.7343	1758.6	7391.8	1.1332
67	14.60	0.123	1172.2	5000.0	2.3381	1435.6	6034.3	1.7362	1758.3	7390.5	1.1343
68	14.60	0.123	1172.0	5000.0	2.3411	1435.4	6033.3	1.7397	1758.0	7389.2	1.1382
69	14.60	0.123	1171.8	5000.0	2.3468	1435.2	6032.3	1.7427	1757.7	7388.0	1.1386
70	14.60	0.123	1171.7	5000.0	2.3531	1435.0	6031.5	1.7455	1757.5	7387.0	1.1379
71	45.50	0.129	1378.7	5065.8	0.9127	1688.6	6204.3	0.5883	2068.1	7598.6	0.2639
72	45.50	0.129	1378.7	5065.8	0.9127	1688.6	6204.3	0.5883	2068.1	7598.6	0.2639
73	100.00	0.128	1388.7	5102.3	0.9127	1700.8	6249.0	0.5883	2083.0	7653.4	0.2639
74	100.00	0.128	1388.7	5102.3	0.9127	1700.8	6249.0	0.5883	2083.0	7653.4	0.2639
75	100.00	0.130	1533.0	5084.5	0.9127	1877.6	6227.2	0.5883	2299.5	7626.7	0.2639
76	100.00	0.130	1533.0	5084.5	0.9127	1877.6	6227.2	0.5883	2299.5	7626.7	0.2639
77	100.00	0.130	1667.2	5529.4	0.9127	2041.9	6772.1	0.5883	2500.8	8294.1	0.2639
78	100.00	0.130	1667.2	5093.3	0.9127	2041.9	6238.0	0.5883	2500.8	7640.0	0.2639
79	100.00	0.130	1735.4	5301.6	0.9127	2125.4	6493.1	0.5883	2603.0	7952.4	0.2639
80	100.00	0.130	1735.4	5301.6	0.9127	2125.4	6493.1	0.5883	2603.0	7952.4	0.2639
81	100.00	0.130	1870.7	5338.3	0.9127	2291.2	6538.0	0.5883	2806.1	8007.4	0.2639
82	100.00	0.130	1870.7	5338.3	0.9127	2291.2	6538.0	0.5883	2806.1	8007.4	0.2639
83	100.00	0.130	1912.1	5456.3	0.9127	2341.8	6682.6	0.5883	2868.1	8184.4	0.2639
84	100.00	0.130	1912.1	5148.5	0.9127	2341.8	6305.6	0.5883	2868.1	7722.7	0.2639

Table 3H.6-1 Strain-Compatible Soil Properties Used in SSI Analysis (Continued)

Soil Layers			Lower Bound			Mean			Upper Bound		
Layer No.	Thickness (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)
85	100.00	0.135	2042.5	5499.7	0.9127	2501.6	6735.7	0.5883	3063.8	8249.6	0.2639
86	100.00	0.135	2051.1	5522.8	0.9127	2512.1	6764.0	0.5883	3076.7	8284.2	0.2639
87	100.00	0.135	2259.9	5786.1	0.9127	2767.8	7086.5	0.5883	3389.8	8679.2	0.2639
88	100.00	0.135	2259.9	5786.1	0.9127	2767.8	7086.5	0.5883	3389.8	8679.2	0.2639
89	100.00	0.135	2402.8	6152.0	0.9127	2942.8	7534.6	0.5883	3604.1	9228.0	0.2639
90	100.00	0.135	2402.8	5885.6	0.9127	2942.8	7208.3	0.5883	3604.1	8828.3	0.2639
91	100.00	0.140	2402.8	5885.6	0.9127	2942.8	7208.3	0.5883	3604.1	8828.3	0.2639
92	100.00	0.140	2409.5	5902.0	0.9127	2951.0	7228.5	0.5883	3614.3	8853.1	0.2639
93	100.00	0.140	2496.3	5878.5	0.9127	3057.3	7199.6	0.5883	3744.4	8817.7	0.2639
94	100.00	0.140	2496.3	5878.5	0.9127	3057.3	7199.6	0.5883	3744.4	8817.7	0.2639
95	100.00	0.140	2531.9	5962.2	0.9127	3100.9	7302.2	0.5883	3797.8	8943.3	0.2639
96	100.00	0.140	2531.9	5755.0	0.9127	3100.9	7048.4	0.5883	3797.8	8632.5	0.2639
97	100.00	0.140	2789.2	6340.0	0.9127	3416.1	7764.8	0.5883	4183.8	9509.9	0.2639
98	100.00	0.140	2789.2	6340.0	0.9127	3416.1	7764.8	0.5883	4183.8	9509.9	0.2639
99	100.00	0.140	3055.6	6726.6	0.9127	3742.3	8238.4	0.5883	4583.4	10089.9	0.2639
100	100.00	0.140	3055.6	6726.6	0.9127	3742.3	8238.4	0.5883	4583.4	10089.9	0.2639
101	100.00	0.140	3144.4	6922.0	0.9127	3851.0	8477.7	0.5883	4716.5	10383.0	0.2639
102	100.00	0.140	3144.4	6722.9	0.9127	3851.0	8233.9	0.5883	4716.5	10084.4	0.2639
103	100.00	0.140	3245.3	6938.8	0.9127	3974.7	8498.3	0.5883	4868.0	10408.3	0.2639
104	100.00	0.140	3245.3	6938.8	0.9127	3974.7	8498.3	0.5883	4868.0	10408.3	0.2639
105	100.00	0.140	3280.1	6828.1	0.9127	4017.3	8362.7	0.5883	4920.2	10242.1	0.2639
106	100.00	0.140	3280.1	6828.1	0.9127	4017.3	8362.7	0.5883	4920.2	10242.1	0.2639
107	100.00	0.140	3280.1	6828.1	0.9127	4017.3	8362.6	0.5883	4920.1	10242.1	0.2639
108	100.00	0.140	3280.1	6661.9	0.9127	4017.3	8159.1	0.5883	4920.1	9992.8	0.2639
109	100.00	0.140	3337.8	6779.1	0.9127	4088.0	8302.7	0.5883	5006.7	10168.6	0.2639
110	100.00	0.140	3337.8	6779.1	0.9127	4088.0	8302.7	0.5883	5006.7	10168.6	0.2639
111	100.00	0.140	3395.5	6740.9	0.9127	4158.6	8255.9	0.5883	5093.3	10111.3	0.2639
112	100.00	0.140	3395.5	6740.9	0.9127	4158.6	8255.9	0.5883	5093.3	10111.3	0.2639

Table 3H.6-1 Strain-Compatible Soil Properties Used in SSI Analysis (Continued)

Soil Layers			Lower Bound			Mean			Upper Bound		
Layer No.	Thickness (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)
113	100.00	0.140	3425.0	6799.4	0.9127	4194.7	8327.6	0.5883	5137.5	10199.1	0.2639
114	100.00	0.140	3425.0	6657.0	0.9127	4194.7	8153.1	0.5883	5137.5	9985.5	0.2639
115	100.00	0.140	3609.5	7015.6	0.9127	4420.7	8592.3	0.5883	5414.2	10523.4	0.2639
116	100.00	0.140	3609.5	7015.6	0.9127	4420.7	8592.3	0.5883	5414.2	10523.4	0.2639
117	100.00	0.140	3815.4	7271.0	0.9127	4672.9	8905.1	0.5883	5723.2	10906.5	0.2639
118	100.00	0.140	3815.4	7271.0	0.9127	4672.9	8905.1	0.5883	5723.2	10906.5	0.2639
119	100.00	0.140	3828.5	7295.9	0.9127	4689.0	8935.6	0.5883	5742.8	10943.9	0.2639
120	100.00	0.140	3828.5	7162.5	0.9127	4689.0	8772.3	0.5883	5742.8	10743.8	0.2639
121	100.00	0.140	3995.3	7474.4	0.9127	4893.2	9154.3	0.5883	5992.9	11211.7	0.2639
122	100.00	0.140	3995.3	7474.4	0.9127	4893.2	9154.3	0.5883	5992.9	11211.7	0.2639
123	100.00	0.140	4042.3	7562.4	0.9127	4950.8	9262.1	0.5883	6063.4	11343.7	0.2639
124	100.00	0.140	4042.3	7562.4	0.9127	4950.8	9262.1	0.5883	6063.4	11343.7	0.2639
125	100.00	0.140	4057.2	7590.4	0.9127	4969.1	9296.2	0.5883	6085.8	11385.5	0.2639
126	100.00	0.140	4057.2	7590.4	0.9127	4969.1	9296.2	0.5883	6085.8	11385.5	0.2639
127	100.00	0.140	4064.5	7604.1	0.9127	4978.0	9313.0	0.5883	6096.8	11406.1	0.2639
128	100.00	0.140	4064.5	7604.1	0.9127	4978.0	9313.0	0.5883	6096.8	11406.1	0.2639
129	100.00	0.140	3997.4	7478.4	0.9127	4895.8	9159.2	0.5883	5996.1	11217.7	0.2639
130	100.00	0.140	3997.4	7478.4	0.9127	4895.8	9159.2	0.5883	5996.1	11217.7	0.2639
131	100.00	0.140	3779.9	7071.5	0.9127	4629.4	8660.8	0.5883	5669.8	10607.3	0.2639
132	100.00	0.140	3779.9	7071.5	0.9127	4629.4	8660.8	0.5883	5669.8	10607.3	0.2639
133	100.00	0.140	3164.0	5919.4	0.9127	3875.1	7249.7	0.5883	4746.1	8879.1	0.2639
134	100.00	0.140	3164.0	5919.4	0.9127	3875.1	7249.7	0.5883	4746.1	8879.1	0.2639
135	100.00	0.140	2974.8	5565.3	0.9127	3643.3	6816.0	0.5883	4462.1	8347.9	0.2639
136	100.00	0.140	2974.8	5565.3	0.9127	3643.3	6816.0	0.5883	4462.1	8347.9	0.2639
137	100.00	0.140	2942.9	5505.7	0.9127	3604.3	6743.0	0.5883	4414.4	8258.5	0.2639
138	100.00	0.140	2942.9	5505.7	0.9127	3604.3	6743.0	0.5883	4414.4	8258.5	0.2639
139	100.00	0.140	2914.5	5452.5	0.9127	3569.5	6677.9	0.5883	4371.7	8178.7	0.2639
140	100.00	0.140	2914.5	5452.5	0.9127	3569.5	6677.9	0.5883	4371.7	8178.7	0.2639

Table 3H.6-1 Strain-Compatible Soil Properties Used in SSI Analysis (Continued)

Soil Layers			Lower Bound			Mean			Upper Bound		
Layer No.	Thickness (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)
141	100.00	0.140	2914.5	5452.5	0.9127	3569.5	6677.9	0.5883	4371.7	8178.7	0.2639
142	100.00	0.140	2914.5	5452.5	0.9127	3569.5	6677.9	0.5883	4371.7	8178.7	0.2639
143	100.00	0.140	2875.7	5379.9	0.9127	3522.0	6589.1	0.5883	4313.6	8069.9	0.2639
144	100.00	0.140	2875.7	5379.9	0.9127	3522.0	6589.1	0.5883	4313.6	8069.9	0.2639
145	100.00	0.140	2875.9	5380.4	0.9127	3522.3	6589.6	0.5883	4313.9	8070.6	0.2639
146	100.00	0.140	2875.9	5380.4	0.9127	3522.3	6589.6	0.5883	4313.9	8070.6	0.2639

Table 3H.6-1a Layer Thicknesses and Strain Compatible In-Situ Soil Properties Used for the SSI Analysis (Mean)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
1	2.75	56.0	53.3	0.124	548.1	1475.9	1.22	39.9
2	3.25	53.3	50.0	0.124	579.0	1559.0	1.34	35.6
3	3.50	50.0	46.5	0.124	599.6	1731.8	1.43	34.3
4	3.50	46.5	43.0	0.124	596.5	3041.5	1.57	34.1
5	3.50	43.0	39.5	0.124	598.4	3051.3	1.64	34.2
6	3.50	39.5	36.0	0.124	598.9	3054.0	1.69	34.2
7	3.00	36.0	33.0	0.124	598.3	3050.9	1.75	39.9
8	3.00	33.0	30.0	0.122	680.1	3468.0	1.96	45.3
9	4.00	30.0	26.0	0.121	730.8	3726.7	2.09	36.5
10	2.00	26.0	24.0	0.121	733.4	3739.4	2.17	73.3
11	4.00	24.0	20.0	0.122	755.1	3850.4	1.83	37.8
12	4.00	20.0	16.0	0.122	777.3	3963.5	1.52	38.9
13	4.00	16.0	12.0	0.122	774.6	3949.6	1.58	38.7
14	4.00	12.0	8.0	0.122	771.2	3932.2	1.66	38.6
15	4.00	8.0	4.0	0.122	771.7	3935.0	1.70	38.6
16	5.00	4.0	-1.0	0.122	856.8	4368.6	1.69	34.3
17	5.00	-1.0	-6.0	0.122	924.8	4715.5	1.68	37.0
18	2.00	-6.0	-8.0	0.122	925.0	4716.5	1.69	92.5
19	5.50	-8.0	-13.5	0.122	924.2	4712.6	1.71	33.6
20	5.60	-13.5	-19.1	0.122	939.9	4763.9	1.67	33.6
21	6.10	-19.1	-25.2	0.123	1012.5	5000.0	1.44	33.2
22	6.10	-25.2	-31.3	0.123	1010.3	5000.0	1.48	33.1
23	6.10	-31.3	-37.4	0.123	1008.2	5000.0	1.52	33.1
24	6.10	-37.4	-43.5	0.125	1037.9	5000.0	1.58	34.0
25	6.30	-43.5	-49.8	0.125	1040.8	5000.0	1.69	33.0
26	6.40	-49.8	-56.2	0.125	1062.3	5000.0	1.55	33.2
27	6.50	-56.2	-62.7	0.125	1084.5	5000.0	1.42	33.4
28	6.60	-62.7	-69.3	0.125	1090.3	5000.0	1.28	33.0
29	6.75	-69.3	-76.1	0.125	1119.9	5000.0	1.70	33.2

Table 3H.6-1a Layer Thicknesses and Strain Compatible In-Situ Soil Properties Used for the SSI Analysis (Mean) (Continued)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
30	6.75	-76.1	-82.8	0.125	1119.3	5000.0	1.71	33.2
31	6.75	-82.8	-89.6	0.125	1117.8	5000.0	1.72	33.1
32	6.75	-89.6	-96.36	0.125	1117.4	5000.0	1.73	33.1
33	6.75	-96.3	-103.1	0.125	1116.8	5000.0	1.74	33.1
34	6.50	-103.1	-109.6	0.125	1102.1	5000.0	1.55	33.9
35	6.50	-109.6	-116.1	0.125	1100.6	5000.0	1.57	33.9
36	6.75	-116.1	-122.8	0.125	1118.6	5000.0	1.70	33.1
37	6.75	-122.8	-129.6	0.125	1126.1	5000.0	1.76	33.4
38	6.75	-129.6	-136.3	0.125	1125.9	5000.0	1.76	33.4
39	6.75	-136.3	-143.1	0.125	1129.8	5000.0	1.77	33.5
40	6.75	-143.1	-149.8	0.125	1130.1	5000.0	1.78	33.5
41	6.75	-149.8	-156.6	0.125	1128.5	5000.0	1.78	33.4
42	6.75	-156.6	-163.3	0.125	1126.7	5000.0	1.79	33.4
43	6.80	-163.3	-170.1	0.124	1146.4	5000.0	1.79	33.7
44	6.90	-170.1	-177.0	0.124	1154.5	5000.0	1.79	33.5
45	7.10	-177.0	-184.1	0.125	1185.1	5059.6	1.68	33.4
46	7.40	-184.1	-191.5	0.127	1222.2	5137.0	1.48	33.0
47	7.30	-191.5	-198.8	0.127	1221.4	5133.7	1.56	33.5
48	7.30	-198.8	-206.1	0.127	1221.2	5133.0	1.55	33.5
49	7.50	-206.1	-213.6	0.126	1249.8	5252.9	1.67	33.3
50	7.40	-213.6	-221.0	0.127	1237.7	5202.1	1.53	33.5
51	7.50	-221.0	-228.5	0.126	1247.3	5242.4	1.61	33.3
52	7.60	-228.5	-236.1	0.123	1266.9	5324.9	1.75	33.3
53	7.60	-236.1	-243.7	0.123	1266.5	5323.4	1.76	33.3
54	7.60	-243.7	-251.3	0.123	1266.3	5322.6	1.76	33.3
55	7.60	-251.3	-258.9	0.123	1266.0	5321.2	1.77	33.3
56	7.60	-258.9	-266.5	0.123	1268.9	5333.3	1.77	33.4
57	7.60	-266.5	-274.1	0.123	1270.3	5339.0	1.77	33.4
58	7.60	-274.1	-281.7	0.123	1269.9	5337.6	1.78	33.4

Table 3H.6-1a Layer Thicknesses and Strain Compatible In-Situ Soil Properties Used for the SSI Analysis (Mean) (Continued)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
59	8.70	-281.7	-290.4	0.126	1443.5	6067.4	1.48	33.2
60	9.50	-290.4	-299.9	0.128	1575.1	6620.6	1.29	33.2
61	9.50	-299.9	-309.4	0.124	1600.0	6725.1	1.54	33.7
62	9.50	-309.4	-318.9	0.128	1604.9	6745.6	1.29	33.8
63	9.50	-318.9	-328.4	0.128	1604.5	6744.1	1.27	33.8
64	9.50	-328.4	-337.9	0.128	1603.7	6740.8	1.29	33.8
65	9.50	-337.9	-347.4	0.126	1592.9	6695.2	1.45	33.5
66	8.90	-347.4	-356.3	0.126	1479.0	6216.6	1.54	33.2
67	8.50	-356.3	-364.8	0.128	1417.2	5956.7	1.47	33.3
68	8.10	-364.8	-372.9	0.126	1339.3	5629.3	1.61	33.1
69	7.30	-372.9	-380.2	0.123	1219.2	5124.3	1.86	33.4
70	7.30	-380.2	-387.5	0.123	1219.1	5124.0	1.86	33.4
71	7.30	-387.5	-394.8	0.123	1218.9	5123.3	1.86	33.4
72	7.30	-394.8	-402.1	0.124	1209.9	5087.2	1.85	33.1
73	7.20	-402.1	-409.3	0.127	1192.6	5018.0	1.84	33.1
74	7.30	-409.3	-416.6	0.123	1213.6	5101.1	1.87	33.2
75	7.30	-416.6	-423.9	0.123	1213.6	5101.1	1.87	33.2
76	7.30	-423.9	-431.2	0.123	1213.4	5100.1	1.87	33.2
77	7.30	-431.2	-438.5	0.123	1213.3.	5099.7	1.87	33.2
78	7.30	-438.5	-445.8	0.123	1215.9	5110.8	1.87	33.3
79	7.40	-445.8	-453.2	0.123	1224.1	5145.1	1.87	33.1
80	7.40	-453.2	-460.6	0.123	1224.1	5145.1	1.87	33.1
81	8.50	-460.6	-469.1	0.123	1419.0	5964.3	1.56	33.4
82	8.80	-469.1	-477.9	0.123	1465.0	6157.6	1.50	33.3
83	8.70	-477.9	-486.6	0.123	1442.8	6064.5	1.68	33.2
84	8.70	-477.9	-495.3	0.123	1435.9	6035.3	1.73	33.0
85	8.70	-495.3	-504.0	0.123	1435.6	6034.3	1.74	33.0
86	8.70	-504.0	-512.7	0.123	1435.5	6033.9	1.74	33.0
87	8.60	-512.7	-521.3	0.123	1435.4	6033.3	1.74	33.4

Table 3H.6-1a Layer Thicknesses and Strain Compatible In-Situ Soil Properties Used for the SSI Analysis (Mean) (Continued)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
88	8.60	-521.3	-529.9	0.123	1435.3	6032.6	1.74	33.4
89	8.60	-529.9	-538.5	0.123	1435.2	6032.3	1.74	33.4
90	8.60	-538.5	-547.1	0.123	1435.0	6031.5	1.75	33.4
91	9.10	-547.1	-556.2	0.125	1515.0	6091.2	1.34	33.3
92	10.20	-556.2	-566.4	0.129	1688.6	6204.3	0.59	33.1
93	10.20	-566.4	-576.6	0.129	1688.6	6204.3	0.59	33.1
94	10.20	-576.6	-586.8	0.129	1688.6	6204.3	0.59	33.1
95	10.20	-586.8	-597.0	0.129	1688.6	6204.3	0.59	33.1
96	10.20	-597.0	-607.2	0.129	1688.6	6204.3	0.59	33.1
97	10.20	-607.2	-617.4	0.129	1688.6	6204.3	0.59	33.1
98	10.20	-617.4	-627.6	0.129	1688.6	6204.3	0.59	33.1
99	10.20	-627.6	-637.8	0.129	1688.6	6204.3	0.59	33.1
100	10.20	-637.8	-648.0	0.129	1693.4	6221.8	0.59	33.2
Halfspace				0.129	1693.4	6221.8	0.588-	-

Table 3H.6-1b Layer Thicknesses and Strain Compatible In-Situ Soil Properties Used for the SSI Analysis (Upper Bound)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
1	2.75	56.0	53.3	0.124	677.2	1823.4	0.77	49.3
2	3.25	53.3	50.0	0.124	711.6	1916.1	0.84	43.8
3	3.50	50.0	46.5	0.124	734.4	2121.0	0.89	42.0
4	3.50	46.5	43.0	0.124	730.5	3725.1	0.97	41.7
5	3.50	43.0	39.5	0.124	732.9	3737.1	1.01	41.9
6	3.50	39.5	36.0	0.124	733.5	3740.4	1.04	41.9
7	3.00	36.0	33.0	0.124	732.8	3736.6	1.08	48.9
8	3.00	33.0	30.0	0.122	833.0	4247.5	1.18	55.5
9	4.00	30.0	26.0	0.121	895.1	4564.3	1.24	44.8
10	2.00	26.0	24.0	0.121	898.2	4579.8	1.28	89.8
11	4.00	24.0	20.0	0.122	924.8	4715.7	1.04	46.2
12	4.00	20.0	16.0	0.122	952.0	4854.2	0.82	47.6
13	4.00	16.0	12.0	0.122	948.7	4837.3	0.85	47.4
14	4.00	12.0	8.0	0.122	944.5	4816.0	0.88	47.2
15	4.00	8.0	4.0	0.122	945.2	4819.3	0.89	47.3
16	5.00	4.0	-1.0	0.122	1049.3	4926.6	1.01	42.0
17	5.00	-1.0	-6.0	0.122	1132.7	5000.0	1.09	45.3
18	2.00	-6.0	-8.0	0.122	1132.9	5000.0	1.10	113.3
19	5.50	-8.0	-13.5	0.122	1131.9	5000.0	1.12	41.2
20	5.60	-13.5	-19.1	0.122	1151.2	5041.0	1.06	41.1
21	6.10	-19.1	-25.2	0.123	1240.1	5212.4	0.80	40.7
22	6.10	-25.2	-31.3	0.123	1237.4	5201.0	0.82	40.6
23	6.10	-31.3	-37.4	0.123	1234.7	5189.9	0.85	40.5
24	6.10	-37.4	-43.5	0.125	1271.2	5343.0	1.05	41.7
25	6.30	-43.5	-49.8	0.125	1274.6	5357.6	1.10	40.5
26	6.40	-49.8	-56.2	0.125	1301.1	5468.8	0.95	40.7
27	6.50	-56.2	-62.7	0.125	1328.2	5582.7	0.81	40.9
28	6.60	-62.7	-69.3	0.125	1335.3	5612.7	0.84	40.5
29	6.75	-69.3	-76.1	0.125	1371.6	5765.2	1.08	40.6

Table 3H.6-1b Layer Thicknesses and Strain Compatible In-Situ Soil Properties Used for the SSI Analysis (Upper Bound) (Continued)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
30	6.75	-76.1	-82.8	0.125	1370.9	5761.9	1.09	40.6
31	6.75	-82.8	-89.6	0.125	1369.1	5754.3	1.10	40.6
32	6.75	-89.6	-96.3	0.125	1368.5	5751.8	1.10	40.5
33	6.75	-96.3.	-103.1	0.125	1367.8	5748.8	1.11	40.5
34	6.50	-103.1	-109.6	0.125	1349.7	5673.1	0.86	41.5
35	6.50	-109.6	-116.1	0.125	1347.9	5665.7	0.87	41.5
36	6.75	-116.1	-122.8	0.125	1370.0	5758.3	1.05	40.6
37	6.75	-122.8	-129.6	0.125	1379.1	5796.7	1.12	40.9
38	6.75	-129.6	-136.3	0.125	1378.9	5795.9	1.12	40.9
39	6.75	-136.3	-143.1	0.125	1383.7	5816.1	1.13	41.0
40	6.75	-143.1	-149.8	0.125	1384.1	5817.6	1.14	41.0
41	6.75	-149.8	-156.6	0.125	1382.2	5809.6	1.14	41.0
42	6.75	-156.6	-163.3	0.125	1379.9	5800.0	1.15	40.9
43	6.80	-163.3.	-170.1	0.124	1404.0	5901.3	1.17	41.3
44	6.90	-170.1	-177.0	0.124	1414.0	5943.2	1.16	41.0
45	7.10	-177.0	-184.1	0.125	1451.5	6100.8	0.99	40.9
46	7.40	-184.1	-191.5	0.127	1496.8	6291.5	0.82	40.5
47	7.30	-191.5	198.8	0.127	1495.9	6287.4	0.80	41.0
48	7.30	-198.8	-206.1	0.127	1495.7	6286.6	0.80	41.0
49	7.50	-206.1	-213.6	0.126	1530.6	6433.5	1.06	40.8
50	7.40	-213.6	-221.0	0.127	1515.8	6371.2	0.95	41.0
51	7.50	-221.0	-228.5	0.126	1527.5	6420.6	1.01	40.7
52	7.60	-228.5	-236.1	0.123	1551.6	6521.6	1.14	40.8
53	7.60	-236.1	-243.7	0.123	1551.1	6519.8	1.15	40.8
54	7.60	-243.7	-251.3	0.123	1550.9	6518.8	1.15	40.8
55	7.60	-251.3	-258.9	0.123	1550.5	6517.1	1.15	40.8
56	7.60	-258.9	-266.5	0.123	1554.1	6531.8	1.15	40.9
57	7.60	-266.5	-274.1	0.123	1555.7	6538.9	1.15	40.9
58	7.60	-274.1	-281.7	0.123	1555.3	6537.2	1.15	40.9

Table 3H.6-1b Layer Thicknesses and Strain Compatible In-Situ Soil Properties Used for the SSI Analysis (Upper Bound) (Continued)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
59	8.70	-281.7	-290.4	0.126	1767.9	7431.0	0.90	40.6
60	9.50	-290.4	-299.9	0.128	1929.1	8108.5	0.74	40.6
61	9.50	-299.9	-309.4	0.124	1959.6	8236.6	0.99	41.3
62	9.50	-309.4	-318.9	0.128	1965.6	8261.6	0.76	41.4
63	9.50	-318.9	-328.4	0.128	1965.2	8259.8	0.74	41.4
64	9.50	-328.4	-337.9	0.128	1964.2	8255.8	0.75	41.4
65	9.50	-337.9	-347.4	0.126	1950.9	8200.0	0.90	41.1
66	8.90	-347.4	-356.3	0.126	1811.4	7613.7	0.95	40.7
67	8.50	-356.3	-364.8	0.128	1735.7	7295.4	0.88	40.8
68	8.10	-364.8	-372.9	0.126	1640.3	6894.5	0.99	40.5
69	7.30	-372.9	-380.2	0.123	1493.2	6276.0	1.19	40.9
70	7.30	-380.2	-387.5	0.123	1493.1	6275.6	1.19	40.9
71	7.30	-387.5	-394.8	0.123	1492.8	6274.7	1.19	40.9
72	7.30	-394.8	-402.1	0.124	1481.8	6228.2	1.15	40.6
73	7.20	-402.1	-409.3	0.127	1460.7	6139.2	1.08	40.6
74	7.30	-409.3	-416.6	0.123	1486.4	6247.5	1.20	40.7
75	7.30	-416.6	-423.9	0.123	1486.4	6247.5	1.20	40.7
76	7.30	-423.9	-431.2	0.123	1486.1	6246.3	1.20	40.7
77	7.30	-431.2	-438.5	0.123	1486.0	6245.8	1.20	40.7
78	7.30	-438.5	-445.8	0.123	1489.2	6259.4	1.20	40.8
79	7.40	-445.8	-453.2	0.123	1499.2	6301.4	1.20	40.5
80	7.40	-453.2	-460.6	0.123	1499.2	6301.4	1.20	40.5
81	8.50	-460.6	-469.1	0.123	1737.9	7304.7	0.95	40.9
82	8.80	-469.1	-477.9	0.123	1794.2	7541.5	0.90	40.8
83	8.70	-477.9	-486.6	0.123	1767.1	7427.4	1.08	40.6
84	8.70	-486.6	-495.3	0.123	1758.6	7391.7	1.13	40.4
85	8.70	-495.3	-504.0	0.123	1758.3	7390.5	1.13	40.4
86	8.70	-504.0	-512.7	0.123	1758.2	7390.0	1.14	40.4
87	8.60	-512.7	-521.3	0.123	1758.0	7389.2	1.14	40.9

Table 3H.6-1b Layer Thicknesses and Strain Compatible In-Situ Soil Properties Used for the SSI Analysis (Upper Bound) (Continued)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
88	8.60	-521.3	-529.9	0.123	1757.8	7388.3	1.14	40.9
89	8.60	-529.9	-538.5	0.123	1757.7	7388.0	1.14	40.9
90	8.60	-538.5	-547.1	0.123	1757.5	7387.0	1.14	40.9
91	9.10	-547.1	-556.2	0.125	1855.5	7460.1	0.83	40.8
92	10.20	-556.2	-566.4	0.129	2068.1	7598.6	0.26	40.6
93	10.20	-566.4	-576.6	0.129	2068.1	7598.6	0.26	40.6
94	10.20	-576.6	-586.8	0.129	2068.1	7598.6	0.26	40.6
95	10.20	-586.8	-597.0	0.129	2068.1	7598.6	0.26	40.6
96	10.20	-597.0	-607.2	0.129	2068.1	7598.6	0.26	40.6
97	10.20	-607.2	-617.4	0.129	2068.1	7598.6	0.26	40.6
98	10.20	-617.4	-627.6	0.129	2068.1	7598.6	0.26	40.6
99	10.20	-627.6	-637.8	0.129	2068.1	7598.6	0.26	40.6
100	10.20	-637.8	-648.0	0.129	2073.9	7620.0	0.26	40.7
Halfspace				0.129	2073.9	7620.0	0.264	-

Table 3H.6-1c Layer Thicknesses and Strain Compatible In-Situ Soil Properties Used or the SSI Analysis (Lower Bound)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
1	2.75	56.0	53.3	0.124	419.1	1128.4	1.67	30.5
2	3.25	53.3	50.0	0.124	451.5	1215.7	1.84	27.8
3	3.50	50.0	46.5	0.124	473.9	1368.8	1.98	27.1
4	3.50	46.5	43.0	0.124	470.6	2399.5	2.16	26.9
5	3.50	43.0	39.5	0.124	470.2	2397.5	2.27	26.9
6	3.50	39.5	36.0	0.124	469.1	2392.1	2.35	26.8
7	3.00	36.0	33.0	0.124	466.9	2380.6	2.43	31.1
8	3.00	33.0	30.0	0.122	535.6	2731.0	2.74	35.7
9	4.00	30.0	26.0	0.121	578.9	2952.0	2.94	28.9
10	2.00	26.0	24.0	0.121	581.3	2964.2	3.05	58.1
11	4.00	24.0	20.0	0.122	593.7	3027.2	2.62	29.7
12	4.00	20.0	16.0	0.122	605.5	3087.4	2.22	30.3
13	4.00	16.0	12.0	0.122	602.2	3070.6	2.31	30.1
14	4.00	12.0	8.0	0.122	598.1	3049.7	2.43	29.9
15	4.00	8.0	4.0	0.122	599.5	3056.8	2.51	30.0
16	5.00	4.0	-1.0	0.122	666.6	3398.8	2.37	26.7
17	5.00	-1.0	-6.0	0.122	720.3	3672.8	2.27	28.8
18	2.00	-6.0	-8.0	0.122	720.6	3674.4	2.28	72.1
19	5.50	-8.0	-13.5	0.122	719.7	3670.1	2.31	26.2
20	5.60	-13.5	-19.1	0.122	738.1	3763.4	2.27	26.4
21	6.10	-19.1	-25.2	0.123	826.7	4215.5	2.08	27.1
22	6.10	-25.2	-31.3	0.123	824.9	4206.3	2.14	27.0
23	6.10	-31.3	-37.4	0.123	823.2	4197.3	2.20	27.0
24	6.10	-37.4	-43.5	0.125	847.5	4321.2	2.11	27.8
25	6.30	-43.5	-49.8	0.125	849.8	4332.9	2.28	27.0
26	6.40	-49.8	-56.2	0.125	861.8	4394.5	2.15	26.9
27	6.50	-56.2	-62.7	0.125	873.6	4454.6	2.03	26.9
28	6.60	-62.7	-69.3	0.125	880.2	4488.0	1.75	26.7
29	6.75	-69.3	-76.1	0.125	914.4	4662.7	2.31	27.1

Table 3H.6-1c Layer Thicknesses and Strain Compatible In-Situ Soil Properties Used or the SSI Analysis (Lower Bound) (Continued)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
30	6.75	-76.1	-82.8	0.125	913.7	4659.3	2.33	27.1
31	6.75	-82.8	-89.6	0.125	911.5	4647.6	2.34	27.0
32	6.75	-89.6	-96.3	0.125	910.9	4644.8	2.36	27.0
33	6.75	-96.3	-103.1	0.125	910.2	4641.2	2.37	27.0
34	6.50	-103.1	-109.6	0.125	883.2	4503.5	2.23	27.2
35	6.50	-109.6	-116.1	0.125	881.1	4492.6	2.26	27.1
36	6.75	-116.1	-122.8	0.125	908.0	4629.8	2.35	26.9
37	6.75	-122.8	-129.6	0.125	919.4	4688.2	2.39	27.2
38	6.75	-129.6	-136.3	0.125	919.3	4687.6	2.40	27.2
39	6.75	-136.3	-143.1	0.125	922.5	4703.8	2.41	27.3
40	6.75	-143.1	-149.8	0.125	922.7	4705.0	2.42	27.3
41	6.75	-149.8	-156.6	0.125	921.4	4698.5	2.43	27.3
42	6.75	-156.6	-163.3	0.125	919.3	4687.6	2.43	27.2
43	6.80	-163.3	-170.1	0.124	921.5	4698.6	2.41	27.1
44	6.90	-170.1	-177.0	0.124	928.7	4735.0	2.41	26.9
45	7.10	-177.0	-184.1	0.125	954.6	4855.4	2.36	26.9
46	7.40	-184.1	-191.5	0.127	985.8	5000.0	2.17	26.6
47	7.30	-191.5	-198.8	0.127	984.9	5000.0	2.32	27.0
48	7.30	-198.8	-206.1	0.127	984.7	5000.0	2.31	27.0
49	7.50	-206.1	-213.6	0.126	1020.4	5000.0	2.27	27.2
50	7.40	-213.6	-221.0	0.127	1010.5	5000.0	2.12	27.3
51	7.50	-221.0	-228.5	0.126	1018.3	5000.0	2.20	27.2
52	7.60	-228.5	-236.1	0.123	1034.4	5000.0	2.36	27.2
53	7.60	-236.1	-243.7	0.123	1034.1	5000.0	2.37	27.2
54	7.60	-243.7	-251.3	0.123	1033.9	5000.0	2.37	27.2
55	7.60	-251.3	-258.9	0.123	1033.7	5000.0	2.38	27.2
56	7.60	-258.9	-266.5	0.123	1036.0	5000.0	2.39	27.3
57	7.60	-266.5	-274.1	0.123	1037.2	5000.0	2.40	27.3
58	7.60	-274.1	-281.7	0.123	1036.9	5000.0	2.40	27.3

Table 3H.6-1c Layer Thicknesses and Strain Compatible In-Situ Soil Properties Used or the SSI Analysis (Lower Bound) (Continued)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
59	8.70	-281.7	-290.4	0.126	1160.9	5160.6	2.05	26.7
60	9.50	-290.4	-299.9	0.128	1252.4	5264.0	1.84	26.4
61	9.50	-299.9	-309.4	0.124	1290.5	5424.1	2.08	27.2
62	9.50	-309.4	-318.9	0.128	1309.8	5504.9	1.82	27.6
63	9.50	-318.9	-328.4	0.128	1310.1	5506.5	1.80	27.6
64	9.50	-328.4	-337.9	0.128	1309.5	5503.9	1.82	27.6
65	9.50	-337.9	-347.4	0.126	1300.6	5466.7	2.00	27.4
66	8.90	-347.4	-356.3	0.126	1206.9	5163.3	2.12	27.1
67	8.50	-356.3	-364.8	0.128	1156.1	5000.0	2.07	27.2
68	8.10	-364.8	-372.9	0.126	1092.9	5000.0	2.23	27.0
69	7.30	-372.9	-380.2	0.123	995.4	5000.0	2.53	27.3
70	7.30	-380.2	-387.5	0.123	995.3	5000.0	2.53	27.3
71	7.30	-387.5	-394.8	0.123	995.2	5000.0	2.53	27.3
72	7.30	-394.8	-402.1	0.124	987.8	4984.4	2.56	27.1
73	7.20	-402.1	-409.3	0.127	973.7	4955.8	2.61	27.0
74	7.30	-409.3	-416.6	0.123	990.9	5000.0	2.54	27.1
75	7.30	-416.6	-423.9	0.123	990.9	5000.0	2.54	27.1
76	7.30	-423.9	-431.2	0.123	990.7	5000.0	2.54	27.1
77	7.30	-431.2	-438.5	0.123	990.6	5000.0	2.54	27.1
78	7.30	-438.5	-445.8	0.123	992.8	5000.0	2.54	27.2
79	7.40	-445.8	-453.2	0.123	999.5	5000.0	2.54	27.0
80	7.40	-453.2	-460.6	0.123	999.5	5000.0	2.54	27.0
81	8.50	-460.6	-469.1	0.123	1158.6	5023.1	2.17	27.3
82	8.80	-469.1	-477.9	0.123	1196.2	5027.7	2.10	27.2
83	8.70	-477.9	-486.6	0.123	1178.1	5006.7	2.28	27.1
84	8.70	-486.6	-495.3	0.123	1172.4	5000.0	2.34	27.0
85	8.70	-495.3	-504.0	0123	1172.2	5000.0	2.34	26.9
86	8.70	-504.0	-512.7	0.123	1172.1	5000.0	2.34	26.9
87	8.60	-512.7	-521.3	0.123	1172.0	5000.0	2.34	27.3

Table 3H.6-1c Layer Thicknesses and Strain Compatible In-Situ Soil Properties Used or the SSI Analysis (Lower Bound) (Continued)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
88	8.60	-521.3	-529.9	0.123	1171.9	5000.0	2.35	27.3
89	8.60	-529.9	-538.5	0.123	1171.8	5000.0	2.35	27.3
90	8.60	-538.5	-547.1	0.123	1171.7	5000.0	2.35	27.2
91	9.10	-547.1	-556.2	0.125	1237.0	5022.9	1.85	27.2
92	10.20	-556.2	-566.4	0.129	1378.7	5065.8	0.91	27.0
93	10.20	-566.4	-576.6	0.129	1378.7	5065.8	0.91	27.0
94	10.20	-576.6	-586.8	0.129	1378.7	5065.8	0.91	27.0
95	10.20	-586.8	-597.0	0.129	1378.7	5065.8	0.91	27.0
96	10.20	-597.0	-607.2	0.129	1378.7	5065.8	0.91	27.0
97	10.20	-607.2	-617.4	0.129	1378.7	5065.8	0.91	27.0
98	10.20	-617.4	-627.6	0.129	1378.7	5065.8	0.91	27.0
99	10.20	-627.6	-637.8	0.129	1378.7	5065.8	0.91	27.0
100	10.20	-637.8	-648.0	0.129	1382.6	5080.1	0.91	27.1
Halfspace				0.129	1382.6	5080.1	0.913	-

Table 3H.6-2 Strain-Compatible Properties of Backfill Material

Soil Depth (ft)	Lower Bound Soil			Mean Soil			Upper Bound Soil		
	Vs (ft/sec)	Vp (ft/sec)	Damping (%)	Vs (ft/sec)	Vp (ft/sec)	Damping (%)	Vs (ft/sec)	Vp (ft/sec)	Damping (%)
0 to 8	449	1208	3	550	1480	2	673	1813	1
8 to 13	553	2323	3	677	2845	2	829	3485	1
13 to 18	586	2462	3	717	3015	2	879	3693	1
18 to 23	614	2580	3	752	3160	2	921	3870	1
23 to 28	639	2684	3	782	3288	2	958	4027	1
28 to 33	661	2778	3	809	3402	2	991	4166	1
33 to 38	681	2862	3	834	3506	2	1021	4294	1
38 to 43	699	2940	3	857	3601	2	1049	4410	1
43 to 48	717	3012	3	878	3689	2	1075	4518	1
48 to 53	733	3079	3	897	3771	2	1099	4619	1
53 to 58	748	3142	3	916	3849	2	1121	4714	1
58 to 63	762	3202	3	933	3922	2	1143	4803	1
63 to 68	775	3258	3	949	3991	2	1163	4888	1
68 to 73	788	3312	3	965	4056	2	1182	4968	1
73 to 78.25	800	3364	3	980	4120	2	1201	5046	1
78.25 to 83.25	812	3414	3	995	4182	2	1218	5121	1
83.25 to 88.25	823	3461	3	1009	4239	2	1235	5192	1
88.25 to 94.25	835	3510	3	1023	4299	2	1253	5266	1

Table 3H.6-2a Layer Thicknesses and Strain-Compatible Backfill Soil Properties Used for the SSI Analysis (Mean)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
1	2.75	56.0	53.3	0.120	550.0	1480.0	2.00	40.0
2	3.25	53.3	50.0	0.120	550.0	1480.0	2.00	33.8
3	3.50	50.0	46.5	0.120	598.1	1863.1	2.00	34.2
4	3.50	46.5	43.0	0.120	677.0	2845.0	2.00	38.7
5	3.50	43.0	39.5	0.120	717.0	3015.0	2.00	41.0
6	3.50	39.5	36.0	0.120	736.6	3096.2	2.00	42.1
7	3.00	36.0	33.0	0.120	752.0	3160.0	2.00	50.1
8	3.00	33.0	30.0	0.120	782.0	3288.0	2.00	52.1
9	4.00	30.0	26.0	0.120	795.3	3344.0	2.00	39.8
10	2.00	26.0	24.0	0.120	809.0	3402.0	2.00	80.9
11	4.00	24.0	20.0	0.120	827.6	3479.4	2.00	41.4
12	4.00	20.0	16.0	0.120	845.3	3552.9	2.00	42.3
13	4.00	16.0	12.0	0.120	862.2	3622.6	2.00	43.1
14	4.00	12.0	8.0	0.120	878.0	3689.0	2.00	43.9
15	4.00	8.0	4.0	0.120	897.0	3771.0	2.00	44.9
16	5.00	4.0	-1.0	0.120	912.1	3833.1	2.00	36.5
17	5.00	-1.0	-6.0	0.120	929.5	3907.2	2.00	37.2
18	2.00	-6.0	-8.0	0.120	940.9	3956.2	2.00	94.1

Table 3H.6-2b Layer Thicknesses and Strain-Compatible Backfill Soil Properties Used for the SSI Analysis (Upper Bound)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
1	2.75	56.0	53.3	0.120	673.0	1813.0	1.00	48.9
2	3.25	53.3	50.0	0.120	673.0	1813.0	1.00	41.1
3	3.50	50.0	46.5	0.120	732.0	2282.3	1.00	41.8
4	3.50	46.5	43.0	0.120	829.0	3485.0	1.00	47.4
5	3.50	43.0	39.5	0.120	879.0	3693.0	1.00	50.2
6	3.50	39.5	36.0	0.120	902.5	3792.1	1.00	51.6
7	3.00	36.0	33.0	0.120	921.0	3870.0	1.00	61.4
8	3.00	33.0	30.0	0.120	958.0	4027.0	1.00	63.9
9	4.00	30.0	26.0	0.120	974.2	4095.3	1.00	48.7
10	2.00	26.0	24.0	0.120	991.0	4166.0	1.00	99.1
11	4.00	24.0	20.0	0.120	1013.3	4261.3	1.00	50.7
12	4.00	20.0	16.0	0.120	1034.8	4351.2	1.00	51.7
13	4.00	16.0	12.0	0.120	1055.4	4436.5	1.00	52.8
14	4.00	12.0	8.0	0.120	1075.0	4518.0	1.00	53.8
15	4.00	8.0	4.0	0.120	1099.0	4619.0	1.00	55.0
16	5.00	4.0	-1.0	0.120	1116.5	4694.7	1.00	44.7
17	5.00	-1.0	-6.0	0.120	1138.5	4784.9	1.00	45.5
18	2.00	-6.0	-8.0	0.120	1152.9	4845.1	1.00	115.3

Table 3H.6-2c Layer Thicknesses and Strain-Compatible Backfill Soil Properties Used for the SSI Analysis (Lower Bound)

Layer No.	Thickness (ft)	Top Elevation of Layer (ft)	Bottom Elevation of Layer (ft)	Unit Weight (kcf)	S-Wave Vel. (ft/sec)	P-Wave Vel. (ft/sec)	Damping (%)	Passing Freq. for S-Wave Vel. (Hz)
1	2.75	56.0	53.3	0.120	449.0	1208.0	3.00	32.7
2	3.25	53.3	50.0	0.120	449.0	1208.0	3.00	27.6
3	3.50	50.0	46.5	0.120	488.4	1520.8	3.00	27.9
4	3.50	46.5	43.0	0.120	553.0	2323.0	3.00	31.6
5	3.50	43.0	39.5	0.120	586.0	2462.0	3.00	33.5
6	3.50	39.5	36.0	0.120	601.7	2528.1	3.00	34.4
7	3.00	36.0	33.0	0.120	614.0	2580.0	3.00	40.9
8	3.00	33.0	30.0	0.120	639.0	2684.0	3.00	42.6
9	4.00	30.0	26.0	0.120	649.8	2730.2	3.00	32.5
10	2.00	26.0	24.0	0.120	661.0	2778.0	3.00	66.1
11	4.00	24.0	20.0	0.120	675.9	2840.5	3.00	33.8
12	4.00	20.0	16.0	0.120	689.9	2900.5	3.00	34.5
13	4.00	16.0	12.0	0.120	703.4	2957.7	3.00	35.2
14	4.00	12.0	8.0	0.120	717.0	3012.0	3.00	35.9
15	4.00	8.0	4.0	0.120	733.0	3079.0	3.00	36.7
16	5.00	4.0	-1.0	0.120	745.0	3129.2	3.00	29.8
17	5.00	-1.0	-6.0	0.120	759.2	3189.8	3.00	30.4
18	2.00	-6.0	-8.0	0.120	768.4	3229.8	3.00	76.8

Table 3H.6-2d Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (E-W Time History)

Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History – (E-W)	Percentage Less than Target	Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History – (E-W)	Percentage Less than Target
0.1	0.0106	0.0119	-	0.224	0.0757	0.0777	-
0.102	0.0112	0.0123	-	0.229	0.08	0.0845	-
0.105	0.0119	0.0129	-	0.234	0.0846	0.0919	-
0.107	0.0126	0.0136	-	0.24	0.0895	0.0996	-
0.11	0.0133	0.0147	-	0.246	0.0947	0.107	-
0.112	0.014	0.016	-	0.251	0.0994	0.113	-
0.115	0.0148	0.0175	-	0.257	0.1014	0.1171	-
0.118	0.0157	0.0193	-	0.263	0.1034	0.1195	-
0.12	0.0166	0.0211	-	0.269	0.1055	0.1215	-
0.123	0.0176	0.0231	-	0.275	0.1076	0.1235	-
0.126	0.0186	0.025	-	0.282	0.1098	0.1255	-
0.129	0.0196	0.0268	-	0.288	0.112	0.1281	-
0.132	0.0208	0.0283	-	0.295	0.1142	0.1314	-
0.135	0.022	0.0295	-	0.302	0.1165	0.1344	-
0.138	0.0232	0.0302	-	0.309	0.1189	0.1349	-
0.141	0.0246	0.0305	-	0.316	0.1212	0.1318	-
0.145	0.026	0.0305	-	0.324	0.1237	0.1219	1.5%
0.148	0.0275	0.0303	-	0.331	0.1261	0.1329	-
0.151	0.0291	0.0302	-	0.339	0.1287	0.1436	-
0.155	0.0308	0.0305	1.0%	0.347	0.1313	0.1513	-
0.159	0.0326	0.0313	4.2%	0.355	0.1339	0.1573	-
0.162	0.0345	0.033	4.5%	0.363	0.1366	0.1606	-
0.166	0.0365	0.0354	3.1%	0.371	0.1393	0.1622	-
0.17	0.0385	0.0385	-	0.38	0.1421	0.1583	-
0.174	0.0408	0.042	-	0.389	0.145	0.1508	-
0.178	0.0431	0.0453	-	0.398	0.1479	0.1641	-
0.182	0.0457	0.0483	-	0.407	0.1509	0.1779	-
0.186	0.0483	0.0511	-	0.417	0.1539	0.1824	-

Table 3H.6-2d Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (E-W Time History) (Continued)

Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History – (E-W)	Percentage Less than Target	Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History – (E-W)	Percentage Less than Target
0.191	0.051	0.055	-	0.427	0.157	0.1842	-
0.195	0.054	0.059	-	0.436	0.1601	0.1897	-
0.2	0.0571	0.0622	-	0.447	0.1633	0.1956	-
0.204	0.0604	0.065	-	0.457	0.1666	0.1925	-
0.209	0.0639	0.0674	-	0.468	0.1699	0.1756	-
0.214	0.0676	0.07	-	0.479	0.1733	0.1889	-
0.219	0.0715	0.073	-	0.49	0.1768	0.2054	-
0.5	0.18	0.2133	-	1.096	0.268	0.3131	-
0.501	0.1802	0.2133	-	1.122	0.2712	0.306	-
0.513	0.1823	0.2061	-	1.148	0.2743	0.304	-
0.525	0.1845	0.194	-	1.175	0.2776	0.3014	-
0.537	0.1866	0.2049	-	1.202	0.2808	0.2998	-
0.55	0.1888	0.2104	-	1.23	0.2841	0.3034	-
0.562	0.191	0.2173	-	1.259	0.2874	0.3143	-
0.575	0.1933	0.2228	-	1.288	0.2908	0.3137	-
0.589	0.1956	0.2271	-	1.318	0.2942	0.3295	-
0.603	0.1979	0.2313	-	1.349	0.2977	0.3442	-
0.617	0.2002	0.2354	-	1.38	0.3012	0.3366	-
0.631	0.2025	0.2385	-	1.412	0.3047	0.3276	-
0.646	0.2049	0.2402	-	1.445	0.3083	0.3508	-
0.661	0.2073	0.2402	-	1.479	0.3119	0.3524	-
0.676	0.2097	0.2387	-	1.514	0.3156	0.3555	-
0.692	0.2122	0.2364	-	1.549	0.3193	0.3626	-
0.708	0.2147	0.2353	-	1.585	0.323	0.3688	-
0.724	0.2172	0.237	-	1.622	0.3268	0.3755	-
0.741	0.2198	0.2393	-	1.659	0.3307	0.377	-
0.759	0.2224	0.2429	-	1.698	0.3345	0.3599	-
0.776	0.225	0.2527	-	1.738	0.3385	0.3894	-
0.794	0.2276	0.2595	-	1.778	0.3425	0.3968	-

Table 3H.6-2d Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (E-W Time History) (Continued)

Frequency (Hz)	**Target Spectral Acceleration**	**Spectral Acceleration from Time History – (E-W)**	**Percentage Less than Target**	**Frequency (Hz)**	**Target Spectral Acceleration**	**Spectral Acceleration from Time History – (E-W)**	**Percentage Less than Target**
0.813	0.2303	0.2569	-	1.82	0.3465	0.3994	-
0.832	0.233	0.2622	-	1.862	0.3505	0.4027	-
0.851	0.2357	0.2669	-	1.905	0.3547	0.3804	-
0.871	0.2385	0.2702	-	1.95	0.3588	0.3969	-
0.891	0.2413	0.2711	-	1.995	0.363	0.4157	-
0.912	0.2441	0.2703	-	2.042	0.3673	0.42	-
0.933	0.247	0.2697	-	2.089	0.3716	0.4167	-
0.955	0.2499	0.2664	-	2.138	0.376	0.4158	-
0.977	0.2528	0.2605	-	2.188	0.3804	0.4123	-
1	0.2558	0.2614	-	2.239	0.3848	0.4421	-
1.023	0.2588	0.279	-	2.291	0.3894	0.442	-
1.047	0.2618	0.2846	-	2.344	0.3939	0.4312	-
1.071	0.2649	0.3019	-	2.399	0.3986	0.4344	-
2.455	0.4032	0.4561	-	5.249	0.3661	0.4155	-
2.5	0.407	0.458	-	5.371	0.3649	0.3992	-
2.512	0.4067	0.4548	-	5.495	0.3637	0.3969	-
2.571	0.4054	0.4526	-	5.624	0.3625	0.4013	-
2.63	0.4041	0.4573	-	5.754	0.3613	0.4031	-
2.692	0.4027	0.4499	-	5.889	0.3602	0.3971	-
2.754	0.4014	0.4415	-	6.024	0.359	0.3893	-
2.818	0.4001	0.437	-	6.165	0.3578	0.3906	-
2.884	0.3988	0.4532	-	6.309	0.3566	0.3964	-
2.952	0.3975	0.4547	-	6.456	0.3555	0.4052	-
3.02	0.3962	0.449	-	6.605	0.3543	0.3992	-
3.09	0.3949	0.4376	-	6.761	0.3531	0.3775	-
3.163	0.3936	0.4301	-	6.92	0.352	0.3885	-
3.236	0.3923	0.4464	-	7.077	0.3508	0.4094	-
3.311	0.391	0.4537	-	7.246	0.3497	0.4119	-
3.389	0.3897	0.4431	-	7.413	0.349	0.4112	-

Table 3H.6-2d Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (E-W Time History) (Continued)

Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History – (E-W)	Percentage Less than Target	Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History – (E-W)	Percentage Less than Target
3.467	0.3884	0.4255	-	7.587	0.347	0.4092	-
3.549	0.3872	0.434	-	7.764	0.346	0.3939	-
3.631	0.3859	0.4236	-	7.943	0.345	0.3753	-
3.715	0.3846	0.4266	-	8.13	0.344	0.3744	-
3.802	0.3834	0.4346	-	8.319	0.343	0.3821	-
3.891	0.3821	0.4275	-	8.511	0.342	0.3825	-
3.981	0.3809	0.416	-	8.711	0.341	0.3792	-
4.073	0.3796	0.4262	-	8.913	0.339	0.3773	-
4.168	0.3784	0.426	-	9.124	0.336	0.3774	-
4.266	0.3771	0.4199	-	9.328	0.33	0.3785	-
4.365	0.3759	0.4244	-	9.551	0.324	0.3648	-
4.466	0.3746	0.4249	-	9.775	0.319	0.3598	-
4.57	0.3734	0.421	-	10	0.314	0.3565	-
4.677	0.3722	0.4029	-	10.235	0.308	0.3522	-
4.787	0.371	0.4141	-	10.471	0.303	0.3331	-
4.897	0.3698	0.4194	-	10.718	0.298	0.3288	-
5	0.3687	0.4188	-	10.965	0.293	0.3356	-
5.013	0.3685	0.4181	-	11.223	0.288	0.324	-
5.128	0.3673	0.4196	-	11.481	0.283	0.3146	-
11.751	0.278	0.3073	-	25.707	0.1563	0.1683	-
12.019	0.274	0.2985	-	26.316	0.1537	0.1658	-
12.3	0.269	0.2821	-	26.882	0.1511	0.1622	-
12.594	0.265	0.3001	-	27.548	0.1485	0.1599	-
12.887	0.26	0.3014	-	28.169	0.146	0.1643	-
13.175	0.256	0.2846	-	28.818	0.1436	0.1656	-
13.495	0.252	0.2863	-	29.499	0.1412	0.1628	-
13.812	0.247	0.2711	-	30.211	0.1388	0.1631	-
14.124	0.243	0.2659	-	30.864	0.1365	0.1616	-
14.451	0.239	0.2621	-	31.646	0.1342	0.1585	-

Table 3H.6-2d Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (E-W Time History) (Continued)

Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History – (E-W)	Percentage Less than Target	Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History – (E-W)	Percentage Less than Target
14.793	0.235	0.2534	-	32.362	0.1319	0.1542	-
15.129	0.231	0.2577	-	33.113	0.13	0.1496	-
15.48	0.227	0.253	-	33.898	0.13	0.1454	-
15.848	0.223	0.251	-	34.722	0.13	0.1426	-
16.207	0.22	0.2464	-	35.461	0.13	0.1398	-
16.584	0.216	0.2412	-	36.364	0.13	0.1394	-
16.978	0.212	0.2305	-	37.175	0.13	0.1434	-
17.391	0.209	0.2316	-	38.023	0.13	0.1438	-
17.794	0.205	0.2273	-	38.911	0.13	0.1444	-
18.182	0.202	0.2253	-	39.841	0.13	0.143	-
18.622	0.198	0.2368	-	40.816	0.13	0.1419	-
19.048	0.195	0.2353	-	41.667	0.13	0.1428	-
19.493	0.1917	0.2275	-	42.735	0.13	0.1436	-
19.96	0.1884	0.2073	-	43.668	0.13	0.1449	-
20.408	0.1853	0.1903	-	44.643	0.13	0.1399	-
20.877	0.1821	0.1951	-	45.662	0.13	0.1425	-
21.368	0.1791	0.1997	-	46.729	0.13	0.1447	-
21.882	0.176	0.2008	-	47.847	0.13	0.1461	-
22.371	0.1731	0.1974	-	49.02	0.13	0.146	-
22.883	0.1702	0.2031	-	50.251	0.13	0.1454	-
23.419	0.1673	0.1967	-				-
23.981	0.1645	0.1908	-				-
24.57	0.1617	0.1788	-				-
25	0.1595	0.1709	-				-
25.126	0.159	0.1705	-				-

Table 3H.6-2e Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (N-S Time History)

Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History - (N-S)	Percentage Less than Target	Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History - (N-S)	Percentage Less than Target
0.1	0.0106	0.0111	-	0.224	0.0757	0.0801	-
0.102	0.0112	0.0121	-	0.229	0.08	0.08	-
0.105	0.0119	0.0133	-	0.234	0.0846	0.0864	-
0.107	0.0126	0.0145	-	0.24	0.0895	0.0916	-
0.11	0.0133	0.0158	-	0.246	0.0947	0.0933	1.5%
0.112	0.014	0.0173	-	0.251	0.0994	0.0981	1.3%
0.115	0.0148	0.0187	-	0.257	0.1014	0.1062	-
0.118	0.0157	0.0203	-	0.263	0.1034	0.1128	-
0.12	0.0166	0.0217	-	0.269	0.1055	0.1168	-
0.123	0.0176	0.0232	-	0.275	0.1076	0.1182	-
0.126	0.0186	0.025	-	0.282	0.1098	0.118	-
0.129	0.0196	0.0277	-	0.288	0.112	0.1189	-
0.132	0.0208	0.0303	-	0.295	0.1142	0.1235	-
0.135	0.022	0.0326	-	0.302	0.1165	0.1265	-
0.138	0.0232	0.0345	-	0.309	0.1189	0.1279	-
0.141	0.0246	0.036	-	0.316	0.1212	0.1294	-
0.145	0.026	0.037	-	0.324	0.1237	0.1342	-
0.148	0.0275	0.0374	-	0.331	0.1261	0.1387	-
0.151	0.0291	0.0374	-	0.339	0.1287	0.1429	-
0.155	0.0308	0.0375	-	0.347	0.1313	0.147	-
0.159	0.0326	0.0373	-	0.355	0.1339	0.1507	-
0.162	0.0345	0.0371	-	0.363	0.1366	0.154	-
0.166	0.0365	0.0369	-	0.371	0.1393	0.1569	-
0.17	0.0385	0.0373	3.2%	0.38	0.1421	0.1592	-
0.174	0.0408	0.0394	3.6%	0.389	0.145	0.1609	-
0.178	0.0431	0.0421	2.4%	0.398	0.1479	0.1621	-
0.182	0.0457	0.0457	-	0.407	0.1509	0.1628	-
0.186	0.0483	0.0502	-	0.417	0.1539	0.163	-

Table 3H.6-2e Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (N-S Time History) (Continued)

Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History - (N-S)	Percentage Less than Target	Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History - (N-S)	Percentage Less than Target
0.191	0.051	0.0557	-	0.427	0.157	0.1748	-
0.195	0.054	0.0617	-	0.436	0.1601	0.1886	-
0.2	0.0571	0.0668	-	0.447	0.1633	0.1903	-
0.204	0.0604	0.0702	-	0.457	0.1666	0.1804	-
0.209	0.0639	0.0708	-	0.468	0.1699	0.1804	-
0.214	0.0676	0.073	-	0.479	0.1733	0.1773	-
0.219	0.0715	0.0782	-	0.49	0.1768	0.1868	-
0.5	0.18	0.1939	-	1.096	0.268	0.2904	-
0.501	0.1802	0.1948	-	1.122	0.2712	0.2979	-
0.513	0.1823	0.2027	-	1.148	0.2743	0.3035	-
0.525	0.1845	0.2028	-	1.175	0.2776	0.3031	-
0.537	0.1866	0.2029	-	1.202	0.2808	0.3058	-
0.55	0.1888	0.2112	-	1.23	0.2841	0.313	-
0.562	0.191	0.1992	-	1.259	0.2874	0.3161	-
0.575	0.1933	0.2094	-	1.288	0.2908	0.3043	-
0.589	0.1956	0.218	-	1.318	0.2942	0.3225	-
0.603	0.1979	0.2219	-	1.349	0.2977	0.3322	-
0.617	0.2002	0.2257	-	1.38	0.3012	0.3329	-
0.631	0.2025	0.2263	-	1.412	0.3047	0.3266	-
0.646	0.2049	0.2249	-	1.445	0.3083	0.3396	-
0.661	0.2073	0.2251	-	1.479	0.3119	0.3465	-
0.676	0.2097	0.228	-	1.514	0.3156	0.3497	-
0.692	0.2122	0.2327	-	1.549	0.3193	0.3526	-
0.708	0.2147	0.2359	-	1.585	0.323	0.3577	-
0.724	0.2172	0.2348	-	1.622	0.3268	0.3644	-
0.741	0.2198	0.247	-	1.659	0.3307	0.3702	-
0.759	0.2224	0.2383	-	1.698	0.3345	0.3723	-
0.776	0.225	0.2463	-	1.738	0.3385	0.3694	-
0.794	0.2276	0.2468	-	1.778	0.3425	0.365	-

Table 3H.6-2e Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (N-S Time History) (Continued)

Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History - (N-S)	Percentage Less than Target	Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History - (N-S)	Percentage Less than Target
0.813	0.2303	0.2496	-	1.82	0.3465	0.3724	-
0.832	0.233	0.2574	-	1.862	0.3505	0.4028	-
0.851	0.2357	0.2647	-	1.905	0.3547	0.4082	-
0.871	0.2385	0.2705	-	1.95	0.3588	0.4003	-
0.891	0.2413	0.2718	-	1.995	0.363	0.3918	-
0.912	0.2441	0.2646	-	2.042	0.3673	0.393	-
0.933	0.247	0.2701	-	2.089	0.3716	0.4265	-
0.955	0.2499	0.2714	-	2.138	0.376	0.422	-
0.977	0.2528	0.2732	-	2.188	0.3804	0.4103	-
1	0.2558	0.279	-	2.239	0.3848	0.4202	-
1.023	0.2588	0.2851	-	2.291	0.3894	0.4271	-
1.047	0.2618	0.2907	-	2.344	0.3939	0.4331	-
1.071	0.2649	0.294	-	2.399	0.3986	0.4345	-
2.455	0.4032	0.4309	-	5.249	0.3661	0.4074	-
2.5	0.407	0.4462	-	5.371	0.3649	0.4083	-
2.512	0.4067	0.4494	-	5.495	0.3637	0.4079	-
2.571	0.4054	0.4537	-	5.624	0.3625	0.4027	-
2.63	0.4041	0.4421	-	5.754	0.3613	0.3928	-
2.692	0.4027	0.4258	-	5.889	0.3602	0.3905	-
2.754	0.4014	0.4424	-	6.024	0.359	0.3932	-
2.818	0.4001	0.4351	-	6.165	0.3578	0.3929	-
2.884	0.3988	0.4337	-	6.309	0.3566	0.3938	-
2.952	0.3975	0.445	-	6.456	0.3555	0.3905	-
3.02	0.3962	0.4484	-	6.605	0.3543	0.3839	-
3.09	0.3949	0.4447	-	6.761	0.3531	0.3916	-
3.163	0.3936	0.4247	-	6.92	0.352	0.3922	-
3.236	0.3923	0.4246	-	7.077	0.3508	0.3964	-
3.311	0.391	0.4452	-	7.246	0.3497	0.3951	-
3.389	0.3897	0.4372	-	7.413	0.349	0.3768	-

Table 3H.6-2e Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (N-S Time History) (Continued)

Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History - (N-S)	Percentage Less than Target	Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History - (N-S)	Percentage Less than Target
3.467	0.3884	0.4171	-	7.587	0.347	0.375	-
3.549	0.3872	0.4115	-	7.764	0.346	0.38	-
3.631	0.3859	0.428	-	7.943	0.345	0.3788	-
3.715	0.3846	0.425	-	8.13	0.344	0.3709	-
3.802	0.3834	0.4256	-	8.319	0.343	0.386	-
3.891	0.3821	0.4153	-	8.511	0.342	0.3889	-
3.981	0.3809	0.4184	-	8.711	0.341	0.3783	-
4.073	0.3796	0.4156	-	8.913	0.339	0.3706	-
4.168	0.3784	0.4101	-	9.124	0.336	0.3642	-
4.266	0.3771	0.4034	-	9.328	0.33	0.3599	-
4.365	0.3759	0.4171	-	9.551	0.324	0.359	-
4.466	0.3746	0.4159	-	9.775	0.319	0.3422	-
4.57	0.3734	0.4077	-	10	0.314	0.344	-
4.677	0.3722	0.4088	-	10.235	0.308	0.3423	-
4.787	0.371	0.4147	-	10.471	0.303	0.3321	-
4.897	0.3698	0.4036	-	10.718	0.298	0.3252	-
5	0.3687	0.3998	-	10.965	0.293	0.3213	-
5.013	0.3685	0.4018	-	11.223	0.288	0.3137	-
5.128	0.3673	0.4093	-	11.481	0.283	0.3232	-
11.751	0.278	0.3143	-	25.707	0.1563	0.1846	-
12.019	0.274	0.3016	-	26.316	0.1537	0.1887	-
12.3	0.269	0.2917	-	26.882	0.1511	0.1815	-
12.594	0.265	0.2816	-	27.548	0.1485	0.1703	-
12.887	0.26	0.2812	-	28.169	0.146	0.1643	-
13.175	0.256	0.2844	-	28.818	0.1436	0.1599	-
13.495	0.252	0.2854	-	29.499	0.1412	0.1563	-
13.812	0.247	0.2787	-	30.211	0.1388	0.1556	-
14.124	0.243	0.2722	-	30.864	0.1365	0.1554	-
14.451	0.239	0.2643	-	31.646	0.1342	0.1549	-

Table 3H.6-2e Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (N-S Time History) (Continued)

Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History - (N-S)	Percentage Less than Target	Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History - (N-S)	Percentage Less than Target
14.793	0.235	0.2558	-	32.362	0.1319	0.1553	-
15.129	0.231	0.2519	-	33.113	0.13	0.1548	-
15.48	0.227	0.2476	-	33.898	0.13	0.1538	-
15.848	0.223	0.2449	-	34.722	0.13	0.1529	-
16.207	0.22	0.2422	-	35.461	0.13	0.1517	-
16.584	0.216	0.2401	-	36.364	0.13	0.1506	-
16.978	0.212	0.2359	-	37.175	0.13	0.1501	-
17.391	0.209	0.2288	-	38.023	0.13	0.1502	-
17.794	0.205	0.2221	-	38.911	0.13	0.1505	-
18.182	0.202	0.2195	-	39.841	0.13	0.1502	-
18.622	0.198	0.2181	-	40.816	0.13	0.1502	-
19.048	0.195	0.2124	-	41.667	0.13	0.1499	-
19.493	0.1917	0.2048	-	42.735	0.13	0.1493	-
19.96	0.1884	0.1989	-	43.668	0.13	0.1491	-
20.408	0.1853	0.2104	-	44.643	0.13	0.1489	-
20.877	0.1821	0.2076	-	45.662	0.13	0.1485	-
21.368	0.1791	0.2035	-	46.729	0.13	0.1483	-
21.882	0.176	0.2014	-	47.847	0.13	0.1482	-
22.371	0.1731	0.1952	-	49.02	0.13	0.1482	-
22.883	0.1702	0.1882	-	50.251	0.13	0.148	-
23.419	0.1673	0.184	-				-
23.981	0.1645	0.1778	-				-
24.57	0.1617	0.1704	-				-
25	0.1595	0.1742	-				-
25.126	0.159	0.1767	-				-

Table 3H.6-2f Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (Vertical Time History)

Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History –V1	Percentage Less than Target	Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History –V1	Percentage Less than Target
0.1	0.0071	0.0101	-	0.224	0.0506	0.0534	-
0.102	0.0075	0.0108	-	0.229	0.0535	0.0552	-
0.105	0.0079	0.0115	-	0.234	0.0566	0.0582	-
0.107	0.0084	0.0123	-	0.24	0.0599	0.0617	-
0.11	0.0088	0.0129	-	0.246	0.0633	0.0652	-
0.112	0.0094	0.0135	-	0.251	0.0665	0.0683	-
0.115	0.0099	0.0141	-	0.257	0.068	0.071	-
0.118	0.0105	0.0146	-	0.263	0.0695	0.073	-
0.12	0.0111	0.0149	-	0.269	0.0711	0.0778	-
0.123	0.0117	0.0152	-	0.275	0.0727	0.0822	-
0.126	0.0124	0.0154	-	0.282	0.0744	0.0847	-
0.129	0.0131	0.016	-	0.288	0.0761	0.0845	-
0.132	0.0139	0.0166	-	0.295	0.0778	0.0812	-
0.135	0.0147	0.0173	-	0.302	0.0796	0.0854	-
0.138	0.0155	0.018	-	0.309	0.0814	0.0895	-
0.141	0.0164	0.0184	-	0.316	0.0832	0.0921	-
0.145	0.0174	0.0186	-	0.324	0.0851	0.0932	-
0.148	0.0184	0.0186	-	0.331	0.087	0.0935	-
0.151	0.0194	0.0195	-	0.339	0.089	0.0939	-
0.155	0.0206	0.0206	-	0.347	0.091	0.0959	-
0.159	0.0217	0.0222	-	0.355	0.0931	0.099	-
0.162	0.023	0.0236	-	0.363	0.0952	0.103	-
0.166	0.0243	0.0249	-	0.371	0.0974	0.1069	-
0.17	0.0257	0.026	-	0.38	0.0996	0.109	-
0.174	0.0272	0.0272	-	0.389	0.1018	0.1092	
0.178	0.0288	0.0287	0.35%	0.398	0.1041	0.1096	-
0.182	0.0305	0.0305	-	0.407	0.1065	0.1124	-
0.186	0.0322	0.0327	-	0.417	0.1089	0.1183	-
0.191	0.0341	0.0354	-	0.427	0.1114	0.1238	-

Table 3H.6-2f Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (Vertical Time History) (Continued)

Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History –V1	Percentage Less than Target	Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History –V1	Percentage Less than Target
0.195	0.0361	0.0385	-	0.436	0.1139	0.1264	-
0.2	0.0381	0.0418	-	0.447	0.1165	0.129	-
0.204	0.0404	0.0452	-	0.457	0.1191	0.1269	-
0.209	0.0427	0.0481	-	0.468	0.1218	0.1199	1.58%
0.214	0.0452	0.0506	-	0.479	0.1246	0.1203	3.57%
0.219	0.0478	0.0524	-	0.49	0.1274	0.1376	-
0.5	0.13	0.1467	-	1.096	0.2019	0.2192	-
0.501	0.1302	0.1473	-	1.122	0.2045	0.2209	-
0.513	0.1319	0.1506	-	1.148	0.2072	0.2163	-
0.525	0.1336	0.1484	-	1.175	0.2099	0.2277	-
0.537	0.1353	0.138	-	1.202	0.2126	0.2264	-
0.55	0.1371	0.1486	-	1.23	0.2154	0.229	-
0.562	0.1388	0.1578	-	1.259	0.2182	0.238	-
0.575	0.1407	0.1568	-	1.288	0.221	0.2453	-
0.589	0.1425	0.1451	-	1.318	0.2239	0.2505	-
0.603	0.1443	0.1558	-	1.349	0.2268	0.2532	-
0.617	0.1462	0.1615	-	1.38	0.2297	0.2529	-
0.631	0.1481	0.1624	-	1.412	0.2327	0.2504	-
0.646	0.15	0.1613	-	1.445	0.2357	0.2466	-
0.661	0.152	0.1599	-	1.479	0.2388	0.2494	-
0.676	0.154	0.1597	-	1.514	0.2419	0.2577	-
0.692	0.156	0.1632	-	1.549	0.245	0.2626	-
0.708	0.158	0.1774	-	1.585	0.2482	0.2612	-
0.724	0.16	0.1746	-	1.622	0.2514	0.263	-
0.741	0.1621	0.1669	-	1.659	0.2547	0.2671	-
0.759	0.1642	0.1656	-	1.698	0.258	0.2677	-
0.776	0.1663	0.1654	0.54%	1.738	0.2614	0.271	-
0.794	0.1685	0.169	-	1.778	0.2648	0.2946	-
0.813	0.1707	0.1762	-	1.82	0.2682	0.2794	-

Table 3H.6-2f Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (Vertical Time History) (Continued)

Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History –V1	Percentage Less than Target	Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History –V1	Percentage Less than Target
0.832	0.1729	0.1823	-	1.862	0.2717	0.2976	-
0.851	0.1752	0.19	-	1.905	0.2752	0.3047	-
0.871	0.1775	0.192	-	1.95	0.2788	0.2924	-
0.891	0.1798	0.1986	-	1.995	0.2824	0.3099	-
0.912	0.1821	0.1913	-	2.042	0.2861	0.3248	-
0.933	0.1845	0.2081	-	2.089	0.2898	0.3319	-
0.955	0.1868	0.205	-	2.138	0.2936	0.3319	-
0.977	0.1893	0.1905	-	2.188	0.2974	0.3102	-
1	0.1917	0.2056	-	2.239	0.3012	0.3101	-
1.023	0.1942	0.2134	-	2.291	0.3052	0.3294	-
1.047	0.1967	0.2171	-	2.344	0.3091	0.337	-
1.071	0.1993	0.2166	-	2.399	0.3131	0.335	-
2.455	0.3172	0.3366	-	5.249	0.3656	0.3918	-
2.5	0.3205	0.3425	-	5.371	0.3645	0.387	-
2.512	0.3213	0.3443	-	5.495	0.3633	0.3886	-
2.571	0.3255	0.3509	-	5.624	0.3621	0.396	-
2.63	0.3297	0.3536	-	5.754	0.3609	0.3873	-
2.692	0.334	0.3613	-	5.889	0.3598	0.3866	-
2.754	0.3384	0.367	-	6.024	0.3586	0.4048	-
2.818	0.3427	0.3586	-	6.165	0.3575	0.406	-
2.884	0.3472	0.3755	-	6.309	0.3563	0.4029	-
2.952	0.3517	0.3927	-	6.456	0.3552	0.3828	-
3.02	0.3563	0.3983	-	6.605	0.354	0.3716	-
3.09	0.3609	0.3991	-	6.761	0.3529	0.3809	-
3.163	0.3656	0.4006	-	6.92	0.3517	0.3851	-
3.236	0.3703	0.4073	-	7.077	0.3506	0.3867	-
3.311	0.3752	0.4222	-	7.246	0.3495	0.3685	-
3.389	0.38	0.4347	-	7.413	0.348	0.3488	-
3.467	0.385	0.4162	-	7.587	0.347	0.3884	-

Table 3H.6-2f Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (Vertical Time History) (Continued)

Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History –V1	Percentage Less than Target	Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History –V1	Percentage Less than Target
3.549	0.3863	0.3931	-	7.764	0.346	0.3934	-
3.631	0.385	0.419	-	7.943	0.345	0.3712	-
3.715	0.3838	0.4216	-	8.13	0.344	0.367	-
3.802	0.3825	0.4112	-	8.319	0.343	0.3804	-
3.891	0.3813	0.4072	-	8.511	0.342	0.3669	-
3.981	0.3801	0.3966	-	8.711	0.341	0.3589	-
4.073	0.3788	0.4033	-	8.913	0.339	0.3563	-
4.168	0.3776	0.4212	-	9.124	0.336	0.3603	-
4.266	0.3764	0.4112	-	9.328	0.33	0.3554	-
4.365	0.3752	0.3923	-	9.551	0.324	0.347	-
4.466	0.374	0.3998	-	9.775	0.319	0.3497	-
4.57	0.3728	0.4	-	10	0.314	0.3288	-
4.677	0.3716	0.4118	-	10.235	0.308	0.3309	-
4.787	0.3704	0.4134	-	10.471	0.303	0.3334	-
4.897	0.3692	0.3894	-	10.718	0.298	0.3315	-
5	0.3681	0.395	-	10.965	0.293	0.325	-
5.013	0.368	0.3967	-	11.223	0.288	0.3163	-
5.128	0.3668	0.3969	-	11.481	0.283	0.3117	-
11.751	0.278	0.2999	-	25.707	0.1563	0.1818	-
12.019	0.274	0.2913	-	26.316	0.1537	0.1875	-
12.3	0.269	0.2869	-	26.882	0.1511	0.1815	-
12.594	0.265	0.2927	-	27.548	0.1485	0.1748	-
12.887	0.26	0.2874	-	28.169	0.146	0.16	-
13.175	0.256	0.275	-	28.818	0.1436	0.1496	-
13.495	0.252	0.2691	-	29.499	0.1412	0.1518	-
13.812	0.247	0.259	-	30.211	0.1388	0.1547	-
14.124	0.243	0.2489	-	30.864	0.1365	0.1535	-
14.451	0.239	0.25	-	31.646	0.1342	0.1592	-
14.793	0.235	0.2586	-	32.362	0.1319	0.1541	-

Table 3H.6-2f Comparison of Spectral Accelerations for Target 5% Damped Spectrum and Synthetic Time History Spectrum (Vertical Time History) (Continued)

Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History –V1	Percentage Less than Target	Frequency (Hz)	Target Spectral Acceleration	Spectral Acceleration from Time History –V1	Percentage Less than Target
15.129	0.231	0.2559	-	33.113	0.13	0.1483	-
15.48	0.227	0.2509	-	33.898	0.13	0.143	-
15.848	0.223	0.2382	-	34.722	0.13	0.1367	-
16.207	0.22	0.2358	-	35.461	0.13	0.1336	-
16.584	0.216	0.239	-	36.364	0.13	0.1332	-
16.978	0.212	0.2318	-	37.175	0.13	0.1362	-
17.391	0.209	0.22	-	38.023	0.13	0.1393	-
17.794	0.205	0.2173	-	38.911	0.13	0.1423	-
18.182	0.202	0.2192	-	39.841	0.13	0.1447	-
18.622	0.198	0.2165	-	40.816	0.13	0.1461	-
19.048	0.195	0.2141	-	41.667	0.13	0.1425	-
19.493	0.1917	0.2073	-	42.735	0.13	0.1389	-
19.96	0.1884	0.2038	-	43.668	0.13	0.1358	-
20.408	0.1853	0.2047	-	44.643	0.13	0.1318	-
20.877	0.1821	0.2039	-	45.662	0.13	0.1332	-
21.368	0.1791	0.2043	-	46.729	0.13	0.1337	-
21.882	0.176	0.1998	-	47.847	0.13	0.1338	-
22.371	0.1731	0.1925	-	49.02	0.13	0.1341	-
22.883	0.1702	0.1813	-	50.251	0.13	0.1346	-
23.419	0.1673	0.175	-				-
23.981	0.1645	0.165	-				-
24.57	0.1617	0.169	-				-
25	0.1595	0.1752	-				-
25.126	0.159	0.1783	-				-

Table 3H.6-3 Dominant UHS and RSW Pump House Natural Frequencies

Dominant Modes in the Global X Direction				
		Mass Participation Ratios		
Mode	**Frequency**	**UX**	**UY**	**UZ**
	(Hz)	**Unitless**	**Unitless**	**Unitless**
1	2.1333	0.1708	0.0000	0.0000
177	14.6380	0.0624	0.0002	0.0006
106	9.5127	0.0369	0.0000	0.0000
105	9.3212	0.0289	0.0172	0.0001
78	7.2357	0.0250	0.0001	0.0000
128	11.2070	0.0199	0.0000	0.0000
76	7.1367	0.0186	0.0001	0.0000
108	9.7128	0.0128	0.0057	0.0016
126	11.0900	0.0126	0.0000	0.0000
113	10.2520	0.0115	0.0001	0.0001
175	14.5110	0.0110	0.0014	0.0015
110	9.9664	0.0082	0.0258	0.0011

Table 3H.6-3 Dominant UHS and RSW Pump House Natural Frequencies (Continued)

Dominant Modes in the Global Y Direction				
		Mass Participation Ratios		
Mode	**Frequency**	**UX**	**UY**	**UZ**
	(Hz)	**Unitless**	**Unitless**	**Unitless**
4	3.1868	0.0000	0.1540	0.0000
100	8.6950	0.0000	0.0333	0.0005
110	9.9664	0.0082	0.0258	0.0011
8	3.4590	0.0000	0.0245	0.0000
147	12.2000	0.0005	0.0242	0.0000
5	3.2757	0.0000	0.0203	0.0000
206	16.5550	0.0001	0.0200	0.0000
102	8.9222	0.0004	0.0197	0.0000
105	9.3212	0.0289	0.0172	0.0001
10	3.7385	0.0000	0.0114	0.0000
66	6.5724	0.0005	0.0109	0.0000
16	4.2676	0.0000	0.0106	0.0000

Table 3H.6-3 Dominant UHS and RSW Pump House Natural Frequencies (Continued)

Dominant Modes in the Global Z Direction				
		Mass Participation Ratios		
Mode	Frequency	UX	UY	UZ
	(Hz)	Unitless	Unitless	Unitless
116	10.7170	0.0000	0.0000	0.0447
120	10.8670	0.0006	0.0000	0.0107
307	21.5020	0.0000	0.0001	0.0067
121	10.8740	0.0001	0.0000	0.0043
99	8.6652	0.0001	0.0076	0.0042
298	20.7030	0.0002	0.0001	0.0041
323	22.2650	0.0000	0.0001	0.0037
131	11.3300	0.0001	0.0009	0.0033
363	24.9310	0.0002	0.0001	0.0032
273	19.4390	0.0001	0.0000	0.0030
203	16.3860	0.0008	0.0000	0.0027
184	15.2450	0.0005	0.0000	0.0026

Table 3H.6-4 Maximum Accelerations and Displacements for UHS and RSW Pump House

Description of Location	Elevation with Respect to Top of Pump House Mat	Maximum Acceleration (g)			Maximum Displacements Relative to Pump House Mat (inches)		
		E-W (X)	N-S (Y)	Vertical (Z)	E-W (X)	N-S (Y)	Vertical (Z)
Top of Pump House Mat	0	0.117	0.128	0.137	0.03	0.05	0.10
Pump House Operating Floor	32'-0"	0.122	0.140	0.541	0.07	0.09	0.11
Pump House Roof	68'-0"	0.121	0.149	0.417	0.09	0.17	0.11
Top of UHS Mat	32'-0"	0.125	0.144	0.133	0.12	0.14	0.12
Top of UHS Basin Walls	115'-6"	0.145	0.175	0.137	0.17	0.27	0.13
Bottom of Cooling Tower Walls	115'-6"	0.438	0.391	0.291	1.65	0.86	0.13
Mid-Level of Cooling Tower Walls	143'-3"	0.657	0.459	0.303	2.14	0.95	0.14
Top of Cooling Tower Walls	171'-0"	0.460	0.499	0.330	1.72	1.01	0.14

Table 3H.6-5 Factors of Safety Against Sliding, Overturning, and Flotation for UHS Basin and RSW Pump House

Load Combination	Calculated Safety Factor			Notes
	Overturning	Sliding	Flotation	
D + F’	---	---	1.77	2, 3
D + H + W	2.15	11.5	---	2, 3
D + H + Wt	2.11	7.2	---	2, 3
D + H + E’	1.47	1.11	---	2, 3, 4, 5, 6

Notes:

(1) Loads D, H, W, Wt, and E’ are defined in Subsection 3H.6.4.3.4.1. F’ is the buoyant force corresponding to the design basis flood.

(2) Reported safety factors are conservatively based on considering empty weight of the UHS Basin.

(3) Coefficients of friction for sliding resistance are 0.3 under the RSW Pump House and 0.4 under the UHS Basin

(4) The calculated safety factor for sliding requires less than half of the available passive pressure to be engaged for sliding resistance

(5) The seismic values considered for stability are based on the full basin case and the empty basin case.

(6) The seismic sliding forces and overturning moments from SSI analysis are less than the seismic sliding forces and overturning moments used in the stability evaluations.

Table 3H.6-6 Results of RSW Piping Tunnel Design

Location [4]	Item	Thickness (ft)	Governing Load Combination	Design Moment (kip-ft/ft)	Design Shear (kip/ft)	Area of Reinforcement (in^2/ft)			
						Moment Reinforcement [1]		Shear Reinforcement	
						Required	Provided (both faces)	Required	Provided
Main Tunnel	Exterior Wall	3'-0"	D+Lo+F+H'+E'	226.78	36.52	1.56 (vertical)	1.56 (vertical)	None	None
	Roof Slab	3'-0"	1.4D+1.7L+1.4F+1.7H	55.90	11.29	0.7 (east-west)	0.79 (east-west)	None	None
	Interior Slab	2'-0"	D+Lo+F+H'+E' [2]	95.22	13.16	1.13 (east-west)	1.27 (east-west)	None	None
	Basemat	3'-0"	D+Lo+F+H'+E' [2]	123.94	19.10	0.97 (east-west)	1.00 (east-west)	None	None
North End of Main Tunnel (~~near~~West of Control Building)	Exterior Wall	3'-0"	D+Lo+F+H'+E'	543.34	59.39	4.27 (east-west)	4.68 (east-west)	0.19	0.20
	Interior Wall	2'-0"	D+Lo+F+H'+E' [2]	152.15	19.96	1.69 (east-west)	2.25 (east-west)	None	None
	Roof Slab	3'-0"	1.4D+1.7L+1.4F+1.7H	86.64	15.29	0.70 (east-west)	0.79 (east-west)	None	None
	Interior Slab	2'-0"	D+Lo+F+H'+E' [2]	136.30	18.03	1.49 (east-west)	2.25 (east-west)	None	None
	Basemat	3'-0"	1.4D+1.7L+1.4F+1.7H	70.42	28.27	0.36 (north-south)	0.79 (north-south)	None	None
			1.4D+1.7L+1.4F+1.7H	155.74	36.39	1.16 (east-west)	1.27 (east-west)	None	None
Main Tunnel (~~near~~in Access Region 1)	Basemat	3'-0"	1.4D+1.7L+1.4F+1.7H	46.60	20.54	0.70 (north-south)	0.79 (north-south)	None	None

Table 3H.6-6 Results of RSW Piping Tunnel Design (Continued)

Location [4]	Item	Thickness (ft)	Governing Load Combination	Design Moment (kip-ft/ft)	Design Shear (kip/ft)	Area of Reinforcement (in^2/ft)			
						Moment Reinforcement [1]		Shear Reinforcement	
						Required	Provided (both faces)	Required	Provided
Main Tunnel (~~near~~In Access Region 2)	Exterior Wall	3'-0"	D+Lo+F+H'+E'	321.96	29.22	2.21 (vertical)	2.25 (vertical)	None	None
				214.84	29.22	1.40 (horizontal)	1.56 (horizontal)	None	None
	Basemat	6'-0"	D+Lo+F+H'+E' [2]	530.76	66.74	1.66 (east-west)	2.25 (east-west)	None	None
			1.4D+1.7L+1.4F+1.7H / D+Lo+F+H'+E' [2]	500.50	66.74	1.78 (north-south)	2.25 (north-south)	None	None
Main Tunnel (~~near~~In Access Region 3) North of Pump House	Exterior Wall	3'-0"	D+Lo+F+H'+E'	245.29	36.52	1.76 (vertical)	3.12 (vertical)	None	None
	Roof Slab	3'-0"	1.4D+1.7L+1.4F+1.7H	344.53	37.20	2.56 (north-south)	4.68 (north-south)	None	None
	Interior Slab	2'-0"	D+Lo+F+H'+E' [2]	150.97	19.29	1.70 (north-south)	3.12 (north-south)	None	None
	Basemat	3'-0"	1.4D+1.7L+1.4F+1.7H	236.52	38.12	1.74 (north-south)	3.12 (north-south)	0.18	0.20

Notes:

(1) Unless noted otherwise, the required reinforcement in the direction not reported in the table is controlled by the minimum required reinforcement. The minimum required reinforcement for 2'-0" thick and 3'-0" thick elements is 0.36 in^2/ft and 0.54 in^2/ft. For such casees the provided reinforcement is 0.79 in^2/ft.

(2) The loading also includes loads due to internal flooding.

Table 3H.6-6 Results of RSW Piping Tunnel Design (Continued)

Location (4)	Item	Thickness (ft)	Governing Load Combination	Design Moment (kip-ft/ft)	Design Shear (kip/ft)	Area of Reinforcement (in^2/ft)			
						Moment Reinforcement (1)		Shear Reinforcement	
						Required	Provided (both faces)	Required	Provided

(3) ~~The following additional reinforcement is required due to SSE Wave Propagation:~~In addition to the reinforcement shown within this table, the following reinforcement is required due to SSE Wave Propagation:

- ~~For the Main Tunnel, #8 bars at 12" o.c. in the longitudinal direction of the Main Tunnel for 84' 0 (measured north from the centerline of the Main Tunnel and Access Region 3)~~For the Main Tunnel, 0.79 in2/ft (applied to both faces of the walls and slabs) in the north-south direction of the Main Tunnel for 84'-0" (measured north from the centerline of the intersection of the Main Tunnel and Access Region 3)
- ~~For Access Region 3 from 0' 0" to 56' 0" (measured east from the centerline of the intersection of the Main Tunnel and Access Region 3)~~For Access Region 3 from 0'-0" to 56'-0" (measured east from the centerline of the intersection of the Main Tunnel and Access Region 3), 1.56 in2/ft (applied to both faces of the roof, interior slab, and basemat) in the north-south direction
  - (i) ~~Second layer of #11 bars at 12" o.c. in the transverse direction applied to both faces of the roof~~
  - (ii) ~~Second layer of #11 bars at 12" o.c. in the transverse direction applied to both faces of the interior slab~~
  - (iii) ~~Second layer of #11 bars at 12" o.c. in the transverse direction applied to both faces of the basemat~~
- ~~For Access Region 3 from 56' 0" to 103' 0" (measured east from the centerline of the intersection of the Main Tunnel and Access Region 3)~~For Access Region 3 from 56'-0" to 103'-0" (measured east from the centerline of the intersection of the Main Tunnel and Access Region 3), 1.56 in2/ft (applied to both faces of the roof and basemat) in the north-south direction
  - (i) ~~Second layer of #11 bars at 12" o.c. in the transverse direction applied to both faces of the roof~~
  - (ii) ~~Second layer of #11 bars at 12" o.c. in the transverse direction applied to both faces of the basemat~~

(4) Refer to Figure 3H.6-248 for plan view of the RSW Tunnel

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane Shear (5) (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Pump House North Wall	6	North (outside)	Horizontal	3H.6-51	1-H-L	MTCM	2923	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	371	-413	D + L + F + H' + T + E'	32	7.8	-	-	-	-	-	-	-
						MCCM	2914	D + L + F + H' + T + E'	-179	-25										
						MMAT	2921	D + L + F + H' + T + E'	128	-548										
						MMAC	2945	D + L + F + H' + T + E'	-56	-528										
					2-H-L	MTCM	5425	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	149	-16	D + L + F + H' + T + E'	118	4.68	-	-	-	-	-	-	-
						MCCM	5482	D + L + F + H' + T + E'	-297	-615										
						MMAT	4082	D + L + F + H' + T + E'	0	-734										
						MMAC	5580	D + L + F + H' + T + E'	-131	-774										
			Vertical	3H.6-52	1-V-L	MTCM	5586	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	186	-199	D + L + F + H' + T + E'	126	4.68	-	-	-	-	-	-	-
						MCCM	3650	D + L + F + H' + T + E'	-244	-180										
						MMAT	5555	D + L + F + H' + T + E'	3	-490										
						MMAC	5555	D + L + F + H' + T + E'	-63	-499										
					2-V-L	MTCM	5570	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	271	-539	D + L + F + H' + T + E'	126	7.8	-	-	-	-	-	-	-
						MCCM	3642	D + L + F + H' + T + E'	-281	-382										
						MMAT	5541	D + L + F + H' + T + E'	3	-1198										
						MMAC	4101	D + L + F + H' + T + E'	-149	-1229										
		South (inside)	Horizontal	3H.6-53	1-H-L	MTCM	2902	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	324	126	D + L + F + H' + T + E'	33	6.24	-	-	-	-	-	-	-
						MCCM	5481	D + L + F + H' + T + E'	-288	108										
						MMAT	2914	D + L + F + H + To + Wt	86	348										
						MMAC	3708	D + L + F + H' + T + E'	-139	360										
					2-H-L	MTCM	5262	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	114	13	D + L + F + H' + T + E'	118	3.12	-	-	-	-	-	-	-
						MCCM	5477	D + L + F + H' + T + E'	-239	151										
						MMAT	3707	D + L + F + H' + T + E'	9	324										
						MMAC	3653	D + L + F + H' + T + E'	-70	441										
			Vertical	3H.6-54	1-V-L	MTCM	3642	D + L + F + H' + T + E'	207	55	D + L + F + H' + T + E'	126	4.68	-	-	-	-	-	-	-
						MCCM	3642	D + L + F + H' + T + E'	-281	56										
						MMAT	5435	D + L + F + H' + T + E'	6	468										
						MMAC	3689	D + L + F + H' + T + E'	-147	481										
		-	Transverse (Horizontal and Vertical)	3H.6-55	1-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-11	15	-121	-46	0.20	
					2-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-65	437	-4	77	0.31	
					3-T	-	-	-	-	-	-	-	-	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	38	218	-118	446	0.44	
Pump House East Wall	6	East (outside)	Horizontal	3H.6-56	1-H-L	MTCM	3222	D + L + F + H' + T + E'	657	-170	D + L + F + H' + T + E'	155	12.48	-	-	-	-	-	-	(8)
						MCCM	3222	D + L + F + H' + T + E'	-750	-67										
						MMAT	3222	D + L + F + H' + T + E'	657	-816										
						MMAC	3222	D + L + F + H' + T + E'	-337	-816										
					2-H-L	MTCM	3079	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	246	-20	D + L + F + H' + T + E'	155	4.68	-	-	-	-	-	-	-
						MCCM	3079	D + L + F + H' + T + E'	-352	-31										
						MMAT	3121	D + L + F + H' + T + E'	61	-271										
						MMAC	3121	D + L + F + H' + T + E'	-51	-404										
					3-H-L	MTCM	8893	D + L + F + H' + T + E'	163	-65	D + L + F + H' + T + E'	263	6.24	-	-	-	-	-	-	-
						MCCM	8827	D + L + F + H' + T + E'	-645	-77										
						MMAT	8829	D + L + F + H' + T + E'	62	-678										
						MMAC	8823	D + L + F + H' + T + E'	-112	-906										
			Vertical	3H.6-57	1-V-L	MTCM	3221	D + L + F + H' + T + E'	484	-197	D + L + F + H' + T + E'	308	10.92	-	-	-	-	-	-	(8)
						MCCM	8825	D + L + F + H' + T + E'	-884	-159										
						MMAT	8813	D + L + F + H' + T + E'	120	-681										
						MMAC	8814	D + L + F + H' + T + E'	-144	-705										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Pump House East Wall (Cont'd)	6	East (outside)	Vertical	3H.6-57	2-V-L	MTCM	3226	D + L + F + H' + T + E'	215	-134	D + L + F + H' + T + E'	247	6.24	-	-	-	-	-	-	-
						MCCM	8853	D + L + F + H' + T + E'	-521	-162										
						MMAT	8854	D + L + F + H' + T + E'	62	-531										
						MMAC	8854	D + L + F + H' + T + E'	-349	-842										
					3-V-L	MTCM	6526	D + L + F + H' + T + E'	76	-30	D + L + F + H' + T + E'	175	3.12	-	-	-	-	-	-	-
						MCCM	6359	D + L + F + H' + T + E'	-306	-61										
						MMAT	3097	D + L + F + H' + T + E'	36	-299										
						MMAC	6491	D + L + F + H' + T + E'	-112	-344										
					4-V-L	MTCM	6556	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	190	-97	D + L + F + H' + T + E'	115	6.24	-	-	-	-	-	-	-
						MCCM	6528	D + L + F + H' + T + E'	-264	-92										
						MMAT	6568	D + L + F + H' + T + E'	109	-229										
						MMAC	6547	D + L + F + H' + T + E'	-50	-221										
					5-V-L	MTCM	6520	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	242	-411	D + L + F + H' + T + E'	247	6.24	-	-	-	-	-	-	-
						MCCM	6349	D + L + F + H' + T + E'	-440	-653										
						MMAT	6518	D + L + F + H' + T + E'	9	-536										
						MMAC	8869	D + L + F + H' + T + E'	-251	-884										
		West (inside)	Horizontal	3H.6-58	1-H-L	MTCM	3222	D + L + F + H' + T + E'	605	40	D + L + F + H' + T + E'	155	12.48	-	-	-	-	-	-	(8)
						MCCM	3222	D + L + F + H' + T + E'	-814	868										
						MMAT	3222	D + L + F + H' + T + E'	180	868										
						MMAC	3222	D + L + F + H' + T + E'	-814	868										
					2-H-L	MTCM	3088	D + L + F + H' + T + E'	262	129	D + L + F + H' + T + E'	155	4.68	-	-	-	-	-	-	-
						MCCM	3088	D + L + F + H' + T + E'	-301	46										
						MMAT	3100	D + L + F + H' + T + E'	27	357										
						MMAC	3100	D + L + F + H' + T + E'	-92	357										
					3-H-L	MTCM	8894	D + L + F + H' + T + E'	168	179	D + L + F + H' + T + E'	194	4.68	-	-	-	-	-	-	-
						MCCM	8829	D + L + F + H' + T + E'	-514	502										
						MMAT	8922	D + L + F + H' + T + E'	57	415										
						MMAC	8829	D + L + F + H' + T + E'	-493	582										
					4-H-L	MTCM	8827	1.4D + 1.4F + 1.7H + 1.7W	62	65	D + L + F + H' + T + E'	263	6.24	-	-	-	-	-	-	-
						MCCM	8827	D + L + F + H' + T + E'	-645	204										
						MMAT	8851	D + L + F + H' + T + E'	6	617										
						MMAC	8881	D + L + F + H' + T + E'	-470	982										
			Vertical	3H.6-59	1-V-L	MTCM	3222	D + L + F + H' + T + E'	640	146	D + L + F + H' + T + E'	308	15.6	-	-	-	-	-	-	(8)
						MCCM	8825	D + L + F + H' + T + E'	-884	1232										
						MMAT	8825	D + L + F + H' + T + E'	-	-										
						MMAC	8825	D + L + F + H' + T + E'	-283	1815										
					2-V-L	MTCM	3226	D + L + F + H' + T + E'	199	51	D + L + F + H' + T + E'	247	9.36	-	-	-	-	-	-	-
						MCCM	8853	D + L + F + H' + T + E'	-535	833										
						MMAT	8854	D + L + F + H' + T + E'	2	1176										
						MMAC	8853	D + L + F + H' + T + E'	-491	1604										
					3-V-L	MTCM	3241	D + L + F + H' + T + E'	60	40	D + L + F + H' + T + E'	234	6.24	-	-	-	-	-	-	-
						MCCM	8900	D + L + F + H' + T + E'	-367	62										
						MMAT	6397	D + L + F + H' + T + E'	1	590										
						MMAC	8880	D + L + F + H' + T + E'	-294	651										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads – Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads – Load Combination	Horizontal Section – Transverse Shear Force (kip / ft)	Horizontal Section – Corresponding Axial Force (kip / ft)	Vertical Section – Transverse Shear Force (kip / ft)	Vertical Section – Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Pump House East Wall (Cont'd)	6	West (inside)	Vertical	3H.6-59	4-V-L	MTCM	6444	D + L + F + H' + T + E'	46	202	D + L + F + H' + T + E'	175	4.68	-	-	-	-	-	-	-
						MCCM	6355	D + L + F + H' + T + E'	-328	20										
						MMAT	6456	D + L + F + H' + T + E'	1	533										
						MMAC	3097	D + L + F + H' + T + E'	-86	551										
					5-V-L	MTCM	6526	D + L + F + H' + T + E'	76	35	D + L + F + H' + T + E'	120	3.12	-	-	-	-	-	-	-
						MCCM	6522	D + L + F + H' + T + E'	-244	217										
						MMAT	6503	D + L + F + H' + T + E'	4	308										
						MMAC	3106	D + L + F + H' + T + E'	-46	321										
					6-V-L	MTCM	6520	D + L + F + H' + T + E'	211	118	D + L + F + H' + T + E'	115	4.68	-	-	-	-	-	-	-
						MCCM	6520	D + L + F + H' + T + E'	-300	164										
						MMAT	6520	D + L + F + H' + T + E'	2	222										
						MMAC	6520	D + L + F + H' + T + E'	-239	228										
		-	Transverse (Horizontal and Vertical)	3H.6-60	1-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	41	34	154	542	0.60	
					2-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-130	-205	-354	-47	1.24	
					3-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	49	23	78	476	0.44	
					4-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	43	32	37	436	0.31	
					5-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	327	-118	328	-308	1.76	
					6-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-58	363	2	89	0.20	
Pump House South Wall	6	North (inside)	Horizontal	3H.6-61	1-H-L	MTCM	5788	D + L + F + H' + T + E'	249	-63	D + L + F + H' + T + E'	235	6.24	-	-	-	-	-	-	-
						MCCM	5611	D + L + F + H' + T + E'	-1115	-117										
						MMAT	5784	D + L + F + H' + T + E'	6	-639										
						MMAC	5784	D + L + F + H' + T + E'	-89	-639										
			Vertical	3H.6-62	1-V-L	MTCM	5784	D + L + F + H' + T + E'	149	-192	D + L + F + H' + T + E'	222	6.24	-	-	-	-	-	-	-
						MCCM	5607	D + L + F + H' + T + E'	-767	-238										
						MMAT	5783	D + L + F + H' + T + E'	0	-492										
						MMAC	5783	D + L + F + H' + T + E'	-230	-663										
					2-V-L	MTCM	5786	D + L + F + H' + T + E'	243	-611	D + L + F + H' + T + E'	222	9.36	-	-	-	-	-	-	-
						MCCM	5609	D + L + F + H' + T + E'	-1036	-801										
						MMAT	5786	D + L + F + H' + T + E'	126	-1204										
						MMAC	5786	D + L + F + H' + T + E'	-605	-1401										
		South (outside)	Horizontal	3H.6-63	1-H-L	MTCM	5783	D + L + F + H' + T + E'	97	205	D + L + F + H' + T + E'	235	6.24	-	-	-	-	-	-	-
						MCCM	5608	D + L + F + H' + T + E'	-628	192										
						MMAT	5784	D + L + F + H' + T + E'	25	712										
						MMAC	5784	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-163	785										
			Vertical	3H.6-64	1-V-L	MTCM	5607	D + L + F + H' + T + E'	164	186	D + L + F + H' + T + E'	222	6.24	-	-	-	-	-	-	-
						MCCM	5607	D + L + F + H' + T + E'	-722	17										
						MMAT	5774	D + L + F + H' + T + E'	0	578										
						MMAC	5757	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-281	1198										
		-	Transverse (Horizontal and Vertical)	3H.6-65	1-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	42	-178	142	51	0.31	
					2-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	13	-145	126	46	0.20	
Pump House West Wall	6	West (outside)	Horizontal	3H.6-66	1-H-L	MTCM	3273	D + L + F + H' + T + E'	462	-106	D + L + F + H + To + Wt	124	6.24	-	-	-	-	-	-	-
						MCCM	6229	D + L + F + H' + T + E'	-252	-58										
						MMAT	3028	D + L + F + H' + T + E'	59	-407										
						MMAC	6169	D + L + F + H' + T + E'	-122	-704										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number [1]	Reinforcement Zone Number [2]	Maximum Forces [3]	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial [4] (kips / ft)	Flexure [4] (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane [5] Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Pump House West Wall (Cont'd)	6	West (outside)		3H.6-66	2-H-L	MTCM	3291	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	974	-529	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	98	14.04	-	-	-	-	-	-	-
						MCCM	3291	D + L + F + H' + T + E'	-360	-356										
						MMAT	3291	D + L + F + H' + T + E'	712	-743										
						MMAC	3290	D + L + F + H' + T + E'	-19	-591										
					3-H-L	MTCM	9052	D + L + F + H' + T + E'	84	-34	D + L + F + H' + T + E'	129	3.12	-	-	-	-	-	-	-
						MCCM	9052	D + L + F + H' + T + E'	-309	-59										
						MMAT	6125	D + L + F + H' + T + E'	4	-200										
						MMAC	6145	D + L + F + H' + T + E'	-158	-742										
					4-H-L	MTCM	3280	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	429	-56	D + L + F + H' + T + E'	129	6.24	-	-	-	-	-	-	-
						MCCM	9136	D + L + F + H' + T + E'	-735	-468										
						MMAT	9138	D + L + F + H' + T + E'	7	-803										
						MMAC	9138	D + L + F + H' + T + E'	-171	-900										
			Vertical	3H.6-67	1-V-L	MTCM	6125	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	317	-384	D + L + F + H' + T + E'	75	7.8	-	-	-	-	-	-	-
						MCCM	6157	D + L + F + H' + T + E'	-233	-26										
						MMAT	6126	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	69	-458										
						MMAC	6126	D + L + F + H' + T + E'	-41	-341										
					2-V-L	MTCM	6151	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	84	-75	D + L + F + H' + T + E'	132	3.12	-	-	-	-	-	-	-
						MCCM	9042	D + L + F + H' + T + E'	-202	-8										
						MMAT	3073	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	19	-348										
						MMAC	6321	D + L + F + H' + T + E'	-127	-408										
					3-V-L	MTCM	6131	D + L + F + H' + T + E'	64	-101	D + L + F + H' + T + E'	132	4.68	-	-	-	-	-	-	-
						MCCM	9037	D + L + F + H' + T + E'	-315	-206										
						MMAT	6127	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	26	-528										
						MMAC	6293	D + L + F + H' + T + E'	-165	-696										
					4-V-L	MTCM	3283	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	222	-188	D + L + F + H' + T + E'	115	4.68	-	-	-	-	-	-	-
						MCCM	9110	D + L + F + H' + T + E'	-285	-315										
						MMAT	9105	D + L + F + H' + T + E'	5	-694										
						MMAC	9105	D + L + F + H' + T + E'	-92	-704										
					5-V-L	MTCM	3290	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	549	-213	D + L + F + H' + T + E'	144	9.36	-	-	-	-	-	-	-
						MCCM	9134	D + L + F + H' + T + E'	-780	-364										
						MMAT	9134	D + L + F + H' + T + E'	256	-916										
						MMAC	9138	D + L + F + H' + T + E'	-340	-1271										
		East (inside)	Horizontal	3H.6-68	1-H-L	MTCM	3276	D + L + F + H' + T + E'	485	49	D + L + F + H + To + Wt	124	6.24	-	-	-	-	-	-	-
						MCCM	9089	D + L + F + H' + T + E'	-315	97										
						MMAT	3268	D + L + F + H' + T + E'	2	261										
						MMAC	9061	D + L + F + H' + T + E'	-145	292										
					2-H-L	MTCM	3291	D + L + F + H' + T + E'	922	153	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	98	12.48	-	-	-	-	-	-	-
						MCCM	3291	D + L + F + H' + T + E'	-360	217										
						MMAT	3291	D + L + F + H' + T + E'	226	820										
						MMAC	3291	D + L + F + H' + T + E'	-126	820										
					3-H-L	MTCM	9087	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	135	57	D + L + F + H' + T + E'	129	3.12	-	-	-	-	-	-	-
						MCCM	9079	D + L + F + H' + T + E'	-422	175										
						MMAT	9077	D + L + F + H' + T + E'	0	267										
						MMAC	9077	D + L + F + H' + T + E'	-355	288										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number [1]	Reinforcement Zone Number [2]	Maximum Forces [3]	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial [4] (kips / ft)	Flexure [4] (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane Shear [5] (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Pump House West Wall (Cont'd)	6	East (inside)	Horizontal	3H.6-68	4-H-L	MTCM	3280	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	424	17	D + L + F + H' + T + E'	129	6.24	-	-	-	-	-	-	-
						MCCM	9134	D + L + F + H' + T + E'	-607	222										
						MMAT	9134	D + L + F + H' + T + E'	21	359										
						MMAC	9134	D + L + F + H' + T + E'	-408	377										
			Vertical	3H.6-69	1-V-L	MTCM	6125	D + L + F + H' + T + E'	209	33	D + L + F + H' + T + E'	75	4.68	-	-	-	-	-	-	-
						MCCM	6161	D + L + F + H' + T + E'	-199	12										
						MMAT	3029	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	7	122										
						MMAC	3029	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-1	121										
					2-V-L	MTCM	6134	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	126	55	D + L + F + H' + T + E'	132	3.12	-	-	-	-	-	-	-
						MCCM	9067	D + L + F + H' + T + E'	-244	68										
						MMAT	6285	D + L + F + H' + T + E'	0	402										
						MMAC	3073	D + L + F + H' + T + E'	-54	425										
					3-V-L	MTCM	9116	D + L + F + H' + T + E'	125	57	D + L + F + H' + T + E'	115	4.68	-	-	-	-	-	-	-
						MCCM	9102	D + L + F + H' + T + E'	-295	308										
						MMAT	9105	D + L + F + H' + T + E'	13	437										
						MMAC	9106	D + L + F + H' + T + E'	-218	739										
					4-V-L	MTCM	3291	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	664	95	D + L + F + H' + T + E'	144	9.36	-	-	-	-	-	-	-
						MCCM	9134	D + L + F + H' + T + E'	-866	1406										
						MMAT	9134	D + L + F + H' + T + E'	4	1105										
						MMAC	9134	D + L + F + H' + T + E'	-866	1406										
		-	Transverse (Horizontal and Vertical)	3H.6-70	1-T	-	-	-	-	-	-	-	-	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-58	69	77	330	0.20	
					2-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	16	100	204	1	0.44	
					3-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-61	343	-92	1213	0.60	
Pump House Internal East Wall	4	East (top)	Horizontal	3H.6-71	1-H-L	MTCM	3246	D + L + F + H' + T + E'	351	-94	D + L + F + H' + T + E'	109	6.24	-	-	-	-	-	-	-
						MCCM	3246	D + L + F + H' + T + E'	-477	-19										
						MMAT	3246	D + L + F + H' + T + E'	194	-119										
						MMAC	3246	D + L + F + H' + T + E'	-304	-119										
					2-H-L	MTCM	3251	D + L + F + H' + T + E'	130	-23	D + L + F + H' + T + E'	186	3.12	-	-	-	-	-	-	-
						MCCM	8939	D + L + F + H' + T + E'	-545	-19										
						MMAT	7016	D + L + F + H (Internal Flood)	5	-147										
						MMAC	6984	D + L + F + H (Internal Flood)	-28	-205										
			Vertical	3H.6-72	1-V-L	MTCM	3246	D + L + F + H' + T + E'	188	-7	D + L + F + H' + T + E'	236	6.24	-	-	-	-	-	-	-
						MCCM	3246	D + L + F + H' + T + E'	-487	-14										
						MMAT	3246	D + L + F + H' + T + E'	58	-21										
						MMAC	8925	D + L + F + H' + T + E'	-191	-199										
					2-V-L	MTCM	3248	D + L + F + H' + T + E'	100	-10	D + L + F + H' + T + E'	199	3.12	-	-	-	-	-	-	-
						MCCM	6800	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-409	-24										
						MMAT	6968	D + L + F + H' + T + E'	38	-99										
						MMAC	6800	D + L + F + H (Internal Flood)	-226	-343										
		West (bottom)	Horizontal	3H.6-73	1-H-L	MTCM	3246	D + L + F + H' + T + E'	333	8	D + L + F + H' + T + E'	109	6.24	-	-	-	-	-	-	-
						MCCM	3246	D + L + F + H' + T + E'	-477	74										
						MMAT	3246	D + L + F + H' + T + E'	198	95										
						MMAC	3246	D + L + F + H' + T + E'	-310	95										
					2-H-L	MTCM	3254	D + L + F + H' + T + E'	126	10	D + L + F + H' + T + E'	186	3.12	-	-	-	-	-	-	-
						MCCM	8937	D + L + F + H' + T + E'	-565	102										
						MMAT	7016	D + L + F + H (Internal Flood)	9	121										
						MMAC	6984	D + L + F + H (Internal Flood)	-21	197										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads – Load Combination	In-plane Shear (5) (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads – Load Combination	Horizontal Section – Transverse Shear Force (kip / ft)	Horizontal Section – Corresponding Axial Force (kip / ft)	Vertical Section – Transverse Shear Force (kip / ft)	Vertical Section – Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Pump House Internal East Wall (Cont'd)	4	West (bottom)	Vertical	3H.6-74	1-V-L	MTCM	3246	D + L + F + H' + T + E'	188	7	D + L + F + H' + T + E'	236	6.24	-	-	-	-	-	-	-
						MCCM	3246	D + L + F + H' + T + E'	-467	5										
						MMAT	3245	D + L + F + H' + T + E'	74	16										
						MMAC	8937	D + L + F + H' + T + E'	-244	146										
					2-V-L	MTCM	3248	D + L + F + H' + T + E'	98	4	D + L + F + H' + T + E'	199	3.12	-	-	-	-	-	-	-
						MCCM	8946	D + L + F + H' + T + E'	-392	16										
						MMAT	6968	D + L + F + H' + T + E'	15	54										
						MMAC	6853	D + L + F + H (Internal Flood)	-109	327										
		-	Transverse (Horizontal and Vertical)	3H.6-74A	1-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-8	100	-26	377	0.20	
Pump House Internal West Wall	4	East (top)	Horizontal	3H.6-75	1-H-L	MTCM	3294	D + L + F + H' + T + E'	275	-46	D + L + F + H' + T + E'	94	4.68	-	-	-	-	-	-	-
						MCCM	3294	D + L + F + H' + T + E'	-410	-57										
						MMAT	3171	D + L + F + H' + T + E'	12	-130										
						MMAC	3171	D + L + F + H' + T + E'	-6	-130										
					2-H-L	MTCM	3299	D + L + F + H' + T + E'	99	-8	D + L + F + H' + T + E'	161	3.12	-	-	-	-	-	-	-
						MCCM	9163	D + L + F + H' + T + E'	-552	-25										
						MMAT	6792	D + L + F + H (Internal Flood)	8	-127										
						MMAC	6760	D + L + F + H (Internal Flood)	-20	-201										
			Vertical	3H.6-76	1-V-L	MTCM	3294	D + L + F + H' + T + E'	139	-16	D + L + F + H' + T + E'	206	4.68	-	-	-	-	-	-	-
						MCCM	9165	D + L + F + H' + T + E'	-465	-29										
						MMAT	3294	D + L + F + H' + T + E'	93	-21										
						MMAC	9161	D + L + F + H' + T + E'	-112	-181										
					2-V-L	MTCM	3296	D + L + F + H' + T + E'	70	-7	D + L + F + H' + T + E'	173	3.12	-	-	-	-	-	-	-
						MCCM	9168	D + L + F + H' + T + E'	-393	-7										
						MMAT	6601	D + L + F + H' + T + E'	1	-57										
						MMAC	6576	D + L + F + H (Internal Flood)	-103	-333										
		West (bottom)	Horizontal	3H.6-77	1-H-L	MTCM	3294	D + L + F + H' + T + E'	275	42	D + L + F + H' + T + E'	94	4.68	-	-	-	-	-	-	-
						MCCM	3294	D + L + F + H' + T + E'	-410	17										
						MMAT	3171	D + L + F + H' + T + E'	12	101										
						MMAC	3171	D + L + F + H' + T + E'	-176	113										
					2-H-L	MTCM	3299	D + L + F + H' + T + E'	99	7	D + L + F + H' + T + E'	161	3.12	-	-	-	-	-	-	-
						MCCM	9161	D + L + F + H' + T + E'	-576	104										
						MMAT	6792	D + L + F + H (Internal Flood)	1	137										
						MMAC	6760	D + L + F + H (Internal Flood)	-28	203										
			Vertical	3H.6-78	1-V-L	MTCM	3294	D + L + F + H' + T + E'	139	6	D + L + F + H' + T + E'	206	4.68	-	-	-	-	-	-	-
						MCCM	9165	D + L + F + H' + T + E'	-465	84										
						MMAT	3294	D + L + F + H' + T + E'	24	23										
						MMAC	9161	D + L + F + H' + T + E'	-325	201										
					2-V-L	MTCM	3296	D + L + F + H' + T + E'	70	6	D + L + F + H' + T + E'	173	3.12	-	-	-	-	-	-	-
						MCCM	9168	D + L + F + H' + T + E'	-394	33										
						MMAT	6744	D + L + F + H' + T + E'	44	89										
						MMAC	6576	D + L + F + H (Internal Flood)	-220	343										
		-	Transverse (Horizontal and Vertical)	3H.6-78A	1-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	6	93	15	399	0.20	

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads – Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads – Load Combination	Horizontal Section – Transverse Shear Force (kip / ft)	Horizontal Section – Corresponding Axial Force (kip / ft)	Vertical Section – Transverse Shear Force (kip / ft)	Vertical Section – Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Pump House Buttresses (9)	6	North (top) South (bottom)	Horizontal	3H.6-79	1-H-L	MTCM	13330	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	220	9	D + L + F + H' + T + E'	218	4.68	-	-	-	-	-	-	-
						MCCM	13461	D + L + F + H' + T + E'	-276	53										
						MMAT	13445	D + L + F + H' + T + E'	89	198										
						MMAC	13451	D + L + F + H' + T + E'	-50	142										
			Vertical	3H.6-80	1-V-L	MTCM	13320	D + L + F + H' + T + E'	188	-90	D + L + F + H' + T + E'	92	4.68	-	-	-	-	-	-	-
						MCCM	13420	D + L + F + H' + T + E'	-281	-99										
						MMAT	13414	D + L + F + H' + T + E'	103	145										
						MMAC	13414	D + L + F + H' + T + E'	-48	143										
					2-V-L	MTCM	13410	D + L + F + H' + T + E'	471	72	D + L + F + H' + T + E'	92	7.8	-	-	-	-	-	-	-
						MCCM	13437	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-321	288										
						MMAT	13437	D + L + F + H' + T + E'	7	475										
						MMAC	13437	D + L + F + H' + T + E'	-127	477										
		-	Transverse (Horizontal and Vertical)	3H.6-81	1-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	38	470	0	76	0.20	-
UHS Basin North Wall	6	North (outside)	Horizontal	3H.6-82	1-H-L	MTCM	6177	D + L + F + H' + T + E'	1005	-246	D + L + F + H' + T + E'	42	12.48	-	-	-	-	-	-	-
						MCCM	5873	D + L + F + H' + T + E'	-294	-499										
						MMAT	5801	D + L + F + H' + T + E'	57	-1311										
						MMAC	5801	D + L + F + H' + T + E'	-133	-1311										
					2-H-L	MTCM	6006	1.4D + 1.7F + 1.3H + 1.4To	648	-139	D + L + F + H' + T + E'	176	9.36	-	-	-	-	-	-	-
						MCCM	2678	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-512	-182										
						MMAT	3939	D + L + F + H' + T + E'	39	-968										
						MMAC	3939	D + L + F + H' + T + E'	-190	-1036										
					3-H-L	MTCM	5796	1.4D + 1.7F + 1.3H + 1.4To	282	-335	D + L + F + H' + T + E'	153	6.24	-	-	-	-	-	-	-
						MCCM	3600	D + L + F + H' + T + E'	-608	-86										
						MMAT	5975	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	66	-533										
						MMAC	3574	1.4D + 1.7F + 1.3H + 1.4To	-48	-477										
			Vertical	3H.6-83	1-V-L	MTCM	2977	D + L + F + H' + T + E'	248	-129	D + L + F + H' + T + E'	139	4.68	-	-	-	-	-	-	-
						MCCM	6108	D + L + F + H' + T + E'	-334	-101										
						MMAT	6108	D + L + F + H' + T + E'	26	-664										
						MMAC	6108	D + L + F + H' + T + E'	-200	-664										
					2-V-L	MTCM	2980	D + L + F + H' + T + E'	259	-190	D + L + F + H' + T + E'	175	6.24	-	-	-	-	-	-	-
						MCCM	6109	D + L + F + H' + T + E'	-320	-41										
						MMAT	6113	D + L + F + H' + T + E'	0	-713										
						MMAC	6113	D + L + F + H' + T + E'	-144	-713										
					3-V-L	MTCM	3004	D + L + F + H' + T + E'	313	-184	D + L + F + H' + T + E'	258	7.8	-	-	-	-	-	-	-
						MCCM	6116	D + L + F + H' + T + E'	-332	-149										
						MMAT	6116	D + L + F + H' + T + E'	76	-736										
						MMAC	6116	D + L + F + H' + T + E'	-189	-736										
					4-V-L	MTCM	3027	D + L + F + H' + T + E'	473	-599	D + L + F + H' + T + E'	249	12.48	-	-	-	-	-	-	-
						MCCM	5998	D + L + F + H' + T + E'	-507	-205										
						MMAT	6124	D + L + F + H' + T + E'	133	-800										
						MMAC	6124	D + L + F + H' + T + E'	-49	-800										
					5-V-L	MTCM	6003	D + L + F + H' + T + E'	281	-59	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	214	6.24	-	-	-	-	-	-	-
						MCCM	6003	D + L + F + H' + T + E'	-284	-61										
						MMAT	4149	D + L + F + H' + T + E'	133	-372										
						MMAC	4149	D + L + F + H' + T + E'	-5	-303										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads					Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads			Load Combination	Horizontal Section		Vertical Section			
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)			Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)		
UHS Basin North Wall (Cont'd)	6	North (outside)	Vertical	3H.6-83	6-V-L	MTCM	6005	D + L + F + H' + T + E'	373	-744	D + L + F + H' + T + E'	222	9.36	-	-	-	-	-	-	-
						MCCM	2469	D + L + F + H' + T + E'	-602	-352										
						MMAT	6005	D + L + F + H' + T + E'	373	-744										
						MMAC	6005	D + L + F + H' + T + E'	-189	-744										
					7-V-L	MTCM	2859	1.4D + 1.7F + 1.3H + 1.4To	143	-152	D + L + F + H' + T + E'	222	6.24	-	-	-	-	-	-	-
						MCCM	2460	D + L + F + H' + T + E'	-558	-157										
						MMAT	3624	D + L + F + H' + T + E'	3	-589										
						MMAC	3600	D + L + F + H' + T + E'	-272	-597										
		South (inside)	Horizontal	3H.6-84	1-H-L	MTCM	2959	1.4D + 1.7F + 1.3H + 1.4To	350	326	D + L + F + H' + T + E'	113	9.36	-	-	-	-	-	-	-
						MCCM	3942	D + L + F + H' + T + E'	-255	368										
						MMAT	2950	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	172	1113										
						MMAC	3938	D + L + F + H' + T + E'	-3	1062										
					2-H-L	MTCM	6177	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	1025	209	D + L + F + H' + T + E'	42	14.04	-	-	-	-	-	-	-
						MCCM	5873	D + L + F + H' + T + E'	-294	193										
						MMAT	7021	D + L + F + H' + T + E'	108	1219										
						MMAC	7021	D + L + F + H' + T + E'	-77	1219										
					3-H-L	MTCM	4005	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	525	417	D + L + F + H' + T + E'	93	9.36	-	-	-	-	-	-	-
						MCCM	3963	D + L + F + H' + T + E'	-344	210										
						MMAT	3002	1.4D + 1.7F + 1.3H + 1.4To	224	900										
						MMAC	3002	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-4	895										
					4-H-L	MTCM	5847	1.4D + 1.7F + 1.3H + 1.4To	175	227	D + L + F + H' + T + E'	149	6.24	-	-	-	-	-	-	-
						MCCM	3600	D + L + F + H' + T + E'	-608	182										
						MMAT	5992	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	58	943										
						MMAC	5992	1.4D + 1.7F + 1.3H + 1.4To	-128	975										
					5-H-L	MTCM	6005	1.4D + 1.7F + 1.3H + 1.4To	664	777	D + L + F + H' + T + E'	176	12.48	-	-	-	-	-	-	-
						MCCM	2610	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-495	99										
						MMAT	3027	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	127	1401										
						MMAC	3027	D + L + F + H' + T + E'	-94	1347										
					6-H-L	MTCM	6093	1.4D + 1.7F + 1.3H + 1.4To	522	61	D + L + F + H' + T + E'	176	12.48	-	-	-	-	-	-	-
						MCCM	3641	D + L + F + H' + T + E'	-384	263										
						MMAT	6964	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	149	1296										
						MMAC	4150	D + L + F + H' + T + E'	-9	1163										
			Vertical	3H.6-85	1-V-L	MTCM	2977	D + L + F + H' + T + E'	248	53	D + L + F + H' + T + E'	139	4.68	-	-	-	-	-	-	-
						MCCM	5846	D + L + F + H' + T + E'	-268	141										
						MMAT	5856	D + L + F + H' + T + E'	28	341										
						MMAC	5828	1.4D + 1.7F + 1.3H + 1.4To	-87	358										
					2-V-L	MTCM	3001	D + L + F + H' + T + E'	309	35	D + L + F + H' + T + E'	211	6.24	-	-	-	-	-	-	-
						MCCM	5918	D + L + F + H' + T + E'	-269	183										
						MMAT	5900	1.4D + 1.7F + 1.3H + 1.4To	23	423										
						MMAC	5900	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-87	476										
					3-V-L	MTCM	3027	D + L + F + H' + T + E'	473	411	D + L + F + H' + T + E'	258	10.92	-	-	-	-	-	-	-
						MCCM	5998	D + L + F + H' + T + E'	-507	713										
						MMAT	5998	D + L + F + H' + T + E'	39	713										
						MMAC	5998	D + L + F + H' + T + E'	-507	713										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin North Wall (Cont'd)	6	South (inside)	Vertical		4-V-L	MTCM	5916	D + L + F + H' + T + E'	243	338	D + L + F + H' + T + E'	258	9.36	-	-	-	-	-	-	-
						MCCM	6101	D + L + F + H' + T + E'	-352	451										
						MMAT	6112	1.4D + 1.7F + 1.3H + 1.4To	35	1265										
						MMAC	6112	1.4D + 1.7F + 1.3H + 1.4To	-12	1298										
					5-V-L	MTCM	6003	D + L + F + H' + T + E'	281	138	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	214	6.24	-	-	-	-	-	-	-
						MCCM	6003	D + L + F + H' + T + E'	-284	114										
						MMAT	7017	D + L + F + H' + T + E'	19	350										
						MMAC	4149	D + L + F + H' + T + E'	-83	366										
					6-V-L	MTCM	6005	D + L + F + H' + T + E'	373	523	D + L + F + H' + T + E'	222	9.36	-	-	-	-	-	-	-
						MCCM	2469	D + L + F + H' + T + E'	-602	591										
						MMAT	6005	D + L + F + H' + T + E'	39	793										
						MMAC	6005	D + L + F + H' + T + E'	-506	793										
					7-V-L	MTCM	2859	1.4D + 1.7F + 1.3H + 1.4To	142	50	D + L + F + H' + T + E'	222	6.24	-	-	-	-	-	-	-
						MCCM	2460	D + L + F + H' + T + E'	-558	147										
						MMAT	3636	D + L + F + H' + T + E'	19	450										
						MMAC	3615	1.4D + 1.7F + 1.3H + 1.4To	-277	945										
		-	Transverse (Horizontal and Vertical)	3H.6-86	1-T	-	-	-	-	-	-	-	-	1.4D + 1.7F + 1.3H + 1.4To	-5	-19	101	138	0.20	
					2-T	-	-	-	-	-	-	-	-	1.4D + 1.7F + 1.3H + 1.4To	16	35	74	362	0.31	
					3-T	-	-	-	-	-	-	-	-	1.4D + 1.7F + 1.3H + 1.4To	-103	238	-100	429	0.80	
UHS Basin South Wall	6	South (outside)	Horizontal	3H.6-87	1-H-L	MTCM	4473	D + L + F + H' + T + E'	607	-301	D + L + F + H' + T + E'	33	10.92	-	-	-	-	-	-	-
						MCCM	4382	D + L + F + H' + T + E'	-329	-544										
						MMAT	4318	D + L + F + H' + T + E'	61	-1117										
						MMAC	4318	D + L + F + H' + T + E'	-128	-1117										
					2-H-L	MTCM	3815	D + L + F + H' + T + E'	275	-187	D + L + F + H' + T + E'	68	6.24	-	-	-	-	-	-	-
						MCCM	3557	D + L + F + H' + T + E'	-362	-250										
						MMAT	3528	D + L + F + H' + T + E'	28	-844										
						MMAC	3528	D + L + F + H' + T + E'	-31	-844										
					3-H-L	MTCM	2201	1.4D + 1.7F + 1.3H + 1.4To	399	-230	D + L + F + H' + T + E'	98	7.8	-	-	-	-	-	-	-
						MCCM	1067	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-237	-110										
						MMAT	2198	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	185	-608										
						MMAC	1741	1.4D + 1.7F + 1.3H + 1.4To	-19	-530										
			Vertical	3H.6-88	1-V-L	MTCM	3551	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	199	-102	D + L + F + H' + T + E'	131	4.68	-	-	-	-	-	-	-
						MCCM	1770	D + L + F + H' + T + E'	-354	-76										
						MMAT	1771	D + L + F + H' + T + E'	3	-508										
						MMAC	1773	D + L + F + H' + T + E'	-176	-616										
					2-V-L	MTCM	3593	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	212	-91	D + L + F + H' + T + E'	169	6.24	-	-	-	-	-	-	-
						MCCM	1844	D + L + F + H' + T + E'	-326	-14										
						MMAT	1844	D + L + F + H' + T + E'	49	-283										
						MMAC	1844	D + L + F + H' + T + E'	-164	-587										
					3-V-L	MTCM	2139	D + L + F + H' + T + E'	238	-111	D + L + F + H' + T + E'	149	4.68	-	-	-	-	-	-	-
						MCCM	1864	D + L + F + H' + T + E'	-388	-69										
						MMAT	1864	D + L + F + H' + T + E'	29	-656										
						MMAC	1864	D + L + F + H' + T + E'	-211	-656										
					4-V-L	MTCM	2142	D + L + F + H' + T + E'	240	-164	D + L + F + H' + T + E'	174	6.24	-	-	-	-	-	-	-
						MCCM	1865	D + L + F + H' + T + E'	-388	-85										
						MMAT	1865	D + L + F + H' + T + E'	26	-655										
						MMAC	1865	D + L + F + H' + T + E'	-216	-655										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Load Combination	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Axial (4) (kips / ft)	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Flexure (4) (ft-kips / ft)	Longitudinal Reinforcement Design Loads – In-Plane Shear Loads – Load Combination	Longitudinal Reinforcement Design Loads – In-Plane Shear Loads – In-plane Shear (5) (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads – Load Combination	Transverse Shear Design Loads – Horizontal Section – Transverse Shear Force (kip / ft)	Transverse Shear Design Loads – Horizontal Section – Corresponding Axial Force (kip / ft)	Transverse Shear Design Loads – Vertical Section – Transverse Shear Force (kip / ft)	Transverse Shear Design Loads – Vertical Section – Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin South Wall (Cont'd)	6	South (outside)	Vertical	3H.6-88	5-V-L	MTCM	2163	D + L + F + H' + T + E'	217	-103	D + L + F + H' + T + E'	148	4.68	-	-	-	-	-	-	-
						MCCM	1873	D + L + F + H' + T + E'	-365	-38										
						MMAT	1872	D + L + F + H' + T + E'	7	-637										
						MMAC	1868	D + L + F + H' + T + E'	-175	-661										
					6-V-L	MTCM	1880	D + L + F + H' + T + E'	227	-308	D + L + F + H' + T + E'	88	6.24	-	-	-	-	-	-	-
						MCCM	1880	D + L + F + H' + T + E'	-237	-125										
						MMAT	1880	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	165	-370										
						MMAC	1880	D + L + F + H' + T + E'	-52	-355										
		North (inside)	Horizontal	3H.6-89	1-H-L	MTCM	2032	1.4D + 1.7F + 1.3H + 1.4To	351	424	D + L + F + H' + T + E'	98	10.92	-	-	-	-	-	-	-
						MCCM	3531	D + L + F + H' + T + E'	-249	438										
						MMAT	4318	D + L + F + H' + T + E'	108	1408										
						MMAC	4318	D + L + F + H' + T + E'	-79	1408										
					2-H-L	MTCM	4473	D + L + F + H' + T + E'	607	384	D + L + F + H' + T + E'	33	9.36	-	-	-	-	-	-	-
						MCCM	4382	D + L + F + H' + T + E'	-329	339										
						MMAT	4497	D + L + F + H' + T + E'	70	698										
						MMAC	4497	D + L + F + H' + T + E'	-99	698										
					3-H-L	MTCM	3815	D + L + F + H' + T + E'	275	280	D + L + F + H' + T + E'	64	6.24	-	-	-	-	-	-	-
						MCCM	3557	D + L + F + H' + T + E'	-362	193										
						MMAT	4436	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	98	713										
						MMAC	4436	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-37	729										
					4-H-L	MTCM	2188	1.4D + 1.7F + 1.3H + 1.4To	360	154	D + L + F + H' + T + E'	76	9.36	-	-	-	-	-	-	-
						MCCM	2118	1.4D + 1.7F + 1.3H + 1.4To	-191	671										
						MMAT	2140	1.4D + 1.7F + 1.3H + 1.4To	286	848										
						MMAC	2092	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-21	852										
					5-H-L	MTCM	1705	1.4D + 1.7F + 1.3H + 1.4To	232	69	D + L + F + H' + T + E'	98	6.24	-	-	-	-	-	-	-
						MCCM	1066	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-244	214										
						MMAT	1687	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	64	720										
						MMAC	1687	1.4D + 1.7F + 1.3H + 1.4To	-83	728										
					6-H-L	MTCM	2204	1.4D + 1.7F + 1.3H + 1.4To	386	568	D + L + F + H' + T + E'	98	10.92	-	-	-	-	-	-	-
						MCCM	3836	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-246	38										
						MMAT	4505	D + L + F + H' + T + E'	111	1546										
						MMAC	4505	D + L + F + H' + T + E'	-76	1546										
			Vertical	3H.6-90	1-V-L	MTCM	3550	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	187	42	D + L + F + H' + T + E'	131	4.68	-	-	-	-	-	-	-
						MCCM	1014	D + L + F + H' + T + E'	-273	120										
						MMAT	4317	D + L + F + H' + T + E'	12	328										
						MMAC	1119	1.4D + 1.7F + 1.3H + 1.4To	-127	451										
					2-V-L	MTCM	3587	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	204	15	D + L + F + H' + T + E'	169	6.24	-	-	-	-	-	-	-
						MCCM	1197	D + L + F + H' + T + E'	-290	142										
						MMAT	4375	D + L + F + H' + T + E'	24	255										
						MMAC	1197	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-239	308										
					3-V-L	MTCM	2139	D + L + F + H' + T + E'	238	25	D + L + F + H' + T + E'	149	4.68	-	-	-	-	-	-	-
						MCCM	1536	D + L + F + H' + T + E'	-324	170										
						MMAT	1380	D + L + F + H' + T + E'	6	344										
						MMAC	1291	1.4D + 1.7F + 1.3H + 1.4To	-129	447										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads – Load Combination	In-plane Shear (5) (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads – Load Combination	Horizontal Section – Transverse Shear Force (kip / ft)	Horizontal Section – Corresponding Axial Force (kip / ft)	Vertical Section – Transverse Shear Force (kip / ft)	Vertical Section – Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin South Wall (Cont'd)	6	North (inside)	Vertical		4-V-L	MTCM	2142	D + L + F + H' + T + E'	240	67	D + L + F + H' + T + E'	174	6.24	-	-	-	-	-	-	-
						MCCM	1553	D + L + F + H' + T + E'	-323	183										
						MMAT	1553	D + L + F + H' + T + E'	5	263										
						MMAC	1553	D + L + F + H' + T + E'	-311	263										
					5-V-L	MTCM	2163	D + L + F + H' + T + E'	217	32	D + L + F + H' + T + E'	148	4.68	-	-	-	-	-	-	-
						MCCM	1700	D + L + F + H' + T + E'	-299	137										
						MMAT	4504	D + L + F + H' + T + E'	14	375										
						MMAC	3838	D + L + F + H' + T + E'	-75	402										
					6-V-L	MTCM	1880	D + L + F + H' + T + E'	227	38	D + L + F + H' + T + E'	174	7.8	-	-	-	-	-	-	-
						MCCM	1864	D + L + F + H' + T + E'	-388	568										
						MMAT	1868	D + L + F + H' + T + E'	27	937										
						MMAC	1781	1.4D + 1.7F + 1.3H + 1.4To	-130	1307										
		-	Transverse (Horizontal and Vertical)	3H.6-91	1-T	-	-	-	-	-	-	-	-	1.4D + 1.7F + 1.3H + 1.4To	-10	-29	-103	128	0.20	
					2-T	-	-	-	-	-	-	-	-	1.4D + 1.7F + 1.3H + 1.4To	-41	-2	-91	260	0.31	
UHS Basin East Wall	6	East (outside)	Horizontal	3H.6-92	1-H-L	MTCM	5234	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	410	-98	D + L + F + H' + T + E'	40	12.48	-	-	-	-	-	-	-
						MCCM	5235	D + L + F + H' + T + E'	-311	-1619										
						MMAT	5241	D + L + F + H' + T + E'	64	-2078										
						MMAC	5241	D + L + F + H' + T + E'	-222	-2130										
					2-H-L	MTCM	2611	1.4D + 1.7F + 1.3H + 1.4To	216	-508	D + L + F + H' + T + E'	71	6.24	-	-	-	-	-	-	-
						MCCM	3504	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-348	-25										
						MMAT	3936	D + L + F + H' + T + E'	27	-968										
						MMAC	3936	D + L + F + H' + T + E'	-190	-1033										
					3-H-L	MTCM	2300	1.4D + 1.7F + 1.3H + 1.4To	393	-216	D + L + F + H' + T + E'	78	7.8	-	-	-	-	-	-	-
						MCCM	2822	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-230	-136										
						MMAT	1995	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	103	-658										
						MMAC	1998	D + L + F + H' + T + E'	-21	-578										
					4-H-L	MTCM	2649	1.4D + 1.7F + 1.3H + 1.4To	275	-248	D + L + F + H' + T + E'	106	6.24	-	-	-	-	-	-	-
						MCCM	2820	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-192	-111										
						MMAT	2649	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	162	-505										
						MMAC	2627	D + L + F + H' + T + E'	-101	-489										
			Vertical	3H.6-93	1-V-L	MTCM	2375	D + L + F + H' + T + E'	266	-222	D + L + F + H' + T + E'	129	6.24	-	-	-	-	-	-	-
						MCCM	2832	D + L + F + H' + T + E'	-460	-157										
						MMAT	4295	D + L + F + H' + T + E'	0	-983										
						MMAC	5234	D + L + F + H' + T + E'	-283	-1073										
		West (inside)	Horizontal	3H.6-94	1-H-L	MTCM	4266	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	410	107	D + L + F + H' + T + E'	40	15.6	-	-	-	-	-	-	-
						MCCM	5235	D + L + F + H' + T + E'	-311	471										
						MMAT	5235	D + L + F + H' + T + E'	209	2186										
						MMAC	5235	D + L + F + H' + T + E'	-67	2124										
					2-H-L	MTCM	2297	1.4D + 1.7F + 1.3H + 1.4To	386	546	D + L + F + H' + T + E'	106	10.92	-	-	-	-	-	-	-
						MCCM	3893	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-255	96										
						MMAT	3890	D + L + F + H' + T + E'	128	1469										
						MMAC	3890	D + L + F + H' + T + E'	-7	1413										
					3-H-L	MTCM	2528	1.4D + 1.7F + 1.3H + 1.4To	204	101	D + L + F + H' + T + E'	71	6.24	-	-	-	-	-	-	-
						MCCM	3507	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-346	20										
						MMAT	2494	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	81	801										
						MMAC	5236	D + L + F + H' + T + E'	-59	756										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in²/ ft)	Transverse Shear Design Loads					Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads			Load Combination	Horizontal Section		Vertical Section			
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)			Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)		
UHS Basin East Wall (Cont'd)	6	West (inside)	Horizontal	3H.6-94	4-H-L	MTCM	2327	1.4D + 1.7F + 1.3H + 1.4To	348	247	D + L + F + H' + T + E'	77	9.36	-	-	-	-	-	-	-
						MCCM	2414	D + L + F + H' + T + E'	-128	124										
						MMAT	1980	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	75	885										
						MMAC	1980	1.4D + 1.7F + 1.3H + 1.4To	-65	800										
					5-H-L	MTCM	2693	1.4D + 1.7F + 1.3H + 1.4To	239	164	D + L + F + H' + T + E'	106	6.24	-	-	-	-	-	-	-
						MCCM	2879	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-240	233										
						MMAT	2492	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	58	749										
						MMAC	2492	1.4D + 1.7F + 1.3H + 1.4To	-94	707										
					6-H-L	MTCM	2436	1.4D + 1.7F + 1.3H + 1.4To	341	334	D + L + F + H' + T + E'	106	9.36	-	-	-	-	-	-	-
						MCCM	3933	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-256	74										
						MMAT	2441	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	176	1101										
						MMAC	3935	D + L + F + H' + T + E'	-1	1070										
			Vertical	3H.6-95	1-V-L	MTCM	2328	D + L + F + H' + T + E'	195	173	D + L + F + H' + T + E'	100	4.68	-	-	-	-	-	-	-
						MCCM	2689	D + L + F + H' + T + E'	-338	277										
						MMAT	5208	D + L + F + H' + T + E'	13	546										
						MMAC	5208	D + L + F + H' + T + E'	-4	546										
					2-V-L	MTCM	2349	D + L + F + H' + T + E'	251	166	D + L + F + H' + T + E'	129	6.24	-	-	-	-	-	-	-
						MCCM	2690	D + L + F + H' + T + E'	-375	254										
						MMAT	4267	D + L + F + H' + T + E'	25	1097										
						MMAC	4267	D + L + F + H' + T + E'	-188	1138										
					3-V-L	MTCM	2375	D + L + F + H' + T + E'	266	136	D + L + F + H' + T + E'	128	4.68	-	-	-	-	-	-	-
						MCCM	2707	D + L + F + H' + T + E'	-366	242										
						MMAT	4295	D + L + F + H' + T + E'	20	795										
						MMAC	4295	D + L + F + H' + T + E'	-180	798										
					4-V-L	MTCM	2825	D + L + F + H' + T + E'	232	138	D + L + F + H' + T + E'	129	7.8	-	-	-	-	-	-	-
						MCCM	2832	D + L + F + H' + T + E'	-460	679										
						MMAT	2955	D + L + F + H' + T + E'	9	1176										
						MMAC	2955	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-185	1331										
		-	Transverse (Horizontal and Vertical)	3H.6-96	1-T	-	-	-	-	-	-	-	-	1.4D + 1.7F + 1.3H + 1.4To	-9	-33	99	130	0.20	
					2-T	-	-	-	-	-	-	-	-	1.4D + 1.7F + 1.3H + 1.4To	-39	-2	89	263	0.31	
					3-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-204	105	-294	428	1.76	
UHS Basin West Wall	6	West (outside)	Horizontal	3H.6-97	1-H-L	MTCM	5176	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	402	-124	D + L + F + H' + T + E'	37	14.04	-	-	-	-	-	-	-
						MCCM	5171	D + L + F + H' + T + E'	-416	-857										
						MMAT	5177	D + L + F + H' + T + E'	52	-2201										
						MMAC	5177	D + L + F + H' + T + E'	-137	-2201										
					2-H-L	MTCM	4514	1.4D + 1.7F + 1.3H + 1.4To	368	-286	D + L + F + H' + T + E'	64	7.8	-	-	-	-	-	-	-
						MCCM	3477	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-356	-143										
						MMAT	3866	D + L + F + H' + T + E'	32	-864										
						MMAC	3866	D + L + F + H' + T + E'	-275	-909										
					3-H-L	MTCM	2222	1.4D + 1.7F + 1.3H + 1.4To	846	-208	D + L + F + H' + T + E'	117	12.48	-	-	-	-	-	-	(8)
						MCCM	2220	D + L + F + H' + T + E'	-156	-195										
						MMAT	2329	D + L + F + H' + T + E'	240	-517										
						MMAC	2329	D + L + F + H' + T + E'	-113	-416										
					4-H-L	MTCM	1956	1.4D + 1.7F + 1.3H + 1.4To	431	-402	D + L + F + H' + T + E'	117	7.8	-	-	-	-	-	-	-
						MCCM	1953	D + L + F + H' + T + E'	-150	-259										
						MMAT	1923	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	109	-651										
						MMAC	2167	D + L + F + H' + T + E'	-17	-634										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin West Wall (Cont'd)	6	West (outside)	Horizontal	3H.6-97	5-H-L	MTCM	2315	1.4D + 1.7F + 1.3H + 1.4To	466	-360	D + L + F + H' + T + E'	141	7.8	-	-	-	-	-	-	-
						MCCM	2314	D + L + F + H' + T + E'	-271	-337										
						MMAT	2314	D + L + F + H' + T + E'	3	-614										
						MMAC	2314	D + L + F + H' + T + E'	-40	-614										
					6-H-L	MTCM	2582	1.4D + 1.7F + 1.3H + 1.4To	290	-295	D + L + F + H' + T + E'	141	6.24	-	-	-	-	-	-	-
						MCCM	2458	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-214	-44										
						MMAT	1903	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	72	-514										
						MMAC	1903	1.4D + 1.7F + 1.3H + 1.4To	-49	-481										
			Vertical	3H.6-98	1-V-L	MTCM	2219	1.4D + 1.7F + 1.3H + 1.4To	617	-67	D + L + F + H' + T + E'	190	9.36	-	-	-	-	-	-	-
						MCCM	2596	D + L + F + H' + T + E'	-172	-183										
						MMAT	2596	D + L + F + H' + T + E'	73	-904										
						MMAC	2596	D + L + F + H' + T + E'	-32	-904										
					2-V-L	MTCM	2604	D + L + F + H' + T + E'	238	-115	D + L + F + H' + T + E'	133	6.24	-	-	-	-	-	-	-
						MCCM	2406	D + L + F + H' + T + E'	-278	-99										
						MMAT	2604	D + L + F + H' + T + E'	40	-704										
						MMAC	3860	D + L + F + H' + T + E'	-75	-725										
					3-V-L	MTCM	2239	D + L + F + H' + T + E'	284	-236	D + L + F + H' + T + E'	162	7.8	-	-	-	-	-	-	-
						MCCM	2606	D + L + F + H' + T + E'	-379	-150										
						MMAT	2320	D + L + F + H' + T + E'	75	-791										
						MMAC	5170	D + L + F + H' + T + E'	-296	-1069										
					4-V-L	MTCM	2242	D + L + F + H' + T + E'	254	-203	D + L + F + H' + T + E'	151	6.24	-	-	-	-	-	-	-
						MCCM	2607	D + L + F + H' + T + E'	-463	-63										
						MMAT	4263	D + L + F + H' + T + E'	4	-1011										
						MMAC	5176	D + L + F + H' + T + E'	-286	-1036										
					5-V-L	MTCM	2246	D + L + F + H' + T + E'	195	-211	D + L + F + H' + T + E'	116	4.68	-	-	-	-	-	-	-
						MCCM	2612	D + L + F + H' + T + E'	-370	-110										
						MMAT	5184	D + L + F + H' + T + E'	1	-646										
						MMAC	5178	D + L + F + H' + T + E'	-73	-770										
		East (inside)	Horizontal	3H.6-99	1-H-L	MTCM	4262	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	404	132	D + L + F + H' + T + E'	37	15.6	-	-	-	-	-	-	-
						MCCM	5171	D + L + F + H' + T + E'	-416	1733										
						MMAT	5171	D + L + F + H' + T + E'	288	2357										
						MMAC	5171	D + L + F + H' + T + E'	-100	2283										
					2-H-L	MTCM	4515	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	228	128	D + L + F + H' + T + E'	61	7.8	-	-	-	-	-	-	-
						MCCM	3857	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-353	60										
						MMAT	3842	D + L + F + H' + T + E'	108	1263										
						MMAC	3887	D + L + F + H' + T + E'	-73	1233										
					3-H-L	MTCM	2220	1.4D + 1.7F + 1.3H + 1.4To	868	1126	D + L + F + H' + T + E'	120	15.6	-	-	-	-	-	-	(8)
						MCCM	2314	D + L + F + H' + T + E'	-271	402										
						MMAT	2329	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	732	1286										
						MMAC	2329	D + L + F + H' + T + E'	-33	1199										
					4-H-L	MTCM	2236	1.4D + 1.7F + 1.3H + 1.4To	521	332	D + L + F + H' + T + E'	120	10.92	-	-	-	-	-	-	-
						MCCM	2183	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-226	276										
						MMAT	2293	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	183	1221										
						MMAC	2291	D + L + F + H' + T + E'	-18	854										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number [1]	Reinforcement Zone Number [2]	Maximum Forces [3]	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads					Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads				Horizontal Section		Vertical Section			
								Load Combination	Axial [4] (kips / ft)	Flexure [4] (ft-kips / ft)	Load Combination	In-plane [5] Shear (kips / ft)		Load Combination	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)		
UHS Basin West Wall (Cont'd)	6	East (inside)	Horizontal		5-H-L	MTCM	2311	1.4D + 1.7F + 1.3H + 1.4To	244	275	D + L + F + H' + T + E'	141	6.24	-	-	-	-	-	-	-
						MCCM	2310	D + L + F + H' + T + E'	-193	242										
						MMAT	2310	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	130	729										
						MMAC	2577	D + L + F + H' + T + E'	-2	534										
			Vertical	3H.6-100	1-V-L	MTCM	2219	1.4D + 1.7F + 1.3H + 1.4To	655	61	D + L + F + H' + T + E'	190	10.92	-	-	-	-	-	-	-
						MCCM	2596	D + L + F + H' + T + E'	-172	310										
						MMAT	2596	D + L + F + H' + T + E'	85	775										
						MMAC	2596	D + L + F + H' + T + E'	-21	775										
					2-V-L	MTCM	2237	D + L + F + H' + T + E'	228	144	D + L + F + H' + T + E'	133	4.68	-	-	-	-	-	-	-
						MCCM	2410	D + L + F + H' + T + E'	-247	174										
						MMAT	3848	D + L + F + H' + T + E'	2	380										
						MMAC	5168	D + L + F + H' + T + E'	-79	440										
					3-V-L	MTCM	2239	D + L + F + H' + T + E'	284	145	D + L + F + H' + T + E'	162	7.8	-	-	-	-	-	-	-
						MCCM	5170	D + L + F + H' + T + E'	-315	130										
						MMAT	4235	D + L + F + H' + T + E'	8	1073										
						MMAC	4235	D + L + F + H' + T + E'	-204	1160										
					4-V-L	MTCM	1834	D + L + F + H' + T + E'	220	244	D + L + F + H' + T + E'	83	4.68	-	-	-	-	-	-	-
						MCCM	2173	D + L + F + H' + T + E'	-293	212										
						MMAT	4251	D + L + F + H' + T + E'	2	394										
						MMAC	4239	D + L + F + H' + T + E'	-112	763										
					5-V-L	MTCM	2242	D + L + F + H' + T + E'	254	113	D + L + F + H' + T + E'	151	6.24	-	-	-	-	-	-	-
						MCCM	2455	D + L + F + H' + T + E'	-359	174										
						MMAT	4263	D + L + F + H' + T + E'	25	839										
						MMAC	4263	D + L + F + H' + T + E'	-173	841										
					6-V-L	MTCM	2246	D + L + F + H' + T + E'	195	138	D + L + F + H' + T + E'	116	4.68	-	-	-	-	-	-	-
						MCCM	2456	D + L + F + H' + T + E'	-309	219										
						MMAT	5185	D + L + F + H' + T + E'	7	486										
						MMAC	5179	D + L + F + H' + T + E'	-21	538										
					7-V-L	MTCM	2320	D + L + F + H' + T + E'	255	681	D + L + F + H' + T + E'	162	9.36	-	-	-	-	-	-	-
						MCCM	2607	D + L + F + H' + T + E'	-463	708										
						MMAT	2324	1.4D + 1.7F + 1.3H + 1.4To	24	1235										
						MMAC	2324	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-139	1298										
		-	Transverse (Horizontal and Vertical)	3H.6-101	1-T	-	-	-	-	-	-	-	-	1.4D + 1.7F + 1.3H + 1.4To	-10	-73	-100	143	0.20	
					2-T	-	-	-	-	-	-			D + L + F + H' + T + E'	-208	80	-307	306	1.76	
					3-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	98	315	71	-73	0.31	
					4-T	-	-	-	-	-	-	-	-	1.4D + 1.7F + 1.3H + 1.4To	-50	600	81	746	0.79	
UHS Basin North-South Buttresses [6]	6	East and West	Horizontal	3H.6-102	1-H-L	MTCM	7788	D + L + F + H' + T + E'	638	-1066	D + L + F + H' + T + E'	331	15.6	-	-	-	-	-	-	(8)
						MCCM	7788	D + L + F + H' + T + E'	-408	-981										
						MMAT	7812	D + L + F + H' + T + E'	350	-1240										
						MMAC	7812	D + L + F + H' + T + E'	-112	-1240										
					2-H-L	MTCM	7417	D + L + F + H' + T + E'	603	-466	D + L + F + H' + T + E'	369	9.36	-	-	-	-	-	-	-
						MCCM	7417	D + L + F + H' + T + E'	-534	-275										
						MMAT	7650	D + L + F + H' + T + E'	188	974										
						MMAC	7650	D + L + F + H' + T + E'	-149	954										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin North-South Buttresses (Cont'd) (9)	6	East and West	Vertical	3H.6-103	1-V-L	MTCM	7424	D + L + F + H' + T + E'	742	-114	D + L + F + H' + T + E'	237	9.36	-	-	-	-	-	-	-
						MCCM	7212	D + L + F + H' + T + E'	-897	103										
						MMAT	7845	D + L + F + H' + T + E'	124	-1010										
						MMAC	7845	D + L + F + H' + T + E'	-122	-1010										
					2-V-L	MTCM	7032	D + L + F + H' + T + E'	991	397	D + L + F + H' + T + E'	237	15.6	-	-	-	-	-	-	(8)
						MCCM	7032	D + L + F + H' + T + E'	-692	412										
						MMAT	7032	D + L + F + H' + T + E'	964	555										
						MMAC	7032	D + L + F + H' + T + E'	-411	555										
		-	Transverse (Horizontal and Vertical)	3H.6-104	1-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-30	433	-4	47	0.20	
					2-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	19	107	68	445	0.31	
					3-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	209	138	205	739	1.76	
UHS Basin East-West Buttresses (9)	6	North and South	Horizontal	3H.6-105	1-H-L	MTCM	7674	D + L + F + H' + T + E'	599	274	D + L + F + H' + T + E'	278	9.36	-	-	-	-	-	-	-
						MCCM	7674	D + L + F + H' + T + E'	-1110	-475										
						MMAT	7681	D + L + F + H' + T + E'	246	607										
						MMAC	7681	D + L + F + H' + T + E'	-527	607										
					2-H-L	MTCM	7511	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	166	189	D + L + F + H' + T + E'	243	6.24	-	-	-	-	-	-	-
						MCCM	7491	D + L + F + H' + T + E'	-96	155										
						MMAT	7856	D + L + F + H' + T + E'	116	-486										
						MMAC	7865	D + L + F + H' + T + E'	-42	298										
					3-H-L	MTCM	7066	D + L + F + H' + T + E'	417	-74	D + L + F + H' + T + E'	332	9.36	-	-	-	-	-	-	-
						MCCM	7065	D + L + F + H' + T + E'	-382	114										
						MMAT	7335	D + L + F + H' + T + E'	125	351										
						MMAC	7276	D + L + F + H' + T + E'	-3	-277										
			Vertical	3H.6-106	1-V-L	MTCM	7489	D + L + F + H' + T + E'	418	-98	D + L + F + H' + T + E'	284	6.24	-	-	-	-	-	-	-
						MCCM	7674	D + L + F + H' + T + E'	-692	108										
						MMAT	7489	D + L + F + H' + T + E'	29	-251										
						MMAC	7489	D + L + F + H' + T + E'	-675	-251										
					2-V-L	MTCM	7345	D + L + F + H' + T + E'	674	165	D + L + F + H' + T + E'	284	9.36	-	-	-	-	-	-	-
						MCCM	7289	D + L + F + H' + T + E'	-897	213										
						MMAT	7289	D + L + F + H' + T + E'	251	276										
						MMAC	7289	D + L + F + H' + T + E'	-834	276										
					3-V-L	MTCM	7067	D + L + F + H' + T + E'	974	-421	D + L + F + H' + T + E'	284	15.6	-	-	-	-	-	-	(8)
						MCCM	7065	D + L + F + H' + T + E'	-916	502										
						MMAT	7065	D + L + F + H' + T + E'	626	587										
						MMAC	7065	D + L + F + H' + T + E'	-700	587										
		-	Transverse (Horizontal and Vertical)	3H.6-107	1-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	22	889	1	35	0.20	
Cooling Tower North and South Walls	2	North (outside of North Wall) and South (outside of South Wall)	Horizontal	3H.6-108	1-H-L	MTCM	1147	D + L + F + H' + T + E'	220	-8	D + L + F + H' + T + E'	31	6.24	-	-	-	-	-	-	-
						MCCM	1127	D + L + F + H' + T + E'	-171	-34										
						MMAT	468	D + L + F + H' + T + E'	77	-169										
						MMAC	468	D + L + F + H' + T + E'	-12	-169										
					BEAM 1	MTCM	-	D + L + F + H' + T + E'	360	-103	D + L + F + H' + T + E'	28	7.49	-	-	-	-	-	-	(8)
						MCCM	-	D + L + F + H' + T + E'	-547	-107										
						MMAT	-	D + L + F + H' + T + E'	99	-239										
						MMAC	-	D + L + F + H' + T + E'	-151	-239										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Cooling Tower North and South Walls (Cont'd)	2	North (outside of North Wall) and South (outside of South Wall)	Vertical	3H.6-109	1-V-L	MTCM	580	D + L + F + H' + T + E'	282	-23	D + L + F + H' + T + E'	87	6.24	-	-	-	-	-	-	-
						MCCM	580	D + L + F + H' + T + E'	-297	-32										
						MMAT	580	D + L + F + H' + T + E'	124	-45										
						MMAC	580	D + L + F + H' + T + E'	-242	-45										
					2-V-L	MTCM	615	D + L + F + H' + T + E'	52	-3	D + L + F + H' + T + E'	59	1.56	-	-	-	-	-	-	-
						MCCM	552	D + L + F + H' + T + E'	-40	-4										
						MMAT	444	D + L + F + H' + T + E'	1	-21										
						MMAC	356	D + L + F + H' + T + E'	-16	-24										
					3-V-L	MTCM	644	D + L + F + H' + T + E'	167	-56	D + L + F + H' + T + E'	59	4.68	-	-	-	-	-	-	-
						MCCM	459	D + L + F + H' + T + E'	-239	-67										
						MMAT	651	D + L + F + H' + T + E'	143	-117										
						MMAC	452	D + L + F + H' + T + E'	-96	-112										
					4-V-L	MTCM	523	D + L + F + H' + T + E'	292	-38	D + L + F + H' + T + E'	92	6.24	-	-	-	-	-	-	-
						MCCM	523	D + L + F + H' + T + E'	-303	-12										
						MMAT	1135	D + L + F + H' + T + E'	285	-39										
						MMAC	1135	D + L + F + H' + T + E'	-88	-39										
		South (inside of North Wall) and North (inside of South Wall)	Horizontal	3H.6-110	1-H-L	MTCM	1147	D + L + F + H' + T + E'	220	18	D + L + F + H' + T + E'	31	4.68	-	-	-	-	-	-	-
						MCCM	1127	D + L + F + H' + T + E'	-171	62										
						MMAT	667	D + L + F + H' + T + E'	48	175										
						MMAC	667	D + L + F + H' + T + E'	-44	175										
					BEAM 1	MTCM	-	D + L + F + H' + T + E'	360	-103	D + L + F + H' + T + E'	28	7.49	-	-	-	-	-	-	(8)
						MCCM	-	D + L + F + H' + T + E'	-547	107										
						MMAT	-	D + L + F + H' + T + E'	99	-239										
						MMAC	-	D + L + F + H' + T + E'	-151	-239										
			Vertical	3H.6-111	1-V-L	MTCM	580	D + L + F + H' + T + E'	282	24	D + L + F + H' + T + E'	87	6.24	-	-	-	-	-	-	-
						MCCM	580	D + L + F + H' + T + E'	-297	44										
						MMAT	1	D + L + F + H' + T + E'	110	48										
						MMAC	1	D + L + F + H' + T + E'	-263	48										
					2-V-L	MTCM	1164	D + L + F + H' + T + E'	54	5	D + L + F + H' + T + E'	59	1.56	-	-	-	-	-	-	-
						MCCM	552	D + L + F + H' + T + E'	-38	3										
						MMAT	795	D + L + F + H' + T + E'	1	22										
						MMAC	683	D + L + F + H' + T + E'	-19	24										
					3-V-L	MTCM	392	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	168	5	D + L + F + H' + T + E'	59	4.68	-	-	-	-	-	-	-
						MCCM	459	D + L + F + H' + T + E'	-239	81										
						MMAT	860	D + L + F + H' + T + E'	108	131										
						MMAC	860	D + L + F + H' + T + E'	-186	136										
					4-V-L	MTCM	523	D + L + F + H' + T + E'	292	47	D + L + F + H' + T + E'	92	6.24	-	-	-	-	-	-	-
						MCCM	523	D + L + F + H' + T + E'	-303	26										
						MMAT	1135	D + L + F + H' + T + E'	249	50										
						MMAC	1135	D + L + F + H' + T + E'	-124	50										
		-	Transverse (Horizontal and Vertical)	3H.6-112	1-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-2	17	-15	153	0.80	
					2-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	34	118	41	178	1.12	
Cooling Tower East Wall	6	East (outside)	Horizontal	3H.6-113	1-H-L	MTCM	289	D + L + F + H' + T + E'	41	-304	D + L + F + H' + T + E'	33	3.12	-	-	-	-	-	-	-
						MCCM	294	D + L + F + H + To + Wt	-60	-19										
						MMAT	273	D + L + F + H' + T + E'	1	-395										
						MMAC	273	D + L + F + H' + T + E'	-42	-395										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane Shear (5) (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Cooling Tower East Wall (Cont'd)	6	East (outside)	Horizontal	3H.6-113	2-H-L	MTCM	239	D + L + F + H' + T + E'	143	-481	D + L + F + H' + T + E'	37	9.36	-	-	-	-	-	-	-
						MCCM	231	D + L + F + H' + T + E'	-146	-744										
						MMAT	287	D + L + F + H' + T + E'	26	-1246										
						MMAC	287	D + L + F + H' + T + E'	-103	-1287										
			Vertical	3H.6-114	1-V-L	MTCM	291	D + L + F + H' + T + E'	31	-171	D + L + F + H' + T + E'	118	3.12	-	-	-	-	-	-	-
						MCCM	291	D + L + F + H' + T + E'	-115	-74										
						MMAT	283	D + L + F + H' + T + E'	7	-195										
						MMAC	275	D + L + F + H' + T + E'	-42	-197										
					2-V-L	MTCM	289	D + L + F + H' + T + E'	121	-799	D + L + F + H' + T + E'	118	6.24	-	-	-	-	-	-	-
						MCCM	233	D + L + F + H' + T + E'	-297	-152										
						MMAT	287	D + L + F + H' + T + E'	1	-1099										
						MMAC	287	D + L + F + H' + T + E'	-197	-1110										
		West (inside)	Horizontal	3H.6-115	1-H-L	MTCM	270	D + L + F + H' + T + E'	39	189	D + L + F + H' + T + E'	33	3.12	-	-	-	-	-	-	-
						MCCM	233	D + L + F + H' + T + E'	-62	256										
						MMAT	289	D + L + F + H' + T + E'	3	295										
						MMAC	289	D + L + F + H' + T + E'	-61	295										
					2-H-L	MTCM	239	D + L + F + H' + T + E'	143	343	D + L + F + H' + T + E'	37	9.36	-	-	-	-	-	-	-
						MCCM	231	D + L + F + H' + T + E'	-146	239										
						MMAT	231	D + L + F + H' + T + E'	126	1397										
						MMAC	231	D + L + F + H' + T + E'	-9	1394										
			Vertical	3H.6-116	1-V-L	MTCM	291	D + L + F + H' + T + E'	31	151	D + L + F + H' + T + E'	118	3.12	-	-	-	-	-	-	-
						MCCM	235	D + L + F + H' + T + E'	-120	71										
						MMAT	283	D + L + F + H' + T + E'	3	243										
						MMAC	275	D + L + F + H' + T + E'	-35	288										
					2-V-L	MTCM	289	D + L + F + H' + T + E'	121	486	D + L + F + H' + T + E'	118	6.24	-	-	-	-	-	-	-
						MCCM	233	D + L + F + H' + T + E'	-297	309										
						MMAT	231	D + L + F + H' + T + E'	6	1173										
						MMAC	232	D + L + F + H' + T + E'	-160	1212										
		-	Transverse (Horizontal and Vertical)	3H.6-116A	1-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	177	-75	125	5	0.60	
					2-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-131	239	-32	43	0.44	
Cooling Tower West Wall	6	West (outside)	Horizontal	3H.6-117	1-H-L	MTCM	193	D + L + F + H' + T + E'	42	-266	D + L + F + H' + T + E'	31	3.12	-	-	-	-	-	-	-
						MCCM	225	D + L + F + H + To + Wt	-60	-23										
						MMAT	204	D + L + F + H' + T + E'	6	-388										
						MMAC	204	D + L + F + H' + T + E'	-49	-391										
					2-H-L	MTCM	210	D + L + F + H' + T + E'	133	-283	D + L + F + H' + T + E'	35	7.8	-	-	-	-	-	-	-
						MCCM	29	D + L + F + H' + T + E'	-172	-706										
						MMAT	218	D + L + F + H' + T + E'	10	-1296										
						MMAC	218	D + L + F + H' + T + E'	-117	-1306										
			Vertical	3H.6-118	1-V-L	MTCM	222	D + L + F + H' + T + E'	35	-173	D + L + F + H' + T + E'	112	3.12	-	-	-	-	-	-	-
						MCCM	222	D + L + F + H' + T + E'	-118	-53										
						MMAT	214	D + L + F + H' + T + E'	7	-198										
						MMAC	206	D + L + F + H' + T + E'	-45	-200										
					2-V-L	MTCM	220	D + L + F + H' + T + E'	123	-770	D + L + F + H' + T + E'	112	6.24	-	-	-	-	-	-	-
						MCCM	220	D + L + F + H' + T + E'	-295	-148										
						MMAT	218	D + L + F + H' + T + E'	8	-1083										
						MMAC	218	D + L + F + H' + T + E'	-193	-1094										

Table 3H.6-7 Results of UHS/RSW Pump House Concrete Wall Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Cooling Tower West Wall (Cont'd)	6	East (inside)	Horizontal	3H.6-119	1-H-L	MTCM	193	D + L + F + H' + T + E'	42	228	D + L + F + H' + T + E'	31	3.12	-	-	-	-	-	-	-
						MCCM	220	D + L + F + H' + T + E'	-62	299										
						MMAT	220	D + L + F + H' + T + E'	3	299										
						MMAC	220	D + L + F + H' + T + E'	-62	299										
					2-H-L	MTCM	210	D + L + F + H' + T + E'	133	139	D + L + F + H' + T + E'	35	7.8	-	-	-	-	-	-	-
						MCCM	29	D + L + F + H' + T + E'	-172	979										
						MMAT	29	D + L + F + H' + T + E'	94	1484										
						MMAC	29	D + L + F + H' + T + E'	-16	1484										
			Vertical	3H.6-120	1-V-L	MTCM	222	D + L + F + H' + T + E'	35	164	D + L + F + H' + T + E'	112	3.12	-	-	-	-	-	-	-
						MCCM	33	D + L + F + H' + T + E'	-119	56										
						MMAT	214	D + L + F + H' + T + E'	3	248										
						MMAC	206	D + L + F + H' + T + E'	-37	280										
					2-V-L	MTCM	220	D + L + F + H' + T + E'	123	544	D + L + F + H' + T + E'	112	6.24	-	-	-	-	-	-	-
						MCCM	220	D + L + F + H' + T + E'	-295	421										
						MMAT	29	D + L + F + H' + T + E'	7	1187										
						MMAC	30	D + L + F + H' + T + E'	-166	1251										
		-	Transverse (Horizontal and Vertical)	3H.6-120A	1-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	177	-70	124	5	0.60	
					2-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-123	239	-42	40	0.31	
Cooling Tower Internal Wall	2	East and West	Horizontal	3H.6-121	1-H-L	MTCM	2427	D + L + F + H' + T + E'	83	-116	D + L + F + H' + T + E'	30	3.12	-	-	-	-	-	-	-
						MCCM	1387	D + L + F + H + To + Wt	-117	-11										
						MMAT	2427	D + L + F + H' + T + E'	19	-139										
						MMAC	2427	D + L + F + H' + T + E'	-9	-139										
					2-H-L	MTCM	2633	D + L + F + H' + T + E'	378	89	D + L + F + H' + T + E'	44	6.24	-	-	-	-	-	-	(8)
						MCCM	2633	D + L + F + H' + T + E'	-232	-90										
						MMAT	2426	D + L + F + H' + T + E'	61	-125										
						MMAC	2426	D + L + F + H' + T + E'	-4	-125										
			Vertical	3H.6-122	1-V-L	MTCM	2428	D + L + F + H' + T + E'	31	23	D + L + F + H' + T + E'	44	1.56	-	-	-	-	-	-	-
						MCCM	2428	D + L + F + H' + T + E'	-67	-20										
						MMAT	2451	D + L + F + H' + T + E'	2	-64										
						MMAC	1568	D + L + F + H' + T + E'	-40	-66										
					2-V-L	MTCM	2587	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	211	2	D + L + F + H' + T + E'	44	4.68	-	-	-	-	-	-	-
						MCCM	2633	D + L + F + H' + T + E'	-220	-54										
						MMAT	1520	D + L + F + H' + T + E'	31	-147										
						MMAC	1520	D + L + F + H' + T + E'	-63	-147										
		-	Transverse (Horizontal and Vertical)	3H.6-122A	1-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	15	128	11	270	0.80	

Notes:

(1) The reinforcement layout drawings show the various zones used to define the minimum reinforcement that will be provided based on finite element analysis results. Actual provided reinforcement based on final rebar layout may exceed the reported provided reinforcement and the zones with higher reinforcement may be extended beyond their reported boundaries.

(2) Each reinforcement layout drawing is divided into reinforcement zones. The reinforcement zone naming convention is as follows: "H" = horizontal, "V" = vertical, "L" = longitudinal reinforcement, "T" = transverse reinforcement.

(3) The maximum tension (MTCM) and compression (MCCM) axial forces are provided with the corresponding moment from the same load combination. The maximum moment that has a corresponding tension (MMAT) in the same load combination and the maximum moment that has a corresponding compression (MMAC) in the same load combination are also provided. For zones where either axial tension or axial compression does not occur for any load combination, dashes are input into the corresponding cell.

(4) Negative axial load is compression and positive axial load is tension. Negative moment applies tension to the top face of the shell element and positive moment applies tension to the bottom face of the shell element.

(5) The reported in-plane shear is the maximum average in-plane shear along a plane that crosses the longitudinal reinforcement zone.

(6) NOT USED.

(7) The Pump House Operating Floor and Roof slab thickness includes the metal decking (2.5 inches).

(8) For certain areas of the structure, the standard element post-processing methods were too conservative. For such cases, detailed manual design was performed and the design forces determined by the detailed manual design are provided in the table.

(9) The transverse reinforcement for the UHS Basin and RSW Pump House Buttresses is spaced with a maximum center-to-center spacing of 4".

Table 3H.6-8 Results of UHS/RSW Pump House Concrete Slab Design

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Pump House Foundation Mat	10	Top	East-West	3H.6-123	1-H-L	MTCM	9644	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	330	-17	D + L + F + H' + T + E'	33	7.8	-	-	-	-	-	-	-
						MCCM	9637	D + L + F + H' + T + E'	-95	-79										
						MMAT	13467	D + L + F + H' + T + E'	7	-950										
						MMAC	13467	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-16	-1027										
					2-H-L	MTCM	13481	D + L + F + H' + T + E'	227	-30	D + L + F + H' + T + E'	138	6.24	-	-	-	-	-	-	-
						MCCM	13549	D + L + F + H' + T + E'	-181	-175										
						MMAT	10584	1.4D + 1.4F + 1.7H + 1.7W	1	-776										
						MMAC	10553	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-104	-1213										
			North-South	3H.6-124	1-V-L	MTCM	13535	D + L + F + H' + T + E'	303	-113	D + L + F + H' + T + E'	35	7.8	-	-	-	-	-	-	-
						MCCM	13490	D + L + F + H' + T + E'	-135	-39										
						MMAT	13467	D + L + F + H' + T + E'	10	-1256										
						MMAC	13467	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-31	-1355										
					2-V-L	MTCM	9651	D + L + F + H' + T + E'	40	-265	D + L + F + H' + T + E'	124	6.24	-	-	-	-	-	-	-
						MCCM	9659	D + L + F + H' + T + E'	-197	-206										
						MMAT	9614	D + L + F + H' + T + E'	9	-953										
						MMAC	9614	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-23	-1101										
					3-V-L	MTCM	13550	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	318	-102	D + L + F + H' + T + E'	50	7.8	-	-	-	-	-	-	-
						MCCM	13470	D + L + F + H' + T + E'	-155	-434										
						MMAT	13470	D + L + F + H' + T + E'	16	-817										
						MMAC	13470	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-41	-1046										
		Bottom	East-West	3H.6-125	1-H-L	MTCM	9645	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	373	142	D + L + F + H' + T + E'	33	7.8	-	-	-	-	-	-	-
						MCCM	9637	D + L + F + H' + T + E'	-79	23										
						MMAT	13470	1.4D + 1.4F + 1.7H + 1.7W	15	1047										
						MMAC	13470	D + L + F + H' + T + E'	-24	938										
					2-H-L	MTCM	10645	D + L + F + H' + T + E'	64	357	D + L + F + H' + T + E'	53	6.24	-	-	-	-	-	-	-
						MCCM	13549	D + L + F + H' + T + E'	-181	377										
						MMAT	10633	1.4D + 1.4F + 1.7H + 1.7W	0	1068										
						MMAC	10633	D + L + F + H' + T + E'	-150	1935										
					3-H-L	MTCM	13564	D + L + F + H' + T + E'	74	519	D + L + F + H' + T + E'	97	7.8	-	-	-	-	-	-	-
						MCCM	10617	D + L + F + H' + T + E'	-199	2116										
						MMAT	10615	1.4D + 1.4F + 1.7H + 1.7W	0	1399										
						MMAC	10617	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-164	2525										
					4-H-L	MTCM	10776	D + L + F + H' + T + E'	61	484	D + L + F + H' + T + E'	115	6.24	-	-	-	-	-	-	-
						MCCM	10699	D + L + F + H' + T + E'	-154	123										
						MMAT	10833	1.4D + 1.4F + 1.7H + 1.7W	1	1113										
						MMAC	10833	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-130	1927										
					5-H-L	MTCM	13481	D + L + F + H' + T + E'	227	288	D + L + F + H' + T + E'	138	7.8	-	-	-	-	-	-	-
						MCCM	10695	D + L + F + H' + T + E'	-113	67										
						MMAT	13646	D + L + F + H' + T + E'	132	926										
						MMAC	13646	1.4D + 1.4F + 1.7H + 1.7W	-8	1191										
			North-South	3H.6-126	1-V-L	MTCM	13535	D + L + F + H' + T + E'	303	200	D + L + F + H' + T + E'	35	7.8	-	-	-	-	-	-	-
						MCCM	13490	D + L + F + H' + T + E'	-136	135										
						MMAT	13549	D + L + F + H' + T + E'	225	621										
						MMAC	13467	1.4D + 1.4F + 1.7H + 1.7W	-54	685										
					2-V-L	MTCM	10517	D + L + F + H' + T + E'	62	449	D + L + F + H' + T + E'	124	6.24	-	-	-	-	-	-	-
						MCCM	9659	D + L + F + H' + T + E'	-197	282										
						MMAT	10775	D + L + F + H' + T + E'	1	915										
						MMAC	10791	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-143	1959										

Table 3H.6-8 Results of UHS/RSW Pump House Concrete Slab Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads – Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads – Load Combination	Horizontal Section – Transverse Shear Force (kip / ft)	Horizontal Section – Corresponding Axial Force (kip / ft)	Vertical Section – Transverse Shear Force (kip / ft)	Vertical Section – Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Pump House Foundation Mat (Cont'd)	10	Bottom	North-South	3H.6-126	3-V-L	MTCM	13552	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	315	288	D + L + F + H' + T + E'	50	7.8	-	-	-	-	-	-	-
						MCCM	13470	D + L + F + H' + T + E'	-155	965										
						MMAT	13470	D + L + F + H' + T + E'	9	892										
						MMAC	13470	1.4D + 1.4F + 1.7H + 1.7W	-65	1192										
		-	Transverse (East-West and North-South)	3H.6-126A	1-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-155	-37	199	-31	0.31	
					2-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	254	-147	-6	-35	0.2	
Pump House Floor EL. 15'-2" (7)	1.75	Top	East-West	3H.6-127	1-H-L	MTCM	13046	D + L + F + H' + T + E'	49	-16	D + L + F + H' + T + E'	98	3.81	-	-	-	-	-	-	-
						MCCM	13105	D + L + F + H' + T + E'	-332	-1										
						MMAT	12434	1.4D + 1.4F + 1.7H + 1.7W	4	-64										
						MMAC	12434	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-34	-68										
			North-South	3H.6-128	1-V-L	MTCM	13129	D + L + F + H' + T + E'	31	-3	D + L + F + H' + T + E'	87	2.54	-	-	-	-	-	-	-
						MCCM	12660	D + L + F + H' + T + E'	-294	-6										
						MMAT	12389	1.4D + 1.4F + 1.7H + 1.7W	0	-32										
						MMAC	13046	D + L + F + H' + T + E'	-126	-36										
		Bottom	East-West	3H.6-129	1-H-L	MTCM	12649	D + L + F + H (Internal Flood)	74	7	D + L + F + H' + T + E'	98	2.54	-	-	-	-	-	-	-
						MCCM	13105	D + L + F + H' + T + E'	-332	0										
						MMAT	12907	1.4D + 1.4F + 1.7H + 1.7W	1	18										
						MMAC	12970	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-42	19										
			North-South	3H.6-130	1-V-L	MTCM	13129	D + L + F + H' + T + E'	31	5	D + L + F + H' + T + E'	87	2.54	-	-	-	-	-	-	-
						MCCM	12660	D + L + F + H' + T + E'	-294	4										
						MMAT	13052	D + L + F + H (Internal Flood)	1	15										
						MMAC	13052	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-103	25										
UHS Basin Foundation Mat	10	Top	East-West	3H.6-131	1-H-L	MTCM	13149	D + L + F + H' + T + E'	381	-399	D + L + F + H' + T + E'	187	8	-	-	-	-	-	-	-
						MCCM	13149	D + L + F + H' + T + E'	-281	-241										
						MMAT	13149	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	42	-1286										
						MMAC	13147	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-80	-1134										
					2-H-L	MTCM	13197	1.4D + 1.7F + 1.3H + 1.4To	926	-377	D + L + F + H' + T + E'	63	16	-	-	-	-	-	-	(6)
						MCCM	13251	D + L + F + H' + T + E'	-701	-1499										
						MMAT	13251	D + L + F + H' + T + E'	402	-2467										
						MMAC	13251	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-93	-2443										
					3-H-L	MTCM	11989	1.4D + 1.7F + 1.3H + 1.4To	562	-572	D + L + F + H' + T + E'	101	12	-	-	-	-	-	-	-
						MCCM	12117	D + L + F + H' + T + E'	-858	-542										
						MMAT	11319	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	77	-3055										
						MMAC	11319	D + L + F + H' + T + E'	-17	-3014										
					4-H-L	MTCM	11961	1.4D + 1.7F + 1.3H + 1.4To	447	-1446	D + L + F + H' + T + E'	104	16	-	-	-	-	-	-	-
						MCCM	12124	D + L + F + H' + T + E'	-229	-351										
						MMAT	11317	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	166	-4436										
						MMAC	11317	D + L + F + H' + T + E'	-44	-3565										
					5-H-L	MTCM	11465	1.4D + 1.7F + 1.3H + 1.4To	200	-880	D + L + F + H' + T + E'	104	8	-	-	-	-	-	-	-
						MCCM	11467	D + L + F + H' + T + E'	-112	-121										
						MMAT	11463	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	171	-1140										
						MMAC	11933	D + L + F + H' + T + E'	-25	-979										
					6-H-L	MTCM	11958	1.4D + 1.7F + 1.3H + 1.4To	662	-2670	D + L + F + H' + T + E'	104	24	-	-	-	-	-	-	-
						MCCM	11958	D + L + F + H' + T + E'	-310	-1252										
						MMAT	11958	D + L + F + H' + T + E'	410	-4583										
						MMAC	11958	D + L + F + H' + T + E'	-17	-4200										

Table 3H.6-8 Results of UHS/RSW Pump House Concrete Slab Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin Foundation Mat (Cont'd)	10	Top	East-West	3H.6-131	7-H-L	MTCM	11511	1.4D + 1.7F + 1.3H + 1.4To	344	-1199	D + L + F + H' + T + E'	78	16	-	-	-	-	-	-	-
						MCCM	11511	D + L + F + H' + T + E'	-146	-724										
						MMAT	11500	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	187	-2818										
						MMAC	11510	D + L + F + H' + T + E'	-9	-2432										
					8-H-L	MTCM	11764	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	534	-3021	D + L + F + H' + T + E'	77	24	-	-	-	-	-	-	-
						MCCM	11764	D + L + F + H' + T + E'	-307	-1268										
						MMAT	11764	D + L + F + H' + T + E'	337	-4002										
						MMAC	11764	D + L + F + H' + T + E'	-19	-3665										
					9-H-L	MTCM	11539	1.4D + 1.7F + 1.3H + 1.4To	247	-502	D + L + F + H' + T + E'	104	8	-	-	-	-	-	-	-
						MCCM	10977	D + L + F + H' + T + E'	-172	-508										
						MMAT	10971	D + L + F + H' + T + E'	90	-1467										
						MMAC	10971	D + L + F + H' + T + E'	-49	-1467										
					10-H-L	MTCM	11407	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	538	-3374	D + L + F + H' + T + E'	104	24	-	-	-	-	-	-	-
						MCCM	11407	D + L + F + H' + T + E'	-340	-1048										
						MMAT	11407	D + L + F + H' + T + E'	335	-4724										
						MMAC	11407	D + L + F + H' + T + E'	-10	-4724										
					11-H-L	MTCM	11004	1.4D + 1.7F + 1.3H + 1.4To	233	-745	D + L + F + H' + T + E'	77	12	-	-	-	-	-	-	-
						MCCM	11004	D + L + F + H' + T + E'	-160	-918										
						MMAT	11005	D + L + F + H' + T + E'	101	-2779										
						MMAC	11005	D + L + F + H' + T + E'	-2	-2616										
					12-H-L	MTCM	11245	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	505	-3592	D + L + F + H' + T + E'	77	24	-	-	-	-	-	-	-
						MCCM	11245	D + L + F + H' + T + E'	-310	-1643										
						MMAT	11245	D + L + F + H' + T + E'	326	-4418										
						MMAC	11245	D + L + F + H' + T + E'	-4	-4418										
					13-H-L	MTCM	11050	1.4D + 1.7F + 1.3H + 1.4To	190	-731	D + L + F + H' + T + E'	104	8	-	-	-	-	-	-	-
						MCCM	11048	D + L + F + H' + T + E'	-118	-343										
						MMAT	11050	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	187	-1179										
						MMAC	11048	D + L + F + H' + T + E'	-6	-986										
					14-H-L	MTCM	11776	1.4D + 1.7F + 1.3H + 1.4To	262	-1079	D + L + F + H' + T + E'	72	16	-	-	-	-	-	-	-
						MCCM	11776	D + L + F + H' + T + E'	-127	-643										
						MMAT	11854	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	209	-3554										
						MMAC	11158	D + L + F + H' + T + E'	-4	-2709										
					15-H-L	MTCM	11771	1.4D + 1.7F + 1.3H + 1.4To	174	-178	D + L + F + H' + T + E'	69	8	-	-	-	-	-	-	-
						MCCM	11718	D + L + F + H' + T + E'	-114	-569										
						MMAT	11773	D + L + F + H' + T + E'	58	-1791										
						MMAC	11773	D + L + F + H' + T + E'	-5	-1791										
					16-H-L	MTCM	11914	1.4D + 1.7F + 1.3H + 1.4To	244	-538	D + L + F + H' + T + E'	69	12	-	-	-	-	-	-	-
						MCCM	11139	D + L + F + H' + T + E'	-105	-137										
						MMAT	11852	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	103	-2315										
						MMAC	11156	D + L + F + H' + T + E'	-5	-1943										
					17-H-L	MTCM	11157	1.4D + 1.7F + 1.3H + 1.4To	164	-705	D + L + F + H' + T + E'	69	8	-	-	-	-	-	-	-
						MCCM	11205	D + L + F + H' + T + E'	-98	-81										
						MMAT	11157	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	66	-1269										
						MMAC	11205	D + L + F + H' + T + E'	-24	-1222										
					18-H-L	MTCM	11225	1.4D + 1.7F + 1.3H + 1.4To	232	-751	D + L + F + H' + T + E'	72	12	-	-	-	-	-	-	-
						MCCM	11263	D + L + F + H' + T + E'	-165	-756										
						MMAT	11222	D + L + F + H' + T + E'	106	-2950										
						MMAC	11222	D + L + F + H' + T + E'	-9	-2868										

Table 3H.6-8 Results of UHS/RSW Pump House Concrete Slab Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin Foundation Mat (Cont'd)	10	Top	East-West	3H.6-131	19-H-L	MTCM	11635	1.4D + 1.7F + 1.3H + 1.4To	930	-199	D + L + F + H' + T + E'	21	16	-	-	-	-	-	-	-
						MCCM	10961	D + L + F + H' + T + E'	-674	-88										
						MMAT	11041	1.4D + 1.7F + 1.3H + 1.4To	442	-966										
						MMAC	11041	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-100	-1191										
			North-South	3H.6-132	1-V-L	MTCM	4577	1.4D + 1.7F + 1.3H + 1.4To	899	-105	D + L + F + H' + T + E'	39	16	-	-	-	-	-	-	-
						MCCM	8336	D + L + F + H' + T + E'	-740	-67										
						MMAT	13146	D + L + F + H' + T + E'	125	-1388										
						MMAC	13146	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-648	-1840										
					2-V-L	MTCM	11956	1.4D + 1.4F + 1.7H + 1.7W	213	-40	D + L + F + H' + T + E'	51	8	-	-	-	-	-	-	-
						MCCM	11940	D + L + F + H' + T + E'	-179	-950										
						MMAT	11944	D + L + F + H' + T + E'	94	-1261										
						MMAC	11746	D + L + F + H' + T + E'	-36	-1236										
					3-V-L	MTCM	13246	D + L + F + H' + T + E'	250	-523	D + L + F + H' + T + E'	184	8	-	-	-	-	-	-	-
						MCCM	13246	D + L + F + H' + T + E'	-539	-748										
						MMAT	13246	D + L + F + H' + T + E'	53	-1003										
						MMAC	13246	D + L + F + H' + T + E'	-150	-1003										
					4-V-L	MTCM	12085	1.4D + 1.4F + 1.7H + 1.7W	261	-341	D + L + F + H' + T + E'	184	8	-	-	-	-	-	-	-
						MCCM	12117	D + L + F + H' + T + E'	-304	-780										
						MMAT	12097	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	95	-1609										
						MMAC	12117	1.4D + 1.7F + 1.3H + 1.4To	-186	-1592										
					5-V-L	MTCM	12060	1.4D + 1.4F + 1.7H + 1.7W	552	-2087	D + L + F + H' + T + E'	117	16	-	-	-	-	-	-	-
						MCCM	12060	D + L + F + H' + T + E'	-450	-629										
						MMAT	12060	D + L + F + H' + T + E'	262	-2862										
						MMAC	12060	D + L + F + H' + T + E'	-22	-2756										
					6-V-L	MTCM	12109	1.4D + 1.4F + 1.7H + 1.7W	494	-2535	D + L + F + H' + T + E'	184	24	-	-	-	-	-	-	-
						MCCM	12109	D + L + F + H' + T + E'	-475	-724										
						MMAT	12109	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	398	-3394										
						MMAC	12109	D + L + F + H' + T + E'	-6	-3043										
					7-V-L	MTCM	11317	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	696	-4489	D + L + F + H' + T + E'	148	24	-	-	-	-	-	-	-
						MCCM	11332	D + L + F + H' + T + E'	-322	-512										
						MMAT	11317	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	696	-4489										
						MMAC	11317	D + L + F + H' + T + E'	-3	-3949										
					8-V-L	MTCM	11395	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	274	-1481	D + L + F + H' + T + E'	60	16	-	-	-	-	-	-	-
						MCCM	11393	D + L + F + H' + T + E'	-158	-771										
						MMAT	11245	D + L + F + H' + T + E'	99	-3775										
						MMAC	11407	D + L + F + H' + T + E'	-2	-3520										
					9-V-L	MTCM	11776	1.4D + 1.7F + 1.3H + 1.4To	257	-1507	D + L + F + H' + T + E'	61	16	-	-	-	-	-	-	-
						MCCM	11974	D + L + F + H' + T + E'	-191	-231										
						MMAT	11958	D + L + F + H' + T + E'	133	-3670										
						MMAC	11958	D + L + F + H' + T + E'	-54	-3326										
					10-V-L	MTCM	11794	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	324	-824	D + L + F + H' + T + E'	88	12	-	-	-	-	-	-	-
						MCCM	11975	D + L + F + H' + T + E'	-211	-36										
						MMAT	11779	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	274	-2157										
						MMAC	11779	D + L + F + H' + T + E'	-24	-1771										
					11-V-L	MTCM	11775	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	520	-2762	D + L + F + H' + T + E'	88	24	-	-	-	-	-	-	-
						MCCM	11775	D + L + F + H' + T + E'	-282	-590										
						MMAT	11790	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	494	-3795										
						MMAC	11775	D + L + F + H' + T + E'	-22	-3398										

Table 3H.6-8 Results of UHS/RSW Pump House Concrete Slab Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin Foundation Mat (Cont'd)	10	Top	North-South	3H.6-132	12-V-L	MTCM	11602	1.4D + 1.4F + 1.7H + 1.7W	251	-245	D + L + F + H' + T + E'	67	8	-	-	-	-	-	-	-
						MCCM	11608	D + L + F + H' + T + E'	-202	-52										
						MMAT	11602	D + L + F + H' + T + E'	65	-953										
						MMAC	11602	D + L + F + H' + T + E'	-81	-953										
					13-V-L	MTCM	11842	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	342	-1802	D + L + F + H' + T + E'	67	16	-	-	-	-	-	-	-
						MCCM	11842	D + L + F + H' + T + E'	-173	-432										
						MMAT	11838	D + L + F + H' + T + E'	95	-2785										
						MMAC	11838	D + L + F + H' + T + E'	-8	-2785										
					14-V-L	MTCM	11858	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	447	-474	D + L + F + H' + T + E'	117	16	-	-	-	-	-	-	-
						MCCM	12054	D + L + F + H' + T + E'	-231	-43										
						MMAT	11858	D + L + F + H' + T + E'	161	-2066										
						MMAC	11858	D + L + F + H' + T + E'	-30	-2066										
					15-V-L	MTCM	11854	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	687	-5307	D + L + F + H' + T + E'	117	28	-	-	-	-	-	-	-
						MCCM	11839	D + L + F + H' + T + E'	-303	-311										
						MMAT	11854	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	675	-5331										
						MMAC	11839	D + L + F + H' + T + E'	-4	-3967										
					16-V-L	MTCM	11311	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	330	-343	D + L + F + H' + T + E'	184	8	-	-	-	-	-	-	-
						MCCM	12118	D + L + F + H' + T + E'	-264	-43										
						MMAT	10846	D + L + F + H' + T + E'	75	-992										
						MMAC	11702	D + L + F + H' + T + E'	-121	-1085										
					17-V-L	MTCM	11859	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	354	-1316	D + L + F + H' + T + E'	96	16	-	-	-	-	-	-	-
						MCCM	11861	D + L + F + H' + T + E'	-177	-326										
						MMAT	11855	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	227	-3419										
						MMAC	11855	D + L + F + H' + T + E'	-4	-3071										
					18-V-L	MTCM	11918	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	724	-5436	D + L + F + H' + T + E'	184	28	-	-	-	-	-	-	-
						MCCM	11903	D + L + F + H' + T + E'	-307	-559										
						MMAT	11918	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	720	-5506										
						MMAC	11903	D + L + F + H' + T + E'	-3	-4321										
					19-V-L	MTCM	11326	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	361	-686	D + L + F + H' + T + E'	120	12	-	-	-	-	-	-	-
						MCCM	11326	D + L + F + H' + T + E'	-176	-159										
						MMAT	11390	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	260	-1488										
						MMAC	10996	D + L + F + H' + T + E'	-21	-1322										
					20-V-L	MTCM	10922	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	308	-419	D + L + F + H' + T + E'	96	12	-	-	-	-	-	-	-
						MCCM	11210	D + L + F + H' + T + E'	-124	-648										
						MMAT	11206	D + L + F + H' + T + E'	107	-2552										
						MMAC	11206	D + L + F + H' + T + E'	0	-2085										
					21-V-L	MTCM	11222	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	524	-2690	D + L + F + H' + T + E'	85	24	-	-	-	-	-	-	-
						MCCM	11222	D + L + F + H' + T + E'	-262	-1058										
						MMAT	11222	D + L + F + H' + T + E'	308	-3746										
						MMAC	11222	D + L + F + H' + T + E'	-16	-3617										
					22-V-L	MTCM	11801	1.4D + 1.7F + 1.3H + 1.4To	192	-884	D + L + F + H' + T + E'	184	8	-	-	-	-	-	-	-
						MCCM	11880	D + L + F + H' + T + E'	-91	-215										
						MMAT	11248	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	71	-1393										
						MMAC	11737	D + L + F + H' + T + E'	-3	-1024										
					23-V-L	MTCM	11423	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	171	-242	D + L + F + H' + T + E'	42	8	-	-	-	-	-	-	-
						MCCM	11263	D + L + F + H' + T + E'	-158	-822										
						MMAT	11253	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	3	-1518										
						MMAC	11251	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-2	-1482										

Table 3H.6-8 Results of UHS/RSW Pump House Concrete Slab Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads					Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads			Load Combination	Horizontal Section		Vertical Section			
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)			Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)		
UHS Basin Foundation Mat (Cont'd)	10	Top	North-South	3H.6-132	24-V-L	MTCM	5064	1.4D + 1.7F + 1.3H + 1.4To	856	-118	D + L + F + H' + T + E'	29	16	-	-	-	-	-	-	-
						MCCM	5041	D + L + F + H' + T + E'	-647	-76										
						MMAT	8318	1.4D + 1.7F + 1.3H + 1.4To	427	-1051										
						MMAC	8318	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-109	-1322										
		Bottom	East-West	3H.6-133	1-H-L	MTCM	13149	D + L + F + H' + T + E'	381	843	D + L + F + H' + T + E'	187	12	-	-	-	-	-	-	-
						MCCM	13149	D + L + F + H' + T + E'	-281	564										
						MMAT	13149	D + L + F + H' + T + E'	250	1101										
						MMAC	8344	1.4D + 1.4F + 1.7H + 1.7W	-10	919										
					2-H-L	MTCM	13205	1.4D + 1.7F + 1.3H + 1.4To	936	447	D + L + F + H' + T + E'	63	16	-	-	-	-	-	-	(8)
						MCCM	13251	D + L + F + H' + T + E'	-701	606										
						MMAT	13150	1.4D + 1.4F + 1.7H + 1.7W	23	1666										
						MMAC	13150	1.4D + 1.7F + 1.3H + 1.4To	-74	1537										
					3-H-L	MTCM	12004	1.4D + 1.7F + 1.3H + 1.4To	585	74	D + L + F + H' + T + E'	104	12	-	-	-	-	-	-	-
						MCCM	12117	D + L + F + H' + T + E'	-858	600										
						MMAT	11981	D + L + F + H' + T + E'	13	2884										
						MMAC	11981	D + L + F + H' + T + E'	-86	2884										
					4-H-L	MTCM	11325	1.4D + 1.7F + 1.3H + 1.4To	201	651	D + L + F + H' + T + E'	101	8	-	-	-	-	-	-	-
						MCCM	12130	D + L + F + H' + T + E'	-237	109										
						MMAT	8549	1.4D + 1.4F + 1.7H + 1.7W	33	1417										
						MMAC	8549	1.4D + 1.7F + 1.3H + 1.4To	-70	1320										
					5-H-L	MTCM	12123	1.4D + 1.7F + 1.3H + 1.4To	229	665	D + L + F + H' + T + E'	104	12	-	-	-	-	-	-	-
						MCCM	12124	D + L + F + H' + T + E'	-230	1608										
						MMAT	11317	D + L + F + H' + T + E'	14	2464										
						MMAC	11317	D + L + F + H' + T + E'	-69	2464										
					6-H-L	MTCM	11464	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	197	210	D + L + F + H' + T + E'	104	8	-	-	-	-	-	-	-
						MCCM	11486	D + L + F + H' + T + E'	-113	509										
						MMAT	11944	D + L + F + H' + T + E'	26	1268										
						MMAC	11944	D + L + F + H' + T + E'	-29	1268										
					7-H-L	MTCM	11958	D + L + F + H' + T + E'	429	947	D + L + F + H' + T + E'	104	16	-	-	-	-	-	-	-
						MCCM	11958	D + L + F + H' + T + E'	-310	2798										
						MMAT	11958	D + L + F + H' + T + E'	223	3328										
						MMAC	11958	D + L + F + H' + T + E'	-102	3328										
					8-H-L	MTCM	11531	1.4D + 1.7F + 1.3H + 1.4To	337	278	D + L + F + H' + T + E'	78	12	-	-	-	-	-	-	-
						MCCM	11511	D + L + F + H' + T + E'	-146	1171										
						MMAT	11546	D + L + F + H' + T + E'	60	2167										
						MMAC	11546	D + L + F + H' + T + E'	-57	2167										
					9-H-L	MTCM	11764	D + L + F + H' + T + E'	345	1776	D + L + F + H' + T + E'	77	16	-	-	-	-	-	-	-
						MCCM	11764	D + L + F + H' + T + E'	-307	2660										
						MMAT	11764	D + L + F + H' + T + E'	229	3272										
						MMAC	11764	D + L + F + H' + T + E'	-82	3272										
					10-H-L	MTCM	11775	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	210	1506	D + L + F + H' + T + E'	72	12	-	-	-	-	-	-	-
						MCCM	11763	D + L + F + H' + T + E'	-170	1119										
						MMAT	11762	D + L + F + H' + T + E'	87	2273										
						MMAC	11762	D + L + F + H' + T + E'	-11	2273										
					11-H-L	MTCM	11993	1.4D + 1.7F + 1.3H + 1.4To	372	357	D + L + F + H' + T + E'	104	12	-	-	-	-	-	-	-
						MCCM	10977	D + L + F + H' + T + E'	-172	156										
						MMAT	11143	D + L + F + H' + T + E'	30	2215										
						MMAC	11143	D + L + F + H' + T + E'	-44	2215										

Table 3H.6-8 Results of UHS/RSW Pump House Concrete Slab Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads					Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads				Horizontal Section		Vertical Section			
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)		
UHS Basin Foundation Mat (Cont'd)	10	Bottom	East-West	3H.6-133	12-H-L	MTCM	11407	D + L + F + H' + T + E'	343	2208	D + L + F + H' + T + E'	104	16	-	-	-	-	-	-	-
						MCCM	11407	D + L + F + H' + T + E'	-340	3102										
						MMAT	11407	D + L + F + H' + T + E'	238	3436										
						MMAC	11407	D + L + F + H' + T + E'	-103	3436										
					13-H-L	MTCM	10994	1.4D + 1.7F + 1.3H + 1.4To	217	454	D + L + F + H' + T + E'	78	12	-	-	-	-	-	-	-
						MCCM	11014	D + L + F + H' + T + E'	-173	1025										
						MMAT	10990	D + L + F + H' + T + E'	59	1891										
						MMAC	10990	D + L + F + H' + T + E'	-34	1891										
					14-H-L	MTCM	11245	D + L + F + H' + T + E'	333	1780	D + L + F + H' + T + E'	77	16	-	-	-	-	-	-	-
						MCCM	11245	D + L + F + H' + T + E'	-310	2419										
						MMAT	11245	D + L + F + H' + T + E'	212	3412										
						MMAC	11245	D + L + F + H' + T + E'	-114	3412										
					15-H-L	MTCM	11051	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	192	543	D + L + F + H' + T + E'	104	8	-	-	-	-	-	-	-
						MCCM	11048	D + L + F + H' + T + E'	-121	461										
						MMAT	5042	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	1	1244										
						MMAC	8324	1.4D + 1.4F + 1.7H + 1.7W	-12	1514										
					16-H-L	MTCM	11912	1.4D + 1.7F + 1.3H + 1.4To	233	119	D + L + F + H' + T + E'	60	8	-	-	-	-	-	-	-
						MCCM	11263	D + L + F + H' + T + E'	-165	115										
						MMAT	8118	1.4D + 1.4F + 1.7H + 1.7W	42	1701										
						MMAC	8118	1.4D + 1.7F + 1.3H + 1.4To	-33	1636										
					17-H-L	MTCM	11616	1.4D + 1.7F + 1.3H + 1.4To	933	486	D + L + F + H' + T + E'	21	16	-	-	-	-	-	-	-
						MCCM	11555	D + L + F + H' + T + E'	-684	223										
						MMAT	4586	1.4D + 1.4F + 1.7H + 1.7W	21	1827										
						MMAC	5036	1.4D + 1.7F + 1.3H + 1.4To	-20	1769										
			North-South	3H.6-134	1-V-L	MTCM	4576	1.4D + 1.7F + 1.3H + 1.4To	904	132	D + L + F + H' + T + E'	39	16	-	-	-	-	-	-	-
						MCCM	8336	D + L + F + H' + T + E'	-740	124										
						MMAT	4586	1.4D + 1.4F + 1.7H + 1.7W	9	1902										
						MMAC	4586	1.4D + 1.7F + 1.3H + 1.4To	-23	1848										
					2-V-L	MTCM	11956	1.4D + 1.4F + 1.7H + 1.7W	219	157	D + L + F + H' + T + E'	51	8	-	-	-	-	-	-	-
						MCCM	11940	D + L + F + H' + T + E'	-162	222										
						MMAT	11456	1.4D + 1.4F + 1.7H + 1.7W	23	1784										
						MMAC	11456	1.4D + 1.7F + 1.3H + 1.4To	-58	1723										
					3-V-L	MTCM	11957	1.4D + 1.4F + 1.7H + 1.7W	256	30	D + L + F + H' + T + E'	117	8	-	-	-	-	-	-	-
						MCCM	12110	D + L + F + H' + T + E'	-264	1522										
						MMAT	12111	D + L + F + H' + T + E'	25	1690										
						MMAC	12111	D + L + F + H' + T + E'	-162	1792										
					4-V-L	MTCM	13246	D + L + F + H' + T + E'	250	506	D + L + F + H' + T + E'	184	12	-	-	-	-	-	-	-
						MCCM	13246	D + L + F + H' + T + E'	-539	165										
						MMAT	11319	D + L + F + H' + T + E'	101	2223										
						MMAC	11319	D + L + F + H' + T + E'	-23	2223										
					5-V-L	MTCM	11373	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	202	415	D + L + F + H' + T + E'	96	8	-	-	-	-	-	-	-
						MCCM	11353	D + L + F + H' + T + E'	-95	537										
						MMAT	13208	1.4D + 1.4F + 1.7H + 1.7W	2	1481										
						MMAC	13206	1.4D + 1.4F + 1.7H + 1.7W	-9	1498										
					6-V-L	MTCM	11981	1.4D + 1.4F + 1.7H + 1.7W	394	751	D + L + F + H' + T + E'	88	12	-	-	-	-	-	-	-
						MCCM	11996	D + L + F + H' + T + E'	-389	1947										
						MMAT	11958	D + L + F + H' + T + E'	68	3269										
						MMAC	11958	D + L + F + H' + T + E'	-26	3269										

Table 3H.6-8 Results of UHS/RSW Pump House Concrete Slab Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads – Load Combination	In-plane Shear (5) (kips / ft)	Longitudinal Reinforcement Provided (in^2/ft)	Transverse Shear Design Loads – Load Combination	Horizontal Section – Transverse Shear Force (kip / ft)	Horizontal Section – Corresponding Axial Force (kip / ft)	Vertical Section – Transverse Shear Force (kip / ft)	Vertical Section – Corresponding Axial Force (kip / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin Foundation Mat (Cont'd)	10	Bottom	North-South	3H.6-134	7-V-L	MTCM	11332	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	566	860	D + L + F + H' + T + E'	184	16	-	-	-	-	-	-	-
						MCCM	12109	D + L + F + H' + T + E'	-475	2095										
						MMAT	11317	D + L + F + H' + T + E'	249	3608										
						MMAC	11317	D + L + F + H' + T + E'	-82	3608										
					8-V-L	MTCM	10936	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	316	1268	D + L + F + H' + T + E'	96	12	-	-	-	-	-	-	-
						MCCM	11376	D + L + F + H' + T + E'	-153	758										
						MMAT	10923	D + L + F + H' + T + E'	134	1979										
						MMAC	10937	D + L + F + H' + T + E'	-1	1778										
					9-V-L	MTCM	11396	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	433	721	D + L + F + H' + T + E'	85	16	-	-	-	-	-	-	-
						MCCM	11396	D + L + F + H' + T + E'	-305	2430										
						MMAT	11407	D + L + F + H' + T + E'	103	3498										
						MMAC	11396	D + L + F + H' + T + E'	-47	3039										
					10-V-L	MTCM	11799	1.4D + 1.7F + 1.3H + 1.4To	187	246	D + L + F + H' + T + E'	184	8	-	-	-	-	-	-	(8)
						MCCM	11853	D + L + F + H' + T + E'	-118	862										
						MMAT	11220	D + L + F + H' + T + E'	94	1660										
						MMAC	11220	D + L + F + H' + T + E'	-2	1449										
					11-V-L	MTCM	11423	1.4D + 1.7F + 1.3H + 1.4To	191	124	D + L + F + H' + T + E'	42	8	-	-	-	-	-	-	-
						MCCM	11263	D + L + F + H' + T + E'	-146	33										
						MMAT	11041	1.4D + 1.4F + 1.7H + 1.7W	39	1625										
						MMAC	11041	1.4D + 1.7F + 1.3H + 1.4To	-41	1557										
					12-V-L	MTCM	5048	1.4D + 1.7F + 1.3H + 1.4To	870	293	D + L + F + H' + T + E'	29	16	-	-	-	-	-	-	-
						MCCM	5063	D + L + F + H' + T + E'	-657	208										
						MMAT	5036	1.4D + 1.4F + 1.7H + 1.7W	11	1867										
						MMAC	5036	1.4D + 1.7F + 1.3H + 1.4To	-18	1834										
		-	Transverse (East-West and North-South)	3H.6-134A	1-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-274	391	45	22	0.44	
					2-T	-	-	-	-	-	-	-	-	1.4D + 1.4F + 1.7H + 1.7W	-199	19	-197	35	0.31	
					3-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-455	143	-481	627	1.76	
					4-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-171	311	-78	103	0.2	
					5-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-270	157	-231	127	0.79	
					6-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-273	427	-17	74	0.6	
					7-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-235	309	350	147	2.4	
Pump House Roof (7)	1.75	Top	East-West	3H.6-135	1-H-L	MTCM	9892	D + L + F + H' + T + E'	130	-3	D + L + F + H' + T + E'	69	3.81	-	-	-	-	-	-	-
						MCCM	10495	D + L + F + H' + T + E'	-121	-20										
						MMAT	9849	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	24	-65										
						MMAC	10508	D + L + F + H' + T + E'	-38	-68										
			North-South	3H.6-136A	1-V-L	MTCM	10495	D + L + F + H' + T + E'	311	-104	D + L + F + H' + T + E'	67	3.81	-	-	-	-	-	-	-
						MCCM	10495	D + L + F + H' + T + E'	-337	-26										
						MMAT	10495	D + L + F + H' + T + E'	286	-105										
						MMAC	10495	D + L + F + H' + T + E'	-198	-105										
		Bottom	East-West	3H.6-136B	1-H-L	MTCM	10317	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	149	36	D + L + F + H' + T + E'	69	3.81	-	-	-	-	-	-	-
						MCCM	9824	D + L + F + H' + T + E'	-123	4										
						MMAT	10318	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	91	54										
						MMAC	10496	D + L + F + H' + T + E'	-1	45										
			North-South	3H.6-136C	1-V-L	MTCM	10495	D + L + F + H' + T + E'	311	44	D + L + F + H' + T + E'	67	3.81	-	-	-	-	-	-	-
						MCCM	10495	D + L + F + H' + T + E'	-330	107										
						MMAT	10495	D + L + F + H' + T + E'	132	112										
						MMAC	10495	D + L + F + H' + T + E'	-297	112										

Table 3H.6-8 Results of UHS/RSW Pump House Concrete Slab Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads					Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads				Horizontal Section		Vertical Section			
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane Shear (5) (kips / ft)		Load Combination	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)		

Notes:

(1) The reinforcement layout drawings show the various zones used to define the minimum reinforcement that will be provided based on finite element analysis results. Actual provided reinforcement based on final rebar layout may exceed the reported provided reinforcement and the zones with higher reinforcement may be extended beyond their reported boundaries.

(2) Each reinforcement layout drawing is divided into reinforcement zones. The reinforcement zone naming convention is as follows: "H" = horizontal, "V" = vertical, "L" = longitudinal reinforcement, "T" = transverse reinforcement.

(3) The maximum tension (MTCM) and compression (MCCM) axial forces are provided with the corresponding moment from the same load combination. The maximum moment that has a corresponding tension (MMAT) in the same load combination and the maximum moment that has a corresponding compression (MMAC) in the same load combination are also provided. For zones where either axial tension or axial compression does not occur for any load combination, dashes are input into the corresponding cell.

(4) Negative axial load is compression and positive axial load is tension. Negative moment applies tension to the top face of the shell element and positive moment applies tension to the bottom face of the shell element.

(5) The reported in-plane shear is the maximum average in-plane shear along a plane that crosses the longitudinal reinforcement zone.

(6) NOT USED.

(7) The Pump House Operating Floor and Roof slab thickness includes the metal decking (2.5 inches).

(8) For certain areas of the structure, the standard element post-processing methods were too conservative. For such cases, detailed manual design was performed and the design forces determined by the detailed manual design are provided in the table.

(9) The transverse reinforcement for the UHS Basin and RSW Pump House Buttresses is spaced with a maximum center-to-center spacing of 4".

Table 3H.6-9 Results of UHS/RSW Pump House Beams and Columns Design

Location	Item	Critical Element Number	Load Combination	Maximum Forces	Design Loads: Axial (kips) P	Design Loads: Moments (ft-kips) M2	Design Loads: Moments (ft-kips) M3	Design Loads: Moments (ft-kips) Torsion	Design Loads: Shear (kips) V2	Design Loads: Shear (kips) V3	Reinforcement: Longitudinal Provided (in^2)	Reinforcement: Transverse Provided x-direction	Reinforcement: Transverse Provided y-direction	Remarks
UHS Basin	5' x 5' Columns	516	1.4D+1.7L+1.7F+1.7H+1.7W	Maximum axial compression with corresponding forces	-2687	-1473	904	-	-	-	148.5	7 # 5 @ 4" O.C	7 # 5 @ 4" O.C	Local Axis definition: 1 = vertical 2 = east-west 3 = north-south Transverse reinforcement includes one closed loop which accounts for two legs in each direction.
		487	D+Lo+F+H'+To+E'	Maximum axial tension with corresponding forces	348	1148	465	-	-	-	148.5	7 # 5 @ 4" O.C	7 # 5 @ 4" O.C	
		510	D+Lo+F+H'+To+E'	Maximum M2 moment with corresponding forces	-1066	-9127	1990	-	-	-	148.5	7 # 5 @ 4" O.C	7 # 5 @ 4" O.C	
		506	D+Lo+F+H'+To+E'	Maximum M3 moment with corresponding forces	-630	834	7298	-	-	-	148.5	7 # 5 @ 4" O.C	7 # 5 @ 4" O.C	
		506	D+Lo+F+H'+To+E'	Maximum V2	-	-	-	-	212	-	148.5	7 # 5 @ 4" O.C	7 # 5 @ 4" O.C	
		510	D+Lo+F+H'+To+E'	Maximum V3	-	-	-	-	-	-278	148.5	7 # 5 @ 4" O.C	7 # 5 @ 4" O.C	
		505	D+Lo+F+H'+To+E'	Maximum Torsion	-	-	-	-652	-	-	148.5	7 # 5 @ 4" O.C	7 # 5 @ 4" O.C	
	5' x 12' Columns	518	1.4D+1.7L+1.7F+1.7H+1.7W	Maximum axial compression with corresponding forces	-4746	-2484	822	-	-	-	175.5	13 # 5 @ 4" O.C	7 # 5 @ 4" O.C	Local Axis definition: 1 = vertical 2 = east-west 3 = north-south Transverse reinforcement includes one closed loop which accounts for two legs in each direction.
		497	D+Lo+F+H'+To+E'	Maximum axial tension with corresponding forces	645	2639	2900	-	-	-	175.5	13 # 5 @ 4" O.C	7 # 5 @ 4" O.C	
		496	D+Lo+F+H'+To+E'	Maximum M2 moment with corresponding forces	-2509	-13456	-10148	-	-	-	175.5	13 # 5 @ 4" O.C	7 # 5 @ 4" O.C	
		518	D+Lo+F+H'+To+E'	Maximum M3 moment with corresponding forces	-3435	3346	30990	-	-	-	175.5	13 # 5 @ 4" O.C	7 # 5 @ 4" O.C	
		518	D+Lo+F+H'+To+E'	Maximum V2	-	-	-	-	453	-	175.5	13 # 5 @ 4" O.C	7 # 5 @ 4" O.C	
		496	D+Lo+F+H'+To+E'	Maximum V3	-	-	-	-	-	-398	175.5	13 # 5 @ 4" O.C	7 # 5 @ 4" O.C	
		497	D+Lo+F+H'+To+E'	Maximum Torsion	-	-	-	-980	-	-	175.5	13 # 5 @ 4" O.C	7 # 5 @ 4" O.C	
	4' x 4'-6" Beams	16	D+Lo+F+H'+To+E'	Maximum axial compression with corresponding forces	-3313	-2968	-3215	-	-	-	155.16	8 # 5 @ 4" O.C.	6 # 5 @ 4" O.C.	Local Axis definition: 1 = north-south 2 = vertical 3 = east-west Transverse reinforcement includes one closed loop which accounts for two legs in each direction.
		16	D+Lo+F+H'+To+E'	Maximum axial tension with corresponding forces	5158	1054	2155	-	-	-	155.16	8 # 5 @ 4" O.C.	6 # 5 @ 4" O.C.	
		36	D+Lo+F+H'+To+E'	Maximum M2 moment with corresponding forces	947	-6596	44	-	-	-	155.16	8 # 5 @ 4" O.C.	6 # 5 @ 4" O.C.	
		16	D+Lo+F+H'+To+E'	Maximum M3 moment with corresponding forces	-1848	2332	6486	-	-	-	155.16	8 # 5 @ 4" O.C.	6 # 5 @ 4" O.C.	
		16	D+Lo+F+H'+To+E'	Maximum V2	-	-	-	-	663	-	155.16	8 # 5 @ 4" O.C.	6 # 5 @ 4" O.C.	
		36	D+Lo+F+H'+To+E'	Maximum V3	-	-	-	-	-	798	155.16	8 # 5 @ 4" O.C.	6 # 5 @ 4" O.C.	
		403	D+Lo+F+H'+To+E'	Maximum Torsion	-	-	-	698	-	-	155.16	8 # 5 @ 4" O.C.	6 # 5 @ 4" O.C.	

Table 3H.6-10 Tornado Missile Impact Evaluations for UHS/RSW Pump House

Local Check	**UHS/ RSW Pump House Walls and Roof**		Minimum Required Thickness to Prevent Penetration, Perforation and Scabbing = 12.9"
			Minimum Provided Thickness = 18"
Overall Check of Impacted Element	**Pump House**	**Roof**	Shear controls. Maximum impact load including Dynamic Load Factor (DLF) = 168 Kips Minimum capacity = 188 Kips
		Walls	Shear controls. Maximum impact load including Dynamic Load Factor (DLF) = 900 Kips Minimum capacity = 1772 Kips
	UHS Basin	**Fan Enclosure Walls**	Flexure controls. Ductility demand = 0.522 < Ductility limit = 10
		Basin Walls	Shear controls. Maximum impact load including Dynamic Load Factor (DLF) = 319 Kips Minimum capacity = 402 Kips
Global Check			Equivalent static impact forces are applied to the FEM analysis of the UHS/RSW Pump House. The analysis results presented in Tables 3H.6-7 and 3H.6-8 provide summary of the results for all load combinations including those applicable to tornado load combinations which include missile impact.

Table 3H.6-11 Results of DGFOS Vault Concrete Design

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads – Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in²/ ft)	Transverse Shear Design Loads(6) – Load Combination	Horizontal Section – Transverse Shear Force (kip / ft)	Horizontal Section – Corresponding Axial Force (kip / ft)	Vertical Section – Transverse Shear Force (kip / ft)	Vertical Section – Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
Slab 1	6	Near Side	Horizontal	3H.6-142	1-H-L	MTCM	244	D + F + L + H' +E'	34	-71	D + F + L + H' +E'	24	3.12	-	-	-	-	-	-	
						MCCM	2278	D + F + L + H' +E'	-78	-164										
						MMAT	283	D + F + L + H' +E'	1	-374										
						MMAC	243	D + F + L + H' +E'	-15	-412										
					2-H-L	MTCM	2260	D + F + L + H' +E'	55	-220	D + F + L + H' +E'	24	4.68	-	-	-	-	-	-	
						MCCM	34	D + F + L + H' +E'	-52	-39										
						MMAT	99	D + F + L + H' +E'	5	-748										
						MMAC	99	D + F + L + H' +E'	-1	-748										
					3-H-L	MTCM	344	D + F + L + H' +E'	36	-341	D + F + L + H' +E'	24	9.36	-	-	-	-	-	-	
						MCCM	364	D + F + L + H' +E'	-66	-610										
						MMAT	363	D + F + L + H' +E'	8	-1693										
						MMAC	363	D + F + L + H' +E'	-11	-1693										
			Vertical	3H.6-143	1-V-L	MTCM	2524	D + F + L + H' +E'	35	-85	D + F + L + H' +E'	27	3.12	-	-	-	-	-	-	
						MCCM	174	D + F + L + H' +E'	-174	-61										
						MMAT	2525	D + F + L + H' +E'	20	-322										
						MMAC	115	D + F + L + H' +E'	-63	-516										
					2-V-L	MTCM	377	D + F + L + H' +E'	38	-52	D + F + L + H' +E'	27	4.68	-	-	-	-	-	-	
						MCCM	231	D + F + L + H' +E'	-147	-9										
						MMAT	35	D + F + L + H' +E'	24	-416										
						MMAC	225	1.4D + 1.4F +1.7L + 1.7H + 1.7W	-82	-688										
					3-V-L	MTCM	18	D + F + L + H' +E'	41	-123	D + F + L + H' +E'	27	6.24	-	-	-	-	-	-	
						MCCM	117	1.4D + 1.4F +1.7L + 1.7H + 1.7W	-123	-432										
						MMAT	344	D + F + L + H' +E'	16	-966										
						MMAC	99	D + F + L + H' +E'	-36	-1131										
		Far side	Horizontal	3H.6-144	1-H-L	MTCM	253	D + F + L + H' +E'	23	185	D + F + L + H' +E'	24	3.12	-	-	-	-	-	-	
						MCCM	2269	D + F + L + H' +E'	-52	136										
						MMAT	109	D + F + L + H' +E'	13	388										
						MMAC	158	D + F + L + H' +E'	-22	445										
					2-H-L	MTCM	2299	D + F + L + H' +E'	82	512	D + F + L + H' +E'	24	4.68	-	-	-	-	-	-	
						MCCM	354	D + F + L + H' +E'	-83	853										
						MMAT	116	D + F + L + H' +E'	11	748										
						MMAC	355	D + F + L + H' +E'	-74	940										
					3-H-L	MTCM	40	D + F + L + H' +E'	64	688	D + F + L + H' +E'	24	6.24	-	-	-	-	-	-	
						MCCM	377	D + F + L + H' +E'	-66	321										
						MMAT	40	D + F + L + H' +E'	46	918										
						MMAC	378	D + F + L + H' +E'	-24	1215										
					4-H-L	MTCM	346	D + F + L + H' +E'	73	935	D + F + L + H' +E'	24	7.8	-	-	-	-	-	-	(8)
						MCCM	364	D + F + L + H' +E'	-66	496										
						MMAT	99	D + F + L + H' +E'	9	1437										
						MMAC	99	D + F + L + H' +E'	-5	1437										
			Vertical	3H.6-145	1-V-L	MTCM	349	D + F + L + H' +E'	81	660	D + F + L + H' +E'	27	6.24	-	-	-	-	-	-	
						MCCM	194	D + F + L + H' +E'	-191	675										
						MMAT	61	D + F + L + H' +E'	18	1001										
						MMAC	295	D + F + L + H' +E'	-15	1102										

Table 3H.6-11 Results of DGFOS Vault Concrete Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number(2)	Maximum Forces(3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads(6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
Slab 1	6	Far side	Vertical	3H.6-145	2-V-L	MTCM	2521	D + F + L + H' +E'	80	575	D + F + L + H' +E'	19	9.36	-	-	-	-	-	-	
						MCCM	225	D + F + L + H' +E'	-300	1143										
						MMAT	383	D + F + L + H' +E'	67	978										
						MMAC	243	D + F + L + H' +E'	-135	1806										
					3-V-L	MTCM	359	D + F + L + H' +E'	119	1130	D + F + L + H' +E'	27	10.92	-	-	-	-	-	-	
						MCCM	117	D + F + L + H' +E'	-285	1289										
						MMAT	71	D + F + L + H' +E'	21	1812										
						MMAC	221	D + F + L + H' +E'	-245	2135										
					4-V-L	MTCM	267	D + F + L + H' +E'	4	177	D + F + L + H' +E'	17	14.04	-	-	-	-	-	-	
						MCCM	231	D + F + L + H' +E'	-303	1378										
						MMAT	-	-	-	-										
						MMAC	125	D + F + L + H' +E'	-248	2465										
					5-V-L	MTCM	-	-	-	-	D + F + L + H' +E'	11	15.6	-	-	-	-	-	-	(8)
						MCCM	215	D + F + L + H' +E'	-268	2308										
						MMAT	-	-	-	-										
						MMAC	197	D + F + L + H' +E'	-246	2453										
		-	Transverse (North-South & East-West)	3H.6-146	1-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	172	-123	27	-21	0.31 (5@12")	
					2-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	195	18	119	5	0.80 (4@6")	
Roof 2	2	Near Side	Horizontal	3H.6-147	1-H-L	MTCM	553	D + F + L + H' +E'	70	-40	D + F + L + H' +E'	40	3.12	-	-	-	-	-	-	(9)
						MCCM	553	D + F + L + H' +E'	-172	-14										
						MMAT	553	D + F + L + H' +E'	21	-53										
						MMAC	539	D + F + L + H' +E'	-92	-70										
			Vertical	3H.6-148	1-V-L	MTCM	401	D + F + L + H' +E'	41	-16	D + F + L + H' +E'	60	1.56	-	-	-	-	-	-	
						MCCM	565	D + F + L + H' +E'	-141	-32										
						MMAT	401	D + F + L + H' +E'	24	-31										
						MMAC	511	D + F + L + H' +E'	-105	-118										
					2-V-L	MTCM	554	D + F + L + H' +E'	80	0	D + F + L + H' +E'	60	3.12	-	-	-	-	-	-	
						MCCM	554	D + F + L + H' +E'	-185	-68										
						MMAT	539	D + F + L + H' +E'	2	-98										
						MMAC	539	D + F + L + H' +E'	-85	-176										
					3-V-L	MTCM	566	D + F + L + H' +E'	6	-12	D + F + L + H' +E'	22	6.24	-	-	-	-	-	-	(8)
						MCCM	566	D + F + L + H' +E'	-152	-152										
						MMAT	566	D + F + L + H' +E'	3	-14										
						MMAC	566	D + F + L + H' +E'	-104	-221										
		Far side	Horizontal	3H.6-149	1-H-L	MTCM	399	D + F + L + H' +E'	18	4	D + F + L + H' +E'	40	3.12	-	-	-	-	-	-	(9)
						MCCM	553	D + F + L + H' +E'	-172	26										
						MMAT	556	D + F + L + H' +E'	3	67										
						MMAC	565	D + F + L + H' +E'	-21	81										
			Vertical	3H.6-150	1-V-L	MTCM	554	D + F + L + H' +E'	81	24	D + F + L + H' +E'	60	1.56	-	-	-	-	-	-	
						MCCM	565	D + F + L + H' +E'	-114	11										
						MMAT	565	D + F + L + H' +E'	71	24										
						MMAC	566	D + F + L + H' +E'	-35	24										
Slab 3	2	Near Side	Horizontal	3H.6-151	1-H-L	MTCM	650	D + F + L + H' +E'	29	-13	D + F + L + H +Wt	24	1.56	-	-	-	-	-	-	
						MCCM	638	D + F + L + H +Wt	-58	-21										
						MMAT	643	D + F + L + H +Wt	2	-38										
						MMAC	638	D + F + L + H +Wt	-54	-57										

Table 3H.6-11 Results of DGFOS Vault Concrete Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number [1]	Reinforcement Zone Number [2]	Maximum Forces [3]	Element	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Load Combination	Axial [4] (kips / ft)	Flexure [4] (ft-kips / ft)	In-Plane Shear Loads – Load Combination	In-plane Shear [5] (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads [6] – Load Combination	Horizontal Section – Transverse Shear Force (kip / ft)	Horizontal Section – Corresponding Axial Force (kip / ft)	Vertical Section – Transverse Shear Force (kip / ft)	Vertical Section – Corresponding Axial Force (kip / ft)	Transverse Shear [7] Reinforcement Provided (in^2/ft^2)	Remarks
Slab 3	2	Near Side	Horizontal	3H.6-151	2-H-L	MTCM	574	D + F + L + H' + E'	7	-19	D + F + L + H + Wt	24	3.12	-	-	-	-	-	-	
						MCCM	574	D + F + L + H' + E'	-8	-6										
						MMAT	574	D + F + L + H' + E'	7	-19										
						MMAC	574	D + F + L + H' + E'	-3	-13										
			Vertical	3H.6-152	1-V-L	MTCM	575	D + F + L + H + Wt	25	-5	D + F + L + H + Wt	16	1.56	-	-	-	-	-	-	
						MCCM	575	D + F + L + H' + E'	-73	-5										
						MMAT	588	D + F + L + H' + E'	16	-25										
						MMAC	588	D + F + L + H' + E'	-5	-25										
					2-V-L	MTCM	574	D + F + L + H' + E'	36	-36	D + F + L + H + Wt	15	3.12	-	-	-	-	-	-	
						MCCM	574	D + F + L + H' + E'	-84	-11										
						MMAT	574	D + F + L + H' + E'	34	-36										
						MMAC	574	D + F + L + H' + E'	-3	-36										
		Far side	Horizontal	3H.6-153	1-H-L	MTCM	638	D + F + L + H + Wt	30	5	D + F + L + H + Wt	24	1.56	-	-	-	-	-	-	
						MCCM	651	D + F + L + H' + E'	-50	1										
						MMAT	643	D + F + L + H' + E'	3	26										
						MMAC	572	D + F + L + H + Wt	-5	31										
					2-H-L	MTCM	574	D + F + L + H' + E'	5	6	D + F + L + H + Wt	24	3.12	-	-	-	-	-	-	
						MCCM	574	D + F + L + H + Wt	-15	14										
						MMAT	574	D + F + L + H' + E'	2	18										
						MMAC	573	D + F + L + H + Wt	-6	35										
			Vertical	3H.6-154A	1-V-L	MTCM	575	D + F + L + H + Wt	30	6	D + F + L + H + Wt	16	1.56	-	-	-	-	-	-	
						MCCM	575	D + F + L + H' + E'	-73	8										
						MMAT	575	D + F + L + H' + E'	16	21										
						MMAC	588	D + F + L + H + Wt	-65	24										
					2-V-L	MTCM	574	D + F + L + H' + E'	36	21	D + F + L + H + Wt	15	3.12	-	-	-	-	-	-	
						MCCM	574	D + F + L + H + Wt	-114	41										
						MMAT	574	D + F + L + H + Wt	1	26										
						MMAC	574	D + F + L + H + Wt	-114	41										
		-	Transverse (North-South & East-West)	3H.6-154B	1-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	-18	51	-28	9	0.44 (3@6")	
Roof 5	2	Near Side	Horizontal	3H.6-155	1-H-L	MTCM	690	D + F + L + H + Wt	44	-12	D + F + L + H + Wt	37	1.56	-	-	-	-	-	-	
						MCCM	695	D + F + L + H + Wt	-47	-8										
						MMAT	771	D + F + L + H' + E'	0	-26										
						MMAC	768	D + F + L + H' + E'	-8	-41										
			Vertical	3H.6-156	1-V-L	MTCM	769	D + F + L + H + Wt	63	-5	D + F + L + H' + E'	18	1.56	-	-	-	-	-	-	
						MCCM	693	D + F + L + H + Wt	-53	-2										
						MMAT	731	D + F + L + H' + E'	0	-19										
						MMAC	768	D + F + L + H + Wt	-31	-19										
		Far side	Horizontal	3H.6-157	1-H-L	MTCM	704	D + F + L + H + Wt	32	5	D + F + L + H + Wt	37	1.56	-	-	-	-	-	-	
						MCCM	767	D + F + L + H + Wt	-145	16										
						MMAT	698	D + F + L + H + Wt	1	19										
						MMAC	732	D + F + L + H + Wt	-22	49										
			Vertical	3H.6-158	1-V-L	MTCM	711	D + F + L + H + Wt	27	0	D + F + L + H' + E'	18	1.56	-	-	-	-	-	-	
						MCCM	732	D + F + L + H + Wt	-170	15										
						MMAT	732	D + F + L + H' + E'	5	17										
						MMAC	697	D + F + L + H + Wt	-43	43										

Table 3H.6-11 Results of DGFOS Vault Concrete Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6)					Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads			Load Combination	Horizontal Section		Vertical Section			
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)			Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)		
Roof 6	2	Near Side	Horizontal	3H.6-159	1-H-L	MTCM	684	D + F + L + H +Wt	43	-7	D + F + L + H +Wt	52	1.56	-	-	-	-	-	-	
						MCCM	689	D + F + L + H +Wt	-107	-29										
						MMAT	687	D + F + L + H +Wt	2	-48										
						MMAC	689	D + F + L + H +Wt	-30	-74										
			Vertical	3H.6-160	1-V-L	MTCM	689	D + F + L + H +Wt	29	-5	D + F + L + H +Wt	87	1.56	-	-	-	-	-	-	
						MCCM	689	D + F + L + H +Wt	-86	-2										
						MMAT	666	D + F + L + H +Wt	5	-24										
						MMAC	656	D + F + L + H +Wt	-38	-25										
		Far side	Horizontal	3H.6-161	1-H-L	MTCM	673	D + F + L + H +Wt	45	9	D + F + L + H +Wt	52	1.56	-	-	-	-	-	-	
						MCCM	657	D + F + L + H +Wt	-230	25										
						MMAT	657	D + F + L + H +Wt	2	53										
						MMAC	666	D + F + L + H +Wt	-21	62										
			Vertical	3H.6-162	1-V-L	MTCM	663	D + F + L + H +Wt	15	6	D + F + L + H +Wt	87	1.56	-	-	-	-	-	-	
						MCCM	666	D + F + L + H +Wt	-267	30										
						MMAT	660	D + F + L + H +Wt	3	17										
						MMAC	656	D + F + L + H +Wt	-37	75										
Wall 7	4	Near Side	Horizontal	3H.6-163	1-H-L	MTCM	875	D + F + L + H' +E'	118	-38	D + F + L + H' +E'	61	3.12	-	-	-	-	-	-	
						MCCM	1044	D + F + L + H' +E'	-187	-40										
						MMAT	811	D + F + L + H' +E'	5	-223										
						MMAC	1069	D + F + L + H' +E'	-163	-366										
					2-H-L	MTCM	1046	D + F + L + H' +E'	21	-80	D + F + L + H' +E'	61	4.68	-	-	-	-	-	-	
						MCCM	1052	D + F + L + H' +E'	-184	-554										
						MMAT	1016	D + F + L + H' +E'	2	-118										
						MMAC	1070	D + F + L + H' +E'	-165	-594										
					3-H-L	MTCM	891	D + F + L + H' +E'	150	-234	D + F + L + H' +E'	61	6.24	-	-	-	-	-	-	
						MCCM	1042	D + F + L + H' +E'	-223	-205										
						MMAT	1042	D + F + L + H' +E'	96	-298										
						MMAC	1041	D + F + L + H' +E'	-179	-765										
					4-H-L	MTCM	-	-	-	-	D + F + L + H' +E'	44	7.8	-	-	-	-	-	-	
						MCCM	1053	D + F + L + H' +E'	-192	-888										
						MMAT	-	-	-	-										
						MMAC	1065	D + F + L + H' +E'	-185	-930										
			Vertical	3H.6-164	1-V-L	MTCM	798	D + F + L + H' +E'	76	-70	D + F + L + H' +E'	92	3.12	-	-	-	-	-	-	
						MCCM	1041	D + F + L + H' +E'	-188	-61										
						MMAT	1059	D + F + L + H' +E'	1	-219										
						MMAC	1059	D + F + L + H' +E'	-54	-219										
					2-V-L	MTCM	796	D + F + L + H' +E'	157	-175	D + F + L + H' +E'	92	4.68	-	-	-	-	-	-	
						MCCM	1029	D + F + L + H' +E'	-213	-61										
						MMAT	891	D + F + L + H' +E'	1	-378										
						MMAC	804	D + F + L + H' +E'	-88	-457										
					3-V-L	MTCM	812	D + F + L + H' +E'	51	-434	D + F + L + H' +E'	74	9.36	-	-	-	-	-	-	
						MCCM	1014	D + F + L + H' +E'	-131	-88										
						MMAT	820	D + F + L + H' +E'	1	-988										
						MMAC	820	D + F + L + H' +E'	-49	-988										

Table 3H.6-11 Results of DGFOS Vault Concrete Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number(2)	Maximum Forces(3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in²/ ft)	Transverse Shear Design Loads(6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
Wall 7	4	Near Side	Vertical	3H.6-164	4-V-L	MTCM	828	D + F + L + H' +E'	38	-629	D + F + L + H' +E'	63	10.92	-	-	-	-	-	-	
						MCCM	828	D + F + L + H' +E'	-118	-40										
						MMAT	836	D + F + L + H' +E'	1	-1217										
						MMAC	836	D + F + L + H' +E'	-54	-1224										
					5-V-L	MTCM	844	D + F + L + H' +E'	23	-717	D + F + L + H' +E'	56	12.48	-	-	-	-	-	-	(8),(10)
						MCCM	844	D + F + L + H' +E'	-112	-36										
						MMAT	868	D + F + L + H' +E'	1	-1227										
						MMAC	852	D + F + L + H' +E'	-64	-1281										
		Far side	Horizontal	3H.6-165	1-H-L	MTCM	859	D + F + L + H' +E'	108	19	D + F + L + H' +E'	61	3.12	-	-	-	-	-	-	
						MCCM	891	D + F + L + H' +E'	-304	264										
						MMAT	1047	D + F + L + H' +E'	9	194										
						MMAC	815	D + F + L + H' +E'	-123	380										
					2-H-L	MTCM	-	-	-	-	D + F + L + H' +E'	50	4.68	-	-	-	-	-	-	
						MCCM	1049	D + F + L + H' +E'	-155	148										
						MMAT	-	-	-	-										
						MMAC	814	D + F + L + H' +E'	-111	418										
			Vertical	3H.6-166	1-V-L	MTCM	1028	D + F + L + H' +E'	75	94	D + F + L + H' +E'	92	3.12	-	-	-	-	-	-	
						MCCM	1029	D + F + L + H' +E'	-203	19										
						MMAT	1058	D + F + L + H' +E'	5	169										
						MMAC	1014	D + F + L + H' +E'	-87	273										
					2-V-L	MTCM	796	D + F + L + H' +E'	138	56	D + F + L + H' +E'	92	4.68	-	-	-	-	-	-	
						MCCM	1017	D + F + L + H' +E'	-256	190										
						MMAT	810	D + F + L + H' +E'	1	300										
						MMAC	1026	D + F + L + H' +E'	-90	456										
					3-V-L	MTCM	1042	D + F + L + H +Wt	74	66	D + F + L + H' +E'	70	6.24	-	-	-	-	-	-	
						MCCM	1042	D + F + L + H' +E'	-211	39										
						MMAT	880	D + F + L + H' +E'	7	663										
						MMAC	880	D + F + L + H' +E'	-51	669										
					4-V-L	MTCM	839	D + F + L + H' +E'	19	258	D + F + L + H' +E'	56	7.8	-	-	-	-	-	-	
						MCCM	871	D + F + L + H' +E'	-75	354										
						MMAT	856	D + F + L + H' +E'	7	755										
						MMAC	856	D + F + L + H' +E'	-27	755										
					5-V-L	MTCM	-	-	-	-	D + F + L + H' +E'	56	12.48	-	-	-	-	-	-	(8),(10)
						MCCM	844	D + F + L + H' +E'	-112	44										
						MMAT	-	-	-	-										
						MMAC	868	D + F + L + H' +E'	-72	116										
		-	Transverse (Horizontal &Vertical)	3H.6-167	1-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	8	-1	95	-159	0.20 (4@12")	
					2-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	5	1	-103	-163	0.31 (5@12")	
					3-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	60	88	-129	144	0.80 (4@6")	
					4-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	-209	-7	1	-13	1.24 (5@6")	
Wall 8	4	Near Side	Horizontal	3H.6-168	1-H-L	MTCM	1124	D + F + L + H' +E'	115	-36	D + F + L + H' +E'	60	3.12	-	-	-	-	-	-	
						MCCM	1307	D + F + L + H' +E'	-173	-289										
						MMAT	1188	D + F + L + H' +E'	5	-198										
						MMAC	1301	D + F + L + H' +E'	-163	-398										

Table 3H.6-11 Results of DGFOS Vault Concrete Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane Shear (5) (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
Wall 8	4	Near Side	Horizontal	3H.6-168	2-H-L	MTCM	1276	D + F + L + H' +E'	20	-114	D + F + L + H' +E'	60	4.68	-	-	-	-	-	-	
						MCCM	1306	D + F + L + H' +E'	-183	-524										
						MMAT	1288	D + F + L + H' +E'	3	-123										
						MMAC	1300	D + F + L + H' +E'	-164	-621										
					3-H-L	MTCM	1108	D + F + L + H' +E'	145	-274	D + F + L + H' +E'	60	6.24	-	-	-	-	-	-	
						MCCM	1280	D + F + L + H' +E'	-217	-242										
						MMAT	1280	D + F + L + H' +E'	80	-339										
						MMAC	1287	D + F + L + H' +E'	-137	-763										
					4-H-L	MTCM	-	-	-	-	D + F + L + H' +E'	44	7.8	-	-	-	-	-	-	
						MCCM	1305	D + F + L + H' +E'	-192	-903										
						MMAT	-	-	-	-										
						MMAC	1311	D + F + L + H' +E'	-184	-946										
			Vertical	3H.6-169	1-V-L	MTCM	1191	D + F + L + H' +E'	78	-83	D + F + L + H' +E'	93	3.12	-	-	-	-	-	-	
						MCCM	1293	D + F + L + H' +E'	-184	-68										
						MMAT	1288	D + F + L + H' +E'	2	-195										
						MMAC	1287	D + F + L + H' +E'	-53	-245										
					2-V-L	MTCM	1189	D + F + L + H' +E'	158	-180	D + F + L + H' +E'	93	4.68	-	-	-	-	-	-	
						MCCM	1281	D + F + L + H' +E'	-210	-43										
						MMAT	1108	D + F + L + H' +E'	3	-415										
						MMAC	1181	D + F + L + H' +E'	-86	-465										
					3-V-L	MTCM	1173	D + F + L + H' +E'	53	-438	D + F + L + H' +E'	72	9.36	-	-	-	-	-	-	
						MCCM	1272	D + F + L + H' +E'	-129	-85										
						MMAT	1165	D + F + L + H' +E'	2	-993										
						MMAC	1165	D + F + L + H' +E'	-47	-993										
					4-V-L	MTCM	1157	D + F + L + H' +E'	39	-632	D + F + L + H' +E'	61	10.92	-	-	-	-	-	-	
						MCCM	1157	D + F + L + H' +E'	-118	-44										
						MMAT	1149	D + F + L + H' +E'	6	-1222										
						MMAC	1149	D + F + L + H' +E'	-55	-1229										
					5-V-L	MTCM	1141	D + F + L + H' +E'	21	-720	D + F + L + H' +E'	54	12.48	-	-	-	-	-	-	(8),(10)
						MCCM	1141	D + F + L + H' +E'	-110	-36										
						MMAT	1117	D + F + L + H' +E'	0	-1229										
						MMAC	1133	D + F + L + H' +E'	-66	-1284										
		Far side	Horizontal	3H.6-170	1-H-L	MTCM	1140	D + F + L + H' +E'	106	12	D + F + L + H' +E'	60	3.12	-	-	-	-	-	-	
						MCCM	1108	D + F + L + H' +E'	-291	288										
						MMAT	1275	D + F + L + H' +E'	9	225										
						MMAC	1104	D + F + L + H' +E'	-134	378										
					2-H-L	MTCM	-	-	-	-	D + F + L + H' +E'	50	4.68	-	-	-	-	-	-	
						MCCM	1184	D + F + L + H' +E'	-167	260										
						MMAT	-	-	-	-										
						MMAC	1175	D + F + L + H' +E'	-111	429										
			Vertical	3H.6-171	1-V-L	MTCM	1282	D + F + L + H' +E'	76	74	D + F + L + H' +E'	93	3.12	-	-	-	-	-	-	
						MCCM	1281	D + F + L + H' +E'	-201	19										
						MMAT	1288	D + F + L + H' +E'	5	201										
						MMAC	1272	D + F + L + H' +E'	-81	257										

Table 3H.6-11 Results of DGFOS Vault Concrete Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads – Load Combination	In-plane Shear (5) (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6) – Load Combination	Horizontal Section – Transverse Shear Force (kip / ft)	Horizontal Section – Corresponding Axial Force (kip / ft)	Vertical Section – Transverse Shear Force (kip / ft)	Vertical Section – Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
Wall 8	4	Far side	Vertical	3H.6-171	2-V-L	MTCM	1189	D + F + L + H' +E'	140	59	D + F + L + H' +E'	93	4.68	-	-	-	-	-	-	
						MCCM	1269	D + F + L + H' +E'	-250	179										
						MMAT	1297	D + F + L + H' +E'	2	477										
						MMAC	1297	D + F + L + H' +E'	-67	489										
					3-V-L	MTCM	1280	D + F + L + H' +E'	72	148	D + F + L + H' +E'	65	6.24	-	-	-	-	-	-	
						MCCM	1280	D + F + L + H' +E'	-189	79										
						MMAT	1161	D + F + L + H' +E'	8	667										
						MMAC	1161	D + F + L + H' +E'	-24	667										
					4-V-L	MTCM	1152	D + F + L + H' +E'	19	266	D + F + L + H' +E'	54	7.8	-	-	-	-	-	-	
						MCCM	1120	D + F + L + H' +E'	-72	351										
						MMAT	1145	D + F + L + H' +E'	7	754										
						MMAC	1145	D + F + L + H' +E'	-26	754										
					5-V-L	MTCM	-	-	-	-	D + F + L + H' +E'	54	12.48	-	-	-	-	-	-	(8),(10)
						MCCM	1141	D + F + L + H' +E'	-110	50										
						MMAT	-	-	-	-										
						MMAC	1117	D + F + L + H' +E'	-67	114										
		-	Transverse (Horizontal &Vertical)	3H.6-172	1-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	6	0	-94	-159	0.20 (4@12")	
					2-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	-104	20	22	-75	0.31 (5@12")	
					3-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	-171	20	-8	-25	0.80 (4@6")	
					4-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	-209	-10	-1	-12	1.24 (5@6")	
Wall 9	2	Near Side	Horizontal	3H.6-173	1-H-L	MTCM	959	D + F + L + H +Wt	43	-4	D + F + L + H +Wt	58	1.56	-	-	-	-	-	-	
						MCCM	987	D + F + L + H +Wt	-98	-4										
						MMAT	996	D + F + L + H' +E'	1	-38										
						MMAC	992	D + F + L + H' +E'	-16	-82										
					2-H-L	MTCM	1019	D + F + L + H +Wt	46	-5	D + F + L + H +Wt	58	3.12	-	-	-	-	-	-	
						MCCM	1019	D + F + L + H +Wt	-73	-7										
						MMAT	1018	D + F + L + H' +E'	20	-79										
						MMAC	1035	D + F + L + H' +E'	-36	-101										
					3-H-L	MTCM	1030	D + F + L + H +Wt	83	-18	D + F + L + H +Wt	58	4.68	-	-	-	-	-	-	
						MCCM	1030	D + F + L + H' +E'	-166	-8										
						MMAT	1030	D + F + L + H' +E'	58	-95										
						MMAC	1030	D + F + L + H' +E'	-16	-95										
			Vertical	3H.6-174	1-V-L	MTCM	993	D + F + L + H +Wt	45	-5	D + F + L + H +Wt	47	1.56	-	-	-	-	-	-	
						MCCM	974	D + F + L + H +Wt	-81	-1										
						MMAT	1033	D + F + L + H' +E'	11	-61										
						MMAC	1033	D + F + L + H' +E'	-23	-61										
					2-V-L	MTCM	1035	D + F + L + H' +E'	67	-9	D + F + L + H +Wt	47	3.12	-	-	-	-	-	-	
						MCCM	1019	D + F + L + H' +E'	-116	-14										
						MMAT	1031	D + F + L + H' +E'	9	-97										
						MMAC	1031	D + F + L + H' +E'	-60	-97										
					3-V-L	MTCM	1030	D + F + L + H' +E'	154	-102	D + F + L + H +Wt	45	6.24	-	-	-	-	-	-	
						MCCM	1030	D + F + L + H' +E'	-255	-50										
						MMAT	1030	D + F + L + H' +E'	60	-179										
						MMAC	1030	D + F + L + H' +E'	-101	-179										

Table 3H.6-11 Results of DGFOS Vault Concrete Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads – Load Combination	In-plane Shear (5) (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6) – Load Combination	Horizontal Section – Transverse Shear Force (kip / ft)	Horizontal Section – Corresponding Axial Force (kip / ft)	Vertical Section – Transverse Shear Force (kip / ft)	Vertical Section – Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
Wall 9	2	Far side	Horizontal	3H.6-175	1-H-L	MTCM	1032	D + F + L + H' + E'	31	17	D + F + L + H + Wt	58	1.56	-	-	-	-	-	-	
						MCCM	995	D + F + L + H + Wt	-181	16										
						MMAT	955	D + F + L + H + Wt	8	49										
						MMAC	983	D + F + L + H + Wt	-41	68										
					2-H-L	MTCM	1030	D + F + L + H + Wt	56	9	D + F + L + H + Wt	58	3.12	-	-	-	-	-	-	
						MCCM	1030	D + F + L + H' + E'	-166	29										
						MMAT	1011	D + F + L + H' + E'	2	37										
						MMAC	1000	D + F + L + H' + E'	-42	45										
			Vertical	3H.6-176A	1-V-L	MTCM	992	D + F + L + H' + E'	48	4	D + F + L + H + Wt	47	1.56	-	-	-	-	-	-	
						MCCM	983	D + F + L + H + Wt	-120	7										
						MMAT	1008	D + F + L + H' + E'	1	18										
						MMAC	995	D + F + L + H + Wt	-39	69										
					2-V-L	MTCM	1035	D + F + L + H' + E'	65	4	D + F + L + H + Wt	45	3.12	-	-	-	-	-	-	
						MCCM	1030	D + F + L + H' + E'	-236	2										
						MMAT	1023	D + F + L + H' + E'	62	5										
						MMAC	1006	D + F + L + H' + E'	-167	27										
		-	Transverse (Horizontal & Vertical)	3H.6-176B	1-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	-31	123	-14	4	0.44 (3@6")	
					2-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	-43	114	-56	-8	1.24 (5@6")	
Wall 10	2	Near Side	Horizontal	3H.6-177	1-H-L	MTCM	1233	D + F + L + H' + E'	35	-31	D + F + L + H + Wt	59	1.56	-	-	-	-	-	-	
						MCCM	1216	D + F + L + H + Wt	-96	-4										
						MMAT	1201	D + F + L + H' + E'	4	-43										
						MMAC	1201	D + F + L + H' + E'	-16	-79										
					2-H-L	MTCM	1246	D + F + L + H' + E'	40	-43	D + F + L + H + Wt	59	3.12	-	-	-	-	-	-	
						MCCM	1246	D + F + L + H + Wt	-66	-8										
						MMAT	1258	D + F + L + H' + E'	18	-78										
						MMAC	1197	D + F + L + H' + E'	-36	-98										
					3-H-L	MTCM	1257	D + F + L + H' + E'	74	-89	D + F + L + H + Wt	59	4.68	-	-	-	-	-	-	
						MCCM	1257	D + F + L + H' + E'	-155	-10										
						MMAT	1257	D + F + L + H' + E'	54	-96										
						MMAC	1257	D + F + L + H' + E'	-11	-96										
			Vertical	3H.6-178	1-V-L	MTCM	1262	D + F + L + H' + E'	53	-5	D + F + L + H + Wt	38	1.56	-	-	-	-	-	-	
						MCCM	1243	D + F + L + H + Wt	-82	-1										
						MMAT	1234	D + F + L + H' + E'	13	-61										
						MMAC	1234	D + F + L + H' + E'	-25	-61										
					2-V-L	MTCM	1259	D + F + L + H' + E'	103	-55	D + F + L + H + Wt	38	3.12	-	-	-	-	-	-	
						MCCM	1259	D + F + L + H' + E'	-145	-6										
						MMAT	1245	D + F + L + H' + E'	11	-103										
						MMAC	1245	D + F + L + H' + E'	-45	-103										
					3-V-L	MTCM	1257	D + F + L + H' + E'	144	-108	D + F + L + H + Wt	35	6.24	-	-	-	-	-	-	
						MCCM	1257	D + F + L + H' + E'	-217	-58										
						MMAT	1257	D + F + L + H' + E'	51	-188										
						MMAC	1257	D + F + L + H' + E'	-78	-188										
		Far side	Horizontal	3H.6-179	1-H-L	MTCM	1233	D + F + L + H' + E'	31	21	D + F + L + H + Wt	59	1.56	-	-	-	-	-	-	
						MCCM	1265	D + F + L + H + Wt	-179	19										
						MMAT	1264	D + F + L + H + Wt	0	49										
						MMAC	1232	D + F + L + H + Wt	-41	66										

Table 3H.6-11 Results of DGFOS Vault Concrete Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads – Axial and Flexure Loads – Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads – Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6) – Load Combination	Horizontal Section – Transverse Shear Force (kip / ft)	Horizontal Section – Corresponding Axial Force (kip / ft)	Vertical Section – Transverse Shear Force (kip / ft)	Vertical Section – Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
Wall 10	2	Far side	Horizontal	3H.6-179	2-H-L	MTCM	1257	D + F + L + H +Wt	51	7	D + F + L + H +Wt	59	3.12	-	-	-	-	-	-	
						MCCM	1257	D + F + L + H' +E'	-155	25										
						MMAT	1199	D + F + L + H' +E'	0	40										
						MMAC	1198	D + F + L + H' +E'	-5	46										
			Vertical	3H.6-180A	1-V-L	MTCM	1261	D + F + L + H' +E'	62	4	D + F + L + H +Wt	38	1.56	-	-	-	-	-	-	
						MCCM	1244	D + F + L + H +Wt	-120	5										
						MMAT	1235	D + F + L + H' +E'	1	20										
						MMAC	1265	D + F + L + H +Wt	-47	69										
					2-V-L	MTCM	1198	D + F + L + H' +E'	60	3	D + F + L + H +Wt	38	3.12	-	-	-	-	-	-	
						MCCM	1257	D + F + L + H' +E'	-191	4										
						MMAT	1199	D + F + L + H' +E'	53	7										
						MMAC	1259	D + F + L + H' +E'	-140	27										
		-	Transverse (Horizontal &Vertical)	3H.6-180B	1-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	-31	120	10	3	0.44 (3@6")	
					2-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	-32	102	57	-12	0.80 (4@6")	
Wall 11	2	Near Side	Horizontal	3H.6-181	1-H-L	MTCM	951	D + F + L + H +Wt	43	-7	D + F + L + H +Wt	55	1.56	-	-	-	-	-	-	
						MCCM	939	D + F + L + H +Wt	-85	-1										
						MMAT	951	D + F + L + H +Wt	34	-44										
						MMAC	947	D + F + L + H +Wt	-2	-38										
			Vertical	3H.6-182	1-V-L	MTCM	944	D + F + L + H +Wt	37	-4	D + F + L + H +Wt	43	1.56	-	-	-	-	-	-	
						MCCM	908	D + F + L + H +Wt	-84	-25										
						MMAT	935	D + F + L + H +Wt	9	-38										
						MMAC	907	D + F + L + H +Wt	-80	-33										
		Far side	Horizontal	3H.6-183	1-H-L	MTCM	934	D + F + L + H +Wt	31	5	D + F + L + H +Wt	55	1.56	-	-	-	-	-	-	
						MCCM	907	D + F + L + H +Wt	-210	25										
						MMAT	947	D + F + L + H +Wt	5	45										
						MMAC	935	D + F + L + H +Wt	-20	89										
			Vertical	3H.6-184	1-V-L	MTCM	944	D + F + L + H +Wt	34	4	D + F + L + H +Wt	43	1.56	-	-	-	-	-	-	
						MCCM	927	D + F + L + H +Wt	-184	23										
						MMAT	935	D + F + L + H +Wt	0	69										
						MMAC	907	D + F + L + H +Wt	-79	99										
Wall 12	4	Near Side	Horizontal	3H.6-185	1-H-L	MTCM	1437	D + F + L + H' +E'	24	-168	D + F + L + H' +E'	108	3.12	-	-	-	-	-	-	
						MCCM	1345	D + F + L + H' +E'	-199	-379										
						MMAT	1349	D + F + L + H' +E'	14	-216										
						MMAC	1432	D + F + L + H' +E'	-188	-474										
					2-H-L	MTCM	-	-	-	-	D + F + L + H' +E'	85	4.68	-	-	-	-	-	-	
						MCCM	1433	D + F + L + H' +E'	-199	-533										
						MMAT	-	-	-	-										
						MMAC	1434	D + F + L + H' +E'	-188	-543										
					3-H-L	MTCM	1341	D + F + L + H' +E'	24	-175	D + F + L + H' +E'	108	7.8	-	-	-	-	-	-	
						MCCM	1337	D + F + L + H' +E'	-201	-831										
						MMAT	1445	D + F + L + H' +E'	16	-226										
						MMAC	1337	D + F + L + H' +E'	-201	-831										
			Vertical	3H.6-186	1-V-L	MTCM	1432	D + F + L + H' +E'	81	-41	D + F + L + H' +E'	100	3.12	-	-	-	-	-	-	
						MCCM	1440	D + F + L + H' +E'	-180	-75										
						MMAT	1365	D + F + L + H' +E'	4	-222										
						MMAC	1373	D + F + L + H' +E'	-23	-230										

Table 3H.6-11 Results of DGFOS Vault Concrete Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6)					Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads			Load Combination	Horizontal Section		Vertical Section			
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane Shear (5) (kips / ft)			Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)	Transverse Shear Force (kip / ft)	Corresponding Axial Force (kip / ft)		
Wall 12	4	Near Side	Vertical	3H.6-186	2-V-L	MTCM	1439	D + F + L + H' +E'	125	-47	D + F + L + H' +E'	100	4.68	-	-	-	-	-	-	
						MCCM	1439	D + F + L + H' +E'	-210	-27										
						MMAT	1415	D + F + L + H' +E'	10	-200										
						MMAC	1415	D + F + L + H' +E'	-49	-200										
					3-V-L	MTCM	1438	D + F + L + H' +E'	194	-118	D + F + L + H' +E'	100	6.24	-	-	-	-	-	-	
						MCCM	1438	D + F + L + H' +E'	-270	-22										
						MMAT	1406	D + F + L + H' +E'	41	-502										
						MMAC	1406	D + F + L + H' +E'	-12	-502										
					4-V-L	MTCM	1382	D + F + L + H' +E'	92	-692	D + F + L + H' +E'	90	7.8	-	-	-	-	-	-	
						MCCM	1398	D + F + L + H' +E'	-86	-47										
						MMAT	1374	D + F + L + H' +E'	85	-714										
						MMAC	1398	D + F + L + H' +E'	-1	-577										
		Far side	Horizontal	3H.6-187	1-H-L	MTCM	1341	D + F + L + H' +E'	20	13	D + F + L + H' +E'	108	3.12	-	-	-	-	-	-	
						MCCM	1409	D + F + L + H' +E'	-194	54										
						MMAT	1349	D + F + L + H' +E'	1	80										
						MMAC	1393	D + F + L + H' +E'	-170	339										
			Vertical	3H.6-188	1-V-L	MTCM	1343	D + F + L + H' +E'	98	57	D + F + L + H' +E'	100	3.12	-	-	-	-	-	-	
						MCCM	1335	D + F + L + H' +E'	-201	11										
						MMAT	1423	D + F + L + H' +E'	8	184										
						MMAC	1423	D + F + L + H' +E'	-109	212										
					2-V-L	MTCM	1430	D + F + L + H' +E'	134	43	D + F + L + H' +E'	100	4.68	-	-	-	-	-	-	
						MCCM	1438	D + F + L + H' +E'	-270	48										
						MMAT	1385	D + F + L + H' +E'	50	339										
						MMAC	1400	D + F + L + H' +E'	-10	324										
					3-V-L	MTCM	1383	D + F + L + H' +E'	78	275	D + F + L + H' +E'	90	6.24	-	-	-	-	-	-	
						MCCM	1391	D + F + L + H' +E'	-62	70										
						MMAT	1384	D + F + L + H' +E'	66	356										
						MMAC	1368	1.4D + 1.4F +1.7L + 1.7H + 1.7W	-1	235										
		-	Transverse (Horizontal &Vertical)	3H.6-189	1-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	13	28	-87	-186	0.20 (4@12")	
					2-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	7	1	-109	-162	0.31 (5@12")	
					3-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	8	-57	174	-189	0.80 (4@6")	
Wall 13	4	Near Side	Horizontal	3H.6-190	1-H-L	MTCM	1874	D + F + L + H +Wt	2	-17	D + F + L + H' +E'	105	3.12	-	-	-	-	-	-	
						MCCM	1953	D + F + L + H' +E'	-200	-462										
						MMAT	1873	D + F + L + H' +E'	0	-62										
						MMAC	1953	D + F + L + H' +E'	-200	-462										
					2-H-L	MTCM	1872	D + F + L + H' +E'	25	-16	D + F + L + H' +E'	105	4.68	-	-	-	-	-	-	
						MCCM	1942	D + F + L + H' +E'	-200	-597										
						MMAT	1872	D + F + L + H' +E'	5	-199										
						MMAC	1956	D + F + L + H' +E'	-189	-613										
					3-H-L	MTCM	1871	D + F + L + H' +E'	33	-48	D + F + L + H' +E'	105	6.24	-	-	-	-	-	-	
						MCCM	1926	D + F + L + H' +E'	-192	-737										
						MMAT	1884	D + F + L + H' +E'	11	-354										
						MMAC	1912	D + F + L + H' +E'	-120	-765										
					4-H-L	MTCM	-	-	-	-	D + F + L + H' +E'	80	7.8	-	-	-	-	-	-	
						MCCM	1954	D + F + L + H' +E'	-202	-881										
						MMAT	-	-	-	-										
						MMAC	1968	D + F + L + H' +E'	-190	-925										

Table 3H.6-11 Results of DGFOS Vault Concrete Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane Shear (5) (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
Wall 13	4	Near Side	Vertical	3H.6-191	1-V-L	MTCM	1871	D + F + L + H +Wt	75	-27	D + F + L + H' +E'	101	3.12	-	-	-	-	-	-	
						MCCM	1913	D + F + L + H' +E'	-185	-110										
						MMAT	1899	D + F + L + H' +E'	3	-174										
						MMAC	1899	D + F + L + H' +E'	-53	-174										
					2-V-L	MTCM	1857	D + F + L + H' +E'	155	-74	D + F + L + H' +E'	101	4.68	-	-	-	-	-	-	
						MCCM	1857	D + F + L + H' +E'	-260	-31										
						MMAT	1860	D + F + L + H' +E'	24	-422										
						MMAC	1860	D + F + L + H' +E'	-48	-422										
					3-V-L	MTCM	1864	D + F + L + H' +E'	89	-724	D + F + L + H' +E'	77	9.36	-	-	-	-	-	-	
						MCCM	1868	D + F + L + H' +E'	-119	-30										
						MMAT	1865	D + F + L + H' +E'	82	-750										
						MMAC	1867	D + F + L + H' +E'	-2	-625										
		Far side	Horizontal	3H.6-192	1-H-L	MTCM	1871	D + F + L + H' +E'	37	152	D + F + L + H' +E'	105	3.12	-	-	-	-	-	-	
						MCCM	1945	D + F + L + H' +E'	-196	95										
						MMAT	1883	D + F + L + H' +E'	4	205										
						MMAC	1964	D + F + L + H' +E'	-160	414										
					2-H-L	MTCM	1882	D + F + L + H' +E'	13	105	D + F + L + H' +E'	53	4.68	-	-	-	-	-	-	
						MCCM	1904	D + F + L + H' +E'	-112	170										
						MMAT	1882	D + F + L + H' +E'	8	115										
						MMAC	1906	D + F + L + H' +E'	-109	384										
			Vertical	3H.6-193	1-V-L	MTCM	1887	D + F + L + H' +E'	82	83	D + F + L + H' +E'	101	3.12	-	-	-	-	-	-	
						MCCM	1885	D + F + L + H' +E'	-201	3										
						MMAT	1887	D + F + L + H' +E'	5	179										
						MMAC	1887	D + F + L + H' +E'	-118	209										
					2-V-L	MTCM	1857	D + F + L + H' +E'	141	17	D + F + L + H' +E'	101	4.68	-	-	-	-	-	-	
						MCCM	1857	D + F + L + H' +E'	-260	41										
						MMAT	1922	D + F + L + H' +E'	60	336										
						MMAC	1919	D + F + L + H' +E'	-7	327										
		-	Transverse (Horizontal &Vertical)	3H.6-194	1-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	-73	81	-9	-101	0.20 (4@12")	
					2-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	5	2	107	-127	0.31 (5@12")	
					3-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	1	-46	-178	-186	0.80 (4@6")	
Wall 14	2	Near Side	Horizontal	3H.6-195	1-H-L	MTCM	1579	D + F + L + H +Wt	55	-10	D + F + L + H +Wt	28	1.56	-	-	-	-	-	-	
						MCCM	1508	D + F + L + H' +E'	-118	-24										
						MMAT	1501	D + F + L + H' +E'	4	-36										
						MMAC	1509	D + F + L + H' +E'	-64	-27										
					2-H-L	MTCM	1653	D + F + L + H' +E'	36	-44	D + F + L + H +Wt	28	3.12	-	-	-	-	-	-	
						MCCM	1496	D + F + L + H' +E'	-154	-34										
						MMAT	1653	D + F + L + H' +E'	7	-68										
						MMAC	1652	D + F + L + H' +E'	-127	-81										
			Vertical	3H.6-196	1-V-L	MTCM	1501	D + F + L + H +Wt	42	-6	D + F + L + H +Wt	39	1.56	-	-	-	-	-	-	
						MCCM	1657	D + F + L + H +Wt	-71	-1										
						MMAT	1569	D + F + L + H +Wt	15	-42										
						MMAC	1617	D + F + L + H +Wt	-1	-32										
					2-V-L	MTCM	1496	D + F + L + H' +E'	90	-23	D + F + L + H +Wt	39	3.12	-	-	-	-	-	-	
						MCCM	1498	D + F + L + H' +E'	-114	-11										
						MMAT	1544	D + F + L + H' +E'	22	-60										
						MMAC	1496	D + F + L + H' +E'	-36	-56										

Table 3H.6-11 Results of DGFOS Vault Concrete Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number(2)	Maximum Forces(3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads(6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
Wall 14	2	Near Side	Vertical	3H.6-196	3-V-L	MTCM	1652	D + F + L + H' + E'	113	-34	D + F + L + H' + E'	35	4.68	-	-	-	-	-	-	
						MCCM	1654	D + F + L + H' + E'	-157	-10										
						MMAT	1652	D + F + L + H' + E'	87	-74										
						MMAC	1652	D + F + L + H' + E'	-49	-74										
		Far side	Horizontal	3H.6-197	1-H-L	MTCM	1628	D + F + L + H' + E'	50	20	D + F + L + H + Wt	28	1.56	-	-	-	-	-	-	
						MCCM	1503	D + F + L + H + Wt	-174	28										
						MMAT	1628	D + F + L + H' + E'	45	35										
						MMAC	1543	D + F + L + H + Wt	-75	66										
					2-H-L	MTCM	1496	D + F + L + H' + E'	53	40	D + F + L + H + Wt	28	3.12	-	-	-	-	-	-	
						MCCM	1496	D + F + L + H' + E'	-150	15										
						MMAT	1652	D + F + L + H' + E'	50	56										
						MMAC	1652	D + F + L + H' + E'	-10	56										
			Vertical	3H.6-198	1-V-L	MTCM	1657	D + F + L + H + Wt	31	3	D + F + L + H + Wt	39	1.56	-	-	-	-	-	-	
						MCCM	1567	D + F + L + H + Wt	-105	8										
						MMAT	1508	D + F + L + H' + E'	0	62										
						MMAC	1628	D + F + L + H' + E'	-51	70										
					2-V-L	MTCM	1653	D + F + L + H' + E'	93	9	D + F + L + H + Wt	39	3.12	-	-	-	-	-	-	
						MCCM	1652	D + F + L + H' + E'	-221	99										
						MMAT	1652	D + F + L + H' + E'	1	66										
						MMAC	1652	D + F + L + H' + E'	-221	99										
		-	Transverse (Horizontal &Vertical)	3H.6-199	1-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	-22	90	13	16	0.44 (3@6")	
					2-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	-40	202	16	-122	0.80 (4@6")	
Wall 15	2	Near Side	Horizontal	3H.6-200	1-H-L	MTCM	1808	D + F + L + H + Wt	65	-9	D + F + L + H' + E'	28	1.56	-	-	-	-	-	-	
						MCCM	1840	D + F + L + H + Wt	-90	-2										
						MMAT	1833	D + F + L + H' + E'	0	-50										
						MMAC	1693	D + F + L + H' + E'	-14	-83										
					2-H-L	MTCM	1689	D + F + L + H' + E'	21	-5	D + F + L + H' + E'	28	3.12	-	-	-	-	-	-	
						MCCM	1689	D + F + L + H' + E'	-33	-43										
						MMAT	1845	D + F + L + H' + E'	16	-86										
						MMAC	1845	D + F + L + H' + E'	-27	-102										
			Vertical	3H.6-201	1-V-L	MTCM	1703	D + F + L + H' + E'	53	-15	D + F + L + H + Wt	34	1.56	-	-	-	-	-	-	
						MCCM	1796	D + F + L + H + Wt	-107	-10										
						MMAT	1770	D + F + L + H' + E'	0	-32										
						MMAC	1796	D + F + L + H' + E'	-11	-44										
					2-V-L	MTCM	1689	D + F + L + H + Wt	75	-26	D + F + L + H + Wt	34	3.12	-	-	-	-	-	-	
						MCCM	1689	D + F + L + H' + E'	-65	-5										
						MMAT	1689	D + F + L + H' + E'	49	-39										
						MMAC	1689	D + F + L + H' + E'	-1	-39										
		Far side	Horizontal	3H.6-202	1-H-L	MTCM	1843	D + F + L + H + Wt	24	1	D + F + L + H' + E'	28	1.56	-	-	-	-	-	-	
						MCCM	1696	D + F + L + H + Wt	-194	20										
						MMAT	1741	D + F + L + H' + E'	3	43										
						MMAC	1784	D + F + L + H + Wt	-86	67										
					2-H-L	MTCM	1689	D + F + L + H' + E'	22	26	D + F + L + H' + E'	28	3.12	-	-	-	-	-	-	
						MCCM	1713	D + F + L + H' + E'	-29	3										
						MMAT	1845	D + F + L + H' + E'	13	38										
						MMAC	1714	D + F + L + H' + E'	-4	34										

Table 3H.6-11 Results of DGFOS Vault Concrete Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
Wall 15	2	Far side	Vertical	3H.6-203A	1-V-L	MTCM	1693	D + F + L + H' +E'	54	10	D + F + L + H +Wt	34	1.56	-	-	-	-	-	-	
						MCCM	1796	D + F + L + H +Wt	-106	6										
						MMAT	1773	D + F + L + H' +E'	1	55										
						MMAC	1696	D + F + L + H +Wt	-29	79										
					2-V-L	MTCM	1702	D + F + L + H' +E'	56	6	D + F + L + H +Wt	34	3.12	-	-	-	-	-	-	
						MCCM	1689	D + F + L + H +Wt	-80	18										
						MMAT	1714	D + F + L + H' +E'	1	18										
						MMAC	1845	D + F + L + H' +E'	-70	32										
		-	Transverse (Horizontal & Vertical)	3H.6-203B	1-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	-22	86	-36	-20	0.44 (3@6")	
Wall 16	2	Near Side	Horizontal	3H.6-204	1-H-L	MTCM	1484	D + F + L + H +Wt	7	-5	D + F + L + H +Wt	41	1.56	-	-	-	-	-	-	
						MCCM	1458	D + F + L + H +Wt	-12	-4										
						MMAT	1492	D + F + L + H +Wt	5	-15										
						MMAC	1492	D + F + L + H +Wt	-6	-13										
					2-H-L	MTCM	1455	D + F + L + H' +E'	13	-2	D + F + L + H +Wt	51	3.12	-	-	-	-	-	-	
						MCCM	1447	D + F + L + H +Wt	-48	-8										
						MMAT	1494	D + F + L + H +Wt	0	-12										
						MMAC	1470	D + F + L + H +Wt	-41	-25										
			Vertical	3H.6-205	1-V-L	MTCM	1450	D + F + L + H +Wt	81	-6	D + F + L + H +Wt	35	1.56	-	-	-	-	-	-	
						MCCM	1491	D + F + L + H +Wt	-51	-26										
						MMAT	1449	D + F + L + H' +E'	5	-12										
						MMAC	1491	D + F + L + H +Wt	-51	-26										
					2-V-L	MTCM	1448	D + F + L + H +Wt	37	-18	D + F + L + H +Wt	35	3.12	-	-	-	-	-	-	
						MCCM	1447	D + F + L + H +Wt	-40	-26										
						MMAT	1455	D + F + L + H +Wt	6	-25										
						MMAC	1447	D + F + L + H +Wt	-31	-43										
		Far side	Horizontal	3H.6-206	1-H-L	MTCM	1468	D + F + L + H +Wt	13	8	D + F + L + H +Wt	41	1.56	-	-	-	-	-	-	
						MCCM	1490	D + F + L + H +Wt	-185	45										
						MMAT	1489	D + F + L + H +Wt	2	31										
						MMAC	1490	D + F + L + H +Wt	-184	45										
					2-H-L	MTCM	1447	D + F + L + H' +E'	21	3	D + F + L + H +Wt	51	3.12	-	-	-	-	-	-	
						MCCM	1478	D + F + L + H +Wt	-54	10										
						MMAT	1494	D + F + L + H +Wt	3	11										
						MMAC	1470	D + F + L + H +Wt	-40	77										
			Vertical	3H.6-207	1-V-L	MTCM	1451	D + F + L + H +Wt	82	11	D + F + L + H +Wt	35	1.56	-	-	-	-	-	-	
						MCCM	1491	D + F + L + H +Wt	-110	14										
						MMAT	1452	D + F + L + H +Wt	9	16										
						MMAC	1491	D + F + L + H +Wt	-50	79										
					2-V-L	MTCM	1453	D + F + L + H +Wt	47	15	D + F + L + H +Wt	35	3.12	-	-	-	-	-	-	
						MCCM	1478	D + F + L + H +Wt	-138	36										
						MMAT	1462	D + F + L + H +Wt	0	38										
						MMAC	1478	D + F + L + H +Wt	-6	41										

Table 3H.6-11 Results of DGFOS Vault Concrete Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Load Combination	In-plane Shear (5) (kips / ft)	Longitudinal Reinforcement Provided (in^2/ ft)	Transverse Shear Design Loads (6): Load Combination	Horizontal Section: Transverse Shear Force (kip / ft)	Horizontal Section: Corresponding Axial Force (kip / ft)	Vertical Section: Transverse Shear Force (kip / ft)	Vertical Section: Corresponding Axial Force (kip / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
Wall 16	2	-	Transverse (Horizontal & Vertical)	3H.6-208	1-T	-	-	-	-	-	-	-	-	-	-	-	-	-	1.24 (5@6")	Transverse shear reinforcement provided due to tornado missle impact evaluation.

Notes:

(1) The reinforcement layout drawings show the various zones used to define the minimum reinforcement that will be provided based on finite element analysis results. Actual provided reinforcement based on final rebar layout and including development length may exceed the reported provided reinforcement and the zones with higher reinforcement may be extended beyond their reported boundaries. The dimensions in the reinforcement drawings are based on the dimensions of the SAP2000 shell elements, which are modeled at the centerline of the walls and slabs. Therefore, the reinforcement drawing dimensions do not match actual building dimensions.

(2) Each reinforcement layout drawing is divided into reinforcement zones. The reinforcement zone naming convention is as follows: "H" = horizontal, "V" = vertical, "L" = longitudinal reinforcement, "T" = transverse reinforcement. For slabs, vertical corresponds to Y-axis and horizontal corresponds to X-axis as shown on Figure 3H.6-140.

(3) The maximum tension (MTCM) and compression (MCCM) axial forces are provided with the corresponding moment from the same load combination. The maximum moment that has a corresponding tension (MMAT) in the same load combination and the maximum moment that has a corresponding compression (MMAC) in the same load combination are also provided.

(4) Negative axial load is compression and positive axial load is tension. Negative moment applies tension to the top face of the shell element and positive moment applies tension to the bottom face of the shell element. For walls or slabs where the same reinforcement is provided on both faces, the moment is shown as absolute value. The axial and flexural loads reported in the table are the average of the 2 node pairs that form the 4 edges of the critical rectangular shell element. If the 2 node pairs on the shell element edges parallel to the reinforcement direction do not satisfy P&M interaction criteria, then only the 2 node pairs on the shell element edges perpendicular to the reinforcement direction are used for design (effective width considered).

(5) The reported in-plane shear is the maximum average in-plane shear along a plane that crosses the longitudinal reinforcement zone.

(6) The transverse shear reinforcement loads are reported for the critical element requiring the largest area of steel for transverse reinforcement within the zone. The shear force and the corresponding axial force in the same load combination for each direction is reported for the critical element.

(7) The reported transverse shear reinforcement is the summation of the requried shear reinforcement in the horizontal direction and the required shear reinforcement in the vertical direction.

(8) For certain areas of the structure, the standard element post-processing methods were too conservative. For such cases, detailed manual design was performed and the design forces determined by the detailed manual design are provided in the table.

(9) The reported forces are from the FEM analysis. The provided longitudinal reinforcement includes additional reinforcement required due to manual one-way design calculations.

(10) The longitudinal reinforcement shown is required to be tied.

Table 3H.6-12 Factors of Safety Against Sliding, Overturning, and Flotation for Diesel Generator Fuel Oil Storage Vaults

Load Combination	Calculated Safety Factor			Notes
	Overturning	Sliding	Flotation	
D + F’	---	---	1.28	2, 3
D + H + W	1.5	5.84	---	2, 3, 4
D + H + Wt	1.41	19.75	---	2, 3
D + H + E’	1.1	1.1	---	3, 4, 5

Notes:

1) Loads D, H, W, Wt, and E’ are defined in Subsection 3H.6.4.3.4.1. F’ is the buoyant force corresponding to the design basis flood.
2) Reported safety factors are conservatively based on considering empty weight of the fuel oil tank.
3) Coefficients of friction for sliding resistance are 0.58 for static conditions and 0.39 for dynamic conditions for the Diesel Generator Fuel Oil Storage Vault.
4) The calculated safety factors consider less that ~~half of the~~ full passive pressure. The calculated safety factors increase if full passive pressure (Kp = 3.0) is considered.
5) The seismic sliding forces and overturning moments from SSI and SSSI analyses are less than the seismic sliding forces and overturning moments used in the stability evaluations.

Table 3H.6-13 Tornado Missile Impact Evaluation for Diesel Generator Fuel Oil Storage Vault

<table>
<tr><td rowspan="1">Local Check</td><td>DGFOS Vault</td><td>Minimum required thickness to prevent penetration, perforation, and scabbing = 13.6”
Minimum provided thickness = 18”</td></tr>
<tr><td rowspan="4">Overall Check of Impacted Element</td><td>Roof</td><td>Flexure controls.
Maximum impact load including Dynamic Load Factor (DLF) = 432 kips
Ductility demand = 0.5 < Ductility limit = 10</td></tr>
<tr><td>Protection Hood</td><td>Flexure controls
Maximum impact load including Dynamic Load Factor (DLF) = 432 kips
Ductility demand = 5 < Ductility limit = 10</td></tr>
<tr><td>Walls</td><td>Flexure controls.
Maximum impact load including Dynamic Load Factor (DLF) = 938 kips
Ductility demand = 0.7 < Ductility limit = 10</td></tr>
<tr><td>Entry Way Wall</td><td>Shear controls.
Maximum impact load including Dynamic Load Factor (DLF) = 617 kips
Minimum capacity = 929 kips
Shear ties are required locally to withstand a missile strike near the top and bottom panel supports. See Table 3H.6-11 and Figure 3H.6-208 for reinforcement size and location.</td></tr>
<tr><td colspan="2">Global Check</td><td>Equivalent static impact forces are applied to the FEM analysis of the DGFOS Vault. The analysis results presented in Table 3H.6-11 provide a summary of the results for all load combinations including those affected by the tornado missile impact.</td></tr>
</table>

Table 3H.6-14 Calculated Overturning and Sliding Factors of Safety Under Site-Specific SSE and Flotation Factors of Safety for TB, SB, RWB and CBA

Structure	Calculated Factor of Safety			Minimum Required Factor of Safety	Coefficient of Friction for Sliding Evaluation
	Overturning	Sliding	Flotation		
Turbine Building (TB)	2.18	1.11	1.46	1.1	0.30 (dynamic)
Service Building (SB)	~~2.65~~2.11	~~1.81~~1.11	1.40	1.1	0.39 (dynamic)
Radwaste[1] Building (RWB)	~~4.23~~3.24	~~1.92~~1.68	1.51	1.1	0.39 (dynamic)
Control Building Annex (CBA)	2.03	1.16	1.18	1.1	0.58 (static)

Notes:

(1) The seismic sliding forces and overturning moments from SSSI analysis are less than the seismic sliding forces and overturning moments used in the stability evaluations.

Table 3H.6-15 Required and Provided Gaps at the Interface of Site-Specific Seismic Category I Structures and Diesel Generator Fuel Oil Tunnels with Adjoining Structures

Interfacing Structures	Required and Provided Gaps (inches)	
	Required Gap	Provided Gap
RSW Piping Tunnels and Control Building	4.54	5.0
RSW Pump House and RSW Piping Tunnel A	3.99	5.0
RSW Pump House and RSW Piping Tunnel B	4.92	5.0
RSW Pump House and RSW Piping Tunnel C	3.07	5.0
Diesel Generator Fuel Oil Storage Vault (DGFOSV) No. 1 and its Diesel Generator Fuel Oil Tunnel	2.37	3.0
Diesel Generator Fuel Oil Storage Vault (DGFOSV) No. 2 and its Diesel Generator Fuel Oil Tunnel	2.60	3.0
Diesel Generator Fuel Oil Storage Vault (DGFOSV) No. 3 and its Diesel Generator Fuel Oil Tunnel	2.42	3.0
Reactor Building and Diesel Generator Fuel Oil Tunnel (DGFOT) No. 1A	2.65	4.0
Reactor Building and Diesel Generator Fuel Oil Tunnel (DGFOT) No. 1B	3.77	4.0
Reactor Building and Diesel Generator Fuel Oil Tunnel (DGFOT) No. 1C	3.24	4.0

Note: See Figure 3H.6-221 for layout of the above structures

Table 3H.6-16 Factors of Safety Against Sliding, Overturning, and Flotation for Reactor Service Water Tunnel

Load Combination	Calculated Safety Factor			Notes
	Overturning	Sliding	Flotation	
D + F'	---	---	1.18	2
D + H + W	2.29	50.76	---	
D + H + W_t	2.23	21.31	---	
D + H + E'	1.1	1.29	---	2,3, 4

Notes

(1) Loads D, H, W, Wt, and E` are defined in Subsection 3H.6.4.3.4.1. F` is the buoyant force corresponding to the design basis flood.

(2) Coefficients of friction for sliding resistance are 0.45 for static conditions and 0.30 for dynamic conditions for the RSW Tunnel.

(3) The calculated safety factors consider less than half of the full passive pressure. The calculated safety factors increase if full passive pressure (Kp = 3.0) is considered.

(4) The seismic sliding forces and overturning moments from SSI and SSSI analyses are less than the seismic sliding forces and overturning moments used in the stability evaluations.

Table 3H.6-17 ~~Response Spectra Modification Factors~~

~~Location~~	~~Direction~~	~~20% Damping~~		~~15% Damping~~		~~10% Damping~~		~~7% Damping~~		~~5% Damping~~	
		~~1-30 Hz~~	~~30-33 Hz~~	~~1-30 Hz~~	~~30-33 Hz~~	~~1-30 Hz~~	~~30-33 Hz~~	~~1-30 Hz~~	~~30-33 Hz~~	~~1-30 Hz~~	~~30-33 Hz~~
~~Pump House Roof~~	~~Vertical~~	~~1.444~~	~~1.331~~	~~1.495~~	~~1.346~~	~~1.577~~	~~1.372~~	~~1.629~~	~~1.409~~	~~1.667~~	~~1.463~~
~~Pump House Operating Floor~~	~~Vertical~~	~~1.223~~	~~1.190~~	~~1.243~~	~~1.194~~	~~1.294~~	~~1.198~~	~~1.362~~	~~1.202~~	~~1.469~~	~~1.204~~
~~Mid-Level of Basin Walls~~	~~Horizontal~~	~~1.310~~	~~1.113~~	~~1.338~~	~~1.110~~	~~1.404~~	~~1.112~~	~~1.461~~	~~1.117~~	~~1.458~~	~~1.129~~
~~CTSS Walls~~	~~Vertical~~	~~1.405~~	~~1.197~~	~~1.441~~	~~1.191~~	~~1.433~~	~~1.205~~	~~1.450~~	~~1.231~~	~~1.478~~	~~1.264~~

~~Location~~	~~Direction~~	~~4% Damping~~		~~3% Damping~~		~~2% Damping~~		~~1% Damping~~		~~0.5% Damping~~	
		~~1-30 Hz~~	~~30-33 Hz~~	~~1-30 Hz~~	~~30-33 Hz~~	~~1-30 Hz~~	~~30-33 Hz~~	~~1-30 Hz~~	~~30-33 Hz~~	~~1-30 Hz~~	~~30-33 Hz~~
~~Pump House Roof~~	~~Vertical~~	~~1.686~~	~~1.511~~	~~1.793~~	~~1.588~~	~~2.038~~	~~1.718~~	~~2.682~~	~~1.926~~	~~2.769~~	~~2.165~~
~~Pump House Operating Floor~~	~~Vertical~~	~~1.550~~	~~1.206~~	~~1.678~~	~~1.209~~	~~1.914~~	~~1.217~~	~~2.486~~	~~1.241~~	~~2.826~~	~~1.373~~
~~Mid-Level of Basin Walls~~	~~Horizontal~~	~~1.502~~	~~1.153~~	~~1.563~~	~~1.186~~	~~1.835~~	~~1.237~~	~~2.372~~	~~1.326~~	~~2.922~~	~~1.370~~
~~CTSS Walls~~	~~Vertical~~	~~1.540~~	~~1.289~~	~~1.585~~	~~1.321~~	~~1.749~~	~~1.364~~	~~1.966~~	~~1.418~~	~~2.593~~	~~1.574~~

Table 3H.6-17 Response Spectra Modification Factors

Group	Direction	Damping	Frequency Range(Hz)							
			0-2	2-5	5-10	10-15	15-20	20-25	25-30	30-35
group1	X	0.005	1.255	1.255	1.472	2.195	2.195	1.837	1.837	1.047
group2			1.432	1.432	1.882	2.348	2.348	1.888	1.367	1.021
group3			1.321	1.321	1.868	2.083	2.083	1.775	1.697	1.097
group4			1.193	1.193	1.858	2.630	2.630	2.136	1.677	1.020
group5			1.195	1.195	1.864	1.838	1.838	1.317	1.219	1.000
group6			1.449	1.590	3.253	3.849	3.270	3.763	3.639	1.514
group7			1.230	1.230	1.814	1.582	1.553	2.234	1.202	1.003
group8			1.660	4.430	4.430	1.734	1.372	1.237	1.222	1.136
group9			1.660	2.138	1.859	1.734	1.413	1.237	1.192	1.117
group10			1.660	2.138	1.770	1.734	1.753	1.275	1.192	1.117
group1	X	0.01	1.273	1.273	1.423	1.754	1.754	1.340	1.298	1.047
group2			1.381	1.381	1.729	1.917	1.917	1.424	1.235	1.019
group3			1.285	1.285	1.734	1.728	1.728	1.384	1.184	1.097
group4			1.207	1.207	1.700	2.164	2.164	1.692	1.385	1.021
group5			1.166	1.166	1.760	1.567	1.567	1.216	1.059	1.000
group6			1.483	1.514	2.566	2.856	2.274	2.672	2.672	1.467
group7			1.192	1.192	1.727	1.347	1.532	1.553	1.110	1.002
group8			1.417	3.653	3.653	1.464	1.231	1.228	1.149	1.136
group9			1.417	2.072	1.662	1.464	1.301	1.149	1.149	1.117
group10			1.417	2.072	1.637	1.464	1.429	1.215	1.149	1.117
group1	X	0.02	1.264	1.264	1.363	1.505	1.505	1.181	1.181	1.047
group2			1.317	1.317	1.518	1.587	1.587	1.292	1.085	1.018
group3			1.252	1.252	1.535	1.377	1.377	1.113	1.097	1.097
group4			1.247	1.247	1.497	1.708	1.708	1.358	1.164	1.021
group5			1.151	1.151	1.576	1.348	1.348	1.118	1.016	1.000
group6			1.441	1.479	2.039	2.277	1.938	1.879	1.893	1.369
group7			1.205	1.205	1.561	1.303	1.334	1.158	1.078	1.001
group8			1.251	2.770	2.770	1.300	1.151	1.194	1.156	1.136
group9			1.251	1.843	1.483	1.300	1.197	1.122	1.123	1.117
group10			1.251	1.843	1.364	1.300	1.195	1.151	1.123	1.117

Table 3H.6-17 Response Spectra Modification Factors (Continued)

Group	Direction	Damping	Frequency Range(Hz) 0-2	2-5	5-10	10-15	15-20	20-25	25-30	30-35
group1	X	0.03	1.227	1.227	1.326	1.342	1.312	1.152	1.152	1.048
group2			1.338	1.338	1.395	1.426	1.436	1.186	1.068	1.018
group3			1.274	1.274	1.413	1.272	1.272	1.054	1.097	1.097
group4			1.274	1.274	1.382	1.415	1.415	1.203	1.116	1.021
group5			1.123	1.123	1.459	1.217	1.217	1.055	1.000	1.000
group6			1.416	1.507	1.871	1.958	1.718	1.673	1.697	1.311
group7			1.181	1.181	1.456	1.247	1.247	1.104	1.073	1.000
group8			1.221	2.315	2.315	1.182	1.151	1.174	1.162	1.136
group9			1.221	1.672	1.317	1.182	1.151	1.117	1.120	1.117
group10			1.221	1.672	1.293	1.182	1.151	1.130	1.120	1.117
group1	X	0.04	1.202	1.202	1.269	1.256	1.233	1.122	1.122	1.047
group2			1.283	1.283	1.318	1.319	1.322	1.126	1.079	1.017
group3			1.236	1.236	1.336	1.239	1.239	1.061	1.097	1.097
group4			1.250	1.250	1.312	1.286	1.286	1.113	1.070	1.022
group5			1.102	1.102	1.379	1.121	1.121	1.012	1.000	1.000
group6			1.402	1.498	1.755	1.834	1.566	1.580	1.595	1.274
group7			1.159	1.159	1.381	1.223	1.207	1.048	1.045	1.000
group8			1.173	2.009	2.009	1.154	1.145	1.163	1.163	1.136
group9			1.173	1.595	1.282	1.154	1.145	1.115	1.118	1.116
group10			1.173	1.595	1.282	1.154	1.145	1.115	1.118	1.116
group1	X	0.05	1.191	1.191	1.230	1.245	1.188	1.103	1.103	1.047
group2			1.245	1.245	1.267	1.241	1.248	1.089	1.081	1.017
group3			1.208	1.208	1.283	1.219	1.219	1.064	1.096	1.096
group4			1.240	1.240	1.265	1.244	1.244	1.058	1.036	1.022
group5			1.127	1.127	1.324	1.089	1.087	1.000	1.000	1.000
group6			1.391	1.476	1.692	1.732	1.460	1.515	1.520	1.248
group7			1.140	1.140	1.326	1.207	1.166	1.018	1.018	1.000
group8			1.157	1.809	1.809	1.146	1.141	1.161	1.161	1.135
group9			1.157	1.545	1.224	1.146	1.141	1.114	1.117	1.116
group10			1.157	1.545	1.224	1.146	1.141	1.114	1.117	1.116

Table 3H.6-17 Response Spectra Modification Factors (Continued)

Group	Direction	Damping	Frequency Range(Hz)							
			0-2	2-5	5-10	10-15	15-20	20-25	25-30	30-35
group1	X	0.07	1.191	1.191	1.124	1.157	1.128	1.075	1.075	1.046
group2			1.212	1.212	1.177	1.140	1.140	1.090	1.039	1.016
group3			1.190	1.190	1.216	1.185	1.185	1.072	1.096	1.096
group4			1.234	1.234	1.198	1.187	1.187	1.055	1.024	1.022
group5			1.095	1.095	1.239	1.057	1.000	1.000	1.000	1.000
group6			1.383	1.457	1.604	1.597	1.373	1.404	1.404	1.223
group7			1.112	1.112	1.255	1.174	1.141	1.000	1.000	1.000
group8			1.147	1.582	1.582	1.138	1.135	1.152	1.152	1.135
group9			1.147	1.460	1.184	1.138	1.135	1.114	1.116	1.116
group10			1.147	1.460	1.184	1.138	1.135	1.114	1.116	1.116
group1	X	0.1	1.164	1.164	1.081	1.087	1.084	1.054	1.054	1.044
group2			1.163	1.163	1.118	1.080	1.091	1.086	1.032	1.014
group3			1.153	1.153	1.148	1.144	1.144	1.079	1.095	1.095
group4			1.182	1.182	1.109	1.155	1.150	1.037	1.022	1.021
group5			1.091	1.091	1.163	1.063	1.000	1.003	1.000	1.000
group6			1.362	1.401	1.559	1.486	1.393	1.306	1.306	1.217
group7			1.083	1.083	1.187	1.145	1.092	1.000	1.000	1.000
group8			1.135	1.416	1.416	1.151	1.130	1.141	1.141	1.134
group9			1.135	1.371	1.164	1.132	1.130	1.113	1.115	1.115
group10			1.135	1.371	1.164	1.132	1.130	1.113	1.115	1.115
group1	X	0.15	1.153	1.153	1.073	1.066	1.058	1.040	1.042	1.041
group2			1.130	1.130	1.079	1.055	1.058	1.058	1.008	1.010
group3			1.122	1.122	1.108	1.104	1.104	1.083	1.094	1.094
group4			1.152	1.152	1.100	1.086	1.086	1.021	1.021	1.020
group5			1.088	1.088	1.087	1.058	1.002	1.007	1.001	1.000
group6			1.324	1.339	1.493	1.390	1.373	1.259	1.260	1.211
group7			1.068	1.068	1.116	1.118	1.040	1.000	1.000	1.000
group8			1.122	1.350	1.350	1.180	1.124	1.134	1.134	1.132
group9			1.122	1.292	1.151	1.125	1.124	1.112	1.115	1.115
group10			1.122	1.292	1.151	1.125	1.124	1.112	1.115	1.115

Table 3H.6-17 Response Spectra Modification Factors (Continued)

Group	Direction	Damping	Frequency Range(Hz)							
			0-2	2-5	5-10	10-15	15-20	20-25	25-30	30-35
group1	X	0.2	1.101	1.101	1.067	1.056	1.049	1.034	1.038	1.038
group2			1.111	1.111	1.054	1.028	1.040	1.034	1.007	1.009
group3			1.105	1.105	1.072	1.080	1.082	1.085	1.094	1.094
group4			1.116	1.116	1.090	1.053	1.052	1.019	1.020	1.020
group5			1.059	1.059	1.061	1.040	1.000	1.004	1.000	1.000
group6			1.300	1.308	1.481	1.350	1.341	1.246	1.242	1.209
group7			1.063	1.066	1.090	1.061	1.006	1.000	1.000	1.000
group8			1.122	1.305	1.305	1.201	1.120	1.130	1.131	1.131
group9			1.122	1.269	1.145	1.120	1.120	1.112	1.115	1.115
group10			1.122	1.269	1.145	1.120	1.120	1.112	1.115	1.115
group1	Y	0.005	1.017	1.229	1.290	1.742	1.742	1.416	1.210	1.033
group2			1.051	1.116	2.071	2.424	2.424	5.938	3.282	1.055
group3			1.088	1.153	1.939	2.213	2.213	2.398	1.289	1.061
group4			1.082	1.113	2.647	1.855	1.687	2.427	1.666	1.031
group5			1.544	1.544	2.718	1.550	1.550	1.513	1.173	1.040
group6			1.394	1.639	5.529	3.093	3.093	3.693	2.794	1.370
group7			1.184	1.425	1.801	1.801	1.699	1.605	1.474	1.081
group8			2.327	9.258	1.967	2.941	1.801	1.495	1.485	1.485
group9			2.327	9.258	1.967	2.941	1.801	1.495	1.485	1.485
group10			2.327	9.258	1.967	2.941	2.357	1.495	1.485	1.485
group1	Y	0.01	1.020	1.203	1.280	1.513	1.513	1.275	1.153	1.033
group2			1.046	1.102	1.877	2.089	2.089	4.171	2.709	1.049
group3			1.091	1.134	1.788	1.793	1.753	1.764	1.209	1.062
group4			1.077	1.098	2.223	1.479	1.360	1.639	1.179	1.031
group5			1.303	1.303	2.137	1.348	1.348	1.241	1.096	1.040
group6			1.372	1.533	4.155	2.303	2.290	2.520	2.246	1.326
group7			1.250	1.318	1.456	1.512	1.512	1.362	1.153	1.081
group8			2.195	5.394	1.666	2.278	1.588	1.480	1.482	1.484
group9			2.195	5.394	1.666	2.278	1.588	1.480	1.482	1.484
group10			2.195	5.394	1.666	2.278	1.847	1.480	1.482	1.484

Table 3H.6-17 Response Spectra Modification Factors (Continued)

Group	Direction	Damping	Frequency Range(Hz)							
			0-2	2-5	5-10	10-15	15-20	20-25	25-30	30-35
group1	Y	0.02	1.023	1.108	1.156	1.233	1.233	1.157	1.123	1.033
group2			1.044	1.079	1.575	1.736	1.807	2.625	2.053	1.038
group3			1.074	1.110	1.488	1.430	1.416	1.260	1.117	1.062
group4			1.078	1.078	1.653	1.284	1.142	1.214	1.053	1.031
group5			1.163	1.163	1.715	1.194	1.194	1.131	1.093	1.040
group6			1.317	1.422	2.837	1.931	1.931	1.820	1.752	1.237
group7			1.191	1.258	1.207	1.207	1.207	1.175	1.090	1.081
group8			1.962	3.812	1.647	1.697	1.552	1.487	1.483	1.485
group9			1.962	3.812	1.647	1.697	1.552	1.487	1.483	1.485
group10			1.962	3.812	1.647	1.697	1.552	1.487	1.483	1.485
group1	Y	0.03	1.014	1.077	1.138	1.132	1.132	1.101	1.101	1.033
group2			1.046	1.073	1.335	1.711	1.767	1.973	1.762	1.038
group3			1.073	1.091	1.279	1.313	1.285	1.113	1.058	1.062
group4			1.076	1.076	1.385	1.183	1.084	1.091	1.035	1.031
group5			1.117	1.117	1.447	1.132	1.132	1.104	1.098	1.040
group6			1.307	1.379	2.238	1.726	1.644	1.574	1.522	1.186
group7			1.163	1.221	1.154	1.130	1.069	1.124	1.101	1.081
group8			1.793	3.145	1.696	1.537	1.537	1.493	1.483	1.485
group9			1.793	3.145	1.696	1.537	1.537	1.493	1.483	1.485
group10			1.793	3.145	1.696	1.537	1.537	1.493	1.483	1.485
group1	Y	0.04	1.012	1.077	1.131	1.093	1.092	1.080	1.080	1.033
group2			1.047	1.068	1.210	1.691	1.691	1.641	1.542	1.038
group3			1.072	1.072	1.189	1.251	1.251	1.073	1.059	1.063
group4			1.071	1.071	1.243	1.157	1.059	1.059	1.034	1.031
group5			1.099	1.117	1.301	1.101	1.103	1.103	1.103	1.040
group6			1.283	1.383	1.953	1.632	1.458	1.473	1.430	1.153
group7			1.143	1.206	1.135	1.133	1.076	1.110	1.107	1.082
group8			1.770	2.845	1.710	1.521	1.521	1.494	1.483	1.485
group9			1.770	2.845	1.710	1.521	1.521	1.494	1.483	1.485
group10			1.770	2.845	1.710	1.521	1.521	1.494	1.483	1.485

Table 3H.6-17 Response Spectra Modification Factors (Continued)

Group	Direction	Damping	Frequency Range(Hz)							
			0-2	2-5	5-10	10-15	15-20	20-25	25-30	30-35
group1	Y	0.05	1.015	1.078	1.122	1.086	1.087	1.067	1.067	1.033
group2			1.055	1.055	1.140	1.571	1.571	1.449	1.398	1.038
group3			1.070	1.070	1.143	1.216	1.216	1.062	1.062	1.063
group4			1.067	1.067	1.177	1.157	1.057	1.053	1.033	1.031
group5			1.092	1.105	1.228	1.088	1.098	1.105	1.105	1.041
group6			1.260	1.394	1.791	1.570	1.452	1.386	1.363	1.129
group7			1.126	1.198	1.132	1.124	1.081	1.106	1.106	1.082
group8			1.751	2.636	1.720	1.512	1.512	1.495	1.484	1.485
group9			1.751	2.636	1.720	1.512	1.512	1.495	1.484	1.485
group10			1.751	2.636	1.720	1.512	1.512	1.495	1.484	1.485
group1	Y	0.07	1.022	1.075	1.101	1.089	1.089	1.059	1.059	1.034
group2			1.055	1.055	1.123	1.389	1.389	1.246	1.234	1.038
group3			1.068	1.088	1.135	1.163	1.163	1.072	1.072	1.064
group4			1.053	1.053	1.162	1.162	1.061	1.052	1.037	1.031
group5			1.048	1.087	1.168	1.083	1.086	1.097	1.097	1.041
group6			1.228	1.321	1.578	1.549	1.420	1.259	1.259	1.117
group7			1.134	1.168	1.124	1.116	1.086	1.097	1.097	1.082
group8			1.818	2.384	1.744	1.502	1.502	1.495	1.484	1.485
group9			1.818	2.384	1.744	1.502	1.502	1.495	1.484	1.485
group10			1.818	2.384	1.744	1.502	1.502	1.495	1.484	1.485
group1	Y	0.1	1.025	1.067	1.083	1.098	1.098	1.044	1.044	1.034
group2			1.049	1.062	1.092	1.250	1.250	1.116	1.115	1.038
group3			1.063	1.087	1.111	1.112	1.114	1.075	1.075	1.065
group4			1.048	1.087	1.114	1.110	1.052	1.051	1.039	1.032
group5			1.035	1.079	1.146	1.069	1.070	1.078	1.078	1.043
group6			1.190	1.231	1.466	1.467	1.379	1.241	1.177	1.112
group7			1.129	1.139	1.123	1.105	1.086	1.089	1.090	1.083
group8			1.886	2.277	1.741	1.550	1.503	1.498	1.484	1.486
group9			1.886	2.277	1.741	1.550	1.503	1.498	1.484	1.486
group10			1.886	2.277	1.741	1.550	1.503	1.498	1.484	1.486

Table 3H.6-17 Response Spectra Modification Factors (Continued)

Group	Direction	Damping	Frequency Range(Hz)							
			0-2	2-5	5-10	10-15	15-20	20-25	25-30	30-35
group1	Y	0.15	1.017	1.055	1.066	1.082	1.082	1.049	1.033	1.035
group2			1.036	1.060	1.075	1.166	1.166	1.058	1.037	1.038
group3			1.028	1.068	1.084	1.081	1.081	1.070	1.070	1.066
group4			1.018	1.078	1.079	1.079	1.054	1.046	1.040	1.033
group5			1.029	1.062	1.093	1.056	1.056	1.062	1.062	1.045
group6			1.180	1.242	1.362	1.410	1.329	1.228	1.139	1.110
group7			1.105	1.114	1.090	1.090	1.075	1.085	1.085	1.083
group8			1.762	1.988	1.761	1.598	1.522	1.500	1.485	1.486
group9			1.762	1.988	1.761	1.598	1.522	1.500	1.485	1.486
group10			1.762	1.988	1.761	1.598	1.522	1.500	1.485	1.486
group1	Y	0.2	1.016	1.049	1.071	1.069	1.069	1.052	1.035	1.036
group2			1.017	1.028	1.068	1.119	1.119	1.055	1.036	1.038
group3			1.029	1.061	1.096	1.096	1.074	1.076	1.074	1.067
group4			1.015	1.048	1.062	1.062	1.055	1.045	1.039	1.033
group5			1.024	1.046	1.066	1.048	1.049	1.054	1.054	1.046
group6			1.187	1.233	1.354	1.381	1.289	1.218	1.125	1.113
group7			1.090	1.103	1.086	1.087	1.073	1.080	1.082	1.083
group8			1.659	1.812	1.692	1.607	1.537	1.503	1.487	1.487
group9			1.659	1.812	1.692	1.607	1.537	1.503	1.487	1.487
group10			1.659	1.812	1.692	1.607	1.537	1.503	1.487	1.487
group1	Z	0.005	1.024	1.025	1.307	1.522	1.410	1.819	1.819	1.115
group2			1.009	1.024	1.458	2.802	2.802	2.301	1.480	1.093
group3			1.054	1.183	1.922	6.446	5.706	3.806	3.825	3.535
group4			1.043	1.126	2.323	4.021	3.146	4.902	3.262	1.346
group5			1.145	1.145	1.230	1.655	1.467	1.867	1.374	1.018
group6			1.027	1.042	1.210	1.562	2.041	2.041	1.589	1.145
group7			1.121	1.173	1.193	1.655	1.636	1.724	1.555	1.072
group8			1.109	1.534	2.401	4.285	3.959	3.979	2.855	1.919
group9			1.109	1.534	2.401	4.285	3.959	3.979	2.855	1.919
group10			1.109	1.534	2.401	4.285	3.959	3.979	2.855	1.919

Table 3H.6-17 Response Spectra Modification Factors (Continued)

Group	Direction	Damping	Frequency Range(Hz) 0-2	2-5	5-10	10-15	15-20	20-25	25-30	30-35
group1	Z	0.01	1.021	1.025	1.244	1.489	1.274	1.308	1.308	1.113
group2			1.008	1.023	1.322	2.493	2.493	2.042	1.385	1.092
group3			1.052	1.196	1.826	5.703	4.015	3.481	3.326	3.099
group4			1.046	1.131	2.326	3.602	2.459	3.543	2.841	1.310
group5			1.109	1.109	1.187	1.521	1.391	1.471	1.387	1.018
group6			1.022	1.028	1.169	1.519	1.660	1.660	1.539	1.096
group7			1.094	1.094	1.155	1.571	1.456	1.406	1.395	1.036
group8			1.109	1.374	2.351	3.517	2.936	2.936	2.405	1.670
group9			1.109	1.374	2.351	3.517	2.936	2.936	2.405	1.670
group10			1.109	1.374	2.351	3.517	2.936	2.936	2.405	1.670
group1	Z	0.02	1.022	1.024	1.211	1.407	1.288	1.291	1.120	1.093
group2			1.008	1.026	1.228	2.051	2.051	1.621	1.219	1.092
group3			1.051	1.152	1.962	3.999	3.028	3.417	3.004	2.767
group4			1.042	1.121	2.180	2.856	1.873	2.338	1.979	1.286
group5			1.073	1.073	1.143	1.360	1.268	1.274	1.274	1.018
group6			1.013	1.020	1.169	1.352	1.473	1.473	1.420	1.065
group7			1.053	1.059	1.158	1.409	1.282	1.275	1.271	1.033
group8			1.107	1.213	1.836	3.179	2.113	2.248	2.248	1.607
group9			1.107	1.213	1.836	3.179	2.113	2.248	2.248	1.607
group10			1.107	1.213	1.836	3.179	2.113	2.248	2.248	1.607
group1	Z	0.03	1.019	1.024	1.197	1.330	1.293	1.307	1.099	1.093
group2			1.009	1.027	1.202	1.778	1.778	1.435	1.134	1.091
group3			1.048	1.166	2.136	3.599	2.822	3.220	2.737	2.571
group4			1.042	1.128	1.901	2.413	1.755	1.986	1.808	1.278
group5			1.064	1.064	1.132	1.274	1.204	1.164	1.164	1.018
group6			1.012	1.020	1.184	1.305	1.449	1.449	1.396	1.055
group7			1.039	1.049	1.162	1.292	1.217	1.243	1.220	1.036
group8			1.101	1.144	1.685	2.767	1.878	2.120	2.120	1.557
group9			1.101	1.144	1.685	2.767	1.878	2.120	2.120	1.557
group10			1.101	1.144	1.685	2.767	1.878	2.120	2.120	1.557

Table 3H.6-17 Response Spectra Modification Factors (Continued)

Group	Direction	Damping	Frequency Range(Hz) 0-2	2-5	5-10	10-15	15-20	20-25	25-30	30-35
group1	Z	0.04	1.016	1.023	1.210	1.277	1.294	1.294	1.093	1.093
group2			1.009	1.027	1.194	1.606	1.606	1.359	1.112	1.091
group3			1.047	1.166	2.248	3.545	2.811	3.012	2.626	2.439
group4			1.039	1.115	1.712	2.124	1.640	1.832	1.661	1.275
group5			1.054	1.054	1.123	1.224	1.180	1.112	1.096	1.017
group6			1.010	1.021	1.194	1.301	1.411	1.411	1.375	1.051
group7			1.031	1.041	1.165	1.235	1.210	1.205	1.205	1.036
group8			1.096	1.125	1.571	2.496	1.870	1.793	1.793	1.519
group9			1.096	1.125	1.571	2.496	1.870	1.793	1.793	1.519
group10			1.096	1.125	1.571	2.496	1.870	1.793	1.793	1.519
group1	Z	0.05	1.014	1.024	1.219	1.270	1.288	1.288	1.092	1.092
group2			1.009	1.028	1.196	1.515	1.515	1.300	1.090	1.090
group3			1.046	1.163	2.285	3.504	2.739	2.855	2.564	2.344
group4			1.039	1.117	1.614	1.944	1.586	1.728	1.571	1.274
group5			1.043	1.043	1.125	1.194	1.138	1.091	1.058	1.017
group6			1.009	1.021	1.203	1.301	1.362	1.362	1.304	1.051
group7			1.026	1.035	1.167	1.242	1.158	1.181	1.181	1.034
group8			1.090	1.132	1.556	2.306	1.791	1.679	1.676	1.491
group9			1.090	1.132	1.556	2.306	1.791	1.679	1.676	1.491
group10			1.090	1.132	1.556	2.306	1.791	1.679	1.676	1.491
group1	Z	0.07	1.011	1.024	1.225	1.253	1.256	1.256	1.109	1.092
group2			1.009	1.029	1.192	1.400	1.400	1.266	1.091	1.089
group3			1.046	1.167	2.487	3.422	2.724	2.767	2.378	2.220
group4			1.056	1.125	1.521	1.776	1.524	1.594	1.497	1.273
group5			1.029	1.029	1.134	1.198	1.080	1.064	1.047	1.016
group6			1.010	1.021	1.214	1.280	1.268	1.268	1.165	1.051
group7			1.023	1.028	1.166	1.231	1.116	1.138	1.138	1.031
group8			1.062	1.137	1.554	2.248	1.724	1.586	1.586	1.451
group9			1.062	1.137	1.554	2.248	1.724	1.586	1.586	1.451
group10			1.062	1.137	1.554	2.248	1.724	1.586	1.586	1.451

Table 3H.6-17 Response Spectra Modification Factors (Continued)

Group	Direction	Damping	Frequency Range(Hz)							
			0-2	2-5	5-10	10-15	15-20	20-25	25-30	30-35
group1	Z	0.1	1.010	1.023	1.199	1.214	1.226	1.226	1.133	1.092
group2			1.009	1.030	1.181	1.314	1.314	1.231	1.111	1.089
group3			1.066	1.188	2.418	3.274	2.734	2.633	2.254	2.120
group4			1.063	1.140	1.421	1.623	1.471	1.487	1.417	1.271
group5			1.022	1.023	1.135	1.207	1.065	1.049	1.036	1.016
group6			1.009	1.021	1.219	1.259	1.207	1.211	1.122	1.049
group7			1.019	1.022	1.142	1.189	1.112	1.093	1.064	1.028
group8			1.047	1.148	1.553	2.218	1.718	1.531	1.497	1.416
group9			1.047	1.148	1.553	2.218	1.718	1.531	1.497	1.416
group10			1.047	1.148	1.553	2.218	1.718	1.531	1.497	1.416
group1	Z	0.15	1.009	1.025	1.099	1.144	1.220	1.217	1.155	1.093
group2			1.009	1.032	1.118	1.217	1.217	1.192	1.095	1.088
group3			1.093	1.226	2.344	2.887	2.672	2.514	2.092	2.042
group4			1.083	1.169	1.354	1.478	1.414	1.398	1.354	1.275
group5			1.016	1.017	1.098	1.166	1.045	1.045	1.023	1.016
group6			1.006	1.022	1.152	1.183	1.195	1.197	1.129	1.048
group7			1.014	1.017	1.090	1.128	1.103	1.081	1.026	1.027
group8			1.056	1.160	1.470	2.138	1.885	1.516	1.472	1.429
group9			1.056	1.160	1.470	2.138	1.885	1.516	1.472	1.429
group10			1.056	1.160	1.470	2.138	1.885	1.516	1.472	1.429
group1	Z	0.2	1.010	1.025	1.089	1.191	1.220	1.217	1.152	1.095
group2			1.009	1.032	1.088	1.153	1.165	1.165	1.097	1.088
group3			1.117	1.298	2.125	2.705	2.643	2.440	2.032	2.007
group4			1.100	1.184	1.330	1.398	1.363	1.342	1.327	1.278
group5			1.014	1.017	1.100	1.120	1.039	1.039	1.017	1.016
group6			1.006	1.023	1.118	1.201	1.189	1.190	1.143	1.056
group7			1.011	1.017	1.091	1.111	1.079	1.071	1.026	1.028
group8			1.063	1.177	1.620	1.985	1.940	1.537	1.463	1.450
group9			1.063	1.177	1.620	1.985	1.940	1.537	1.463	1.450
group10			1.063	1.177	1.620	1.985	1.940	1.537	1.463	1.450

Table 3H.7-1 Results of DGFOT Concrete ~~Wall and Slab~~ Design

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1,8)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Loads (11) Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Loads (11) Combination	In-plane (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in²/ ft)	Transverse Shear Design Forces: Load Combination	Horizontal Section: Transverse Shear Force (kips / ft)	Horizontal Section: Corresponding Axial Force (kips / ft)	Vertical Section: Transverse Shear Force (kips / ft)	Vertical Section: Corresponding Axial Force (kips / ft)	Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
Tunnel Walls	2	Near Side	Horizontal	3H.7-11	1-H-L	Max Tension w/ corresponding moment	951	D + L + H' +E' (WP)	130	-28	D + L + H' +E' (WP)	26	4.68	-				-	-	
						Max Compression w/ corresponding moment	932	D + L + H' +E' (WP)	-66	-1										
						Max Moment with axial tension	952	D + L + H' +E' (WP)	48	-32										
						Max Moment with axial compression	953	D + L + H' +E' (WP)	-1	-28										
					2-H-L	Max Tension w/ corresponding moment	153	D + L + H' +E' (WP)	89	-11	D + L + H' +E' (WP)	21	3.12	-				-	-	
						Max Compression w/ corresponding moment	854	D + L + H' +E' (WP)	-77	-1										
						Max Moment with axial tension	265	D + L + H' +E' (WP)	62	-17										
						Max Moment with axial compression	706	D + L + H' +E' (WP)	-8	-16										
					3-H-L	Max Tension w/ corresponding moment	149	D + L + H' +E' (WP)	108	-28	D + L + H' +E' (WP)	26	4.68	-				-	-	
						Max Compression w/ corresponding moment	149	D + L + H' +E' (WP)	-123	-6										
						Max Moment with axial tension	149	D + L + H' +E' (WP)	104	-28										
						Max Moment with axial compression	141	D + L + H' +E' (WP)	-9	-28										
		Far Side	Horizontal	3H.7-12	1-H-L	Max Tension w/ corresponding moment	284	D + L + H +Wt	109	0	D + L + H' +E' (WP)	26	3.12	-				-	-	
						Max Compression w/ corresponding moment	149	D + L + H' +E' (WP)	-129	25										
						Max Moment with axial tension	634	D + L + H' +E' (WP)	4	28										
						Max Moment with axial compression	277	D + L + H' +E' (WP)	-72	30										
		Near Side	Vertical	3H.7-13	1-V-L	Max Tension w/ corresponding moment	953	D + L + H' +E'	35	-6	D + L + H + Wt	59	3.12	-				-	-	
						Max Compression w/ corresponding moment	918	D + L + H +Wt	-96	-16										
						Max Moment with axial tension	902	D + L + H' +E' (WP)	14	-86										
						Max Moment with axial compression	902	D + L + H' +E' (WP)	-10	-86										
		Far Side	Vertical	3H.7-14	1-V-L	-	-	D + L + H +Wt	-	17	D + L + H + Wt	59	3.12	-				-	-	
				3H.7-14A	1-T	-	-	-	-	-	-	-	-	D + F + L + H' + E'	26	3	10	146	0.44	
Access Region Walls	2	Near Side	Horizontal	3H.7-9	1-H-L	-	-	D + L + H + Wt	See Note (9)		D + L + H' +E' (WP)	34	3.12	-				-	-	
		Far Side	Horizontal	3H.7-9	1-H-L	-	-	D + L + H + Wt			D + L + H' +E' (WP)	34	3.12	-				-	-	
		Near Side	Vertical	3H.7-10	1-V-L	-	-	D + L + H + Wt			D + L + H + Wt	182	3.12	-				-	-	
		Far Side	Vertical	3H.7-10	1-V-L	-	-	D + L + H + Wt			D + L + H + Wt	182	3.12	-				-	-	
				3H.7-10A	1-T	-	-	-	-	-	-	-	-	D + F + L + H + Wt	-6	-102	28	86	0.44	

Table 3H.7-1 Results of DGFOT Concrete ~~Wall and Slab~~ Design (Continued)

Location	Thickness (ft)	Face	Direction	orcement Layout ing Number (1,8)	ment Zone Number (2)	imum Forces (3)	Element	Longitudinal Reinforcement Design Loads: Axial and Flexure Loads: Loads Combination (11)	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	In-Plane Shear Loads: Loads Combination (11)	In-plane Shear (5) (kips / ft)	Longitudinal Reinforcement Provided (in²/ ft)	Transverse Shear Design Forces: Load Combination	Horizontal Section		Vertical Section		Transverse Shear Reinforcement Provided (7) (in²/ft²)	Remarks
Basemat	2	Near Side	Horizontal	3H.7-15	1-H-L	-	-	D + L + H + Wt	See Note (10)		D + L + H' +E' (WP)	27	3.12	-				-	-	
		Far Side	Horizontal	3H.7-15	1-H-L	Max Tension w/ corresponding moment	2584	D + L + H' +E' (WP)	95	8	D + L + H' +E' (WP)	27	3.12	-				-	-	
						Max Compression w/ corresponding moment	309	D + L + H' +E' (WP)	-117	12										
						Max Moment with axial tension	2351	D + L + H' +E' (WP)	12	21										
						Max Moment with axial compression	2316	D + L + H +Wt	-13	32										
		Near Side	Vertical	3H.7-16	1-V-L	Max Tension w/ corresponding moment	2425	D + L + H' +E' (WP)	20	-60	D + L + H' +E' (WP)	47	3.12	-				-	-	
						Max Compression w/ corresponding moment	301	D + L + H' +E' (WP)	-23	0										
						Max Moment with axial tension	2433	D + L + H' +E' (WP)	16	-74										
						Max Moment with axial compression	2554	D + L + H' +E' (WP)	-2	-72										
		Far Side	Vertical	3H.7-16	1-V-L	Max Tension w/ corresponding moment	2315	D + L + H +Wt	13	2	D + L + H' +E' (WP)	47	3.12	-				-	-	
						Max Compression w/ corresponding moment	309	D + L + H' +E' (WP)	-35	79										
						Max Moment with axial tension	2438	D + L + H' +E' (WP)	1	56										
						Max Moment with axial compression	2496	D + L + H' +E' (WP)	-29	87										
				3H.7-17	1-T	-	-	-	-	-	-	-	-	1.4D + 1.4F + 1.7L + 1.7H + 1.7W	52	12	12	1	0.44	
Roof of Tunnel	2	Near Side	Horizontal	3H.7-18	1-H-L	Max Tension w/ corresponding moment	174	D + L + H + Wt	124	-11	D + L + H' +E' (WP)	34	3.12	-				-	-	
						Max Compression w/ corresponding moment	1703	D + L + H' +E' (WP)	-117	-4										
						Max Moment with axial tension	1688	D + L + H + Wt	53	-38										
						Max Moment with axial compression	1694	D + L + H' +E' (WP)	-9	-30										
		Far Side	Horizontal	3H.7-18	1-H-L	Max Tension w/ corresponding moment	1710	D + L + H' +E' (WP)	118	7	D + L + H' +E' (WP)	34	3.12	-				-	-	
						Max Compression w/ corresponding moment	1703	D + L + H' +E' (WP)	-117	12										
						Max Moment with corresponding axial tension	1695	D + L + H + Wt	10	41										
						Max Moment with corresponding axial compression	1840	D + L + H + Wt	-10	53										
		Near Side	Vertical	3H.7-19	1-V-L	Max Tension w/ corresponding moment	1694	D + L + H + Wt	17	-20	D + L + H' +E' (WP)	53	3.12	-				-	-	
						Max Compression w/ corresponding moment	1694	D + L + H' +E' (WP)	-28	-45										
						Max Moment with corresponding axial tension	1710	D + L + H' +E' (WP)	0	-65										
						Max Moment with corresponding axial compression	174	D + L + H' +E' (WP)	-14	-70										
		Far Side	Vertical	3H.7-19	1-V-L	Max Tension w/ corresponding moment	1694	D + L + H + Wt	16	9	D + L + H' +E' (WP)	53	3.12	-				-	-	
						Max Compression w/ corresponding moment	1839	D + L + H' +E' (WP)	-23	6										
						Max Moment with corresponding axial tension	209	D + L + H' +E' (WP)	2	54										
						Max Moment with corresponding axial compression	209	D + L + H' +E' (WP)	-5	54										
				3H.7-19A	1-T	-	-	-	-	-	-	-	-	D + F + L + H + Wt	-7	21	33	22	0.44	

Notes:

(1) The reinforcement layout drawings show the various zones used to define the minimum reinforcement that will be provided based on finite element analysis results. Actual provided reinforcement based on final rebar layout and including development length may exceed the reported provided reinforcement and the zones with higher reinforcement may be extended beyond their reported boundaries. The dimensions in the reinforcement drawings are based on the dimensions of the 2D SAP2000 shell elements, which are modeled at the centerline of the walls and slabs.

(2) Each reinforcement layout drawing is divided into reinforcement zones. The reinforcement zone naming convention is as follows: "H" = horizontal, "V" = vertical, "L" = longitudinal reinforcement, "T" = transverse reinforcement. For slabs, vertical corresponds to Y-axis and horizontal corresponds to X-axis as shown on Figure 3H.7-1.

(3) The maximum tension and compression axial forces are provided with the corresponding moment from the same load combination. The maximum moment that has a corresponding tension in the same load combination and the maximum moment that has a corresponding compression in the same load combination are also provided.

(4) Negative axial load is compression and positive axial load is tension. Negative moment applies tension to the top face of the shell element and positive moment applies tension to the bottom face of the shell element. For walls or slabs where the same reinforcement is provided on both faces, the moment is shown as absolute value.

(5) The reported in-plane shear is the maximum average in-plane shear along a plane that crosses the longitudinal reinforcement zone.

(6) Not used.

(7) In areas where horizontal and vertical transverse shear zones overlap, the total transverse shear reinforcement to be supplied in the overlapping area is the sum of the transverse reinforcement required from the horizontal and vertical zones.

(8) Openings in the Access Regions have not been included in the Reinforcement Layout Drawings.

(9) The Access Region is governed by the tornado load combination. The outside layer of transverse torsional reinforcement (all 4 near sides horizontal) in conjunction with the near side vertical longitudinal reinforcement are utilized to resist a torsional moment of 1438 kip*ft due to an eccentric tornado missile load. The far side horizontal reinforcement is utilized to resist an axial force of 805 kip due to a concentric tornado missile load as well as a tornado wind pressure of 294 psf. The remaining capacity of the near side vertical longitudinal reinforcement in conjunction with the far side vertical longitudinal reinforcement are utilized to resist a moment of 10076 kip*ft due to the tornado load combination.

(10) The basemat near side horizontal reinforcement is governed by the tornado load combination. The outside layer of transverse torsional reinforcement is composed of near side vertical reinforcement (tunnel walls in Z-direction and roof and basemat in Y-direction) in conjunction with the near side horizontal reinforcement (2 tunnel walls, roof, and basemat in X-direction) are utilized to resist a torsional moment of 8085 kip*ft due to tornado load combination.

(11) The "E ' (WP)" designation in the load combination column indicates seismic SSE loading including wave propagation effects.

Table 3H.7-2 Factors of Safety against Sliding, Overturning and Flotation for DGFOT

Load Combination	Calculated Safety Factor			Notes
	Overturning	Sliding	Flotation	
D + F_b	--	--	1.70	
D + H + W	1.58	3.47	--	2, 3 (Sliding Only)
D + H + W_t	1.10	1.10	--	2, 4
D + H' + E'	1.30	1.28	--	2, 3, 5

Notes:

(1) Loads D, H, H', W, W_t, and E' are defined in Section 3H.7.4.3.4. F_b is the buoyant force corresponding to the design basis flood.

(2) Coefficients of friction for sliding resistance are 0.58 for static conditions and 0.39 for dynamic conditions for the Diesel Generator Fuel Oil Tunnel.

(3) The calculated safety factors consider the full passive pressure.

(4) The minimum calculated safety factor against sliding and overturning for tornado wind is 2.32. For tornado wind in conjunction with tornado missile, subsequent detailed design of the restraints for the Access Regions will provide sliding and overturning safety factors greater than 1.10.

(5) The seismic sliding forces and overturning moments from SSI and SSSI analyses are less than the seismic sliding forces and overturning moments used in the stability evaluations.

Table 3H.7-3 Tornado Missile Impact Evaluation for Diesel Generator Fuel Oil Tunnel

Local Check	**DGFOT and Access Regions**	Minimum required thickness to prevent penetration, perforation, and scabbing = 15.14” Minimum provided thickness = 24”
Overall Check of Impacted Element	**Walls and Slabs of DGFOT and Access Regions**	Flexure controls. Maximum impact load including Dynamic Load Factor (DLF) = 899 kips for Access Regions and 862 kips for DGFOT Ductility demand = 1.4 for shell missile and 1.0 for automobile missile < Ductility limit = 10
Global Check		Equivalent static impact forces due to missile impact are considered in the local and global design of the DGFOT. The analysis results presented in Table 3H.7-1 provide a summary of the results for all load combinations including those affected by the tornado missile impact.

Table 3H-9-1 Extreme Environmental Design Parameters for Seismic Analysis, Design, Stability Evaluation and Seismic Category II/I Design

Structure	Seismic Analysis					Design									Design for II/I (applicable to the design of lateral load resisting system)			
	SSI			SSSI		Structure				Stability								
	Input Motion	Soil Type	Structural Damping for Generation of ISRS	Input Motion	Soil Type	Seismic	Tornado	Tornado Missiles	Flood	Seismic	Tornado	Tornado Missiles	Flotation	Coeff. Of Friction for Waterproofing Membrane	Seismic	Tornado	Tornado Missiles	Flood
Diesel Generator Fuel Oil Tunnels (DGFOT)	Envelope of Amplified[1] Site-Specific SSE & 0.3g RG 1.60	DCD & Site-Specific	4% for all SSI analysis cases	Site-Specific SSE	Site-Specific	Envelope of Amplified[1] Site-Specific SSE & 0.3g RG 1.60 (See Note 4)	DCD Tornado Wind Parameters (As described in Table 5.0 of DCD/Tier 1)	DCD Missile Spectrum 1 as defined in Table 5.0 of DCD/Tier 1	Flood El. 40' MSL, Water Density 63.85 lb/ft3 (above grade) + Drag Effect 44 psf (above grade) + Impact of Floating Debris per *COLA* Section 3.4.2 + Wind Generated Wave Action per *COLA* Figure 3.4-1 (only hydrodynamic portion)	Amplified[1] Site-Specific SSE	Site-Specific Tornado Wind Parameters (Region II, RG 1.76 Rev. 1)	Site-Specific Tornado Missile Spectrum for Region II as shown in Table 2 of RG 1.76 Rev. 1 (Note 2)	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade)	Site-Specific	NA	NA	NA	NA
UHS/RSW Pump House	Site-Specific SSE	Site-Specific	4% for all SSI analysis cases	Site-Specific SSE	Site-Specific	Site-Specific SSE	Site-Specific Tornado Wind Parameters (Region II, RG 1.76 Rev. 1)	Site-Specific Tornado Missile Spectrum for Region II as shown in Table 2 of RG 1.76 Rev. 1	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade) + Drag Effect 44 psf (above grade) + Impact of Floating Debris per *COLA* Section 3.4.2 + Wind Generated Wave Action per *COLA* Figure 3.4-1 (only hydrodynamic portion)	Site-Specific SSE	Site-Specific Tornado Wind Parameters (Region II, RG 1.76 Rev. 1)	Site-Specific Tornado Missile Spectrum for Region II as shown in Table 2 of RG 1.76 Rev. 1	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade)	Site-Specific	NA	NA	NA	NA
RSW Piping Tunnels	Amplified[1] Site-Specific SSE	Site-Specific	4% for all SSI analysis cases Except 7% for Cracked Case	Site-Specific SSE	Site-Specific	Amplified[1] Site-Specific SSE (See Note 4)	Site-Specific Tornado Wind Parameters (Region II, RG 1.76 Rev. 1)	Site-Specific Tornado Missile Spectrum for Region II as shown in Table 2 of RG 1.76 Rev. 1	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade) + Drag Effect 44 psf (above grade) + Impact of Floating Debris per *COLA* Section 3.4.2 + Wind Generated Wave Action per *COLA* Figure 3.4-1 (only hydrodynamic portion)	Amplified[1] Site-Specific SSE	Site-Specific Tornado Wind Parameters (Region II, RG 1.76 Rev. 1)	Site-Specific Tornado Missile Spectrum for Region II as shown in Table 2 of RG 1.76 Rev. 1	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade)	Site-Specific	NA	NA	NA	NA
Diesel Generator Fuel oil Storage Vault (DGFOSV)	Envelope of Amplified[1] Site-Specific SSE & 0.3g RG 1.60	Site-Specific	4% for all SSI analysis cases	Site-Specific SSE	Site-Specific	Envelope of Amplified[1] Site-Specific SSE & 0.3g RG 1.60	Site-Specific Tornado Wind Parameters (Region II, RG 1.76 Rev. 1)	Site-Specific Tornado Missile Spectrum for Region II as shown in Table 2 of RG 1.76 Rev. 1	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade) + Drag Effect 44 psf (above grade) + Impact of Floating Debris per *COLA* Section 3.4.2 + Wind Generated Wave Action per *COLA* Figure 3.4-1 (only hydrodynamic portion)	Amplified[1] Site-Specific SSE	Site-Specific Tornado Wind Parameters (Region II, RG 1.76 Rev. 1)	Site-Specific Tornado Missile Spectrum for Region II as shown in Table 2 of RG 1.76 Rev. 1	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade)	Site-Specific	NA	NA	NA	NA
Radwaste Building (RWB)	NA	NA	NA	Site-Specific SSE	Site-Specific	1/2 of 0.3g RG 1.60 SSE for RW-IIa Classification, 4% Damping	Per Table 2 of RG 1.143 Rev. 2 for RW-IIa Classification	Per Table 2 of RG 1.143 Rev. 2 for RW-IIa Classification	Flood El. 33' MSL RW-IIb Classification	Amplified[1] Site-Specific SSE , 7% Damping	Site-Specific Tornado Wind Parameters (Region II, RG 1.76 Rev. 1)	Site-Specific Tornado Missile Spectrum for Region II as shown in Table 2 of RG 1.76 Rev. 1	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade)	Site-Specific	Envelope of Amplified[1] Site-Specific SSE & 0.3g RG 1.60, 7% Damping	DCD Tornado Wind Parameters (As described in Table 5.0 of DCD/Tier 1)	DCD Missile Spectrum 1 as defined in Table 5.0 of DCD/Tier 1	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade) + Drag Effect 44 psf (above grade) + Impact of Floating Debris per *COLA* Section 3.4.2 + Wind Generated Wave Action per *COLA* Figure 3.4-1 (only hydrodynamic portion)
Control Bldg. Annex (CBA)	NA	NA	NA	NA	NA	IBC 2006	NA	NA	NA	Amplified[1] Site-Specific SSE	Site-Specific Tornado Wind Parameters (Region II, RG 1.76 Rev. 1)	Site-Specific Tornado Missile Spectrum for Region II as shown in Table 2 of RG 1.76 Rev. 1	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade)	Site-Specific	Envelope of Amplified[1] Site-Specific SSE & 0.3g RG 1.60	DCD Tornado Wind Parameters (As described in Table 5.0 of DCD/Tier 1)	DCD Missile Spectrum 1 as defined in Table 5.0 of DCD/Tier 1	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade) + Drag Effect 44 psf (above grade) + Impact of Floating Debris per *COLA* Section 3.4.2 + Wind Generated Wave Action per *COLA* Figure 3.4-1 (only hydrodynamic portion)
Turbine Building (TB)	NA	NA	NA	NA	NA	IBC 2006	NA	NA	NA	Site-Specific SSE	Site-Specific Tornado Wind Parameters (Region II, RG 1.76 Rev. 1)	Site-Specific Tornado Missile Spectrum for Region II as shown in Table 2 of RG 1.76 Rev. 1	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade)	Site-Specific	0.3g RG 1.60 SSE	DCD Tornado Wind Parameters (As described in Table 5.0 of DCD/Tier 1)	DCD Missile Spectrum 1 as defined in Table 5.0 of DCD/Tier 1	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade) + Drag Effect 44 psf (above grade) + Impact of Floating Debris per *COLA* Section 3.4.2 + Wind Generated Wave Action per *COLA* Figure 3.4-1 (only hydrodynamic portion)
Service Building (SB)	NA	NA	NA	NA	NA	IBC 2006	NA	NA	NA	Amplified[1] Site-Specific SSE	Site-Specific Tornado Wind Parameters (Region II, RG 1.76 Rev. 1)	Site-Specific Tornado Missile Spectrum for Region II as shown in Table 2 of RG 1.76 Rev. 1	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade)	Site-Specific	Envelope of Amplified[1] Site-Specific SSE & 0.3g RG 1.60	DCD Tornado Wind Parameters (As described in Table 5.0 of DCD/Tier 1)	DCD Missile Spectrum 1 as defined in Table 5.0 of DCD/Tier 1	Flood El. 40' MSL, Water Density 63.85 lb/ft^3 (above grade) + Drag Effect 44 psf (above grade) + Impact of Floating Debris per *COLA* Section 3.4.2 + Wind Generated Wave Action per *COLA* Figure 3.4-1 (only hydrodynamic portion)

General Notes:
1) Amplified Site-Specific SSE accounts for the influence of nearby heavy Reactor Building, Control Building, and/or UHS/RSW Pump House.
2) For stability under tornado loading with tornado missile, restraints are required at top of DGFOT access regions.
3) NA: Not Applicable
4) Seismic wave propagation for DGFOT and RSW Piping Tunnels is based on site-specific SSE because their layouts are site-specific.

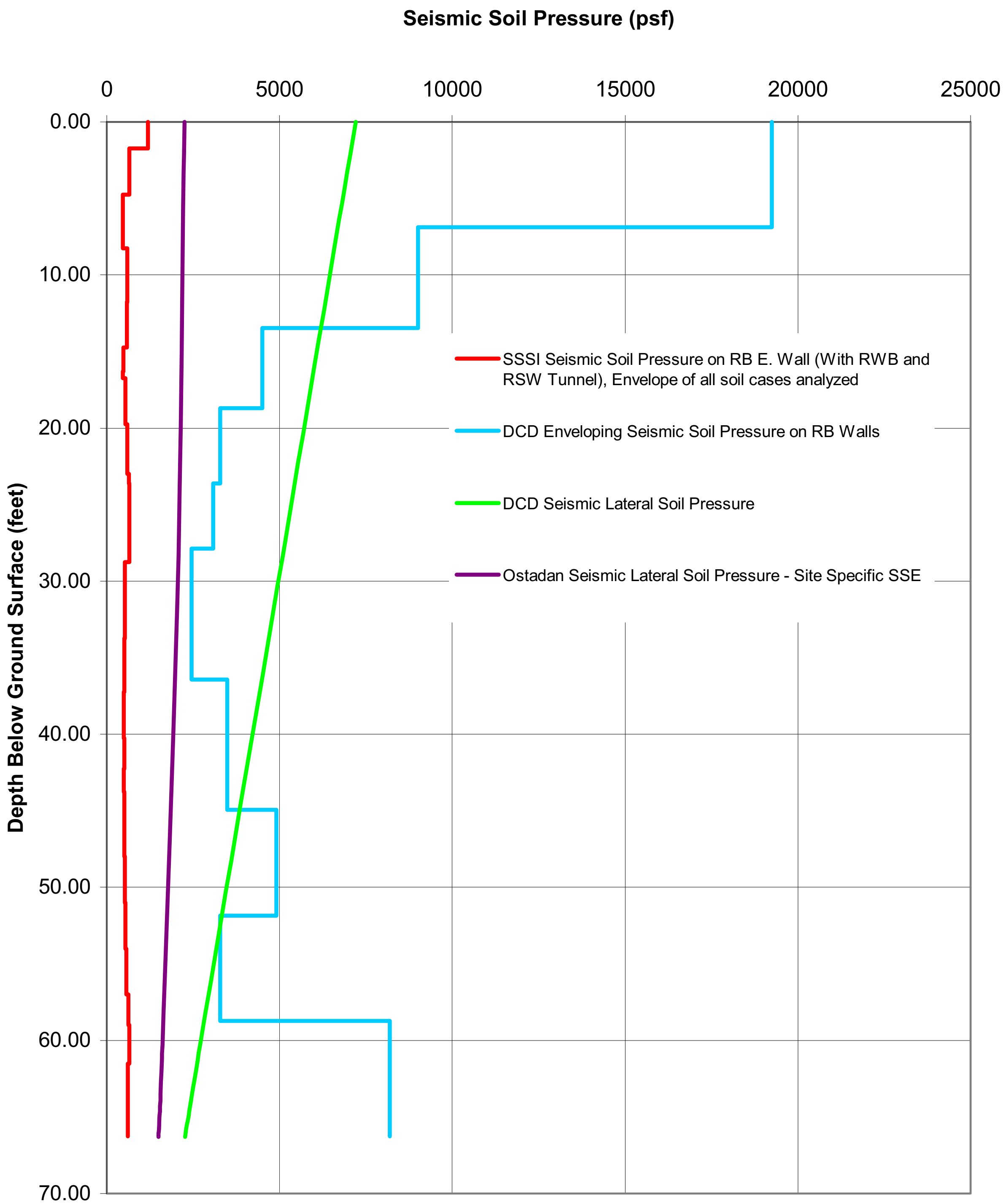


Figure 3H.1-1 Lateral Seismic Soil Pressure Comparison for RB East Wall (Considering RSW Tunnel & Radwaste Building)

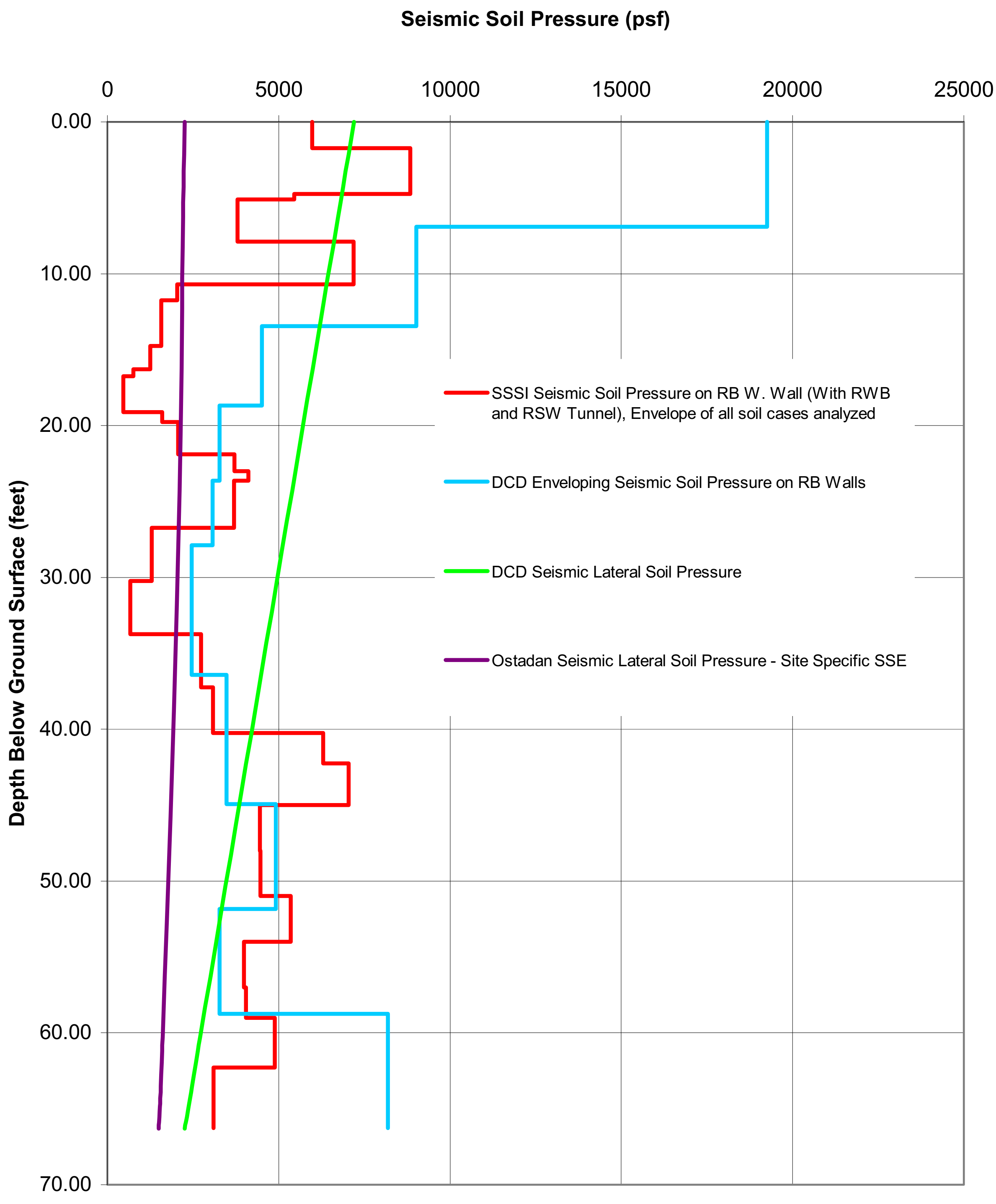


Figure 3H.1-2 Lateral Seismic Soil Pressure Comparison for RB West Wall (Considering RSW Tunnel & Radwaste Building)

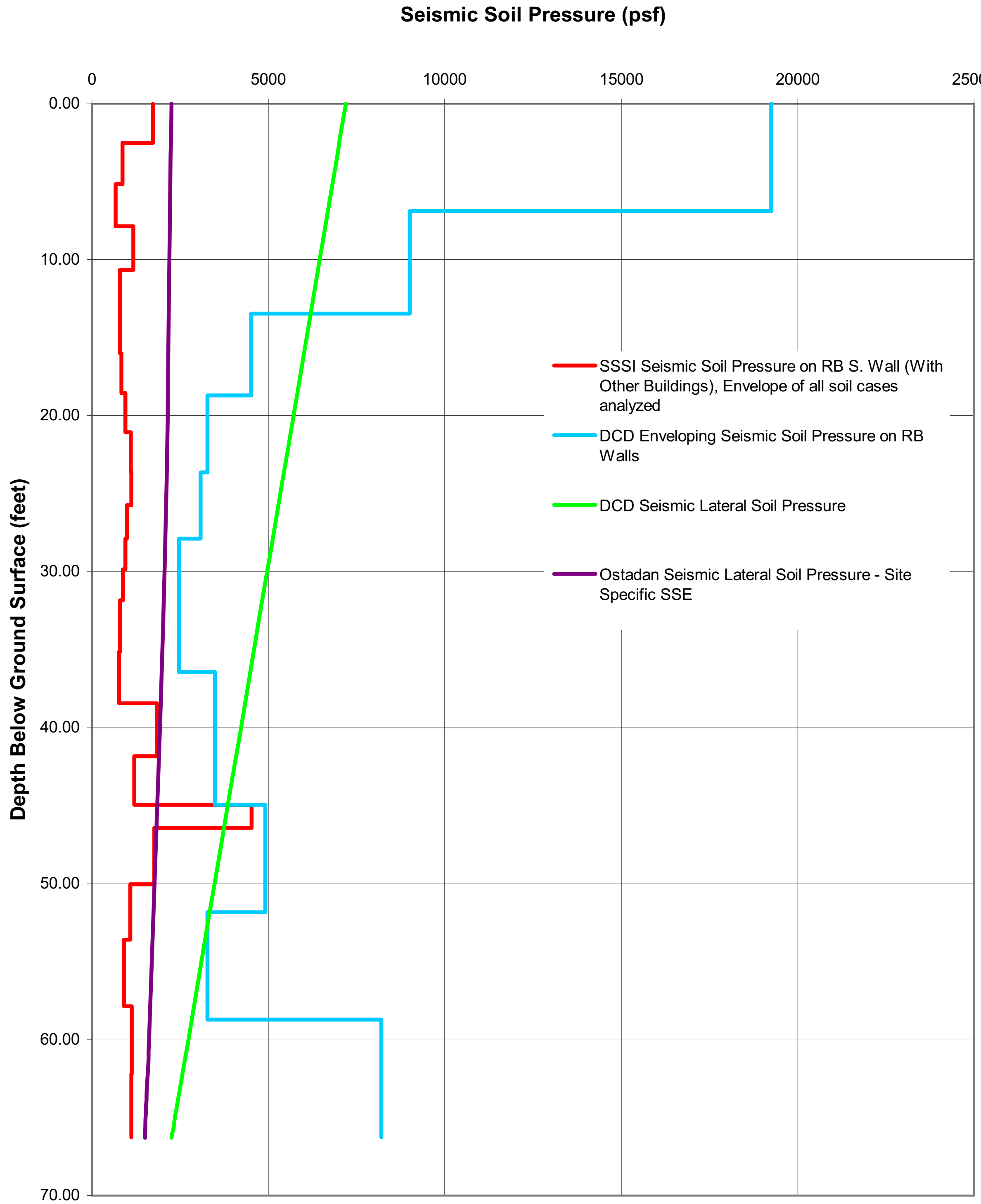


Figure 3H.1-3 Lateral Seismic Soil Pressure Comparison for RB South Wall (Considering DGFOSVS, RSW Tunnel & UHS/RSW Pump House Building)

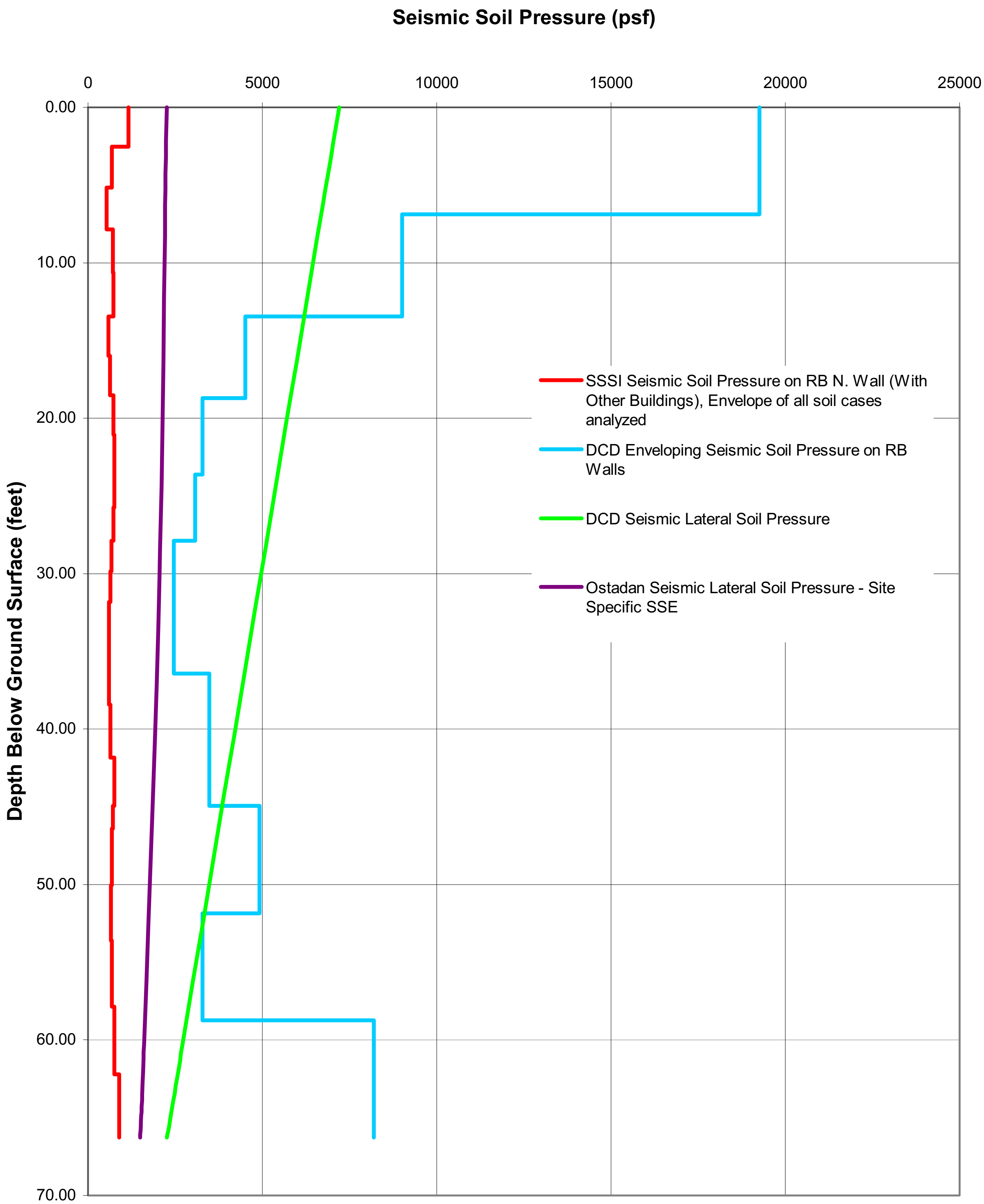


Figure 3H.1-4 Lateral Seismic Soil Pressure Comparison for RB North Wall (Considering DGFOSVS, RSW Tunnel & UHS/RSW Pump House Building)

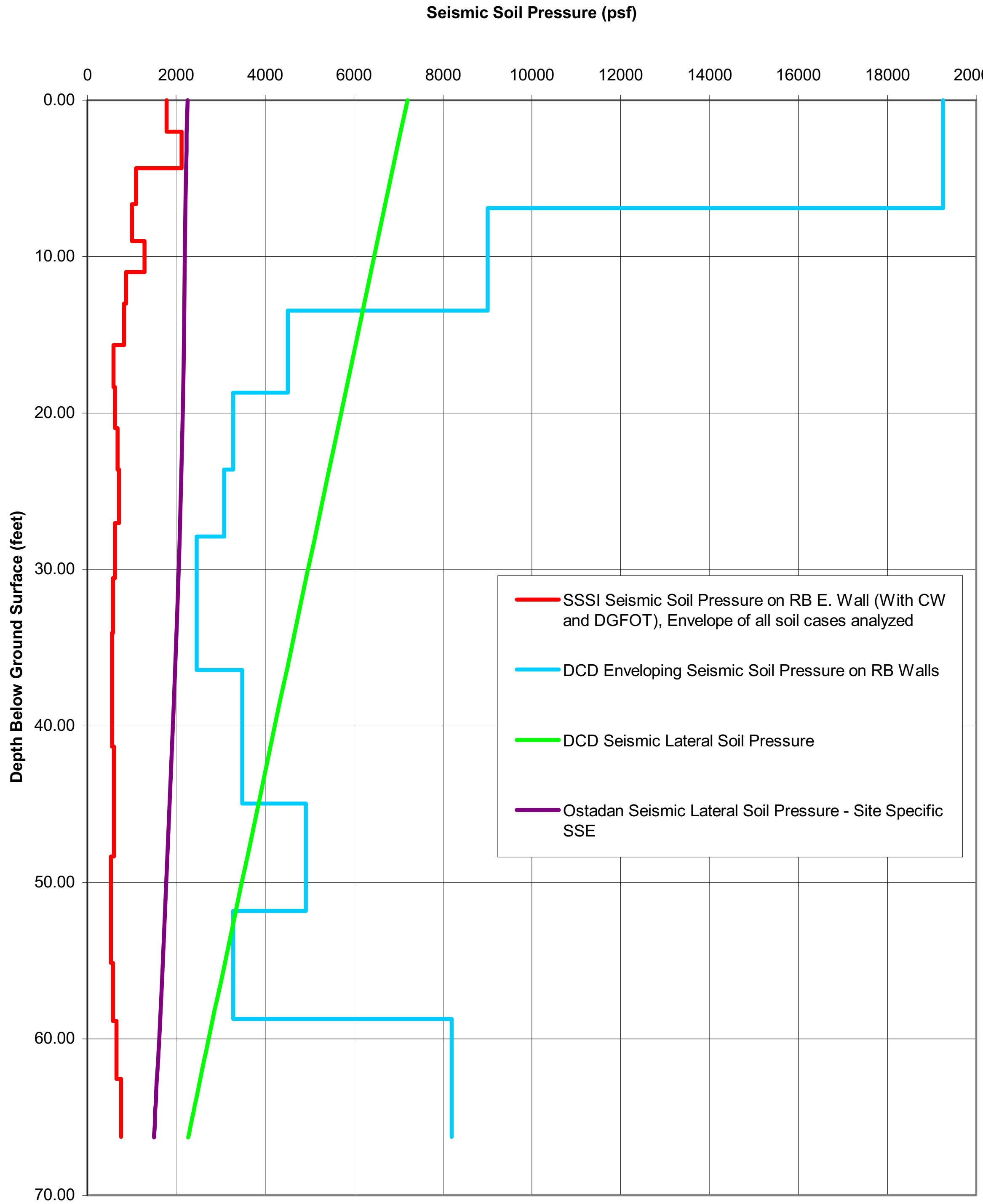


Figure 3H.1-5 Lateral Seismic Soil Pressure Comparison for RB East Wall (Considering DGFOT & Crane Wall)

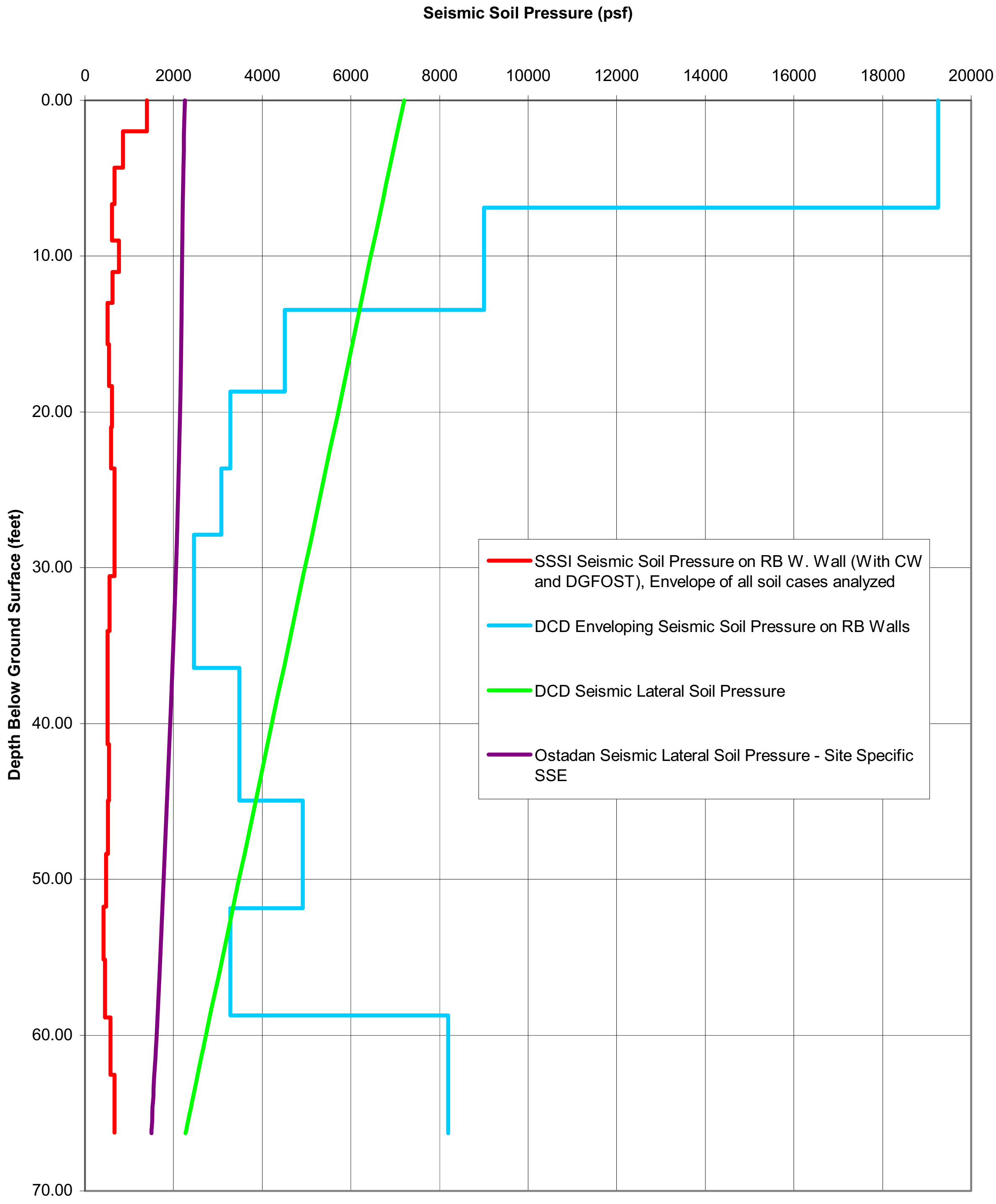


Figure 3H.1-6 Lateral Seismic Soil Pressure Comparison for RB West Wall (Considering DGFOT & Crane Wall)

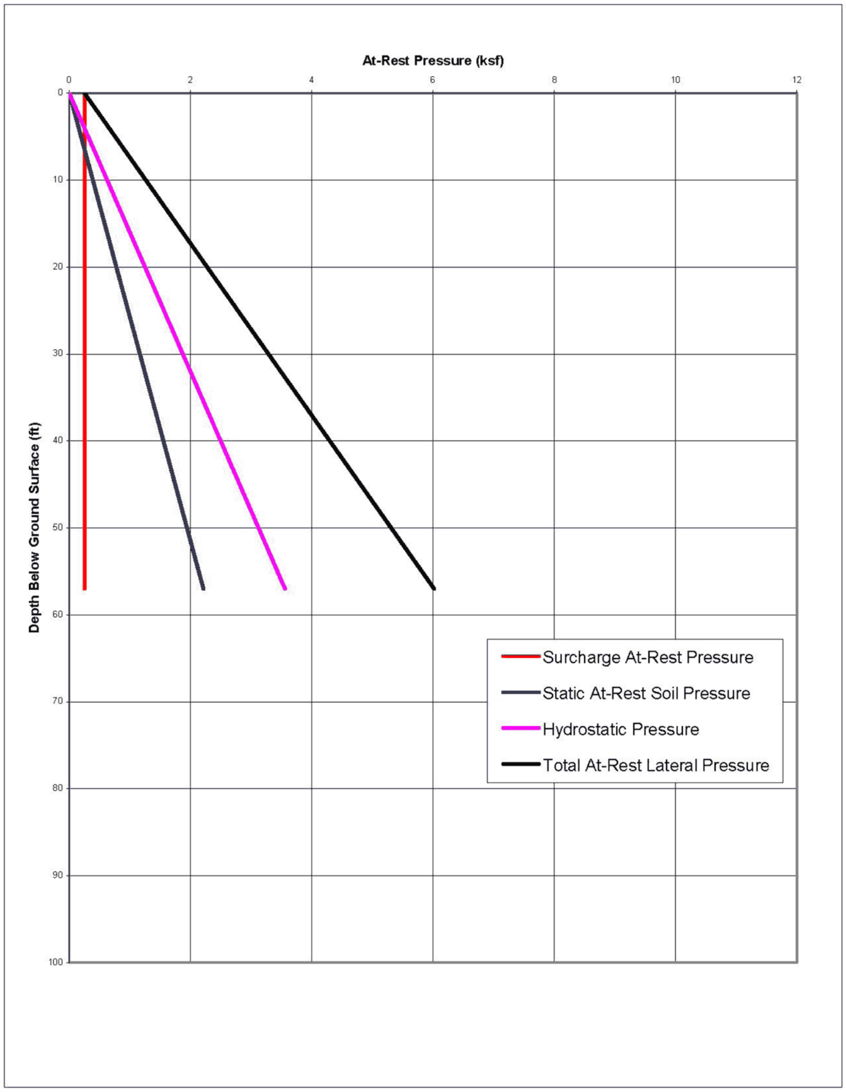


Figure 3H.3-1 At-Rest Lateral Earth Pressure on the RWB Walls

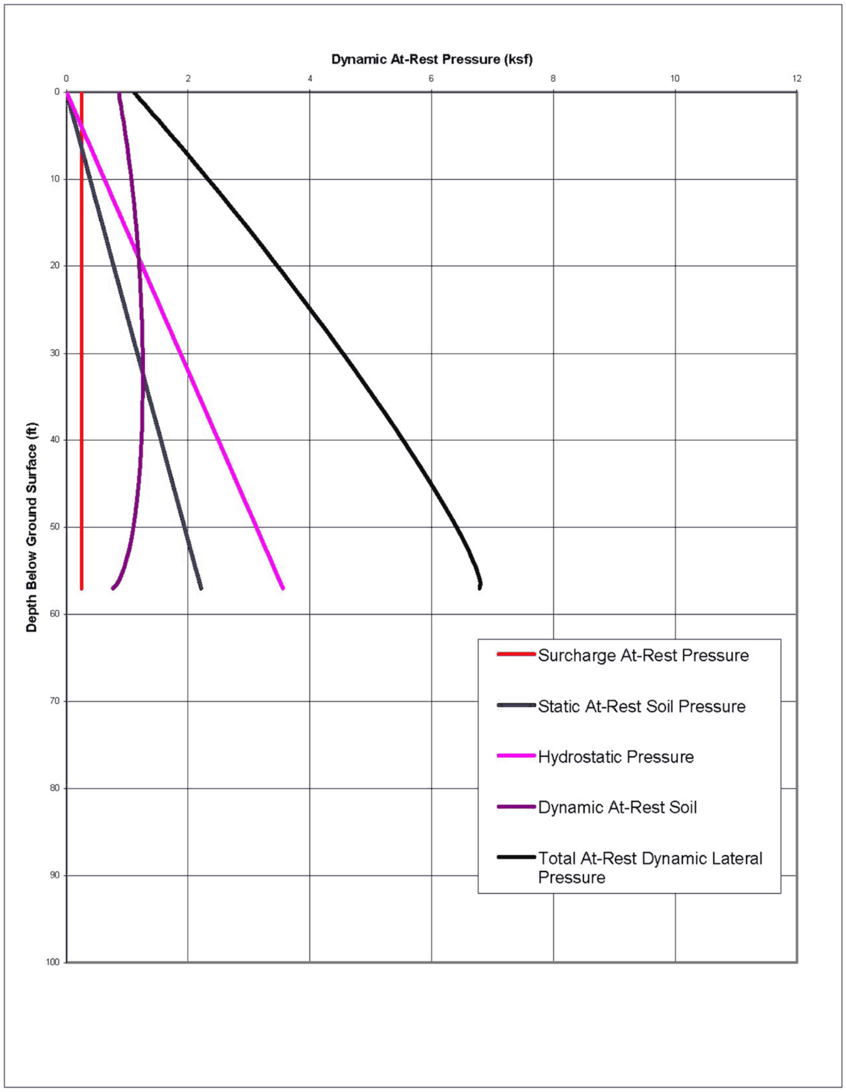


Figure 3H.3-2 Dynamic At-Rest Lateral Earth Pressure on the RWB Walls

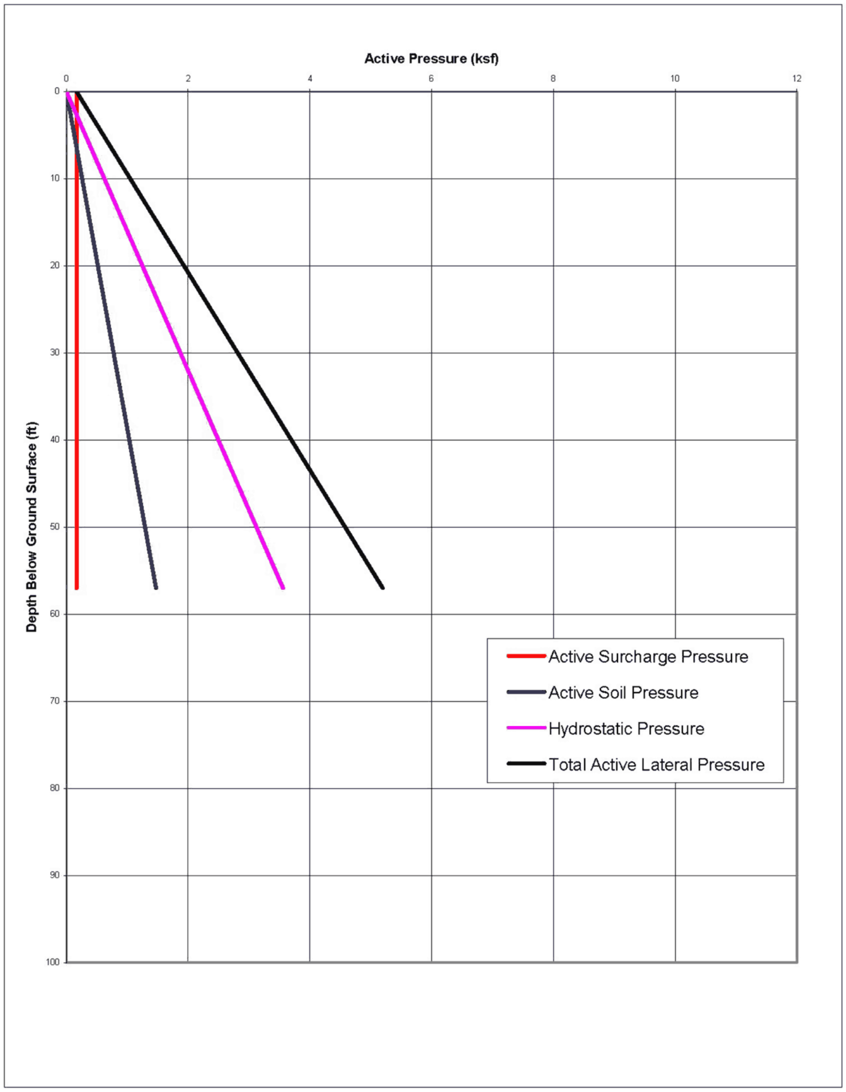


Figure 3H.3-3 Active Lateral Earth Pressure on the RWB Walls

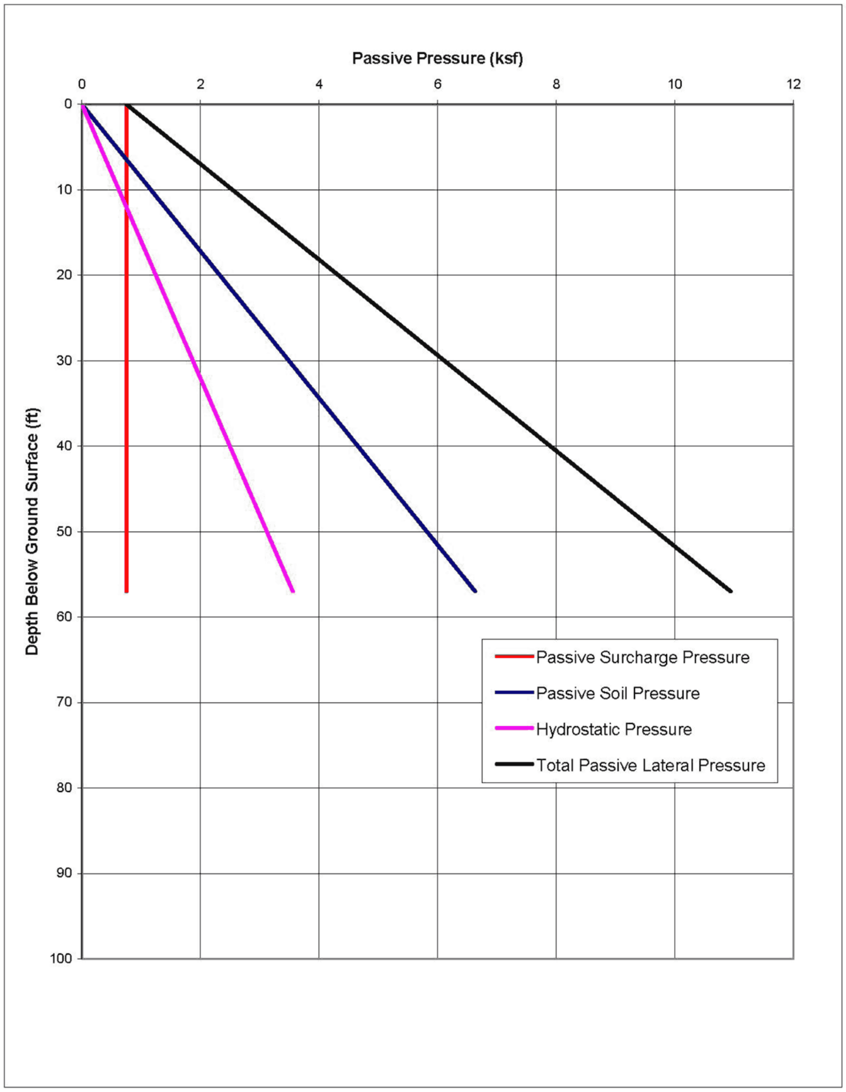


Figure 3H.3-4 Passive Lateral Earth Pressure on the RWB Walls

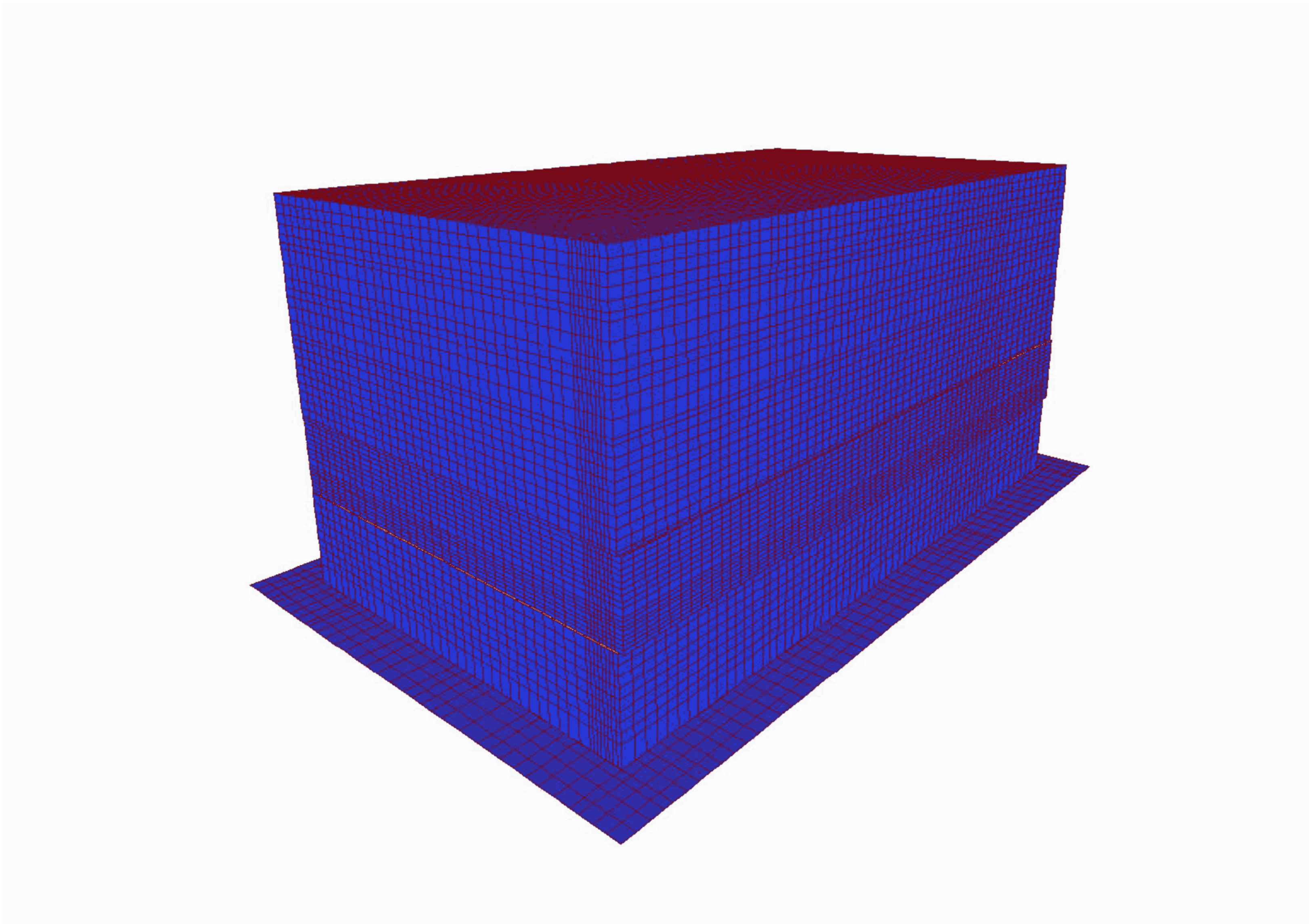


Figure 3H.3-5 Radwaste Building SAP2000 Model (Looking from Southwest Corner)

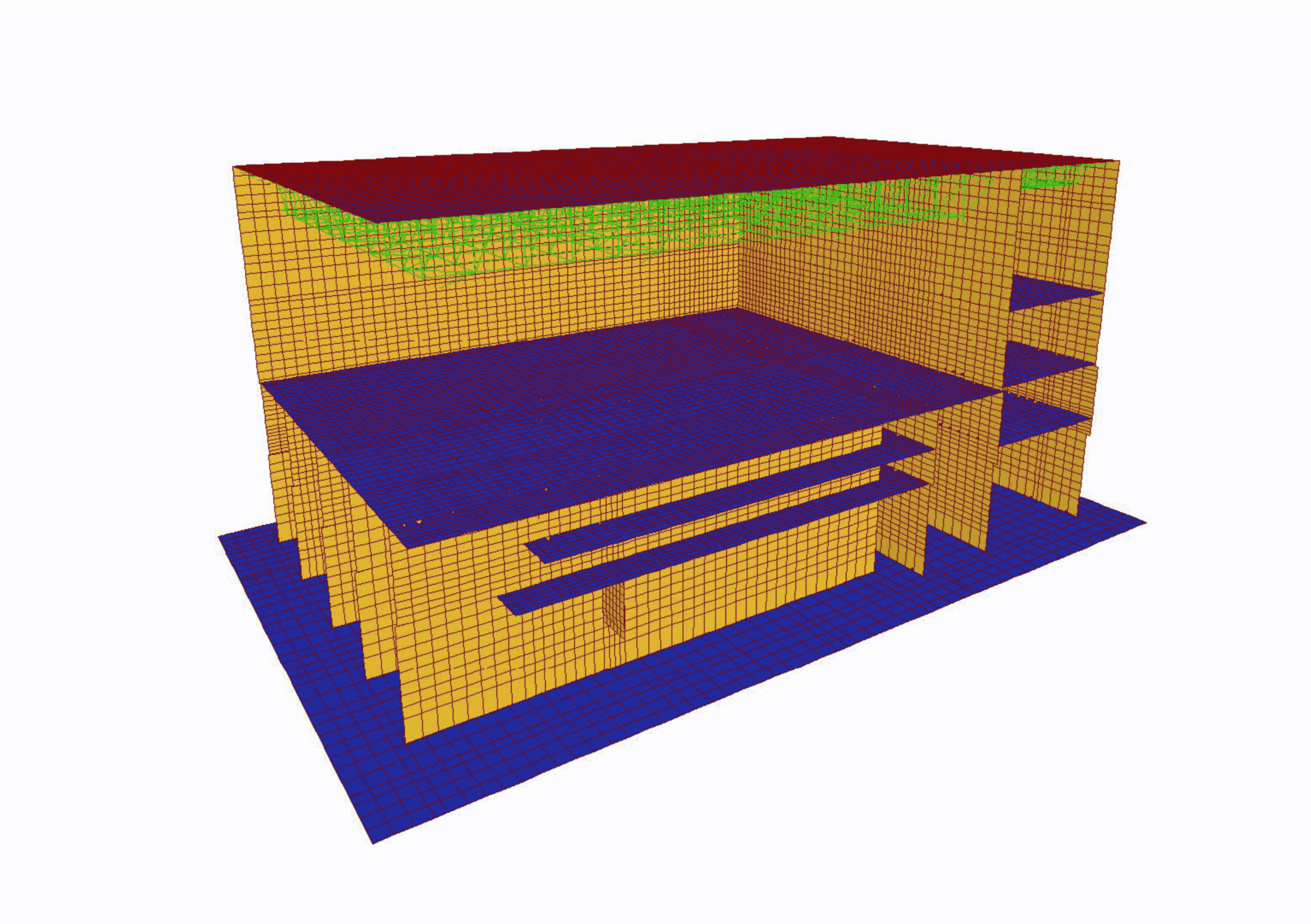


Figure 3H.3-6 Radwaste Building SAP2000 Model (South and West Walls Removed)

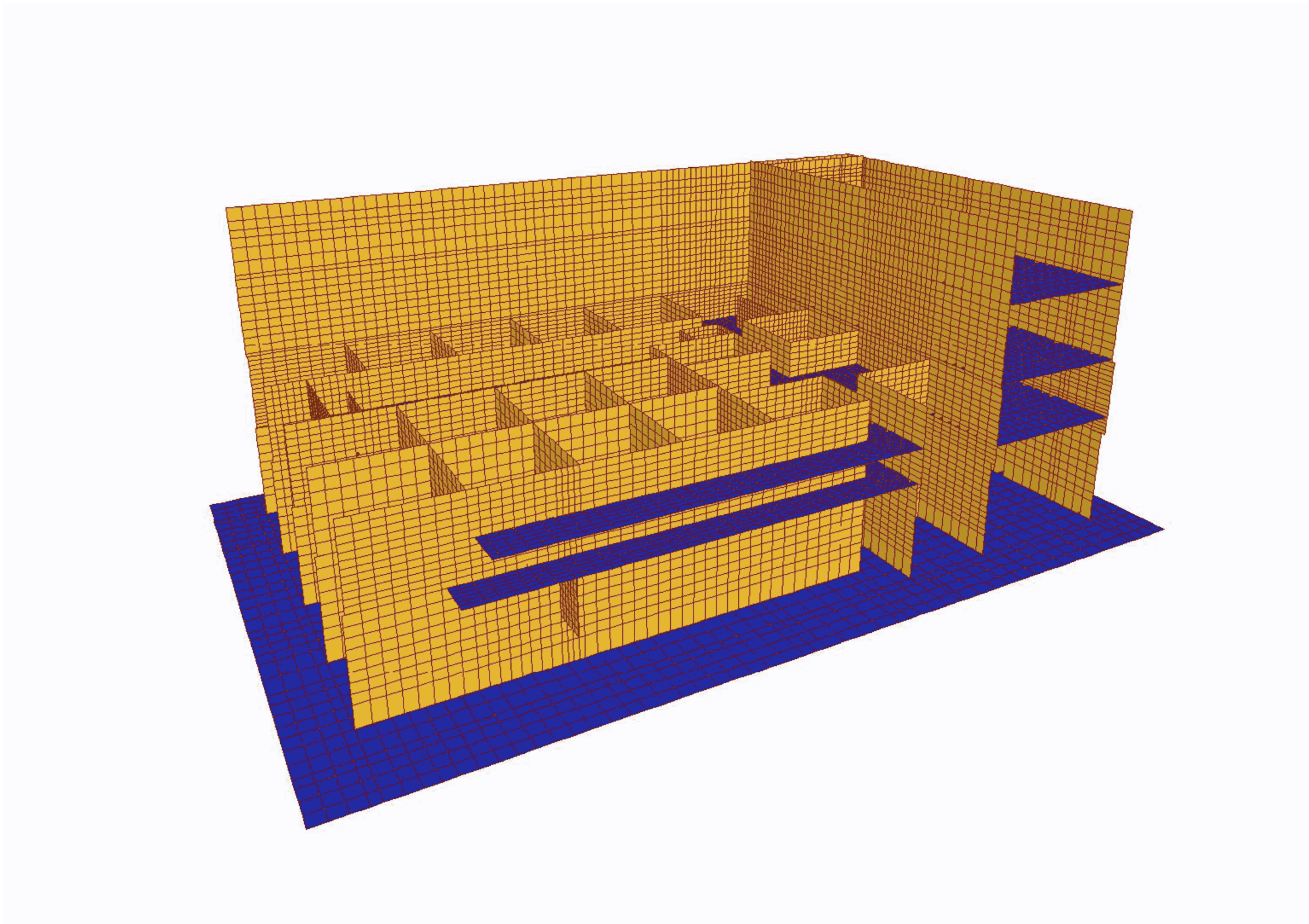


Figure 3H.3-7 Radwaste Building SAP2000 Model (South Wall, West Wall, Roof and El. 35’-0” Slab Removed)

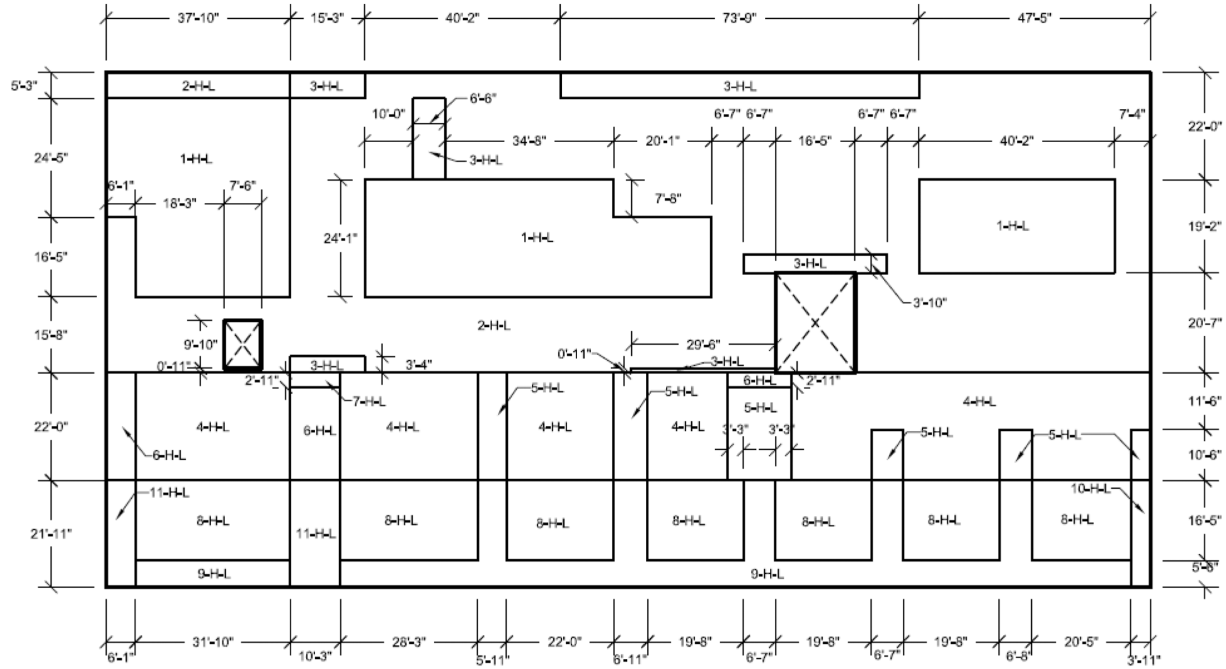


Figure 3H.3-8 North Wall Looking South Horizontal Reinforcement Zones Near Side Face

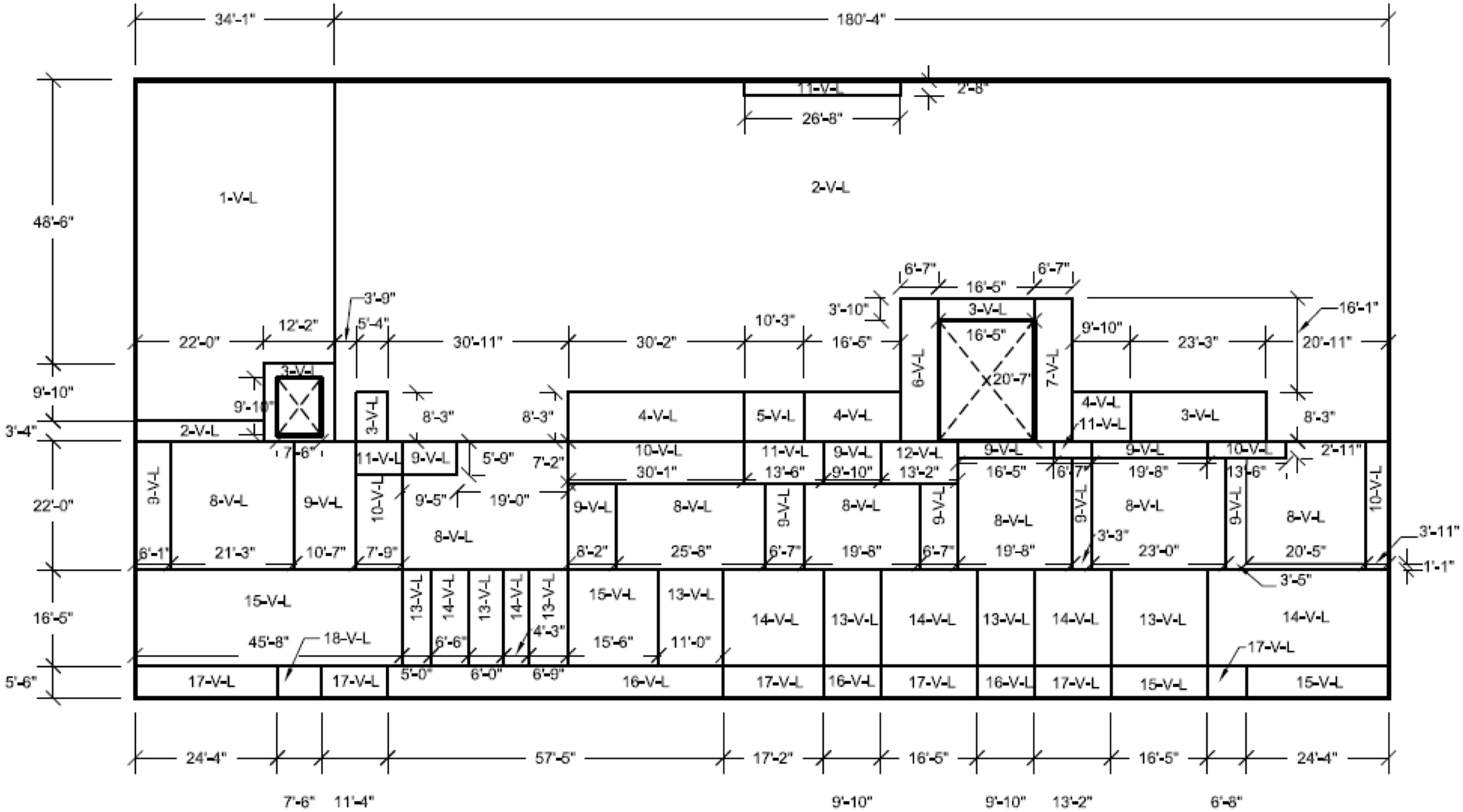


Figure 3H.3-9 North Wall Looking South
Vertical Reinforcement Zones
Near Side Face

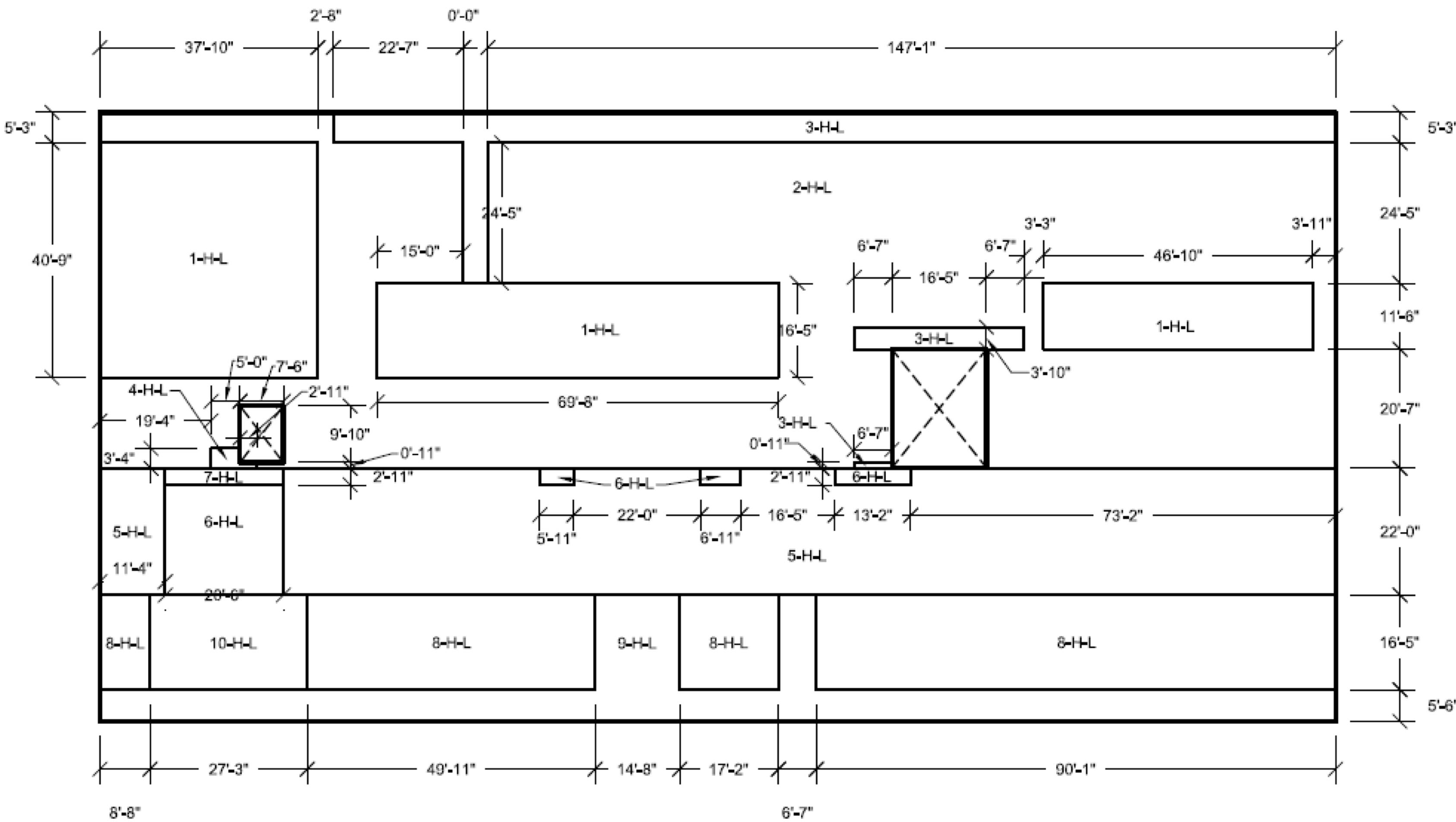


Figure 3H.3-10 North Wall Looking South
Horizontal Reinforcement Zones
Far Side Face

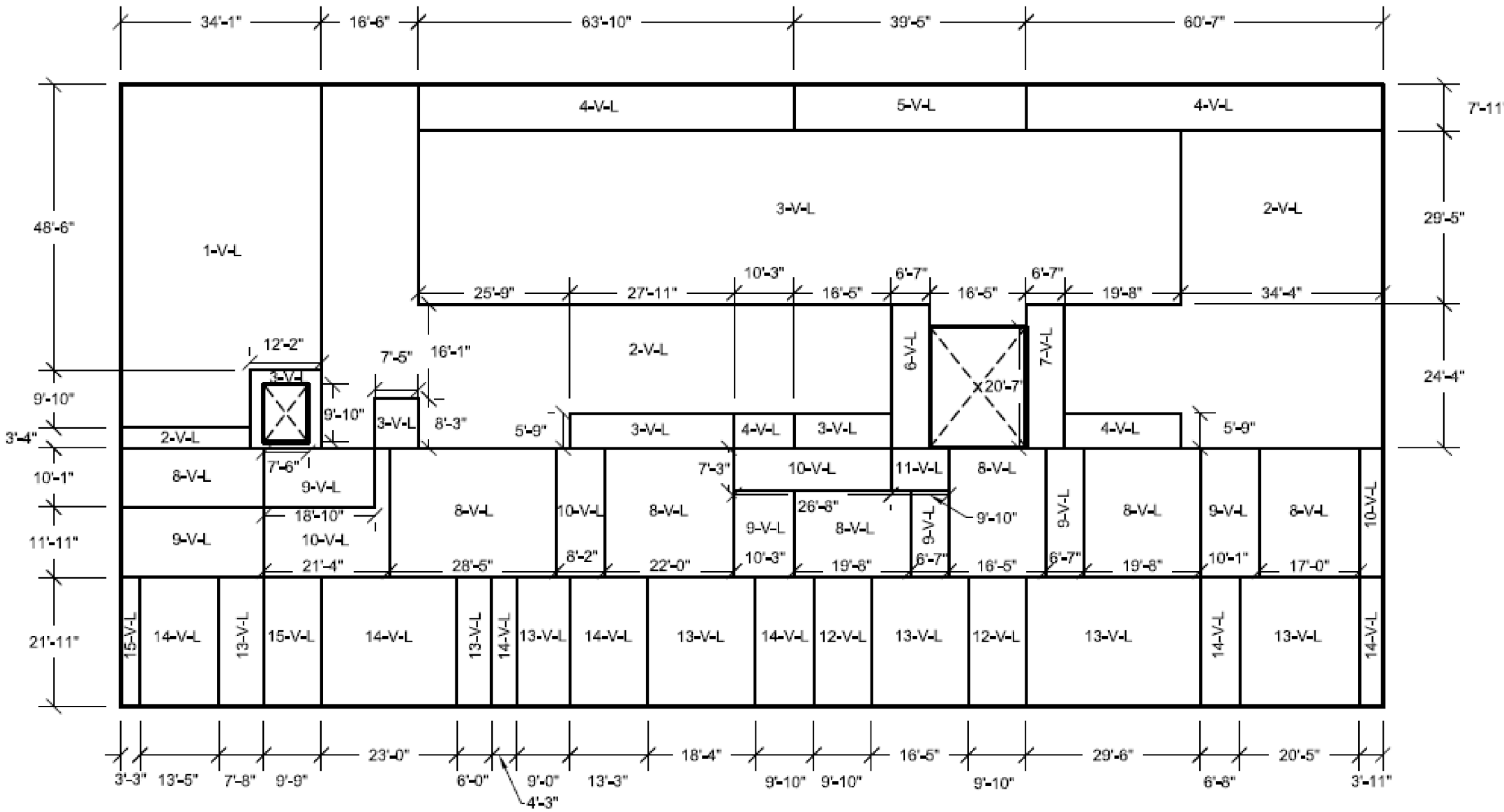


Figure 3H.3-11 North Wall Looking South Vertical Reinforcement Zones Far Side Face

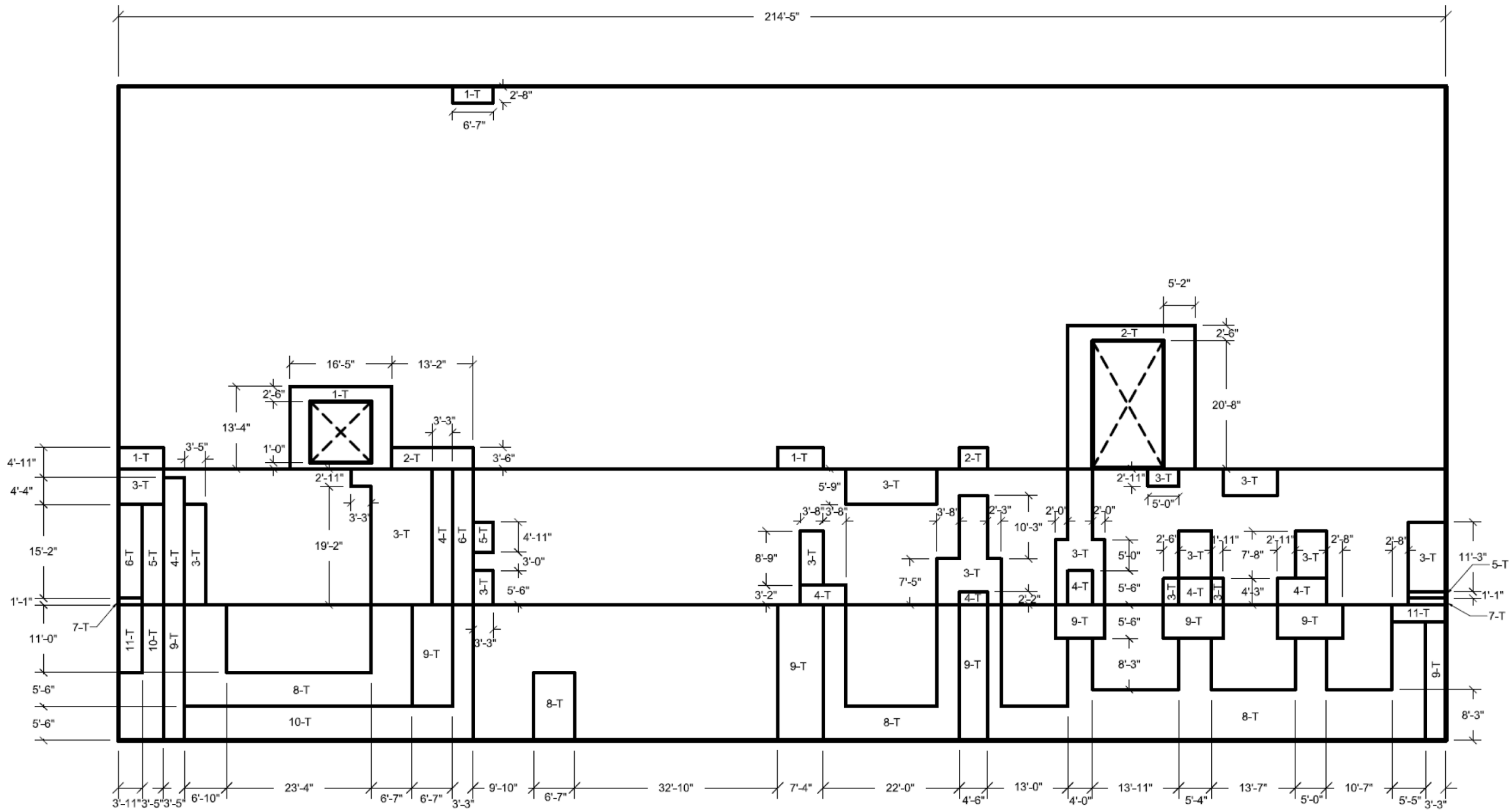


**Figure 3H.3-12 North Wall Looking South
Transverse Reinforcement Zones**

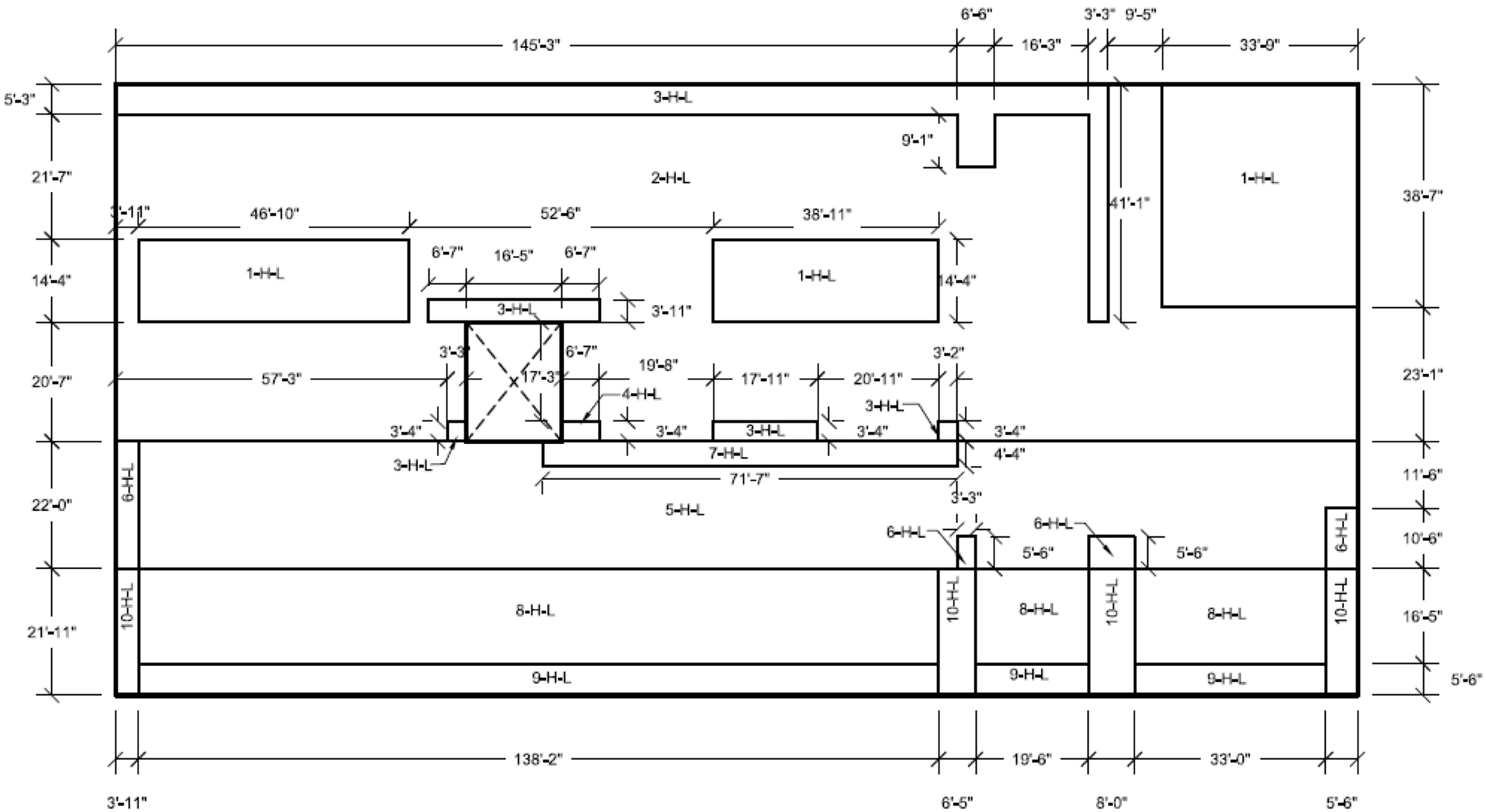


Figure 3H.3-13 South Wall Looking North Horizontal Reinforcement Zones Near Side Face

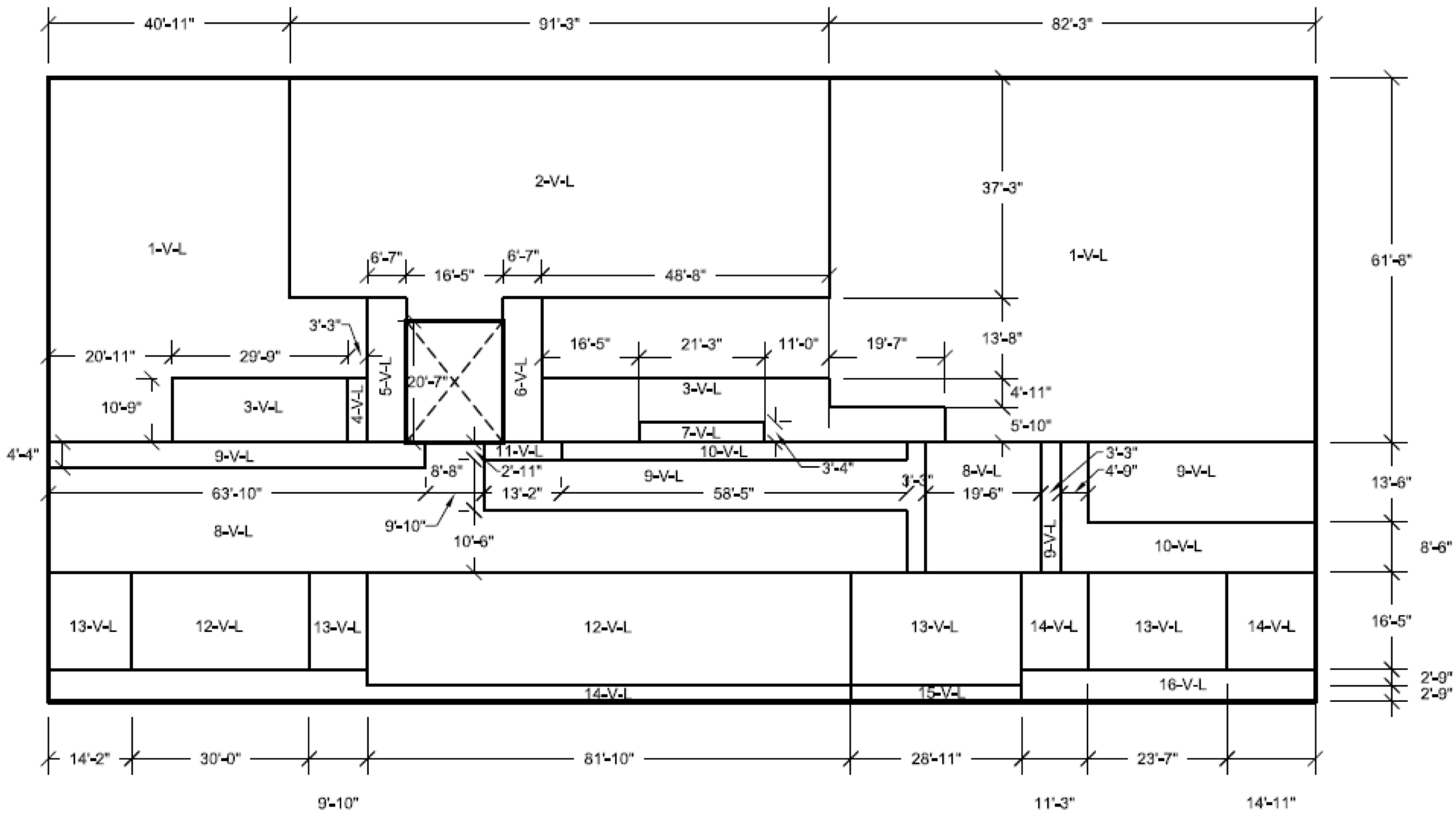


Figure 3H.3-14 South Wall Looking North Vertical Reinforcement Zones Near Side Face

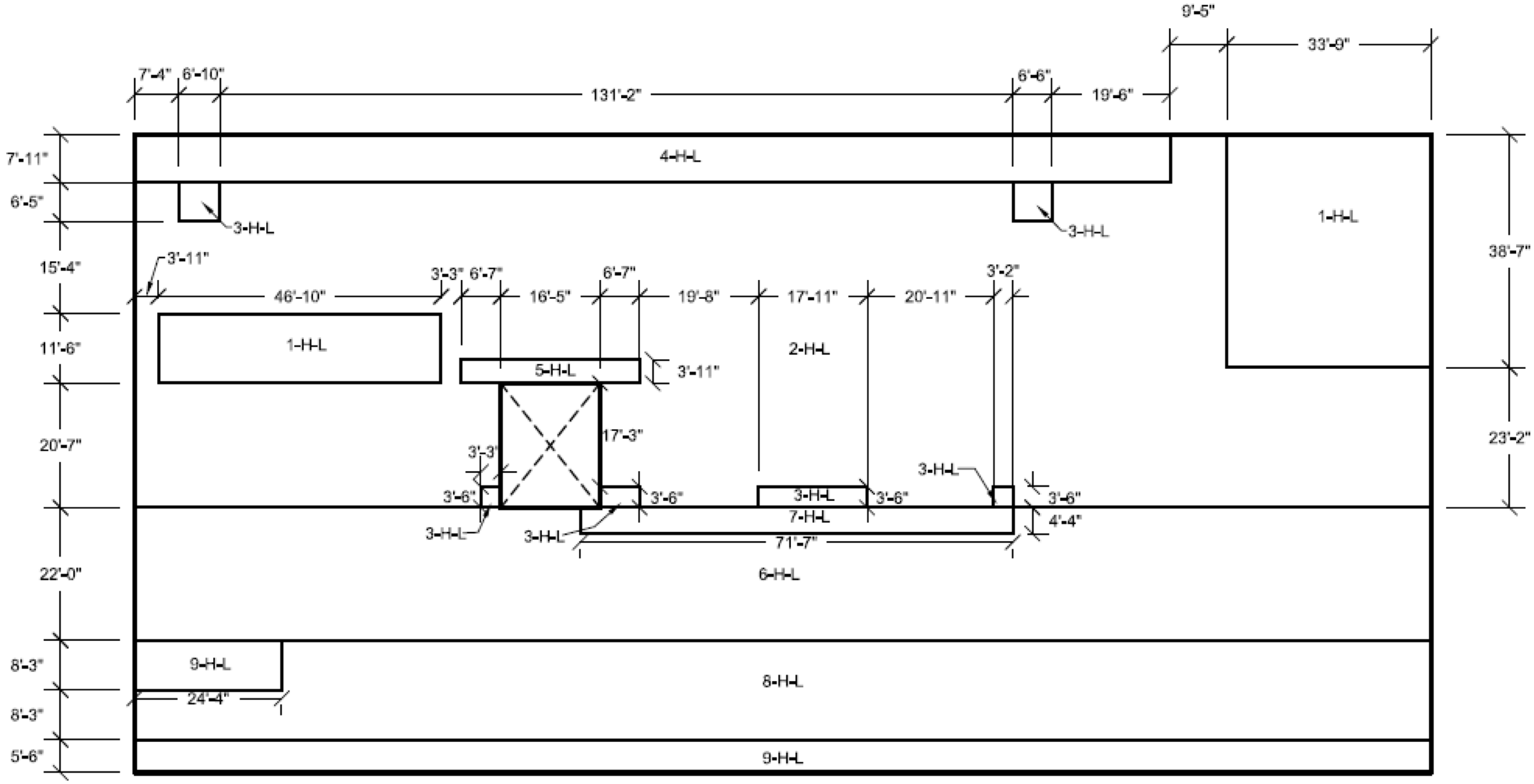


Figure 3H.3-15 South Wall Looking North Horizontal Reinforcement Zones Far Side Face

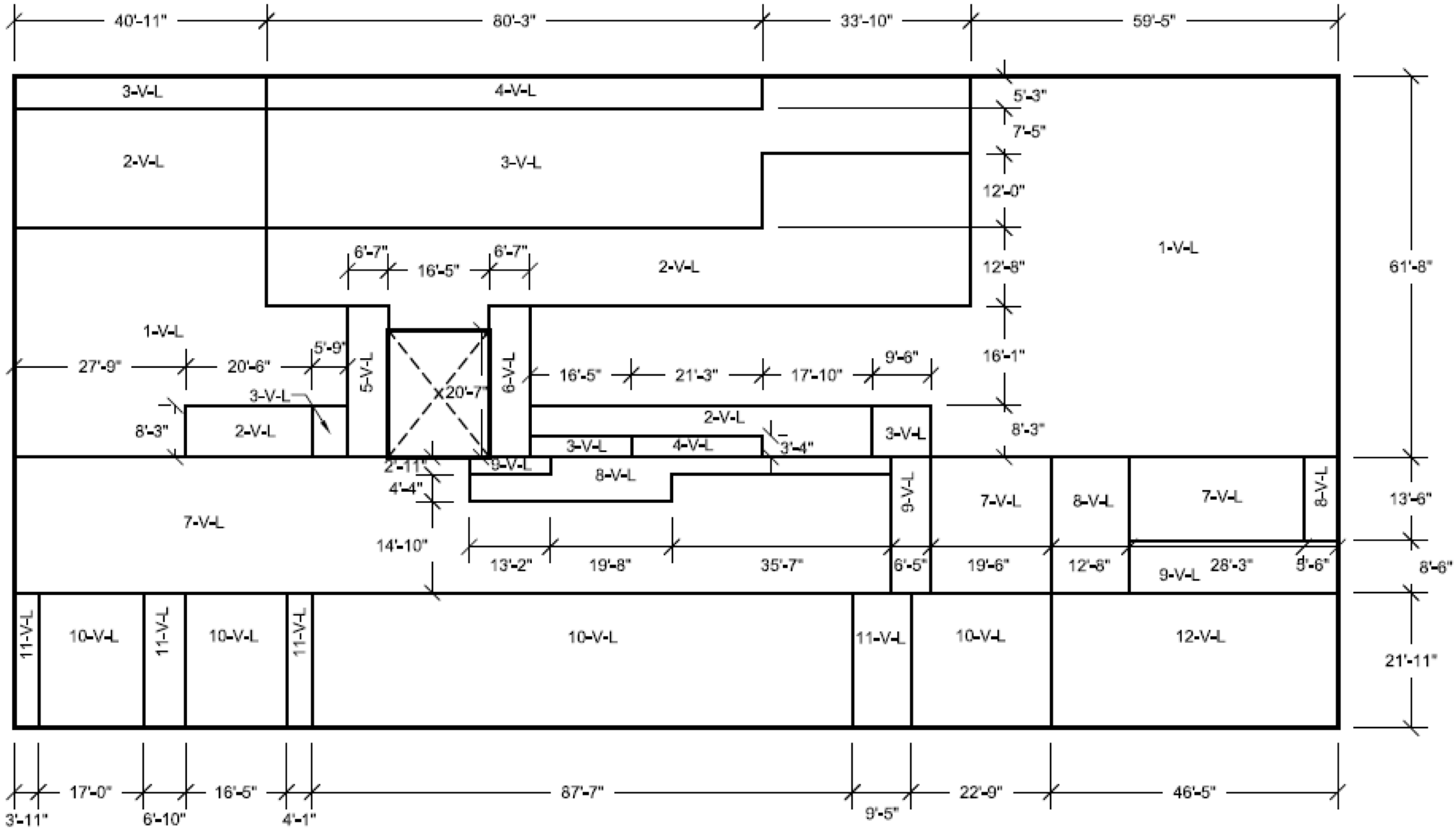


**Figure 3H.3-16 South Wall Looking North
Vertical Reinforcement Zones
Far Side Face**

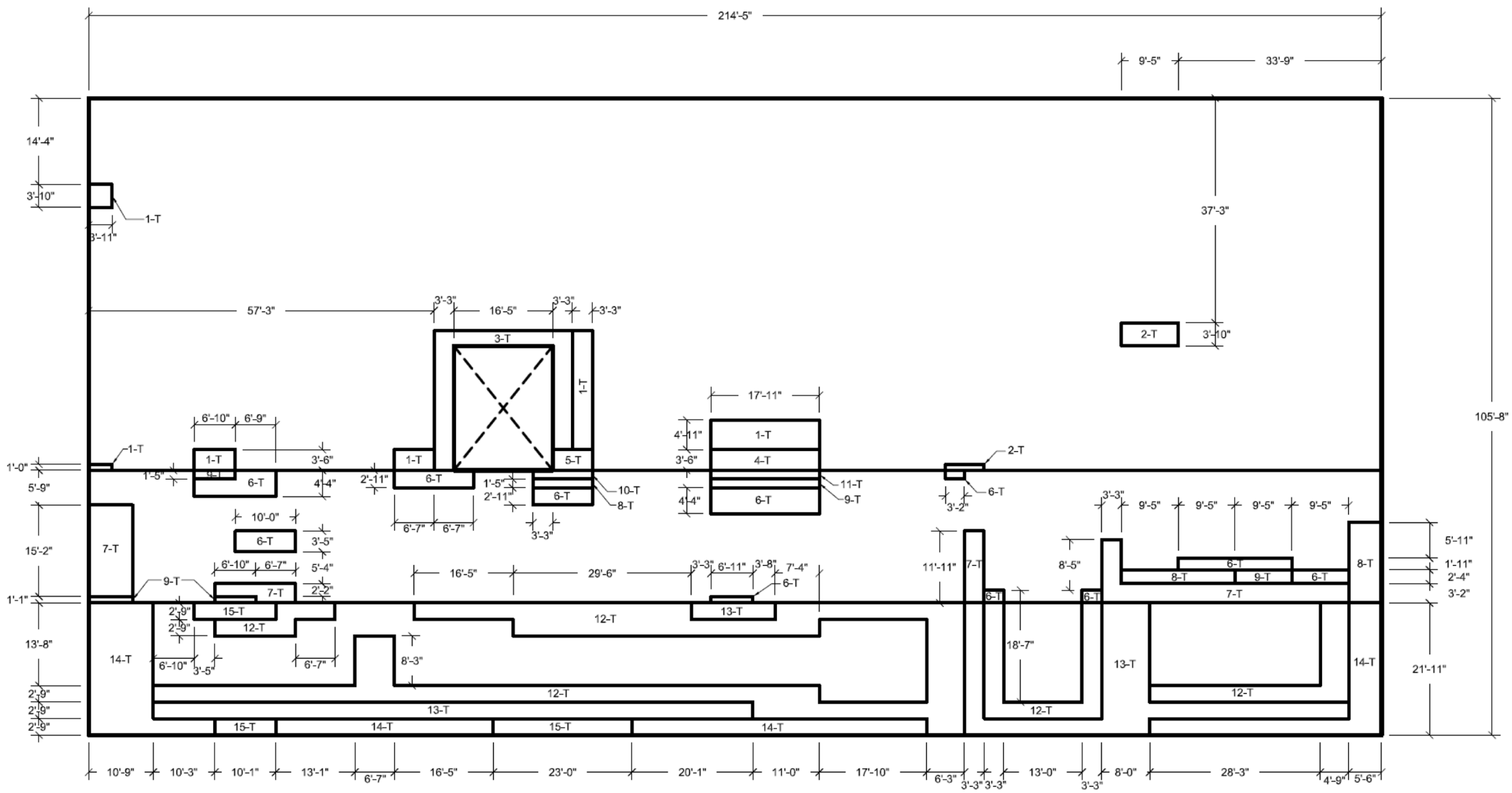


Figure 3H.3-17 South Wall Looking North Transverse Reinforcement Zones

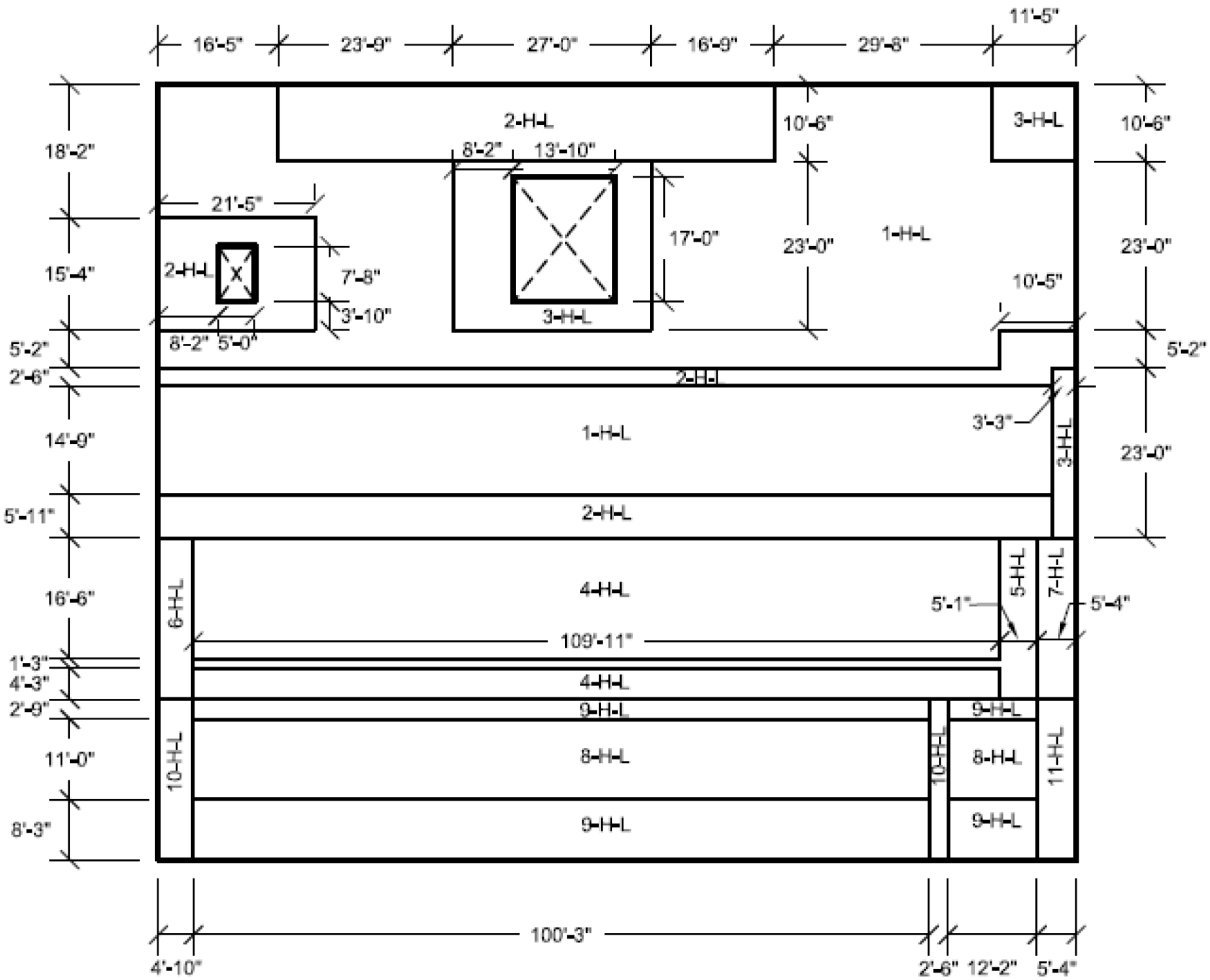


**Figure 3H.3-18 East Wall Looking West
Horizontal Reinforcement Zones
Near Side Face**

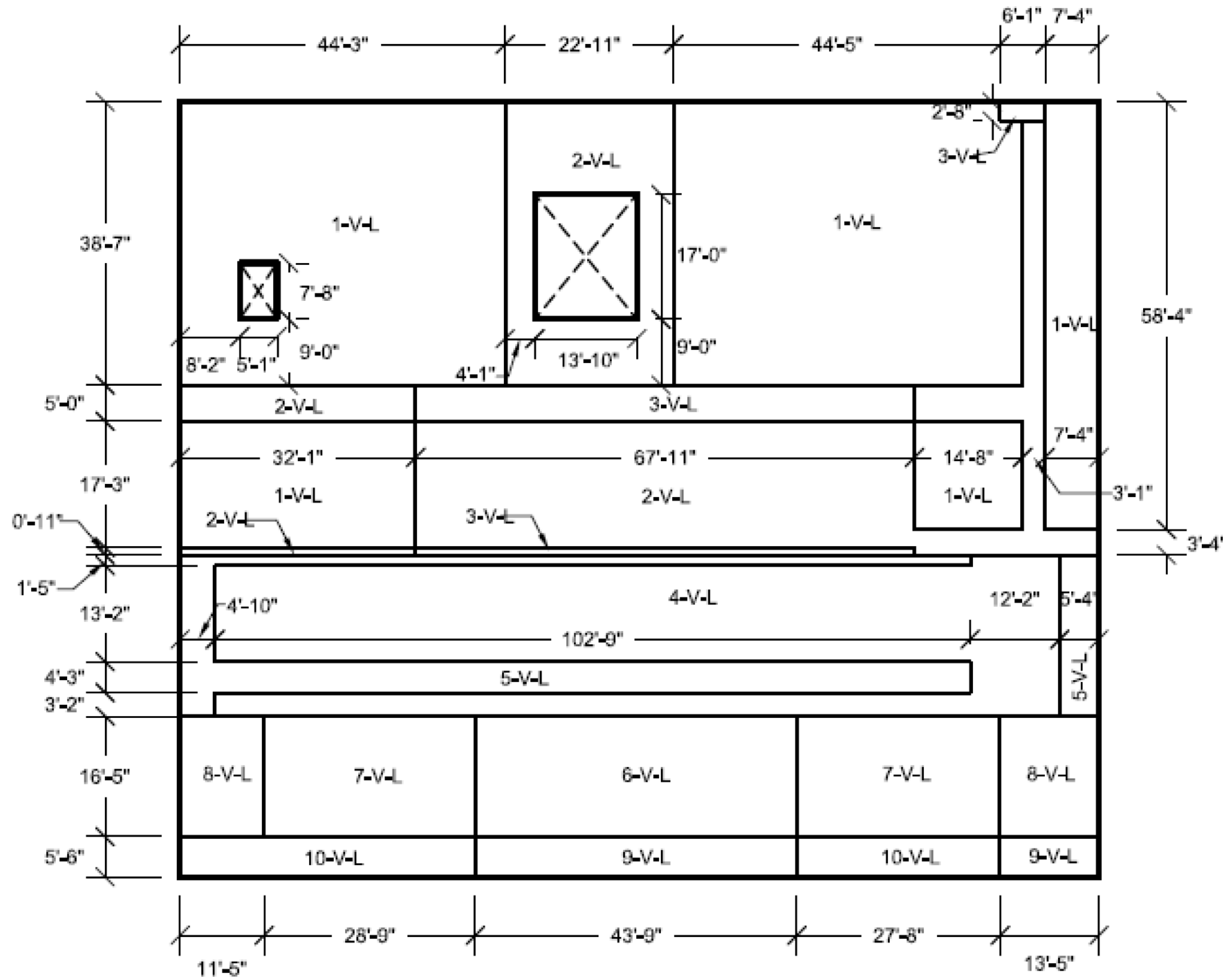


Figure 3H.3-19 East Wall Looking West
Vertical Reinforcement Zones
Near Side Face

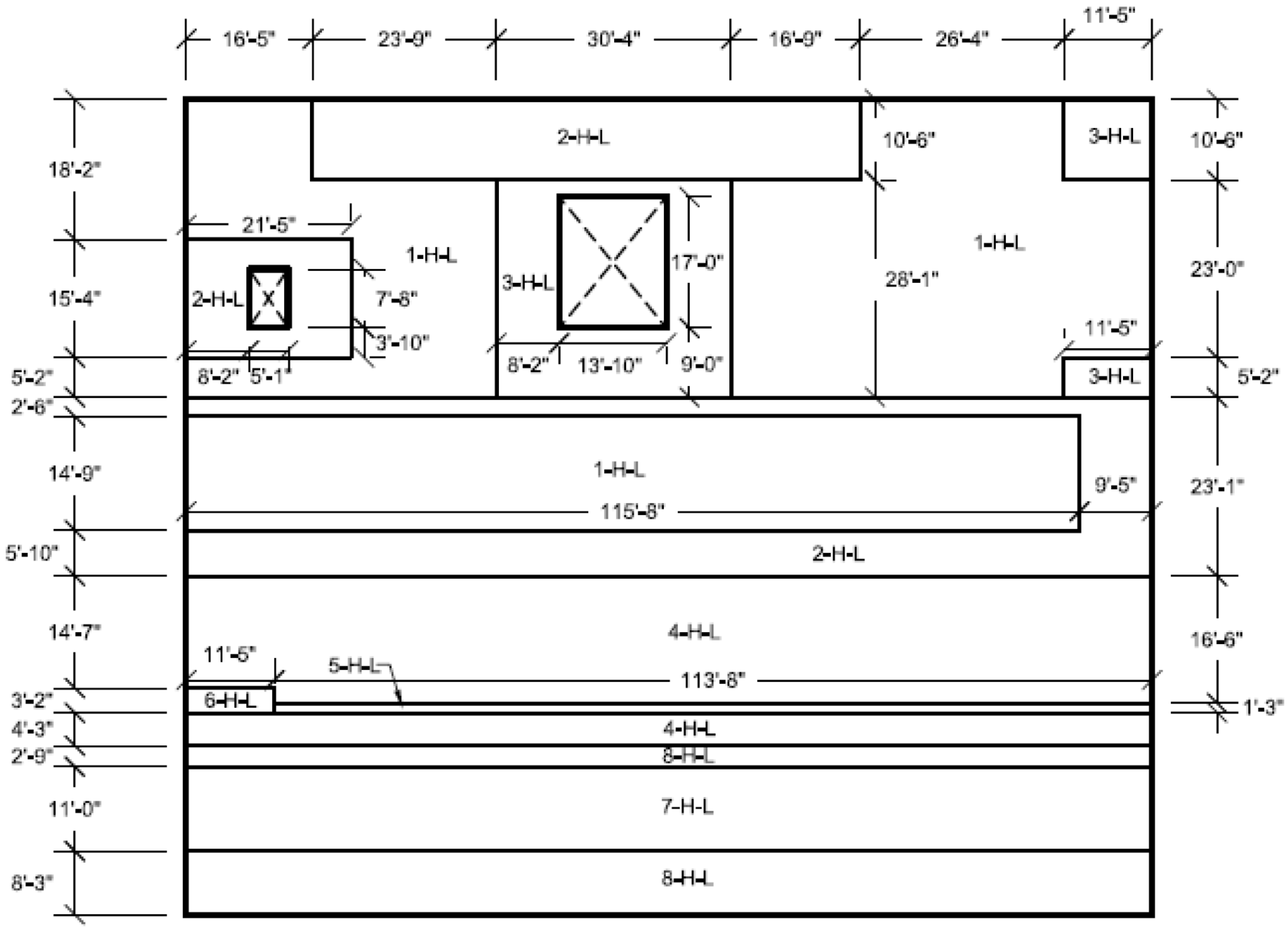


**Figure 3H.3-20 East Wall Looking West
Horizontal Reinforcement Zones
Far Side Face**

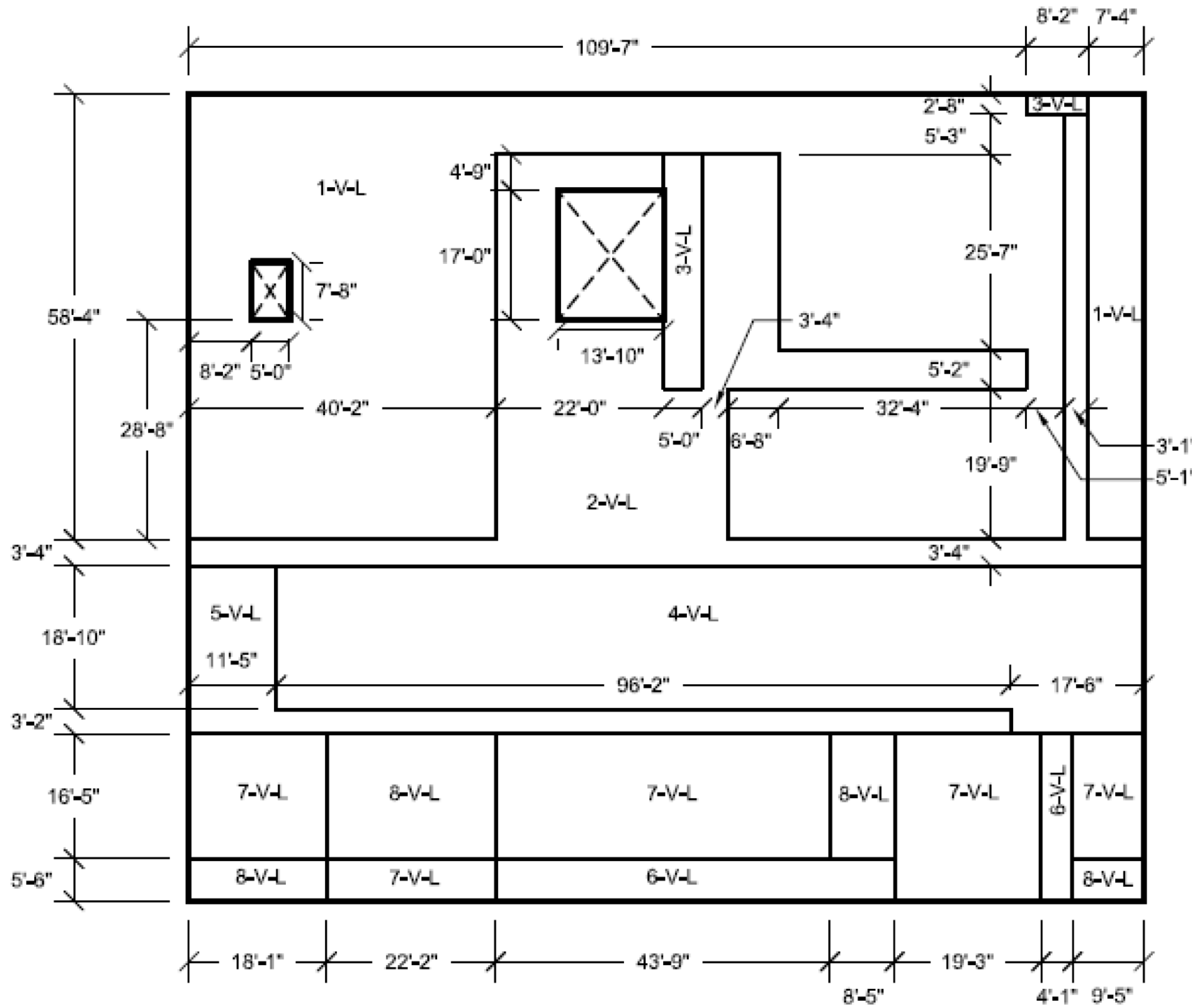


Figure 3H.3-21 East Wall Looking West
Vertical Reinforcement Zones
Far Side Face

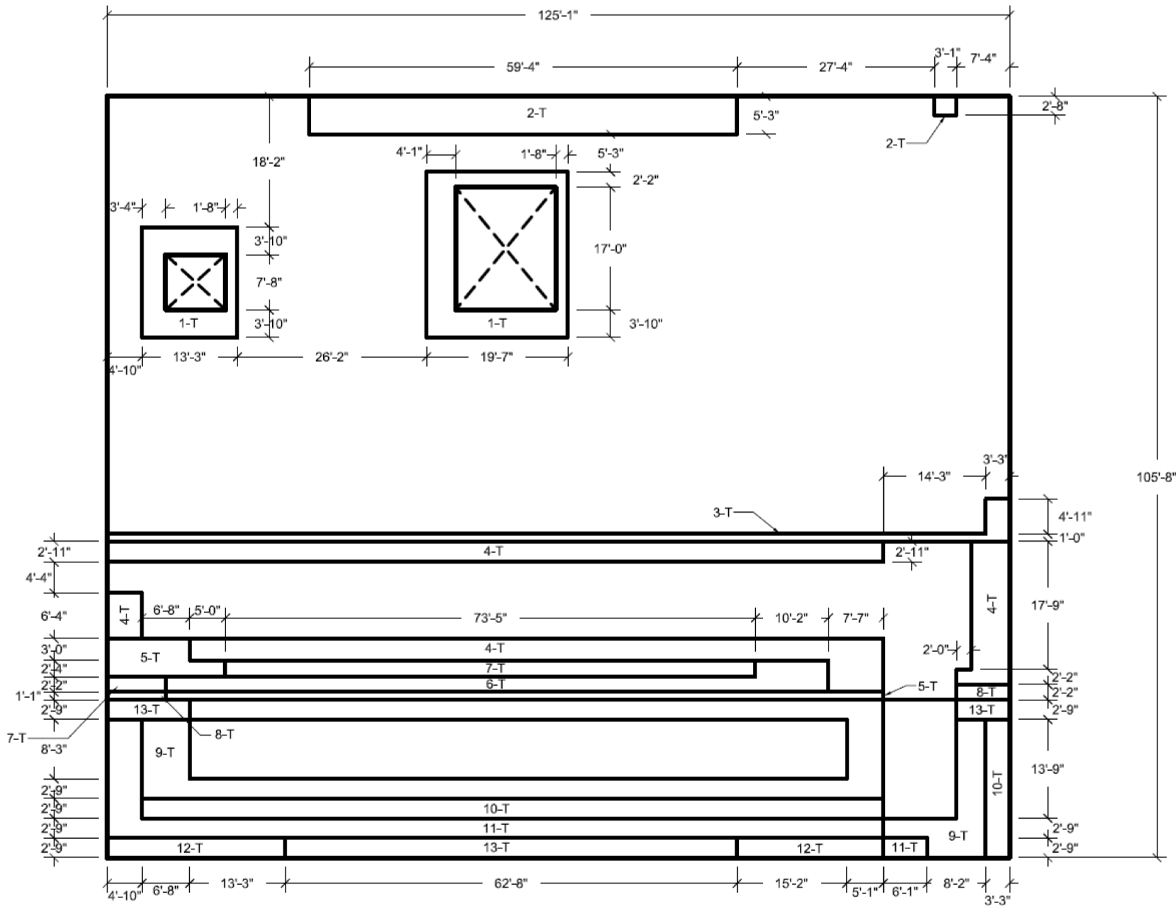


Figure 3H.3-22 East Wall Looking West
Transverse Reinforcement Zones

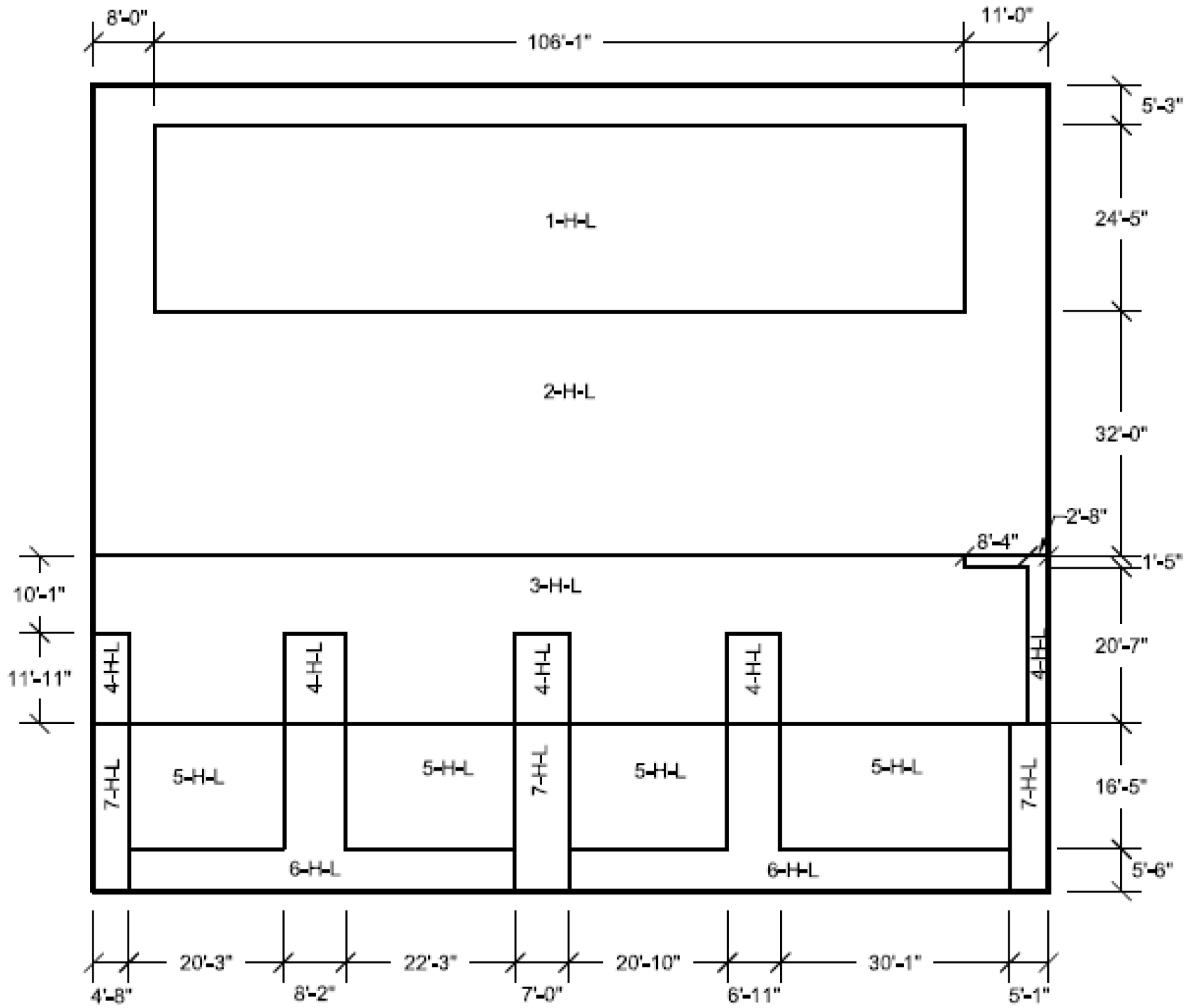


Figure 3H.3-23 West Wall Looking East
Horizontal Reinforcement Zones
Near Side Face

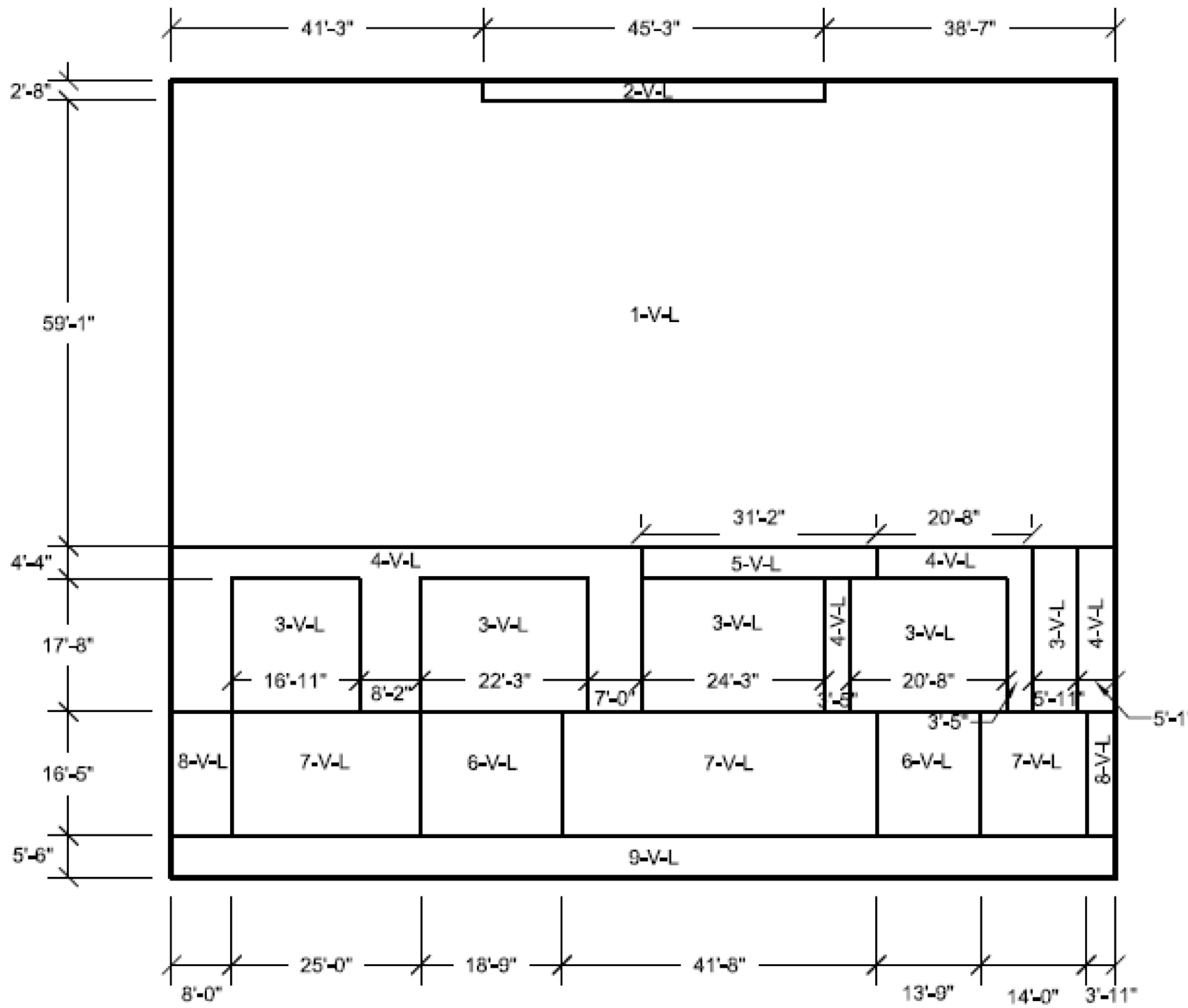


**Figure 3H.3-24 West Wall Looking East
Vertical Reinforcement Zones
Near Side Face**

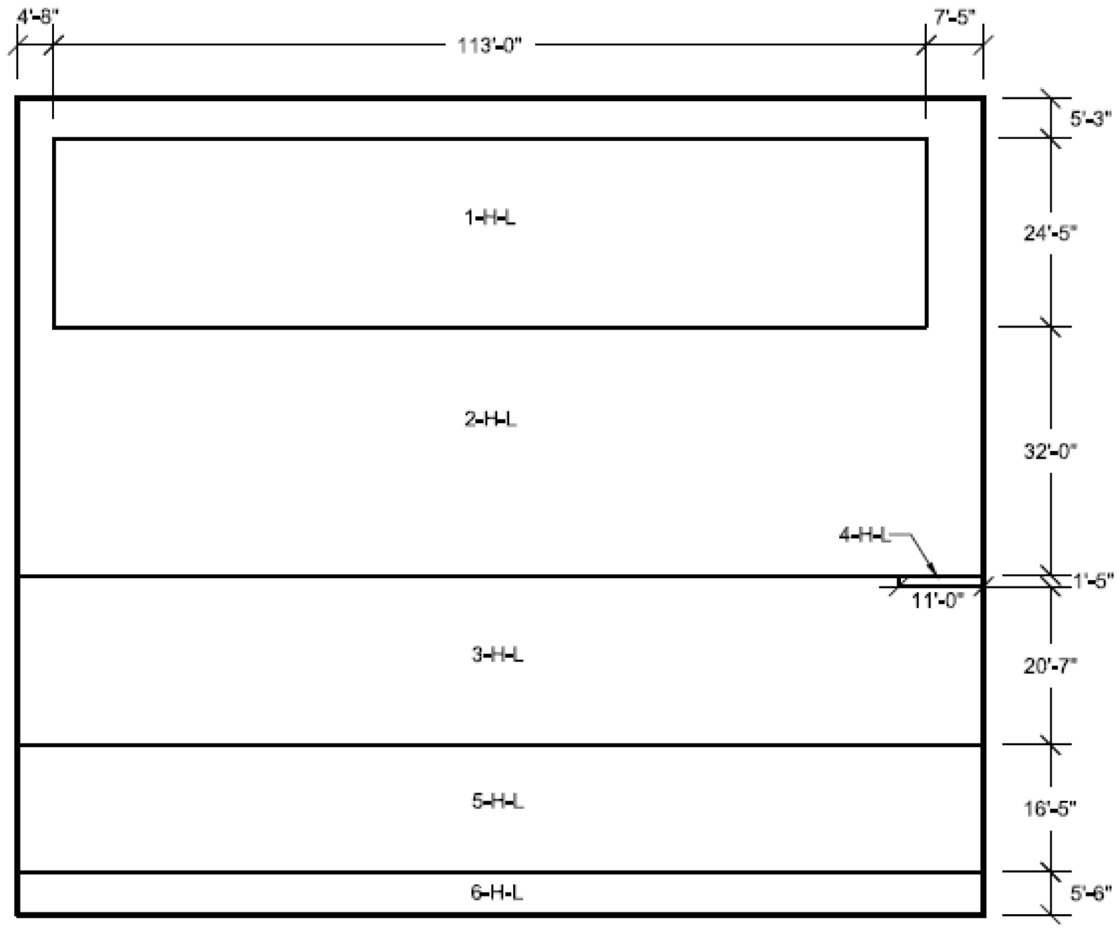


Figure 3H.3-25 West Wall Looking East Horizontal Reinforcement Zones Far Side Face

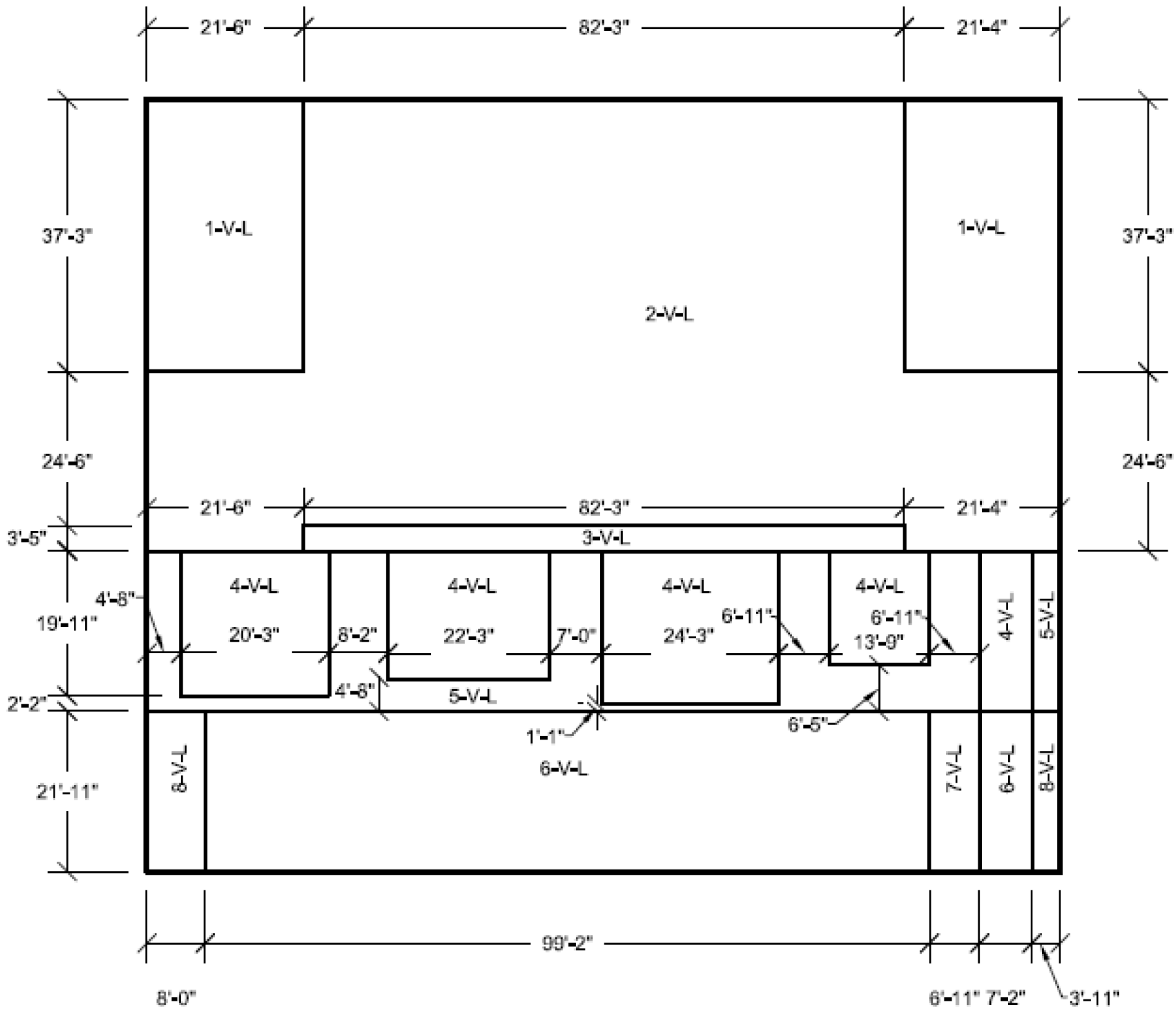


Figure 3H.3-26 West Wall Looking East Vertical Reinforcement Zones Far Side Face

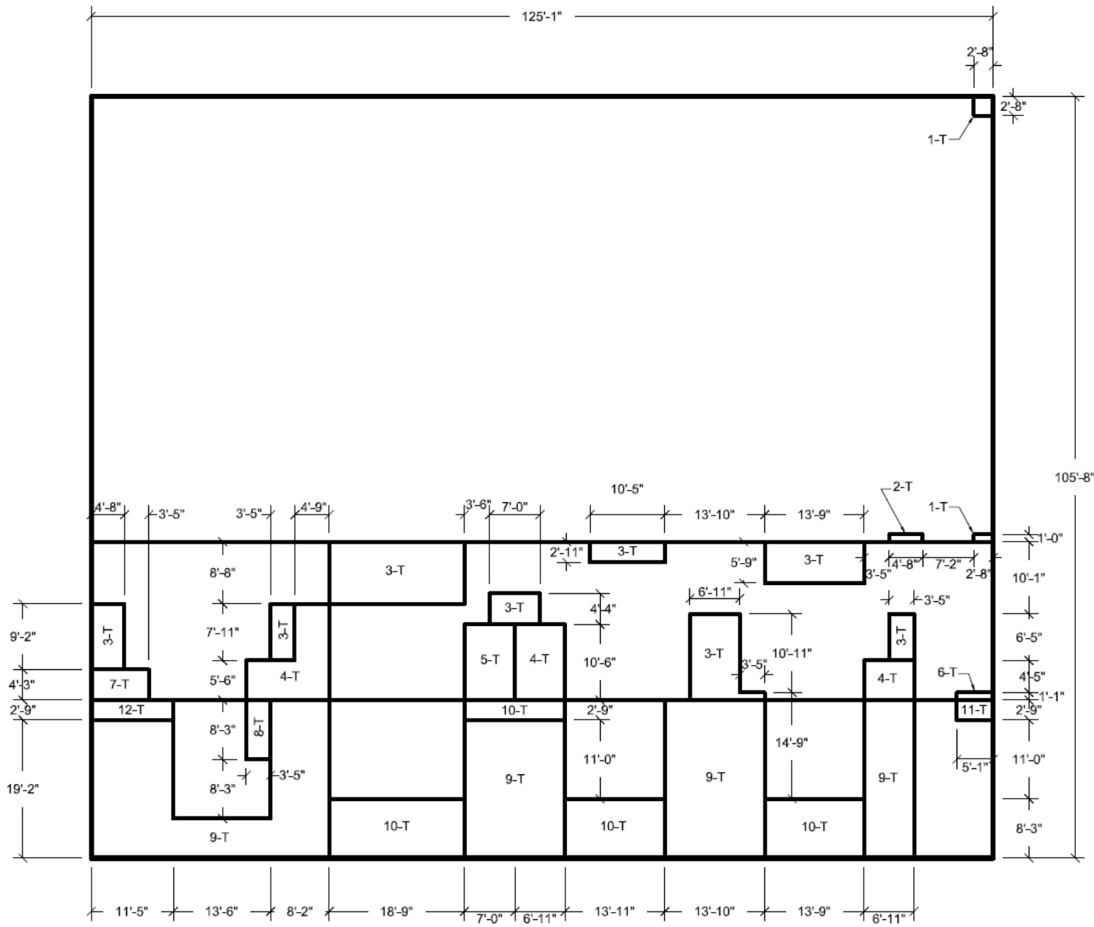


Figure 3H.3-27 West Wall Looking East Transverse Reinforcement Zones

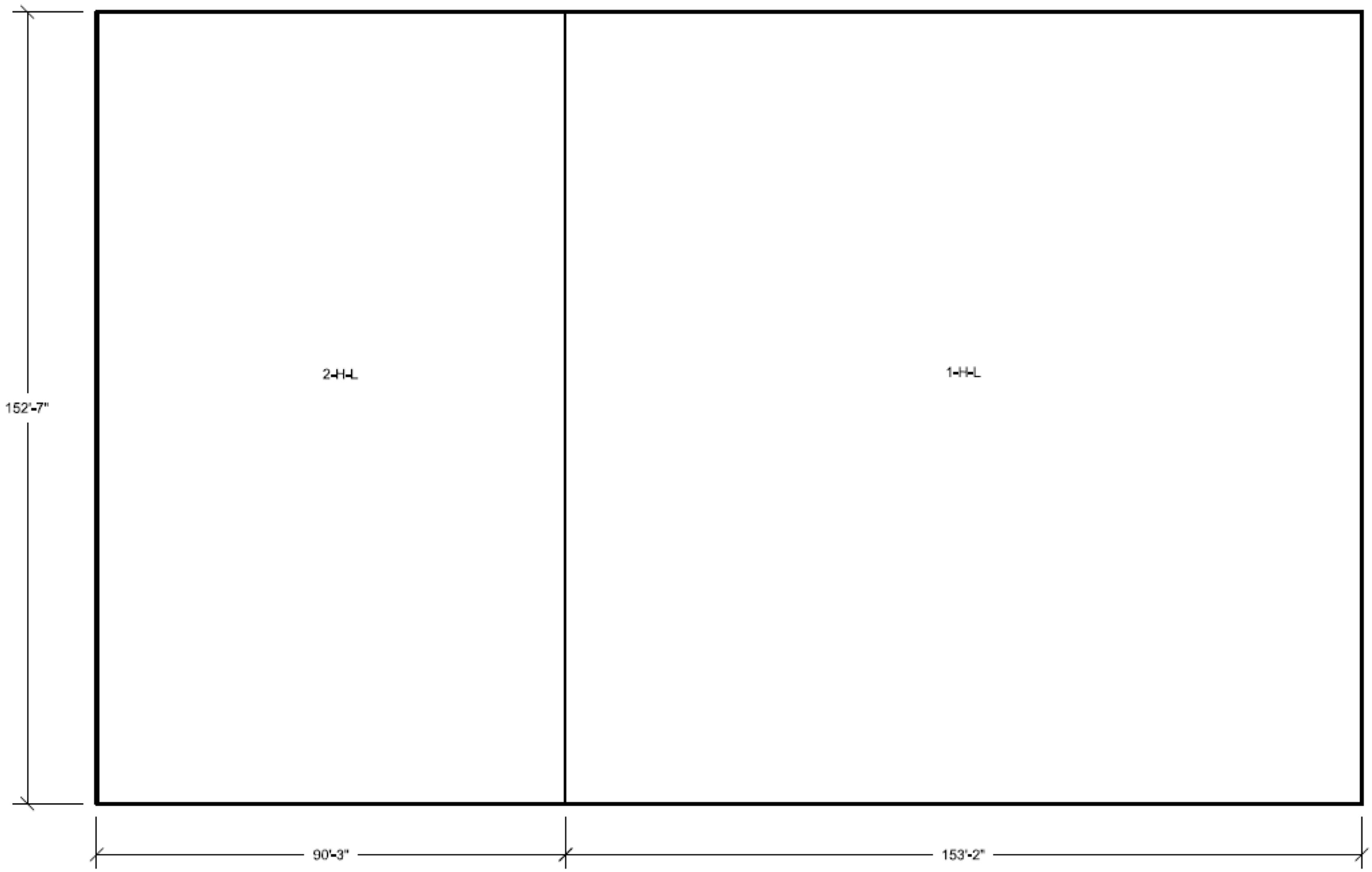


Figure 3H.3-28 Basemat Looking Down East-West Reinforcement Zones Near Side Face

Figure 3H.3-29 Basemat Looking Down North-South Reinforcement Zones Near Side Face

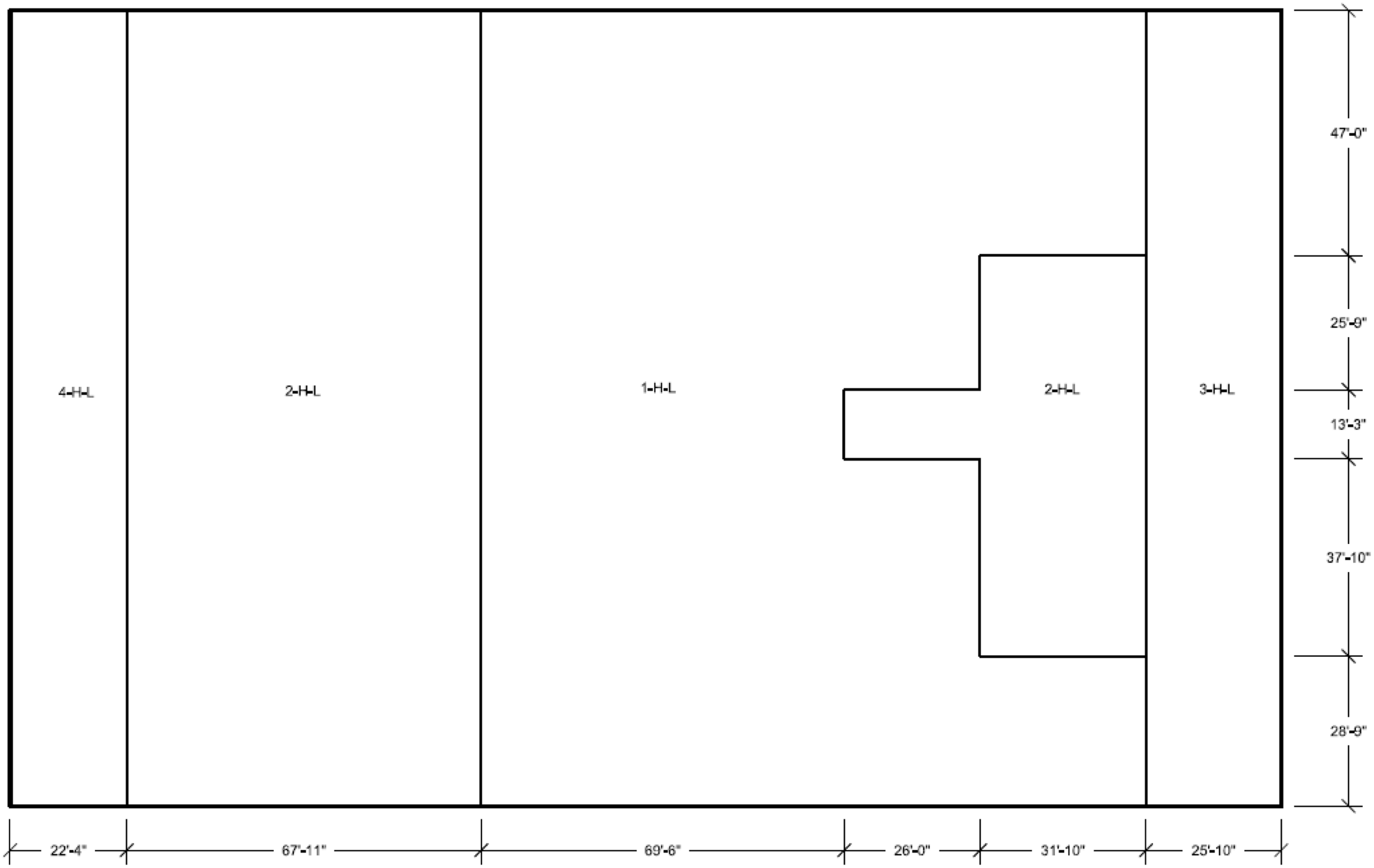


**Figure 3H.3-30 Basemat Looking Down
East-West Reinforcement Zones
Far Side Face**

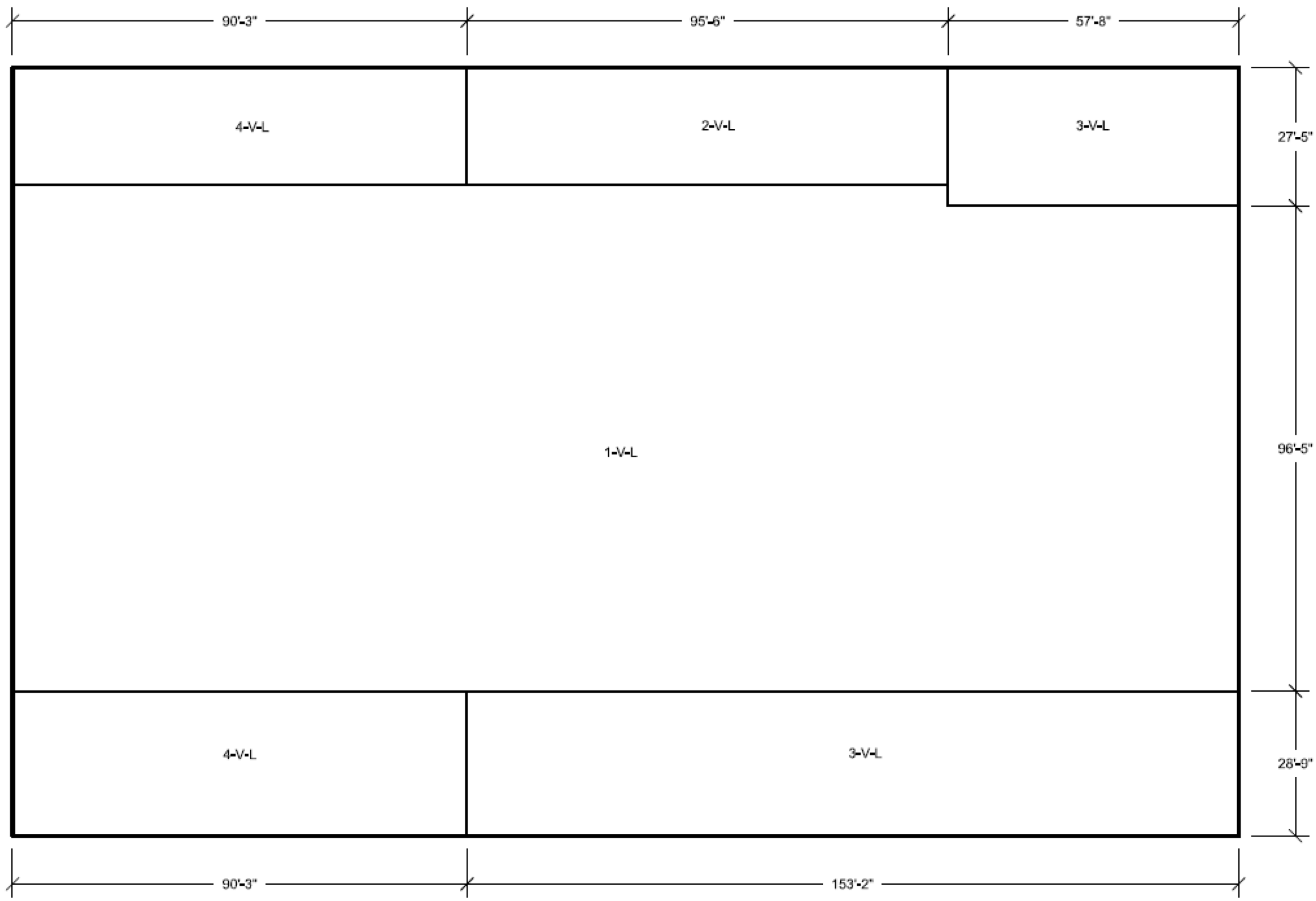


Figure 3H.3-31 Basemat Looking Down North-South Reinforcement Zones Far Side Face

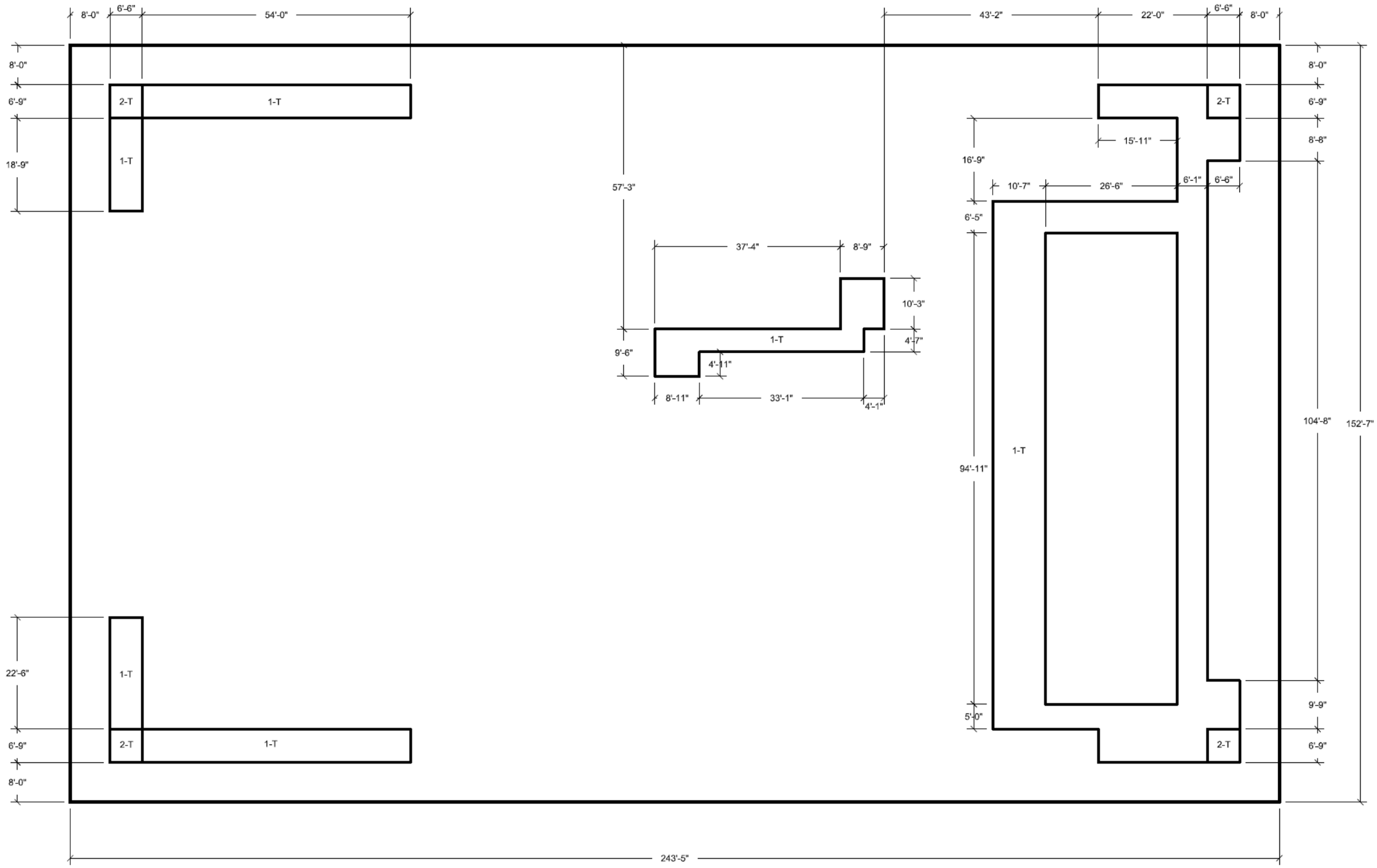


Figure 3H.3-32 Basemat Looking Down Transverse Reinforcement Zones

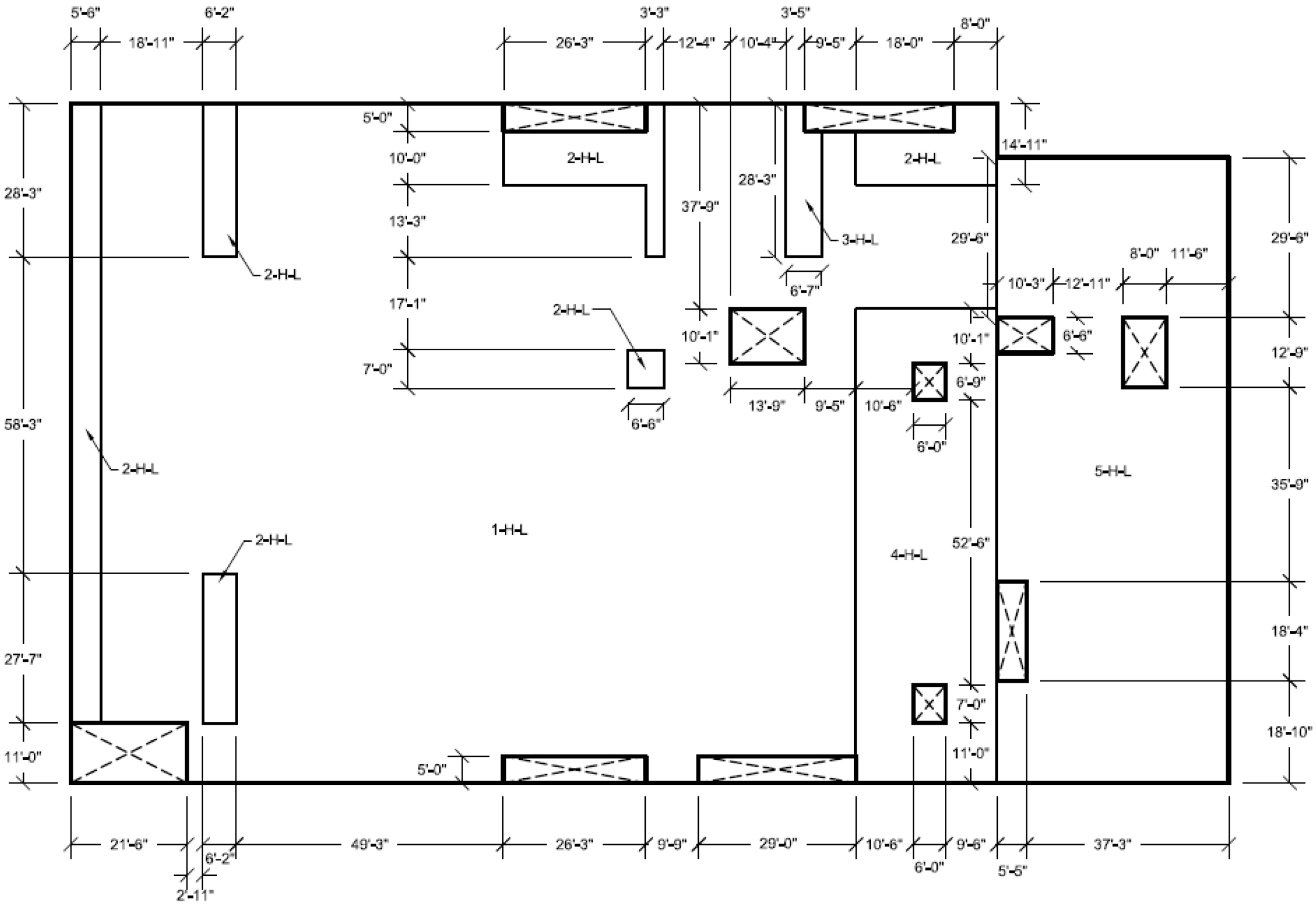


Figure 3H.3-33 Elevation 35 Looking Down East-West Reinforcement Zones Near Side Face

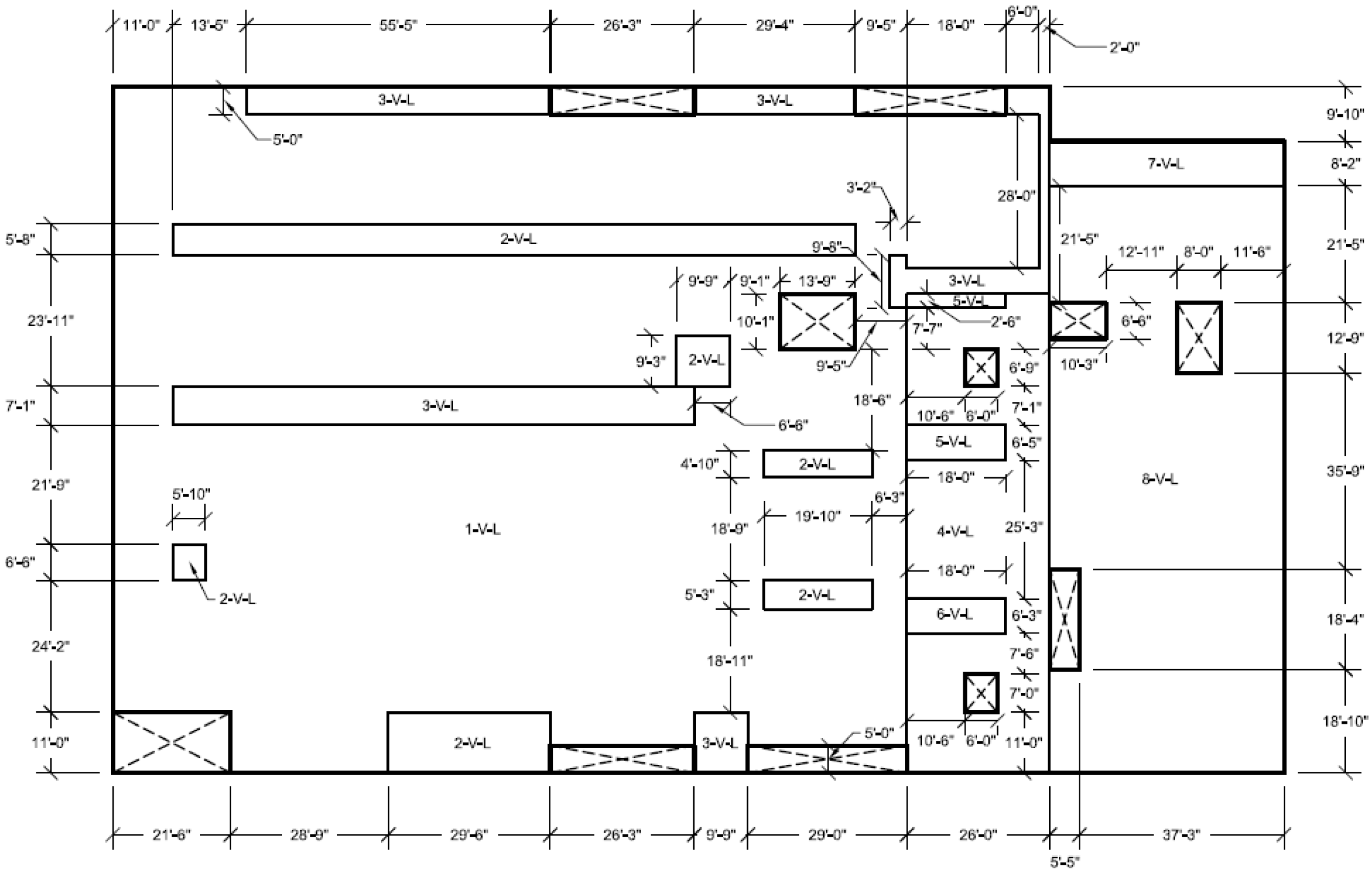


Figure 3H.3-34 Elevation 35 Looking Down North-South Reinforcement Zones Near Side Face

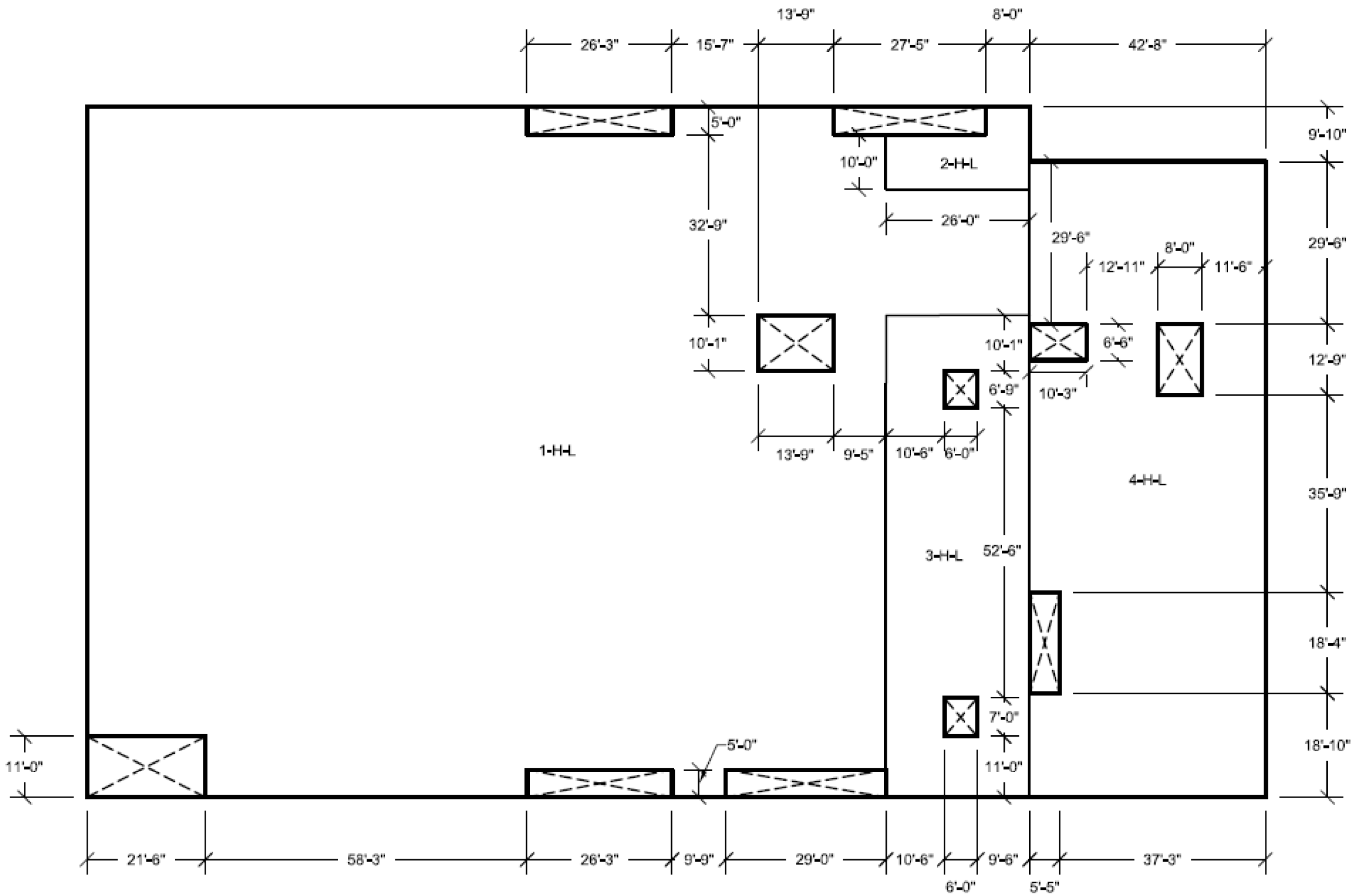


Figure 3H.3-35 Elevation 35 Looking Down
East-West Reinforcement Zones
Far Side Face

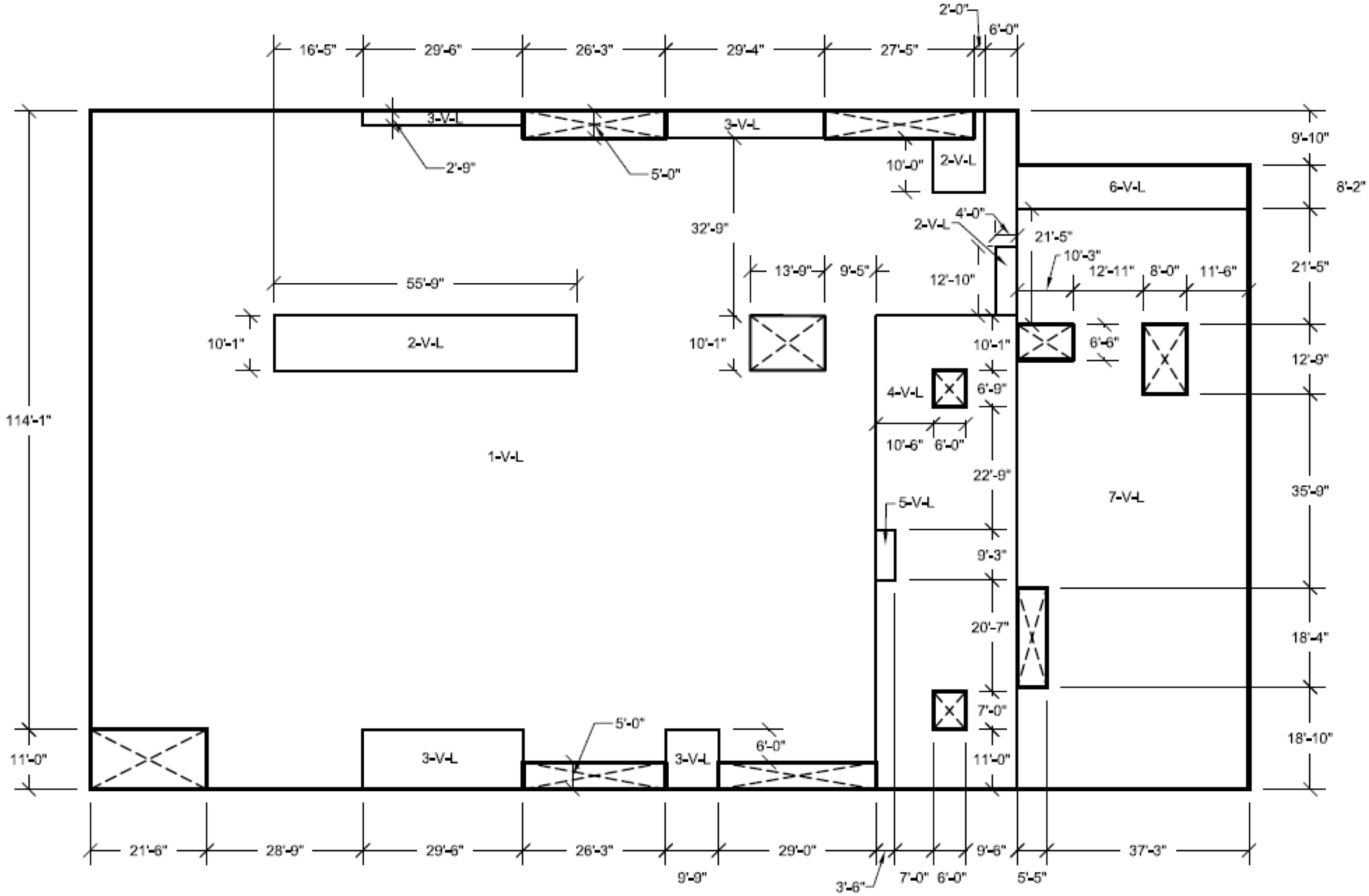


Figure 3H.3-36 Elevation 35 Looking Down
North-South Reinforcement Zones
Far Side Face

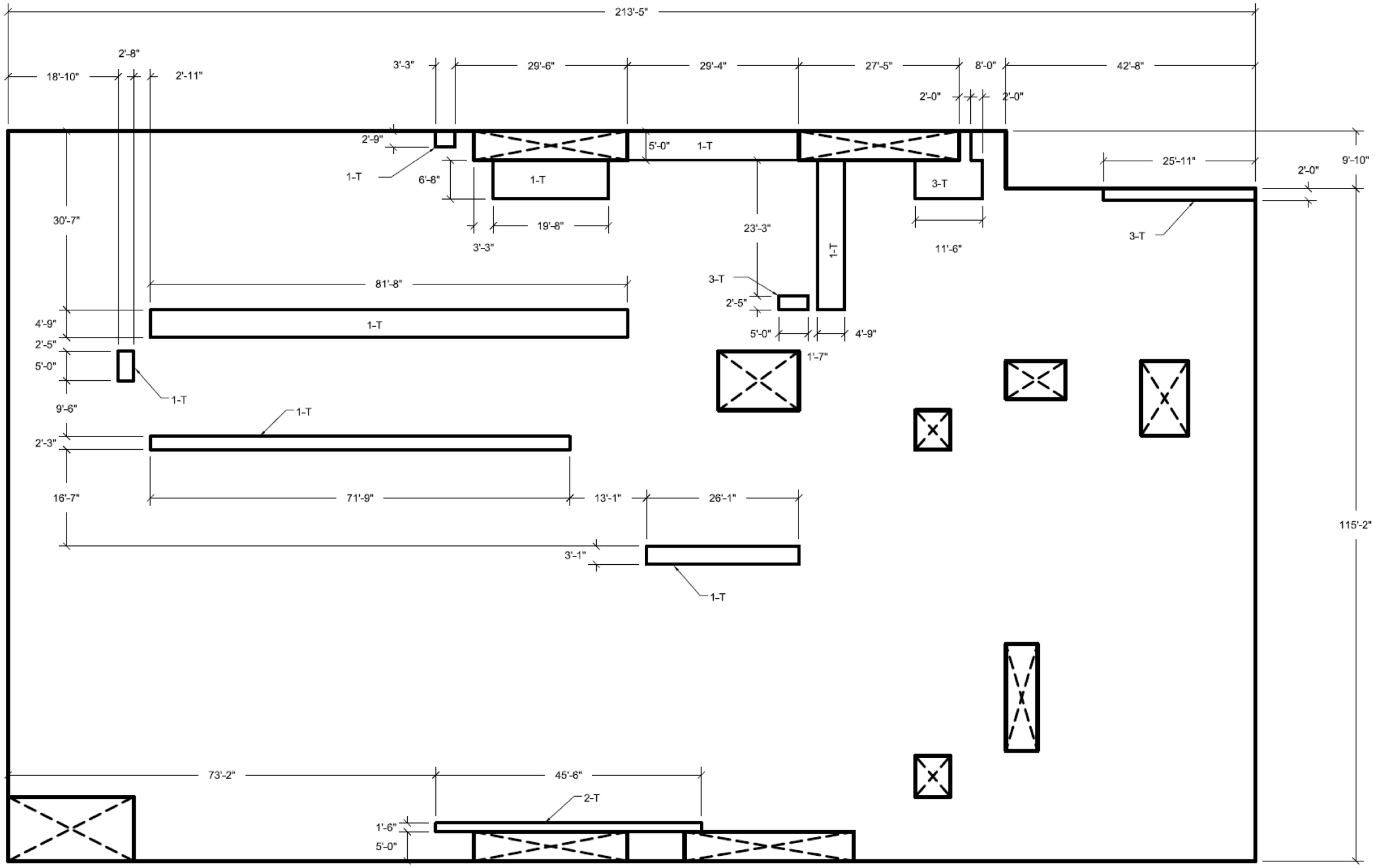


Figure 3H.3-37a Elevation 35 Looking Down
~~Horizontal~~ Transverse Reinforcement Zones

Figure 3H.3-37b ~~Elevation 35 Looking Down Vertical Transverse Reinforcement Zones~~Not Used

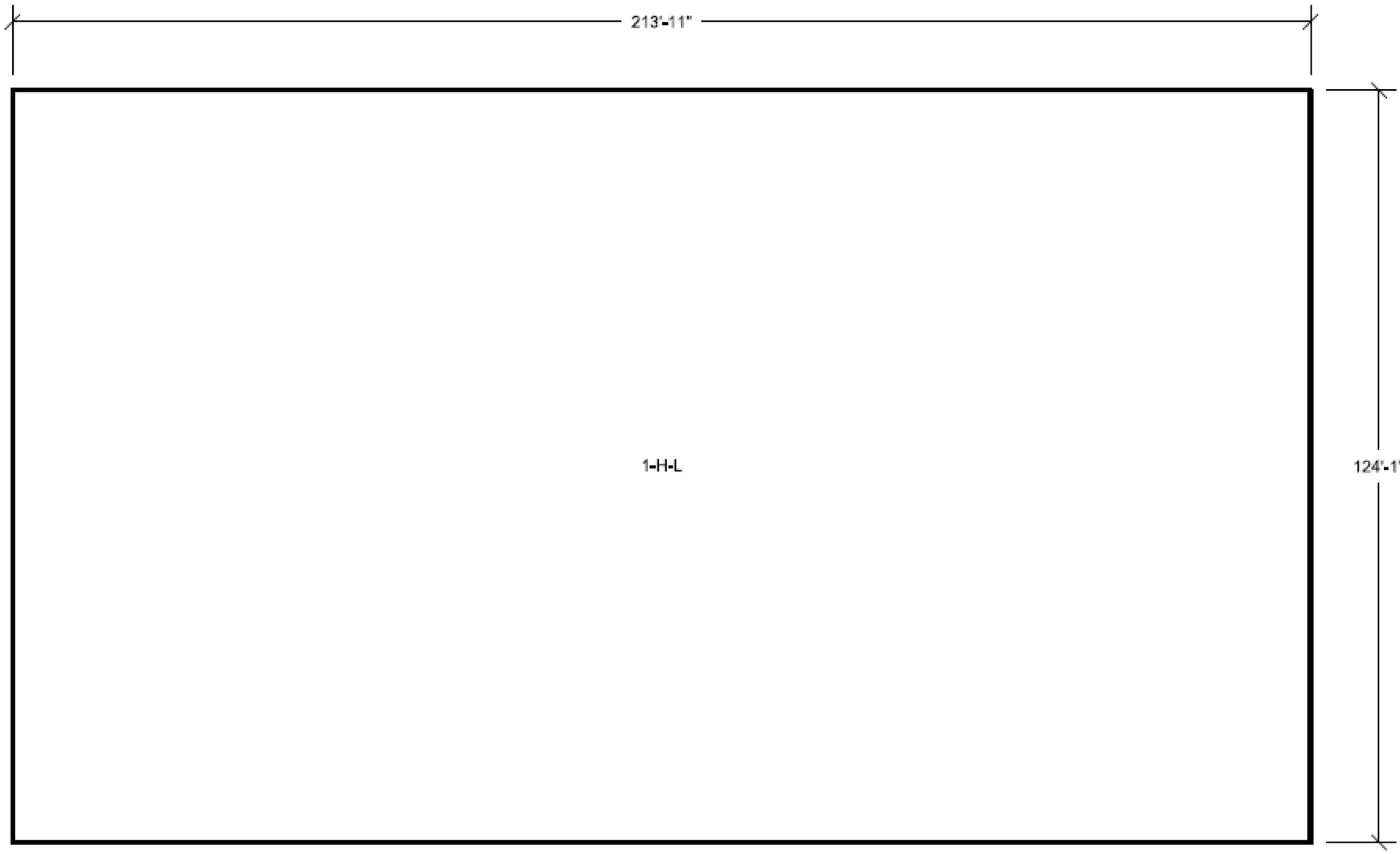


Figure 3H.3-38 Elevation 95 Looking Down
East-West Reinforcement Zones
Near Side Face

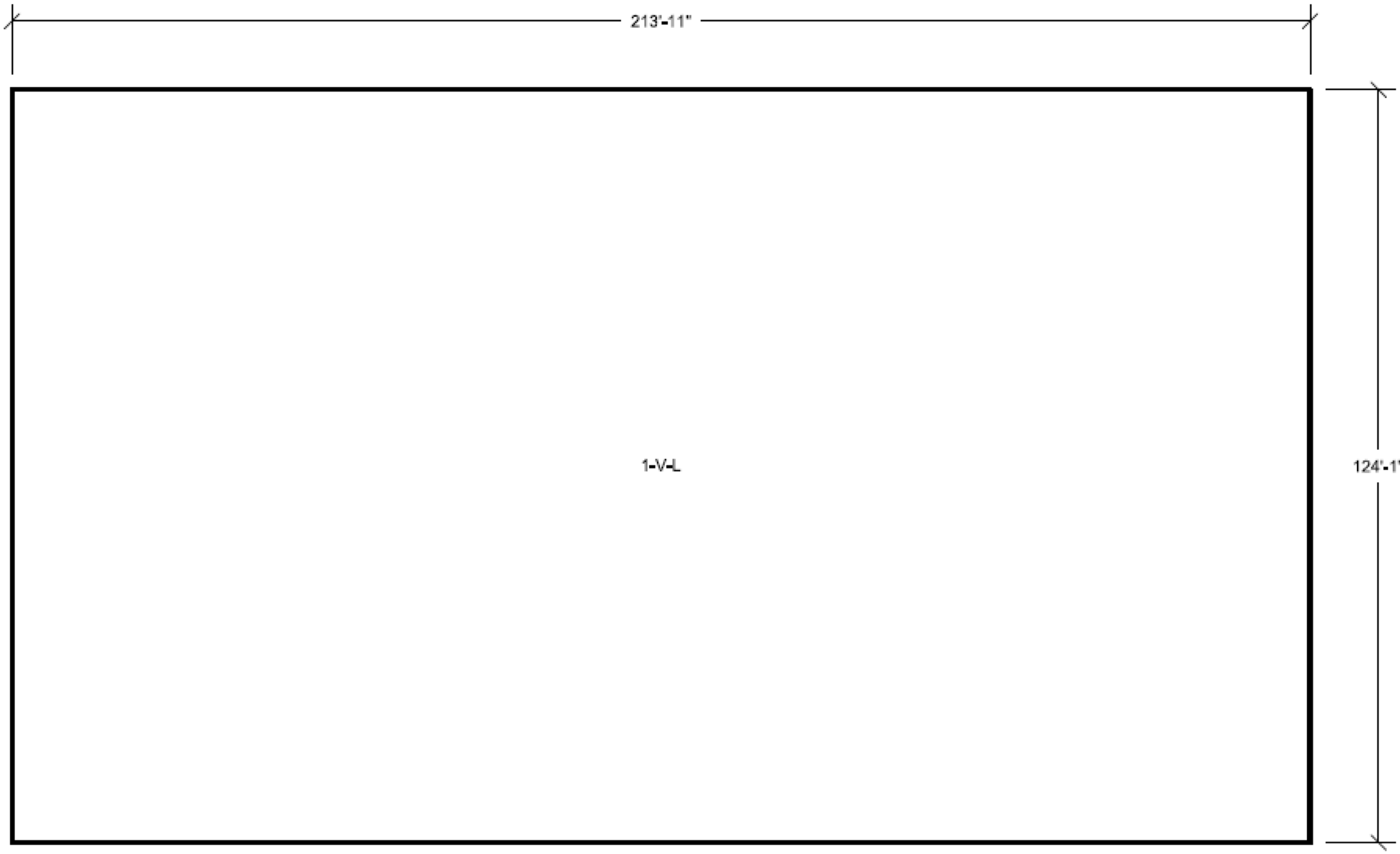


**Figure 3H.3-39 Elevation 95 Looking Down
North-South Reinforcement Zones
Near Side Face**

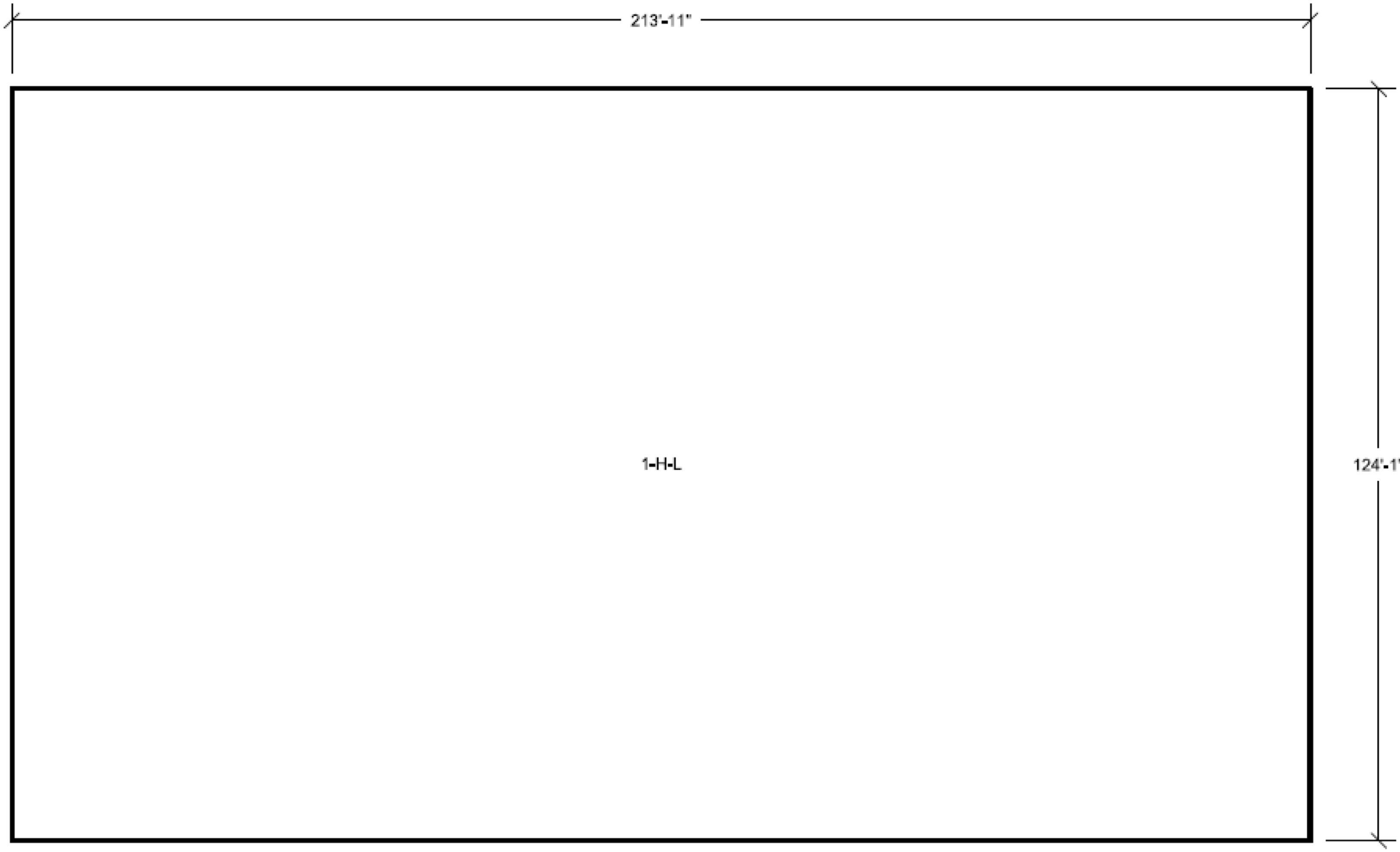


**Figure 3H.3-40 Elevation 95 Looking Down
East-West Reinforcement Zones
Far Side Face**

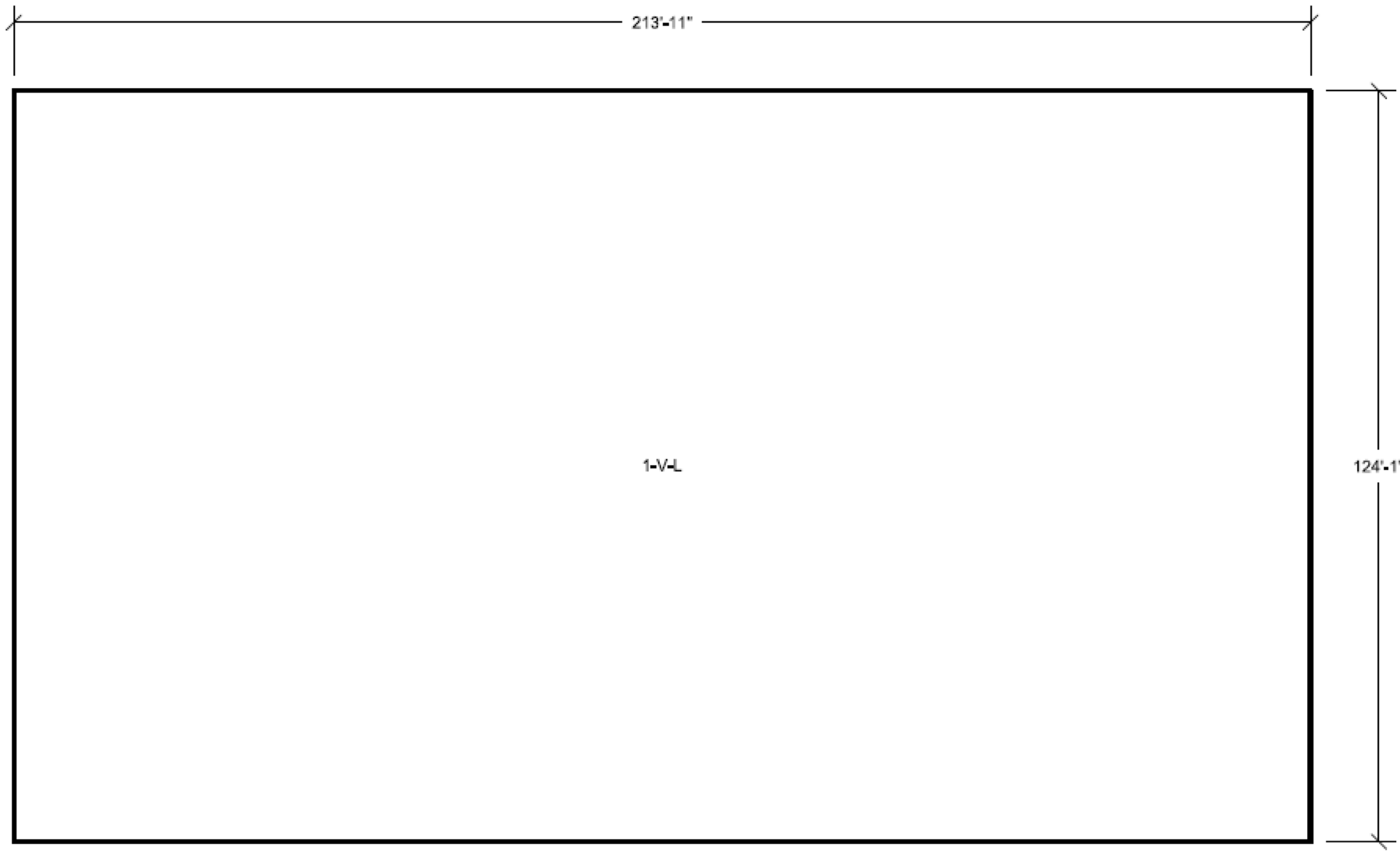


**Figure 3H.3-41 Elevation 95 Looking Down
North-South Reinforcement Zones
Far Side Face**

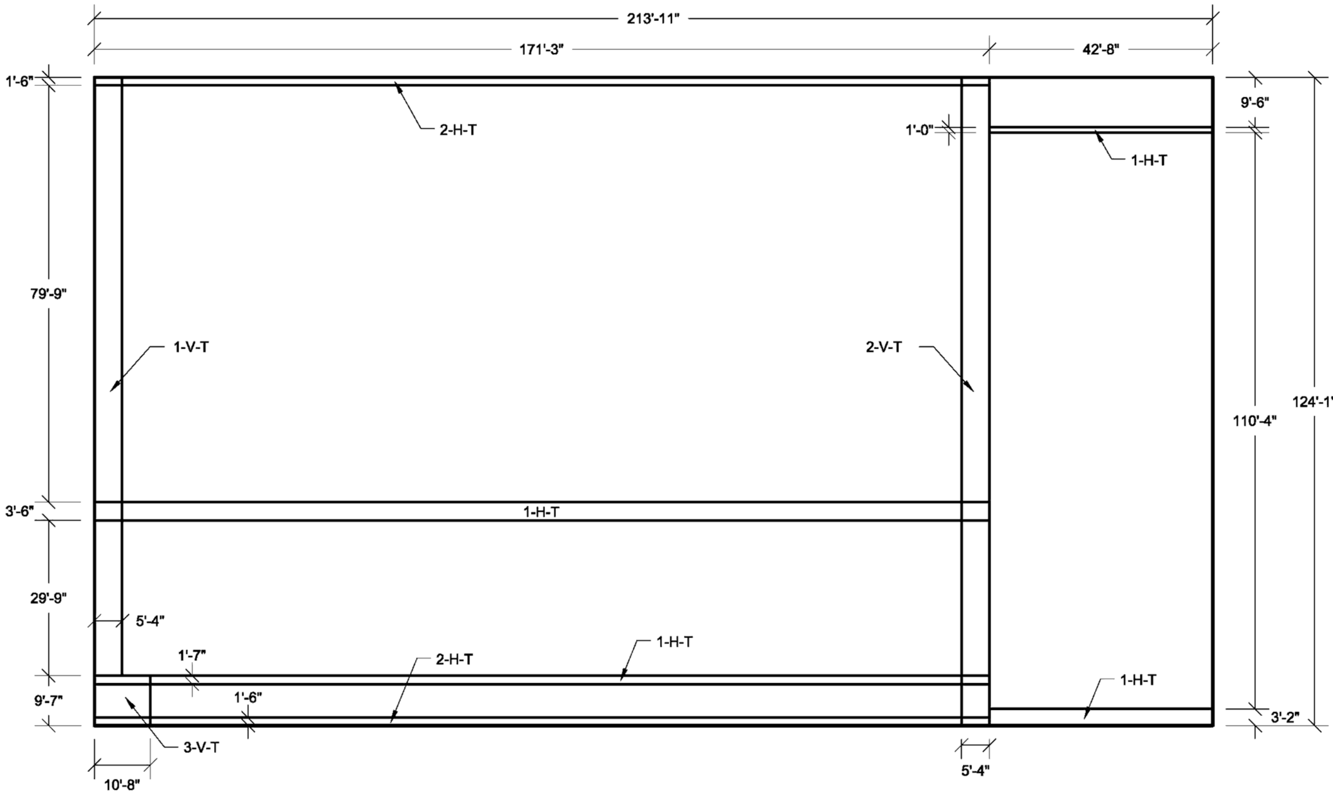


Figure 3H.3-42 Elevation 95 Looking Down Transverse Reinforcement Zones

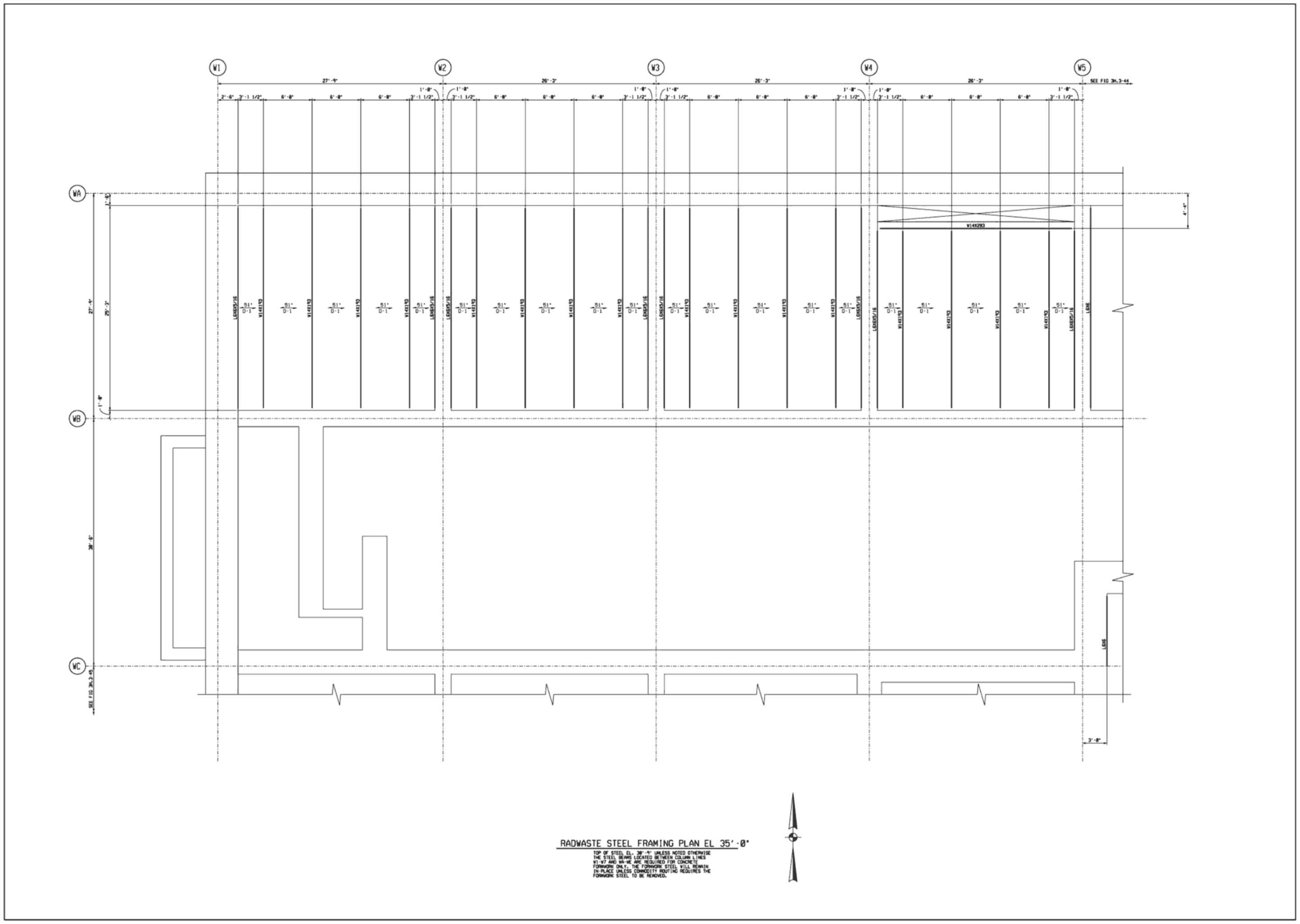


Figure 3H.3-43 El 35’-0” Steel Layout Between Column Lines W1-W5 and WA-WC

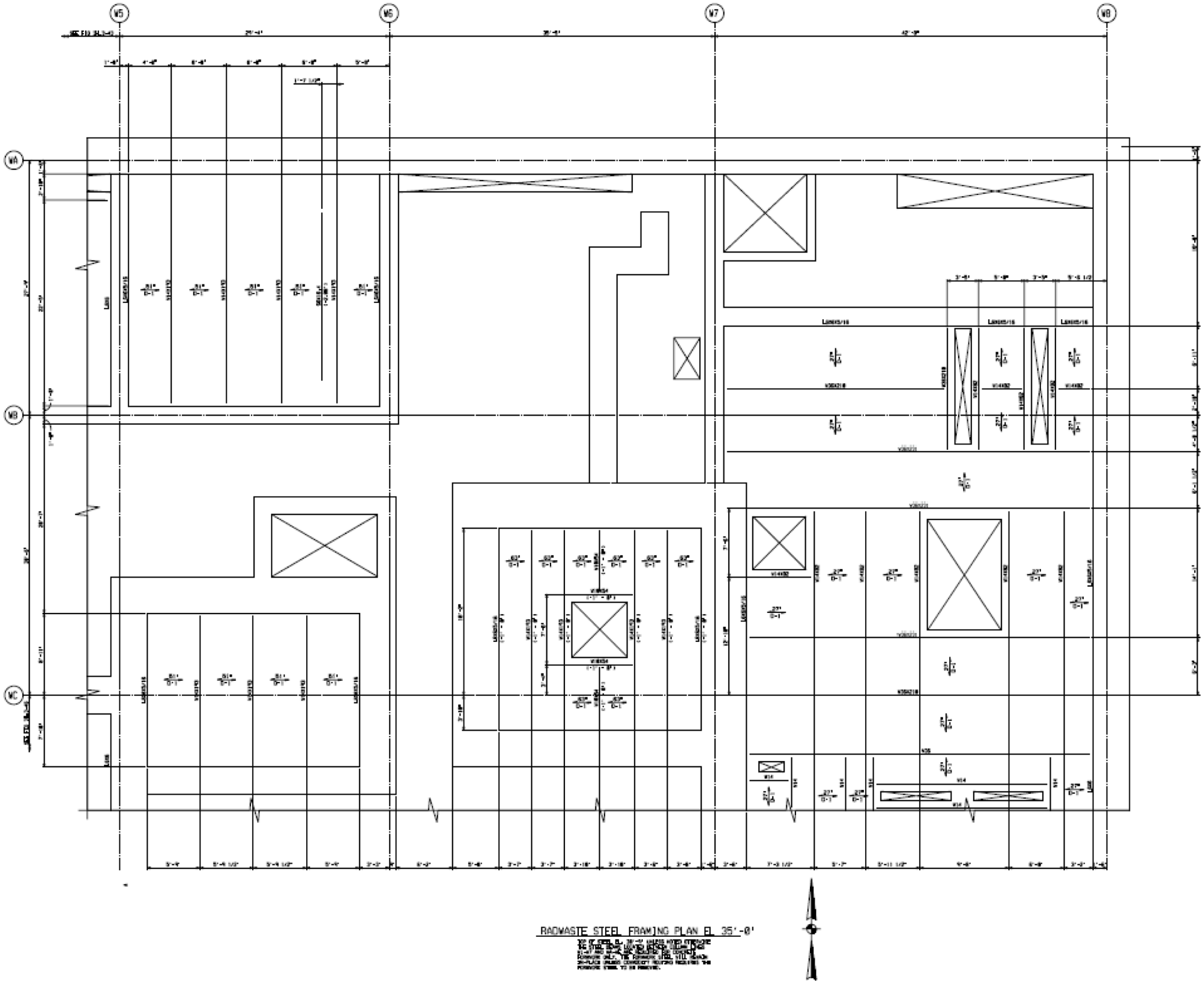


Figure 3H.3-44 El 35’-0” Steel Layout Between Column Lines W5-W8 and WA-WC

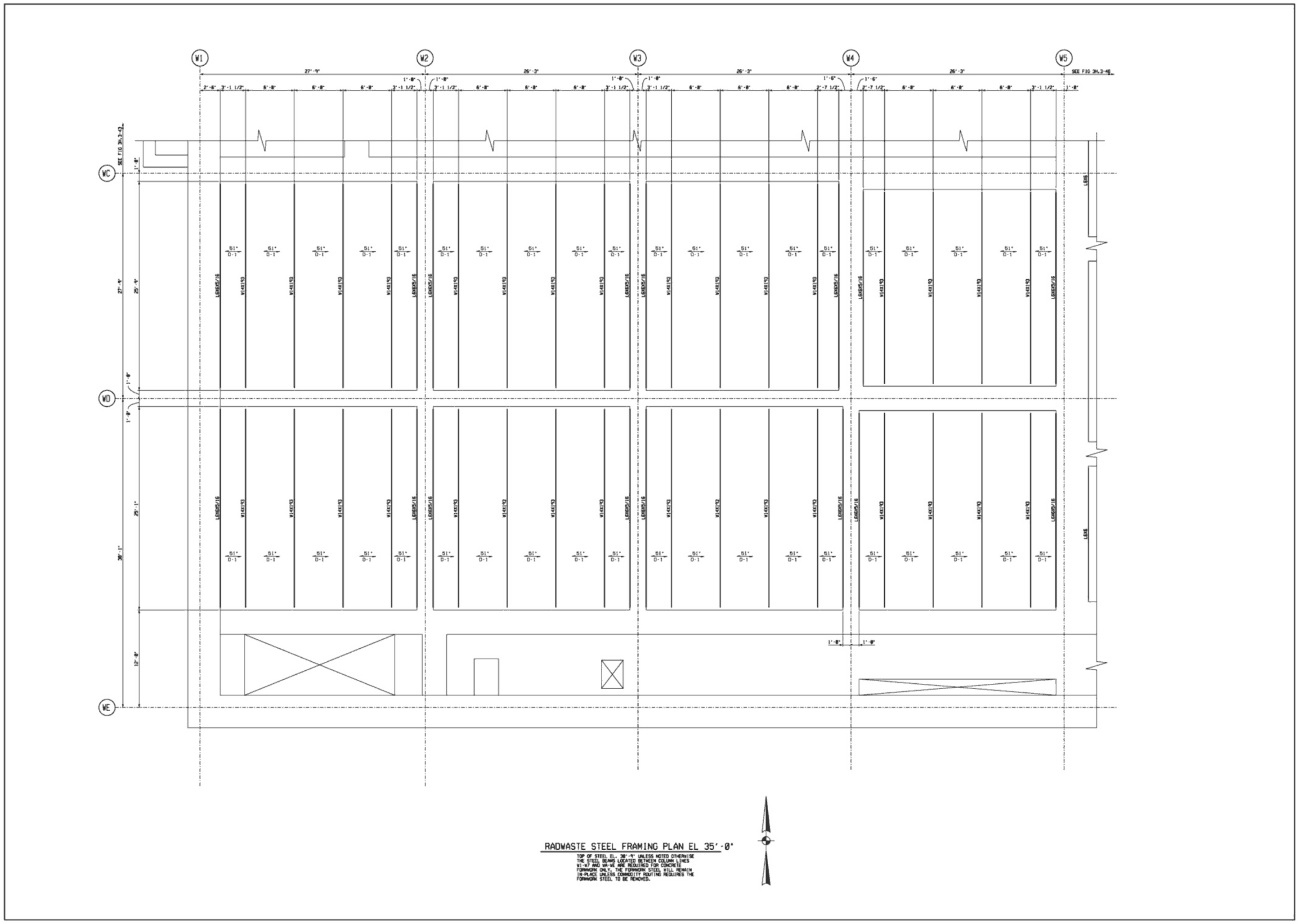


Figure 3H.3-45 El 35’-0” Steel Layout Between Column Lines W1-W5 and WC-WE

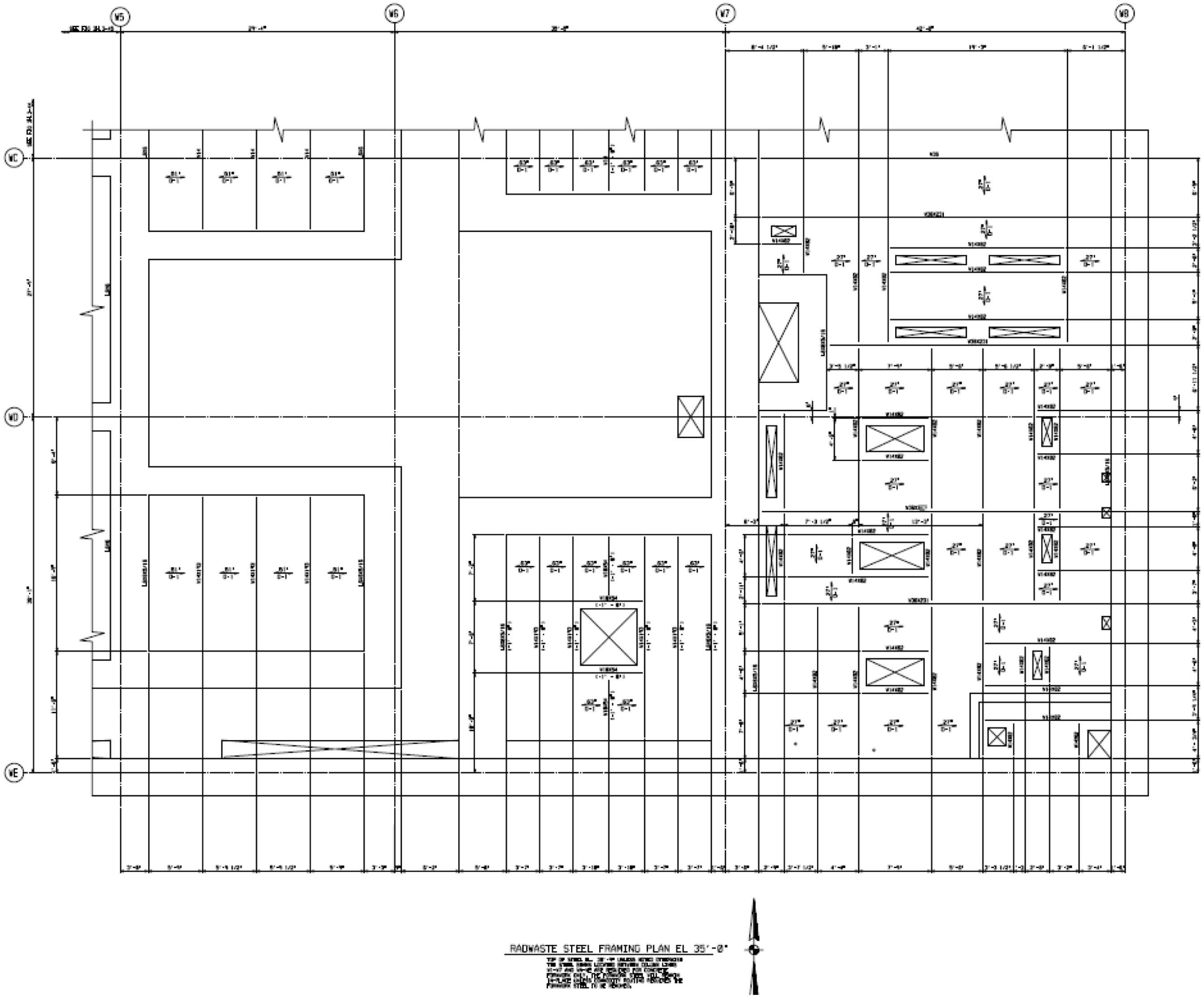


Figure 3H.3-46 El 35’-0” Steel Layout Between Column Lines W5-W8 and WC-WE

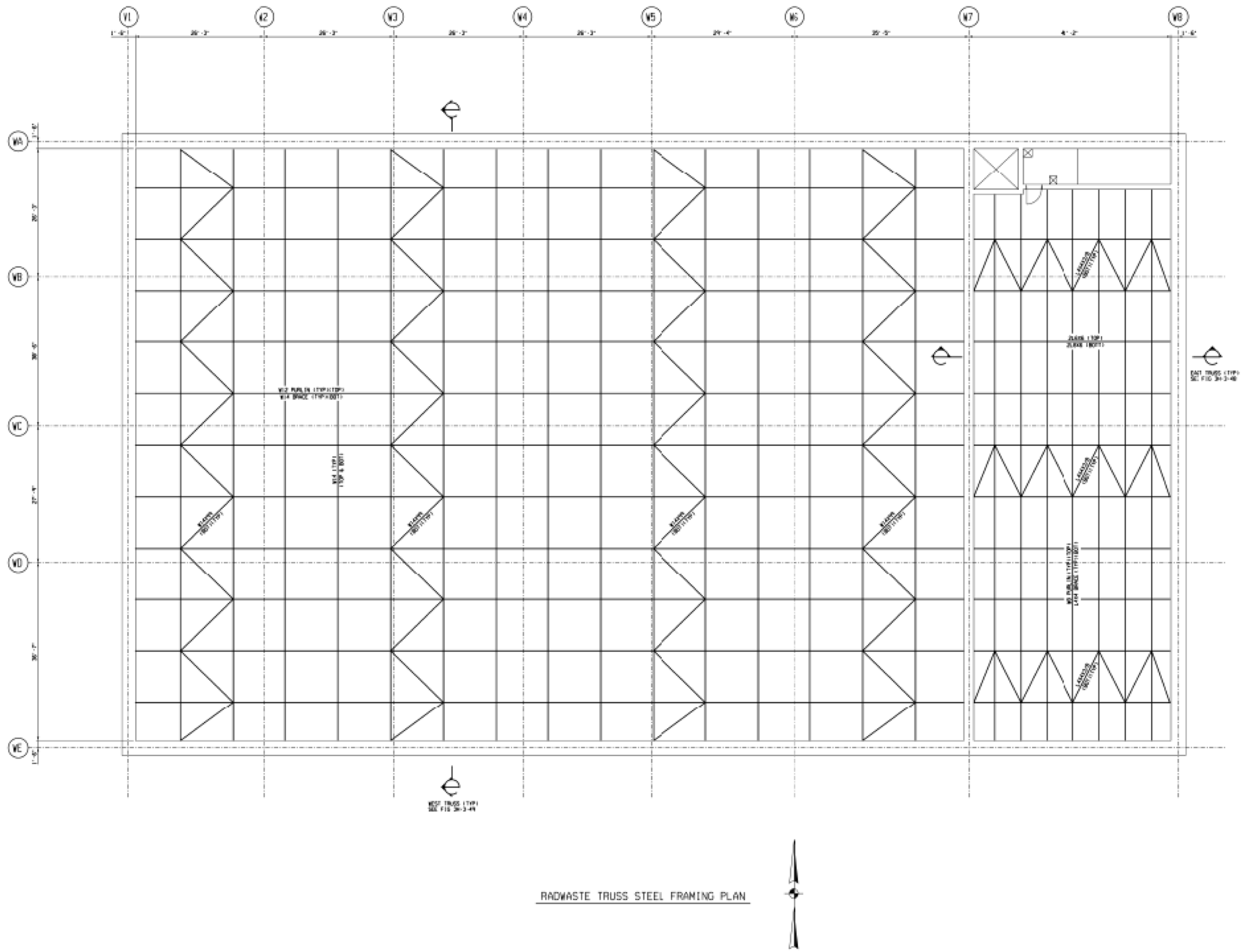


Figure 3H.3-47 Roof Truss. Purlin and Horizontal Bracing Layout (Plan View)

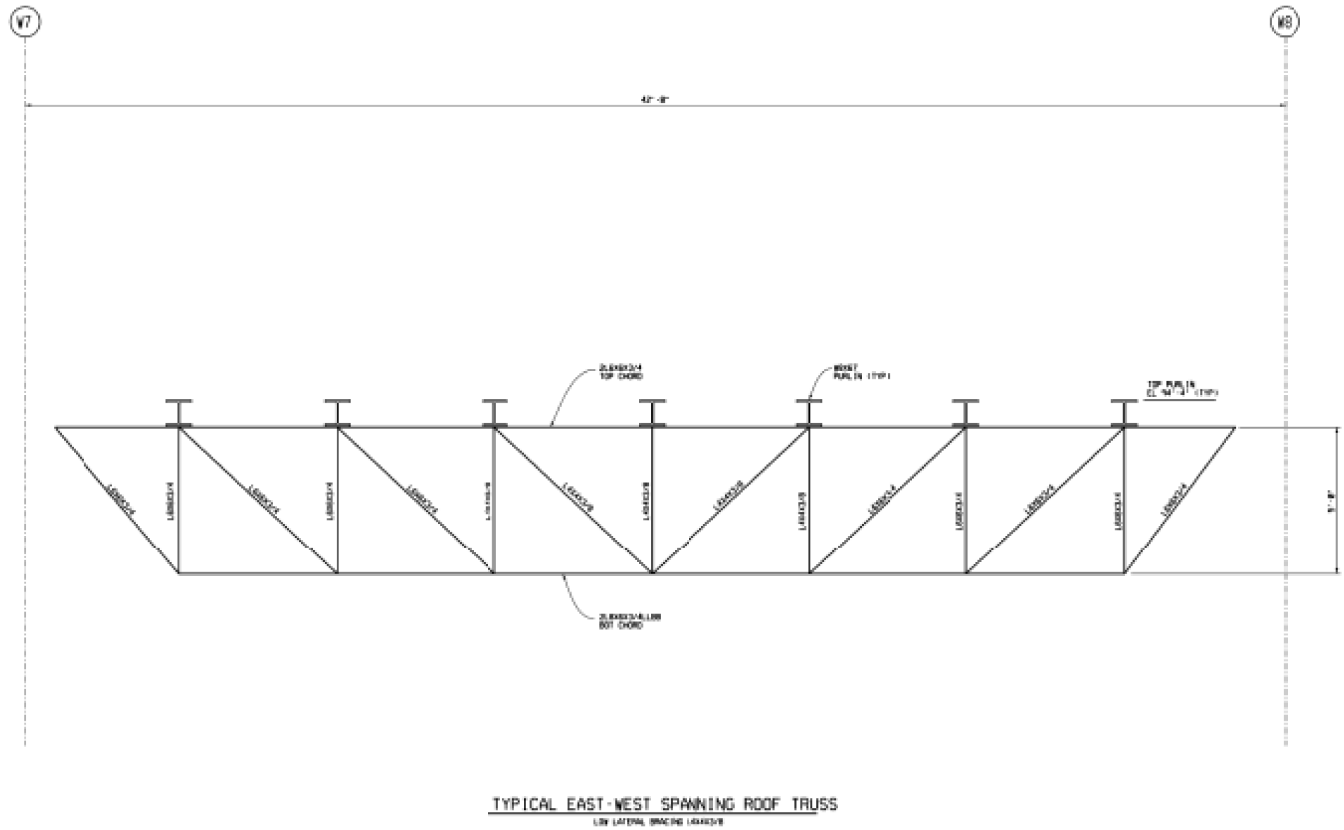


Figure 3H.3-48 Typical East-West Spanning Roof Truss Between Column Lines W7-W8 (Elevation View)

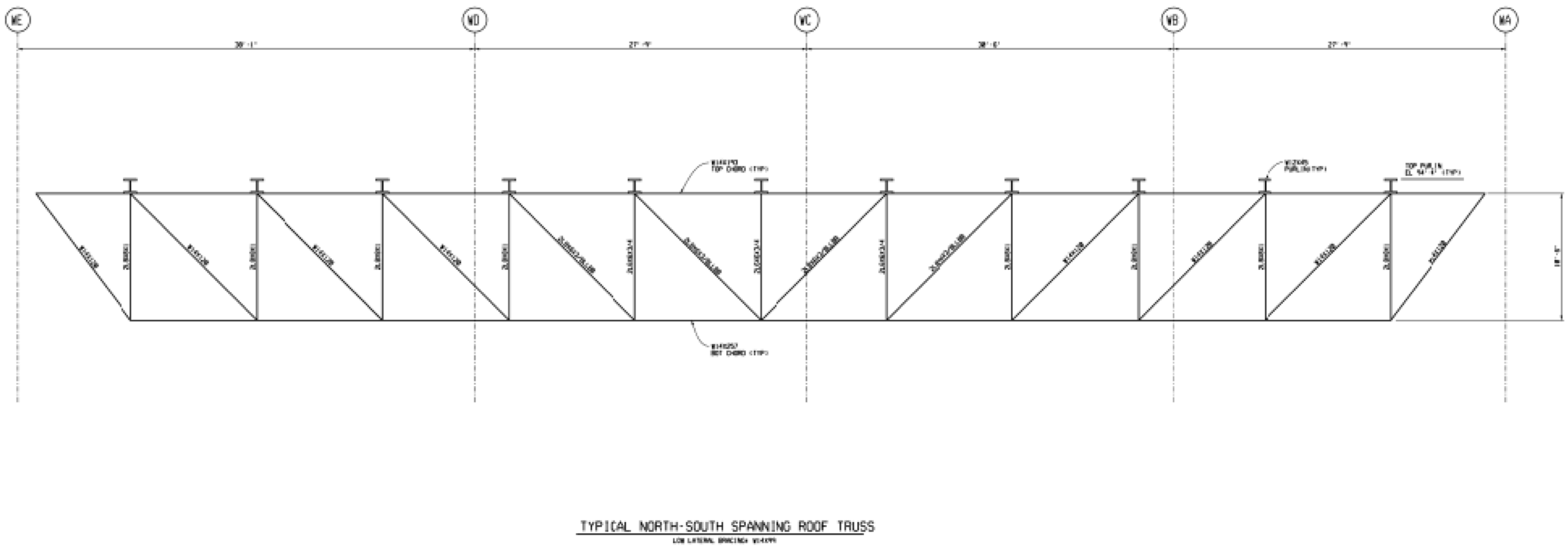


Figure 3H.3-49 Typical North-South Spanning Truss Between Column Lines WA-WE (Elevation View)

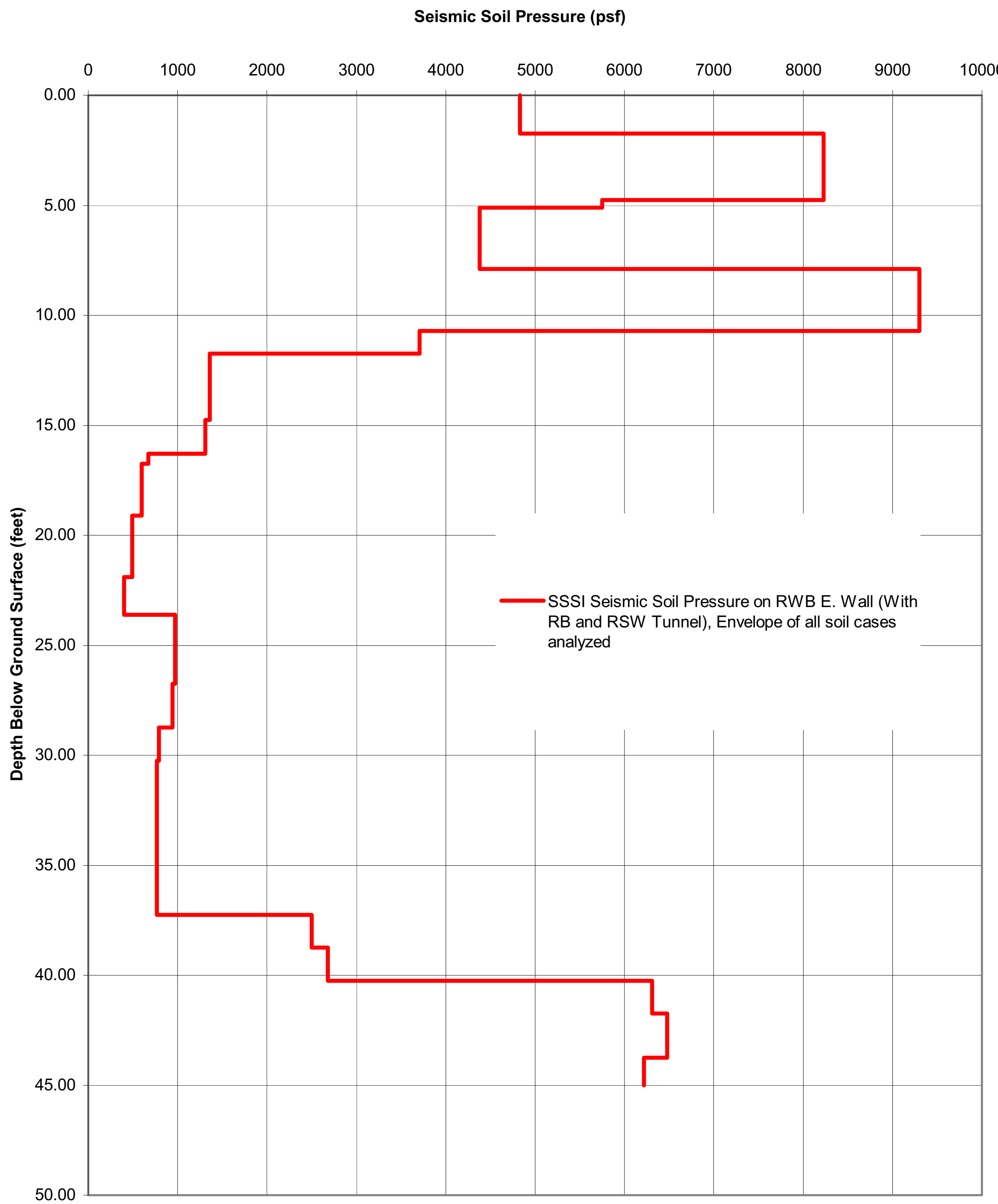


Figure 3H.3-50 SSSI Lateral Seismic Soil Pressures (psf) on Radwaste Building East Wall

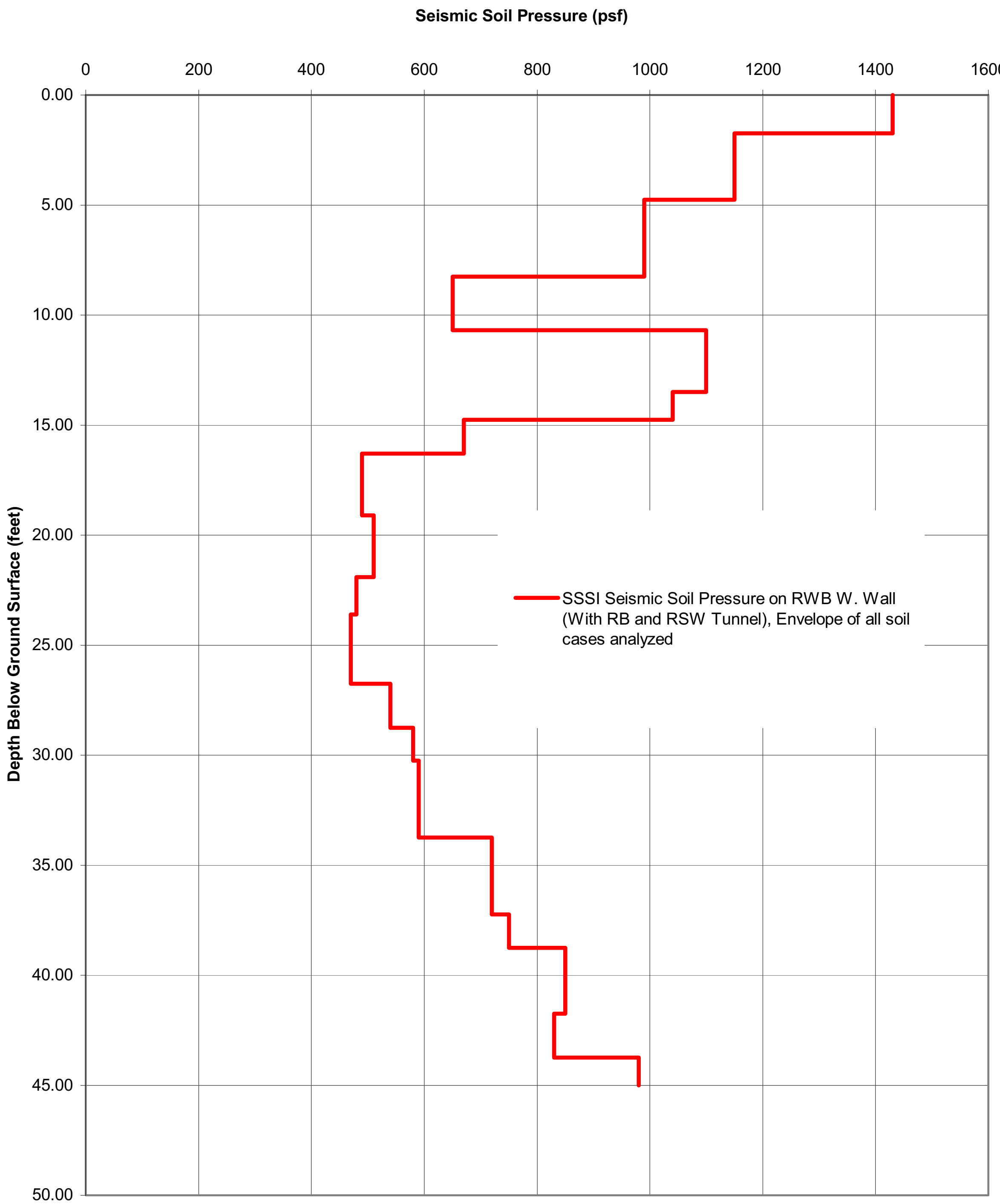
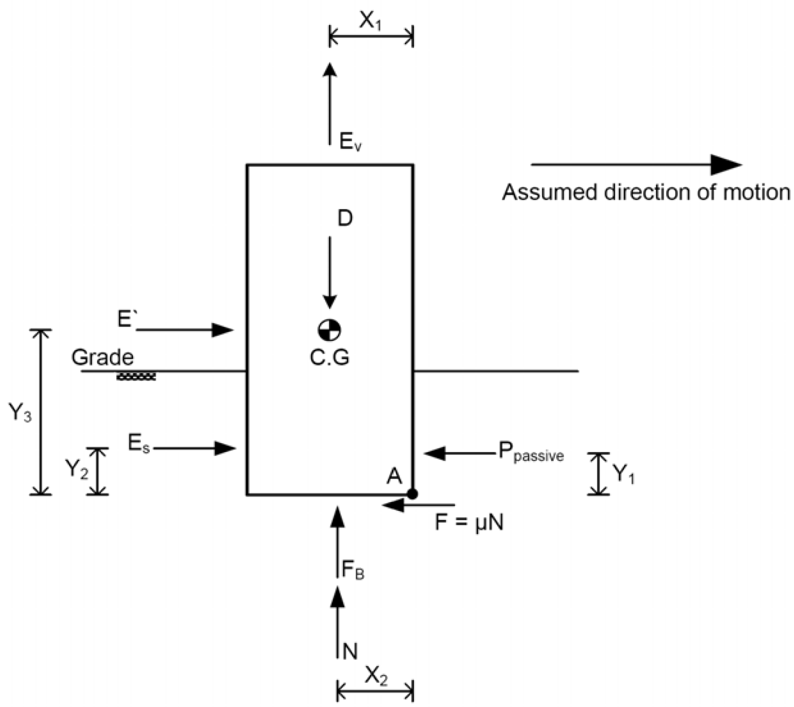


Figure 3H.3-51 SSSI Lateral Seismic Soil Pressures (psf) on Radwaste Building West Wall



Factors of Safety against Sliding and Overturning about point A are calculated as follows:

$$SF_{sliding} = \frac{P_{passive} + F}{E_s + E`}$$

$$SF_{OT\_A} = \frac{(P_{passive})(Y_1) + (D)(X_1) - (F_B)(X_2)}{(E_s)(Y_2) + (E`)(Y_3) + (E_v)(X_1)}$$

Where:

$SF_{sliding}$ = Safety factor against sliding

SF_{OT_A} = Safety factor against overturning about "A"

D = Dead load

$P_{passive}$ = Total passive soil pressure

$F = \mu N$ = friction force and μ is the coefficient of friction

E_s = Static and dynamic soil pressure (active condition)

E` = Self weight excitation in the horizontal direction

E_v = Self weight excitation in the vertical direction

F_B = Buoyancy force

N = Vertical reaction $= D - F_B - E_v$

Notes:

(1) E' represents the inertia of the structure and it is either determined from equivalent static method or response spectrum analysis.

(2) E_S represents the static and dynamic loads from soil which includes seismic loads from soil and hydrodynamic pressure from groundwater. These loads are computed in accordance with Selection 2.5S4.10.5.

Figure 3H.3-52 Formulations Used for Calculations of Factors of Stability Against Sliding and Overturning for Seismic II/I Considerations