Enclosure 2
Revision to COLA Section 3.8

3.8.6.1 Foundation Waterproofing

The coefficient of friction of the waterproofing material will be determined with a qualification program prior to procurement of the membrane material. The qualification program will be developed to demonstrate that the selected material will meet the waterproofing and friction requirements. The qualification program will include testing to demonstrate that the waterproofing requirements and the coefficient of friction required to transfer seismic loads for STP 3 & 4 have been met. Testing methods will simulate field conditions to demonstrate that the minimum required coefficient of friction is achieved by the structural concrete fill - waterproof membrane structural interface. The material will meet the ~~required friction factor.~~ minimum required coefficient of friction determined based on sliding stability of the structure considering the site-specific SSE motion.

3.8.6.4 Identification of Seismic Category I Structures

The following site-specific supplement addresses COL License Information Item 3.26.

A complete list of Seismic Category I Structures, Systems, and Components can be found in Table 3.2-1, which includes the following site-specific Seismic Category I Structures:

- Ultimate Heat Sink
- Rector Service Water Piping Tunnel
- Diesel Generator Fuel Oil Storage Vault

A description of these structures can be found in section 3H.6.

Enclosure 3

Revision to COLA Section 3H.6

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

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

~~The forces and moments at critical locations in the DGFOSV along with the provided longitudinal and transverse reinforcement are included in Table 3H.6-11 in conjunction with Figures 3H.6-140 through 3H.6-208.~~

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.

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 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 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% for the foundation mat shear and axial forces, 17% increase for the foundation mat bending moments, and 6% 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 to all forces in the foundation mat, an increase factor of 1.17 to all moments in the foundation mat, and an increase factor 1.06 to all forces and moments in the connecting walls for the DGFOSV design.

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: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
Slab 1	6	Near Side	Horizontal	3H.6-142	1-H-L	Max Tension w/ corresponding moment	372	D + F + L + H' +E'	47	-170	D + F + L + H' +E'	19	3.12	-	-	-	
						Max Compression w/ corresponding moment	139	D + F + L + H' +E'	-94	-131							
						Max Moment with axial tension	104	D + F + L + H' +E'	1	-297							
						Max Moment with axial compression	105	D + F + L + H' +E'	-13	-301							
					2-H-L	Max Tension w/ corresponding moment	361	D + F + L + H' +E'	54	-101	D + F + L + H' +E'	30	4.68	-	-	-	
						Max Compression w/ corresponding moment	377	D + F + L + H' +E'	-93	-173							
						Max Moment with axial tension	36	D + F + L + H' +E'	11	-706							
						Max Moment with axial compression	36	D + F + L + H' +E'	-8	-706							
					3-H-L	Max Tension w/ corresponding moment	344	D + F + L + H' +E'	56	-140	D + F + L + H' +E'	33	4.68	-	-	-	
						Max Compression w/ corresponding moment	365	D + F + L + H' +E'	-96	-21							
						Max Moment with axial tension	363	D + F + L + H' +E'	7	-703							
						Max Moment with axial compression	363	D + F + L + H' +E'	-12	-703							
					4-H-L	Max Tension w/ corresponding moment	2182	D + F + L + H' +E'	101	-96	D + F + L + H' +E'	10	3.12	-	-	-	
						Max Compression w/ corresponding moment	2221	D + F + L + H' +E'	-113	-64							
						Max Moment with axial tension	2183	D + F + L + H' +E'	13	-226							
						Max Moment with axial compression	2183	D + F + L + H' +E'	-17	-178							
					5-H-L	Max Tension w/ corresponding moment	2263	D + F + L + H' +E'	103	-88	D + F + L + H' +E'	10	3.12	-	-	-	
						Max Compression w/ corresponding moment	2278	D + F + L + H' +E'	-113	-69							
						Max Moment with axial tension	2249	D + F + L + H' +E'	23	-213							
						Max Moment with axial compression	2249	D + F + L + H' +E'	-6	-163							
			Vertical	3H.6-143	1-V-L	Max Tension w/ corresponding moment	180	D + F + L + H' +E'	38	-286	D + F + L + H' +E'	27	3.12	-	-	-	
						Max Compression w/ corresponding moment	174	D + F + L + H' +E'	-262	-29							
						Max Moment with corresponding axial tension	327	D + F + L + H' +E'	10	-422							
						Max Moment with corresponding axial compression	105	D + F + L + H' +E'	-47	-440							
					2-V-L	Max Tension w/ corresponding moment	2432	D + F + L + H' +E'	63	-78	D + F + L + H' +E'	23	3.12	-	-	-	
						Max Compression w/ corresponding moment	19	D + F + L + H' +E'	-18	-26							
						Max Moment with axial tension	18	D + F + L + H' +E'	27	-398							
						Max Moment with axial compression	18	D + F + L + H +Wt	0	-111							
					3-V-L	Max Tension w/ corresponding moment	398	D + F + L + H' +E'	62	-35	D + F + L + H' +E'	28	3.12	-	-	-	
						Max Compression w/ corresponding moment	397	D + F + L + H' +E'	-21	-11							
						Max Moment with axial tension	381	D + F + L + H' +E'	33	-363							
						Max Moment with axial compression	381	D + F + L + H +Wt	0	-63							
					4-V-L	Max Tension w/ corresponding moment	22	D + F + L + H' +E'	49	-21	D + F + L + H' +E'	34	6.24	-	-	-	
						Max Compression w/ corresponding moment	39	D + F + L + H' +E'	-124	-65							
						Max Moment with axial tension	36	D + F + L + H' +E'	34	-721							
						Max Moment with axial compression	36	D + F + L + H' +E'	-29	-555							
					5-V-L	Max Tension w/ corresponding moment	363	D + F + L + H' +E'	57	-194	D + F + L + H' +E'	37	6.24	-	-	-	
						Max Compression w/ corresponding moment	345	D + F + L + H' +E'	-137	-67							
						Max Moment with axial tension	363	D + F + L + H' +E'	42	-727							
						Max Moment with axial compression	363	D + F + L + H' +E'	-21	-574							

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 — Load Combination	Transverse Shear [6] Reinforcement Design Loads (kips / ft)	Transverse Shear [7] Reinforcement Provided (in^2/ft^2)	Remarks
Slab 1	6	Far side	Horizontal	3H.6-144	1-H-L	Max Tension w/ corresponding moment	2299	D + F + L + H' +E'	120	209	D + F + L + H' +E'	33	3.12	-	-	-	
						Max Compression w/ corresponding moment	354	D + F + L + H' +E'	-125	333							
						Max Moment with axial tension	99	D + F + L + H' +E'	7	563							
						Max Moment with axial compression	99	D + F + L + H' +E'	-1	563							
			Vertical	3H.6-145	1-V-L	Max Tension w/ corresponding moment	71	D + F + L + H' +E'	15	182	D + F + L + H' +E'	27	3.12	-	-	-	(8)
						Max Compression w/ corresponding moment	231	D + F + L + H' +E'	-456	540							
						Max Moment with corresponding axial tension	58	D + F + L + H' +E'	11	256							
						Max Moment with corresponding axial compression	184	D + F + L + H' +E'	-385	1091							
					2-V-L	Max Tension w/ corresponding moment	2467	D + F + L + H' +E'	116	208	D + F + L + H' +E'	23	3.12	-	-	-	
						Max Compression w/ corresponding moment	19	D + F + L + H' +E'	-18	96							
						Max Moment with axial tension	17	D + F + L + H' +E'	79	377							
						Max Moment with axial compression	3	D + F + L + H' +E'	-1	292							
					3-V-L	Max Tension w/ corresponding moment	2521	D + F + L + H' +E'	118	235	D + F + L + H' +E'	15	3.12	-	-	-	
						Max Compression w/ corresponding moment	2512	D + F + L + H' +E'	-12	25							
						Max Moment with axial tension	2525	D + F + L + H' +E'	97	297							
						Max Moment with axial compression	2483	D + F + L + H' +E'	0	168							
					4-V-L	Max Tension w/ corresponding moment	40	D + F + L + H' +E'	147	631	D + F + L + H' +E'	34	6.24	-	-	-	
						Max Compression w/ corresponding moment	39	D + F + L + H' +E'	-124	210							
						Max Moment with axial tension	40	D + F + L + H' +E'	147	631							
						Max Moment with axial compression	21	D + F + L + H' +E'	-62	519							
					5-V-L	Max Tension w/ corresponding moment	346	D + F + L + H' +E'	187	585	D + F + L + H' +E'	37	6.24	-	-	-	
						Max Compression w/ corresponding moment	345	D + F + L + H' +E'	-137	304							
						Max Moment with axial tension	310	D + F + L + H' +E'	43	716							
						Max Moment with axial compression	378	D + F + L + H' +E'	-66	584							
Roof 2	2	Near Side	Horizontal	3H.6-147	1-H-L	Max Tension w/ corresponding moment	553	D + F + L + H' +E'	61	-25	D + F + L + H' +E'	40	3.12	-	-	-	(9)
						Max Compression w/ corresponding moment	553	D + F + L + H' +E'	-126	-29							
						Max Moment with axial tension	553	D + F + L + H' +E'	21	-52							
						Max Moment with axial compression	539	D + F + L + H' +E'	-92	-68							
			Vertical	3H.6-148	1-V-L	Max Tension w/ corresponding moment	399	D + F + L + H' +E'	34	-53	D + F + L + H' +E'	60	3.12	-	-	-	
						Max Compression w/ corresponding moment	554	D + F + L + H' +E'	-136	-120							
						Max Moment with corresponding axial tension	399	D + F + L + H' +E'	32	-58							
						Max Moment with corresponding axial compression	540	D + F + L + H' +E'	-105	-134							
					2-V-L	Max Tension w/ corresponding moment	566	D + F + L + H' +E'	-	-	D + F + L + H' +E'	22	6.24	-	-	-	(10)
						Max Compression w/ corresponding moment	566	D + F + L + H' +E'	-140	-151							
						Max Moment with corresponding axial tension	566	D + F + L + H' +E'	-	-							
						Max Moment with corresponding axial compression	566	D + F + L + H' +E'	-102	-210							
					3-V-L	Max Tension w/ corresponding moment	553	D + F + L + H' +E'	-	-	D + F + L + H' +E'	22	6.24	-	-	-	(10)
						Max Compression w/ corresponding moment	553	D + F + L + H' +E'	-142	-154							
						Max Moment with corresponding axial tension	539	D + F + L + H' +E'	-	-							
						Max Moment with corresponding axial compression	553	D + F + L + H' +E'	-103	-216							
		Far side	Horizontal	3H.6-149	1-H-L	Max Tension w/ corresponding moment	399	D + F + L + H' +E'	18	6	D + F + L + H' +E'	40	3.12	-	-	-	
						Max Compression w/ corresponding moment	553	D + F + L + H' +E'	-108	56							
						Max Moment with axial tension	556	D + F + L + H' +E'	0	65							
						Max Moment with axial compression	565	D + F + L + H' +E'	-21	78							
			Vertical	3H.6-150	1-V-L	Max Tension w/ corresponding moment	554	D + F + L + H' +E'	17	15	D + F + L + H' +E'	60	3.12	-	-	-	
						Max Compression w/ corresponding moment	565	D + F + L + H' +E'	-114	10							
						Max Moment with corresponding axial tension	566	D + F + L + H' +E'	14	24							
						Max Moment with corresponding axial compression	566	D + F + L + H' +E'	-35	24							

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: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
Slab 3	2	Near Side	Horizontal	3H.6-151	1-H-L	Max Tension w/ corresponding moment	650	D + F + L + H' +E'	29	-10	D + F + L + H +Wt	24	1.56	-	-	-	
						Max Compression w/ corresponding moment	638	D + F + L + H +Wt	-58	-21							
						Max Moment with axial tension	643	D + F + L + H +Wt	2	-38							
						Max Moment with axial compression	638	D + F + L + H +Wt	-54	-57							
			Vertical	3H.6-152	1-V-L	Max Tension w/ corresponding moment	574	D + F + L + H +Wt	34	-10	D + F + L + H +Wt	16	1.56	-	-	-	
						Max Compression w/ corresponding moment	574	D + F + L + H' +E'	-81	-10							
						Max Moment with corresponding axial tension	574	D + F + L + H' +E'	31	-35							
						Max Moment with corresponding axial compression	574	D + F + L + H' +E'	0	-35							
		Far side	Horizontal	3H.6-153	1-H-L	Max Tension w/ corresponding moment	638	D + F + L + H +Wt	30	5	D + F + L + H +Wt	24	1.56	-	-	-	
						Max Compression w/ corresponding moment	651	D + F + L + H' +E'	-44	6							
						Max Moment with axial tension	643	D + F + L + H' +E'	3	26							
						Max Moment with axial compression	573	D + F + L + H +Wt	-6	35							
			Vertical	3H.6-154	1-V-L	Max Tension w/ corresponding moment	574	D + F + L + H +Wt	34	7	D + F + L + H +Wt	16	1.56	-	-	-	
						Max Compression w/ corresponding moment	574	D + F + L + H +Wt	-114	41							
						Max Moment with corresponding axial tension	574	D + F + L + H +Wt	1	26							
						Max Moment with corresponding axial compression	574	D + F + L + H +Wt	-114	41							
Roof 5	2	Near Side	Horizontal	3H.6-155	1-H-L	Max Tension w/ corresponding moment	690	D + F + L + H +Wt	44	-12	D + F + L + H +Wt	37	1.56	-	-	-	
						Max Compression w/ corresponding moment	695	D + F + L + H +Wt	-47	-8							
						Max Moment with axial tension	771	D + F + L + H' +E'	0	-24							
						Max Moment with axial compression	768	D + F + L + H' +E'	-8	-39							
			Vertical	3H.6-156	1-V-L	Max Tension w/ corresponding moment	769	D + F + L + H +Wt	63	-5	D + F + L + H' +E'	18	1.56	-	-	-	
						Max Compression w/ corresponding moment	693	D + F + L + H +Wt	-53	-2							
						Max Moment with corresponding axial tension	766	D + F + L + H +Wt	2	-17							
						Max Moment with corresponding axial compression	768	D + F + L + H +Wt	-31	-19							
		Far side	Horizontal	3H.6-157	1-H-L	Max Tension w/ corresponding moment	704	D + F + L + H +Wt	32	5	D + F + L + H +Wt	37	1.56	-	-	-	
						Max Compression w/ corresponding moment	767	D + F + L + H +Wt	-145	16							
						Max Moment with axial tension	696	D + F + L + H +Wt	1	19							
						Max Moment with axial compression	732	D + F + L + H +Wt	-22	49							
			Vertical	3H.6-158	1-V-L	Max Tension w/ corresponding moment	711	D + F + L + H +Wt	27	0	D + F + L + H' +E'	18	1.56	-	-	-	
						Max Compression w/ corresponding moment	732	D + F + L + H +Wt	-170	15							
						Max Moment with corresponding axial tension	732	D + F + L + H' +E'	4	14							
						Max Moment with corresponding axial compression	697	D + F + L + H +Wt	-43	43							
Roof 6	2	Near Side	Horizontal	3H.6-159	1-H-L	Max Tension w/ corresponding moment	684	D + F + L + H +Wt	43	-7	D + F + L + H +Wt	52	1.56	-	-	-	
						Max Compression w/ corresponding moment	689	D + F + L + H +Wt	-107	-29							
						Max Moment with axial tension	687	D + F + L + H +Wt	2	-48							
						Max Moment with axial compression	689	D + F + L + H +Wt	-30	-74							
			Vertical	3H.6-160	1-V-L	Max Tension w/ corresponding moment	689	D + F + L + H +Wt	29	-5	D + F + L + H +Wt	87	1.56	-	-	-	
						Max Compression w/ corresponding moment	689	D + F + L + H +Wt	-86	-2							
						Max Moment with corresponding axial tension	666	D + F + L + H +Wt	5	-24							
						Max Moment with corresponding axial compression	656	D + F + L + H +Wt	-38	-25							
		Far side	Horizontal	3H.6-161	1-H-L	Max Tension w/ corresponding moment	673	D + F + L + H +Wt	45	9	D + F + L + H +Wt	52	1.56	-	-	-	
						Max Compression w/ corresponding moment	657	D + F + L + H +Wt	-230	25							
						Max Moment with axial tension	657	D + F + L + H +Wt	2	53							
						Max Moment with axial compression	666	D + F + L + H +Wt	-21	62							
			Vertical	3H.6-162	1-V-L	Max Tension w/ corresponding moment	663	D + F + L + H +Wt	15	6	D + F + L + H +Wt	87	1.56	-	-	-	
						Max Compression w/ corresponding moment	666	D + F + L + H +Wt	-267	30							
						Max Moment with corresponding axial tension	660	D + F + L + H +Wt	3	17							
						Max Moment with corresponding axial compression	656	D + F + L + H +Wt	-37	75							

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 (in²/ ft)	Transverse Shear Design Loads		Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads						
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)		
Wall 7	4	Near Side	Horizontal	3H.6-163	1-H-L	Max Tension w/ corresponding moment	843	D + F + L + H' +E'	98	-44	D + F + L + H' +E'	60	3.12	-	-	-	
						Max Compression w/ corresponding moment	1051	D + F + L + H' +E'	-172	-310							
						Max Moment with axial tension	1014	D + F + L + H' +E'	0	-107							
						Max Moment with axial compression	1069	D + F + L + H' +E'	-162	-352							
					2-H-L	Max Tension w/ corresponding moment	811	D + F + L + H' +E'	49	-80	D + F + L + H' +E'	60	7.8	-	-	-	
						Max Compression w/ corresponding moment	799	D + F + L + H' +E'	-190	-815							
						Max Moment with axial tension	803	D + F + L + H' +E'	8	-239							
						Max Moment with axial compression	799	D + F + L + H' +E'	-190	-815							
					3-H-L	Max Tension w/ corresponding moment	891	D + F + L + H' +E'	147	-231	D + F + L + H' +E'	31	6.24	-	-	-	
						Max Compression w/ corresponding moment	1042	D + F + L + H' +E'	-218	-202							
						Max Moment with axial tension	1042	D + F + L + H' +E'	91	-291							
						Max Moment with axial compression	1057	D + F + L + H' +E'	-145	-344							
					4-H-L	Max Tension w/ corresponding moment	1046	D + F + L + H' +E'	20	-77	D + F + L + H' +E'	60	7.8	-	-	-	
						Max Compression w/ corresponding moment	1053	D + F + L + H' +E'	-191	-856							
						Max Moment with axial tension	1017	D + F + L + H' +E'	3	-114							
						Max Moment with axial compression	1065	D + F + L + H' +E'	-183	-897							
			Vertical	3H.6-164	1-V-L	Max Tension w/ corresponding moment	797	D + F + L + H' +E'	106	-127	D + F + L + H' +E'	90	4.68	-	-	-	
						Max Compression w/ corresponding moment	1029	D + F + L + H' +E'	-200	-59							
						Max Moment with corresponding axial tension	837	D + F + L + H' +E'	4	-345							
						Max Moment with corresponding axial compression	891	D + F + L + H' +E'	-118	-407							
					2-V-L	Max Tension w/ corresponding moment	796	D + F + L + H' +E'	151	-170	D + F + L + H' +E	90	12.48	-	-	-	
						Max Compression w/ corresponding moment	796	D + F + L + H' +E'	-166	-79							
						Max Moment with corresponding axial tension	836	D + F + L + H' +E'	2	-1165							
						Max Moment with corresponding axial compression	852	D + F + L + H' +E'	-53	-1235							
		Far side	Horizontal	3H.6-165	1-H-L	Max Tension w/ corresponding moment	851	D + F + L + H' +E'	100	27	D + F + L + H' +E'	60	3.12	-	-	-	
						Max Compression w/ corresponding moment	891	D + F + L + H' +E'	-298	259							
						Max Moment with axial tension	1047	D + F + L + H' +E'	9	189							
						Max Moment with axial compression	814	D + F + L + H' +E'	-109	403							
			Vertical	3H.6-166	1-V-L	Max Tension w/ corresponding moment	796	D + F + L + H' +E'	130	62	D + F + L + H' +E'	90	6.24	-	-	-	
						Max Compression w/ corresponding moment	1017	D + F + L + H' +E'	-237	183							
						Max Moment with corresponding axial tension	848	D + F + L + H' +E'	0	717							
						Max Moment with corresponding axial compression	856	D + F + L + H' +E'	-19	724							
			Horizontal Plane	3H.6-167	1-H-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	95	0.31 (#5 @12)	
				3H.6-167	2-H-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	155	0.62 (#5 @6)	
				3H.6-167	3-H-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	60	0.31 (#5 @12)	
			Vertical Plane	3H.6-167	1-V-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	103	0.31 (#5 @12)	
				3H.6-167	2-V-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	102	0.31 (#5 @12)	
				3H.6-167	3-V-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	128	0.62 (#5 @6)	

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			Longitudinal Reinforcement Design Loads: In-Plane Shear Loads		Longitudinal Reinforcement Provided (in²/ ft)	Transverse Shear Design Loads		Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)		
Wall 8	4	Near Side	Horizontal	3H.6-168	1-H-L	Max Tension w/ corresponding moment	1156	D + F + L + H' +E'	97	-35	D + F + L + H' +E'	59	3.12	-	-	-	
						Max Compression w/ corresponding moment	1307	D + F + L + H' +E'	-171	-278							
						Max Moment with axial tension	1188	D + F + L + H' +E'	5	-193							
						Max Moment with axial compression	1183	D + F + L + H' +E'	-157	-351							
					2-H-L	Max Tension w/ corresponding moment	1276	D + F + L + H' +E'	20	-111	D + F + L + H' +E'	59	7.8	-	-	-	
						Max Compression w/ corresponding moment	1305	D + F + L + H' +E'	-190	-870							
						Max Moment with axial tension	1288	D + F + L + H' +E'	3	-119							
						Max Moment with axial compression	1311	D + F + L + H' +E'	-183	-913							
					3-H-L	Max Tension w/ corresponding moment	1108	D + F + L + H' +E'	142	-281	D + F + L + H' +E'	34	6.24	-	-	-	
						Max Compression w/ corresponding moment	1280	D + F + L + H' +E'	-212	-230							
						Max Moment with axial tension	1280	D + F + L + H' +E'	76	-324							
						Max Moment with axial compression	1301	D + F + L + H' +E'	-181	-385							
					4-H-L	Max Tension w/ corresponding moment	1189	D + F + L + H' +E'	27	-92	D + F + L + H' +E'	59	7.8	-	-	-	
						Max Compression w/ corresponding moment	1192	D + F + L + H' +E'	-190	-823							
						Max Moment with axial tension	1196	D + F + L + H' +E'	7	-222							
						Max Moment with axial compression	1192	D + F + L + H' +E'	-190	-823							
			Vertical	3H.6-169	1-V-L	Max Tension w/ corresponding moment	1190	D + F + L + H' +E'	109	-133	D + F + L + H' +E'	92	4.68	-	-	-	
						Max Compression w/ corresponding moment	1281	D + F + L + H' +E'	-198	-42							
						Max Moment with corresponding axial tension	1108	D + F + L + H' +E'	0	-382							
						Max Moment with corresponding axial compression	1108	D + F + L + H' +E'	-105	-429							
					2-V-L	Max Tension w/ corresponding moment	1189	D + F + L + H' +E'	152	-174	D + F + L + H' +E'	92	12.48	-	-	-	
						Max Compression w/ corresponding moment	1189	D + F + L + H' +E'	-164	-88							
						Max Moment with corresponding axial tension	1149	D + F + L + H' +E'	1	-1170							
						Max Moment with corresponding axial compression	1133	D + F + L + H' +E'	-54	-1237							
		Far Side	Horizontal	3H.6-170	1-H-L	Max Tension w/ corresponding moment	1148	D + F + L + H' +E'	99	20	D + F + L + H' +E'	59	4.68	-	-	-	
						Max Compression w/ corresponding moment	1108	D + F + L + H' +E'	-286	275							
						Max Moment with axial tension	1275	D + F + L + H' +E'	9	220							
						Max Moment with axial compression	1175	D + F + L + H' +E'	-108	413							
			Vertical	3H.6-171	1-V-L	Max Tension w/ corresponding moment	1189	D + F + L + H' +E'	131	65	D + F + L + H' +E'	92	6.24	-	-	-	
						Max Compression w/ corresponding moment	1269	D + F + L + H' +E'	-233	173							
						Max Moment with corresponding axial tension	1145	D + F + L + H' +E'	2	721							
						Max Moment with corresponding axial compression	1145	D + F + L + H' +E'	-18	723							
			Horizontal Plane	3H.6-172	1-H-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	96	0.31 (#5 @12)	
				3H.6-172	2-H-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	155	0.62 (#5 @6)	
				3H.6-172	3-H-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	60	0.31 (#5 @12)	
			Vertical Plane	3H.6-172	1-V-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	127	0.62 (#5 @6)	
				3H.6-172	2-V-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	101	0.31 (#5 @12)	
				3H.6-172	3-V-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	102	0.31 (#5 @12)	

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 – Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
Wall 9	2	Near Side	Horizontal	3H.6-173	1-H-L	Max Tension w/ corresponding moment	1031	D + F + L + H +Wt	53	-8	D + F + L + H +Wt	58	3.12	-	-	-	
						Max Compression w/ corresponding moment	987	D + F + L + H +Wt	-98	-4							
						Max Moment with axial tension	1018	D + F + L + H' +E'	16	-79							
						Max Moment with axial compression	1035	D + F + L + H' +E'	-36	-101							
					2-H-L	Max Tension w/ corresponding moment	1030	D + F + L + H +Wt	83	-18	D + F + L + H +Wt	58	4.68	-	-	-	
						Max Compression w/ corresponding moment	1030	D + F + L + H' +E'	-160	-8							
						Max Moment with axial tension	1030	D + F + L + H' +E'	53	-94							
						Max Moment with axial compression	1030	D + F + L + H' +E'	-11	-94							
			Vertical	3H.6-174	1-V-L	Max Tension w/ corresponding moment	1006	D + F + L + H' +E'	84	-61	D + F + L + H +Wt	47	3.12	-	-	-	
						Max Compression w/ corresponding moment	1006	D + F + L + H +Wt	-162	-2							
						Max Moment with corresponding axial tension	1031	D + F + L + H' +E'	8	-97							
						Max Moment with corresponding axial compression	1031	D + F + L + H' +E'	-46	-97							
					2-V-L	Max Tension w/ corresponding moment	1030	D + F + L + H' +E'	130	-103	D + F + L + H +Wt	45	6.24	-	-	-	
						Max Compression w/ corresponding moment	1030	D + F + L + H' +E'	-231	-50							
						Max Moment with corresponding axial tension	1030	D + F + L + H' +E'	36	-180							
						Max Moment with corresponding axial compression	1030	D + F + L + H' +E'	-77	-180							
		Far side	Horizontal	3H.6-175	1-H-L	Max Tension w/ corresponding moment	1030	D + F + L + H +Wt	56	9	D + F + L + H +Wt	58	3.12	-	-	-	
						Max Compression w/ corresponding moment	995	D + F + L + H +Wt	-181	16							
						Max Moment with axial tension	955	D + F + L + H +Wt	8	49							
						Max Moment with axial compression	983	D + F + L + H +Wt	-41	68							
			Vertical	3H.6-176	1-V-L	Max Tension w/ corresponding moment	1035	D + F + L + H' +E'	64	4	D + F + L + H +Wt	47	3.12	-	-	-	
						Max Compression w/ corresponding moment	1030	D + F + L + H' +E'	-205	8							
						Max Moment with corresponding axial tension	1003	D + F + L + H' +E'	6	15							
						Max Moment with corresponding axial compression	995	D + F + L + H +Wt	-39	69							
Wall 10	2	Near Side	Horizontal	3H.6-177	1-H-L	Max Tension w/ corresponding moment	1257	D + F + L + H +Wt	71	-16	D + F + L + H +Wt	59	3.12	-	-	-	
						Max Compression w/ corresponding moment	1257	D + F + L + H' +E'	-150	-10							
						Max Moment with axial tension	1257	D + F + L + H' +E'	50	-95							
						Max Moment with axial compression	1197	D + F + L + H' +E'	-36	-98							
			Vertical	3H.6-178	1-V-L	Max Tension w/ corresponding moment	1259	D + F + L + H' +E'	90	-56	D + F + L + H +Wt	38	3.12	-	-	-	
						Max Compression w/ corresponding moment	1259	D + F + L + H' +E'	-132	-6							
						Max Moment with corresponding axial tension	1245	D + F + L + H' +E'	1	-103							
						Max Moment with corresponding axial compression	1245	D + F + L + H' +E'	-34	-103							
					2-V-L	Max Tension w/ corresponding moment	1257	D + F + L + H' +E'	126	-110	D + F + L + H +Wt	35	6.24	-	-	-	
						Max Compression w/ corresponding moment	1257	D + F + L + H' +E'	-199	-57							
						Max Moment with corresponding axial tension	1257	D + F + L + H' +E'	34	-187							
						Max Moment with corresponding axial compression	1257	D + F + L + H' +E'	-60	-187							
		Far side	Horizontal	3H.6-179	1-H-L	Max Tension w/ corresponding moment	1257	D + F + L + H +Wt	51	7	D + F + L + H +Wt	59	3.12	-	-	-	
						Max Compression w/ corresponding moment	1265	D + F + L + H +Wt	-179	19							
						Max Moment with axial tension	1264	D + F + L + H +Wt	0	49							
						Max Moment with axial compression	1232	D + F + L + H +Wt	-41	66							
			Vertical	3H.6-180	1-V-L	Max Tension w/ corresponding moment	1198	D + F + L + H' +E'	60	3	D + F + L + H +Wt	38	3.12	-	-	-	
						Max Compression w/ corresponding moment	1257	D + F + L + H' +E'	-173	4							
						Max Moment with corresponding axial tension	1224	D + F + L + H' +E'	6	17							
						Max Moment with corresponding axial compression	1265	D + F + L + H +Wt	-47	69							

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 (in²/ ft)	Transverse Shear Design Loads: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
Wall 11	2	Near Side	Horizontal	3H.6-181	1-H-L	Max Tension w/ corresponding moment	951	D + F + L + H +Wt	43	-7	D + F + L + H +Wt	55	1.56	-	-	-	
						Max Compression w/ corresponding moment	939	D + F + L + H +Wt	-85	-1							
						Max Moment with axial tension	951	D + F + L + H +Wt	34	-44							
						Max Moment with axial compression	947	D + F + L + H +Wt	-2	-38							
			Vertical	3H.6-182	1-V-L	Max Tension w/ corresponding moment	944	D + F + L + H +Wt	37	-4	D + F + L + H +Wt	43	1.56	-	-	-	
						Max Compression w/ corresponding moment	908	D + F + L + H +Wt	-84	-25							
						Max Moment with corresponding axial tension	935	D + F + L + H +Wt	9	-38							
						Max Moment with corresponding axial compression	907	D + F + L + H +Wt	-80	-33							
		Far side	Horizontal	3H.6-183	1-H-L	Max Tension w/ corresponding moment	934	D + F + L + H +Wt	31	5	D + F + L + H +Wt	55	1.56	-	-	-	
						Max Compression w/ corresponding moment	907	D + F + L + H +Wt	-210	25							
						Max Moment with axial tension	947	D + F + L + H +Wt	5	45							
						Max Moment with axial compression	935	D + F + L + H +Wt	-20	89							
			Vertical	3H.6-184	1-V-L	Max Tension w/ corresponding moment	944	D + F + L + H +Wt	34	4	D + F + L + H +Wt	43	1.56	-	-	-	
						Max Compression w/ corresponding moment	927	D + F + L + H +Wt	-184	23							
						Max Moment with corresponding axial tension	935	D + F + L + H +Wt	0	69							
						Max Moment with corresponding axial compression	907	D + F + L + H +Wt	-79	99							
Wall 12	4	Near Side	Horizontal	3H.6-185	1-H-L	Max Tension w/ corresponding moment	1349	D + F + L + H' +E'	20	-12	D + F + L + H' +E'	107	3.12	-	-	-	
						Max Compression w/ corresponding moment	1345	D + F + L + H' +E'	-197	-365							
						Max Moment with axial tension	1349	D + F + L + H' +E'	14	-207							
						Max Moment with axial compression	1346	D + F + L + H' +E'	-185	-396							
					2-H-L	Max Tension w/ corresponding moment	1341	D + F + L + H' +E'	24	-166	D + F + L + H' +E'	107	6.24	-	-	-	
						Max Compression w/ corresponding moment	1337	D + F + L + H' +E'	-199	-800							
						Max Moment with axial tension	1341	D + F + L + H' +E'	18	-212							
						Max Moment with axial compression	1337	D + F + L + H' +E'	-199	-800							
					3-H-L	Max Tension w/ corresponding moment	1437	D + F + L + H' +E'	23	-163	D + F + L + H' +E'	107	6.24	-	-	-	
						Max Compression w/ corresponding moment	1433	D + F + L + H' +E'	-197	-513							
						Max Moment with axial tension	1445	D + F + L + H' +E'	15	-216							
						Max Moment with axial compression	1441	D + F + L + H' +E'	-197	-794							
			Vertical	3H.6-186	1-V-L	Max Tension w/ corresponding moment	1432	D + F + L + H' +E'	78	-40	D + F + L + H' +E'	99	3.12	-	-	-	
						Max Compression w/ corresponding moment	1440	D + F + L + H' +E'	-174	-73							
						Max Moment with corresponding axial tension	1373	D + F + L + H' +E'	3	-186							
						Max Moment with corresponding axial compression	1373	D + F + L + H' +E'	-18	-207							
					2-V-L	Max Tension w/ corresponding moment	1438	D + F + L + H' +E'	188	-113	D + F + L + H' +E'	99	6.24	-	-	-	
						Max Compression w/ corresponding moment	1438	D + F + L + H' +E'	-258	-18							
						Max Moment with corresponding axial tension	1350	D + F + L + H' +E'	30	-447							
						Max Moment with corresponding axial compression	1350	D + F + L + H' +E'	-15	-447							
					3-V-L	Max Tension w/ corresponding moment	1382	D + F + L + H' +E'	85	-666	D + F + L + H' +E'	89	7.8	-	-	-	
						Max Compression w/ corresponding moment	1406	D + F + L + H' +E'	-93	-43							
						Max Moment with corresponding axial tension	1374	D + F + L + H' +E'	78	-689							
						Max Moment with corresponding axial compression	1406	D + F + L + H' +E'	-7	-483							

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 – Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
Wall 12	4	Far side	Horizontal	3H.6-187	1-H-L	Max Tension w/ corresponding moment	1349	D + F + L + H' +E'	20	5	D + F + L + H' +E'	107	3.12	-	-	-	
						Max Compression w/ corresponding moment	1409	D + F + L + H' +E'	-192	52							
						Max Moment with axial tension	1349	D + F + L + H' +E'	1	75							
						Max Moment with axial compression	1393	D + F + L + H' +E'	-167	329							
			Vertical	3H.6-188	1-V-L	Max Tension w/ corresponding moment	1430	D + F + L + H' +E'	126	40	D + F + L + H' +E'	99	4.68	-	-	-	
						Max Compression w/ corresponding moment	1438	D + F + L + H' +E'	-258	41							
						Max Moment with corresponding axial tension	1384	D + F + L + H' +E'	51	343							
						Max Moment with corresponding axial compression	1400	D + F + L + H' +E'	-4	312							
		-	Horizontal Plane	3H.6-189	1-H-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	99	0.31 (#5 @12)	
			Vertical Plane	3H.6-189	1-V-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	107	0.31 (#5 @12)	
				3H.6-189	2-V-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	115	0.31 (#5 @12)	
Wall 13	4	Near Side	Horizontal	3H.6-190	1-H-L	Max Tension w/ corresponding moment	1883	D + F + L + H +Wt	2	-42	D + F + L + H' +E'	104	3.12	-	-	-	
						Max Compression w/ corresponding moment	1953	D + F + L + H' +E'	-198	-446							
						Max Moment with axial tension	1883	D + F + L + H' +E'	0	-107							
						Max Moment with axial compression	1953	D + F + L + H' +E'	-198	-446							
					2-H-L	Max Tension w/ corresponding moment	1871	D + F + L + H' +E'	33	-48	D + F + L + H' +E'	104	7.8	-	-	-	
						Max Compression w/ corresponding moment	1942	D + F + L + H' +E'	-198	-575							
						Max Moment with axial tension	1871	D + F + L + H' +E'	13	-325							
						Max Moment with axial compression	1955	D + F + L + H' +E'	-187	-879							
					3-H-L	Max Tension w/ corresponding moment	1884	D + F + L + H' +E'	32	-67	D + F + L + H' +E'	104	7.8	-	-	-	
						Max Compression w/ corresponding moment	1954	D + F + L + H' +E'	-200	-849							
						Max Moment with axial tension	1884	D + F + L + H' +E'	11	-344							
						Max Moment with axial compression	1968	D + F + L + H' +E'	-188	-892							
			Vertical	3H.6-191	1-V-L	Max Tension w/ corresponding moment	1857	D + F + L + H' +E'	144	-67	D + F + L + H' +E'	99	4.68	-	-	-	
						Max Compression w/ corresponding moment	1857	D + F + L + H' +E'	-241	-21							
						Max Moment with corresponding axial tension	1869	D + F + L + H' +E'	34	-271							
						Max Moment with corresponding axial compression	1869	D + F + L + H' +E'	-71	-300							
					2-V-L	Max Tension w/ corresponding moment	1860	D + F + L + H' +E'	80	-225	D + F + L + H' +E'	76	7.8	-	-	-	
						Max Compression w/ corresponding moment	1860	D + F + L + H' +E'	-123	-20							
						Max Moment with corresponding axial tension	1865	D + F + L + H' +E'	73	-723							
						Max Moment with corresponding axial compression	1867	D + F + L + H' +E'	-1	-600							
		Far side	Horizontal	3H.6-192	1-H-L	Max Tension w/ corresponding moment	1871	D + F + L + H' +E'	37	149	D + F + L + H' +E'	104	3.12	-	-	-	
						Max Compression w/ corresponding moment	1945	D + F + L + H' +E'	-193	92							
						Max Moment with axial tension	1883	D + F + L + H' +E'	4	198							
						Max Moment with axial compression	1964	D + F + L + H' +E'	-161	396							
			Vertical	3H.6-193	1-V-L	Max Tension w/ corresponding moment	1857	D + F + L + H' +E'	123	7	D + F + L + H' +E'	99	4.68	-	-	-	
						Max Compression w/ corresponding moment	1857	D + F + L + H' +E'	-241	30							
						Max Moment with corresponding axial tension	1922	D + F + L + H' +E'	52	324							
						Max Moment with corresponding axial compression	1919	D + F + L + H' +E'	-1	315							
		-	Horizontal Plane	3H.6-194	1-H-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	97	0.31 (#5 @12)	
			Vertical Plane	3H.6-194	1-V-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	132	0.62 (#5 @6)	
				3H.6-194	2-V-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	113	0.31 (#5 @12)	
				3H.6-194	3-V-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	95	0.31 (#5 @12)	
				3H.6-194	4-V-T	-	-	-	-	-	-	-	-	D + F + L + H' +E'	124	0.62 (#5 @6)	

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: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
Wall 14	2	Near Side	Horizontal	3H.6-195	1-H-L	Max Tension w/ corresponding moment	1579	D + F + L + H +Wt	55	-10	D + F + L + H +Wt	28	3.12	-	-	-	
						Max Compression w/ corresponding moment	1496	D + F + L + H' +E'	-153	-32							
						Max Moment with axial tension	1653	D + F + L + H' +E'	6	-68							
						Max Moment with axial compression	1652	D + F + L + H' +E'	-124	-81							
			Vertical	3H.6-196	1-V-L	Max Tension w/ corresponding moment	1652	D + F + L + H +Wt	102	-27	D + F + L + H +Wt	39	3.12	-	-	-	
						Max Compression w/ corresponding moment	1654	D + F + L + H' +E'	-139	-10							
						Max Moment with corresponding axial tension	1652	D + F + L + H' +E'	66	-71							
						Max Moment with corresponding axial compression	1652	D + F + L + H' +E'	-28	-71							
		Far side	Horizontal	3H.6-197	1-H-L	Max Tension w/ corresponding moment	1496	D + F + L + H' +E'	52	41	D + F + L + H +Wt	28	3.12	-	-	-	
						Max Compression w/ corresponding moment	1503	D + F + L + H +Wt	-174	28							
						Max Moment with axial tension	1652	D + F + L + H' +E'	49	54							
						Max Moment with axial compression	1543	D + F + L + H +Wt	-75	66							
			Vertical	3H.6-198	1-V-L	Max Tension w/ corresponding moment	1654	D + F + L + H' +E'	63	10	D + F + L + H +Wt	39	3.12	-	-	-	
						Max Compression w/ corresponding moment	1652	D + F + L + H +Wt	-204	74							
						Max Moment with corresponding axial tension	1508	D + F + L + H' +E'	1	58							
						Max Moment with corresponding axial compression	1652	D + F + L + H' +E'	-201	96							
Wall 15	2	Near Side	Horizontal	3H.6-200	1-H-L	Max Tension w/ corresponding moment	1808	D + F + L + H +Wt	65	-9	D + F + L + H' +E'	28	1.56	-	-	-	
						Max Compression w/ corresponding moment	1840	D + F + L + H +Wt	-90	-2							
						Max Moment with axial tension	1845	D + F + L + H' +E'	16	-86							
						Max Moment with axial compression	1845	D + F + L + H' +E'	-27	-102							
			Vertical	3H.6-201	1-V-L	Max Tension w/ corresponding moment	1689	D + F + L + H +Wt	75	-26	D + F + L + H +Wt	34	2.08	-	-	-	
						Max Compression w/ corresponding moment	1796	D + F + L + H +Wt	-107	-10							
						Max Moment with corresponding axial tension	1689	D + F + L + H' +E'	49	-38							
						Max Moment with corresponding axial compression	1796	D + F + L + H' +E'	-9	-42							
		Far side	Horizontal	3H.6-202	1-H-L	Max Tension w/ corresponding moment	1843	D + F + L + H +Wt	24	1	D + F + L + H' +E'	28	1.56	-	-	-	
						Max Compression w/ corresponding moment	1696	D + F + L + H +Wt	-194	20							
						Max Moment with axial tension	1728	D + F + L + H' +E'	0	42							
						Max Moment with axial compression	1784	D + F + L + H +Wt	-86	67							
			Vertical	3H.6-203	1-V-L	Max Tension w/ corresponding moment	1702	D + F + L + H' +E'	56	6	D + F + L + H +Wt	34	2.08	-	-	-	
						Max Compression w/ corresponding moment	1796	D + F + L + H +Wt	-106	6							
						Max Moment with corresponding axial tension	1785	D + F + L + H' +E'	0	54							
						Max Moment with corresponding axial compression	1696	D + F + L + H +Wt	-29	79							
Wall 16	2	Near Side	Horizontal	3H.6-204	1-H-L	Max Tension w/ corresponding moment	1455	D + F + L + H' +E'	13	-2	D + F + L + H +Wt	51	1.56	-	-	-	
						Max Compression w/ corresponding moment	1447	D + F + L + H +Wt	-48	-8							
						Max Moment with axial tension	1492	D + F + L + H +Wt	5	-15							
						Max Moment with axial compression	1470	D + F + L + H +Wt	-41	-25							
			Vertical	3H.6-205	1-V-L	Max Tension w/ corresponding moment	1450	D + F + L + H +Wt	81	-6	D + F + L + H +Wt	35	1.56	-	-	-	
						Max Compression w/ corresponding moment	1491	D + F + L + H +Wt	-51	-26							
						Max Moment with corresponding axial tension	1455	D + F + L + H +Wt	6	-25							
						Max Moment with corresponding axial compression	1447	D + F + L + H +Wt	-31	-43							
		Far side	Horizontal	3H.6-206	1-H-L	Max Tension w/ corresponding moment	1447	D + F + L + H' +E'	21	3	D + F + L + H +Wt	51	1.56	-	-	-	
						Max Compression w/ corresponding moment	1490	D + F + L + H +Wt	-185	45							
						Max Moment with axial tension	1489	D + F + L + H +Wt	2	31							
						Max Moment with axial compression	1470	D + F + L + H +Wt	-40	77							
			Vertical	3H.6-207	1-V-L	Max Tension w/ corresponding moment	1451	D + F + L + H +Wt	82	11	D + F + L + H +Wt	35	1.56	-	-	-	
						Max Compression w/ corresponding moment	1478	D + F + L + H +Wt	-138	36							
						Max Moment with corresponding axial tension	1462	D + F + L + H +Wt	0	38							
						Max Moment with corresponding axial compression	1491	D + F + L + H +Wt	-50	79							

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		Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads						
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)		
Wall 16	2	-	Horizontal Plane	3H.6-208	1-H-T	-	-	-	-	-	-	-	-	-	-	0.62 (#5 @6)	Transverse shear reinforcement provided due to tornado missile impact evaluation.
				3H.6-208	2-H-T	-	-	-	-	-	-	-	-	-	-	0.62 (#5 @6)	

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. 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 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. 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. 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) The reported transverse shear is the maximum average transverse shear along a plane in that transverse reinforcement zone.

(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) 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) Element 553 and 566 were reported for Maximum Axial Tension w/ Corresponding Moment and Maximum Moment w/ Corresponding Axial Tension based on original analysis results. Element 553 shell element forces were averaged with Element 539 shell element forces as stated in Note 8. Element 566 shell element forces were averaged with Element 552 shell element forces as stated in Note 8. As a result of averaging, there were no PM points in Axial Tension; dashes are input into the corresponding cells.

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	~~73.3~~1.5	~~63.1~~ 45.84	---	2, 3, 4
D + H + Wt	~~32.5~~1.41	~~27.3~~19.75	---	2, 3
D + H + E'	1.1	1.1	---	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) 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 than the full passive pressure. The calculated safety factors increase if full passive pressure (Kp = 3.0) is considered.

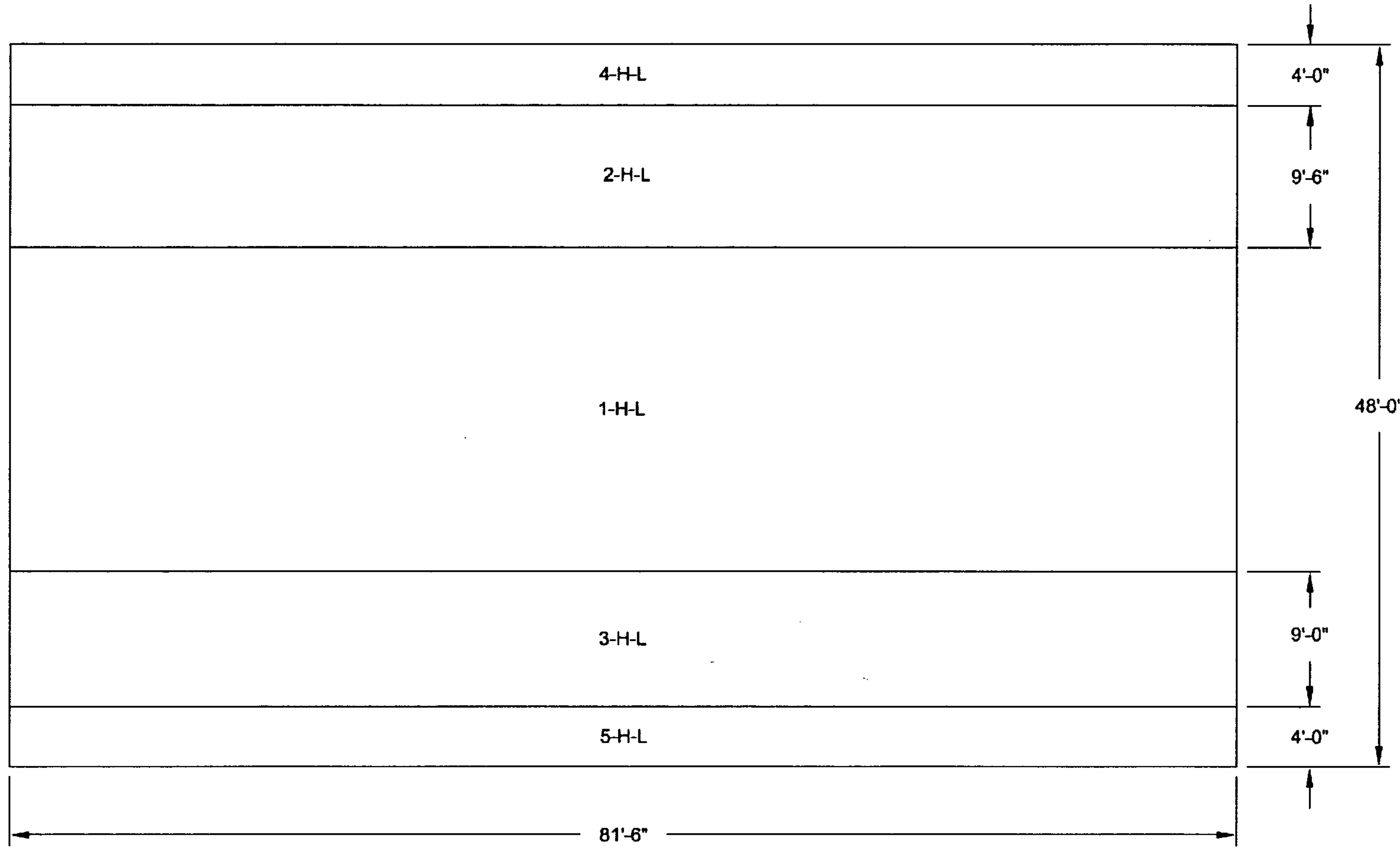


Figure 3H.6-142 Slab 1 Looking Down Horizontal Reinforcement Zones Near Side Face

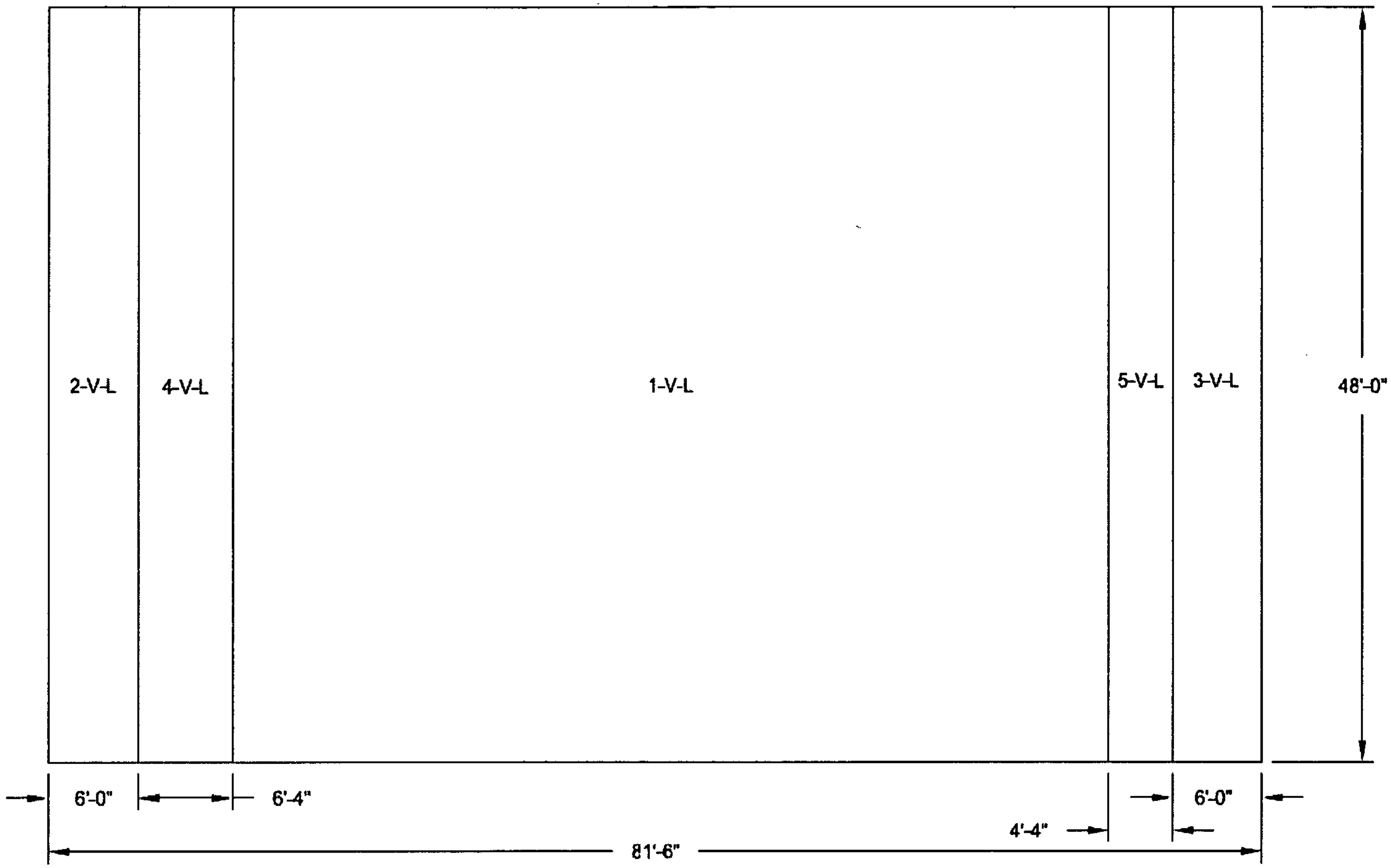


Figure 3H.6-143 Slab 1 Looking Down Vertical Reinforcement Zones Near Side Face

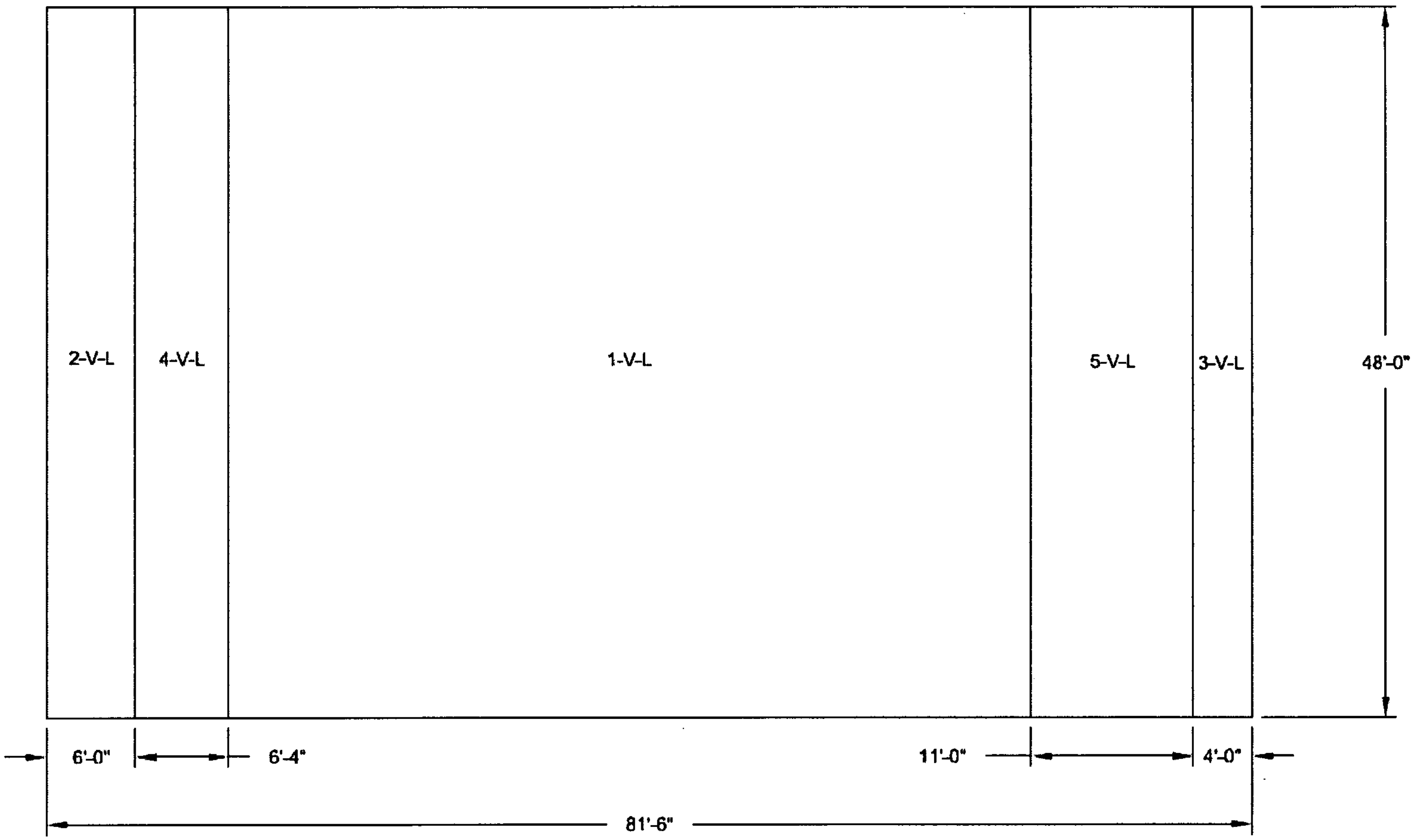


Figure 3H.6-145 Slab 1 Looking Down Vertical Reinforcement Zones Far Side Face

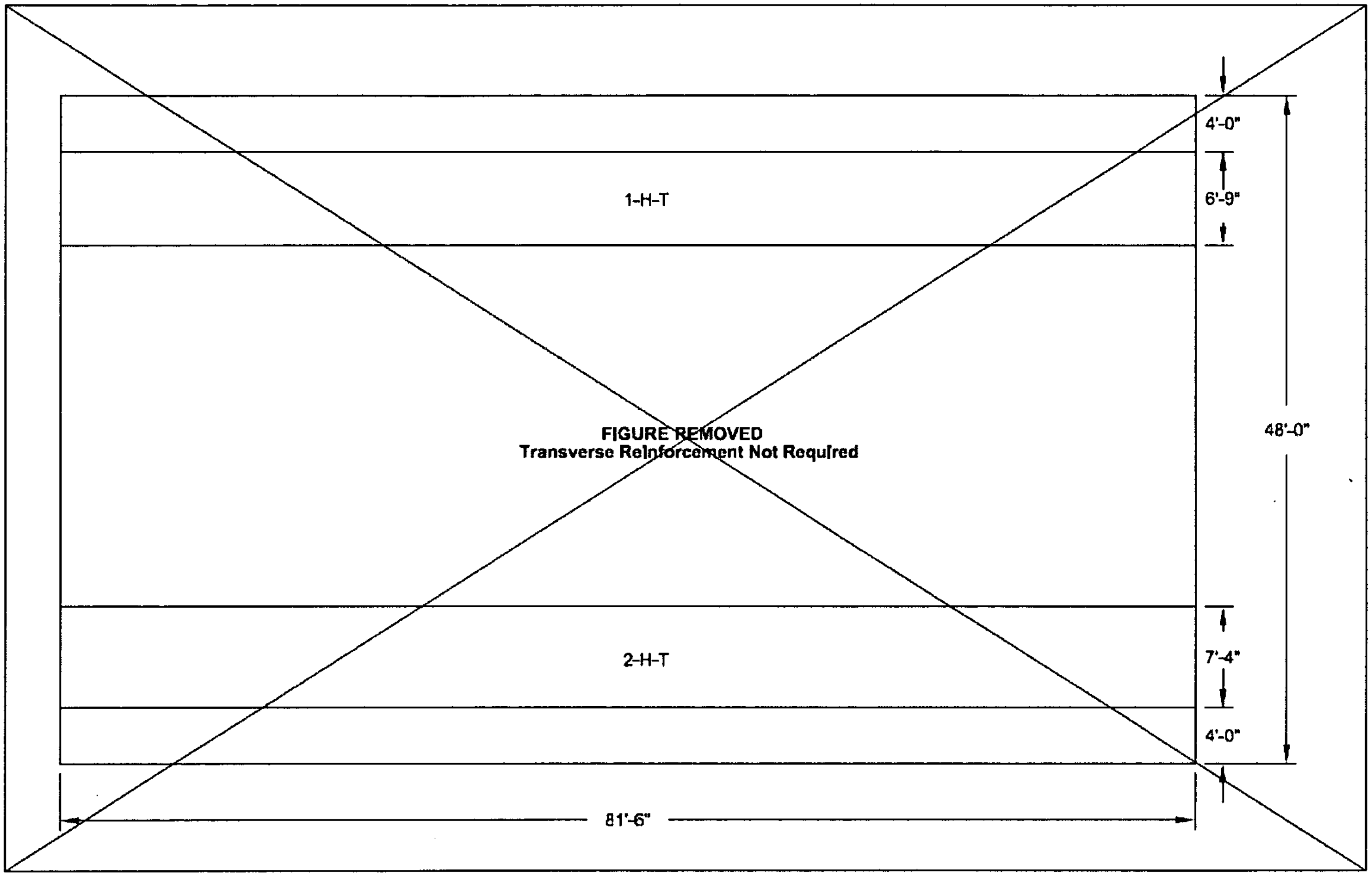


Figure 3H.6-146 ~~Slab 1 Looking Down Transverse Reinforcement Zones~~ Not Used

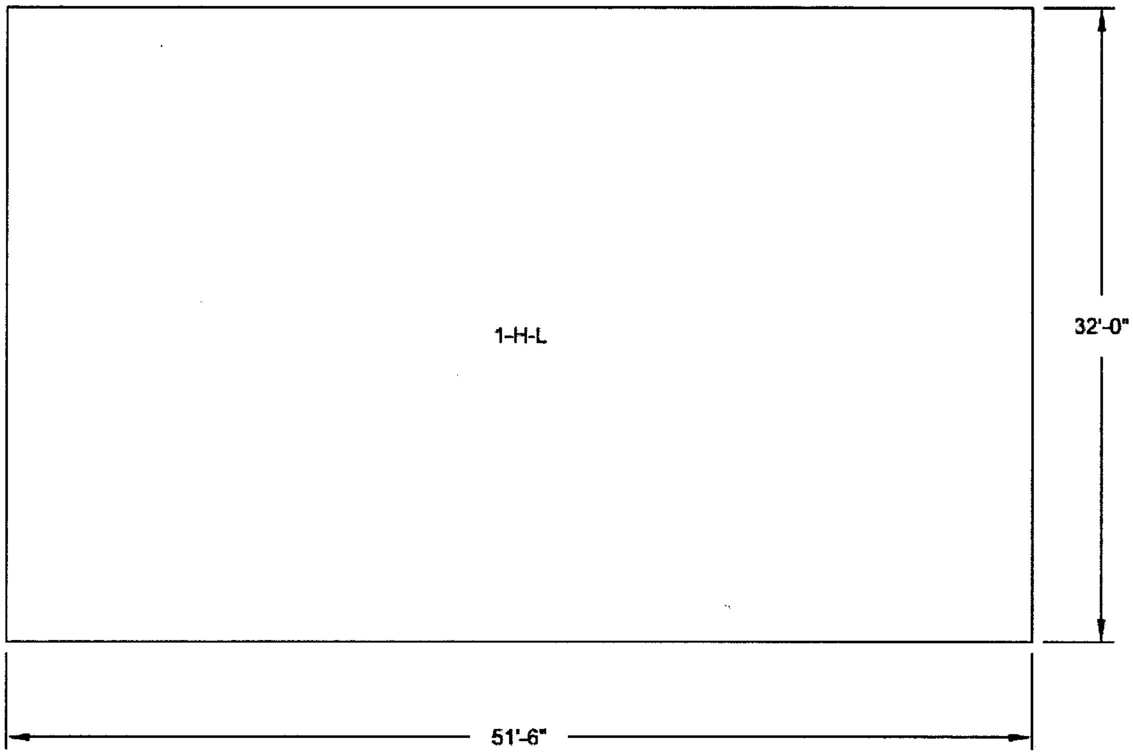


Figure 3H.6-147 Roof 2 Looking Down Horizontal Reinforcement Zones Near Side Face

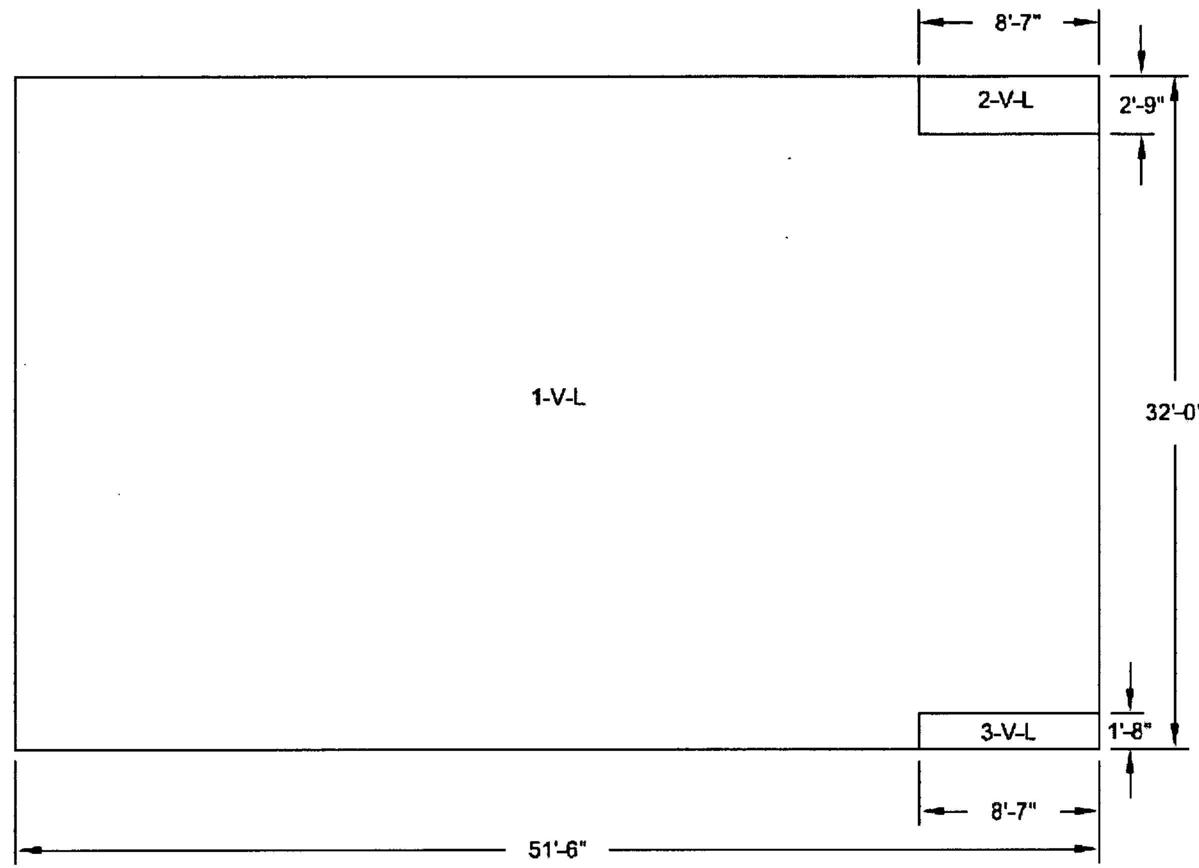


Figure 3H.6-148 Roof 2 Looking Down Vertical Reinforcement Zones Near Side Face

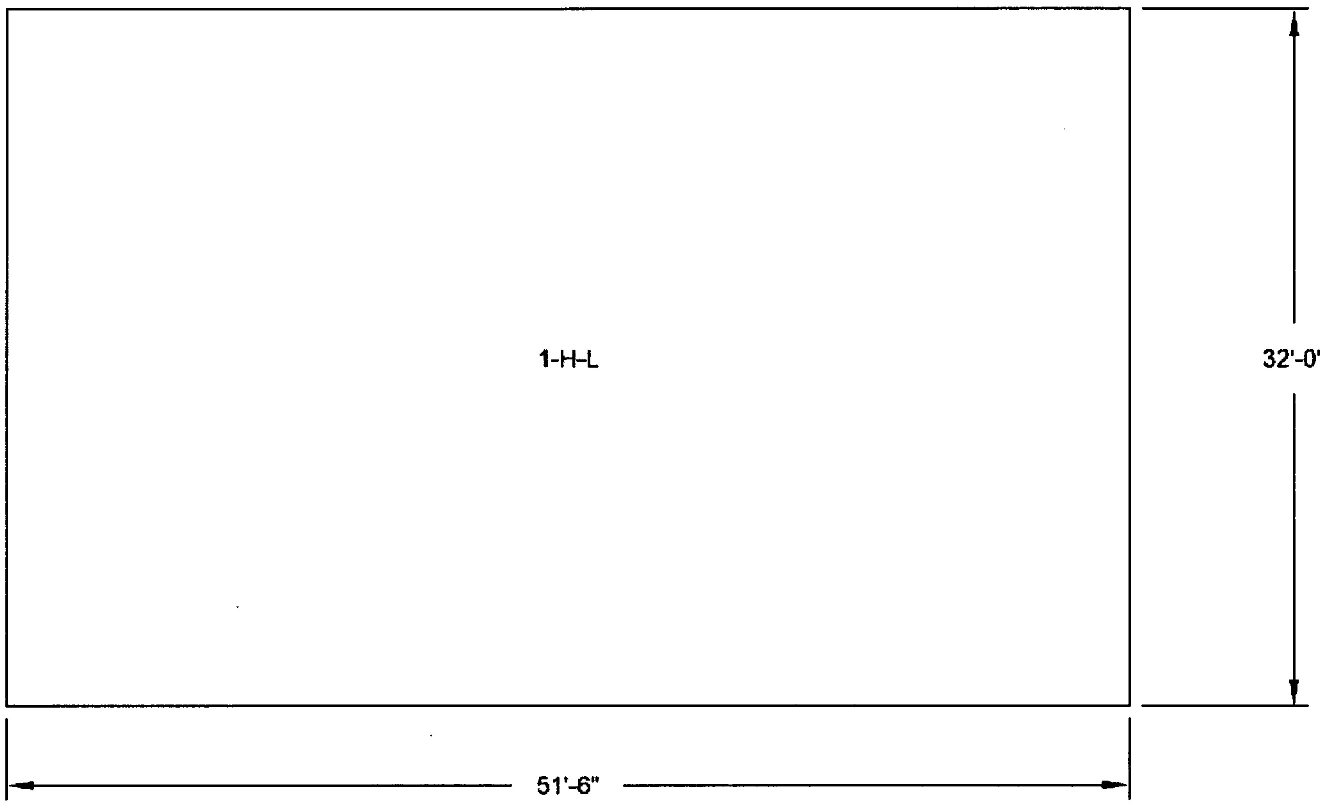


Figure 3H.6-149 Roof 2 Looking Down Horizontal Reinforcement Zones Far Side Face

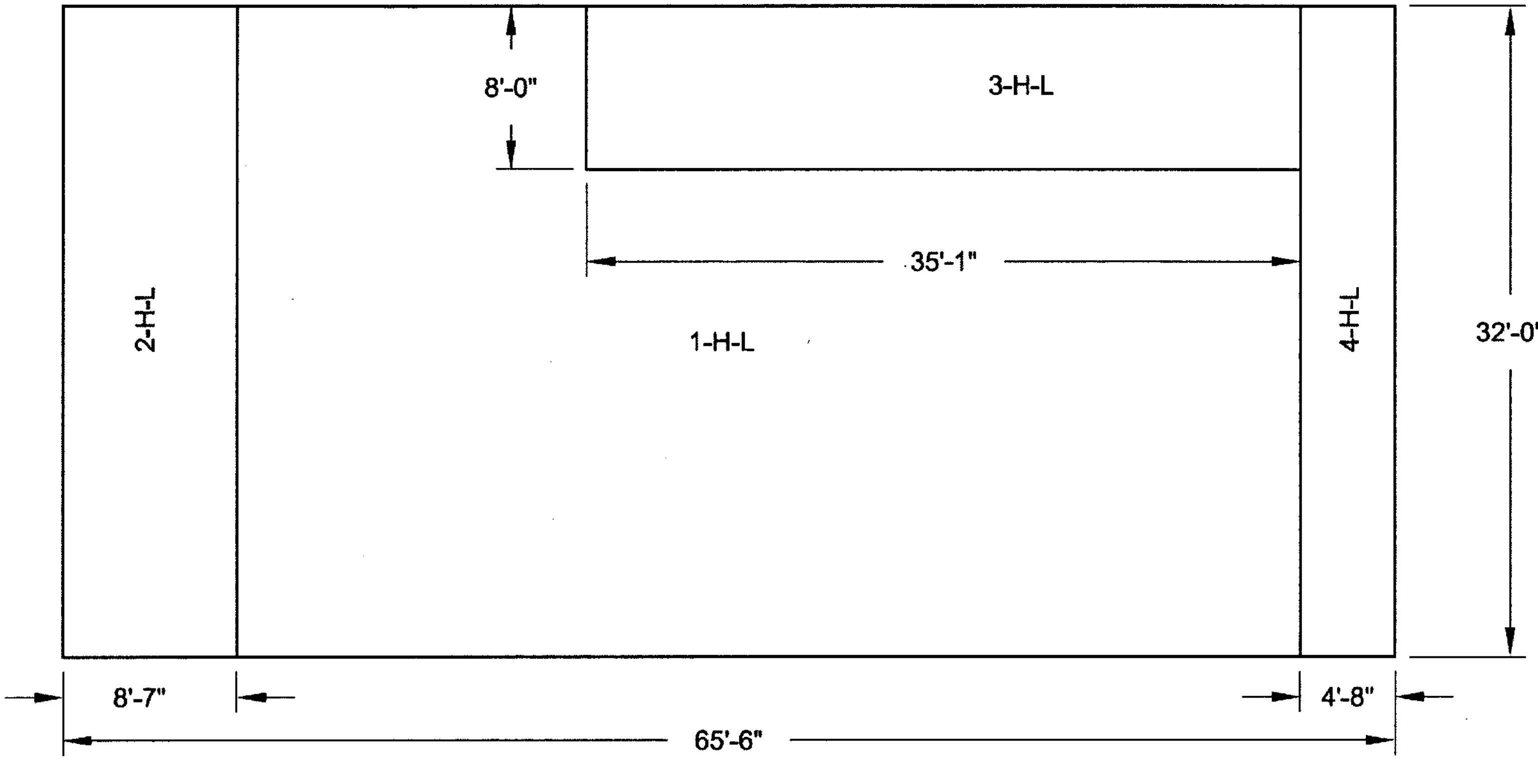


Figure 3H.6-163 Wall 7 Looking From Outside Horizontal Reinforcement Zones Near Side Face

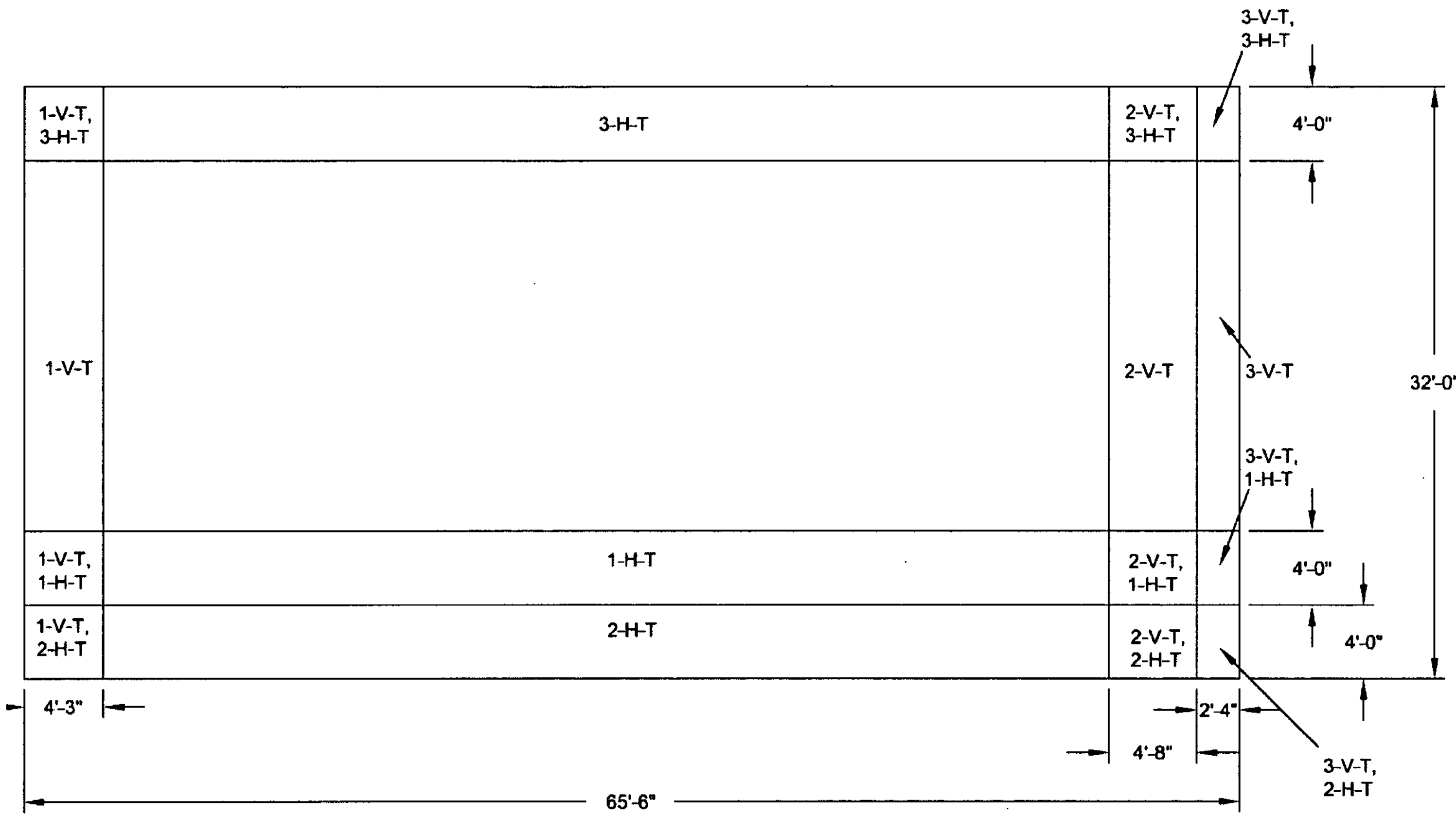


Figure 3H.6-167 Wall 7 Looking From Outside Transverse Reinforcement Zones

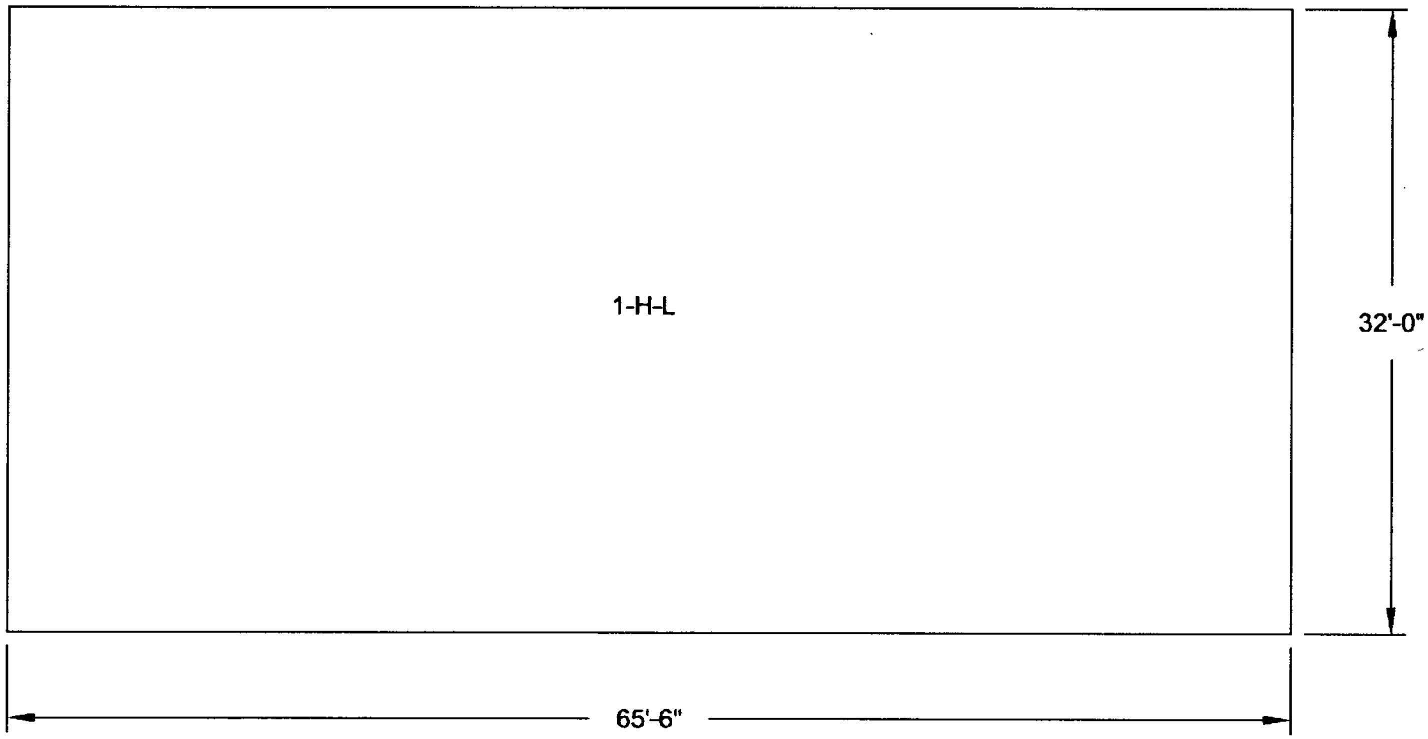


Figure 3H.6-170 Wall 8 Looking From Outside Horizontal Reinforcement Zones Far Side Face

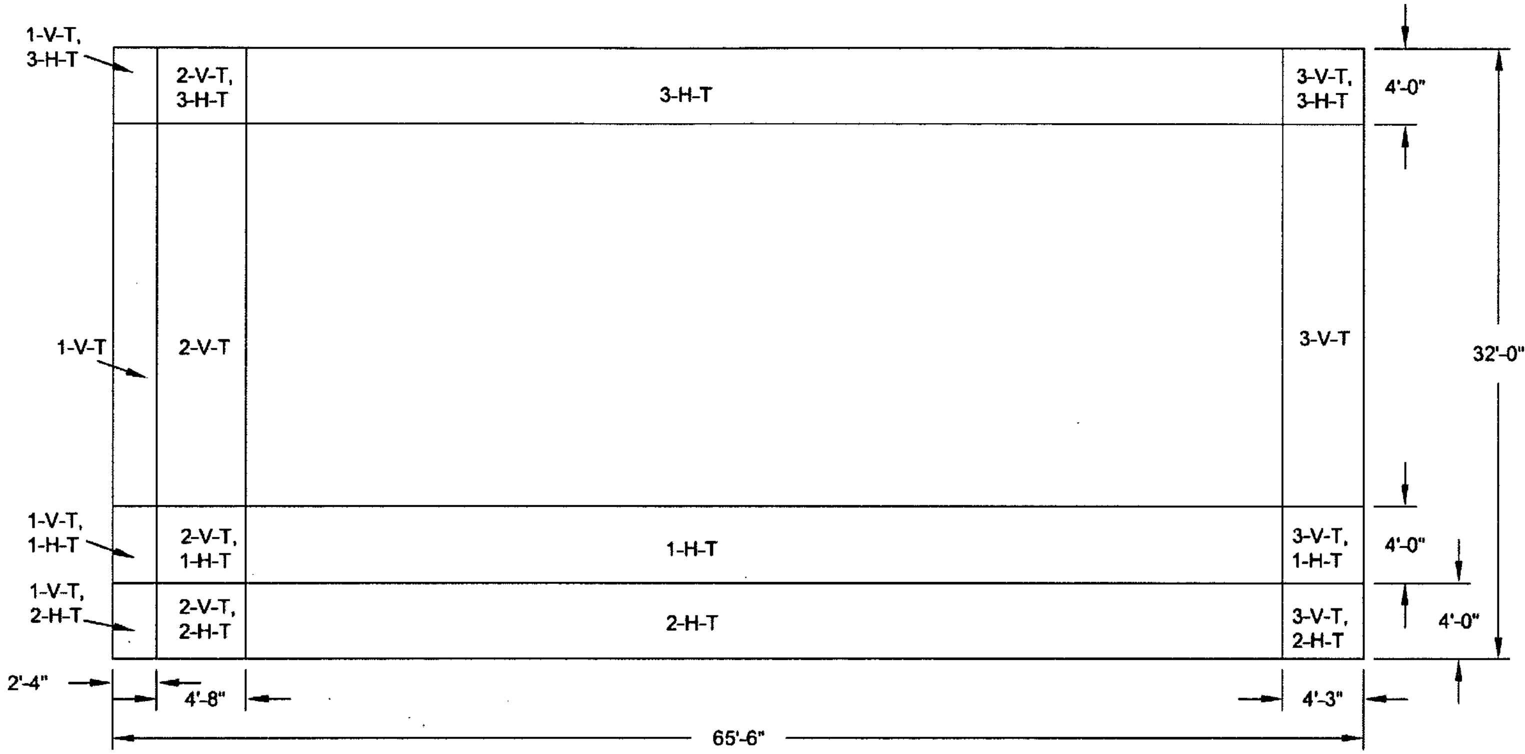


Figure 3H.6-172 Wall 8 Looking From Outside Transverse Reinforcement Zones

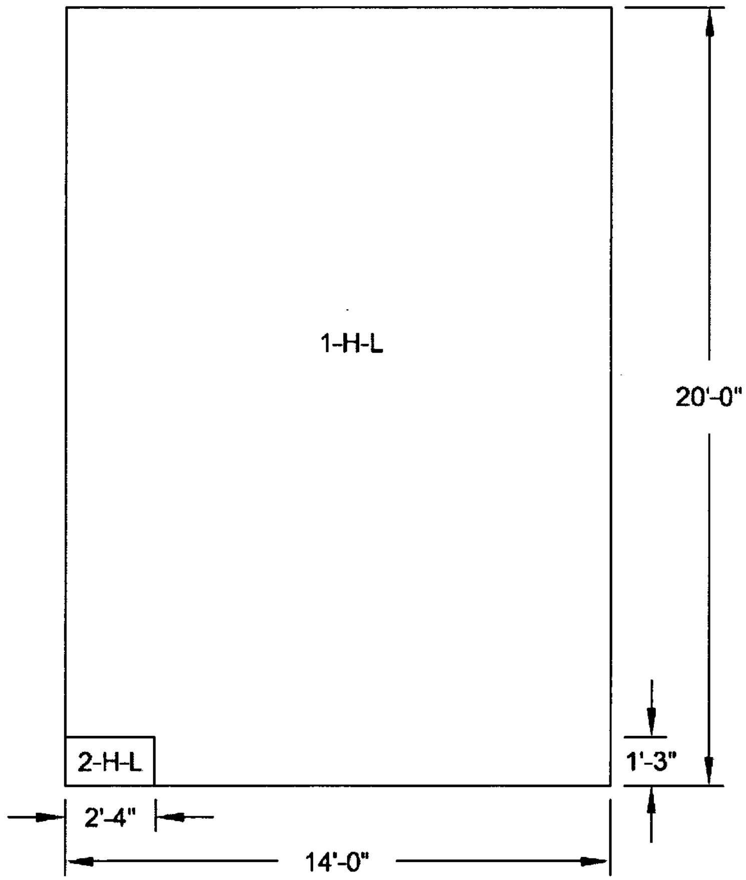


Figure 3H.6-173 Wall 9 Looking From Outside Horizontal Reinforcement Zones Near Side Face

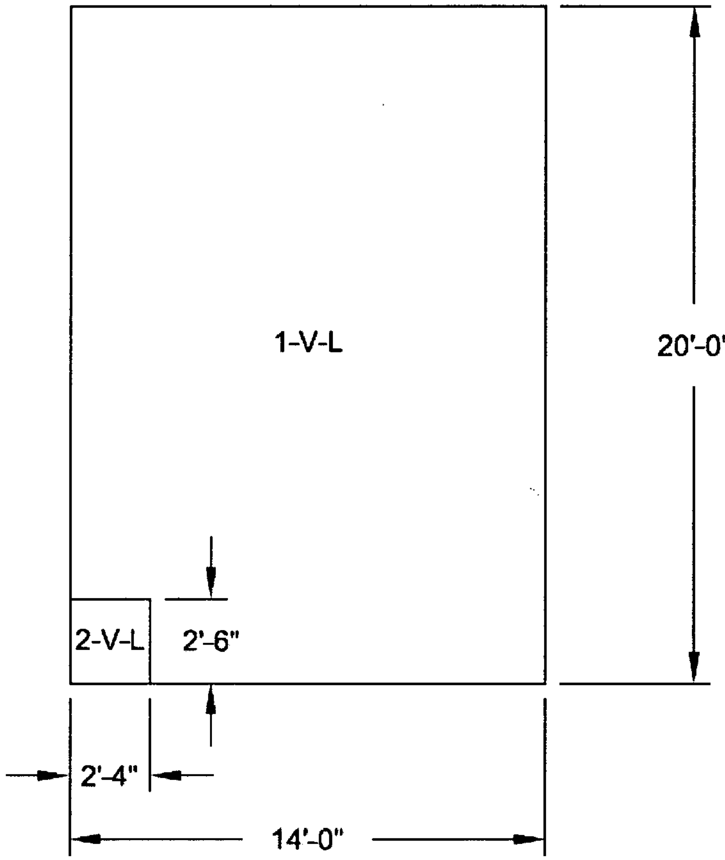


Figure 3H.6-174 Wall 9 Looking From Outside Vertical Reinforcement Zones Near Side Face

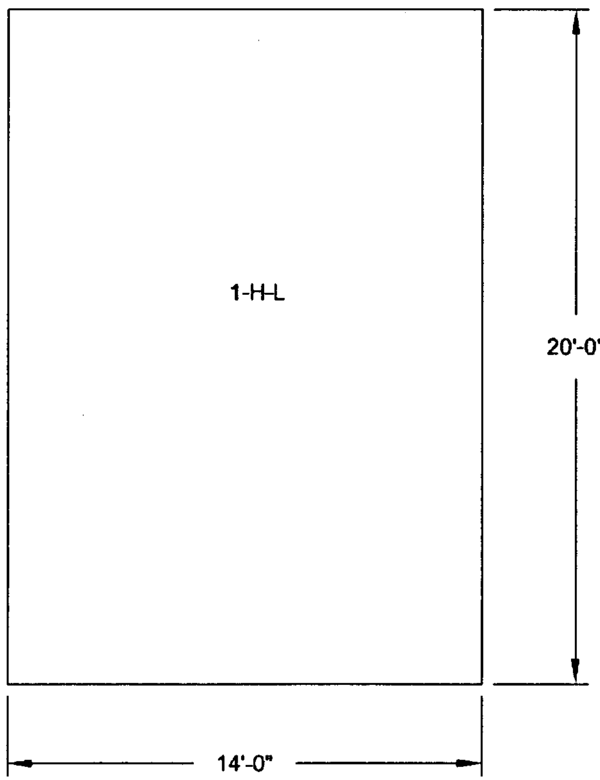


Figure 3H.6-175 Wall 9 Looking From Outside Horizontal Reinforcement Zones Far Side Face

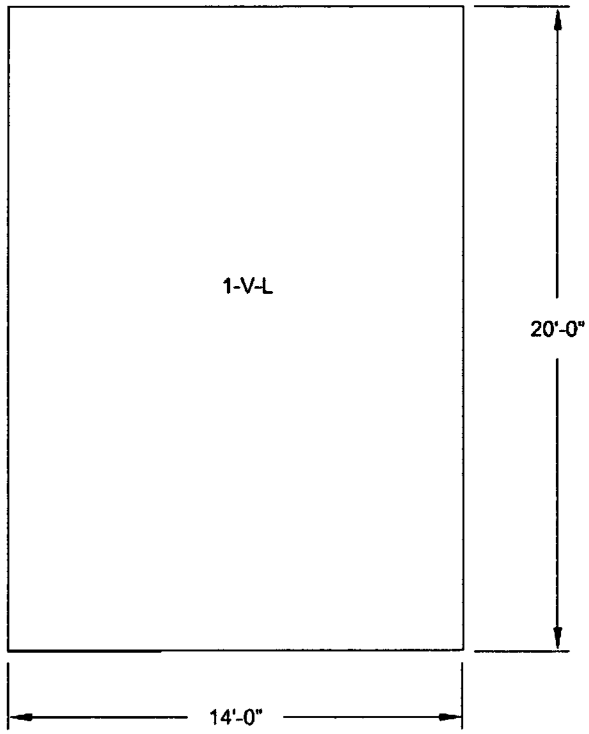


Figure 3H.6-176 Wall 9 Looking From Outside Vertical Reinforcement Zones Far Side Face

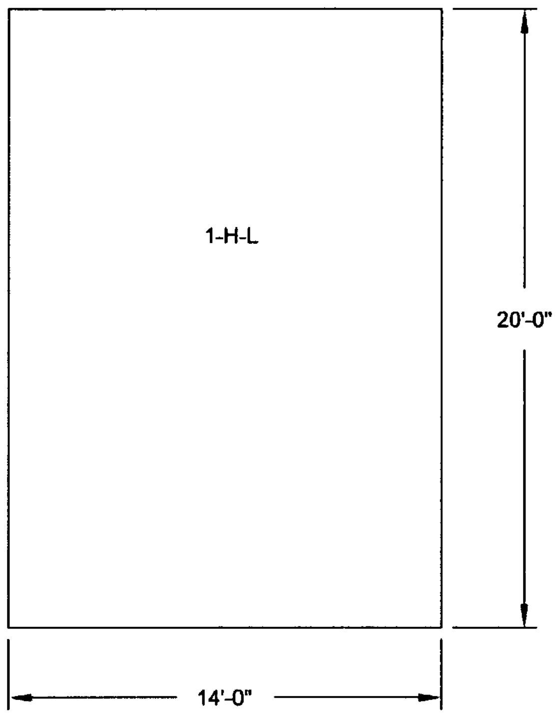


Figure 3H.6-177 Wall 10 Looking From Outside Horizontal Reinforcement Zones Near Side Face

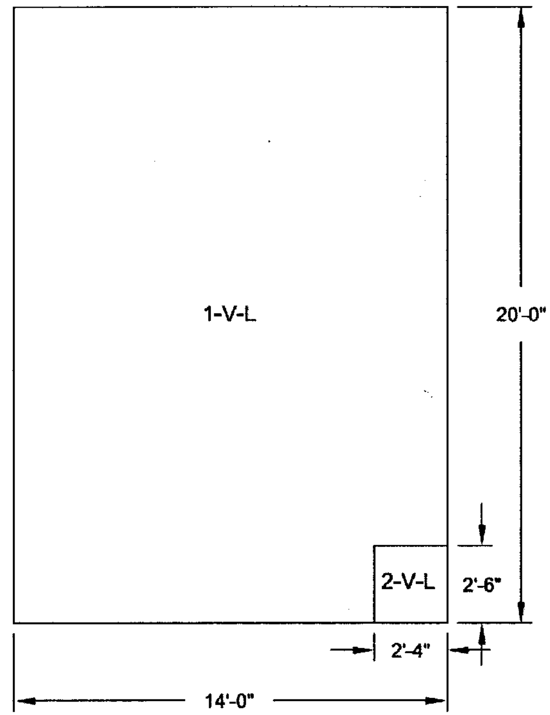


Figure 3H.6-178 Wall 10 Looking From Outside Vertical Reinforcement Zones Near Side Face

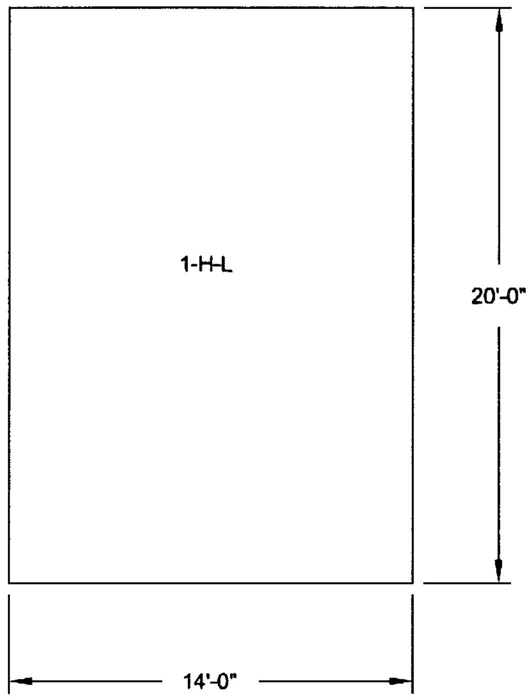


Figure 3H.6-179 Wall 10 Looking From Outside Horizontal Reinforcement Zones Far Side Face

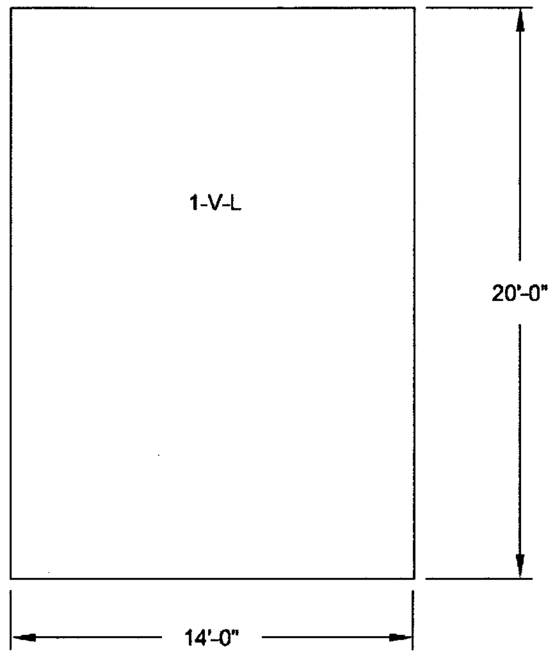


Figure 3H.6-180 Wall 10 Looking From Outside Vertical Reinforcement Zones Far Side Face

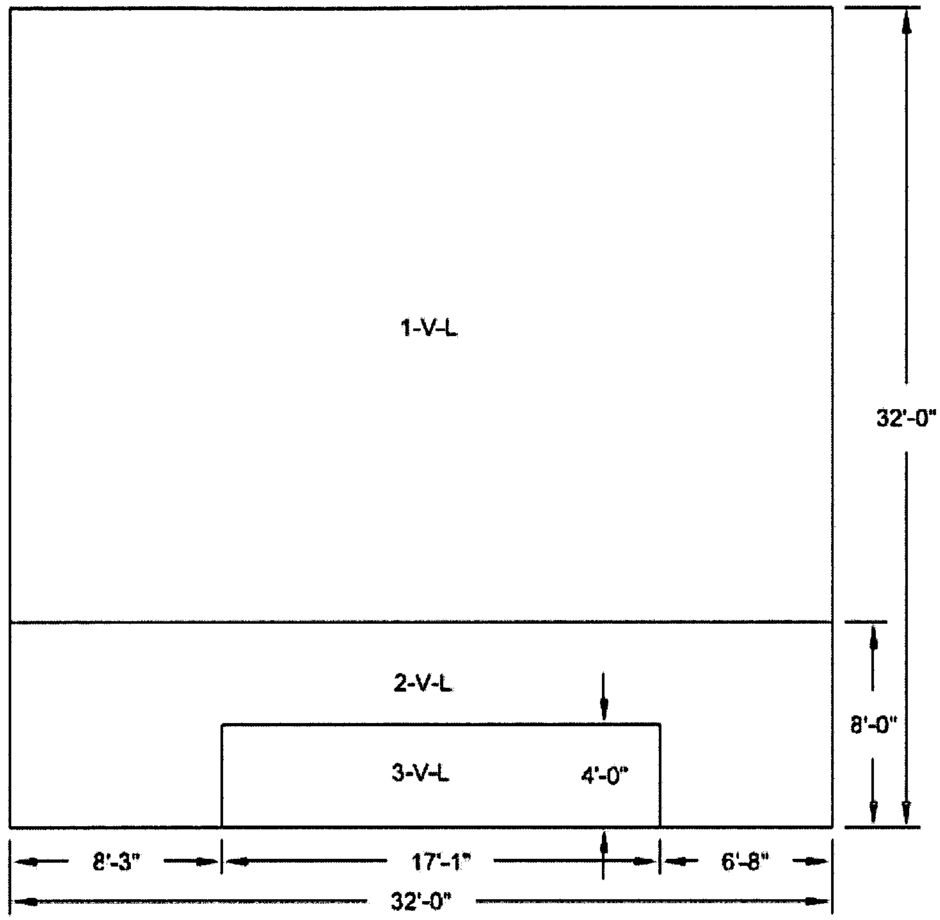


Figure 3H.6-186 Wall 12 Looking From Outside Vertical Reinforcement Zones Near Side Face

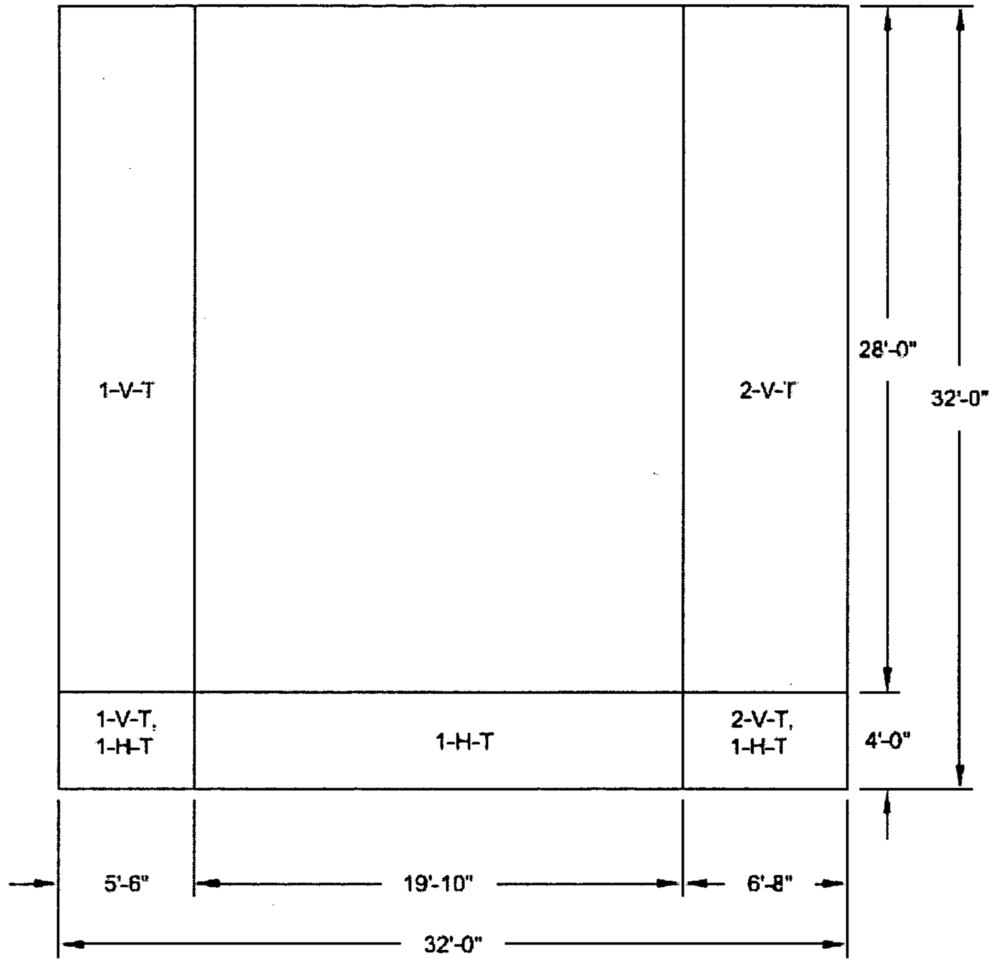


Figure 3H.6-189 Wall 12 Looking From Outside Transverse Reinforcement Zones

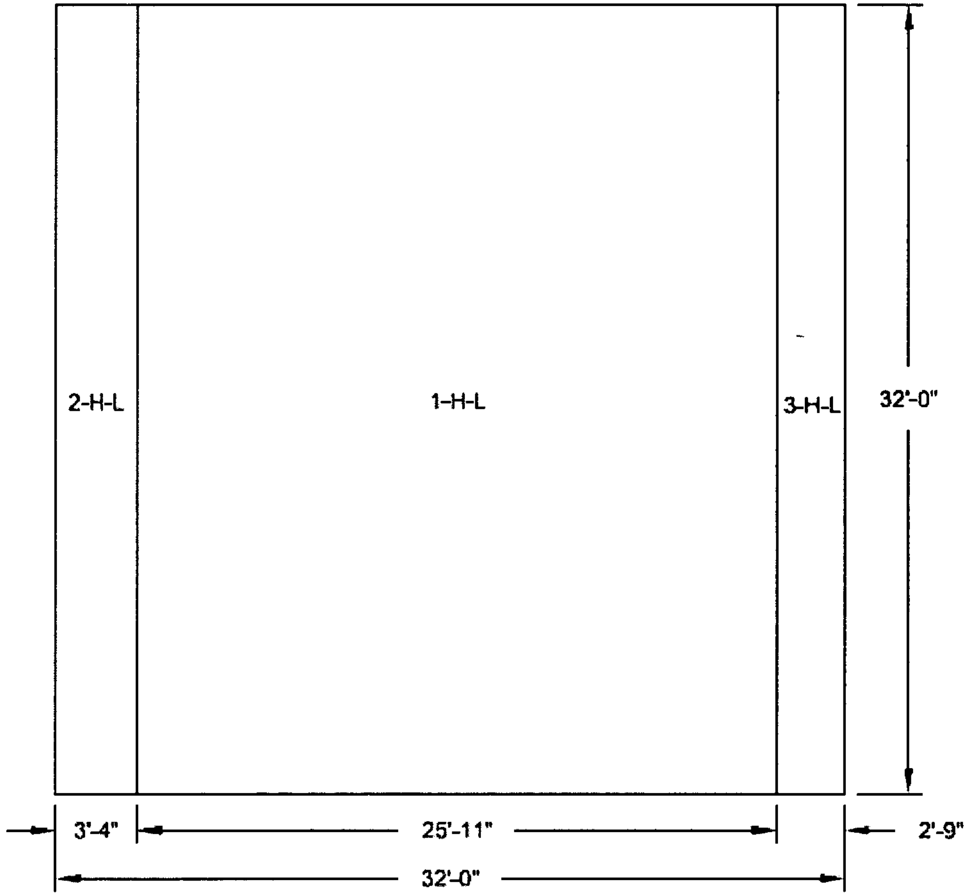


Figure 3H.6-190 Wall 13 Looking From Outside Horizontal Reinforcement Zones Near Side Face

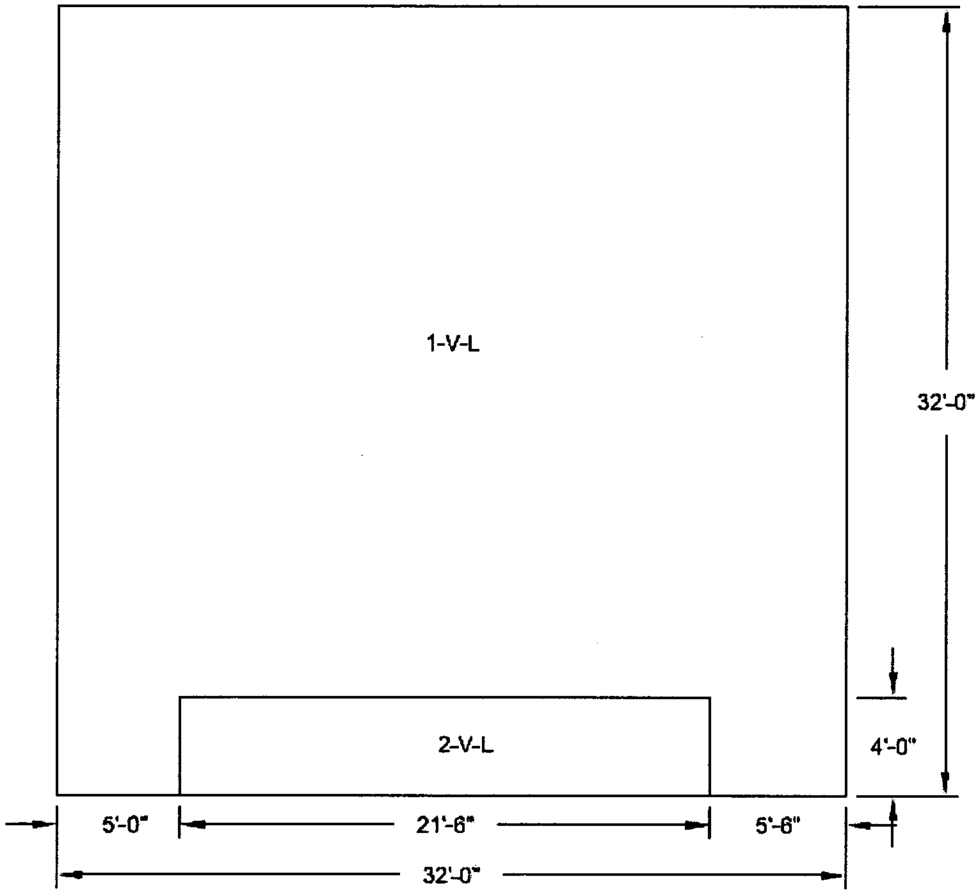


Figure 3H.6-191 Wall 13 Looking From Outside Vertical Reinforcement Zones Near Side Face

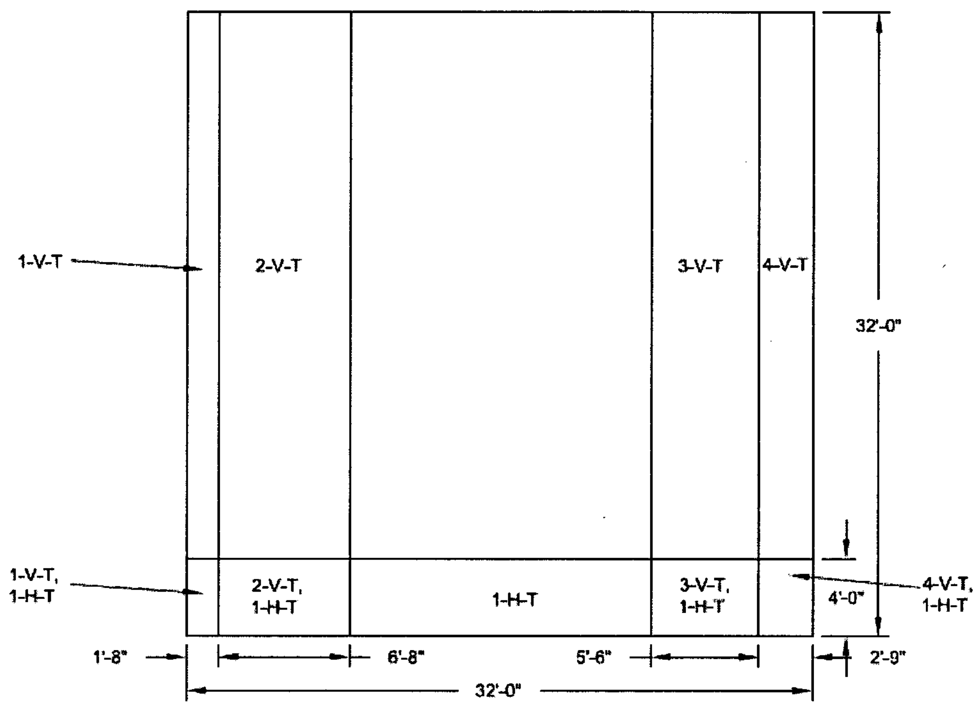


Figure 3H.6-194 Wall 13 Looking From Outside
Transverse Reinforcement Zones

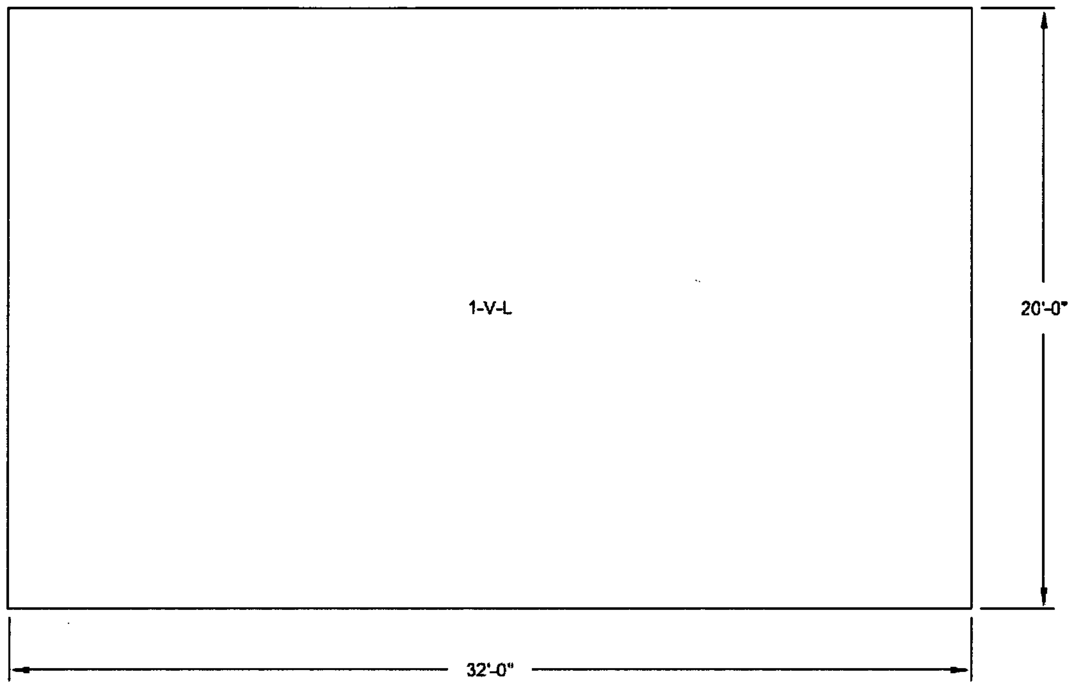


Figure 3H.6-196 Wall 14 Looking From Outside Vertical Reinforcement Zones Near Side Face

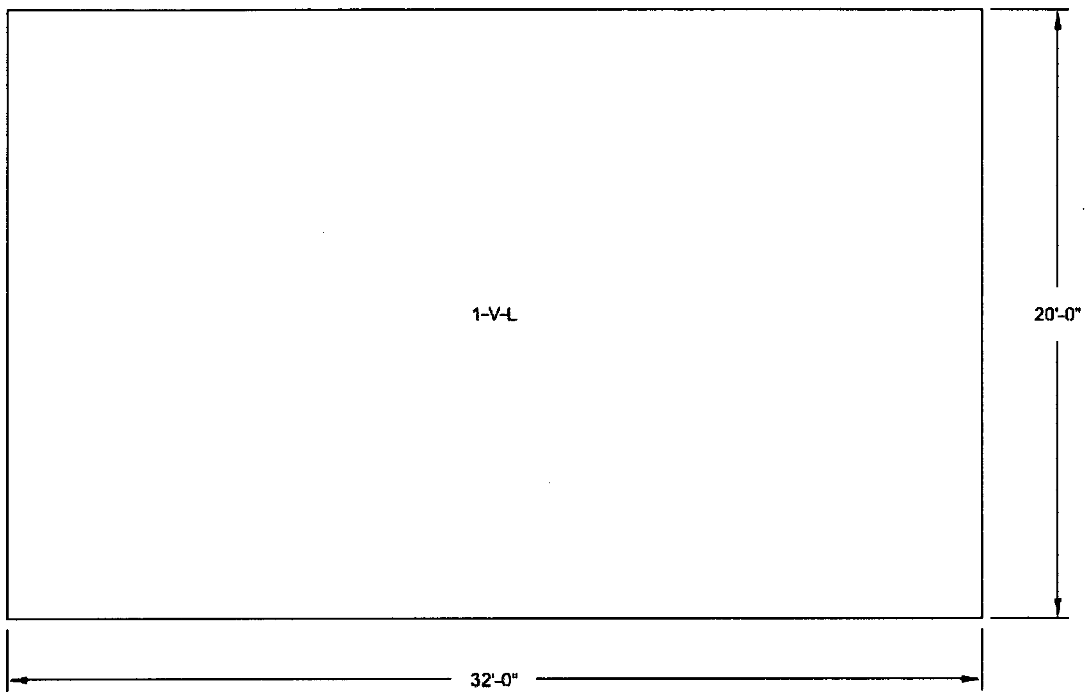


Figure 3H.6-198 Wall 14 Looking From Outside Vertical Reinforcement Zones Far Side Face

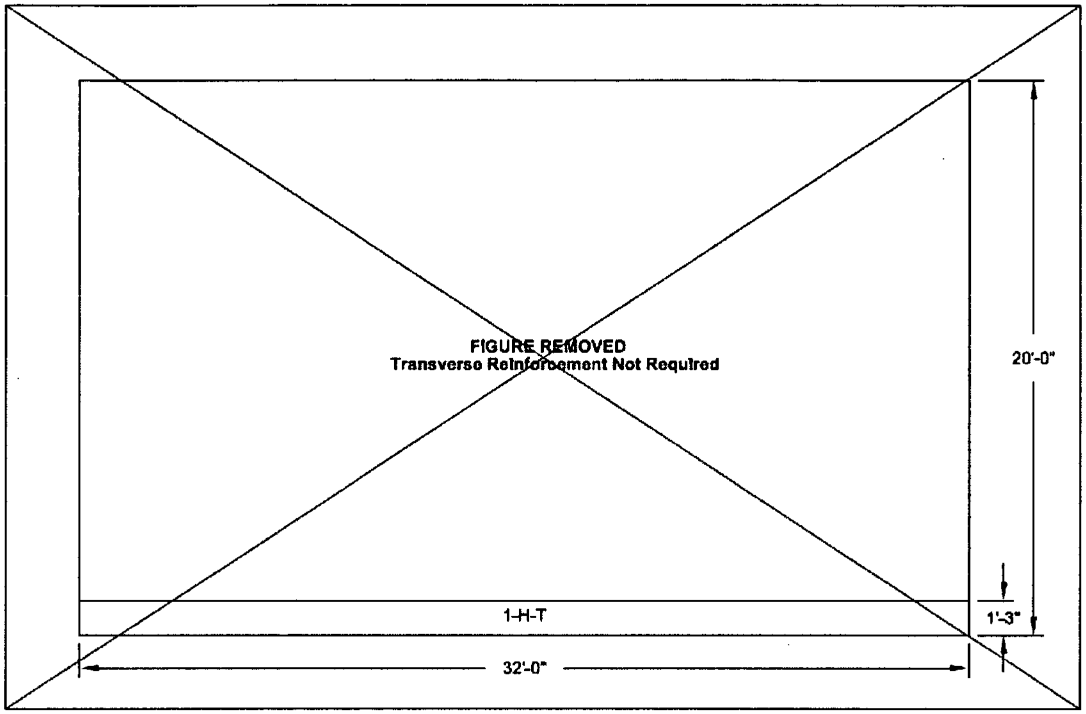


Figure 3H.6-199 ~~Wall 14 Looking From Outside Transverse Reinforcement Zones~~ Not Used

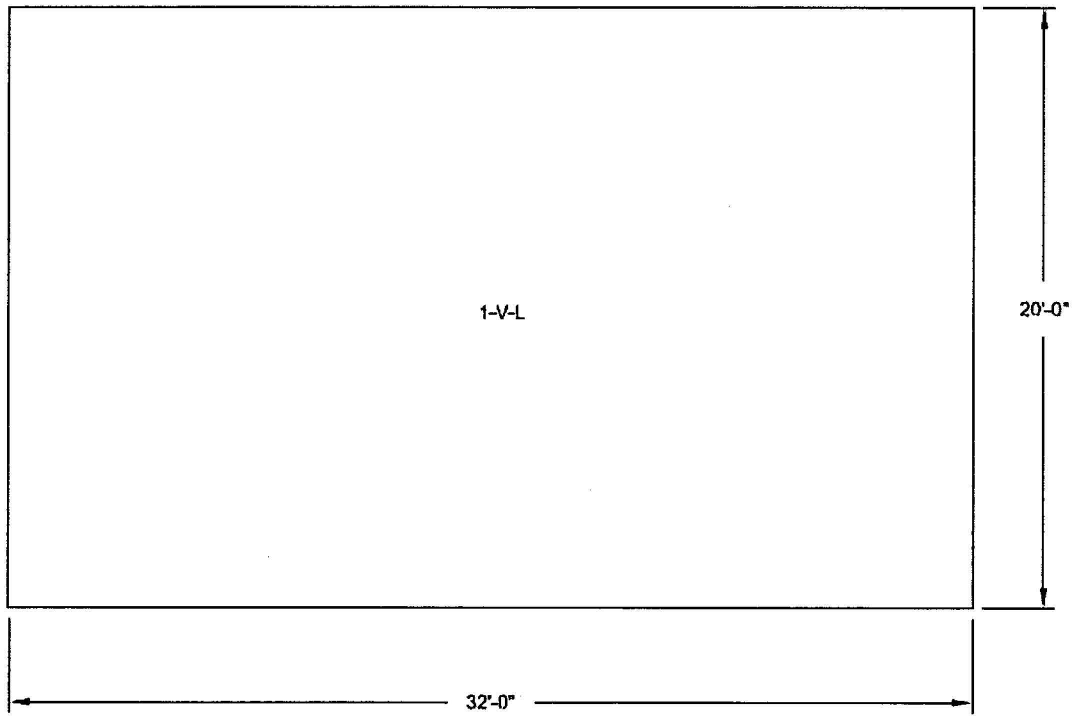


Figure 3H.6-201 Wall 15 Looking From Outside Vertical Reinforcement Zones Near Side Face

Enclosure 4

Revision to COLA Section 3H.7

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 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 Pheonemena", 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, Ddesign 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/m3)
- Unit weight (saturated):...140 pcf (2.24 t/m3)
- 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.7-8.

~~**3H.7.4.3.1.4 Thermal Load**~~

~~The DGFOT is primarily below grade. The temperature of the DGFOT will remain essentially constant with the temperature of the surrounding soil. Therefore the thermal load condition is not applicable to the DGFOT.~~

3H.7.4.3.1.54 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).

~~as shown in Table 2.0-2 as the ABWR Standard Plant Site Parameter.~~

- 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-800 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 is considered at 8 ft depth for site-specific soil and backfill cases and 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 instead of 0.48. 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. The input motions consistent with RG 1.60 response spectra anchored at 0.3g peak ground acceleration envelop both the site-specific input motions and the amplified site-specific motions considering the impact of nearby heavy RB and Ultimate Heat Sink (UHS)/Reactor Service Water (RSW) Pump House.

- 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. The induced forces at the tunnel bends 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.

~~The forces at bends due to SSE wave propagation are determined based on Section 3.5.2.2 of ASCE 4-98.~~

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 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 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.

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					Longitudinal Reinforcement Provided (in²/ ft)	Transverse Shear Design Loads		Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads						
								Loads (11) Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Loads (11) Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)		
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	-	-	-	

Table 3H.7-1: Results of DGFOT Concrete Wall and Slab Design (Continued)

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 Loads: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
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	-	-	-	

Table 3H.7-1: Results of DGFOT Concrete Wall and Slab Design (Continued)

Location	Thickness (ft)	Face	Direction	Reinforcement Layout Drawing Number (1,8)	Reinforcement Zone Number (2)	Maximum Forces (3)	Element	Longitudinal Reinforcement Design Loads					Longitudinal Reinforcement Provided (in²/ft)	Transverse Shear Design Loads		Transverse Shear (7) Reinforcement Provided (in²/ft²)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads						
								Loads (11) Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Loads (11) Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)		
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-H-T	-	-	-	-	-	-	-	-	D + L + H + Wt	47	0.31	

Table 3H.7-1: Results of DGFOT Concrete Wall and Slab Design (Continued)

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 (in^2/ ft)	Transverse Shear Design Loads: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear (7) Reinforcement Provided (in^2/ft^2)	Remarks
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							

Table 3H.7-1: Results of DGFOT Concrete Wall and 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 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) The reported transverse shear is the maximum average transverse shear along a plane in that transverse reinforcement zone.

(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 + Wt	1.10	1.10	--	2, 4
D + H' + E'	1.30	1.28	--	2, 3

Notes:

1) Loads D, H, H', W, Wt, 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.

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.

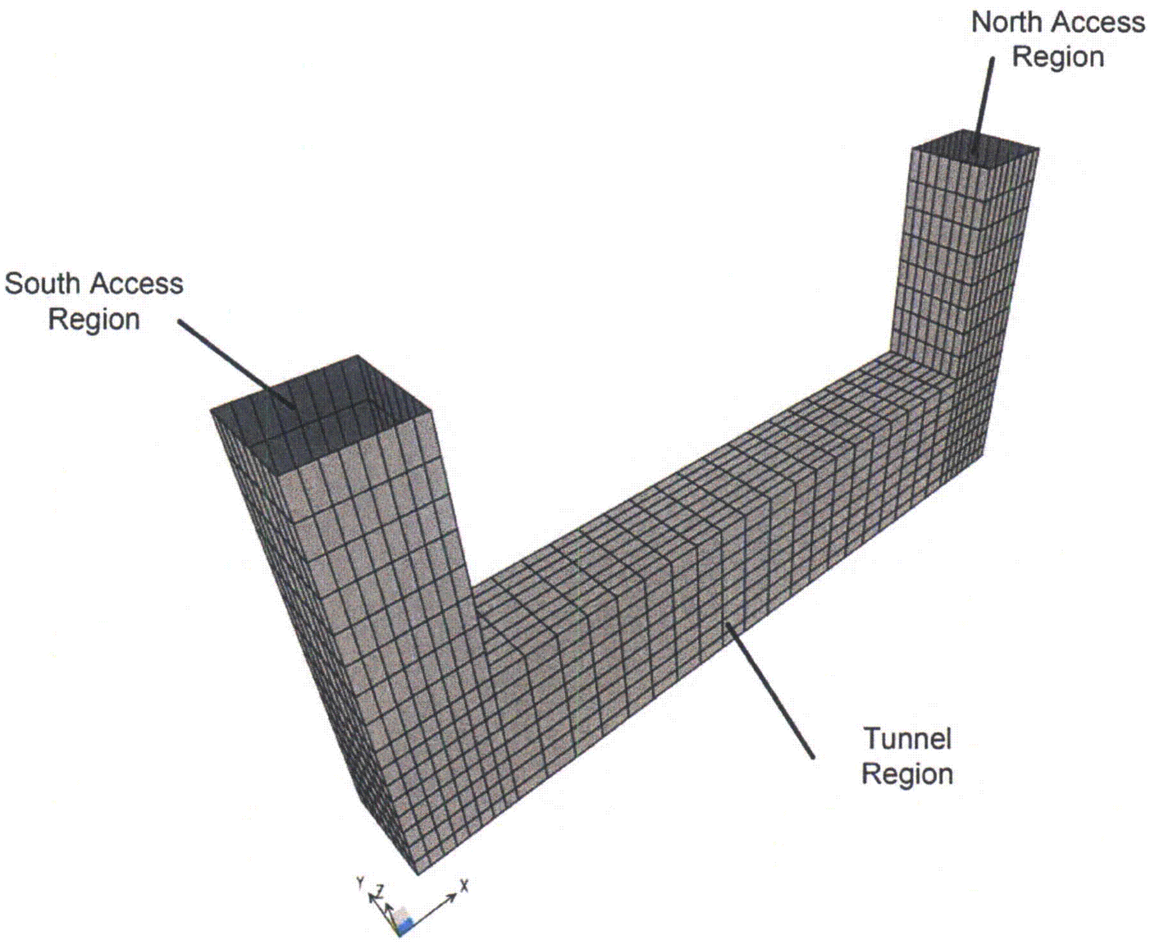


Figure 3H.7-1: SAP2000 Finite Element Analysis Model for DGFOT

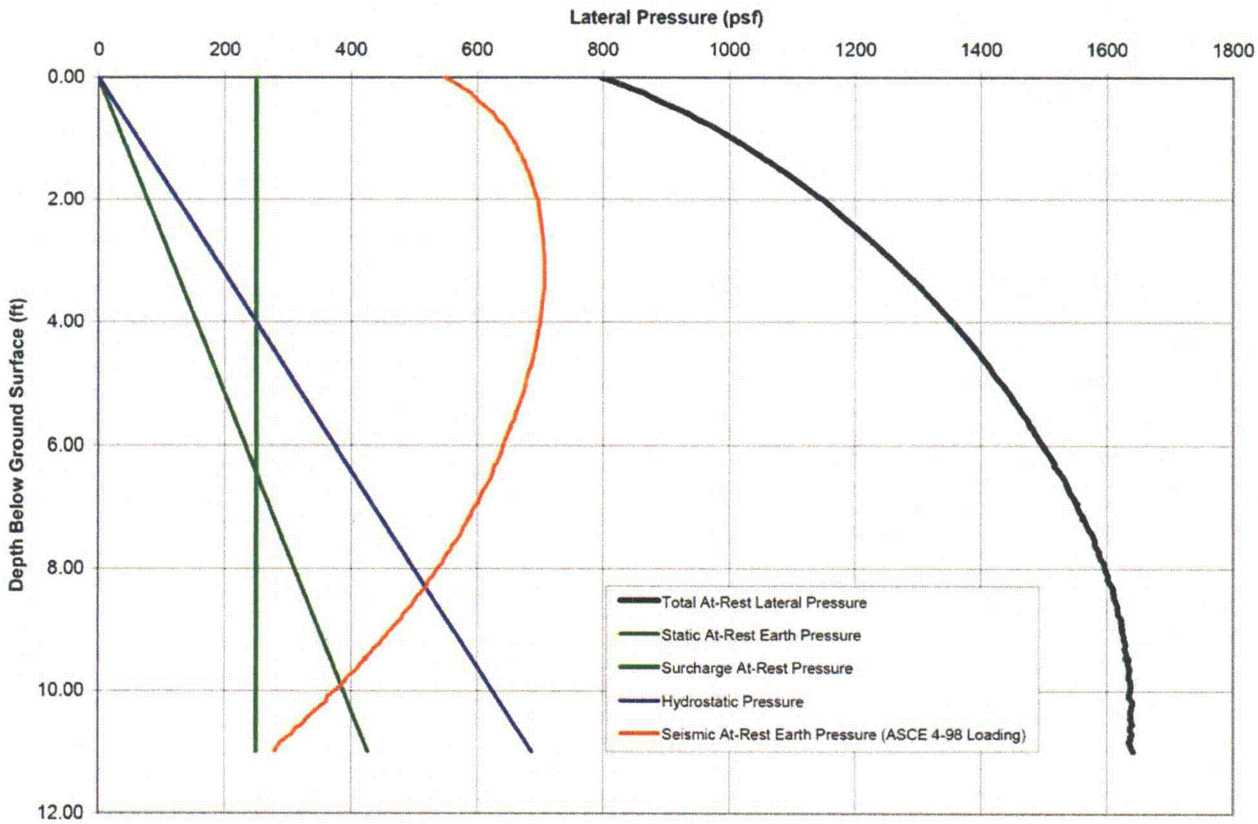


Figure 3H.7-2: At-Rest Lateral Earth Pressure (psf) on the Walls of the Fuel Oil Tunnel

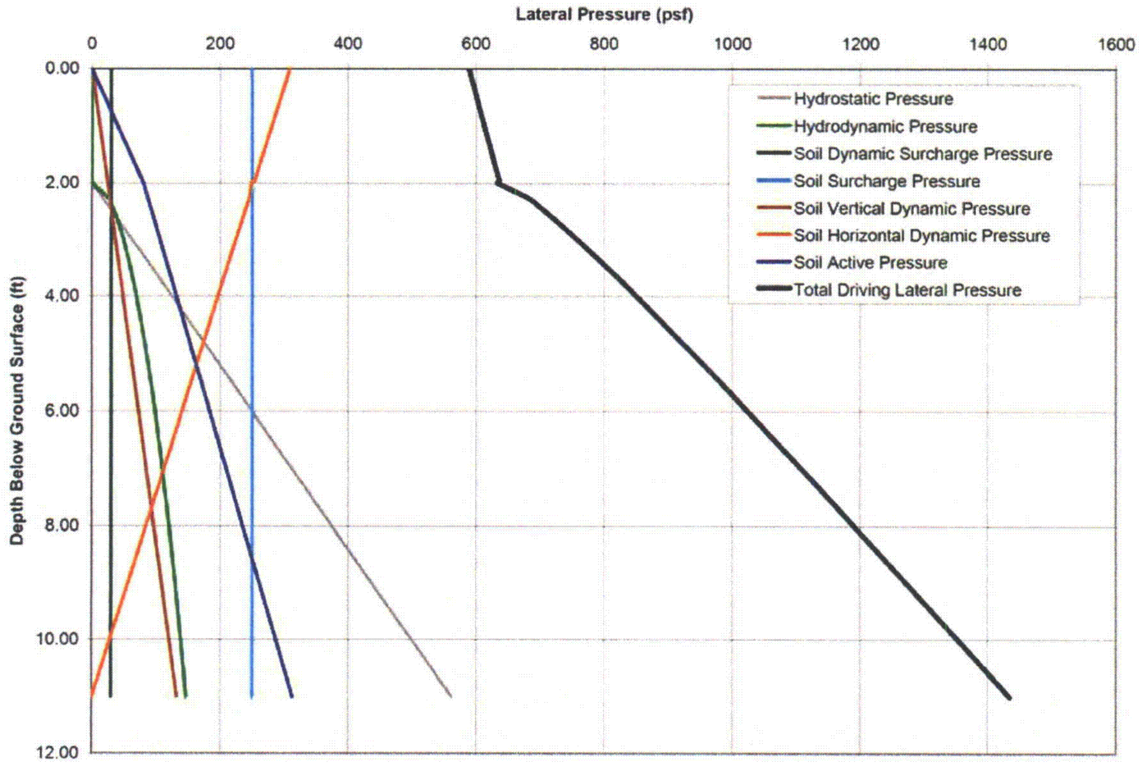


Figure 3H.7-3: Driving Lateral Earth Pressure (psf) on the Walls of the Fuel Oil Tunnel

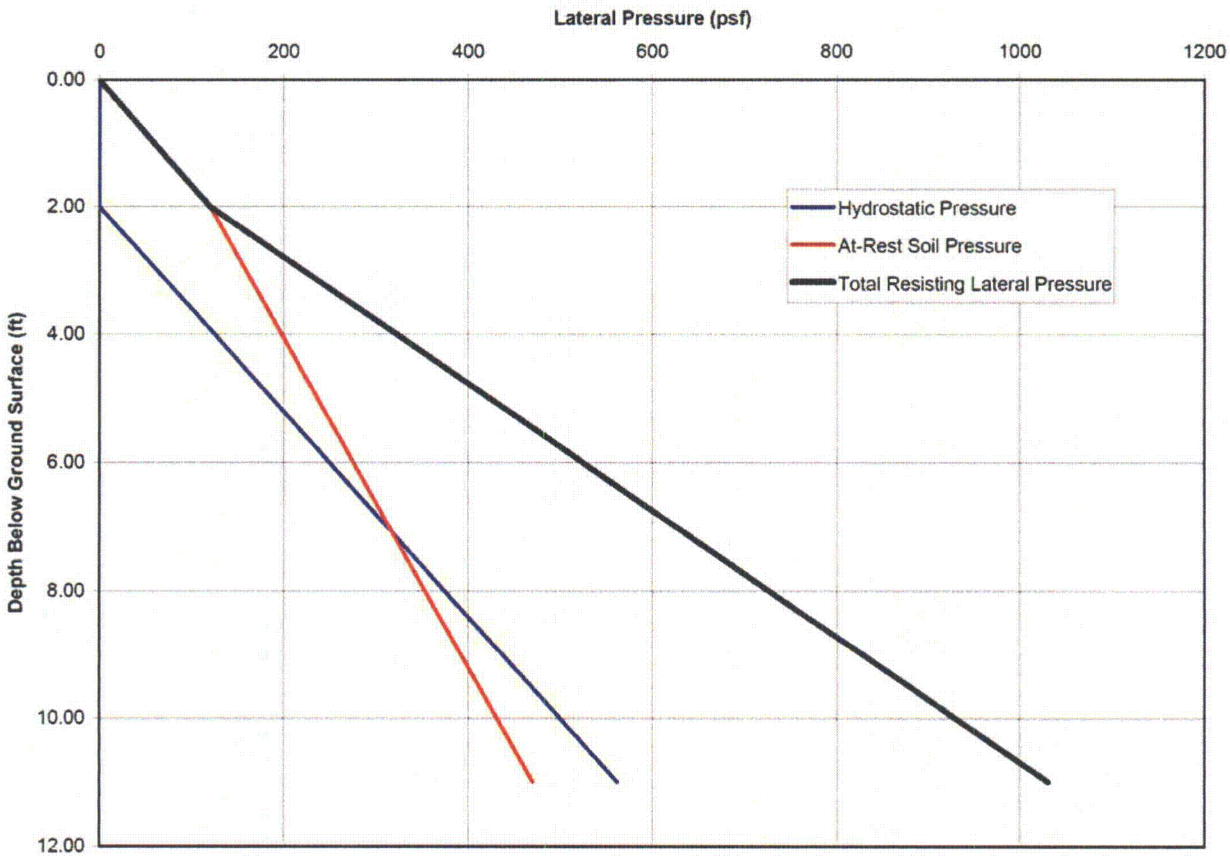


Figure 3H.7-4: Resisting Lateral Earth Pressure (psf) on the Walls of the Fuel Oil Tunnel

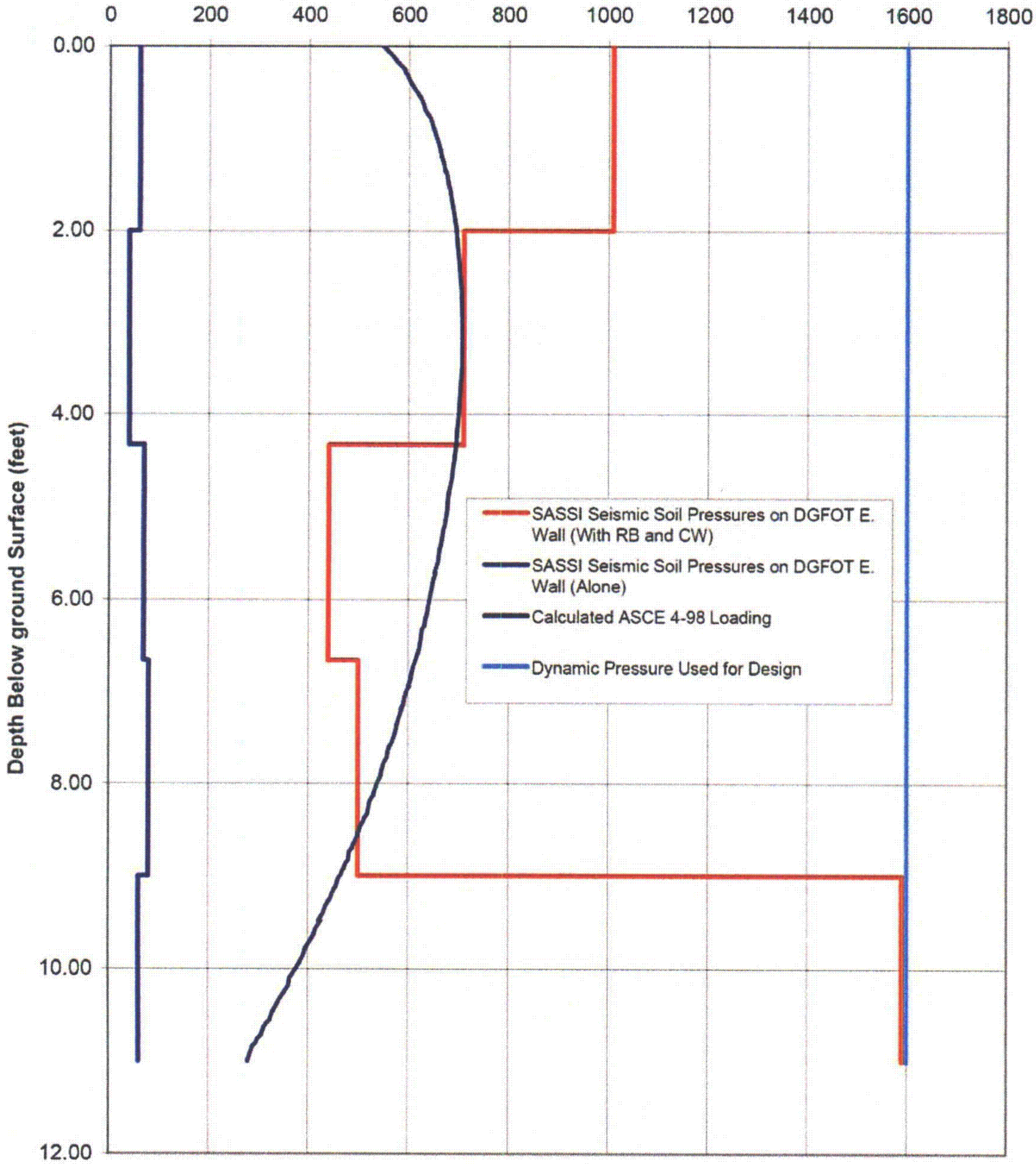


Figure 3H.7-5: SSI, SSSI, ASCE 4-98 and Design Lateral Seismic Soil Pressures (psf) on Fuel Oil Tunnel East Wall with Reactor Building and Crane Wall

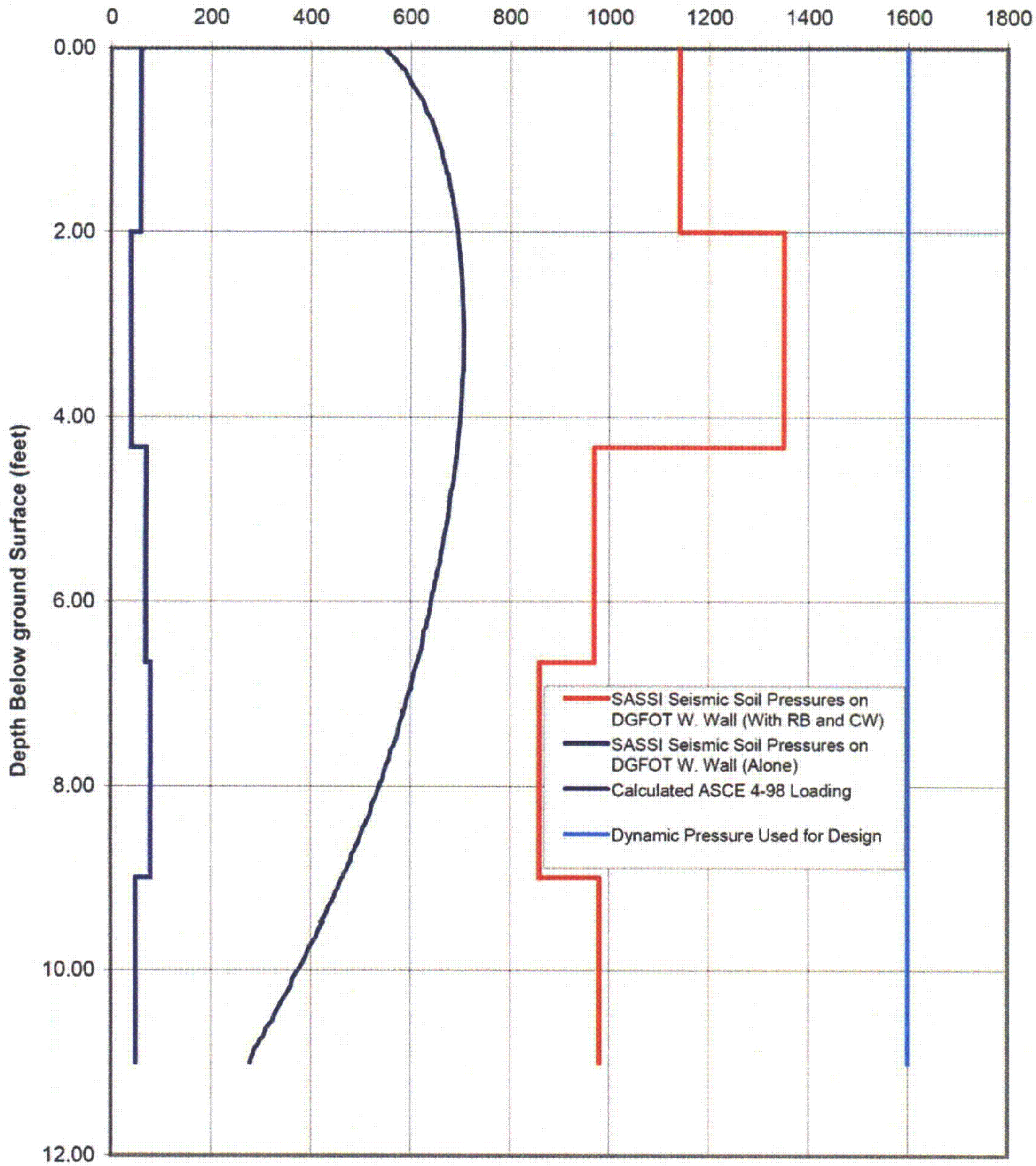


Figure 3H.7-6: SSI, SSSI, ASCE 4-98 and Design Lateral Seismic Soil Pressures (psf) on Fuel Oil Tunnel West Wall with Reactor Building and Crane Wall

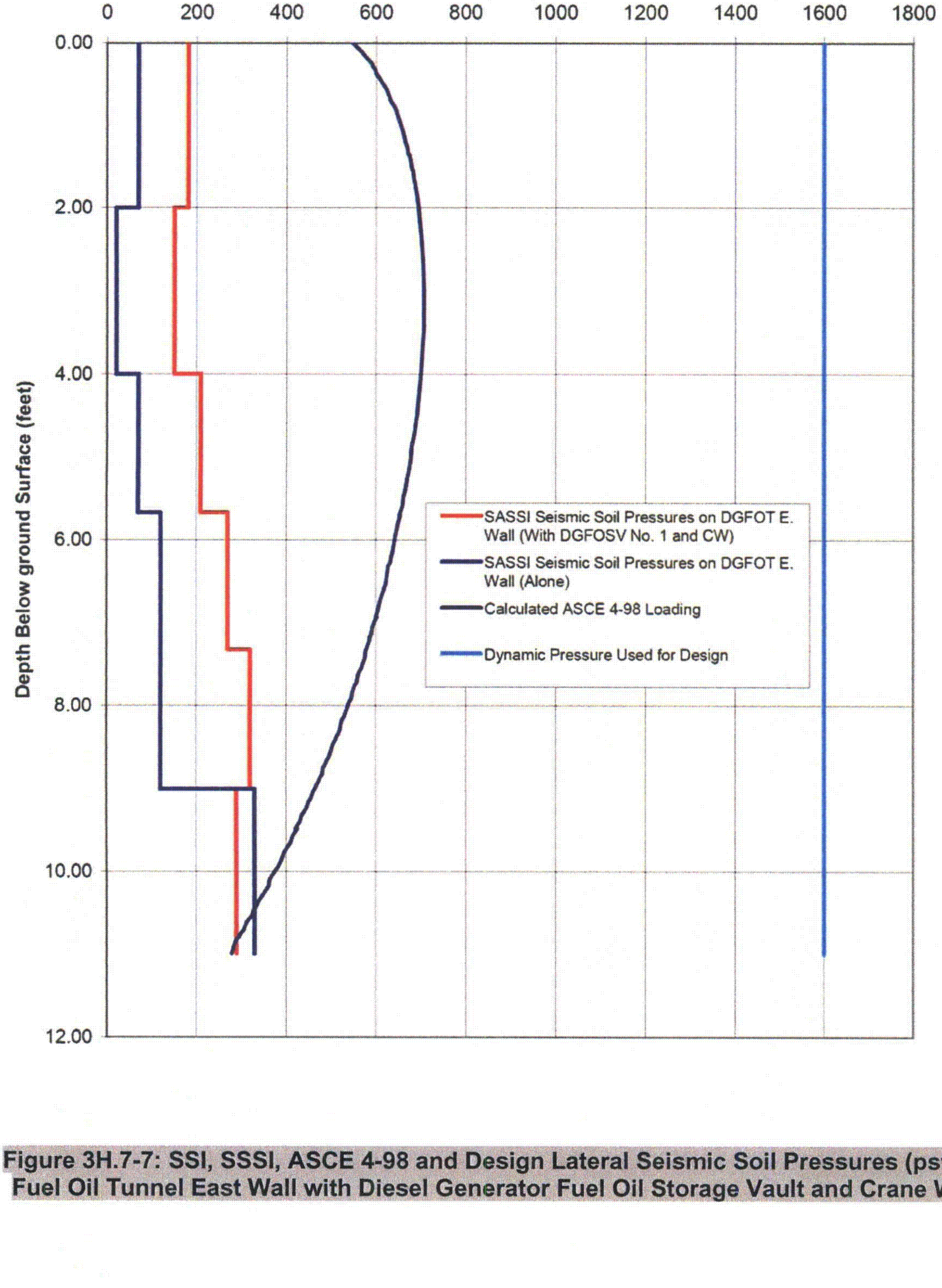


Figure 3H.7-7: SSI, SSSI, ASCE 4-98 and Design Lateral Seismic Soil Pressures (psf) on Fuel Oil Tunnel East Wall with Diesel Generator Fuel Oil Storage Vault and Crane Wall

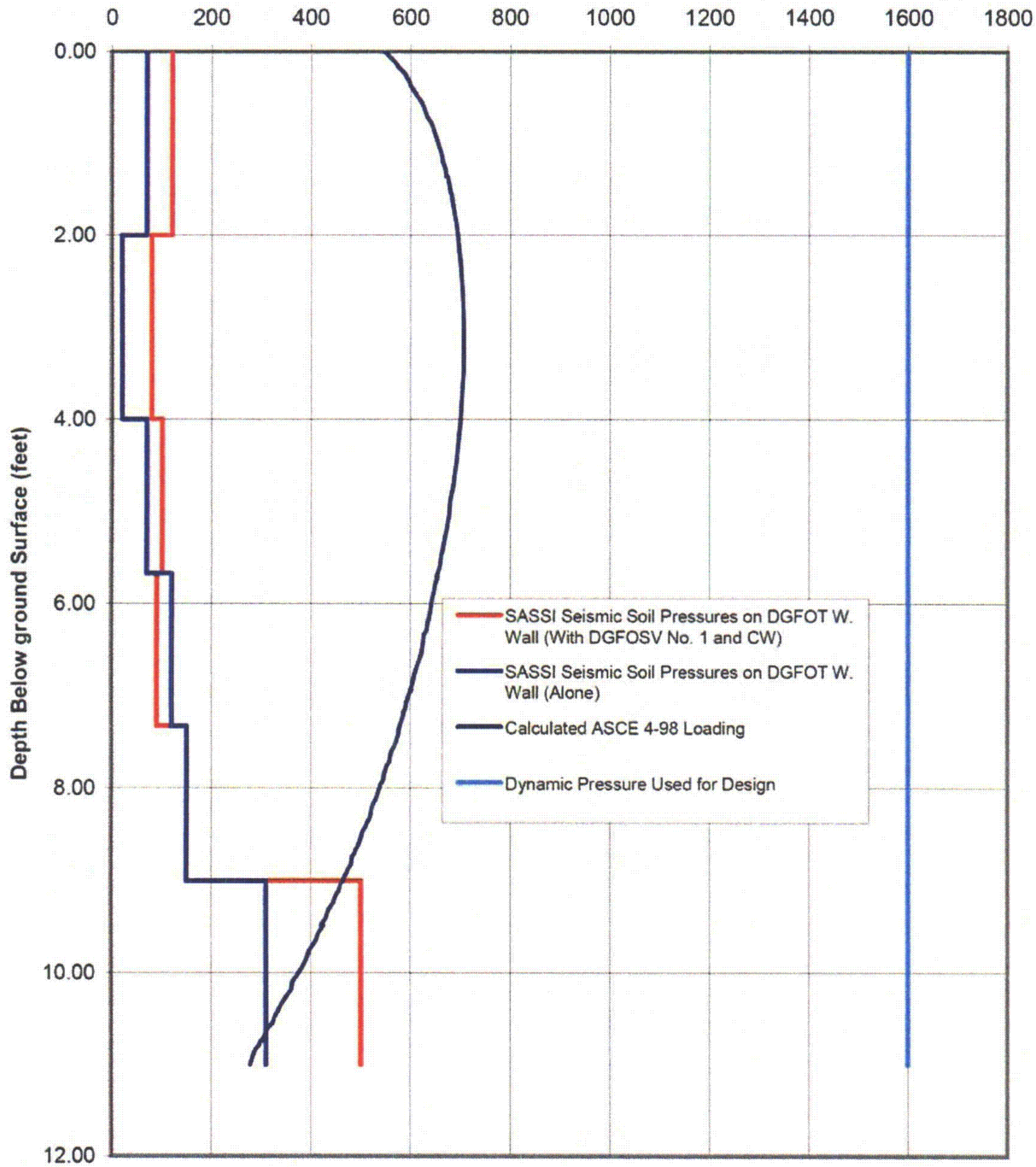


Figure 3H.7-8: SSI, SSSI, ASCE 4-98 and Design Lateral Seismic Soil Pressures (psf) on Fuel Oil Tunnel West Wall with Diesel Generator Fuel Oil Storage Vault and Crane Wall

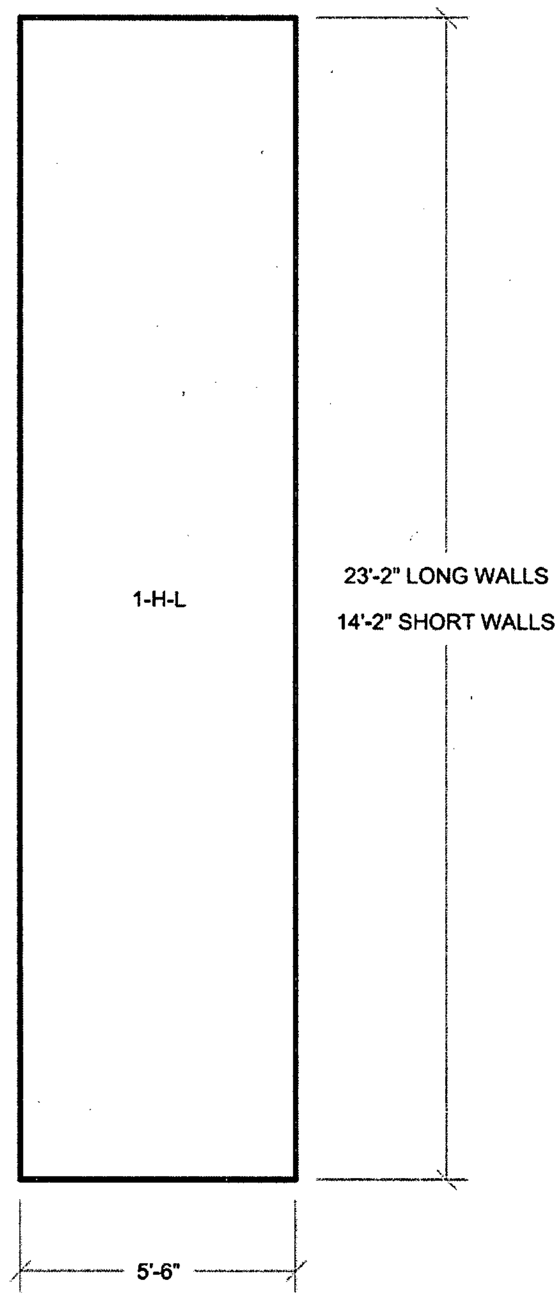


Figure 3H.7-9: Access Region Walls Looking From Outside Horizontal Reinforcement Zones Near Side and Far Side Faces

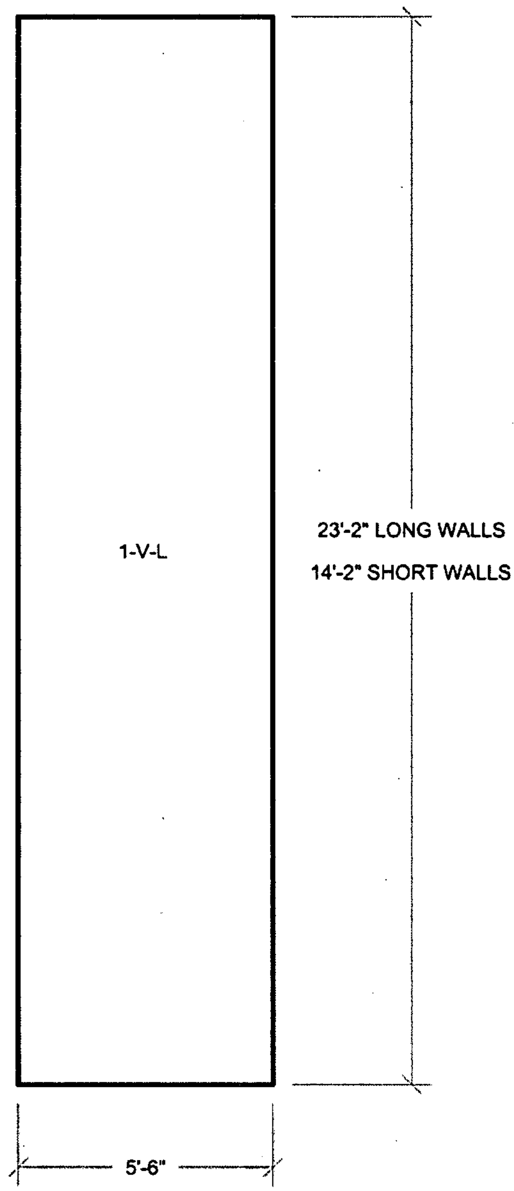


Figure 3H.7-10: Access Region Walls Looking From Outside Vertical Reinforcement Zones Near Side and Far Side Faces

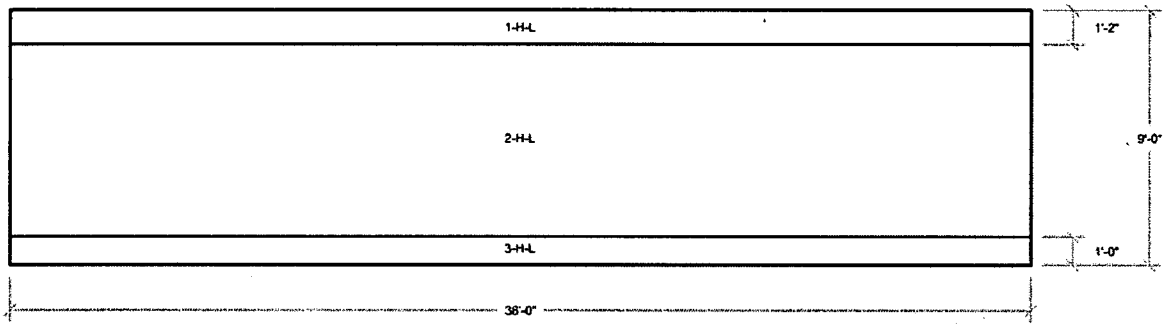


Figure 3H.7-11: Tunnel Walls Looking From Outside Horizontal Reinforcement Zones Near Side Face

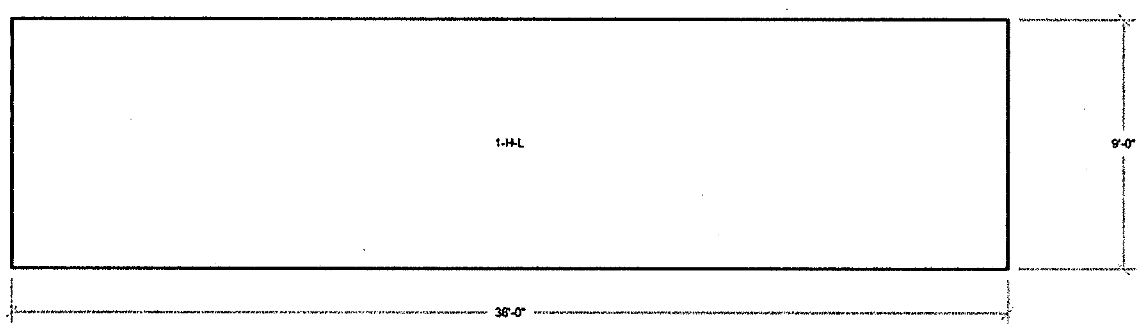


Figure 3H.7-12: Tunnel Walls Looking From Outside Horizontal Reinforcement Zones Far Side Face

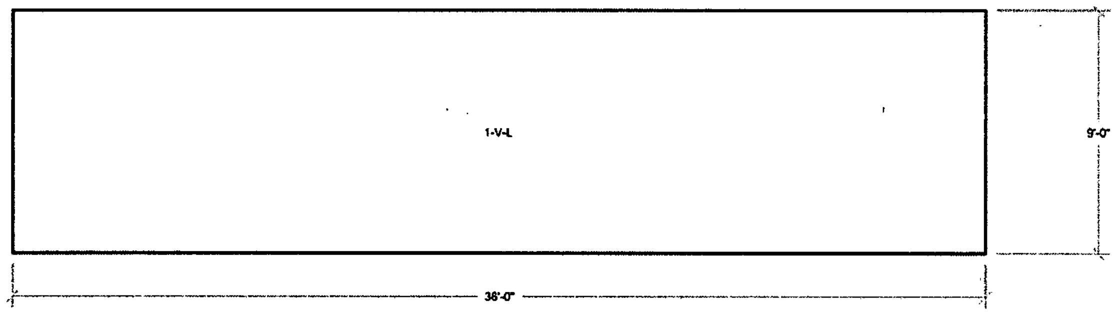


Figure 3H.7-13: Tunnel Walls Looking From Outside Vertical Reinforcement Zones Near Side Face

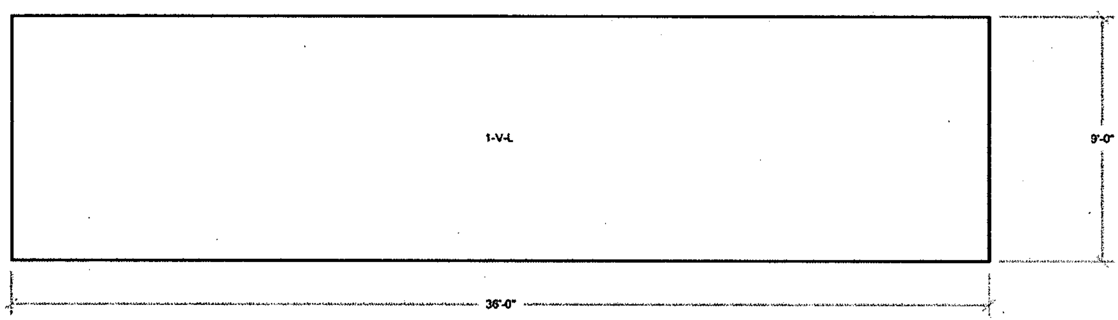


Figure 3H.7-14: Tunnel Walls Looking From Outside Vertical Reinforcement Zones Far Side Face

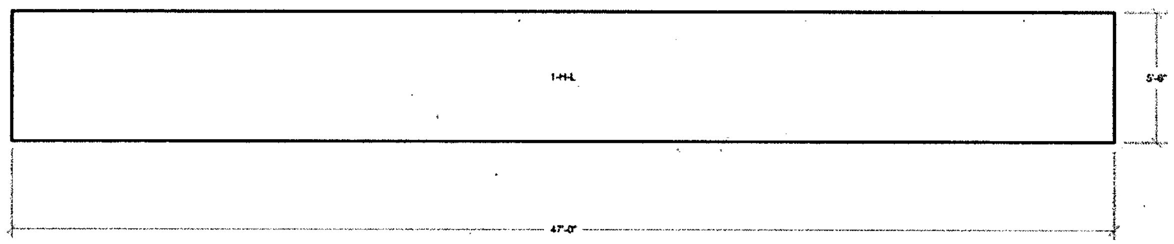


Figure 3H.7-15: Tunnel and Access Region Basemat Looking Down Horizontal Reinforcement Zones Near Side and Far Side Faces

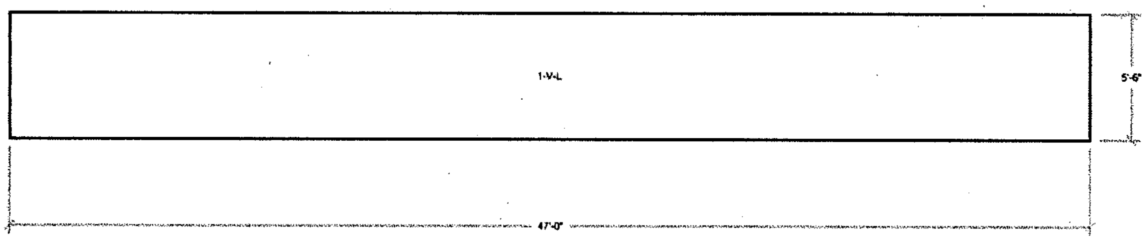


Figure 3H.7-16: Tunnel and Access Region Basemat Looking Down Vertical Reinforcement Zones Near Side and Far Side Faces

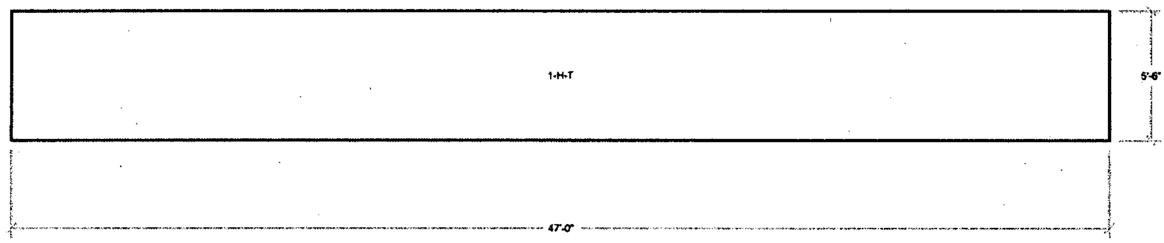


Figure 3H.7-17: Tunnel and Access Region Basemat Looking Down
Transverse Reinforcement Zones

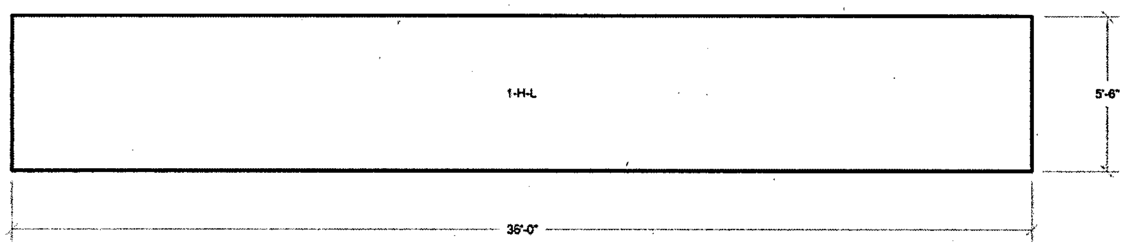


Figure 3H.7-18: Roof of Tunnel Looking Down Horizontal Reinforcement Zones
Near Side and Far Side Faces

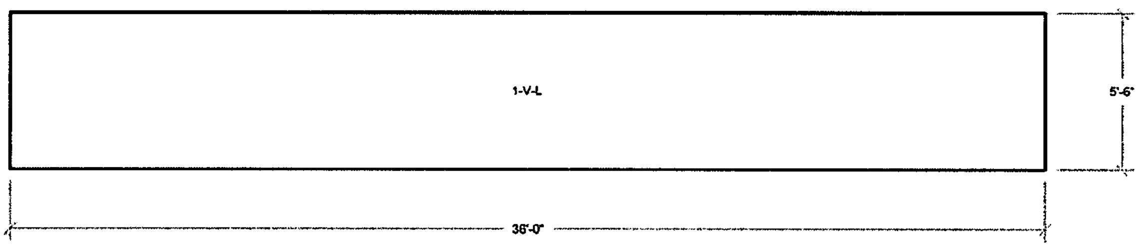


Figure 3H.7-19: Roof of Tunnel Looking Down Vertical Reinforcement Zones
Near Side and Far Side Faces

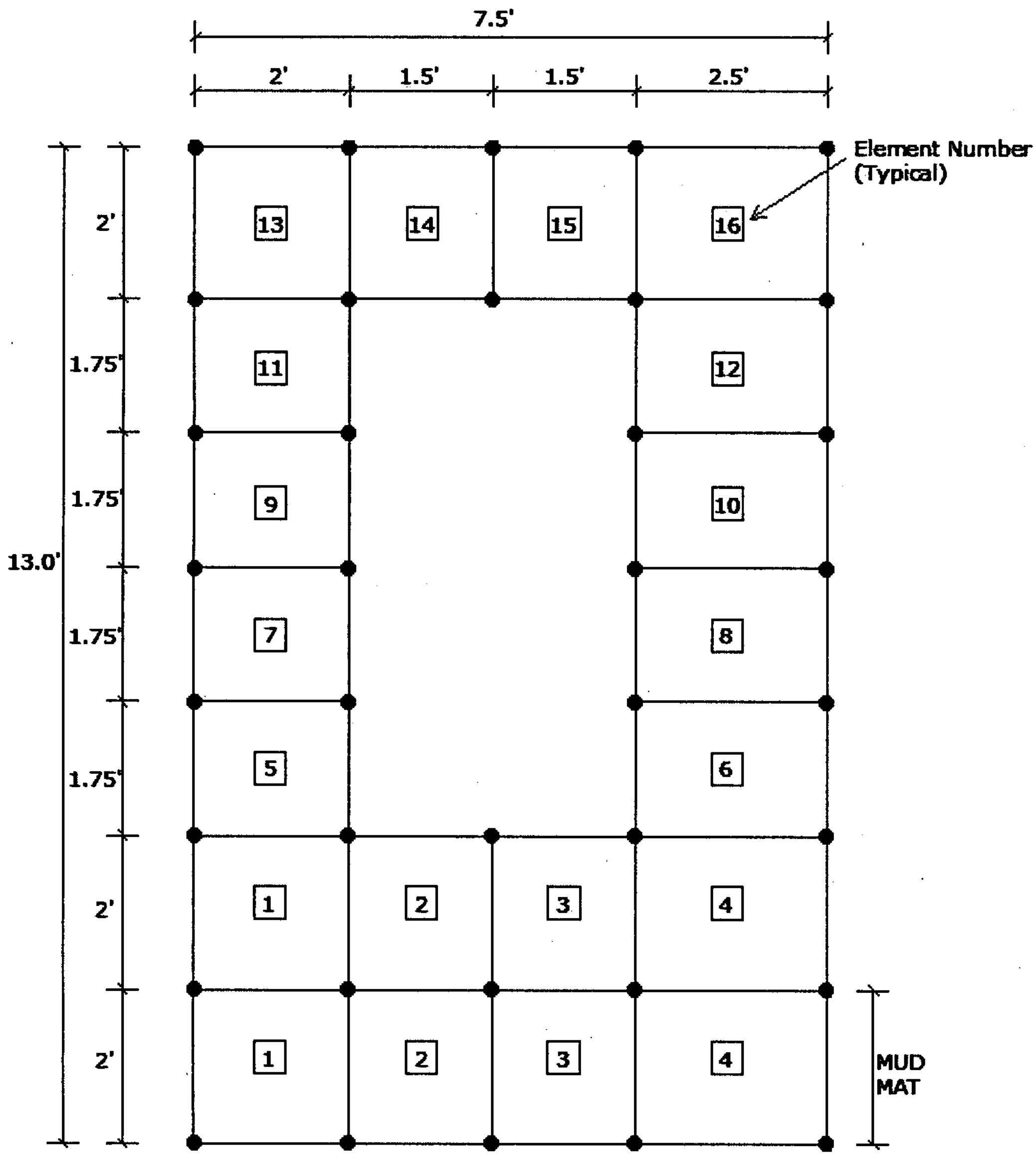


Figure 3H.7-20: 2D Model for SSI Analysis of a Typical Cross section of DGFOT

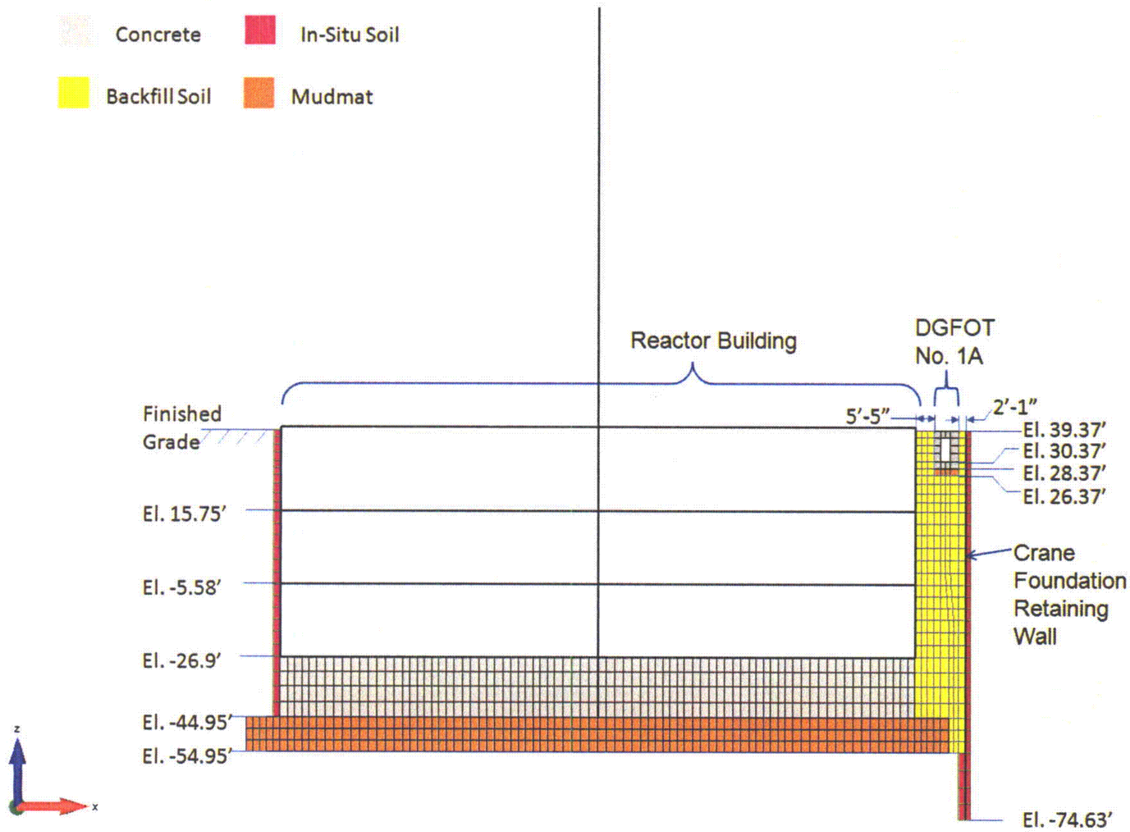


Figure 3H.7-21: 2D SSSI Model of RB, DGFOT and Crane Foundation Retaining Wall

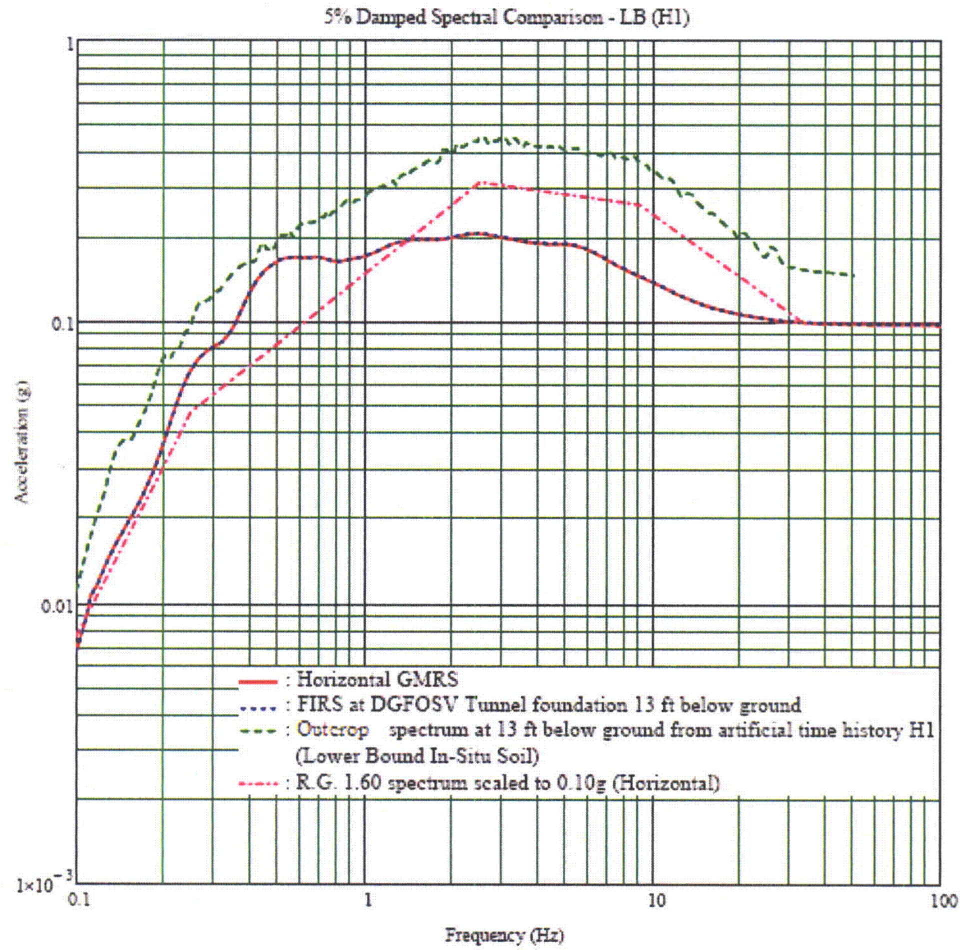


Figure 3H.7-22: Comparison of Spectra at Foundation of DGFOT – Lower Bound Soil Properties, Horizontal X Direction

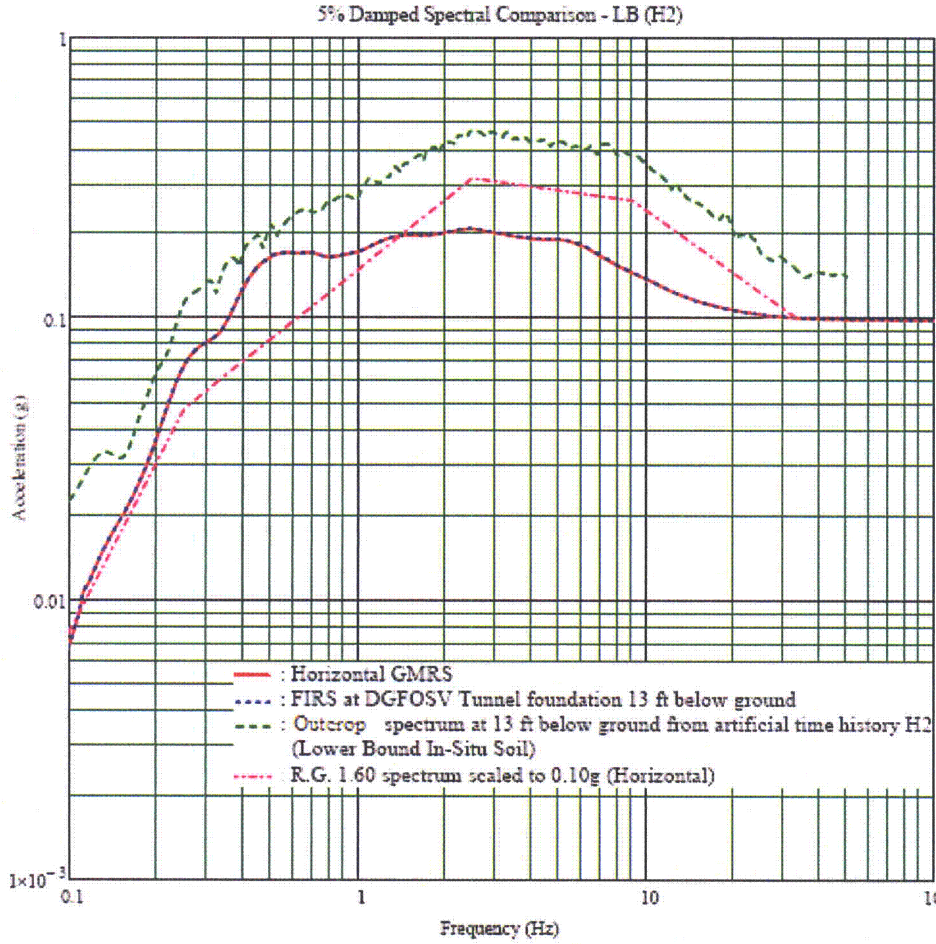


Figure 3H.7-23: Comparison of Spectra at Foundation of DGFOT – Lower Bound Soil Properties, Horizontal Y Direction

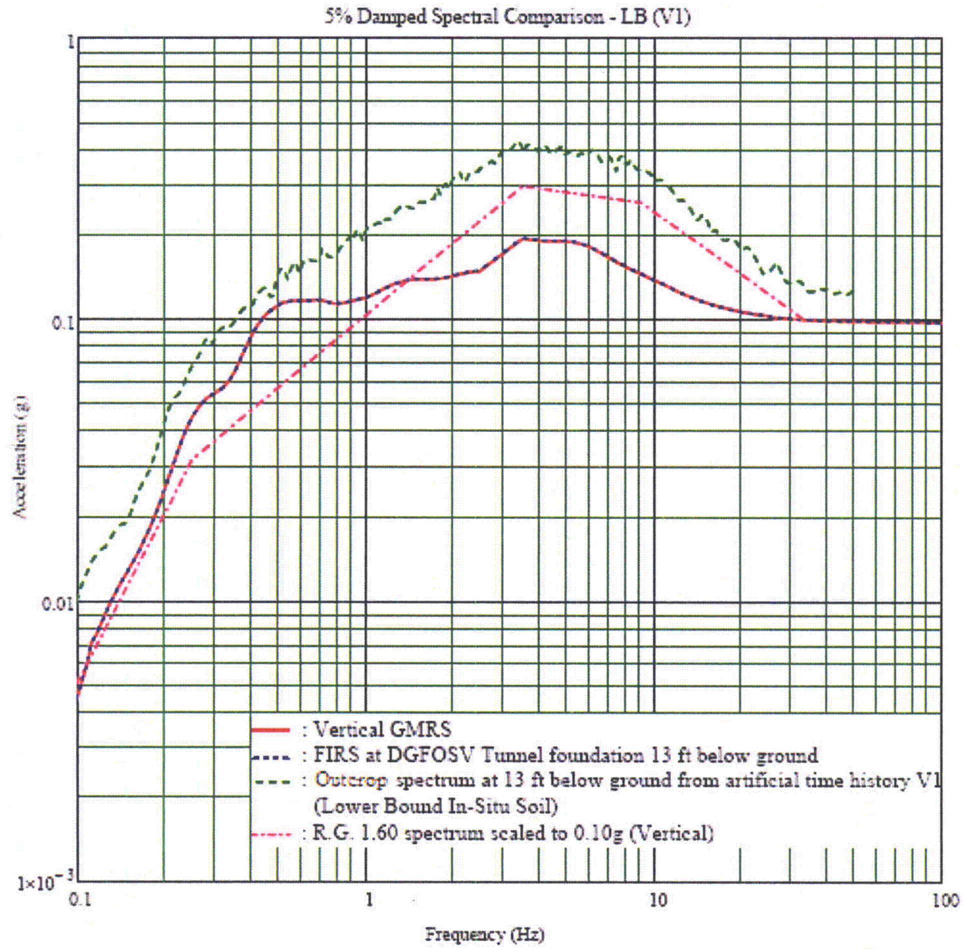


Figure 3H.7-24: Comparison of Spectra at Foundation of DGFOT – Lower Bound Soil Properties, Vertical Direction

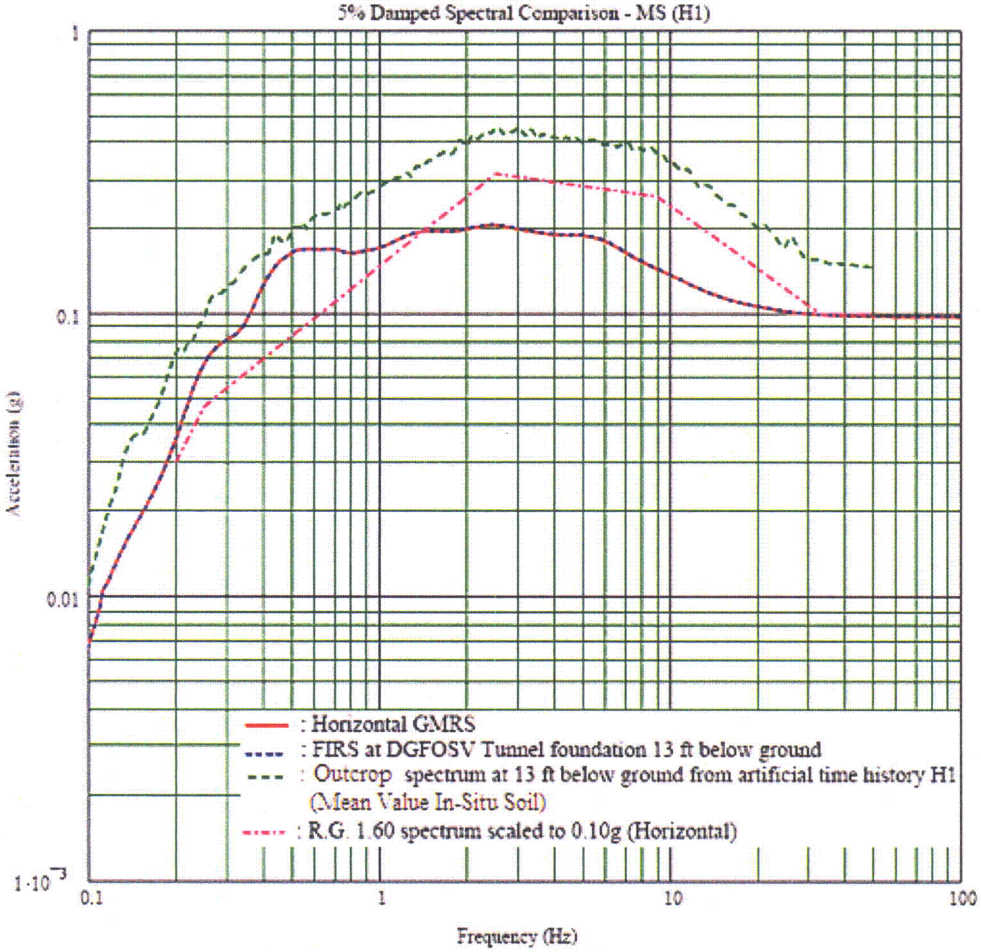


Figure 3H.7-25: Comparison of Spectra at Foundation of DGFOT – Mean Soil Properties, Horizontal X Direction

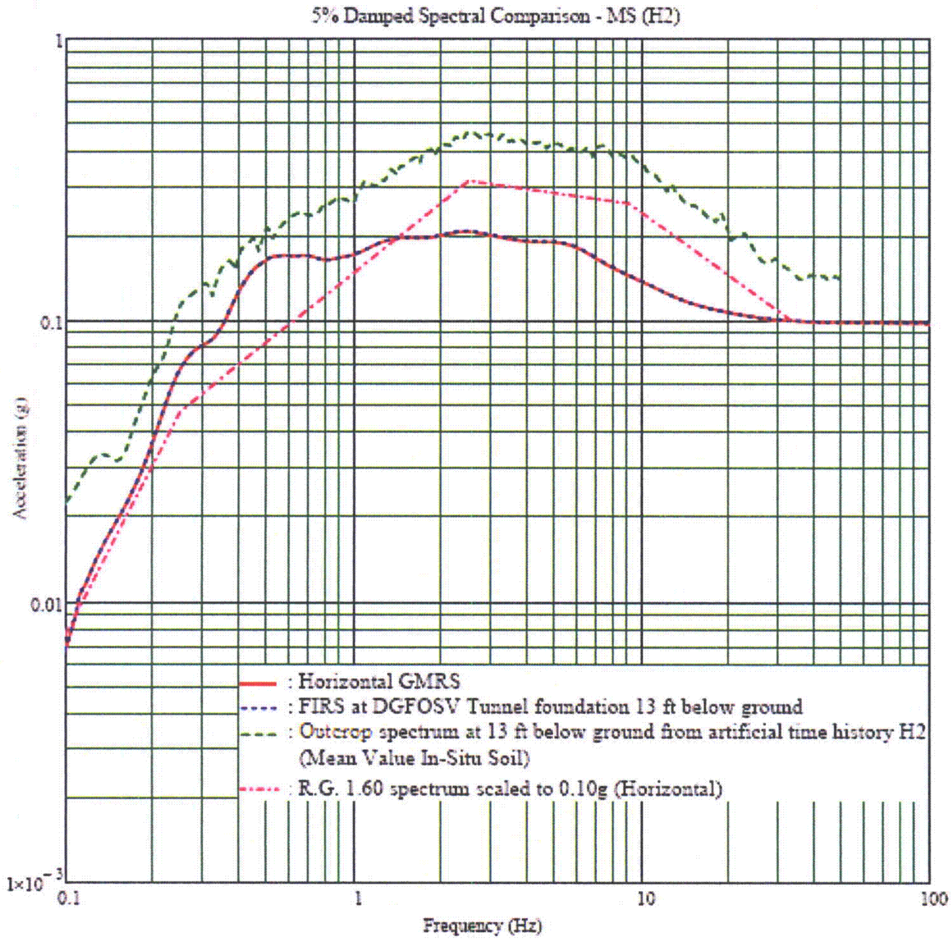


Figure 3H.7-26: Comparison of Spectra at Foundation of DGFOT – Mean Soil Properties, Horizontal Y Direction

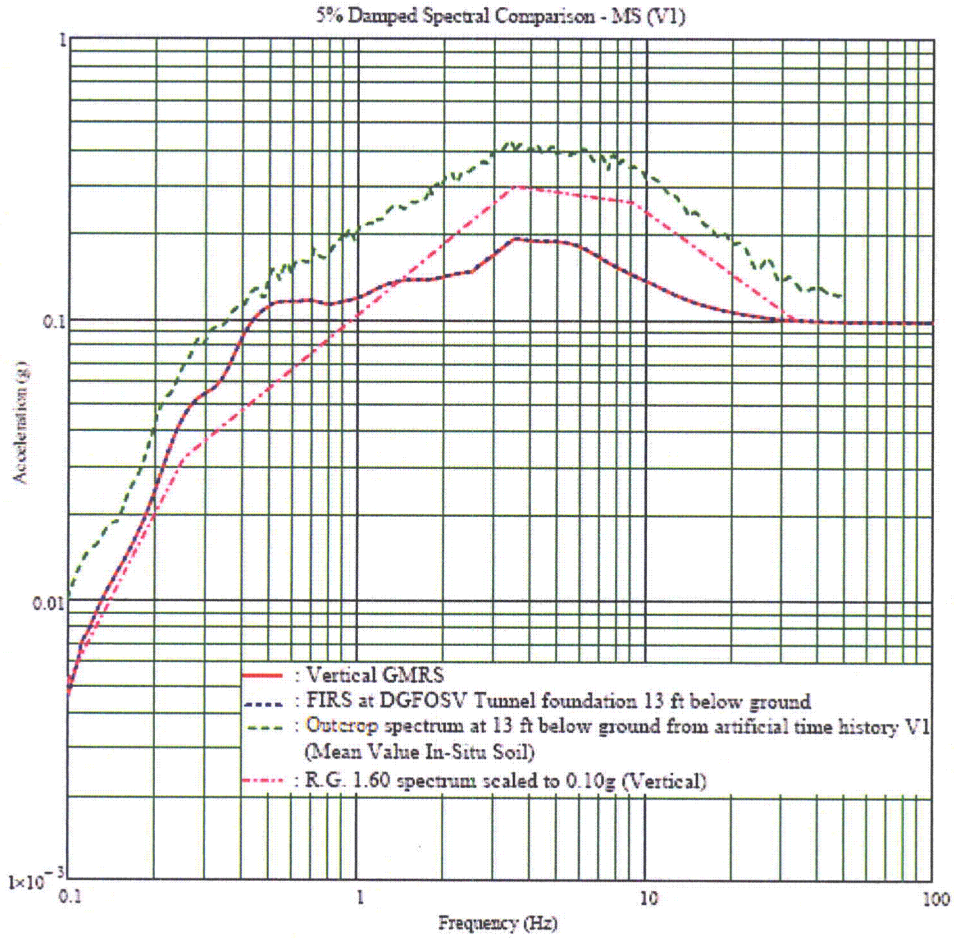


Figure 3H.7-27: Comparison of Spectra at Foundation of DGFOT – Mean Soil Properties, Vertical Direction

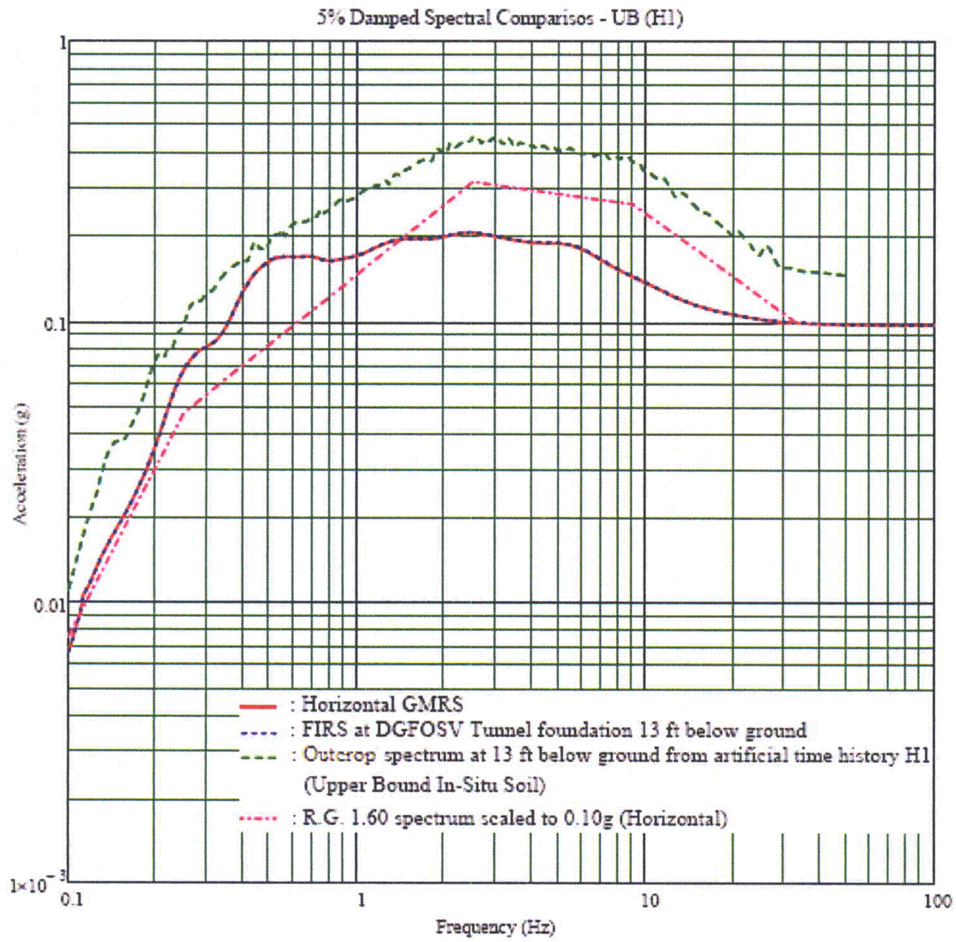


Figure 3H.7-28: Comparison of Spectra at Foundation of DGFOT – Upper Bound Soil Properties, Horizontal X Direction

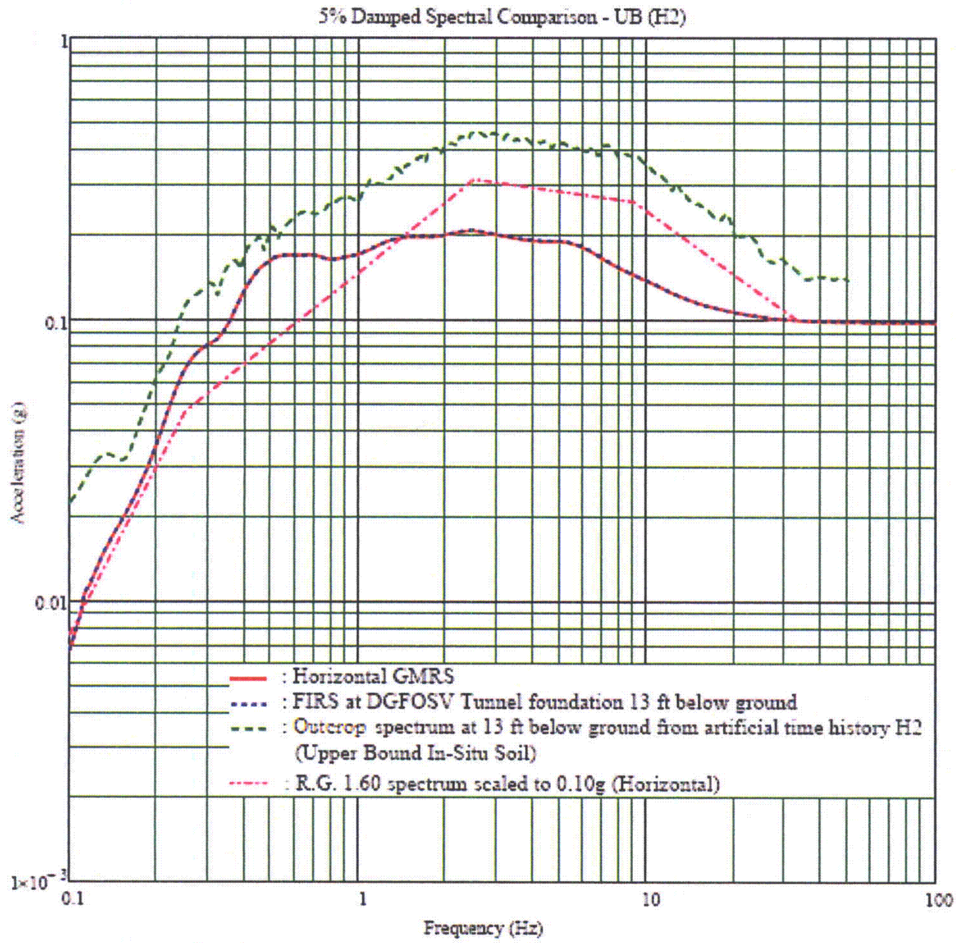


Figure 3H.7-29: Comparison of Spectra at Foundation of DGFOT – Upper Bound Soil Properties, Horizontal Y Direction

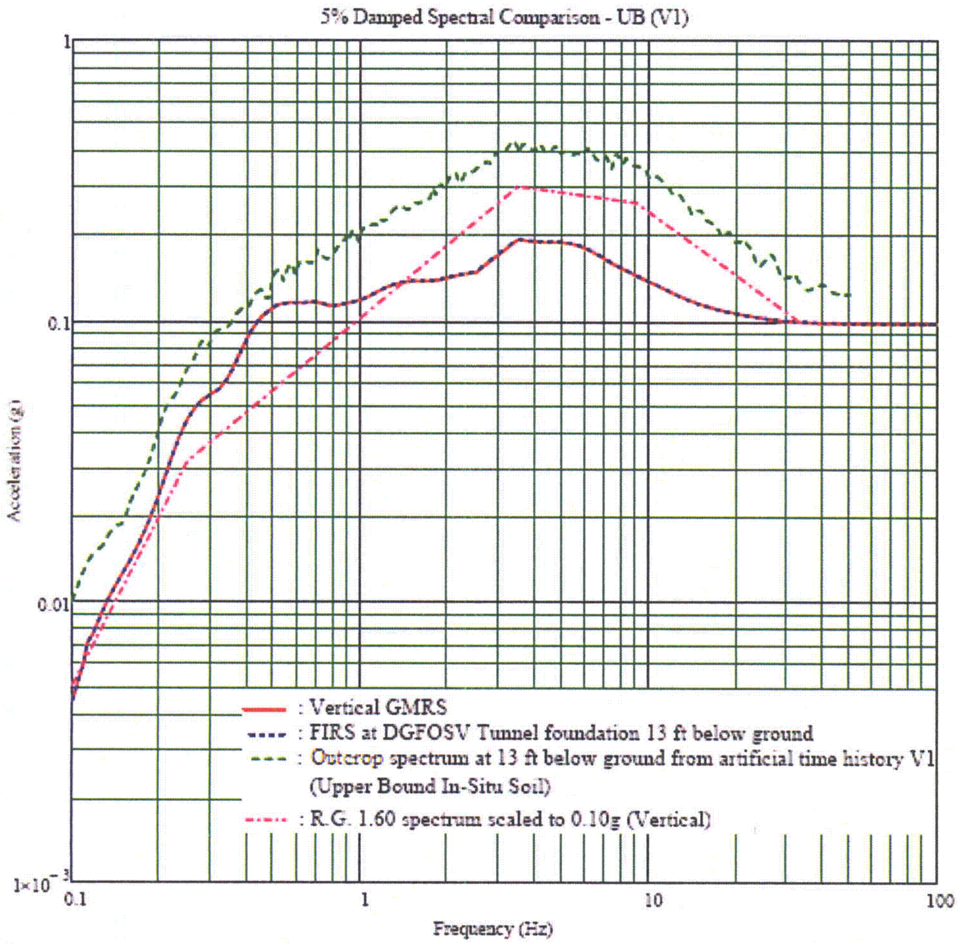


Figure 3H.7-30: Comparison of Spectra at Foundation of DGFOT – Upper Bound Soil Properties, Vertical Direction

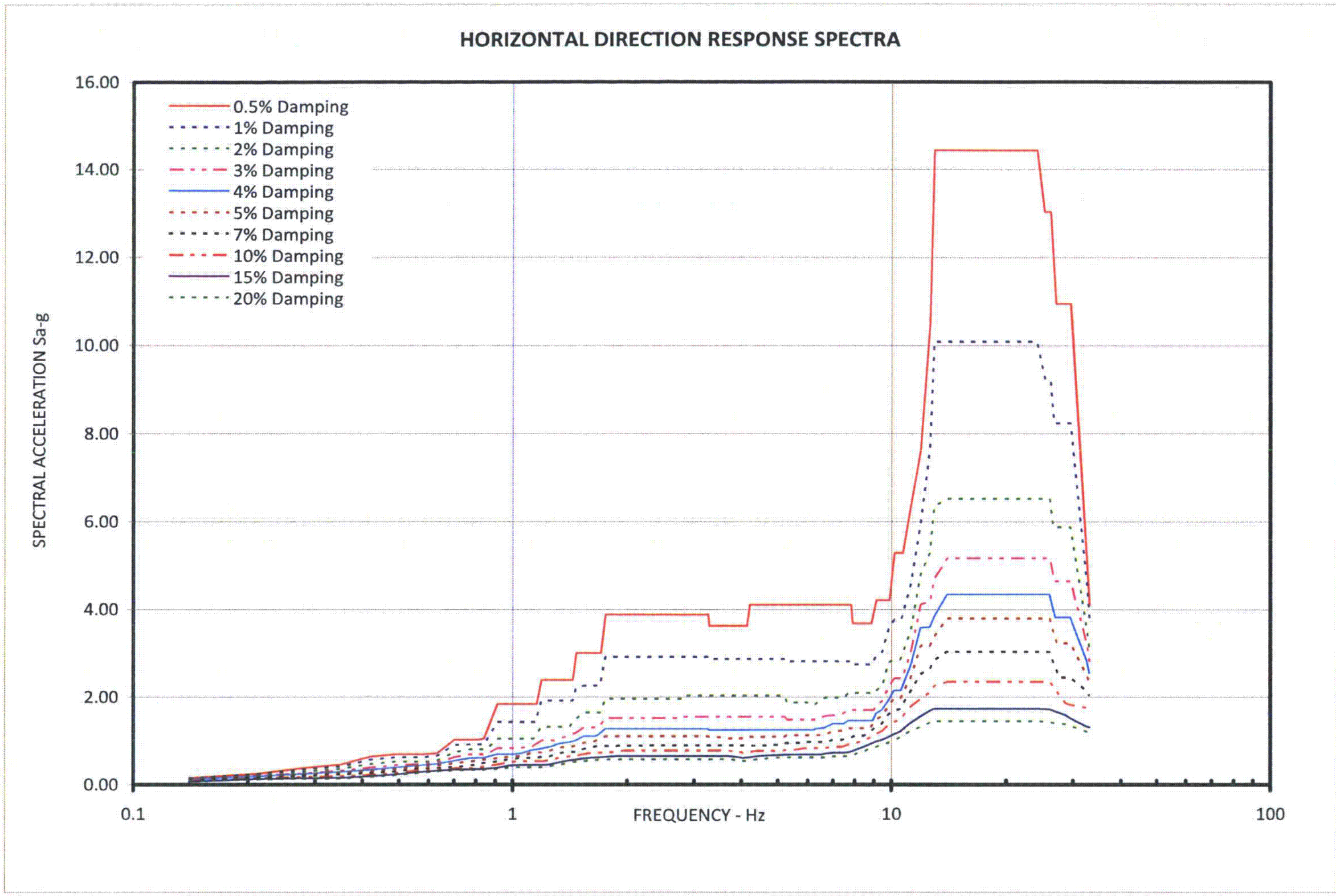


Figure 3H.7-31: Enveloped, Broadened Horizontal Response Spectra for DGFOTs

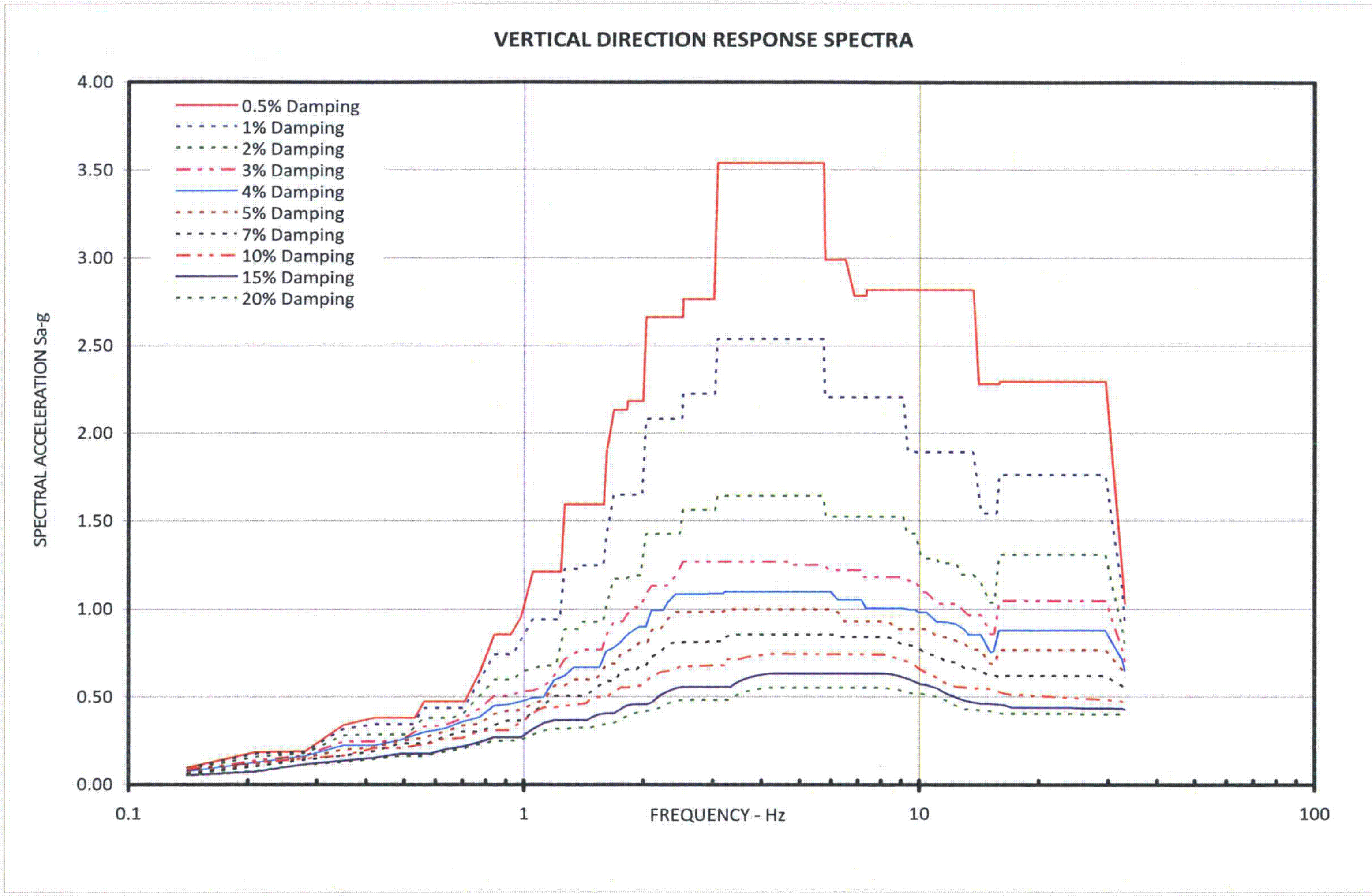


Figure 3H.7-32: Enveloped, Broadened Vertical Response Spectra for DGFOTs

Enclosure 5
Revision to COLA Section 3.2

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]		Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
Y2	Diesel Generator Fuel Oil Storage and Transfer System including Fuel Oil Storage Vaults	3	O,RZ	—	B	I	
Y3	Site Security	N	ALL	—	E	—	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

RAI 03.08.04-30, Supplement 1

QUESTION:

Follow-up to Question 03.08.04-23

In response to staff question requesting additional information (Letter U7-C-STP-NRC-100036, dated February 10, 2010) about how various steel and concrete elements of site-specific structures are designed, and the design results, the applicant provided some analysis and design information. The applicant also referred to the Supplement 2 response to Question 03.07.01-13 (Letter U7-C-STP-NRC-090230, dated 12/30/09) for pertinent design summary information. In order for the staff to conclude that the design of site-specific structures meet the requirements of GDC 2 by meeting the guidance provided in SRP 3.8.4 and 3.8.5, or otherwise, the applicant is requested to provide the following additional information:

1. The applicant states in the response that a three dimensional finite element analysis (FEA) is used for structural analysis and design of the UHS/RSW Pump House. FSAR Section 3H.6.6.1 states that analysis for the seismic loads was performed using equivalent static loads and the induced forces due to X, Y, and Z seismic excitations were combined using the SRSS method of combination. However, the applicant did not describe how the equivalent static loads due to seismic excitation were determined and applied to the static FEA model from the results of soil structure interaction (SSI) analysis used for determination of seismic response. Therefore, the applicant is requested to provide details of how seismic response analysis results from dynamic SSI analysis were transferred to the static FEA model, including how the effects of accidental torsion were included in the analysis and design of UHS/RSW Pump house. Please also update FSAR with the information, as appropriate.

2. The applicant stated in its response that the modulus of subgrade reaction for static loading was calculated as the average of the local values at nine locations under the foundation. The applicant is requested to provide these nine values, and explain why it is considered appropriate to use the average value. Please also explain how the foundation subgrade modulus was used for calculating nodal springs for the FEA model, and how the effect due to coupling of soil springs was considered in the analysis.

3. For seismic loading, the applicant has outlined a hand-calculated procedure that utilizes published formulas and charts to estimate the foundation spring constants. According to this procedure, the equivalent modulus and Poisson's ratio of a layered soil system are first estimated using the cumulative strain energy method. The resulting values are then used in the equations for computation of the spring constants for a rigid foundation of an arbitrary shape embedded in a uniform half-space. The shear moduli used for individual layers are strain compatible values, and include the mean, upper bound, and lower bound soil cases. The approximate procedure outlined

above for developing the foundation spring constants does not take into account the pressure distribution under the base slab. Furthermore, this procedure does not account for the frequency dependence of these springs. As such, the applicant is requested to provide a justification for not considering the effects of pressure distribution and system frequency in developing the foundation dynamic springs including describing the impact on the calculated results.

4. The applicant's response does not provide details as to how the soil springs calculated under static and seismic loadings are inputted to the 3-D static FEA model to calculate the design stresses. Therefore, the applicant is requested to describe in detail how the static and seismic soil springs are inputted into the FEA model, and how the results are obtained for stress evaluations. Specifically, the applicant is requested to explain if the two sets of springs were used in a single model, and how the two sets were combined to a single set of springs. Otherwise, if the two sets of springs were applied to separate FEA models, describe how the load combinations were performed. The applicant is also requested to provide sufficient detail to assist staff in understanding how static and seismic soil springs are used in the FEA model and results combined for stress evaluations.

5. In the FSAR mark-up of Sections 3H.6.6.3.1 and 3H.6.6.3.2 provided with the response, the applicant identifies the method used by the applicant for combining forces and moments. In this method, for each reinforcing zone, the maximum force or moment is coupled with the corresponding moment or force for design for the same load combination. It is not clear if this method of combining forces and moments for design will envelop the worst combination of forces and moments for all elements in a reinforcing zone. Therefore, the applicant is requested to describe the method of combining forces and moments used by the applicant with a typical example of a reinforcing zone, and demonstrate that this method of combination will yield the worst combination of forces and moments that should be considered for design.

6. The staff notes that in the FSAR mark-up of Section 3H.6.6.3.1 provided with the response, the reported values of soil springs for the RSW Pump House are significantly larger than those for the UHS basin. The applicant is requested to confirm these values, and explain the reason for the large difference.

7. The response did not include any information about the maximum static and dynamic bearing pressures under the foundations of UHS/RSW Pump House. The applicant is requested to provide the maximum static and dynamic bearing pressure under the foundations of UHS/RSW Pump House, compare these values with the maximum allowable static and dynamic bearing pressures, and include this information in the FSAR.

8. In its response to Question 03.07.01-19 (letter U7-C-STP-NRC-100129, dated June 7, 2010), the applicant provided analysis and design information for the seismic category I Diesel Generator Fuel Oil Storage Vault (DGFOSV) a which was not previously included in the FSAR. The information included in the response does not describe how

structural analysis and design of the structure was performed. Also, reference is made to FSAR Section 3H.6.4 for design loads. FSAR Section 3H.6.4 has been updated several times in various responses, and it is not clear where this information can be found. Therefore, the applicant is requested to provide complete structural analysis and design information for the DGFOSV to ensure it meets acceptance criteria 1 through 7 of SRP 3.8.4 and 3.8.5. The staff needs this information to conclude that the DGFOSV is designed to withstand seismic loads and meet GDC 2. Include in the response an updated version of Appendix 3H where structural analysis and design information for all seismic category I structures can be found.

9. While reviewing this response, and other responses referenced in this response, the staff noted that the applicant has used different values of coefficient of friction for sliding stability evaluation; e.g., the value 0.3 was used for the RSW Pump House, 0.4 was used for UHS basin, 0.58 was used DGFOSV, and for the Reactor Building (RB) and the Control Building (CB), it was stated to be more than 0.47. It is not clear if these values are the required coefficient of friction, or the minimum coefficient of friction available. The applicant is requested to clearly specify the minimum coefficient of friction at various locations of the site, if they are different, and explain how these values were determined. Please also clarify this information in the FSAR.

10. The staff noted references to Diesel Generator Fuel Oil Tunnel (DGFOT) in several RAI responses. Please confirm that DGFOT is not a seismic category I structure, and if it is seismic category I, include the analysis and design information to show how the design of the DGFOT meets the acceptance criteria 1 through 7 in the SRP 3.8.4 and 3.8.5 in the FSAR.

SUPPLEMENTAL RESPONSE:

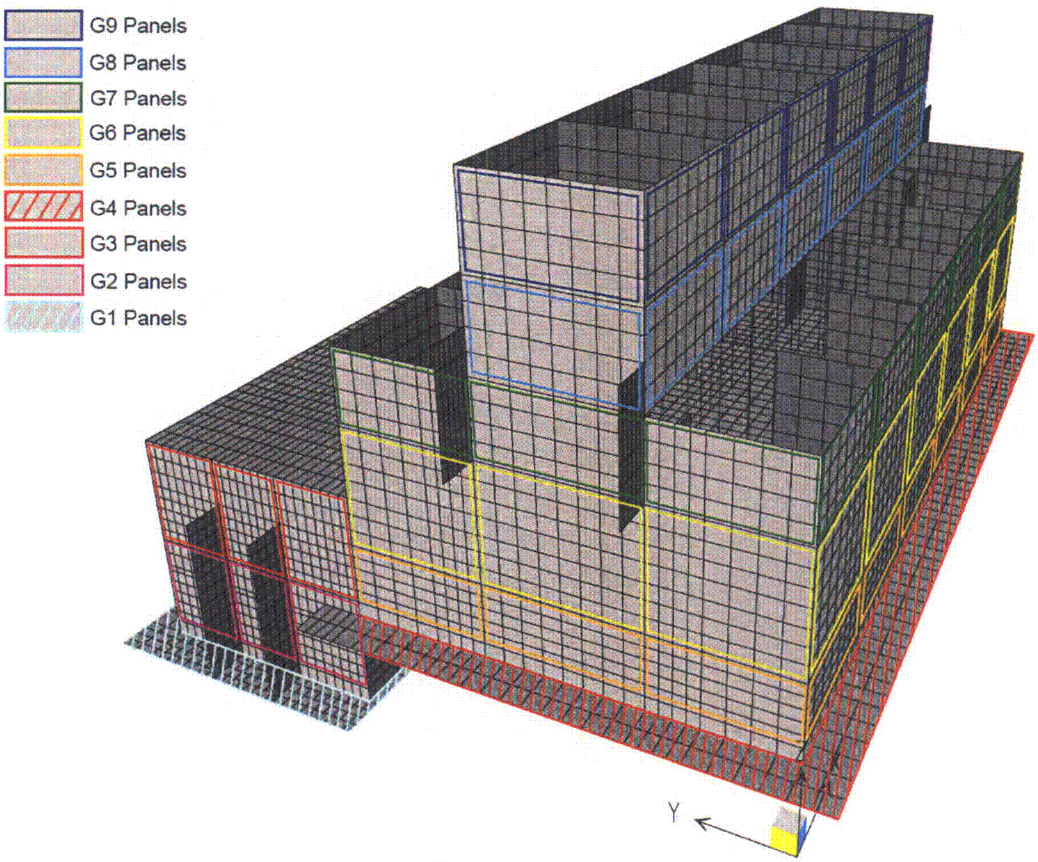
Revision 1 of the response to Parts 8 through 10 of this RAI is being submitted concurrently with this response.

This supplemental response provides the response to Parts 1 through 7. In addition, this response also provides information about the design for extreme winds and tornado as a result of a question raised during the NRC Audit performed during the week of October 18, 2010.

In follow-up to Action Item 3.8-9 from the NRC Audit of South Texas Project Units 3 & 4 on October 18-22, 2010, the structure-soil-structure interaction (SSSI) soil pressures are provided for the Reactor Building (RB).

In order to assess the structure-soil-structure interaction (SSSI) effects on the lateral pressures on the walls of the Reactor Building, a two dimensional (2D) soil-structure interaction analysis was performed to determine the SSSI soil pressures. Figures 3H.1-1 through 3H.1-6, included in Enclosure 2 of this response, show a comparison of the lateral seismic soil pressures provided in the DCD, those calculated for site-specific conditions including the SSSI soil pressures. As shown in these figures, site-specific seismic soil pressures are enveloped by the DCD lateral seismic soil pressures for all walls except for portions of the RB West wall when considering SSSI effects with the Radwaste Building and Reactor Service Water Tunnel. However, when comparing the total force applied to any segment of the wall from slab to slab, the DCD seismic soil loads are greater than the Site-Specific soil loads. Therefore, the seismic lateral soil pressures calculated for site-specific soil conditions present at STP 3&4 are enveloped by those presented in the DCD.

1) In order to obtain the equivalent static seismic loads, the nodal zero period accelerations from the soil-structure interaction (SSI) analysis were separated into nine panel acceleration groups as shown in Figure 03.08.04-30.1. These nine panel acceleration groups are further separated into 208 panel sections. The nodal accelerations in the global X, Y, and Z directions are averaged for each panel section. The acceleration value assigned in each direction represents the mean value of all the nodal ZPAs within a given panel section. The mass of the structure, equipment weights, seismic live loads, and hydrodynamic forces are normalized by a factor of 1 g. Depending on their location in the structure, these loads are factored by the panel section acceleration and combined with other seismic loads by first adding the seismic loads in the same direction and then combining the X, Y, and Z components by the square root sum of squares (SRSS) method.



Group 1: Pump house foundation mat
Group 2: Lower pump house walls and pump house operating floor slab
Group 3: Upper pump house walls and pump house roof slab
Group 4: Basin foundation mat
Group 5: Below grade section of basin walls
Group 6: Mid-section of the basin walls
Group 7: Top section of the basin walls
Group 8: Lower cooling tower walls
Group 9: Upper cooling tower walls

Figure 03.08.04-30.1: UHS basin, RSW pump house, and cooling tower equivalent static seismic model panel section acceleration groups

Two seismic load cases were considered in the SAP2000 three-dimensional (3D) finite element analysis (FEA) models used in design: a full basin case and an empty basin case. The enveloping SSI nodal accelerations in the global X, Y, and Z directions for each load case (full basin or empty basin) were averaged by group. The same averaging procedure was employed to determine full basin and empty basin group accelerations for the refined mesh upper bound (UB) soil case. The refined mesh analysis is described in response to RAI 03.07.02-24, Supplement 2, submitted with Letter U7-C-STP-NRC-100268, dated December 14, 2010. 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 modified by an adjustment factor. Specifically, the ratio of the refined mesh UB acceleration divided by the original mesh UB acceleration is calculated. When the ratio is greater than 1, the corresponding enveloping original mesh acceleration is multiplied by the ratio. Otherwise, the adjustment factor is 1.

The following example is for Full Basin Group 2 Pump House West Wall Panel 1, Average X acceleration. Since the refined mesh UB acceleration of 0.119g is greater than the original mesh UB acceleration of 0.118g, the ratio 0.119/.118 = 1.008 becomes the adjustment factor. The enveloping Full Basin Group 2 Pump House West Wall Panel 1 acceleration is multiplied by this adjustment factor. However, when the ratio is less than one, as is the case between the refined mesh and original mesh UB average Y acceleration for the Full Basin Group 2 Pump House West Wall Panel 1, the adjustment factor is simply 1.00 and the final full basin design acceleration for the group is the enveloping original mesh Full Basin Group 2 Pump House West Wall Panel 1 Y acceleration multiplied by 1.00.

Table 03.08.04-30.1 shows the group accelerations from the original and refined mesh SSI models for the full basin seismic UB condition and the corresponding adjustment factors used in design. Table 03.08.04-30.2 shows group accelerations from the original and refined mesh SSI models for the empty basin seismic UB condition and the corresponding adjustment factors used in design.

Table 03.08.04-30.1 – Group accelerations from original and refined mesh SSI models for full basin seismic UB condition and corresponding adjustment factors

Original Model				Refined Model			Calculated Factor for Full Basin		
Group	Average X	Average Y	Average Z	Average X	Average Y	Average Z	Average X	Average Y	Average Z
G2-PH West Wall Panel 1	0.118	0.124	0.127	0.119	0.123	0.131	1.008	1.000	1.029
G2-PH West Wall Panel 2	0.121	0.123	0.126	0.121	0.123	0.132	1.005	1.000	1.052
G2-PH West Wall Panel 3	0.118	0.121	0.127	0.116	0.123	0.132	1.000	1.016	1.033
G2-PH South Wall Panel 1	0.115	0.125	0.122	0.115	0.127	0.126	1.004	1.016	1.026
G2-PH South Wall Panel 2	0.114	0.127	0.118	0.114	0.131	0.121	1.004	1.027	1.020
G2-PH South Wall Panel 3	0.112	0.133	0.123	0.113	0.131	0.126	1.008	1.000	1.027
G2-PH North Wall Panel 1	0.113	0.125	0.126	0.112	0.128	0.126	1.000	1.023	1.000
G2-PH North Wall Panel 2	0.112	0.133	0.125	0.111	0.131	0.124	1.000	1.000	1.000
G2-PH North Wall Panel 3	0.116	0.130	0.130	0.112	0.131	0.129	1.000	1.003	1.000
G2-PH East Wall Panel 1	0.115	0.132	0.125	0.117	0.128	0.131	1.017	1.000	1.051
G2-PH East Wall Panel 2	0.119	0.130	0.127	0.122	0.126	0.135	1.024	1.000	1.056
G2-PH East Wall Panel 3	0.118	0.129	0.133	0.119	0.126	0.135	1.007	1.000	1.017
G2-PH Op Fl Panel 1	0.116	0.127	0.174	0.116	0.129	0.200	1.003	1.016	1.145
G2-PH Op Fl Panel 2	0.113	0.132	0.184	0.113	0.133	0.196	1.000	1.007	1.067
G2-PH Op Fl Panel 3	0.116	0.134	0.182	0.116	0.133	0.202	1.002	1.000	1.108
G3-PH West Wall Panel 1	0.125	0.130	0.129	0.126	0.130	0.131	1.006	1.000	1.021
G3-PH West Wall Panel 2	0.134	0.130	0.128	0.133	0.131	0.133	1.000	1.001	1.045
G3-PH West Wall Panel 3	0.122	0.127	0.130	0.123	0.131	0.133	1.004	1.030	1.020
G3-PH South Wall Panel 1	0.115	0.134	0.123	0.116	0.137	0.125	1.011	1.018	1.014
G3-PH South Wall Panel 2	0.114	0.137	0.120	0.116	0.138	0.122	1.012	1.008	1.015
G3-PH South Wall Panel 3	0.114	0.142	0.126	0.115	0.139	0.128	1.011	1.000	1.016
G3-PH North Wall Panel 1	0.115	0.136	0.129	0.116	0.142	0.128	1.007	1.045	1.000
G3-PH North Wall Panel 2	0.114	0.143	0.127	0.114	0.147	0.127	1.000	1.025	1.002
G3-PH North Wall Panel 3	0.115	0.145	0.132	0.114	0.144	0.130	1.000	1.000	1.000
G3-PH East Wall Panel 1	0.123	0.142	0.127	0.125	0.138	0.133	1.016	1.000	1.042
G3-PH East Wall Panel 2	0.131	0.142	0.130	0.131	0.137	0.137	1.000	1.000	1.051
G3-PH East Wall Panel 3	0.124	0.142	0.135	0.123	0.137	0.136	1.000	1.000	1.011
G3-PH Roof Panel 1	0.117	0.135	0.156	0.118	0.139	0.175	1.009	1.025	1.124
G3-PH Roof Panel 2	0.115	0.139	0.153	0.116	0.139	0.168	1.004	1.005	1.096
G3-PH Roof Panel 3	0.115	0.146	0.155	0.118	0.139	0.174	1.022	1.000	1.125
G5-Basin South Wall Panel 1	0.124	0.142	0.127	0.123	0.145	0.138	1.000	1.021	1.089
G5-Basin South Wall Panel 2	0.120	0.149	0.133	0.119	0.148	0.134	1.000	1.000	1.008
G5-Basin South Wall Panel 3	0.118	0.152	0.139	0.118	0.148	0.141	1.000	1.000	1.012
G5-Basin South Wall Panel 4	0.118	0.154	0.141	0.117	0.152	0.141	1.000	1.000	1.003
G5-Basin South Wall Panel 5	0.119	0.161	0.133	0.118	0.152	0.132	1.000	1.000	1.000

Table 03.08.04-30.1 – Group accelerations from original and refined mesh SSI models for full basin seismic UB condition and corresponding adjustment factors (continued)

Original Model				Refined Model			Calculated Factor for Full Basin		
Group	Average X	Average Y	Average Z	Average X	Average Y	Average Z	Average X	Average Y	Average Z
G5-Basin South Wall Panel 6	0.120	0.150	0.132	0.119	0.150	0.130	1.000	1.003	1.000
G5-Basin North Wall Panel 1	0.114	0.132	0.123	0.116	0.135	0.125	1.014	1.019	1.014
G5-Basin North Wall Panel 2	0.114	0.136	0.120	0.116	0.137	0.122	1.013	1.005	1.013
G5-Basin North Wall Panel 3	0.113	0.141	0.125	0.115	0.138	0.127	1.014	1.000	1.019
G5-Basin North Wall Panel 4	0.114	0.147	0.129	0.116	0.148	0.130	1.020	1.004	1.013
G5-Basin North Wall Panel 5	0.116	0.161	0.127	0.116	0.155	0.130	1.008	1.000	1.025
G5-Basin North Wall Panel 6	0.118	0.149	0.130	0.117	0.151	0.130	1.000	1.012	1.000
G5-Basin S Buttress 1 Panel 1	0.128	0.143	0.132	0.128	0.142	0.143	1.000	1.000	1.081
G5-Basin S Buttress 2 Panel 1	0.125	0.147	0.141	0.128	0.142	0.141	1.021	1.000	1.000
G5-Basin S Buttress 3 Panel 1	0.122	0.154	0.146	0.123	0.147	0.149	1.004	1.000	1.020
G5-Basin S Buttress 4 Panel 1	0.124	0.152	0.141	0.126	0.147	0.138	1.017	1.000	1.000
G5-Basin S Buttress 5 Panel 1	0.127	0.155	0.129	0.122	0.152	0.130	1.000	1.000	1.004
G5-Basin N Buttress 1 Panel 1	0.121	0.130	0.122	0.119	0.134	0.124	1.000	1.032	1.016
G5-Basin N Buttress 2 Panel 1	0.124	0.135	0.126	0.124	0.136	0.132	1.003	1.002	1.049
G5-Basin N Buttress 3 Panel 1	0.118	0.141	0.134	0.118	0.138	0.134	1.006	1.000	1.000
G5-Basin N Buttress 4 Panel 1	0.129	0.148	0.132	0.125	0.149	0.136	1.000	1.008	1.029
G5-Basin N Buttress 5 Panel 1	0.125	0.154	0.131	0.122	0.151	0.131	1.000	1.000	1.000
G5-Basin E Buttress 1 Panel 1	0.145	0.149	0.131	0.140	0.149	0.134	1.000	1.000	1.023
G5-Basin E Buttress 2 Panel 1	0.139	0.151	0.128	0.137	0.148	0.131	1.000	1.000	1.030
G5-Basin W Buttress 1 Panel 1	0.142	0.139	0.131	0.137	0.140	0.134	1.000	1.009	1.020
G5-Basin W Buttress 2 Panel 1	0.135	0.146	0.132	0.138	0.140	0.131	1.020	1.000	1.000
G5-Basin West Wall Panel 1	0.142	0.129	0.125	0.136	0.133	0.131	1.000	1.037	1.047
G5-Basin West Wall Panel 2	0.153	0.129	0.127	0.149	0.132	0.130	1.000	1.019	1.025
G5-Basin West Wall Panel 3	0.130	0.130	0.129	0.132	0.130	0.130	1.021	1.004	1.011
G5-Basin East Wall Panel 1	0.140	0.141	0.130	0.134	0.140	0.129	1.000	1.000	1.000
G5-Basin East Wall Panel 2	0.159	0.141	0.126	0.154	0.140	0.129	1.000	1.000	1.021
G5-Basin East Wall Panel 3	0.129	0.140	0.130	0.134	0.141	0.128	1.040	1.005	1.000
G6-Basin South Wall Panel 1	0.126	0.164	0.129	0.124	0.165	0.136	1.000	1.007	1.053
G6-Basin South Wall Panel 2	0.123	0.194	0.133	0.121	0.194	0.133	1.000	1.001	1.002
G6-Basin South Wall Panel 3	0.122	0.192	0.139	0.119	0.192	0.140	1.000	1.000	1.006
G6-Basin South Wall Panel 4	0.122	0.213	0.142	0.118	0.220	0.141	1.000	1.034	1.000
G6-Basin South Wall Panel 5	0.122	0.210	0.136	0.119	0.217	0.135	1.000	1.033	1.000
G6-Basin South Wall Panel 6	0.124	0.175	0.132	0.120	0.177	0.131	1.000	1.006	1.000
G6-Basin North Wall Panel 1	0.119	0.148	0.124	0.118	0.152	0.126	1.000	1.023	1.018
G6-Basin North Wall Panel 2	0.117	0.153	0.122	0.118	0.154	0.124	1.006	1.006	1.017

Table 03.08.04-30.1 – Group accelerations from original and refined mesh SSI models for full basin seismic UB condition and corresponding adjustment factors (continued)

Original Model				Refined Model			Calculated Factor for Full Basin		
Group	Average X	Average Y	Average Z	Average X	Average Y	Average Z	Average X	Average Y	Average Z
G6-Basin North Wall Panel 3	0.118	0.162	0.128	0.118	0.157	0.129	1.005	1.000	1.004
G6-Basin North Wall Panel 4	0.119	0.189	0.132	0.120	0.196	0.132	1.013	1.036	1.003
G6-Basin North Wall Panel 5	0.118	0.208	0.130	0.120	0.213	0.132	1.019	1.025	1.011
G6-Basin North Wall Panel 6	0.119	0.173	0.131	0.122	0.178	0.130	1.026	1.029	1.000
G6-Basin S Buttress 1 Panel 1	0.150	0.177	0.133	0.149	0.174	0.142	1.000	1.000	1.064
G6-Basin S Buttress 2 Panel 1	0.144	0.191	0.141	0.143	0.188	0.141	1.000	1.000	1.002
G6-Basin S Buttress 3 Panel 1	0.140	0.194	0.146	0.134	0.200	0.147	1.000	1.030	1.005
G6-Basin S Buttress 4 Panel 1	0.138	0.216	0.139	0.142	0.220	0.138	1.027	1.019	1.000
G6-Basin S Buttress 5 Panel 1	0.155	0.194	0.129	0.135	0.197	0.132	1.000	1.015	1.020
G6-Basin S Buttress 1 Panel 2	0.230	0.177	0.144	0.264	0.173	0.158	1.150	1.000	1.094
G6-Basin S Buttress 2 Panel 2	0.206	0.190	0.155	0.235	0.188	0.166	1.140	1.000	1.070
G6-Basin S Buttress 3 Panel 2	0.197	0.193	0.164	0.197	0.200	0.167	1.000	1.035	1.018
G6-Basin S Buttress 4 Panel 2	0.191	0.218	0.146	0.226	0.221	0.151	1.185	1.014	1.029
G6-Basin S Buttress 5 Panel 2	0.238	0.194	0.135	0.211	0.197	0.149	1.000	1.013	1.106
G6-Basin N Buttress 1 Panel 1	0.183	0.148	0.129	0.190	0.150	0.136	1.037	1.015	1.050
G6-Basin N Buttress 2 Panel 1	0.191	0.159	0.133	0.179	0.157	0.145	1.000	1.000	1.089
G6-Basin N Buttress 3 Panel 1	0.184	0.155	0.138	0.219	0.161	0.143	1.190	1.039	1.037
G6-Basin N Buttress 4 Panel 1	0.208	0.206	0.142	0.219	0.216	0.153	1.050	1.050	1.082
G6-Basin N Buttress 5 Panel 1	0.218	0.192	0.140	0.214	0.198	0.146	1.000	1.028	1.044
G6-Basin N Buttress 1 Panel 2	0.132	0.147	0.122	0.129	0.150	0.124	1.000	1.025	1.019
G6-Basin N Buttress 2 Panel 2	0.139	0.159	0.126	0.132	0.156	0.131	1.000	1.000	1.039
G6-Basin N Buttress 3 Panel 2	0.133	0.155	0.133	0.129	0.161	0.133	1.000	1.038	1.001
G6-Basin N Buttress 4 Panel 2	0.146	0.206	0.133	0.145	0.216	0.136	1.000	1.050	1.022
G6-Basin N Buttress 5 Panel 2	0.147	0.194	0.130	0.138	0.198	0.131	1.000	1.023	1.007
G6-Basin E Buttress 1 Panel 1	0.196	0.296	0.143	0.189	0.306	0.146	1.000	1.033	1.020
G6-Basin E Buttress 2 Panel 1	0.192	0.259	0.139	0.188	0.288	0.144	1.000	1.113	1.031
G6-Basin E Buttress 1 Panel 2	0.198	0.184	0.133	0.190	0.174	0.131	1.000	1.000	1.000
G6-Basin E Buttress 2 Panel 2	0.194	0.174	0.130	0.189	0.169	0.130	1.000	1.000	1.001
G6-Basin W Buttress 1 Panel 1	0.194	0.163	0.131	0.190	0.164	0.135	1.000	1.010	1.028
G6-Basin W Buttress 2 Panel 1	0.181	0.177	0.132	0.188	0.160	0.133	1.040	1.000	1.011
G6-Basin W Buttress 1 Panel 2	0.194	0.238	0.145	0.189	0.284	0.153	1.000	1.195	1.049
G6-Basin W Buttress 2 Panel 2	0.180	0.263	0.145	0.187	0.274	0.146	1.040	1.042	1.007
G6-Basin West Wall Panel 1	0.163	0.134	0.127	0.160	0.136	0.133	1.000	1.014	1.044
G6-Basin West Wall Panel 2	0.217	0.135	0.129	0.211	0.135	0.132	1.000	1.000	1.027
G6-Basin West Wall Panel 3	0.178	0.135	0.130	0.157	0.134	0.131	1.000	1.000	1.009

Table 03.08.04-30.1 – Group accelerations from original and refined mesh SSI models for full basin seismic UB condition and corresponding adjustment factors (continued)

Original Model				Refined Model			Calculated Factor for Full Basin		
Group	Average X	Average Y	Average Z	Average X	Average Y	Average Z	Average X	Average Y	Average Z
G6-Basin East Wall Panel 1	0.168	0.144	0.132	0.162	0.143	0.130	1.000	1.000	1.000
G6-Basin East Wall Panel 2	0.225	0.143	0.130	0.217	0.143	0.130	1.000	1.000	1.004
G6-Basin East Wall Panel 3	0.162	0.142	0.132	0.163	0.143	0.129	1.002	1.001	1.000
G7-Basin South Wall Panel 1	0.130	0.188	0.129	0.125	0.205	0.135	1.000	1.089	1.050
G7-Basin South Wall Panel 2	0.129	0.280	0.133	0.123	0.281	0.134	1.000	1.002	1.004
G7-Basin South Wall Panel 3	0.123	0.264	0.139	0.121	0.272	0.141	1.000	1.032	1.011
G7-Basin South Wall Panel 4	0.123	0.313	0.142	0.119	0.324	0.142	1.000	1.035	1.000
G7-Basin South Wall Panel 5	0.125	0.319	0.138	0.123	0.321	0.136	1.000	1.005	1.000
G7-Basin South Wall Panel 6	0.130	0.228	0.133	0.126	0.243	0.132	1.000	1.062	1.000
G7-Basin North Wall Panel 1	0.130	0.179	0.125	0.121	0.188	0.128	1.000	1.053	1.024
G7-Basin North Wall Panel 2	0.125	0.214	0.123	0.122	0.212	0.125	1.000	1.000	1.013
G7-Basin North Wall Panel 3	0.122	0.249	0.131	0.122	0.229	0.129	1.003	1.000	1.000
G7-Basin North Wall Panel 4	0.120	0.273	0.133	0.124	0.295	0.133	1.031	1.079	1.000
G7-Basin North Wall Panel 5	0.122	0.314	0.132	0.126	0.318	0.133	1.033	1.013	1.003
G7-Basin North Wall Panel 6	0.124	0.220	0.133	0.129	0.237	0.132	1.044	1.078	1.000
G7-Basin S Buttress 1 Panel 1	0.195	0.243	0.135	0.177	0.257	0.142	1.000	1.061	1.056
G7-Basin S Buttress 2 Panel 1	0.169	0.267	0.142	0.152	0.278	0.143	1.000	1.040	1.007
G7-Basin S Buttress 3 Panel 1	0.156	0.272	0.147	0.149	0.287	0.148	1.000	1.054	1.008
G7-Basin S Buttress 4 Panel 1	0.165	0.333	0.141	0.160	0.330	0.139	1.000	1.000	1.000
G7-Basin S Buttress 5 Panel 1	0.175	0.290	0.131	0.154	0.303	0.136	1.000	1.046	1.044
G7-Basin S Buttress 1 Panel 2	0.317	0.240	0.147	0.351	0.259	0.162	1.107	1.080	1.106
G7-Basin S Buttress 2 Panel 2	0.266	0.265	0.157	0.283	0.276	0.161	1.065	1.042	1.030
G7-Basin S Buttress 3 Panel 2	0.236	0.271	0.157	0.260	0.287	0.170	1.102	1.056	1.086
G7-Basin S Buttress 4 Panel 2	0.256	0.362	0.151	0.303	0.330	0.159	1.186	1.000	1.052
G7-Basin S Buttress 5 Panel 2	0.282	0.294	0.135	0.283	0.306	0.159	1.004	1.041	1.174
G7-Basin N Buttress 1 Panel 1	0.241	0.206	0.135	0.249	0.201	0.145	1.033	1.000	1.075
G7-Basin N Buttress 2 Panel 1	0.279	0.230	0.143	0.228	0.218	0.147	1.000	1.000	1.030
G7-Basin N Buttress 3 Panel 1	0.279	0.211	0.141	0.296	0.235	0.146	1.062	1.112	1.033
G7-Basin N Buttress 4 Panel 1	0.261	0.311	0.145	0.291	0.328	0.160	1.118	1.056	1.105
G7-Basin N Buttress 5 Panel 1	0.283	0.281	0.144	0.268	0.302	0.159	1.000	1.077	1.106
G7-Basin N Buttress 1 Panel 2	0.157	0.207	0.123	0.145	0.200	0.128	1.000	1.000	1.035
G7-Basin N Buttress 2 Panel 2	0.157	0.228	0.130	0.149	0.217	0.133	1.000	1.000	1.028
G7-Basin N Buttress 3 Panel 2	0.172	0.213	0.132	0.153	0.234	0.133	1.000	1.102	1.008
G7-Basin N Buttress 4 Panel 2	0.163	0.306	0.135	0.164	0.325	0.138	1.007	1.065	1.017
G7-Basin N Buttress 5 Panel 2	0.175	0.280	0.132	0.165	0.302	0.134	1.000	1.078	1.013

Table 03.08.04-30.1 – Group accelerations from original and refined mesh SSI models for full basin seismic UB condition and corresponding adjustment factors (continued)

Original Model				Refined Model			Calculated Factor for Full Basin		
Group	Average X	Average Y	Average Z	Average X	Average Y	Average Z	Average X	Average Y	Average Z
G7-Basin E Buttress 1 Panel 1	0.254	0.368	0.145	0.251	0.406	0.149	1.000	1.104	1.026
G7-Basin E Buttress 2 Panel 1	0.243	0.333	0.143	0.249	0.389	0.145	1.024	1.170	1.021
G7-Basin E Buttress 1 Panel 2	0.252	0.213	0.135	0.252	0.196	0.130	1.000	1.000	1.000
G7-Basin E Buttress 2 Panel 2	0.246	0.204	0.132	0.252	0.195	0.133	1.023	1.000	1.003
G7-Basin W Buttress 1 Panel 1	0.265	0.189	0.133	0.262	0.189	0.136	1.000	1.000	1.022
G7-Basin W Buttress 2 Panel 1	0.238	0.201	0.135	0.258	0.183	0.135	1.082	1.000	1.004
G7-Basin W Buttress 1 Panel 2	0.263	0.312	0.149	0.261	0.396	0.158	1.000	1.272	1.057
G7-Basin W Buttress 2 Panel 2	0.233	0.336	0.149	0.256	0.360	0.151	1.095	1.073	1.017
G7-Basin West Wall Panel 1	0.213	0.139	0.130	0.216	0.142	0.134	1.012	1.024	1.026
G7-Basin West Wall Panel 2	0.304	0.140	0.133	0.303	0.143	0.137	1.000	1.020	1.030
G7-Basin West Wall Panel 3	0.205	0.139	0.132	0.211	0.142	0.133	1.029	1.022	1.008
G7-Basin East Wall Panel 1	0.206	0.152	0.134	0.209	0.147	0.133	1.017	1.000	1.000
G7-Basin East Wall Panel 2	0.298	0.151	0.136	0.306	0.147	0.137	1.027	1.000	1.007
G7-Basin East Wall Panel 3	0.210	0.151	0.134	0.216	0.148	0.132	1.026	1.000	1.000
G8-Cooling Tower South Panel 1	0.384	0.234	0.165	0.391	0.240	0.182	1.019	1.026	1.099
G8-Cooling Tower South Panel 2	0.400	0.361	0.216	0.404	0.370	0.242	1.011	1.025	1.121
G8-Cooling Tower South Panel 3	0.408	0.322	0.226	0.410	0.330	0.252	1.005	1.025	1.114
G8-Cooling Tower South Panel 4	0.408	0.404	0.222	0.409	0.411	0.241	1.002	1.018	1.087
G8-Cooling Tower South Panel 5	0.403	0.455	0.203	0.399	0.471	0.220	1.000	1.034	1.079
G8-Cooling Tower South Panel 6	0.383	0.290	0.161	0.380	0.299	0.169	1.000	1.031	1.048
G8-Cooling Tower North Panel 1	0.366	0.230	0.172	0.379	0.222	0.183	1.034	1.000	1.062
G8-Cooling Tower North Panel 2	0.384	0.353	0.215	0.393	0.356	0.238	1.025	1.007	1.104
G8-Cooling Tower North Panel 3	0.391	0.323	0.233	0.399	0.314	0.251	1.023	1.000	1.080
G8-Cooling Tower North Panel 4	0.394	0.393	0.237	0.403	0.402	0.247	1.022	1.023	1.041
G8-Cooling Tower North Panel 5	0.388	0.442	0.203	0.398	0.469	0.224	1.026	1.060	1.104
G8-Cooling Tower North Panel 6	0.371	0.307	0.155	0.379	0.308	0.165	1.023	1.002	1.067
G8-Cooling Tower NS Panel 1	0.379	0.149	0.138	0.383	0.153	0.143	1.011	1.024	1.040
G8-Cooling Tower NS Panel 2	0.461	0.251	0.197	0.473	0.248	0.213	1.025	1.000	1.083
G8-Cooling Tower NS Panel 3	0.547	0.286	0.228	0.483	0.267	0.256	1.000	1.000	1.123
G8-Cooling Tower NS Panel 4	0.470	0.273	0.214	0.488	0.289	0.235	1.039	1.062	1.095
G8-Cooling Tower NS Panel 5	0.544	0.422	0.223	0.482	0.422	0.232	1.000	1.000	1.039
G8-Cooling Tower NS Panel 6	0.458	0.353	0.173	0.469	0.363	0.187	1.024	1.028	1.079
G8-Cooling Tower NS Panel 7	0.379	0.163	0.139	0.380	0.157	0.142	1.003	1.000	1.020
G9-Cooling Tower South Panel 1	0.415	0.258	0.169	0.420	0.267	0.187	1.013	1.033	1.103
G9-Cooling Tower South Panel 2	0.405	0.386	0.227	0.409	0.388	0.252	1.010	1.006	1.111

Table 03.08.04-30.1 – Group accelerations from original and refined mesh SSI models for full basin seismic UB condition and corresponding adjustment factors (continued)

Original Model				Refined Model			Calculated Factor for Full Basin		
Group	Average X	Average Y	Average Z	Average X	Average Y	Average Z	Average X	Average Y	Average Z
G9-Cooling Tower South Panel 3	0.403	0.355	0.237	0.403	0.363	0.265	1.000	1.023	1.115
G9-Cooling Tower South Panel 4	0.406	0.429	0.231	0.403	0.441	0.252	1.000	1.029	1.088
G9-Cooling Tower South Panel 5	0.410	0.492	0.212	0.406	0.495	0.228	1.000	1.005	1.075
G9-Cooling Tower South Panel 6	0.416	0.331	0.164	0.415	0.330	0.172	1.000	1.000	1.050
G9-Cooling Tower North Panel 1	0.393	0.262	0.176	0.401	0.268	0.186	1.021	1.022	1.061
G9-Cooling Tower North Panel 2	0.390	0.399	0.224	0.397	0.398	0.248	1.017	1.000	1.103
G9-Cooling Tower North Panel 3	0.391	0.366	0.243	0.398	0.373	0.264	1.019	1.019	1.086
G9-Cooling Tower North Panel 4	0.391	0.424	0.247	0.401	0.440	0.258	1.025	1.037	1.046
G9-Cooling Tower North Panel 5	0.392	0.482	0.210	0.403	0.493	0.229	1.029	1.023	1.091
G9-Cooling Tower North Panel 6	0.406	0.342	0.156	0.416	0.338	0.168	1.023	1.000	1.076
G9-Cooling Tower NS Panel 1	0.451	0.175	0.142	0.449	0.175	0.149	1.000	1.000	1.051
G9-Cooling Tower NS Panel 2	0.455	0.288	0.207	0.467	0.287	0.223	1.028	1.000	1.075
G9-Cooling Tower NS Panel 3	0.465	0.321	0.238	0.472	0.313	0.266	1.016	1.000	1.118
G9-Cooling Tower NS Panel 4	0.470	0.306	0.226	0.492	0.316	0.248	1.048	1.030	1.096
G9-Cooling Tower NS Panel 5	0.463	0.444	0.230	0.474	0.449	0.242	1.024	1.012	1.048
G9-Cooling Tower NS Panel 6	0.456	0.389	0.180	0.466	0.407	0.196	1.023	1.046	1.092
G9-Cooling Tower NS Panel 7	0.455	0.189	0.142	0.463	0.179	0.145	1.018	1.000	1.026
Basin Mat Panel 1	0.118	0.129	0.128	0.119	0.131	0.132	1.003	1.014	1.033
Basin Mat Panel 2	0.116	0.135	0.134	0.117	0.135	0.137	1.009	1.000	1.021
Basin Mat Panel 3	0.116	0.144	0.135	0.116	0.140	0.136	1.004	1.000	1.006
PH Mat	0.114	0.117	0.122	0.113	0.116	0.123	1.000	1.000	1.008
G2-PH W Buttress 1	0.120	0.124	0.127	0.123	0.123	0.133	1.019	1.000	1.043
G2-PH W Buttress 2	0.120	0.122	0.125	0.118	0.122	0.132	1.000	1.002	1.052
G2-PH E Buttress 1	0.117	0.131	0.124	0.121	0.127	0.134	1.031	1.000	1.077
G2-PH E Buttress 2	0.118	0.129	0.129	0.121	0.125	0.134	1.026	1.000	1.037
G3-PH W Buttress 1	0.137	0.132	0.127	0.138	0.128	0.133	1.007	1.000	1.041
G3-PH W Buttress 2	0.136	0.129	0.127	0.127	0.130	0.133	1.000	1.008	1.048
G3-PH E Buttress 1	0.131	0.141	0.127	0.137	0.136	0.136	1.041	1.000	1.067
G3-PH E Buttress 2	0.136	0.141	0.133	0.131	0.136	0.137	1.000	1.000	1.026
G2-PH Int Wall 1 Panel 1	0.114	0.123	0.121	0.115	0.123	0.118	1.005	1.005	1.000
G2-PH Int Wall 2 Panel 1	0.113	0.126	0.119	0.114	0.126	0.120	1.005	1.001	1.006
G3-PH Int Wall 1 Panel 1	0.119	0.133	0.122	0.121	0.135	0.120	1.019	1.016	1.000
G3-PH Int Wall 2 Panel 1	0.118	0.137	0.121	0.120	0.135	0.123	1.017	1.000	1.010

Table 03.08.04-30.2 – Group accelerations from original and refined mesh SSI models for empty basin seismic UB condition and corresponding adjustment factors

Original Model				Refined Model			Calculated Factor for Empty Basin		
Group	Average X	Average Y	Average Z	Average X	Average Y	Average Z	Average X	Average Y	Average Z
G2-PH West Wall Panel 1	0.117	0.125	0.132	0.120	0.128	0.131	1.022	1.026	1.000
G2-PH West Wall Panel 2	0.121	0.124	0.129	0.122	0.127	0.130	1.010	1.022	1.007
G2-PH West Wall Panel 3	0.116	0.123	0.130	0.116	0.128	0.132	1.000	1.046	1.017
G2-PH South Wall Panel 1	0.111	0.128	0.127	0.114	0.128	0.128	1.026	1.007	1.009
G2-PH South Wall Panel 2	0.111	0.130	0.124	0.112	0.128	0.124	1.011	1.000	1.002
G2-PH South Wall Panel 3	0.110	0.130	0.122	0.110	0.129	0.124	1.002	1.000	1.019
G2-PH North Wall Panel 1	0.112	0.129	0.130	0.111	0.134	0.133	1.000	1.036	1.026
G2-PH North Wall Panel 2	0.111	0.135	0.125	0.111	0.134	0.128	1.005	1.000	1.023
G2-PH North Wall Panel 3	0.112	0.132	0.128	0.114	0.132	0.135	1.020	1.000	1.052
G2-PH East Wall Panel 1	0.112	0.128	0.124	0.116	0.124	0.127	1.034	1.000	1.024
G2-PH East Wall Panel 2	0.118	0.126	0.125	0.125	0.122	0.128	1.056	1.000	1.023
G2-PH East Wall Panel 3	0.118	0.126	0.127	0.123	0.122	0.137	1.043	1.000	1.072
G2-PH Op Fl Panel 1	0.115	0.133	0.185	0.114	0.132	0.208	1.000	1.000	1.124
G2-PH Op Fl Panel 2	0.113	0.134	0.199	0.112	0.132	0.216	1.000	1.000	1.084
G2-PH Op Fl Panel 3	0.116	0.133	0.197	0.117	0.129	0.229	1.005	1.000	1.166
G3-PH West Wall Panel 1	0.122	0.133	0.135	0.130	0.139	0.137	1.059	1.050	1.012
G3-PH West Wall Panel 2	0.130	0.132	0.131	0.136	0.138	0.130	1.047	1.045	1.000
G3-PH West Wall Panel 3	0.120	0.133	0.135	0.122	0.139	0.136	1.012	1.049	1.005
G3-PH South Wall Panel 1	0.113	0.136	0.132	0.120	0.137	0.136	1.060	1.006	1.027
G3-PH South Wall Panel 2	0.115	0.136	0.127	0.116	0.136	0.128	1.013	1.002	1.010
G3-PH South Wall Panel 3	0.114	0.135	0.124	0.114	0.134	0.127	1.000	1.000	1.026
G3-PH North Wall Panel 1	0.115	0.145	0.134	0.115	0.146	0.135	1.000	1.002	1.004
G3-PH North Wall Panel 2	0.116	0.146	0.127	0.115	0.149	0.127	1.000	1.020	1.000
G3-PH North Wall Panel 3	0.118	0.145	0.132	0.119	0.139	0.134	1.009	1.000	1.015
G3-PH East Wall Panel 1	0.121	0.135	0.125	0.122	0.131	0.131	1.007	1.000	1.049
G3-PH East Wall Panel 2	0.135	0.135	0.126	0.138	0.132	0.133	1.022	1.000	1.061
G3-PH East Wall Panel 3	0.128	0.136	0.130	0.133	0.133	0.138	1.039	1.000	1.057
G3-PH Roof Panel 1	0.117	0.138	0.161	0.119	0.140	0.187	1.016	1.017	1.164
G3-PH Roof Panel 2	0.118	0.140	0.158	0.117	0.141	0.176	1.000	1.012	1.114
G3-PH Roof Panel 3	0.120	0.140	0.164	0.120	0.138	0.189	1.000	1.000	1.150
G5-Basin South Wall Panel 1	0.120	0.152	0.132	0.121	0.145	0.132	1.003	1.000	1.000
G5-Basin South Wall Panel 2	0.118	0.145	0.128	0.117	0.150	0.130	1.000	1.030	1.015
G5-Basin South Wall Panel 3	0.116	0.145	0.129	0.115	0.153	0.137	1.000	1.058	1.064
G5-Basin South Wall Panel 4	0.116	0.145	0.130	0.114	0.143	0.139	1.000	1.000	1.069
G5-Basin South Wall Panel 5	0.118	0.156	0.129	0.116	0.148	0.134	1.000	1.000	1.044

Table 03.08.04-30.2 – Group accelerations from original and refined mesh SSI models for empty basin seismic UB condition and corresponding adjustment factors (continued)

Original Model				Refined Model			Calculated Factor for Empty Basin		
Group	Average X	Average Y	Average Z	Average X	Average Y	Average Z	Average X	Average Y	Average Z
G5-Basin South Wall Panel 6	0.121	0.143	0.132	0.120	0.147	0.132	1.000	1.030	1.000
G5-Basin North Wall Panel 1	0.112	0.134	0.132	0.120	0.135	0.135	1.067	1.007	1.018
G5-Basin North Wall Panel 2	0.114	0.134	0.126	0.116	0.135	0.127	1.019	1.003	1.003
G5-Basin North Wall Panel 3	0.113	0.134	0.123	0.113	0.133	0.126	1.001	1.000	1.025
G5-Basin North Wall Panel 4	0.112	0.147	0.128	0.115	0.136	0.137	1.030	1.000	1.069
G5-Basin North Wall Panel 5	0.112	0.159	0.134	0.118	0.148	0.139	1.049	1.000	1.038
G5-Basin North Wall Panel 6	0.117	0.149	0.137	0.123	0.148	0.134	1.047	1.000	1.000
G5-Basin S Buttress 1 Panel 1	0.136	0.154	0.130	0.130	0.142	0.130	1.000	1.000	1.000
G5-Basin S Buttress 2 Panel 1	0.128	0.138	0.132	0.128	0.149	0.132	1.000	1.078	1.000
G5-Basin S Buttress 3 Panel 1	0.125	0.138	0.130	0.125	0.144	0.144	1.000	1.048	1.106
G5-Basin S Buttress 4 Panel 1	0.130	0.149	0.133	0.127	0.139	0.137	1.000	1.000	1.036
G5-Basin S Buttress 5 Panel 1	0.129	0.141	0.127	0.126	0.142	0.128	1.000	1.002	1.005
G5-Basin N Buttress 1 Panel 1	0.117	0.134	0.132	0.125	0.134	0.131	1.067	1.000	1.000
G5-Basin N Buttress 2 Panel 1	0.116	0.133	0.127	0.123	0.133	0.125	1.066	1.000	1.000
G5-Basin N Buttress 3 Panel 1	0.122	0.136	0.126	0.124	0.130	0.137	1.014	1.000	1.083
G5-Basin N Buttress 4 Panel 1	0.129	0.148	0.132	0.128	0.138	0.139	1.000	1.000	1.048
G5-Basin N Buttress 5 Panel 1	0.128	0.155	0.132	0.129	0.144	0.132	1.002	1.000	1.000
G5-Basin E Buttress 1 Panel 1	0.139	0.147	0.131	0.137	0.146	0.135	1.000	1.000	1.028
G5-Basin E Buttress 2 Panel 1	0.137	0.157	0.136	0.134	0.148	0.132	1.000	1.000	1.000
G5-Basin W Buttress 1 Panel 1	0.138	0.150	0.133	0.137	0.146	0.133	1.000	1.000	1.001
G5-Basin W Buttress 2 Panel 1	0.137	0.146	0.136	0.132	0.144	0.147	1.000	1.000	1.077
G5-Basin West Wall Panel 1	0.137	0.140	0.134	0.135	0.141	0.135	1.000	1.003	1.001
G5-Basin West Wall Panel 2	0.151	0.137	0.134	0.140	0.139	0.138	1.000	1.017	1.032
G5-Basin West Wall Panel 3	0.132	0.135	0.138	0.137	0.135	0.142	1.040	1.005	1.029
G5-Basin East Wall Panel 1	0.132	0.138	0.135	0.135	0.134	0.135	1.025	1.000	1.002
G5-Basin East Wall Panel 2	0.146	0.138	0.134	0.143	0.132	0.134	1.000	1.000	1.000
G5-Basin East Wall Panel 3	0.133	0.139	0.136	0.131	0.136	0.134	1.000	1.000	1.000
G6-Basin South Wall Panel 1	0.124	0.180	0.133	0.123	0.167	0.134	1.000	1.000	1.007
G6-Basin South Wall Panel 2	0.121	0.199	0.130	0.120	0.184	0.131	1.000	1.000	1.009
G6-Basin South Wall Panel 3	0.119	0.181	0.131	0.118	0.186	0.137	1.000	1.029	1.045
G6-Basin South Wall Panel 4	0.120	0.195	0.134	0.117	0.197	0.143	1.000	1.013	1.068
G6-Basin South Wall Panel 5	0.122	0.199	0.131	0.117	0.195	0.139	1.000	1.000	1.056
G6-Basin South Wall Panel 6	0.125	0.168	0.136	0.120	0.172	0.136	1.000	1.024	1.003
G6-Basin North Wall Panel 1	0.120	0.149	0.135	0.121	0.148	0.143	1.010	1.000	1.062
G6-Basin North Wall Panel 2	0.120	0.153	0.128	0.118	0.150	0.132	1.000	1.000	1.031

Table 03.08.04-30.2 – Group accelerations from original and refined mesh SSI models for empty basin seismic UB condition and corresponding adjustment factors (continued)

Original Model				Refined Model			Calculated Factor for Empty Basin		
Group	Average X	Average Y	Average Z	Average X	Average Y	Average Z	Average X	Average Y	Average Z
G6-Basin North Wall Panel 3	0.119	0.151	0.127	0.116	0.153	0.130	1.000	1.018	1.029
G6-Basin North Wall Panel 4	0.117	0.175	0.130	0.117	0.179	0.141	1.000	1.027	1.089
G6-Basin North Wall Panel 5	0.117	0.197	0.135	0.119	0.193	0.143	1.023	1.000	1.060
G6-Basin North Wall Panel 6	0.118	0.172	0.140	0.123	0.169	0.137	1.046	1.000	1.000
G6-Basin S Buttress 1 Panel 1	0.159	0.189	0.131	0.153	0.174	0.133	1.000	1.000	1.012
G6-Basin S Buttress 2 Panel 1	0.156	0.191	0.136	0.149	0.185	0.137	1.000	1.000	1.011
G6-Basin S Buttress 3 Panel 1	0.144	0.174	0.136	0.142	0.187	0.145	1.000	1.073	1.068
G6-Basin S Buttress 4 Panel 1	0.152	0.207	0.134	0.142	0.198	0.143	1.000	1.000	1.062
G6-Basin S Buttress 5 Panel 1	0.144	0.178	0.128	0.140	0.179	0.135	1.000	1.004	1.052
G6-Basin S Buttress 1 Panel 2	0.262	0.189	0.135	0.261	0.176	0.144	1.000	1.000	1.066
G6-Basin S Buttress 2 Panel 2	0.240	0.192	0.156	0.280	0.184	0.149	1.168	1.000	1.000
G6-Basin S Buttress 3 Panel 2	0.211	0.174	0.148	0.239	0.187	0.162	1.136	1.074	1.095
G6-Basin S Buttress 4 Panel 2	0.233	0.207	0.147	0.261	0.199	0.154	1.118	1.000	1.048
G6-Basin S Buttress 5 Panel 2	0.218	0.178	0.134	0.249	0.179	0.150	1.142	1.005	1.117
G6-Basin N Buttress 1 Panel 1	0.166	0.154	0.138	0.192	0.148	0.139	1.160	1.000	1.008
G6-Basin N Buttress 2 Panel 1	0.169	0.152	0.140	0.234	0.152	0.142	1.384	1.000	1.014
G6-Basin N Buttress 3 Panel 1	0.201	0.152	0.143	0.247	0.158	0.162	1.232	1.044	1.127
G6-Basin N Buttress 4 Panel 1	0.286	0.191	0.149	0.258	0.194	0.154	1.000	1.017	1.040
G6-Basin N Buttress 5 Panel 1	0.238	0.186	0.140	0.230	0.184	0.149	1.000	1.000	1.063
G6-Basin N Buttress 1 Panel 2	0.130	0.153	0.132	0.132	0.147	0.137	1.014	1.000	1.037
G6-Basin N Buttress 2 Panel 2	0.130	0.152	0.130	0.135	0.151	0.130	1.036	1.000	1.000
G6-Basin N Buttress 3 Panel 2	0.137	0.151	0.131	0.138	0.158	0.140	1.007	1.048	1.074
G6-Basin N Buttress 4 Panel 2	0.167	0.191	0.137	0.142	0.194	0.146	1.000	1.017	1.066
G6-Basin N Buttress 5 Panel 2	0.149	0.187	0.136	0.140	0.185	0.136	1.000	1.000	1.003
G6-Basin E Buttress 1 Panel 1	0.200	0.247	0.143	0.198	0.277	0.155	1.000	1.118	1.084
G6-Basin E Buttress 2 Panel 1	0.201	0.261	0.148	0.198	0.288	0.148	1.000	1.107	1.002
G6-Basin E Buttress 1 Panel 2	0.197	0.168	0.135	0.199	0.162	0.139	1.010	1.000	1.030
G6-Basin E Buttress 2 Panel 2	0.201	0.176	0.137	0.199	0.167	0.135	1.000	1.000	1.000
G6-Basin W Buttress 1 Panel 1	0.202	0.178	0.136	0.190	0.161	0.137	1.000	1.000	1.008
G6-Basin W Buttress 2 Panel 1	0.184	0.179	0.142	0.197	0.161	0.150	1.071	1.000	1.054
G6-Basin W Buttress 1 Panel 2	0.202	0.260	0.142	0.190	0.260	0.146	1.000	1.000	1.033
G6-Basin W Buttress 2 Panel 2	0.184	0.267	0.153	0.198	0.269	0.168	1.073	1.008	1.095
G6-Basin West Wall Panel 1	0.171	0.146	0.137	0.160	0.146	0.138	1.000	1.000	1.004
G6-Basin West Wall Panel 2	0.207	0.144	0.141	0.206	0.144	0.144	1.000	1.000	1.021
G6-Basin West Wall Panel 3	0.157	0.142	0.141	0.164	0.143	0.145	1.049	1.006	1.029

Table 03.08.04-30.2 – Group accelerations from original and refined mesh SSI models for empty basin seismic UB condition and corresponding adjustment factors (continued)

Original Model				Refined Model			Calculated Factor for Empty Basin		
Group	Average X	Average Y	Average Z	Average X	Average Y	Average Z	Average X	Average Y	Average Z
G6-Basin East Wall Panel 1	0.166	0.139	0.137	0.171	0.137	0.138	1.029	1.000	1.008
G6-Basin East Wall Panel 2	0.207	0.138	0.136	0.214	0.137	0.139	1.032	1.000	1.019
G6-Basin East Wall Panel 3	0.164	0.140	0.138	0.168	0.137	0.137	1.020	1.000	1.000
G7-Basin South Wall Panel 1	0.128	0.211	0.135	0.130	0.201	0.134	1.018	1.000	1.000
G7-Basin South Wall Panel 2	0.125	0.282	0.131	0.124	0.266	0.134	1.000	1.000	1.019
G7-Basin South Wall Panel 3	0.123	0.258	0.132	0.122	0.271	0.140	1.000	1.049	1.059
G7-Basin South Wall Panel 4	0.125	0.285	0.136	0.119	0.291	0.145	1.000	1.020	1.062
G7-Basin South Wall Panel 5	0.128	0.305	0.134	0.120	0.296	0.142	1.000	1.000	1.063
G7-Basin South Wall Panel 6	0.134	0.226	0.136	0.128	0.230	0.139	1.000	1.017	1.024
G7-Basin North Wall Panel 1	0.129	0.181	0.137	0.125	0.188	0.147	1.000	1.034	1.073
G7-Basin North Wall Panel 2	0.125	0.226	0.131	0.120	0.211	0.136	1.000	1.000	1.036
G7-Basin North Wall Panel 3	0.124	0.220	0.129	0.119	0.230	0.134	1.000	1.046	1.033
G7-Basin North Wall Panel 4	0.123	0.269	0.133	0.124	0.270	0.145	1.008	1.004	1.092
G7-Basin North Wall Panel 5	0.123	0.302	0.136	0.122	0.311	0.145	1.000	1.032	1.063
G7-Basin North Wall Panel 6	0.126	0.234	0.142	0.131	0.231	0.141	1.032	1.000	1.000
G7-Basin S Buttress 1 Panel 1	0.196	0.233	0.133	0.192	0.226	0.134	1.000	1.000	1.010
G7-Basin S Buttress 2 Panel 1	0.186	0.259	0.142	0.176	0.264	0.141	1.000	1.020	1.000
G7-Basin S Buttress 3 Panel 1	0.175	0.254	0.141	0.165	0.264	0.148	1.000	1.038	1.048
G7-Basin S Buttress 4 Panel 1	0.180	0.338	0.141	0.166	0.306	0.143	1.000	1.000	1.016
G7-Basin S Buttress 5 Panel 1	0.165	0.264	0.132	0.173	0.272	0.142	1.044	1.029	1.071
G7-Basin S Buttress 1 Panel 2	0.378	0.236	0.141	0.375	0.224	0.153	1.000	1.000	1.084
G7-Basin S Buttress 2 Panel 2	0.326	0.256	0.168	0.357	0.261	0.150	1.093	1.018	1.000
G7-Basin S Buttress 3 Panel 2	0.277	0.253	0.157	0.325	0.260	0.162	1.171	1.026	1.034
G7-Basin S Buttress 4 Panel 2	0.297	0.336	0.156	0.351	0.309	0.160	1.181	1.000	1.026
G7-Basin S Buttress 5 Panel 2	0.264	0.264	0.142	0.336	0.267	0.159	1.272	1.011	1.117
G7-Basin N Buttress 1 Panel 1	0.197	0.197	0.141	0.283	0.185	0.146	1.436	1.000	1.040
G7-Basin N Buttress 2 Panel 1	0.209	0.223	0.146	0.274	0.209	0.148	1.309	1.000	1.014
G7-Basin N Buttress 3 Panel 1	0.256	0.219	0.150	0.283	0.246	0.169	1.106	1.126	1.128
G7-Basin N Buttress 4 Panel 1	0.384	0.278	0.164	0.337	0.283	0.164	1.000	1.018	1.000
G7-Basin N Buttress 5 Panel 1	0.261	0.289	0.147	0.291	0.277	0.155	1.115	1.000	1.052
G7-Basin N Buttress 1 Panel 2	0.146	0.199	0.136	0.151	0.186	0.139	1.034	1.000	1.026
G7-Basin N Buttress 2 Panel 2	0.145	0.225	0.134	0.148	0.211	0.132	1.020	1.000	1.000
G7-Basin N Buttress 3 Panel 2	0.160	0.221	0.135	0.154	0.246	0.144	1.000	1.109	1.065
G7-Basin N Buttress 4 Panel 2	0.204	0.278	0.143	0.166	0.283	0.151	1.000	1.018	1.056
G7-Basin N Buttress 5 Panel 2	0.167	0.289	0.138	0.156	0.276	0.141	1.000	1.000	1.018

Table 03.08.04-30.2 – Group accelerations from original and refined mesh SSI models for empty basin seismic UB condition and corresponding adjustment factors (continued)

Original Model				Refined Model			Calculated Factor for Empty Basin		
Group	Average X	Average Y	Average Z	Average X	Average Y	Average Z	Average X	Average Y	Average Z
G7-Basin E Buttress 1 Panel 1	0.260	0.333	0.147	0.264	0.348	0.156	1.016	1.044	1.062
G7-Basin E Buttress 2 Panel 1	0.281	0.331	0.152	0.261	0.395	0.156	1.000	1.191	1.024
G7-Basin E Buttress 1 Panel 2	0.260	0.203	0.140	0.266	0.185	0.140	1.022	1.000	1.001
G7-Basin E Buttress 2 Panel 2	0.280	0.201	0.139	0.261	0.218	0.139	1.000	1.087	1.000
G7-Basin W Buttress 1 Panel 1	0.277	0.204	0.139	0.292	0.186	0.140	1.053	1.000	1.005
G7-Basin W Buttress 2 Panel 1	0.253	0.219	0.145	0.273	0.183	0.155	1.077	1.000	1.063
G7-Basin W Buttress 1 Panel 2	0.278	0.327	0.146	0.274	0.350	0.151	1.000	1.069	1.036
G7-Basin W Buttress 2 Panel 2	0.254	0.368	0.156	0.261	0.355	0.169	1.028	1.000	1.085
G7-Basin West Wall Panel 1	0.231	0.158	0.140	0.218	0.153	0.141	1.000	1.000	1.012
G7-Basin West Wall Panel 2	0.303	0.159	0.149	0.304	0.152	0.155	1.003	1.000	1.041
G7-Basin West Wall Panel 3	0.212	0.155	0.146	0.209	0.154	0.152	1.000	1.000	1.037
G7-Basin East Wall Panel 1	0.212	0.151	0.140	0.218	0.152	0.142	1.030	1.007	1.014
G7-Basin East Wall Panel 2	0.304	0.149	0.141	0.313	0.150	0.146	1.031	1.006	1.034
G7-Basin East Wall Panel 3	0.218	0.151	0.141	0.217	0.149	0.140	1.000	1.000	1.000
G8-Cooling Tower South Panel 1	0.364	0.228	0.182	0.364	0.235	0.186	1.000	1.033	1.024
G8-Cooling Tower South Panel 2	0.377	0.321	0.218	0.375	0.336	0.236	1.000	1.046	1.082
G8-Cooling Tower South Panel 3	0.374	0.314	0.252	0.374	0.318	0.289	1.000	1.013	1.149
G8-Cooling Tower South Panel 4	0.374	0.363	0.257	0.372	0.381	0.271	1.000	1.050	1.053
G8-Cooling Tower South Panel 5	0.373	0.418	0.224	0.370	0.436	0.222	1.000	1.044	1.000
G8-Cooling Tower South Panel 6	0.356	0.274	0.183	0.358	0.281	0.174	1.005	1.026	1.000
G8-Cooling Tower North Panel 1	0.343	0.220	0.198	0.347	0.217	0.207	1.013	1.000	1.050
G8-Cooling Tower North Panel 2	0.362	0.322	0.230	0.364	0.319	0.257	1.005	1.000	1.113
G8-Cooling Tower North Panel 3	0.363	0.308	0.245	0.368	0.315	0.278	1.012	1.022	1.136
G8-Cooling Tower North Panel 4	0.366	0.358	0.245	0.372	0.371	0.261	1.016	1.036	1.062
G8-Cooling Tower North Panel 5	0.365	0.401	0.224	0.370	0.433	0.223	1.012	1.081	1.000
G8-Cooling Tower North Panel 6	0.355	0.272	0.178	0.358	0.284	0.175	1.010	1.043	1.000
G8-Cooling Tower NS Panel 1	0.354	0.174	0.157	0.363	0.160	0.164	1.028	1.000	1.048
G8-Cooling Tower NS Panel 2	0.423	0.221	0.209	0.440	0.226	0.221	1.039	1.019	1.060
G8-Cooling Tower NS Panel 3	0.497	0.265	0.231	0.454	0.245	0.264	1.000	1.000	1.143
G8-Cooling Tower NS Panel 4	0.423	0.264	0.253	0.442	0.268	0.281	1.045	1.013	1.109
G8-Cooling Tower NS Panel 5	0.493	0.357	0.244	0.455	0.360	0.243	1.000	1.008	1.000
G8-Cooling Tower NS Panel 6	0.424	0.312	0.200	0.434	0.325	0.185	1.024	1.039	1.000
G8-Cooling Tower NS Panel 7	0.359	0.162	0.145	0.369	0.163	0.154	1.028	1.004	1.060
G9-Cooling Tower South Panel 1	0.390	0.259	0.185	0.390	0.272	0.193	1.000	1.049	1.042
G9-Cooling Tower South Panel 2	0.378	0.331	0.226	0.378	0.336	0.247	1.000	1.015	1.091

Table 03.08.04-30.2 – Group accelerations from original and refined mesh SSI models for empty basin seismic UB condition and corresponding adjustment factors (continued)

Original Model				Refined Model			Calculated Factor for Empty Basin		
Group	Average X	Average Y	Average Z	Average X	Average Y	Average Z	Average X	Average Y	Average Z
G9-Cooling Tower South Panel 3	0.373	0.331	0.260	0.371	0.340	0.298	1.000	1.028	1.145
G9-Cooling Tower South Panel 4	0.370	0.400	0.265	0.371	0.412	0.281	1.001	1.032	1.060
G9-Cooling Tower South Panel 5	0.371	0.428	0.232	0.374	0.446	0.233	1.009	1.042	1.003
G9-Cooling Tower South Panel 6	0.388	0.318	0.184	0.389	0.330	0.179	1.004	1.037	1.000
G9-Cooling Tower North Panel 1	0.371	0.273	0.200	0.374	0.271	0.215	1.010	1.000	1.071
G9-Cooling Tower North Panel 2	0.359	0.329	0.240	0.363	0.337	0.263	1.011	1.026	1.097
G9-Cooling Tower North Panel 3	0.361	0.343	0.253	0.364	0.338	0.287	1.010	1.000	1.136
G9-Cooling Tower North Panel 4	0.361	0.404	0.254	0.368	0.412	0.267	1.022	1.021	1.050
G9-Cooling Tower North Panel 5	0.391	0.427	0.235	0.372	0.449	0.230	1.000	1.051	1.000
G9-Cooling Tower North Panel 6	0.383	0.318	0.183	0.384	0.333	0.178	1.002	1.048	1.000
G9-Cooling Tower NS Panel 1	0.420	0.209	0.165	0.429	0.181	0.174	1.022	1.000	1.059
G9-Cooling Tower NS Panel 2	0.430	0.248	0.218	0.447	0.257	0.229	1.040	1.038	1.053
G9-Cooling Tower NS Panel 3	0.427	0.289	0.237	0.433	0.276	0.277	1.014	1.000	1.165
G9-Cooling Tower NS Panel 4	0.405	0.301	0.265	0.426	0.304	0.291	1.053	1.009	1.099
G9-Cooling Tower NS Panel 5	0.425	0.377	0.256	0.432	0.385	0.252	1.018	1.020	1.000
G9-Cooling Tower NS Panel 6	0.431	0.345	0.208	0.449	0.356	0.197	1.043	1.033	1.000
G9-Cooling Tower NS Panel 7	0.428	0.187	0.152	0.436	0.197	0.162	1.017	1.053	1.063
Basin Mat Panel 1	0.119	0.135	0.136	0.120	0.135	0.137	1.003	1.000	1.007
Basin Mat Panel 2	0.116	0.134	0.136	0.117	0.133	0.137	1.013	1.000	1.009
Basin Mat Panel 3	0.116	0.141	0.135	0.119	0.136	0.138	1.028	1.000	1.026
PH Mat	0.109	0.118	0.123	0.114	0.119	0.128	1.042	1.014	1.043
G2-PH W Buttress 1	0.123	0.124	0.129	0.124	0.126	0.132	1.011	1.018	1.023
G2-PH W Buttress 2	0.120	0.123	0.131	0.119	0.127	0.130	1.000	1.031	1.000
G2-PH E Buttress 1	0.116	0.126	0.126	0.122	0.122	0.125	1.052	1.000	1.000
G2-PH E Buttress 2	0.122	0.126	0.125	0.129	0.121	0.131	1.059	1.000	1.046
G3-PH W Buttress 1	0.134	0.132	0.130	0.147	0.137	0.130	1.097	1.041	1.000
G3-PH W Buttress 2	0.127	0.132	0.132	0.133	0.137	0.131	1.047	1.041	1.000
G3-PH E Buttress 1	0.133	0.133	0.127	0.135	0.129	0.130	1.016	1.000	1.025
G3-PH E Buttress 2	0.141	0.135	0.126	0.145	0.130	0.136	1.025	1.000	1.079
G2-PH Int Wall 1 Panel 1	0.111	0.127	0.120	0.113	0.124	0.123	1.020	1.000	1.026
G2-PH Int Wall 2 Panel 1	0.112	0.126	0.120	0.114	0.124	0.123	1.018	1.000	1.024
G3-PH Int Wall 1 Panel 1	0.119	0.136	0.123	0.127	0.135	0.126	1.062	1.000	1.023
G3-PH Int Wall 2 Panel 1	0.122	0.135	0.122	0.124	0.135	0.124	1.012	1.001	1.015

Horizontal section cut elevations at the base of the Ultimate Heat Sink (UHS) Basin and the base of the Reactor Service Water (RSW) Pump House for comparison of forces and moments from the SSI model and the equivalent static FEA are shown in Figure 03.08.04-30.2. A comparison of the forces and moments at these section cuts from the SSI analysis and the SAP2000 equivalent static FEA are provided in Tables 03.08.04-30.3 through 03.08.04-30.6. As shown in these tables, the ratio of equivalent static FEA forces and moments to the SSI analysis forces and moments is greater than 1.0; therefore, the design forces used in the equivalent static FEA envelop the maximum SSI analysis forces.

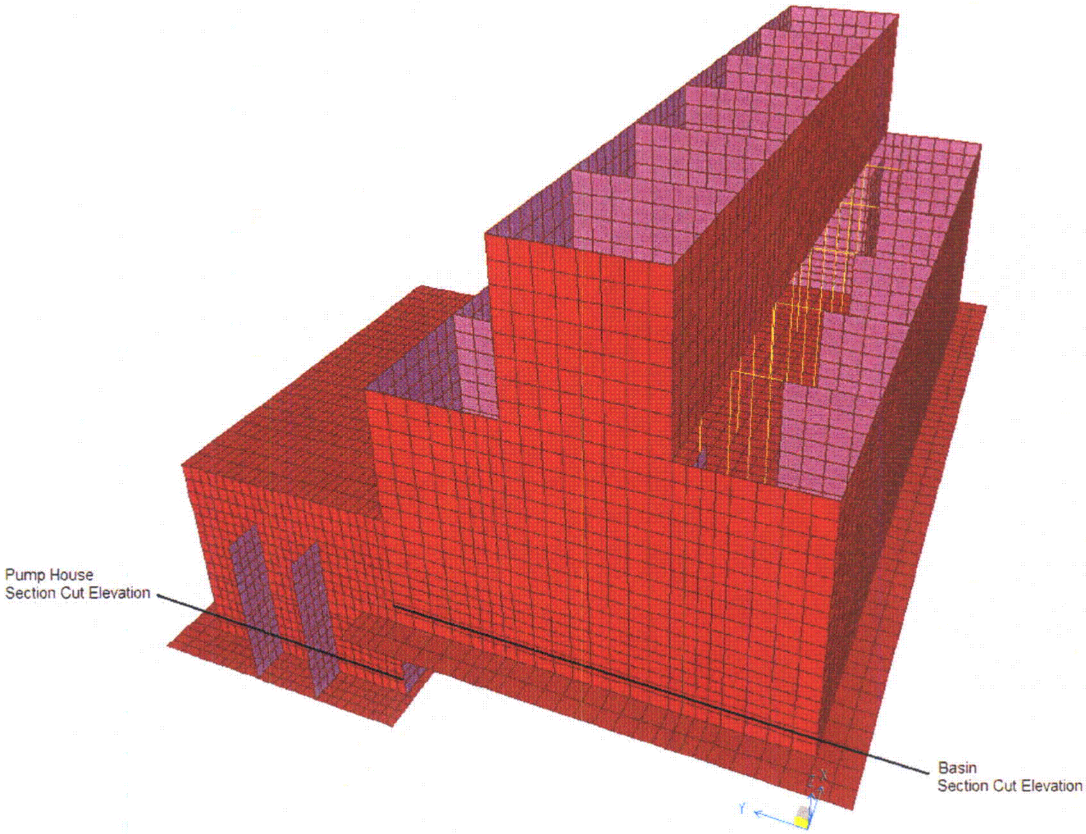


Figure 03.08.04-30.2: Horizontal section cut elevations

Notes:

1.The first row of elements at the bottom of the UHS Basin and RSW Pump House walls are 5'-0" link elements that model the distance from the center of the 10'-0" basemat to the bottom of the walls. Therefore, the sections cuts are taken at the second row of elements from the bottom of the walls.

2.The forces and moments in the design model due to the seismic accidental eccentricity are not included in the section cut forces reported in the tables below.

Table 03.08.04-30.3: Section Cut Seismic Force and Moment Comparison between SAP2000 Model vs. SSI Model for UHS Basin (Full Basin Condition)

	Forces			Moments	
	FX kip	**FY** kip	**FZ** kip	**MX** kip-ft	**MY** kip-ft
SRSS Seismic Response and Dynamic Soil Section Cut Forces	44225	54889	23895	1601151	2409440
Enveloping SSI Section Cut Forces	24605	25224	12984	953117	1445198
Ratio of SAP2000/SSI Section Cut Forces	1.80	2.18	1.84	1.68	1.67

Table 03.08.04-30.4: Section Cut Seismic Force and Moment Comparison between SAP2000 Model vs. SSI Model for UHS Basin (Empty Basin Condition)

	Forces			Moments	
	FX	**FY**	**FZ**	**MX**	**MY**
	kip	kip	kip	kip-ft	kip-ft
SRSS Seismic Response and Dynamic Soil Section Cut Forces	40770	44785	22255	1272927	2132180
Enveloping SSI Section Cut Forces	18952	17824	15048	769727	1347310
Ratio of SAP2000/SSI Section Cut Forces	2.15	2.51	1.48	1.65	1.58

Table 03.08.04-30.5: Section Cut Seismic Force and Moment Comparison between SAP2000 Model vs. SSI Model for RSW Pump House (Full Basin Condition)

	Forces			Moments	
	FX	**FY**	**FZ**	**MX**	**MY**
	kip	kip	kip	kip-ft	kip-ft
SRSS Seismic Response and Dynamic Soil Section Cut Forces	29988	47954	26898	531600	681142
Enveloping SSI Section Cut Forces	17922	22490	13291	253012	309953
Ratio of SAP2000/SSI Section Cut Forces	1.67	2.13	2.02	2.10	2.20

Table 03.08.04-30.6: Section Cut Seismic Force and Moment Comparison between SAP2000 Model vs. SSI Model for RSW Pump House (Empty Basin Condition)

	Forces			Moments	
	FX	**FY**	**FZ**	**MX**	**MY**
	kip	kip	kip	kip-ft	kip-ft
SRSS Seismic Response and Dynamic Soil Section Cut Forces	32366	43198	25760	340860	524264
Enveloping SSI Section Cut Forces	17384	21139	11973	204532	282817
Ratio of SAP2000/SSI Section Cut Forces	1.86	2.04	2.15	1.67	1.85

The methodology used to account for torsional effects is described in response to RAI 03.07.01-11 submitted with STPNOC letter U7-C-STP-NRC-090128, dated September 3, 2009. According to ASCE 4-98, accidental torsional motion is accounted for in the structural model by applying a torsional moment resulting from an accidental eccentricity of 5% of the plan dimensions between the center of mass and center of rigidity. The structural masses, equipment masses including dead and live loads, and the impulsive mass of the water in the X and Y direction were used in conjunction with the enveloping seismic accelerations from the refined and original SSI analysis considering both the full and empty basin in order to obtain the equivalent static loads per structural element. These forces were then applied to each node at the elevation of interest. For example, the accidental torsional moment for the top half of the cooling tower was applied as nodal forces to the top of the cooling tower. All of the torsional moments acting in the clockwise direction due to both X and Y direction excitations were applied simultaneously. Similarly, all of the counterclockwise torsional moments due to x and y direction excitations were applied at the same time. This method assumes that ground excitations in both directions are exciting the structure simultaneously and therefore represents a conservative approach. Since the accidental torsional moments are directional in nature, the resulting forces were always added to the other forces in the seismic load combination. Figure 03.08.04-30.3 offers a schematic diagram of how the nodal forces were applied to the FEA model.

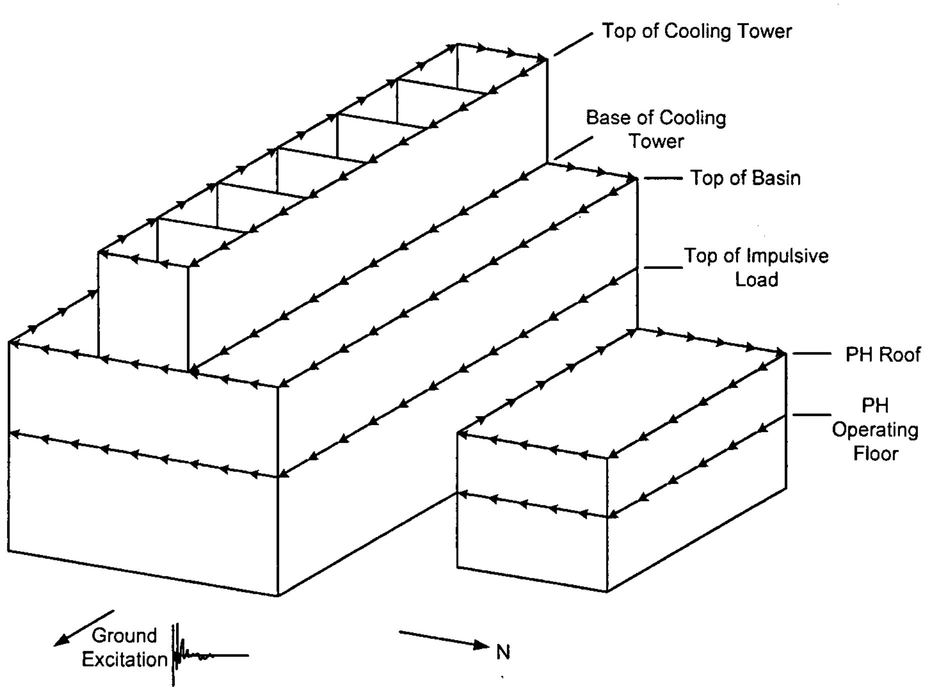


Figure 03.08.04-30.3: Location of accidental eccentricity forces and how they were applied as nodal loads to create a torsional moment on the structure.

The UHS has ten 4'-0" x 4'-6" beams spanning between the buttresses and the fan wall enclosure. The UHS also has twenty 5'-0" x 5'-0" columns and three 5'-0" x 12'0 columns supporting the cooling tower. The comparisons of maximum section cut forces between the equivalent static seismic SRSS model and the SSI model in Table 03.08.04-30.5 and Table 03.08.04-30.6 demonstrate that there is significant margin in the equivalent static seismic loads. Since the induced seismic shears and moments about each of the two major axes of the beams and the columns are mainly due to one seismic excitation, the 100-40-40 rule was used for the combination of three seismic load components for the design of beams and columns. Considering the 0.06 reinforcement ratio limitation placed on the longitudinal reinforcement ratio by Section 21.4.3.1 of ACI 349-97, it is not possible to accommodate all of the conservatism of the equivalent static seismic loading in the beam and column design. Therefore, revised panel section accelerations for the full basin case were applied to the 100-40-40 beam and column analysis models. A comparison of the maximum section cut forces is provided in Table 03.08.04-30.7 and Table 03.08.04-30.8 to verify that the inertial section cut forces from the 100-40-40 equivalent static seismic beam and column model envelop the SSI section cut forces even with the reduced conservatism. As the comparison demonstrates, the beam and column design strengths still satisfy full seismic demands as determined by the SSI analysis, but do not have the additional component of conservatism incorporated into other elements of the structure designed with equivalent static seismic SRSS model forces.

The stability of the UHS/ RSW Pump House against sliding, overturning and flotation was re-evaluated considering both full and empty basin conditions. The UHS/RSW Pump House considering a full basin is shown to be stable against sliding with only at-rest soil pressure resistance. The UHS/RSW Pump House considering an empty basin is shown to be stable against sliding by engaging some passive pressure. The coefficients of friction considered for this stability evaluation were 0.3 for RSW Pump House and 0.4 for UHS Basin.

The results of the revised stability calculation are provided in Table 3H.6-5 (see Enclosure 1).

Table 03.08.04-30.7: Section Cut Seismic Force and Moment Comparison between SAP2000 Model (100-40-40 Combination) vs. SSI Model for UHS Basin (Full Basin Condition)

	Forces			Moments	
	FX kip	FY kip	FZ kip	MX kip-ft	MY kip-ft
100-40-40 Seismic Response and Dynamic Soil Section Cut Forces	33456	42502	21773	1509926	2291496
Enveloping SSI Section Cut Forces	24605	25224	12984	953117	1445198
Ratio of SAP2000/SSI Section Cut Forces	1.36	1.68	1.68	1.58	1.59

Table 03.08.04-30.8: Section Cut Seismic Force and Moment Comparison between SAP2000 Model (100-40-40 Combination) vs. SSI Model for RSW Pump House (Full Basin Condition)

	Forces			Moments	
	FX kip	FY kip	FZ kip	MX kip-ft	MY kip-ft
100-40-40 Seismic Response and Dynamic Soil Section Cut Forces	27293	45288	24041	495151	704988
Enveloping SSI Section Cut Forces	17922	22490	13291	253012	309953
Ratio of SAP2000/SSI Section Cut Forces	1.52	2.01	1.81	1.96	2.27

2) Design of UHS/RSW Pump House is revised using both Winkler and pseudo-coupled method. For further detail, please see the response to RAI 03.08.05-4, Supplement 1, submitted with STPNOC letter U7-C-STP-NRC-100248 dated November 17, 2010.

3) Seismic loading are calculated using equivalent static method considering maximum accelerations from SSI analyses. In addition, the design as noted in part 2 above also considers pseudo-coupled method. The use of pseudo-coupled method accounts for the effect of pressure distribution.

4) 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 difference 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 COLA Part 2, Tier 2 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 COLA Part 2, Tier 2 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.

5) The UHS/RSW Pump House design used an iterative approach of checking the design axial force and moment couples for every load combination from the finite element model versus ACI 349-97 axial force and moment (P&M) interaction diagrams that were calculated based on actual reinforcement bar diameters, spacings, and layers. If the design axial force and moment couple for any load combination was outside of the allowable ACI 349-97 P&M interaction curve for a given reinforcement pattern, the design axial force and moment couples for every load combination were rechecked versus the allowable ACI 349-97 P&M interaction curve for a reinforcement pattern with a higher capacity (higher area of steel). When all of the axial force and moment couples from every load combination were within the allowable ACI 349-97 P&M interaction curve for a given reinforcement pattern, the area of steel corresponding to this reinforcement pattern plus any additional required reinforcement for in-plane shear was reported in COLA Part 2, Tier 2, Tables 3H.6-7 and 3H.6-8 as the "longitudinal reinforcing provided".

The method described in COLA Part 2, Tier 2, Sections 3H.6.6.3.1 and 3H.6.6.3.2 for reporting forces and moments in Tables 3H.6-7 and 3H.6-8 (max tension with corresponding moment "MTCM", max compression with corresponding moment "MCCM", max moment with axial tension "MMAT", max moment with axial compression "MMAC") was selected to indicate the range of critical forces and moments for a given reinforcing zone depending on the load combination. The forces and moments reported in Tables 3H.6-7 and 3H.6-8 are not the only forces and moments considered in the design of the longitudinal reinforcing. 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 and for every element* within each reinforcing zone. Approximately 1600 permutations of the design load combinations in Section 3H.6 are considered in the design (varying wind directions, varying thermal conditions, etc.). The forces and moments from every load combination permutation are evaluated to determine the provided reinforcement.

The force/moment couples reported in Tables 3H.6-7 and 3H.6-8 are the maximum from the two element faces considered in design (faces 1 and 3 for vertical reinforcement of walls or north-south reinforcement of slabs, and faces 2 and 4 for horizontal reinforcement of walls or east-west reinforcement of slabs). Table 03.08.04-30.9 is an excerpt from Table 3H.6-7. The elements and element forces provided in Table 03.08.04-30.9 are for the vertical reinforcement for zone 6-V-L of the UHS Basin South Wall (outside face). Figure 03.08.04-30.4 shows the P&M interaction diagram for Element 1880 listed in Table 03.08.04-30.9 with the design forces and moments from every load combination permutation plotted within the curve for the full and empty basin, uniform and coupled spring analysis models. The inner curve (solid line) is for the reinforcement pattern required to envelop the axial force and moment pairs for every load combination. The outer curve (dashed line) is for the reinforcement provided to envelop the axial force and moment pairs plus the maximum required reinforcement required for in-plane shear for every load combination.

Certain load combination permutations cause only minor variation in the loading and yield nearly identical P&M output, which cause large clusters of P&M interaction points on the diagrams. The clusters can be composed of several hundred load combination points. Rather than reporting the results for every data point, maximum tension with corresponding moment, maximum compression with corresponding moment, maximum moment with axial tension, and maximum moment with axial compression are the only force/moment couples reported in Tables 3H.6-7 and 3H.6-8.

The concrete cross sections corresponding to Element 1880 in Table 03.08.04-30.9 are shown in Figures 03.08.04-30.5 and 03.08.04-30.6 for the required reinforcement (shown in red) based on axial forces and moments only and for the provided reinforcement (shown in red) based on axial forces, moments, and in-plane shears, respectively.

Thermal gradients are applied in the FEA model to evaluate the shear effects on the structural elements mechanically. Separate thermal load combinations are created that include the thermal axial loads. These combinations are considered in the required reinforcement analysis of out-of-plane moment and axial force couples. Therefore, all axial and flexure loads in Table 03.08.04-30.9 exclude thermal gradient loads since the P&M is run for mechanical loads only, without the thermal gradient. The in-plane shear and out-of-plane shear include thermal gradient loads. After the final reinforcement is determined for the axial force and moment pairs combined with the maximum in-plane shear, the computer program TEMCO performs a cracked analysis of reinforced concrete sections subjected to thermal gradients and non-thermal axial and flexural loads. The concrete is allowed to crack and the steel is allowed to yield in the analysis, thus relieving the thermal moment. Critical elements to be analyzed are identified based on the magnitude of the thermal gradient coupled with the least design margin. The concrete and steel strains resulting from the cracked analysis are evaluated to ensure that the strain allowables are not exceeded.

Table 03.08.04-30.9: Excerpt of COLA Table for UHS Basin South Wall (For Notes See Table 3H.6-7 in Enclosure 1 of this response)

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)
								Axial and Flexure Loads			In-Plane Shear Loads		
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)	
UHS Basin South Wall	6	South (outside)	Vertical	3H.6-88	6-V-L	MTCM	1880	D + L + F + H' + T + E'	226	-301	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'	-51	-349			

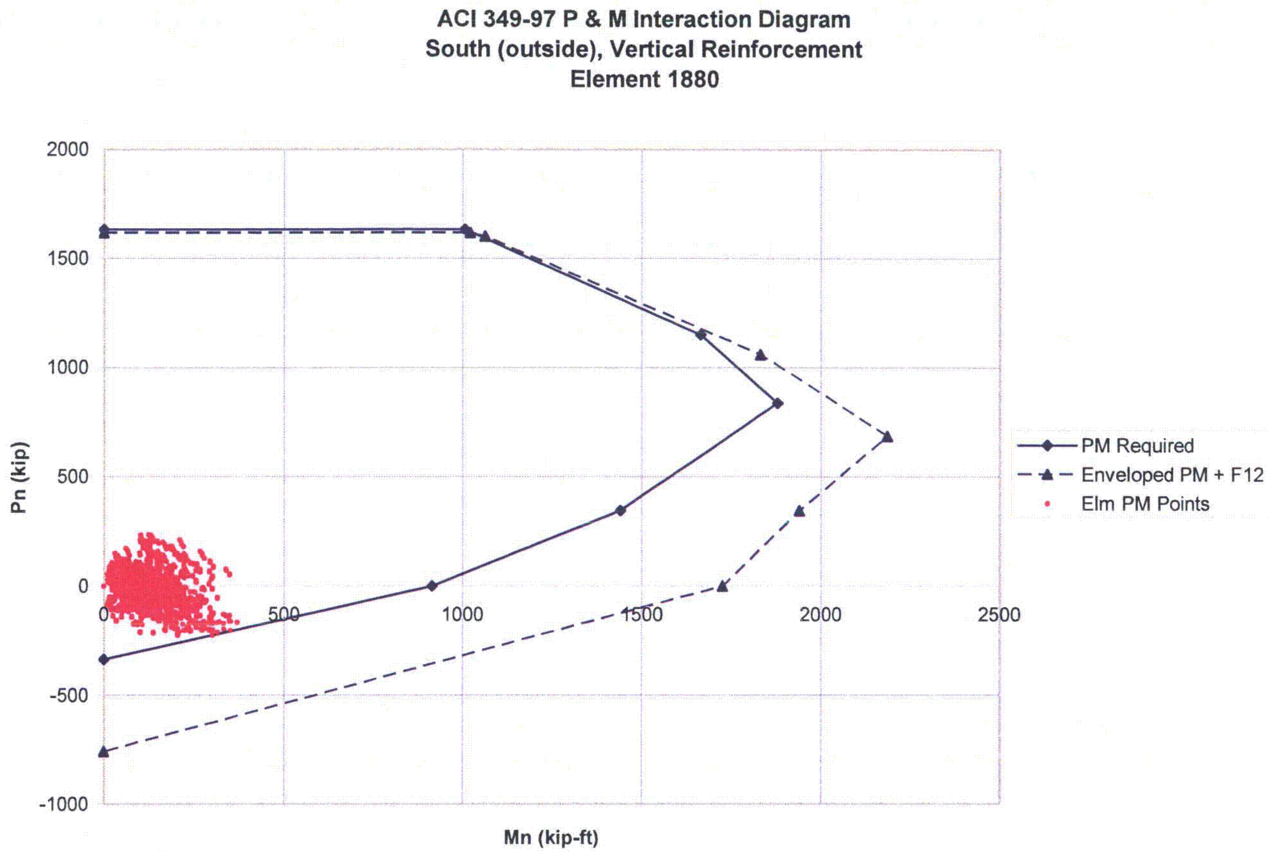


Figure 03.08.04-30.4: P&M Interaction Diagram for Element 1880 South (outside face), Vertical Reinforcement [#11@6" (1st layer) & #11@12"(2nd layer) spacing for solid line and #11@6"(1st layer) & # 11@6"(2nd layer) spacing for dashed line, see Figures 03.08.04-30.5 and 03.08.04-30.6, respectively]

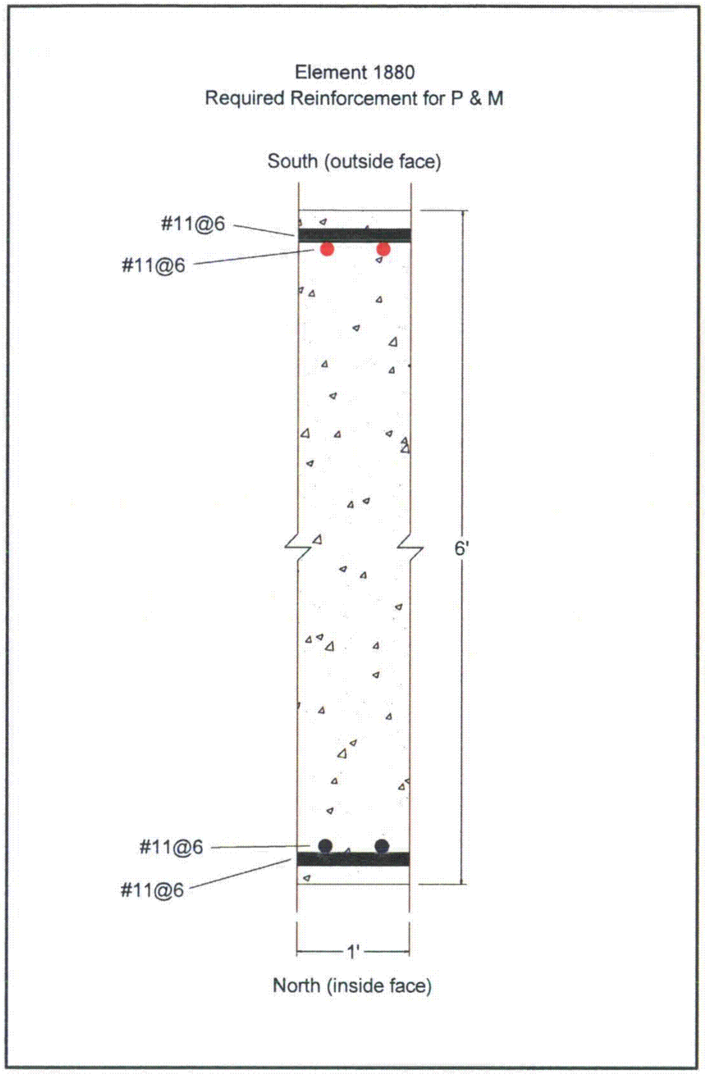


Figure 03.08.04-30.5: Cross Section of Wall with Reinforcement Required for P & M only

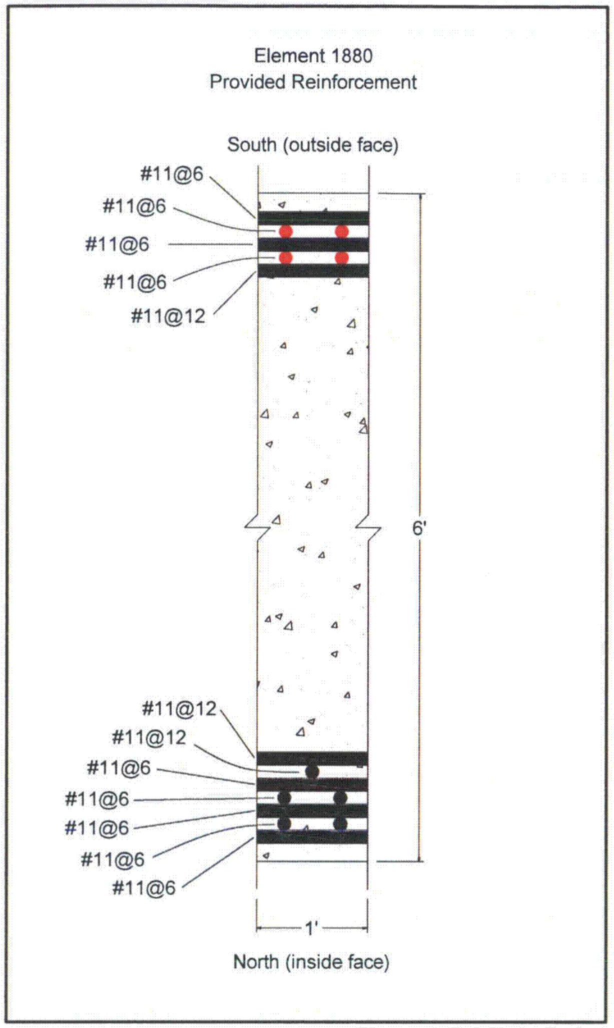


Figure 03.08.04-30.6: Cross Section of Wall with Reinforcement Provided for P & M and In-Plane Shear

6) The accuracy of the spring values reported in COLA Part 2, Tier 2 Section 3H.6.6.3.1 has been confirmed. The magnitude of difference between soil springs for the UHS Basin and RSW Pump House occurs for the following reasons:

- The top of the RSW Pump House foundation is 32 feet deeper than the top of the UHS Basin foundation.
- The RSW Pump House foundation mat (approximately 94 feet by 170 feet) is much smaller than the UHS Basin foundation mat (approximately 164 feet by 312 feet). As a result, the stress bulb for the RSW Pump House is not as deep as for the UHS Basin.

Thus, settlement for the same area load would be smaller for the RSW Pump House than the UHS Basin (*i.e.*, the RSW Pump House has stiffer soil springs than the UHS Basin).

7) The static ultimate bearing capacity and factors of safety for the UHS/RSW Pump House are given in COLA Part 2, Tier 2, Table 2.5S.4-41B, "Bearing Capacity of Foundation." The dynamic ultimate bearing capacity and factors of safety are provided in Table 2.5S.4-41C, "Bearing Capacity of Foundations under Dynamic or Transient Loading", included in Enclosure 1 of this response. The static and dynamic bearing pressure values can be determined via dividing the ultimate bearing capacity by the factors of safety.

Determination of Extreme Wind and Tornado Loadings

a. Extreme Wind Loading

As stated in COLA Part 2, Tier 2 Section 3H.6.4.3.2, the extreme wind load for site-specific structures is calculated in accordance with the provisions of Chapter 6 of ASCE 7-05. As discussed below, we believe that the procedure used is consistent with the procedure given in Standard Review Plan (SRP) 3.3.1.

SRP 3.3.1, Acceptance Criterion 3 states that the procedures used to transform the wind speed into an equivalent pressure to be applied to structures provided in ASCE 7-05 are acceptable. It also provides the same formula as in ASCE 7-05 (Equation 6-15) for calculating velocity pressure and states that the design wind speed is as stated in SRP 2.3.1 and the Importance Factor is 1.15. SRP 2.3.1 Acceptance Criterion 4 states that the 100-year return period wind should be based on appropriate standards and cites ASCE 7-05 as an appropriate standard. The commentary in ASCE 7-05, on Importance Factor (comment C6.5.5), indicates that the Importance Factors adjust the velocity pressure to different annual probabilities of being exceeded, and that Importance Factor 1.15 corresponds to a 100-year mean recurrence interval. Table C6-7 provides factors for converting the 50-year wind speed to other recurrence interval wind speeds. It should be noted that use of the 100-year wind speed, calculated based on the use of factor given in Table C6-7, and Importance Factor of 1.0 in Equation 6-15 yields essentially the same velocity pressure as the use of 50-year wind speed and Importance Factor of 1.15.

As explained above, the combination of Equation 6-15, the definition of "V" and the explanation in Comment C6.5.5 of ASCE 7-05 make clear that the procedure for determining the wind load, or "velocity pressure", due to a 100-year wind is to apply the 1.15 Importance Factor to the wind load calculated for a 50-year wind, or to apply the 1.0 Importance Factor to the wind load calculated for a 100-year wind.

NRC reviews of other applications also have concluded that the procedure described above is consistent with SRP 3.3.1. The DCD for the AP1000, in Section 3.3.1.1, Design Wind Velocity, describes how the Importance Factor of 1.15 is used to adjust the 145 mph wind speed with an annual probability of occurrence of 0.02 to an annual probability of occurrence of 0.01. In Section 3.3.1.2, Determination of Applied Forces, wind velocities are transformed to wind pressures according to ASCE 7-98 guidelines, and there is no mention of applying the Importance Factor of 1.15 again. This procedure to calculate design wind loads for the AP1000 is the same as that used for STP 3 & 4.

The Safety Evaluation Report (SER) for the AP1000 Design Certification, NUREG-1793 (September 2004), accepted the procedure described in the AP1000 DCD, and included the following discussion of wind design criteria:

"The importance factor, I, is a multiplier for basic wind speeds shown in the maps of ASCE 7-98. The end product is a wind speed with an appropriate recurrence interval. The basic wind speed values of the maps in ASCE 7-98 are for a 50-year mean recurrence interval (annual probability of 0.02). The commentary, Section C6.5.5 of ASCE 7-98, explains that an importance factor of 1.15 is associated with a mean recurrence interval of 100 years, and is to be used to adjust the structural reliability of a building or other structures to be consistent with building classification. ... The use of an importance factor of 1.15 is conservative."

Similarly, the DCD for the ESBWR describes the same procedure as used by AP1000 and STP 3 & 4. In Section 3.3.1.1 it states, "Seismic Category I and II structures are designed to withstand the design wind velocity listed in Table 2.0-1. The recurrence interval listed in Table 2.0-1 is equivalent to an importance factor of 1.15 based on Category IV building.", and in Section 3.3.1.2, Determination of Applied Forces, there is no mention of using an Importance Factor of 1.15.

In Section 3.3.1.3 of the Advanced Final Safety Evaluation Report for the ESBWR, the NRC Staff accepted the procedure described in the ESBWR DCD, and stated that in Revision 3 of SRP 3.3.1 the NRC staff accepted these provisions of ASCE 7-05 for transforming wind speed into equivalent pressure to be applied to structures and portions of structures.

The draft SER for STP 3&4, in Section 2.3S.1.4.2.2, also describes the same process, as described in ASCE 7-05 and the DCD/SER for AP1000 and ESBWR, for the use of Importance Factor of 1.15, which is to convert the 50-year wind speed to 100-year wind speed.

Based on the above, the use of Importance Factor of 1.0 with the 100-year wind speed in ASCE Equation 6-15 is consistent with both ASCE 7-05 and the intent of SRP 3.3.1.

COLA Part 2, Tier 2 Section 3H.6.4.3.2 will be revised, as shown in Enclosure 1, to clarify that the 50-year wind speed was converted to obtain the basic (100-year recurrence interval) wind speed of 134 mph in accordance with the requirements of ASCE 7-05, and the velocity pressure was calculated with the ASCE 7-05 Equation 6-15, using Importance Factor of 1.0 with the basic wind speed of 134 mph.

b. Tornado Loading

The tornado wind pressure for site-specific structures is calculated in accordance with the requirements of SRP 3.3.2. An Importance Factor of 1.15 is used with the wind speeds stated in COLA Section 3H.6.4.3.3.1. No COLA revision is required for the tornado loading.

The COLA will be revised as shown in Enclosure 1.

Enclosure 1
Revision to COLA Sections 2.3, 2.5 and 3H.6

Section 2.3S.1.3.1

Design wind loading is based on a basic wind speed which is the "3-secnd gust speed at 33 feet (10 meters) above the ground in Exposure Category C," as defined in Sections 6.2 and 6.3 of Reference 2.3S-10. The basic wind speed for the STP 3 & 4 site is approximately 125 mph (201 km/h), based on a linear interpolation from the plot of basic wind speeds in Figure 6-1 of ASCE 20027 (Reference 2.3S-10) for that portion of the U.S. that includes the site for STP 3 & 4. From a probabilistic standpoint, a basic wind speed of 125 mph (201 km/h) for the STP 3 & 4 site is associated with a mean recurrence interval of 50 years. Section C6.0 (Table C6-37) of the ASCE-SEI design standard provides conversion factors for estimating 3-second-gust wind speeds for other recurrence intervals (Reference 2.3S-10).

Using the data and the methodology recommended in Reference 2.3S-10 to verify design basis wind loadings are less than or equal to those specified in the reference ABWR without specific consideration of the CSC Hurricane Track Query data satisfies the requirements of ASCE/SEI-7-02 (Reference 2.3S-10) and NUREG-0800 (Reference 2.3S-6). The ASCE/SEI-7-2002 design standard wind speed map considered wind speeds of historically reported hurricanes and is updated periodically.

2.3S.6 References

2.3S-10 ASCE Standard ASCE/SEI-7-052, Minimum Design Loads for Buildings and Other Structures, Revision of ASCE 7-98, American Society of Civil Engineers (ASCE) and Structural Engineering Institute, January 20022005

Table 2.5S.4-41C Bearing Capacity of Foundations under Dynamic or Transient Loading

Structure	STP	Soil Strength Selection [1]	Ultimate Bearing Capacity at Base of Concrete Fill, q_{ULT} (ksf)	Factor of Safety (FOS) [2]
Reactor Building	3	Short Term	49.4	2.35
	4	Short Term	94.7	4.55
Control Building	3	Short Term	432.3	6.01
	4	Short Term	86.4	1.73
UHS/RSW Pump House	3	Short Term	65.0	5.22
	4	Short Term	87.0	6.98
RSW Piping Tunnels	3	Short Term	235.3	44.74
	4	Short Term	180.1	34.24
Diesel Generator Fuel Oil Storage Vaults	3	Short Term	250.9	68.06
	4	Short Term	332.6	90.22

[1] Short term - undrained condition

[2] See Section 2.5S.4.10.3

3H.6.2 Summary

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 are presented in tables and figures, as indicated.

- 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.6-44)
- Lateral soil pressures for stability evaluation during normal operation (Figures 3H.6-45 through 3H.6-50)

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

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

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

3H.6.4.3.1.6 Hydrostatic Loads (F)

This load is only applicable to UHS/RSW Pump House. The hydrostatic load due to water inside the UHS basin is conservatively 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.

Section 3H.6.4.3.2

Importance Factor 1.15

(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.)

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

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.

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'	---	---	~~1.8~~1.77	2,3
D + H + W	~~69.3~~2.15	~~12.3~~11.5	---	
D + H + Wt	~~49.7~~2.11	~~8.9~~7.2	---	
D + H + E'	~~2.27~~1.47	~~1.12~~1.11	---	2,3,4,5

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 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.

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.

~~The analysis for the seismic loads was performed using equivalent static loads and the induced forces due to the X, Y, and Z seismic excitations were combined using the SRSS method of combination.~~ 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 ~~s oly~~ 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.

- Dynamic lateral soil pressures on the walls of the UHS basin and RSW pump houses due to an SSE, calculated using the methodology defined in Subsection 3.5.3.2.2 of ASCE 4.

- Surcharge pressure of 300 psf (14.4 kPa) is applied ~~to the access road~~ to the UHS basin and RSW pump houses.

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					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	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)		
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	-23							
						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'	117	4.68	-	-	-	-
						MCCM	5482	D + L + F + H' + T + E'	-297	-615							
						MMAT	4082	D + L + F + H' + T + E'	0	-733							
						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'	-242	-179							
						MMAT	5555	D + L + F + H' + T + E'	3	-490							
						MMAC	5555	D + L + F + H' + T + E'	-62	-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'	-277	-376							
						MMAT	5541	D + L + F + H' + T + E'	2	-1197							
						MMAC	4101	D + L + F + H' + T + E'	-148	-1227							
		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'	117	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	440							
			Vertical	3H.6-54	1-V-L	MTCM	3642	D + L + F + H' + T + E'	203	49	D + L + F + H' + T + E'	126	4.68	-	-	-	-
						MCCM	3642	D + L + F + H' + T + E'	-277	50							
						MMAT	5435	D + L + F + H' + T + E'	5	468							
						MMAC	3689	.D + L + F + H' + T + E'	-146	480							
		-	Horizontal Plane	3H.6-55	1-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-83	0.20	
														D + L + F + H' + T + E'	-91		
					2-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-80	0.20	
														D + L + F + H' + T + E'	-91		
					3-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-125	0.31	
														D + L + F + H' + T + E'	-91		

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	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)		
Pump House East Wall	6	East (outside)	Horizontal	3H.6-56	1-H-L	MTCM	3222	D + L + F + H' + T + E'	642	-176	D + L + F + H' + T + E'	153	12.48	-	-	-	(8)
						MCCM	3222	D + L + F + H' + T + E'	-735	-57							
						MMAT	3222	D + L + F + H' + T + E'	642	-806							
						MMAC	3222	D + L + F + H' + T + E'	-321	-806							
					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'	153	4.68	-	-	-	-
						MCCM	3079	D + L + F + H' + T + E'	-348	-31							
						MMAT	3121	D + L + F + H' + T + E'	61	-270							
						MMAC	3121	D + L + F + H' + T + E'	-51	-404							
					3-H-L	MTCM	8893	D + L + F + H' + T + E'	160	-64	D + L + F + H' + T + E'	260	6.24	-	-	-	-
						MCCM	8827	D + L + F + H' + T + E'	-642	-76							
						MMAT	8829	D + L + F + H' + T + E'	60	-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'	475	-195	D + L + F + H' + T + E'	304	10.92	-	-	-	(8)
						MCCM	8825	D + L + F + H' + T + E'	-880	-149							
						MMAT	8813	D + L + F + H' + T + E'	119	-678							
						MMAC	8814	D + L + F + H' + T + E'	-144	-703							
					2-V-L	MTCM	3226	D + L + F + H' + T + E'	210	-134	D + L + F + H' + T + E'	244	6.24	-	-	-	-
						MCCM	8853	D + L + F + H' + T + E'	-517	-153							
						MMAT	8854	D + L + F + H' + T + E'	62	-531							
						MMAC	8854	D + L + F + H' + T + E'	-345	-833							
					3-V-L	MTCM	6526	D + L + F + H' + T + E'	74	-29	D + L + F + H' + T + E'	172	3.12	-	-	-	-
						MCCM	6359	D + L + F + H' + T + E'	-304	-61							
						MMAT	6545	D + L + F + H' + T + E'	3	-298							
						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'	113	6.24	-	-	-	-
						MCCM	6528	D + L + F + H' + T + E'	-261	-92							
						MMAT	6568	D + L + F + H' + T + E'	109	-229							
						MMAC	6547	D + L + F + H' + T + E'	-49	-220							
					5-V-L	MTCM	6520	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	242	-411	D + L + F + H' + T + E'	244	6.24	-	-	-	-
						MCCM	6349	D + L + F + H' + T + E'	-439	-651							
						MMAT	6518	D + L + F + H' + T + E'	7	-535							
						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'	590	34	D + L + F + H' + T + E'	153	12.48	-	-	-	(8)
						MCCM	3222	D + L + F + H' + T + E'	-799	858							
						MMAT	3222	D + L + F + H' + T + E'	143	881							
						MMAC	3222	D + L + F + H' + T + E'	-794	881							

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	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)		
Pump House East Wall	6	West (inside)	Horizontal	3H.6-58	2-H-L	MTCM	3088	D + L + F + H' + T + E'	259	130	D + L + F + H' + T + E'	153	4.68	-	-	-	-
						MCCM	3088	D + L + F + H' + T + E'	-298	46							
						MMAT	3100	D + L + F + H' + T + E'	25	357							
						MMAC	3100	D + L + F + H' + T + E'	-90	357							
					3-H-L	MTCM	8894	D + L + F + H' + T + E'	164	178	D + L + F + H' + T + E'	190	4.68	-	-	-	-
						MCCM	8829	D + L + F + H' + T + E'	-512	500							
						MMAT	8922	D + L + F + H' + T + E'	54	414							
						MMAC	8829	D + L + F + H' + T + E'	-491	580							
					4-H-L	MTCM	8827	1.4D + 1.4F + 1.7H + 1.7W	62	65	D + L + F + H' + T + E'	260	6.24	-	-	-	-
						MCCM	8827	D + L + F + H' + T + E'	-642	203							
						MMAT	8851	D + L + F + H' + T + E'	6	617							
						MMAC	8881	D + L + F + H' + T + E'	-469	976							
			Vertical	3H.6-59	1-V-L	MTCM	3222	D + L + F + H' + T + E'	627	143	D + L + F + H' + T + E'	304	15.6	-	-	-	(8)
						MCCM	8825	D + L + F + H' + T + E'	-880	1222							
						MMAT	8825	D + L + F + H' + T + E'	-	-							
						MMAC	8825	D + L + F + H' + T + E'	-288	1804							
					2-V-L	MTCM	3226	D + L + F + H' + T + E'	194	49	D + L + F + H' + T + E'	244	9.36	-	-	-	-
						MCCM	8853	D + L + F + H' + T + E'	-531	827							
						MMAT	8854	D + L + F + H' + T + E'	11	1071							
						MMAC	8853	D + L + F + H' + T + E'	-487	1595							
					3-V-L	MTCM	3241	D + L + F + H' + T + E'	58	39	D + L + F + H' + T + E'	231	6.24	-	-	-	-
						MCCM	8900	D + L + F + H' + T + E'	-366	61							
						MMAT	6397	D + L + F + H' + T + E'	0	582							
						MMAC	8880	D + L + F + H' + T + E'	-292	647							
					4-V-L	MTCM	6444	D + L + F + H' + T + E'	46	202	D + L + F + H' + T + E'	172	4.68	-	-	-	-
						MCCM	6355	D + L + F + H' + T + E'	-327	20							
						MMAT	6456	D + L + F + H' + T + E'	0	532							
						MMAC	3097	D + L + F + H' + T + E'	-86	551							
					5-V-L	MTCM	6526	D + L + F + H' + T + E'	74	35	D + L + F + H' + T + E'	117	3.12	-	-	-	-
						MCCM	6467	D + L + F + H' + T + E'	-242	64							
						MMAT	6503	D + L + F + H' + T + E'	3	308							
						MMAC	3106	D + L + F + H' + T + E'	-46	321							
					6-V-L	MTCM	6520	D + L + F + H' + T + E'	208	117	D + L + F + H' + T + E'	113	4.68	-	-	-	-
						MCCM	6520	D + L + F + H' + T + E'	-296	163							
						MMAT	6520	D + L + F + H' + T + E'	2	222							
						MMAC	6520	D + L + F + H' + T + E'	-239	228							

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 (in²/ ft)	Transverse Shear Design Loads: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
Pump House East Wall	6	-	Horizontal Plane	3H.6-60	1-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	144	0.40	
														D + L + F + H' + T + E'	-135		
					2-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	144	0.20	
					3-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-101	0.20	
		-	Vertical Plane	3H.6-60	1-V-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-75	0.20	
					2-V-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-92	0.20	
														D + L + F + H' + T + E'	-135		
Pump House South Wall	6	North (inside)	Horizontal	3H.6-61	1-H-L	MTCM	5788	D + L + F + H' + T + E'	247	-62	D + L + F + H' + T + E'	234	6.24	-	-	-	-
						MCCM	5611	D + L + F + H' + T + E'	-1115	-117							
						MMAT	5784	D + L + F + H' + T + E'	5	-634							
						MMAC	5784	D + L + F + H' + T + E'	-89	-634							
			Vertical	3H.6-62	1-V-L	MTCM	5784	D + L + F + H' + T + E'	146	-188	D + L + F + H' + T + E'	221	6.24	-	-	-	-
						MCCM	5607	D + L + F + H' + T + E'	-764	-237							
						MMAT	5783	D + L + F + H' + T + E'	9	-475							
						MMAC	5783	D + L + F + H' + T + E'	-229	-657							
					2-V-L	MTCM	5786	D + L + F + H' + T + E'	239	-596	D + L + F + H' + T + E'	221	9.36	-	-	-	-
						MCCM	5609	D + L + F + H' + T + E'	-1032	-797							
						MMAT	5786	D + L + F + H' + T + E'	122	-1189							
						MMAC	5786	D + L + F + H' + T + E'	-600	-1386							
		South (outside)	Horizontal	3H.6-63	1-H-L	MTCM	5783	D + L + F + H' + T + E'	96	203	D + L + F + H' + T + E'	234	6.24	-	-	-	-
						MCCM	5608	D + L + F + H' + T + E'	-628	192							
						MMAT	5784	D + L + F + H' + T + E'	24	708							
						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'	221	6.24	-	-	-	-
						MCCM	5607	D + L + F + H' + T + E'	-719	17							
						MMAT	5774	D + L + F + H' + T + E'	6	570							
						MMAC	5757	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-281	1198							
		-	Horizontal Plane	3H.6-65	1-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-94	0.20	
					2-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	101	0.20	
					3-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	147	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	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
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	-406							
						MMAC	6169	D + L + F + H' + T + E'	-122	-704							
					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'	706	-739							
						MMAC	3290	D + L + F + H' + T + E'	-17	-589							
					3-H-L	MTCM	6336	D + L + F + H' + T + E'	83	-15	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'	-730	-467							
						MMAT	9138	D + L + F + H' + T + E'	6	-800							
						MMAC	9138	D + L + F + H' + T + E'	-170	-897							
			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'	-40	-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'	131	3.12	-	-	-	-
						MCCM	9042	D + L + F + H' + T + E'	-202	-7							
						MMAT	3073	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	19	-348							
						MMAC	6321	D + L + F + H' + T + E'	-126	-408							
					3-V-L	MTCM	6131	D + L + F + H' + T + E'	64	-101	D + L + F + H' + T + E'	131	4.68	-	-	-	-
						MCCM	9037	D + L + F + H' + T + E'	-314	-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'	114	4.68	-	-	-	-
						MCCM	9110	D + L + F + H' + T + E'	-285	-315							
						MMAT	9105	D + L + F + H' + T + E'	4	-692							
						MMAC	9105	D + L + F + H' + T + E'	-91	-702							
					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'	142	9.36	-	-	-	-
						MCCM	9134	D + L + F + H' + T + E'	-774	-360							
						MMAT	9134	D + L + F + H' + T + E'	250	-912							
						MMAC	9138	D + L + F + H' + T + E'	-339	-1265							

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	Transverse Shear Reinforcement Design Loads[6] (kips / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Pump House West Wall	6	East (inside)	Horizontal	3H.6-68	1-H-L	MTCM	3276	D + L + F + H' + T + E'	482	48	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'	1	261							
						MMAC	9061	D + L + F + H' + T + E'	-145	292							
					2-H-L	MTCM	3291	D + L + F + H' + T + E'	916	149	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'	220	815							
						MMAC	3291	D + L + F + H' + T + E'	-121	815							
					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'	-419	174							
						MMAT	9077	D + L + F + H' + T + E'	2	264							
						MMAC	9077	D + L + F + H' + T + E'	-352	288							
					4-H-L	MTCM	3280	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	425	17	D + L + F + H' + T + E'	129	6.24	-	-	-	-
						MCCM	9134	D + L + F + H' + T + E'	-601	220							
						MMAT	9134	D + L + F + H' + T + E'	16	357							
						MMAC	9134	D + L + F + H' + T + E'	-403	375							
			Vertical	3H.6-69	1-V-L	MTCM	6125	D + L + F + H' + T + E'	207	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'	131	3.12	-	-	-	-
						MCCM	9067	D + L + F + H' + T + E'	-244	68							
						MMAT	6285	D + L + F + H' + T + E'	3	398							
						MMAC	3073	D + L + F + H' + T + E'	-54	425							
					3-V-L	MTCM	9116	D + L + F + H' + T + E'	124	56	D + L + F + H' + T + E'	114	4.68	-	-	-	-
						MCCM	9102	D + L + F + H' + T + E'	-294	308							
						MMAT	9105	D + L + F + H' + T + E'	12	435							
						MMAC	9106	D + L + F + H' + T + E'	-217	737							
					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'	142	9.36	-	-	-	-
						MCCM	9134	D + L + F + H' + T + E'	-861	1401							
						MMAT	9134	D + L + F + H' + T + E'	4	1105							
						MMAC	9134	D + L + F + H' + T + E'	-861	1401							
		-	Vertical Plane	3H.6-70	1-V-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	97	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	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 (5) Shear (kips / ft)	Longitudinal Reinforcement Provided (in²/ft)	Transverse Shear Design Loads – Load Combination	Transverse Shear Design Loads – Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
Pump House Internal East Wall	4	East (top)	Horizontal	3H.6-71	1-H-L	MTCM	3246	D + L + F + H' + T + E'	343	-94	D + L + F + H' + T + E'	107	6.24	-	-	-	-
						MCCM	3246	D + L + F + H' + T + E'	-469	-19							
						MMAT	3246	D + L + F + H' + T + E'	186	-119							
						MMAC	3246	D + L + F + H' + T + E'	-296	-119							
					2-H-L	MTCM	3251	D + L + F + H' + T + E'	127	-23	D + L + F + H' + T + E'	184	3.12	-	-	-	-
						MCCM	8939	D + L + F + H' + T + E'	-545	-18							
						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'	182	-7	D + L + F + H' + T + E'	233	6.24	-	-	-	-
						MCCM	3246	D + L + F + H' + T + E'	-487	-14							
						MMAT	3246	D + L + F + H' + T + E'	84	-21							
						MMAC	8925	D + L + F + H' + T + E'	-190	-198							
					2-V-L	MTCM	3248	D + L + F + H' + T + E'	97	-10	D + L + F + H' + T + E'	197	3.12	-	-	-	-
						MCCM	6800	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-409	-24							
						MMAT	6968	D + L + F + H' + T + E'	36	-98							
						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'	325	5	D + L + F + H' + T + E'	107	6.24	-	-	-	-
						MCCM	3246	D + L + F + H' + T + E'	-469	74							
						MMAT	3246	D + L + F + H' + T + E'	189	94							
						MMAC	3246	D + L + F + H' + T + E'	-302	94							
					2-H-L	MTCM	3254	D + L + F + H' + T + E'	123	10	D + L + F + H' + T + E'	184	3.12	-	-	-	-
						MCCM	8937	D + L + F + H' + T + E'	-564	102							
						MMAT	7016	D + L + F + H (Internal Flood)	9	121							
						MMAC	6984	D + L + F + H (Internal Flood)	-21	197							
			Vertical	3H.6-74	1-V-L	MTCM	3246	D + L + F + H' + T + E'	182	7	D + L + F + H' + T + E'	233	6.24	-	-	-	-
						MCCM	3246	D + L + F + H' + T + E'	-467	5							
						MMAT	3245	D + L + F + H' + T + E'	71	15							
						MMAC	8937	D + L + F + H' + T + E'	-244	146							
					2-V-L	MTCM	3248	D + L + F + H' + T + E'	97	4	D + L + F + H' + T + E'	197	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							

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	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)		
Pump House Internal West Wall	4	East (top)	Horizontal	3H.6-75	1-H-L	MTCM	3294	D + L + F + H' + T + E'	269	-45	D + L + F + H' + T + E'	93	4.68	-	-	-	-
						MCCM	3294	D + L + F + H' + T + E'	-410	-57							
						MMAT	3171	D + L + F + H' + T + E'	12	-128							
						MMAC	3171	D + L + F + H' + T + E'	-6	-128							
					2-H-L	MTCM	3299	D + L + F + H' + T + E'	97	-7	D + L + F + H' + T + E'	160	3.12	-	-	-	-
						MCCM	9163	D + L + F + H' + T + E'	-550	-24							
						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'	135	-15	D + L + F + H' + T + E'	204	4.68	-	-	-	-
						MCCM	9165	D + L + F + H' + T + E'	-465	-29							
						MMAT	3294	D + L + F + H' + T + E'	90	-21							
						MMAC	9161	D + L + F + H' + T + E'	-112	-181							
					2-V-L	MTCM	3296	D + L + F + H' + T + E'	68	-7	D + L + F + H' + T + E'	172	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'	269	42	D + L + F + H' + T + E'	93	4.68	-	-	-	-
						MCCM	3294	D + L + F + H' + T + E'	-410	17							
						MMAT	3171	D + L + F + H' + T + E'	12	99							
						MMAC	3171	D + L + F + H' + T + E'	-176	111							
					2-H-L	MTCM	3299	D + L + F + H' + T + E'	97	7	D + L + F + H' + T + E'	160	3.12	-	-	-	-
						MCCM	9161	D + L + F + H' + T + E'	-574	103							
						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'	135	6	D + L + F + H' + T + E'	204	4.68	-	-	-	-
						MCCM	9165	D + L + F + H' + T + E'	-465	84							
						MMAT	3294	D + L + F + H' + T + E'	22	23							
						MMAC	9161	D + L + F + H' + T + E'	-324	200							
					2-V-L	MTCM	3296	D + L + F + H' + T + E'	68	5	D + L + F + H' + T + E'	172	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							

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	Transverse Shear (6) Reinforcement Design Loads (kips / 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'	-275	-52							
						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	-89	D + L + F + H' + T + E'	92	4.68	-	-	-	-
						MCCM	13420	D + L + F + H' + T + E'	-280	-99							
						MMAT	13414	D + L + F + H' + T + E'	102	143							
						MMAC	13414	D + L + F + H' + T + E'	-48	141							
					2-V-L	MTCM	13410	D + L + F + H' + T + E'	471	-41	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'	6	470							
						MMAC	13437	D + L + F + H' + T + E'	-126	472							
		-	Horizontal Plane	3H.6-81	1-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	48	0.20	-
UHS Basin North Wall	6	North (outside)	Horizontal	3H.6-82	1-H-L	MTCM	6235	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	1004	-83	D + L + F + H' + T + E'	41	12.48	-	-	-	-
						MCCM	5873	D + L + F + H' + T + E'	-292	-493							
						MMAT	5801	D + L + F + H' + T + E'	55	-1293							
						MMAC	5801	D + L + F + H' + T + E'	-132	-1293							
					2-H-L	MTCM	6006	1.4D + 1.7F + 1.3H + 1.4To	648	-139	D + L + F + H' + T + E'	175	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'	38	-954							
						MMAC	3939	D + L + F + H' + T + E'	-190	-1022							
					3-H-L	MTCM	5796	1.4D + 1.7F + 1.3H + 1.4To	282	-335	D + L + F + H' + T + E'	152	6.24	-	-	-	-
						MCCM	3600	D + L + F + H' + T + E'	-607	-85							
						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'	245	-126	D + L + F + H' + T + E'	137	4.68	-	-	-	-
						MCCM	6108	D + L + F + H' + T + E'	-329	-95							
						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'	255	-186	D + L + F + H' + T + E'	175	6.24	-	-	-	-
						MCCM	6109	D + L + F + H' + T + E'	-315	-35							
						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'	308	-180	D + L + F + H' + T + E'	255	7.8	-	-	-	-
						MCCM	6116	D + L + F + H' + T + E'	-327	-142							
						MMAT	6116	D + L + F + H' + T + E'	76	-736							
						MMAC	6116	D + L + F + H' + T + E'	-189	-736							

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	Transverse Shear [6] Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin North Wall	6	North (outside)	Vertical	3H.6-83	4-V-L	MTCM	3027	D + L + F + H' + T + E'	465	-583	D + L + F + H' + T + E'	247	12.48	-	-	-	-
						MCCM	5998	D + L + F + H' + T + E'	-497	-188							
						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'	275	-56	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	214	6.24	-	-	-	-
						MCCM	6003	D + L + F + H' + T + E'	-278	-59							
						MMAT	4149	D + L + F + H' + T + E'	133	-367							
						MMAC	4149	D + L + F + H' + T + E'	-4	-299							
					6-V-L	MTCM	6005	D + L + F + H' + T + E'	363	-724	D + L + F + H' + T + E'	221	9.36	-	-	-	-
						MCCM	2469	D + L + F + H' + T + E'	-594	-336							
						MMAT	6005	D + L + F + H' + T + E'	363	-724							
						MMAC	6005	D + L + F + H' + T + E'	-179	-724							
					7-V-L	MTCM	2859	1.4D + 1.7F + 1.3H + 1.4To	143	-152	D + L + F + H' + T + E'	221	6.24	-	-	-	-
						MCCM	2460	D + L + F + H' + T + E'	-552	-153							
						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'	112	9.36	-	-	-	-
						MCCM	3942	D + L + F + H' + T + E'	-255	360							
						MMAT	2950	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	172	1113							
						MMAC	3938	D + L + F + H' + T + E'	-3	1049							
					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'	41	14.04	-	-	-	-
						MCCM	5873	D + L + F + H' + T + E'	-292	187							
						MMAT	7021	D + L + F + H' + T + E'	107	1205							
						MMAC	7021	D + L + F + H' + T + E'	-76	1205							
					3-H-L	MTCM	4005	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	525	417	D + L + F + H' + T + E'	92	9.36	-	-	-	-
						MCCM	3963	D + L + F + H' + T + E'	-343	205							
						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'	148	6.24	-	-	-	-
						MCCM	3600	D + L + F + H' + T + E'	-607	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'	175	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'	-93	1334							

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	Transverse Shear(6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin North Wall	6	South (inside)	Horizontal	3H.6-84	6-H-L	MTCM	6093	1.4D + 1.7F + 1.3H + 1.4To	522	61	D + L + F + H' + T + E'	175	12.48	-	-	-	-
						MCCM	3641	D + L + F + H' + T + E'	-382	261							
						MMAT	6964	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	149	1297							
						MMAC	4150	D + L + F + H' + T + E'	-9	1152							
			Vertical	3H.6-85	1-V-L	MTCM	2977	D + L + F + H' + T + E'	245	49	D + L + F + H' + T + E'	137	4.68	-	-	-	-
						MCCM	5846	D + L + F + H' + T + E'	-268	141							
						MMAT	5856	D + L + F + H' + T + E'	27	336							
						MMAC	5828	1.4D + 1.7F + 1.3H + 1.4To	-87	358							
					2-V-L	MTCM	3001	D + L + F + H' + T + E'	305	33	D + L + F + H' + T + E'	211	6.24	-	-	-	-
						MCCM	5918	D + L + F + H' + T + E'	-266	149							
						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	477							
					3-V-L	MTCM	3027	D + L + F + H' + T + E'	465	396	D + L + F + H' + T + E'	255	10.92	-	-	-	-
						MCCM	5998	D + L + F + H' + T + E'	-497	697							
						MMAT	5998	D + L + F + H' + T + E'	30	697							
						MMAC	5998	D + L + F + H' + T + E'	-497	697							
					4-V-L	MTCM	5916	D + L + F + H' + T + E'	237	332	D + L + F + H' + T + E'	255	9.36	-	-	-	-
						MCCM	6101	D + L + F + H' + T + E'	-351	446							
						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'	275	135	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	214	6.24	-	-	-	-
						MCCM	6003	D + L + F + H' + T + E'	-278	111							
						MMAT	7017	D + L + F + H' + T + E'	19	347							
						MMAC	4149	D + L + F + H' + T + E'	-82	362							
					6-V-L	MTCM	6005	D + L + F + H' + T + E'	363	503	D + L + F + H' + T + E'	221	9.36	-	-	-	-
						MCCM	2469	D + L + F + H' + T + E'	-594	574							
						MMAT	6005	D + L + F + H' + T + E'	29	777							
						MMAC	6005	D + L + F + H' + T + E'	-496	777							
					7-V-L	MTCM	2859	1.4D + 1.7F + 1.3H + 1.4To	142	50	D + L + F + H' + T + E'	221	6.24	-	-	-	-
						MCCM	2460	D + L + F + H' + T + E'	-552	142							
						MMAT	3636	D + L + F + H' + T + E'	18	449							
						MMAC	3615	1.4D + 1.7F + 1.3H + 1.4To	-277	945							

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 (in²/ ft)	Transverse Shear Design Loads: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
UHS Basin North Wall	6	-	Horizontal Plane	3H.6-86	1-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	66	0.20	
					2-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	93	0.20	
		-	Vertical Plane	3H.6-86	1-V-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	76	0.20	
														D + L + F + H' + T + E'	-60		
					2-V-T	-	-	-	-	-	-	-	-	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-76	0.20	
UHS Basin South Wall	6	South (outside)	Horizontal	3H.6-87	1-H-L	MTCM	4473	D + L + F + H' + T + E'	606	-296	D + L + F + H' + T + E'	33	10.92	-	-	-	-
						MCCM	4382	D + L + F + H' + T + E'	-329	-538							
						MMAT	4318	D + L + F + H' + T + E'	59	-1102							
						MMAC	4318	D + L + F + H' + T + E'	-127	-1102							
					2-H-L	MTCM	1525	1.4D + 1.7F + 1.3H + 1.4To	275	-342	D + L + F + H' + T + E'	67	6.24	-	-	-	-
						MCCM	3557	D + L + F + H' + T + E'	-361	-248							
						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'	-352	-70							
						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'	-314	-16							
						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'	234	-109	D + L + F + H' + T + E'	148	4.68	-	-	-	-
						MCCM	1864	D + L + F + H' + T + E'	-383	-63							
						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'	236	-162	D + L + F + H' + T + E'	173	6.24	-	-	-	-
						MCCM	1865	D + L + F + H' + T + E'	-383	-79							
						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	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: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
UHS Basin South Wall	6	South (outside)	Vertical	3H.6-88	5-V-L	MTCM	2163	D + L + F + H' + T + E'	213	-102	D + L + F + H' + T + E'	147	4.68	-	-	-	-
						MCCM	1873	D + L + F + H' + T + E'	-361	-32							
						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'	226	-301	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'	-51	-349							
		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	431							
						MMAT	4318	D + L + F + H' + T + E'	107	1393							
						MMAC	4318	D + L + F + H' + T + E'	-78	1393							
					2-H-L	MTCM	4473	D + L + F + H' + T + E'	606	379	D + L + F + H' + T + E'	33	9.36	-	-	-	-
						MCCM	4382	D + L + F + H' + T + E'	-329	333							
						MMAT	4497	D + L + F + H' + T + E'	69	689							
						MMAC	4497	D + L + F + H' + T + E'	-98	689							
					3-H-L	MTCM	3815	D + L + F + H' + T + E'	274	276	D + L + F + H' + T + E'	63	6.24	-	-	-	-
						MCCM	3557	D + L + F + H' + T + E'	-361	191							
						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'	97.83391	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'	110	1529							
						MMAC	4505	D + L + F + H' + T + E'	-75	1529							
			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'	-270	118							
						MMAT	4317	D + L + F + H' + T + E'	12	323							
						MMAC	1119	1.4D + 1.7F + 1.3H + 1.4To	-127	451							

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	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin South Wall	6	North (inside)	Vertical	3H.6-90	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'	-288	141							
						MMAT	4375	D + L + F + H' + T + E'	24	253							
						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'	234	23	D + L + F + H' + T + E'	147.98492	4.68	-	-	-	-
						MCCM	1536	D + L + F + H' + T + E'	-319	167							
						MMAT	1380	D + L + F + H' + T + E'	3	340							
						MMAC	1291	1.4D + 1.7F + 1.3H + 1.4To	-129	447							
					4-V-L	MTCM	2142	D + L + F + H' + T + E'	236	65	D + L + F + H' + T + E'	173	6.24	-	-	-	-
						MCCM	1553	D + L + F + H' + T + E'	-318	181							
						MMAT	1553	D + L + F + H' + T + E'	1	259							
						MMAC	1553	D + L + F + H' + T + E'	-306	259							
					5-V-L	MTCM	2163	D + L + F + H' + T + E'	213	31	D + L + F + H' + T + E'	147	4.68	-	-	-	-
						MCCM	1700	D + L + F + H' + T + E'	-295	133							
						MMAT	4504	D + L + F + H' + T + E'	14	369							
						MMAC	3838	D + L + F + H' + T + E'	-75	396							
					6-V-L	MTCM	1880	D + L + F + H' + T + E'	226	31	D + L + F + H' + T + E'	173	7.8	-	-	-	-
						MCCM	1864	D + L + F + H' + T + E'	-383	562							
						MMAT	1868	D + L + F + H' + T + E'	24	932							
						MMAC	1781	1.4D + 1.7F + 1.3H + 1.4To	-130	1307							
		-	Horizontal Plane	3H.6-91	1-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	63	0.20	
					2-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	90	0.20	
					3-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	71	0.20	
														1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-70		

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 (in²/ ft)	Transverse Shear Design Loads: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
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'	39	12.48	-	-	-	-
						MCCM	5235	D + L + F + H' + T + E'	-311	-1619							
						MMAT	5241	D + L + F + H' + T + E'	64	-2059							
						MMAC	5241	D + L + F + H' + T + E'	-221	-2110							
					2-H-L	MTCM	2611	1.4D + 1.7F + 1.3H + 1.4To	216	-508	D + L + F + H' + T + E'	70	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'	26	-954							
						MMAC	3936	D + L + F + H' + T + E'	-189	-1020							
					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'	-20	-577							
					4-H-L	MTCM	2649	1.4D + 1.7F + 1.3H + 1.4To	275	-248	D + L + F + H' + T + E'	105	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'	265	-220	D + L + F + H' + T + E'	128	6.24	-	-	-	-
						MCCM	2832	D + L + F + H' + T + E'	-458	-155							
						MMAT	4295	D + L + F + H' + T + E'	0	-974							
						MMAC	5234	D + L + F + H' + T + E'	-283	-1067							
		West (inside)	Horizontal	3H.6-94	1-H-L	MTCM	4266	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	410	108	D + L + F + H' + T + E'	39	14.04	-	-	-	-
						MCCM	5235	D + L + F + H' + T + E'	-311	471							
						MMAT	5235	D + L + F + H' + T + E'	208	2168							
						MMAC	5235	D + L + F + H' + T + E'	-65	2106							
					2-H-L	MTCM	2297	1.4D + 1.7F + 1.3H + 1.4To	386	546	D + L + F + H' + T + E'	105	10.92	-	-	-	-
						MCCM	3893	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-255	96							
						MMAT	2637	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	176	1459							
						MMAC	3890	D + L + F + H' + T + E'	-6	1399							
					3-H-L	MTCM	2528	1.4D + 1.7F + 1.3H + 1.4To	204	101	D + L + F + H' + T + E'	70	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	752							

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 (in²/ ft)	Transverse Shear Design Loads: Load Combination	Transverse Shear[(6)] Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
UHS Basin East Wall	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'	76	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'	105	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'	105	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'	-3	1058							
			Vertical	3H.6-95	1-V-L	MTCM	2328	D + L + F + H' + T + E'	194	171	D + L + F + H' + T + E'	99	4.68	-	-	-	-
						MCCM	2689	D + L + F + H' + T + E'	-336	275							
						MMAT	5208	D + L + F + H' + T + E'	13	541							
						MMAC	5208	D + L + F + H' + T + E'	-4	541							
					2-V-L	MTCM	2349	D + L + F + H' + T + E'	250	165	D + L + F + H' + T + E'	128	6.24	-	-	-	-
						MCCM	2690	D + L + F + H' + T + E'	-373	252							
						MMAT	4267	D + L + F + H' + T + E'	25	1088							
						MMAC	4267	D + L + F + H' + T + E'	-188	1129							
					3-V-L	MTCM	2375	D + L + F + H' + T + E'	265	134	D + L + F + H' + T + E'	127	4.68	-	-	-	-
						MCCM	2707	D + L + F + H' + T + E'	-365	240							
						MMAT	4295	D + L + F + H' + T + E'	20	786							
						MMAC	4295	D + L + F + H' + T + E'	-180	789							
					4-V-L	MTCM	2825	D + L + F + H' + T + E'	231	134	D + L + F + H' + T + E'	128	7.8	-	-	-	-
						MCCM	2832	D + L + F + H' + T + E'	-458	677							
						MMAT	2955	D + L + F + H' + T + E'	8	1173							
						MMAC	2955	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-185	1331							
		-	Horizontal Plane	3H.6-96	1-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	69	0.20	
					2-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	96	0.20	
			Vertical Plane	3H.6-96	1-V-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	65	0.20	
														D + L + F + H' + T + E'	73		

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	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
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'	36	14.04	-	-	-	-
						MCCM	5171	D + L + F + H' + T + E'	-416	-857							
						MMAT	5177	D + L + F + H' + T + E'	50	-2181							
						MMAC	5177	D + L + F + H' + T + E'	-135	-2181							
					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'	31	-859							
						MMAC	3866	D + L + F + H' + T + E'	-274	-904							
					3-H-L	MTCM	2222	1.4D + 1.7F + 1.3H + 1.4To	846	-208	D + L + F + H' + T + E'	116	12.48	-	-	-	(8)
						MCCM	2220	D + L + F + H' + T + E'	-153	-189							
						MMAT	2329	D + L + F + H' + T + E'	237	-513							
						MMAC	2329	D + L + F + H' + T + E'	-111	-411							
					4-H-L	MTCM	1956	1.4D + 1.7F + 1.3H + 1.4To	431	-402	D + L + F + H' + T + E'	116	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	-632							
					5-H-L	MTCM	2315	1.4D + 1.7F + 1.3H + 1.4To	466	-360	D + L + F + H' + T + E'	139	7.8	-	-	-	-
						MCCM	2314	D + L + F + H' + T + E'	-270	-335							
						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'	139	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							

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	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)		
UHS Basin West Wall	6	West (outside)	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'	188	9.36	-	-	-	-
						MCCM	2596	D + L + F + H' + T + E'	-172	-183							
						MMAT	2596	D + L + F + H' + T + E'	72	-899							
						MMAC	2596	D + L + F + H' + T + E'	-32	-899							
					2-V-L	MTCM	2604	D + L + F + H' + T + E'	236	-113	D + L + F + H' + T + E'	132	6.24	-	-	-	-
						MCCM	2406	D + L + F + H' + T + E'	-277	-97							
						MMAT	2604	D + L + F + H' + T + E'	40	-704							
						MMAC	3860	D + L + F + H' + T + E'	-75	-720							
					3-V-L	MTCM	2239	D + L + F + H' + T + E'	283	-234	D + L + F + H' + T + E'	160	7.8	-	-	-	-
						MCCM	2606	D + L + F + H' + T + E'	-377	-148							
						MMAT	2320	D + L + F + H' + T + E'	75	-791							
						MMAC	5170	D + L + F + H' + T + E'	-296	-1061							
					4-V-L	MTCM	2242	D + L + F + H' + T + E'	252	-202	D + L + F + H' + T + E'	150	6.24	-	-	-	-
						MCCM	2607	D + L + F + H' + T + E'	-461	-60							
						MMAT	4263	D + L + F + H' + T + E'	4	-1002							
						MMAC	5176	D + L + F + H' + T + E'	-286	-1029							
					5-V-L	MTCM	2246	D + L + F + H' + T + E'	194	-210	D + L + F + H' + T + E'	116	4.68	-	-	-	-
						MCCM	2612	D + L + F + H' + T + E'	-369	-108							
						MMAT	5184	D + L + F + H' + T + E'	1	-641							
						MMAC	5178	D + L + F + H' + T + E'	-73	-764							
		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'	36	14.04	-	-	-	-
						MCCM	5171	D + L + F + H' + T + E'	-416	1733							
						MMAT	5171	D + L + F + H' + T + E'	288	2338							
						MMAC	5171	D + L + F + H' + T + E'	-99	2264							
					2-H-L	MTCM	4515	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	228	128	D + L + F + H' + T + E'	60	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	1252							
						MMAC	3887	D + L + F + H' + T + E'	-73	1221							
					3-H-L	MTCM	2220	1.4D + 1.7F + 1.3H + 1.4To	868	1126	D + L + F + H' + T + E'	119	15.6	-	-	-	(8)
						MCCM	2314	D + L + F + H' + T + E'	-270	400							
						MMAT	2329	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	732	1286							
						MMAC	2329	D + L + F + H' + T + E'	-31	1193							
					4-H-L	MTCM	2236	1.4D + 1.7F + 1.3H + 1.4To	521	332	D + L + F + H' + T + E'	119	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	851							

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	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)		
UHS Basin West Wall	6	East (inside)	Horizontal	3H.6-99	5-H-L	MTCM	2311	1.4D + 1.7F + 1.3H + 1.4To	244	275	D + L + F + H' + T + E'	139	6.24	-	-	-	-
						MCCM	2310	D + L + F + H' + T + E'	-193	240							
						MMAT	2310	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	130	729							
						MMAC	2577	D + L + F + H' + T + E'	-1	531							
			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'	188	10.92	-	-	-	-
						MCCM	2596	D + L + F + H' + T + E'	-172	310							
						MMAT	2596	D + L + F + H' + T + E'	84	771							
						MMAC	2596	D + L + F + H' + T + E'	-20	771							
					2-V-L	MTCM	2237	D + L + F + H' + T + E'	227	142	D + L + F + H' + T + E'	132	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'	283	144	D + L + F + H' + T + E'	160	7.8	-	-	-	-
						MCCM	5170	D + L + F + H' + T + E'	-315	127							
						MMAT	4235	D + L + F + H' + T + E'	8	1064							
						MMAC	4235	D + L + F + H' + T + E'	-204	1151							
					4-V-L	MTCM	1834	D + L + F + H' + T + E'	219	242	D + L + F + H' + T + E'	82	4.68	-	-	-	-
						MCCM	2173	D + L + F + H' + T + E'	-291	211							
						MMAT	4251	D + L + F + H' + T + E'	2	391							
						MMAC	4239	D + L + F + H' + T + E'	-113	758							
					5-V-L	MTCM	2242	D + L + F + H' + T + E'	252	112	D + L + F + H' + T + E'	150	6.24	-	-	-	-
						MCCM	2455	D + L + F + H' + T + E'	-359	174							
						MMAT	4263	D + L + F + H' + T + E'	24	830							
						MMAC	4263	D + L + F + H' + T + E'	-173	832							
					6-V-L	MTCM	2246	D + L + F + H' + T + E'	194	136	D + L + F + H' + T + E'	116	4.68	-	-	-	-
						MCCM	2456	D + L + F + H' + T + E'	-308	206							
						MMAT	5185	D + L + F + H' + T + E'	7	481							
						MMAC	5179	D + L + F + H' + T + E'	-21	534							
					7-V-L	MTCM	2320	D + L + F + H' + T + E'	253	678	D + L + F + H' + T + E'	160	9.36	-	-	-	-
						MCCM	2607	D + L + F + H' + T + E'	-461	705							
						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							
		-	Horizontal Plane	3H.6-101	1-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	66	0.20	
					2-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	92	0.20	
			Vertical Plane	3H.6-101	1-V-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	82	0.20	
														D + L + F + H' + T + E'	69		

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	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin North-South Buttresses (9)	6	East and West	Horizontal	3H.6-102	1-H-L	MTCM	7788	D + L + F + H' + T + E'	625	-1055	D + L + F + H' + T + E'	322	15.6	-	-	-	(8)
						MCCM	7788	D + L + F + H' + T + E'	-395	-968							
						MMAT	7812	D + L + F + H' + T + E'	341	-1228							
						MMAC	7812	D + L + F + H' + T + E'	-103	-1228							
					2-H-L	MTCM	7417	D + L + F + H' + T + E'	589	-462	D + L + F + H' + T + E'	367	9.36	-	-	-	-
						MCCM	7621	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-523	27							
						MMAT	7650	D + L + F + H' + T + E'	188	963							
						MMAC	7650	D + L + F + H' + T + E'	-149	944							
			Vertical	3H.6-103	1-V-L	MTCM	7424	D + L + F + H' + T + E'	721	-112	D + L + F + H' + T + E'	234	9.36	-	-	-	-
						MCCM	7212	D + L + F + H' + T + E'	-878	-88							
						MMAT	7845	D + L + F + H' + T + E'	123	-1000							
						MMAC	7845	D + L + F + H' + T + E'	-121	-1000							
					2-V-L	MTCM	7032	D + L + F + H' + T + E'	972	395	D + L + F + H' + T + E'	234	15.6	-	-	-	(8)
						MCCM	7032	D + L + F + H' + T + E'	-673	410							
						MMAT	7032	D + L + F + H' + T + E'	945	553							
						MMAC	7032	D + L + F + H' + T + E'	-392	553							
		-	Horizontal Plane	3H.6-104	1-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	28	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 (in²/ ft)	Transverse Shear Design Loads: Load Combination	Transverse Shear [6] Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
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	-218	D + L + F + H' + T + E'	276	9.36	-	-	-	-
						MCCM	7674	D + L + F + H' + T + E'	-1103	-473							
						MMAT	7681	D + L + F + H' + T + E'	240	603							
						MMAC	7681	D + L + F + H' + T + E'	-520	603							
					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	-124							
						MMAT	7856	D + L + F + H' + T + E'	116	-484							
						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'	331	9.36	-	-	-	-
						MCCM	7065	D + L + F + H' + T + E'	-380	-71							
						MMAT	7335	D + L + F + H' + T + E'	125	350							
						MMAC	7276	D + L + F + H' + T + E'	-3	-276							
			Vertical	3H.6-106	1-V-L	MTCM	7489	D + L + F + H' + T + E'	418	-98	D + L + F + H' + T + E'	282	6.24	-	-	-	-
						MCCM	7674	D + L + F + H' + T + E'	-690	-103							
						MMAT	7489	D + L + F + H' + T + E'	24	-250							
						MMAC	7489	D + L + F + H' + T + E'	-670	-250							
					2-V-L	MTCM	7345	D + L + F + H' + T + E'	668	-151	D + L + F + H' + T + E'	282	9.36	-	-	-	-
						MCCM	7289	D + L + F + H' + T + E'	-890	-184							
						MMAT	7289	D + L + F + H' + T + E'	245	275							
						MMAC	7289	D + L + F + H' + T + E'	-827	275							
					3-V-L	MTCM	7067	D + L + F + H' + T + E'	967	-418	D + L + F + H' + T + E'	282	15.6	-	-	-	(8)
						MCCM	7065	D + L + F + H' + T + E'	-909	499							
						MMAT	7065	D + L + F + H' + T + E'	619	584							
						MMAC	7065	D + L + F + H' + T + E'	-693	584							
		-	Horizontal Plane	3H.6-107	1-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-28	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 (in²/ ft)	Transverse Shear Design Loads: Load Combination	Transverse Shear[6] Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
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'	218	-9	D + L + F + H' + T + E'	30	6.24	-	-	-	-
						MCCM	1127	D + L + F + H' + T + E'	-169	-35							
						MMAT	468	D + L + F + H' + T + E'	76	-155							
						MMAC	468	D + L + F + H' + T + E'	-11	-155							
					BEAM 1	MTCM	-	D + L + F + H' + T + E'	543	-107	D + L + F + H' + T + E'	37	7.49	-	-	-	(8)
						MCCM	-	D + L + F + H' + T + E'	-360	-103							
						MMAT	-	D + L + F + H' + T + E'	151	-208							
						MMAC	-	D + L + F + H' + T + E'	-99	-208							
			Vertical	3H.6-109	1-V-L	MTCM	580	D + L + F + H' + T + E'	280	-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'	121	-45							
						MMAC	580	D + L + F + H' + T + E'	-240	-45							
					2-V-L	MTCM	81	D + L + F + H' + T + E'	80	-9	D + L + F + H' + T + E'	59	1.56	-	-	-	-
						MCCM	544	D + L + F + H' + T + E'	-60	-5							
						MMAT	348	D + L + F + H' + T + E'	1	-36							
						MMAC	348	D + L + F + H' + T + E'	-18	-36							
					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'	-240	-57							
						MMAT	651	D + L + F + H' + T + E'	143	-106							
						MMAC	452	D + L + F + H' + T + E'	-96	-102							
					4-V-L	MTCM	523	D + L + F + H' + T + E'	289	-37	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'	283	-39							
						MMAC	1135	D + L + F + H' + T + E'	-86	-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'	218	19	D + L + F + H' + T + E'	30	4.68	-	-	-	-
						MCCM	1127	D + L + F + H' + T + E'	-169	62							
						MMAT	667	D + L + F + H' + T + E'	47	162							
						MMAC	667	D + L + F + H' + T + E'	-43	162							
					BEAM 1	MTCM	-	D + L + F + H' + T + E'	543	107	D + L + F + H' + T + E'	37	7.49	-	-	-	(8)
						MCCM	-	D + L + F + H' + T + E'	-360	103							
						MMAT	-	D + L + F + H' + T + E'	151	208							
						MMAC	-	D + L + F + H' + T + E'	-99	208							
			Vertical	3H.6-111	1-V-L	MTCM	580	D + L + F + H' + T + E'	280	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'	107	47							
						MMAC	1	D + L + F + H' + T + E'	-260	47							

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	Transverse Shear Reinforcement Design Loads[6] (kips / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Cooling Tower North and South Walls	2	South (inside of North Wall) and North (inside of South Wall)	Vertical	3H.6-111	2-V-L	MTCM	1156	D + L + F + H' + T + E'	90	6	D + L + F + H' + T + E'	59	1.56	-	-	-	-
						MCCM	1156	D + L + F + H' + T + E'	-55	2							
						MMAT	157	D + L + F + H' + T + E'	1	28							
						MMAC	827	D + L + F + H' + T + E'	-31	37							
					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'	-240	70							
						MMAT	739	D + L + F + H' + T + E'	5	123							
						MMAC	860	D + L + F + H' + T + E'	-187	128							
					4-V-L	MTCM	523	D + L + F + H' + T + E'	289	46	D + L + F + H' + T + E'	92	6.24	-	-	-	-
						MCCM	523	D + L + F + H' + T + E'	-303	26							
						MMAT	523	D + L + F + H' + T + E'	251	50							
						MMAC	523	D + L + F + H' + T + E'	-113	50							
		-	Vertical Plane	3H.6-112	1-V-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-5	0.20	
					2-V-T									D + L + F + H' + T + E'	-8	0.20	
					3-V-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-8	0.20	
					4-V-T									D + L + F + H' + T + E'	-6	0.20	
Cooling Tower East Wall	6	East (outside)	Horizontal	3H.6-113	1-H-L	MTCM	289	D + L + F + H' + T + E'	40	-301	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'	0	-393							
						MMAC	273	D + L + F + H' + T + E'	-42	-393							
					2-H-L	MTCM	239	D + L + F + H' + T + E'	142	-479	D + L + F + H' + T + E'	37	7.8	-	-	-	-
						MCCM	231	D + L + F + H' + T + E'	-146	-744							
						MMAT	287	D + L + F + H' + T + E'	25	-1234							
						MMAC	287	D + L + F + H' + T + E'	-102	-1276							
			Vertical	3H.6-114	1-V-L	MTCM	291	D + L + F + H' + T + E'	30	-168	D + L + F + H' + T + E'	117	3.12	-	-	-	-
						MCCM	291	D + L + F + H' + T + E'	-115	-72							
						MMAT	283	D + L + F + H' + T + E'	6	-192							
						MMAC	275	D + L + F + H' + T + E'	-42	-194							
					2-V-L	MTCM	289	D + L + F + H' + T + E'	120	-791	D + L + F + H' + T + E'	117	6.24	-	-	-	-
						MCCM	233	D + L + F + H' + T + E'	-296	-143							
						MMAT	287	D + L + F + H' + T + E'	0	-1090							
						MMAC	287	D + L + F + H' + T + E'	-197	-1102							
		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'	-61	253							
						MMAT	289	D + L + F + H' + T + E'	2	293							
						MMAC	289	D + L + F + H' + T + E'	-61	293							

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	Transverse Shear [(6)] Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Cooling Tower East Wall	6	West (inside)	Horizontal	3H.6-115	2-H-L	MTCM	239	D + L + F + H' + T + E'	142	340	D + L + F + H' + T + E'	37	7.8	-	-	-	-
						MCCM	231	D + L + F + H' + T + E'	-146	239							
						MMAT	231	D + L + F + H' + T + E'	126	1385							
						MMAC	231	D + L + F + H' + T + E'	-8	1383							
			Vertical	3H.6-116	1-V-L	MTCM	291	D + L + F + H' + T + E'	30	148	D + L + F + H' + T + E'	117	3.12	-	-	-	-
						MCCM	235	D + L + F + H' + T + E'	-119	69							
						MMAT	283	D + L + F + H' + T + E'	3	241							
						MMAC	275	D + L + F + H' + T + E'	-35	285							
					2-V-L	MTCM	289	D + L + F + H' + T + E'	120	477	D + L + F + H' + T + E'	117	6.24	-	-	-	-
						MCCM	233	D + L + F + H' + T + E'	-296	305							
						MMAT	231	D + L + F + H' + T + E'	5	1164							
						MMAC	232	D + L + F + H' + T + E'	-161	1202							
Cooling Tower West Wall	6	West (outside)	Horizontal	3H.6-117	1-H-L	MTCM	193	D + L + F + H' + T + E'	41	-265	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	-386							
						MMAC	204	D + L + F + H' + T + E'	-49	-389							
					2-H-L	MTCM	210	D + L + F + H' + T + E'	132	-283	D + L + F + H' + T + E'	34	7.8	-	-	-	-
						MCCM	29	D + L + F + H' + T + E'	-172	-706							
						MMAT	218	D + L + F + H' + T + E'	9	-1285							
						MMAC	218	D + L + F + H' + T + E'	-116	-1294							
			Vertical	3H.6-118	1-V-L	MTCM	222	D + L + F + H' + T + E'	34	-171	D + L + F + H' + T + E'	111	3.12	-	-	-	-
						MCCM	222	D + L + F + H' + T + E'	-117	-53							
						MMAT	214	D + L + F + H' + T + E'	7	-196							
						MMAC	206	D + L + F + H' + T + E'	-45	-197							
					2-V-L	MTCM	220	D + L + F + H' + T + E'	122	-762	D + L + F + H' + T + E'	111	6.24	-	-	-	-
						MCCM	220	D + L + F + H' + T + E'	-293	-144							
						MMAT	218	D + L + F + H' + T + E'	7	-1074							
						MMAC	218	D + L + F + H' + T + E'	-192	-1085							
		East (inside)	Horizontal	3H.6-119	1-H-L	MTCM	193	D + L + F + H' + T + E'	41	227	D + L + F + H' + T + E'	31	3.12	-	-	-	-
						MCCM	220	D + L + F + H' + T + E'	-61	297							
						MMAT	220	D + L + F + H' + T + E'	2	297							
						MMAC	220	D + L + F + H' + T + E'	-61	297							

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 (in²/ ft)	Transverse Shear Design Loads: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
Cooling Tower West Wall	6	East (inside)	Horizontal	3H.6-119	2-H-L	MTCM	210	D + L + F + H' + T + E'	132	139	D + L + F + H' + T + E'	34	7.8	-	-	-	-
						MCCM	29	D + L + F + H' + T + E'	-172	979							
						MMAT	29	D + L + F + H' + T + E'	94	1473							
						MMAC	29	D + L + F + H' + T + E'	-16	1473							
			Vertical	3H.6-120	1-V-L	MTCM	222	D + L + F + H' + T + E'	34	162	D + L + F + H' + T + E'	111	3.12	-	-	-	-
						MCCM	33	D + L + F + H' + T + E'	-119	56							
						MMAT	214	D + L + F + H' + T + E'	2	246							
						MMAC	206	D + L + F + H' + T + E'	-37	278							
					2-V-L	MTCM	220	D + L + F + H' + T + E'	122	536	D + L + F + H' + T + E'	111	6.24	-	-	-	-
						MCCM	220	D + L + F + H' + T + E'	-293	418							
						MMAT	29	D + L + F + H' + T + E'	7	1178							
						MMAC	30	D + L + F + H' + T + E'	-166	1242							
Cooling Tower Internal Wall	2	East and West	Horizontal	3H.6-121	1-H-L	MTCM	2427	D + L + F + H' + T + E'	81	-114	D + L + F + H' + T + E'	31	3.12	-	-	-	-
						MCCM	1387	D + L + F + H + To + Wt	-117	-11							
						MMAT	2427	D + L + F + H' + T + E'	18	-137							
						MMAC	2427	D + L + F + H' + T + E'	-8	-137							
					2-H-L	MTCM	2633	D + L + F + H' + T + E'	290	81	D + L + F + H' + T + E'	43	6.24	-	-	-	(8)
						MCCM	2633	D + L + F + H' + T + E'	-125	-87							
						MMAT	2426	D + L + F + H' + T + E'	60	-124							
						MMAC	2426	D + L + F + H' + T + E'	-2	-124							
			Vertical	3H.6-122	1-V-L	MTCM	2428	D + L + F + H' + T + E'	31	-22	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'	1	-63							
						MMAC	1568	D + L + F + H' + T + E'	-40	-65							
					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'	-219	-56							
						MMAT	1520	D + L + F + H' + T + E'	30	-146							
						MMAC	1520	D + L + F + H' + T + E'	-63	-146							

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) The reported transverse shear is the maximum average transverse shear along a plane in that transverse reinforcement zone

(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 (in²/ ft)	Transverse Shear Design Loads: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	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'	-94	-78							
						MMAT	13467	D + L + F + H' + T + E'	7	-943							
						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	-171							
						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'	9	-1247							
						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'	-196	-201							
						MMAT	9614	D + L + F + H' + T + E'	8	-945							
						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'	49	7.8	-	-	-	-
						MCCM	13470	D + L + F + H' + T + E'	-154	-417							
						MMAT	13470	D + L + F + H' + T + E'	15	-802							
						MMAC	13470	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-41	-1047							
		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	924							
					2-H-L	MTCM	10645	D + L + F + H' + T + E'	64	345	D + L + F + H' + T + E'	53	6.24	-	-	-	-
						MCCM	13549	D + L + F + H' + T + E'	-181	372							
						MMAT	10633	1.4D + 1.4F + 1.7H + 1.7W	0	1068							
						MMAC	10633	D + L + F + H' + T + E'	-150	1926							
					3-H-L	MTCM	13564	D + L + F + H' + T + E'	74	517	D + L + F + H' + T + E'	97	7.8	-	-	-	-
						MCCM	10617	D + L + F + H' + T + E'	-199	2107							
						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							

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	Transverse Shear [6] Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
Pump House Foundation Mat	10	Bottom	East-West	3H.6-125	4-H-L	MTCM	10776	D + L + F + H' + T + E'	61	483	D + L + F + H' + T + E'	115	6.24	-	-	-	-
						MCCM	10699	D + L + F + H' + T + E'	-154	124							
						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'	-112	67							
						MMAT	13646	D + L + F + H' + T + E'	131	925							
						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'	-135	134							
						MMAT	13549	D + L + F + H' + T + E'	225	617							
						MMAC	13467	1.4D + 1.4F + 1.7H + 1.7W	-54	685							
					2-V-L	MTCM	10517	D + L + F + H' + T + E'	61	448	D + L + F + H' + T + E'	124	6.24	-	-	-	-
						MCCM	9659	D + L + F + H' + T + E'	-196	276							
						MMAT	10775	D + L + F + H' + T + E'	1	912							
						MMAC	10791	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-143	1959							
					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'	49	7.8	-	-	-	-
						MCCM	13470	D + L + F + H' + T + E'	-154	948							
						MMAT	13470	D + L + F + H' + T + E'	8	875							
						MMAC	13470	1.4D + 1.4F + 1.7H + 1.7W	-65	1192							
Pump House Floor EL. 15'-2" [7]	1.75	Top	East-West	3H.6-127	1-H-L	MTCM	13105	D + L + F + H' + T + E'	74	-1	D + L + F + H' + T + E'	98	2.54	-	-	-	-
						MCCM	13105	D + L + F + H' + T + E'	-340	0							
						MMAT	13046	D + L + F + H' + T + E'	3	-21							
						MMAC	13046	D + L + F + H' + T + E'	-63	-21							
			North-South	3H.6-128	1-V-L	MTCM	13129	D + L + F + H' + T + E'	30	-1	D + L + F + H' + T + E'	88	2.54	-	-	-	-
						MCCM	12660	D + L + F + H' + T + E'	-305	-5							
						MMAT	13046	D + L + F + H' + T + E'	5	-20							
						MMAC	13046	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-47	-27							
		Bottom	East-West	3H.6-129	1-H-L	MTCM	13105	D + L + F + H' + T + E'	74	0	D + L + F + H' + T + E'	98	2.54	-	-	-	-
						MCCM	13105	D + L + F + H' + T + E'	-340	1							
						MMAT	13135	D + L + F + H' + T + E'	42	15							
						MMAC	12693	D + L + F + H' + T + E'	-155	18							
			North-South	3H.6-130	1-V-L	MTCM	13129	D + L + F + H' + T + E'	30	1	D + L + F + H' + T + E'	88	2.54	-	-	-	-
						MCCM	12660	D + L + F + H' + T + E'	-305	3							
						MMAT	13134	D + L + F + H' + T + E'	3	18							
						MMAC	13134	D + L + F + H' + T + E'	-117	30							

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 (in²/ ft)	Transverse Shear Design Loads: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
UHS Basin Foundation Mat	10	Top	East-West	3H.6-131	1-H-L	MTCM	13149	D + L + F + H' + T + E'	379	-393	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	-	-	-	(8)
						MCCM	13251	D + L + F + H' + T + E'	-698	-1475							
						MMAT	13251	D + L + F + H' + T + E'	400	-2442							
						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'	100	12	-	-	-	-
						MCCM	12117	D + L + F + H' + T + E'	-853	-524							
						MMAT	11319	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	77	-3055							
						MMAC	11319	D + L + F + H' + T + E'	-16	-2972							
					4-H-L	MTCM	11961	1.4D + 1.7F + 1.3H + 1.4To	447	-1446	D + L + F + H' + T + E'	103	16	-	-	-	-
						MCCM	12124	D + L + F + H' + T + E'	-229	-351							
						MMAT	11317	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	166	-4437							
						MMAC	11317	D + L + F + H' + T + E'	-43	-3518							
					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	-973							
					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	-4555							
						MMAC	11958	D + L + F + H' + T + E'	-16	-4172							
					7-H-L	MTCM	11511	1.4D + 1.7F + 1.3H + 1.4To	344	-1199	D + L + F + H' + T + E'	77	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	-2420							
					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	-3976							
						MMAC	11764	D + L + F + H' + T + E'	-19	-3639							

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	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin Foundation Mat	10	Top	East-West	3H.6-131	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	-1428							
						MMAC	10971	D + L + F + H' + T + E'	-49	-1428							
					10-H-L	MTCM	11407	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	538	-3375	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'	334	-4689							
						MMAC	11407	D + L + F + H' + T + E'	-10	-4689							
					11-H-L	MTCM	11004	1.4D + 1.7F + 1.3H + 1.4To	233	-745	D + L + F + H' + T + E'	76	12	-	-	-	-
						MCCM	11004	D + L + F + H' + T + E'	-160	-918							
						MMAT	11005	D + L + F + H' + T + E'	101	-2762							
						MMAC	11005	D + L + F + H' + T + E'	-2	-2599							
					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'	325	-4385							
						MMAC	11245	D + L + F + H' + T + E'	-4	-4385							
					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	-979							
					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	-3553							
						MMAC	11158	D + L + F + H' + T + E'	-4	-2660							
					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'	-113	-564							
						MMAT	11773	D + L + F + H' + T + E'	58	-1763							
						MMAC	11773	D + L + F + H' + T + E'	-4	-1763							
					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'	-4	-1909							
					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	-1200							

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 (in²/ ft)	Transverse Shear Design Loads: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
UHS Basin Foundation Mat	10	Top	East-West	3H.6-131	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'	-164	-753							
						MMAT	11222	D + L + F + H' + T + E'	106	-2897							
						MMAC	11222	D + L + F + H' + T + E'	-9	-2827							
					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'	117	-1378							
						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'	-178	-941							
						MMAT	11944	D + L + F + H' + T + E'	93	-1251							
						MMAC	11746	D + L + F + H' + T + E'	-35	-1227							
					3-V-L	MTCM	13246	D + L + F + H' + T + E'	247	-509	D + L + F + H' + T + E'	184	8	-	-	-	-
						MCCM	13246	D + L + F + H' + T + E'	-537	-734							
						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'	-302	-771							
						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'	116	16	-	-	-	-
						MCCM	12060	D + L + F + H' + T + E'	-449	-601							
						MMAT	12060	D + L + F + H' + T + E'	262	-2831							
						MMAC	12060	D + L + F + H' + T + E'	-22	-2725							
					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'	-474	-700							
						MMAT	12109	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	398	-3395							
						MMAC	12109	D + L + F + H' + T + E'	-4	-2994							
					7-V-L	MTCM	11317	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	696	-4489	D + L + F + H' + T + E'	147	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'	-2	-3894							

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 (in²/ ft)	Transverse Shear Design Loads		Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
								Axial and Flexure Loads			In-Plane Shear Loads						
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)		
UHS Basin Foundation Mat	10	Top	North-South	3H.6-132	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	-3743							
						MMAC	11407	D + L + F + H' + T + E'	-3	-3483							
					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'	-190	-223							
						MMAT	11958	D + L + F + H' + T + E'	133	-3643							
						MMAC	11958	D + L + F + H' + T + E'	-53	-3299							
					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'	-210	-36							
						MMAT	11779	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	274	-2157							
						MMAC	11779	D + L + F + H' + T + E'	-23	-1761							
					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'	-21	-3356							
					12-V-L	MTCM	11602	1.4D + 1.4F + 1.7H + 1.7W	251	-245	D + L + F + H' + T + E'	66	8	-	-	-	-
						MCCM	11608	D + L + F + H' + T + E'	-201	-54							
						MMAT	11602	D + L + F + H' + T + E'	64	-929							
						MMAC	11602	D + L + F + H' + T + E'	-80	-929							
					13-V-L	MTCM	11842	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	342	-1802	D + L + F + H' + T + E'	66	16	-	-	-	-
						MCCM	11842	D + L + F + H' + T + E'	-173	-432							
						MMAT	11791	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	184	-2774							
						MMAC	11838	D + L + F + H' + T + E'	-8	-2758							
					14-V-L	MTCM	11858	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	447	-474	D + L + F + H' + T + E'	116	16	-	-	-	-
						MCCM	12054	D + L + F + H' + T + E'	-231	-43							
						MMAT	11858	D + L + F + H' + T + E'	161	-2040							
						MMAC	11858	D + L + F + H' + T + E'	-30	-2040							
					15-V-L	MTCM	11854	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	687	-5307	D + L + F + H' + T + E'	116	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'	-2	-3924							
					16-V-L	MTCM	11311	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	330	-344	D + L + F + H' + T + E'	184	8	-	-	-	-
						MCCM	12103	D + L + F + H' + T + E'	-246	-61							
						MMAT	10846	D + L + F + H' + T + E'	75	-972							
						MMAC	11702	D + L + F + H' + T + E'	-121	-1085							

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 (in²/ ft)	Transverse Shear Design Loads: Load Combination	Transverse Shear[6] Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
UHS Basin Foundation Mat	10	Top	North-South	3H.6-132	17-V-L	MTCM	11859	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	354	-1316	D + L + F + H' + T + E'	95	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	-3052							
					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'	-1	-4262							
					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	-1311							
					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	-2523							
						MMAC	11206	D + L + F + H' + T + E'	0	-2074							
					21-V-L	MTCM	11222	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	524	-2691	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'	306	-3682							
						MMAC	11222	D + L + F + H' + T + E'	-15	-3553							
					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'	-2	-1012							
					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'	-157	-817							
						MMAT	11253	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	3	-1519							
						MMAC	11251	1.4D + 1.7L + 1.7F + 1.7H + 1.7W	-2	-1482							
					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							

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 (in²/ ft)	Transverse Shear Design Loads – Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
UHS Basin Foundation Mat	10	Bottom	East-West	3H.6-133	1-H-L	MTCM	13149	D + L + F + H' + T + E'	379	838	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'	248	1095							
						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'	-698	582							
						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'	103	12	-	-	-	-
						MCCM	12117	D + L + F + H' + T + E'	-853	582							
						MMAT	11981	D + L + F + H' + T + E'	12	2853							
						MMAC	11981	D + L + F + H' + T + E'	-86	2853							
					4-H-L	MTCM	11325	1.4D + 1.7F + 1.3H + 1.4To	201	651	D + L + F + H' + T + E'	100	8	-	-	-	-
						MCCM	12130	D + L + F + H' + T + E'	-236	111							
						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'	103	12	-	-	-	-
						MCCM	12124	D + L + F + H' + T + E'	-230	1597							
						MMAT	11317	D + L + F + H' + T + E'	13	2402							
						MMAC	11317	D + L + F + H' + T + E'	-69	2402							
					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	1257							
						MMAC	11944	D + L + F + H' + T + E'	-29	1257							
					7-H-L	MTCM	11958	D + L + F + H' + T + E'	428	919	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	3300							
						MMAC	11958	D + L + F + H' + T + E'	-102	3300							
					8-H-L	MTCM	11531	1.4D + 1.7F + 1.3H + 1.4To	337	278	D + L + F + H' + T + E'	77	12	-	-	-	-
						MCCM	11511	D + L + F + H' + T + E'	-146	1171							
						MMAT	11546	D + L + F + H' + T + E'	59	2126							
						MMAC	11546	D + L + F + H' + T + E'	-56	2126							
					9-H-L	MTCM	11764	D + L + F + H' + T + E'	344	1750	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'	228	3246							
						MMAC	11764	D + L + F + H' + T + E'	-81	3246							

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 (in²/ft)	Transverse Shear Design Loads: Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in²/ft²)	Remarks
UHS Basin Foundation Mat	10	Bottom	East-West	3H.6-133	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	2256							
						MMAC	11762	D + L + F + H' + T + E'	-11	2256							
					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	2177							
						MMAC	11143	D + L + F + H' + T + E'	-44	2177							
					12-H-L	MTCM	11407	D + L + F + H' + T + E'	342	2174	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'	237	3401							
						MMAC	11407	D + L + F + H' + T + E'	-102	3401							
					13-H-L	MTCM	10994	1.4D + 1.7F + 1.3H + 1.4To	217	454	D + L + F + H' + T + E'	77	12	-	-	-	-
						MCCM	11014	D + L + F + H' + T + E'	-173	1025							
						MMAT	10990	D + L + F + H' + T + E'	59	1864							
						MMAC	10990	D + L + F + H' + T + E'	-34	1864							
					14-H-L	MTCM	11245	D + L + F + H' + T + E'	333	1746	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'	211	3377							
						MMAC	11245	D + L + F + H' + T + E'	-114	3377							
					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'	59	8	-	-	-	-
						MCCM	11263	D + L + F + H' + T + E'	-164	112							
						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							

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	Transverse Shear (6) Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin Foundation Mat	10	Bottom	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'	-161	212							
						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'	116	8	-	-	-	-
						MCCM	12110	D + L + F + H' + T + E'	-262	1488							
						MMAT	12111	D + L + F + H' + T + E'	23	1655							
						MMAC	11983	D + L + F + H' + T + E'	-111	1768							
					4-V-L	MTCM	13246	D + L + F + H' + T + E'	247	492	D + L + F + H' + T + E'	184	12	-	-	-	-
						MCCM	13246	D + L + F + H' + T + E'	-537	152							
						MMAT	11319	D + L + F + H' + T + E'	100	2176							
						MMAC	11319	D + L + F + H' + T + E'	-22	2176							
					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'	-388	1917							
						MMAT	11958	D + L + F + H' + T + E'	68	3243							
						MMAC	11958	D + L + F + H' + T + E'	-25	3243							
					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'	-474	2072							
						MMAT	11317	D + L + F + H' + T + E'	248	3534							
						MMAC	11317	D + L + F + H' + T + E'	-81	3534							
					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'	131	1820							
						MMAC	10937	D + L + F + H' + T + E'	-7	1562							
					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	3462							
						MMAC	11396	D + L + F + H' + T + E'	-45	2973							

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	Transverse Shear [6] Reinforcement Design Loads (kips / ft)	Transverse Shear Reinforcement Provided (in^2/ft^2)	Remarks
UHS Basin Foundation Mat	10	Bottom	North-South	3H.6-134	10-V-L	MTCM	11799	1.4D + 1.7F + 1.3H + 1.4To	187	246	D + L + F + H' + T + E'	184	8	-	-	-	-
						MCCM	11853	D + L + F + H' + T + E'	-118	862							
						MMAT	11220	D + L + F + H' + T + E'	89	1883							
						MMAC	11220	D + L + F + H' + T + E'	-10	1883							
					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'	-144	23							
						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							
Pump House Roof [7]	1.75	Top	East-West	3H.6-135	1-H-L	MTCM	9892	D + L + F + H' + T + E'	152	-3	D + L + F + H' + T + E'	67	2.54	-	-	-	-
						MCCM	9824	D + L + F + H' + T + E'	-120	-1							
						MMAT	9867	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	50	-39							
						MMAC	10500	D + L + F + H' + T + E'	-45	-39							
					2-H-L	MTCM	10319	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	126	-12	D + L + F + H' + T + E'	45	3.81	-	-	-	-
						MCCM	10495	D + L + F + H' + T + E'	-123	-16							
						MMAT	10317	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	96	-39							
						MMAC	10496	D + L + F + H' + T + E'	-101	-42							
			North-South	3H.6-136A	1-V-L	MTCM	10495	D + L + F + H' + T + E'	285	-95	D + L + F + H' + T + E'	69	3.81	-	-	-	-
						MCCM	10495	D + L + F + H' + T + E'	-321	-21							
						MMAT	10495	D + L + F + H' + T + E'	285	-95							
						MMAC	10495	D + L + F + H' + T + E'	-130	-95							
		Bottom	East-West	3H.6-136B	1-H-L	MTCM	9892	D + L + F + H' + T + E'	152	2	D + L + F + H' + T + E'	67	2.54	-	-	-	-
						MCCM	9892	D + L + F + H' + T + E'	-113	1							
						MMAT	10322	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	46	48							
						MMAC	10500	D + L + F + H' + T + E'	-4	39							
					2-H-L	MTCM	10317	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	150	39	D + L + F + H' + T + E'	45	3.81	-	-	-	-
						MCCM	10495	D + L + F + H' + T + E'	-123	5							
						MMAT	10318	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	92	61							
						MMAC	10496	D + L + F + H' + T + E'	-2	51							
			North-South	3H.6-136C	1-V-L	MTCM	10495	D + L + F + H' + T + E'	285	43	D + L + F + H' + T + E'	69	3.81	-	-	-	-
						MCCM	10495	D + L + F + H' + T + E'	-315	110							
						MMAT	10495	D + L + F + H' + T + E'	127	112							
						MMAC	10495	D + L + F + H' + T + E'	-277	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						
								Load Combination	Axial (4) (kips / ft)	Flexure (4) (ft-kips / ft)	Load Combination	In-plane (5) Shear (kips / ft)		Load Combination	Transverse Shear (6) Reinforcement Design Loads (kips / ft)		
Pump House Roof(7)	1.75	-	Horizontal Plane	3H.6-136D	1-H-T	-	-	-	-	-	-	-	-	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-6	0.20	
					2-H-T	-	-	-	-	-	-	-	-	1.05D + 1.3L + 1.05F + 1.3H + 1.2T + 1.3W	-6	0.20	
					3-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-2	0.20	
					4-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	3	0.20	
					5-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-8	0.20	
					6-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-7	0.20	
					7-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-4	0.20	
					8-H-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-11	0.31	
			Vertical Plane	3H.6-136D	1-V-T	-	-	-	-	-	-	-	-	D + L + F + H' + T + E'	-2	0.20	

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) The reported transverse shear is the maximum average transverse shear along a plane in that transverse reinforcement zone

(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".

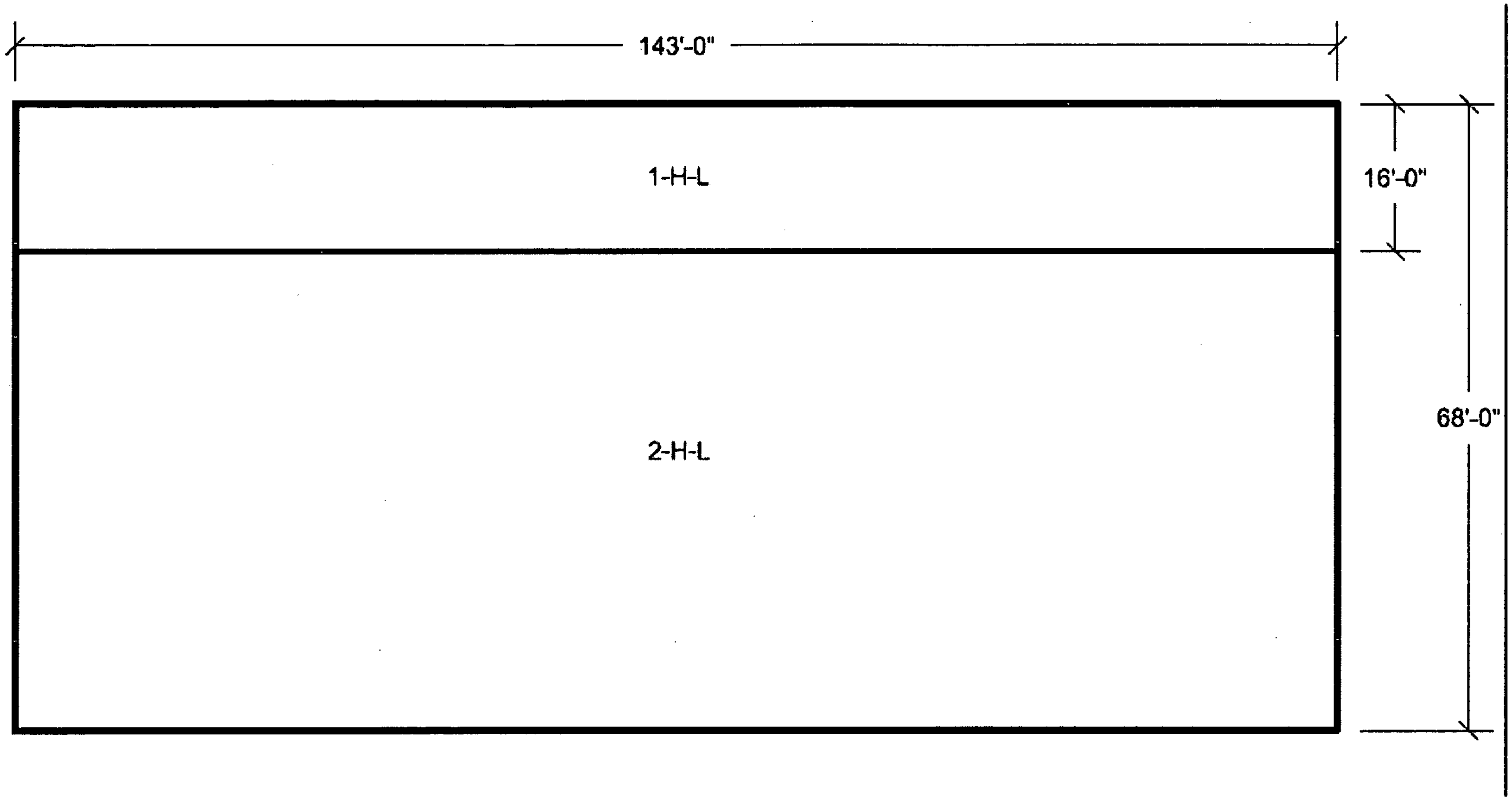


Figure 3H.6-51 Pumphouse Roof Pump House North Wall Looking South North/South Horizontal Reinforcement Zones Bottom Near Side Face

Note: 1-V-L, unless noted otherwise.

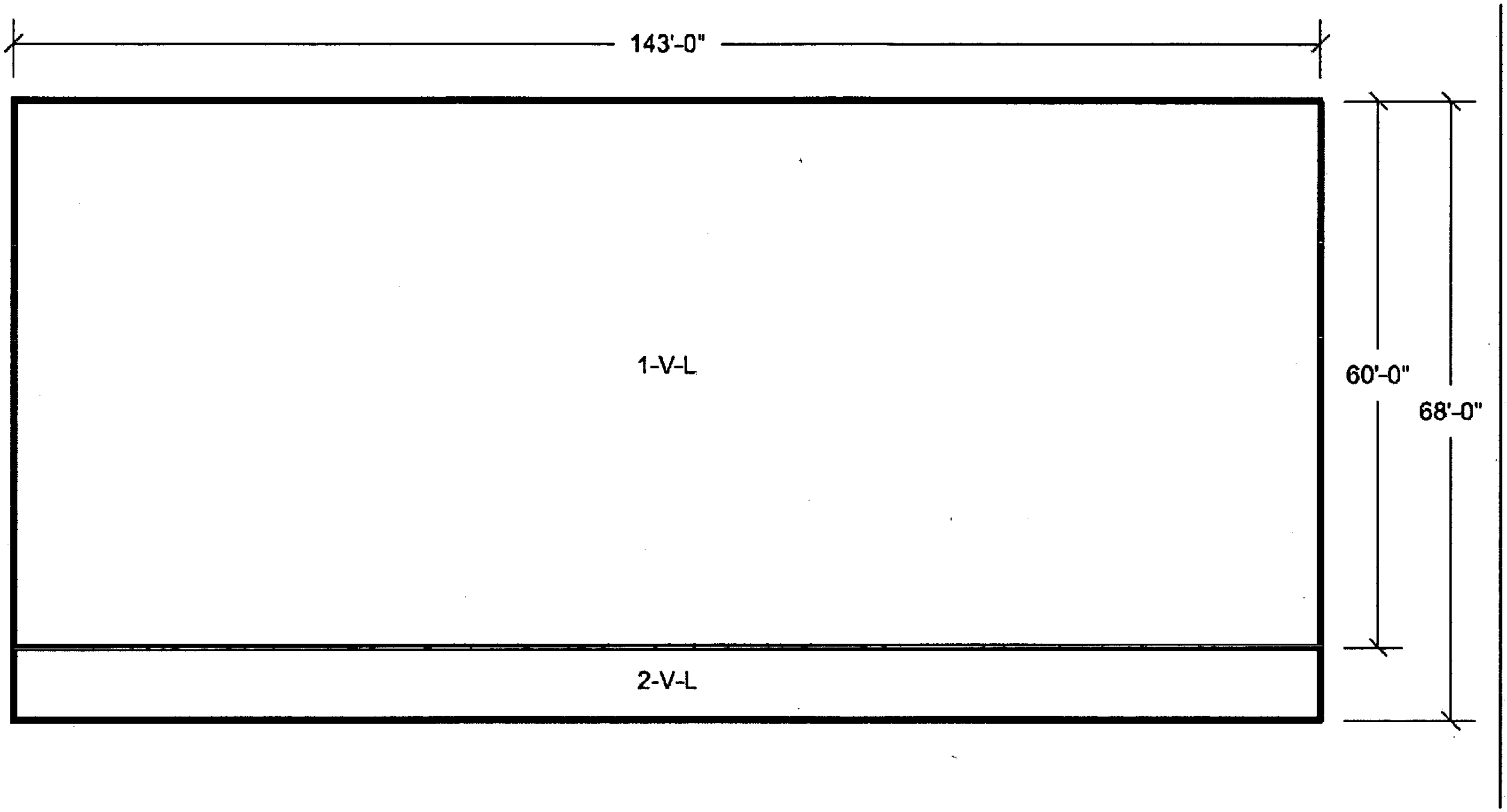


Figure 3H.6-52 ~~Pumphouse~~ Pump House North Wall Looking South Vertical Reinforcement Zones Near Side Face

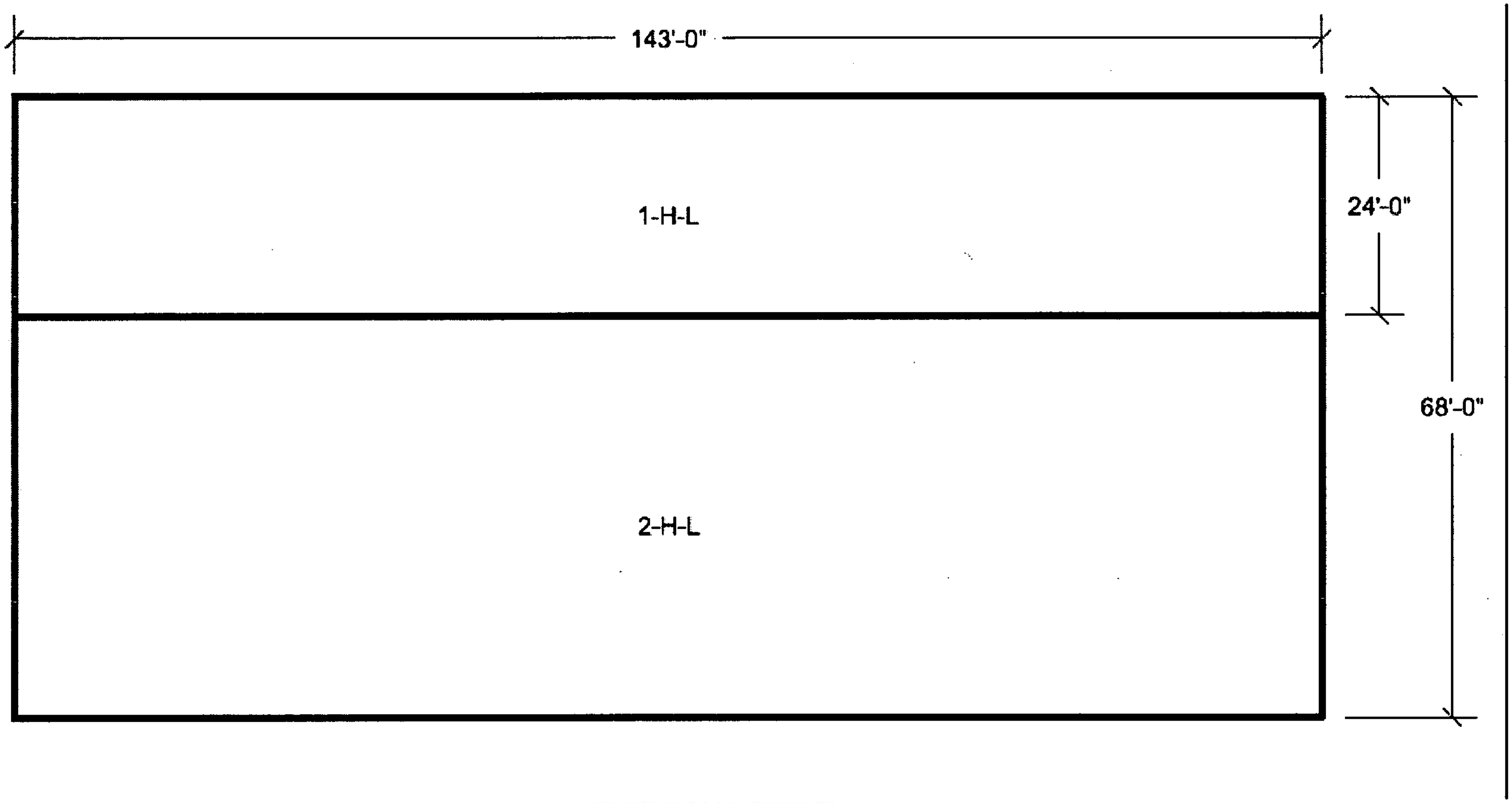


Figure 3H.6-53 ~~Pumphouse~~ Pump House North Wall Looking South Horizontal Reinforcement Zones Far Side Face

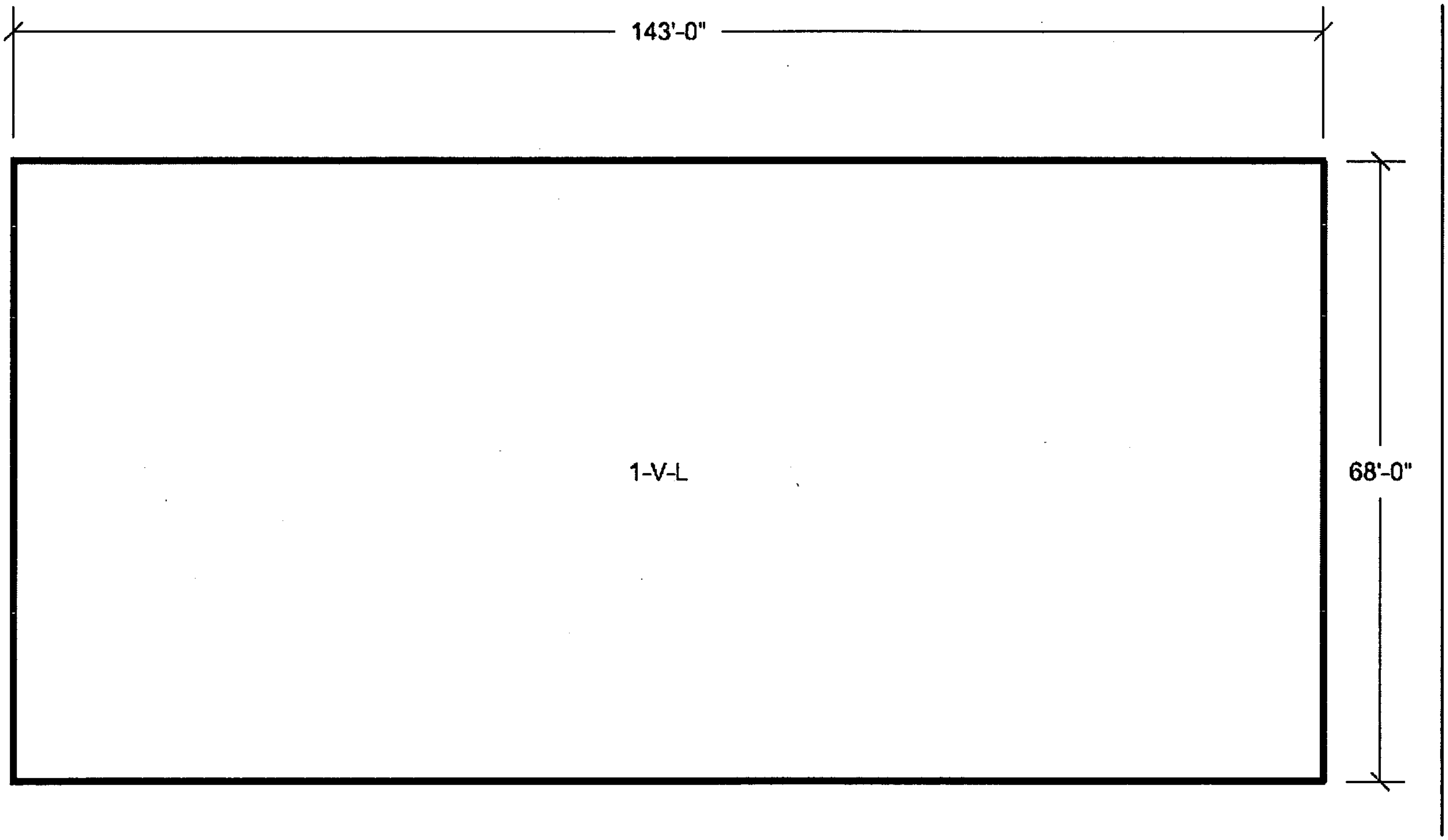
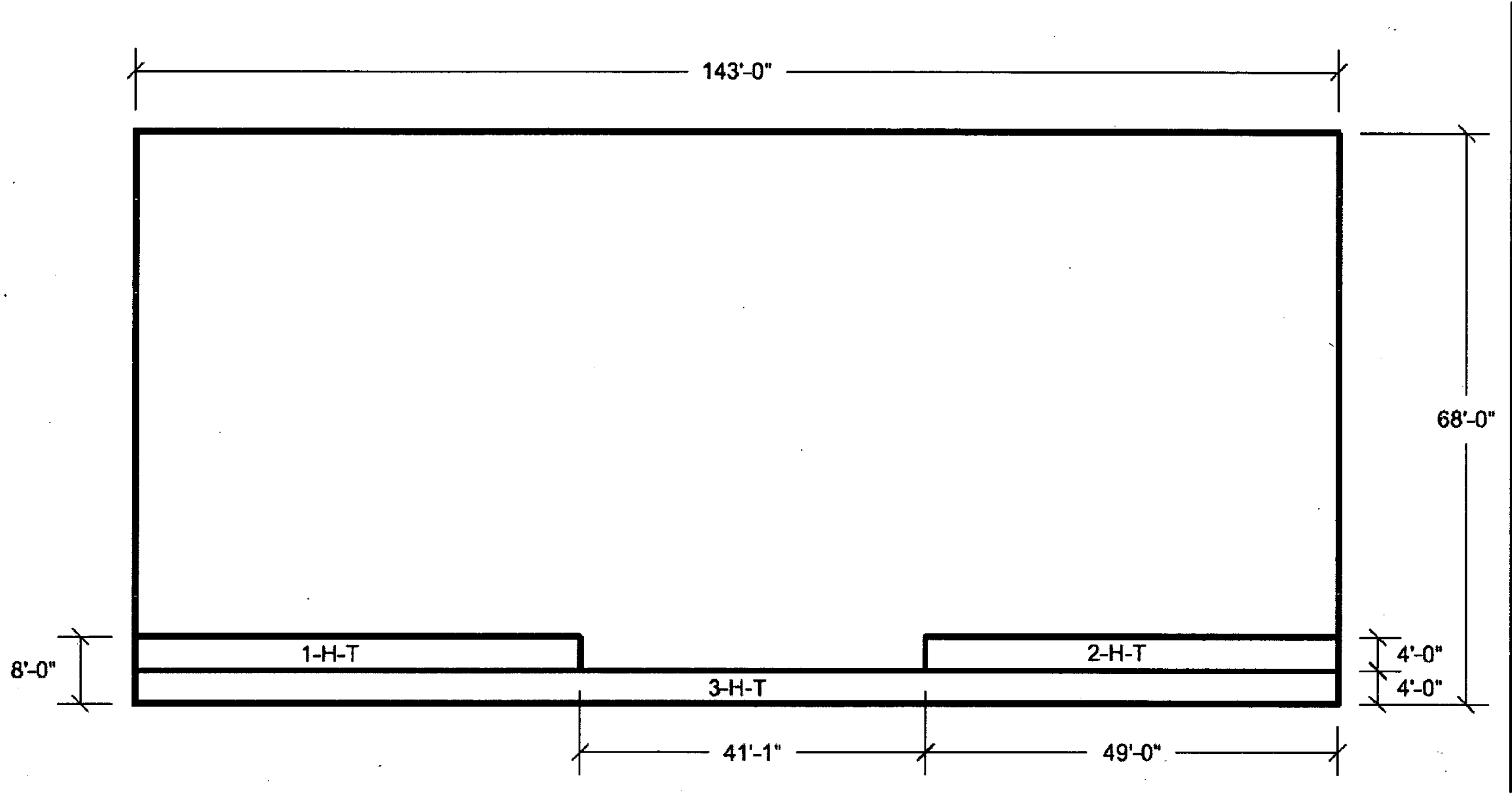
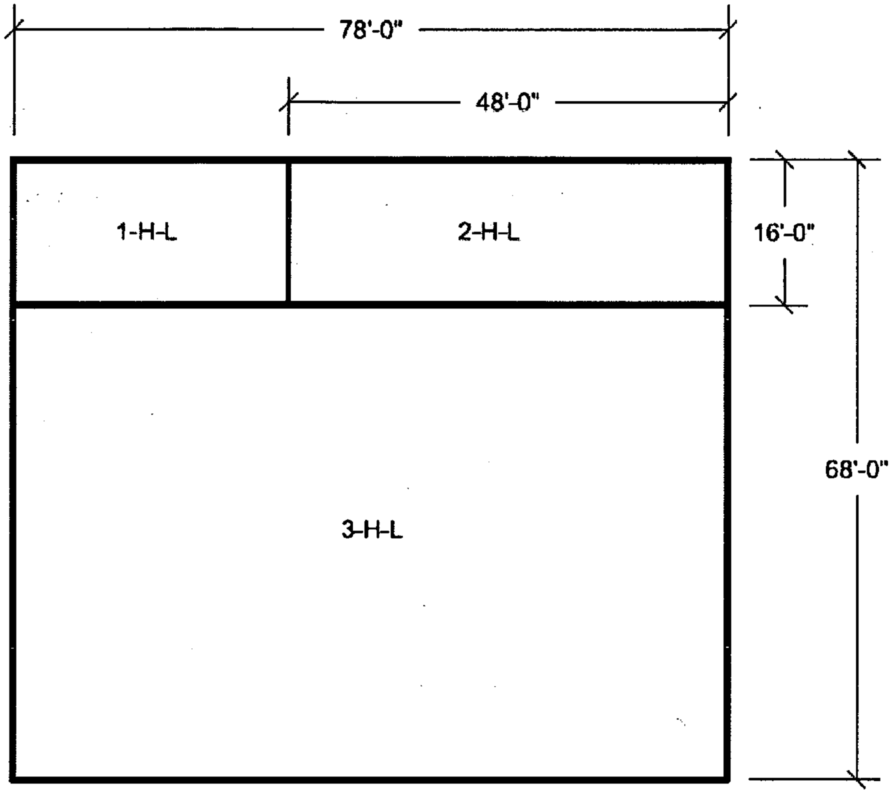


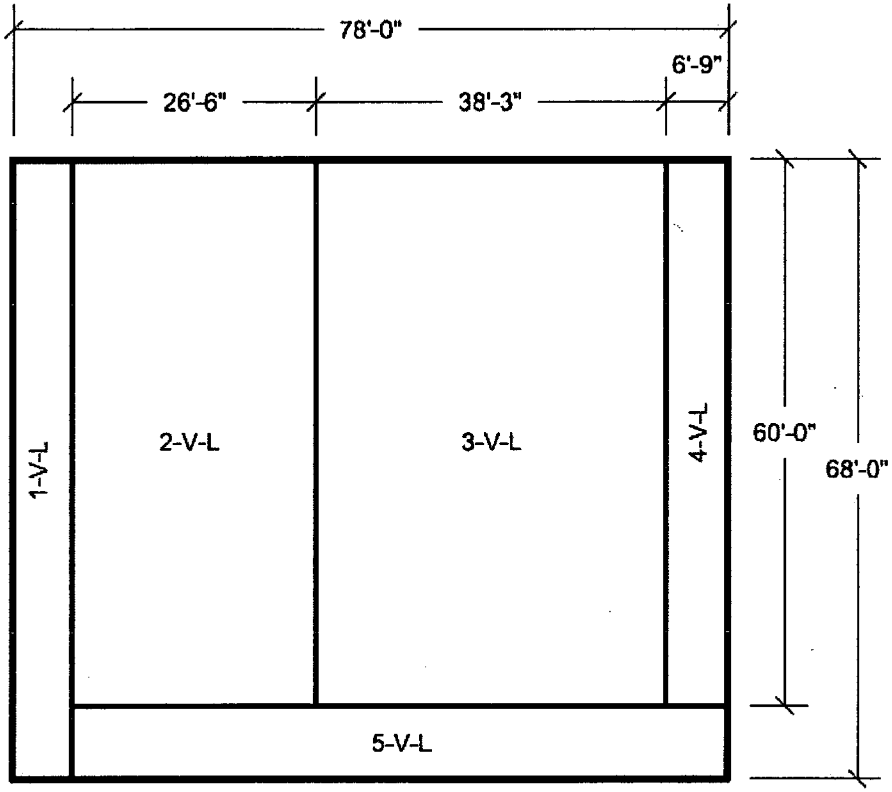
Figure 3H.6-54 ~~Pumphouse~~ Pump House North Wall Looking South Vertical Reinforcement Zones Far Side Face



3H.6-55 ~~Pumphouse~~ Pump House North Wall Looking South
Transverse Horizontal Reinforcement Zones

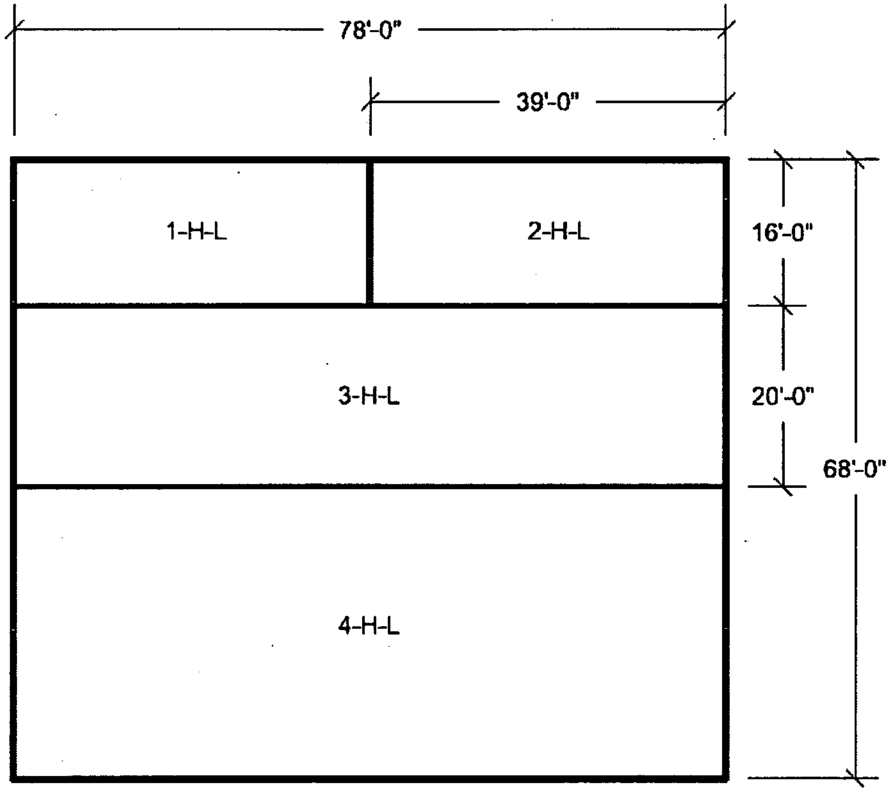


3H.6-56 ~~Pumphouse North~~ Pump House East Wall Looking ~~South~~ West ~~Transverse~~ Horizontal Reinforcement Zones Near Side Face



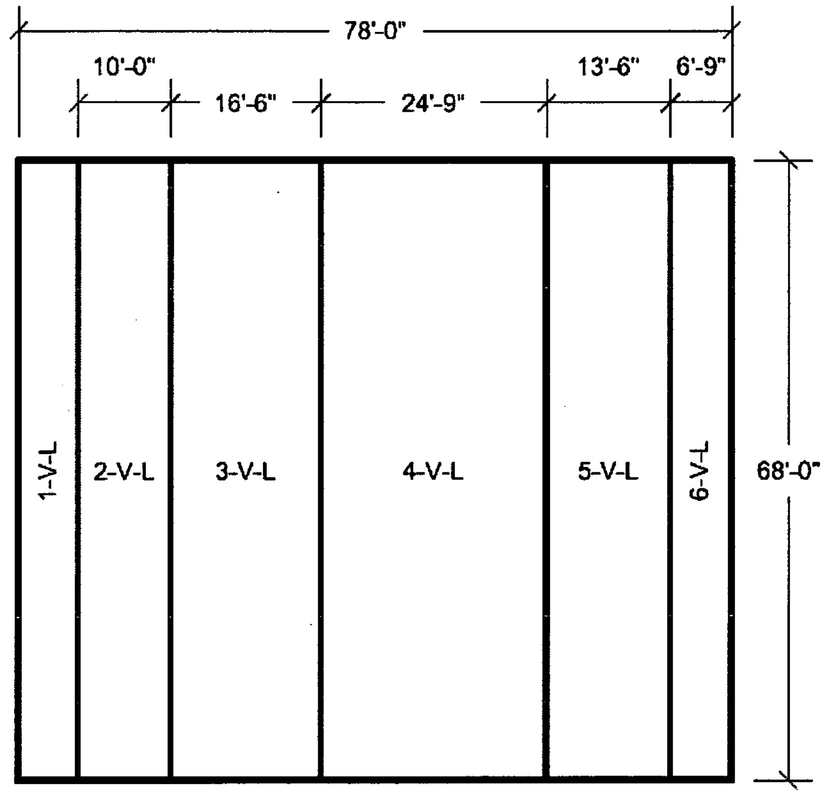
3H.6-57 Pumphouse Pump House East Wall Looking West
Horizontal Vertical Reinforcement Zones Near Side Face

Note: 1-H-L, unless noted otherwise.



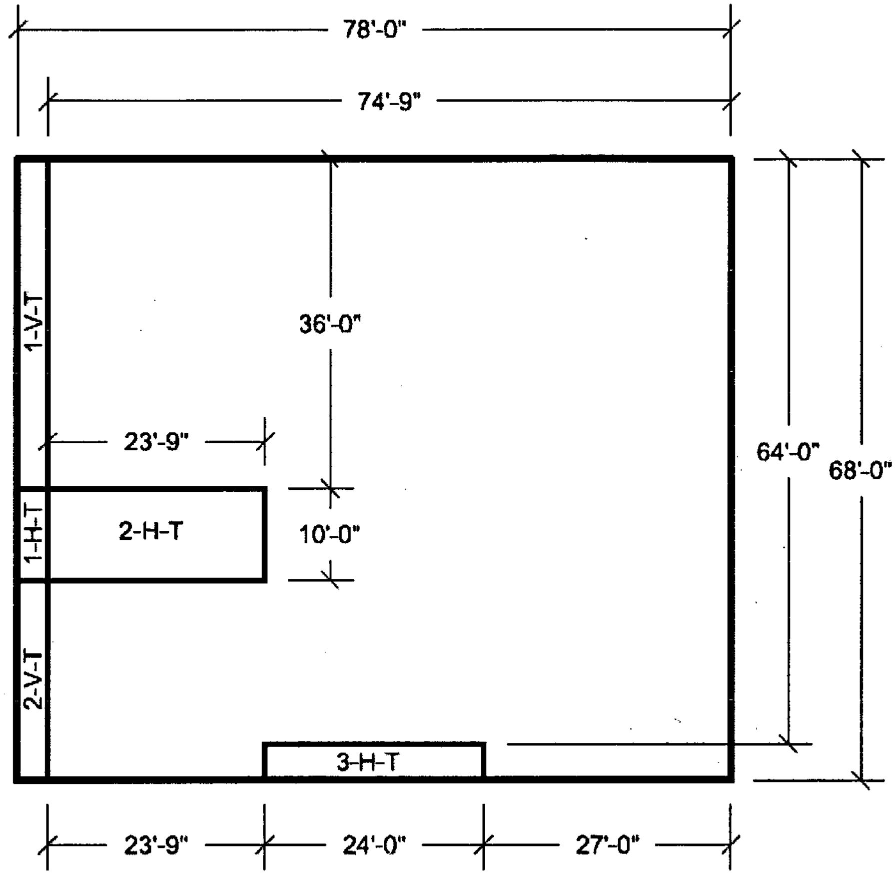
3H.6-58 Pumphouse Pump House East Wall Looking West
Vertical Horizontal Reinforcement Zones Near Far Side Face

Note: 1-V-L unless noted otherwise.



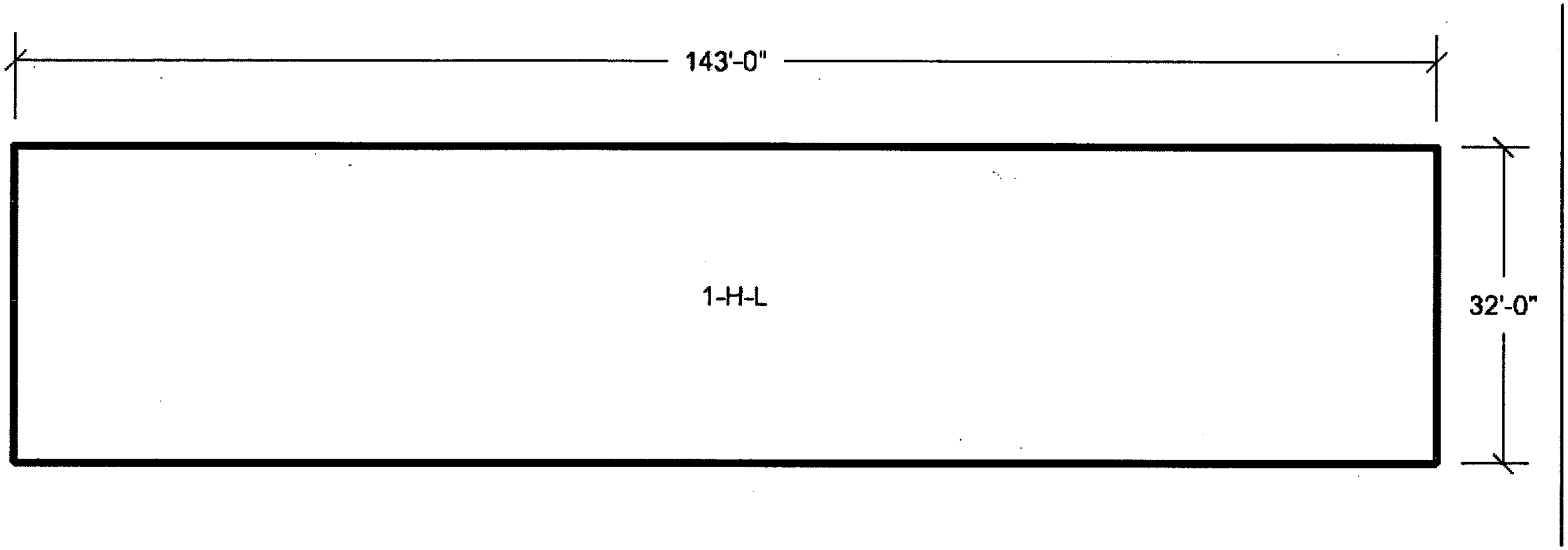
3H.6-59 ~~Pumphouse~~ Pump House East Wall Looking West
~~Horizontal~~ Vertical Reinforcement Zones Far Side Face

~~Note: 1. H = L, unless noted otherwise.~~

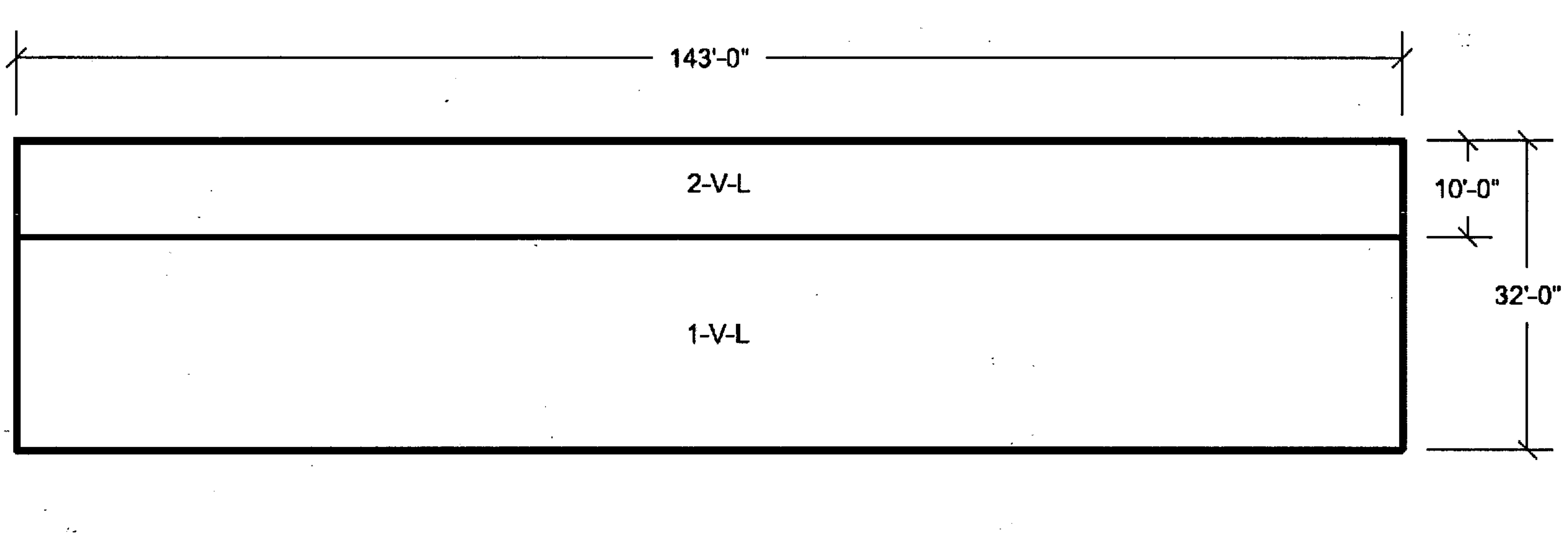


3H.6-60 Pumphouse Pump House East Wall Looking West
Transverse Vertical and Horizontal Reinforcement Zones Far Side Face

Note: 1-V-L unless noted otherwise.

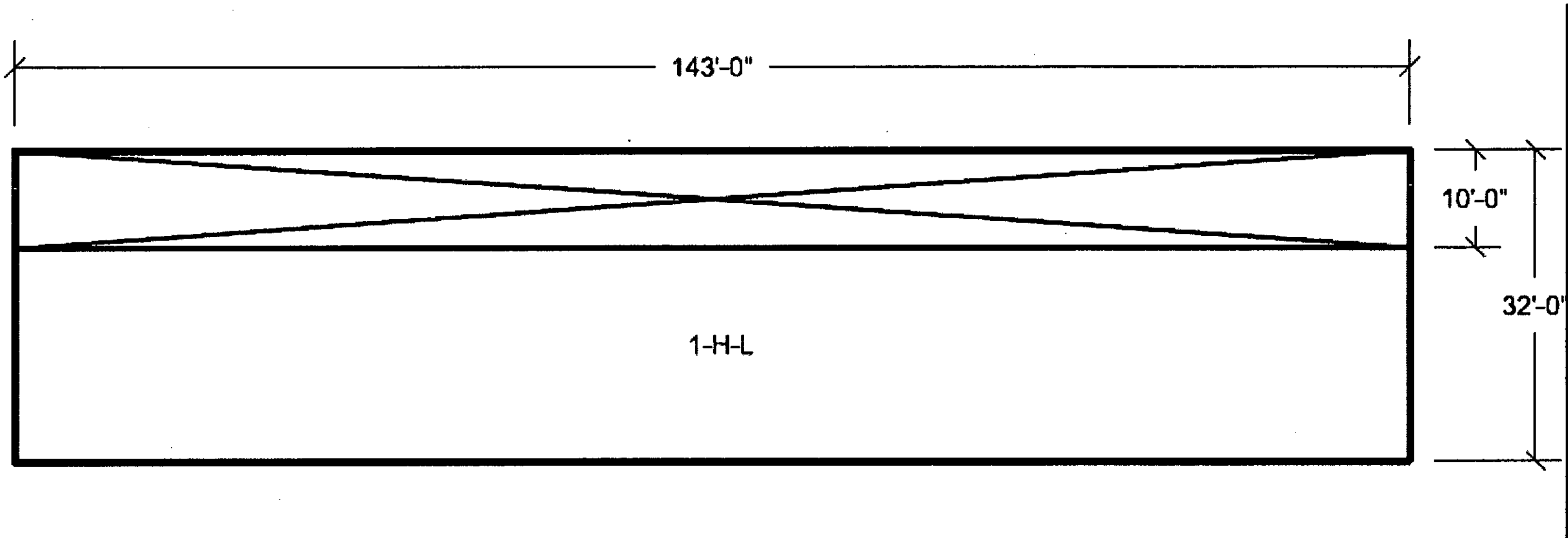


3H.6-61 Pumphouse East Pump House South Wall Looking West South Transverse Vertical and Horizontal Reinforcement Zones Near Side Face



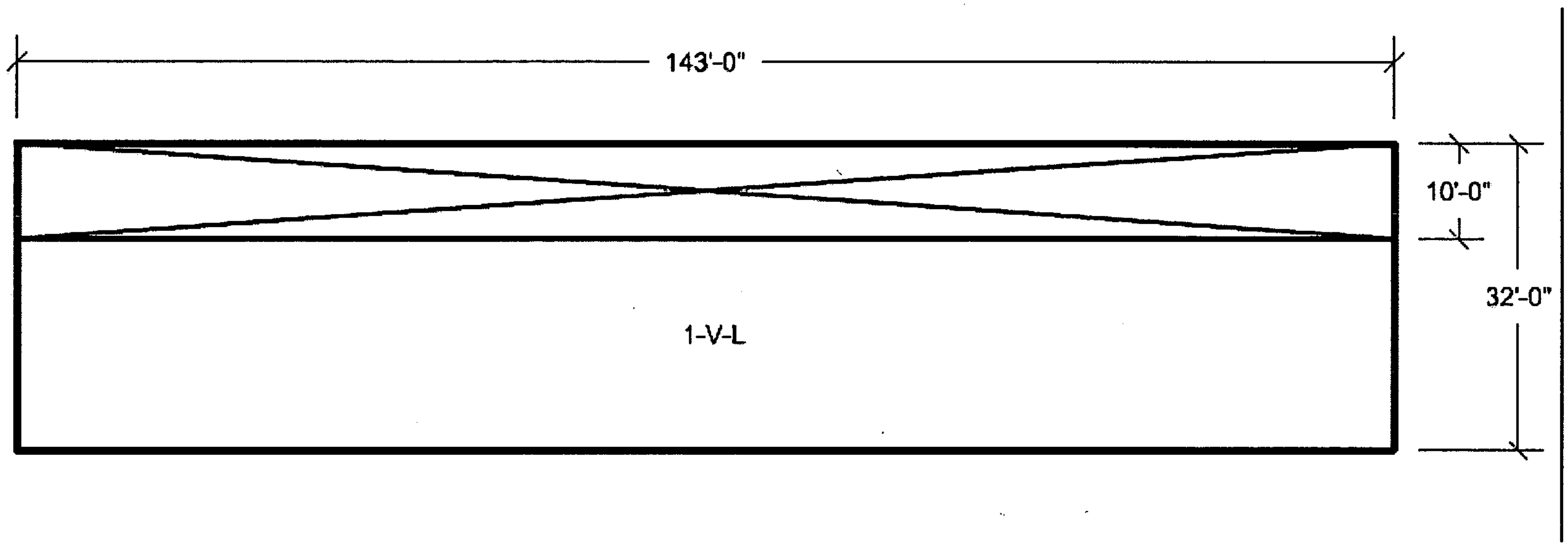
3H.6-62 Pumphouse Pump House South Wall Looking South
Horizontal Vertical Reinforcement Zones Rear Near Side Face

Note: 1-V-L, unless noted otherwise.



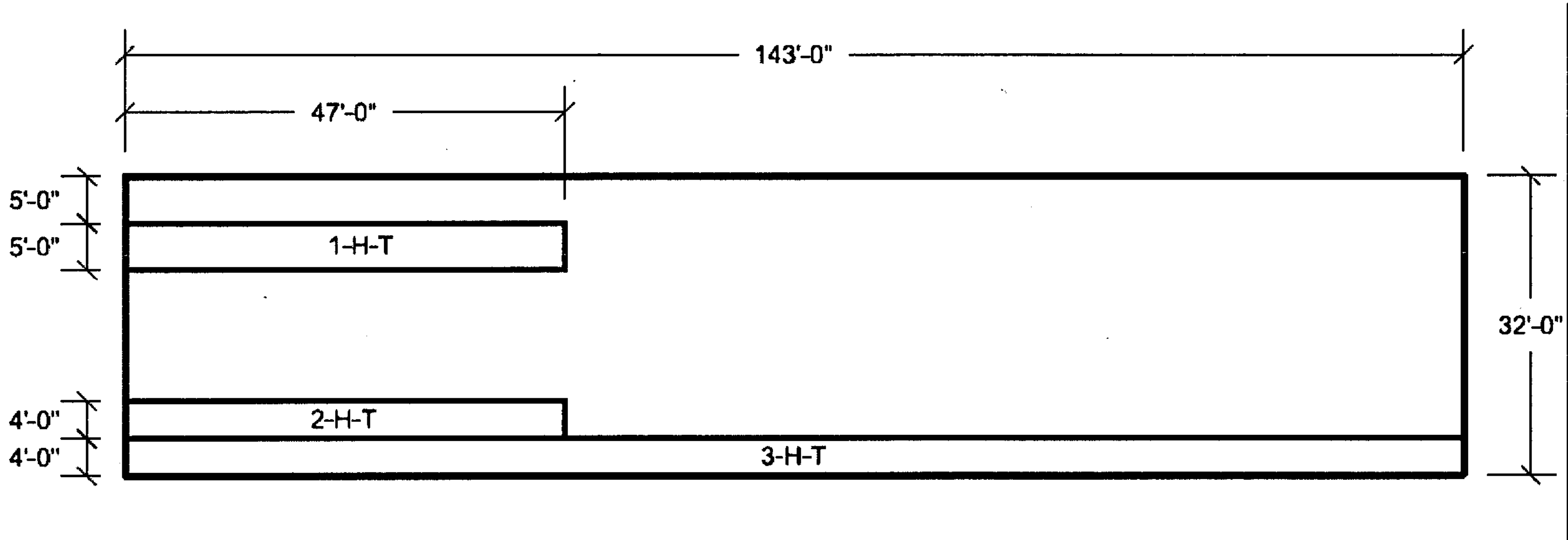
3H.6-63 ~~Pumphouse~~ Pump House South Wall Looking South
~~Vertical~~ Horizontal Reinforcement Zones ~~Near~~ Far Side Face

~~Note: 1-V-L, unless noted otherwise.~~



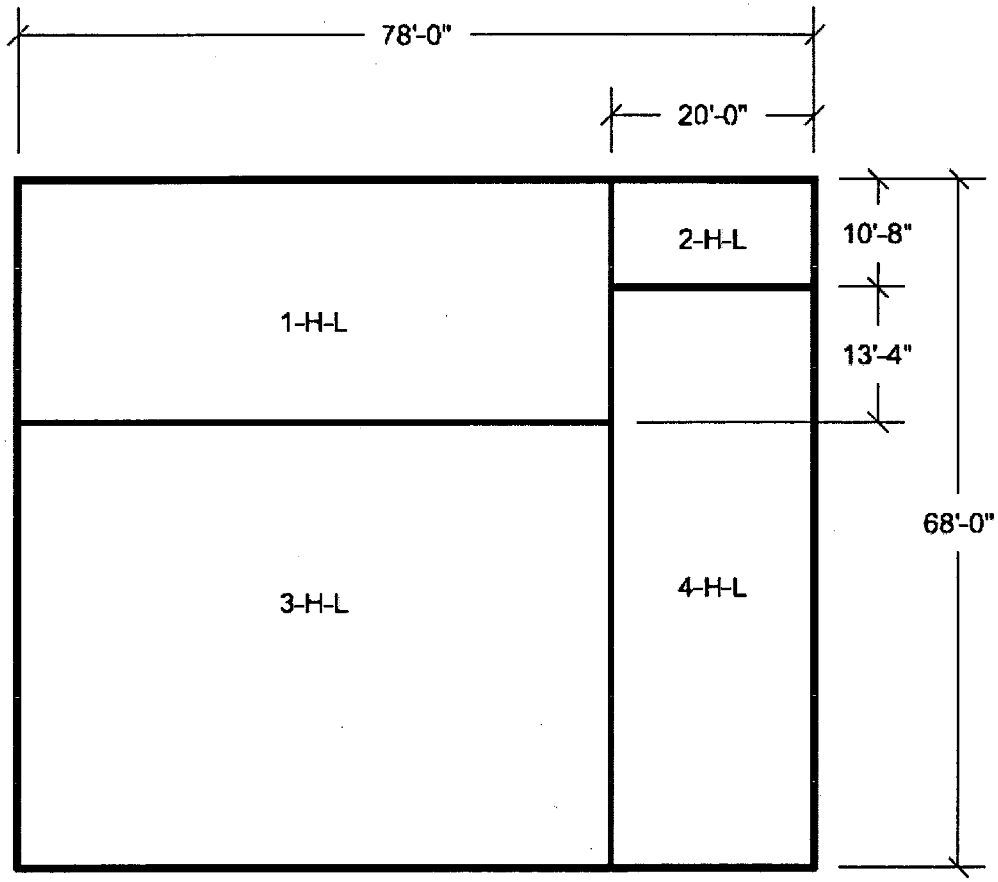
3H.6-64 ~~Pumphouse~~ Pump House South Wall Looking South
~~Horizontal~~ Vertical Reinforcement Zones Far Side Face

~~Note: 1-V-L unless noted otherwise.~~

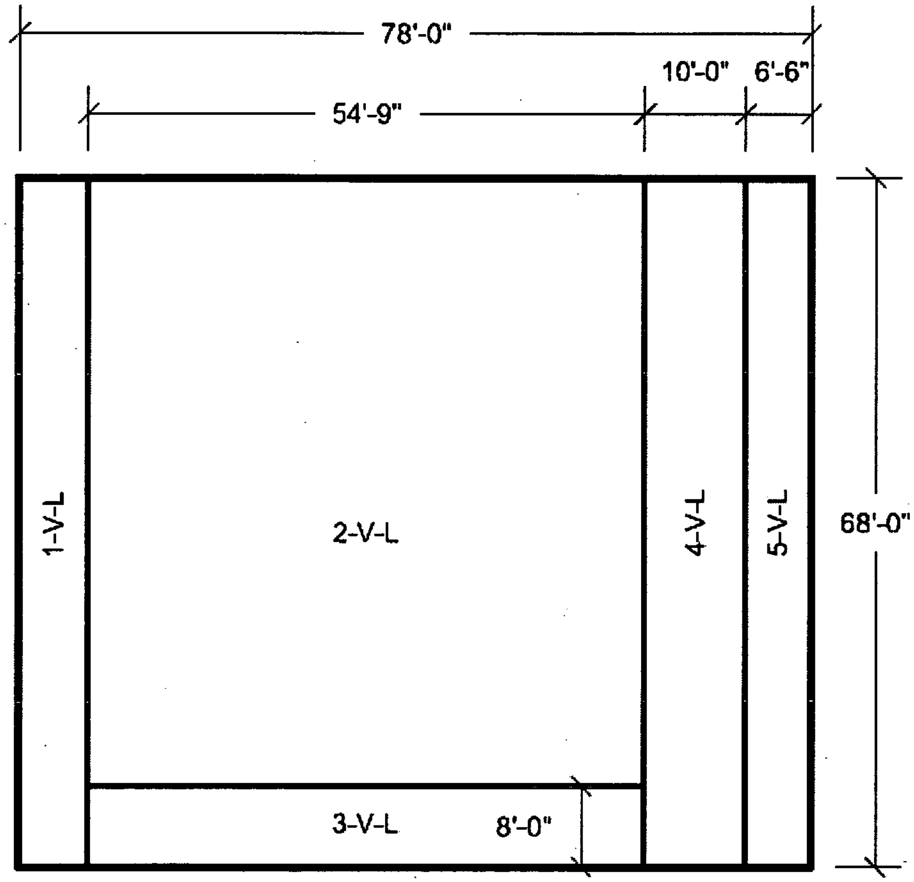


3H.6-65 Pumphouse Pump House South Wall Looking South
Vertical Transverse Horizontal Reinforcement Zones Far Side Face

Note: 1-V-L unless noted otherwise.

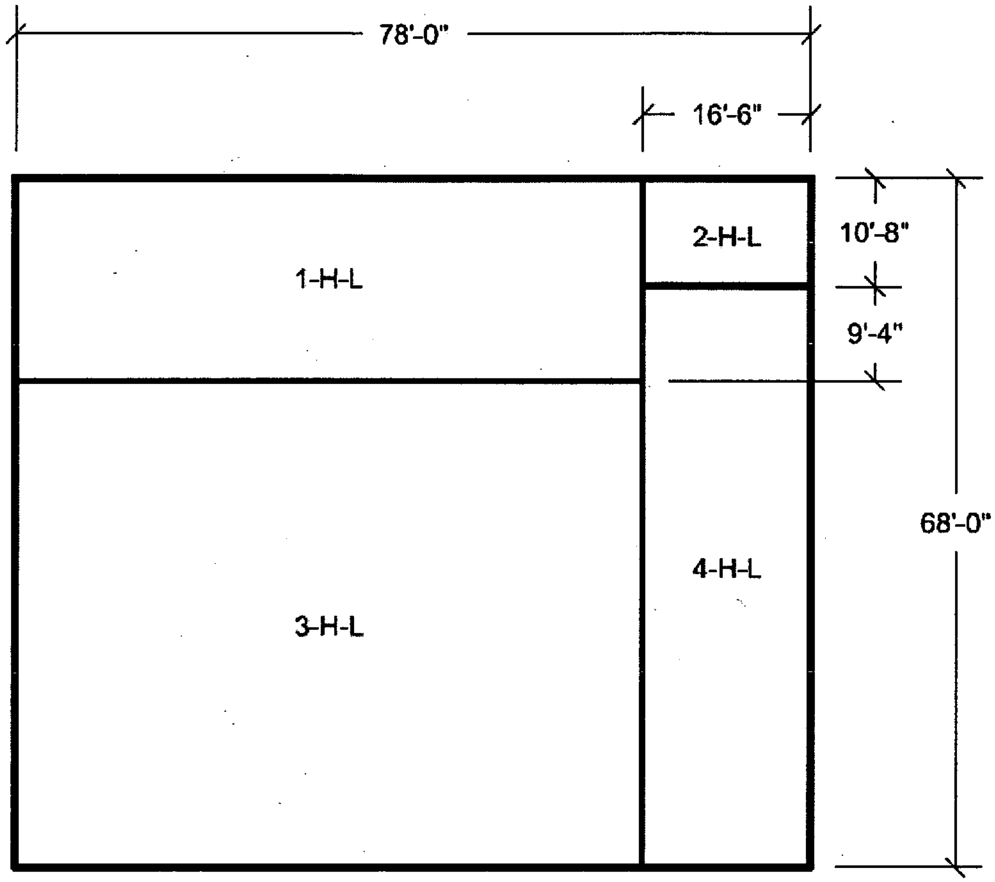


3H.6-66 Pumphouse South Pump House West Wall Looking North East Transverse Horizontal and Vertical Reinforcement Zones Near Side Face



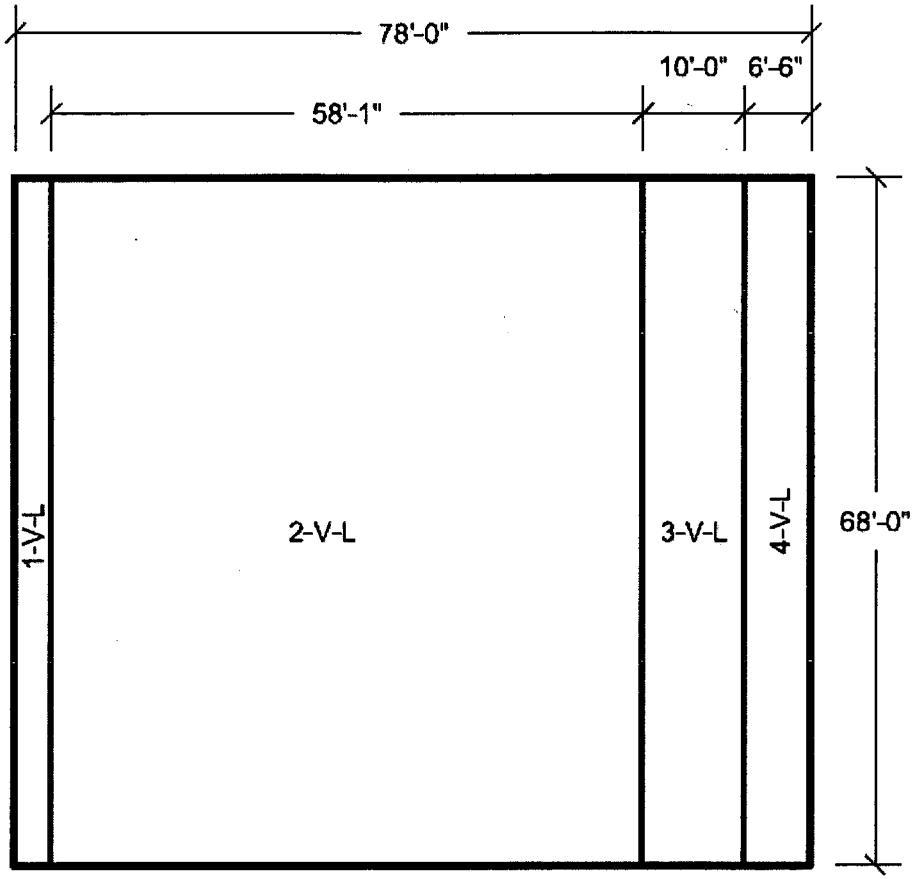
3H.6-67 ~~Pumphouse~~ Pump House West Wall Looking East
~~Horizontal~~ Vertical Reinforcement Zones Near Side Face

~~Note: 1-V-L unless noted otherwise.~~



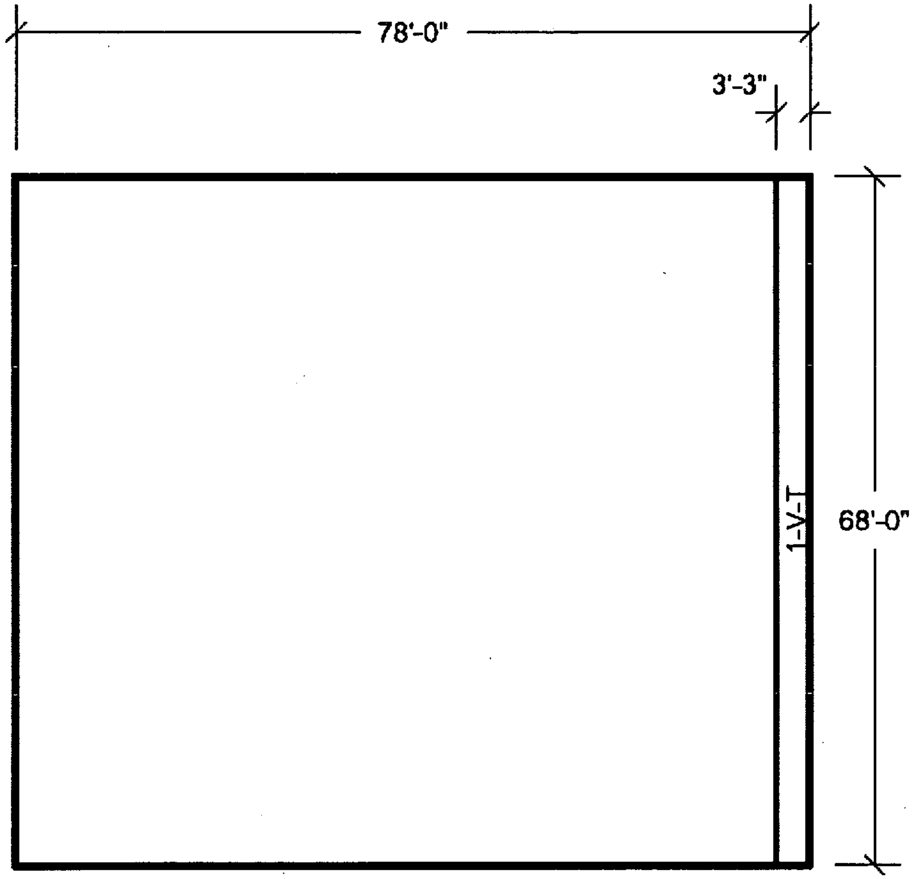
3H.6-68 Pumphouse Pump House West Wall Looking East
Vertical Horizontal Reinforcement Zones Near Far Side Face

Note: 1-V-L, unless noted otherwise.



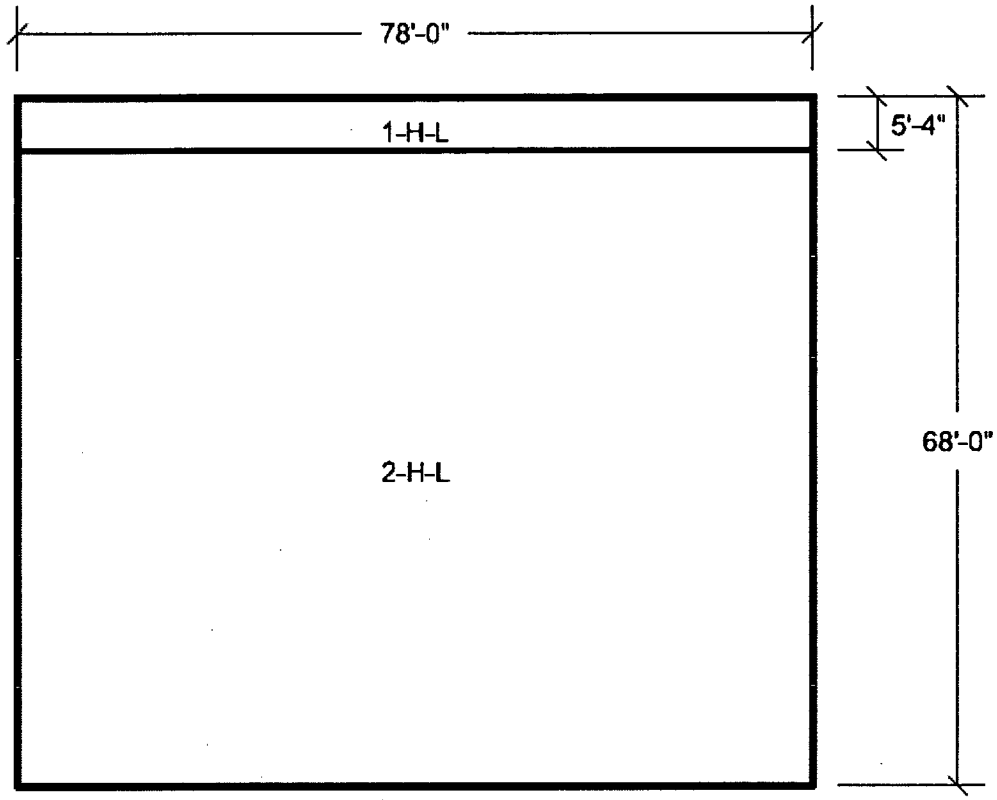
3H.6-69 ~~Pumphouse~~ Pump House West Wall Looking East
~~Horizontal~~ Vertical Reinforcement Zones Far Side Face

~~Note: 1-V-L unless noted otherwise.~~

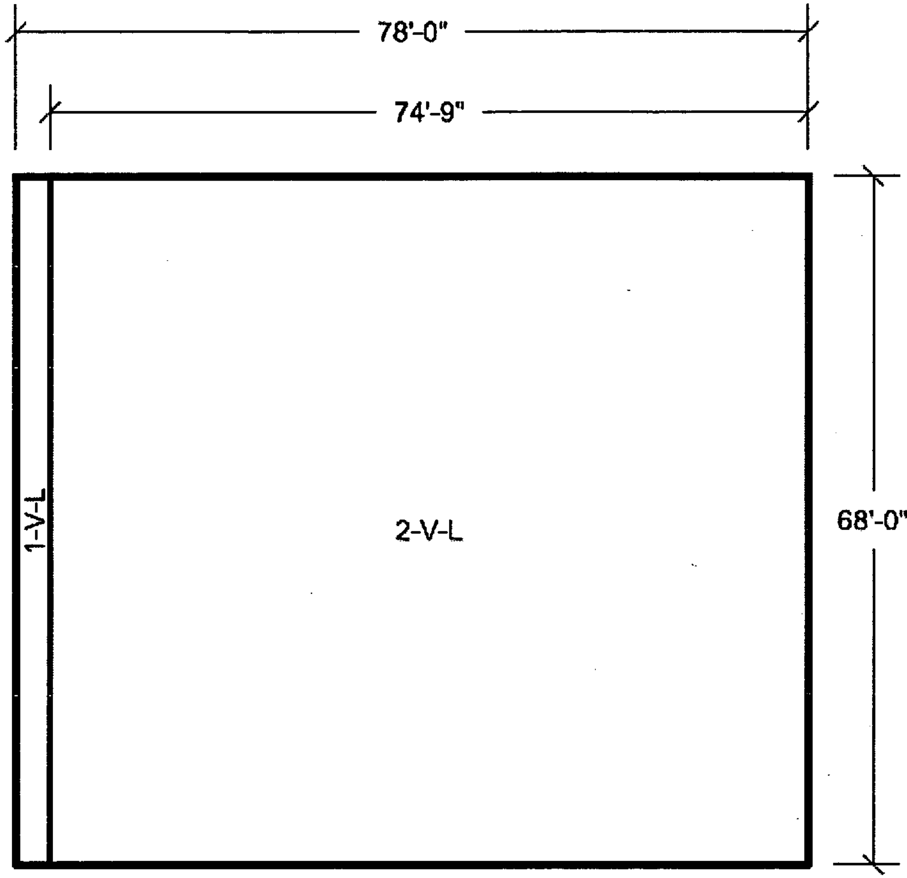


3H.6-70 ~~Pumphouse~~ Pump House West Wall Looking East
Transverse Vertical Reinforcement Zones ~~Far Side Face~~

~~Note: 1-V-L, unless noted otherwise.~~

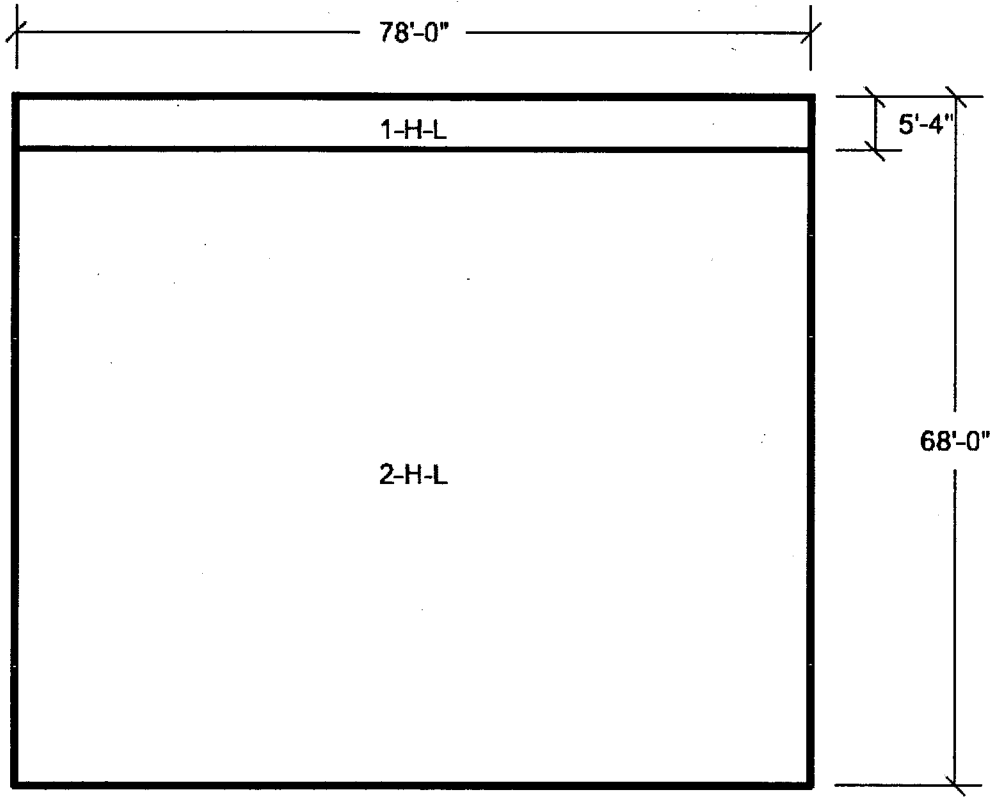


3H.6-71 Pumphouse West Pump House Internal East Wall Looking East West Transverse Vertical Horizontal Reinforcement Zones Near Side Face



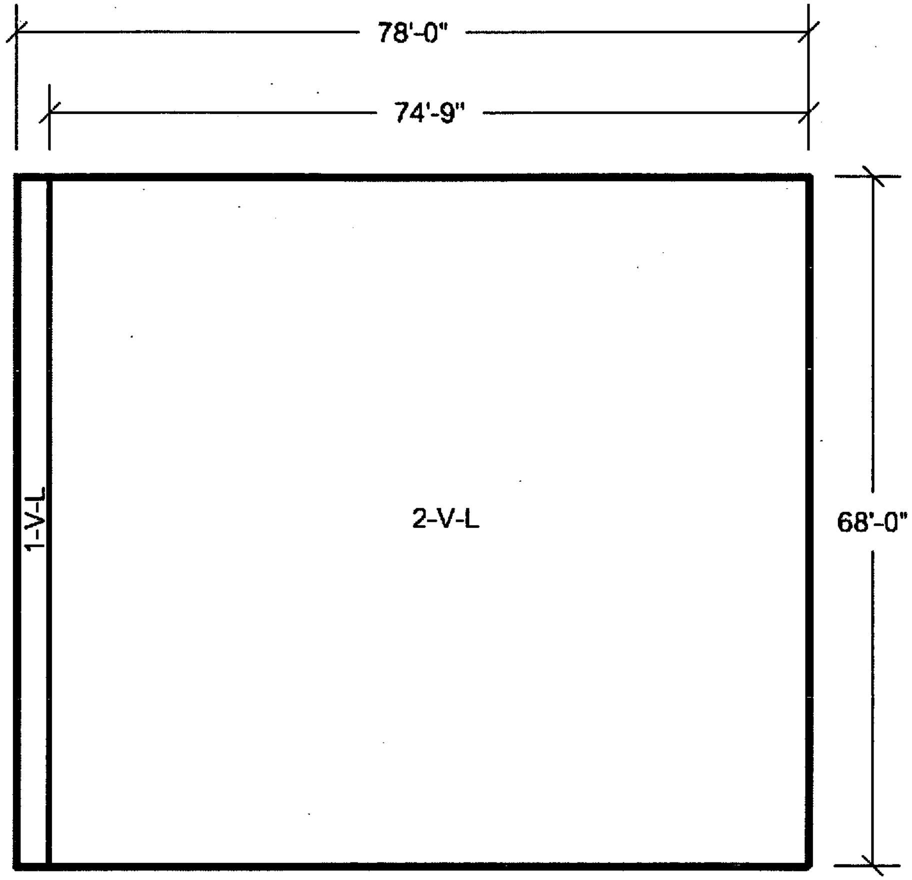
3H.6-72 Pumphouse Pump House Internal East Wall Looking West Horizontal Vertical Reinforcement Zones Near Side Face

Note: 1–H–L, unless noted otherwise.



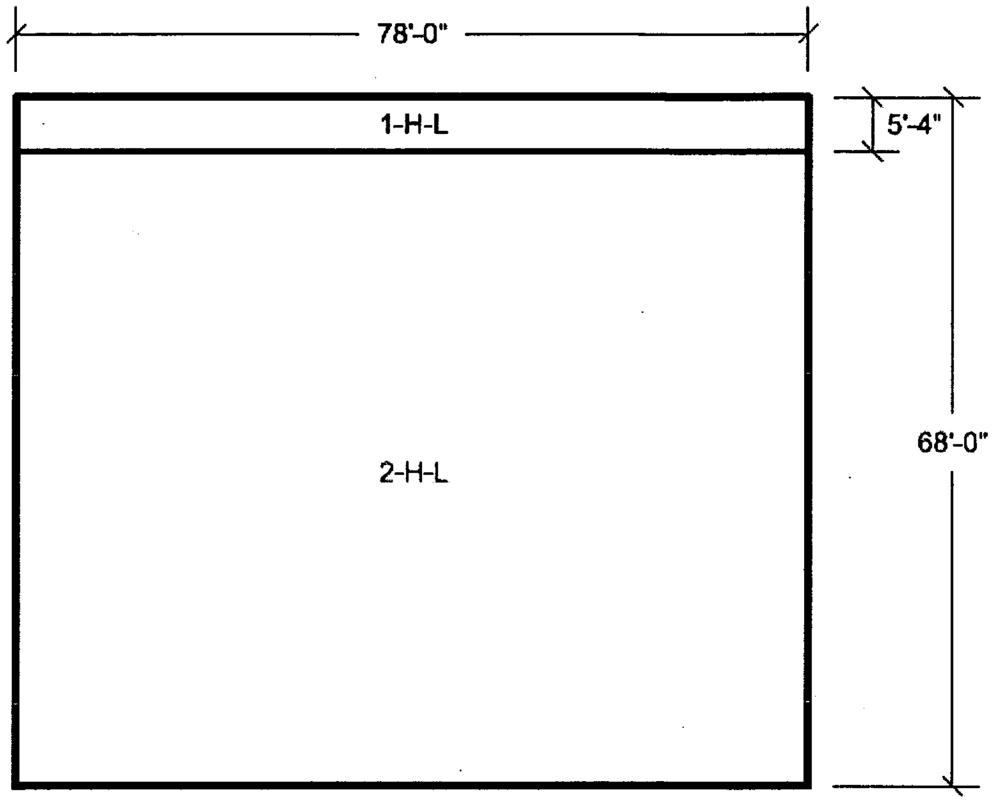
3H.6-73 ~~Pumphouse~~ Pump House Internal East Wall Looking West
~~Vertical~~ Horizontal Reinforcement Zones ~~Near~~ Far Side Face

~~Note: 1-V-L unless noted otherwise.~~



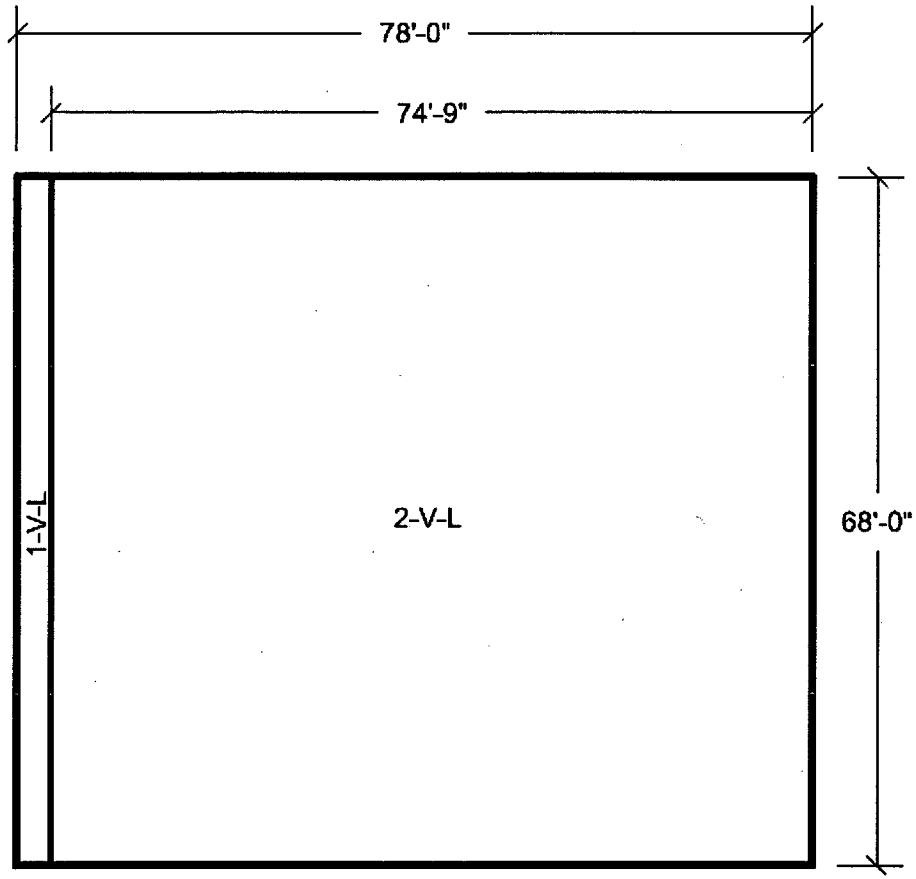
3H.6-74 Pumphouse Pump House Internal East Wall Looking West Horizontal Vertical Reinforcement Zones Far Side Face

Note: 1-H-L unless noted otherwise.



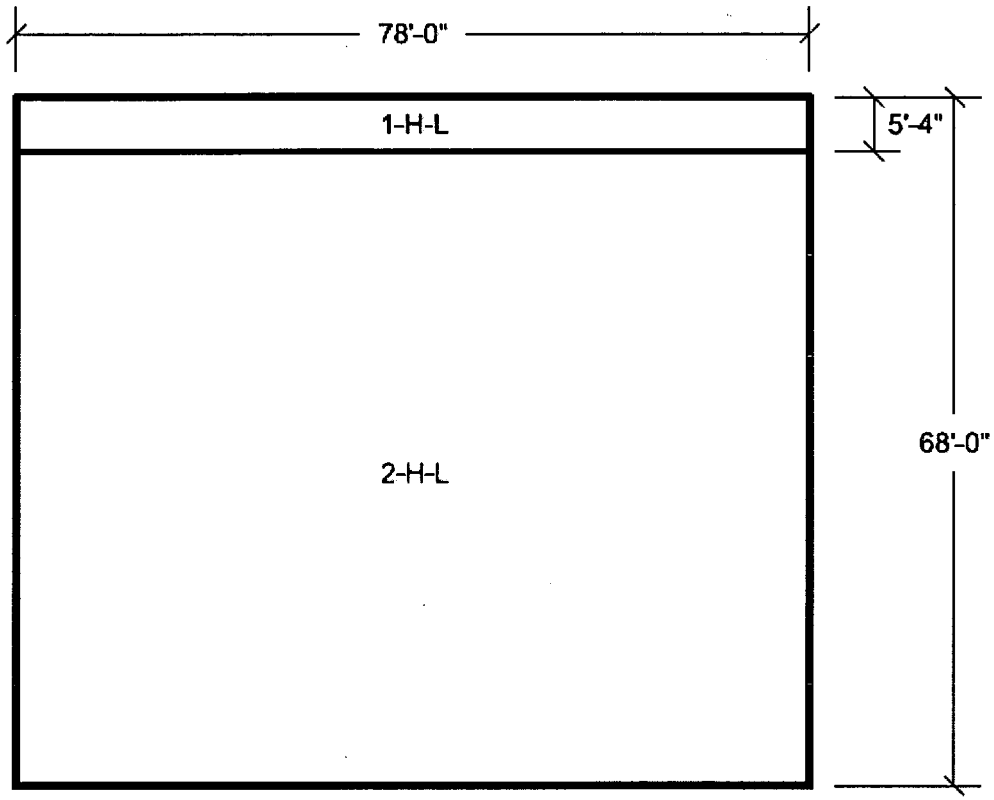
3H.6-75 Pumphouse Pump House Internal East West Wall Looking West
Vertical Horizontal Reinforcement Zones Far Near Side Face

Note: 1-V-L, unless noted otherwise.



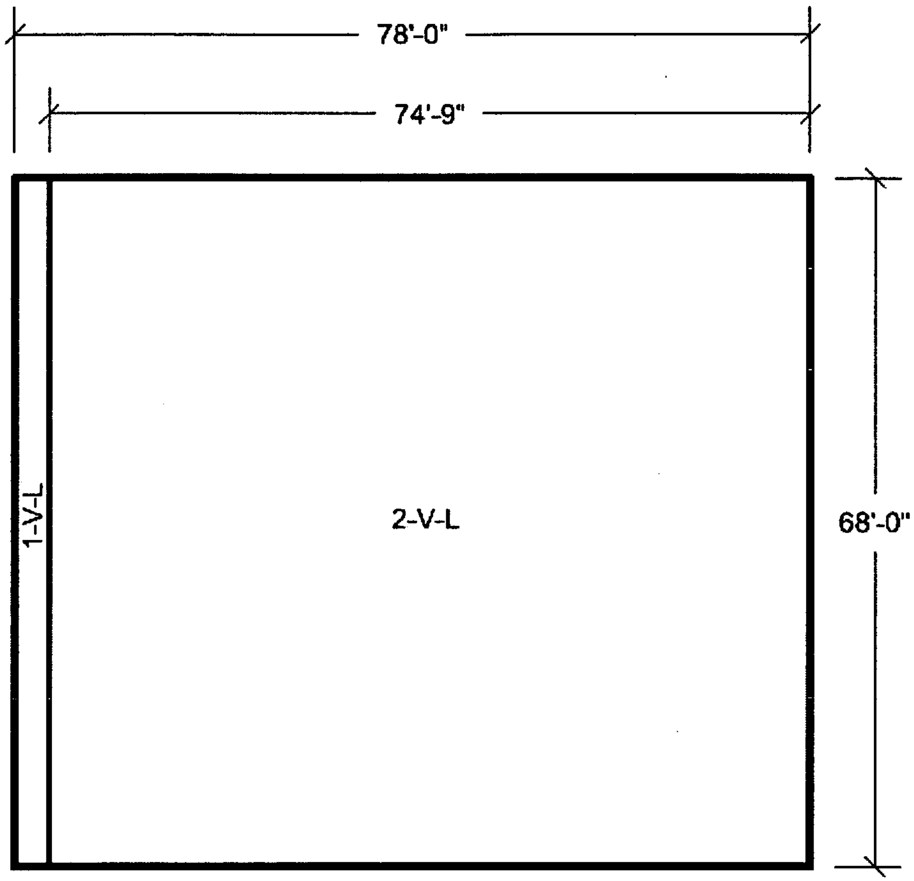
3H.6-76 Pumphouse Pump House Internal West Wall Looking West
Horizontal Vertical Reinforcement Zones Near Side Face

Note: 1-H-L unless noted otherwise.



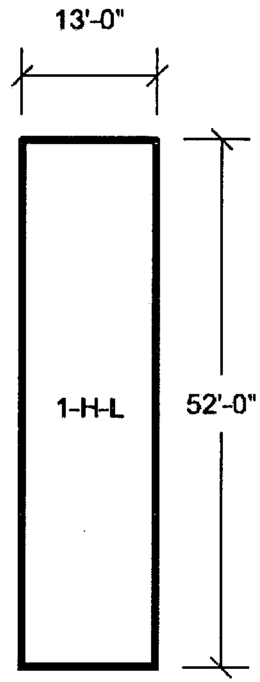
3H.6-77 Pumphouse Pump House Internal West Wall Looking West
Vertical Horizontal Reinforcement Zones Near Far Side Face

Note: 1-V-L, unless noted otherwise.



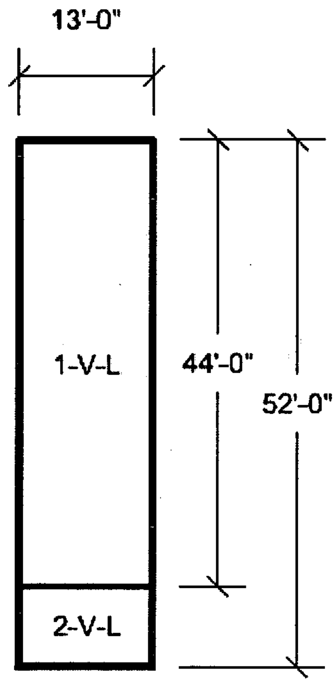
3H.6-78 Pumphouse Pump House Internal West Wall Looking West
Horizontal Vertical Reinforcement Zones Far Side Face

Note: 1-H-L unless noted otherwise.



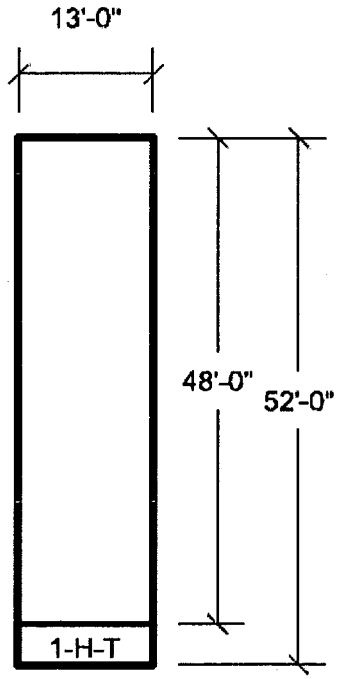
3H.6-79 ~~Pumphouse Internal West Wall~~ Pump House East Buttress Looking North & Pump House West Buttress Looking ~~West~~ South ~~Vertical~~ Horizontal Reinforcement Zones Near and Far Side Faces

~~Note: 1-V-L, unless noted otherwise.~~



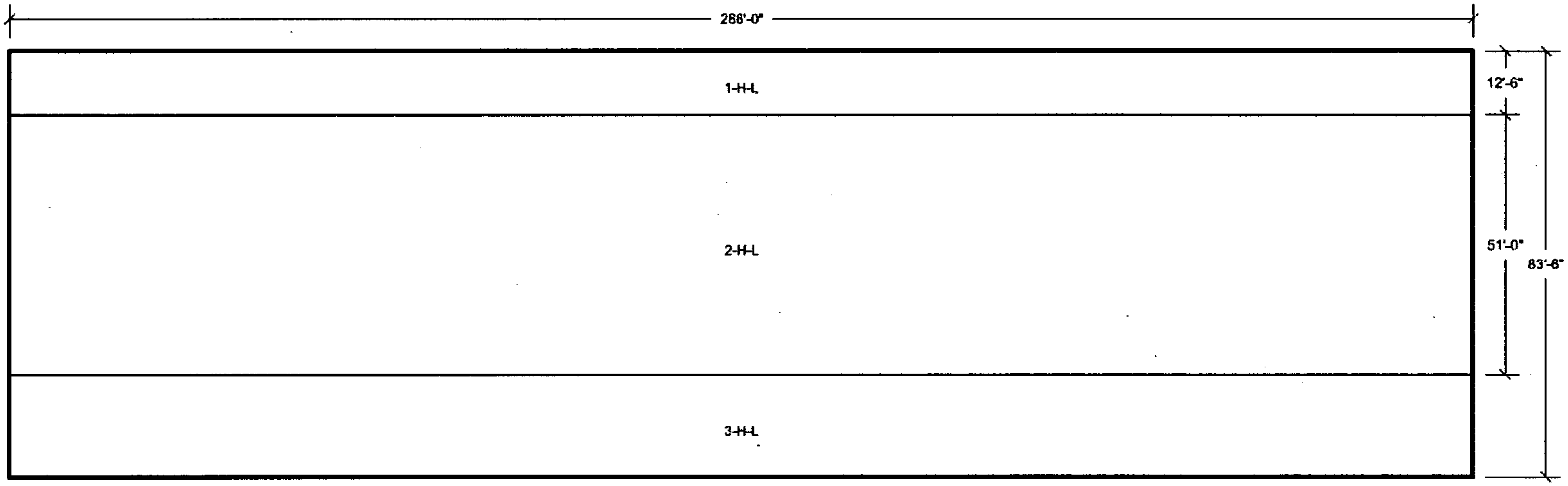
3H.6-80 ~~Pumphouse~~ Pump House East Buttress Looking North & ~~Pumphouse~~ Pump House West Buttress Looking South ~~Horizontal~~ Vertical Reinforcement Zones Near ~~&~~ and Far Side Faces

~~Note: 1=H=L, unless noted otherwise.~~

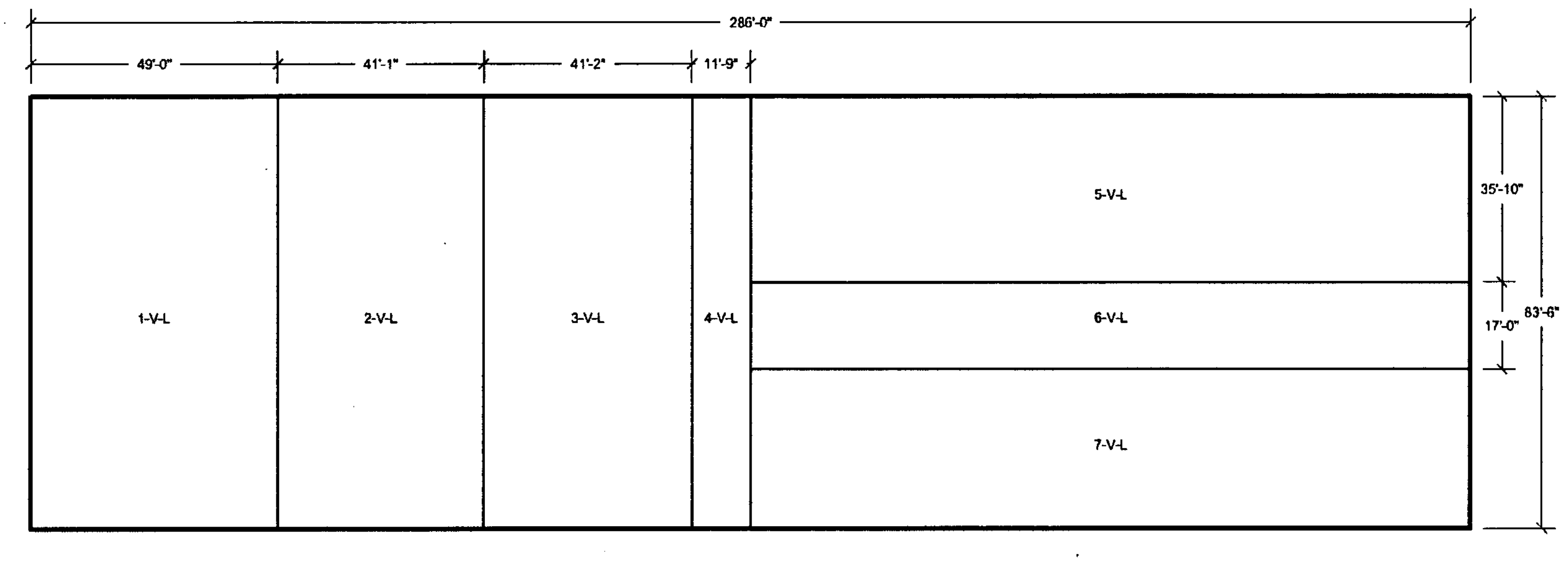


3H.6-81 ~~Pumphouse~~ Pump House East Buttress Looking North & ~~Pumphouse~~ Pump House West Buttress Looking South ~~Vertical~~ Transverse Horizontal Reinforcement Zones ~~Near & Far Side Faces~~

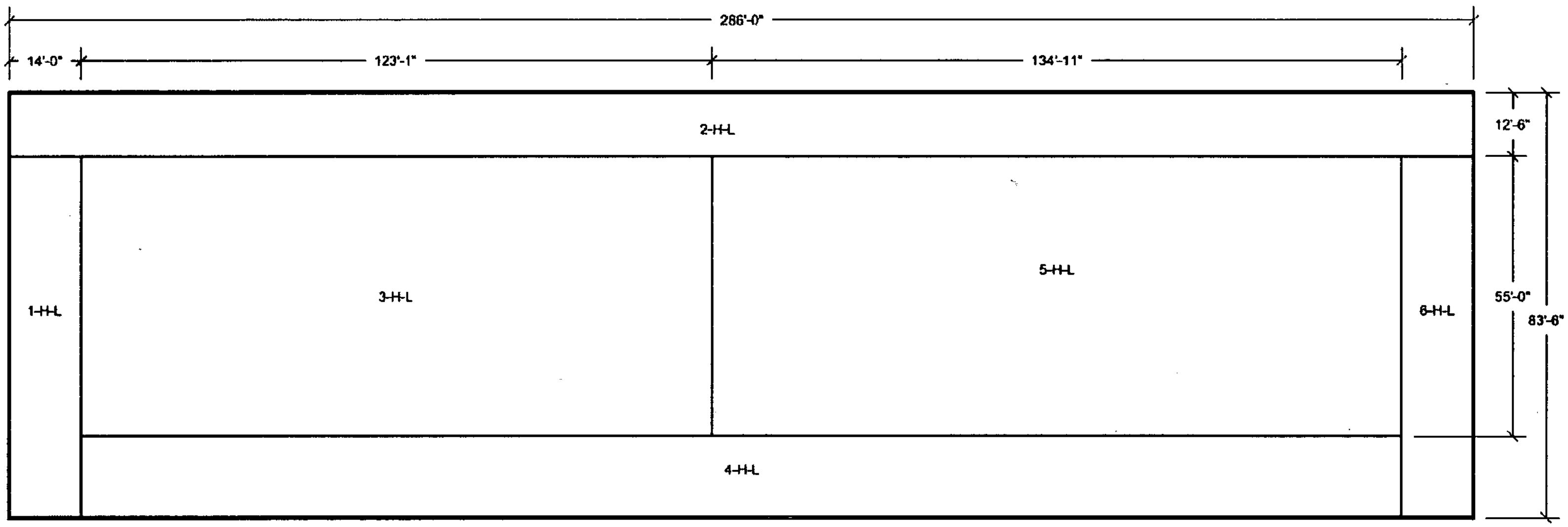
~~Note: 1-V-L unless noted otherwise.~~



3H.6-82 UHS Basin North Wall Looking South
Horizontal Reinforcement Zones Near Side Face

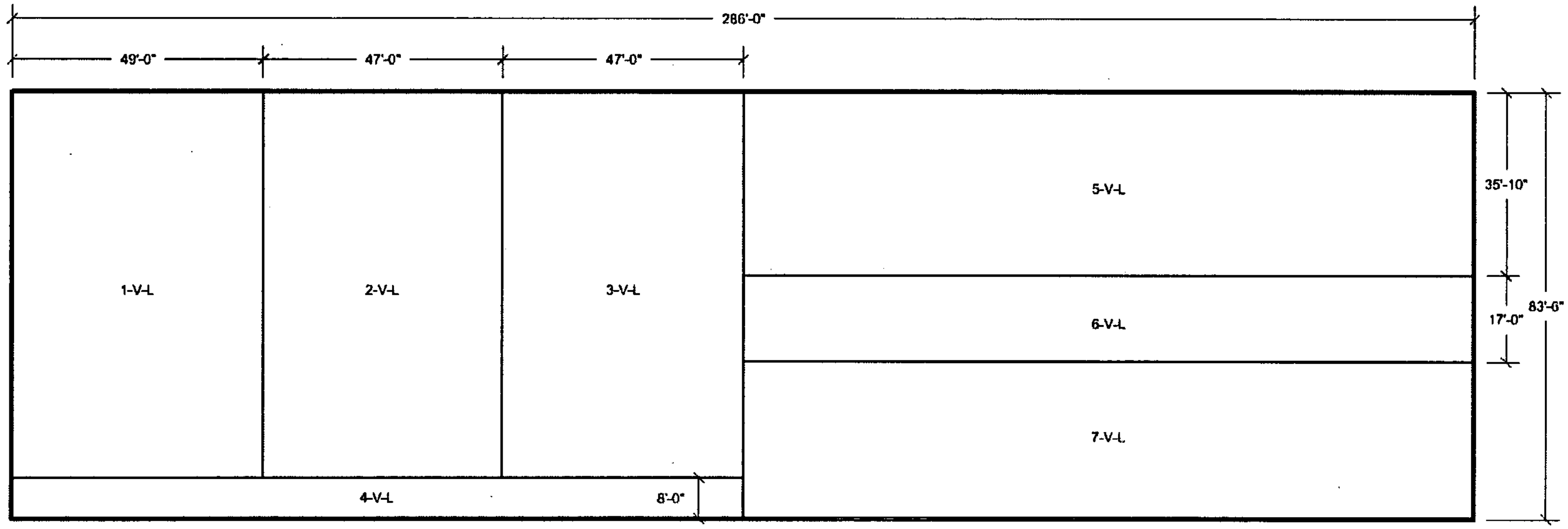


3H.6-83 UHS Basin North Wall Looking South
Vertical Reinforcement Zones Near Side Face

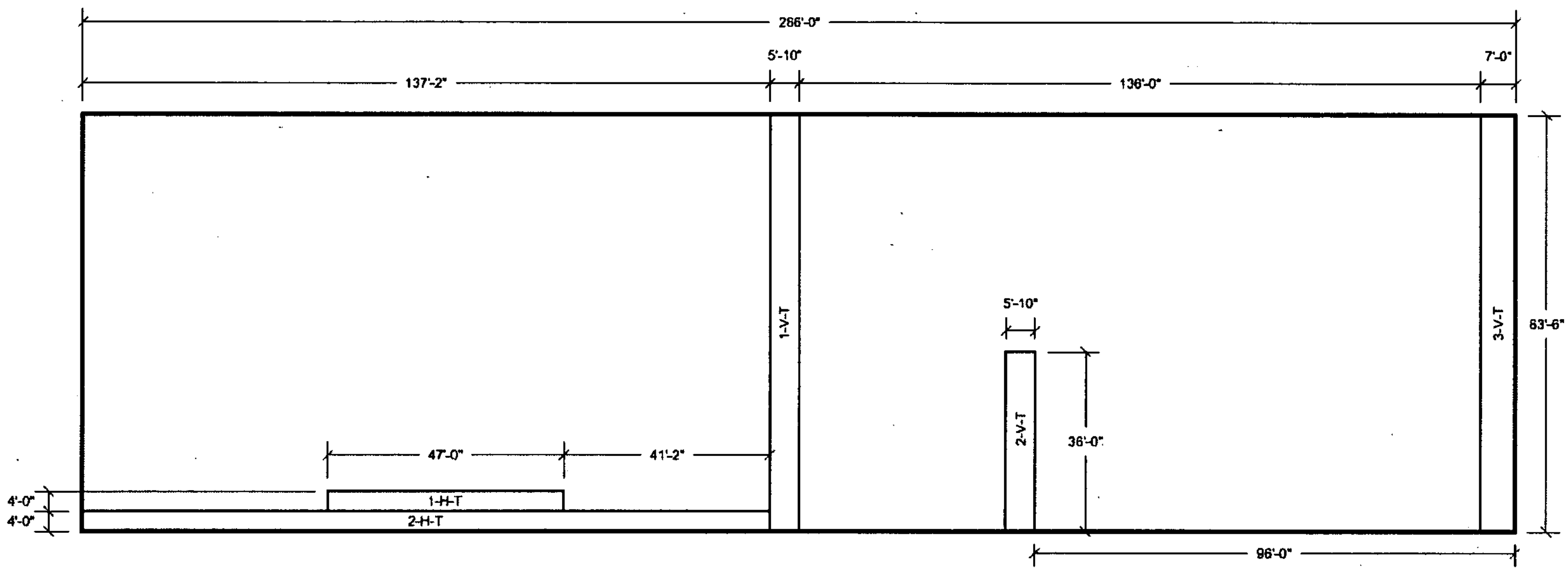


3H.6-84 UHS Basin North Wall Looking South
Horizontal Reinforcement Zones Far Side Face

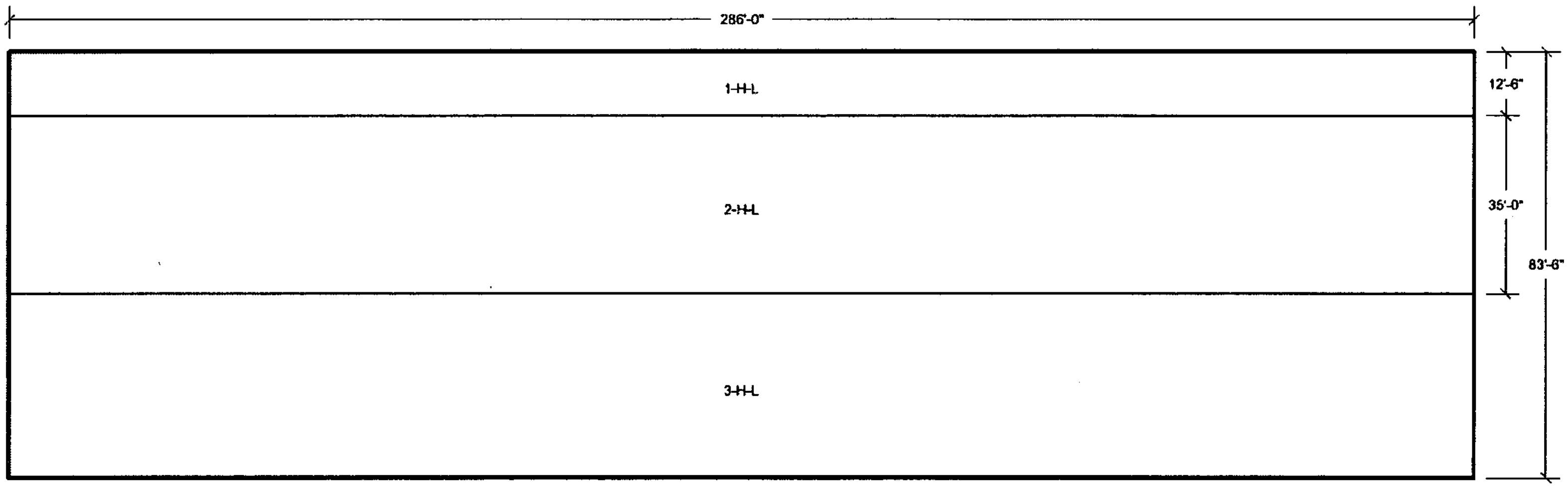
~~Note: 1-H-L, unless noted otherwise.~~



3H.6-85 UHS Basin North Wall Looking South
Vertical Reinforcement Zones Far Side Face

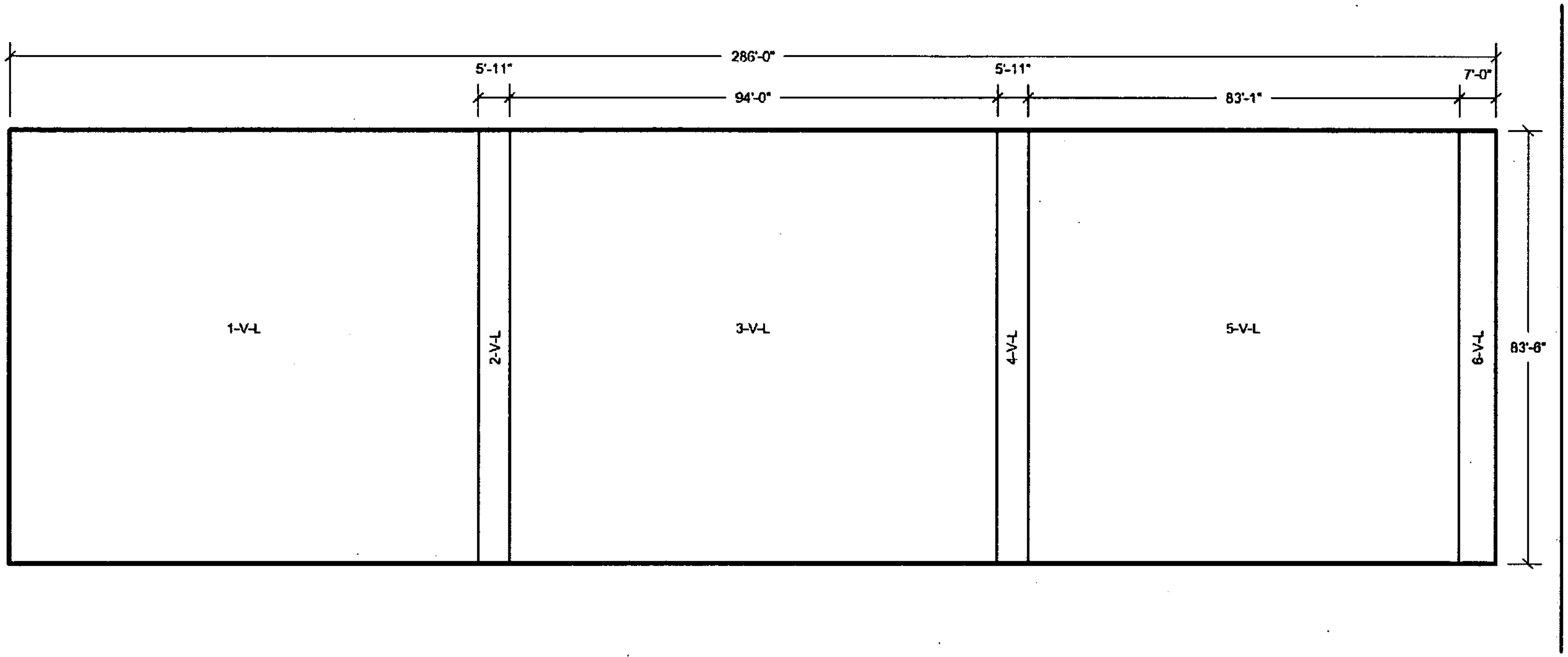


3H.6-86 UHS Basin North Wall Looking South
Transverse Horizontal and Vertical Reinforcement Zones

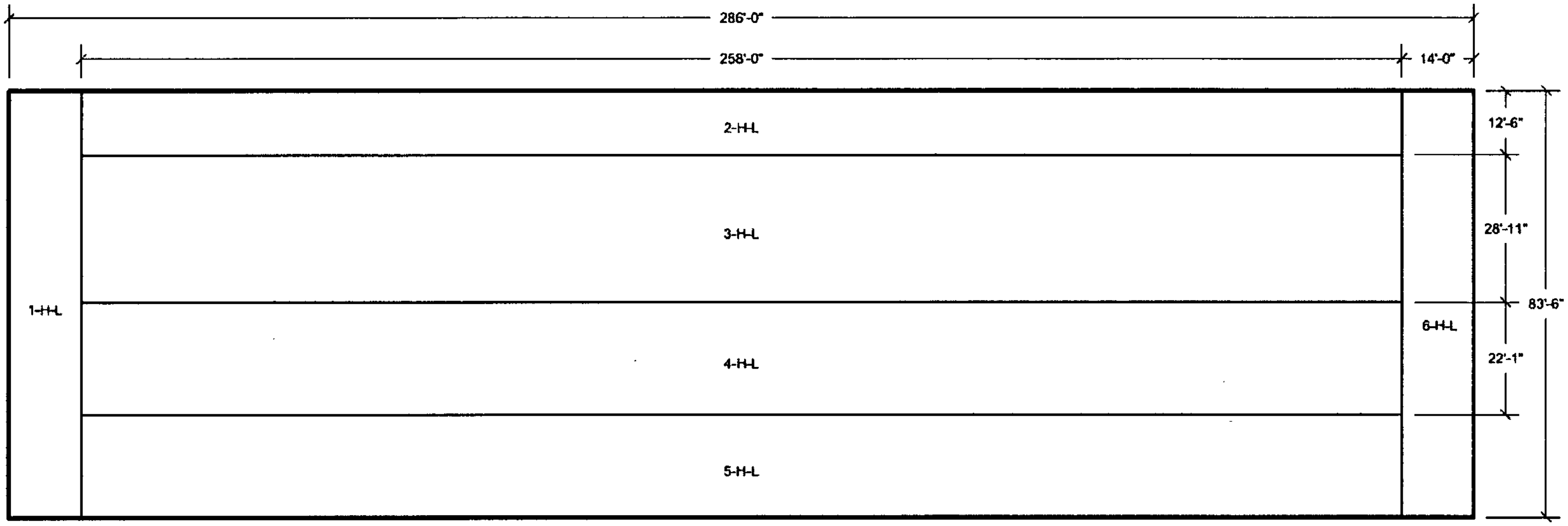


3H.6-87 UHS Basin South Wall Looking North
Horizontal Reinforcement Zones Near Side Face

Note: 1-H-L, unless noted otherwise.

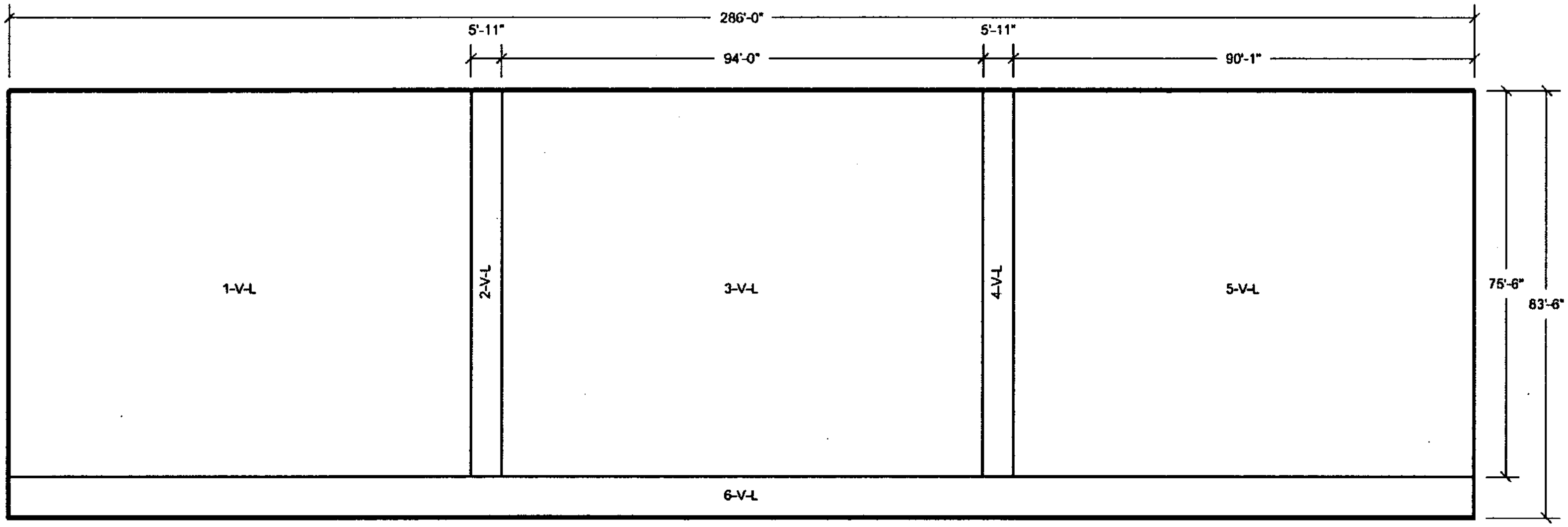


3H.6-88 UHS Basin South Wall Looking North
Vertical Reinforcement Zones Near Side Face



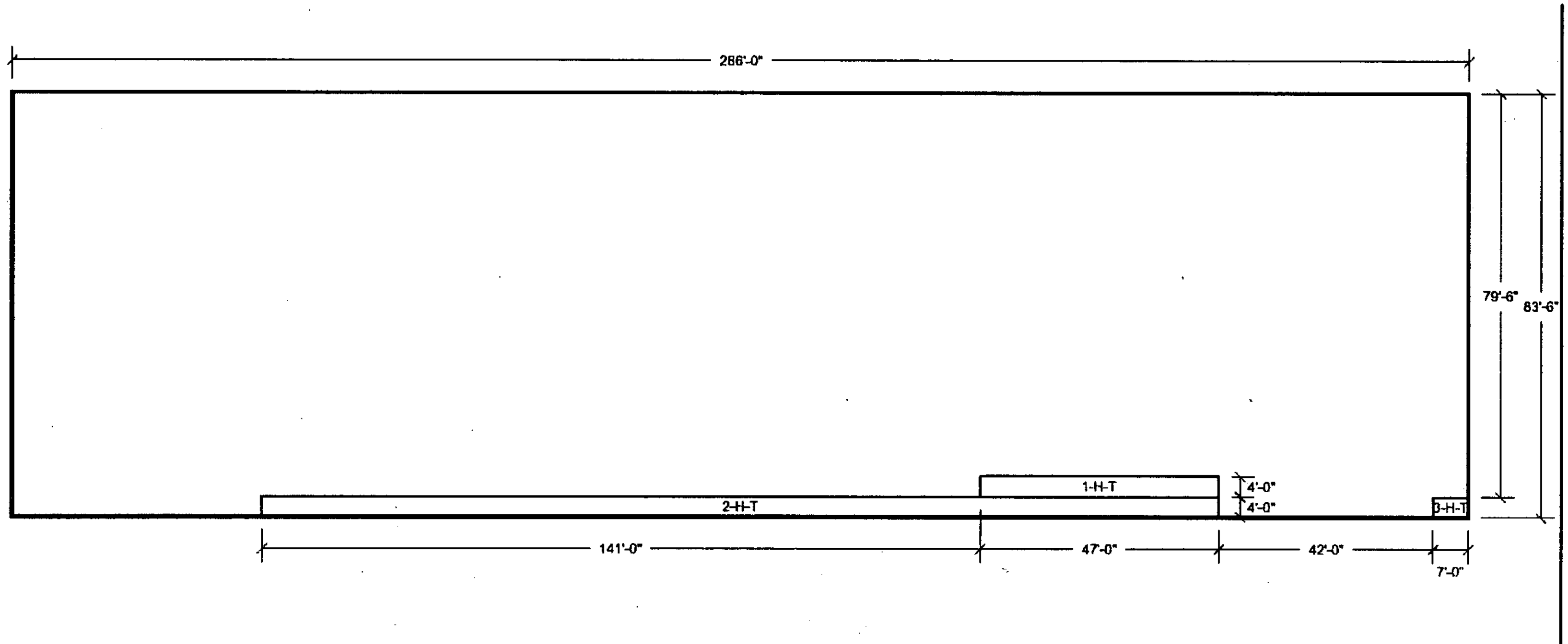
3H.6-89 UHS Basin South Wall Looking North
Horizontal Reinforcement Zones Far Side Face

Note: 1-H-L, unless noted otherwise.

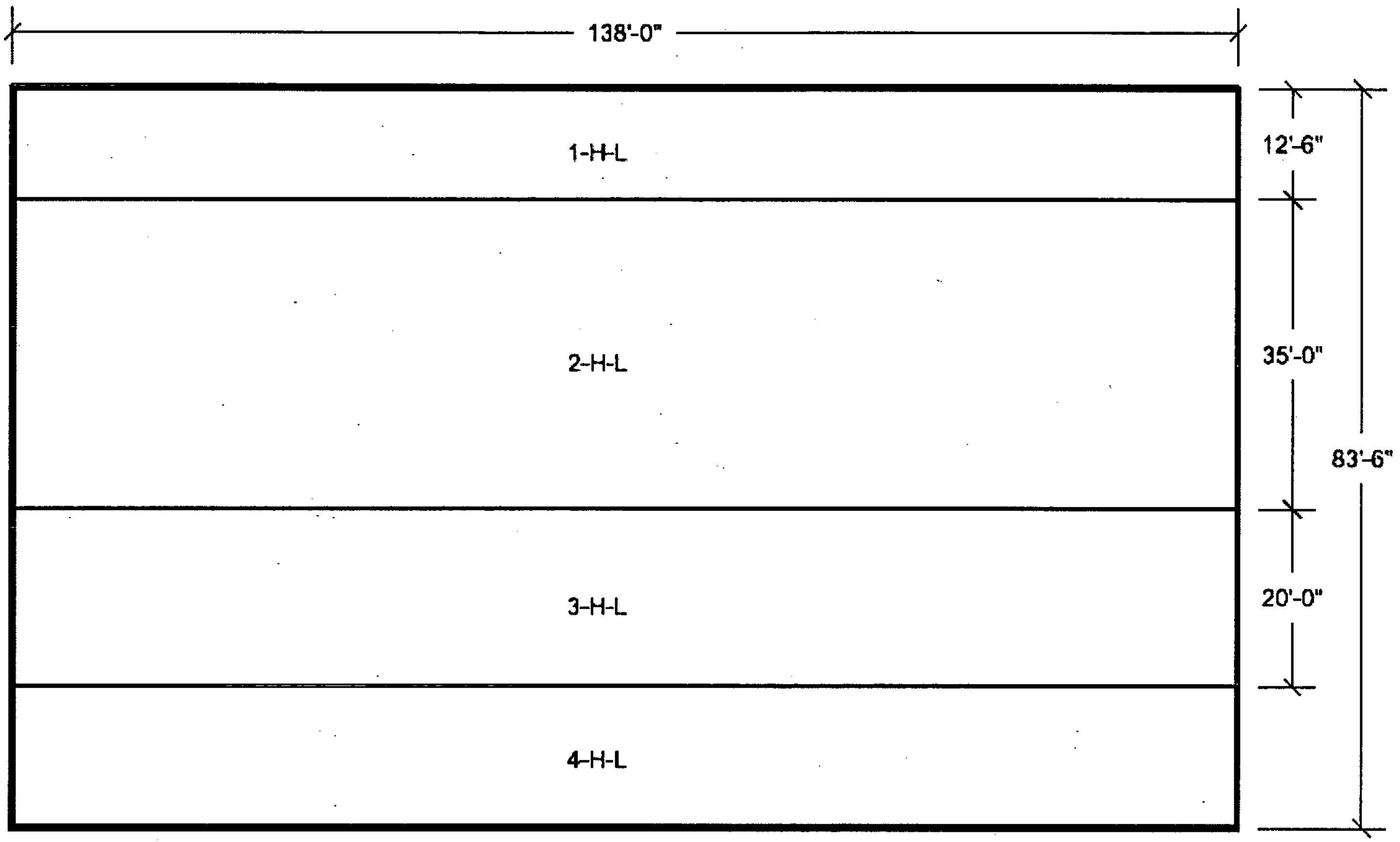


3H.6-90 UHS Basin South Wall Looking North
Vertical Reinforcement Zones Far Side Face

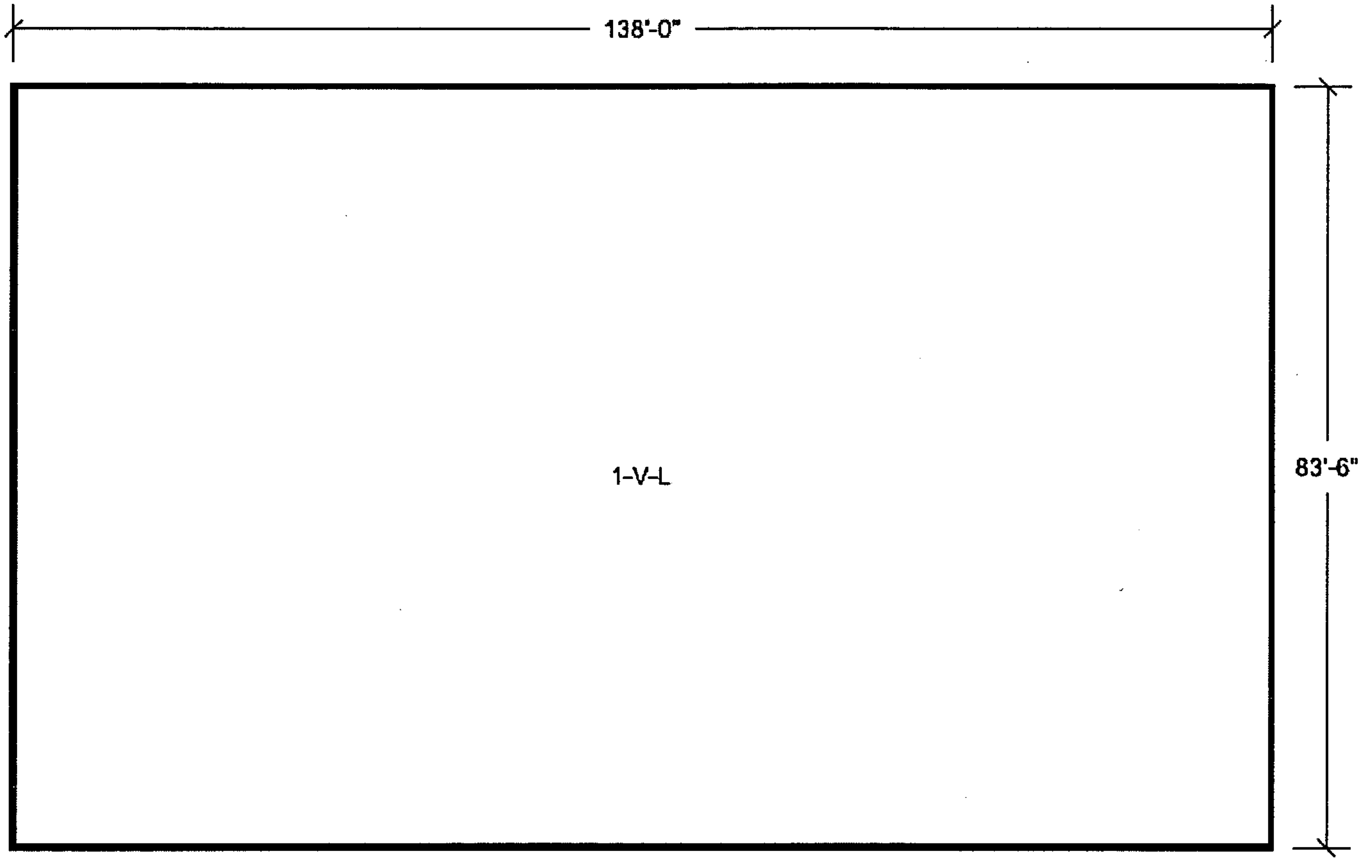
Note: 1 V L, unless noted otherwise.



3H.6-91 UHS Basin South Wall Looking North
Transverse Horizontal Reinforcement Zones

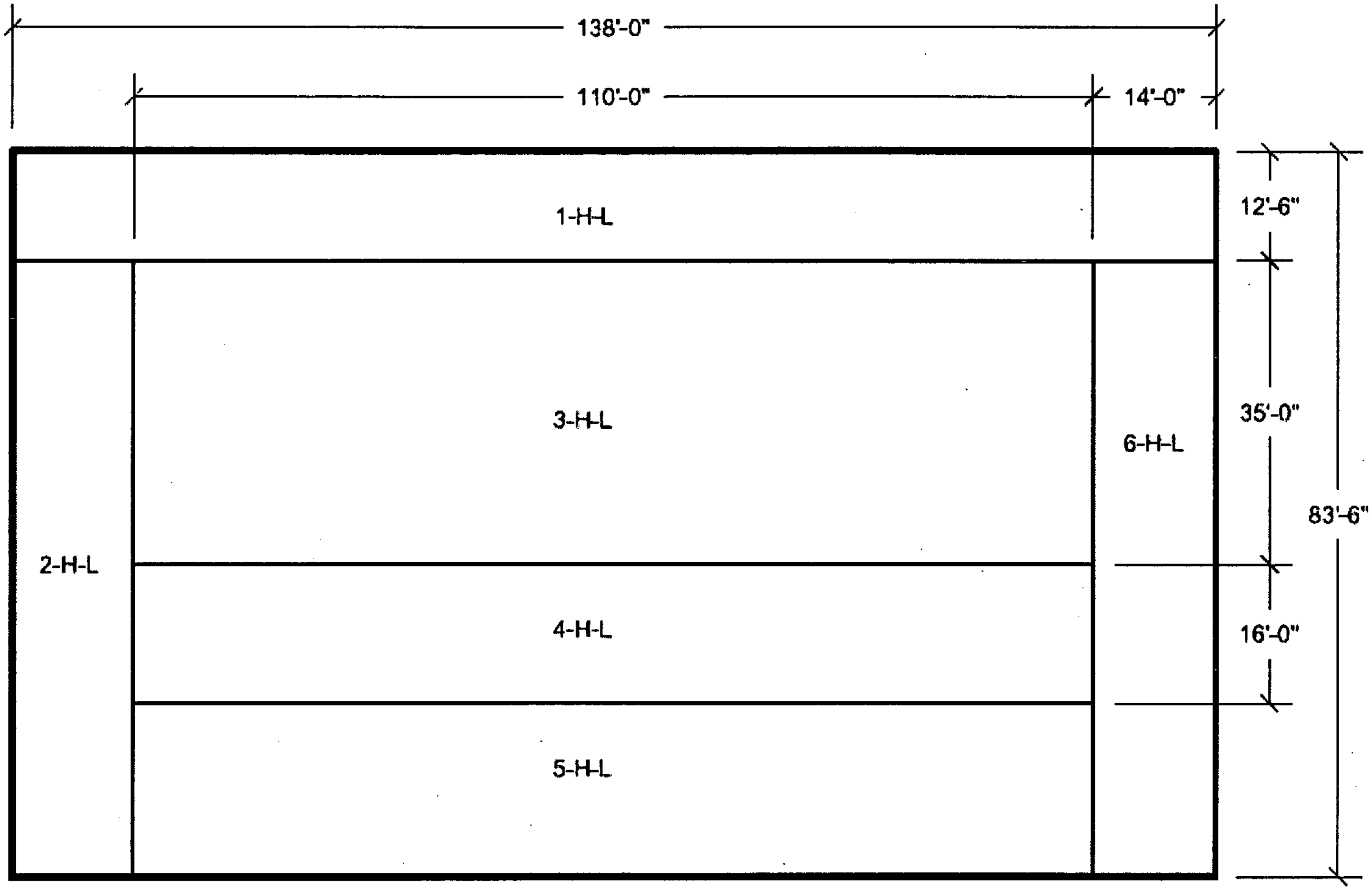


3H.6-92 UHS Basin East Wall Looking West
Horizontal Reinforcement Zones Near Side Face

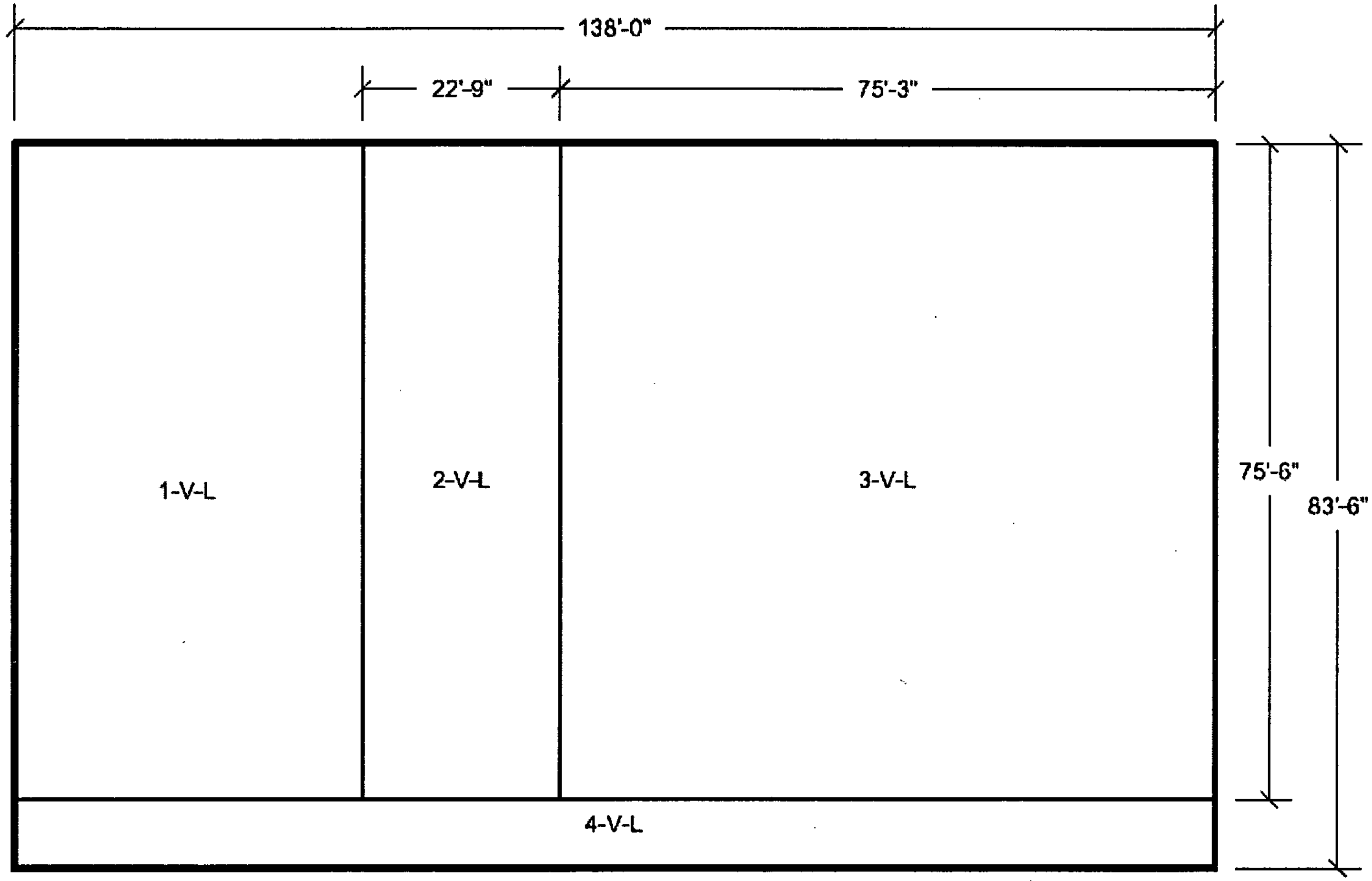


3H.6-93 UHS Basin East Wall Looking West
Vertical Reinforcement Zones Near Side Face

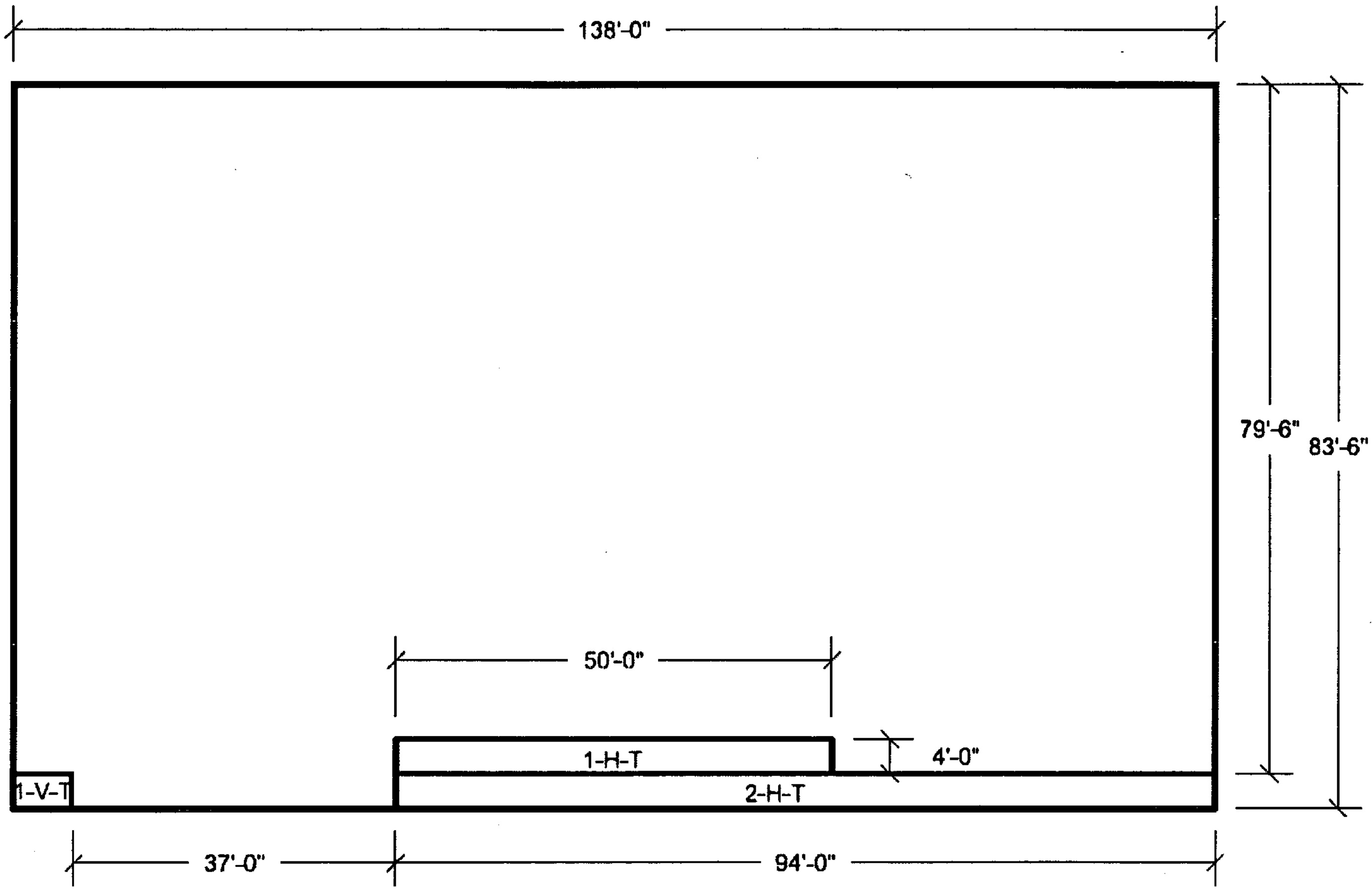
Note: 1-V-L, unless noted otherwise.



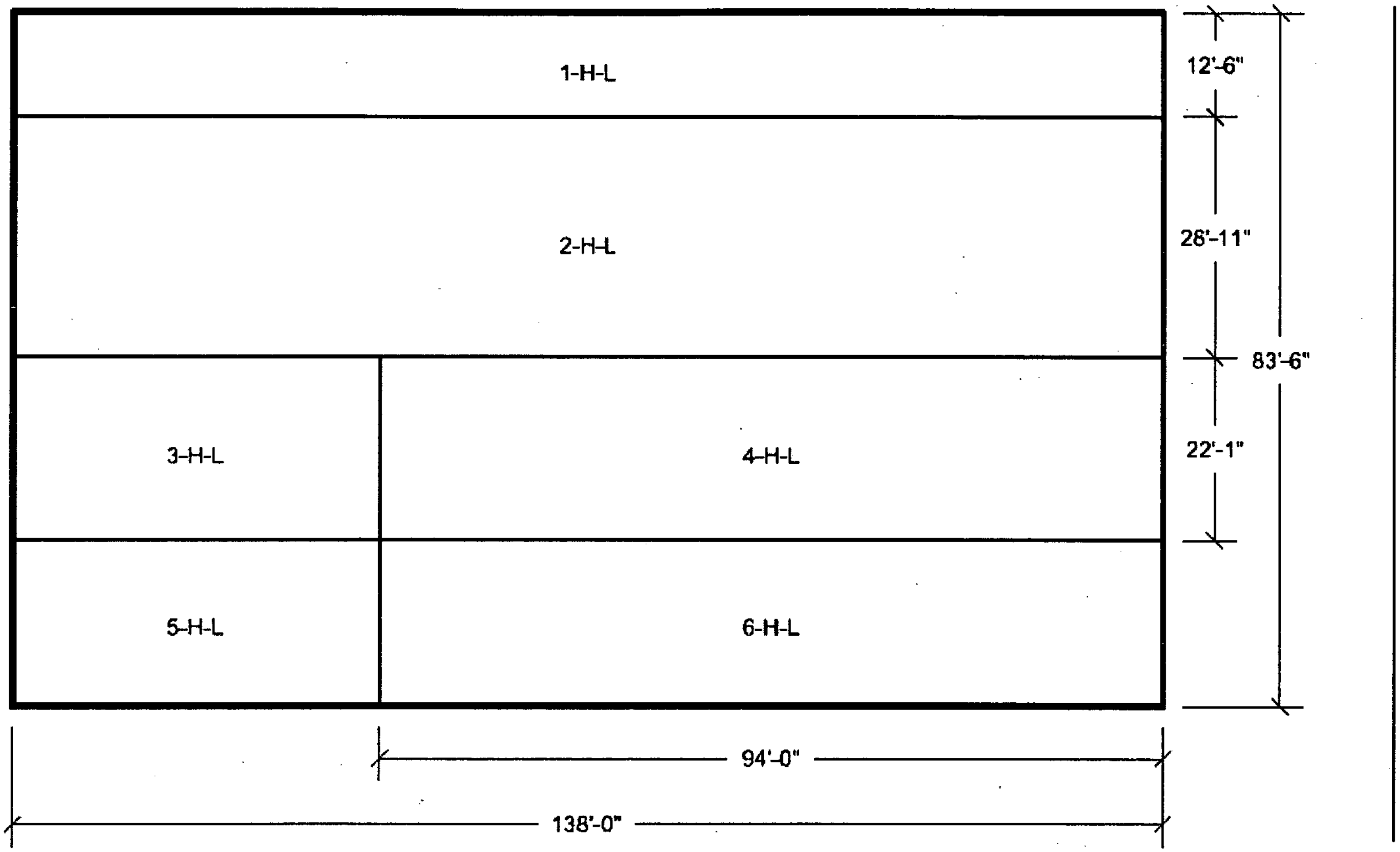
3H.6-94 UHS Basin East Wall Looking West
Horizontal Reinforcement Zones Far Side Face



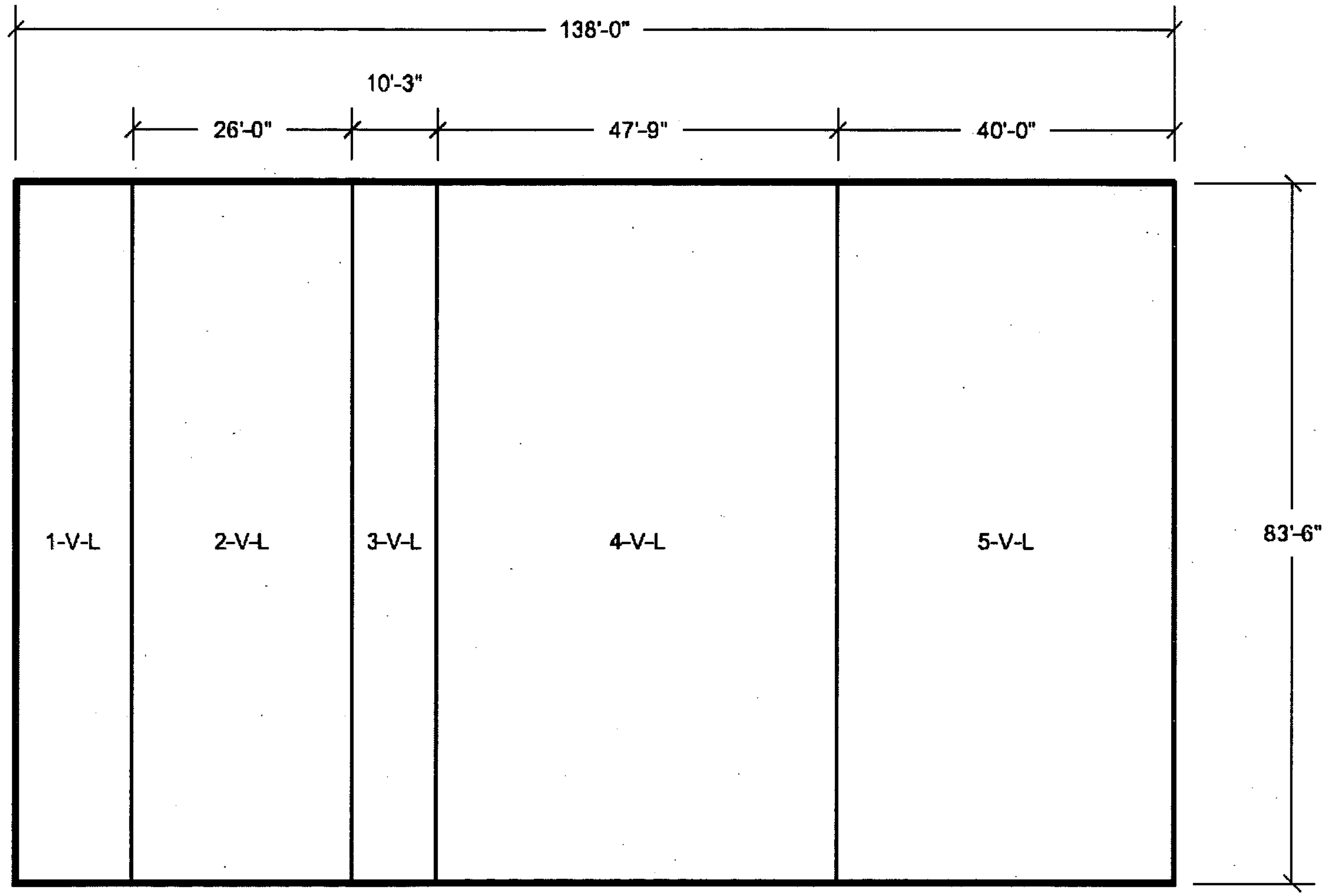
3H.6-95 UHS Basin East Wall Looking West
Vertical Reinforcement Zones Far Side Face



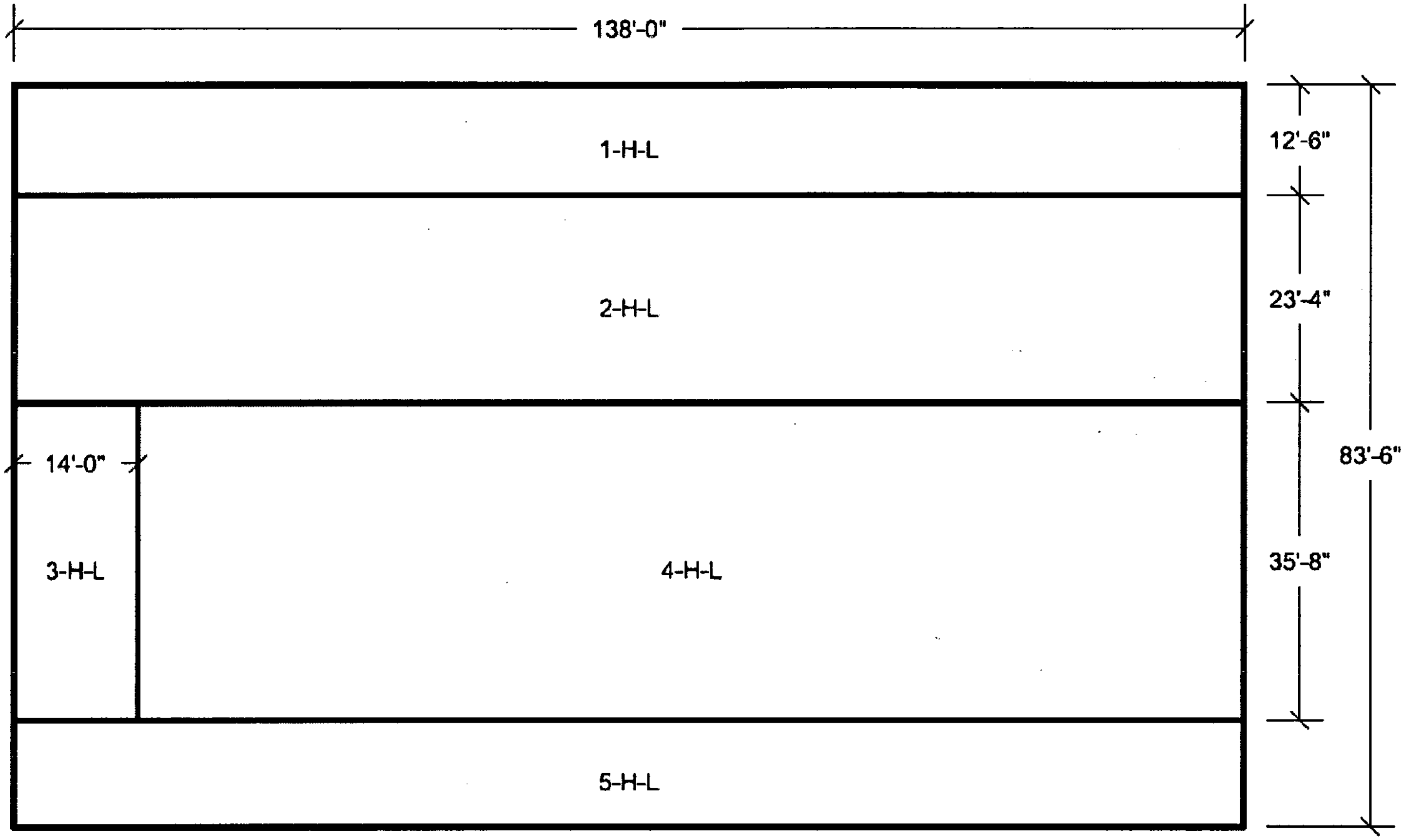
3H.6-96 UHS Basin/Fan East Wall Looking West
Transverse Horizontal and Vertical Reinforcement Zones



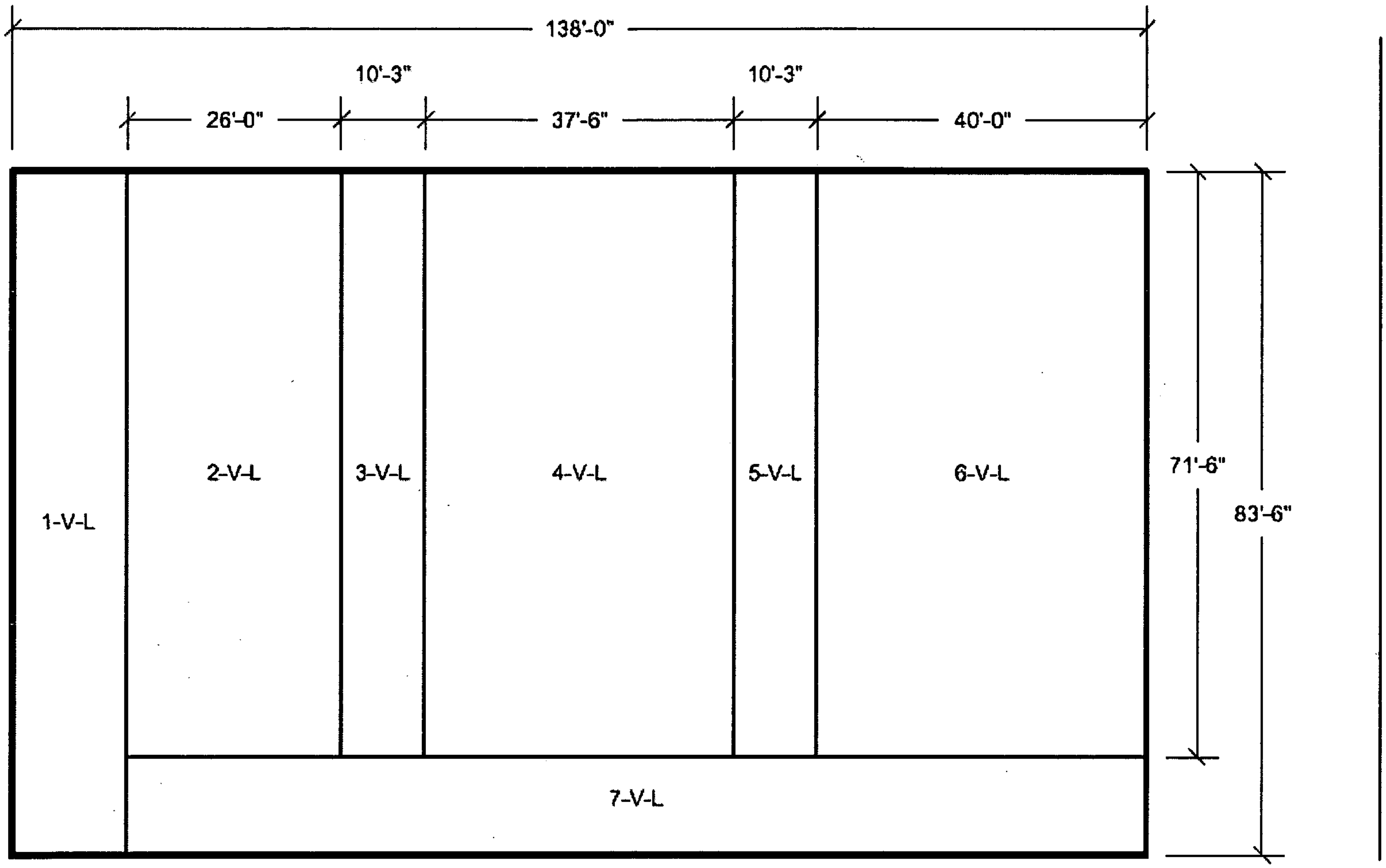
3H.6-97 UHS Basin West Wall Looking East
Horizontal Reinforcement Zones Near Side Face



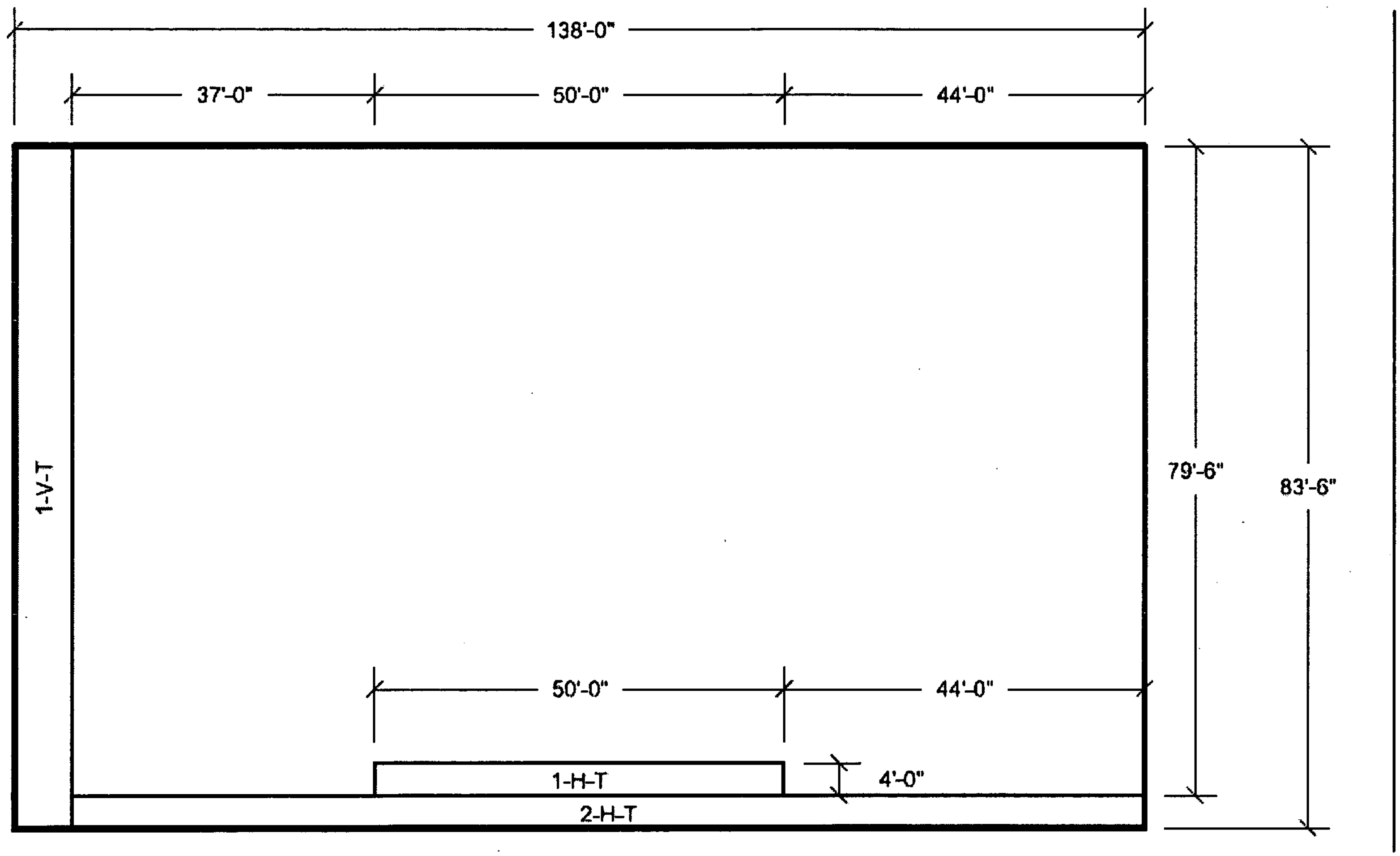
3H.6-98 UHS Basin West Wall Looking East
Vertical Reinforcement Zones Near Side Face



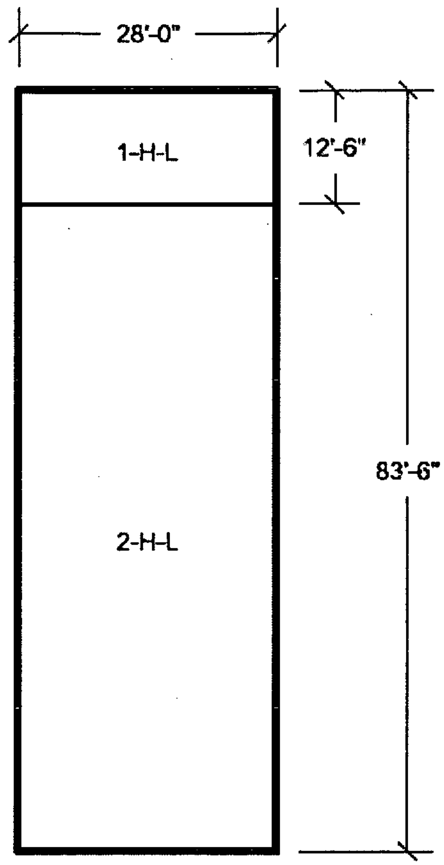
3H.6-99 UHS Basin West Wall Looking East
Horizontal Reinforcement Zones Far Side Face



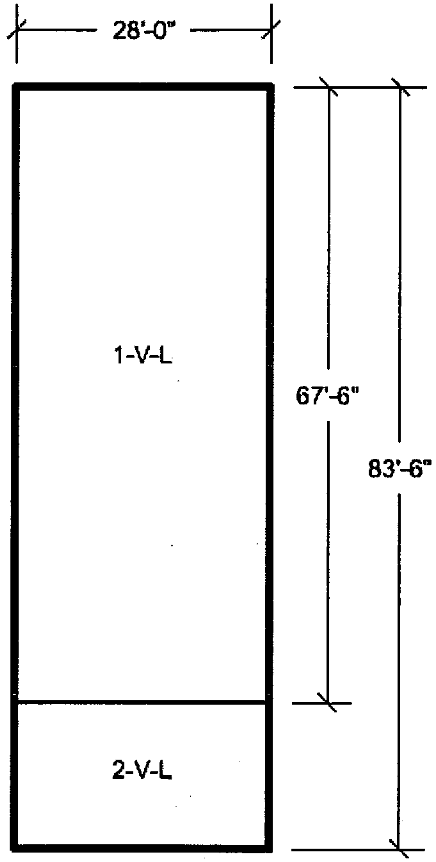
3H.6-100 UHS Basin West Wall Looking East
Vertical Reinforcement Zones Far Side Face



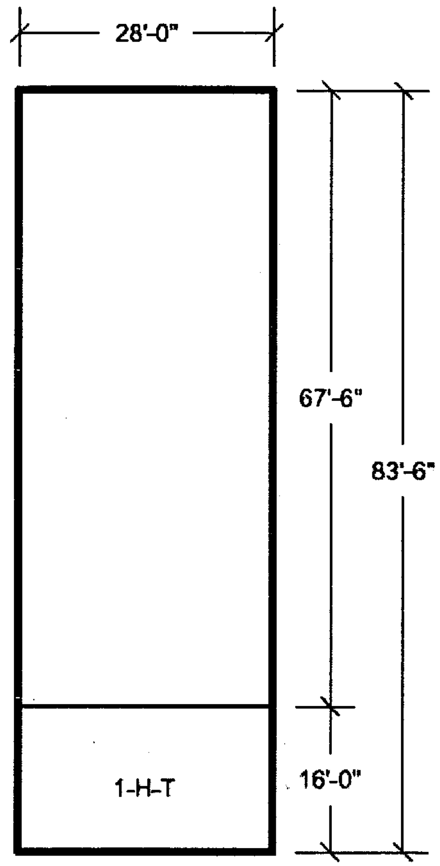
3H.6-101 UHS Basin/Fan West Wall Looking East
Transverse Horizontal and Vertical Reinforcement Zones



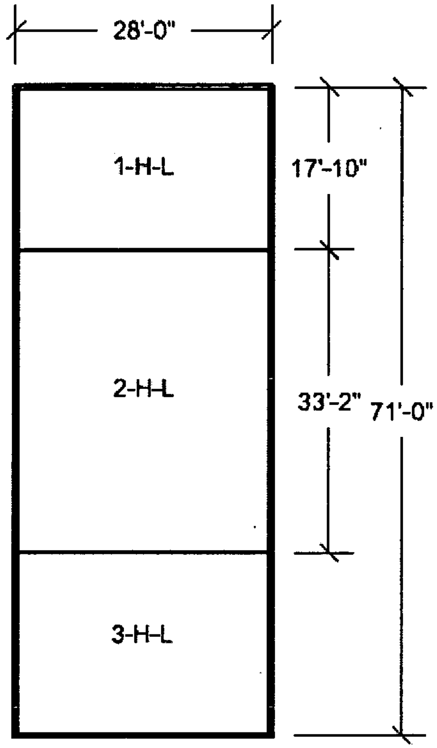
3H.6-102 UHS Basin North Buttress Looking West & UHS Basin South Buttress Looking East Horizontal Reinforcement Zones Near & Far Side Faces



3H.6-103 UHS Basin North Buttress Looking West & UHS Basin South Buttress Looking East Vertical Reinforcement Zones Near & Far Side Faces

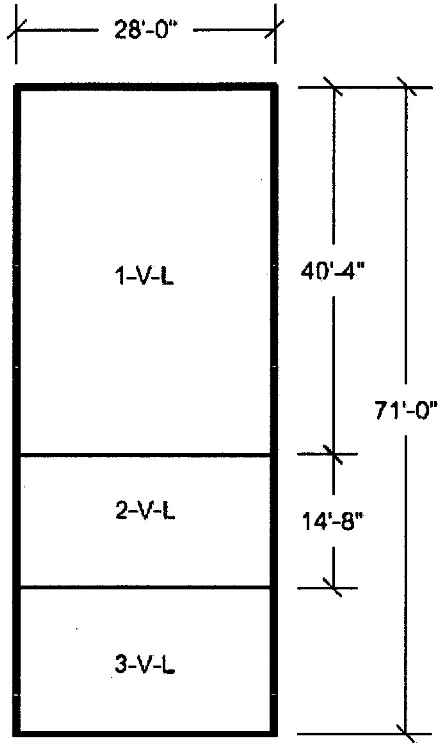


3H.6-104 UHS Basin North Buttress Looking West & UHS Basin South Buttress Looking East Transverse Horizontal Reinforcement Zones



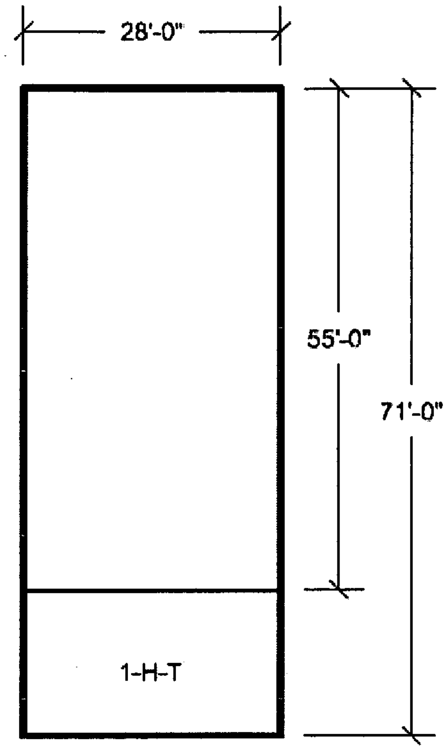
3H.6-105 UHS Basin East Buttress Looking North & UHS Basin West Buttress Looking South Horizontal Reinforcement Zones Near and Far Side Faces

Note: 1-H-L, unless noted otherwise.

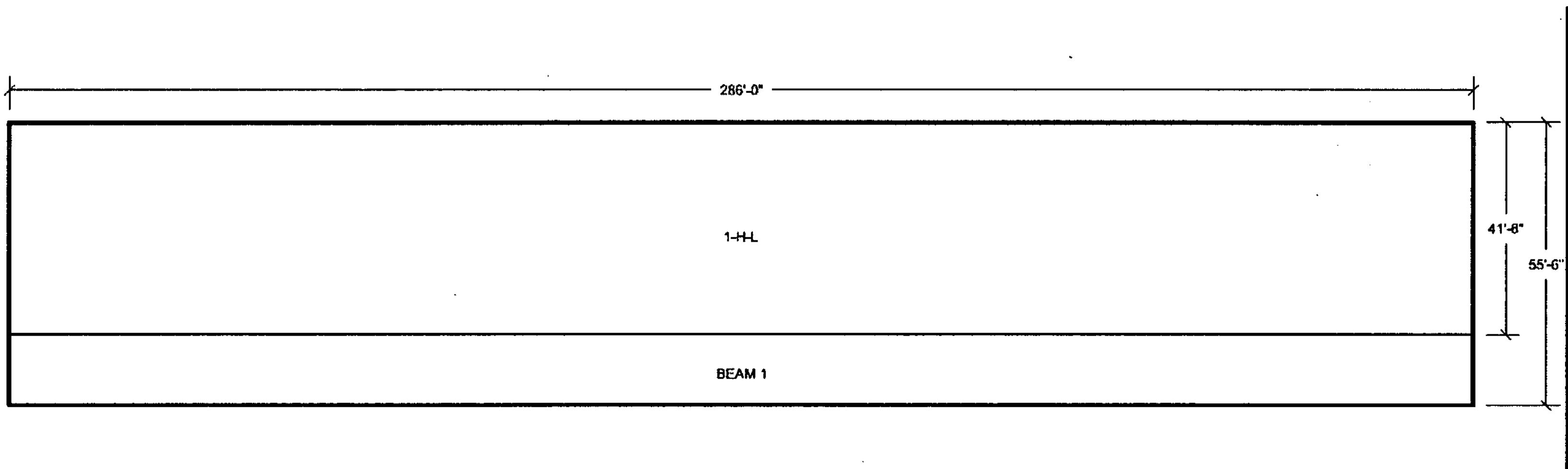


3H.6-106 UHS Basin East Buttress Looking North & UHS Basin West Buttress Looking South Vertical Reinforcement Zones Near & and Far Side Faces

Note: 1-V-L unless noted otherwise

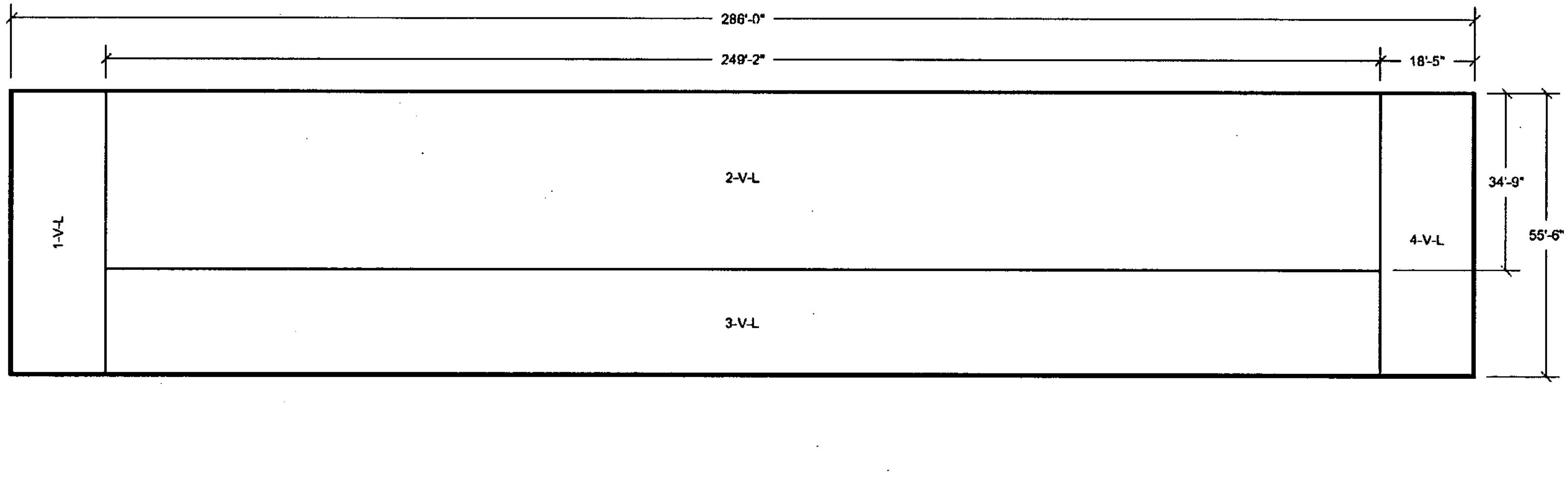


3H.6-107 UHS Basin East Buttress Looking North & UHS Basin West Buttress Looking South Transverse Horizontal Reinforcement Zones Near & Far Side Faces



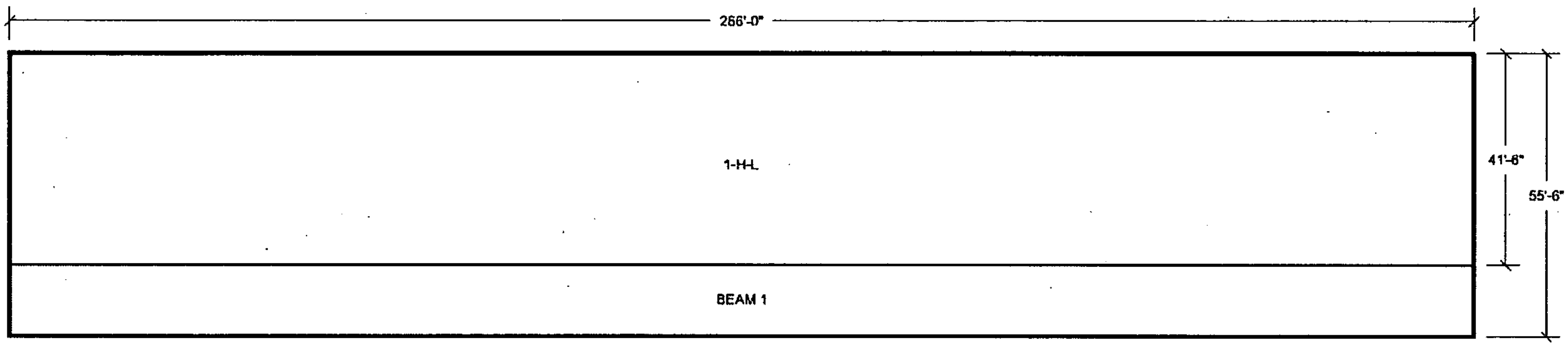
3H.6-108 Fan Cooling Tower North (and South) Wall Looking South (North)
Horizontal Reinforcement Zones Near Side Face

~~Note: 1-H-L, unless noted otherwise.~~



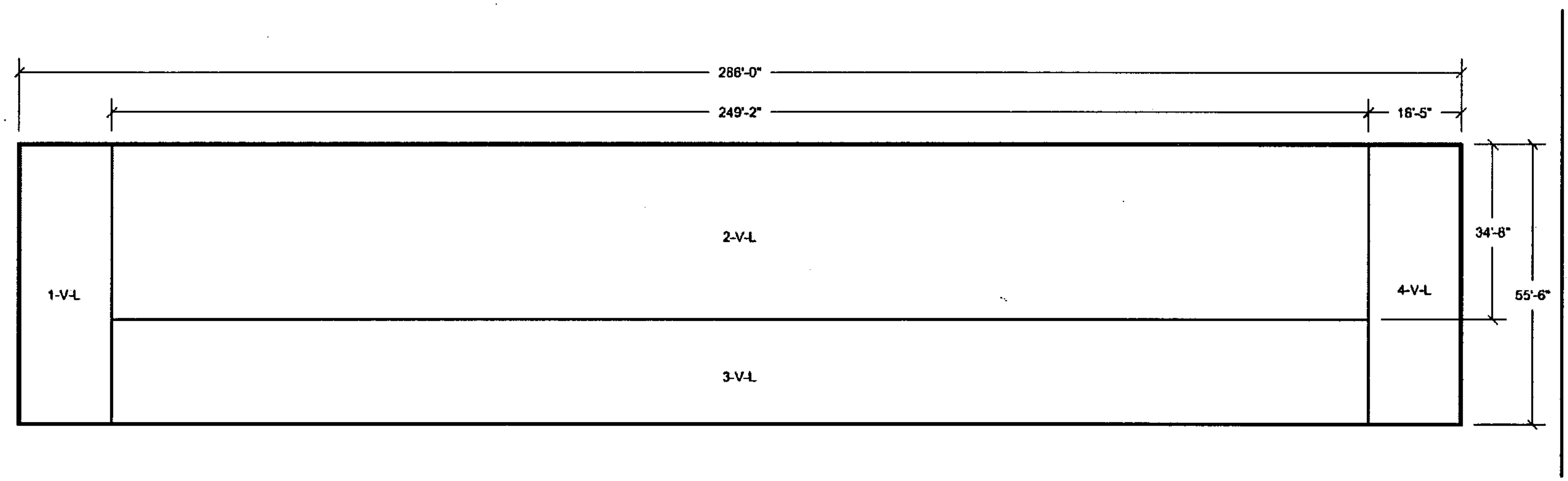
3H.6-109 Fan Cooling Tower North (and South) Wall Looking South (North) Vertical Reinforcement Zones Near Side Face

Note: 1-V-L unless noted otherwise.



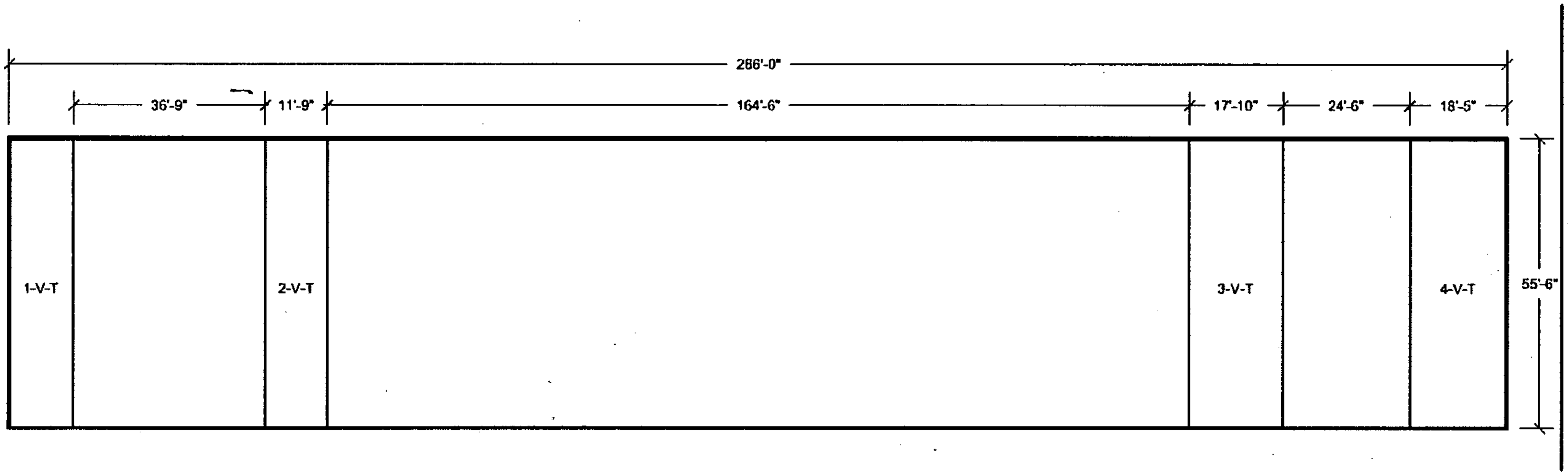
3H.6-110 Fan Cooling Tower North (and South) Wall Looking South (North) Horizontal Reinforcement Zones Far Side Face

Note: 1-H-L, unless noted otherwise.

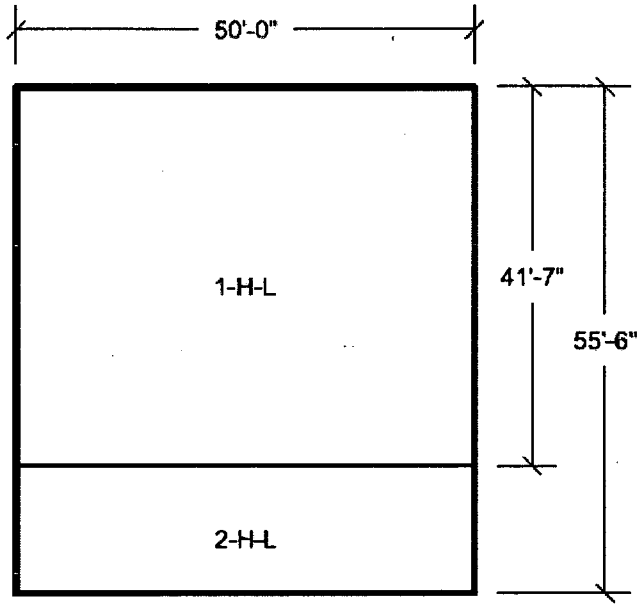


3H.6-111 Fan Cooling Tower North (and South) Wall Looking South (North) Vertical Reinforcement Zones Far Side Face

Note: 1-V-L unless noted otherwise.

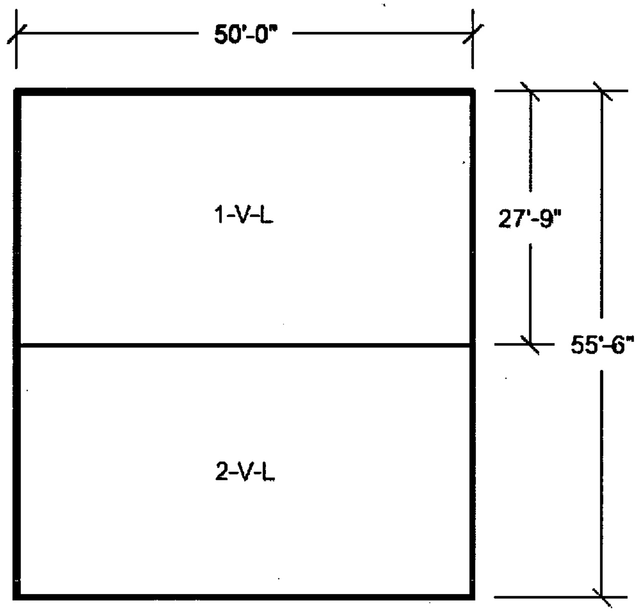


3H.6-112 ~~Fan~~ Cooling Tower North (and South) Wall Looking ~~South &~~ South ~~Wall Looking~~ (North)
Transverse Vertical Reinforcement Zones



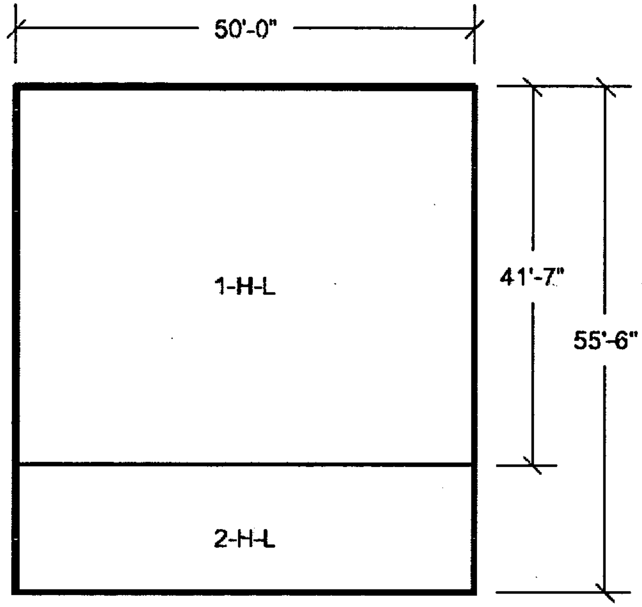
3H.6-113 Fan Cooling Tower Enclosure East Wall Looking West
Horizontal Reinforcement Zones Near Side Face

Note: 1-H-L, unless noted otherwise.



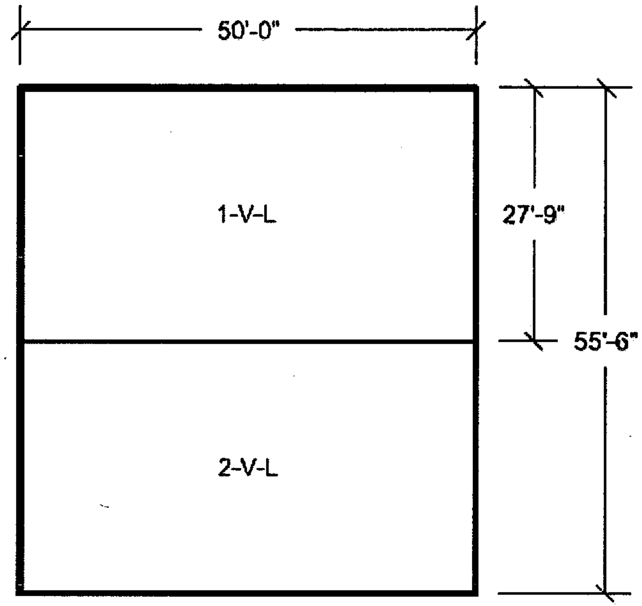
**3H.6-114 ~~Fan~~ Cooling Tower Enclosure East Wall Looking West
Vertical Reinforcement Zones Near Side Face**

~~Note: 1-V-L unless noted otherwise.~~



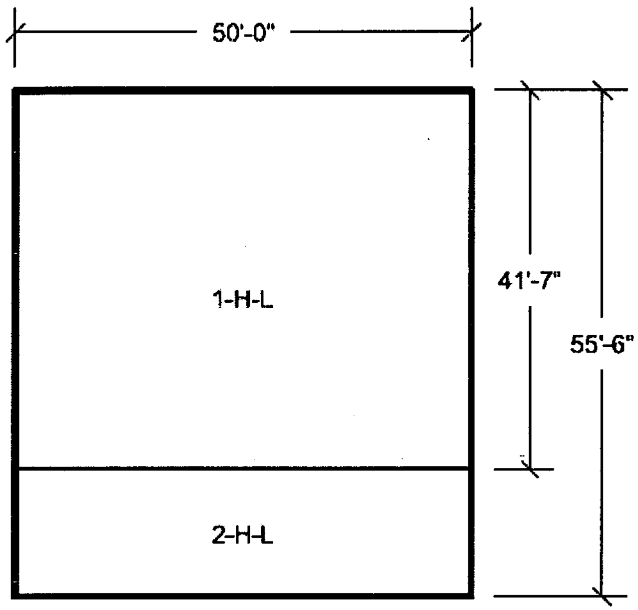
3H.6-115 Fan Cooling Tower Enclosure East Wall Looking West
Horizontal Reinforcement Zones Far Side Face

Note: 1-H-L unless noted otherwise.



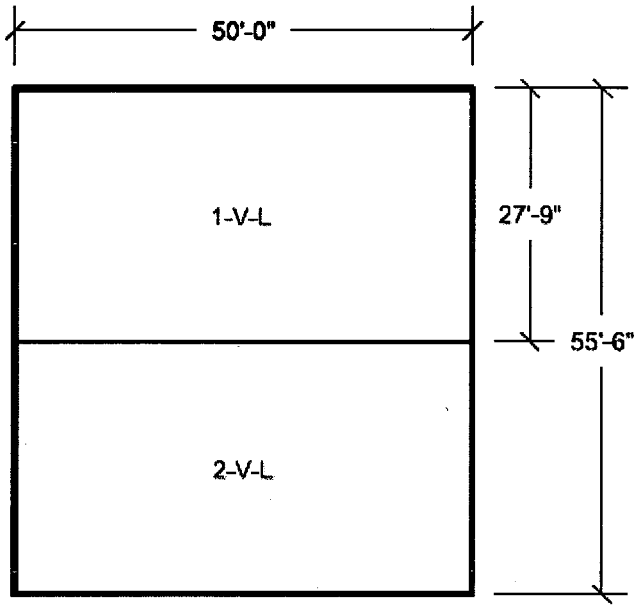
3H.6-116 Fan Cooling Tower Enclosure East Wall Looking West
Vertical Reinforcement Zones Far Side Face

Note: 1-V-L unless noted otherwise.



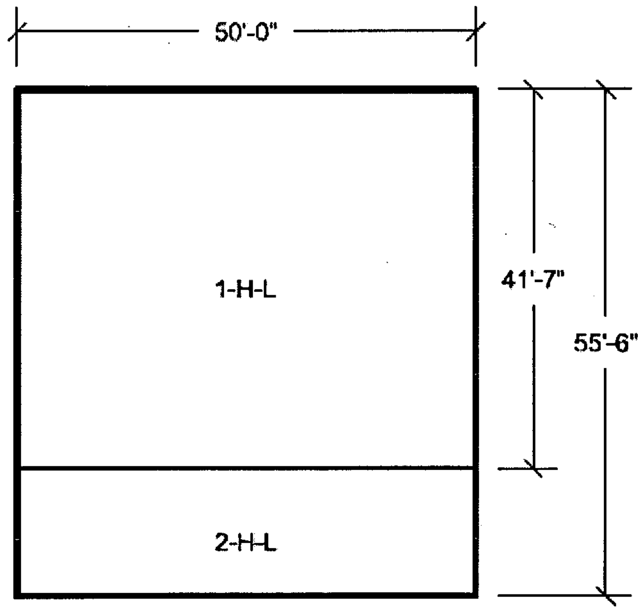
3H.6-117 Fan Cooling Tower West Wall Looking East
Horizontal Reinforcement Zones Near Side Face

~~Note: 1. H=L, unless noted otherwise.~~



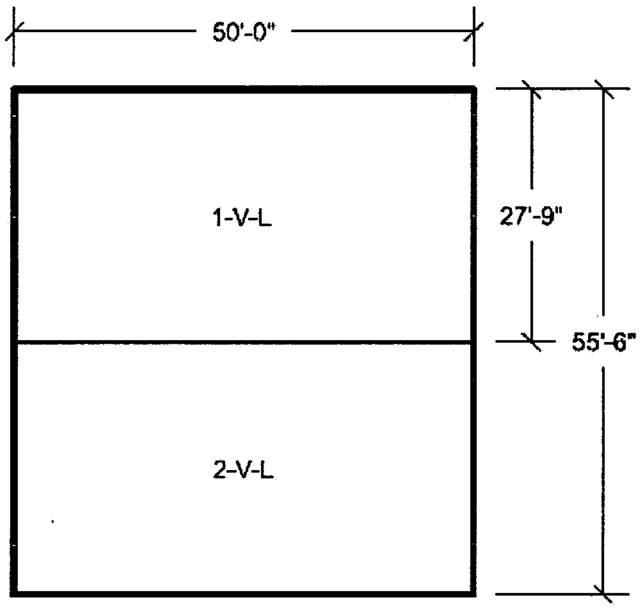
3H.6-118 Fan Cooling Tower West Wall Looking East
Vertical Reinforcement Zones Near Side Face

Note: 1-V-L unless noted otherwise.



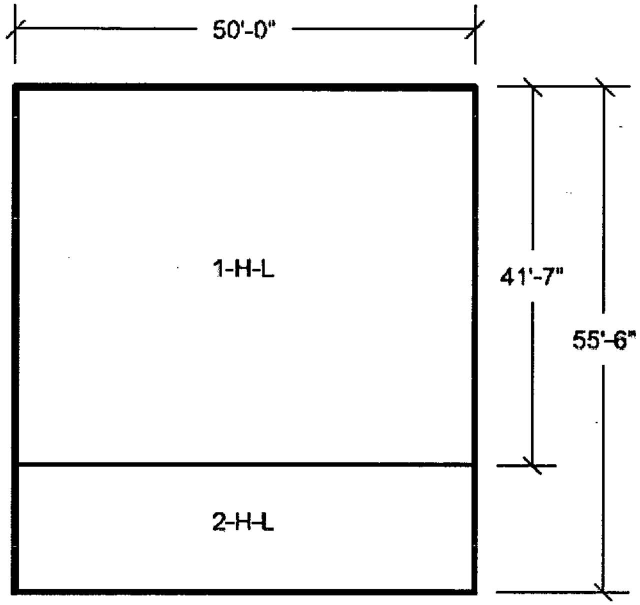
3H.6-119 ~~Fan~~ Cooling Tower West Wall Looking East
Horizontal Reinforcement Zones Far Side Face

~~Note: 1-H-L unless noted otherwise.~~



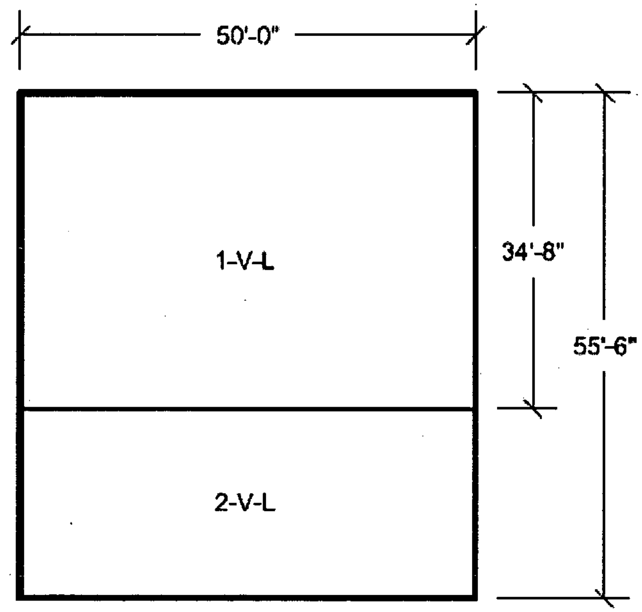
3H.6-120 ~~Fan~~ Cooling Tower West Wall Looking East
Vertical Reinforcement Zones Far Side Face

~~Note: 1-V-L, unless noted otherwise.~~

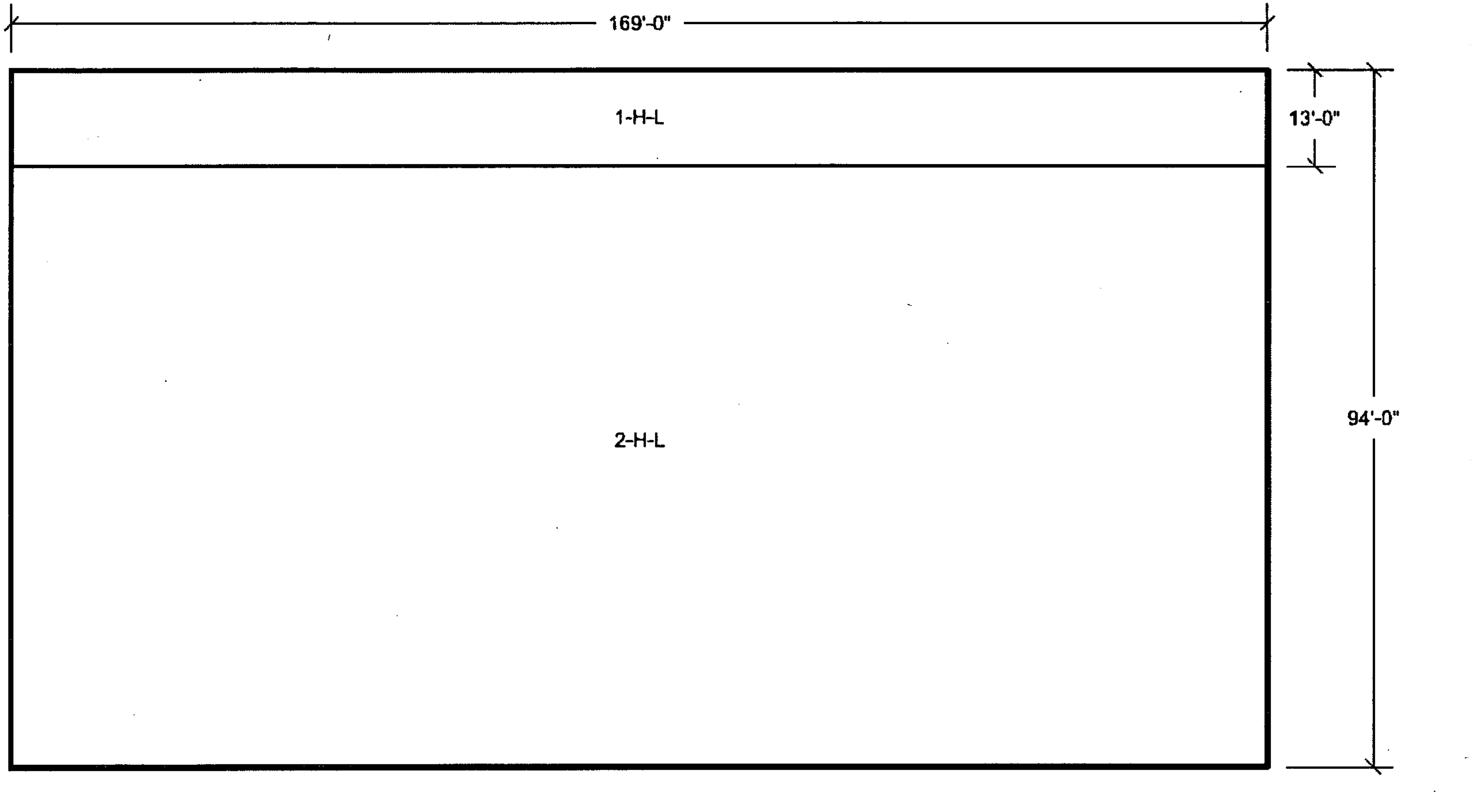


3H.6-121 ~~Fan~~ Cooling Tower Internal Wall Looking West
Horizontal Reinforcement Zones Near and Far Side Faces

~~Note: 1-H-L unless noted otherwise.~~

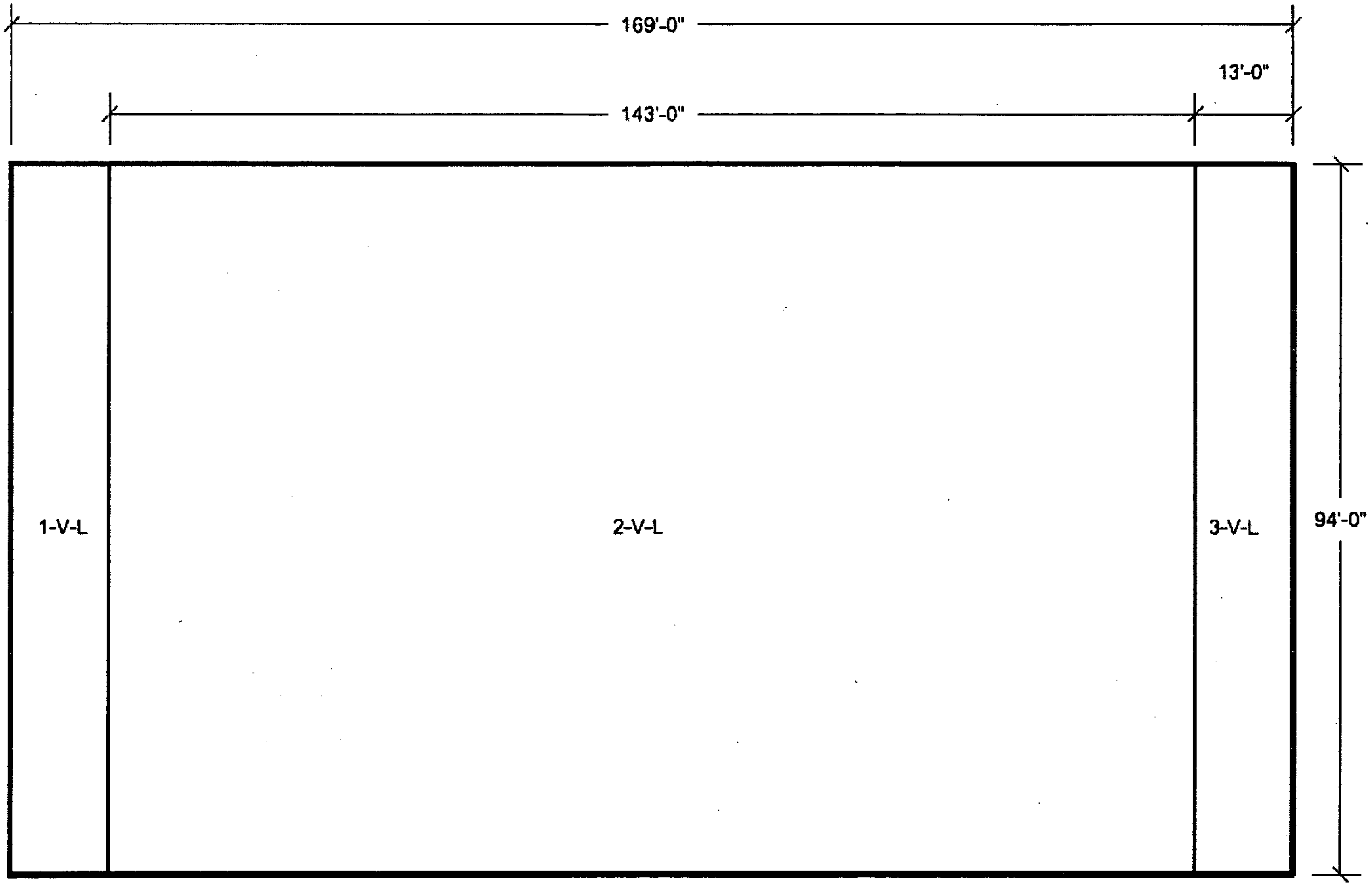


3H.6-122 Fan Cooling Tower Internal Wall Looking West
Vertical Reinforcement Zones Near and Far Side Faces



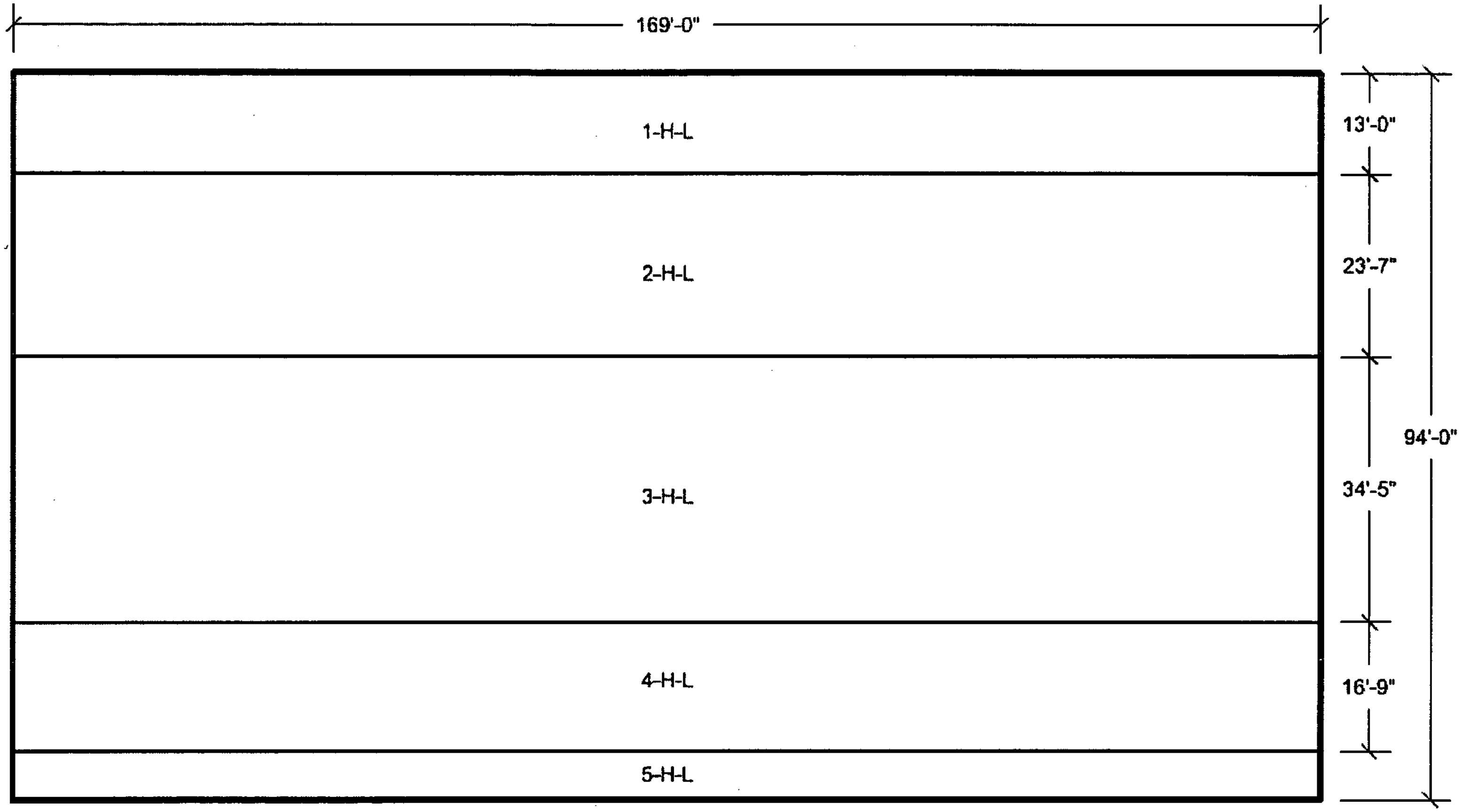
3H.6-123 ~~Pumphouse~~ Pump House Foundation Mat
East/West Reinforcement Zones Top Face

~~Note: 1-H-L, unless noted otherwise.~~



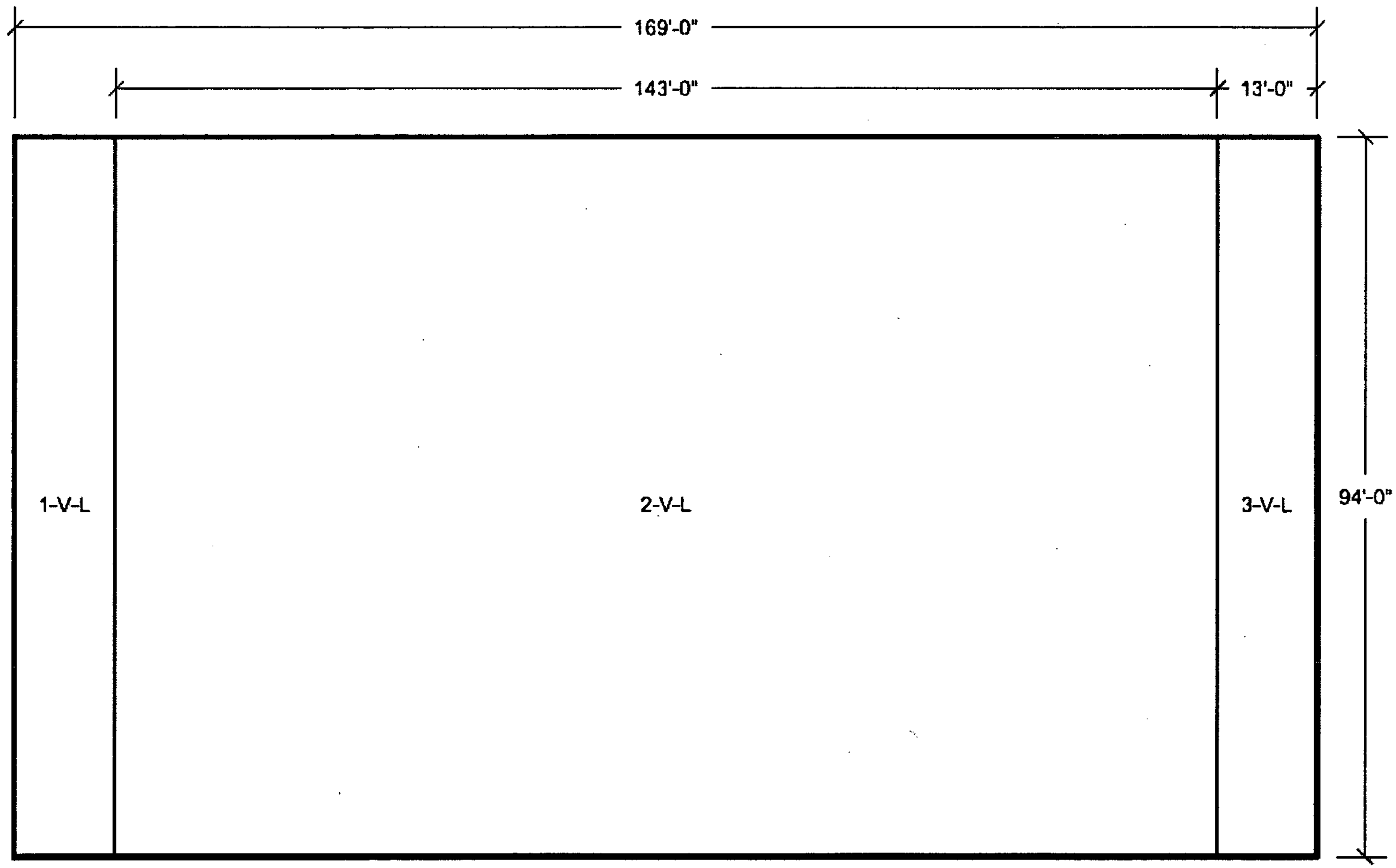
3H.6-124 Pumphouse Pump House Foundation Mat
North/South Reinforcement Zones Top Face

Note: 1-V-L unless noted otherwise.



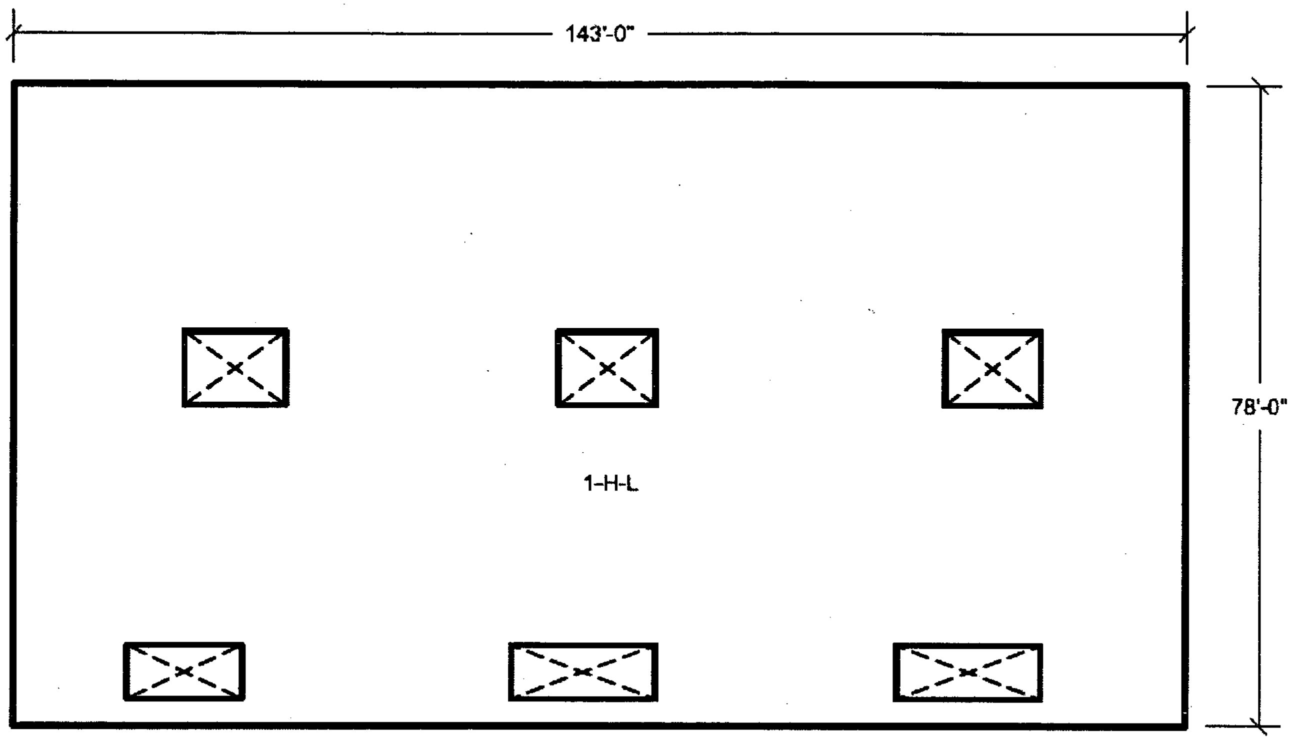
3H.6-125 Pumphouse Pump House Foundation Mat
East/West Reinforcement Zones Bottom Face

Note: 1 H L unless noted otherwise.



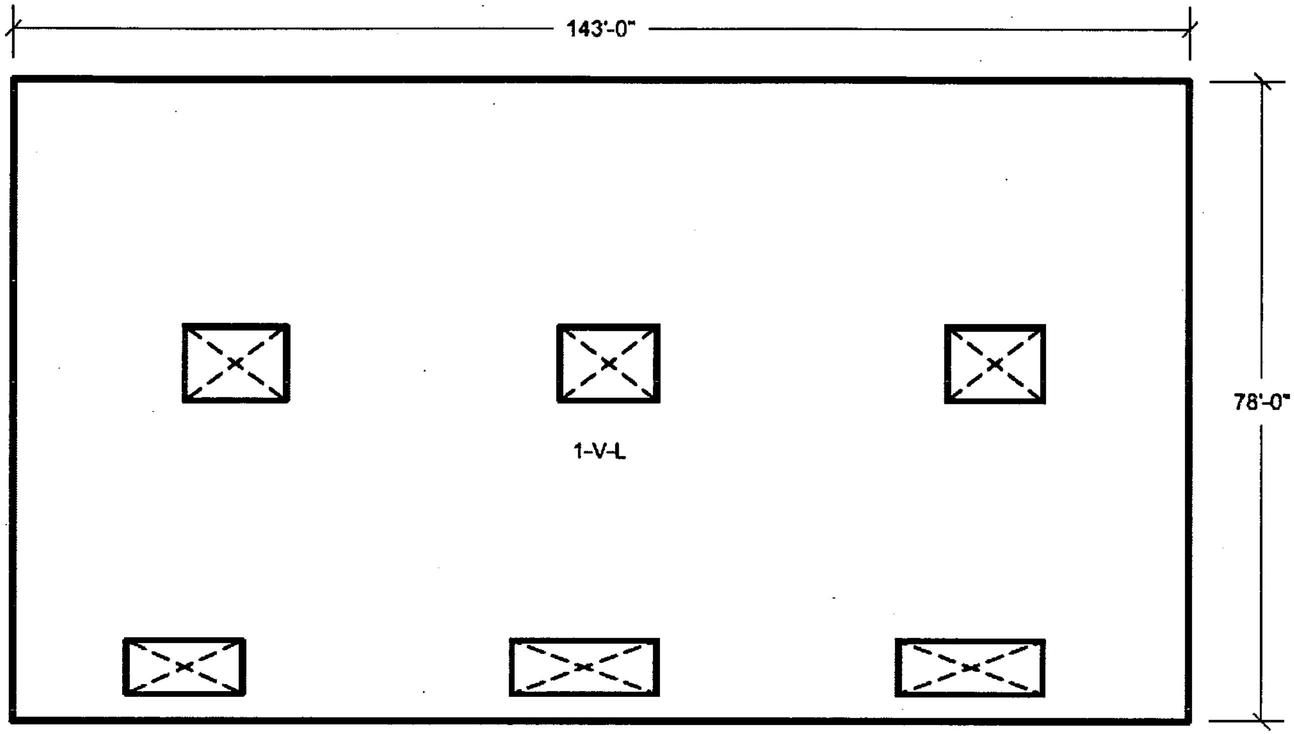
3H.6-126 Pumphouse Pump House Foundation Mat
North/South Reinforcement Zones Bottom Face

Note: 1-V-L unless noted otherwise.



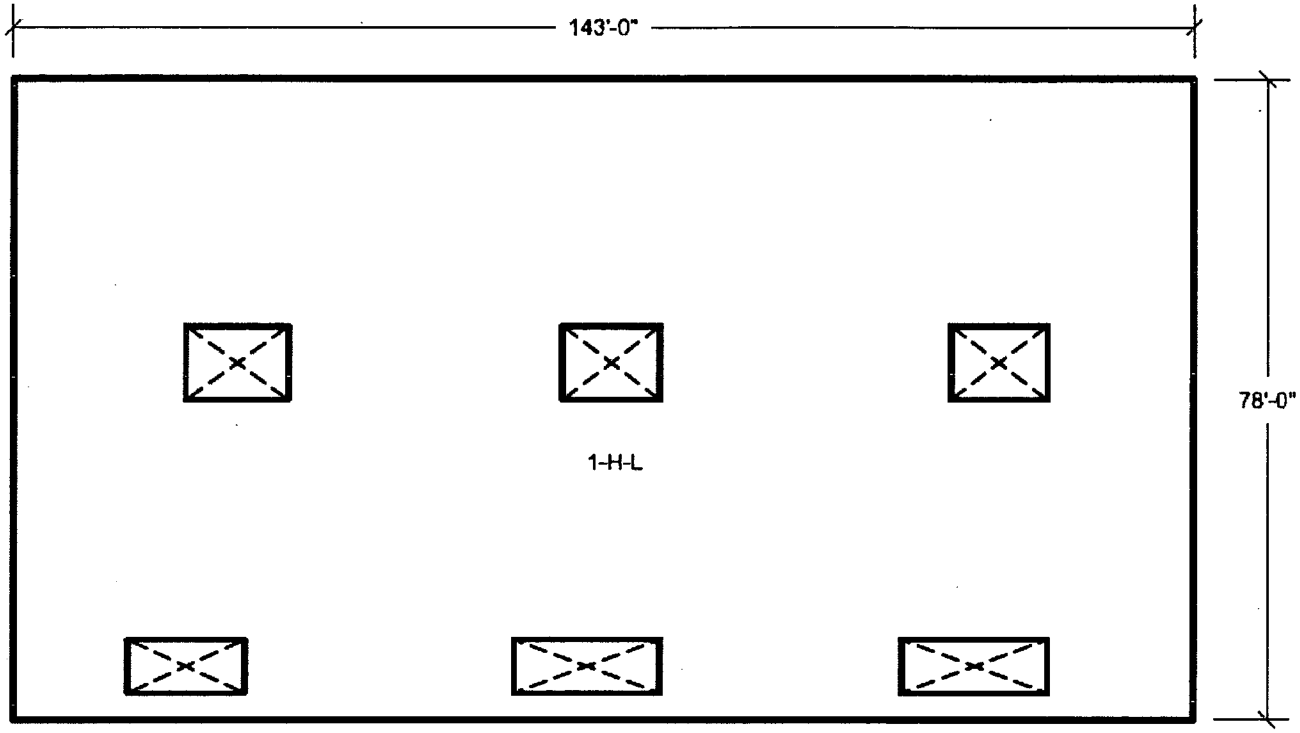
3H.6-127 Pumphouse Pump House Floor El 14'-0" 15'-2"
East/West Reinforcement Zones Top and Bottom Faces

Note: 1-H-L, unless noted otherwise.



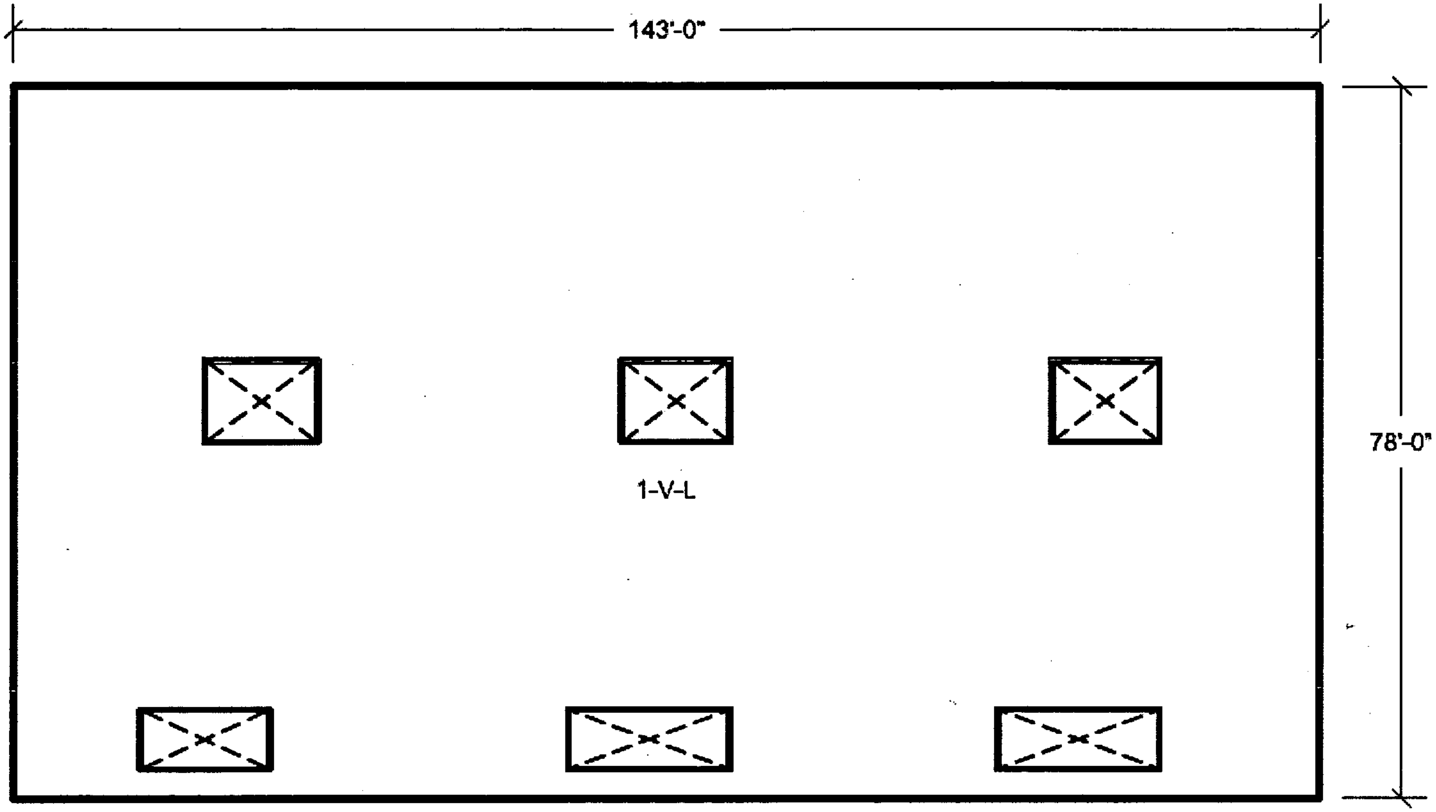
3H.6-128 Pumphouse Pump House Floor El 14'-0" 15'-2"
North/South Reinforcement Zones Top and Bottom Faces

Note: 1-V-L, unless noted otherwise.



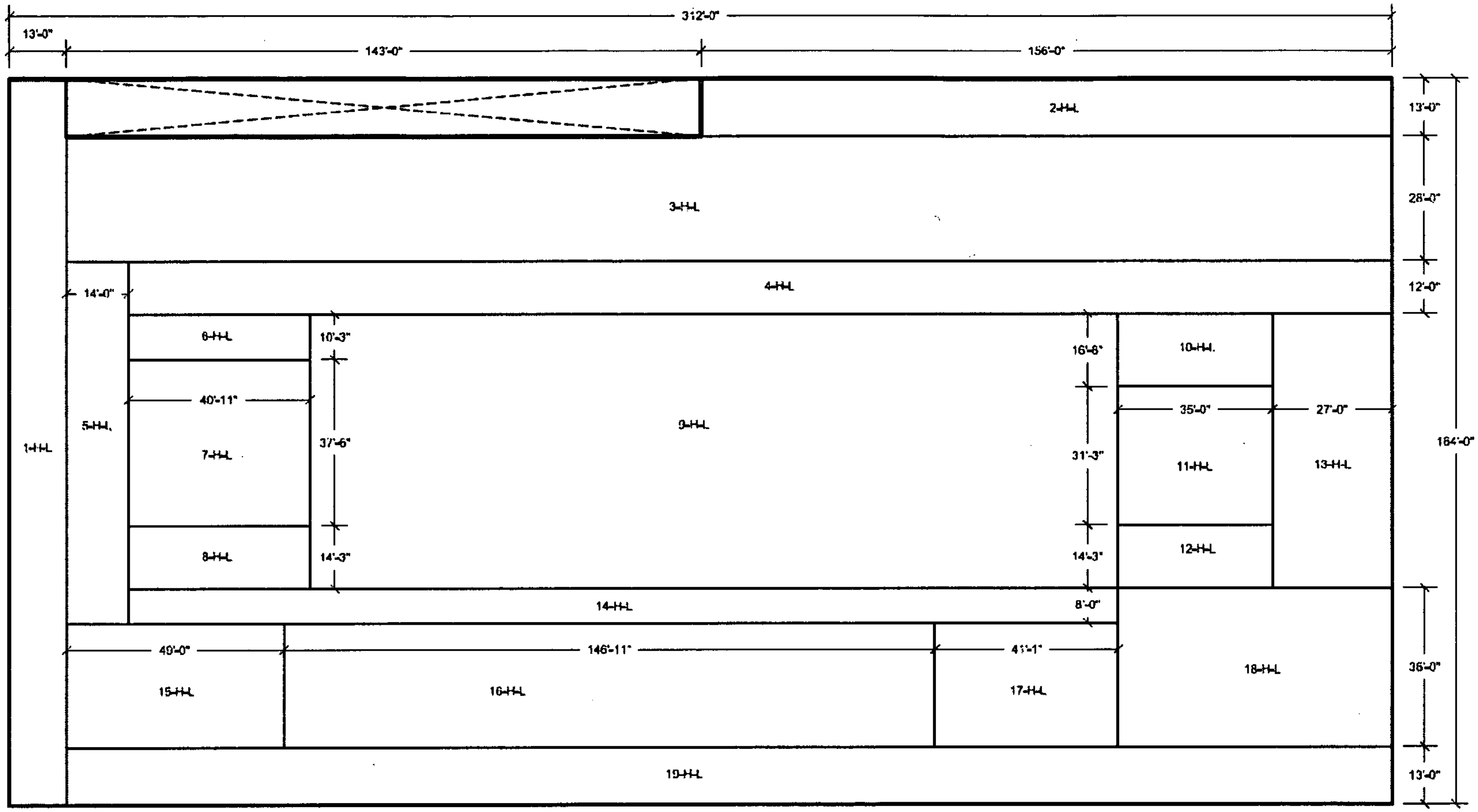
3H.6-129 Ultimate Heat Sink Basin Base Mat Plan Pump House Floor El 15'-2"
East/West Reinforcement Zones Top Bottom Face

Note: 1-H-L unless noted otherwise.



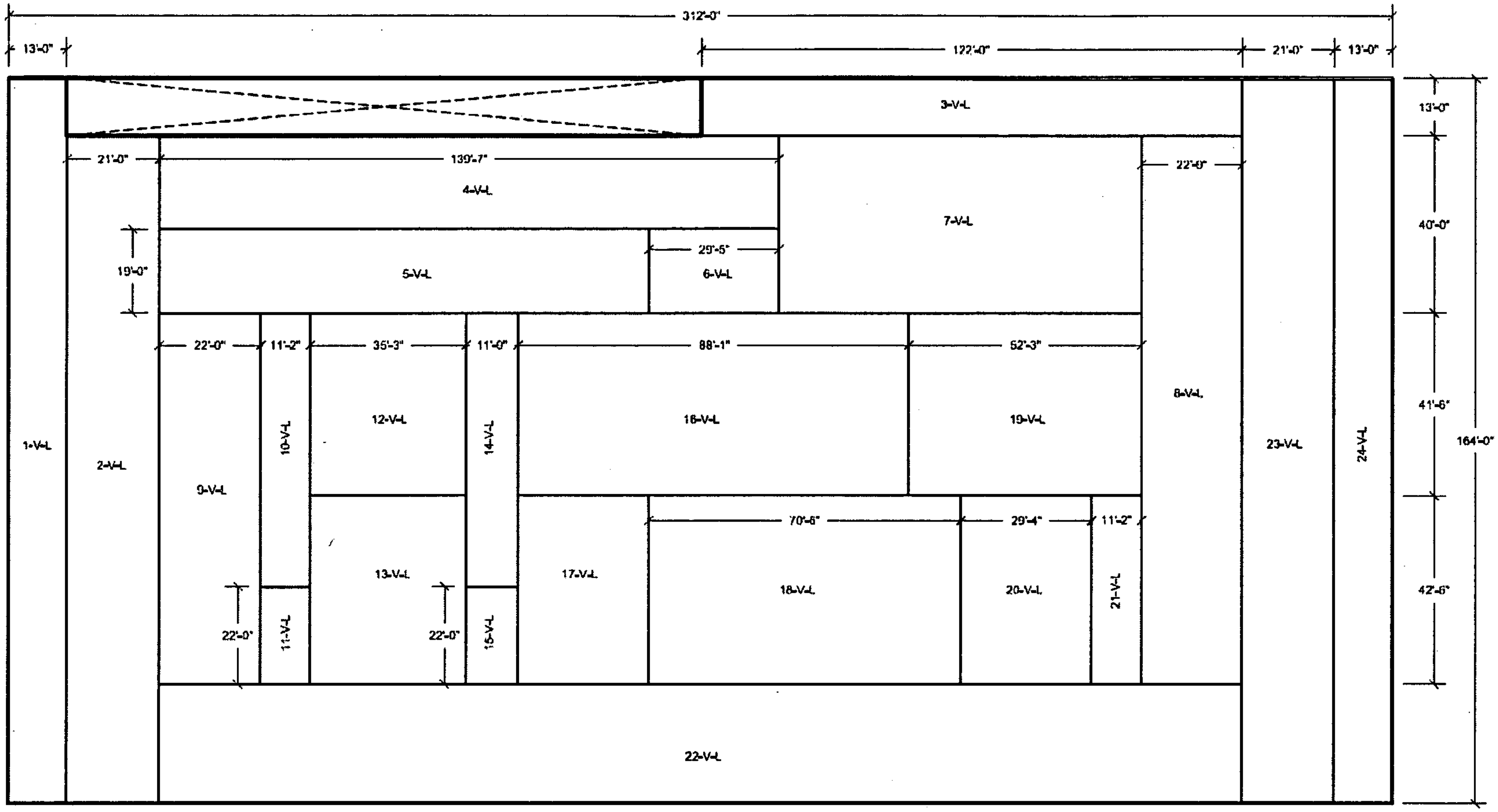
3H.6-130 Ultimate Heat Sink Basin Base Mat Plan Pump House Floor El 15'-2" North/South Reinforcement Zones Top Bottom Face

Note: 1-V-L unless noted otherwise.



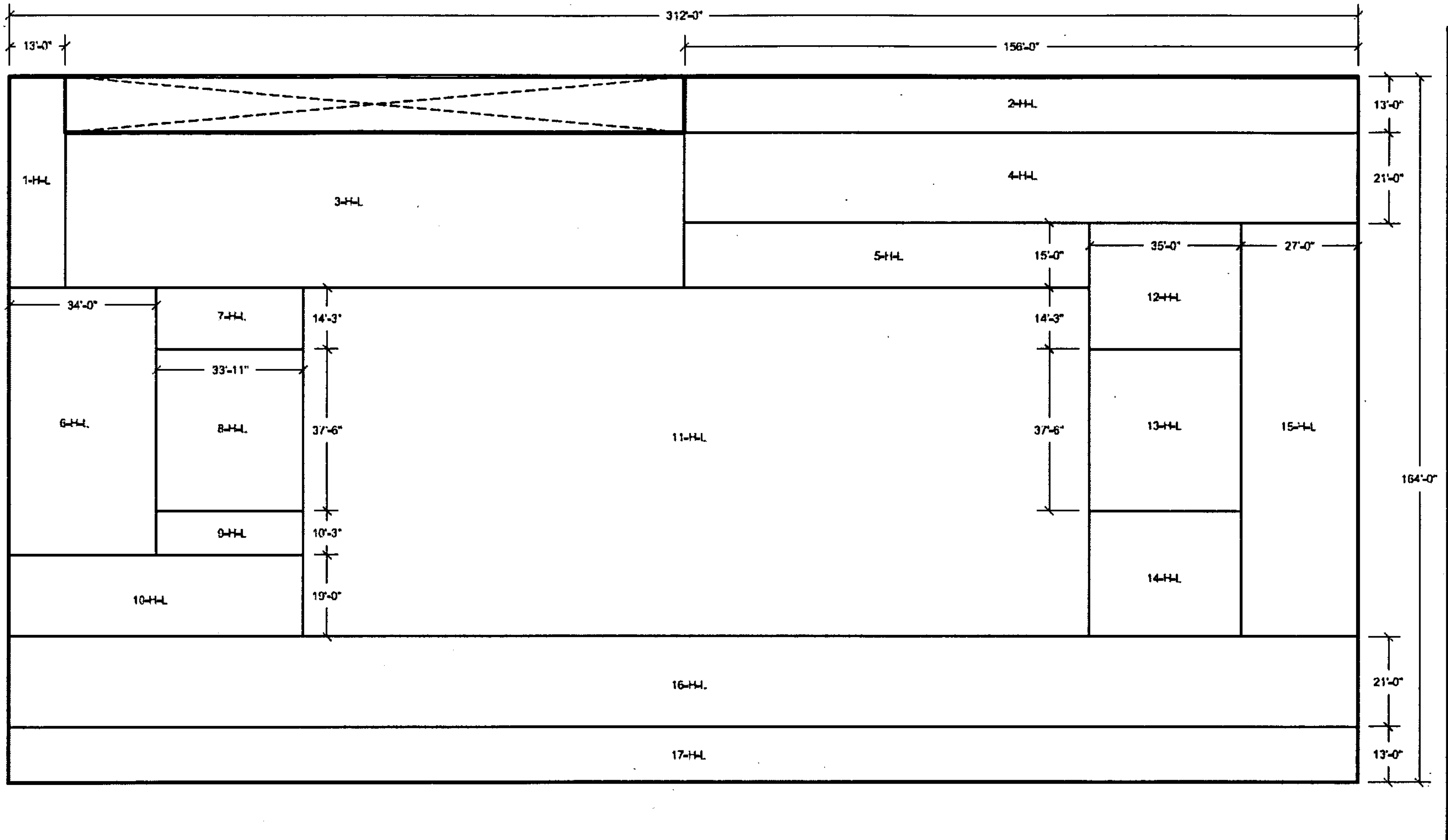
3H.6-131 Ultimate Heat Sink UHS Basin Base Foundation Mat Plan
East/West Reinforcement Zones Bottom Top Face

Note: 1. H-L unless noted otherwise.

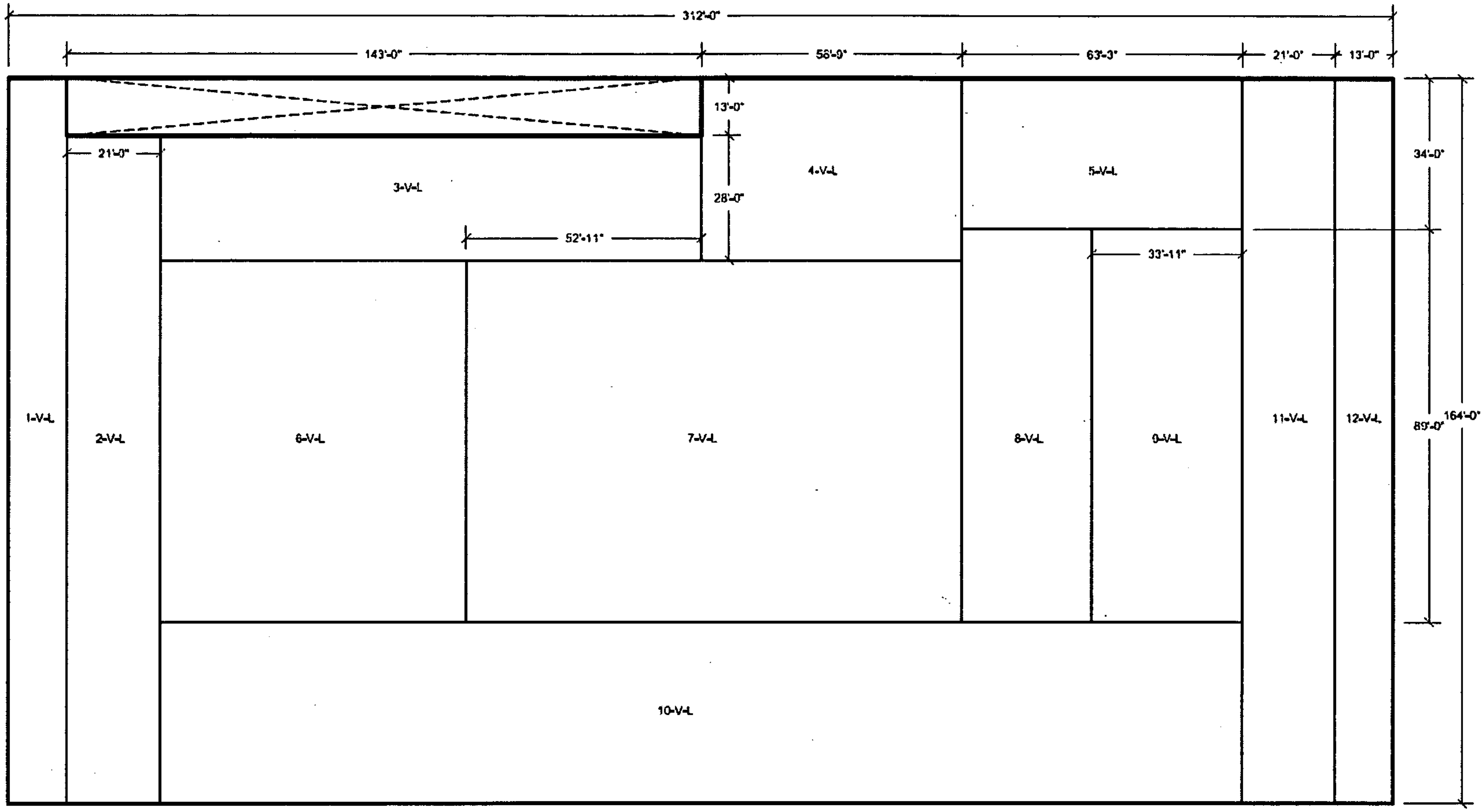


3H.6-132 ~~Ultimate Heat Sink~~ UHS Basin ~~Base~~ Foundation Mat ~~Plan~~
North/South Reinforcement Zones ~~Bottom~~ Top Face

~~Note: 1-V-L, unless noted otherwise.~~

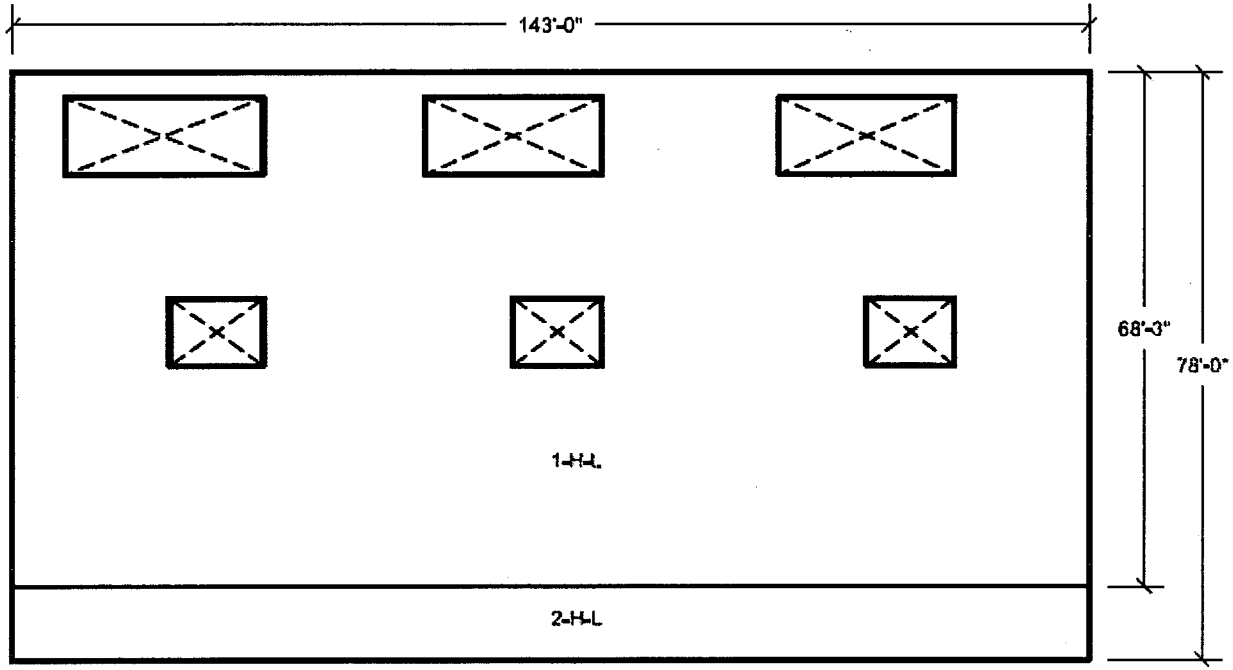


3H.6-133 ~~Ultimate Heat Sink~~ UHS Basin ~~Base~~ Foundation Mat ~~Plan~~ ~~Transverse Horizontal~~ East/West Reinforcement Zones Bottom Face



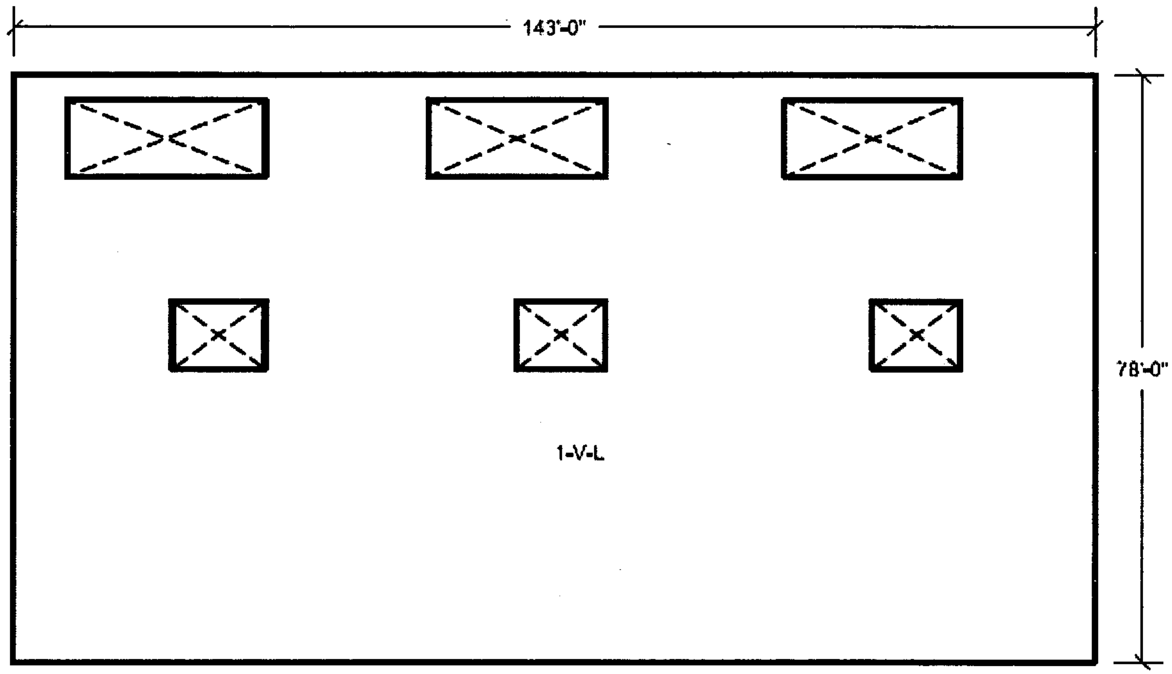
3H.6-134 ~~Pumphouse Roof~~ UHS Basin Foundation Mat ~~East/West~~ North/South Reinforcement Zones ~~Top~~ Bottom Face

~~Note: 1-H=L, unless noted otherwise.~~



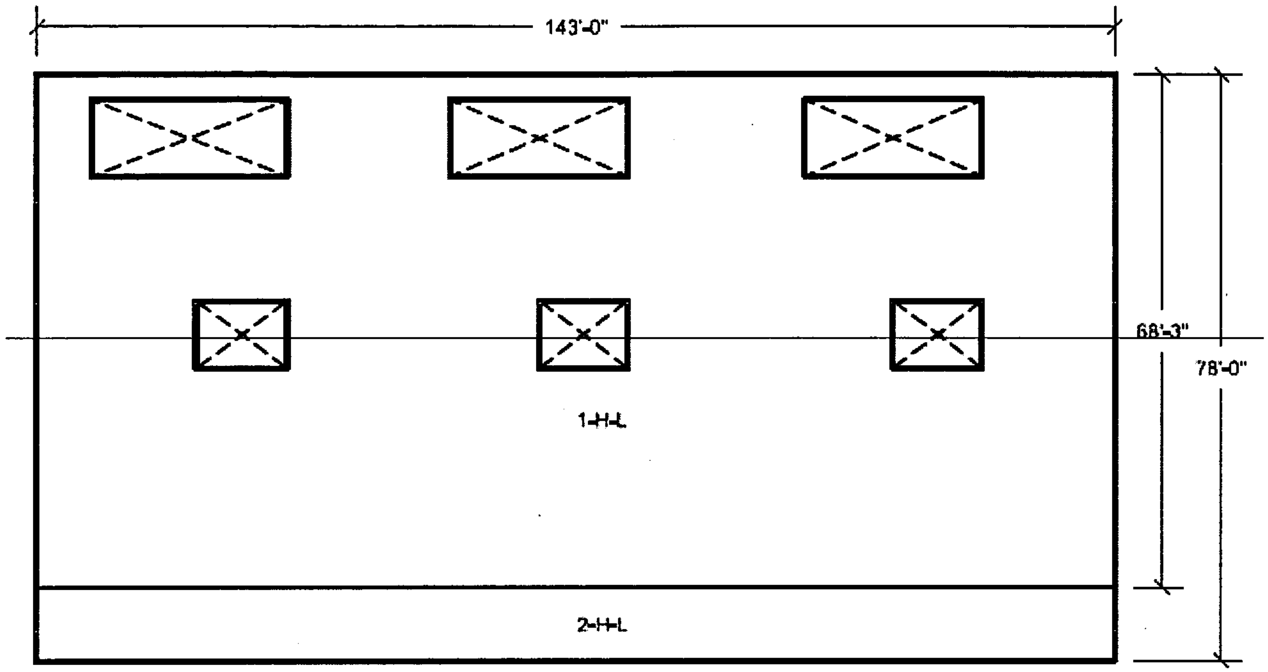
3H.6-135 Pumphouse Pump House Roof
North/South East/West Reinforcement Zones Top Face

Note: 1-V-L, unless noted otherwise.

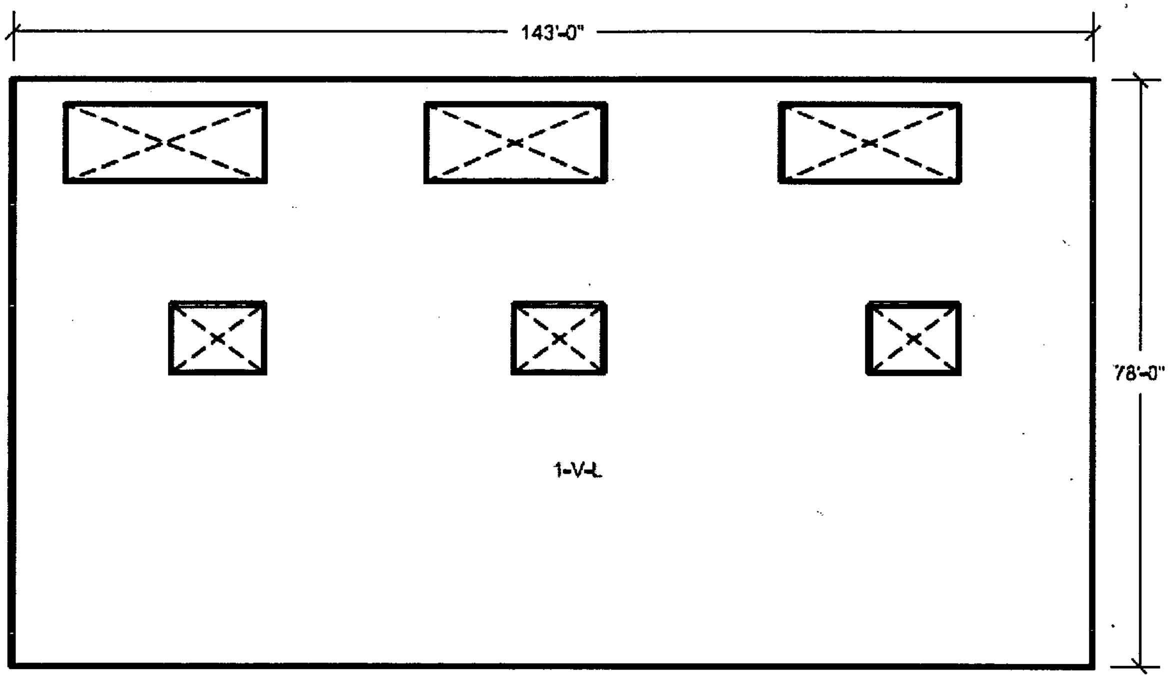


3H.6-136A Pumphouse Pump House Roof
East/West North/South Reinforcement Zones Bottom Top Face

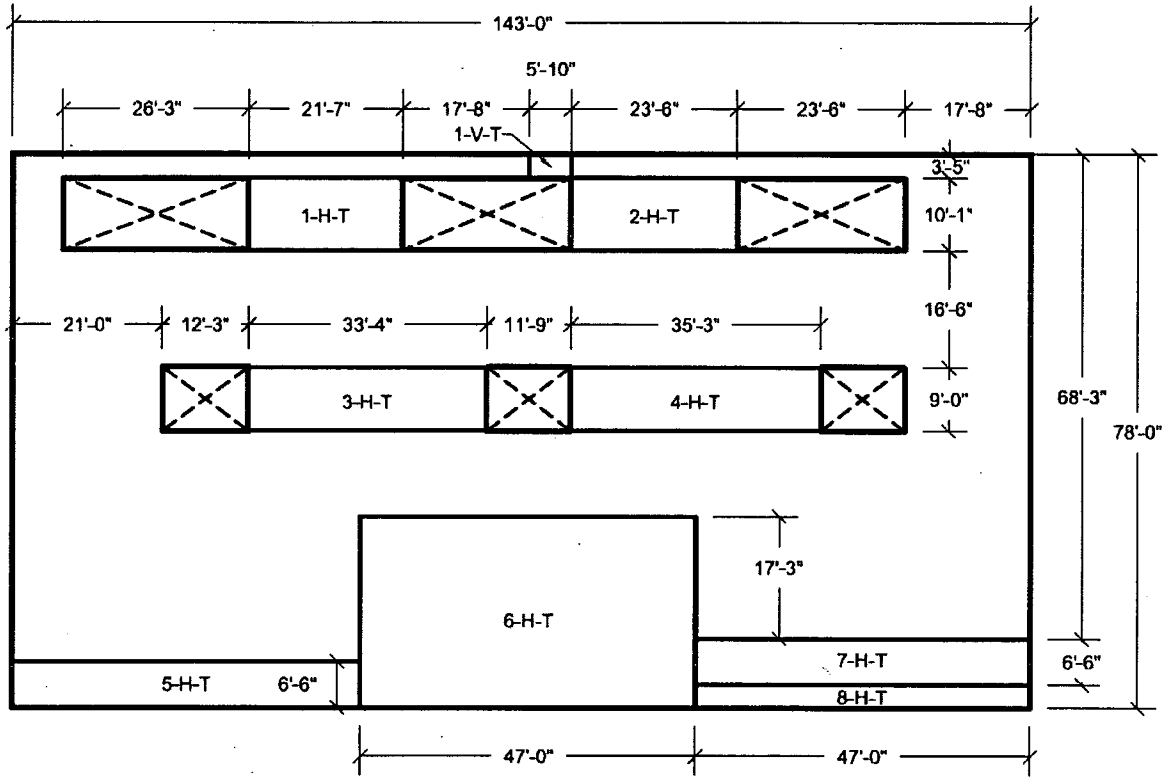
Note: 1-H-L, unless noted otherwise.



3H.6-136B Pump House Roof
East/West Reinforcement Zones Bottom Face

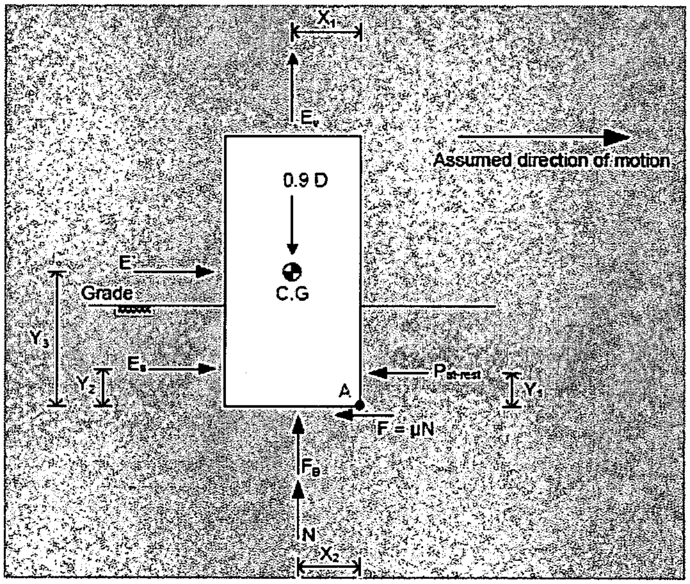


3H.6-136C Pump House Roof
North/South Reinforcement Zones Bottom Face



3H.6-136D Pump House Roof
Transverse Vertical and Horizontal Reinforcement Zones

Figure 3H.6-137: Formulations Used for Calculation of Factors of Safety Against Sliding and Overturning



Factors of Safety against Sliding and Overturning about point A are calculated as follows:

$$SF_{sliding} = \frac{P_{at\_rest} + F}{E_s + E}$$

$$SF_{OT\_A} = \frac{(P_{at\_rest})(Y_1) + (0.9D)(X_1)}{(F_B)(X_2) + (E_s)(Y_2) + (E)(Y_3) + (E_v)(X_1)}$$

Where:

$SF_{sliding}$ = Safety factor against sliding
SF_{OT_A} = Safety factor against overturning about "A"
D = Dead load
P_{at_rest} = Total at-rest soil pressure (see Figures 3H.6-48 through 3H.6-50)
$F = \mu N$ = friction force and μ is the coefficient of friction
E_s = Static and dynamic soil pressure (see Figures 3H.6-45 through 3H.6-47)
E = Self weight excitation in the horizontal direction
E_v = Self weight excitation in the vertical direction
F_B = Buoyancy force
N = Vertical reaction = $0.9D - F_B - E_v$

Note: If passive pressure is utilized, $P_{passive}$ should be used instead of $P_{at\text{-}rest}$.

Enclosure 2

Revision to COLA Sections 3H.1

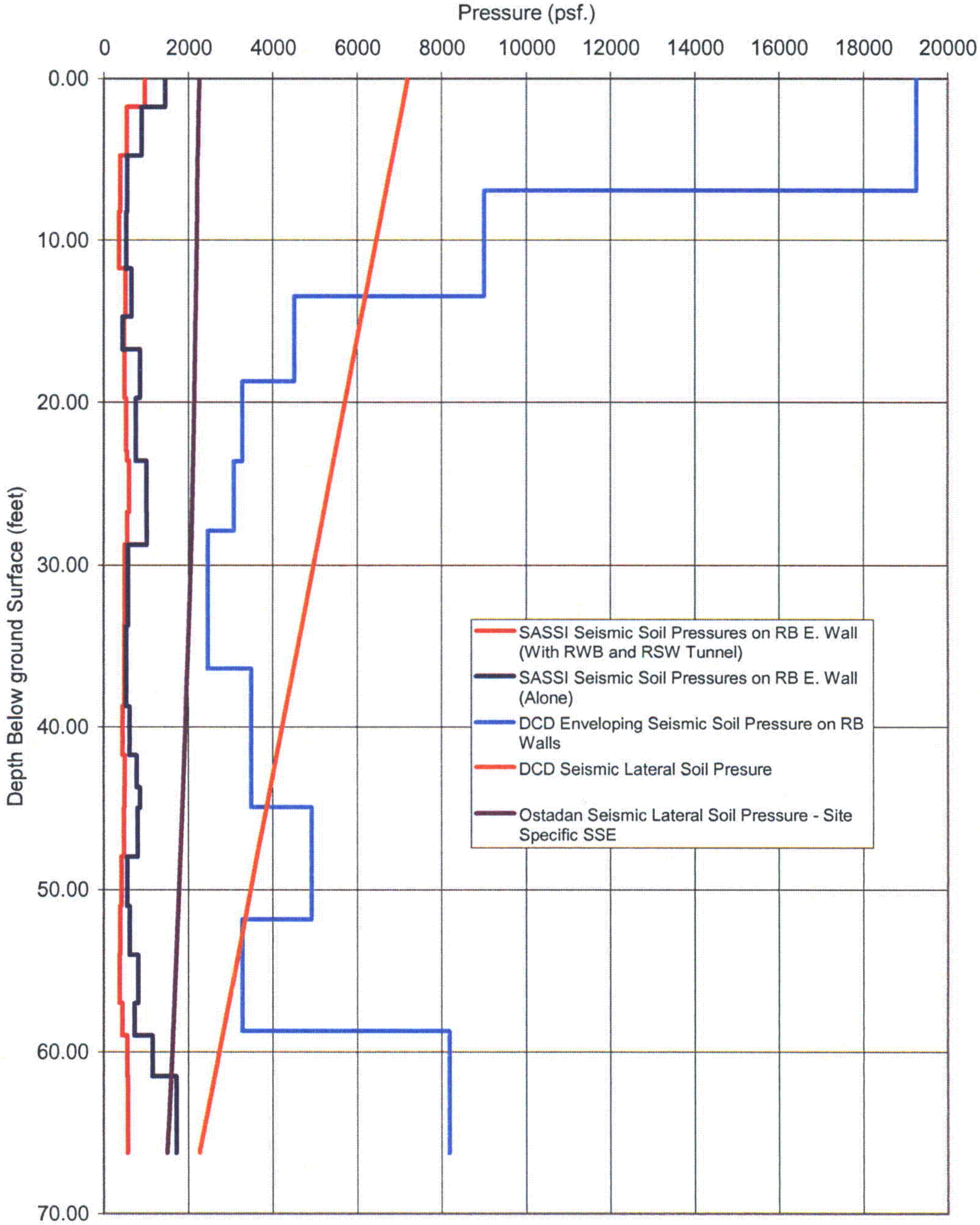


Figure 3H.1-1 Lateral Seismic Soil Pressure Comparison for RB East Wall (Considering RSW Tunnel & Radwaste Building)

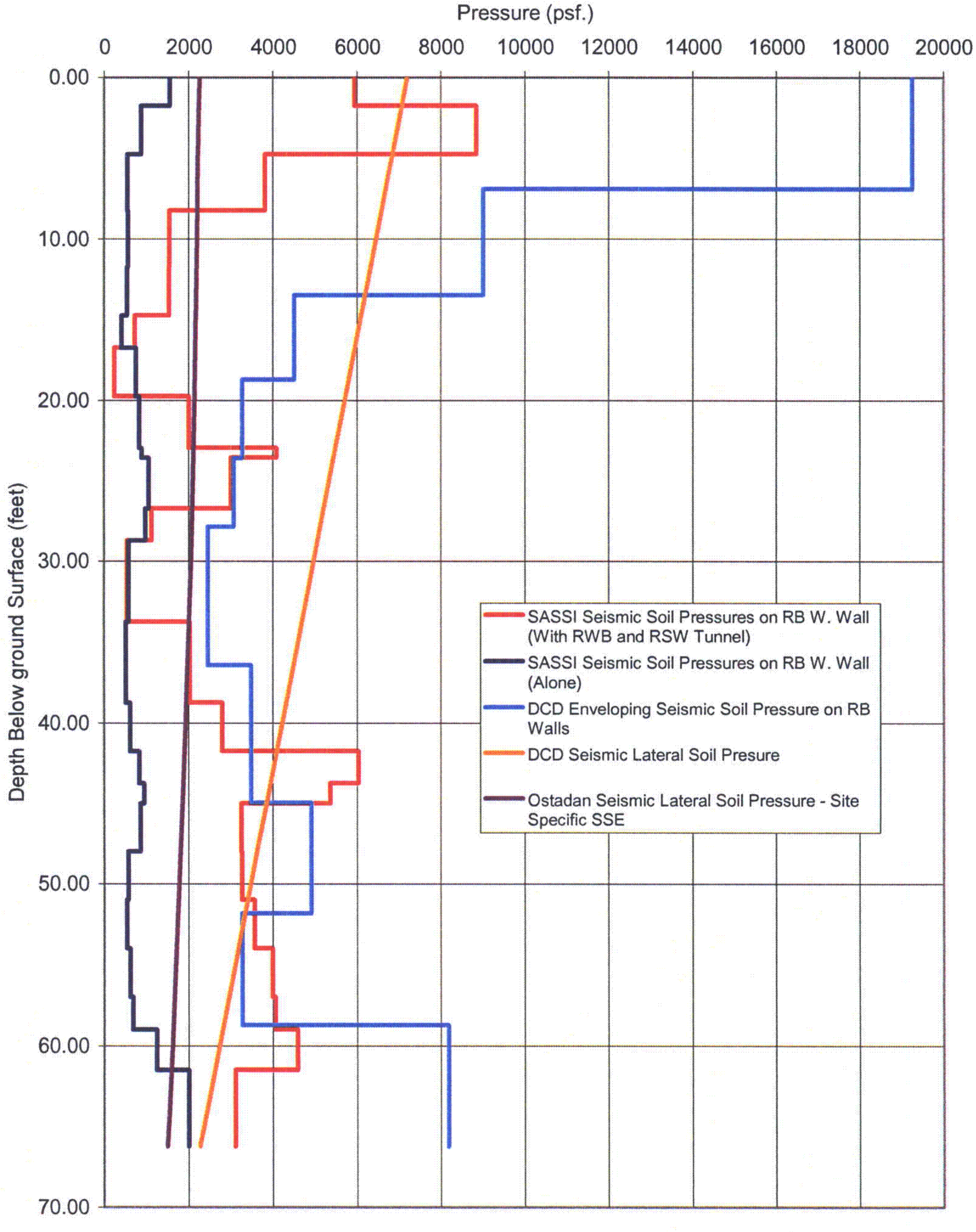


Figure 3H.1-2 Lateral Seismic Soil Pressure Comparison for RB West Wall (Considering RSW Tunnel & Radwaste Building)

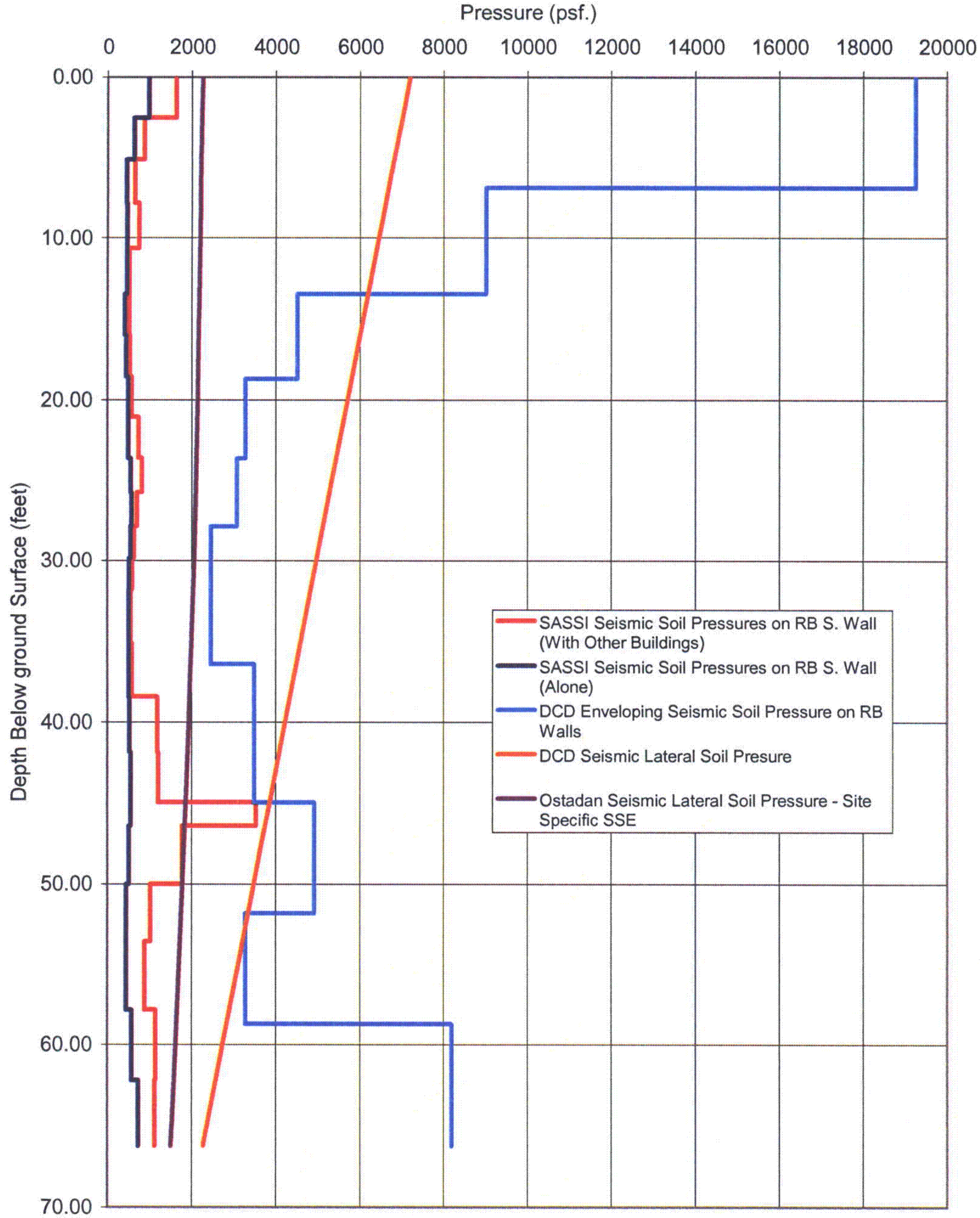


Figure 3H.1-3 Lateral Seismic Soil Pressure Comparison for RB South Wall (Considering DGFOSVS, RSW Tunnel & UHS-Pump House Building)

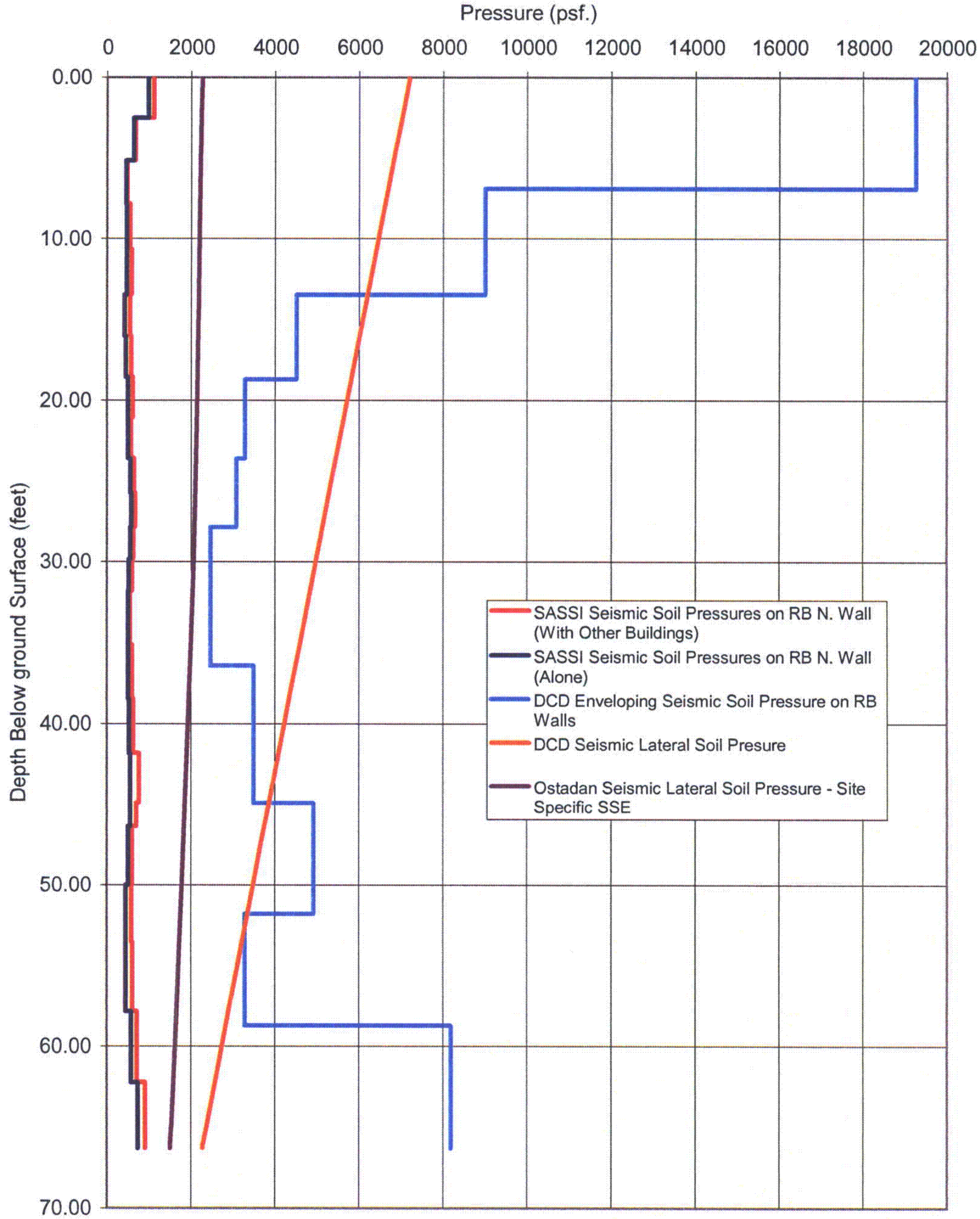


Figure 3H.1-4 Lateral Seismic Soil Pressure Comparison for RB North Wall (Considering DGFOSVS, RSW Tunnel & UHS-Pump House Building)

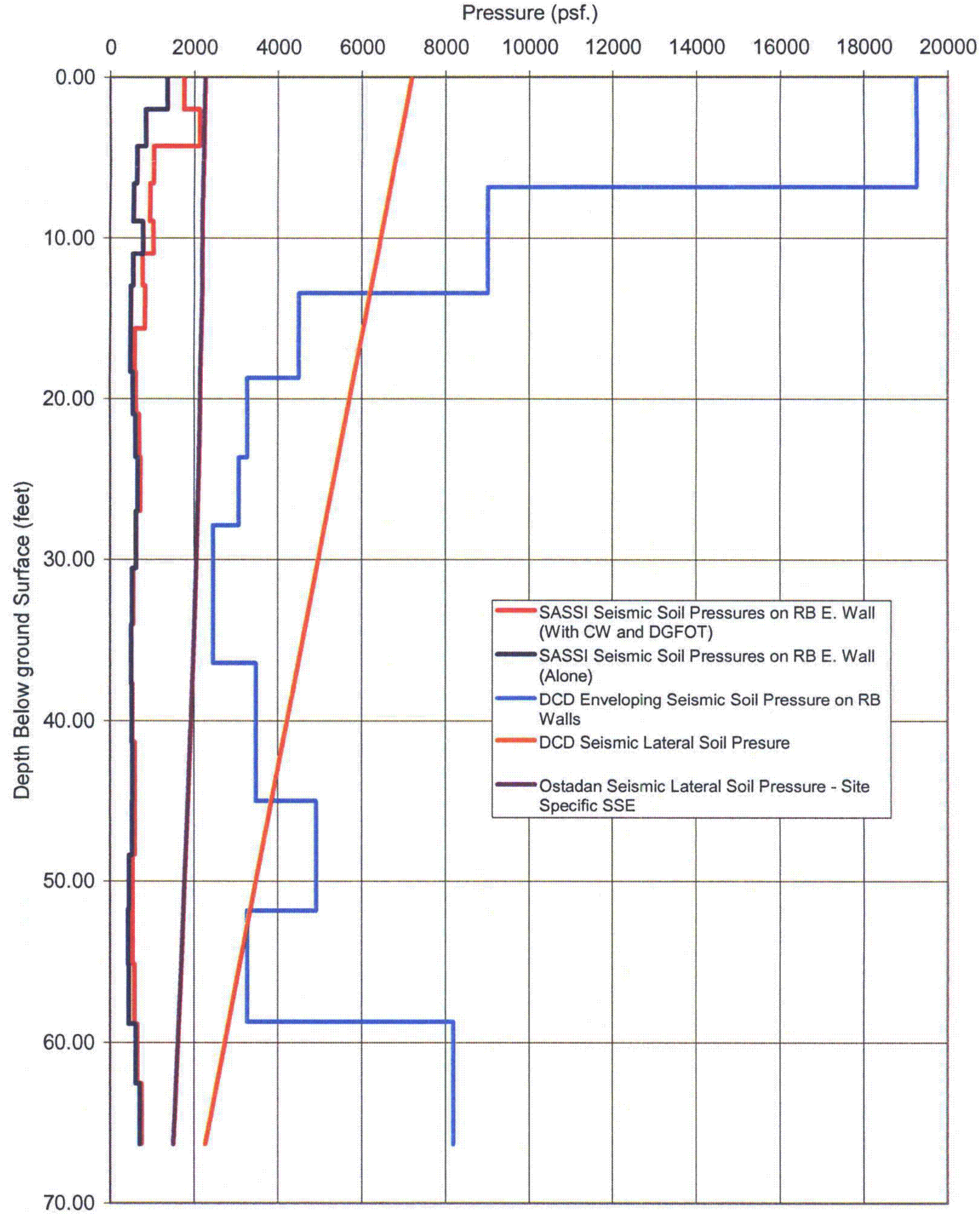


Figure 3H.1-5 Lateral Seismic Soil Pressure Comparison for RB East Wall (Considering DGFOT & Crane Wall)

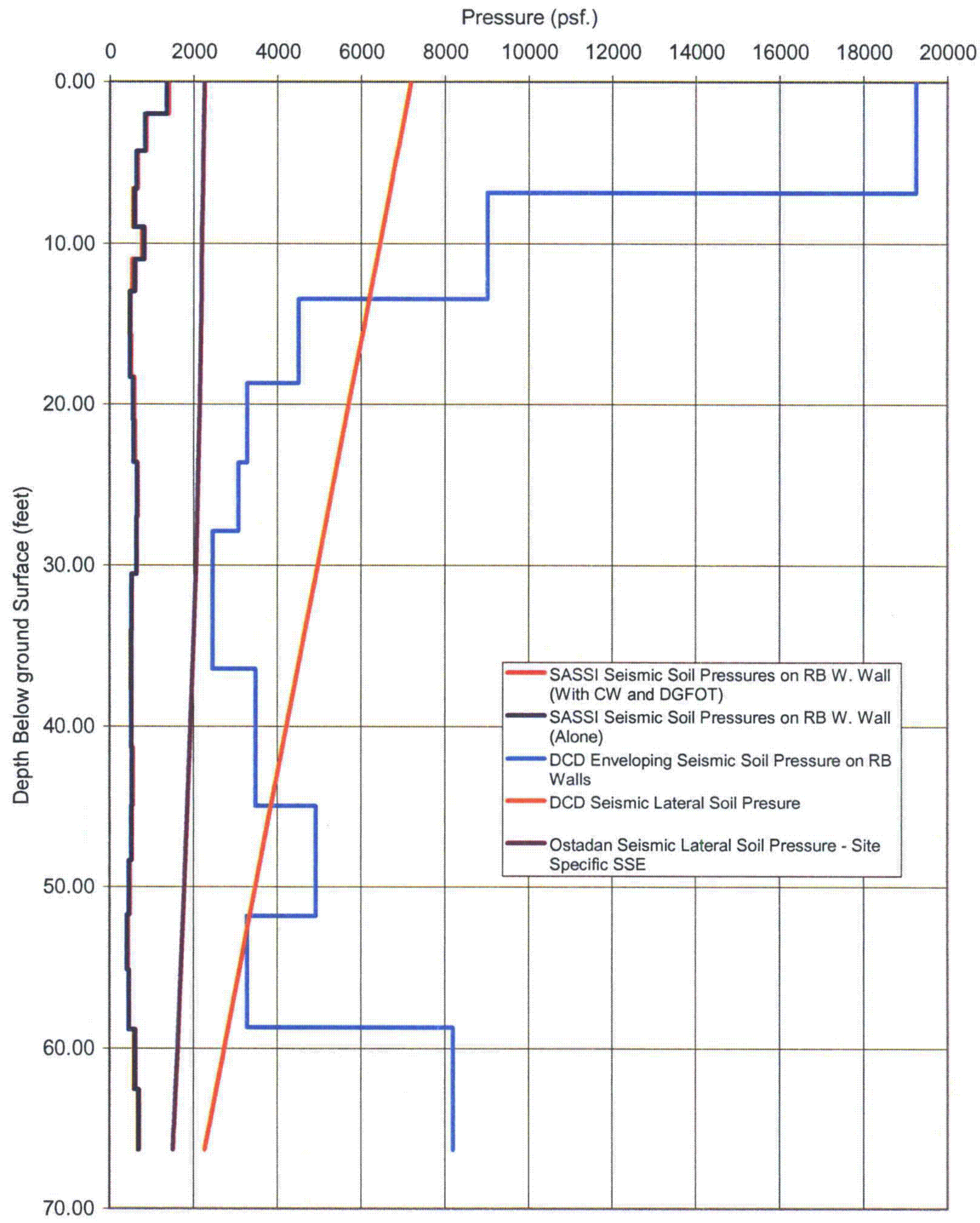


Figure 3H.1-6 Lateral Seismic Soil Pressure Comparison for RB West Wall (Considering DGFOT & Crane Wall)