OGDEN CITY
WATER TREATMENT PLANT
RECONSTRUCTION
STRUCTURAL CALCULATIONS

PREPARED BY:
SUNRISE ENGINEERING, INC.
12227 SO. BUSINESS PARK DR.
SUITE 220
DRAPER, UTAH 84020

SUNRISE ENGINEERING

OGDEN WATER TREATMENT PLANT RECONSTRUCTION
STRUCTURAL CALCULATIONS
TABLE OF CONTENTS

SECTION	PAGE NO.
GENERAL CALCULATIONS	1
ROOF SYSTEM CALCULATIONS	7
GRAVITY ANALYSIS	21
LATERAL ANALYSIS	27
STEEL GIRDER TRUSS	41
MASONRY WALLS	74
EMBED PLATE CALCULATIONS	305
FOUNDATION CALCULATIONS	318
MISCELLANEOUS CALCULATIONS	473

GENERAL CALCULATIONS

BASIS FOR DESIGN

Project:Ogden Treatment Plant Reconstruction

1.1 Building Codes:	American Concrete Institute (ACI) 350 "Code Requirments for Environmental Engineering Concrete Structures and Commentary" American Concrete Institute (ACI) 350.3 "Seismic Deisgn of Liquid-Containing Concrete Structures and Commentary" ACI 318-11 ASCE 7 "Minimum Design Loads for Buildings and Other Structures" IBC 2006 AISC 360-10 "Specification for Structal Steel Buildings"
1.2 Roof Live Load:	20 psf
Floor Live Load:	100 psf
Storage Live Load:	250 psf
1.3 Wind Load:	120 MPH Basic Wind Speed Exposure B
1.4 Seismic Load:	Seismic Design Category D Importance Factor =1.25 Site Class C
1.5 Snow Load:	Per Snow Load Calculations
2.1 Foundation:	Footings for structure designed in accordance with Soils Investigation values provided by Smith & Annala Engineering Co. Concrete tank designed using the following values: Allowable Bearing Pressure = 2500 psf Allowable Bearing Pressure for Temporary Loads = 3150 psf Active Soil Pressure (Equivalent Fluid Weight) = 35 lb/ft^3 At-Rest Soil Pressure (Equivalent Fluid Weight) = 65 lb/ft^3 Passive Soil Pressure (Equivalent Fluid Weight) = 250 lb/ft^3
3.1 Concrete:	All concrete shall be normal weight using hardrock aggregates and shall meet all requirements of the specifications and plans. Minimum 28-day compressive strength be f'_c = 4500 psi. Design of footings based off of f'c = 2500.
4.1 Reinforcing Steel:	Reinforcement shall conform to ASTM A615 or ASTM A706 and shall be Grade 60 (fy = 60 ksi) deformed bars.

Design Dead Loads

Roof Loads

No. 24 Gage Standing Seam Metal Roofing (Custom-Built Metals)	1.0 psf
Rigid Insulation (4" thick)	6.0 psf
20 Gage B-36 Structural Roof Decking	2.3 psf
Steel Joists at 6 to 8' o.c.	4.0 psf
Suspended Ceiling	2.0 psf
Mechanical & Miscellaneous	2.7 psf
Total	18.0 psf

Wall Loads

8" x 4" x 16" Atlas Brick Solid Grouted	77.0 psf
Interior Metal Stud Wall with 2x6 studs at 16" o.c.	3.0 psf
5/8" Gypsum Wall Board	3.1 psf
Miscellaneous/Mechanical	4.9 psf
Total	88.0 psf

Storage Area Loads

Flooring Material	2.0 psf
Normal Weight Concrete over 1-1/2" B-Deck (4.5 " Thickness)	42.7 psf
Steel Joists at 8'-0" o.c.	4.0 psf
Mechanical & Miscellaneous	6.3 psf
Total	55.0 psf

Ground Snow Load (Utah Amendment 15A-3-107(6)

P_0	43	psf	Base Ground Snow Load	Table 1608.1.2(a)
A	4.825	ft/1000	Elevation of Structure Above Sea Level	
A_0	4.5	ft/1000	Base Ground Snow Elevation	Table 1608.1.2(a)
S	63	psf/100	Change in Ground Snow Elev.	Table 1608.1.2(a)
P_g	48	psf	Ground Snow Load	(15A-3-107(6)

Design Snow Loads (ASCE 7-10: Chapter 7)

Flat Roofs	$p_f = 0.7\, C_e\, C_t\, I_s\, p_g$		ASCE 7-10 Eq. 7.3-1
p_g	48	psf	Ground Snow Load from Utah Amendment 15A-3-107(6)
C_e	1.0		Exposure Factor from (ASCE 7 Table 7-2)
C_t	1.0		Thermal Factor from (ASCE 7 Table 7-3)
I	1.1		Importance Factor ASCE 7-10 Table 1.5-2
p_m	22	psf	Minimum Snow Load from ASCE 7-10 7.3.4
p_f	37.0	psf	Flat Roof Snow Load from ASCE 7-10 7.3

Sloped Roofs	$p_s = C_s\, p_f$		ASCE 7-10 Eq. 7.4-1
C_s	1		Warm Roof Slope Factor from ASCE 7 Figure 7.2
p_s	**37**	**psf**	Sloped Roof Snow Load from ASCE 7-10 7.4

Seismic Snow Loads (Utah Amendments 15A-3-107(3))

Seismic Snow	$W_s = (0.20 + 0.025(A-5))P_f$		
W_s	**7.4**	**psf**	Seismic Snow Load from Utah Amendment 15A-3-107 (3)

Drift Snow Load (ASCE 7-10 7.7)

LOCATION:			
h_{upper}	26	ft	Elev. of Upper Roof
h_{lower}	17	ft	Elev. of lower Roof
l_u	59.33	ft	Upper Roof Length
l_l	50	ft	Lower Roof Length
$l_{u\,(used)}$	59.33	ft	Leeward
$l_{u\,(used)}$	50	ft	Windward
P_g	48	psf	Ground Snow Load
γ	20.24	pcf	Snow Density
P_s	37	psf	Sloped Roof Snow Load
$h_{D\,(leeward)}$	3.13	ft	Leewared Drift Height
$h_{D\,(windward)}$	2.15	ft	Windward Drift Height
$h_{D\,(used)}$	3.13		Drift Height Used in Design
h_b	1.83	ft	Height of Balanced Snow
h_c	7.17	ft	Clear Height from h_b
w	12.51	ft	Width of drift
h_D	3.13	ft	Drift Height

P_d	64.0	psf	Drift Snow Load

OK

Drift Snow Load (ASCE 7-10 7.7)

LOCATION:			
h_{upper}	34	ft	Elev. of Upper Roof
h_{lower}	21	ft	Elev. of lower Roof
l_u	59.33	ft	Upper Roof Length
l_l	50	ft	Lower Roof Length
$l_{u\,(used)}$	59.33	ft	Leeward
$l_{u\,(used)}$	50	ft	Windward
P_g	48	psf	Ground Snow Load
γ	20.24	pcf	Snow Density
P_s	37	psf	Sloped Roof Snow Load
$h_{D\,(leeward)}$	3.13	ft	Leewared Drift Height
$h_{D\,(windward)}$	2.15	ft	Windward Drift Height
$h_{D\,(used)}$	3.13		Drift Height Used in Design
h_b	1.83	ft	Height of Balanced Snow
h_c	11.17	ft	Clear Height from h_b
w	12.51	ft	Width of drift
h_D	3.13	ft	Drift Height

P_d	64.0	psf	Drift Snow Load

OK

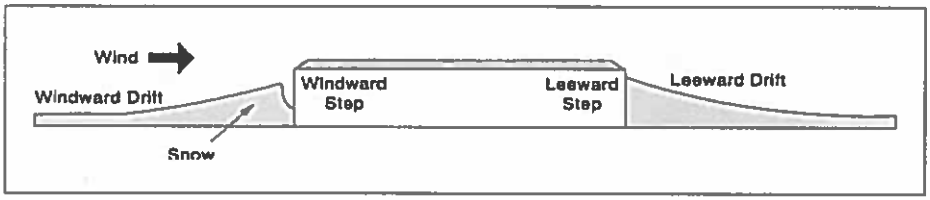
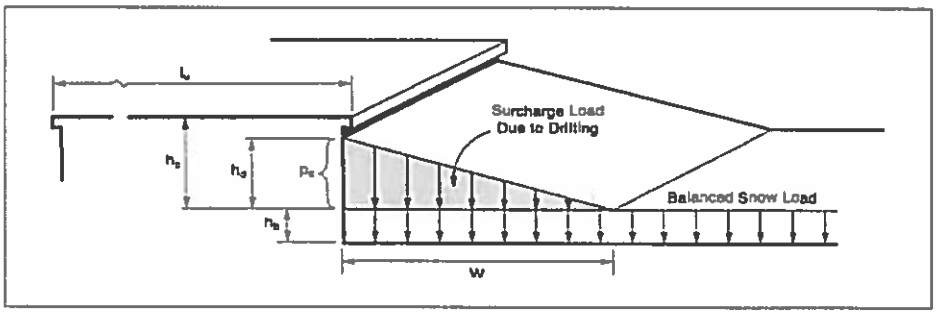


FIGURE 7-7 Drifts Formed at Windward and Leeward Steps.



Drift Snow Load (ASCE 7-10 7.7)			
LOCATION:	**Flat Roof at Steel Truss**		
h_{upper}	21.67	ft	Elev. of Upper Roof
h_{lower}	19.67	ft	Elev. of lower Roof
l_u	1	ft	Upper Roof Length
l_l	50	ft	Lower Roof Length
$l_{u\,(used)}$	20	ft	Leeward
$l_{u\,(used)}$	50	ft	Windward
P_g	48	psf	Ground Snow Load
γ	20.24	pcf	Snow Density
P_s	37	psf	Sloped Roof Snow Load
$h_{D\,(leeward)}$	1.72	ft	Leewared Drift Height
$h_{D\,(windward)}$	2.15	ft	Windward Drift Height
$h_{D\,(used)}$	2.15		Drift Height Used in Design
h_b	1.83	ft	Height of Balanced Snow
h_c	0.17	ft	Clear Height from h_b
w	1.38	ft	Width of drift
h_D	0.17	ft	Drift Height
P_d	4.0	psf	Drift Snow Load

OK

Drift Snow Load (ASCE 7-10 7.7)			
LOCATION:	**Sloped Roof at Steel Truss**		
h_{upper}	24.5	ft	Elev. of Upper Roof
h_{lower}	19.67	ft	Elev. of lower Roof
l_u	50.33	ft	Upper Roof Length
l_l	49.67	ft	Lower Roof Length
$l_{u\,(used)}$	50.33	ft	Leeward
$l_{u\,(used)}$	49.67	ft	Windward
P_g	48	psf	Ground Snow Load
γ	20.24	pcf	Snow Density
P_s	37	psf	Sloped Roof Snow Load
$h_{D\,(leeward)}$	2.88	ft	Leewared Drift Height
$h_{D\,(windward)}$	2.15	ft	Windward Drift Height
$h_{D\,(used)}$	2.88		Drift Height Used in Design
h_b	1.83	ft	Height of Balanced Snow
h_c	3.00	ft	Clear Height from h_b
w	11.53	ft	Width of drift
h_D	2.88	ft	Drift Height
P_d	59.0	psf	Drift Snow Load

OK

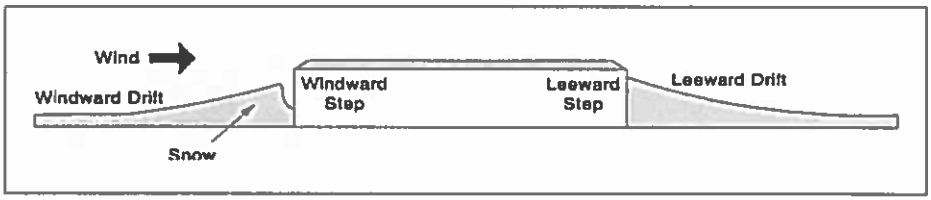
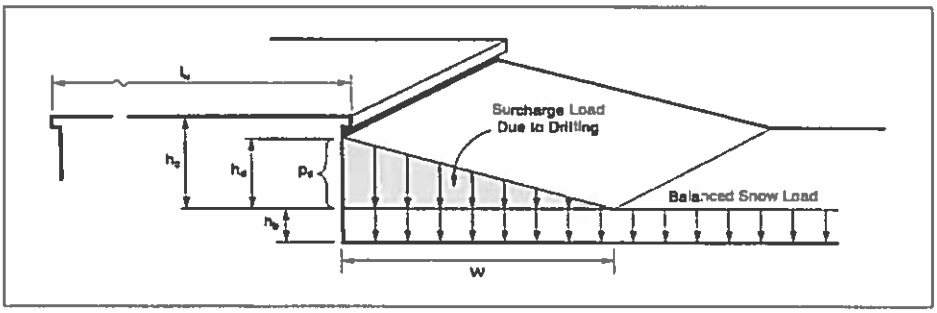


FIGURE 7-7 Drifts Formed at Windward and Leeward Steps.



ROOF SYSTEM CALCULATIONS

SUNRISE ENGINEERING

Roof Deck Summary

Location:	High Roof				
	Max. D + L =	55	psf		
	Max. S =	37	psf		
	Span	7	ft	Deflection Criteria	
	L/180	0.47	in	Total Loac	L/180
	L/240	0.35	in	Snow Loac	L/240
	Deck Type:	PLB-36			
	Depth:	1.5	in		
	Gauge:	20	gauge		
	Allowable Loads			psf	
	Single	Max. Allow. Load (Stress)		76	OK
		Max. Allow. Load (L/240)		43	OK
	Double	Max. Allow. Load (Stress)		80	OK
		Max. Allow. Load (L/240)		***	OK
	Triple	Max. Allow. Load (Stress)		100	OK
		Max. Allow. Load (L/240)		83	OK

Location:	Flat Roof w/ drift load				
	Max. D + L =	82	psf		
	Max. S =	64	psf		
	Span	6	ft	Deflection Criteria	
	L/180	0.40	in	Total Loac	L/180
	L/240	0.3	in	Snow Loac	L/240
	Deck Type:	PLB-36			
	Depth:	1.5	in		
	Gauge:	20	gauge		
	Allowable Loads			psf	
	Single	Max. Allow. Load (Stress)		104	OK
		Max. Allow. Load (L/240)		68	OK
	Double	Max. Allow. Load (Stress)		108	OK
		Max. Allow. Load (L/240)		***	OK
	Triple	Max. Allow. Load (Stress)		136	OK
		Max. Allow. Load (L/240)		132	OK

SUNRISE ENGINEERING

Location: Flat Roof no drift load

	Max. D + L =	55	psf	
	Max. S =	37	psf	
	Span	7	ft	Deflection Criteria
	L/180	0.47	in	Total Loac L/180
	L/240	0.35	in	Snow Loac L/240
	Deck Type:	PLB-36		
	Depth:	1.5	in	
	Gauge:	20	gauge	

Allowable Loads		psf	
Single	Max. Allow. Load (Stress)	76	OK
	Max. Allow. Load (L/240)	43	OK
Double	Max. Allow. Load (Stress)	80	OK
	Max. Allow. Load (L/240)	***	OK
Triple	Max. Allow. Load (Stress)	100	OK
	Max. Allow. Load (L/240)	83	OK

Type PLB™-36 or HSB®-36

1½" Deep Roof Deck
Primer Painted or Galvanized

Allowable Uniform Loads (psf)

SPAN	GAGE		SPAN (ft-in.) 4'-0"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"	11'-0"	11'-6"	12'-0"
SINGLE	22	Stress	185	118	98	82	70	60	53	46	41	37	33	30				
		L/240	185	95	71	55	43	34	28	23	19	16	14	12				
	20	Stress	223	149	123	104	88	76	66	58	52	46	41	37	34	31	28	26
		L/240	229	117	88	68	53	43	35	29	24	20	17	15	13	11	10	8
	18	Stress	300	204	168	141	120	104	90	80	70	63	56	51	46	42	38	35
		L/240	♦♦♦	160	120	93	73	58	47	39	33	27	23	20	17	15	13	12
	16	Stress	300	259	214	180	153	132	115	101	89	80	72	65	59	53	49	45
		L/240	♦♦♦	200	150	116	91	73	59	49	41	34	29	25	22	19	16	14
DOUBLE	22	Stress	194	124	103	86	73	63	55	49	43	38	34	31				
		L/240	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	30				
	20	Stress	244	156	129	108	92	80	69	61	54	48	43	39	35	32	30	27
		L/240	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	43	37	32	27	24	21
	18	Stress	300	212	175	147	125	108	94	83	73	65	59	53	48	44	40	37
		L/240	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	56	48	42	36	32	28
	16	Stress	300	262	217	182	155	134	117	103	91	81	73	66	60	54	50	46
		L/240	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦	70	60	52	45	40	35
TRIPLE	22	Stress	243	155	128	108	92	79	69	61	54	48	43	39				
		L/240	♦♦♦	♦♦♦	♦♦♦	♦♦♦	86	69	56	46	39	33	28	24				
	20	Stress	300	195	161	136	116	100	87	76	68	60	54	49	44	40	37	34
		L/240	♦♦♦	♦♦♦	♦♦♦	132	104	83	68	56	47	39	33	29	25	21	19	17
	18	Stress	300	265	219	184	157	135	118	103	92	82	73	66	60	55	50	46
		L/240	♦♦♦	♦♦♦	♦♦♦	175	138	110	90	74	62	52	44	38	33	28	25	22
	16	Stress	300	300	271	228	194	167	146	128	113	101	91	82	74	68	62	57
		L/240	♦♦♦	♦♦♦	♦♦♦	218	172	137	112	92	77	65	55	47	41	35	31	27

Notes:
1. Stress = Uniform load which produces maximum allowable stress in deck.
2. L/240 = Uniform load which produces L/240 deflection in deck.
3. Self-weight of the deck should be included when determining dead load.
4. The symbol ♦♦♦ indicates allowable uniform load based on deflection exceeds allowable uniform load based on stress.

SUNRISE ENGINEERING, INC.

PROJECT NO. ..... PROJECT NAME ..... SUBJECT .....
SHEET NO. ..... OF ..... BY ..... DATE ..... CHKD. BY ..... DATE .....

Storage Area Loading

Dead Loads = 55.0 psf (See Spreadsheet)
Live Loads = 250 psf (Heavy Storage per ASCE 7 x 1.2)

ASD Load Comb. (2) = 295.0 psf

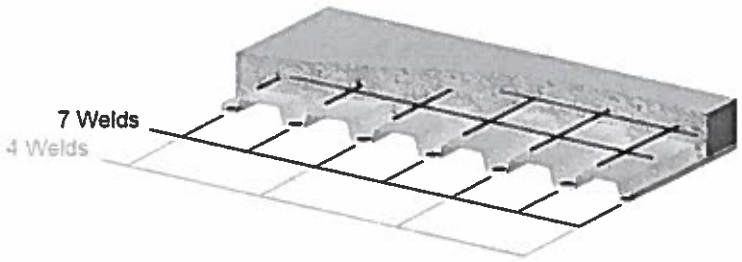
Use B-deck 20 gauge with Normal Weight Concrete (145 pcf)

Max. Span = 6'-0"

Allowable Superimposed Load = 365 psf > 295 psf o.k.

PLB™ or B FORMLOK™

- 4½ in. TOTAL SLAB DEPTH
- Normal Weight Concrete (145 pcf) 42.7 psf
- Galvanized or Phosphatized/Painted



Deck Weight and Section Properties

Gage	Weight (psf)		I_d for Deflection		Moment		Allowable Reactions per ft of Width (lb)				
							End Bearing			Interior Bearing	
	Galv G60	Phos/ Painted	Single Span (in.⁴/ft)	Multiple Spans (in.⁴/ft)	$+S_{eff}$ (in.³/ft)	$-S_{eff}$ (in.³/ft)	2"	3"	4"	3"	4"
22	1.9	1.8	0.177	0.192	0.176	0.188	935	1076	1163	1559	1671
20	2.3	2.2	0.219	0.231	0.230	0.237	1301	1492	1609	2190	2340
18	2.9	2.8	0.302	0.306	0.314	0.331	2181	2484	2667	3714	3950
16	3.5	3.4	0.381	0.381	0.399	0.410	3265	3699	3955	5607	5938

Allowable Superimposed Loads (psf)

Gage	Spans	Max. UCS[1]	Span (ft-in.)										
			6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"	11'-0"
22	1	5'-11"	306	263	227	198	174	153	135	120	107	95	85
	2	6'-11"	348	304	227	198	174	153	135	120	107	95	85
	3	7'-0"	348	304	269	198	174	153	135	120	107	95	85
20	1	7'-1"	365	319	282	210	184	162	144	128	114	102	91
	2	8'-3"	365	319	282	252	226	162	144	128	114	102	91
	3	8'-4"	365	319	282	252	226	162	144	128	114	102	91
18	1	8'-1"	393	344	304	271	244	178	158	140	125	112	101
	2	9'-9"	393	344	304	271	244	220	200	183	125	112	101
	3	10'-0"	393	344	304	271	244	220	200	183	168	112	101
16	1	8'-8"	391	342	302	269	242	219	156	138	124	111	99
	2	10'-9"	391	342	302	269	242	219	199	182	167	154	99
	3	10'-9"	391	342	302	269	242	219	199	182	167	154	99

[1] Max. UCS = Maximum Unshored Clear Span (ft-in.)

Shoring required in shaded areas to right of heavy line.

Allowable Diaphragm Shear Values, q (plf) and Flexibility Factors, F (in./lb x 10^6)

Gage	Welds	Span (ft-in.)										
		6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"	11'-0"
22	q4	2304	2265	2232	2204	2179	2157	2138	2120	2104	2090	2077
	F4	0.36	0.36	0.37	0.37	0.38	0.38	0.39	0.39	0.39	0.39	0.40
	q7	2513	2459	2412	2372	2336	2305	2277	2252	2230	2210	2191
	F7	0.33	0.34	0.34	0.35	0.35	0.36	0.36	0.37	0.37	0.37	0.38
20	q4	2371	2325	2286	2252	2222	2195	2172	2151	2132	2115	2099
	F4	0.32	0.32	0.33	0.33	0.34	0.34	0.35	0.35	0.35	0.36	0.36
	q7	2623	2557	2501	2453	2410	2373	2340	2310	2283	2259	2237
	F7	0.29	0.29	0.30	0.31	0.31	0.32	0.32	0.33	0.33	0.33	0.34
18	q4	2524	2463	2410	2365	2325	2290	2259	2231	2206	2183	2162
	F4	0.26	0.26	0.27	0.28	0.28	0.28	0.29	0.29	0.30	0.30	0.30
	q7	2859	2772	2698	2633	2576	2527	2482	2442	2407	2374	2345
	F7	0.23	0.24	0.24	0.25	0.25	0.26	0.26	0.27	0.27	0.27	0.28
16	q4	2693	2616	2551	2494	2444	2400	2361	2326	2295	2266	2240
	F4	0.22	0.22	0.23	0.23	0.24	0.24	0.25	0.25	0.25	0.26	0.26
	q7	3112	3003	2910	2829	2758	2696	2640	2591	2546	2506	2469
	F7	0.19	0.19	0.20	0.21	0.21	0.22	0.22	0.22	0.23	0.23	0.24

Joist Sizing
Location: High Roof between lines 1 and 4

General Input

SDS	0.779	% g	Design Spectral Response Acceleration
Trib. Width	7	ft	Tributary Width to Joist
Span	60	ft	Joist Span

Loads

Roof					
	Dead	D	18	psf	
	Live Roof	L_r	20	psf	
	Snow	S	37	psf	
	Snow E	S_E	7.5	psf	
	Vertical Seismic	E_v	2.80	psf	ASCE 7-10 Eq. 12.4-4
	Vertical Wind	W	0.00	psf	
Floor					
	Dead	D	0	psf	
	Live	L	0	psf	
	Vertical Seismic	E_v	0.00	psf	ASCE 7-10 Eq. 12.4-4

Max TL	**55.0**	psf	3b	ASCE 7-10 Governing Load Combination
Max TL plf	**385**	plf	3b	ASCE 7-10 Governing Load Combination
Max S	**37.0**	psf		
Max S plf	**259**	plf		
Max Lr	**20.0**	psf		
Max Lr plf	**140**	plf		
Axial Load	**3000**	lb		Wind/Seismic Forces
Misc. Loac	**1000**	lb		Vertical Point Load at any panel point or mechanical unit

Joist Pre-Design Analysis

Steel Joist Selection	36LH11		See Plans for specific depth requirements
Allowable Loads from Economy Table			F.S.
Total D + (Lr or S)	465	plf	OK 1.21
Allow. For L/360	269	plf	OK 1.04
Allow. For L/240	404	plf	1.56

Moment of Inertia, I_j	1530	in^4	Design Criteria		
Est. Joist Deflection at TL	2.8	in	L/240	3.0	OK
Est. Joist Deflection at S	1.9	in	L/360	2.0	OK
Est. Joist Deflection at Lr	1.0	in	L/240	3.0	OK

Joist Sizing
Location: Flat Roof joists spanning from B to B.9

General Input

SDS	0.779	% g	Design Spectral Response Acceleration
Trib. Width	6	ft	Tributary Width to Joist
Span	21	ft	Joist Span

Loads

Roof				
Dead	D	18	psf	
Live Roof	L_r	20	psf	
Snow	S	50.5	psf	* Drift Load has been averaged over length
Snow E	S_E	7.5	psf	
Vertical Seismic	E_v	2.80	psf	ASCE 7-10 Eq. 12.4-4
Vertical Wind	W	0.00	psf	
Floor				
Dead	D	0	psf	
Live	L	0	psf	
Vertical Seismic	E_v	0.00	psf	ASCE 7-10 Eq. 12.4-4

Max TL	68.5	psf	3b	ASCE 7-10 Governing Load Combination
Max TL plf	411	plf	3b	ASCE 7-10 Governing Load Combination
Max S	50.5	psf		
Max S plf	303	plf		
Max Lr	20.0	psf		
Max Lr plf	120	plf		
Axial Load	3000	lb		Wind/Seismic Forces
Misc. Loac	1000	lb		Vertical Point Load at any panel point or mechanical unit

Joist Pre-Design Analysis

Steel Joist Selection 16K4

Allowable Loads from Economy Table				F.S.
Total D + (Lr or S)	447	plf	OK	1.09
Lr or S	333	plf	OK	1.10
Allow. For L/240	500	plf		1.65

			Design Criteria		
Moment of Inertia, I_j	79	in^4			
Est. Joist Deflection at TL	0.9	in	L/240	1.1	OK
Est. Joist Deflection at S	0.6	in	L/360	0.7	OK
Est. Joist Deflection at Lr	0.2	in	L/240	1.1	OK

Joist Sizing
Location: Flat Roof joists spanning from A to B

General Input

SDS	0.779	% g	Design Spectral Response Acceleration
Trib. Width	6	ft	Tributary Width to Joist
Span	29	ft	Joist Span

Loads

Roof					
	Dead	D	18	psf	
	Live Roof	L_r	20	psf	
	Snow	S	37	psf	
	Snow E	S_E	7.5	psf	
	Vertical Seismic	E_v	2.80	psf	ASCE 7-10 Eq. 12.4-4
	Vertical Wind	W	0.00	psf	
Floor					
	Dead	D	0	psf	
	Live	L	0	psf	
	Vertical Seismic	E_v	0.00	psf	ASCE 7-10 Eq. 12.4-4

Max TL	55.0 psf	3b	ASCE 7-10 Governing Load Combination
Max TL plf	330 plf	3b	ASCE 7-10 Governing Load Combination
Max S	37.0 psf		
Max S plf	222 plf		
Max Lr	20.0 psf		
Max Lr plf	120 plf		
Axial Load	3000 lb		Wind/Seismic Forces
Misc. Loac	1000 lb		Vertical Point Load at any panel point or mechanical unit

Joist Pre-Design Analysis

Steel Joist Selection 24k6

Allowable Loads from Economy Table			F.S.
Total D + (Lr or S)	435 plf	OK	1.32
Lr or S	354 plf	OK	1.59
Allow. For L/240	531 plf		2.39

Moment of Inertia, I_j	223	in^4	Design Criteria		
Est. Joist Deflection at TL	0.9	in	L/240	1.5	OK
Est. Joist Deflection at S	0.6	in	L/360	1.0	OK
Est. Joist Deflection at Lr	0.3	in	L/240	1.5	OK

Joist Sizing
Location: Sloped Roof joists spanning from 3 to 4 between B and B.9

General Input

SDS	0.779	% g	Design Spectral Response Acceleration
Trib. Width	4	ft	Tributary Width to Joist
Span	26	ft	Joist Span

Loads

Roof					
	Dead	D	18	psf	
	Live Roof	L_r	20	psf	
	Snow	S	64	psf	
	Snow E	S_E	7.5	psf	
	Vertical Seismic	E_v	2.80	psf	ASCE 7-10 Eq. 12.4-4
	Vertical Wind	W	0.00	psf	
Floor					
	Dead	D	0	psf	
	Live	L	0	psf	
	Vertical Seismic	E_v	0.00	psf	ASCE 7-10 Eq. 12.4-4

Max TL	**82.0**	psf	3b	ASCE 7-10 Governing Load Combination
Max TL plf	**328**	plf	3b	ASCE 7-10 Governing Load Combination
Max S	**64.0**	psf		
Max S plf	**256**	plf		
Max Lr	**20.0**	psf		
Max Lr plf	**80**	plf		
Axial Load	**3000**	lb		Wind/Seismic Forces
Misc. Loa	**1000**	lb		Vertical Point Load at any panel point or mechanical unit

Joist Pre-Design Analysis

Steel Joist Selection 22k4

Allowable Loads from Economy Table				F.S.
Total D + (Lr or S)	404	plf	OK	1.23
Lr or S	338	plf	OK	1.32
Allow. For L/240	507	plf		1.98

Moment of Inertia, I_j	153	in^4	Design Criteria		
Est. Joist Deflection at TL	0.8	in	L/240	1.3	OK
Est. Joist Deflection at S	0.6	in	L/360	0.9	OK
Est. Joist Deflection at Lr	0.2	in	L/240	1.3	OK

Joist Sizing
Location: Sloped Roof joists spanning from 3 to 4 between A & B

General Input

SDS	0.779	% g	Design Spectral Response Acceleration
Trib. Width	6	ft	Tributary Width to Joist
Span	26	ft	Joist Span

Loads

Roof					
	Dead	D	18	psf	
	Live Roof	L_r	20	psf	
	Snow	S	37	psf	
	Snow E	S_E	7.5	psf	
	Vertical Seismic	E_v	2.80	psf	ASCE 7-10 Eq. 12.4-4
	Vertical Wind	W	0.00	psf	
Floor					
	Dead	D	0	psf	
	Live	L	0	psf	
	Vertical Seismic	E_v	0.00	psf	ASCE 7-10 Eq. 12.4-4

Max TL	**55.0**	psf	3b	ASCE 7-10 Governing Load Combination
Max TL plf	**330**	plf	3b	ASCE 7-10 Governing Load Combination
Max S	**37.0**	psf		
Max S plf	**222**	plf		
Max Lr	**20.0**	psf		
Max Lr plf	**120**	plf		
Axial Load	**3000**	lb		Wind/Seismic Forces
Misc. Loac	**1000**	lb		Vertical Point Load at any panel point or mechanical unit

Joist Pre-Design Analysis

Steel Joist Selection 22k4

Allowable Loads from Economy Table				F.S.
Total D + (Lr or S)	404	plf	OK	1.22
Lr or S	338	plf	OK	1.52
Allow. For L/240	507	plf		2.28

Moment of Inertia, I_j	153	in^4	Design Criteria		
Est. Joist Deflection at TL	0.8	in	L/240	1.3	OK
Est. Joist Deflection at S	0.6	in	L/360	0.9	OK
Est. Joist Deflection at Lr	0.3	in	L/240	1.3	OK

SUNRISE ENGINEERING

Joist Sizing
Location: Sloped Roof joists on De-watering building

General Input

SDS	0.779	% g	Design Spectral Response Acceleration
Trib. Width	7	ft	Tributary Width to Joist
Span	26	ft	Joist Span

Loads

Roof					
	Dead	D	18	psf	
	Live Roof	L_r	20	psf	
	Snow	S	37	psf	
	Snow E	S_E	7.5	psf	
	Vertical Seismic	E_v	2.80	psf	ASCE 7-10 Eq. 12.4-4
	Vertical Wind	W	0.00	psf	
Floor					
	Dead	D	0	psf	
	Live	L	0	psf	
	Vertical Seismic	E_v	0.00	psf	ASCE 7-10 Eq. 12.4-4

Max TL	**55.0**	psf	3b	ASCE 7-10 Governing Load Combination
Max TL plf	**385**	plf	3b	ASCE 7-10 Governing Load Combination
Max S	**37.0**	psf		
Max S plf	**259**	plf		
Max Lr	**20.0**	psf		
Max Lr plf	**140**	plf		
Axial Load	**3000**	lb		Wind/Seismic Forces
Misc. Loac	**1000**	lb		Vertical Point Load at any panel point or mechanical unit

Joist Pre-Design Analysis

Steel Joist Selection 24k6

Allowable Loads from Economy Table				F.S.	
Total D + (Lr or S)	435	plf	OK	1.13	
Lr or S	354	plf	OK	1.37	
Allow. For L/240	531	plf		2.05	
Moment of Inertia, I_j	160	in^4	Design Criteria		
Est. Joist Deflection at TL	0.9	in	L/240	1.3	OK
Est. Joist Deflection at S	0.6	in	L/360	0.9	OK
Est. Joist Deflection at Lr	0.3	in	L/240	1.3	OK

Joist Sizing
Location: Floor Joists over Control Room

General Input

SDS	0.779	% g	Design Spectral Response Acceleration
Trib. Width	6	ft	Tributary Width to Joist
Span	20	ft	Joist Span

Loads

Roof					
	Dead	D	55	psf	
	Live Roof	L_r	0	psf	
	Snow	S	0	psf	
	Snow E	S_E	7.5	psf	
	Vertical Seismic	E_v	8.57	psf	ASCE 7-10 Eq. 12.4-4
	Vertical Wind	W	0.00	psf	
Floor					
	Dead	D	0	psf	
	Live	L	100	psf	
	Vertical Seismic	E_v	0.00	psf	ASCE 7-10 Eq. 12.4-4

Max TL	155.0	psf	2.00	ASCE 7-10 Governing Load Combination
Max TL plf	930	plf	2.00	ASCE 7-10 Governing Load Combination
Max S	0.0	psf		
Max S plf	0	plf		
Max Lr	0.0	psf		
Max Lr plf	0	plf		
Max L	100.0	psf		
Max L plf	600	plf		
Axial Load	3000	lb		Wind/Seismic Forces
Misc. Loac	1000	lb		Vertical Point Load at any panel point or mechanical unit

Joist Pre-Design Analysis

Steel Joist Selection 18LH06

Allowable Loads from Economy Table			F.S.
Total D + (Lr or S)	955 plf	OK	1.03
L, Lr, or S	738 plf	OK	1.23
Allow. For L/240	1107 plf		1.85

Moment of Inertia, I_j	150	in^4	Design Criteria		
Est. Joist Deflection at TL	0.8	in	L/240	1.0	OK
Est. Joist Deflection at S	0.0	in	L/360	0.7	OK
Est. Joist Deflection at Lr	0.0	in	L/360	0.7	OK
Est. Joist Deflection at L	0.5	in	L/360	0.7	OK

Joist Sizing
Location: Floor Joists over Storage Area

General Input

SDS	0.779	% g	Design Spectral Response Acceleration
Trib. Width	4	ft	Tributary Width to Joist
Span	17	ft	Joist Span

Loads

Roof					
	Dead	D	55	psf	
	Live Roof	L_r	0	psf	
	Snow	S	0	psf	
	Snow E	S_E	7.5	psf	
	Vertical Seismic	E_v	8.57	psf	ASCE 7-10 Eq. 12.4-4
	Vertical Wind	W	0.00	psf	
Floor					
	Dead	D	0	psf	
	Live	L	200	psf	
	Vertical Seismic	E_v	0.00	psf	ASCE 7-10 Eq. 12.4-4

Max TL	**255.0**	psf	2.00	ASCE 7-10 Governing Load Combination
Max TL plf	**1020**	plf	2.00	ASCE 7-10 Governing Load Combination
Max S	**0.0**	psf		
Max S plf	**0**	plf		
Max Lr	**0.0**	psf		
Max Lr plf	**0**	plf		
Max L	**200.0**	psf		
Max L plf	**800**	plf		
Axial Load	**3000**	lb		Wind/Seismic Forces
Misc. Loac	**1000**	lb		Vertical Point Load at any panel point or mechanical unit

Joist Pre-Design Analysis

Steel Joist Selection 18LH06

Allowable Loads from Economy Table				F.S.
Total D + (Lr or S)	954	plf	CHECK	0.94
L, Lr, or S	900	plf	OK	1.13
Allow. For L/240	1350	plf		1.69

Moment of Inertia, I_j	112	in^4	Design Criteria		
Est. Joist Deflection at TL	0.6	in	L/240	0.9	OK
Est. Joist Deflection at S	0.0	in	L/360	0.6	OK
Est. Joist Deflection at Lr	0.0	in	L/360	0.6	OK
Est. Joist Deflection at L	0.5	in	L/360	0.6	OK

GRAVITY ANALYSIS

Printed: 29 JAN 2014, 11:52AM
File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Steel Beam

Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : Beam 1- Beam along Line 2 Suporting sloped roof

CODE REFERENCES

Load Combination Set : ASCE 7-10

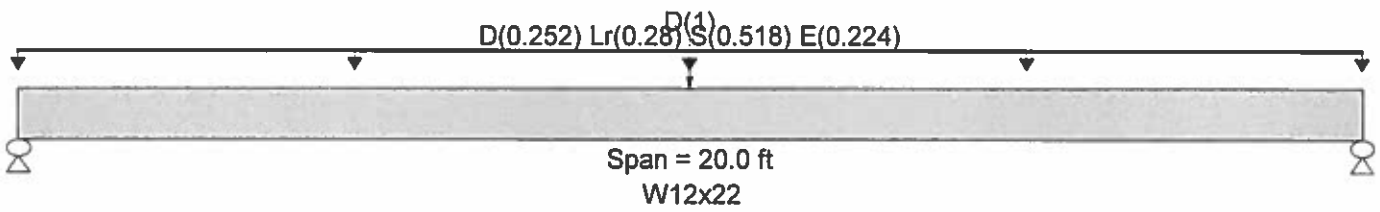
Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam bracing is defined as a set spacing over all spans
Bending Axis : Major Axis Bending
Load Combination ASCE 7-10

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi

Unbraced Lengths

First Brace starts at ft from Left-Most support
Regular spacing of lateral supports on length of beam = 4.0 ft



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.0180, Lr = 0.020, S = 0.0370, E = 0.0160 ksf, Tributary Width = 14.0 ft, (Roof Loading)
Point Load : D = 1.0 k @ 10.0 ft, (Miscellaneous Mech/Industrial)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.645 : 1	Maximum Shear Stress Ratio =	0.132 : 1
Section used for this span	W12x22	Section used for this span	W12x22
Ma : Applied	44.603 k-ft	Va : Applied	8.421 k
Mn / Omega : Allowable	69.107 k-ft	Vn/Omega : Allowable	63.960 k
Load Combination	+D+S+H	Load Combination	+D+S+H
Location of maximum on span	10.000 ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.415 in	Ratio =	577
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.924 in	Ratio =	260
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
+D+H													
Dsgn. L = 4.00 ft	1	0.147	0.051	10.77		10.77	122.08	73.10	1.58	1.00	3.24	95.94	63.96
Dsgn. L = 4.00 ft	1	0.235	0.034	17.15	10.77	17.15	122.08	73.10	1.15	1.00	2.14	95.94	63.96
Dsgn. L = 4.00 ft	1	0.269	0.016	18.70	17.15	18.70	116.21	69.59	1.02	1.00	1.05	95.94	63.96
Dsgn. L = 4.00 ft	1	0.235	0.034	17.15	10.77	17.15	122.08	73.10	1.15	1.00	2.14	95.94	63.96
Dsgn. L = 4.00 ft	1	0.147	0.051	10.77		10.77	122.08	73.10	1.58	1.00	3.24	95.94	63.96
+D+L+H													
Dsgn. L = 4.00 ft	1	0.147	0.051	10.77		10.77	122.08	73.10	1.58	1.00	3.24	95.94	63.96
Dsgn. L = 4.00 ft	1	0.235	0.034	17.15	10.77	17.15	122.08	73.10	1.15	1.00	2.14	95.94	63.96
Dsgn. L = 4.00 ft	1	0.269	0.016	18.70	17.15	18.70	116.21	69.59	1.02	1.00	1.05	95.94	63.96
Dsgn. L = 4.00 ft	1	0.235	0.034	17.15	10.77	17.15	122.08	73.10	1.15	1.00	2.14	95.94	63.96
Dsgn. L = 4.00 ft	1	0.147	0.051	10.77		10.77	122.08	73.10	1.58	1.00	3.24	95.94	63.96
+D+Lr+H													
Dsgn. L = 4.00 ft	1	0.270	0.094	19.73		19.73	122.08	73.10	1.57	1.00	6.04	95.94	63.96
Dsgn. L = 4.00 ft	1	0.419	0.060	30.59	19.73	30.59	122.08	73.10	1.13	1.00	3.82	95.94	63.96
Dsgn. L = 4.00 ft	1	0.472	0.025	32.70	30.59	32.70	115.64	69.24	1.01	1.00	1.61	95.94	63.96
Dsgn. L = 4.00 ft	1	0.419	0.060	30.59	19.73	30.59	122.08	73.10	1.13	1.00	3.82	95.94	63.96
Dsgn. L = 4.00 ft	1	0.270	0.094	19.73		19.73	122.08	73.10	1.57	1.00	6.04	95.94	63.96
+D+S+H													
Dsgn. L = 4.00 ft	1	0.374	0.132	27.35		27.35	122.08	73.10	1.56	1.00	8.42	95.94	63.96

Steel Beam

File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : Beam 1- Beam along Line 2 Suporting sloped roof

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
Dsgn. L = 4.00 ft	1	0.575	0.082	42.02	27.35	42.02	122.08	73.10	1.13	1.00	5.25	95.94	63.96
Dsgn. L = 4.00 ft	1	0.645	0.033	44.60	42.02	44.60	115.41	69.11	1.01	1.00	2.08	95.94	63.96
Dsgn. L = 4.00 ft	1	0.575	0.082	42.02	27.35	42.02	122.08	73.10	1.13	1.00	5.25	95.94	63.96
Dsgn. L = 4.00 ft	1	0.374	0.132	27.35		27.35	122.08	73.10	1.56	1.00	8.42	95.94	63.96
+D+0.750Lr+0.750L+H													
Dsgn. L = 4.00 ft	1	0.239	0.083	17.49		17.49	122.08	73.10	1.57	1.00	5.34	95.94	63.96
Dsgn. L = 4.00 ft	1	0.373	0.053	27.23	17.49	27.23	122.08	73.10	1.14	1.00	3.40	95.94	63.96
Dsgn. L = 4.00 ft	1	0.422	0.023	29.20	27.23	29.20	115.64	69.24	1.01	1.00	1.47	95.94	63.96
Dsgn. L = 4.00 ft	1	0.373	0.053	27.23	17.49	27.23	122.08	73.10	1.14	1.00	3.40	95.94	63.96
Dsgn. L = 4.00 ft	1	0.239	0.083	17.49		17.49	122.08	73.10	1.57	1.00	5.34	95.94	63.96
+D+0.750L+0.750S+H													
Dsgn. L = 4.00 ft	1	0.317	0.111	23.20		23.20	122.08	73.10	1.57	1.00	7.13	95.94	63.96
Dsgn. L = 4.00 ft	1	0.490	0.070	35.80	23.20	35.80	122.08	73.10	1.13	1.00	4.48	95.94	63.96
Dsgn. L = 4.00 ft	1	0.551	0.029	38.13	35.80	38.13	115.52	69.18	1.01	1.00	1.83	95.94	63.96
Dsgn. L = 4.00 ft	1	0.490	0.070	35.80	23.20	35.80	122.08	73.10	1.13	1.00	4.48	95.94	63.96
Dsgn. L = 4.00 ft	1	0.317	0.111	23.20		23.20	122.08	73.10	1.57	1.00	7.13	95.94	63.96
+D+0.60W+H													
Dsgn. L = 4.00 ft	1	0.147	0.051	10.77		10.77	122.08	73.10	1.58	1.00	3.24	95.94	63.96
Dsgn. L = 4.00 ft	1	0.235	0.034	17.15	10.77	17.15	122.08	73.10	1.15	1.00	2.14	95.94	63.96
Dsgn. L = 4.00 ft	1	0.269	0.016	18.70	17.15	18.70	116.21	69.59	1.02	1.00	1.05	95.94	63.96
Dsgn. L = 4.00 ft	1	0.235	0.034	17.15	10.77	17.15	122.08	73.10	1.15	1.00	2.14	95.94	63.96
Dsgn. L = 4.00 ft	1	0.147	0.051	10.77		10.77	122.08	73.10	1.58	1.00	3.24	95.94	63.96
+D+0.70E+H													
Dsgn. L = 4.00 ft	1	0.216	0.075	15.79		15.79	122.08	73.10	1.57	1.00	4.81	95.94	63.96
Dsgn. L = 4.00 ft	1	0.338	0.048	24.68	15.79	24.68	122.08	73.10	1.14	1.00	3.09	95.94	63.96
Dsgn. L = 4.00 ft	1	0.383	0.021	26.54	24.68	26.54	115.75	69.31	1.01	1.00	1.36	95.94	63.96
Dsgn. L = 4.00 ft	1	0.338	0.048	24.68	15.79	24.68	122.08	73.10	1.14	1.00	3.09	95.94	63.96
Dsgn. L = 4.00 ft	1	0.216	0.075	15.79		15.79	122.08	73.10	1.57	1.00	4.81	95.94	63.96
+D+0.750Lr+0.750L+0.450W+H													
Dsgn. L = 4.00 ft	1	0.239	0.083	17.49		17.49	122.08	73.10	1.57	1.00	5.34	95.94	63.96
Dsgn. L = 4.00 ft	1	0.373	0.053	27.23	17.49	27.23	122.08	73.10	1.14	1.00	3.40	95.94	63.96
Dsgn. L = 4.00 ft	1	0.422	0.023	29.20	27.23	29.20	115.64	69.24	1.01	1.00	1.47	95.94	63.96
Dsgn. L = 4.00 ft	1	0.373	0.053	27.23	17.49	27.23	122.08	73.10	1.14	1.00	3.40	95.94	63.96
Dsgn. L = 4.00 ft	1	0.239	0.083	17.49		17.49	122.08	73.10	1.57	1.00	5.34	95.94	63.96
+D+0.750L+0.750S+0.450W+H													
Dsgn. L = 4.00 ft	1	0.317	0.111	23.20		23.20	122.08	73.10	1.57	1.00	7.13	95.94	63.96
Dsgn. L = 4.00 ft	1	0.490	0.070	35.80	23.20	35.80	122.08	73.10	1.13	1.00	4.48	95.94	63.96
Dsgn. L = 4.00 ft	1	0.551	0.029	38.13	35.80	38.13	115.52	69.18	1.01	1.00	1.83	95.94	63.96
Dsgn. L = 4.00 ft	1	0.490	0.070	35.80	23.20	35.80	122.08	73.10	1.13	1.00	4.48	95.94	63.96
Dsgn. L = 4.00 ft	1	0.317	0.111	23.20		23.20	122.08	73.10	1.57	1.00	7.13	95.94	63.96
+D+0.750L+0.750S+0.5250E+H													
Dsgn. L = 4.00 ft	1	0.369	0.130	26.97		26.97	122.08	73.10	1.56	1.00	8.30	95.94	63.96
Dsgn. L = 4.00 ft	1	0.567	0.081	41.45	26.97	41.45	122.08	73.10	1.13	1.00	5.18	95.94	63.96
Dsgn. L = 4.00 ft	1	0.637	0.032	44.01	41.45	44.01	115.41	69.11	1.01	1.00	2.06	95.94	63.96
Dsgn. L = 4.00 ft	1	0.567	0.081	41.45	26.97	41.45	122.08	73.10	1.13	1.00	5.18	95.94	63.96
Dsgn. L = 4.00 ft	1	0.369	0.130	26.97		26.97	122.08	73.10	1.56	1.00	8.30	95.94	63.96
+0.60D+0.60W+0.60H													
Dsgn. L = 4.00 ft	1	0.088	0.030	6.46		6.46	122.08	73.10	1.58	1.00	1.94	95.94	63.96
Dsgn. L = 4.00 ft	1	0.141	0.020	10.29	6.46	10.29	122.08	73.10	1.15	1.00	1.29	95.94	63.96
Dsgn. L = 4.00 ft	1	0.161	0.010	11.22	10.29	11.22	116.21	69.59	1.02	1.00	0.63	95.94	63.96
Dsgn. L = 4.00 ft	1	0.141	0.020	10.29	6.46	10.29	122.08	73.10	1.15	1.00	1.29	95.94	63.96
Dsgn. L = 4.00 ft	1	0.088	0.030	6.46		6.46	122.08	73.10	1.58	1.00	1.94	95.94	63.96
+0.60D+0.70E+0.60H													
Dsgn. L = 4.00 ft	1	0.157	0.055	11.48		11.48	122.08	73.10	1.57	1.00	3.51	95.94	63.96
Dsgn. L = 4.00 ft	1	0.244	0.035	17.82	11.48	17.82	122.08	73.10	1.13	1.00	2.23	95.94	63.96
Dsgn. L = 4.00 ft	1	0.275	0.015	19.06	17.82	19.06	115.64	69.24	1.01	1.00	0.94	95.94	63.96
Dsgn. L = 4.00 ft	1	0.244	0.035	17.82	11.48	17.82	122.08	73.10	1.13	1.00	2.23	95.94	63.96
Dsgn. L = 4.00 ft	1	0.157	0.055	11.48		11.48	122.08	73.10	1.57	1.00	3.51	95.94	63.96

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr+S	1	0.9241	10.100		0.0000	0.000

Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Span	Max. Downward Defl	Location in Span	Span	Max. Upward Defl	Location in Span
D Only	1	0.2840	10.100		0.0000	0.000
Lr Only	1	0.2246	10.100		0.0000	0.000
S Only	1	0.4155	10.100		0.0000	0.000
Lr+S	1	0.6401	10.100		0.0000	0.000

Steel Beam

Description : Beam 1- Beam along Line 2 Suporting sloped roof

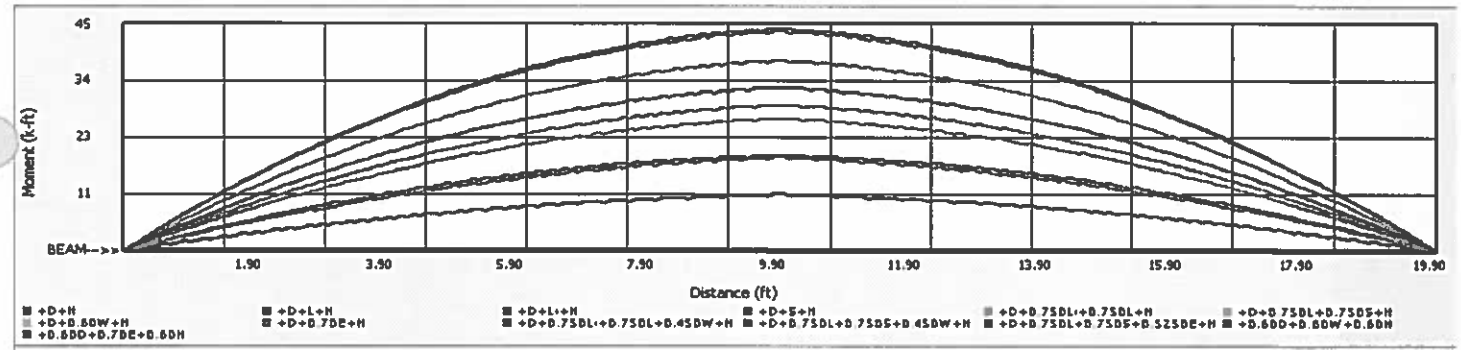
Maximum Deflections for Load Combinations - Unfactored Loads

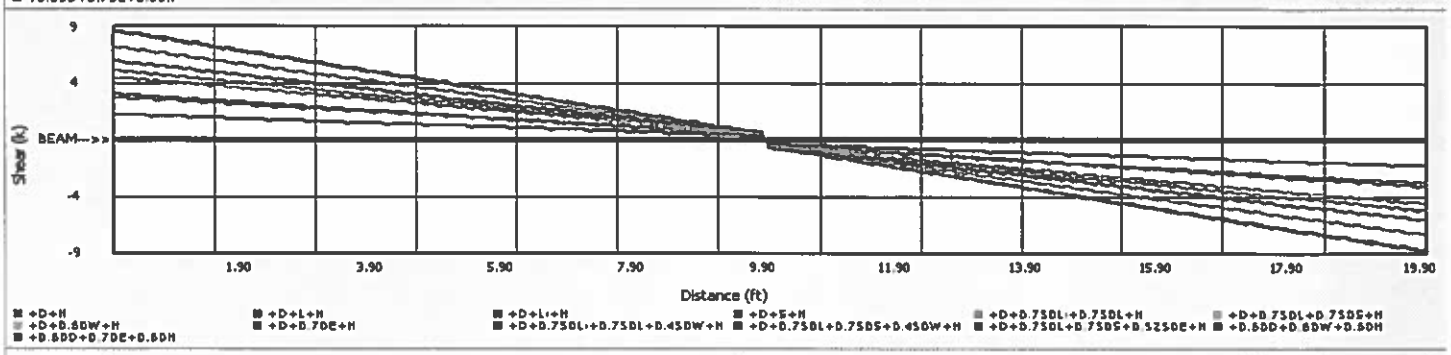
Load Combination	Span	Max. Downward Defl	Location in Span	Span	Max. Upward Defl	Location in Span
E Only	1	0.1797	10.100		0.0000	0.000
D+Lr	1	0.5086	10.100		0.0000	0.000
D+S	1	0.6995	10.100		0.0000	0.000
D+Lr+S	1	0.9241	10.100		0.0000	0.000
D+E	1	0.4636	10.100		0.0000	0.000
D+Lr+E	1	0.6882	10.100		0.0000	0.000

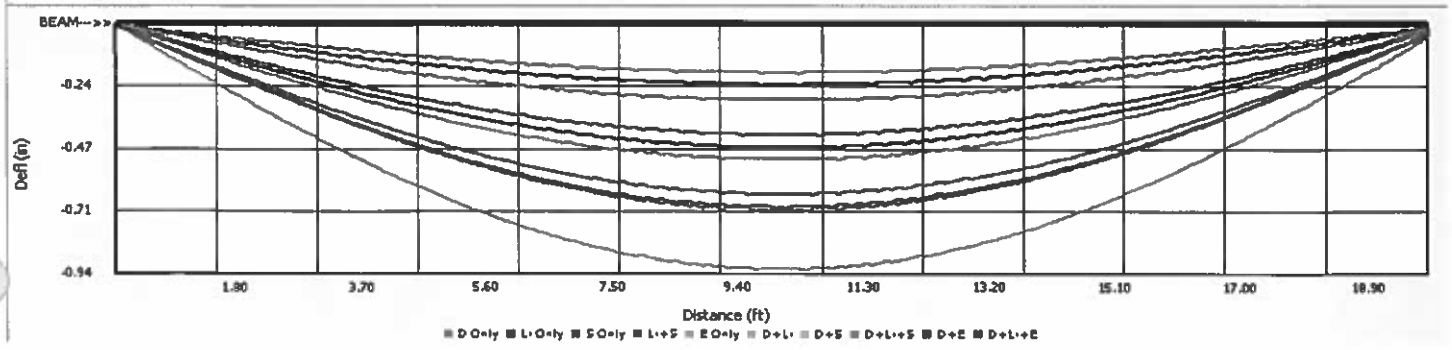
Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	11.221	11.221
D Only	3.241	3.241
Lr Only	2.800	2.800
S Only	5.180	5.180
Lr+S	7.980	7.980
E Only	2.240	2.240
D+Lr	6.041	6.041
D+S	8.421	8.421
D+Lr+S	11.221	11.221
D+E	5.481	5.481
D+Lr+E	8.281	8.281







Printed: 29 JAN 2014, 12:01PM

Steel Beam

File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Beam along 3.2

CODE REFERENCES

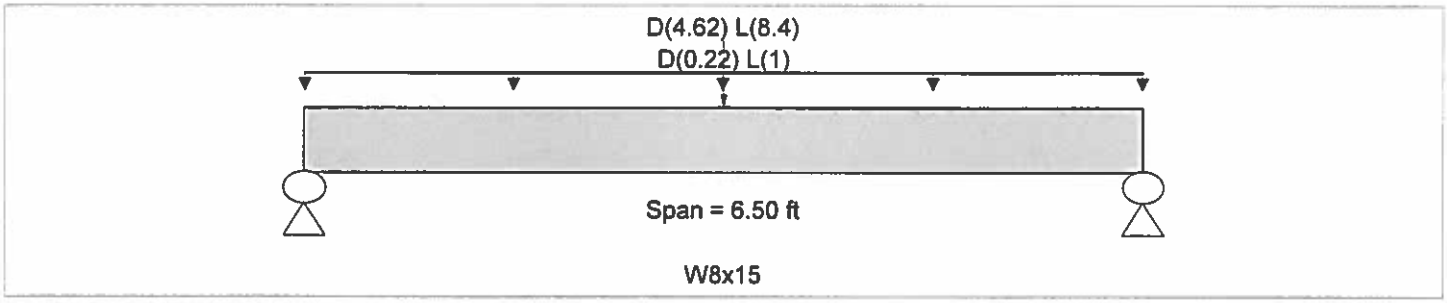
(

Load Combination Set : ASCE 7-10

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending
Load Combination ASCE 7-10

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Load(s) for Span Number 1
Point Load : D = 4.620, L = 8.40 k @ 3.250 ft
Uniform Load : D = 0.220, L = 1.0 k/ft, Tributary Width = 1.0 ft, (Storage Area)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.813 : 1	Maximum Shear Stress Ratio =	0.264 : 1
Section used for this span	W8x15	Section used for this span	W8x15
Ma : Applied	27.601 k-ft	Va : Applied	10.475 k
Mn / Omega : Allowable	33.932 k-ft	Vn/Omega : Allowable	39.739 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	3.250ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.089 in	Ratio =	874
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <180
Max Downward Total Deflection	0.129 in	Ratio =	606
Max Upward Total Deflection	0.000 in	Ratio =	0 <60.

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
+D+H													
Dsgn. L = 6.50 ft	1	0.255	0.076	8.67		8.67	56.67	33.93	1.29	1.00	3.03	59.61	39.74
+D+L+H													
Dsgn. L = 6.50 ft	1	0.813	0.264	27.60		27.60	56.67	33.93	1.27	1.00	10.48	59.61	39.74
+D+Lr+H													
Dsgn. L = 6.50 ft	1	0.255	0.076	8.67		8.67	56.67	33.93	1.29	1.00	3.03	59.61	39.74
+D+S+H													
Dsgn. L = 6.50 ft	1	0.255	0.076	8.67		8.67	56.67	33.93	1.29	1.00	3.03	59.61	39.74
+D+0.750Lr+0.750L+H													
Dsgn. L = 6.50 ft	1	0.674	0.217	22.87		22.87	56.67	33.93	1.27	1.00	8.61	59.61	39.74
+D+0.750L+0.750S+H													
Dsgn. L = 6.50 ft	1	0.674	0.217	22.87		22.87	56.67	33.93	1.27	1.00	8.61	59.61	39.74
+D+0.60W+H													
Dsgn. L = 6.50 ft	1	0.255	0.076	8.67		8.67	56.67	33.93	1.29	1.00	3.03	59.61	39.74
+D+0.70E+H													
Dsgn. L = 6.50 ft	1	0.255	0.076	8.67		8.67	56.67	33.93	1.29	1.00	3.03	59.61	39.74
+D+0.750Lr+0.750L+0.450W+H													
Dsgn. L = 6.50 ft	1	0.674	0.217	22.87		22.87	56.67	33.93	1.27	1.00	8.61	59.61	39.74
+D+0.750L+0.750S+0.450W+H													
Dsgn. L = 6.50 ft	1	0.674	0.217	22.87		22.87	56.67	33.93	1.27	1.00	8.61	59.61	39.74
+D+0.750L+0.750S+0.5250E+H													
Dsgn. L = 6.50 ft	1	0.674	0.217	22.87		22.87	56.67	33.93	1.27	1.00	8.61	59.61	39.74
+0.60D+0.60W+0.60H													

Printed: 29 JAN 2014, 12:01PM

Steel Beam

File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Beam along 3.2

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
Dsgn. L = 6.50 ft +0.60D+0.70E+0.60H	1	0.153	0.046	5.20		5.20	56.67	33.93	1.29	1.00	1.82	59.61	39.74
Dsgn. L = 6.50 ft	1	0.153	0.046	5.20		5.20	56.67	33.93	1.29	1.00	1.82	59.61	39.74

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.1286	3.283		0.0000	0.000

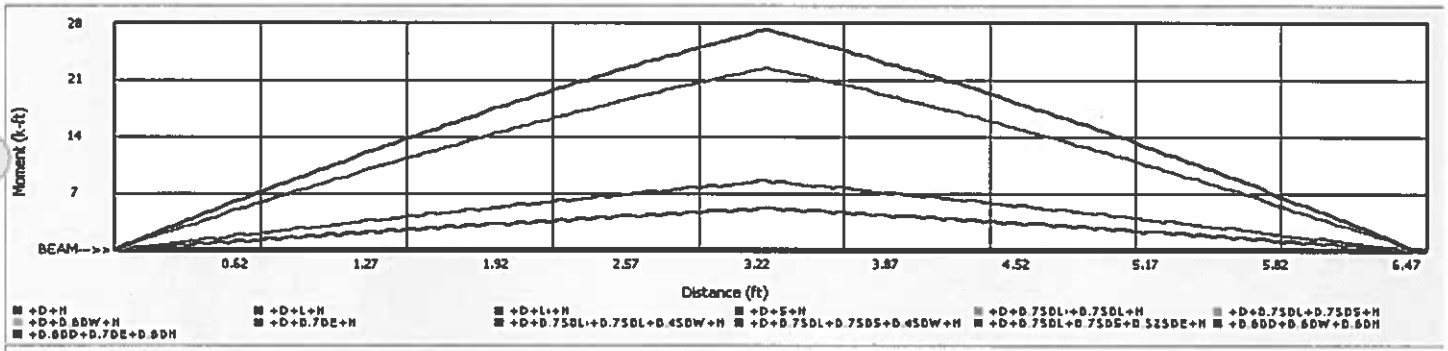
Maximum Deflections for Load Combinations - Unfactored Loads

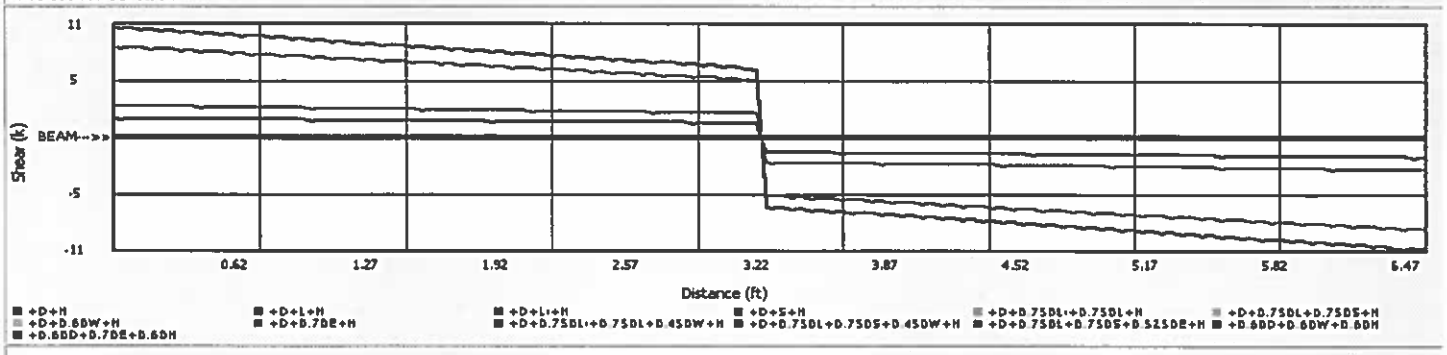
Load Combination	Span	Max. Downward Defl	Location in Span	Span	Max. Upward Defl	Location in Span
D Only	1	0.0395	3.283		0.0000	0.000
L Only	1	0.0892	3.283		0.0000	0.000
D+L	1	0.1286	3.283		0.0000	0.000

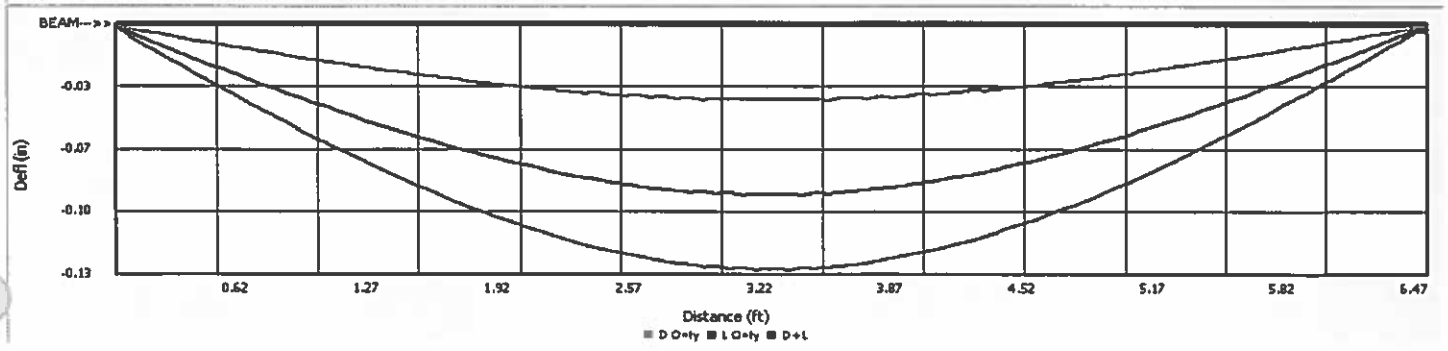
Vertical Reactions - Unfactored

Support notation : Far left is #1 — Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	10.475	10.475
D Only	3.025	3.025
L Only	7.450	7.450
D+L	10.475	10.475







LATERAL ANALYSIS

Design Seismic Loads
ASCE 7-10 (Equivalent Lateral Force Procedure)

Site Class	D		Risk Category	III	
S_s	1.103		Seismic Importance Factor, I_E	1.25	
S_1	0.417		Response Modification Coefficient, R	5	
F_a	1.1		Height above base to highest level, h_n	26	ft
F_v	1.583		Period Coefficient, C_t	0.02	
S_{MS}	1.168077		Period height variable, x	0.75	
S_{M1}	0.660111		Approximate Period, T_a	0.230	sec
S_{DS}	0.779		Short Period, T_s	0.565	sec
S_{D1}	0.440		Is Equivalent Lateral Forc e Procedure OK?	YES	(ASCE 7-10 Table 12.6-1)
Seismic Design Category		D	Long Period Transition Period, T_L	8	sec

C_s	0.195		**Structural Walls and Their Anchorage**		
$C_{s\ MAX}$	0.478		Dead Weight of Roof	18	psf
$C_{s\ MIN}$	0.043		Masonry wall height	26	ft
$C_{s\ USED}$	0.195		Masonry wall weight	77	psf
Base Shear, V	**0.195W**	lb	Is Diaphragm Flexiblel or Rigid	F	
	0.136W	lb	Maximum Diaphragm Span	50.5	ft
W	630450	lb	Diaphragm Span Used in Eq. 12.11-2, L_f	50.5	ft
V (LRFD)	122736	lb	Amplification Factor for Diaphragm Flex. k_a	1.505	
V (ASD)	85915	lb			
k	1		Anchorage of Masonry Wall	587	plf (ASCE 7-10 12.11-1)
$\Sigma w_i h_i^k$	16391700				
Max Fp	0.389Wpx		Seismic Lateral Pressure for Out of Plane Des	30.0	psf (ASCE 7-10 12.11.1)
Min Fp	0.195Wpx		Seismic Vert. Pressure for Anchorage at Roo	2.803	psf (ASCE 7-10 12.4-4)

	Level	Total Effective Seismic Weight	Height from Base to Level	Lateral Seismic Force	Lateral Seismic Force	Diaphragm Design Force	Governing Diaphragm Design Force
	#	*w (lb)*	*h (ft)*	*F_x (lb) [LRFD]*	*F_x (lb) [ASD]*	*F_{px} (lb) [LRFD]*	*F_{px} (lb)[LRFD]*
3	n/a	0	0	**0.000Wx**	**0.000Wx**	0.000Wpx	**0.000Wpx**
2	High Roof	0	0	**0.000Wx**	**0.000Wx**	0.000Wpx	**0.000Wpx**
1	Low Roof	630450	26	**0.195Wx**	**0.136Wx**	0.195Wpx	**0.195Wpx**

ASCE 7-10 Wind Forces, Chapter 27, Part I

Description : OWTP Wind Evaluation

OWTP Wind Evaluation

Basic Values

Risk Category	3 per ASCE 7-10 Table 1.5.1	Horizontal Dim. in North-South Direction (B or L) =	100.0 ft
V : Basic Wind Speed	120.0	Horizontal Dim. in East-West Direction (B or L) =	109.0 ft
Kd : Directionality Factor	0.850 per ASCE 7-10 Table 26.6-1	h : Mean Roof height =	28.50 ft

Exposure Category per ASCE 7-10 Section 26.7

North : Exposure B East : Exposure B
South : Exposure B West : Exposure B

Topographic Factor per ASCE 7-10 Sec 26.8 & Figure 26.8-1

North :	K1 =	K2 =	K3 =	Kzt = 1.000
South :	K1 =	K2 =	K3 =	Kzt = 1.000
East :	K1 =	K2 =	K3 =	Kzt = 1.000
West :	K1 =	K2 =	K3 =	Kzt = 1.000

Building Period & Flexibility Category

User has specified the building frequency is >= 1 Hz, therefore considered RIGID for both North-South and East-West directions.

Building Story Data

Level Description	hi ft	Story Ht ft	E_R : X ft	E_R : X ft
Roof	26.00	26.00	0.000	0.000

Gust Factor

For wind coming from direction indicated

North	=	**0.850**	South	=	**0.850**
East	=	**0.850**	West	=	**0.850**

Enclosure

Check if Building Qualifies as "Open"

	North Wall	South Wall	East Wall	West Wall	Roof	Total
Agross	2,686.0 ft^2	2,463.0 ft^2	2,700.0 ft^2	2,110.0 ft^2	12,112.0 ft^2	22,071.0 ft^2
Aopenings	60.0 ft^2	276.0 ft^2	128.0 ft^2	320.0 ft^2	64.0 ft^2	848.0 ft^2
Aopenings >= 0.8 * Agross ?	No	No	No	No		

All four Agross values must be non-zero **Building does NOT qualify as "Open"**

North Elevation : Determine Enclosure Classification per ASCE Section 26.10

Reference area = smaller of 4 sq. ft. or 1% of Agross	=	4.0 ft^2	Is Ao > 1.10 * Aoi ?	=	No
Aoi = Ao-total - Ao	=	788.0 ft^2	Is Ao > Reference Area ?	=	Yes
Agi = Ag-total - Ag	=	19,385.0 ft^2	Is Aoi / Agi >= 0.20 ?	=	Yes
Aoi / Agi	=	0.04065			

Building is "Enclosed" when the North wall receives positive external pressure

South Elevation : Determine Enclosure Classification per ASCE Section 26.10

Reference area = smaller of 4 sq. ft. or 1% of Agross	=	4.0 ft^2	Is Ao > 1.10 * Aoi ?	=	No
Aoi = Ao-total - Ao	=	572.0 ft^2	Is Ao > Reference Area ?	=	Yes
Agi = Ag-total - Ag	=	19,608.0 ft^2	Is Aoi / Agi >= 0.20 ?	=	Yes
Aoi / Agi	=	0.02917			

Building is "Enclosed" when the South wall receives positive external pressure

East Elevation : Determine Enclosure Classification per ASCE Section 26.10

Reference area = smaller of 4 sq. ft. or 1% of Agross	=	4.0 ft^2	Is Ao > 1.10 * Aoi ?	=	No
Aoi = Ao-total - Ao	=	720.0 ft^2	Is Ao > Reference Area ?	=	Yes
Agi = Ag-total - Ag	=	19,371.0 ft^2	Is Aoi / Agi >= 0.20 ?	=	Yes
Aoi / Agi	=	0.03717			

Building is "Enclosed" when the East wall receives positive external pressure

ASCE 7-10 Wind Forces, Chapter 27, Part I

Description : OWTP Wind Evaluation

West Elevation : Determine Enclosure Classification per ASCE Section 26.10

Reference area = smaller of 4 sq. ft. or 1% of Agross	=	4.0 ft^2	Is Ao > 1.10 * Aoi ?	=	No
Aoi = Ao-total - Ao	=	528.0 ft^2	Is Ao > Reference Area ?	=	Yes
Agi = Ag-total - Ag	=	19,961.0 ft^2	Is Aoi / Agi >= 0.20 ?	=	Yes
Aoi / Agi	=	0.02645			

Building is "Enclosed" when the West wall receives positive external pressure

Velocity Pressures

When the following walls experience leeward or sidewall pressures, the value of Kh shall be (per Table 27.3-1) :

North Wall = 0.6904 psf South Wall = 0.6904 psf East Wall = 0.6904 psf West Wall = 0.6904 psf

When the following walls experience leeward or sidewall pressures, the value of qh shall be (per Table 27.3-1) :

North Wall = 21.633 psf South Wall = 21.633 psf East Wall = 21.633 psf West Wall = 21.633 psf

qz : Windward Wall Velocity Pressures at various heights per Eq. 27.3-1

Height Above Base (ft)	North Elevation Kz	qz	South Elevation Kz	qz	East Elevation Kz	qz	West Elevation Kz	qz
0.00	0.575	18.01	0.575	18.01	0.575	18.01	0.575	18.01
5.00	0.575	18.01	0.575	18.01	0.575	18.01	0.575	18.01
10.00	0.575	18.01	0.575	18.01	0.575	18.01	0.575	18.01
15.00	0.575	18.01	0.575	18.01	0.575	18.01	0.575	18.01
20.00	0.624	19.55	0.624	19.55	0.624	19.55	0.624	19.55
25.00	0.665	20.84	0.665	20.84	0.665	20.84	0.665	20.84

Pressure Coefficients

GCpi Values when elevation receives positive external pressure

GCpi : Internal pressure coefficient, per sec. 26.11 and Table 26.11-1

North	South	East	West
+/- 0.180	+/- 0.180	+/- 0.180	+/- 0.180

Specify Cp Values from Figure 27.4-1 for Windward, Leeward & Side Walls

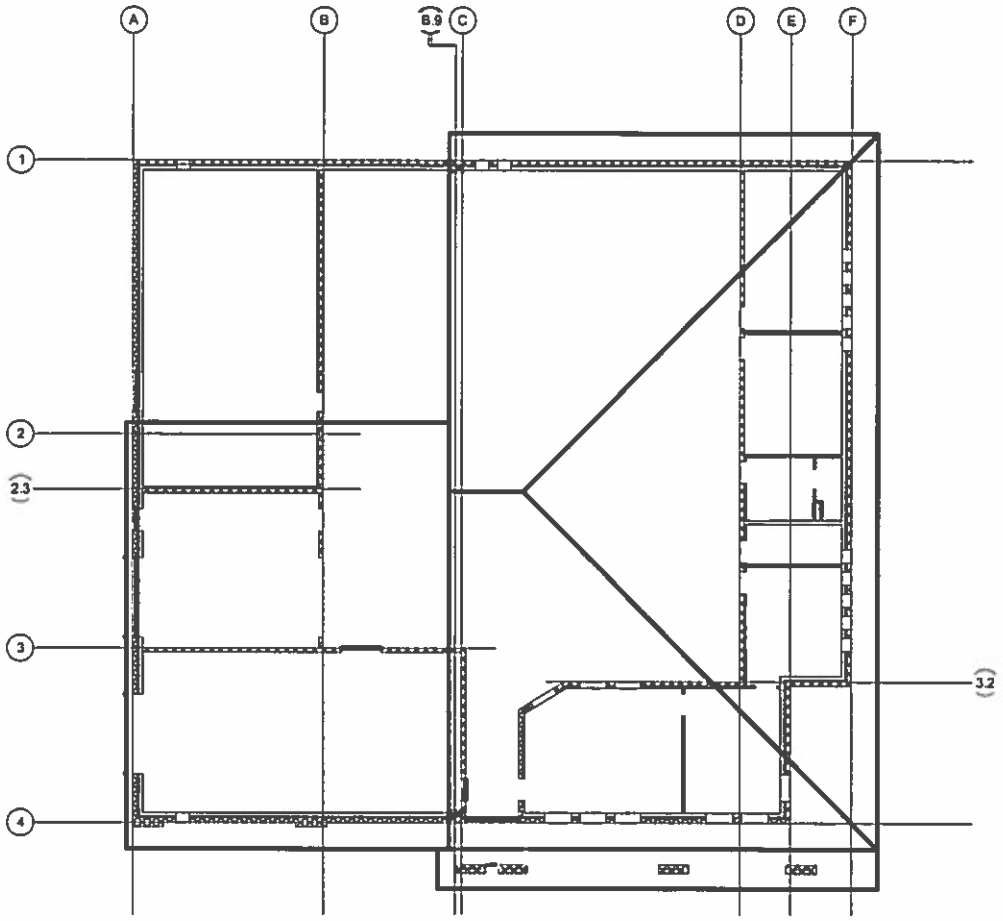
Cp Values when elevation receives positive external pressure

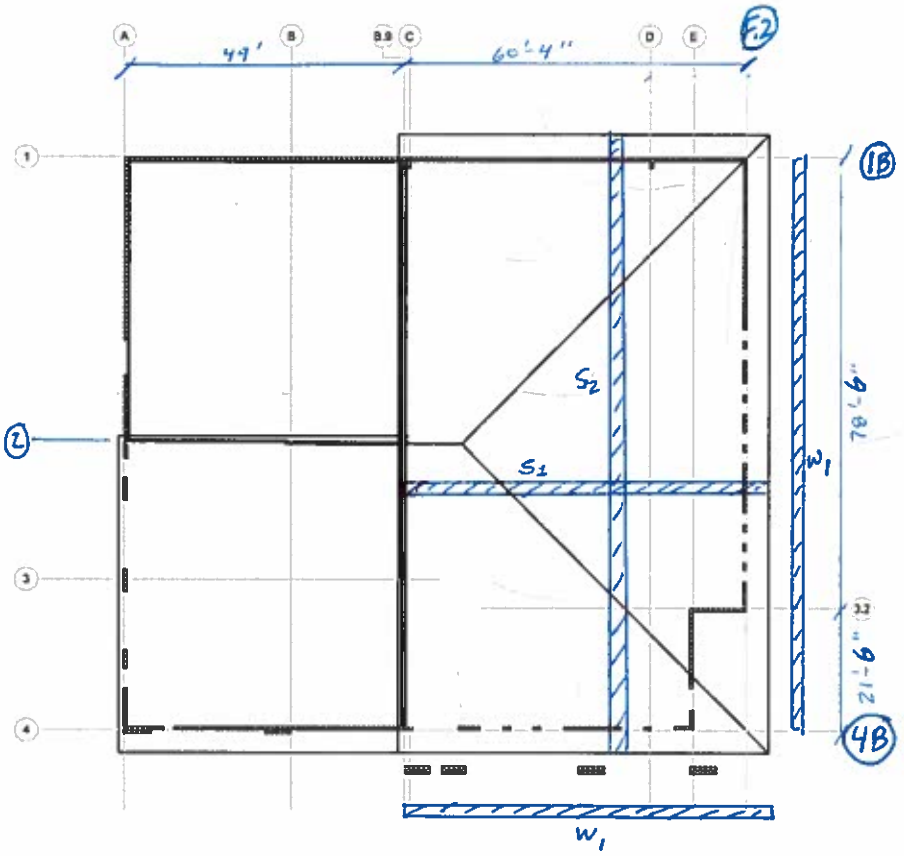
	North	South	East	West
Windward Wall	0.80	0.80	0.80	0.80
Leeward Wall	-0.50	-0.50	-0.50	-0.50
Side Walls	-0.70	-0.70	-0.70	-0.70

User Defined Roof locations and Net Directional Pressure Coefficients : Cp or Cn

Cp or Cn Values when the indicated building elevation receives positive external pressure

Description	North	South	East	West
High Roof Windward	-0.90	-0.90	-0.90	
High Roof Leeward	-0.180	-0.180		-0.180
Monoslope Roof Windward		-0.90	-0.90	-0.90
Monoslope Roof Leeward	-0.180			
Flat Roof Windward	-0.90	-0.90	-0.90	-0.90


A
B
B.9
C
D
E
F
1
2
2.3
3
3.2
4



Wind Forces:

N & S Direction: Story Wind Shear = 36.84 k

36.9 k / 109' = 339 plf use 340 plf = w_1

E & W Direction: Story Wind Shear = 33.80 k

33.8 k / 100' = 338 plf use 340 plf = w_1

Line Forces:

(1B) = (4B) = 340 plf (50') = 17 k

(B.9) = (F.2) = 340 plf (60'-4"/2) = 10.3 k

Seismic Base Shear Coefficient = 0.195 Wx (LRFD) = 0.136 Wx (ASD)

High Roof: D + S = 18psf + 7.4psf = 25.4 psf

S_1 = 0.195 [25.4psf 100' + (2) 90psf 13'] = 952 plf

S_2 = 0.195 [25.4psf (60') + (1) 90psf (13'/2)] = 411 plf

Line Forces from Roof:

(1B) = 411 plf (100'/2) = 20.6 k

(4B) = (1B) = 20.6 k

(F.2) = 952 plf (60.33'/2) = 28.7 k

(B.9) = (F.2) = 28.7 k

Wall Inertial Forces:

(1B) = 0.195 [90psf (26') 60.33'] = 27.5 k

(4B) = 0.195 [90psf (13') 60.33'] = 13.8 k [2nd Floor]

(F.2) = 0.195 [90psf (13') 100'] = 22.9 k [2nd Floor]

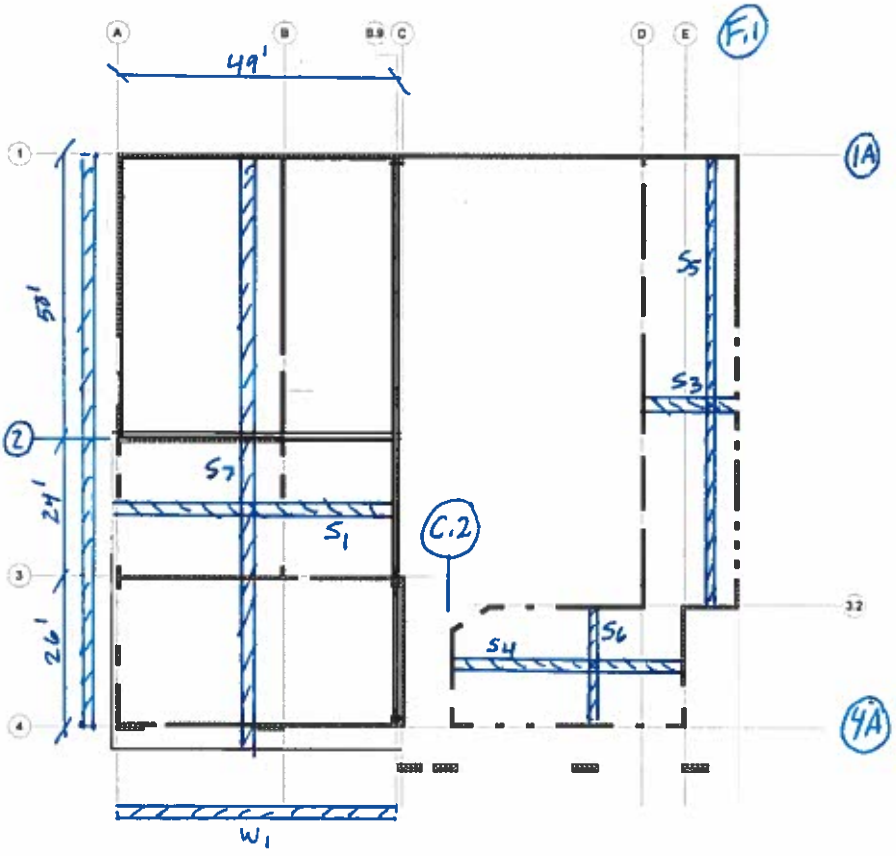
Total Forces:

(1B) = 20.6 k + 27.5 k = 48.1 k [2nd Floor]

(4B) = 20.6 k + 13.8 k = 34.4 k [2nd Floor]

(F.2) = 28.7 k + 22.9 k = 51.6 k

(B.9) = 28.7 k



Wind Forces:

W_1 = 340 plf (conservative for Lower roofs)

Line Forces:

(A) = (B.9) = 340 plf (49'/2) = 8.4 k

Total Wind Force to (B.9) = 8.4 k + 10.3 k = 18.7 k

(2) = 340 plf [50'/2 + 24'/2] = 12.6 k

(3) = 340 plf [24'/2 + 26'/2] = 8.5 k

(4) = 340 plf (26'/2) = 4.5 k

(1) = 340 plf [25'] = 8.5 k

Lower Roofs & Storage:

$S_7 = 0.195\,[25\text{psf}\ 49' + (1)\ 90\text{psf}\ (21.67'/2)] = 433\ \text{plf}$

Live Load used in seismic calculations [ASCE 7-10 12.7.2.(1)]:

200 psf (0.25) = 50 psf

$S_3 = 0.195\,[(55+50)\text{psf}\ 785'] = 1{,}607\ \text{plf}$

$S_4 = 0.195\,[55\ \text{psf}\ 21.5'] = 230\ \text{plf}$

$S_5 = 0.195\,[(55\ \text{psf} + 50\text{psf})\ 17'] = 350\ \text{plf}$

$S_6 = 0.195\,[55\text{psf}\ 41.33'] = 443\ \text{plf}$

Line Forces from Roofs:

① = 433 plf (25') = 10.8 k

② = 433 plf (25' + 12') = 16.0 k

③ = 433 plf (12' + 13') = 10.9 k

④ = 433 plf (13') = 5.7 k

Ⓐ = 952 plf (49'/2) = 23.3 k

B.9 = Ⓐ = 23.3 k

Wall Inertial Forces:

① = 0.195 [90psf 21.67' 49'] = 18.7 k

② = 0.195 [90psf 23' 29.33'] = 11.9 k

③ = 0.195 [90psf 20.33' 49'] = 17.5 k

④ = 0.195 [90psf 17' 49'] = 14.7 k

Ⓐ = 0.195 [90 psf 21.67' 100'] = 38.0 k

Ⓒ = 0.195 [90 psf 18.67' 26'] = 8.6 k

Total Forces:

(1) = 10.8^k + 18.7^k = 29.5^k

(2) = 16.0^k + 11.9^k = 27.9^k

(3) = 10.9^k + 17.5^k = 28.4^k

(4) = 5.7^k + 14.7^k = 20.4^k

(A) = 23.3^k + 38.0^k = 61.3^k

(C) = 23.3^k + 28.7^k + 8.6^k = 60.6^k
Low Roof High Roof Wall I

Line Forces from Storage:

(1A) = 350 plf (78.5'/2) = 13.8^k

(3.2) = (1A) = 13.8^k + 443 plf (21.5'/2) = 18.6^k

(4A) = 4.8^k

(D) = 1,607 plf (17'/2) = 13.7^k

(F.1) = (D) = 13.7^k

(E) = 230 plf (41.5'/2) = 4.8^k

(C.2) = (E) = 4.8^k

Wall Inertial Forces:

(3.2) = 0.195 [90 psf (16.67') 50'] = 14.7^k

(4A) = 0.195 [90 psf (13') 60.33'] = 13.8^k

(D) = 0.195 [90 psf (16.67') 78.5'] = 23.0^k = (F.1)

(E) = 0.195 [90 psf (26') 21.5'] = 9.8^k

(C.2) = (E) = 4.9^k

Total Forces:

(1A) = 48.1^k + 13.8^k = 61.9^k

(3.2) = 18.6^k + 14.7^k = 33.3^k

(4A) = 4.8^k + 13.8^k + 34.4^k = 53.0^k

(F.1) = 13.7^k + 23.0^k + 51.6^k = 88.3^k

(E) = 4.8^k + 9.8^k = 14.6^k

(D) = 13.7^k + 23^k = 36.7^k

(C.2) = 4.8^k + 4.9^k = 9.7^k

Max Diaphragm Shear in High Roof:

411 plf (100)/2(60) = 342 plf

Allowable Diaphragm shear = 487 plf

(4) Welds at perp supports and VSC @ 12" o.c.

Max. Diaphragm shear in Low Roof:

433 plf (50/2) /(44) = 220 plf

Allowable Diaphragm shear = 487 plf

(4) Welds at perp supports and VSC @ 12" o.c.

Max Diaphragm shear at storage:

350 plf (78.5'/2) = 13,737# / 15.25' = 900 plf

Allowable Diaphragm shear = 2371 plf

(4) welds at perp. supports

Type PLB™-36

- 4 Weld Pattern at Supports
- Sidelaps Connected with PunchLok® Tool
- Primer Painted or Galvanized

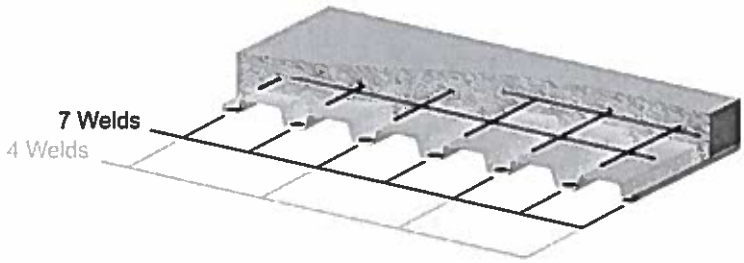
Allowable Diaphragm Shear Values, q (plf) and Flexibility Factors, F ((in./lb)x10^6)

GAGE	SIDELAP ATTACH-MENT		SPAN (ft-in.) 4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"
22	VSC @ 24"	q	545	497	434	417	380	374	349		
		F	13.7+161R	16.4+115R	20.2+87R	22.7+69R	26.6+57R	29.0+48R	32.9+41R		
	VSC @ 18"	q	590	531	465	443	426	395	387		
		F	12.8+161R	15.5+115R	19.0+87R	21.6+69R	24.0+57R	27.6+48R	29.9+41R		
	VSC @ 12"	q	627	561	518	487	465	449	436		
		F	12.2+161R	14.8+115R	17.4+87R	19.9+69R	22.3+57R	24.6+48R	26.9+41R		
	VSC @ 8"	q	691	636	582	561	531	522	503		
		F	11.4+161R	13.4+115R	15.8+87R	17.6+69R	19.9+57R	21.6+48R	23.7+41R		
	VSC @ 6"	q	744	679	636	607	586	571	559		
		F	10.8+161R	12.8+115R	14.7+87R	16.5+69R	18.2+57R	19.9+48R	21.6+41R		
	VSC @ 4"	q	833	769	727	699	679	665	654		
		F	9.9+161R	11.6+115R	13.2+87R	14.7+69R	16.1+57R	17.5+48R	18.9+41R		
20	VSC @ 24"	q	802	722	628	598	544	532	496	492	466
		F	10.4+111R	12.6+80R	15.6+61R	17.8+48R	20.9+39R	22.9+33R	26.1+28R	28.0+24R	31.2+21R
	VSC @ 18"	q	861	767	670	633	606	560	547	537	510
		F	9.9+111R	12.0+80R	14.8+61R	16.9+48R	19.0+39R	21.9+33R	23.8+28R	25.8+24R	28.7+21R
	VSC @ 12"	q	910	807	739	692	658	632	612	596	584
		F	9.5+111R	11.6+80R	13.6+61R	15.7+48R	17.7+39R	19.6+33R	21.6+28R	23.5+24R	25.3+21R
	VSC @ 8"	q	994	906	824	789	745	729	701	694	675
		F	8.9+111R	10.6+80R	12.5+61R	14.0+48R	15.9+39R	17.3+33R	19.1+28R	20.5+24R	22.2+21R
	VSC @ 6"	q	1064	962	896	851	818	794	776	762	688
		F	8.4+111R	10.1+80R	11.7+61R	13.2+48R	14.7+39R	16.1+33R	17.5+28R	18.9+24R	20.2+21R
	VSC @ 4"	q	1181	1081	1016	972	941	918	902	818	688
		F	7.8+111R	9.2+80R	10.5+61R	11.8+48R	13.0+39R	14.2+33R	15.4+28R	16.5+24R	17.6+21R

Notes:
1. VSC = Verco Sidelap Connection

PLB™ or B FORMLOK™

- 4½ in. TOTAL SLAB DEPTH
- Normal Weight Concrete (145 pcf) 42.7 psf
- Galvanized or Phosphatized/Painted



Deck Weight and Section Properties

Gage	Weight (psf)		I_d for Deflection		Moment		Allowable Reactions per ft of Width (lb)				
							End Bearing			Interior Bearing	
	Galv G60	Phos/ Painted	Single Span ($in.^4/ft$)	Multiple Spans ($in.^4/ft$)	$+S_{eff}$ ($in.^3/ft$)	$-S_{eff}$ ($in.^3/ft$)	2"	3"	4"	3"	4"
22	1.9	1.8	0.177	0.192	0.176	0.188	935	1076	1163	1559	1671
20	2.3	2.2	0.219	0.231	0.230	0.237	1301	1492	1609	2190	2340
18	2.9	2.8	0.302	0.306	0.314	0.331	2181	2484	2667	3714	3950
16	3.5	3.4	0.381	0.381	0.399	0.410	3265	3699	3955	5607	5938

Allowable Superimposed Loads (psf)

Gage	Spans	Max. UCS[1]	Span (ft-in.)										
			6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"	11'-0"
22	1	5'-11"	306	263	227	198	174	153	135	120	107	95	85
	2	6'-11"	348	304	227	198	174	153	135	120	107	95	85
	3	7'-0"	348	304	269	198	174	153	135	120	107	95	85
20	1	7'-1"	365	319	282	210	184	162	144	128	114	102	91
	2	8'-3"	365	319	282	252	226	162	144	128	114	102	91
	3	8'-4"	365	319	282	252	226	162	144	128	114	102	91
18	1	8'-1"	393	344	304	271	244	178	158	140	125	112	101
	2	9'-9"	393	344	304	271	244	220	200	183	125	112	101
	3	10'-0"	393	344	304	271	244	220	200	183	168	112	101
16	1	8'-8"	391	342	302	269	242	219	156	138	124	111	99
	2	10'-9"	391	342	302	269	242	219	199	182	167	154	99
	3	10'-9"	391	342	302	269	242	219	199	182	167	154	99

[1] Max. UCS = Maximum Unshored Clear Span (ft-in.)

Shoring required in shaded areas to right of heavy line.

Allowable Diaphragm Shear Values, q (plf) and Flexibility Factors, F (in./lb x 10^6)

Gage	Welds	Span (ft-in.)										
		6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"	11'-0"
22	q4	2304	2265	2232	2204	2179	2157	2138	2120	2104	2090	2077
	F4	0.36	0.36	0.37	0.37	0.38	0.38	0.39	0.39	0.39	0.39	0.40
	q7	2513	2459	2412	2372	2336	2305	2277	2252	2230	2210	2191
	F7	0.33	0.34	0.34	0.35	0.35	0.36	0.36	0.37	0.37	0.37	0.38
20	q4	2371	2325	2286	2252	2222	2195	2172	2151	2132	2115	2099
	F4	0.32	0.32	0.33	0.33	0.34	0.34	0.35	0.35	0.35	0.36	0.36
	q7	2623	2557	2501	2453	2410	2373	2340	2310	2283	2259	2237
	F7	0.29	0.29	0.30	0.31	0.31	0.32	0.32	0.33	0.33	0.33	0.34
18	q4	2524	2463	2410	2365	2325	2290	2259	2231	2206	2183	2162
	F4	0.26	0.26	0.27	0.28	0.28	0.28	0.29	0.29	0.30	0.30	0.30
	q7	2859	2772	2698	2633	2576	2527	2482	2442	2407	2374	2345
	F7	0.23	0.24	0.24	0.25	0.25	0.26	0.26	0.27	0.27	0.27	0.28
16	q4	2693	2616	2551	2494	2444	2400	2361	2326	2295	2266	2240
	F4	0.22	0.22	0.23	0.23	0.24	0.24	0.25	0.25	0.25	0.26	0.26
	q7	3112	3003	2910	2829	2758	2696	2640	2591	2546	2506	2469
	F7	0.19	0.19	0.20	0.21	0.21	0.22	0.22	0.22	0.23	0.23	0.24

STEEL GIRDER TRUSS ANALYSIS

Steel Truss Loading

Unfactored Loads on Truss from High Roof:

Dead – 18 psf 30.165 = 543 plf ≈ 0.55 k/ft

Roof LL – 20 psf 30.165 = 604 plf ≈ 0.605 k/ft

Snow L – 37 psf 30.165 = 1.12 plf ≈ 1.12 k/ft

Earthquake – Drag at top – 28.7 k / 98' = 0.292 k/ft

Increase Load to Collector (Drag Truss) per ASCE 7-10 12.3.3.4

0.292 k/ft × 1.25 = 0.366 k/ft

Earthquake – Vertical = 0.2 S_{DS} D = 2.8 psf + 7.4 snow surcharge
(0.1558) D
= 10.2 psf

10.2 psf (30.165) = 308 plf = 0.308 k/ft

Wind – Drag at top – 10.3k / 98' = 105 plf = 0.105 k/ft

Unfactored Loads on Truss from Low Flat Roof to Ledger

Dead – 18 psf (10') = 180 plf = 0.18 k/ft

Roof LL – 20 psf (10') = 200 plf = 0.20 k/ft

Snow L – 64 psf (Drift) (10') = 0.64 k/ft

Earthquake – Drag = 23.3 k / 98' = 0.238 k/ft

Increase Load to collector (Drag truss) per ASCE 7-10 12.3.3.4

0.238 k/ft × 1.25 = 0.297 = 0.30 k/ft
0.30 k/ft 12.5' = 3.75 k

Earthquake – Vertical = 10.2 psf (10') = 102 plf = 0.102 k/ft

Wind – Drag from low roof = 8.4 k / 98 = 0.086 k/ft

0.086 k/ft 12.5' = 1.1 k

Unfactored Loads on Truss from Sloped Roof to Leger

Dead - 18psf 2' = 36 plf = 0.036 k/ft

Roof LL - 20psf (2') = 40plf = 0.040 k/ft

Snow L - 64psf (2') = 128plf = 0.128 k/ft

Earthquake - Drag = 0.30 k/ft x 12.5' = 3.75 k

Wind - Drag = 0.086 k/ft x 12.5' = 1.1 k

Earthquake - Vertical = 10.2psf (2') 20.4 plf = 0.0204 k/ft

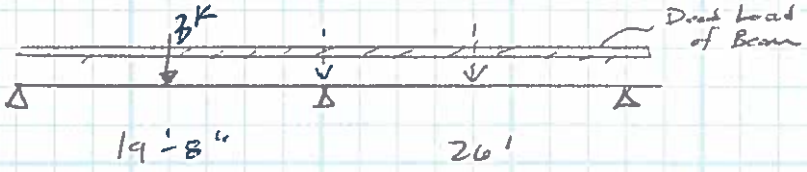
SUNRISE ENGINEERING, INC.

PROJECT NO. ..... PROJECT NAME ..... SUBJECT .....
SHEET NO. ..... OF ..... BY ..... DATE ..... CHKD. BY ..... DATE .....

Point Load at Girder Truss from Trolley

Assume 1.5 ton Live Load from Trolley

Trolley Beam



Assume W 14 x 43 43 lb/ft

Reaction at Center when trolley is in the Center

PL = 1.243 K
LL = 3.0 K } These loads added to Risa Model

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:
Project ID: S04310

Printed: 19 NOV 2013, 10:50AM

Steel Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\owtp.ec6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Beam 2- Ledger supporting low flat Roof-1 span

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
Dsgn. L = 12.50 ft +0.60D+W+H	1	0.514	0.064	14.40		14.40	46.75	28.00	1.00	1.00	4.61	120.00	71.86
Dsgn. L = 12.50 ft +0.60D+0.70E+H	1	0.084	0.010	2.34		2.34	46.75	28.00	1.00	1.00	0.75	120.00	71.86
Dsgn. L = 12.50 ft	1	0.137	0.017	3.84		3.84	46.75	28.00	1.00	1.00	1.23	120.00	71.86

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr+S	1	0.5142	6.313		0.0000	0.000

Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Span	Max. Downward Defl	Location in Span	Span	Max. Upward Defl	Location in Span
D Only	1	0.0987	6.313		0.0000	0.000
Lr Only	1	0.0989	6.313		0.0000	0.000
S Only	1	0.3166	6.313		0.0000	0.000
Lr+S	1	0.4155	6.313		0.0000	0.000
E Only	1	0.0544	6.313		0.0000	0.000
D+Lr	1	0.1977	6.313		0.0000	0.000
D+S	1	0.4153	6.313		0.0000	0.000
D+Lr+S	1	0.5142	6.313		0.0000	0.000
D+E	1	0.1531	6.313		0.0000	0.000
D+Lr+E	1	0.2521	6.313		0.0000	0.000

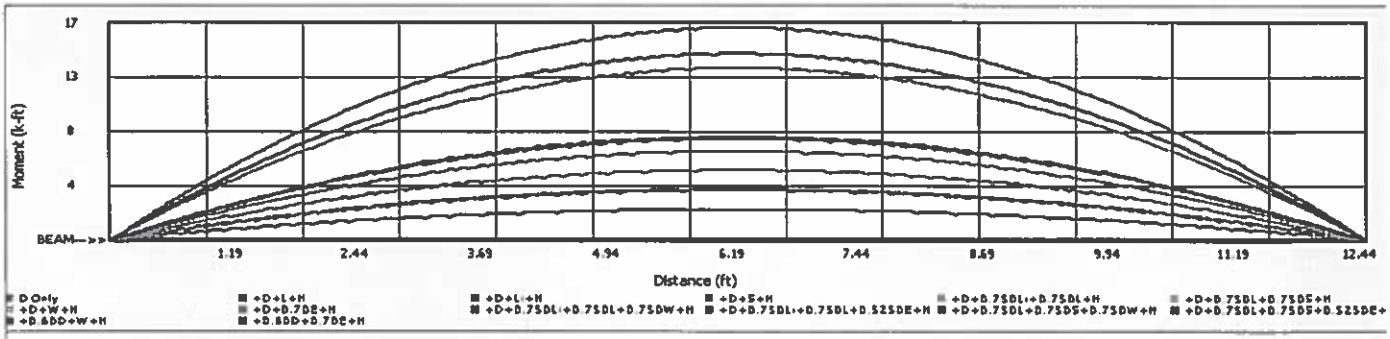
Vertical Reactions - Unfactored

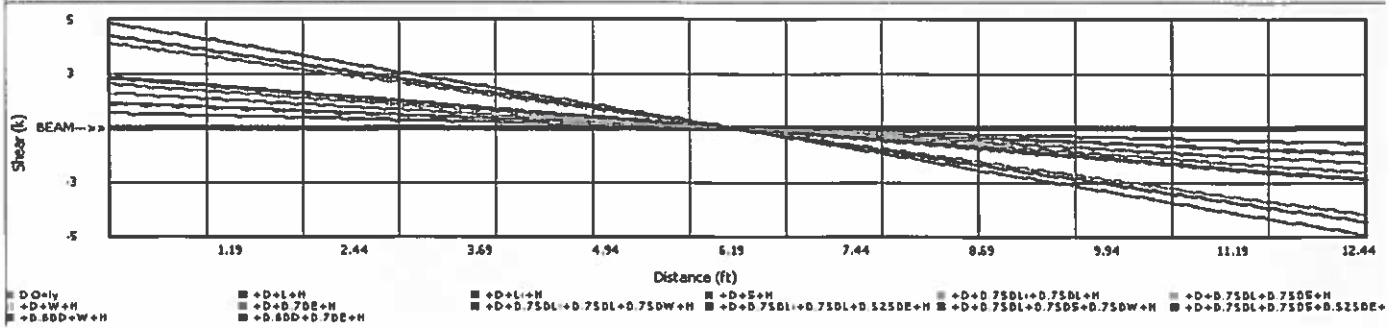
Support notation : Far left is #1 — Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	6.498	6.498
D Only	1.248	1.248
Lr Only	1.250	1.250
S Only	4.000	4.000
Lr+S	5.250	5.250
E Only	0.688	0.688
D+Lr	2.498	2.498
D+S	5.248	5.248
D+Lr+S	6.498	6.498
D+E	1.935	1.935
D+Lr+E	3.185	3.185

Used for end joists on levels

Loads applied to G.T.





Steel Beam

Description : Beam 2- Ledger supporting low flat Roof

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr+S	1	0.2431	5.481		0.0000	0.000
D+Lr+S	2	0.2403	7.115		0.0000	0.000

Maximum Deflections for Load Combinations - Unfactored Loads

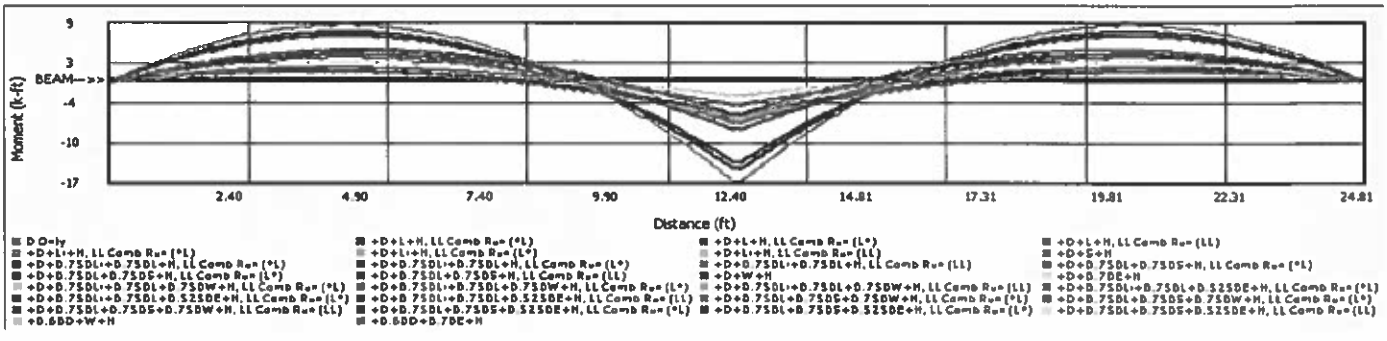
Load Combination	Span	Max. Downward Defl	Location in Span	Span	Max. Upward Defl	Location in Span
D Only	1	0.0413	5.288		0.0000	0.000
Lr Only, LL Comb Run (*L)	2	0.0696	6.635	1	-0.0305	7.308
Lr Only, LL Comb Run (L*)	1	0.0699	5.962	2	-0.0308	5.288
Lr Only, LL Comb Run (LL)	1	0.0414	5.288		0.0000	0.000
S Only	1	0.1326	5.288		0.0000	0.000
Lr+S, LL Comb Run (*L)	2	0.1996	7.115	1	-0.0021	11.923
Lr+S, LL Comb Run (L*)	1	0.2018	5.481	2	-0.0044	0.673
Lr+S, LL Comb Run (LL)	1	0.1740	5.288		0.0000	0.000
E Only	1	0.0228	5.288		0.0000	0.000
D+Lr, LL Comb Run (*L)	2	0.1099	6.923	1	-0.0101	10.673
D+Lr, LL Comb Run (L*)	1	0.1108	5.673	2	-0.0110	1.923
D+Lr, LL Comb Run (LL)	1	0.0828	5.288		0.0000	0.000
D+S	1	0.1739	5.288		0.0000	0.000
D+Lr+S, LL Comb Run (*L)	2	0.2403	7.115	1	-0.0006	12.019
D+Lr+S, LL Comb Run (L*)	1	0.2431	5.481	2	-0.0036	0.577
D+Lr+S, LL Comb Run (LL)	1	0.2154	5.288		0.0000	0.000
D+E	1	0.0641	5.288		0.0000	0.000
D+Lr+E, LL Comb Run (*L)	2	0.1323	7.019	1	-0.0066	11.250
D+Lr+E, LL Comb Run (L*)	1	0.1335	5.577	2	-0.0079	1.346
D+Lr+E, LL Comb Run (LL)	1	0.1056	5.288		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	5.029	16.244	5.029
D Only	0.936	3.119	0.936
Lr Only, LL Comb Run (*L)	-0.156	1.562	1.094
Lr Only, LL Comb Run (L*)	1.094	1.562	-0.156
Lr Only, LL Comb Run (LL)	0.938	3.125	0.938
S Only	3.000	10.000	3.000
Lr+S, LL Comb Run (*L)	2.844	11.562	4.094
Lr+S, LL Comb Run (L*)	4.094	11.562	2.844
Lr+S, LL Comb Run (LL)	3.938	13.125	3.938
E Only	0.516	1.719	0.516
D+Lr, LL Comb Run (*L)	0.779	4.681	2.029
D+Lr, LL Comb Run (L*)	2.029	4.681	0.779
D+Lr, LL Comb Run (LL)	1.873	6.244	1.873
D+S	3.936	13.119	3.936
D+Lr+S, LL Comb Run (*L)	3.779	14.681	5.029
D+Lr+S, LL Comb Run (L*)	5.029	14.681	3.779
D+Lr+S, LL Comb Run (LL)	4.873	16.244	4.873
D+E	1.451	4.837	1.451
D+Lr+E, LL Comb Run (*L)	1.295	6.400	2.545
D+Lr+E, LL Comb Run (L*)	2.545	6.400	1.295
D+Lr+E, LL Comb Run (LL)	2.389	7.962	2.389

Used for middle joints on steel truss



Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:
Project ID: S04310

Printed: 19 NOV 2013, 12:01PM

Steel Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\owtp.ec6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : Beam 3- Ledger supporting sloped roof-2 span

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr+S	1	0.2316	5.590		0.0000	0.000
D+Lr+S	2	0.2288	7.258		0.0000	0.000

Maximum Deflections for Load Combinations - Unfactored Loads

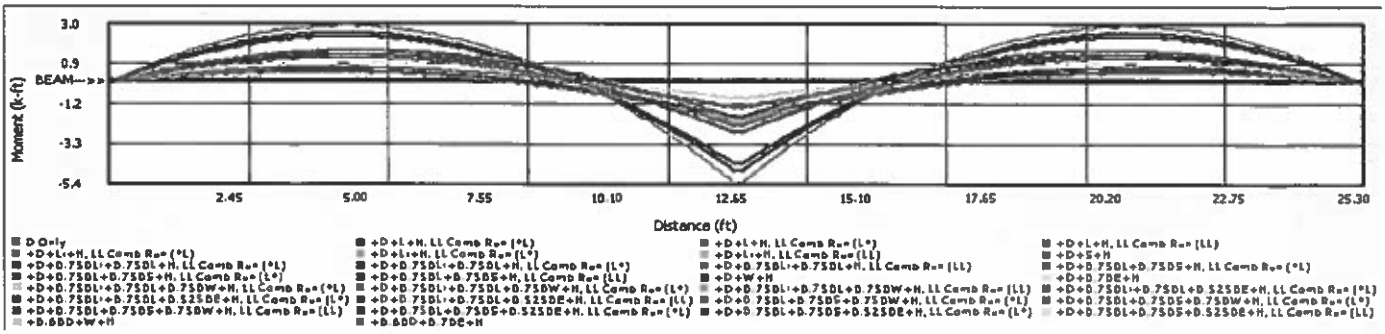
Load Combination	Span	Max. Downward Defl	Location in Span	Span	Max. Upward Defl	Location in Span
D Only	1	0.0428	5.394		0.0000	0.000
Lr Only, LL Comb Run (*L)	2	0.0651	6.767	1	-0.0286	7.454
Lr Only, LL Comb Run (L*)	1	0.0654	6.081	2	-0.0288	5.394
Lr Only, LL Comb Run (LL)	1	0.0388	5.394		0.0000	0.000
S Only	1	0.1240	5.394		0.0000	0.000
Lr+S, LL Comb Run (*L)	2	0.1867	7.258	1	-0.0020	12.162
Lr+S, LL Comb Run (L*)	1	0.1888	5.590	2	-0.0042	0.687
Lr+S, LL Comb Run (LL)	1	0.1628	5.394		0.0000	0.000
E Only	1	0.0213	5.394		0.0000	0.000
D+Lr, LL Comb Run (*L)	2	0.1069	7.062	1	-0.0087	11.083
D+Lr, LL Comb Run (L*)	1	0.1078	5.787	2	-0.0096	1.765
D+Lr, LL Comb Run (LL)	1	0.0816	5.394		0.0000	0.000
D+S	1	0.1668	5.394		0.0000	0.000
D+Lr+S, LL Comb Run (*L)	2	0.2288	7.258	1	-0.0005	12.358
D+Lr+S, LL Comb Run (L*)	1	0.2316	5.590	2	-0.0033	0.490
D+Lr+S, LL Comb Run (LL)	1	0.2056	5.394		0.0000	0.000
D+E	1	0.0641	5.394		0.0000	0.000
D+Lr+E, LL Comb Run (*L)	2	0.1278	7.160	1	-0.0058	11.573
D+Lr+E, LL Comb Run (L*)	1	0.1290	5.688	2	-0.0070	1.275
D+Lr+E, LL Comb Run (LL)	1	0.1029	5.394		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	1.570	5.073	1.570
D Only	0.317	1.057	0.317
Lr Only, LL Comb Run (*L)	-0.048	0.478	0.335
Lr Only, LL Comb Run (L*)	0.335	0.478	-0.048
Lr Only, LL Comb Run (LL)	0.287	0.956	0.287
S Only	0.918	3.060	0.918
Lr+S, LL Comb Run (*L)	0.870	3.538	1.253
Lr+S, LL Comb Run (L*)	1.253	3.538	0.870
Lr+S, LL Comb Run (LL)	1.205	4.016	1.205
E Only	0.158	0.526	0.158
D+Lr, LL Comb Run (*L)	0.269	1.535	0.652
D+Lr, LL Comb Run (L*)	0.652	1.535	0.269
D+Lr, LL Comb Run (LL)	0.604	2.013	0.604
D+S	1.235	4.117	1.235
D+Lr+S, LL Comb Run (*L)	1.187	4.595	1.570
D+Lr+S, LL Comb Run (L*)	1.570	4.595	1.187
D+Lr+S, LL Comb Run (LL)	1.522	5.073	1.522
D+E	0.475	1.583	0.475
D+Lr+E, LL Comb Run (*L)	0.427	2.061	0.809
D+Lr+E, LL Comb Run (L*)	0.809	2.061	0.427
D+Lr+E, LL Comb Run (LL)	0.762	2.539	0.762

Used for worst case reaction at middle joint on steel truss



Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:
Project ID: S04310

Printed: 19 NOV 2013, 11:58AM

Steel Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\owtp.ec6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Beam 3- Ledger supporting sloped roof-2 span

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
Dsgn. L = 12.75 ft +0.60D+W+H	1	0.375	0.036	4.63		4.63	20.58	12.32	1.00	1.00	1.45	67.50	40.42
Dsgn. L = 12.75 ft +0.60D+0.70E+H	1	0.066	0.006	0.81		0.81	20.58	12.32	1.00	1.00	0.25	67.50	40.42
Dsgn. L = 12.75 ft	1	0.104	0.010	1.28		1.28	20.58	12.32	1.00	1.00	0.40	67.50	40.42

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr+S	1	0.4909	6.439		0.0000	0.000

Maximum Deflections for Load Combinations - Unfactored Loads

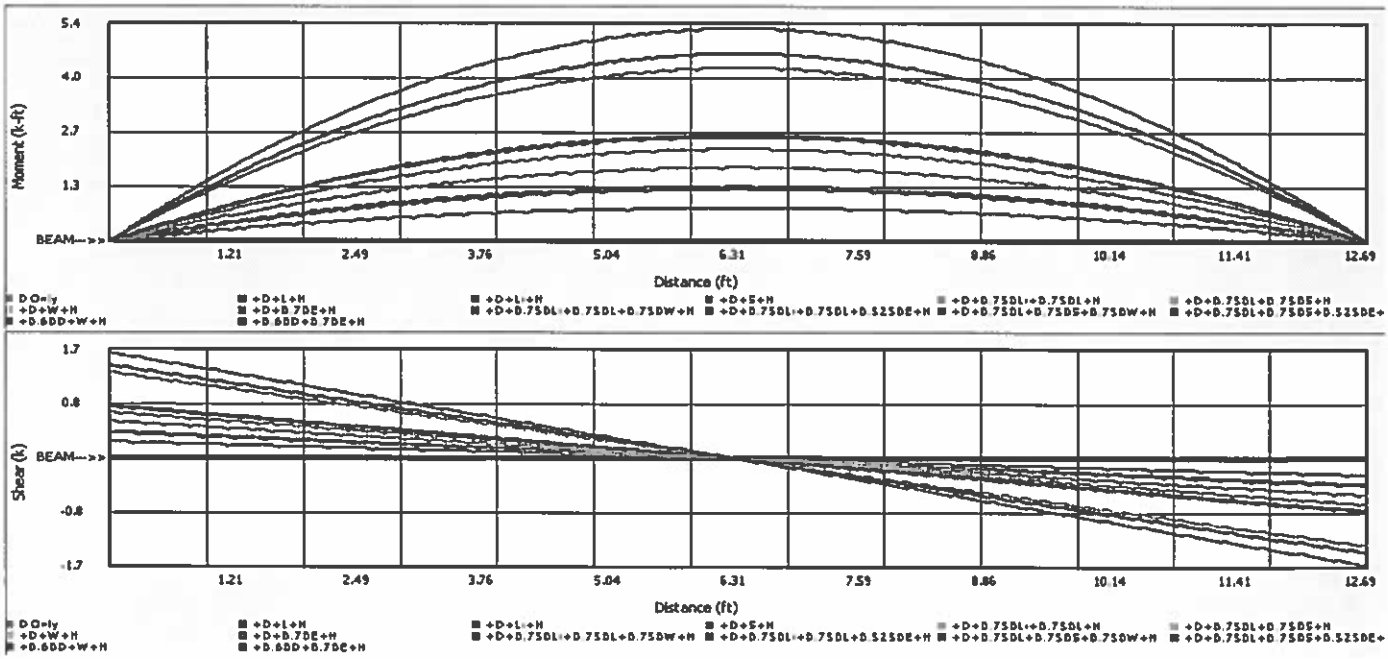
Load Combination	Span	Max. Downward Defl	Location in Span	Span	Max. Upward Defl	Location in Span
D Only	1	0.1023	6.439		0.0000	0.000
Lr Only	1	0.0925	6.439		0.0000	0.000
S Only	1	0.2961	6.439		0.0000	0.000
Lr+S	1	0.3887	6.439		0.0000	0.000
E Only	1	0.0509	6.439		0.0000	0.000
D+Lr	1	0.1948	6.439		0.0000	0.000
D+S	1	0.3984	6.439		0.0000	0.000
D+Lr+S	1	0.4909	6.439		0.0000	0.000
D+E	1	0.1532	6.439		0.0000	0.000
D+Lr+E	1	0.2457	6.439		0.0000	0.000

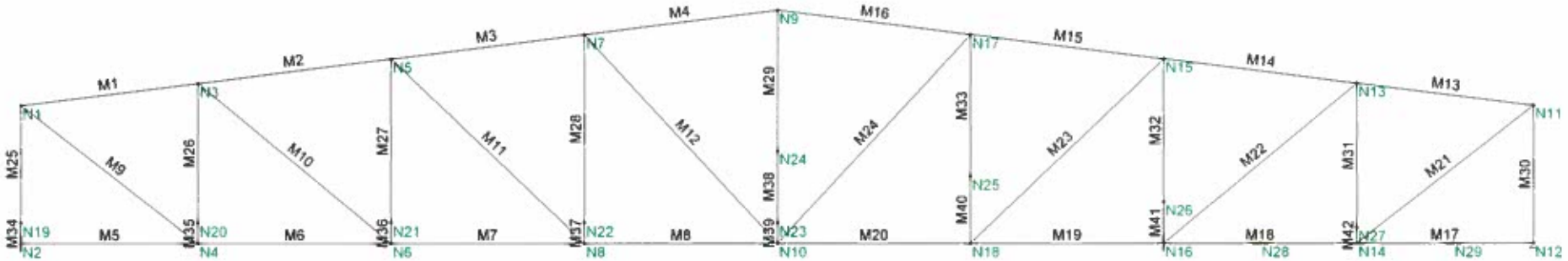
Vertical Reactions - Unfactored

Support notation : Far left is #1 — Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.029	2.029
D Only	0.423	0.423
Lr Only	0.383	0.383
S Only	1.224	1.224
Lr+S	1.607	1.607
E Only	0.210	0.210
D+Lr	0.805	0.805
D+S	1.647	1.647
D+Lr+S	2.029	2.029
D+E	0.633	0.633
D+Lr+E	1.016	1.016

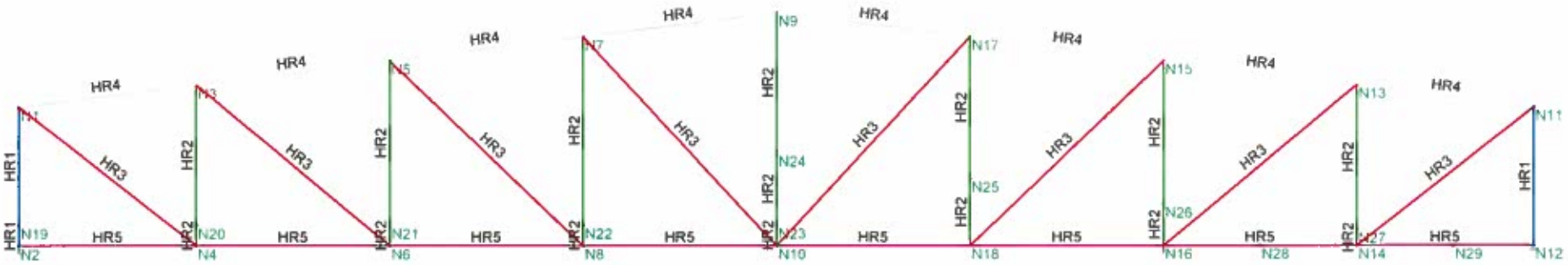
Use for worst case reaction to steel truss on end span





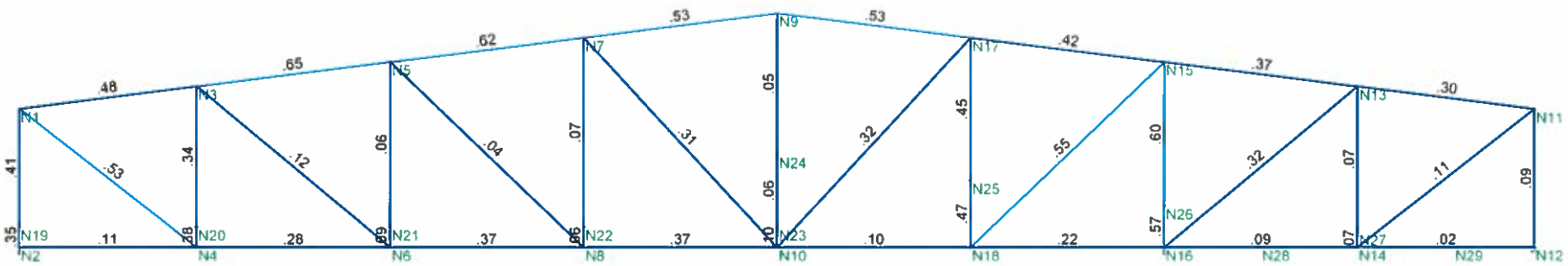
Solution: Envelope

Sunrise Engineering	OWTP Truss	Nodes & Members
SMH		Dec 18, 2013 at 11:28 AM
S04655		Wireframe Truss.R3D



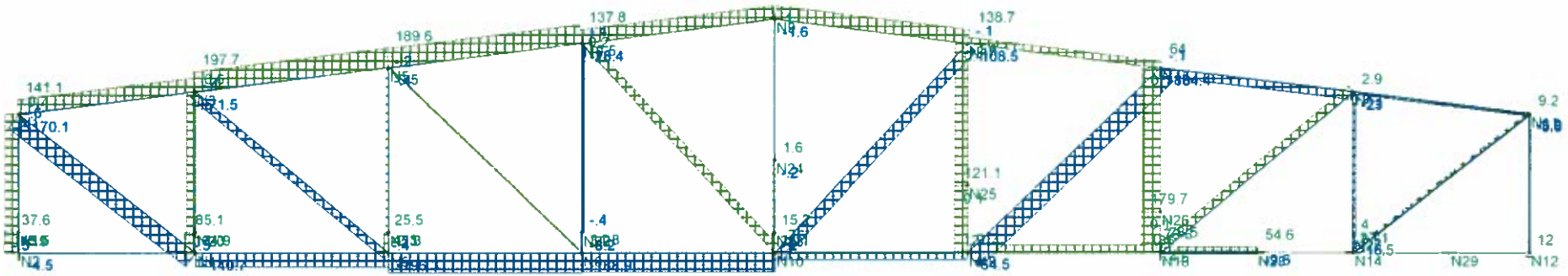
Solution: Envelope

Sunrise Engineering	OWTP Truss	Section Set
SMH		Dec 18, 2013 at 11:28 AM
S04655		Wireframe Truss.R3D



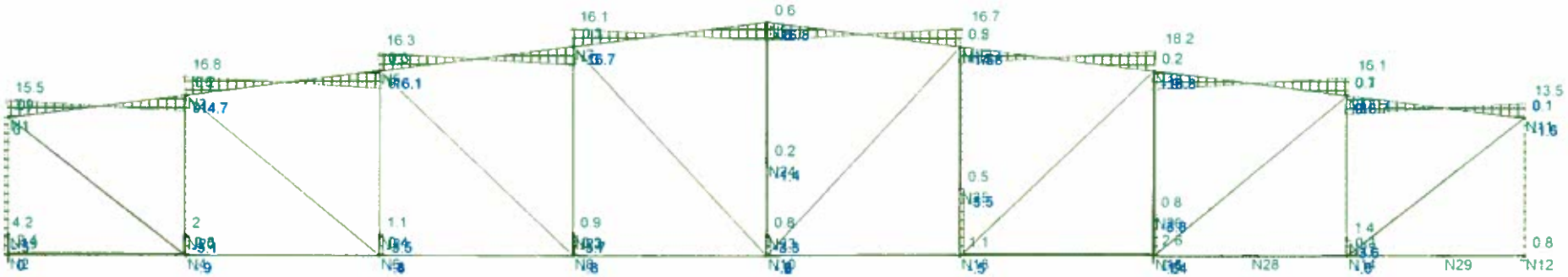
Member Code Checks Displayed
Solution: Envelope

Sunrise Engineering	OWTP Truss	Bending (Unity Check)
SMH		Dec 18, 2013 at 11:27 AM
S04655		Wireframe Truss.R3D



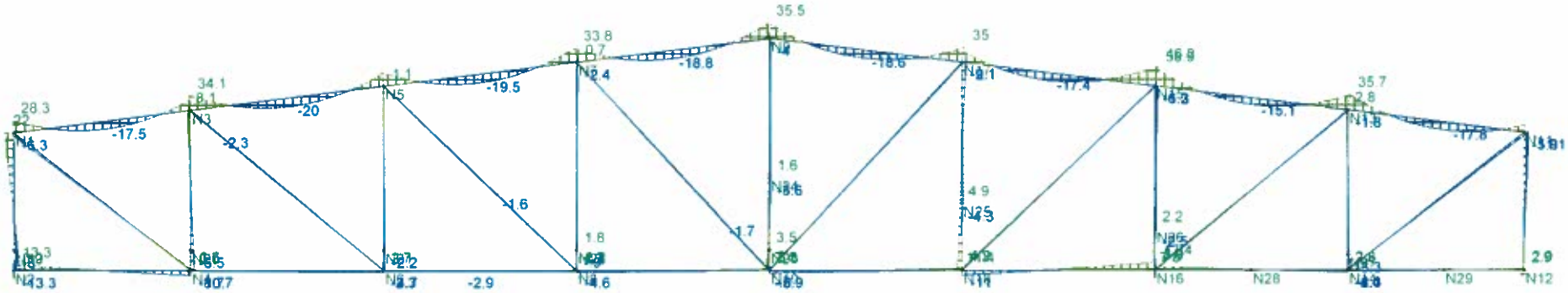
Solution: Envelope
Member Axial Forces (k)

Sunrise Engineering	OWTP Truss	Axial Forces in Members
SMH		Dec 18, 2013 at 11:30 AM
S04655		Wireframe Truss.R3D



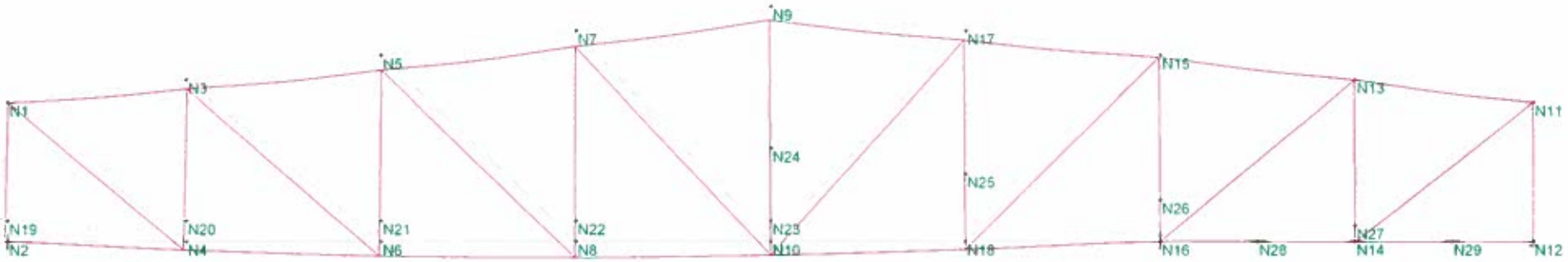
Solution: Envelope
Member y Shear Forces (k)

Sunrise Engineering	OWTP Truss	Shear in Y-Direction
SMH		Dec 18, 2013 at 11:31 AM
S04655		Wireframe Truss.R3D



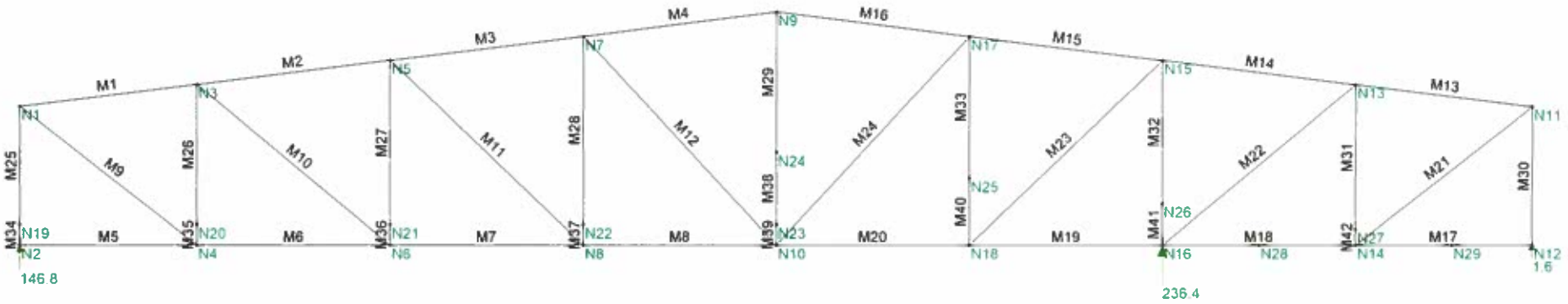
Solution: Envelope
Member z Bending Moments (k-ft)

Sunrise Engineering	OWTP Truss	Moment about Z-axis
SMH		Dec 18, 2013 at 11:32 AM
S04655		Wireframe Truss.R3D



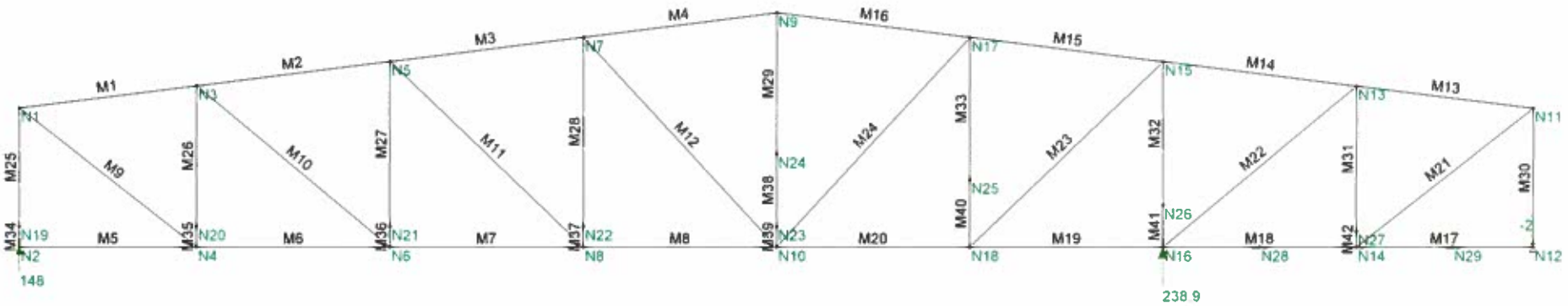
Results for LC 12, IBC 16-3 (d) (b)

Sunrise Engineering	OWTP Truss	Deflection Magnified 12X
SMH		Dec 18, 2013 at 11:36 AM
S04655		Wireframe Truss.R3D



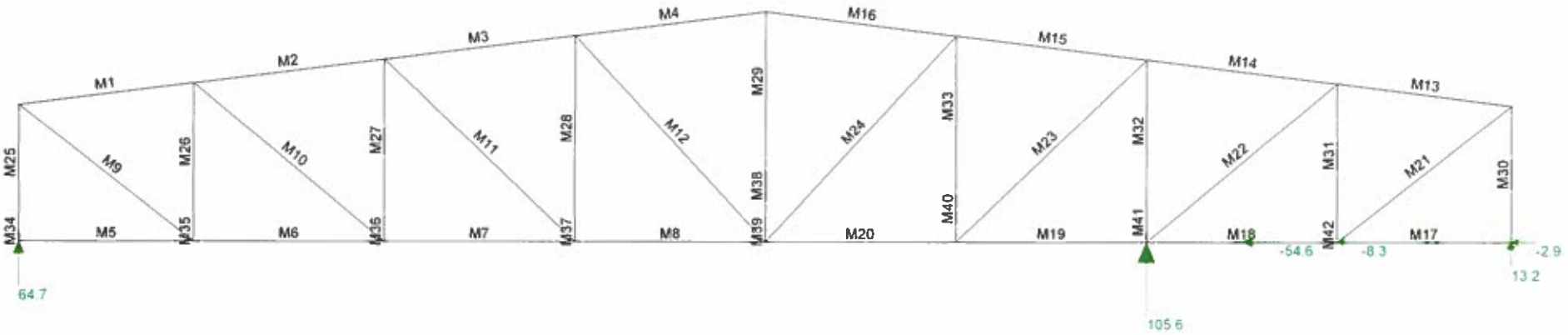
Results for LC 11, IBC 16-3 (d) (a)
Y-direction Reaction units are k and k-ft

Sunrise Engineering	OWTP Truss	Reactions LC 11
SMH		Dec 18, 2013 at 11:38 AM
S04655		Wireframe Truss.R3D



Results for LC 12, IBC 16-3 (d) (b)
Y-direction Reaction units are k and k-ft

Sunrise Engineering	OWTP Truss	Reactions LC 12
SMH		Dec 18, 2013 at 11:39 AM
S04655		Wireframe Truss.R3D



Results for LC 23, IBC 16-5
Y-direction Reaction units are k and k-ft

Sunrise Engineering	OWTP Truss	Reactions LC 23 Earthquake
SMH		Dec 18, 2013 at 11:40 AM
S04655		Wireframe Truss.R3D

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E...	Density[k/ft...	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	65	1.1
3	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	.3	.65	.49	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	.3	.65	.49	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	.3	.65	.49	35	1.6	60	1.2

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	HR1	HSS8x8x8	Column	SquareTu...	A500 Gr.B Rect	Typical	13.5	125	125	204
2	HR2	HSS8x8x5	VBrace	SquareTu...	A500 Gr.B Rect	Typical	8.76	85.6	85.6	136
3	HR3	HSS8x8x5	HBrace	SquareTu...	A500 Gr.B Rect	Typical	8.76	85.6	85.6	136
4	HR4	HSS8x8x8	Beam	SquareTu...	A500 Gr.B Rect	Typical	13.5	125	125	204
5	HR5	HSS8x8x8	Beam	SquareTu...	A500 Gr.B Rect	Typical	13.5	125	125	204

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
1	N1	1.048045	8.954887	0	0	
2	N2	1.048045	0	0	0	
3	N3	12.5	10.387181	0	0	
4	N4	12.5	0	0	0	
5	N5	25	11.950553	0	0	
6	N6	25	0	0	0	
7	N7	37.5	13.513925	0	0	
8	N8	37.5	0	0	0	
9	N9	50	15.077298	0	0	
10	N10	50	0	0	0	
11	N11	98.951955	8.954887	0	0	
12	N12	98.951955	0	0	0	
13	N13	87.5	10.387181	0	0	
14	N14	87.5	0	0	0	
15	N15	75	11.950553	0	0	
16	N16	75	0	0	0	
17	N17	62.5	13.513925	0	0	
18	N18	62.5	-0.	0	0	
19	N19	1.048045	1.33	0	0	
20	N20	12.5	1.33	0	0	
21	N21	25	1.33	0	0	
22	N22	37.5	1.33	0	0	
23	N23	50	1.33	0	0	
24	N24	50	6	0	0	
25	N25	62.5	4.33	0	0	
26	N26	75	2.67	0	0	
27	N27	87.5	1	0	0	
28	N28	81.25	0	0	0	
29	N29	93.75	0	0	0	

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torq...	Kyy	Kzz	Cb	Functi...
1	M1	HR4	11.541						1	1		Lateral
2	M2	HR4	12.597						1	1		Lateral
3	M3	HR4	12.597						1	1		Lateral
4	M4	HR4	12.597						1	1		Lateral

Hot Rolled Steel Design Parameters (Continued)

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torq...	Kyy	Kzz	Cb	Functi...
5	M5	HR5	11.452						1	1		Lateral
6	M6	HR5	12.5						1	1		Lateral
7	M7	HR5	12.5						1	1		Lateral
8	M8	HR5	12.5						1	1		Lateral
9	M9	HR3	14.537						1	1		Lateral
10	M10	HR3	16.252						1	1		Lateral
11	M11	HR3	17.294						1	1		Lateral
12	M12	HR3	18.409						1	1		Lateral
13	M13	HR4	11.541						1	1		Lateral
14	M14	HR4	12.597						1	1		Lateral
15	M15	HR4	12.597						1	1		Lateral
16	M16	HR4	12.597						1	1		Lateral
17	M17	HR5	11.452						1	1		Lateral
18	M18	HR5	12.5						1	1		Lateral
19	M19	HR5	12.5						1	1		Lateral
20	M20	HR5	12.5						1	1		Lateral
21	M21	HR3	14.537						1	1		Lateral
22	M22	HR3	16.252						1	1		Lateral
23	M23	HR3	17.294						1	1		Lateral
24	M24	HR3	18.409						1	1		Lateral
25	M25	HR1	7.625						1	1		Lateral
26	M26	HR2	9.057						1	1		Lateral
27	M27	HR2	10.621						1	1		Lateral
28	M28	HR2	12.184						1	1		Lateral
29	M29	HR2	9.077						1	1		Lateral
30	M30	HR1	8.955						1	1		Lateral
31	M31	HR2	9.387						1	1		Lateral
32	M32	HR2	9.281						1	1		Lateral
33	M33	HR2	9.184						1	1		Lateral
34	M34	HR1	1.33									Lateral
35	M35	HR2	1.33									Lateral
36	M36	HR2	1.33									Lateral
37	M37	HR2	1.33									Lateral
38	M38	HR2	4.67									Lateral
39	M39	HR2	1.33									Lateral
40	M40	HR2	4.33									Lateral
41	M41	HR2	2.67									Lateral
42	M42	HR2	1									Lateral

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
1	N2		Reaction	Reaction				
2	N12	Reaction	Reaction	Reaction				
3	N1			Reaction				
4	N3			Reaction				
5	N5			Reaction				
6	N7			Reaction				
7	N9			Reaction				
8	N17			Reaction				
9	N15			Reaction				
10	N13			Reaction				
11	N11			Reaction				
12	N16		Reaction	Reaction				
13	N14	Reaction		Reaction				
14	N29	Reaction						
15	N28	Reaction						

Joint Loads and Enforced Displacements (BLC 1 : DEAD)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	N24	L	Y	-3.24
2	N19	L	Y	-1.248
3	N23	L	Y	-1.248
4	N20	L	Y	-3.119
5	N21	L	Y	-3.119
6	N22	L	Y	-3.119
7	N24	L	Y	-.423
8	N12	L	Y	-.423
9	N25	L	Y	-1.057
10	N26	L	Y	-1.057
11	N27	L	Y	-1.057

Joint Loads and Enforced Displacements (BLC 2 : LIVE ROOF)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	N24	L	Y	-2.8
2	N19	L	Y	-1.25
3	N23	L	Y	-1.25
4	N20	L	Y	-3.125
5	N21	L	Y	-3.125
6	N22	L	Y	-3.125
7	N24	L	Y	-.383
8	N12	L	Y	-.383
9	N25	L	Y	-.956
10	N26	L	Y	-.956
11	N27	L	Y	-.956

Joint Loads and Enforced Displacements (BLC 3 : SNOW)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	N24	L	Y	-5.18
2	N19	L	Y	-4
3	N23	L	Y	-4
4	N20	L	Y	-10
5	N21	L	Y	-10
6	N22	L	Y	-10
7	N24	L	Y	-1.224
8	N12	L	Y	-1.224
9	N25	L	Y	-3.06
10	N26	L	Y	-3.06
11	N27	L	Y	-3.06

Joint Loads and Enforced Displacements (BLC 4 : EARTHQUAKE)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	N24	L	Y	-2.24
2	N19	L	Y	-.7
3	N23	L	Y	-.7
4	N20	L	Y	-1.719
5	N21	L	Y	-1.719
6	N22	L	Y	-1.719
7	N19	L	X	1.875
8	N23	L	X	1.875
9	N20	L	X	3.75
10	N21	L	X	3.75
11	N22	L	X	3.75
12	N24	L	Y	-.21
13	N12	L	Y	-.21
14	N25	L	Y	-.526

Joint Loads and Enforced Displacements (BLC 4 : EARTHQUAKE) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
15	N26	L	Y	-.526
16	N27	L	Y	-.526
17	N24	L	X	1.875
18	N12	L	X	1.875
19	N25	L	X	3.75
20	N26	L	X	3.75
21	N27	L	X	3.75

Joint Loads and Enforced Displacements (BLC 5 : WIND)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	N19	L	X	.525
2	N23	L	X	.525
3	N20	L	X	1.05
4	N21	L	X	1.05
5	N22	L	X	1.05
6	N24	L	X	.525
7	N12	L	X	.525
8	N25	L	X	1.05
9	N26	L	X	1.05
10	N27	L	X	1.05

Member Distributed Loads (BLC 1 : DEAD)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.55	-.55	0	0
2	M2	Y	-.55	-.55	0	0
3	M3	Y	-.55	-.55	0	0
4	M4	Y	-.55	-.55	0	0
5	M16	Y	-.55	-.55	0	0
6	M15	Y	-.55	-.55	0	0
7	M14	Y	-.55	-.55	0	0
8	M13	Y	-.55	-.55	0	0

Member Distributed Loads (BLC 2 : LIVE ROOF)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.605	-.605	0	0
2	M2	Y	-.605	-.605	0	0
3	M3	Y	-.605	-.605	0	0
4	M4	Y	-.605	-.605	0	0
5	M16	Y	-.605	-.605	0	0
6	M15	Y	-.605	-.605	0	0
7	M14	Y	-.605	-.605	0	0
8	M13	Y	-.605	-.605	0	0

Member Distributed Loads (BLC 3 : SNOW)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-1.2	-1.2	0	0
2	M2	Y	-1.2	-1.2	0	0
3	M3	Y	-1.2	-1.2	0	0
4	M4	Y	-1.2	-1.2	0	0
5	M16	Y	-1.2	-1.2	0	0
6	M15	Y	-1.2	-1.2	0	0
7	M14	Y	-1.2	-1.2	0	0
8	M13	Y	-1.2	-1.2	0	0

Member Distributed Loads (BLC 4 : EARTHQUAKE)

Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]

Member Distributed Loads (BLC 4 : EARTHQUAKE) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	x	.366	.366	0	0
2	M2	x	.366	.366	0	0
3	M3	x	.366	.366	0	0
4	M4	x	.366	.366	0	0
5	M16	x	-.366	-.366	0	0
6	M15	x	-.366	-.366	0	0
7	M14	x	-.366	-.366	0	0
8	M13	x	-.366	-.366	0	0
9	M1	Y	-.308	-.308	0	0
10	M2	Y	-.308	-.308	0	0
11	M3	Y	-.308	-.308	0	0
12	M4	Y	-.308	-.308	0	0
13	M16	Y	-.308	-.308	0	0
14	M15	Y	-.308	-.308	0	0
15	M14	Y	-.308	-.308	0	0
16	M13	Y	-.308	-.308	0	0

Member Distributed Loads (BLC 5 : WIND)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	x	.103	.103	0	0
2	M2	x	.103	.103	0	0
3	M3	x	.103	.103	0	0
4	M4	x	.103	.103	0	0
5	M16	x	-.103	-.103	0	0
6	M15	x	-.103	-.103	0	0
7	M14	x	-.103	-.103	0	0
8	M13	x	-.103	-.103	0	0

Load Combinations

	Description	Sol...	PDelta	SRSS	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1																				
2	IBC 16-1	Yes	Y		DL	1.4														
3	IBC 16-2 (a)	Yes	Y		DL	1.2	LL	1.6	LLS	1.6	RLL	.5								
4	IBC 16-2 (b)	Yes	Y		DL	1.2	LL	1.6	LLS	1.6	SL	.5	SLN	.5						
5	IBC 16-2 (c)	Yes	Y		DL	1.2	LL	1.6	LLS	1.6	RL	.5								
6	IBC 16-3 (a)	Yes	Y		DL	1.2	RLL	1.6	LL	.5	LLS	1								
7	IBC 16-3 (c)	Yes	Y		DL	1.2	SL	1.6	SLN	1.6	LL	.5	LLS	1						
8	IBC 16-3 (e)	Yes	Y		DL	1.2	RL	1.6	LL	.5	LLS	1								
9	IBC 16-3 (b...	Yes	Y		DL	1.2	RLL	1.6	WL	.5										
10	IBC 16-3 (b...	Yes	Y		DL	1.2	RLL	1.6	WL	-.5										
11	IBC 16-3 (d...	Yes	Y		DL	1.2	SL	1.6	SLN	1.6	WL	.5								
12	IBC 16-3 (d...	Yes	Y		DL	1.2	SL	1.6	SLN	1.6	WL	-.5								
13	IBC 16-3 (f)...	Yes	Y		DL	1.2	RL	1.6	WL	.5										
14	IBC 16-3 (f)...	Yes	Y		DL	1.2	RL	1.6	WL	-.5										
15	IBC 16-4 (a...	Yes	Y		DL	1.2	WL	1	LL	.5	LLS	1	RLL	.5						
16	IBC 16-4 (a...	Yes	Y		DL	1.2	WL	-1	LL	.5	LLS	1	RLL	.5						
17	IBC 16-4 (b...	Yes	Y		DL	1.2	WL	1	LL	.5	LLS	1	SL	.5	SLN	.5				
18	IBC 16-4 (b...	Yes	Y		DL	1.2	WL	-1	LL	.5	LLS	1	SL	.5	SLN	.5				
19	IBC 16-4 (c...	Yes	Y		DL	1.2	WL	1	LL	.5	LLS	1	RL	.5						
20	IBC 16-4 (c...	Yes	Y		DL	1.2	WL	-1	LL	.5	LLS	1	RL	.5						
21	IBC 16-6 (a)	Yes	Y		DL	.9	WL	1												
22	IBC 16-6 (b)	Yes	Y		DL	.9	WL	-1												
23	IBC 16-5	Yes	Y		DL	1.2	EL	1	LL	.5	LLS	1	SL	.2	SLN	.7				
24	IBC 16-7	Yes	Y		DL	.9	EL	1												
25	12-DL	Yes	Y		DL	1.2														
26	12-SL	Yes	Y		SL	1.6														
27	12-W	Yes	Y		WL	.5														

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N2	max	0	2	147.973	12	0	2	0	2	0	2	0	2
2		min	0	2	-.568	27	0	2	0	2	0	2	0	2
3	N12	max	.232	22	13.225	23	0	2	0	2	0	2	0	2
4		min	-2.888	23	-3.093	18	0	2	0	2	0	2	0	2
5	N1	max	0	2	0	2	0	2	0	2	0	2	0	2
6		min	0	2	0	2	0	2	0	2	0	2	0	2
7	N3	max	0	2	0	2	0	2	0	2	0	2	0	2
8		min	0	2	0	2	0	2	0	2	0	2	0	2
9	N5	max	0	2	0	2	0	2	0	2	0	2	0	2
10		min	0	2	0	2	0	2	0	2	0	2	0	2
11	N7	max	0	2	0	2	0	2	0	2	0	2	0	2
12		min	0	2	0	2	0	2	0	2	0	2	0	2
13	N9	max	0	2	0	2	0	2	0	2	0	2	0	2
14		min	0	2	0	2	0	2	0	2	0	2	0	2
15	N17	max	0	2	0	2	0	2	0	2	0	2	0	2
16		min	0	2	0	2	0	2	0	2	0	2	0	2
17	N15	max	0	2	0	2	0	2	0	2	0	2	0	2
18		min	0	2	0	2	0	2	0	2	0	2	0	2
19	N13	max	0	2	0	2	0	2	0	2	0	2	0	2
20		min	0	2	0	2	0	2	0	2	0	2	0	2
21	N11	max	0	2	0	2	0	2	0	2	0	2	0	2
22		min	0	2	0	2	0	2	0	2	0	2	0	2
23	N16	max	0	2	238.858	12	0	2	0	2	0	2	0	2
24		min	0	2	-1.211	27	0	2	0	2	0	2	0	2
25	N14	max	22.026	12	0	2	0	2	0	2	0	2	0	2
26		min	-11.417	24	0	2	0	2	0	2	0	2	0	2
27	N29	max	0	12	0	2	0	2	0	2	0	2	0	2
28		min	0	24	0	2	0	2	0	2	0	2	0	2
29	N28	max	9.558	22	0	2	0	2	0	2	0	2	0	2
30		min	-54.616	23	0	2	0	2	0	2	0	2	0	2
31	Totals:	max	18.484	22	384.869	11	0	2						
32		min	-65.833	23	0	27	0	2						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation...	LC	Y Rotation...	LC	Z Rotation ...	LC
1	N1	max	.065	23	0	27	0	2	0	2	0	2	1.501e-5	27
2		min	-.005	22	-.048	12	0	2	0	2	0	2	-4.502e-3	12
3	N2	max	.007	27	0	27	0	2	0	2	0	2	-5.469e-6	27
4		min	-.199	12	0	12	0	2	0	2	0	2	-2.52e-3	11
5	N3	max	.073	23	.002	27	0	2	0	2	0	2	1.47e-5	27
6		min	-.002	22	-.585	12	0	2	0	2	0	2	-2.796e-3	12
7	N4	max	.007	27	.002	27	0	2	0	2	0	2	-9.204e-6	27
8		min	-.197	12	-.531	12	0	2	0	2	0	2	-2.904e-3	11
9	N5	max	.056	23	.003	27	0	2	0	2	0	2	9.457e-6	27
10		min	-.008	22	-.923	12	0	2	0	2	0	2	-1.134e-3	12
11	N6	max	.007	27	.003	27	0	2	0	2	0	2	-1.656e-5	27
12		min	-.143	12	-.903	12	0	2	0	2	0	2	-1.459e-3	11
13	N7	max	.032	24	.003	27	0	2	0	2	0	2	2.201e-4	12
14		min	-.05	12	-.978	12	0	2	0	2	0	2	-1.505e-7	27
15	N8	max	.021	24	.003	27	0	2	0	2	0	2	1.385e-4	12
16		min	-.068	12	-.999	12	0	2	0	2	0	2	-1.252e-4	24
17	N9	max	.009	24	.002	27	0	2	0	2	0	2	1.157e-3	11
18		min	-.119	12	-.846	12	0	2	0	2	0	2	1.519e-5	27
19	N10	max	.036	23	.002	27	0	2	0	2	0	2	1.357e-3	12
20		min	-.007	22	-.84	12	0	2	0	2	0	2	-3.768e-5	27
21	N11	max	.006	24	.002	12	0	2	0	2	0	2	1.887e-3	12
22		min	-.05	12	-.004	24	0	2	0	2	0	2	-1.725e-5	27

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation...	LC	Y Rotation...	LC	Z Rotation ...	LC
23	N12	max	0	23	0	18	0	2	0	2	0	2	8.423e-5	18
24		min	0	22	0	23	0	2	0	2	0	2	-7.482e-5	24
25	N13	max	.008	24	0	27	0	2	0	2	0	2	2.801e-4	12
26		min	-.059	12	-.019	11	0	2	0	2	0	2	-5.033e-6	27
27	N14	max	0	24	0	27	0	2	0	2	0	2	1.899e-5	22
28		min	0	12	-.032	12	0	2	0	2	0	2	-2.188e-4	23
29	N15	max	.005	27	0	27	0	2	0	2	0	2	1.676e-3	11
30		min	-.103	12	-.128	11	0	2	0	2	0	2	2.02e-6	27
31	N16	max	.01	23	0	27	0	2	0	2	0	2	1.007e-3	12
32		min	-.002	22	0	12	0	2	0	2	0	2	-4.038e-5	27
33	N17	max	.006	27	.001	27	0	2	0	2	0	2	1.989e-3	11
34		min	-.137	12	-.581	12	0	2	0	2	0	2	1.546e-5	27
35	N18	max	.036	23	.002	27	0	2	0	2	0	2	2.575e-3	12
36		min	0	22	-.483	12	0	2	0	2	0	2	-5.408e-5	27
37	N19	max	.007	27	0	27	0	2	0	2	0	2	-7.535e-6	27
38		min	-.166	12	-.007	12	0	2	0	2	0	2	-1.83e-3	11
39	N20	max	.008	27	.002	27	0	2	0	2	0	2	-1.928e-5	27
40		min	-.157	12	-.539	12	0	2	0	2	0	2	-2.352e-3	11
41	N21	max	.015	24	.003	27	0	2	0	2	0	2	-2.674e-5	27
42		min	-.122	12	-.907	12	0	2	0	2	0	2	-1.337e-3	11
43	N22	max	.026	24	.003	27	0	2	0	2	0	2	7.242e-5	20
44		min	-.069	12	-.998	12	0	2	0	2	0	2	-2.453e-4	23
45	N23	max	.037	24	.002	27	0	2	0	2	0	2	1.117e-3	12
46		min	-.016	18	-.842	12	0	2	0	2	0	2	-2.261e-4	24
47	N24	max	.055	24	.002	27	0	2	0	2	0	2	4.907e-4	12
48		min	-.058	12	-.846	12	0	2	0	2	0	2	-8.867e-5	24
49	N25	max	.048	24	.001	27	0	2	0	2	0	2	8.53e-4	12
50		min	-.055	12	-.515	12	0	2	0	2	0	2	-2.973e-4	24
51	N26	max	.022	24	0	27	0	2	0	2	0	2	5.825e-4	12
52		min	-.023	12	-.029	11	0	2	0	2	0	2	-3.525e-4	24
53	N27	max	.004	24	0	27	0	2	0	2	0	2	1.668e-4	12
54		min	-.001	18	-.031	12	0	2	0	2	0	2	-2.444e-4	24
55	N28	max	0	23	.003	26	0	2	0	2	0	2	1.989e-5	27
56		min	0	22	-.002	2	0	2	0	2	0	2	-5.324e-4	12
57	N29	max	0	24	0	27	0	2	0	2	0	2	3.514e-4	11
58		min	0	12	-.018	12	0	2	0	2	0	2	3.88e-6	27

Envelope AISC 14th(360-10): LRFD Steel Code Checks

	Member	Shape	Code Che...	Loc[ft]	LC	Shea...	Loc...	Dir	LC	phi*Pnc ...	phi*Pnt [k]	phi*Mn y-...	phi*Mn ...	Cb	Eqn
1	M1	HSS8x8x8	.484	0	12	.101	0	y	11	486.202	558.9	129.375	129.375	1.959	H1-1a
2	M2	HSS8x8x8	.652	0	12	.110	0	y	11	473.406	558.9	129.375	129.375	2.058	H1-1a
3	M3	HSS8x8x8	.625	12.597	11	.109	12....	y	12	473.406	558.9	129.375	129.375	2.101	H1-1a
4	M4	HSS8x8x8	.525	12.597	11	.110	12....	y	12	473.406	558.9	129.375	129.375	2.221	H1-1a
5	M5	HSS8x8x8	.107	0	12	.016	0	y	12	487.247	558.9	129.375	129.375	2.348	H1-1b
6	M6	HSS8x8x8	.284	12.5	12	.005	0	y	12	474.618	558.9	129.375	129.375	1.582	H1-1a
7	M7	HSS8x8x8	.371	5.99	12	.004	12.5	y	23	474.618	558.9	129.375	129.375	1.047	H1-1a
8	M8	HSS8x8x8	.367	0	12	.006	12.5	y	11	474.618	558.9	129.375	129.375	1.63	H1-1a
9	M9	HSS8x8x5	.534	0	12	.009	14....	y	11	294.118	362.664	86.595	86.595	2.016	H1-1a
10	M10	HSS8x8x5	.125	1.862	12	.004	16....	y	11	279.118	362.664	86.595	86.595	1.301	H1-1b
11	M11	HSS8x8x5	.039	9.908	11	.003	0	y	2	269.621	362.664	86.595	86.595	1.09	H1-1b
12	M12	HSS8x8x5	.309	13.806	11	.003	0	y	12	259.188	362.664	86.595	86.595	1.229	H1-1a
13	M13	HSS8x8x8	.295	11.541	12	.110	11....	y	12	486.202	558.9	129.375	129.375	2.266	H1-1b
14	M14	HSS8x8x8	.372	12.597	12	.110	12....	y	11	473.406	558.9	129.375	129.375	2.857	H1-1b
15	M15	HSS8x8x8	.422	0	11	.120	0	y	12	473.406	558.9	129.375	129.375	2.677	H1-1b
16	M16	HSS8x8x8	.530	0	11	.110	0	y	12	473.406	558.9	129.375	129.375	2.217	H1-1a
17	M17	HSS8x8x8	.023	0	11	.005	0	y	11	487.247	558.9	129.375	129.375	2.113	H1-1b
18	M18	HSS8x8x8	.089	12.5	11	.009	12.5	y	12	474.618	558.9	129.375	129.375	2.374	H1-1b
19	M19	HSS8x8x8	.218	0	11	.017	0	y	11	474.618	558.9	129.375	129.375	2.299	H1-1b

Envelope AISC 14th(360-10): LRFD Steel Code Checks (Continued)

	Member	Shape	Code Che...	Loc[ft]	LC	Shea...	Loc...	Dir	LC	phi*Pnc ...	phi*Pnt [k]	phi*Mn y-...	phi*Mn ...	Cb	Eqn
20	M20	HSS8x8x8	.098	12.5	12	.007	0	y	23	474.618	558.9	129.375	129.375	1.869	H1-1b
21	M21	HSS8x8x5	.114	0	12	.007	14....	y	12	294.118	362.664	86.595	86.595	1.884	H1-1b
22	M22	HSS8x8x5	.321	16.252	12	.006	16....	y	12	279.118	362.664	86.595	86.595	2.496	H1-1a
23	M23	HSS8x8x5	.549	17.294	12	.005	17....	y	12	269.621	362.664	86.595	86.595	2.529	H1-1a
24	M24	HSS8x8x5	.321	0	11	.004	18....	y	12	259.188	362.664	86.595	86.595	1.701	H1-1a
25	M25	HSS8x8x8	.412	0	12	.026	0	y	11	525.92	558.9	129.375	129.375	2.146	H1-1a
26	M26	HSS8x8x5	.335	0	12	.016	0	y	11	334.34	362.664	86.595	86.595	2.226	H1-1a
27	M27	HSS8x8x5	.059	10.621	11	.003	0	y	23	324.298	362.664	86.595	86.595	2.192	H1-1b
28	M28	HSS8x8x5	.066	0	12	.003	0	y	12	313.037	362.664	86.595	86.595	2.222	H1-1b
29	M29	HSS8x8x5	.046	0	12	.006	0	y	12	334.219	362.664	86.595	86.595	2.153	H1-1b
30	M30	HSS8x8x8	.088	0	12	.010	0	y	11	513.926	558.9	129.375	129.375	1.992	H1-1b
31	M31	HSS8x8x5	.069	9.387	12	.006	0	y	12	332.329	362.664	86.595	86.595	2.247	H1-1b
32	M32	HSS8x8x5	.603	0	12	.009	0	y	12	332.985	362.664	86.595	86.595	2.147	H1-1a
33	M33	HSS8x8x5	.455	0	12	.015	0	y	12	333.575	362.664	86.595	86.595	2.182	H1-1a
34	M34	HSS8x8x8	.352	1.33	12	.027	0	y	12	557.867	558.9	129.375	129.375	1.2	H1-1a
35	M35	HSS8x8x5	.379	1.33	12	.030	0	y	24	362.029	362.664	86.595	86.595	1.137	H1-1a
36	M36	HSS8x8x5	.089	1.33	12	.034	0	y	24	362.029	362.664	86.595	86.595	1.193	H1-1b
37	M37	HSS8x8x5	.058	1.33	23	.036	0	y	23	362.029	362.664	86.595	86.595	1.856	H1-1b
38	M38	HSS8x8x5	.061	4.67	11	.014	0	y	23	354.908	362.664	86.595	86.595	1.536	H1-1b
39	M39	HSS8x8x5	.100	1.33	23	.032	0	y	23	362.029	362.664	86.595	86.595	1.305	H1-1b
40	M40	HSS8x8x5	.468	4.33	11	.034	0	y	23	355.986	362.664	86.595	86.595	1.38	H1-1a
41	M41	HSS8x8x5	.567	2.67	11	.036	0	y	23	360.11	362.664	86.595	86.595	1.406	H1-1a
42	M42	HSS8x8x5	.074	1	12	.035	0	y	24	362.305	362.664	86.595	86.595	1.119	H1-1b

Printed: 29 JAN 2014, 12:12PM

Masonry Column

File = P:\OGDENC~1\04310~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Masonry Column for Steel Truss (Load Comb. 12)

Code References

Load Combinations Used : ASCE 7-10

General Information

Material Properties

F'm	=	1,500.0 psi
Fr - Rupture	=	163.0 psi
Em = f'm *	=	900.0
Column Density	=	130.0 pcf
Rebar Grade	=	Grade 60
Fy - Yield	=	60000 psi
Fs - Allowable	=	24000 psi
E - Rebar	=	29,000.0 ksi
Load Combination =		ASCE 7-10

Brace condition for deflection (buckling) along columns :

Column Data

Column width along X-X	=	15.625 in
Column depth along Y-Y	=	23.625 in
Longitudinal Bar Size	=	# 6.0
Bars per side at +Y & -Y	=	2
Bars per side at +X & -X	=	3
Cover from ties	=	3.50 in
Actual Edge to Bar Center	=	4.25 in

Analysis Settings

Analysis Method	=	**Strength Design**
φ factor for Strength Design	=	0.90
End Fixity Condition	=	Top Free, Bottom Fixed
Overall Column Height	=	17.0 ft
Construction Type		Solid Grouted Hollow Concrete Masonry
Tie Bar Size	=	# 3.0
Tie Bar Spacing	=	12.0 in

X-X (width) axis : Unbraced Length for X-X Axis buckling = 17.0 ft, K = 1.0
Y-Y (depth) axis : Unbraced Length for X-X Axis buckling = 17.0 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 5,665.28 lbs * Dead Load Factor
AXIAL LOADS . . .
Max Reaction fro Truss: Axial Load at 17.0 ft, D = 67.20, S = 171.0, W = -1.211 k
BENDING LOADS . . .

DESIGN SUMMARY

Bending & Shear Check Results

PASS **Maximum Bending Stress Ratio** = 0.851 : 1
Load Combination +1.20D+0.50L+1.60S+1.60H
Location of max.above base 0.000 ft
At maximum location values are . . .
Pu 361.038 k
0.9 * Pn 410.789 k
Mu-x 0.000 k-ft
0.9 * Mn-x : 106.121 k-ft

PASS **Reinforcing Area Check** *(ACI 530-08, Sec 3.3.4.*
As : Actual Reinforcement 2.640
Min: 0.0025 * An 0.923
Max: 0.04 * An 14.766

Dimensional Checks
Min. Width/Depth >= 8" *(ACI 530-08, Sec 3.4.4.*
PASS Overall Height / Min Dim <= 30 *(ACI 530-08, Sec 3.4.4.*

Maximum SERVICE Load Reactions . .
Top along X-X 0.000 k
Bottom along X-X 0.000 k

Maximum SERVICE Load Deflections . . .
Along x-x 0.000 in at 0.000 ft above base
for load combination :

Compressive Strength 411.087 k *(ACI 530-08, Sec 3.3.4.*
Pa = 0.80 [0.80 f'm (An - Ast) + FyAst) * [1-(h/(140*r))^2]

PASS **Check Column Ties** *(ACI 530-08, Sec 2.1.6.*
Min. Tie Dia. = 1/4", # 3 bar provided
Max Tie Spacing = 12.00 in, Provided = 12.00 in

Load Combination Results

Load Combination	Maximum Bending Stress Ratios Stress Ratio	Status	Location	Maximum Axial Load Actual	Allow	Maximum Moments Actual	Allow
+1.40D+1.60H	0.2404	PASS	0.0 ft	102.011 k	410.789 k	0.0 k-ft	106.121 k-ft
+1.20D+0.50Lr+1.60L+1.60H	0.2061	PASS	0.0 ft	87.438 k	410.789 k	0.0 k-ft	106.121 k-ft
+1.20D+1.60L+0.50S+1.60H	0.4076	PASS	0.0 ft	172.938 k	410.789 k	0.0 k-ft	106.121 k-ft
+1.20D+1.60Lr+0.50L+1.60H	0.2061	PASS	0.0 ft	87.438 k	410.789 k	0.0 k-ft	106.121 k-ft
+1.20D+1.60Lr+0.50W+1.60H	0.2047	PASS	0.1141 ft	86.833 k	410.789 k	0.0 k-ft	106.121 k-ft
+1.20D+0.50L+1.60S+1.60H	0.8510	PASS	0.0 ft	361.038 k	410.789 k	0.0 k-ft	106.121 k-ft
+1.20D+1.60S+0.50W+1.60H	0.8495	PASS	0.0 ft	360.433 k	410.789 k	0.0 k-ft	106.121 k-ft
+1.20D+0.50Lr+0.50L+W+1.60H	0.2032	PASS	0.0 ft	86.227 k	410.789 k	0.0 k-ft	106.121 k-ft
+1.20D+0.50L+0.50S+W+1.60H	0.4048	PASS	0.1141 ft	171.727 k	410.789 k	0.0 k-ft	106.121 k-ft
+1.20D+0.50L+0.20S+E+1.60H	0.2867	PASS	0.0 ft	121.638 k	410.789 k	0.0 k-ft	106.121 k-ft

Printed: 29 JAN 2014, 12:12PM

Masonry Column

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Masonry Column for Steel Truss (Load Comb. 12)

Load Combination Results

Load Combination	Maximum Bending Stress Ratios Stress Ratio	Status	Location	Maximum Axial Load Actual	Allow	Maximum Moments Actual	Allow
+0.90D+W+0.90H	0.1517	PASS	0.0 ft	64.368 k	410.789 k	0.0 k-ft	106.121 k-ft
+0.90D+E+0.90H	0.1546	PASS	0.0 ft	65.579 k	410.789 k	0.0 k-ft	106.121 k-ft

Maximum Reactions - Unfactored

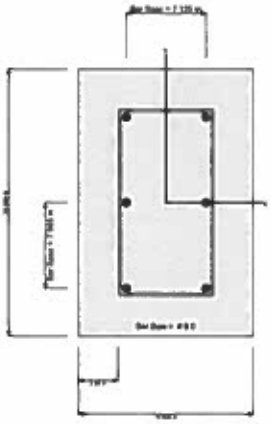
Note: Only non-zero reactions are listed.

Load Combination	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base
D Only	k	k	72.865 k
S Only	k	k	171.000 k
W Only	k	k	k
D+S	k	k	243.865 k
D+W	k	k	71.654 k

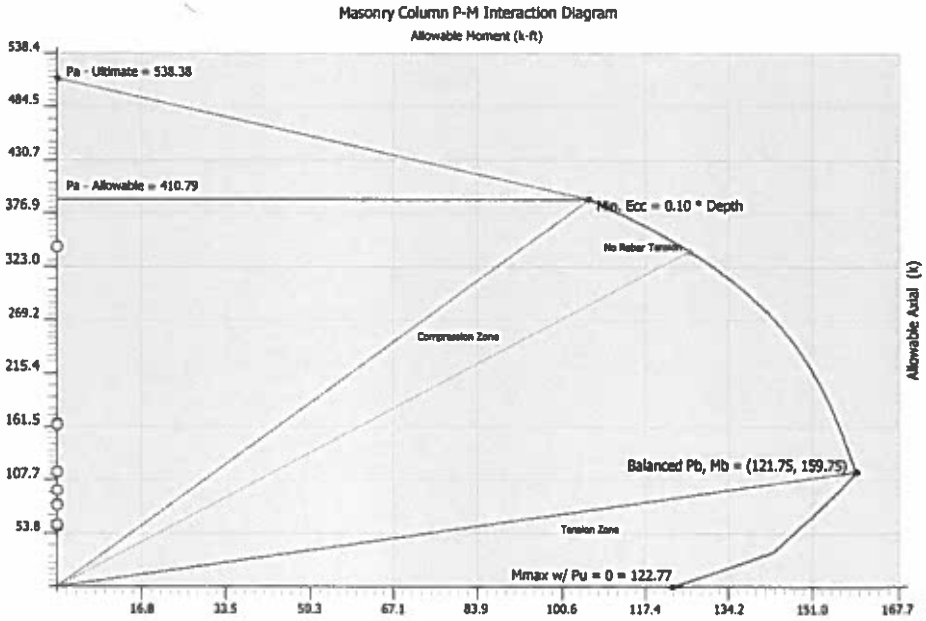
Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000 ft
S Only	0.0000 in	0.000 ft
D+S	0.0000 in	0.000 ft
D+W	0.0000 in	0.000 ft

Cross Section



Interaction Diagram



Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	25	N2	0	39.83	0	0	0	0
2	25	N12	-.478	.754	0	0	0	0
3	25	N1	0	0	0	0	0	0
4	25	N3	0	0	0	0	0	0
5	25	N5	0	0	0	0	0	0
6	25	N7	0	0	0	0	0	0
7	25	N9	0	0	0	0	0	0
8	25	N17	0	0	0	0	0	0
9	25	N15	0	0	0	0	0	0
10	25	N13	0	0	0	0	0	0
11	25	N11	0	0	0	0	0	0
12	25	N16	0	67.152	0	0	0	0
13	25	N14	5.095	0	0	0	0	0
14	25	N29	0	0	0	0	0	0
15	25	N28	-4.617	0	0	0	0	0
16	25	Totals:	0	107.736	0			
17	25	COG (ft):	X: 47.828	Y: 8.857	Z: 0			

Load Comb. 12 - Dead Load 1.2 DL

Load Comb 16b - Dead Load 1.2 DL

Load Comb 12 is worst case for Column Loading

1.2 D + 1.6 S + 0.5 W

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	27	N2	0	-.568	0	0	0	0
2	27	N12	-.295	1.779	0	0	0	0
3	27	N1	0	0	0	0	0	0
4	27	N3	0	0	0	0	0	0
5	27	N5	0	0	0	0	0	0
6	27	N7	0	0	0	0	0	0
7	27	N9	0	0	0	0	0	0
8	27	N17	0	0	0	0	0	0
9	27	N15	0	0	0	0	0	0
10	27	N13	0	0	0	0	0	0
11	27	N11	0	0	0	0	0	0
12	27	N16	0	-1.211	0	0	0	0
13	27	N14	-2.437	0	0	0	0	0
14	27	N29	0	0	0	0	0	0
15	27	N28	-6.51	0	0	0	0	0
16	27	Totals:	-9.242	0	0			
17	27	COG (ft):	NC	NC	NC			

Load Comb. 12 - Wind Load 0.5W

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	26	N2	0	107.583	0	0	0	0
2	26	N12	-1.054	-.933	0	0	0	0
3	26	N1	0	0	0	0	0	0
4	26	N3	0	0	0	0	0	0
5	26	N5	0	0	0	0	0	0
6	26	N7	0	0	0	0	0	0
7	26	N9	0	0	0	0	0	0
8	26	N17	0	0	0	0	0	0
9	26	N15	0	0	0	0	0	0
10	26	N13	0	0	0	0	0	0
11	26	N11	0	0	0	0	0	0
12	26	N16	0	170.483	0	0	0	0
13	26	N14	14.488	0	0	0	0	0
14	26	N29	0	0	0	0	0	0
15	26	N28	-13.435	0	0	0	0	0
16	26	Totals:	0	277.133	0			
17	26	COG (ft):	X: 46.21	Y: 8.869	Z: 0			

Load Comb. 12 - Snow Load 1.6 SL

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	29	N2	0	47.069	0	0	0	0
2	29	N12	-.461	-.406	0	0	0	0
3	29	N1	0	0	0	0	0	0
4	29	N3	0	0	0	0	0	0
5	29	N5	0	0	0	0	0	0
6	29	N7	0	0	0	0	0	0
7	29	N9	0	0	0	0	0	0
8	29	N17	0	0	0	0	0	0
9	29	N15	0	0	0	0	0	0
10	29	N13	0	0	0	0	0	0
11	29	N11	0	0	0	0	0	0
12	29	N16	0	74.582	0	0	0	0
13	29	N14	6.336	0	0	0	0	0
14	29	N29	0	0	0	0	0	0
15	29	N28	-5.875	0	0	0	0	0
16	29	Totals:	0	121.246	0			
17	29	COG (ft):	X: 46.21	Y: 8.869	Z: 0			

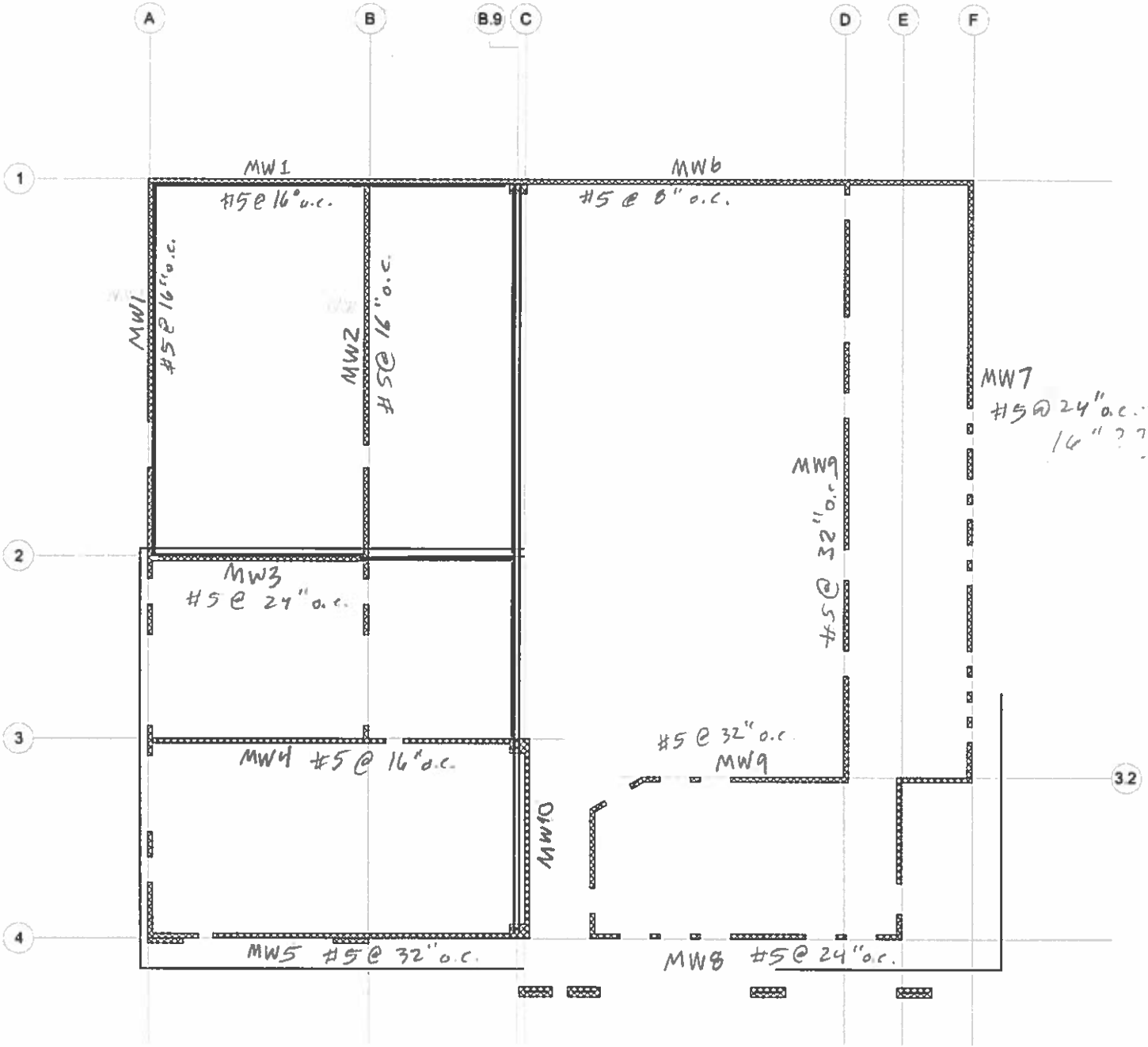
Load comb. 166 - Snow Load (Non-sledding) 0.7 SL

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	28	N2	0	11.405	0	0	0	0
2	28	N12	-2.277	12.595	0	0	0	0
3	28	N1	0	0	0	0	0	0
4	28	N3	0	0	0	0	0	0
5	28	N5	0	0	0	0	0	0
6	28	N7	0	0	0	0	0	0
7	28	N9	0	0	0	0	0	0
8	28	N17	0	0	0	0	0	0
9	28	N15	0	0	0	0	0	0
10	28	N13	0	0	0	0	0	0
11	28	N11	0	0	0	0	0	0
12	28	N16	0	17.184	0	0	0	0
13	28	N14	-15.243	0	0	0	0	0
14	28	N29	0	0	0	0	0	0
15	28	N28	-48.313	0	0	0	0	0
16	28	Totals:	-65.833	41.184	0			
17	28	COG (ft):	X: 49.908	Y: 9.537	Z: 0			

Load Comb. 16b - Earthquake Load 1.0 EL

MASONRY WALLS



0.594 s.f.

1,612.9 s.f.

Masonry Slender Wall

Lic. # : KW-06005617

Description : MW1- 19' Wall 2'-9" Parapet

General Information

Calculations per . ASCE 7-10

Construction Type : Grouted Hollow Concrete Masonry

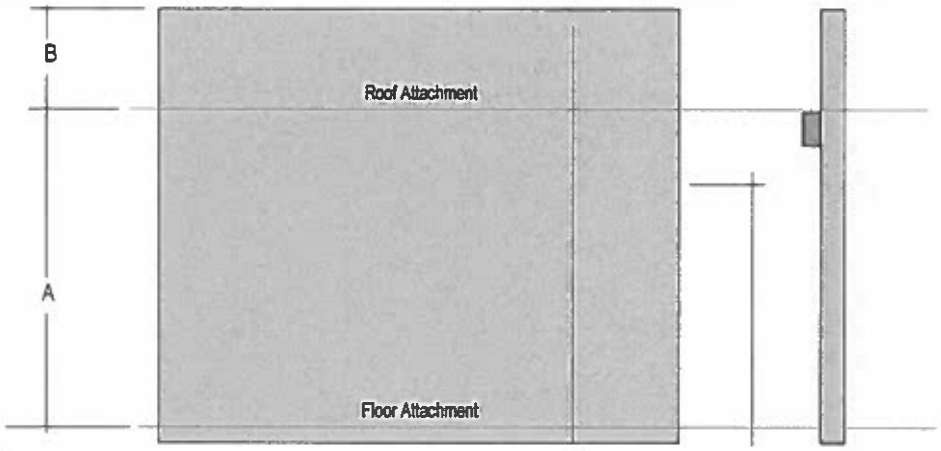
F'm	=	2.50 ksi	Nom. Wall Thickness	8 in	Temp Diff across thickness	=	30.0 deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625 in	Min Allow Out-of-plane Defl Ratio	=	150.0
Fr - Rupture	=	163.0 psi	Rebar "d" distance	3.813 in	Minimum Vertical Steel %	=	0.0020
Em = f'm *	=	900.0	Lower Level Rebar . . .				
Max % of ρ bal.	=	0.01190	Bar Size	# 5			
Grout Density	=	140 pcf	Bar Spacing	24.0 in			
Block Weight		Normal Weight					
Wall Weight	=	84.0 psf					

Wall is Solid Grouted

One-Story Wall Dimensions

A Clear Height	=	19.0 ft
B Parapet height	=	2.670 ft

Wall Support Condition Top & Bottom Pinned



Vertical Loads

Vertical Uniform Loads . . . *(Applied per foot of Strip Width)*

			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity	6.750 in					k/ft
Concentric Load			0.2610	0.290		0.540	k/ft

Lateral Loads

Full area WIND load			20.0 psf	Wall Weight Seismic Load Input Method :	Direct entry of Lateral Wall Weight
Fp	1.0	=	30.0 psf	Seismic Wall Lateral Load	30.0 psf

Printed: 23 JAN 2014, 4:28PM
File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Licensee : SUNRISE ENGINEERING

Masonry Slender Wall

Lic. # : KW-06005617

Description : MW1- 19' Wall 2'-9" Parapet

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +1.20D+0.50L+0.50S+1.60W	Maximum Bending Stress Ratio = 0.5517			
		Max Mu	1.662 k-ft	Phi * Mn	3.012 k-ft
PASS	Service Deflection Check D + L + S + E/1.4	Min. Defl. Ratio	160.035	Max Allow Ratio	150.0
		Max. Deflection	1.425 in	Max. Allow. Defl.	1.520 in
PASS	Axial Load Check +1.20D+0.50L+0.50S+1.60W	Max Pu / Ag	20.546 psi	0.2 * f'm	500.0 psi
		Location	9.183 ft		
PASS	Reinforcing Limit Check	Controlling As/bd	0.003388	As/bd=.01190 rho bal	0.01190
PASS	Minimum Moment Check +1.40D	Mcracking	1.579 k-ft	Minimum Phi Mn	3.292 k-ft
		Maximum Reactions . . .	*for Load Combination....*		
		Top Horizontal	E Only		0.3707 k
		Base Horizontal	E Only		0.2794 k
		Vertical Reaction	D + L + S		2.621 k

Design Maximum Combinations - Moments

Load Combination	Axial Load Pu (k)	0.2*f'm*b*t (k)	Moment Values Mcr (k-ft)	Mu (k-ft)	Phi	Phi Mn (k-ft)	As (in^2)	As Ratio	0.6 * rho bal
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
+1.20D+1.60Lr+0.80W at 8.87 to 9.50	2.068	45.600	1.58	0.85	0.90	3.06	0.155	0.0034	0.0119
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
+1.20D+1.60S+0.80W at 8.87 to 9.50	2.468	45.600	1.58	0.88	0.90	3.16	0.155	0.0034	0.0119
+1.20D+0.50Lr+0.50L+1.60W at 8.87 to 9.50	1.749	45.600	1.58	1.64	0.90	2.98	0.155	0.0034	0.0119
+1.20D+0.50L+0.50S+1.60W at 8.87 to 9.50	1.874	45.600	1.58	1.66	0.90	3.01	0.155	0.0034	0.0119
+1.20D+0.50L+0.20S+E at 8.87 to 9.50	1.712	45.600	1.58	1.53	0.90	2.97	0.155	0.0034	0.0119
+0.90D+1.60W at 8.87 to 9.50	1.203	45.600	1.58	1.56	0.90	2.84	0.155	0.0034	0.0119
+0.90D+E at 8.87 to 9.50	1.203	45.600	1.58	1.46	0.90	2.84	0.155	0.0034	0.0119

Design Maximum Combinations - Deflections

Load Combination	Axial Load Pu (k)	Moment Values Mcr (k-ft)	Mactual (k-ft)	Stiffness I gross (in^4)	I cracked (in^4)	I effective (in^4)	Deflections Deflection (in)	Defl. Ratio
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
D + L + W at 8.87 to 9.50	1.336	1.58	1.01	443.30	22.07	22.067	1.304	174.9
D + L + W + S/2 at 8.87 to 9.50	1.606	1.58	1.04	443.30	22.52	22.515	1.316	173.2
D + L + S + W/2 at 8.87 to 9.50	1.876	1.58	0.54	443.30	22.96	22.959	0.665	343.0
D + L + S + E/1.4 at 8.87 to 9.50	1.876	1.58	1.15	443.30	22.96	22.959	1.425	160.0
D + 0.5(L+Lr) + 0.7W at 8.87 to 9.50	1.481	1.58	0.72	443.30	22.31	22.308	0.917	248.6
D + 0.5(L+Lr) + 0.7E at 8.87 to 9.50	1.481	1.58	1.08	443.30	22.31	22.308	1.376	165.7

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.00 k	2.081 k
S Only	0.0 k	0.00 k	0.540 k
W Only	0.2 k	0.25 k	0.000 k
E Only	0.3 k	0.37 k	0.000 k
D + L + Lr	0.0 k	0.00 k	2.371 k
D + L + S	0.0 k	0.00 k	2.621 k

Masonry Slender Wall

Description : MW1- 19' Wall 2'-9" Parapet

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D + L + W + S/2	0.2 k	0.25 k	2.351 k
D + L + S + W/2	0.1 k	0.13 k	2.621 k
D + L + S + E/1.4	0.2 k	0.27 k	2.621 k

Printed: 23 JAN 2014, 4:29PM
File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Masonry Slender Wall

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : MW2- 19' Wall

Code References

Calculations per ACI 530-08/MSJC 2009 Sec. 3.3.5, ASCE 7-10

General Information

Calculations per ACI 530-08/MSJC 2009 Sec. 3.3.5, IBC 2009, CBC 2010, ASCE 7-10

Construction Type : Grouted Hollow Concrete Masonry

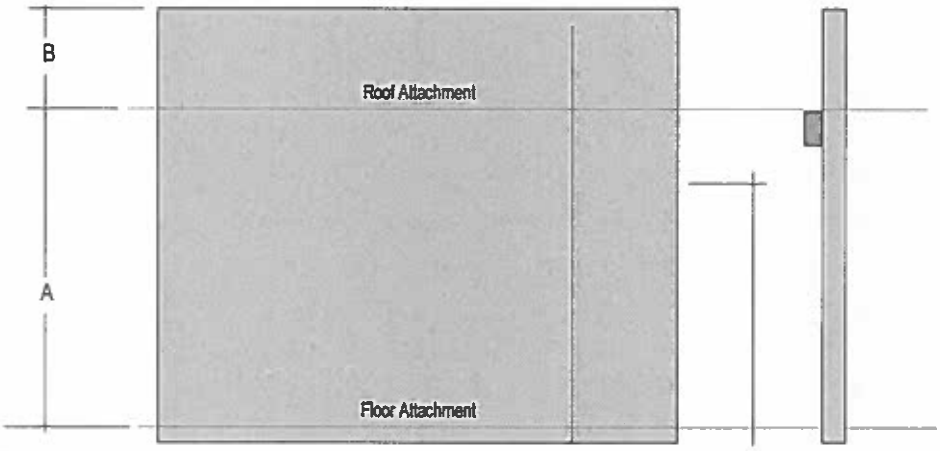
F'm	=	1.50 ksi	Nom. Wall Thickness	8 in	Temp Diff across thickness	=	30.0 deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625 in	Min Allow Out-of-plane Defl Ratio	=	150.0
Fr - Rupture	=	120.0 psi	Rebar "d" distance	3.813 in	Minimum Vertical Steel %	=	0.0020
Em = f'm *	=	900.0	Lower Level Rebar . . .				
Max % of ρ bal.	=	0.007138	Bar Size	# 5			
Grout Density	=	140 pcf	Bar Spacing	16.0 in			
Block Weight		Normal Weight					
Wall Weight	=	84.0 psf					

Wall is Solid Grouted

One-Story Wall Dimensions

A Clear Height = 19.0 ft
B Parapet height = ft

Wall Support Condition Top & Bottom Pinned



Vertical Loads

Vertical Uniform Loads . . . *(Applied per foot of Strip Width)*

		DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity 6.750 in					k/ft
Concentric Load		0.5220	0.580		1.10	k/ft

Lateral Loads

Full area WIND load psf

Fp 1.0 = 30.0 psf

Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight

Seismic Wall Lateral Load 30.0 psf

Printed: 23 JAN 2014, 4:29PM

Masonry Slender Wall

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 Licensee : SUNRISE ENGINEERING

Description : MW2- 19' Wall

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +1.20D+0.50L+0.20S+E	Maximum Bending Stress Ratio =	0.4129		
		Max Mu	1.614 k-ft	Phi * Mn	3.910 k-ft
PASS	Service Deflection Check D + L + S + E/1.4	Min. Defl. Ratio	173.979	Max Allow Ratio	150.0
		Max. Deflection	1.311 in	Max. Allow. Defl.	1.520 in
PASS	Axial Load Check +1.20D+0.50L+0.20S+E	Max Pu / Ag	20.481 psi	0.2 * f'm	300.0 psi
		Location	9.183 ft		
PASS	Reinforcing Limit Check	Controlling As/bd	0.005081	As/bd007138 rho bal	0.007138
PASS	Minimum Moment Check +1.40D	Mcracking	1.163 k-ft	Minimum Phi Mn	4.566 k-ft

Maximum Reactions . . . *for Load Combination....*

Top Horizontal	E Only	0.2850 k
Base Horizontal	E Only	0.2850 k
Vertical Reaction	D + L + S	3.218 k

Design Maximum Combinations - Moments

Load Combination	Axial Load Pu (k)	0.2*f'm*b*t (k)	Mcr (k-ft)	Mu (k-ft)	Phi	Phi Mn (k-ft)	As (in^2)	As Ratio	0.6 * rho bal
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
+1.20D+0.50L+0.20S+E at 8.87 to 9.50	1.868	27.360	1.16	1.61	0.90	3.91	0.233	0.0051	0.0071
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
+0.90D+E at 8.87 to 9.50	1.236	27.360	1.16	1.52	0.90	3.78	0.233	0.0051	0.0071

Design Maximum Combinations - Deflections

Load Combination	Axial Load Pu (k)	Mcr (k-ft)	Mactual (k-ft)	I gross (in^4)	I cracked (in^4)	I effective (in^4)	Deflection (in)	Defl. Ratio
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
D + L + S + E/1.4 at 8.87 to 9.50	2.473	1.16	1.23	443.30	44.96	44.957	1.311	174.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
D + 0.5(L+Lr) + 0.7E at 8.87 to 9.50	1.663	1.16	1.11	443.30	43.39	43.392	1.229	185.5

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.00 k	2.118 k
S Only	0.0 k	0.00 k	1.100 k
W Only	0.0 k	0.00 k	0.000 k
E Only	0.3 k	0.28 k	0.000 k
D + L + Lr	0.0 k	0.00 k	2.698 k
D + L + S	0.0 k	0.00 k	3.218 k

Printed: 23 JAN 2014, 4:29PM

Masonry Slender Wall

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : MW2- 19' Wall

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D + L + W + S/2	0.0 k	0.00 k	2.668 k
D + L + S + W/2	0.0 k	0.00 k	3.218 k
D + L + S + E/1.4	0.2 k	0.21 k	3.218 k

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:
Project ID: S04310

Printed: 19 DEC 2013, 2:07PM

Masonry Slender Wall

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : MW3-

General Information

Calculations per [illegible], ASCE 7-10

Construction Type : Grouted Hollow Concrete Masonry

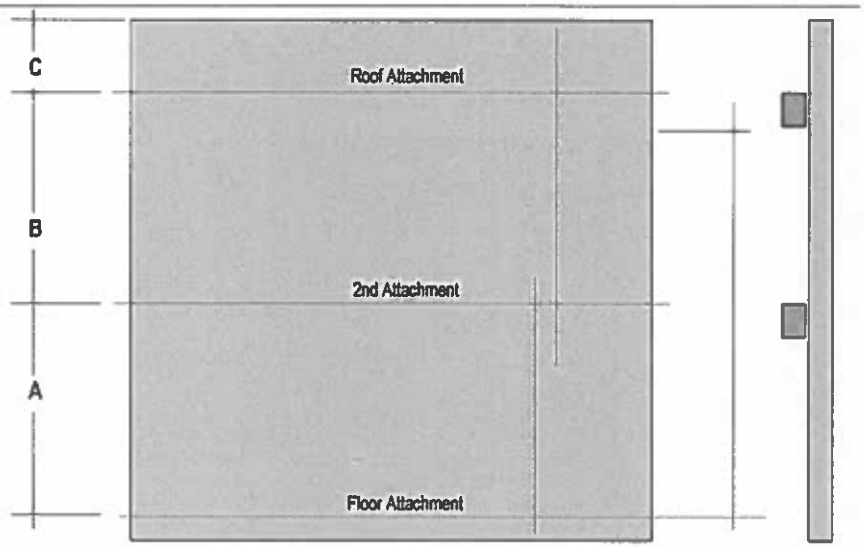
F'm	=	1.50 ksi	Nom. Wall Thickness	8	in	Temp Diff across thickness =	70.0 deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625	in	Min Allow Out-of-plane Defl Ratio =	150.0
Fr - Rupture	=	163.0 psi	Rebar "d" distance	3.813	in	Minimum Vertical Steel % =	0.0020
Em = f'm *	=	900.0	Lower Level Rebar . . .				
Max % of ρ bal.	=	0.007138	Bar Size	#	5		
Grout Density	=	140 pcf	Bar Spacing		24.0 in		
Block Weight		Normal Weight	Upper Level Rebar . . .				
Wall Weight	=	84.0 psf	Bar Size	#	5		
		Wall is Solid Grouted	Bar Spacing		24.0 in		

Two-Story Wall Dimensions

A	1st Story Height	=	19.0 ft
B	2nd Story Height	=	3.670 ft
C	Parapet height	=	ft

Wall Support Condition: Top & Bottom Pinned

Initial Lateral Disp. @ Top Support: in



Vertical Loads

Vertical Uniform Loads . . . (Applied per foot of Strip Width)		DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity in					k/ft
Concentric Load		0.2130	0.2370		0.4370	k/ft
Mid-Height Vertical Uniform Loads . . . (Applied per foot of Strip Width)		**DL : Dead**	**Lr : Roof Live**	**Lf : Floor Live**	**S : Snow**	**W : Wind**
Ledger Load	Eccentricity 6.0 in	0.1080	0.120		0.2220	k/ft
Concentric Load						k/ft

Lateral Loads

Full area WIND load: 20.0 psf

Fp 1.0 = 30.0 psf

Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight

Seismic Wall Lateral Load: 30.0 psf

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:
Project ID: S04310

Printed: 19 DEC 2013, 2:07PM

Masonry Slender Wall

File = p:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : MW3-

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

		Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check	+1.20D+0.50L+0.50S+1.60W	Maximum Bending Stress Ratio =	0.6024		
			Max Mu	-1.596 k-ft	Phi * Mn	2.649 k-ft
PASS	Service Deflection Check	D + L + S + E/1.4	Min. Defl. Ratio	229.401	Max Allow Ratio	150.0
			Max. Deflection	0.9939 in	Max. Allow. Defl.	1.520 in
PASS	Axial Load Check	+1.20D+0.50L+0.50S+1.60W	Max Pu / Ag	9.279 psi	0.2 * f'm	300.0 psi
			Location	19.184 ft		
PASS	Reinforcing Limit Check		Controlling As/bd	0.003388	As/bd0.07138 rho bal	0.007138
PASS	Minimum Moment Check	+1.40D	Mcracking	1.579 k-ft	Minimum Phi Mn	3.182 k-ft
			Maximum Reactions . . .	*for Load Combination....*		
			Top Horizontal	D + L + S + E/1.4		0.2842 k
			Base Horizontal	E Only		0.2258 k
			Mid-Ht Horizontal	E Only		0.7059 k
			Vertical Reaction	D + L + S + E/1.4		2.884 k

Design Maximum Combinations - Moments

Load Combination	Axial Load Pu k	0.2*f'm*b*t k	Moment Values Mcr k-ft	Mu k-ft	Phi	Phi Mn k-ft	As in^2	As Ratio	0.6 * rho bal
+1.40D at 19.12 to 19.24	0.717	27.360	1.58	0.29	0.90	2.62	0.155	0.0034	0.0071
+1.20D+0.50Lr+1.60L at 19.12 to 19.24	0.733	27.360	1.58	0.31	0.90	2.62	0.155	0.0034	0.0071
+1.20D+1.60L+0.50S at 19.12 to 19.24	0.833	27.360	1.58	0.35	0.90	2.65	0.155	0.0034	0.0071
+1.20D+1.60Lr+0.50L at 19.12 to 19.24	0.994	27.360	1.58	0.43	0.90	2.68	0.155	0.0034	0.0071
+1.20D+1.60Lr+0.80W at 19.12 to 19.24	1.001	27.360	1.58	1.06	0.90	2.69	0.155	0.0034	0.0071
+1.20D+0.50L+1.60S at 19.12 to 19.24	1.315	27.360	1.58	0.58	0.90	2.76	0.155	0.0034	0.0071
+1.20D+1.60S+0.80W at 19.12 to 19.24	1.321	27.360	1.58	1.23	0.90	2.76	0.155	0.0034	0.0071
+1.20D+0.50Lr+0.50L+1.60W at 19.12 to 19.	0.746	27.360	1.58	1.54	0.90	2.63	0.155	0.0034	0.0071
+1.20D+0.50L+0.50S+1.60W at 19.12 to 19.2	0.846	27.360	1.58	1.60	0.90	2.65	0.155	0.0034	0.0071
+1.20D+0.50L+0.20S+E at 19.12 to 19.24	0.714	27.360	1.58	1.45	0.90	2.62	0.155	0.0034	0.0071
+0.90D+1.60W at 19.00 to 19.12	0.623	27.360	1.58	1.39	0.90	2.60	0.155	0.0034	0.0071
+0.90D+E at 19.00 to 19.12	0.600	27.360	1.58	1.31	0.90	2.59	0.155	0.0034	0.0071

Design Maximum Combinations - Deflections

Load Combination	Axial Load Pu k	Moment Values Mcr k-ft	Mactual k-ft	Stiffness I gross in^4	I cracked in^4	I effective in^4	Deflections Deflection in	Defl. Ratio
D + L + Lr at 8.23 to 8.87	1.891	1.58	0.12	443.30	34.09	34.090	0.157	1,448.7
D + L + W at 8.23 to 8.87	1.534	1.58	0.72	443.30	33.27	33.275	0.864	263.9
D + L + W + S/2 at 8.23 to 8.87	1.863	1.58	0.76	443.30	34.03	34.027	0.902	252.8
D + L + S + W/2 at 8.23 to 8.87	2.193	1.58	0.48	443.30	34.77	34.771	0.567	402.4
D + L + S + E/1.4 at 8.23 to 8.87	2.193	1.58	0.85	443.30	34.77	34.771	0.994	229.4
D + 0.5(L+Lr) + 0.7W at 8.23 to 8.87	1.712	1.58	0.55	443.30	33.68	33.684	0.660	345.4
D + 0.5(L+Lr) + 0.7E at 8.23 to 8.87	1.712	1.58	0.77	443.30	33.68	33.684	0.922	247.3

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Mid Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.056 k	0.05 k	2.225 k
S Only	0.0 k	0.028 k	0.03 k	0.659 k
W Only	0.2 k	0.471 k	0.17 k	0.000 k
E Only	0.2 k	0.706 k	0.25 k	0.000 k
D + L + Lr	0.0 k	0.074 k	0.07 k	2.582 k

Masonry Slender Wall

Description : MW3-

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Mid Horizontal	Top Horizontal	Vertical @ Wall Base
D + L + S	0.0 k	0.089 k	0.08 k	2.884 k
D + L + W + S/2	0.1 k	0.568 k	0.25 k	2.555 k
D + L + S + W/2	0.1 k	0.339 k	0.18 k	2.884 k
D + L + S + E/1.4	0.1 k	0.624 k	0.28 k	2.884 k

Masonry Slender Wall

Description : MW4- 20'-4" Wall

General Information

ASCE 7-10

Construction Type : Grouted Hollow Concrete Masonry

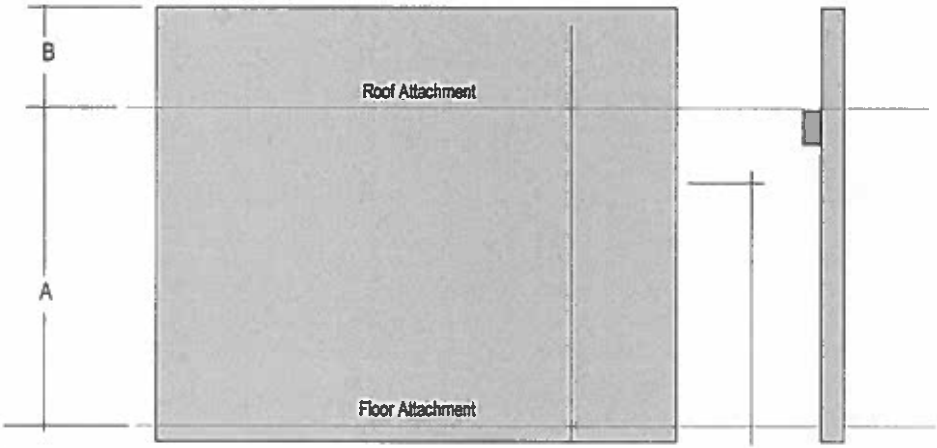
F'm	=	1.50 ksi	Nom. Wall Thickness	8 in	Temp Diff across thickness	=	30.0 deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625 in	Min Allow Out-of-plane Defl Ratio	=	150.0
Fr - Rupture	=	163.0 psi	Rebar "d" distance	3.813 in	Minimum Vertical Steel %	=	0.0020
Em = f'm *	=	900.0	Lower Level Rebar . . .				
Max % of ρ bal.	=	0.007138	Bar Size	# 5			
Grout Density	=	140 pcf	Bar Spacing	16.0 in			
Block Weight		Normal Weight					
Wall Weight	=	84.0 psf					

Wall is Solid Grouted

One-Story Wall Dimensions

A Clear Height = 20.330 ft
B Parapet height = ft

Wall Support Condition Top & Bottom Pinned



Vertical Loads

Vertical Uniform Loads . . . (Applied per foot of Strip Width)		DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity 6.750 in					k/ft
Concentric Load		0.4480	0.50		0.920	k/ft

Lateral Loads

Full area WIND load psf
Fp 1.0 = 30.0 psf

Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight
Seismic Wall Lateral Load 30.0 psf

Masonry Slender Wall

Description : MW4- 20'-4" Wall

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +0.90D+E	Maximum Bending Stress Ratio =	0.4158		
		Max Mu	1.565 k-ft	Phi * Mn	3.764 k-ft
PASS	Service Deflection Check D + L + S + E/1.4	Min. Defl. Ratio	1,736.67	Max Allow Ratio	150.0
		Max. Deflection	0.1405 in	Max. Allow. Defl.	1.626 in
PASS	Axial Load Check +1.20D+0.50L+0.20S+E	Max Pu / Ag	19.896 psi	0.05 * f'm	75.0 psi
		Location	9.826 ft		
PASS	Reinforcing Limit Check	Controlling As/bd	0.005081	As/bd007138 rho bal	0.007138
PASS	Minimum Moment Check +1.40D	Mcracking	1.579 k-ft	Minimum Phi Mn	4.566 k-ft

Maximum Reactions . . . *for Load Combination....*

Top Horizontal	E Only	0.3050 k
Base Horizontal	E Only	0.3050 k
Vertical Reaction	D + L + S	3.076 k

Design Maximum Combinations - Moments

Load Combination	Axial Load Pu (k)	0.05*f'm*b*t (k)	Mcr (k-ft)	Mu (k-ft)	Phi	Phi Mn (k-ft)	As (in^2)	As Ratio	0.6 * rho bal
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
+1.20D+0.50L+0.20S+E at 9.49 to 10.17	1.815	6.840	1.58	1.58	0.90	3.90	0.233	0.0051	0.0071
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
+0.90D+E at 9.49 to 10.17	1.223	6.840	1.58	1.57	0.90	3.77	0.233	0.0051	0.0071

Design Maximum Combinations - Deflections

Load Combination	Axial Load Pu (k)	Mcr (k-ft)	Mactual (k-ft)	I gross (in^4)	I cracked (in^4)	I effective (in^4)	Deflection (in)	Defl. Ratio
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
D + L + S + E/1.4 at 9.49 to 10.17	2.279	1.58	1.13	443.30	44.58	443.300	0.140	1,736.7
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
D + 0.5(L+Lr) + 0.7E at 9.49 to 10.17	1.609	1.58	1.10	443.30	43.29	443.300	0.137	1,784.4

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.00 k	2.156 k
S Only	0.0 k	0.00 k	0.920 k
W Only	0.0 k	0.00 k	0.000 k
E Only	0.3 k	0.30 k	0.000 k
D + L + Lr	0.0 k	0.00 k	2.656 k
D + L + S	0.0 k	0.00 k	3.076 k

Masonry Slender Wall

Description : MW4- 20'-4" Wall

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D + L + W + S/2	0.0 k	0.00 k	2.616 k
D + L + S + W/2	0.0 k	0.00 k	3.076 k
D + L + S + E/1.4	0.2 k	0.22 k	3.076 k

Masonry Slender Wall

Description : MW5- 17' Wall

General Information

Calculations per ASCE 7-10

Construction Type : Grouted Hollow Concrete Masonry

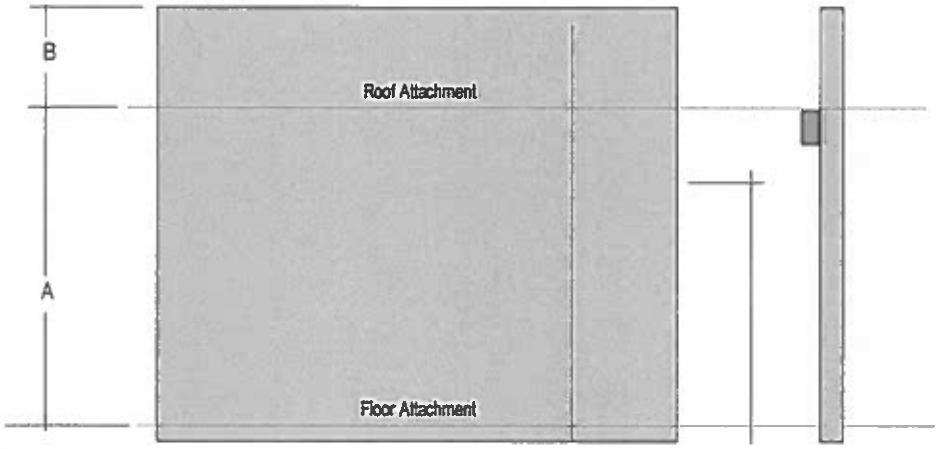
F'm	=	2.50 ksi	Nom. Wall Thickness	8 in	Temp Diff across thickness	=	30.0 deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625 in	Min Allow Out-of-plane Defl Ratio	=	150.0
Fr - Rupture	=	163.0 psi	Rebar "d" distance	3.813 in	Minimum Vertical Steel %	=	0.0020
Em = f'm *	=	900.0	Lower Level Rebar . . .				
Max % of ρ bal.	=	0.01190	Bar Size #	5			
Grout Density	=	140 pcf	Bar Spacing	32.0 in			
Block Weight		Normal Weight					
Wall Weight	=	84.0 psf					

Wall is Solid Grouted

One-Story Wall Dimensions

A Clear Height = 17.0 ft
B Parapet height = ft

Wall Support Condition Top & Bottom Pinned



Vertical Loads

Vertical Uniform Loads . . . *(Applied per foot of Strip Width)*

		DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity 6.750 in					k/ft
Concentric Load		0.2340	0.260		0.4810	k/ft

Lateral Loads

Full area WIND load 20.0 psf

Fp 1.0 = 30.0 psf

Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight

Seismic Wall Lateral Load 30.0 psf

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:
Project ID: S04310

Printed: 19 DEC 2013, 2:09PM

Masonry Slender Wall

File = p:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : MW5- 17' Wall

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +0.90D+1.60W	Maximum Bending Stress Ratio = 0.5839 Max Mu 1.255 k-ft		Phi * Mn	2.149 k-ft
PASS	Service Deflection Check D + L + S + E/1.4	Min. Defl. Ratio 177.889 Max. Deflection 1.147 in		Max Allow Ratio Max. Allow. Defl.	150.0 1.360 in
PASS	Axial Load Check +1.20D+0.50L+0.50S+1.60W	Max Pu / Ag 15.737 psi Location 8.217 ft		0.2 * f'm	500.0 psi
PASS	Reinforcing Limit Check	Controlling As/bd 0.002541		As/bd=.01190 rho bal	0.01190
PASS	Minimum Moment Check +1.40D	Mcracking 1.579 k-ft		Minimum Phi Mn	2.50 k-ft
		Maximum Reactions . . .	*for Load Combination....*		
		Top Horizontal	E Only		0.2550 k
		Base Horizontal	E Only		0.2550 k
		Vertical Reaction	D + L + S		2.143 k

Design Maximum Combinations - Moments

Load Combination	Axial Load Pu k	0.2*f'm*b*t k	Moment Values Mcr k-ft	Mu k-ft	Phi	Phi Mn k-ft	As in^2	As Ratio	0.6 * rho bal
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
+1.20D+1.60Lr+0.80W at 7.93 to 8.50	1.611	45.600	1.58	0.67	0.90	2.35	0.116	0.0025	0.0119
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
+1.20D+1.60S+0.80W at 7.93 to 8.50	1.964	45.600	1.58	0.69	0.90	2.44	0.116	0.0025	0.0119
+1.20D+0.50Lr+0.50L+1.60W at 7.93 to 8.50	1.325	45.600	1.58	1.31	0.90	2.27	0.116	0.0025	0.0119
+1.20D+0.50L+0.50S+1.60W at 7.93 to 8.50	1.435	45.600	1.58	1.32	0.90	2.30	0.116	0.0025	0.0119
+1.20D+0.50L+0.20S+E at 7.93 to 8.50	1.291	45.600	1.58	1.22	0.90	2.26	0.116	0.0025	0.0119
+0.90D+1.60W at 7.93 to 8.50	0.896	45.600	1.58	1.26	0.90	2.16	0.116	0.0025	0.0119
+0.90D+E at 7.93 to 8.50	0.896	45.600	1.58	1.18	0.90	2.16	0.116	0.0025	0.0119

Design Maximum Combinations - Deflections

Load Combination	Axial Load Pu k	Moment Values Mcr k-ft	Mactual k-ft	Stiffness I gross in^4	I cracked in^4	I effective in^4	Deflections Deflection in	Defl. Ratio
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
D + L + W at 8.50 to 9.07	0.948	1.58	0.80	443.30	17.36	17.357	1.068	191.1
D + L + W + S/2 at 8.50 to 9.07	1.188	1.58	0.83	443.30	17.79	17.792	1.069	190.9
D + L + S + W/2 at 8.50 to 9.07	1.429	1.58	0.42	443.30	18.22	18.223	0.535	381.2
D + L + S + E/1.4 at 8.50 to 9.07	1.429	1.58	0.91	443.30	18.22	18.223	1.147	177.9
D + 0.5(L+Lr) + 0.7W at 8.50 to 9.07	1.078	1.58	0.57	443.30	17.59	17.593	0.748	272.8
D + 0.5(L+Lr) + 0.7E at 8.50 to 9.07	1.078	1.58	0.86	443.30	17.59	17.593	1.122	181.9

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.00 k	1.662 k
S Only	0.0 k	0.00 k	0.481 k
W Only	0.2 k	0.17 k	0.000 k
E Only	0.3 k	0.25 k	0.000 k
D + L + Lr	0.0 k	0.00 k	1.922 k
D + L + S	0.0 k	0.00 k	2.143 k

Masonry Slender Wall

Description : MW5- 17' Wall

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D + L + W + S/2	0.2 k	0.17 k	1.903 k
D + L + S + W/2	0.1 k	0.09 k	2.143 k
D + L + S + E/1.4	0.2 k	0.19 k	2.143 k

Masonry Slender Wall

Lic. # : KW-06005617

Description : MW6- 26'-4" TALL WALL

General Information

Calculations per , , , ASCE 7-10

Construction Type : Grouted Hollow Concrete Masonry

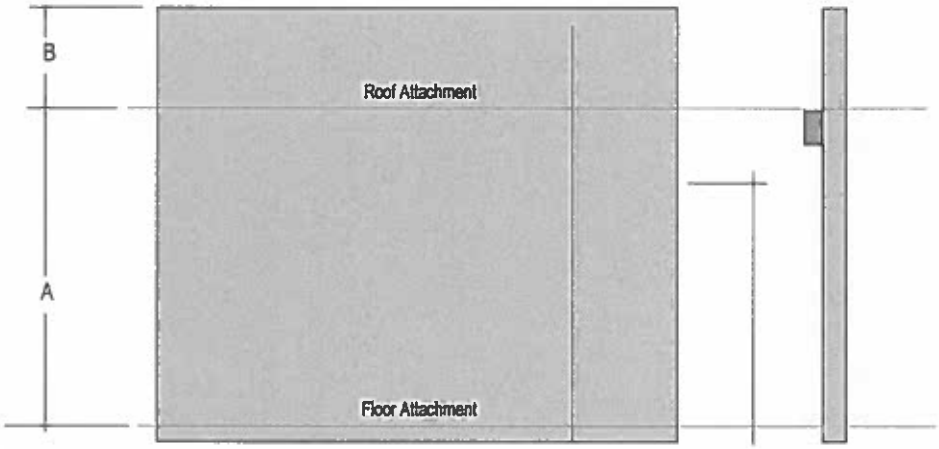
F'm	=	2.50 ksi	Nom. Wall Thickness	8	in	Temp Diff across thickness =	70.0 deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625	in	Min Allow Out-of-plane Defl Ratio =	150.0
Fr - Rupture	=	163.0 psi	Rebar "d" distance	3.813	in	Minimum Vertical Steel % =	0.0020
Em = f'm *	=	900.0	Lower Level Rebar . . .				
Max % of ρbal.	=	0.01190	Bar Size	#	5		
Grout Density	=	140 pcf	Bar Spacing		16.0 in		
Block Weight		Normal Weight					
Wall Weight	=	84.0 psf					

Wall is Solid Grouted

One-Story Wall Dimensions

A Clear Height = 26.30 ft
B Parapet height = ft

Wall Support Condition Top & Bottom Pinned



Vertical Loads

Vertical Uniform Loads . . . (Applied per foot of Strip Width)		DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity in					k/ft
Concentric Load		0.1260	0.140		0.2590	k/ft

Lateral Loads

Full area WIND load 20.0 psf
Fp 1.0 = 30.0 psf

Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight
Seismic Wall Lateral Load 30.0 psf

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:
Project ID: S04310

Printed: 31 DEC 2013, 12:40AM

Masonry Slender Wall

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : MW6- 26'-4" TALL WALL

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +1.20D+0.50L+0.50S+1.60W	Maximum Bending Stress Ratio = 0.7736 Max Mu	3.166 k-ft	Phi * Mn	4.093 k-ft
PASS	Service Deflection Check D + L + S + E/1.4	Min. Defl. Ratio Max. Deflection	411.567 0.7668 in	Max Allow Ratio Max. Allow. Defl.	150.0 2.104 in
PASS	Axial Load Check +1.20D+0.50L+0.50S+1.60W	Max Pu / Ag Location	18.581 psi 12.712 ft	0.05 * f'm	125.0 psi
PASS	Reinforcing Limit Check	Controlling As/bd	0.005081	As/bd=.01190 rho bal	0.01190
PASS	Minimum Moment Check +1.40D	Mcracking	1.579 k-ft	Minimum Phi Mn	4.814 k-ft
		Maximum Reactions . . .	*for Load Combination....*		
		Top Horizontal	E Only		0.3945 k
		Base Horizontal	E Only		0.3945 k
		Vertical Reaction	D + L + S + E/1.4		2.594 k

Design Maximum Combinations - Moments

Load Combination	Axial Load Pu (k)	0.05*f'm*b*t (k)	Moment Values Mcr (k-ft)	Mu (k-ft)	Phi	Phi Mn (k-ft)	As (in^2)	As Ratio	0.6 * rho bal
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
+1.20D+1.60Lr+0.80W at 12.27 to 13.15	1.789	11.400	1.58	1.41	0.90	4.14	0.233	0.0051	0.0119
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
+1.20D+1.60S+0.80W at 12.27 to 13.15	1.979	11.400	1.58	1.41	0.90	4.18	0.233	0.0051	0.0119
+1.20D+0.50Lr+0.50L+1.60W at 12.27 to 13.	1.635	11.400	1.58	3.16	0.90	4.10	0.233	0.0051	0.0119
+1.20D+0.50L+0.50S+1.60W at 12.27 to 13.1	1.695	11.400	1.58	3.18	0.90	4.11	0.233	0.0051	0.0119
+1.20D+0.50L+0.20S+E at 12.27 to 13.15	1.617	11.400	1.58	2.93	0.90	4.10	0.233	0.0051	0.0119
+0.90D+1.60W at 12.27 to 13.15	1.174	11.400	1.58	3.03	0.90	3.99	0.233	0.0051	0.0119
+0.90D+E at 12.27 to 13.15	1.174	11.400	1.58	2.82	0.90	3.99	0.233	0.0051	0.0119

Design Maximum Combinations - Deflections

Load Combination	Axial Load Pu (k)	Moment Values Mcr (k-ft)	Mactual (k-ft)	Stiffness I gross (in^4)	I cracked (in^4)	I effective (in^4)	Deflections Deflection (in)	Defl. Ratio
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
D + L + W at 12.27 to 13.15	1.304	1.58	1.77	443.30	29.29	44.125	0.452	698.2
D + L + W + S/2 at 12.27 to 13.15	1.434	1.58	1.78	443.30	29.48	44.013	0.460	685.6
D + L + S + W/2 at 12.27 to 13.15	1.563	1.58	0.88	443.30	29.67	443.300	0.109	2,886.3
D + L + S + E/1.4 at 12.27 to 13.15	1.563	1.58	1.95	443.30	29.67	37.720	0.767	411.6
D + 0.5(L+Lr) + 0.7W at 12.27 to 13.15	1.374	1.58	1.22	443.30	29.39	443.300	0.153	2,065.6
D + 0.5(L+Lr) + 0.7E at 12.27 to 13.15	1.374	1.58	1.88	443.30	29.39	39.068	0.655	481.8

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.00 k	2.335 k
S Only	0.0 k	0.00 k	0.259 k
W Only	0.3 k	0.26 k	0.000 k
E Only	0.4 k	0.39 k	0.000 k
D + L + Lr	0.0 k	0.00 k	2.475 k
D + L + S	0.0 k	0.00 k	2.594 k

Masonry Slender Wall

Description : MW6- 26'-4" TALL WALL

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D + L + W + S/2	0.3 k	0.26 k	2.465 k
D + L + S + W/2	0.1 k	0.13 k	2.594 k
D + L + S + E/1.4	0.3 k	0.28 k	2.594 k

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:
Project ID: S04310

Printed: 19 DEC 2013, 2:08PM

Masonry Slender Wall

File = p:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : MW7- 26'-4" TALL WALL

General Information

Construction Type : Grouted Hollow Concrete Masonry

F'm	=	2.50 ksi	Nom. Wall Thickness		8 in	Temp Diff across thickness	=	70.0 deg F
Fy - Yield	=	60.0 ksi	Actual Thickness		7.625 in	Min Allow Out-of-plane Defl Ratio	=	150.0
Fr - Rupture	=	163.0 psi	Rebar "d" distance		3.813 in	Minimum Vertical Steel %	=	0.0020
Em = f'm *	=	900.0	Lower Level Rebar . . .					
Max % of ρ bal.	=	0.01190	Bar Size	#	5			
Grout Density	=	140 pcf	Bar Spacing		24.0 in			
Block Weight		Normal Weight	Upper Level Rebar . . .					
Wall Weight	=	84.0 psf	Bar Size	#	5			
			Bar Spacing		24.0 in			

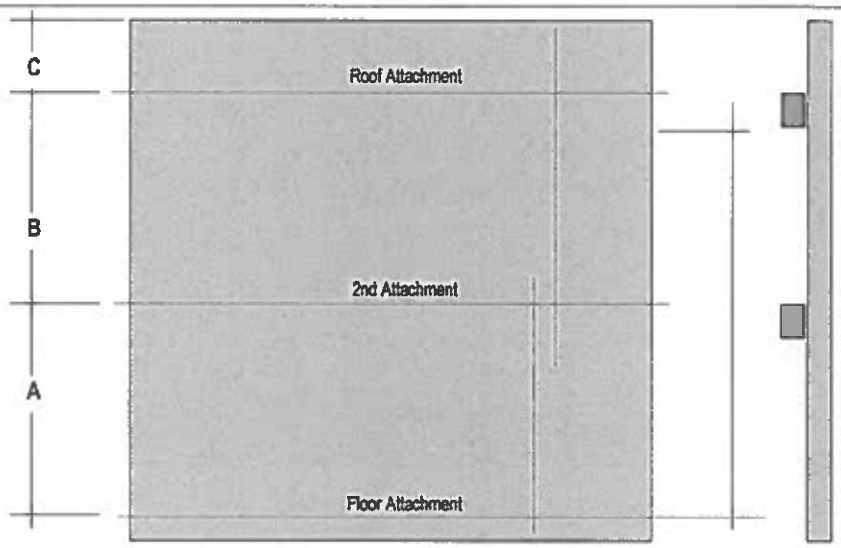
Wall is Solid Grouted

Two-Story Wall Dimensions

A	1st Story Height	=	13.0 ft
B	2nd Story Height	=	13.330 ft
C	Parapet height	=	ft

Wall Support Condition: Top & Bottom Pinned

Initial Lateral Disp. @ Top Support: in



Vertical Loads

Vertical Uniform Loads . . . (Applied per foot of Strip Width)		DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity in					k/ft
Concentric Load		0.540	0.60		1.110	k/ft
Mid-Height Vertical Uniform Loads . . . (Applied per foot of Strip Width)		**DL : Dead**	**Lr : Roof Live**	**Lf : Floor Live**	**S : Snow**	**W : Wind**
Ledger Load	Eccentricity 2.0 in	0.470		1.70		k/ft
Concentric Load						k/ft

Lateral Loads

Full area WIND load			20.0 psf	Wall Weight Seismic Load Input Method :	Direct entry of Lateral Wall Weight
Fp	1.0	=	30.0 psf	Seismic Wall Lateral Load	30.0 psf

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:
Project ID: S04310

Printed: 19 DEC 2013, 2:08PM

Masonry Slender Wall

File = p:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : MW7- 26'-4" TALL WALL

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +1.20D+0.50Lr+0.50L+1.60W	Maximum Bending Stress Ratio = 0.2539 Max Mu -0.7916 k-ft		Phi * Mn	3.118 k-ft
PASS	Service Deflection Check D + L + S + E/1.4	Min. Defl. Ratio 601.61 Max. Deflection 0.2593 in		Max Allow Ratio Max. Allow. Defl.	150.0 1.066 in
PASS	Axial Load Check +1.20D+0.50Lr+0.50L+1.60W	Max Pu / Ag 25.142 psi Location 13.222 ft		0.2 * f'm	500.0 psi
PASS	Reinforcing Limit Check	Controlling As/bd 0.003388		As/bd=.01190 rho bal	0.01190
PASS	Minimum Moment Check +1.40D	Mcracking 1.579 k-ft		Minimum Phi Mn	3.292 k-ft
		Maximum Reactions . . .	*for Load Combination....*		
		Top Horizontal	E Only		0.1511 k
		Base Horizontal	E Only		0.1449 k
		Mid-Ht Horizontal	E Only		0.4938 k
		Vertical Reaction	D + L + S + W/2		6.032 k

Design Maximum Combinations - Moments

Load Combination	Axial Load Pu k	0.2*f'm*b*t k	Moment Values Mcr k-ft	Mu k-ft	Phi	Phi Mn k-ft	As in^2	As Ratio	0.6 * rho bal
+1.40D at 25.44 to 25.89	0.861	45.600	1.58	0.19	0.90	2.75	0.155	0.0034	0.0119
+1.20D+0.50Lr+1.60L at 7.37 to 7.80	6.144	45.600	1.58	0.39	0.90	4.07	0.155	0.0034	0.0119
+1.20D+1.60L+0.50S at 7.37 to 7.80	6.399	45.600	1.58	0.41	0.90	4.13	0.155	0.0034	0.0119
+1.20D+1.60Lr+0.50L at 25.44 to 25.89	1.698	45.600	1.58	0.40	0.90	2.97	0.155	0.0034	0.0119
+1.20D+1.60Lr+0.80W at 5.20 to 5.63	4.302	45.600	1.58	0.39	0.90	3.62	0.155	0.0034	0.0119
+1.20D+0.50L+1.60S at 25.44 to 25.89	2.513	45.600	1.58	0.59	0.90	3.17	0.155	0.0034	0.0119
+1.20D+1.60S+0.80W at 25.44 to 25.89	2.511	45.600	1.58	0.53	0.90	3.17	0.155	0.0034	0.0119
+1.20D+0.50Lr+0.50L+1.60W at 13.00 to 13.	2.293	45.600	1.58	0.79	0.90	3.12	0.155	0.0034	0.0119
+1.20D+0.50L+0.50S+1.60W at 13.00 to 13.4	2.548	45.600	1.58	0.79	0.90	3.18	0.155	0.0034	0.0119
+1.20D+0.50L+0.20S+E at 13.00 to 13.44	2.215	45.600	1.58	0.75	0.90	3.10	0.155	0.0034	0.0119
+0.90D+1.60W at 13.00 to 13.44	1.495	45.600	1.58	0.69	0.90	2.92	0.155	0.0034	0.0119
+0.90D+E at 13.00 to 13.44	1.495	45.600	1.58	0.65	0.90	2.92	0.155	0.0034	0.0119

Design Maximum Combinations - Deflections

Load Combination	Axial Load Pu k	Moment Values Mcr k-ft	Mactual k-ft	Stiffness I gross in^4	I cracked in^4	I effective in^4	Deflections Deflection in	Defl. Ratio
D + L + Lr at 19.67 to 20.11	1.700	1.58	0.25	443.30	27.83	27.828	0.153	1,046.5
D + L + W at 6.07 to 6.50	4.412	1.58	0.49	443.30	26.97	26.972	0.227	687.2
D + L + W + S/2 at 6.07 to 6.50	4.967	1.58	0.53	443.30	27.81	27.815	0.240	650.5
D + L + S + W/2 at 6.07 to 6.50	5.522	1.58	0.45	443.30	28.65	28.646	0.207	754.9
D + L + S + E/1.4 at 6.07 to 6.50	5.522	1.58	0.59	443.30	28.65	28.646	0.259	601.6
D + 0.5(L+Lr) + 0.7W at 6.07 to 6.50	3.862	1.58	0.36	443.30	26.12	26.124	0.174	896.6
D + 0.5(L+Lr) + 0.7E at 5.63 to 6.07	3.899	1.58	0.46	443.30	26.18	26.181	0.208	749.4

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Mid Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.012 k	0.01 k	3.222 k
S Only	0.0 k	0.005 k	0.00 k	1.110 k
W Only	0.1 k	0.329 k	0.10 k	0.000 k
E Only	0.1 k	0.494 k	0.15 k	0.000 k
D + L + Lr	0.0 k	0.016 k	0.02 k	5.522 k

Masonry Slender Wall

Description : MW7- 26'-4" TALL WALL

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Mid Horizontal	Top Horizontal	Vertical @ Wall Base
D + L + S	0.0 k	0.014 k	0.02 k	6.032 k
D + L + W + S/2	0.1 k	0.347 k	0.08 k	5.477 k
D + L + S + W/2	0.1 k	0.179 k	0.03 k	6.032 k
D + L + S + E/1.4	0.1 k	0.369 k	0.08 k	6.032 k

Title Block Line 1
You can change this area using the "Settings" menu item and then using the "Printing & Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:
Project ID: S04310

Printed: 19 DEC 2013, 2:08PM

Masonry Slender Wall

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : MW8- 26'-4" TALL WALL

General Information

Construction Type : Grouted Hollow Concrete Masonry

F'm	=	2.50 ksi	Nom. Wall Thickness	8 in	Temp Diff across thickness	=	70.0 deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625 in	Min Allow Out-of-plane Defl Ratio	=	150.0
Fr - Rupture	=	163.0 psi	Rebar "d" distance	3.813 in	Minimum Vertical Steel %	=	0.0020
Em = f'm *	=	900.0	Lower Level Rebar . . .				
Max % of ρ bal.	=	0.01190	Bar Size #	5			
Grout Density	=	140 pcf	Bar Spacing	24.0 in			
Block Weight		Normal Weight	Upper Level Rebar . . .				
Wall Weight	=	84.0 psf	Bar Size #	5			
			Bar Spacing	24.0 in			

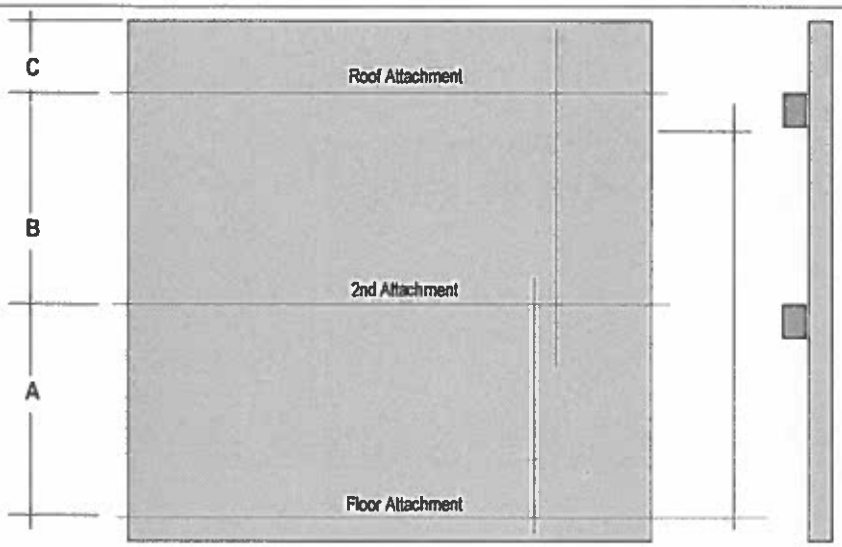
Wall is Solid Grouted

Two-Story Wall Dimensions

A	1st Story Height	=	13.0 ft
B	2nd Story Height	=	13.330 ft
C	Parapet height	=	ft

Wall Support Condition: Top & Bottom Pinned

Initial Lateral Disp. @ Top Support: in



Vertical Loads

Vertical Uniform Loads . . . (Applied per foot of Strip Width)		DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity in					k/ft
Concentric Load		0.1260	0.140		0.260	k/ft
Mid-Height Vertical Uniform Loads . . . (Applied per foot of Strip Width)		**DL : Dead**	**Lr : Roof Live**	**Lf : Floor Live**	**S : Snow**	**W : Wind**
Ledger Load	Eccentricity 2.0 in	0.60		1.10		k/ft
Concentric Load						k/ft

Lateral Loads

Full area WIND load		20.0 psf	Wall Weight Seismic Load Input Method :	Direct entry of Lateral Wall Weight	
Fp	1.0 =	30.0 psf	Seismic Wall Lateral Load	30.0 psf	

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:
Project ID: S04310

Printed: 19 DEC 2013, 2:08PM

Masonry Slender Wall

File = p:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : MW8- 26'-4" TALL WALL

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +1.20D+0.50Lr+0.50L+1.60W	Maximum Bending Stress Ratio = 0.2697 Max Mu	-0.7911 k-ft	Phi * Mn	2.934 k-ft
PASS	Service Deflection Check D + L + S + E/1.4	Min. Defl. Ratio Max. Deflection	730.60 0.2135 in	Max Allow Ratio Max. Allow. Defl.	150.0 1.066 in
PASS	Axial Load Check +1.20D+0.50Lr+0.50L+1.60W	Max Pu / Ag Location	17.171 psi 13.222 ft	0.2 * f'm	500.0 psi
PASS	Reinforcing Limit Check	Controlling As/bd	0.003388	As/bd=.01190 rho bal	0.01190
PASS	Minimum Moment Check +1.40D	Mcracking	1.579 k-ft	Minimum Phi Mn	3.292 k-ft

Maximum Reactions . . . *for Load Combination....*

Top Horizontal	E Only	0.1511 k
Base Horizontal	E Only	0.1449 k
Mid-Ht Horizontal	E Only	0.4938 k
Vertical Reaction	D + L + S + E/1.4	4.298 k

Design Maximum Combinations - Moments

Load Combination	Axial Load Pu k	0.2*f'm*b*t k	Moment Values Mcr k-ft	Mu k-ft	Phi	Phi Mn k-ft	As in^2	As Ratio	0.6 * rho bal
+1.40D at 6.07 to 6.50	3.399	45.600	1.58	0.14	0.90	3.39	0.155	0.0034	0.0119
+1.20D+0.50Lr+1.60L at 13.00 to 13.44	1.565	45.600	1.58	0.27	0.90	2.93	0.155	0.0034	0.0119
+1.20D+1.60L+0.50S at 13.00 to 13.44	1.625	45.600	1.58	0.27	0.90	2.95	0.155	0.0034	0.0119
+1.20D+1.60Lr+0.50L at 6.93 to 7.37	3.600	45.600	1.58	0.17	0.90	3.44	0.155	0.0034	0.0119
+1.20D+1.60Lr+0.80W at 13.00 to 13.44	1.719	45.600	1.58	0.41	0.90	2.97	0.155	0.0034	0.0119
+1.20D+0.50L+1.60S at 6.93 to 7.37	3.792	45.600	1.58	0.18	0.90	3.49	0.155	0.0034	0.0119
+1.20D+1.60S+0.80W at 13.00 to 13.44	1.911	45.600	1.58	0.40	0.90	3.02	0.155	0.0034	0.0119
+1.20D+0.50Lr+0.50L+1.60W at 13.00 to 13.	1.566	45.600	1.58	0.79	0.90	2.93	0.155	0.0034	0.0119
+1.20D+0.50L+0.50S+1.60W at 13.00 to 13.4	1.626	45.600	1.58	0.79	0.90	2.95	0.155	0.0034	0.0119
+1.20D+0.50L+0.20S+E at 13.00 to 13.44	1.548	45.600	1.58	0.75	0.90	2.93	0.155	0.0034	0.0119
+0.90D+1.60W at 13.00 to 13.44	1.122	45.600	1.58	0.71	0.90	2.82	0.155	0.0034	0.0119
+0.90D+E at 13.00 to 13.44	1.122	45.600	1.58	0.67	0.90	2.82	0.155	0.0034	0.0119

Design Maximum Combinations - Deflections

Load Combination	Axial Load Pu k	Moment Values Mcr k-ft	Mactual k-ft	Stiffness I gross in^4	I cracked in^4	I effective in^4	Deflections Deflection in	Defl. Ratio
D + L + Lr at 6.50 to 6.93	3.632	1.58	0.19	443.30	25.77	25.766	0.106	1,470.1
D + L + W at 5.63 to 6.07	3.565	1.58	0.43	443.30	25.66	25.661	0.200	778.2
D + L + W + S/2 at 5.63 to 6.07	3.695	1.58	0.44	443.30	25.86	25.864	0.203	766.8
D + L + S + W/2 at 6.07 to 6.50	3.788	1.58	0.32	443.30	26.01	26.009	0.158	990.2
D + L + S + E/1.4 at 5.63 to 6.07	3.825	1.58	0.46	443.30	26.07	26.066	0.214	730.6
D + 0.5(L+Lr) + 0.7W at 5.63 to 6.07	3.085	1.58	0.31	443.30	24.91	24.905	0.151	1,030.6
D + 0.5(L+Lr) + 0.7E at 5.63 to 6.07	3.085	1.58	0.40	443.30	24.91	24.905	0.187	834.3

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Mid Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.014 k	0.01 k	2.938 k
S Only	0.0 k	0.001 k	0.00 k	0.260 k
W Only	0.1 k	0.329 k	0.10 k	0.000 k
E Only	0.1 k	0.494 k	0.15 k	0.000 k
D + L + Lr	0.0 k	0.018 k	0.02 k	4.178 k

Masonry Slender Wall

Description : MW8- 26'-4" TALL WALL

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Mid Horizontal	Top Horizontal	Vertical @ Wall Base
D + L + S	0.0 k	0.017 k	0.02 k	4.298 k
D + L + W + S/2	0.1 k	0.348 k	0.08 k	4.168 k
D + L + S + W/2	0.1 k	0.182 k	0.03 k	4.298 k
D + L + S + E/1.4	0.1 k	0.371 k	0.09 k	4.298 k

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:
Project ID: S04310

Printed: 19 DEC 2013, 2:09PM

Masonry Slender Wall

File = p:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : MW9- 13' Wall 4'-0" Parapet

General Information

Calculations per ASCE 7-10

Construction Type : Grouted Hollow Concrete Masonry

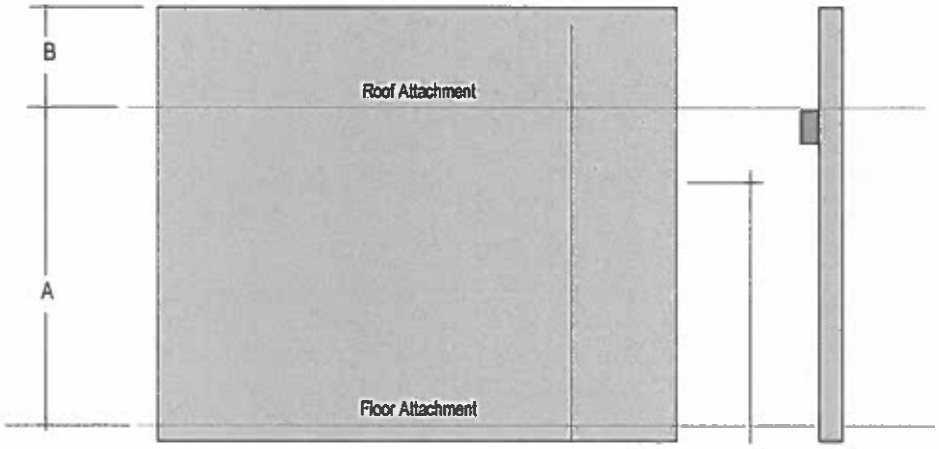
F'm	=	1.50 ksi	Nom. Wall Thickness	8	in	Temp Diff across thickness =	30.0 deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625	in	Min Allow Out-of-plane Defl Ratio =	150.0
Fr - Rupture	=	163.0 psi	Rebar "d" distance	3.813	in	Minimum Vertical Steel % =	0.0020
Em = f'm *	=	900.0	Lower Level Rebar . . .				
Max % of ρ bal.	=	0.007138	Bar Size	# 5			
Grout Density	=	140 pcf	Bar Spacing	48.0	in		
Block Weight		Normal Weight					
Wall Weight	=	84.0 psf					

Wall is Solid Grouted

One-Story Wall Dimensions

A Clear Height	=	13.0 ft
B Parapet height	=	4.0 ft

Wall Support Condition Top & Bottom Pinned



Vertical Loads

Vertical Uniform Loads . . . (Applied per foot of Strip Width)		DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity 6.750 in					k/ft
Concentric Load		0.470		1.70		k/ft

Lateral Loads

Full area WIND load psf

Fp 1.0 = 30.0 psf

Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight

Seismic Wall Lateral Load 30.0 psf

Masonry Slender Wall

Description : MW9- 13' Wall 4'-0" Parapet

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +0.90D+E	Maximum Bending Stress Ratio =	0.3552		
		Max Mu	0.5689 k-ft	Phi * Mn	1.602 k-ft
PASS	Service Deflection Check D + 0.5(L+Lr)+ 0.7E	Min. Defl. Ratio	392.316	Max Allow Ratio	150.0
		Max. Deflection	0.3976 in	Max. Allow. Defl.	1.040 in
PASS	Axial Load Check +1.20D+0.50L+0.20S+E	Max Pu / Ag	28.067 psi	0.2 * f'm	300.0 psi
		Location	5.850 ft		
PASS	Reinforcing Limit Check	Controlling As/bd	0.001694	As/bd007138 rho bal	0.007138
PASS	Minimum Moment Check +1.40D	Mcracking	1.579 k-ft	Minimum Phi Mn	1.660 k-ft

Maximum Reactions . . . *for Load Combination....*

Top Horizontal	E Only	0.3335 k
Base Horizontal	E Only	0.1765 k
Vertical Reaction	D + L + S + E/1.4	3.598 k

Design Maximum Combinations - Moments

Load Combination	Axial Load Pu (k)	0.2*f'm*b*t (k)	Mcr (k-ft)	Moment Values Mu (k-ft)	Phi	Phi Mn (k-ft)	As (in^2)	As Ratio	0.6 * rho bal
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
+1.20D+0.50L+0.20S+E at 5.63 to 6.07	2.560	27.360	1.58	0.62	0.90	1.93	0.078	0.0017	0.0071
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
+0.90D+E at 5.63 to 6.07	1.282	27.360	1.58	0.57	0.90	1.61	0.078	0.0017	0.0071

Design Maximum Combinations - Deflections

Load Combination	Axial Load Pu (k)	Moment Values Mcr (k-ft)	Mactual (k-ft)	I gross (in^4)	Stiffness I cracked (in^4)	I effective (in^4)	Deflections Deflection (in)	Defl. Ratio
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
D + L + S + E/1.4 at 6.07 to 6.50	3.088	1.58	0.47	443.30	25.71	25.712	0.391	398.6
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
D + 0.5(L+Lr)+ 0.7E at 6.07 to 6.50	2.238	1.58	0.44	443.30	23.46	23.455	0.398	392.3

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.00 k	1.898 k
S Only	0.0 k	0.00 k	0.000 k
W Only	0.0 k	0.00 k	0.000 k
E Only	0.2 k	0.33 k	0.000 k
D + L + Lr	0.0 k	0.00 k	3.598 k
D + L + S	0.0 k	0.00 k	3.598 k

Masonry Slender Wall

Description : MW9- 13' Wall 4'-0" Parapet

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D + L + W + S/2	0.0 k	0.00 k	3.598 k
D + L + S + W/2	0.0 k	0.00 k	3.598 k
D + L + S + E/1.4	0.1 k	0.24 k	3.598 k

MW10 Out-of Plane

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:
Project ID: S04310

Printed: 31 DEC 2013, 4:51PM

Masonry Slender Wall

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : MW10- 20'-4" Wall (Average Height)

General Information

Construction Type : Grouted Hollow Concrete Masonry

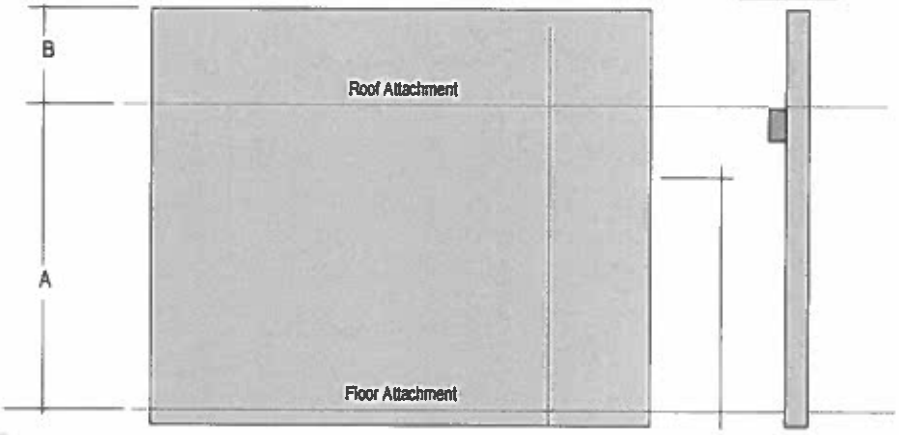
F'm	=	1.50 ksi	Nom. Wall Thickness	8	in	Temp Diff across thickness	=	30.0 deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625	in	Min Allow Out-of-plane Defl Ratio	=	150.0
Fr - Rupture	=	163.0 psi	Rebar "d" distance	3.813	in	Minimum Vertical Steel %	=	0.0020
Em = f'm *	=	900.0	Lower Level Rebar . . .					
Max % of ρ bal.	=	0.007138	Bar Size	#	5			
Grout Density	=	140 pcf	Bar Spacing		24.0 in			
Block Weight		Normal Weight						
Wall Weight	=	84.0 psf						

Wall is Solid Grouted

One-Story Wall Dimensions

A Clear Height	=	20.330 ft
B Parapet height	=	0.0 ft

Wall Support Condition Top & Bottom Pinned



Vertical Loads

Vertical Uniform Loads . . . *(Applied per foot of Strip Width)*

		DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity 6.750 in	0.0	0.0	0.0	0.0	0.0 k/ft
Concentric Load		0.090	0.10	0.0	0.530	0.0 k/ft

Lateral Loads

Full area WIND load		0.0 psf	Wall Weight Seismic Load Input Method :	Direct entry of Lateral Wall Weight	
Fp	1.0	= 30.0 psf	Seismic Wall Lateral Load	30.0 psf	

MW10 Out-of Plane

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:

Project ID: S04310

Printed: 31 DEC 2013 4:51PM

Masonry Slender Wall

File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617

Licensee : SUNRISE ENGINEERING

Description : MW10- 20'-4" Wall (Average Height)

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .			Allowable Values . . .	
PASS	Moment Capacity Check +0.90D+E	Maximum Bending Stress Ratio =	0.5887			
		Max Mu	1.560 k-ft	Phi * Mn		2.650 k-ft
PASS	Service Deflection Check D + L + S + E/1.4	Min. Defl. Ratio	1,750.08	Max Allow Ratio		150.0
		Max. Deflection	0.1394 in	Max. Allow. Defl.		1.626 in
PASS	Axial Load Check +1.20D+0.50L+0.20S+E	Max Pu / Ag	14.330 psi	0.05 * f'm		75.0 psi
		Location	9.826 ft			
PASS	Reinforcing Limit Check	Controlling As/bd	0.003388	As/bd007138 rho bal		0.007138
PASS	Minimum Moment Check +1.40D	Mcracking	1.579 k-ft	Minimum Phi Mn		3.182 k-ft

Maximum Reactions . . . *for Load Combination....*

Top Horizontal	E Only	0.3050 k
Base Horizontal	E Only	0.3050 k
Vertical Reaction	D + L + S + E/1.4	2.328 k

Design Maximum Combinations - Moments

Load Combination	Axial Load Pu (k)	Axial Load 0.05*f'm*b*t (k)	Mcr (k-ft)	Mu (k-ft)	Phi	Phi Mn (k-ft)	As (in^2)	As Ratio	0.6 * rho bal
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
+1.20D+0.50L+0.20S+E at 9.49 to 10.17	1.307	6.840	1.58	1.57	0.90	2.76	0.155	0.0034	0.0071
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000
+0.90D+E at 9.49 to 10.17	0.901	6.840	1.58	1.56	0.90	2.66	0.155	0.0034	0.0071

Design Maximum Combinations - Deflections

Load Combination	Axial Load Pu (k)	Moment Values Mcr (k-ft)	Moment Values Mactual (k-ft)	Stiffness I gross (in^4)	Stiffness I cracked (in^4)	Stiffness I effective (in^4)	Deflections Deflection (in)	Deflections Defl. Ratio
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
D + L + S + E/1.4 at 9.49 to 10.17	1.531	1.58	1.12	443.30	33.27	443.300	0.139	1,750.1
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
D + 0.5(L+Lr)+ 0.7E at 9.49 to 10.17	1.051	1.58	1.09	443.30	32.16	443.300	0.136	1,794.6

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.00 k	1.798 k
S Only	0.0 k	0.00 k	0.530 k
W Only	0.0 k	0.00 k	0.000 k
E Only	0.3 k	0.30 k	0.000 k
D + L + Lr	0.0 k	0.00 k	1.898 k
D + L + S	0.0 k	0.00 k	2.328 k

MW10 Out-of Time

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: Ogden Water Treatment Plant
Engineer:
Project Descr:
Project ID: S04310

Printed: 31 DEC 2013, 4:51PM

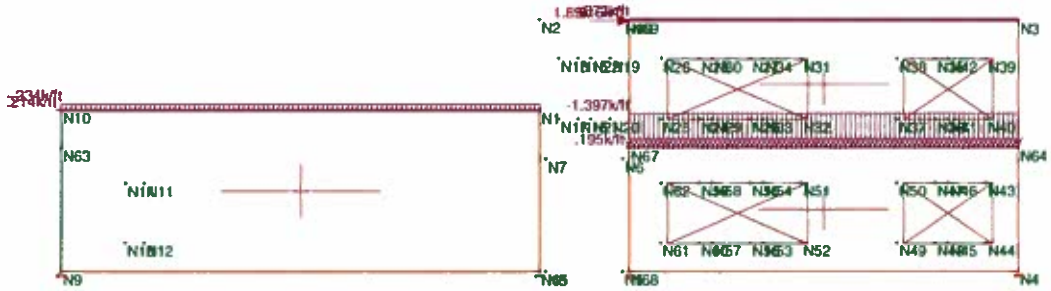
Masonry Slender Wall

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : MW10- 20'-4" Wall (Average Height)

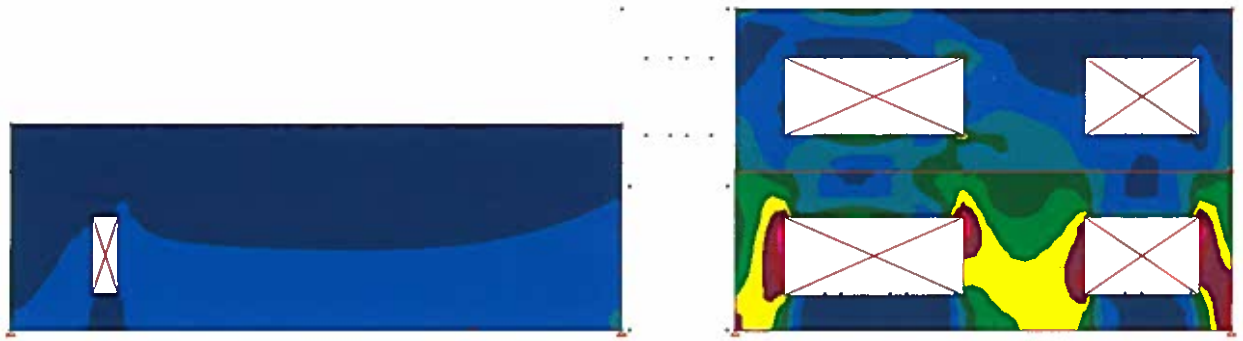
Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D + L + W + S/2	0.0 k	0.00 k	2.063 k
D + L + S + W/2	0.0 k	0.00 k	2.328 k
D + L + S + E/1.4	0.2 k	0.22 k	2.328 k



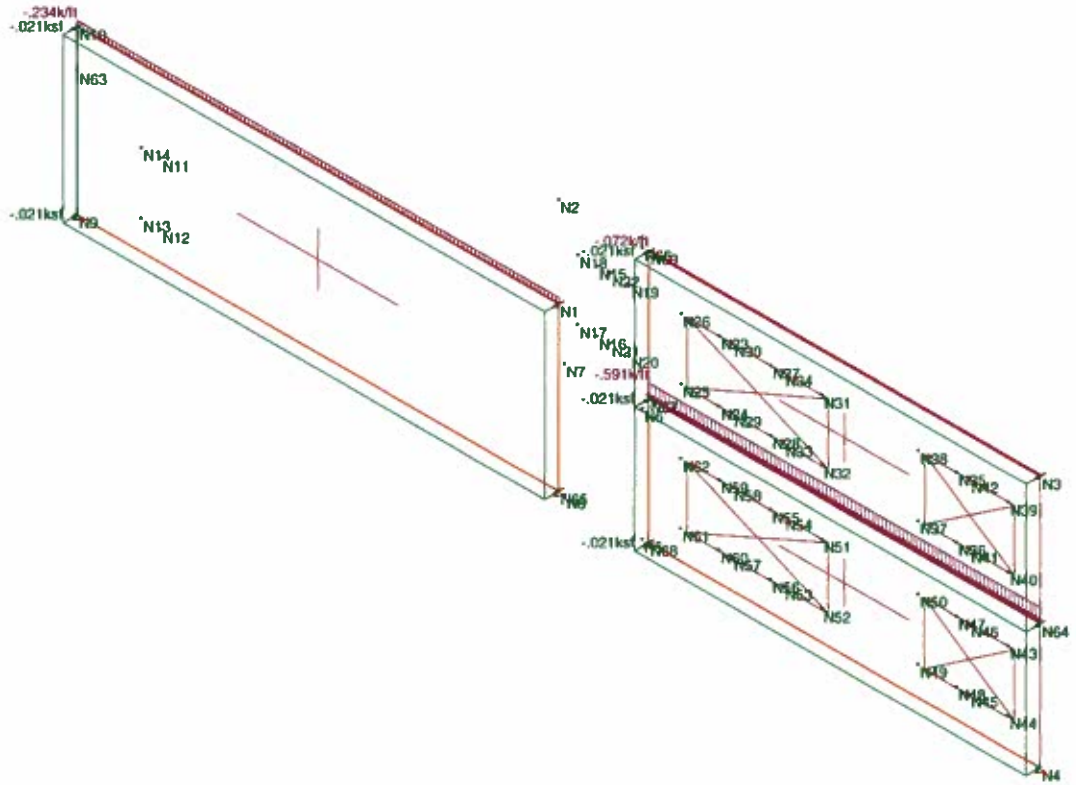
Loads: LC 41, IBC 16-14 (c) (a)
Results for LC 30, IBC 16-12 (b) (b)

Sunrise Engineering		8
SMH	OWTP South Wall	Jan 24, 2014 at 12:26 PM
	LC 41: Worst Case In-Plane Loading	South Wall.r3d



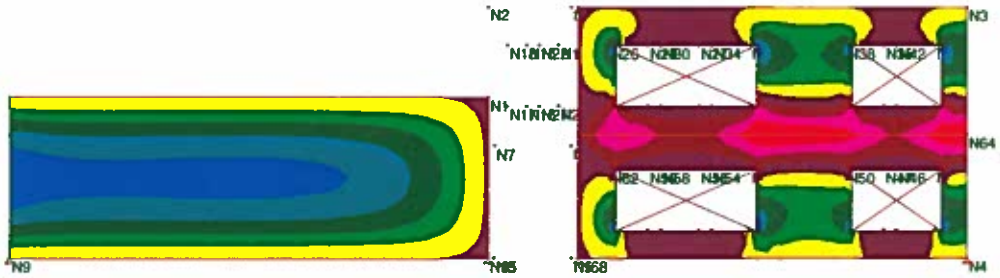
Results for LC 41, IBC 16-14 (c) (a)

Sunrise Engineering		South Walls 2
SMH	OWTP South Wall	Jan 24, 2014 at 11:10 AM
	Worst Case In Plane Load Combination	South Wall.r3d



Loads: LC 30, IBC 16-12 (b) (b)
Results for LC 30, IBC 16-12 (b) (b)

Sunrise Engineering		7
SMH	OWTP South Wall	Jan 24, 2014 at 12:25 PM
	LC 30: Worst Case Out-of Plane Loading	South Wall.r3d



Results for LC 30, IBC 16-12 (b) (b)

Sunrise Engineering	OWTP South Wall	1
SMH		Jan 24, 2014 at 12:14 PM
		South Wall.r3d

Masonry Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Self Weight[k/ft...	f'm[ksi]	Flex Steel[ksi]	Shear St...
1	Concrete Matl	1350	540	.25	.6	Custom	1.5	60	60
2	Clay Matl	2100	420	.25	.6	Custom	3	60	60
3	Gen Masonry	1050	420	.25	.6	.08	1.5	60	60

Masonry Wall Panel In Plane Parameters

	Label	Vert Bar Size	Bars Per Cell	Min Bound Zone Wi...	Max Bound Zone Width[in]	Horz Bar Size	1.5x Shear Inc	Transfer Lo...
1	Typical	#5	2	4	40	#5	Yes	Yes
2	Design #6	#5	2	4	40	#5	Yes	Yes

Masonry Wall Panel Out of Plane Parameters

	Label	Bar Size	Bar Space Min	Bar Space Max	Bar Placement	Mortar Type	Cement Type	Transfer Load
1	Typical	#5	8"	24"	Center	Type M or S	Portland, Lime/M...	Yes
2	Design #6	#5	8"	24"	Center	Type M or S	Portland, Lime/M...	Yes

Wall Panel Data

	Label	A Joint	B Joint	C Joint	D Joint	Material T...	Material Set	Thickness[in]	Design Ru...	Panel/Spacing
1	WP1	N10	N1	N65	N9	Masonry	Clay Matl	8	Typical	24
2	WP3	N69	N3	N64	N67	Masonry	Clay Matl	8	Typical	24
3	WP4	N67	N64	N4	N68	Masonry	Clay Matl	8	Design #6	24

Joint Loads and Enforced Displacements (BLC 6 : Earthquake Dir X)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	N69	L	X	3.6

Wall Panel Point Loads

Wall Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Wall Panel Distributed Loads (BLC 1 : Dead Load)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Locatio...
1	WP3(13.337ft)	Y	-.072	-.072	0	40.667
2	WP1(16.917ft)	Y	-.234	-.234	0	50
3	WP3(0ft)	Y	-.591	-.591	0	40.667

Wall Panel Distributed Loads (BLC 2 : Live Roof)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Locatio...
1	WP3(13.337ft)	Y	-.08	-.08	0	40.667
2	WP1(16.917ft)	Y	-.26	-.26	0	50

Wall Panel Distributed Loads (BLC 3 : Live Floor)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Locatio...
1	WP3(0ft)	Y	-1.075	-1.075	0	40.667

Wall Panel Distributed Loads (BLC 4 : Wind Dir X)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Locatio...
1	WP3(13.337ft)	X	.34	.34	0	40.667
2	WP1(16.917ft)	X	.09	.09	0	50

Wall Panel Distributed Loads (BLC 6 : Earthquake Dir X)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Locatio...
1	WP3(13.337ft)	X	.412	.412	0	40.667
2	WP1(16.917ft)	X	.408	.408	0	50
3	WP3(0ft)	X	.372	.372	0	40.667

Wall Panel Distributed Loads (BLC 8 : Snow Load)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Locatio...
1	WP3(13.337ft)	Y	-.148	-.148	0	40.667
2	WP1(16.917ft)	Y	-.481	-.481	0	50

Wall Panel Surface Loads (BLC 5 : Wind Dir Z)

	Wall Panel Label	Direction	Top Magnitude[ksf,...	Bottom Magnitude[...	Start Location[ft]	Height[ft]
1	WP1	Z	-.02	-.02	0	0
2	WP3	Z	-.02	-.02	0	0
3	WP4	Z	-.02	-.02	0	0

Wall Panel Surface Loads (BLC 7 : Earthquake Dir Z)

	Wall Panel Label	Direction	Top Magnitude[ksf,...	Bottom Magnitude[...	Start Location[ft]	Height[ft]
1	WP1	Z	-.03	-.03	0	0
2	WP3	Z	-.03	-.03	0	0
3	WP4	Z	-.03	-.03	0	0

Load Combinations

	Description	Sol...	PDelta	SRSS	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	IBC 16-8	Yes			DL	1														
2	IBC 16-9	Yes			DL	1	LL	1	LLS	1										
3	IBC 16-10 (a)	Yes			DL	1	RLL	1												
4	IBC 16-10 (b)	Yes			DL	1	SL	1	SLN	1										
5	IBC 16-10 (c)	Yes			DL	1	RL	1												
6	IBC 16-11 (a)	Yes			DL	1	LL	.75	LLS	.75	RLL	.75								
7	IBC 16-11 (b)	Yes			DL	1	LL	.75	LLS	.75	SL	.75	SLN	.75						
8	IBC 16-11 (c)	Yes			DL	1	LL	.75	LLS	.75	RL	.75								
9	IBC 16-12 (a) (a)	Yes			DL	1	WLX	.6												
10	IBC 16-12 (a) (b)	Yes			DL	1	WLZ	.6												
11	IBC 16-12 (a) (c)	Yes			DL	1	WLX	-.6												
12	IBC 16-12 (a) (d)	Yes			DL	1	WLZ	-.6												
13	IBC 16-13 (a) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	RLL	.75						
14	IBC 16-13 (a) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	RLL	.75						
15	IBC 16-13 (a) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	RLL	.75						
16	IBC 16-13 (a) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	RLL	.75						
17	IBC 16-13 (b) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
18	IBC 16-13 (b) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
19	IBC 16-13 (b) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
20	IBC 16-13 (b) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
21	IBC 16-13 (c) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	RL	.75						
22	IBC 16-13 (c) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	RL	.75						
23	IBC 16-13 (c) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	RL	.75						
24	IBC 16-13 (c) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	RL	.75						
25	IBC 16-15 (a)	Yes			DL	.6	WLX	.6												
26	IBC 16-15 (b)	Yes			DL	.6	WLZ	.6												
27	IBC 16-15 (c)	Yes			DL	.6	WLX	-.6												
28	IBC 16-15 (d)	Yes			DL	.6	WLZ	-.6												
29	IBC 16-12 (b) (a)	Yes			DL	1	ELX	.7												
30	IBC 16-12 (b) (b)	Yes			DL	1	ELZ	.7												
31	IBC 16-12 (b) (c)	Yes			DL	1	ELX	-.7												
32	IBC 16-12 (b) (d)	Yes			DL	1	ELZ	-.7												

Load Combinations (Continued)

	Description	Sol..	PDelta	SRSS	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..
33	IBC 16-14 (a) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	RLL	.75						
34	IBC 16-14 (a) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	RLL	.75						
35	IBC 16-14 (a) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	RLL	.75						
36	IBC 16-14 (a) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	RLL	.75						
37	IBC 16-14 (b) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
38	IBC 16-14 (b) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
39	IBC 16-14 (b) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
40	IBC 16-14 (b) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
41	IBC 16-14 (c) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	RL	.75						
42	IBC 16-14 (c) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	RL	.75						
43	IBC 16-14 (c) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	RL	.75						
44	IBC 16-14 (c) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	RL	.75						
45	IBC 16-16 (a)	Yes			DL	.6	ELX	.7												
46	IBC 16-16 (b)	Yes			DL	.6	ELZ	.7												
47	IBC 16-16 (c)	Yes			DL	.6	ELX	-.7												
48	IBC 16-16 (d)	Yes			DL	.6	ELZ	-.7												

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	WP1	max	5.274	47	101.725	4	17.763	30	150.241	30	0	30	165.398	29
2		min	-5.274	29	46.605	47	-17.763	32	-150.241	32	0	32	-165.398	47
3	WP3	max	0	1	0	1	11.124	30	54.533	30	1.035	32	0	1
4		min	0	1	0	1	-11.124	32	-54.533	32	-1.035	30	0	1
5	WP4	max	8.234	31	128.233	2	10.923	30	89.424	30	.276	32	180.202	45
6		min	-8.234	45	50.71	45	-10.923	32	-89.424	32	-.276	30	-182.422	31
7	Totals:	max	13.508	31	214.275	39	39.81	30						
8		min	-13.508	45	97.315	27	-39.81	32						

Masonry Wall Reinforcement

	Wall	Region	Hor. Bar Size	Vert. Bar Size	Boundary Reinf.
1	WP1	R1	Not Reqd.	#5@24" oc	2-#5
2	WP3	R1	Not Reqd.	#5@24" oc	2-#5
3		R2	Not Reqd.	#5@24" oc	2-#5
4		R3	Not Reqd.	#5@24" oc	2-#5
5		R4	Not Reqd.	#5@24" oc	2-#5
6		R5	Not Reqd.	#5@24" oc	2-#5
7		R6	Not Reqd.	#5@24" oc	2-#5
8		R7	Not Reqd.	#5@24" oc	2-#5
9	WP4	R1	Not Reqd.	#5@24" oc	2-#5
10		R2	Not Reqd.	#5@24" oc	2-#5
11		R3	Not Reqd.	#5@24" oc	2-#5
12		R4	Not Reqd.	#5@24" oc	2-#5
13		R5	Not Reqd.	#5@24" oc	2-#5
14		R6	Not Reqd.	#5@24" oc	2-#5
15		R7	Not Reqd.	#5@24" oc	6-#5

Masonry Lintel Reinforcement

	Wall	Lintel	Flex. Steel	Stirrup
1	WP3	L1	1-#5	Not Reqd.
2		L2	1-#5	Not Reqd.
3	WP4	L1	2-#5	Not Reqd.
4		L2	1-#5	Not Reqd.

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (In Plane)

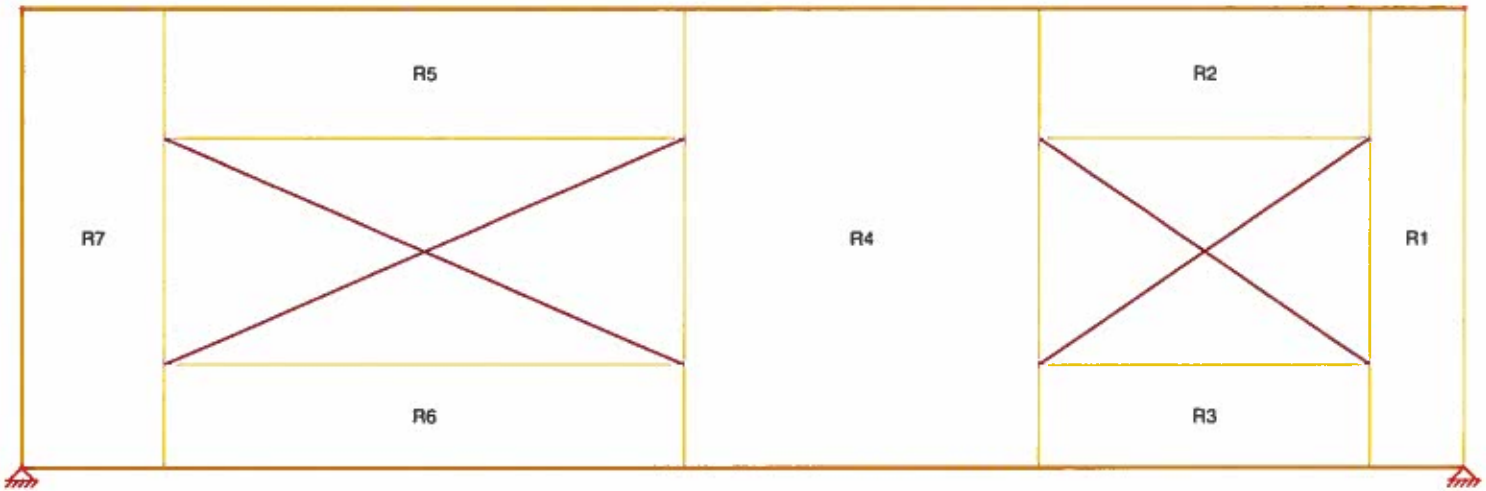
	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP1	R1	Typical	.024	37	.048	45	.421	1	.099
2	WP3	R1	Typical	.348	2	.335	2	.546	1	.067
3		R2	Typical	0	N/A	0	N/A	.732	1	0
4		R3	Typical	0	N/A	0	N/A	.74	1	0
5		R4	Typical	.052	17	.137	17	.546	1	.084
6		R5	Typical	0	N/A	0	N/A	.732	1	0
7		R6	Typical	0	N/A	0	N/A	.74	1	0
8		R7	Typical	.529	19	.627	2	.546	1	.069
9	WP4	R1	Design #6	.861	41	.468	41	.556	1	.072
10		R2	Design #6	0	N/A	0	N/A	.735	1	0
11		R3	Design #6	0	N/A	0	N/A	.74	1	0
12		R4	Design #6	.146	37	.261	33	.556	1	.072
13		R5	Design #6	0	N/A	0	N/A	.735	1	0
14		R6	Design #6	0	N/A	0	N/A	.74	1	0
15		R7	Design #6	1	35	.803	43	.556	1	.074

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (Out of Plane)

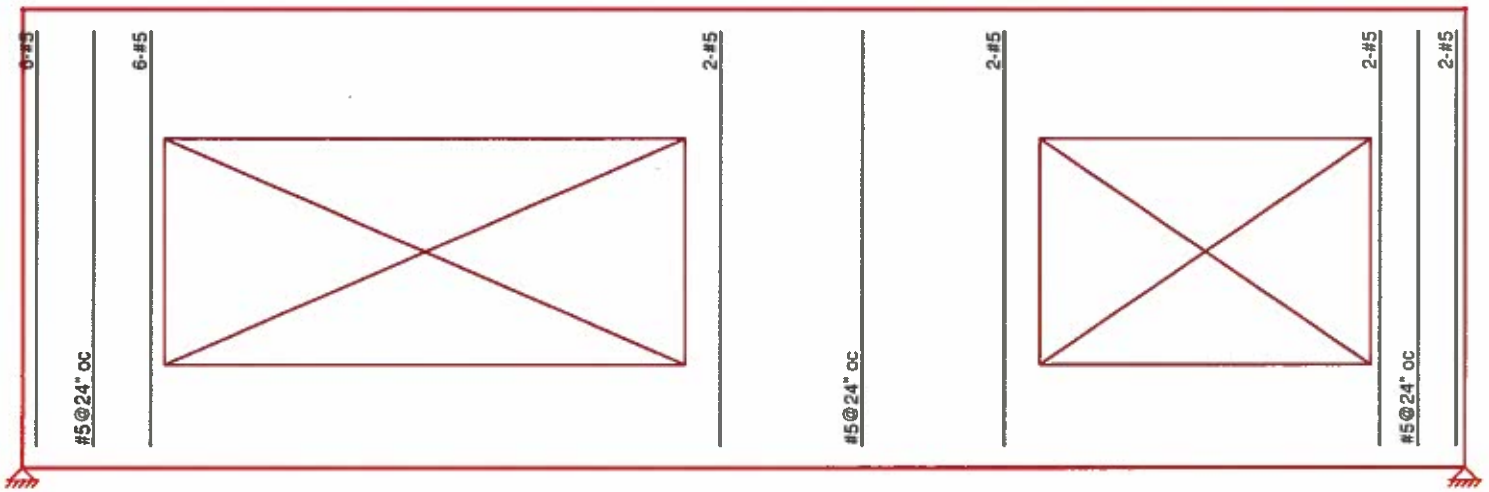
	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP1	R1	Typical	.288	30	.016	30	.421	1.35	.11
2	WP3	R1	Typical	.612	30	.048	46	.546	1.35	.11
3		R2	Typical	0	N/A	0	N/A	.732	1.35	.055
4		R3	Typical	0	N/A	0	N/A	.74	1.35	.055
5		R4	Typical	.486	30	.039	46	.546	1.35	.11
6		R5	Typical	0	N/A	0	N/A	.732	1.35	.055
7		R6	Typical	0	N/A	0	N/A	.74	1.35	.055
8		R7	Typical	.458	30	.042	46	.546	1.35	.11
9	WP4	R1	Design #6	.619	30	.047	46	.556	1.35	.11
10		R2	Design #6	0	N/A	0	N/A	.735	1.35	.055
11		R3	Design #6	0	N/A	0	N/A	.74	1.35	.055
12		R4	Design #6	.492	30	.038	46	.556	1.35	.11
13		R5	Design #6	0	N/A	0	N/A	.735	1.35	.055
14		R6	Design #6	0	N/A	0	N/A	.74	1.35	.055
15		R7	Design #6	.464	30	.04	46	.556	1.35	.11

Wall Panel ACI 530-11: ASD Masonry Code Checks for Lintels

	Wall Pa...	Lintel	Design ...	Flexure UC	LC	Shear UC	LC	Fvm[ksi]	Fvs[ksi]	Fm[ksi]	Fs[ksi]
1	WP3	L1	Typical	.399	37	.32	4	.062	0	1	32
2		L2	Typical	.215	29	.179	29	.062	0	1	32
3	WP4	L1	Design #6	.566	2	.827	2	.062	0	1	32
4		L2	Design #6	.532	2	.471	2	.077	0	1	32



Sunrise Engineering	OWTP South Wall	Wall Panel: WP4
SMH		Jan 24, 2014 at 11:14 AM
		South Wall.r3d



Sunrise Engineering	OWTP South Wall	Wall Panel: WP4
SMH		Jan 24, 2014 at 11:14 AM
		South Wall.r3d

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Hor Bar Size	: #5	
Vert Bar Size	: #5	
No of Ten Bars	: 4	
Effective Depth	: 40	in

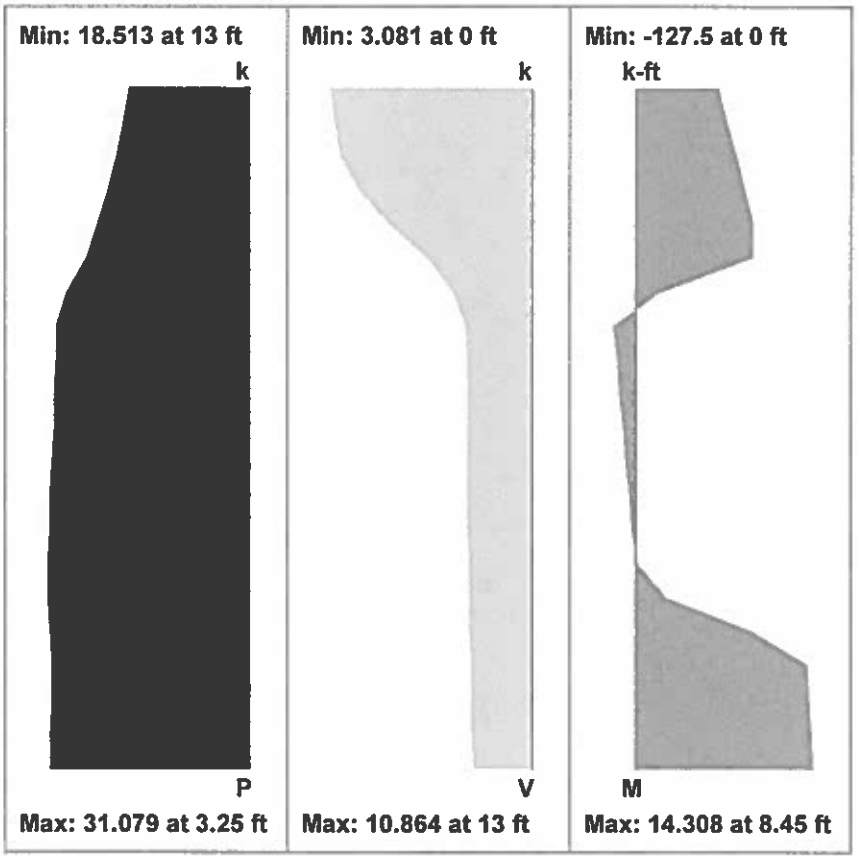
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 13	ft
Total Length	: 4	ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 24"	
Blk Nom Width	: 8"	
1.5 Shear Factor	: Yes	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb)/Fb	: .995
fa/Fa	: .152
fs/Fs	: .695

AXIAL SUMMARY

fa	: .084	ksi
Fa	: .556	ksi

BENDING SUMMARY

fb	: .911	ksi
Fb	: 1	ksi
fs	: 22.232	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv / Fv	: .719
u/U	: .201

SHEAR SUMMARY

fv	: .053	ksi
Fv	: .074	ksi
Fvm	: .074	ksi
Fv max	: .11	ksi
u	: .04	ksi
U	: .2	ksi

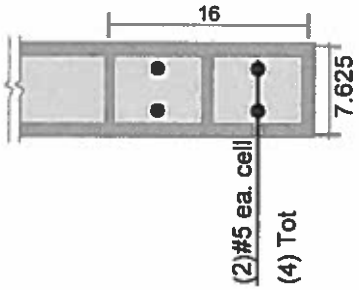
DESIGN DETAILS AT GOVERNING SECTION

AXIAL COMPRESSION DETAILS			BENDING DETAILS			SHEAR DETAILS		
Axial	: 30.828	k	Moment	: 127.466	k-ft	Shear	: 10.864	k
Location	: 0	ft	Location	: 0	ft	Location	: 13	ft
Load Comb	: 35		Load Comb	: 35		Load Comb	: 35	
Rad gyration r	: 2.19	in	Sect Mod S	: 2928	in3	Corresponding M	: 58.982	k-ft
h'/r	: 71.233		Tension St Asv	: 1.227	in2	Corresponding P	: 18.513	k
Red Factor R	: .741		Per of steel p	: 0.004024		M / (V*d)	: 1	
			k*d	: 15.28	in	Shear St Area	: Not Reqd.	
			j	: 0.87		Shear Spacing	: N/A	
						Peri of Bars	: N/A	

CRACKED SECT ANALYSIS

fm = fa + fb	: .995	ksi
C	: 57.949	k
T	: 27.121	k

CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Hor Bar Size	: #5	
Vert Bar Size	: #5	
No of Ten Bars	: 2	
Effective Depth	: 28	in

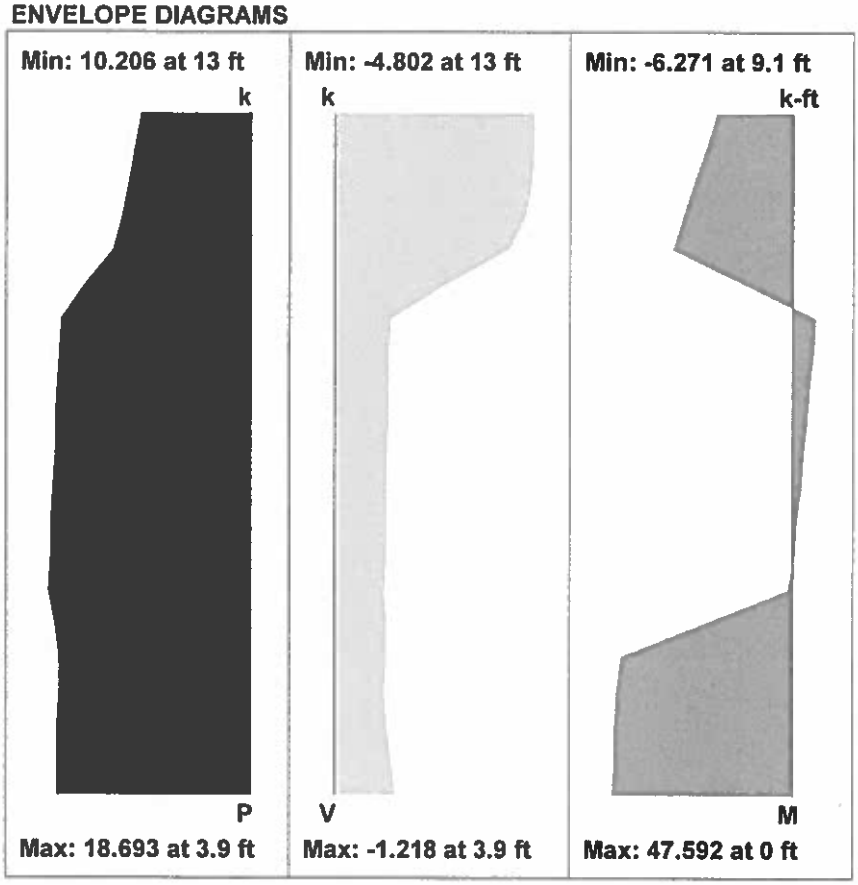
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 13	ft
Total Length	: 2.667	ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 24"	
Blk Nom Width	: 8"	
1.5 Shear Factor	: Yes	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb)/Fb	: .861
fa/Fa	: .132
fs/Fs	: .704

AXIAL SUMMARY

fa	: .073	ksi
Fa	: .556	ksi

BENDING SUMMARY

fb	: .787	ksi
Fb	: 1	ksi
fs	: 22.532	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv / Fv	: .468
u/U	: .251

SHEAR SUMMARY

fv	: .034	ksi
Fv	: .072	ksi
Fvm	: .072	ksi
Fv max	: .11	ksi
u	: .05	ksi
U	: .2	ksi

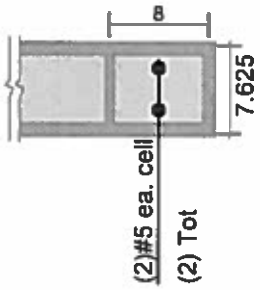
DESIGN DETAILS AT GOVERNING SECTION

AXIAL COMPRESSION DETAILS			BENDING DETAILS			SHEAR DETAILS		
Axial	: 17.902	k	Moment	: 47.592	k-ft	Shear	: 4.802	k
Location	: 0	ft	Location	: 0	ft	Location	: 13	ft
Load Comb	: 41		Load Comb	: 41		Load Comb	: 41	
Rad gyration r	: 2.19	in	Sect Mod S	: 1301	in3	Corresponding M	: 19.542	k-ft
h'/r	: 71.233		Tension St Asv	: 0.6136	in2	Corresponding P	: 10.206	k
Red Factor R	: .741		Per of steel p	: 0.002874		M / (V*d)	: 1	
			k*d	: 9.668	in	Shear St Area	: Not Reqd.	
			j	: 0.88		Shear Spacing	: N/A	
						Peri of Bars	: N/A	

CRACKED SECT ANALYSIS

fm = fa + fb	: .861	ksi
C	: 31.719	k
T	: 13.818	k

CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Hor Bar Size	: #5	
Vert Bar Size	: #5	
No of Ten Bars	: 2	
Effective Depth	: 116	in

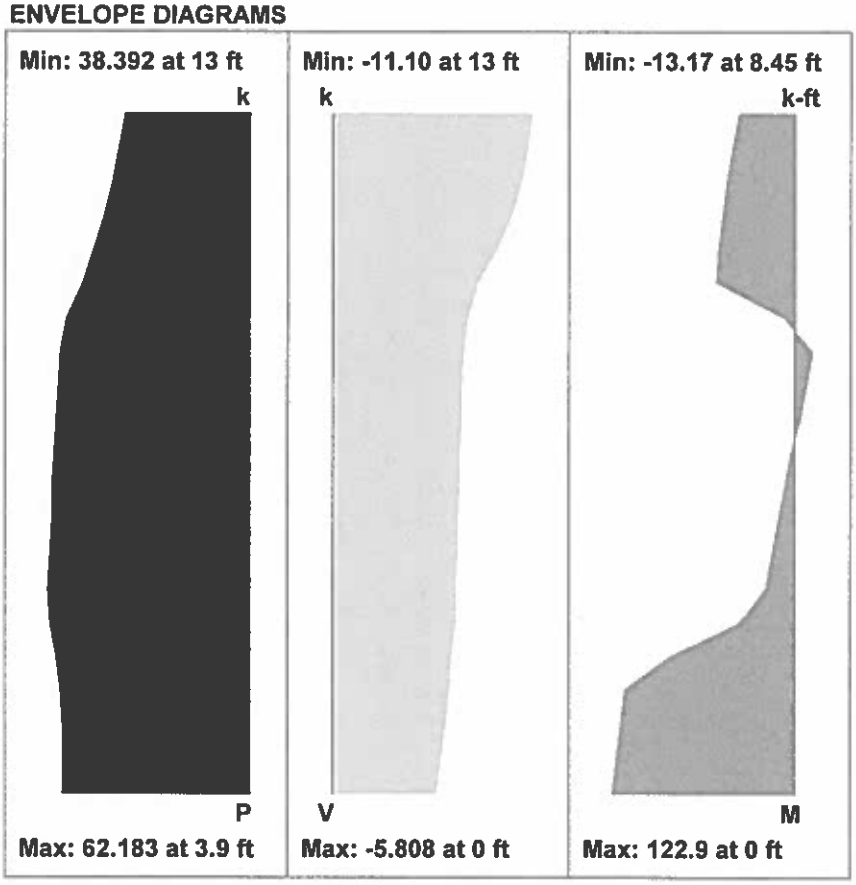
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 13	ft
Total Length	: 10	ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 24"	
Blk Nom Width	: 8"	
1.5 Shear Factor	: Yes	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb)/Fb	: .146
fa/Fa	: .113
fs/Fs	: .008

AXIAL SUMMARY

fa	: .063	ksi
Fa	: .556	ksi

BENDING SUMMARY

fb	: .083	ksi
Fb	: 1	ksi
fs	: .255	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv / Fv	: .261
u/U	: .122

SHEAR SUMMARY

fv	: .019	ksi
Fv	: .072	ksi
Fvm	: .072	ksi
Fv max	: .11	ksi
u	: .024	ksi
U	: .2	ksi

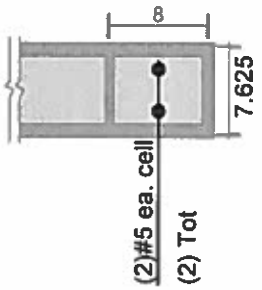
DESIGN DETAILS AT GOVERNING SECTION

AXIAL COMPRESSION DETAILS			BENDING DETAILS			SHEAR DETAILS		
Axial	: 57.332	k	Moment	: 122.853	k-ft	Shear	: 11.105	k
Location	: 0	ft	Location	: 0	ft	Location	: 13	ft
Load Comb	: 37		Load Comb	: 37		Load Comb	: 37	
Rad gyration r	: 2.19	in	Sect Mod S	: 1.83e+004	in3	Corresponding M:	36.222	k-ft
h'/r	: 71.233		Tension St Asv	: 0.6136	in2	Corresponding P :	38.392	k
Red Factor R	: .741		Per of steel p	: 0.0006937		M / (V*d)	: 1	
			k*d	: 103	in	Shear St Area	: Not Reqd.	
			j	: 0.7		Shear Spacing	: N/A	
						Peri of Bars	: N/A	

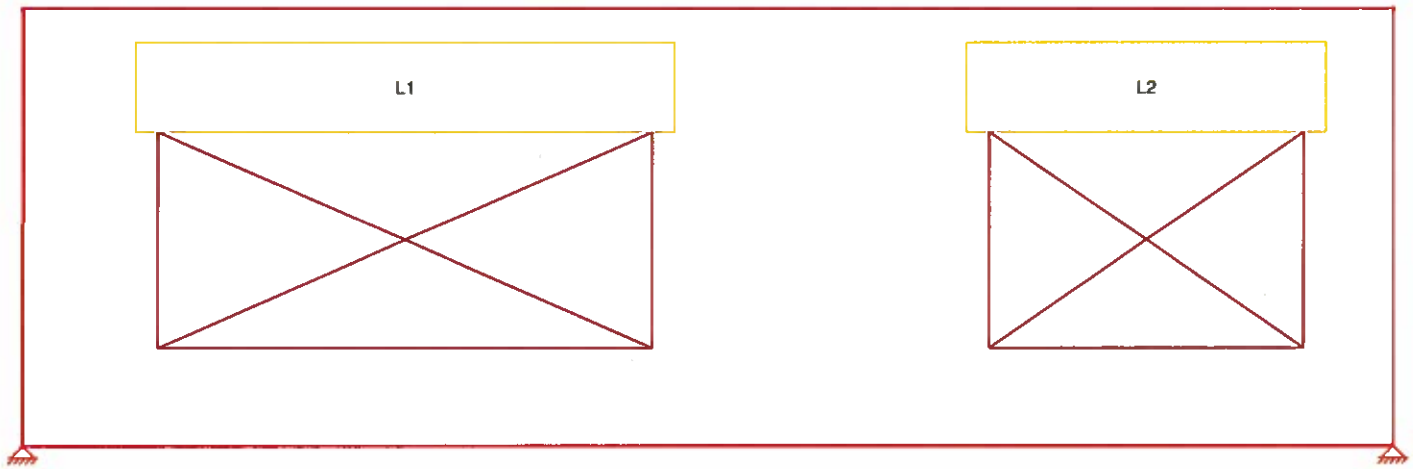
CRACKED SECT ANALYSIS

fm = fa + fb	: .146	ksi
C	: 57.365	k
T	: .034	k

CROSS SECTION DETAILING



NOTE: All units are in "in."



Sunrise Engineering	OWTP South Wall	Wall Panel: WP4
SMH		Jan 24, 2014 at 11:58 AM
		South Wall.r3d

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Type of Design	: ASD	
Stirrup Size	: #3	
Flex Steel	: 2-#5	

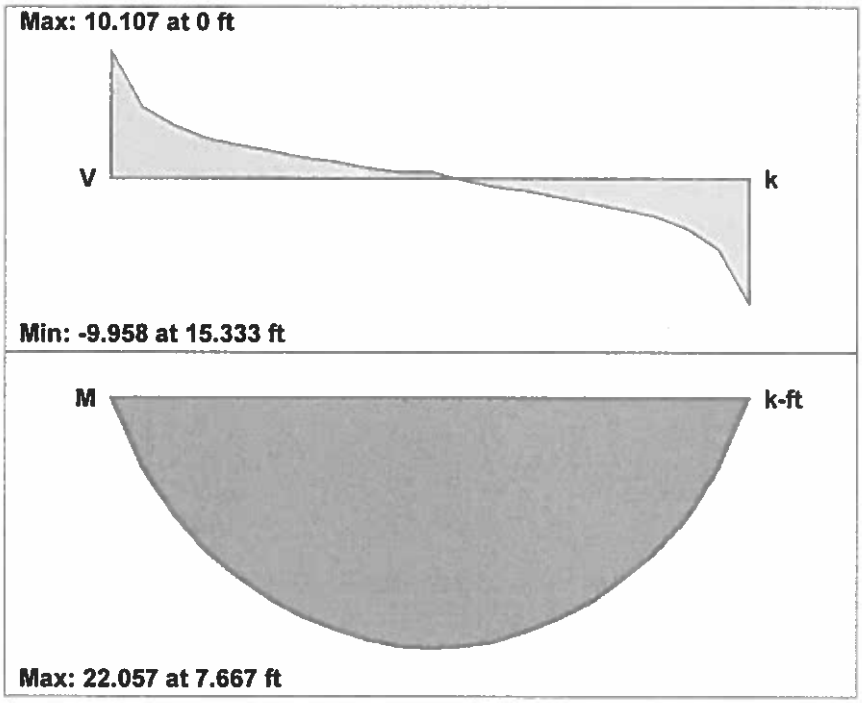
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Beam Dead Wt	: .208	k/ft
Wall Dead Wt	: .078	ksf

GEOMETRY

Dist to Top of Wall	: 1	ft
Eff Length	: 15.333	ft
Eff Width	: 7.625	in
Eff depth	: 26	in
Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .827	
Bond Chk u/U	: .54	
fv	: .051	ksi
Fv	: .062	ksi
Fvm	: .062	ksi
FvMax	: .11	ksi
u	: .108	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .566	
Bend Chk fm/Fm	: .444	
fm	: .444	ksi
Fm	: 1	ksi
fs	: 18.117	ksi
Fs	: 32	ksi

DESIGN DETAILS

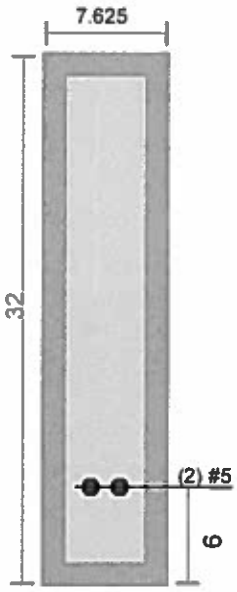
BENDING DETAILS

Max Moment	: 22.057	k-ft	Steel Area As	: .614	in2
Location	: 7.667	ft	Per of steel p	: .003	
Load Comb	: 2				
Mm	: 49.708	k-ft	k	: .253	
Ms	: 38.958	k-ft	j	: .916	

SHEAR DETAILS

Max Shear	: 10.107	k
Location	: 0	ft
Load Comb	: 2	
M / (V*d)	: 1	
Tie Spacing	: Not Required	

CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA

Code	: ACI 530-11: ASD
Special Insp	: Yes
Type of Design	: ASD
Stirrup Size	: #3
Flex Steel	: 1-#5

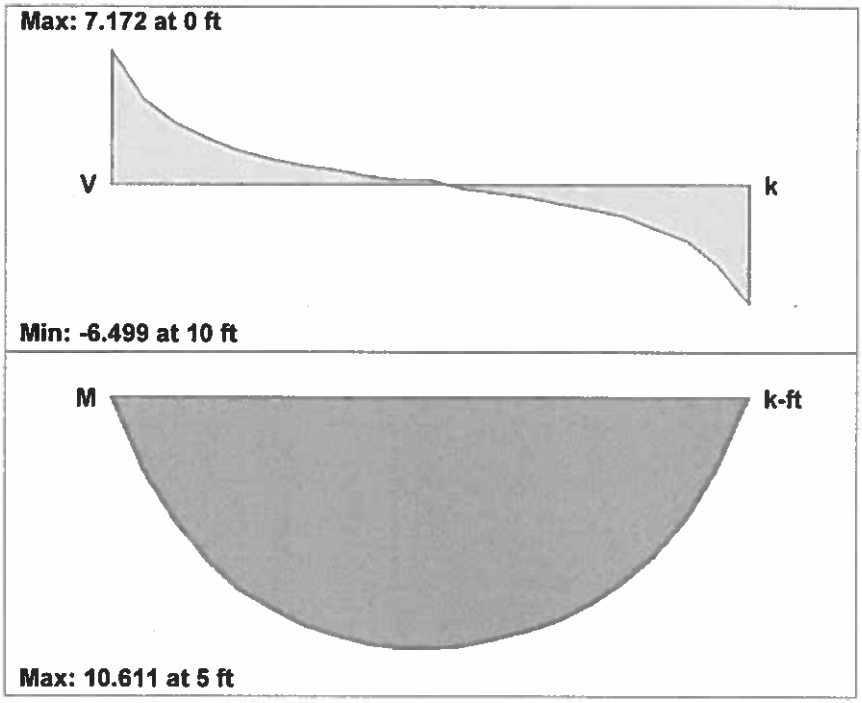
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Beam Dead Wt	: .208	k/ft
Wall Dead Wt	: .078	ksf

GEOMETRY

Dist to Top of Wall	: 1	ft
Eff Length	: 10	ft
Eff Width	: 7.625	in
Eff depth	: 26	in
Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .471	
Bond Chk u/U	: .749	
fv	: .036	ksi
Fv	: .077	ksi
Fvm	: .077	ksi
FvMax	: .133	ksi
u	: .15	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .532	
Bend Chk fm/Fm	: .283	
fm	: .283	ksi
Fm	: 1	ksi
fs	: 17.022	ksi
Fs	: 32	ksi

DESIGN DETAILS

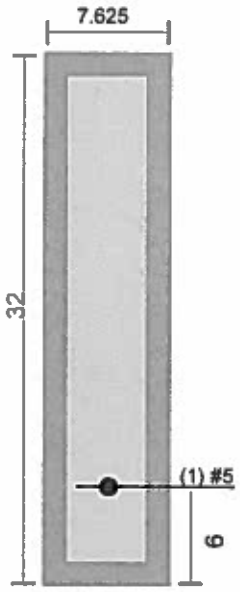
BENDING DETAILS

Max Moment	: 10.611	k-ft	Steel Area As	: .307	in2
Location	: 5	ft	Per of steel p	: .002	
Load Comb	: 2				
Mm	: 37.559	k-ft	k	: .186	
Ms	: 19.949	k-ft	j	: .938	

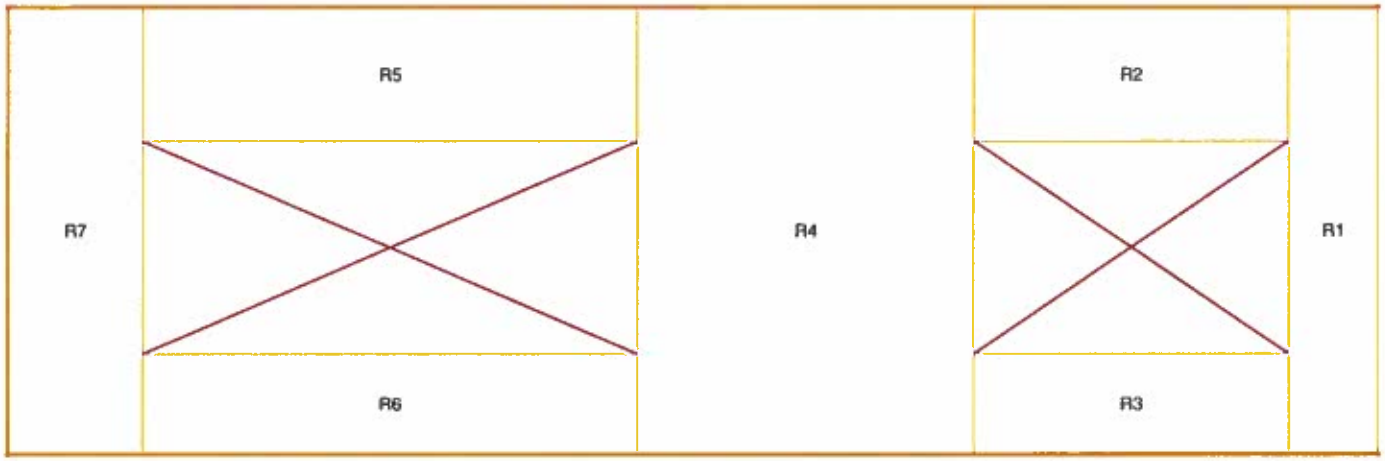
SHEAR DETAILS

Max Shear	: 7.172	k
Location	: 0	ft
Load Comb	: 2	
M / (V*d)	: .683	
Tie Spacing	: Not Required	

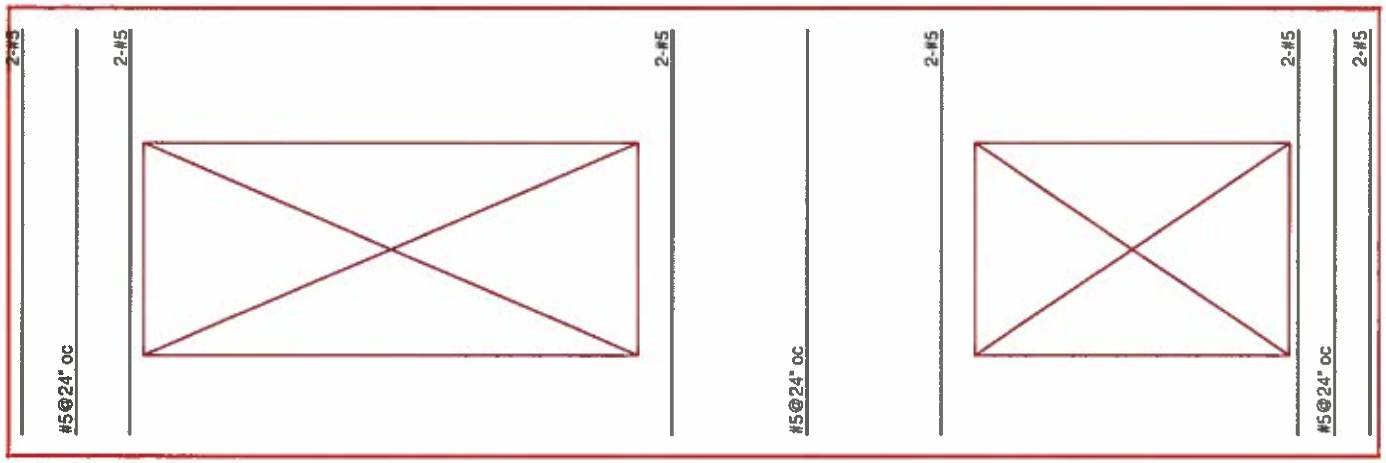
CROSS SECTION DETAILING



NOTE: All units are in "in."



Sunrise Engineering	OWTP South Wall	Wall Panel: WP3
SMH		Jan 24, 2014 at 11:59 AM
		South Wall.r3d



Sunrise Engineering	OWTP South Wall	Wall Panel: WP3
SMH		Jan 24, 2014 at 11:58 AM
		South Wall.r3d

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Hor Bar Size	: #5	
Vert Bar Size	: #5	
No of Ten Bars	: 2	
Effective Depth	: 28	in

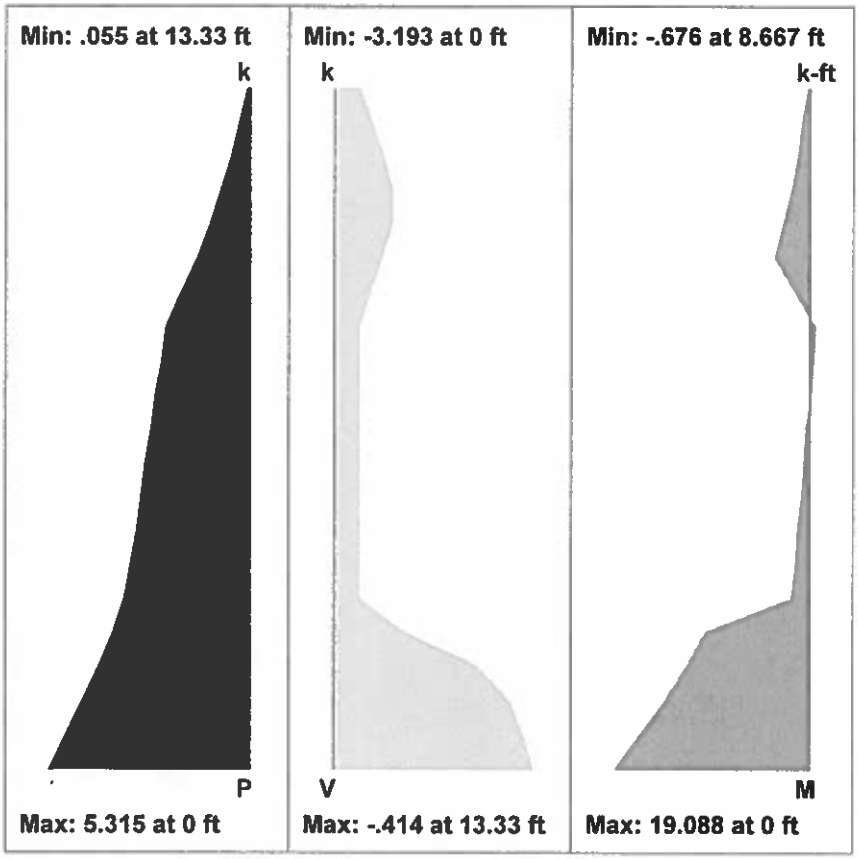
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 13.333	ft
Total Length	: 2.667	ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 24"	
Blk Nom Width	: 8"	
1.5 Shear Factor	: Yes	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb)/Fb	: .348
fa/Fa	: .04
fs/Fs	: .328

AXIAL SUMMARY

fa	: .022	ksi
Fa	: .546	ksi

BENDING SUMMARY

fb	: .326	ksi
Fb	: 1	ksi
fs	: 10.485	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv / Fv	: .335
u/U	: .161

SHEAR SUMMARY

fv	: .022	ksi
Fv	: .067	ksi
Fvm	: .067	ksi
Fv max	: .11	ksi
u	: .032	ksi
U	: .2	ksi

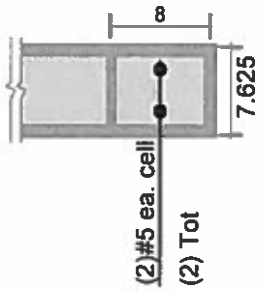
DESIGN DETAILS AT GOVERNING SECTION

AXIAL COMPRESSION DETAILS			BENDING DETAILS			SHEAR DETAILS		
Axial	: 5.315	k	Moment	: 19.088	k-ft	Shear	: 3.193	k
Location	: 0	ft	Location	: 0	ft	Location	: 0	ft
Load Comb	: 2		Load Comb	: 2		Load Comb	: 2	
Rad gyration r	: 2.19	in	Sect Mod S	: 1301	in3	Corresponding M	: 19.088	k-ft
h'/r	: 73.059		Tension St Asv	: 0.6136	in2	Corresponding P	: 5.315	k
Red Factor R	: .728		Per of steel p	: 0.002874		M / (V*d)	: 1	
			k*d	: 8.802	in	Shear St Area	: Not Reqd.	
			j	: 0.9		Shear Spacing	: N/A	
						Peri of Bars	: N/A	

CRACKED SECT ANALYSIS

fm = fa + fb	: .348	ksi
C	: 11.683	k
T	: 6.368	k

CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Hor Bar Size	: #5	
Vert Bar Size	: #5	
No of Ten Bars	: 2	
Effective Depth	: 44	in

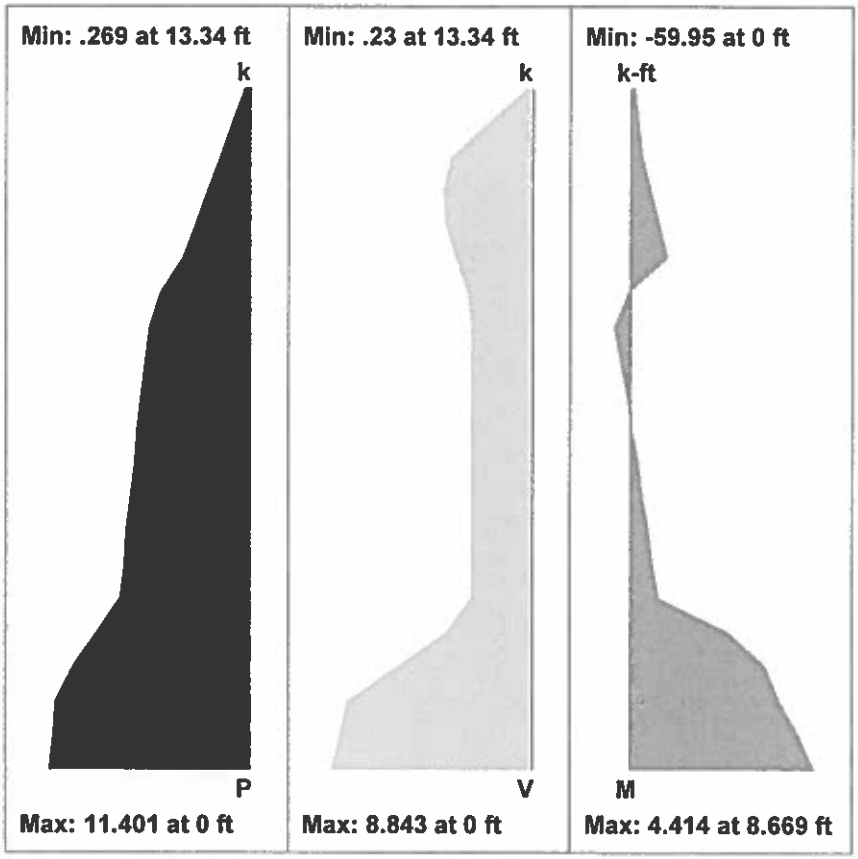
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 13.336	ft
Total Length	: 4	ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 24"	
Blk Nom Width	: 8"	
1.5 Shear Factor	: Yes	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb)/Fb	: .529
fa/Fa	: .057
fs/Fs	: .628

AXIAL SUMMARY

fa	: .031	ksi
Fa	: .546	ksi

BENDING SUMMARY

fb	: .498	ksi
Fb	: 1	ksi
fs	: 20.11	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv / Fv	: .57
u/U	: .281

SHEAR SUMMARY

fv	: .04	ksi
Fv	: .069	ksi
Fvm	: .069	ksi
Fv max	: .11	ksi
u	: .056	ksi
U	: .2	ksi

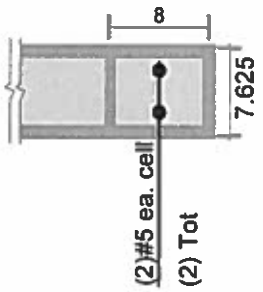
DESIGN DETAILS AT GOVERNING SECTION

AXIAL COMPRESSION DETAILS			BENDING DETAILS			SHEAR DETAILS		
Axial	: 11.401	k	Moment	: 59.955	k-ft	Shear	: 8.843	k
Location	: 0	ft	Location	: 0	ft	Location	: 0	ft
Load Comb	: 19		Load Comb	: 19		Load Comb	: 19	
Rad gyration r	: 2.19	in	Sect Mod S	: 2928	in3	Corresponding M	: 59.955	k-ft
h'/r	: 73.076		Tension St Asv	: 0.6136	in2	Corresponding P	: 11.401	k
Red Factor R	: .728		Per of steel p	: 0.001829		M / (V*d)	: 1	
			k*d	: 11.72	in	Shear St Area	: Not Reqd.	
			j	: 0.91		Shear Spacing	: N/A	
						Peri of Bars	: N/A	

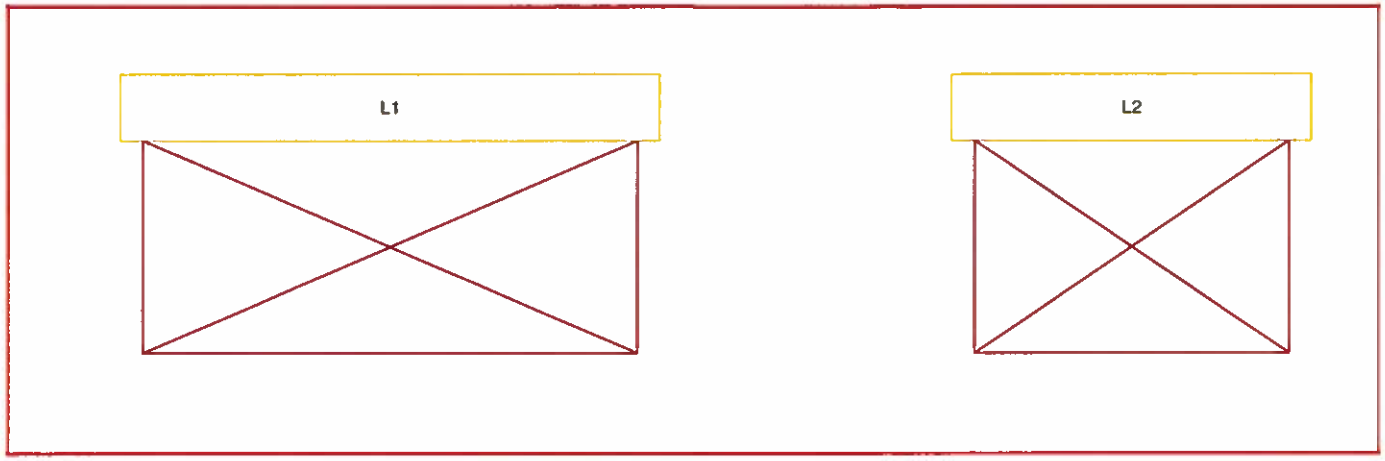
CRACKED SECT ANALYSIS

fm = fa + fb	: .529	ksi
C	: 23.632	k
T	: 12.231	k

CROSS SECTION DETAILING



NOTE: All units are in "in."

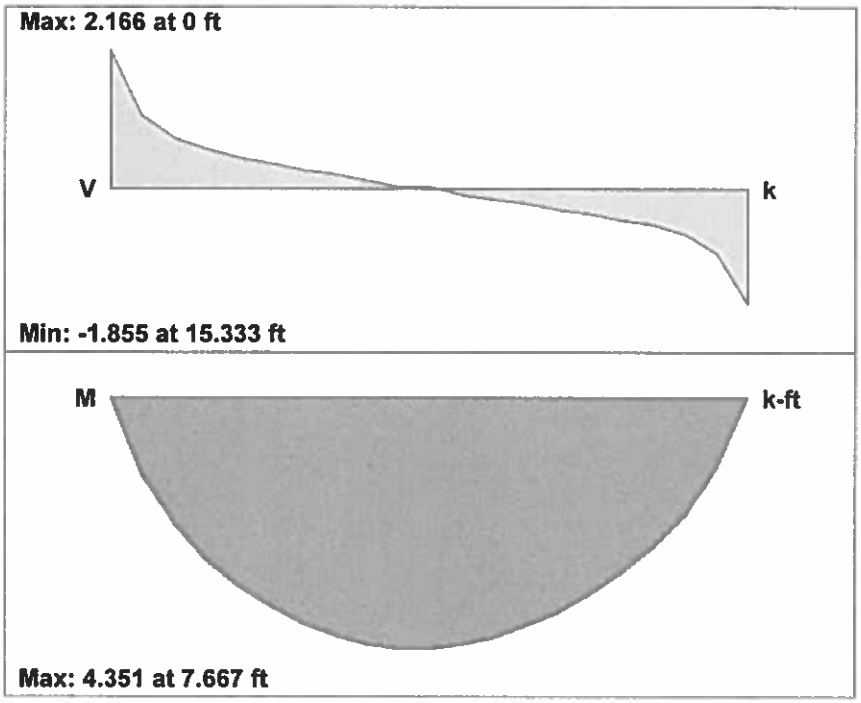


Sunrise Engineering	OWTP South Wall	Wall Panel: WP3
SMH		Jan 24, 2014 at 11:59 AM
		South Wall.r3d

WP3 : L1 (Lintel)

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 3	ksi	Dist to Top of Wall	: 2.003	ft
Special Insp	: Yes	Masonry Em	: 2100	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 15.333	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .156	k/ft	Eff depth	: 18	in
Flex Steel	: 1-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 24	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .256	
Bond Chk u/U	: .331	
fv	: .016	ksi
Fv	: .062	ksi
Fvm	: .062	ksi
FvMax	: .11	ksi
u	: .066	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .319	
Bend Chk fm/Fm	: .208	
fm	: .208	ksi
Fm	: 1	ksi
fs	: 10.202	ksi
Fs	: 32	ksi

DESIGN DETAILS

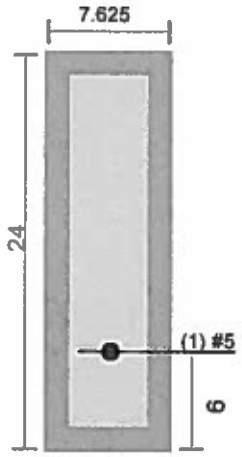
BENDING DETAILS

Max Moment	: 4.351	k-ft	Steel Area As	: .307	in2
Location	: 7.667	ft	Per of steel p	: .002	
Load Comb	: 2				
Mm	: 20.943	k-ft	k	: .22	
Ms	: 13.649	k-ft	j	: .927	

SHEAR DETAILS

Max Shear	: 2.166	k
Location	: 0	ft
Load Comb	: 2	
M / (V*d)	: 1	
Tie Spacing	: Not Required	

CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Type of Design	: ASD	
Stirrup Size	: #3	
Flex Steel	: 1-#5	

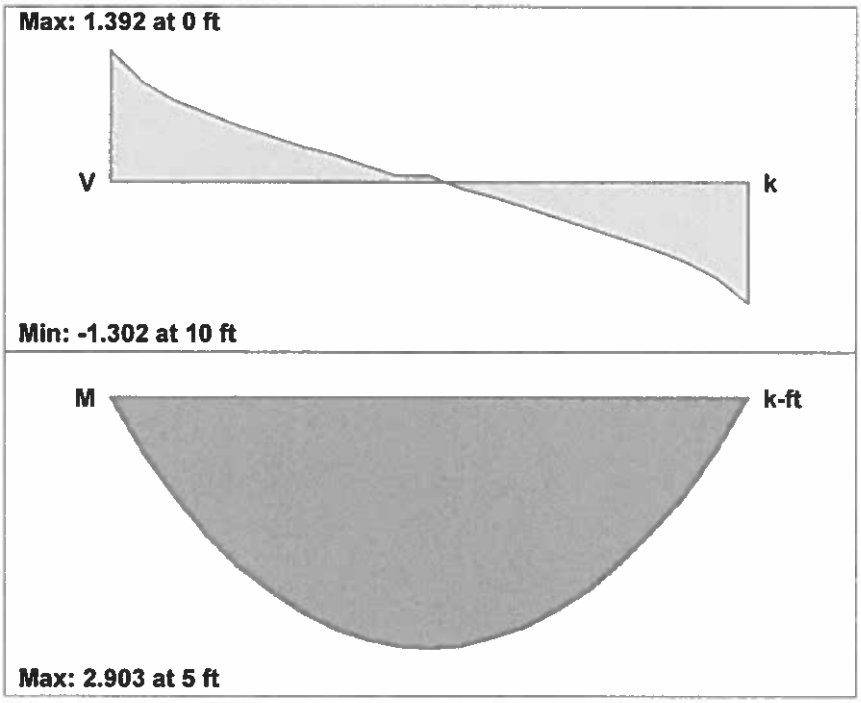
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Beam Dead Wt	: .156	k/ft
Wall Dead Wt	: .078	ksf

GEOMETRY

Dist to Top of Wall	: 2.003	ft
Eff Length	: 10	ft
Eff Width	: 7.625	in
Eff depth	: 18	in
Total Depth	: 24	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .165	
Bond Chk u/U	: .212	
fv	: .01	ksi
Fv	: .062	ksi
Fvm	: .062	ksi
FvMax	: .11	ksi
u	: .042	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .213	
Bend Chk fm/Fm	: .139	
fm	: .139	ksi
Fm	: 1	ksi
fs	: 6.806	ksi
Fs	: 32	ksi

DESIGN DETAILS

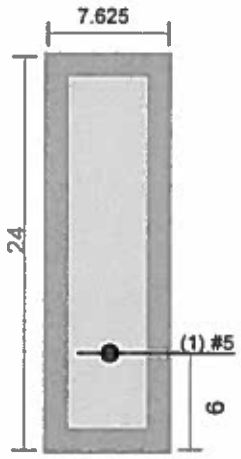
BENDING DETAILS

Max Moment	: 2.903	k-ft	Steel Area As	: .307	in2
Location	: 5	ft	Per of steel p	: .002	
Load Comb	: 2				
Mm	: 20.943	k-ft	k	: .22	
Ms	: 13.649	k-ft	j	: .927	

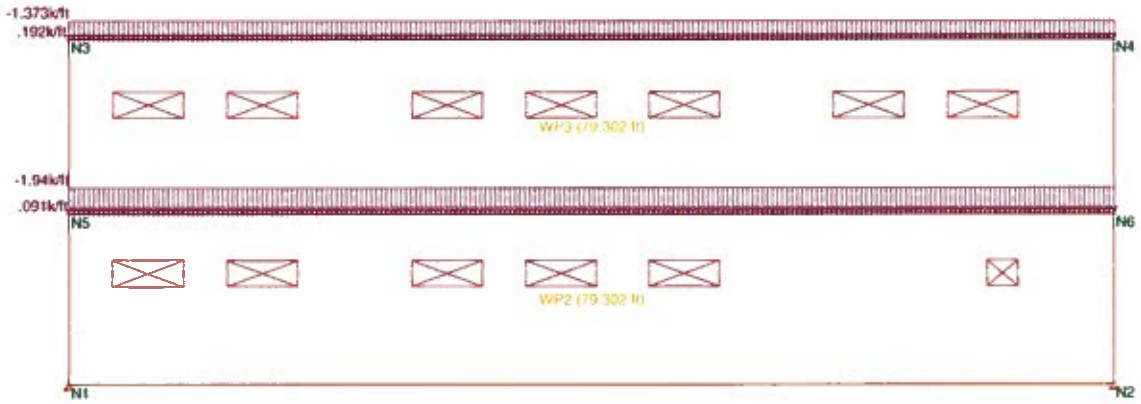
SHEAR DETAILS

Max Shear	: 1.392	k
Location	: 0	ft
Load Comb	: 2	
M / (V*d)	: 1	
Tie Spacing	: Not Required	

CROSS SECTION DETAILING

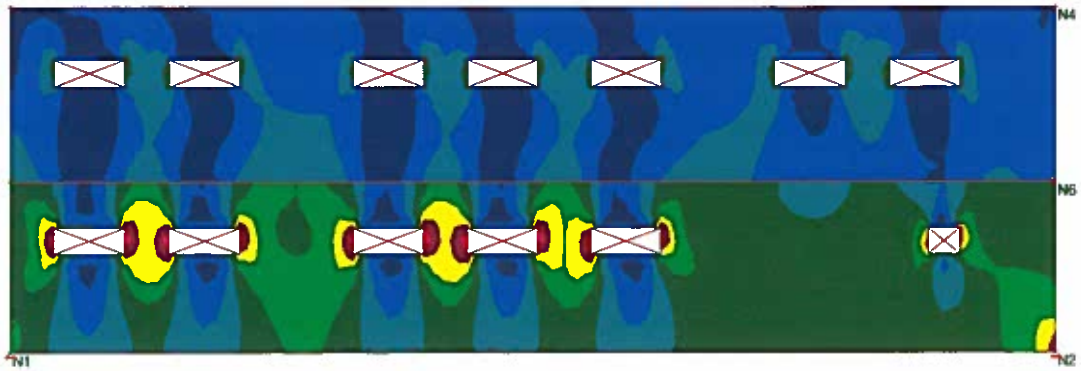


NOTE: All units are in "in."



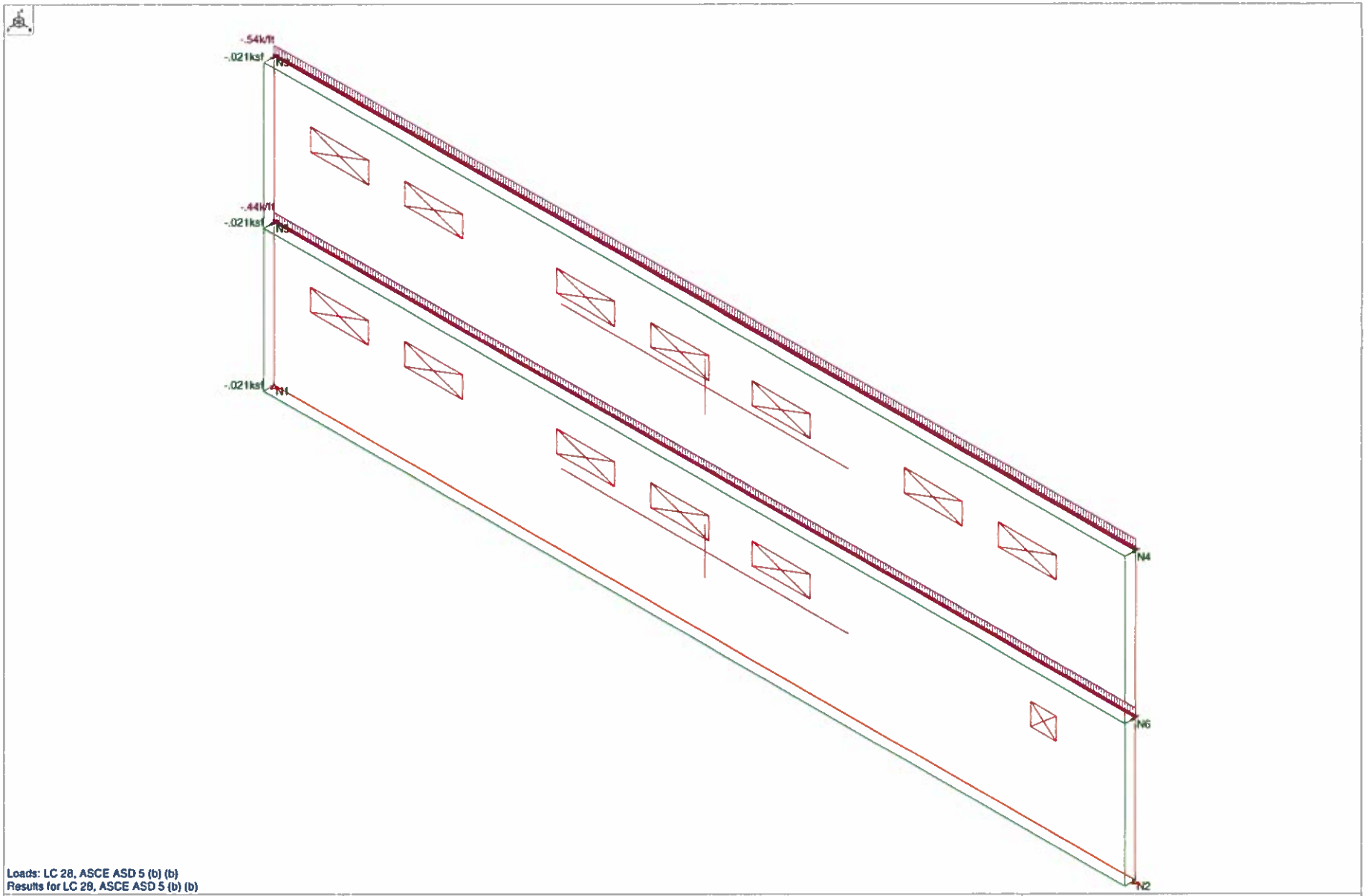
Loads: LC 35, ASCE ASD 6 (d) (a)
Solution: Envelope

		1
	OWTP East Wall	Jan 24, 2014 at 1:13 PM
	LC 35: Worst Case In-Plane Loading	East Wall.R3D



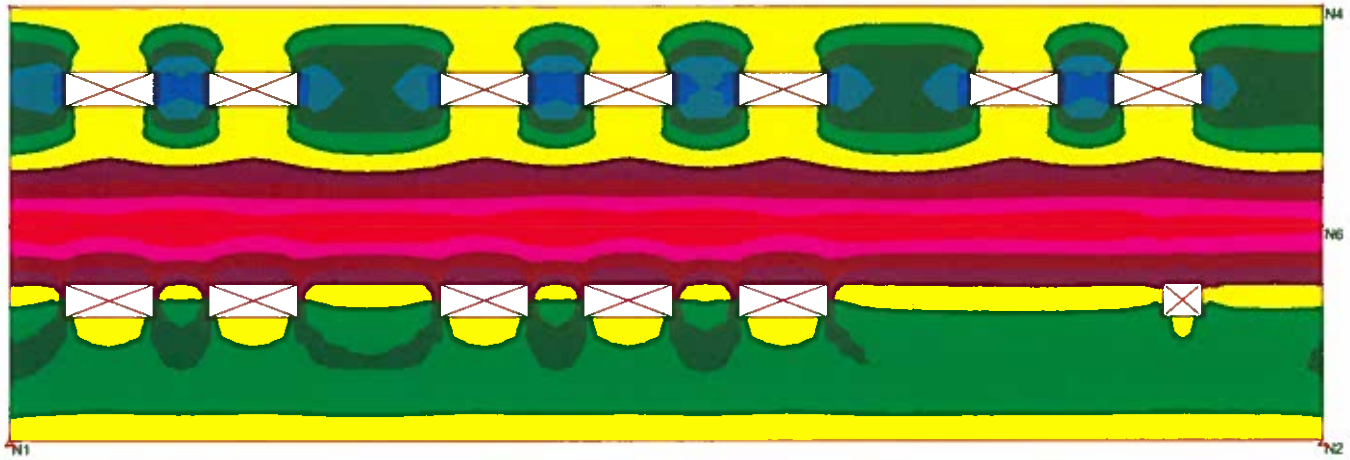
Results for LC 35, ASCE ASD 6 (d) (a)

	OWTP East Wall	2
		Jan 24, 2014 at 1:14 PM
	LC 35: In-Plane Stresses	East Wall.R3D



Loads: LC 28, ASCE ASD 5 (b) (b)
Results for LC 28, ASCE ASD 5 (b) (b)

	OWTP East Wall	3
		Jan 24, 2014 at 1:40 PM
		East Wall.R3D



Results for LC 28, ASCE ASD 5 (b) (b)

	OWTP East Wall	4
		Jan 24, 2014 at 1:56 PM
	LC28: Out-of Plane Stresses	East Wall.R3D

Masonry Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (1E5 F)	Self Weight[k/ft...	f'm[ksi]	Flex Steel[ksi]	Shear St...
1	Concrete Matl	1350	540	.25	.6	Custom	1.5	60	60
2	Clay Matl	1750	420	.25	.6	Custom	2.5	60	60
3	Gen Masonry	1050	420	.25	.6	.08	1.5	60	60

Masonry Wall Panel In Plane Parameters

	Label	Vert Bar Size	Bars Per Cell	Min Bound Zone Wi...	Max Bound Zone Width[in]	Horz Bar Size	1.5x Shear Inc	Transfer Lo...
1	Typical	#5	2	8	40	#5	Yes	Yes
2	32 Deep	#5	2	8	40	#5	Yes	Yes

Masonry Wall Panel Out of Plane Parameters

	Label	Bar Size	Bar Space Min	Bar Space Max	Bar Placement	Mortar Type	Cement Type	Transfer Load
1	Typical	#5	8"	32"	Center	Type M or S	Portland, Lime/M...	Yes
2	32 Deep	#5	8"	32"	Center	Type M or S	Portland, Lime/M...	Yes

Wall Panel Data

	Label	A Joint	B Joint	C Joint	D Joint	Material T...	Material Set	Thickness[in]	Design Ru...	Panel/Spacing
1	WP2	N5	N6	N2	N1	Masonry	Clay Matl	8	Typical	32
2	WP3	N3	N4	N6	N5	Masonry	Clay Matl	8	Typical	24

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
No Data to Print ...			

Wall Panel Point Loads

Wall Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Wall Panel Distributed Loads (BLC 1 : Dead)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Locatio...
1	WP3(13.333ft)	Y	-.54	-.54	0	79.302
2	WP2(13ft)	Y	-.44	-.44	0	79.302

Wall Panel Distributed Loads (BLC 2 : Roof Live)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Locatio...
1	WP3(13.333ft)	Y	-.6	-.6	0	79.302

Wall Panel Distributed Loads (BLC 3 : Live Load)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Locatio...
1	WP2(13ft)	Y	-2	-2	0	79.302

Wall Panel Distributed Loads (BLC 4 : Snow Load)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Locatio...
1	WP3(13.333ft)	Y	-1.11	-1.11	0	79.302

Wall Panel Distributed Loads (BLC 5 : Wind X Dir)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Locatio...
1	WP3(13.333ft)	X	.131	.131	0	79.302

Wall Panel Distributed Loads (BLC 7 : Earthquake X Dir)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Locatio...
1	WP3(13.333ft)	X	.365	.365	0	79.302
2	WP2(13ft)	X	.174	.174	0	79.302

Wall Panel Surface Loads (BLC 6 : Wind Z Dir)

	Wall Panel Label	Direction	Top Magnitude[ksf,...	Bottom Magnitude[...	Start Location[ft]	Height[ft]
1	WP3	Z	-.02	-.02	0	0
2	WP2	Z	-.02	-.02	0	0

Wall Panel Surface Loads (BLC 8 : Earthquake Z Dir)

	Wall Panel Label	Direction	Top Magnitude[ksf,...	Bottom Magnitude[...	Start Location[ft]	Height[ft]
1	WP3	Z	-.03	-.03	0	0
2	WP2	Z	-.03	-.03	0	0

Load Combinations

	Description	Sol...	PDelta	SRSS	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	IBC 16-1	Yes	Y		DL	1.4														
2	IBC 16-2 (a)	Yes	Y		DL	1.2	LL	1.6	LLS	1.6	RLL	.5								
3	IBC 16-2 (b)	Yes	Y		DL	1.2	LL	1.6	LLS	1.6	SL	.5	SLN	.5						
4	IBC 16-2 (c)	Yes	Y		DL	1.2	LL	1.6	LLS	1.6										
5	IBC 16-3 (a)	Yes	Y		DL	1.2	RLL	1.6	LL	.5	LLS	1								
6	IBC 16-3 (c)	Yes	Y		DL	1.2	SL	1.6	SLN	1.6	LL	.5	LLS	1						
7	ASCE ASD 5 (a) (a)	Yes			DL	1	WLX	.6												
8	ASCE ASD 5 (a) (b)	Yes			DL	1	WLZ	.6												
9	ASCE ASD 5 (a) (c)	Yes			DL	1	WLX	-.6												
10	ASCE ASD 5 (a) (d)	Yes			DL	1	WLZ	-.6												
11	ASCE ASD 6 (a) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	RLL	.75						
12	ASCE ASD 6 (a) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	RLL	.75						
13	ASCE ASD 6 (a) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	RLL	.75						
14	ASCE ASD 6 (a) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	RLL	.75						
15	ASCE ASD 6 (c) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
16	ASCE ASD 6 (c) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
17	ASCE ASD 6 (c) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
18	ASCE ASD 6 (c) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
19	ASCE ASD 6 (e) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75								
20	ASCE ASD 6 (e) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75								
21	ASCE ASD 6 (e) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75								
22	ASCE ASD 6 (e) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75								
23	ASCE ASD 7 (a)	Yes			DL	.6	WLX	.6												
24	ASCE ASD 7 (b)	Yes			DL	.6	WLZ	.6												
25	ASCE ASD 7 (c)	Yes			DL	.6	WLX	-.6												
26	ASCE ASD 7 (d)	Yes			DL	.6	WLZ	-.6												
27	ASCE ASD 5 (b) (a)	Yes			DL	1	ELX	.7												
28	ASCE ASD 5 (b) (b)	Yes			DL	1	ELZ	.7												
29	ASCE ASD 5 (b) (c)	Yes			DL	1	ELX	-.7												
30	ASCE ASD 5 (b) (d)	Yes			DL	1	ELZ	-.7												
31	ASCE ASD 6 (b) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	RLL	.75						
32	ASCE ASD 6 (b) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	RLL	.75						
33	ASCE ASD 6 (b) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	RLL	.75						
34	ASCE ASD 6 (b) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	RLL	.75						
35	ASCE ASD 6 (d) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
36	ASCE ASD 6 (d) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
37	ASCE ASD 6 (d) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
38	ASCE ASD 6 (d) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
39	ASCE ASD 6 (f) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75								
40	ASCE ASD 6 (f) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75								

Load Combinations (Continued)

	Description	Sol..	PDelta	SRSS	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..
41	ASCE ASD 6 (f) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75										
42	ASCE ASD 6 (f) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75										
43	ASCE ASD 8 (a)	Yes			DL	.6	ELX	.7														
44	ASCE ASD 8 (b)	Yes			DL	.6	ELZ	.7														
45	ASCE ASD 8 (c)	Yes			DL	.6	ELX	-.7														
46	ASCE ASD 8 (d)	Yes			DL	.6	ELZ	-.7														

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	WP2	max	50.742	29	574.085	3	21.649	28	180.976	28	.028	28	984.175	27
2		min	-50.742	43	138.153	23	-21.649	30	-180.976	30	-.028	30	-896.971	45
3	WP3	max	0	1	0	1	22.205	28	107.795	28	.028	30	0	1
4		min	0	1	0	1	-22.205	30	-107.795	30	-.028	28	0	1
5	Totals:	max	50.742	29	574.085	3	43.854	28						
6		min	-50.742	43	138.153	23	-43.854	30						

Masonry Wall Reinforcement

	Wall	Region	Hor. Bar Size	Vert. Bar Size	Boundary Reinf.
1	WP2	R1	Not Reqd.	#5@32" oc	2-#5
2		R2	Not Reqd.	#5@32" oc	2-#5
3		R3	Not Reqd.	#5@32" oc	2-#5
4		R4	Not Reqd.	#5@32" oc	2-#5
5		R5	Not Reqd.	#5@32" oc	2-#5
6		R6	Not Reqd.	#5@32" oc	2-#5
7		R7	Not Reqd.	#5@32" oc	2-#5
8		R8	Not Reqd.	#5@32" oc	2-#5
9		R9	Not Reqd.	#5@32" oc	2-#5
10		R10	Not Reqd.	#5@32" oc	2-#5
11		R11	Not Reqd.	#5@32" oc	2-#5
12		R12	Not Reqd.	#5@32" oc	2-#5
13		R13	Not Reqd.	#5@32" oc	2-#5
14		R14	Not Reqd.	#5@32" oc	2-#5
15		R15	Not Reqd.	#5@32" oc	2-#5
16		R16	Not Reqd.	#5@32" oc	2-#5
17		R17	Not Reqd.	#5@32" oc	2-#5
18		R18	Not Reqd.	#5@32" oc	2-#5
19		R19	Not Reqd.	#5@32" oc	2-#5
20	WP3	R1	Not Reqd.	#5@24" oc	2-#5
21		R2	Not Reqd.	#5@24" oc	2-#5
22		R3	Not Reqd.	#5@24" oc	2-#5
23		R4	Not Reqd.	#5@24" oc	2-#5
24		R5	Not Reqd.	#5@24" oc	2-#5
25		R6	Not Reqd.	#5@24" oc	2-#5
26		R7	Not Reqd.	#5@24" oc	2-#5
27		R8	Not Reqd.	#5@24" oc	2-#5
28		R9	Not Reqd.	#5@24" oc	2-#5
29		R10	Not Reqd.	#5@24" oc	2-#5
30		R11	Not Reqd.	#5@24" oc	2-#5
31		R12	Not Reqd.	#5@24" oc	2-#5
32		R13	Not Reqd.	#5@24" oc	2-#5
33		R14	Not Reqd.	#5@24" oc	2-#5
34		R15	Not Reqd.	#5@24" oc	2-#5
35		R16	Not Reqd.	#5@24" oc	2-#5
36		R17	Not Reqd.	#5@24" oc	2-#5
37		R18	Not Reqd.	#5@24" oc	2-#5
38		R19	Not Reqd.	#5@24" oc	2-#5

Masonry Wall Reinforcement (Continued)

	Wall	Region	Hor. Bar Size	Vert. Bar Size	Boundary Reinf.
39		R20	Not Reqd.	#5@24" oc	2-#5
40		R21	Not Reqd.	#5@24" oc	2-#5
41		R22	Not Reqd.	#5@24" oc	2-#5

Masonry Lintel Reinforcement

	Wall	Lintel	Flex. Steel	Stirrup
1	WP2	L1	2-#5	Not Reqd.
2		L2	2-#5	Not Reqd.
3		L3	2-#5	Not Reqd.
4		L4	2-#5	Not Reqd.
5		L5	2-#5	Not Reqd.
6		L6	1-#5	Not Reqd.
7	WP3	L1	1-#5	Not Reqd.
8		L2	1-#5	Not Reqd.
9		L3	1-#5	Not Reqd.
10		L4	1-#5	Not Reqd.
11		L5	1-#5	Not Reqd.
12		L6	1-#5	Not Reqd.
13		L7	1-#5	Not Reqd.

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (In Plane)

	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP2	R1	Typical	.127	3	.199	35	.463	.833	.101
2		R2	Typical	.066	3	.139	29	.613	.833	.095
3		R3	Typical	.098	3	.19	35	.571	.833	.102
4		R4	Typical	.121	3	.146	27	.463	.833	.104
5		R5	Typical	.053	3	.138	27	.613	.833	.096
6		R6	Typical	.078	3	.156	27	.571	.833	.093
7		R7	Typical	.192	3	.227	43	.463	.833	.1
8		R8	Typical	.054	3	.131	29	.613	.833	.094
9		R9	Typical	.08	3	.138	45	.571	.833	.091
10		R10	Typical	.208	3	.249	45	.463	.833	.1
11		R11	Typical	.055	3	.148	29	.613	.833	.095
12		R12	Typical	.08	3	.156	29	.571	.833	.093
13		R13	Typical	.15	3	.192	29	.463	.833	.106
14		R14	Typical	.057	3	.133	29	.613	.833	.094
15		R15	Typical	.082	3	.159	37	.571	.833	.106
16		R16	Typical	.638	3	.356	35	.463	.833	.076
17		R17	Typical	0	N/A	0	N/A	.613	.833	0
18		R18	Typical	.086	3	.19	37	.571	.833	.101
19		R19	Typical	.415	3	.325	37	.463	.833	.076
20	WP3	R1	Typical	.084	6	.095	35	.455	.833	.076
21		R2	Typical	0	N/A	0	N/A	.61	.833	0
22		R3	Typical	0	N/A	0	N/A	.574	.833	0
23		R4	Typical	.104	6	.284	29	.455	.833	.09
24		R5	Typical	0	N/A	0	N/A	.61	.833	0
25		R6	Typical	0	N/A	0	N/A	.574	.833	0
26		R7	Typical	.092	6	.213	35	.455	.833	.093
27		R8	Typical	0	N/A	0	N/A	.61	.833	0
28		R9	Typical	0	N/A	0	N/A	.574	.833	0
29		R10	Typical	.088	6	.213	27	.455	.833	.092
30		R11	Typical	0	N/A	0	N/A	.61	.833	0
31		R12	Typical	0	N/A	0	N/A	.574	.833	0
32		R13	Typical	.098	6	.273	29	.455	.833	.091
33		R14	Typical	0	N/A	0	N/A	.61	.833	0
34		R15	Typical	0	N/A	0	N/A	.574	.833	0

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (In Plane) (Continued)

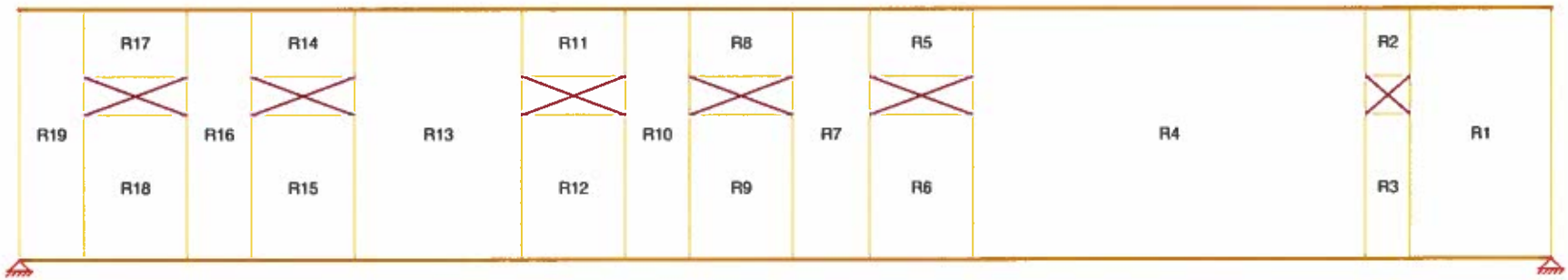
	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
35		R16	Typical	.07	6	.125	29	.455	.833	.099
36		R17	Typical	0	N/A	0	N/A	.61	.833	0
37		R18	Typical	0	N/A	0	N/A	.574	.833	0
38		R19	Typical	.1	6	.195	27	.455	.833	.088
39		R20	Typical	0	N/A	0	N/A	.61	.833	0
40		R21	Typical	0	N/A	0	N/A	.574	.833	0
41		R22	Typical	.279	3	.318	6	.455	.833	.066

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (Out of Plane)

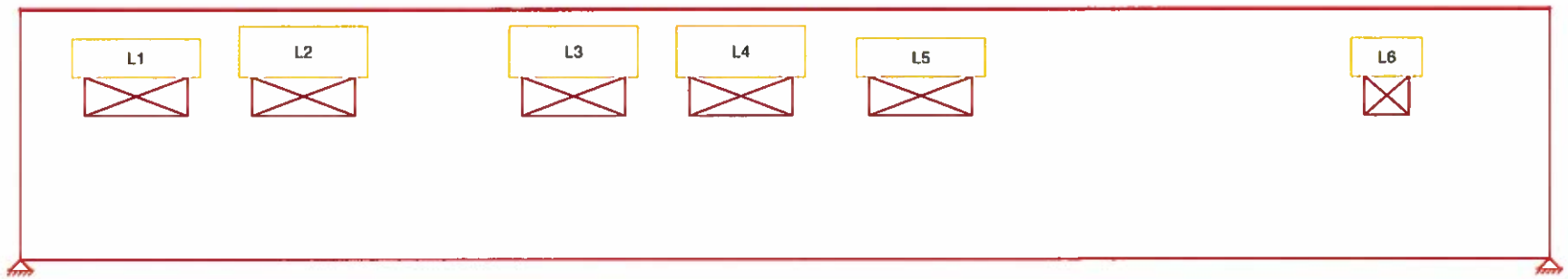
	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP2	R1	Typical	.279	28	.019	44	.463	1.125	.1
2		R2	Typical	.276	28	.018	28	.613	1.125	.1
3		R3	Typical	.137	28	.011	28	.571	1.125	.1
4		R4	Typical	.29	28	.019	44	.463	1.125	.1
5		R5	Typical	.272	28	.018	28	.613	1.125	.1
6		R6	Typical	.125	28	.01	28	.571	1.125	.1
7		R7	Typical	.318	28	.023	44	.463	1.125	.1
8		R8	Typical	.284	28	.019	28	.613	1.125	.1
9		R9	Typical	.129	28	.01	28	.571	1.125	.1
10		R10	Typical	.319	28	.025	44	.463	1.125	.1
11		R11	Typical	.275	28	.019	28	.613	1.125	.1
12		R12	Typical	.127	28	.01	28	.571	1.125	.1
13		R13	Typical	.302	28	.02	44	.463	1.125	.1
14		R14	Typical	.275	28	.019	28	.613	1.125	.1
15		R15	Typical	.127	28	.01	28	.571	1.125	.1
16		R16	Typical	.532	28	.035	44	.463	1.125	.1
17		R17	Typical	0	N/A	0	N/A	.613	1.125	.05
18		R18	Typical	.126	28	.01	28	.571	1.125	.1
19		R19	Typical	.519	28	.035	44	.463	1.125	.1
20	WP3	R1	Typical	.335	28	.027	44	.455	1.125	.1
21		R2	Typical	0	N/A	0	N/A	.61	1.125	.05
22		R3	Typical	0	N/A	0	N/A	.574	1.125	.05
23		R4	Typical	.641	28	.05	44	.455	1.125	.1
24		R5	Typical	0	N/A	0	N/A	.61	1.125	.05
25		R6	Typical	0	N/A	0	N/A	.574	1.125	.05
26		R7	Typical	.403	28	.031	44	.455	1.125	.1
27		R8	Typical	0	N/A	0	N/A	.61	1.125	.05
28		R9	Typical	0	N/A	0	N/A	.574	1.125	.05
29		R10	Typical	.601	28	.046	44	.455	1.125	.1
30		R11	Typical	0	N/A	0	N/A	.61	1.125	.05
31		R12	Typical	0	N/A	0	N/A	.574	1.125	.05
32		R13	Typical	.669	28	.051	44	.455	1.125	.1
33		R14	Typical	0	N/A	0	N/A	.61	1.125	.05
34		R15	Typical	0	N/A	0	N/A	.574	1.125	.05
35		R16	Typical	.41	28	.031	44	.455	1.125	.1
36		R17	Typical	0	N/A	0	N/A	.61	1.125	.05
37		R18	Typical	0	N/A	0	N/A	.574	1.125	.05
38		R19	Typical	.664	28	.05	44	.455	1.125	.1
39		R20	Typical	0	N/A	0	N/A	.61	1.125	.05
40		R21	Typical	0	N/A	0	N/A	.574	1.125	.05
41		R22	Typical	.462	28	.035	44	.455	1.125	.1

Wall Panel ACI 530-11: ASD Masonry Code Checks for Lintels

	Wall Pa...	Lintel	Design ...	Flexure UC	LC	Shear UC	LC	Fvm[ksi]	Fvs[ksi]	Fm[ksi]	Fs[ksi]
1	WP2	L1	Typical	.384	3	.812	3	.078	0	.833	32
2		L2	<Custo...	.402	3	.85	3	.078	0	.833	32
3		L3	<Custo...	.402	3	.836	3	.078	0	.833	32
4		L4	<Custo...	.415	3	.862	3	.078	0	.833	32
5		L5	Typical	.382	3	.803	3	.078	0	.833	32
6		L6	Typical	.259	3	.419	3	.087	0	.833	32
7	WP3	L1	Typical	.402	6	.422	6	.077	0	.833	32
8		L2	Typical	.399	6	.418	6	.077	0	.833	32
9		L3	Typical	.399	6	.419	6	.077	0	.833	32
10		L4	Typical	.401	6	.421	6	.077	0	.833	32
11		L5	Typical	.4	6	.417	6	.077	0	.833	32
12		L6	Typical	.398	6	.416	6	.077	0	.833	32
13		L7	Typical	.401	6	.426	6	.078	0	.833	32



	OWTP East Wall	Wall Panel: WP2
		Jan 24, 2014 at 1:16 PM
		East Wall.R3D



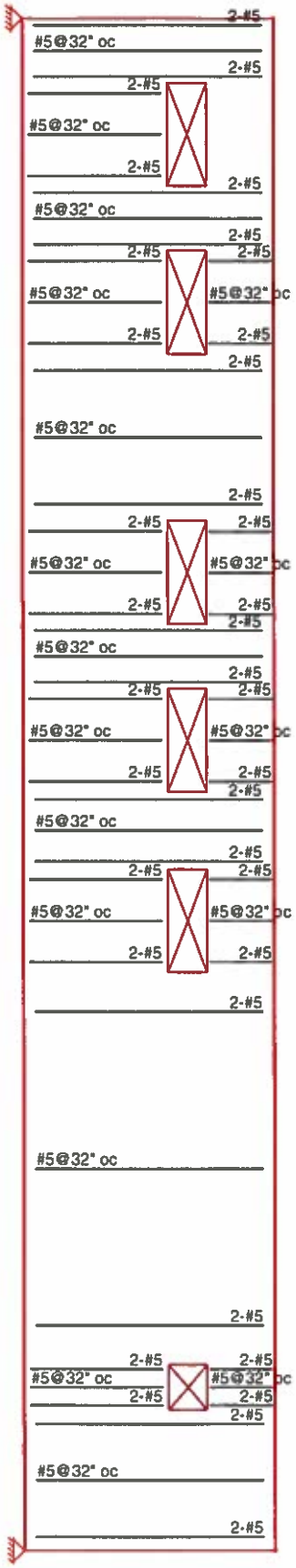
	OWTP East Wall	Wall Panel: WP2
		Jan 24, 2014 at 1:16 PM
		East Wall.R3D

OWTP East Wall

Wall Panel: WP2

Jan 24, 2014 at 1:15 PM

East Wall.R3D



CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Hor Bar Size	: #5	
Vert Bar Size	: #5	
No of Ten Bars	: 2	
Effective Depth	: 36	in

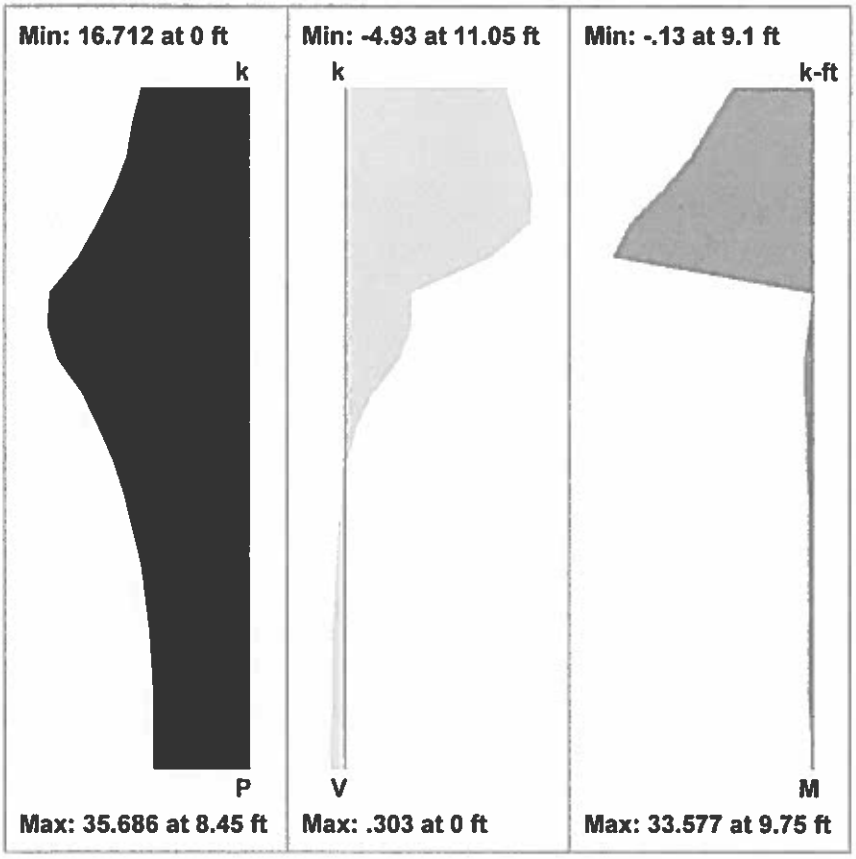
MATERIALS

Masonry f'm	: 2.5	ksi
Masonry Em	: 1750	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 13	ft
Total Length	: 3.333	ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 32"	
Blk Nom Width	: 8"	
1.5 Shear Factor	: Yes	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb)/Fb	: .41
fa/Fa	: .214
fs/Fs	: .084

AXIAL SUMMARY

fa	: .099	ksi
Fa	: .463	ksi

BENDING SUMMARY

fb	: .243	ksi
Fb	: .833	ksi
fs	: 2.69	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv / Fv	: .356
u/U	: .226

SHEAR SUMMARY

fv	: .027	ksi
Fv	: .076	ksi
Fvm	: .076	ksi
Fv max	: .1	ksi
u	: .045	ksi
U	: .2	ksi

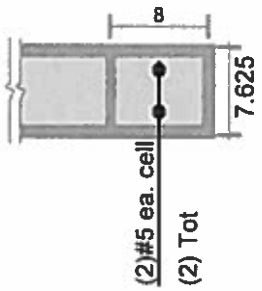
DESIGN DETAILS AT GOVERNING SECTION

AXIAL COMPRESSION DETAILS			BENDING DETAILS			SHEAR DETAILS		
Axial	: 30.19	k	Moment	: 33.577	k-ft	Shear	: 4.93	k
Location	: 9.75	ft	Location	: 9.75	ft	Location	: 11.05	ft
Load Comb	: 35		Load Comb	: 35		Load Comb	: 35	
Rad gyration r	: 2.19	in	Sect Mod S	: 2033	in3	Corresponding M:	25.266	k-ft
h'/r	: 71.233		Tension St Asv	: 0.6136	in2	Corresponding P :	23.79	k
Red Factor R	: .741		Per of steel p	: 0.002235		M / (V*d)	: 1	
			k*d	: 24.4	in	Shear St Area	: Not Reqd.	
			j	: 0.77		Shear Spacing	: N/A	
						Peri of Bars	: N/A	

CRACKED SECT ANALYSIS

fm = fa + fb	: .342	ksi
C	: 31.795	k
T	: 1.605	k

CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Type of Design	: ASD	
Reinforced	: Yes	
Vertical Bar Size	: #5	
End Face Dist	: 3.813	in

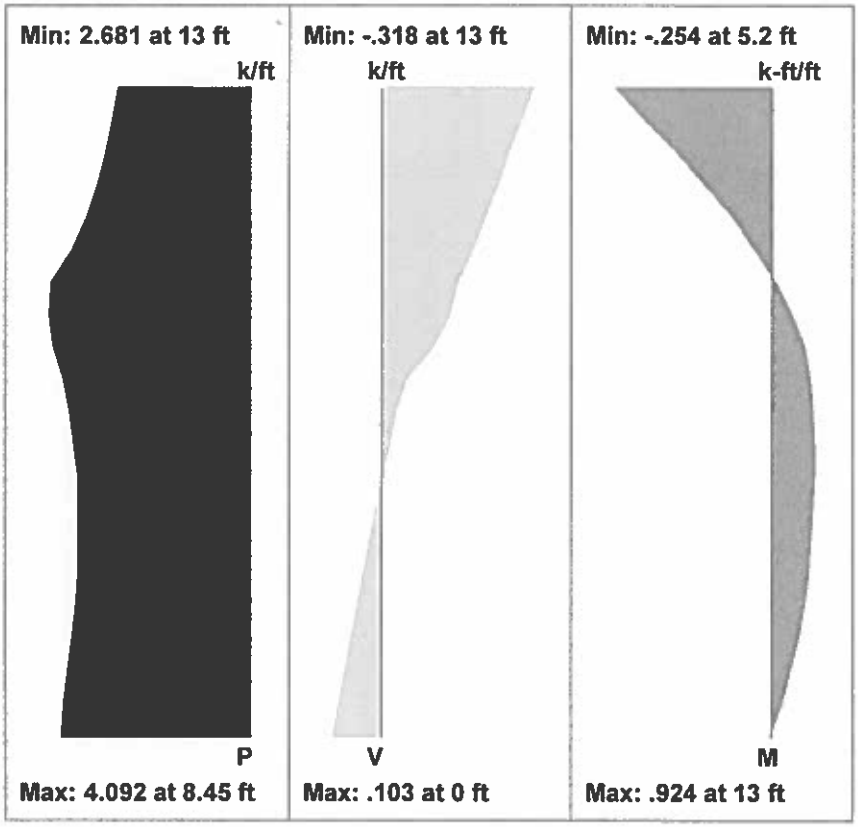
MATERIALS

Masonry f'm	: 2.5	ksi
Masonry Em	: 1750	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 13	ft
Eq Sld Thickness	: 7.625"	
An	: 91.5	in2/ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 32"	
Loc of r/f	: Center	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb) / Fb	: .519
fa/Fa	: .063
fs/Fs	: .862

AXIAL SUMMARY

fa	: .029	ksi
Fa	: .463	ksi

BENDING SUMMARY

fb	: .555	ksi
Fb	: 1.125	ksi
fs	: 27.579	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv/Fv	: .035
u/U	: .617

SHEAR SUMMARY

fv	: .003	ksi
Fv	: .1	ksi
Fv max	: .15	ksi
u	: .123	ksi
U	: .2	ksi

DESIGN DETAILS

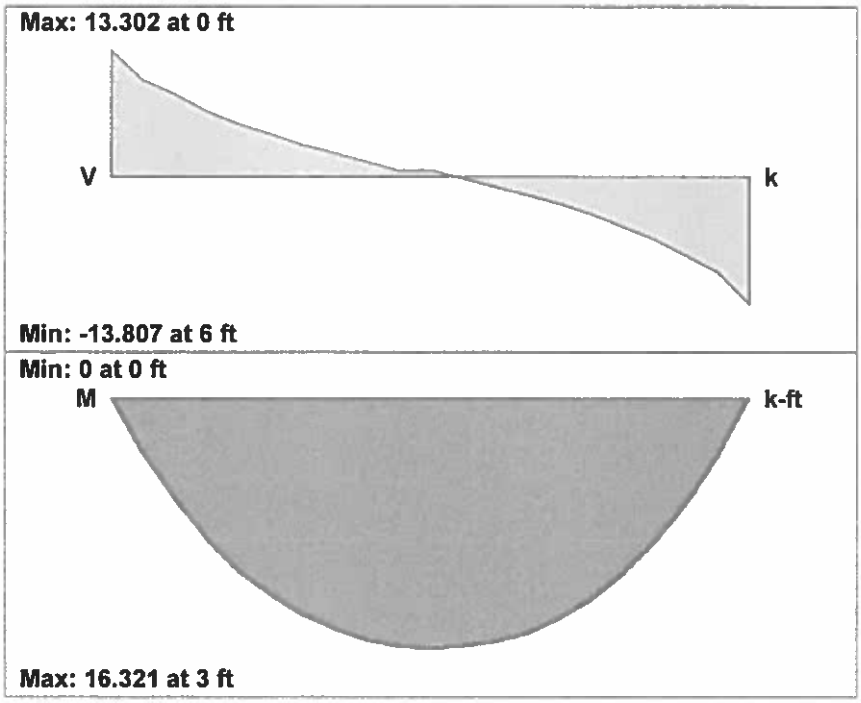
AXIAL DETAILS			BENDING DETAILS			SHEAR DETAILS		
Max Axial	: 2.681	k/ft	Max Moment	: .924	k-ft/ft	Max Shear	: .318	k/ft
Location	: 13	ft	Location	: 13	ft	Location	: 13	ft
Load Comb	: 28		Load Comb	: 28		Load Comb	: 28	
Rad gyration r	: 2.19	in	k	: .25		Width for Shear	: 32	in
h'/r	: 71.233		d	: 3.813	in	Corresponding M:	.924	k-ft/ft
			j	: .917		Corresponding P :	2.681	k/ft
						M / (V*d)	: 0	

CROSS SECTION DETAILING

NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 2.5	ksi	Dist to Top of Wall	: .833	ft
Special Insp	: Yes	Masonry Em	: 1750	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 6	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 2-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .812	
Bond Chk u/U	: .676	
fv	: .064	ksi
Fv	: .078	ksi
Fvm	: .078	ksi
FvMax	: .133	ksi
u	: .135	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .384	
Bend Chk fm/Fm	: .317	
fm	: .264	ksi
Fm	: .833	ksi
fs	: 12.275	ksi
Fs	: 32	ksi

DESIGN DETAILS

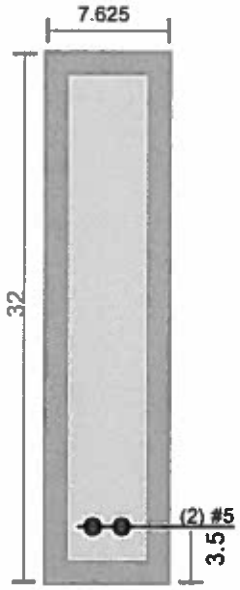
BENDING DETAILS

Max Moment	: 16.321	k-ft	Steel Area As	: .614	in2
Location	: 3	ft	Per of steel p	: .003	
Load Comb	: 3				
Mm	: 51.542	k-ft	k	: .263	
Ms	: 42.55	k-ft	j	: .912	

SHEAR DETAILS

Max Shear	: 13.807	k
Location	: 6	ft
Load Comb	: 3	
M / (V*d)	: .498	
Tie Spacing	: Not Required	

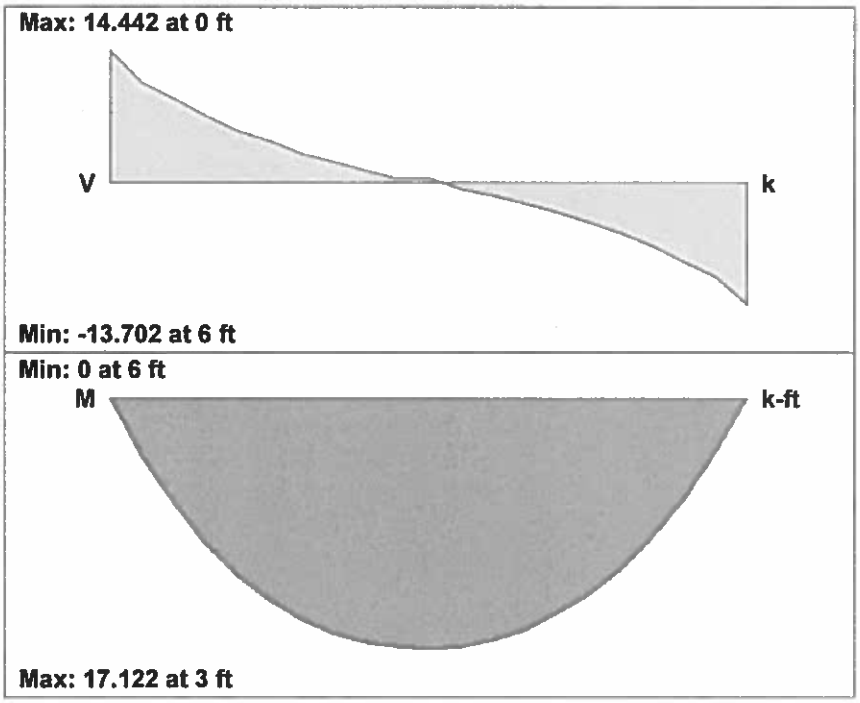
CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 2.5	ksi	Dist to Top of Wall	: .833	ft
Special Insp	: Yes	Masonry Em	: 1750	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 6	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 2-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .85	
Bond Chk u/U	: .707	
fv	: .066	ksi
Fv	: .078	ksi
Fvm	: .078	ksi
FvMax	: .133	ksi
u	: .141	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .402	
Bend Chk fm/Fm	: .332	
fm	: .277	ksi
Fm	: .833	ksi
fs	: 12.877	ksi
Fs	: 32	ksi

DESIGN DETAILS

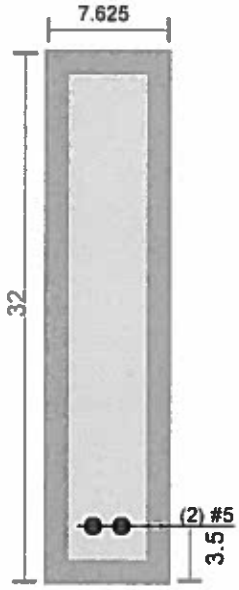
BENDING DETAILS

Max Moment	: 17.122	k-ft	Steel Area As	: .614	in2
Location	: 3	ft	Per of steel p	: .003	
Load Comb	: 3				
Mm	: 51.542	k-ft	k	: .263	
Ms	: 42.55	k-ft	j	: .912	

SHEAR DETAILS

Max Shear	: 14.442	k
Location	: 0	ft
Load Comb	: 3	
M / (V*d)	: .499	
Tie Spacing	: Not Required	

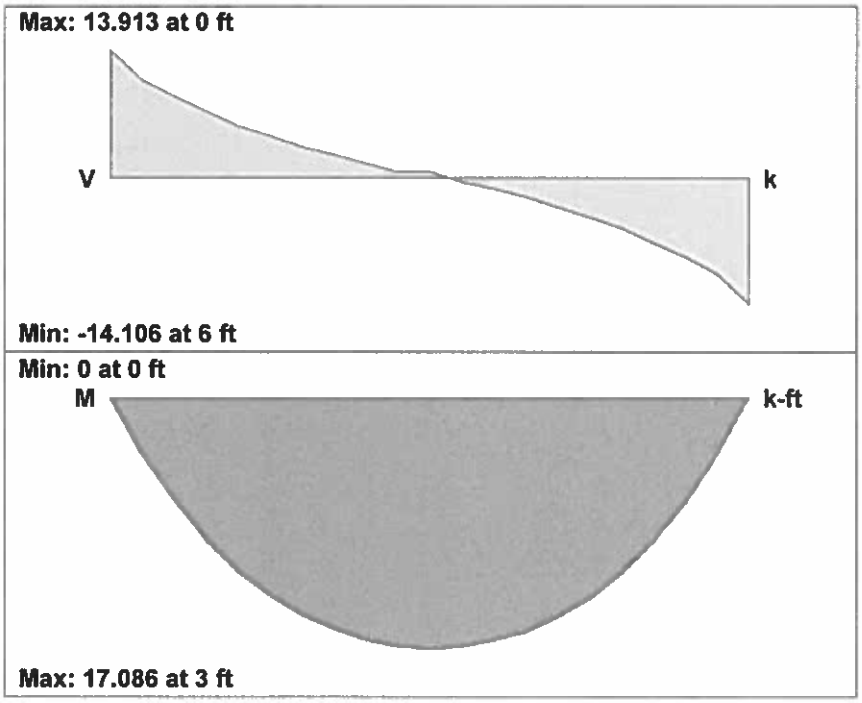
CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 2.5	ksi	Dist to Top of Wall	: .833	ft
Special Insp	: Yes	Masonry Em	: 1750	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 6	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 2-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .836	
Bond Chk u/U	: .691	
fv	: .065	ksi
Fv	: .078	ksi
Fvm	: .078	ksi
FvMax	: .133	ksi
u	: .138	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .402	
Bend Chk fm/Fm	: .331	
fm	: .276	ksi
Fm	: .833	ksi
fs	: 12.85	ksi
Fs	: 32	ksi

DESIGN DETAILS

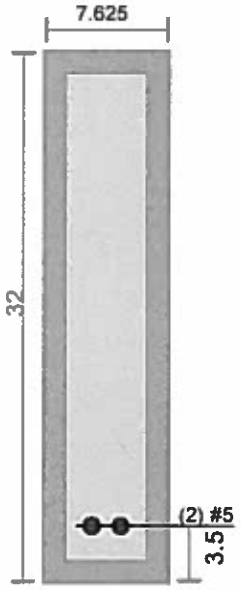
BENDING DETAILS

Max Moment	: 17.086	k-ft	Steel Area As	: .614	in2
Location	: 3	ft	Per of steel p	: .003	
Load Comb	: 3				
Mm	: 51.542	k-ft	k	: .263	
Ms	: 42.55	k-ft	j	: .912	

SHEAR DETAILS

Max Shear	: 14.106	k
Location	: 6	ft
Load Comb	: 3	
M / (V*d)	: .51	
Tie Spacing	: Not Required	

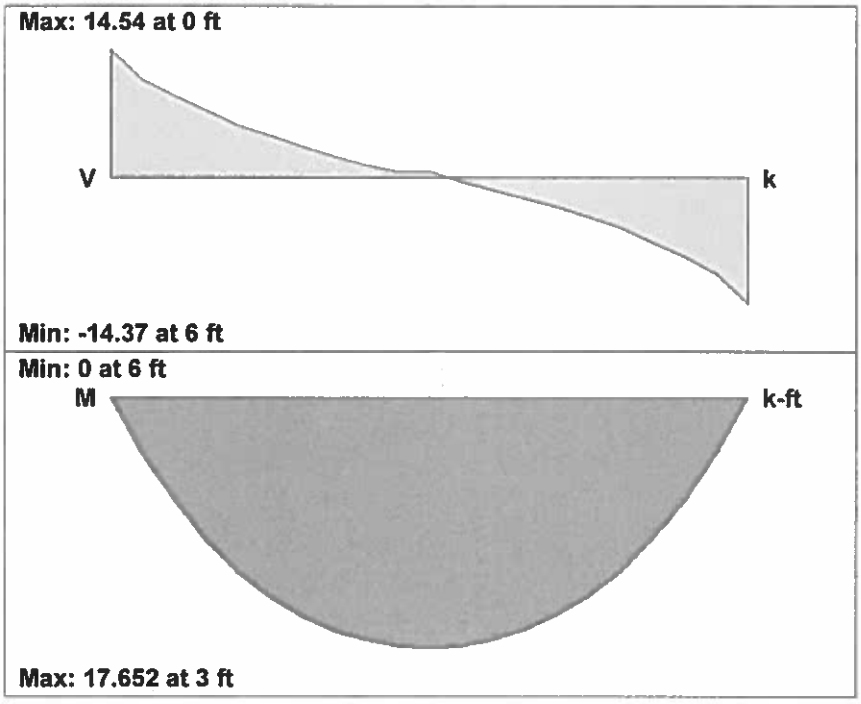
CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 2.5	ksi	Dist to Top of Wall	: .833	ft
Special Insp	: Yes	Masonry Em	: 1750	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 6	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 2-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .862	
Bond Chk u/U	: .712	
fv	: .067	ksi
Fv	: .078	ksi
Fvm	: .078	ksi
FvMax	: .133	ksi
u	: .142	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .415	
Bend Chk fm/Fm	: .342	
fm	: .285	ksi
Fm	: .833	ksi
fs	: 13.275	ksi
Fs	: 32	ksi

DESIGN DETAILS

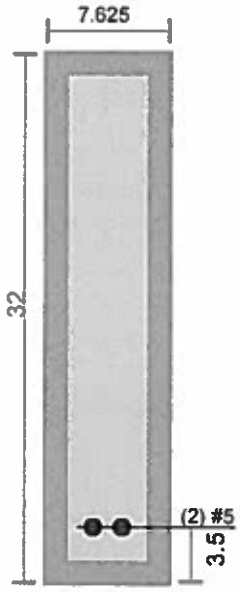
BENDING DETAILS

Max Moment	: 17.652	k-ft	Steel Area As	: .614	in2
Location	: 3	ft	Per of steel p	: .003	
Load Comb	: 3				
Mm	: 51.542	k-ft	k	: .263	
Ms	: 42.55	k-ft	j	: .912	

SHEAR DETAILS

Max Shear	: 14.54	k
Location	: 0	ft
Load Comb	: 3	
M / (V*d)	: .511	
Tie Spacing	: Not Required	

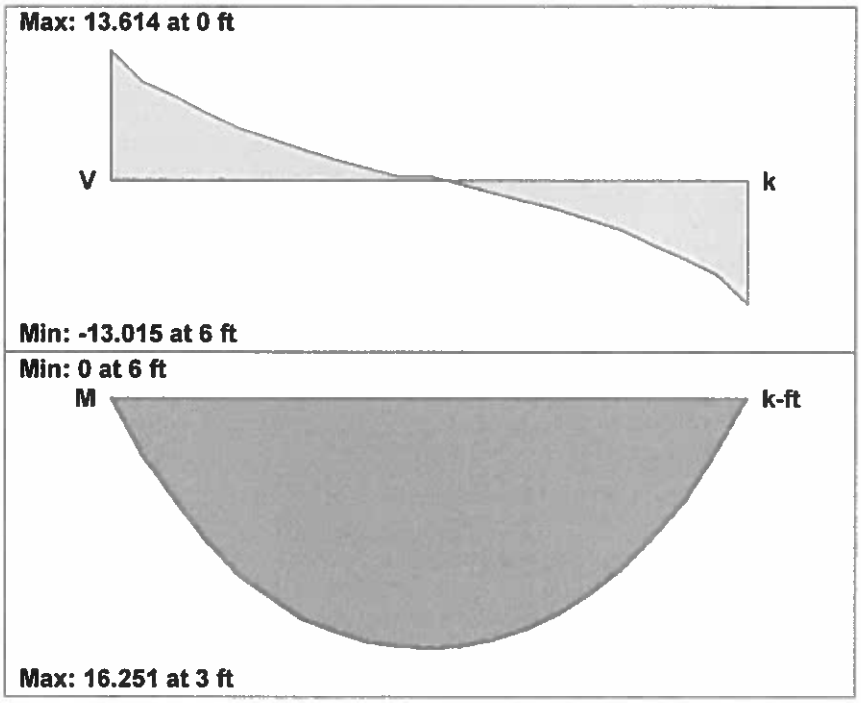
CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 2.5	ksi	Dist to Top of Wall	: .833	ft
Special Insp	: Yes	Masonry Em	: 1750	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 6	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 2-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .803	
Bond Chk u/U	: .667	
fv	: .063	ksi
Fv	: .078	ksi
Fvm	: .078	ksi
FvMax	: .133	ksi
u	: .133	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .382	
Bend Chk fm/Fm	: .315	
fm	: .263	ksi
Fm	: .833	ksi
fs	: 12.222	ksi
Fs	: 32	ksi

DESIGN DETAILS

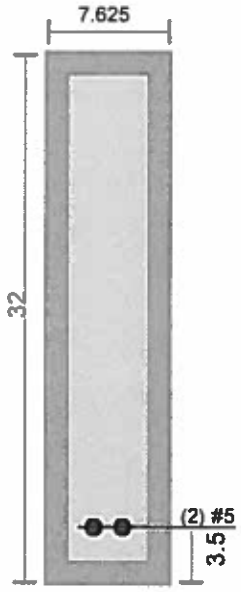
BENDING DETAILS

Max Moment	: 16.251	k-ft	Steel Area As	: .614	in2
Location	: 3	ft	Per of steel p	: .003	
Load Comb	: 3				
Mm	: 51.542	k-ft	k	: .263	
Ms	: 42.55	k-ft	j	: .912	

SHEAR DETAILS

Max Shear	: 13.614	k
Location	: 0	ft
Load Comb	: 3	
M / (V*d)	: .503	
Tie Spacing	: Not Required	

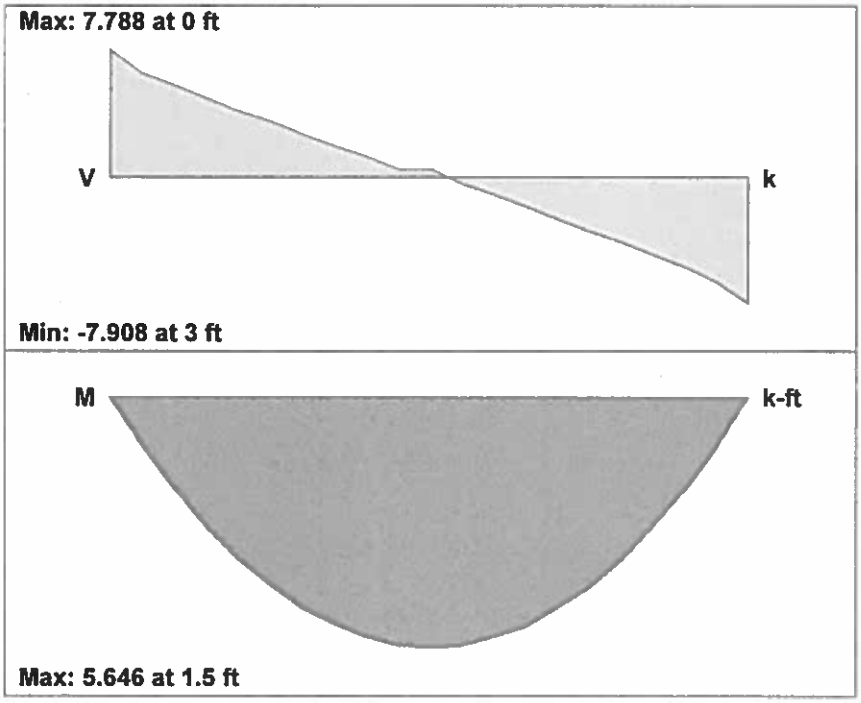
CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 2.5	ksi	Dist to Top of Wall	: .833	ft
Special Insp	: Yes	Masonry Em	: 1750	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 3	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 1-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .419	
Bond Chk u/U	: .756	
fv	: .036	ksi
Fv	: .087	ksi
Fvm	: .087	ksi
FvMax	: .147	ksi
u	: .151	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .259	
Bend Chk fm/Fm	: .145	
fm	: .12	ksi
Fm	: .833	ksi
fs	: 8.285	ksi
Fs	: 32	ksi

DESIGN DETAILS

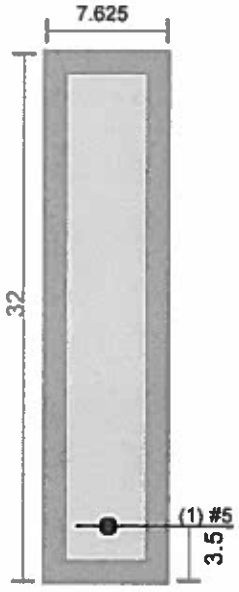
BENDING DETAILS

Max Moment	: 5.646	k-ft	Steel Area As	: .307	in2
Location	: 1.5	ft	Per of steel p	: .001	
Load Comb	: 3				
Mm	: 39.055	k-ft	k	: .194	
Ms	: 21.807	k-ft	j	: .935	

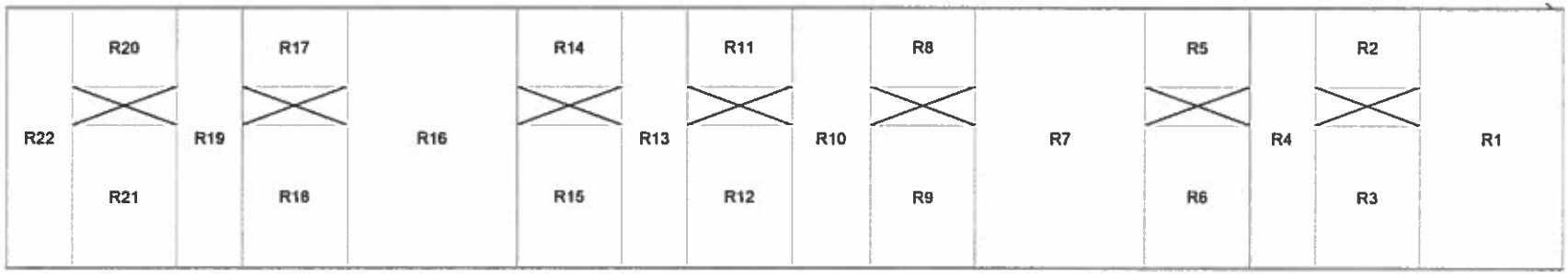
SHEAR DETAILS

Max Shear	: 7.908	k
Location	: 3	ft
Load Comb	: 3	
M / (V*d)	: .301	
Tie Spacing	: Not Required	

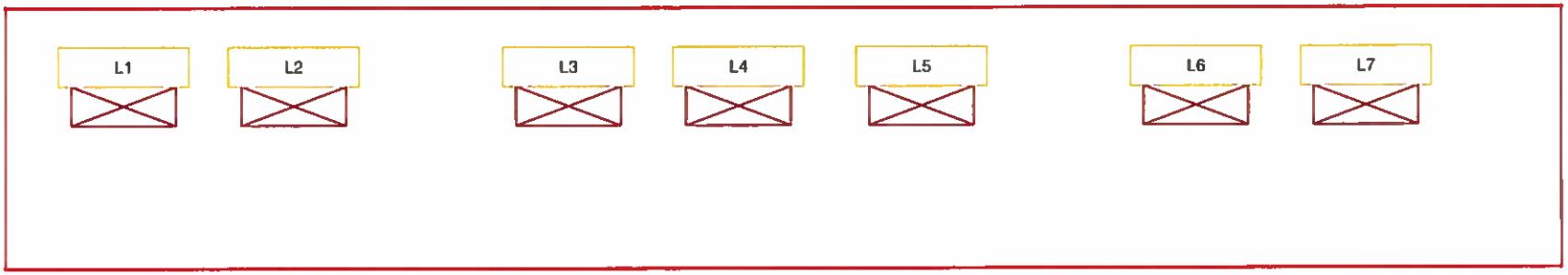
CROSS SECTION DETAILING



NOTE: All units are in "in."



	OWTP East Wall	Wall Panel: WP3
		Jan 24, 2014 at 1:16 PM
		East Wall.R3D



	OWTP East Wall	Wall Panel: WP3
		Jan 24, 2014 at 1:17 PM
		East Wall.R3D

OWTP East Wall

Wall Panel: WP3

Jan 24, 2014 at 1:16 PM

East Wall.R3D

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Hor Bar Size	: #5	
Vert Bar Size	: #5	
No of Ten Bars	: 2	
Effective Depth	: 36	in

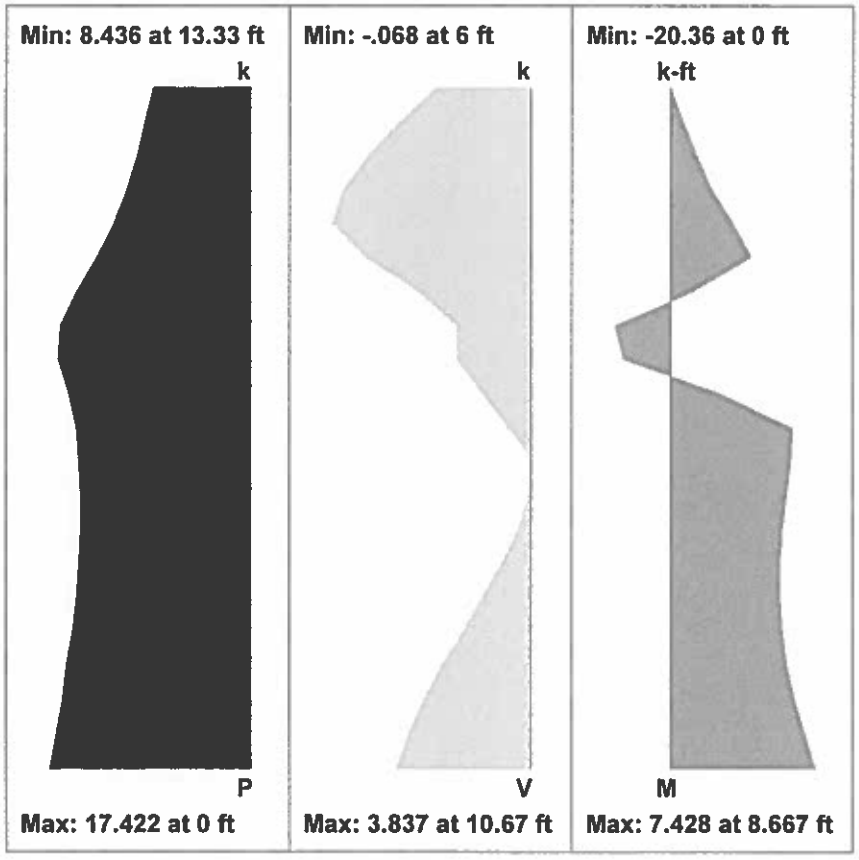
MATERIALS

Masonry f'm	: 2.5	ksi
Masonry Em	: 1750	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 13.333	ft
Total Length	: 3.333	ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 32"	
Blk Nom Width	: 8"	
1.5 Shear Factor	: Yes	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb)/Fb	: .251
fa/Fa	: .126
fs/Fs	: .06

AXIAL SUMMARY

fa	: .057	ksi
Fa	: .455	ksi

BENDING SUMMARY

fb	: .152	ksi
Fb	: .833	ksi
fs	: 1.912	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv / Fv	: .318
u/U	: .197

SHEAR SUMMARY

fv	: .021	ksi
Fv	: .066	ksi
Fvm	: .066	ksi
Fv max	: .1	ksi
u	: .039	ksi
U	: .2	ksi

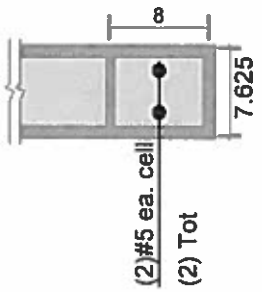
DESIGN DETAILS AT GOVERNING SECTION

AXIAL COMPRESSION DETAILS			BENDING DETAILS			SHEAR DETAILS		
Axial	: 17.422	k	Moment	: 20.364	k-ft	Shear	: 3.837	k
Location	: 0	ft	Location	: 0	ft	Location	: 10.667	ft
Load Comb	: 6		Load Comb	: 6		Load Comb	: 6	
Rad gyration r	: 2.19	in	Sect Mod S	: 2033	in3	Corresponding M:	8.719	k-ft
h'/r	: 73.059		Tension St Asv	: 0.6136	in2	Corresponding P :	11.822	k
Red Factor R	: .728		Per of steel p	: 0.002235		M / (V*d)	: 1	
			k*d	: 23.2	in	Shear St Area	: Not Reqd.	
			j	: 0.79		Shear Spacing	: N/A	
						Peri of Bars	: N/A	

CRACKED SECT ANALYSIS

fm = fa + fb	: .209	ksi
C	: 18.507	k
T	: 1.085	k

CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Type of Design	: ASD	
Reinforced	: Yes	
Vertical Bar Size	: #5	
End Face Dist	: 3.813	in

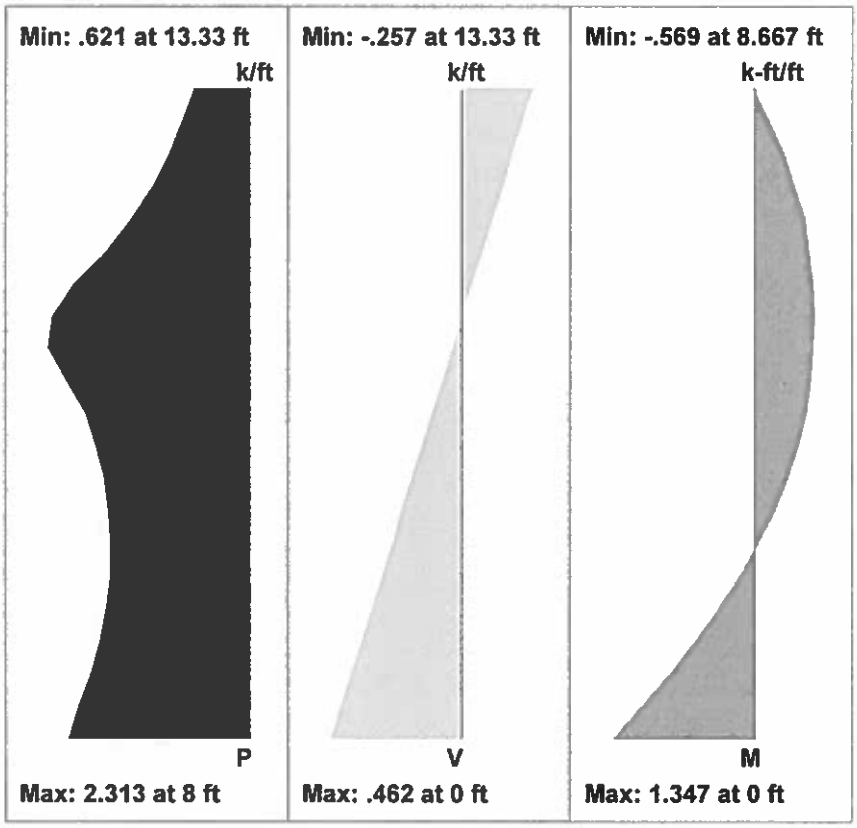
MATERIALS

Masonry f'm	: 2.5	ksi
Masonry Em	: 1750	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 13.333	ft
Eq Sld Thickness	: 7.625"	
An	: 91.5	in2/ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 24"	
Loc of r/f	: Center	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb) / Fb	: .664
fa/Fa	: .05
fs/Fs	: .953

AXIAL SUMMARY

fa	: .023	ksi
Fa	: .455	ksi

BENDING SUMMARY

fb	: .725	ksi
Fb	: 1.125	ksi
fs	: 30.51	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv/Fv	: .05
u/U	: .682

SHEAR SUMMARY

fv	: .005	ksi
Fv	: .1	ksi
Fv max	: .15	ksi
u	: .136	ksi
U	: .2	ksi

DESIGN DETAILS

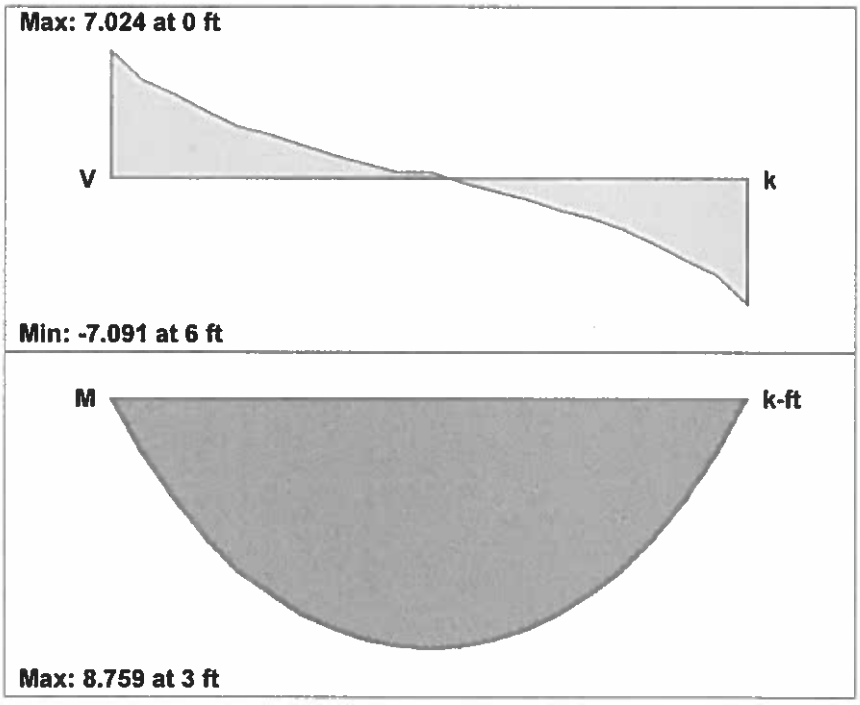
AXIAL DETAILS			BENDING DETAILS			SHEAR DETAILS		
Max Axial	: 2.069	k/ft	Max Moment	: 1.347	k-ft/ft	Max Shear	: .462	k/ft
Location	: 0	ft	Location	: 0	ft	Location	: 0	ft
Load Comb	: 28		Load Comb	: 28		Load Comb	: 28	
Rad gyration r	: 2.19	in	k	: .282		Width for Shear	: 24	in
h'/r	: 73.059		d	: 3.813	in	Corresponding M:	1.347	k-ft/ft
			j	: .906		Corresponding P :	2.069	k/ft
						M / (V*d)	: 0	

CROSS SECTION DETAILING

NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 2.5	ksi	Dist to Top of Wall	: 1.333	ft
Special Insp	: Yes	Masonry Em	: 1750	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 6	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 1-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .422	
Bond Chk u/U	: .677	
fv	: .033	ksi
Fv	: .077	ksi
Fvm	: .077	ksi
FvMax	: .132	ksi
u	: .135	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .402	
Bend Chk fm/Fm	: .224	
fm	: .187	ksi
Fm	: .833	ksi
fs	: 12.853	ksi
Fs	: 32	ksi

DESIGN DETAILS

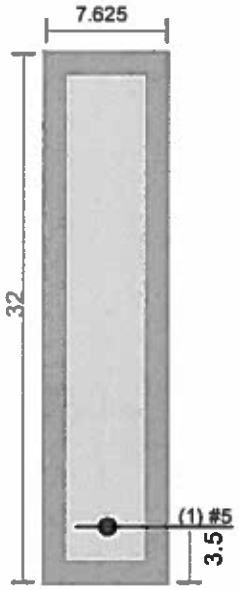
BENDING DETAILS

Max Moment	: 8.759	k-ft	Steel Area As	: .307	in2
Location	: 3	ft	Per of steel p	: .001	
Load Comb	: 6				
Mm	: 39.055	k-ft	k	: .194	
Ms	: 21.807	k-ft	j	: .935	

SHEAR DETAILS

Max Shear	: 7.091	k
Location	: 6	ft
Load Comb	: 6	
M / (V*d)	: .52	
Tie Spacing	: Not Required	

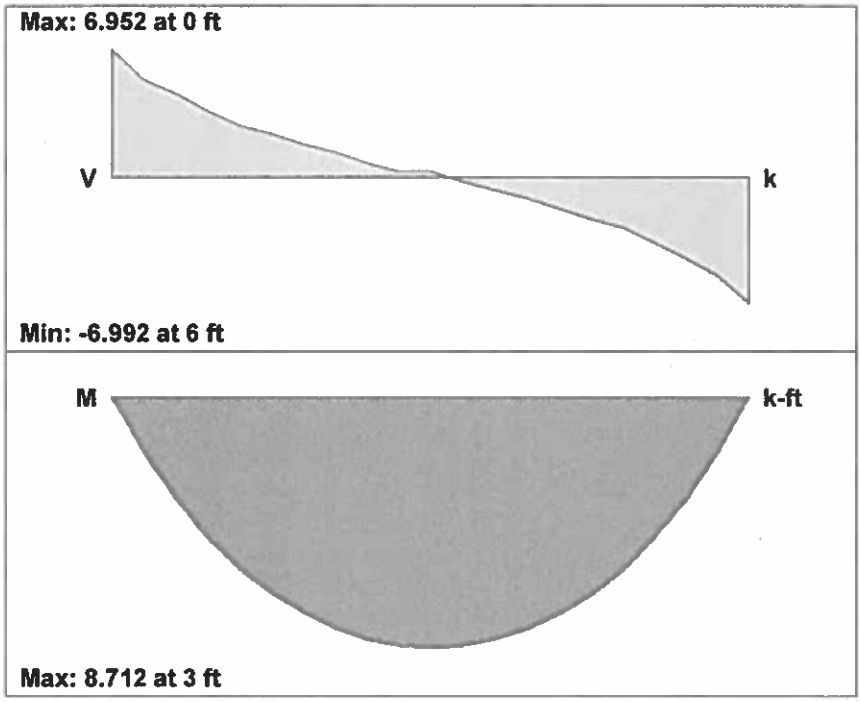
CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 2.5	ksi	Dist to Top of Wall	: 1.333	ft
Special Insp	: Yes	Masonry Em	: 1750	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 6	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 1-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .418	
Bond Chk u/U	: .668	
fv	: .032	ksi
Fv	: .077	ksi
Fvm	: .077	ksi
FvMax	: .132	ksi
u	: .134	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .399	
Bend Chk fm/Fm	: .223	
fm	: .186	ksi
Fm	: .833	ksi
fs	: 12.784	ksi
Fs	: 32	ksi

DESIGN DETAILS

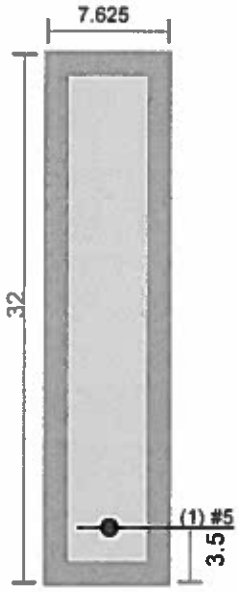
BENDING DETAILS

Max Moment	: 8.712	k-ft	Steel Area As	: .307	in2
Location	: 3	ft	Per of steel p	: .001	
Load Comb	: 6				
Mm	: 39.055	k-ft	k	: .194	
Ms	: 21.807	k-ft	j	: .935	

SHEAR DETAILS

Max Shear	: 6.992	k
Location	: 6	ft
Load Comb	: 6	
M / (V*d)	: .525	
Tie Spacing	: Not Required	

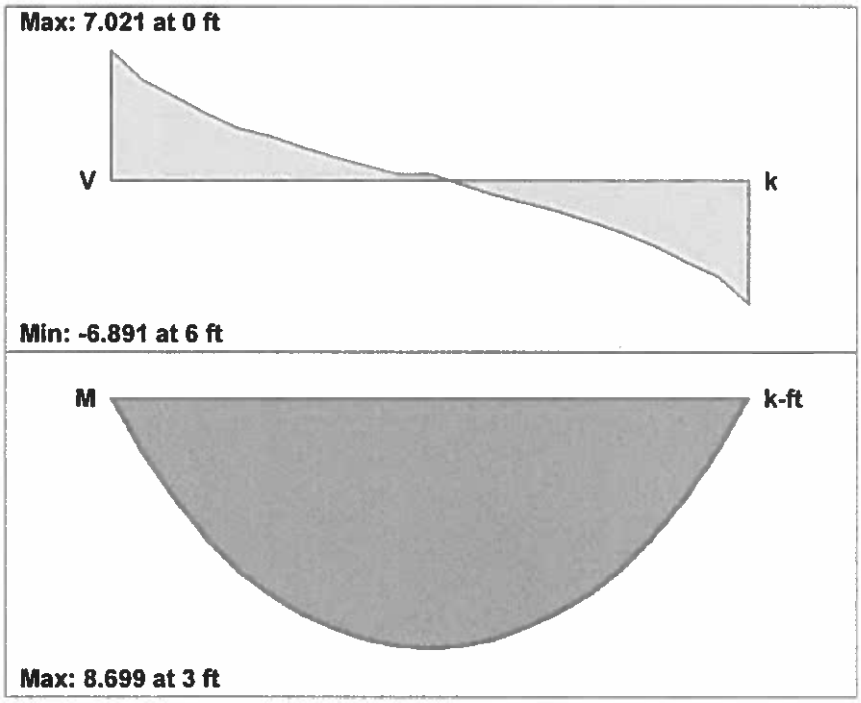
CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 2.5	ksi	Dist to Top of Wall	: 1.333	ft
Special Insp	: Yes	Masonry Em	: 1750	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 6	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 1-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .419	
Bond Chk u/U	: .671	
fv	: .032	ksi
Fv	: .077	ksi
Fvm	: .077	ksi
FvMax	: .132	ksi
u	: .134	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .399	
Bend Chk fm/Fm	: .223	
fm	: .186	ksi
Fm	: .833	ksi
fs	: 12.765	ksi
Fs	: 32	ksi

DESIGN DETAILS

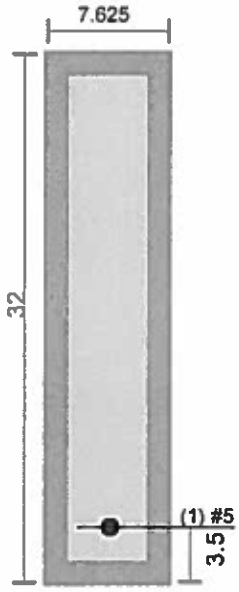
BENDING DETAILS

Max Moment	: 8.699	k-ft	Steel Area As	: .307	in2
Location	: 3	ft	Per of steel p	: .001	
Load Comb	: 6				
Mm	: 39.055	k-ft	k	: .194	
Ms	: 21.807	k-ft	j	: .935	

SHEAR DETAILS

Max Shear	: 7.021	k
Location	: 0	ft
Load Comb	: 6	
M / (V*d)	: .522	
Tie Spacing	: Not Required	

CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Type of Design	: ASD	
Stirrup Size	: #3	
Flex Steel	: 1-#5	

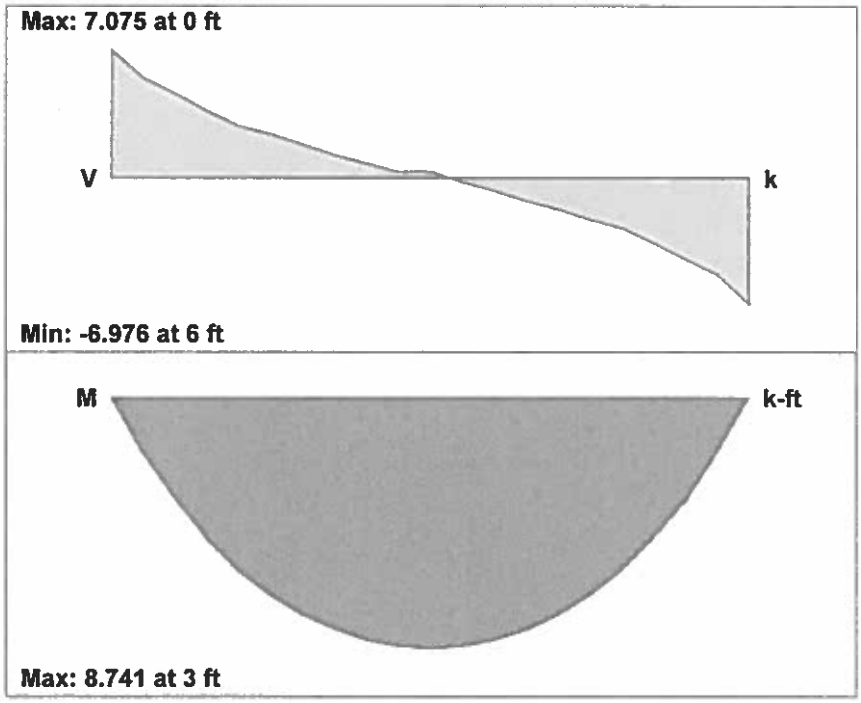
MATERIALS

Masonry f'm	: 2.5	ksi
Masonry Em	: 1750	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Beam Dead Wt	: .208	k/ft
Wall Dead Wt	: .078	ksf

GEOMETRY

Dist to Top of Wall	: 1.333	ft
Eff Length	: 6	ft
Eff Width	: 7.625	in
Eff depth	: 28.5	in
Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .421	
Bond Chk u/U	: .676	
fv	: .033	ksi
Fv	: .077	ksi
Fvm	: .077	ksi
FvMax	: .132	ksi
u	: .135	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .401	
Bend Chk fm/Fm	: .224	
fm	: .187	ksi
Fm	: .833	ksi
fs	: 12.826	ksi
Fs	: 32	ksi

DESIGN DETAILS

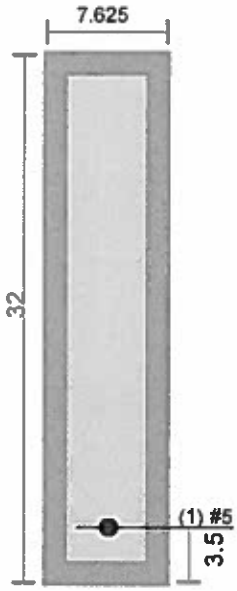
BENDING DETAILS

Max Moment	: 8.741	k-ft	Steel Area As	: .307	in2
Location	: 3	ft	Per of steel p	: .001	
Load Comb	: 6				
Mm	: 39.055	k-ft	k	: .194	
Ms	: 21.807	k-ft	j	: .935	

SHEAR DETAILS

Max Shear	: 7.075	k
Location	: 0	ft
Load Comb	: 6	
M / (V*d)	: .52	
Tie Spacing	: Not Required	

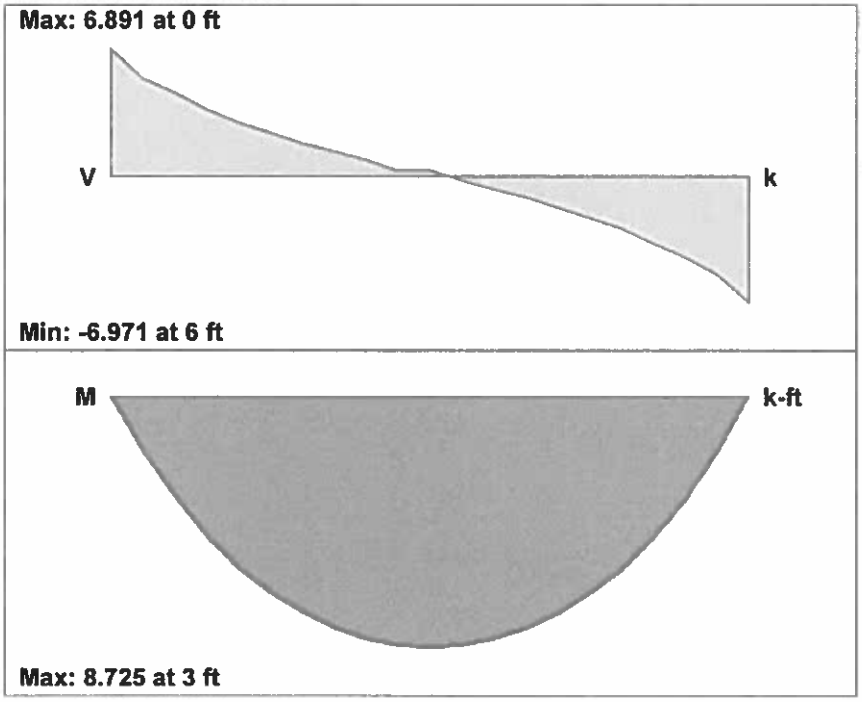
CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 2.5	ksi	Dist to Top of Wall	: 1.333	ft
Special Insp	: Yes	Masonry Em	: 1750	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 6	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 1-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .417	
Bond Chk u/U	: .666	
fv	: .032	ksi
Fv	: .077	ksi
Fvm	: .077	ksi
FvMax	: .132	ksi
u	: .133	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .4	
Bend Chk fm/Fm	: .223	
fm	: .186	ksi
Fm	: .833	ksi
fs	: 12.803	ksi
Fs	: 32	ksi

DESIGN DETAILS

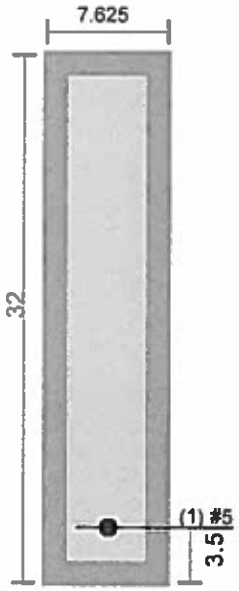
BENDING DETAILS

Max Moment	: 8.725	k-ft	Steel Area As	: .307	In2
Location	: 3	ft	Per of steel p	: .001	
Load Comb	: 6				
Mm	: 39.055	k-ft	k	: .194	
Ms	: 21.807	k-ft	j	: .935	

SHEAR DETAILS

Max Shear	: 6.971	k
Location	: 6	ft
Load Comb	: 6	
M / (V*d)	: .527	
Tie Spacing	: Not Required	

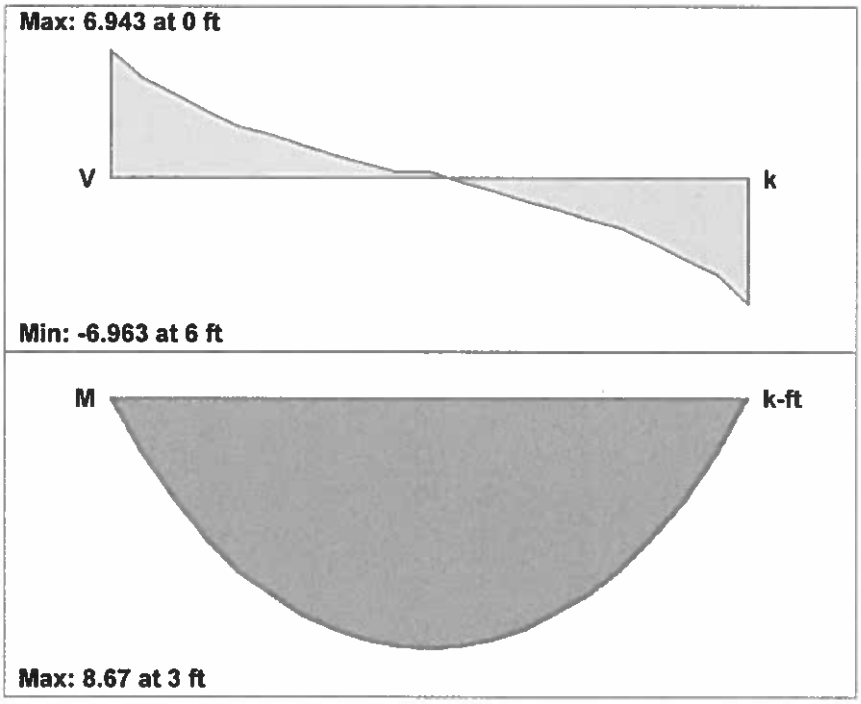
CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 2.5	ksi	Dist to Top of Wall	: 1.333	ft
Special Insp	: Yes	Masonry Em	: 1750	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 6	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 1-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .416	
Bond Chk u/U	: .665	
fv	: .032	ksi
Fv	: .077	ksi
Fvm	: .077	ksi
FvMax	: .132	ksi
u	: .133	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .398	
Bend Chk fm/Fm	: .222	
fm	: .185	ksi
Fm	: .833	ksi
fs	: 12.722	ksi
Fs	: 32	ksi

DESIGN DETAILS

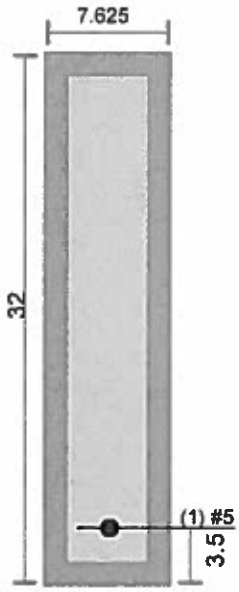
BENDING DETAILS

Max Moment	: 8.67	k-ft	Steel Area As	: .307	in2
Location	: 3	ft	Per of steel p	: .001	
Load Comb	: 6				
Mm	: 39.055	k-ft	k	: .194	
Ms	: 21.807	k-ft	j	: .935	

SHEAR DETAILS

Max Shear	: 6.963	k
Location	: 6	ft
Load Comb	: 6	
M / (V*d)	: .524	
Tie Spacing	: Not Required	

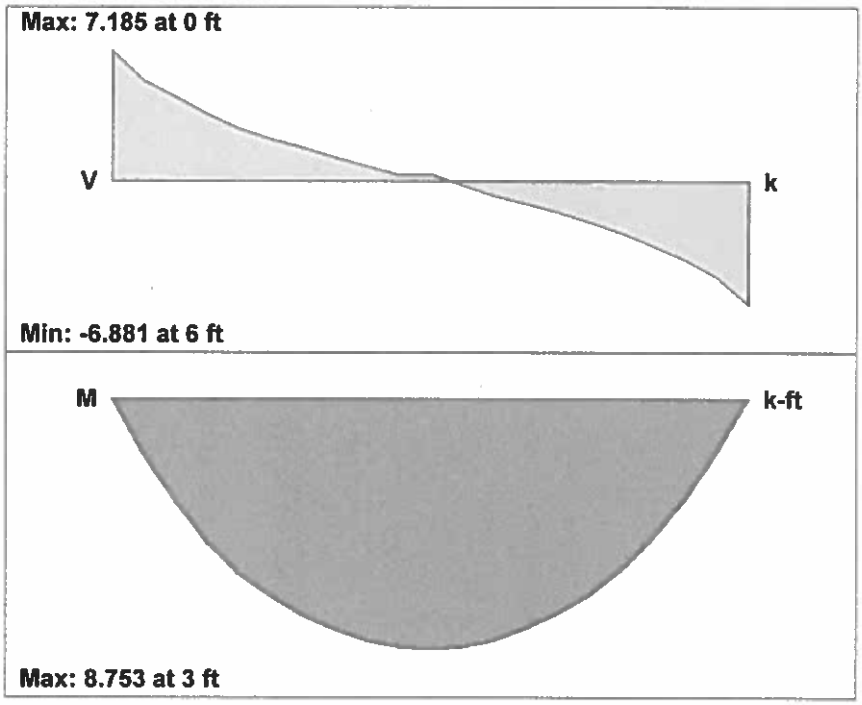
CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 2.5	ksi	Dist to Top of Wall	: 1.333	ft
Special Insp	: Yes	Masonry Em	: 1750	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 6	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 1-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .426	
Bond Chk u/U	: .686	
fv	: .033	ksi
Fv	: .078	ksi
Fvm	: .078	ksi
FvMax	: .132	ksi
u	: .137	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .401	
Bend Chk fm/Fm	: .224	
fm	: .187	ksi
Fm	: .833	ksi
fs	: 12.844	ksi
Fs	: 32	ksi

DESIGN DETAILS

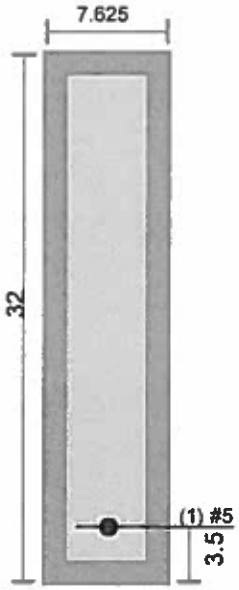
BENDING DETAILS

Max Moment	: 8.753	k-ft	Steel Area As	: .307	in2
Location	: 3	ft	Per of steel p	: .001	
Load Comb	: 6				
Mm	: 39.055	k-ft	k	: .194	
Ms	: 21.807	k-ft	j	: .935	

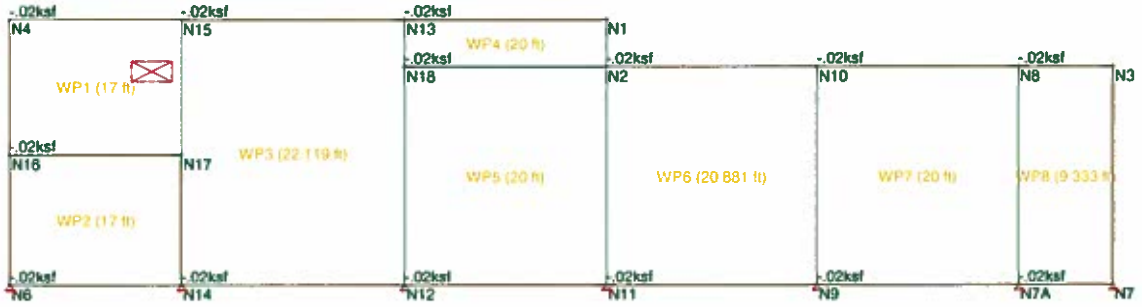
SHEAR DETAILS

Max Shear	: 7.185	k
Location	: 0	ft
Load Comb	: 6	
M / (V*d)	: .513	
Tie Spacing	: Not Required	

CROSS SECTION DETAILING

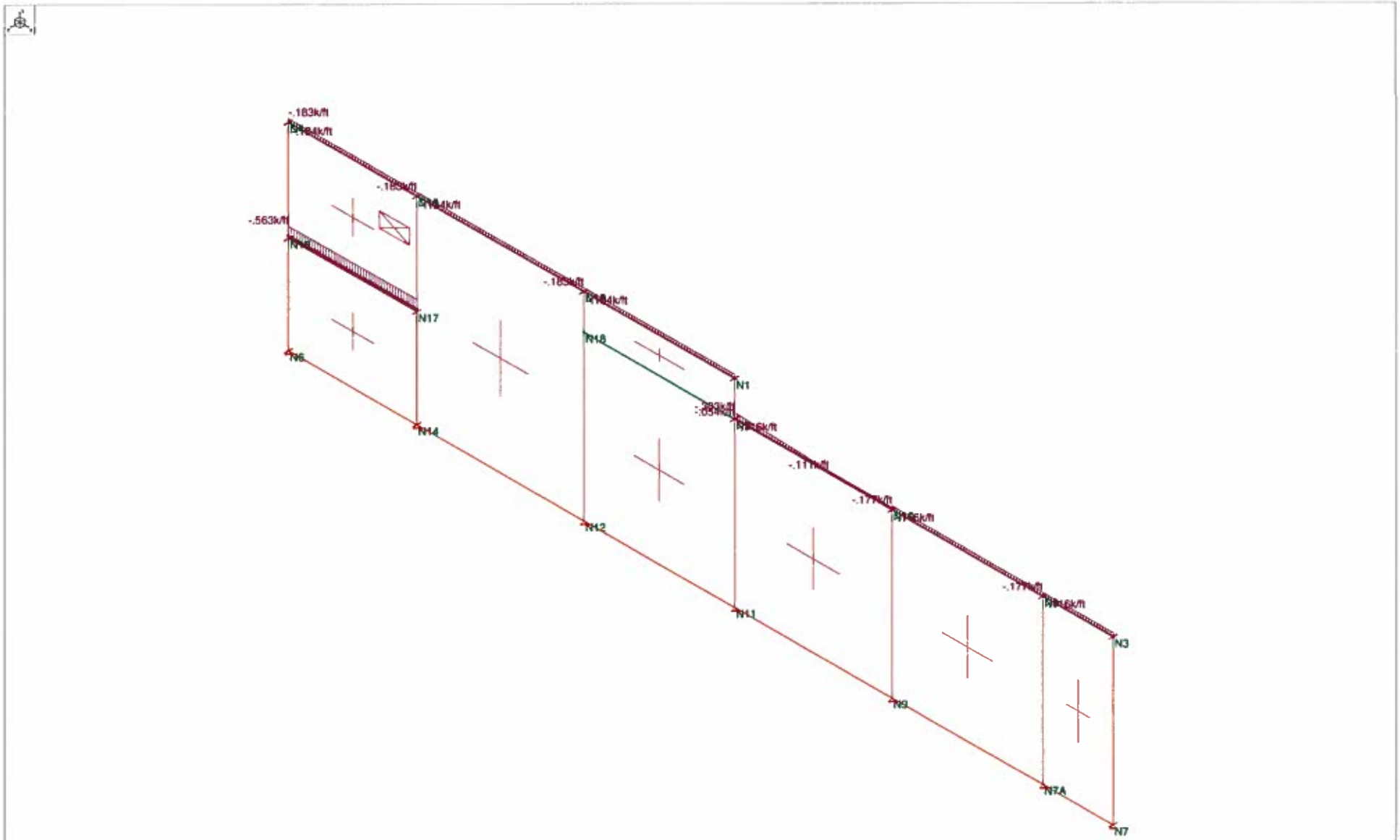


NOTE: All units are in "in."



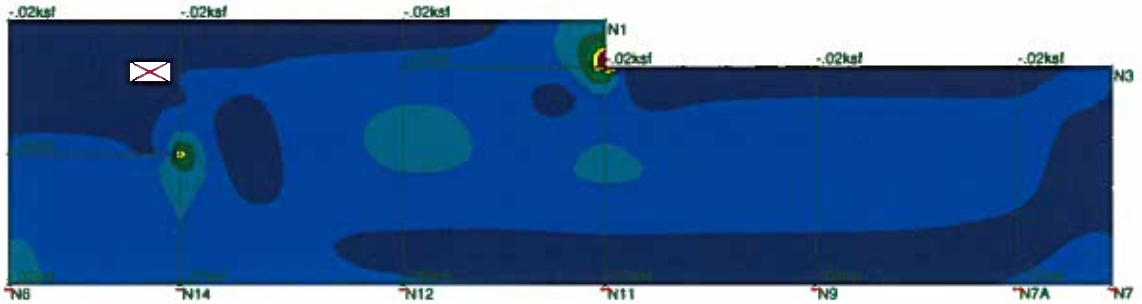
Loads: BLC 8, W ZDIR
Solution: Envelope

Sunrise Engineering	owtp North Wall	4
SMH		Jan 27, 2014 at 12:38 PM
		North Wall Wireframe.R3D



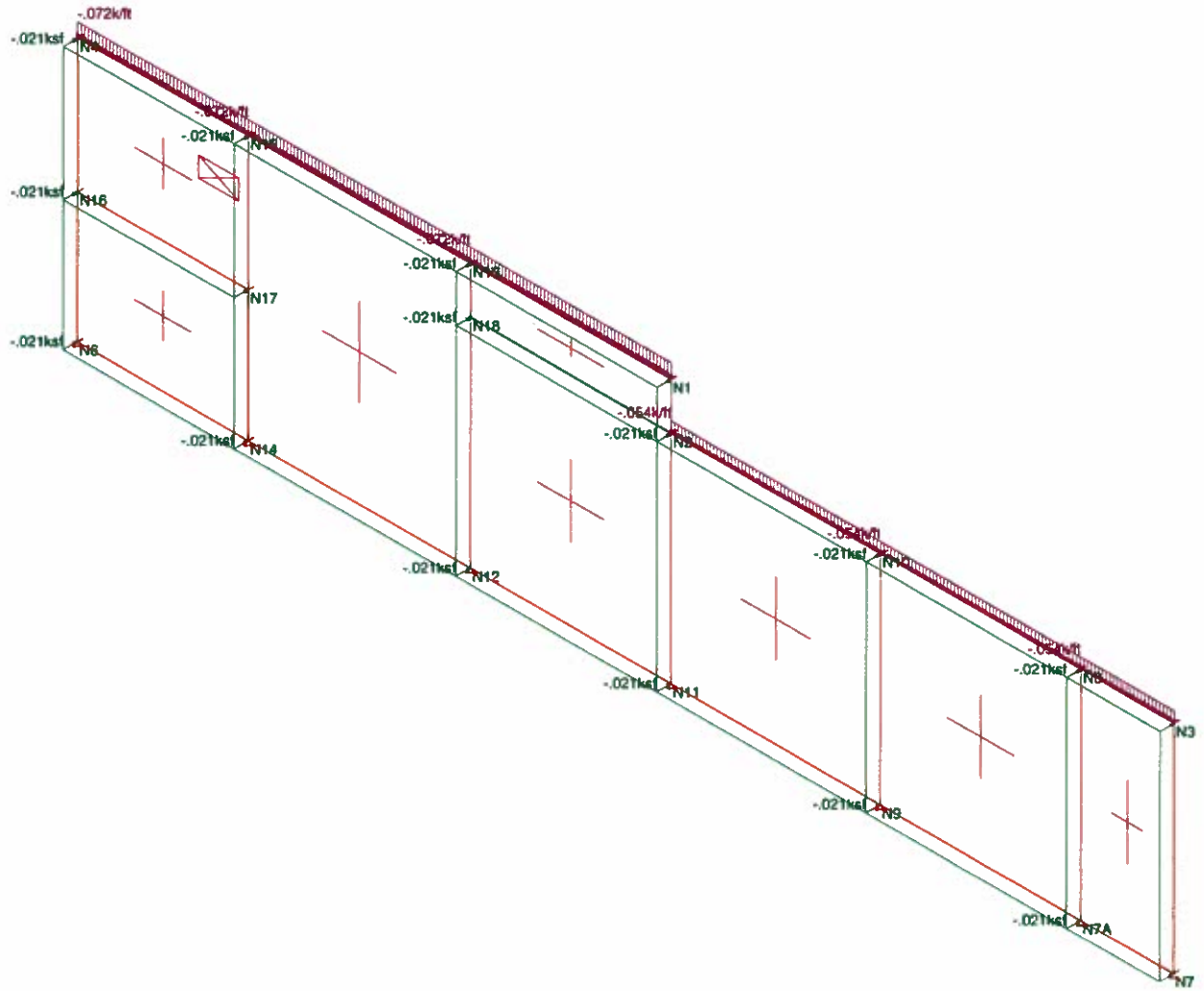
Loads: LC 38, ASCE ASD 6 (d) (c)
Solution: Envelope

Sunrise Engineering		SK - 1
SMH	owtp North Wall	Jan 27, 2014 at 12:58 PM
	LC38: Worst Case In Plane Loading	North Wall Wireframe.R3D



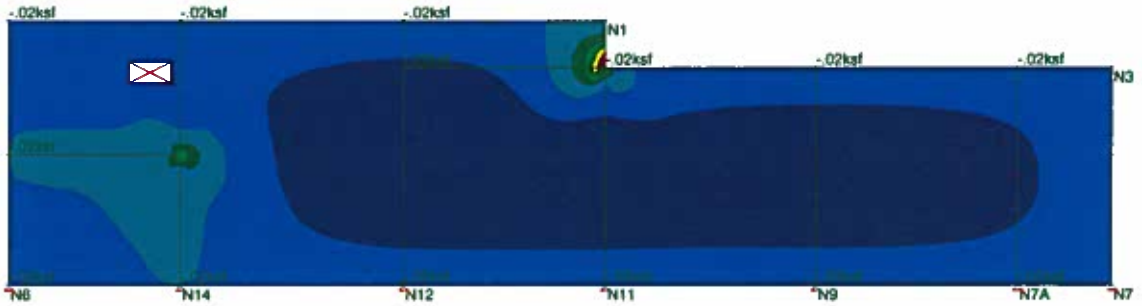
Loads: BLC 8, W ZDIR
Results for LC 38, ASCE ASD 6 (d) (c)

Sunrise Engineering		5
SMH	owtp North Wall	Jan 27, 2014 at 12:40 PM
	LC 38: Worst Case In-Plane Stresses	North Wall Wireframe.R3D



Loads: LC 29, ASCE ASD 5 (b) (b)
Solution: Envelope

Sunrise Engineering		SK - 2
SMH	owtp North Wall	Jan 27, 2014 at 12:59 PM
	LC 29: Worst Case Out of Plane	North Wall Wireframe.R3D



Loads: BLC 8, W ZDIR
Results for LC 29, ASCE ASD 5 (b) (b)

Sunrise Engineering		6
SMH	owtp North Wall	Jan 27, 2014 at 12:46 PM
	LC 29: Worst Case Loading Out of Plane	North Wall Wireframe.R3D

Masonry Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Self Weight[k/ft...	f'm[ksi]	Flex Steel[ksi]	Shear St...
1	Concrete Matl	1350	540	.25	.6	Custom	1.5	60	60
2	Clay Matl	2100	420	.25	.6	Custom	3	60	60
3	Gen Masonry	1050	420	.25	.6	.08	1.5	60	60

Masonry Wall Panel In Plane Parameters

	Label	Vert Bar Size	Bars Per Cell	Min Bound Zone Wi...	Max Bound Zone Width[in]	Horz Bar Size	1.5x Shear Inc	Transfer Lo...
1	Typical	#5	1	4	16	#5	Yes	Yes
2	R2	#5	1	4	16	#5	Yes	Yes

Masonry Wall Panel Out of Plane Parameters

	Label	Bar Size	Bar Space Min	Bar Space Max	Bar Placement	Mortar Type	Cement Type	Transfer Load
1	Typical	#5	16"	16"	Center	Type M or S	Portland, Lime/M...	Yes
2	R2	#5	16"	24"	Center	Type M or S	Portland, Lime/M...	Yes

Masonry Wall Panel Lintel Parameters

	Label	Depth[in]	Bear L...	Bar ...	Min # Bars Per ...	Max # Bars Pe...	Num of La...	c/c Sp of La...	Dist to Bo...	Stirrup Size
1	Typical	32	8	#5	1	2	1	N/A	3.5	#4
2	R2	32	8	#5	1	2	1	N/A	3.5	#4

Wall Panel Data

	Label	A Joint	B Joint	C Joint	D Joint	Material T...	Material Set	Thickness[in]	Design Rule	Panel/Spacing
1	WP1	N4	N15	N17	N16	Masonry	Clay Matl	8	Typical	16
2	WP2	N16	N17	N14	N6	Masonry	Clay Matl	8	Typical	16
3	WP3	N15	N13	N12	N14	Masonry	Clay Matl	8	Typical	16
4	WP4	N13	N1	N2	N18	Masonry	Clay Matl	8	Typical	16
5	WP5	N18	N2	N11	N12	Masonry	Clay Matl	8	Typical	16
6	WP6	N2	N10	N9	N11	Masonry	Clay Matl	8	R2	24
7	WP7	N10	N8	N7A	N9	Masonry	Clay Matl	8	R2	24
8	WP8	N8	N3	N7	N7A	Masonry	Clay Matl	8	R2	24

Wall Panel Distributed Loads (BLC 1 : DL)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP1(13.333ft)	Y	-.072	-.072	0	17
2	WP3(26.333ft)	Y	-.072	-.072	0	22.119
3	WP4(4.666ft)	Y	-.072	-.072	0	20
4	WP6(21.667ft)	Y	-.054	-.054	0	20.881
5	WP7(21.667ft)	Y	-.054	-.054	0	20
6	WP8(21.667ft)	Y	-.054	-.054	0	9.333

Wall Panel Distributed Loads (BLC 2 : LL Roof)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP1(13.333ft)	Y	-.08	-.08	0	17
2	WP3(26.333ft)	Y	-.08	-.08	0	22.119
3	WP4(4.666ft)	Y	-.08	-.08	0	20
4	WP6(21.667ft)	Y	-.08	-.08	0	20.881
5	WP7(21.667ft)	Y	-.08	-.08	0	20
6	WP8(21.667ft)	Y	-.08	-.08	0	9.333

Wall Panel Distributed Loads (BLC 3 : LL)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP1(0ft)	Y	-.75	-.75	0	17

Wall Panel Distributed Loads (BLC 4 : SL)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP1(13.333ft)	Y	-.148	-.148	0	17
2	WP3(26.333ft)	Y	-.148	-.148	0	22.119
3	WP4(4.666ft)	Y	-.148	-.148	0	20
4	WP6(21.667ft)	Y	-.404	-.148	0	12.5
5	WP6(21.667ft)	Y	-.148	-.148	12.5	20.881
6	WP7(21.667ft)	Y	-.164	-.164	0	20
7	WP8(21.667ft)	Y	-.164	-.164	0	9.333

Wall Panel Distributed Loads (BLC 5 : E XDIR)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP6(21.667ft)	X	.22	.22	0	20.881
2	WP7(21.667ft)	X	.22	.22	0	20
3	WP8(21.667ft)	X	.22	.22	0	9.333
4	WP1(13.333ft)	X	.35	.35	0	17
5	WP3(26.333ft)	X	.35	.35	0	22.119
6	WP4(4.666ft)	X	.35	.35	0	20

Wall Panel Distributed Loads (BLC 7 : W XDIR)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP1(13.333ft)	X	.288	.288	0	17
2	WP3(26.333ft)	X	.288	.288	0	22.119
3	WP4(4.666ft)	X	.288	.288	0	20
4	WP6(21.667ft)	X	.174	.174	0	20.881
5	WP7(21.667ft)	X	.174	.174	0	20
6	WP8(21.667ft)	X	.174	.174	0	9.333

Wall Panel Surface Loads (BLC 6 : E ZDIR)

	Wall Panel Label	Direction	Top Magnitude[ksf,F]	Bottom Magnitude[...	Start Location[ft]	Height[ft]
1	WP1	Z	-.03	-.03	0	0
2	WP2	Z	-.03	-.03	0	0
3	WP3	Z	-.03	-.03	0	0
4	WP4	Z	-.03	-.03	0	0
5	WP5	Z	-.03	-.03	0	0
6	WP6	Z	-.03	-.03	0	0
7	WP7	Z	-.03	-.03	0	0
8	WP8	Z	-.03	-.03	0	0

Wall Panel Surface Loads (BLC 8 : W ZDIR)

	Wall Panel Label	Direction	Top Magnitude[ksf,F]	Bottom Magnitude[...	Start Location[ft]	Height[ft]
1	WP1	Z	-.02	-.02	0	0
2	WP2	Z	-.02	-.02	0	0
3	WP3	Z	-.02	-.02	0	0
4	WP4	Z	-.02	-.02	0	0
5	WP5	Z	-.02	-.02	0	0
6	WP6	Z	-.02	-.02	0	0
7	WP7	Z	-.02	-.02	0	0
8	WP8	Z	-.02	-.02	0	0

Load Combinations

	Description	Sol..	PDelta	SRSS	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..
1	ASCE ASD 1	Yes			DL	1														
2	ASCE ASD 2	Yes			DL	1	LL	1	LLS	1										
3	ASCE ASD 3 (a)	Yes			DL	1	RLL	1												
4	ASCE ASD 3 (b)	Yes			DL	1	SL	1	SLN	1										
5	ASCE ASD 3 (c)	Yes			DL	1														
6	ASCE ASD 4 (a)	Yes			DL	1	LL	.75	LLS	.75	RLL	.75								
7	ASCE ASD 4 (b)	Yes			DL	1	LL	.75	LLS	.75	SL	.75	SLN	.75						
8	ASCE ASD 5 (a) (a)	Yes			DL	1	WLX	.6												
9	ASCE ASD 5 (a) (b)	Yes			DL	1	WLZ	.6												
10	ASCE ASD 5 (a) (c)	Yes			DL	1	WLX	-.6												
11	ASCE ASD 5 (a) (d)	Yes			DL	1	WLZ	-.6												
12	ASCE ASD 6 (a) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	RLL	.75						
13	ASCE ASD 6 (a) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	RLL	.75						
14	ASCE ASD 6 (a) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	RLL	.75						
15	ASCE ASD 6 (a) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	RLL	.75						
16	ASCE ASD 6 (c) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
17	ASCE ASD 6 (c) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
18	ASCE ASD 6 (c) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
19	ASCE ASD 6 (c) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
20	ASCE ASD 6 (e) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75								
21	ASCE ASD 6 (e) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75								
22	ASCE ASD 6 (e) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75								
23	ASCE ASD 6 (e) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75								
24	ASCE ASD 7 (a)	Yes			DL	.6	WLX	.6												
25	ASCE ASD 7 (b)	Yes			DL	.6	WLZ	.6												
26	ASCE ASD 7 (c)	Yes			DL	.6	WLX	-.6												
27	ASCE ASD 7 (d)	Yes			DL	.6	WLZ	-.6												
28	ASCE ASD 5 (b) (a)	Yes			DL	1	ELX	.7												
29	ASCE ASD 5 (b) (b)	Yes			DL	1	ELZ	.7												
30	ASCE ASD 5 (b) (c)	Yes			DL	1	ELX	-.7												
31	ASCE ASD 5 (b) (d)	Yes			DL	1	ELZ	-.7												
32	ASCE ASD 6 (b) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	RLL	.75						
33	ASCE ASD 6 (b) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	RLL	.75						
34	ASCE ASD 6 (b) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	RLL	.75						
35	ASCE ASD 6 (b) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	RLL	.75						
36	ASCE ASD 6 (d) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
37	ASCE ASD 6 (d) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
38	ASCE ASD 6 (d) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
39	ASCE ASD 6 (d) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
40	ASCE ASD 6 (f) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75								
41	ASCE ASD 6 (f) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75								
42	ASCE ASD 6 (f) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75								
43	ASCE ASD 6 (f) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75								
44	ASCE ASD 8 (a)	Yes			DL	.6	ELX	.7												
45	ASCE ASD 8 (b)	Yes			DL	.6	ELZ	.7												
46	ASCE ASD 8 (c)	Yes			DL	.6	ELX	-.7												
47	ASCE ASD 8 (d)	Yes			DL	.6	ELZ	-.7												

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	WP1	max	0	1	0	1	6.227	29	24.206	29	18.981	31	0	1
2		min	0	1	0	1	-6.227	31	-24.206	31	-18.981	29	0	1
3	WP2	max	6.552	30	51.425	38	8.136	29	70.098	29	42.663	31	19.975	44
4		min	-1.184	44	15.576	44	-8.136	31	-70.098	31	-42.663	29	-38.675	38
5	WP3	max	6.197	30	50.589	38	7.303	29	110.429	29	23.676	31	6.109	28

Envelope Joint Reactions (Continued)

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
6		min	-4.193	44	27.787	44	-7.303	31	-110.429	31	-23.676	29	-14.248	34
7	WP4	max	0	1	0	1	.896	29	4.183	29	32.834	29	0	1
8		min	0	1	0	1	-.896	31	-4.183	31	-32.834	31	0	1
9	WP5	max	4.221	46	44.192	4	4.693	29	0	1	1.35	29	1.692	44
10		min	-4.715	28	23.223	46	-4.693	31	0	1	-1.35	31	-11.008	30
11	WP6	max	3.984	46	41.388	4	15.009	29	224.822	29	68.649	29	-2.006	46
12		min	-5.512	28	21.32	46	-15.009	31	-224.822	31	-68.649	31	-8.617	36
13	WP7	max	2.837	46	37.844	4	8.691	29	94.178	29	4.275	29	5.798	28
14		min	-5.212	28	20.201	46	-8.691	31	-94.178	31	-4.275	31	-4.3	46
15	WP8	max	.269	46	20.814	36	4.585	29	49.669	29	4.941	31	9.73	28
16		min	-3.244	28	6.603	46	-4.585	31	-49.669	31	-4.941	29	-4.183	46
17	Totals:	max	22.217	46	235.886	38	55.54	29						
18		min	-22.217	28	127.582	44	-55.54	31						

Masonry Wall Reinforcement

	Wall	Region	Hor. Bar Size	Vert. Bar Size	Boundary Reinf.
1	WP1	R1	Not Reqd.	#5@16" oc	1-#5
2		R2	Not Reqd.	#5@16" oc	1-#5
3		R3	Not Reqd.	#5@16" oc	1-#5
4		R4	Not Reqd.	#5@16" oc	1-#5
5	WP2	R1	Not Reqd.	#5@16" oc	1-#5
6	WP3	R1	Not Reqd.	#5@16" oc	1-#5
7	WP4	R1	Not Reqd.	#5@16" oc	1-#5
8	WP5	R1	Not Reqd.	#5@16" oc	1-#5
9	WP6	R1	Not Reqd.	#5@24" oc	1-#5
10	WP7	R1	Not Reqd.	#5@24" oc	1-#5
11	WP8	R1	Not Reqd.	#5@24" oc	1-#5

Masonry Lintel Reinforcement

	Wall	Lintel	Flex. Steel	Stirrup
1	WP1	L1	1-#5	Not Reqd.

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (In Plane)

	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP1	R1	Typical	.201	38	.42	44	.546	1	.067
2		R2	Typical	0	N/A	0	N/A	.73	1	0
3		R3	Typical	0	N/A	0	N/A	.69	1	0
4		R4	Typical	.019	38	.036	44	.546	1	.097
5	WP2	R1	Typical	.042	38	.064	30	.556	1	.1
6	WP3	R1	Typical	.027	38	.046	30	.177	1	.109
7	WP4	R1	Typical	.008	36	.043	30	.725	1	.105
8	WP5	R1	Typical	.025	4	.04	30	.261	1	.105
9	WP6	R1	R2	.023	4	.028	28	.261	1	.105
10	WP7	R1	R2	.021	36	.039	28	.261	1	.112
11	WP8	R1	R2	.031	28	.059	28	.261	1	.1

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (Out of Plane)

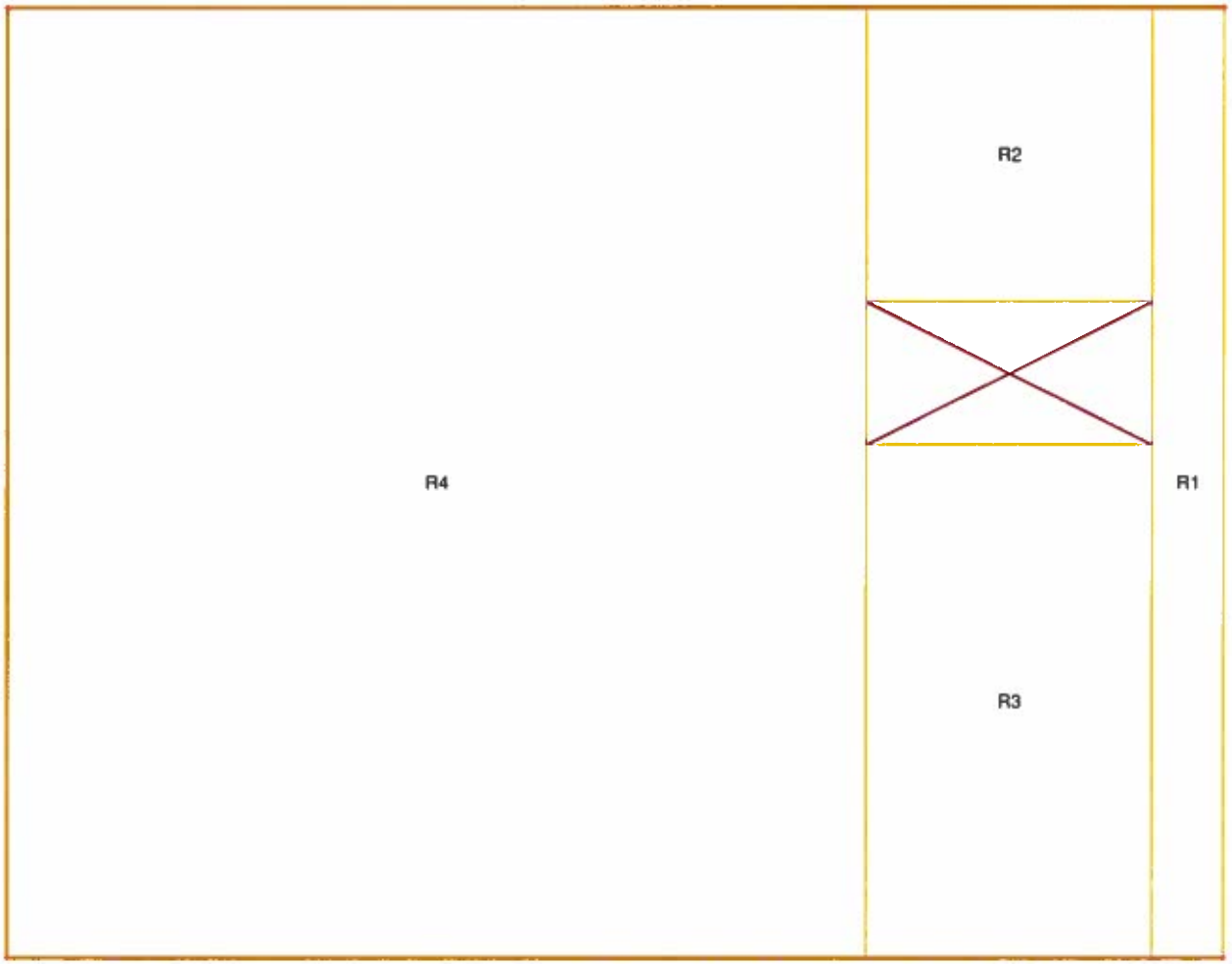
	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP1	R1	Typical	.719	29	.12	45	.546	1.35	.062
2		R2	Typical	0	N/A	0	N/A	.73	1.35	.055
3		R3	Typical	0	N/A	0	N/A	.69	1.35	.055
4		R4	Typical	.105	29	.021	45	.546	1.35	.062

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (Out of Plane) (Continued)

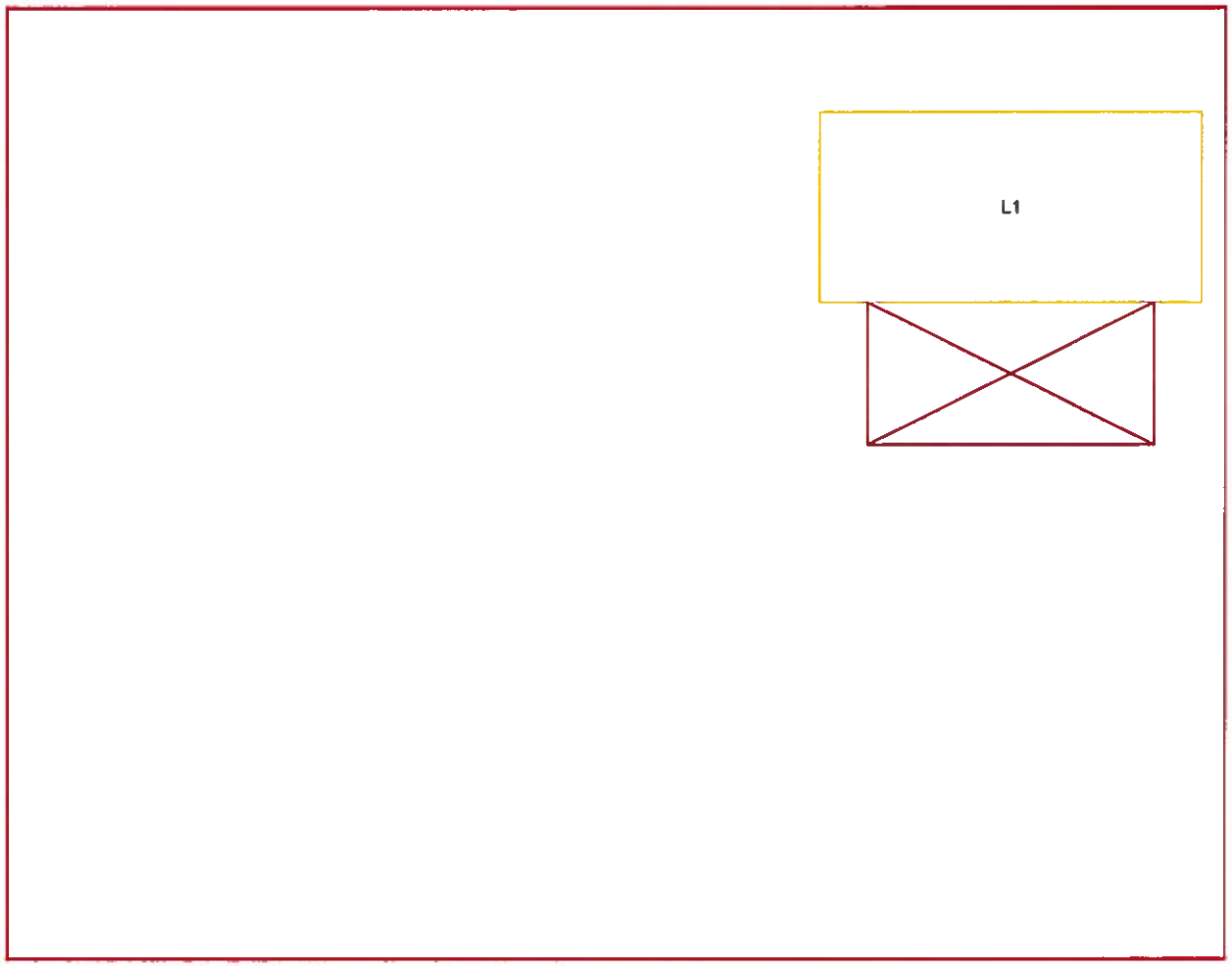
	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
5	WP2	R1	Typical	.119	29	.01	45	.556	1.35	.062
6	WP3	R1	Typical	.3	29	.034	29	.177	1.35	.062
7	WP4	R1	Typical	.018	29	.009	29	.725	1.35	.062
8	WP5	R1	Typical	.475	29	.048	45	.261	1.35	.062
9	WP6	R1	R2	.511	29	.022	45	.261	1.35	.11
10	WP7	R1	R2	.477	29	.022	29	.261	1.35	.11
11	WP8	R1	R2	.204	29	.009	29	.261	1.35	.11

Wall Panel ACI 530-11: ASD Masonry Code Checks for Lintels

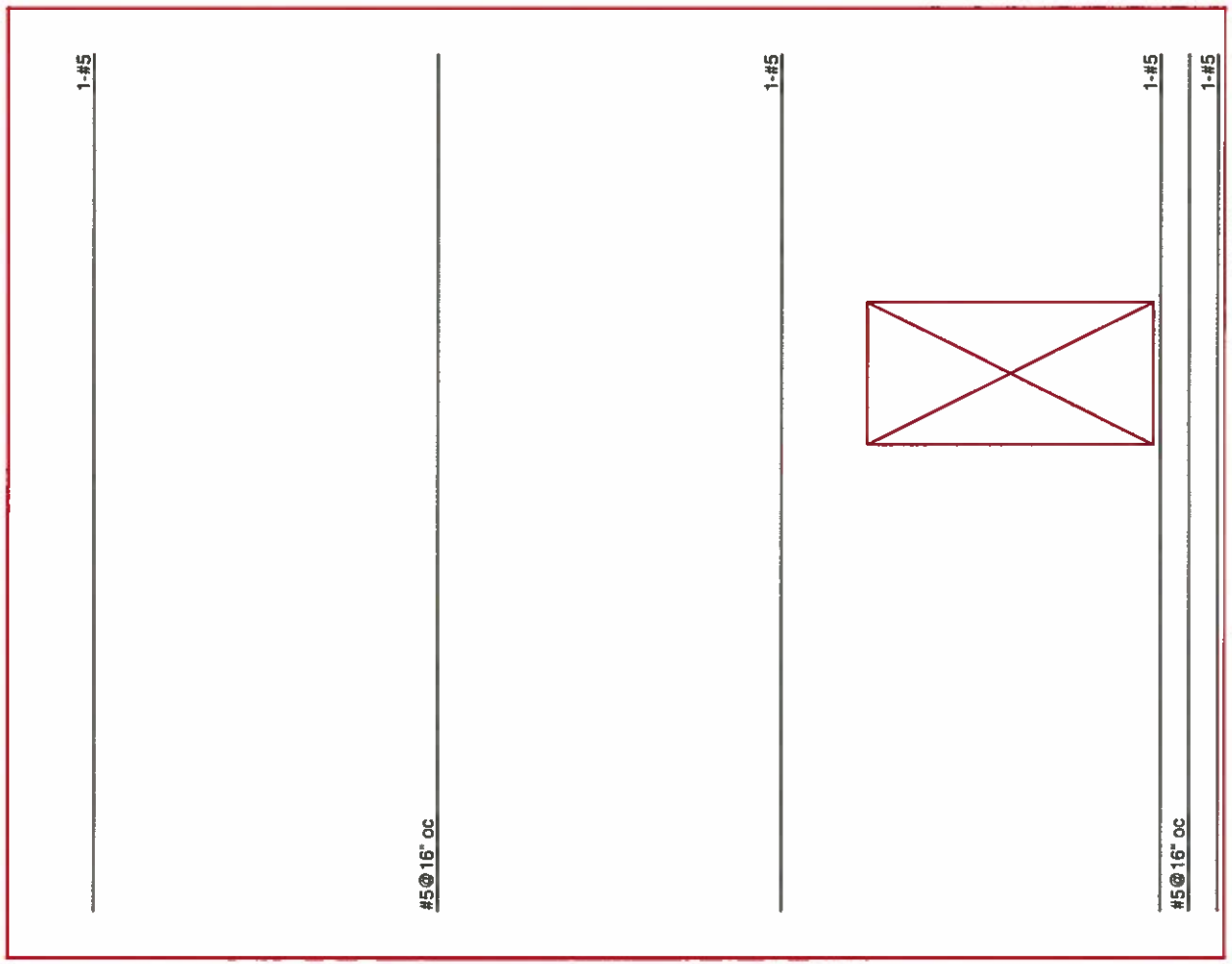
	Wall Pa...	Lintel	Design ...	Flexure UC	LC	Shear UC	LC	Fvm[ksi]	Fvs[ksi]	Fm[ksi]	Fs[ksi]
1	WP1	L1	Typical	.056	4	.059	4	.087	0	1	32



Sunrise Engineering	owtp North Wall	Wall Panel: WP1
SMH		Jan 27, 2014 at 12:42 PM
		North Wall Wireframe.R3D



Sunrise Engineering	owtp North Wall	Wall Panel: WP1
SMH		Jan 27, 2014 at 12:42 PM
		North Wall Wireframe.R3D



Sunrise Engineering	owtp North Wall	Wall Panel: WP1
SMH		Jan 27, 2014 at 12:41 PM
		North Wall Wireframe.R3D

200

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Hor Bar Size	: #5	
Vert Bar Size	: #5	
No of Ten Bars	: 1	
Effective Depth	: 8	in

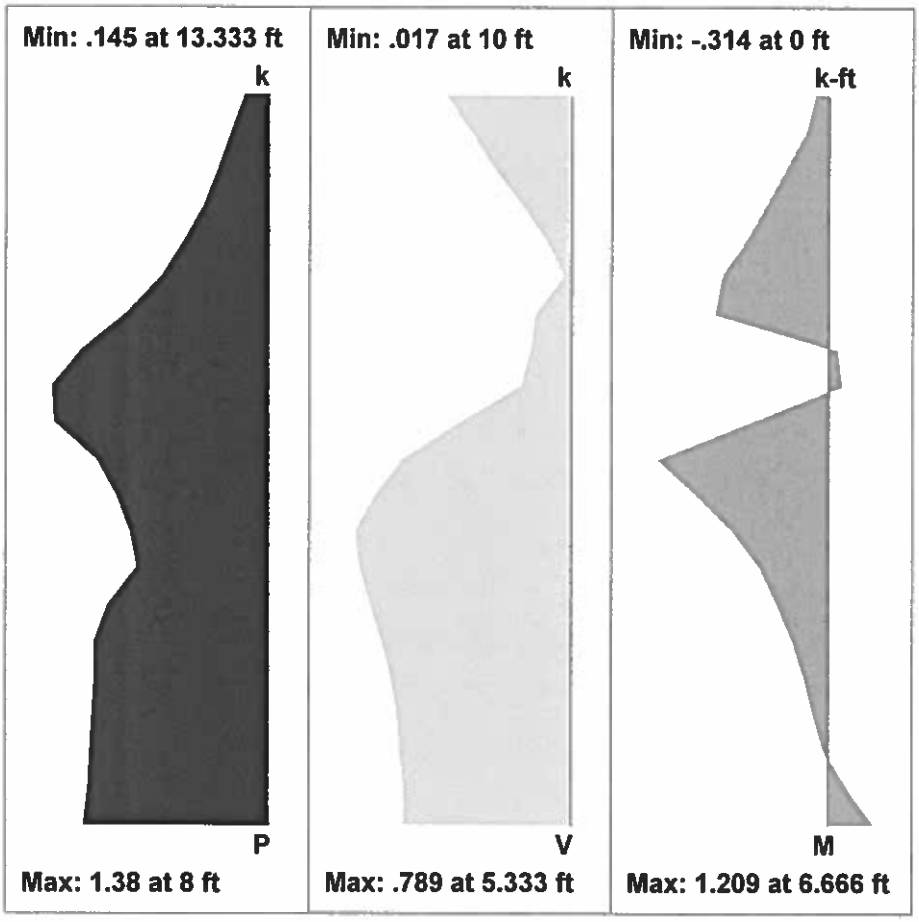
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 13.333	ft
Total Length	: 1	ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 16"	
Blk Nom Width	: 8"	
1.5 Shear Factor	: Yes	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb)/Fb	: .201
fa/Fa	: .022
fs/Fs	: .134

AXIAL SUMMARY

fa	: .012	ksi
Fa	: .546	ksi

BENDING SUMMARY

fb	: .189	ksi
Fb	: 1	ksi
fs	: 4.296	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv / Fv	: .263
u/U	: .329

SHEAR SUMMARY

fv	: .017	ksi
Fv	: .065	ksi
Fvm	: .065	ksi
Fv max	: .11	ksi
u	: .066	ksi
U	: .2	ksi

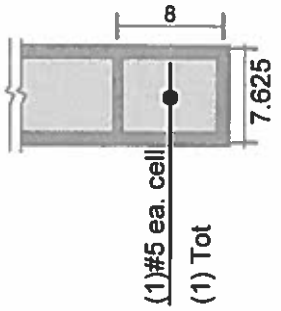
DESIGN DETAILS AT GOVERNING SECTION

AXIAL COMPRESSION DETAILS			BENDING DETAILS			SHEAR DETAILS		
Axial	: 1.093	k	Moment	: 1.209	k-ft	Shear	: .692	k
Location	: 6.666	ft	Location	: 6.666	ft	Location	: 3.333	ft
Load Comb	: 38		Load Comb	: 38		Load Comb	: 38	
Rad gyration r	: 2.19	in	Sect Mod S	: 183	in3	Corresponding M:	.238	k-ft
h'/r	: 73.058		Tension St Asv	: 0.3068	in2	Corresponding P :	1.11	k
Red Factor R	: .728		Per of steel p	: 0.005029		M / (V*d)	: 1	
			k*d	: 3.137	in	Shear St Area	: Not Reqd.	
			j	: 0.87		Shear Spacing	: N/A	
						Peri of Bars	: N/A	

CRACKED SECT ANALYSIS

fm = fa + fb	: .201	ksi
C	: 2.401	k
T	: 1.308	k

CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Type of Design	: ASD	
Reinforced	: Yes	
Vertical Bar Size	: #5	
End Face Dist	: 3.813	in

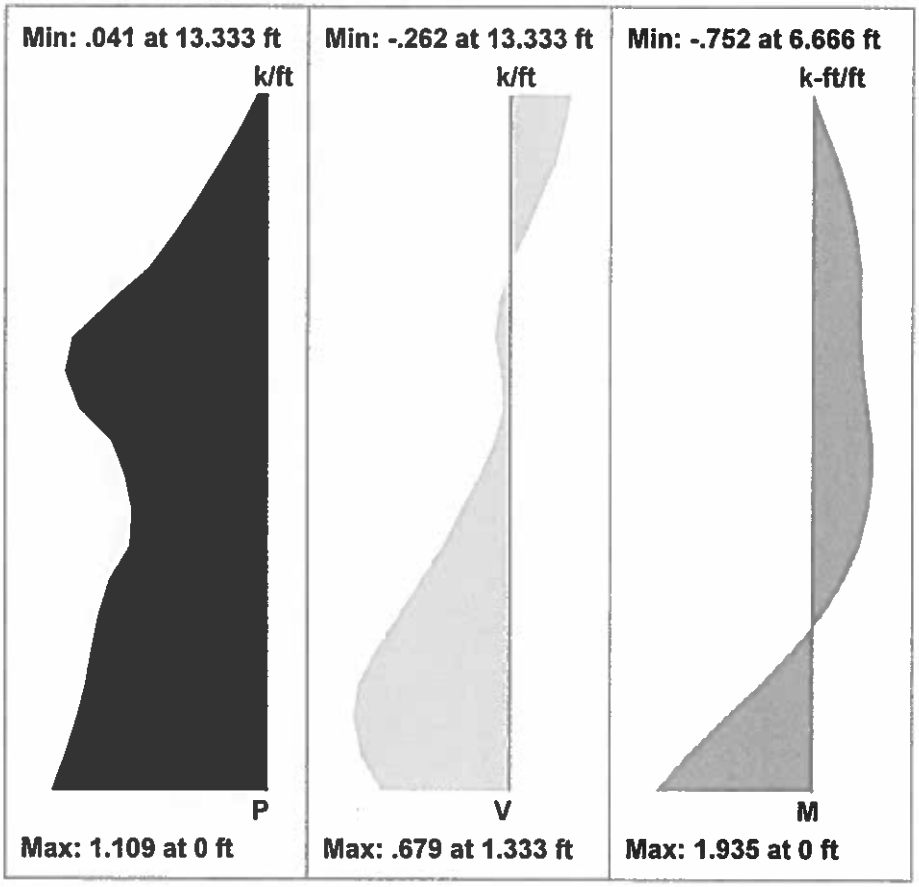
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 13.333	ft
Eq Sld Thickness	: 7.625"	
An	: 91.5	in2/ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 16"	
Loc of r/f	: Center	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb) / Fb	: .719
fa/Fa	: .022
fs/Fs	: .922

AXIAL SUMMARY

fa	: .012	ksi
Fa	: .546	ksi

BENDING SUMMARY

fb	: .959	ksi
Fb	: 1.35	ksi
fs	: 29.518	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv/Fv	: .12
u/U	: .674

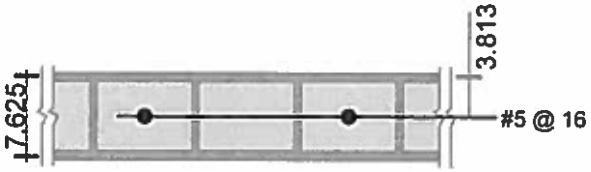
SHEAR SUMMARY

fv	: .007	ksi
Fv	: .062	ksi
Fv max	: .11	ksi
u	: .135	ksi
U	: .2	ksi

DESIGN DETAILS

AXIAL DETAILS			BENDING DETAILS			SHEAR DETAILS		
Max Axial	: 1.109	k/ft	Max Moment	: 1.935	k-ft/ft	Max Shear	: .679	k/ft
Location	: 0	ft	Location	: 0	ft	Location	: 1.333	ft
Load Comb	: 29		Load Comb	: 29		Load Comb	: 29	
Rad gyration r	: 2.19	in	k	: .31		Width for Shear	: 16	in
h'/r	: 73.058		d	: 3.813	in	Corresponding M:	1.097	k-ft/ft
			j	: .897		Corresponding P :	.984	k/ft
						M / (V*d)	: 1	

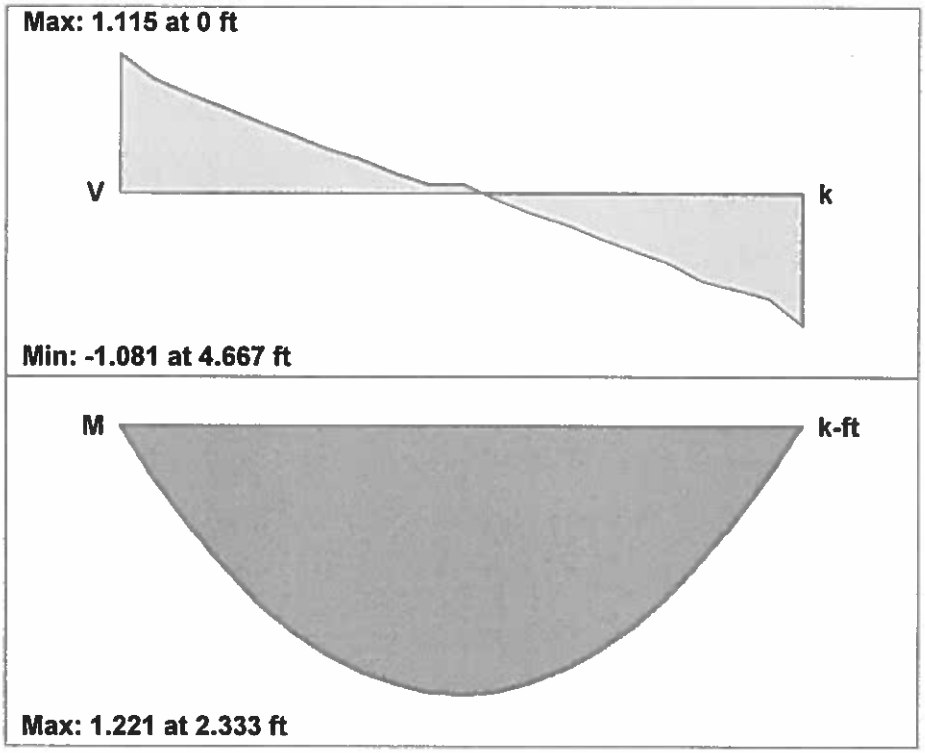
CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 3	ksi	Dist to Top of Wall	: 1.466	ft
Special Insp	: Yes	Masonry Em	: 2100	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 4.667	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #4	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 1-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .059	
Bond Chk u/U	: .106	
fv	: .005	ksi
Fv	: .087	ksi
Fvm	: .087	ksi
FvMax	: .149	ksi
u	: .021	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .056	
Bend Chk fm/Fm	: .028	
fm	: .028	ksi
Fm	: 1	ksi
fs	: 1.782	ksi
Fs	: 32	ksi

DESIGN DETAILS

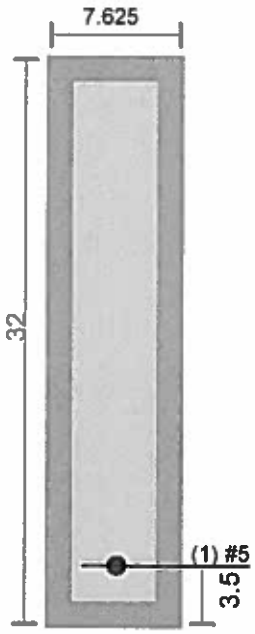
BENDING DETAILS

Max Moment	: 1.221	k-ft	Steel Area As	: .307	in2
Location	: 2.333	ft	Per of steel p	: .001	
Load Comb	: 4				
Mm	: 43.42	k-ft	k	: .179	
Ms	: 21.926	k-ft	j	: .94	

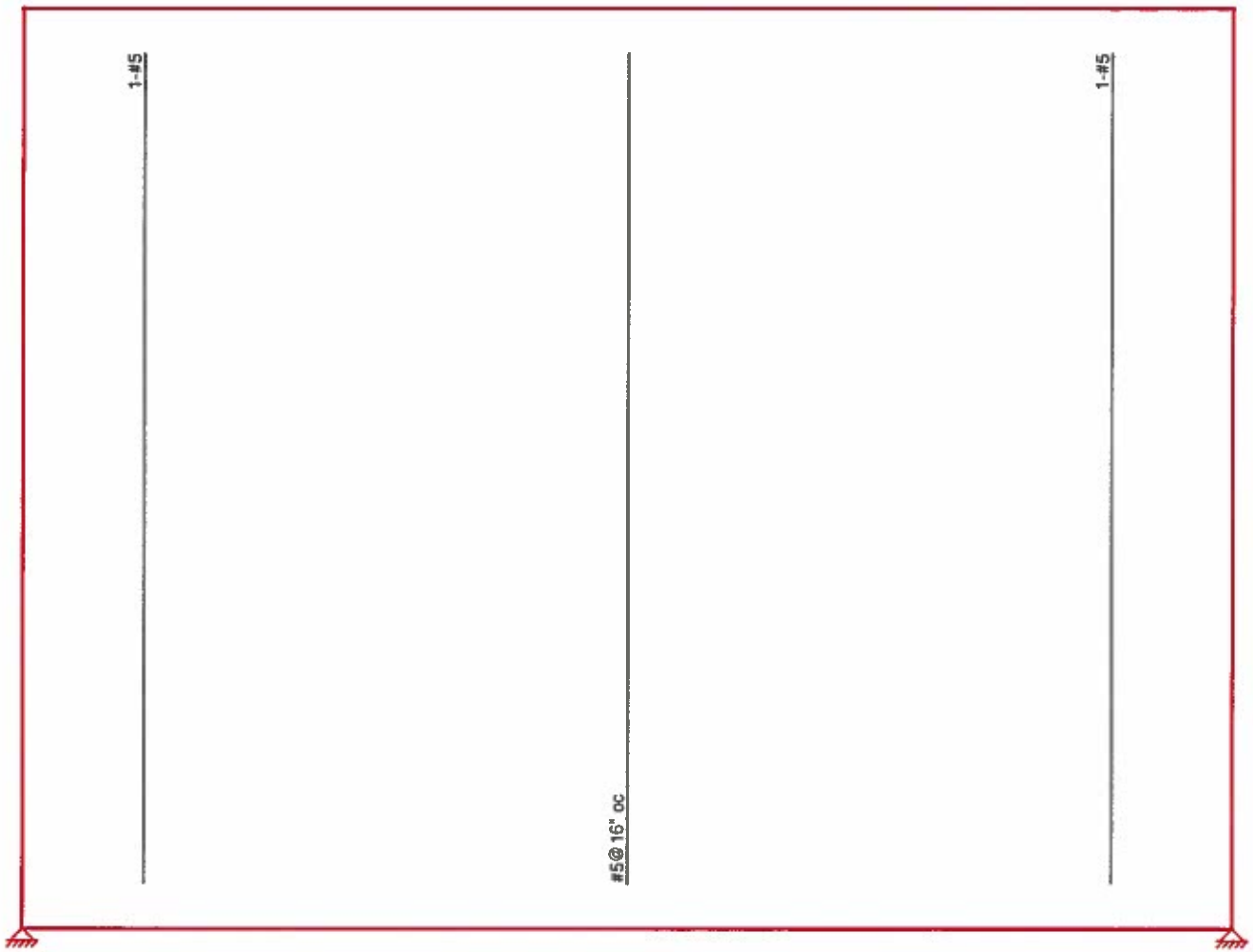
SHEAR DETAILS

Max Shear	: 1.115	k
Location	: 0	ft
Load Comb	: 4	
M / (V*d)	: .461	
Tie Spacing	: Not Required	

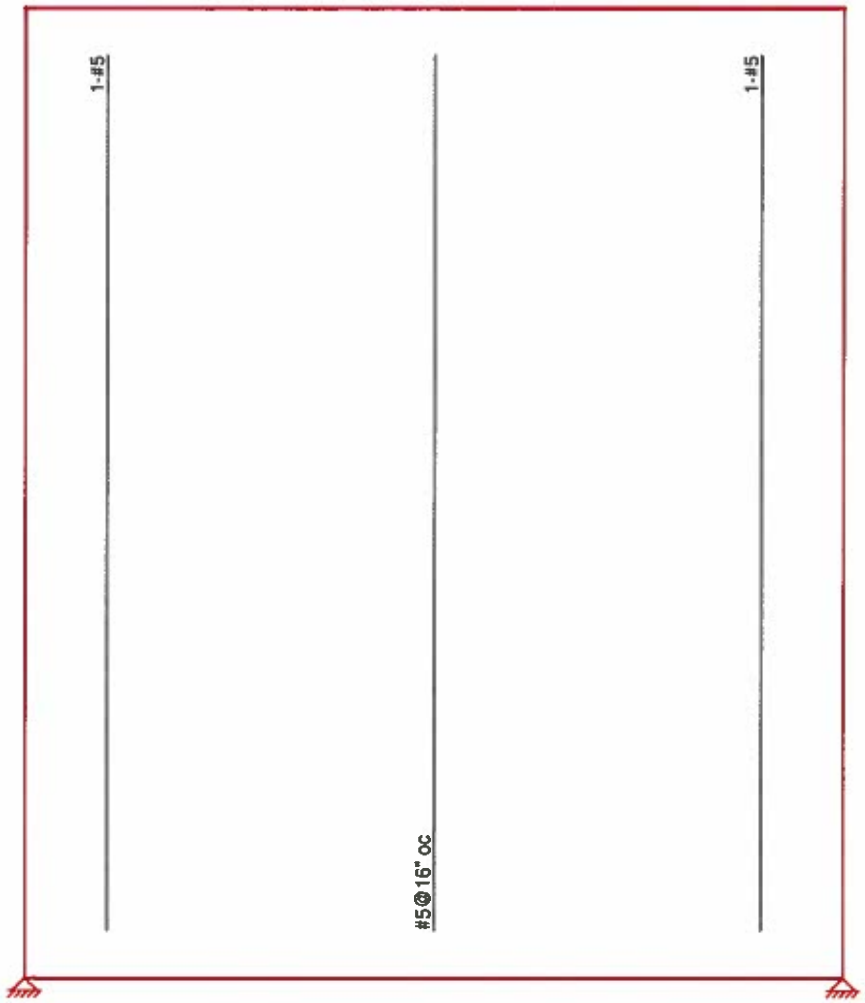
CROSS SECTION DETAILING



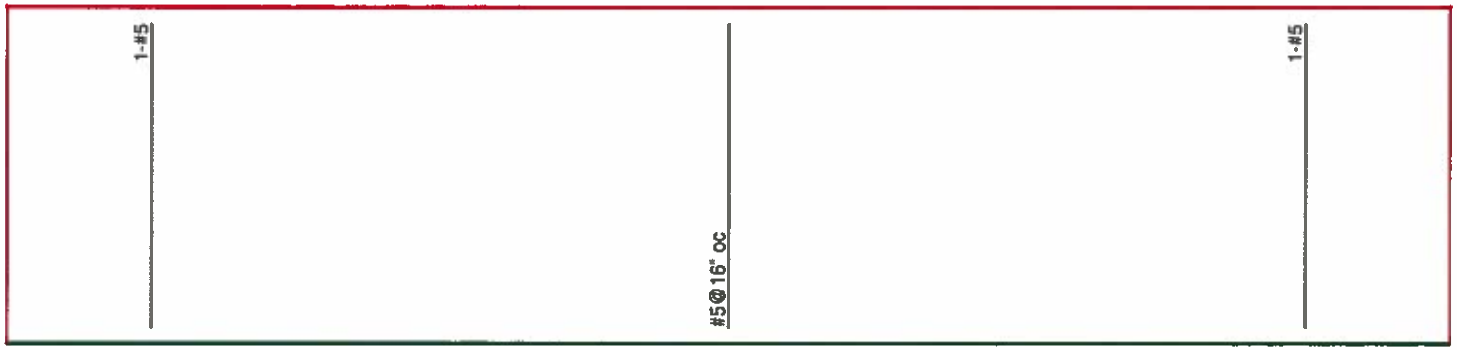
NOTE: All units are in "in."



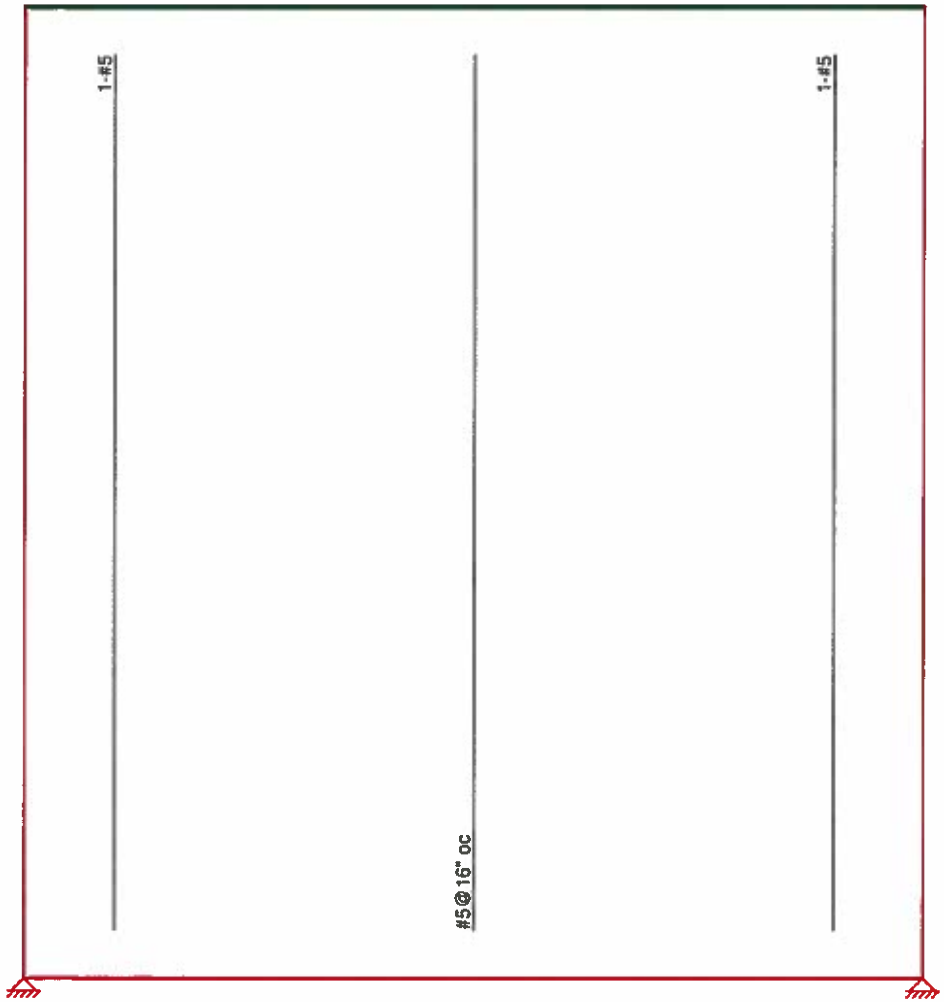
Sunrise Engineering	owtp North Wall	Wall Panel: WP2
SMH		Jan 27, 2014 at 12:42 PM
		North Wall Wireframe.R3D



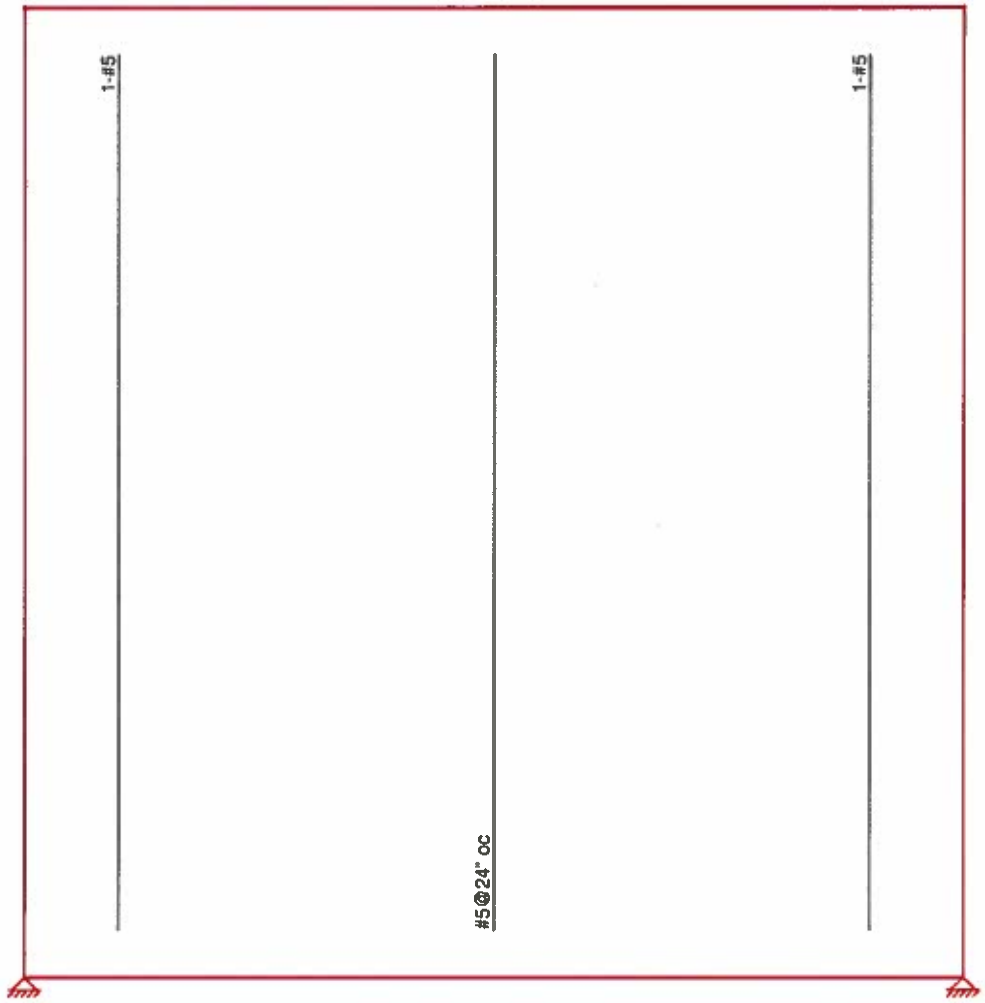
Sunrise Engineering	owtp North Wall	Wall Panel: WP3
SMH		Jan 27, 2014 at 12:43 PM
		North Wall Wireframe.R3D



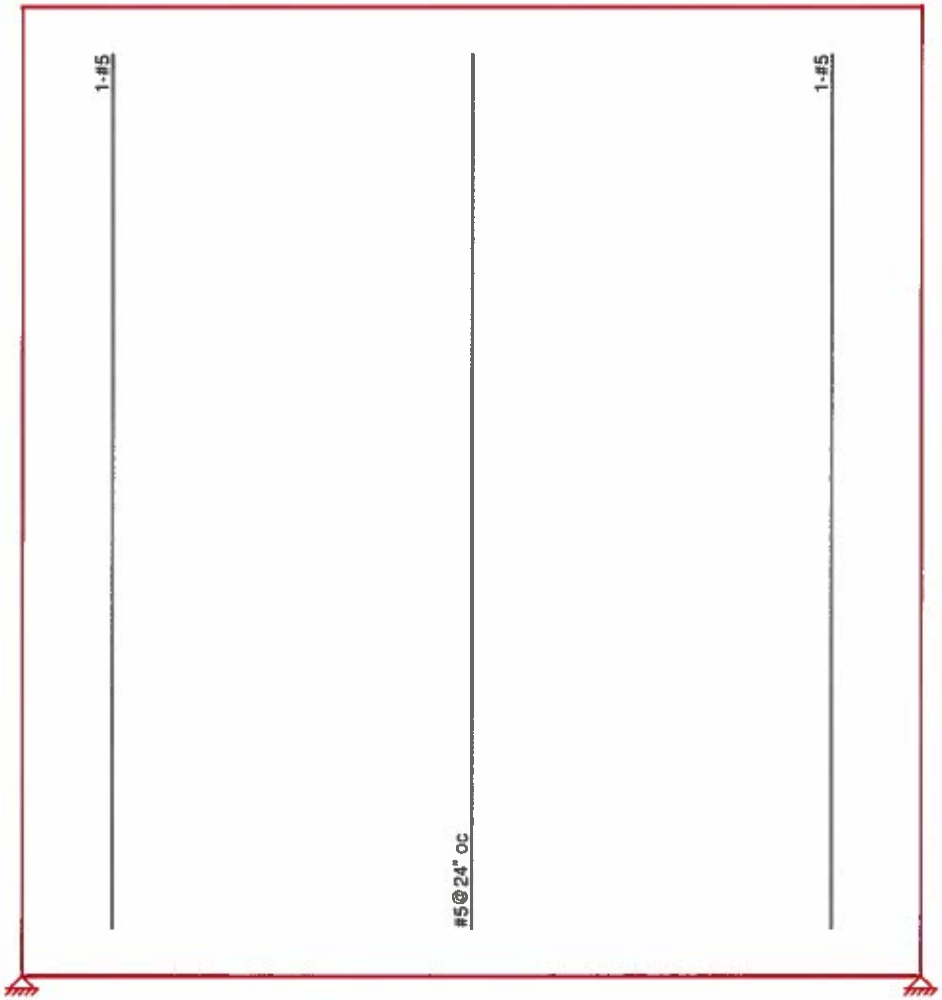
Sunrise Engineering	owtp North Wall	Wall Panel: WP4
SMH		Jan 27, 2014 at 12:43 PM
		North Wall Wireframe.R3D



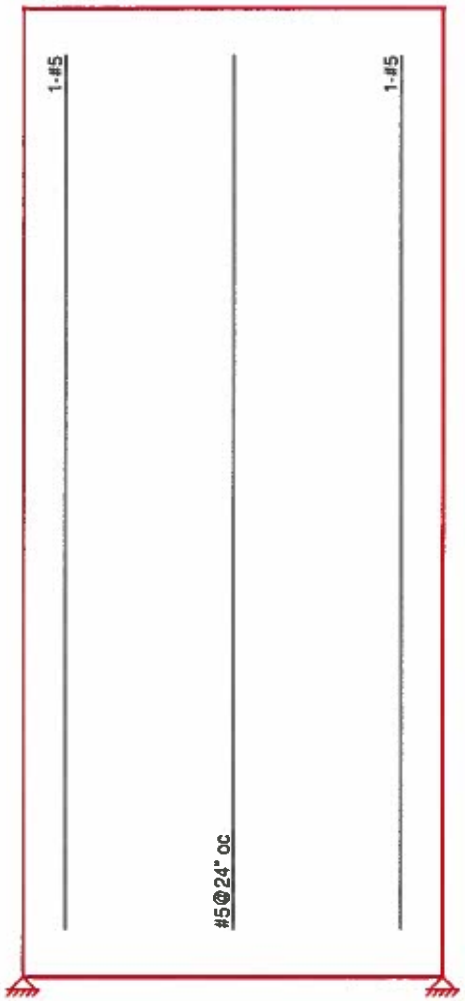
Sunrise Engineering	owtp North Wall	Wall Panel: WP5
SMH		Jan 27, 2014 at 12:43 PM
		North Wall Wireframe.R3D



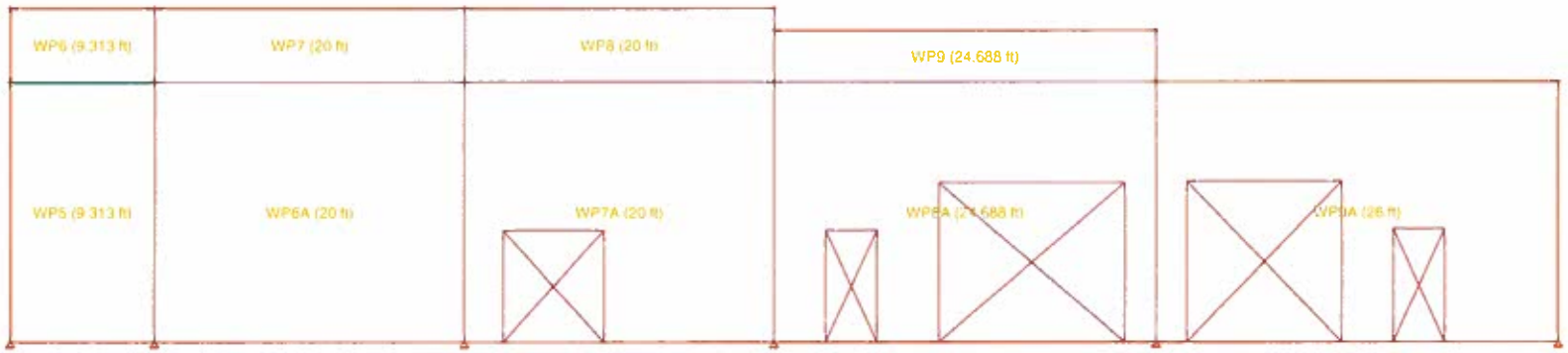
Sunrise Engineering	owtp North Wall	Wall Panel: WP6
SMH		Jan 27, 2014 at 12:43 PM
		North Wall Wireframe.R3D



Sunrise Engineering	owtp North Wall	Wall Panel: WP7
SMH		Jan 27, 2014 at 12:43 PM
		North Wall Wireframe.R3D

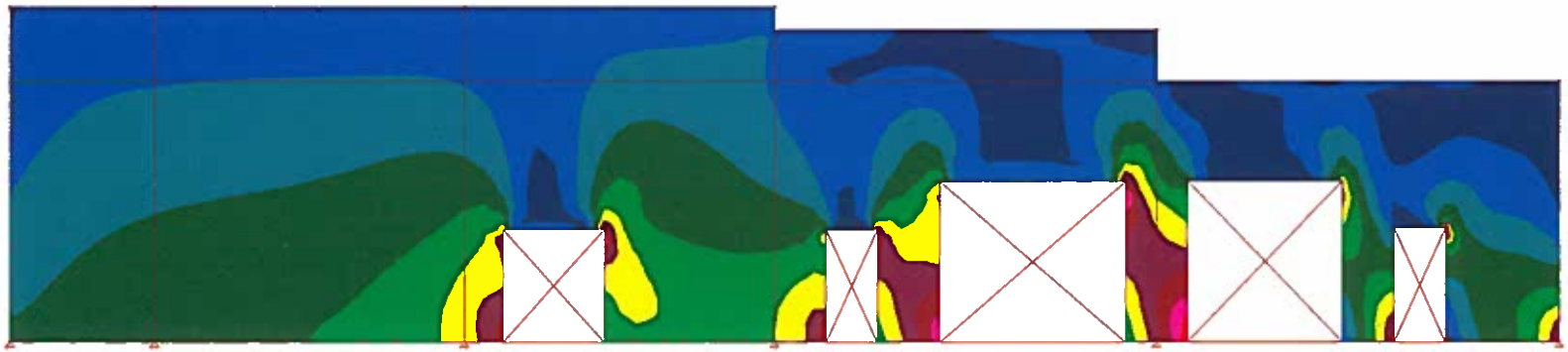


Sunrise Engineering	owtp North Wall	Wall Panel: WP8
SMH		Jan 27, 2014 at 12:43 PM
		North Wall Wireframe.R3D



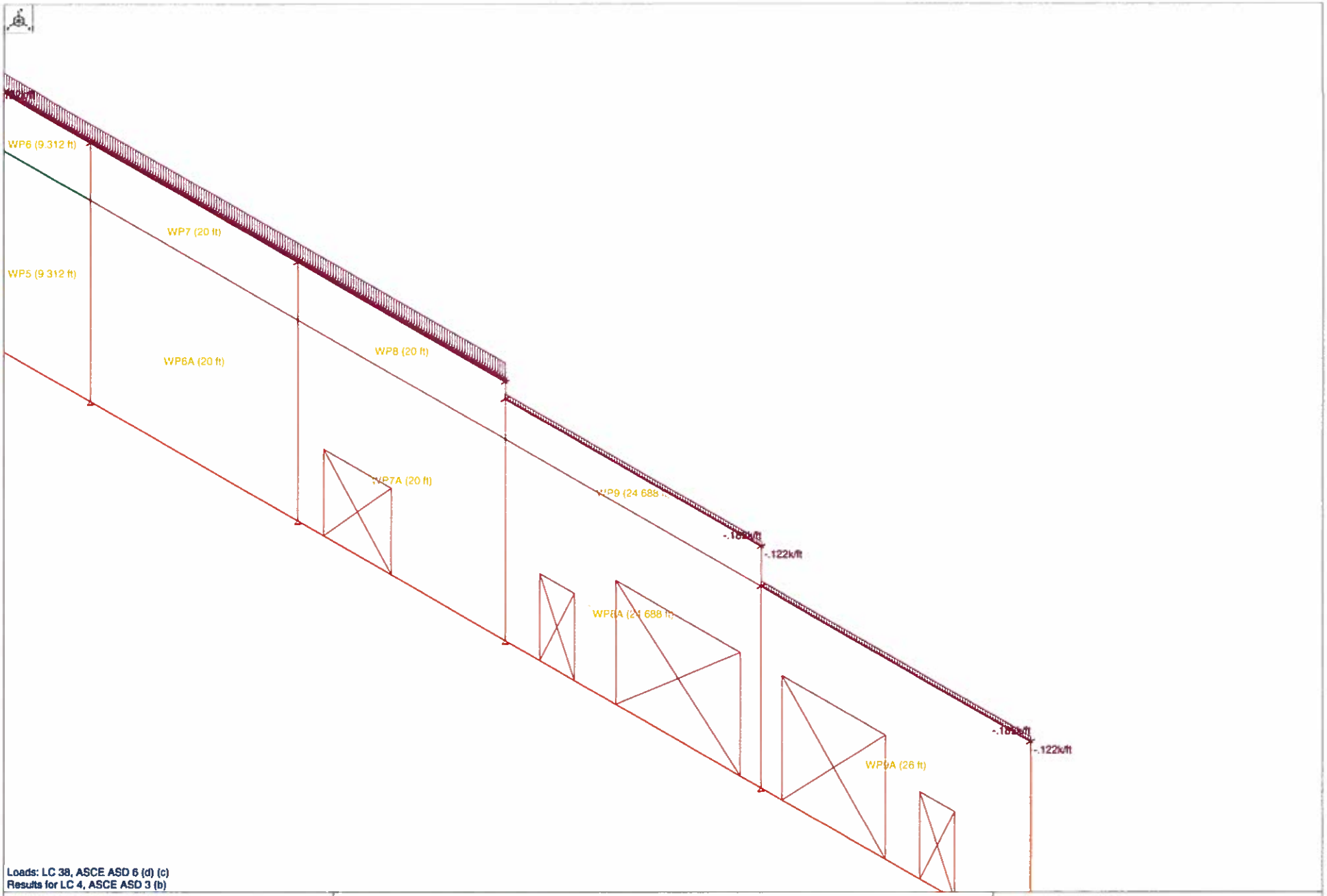
Results for LC 36, ASCE ASD 6 (d) (a)

	OWTP West Wall	2
		Jan 24, 2014 at 4:31 PM
		untitled.r3d

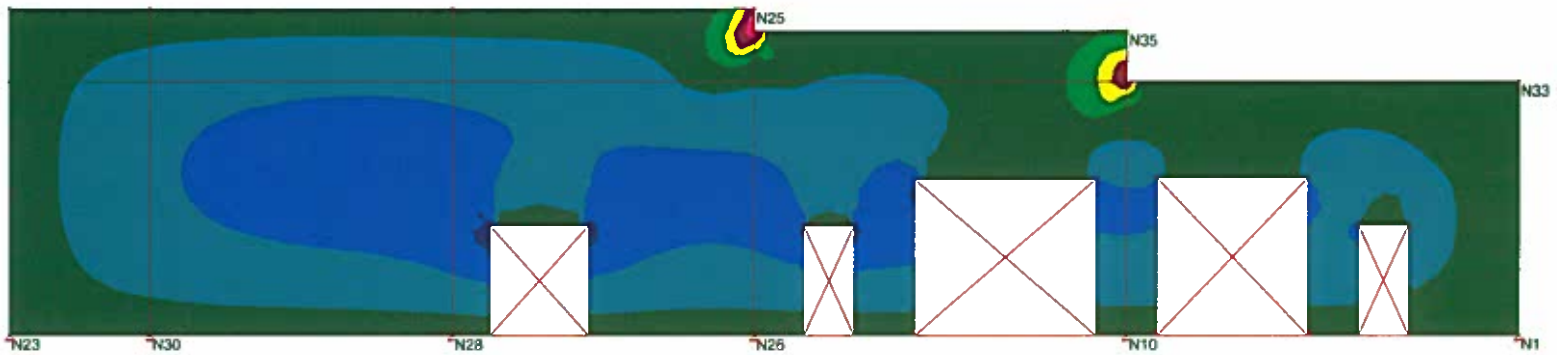


Results for LC 36, ASCE ASD 6 (d) (a)

	OWTP West Wall	1
		Jan 24, 2014 at 4:31 PM
	LC 36: Worst Case In Plane Stresses	untitled.r3d

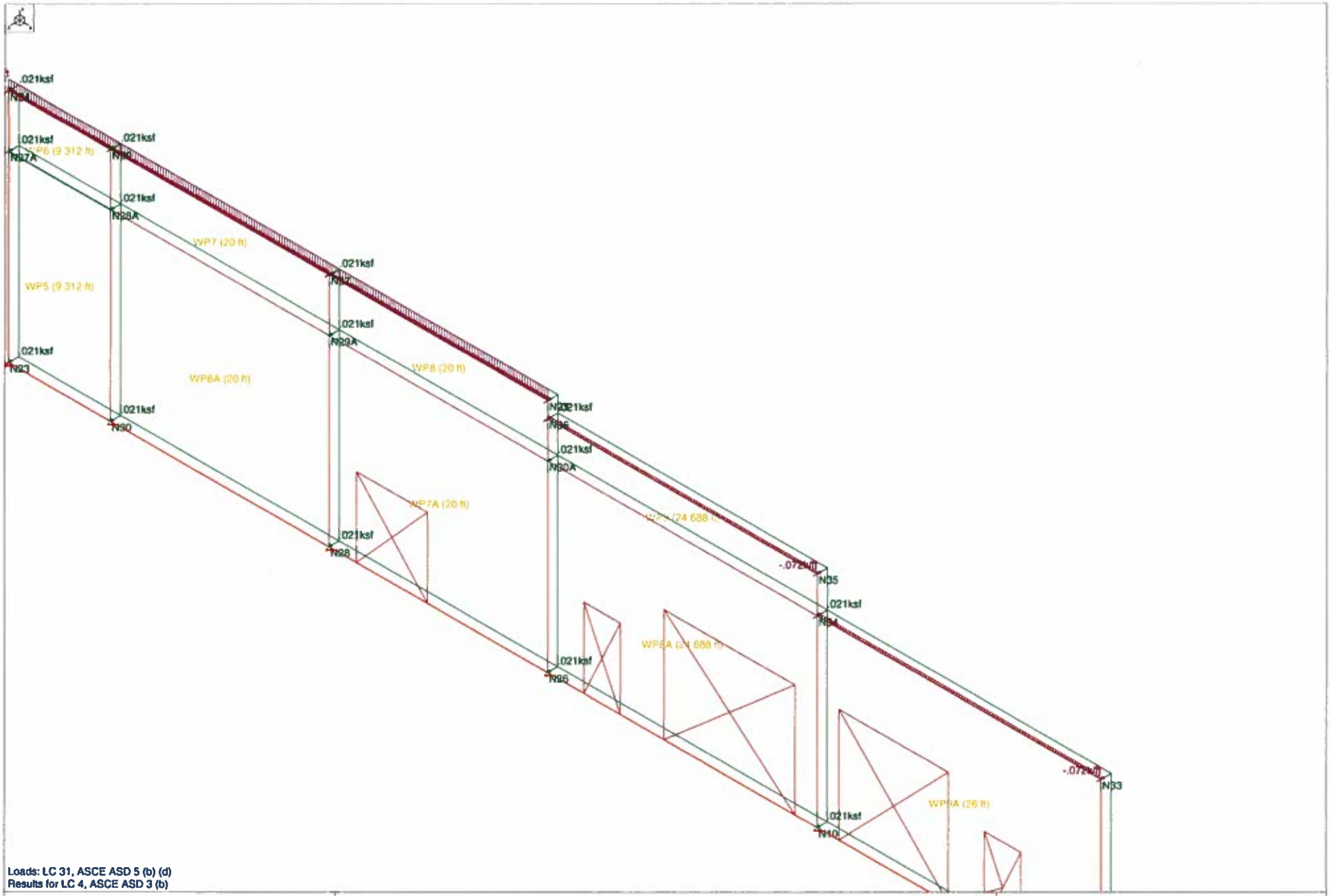


	OWTP West Wall	3
	LC 38: Worst Case In-plane Loading	Jan 27, 2014 at 10:38 AM
		West Wall.R3D



Results for LC 29, ASCE ASD 5 (b) (b)

	OWTP West Wall	2
	WORST CASE Out of Plane Stresses	Jan 24, 2014 at 4:53 PM
		untitled.r3d



	OWTP West Wall	2
	LC 31: Worst Case Out-of Plane Loading	Jan 27, 2014 at 10:37 AM
		West Wall.R3D

Masonry Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Self Weight[k/ft...	f'm[ksi]	Flex Steel[ksi]	Shear St...
1	Concrete Matl	1350	540	.25	.6	Custom	1.5	60	60
2	Clay Matl	2100	420	.25	.6	Custom	3	60	60
3	Gen Masonry	1050	420	.25	.6	.08	1.5	60	60

Masonry Wall Panel In Plane Parameters

	Label	Vert Bar Size	Bars Per Cell	Min Bound Zone Wi...	Max Bound Zone Width[in]	Horz Bar Size	1.5x Shear Inc	Transfer Lo...
1	Typical	#5	1	4	40	#5	Yes	Yes

Masonry Wall Panel Out of Plane Parameters

	Label	Bar Size	Bar Space Min	Bar Space Max	Bar Placement	Mortar Type	Cement Type	Transfer Load
1	Typical	#5	24"	24"	Center	Type M or S	Portland, Lime/M...	Yes

Masonry Wall Panel Lintel Parameters

	Label	Depth[in]	Bear L...	Bar ...	Min # Bars Per ...	Max # Bars Pe...	Num of La...	c/c Sp of La...	Dist to Bo...	Stirrup Size
1	Typical	32	8	#5	1	2	1	N/A	3.5	#3

Wall Panel Data

	Label	A Joint	B Joint	C Joint	D Joint	Material T...	Material Set	Thickness[in]	Design Rule	Panel/Spacing
1	WP6	N24	N29	N28A	N27A	Masonry	Clay Matl	8	Typical	24
2	WP7	N29	N27	N29A	N28A	Masonry	Clay Matl	8	Typical	24
3	WP8	N27	N25	N30A	N29A	Masonry	Clay Matl	8	Typical	24
4	WP9	N36	N35	N34	N30A	Masonry	Clay Matl	8	Typical	24
5	WP5	N27A	N28A	N30	N23	Masonry	Clay Matl	8	Typical	24
6	WP6A	N28A	N29A	N28	N30	Masonry	Clay Matl	8	Typical	24
7	WP7A	N29A	N30A	N26	N28	Masonry	Clay Matl	8	Typical	24
8	WP8A	N30A	N34	N10	N26	Masonry	Clay Matl	8	Typical	24
9	WP9A	N34	N33	N1	N10	Masonry	Clay Matl	8	Typical	24

Wall Panel Distributed Loads

Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
No Data to Print ...					

Wall Panel Surface Loads (BLC 5 : E Z dir)

	Wall Panel Label	Direction	Top Magnitude[ksf,F]	Bottom Magnitude[...	Start Location[ft]	Height[ft]
1	WP9	Z	-.03	-.03	0	0
2	WP7A	Z	-.03	-.03	0	0
3	WP8A	Z	-.03	-.03	0	0
4	WP9A	Z	-.03	-.03	0	0
5	WP5	Z	-.03	-.03	0	0
6	WP6A	Z	-.03	-.03	0	0
7	WP7	Z	-.03	-.03	0	0
8	WP6	Z	-.03	-.03	0	0
9	WP8	Z	-.03	-.03	0	0

Wall Panel Surface Loads (BLC 7 : W Z dir)

	Wall Panel Label	Direction	Top Magnitude[ksf,F]	Bottom Magnitude[...	Start Location[ft]	Height[ft]
1	WP5	Z	-.02	-.02	0	0

Wall Panel Surface Loads (BLC 7 : W Z dir) (Continued)

	Wall Panel Label	Direction	Top Magnitude[ksf,F]	Bottom Magnitude[...	Start Location[ft]	Height[ft]
2	WP6	Z	-.02	-.02	0	0
3	WP7	Z	-.02	-.02	0	0
4	WP6A	Z	-.02	-.02	0	0
5	WP7A	Z	-.02	-.02	0	0
6	WP8	Z	-.02	-.02	0	0
7	WP8A	Z	-.02	-.02	0	0
8	WP9A	Z	-.02	-.02	0	0
9	WP9	Z	-.02	-.02	0	0

Load Combinations

	Description	Sol...	PDelta	SRSS	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	ASCE ASD 1	Yes			DL	1														
2	ASCE ASD 2	Yes			DL	1	LL	1	LLS	1										
3	ASCE ASD 3 (a)	Yes			DL	1	RLL	1												
4	ASCE ASD 3 (b)	Yes			DL	1	SL	1	SLN	1										
5	ASCE ASD 3 (c)	Yes			DL	1														
6	ASCE ASD 4 (a)	Yes			DL	1	LL	.75	LLS	.75	RLL	.75								
7	ASCE ASD 4 (b)	Yes			DL	1	LL	.75	LLS	.75	SL	.75	SLN	.75						
8	ASCE ASD 5 (a) (a)	Yes			DL	1	WLX	.6												
9	ASCE ASD 5 (a) (b)	Yes			DL	1	WLZ	.6												
10	ASCE ASD 5 (a) (c)	Yes			DL	1	WLX	-.6												
11	ASCE ASD 5 (a) (d)	Yes			DL	1	WLZ	-.6												
12	ASCE ASD 6 (a) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	RLL	.75						
13	ASCE ASD 6 (a) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	RLL	.75						
14	ASCE ASD 6 (a) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	RLL	.75						
15	ASCE ASD 6 (a) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	RLL	.75						
16	ASCE ASD 6 (c) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
17	ASCE ASD 6 (c) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
18	ASCE ASD 6 (c) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
19	ASCE ASD 6 (c) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
20	ASCE ASD 6 (e) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75								
21	ASCE ASD 6 (e) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75								
22	ASCE ASD 6 (e) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75								
23	ASCE ASD 6 (e) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75								
24	ASCE ASD 7 (a)	Yes			DL	.6	WLX	.6												
25	ASCE ASD 7 (b)	Yes			DL	.6	WLZ	.6												
26	ASCE ASD 7 (c)	Yes			DL	.6	WLX	-.6												
27	ASCE ASD 7 (d)	Yes			DL	.6	WLZ	-.6												
28	ASCE ASD 5 (b) (a)	Yes			DL	1	ELX	.7												
29	ASCE ASD 5 (b) (b)				DL	1	ELZ	.7												
30	ASCE ASD 5 (b) (c)	Yes			DL	1	ELX	-.7												
31	ASCE ASD 5 (b) (d)	Yes			DL	1	ELZ	-.7												
32	ASCE ASD 6 (b) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	RLL	.75						
33	ASCE ASD 6 (b) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	RLL	.75						
34	ASCE ASD 6 (b) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	RLL	.75						
35	ASCE ASD 6 (b) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	RLL	.75						
36	ASCE ASD 6 (d) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
37	ASCE ASD 6 (d) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
38	ASCE ASD 6 (d) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
39	ASCE ASD 6 (d) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
40	ASCE ASD 6 (f) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75								
41	ASCE ASD 6 (f) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75								
42	ASCE ASD 6 (f) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75								
43	ASCE ASD 6 (f) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75								
44	ASCE ASD 8 (a)	Yes			DL	.6	ELX	.7												
45	ASCE ASD 8 (b)	Yes			DL	.6	ELZ	.7												

Load Combinations (Continued)

	Description	Sol..	PDelta	SRSS	BLC Fact..		BLC Fact..		BLC Fact..		BLC Fact..		BLC Fact..		BLC Fact..		BLC Fact..		BLC Fact..	
46	ASCE ASD 8 (c)	Yes			DL	.6	ELX	-.7												
47	ASCE ASD 8 (d)	Yes			DL	.6	ELZ	-.7												

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	WP6	max	0	1	0	1	1.42	45	4.724	45	1.639	31	0	1
2		min	0	1	0	1	-1.42	31	-4.724	31	-1.639	45	0	1
3	WP7	max	0	1	0	1	4.396	45	21.187	45	2.375	31	0	1
4		min	0	1	0	1	-4.396	31	-21.187	31	-2.375	45	0	1
5	WP8	max	0	1	0	1	2.646	31	12.75	31	64.054	45	0	1
6		min	0	1	0	1	-2.646	45	-12.75	45	-64.054	31	0	1
7	WP9	max	0	1	0	1	8.135	45	27.235	45	155.331	45	0	1
8		min	0	1	0	1	-8.135	31	-27.235	31	-155.331	31	0	1
9	WP5	max	4.084	38	27.782	38	3.151	45	20.894	45	6.448	45	6.645	44
10		min	-.986	44	4.582	44	-3.151	31	-20.894	31	-6.448	31	-12.051	30
11	WP6A	max	6.116	30	54.398	38	4.504	45	0	1	4.189	31	24.874	36
12		min	-4.737	44	19.923	44	-4.504	31	0	1	-4.189	45	.075	46
13	WP7A	max	3.929	46	42.566	38	4.149	45	0	1	1.622	31	76.269	38
14		min	-4.352	28	15.934	44	-4.149	31	0	1	-1.622	45	21.055	44
15	WP8A	max	1.601	46	32.211	4	4.157	45	0	1	3.633	45	-7.818	46
16		min	-2.698	28	15.037	44	-4.157	31	0	1	-3.633	31	-88.766	36
17	WP9A	max	1.717	46	31.815	4	14.841	45	178.468	45	82.532	45	52.357	28
18		min	-4.65	28	15.793	26	-14.841	31	-178.468	31	-82.532	31	6.845	46
19	Totals:	max	16.31	30	188.354	38	42.107	45						
20		min	-16.31	44	71.29	44	-42.107	31						

Masonry Wall Reinforcement

	Wall	Region	Hor. Bar Size	Vert. Bar Size	Boundary Reinf.
1	WP6	R1	Not Reqd.	#5@24" oc	1-#5
2	WP7	R1	Not Reqd.	#5@24" oc	1-#5
3	WP8	R1	Not Reqd.	#5@24" oc	1-#5
4	WP9	R1	Not Reqd.	#5@24" oc	1-#5
5	WP5	R1	Not Reqd.	#5@24" oc	1-#5
6	WP6A	R1	Not Reqd.	#5@24" oc	1-#5
7	WP7A	R1	Not Reqd.	#5@24" oc	1-#5
8		R2	Not Reqd.	#5@24" oc	1-#5
9		R3	Not Reqd.	#5@8" oc	1-#5
10	WP8A	R1	Not Reqd.	#5@8" oc	2-#5
11		R2	Not Reqd.	#5@24" oc	1-#5
12		R3	Not Reqd.	#5@24" oc	1-#5
13		R4	Not Reqd.	#5@24" oc	1-#5
14		R5	Not Reqd.	#5@8" oc	1-#5
15	WP9A	R1	Not Reqd.	#5@24" oc	1-#5
16		R2	Not Reqd.	#5@24" oc	1-#5
17		R3	Not Reqd.	#5@24" oc	1-#5
18		R4	Not Reqd.	#5@24" oc	1-#5
19		R5	Not Reqd.	#5@8" oc	1-#5

Masonry Lintel Reinforcement

	Wall	Lintel	Flex. Steel	Stirrup
1	WP7A	L1	1-#5	Not Reqd.
2	WP8A	L1	1-#5	Not Reqd.
3		L2	1-#5	Not Reqd.

Masonry Lintel Reinforcement (Continued)

	Wall	Lintel	Flex. Steel	Stirrup
4	WP9A	L1	1-#5	Not Reqd.
5		L2	1-#5	Not Reqd.

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (In Plane)

	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP6	R1	Typical	.013	4	.026	28	.723	1	.102
2	WP7	R1	Typical	.014	4	.033	30	.723	1	.11
3	WP8	R1	Typical	.013	4	.036	28	.723	1	.106
4	WP9	R1	Typical	.007	38	.029	30	.737	1	.105
5	WP5	R1	Typical	.04	38	.072	38	.424	1	.104
6	WP6A	R1	Typical	.032	4	.053	30	.424	1	.111
7	WP7A	R1	Typical	.042	38	.086	36	.424	1	.097
8		R2	Typical	0	N/A	0	N/A	.644	1	0
9		R3	<Custom>	.245	38	.376	38	.424	1	.069
10	WP8A	R1	<Custom>	.49	4	.486	36	.424	1	.065
11		R2	Typical	0	N/A	0	N/A	.701	1	0
12		R3	Typical	.238	36	.355	30	.424	1	.067
13		R4	Typical	0	N/A	0	N/A	.644	1	0
14		R5	<Custom>	.055	38	.148	38	.424	1	.094
15	WP9A	R1	Typical	.04	28	.092	28	.424	1	.08
16		R2	Typical	0	N/A	0	N/A	.646	1	0
17		R3	Typical	.173	38	.223	28	.424	1	.074
18		R4	Typical	0	N/A	0	N/A	.702	1	0
19		R5	<Custom>	.578	38	.44	38	.424	1	.067

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (Out of Plane)

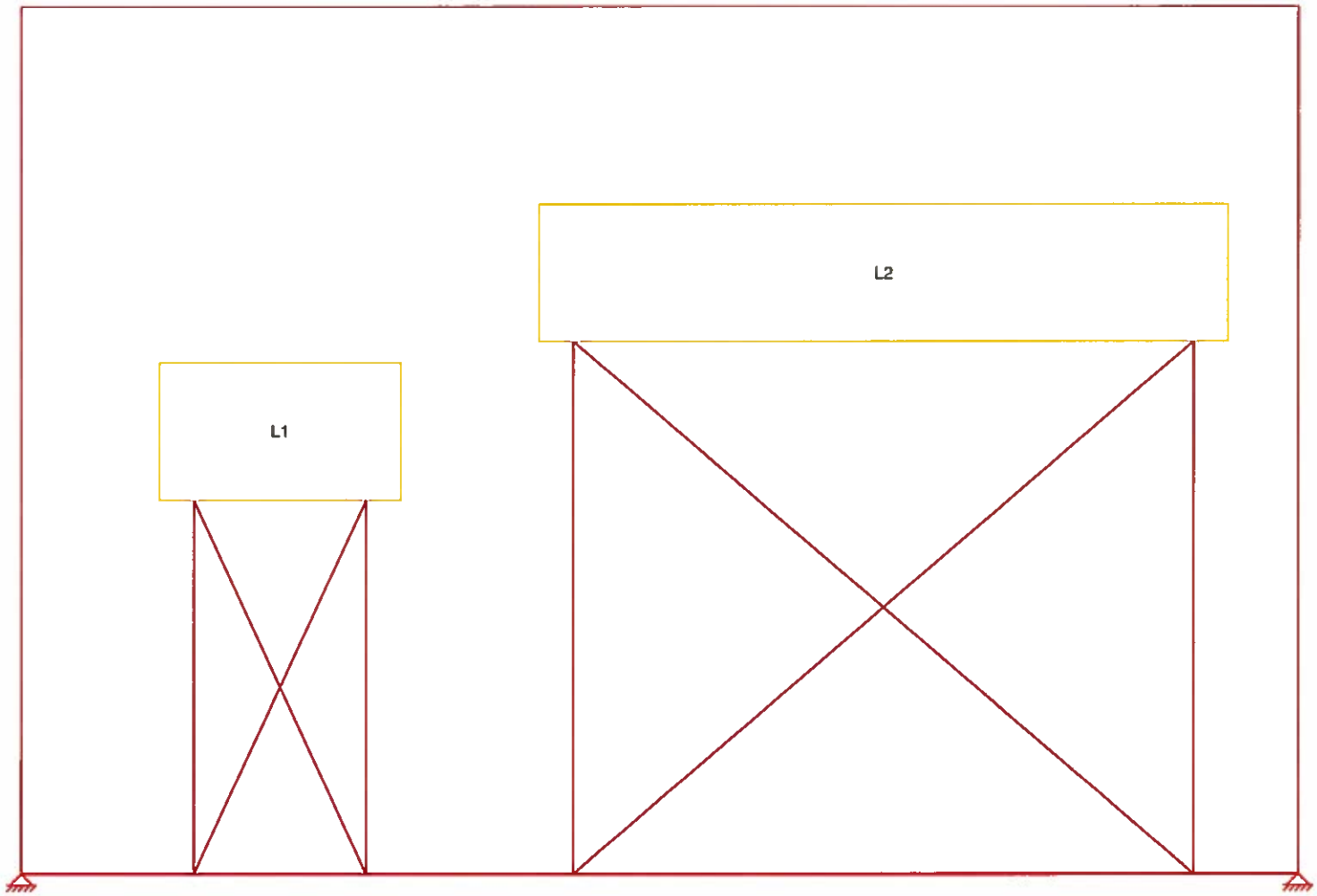
	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP6	R1	Typical	.147	31	.017	31	.723	1.35	.062
2	WP7	R1	Typical	.34	31	.039	31	.723	1.35	.062
3	WP8	R1	Typical	.242	31	.042	45	.723	1.35	.062
4	WP9	R1	Typical	.078	31	.009	31	.737	1.35	.062
5	WP5	R1	Typical	.206	31	.017	45	.424	1.35	.062
6	WP6A	R1	Typical	.501	31	.04	45	.424	1.35	.062
7	WP7A	R1	Typical	.609	31	.049	45	.424	1.35	.062
8		R2	Typical	0	N/A	0	N/A	.644	1.35	.055
9		R3	<Custom>	.682	31	.075	45	.424	1.35	.062
10	WP8A	R1	<Custom>	.643	31	.286	45	.424	1.35	.062
11		R2	Typical	0	N/A	0	N/A	.701	1.35	.055
12		R3	Typical	.893	31	.081	45	.424	1.35	.062
13		R4	Typical	0	N/A	0	N/A	.644	1.35	.055
14		R5	<Custom>	.486	31	.058	45	.424	1.35	.062
15	WP9A	R1	Typical	.225	31	.023	45	.424	1.35	.062
16		R2	Typical	0	N/A	0	N/A	.646	1.35	.055
17		R3	Typical	.696	31	.081	31	.424	1.35	.062
18		R4	Typical	0	N/A	0	N/A	.702	1.35	.055
19		R5	<Custom>	.565	31	.095	45	.424	1.35	.062

Wall Panel ACI 530-11: ASD Masonry Code Checks for Lintels

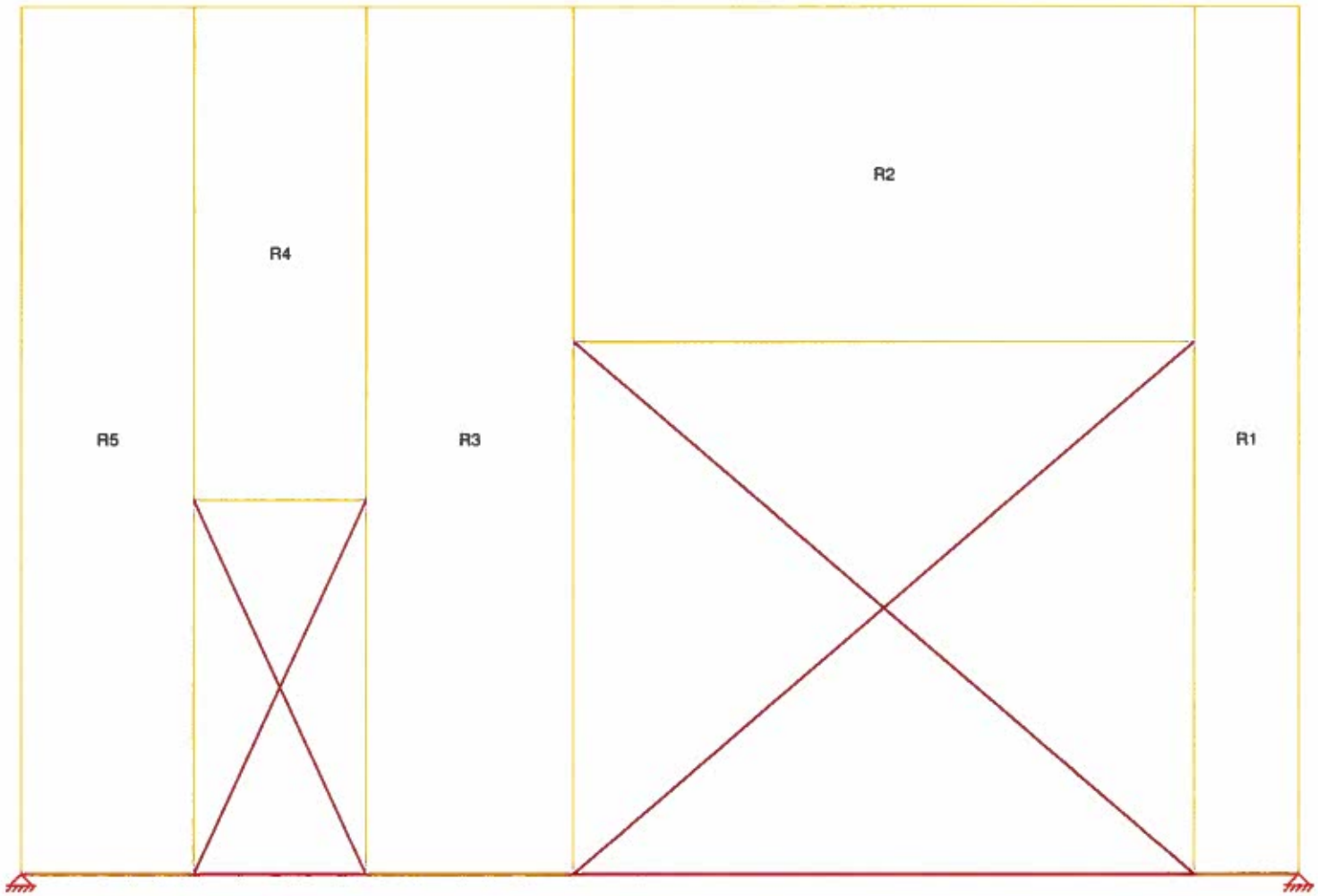
	Wall Pa...	Lintel	Design ...	Flexure UC	LC	Shear UC	LC	Fvm[ksi]	Fvs[ksi]	Fm[ksi]	Fs[ksi]
1	WP7A	L1	Typical	.243	4	.244	38	.086	0	1	32
2	WP8A	L1	Typical	.096	38	.119	38	.092	0	1	32
3		L2	Typical	.319	38	.244	38	.073	0	1	32
4	WP9A	L1	Typical	.245	38	.198	38	.077	0	1	32

Wall Panel ACI 530-11: ASD Masonry Code Checks for Lintels (Continued)

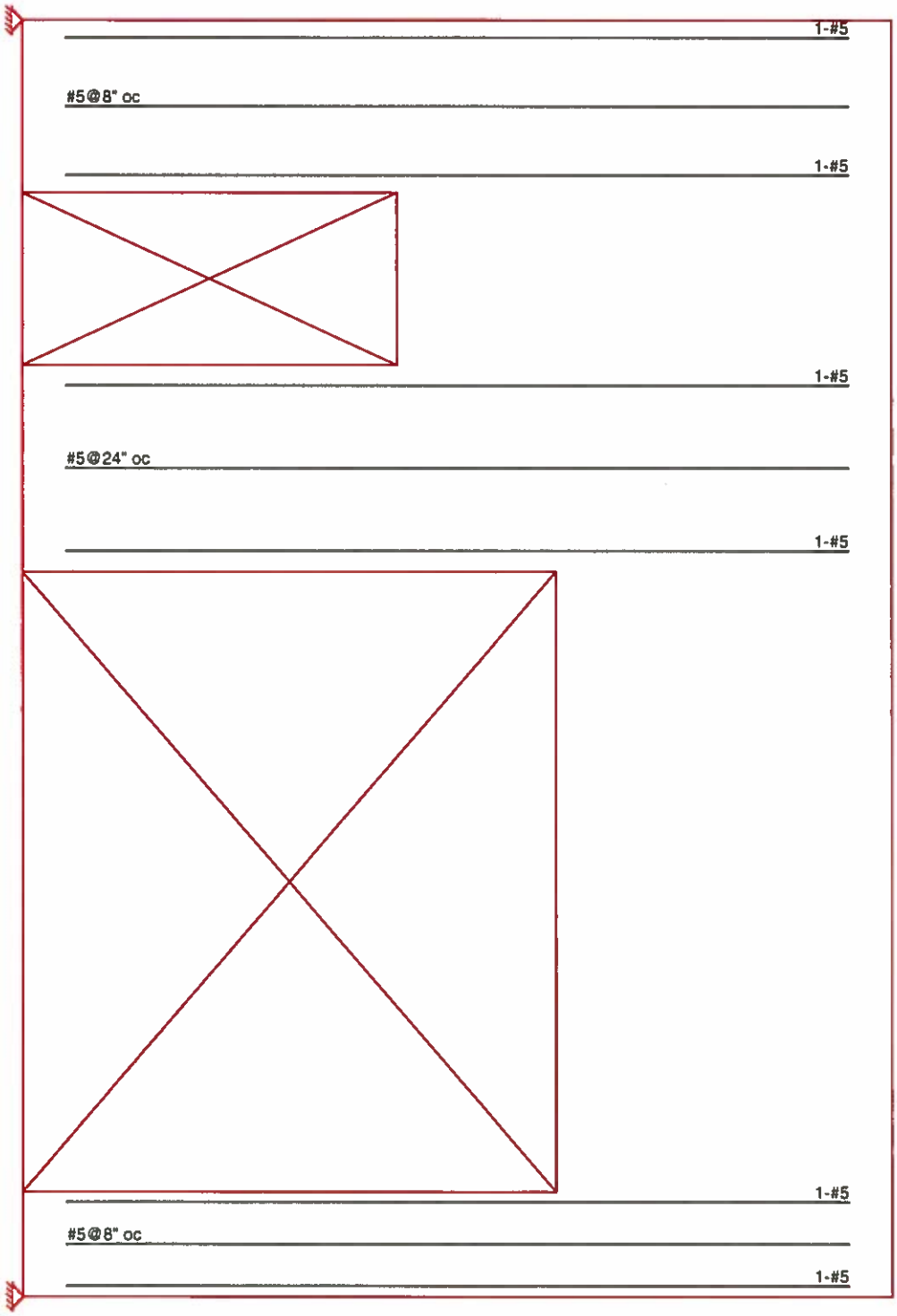
	Wall Pa...	Lintel	Design ...	Flexure UC	LC	Shear UC	LC	Fvm[ksi]	Fvs[ksi]	Fm[ksi]	Fs[ksi]
5		L2	Typical	.07	38	.091	38	.093	0	1	32



	OWTP West Wall	Wall Panel: WP8A
		Jan 24, 2014 at 4:32 PM
		untitled.r3d



	OWTP West Wall	Wall Panel: WP8A
		Jan 24, 2014 at 4:32 PM
		untitled.r3d



OWTP West Wall

Wall Panel: WP8A

Jan 27, 2014 at 9:26 AM

West Wall.R3D

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Hor Bar Size	: #5	
Vert Bar Size	: #5	
No of Ten Bars	: 2	
Effective Depth	: 20.33	in

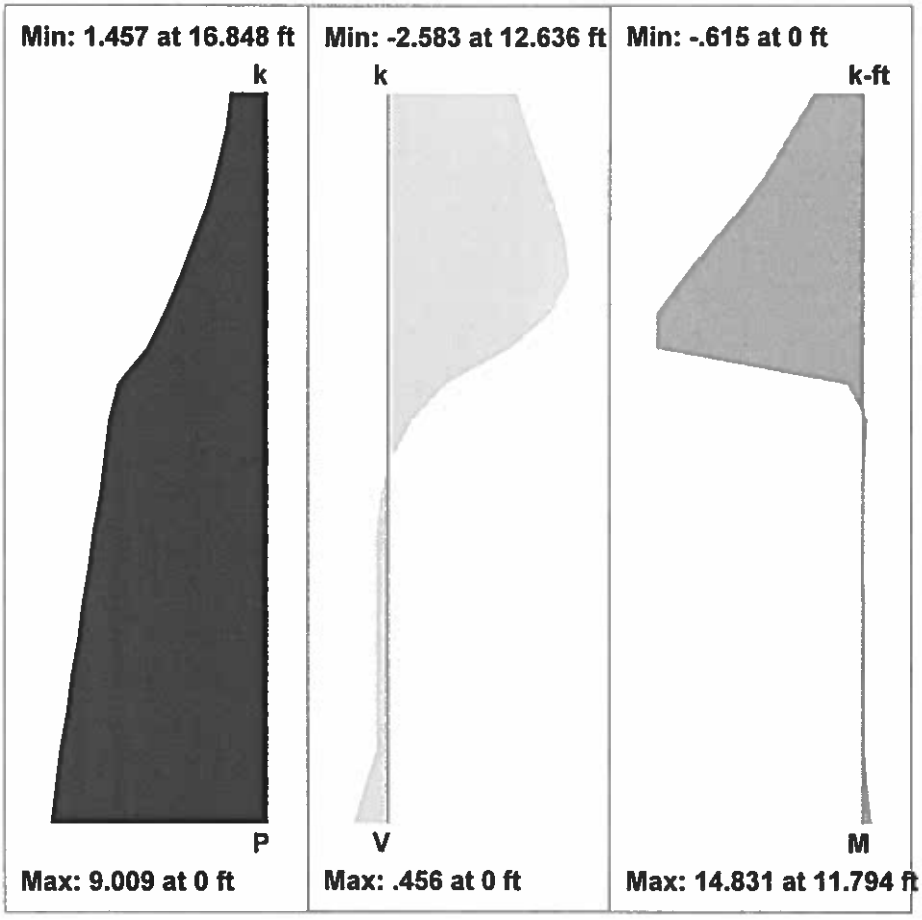
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 16.848	ft
Total Length	: 2.027	ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 8"	
Blk Nom Width	: 8"	
1.5 Shear Factor	: Yes	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb)/Fb	: .452
fa/Fa	: .064
fs/Fs	: .368

AXIAL SUMMARY

fa	: .027	ksi
Fa	: .424	ksi

BENDING SUMMARY

fb	: .425	ksi
Fb	: 1	ksi
fs	: 11.77	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv / Fv	: .376
u/U	: .182

SHEAR SUMMARY

fv	: .025	ksi
Fv	: .066	ksi
Fvm	: .066	ksi
Fv max	: .11	ksi
u	: .036	ksi
U	: .2	ksi

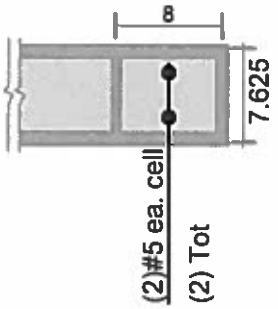
DESIGN DETAILS AT GOVERNING SECTION

AXIAL COMPRESSION DETAILS			BENDING DETAILS			SHEAR DETAILS		
Axial	: 5.003	k	Moment	: 14.777	k-ft	Shear	: 2.583	k
Location	: 10.951	ft	Location	: 10.951	ft	Location	: 12.636	ft
Load Comb	: 38		Load Comb	: 38		Load Comb	: 38	
Rad gyration r	: 2.19	in	Sect Mod S	: 752.3	in3	Corresponding M:	12.735	k-ft
h'/r	: 92.318		Tension St Asv	: 0.6136	in2	Corresponding P :	3.597	k
Red Factor R	: .565		Per of steel p	: 0.003958		M / (V*d)	: 1	
			k*d	: 7.043	in	Shear St Area	: Not Reqd.	
			j	: 0.88		Shear Spacing	: N/A	
						Peri of Bars	: N/A	

CRACKED SECT ANALYSIS

fm = fa + fb	: .452	ksi
C	: 12.132	k
T	: 7.13	k

CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Type of Design	: ASD	
Reinforced	: Yes	
Vertical Bar Size	: #5	
End Face Dist	: 5.563	in

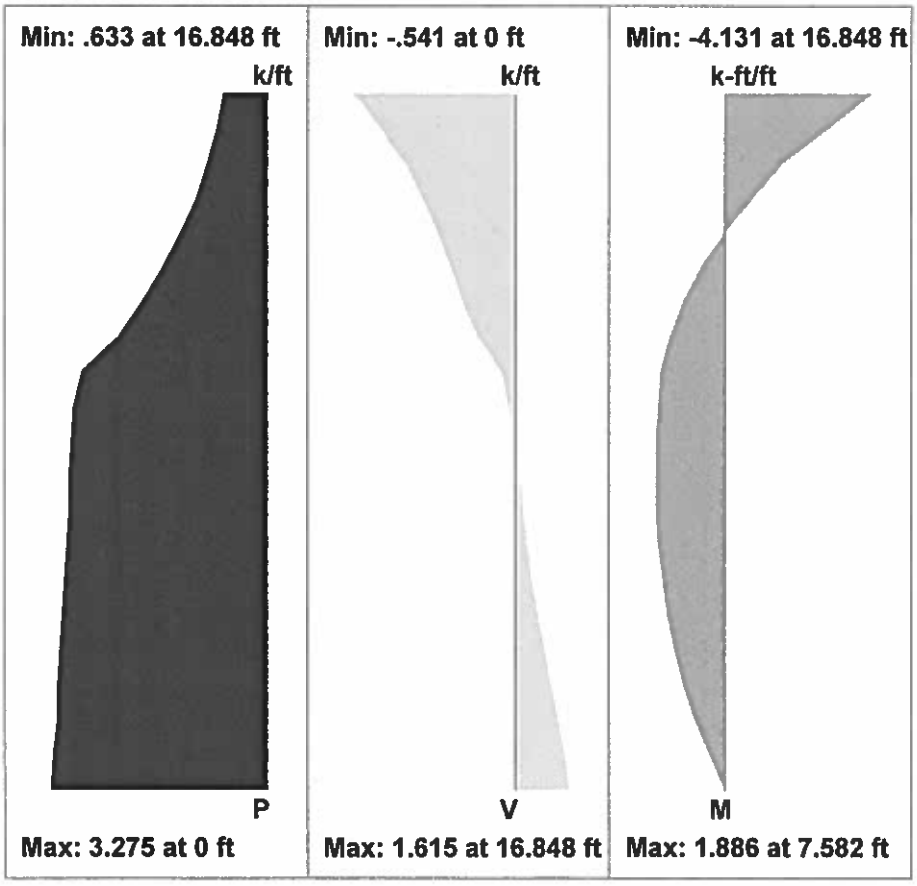
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 16.848	ft
Eq Sld Thickness	: 7.625"	
An	: 91.5	in2/ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 8"	
Loc of r/f	: Each Face	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb) / Fb	: .643
fa/Fa	: .016
fs/Fs	: .685

AXIAL SUMMARY

fa	: .007	ksi
Fa	: .424	ksi

BENDING SUMMARY

fb	: .861	ksi
Fb	: 1.35	ksi
fs	: 21.933	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv/Fv	: .285
u/U	: .558

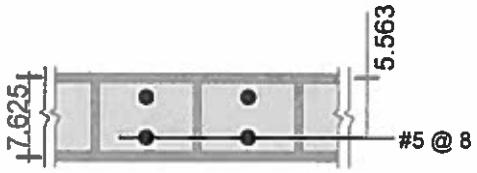
SHEAR SUMMARY

fv	: .018	ksi
Fv	: .062	ksi
Fv max	: .11	ksi
u	: .112	ksi
U	: .2	ksi

DESIGN DETAILS

AXIAL DETAILS			BENDING DETAILS			SHEAR DETAILS		
Max Axial	: .633	k/ft	Max Moment	: 4.131	k-ft/ft	Max Shear	: 1.615	k/ft
Location	: 16.848	ft	Location	: 16.848	ft	Location	: 16.848	ft
Load Comb	: 31		Load Comb	: 31		Load Comb	: 31	
Rad gyration r	: 2.19	in	k	: .351		Width for Shear	: 8	in
h'/r	: 92.318		d	: 5.563	in	Corresponding M:	4.131	k-ft/ft
			j	: .883		Corresponding P :	.633	k/ft
						M / (V*d)	: 1	

CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Type of Design	: ASD	
Stirrup Size	: #3	
Flex Steel	: 1-#5	

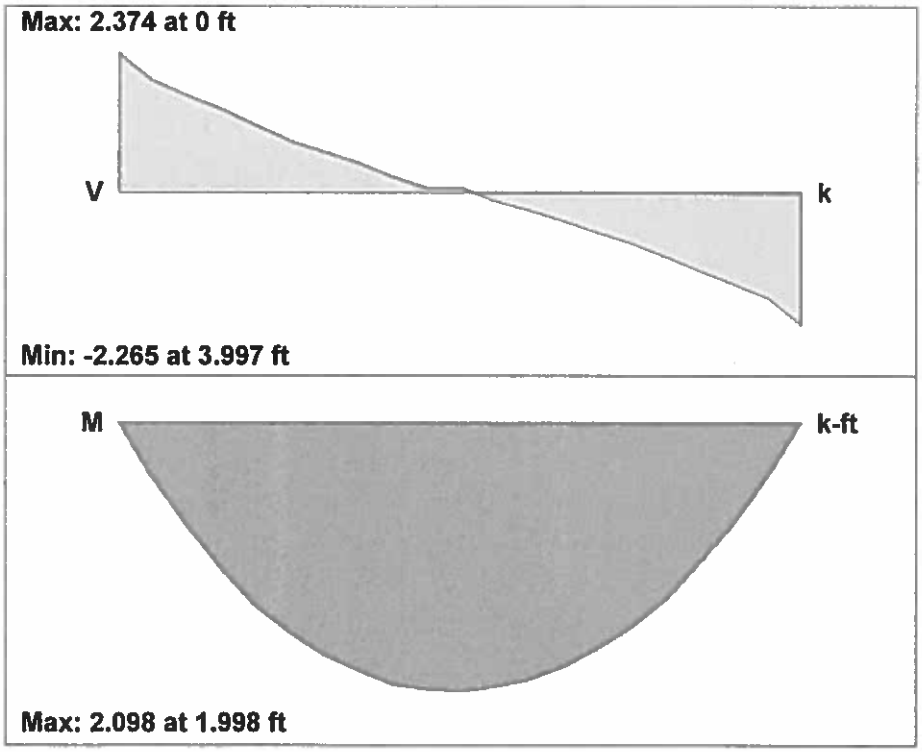
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Beam Dead Wt	: .208	k/ft
Wall Dead Wt	: .078	ksf

GEOMETRY

Dist to Top of Wall	: 6.931	ft
Eff Length	: 3.997	ft
Eff Width	: 7.625	in
Eff depth	: 28.5	in
Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .119	
Bond Chk u/U	: .226	
fv	: .011	ksi
Fv	: .092	ksi
Fvm	: .092	ksi
FvMax	: .155	ksi
u	: .045	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .096	
Bend Chk fm/Fm	: .048	
fm	: .048	ksi
Fm	: 1	ksi
fs	: 3.062	ksi
Fs	: 32	ksi

DESIGN DETAILS

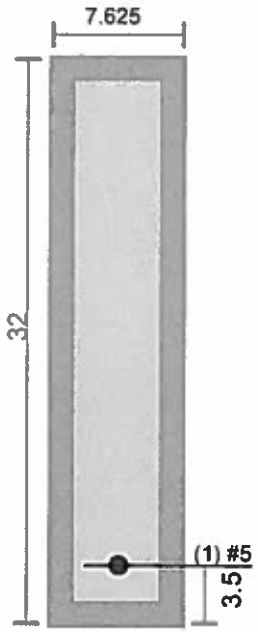
BENDING DETAILS

Max Moment	: 2.098	k-ft	Steel Area As	: .307	in2
Location	: 1.998	ft	Per of steel p	: .001	
Load Comb	: 38				
Mm	: 43.42	k-ft	k	: .179	
Ms	: 21.926	k-ft	j	: .94	

SHEAR DETAILS

Max Shear	: 2.374	k
Location	: 0	ft
Load Comb	: 38	
M / (V*d)	: .372	
Tie Spacing	: Not Required	

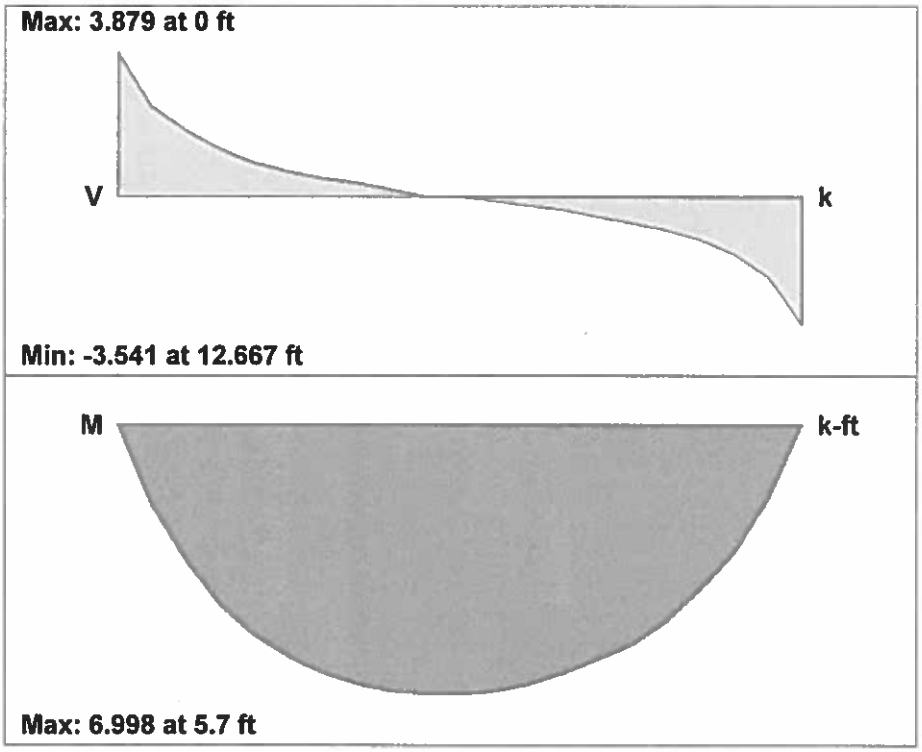
CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 3	ksi	Dist to Top of Wall	: 3.848	ft
Special Insp	: Yes	Masonry Em	: 2100	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 12.667	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 1-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .244	
Bond Chk u/U	: .369	
fv	: .018	ksi
Fv	: .073	ksi
Fvm	: .073	ksi
FvMax	: .127	ksi
u	: .074	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .319	
Bend Chk fm/Fm	: .161	
fm	: .161	ksi
Fm	: 1	ksi
fs	: 10.214	ksi
Fs	: 32	ksi

DESIGN DETAILS

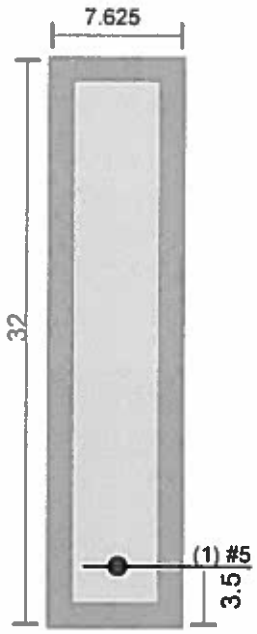
BENDING DETAILS

Max Moment	: 6.998	k-ft	Steel Area As	: .307	in2
Location	: 5.7	ft	Per of steel p	: .001	
Load Comb	: 38				
Mm	: 43.42	k-ft	k	: .179	
Ms	: 21.926	k-ft	j	: .94	

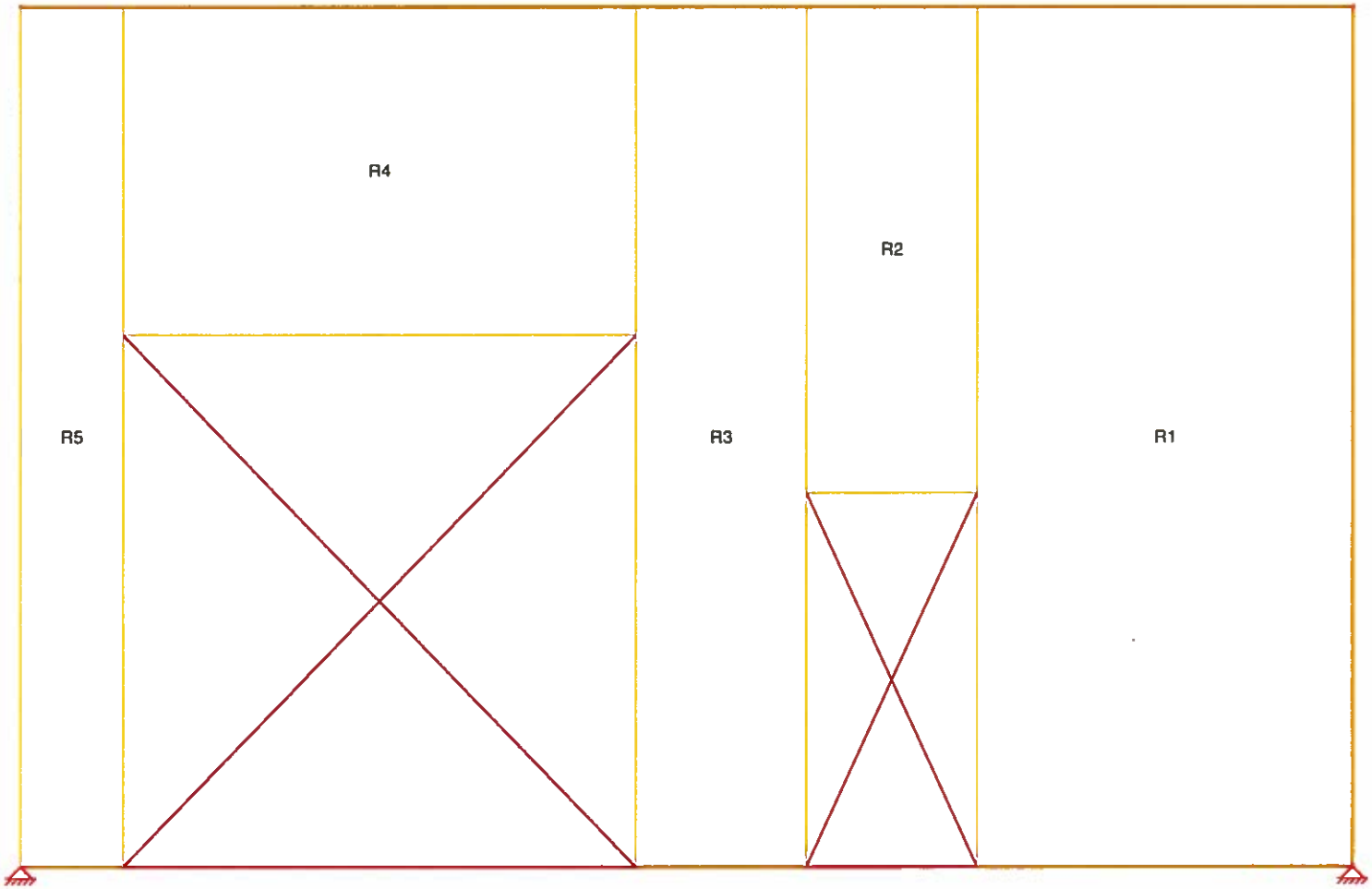
SHEAR DETAILS

Max Shear	: 3.879	k
Location	: 0	ft
Load Comb	: 38	
M / (V*d)	: .76	
Tie Spacing	: Not Required	

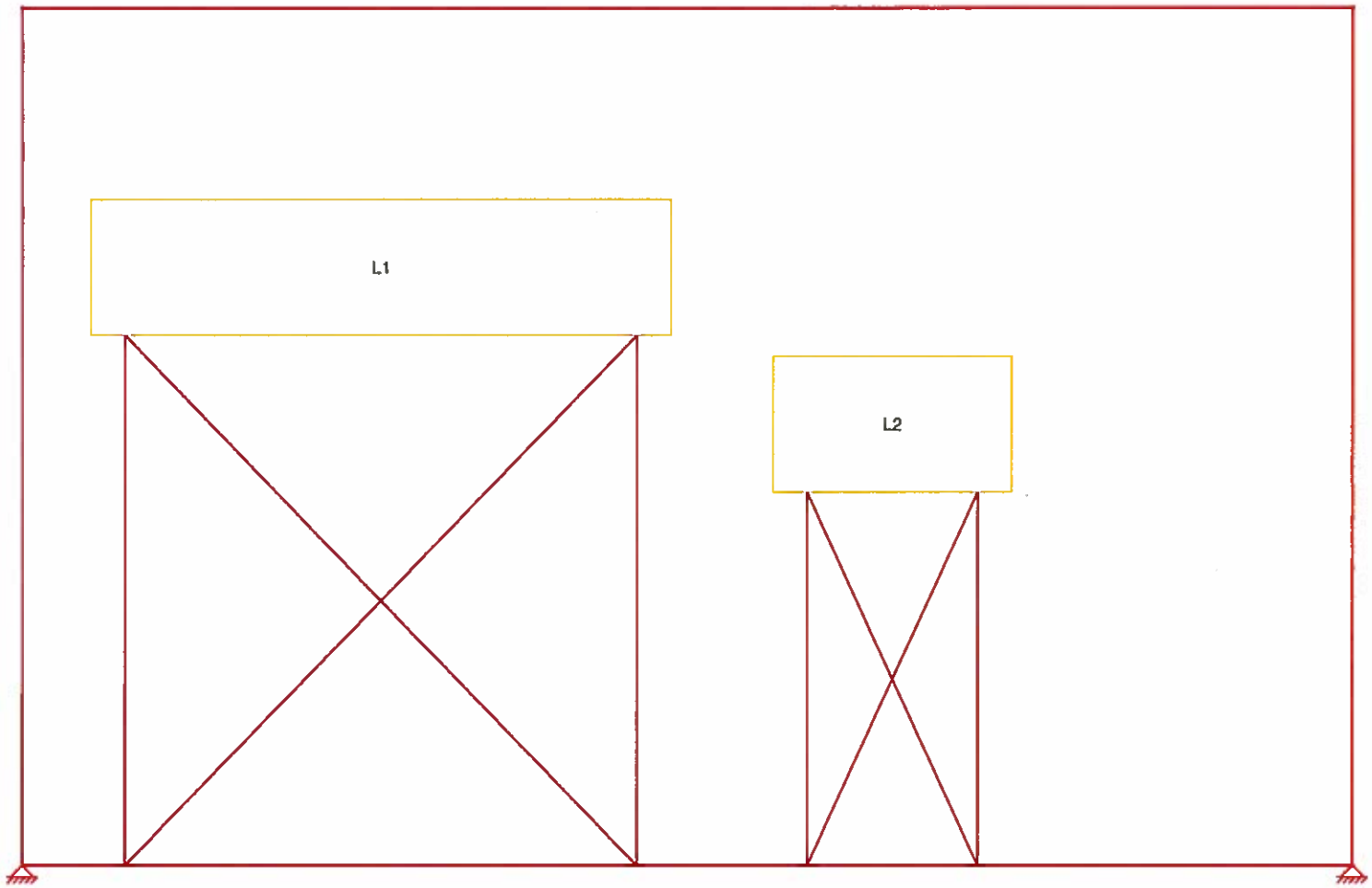
CROSS SECTION DETAILING



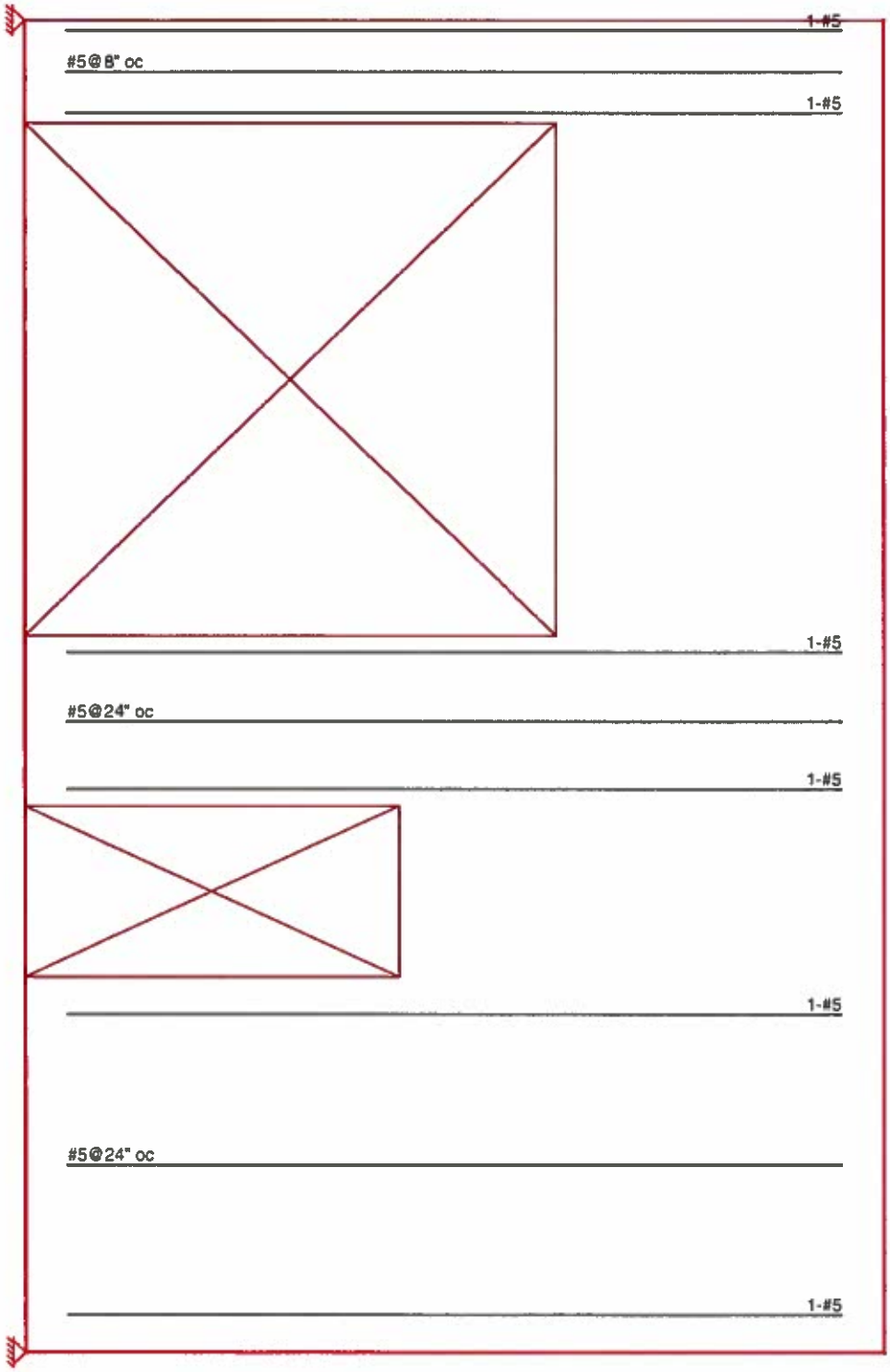
NOTE: All units are in "in."



	OWTP West Wall	Wall Panel: WP9A
		Jan 24, 2014 at 4:33 PM
		untitled.r3d



	OWTP West Wall	Wall Panel: WP9A
		Jan 24, 2014 at 4:33 PM
		untitled.r3d



OWTP West Wall

Wall Panel: WP9A

Jan 27, 2014 at 10:48 AM

West Wall.R3D

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Hor Bar Size	: #5	
Vert Bar Size	: #5	
No of Ten Bars	: 1	
Effective Depth	: 20	in

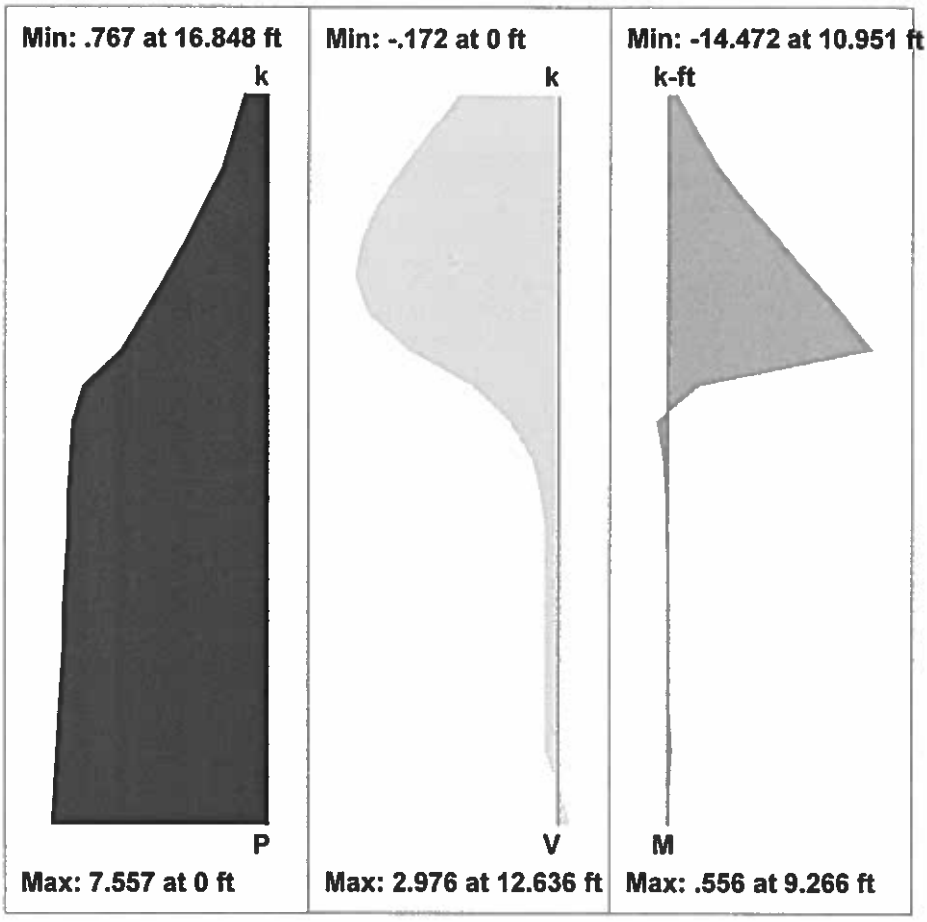
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 16.848	ft
Total Length	: 2	ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 8"	
Blk Nom Width	: 8"	
1.5 Shear Factor	: Yes	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb)/Fb	: .578
fa/Fa	: .066
fs/Fs	: .684

AXIAL SUMMARY

fa	: .028	ksi
Fa	: .424	ksi

BENDING SUMMARY

fb	: .55	ksi
Fb	: 1	ksi
fs	: 21.893	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv / Fv	: .44
u/U	: .416

SHEAR SUMMARY

fv	: .029	ksi
Fv	: .067	ksi
Fvm	: .067	ksi
Fv max	: .11	ksi
u	: .083	ksi
U	: .2	ksi

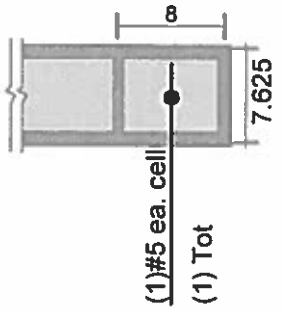
DESIGN DETAILS AT GOVERNING SECTION

AXIAL COMPRESSION DETAILS			BENDING DETAILS			SHEAR DETAILS		
Axial	: 5.146	k	Moment	: 14.472	k-ft	Shear	: 2.976	k
Location	: 10.951	ft	Location	: 10.951	ft	Location	: 12.636	ft
Load Comb	: 38		Load Comb	: 38		Load Comb	: 38	
Rad gyration r	: 2.19	in	Sect Mod S	: 732	in3	Corresponding M	: 10.095	k-ft
h'/r	: 92.318		Tension St Asv	: 0.3068	in2	Corresponding P	: 3.581	k
Red Factor R	: .565		Per of steel p	: 0.002012		M / (V*d)	: 1	
			k*d	: 5.347	in	Shear St Area	: Not Reqd.	
			j	: 0.91		Shear Spacing	: N/A	
						Peri of Bars	: N/A	

CRACKED SECT ANALYSIS

fm = fa + fb	: .578	ksi
C	: 11.792	k
T	: 6.646	k

CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Type of Design	: ASD	
Reinforced	: Yes	
Vertical Bar Size	: #5	
End Face Dist	: 3.813	in

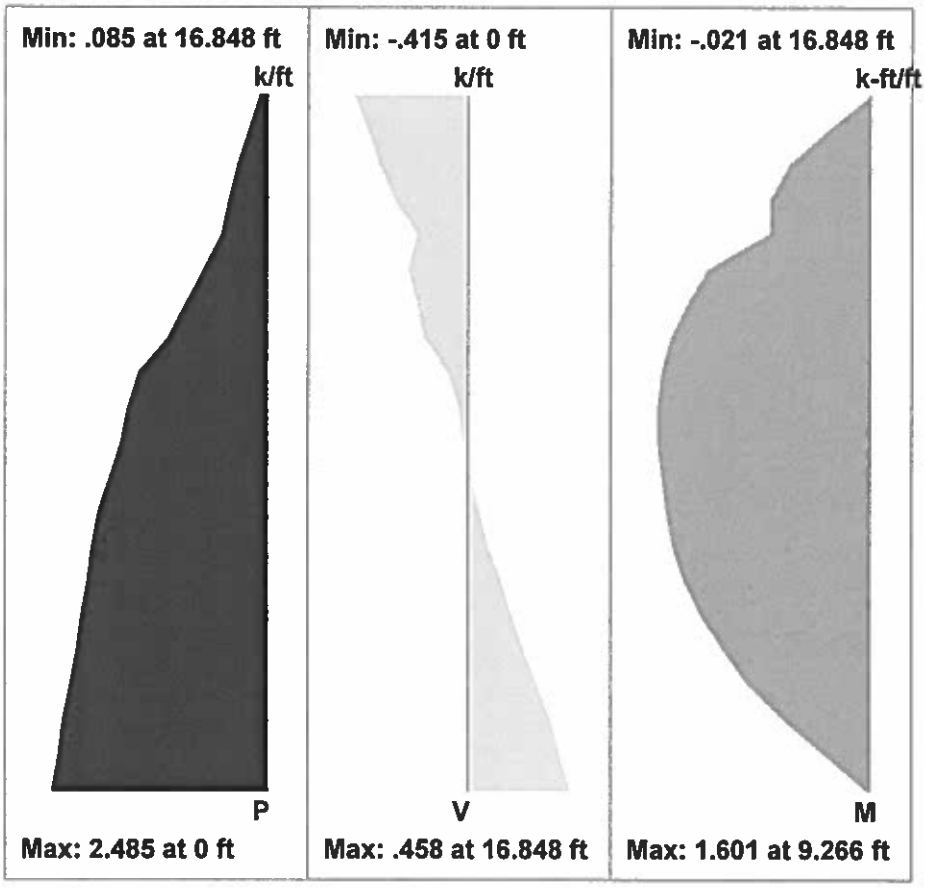
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 16.848	ft
Eq Sld Thickness	: 7.625"	
An	: 91.5	in2/ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 24"	
Loc of r/f	: Center	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb) / Fb	: .696
fa/Fa	: .041
fs/Fs	: 1.125

AXIAL SUMMARY

fa	: .017	ksi
Fa	: .424	ksi

BENDING SUMMARY

fb	: .923	ksi
Fb	: 1.35	ksi
fs	: 35.986	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv/Fv	: .081
u/U	: .67

SHEAR SUMMARY

fv	: .005	ksi
Fv	: .062	ksi
Fv max	: .11	ksi
u	: .134	ksi
U	: .2	ksi

DESIGN DETAILS

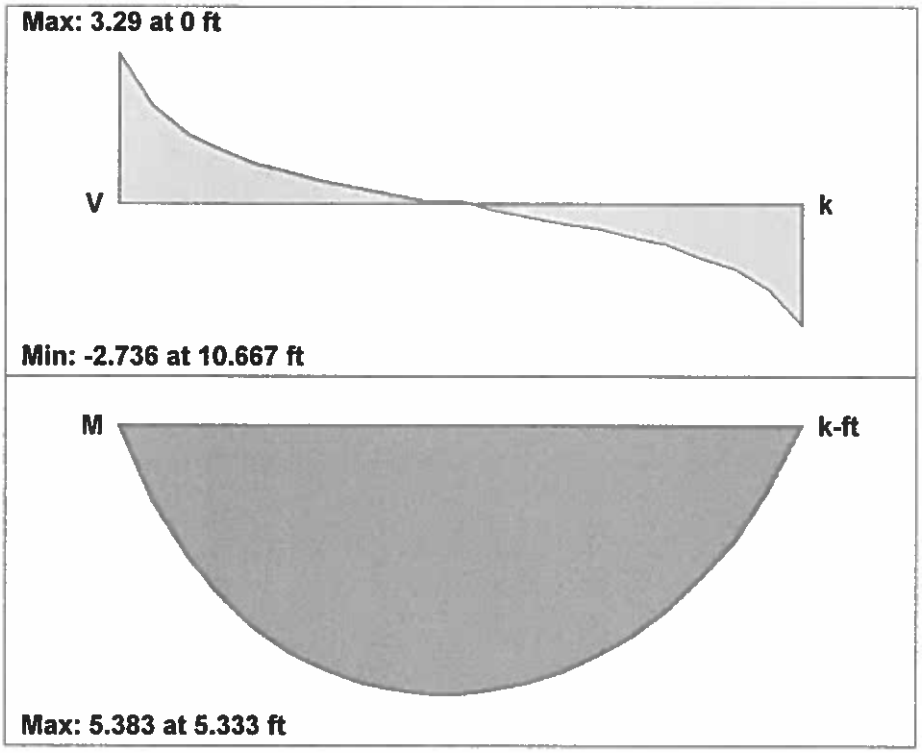
AXIAL DETAILS			BENDING DETAILS			SHEAR DETAILS		
Max Axial	: 1.594	k/ft	Max Moment	: 1.601	k-ft/ft	Max Shear	: .458	k/ft
Location	: 9.266	ft	Location	: 9.266	ft	Location	: 16.848	ft
Load Comb	: 31		Load Comb	: 31		Load Comb	: 31	
Rad gyration r	: 2.19	in	k	: .262		Width for Shear	: 24	in
h'/r	: 92.318		d	: 3.813	in	Corresponding M	: .021	k-ft/ft
			j	: .913		Corresponding P	: .085	k/ft
						M / (V*d)	: 1	

CROSS SECTION DETAILING

NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 3	ksi	Dist to Top of Wall	: 3.769	ft
Special Insp	: Yes	Masonry Em	: 2100	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 10.667	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 1-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .198	
Bond Chk u/U	: .313	
fv	: .015	ksi
Fv	: .077	ksi
Fvm	: .077	ksi
FvMax	: .132	ksi
u	: .063	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .246	
Bend Chk fm/Fm	: .124	
fm	: .124	ksi
Fm	: 1	ksi
fs	: 7.856	ksi
Fs	: 32	ksi

DESIGN DETAILS

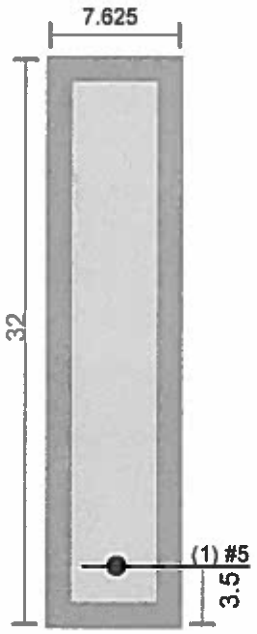
BENDING DETAILS

Max Moment	: 5.383	k-ft	Steel Area As	: .307	in2
Location	: 5.333	ft	Per of steel p	: .001	
Load Comb	: 38				
Mm	: 43.42	k-ft	k	: .179	
Ms	: 21.926	k-ft	j	: .94	

SHEAR DETAILS

Max Shear	: 3.29	k
Location	: 0	ft
Load Comb	: 38	
M / (V*d)	: .689	
Tie Spacing	: Not Required	

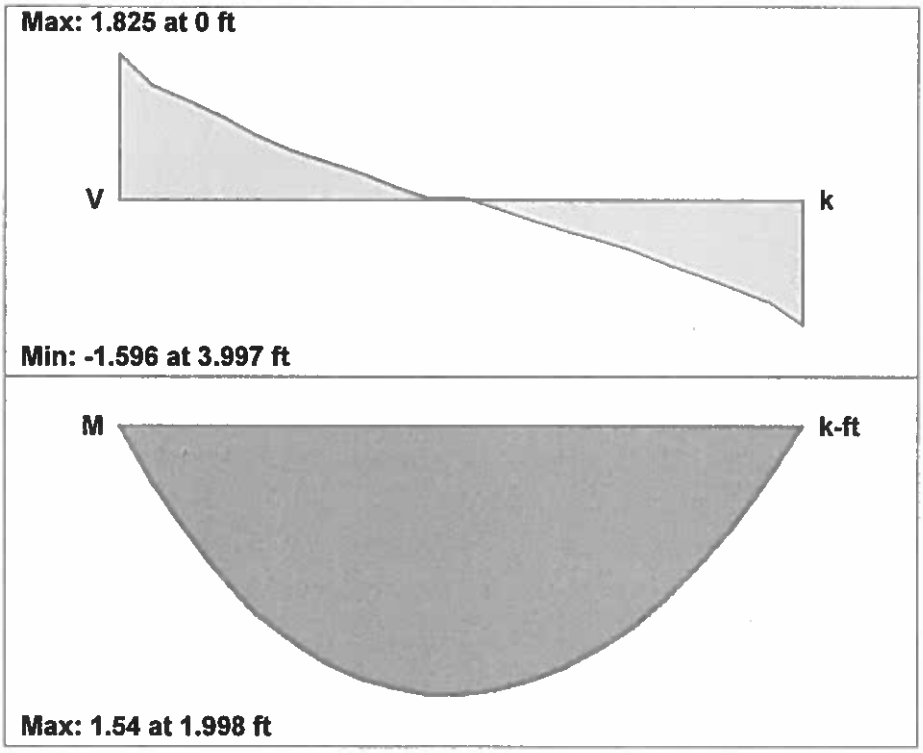
CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 3	ksi	Dist to Top of Wall	: 6.852	ft
Special Insp	: Yes	Masonry Em	: 2100	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 3.997	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 1-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .091	
Bond Chk u/U	: .173	
fv	: .008	ksi
Fv	: .093	ksi
Fvm	: .093	ksi
FvMax	: .157	ksi
u	: .035	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .07	
Bend Chk fm/Fm	: .035	
fm	: .035	ksi
Fm	: 1	ksi
fs	: 2.247	ksi
Fs	: 32	ksi

DESIGN DETAILS

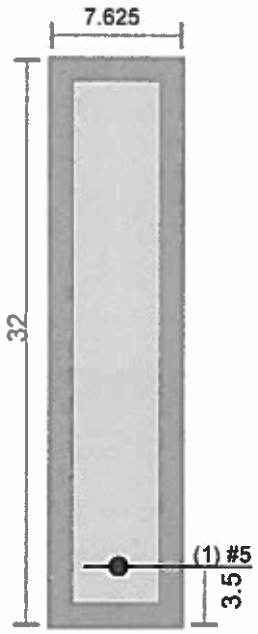
BENDING DETAILS

Max Moment	: 1.54	k-ft	Steel Area As	: .307	in2
Location	: 1.998	ft	Per of steel p	: .001	
Load Comb	: 38				
Mm	: 43.42	k-ft	k	: .179	
Ms	: 21.926	k-ft	j	: .94	

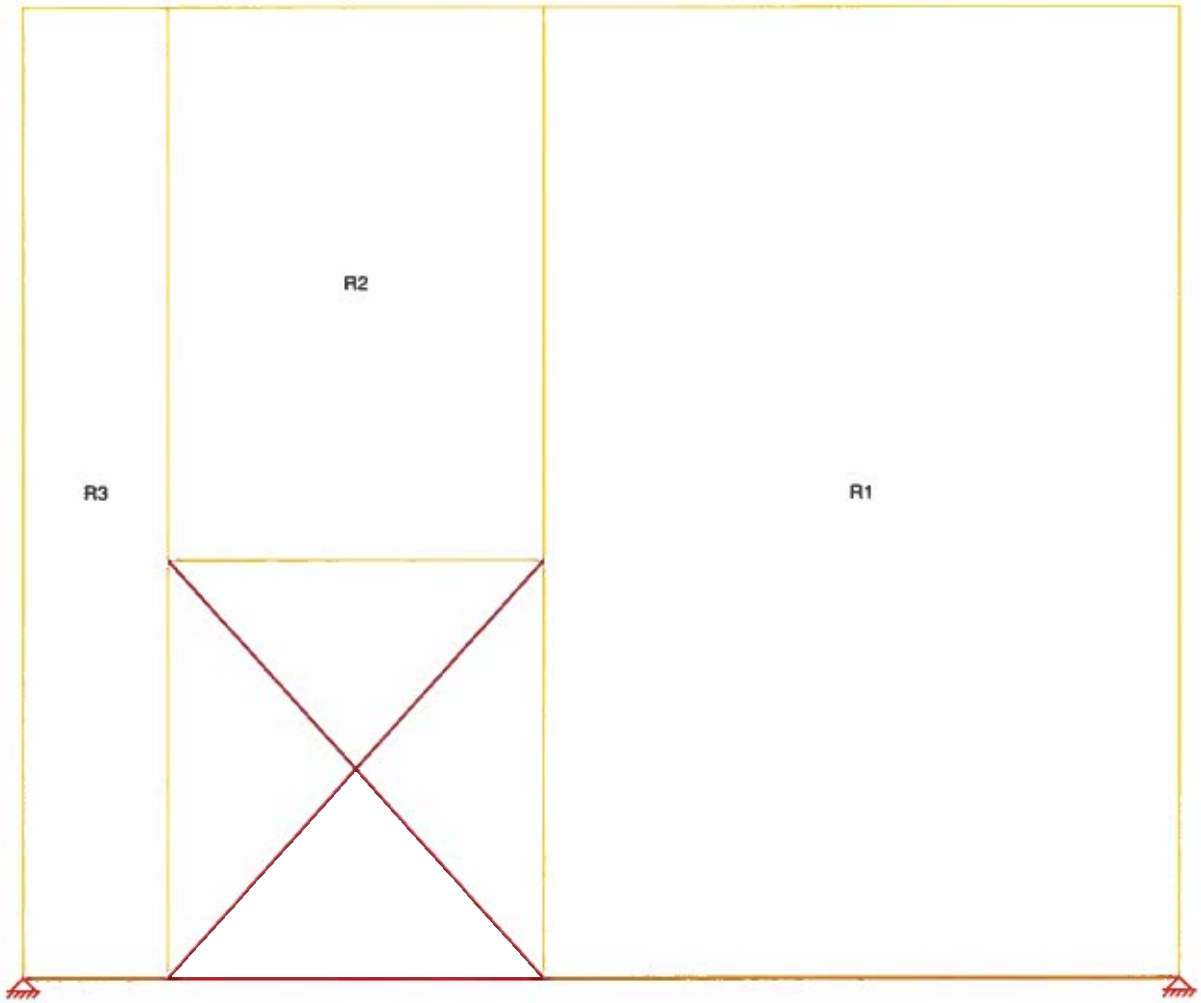
SHEAR DETAILS

Max Shear	: 1.825	k
Location	: 0	ft
Load Comb	: 38	
M / (V*d)	: .355	
Tie Spacing	: Not Required	

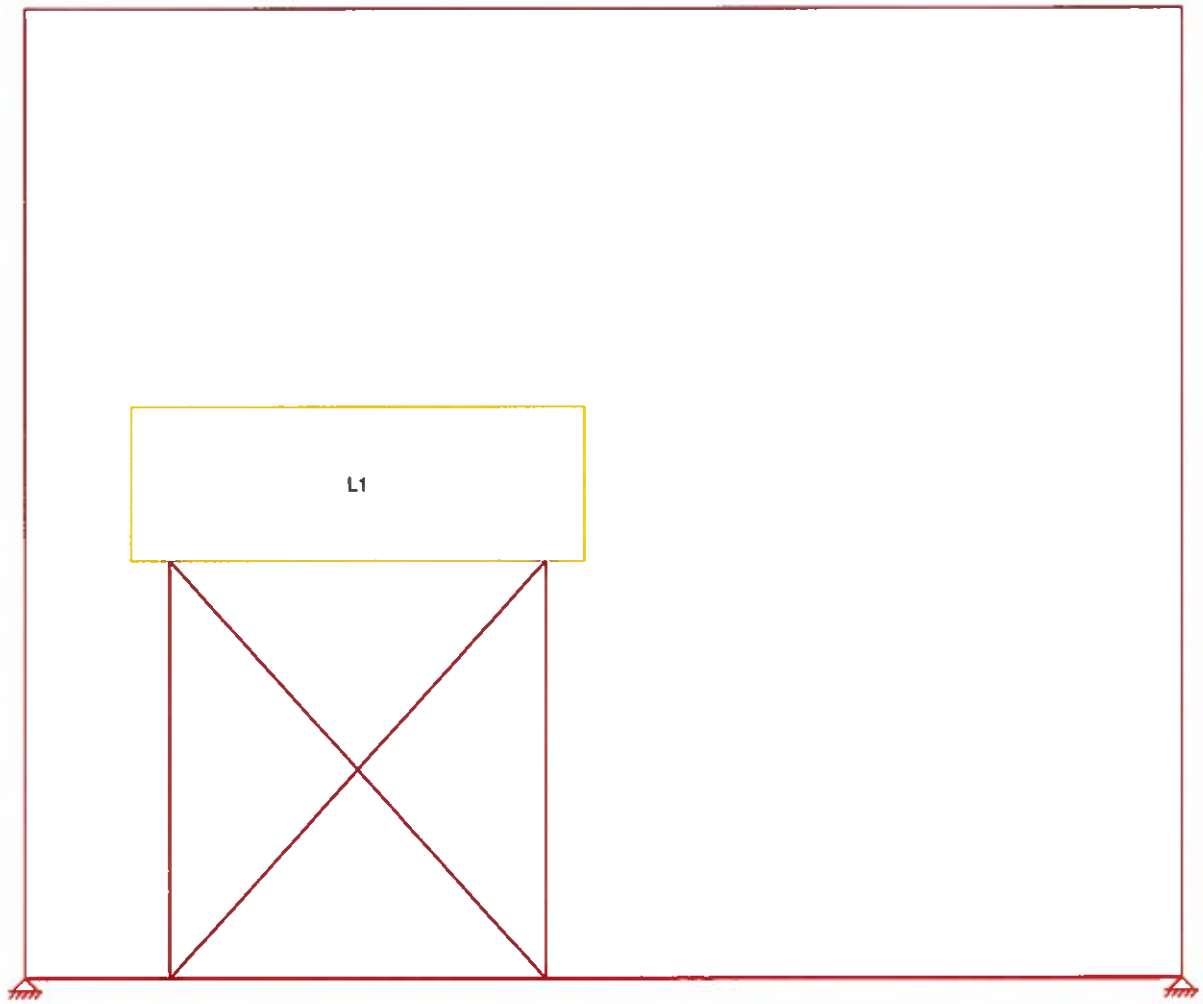
CROSS SECTION DETAILING



NOTE: All units are in "in."



	OWTP West Wall	Wall Panel: WP7A
		Jan 24, 2014 at 4:34 PM
		untitled.r3d



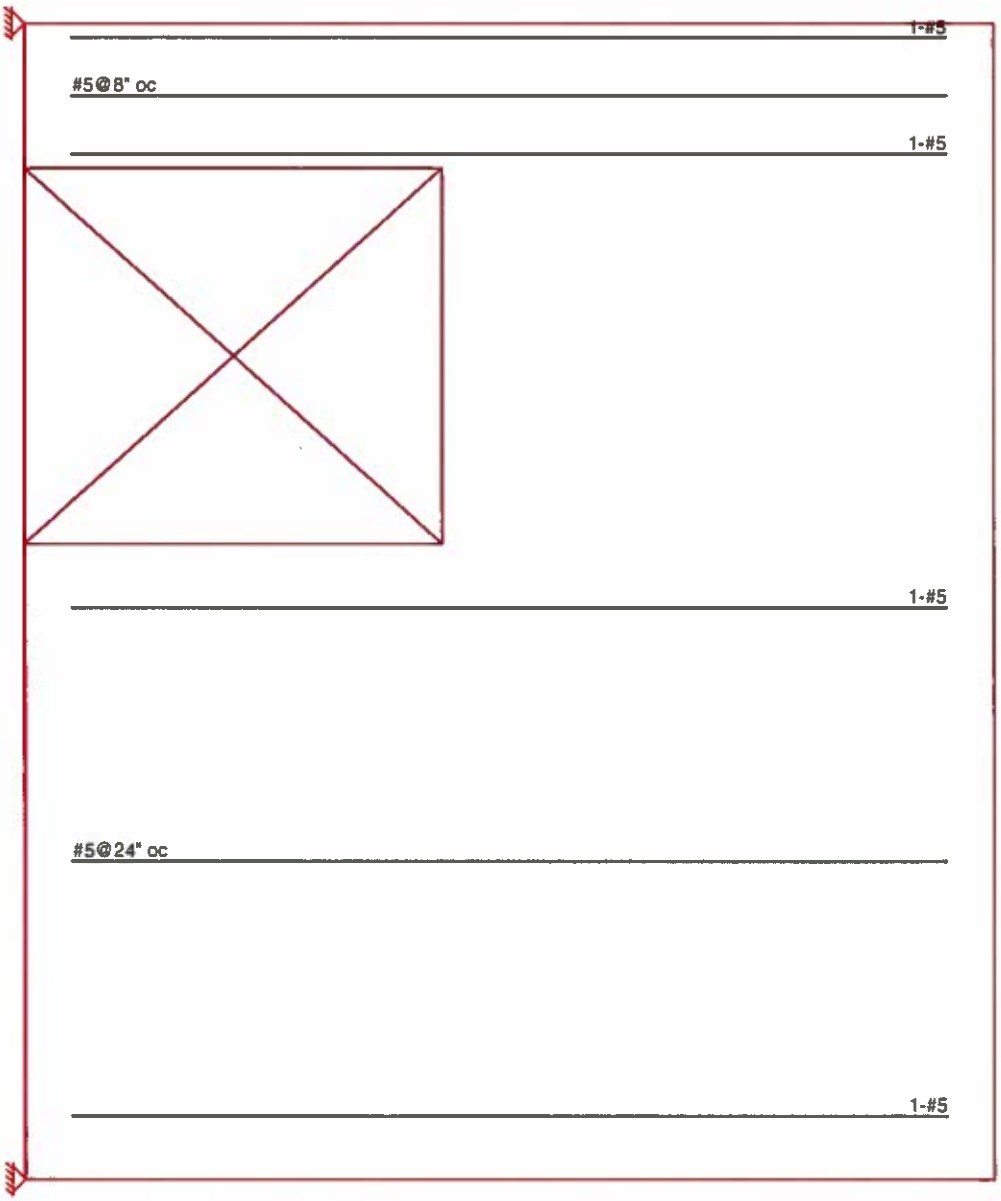
	OWTP West Wall	Wall Panel: WP7A
		Jan 24, 2014 at 4:34 PM
		untitled.r3d

OWTP West Wall

Wall Panel: WP7A

Jan 27, 2014 at 10:47 AM

West Wall.R3D



CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Hor Bar Size	: #5	
Vert Bar Size	: #5	
No of Ten Bars	: 1	
Effective Depth	: 26	in

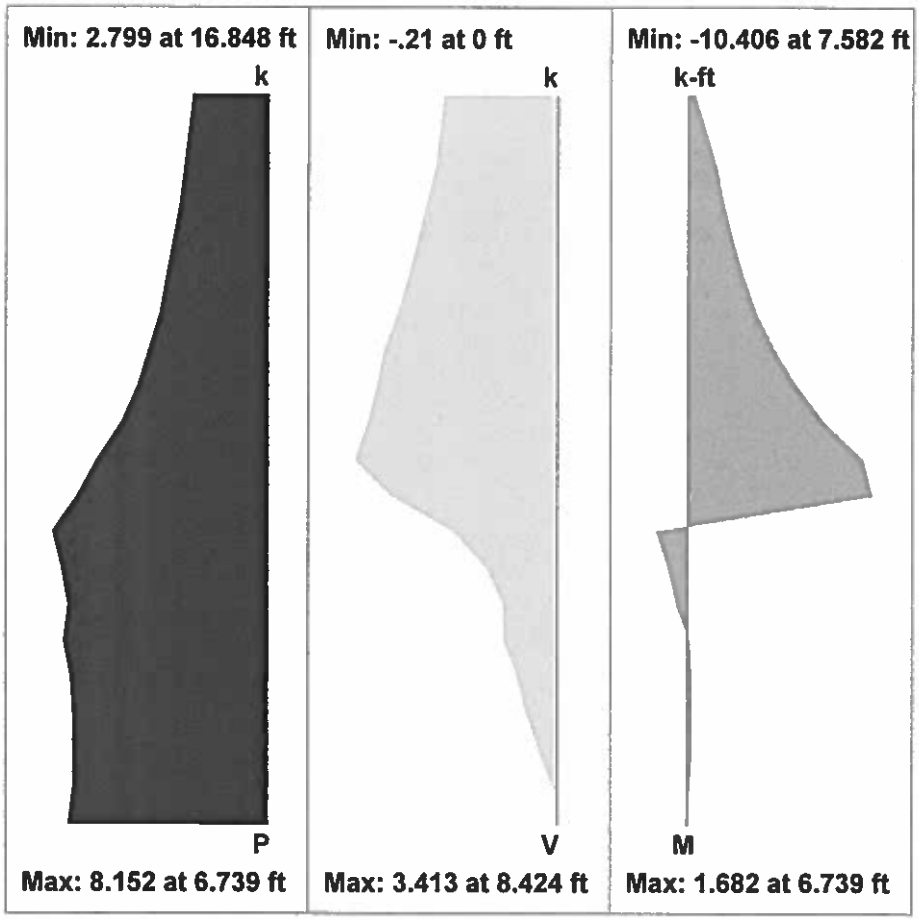
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 16.848	ft
Total Length	: 2.5	ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 8"	
Blk Nom Width	: 8"	
1.5 Shear Factor	: Yes	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb)/Fb	: .245
fa/Fa	: .074
fs/Fs	: .181

AXIAL SUMMARY

fa	: .031	ksi
Fa	: .424	ksi

BENDING SUMMARY

fb	: .213	ksi
Fb	: 1	ksi
fs	: 5.782	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv / Fv	: .376
u/U	: .38

SHEAR SUMMARY

fv	: .026	ksi
Fv	: .069	ksi
Fvm	: .069	ksi
Fv max	: .11	ksi
u	: .076	ksi
U	: .2	ksi

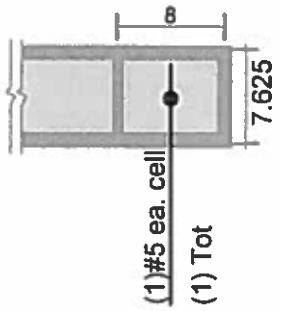
DESIGN DETAILS AT GOVERNING SECTION

AXIAL COMPRESSION DETAILS			BENDING DETAILS			SHEAR DETAILS		
Axial	: 7.193	k	Moment	: 10.406	k-ft	Shear	: 3.413	k
Location	: 7.582	ft	Location	: 7.582	ft	Location	: 8.424	ft
Load Comb	: 38		Load Comb	: 38		Load Comb	: 38	
Rad gyration r	: 2.19	in	Sect Mod S	: 1144	in3	Corresponding M:	10.008	k-ft
h'/r	: 92.318		Tension St Asv	: 0.3068	in2	Corresponding P :	6.471	k
Red Factor R	: .565		Per of steel p	: 0.001548		M / (V*d)	: 1	
			k*d	: 9.59	in	Shear St Area	: Not Reqd.	
			j	: 0.88		Shear Spacing	: N/A	
						Peri of Bars	: N/A	

CRACKED SECT ANALYSIS

fm = fa + fb	: .245	ksi
C	: 8.946	k
T	: 1.753	k

CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Type of Design	: ASD	
Reinforced	: Yes	
Vertical Bar Size	: #5	
End Face Dist	: 3.813	in

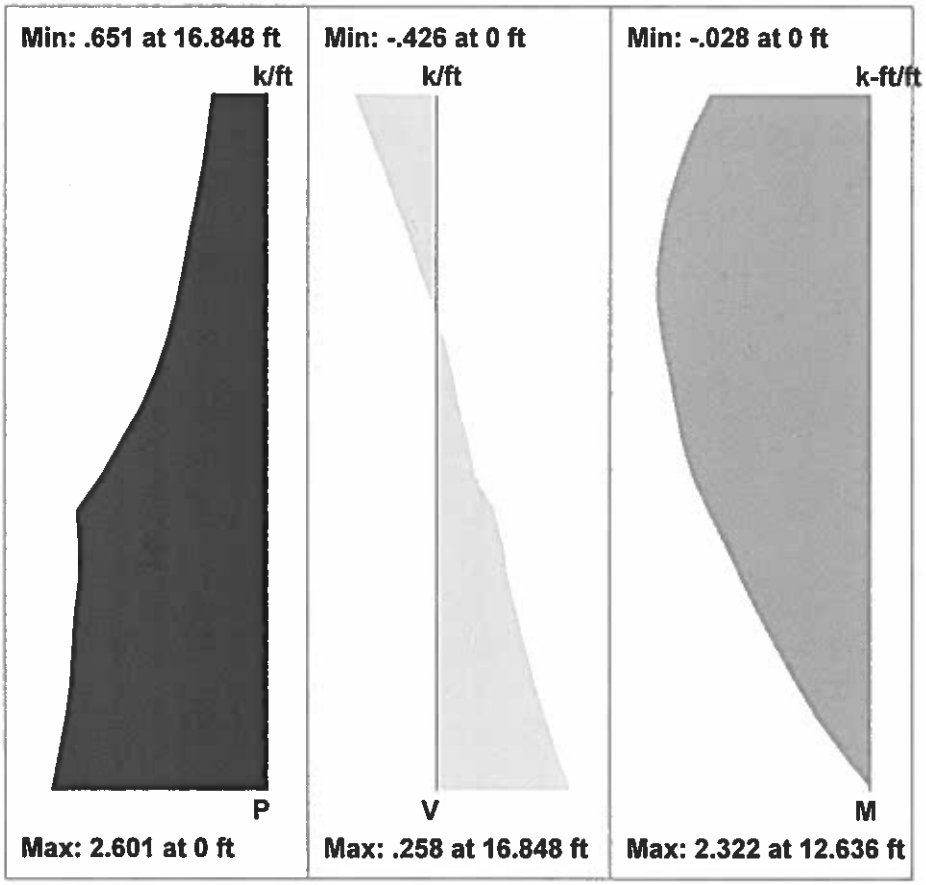
MATERIALS

Masonry f'm	: 3	ksi
Masonry Em	: 2100	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 16.848	ft
Eq Sld Thickness	: 7.625"	
An	: 91.5	in2/ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 8"	
Loc of r/f	: Center	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb) / Fb	: .682
fa/Fa	: .026
fs/Fs	: .574

AXIAL SUMMARY

fa	: .011	ksi
Fa	: .424	ksi

BENDING SUMMARY

fb	: .91	ksi
Fb	: 1.35	ksi
fs	: 18.369	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv/Fv	: .074
u/U	: .219

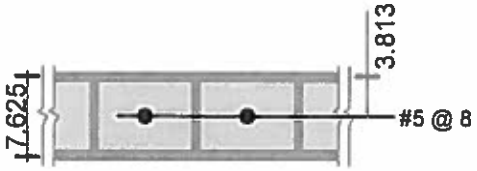
SHEAR SUMMARY

fv	: .005	ksi
Fv	: .063	ksi
Fv max	: .11	ksi
u	: .044	ksi
U	: .2	ksi

DESIGN DETAILS

AXIAL DETAILS			BENDING DETAILS			SHEAR DETAILS		
Max Axial	: .995	k/ft	Max Moment	: 2.322	k-ft/ft	Max Shear	: .426	k/ft
Location	: 12.636	ft	Location	: 12.636	ft	Location	: 0	ft
Load Comb	: 31		Load Comb	: 31		Load Comb	: 31	
Rad gyration r	: 2.19	in	k	: .406		Width for Shear	: 8	in
h'/r	: 92.318		d	: 3.813	in	Corresponding M:	.028	k-ft/ft
			j	: .865		Corresponding P :	2.601	k/ft
						M / (V*d)	: 1	

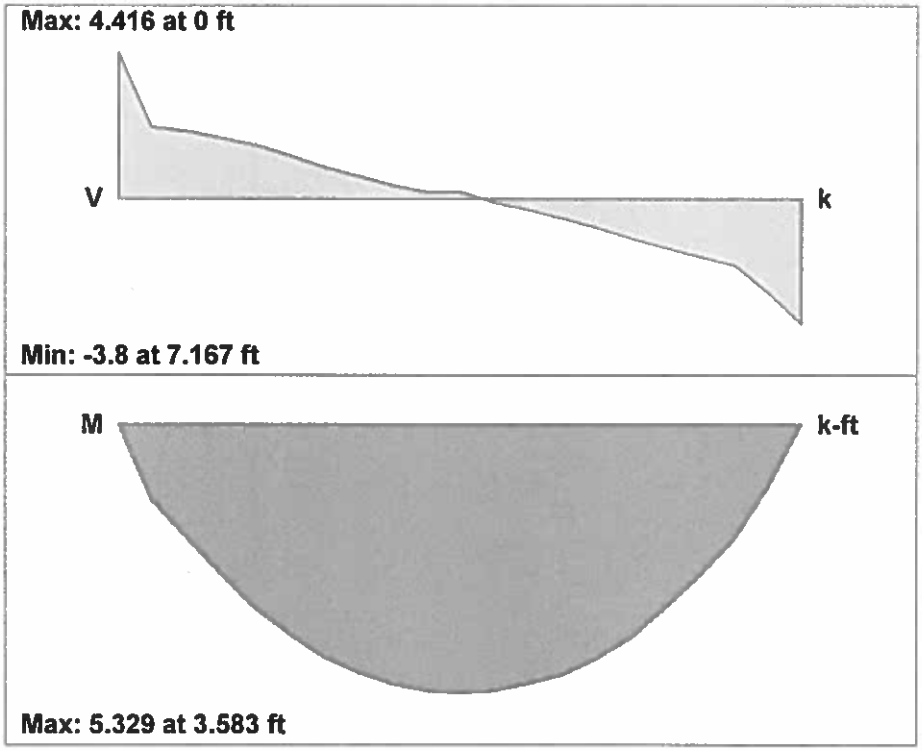
CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 3	ksi	Dist to Top of Wall	: 6.932	ft
Special Insp	: Yes	Masonry Em	: 2100	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 7.167	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #3	Beam Dead Wt	: .208	k/ft	Eff depth	: 28.5	in
Flex Steel	: 1-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 32	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .239	
Bond Chk u/U	: .42	
fv	: .02	ksi
Fv	: .085	ksi
Fvm	: .085	ksi
FvMax	: .145	ksi
u	: .084	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .243	
Bend Chk fm/Fm	: .123	
fm	: .123	ksi
Fm	: 1	ksi
fs	: 7.778	ksi
Fs	: 32	ksi

DESIGN DETAILS

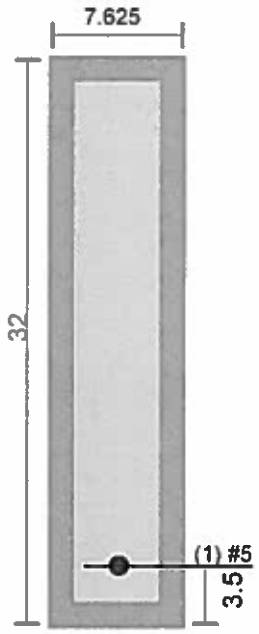
BENDING DETAILS

Max Moment	: 5.329	k-ft	Steel Area As	: .307	in2
Location	: 3.583	ft	Per of steel p	: .001	
Load Comb	: 4				
Mm	: 43.42	k-ft	k	: .179	
Ms	: 21.926	k-ft	j	: .94	

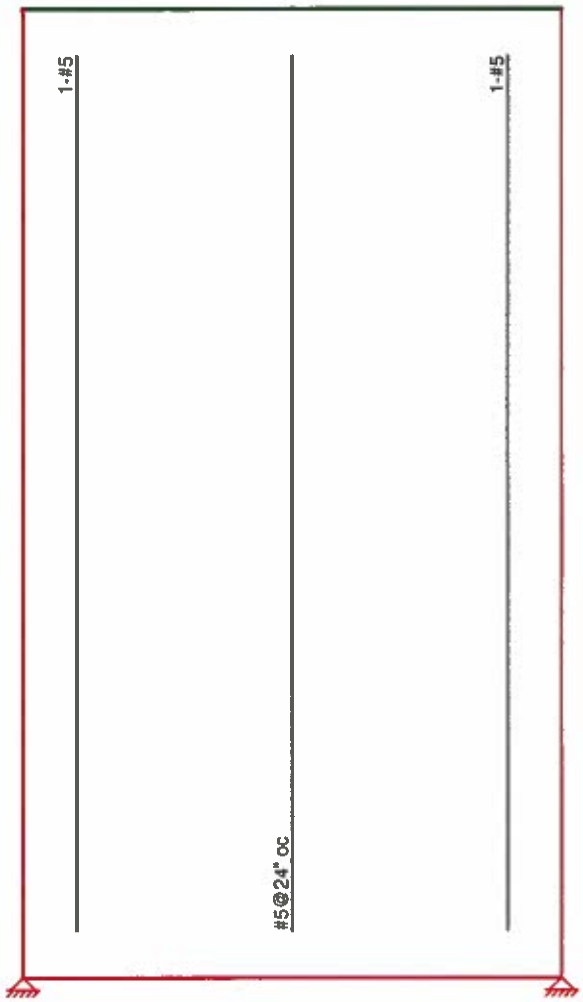
SHEAR DETAILS

Max Shear	: 4.416	k
Location	: 0	ft
Load Comb	: 4	
M / (V*d)	: .508	
Tie Spacing	: Not Required	

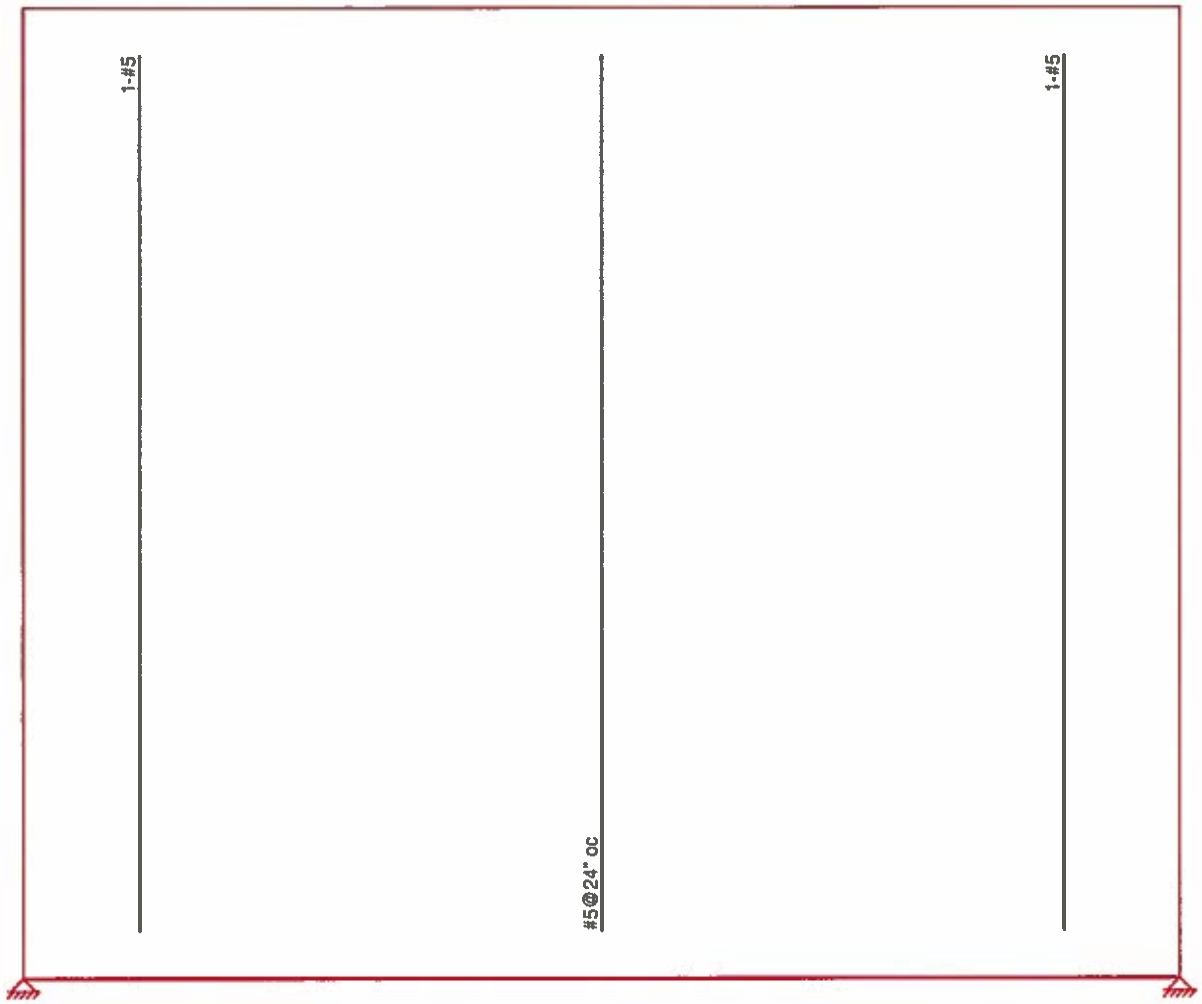
CROSS SECTION DETAILING



NOTE: All units are in "in."

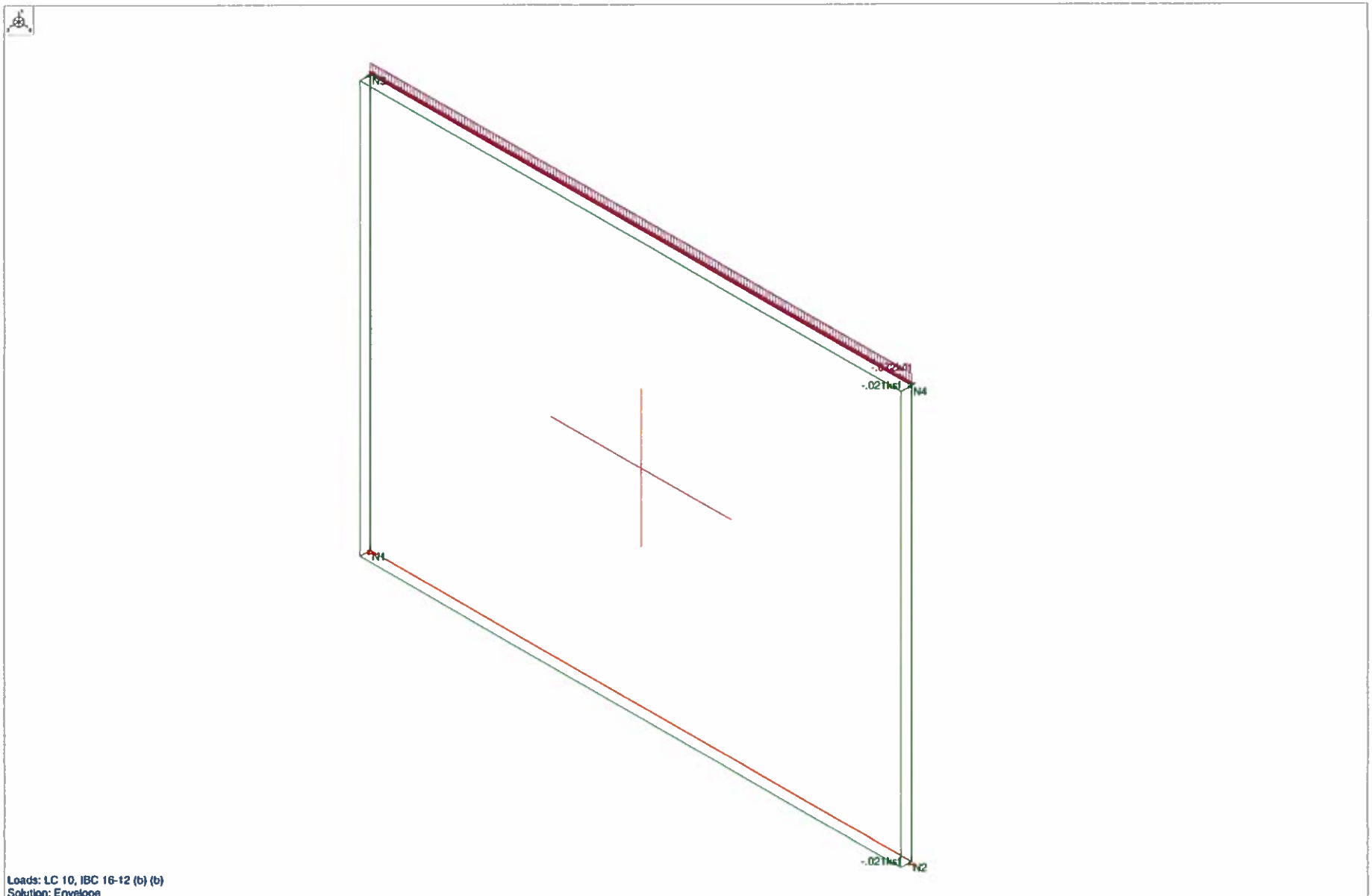


	OWTP West Wall	Wall Panel: WP5
		Jan 27, 2014 at 10:47 AM
		West Wall.R3D



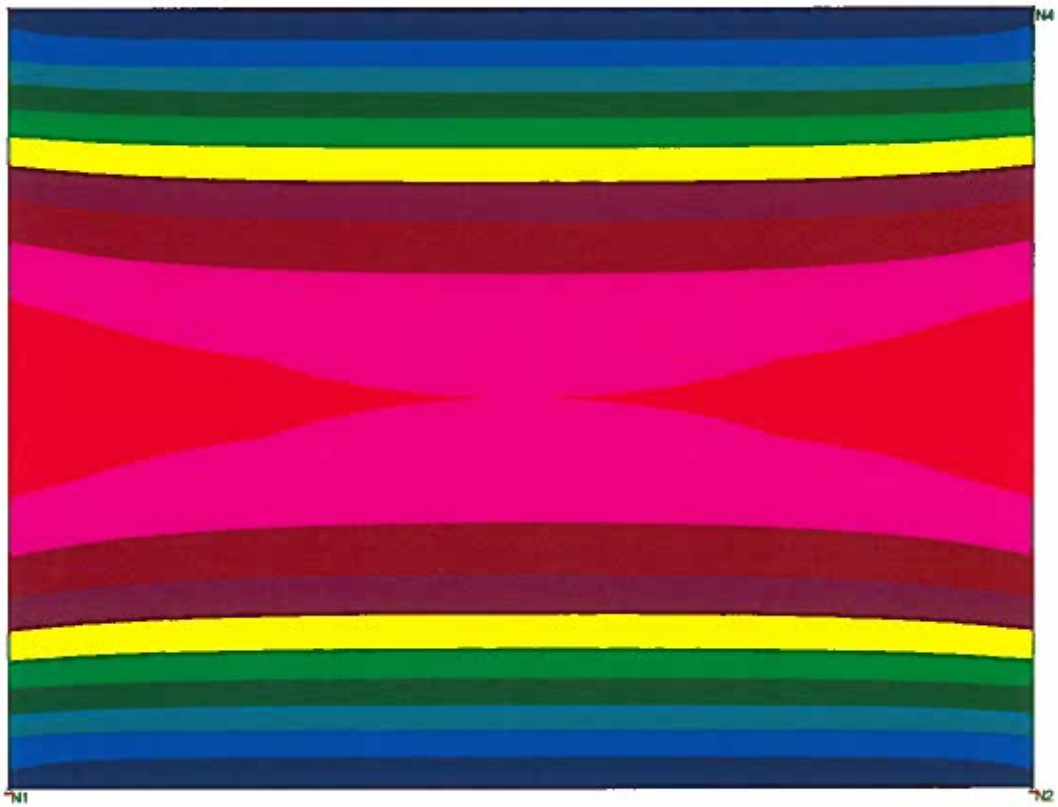
	OWTP West Wall	Wall Panel: WP6A
		Jan 27, 2014 at 10:47 AM
		West Wall.R3D

Sunrise Engineering	OWTP-Masonry Shear Wall Line C	Wall Panel: WP1
SMH		Jan 24, 2014 at 12:36 PM
		Shear Wall Line C.r3d



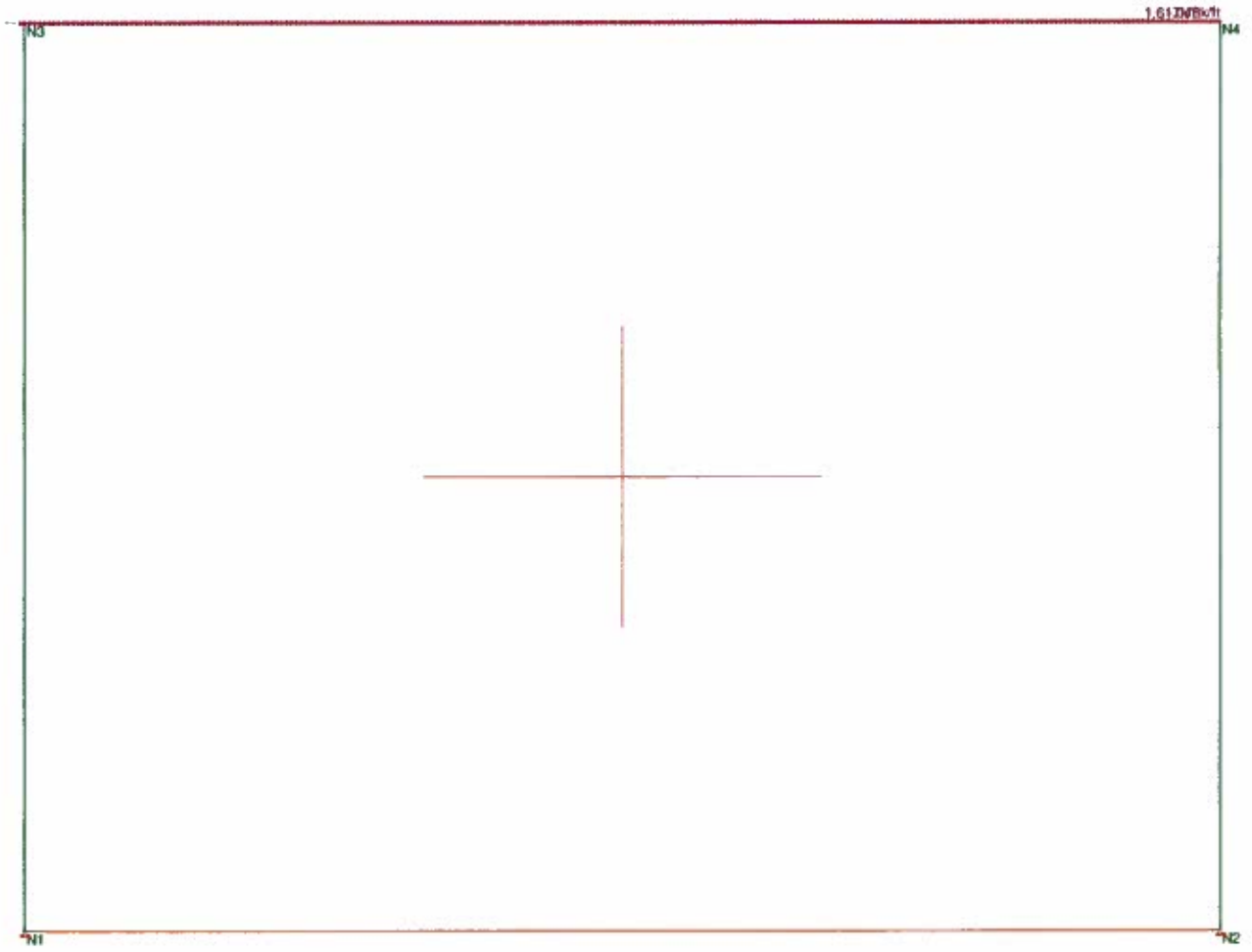
Loads: LC 10, IBC 16-12 (b) (b)
Solution: Envelope

Sunrise Engineering		2
SMH	OWTP-Masonry Shear Wall Line C	Jan 24, 2014 at 12:36 PM
	LC10: Worst Case Out-of Plane	Shear Wall Line C.r3d



Results for LC 10, IBC 16-12 (b) (b)

Sunrise Engineering	OWTP-Masonry Shear Wall Line C	3
SMH		Jan 24, 2014 at 12:37 PM
		Shear Wall Line C.r3d



Loads: LC 17, IBC 16-16 (a)
Solution: Envelope

Sunrise Engineering		1
SMH	OWTP-Masonry Shear Wall Line C	Jan 24, 2014 at 12:35 PM
	LC17: Worst Case In-Plane Loading	Shear Wall Line C.r3d

Results for LC 17, IBC 16-16 (a)

Sunrise Engineering	OWTP-Masonry Shear Wall Line C	Wall Stresses 1
SMH		Jan 24, 2014 at 10:41 AM
		Shear Wall Line C.r3d

MW10 Risa Results

Masonry Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\...	Self Weight[k/ft^3]	f'm[ksi]	Flex Steel[ksi]	Shear St...
1	Concrete Matl	1800	720	.25	.6	Custom	1.5	60	60
2	Clay Matl	1050	420	.25	.6	Custom	1.5	60	60
3	Gen Masonry	1050	420	.25	.6	.08	1.5	60	60

Masonry Wall Panel In Plane Parameters

	Label	Vert Bar Size	Bars Per Cell	Min Bound Zone Wi...	Max Bound Zone Width[in]	Horz Bar Size	1.5x Shear Inc	Transfer Load
1	Typical	#5	2	8	24	#5	Yes	Yes

Masonry Wall Panel Out of Plane Parameters

	Label	Bar Size	Bar Space Min	Bar Space Max	Bar Placement	Mortar Type	Cement Type	Transfer Load
1	Typical	#5	8"	24"	Center	Type M or S	Portland, Lime/M...	Yes

Wall Panel Data

	Label	A Joint	B Joint	C Joint	D Joint	Material Type	Material Set	Thickness[in]	Design Rule	Panel/Spacing
1	WP1	N1	N2	N4	N3	Masonry	Concrete Matl	8	Typical	24

Wall Panel Point Loads

Wall Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Wall Panel Distributed Loads (BLC 1 : Dead Load)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP1(20.33ft)	Y	-.072	-.072	0	26.63

Wall Panel Distributed Loads (BLC 2 : Live Roof)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP1(20.33ft)	Y	-.08	-.08	0	26.63

Wall Panel Distributed Loads (BLC 3 : Snow Load)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP1(20.33ft)	Y	-.4	-.4	0	26.63

Wall Panel Distributed Loads (BLC 6 : Earthquake Load X)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP1(20.33ft)	X	2.31	2.31	0	26.63

Wall Panel Surface Loads (BLC 7 : Earthquake Load Z)

	Wall Panel Label	Direction	Top Magnitude[ksf,F]	Bottom Magnitude[...	Start Location[ft]	Height[ft]
1	WP1	Z	-.03	-.03	0	0

MWIO

Load Combinations

	Description	Solve	PDelta	SRSS	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	IBC 16-8	Yes			DL	1														
2	IBC 16-9	Yes			DL	1	LL	1	LLS	1										
3	IBC 16-10 (a)	Yes			DL	1	RLL	1												
4	IBC 16-10 (b)	Yes			DL	1	SL	1	SLN	1										
5	IBC 16-10 (c)	Yes			DL	1	RL	1												
6	IBC 16-11 (a)	Yes			DL	1	LL	.75	LLS	.75	RLL	.75								
7	IBC 16-11 (b)	Yes			DL	1	LL	.75	LLS	.75	SL	.75	SLN	.75						
8	IBC 16-11 (c)	Yes			DL	1	LL	.75	LLS	.75	RL	.75								
9	IBC 16-12 (..	Yes			DL	1	ELX	.7												
10	IBC 16-12 (..	Yes			DL	1	ELZ	.7												
11	IBC 16-14 (..	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	RLL	.75						
12	IBC 16-14 (..	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	RLL	.75						
13	IBC 16-14 (..	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
14	IBC 16-14 (..	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
15	IBC 16-14 (..	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	RL	.75						
16	IBC 16-14 (..	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	RL	.75						
17	IBC 16-16 (a)	Yes			DL	.6	ELX	.7												
18	IBC 16-16 (b)	Yes			DL	.6	ELZ	.7												
19	IBC 16-12 (..	Yes			DL	1	ELX	.7												
20	IBC 16-12 (..	Yes			DL	1	ELZ	.7												
21	IBC 16-12 (..	Yes			DL	1	ELX	-.7												
22	IBC 16-12 (..	Yes			DL	1	ELZ	-.7												
23	IBC 16-14 (..	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	RLL	.75						
24	IBC 16-14 (..	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	RLL	.75						
25	IBC 16-14 (..	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	RLL	.75						
26	IBC 16-14 (..	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	RLL	.75						
27	IBC 16-14 (..	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
28	IBC 16-14 (..	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
29	IBC 16-14 (..	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
30	IBC 16-14 (..	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
31	IBC 16-14 (..	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	RL	.75						
32	IBC 16-14 (..	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	RL	.75						
33	IBC 16-14 (..	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	RL	.75						
34	IBC 16-14 (..	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	RL	.75						
35	IBC 16-16 (a)	Yes			DL	.6	ELX	.7												
36	IBC 16-16 (b)	Yes			DL	.6	ELZ	.7												
37	IBC 16-16 (c)	Yes			DL	.6	ELX	-.7												
38	IBC 16-16 (d)	Yes			DL	.6	ELZ	-.7												
39	IBC 16-12 (..	Yes			DL	1	WLX	.6												
40	IBC 16-12 (..	Yes			DL	1	WLZ	.6												
41	IBC 16-12 (..	Yes			DL	1	WLX	-.6												
42	IBC 16-12 (..	Yes			DL	1	WLZ	-.6												
43	IBC 16-13 (..	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	RLL	.75						
44	IBC 16-13 (..	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	RLL	.75						
45	IBC 16-13 (..	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	RLL	.75						
46	IBC 16-13 (..	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	RLL	.75						
47	IBC 16-13 (..	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
48	IBC 16-13 (..	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
49	IBC 16-13 (..	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
50	IBC 16-13 (..	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
51	IBC 16-13 (..	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	RL	.75						
52	IBC 16-13 (..	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	RL	.75						

MW10

Load Combinations (Continued)

	Description	Solve	PDelta	SRSS	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
53	IBC 16-13 (..	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	RL	.75						
54	IBC 16-13 (..	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	RL	.75						
55	IBC 16-15 (a)	Yes			DL	.6	WLX	.6												
56	IBC 16-15 (b)	Yes			DL	.6	WLZ	.6												
57	IBC 16-15 (c)	Yes			DL	.6	WLX	-.6												
58	IBC 16-15 (d)	Yes			DL	.6	WLZ	-.6												

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	17	WP1	-43.061	26.487	0	0	0	875.424
2	17	Totals:	-43.061	26.487	0			
3	17	COG (ft):	X: 13.315	Y: 10.606	Z: 0			

Masonry Wall Reinforcement

	Wall	Region	Hor. Bar Size	Vert. Bar Size	Boundary Reinf.
1	WP1	R1	Not Reqd.	#5@24" oc	4-#5

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (In Plane)

	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP1	R1	Typical	.485	17	.533	17	.148	.5	.051

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (Out of Plane)

(See Enercalc for MW10 Out-of Plane)

	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP1	R1	Typical	.016	17	0	N/A	.148	.675	.039

Wall Panel ACI 530-08: Strength Masonry Code Checks for Wall Regions (In Plane)

Wall Pa...	Region	Design ...	Axial UC	LC	Bending UC	LC	Shear UC	LC	Pn*phi[k]	Mn*phi[k-ft]	Vn*phi[k]
No Data to Print ...											

Wall Panel ACI 530-08: Strength Masonry Code Checks for Wall Regions (Out of Plane)

Wall Panel	Region	Design Rule	Axial UC	LC	Bending UC	LC	Pn[k-ft]	Mn*phi[k-ft]
No Data to Print ...								

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (In Plane)

	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP2	R1	Typical	.127	3	.199	35	.463	.833	.101
2		R2	Typical	.066	3	.139	29	.613	.833	.095
3		R3	Typical	.098	3	.19	35	.571	.833	.102
4		R4	Typical	.121	3	.146	27	.463	.833	.104
5		R5	Typical	.053	3	.138	27	.613	.833	.096
6		R6	Typical	.078	3	.156	27	.571	.833	.093
7		R7	Typical	.192	3	.227	43	.463	.833	.1
8		R8	Typical	.054	3	.131	29	.613	.833	.094
9		R9	Typical	.08	3	.138	45	.571	.833	.091
10		R10	Typical	.208	3	.249	45	.463	.833	.1
11		R11	Typical	.055	3	.148	29	.613	.833	.095
12		R12	Typical	.08	3	.156	29	.571	.833	.093
13		R13	Typical	.15	3	.192	29	.463	.833	.106
14		R14	Typical	.057	3	.133	29	.613	.833	.094
15		R15	Typical	.082	3	.159	37	.571	.833	.106
16		R16	Typical	.638	3	.356	35	.463	.833	.076
17		R17	Typical	0	N/A	0	N/A	.613	.833	0
18		R18	Typical	.086	3	.19	37	.571	.833	.101
19		R19	Typical	.415	3	.325	37	.463	.833	.076
20	WP3	R1	Typical	.084	6	.095	35	.455	.833	.076
21		R2	Typical	0	N/A	0	N/A	.61	.833	0
22		R3	Typical	0	N/A	0	N/A	.574	.833	0
23		R4	Typical	.104	6	.284	29	.455	.833	.09
24		R5	Typical	0	N/A	0	N/A	.61	.833	0
25		R6	Typical	0	N/A	0	N/A	.574	.833	0
26		R7	Typical	.092	6	.213	35	.455	.833	.093
27		R8	Typical	0	N/A	0	N/A	.61	.833	0
28		R9	Typical	0	N/A	0	N/A	.574	.833	0
29		R10	Typical	.088	6	.213	27	.455	.833	.092
30		R11	Typical	0	N/A	0	N/A	.61	.833	0
31		R12	Typical	0	N/A	0	N/A	.574	.833	0
32		R13	Typical	.098	6	.273	29	.455	.833	.091
33		R14	Typical	0	N/A	0	N/A	.61	.833	0
34		R15	Typical	0	N/A	0	N/A	.574	.833	0
35		R16	Typical	.07	6	.125	29	.455	.833	.099
36		R17	Typical	0	N/A	0	N/A	.61	.833	0
37		R18	Typical	0	N/A	0	N/A	.574	.833	0
38		R19	Typical	.1	6	.195	27	.455	.833	.088
39		R20	Typical	0	N/A	0	N/A	.61	.833	0
40		R21	Typical	0	N/A	0	N/A	.574	.833	0
41		R22	Typical	.279	3	.318	6	.455	.833	.066

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (Out of Plane)

	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP2	R1	Typical	.279	28	.019	44	.463	1.125	.1
2		R2	Typical	.276	28	.018	28	.613	1.125	.1
3		R3	Typical	.137	28	.011	28	.571	1.125	.1
4		R4	Typical	.29	28	.019	44	.463	1.125	.1
5		R5	Typical	.272	28	.018	28	.613	1.125	.1
6		R6	Typical	.125	28	.01	28	.571	1.125	.1

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (Out of Plane) (Continued)

	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
7		R7	Typical	.318	28	.023	44	.463	1.125	.1
8		R8	Typical	.284	28	.019	28	.613	1.125	.1
9		R9	Typical	.129	28	.01	28	.571	1.125	.1
10		R10	Typical	.319	28	.025	44	.463	1.125	.1
11		R11	Typical	.275	28	.019	28	.613	1.125	.1
12		R12	Typical	.127	28	.01	28	.571	1.125	.1
13		R13	Typical	.302	28	.02	44	.463	1.125	.1
14		R14	Typical	.275	28	.019	28	.613	1.125	.1
15		R15	Typical	.127	28	.01	28	.571	1.125	.1
16		R16	Typical	.532	28	.035	44	.463	1.125	.1
17		R17	Typical	0	N/A	0	N/A	.613	1.125	.05
18		R18	Typical	.126	28	.01	28	.571	1.125	.1
19		R19	Typical	.519	28	.035	44	.463	1.125	.1
20	WP3	R1	Typical	.335	28	.027	44	.455	1.125	.1
21		R2	Typical	0	N/A	0	N/A	.61	1.125	.05
22		R3	Typical	0	N/A	0	N/A	.574	1.125	.05
23		R4	Typical	.641	28	.05	44	.455	1.125	.1
24		R5	Typical	0	N/A	0	N/A	.61	1.125	.05
25		R6	Typical	0	N/A	0	N/A	.574	1.125	.05
26		R7	Typical	.403	28	.031	44	.455	1.125	.1
27		R8	Typical	0	N/A	0	N/A	.61	1.125	.05
28		R9	Typical	0	N/A	0	N/A	.574	1.125	.05
29		R10	Typical	.601	28	.046	44	.455	1.125	.1
30		R11	Typical	0	N/A	0	N/A	.61	1.125	.05
31		R12	Typical	0	N/A	0	N/A	.574	1.125	.05
32		R13	Typical	.669	28	.051	44	.455	1.125	.1
33		R14	Typical	0	N/A	0	N/A	.61	1.125	.05
34		R15	Typical	0	N/A	0	N/A	.574	1.125	.05
35		R16	Typical	.41	28	.031	44	.455	1.125	.1
36		R17	Typical	0	N/A	0	N/A	.61	1.125	.05
37		R18	Typical	0	N/A	0	N/A	.574	1.125	.05
38		R19	Typical	.664	28	.05	44	.455	1.125	.1
39		R20	Typical	0	N/A	0	N/A	.61	1.125	.05
40		R21	Typical	0	N/A	0	N/A	.574	1.125	.05
41		R22	Typical	.462	28	.035	44	.455	1.125	.1

Wall Panel ACI 530-11: ASD Masonry Code Checks for Lintels

	Wall Pa...	Lintel	Design ...	Flexure UC	LC	Shear UC	LC	Fvm[ksi]	Fvs[ksi]	Fm[ksi]	Fs[ksi]
1	WP2	L1	Typical	.402	3	.967	2	.075	0	.833	32
2		L2	<Custom>	.402	3	.85	3	.078	0	.833	32
3		L3	<Custom>	.402	3	.836	3	.078	0	.833	32
4		L4	<Custom>	.415	3	.862	3	.078	0	.833	32
5		L5	Typical	.4	3	.991	2	.074	0	.833	32
6		L6	Typical	.322	3	.559	3	.082	0	.833	32
7	WP3	L1	Typical	.568	6	.664	6	.068	0	.833	32
8		L2	Typical	.566	6	.657	6	.068	0	.833	32
9		L3	Typical	.566	6	.658	6	.068	0	.833	32
10		L4	Typical	.569	6	.663	6	.068	0	.833	32
11		L5	Typical	.565	6	.655	6	.068	0	.833	32
12		L6	Typical	.563	6	.655	6	.068	0	.833	32
13		L7	Typical	.562	6	.661	6	.068	0	.833	32

Masonry Wall Reinforcement

	Wall	Region	Hor. Bar Size	Vert. Bar Size	Boundary Reinf.
1	WP2	R1	Not Reqd.	#5@32" oc	2-#5
2		R2	Not Reqd.	#5@32" oc	2-#5
3		R3	Not Reqd.	#5@32" oc	2-#5
4		R4	Not Reqd.	#5@32" oc	2-#5
5		R5	Not Reqd.	#5@32" oc	2-#5
6		R6	Not Reqd.	#5@32" oc	2-#5
7		R7	Not Reqd.	#5@32" oc	2-#5
8		R8	Not Reqd.	#5@32" oc	2-#5
9		R9	Not Reqd.	#5@32" oc	2-#5
10		R10	Not Reqd.	#5@32" oc	2-#5
11		R11	Not Reqd.	#5@32" oc	2-#5
12		R12	Not Reqd.	#5@32" oc	2-#5
13		R13	Not Reqd.	#5@32" oc	2-#5
14		R14	Not Reqd.	#5@32" oc	2-#5
15		R15	Not Reqd.	#5@32" oc	2-#5
16		R16	Not Reqd.	#5@32" oc	2-#5
17		R17	Not Reqd.	#5@32" oc	2-#5
18		R18	Not Reqd.	#5@32" oc	2-#5
19		R19	Not Reqd.	#5@32" oc	2-#5
20	WP3	R1	Not Reqd.	#5@24" oc	2-#5
21		R2	Not Reqd.	#5@24" oc	2-#5
22		R3	Not Reqd.	#5@24" oc	2-#5
23		R4	Not Reqd.	#5@24" oc	2-#5
24		R5	Not Reqd.	#5@24" oc	2-#5
25		R6	Not Reqd.	#5@24" oc	2-#5
26		R7	Not Reqd.	#5@24" oc	2-#5
27		R8	Not Reqd.	#5@24" oc	2-#5
28		R9	Not Reqd.	#5@24" oc	2-#5
29		R10	Not Reqd.	#5@24" oc	2-#5
30		R11	Not Reqd.	#5@24" oc	2-#5
31		R12	Not Reqd.	#5@24" oc	2-#5
32		R13	Not Reqd.	#5@24" oc	2-#5
33		R14	Not Reqd.	#5@24" oc	2-#5
34		R15	Not Reqd.	#5@24" oc	2-#5
35		R16	Not Reqd.	#5@24" oc	2-#5
36		R17	Not Reqd.	#5@24" oc	2-#5
37		R18	Not Reqd.	#5@24" oc	2-#5
38		R19	Not Reqd.	#5@24" oc	2-#5
39		R20	Not Reqd.	#5@24" oc	2-#5
40		R21	Not Reqd.	#5@24" oc	2-#5
41		R22	Not Reqd.	#5@24" oc	2-#5

Masonry Lintel Reinforcement

	Wall	Lintel	Flex. Steel	Stirrup
1	WP2	L1	2-#5	Not Reqd.
2		L2	2-#5	Not Reqd.
3		L3	2-#5	Not Reqd.
4		L4	2-#5	Not Reqd.
5		L5	2-#5	Not Reqd.
6		L6	1-#5	Not Reqd.

Masonry Lintel Reinforcement (Continued)

	Wall	Lintel	Flex. Steel	Stirrup
7	WP3	L1	1-#5	Not Reqd.
8		L2	1-#5	Not Reqd.
9		L3	1-#5	Not Reqd.
10		L4	1-#5	Not Reqd.
11		L5	1-#5	Not Reqd.
12		L6	1-#5	Not Reqd.
13		L7	1-#5	Not Reqd.

MW10 Shear-In-Plane

Company	: Sunrise Engineering		Dec 31, 2013
Designer	: SMH		4:41 PM
Job Number	:	WP1 : R1 (In-Plane)	Checked By:_____

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Hor Bar Size	: #5	
Vert Bar Size	: #5	
No of Ten Bars	: 4	
Effective Depth	: 311.56	in

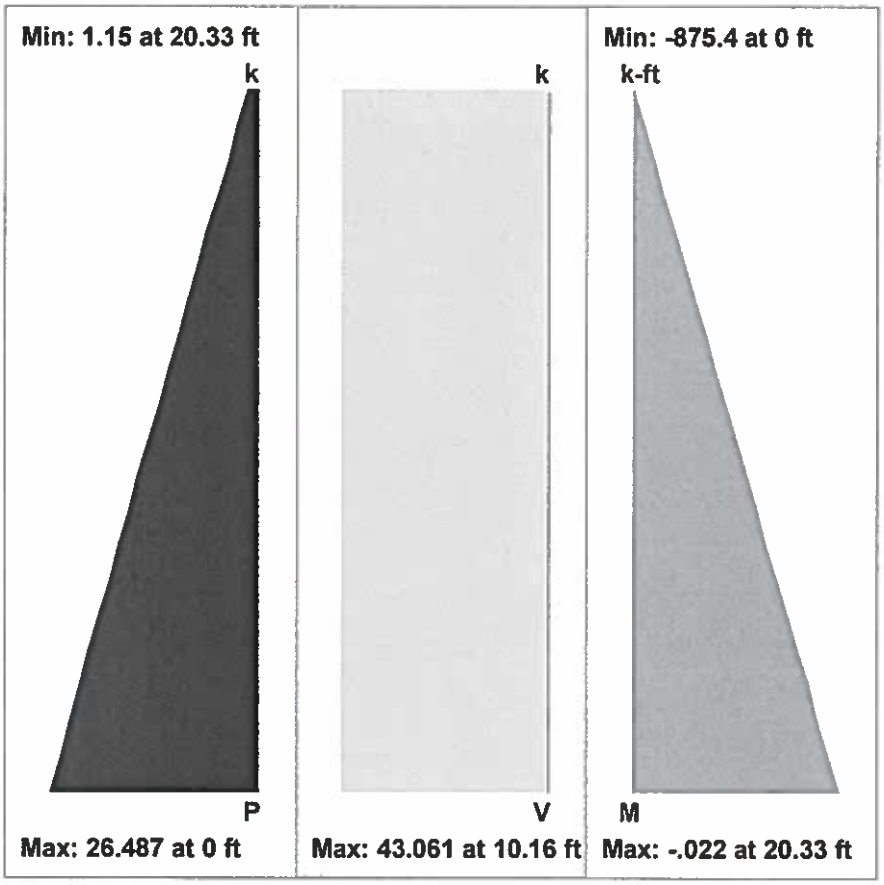
MATERIALS

Masonry f'm	: 1.5	ksi
Masonry Em	: 1800	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 20.33	ft
Total Length	: 26.63	ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 24"	
Blk Nom Width	: 8"	
1.5 Shear Factor	: Yes	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb)/Fb	: .485
fa/Fa	: .073
fs/Fs	: .589

AXIAL SUMMARY

fa	: .011	ksi
Fa	: .148	ksi

BENDING SUMMARY

fb	: .232	ksi
Fb	: .5	ksi
fs	: 18.832	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv / Fv	: .533
u/U	: .088

SHEAR SUMMARY

fv	: .027	ksi
Fv	: .051	ksi
Fvm	: .051	ksi
Fv max	: .089	ksi
u	: .018	ksi
U	: .2	ksi

MW10 Shear In-Plane

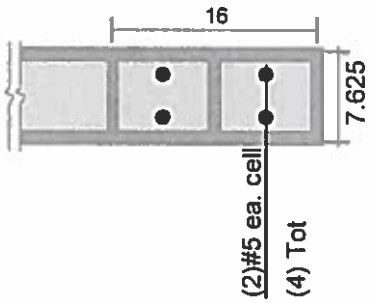
DESIGN DETAILS AT GOVERNING SECTION

AXIAL COMPRESSION DETAILS			BENDING DETAILS			SHEAR DETAILS		
Axial	: 26.487	k	Moment	: 875.403	k-ft	Shear	: 43.061	k
Location	: 0	ft	Location	: 0	ft	Location	: 20.33	ft
Load Comb	: 17		Load Comb	: 17		Load Comb	: 17	
Rad gyration r	: 2.19	in	Sect Mod S	: 1.298e+005	in3	Corresponding M:	.022	k-ft
h'/r	: 111.397		Tension St Asv	: 1.227	in2	Corresponding P :	1.15	k
Red Factor R	: .395		Per of steel p	: 0.0005166		M / (V*d)	: .783	
			k*d	: 53.51	in	Shear St Area	: Not Reqd.	
			j	: 0.94		Shear Spacing	: N/A	
						Peri of Bars	: N/A	

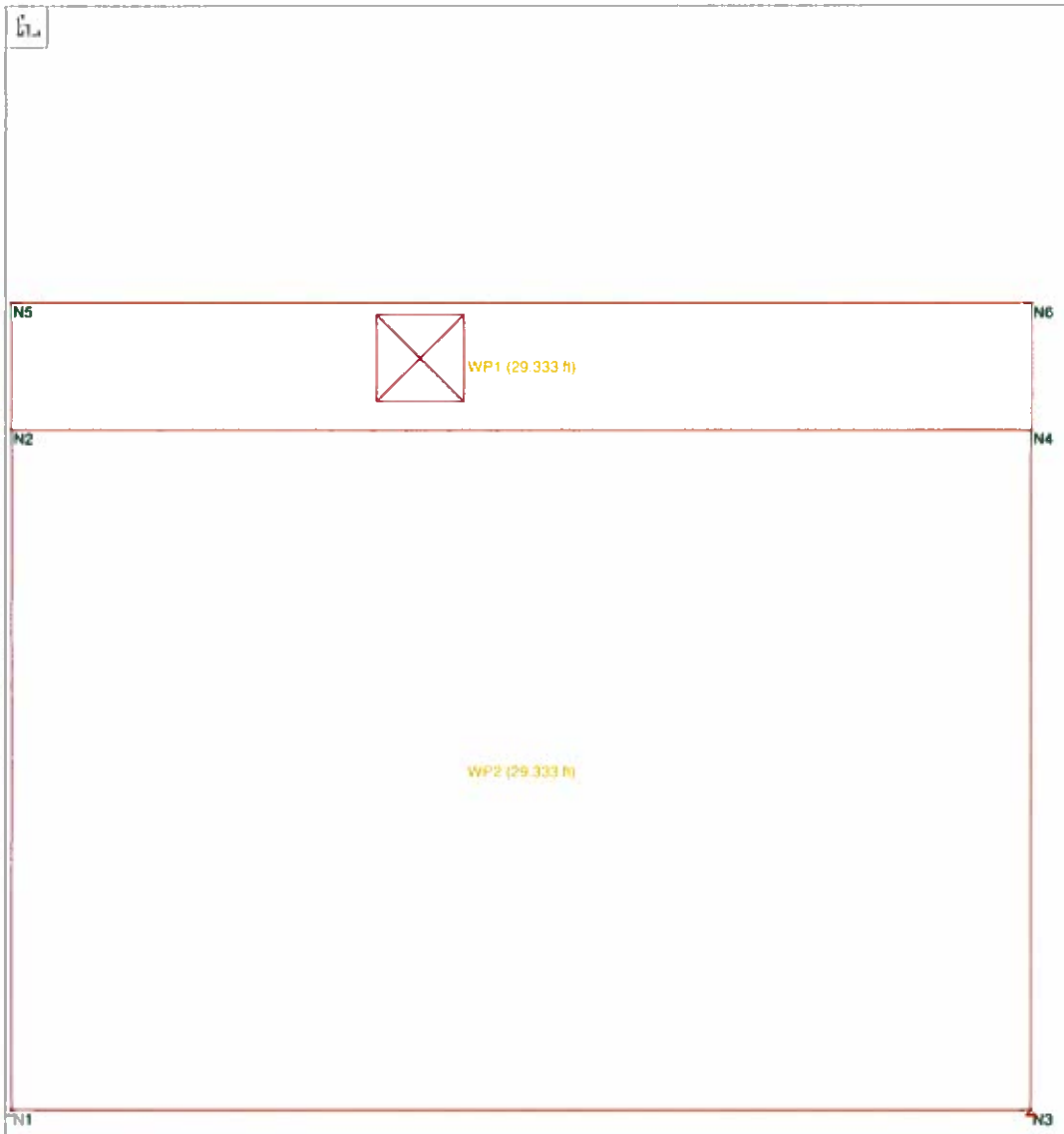
CRACKED SECT ANALYSIS

fm = fa + fb	: .242	ksi
C	: 49.452	k
T	: 22.964	k

CROSS SECTION DETAILING



NOTE: All units are in "in."



Solution: Envelope

		SK - 1
		Jan 27, 2014 at 1:35 PM
		SW Line 2.r3d

Masonry Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Self Weight[k/ft...	f'm[ksi]	Flex Steel[ksi]	Shear St...
1	Concrete Matl	1350	540	.25	.6	Custom	1.5	60	60
2	Clay Matl	2100	420	.25	.6	Custom	3	60	60
3	Gen Masonry	1050	420	.25	.6	.08	1.5	60	60

Masonry Wall Panel In Plane Parameters

	Label	Vert Bar Size	Bars Per Cell	Min Bound Zone Wi...	Max Bound Zone Width[in]	Horz Bar Size	1.5x Shear Inc	Transfer Lo...
1	Typical	#5	1	8	40	#5	Yes	Yes

Masonry Wall Panel Out of Plane Parameters

	Label	Bar Size	Bar Space Min	Bar Space Max	Bar Placement	Mortar Type	Cement Type	Transfer Load
1	Typical	#5	24"	24"	Center	Type M or S	Portland, Lime/M...	Yes

Masonry Wall Panel Lintel Parameters

	Label	Depth[in]	Bear L...	Bar ...	Min # Bars Per ...	Max # Bars Pe...	Num of La...	c/c Sp of La...	Dist to Bo...	Stirrup Size
1	Typical	8	8	#5	1	2	1	N/A	3.5	#4

Wall Panel Data

	Label	A Joint	B Joint	C Joint	D Joint	Material T...	Material Set	Thickness[in]	Design Rule	Panel/Spacing
1	WP1	N5	N6	N4	N2	Masonry	Concrete Matl	8	Typical	24
2	WP2	N2	N4	N3	N1	Masonry	Concrete Matl	8	Typical	24

Wall Panel Distributed Loads (BLC 1 : DL)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP1(3.666ft)	Y	-.216	-.216	0	29.333
2	WP1(0ft)	Y	-.072	-.072	0	29.333

Wall Panel Distributed Loads (BLC 2 : LL Roof)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP1(3.666ft)	Y	-.24	-.24	0	29.333
2	WP1(0ft)	Y	-.08	-.08	0	29.333

Wall Panel Distributed Loads (BLC 3 : SL)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP1(0ft)	Y	-.164	-.164	0	29.333
2	WP1(3.666ft)	Y	-.444	-.444	0	29.333

Wall Panel Distributed Loads (BLC 4 : E Xdir)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP1(0ft)	X	.33	.33	0	29.333

Wall Panel Distributed Loads (BLC 6 : W x dir)

	Wall Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Locatio...	End Location...
1	WP1(0ft)	X	.26	.26	0	29.333

Wall Panel Surface Loads (BLC 5 : E Z dir)

	Wall Panel Label	Direction	Top Magnitude[ksf,F]	Bottom Magnitude[...	Start Location[ft]	Height[ft]
1	WP2	Z	-.033	-.033	0	0
2	WP1	Z	-.033	-.033	0	0

Wall Panel Surface Loads (BLC 7 : W Z dir)

	Wall Panel Label	Direction	Top Magnitude[ksf,F]	Bottom Magnitude[...	Start Location[ft]	Height[ft]
1	WP2	Z	-.02	-.02	0	0
2	WP1	Z	-.02	-.02	0	0

Load Combinations

	Description	Sol...	PDelta	SRSS	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	ASCE ASD 1	Yes			DL	1														
2	ASCE ASD 2	Yes			DL	1	LL	1	LLS	1										
3	ASCE ASD 3 (a)	Yes			DL	1	RLL	1												
4	ASCE ASD 3 (b)	Yes			DL	1	SL	1	SLN	1										
5	ASCE ASD 3 (c)	Yes			DL	1														
6	ASCE ASD 4 (a)	Yes			DL	1	LL	.75	LLS	.75	RLL	.75								
7	ASCE ASD 4 (b)	Yes			DL	1	LL	.75	LLS	.75	SL	.75	SLN	.75						
8	ASCE ASD 5 (a) (a)	Yes			DL	1	WLX	.6												
9	ASCE ASD 5 (a) (b)	Yes			DL	1	WLZ	.6												
10	ASCE ASD 5 (a) (c)	Yes			DL	1	WLX	-.6												
11	ASCE ASD 5 (a) (d)	Yes			DL	1	WLZ	-.6												
12	ASCE ASD 6 (a) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	RLL	.75						
13	ASCE ASD 6 (a) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	RLL	.75						
14	ASCE ASD 6 (a) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	RLL	.75						
15	ASCE ASD 6 (a) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	RLL	.75						
16	ASCE ASD 6 (c) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
17	ASCE ASD 6 (c) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
18	ASCE ASD 6 (c) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
19	ASCE ASD 6 (c) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
20	ASCE ASD 6 (e) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75								
21	ASCE ASD 6 (e) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75								
22	ASCE ASD 6 (e) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75								
23	ASCE ASD 6 (e) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75								
24	ASCE ASD 7 (a)	Yes			DL	.6	WLX	.6												
25	ASCE ASD 7 (b)	Yes			DL	.6	WLZ	.6												
26	ASCE ASD 7 (c)	Yes			DL	.6	WLX	-.6												
27	ASCE ASD 7 (d)	Yes			DL	.6	WLZ	-.6												
28	ASCE ASD 5 (b) (a)	Yes			DL	1	ELX	.7												
29	ASCE ASD 5 (b) (b)	Yes			DL	1	ELZ	.7												
30	ASCE ASD 5 (b) (c)	Yes			DL	1	ELX	-.7												
31	ASCE ASD 5 (b) (d)	Yes			DL	1	ELZ	-.7												
32	ASCE ASD 6 (b) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	RLL	.75						
33	ASCE ASD 6 (b) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	RLL	.75						
34	ASCE ASD 6 (b) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	RLL	.75						
35	ASCE ASD 6 (b) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	RLL	.75						
36	ASCE ASD 6 (d) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
37	ASCE ASD 6 (d) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
38	ASCE ASD 6 (d) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
39	ASCE ASD 6 (d) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
40	ASCE ASD 6 (f) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75								
41	ASCE ASD 6 (f) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75								
42	ASCE ASD 6 (f) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75								
43	ASCE ASD 6 (f) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75								
44	ASCE ASD 8 (a)	Yes			DL	.6	ELX	.7												
45	ASCE ASD 8 (b)	Yes			DL	.6	ELZ	.7												

Load Combinations (Continued)

	Description	Sol..	PDelta	SRSS	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..
46	ASCE ASD 8 (c)	Yes			DL	.6	ELX	-.7														
47	ASCE ASD 8 (d)	Yes			DL	.6	ELZ	-.7														

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	WP1	max	0	1	0	1	2.484	29	22.96	31	.143	28	0	1
2		min	0	1	0	1	-2.484	31	-22.96	29	-.143	30	0	1
3	WP2	max	11.627	30	65.617	4	13.326	29	158.555	29	.007	31	229.725	28
4		min	-11.627	44	28.669	44	-13.326	31	-158.555	31	-.007	29	-228.032	46
5	Totals:	max	11.627	30	65.617	4	15.81	29						
6		min	-11.627	44	28.669	44	-15.81	31						

Masonry Wall Reinforcement

	Wall	Region	Hor. Bar Size	Vert. Bar Size	Boundary Reinf.
1	WP1	R1	Not Reqd.	#5@24" oc	1-#5
2		R2	Not Reqd.	#5@24" oc	1-#5
3		R3	Not Reqd.	#5@24" oc	1-#5
4		R4	Not Reqd.	#5@24" oc	1-#5
5	WP2	R1	Not Reqd.	#5@24" oc	1-#5

Masonry Lintel Reinforcement

	Wall	Lintel	Flex. Steel	Stirrup
1	WP1	L1	1-#5	Not Reqd.

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (In Plane)

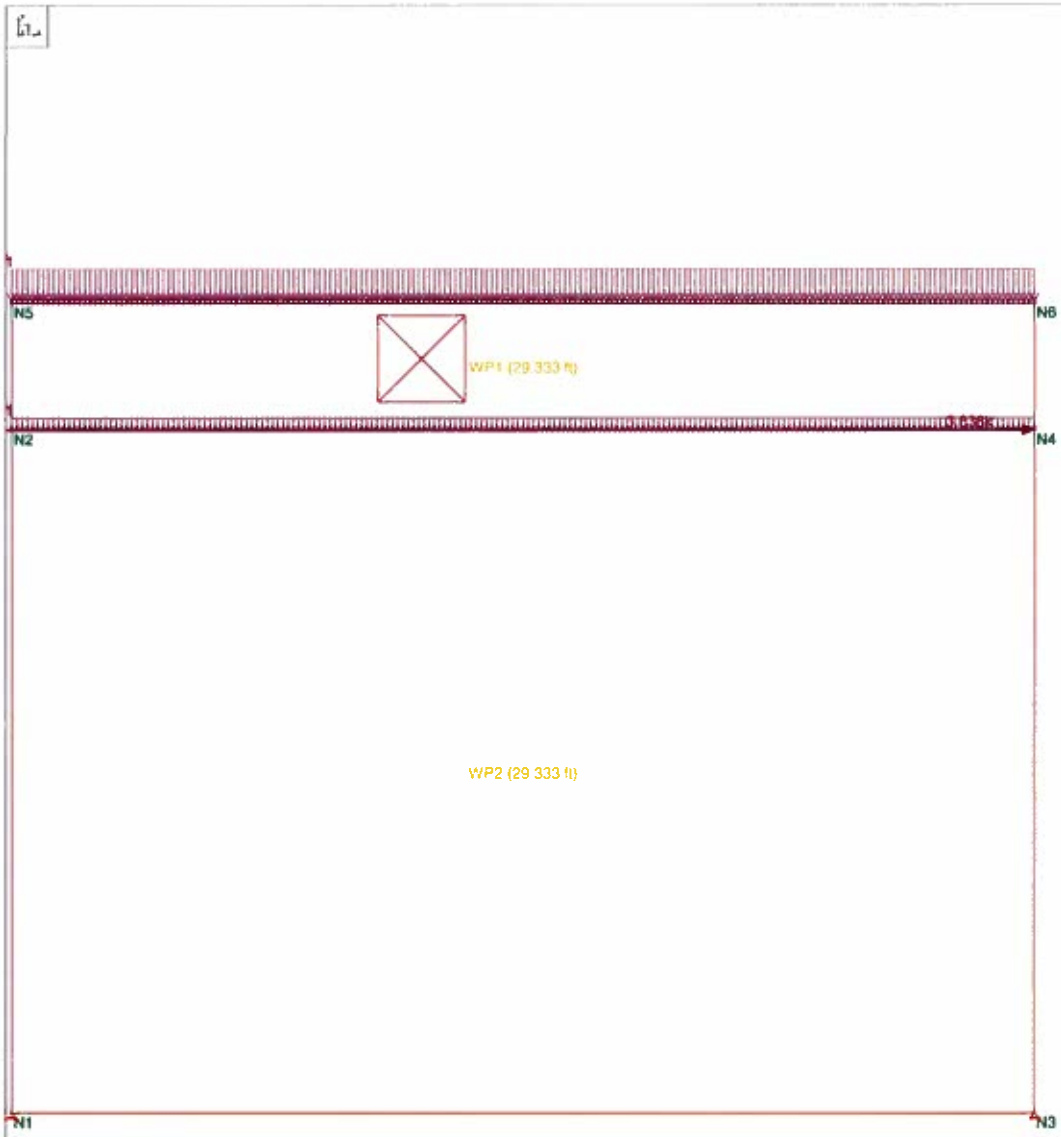
	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP1	R1	Typical	.039	4	.025	4	.369	.5	.063
2		R2	Typical	0	N/A	0	N/A	.375	.5	0
3		R3	Typical	0	N/A	0	N/A	.375	.5	0
4		R4	Typical	.043	4	.039	4	.369	.5	.063
5	WP2	R1	Typical	.128	36	.209	44	.209	.5	.056

Wall Panel ACI 530-11: ASD Masonry Code Checks for Wall Regions (Out of Plane)

	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP1	R1	Typical	.743	29	.143	45	.369	.675	.044
2		R2	Typical	0	N/A	0	N/A	.375	.675	.039
3		R3	Typical	0	N/A	0	N/A	.375	.675	.039
4		R4	Typical	.773	29	.149	45	.369	.675	.044
5	WP2	R1	Typical	.693	29	.123	45	.209	.675	.044

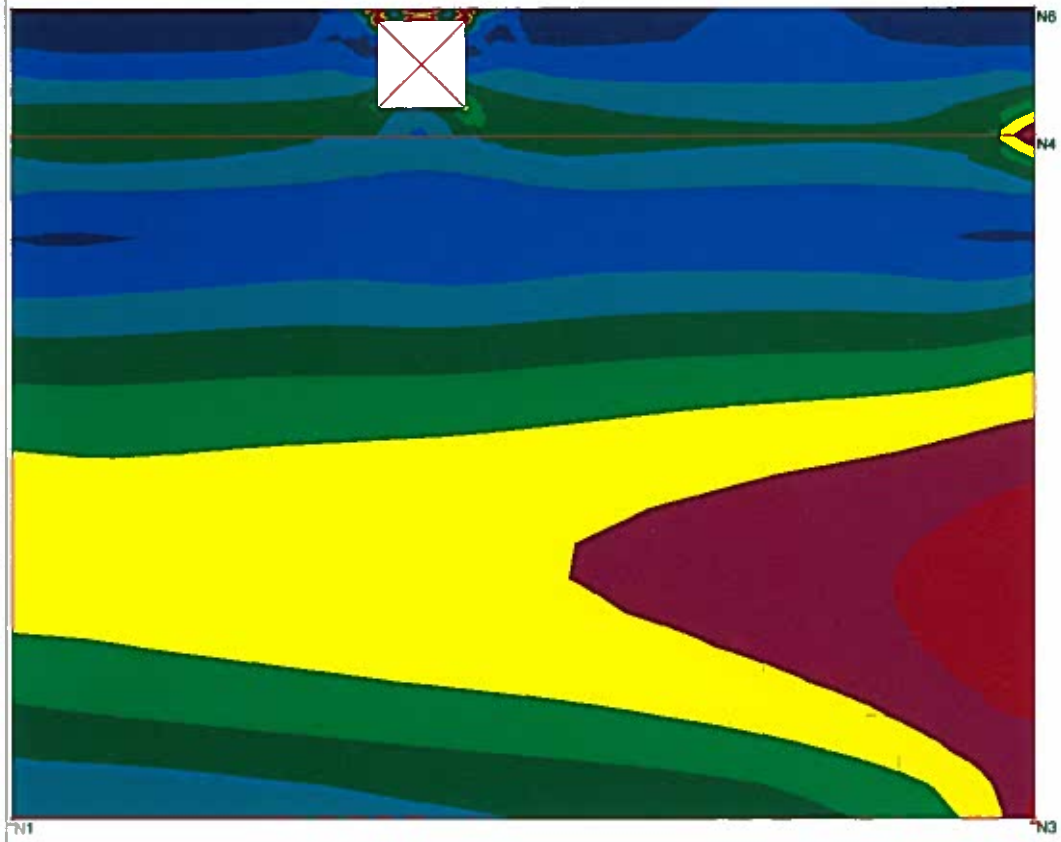
Wall Panel ACI 530-11: ASD Masonry Code Checks for Lintels

	Wall Pa...	Lintel	Design ...	Flexure UC	LC	Shear UC	LC	Fvm[ksi]	Fvs[ksi]	Fm[ksi]	Fs[ksi]
1	WP1	L1	Typical	.609	4	.844	4	.044	0	.5	32



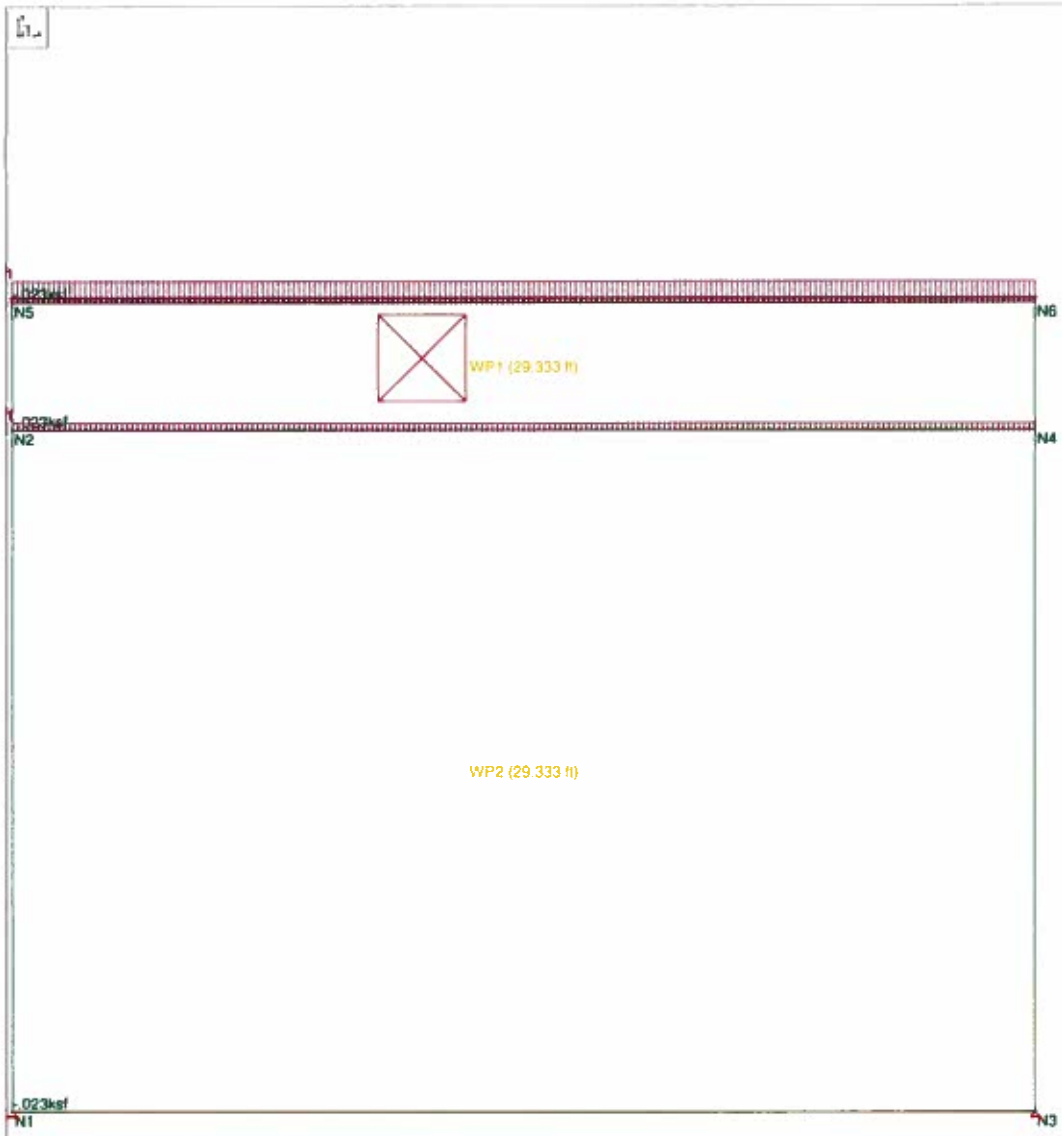
Loads: LC 36, ASCE ASD 6 (d) (a)
Solution: Envelope

	LC 35: Worst Case Loading for In-plane	SK - 2
		Jan 27, 2014 at 1:36 PM
		SW Line 2.r3d



Results for LC 36, ASCE ASD 6 (d) (a)

		SK - 4
		Jan 27, 2014 at 1:47 PM
	In-Plane Wall Stresses	SW Line 2.r3d

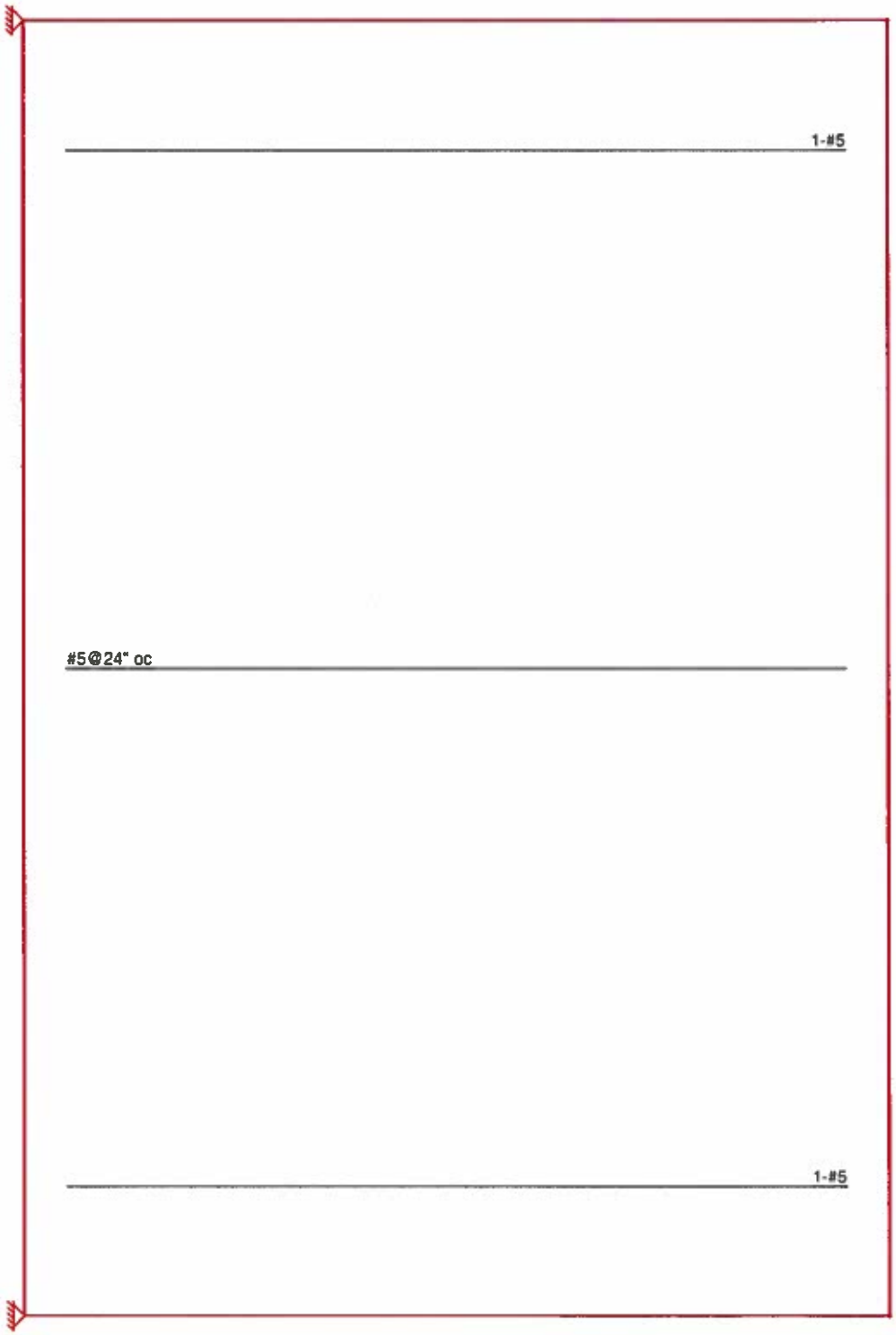


Loads: LC 29, ASCE ASD 5 (b) (b)
Solution: Envelope

		SK - 3
		Jan 27, 2014 at 1:36 PM
	LC 29: Worst Case Loading for Out of plane	SW Line 2.r3d

Results for LC 29, ASCE ASD 5 (b) (b)

		SK - 5
		Jan 27, 2014 at 1:49 PM
	Out of Plane Wall Stresses	SW Line 2.r3d



Wall Panel: WP2

Jan 27, 2014 at 1:51 PM

SW Line 2.r3d

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Hor Bar Size	: #5	
Vert Bar Size	: #5	
No of Ten Bars	: 1	
Effective Depth	: 347.996	in

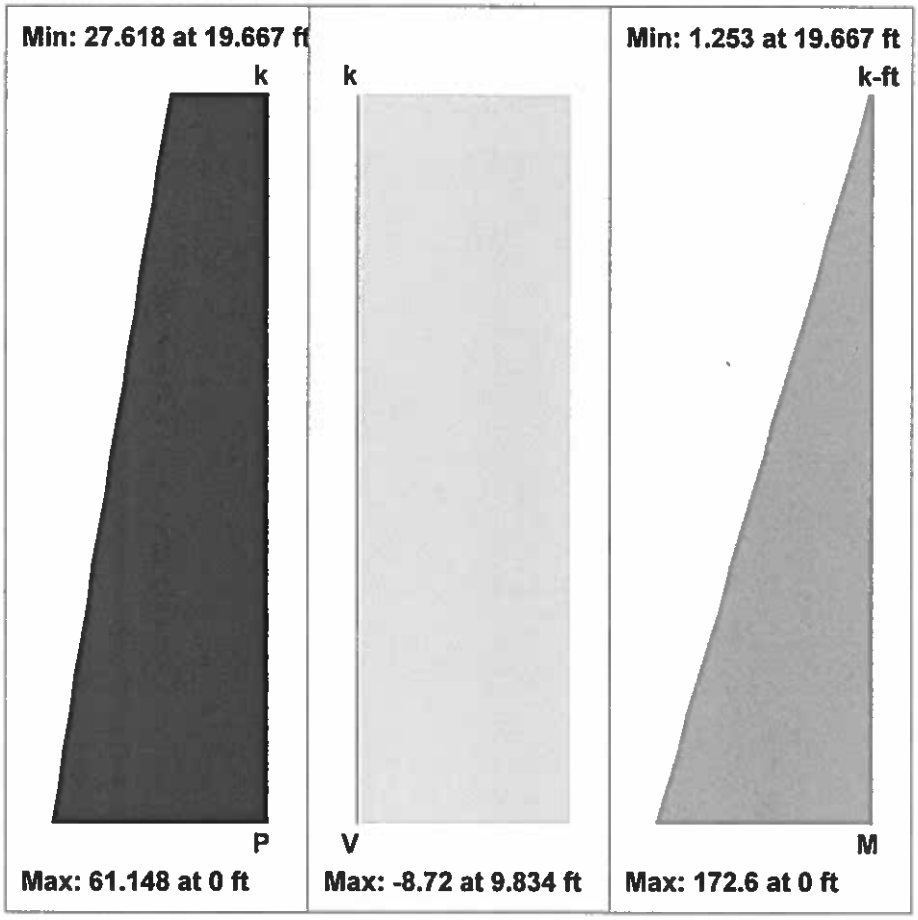
MATERIALS

Masonry f'm	: 1.5	ksi
Masonry Em	: 1350	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 19.667	ft
Total Length	: 29.333	ft
Blk Grouting	: Partially Grouted	
Grt/Bar Spacing	: 24"	
Blk Nom Width	: 8"	
1.5 Shear Factor	: Yes	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb)/Fb	: .128
fa/Fa	: .195
fs/Fs	: 0

AXIAL SUMMARY

fa	: .041	ksi
Fa	: .209	ksi

BENDING SUMMARY

fb	: .023	ksi
Fb	: .5	ksi
fs	: 0	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv / Fv	: .149
u/U	: .064

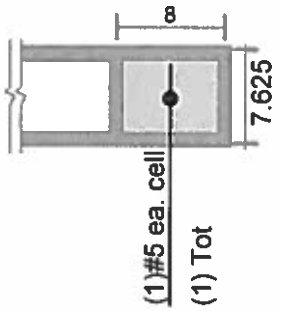
SHEAR SUMMARY

fv	: .009	ksi
Fv	: .059	ksi
Fvm	: .059	ksi
Fv max	: .094	ksi
u	: .013	ksi
U	: .2	ksi

DESIGN DETAILS AT GOVERNING SECTION

AXIAL COMPRESSION DETAILS			BENDING DETAILS			SHEAR DETAILS		
Axial	: 61.148	k	Moment	: 172.557	k-ft	Shear	: 8.72	k
Location	: 0	ft	Location	: 0	ft	Location	: 19.667	ft
Load Comb	: 36		Load Comb	: 36		Load Comb	: 36	
Rad gyration r	: 2.53	in	Sect Mod S	: 8.828e+004	in3	Corresponding M	: 1.253	k-ft
h'/r	: 93.282		Tension St Asv	: 0.3068	in2	Corresponding P	: 27.618	k
Red Factor R	: .556		Per of steel p	: 0.0002062		M / (V*d)	: .682	
			k*d	: 31.25	in	Shear St Area	: Not Reqd.	
			j	: 1		Shear Spacing	: N/A	
						Peri of Bars	: N/A	

CROSS SECTION DETAILING



NOTE: All units are in "in."

CRITERIA

Code	: ACI 530-11: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Type of Design	: ASD	
Reinforced	: Yes	
Vertical Bar Size	: #5	
End Face Dist	: 3.813	in

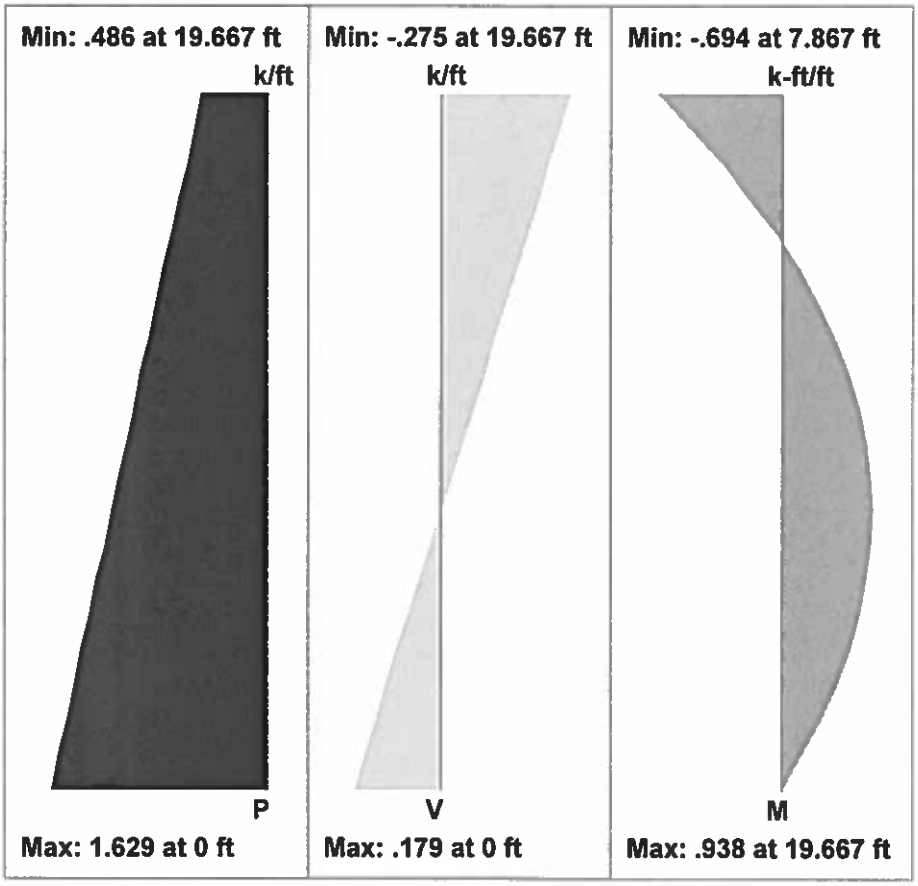
MATERIALS

Masonry f'm	: 1.5	ksi
Masonry Em	: 1350	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 19.667	ft
Eq Sld Thickness:	4.275"	
An	: 51.3	in2/ft
Blk Grouting	: Partially Grouted	
Grt/Bar Spacing	: 24"	
Loc of r/f	: Center	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb) / Fb	: .693
fa/Fa	: .045
fs/Fs	: .672

AXIAL SUMMARY

fa	: .009	ksi
Fa	: .209	ksi

BENDING SUMMARY

fb	: .459	ksi
Fb	: .675	ksi
fs	: 21.495	ksi
Fs	: 32	ksi

SHEAR CHECKS

fv/Fv	: .123
u/U	: .41

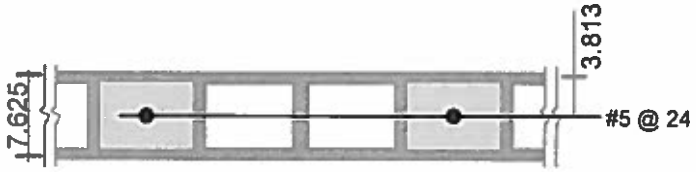
SHEAR SUMMARY

fv	: .005	ksi
Fv	: .044	ksi
Fv max	: .077	ksi
u	: .082	ksi
U	: .2	ksi

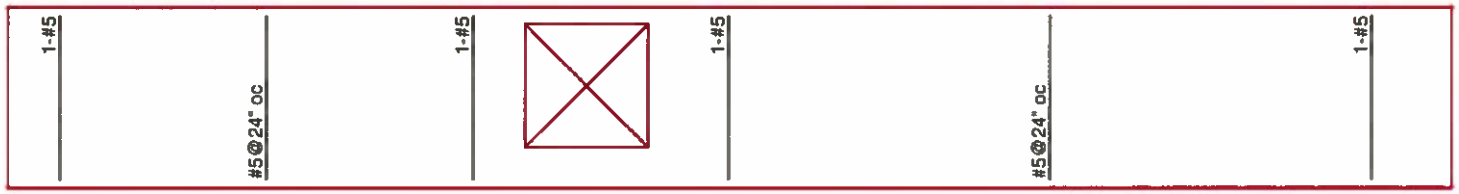
DESIGN DETAILS

AXIAL DETAILS			BENDING DETAILS			SHEAR DETAILS		
Max Axial	: .486	k/ft	Max Moment	: .938	k-ft/ft	Max Shear	: .275	k/ft
Location	: 19.667	ft	Location	: 19.667	ft	Location	: 19.667	ft
Load Comb	: 29		Load Comb	: 29		Load Comb	: 29	
Rad gyration r	: 2.53	in	k	: .314		Width for Shear	: 24	in
h'/r	: 93.282		d	: 3.813	in	Corresponding M	: .938	k-ft/ft
			j	: .895		Corresponding P	: .486	k/ft
						M / (V*d)	: 1	

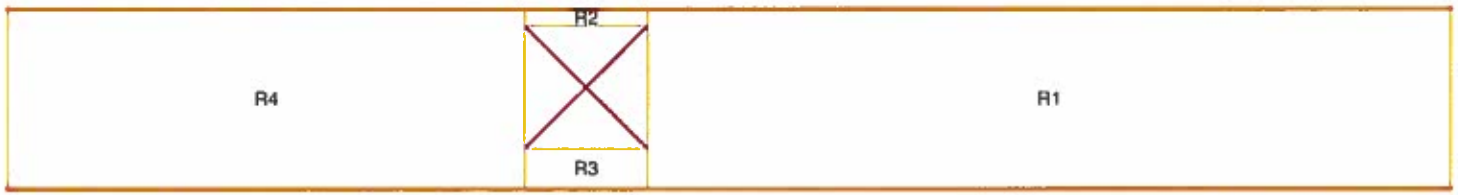
CROSS SECTION DETAILING



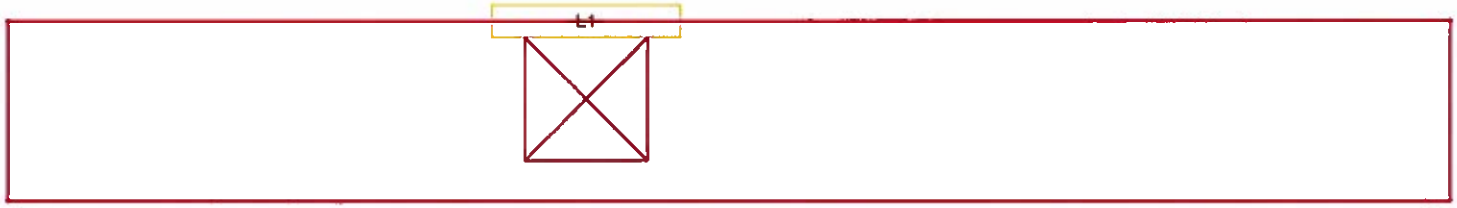
NOTE: All units are in "in."



		Wall Panel: WP1
		Jan 27, 2014 at 1:52 PM
		SW Line 2.r3d



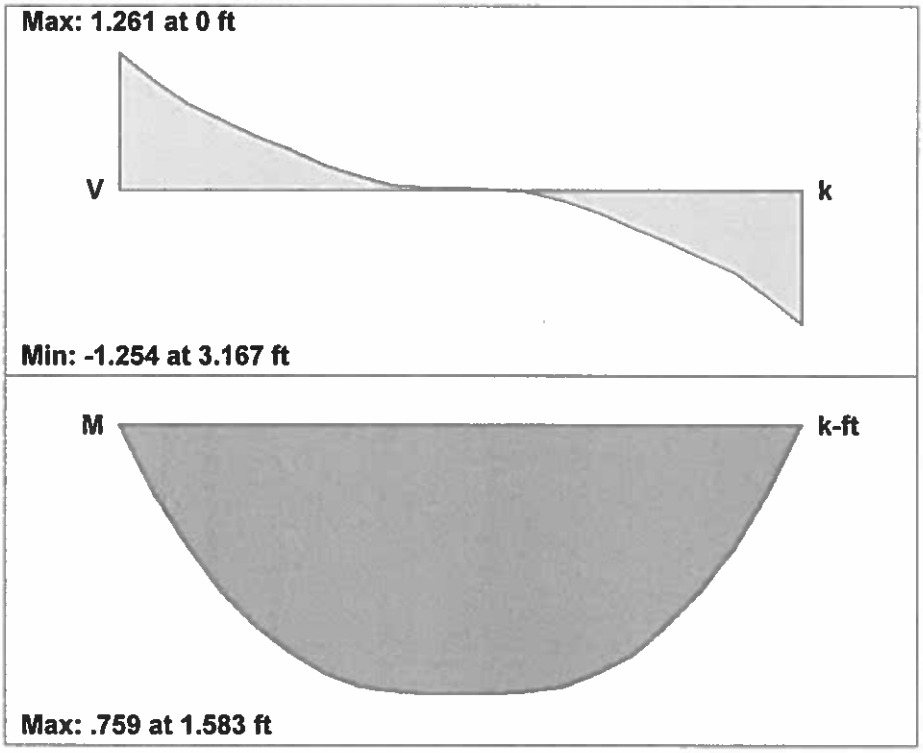
		Wall Panel: WP1
		Jan 27, 2014 at 1:52 PM
		SW Line 2.r3d



		Wall Panel: WP1
		Jan 27, 2014 at 1:53 PM
		SW Line 2.r3d

CRITERIA		MATERIALS			GEOMETRY		
Code	: ACI 530-11: ASD	Masonry f'm	: 1.5	ksi	Dist to Top of Wall	: 0	ft
Special Insp	: Yes	Masonry Em	: 1350	ksi			
Type of Design	: ASD	Steel fy	: 60	ksi	Eff Length	: 3.167	ft
		Steel E	: 29000	ksi	Eff Width	: 7.625	in
Stirrup Size	: #4	Beam Dead Wt	: .052	k/ft	Eff depth	: 4.5	in
Flex Steel	: 1-#5	Wall Dead Wt	: .078	ksf	Total Depth	: 8	in

ENVELOPE DIAGRAMS



SHEAR SUMMARY

Shear Chk fv/Fv	: .844	
Bond Chk u/U	: .842	
fv	: .037	ksi
Fv	: .044	ksi
Fvm	: .044	ksi
FvMax	: .077	ksi
u	: .168	ksi
U	: .2	ksi

BENDING SUMMARY

Bend Chk fs/Fs	: .243	
Bend Chk fm/Fm	: .609	
fm	: .305	ksi
Fm	: .5	ksi
fs	: 7.779	ksi
Fs	: 32	ksi

DESIGN DETAILS

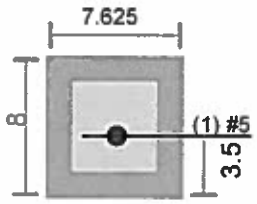
BENDING DETAILS

Max Moment	: .759	k-ft	Steel Area As	: .307	in2
Location	: 1.583	ft	Per of steel p	: .009	
Load Comb	: 4				
Mm	: 1.246	k-ft	k	: .457	
Ms	: 3.121	k-ft	j	: .848	

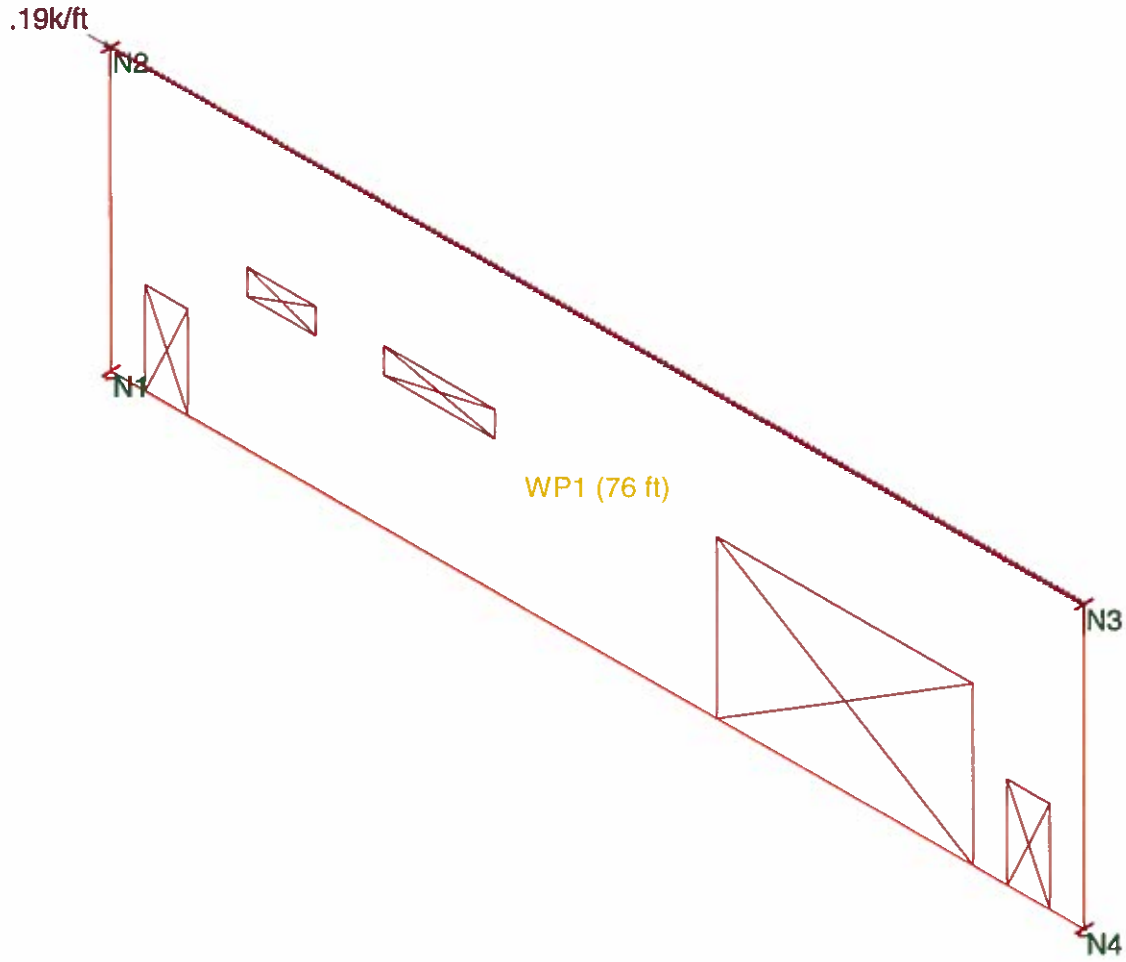
SHEAR DETAILS

Max Shear	: 1.261	k
Location	: 0	ft
Load Comb	: 4	
M / (V*d)	: 1	
Tie Spacing	: Not Required	

CROSS SECTION DETAILING

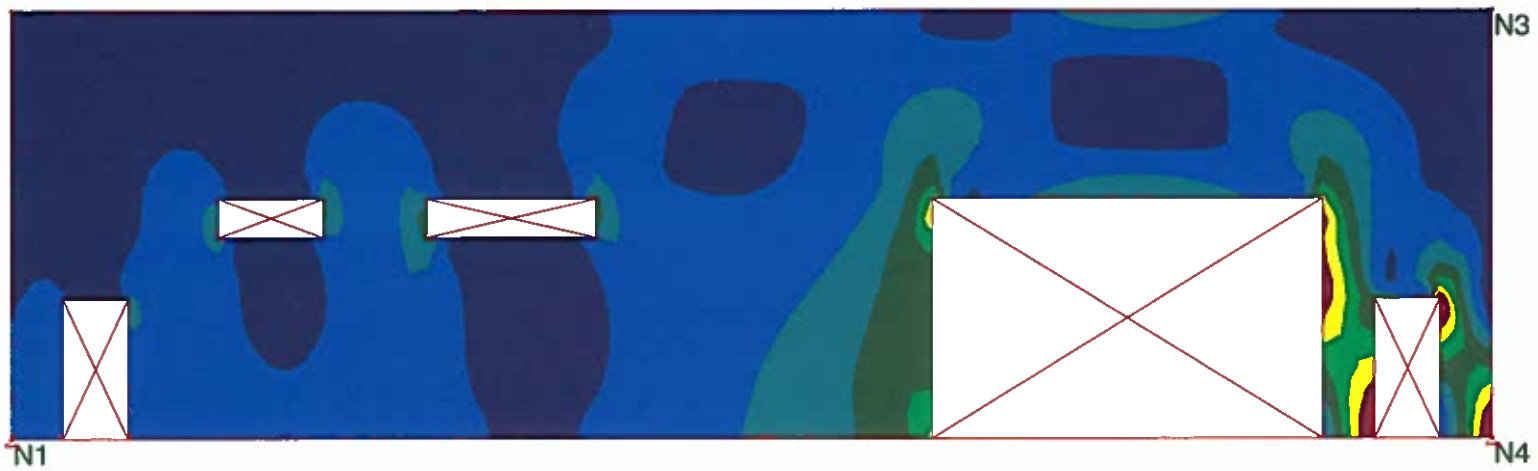


NOTE: All units are in "in."



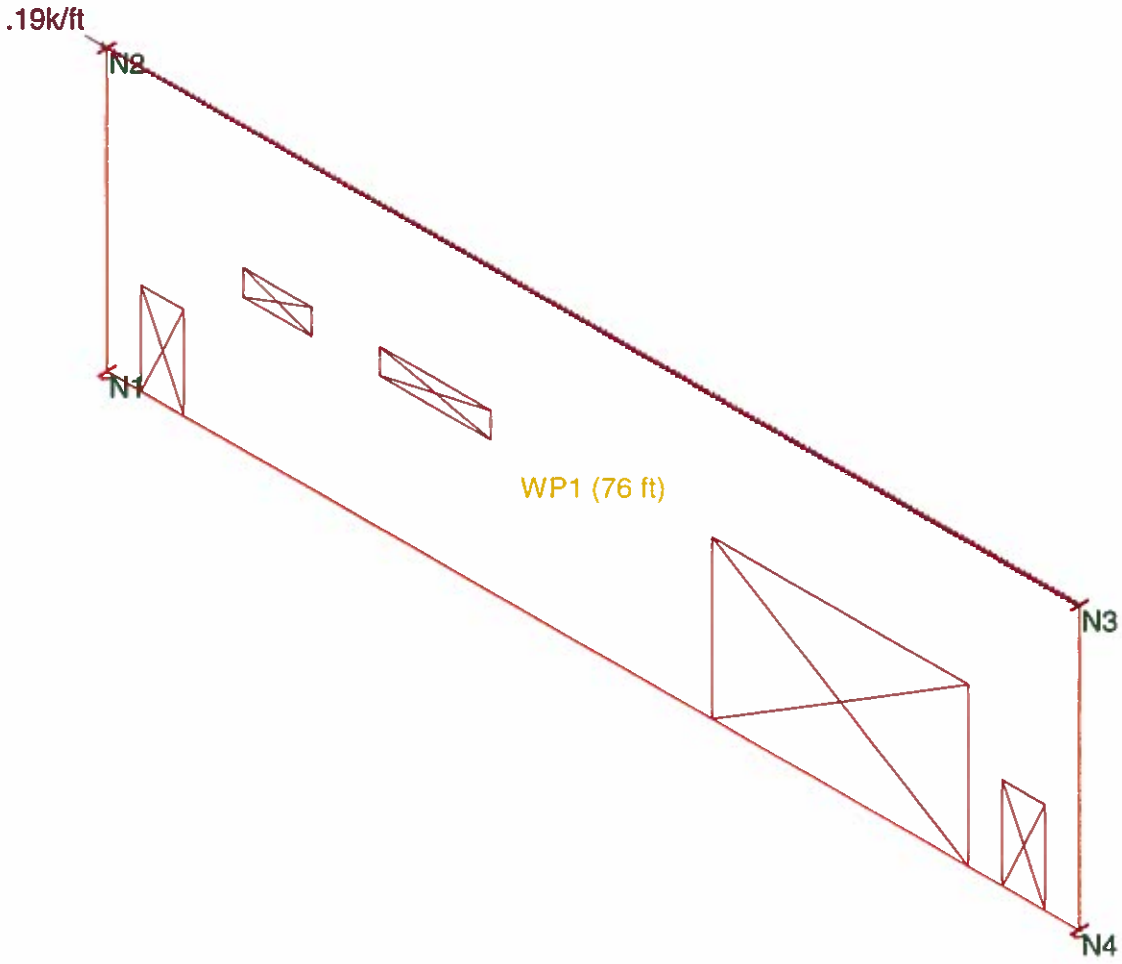
Member Code Checks Displayed
Loads: BLC 6, E X Dir
Solution: Envelope
Member y Bending Moments (k-ft)

	OWTP South Wall LC: 40 Worst Case In Plane Loading	SK - 11
		Jan 30, 2014 at 9:46 AM
		Dewatering South Wall.r3d



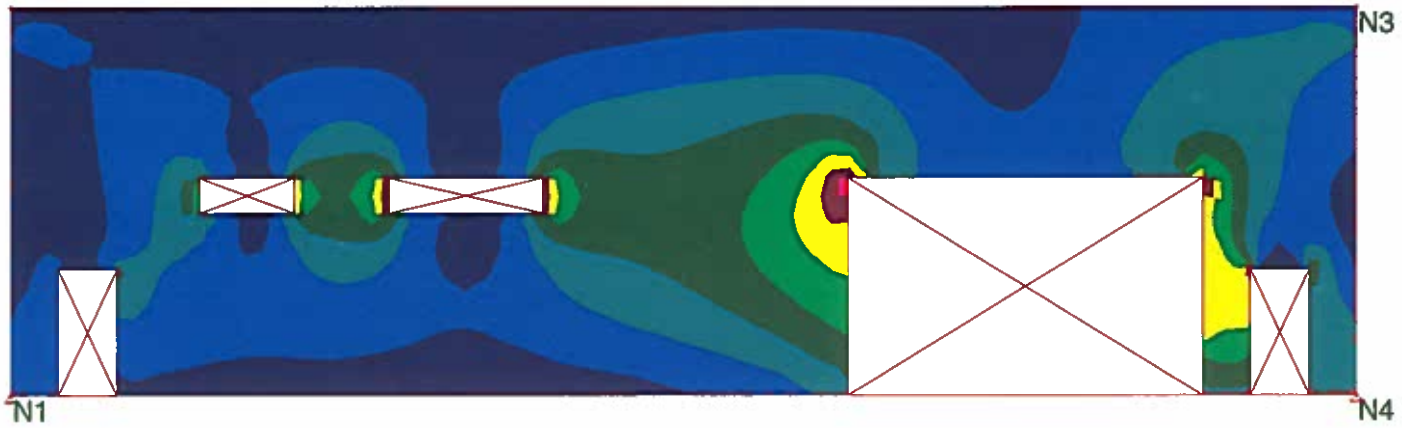
Member Code Checks Displayed
Results for LC 40, ASCE ASD 6 (d) (d)
Member y Bending Moments (k-ft)

		SK - 6
		Jan 30, 2014 at 9:06 AM
	OWTP South Wall LC 40: Worst Case In Plane Stresses	Dewatering South Wall.r3d



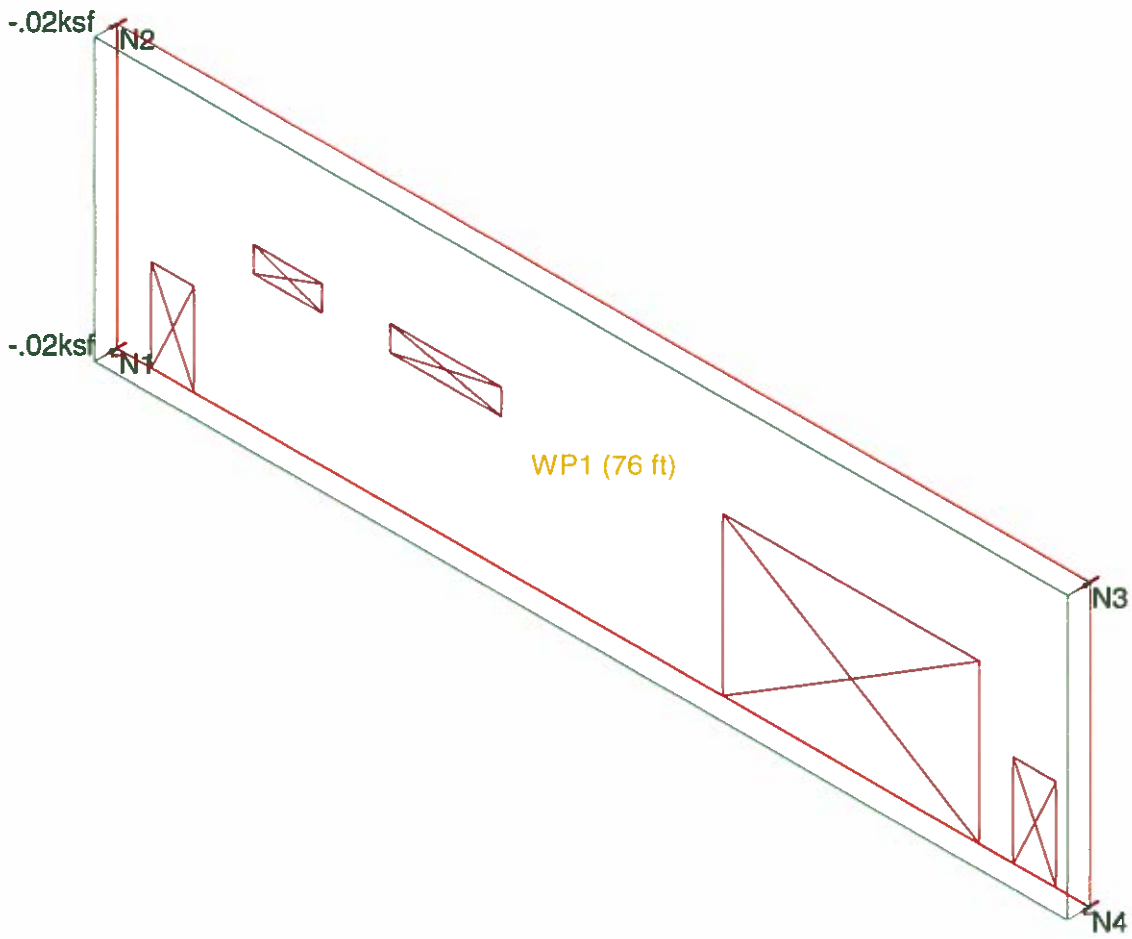
Member Code Checks Displayed
Loads: BLC 6, E X Dir
Solution: Envelope
Member y Bending Moments (k-ft)

		SK - 12
		Jan 30, 2014 at 9:49 AM
	OWTP South Wall LC 40: Worst In Plane Loading	Dewatering South Wall.r3d



Member Code Checks Displayed
Results for LC 10, ASCE ASD 5 (a) (b)
Member y Bending Moments (k-ft)

		SK - 8
		Jan 30, 2014 at 9:08 AM
	OWTP South Wall Worst Case Out Of Plane Stresses	Dewatering South Wall.r3d



Member Code Checks Displayed
Loads: BLC 5, Wind Z Dir
Results for LC 10, ASCE ASD 5 (a) (b)
Member y Bending Moments (k-ft)

		SK - 9
		Jan 30, 2014 at 9:10 AM
	OWTP South Wall LC 10: Worst Case Out Of Plane Loading	Dewatering South Wall.r3d

Masonry Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5..	Self Weight[...	f'm[ksi]	Flex Steel[ksi]	Shear Steel[...
1	Concrete Matl	1800	720	.25	.6	Custom	2	60	60
2	Clay Matl	1750	420	.25	.6	Custom	2.5	60	60
3	Gen Masonry	1050	420	.25	.6	.08	1.5	60	60

Masonry Wall Panel Parameters

	Label	Block Nom Width	Block Grouting	Reinforced	Wall Area Method
1	Typical	8"	Fully Grouted	Yes	NCMA
2	R3 SPecial	8"	Fully Grouted	Yes	NCMA

Masonry Wall Panel In Plane Parameters

	Label	Vert Bar Size	Bars Per Cell	Min Bound Zone ...	Max Bound Zo...	Horz Bar Size	1.5x Shear Inc	Transfer Load
1	Typical	#5	2	8	16	#6	Yes	Yes
2	R3 SPecial	#8	1	8	16	#6	Yes	Yes

Masonry Wall Panel Out of Plane Parameters

	Label	Bar Size	Bar Space Min	Bar Space Max	Bar Placement	Mortar Type	Cement Type	Transfer Load
1	Typical	#5	24"	24"	Center	Type M or S	Portland, Lime/...	
2	R3 SPecial	#8	24"	24"	Center	Type M or S	Portland, Lime/...	

Masonry Wall Panel Lintel Parameters

	Label	Depth[in]	Bear Lengt...	Bar Size	Min # Bars ...	Max # Bars Per La...	Num of Lay...	c/c Sp of La...	Dist to Bot[in]	Stirrup ...
1	Typical	16	8	#5	1	3	1	N/A	4.5	#4
2	R3 SPecial	24	8	#5	1	3	1	N/A	4.5	#4

Wall Panel Data

	Label	A Joint	B Joint	C Joint	D Joint	Material Type	Material Set	Thicknes...	Design Rule	Panel/Spacing
1	WP1	N1	N2	N3	N4	Masonry	Clay Matl	8	Typical	24

Wall Panel Advanced Data

	Label	Design Method	SSAF	In-plane Icr Factor	Out-plane Icr Factor	K
1	WP1	N/A	N/A	N/A	N/A	N/A

Wall Panel Surface Loads (BLC 5 : Wind Z Dir)

	Wall Panel Label	Direction	Top Magnitude[ksf,F]	Bottom Magnitude[...	Start Location[ft]	Height[ft]
1	WP1	Z	-.02	-.02	0	0

Load Combinations

	Description	Sol...	PDelta	SR...	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	ASCE ASD 1	Yes			DL	1														
2	ASCE ASD 2	Yes			DL	1	LL	1	LLS	1										
3	ASCE ASD 3 (a)	Yes			DL	1	RLL	1												
4	ASCE ASD 3 (b)	Yes			DL	1	SL	1	SLN	1										
5	ASCE ASD 3 (c)	Yes			DL	1	RL	1												
6	ASCE ASD 4 (a)	Yes			DL	1	LL	.75	LLS	.75	RLL	.75								
7	ASCE ASD 4 (b)	Yes			DL	1	LL	.75	LLS	.75	SL	.75	SLN	.75						

Load Combinations (Continued)

	Description	Sol...	PDelta	SR...	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
8	ASCE ASD 4 (c)	Yes			DL	1	LL	.75	LLS	.75	RL	.75								
9	ASCE ASD 5 (a) (a)	Yes			DL	1	WLX	.6												
10	ASCE ASD 5 (a) (b)	Yes			DL	1	WLZ	.6												
11	ASCE ASD 5 (a) (c)	Yes			DL	1	WLX	-.6												
12	ASCE ASD 5 (a) (d)	Yes			DL	1	WLZ	-.6												
13	ASCE ASD 6 (a) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	RLL	.75						
14	ASCE ASD 6 (a) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	RLL	.75						
15	ASCE ASD 6 (a) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	RLL	.75						
16	ASCE ASD 6 (a) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	RLL	.75						
17	ASCE ASD 6 (c) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
18	ASCE ASD 6 (c) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
19	ASCE ASD 6 (c) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
20	ASCE ASD 6 (c) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	SL	.75	SLN	.75				
21	ASCE ASD 6 (e) (a)	Yes			DL	1	WLX	.45	LL	.75	LLS	.75	RL	.75						
22	ASCE ASD 6 (e) (b)	Yes			DL	1	WLZ	.45	LL	.75	LLS	.75	RL	.75						
23	ASCE ASD 6 (e) (c)	Yes			DL	1	WLX	-.45	LL	.75	LLS	.75	RL	.75						
24	ASCE ASD 6 (e) (d)	Yes			DL	1	WLZ	-.45	LL	.75	LLS	.75	RL	.75						
25	ASCE ASD 7 (a)	Yes			DL	.6	WLX	.6												
26	ASCE ASD 7 (b)	Yes			DL	.6	WLZ	.6												
27	ASCE ASD 7 (c)	Yes			DL	.6	WLX	-.6												
28	ASCE ASD 7 (d)	Yes			DL	.6	WLZ	-.6												
29	ASCE ASD 5 (b) (a)	Yes			DL	1	ELX	.7												
30	ASCE ASD 5 (b) (b)	Yes			DL	1	ELZ	.7												
31	ASCE ASD 5 (b) (c)	Yes			DL	1	ELX	-.7												
32	ASCE ASD 5 (b) (d)	Yes			DL	1	ELZ	-.7												
33	ASCE ASD 6 (b) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	RLL	.75						
34	ASCE ASD 6 (b) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	RLL	.75						
35	ASCE ASD 6 (b) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	RLL	.75						
36	ASCE ASD 6 (b) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	RLL	.75						
37	ASCE ASD 6 (d) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
38	ASCE ASD 6 (d) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
39	ASCE ASD 6 (d) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
40	ASCE ASD 6 (d) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	SL	.75	SLN	.75				
41	ASCE ASD 6 (f) (a)	Yes			DL	1	ELX	.525	LL	.75	LLS	.75	RL	.75						
42	ASCE ASD 6 (f) (b)	Yes			DL	1	ELZ	.525	LL	.75	LLS	.75	RL	.75						
43	ASCE ASD 6 (f) (c)	Yes			DL	1	ELX	-.525	LL	.75	LLS	.75	RL	.75						
44	ASCE ASD 6 (f) (d)	Yes			DL	1	ELZ	-.525	LL	.75	LLS	.75	RL	.75						
45	ASCE ASD 8 (a)	Yes			DL	.6	ELX	.7												
46	ASCE ASD 8 (b)	Yes			DL	.6	ELZ	.7												
47	ASCE ASD 8 (c)	Yes			DL	.6	ELX	-.7												
48	ASCE ASD 8 (d)	Yes			DL	.6	ELZ	-.7												

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	10	WP1	0	125.785	20.064	223.695	0	-334.804
2	10	Totals:	0	125.785	20.064			
3	10	COG (ft):	X: 35.338	Y: 13.748	Z: 0			

Masonry Wall Reinforcement

	Wall	Region	Hor. Bar Size	Vert. Bar Size	Boundary Reinf.
1	WP1	R1	Not Reqd.	#5@24" oc	2-#5
2		R2	Not Reqd.	#5@24" oc	2-#5
3		R3	Not Reqd.	#5@24" oc	2-#5
4		R4	Not Reqd.	#5@24" oc	2-#5
5		R5	Not Reqd.	#5@24" oc	2-#5

Masonry Wall Reinforcement (Continued)

	Wall	Region	Hor. Bar Size	Vert. Bar Size	Boundary Reinf.
6		R6	Not Reqd.	#5@24" oc	2-#5
7		R7	Not Reqd.	#5@24" oc	2-#5
8		R8	Not Reqd.	#5@24" oc	2-#5
9		R9	Not Reqd.	#5@24" oc	2-#5
10		R10	Not Reqd.	#5@24" oc	2-#5
11		R11	Not Reqd.	#5@24" oc	2-#5
12		R12	Not Reqd.	#5@24" oc	2-#5
13		R13	Not Reqd.	#5@24" oc	2-#5

Masonry Lintel Reinforcement

	Wall	Lintel	Flex. Steel	Stirrup
1	WP1	L1	2-#5	Not Reqd.
2		L3	1-#5	Not Reqd.
3		L10	1-#5	Not Reqd.
4		L11	1-#5	Not Reqd.
5		L12	1-#5	Not Reqd.

Wall Panel ACI 530-08: ASD Masonry Code Checks for Wall Regions (In Plane)

	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP1	R1	Typical	.11	10	.265	10	.211	.833	.035
2		R2	Typical	.024	10	.174	10	.414	.833	.063
3		R3	Typical	.104	10	.223	10	.211	.833	.05
4		R4	Typical	.005	10	.041	10	.536	.833	.066
5		R5	Typical	.048	10	.062	10	.211	.833	.053
6		R6	Typical	.005	10	.035	10	.536	.833	.065
7		R7	Typical	.021	10	.017	10	.523	.833	.062
8		R8	Typical	.036	10	.028	10	.211	.833	.059
9		R9	Typical	.007	10	.033	10	.536	.833	.064
10		R10	Typical	.027	10	.019	10	.523	.833	.062
11		R11	Typical	.039	10	.07	10	.211	.833	.051
12		R12	Typical	.011	10	.027	10	.414	.833	.065
13		R13	Typical	.045	10	.063	10	.211	.833	.035

Wall Panel ACI 530-08: ASD Masonry Code Checks for Wall Regions (Out of Plane)

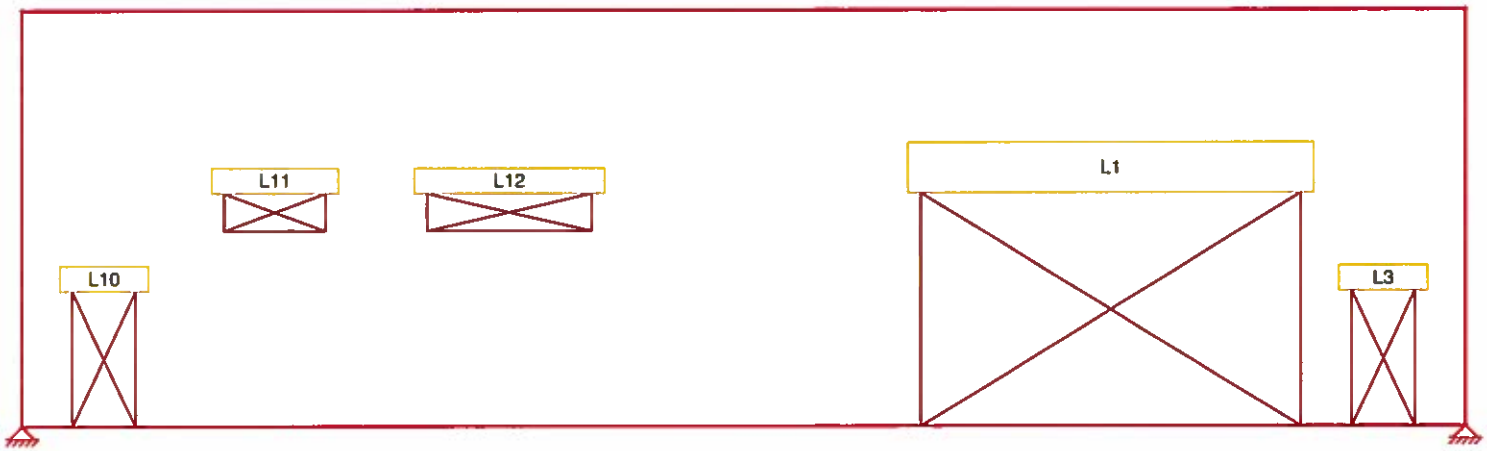
	Wall Panel	Region	Design R...	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP1	R1	Typical	.213	10	.03	10	.211	.833	.05
2		R2	Typical	.4	10	.036	10	.414	.833	.05
3		R3	Typical	.982	10	.087	10	.211	.833	.05
4		R4	Typical	.166	10	.024	10	.536	.833	.05
5		R5	Typical	.887	10	.045	10	.211	.833	.05
6		R6	Typical	.268	10	.025	10	.536	.833	.05
7		R7	Typical	.297	10	.026	10	.523	.833	.05
8		R8	Typical	.938	10	.037	10	.211	.833	.05
9		R9	Typical	.272	10	.026	10	.536	.833	.05
10		R10	Typical	.321	10	.027	10	.523	.833	.05
11		R11	Typical	.497	10	.024	10	.211	.833	.05
12		R12	Typical	.206	10	.016	10	.414	.833	.05
13		R13	Typical	.113	10	.015	10	.211	.833	.05

Wall Panel ACI 530-08: Strength Masonry Code Checks for Wall Regions (In Plane)

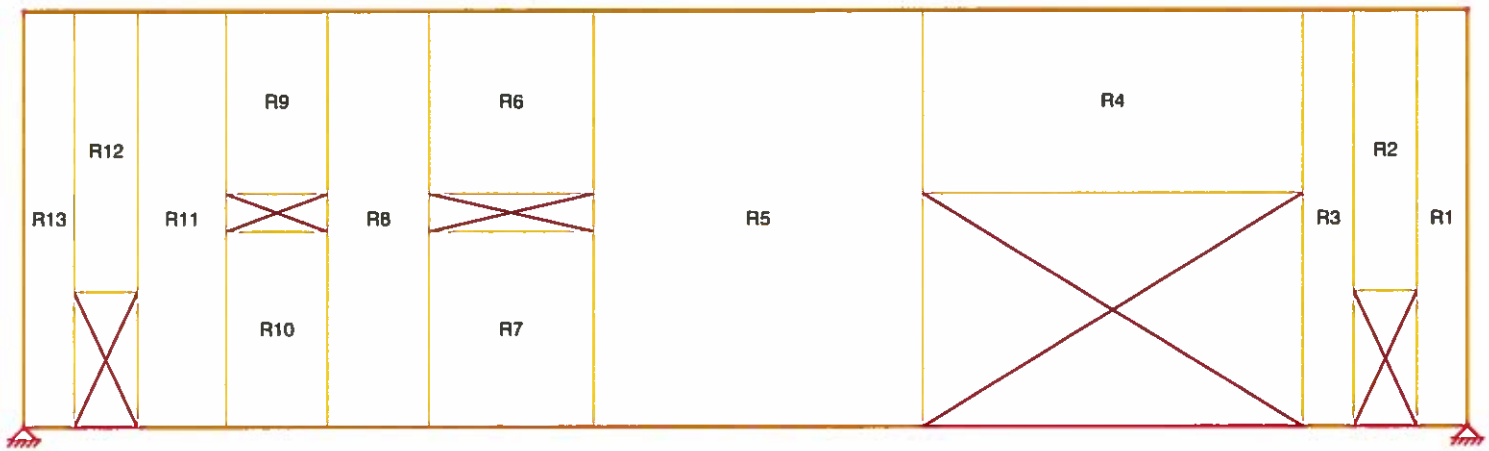
Wall Pa...	Region	Design ...	Axial UC	LC	Bending UC	LC	Shear UC	LC	Pn*phi[k]	Mn*phi[k-ft]	Vn*phi[k]
No Data to Print ...											

Wall Panel ACI 530-08: Strength Masonry Code Checks for Wall Regions (Out of Plane)

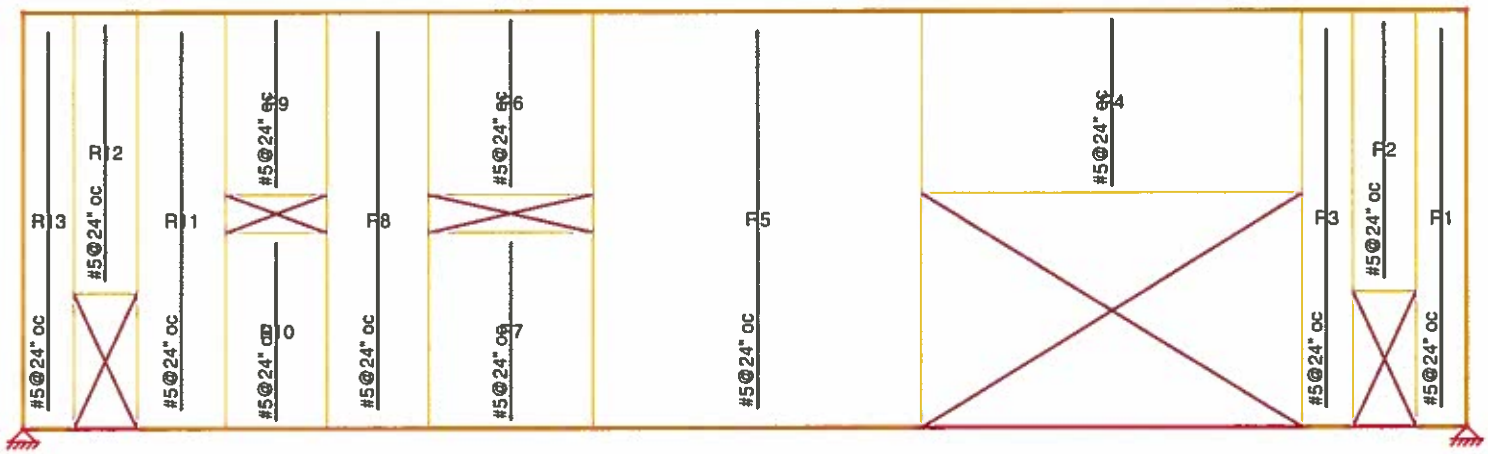
Wall Panel	Region	Design Rule	Axial UC	LC	Bending UC	LC	Pn[k-ft]	Mn*phi[k-ft]
No Data to Print ...								



	OWTP South Wall Lintel Schedule	Wall Panel: WP1
		Jan 30, 2014 at 9:26 AM
		Dewatering South Wall.r3d



	OWTP South Wall Region Schedule	Wall Panel: WP1
		Jan 30, 2014 at 9:28 AM
		Dewatering South Wall.r3d



300

	OWTP South Wall	Wall Panel: WP1
		Jan 30, 2014 at 9:28 AM
		Dewatering South Wall.r3d

CRITERIA

Code	: ACI 530-08: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Type of Design	: ASD	
Reinforced	: Yes	
Vertical Bar Size	: #5	
End Face Dist	: 3.813	in

MATERIALS

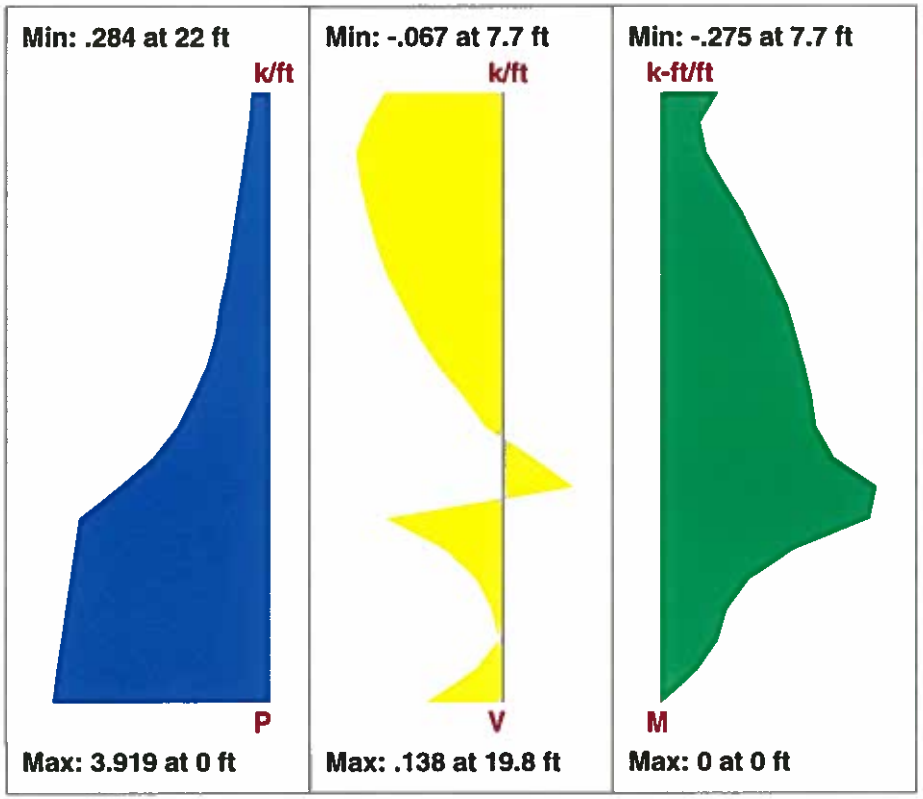
Masonry f'm	: 2.5	ksi
Masonry Em	: 1750	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 22	ft
Eq Sld Thickness	: 7.625"	
An	: 91.5	in2/ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 24"	
Loc of r/f	: Center	

WARNING : h'/t = 33 exceeds 30! Refer ACI530 3.3.5.3/4 / Design Wall as Slender.

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb) / Fb	: .213
fa/Fa	: .139
fs/Fs	: .259

AXIAL SUMMARY

fa	: .029	ksi
Fa	: .211	ksi

BENDING SUMMARY

fb	: .148	ksi
Fb	: .833	ksi
fs	: 6.227	ksi
Fs	: 24	ksi

SHEAR CHECKS

fv/Fv	: .03
u/U	: .203

SHEAR SUMMARY

fv	: .002	ksi
Fv	: .05	ksi
u	: .011	ksi
U	: .2	ksi

DESIGN DETAILS

AXIAL DETAILS			BENDING DETAILS			SHEAR DETAILS		
Max Axial	: 2.682	k/ft	Max Moment	: .275	k-ft/ft	Max Shear	: .138	k/ft
Location	: 7.7	ft	Location	: 7.7	ft	Location	: 19.8	ft
Load Comb	: 10		Load Comb	: 10		Load Comb	: 10	
Rad gyration r	: 2.19	in	k	: .282		Width for Shear	: 24	in
h'/r	: 120.548		d	: 3.813	in			
			j	: .906				

CROSS SECTION DETAILING

NOTE: All units are in "in."

302

CRITERIA

Code	: ACI 530-08: ASD	
Special Insp	: Yes	
Wall Area	: NCMA	
Hor Bar Size	: #6	
Vert Bar Size	: #5	
No of Ten Bars	: 2	
Effective Depth	: 27.98	in

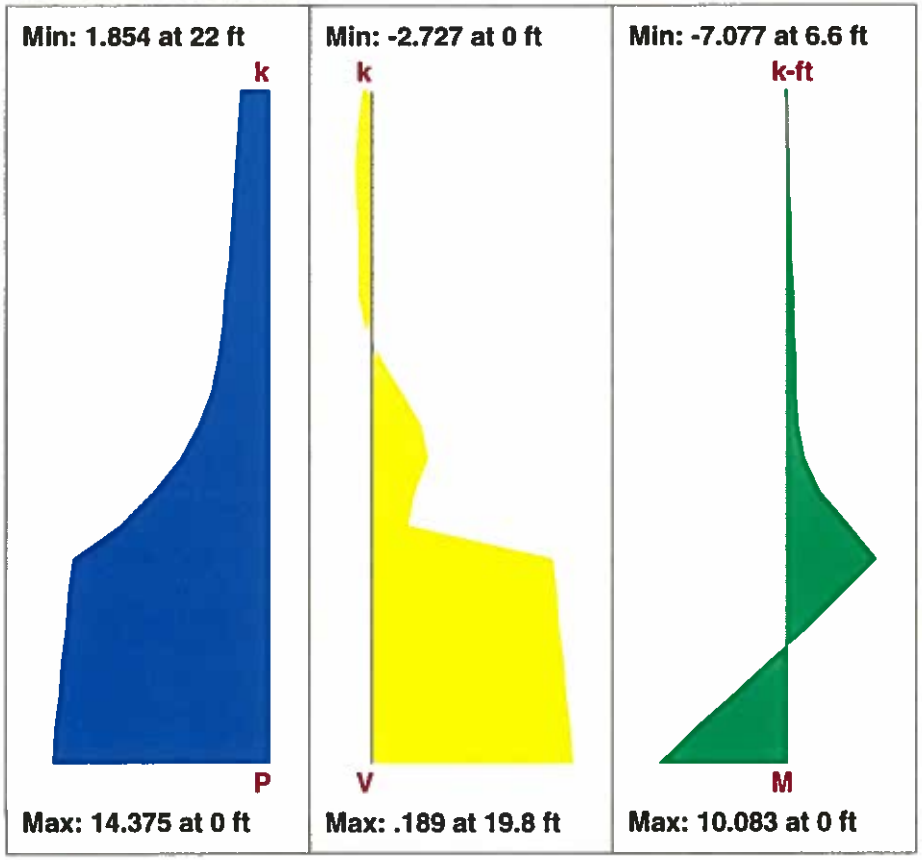
MATERIALS

Masonry f'm	: 2.5	ksi
Masonry Em	: 1750	ksi
Steel fy	: 60	ksi
Steel E	: 29000	ksi
Blk Material	: Conc 115 pcf	
Grt Weight	: 140 pcf	

GEOMETRY

Total Height	: 22	ft
Total Length	: 2.665	ft
Blk Grouting	: Fully Grouted	
Grt/Bar Spacing	: 24"	
Blk Nom Width	: 8"	
1.5 Shear Factor	: Yes	

ENVELOPE DIAGRAMS



COMBINED CHECKS

(fa + fb)/Fb	: .193
fa/Fa	: .28
fs/Fs	: .019

AXIAL SUMMARY

fa	: .059	ksi
Fa	: .211	ksi

BENDING SUMMARY

fb	: .102	ksi
Fb	: .833	ksi
fs	: .466	ksi
Fs	: 24	ksi

SHEAR CHECKS

fv / Fv	: .548
u/U	: .172

SHEAR SUMMARY

fv	: .019	ksi
Fvm	: .035	ksi
Fvs max	: .075	ksi
u	: .034	ksi
U	: .2	ksi

DESIGN DETAILS AT GOVERNING SECTION

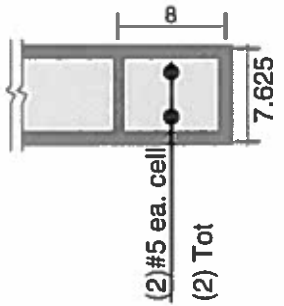
AXIAL COMPRESSION DETAILS			BENDING DETAILS			SHEAR DETAILS		
Axial	: 14.375	k	Moment	: 10.083	k-ft	Shear	: 2.727	k
Location	: 0	ft	Location	: 0	ft	Location	: 0	ft
Load Comb	: 40		Load Comb	: 40		Load Comb	: 40	
Rad gyration r	: 2.19	in	Sect Mod S	: 1300	in3	Corresponding M:	10.083	k-ft
h'/r	: 120.548		Tension St Asv	: 0.6136	in2	Corresponding P :	14.375	k
Red Factor R	: .337		Per of steel p	: 0.002876		M / (V*d)	: 1.586	
			k*d	: 23.83	in	Shear St Area	: Not Reqd.	
			j	: 0.72		Shear Spacing	: N/A	
						Peri of Bars	: N/A	

CRACKED SECT ANALYSIS

fm = fa + fb	: .161	ksi
C	: 14.64	k
T	: .264	k

304

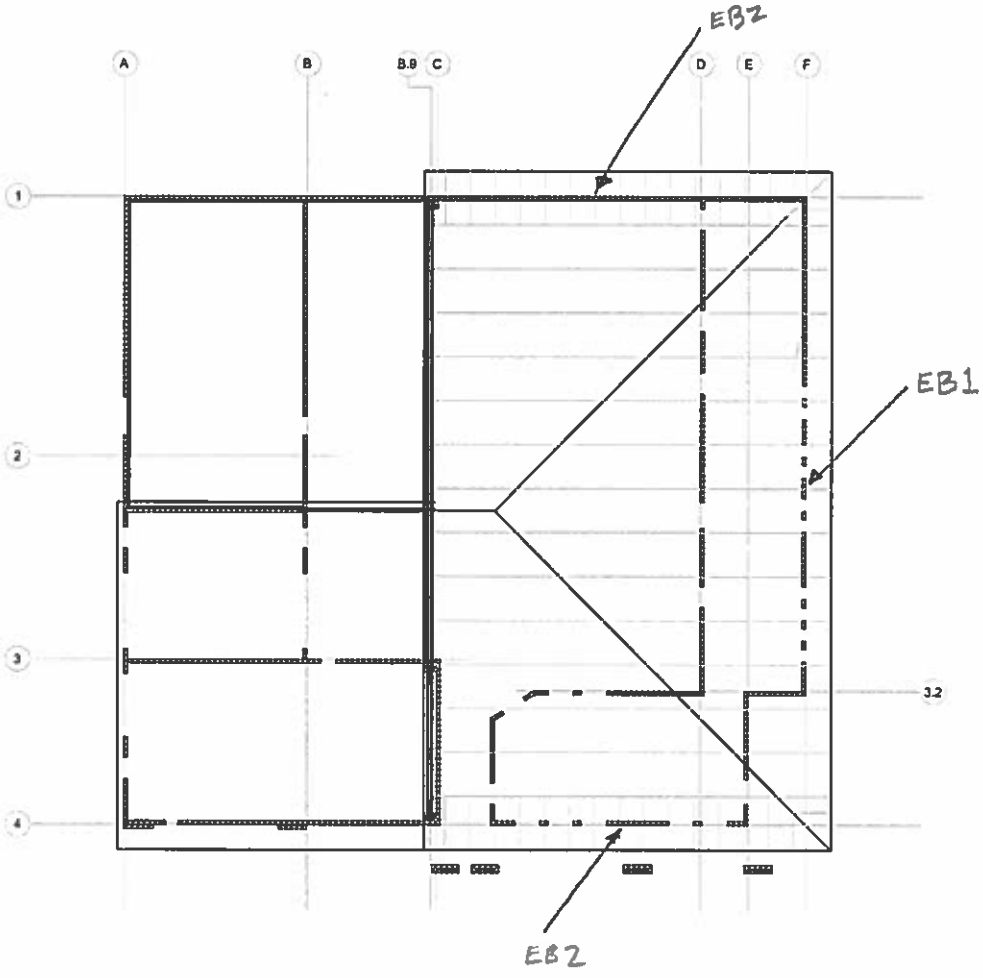
CROSS SECTION DETAILING

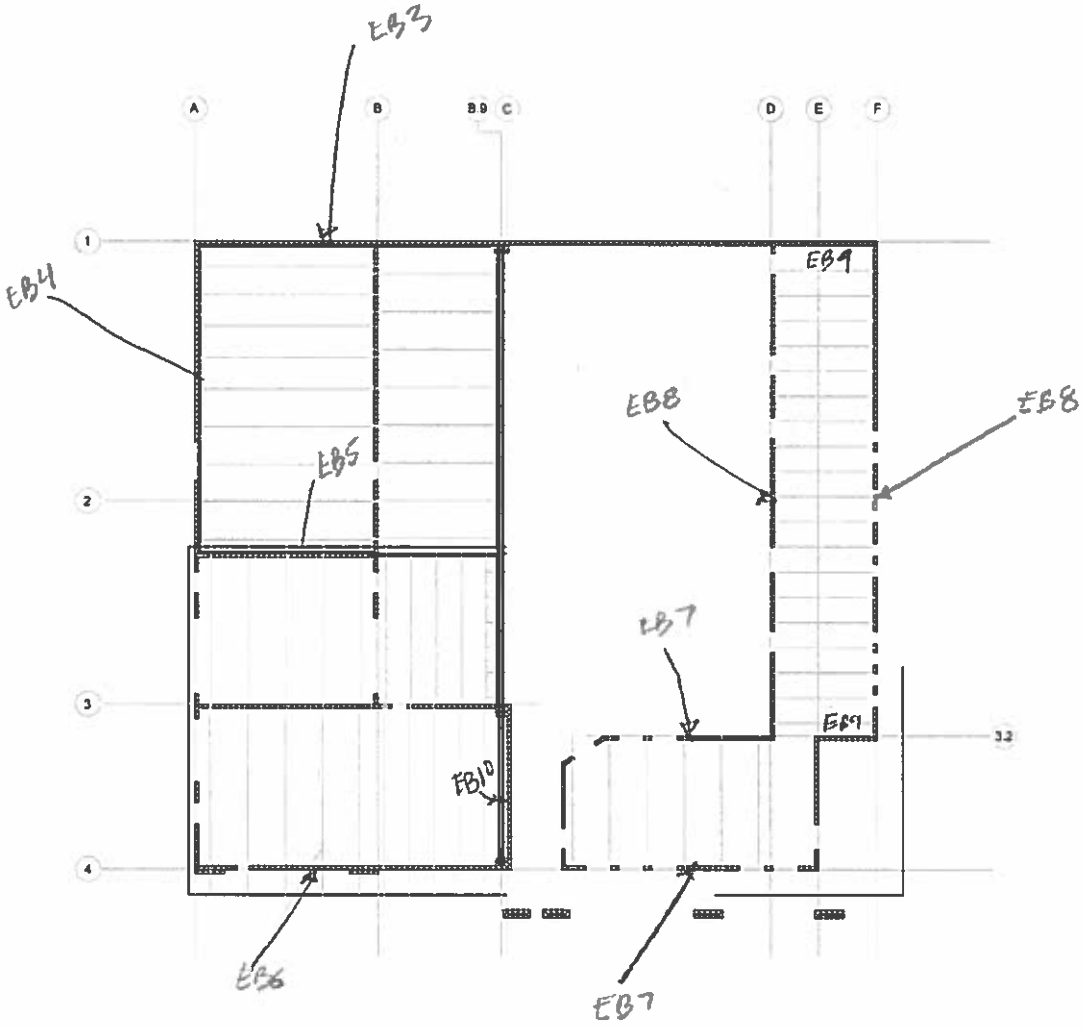


NOTE: All units are in "in."

EMBED PLATE CALCULATIONS

Embed Plate Map




EB3
A
B
B9
C
D
E
F
1
2
3
4
EB4
EB5
EB1
EB8
EB8
EB7
EB9
EB10
EB6
EB7

SUNRISE ENGINEERING

Project: Ogden Water Treatment Plant
Date: 12-11-2013
Embed Anchor Bolts in Top of Masonry Wall (ASD)
Location: EB1

Loading	In-plane Vertical				Out-of Plane Horiz.		
	Dead	Live	LiveR	Snow	R	Wind	Seismic
	18	0	0	37	0	0	293
	psf	psf	psf	psf	psf	psf	plf

In Plane Load 20.6 kips

Input		
Length/Distance between Suppor	7	ft
Width/ Half Span	30	ft
SDS	0.779	%g
Area	210	sqft
Masonry Strength, f'm	1500	psi
Diameter Anchor	0.75	in
Yield Anchor	58000	psi
Masonry Width (Atlas Blocks)	7.5625	in
Compression Top of Wall		
In Plane Wall Length	100	ft
Dist. Between Shear Connections	7	ft

Bolt Geometry		
Vertical Bolt Spacing	0	in
Horizontal Bolt Spacing	6	in
Vertical Spacing	0	in
Eccentricity	0	in
Bolts Bottom Row	0	#
Bolts Top Row	2	#
Lb-Embed Depth	6	in

Calculations	
Area Anchor	0.44179
X=	4.65856
Y=	1.34144
Theta Calc	0.63021
Theta=	78.131
Angle Calc	1.36364
Angle Calc	0.97862
Apt Calc	13.8608
Apt	113.097
TOW APT	129.696
Area Reduced	
Apv	20.007

Calculations	lb	lb total
Bab=	6278.9	
Bap=	26100	52200
Bvb-	968.586	1937.17
Bvc=	1775.8	3551.6
Bvpry=	10950.6	21901.2
Bvs=	9224.5	18449
Bab Wall=	1667.22	3334.45

Results

Out of Plane			
Total App Axial Force	0	lbs	OK
Total App Shear Force	1435.7	lbs	OK
Ratio	0.74113		OK
In Plane			
In Plane Shear	144.2	plf	
Total App Shear Force	1009.4	lbs	OK
Ratio	0.28421		OK

SUNRISE ENGINEERING

Project: Ogden Water Treatment Plant
Date: 12-11-2013
Embed Anchor Bolts in Top of Masonry Wall (ASD)
Location: EB2

Loading	In-plane Vertical				Out-of Plane Horiz.		
	Dead	Live	LiveR	Snow	R	Wind	Seismic
	18	0	0	37	0	0	594
	psf	psf	psf	psf	psf	psf	plf

In Plane Load 20.6 kips

Input		
Length/Distance between Suppor	4	ft
Width/ Half Span	7.5	ft
SDS	0.779	%g
Area	30	sqft
Masonry Strength, f'm	1500	psi
Diameter Anchor	0.75	in
Yield Anchor	58000	psi
Masonry Width (Atlas Blocks)	7.5625	in
Compression Top of Wall		
In Plane Wall Length	60	ft
Dist. Between Shear Connections	4	ft

Bolt Geometry		
Vertical Bolt Spacing	0	in
Horizontal Bolt Spacing	6	in
Vertical Spacing	0	in
Eccentricity	0	in
Bolts Bottom Row	0	#
Bolts Top Row	2	#
Lb-Embed Depth	6	in

Calculations	
Area Anchor	0.44179
X=	4.65856
Y=	1.34144
Theta Calc	0.63021
Theta=	78.131
Angle Calc	1.36364
Angle Calc	0.97862
Apt Calc	13.8608
Apt	113.097
TOW APT	129.696
Area Reduced	
Apv	20.007

Calculations	lb	lb total
Bab=	6278.9	
Bap=	26100	52200
Bvb-	968.586	1937.17
Bvc=	1775.8	3551.6
Bvpry=	10950.6	21901.2
Bvs=	9224.5	18449
Bab Wall=	1667.22	3334.45

Results

Out of Plane			
Total App Axial Force	0	lbs	OK
Total App Shear Force	1663.2	lbs	OK
Ratio	0.85857		OK
In Plane			
In Plane Shear	240.333	plf	
Total App Shear Force	961.333	lbs	OK
Ratio	0.27068		OK

SUNRISE ENGINEERING

Project: Ogden Water Treatment Plant
Date: 12-11-2013
Embed Anchor Bolts in Masonry Wall (ASD)
Location: EB3

Loading	In-plane Vertical				Out-of Plane Horiz.		
	Dead	Live	LiveR	Snow	R	Wind	Seismic
	18	0	0	41	0	0	496
	psf	psf	psf	psf	psf	psf	plf
In Plane Load	10.8 kips						

Input		
Length/Distance between Suppor	4	ft
Width/ Half Span	3	ft
SDS	0.779	%g
Area	12	sqft
Masonry Strength, f'm	2500	psi
Diameter Anchor	0.75	in
Yield Anchor	58000	psi
Masonry Width (Atlas Blocks)	7.5625	in
Tension Top of Wall		
In Plane Wall Length	49	ft
Dist. Between Shear Connections	4	ft

Bolt Geometry		
Horizontal Bolt Spacing	8	in
Vertical Spacing	8	in
Eccentricity	4	in
Bolts Bottom Row	0	#
Bolts Top Row	2	#
Lb-Embed Depth	6	in

Calculations	
Area Anchor	0.44179
X=	4.65856
Y=	1.34144
Theta Calc	0.47266
Theta=	56.4137
Angle Calc	0.98461
Angle Calc	0.83305
Apt Calc	5.45585
Apt	113.097
Reduced Apt	64.69
Area Reduced	
Apv	22.459

Calculations	lb	lb total
Bab=	4043.13	8086.25
Bap=	26100	52200
Bvb-	1403.69	2807.38
Bvc=	2017.7	4035.4
Bvpry=	14137.2	28274.3
Bvs=	9224.5	18449

Results			
Out of Plane			
Total App Axial Force	1867.91	lbs	OK
Total App Shear Force	239.557	lbs	OK
Ratio	0.52432		OK
In Plane			
In Plane Shear	154.286	plf	
Total App Shear Force	617.143	lbs	OK
Ratio	0.15293		OK

SUNRISE ENGINEERING

Project: Ogden Water Treatment Plant
Date: 12-11-2013
Embed Anchor Bolts in Top of Masonry Wall (ASD)
Location: EB4

Loading	In-plane Vertical				Out-of Plane Horiz.		
	Dead	Live	LiveR	Snow	R	Wind	Seismic
	18	0	0	42	0	0	496
	psf	psf	psf	psf	psf	psf	plf

In Plane Load 23.3 kips

Input		
Length/Distance between Suppor	6	ft
Width/ Half Span	14.67	ft
SDS	0.779	%g
Area	88.02	sqft
Masonry Strength, f'm	2500	psi
Diameter Anchor	0.75	in
Yield Anchor	58000	psi
Masonry Width (Atlas Blocks)	7.5625	in
Compression Top of Wall		
In Plane Wall Length	50	ft
Dist. Between Shear Connections	6	ft

Bolt Geometry		
Vertical Bolt Spacing	0	in
Horizontal Bolt Spacing	6	in
Vertical Spacing	0	in
Eccentricity	0	in
Bolts Bottom Row	0	#
Bolts Top Row	2	#
Lb-Embed Depth	5	in

Calculations	
Area Anchor	0.44179
X=	3.27141
Y=	1.72859
Theta Calc	0.63021
Theta=	78.131
Angle Calc	1.36364
Angle Calc	0.97862
Apt Calc	9.62557
Apt	78.5398
TOW APT	104.481
Area Reduced	
Apv	20.007

Calculations	lb	lb total
Bab=	6530.04	
Bap=	26100	52200
Bvb-	1250.44	2500.88
Bvc=	2017.7	4035.4
Bvpry=	9817.48	19635
Bvs=	9224.5	18449
Bab Wall=	1755.47	3510.94

Results

Out of Plane			
Total App Axial Force	0	lbs	OK
Total App Shear Force	2083.2	lbs	OK
Ratio	0 83299		OK

In Plane			
In Plane Shear	326.2	plf	
Total App Shear Force	1957.2	lbs	OK
Ratio	0.48501		OK

SUNRISE ENGINEERING

Project: Ogden Water Treatment Plant
Date: 12-11-2013
Embed Anchor Bolts in Masonry Wall (ASD)
Location: EB5

Loading	In-plane Vertical				Out-of Plane Horiz.		
	Dead	Live	LiveR	Snow	R	Wind	Seismic
	50	250	0	41	0	0	0
	psf	psf	psf	psf	psf	psf	plf

In Plane Load 10.8 kips

Input		
Length/Distance between Suppor	4	ft
Width/ Half Span	2	ft
SDS	0.779	%g
Area	8	sqft
Masonry Strength, f'm	1500	psi
Diameter Anchor	0.75	in
Yield Anchor	58000	psi
Masonry Width (Atlas Blocks)	7.5625	in
Tension Top of Wall		
In Plane Wall Length	28	ft
Dist. Between Shear Connections	4	ft

Bolt Geometry		
Horizontal Bolt Spacing	8	in
Vertical Spacing	8	in
Eccentricity	4	in
Bolts Bottom Row	0	#
Bolts Top Row	2	#
Lb-Embed Depth	5	in

Calculations	
Area Anchor	0.44179
X=	3.27141
Y=	1.72859
Theta Calc	0.47266
Theta=	56.4137
Angle Calc	0.98461
Angle Calc	0.83305
Apt Calc	3.78878
Apt	78.5398
Reduced Apt	64.69
Area Reduced	
Apv	22.459

Calculations	lb	lb total
Bab=	3131.79	6263.58
Bap=	26100	52200
Bvb-	1087.29	2174.58
Bvc=	1775.8	3551.6
Bvpry=	7604.59	15209.2
Bvs=	9224.5	18449

Results			
Out of Plane			
Total App Axial Force	392.752	lbs	OK
Total App Shear Force	196.376	lbs	OK
Ratio	0.38317		OK
In Plane			
In Plane Shear	270	plf	
Total App Shear Force	1080	lbs	OK
Ratio	0.30409		OK

SUNRISE ENGINEERING

Project: Ogden Water Treatment Plant
Date: 12-11-2013
Embed Anchor Bolts in Top of Masonry Wall (ASD)
Location: EB6

Loading	In-plane Vertical				Out-of Plane Horiz.		
	Dead	Live	LiveR	Snow	R	Wind	Seismic
	18	0	0	37	0	0	384
	psf	psf	psf	psf	psf	psf	plf

In Plane Load 20.6 kips

Input		
Length/Distance between Suppor	6	ft
Width/ Half Span	8.5	ft
SDS	0.779	%g
Area	51	sqft
Masonry Strength, f'm	1500	psi
Diameter Anchor	0.75	in
Yield Anchor	58000	psi
Masonry Width (Atlas Blocks)	7.5625	in
Compression Top of Wall		
In Plane Wall Length	47	ft
Dist. Between Shear Connections	6	ft

Bolt Geometry		
Vertical Bolt Spacing	0	in
Horizontal Bolt Spacing	6	in
Vertical Spacing	0	in
Eccentricity	0	in
Bolts Bottom Row	0	#
Bolts Top Row	2	#
Lb-Embed Depth	6	in

Calculations	
Area Anchor	0.44179
X=	4.65856
Y=	1.34144
Theta Calc	0.63021
Theta=	78.131
Angle Calc	1.36364
Angle Calc	0.97862
Apt Calc	13.8608
Apt	113.097
TOW APT	129.696
Area Reduced	
Apv	20.007

Calculations	lb	lb total
Bab=	6278.9	
Bap=	26100	52200
Bvb-	968.586	1937.17
Bvc=	1775.8	3551.6
Bvpry=	10950.6	21901.2
Bvs=	9224.5	18449
Bab Wall=	1667.22	3334.45

Results			
Out of Plane			
Total App Axial Force	0	lbs	OK
Total App Shear Force	1612.8	lbs	OK
Ratio	0.83255		OK
In Plane			
In Plane Shear	306.809	plf	
Total App Shear Force	1840.85	lbs	OK
Ratio	0.51832		OK

SUNRISE ENGINEERING

Project: Ogden Water Treatment Plant
Date: 12-11-2013
Embed Anchor Bolts in Top of Masonry Wall (ASD)
EB7

Loading	In-plane Vertical				Out-of Plane Horiz.		
	Dead	Live	LiveR	Snow	R	Wind	Seismic
	55	250	0	0	0	0	305
	psf	psf	psf	psf	psf	psf	plf
In Plane Load	13.8 kips						

Input		
Length/Distance between Suppor	4	ft
Width/ Half Span	8.5	ft
SDS	0.779	%g
Area	34	sqft
Masonry Strength, f'm	1500	psi
Diameter Anchor	0.75	in
Yield Anchor	58000	psi
Masonry Width (Atlas Blocks)	7.5625	in
Compression Top of Wall		
In Plane Wall Length	100	ft
Dist. Between Shear Connections	4	ft

Bolt Geometry		
Vertical Bolt Spacing	0	in
Horizontal Bolt Spacing	8	in
Vertical Spacing	0	in
Eccentricity	0	in
Bolts Bottom Row	0	#
Bolts Top Row	2	#
Lb-Embed Depth	6	in

Calculations	
Area Anchor	0.44179
X=	4.65856
Y=	1.34144
Theta Calc	0.47266
Theta=	56.4137
Angle Calc	0.98461
Angle Calc	0.83305
Apt Calc	5.45585
Apt	113.097
TOW APT	136.417
Area Not Reduced	
Apv	22.459

Calculations	lb	lb total
Bab=	6604.24	
Bap=	26100	52200
Bvb-	1087.29	2174.58
Bvc=	1775.8	3551.6
Bvpry=	10950.6	21901.2
Bvs=	9224.5	18449
Bab Wall=	2137.83	4275.65

Results			
Out of Plane			
Total App Axial Force	0	lbs	OK
Total App Shear Force	854	lbs	OK
Ratio	0.39272		OK
In Plane			
In Plane Shear	96.6	plf	
Total App Shear Force	386.4	lbs	OK
Ratio	0.1088		OK

SUNRISE ENGINEERING

Project: Ogden Water Treatment Plant
Date: 12-11-2013
Embed Anchor Bolts in Top of Masonry Wall (ASD)
Location: EB8

Loading	In-plane Vertical				Out-of Plane Horiz.		
	Dead	Live	LiveR	Snow	R	Wind	Seismic
	55	250	0	0	0	0	770
	psf	psf	psf	psf	psf	psf	plf

In Plane Load 20.6 kips

Input		
Length/Distance between Suppor	4	ft
Width/ Half Span	8.5	ft
SDS	0.779	%g
Area	34	sqft
Masonry Strength, f'm	1500	psi
Diameter Anchor	0.75	in
Yield Anchor	58000	psi
Masonry Width (Atlas Blocks)	7.5625	in
Compression Top of Wall		
In Plane Wall Length	100	ft
Dist. Between Shear Connections	4	ft

Bolt Geometry		
Vertical Bolt Spacing	0	in
Horizontal Bolt Spacing	8	in
Vertical Spacing	0	in
Eccentricity	0	in
Bolts Bottom Row	0	#
Bolts Top Row	2	#
Lb-Embed Depth	6	in

Calculations	
Area Anchor	0.44179
X=	4.65856
Y=	1.34144
Theta Calc	0.47266
Theta=	56.4137
Angle Calc	0.98461
Angle Calc	0.83305
Apt Calc	5.45585
Apt	113.097
TOW APT	136.417
Area Not Reduced	
Apv	22.459

Calculations	lb	lb total
Bab=	6604.24	
Bap=	26100	52200
Bvb-	1087.29	2174.58
Bvc=	1775.8	3551.6
Bvpry=	10950.6	21901.2
Bvs=	9224.5	18449
Bab Wall=	2137.83	4275.65

Results

Out of Plane			
Total App Axial Force	0	lbs	OK
Total App Shear Force	2156	lbs	OK
Ratio	0.99145		OK
In Plane			
In Plane Shear	144.2	plf	
Total App Shear Force	576.8	lbs	OK
Ratio	0.16241		OK

SUNRISE ENGINEERING

Project: Ogden Water Treatment Plant
Date: 12-11-2013
Embed Anchor Bolts in Masonry Wall (ASD)
Location: EB9

Loading	In-plane Vertical				Out-of Plane Horiz.		
	Dead	Live	LiveR	Snow	R	Wind	Seismic
	50	250	0	41	0	0	0
	psf	psf	psf	psf	psf	psf	plf

In Plane Load 10.8 kips

Input		
Length/Distance between Suppor	4	ft
Width/ Half Span	2	ft
SDS	0.779	%g
Area	8	sqft
Masonry Strength, f'm	1500	psi
Diameter Anchor	0.75	in
Yield Anchor	58000	psi
Masonry Width (Atlas Blocks)	7.5625	in
Tension Top of Wall		
In Plane Wall Length	28	ft
Dist. Between Shear Connections	4	ft

Bolt Geometry		
Horizontal Bolt Spacing	8	in
Vertical Spacing	8	in
Eccentricity	4	in
Bolts Bottom Row	0	#
Bolts Top Row	2	#
Lb-Embed Depth	5	in

Calculations	
Area Anchor	0.44179
X=	3.27141
Y=	1.72859
Theta Calc	0.47266
Theta=	56.4137
Angle Calc	0.98461
Angle Calc	0.83305
Apt Calc	3.78878
Apt	78.5398
Reduced Apt	64.69
Area Reduced	
Apv	22.459

Calculations	lb	lb total
Bab=	3131.79	6263.58
Bap=	26100	52200
Bvb-	1087.29	2174.58
Bvc=	1775.8	3551.6
Bvpry=	7604.59	15209.2
Bvs=	9224.5	18449

Results

Out of Plane			
Total App Axial Force	392.752	lbs	OK
Total App Shear Force	196.376	lbs	OK
Ratio	0.38317		OK
In Plane			
In Plane Shear	270	plf	
Total App Shear Force	1080	lbs	OK
Ratio	0.30409		OK

SUNRISE ENGINEERING

Project: Ogden Water Treatment Plant
Date: 12-11-2013
Embed Anchor Bolts in Masonry Wall (ASD)
Location: EB10 Embed Plates at Shear Wall (Line C)

Loading	In-plane Vertical				Out-of Plane Horiz.		
	Dead	Live	LiveR	Snow	R	Wind	Seismic
	18	0	0	0	0	0	265
	psf	psf	psf	psf	psf	psf	plf
In Plane Load		52 kips					

Input		
Length/Distance between Suppor	3	ft
Width/ Half Span	1	ft
SDS	0.779	%g
Area	3	sqft
Masonry Strength, f'm	1500	psi
Diameter Anchor	0.75	in
Yield Anchor	58000	psi
Masonry Width (CMU)	7.625	in
Compression Top of Wall		
In Plane Wall Length	22	ft
Dist. Between Shear Connections	3	ft

Bolt Geometry		
Horizontal Bolt Spacing	6	in
Vertical Spacing	6	in
Eccentricity	4	in
Bolts Bottom Row	2	#
Bolts Top Row	2	#
Lb-Embed Depth	6	in

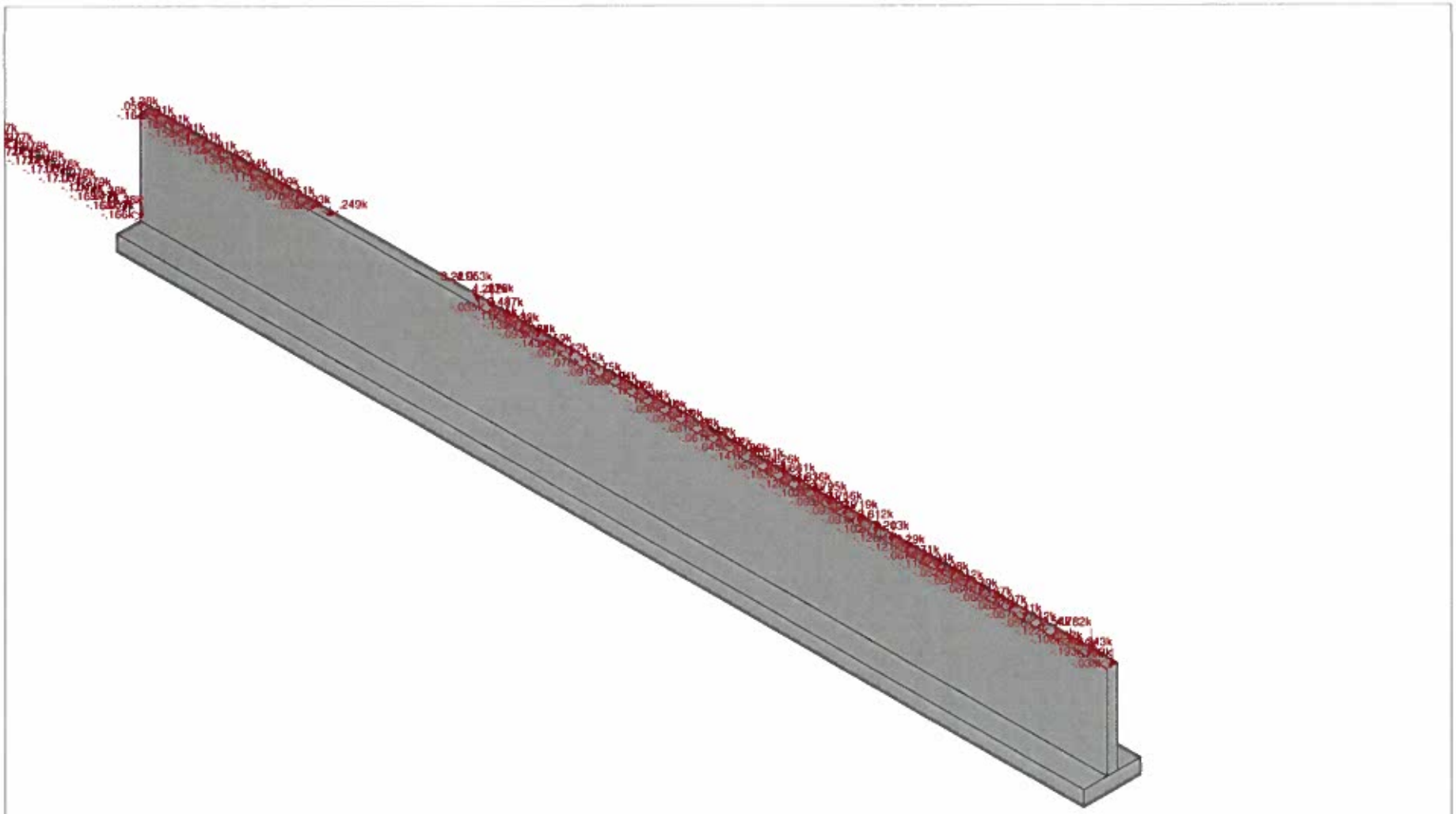
Calculations	
Area Anchor	0.44179
X=	4.63302
Y=	1.36698
Theta Calc	0.63542
Theta=	78.9018
Angle Calc	1.3771
Angle Calc	0.9813
Apt Calc	14.2487
Apt	113.097
Reduced Apt	40.6
Area Reduced	
Apv	22.8318

Calculations	lb	lb total
Bab=	1965.54	7862.16
Bap=	26100	104400
Bvb-	1105.34	4421.35
Bvc=	1775.8	7103.2
Bvpry=	10950.6	43802.4
Bvs=	9224.5	36898

Results			
Out of Plane			
Total App Axial Force	576.463	lbs	OK
Total App Shear Force	0	lbs	OK
Ratio	0.12587		OK
In Plane			
In Plane Shear	1654.55	plf	
Total App Shear Force	4963.64	lbs	OK
Ratio	0.69879		OK

FOUNDATION CALCULATIONS

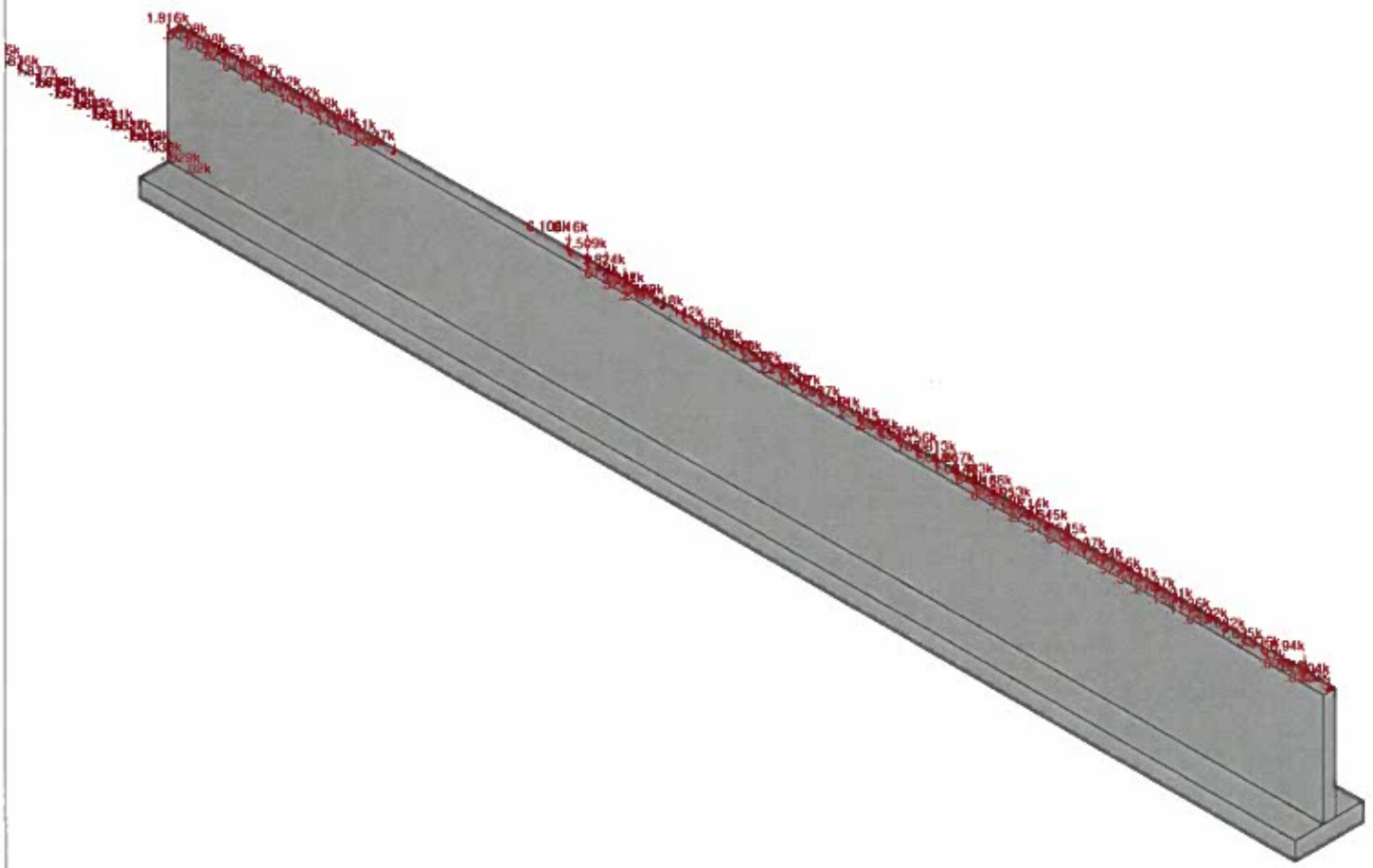
F1 lcw5



Loads: LC 41, IBC 16-6 (b) (b)
Results for LC 1, IBC 16-1

Sunrise Engineering		1
SMH	OWTP South Wall	Jan 24, 2014 at 12:59 PM
	LC 41: Worst Case Loading	South Wall.r3d

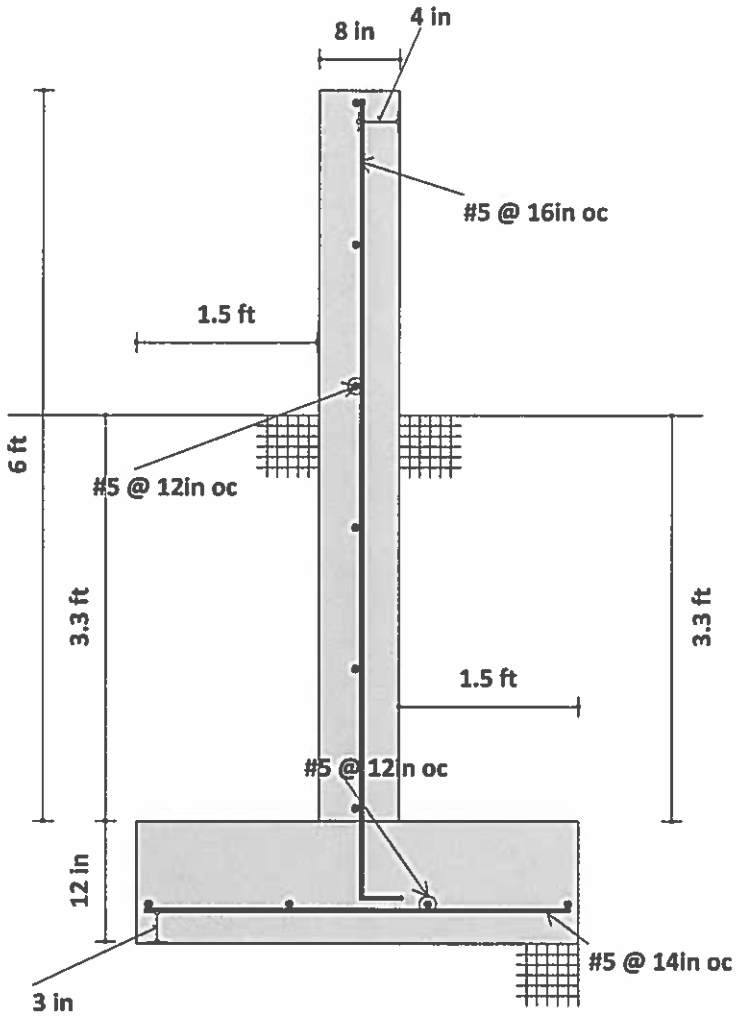
319



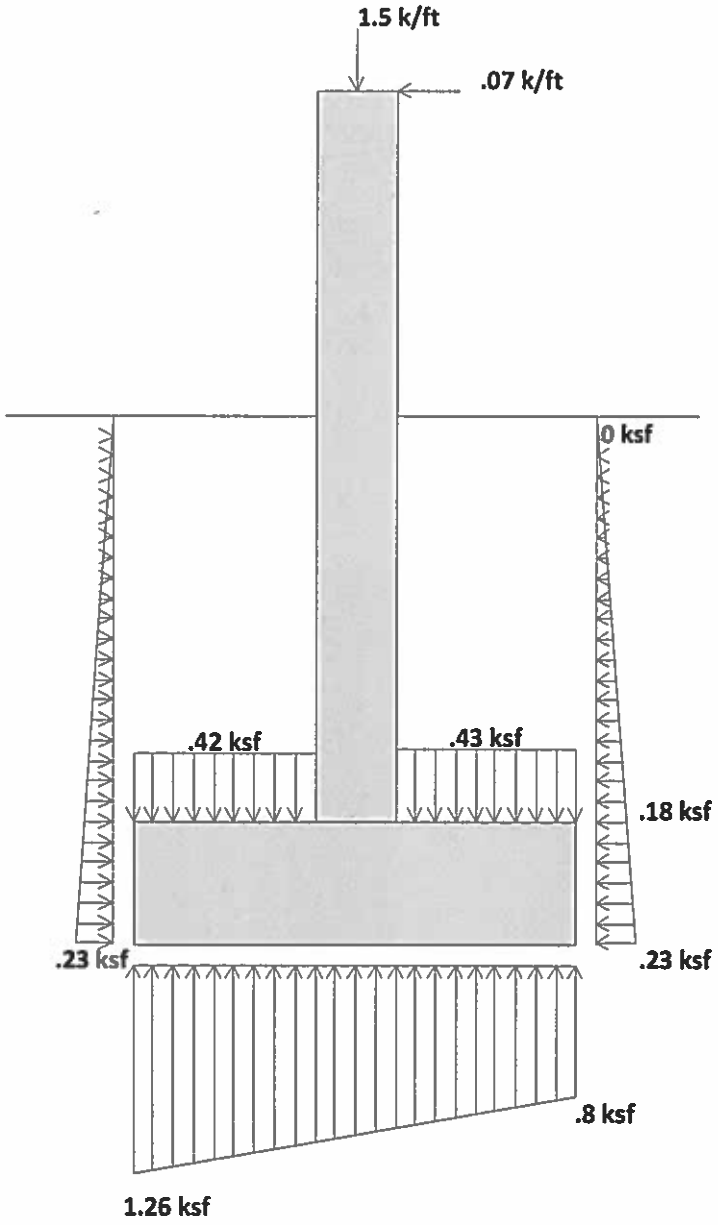
Loads: LC 30, IBC 16-4 (c) (c)
Results for LC 1, IBC 16-1

Sunrise Engineering		2
SMH	OWTP South Wall	Jan 24, 2014 at 12:59 PM
	LC 30: Worst Case Out-of Plane Loading	South Wall.r3d

Sketch


8 in
4 in
#5 @ 16in oc
1.5 ft
6 ft
#5 @ 12in oc
3.3 ft
3.3 ft
1.5 ft
#5 @ 12in oc
12 in
#5 @ 14in oc
3 in

Loading Diagram

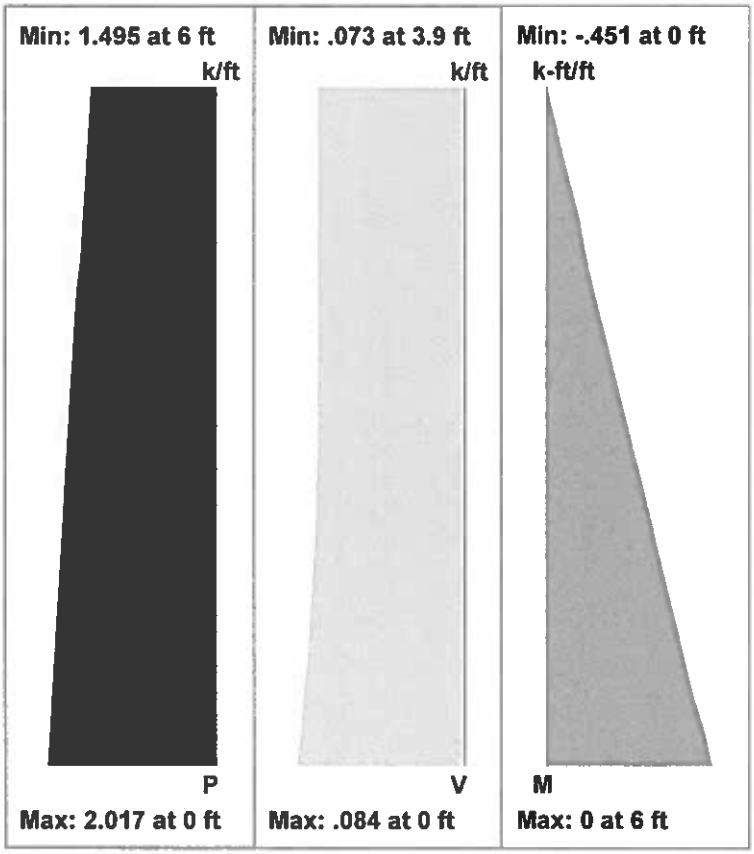


Geometry, Materials and Criteria

Start Point	: R3D_N451	Design Code	: ACI 318-11	Wall Int Bar	: #5@16 in
End Point	: R3D_N4			Wall Horz Bar	: #5@12 in
				Wall Bar Location	: Single Layer
Wall Length	: 61.81 ft	Concrete Weight	: .145 k/ft^3	Wall Outer Bar	: Vertical
Wall Height	: 6 ft	Concrete f'c	: 2.5 ksi		
Wall Thickness	: 8 in	Steel fy	: 60 ksi	Foot Bot Bar	: #5@14 in
Wall Int Cover	: 4 in	Heel Soil Height	: 3.33 ft	Foot Long Bar	: #5@12 in
Wall Ext Cover	: 1.5 in	Toe Soil Height	: 3.33 ft	Foot bar Location	: Single Layer
		Backfill Angle(α)	: 0 deg		
Foot Toe Len.	: 1.5 ft	Water Height	: 0 ft	γ_{Toe}	: .14 k/ft^3
Foot Heel Len.	: 1.5 ft	Heel Surcharge	: 0 ksf	Φ_{Toe}	: 30 deg
Foot Thickness	: 12 in			$K_{Lat\ Toe}$	: .413 (Passive)
Foot Top Cover	: 3 in	γ_{Heel}	: .145 k/ft^3		
Foot Bot Cover	: 3 in	Φ_{Heel}	: 30 deg		
		$K_{Lat\ Heel}$	: .413 (Active)		
Shear Key ?	: NO				
Wall Propped ?	: NO				

Wall Design

LC 41 DIAGRAMS



ACI 318-11 Code Check

AXIAL/BENDING DETAILS

UC Max Int(+z)	: .187
Location	: 0 ft
Gov Pu Int(+z)	: 0 k/ft
phi *Pn Int(+z)	: 0 k/ft
Gov Mu Int(+z)	: -.671 k-ft/ft
phi *Mn Int(+z)	: 3.583 k-ft/ft
phi eff. Int(+z)	: .9
Gov LC Int(+z)	: 49
UC Max Ext(-z)	: .153
Location	: 0 ft
Gov Pu Ext(-z)	: 0 k/ft
phi *Pn Ext(-z)	: 0 k/ft
Gov Mu Ext(-z)	: .648 k-ft/ft
phi *Mn Ext(-z)	: 4.239 k-ft/ft
phi eff. Ext(-z)	: .9
Gov LC Ext(-z)	: 51

SHEAR DETAILS

UC Max	: .038
Location	: .307 ft
Gov Vu	: .125 k/ft
phi*Vn	: 3.319 k/ft
Gov LC	: 33
UC Max Dowel	: .012
μ	: 1
A_{vf}	: .23 in^2/ft
Dowel Bars	: #5@16in Int

RESULTS FOR FULL WALL

As Provided(H)	: 1.841 in^2 (6 #5)
Rho Provided(H)	: .0032
As min(H)	: 1.152 in^2
Rho min(H)	: .002
Int As Provided(V)	: 14.419 in^2 (47 #5)
Int rho Provided(V)	: .0024
Ext As Provided(V)	: 0 in^2 (0 #8)
Ext rho Provided(V)	: 0
As min(V)	: 8.901 in^2
rho min(V)	: .0015

ENVELOPED WALL FORCES (NOT USED FOR DESIGN)

M in Plane : 92.215 k-ft (LC : 32) in Plane : 15.369 k (LC : 32)

Footing Design

As-min z-dir (Top Flexure): .348 in^2/ft
As-min z-dir (Bot Flexure): .348 in^2/ft
z-dir (T & S) : .259 in^2/ft
x-dir Long. (T & S) : .95 in^2

Bottom Bar Design (Toe) : Shear (Toe)

Mu UC Max	Gov Mu LC	Max Mu (k-ft/ft)	Phi*Mn (k-ft/ft)	As Req'd (in^2/ft)	As Prov'd (in^2/ft)	Vu UC Max	Gov Vu LC	Vu (k/ft)	Phi*Vn (k/ft)
.113	33	1.121	9.914	.029	.263	.101	33	.79	7.819

Top Bar Design (Toe) : Shear (Heel)

Mu UC Max	Gov Mu LC	Max Mu (k-ft/ft)	Phi*Mn (k-ft/ft)	As Req'd (in^2/ft)	As Prov'd (in^2/ft)	Vu UC Max	Gov Vu LC	Vu (k/ft)	Phi*Vn (k/ft)
0	NC	0	3.554	0	.263	.055	35	.43	7.819

Overturning Check (Service)

Description	Categories and Factors	Moverturn (k-ft/ft)	Mresist (k-ft/ft)	SF	SF Min	SF Min/SF
IBC 16-8	1DL	0	7.721	0	1.5	0
IBC 16-9	1DL+1HL+1LL+1LLS	.81	9.8	12.094	1.5	.124
IBC 16-10 (a)	1DL+1HL+1RLL	.81	8.623	10.642	1.5	.141
IBC 16-10 (b)	1DL+1HL+1SL+.75S..	.81	8.724	10.767	1.5	.139
IBC 16-10 (c)	1DL+1HL+1RL	.81	8.503	10.494	1.5	.143
IBC 16-11 (a)	1DL+1HL+.75LL+...	.81	9.565	11.805	1.5	.127
IBC 16-11 (b)	1DL+1HL+.75LL+...	.81	9.642	11.899	1.5	.126
IBC 16-11 (c)	1DL+1HL+.75LL+...	.81	9.476	11.694	1.5	.128
IBC 16-12 (a) (a)	1DL+1HL+.6WLX	.81	8.534	10.532	1.5	.142
IBC 16-12 (a) (b)	1DL+1HL+.6WLZ	1.118	8.503	7.605	1.5	.197
IBC 16-12 (a) (c)	1DL+1HL-.6WLX	.841	8.503	10.115	1.5	.148
IBC 16-12 (a) (d)	1DL+1HL-.6WLZ	.81	8.811	10.874	1.5	.138
IBC 16-12 (b) (a)	1DL+1HL+.7ELX	.81	8.614	10.631	1.1	.103
IBC 16-12 (b) (b)	1DL+1HL+.7ELZ	1.349	8.503	6.304	1.1	.174
IBC 16-12 (b) (c)	1DL+1HL-.7ELX	.921	8.503	9.23	1.1	.119
IBC 16-12 (b) (d)	1DL+1HL-.7ELZ	.81	9.042	11.159	1.1	.099
IBC 16-13 (a) (a)	1DL+1HL+.45WLX+..	.81	9.588	11.833	1.5	.127
IBC 16-13 (a) (b)	1DL+1HL+.45WLZ+..	1.041	9.565	9.188	1.5	.163
IBC 16-13 (a) (c)	1DL+1HL-.45WLX+..	.833	9.565	11.482	1.5	.131
IBC 16-13 (a) (d)	1DL+1HL-.45WLZ+..	.81	9.796	12.09	1.5	.124
IBC 16-13 (b) (a)	1DL+1HL+.45WLX+..	.81	9.664	11.927	1.5	.126
IBC 16-13 (b) (b)	1DL+1HL+.45WLZ+..	1.041	9.642	9.261	1.5	.162
IBC 16-13 (b) (c)	1DL+1HL-.45WLX+..	.833	9.642	11.574	1.5	.13
IBC 16-13 (b) (d)	1DL+1HL-.45WLZ+..	.81	9.872	12.184	1.5	.123
IBC 16-13 (c) (a)	1DL+1HL+.45WLX+..	.81	9.498	11.723	1.5	.128
IBC 16-13 (c) (b)	1DL+1HL+.45WLZ+..	1.041	9.476	9.102	1.5	.165
IBC 16-13 (c) (c)	1DL+1HL-.45WLX+..	.833	9.476	11.374	1.5	.132
IBC 16-13 (c) (d)	1DL+1HL-.45WLZ+..	.81	9.706	11.979	1.5	.125
IBC 16-14 (a) (a)	1DL+1HL+.525ELX+..	.81	9.649	11.908	1.1	.092
IBC 16-14 (a) (b)	1DL+1HL+.525ELZ+..	1.214	9.565	7.878	1.1	.14
IBC 16-14 (a) (c)	1DL+1HL-.525ELX+..	.894	9.565	10.705	1.1	.103
IBC 16-14 (a) (d)	1DL+1HL-.525ELZ+..	.81	9.969	12.304	1.1	.089
IBC 16-14 (b) (a)	1DL+1HL+.525ELX+..	.81	9.725	12.002	1.1	.092
IBC 16-14 (b) (b)	1DL+1HL+.525ELZ+..	1.214	9.642	7.941	1.1	.139
IBC 16-14 (b) (c)	1DL+1HL-.525ELX+..	.894	9.642	10.791	1.1	.102
IBC 16-14 (b) (d)	1DL+1HL-.525ELZ+..	.81	10.046	12.398	1.1	.089
IBC 16-14 (c) (a)	1DL+1HL+.525ELX+..	.81	9.559	11.797	1.1	.093
IBC 16-14 (c) (b)	1DL+1HL+.525ELZ+..	1.214	9.476	7.804	1.1	.141
IBC 16-14 (c) (c)	1DL+1HL-.525ELX+..	.894	9.476	10.605	1.1	.104
IBC 16-14 (c) (d)	1DL+1HL-.525ELZ+..	.81	9.88	12.193	1.1	.09
IBC 16-15 (a) (a)	.6DL+1HL+.6WLX	.81	5.445	6.72	1	.149
IBC 16-15 (a) (b)	.6DL+1HL+.6WLZ	1.118	5.415	4.843	1	.206
IBC 16-15 (a) (c)	.6DL+1HL-.6WLX	.841	5.415	6.441	1	.155
IBC 16-15 (a) (d)	.6DL+1HL-.6WLZ	.81	5.723	7.063	1	.142
IBC 16-15 (b) (a)	.6DL+.6HL+.6WL..	.486	5.132	10.557	1	.095
IBC 16-15 (b) (b)	.6DL+.6HL+.6WL..	.794	5.102	6.426	1	.156
IBC 16-15 (b) (c)	.6DL+.6HL-.6WL..	.517	5.102	9.877	1	.101
IBC 16-15 (b) (d)	.6DL+.6HL-.6WL..	.486	5.41	11.127	1	.09
IBC 16-15 (c) (a)	.6DL+1HL+.7ELX	.81	5.526	6.82	1	.147
IBC 16-15 (c) (b)	.6DL+1HL+.7ELZ	1.349	5.415	4.014	1	.249
IBC 16-15 (c) (c)	.6DL+1HL-.7ELX	.921	5.415	5.878	1	.17
IBC 16-15 (c) (d)	.6DL+1HL-.7ELZ	.81	5.953	7.347	1	.136
IBC 16-15 (d) (a)	.6DL+.6HL+.7EL..	.486	5.213	10.723	1	.093
IBC 16-15 (d) (b)	.6DL+.6HL+.7EL..	1.025	5.102	4.979	1	.201
IBC 16-15 (d) (c)	.6DL+.6HL-.7EL..	.597	5.102	8.543	1	.117
IBC 16-15 (d) (d)	.6DL+.6HL-.7EL..	.486	5.64	11.602	1	.086

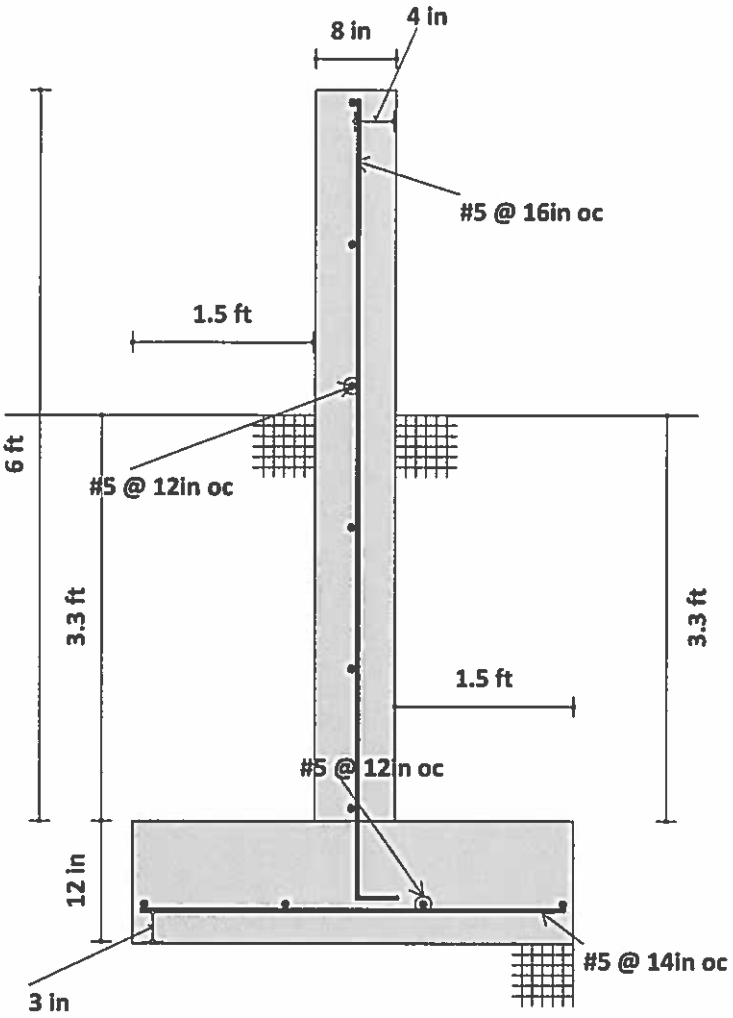
Sliding Check (Service)

Description	Categories and Factors	Vsliding (k/ft)	Vresist (k/ft)	SF	SF Min	SF Min/SF
IBC 16-8	1DL	0	1.259	0	1.5	0
IBC 16-9	1DL+1HL+1LL+1LLS	.561	2.013	3.586	1.5	.418
IBC 16-10 (a)	1DL+1HL+1RLL	.561	1.821	3.243	1.5	.463
IBC 16-10 (b)	1DL+1HL+1SL+.75S..	.561	1.837	3.273	1.5	.458
IBC 16-10 (c)	1DL+1HL+1RL	.561	1.801	3.208	1.5	.468
IBC 16-11 (a)	1DL+1HL+.75LL+...	.561	1.975	3.518	1.5	.426
IBC 16-11 (b)	1DL+1HL+.75LL+...	.561	1.987	3.54	1.5	.424
IBC 16-11 (c)	1DL+1HL+.75LL+...	.561	1.96	3.492	1.5	.43
IBC 16-12 (a) (a)	1DL+1HL+.6WLX	.561	1.806	3.217	1.5	.466
IBC 16-12 (a) (b)	1DL+1HL+.6WLZ	.605	1.801	2.975	1.5	.504
IBC 16-12 (a) (c)	1DL+1HL-.6WLX	.561	1.796	3.199	1.5	.469
IBC 16-12 (a) (d)	1DL+1HL-.6WLZ	.561	1.845	3.286	1.5	.456
IBC 16-12 (b) (a)	1DL+1HL+.7ELX	.561	1.819	3.24	1.1	.339
IBC 16-12 (b) (b)	1DL+1HL+.7ELZ	.638	1.801	2.821	1.1	.39
IBC 16-12 (b) (c)	1DL+1HL-.7ELX	.561	1.783	3.176	1.1	.346
IBC 16-12 (b) (d)	1DL+1HL-.7ELZ	.561	1.878	3.345	1.1	.329
IBC 16-13 (a) (a)	1DL+1HL+.45WLX+..	.561	1.979	3.524	1.5	.426
IBC 16-13 (a) (b)	1DL+1HL+.45WLZ+..	.594	1.975	3.323	1.5	.451
IBC 16-13 (a) (c)	1DL+1HL-.45WLX+..	.561	1.971	3.511	1.5	.427
IBC 16-13 (a) (d)	1DL+1HL-.45WLZ+..	.561	2.008	3.576	1.5	.419
IBC 16-13 (b) (a)	1DL+1HL+.45WLX+..	.561	1.991	3.547	1.5	.423
IBC 16-13 (b) (b)	1DL+1HL+.45WLZ+..	.594	1.987	3.344	1.5	.449
IBC 16-13 (b) (c)	1DL+1HL-.45WLX+..	.561	1.984	3.533	1.5	.425
IBC 16-13 (b) (d)	1DL+1HL-.45WLZ+..	.561	2.02	3.599	1.5	.417
IBC 16-13 (c) (a)	1DL+1HL+.45WLX+..	.561	1.964	3.498	1.5	.429
IBC 16-13 (c) (b)	1DL+1HL+.45WLZ+..	.594	1.96	3.298	1.5	.455
IBC 16-13 (c) (c)	1DL+1HL-.45WLX+..	.561	1.956	3.485	1.5	.43
IBC 16-13 (c) (d)	1DL+1HL-.45WLZ+..	.561	1.993	3.55	1.5	.422
IBC 16-14 (a) (a)	1DL+1HL+.525ELX+..	.561	1.988	3.542	1.1	.311
IBC 16-14 (a) (b)	1DL+1HL+.525ELZ+..	.619	1.975	3.19	1.1	.345
IBC 16-14 (a) (c)	1DL+1HL-.525ELX+..	.561	1.961	3.493	1.1	.315
IBC 16-14 (a) (d)	1DL+1HL-.525ELZ+..	.561	2.033	3.621	1.1	.304
IBC 16-14 (b) (a)	1DL+1HL+.525ELX+..	.561	2.001	3.564	1.1	.309
IBC 16-14 (b) (b)	1DL+1HL+.525ELZ+..	.619	1.987	3.21	1.1	.343
IBC 16-14 (b) (c)	1DL+1HL-.525ELX+..	.561	1.974	3.516	1.1	.313
IBC 16-14 (b) (d)	1DL+1HL-.525ELZ+..	.561	2.045	3.643	1.1	.302
IBC 16-14 (c) (a)	1DL+1HL+.525ELX+..	.561	1.974	3.516	1.1	.313
IBC 16-14 (c) (b)	1DL+1HL+.525ELZ+..	.619	1.96	3.166	1.1	.347
IBC 16-14 (c) (c)	1DL+1HL-.525ELX+..	.561	1.947	3.467	1.1	.317
IBC 16-14 (c) (d)	1DL+1HL-.525ELZ+..	.561	2.018	3.594	1.1	.306
IBC 16-15 (a) (a)	.6DL+1HL+.6WLX	.561	1.302	2.32	1	.431
IBC 16-15 (a) (b)	.6DL+1HL+.6WLZ	.605	1.297	2.143	1	.467
IBC 16-15 (a) (c)	.6DL+1HL-.6WLX	.561	1.292	2.302	1	.434
IBC 16-15 (a) (d)	.6DL+1HL-.6WLZ	.561	1.341	2.389	1	.419
IBC 16-15 (b) (a)	.6DL+.6HL+.6WL..	.337	1.086	3.223	1	.31
IBC 16-15 (b) (b)	.6DL+.6HL+.6WL..	.381	1.081	2.838	1	.352
IBC 16-15 (b) (c)	.6DL+.6HL-.6WL..	.337	1.076	3.193	1	.313
IBC 16-15 (b) (d)	.6DL+.6HL-.6WL..	.337	1.125	3.339	1	.3
IBC 16-15 (c) (a)	.6DL+1HL+.7ELX	.561	1.316	2.343	1	.427
IBC 16-15 (c) (b)	.6DL+1HL+.7ELZ	.638	1.297	2.033	1	.492
IBC 16-15 (c) (c)	.6DL+1HL-.7ELX	.561	1.279	2.279	1	.439
IBC 16-15 (c) (d)	.6DL+1HL-.7ELZ	.561	1.374	2.448	1	.408
IBC 16-15 (d) (a)	.6DL+.6HL+.7EL..	.337	1.099	3.262	1	.307
IBC 16-15 (d) (b)	.6DL+.6HL+.7EL..	.414	1.081	2.612	1	.383
IBC 16-15 (d) (c)	.6DL+.6HL-.7EL..	.337	1.062	3.154	1	.317
IBC 16-15 (d) (d)	.6DL+.6HL-.7EL..	.337	1.158	3.437	1	.291

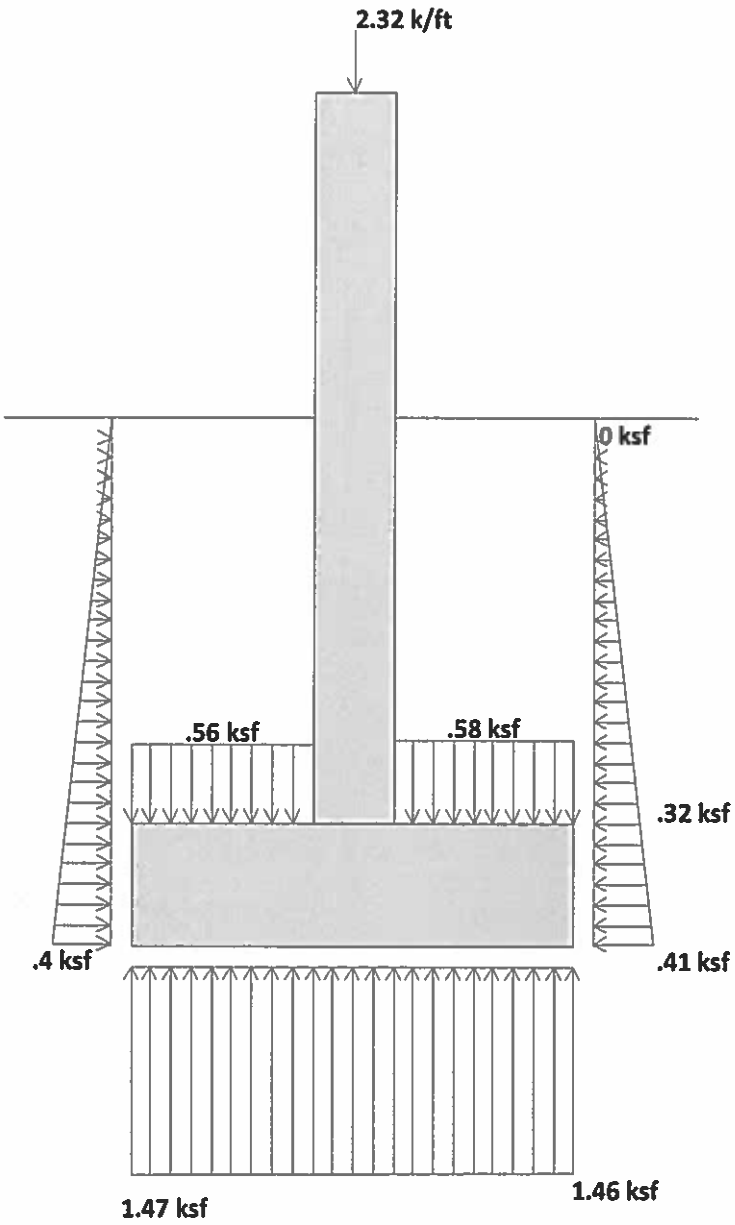
Soil Bearing Check (Service)

Description	Categories and Factors	Max Bearing (ksf)	Bearing Allowed (ksf)	Bearing UC
IBC 16-8	1DL	1.157	2.5	.463
IBC 16-9	1DL+1HL+1LL+1LLS	1.338	2.5	.535
IBC 16-10 (a)	1DL+1HL+1RLL	1.163	2.5	.465
IBC 16-10 (b)	1DL+1HL+1SL+.75S..	1.178	2.5	.471
IBC 16-10 (c)	1DL+1HL+1RL	1.145	2.5	.458
IBC 16-11 (a)	1DL+1HL+.75LL+...	1.303	2.5	.521
IBC 16-11 (b)	1DL+1HL+.75LL+...	1.314	2.5	.526
IBC 16-11 (c)	1DL+1HL+.75LL+...	1.29	2.5	.516
IBC 16-12 (a) (a)	1DL+1HL+.6WLX	1.149	2.5	.46
IBC 16-12 (a) (b)	1DL+1HL+.6WLZ	1.282	2.5	.513
IBC 16-12 (a) (c)	1DL+1HL-.6WLX	1.14	2.5	.456
IBC 16-12 (a) (d)	1DL+1HL-.6WLZ	1.281	2.5	.513
IBC 16-12 (b) (a)	1DL+1HL+.7ELX	1.161	2.5	.465
IBC 16-12 (b) (b)	1DL+1HL+.7ELZ	1.385	2.5	.554
IBC 16-12 (b) (c)	1DL+1HL-.7ELX	1.128	2.5	.451
IBC 16-12 (b) (d)	1DL+1HL-.7ELZ	1.384	2.5	.554
IBC 16-13 (a) (a)	1DL+1HL+.45WLX+..	1.306	2.5	.523
IBC 16-13 (a) (b)	1DL+1HL+.45WLZ+..	1.406	2.5	.562
IBC 16-13 (a) (c)	1DL+1HL-.45WLX+..	1.3	2.5	.52
IBC 16-13 (a) (d)	1DL+1HL-.45WLZ+..	1.405	2.5	.562
IBC 16-13 (b) (a)	1DL+1HL+.45WLX+..	1.318	2.5	.527
IBC 16-13 (b) (b)	1DL+1HL+.45WLZ+..	1.417	2.5	.567
IBC 16-13 (b) (c)	1DL+1HL-.45WLX+..	1.311	2.5	.524
IBC 16-13 (b) (d)	1DL+1HL-.45WLZ+..	1.417	2.5	.567
IBC 16-13 (c) (a)	1DL+1HL+.45WLX+..	1.293	2.5	.517
IBC 16-13 (c) (b)	1DL+1HL+.45WLZ+..	1.393	2.5	.557
IBC 16-13 (c) (c)	1DL+1HL-.45WLX+..	1.286	2.5	.514
IBC 16-13 (c) (d)	1DL+1HL-.45WLZ+..	1.392	2.5	.557
IBC 16-14 (a) (a)	1DL+1HL+.525ELX+..	1.315	2.5	.526
IBC 16-14 (a) (b)	1DL+1HL+.525ELZ+..	1.483	2.5	.593
IBC 16-14 (a) (c)	1DL+1HL-.525ELX+..	1.291	2.5	.516
IBC 16-14 (a) (d)	1DL+1HL-.525ELZ+..	1.482	2.5	.593
IBC 16-14 (b) (a)	1DL+1HL+.525ELX+..	1.327	2.5	.531
IBC 16-14 (b) (b)	1DL+1HL+.525ELZ+..	1.495	2.5	.598
IBC 16-14 (b) (c)	1DL+1HL-.525ELX+..	1.302	2.5	.521
IBC 16-14 (b) (d)	1DL+1HL-.525ELZ+..	1.494	2.5	.598
IBC 16-14 (c) (a)	1DL+1HL+.525ELX+..	1.302	2.5	.521
IBC 16-14 (c) (b)	1DL+1HL+.525ELZ+..	1.47	2.5	.588
IBC 16-14 (c) (c)	1DL+1HL-.525ELX+..	1.277	2.5	.511
IBC 16-14 (c) (d)	1DL+1HL-.525ELZ+..	1.469	2.5	.588
IBC 16-15 (a) (a)	.6DL+1HL+.6WLX	.696	2.5	.279
IBC 16-15 (a) (b)	.6DL+1HL+.6WLZ	.829	2.5	.332
IBC 16-15 (a) (c)	.6DL+1HL-.6WLX	.687	2.5	.275
IBC 16-15 (a) (d)	.6DL+1HL-.6WLZ	.819	2.5	.328
IBC 16-15 (b) (a)	.6DL+.6HL+.6WL..	.691	2.5	.277
IBC 16-15 (b) (b)	.6DL+.6HL+.6WL..	.824	2.5	.33
IBC 16-15 (b) (c)	.6DL+.6HL-.6WL..	.682	2.5	.273
IBC 16-15 (b) (d)	.6DL+.6HL-.6WL..	.824	2.5	.33
IBC 16-15 (c) (a)	.6DL+1HL+.7ELX	.708	2.5	.283
IBC 16-15 (c) (b)	.6DL+1HL+.7ELZ	.932	2.5	.373
IBC 16-15 (c) (c)	.6DL+1HL-.7ELX	.675	2.5	.27
IBC 16-15 (c) (d)	.6DL+1HL-.7ELZ	.922	2.5	.369
IBC 16-15 (d) (a)	.6DL+.6HL+.7EL..	.703	2.5	.281
IBC 16-15 (d) (b)	.6DL+.6HL+.7EL..	.927	2.5	.371
IBC 16-15 (d) (c)	.6DL+.6HL-.7EL..	.67	2.5	.268
IBC 16-15 (d) (d)	.6DL+.6HL-.7EL..	.927	2.5	.371

Sketch


8 in
4 in
#5 @ 16in oc
1.5 ft
6 ft
#5 @ 12in oc
3.3 ft
3.3 ft
1.5 ft
#5 @ 12in oc
12 in
#5 @ 14in oc
3 in

Loading Diagram

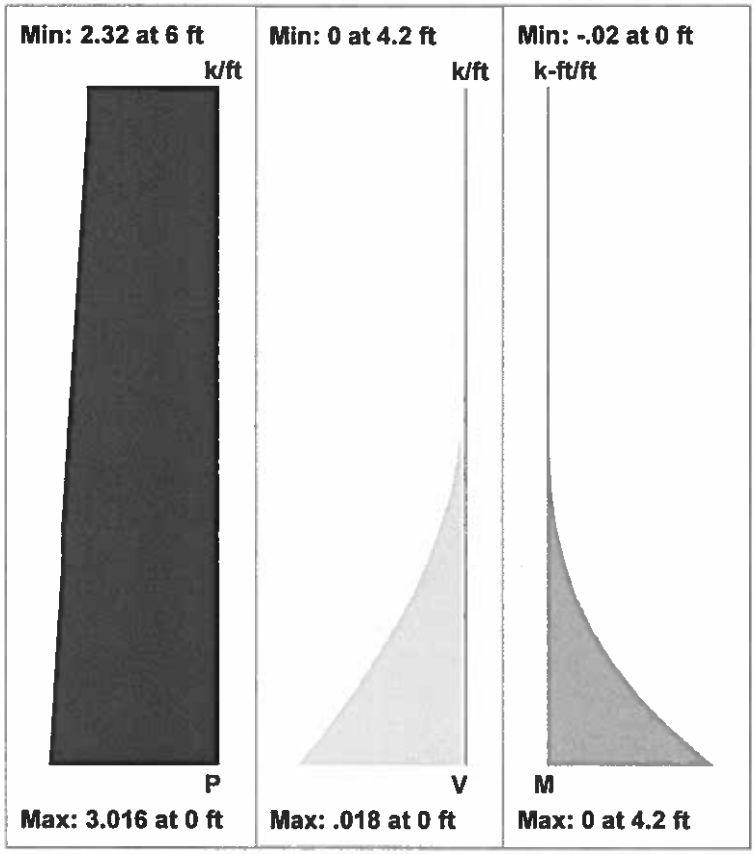


Geometry, Materials and Criteria

Start Point	: R3D_N451	Design Code	: ACI 318-11	Wall Int Bar	: #5@16 in
End Point	: R3D_N4			Wall Horz Bar	: #5@12 in
				Wall Bar Location	: Single Layer
Wall Length	: 61.81 ft	Concrete Weight	: .145 k/ft^3	Wall Outer Bar	: Vertical
Wall Height	: 6 ft	Concrete f'c	: 2.5 ksi		
Wall Thickness	: 8 in	Steel fy	: 60 ksi	Foot Bot Bar	: #5@14 in
Wall Int Cover	: 4 in	Heel Soil Height	: 3.33 ft	Foot Long Bar	: #5@12 in
Wall Ext Cover	: 1.5 in	Toe Soil Height	: 3.33 ft	Foot bar Location	: Single Layer
		Backfill Angle(α)	: 0 deg		
Foot Toe Len.	: 1.5 ft	Water Height	: 0 ft	γ_{Toe}	: .14 k/ft^3
Foot Heel Len.	: 1.5 ft	Heel Surcharge	: 0 ksf	Φ_{Toe}	: 30 deg
Foot Thickness	: 12 in			$K_{Lat\ Toe}$	: .413 (Passive)
Foot Top Cover	: 3 in	γ_{Heel}	: .145 k/ft^3		
Foot Bot Cover	: 3 in	Φ_{Heel}	: 30 deg		
		$K_{Lat\ Heel}$	: .413 (Active)		
Shear Key ?	: NO				
Wall Propped ?	: NO				

Wall Design

LC 30 DIAGRAMS



ACI 318-11 Code Check

AXIAL/BENDING DETAILS

UC Max Int(+z)	: .187
Location	: 0 ft
Gov Pu Int(+z)	: 0 k/ft
phi *Pn Int(+z)	: 0 k/ft
Gov Mu Int(+z)	: -.671 k-ft/ft
phi *Mn Int(+z)	: 3.583 k-ft/ft
phi eff. Int(+z)	: .9
Gov LC Int(+z)	: 49
UC Max Ext(-z)	: .153
Location	: 0 ft
Gov Pu Ext(-z)	: 0 k/ft
phi *Pn Ext(-z)	: 0 k/ft
Gov Mu Ext(-z)	: .648 k-ft/ft
phi *Mn Ext(-z)	: 4.239 k-ft/ft
phi eff. Ext(-z)	: .9
Gov LC Ext(-z)	: 51

SHEAR DETAILS

UC Max	: .038
Location	: .307 ft
Gov Vu	: .125 k/ft
phi*Vn	: 3.319 k/ft
Gov LC	: 33
UC Max Dowel	: .012
μ	: 1
A_{vf}	: .23 in^2/ft
Dowel Bars	: #5@16in Int

RESULTS FOR FULL WALL

As Provided(H)	: 1.841 in^2 (6 #5)
Rho Provided(H)	: .0032
As min(H)	: 1.152 in^2
Rho min(H)	: .002
Int As Provided(V)	: 14.419 in^2 (47 #5)
Int rho Provided(V)	: .0024
Ext As Provided(V)	: 0 in^2 (0 #8)
Ext rho Provided(V)	: 0
As min(V)	: 8.901 in^2
rho min(V)	: .0015

ENVELOPED WALL FORCES (NOT USED FOR DESIGN)

M in Plane : 92.215 k-ft (LC : 32) V in Plane : 15.369 k (LC : 32)

Footing Design

As-min z-dir (Top Flexure): .348 in^2/ft
As-min z-dir (Bot Flexure): .348 in^2/ft
z-dir (T & S) : .259 in^2/ft
x-dir Long. (T & S) : .95 in^2

Bottom Bar Design (Toe) : Shear (Toe)

Mu UC Max	Gov Mu LC	Max Mu (k-ft/ft)	Phi*Mn (k-ft/ft)	As Req'd (in^2/ft)	As Prov'd (in^2/ft)	Vu UC Max	Gov Vu LC	Vu (k/ft)	Phi*Vn (k/ft)
.113	33	1.121	9.914	.029	.263	.101	33	.79	7.819

Top Bar Design (Toe) : Shear (Heel)

Mu UC Max	Gov Mu LC	Max Mu (k-ft/ft)	Phi*Mn (k-ft/ft)	As Req'd (in^2/ft)	As Prov'd (in^2/ft)	Vu UC Max	Gov Vu LC	Vu (k/ft)	Phi*Vn (k/ft)
0	NC	0	3.554	0	.263	.055	35	.43	7.819

Overturning Check (Service)

Description	Categories and Factors	Moverturn (k-ft/ft)	Mresist (k-ft/ft)	SF	SF Min	SF Min/SF
IBC 16-8	1DL	0	7.721	0	1.5	0
IBC 16-9	1DL+1HL+1LL+1LLS	.81	9.8	12.094	1.5	.124
IBC 16-10 (a)	1DL+1HL+1RLL	.81	8.623	10.642	1.5	.141
IBC 16-10 (b)	1DL+1HL+1SL+.75S..	.81	8.724	10.767	1.5	.139
IBC 16-10 (c)	1DL+1HL+1RL	.81	8.503	10.494	1.5	.143
IBC 16-11 (a)	1DL+1HL+.75LL+...	.81	9.565	11.805	1.5	.127
IBC 16-11 (b)	1DL+1HL+.75LL+...	.81	9.642	11.899	1.5	.126
IBC 16-11 (c)	1DL+1HL+.75LL+...	.81	9.476	11.694	1.5	.128
IBC 16-12 (a) (a)	1DL+1HL+.6WLX	.81	8.534	10.532	1.5	.142
IBC 16-12 (a) (b)	1DL+1HL+.6WLZ	1.118	8.503	7.605	1.5	.197
IBC 16-12 (a) (c)	1DL+1HL-.6WLX	.841	8.503	10.115	1.5	.148
IBC 16-12 (a) (d)	1DL+1HL-.6WLZ	.81	8.811	10.874	1.5	.138
IBC 16-12 (b) (a)	1DL+1HL+.7ELX	.81	8.614	10.631	1.1	.103
IBC 16-12 (b) (b)	1DL+1HL+.7ELZ	1.349	8.503	6.304	1.1	.174
IBC 16-12 (b) (c)	1DL+1HL-.7ELX	.921	8.503	9.23	1.1	.119
IBC 16-12 (b) (d)	1DL+1HL-.7ELZ	.81	9.042	11.159	1.1	.099
IBC 16-13 (a) (a)	1DL+1HL+.45WLX+..	.81	9.588	11.833	1.5	.127
IBC 16-13 (a) (b)	1DL+1HL+.45WLZ+..	1.041	9.565	9.188	1.5	.163
IBC 16-13 (a) (c)	1DL+1HL-.45WLX+..	.833	9.565	11.482	1.5	.131
IBC 16-13 (a) (d)	1DL+1HL-.45WLZ+..	.81	9.796	12.09	1.5	.124
IBC 16-13 (b) (a)	1DL+1HL+.45WLX+..	.81	9.664	11.927	1.5	.126
IBC 16-13 (b) (b)	1DL+1HL+.45WLZ+..	1.041	9.642	9.261	1.5	.162
IBC 16-13 (b) (c)	1DL+1HL-.45WLX+..	.833	9.642	11.574	1.5	.13
IBC 16-13 (b) (d)	1DL+1HL-.45WLZ+..	.81	9.872	12.184	1.5	.123
IBC 16-13 (c) (a)	1DL+1HL+.45WLX+..	.81	9.498	11.723	1.5	.128
IBC 16-13 (c) (b)	1DL+1HL+.45WLZ+..	1.041	9.476	9.102	1.5	.165
IBC 16-13 (c) (c)	1DL+1HL-.45WLX+..	.833	9.476	11.374	1.5	.132
IBC 16-13 (c) (d)	1DL+1HL-.45WLZ+..	.81	9.706	11.979	1.5	.125
IBC 16-14 (a) (a)	1DL+1HL+.525ELX+..	.81	9.649	11.908	1.1	.092
IBC 16-14 (a) (b)	1DL+1HL+.525ELZ+..	1.214	9.565	7.878	1.1	.14
IBC 16-14 (a) (c)	1DL+1HL-.525ELX+..	.894	9.565	10.705	1.1	.103
IBC 16-14 (a) (d)	1DL+1HL-.525ELZ+..	.81	9.969	12.304	1.1	.089
IBC 16-14 (b) (a)	1DL+1HL+.525ELX+..	.81	9.725	12.002	1.1	.092
IBC 16-14 (b) (b)	1DL+1HL+.525ELZ+..	1.214	9.642	7.941	1.1	.139
IBC 16-14 (b) (c)	1DL+1HL-.525ELX+..	.894	9.642	10.791	1.1	.102
IBC 16-14 (b) (d)	1DL+1HL-.525ELZ+..	.81	10.046	12.398	1.1	.089
IBC 16-14 (c) (a)	1DL+1HL+.525ELX+..	.81	9.559	11.797	1.1	.093
IBC 16-14 (c) (b)	1DL+1HL+.525ELZ+..	1.214	9.476	7.804	1.1	.141
IBC 16-14 (c) (c)	1DL+1HL-.525ELX+..	.894	9.476	10.605	1.1	.104
IBC 16-14 (c) (d)	1DL+1HL-.525ELZ+..	.81	9.88	12.193	1.1	.09
IBC 16-15 (a) (a)	.6DL+1HL+.6WLX	.81	5.445	6.72	1	.149
IBC 16-15 (a) (b)	.6DL+1HL+.6WLZ	1.118	5.415	4.843	1	.206
IBC 16-15 (a) (c)	.6DL+1HL-.6WLX	.841	5.415	6.441	1	.155
IBC 16-15 (a) (d)	.6DL+1HL-.6WLZ	.81	5.723	7.063	1	.142
IBC 16-15 (b) (a)	.6DL+.6HL+.6WL..	.486	5.132	10.557	1	.095
IBC 16-15 (b) (b)	.6DL+.6HL+.6WL..	.794	5.102	6.426	1	.156
IBC 16-15 (b) (c)	.6DL+.6HL-.6WL..	.517	5.102	9.877	1	.101
IBC 16-15 (b) (d)	.6DL+.6HL-.6WL..	.486	5.41	11.127	1	.09
IBC 16-15 (c) (a)	.6DL+1HL+.7ELX	.81	5.526	6.82	1	.147
IBC 16-15 (c) (b)	.6DL+1HL+.7ELZ	1.349	5.415	4.014	1	.249
IBC 16-15 (c) (c)	.6DL+1HL-.7ELX	.921	5.415	5.878	1	.17
IBC 16-15 (c) (d)	.6DL+1HL-.7ELZ	.81	5.953	7.347	1	.136
IBC 16-15 (d) (a)	.6DL+.6HL+.7EL..	.486	5.213	10.723	1	.093
IBC 16-15 (d) (b)	.6DL+.6HL+.7EL..	1.025	5.102	4.979	1	.201
IBC 16-15 (d) (c)	.6DL+.6HL-.7EL..	.597	5.102	8.543	1	.117
IBC 16-15 (d) (d)	.6DL+.6HL-.7EL..	.486	5.64	11.602	1	.086

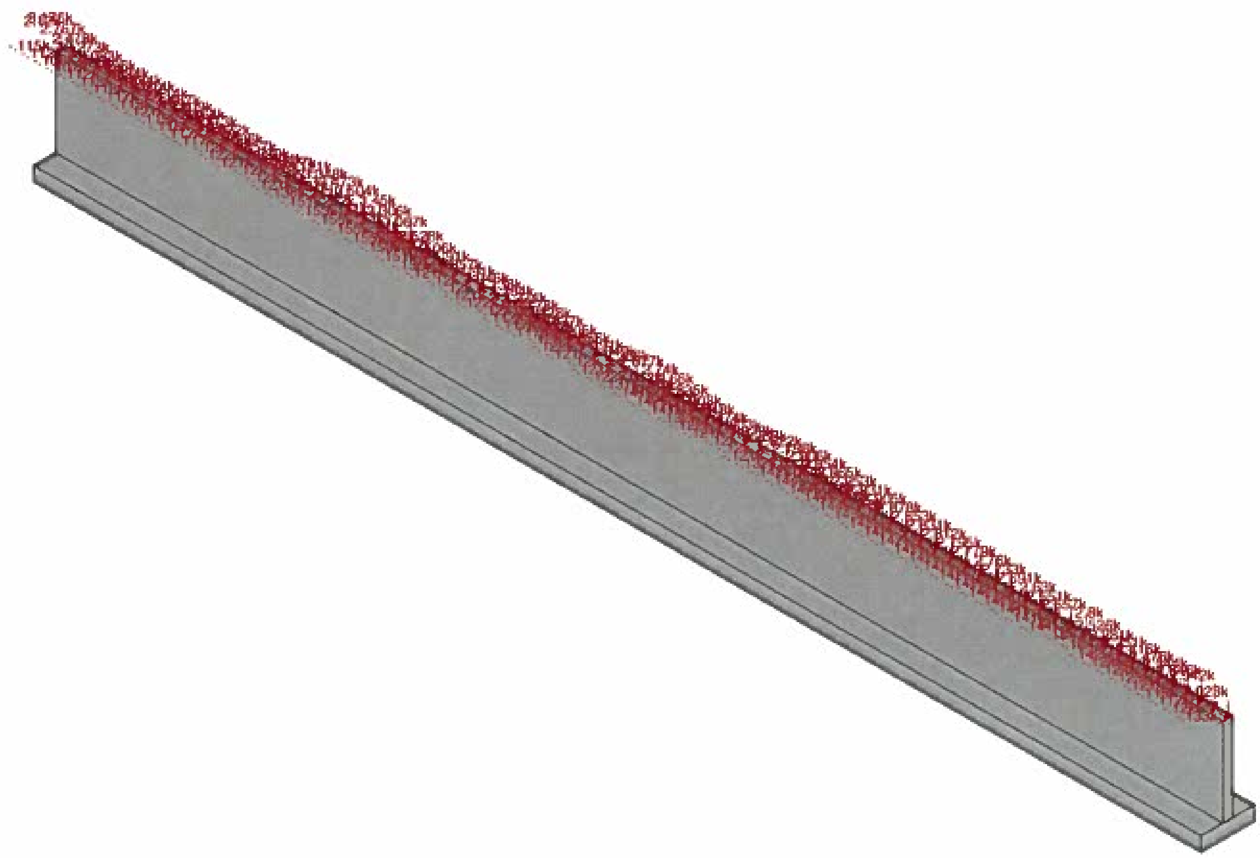
Sliding Check (Service)

Description	Categories and Factors	Vsliding (k/ft)	Vresist (k/ft)	SF	SF Min	SF Min/SF
IBC 16-8	1DL	0	1.259	0	1.5	0
IBC 16-9	1DL+1HL+1LL+1LLS	.561	2.013	3.586	1.5	.418
IBC 16-10 (a)	1DL+1HL+1RLL	.561	1.821	3.243	1.5	.463
IBC 16-10 (b)	1DL+1HL+1SL+.75S..	.561	1.837	3.273	1.5	.458
IBC 16-10 (c)	1DL+1HL+1RL	.561	1.801	3.208	1.5	.468
IBC 16-11 (a)	1DL+1HL+.75LL+...	.561	1.975	3.518	1.5	.426
IBC 16-11 (b)	1DL+1HL+.75LL+...	.561	1.987	3.54	1.5	.424
IBC 16-11 (c)	1DL+1HL+.75LL+...	.561	1.96	3.492	1.5	.43
IBC 16-12 (a) (a)	1DL+1HL+.6WLX	.561	1.806	3.217	1.5	.466
IBC 16-12 (a) (b)	1DL+1HL+.6WLZ	.605	1.801	2.975	1.5	.504
IBC 16-12 (a) (c)	1DL+1HL-.6WLX	.561	1.796	3.199	1.5	.469
IBC 16-12 (a) (d)	1DL+1HL-.6WLZ	.561	1.845	3.286	1.5	.456
IBC 16-12 (b) (a)	1DL+1HL+.7ELX	.561	1.819	3.24	1.1	.339
IBC 16-12 (b) (b)	1DL+1HL+.7ELZ	.638	1.801	2.821	1.1	.39
IBC 16-12 (b) (c)	1DL+1HL-.7ELX	.561	1.783	3.176	1.1	.346
IBC 16-12 (b) (d)	1DL+1HL-.7ELZ	.561	1.878	3.345	1.1	.329
IBC 16-13 (a) (a)	1DL+1HL+.45WLX+..	.561	1.979	3.524	1.5	.426
IBC 16-13 (a) (b)	1DL+1HL+.45WLZ+..	.594	1.975	3.323	1.5	.451
IBC 16-13 (a) (c)	1DL+1HL-.45WLX+..	.561	1.971	3.511	1.5	.427
IBC 16-13 (a) (d)	1DL+1HL-.45WLZ+..	.561	2.008	3.576	1.5	.419
IBC 16-13 (b) (a)	1DL+1HL+.45WLX+..	.561	1.991	3.547	1.5	.423
IBC 16-13 (b) (b)	1DL+1HL+.45WLZ+..	.594	1.987	3.344	1.5	.449
IBC 16-13 (b) (c)	1DL+1HL-.45WLX+..	.561	1.984	3.533	1.5	.425
IBC 16-13 (b) (d)	1DL+1HL-.45WLZ+..	.561	2.02	3.599	1.5	.417
IBC 16-13 (c) (a)	1DL+1HL+.45WLX+..	.561	1.964	3.498	1.5	.429
IBC 16-13 (c) (b)	1DL+1HL+.45WLZ+..	.594	1.96	3.298	1.5	.455
IBC 16-13 (c) (c)	1DL+1HL-.45WLX+..	.561	1.956	3.485	1.5	.43
IBC 16-13 (c) (d)	1DL+1HL-.45WLZ+..	.561	1.993	3.55	1.5	.422
IBC 16-14 (a) (a)	1DL+1HL+.525ELX+..	.561	1.988	3.542	1.1	.311
IBC 16-14 (a) (b)	1DL+1HL+.525ELZ+..	.619	1.975	3.19	1.1	.345
IBC 16-14 (a) (c)	1DL+1HL-.525ELX+..	.561	1.961	3.493	1.1	.315
IBC 16-14 (a) (d)	1DL+1HL-.525ELZ+..	.561	2.033	3.621	1.1	.304
IBC 16-14 (b) (a)	1DL+1HL+.525ELX+..	.561	2.001	3.564	1.1	.309
IBC 16-14 (b) (b)	1DL+1HL+.525ELZ+..	.619	1.987	3.21	1.1	.343
IBC 16-14 (b) (c)	1DL+1HL-.525ELX+..	.561	1.974	3.516	1.1	.313
IBC 16-14 (b) (d)	1DL+1HL-.525ELZ+..	.561	2.045	3.643	1.1	.302
IBC 16-14 (c) (a)	1DL+1HL+.525ELX+..	.561	1.974	3.516	1.1	.313
IBC 16-14 (c) (b)	1DL+1HL+.525ELZ+..	.619	1.96	3.166	1.1	.347
IBC 16-14 (c) (c)	1DL+1HL-.525ELX+..	.561	1.947	3.467	1.1	.317
IBC 16-14 (c) (d)	1DL+1HL-.525ELZ+..	.561	2.018	3.594	1.1	.306
IBC 16-15 (a) (a)	.6DL+1HL+.6WLX	.561	1.302	2.32	1	.431
IBC 16-15 (a) (b)	.6DL+1HL+.6WLZ	.605	1.297	2.143	1	.467
IBC 16-15 (a) (c)	.6DL+1HL-.6WLX	.561	1.292	2.302	1	.434
IBC 16-15 (a) (d)	.6DL+1HL-.6WLZ	.561	1.341	2.389	1	.419
IBC 16-15 (b) (a)	.6DL+.6HL+.6WL..	.337	1.086	3.223	1	.31
IBC 16-15 (b) (b)	.6DL+.6HL+.6WL..	.381	1.081	2.838	1	.352
IBC 16-15 (b) (c)	.6DL+.6HL-.6WL..	.337	1.076	3.193	1	.313
IBC 16-15 (b) (d)	.6DL+.6HL-.6WL..	.337	1.125	3.339	1	.3
IBC 16-15 (c) (a)	.6DL+1HL+.7ELX	.561	1.316	2.343	1	.427
IBC 16-15 (c) (b)	.6DL+1HL+.7ELZ	.638	1.297	2.033	1	.492
IBC 16-15 (c) (c)	.6DL+1HL-.7ELX	.561	1.279	2.279	1	.439
IBC 16-15 (c) (d)	.6DL+1HL-.7ELZ	.561	1.374	2.448	1	.408
IBC 16-15 (d) (a)	.6DL+.6HL+.7EL..	.337	1.099	3.262	1	.307
IBC 16-15 (d) (b)	.6DL+.6HL+.7EL..	.414	1.081	2.612	1	.383
IBC 16-15 (d) (c)	.6DL+.6HL-.7EL..	.337	1.062	3.154	1	.317
IBC 16-15 (d) (d)	.6DL+.6HL-.7EL..	.337	1.158	3.437	1	.291

Soil Bearing Check (Service)

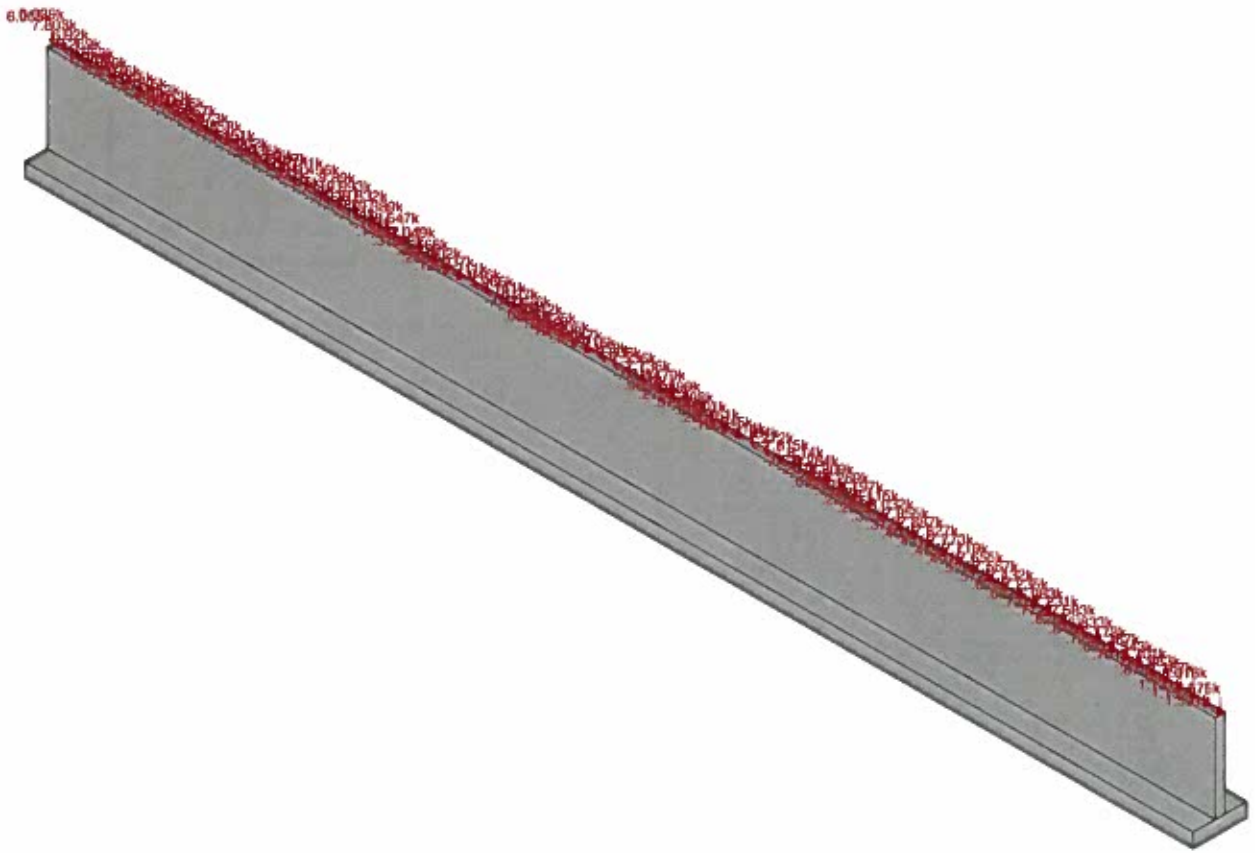
Description	Categories and Factors	Max Bearing (ksf)	Bearing Allowed (ksf)	Bearing UC
IBC 16-8	1DL	1.157	2.5	.463
IBC 16-9	1DL+1HL+1LL+1LLS	1.338	2.5	.535
IBC 16-10 (a)	1DL+1HL+1RLL	1.163	2.5	.465
IBC 16-10 (b)	1DL+1HL+1SL+.75S..	1.178	2.5	.471
IBC 16-10 (c)	1DL+1HL+1RL	1.145	2.5	.458
IBC 16-11 (a)	1DL+1HL+.75LL+...	1.303	2.5	.521
IBC 16-11 (b)	1DL+1HL+.75LL+...	1.314	2.5	.526
IBC 16-11 (c)	1DL+1HL+.75LL+...	1.29	2.5	.516
IBC 16-12 (a) (a)	1DL+1HL+.6WLX	1.149	2.5	.46
IBC 16-12 (a) (b)	1DL+1HL+.6WLZ	1.282	2.5	.513
IBC 16-12 (a) (c)	1DL+1HL-.6WLX	1.14	2.5	.456
IBC 16-12 (a) (d)	1DL+1HL-.6WLZ	1.281	2.5	.513
IBC 16-12 (b) (a)	1DL+1HL+.7ELX	1.161	2.5	.465
IBC 16-12 (b) (b)	1DL+1HL+.7ELZ	1.385	2.5	.554
IBC 16-12 (b) (c)	1DL+1HL-.7ELX	1.128	2.5	.451
IBC 16-12 (b) (d)	1DL+1HL-.7ELZ	1.384	2.5	.554
IBC 16-13 (a) (a)	1DL+1HL+.45WLX+..	1.306	2.5	.523
IBC 16-13 (a) (b)	1DL+1HL+.45WLZ+..	1.406	2.5	.562
IBC 16-13 (a) (c)	1DL+1HL-.45WLX+..	1.3	2.5	.52
IBC 16-13 (a) (d)	1DL+1HL-.45WLZ+..	1.405	2.5	.562
IBC 16-13 (b) (a)	1DL+1HL+.45WLX+..	1.318	2.5	.527
IBC 16-13 (b) (b)	1DL+1HL+.45WLZ+..	1.417	2.5	.567
IBC 16-13 (b) (c)	1DL+1HL-.45WLX+..	1.311	2.5	.524
IBC 16-13 (b) (d)	1DL+1HL-.45WLZ+..	1.417	2.5	.567
IBC 16-13 (c) (a)	1DL+1HL+.45WLX+..	1.293	2.5	.517
IBC 16-13 (c) (b)	1DL+1HL+.45WLZ+..	1.393	2.5	.557
IBC 16-13 (c) (c)	1DL+1HL-.45WLX+..	1.286	2.5	.514
IBC 16-13 (c) (d)	1DL+1HL-.45WLZ+..	1.392	2.5	.557
IBC 16-14 (a) (a)	1DL+1HL+.525ELX+..	1.315	2.5	.526
IBC 16-14 (a) (b)	1DL+1HL+.525ELZ+..	1.483	2.5	.593
IBC 16-14 (a) (c)	1DL+1HL-.525ELX+..	1.291	2.5	.516
IBC 16-14 (a) (d)	1DL+1HL-.525ELZ+..	1.482	2.5	.593
IBC 16-14 (b) (a)	1DL+1HL+.525ELX+..	1.327	2.5	.531
IBC 16-14 (b) (b)	1DL+1HL+.525ELZ+..	1.495	2.5	.598
IBC 16-14 (b) (c)	1DL+1HL-.525ELX+..	1.302	2.5	.521
IBC 16-14 (b) (d)	1DL+1HL-.525ELZ+..	1.494	2.5	.598
IBC 16-14 (c) (a)	1DL+1HL+.525ELX+..	1.302	2.5	.521
IBC 16-14 (c) (b)	1DL+1HL+.525ELZ+..	1.47	2.5	.588
IBC 16-14 (c) (c)	1DL+1HL-.525ELX+..	1.277	2.5	.511
IBC 16-14 (c) (d)	1DL+1HL-.525ELZ+..	1.469	2.5	.588
IBC 16-15 (a) (a)	.6DL+1HL+.6WLX	.696	2.5	.279
IBC 16-15 (a) (b)	.6DL+1HL+.6WLZ	.829	2.5	.332
IBC 16-15 (a) (c)	.6DL+1HL-.6WLX	.687	2.5	.275
IBC 16-15 (a) (d)	.6DL+1HL-.6WLZ	.819	2.5	.328
IBC 16-15 (b) (a)	.6DL+.6HL+.6WL..	.691	2.5	.277
IBC 16-15 (b) (b)	.6DL+.6HL+.6WL..	.824	2.5	.33
IBC 16-15 (b) (c)	.6DL+.6HL-.6WL..	.682	2.5	.273
IBC 16-15 (b) (d)	.6DL+.6HL-.6WL..	.824	2.5	.33
IBC 16-15 (c) (a)	.6DL+1HL+.7ELX	.708	2.5	.283
IBC 16-15 (c) (b)	.6DL+1HL+.7ELZ	.932	2.5	.373
IBC 16-15 (c) (c)	.6DL+1HL-.7ELX	.675	2.5	.27
IBC 16-15 (c) (d)	.6DL+1HL-.7ELZ	.922	2.5	.369
IBC 16-15 (d) (a)	.6DL+.6HL+.7EL..	.703	2.5	.281
IBC 16-15 (d) (b)	.6DL+.6HL+.7EL..	.927	2.5	.371
IBC 16-15 (d) (c)	.6DL+.6HL-.7EL..	.67	2.5	.268
IBC 16-15 (d) (d)	.6DL+.6HL-.7EL..	.927	2.5	.371

F1 / CW5



Loads: LC 101, IBC 16-7 (a) (b)
Results for LC 1, IBC 16-8

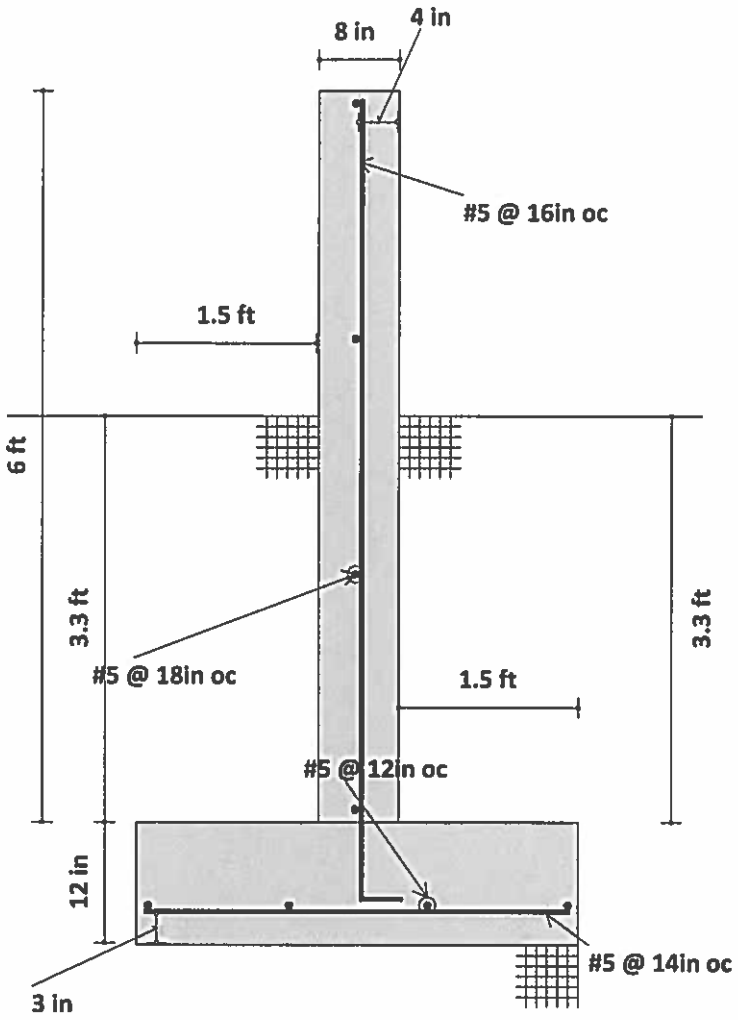
		7
	OWTP East Wall	Jan 24, 2014 at 2:14 PM
	LC 101: WORST CASE FOR FOUND. WALL	East Wall.R3D

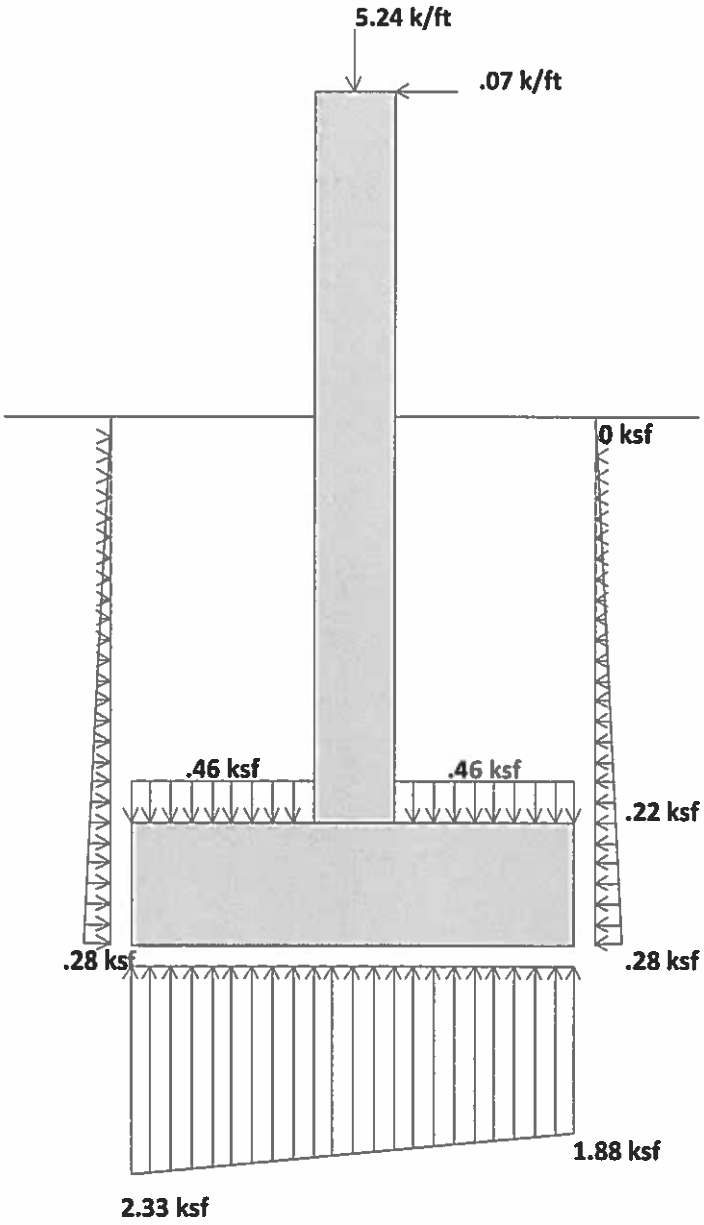


Loads: LC 59, IBC 16-2 (b)
Results for LC 1, IBC 16-8

		8
	OWTP East Wall	Jan 24, 2014 at 2:15 PM
	LC 59: WORST CASE FOR BEARING	East Wall.R3D

Sketch


8 in
4 in
#5 @ 16in oc
1.5 ft
6 ft
3.3 ft
#5 @ 18in oc
1.5 ft
3.3 ft
#5 @ 12in oc
12 in
#5 @ 14in oc
3 in

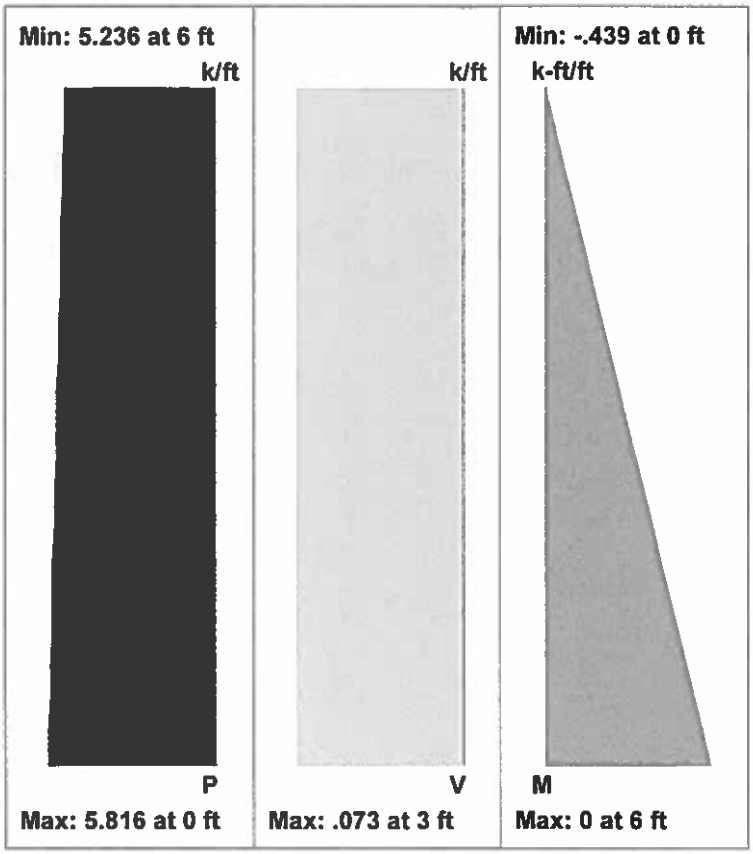

5.24 k/ft
.07 k/ft
0 ksf
.46 ksf
.46 ksf
.22 ksf
.28 ksf
.28 ksf
1.88 ksf
2.33 ksf

Geometry, Materials and Criteria

Start Point	: R3D_N1	Design Code	: ACI 318-11	Wall Int Bar	: #5@16 in
End Point	: R3D_N2			Wall Horz Bar	: #5@18 in
				Wall Bar Location	: Single Layer
Wall Length	: 79.302 ft	Concrete Weight	: .145 k/ft^3	Wall Outer Bar	: Vertical
Wall Height	: 6 ft	Concrete f'c	: 3 ksi		
Wall Thickness	: 8 in	Steel fy	: 60 ksi	Foot Bot Bar	: #5@14 in
Wall Int Cover	: 4 in	Heel Soil Height	: 3.33 ft	Foot Long Bar	: #5@12 in
Wall Ext Cover	: 1.5 in	Toe Soil Height	: 3.33 ft	Foot bar Location	: Single Layer
		Backfill Angle(α)	: 0 deg		
Foot Toe Len.	: 1.5 ft	Water Height	: 0 ft	γ_{Toe}	: .137 k/ft^3
Foot Heel Len.	: 1.5 ft	Heel Surcharge	: 0 ksf	Φ_{Toe}	: 30 deg
Foot Thickness	: 12 in			$K_{Lat\ Toe}$	: .48 (Passive)
Foot Top Cover	: 3 in	γ_{Heel}	: .137 k/ft^3		
Foot Bot Cover	: 3 in	Φ_{Heel}	: 30 deg		
		$K_{Lat\ Heel}$	: .48 (Active)		
Shear Key ?	: NO				
Wall Propped ?	: NO				

Wall Design

LC 34 DIAGRAMS



ACI 318-11 Code Check

AXIAL/BENDING DETAILS

UC Max Int(+z)	: .116
Location	: 0 ft
Gov Pu Int(+z)	: 0 k/ft
phi *Pn Int(+z)	: 0 k/ft
Gov Mu Int(+z)	: -.418 k-ft/ft
phi *Mn Int(+z)	: 3.614 k-ft/ft
phi eff. Int(+z)	: .9
Gov LC Int(+z)	: 101
UC Max Ext(-z)	: .098
Location	: 3 ft
Gov Pu Ext(-z)	: 0 k/ft
phi *Pn Ext(-z)	: 0 k/ft
Gov Mu Ext(-z)	: .418 k-ft/ft
phi *Mn Ext(-z)	: 4.267 k-ft/ft
phi eff. Ext(-z)	: .9
Gov LC Ext(-z)	: 107

SHEAR DETAILS

UC Max	: .038
Location	: .307 ft
Gov Vu	: .139 k/ft
phi*Vn	: 3.636 k/ft
Gov LC	: 107
UC Max Dowel	: .013
μ	: 1
A_{vf}	: .23 in^2/ft
Dowel Bars	: #5@16in Int

RESULTS FOR FULL WALL

As Provided(H)	: 1.227 in^2 (4 #5)
Rho Provided(H)	: .0021
As min(H)	: 1.152 in^2
Rho min(H)	: .002
Int As Provided(V)	: 18.408 in^2 (60 #5)
Int rho Provided(V)	: .0024
Ext As Provided(V)	: 0 in^2 (0 #5)
Ext rho Provided(V)	: 0
As min(V)	: 9.136 in^2
rho min(V)	: .0012

ENVELOPED WALL FORCES (NOT USED FOR DESIGN)

M in Plane : 434.933 k-ft (LC : 90) n Plane : 72.489 k (LC : 90)

Footing Design

As-min z-dir (Top Flexure): .348 in^2/ft
As-min z-dir (Bot Flexure): .348 in^2/ft
z-dir (T & S) : .259 in^2/ft
x-dir Long. (T & S) : .95 in^2

Bottom Bar Design (Heel) : Shear (Toe)

Mu UC Max	Gov Mu LC	Max Mu (k-ft/ft)	Phi*Mn (k-ft/ft)	As Req'd (in^2/ft)	As Prov'd (in^2/ft)	Vu UC Max	Gov Vu LC	Vu (k/ft)	Phi*Vn (k/ft)
.233	59	2.323	9.975	.06	.263	.187	59	1.602	8.565

Top Bar Design (Toe) : Shear (Heel)

Mu UC Max	Gov Mu LC	Max Mu (k-ft/ft)	Phi*Mn (k-ft/ft)	As Req'd (in^2/ft)	As Prov'd (in^2/ft)	Vu UC Max	Gov Vu LC	Vu (k/ft)	Phi*Vn (k/ft)
0	NC	0	3.615	0	.263	.149	59	1.279	8.565

Overturning Check (Service)

Description	Categories and Factors	Moverturn (k-ft/ft)	Mresist (k-ft/ft)	SF	SF Min	SF Min/SF
IBC 16-8	1DL	0	9.87	0	1.5	0
IBC 16-9	1DL+1HL+1LL+1LLS	.89	14.427	16.214	1.5	.093
IBC 16-10 (a)	1DL+1HL+1RLL	.89	11.86	13.329	1.5	.113
IBC 16-10 (b)	1DL+1HL+1SL+.75S..	.89	12.795	14.38	1.5	.104
IBC 16-10 (c)	1DL+1HL+1RL	.89	10.76	12.093	1.5	.124
IBC 16-11 (a)	1DL+1HL+.75LL+...	.89	14.335	16.111	1.5	.093
IBC 16-11 (b)	1DL+1HL+.75LL+...	.89	15.036	16.899	1.5	.089
IBC 16-11 (c)	1DL+1HL+.75LL+...	.89	13.51	15.184	1.5	.099
IBC 16-12 (a) (a)	1DL+1HL+.6WLX	.89	10.76	12.093	1.5	.124
IBC 16-12 (a) (b)	1DL+1HL+.6WLZ	1.28	10.76	8.409	1.5	.178
IBC 16-12 (a) (c)	1DL+1HL-.6WLX	.89	10.76	12.093	1.5	.124
IBC 16-12 (a) (d)	1DL+1HL-.6WLZ	.89	11.15	12.531	1.5	.12
IBC 16-12 (b) (a)	1DL+1HL+.7ELX	.89	10.76	12.093	1.1	.091
IBC 16-12 (b) (b)	1DL+1HL+.7ELZ	1.572	10.76	6.845	1.1	.161
IBC 16-12 (b) (c)	1DL+1HL-.7ELX	.89	10.76	12.093	1.1	.091
IBC 16-12 (b) (d)	1DL+1HL-.7ELZ	.89	11.442	12.86	1.1	.086
IBC 16-13 (a) (a)	1DL+1HL+.45WLX+..	.89	14.335	16.111	1.5	.093
IBC 16-13 (a) (b)	1DL+1HL+.45WLZ+..	1.182	14.335	12.127	1.5	.124
IBC 16-13 (a) (c)	1DL+1HL-.45WLX+..	.89	14.335	16.111	1.5	.093
IBC 16-13 (a) (d)	1DL+1HL-.45WLZ+..	.89	14.627	16.44	1.5	.091
IBC 16-13 (b) (a)	1DL+1HL+.45WLX+..	.89	15.036	16.899	1.5	.089
IBC 16-13 (b) (b)	1DL+1HL+.45WLZ+..	1.182	15.036	12.72	1.5	.118
IBC 16-13 (b) (c)	1DL+1HL-.45WLX+..	.89	15.036	16.899	1.5	.089
IBC 16-13 (b) (d)	1DL+1HL-.45WLZ+..	.89	15.329	17.228	1.5	.087
IBC 16-13 (c) (a)	1DL+1HL+.45WLX+..	.89	13.51	15.184	1.5	.099
IBC 16-13 (c) (b)	1DL+1HL+.45WLZ+..	1.182	13.51	11.429	1.5	.131
IBC 16-13 (c) (c)	1DL+1HL-.45WLX+..	.89	13.51	15.184	1.5	.099
IBC 16-13 (c) (d)	1DL+1HL-.45WLZ+..	.89	13.802	15.512	1.5	.097
IBC 16-14 (a) (a)	1DL+1HL+.525ELX+..	.89	14.335	16.111	1.1	.068
IBC 16-14 (a) (b)	1DL+1HL+.525ELZ+..	1.401	14.335	10.229	1.1	.108
IBC 16-14 (a) (c)	1DL+1HL-.525ELX+..	.89	14.335	16.111	1.1	.068
IBC 16-14 (a) (d)	1DL+1HL-.525ELZ+..	.89	14.847	16.686	1.1	.066
IBC 16-14 (b) (a)	1DL+1HL+.525ELX+..	.89	15.036	16.899	1.1	.065
IBC 16-14 (b) (b)	1DL+1HL+.525ELZ+..	1.401	15.036	10.73	1.1	.103
IBC 16-14 (b) (c)	1DL+1HL-.525ELX+..	.89	15.036	16.899	1.1	.065
IBC 16-14 (b) (d)	1DL+1HL-.525ELZ+..	.89	15.548	17.474	1.1	.063
IBC 16-14 (c) (a)	1DL+1HL+.525ELX+..	.89	13.51	15.184	1.1	.072
IBC 16-14 (c) (b)	1DL+1HL+.525ELZ+..	1.401	13.51	9.64	1.1	.114
IBC 16-14 (c) (c)	1DL+1HL-.525ELX+..	.89	13.51	15.184	1.1	.072
IBC 16-14 (c) (d)	1DL+1HL-.525ELZ+..	.89	14.022	15.759	1.1	.07
IBC 16-15 (a) (a)	.6DL+1HL+.6WLX	.89	6.812	7.656	1	.131
IBC 16-15 (a) (b)	.6DL+1HL+.6WLZ	1.28	6.812	5.324	1	.188
IBC 16-15 (a) (c)	.6DL+1HL-.6WLX	.89	6.812	7.656	1	.131
IBC 16-15 (a) (d)	.6DL+1HL-.6WLZ	.89	7.202	8.094	1	.124
IBC 16-15 (b) (a)	.6DL+.6HL+.6WL..	.534	6.456	12.093	1	.083
IBC 16-15 (b) (b)	.6DL+.6HL+.6WL..	.924	6.456	6.99	1	.143
IBC 16-15 (b) (c)	.6DL+.6HL-.6WL..	.534	6.456	12.093	1	.083
IBC 16-15 (b) (d)	.6DL+.6HL-.6WL..	.534	6.846	12.823	1	.078
IBC 16-15 (c) (a)	.6DL+1HL+.7ELX	.89	6.812	7.656	1	.131
IBC 16-15 (c) (b)	.6DL+1HL+.7ELZ	1.572	6.812	4.333	1	.231
IBC 16-15 (c) (c)	.6DL+1HL-.7ELX	.89	6.812	7.656	1	.131
IBC 16-15 (c) (d)	.6DL+1HL-.7ELZ	.89	7.494	8.423	1	.119
IBC 16-15 (d) (a)	.6DL+.6HL+.7EL..	.534	6.456	12.093	1	.083
IBC 16-15 (d) (b)	.6DL+.6HL+.7EL..	1.216	6.456	5.309	1	.188
IBC 16-15 (d) (c)	.6DL+.6HL-.7EL..	.534	6.456	12.093	1	.083
IBC 16-15 (d) (d)	.6DL+.6HL-.7EL..	.534	7.138	13.371	1	.075

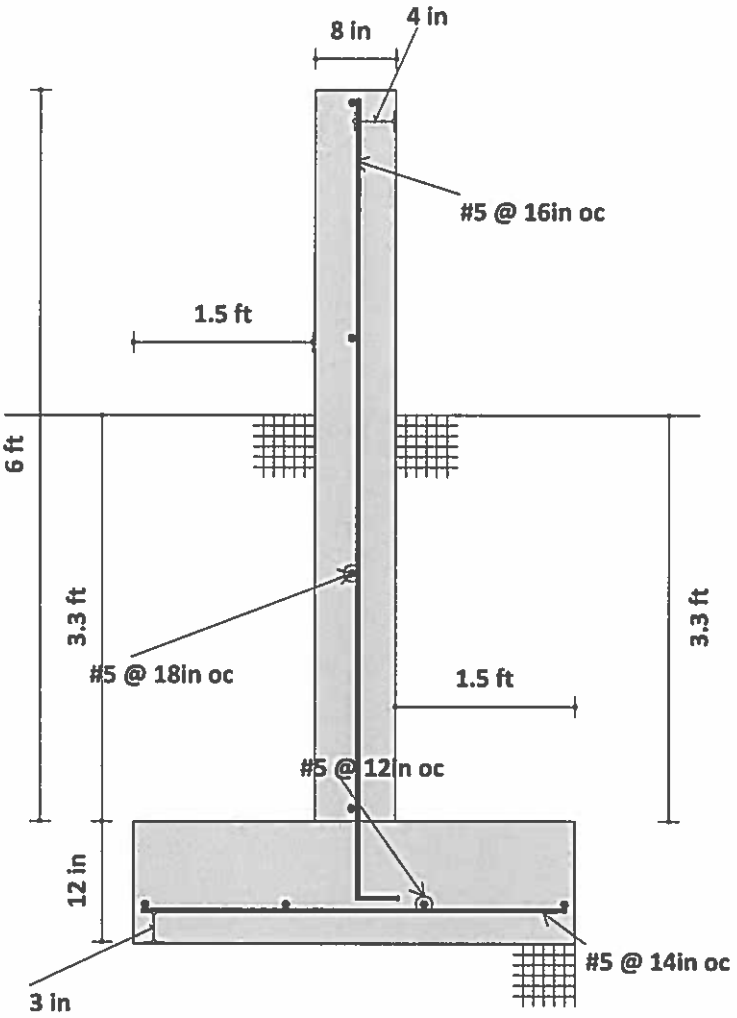
Sliding Check (Service)

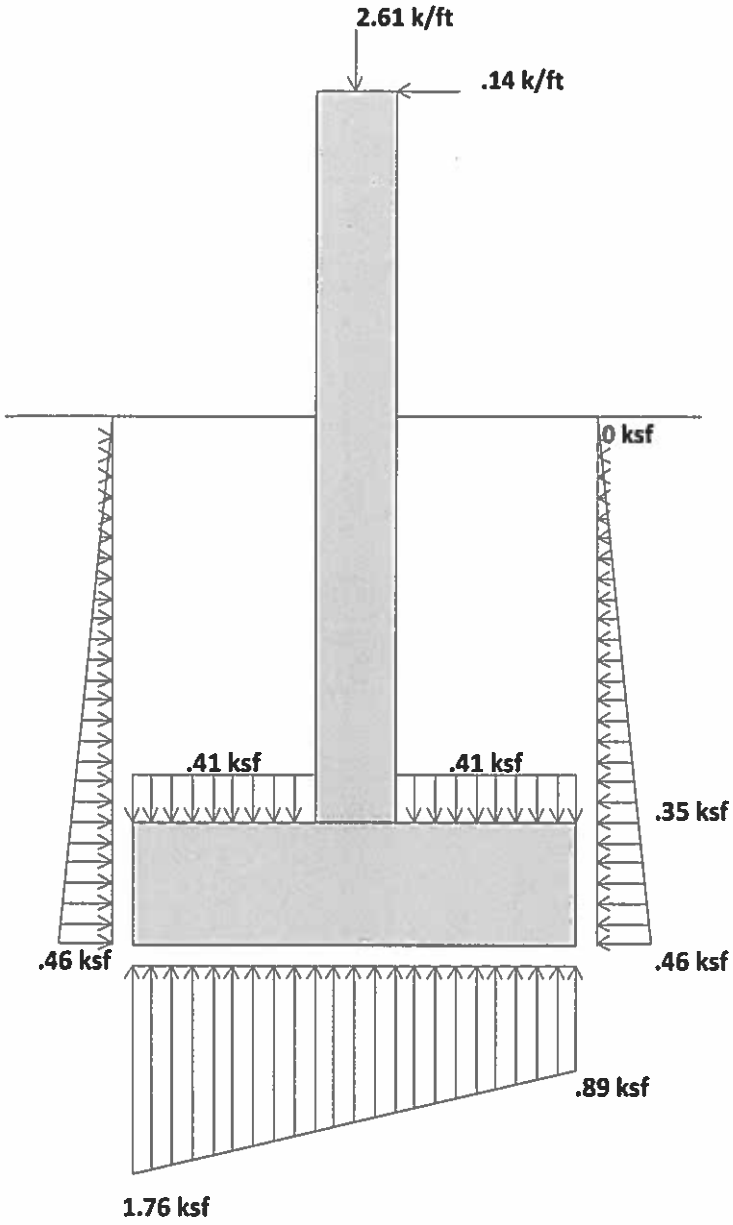
Description	Categories and Factors	Vsliding (k/ft)	Vresist (k/ft)	SF	SF Min	SF Min/SF
IBC 16-8	1DL	0	1.615	0	1.5	0
IBC 16-9	1DL+1HL+1LL+1LLS	.616	2.832	4.593	1.5	.327
IBC 16-10 (a)	1DL+1HL+1RLL	.616	2.412	3.912	1.5	.383
IBC 16-10 (b)	1DL+1HL+1SL+.75S..	.616	2.565	4.16	1.5	.361
IBC 16-10 (c)	1DL+1HL+1RL	.616	2.232	3.62	1.5	.414
IBC 16-11 (a)	1DL+1HL+.75LL+...	.616	2.817	4.569	1.5	.328
IBC 16-11 (b)	1DL+1HL+.75LL+...	.616	2.931	4.755	1.5	.315
IBC 16-11 (c)	1DL+1HL+.75LL+...	.616	2.682	4.35	1.5	.345
IBC 16-12 (a) (a)	1DL+1HL+.6WLX	.616	2.232	3.62	1.5	.414
IBC 16-12 (a) (b)	1DL+1HL+.6WLZ	.672	2.232	3.32	1.5	.452
IBC 16-12 (a) (c)	1DL+1HL-.6WLX	.616	2.232	3.62	1.5	.414
IBC 16-12 (a) (d)	1DL+1HL-.6WLZ	.616	2.287	3.71	1.5	.404
IBC 16-12 (b) (a)	1DL+1HL+.7ELX	.616	2.232	3.62	1.1	.304
IBC 16-12 (b) (b)	1DL+1HL+.7ELZ	.714	2.232	3.126	1.1	.352
IBC 16-12 (b) (c)	1DL+1HL-.7ELX	.616	2.232	3.62	1.1	.304
IBC 16-12 (b) (d)	1DL+1HL-.7ELZ	.616	2.329	3.778	1.1	.291
IBC 16-13 (a) (a)	1DL+1HL+.45WLX+..	.616	2.817	4.569	1.5	.328
IBC 16-13 (a) (b)	1DL+1HL+.45WLZ+..	.658	2.817	4.279	1.5	.351
IBC 16-13 (a) (c)	1DL+1HL-.45WLX+..	.616	2.817	4.569	1.5	.328
IBC 16-13 (a) (d)	1DL+1HL-.45WLZ+..	.616	2.858	4.637	1.5	.324
IBC 16-13 (b) (a)	1DL+1HL+.45WLX+..	.616	2.931	4.755	1.5	.315
IBC 16-13 (b) (b)	1DL+1HL+.45WLZ+..	.658	2.931	4.453	1.5	.337
IBC 16-13 (b) (c)	1DL+1HL-.45WLX+..	.616	2.931	4.755	1.5	.315
IBC 16-13 (b) (d)	1DL+1HL-.45WLZ+..	.616	2.973	4.823	1.5	.311
IBC 16-13 (c) (a)	1DL+1HL+.45WLX+..	.616	2.682	4.35	1.5	.345
IBC 16-13 (c) (b)	1DL+1HL+.45WLZ+..	.658	2.682	4.074	1.5	.368
IBC 16-13 (c) (c)	1DL+1HL-.45WLX+..	.616	2.682	4.35	1.5	.345
IBC 16-13 (c) (d)	1DL+1HL-.45WLZ+..	.616	2.723	4.418	1.5	.34
IBC 16-14 (a) (a)	1DL+1HL+.525ELX+..	.616	2.817	4.569	1.1	.241
IBC 16-14 (a) (b)	1DL+1HL+.525ELZ+..	.69	2.817	4.085	1.1	.269
IBC 16-14 (a) (c)	1DL+1HL-.525ELX+..	.616	2.817	4.569	1.1	.241
IBC 16-14 (a) (d)	1DL+1HL-.525ELZ+..	.616	2.89	4.688	1.1	.235
IBC 16-14 (b) (a)	1DL+1HL+.525ELX+..	.616	2.931	4.755	1.1	.231
IBC 16-14 (b) (b)	1DL+1HL+.525ELZ+..	.69	2.931	4.251	1.1	.259
IBC 16-14 (b) (c)	1DL+1HL-.525ELX+..	.616	2.931	4.755	1.1	.231
IBC 16-14 (b) (d)	1DL+1HL-.525ELZ+..	.616	3.004	4.874	1.1	.226
IBC 16-14 (c) (a)	1DL+1HL+.525ELX+..	.616	2.682	4.35	1.1	.253
IBC 16-14 (c) (b)	1DL+1HL+.525ELZ+..	.69	2.682	3.889	1.1	.283
IBC 16-14 (c) (c)	1DL+1HL-.525ELX+..	.616	2.682	4.35	1.1	.253
IBC 16-14 (c) (d)	1DL+1HL-.525ELZ+..	.616	2.755	4.469	1.1	.246
IBC 16-15 (a) (a)	.6DL+1HL+.6WLX	.616	1.586	2.572	1	.389
IBC 16-15 (a) (b)	.6DL+1HL+.6WLZ	.672	1.586	2.359	1	.424
IBC 16-15 (a) (c)	.6DL+1HL-.6WLX	.616	1.586	2.572	1	.389
IBC 16-15 (a) (d)	.6DL+1HL-.6WLZ	.616	1.641	2.662	1	.376
IBC 16-15 (b) (a)	.6DL+.6HL+.6WL..	.37	1.339	3.62	1	.276
IBC 16-15 (b) (b)	.6DL+.6HL+.6WL..	.426	1.339	3.146	1	.318
IBC 16-15 (b) (c)	.6DL+.6HL-.6WL..	.37	1.339	3.62	1	.276
IBC 16-15 (b) (d)	.6DL+.6HL-.6WL..	.37	1.395	3.771	1	.265
IBC 16-15 (c) (a)	.6DL+1HL+.7ELX	.616	1.586	2.572	1	.389
IBC 16-15 (c) (b)	.6DL+1HL+.7ELZ	.714	1.586	2.221	1	.45
IBC 16-15 (c) (c)	.6DL+1HL-.7ELX	.616	1.586	2.572	1	.389
IBC 16-15 (c) (d)	.6DL+1HL-.7ELZ	.616	1.683	2.73	1	.366
IBC 16-15 (d) (a)	.6DL+.6HL+.7EL..	.37	1.339	3.62	1	.276
IBC 16-15 (d) (b)	.6DL+.6HL+.7EL..	.467	1.339	2.865	1	.349
IBC 16-15 (d) (c)	.6DL+.6HL-.7EL..	.37	1.339	3.62	1	.276
IBC 16-15 (d) (d)	.6DL+.6HL-.7EL..	.37	1.436	3.883	1	.258

Soil Bearing Check (Service)

Description	Categories and Factors	Max Bearing (ksf)	Bearing Allowed (ksf)	Bearing UC
IBC 16-8	1DL	1.468	2.5	.587
IBC 16-9	1DL+1HL+1LL+1LLS	2.014	2.5	.806
IBC 16-10 (a)	1DL+1HL+1RLL	1.632	2.5	.653
IBC 16-10 (b)	1DL+1HL+1SL+.75S..	1.771	2.5	.708
IBC 16-10 (c)	1DL+1HL+1RL	1.468	2.5	.587
IBC 16-11 (a)	1DL+1HL+.75LL+...	2	2.5	.8
IBC 16-11 (b)	1DL+1HL+.75LL+...	2.104	2.5	.842
IBC 16-11 (c)	1DL+1HL+.75LL+...	1.877	2.5	.751
IBC 16-12 (a) (a)	1DL+1HL+.6WLX	1.468	2.5	.587
IBC 16-12 (a) (b)	1DL+1HL+.6WLZ	1.642	2.5	.657
IBC 16-12 (a) (c)	1DL+1HL-.6WLX	1.468	2.5	.587
IBC 16-12 (a) (d)	1DL+1HL-.6WLZ	1.642	2.5	.657
IBC 16-12 (b) (a)	1DL+1HL+.7ELX	1.468	2.5	.587
IBC 16-12 (b) (b)	1DL+1HL+.7ELZ	1.773	2.5	.709
IBC 16-12 (b) (c)	1DL+1HL-.7ELX	1.468	2.5	.587
IBC 16-12 (b) (d)	1DL+1HL-.7ELZ	1.773	2.5	.709
IBC 16-13 (a) (a)	1DL+1HL+.45WLX+..	2	2.5	.8
IBC 16-13 (a) (b)	1DL+1HL+.45WLZ+..	2.131	2.5	.852
IBC 16-13 (a) (c)	1DL+1HL-.45WLX+..	2	2.5	.8
IBC 16-13 (a) (d)	1DL+1HL-.45WLZ+..	2.131	2.5	.852
IBC 16-13 (b) (a)	1DL+1HL+.45WLX+..	2.104	2.5	.842
IBC 16-13 (b) (b)	1DL+1HL+.45WLZ+..	2.235	2.5	.894
IBC 16-13 (b) (c)	1DL+1HL-.45WLX+..	2.104	2.5	.842
IBC 16-13 (b) (d)	1DL+1HL-.45WLZ+..	2.235	2.5	.894
IBC 16-13 (c) (a)	1DL+1HL+.45WLX+..	1.877	2.5	.751
IBC 16-13 (c) (b)	1DL+1HL+.45WLZ+..	2.008	2.5	.803
IBC 16-13 (c) (c)	1DL+1HL-.45WLX+..	1.877	2.5	.751
IBC 16-13 (c) (d)	1DL+1HL-.45WLZ+..	2.008	2.5	.803
IBC 16-14 (a) (a)	1DL+1HL+.525ELX+..	2	2.5	.8
IBC 16-14 (a) (b)	1DL+1HL+.525ELZ+..	2.228	2.5	.891
IBC 16-14 (a) (c)	1DL+1HL-.525ELX+..	2	2.5	.8
IBC 16-14 (a) (d)	1DL+1HL-.525ELZ+..	2.228	2.5	.891
IBC 16-14 (b) (a)	1DL+1HL+.525ELX+..	2.104	2.5	.842
IBC 16-14 (b) (b)	1DL+1HL+.525ELZ+..	2.333	2.5	.933
IBC 16-14 (b) (c)	1DL+1HL-.525ELX+..	2.104	2.5	.842
IBC 16-14 (b) (d)	1DL+1HL-.525ELZ+..	2.333	2.5	.933
IBC 16-14 (c) (a)	1DL+1HL+.525ELX+..	1.877	2.5	.751
IBC 16-14 (c) (b)	1DL+1HL+.525ELZ+..	2.106	2.5	.842
IBC 16-14 (c) (c)	1DL+1HL-.525ELX+..	1.877	2.5	.751
IBC 16-14 (c) (d)	1DL+1HL-.525ELZ+..	2.106	2.5	.842
IBC 16-15 (a) (a)	.6DL+1HL+.6WLX	.881	2.5	.352
IBC 16-15 (a) (b)	.6DL+1HL+.6WLZ	1.055	2.5	.422
IBC 16-15 (a) (c)	.6DL+1HL-.6WLX	.881	2.5	.352
IBC 16-15 (a) (d)	.6DL+1HL-.6WLZ	1.055	2.5	.422
IBC 16-15 (b) (a)	.6DL+.6HL+.6WL..	.881	2.5	.352
IBC 16-15 (b) (b)	.6DL+.6HL+.6WL..	1.055	2.5	.422
IBC 16-15 (b) (c)	.6DL+.6HL-.6WL..	.881	2.5	.352
IBC 16-15 (b) (d)	.6DL+.6HL-.6WL..	1.055	2.5	.422
IBC 16-15 (c) (a)	.6DL+1HL+.7ELX	.881	2.5	.352
IBC 16-15 (c) (b)	.6DL+1HL+.7ELZ	1.185	2.5	.474
IBC 16-15 (c) (c)	.6DL+1HL-.7ELX	.881	2.5	.352
IBC 16-15 (c) (d)	.6DL+1HL-.7ELZ	1.185	2.5	.474
IBC 16-15 (d) (a)	.6DL+.6HL+.7EL..	.881	2.5	.352
IBC 16-15 (d) (b)	.6DL+.6HL+.7EL..	1.185	2.5	.474
IBC 16-15 (d) (c)	.6DL+.6HL-.7EL..	.881	2.5	.352
IBC 16-15 (d) (d)	.6DL+.6HL-.7EL..	1.185	2.5	.474

Sketch


8 in
4 in
#5 @ 16in oc
1.5 ft
6 ft
3.3 ft
#5 @ 18in oc
1.5 ft
3.3 ft
#5 @ 12in oc
12 in
#5 @ 14in oc
3 in

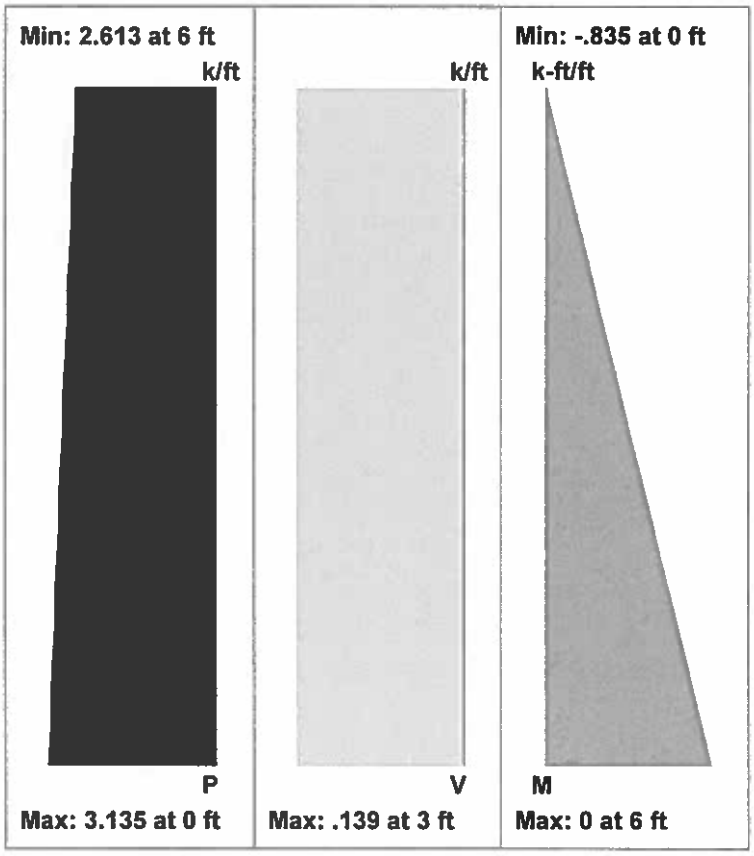

2.61 k/ft
.14 k/ft
0 ksf
.41 ksf
.41 ksf
.35 ksf
.46 ksf
.46 ksf
.89 ksf
1.76 ksf

Geometry, Materials and Criteria

Start Point	: R3D_N1	Design Code	: ACI 318-11	Wall Int Bar	: #5@16 in
End Point	: R3D_N2			Wall Horz Bar	: #5@18 in
				Wall Bar Location	: Single Layer
Wall Length	: 79.302 ft	Concrete Weight	: .145 k/ft^3	Wall Outer Bar	: Vertical
Wall Height	: 6 ft	Concrete f'c	: 3 ksi		
Wall Thickness	: 8 in	Steel fy	: 60 ksi	Foot Bot Bar	: #5@14 in
Wall Int Cover	: 4 in	Heel Soil Height	: 3.33 ft	Foot Long Bar	: #5@12 in
Wall Ext Cover	: 1.5 in	Toe Soil Height	: 3.33 ft	Foot bar Location	: Single Layer
		Backfill Angle(α)	: 0 deg		
Foot Toe Len.	: 1.5 ft	Water Height	: 0 ft	γ_{Toe}	: .137 k/ft^3
Foot Heel Len.	: 1.5 ft	Heel Surcharge	: 0 ksf	Φ_{Toe}	: 30 deg
Foot Thickness	: 12 in			$K_{Lat\ Toe}$	: .48 (Passive)
Foot Top Cover	: 3 in	γ_{Heel}	: .137 k/ft^3		
Foot Bot Cover	: 3 in	Φ_{Heel}	: 30 deg		
		$K_{Lat\ Heel}$	: .48 (Active)		
Shear Key ?	: NO				
Wall Propped ?	: NO				

Wall Design

LC 101 DIAGRAMS



ACI 318-11 Code Check

AXIAL/BENDING DETAILS

UC Max Int(+z)	: .116
Location	: 0 ft
Gov Pu Int(+z)	: 0 k/ft
phi *Pn Int(+z)	: 0 k/ft
Gov Mu Int(+z)	: -.418 k-ft/ft
phi *Mn Int(+z)	: 3.614 k-ft/ft
phi eff. Int(+z)	: .9
Gov LC Int(+z)	: 101
UC Max Ext(-z)	: .098
Location	: 3 ft
Gov Pu Ext(-z)	: 0 k/ft
phi *Pn Ext(-z)	: 0 k/ft
Gov Mu Ext(-z)	: .418 k-ft/ft
phi *Mn Ext(-z)	: 4.267 k-ft/ft
phi eff. Ext(-z)	: .9
Gov LC Ext(-z)	: 107

SHEAR DETAILS

UC Max	: .038
Location	: .307 ft
Gov Vu	: .139 k/ft
phi*Vn	: 3.636 k/ft
Gov LC	: 107
UC Max Dowel	: .013
μ	: 1
A_{vf}	: .23 in^2/ft
Dowel Bars	: #5@16in Int

RESULTS FOR FULL WALL

As Provided(H)	: 1.227 in^2 (4 #5)
Rho Provided(H)	: .0021
As min(H)	: 1.152 in^2
Rho min(H)	: .002
Int As Provided(V)	: 18.408 in^2 (60 #5)
Int rho Provided(V)	: .0024
Ext As Provided(V)	: 0 in^2 (0 #5)
Ext rho Provided(V)	: 0
As min(V)	: 9.136 in^2
rho min(V)	: .0012

ENVELOPED WALL FORCES (NOT USED FOR DESIGN)

M in Plane : 434.933 k-ft (LC : 90) n Plane : 72.489 k (LC : 90)

Footing Design

As-min z-dir (Top Flexure): .348 in^2/ft
As-min z-dir (Bot Flexure): .348 in^2/ft
z-dir (T & S) : .259 in^2/ft
x-dir Long. (T & S) : .95 in^2

Bottom Bar Design (Heel) : Shear (Toe)

Mu UC Max	Gov Mu LC	Max Mu (k-ft/ft)	Phi*Mn (k-ft/ft)	As Req'd (in^2/ft)	As Prov'd (in^2/ft)	Vu UC Max	Gov Vu LC	Vu (k/ft)	Phi*Vn (k/ft)
.233	59	2.323	9.975	.06	.263	.187	59	1.602	8.565

Top Bar Design (Toe) : Shear (Heel)

Mu UC Max	Gov Mu LC	Max Mu (k-ft/ft)	Phi*Mn (k-ft/ft)	As Req'd (in^2/ft)	As Prov'd (in^2/ft)	Vu UC Max	Gov Vu LC	Vu (k/ft)	Phi*Vn (k/ft)
0	NC	0	3.615	0	.263	.149	59	1.279	8.565

Overturning Check (Service)

Description	Categories and Factors	Moverturn (k-ft/ft)	Mresist (k-ft/ft)	SF	SF Min	SF Min/SF
IBC 16-8	1DL	0	9.87	0	1.5	0
IBC 16-9	1DL+1HL+1LL+1LLS	.89	14.427	16.214	1.5	.093
IBC 16-10 (a)	1DL+1HL+1RLL	.89	11.86	13.329	1.5	.113
IBC 16-10 (b)	1DL+1HL+1SL+.75S..	.89	12.795	14.38	1.5	.104
IBC 16-10 (c)	1DL+1HL+1RL	.89	10.76	12.093	1.5	.124
IBC 16-11 (a)	1DL+1HL+.75LL+...	.89	14.335	16.111	1.5	.093
IBC 16-11 (b)	1DL+1HL+.75LL+...	.89	15.036	16.899	1.5	.089
IBC 16-11 (c)	1DL+1HL+.75LL+...	.89	13.51	15.184	1.5	.099
IBC 16-12 (a) (a)	1DL+1HL+.6WLX	.89	10.76	12.093	1.5	.124
IBC 16-12 (a) (b)	1DL+1HL+.6WLZ	1.28	10.76	8.409	1.5	.178
IBC 16-12 (a) (c)	1DL+1HL-.6WLX	.89	10.76	12.093	1.5	.124
IBC 16-12 (a) (d)	1DL+1HL-.6WLZ	.89	11.15	12.531	1.5	.12
IBC 16-12 (b) (a)	1DL+1HL+.7ELX	.89	10.76	12.093	1.1	.091
IBC 16-12 (b) (b)	1DL+1HL+.7ELZ	1.572	10.76	6.845	1.1	.161
IBC 16-12 (b) (c)	1DL+1HL-.7ELX	.89	10.76	12.093	1.1	.091
IBC 16-12 (b) (d)	1DL+1HL-.7ELZ	.89	11.442	12.86	1.1	.086
IBC 16-13 (a) (a)	1DL+1HL+.45WLX+..	.89	14.335	16.111	1.5	.093
IBC 16-13 (a) (b)	1DL+1HL+.45WLZ+..	1.182	14.335	12.127	1.5	.124
IBC 16-13 (a) (c)	1DL+1HL-.45WLX+..	.89	14.335	16.111	1.5	.093
IBC 16-13 (a) (d)	1DL+1HL-.45WLZ+..	.89	14.627	16.44	1.5	.091
IBC 16-13 (b) (a)	1DL+1HL+.45WLX+..	.89	15.036	16.899	1.5	.089
IBC 16-13 (b) (b)	1DL+1HL+.45WLZ+..	1.182	15.036	12.72	1.5	.118
IBC 16-13 (b) (c)	1DL+1HL-.45WLX+..	.89	15.036	16.899	1.5	.089
IBC 16-13 (b) (d)	1DL+1HL-.45WLZ+..	.89	15.329	17.228	1.5	.087
IBC 16-13 (c) (a)	1DL+1HL+.45WLX+..	.89	13.51	15.184	1.5	.099
IBC 16-13 (c) (b)	1DL+1HL+.45WLZ+..	1.182	13.51	11.429	1.5	.131
IBC 16-13 (c) (c)	1DL+1HL-.45WLX+..	.89	13.51	15.184	1.5	.099
IBC 16-13 (c) (d)	1DL+1HL-.45WLZ+..	.89	13.802	15.512	1.5	.097
IBC 16-14 (a) (a)	1DL+1HL+.525ELX+..	.89	14.335	16.111	1.1	.068
IBC 16-14 (a) (b)	1DL+1HL+.525ELZ+..	1.401	14.335	10.229	1.1	.108
IBC 16-14 (a) (c)	1DL+1HL-.525ELX+..	.89	14.335	16.111	1.1	.068
IBC 16-14 (a) (d)	1DL+1HL-.525ELZ+..	.89	14.847	16.686	1.1	.066
IBC 16-14 (b) (a)	1DL+1HL+.525ELX+..	.89	15.036	16.899	1.1	.065
IBC 16-14 (b) (b)	1DL+1HL+.525ELZ+..	1.401	15.036	10.73	1.1	.103
IBC 16-14 (b) (c)	1DL+1HL-.525ELX+..	.89	15.036	16.899	1.1	.065
IBC 16-14 (b) (d)	1DL+1HL-.525ELZ+..	.89	15.548	17.474	1.1	.063
IBC 16-14 (c) (a)	1DL+1HL+.525ELX+..	.89	13.51	15.184	1.1	.072
IBC 16-14 (c) (b)	1DL+1HL+.525ELZ+..	1.401	13.51	9.64	1.1	.114
IBC 16-14 (c) (c)	1DL+1HL-.525ELX+..	.89	13.51	15.184	1.1	.072
IBC 16-14 (c) (d)	1DL+1HL-.525ELZ+..	.89	14.022	15.759	1.1	.07
IBC 16-15 (a) (a)	.6DL+1HL+.6WLX	.89	6.812	7.656	1	.131
IBC 16-15 (a) (b)	.6DL+1HL+.6WLZ	1.28	6.812	5.324	1	.188
IBC 16-15 (a) (c)	.6DL+1HL-.6WLX	.89	6.812	7.656	1	.131
IBC 16-15 (a) (d)	.6DL+1HL-.6WLZ	.89	7.202	8.094	1	.124
IBC 16-15 (b) (a)	.6DL+.6HL+.6WL..	.534	6.456	12.093	1	.083
IBC 16-15 (b) (b)	.6DL+.6HL+.6WL..	.924	6.456	6.99	1	.143
IBC 16-15 (b) (c)	.6DL+.6HL-.6WL..	.534	6.456	12.093	1	.083
IBC 16-15 (b) (d)	.6DL+.6HL-.6WL..	.534	6.846	12.823	1	.078
IBC 16-15 (c) (a)	.6DL+1HL+.7ELX	.89	6.812	7.656	1	.131
IBC 16-15 (c) (b)	.6DL+1HL+.7ELZ	1.572	6.812	4.333	1	.231
IBC 16-15 (c) (c)	.6DL+1HL-.7ELX	.89	6.812	7.656	1	.131
IBC 16-15 (c) (d)	.6DL+1HL-.7ELZ	.89	7.494	8.423	1	.119
IBC 16-15 (d) (a)	.6DL+.6HL+.7EL..	.534	6.456	12.093	1	.083
IBC 16-15 (d) (b)	.6DL+.6HL+.7EL..	1.216	6.456	5.309	1	.188
IBC 16-15 (d) (c)	.6DL+.6HL-.7EL..	.534	6.456	12.093	1	.083
IBC 16-15 (d) (d)	.6DL+.6HL-.7EL..	.534	7.138	13.371	1	.075

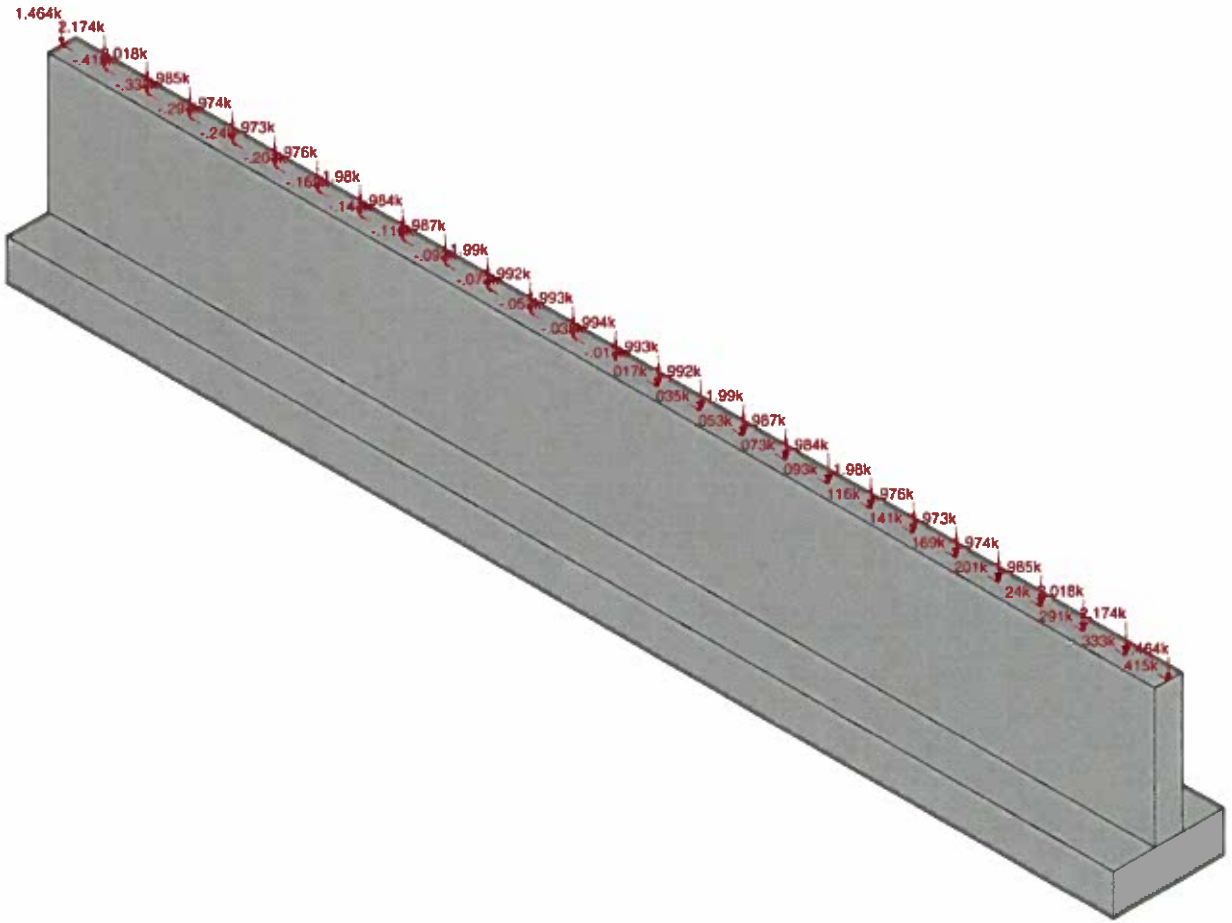
Sliding Check (Service)

Description	Categories and Factors	Vsliding (k/ft)	Vresist (k/ft)	SF	SF Min	SF Min/SF
IBC 16-8	1DL	0	1.615	0	1.5	0
IBC 16-9	1DL+1HL+1LL+1LLS	.616	2.832	4.593	1.5	.327
IBC 16-10 (a)	1DL+1HL+1RLL	.616	2.412	3.912	1.5	.383
IBC 16-10 (b)	1DL+1HL+1SL+.75S..	.616	2.565	4.16	1.5	.361
IBC 16-10 (c)	1DL+1HL+1RL	.616	2.232	3.62	1.5	.414
IBC 16-11 (a)	1DL+1HL+.75LL+...	.616	2.817	4.569	1.5	.328
IBC 16-11 (b)	1DL+1HL+.75LL+...	.616	2.931	4.755	1.5	.315
IBC 16-11 (c)	1DL+1HL+.75LL+...	.616	2.682	4.35	1.5	.345
IBC 16-12 (a) (a)	1DL+1HL+.6WLX	.616	2.232	3.62	1.5	.414
IBC 16-12 (a) (b)	1DL+1HL+.6WLZ	.672	2.232	3.32	1.5	.452
IBC 16-12 (a) (c)	1DL+1HL-.6WLX	.616	2.232	3.62	1.5	.414
IBC 16-12 (a) (d)	1DL+1HL-.6WLZ	.616	2.287	3.71	1.5	.404
IBC 16-12 (b) (a)	1DL+1HL+.7ELX	.616	2.232	3.62	1.1	.304
IBC 16-12 (b) (b)	1DL+1HL+.7ELZ	.714	2.232	3.126	1.1	.352
IBC 16-12 (b) (c)	1DL+1HL-.7ELX	.616	2.232	3.62	1.1	.304
IBC 16-12 (b) (d)	1DL+1HL-.7ELZ	.616	2.329	3.778	1.1	.291
IBC 16-13 (a) (a)	1DL+1HL+.45WLX+..	.616	2.817	4.569	1.5	.328
IBC 16-13 (a) (b)	1DL+1HL+.45WLZ+..	.658	2.817	4.279	1.5	.351
IBC 16-13 (a) (c)	1DL+1HL-.45WLX+..	.616	2.817	4.569	1.5	.328
IBC 16-13 (a) (d)	1DL+1HL-.45WLZ+..	.616	2.858	4.637	1.5	.324
IBC 16-13 (b) (a)	1DL+1HL+.45WLX+..	.616	2.931	4.755	1.5	.315
IBC 16-13 (b) (b)	1DL+1HL+.45WLZ+..	.658	2.931	4.453	1.5	.337
IBC 16-13 (b) (c)	1DL+1HL-.45WLX+..	.616	2.931	4.755	1.5	.315
IBC 16-13 (b) (d)	1DL+1HL-.45WLZ+..	.616	2.973	4.823	1.5	.311
IBC 16-13 (c) (a)	1DL+1HL+.45WLX+..	.616	2.682	4.35	1.5	.345
IBC 16-13 (c) (b)	1DL+1HL+.45WLZ+..	.658	2.682	4.074	1.5	.368
IBC 16-13 (c) (c)	1DL+1HL-.45WLX+..	.616	2.682	4.35	1.5	.345
IBC 16-13 (c) (d)	1DL+1HL-.45WLZ+..	.616	2.723	4.418	1.5	.34
IBC 16-14 (a) (a)	1DL+1HL+.525ELX+..	.616	2.817	4.569	1.1	.241
IBC 16-14 (a) (b)	1DL+1HL+.525ELZ+..	.69	2.817	4.085	1.1	.269
IBC 16-14 (a) (c)	1DL+1HL-.525ELX+..	.616	2.817	4.569	1.1	.241
IBC 16-14 (a) (d)	1DL+1HL-.525ELZ+..	.616	2.89	4.688	1.1	.235
IBC 16-14 (b) (a)	1DL+1HL+.525ELX+..	.616	2.931	4.755	1.1	.231
IBC 16-14 (b) (b)	1DL+1HL+.525ELZ+..	.69	2.931	4.251	1.1	.259
IBC 16-14 (b) (c)	1DL+1HL-.525ELX+..	.616	2.931	4.755	1.1	.231
IBC 16-14 (b) (d)	1DL+1HL-.525ELZ+..	.616	3.004	4.874	1.1	.226
IBC 16-14 (c) (a)	1DL+1HL+.525ELX+..	.616	2.682	4.35	1.1	.253
IBC 16-14 (c) (b)	1DL+1HL+.525ELZ+..	.69	2.682	3.889	1.1	.283
IBC 16-14 (c) (c)	1DL+1HL-.525ELX+..	.616	2.682	4.35	1.1	.253
IBC 16-14 (c) (d)	1DL+1HL-.525ELZ+..	.616	2.755	4.469	1.1	.246
IBC 16-15 (a) (a)	.6DL+1HL+.6WLX	.616	1.586	2.572	1	.389
IBC 16-15 (a) (b)	.6DL+1HL+.6WLZ	.672	1.586	2.359	1	.424
IBC 16-15 (a) (c)	.6DL+1HL-.6WLX	.616	1.586	2.572	1	.389
IBC 16-15 (a) (d)	.6DL+1HL-.6WLZ	.616	1.641	2.662	1	.376
IBC 16-15 (b) (a)	.6DL+.6HL+.6WL..	.37	1.339	3.62	1	.276
IBC 16-15 (b) (b)	.6DL+.6HL+.6WL..	.426	1.339	3.146	1	.318
IBC 16-15 (b) (c)	.6DL+.6HL-.6WL..	.37	1.339	3.62	1	.276
IBC 16-15 (b) (d)	.6DL+.6HL-.6WL..	.37	1.395	3.771	1	.265
IBC 16-15 (c) (a)	.6DL+1HL+.7ELX	.616	1.586	2.572	1	.389
IBC 16-15 (c) (b)	.6DL+1HL+.7ELZ	.714	1.586	2.221	1	.45
IBC 16-15 (c) (c)	.6DL+1HL-.7ELX	.616	1.586	2.572	1	.389
IBC 16-15 (c) (d)	.6DL+1HL-.7ELZ	.616	1.683	2.73	1	.366
IBC 16-15 (d) (a)	.6DL+.6HL+.7EL..	.37	1.339	3.62	1	.276
IBC 16-15 (d) (b)	.6DL+.6HL+.7EL..	.467	1.339	2.865	1	.349
IBC 16-15 (d) (c)	.6DL+.6HL-.7EL..	.37	1.339	3.62	1	.276
IBC 16-15 (d) (d)	.6DL+.6HL-.7EL..	.37	1.436	3.883	1	.258

Soil Bearing Check (Service)

Description	Categories and Factors	Max Bearing (ksf)	Bearing Allowed (ksf)	Bearing UC
IBC 16-8	1DL	1.468	2.5	.587
IBC 16-9	1DL+1HL+1LL+1LLS	2.014	2.5	.806
IBC 16-10 (a)	1DL+1HL+1RLL	1.632	2.5	.653
IBC 16-10 (b)	1DL+1HL+1SL+.75S..	1.771	2.5	.708
IBC 16-10 (c)	1DL+1HL+1RL	1.468	2.5	.587
IBC 16-11 (a)	1DL+1HL+.75LL+...	2	2.5	.8
IBC 16-11 (b)	1DL+1HL+.75LL+...	2.104	2.5	.842
IBC 16-11 (c)	1DL+1HL+.75LL+...	1.877	2.5	.751
IBC 16-12 (a) (a)	1DL+1HL+.6WLX	1.468	2.5	.587
IBC 16-12 (a) (b)	1DL+1HL+.6WLZ	1.642	2.5	.657
IBC 16-12 (a) (c)	1DL+1HL-.6WLX	1.468	2.5	.587
IBC 16-12 (a) (d)	1DL+1HL-.6WLZ	1.642	2.5	.657
IBC 16-12 (b) (a)	1DL+1HL+.7ELX	1.468	2.5	.587
IBC 16-12 (b) (b)	1DL+1HL+.7ELZ	1.773	2.5	.709
IBC 16-12 (b) (c)	1DL+1HL-.7ELX	1.468	2.5	.587
IBC 16-12 (b) (d)	1DL+1HL-.7ELZ	1.773	2.5	.709
IBC 16-13 (a) (a)	1DL+1HL+.45WLX+..	2	2.5	.8
IBC 16-13 (a) (b)	1DL+1HL+.45WLZ+..	2.131	2.5	.852
IBC 16-13 (a) (c)	1DL+1HL-.45WLX+..	2	2.5	.8
IBC 16-13 (a) (d)	1DL+1HL-.45WLZ+..	2.131	2.5	.852
IBC 16-13 (b) (a)	1DL+1HL+.45WLX+..	2.104	2.5	.842
IBC 16-13 (b) (b)	1DL+1HL+.45WLZ+..	2.235	2.5	.894
IBC 16-13 (b) (c)	1DL+1HL-.45WLX+..	2.104	2.5	.842
IBC 16-13 (b) (d)	1DL+1HL-.45WLZ+..	2.235	2.5	.894
IBC 16-13 (c) (a)	1DL+1HL+.45WLX+..	1.877	2.5	.751
IBC 16-13 (c) (b)	1DL+1HL+.45WLZ+..	2.008	2.5	.803
IBC 16-13 (c) (c)	1DL+1HL-.45WLX+..	1.877	2.5	.751
IBC 16-13 (c) (d)	1DL+1HL-.45WLZ+..	2.008	2.5	.803
IBC 16-14 (a) (a)	1DL+1HL+.525ELX+..	2	2.5	.8
IBC 16-14 (a) (b)	1DL+1HL+.525ELZ+..	2.228	2.5	.891
IBC 16-14 (a) (c)	1DL+1HL-.525ELX+..	2	2.5	.8
IBC 16-14 (a) (d)	1DL+1HL-.525ELZ+..	2.228	2.5	.891
IBC 16-14 (b) (a)	1DL+1HL+.525ELX+..	2.104	2.5	.842
IBC 16-14 (b) (b)	1DL+1HL+.525ELZ+..	2.333	2.5	.933
IBC 16-14 (b) (c)	1DL+1HL-.525ELX+..	2.104	2.5	.842
IBC 16-14 (b) (d)	1DL+1HL-.525ELZ+..	2.333	2.5	.933
IBC 16-14 (c) (a)	1DL+1HL+.525ELX+..	1.877	2.5	.751
IBC 16-14 (c) (b)	1DL+1HL+.525ELZ+..	2.106	2.5	.842
IBC 16-14 (c) (c)	1DL+1HL-.525ELX+..	1.877	2.5	.751
IBC 16-14 (c) (d)	1DL+1HL-.525ELZ+..	2.106	2.5	.842
IBC 16-15 (a) (a)	.6DL+1HL+.6WLX	.881	2.5	.352
IBC 16-15 (a) (b)	.6DL+1HL+.6WLZ	1.055	2.5	.422
IBC 16-15 (a) (c)	.6DL+1HL-.6WLX	.881	2.5	.352
IBC 16-15 (a) (d)	.6DL+1HL-.6WLZ	1.055	2.5	.422
IBC 16-15 (b) (a)	.6DL+.6HL+.6WL..	.881	2.5	.352
IBC 16-15 (b) (b)	.6DL+.6HL+.6WL..	1.055	2.5	.422
IBC 16-15 (b) (c)	.6DL+.6HL-.6WL..	.881	2.5	.352
IBC 16-15 (b) (d)	.6DL+.6HL-.6WL..	1.055	2.5	.422
IBC 16-15 (c) (a)	.6DL+1HL+.7ELX	.881	2.5	.352
IBC 16-15 (c) (b)	.6DL+1HL+.7ELZ	1.185	2.5	.474
IBC 16-15 (c) (c)	.6DL+1HL-.7ELX	.881	2.5	.352
IBC 16-15 (c) (d)	.6DL+1HL-.7ELZ	1.185	2.5	.474
IBC 16-15 (d) (a)	.6DL+.6HL+.7EL..	.881	2.5	.352
IBC 16-15 (d) (b)	.6DL+.6HL+.7EL..	1.185	2.5	.474
IBC 16-15 (d) (c)	.6DL+.6HL-.7EL..	.881	2.5	.352
IBC 16-15 (d) (d)	.6DL+.6HL-.7EL..	1.185	2.5	.474

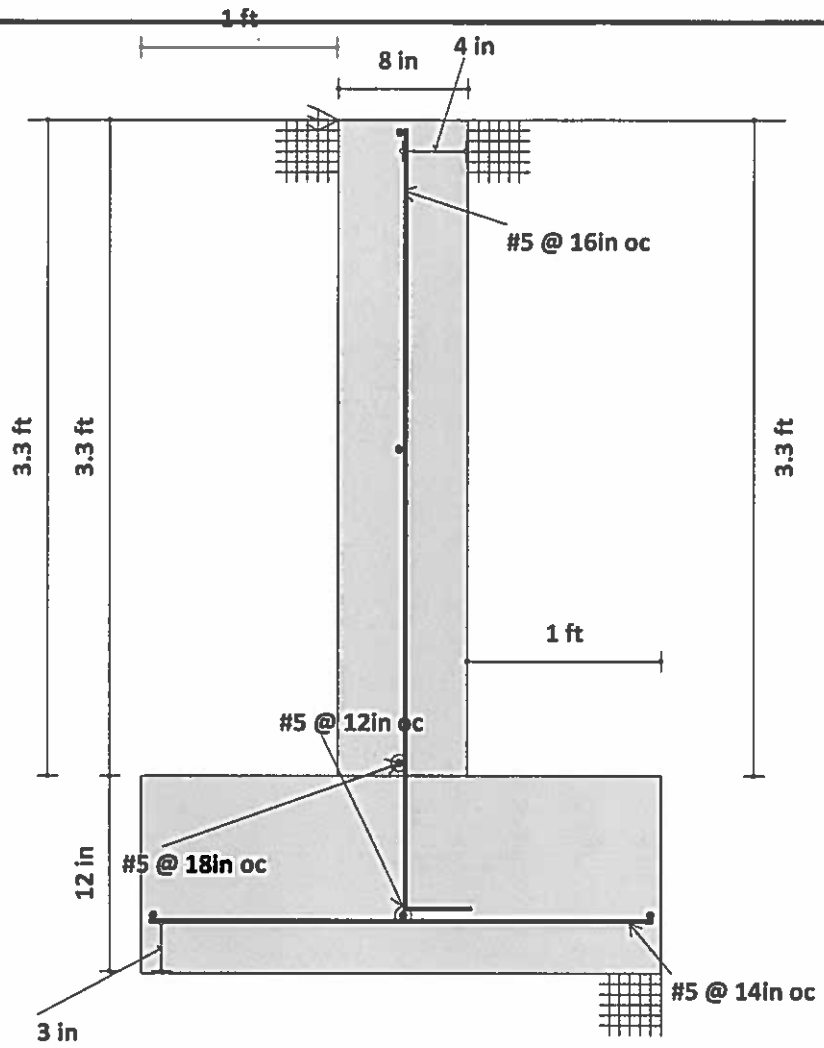
F2 / CW6



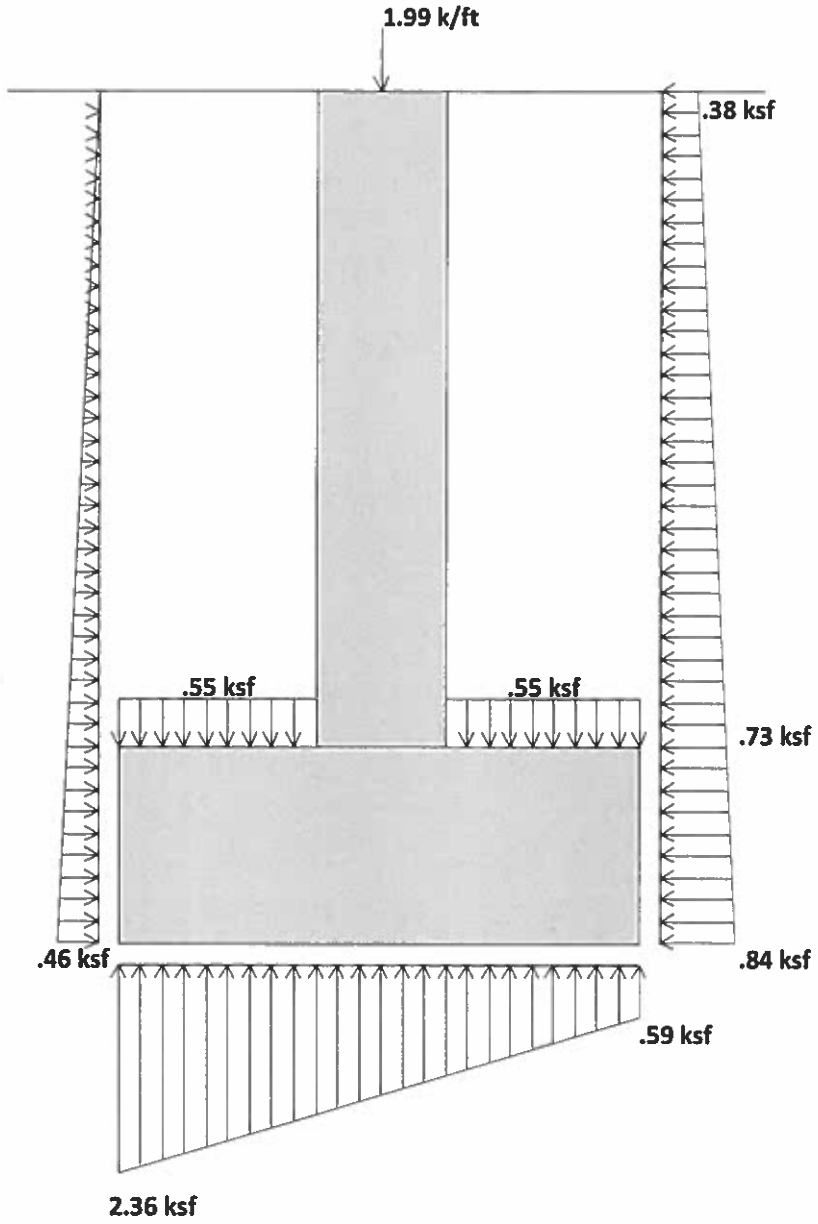
Loads: LC 17, IBC 16-3 (f) (b)
Results for LC 17, IBC 16-3 (f) (b)

Sunrise Engineering		Loads to Foundation Wall & Foo 4
SMH	OWTP-Masonry Shear Wall Line C	Jan 24, 2014 at 10:55 AM
	Worst Case Load Comb.	Shear Wall Line C.r3d

Sketch


1 ft
8 in
4 in
#5 @ 16in oc
3.3 ft
3.3 ft
3.3 ft
1 ft
#5 @ 12in oc
#5 @ 18in oc
12 in
#5 @ 14in oc
3 in

Loading Diagram

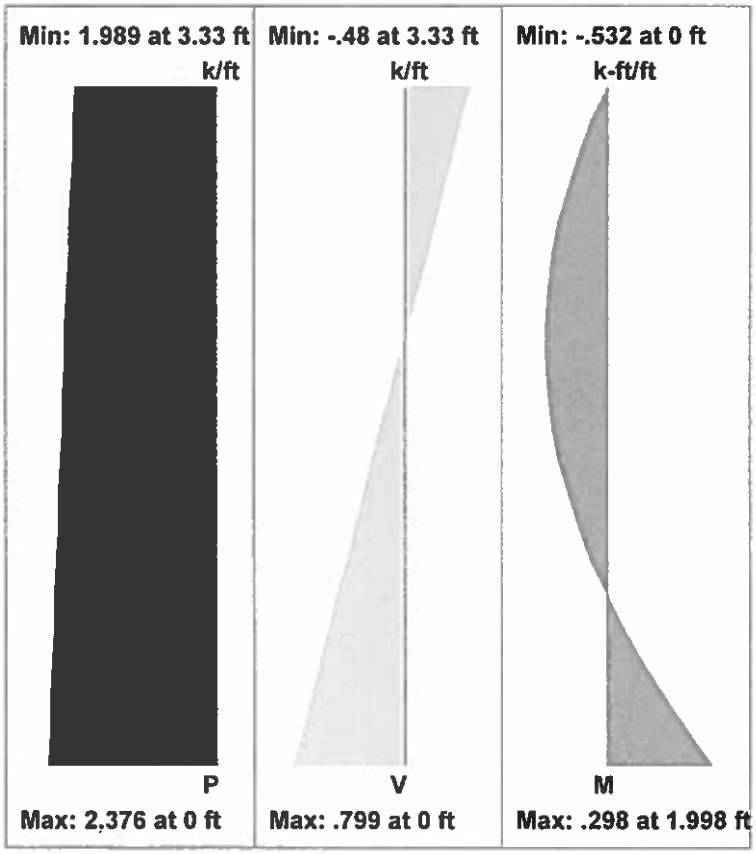


Geometry, Materials and Criteria

Start Point	: R3D_N1	Design Code	: ACI 318-11	Wall Int Bar	: #5@16 in
End Point	: R3D_N2			Wall Horz Bar	: #5@18 in
				Wall Bar Location	: Single Layer
Wall Length	: 26.63 ft	Concrete Weight	: .145 k/ft^3	Wall Outer Bar	: Vertical
Wall Height	: 3.33 ft	Concrete f'c	: 2.5 ksi		
Wall Thickness	: 8 in	Steel fy	: 60 ksi	Foot Bot Bar	: #5@14 in
Wall Int Cover	: 4 in	Heel Soil Height	: 3.33 ft	Foot Long Bar	: #5@12 in
Wall Ext Cover	: 1.5 in	Toe Soil Height	: 3.33 ft	Foot bar Location	: Single Layer
		Backfill Angle(α)	: 0 deg		
Foot Toe Len.	: 1 ft	Water Height	: 0 ft	γ_{Toe}	: .137 k/ft^3
Foot Heel Len.	: 1 ft	Heel Surcharge	: .5 ksf	Φ_{Toe}	: 30 deg
Foot Thickness	: 12 in			$K_{Lat\ Toe}$	: .48 (At Rest)
Foot Top Cover	: 3 in	γ_{Heel}	: .137 k/ft^3		
Foot Bot Cover	: 3 in	Φ_{Heel}	: 30 deg		
		$K_{Lat\ Heel}$	: .48 (At Rest)		
Shear Key ?	: NO				
Wall Propped ?	: YES				

Wall Design

LC 17 DIAGRAMS



ACI 318-11 Code Check

AXIAL/BENDING DETAILS

UC Max Int(+z)	: .15
Location	: 0 ft
Gov Pu Int(+z)	: 0 k/ft
phi *Pn Int(+z)	: 0 k/ft
Gov Mu Int(+z)	: -.532 k-ft/ft
phi *Mn Int(+z)	: 3.542 k-ft/ft
phi eff. Int(+z)	: .9
Gov LC Int(+z)	: 4
UC Max Ext(-z)	: .071
Location	: 0 ft
Gov Pu Ext(-z)	: 0 k/ft
phi *Pn Ext(-z)	: 0 k/ft
Gov Mu Ext(-z)	: .298 k-ft/ft
phi *Mn Ext(-z)	: 4.19 k-ft/ft
phi eff. Ext(-z)	: .9
Gov LC Ext(-z)	: 2

SHEAR DETAILS

UC Max	: .205
Location	: .307 ft
Gov Vu	: .681 k/ft
phi*Vn	: 3.319 k/ft
Gov LC	: 2
UC Max Dowel	: .077
μ	: 1
A_{vf}	: .23 in^2/ft
Dowel Bars	: #5@16in Int

RESULTS FOR FULL WALL

As Provided(H)	: .92 in^2 (3 #5)
Rho Provided(H)	: .0029
As min(H)	: .639 in^2
Rho min(H)	: .002
Int As Provided(V)	: 6.136 in^2 (20 #5)
Int rho Provided(V)	: .0024
Ext As Provided(V)	: 0 in^2 (0 #8)
Ext rho Provided(V)	: 0
As min(V)	: 3.835 in^2
rho min(V)	: .0015

ENVELOPED WALL FORCES (NOT USED FOR DESIGN)

M in Plane : 204.846 k-ft (LC : 32) n Plane : 61.515 k (LC : 32)

Footing Design

As-min z-dir (Top Flexure): .348 in^2/ft
As-min z-dir (Bot Flexure): .348 in^2/ft
z-dir (T & S) : .259 in^2/ft
x-dir Long. (T & S) : .691 in^2

Bottom Bar Design (Toe) : Shear (Toe)

Mu UC Max	Gov Mu LC	Max Mu (k-ft/ft)	Phi*Mn (k-ft/ft)	As Req'd (in^2/ft)	As Prov'd (in^2/ft)	Vu UC Max	Gov Vu LC	Vu (k/ft)	Phi*Vn (k/ft)
.083	11	.828	9.914	.021	.263	.063	11	.493	7.819

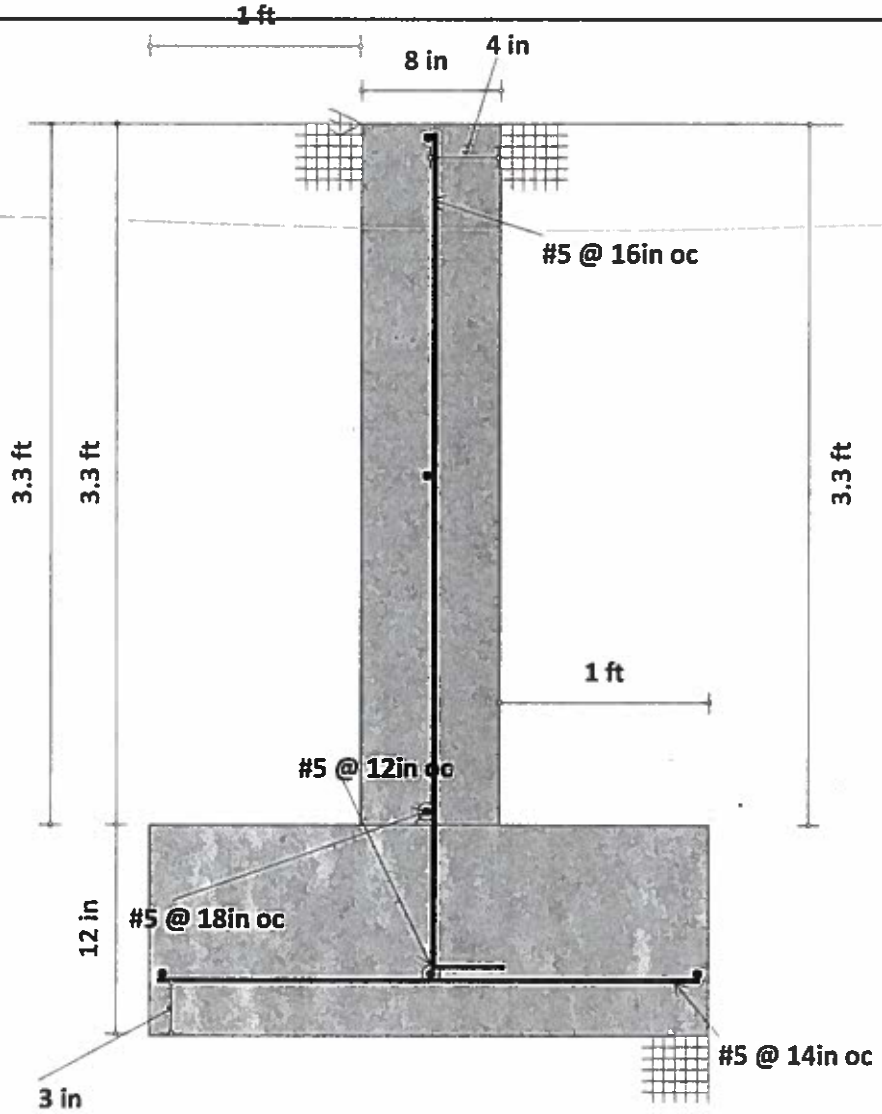
Top Bar Design (Heel) : Shear (Heel)

Mu UC Max	Gov Mu LC	Max Mu (k-ft/ft)	Phi*Mn (k-ft/ft)	As Req'd (in^2/ft)	As Prov'd (in^2/ft)	Vu UC Max	Gov Vu LC	Vu (k/ft)	Phi*Vn (k/ft)
.014	36	.048	3.554	.003	.263	.232	4	.69	2.981

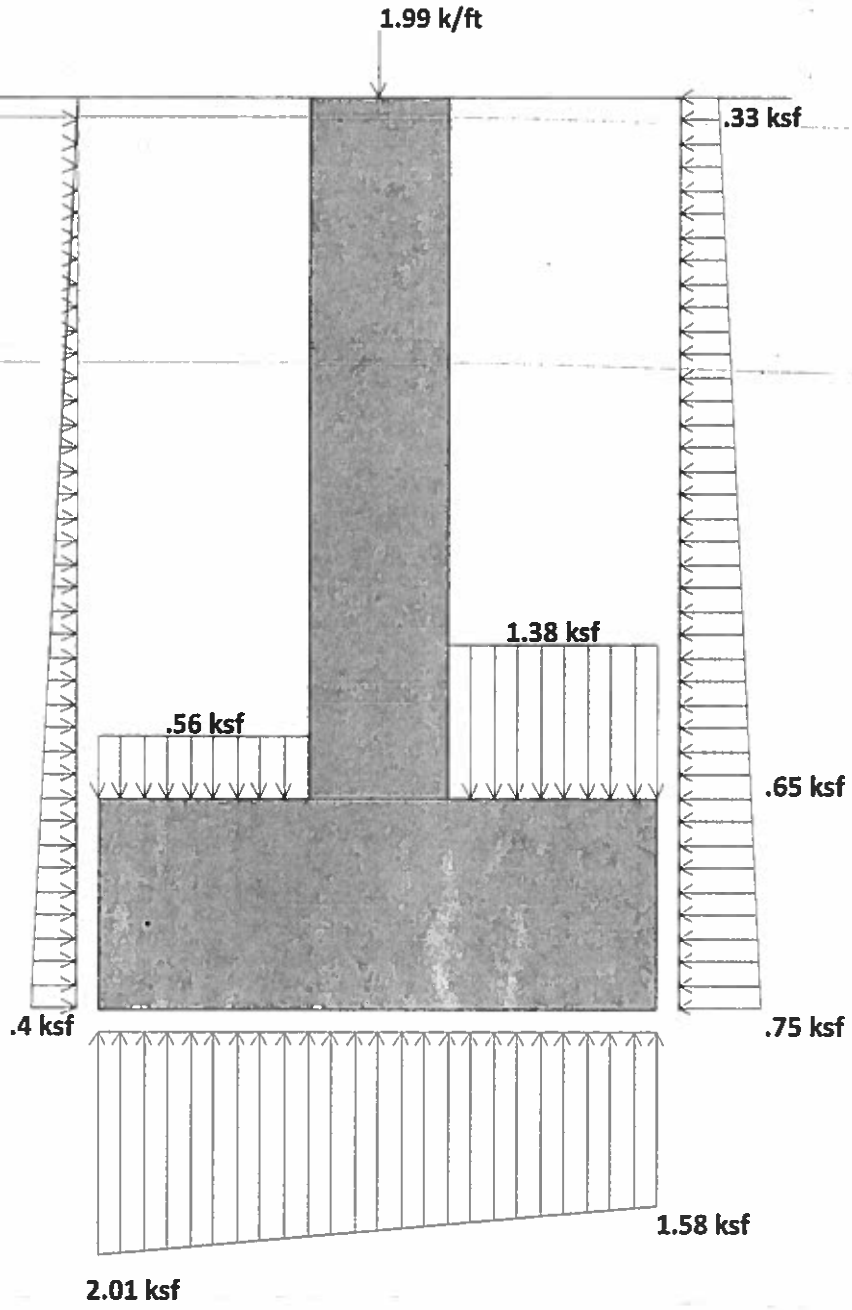
Soil Bearing Check (Service)

Description	Categories and Factors	Max Bearing (ksf)	Bearing Allowed (ksf)	Bearing UC
IBC 16-8	1DL	1.23	2.5	.492
IBC 16-9	1DL+1HL+1LL+1LLS	1.617	2.5	.647
IBC 16-10 (a)	1DL+1HL+1RLL	1.811	2.5	.724
IBC 16-10 (b)	1DL+1HL+1SL+.75S..	1.931	2.5	.772
IBC 16-10 (c)	1DL+1HL+1RL	1.781	2.5	.712
IBC 16-11 (a)	1DL+1HL+.75LL+...	1.68	2.5	.672
IBC 16-11 (b)	1DL+1HL+.75LL+...	1.77	2.5	.708
IBC 16-11 (c)	1DL+1HL+.75LL+...	1.658	2.5	.663
IBC 16-12 (a) (a)	1DL+1HL+.6WLX	1.781	2.5	.712
IBC 16-12 (a) (b)	1DL+1HL+.6WLZ	1.781	2.5	.712
IBC 16-12 (a) (c)	1DL+1HL-.6WLX	1.781	2.5	.712
IBC 16-12 (a) (d)	1DL+1HL-.6WLZ	1.781	2.5	.712
IBC 16-12 (b) (a)	1DL+1HL+.7ELX	1.781	2.5	.712
IBC 16-12 (b) (b)	1DL+1HL+.7ELZ	1.781	2.5	.712
IBC 16-12 (b) (c)	1DL+1HL-.7ELX	1.781	2.5	.712
IBC 16-12 (b) (d)	1DL+1HL-.7ELZ	1.781	2.5	.712
IBC 16-13 (a) (a)	1DL+1HL+.45WLX+..	1.68	2.5	.672
IBC 16-13 (a) (b)	1DL+1HL+.45WLZ+..	1.68	2.5	.672
IBC 16-13 (a) (c)	1DL+1HL-.45WLX+..	1.68	2.5	.672
IBC 16-13 (a) (d)	1DL+1HL-.45WLZ+..	1.68	2.5	.672
IBC 16-13 (b) (a)	1DL+1HL+.45WLX+..	1.77	2.5	.708
IBC 16-13 (b) (b)	1DL+1HL+.45WLZ+..	1.77	2.5	.708
IBC 16-13 (b) (c)	1DL+1HL-.45WLX+..	1.77	2.5	.708
IBC 16-13 (b) (d)	1DL+1HL-.45WLZ+..	1.77	2.5	.708
IBC 16-13 (c) (a)	1DL+1HL+.45WLX+..	1.658	2.5	.663
IBC 16-13 (c) (b)	1DL+1HL+.45WLZ+..	1.658	2.5	.663
IBC 16-13 (c) (c)	1DL+1HL-.45WLX+..	1.658	2.5	.663
IBC 16-13 (c) (d)	1DL+1HL-.45WLZ+..	1.658	2.5	.663
IBC 16-14 (a) (a)	1DL+1HL+.525ELX+..	1.68	2.5	.672
IBC 16-14 (a) (b)	1DL+1HL+.525ELZ+..	1.68	2.5	.672
IBC 16-14 (a) (c)	1DL+1HL-.525ELX+..	1.68	2.5	.672
IBC 16-14 (a) (d)	1DL+1HL-.525ELZ+..	1.68	2.5	.672
IBC 16-14 (b) (a)	1DL+1HL+.525ELX+..	1.77	2.5	.708
IBC 16-14 (b) (b)	1DL+1HL+.525ELZ+..	1.77	2.5	.708
IBC 16-14 (b) (c)	1DL+1HL-.525ELX+..	1.77	2.5	.708
IBC 16-14 (b) (d)	1DL+1HL-.525ELZ+..	1.77	2.5	.708
IBC 16-14 (c) (a)	1DL+1HL+.525ELX+..	1.658	2.5	.663
IBC 16-14 (c) (b)	1DL+1HL+.525ELZ+..	1.658	2.5	.663
IBC 16-14 (c) (c)	1DL+1HL-.525ELX+..	1.658	2.5	.663
IBC 16-14 (c) (d)	1DL+1HL-.525ELZ+..	1.658	2.5	.663
IBC 16-15 (a) (a)	.6DL+1HL+.6WLX	1.289	2.5	.516
IBC 16-15 (a) (b)	.6DL+1HL+.6WLZ	1.289	2.5	.516
IBC 16-15 (a) (c)	.6DL+1HL-.6WLX	1.289	2.5	.516
IBC 16-15 (a) (d)	.6DL+1HL-.6WLZ	1.289	2.5	.516
IBC 16-15 (b) (a)	.6DL+.6HL+.6WL..	1.068	2.5	.427
IBC 16-15 (b) (b)	.6DL+.6HL+.6WL..	1.068	2.5	.427
IBC 16-15 (b) (c)	.6DL+.6HL-.6WL..	1.068	2.5	.427
IBC 16-15 (b) (d)	.6DL+.6HL-.6WL..	1.068	2.5	.427
IBC 16-15 (c) (a)	.6DL+1HL+.7ELX	1.289	2.5	.516
IBC 16-15 (c) (b)	.6DL+1HL+.7ELZ	1.289	2.5	.516
IBC 16-15 (c) (c)	.6DL+1HL-.7ELX	1.289	2.5	.516
IBC 16-15 (c) (d)	.6DL+1HL-.7ELZ	1.289	2.5	.516
IBC 16-15 (d) (a)	.6DL+.6HL+.7EL..	1.068	2.5	.427
IBC 16-15 (d) (b)	.6DL+.6HL+.7EL..	1.068	2.5	.427
IBC 16-15 (d) (c)	.6DL+.6HL-.7EL..	1.068	2.5	.427
IBC 16-15 (d) (d)	.6DL+.6HL-.7EL..	1.068	2.5	.427

Sketch


1 ft
8 in
4 in
#5 @ 16in oc
3.3 ft
3.3 ft
3.3 ft
1 ft
#5 @ 12in oc
12 in
#5 @ 18in oc
#5 @ 14in oc
3 in

Loading Diagram

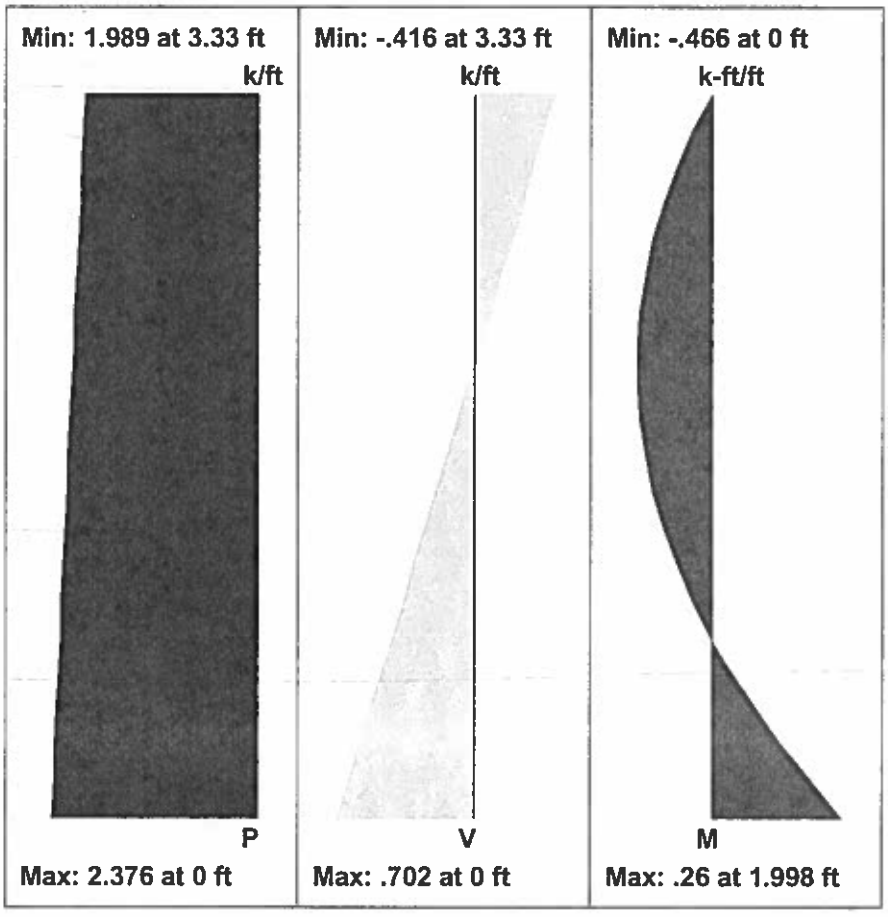


Geometry, Materials and Criteria

Start Point	: R3D_N1	Design Code	: ACI 318-11	Wall Int Bar	: #5@16 in
End Point	: R3D_N2			Wall Horz Bar	: #5@18 in
				Wall Bar Location	: Single Layer
Wall Length	: 26.63 ft	Concrete Weight	: .145 k/ft^3	Wall Outer Bar	: Vertical
Wall Height	: 3.33 ft	Concrete f'c	: 2.5 ksi		
Wall Thickness	: 8 in	Steel fy	: 60 ksi	Foot Bot Bar	: #5@14 in
Wall Int Cover	: 4 in	Heel Soil Height	: 3.33 ft	Foot Long Bar	: #5@12 in
Wall Ext Cover	: 1.5 in	Toe Soil Height	: 3.33 ft	Foot bar Location	: Single Layer
		Backfill Angle(α)	: 0 deg		
Foot Toe Len.	: 1 ft	Water Height	: 0 ft	γ_{Toe}	: .14 k/ft^3
Foot Heel Len.	: 1 ft	Heel Surcharge	: .5 ksf	Φ_{Toe}	: 30 deg
Foot Thickness	: 12 in			$K_{Lat\ Toe}$	: .413 (At Rest)
Foot Top Cover	: 3 in	γ_{Heel}	: .145 k/ft^3		
Foot Bot Cover	: 3 in	Φ_{Heel}	: 30 deg		
		$K_{Lat\ Heel}$	: .413 (At Rest)		
Shear Key ?	: NO				
Wall Propped ?	: YES				

Wall Design

LC 4 DIAGRAMS



ACI 318-11 Code Check

AXIAL/BENDING DETAILS

UC Max Int(+z)	: .132
Location	: 0 ft
Gov Pu Int(+z)	: 0 k/ft
phi *Pn Int(+z)	: 0 k/ft
Gov Mu Int(+z)	: -.466 k-ft/ft
phi *Mn Int(+z)	: 3.542 k-ft/ft
phi eff. Int(+z)	: .9
Gov LC Int(+z)	: 4
UC Max Ext(-z)	: .062
Location	: 0 ft
Gov Pu Ext(-z)	: 0 k/ft
phi *Pn Ext(-z)	: 0 k/ft
Gov Mu Ext(-z)	: .26 k-ft/ft
phi *Mn Ext(-z)	: 4.19 k-ft/ft
phi eff. Ext(-z)	: .9
Gov LC Ext(-z)	: 2

SHEAR DETAILS

UC Max	: **.18**
Location	: **.307 ft**
Gov Vu	: **.598 k/ft**
phi*Vn	: **3.319 k/ft**
Gov LC	: **2**
UC Max Dowel	: **.068**
μ	: **1**
A_{vf}	: **.23 in^2/ft**
Dowel Bars	: **#5@16in Int**

RESULTS FOR FULL WALL

As Provided(H)	: **.92 in^2 (3 #5)**
Rho Provided(H)	: **.0029**
As min(H)	: **.639 in^2**
Rho min(H)	: **.002**
Int As Provided(V)	: **6.136 in^2 (20 #5)**
Int rho Provided(V)	: **.0024**
Ext As Provided(V)	: **0 in^2 (0 #8)**
Ext rho Provided(V)	: **0**
As min(V)	: **3.835 in^2**
rho min(V)	: **.0015**

ENVELOPED WALL FORCES (NOT USED FOR DESIGN)

M in Plane : **204.846 k-ft (LC : 32)** V in Plane : **61.515 k (LC : 32)**

Footing Design

As-min z-dir (Top Flexure): **.348 in^2/ft**
As-min z-dir (Bot Flexure): **.348 in^2/ft**
z-dir (T & S) : **.259 in^2/ft**
x-dir Long. (T & S) : **.691 in^2**

Bottom Bar Design (Toe) : Shear (Toe)

Mu UC Max	Gov Mu LC	Max Mu (k-ft/ft)	Phi*Mn (k-ft/ft)	As Req'd (in^2/ft)	As Prov'd (in^2/ft)	Vu UC Max	Gov Vu LC	Vu (k/ft)	Phi*Vn (k/ft)
.08	11	.791	9.914	.02	.263	.06	11	.468	7.819

Top Bar Design (Heel) : Shear (Heel)

Mu UC Max	Gov Mu LC	Max Mu (k-ft/ft)	Phi*Mn (k-ft/ft)	As Req'd (in^2/ft)	As Prov'd (in^2/ft)	Vu UC Max	Gov Vu LC	Vu (k/ft)	Phi*Vn (k/ft)
.004	36	.016	3.554	.001	.263	.229	4	.683	2.981

Soil Bearing Check (Service)

Description	Categories and Factors	Max Bearing (ksf)	Bearing Allowed (ksf)	Bearing UC
IBC 16-8	1DL	1.255	2.5	.502
IBC 16-9	1DL+1HL+1LL+1LLS	1.562	2.5	.625
IBC 16-10 (a)	1DL+1HL+1RLL	1.756	2.5	.702
IBC 16-10 (b)	1DL+1HL+1SL+.75S..	1.876	2.5	.75
IBC 16-10 (c)	1DL+1HL+1RL	1.726	2.5	.69
IBC 16-11 (a)	1DL+1HL+.75LL+...	1.626	2.5	.65
IBC 16-11 (b)	1DL+1HL+.75LL+...	1.716	2.5	.686
IBC 16-11 (c)	1DL+1HL+.75LL+...	1.603	2.5	.641
IBC 16-12 (a) (a)	1DL+1HL+.6WLX	1.726	2.5	.69
IBC 16-12 (a) (b)	1DL+1HL+.6WLZ	1.726	2.5	.69
IBC 16-12 (a) (c)	1DL+1HL-.6WLX	1.726	2.5	.69
IBC 16-12 (a) (d)	1DL+1HL-.6WLZ	1.726	2.5	.69
IBC 16-12 (b) (a)	1DL+1HL+.7ELX	1.726	2.5	.69
IBC 16-12 (b) (b)	1DL+1HL+.7ELZ	1.726	2.5	.69
IBC 16-12 (b) (c)	1DL+1HL-.7ELX	1.726	2.5	.69
IBC 16-12 (b) (d)	1DL+1HL-.7ELZ	1.726	2.5	.69
IBC 16-13 (a) (a)	1DL+1HL+.45WLX+..	1.626	2.5	.65
IBC 16-13 (a) (b)	1DL+1HL+.45WLZ+..	1.626	2.5	.65
IBC 16-13 (a) (c)	1DL+1HL-.45WLX+..	1.626	2.5	.65
IBC 16-13 (a) (d)	1DL+1HL-.45WLZ+..	1.626	2.5	.65
IBC 16-13 (b) (a)	1DL+1HL+.45WLX+..	1.716	2.5	.686
IBC 16-13 (b) (b)	1DL+1HL+.45WLZ+..	1.716	2.5	.686
IBC 16-13 (b) (c)	1DL+1HL-.45WLX+..	1.716	2.5	.686
IBC 16-13 (b) (d)	1DL+1HL-.45WLZ+..	1.716	2.5	.686
IBC 16-13 (c) (a)	1DL+1HL+.45WLX+..	1.603	2.5	.641
IBC 16-13 (c) (b)	1DL+1HL+.45WLZ+..	1.603	2.5	.641
IBC 16-13 (c) (c)	1DL+1HL-.45WLX+..	1.603	2.5	.641
IBC 16-13 (c) (d)	1DL+1HL-.45WLZ+..	1.603	2.5	.641
IBC 16-14 (a) (a)	1DL+1HL+.525ELX+..	1.626	2.5	.65
IBC 16-14 (a) (b)	1DL+1HL+.525ELZ+..	1.626	2.5	.65
IBC 16-14 (a) (c)	1DL+1HL-.525ELX+..	1.626	2.5	.65
IBC 16-14 (a) (d)	1DL+1HL-.525ELZ+..	1.626	2.5	.65
IBC 16-14 (b) (a)	1DL+1HL+.525ELX+..	1.716	2.5	.686
IBC 16-14 (b) (b)	1DL+1HL+.525ELZ+..	1.716	2.5	.686
IBC 16-14 (b) (c)	1DL+1HL-.525ELX+..	1.716	2.5	.686
IBC 16-14 (b) (d)	1DL+1HL-.525ELZ+..	1.716	2.5	.686
IBC 16-14 (c) (a)	1DL+1HL+.525ELX+..	1.603	2.5	.641
IBC 16-14 (c) (b)	1DL+1HL+.525ELZ+..	1.603	2.5	.641
IBC 16-14 (c) (c)	1DL+1HL-.525ELX+..	1.603	2.5	.641
IBC 16-14 (c) (d)	1DL+1HL-.525ELZ+..	1.603	2.5	.641
IBC 16-15 (a) (a)	.6DL+1HL+.6WLX	1.233	2.5	.493
IBC 16-15 (a) (b)	.6DL+1HL+.6WLZ	1.233	2.5	.493
IBC 16-15 (a) (c)	.6DL+1HL-.6WLX	1.233	2.5	.493
IBC 16-15 (a) (d)	.6DL+1HL-.6WLZ	1.233	2.5	.493
IBC 16-15 (b) (a)	.6DL+.6HL+.6WL..	1.036	2.5	.414
IBC 16-15 (b) (b)	.6DL+.6HL+.6WL..	1.036	2.5	.414
IBC 16-15 (b) (c)	.6DL+.6HL-.6WL..	1.036	2.5	.414
IBC 16-15 (b) (d)	.6DL+.6HL-.6WL..	1.036	2.5	.414
IBC 16-15 (c) (a)	.6DL+1HL+.7ELX	1.233	2.5	.493
IBC 16-15 (c) (b)	.6DL+1HL+.7ELZ	1.233	2.5	.493
IBC 16-15 (c) (c)	.6DL+1HL-.7ELX	1.233	2.5	.493
IBC 16-15 (c) (d)	.6DL+1HL-.7ELZ	1.233	2.5	.493
IBC 16-15 (d) (a)	.6DL+.6HL+.7EL..	1.036	2.5	.414
IBC 16-15 (d) (b)	.6DL+.6HL+.7EL..	1.036	2.5	.414
IBC 16-15 (d) (c)	.6DL+.6HL-.7EL..	1.036	2.5	.414
IBC 16-15 (d) (d)	.6DL+.6HL-.7EL..	1.036	2.5	.414

Printed: 29 JAN 2014, 11:28AM

Cantilevered Retaining Wall

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Dewatering Divider Wall F3/CW12

Criteria

Retained Height	=	3.33 ft
Wall height above soil	=	2.67 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	40.00 in
Water height over heel	=	0.0 ft

Vertical component of active Lateral soil pressure options:
NOT USED for Soil Pressure.
NOT USED for Sliding Resistance.
USED for Overturning Resistance.

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	65.0 psf/ft
Toe Active Pressure	=	65.0 psf/ft
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Friction Coeff btwn Ftg & Soil	=	0.300
Soil height to ignore for passive pressure	=	0.00 in

Surcharge Loads

Surcharge Over Heel	=	75.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	75.0 psf
NOT Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	1,000.0 plf
...Height to Top	=	6.00 ft
...Height to Bottom	=	5.00 ft
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	1.50 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	1.00 ft
Footing Type		Line
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	1,802.0 lbs
Axial Live Load	=	222.0 lbs
Axial Load Eccentricity	=	0.0 in

Design Summary

Wall Stability Ratios

Overturning	=	2.21 OK
Sliding	=	3.57 OK
Total Bearing Load	=	4,298 lbs
...resultant ecc.	=	8.95 in
Soil Pressure @ Toe	=	1,417 psf OK
Soil Pressure @ Heel	=	146 psf OK
Allowable	=	2,500 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,730 psf
ACI Factored @ Heel	=	178 psf
Footing Shear @ Toe	=	11.7 psi OK
Footing Shear @ Heel	=	4.6 psi OK
Allowable	=	75.0 psi

Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	998.9 lbs
less 100% Passive Force	= -	2,347.2 lbs
less 100% Friction Force	= -	1,220.9 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	0.0 lbs OK

Load Factors

Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Top Stem — Stem OK

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	in =	12.00
Rebar Size	=	# 5
Rebar Spacing	in =	16.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.524
Total Force @ Section	lbs =	998.6
Moment....Actual	ft-l =	5,497.3
Moment.....Allowable	ft-l =	10,499.2
Shear.....Actual	psi =	8.2
Shear.....Allowable	psi =	100.6
Wall Weight	psf =	150.0
Rebar Depth 'd'	in =	10.19
Lap splice if above	in =	17.44
Lap splice if below	in =	6.00
Hook embed into footing	in =	6.00

Concrete Data

f'c	psi =	4,500.0
Fy	psi =	60,000.0

Printed: 29 JAN 2014, 11:28AM

Cantilevered Retaining Wall

File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Dewatering Divider Wall F3/CW12

Footing Dimensions & Strengths

Toe Width	=	3.00 ft
Heel Width	=	2.50
Total Footing Width	=	5.50
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,730	178 psf
Mu' : Upward	=	6,515	359 ft-lb
Mu' : Downward	=	3,330	832 ft-lb
Mu: Design	=	3,185	473 ft-lb
Actual 1-Way Shear	=	11.68	4.61 psi
Allow 1-Way Shear	=	75.00	75.00 psi

Toe Reinforcing = # 5 @ 18.00 in
Heel Reinforcing = # 5 @ 18.00 in
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: #4@ 13.25 in, #5@ 20.50 in, #6@ 29.00 in, #7@ 39.25 in, #8@ 48.25 in, #9@ 4
Heel: Not req'd, Mu < S * Fr
Key: No key defined

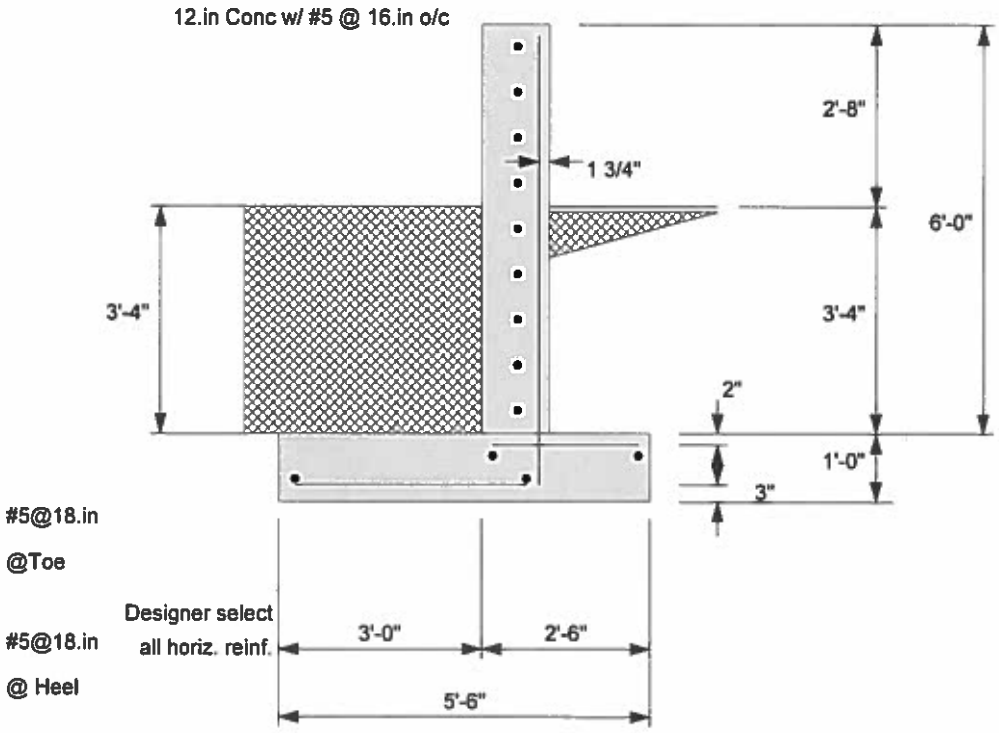
Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-lb		.....RESISTING..... Force lbs	Distance ft	Moment ft-lb
Heel Active Pressure	=	609.3	1.44	879.5	Soil Over Heel	= 549.5	4.75	2,609.9
Surcharge over Heel	=	191.9	2.17	415.5	Sloped Soil Over Heel	=		
Toe Active Pressure	=	-610.3	1.44	-881.5	Surcharge Over Heel	=		
Surcharge Over Toe	=	-192.0	2.17	-416.1	Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	= 1,802.0	3.50	6,307.0
Added Lateral Load	=	1,000.0	6.50	6,500.0	* Axial Live Load on Stem	= 222.0	3.50	777.0
Load @ Stem Above Soil	=				Soil Over Toe	=	1.50	
					Surcharge Over Toe	=		
					Stem Weight(s)	= 900.0	3.50	3,150.0
					Earth @ Stem Transitions	=		
					Footing Weight	= 825.0	2.75	2,268.8
					Key Weight	=		
					Vert. Component	=	5.50	
Total	=	998.9	O.T.M. =	6,497.3	Total =	4,076.5 lbs	R.M. =	14,335.6

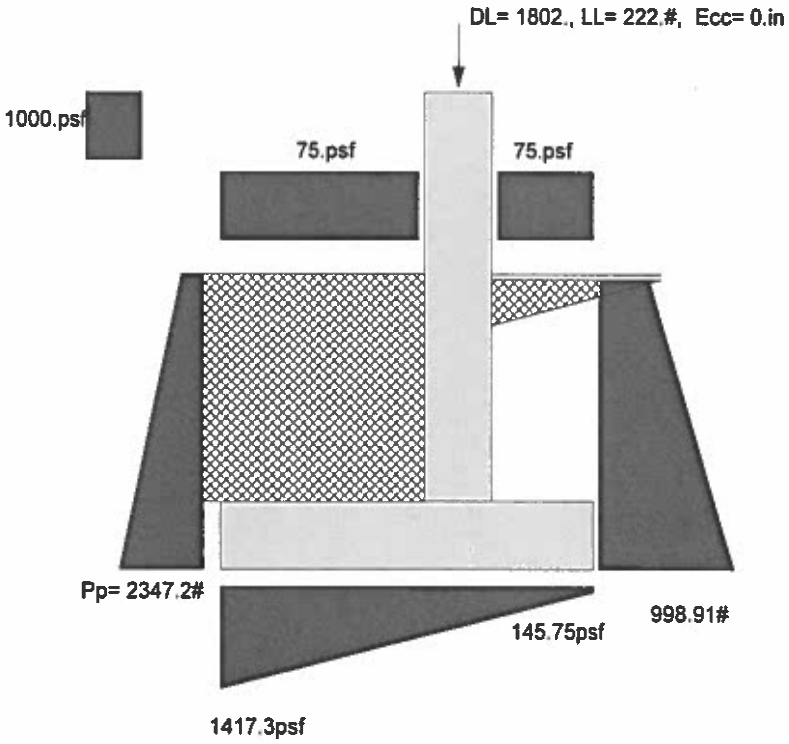
Resisting/Overturning Ratio = 2.21
Vertical Loads used for Soil Pressure = 4,298.5 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

F3/CW12


12.in Conc w/ #5 @ 16.in o/c
2'-8"
1 3/4"
6'-0"
3'-4"
3'-4"
2"
1'-0"
3"
#5@18.in
@Toe
Designer select
all horiz. reinf.
#5@18.in
@ Heel
3'-0"
2'-6"
5'-6"

F3/CW12


DL= 1802., LL= 222.#, Ecc= 0.in
1000.psf
75.psf
75.psf
Pp= 2347.2#
998.91#
145.75psf
1417.3psf

Printed: 30 JAN 2014, 10:57AM

Wall Footing

File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Footing F4 & F5

Code References

Calculations per ASCE 7-10

Load Combinations Used : ASCE 7-10

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	2,850.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 :1
Min. Sliding Safety Factor	=	1.0 :1
AutoCalc Footing Weight as DL	:	Yes

Soil Design Values

Allowable Soil Bearing	=	2.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

Reference Depth below Surface	=	0.0 ft
Allow. Pressure Increase per foot of depth	=	0.0 ksf
when base footing is below	=	0.0 ft

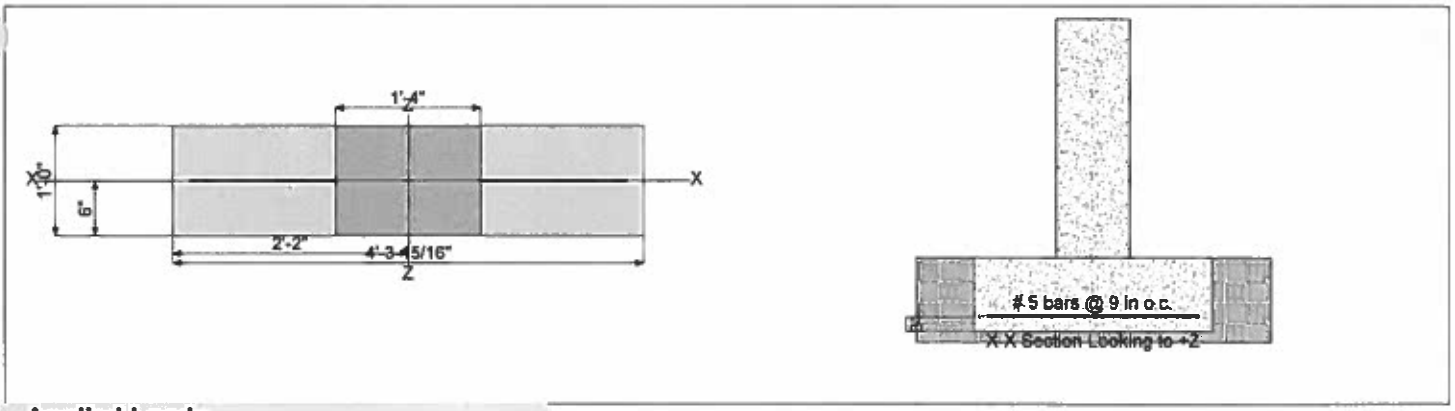
Increases based on footing Width

Allow. Pressure Increase per foot of width	=	0.0 ksf
when footing is wider than	=	0.0 ft

Dimensions

Footing Width	=	4.330 ft	Footing Thickness	=	16.0 in	Bars along X-X Axis	
Wall Thickness	=	16.0 in	Rebar Centerline to Edge of Concrete..			Bar spacing	= 9.00
Wall center offset from center of footing	=	0 in	at Bottom of footing	=	3.0 in	Reinforcing Bar Size	= # 5

Reinforcing



Applied Loads

		D	Lr	L	S	W	E	H
P : Column Load	=	1.40	1.60	0.0	4.0	0.0	0.0	0.0 k
OB : Overburden	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0 ksf
V-x	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0 k
M-zz	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0 k-ft

Vx applied = 0.0 in above top of footing

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.5762	Soil Bearing	1.440 ksf	2.50 ksf	+D+S+H
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.1012	Z Flexure (+X)	2.355 k-ft	23.276 k-ft	+1.20D+0.50L+1.60S+1
PASS	0.02243	Z Flexure (-X)	0.5220 k-ft	23.276 k-ft	+0.90D+E+0.90H
PASS	0.07247	1-way Shear (+X)	5.435 psi	75.0 psi	+1.20D+0.50L+1.60S+1
PASS	0.07247	1-way Shear (-X)	5.435 psi	75.0 psi	+1.20D+0.50L+1.60S+1

Wall Footing

Description : Footing F4 & F5

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc	Actual Soil Bearing Stress +Z	+Z	-X	-X	Actual / Allowable Ratio
. +D+H	2.50 ksf	0.0 in			0.5167 ksf	0.5167 ksf		0.207
. +D+L+H	2.50 ksf	0.0 in			0.5167 ksf	0.5167 ksf		0.207
. +D+Lr+H	2.50 ksf	0.0 in			0.8862 ksf	0.8862 ksf		0.355
. +D+S+H	2.50 ksf	0.0 in			1.440 ksf	1.440 ksf		0.576
. +D+0.750Lr+0.750L+H	2.50 ksf	0.0 in			0.7938 ksf	0.7938 ksf		0.318
. +D+0.750L+0.750S+H	2.50 ksf	0.0 in			1.210 ksf	1.210 ksf		0.484
. +D+0.60W+H	2.50 ksf	0.0 in			0.5167 ksf	0.5167 ksf		0.207
. +D+0.70E+H	2.50 ksf	0.0 in			0.5167 ksf	0.5167 ksf		0.207
. +D+0.750Lr+0.750L+0.450W+H	2.50 ksf	0.0 in			0.7938 ksf	0.7938 ksf		0.318
. +D+0.750L+0.750S+0.450W+H	2.50 ksf	0.0 in			1.210 ksf	1.210 ksf		0.484
. +D+0.750L+0.750S+0.5250E+H	2.50 ksf	0.0 in			1.210 ksf	1.210 ksf		0.484
. +0.60D+0.60W+0.60H	2.50 ksf	0.0 in			0.310 ksf	0.310 ksf		0.124
. +0.60D+0.70E+0.60H	2.50 ksf	0.0 in			0.310 ksf	0.310 ksf		0.124

Overturning Stability

Units : k-ft

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturning				

Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Sliding SafetyRatio	Status
Footing Has NO Sliding				

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
. +1.40D+1.60H	0.8119	-X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.40D+1.60H	0.8119	+X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+0.50Lr+1.60L+1.60H	0.9033	-X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+0.50Lr+1.60L+1.60H	0.9033	+X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+1.60L+0.50S+1.60H	1.214	-X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+1.60L+0.50S+1.60H	1.214	+X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+1.60Lr+0.50L+1.60H	1.36	-X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+1.60Lr+0.50L+1.60H	1.36	+X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+1.60Lr+0.50W+1.60H	1.36	-X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+1.60Lr+0.50W+1.60H	1.36	+X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+0.50L+1.60S+1.60H	2.355	-X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+0.50L+1.60S+1.60H	2.355	+X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+1.60S+0.50W+1.60H	2.355	-X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+1.60S+0.50W+1.60H	2.355	+X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+0.50Lr+0.50L+W+1.60H	0.9033	-X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+0.50Lr+0.50L+W+1.60H	0.9033	+X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+0.50L+0.50S+W+1.60H	1.214	-X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+0.50L+0.50S+W+1.60H	1.214	+X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+0.50L+0.20S+E+1.60H	0.9033	-X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +1.20D+0.50L+0.20S+E+1.60H	0.9033	+X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +0.90D+W+0.90H	0.522	-X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +0.90D+W+0.90H	0.522	+X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +0.90D+E+0.90H	0.522	-X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK
. +0.90D+E+0.90H	0.522	+X	Bottom	0.3456	Min Temp %	0.4133	23.276	OK

One Way Shear

Units : k

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	1.874 psi	1.874 psi	1.874 psi	75 psi	0.02499	OK
+1.20D+0.50Lr+1.60L+1.60H	2.085 psi	2.085 psi	2.085 psi	75 psi	0.0278	OK
+1.20D+1.60L+0.50S+1.60H	2.803 psi	2.803 psi	2.803 psi	75 psi	0.03737	OK
+1.20D+1.60Lr+0.50L+1.60H	3.138 psi	3.138 psi	3.138 psi	75 psi	0.04184	OK
+1.20D+1.60Lr+0.50W+1.60H	3.138 psi	3.138 psi	3.138 psi	75 psi	0.04184	OK
+1.20D+0.50L+1.60S+1.60H	5.435 psi	5.435 psi	5.435 psi	75 psi	0.07247	OK
+1.20D+1.60S+0.50W+1.60H	5.435 psi	5.435 psi	5.435 psi	75 psi	0.07247	OK

Wall Footing

Description : Footing F4 & F5

+1.20D+0.50Lr+0.50L+W+1.60H	2.085 psi	2.085 psi	2.085 psi	75 psi	0.0278	OK
+1.20D+0.50L+0.50S+W+1.60H	2.803 psi	2.803 psi	2.803 psi	75 psi	0.03737	OK
+1.20D+0.50L+0.20S+E+1.60H	2.085 psi	2.085 psi	2.085 psi	75 psi	0.0278	OK

Printed: 30 JAN 2014, 10:57AM

Wall Footing

File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : Footing F4 & F5

One Way Shear

Units : k

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+0.90D+W+0.90H	1.205 psi	1.205 psi	1.205 psi	75 psi	0.01606	OK
+0.90D+E+0.90H	1.205 psi	1.205 psi	1.205 psi	75 psi	0.01606	OK

General Footing

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : Pilaster Footing at Center Support F 7

Code References

Calculations per ACI 318-
Load Combinations Used : ASCE 7

General Information

Material Properties

f'c : Concrete 28 day strength	=	4.50 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	Yes

Soil Design Values

Allowable Soil Bearing	=	3.250 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

Footing base depth below soil surface	=	4.0 ft
Allowable pressure increase per foot of depth	=	ksf
when footing base is below	=	3.0 ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	ksf
when maximum length or width is greater	=	ft

Dimensions

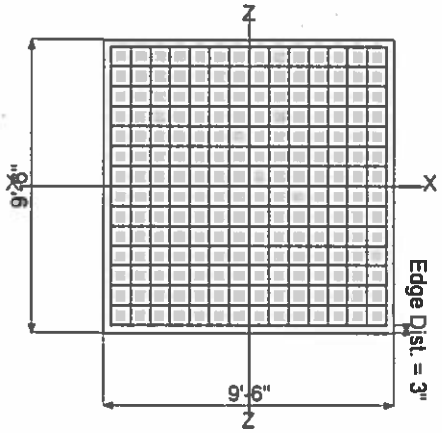
Width parallel to X-X Axis	=	9.50 ft
Length parallel to Z-Z Axis	=	9.50 ft
Footing Thicknes	=	32.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	0.0 in
pz : parallel to Z-Z Axis	=	0.0 in
Height	=	0.0 in

Rebar Centerline to Edge of Concrete..

at Bottom of footing	=	3.0 in

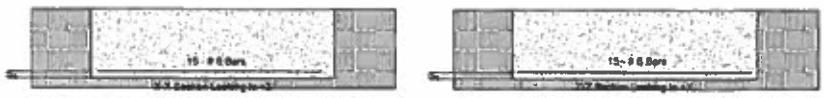


Reinforcing

Bars parallel to X-X Axis		
Number of Bars	=	15.0
Reinforcing Bar Size	=	# 6
Bars parallel to Z-Z Axis		
Number of Bars	=	15.0
Reinforcing Bar Size	=	# 6

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a



Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	240.0							k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

Printed: 16 JAN 2014, 11:56PM

General Footing

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Pilaster Footing at Center Support F7

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9372	Soil Bearing	3.046 ksf	3.250 ksf	0.0 deg CCW
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.5480	Z Flexure (+X)	48.909 k-ft	89.244 k-ft	+1.40D
PASS	0.5474	Z Flexure (-X)	48.856 k-ft	89.244 k-ft	+1.40D
PASS	0.5391	X Flexure (+Z)	48.107 k-ft	89.244 k-ft	+1.40D
PASS	0.5474	X Flexure (-Z)	48.856 k-ft	89.244 k-ft	+1.40D
PASS	0.2940	1-way Shear (+X)	29.588 psi	100.623 psi	+1.40D
PASS	0.2937	1-way Shear (-X)	29.556 psi	100.623 psi	+1.40D
PASS	0.8677	1-way Shear (+Z)	87.308 psi	100.623 psi	+1.40D
PASS	0	1-way Shear (-Z)	0 psi	100.623 psi	+1.40D
PASS	0.5281	2-way Punching	106.269 psi	201.246 psi	+1.40D

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc	Actual Soil Bearing Stress +Z	Actual Soil Bearing Stress -X	Actual / Allowable Ratio

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status

Footing Has NO Overturning

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Sliding SafetyRatio	Status

Footing Has NO Sliding

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	48.107	+Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.40D	48.856	-Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	41.235	+Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	41.877	-Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+1.60L+0.50S+1.60H	41.235	+Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+1.60L+0.50S+1.60H	41.877	-Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+1.60Lr+0.50L	41.235	+Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+1.60Lr+0.50L	41.877	-Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+1.60Lr+0.80W	41.235	+Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+1.60Lr+0.80W	41.877	-Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+0.50L+1.60S	41.235	+Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+0.50L+1.60S	41.877	-Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+1.60S+0.80W	41.235	+Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+1.60S+0.80W	41.877	-Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+0.50Lr+0.50L+1.60W	41.235	+Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+0.50Lr+0.50L+1.60W	41.877	-Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+0.50L+0.50S+1.60W	41.235	+Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+0.50L+0.50S+1.60W	41.877	-Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+0.50L+0.20S+E	41.235	+Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +1.20D+0.50L+0.20S+E	41.877	-Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +0.90D+1.60W+1.60H	30.926	+Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +0.90D+1.60W+1.60H	31.408	-Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +0.90D+E+1.60H	30.926	+Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
X-X, +0.90D+E+1.60H	31.408	-Z	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.40D	48.856	-X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK

Project Title: OWTP
Engineer: SMH
Project Descr:

Project ID: 04655

Printed: 16 JAN 2014, 11:56PM

General Footing

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Pilaster Footing at Center Support F7

Z-Z, +1.40D	48.909	+X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	41.877	-X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	41.922	+X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK

General Footing

Description : Pilaster Footing at Center Support F7

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.20D+1.60L+0.50S+1.60H	41.877	-X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	41.922	+X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+1.60Lr+0.50L	41.877	-X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+1.60Lr+0.50L	41.922	+X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+1.60Lr+0.80W	41.877	-X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+1.60Lr+0.80W	41.922	+X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+0.50L+1.60S	41.877	-X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+0.50L+1.60S	41.922	+X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+1.60S+0.80W	41.877	-X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+1.60S+0.80W	41.922	+X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+0.50Lr+0.50L+1.60W	41.877	-X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+0.50Lr+0.50L+1.60W	41.922	+X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+0.50L+0.50S+1.60W	41.877	-X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+0.50L+0.50S+1.60W	41.922	+X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+0.50L+0.20S+E	41.877	-X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +1.20D+0.50L+0.20S+E	41.922	+X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +0.90D+1.60W+1.60H	31.408	-X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +0.90D+1.60W+1.60H	31.441	+X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +0.90D+E+1.60H	31.408	-X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK
Z-Z, +0.90D+E+1.60H	31.441	+X	Bottom	0.6912	Min Temp %	0.6947	89.244	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	29.556 psi	29.588 psi	0 psi	87.308 psi	0 psi	100.623 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	25.333 psi	25.361 psi	0 psi	74.836 psi	0 psi	100.623 psi	0	OK
+1.20D+1.60L+0.50S+1.60H	25.333 psi	25.361 psi	0 psi	74.836 psi	0 psi	100.623 psi	0	OK
+1.20D+1.60Lr+0.50L	25.333 psi	25.361 psi	0 psi	74.836 psi	0 psi	100.623 psi	0	OK
+1.20D+1.60Lr+0.80W	25.333 psi	25.361 psi	0 psi	74.836 psi	0 psi	100.623 psi	0	OK
+1.20D+0.50L+1.60S	25.333 psi	25.361 psi	0 psi	74.836 psi	0 psi	100.623 psi	0	OK
+1.20D+1.60S+0.80W	25.333 psi	25.361 psi	0 psi	74.836 psi	0 psi	100.623 psi	0	OK
+1.20D+0.50Lr+0.50L+1.60W	25.333 psi	25.361 psi	0 psi	74.836 psi	0 psi	100.623 psi	0	OK
+1.20D+0.50L+0.50S+1.60W	25.333 psi	25.361 psi	0 psi	74.836 psi	0 psi	100.623 psi	0	OK
+1.20D+0.50L+0.20S+E	25.333 psi	25.361 psi	0 psi	74.836 psi	0 psi	100.623 psi	0	OK
+0.90D+1.60W+1.60H	19 psi	19.021 psi	0 psi	56.127 psi	0 psi	100.623 psi	0	OK
+0.90D+E+1.60H	19 psi	19.021 psi	0 psi	56.127 psi	0 psi	100.623 psi	0	OK

Punching Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	106.269 psi	201.246psi	0.5281	OK
+1.20D+0.50Lr+1.60L+1.60H	91.087 psi	201.246psi	0.4526	OK
+1.20D+1.60L+0.50S+1.60H	91.087 psi	201.246psi	0.4526	OK
+1.20D+1.60Lr+0.50L	91.087 psi	201.246psi	0.4526	OK
+1.20D+1.60Lr+0.80W	91.087 psi	201.246psi	0.4526	OK
+1.20D+0.50L+1.60S	91.087 psi	201.246psi	0.4526	OK
+1.20D+1.60S+0.80W	91.087 psi	201.246psi	0.4526	OK
+1.20D+0.50Lr+0.50L+1.60W	91.087 psi	201.246psi	0.4526	OK
+1.20D+0.50L+0.50S+1.60W	91.087 psi	201.246psi	0.4526	OK
+1.20D+0.50L+0.20S+E	91.087 psi	201.246psi	0.4526	OK
+0.90D+1.60W+1.60H	68.316 psi	201.246psi	0.3395	OK
+0.90D+E+1.60H	68.316 psi	201.246psi	0.3395	OK

Printed: 17 JAN 2014, 12:43AM

General Footing

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Description : Pilaster Footing at North Wall F8

Code References

Calculations per ACI 318-
Load Combinations Used : ASCE 7-

General Information

Material Properties

f'c : Concrete 28 day strength	=	4.50 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	Yes

Soil Design Values

Allowable Soil Bearing	=	3.250 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

Footing base depth below soil surface	=	4.0 ft
Allowable pressure increase per foot of depth	=	0.0 ksf
when footing base is below	=	3.0 ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	0.0 ksf
when maximum length or width is greater	=	0.0 ft

Dimensions

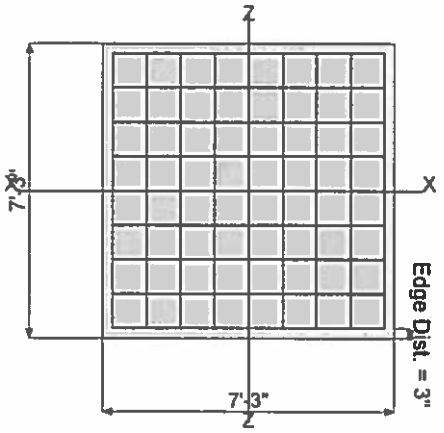
Width parallel to X-X Axis	=	7.250 ft
Length parallel to Z-Z Axis	=	7.250 ft
Footing Thicknes	=	24.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	30.0 in
pz : parallel to Z-Z Axis	=	23.0 in
Height	=	0.0 in

Rebar Centerline to Edge of Concrete..

at Bottom of footing	=	3.0 in

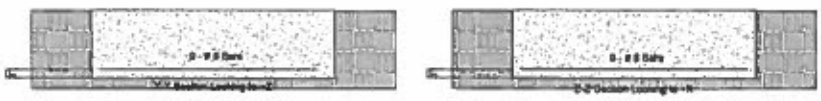


Reinforcing

Bars parallel to X-X Axis		
Number of Bars	=	9
Reinforcing Bar Size	=	# 6
Bars parallel to Z-Z Axis		
Number of Bars	=	9
Reinforcing Bar Size	=	# 6

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a



Applied Loads

		D	Lr	L	S	W	E	H
P : Column Load	=	39.0	0.0	0.0	111.0	0.0	0.0	0.0 k
OB : Overburden	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0 ksf
M-xx	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0 k-ft
M-zz	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0 k-ft
V-x	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0 k
V-z	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0 k

Printed: 17 JAN 2014, 12:43AM

General Footing

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Pilaster Footing at North Wall F8

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9674	Soil Bearing	3.144 ksf	3.250 ksf	0.0 deg CCW
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.2608	Z Flexure (+X)	13.235 k-ft	50.739 k-ft	+1.20D+0.50L+1.60S
PASS	0.2604	Z Flexure (-X)	13.213 k-ft	50.739 k-ft	+1.20D+0.50L+1.60S
PASS	0.3235	X Flexure (+Z)	16.417 k-ft	50.739 k-ft	+1.20D+0.50L+1.60S
PASS	0.3285	X Flexure (-Z)	16.666 k-ft	50.739 k-ft	+1.20D+0.50L+1.60S
PASS	0.1118	1-way Shear (+X)	11.254 psi	100.623 psi	+1.20D+0.50L+1.60S
PASS	0.1115	1-way Shear (-X)	11.217 psi	100.623 psi	+1.20D+0.50L+1.60S
PASS	0	1-way Shear (+Z)	0 psi	100.623 psi	+1.40D
PASS	0.1760	1-way Shear (-Z)	17.711 psi	100.623 psi	+1.20D+0.50L+1.60S
PASS	0.2116	2-way Punching	42.578 psi	201.246 psi	+1.20D+0.50L+1.60S

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc	Actual Soil Bearing Stress +Z	Actual Soil Bearing Stress +Z	Actual Soil Bearing Stress -X	Actual Soil Bearing Stress -X	Actual / Allowable Ratio

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status

Footing Has NO Overturning

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Sliding SafetyRatio	Status

Footing Has NO Sliding

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	5.137	+Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.40D	5.215	-Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	4.403	+Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	4.470	-Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+1.60L+0.50S+1.60H	8.157	+Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+1.60L+0.50S+1.60H	8.281	-Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+1.60Lr+0.50L	4.403	+Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+1.60Lr+0.50L	4.470	-Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+1.60Lr+0.80W	4.403	+Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+1.60Lr+0.80W	4.470	-Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+0.50L+1.60S	16.417	+Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+0.50L+1.60S	16.666	-Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+1.60S+0.80W	16.417	+Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+1.60S+0.80W	16.666	-Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+0.50Lr+0.50L+1.60W	4.403	+Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+0.50Lr+0.50L+1.60W	4.470	-Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+0.50L+0.50S+1.60W	8.157	+Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+0.50L+0.50S+1.60W	8.281	-Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+0.50L+0.20S+E	5.905	+Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +1.20D+0.50L+0.20S+E	5.994	-Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +0.90D+1.60W+1.60H	3.302	+Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +0.90D+1.60W+1.60H	3.352	-Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +0.90D+E+1.60H	3.302	+Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
X-X, +0.90D+E+1.60H	3.352	-Z	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.40D	4.135	-X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK

General Footing

Description : Pilaster Footing at North Wall FB

Z-Z, +1.40D	4.141	+X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	3.544	-X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	3.550	+X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK

Printed: 17 JAN 2014, 12:43AM

General Footing

File = p:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Pilaster Footing at North Wall F8

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.20D+1.60L+0.50S+1.60H	6.566	-X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	6.576	+X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+1.60Lr+0.50L	3.544	-X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+1.60Lr+0.50L	3.550	+X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+1.60Lr+0.80W	3.544	-X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+1.60Lr+0.80W	3.550	+X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+0.50L+1.60S	13.213	-X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+0.50L+1.60S	13.235	+X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+1.60S+0.80W	13.213	-X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+1.60S+0.80W	13.235	+X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+0.50Lr+0.50L+1.60W	3.544	-X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+0.50Lr+0.50L+1.60W	3.550	+X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+0.50L+0.50S+1.60W	6.566	-X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+0.50L+0.50S+1.60W	6.576	+X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+0.50L+0.20S+E	4.753	-X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +1.20D+0.50L+0.20S+E	4.760	+X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +0.90D+1.60W+1.60H	2.658	-X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +0.90D+1.60W+1.60H	2.662	+X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +0.90D+E+1.60H	2.658	-X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK
Z-Z, +0.90D+E+1.60H	2.662	+X	Bottom	0.5184	Min Temp %	0.5462	50.739	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	3.51 psi	3.522 psi	5.542 psi	0 psi	0 psi	100.623 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	3.009 psi	3.018 psi	4.75 psi	0 psi	0 psi	100.623 psi	0	OK
+1.20D+1.60L+0.50S+1.60H	5.574 psi	5.592 psi	8.801 psi	0 psi	0 psi	100.623 psi	0	OK
+1.20D+1.60Lr+0.50L	3.009 psi	3.018 psi	4.75 psi	0 psi	0 psi	100.623 psi	0	OK
+1.20D+1.60Lr+0.80W	3.009 psi	3.018 psi	4.75 psi	0 psi	0 psi	100.623 psi	0	OK
+1.20D+0.50L+1.60S	11.217 psi	11.254 psi	17.711 psi	0 psi	0 psi	100.623 psi	0	OK
+1.20D+1.60S+0.80W	11.217 psi	11.254 psi	17.711 psi	0 psi	0 psi	100.623 psi	0	OK
+1.20D+0.50Lr+0.50L+1.60W	3.009 psi	3.018 psi	4.75 psi	0 psi	0 psi	100.623 psi	0	OK
+1.20D+0.50L+0.50S+1.60W	5.574 psi	5.592 psi	8.801 psi	0 psi	0 psi	100.623 psi	0	OK
+1.20D+0.50L+0.20S+E	4.035 psi	4.048 psi	6.371 psi	0 psi	0 psi	100.623 psi	0	OK
+0.90D+1.60W+1.60H	2.256 psi	2.264 psi	3.563 psi	0 psi	0 psi	100.623 psi	0	OK
+0.90D+E+1.60H	2.256 psi	2.264 psi	3.563 psi	0 psi	0 psi	100.623 psi	0	OK

Punching Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	13.323 psi	201.246psi	0.0662	OK
+1.20D+0.50Lr+1.60L+1.60H	11.42 psi	201.246psi	0.05674	OK
+1.20D+1.60L+0.50S+1.60H	21.156 psi	201.246psi	0.1051	OK
+1.20D+1.60Lr+0.50L	11.42 psi	201.246psi	0.05674	OK
+1.20D+1.60Lr+0.80W	11.42 psi	201.246psi	0.05674	OK
+1.20D+0.50L+1.60S	42.578 psi	201.246psi	0.2116	OK
+1.20D+1.60S+0.80W	42.578 psi	201.246psi	0.2116	OK
+1.20D+0.50Lr+0.50L+1.60W	11.42 psi	201.246psi	0.05674	OK
+1.20D+0.50L+0.50S+1.60W	21.156 psi	201.246psi	0.1051	OK
+1.20D+0.50L+0.20S+E	15.314 psi	201.246psi	0.0761	OK
+0.90D+1.60W+1.60H	8.565 psi	201.246psi	0.04256	OK
+0.90D+E+1.60H	8.565 psi	201.246psi	0.04256	OK

Printed: 15 JAN 2014, 8:20PM

Cantilevered Retaining Wall

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : Filter Room Pit Wall CWQ

Criteria

Retained Height	=	4.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Vertical component of active Lateral soil pressure options:
NOT USED for Soil Pressure.
NOT USED for Sliding Resistance.
USED for Overturning Resistance.

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	65.0 psf/ft
Toe Active Pressure	=	30.0 psf/ft
Passive Pressure	=	389.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Friction Coeff btwn Ftg & Soil	=	0.400
Soil height to ignore for passive pressure	=	12.00 in

Surcharge Loads

Surcharge Over Heel	=	225.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
NOT Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	468.0 plf
...Height to Top	=	3.50 ft
...Height to Bottom	=	2.50 ft
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	15000.0 lbs
Footing Width	=	1.50 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	1.00 ft
Footing Type		Line
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	500.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Design Summary

Wall Stability Ratios

Overturning	=	1.28	Ratio < 1.5!
Sliding	=	0.38	~~UNSTABLE!~~
Slab Resists All Sliding !			O.K.
Total Bearing Load	=	2,287 lbs	
...resultant ecc.	=	15.41 in	
Soil Pressure @ Toe	=	2,130 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	2,500 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,832 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	34.3 psi	OK
Footing Shear @ Heel	=	3.8 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	2,235.1 lbs	
less 100% Passive Force	= -	59.4 lbs	
less 100% Friction Force	= -	916.0 lbs	
Added Force Req'd	=	1,379.6 lbs	~~NG~~ ok
....for 1.5 : 1 Stability	=	2,497.2 lbs	~~NG~~ o.k

Load Factors

Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Top Stem

Stem OK

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	in =	8.00
Rebar Size	=	# 5
Rebar Spacing	in =	6.00
Rebar Placed at	=	Center

Design Data

fb/FB + fa/Fa	=	0.562
Total Force @ Section	lbs =	2,732.0
Moment....Actual	ft-l =	5,638.0
Moment.....Allowable	ft-l =	10,026.0
Shear.....Actual	psi =	56.9
Shear.....Allowable	psi =	100.6
Wall Weight	psf =	100.0
Rebar Depth 'd'	in =	4.00
Lap splice if above	in =	17.44
Lap splice if below	in =	6.00
Hook embed into footing	in =	6.00

Concrete Data

f'c	psi =	4,500.0
Fy	psi =	60,000.0

Sliding OK - Equal & opposite Force on other side of Pit

Printed: 15 JAN 2014, 8:20PM

Cantilevered Retaining Wall

File = P:\OGDENC~1\04310C~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : Filter Room Pit Wall

CW9

Footing Dimensions & Strengths

Toe Width	=	3.00 ft
Heel Width	=	1.00
Total Footing Width	=	4.00
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,832	0 psf
Mu' : Upward	=	0	0 ft-lb
Mu' : Downward	=	0	58 ft-lb
Mu: Design	=	5,638	58 ft-lb
Actual 1-Way Shear	=	34.26	3.84 psi
Allow 1-Way Shear	=	75.00	75.00 psi

Toe Reinforcing = # 5 @ 10.00 in
Heel Reinforcing = # 6 @ 16.00 in
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: #4@ 9.25 in, #5@ 14.50 in, #6@ 20.50 in, #7@ 27.75 in, #8@ 36.50 in, #9@ 46
Heel: Not req'd, Mu < S * Fr
Key: No key defined

Summary of Overturning & Resisting Forces & Moments

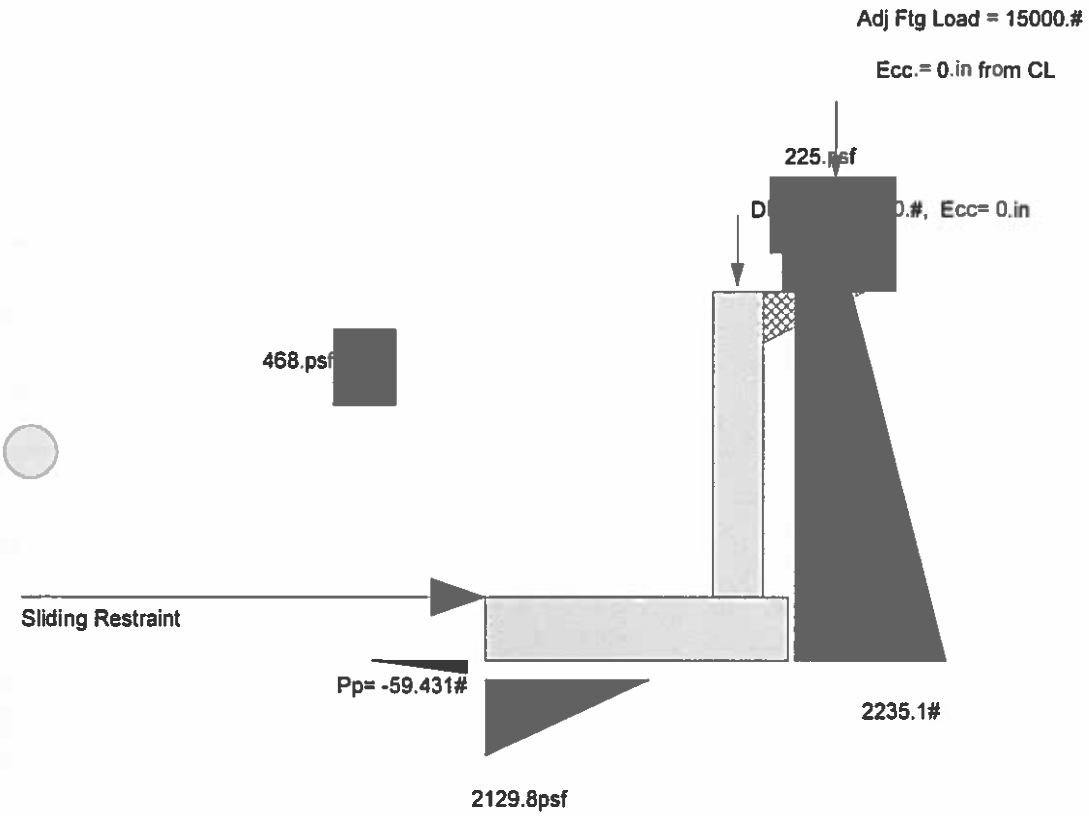
Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-lb		.....RESISTING..... Force lbs	Distance ft	Moment ft-lb
Heel Active Pressure	=	759.2	1.61	1,223.2	Soil Over Heel	= 146.7	3.83	562.2
Surcharge over Heel	=	642.6	2.42	1,553.0	Sloped Soil Over Heel	=		
Toe Active Pressure	=	-10.4	0.28	-2.9	Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	= 740.7	3.83	2,839.5
Adjacent Footing Load	=	375.7	3.18	1,196.6	Axial Dead Load on Stem	= 500.0	3.33	1,666.7
Added Lateral Load	=	468.0	3.83	1,794.0	* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	=		
					Surcharge Over Toe	=		
					Stem Weight(s)	= 400.0	3.33	1,333.3
					Earth @ Stem Transitions	=		
					Footing Weight	= 500.0	2.00	1,000.0
					Key Weight	=		
					Vert. Component	=	4.00	
Total	=	2,235.1	O.T.M. =	5,763.9	Total =	2,287.4 lbs	R.M. =	7,401.7

Resisting/Overturning Ratio = 1.28
Vertical Loads used for Soil Pressure = 2,287.4 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

O.K. Equal & Opposite Force on other side of Pit.

CW9


Adj Ftg Load = 15000.#
Ecc.= 0.in from CL
225.psf
D
0.#, Ecc= 0.in
468.psf
Sliding Restraint
Pp= -59.431#
2235.1#
2129.8psf

Printed: 15 JAN 2014, 8:40PM

Cantilevered Retaining Wall

File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : North Pit Wall in Filter Room

CW10

Criteria

Retained Height	=	6.00 ft
Wall height above soil	=	2.67 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Vertical component of active Lateral soil pressure options:
NOT USED for Soil Pressure.
USED for Sliding Resistance.
NOT USED for Overturning Resistance.

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	65.0 psf/ft
Toe Active Pressure	=	30.0 psf/ft
Passive Pressure	=	389.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Friction Coeff btwn Ftg & Soil	=	0.400
Soil height to ignore for passive pressure	=	12.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf

NOT Used To Resist Sliding & Overturning

Surcharge Over Toe	=	0.0 psf

NOT Used for Sliding & Overturning

Axial Load Applied to Stem

Axial Dead Load	=	2,100.0 lbs
Axial Live Load	=	80.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	780.0 plf
...Height to Top	=	8.67 ft
...Height to Bottom	=	7.67 ft
Wind on Exposed Stem	=	20.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	1.50 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	1.00 ft
Footing Type		Line
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	2.19 OK
Sliding	=	1.00 Ratio < 1.5!
Slab Resists All Sliding !		
Total Bearing Load	=	6,125 lbs
...resultant ecc.	=	11.58 in
Soil Pressure @ Toe	=	1,816 psf OK
Soil Pressure @ Heel	=	93 psf OK
Allowable	=	2,500 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	2,189 psf
ACI Factored @ Heel	=	112 psf
Footing Shear @ Toe	=	36.8 psi OK
Footing Shear @ Heel	=	8.1 psi OK
Allowable	=	75.0 psi

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	2,410.9 lbs
less 100% Passive Force	= -	0.0 lbs
less 100% Friction Force	= -	2,410.9 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	1,198.4 lbs ~~NG~~ O.K

O.K.

Load Factors

Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

		Top Stem	2nd
		Stem OK	Stem OK
Design Height Above Ftg	ft =	6.00	0.00
Wall Material Above "Ht"	=	Concrete	Concrete
Thickness	in =	8.00	23.00
Rebar Size	=	# 5	# 5
Rebar Spacing	in =	16.00	12.00
Rebar Placed at	=	Center	User Spec
Design Data			
fb/FB + fa/Fa	=	0.463	0.392
Total Force @ Section	lbs =	865.4	2,737.4
Moment....Actual	ft-l =	1,806.7	10,743.3
Moment.....Allowable	ft-l =	3,898.0	27,389.7
Shear.....Actual	psi =	27.8	13.4
Shear.....Allowable	psi =	75.0	75.0
Wall Weight	psf =	100.0	287.5
Rebar Depth 'd'	in =	4.00	20.00
Lap splice if above	in =	23.40	23.40
Lap splice if below	in =	23.40	6.00
Hook embed into footing	in =	23.40	6.00
Concrete Data			
f'c	psi =	2,500.0	2,500.0
Fy	psi =	60,000.0	60,000.0

Sliding O.K. — Being resisted by forces from other side of pit.

Printed: 15 JAN 2014, 8:40PM

Cantilevered Retaining Wall

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : North Pit Wall in Filter Room CW10

Footing Dimensions & Strengths

Toe Width	=	3.00 ft
Heel Width	=	3.42
Total Footing Width	=	6.42
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	2,189	112	psf
Mu' : Upward	=	8,393	308	ft-lb
Mu' : Downward	=	810	1,094	ft-lb
Mu: Design	=	7,583	786	ft-lb
Actual 1-Way Shear	=	36.80	8.12	psi
Allow 1-Way Shear	=	75.00	75.00	psi

Toe Reinforcing = # 5 @ 12.00 in
Heel Reinforcing = # 6 @ 16.00 in
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: #4@ 9.00 in, #5@ 13.75 in, #6@ 19.50 in, #7@ 26.75 in, #8@ 35.00 in, #9@ 44
Heel: Not req'd, Mu < S * Fr
Key: No key defined

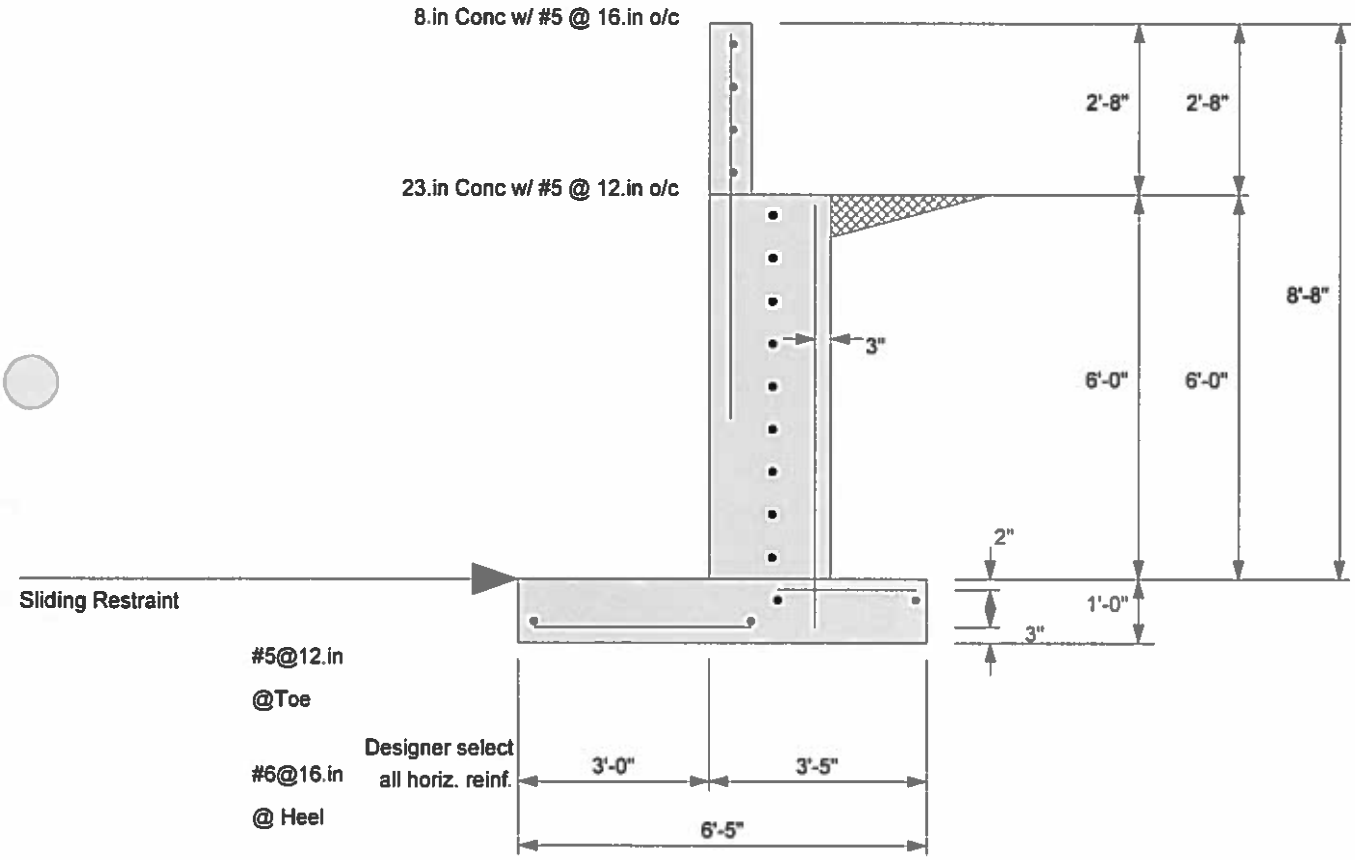
Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-lb		.....RESISTING..... Force lbs	Distance ft	Moment ft-lb
Heel Active Pressure	=	1,592.5	2.33	3,715.8	Soil Over Heel	= 990.2	5.67	5,611.4
Surcharge over Heel	=				Sloped Soil Over Heel	=		
Toe Active Pressure	=	-15.0	0.33	-5.0	Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	= 2,100.0	3.96	8,312.5
Added Lateral Load	=	780.0	9.17	7,152.6	* Axial Live Load on Stem	= 80.0	3.96	316.7
Load @ Stem Above Soil	=	53.4	8.34	445.1	Soil Over Toe	=		
					Surcharge Over Toe	=		
					Stem Weight(s)	= 1,992.0	3.87	7,718.1
					Earth @ Stem Transitions	=		
					Footing Weight	= 962.6	3.21	3,088.3
					Key Weight	=		
					Vert. Component	=		
Total	=	2,410.9	O.T.M. =	11,308.5	Total =	6,044.8 lbs	R.M. =	24,730.4

Resisting/Overturning Ratio = 2.19
Vertical Loads used for Soil Pressure = 6,124.8 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

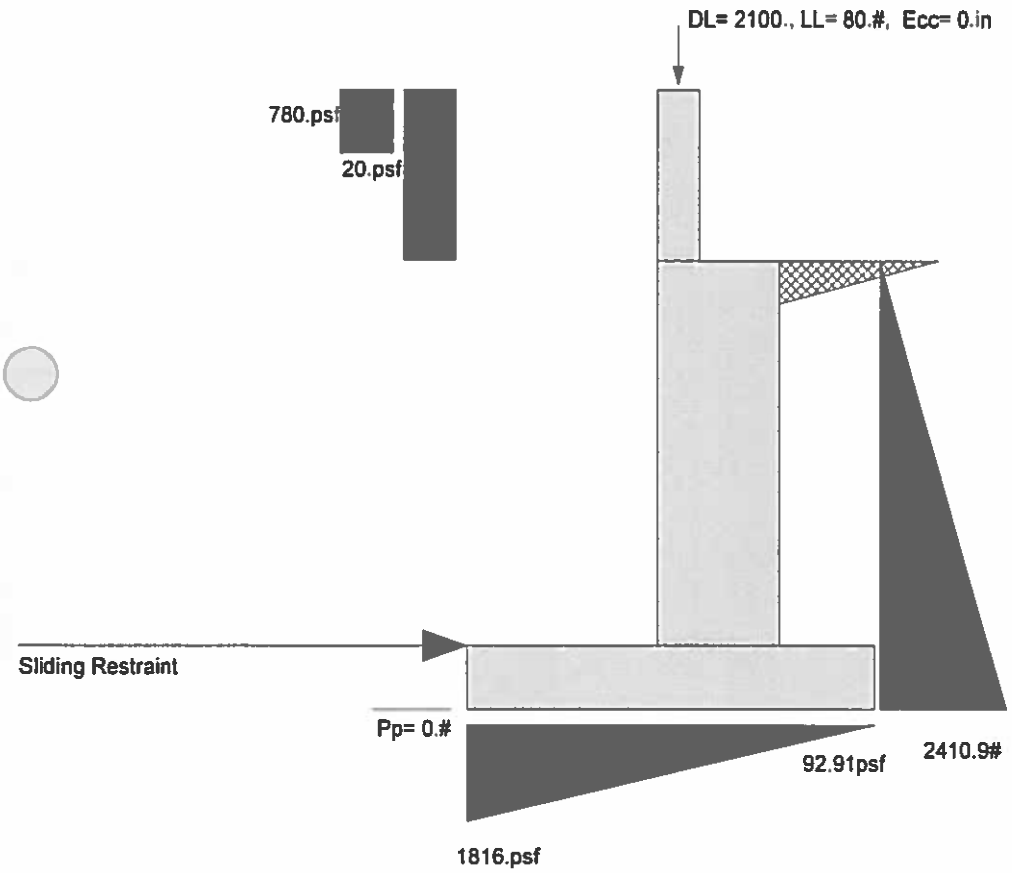
CW10

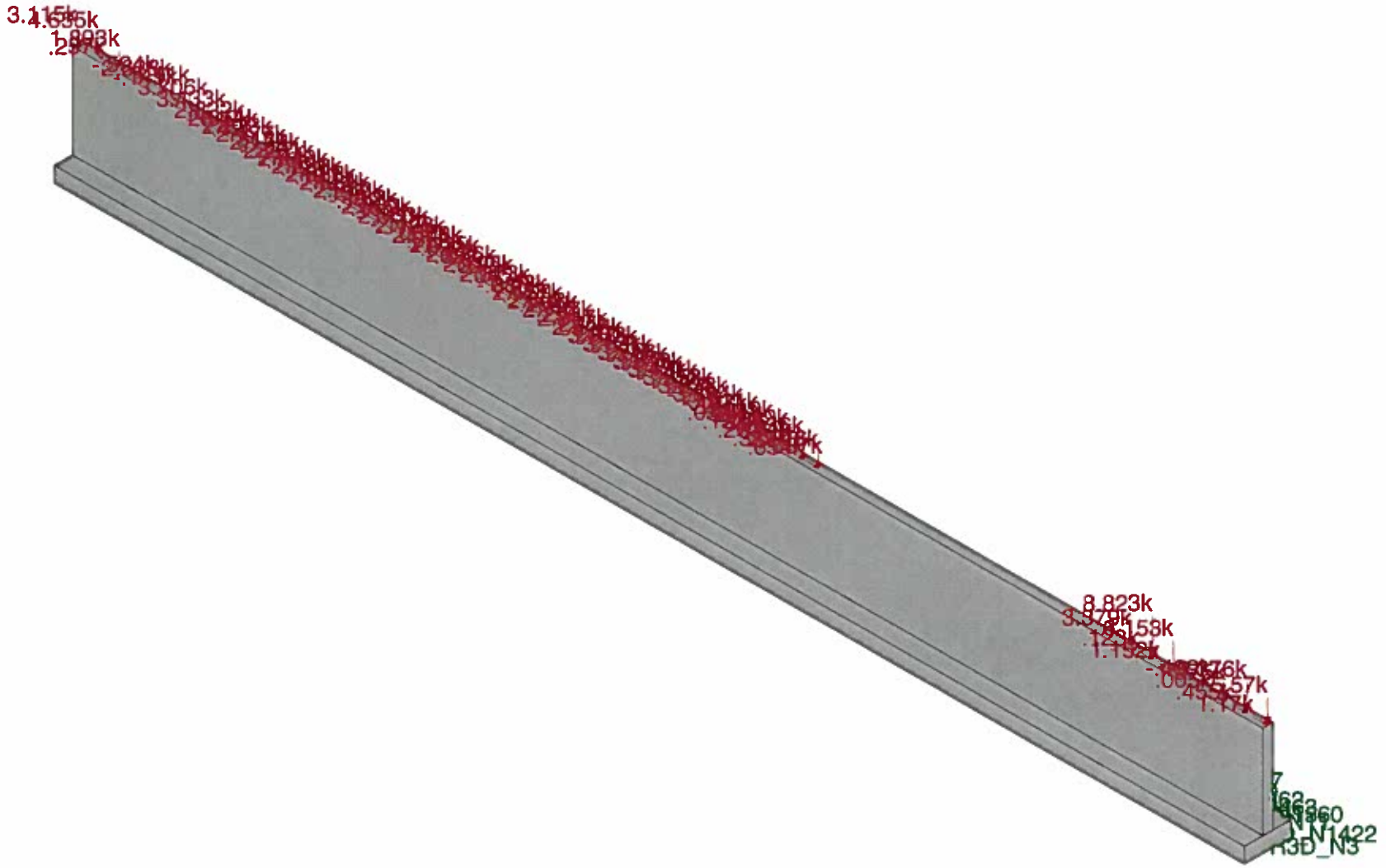


Vertical - A_{min} = 0.0015 (12" 20") = .36 reinf A_s = 0.61 > A_{min}

horizontal - ρ_{min} = 0.0025 (12" 20") = 0.6 reinf A_s = 0.61 > ρ_{min}

CW10


DL= 2100., LL= 80.#, Ecc= 0.in
780.psf
20.psf
Sliding Restraint
Pp= 0.#
92.91psf
2410.9#
1816.psf

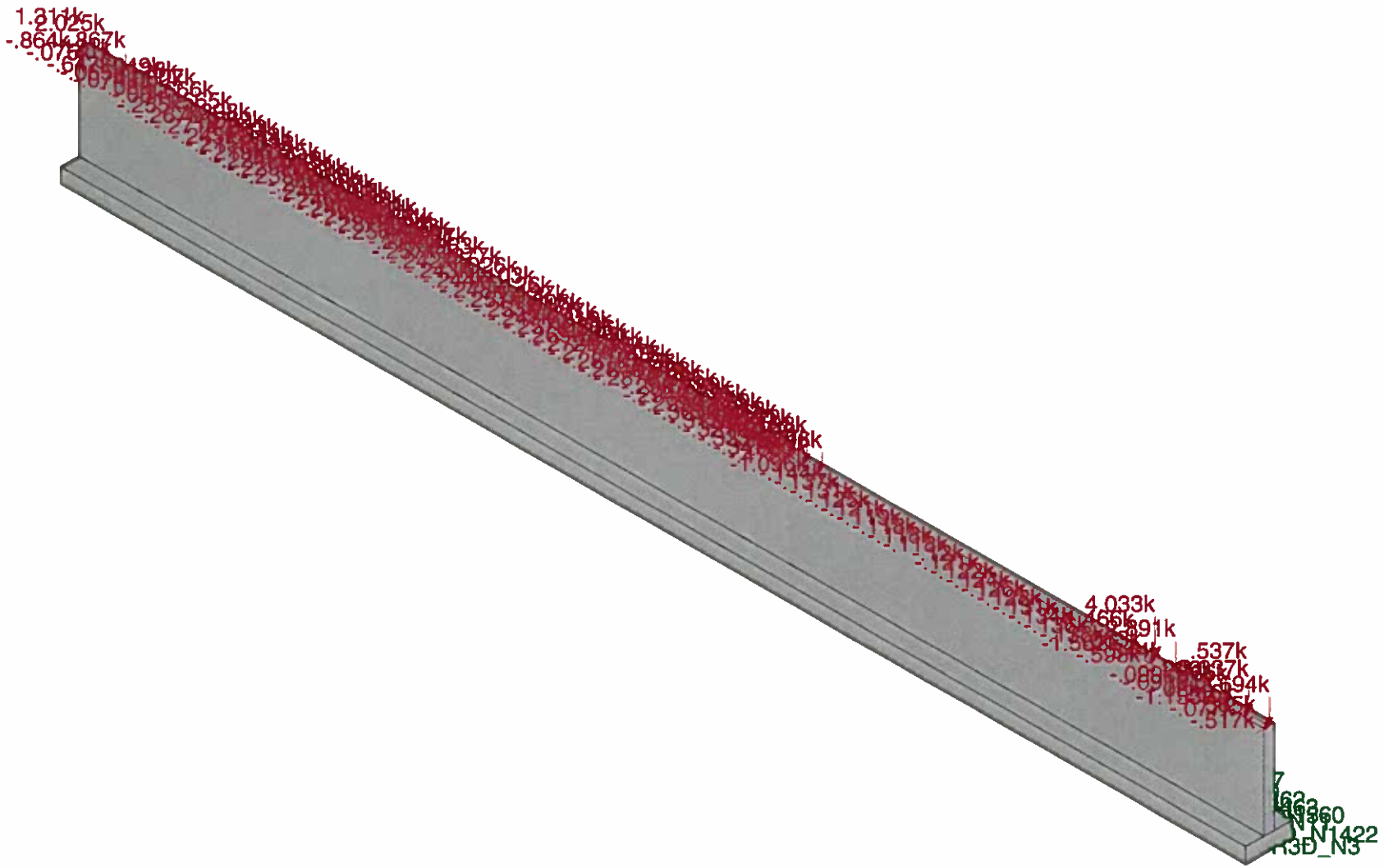


Loads: LC 78, IBC 16-4 (a) (c)
Results for LC 1, ASCE 1

	OWTP South Foundation	SK - 13
		Jan 30, 2014 at 10:23 AM
	LC 77: Worst Case Loading	Dewatering South Wall.r3d

385

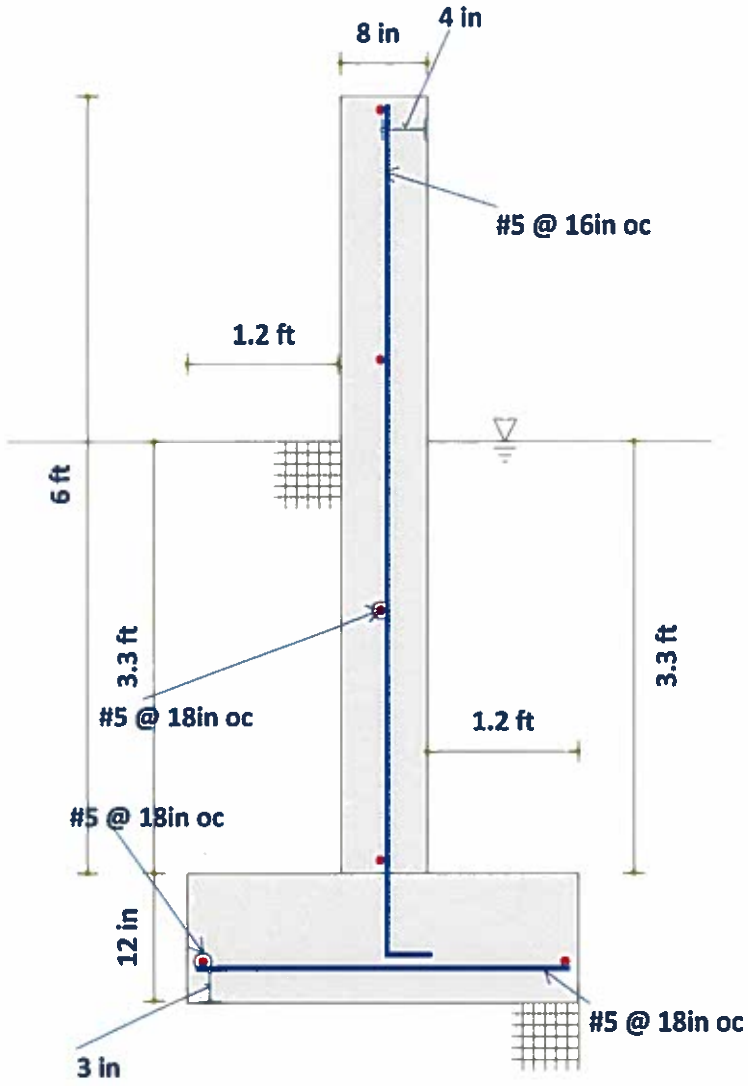
F11



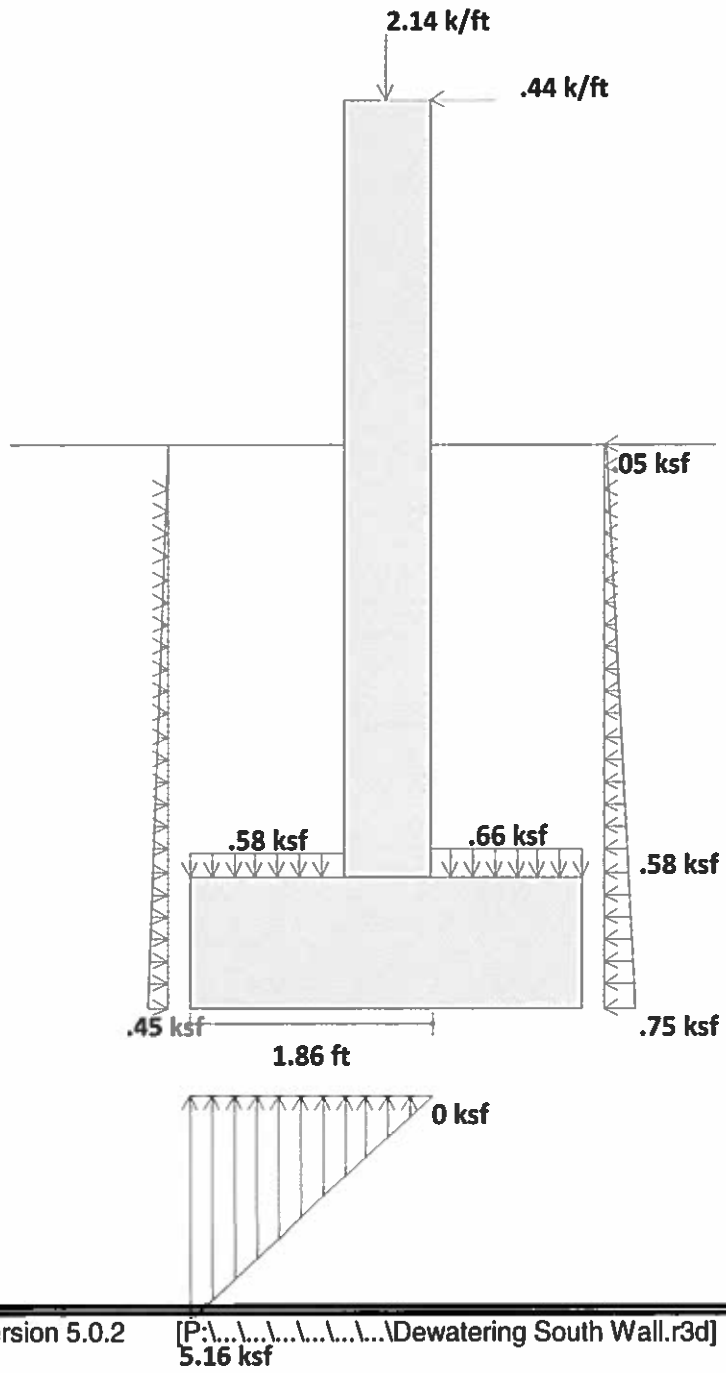
Loads: LC 42, ASCE 7 (a) (b)
Results for LC 1, ASCE 1

	OWTP South Foundation	SK - 14
		Jan 30, 2014 at 10:25 AM
	LC 42: Worst Case Out-of-Plane Loading	Dewatering South Wall.r3d

Sketch


8 in
4 in
#5 @ 16in oc
1.2 ft
6 ft
3.3 ft
#5 @ 18in oc
1.2 ft
3.3 ft
#5 @ 18in oc
12 in
3 in
#5 @ 18in oc

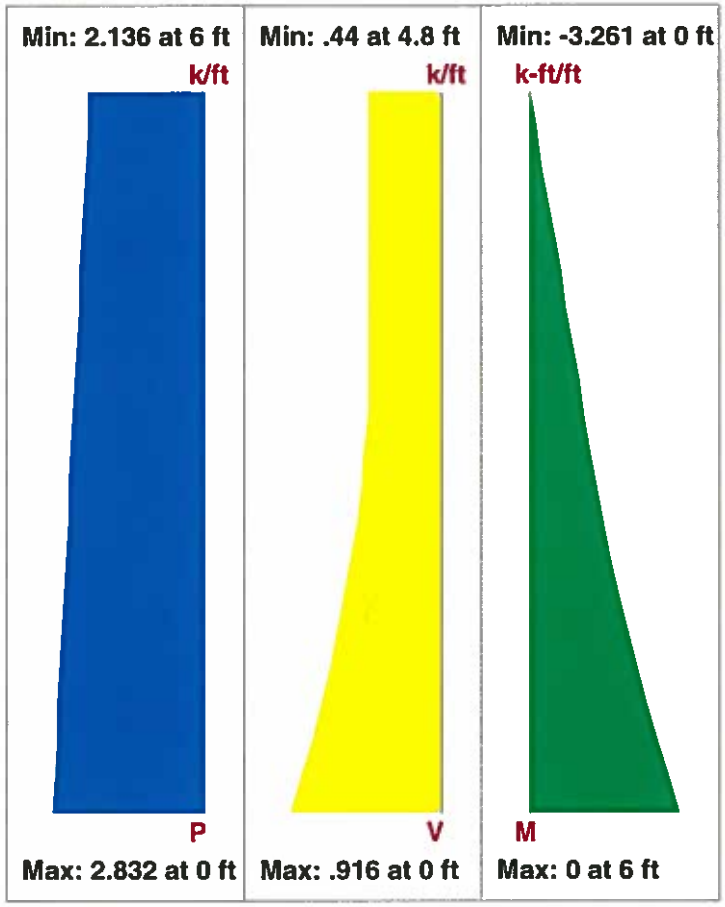
Loading Diagram



Geometry, Materials and Criteria

Start Point	: **R3D_N1**	Design Code	: **ACI 318-11**	Wall Int Bar	: **#5@16 in**
End Point	: **R3D_N3**			Wall Horz Bar	: **#5@18 in**
				Wall Bar Location	: **Single Layer**
Wall Length	: **76 ft**	Concrete Weight	: **.145 k/ft^3**	Wall Outer Bar	: **Vertical**
Wall Height	: **6 ft**	Concrete f'c	: **3 ksi**		
Wall Thickness	: **8 in**	Steel fy	: **60 ksi**	Foot Bot Bar	: **#5@18 in**
Wall Int Cover	: **4 in**	Heel Soil Height	: **3.334 ft**	Foot Long Bar	: **#5@18 in**
Wall Ext Cover	: **1.5 in**	Toe Soil Height	: **3.334 ft**	Foot bar Location	: **Single Layer**
		Backfill Angle(α)	: **0 deg**		
Foot Toe Len.	: **1.167 ft**	Water Height	: **3.334 ft**	γ_{Toe}	: **.145 k/ft^3**
Foot Heel Len.	: **1.167 ft**	Heel Surcharge	: **.075 ksf**	Φ'_{Toe}	: **30 deg**
Foot Thickness	: **12 in**			$K_{Lat\ Toe}$	: **.45 (Passive)**
Foot Top Cover	: **3 in**	γ_{Heel}	: **.145 k/ft^3**		
Foot Bot Cover	: **3 in**	Φ'_{Heel}	: **30 deg**		
		$K_{Lat\ Heel}$	: **.45 (Active)**		
Shear Key ?	: **NO**	$\gamma_{Heel\ Sat}$	: **.155 k/ft^3**		
Wall Propped ?	: **NO**	$\Phi'_{Heel\ Sat}$	: **30 deg**		
		$K_{Lat\ Heel\ Sat}$	: **.41 (Active)**		

LC 77 DIAGRAMS



ACI 318-11 Code Check

AXIAL/BENDING DETAILS

UC Max Int(+z)	: **.91**
Location	: **0 ft**
Gov Pu Int(+z)	: **0 k/ft**
phi *Pn Int(+z)	: **0 k/ft**
Gov Mu Int(+z)	: **-3.261 k-ft/ft**
phi *Mn Int(+z)	: **3.585 k-ft/ft**
phi eff. Int(+z)	: **.9**
Gov LC Int(+z)	: **77**
UC Max Ext(-z)	: **.541**
Location	: **0 ft**
Gov Pu Ext(-z)	: **0 k/ft**
phi *Pn Ext(-z)	: **0 k/ft**
Gov Mu Ext(-z)	: **2.291 k-ft/ft**
phi *Mn Ext(-z)	: **4.232 k-ft/ft**
phi eff. Ext(-z)	: **.9**
Gov LC Ext(-z)	: **99**

390

SHEAR DETAILS

UC Max	: .233
Location	: .307 ft
Gov Vu	: .846 k/ft
phi*Vn	: 3.636 k/ft
Gov LC	: 77
UC Max Dowel	: .089
μ	: 1
A_{vf}	: .23 in^2/ft
Dowel Bars	: #5@16in Int

RESULTS FOR FULL WALL

As Provided(H)	: 1.227 in^2 (4 #5)
Rho Provided(H)	: .0021
As min(H)	: 1.152 in^2
Rho min(H)	: .002
Int As Provided(V)	: 17.487 in^2 (57 #5)
Int rho Provided(V)	: .0024
Ext As Provided(V)	: 0 in^2 (0 #8)
Ext rho Provided(V)	: 0
As min(V)	: 10.944 in^2
rho min(V)	: .0015

ENVELOPED WALL FORCES (NOT USED FOR DESIGN)

M in Plane : 240.005 k-ft (LC : 89) V in Plane : 40.001 k (LC : 89)

Footing Design

As-min z-dir (Top Flexure): .348 in^2/ft
As-min z-dir (Bot Flexure) : .348 in^2/ft
z-dir (T & S) : .259 in^2/ft
x-dir Long. (T & S) : .778 in^2

Footing longitudinal rebar spacing does not meet T & S minimum

Bottom Bar Design (Toe) : Shear (Toe)

Mu UC Max	Gov Mu LC	Max Mu (k-ft/ft)	Phi*Mn (k-ft/ft)	As Req'd (in^2/ft)	As Prov'd (in^2/ft)	Vu UC Max	Gov Vu LC	Vu (k/ft)	Phi*Vn (k/ft)
.35	93	2.736	7.811	.071	.205	.296	93	2.538	8.565

Top Bar Design (Heel) : Shear (Heel)

Mu UC Max	Gov Mu LC	Max Mu (k-ft/ft)	Phi*Mn (k-ft/ft)	As Req'd (in^2/ft)	As Prov'd (in^2/ft)	Vu UC Max	Gov Vu LC	Vu (k/ft)	Phi*Vn (k/ft)
.198	85	.566	2.864	.038	.205	.297	85	.971	3.266

As provided does not meet T & S minimum

Soil Bearing Check (Service)

Description	Categories and Factors	Max Bearing (ksf)	Bearing Allowed (ksf)	Bearing UC
ASCE 1	1DL	1.303	5	.261
ASCE 2	1DL+1HL+1LL+1LLS	1.741	5	.348
ASCE 3 (a)	1DL+1HL+1RLL	1.865	5	.373
ASCE 3 (b)	1DL+1HL+1SL	1.95	5	.39
ASCE 3 (c)	1DL+1HL+1RL	1.765	5	.353
ASCE 4 (a)	1DL+1HL+.75LL+...	1.822	5	.364
ASCE 4 (b)	1DL+1HL+.75LL+...	1.886	5	.377
ASCE 4 (c)	1DL+1HL+.75LL+...	1.747	5	.349
ASCE 5 (a) (a)	1DL+1HL+.6WLX	1.765	5	.353
ASCE 5 (a) (b)	1DL+1HL+.6WLZ	3.087	5	.618
ASCE 5 (a) (c)	1DL+1HL-.6WLX	1.765	5	.353
ASCE 5 (a) (d)	1DL+1HL-.6WLZ	2.024	5	.405
ASCE 5 (b) (a)	1DL+1HL+.7ELX	1.765	5	.353
ASCE 5 (b) (b)	1DL+1HL+.7ELZ	1.765	5	.353
ASCE 5 (b) (c)	1DL+1HL-.7ELX	1.765	5	.353
ASCE 5 (b) (d)	1DL+1HL-.7ELZ	1.765	5	.353
ASCE 6 (a) (a)	1DL+1HL+.45WLX+..	1.822	5	.364
ASCE 6 (a) (b)	1DL+1HL+.45WLZ+..	2.745	5	.549
ASCE 6 (a) (c)	1DL+1HL-.45WLX+..	1.822	5	.364
ASCE 6 (a) (d)	1DL+1HL-.45WLZ+..	1.853	5	.371
ASCE 6 (b) (a)	1DL+1HL+.525ELX+..	1.822	5	.364
ASCE 6 (b) (b)	1DL+1HL+.525ELZ+..	1.822	5	.364
ASCE 6 (b) (c)	1DL+1HL-.525ELX+..	1.822	5	.364
ASCE 6 (b) (d)	1DL+1HL-.525ELZ+..	1.822	5	.364
ASCE 6 (c) (a)	1DL+1HL+.45WLX+..	1.886	5	.377
ASCE 6 (c) (b)	1DL+1HL+.45WLZ+..	2.809	5	.562
ASCE 6 (c) (c)	1DL+1HL-.45WLX+..	1.886	5	.377
ASCE 6 (c) (d)	1DL+1HL-.45WLZ+..	1.917	5	.383
ASCE 6 (d) (a)	1DL+1HL+.525ELX+..	1.886	5	.377
ASCE 6 (d) (b)	1DL+1HL+.525ELZ+..	1.886	5	.377
ASCE 6 (d) (c)	1DL+1HL-.525ELX+..	1.886	5	.377
ASCE 6 (d) (d)	1DL+1HL-.525ELZ+..	1.886	5	.377
ASCE 6 (e) (a)	1DL+1HL+.45WLX+..	1.747	5	.349
ASCE 6 (e) (b)	1DL+1HL+.45WLZ+..	2.672	5	.534
ASCE 6 (e) (c)	1DL+1HL-.45WLX+..	1.747	5	.349
ASCE 6 (e) (d)	1DL+1HL-.45WLZ+..	1.778	5	.356
ASCE 6 (f) (a)	1DL+1HL+.525ELX+..	1.747	5	.349
ASCE 6 (f) (b)	1DL+1HL+.525ELZ+..	1.747	5	.349
ASCE 6 (f) (c)	1DL+1HL-.525ELX+..	1.747	5	.349
ASCE 6 (f) (d)	1DL+1HL-.525ELZ+..	1.747	5	.349
ASCE 7 (a) (a)	.6DL+1HL+.6WLX	1.263	5	.253

ASCE 7 (a) (b)	.6DL+1HL+.6WLZ	4.098	5	.82
ASCE 7 (a) (c)	.6DL+1HL-.6WLX	1.263	5	.253
ASCE 7 (a) (d)	.6DL+1HL-.6WLZ	1.503	5	.301
ASCE 7 (b) (a)	.6DL+.6HL+.6WL..	1.059	5	.212
ASCE 7 (b) (b)	.6DL+.6HL+.6WL..	3.024	5	.605
ASCE 7 (b) (c)	.6DL+.6HL-.6WL..	1.059	5	.212
ASCE 7 (b) (d)	.6DL+.6HL-.6WL..	1.729	5	.346
ASCE 8 (a) (a)	.6DL+1HL+.7ELX	1.263	5	.253
ASCE 8 (a) (b)	.6DL+1HL+.7ELZ	1.263	5	.253
ASCE 8 (a) (c)	.6DL+1HL-.7ELX	1.263	5	.253
ASCE 8 (a) (d)	.6DL+1HL-.7ELZ	1.263	5	.253
ASCE 8 (b) (a)	.6DL+.6HL+.7EL..	1.059	5	.212
ASCE 8 (b) (b)	.6DL+.6HL+.7EL..	1.059	5	.212
ASCE 8 (b) (c)	.6DL+.6HL-.7EL..	1.059	5	.212
ASCE 8 (b) (d)	.6DL+.6HL-.7EL..	1.059	5	.212

Overturning Check (Service)

Description	Categories and Factors	Moverturn (k-ft/ft)	Mresist (k-ft/ft)	SF	SF Min	SF Min/SF
ASCE 1	1DL	0	5.793	0	1.5	0
ASCE 2	1DL+1HL+1LL+1LLS	1.651	6.89	4.174	1.5	.359
ASCE 3 (a)	1DL+1HL+1RLL	1.651	7.128	4.318	1.5	.347
ASCE 3 (b)	1DL+1HL+1SL	1.651	7.511	4.55	1.5	.33
ASCE 3 (c)	1DL+1HL+1RL	1.651	6.678	4.046	1.5	.371
ASCE 4 (a)	1DL+1HL+.75LL+...	1.651	7.175	4.346	1.5	.345
ASCE 4 (b)	1DL+1HL+.75LL+...	1.651	7.462	4.52	1.5	.332
ASCE 4 (c)	1DL+1HL+.75LL+...	1.651	6.837	4.142	1.5	.362
ASCE 5 (a) (a)	1DL+1HL+.6WLX	1.651	6.678	4.046	1.5	.371
ASCE 5 (a) (b)	1DL+1HL+.6WLZ	3.499	6.678	1.909	1.5	.786
ASCE 5 (a) (c)	1DL+1HL-.6WLX	1.651	6.678	4.046	1.5	.371
ASCE 5 (a) (d)	1DL+1HL-.6WLZ	1.651	8.526	5.165	1.5	.29
ASCE 5 (b) (a)	1DL+1HL+.7ELX	1.651	6.678	4.046	1.5	.371
ASCE 5 (b) (b)	1DL+1HL+.7ELZ	1.651	6.678	4.046	1.5	.371
ASCE 5 (b) (c)	1DL+1HL-.7ELX	1.651	6.678	4.046	1.5	.371
ASCE 5 (b) (d)	1DL+1HL-.7ELZ	1.651	6.678	4.046	1.5	.371
ASCE 6 (a) (a)	1DL+1HL+.45WLX+..	1.651	7.175	4.346	1.5	.345
ASCE 6 (a) (b)	1DL+1HL+.45WLZ+..	3.037	7.175	2.363	1.5	.635
ASCE 6 (a) (c)	1DL+1HL-.45WLX+..	1.651	7.175	4.346	1.5	.345
ASCE 6 (a) (d)	1DL+1HL-.45WLZ+..	1.651	8.561	5.186	1.5	.289
ASCE 6 (b) (a)	1DL+1HL+.525ELX+..	1.651	7.175	4.346	1.5	.345
ASCE 6 (b) (b)	1DL+1HL+.525ELZ+..	1.651	7.175	4.346	1.5	.345
ASCE 6 (b) (c)	1DL+1HL-.525ELX+..	1.651	7.175	4.346	1.5	.345
ASCE 6 (b) (d)	1DL+1HL-.525ELZ+..	1.651	7.175	4.346	1.5	.345
ASCE 6 (c) (a)	1DL+1HL+.45WLX+..	1.651	7.462	4.52	1.5	.332
ASCE 6 (c) (b)	1DL+1HL+.45WLZ+..	3.037	7.462	2.457	1.5	.61
ASCE 6 (c) (c)	1DL+1HL-.45WLX+..	1.651	7.462	4.52	1.5	.332
ASCE 6 (c) (d)	1DL+1HL-.45WLZ+..	1.651	8.848	5.36	1.5	.28
ASCE 6 (d) (a)	1DL+1HL+.525ELX+..	1.651	7.462	4.52	1.5	.332
ASCE 6 (d) (b)	1DL+1HL+.525ELZ+..	1.651	7.462	4.52	1.5	.332
ASCE 6 (d) (c)	1DL+1HL-.525ELX+..	1.651	7.462	4.52	1.5	.332
ASCE 6 (d) (d)	1DL+1HL-.525ELZ+..	1.651	7.462	4.52	1.5	.332
ASCE 6 (e) (a)	1DL+1HL+.45WLX+..	1.651	6.837	4.142	1.5	.362
ASCE 6 (e) (b)	1DL+1HL+.45WLZ+..	3.037	6.837	2.251	1.5	.666
ASCE 6 (e) (c)	1DL+1HL-.45WLX+..	1.651	6.837	4.142	1.5	.362
ASCE 6 (e) (d)	1DL+1HL-.45WLZ+..	1.651	8.223	4.981	1.5	.301
ASCE 6 (f) (a)	1DL+1HL+.525ELX+..	1.651	6.837	4.142	1.5	.362
ASCE 6 (f) (b)	1DL+1HL+.525ELZ+..	1.651	6.837	4.142	1.5	.362
ASCE 6 (f) (c)	1DL+1HL-.525ELX+..	1.651	6.837	4.142	1.5	.362
ASCE 6 (f) (d)	1DL+1HL-.525ELZ+..	1.651	6.837	4.142	1.5	.362
ASCE 7 (a) (a)	.6DL+1HL+.6WLX	1.651	4.361	2.642	1	.379

ASCE 7 (a) (b)	.6DL+1HL+.6WLZ	3.499	4.361	1.246	1	.802
ASCE 7 (a) (c)	.6DL+1HL-.6WLX	1.651	4.361	2.642	1	.379
ASCE 7 (a) (d)	.6DL+1HL-.6WLZ	1.651	6.209	3.761	1	.266
ASCE 7 (b) (a)	.6DL+.6HL+.6WL..	.99	4.007	4.046	1	.247
ASCE 7 (b) (b)	.6DL+.6HL+.6WL..	2.838	4.007	1.412	1	.708
ASCE 7 (b) (c)	.6DL+.6HL-.6WL..	.99	4.007	4.046	1	.247
ASCE 7 (b) (d)	.6DL+.6HL-.6WL..	.99	5.855	5.912	1	.169
ASCE 8 (a) (a)	.6DL+1HL+.7ELX	1.651	4.361	2.642	1	.379
ASCE 8 (a) (b)	.6DL+1HL+.7ELZ	1.651	4.361	2.642	1	.379
ASCE 8 (a) (c)	.6DL+1HL-.7ELX	1.651	4.361	2.642	1	.379
ASCE 8 (a) (d)	.6DL+1HL-.7ELZ	1.651	4.361	2.642	1	.379
ASCE 8 (b) (a)	.6DL+.6HL+.7EL..	.99	4.007	4.046	1	.247
ASCE 8 (b) (b)	.6DL+.6HL+.7EL..	.99	4.007	4.046	1	.247
ASCE 8 (b) (c)	.6DL+.6HL-.7EL..	.99	4.007	4.046	1	.247
ASCE 8 (b) (d)	.6DL+.6HL-.7EL..	.99	4.007	4.046	1	.247

Printed: 30 JAN 2014, 10:58AM

Point Load on Slab

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Filter Weight on Slab on Grade

Code References

Calculations per ASCE 7-10

Analytical Values

d - Slab Thickness	6.0 in	Ks - Soil Modulus of Subgrade Reaction	100.0 pci
FS - Req'd Factor of Safety	3.0 : 1	Ec - Concrete Elastic Modulus	3,122.0 ksi
		f'c - Concrete Compressive Strength	3.0 ksi
		μ - Poisson's Ratio	0.150
		ϕ - LRFD Reduction Factor	0.850
		Min. Adjacent Load Distance	41.304 in

Analysis Formulas

Pn = 1.72 [(Ks R1 / Ec) 10,000 + 3.6] Fr d^2

Ks = Soil modulus of subgrade reaction
R1 = 50% plate average dimension = sqrt(PlWid * PlLen) /2
Ec = Concrete elastic modulus
Fr - Concrete modulus of rupture = 7.5 * sqrt(f'c)
d - Slab Thickness

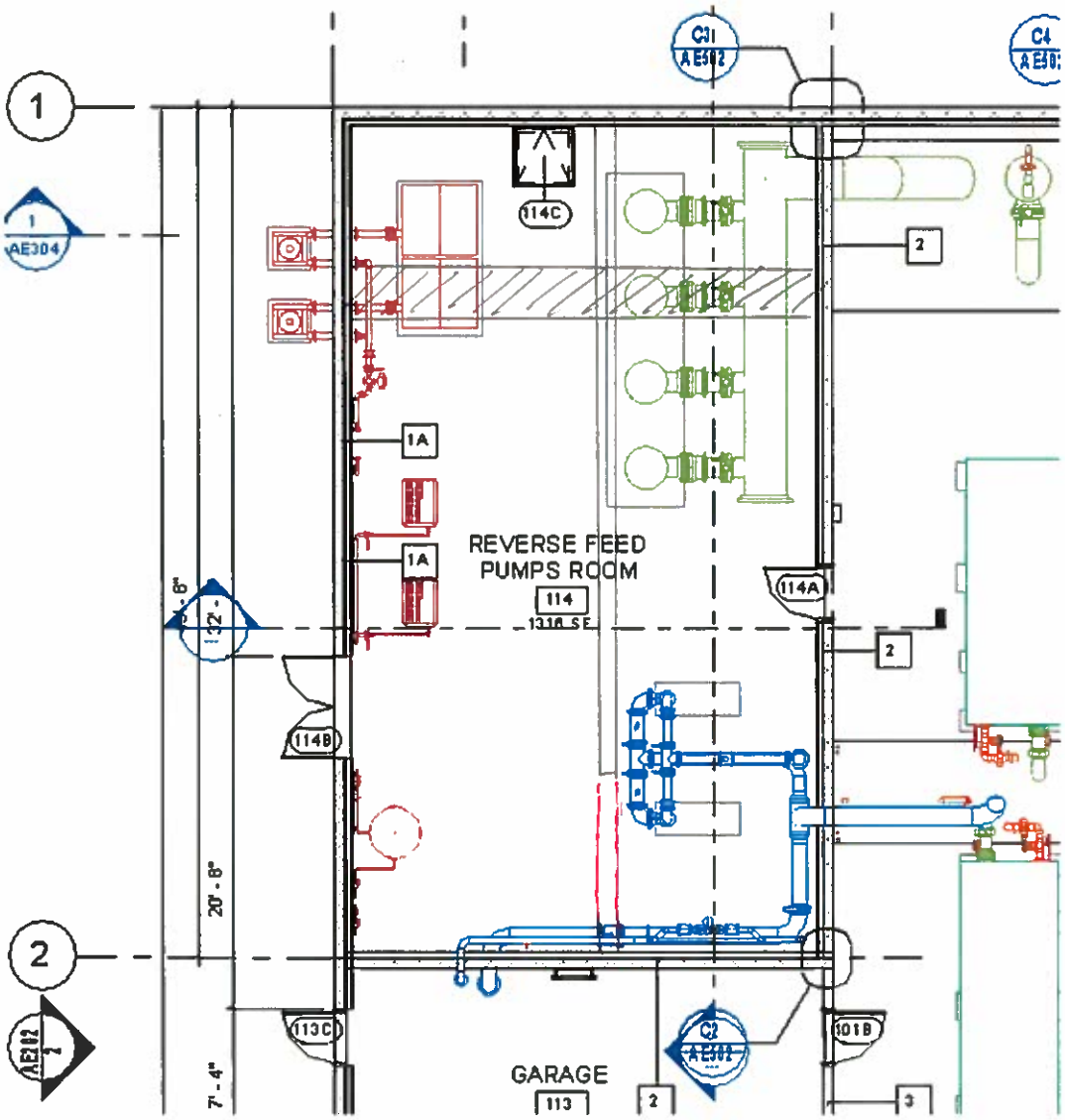
Min Adjacent Column Distance = 1.5 * ([Ec d^3 / (12 * (1- u^2) Ks] ^ 1/4)

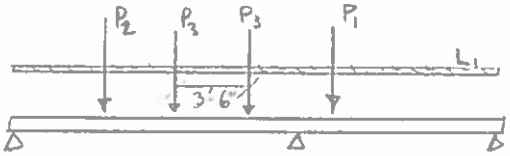
Ec = Concrete elastic modulus
d - Slab Thickness
u - Poisson's ratio
Ks = Soil modulus of subgrade reaction

Load & Capacity Table

Load ID	Plate (in) Wid	Len	R1 (in)	Applied Concentrated Load on Plate - (kip) D	Lr	L	S	W	E	Governing Ld Comb	Pu (kip)	Phi*Pn (kip)	Check
Filter 1	20.00	20.00	10.00	5.00						+1.40D	7.0	147.1	Pass, FS=21.01 >= 3
x 6 Columr	12.00	12.00	6.00	10.00		5.00			3.00	+1.20D+0.50Lr+1.60L	20.0	119.4	Pass, FS= 5.97 >= 3
Forklift	7.00	7.00	3.50			5.00				+1.20D+0.50Lr+1.60L	8.0	102.1	Pass, FS=12.76 >= 3

Pump Vault Calculations





P_1 = Pump Load = 8600#

P_2 = Blower Load = 1350#

P_3 = Forklift Axle Load = 9,667#/2 = 4834#

L_1 = 125 psf (Light Manufacturing)

Printed: 11 JAN 2014, 1:09PM
File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Licensee : SUNRISE ENGINEERING

Concrete Beam

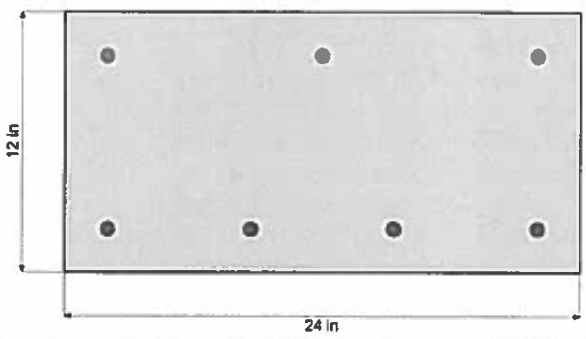
Lic. # : KW-06005617

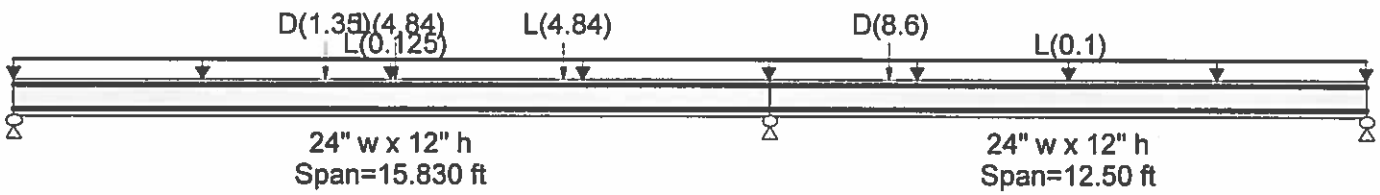
Description : One-Way Slab in Pump Room-

Material Properties

f'c	=	4.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	=	474.342 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	# 3
			Number of Resisting Legs Per Stirrup	=	2

Load Combination ASCE 7-02





Cross Section & Reinforcing Details

Rectangular Section, Width = 24.0 in, Height = 12.0 in

Span #1 Reinforcing....
- 4-#6 at 2.0 in from Bottom, from 0.0 to 15.830 ft in this span
- 3-#6 at 2.0 in from Top, from 0.0 to 15.830 ft in this span

Span #2 Reinforcing....
- 4-#6 at 2.0 in from Bottom, from 0.0 to 12.50 ft in this span
- 3-#6 at 2.0 in from Top, from 0.0 to 12.50 ft in this span

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads

Load for Span Number 1
- Uniform Load : L = 0.1250 k/ft, Tributary Width = 1.0 ft, (Live Load)
- Point Load : D = 1.350 k @ 6.50 ft, (Blower Load)
- Point Load : L = 4.840 k @ 8.0 ft, (Forklift Tire)
- Point Load : L = 4.840 k @ 11.50 ft, (Forklift Tire (front axle))

Load for Span Number 2
- Uniform Load : L = 0.10 k/ft, Tributary Width = 1.0 ft, (Live Load (Light Manufacturing))
- Point Load : D = 8.60 k @ 2.50 ft, (Pump Load)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.840 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward L+Lr+S Deflection	0.125 in Ratio = 1524
Mu : Applied	-49.249 k-ft	Max Upward L+Lr+S Deflection	-0.049 in Ratio = 3070
Mn * Phi : Allowable	58.620 k-ft	Max Downward Total Deflection	0.139 in Ratio = 1368
Load Combination	1.20D+0.50Lr+1.60L+1.60H, LL Comb Run (LL)	Max Upward Total Deflection	-0.009 in Ratio = 17286
Location of maximum on span	0.000 ft		
Span # where maximum occurs	Span # 2		

Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	5.722	23.829	2.773
D Only	2.052	13.896	2.217
L Only, LL Comb Run (*L)	-0.054	0.748	0.556
L Only, LL Comb Run (L*)	3.581	9.504	-1.426
L Only, LL Comb Run (LL)	3.533	10.237	-0.862
D+L, LL Comb Run (*L)	1.998	14.645	2.773

Printed: 11 JAN 2014, 1:09PM

Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-Way Slab in Pump Room-

Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
D+L, LL Comb Run (L*)	5.722	23.200	0.903
D+L, LL Comb Run (LL)	5.720	23.829	1.525

Shear Stirrup Requirements

Entire Beam Span Length : Vu < PhiVc/2, Req'd Vs = Not Reqd, use stirrups spaced at 0.000 in

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Location (ft) in Span	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	15.830	-47.92	58.62	0.82
Span # 2	2	12.500	-49.25	58.62	0.84
+1.40D					
Span # 1	1	15.830	-22.61	58.62	0.39
Span # 2	2	12.500	-23.02	58.62	0.39
+1.20D+0.50Lr+1.60L+1.60H, LL Comb					
Span # 1	1	15.830	-20.75	58.62	0.35
Span # 2	2	12.500	-21.11	58.62	0.36
+1.20D+0.50Lr+1.60L+1.60H, LL Comb					
Span # 1	1	15.830	-46.55	58.62	0.79
Span # 2	2	12.500	-47.87	58.62	0.82
+1.20D+0.50Lr+1.60L+1.60H, LL Comb					
Span # 1	1	15.830	-47.92	58.62	0.82
Span # 2	2	12.500	-49.25	58.62	0.84
+1.20D+1.60L+0.50S+1.60H, LL Comb F					
Span # 1	1	15.830	-20.75	58.62	0.35
Span # 2	2	12.500	-21.11	58.62	0.36
+1.20D+1.60L+0.50S+1.60H, LL Comb F					
Span # 1	1	15.830	-46.55	58.62	0.79
Span # 2	2	12.500	-47.87	58.62	0.82
+1.20D+1.60L+0.50S+1.60H, LL Comb F					
Span # 1	1	15.830	-47.92	58.62	0.82
Span # 2	2	12.500	-49.25	58.62	0.84
+1.20D+1.60Lr+0.50L, LL Comb Run (*					
Span # 1	1	15.830	-19.81	58.62	0.34
Span # 2	2	12.500	-20.16	58.62	0.34
+1.20D+1.60Lr+0.50L, LL Comb Run (L					
Span # 1	1	15.830	-27.87	58.62	0.48
Span # 2	2	12.500	-28.53	58.62	0.49
+1.20D+1.60Lr+0.50L, LL Comb Run (L					
Span # 1	1	15.830	-28.30	58.62	0.48
Span # 2	2	12.500	-28.96	58.62	0.49
+1.20D+1.60Lr+0.80W, LL Comb Run (*					
Span # 1	1	15.830	-19.38	58.62	0.33
Span # 2	2	12.500	-19.73	58.62	0.34
+1.20D+1.60Lr+0.80W, LL Comb Run (L					
Span # 1	1	15.830	-19.38	58.62	0.33
Span # 2	2	12.500	-19.73	58.62	0.34
+1.20D+1.60Lr+0.80W, LL Comb Run (L					
Span # 1	1	15.830	-19.38	58.62	0.33
Span # 2	2	12.500	-19.73	58.62	0.34
+1.20D+0.50L+1.60S, LL Comb Run (*L					
Span # 1	1	15.830	-19.81	58.62	0.34
Span # 2	2	12.500	-20.16	58.62	0.34
+1.20D+0.50L+1.60S, LL Comb Run (L*					
Span # 1	1	15.830	-27.87	58.62	0.48
Span # 2	2	12.500	-28.53	58.62	0.49
+1.20D+0.50L+1.60S, LL Comb Run (LL					
Span # 1	1	15.830	-28.30	58.62	0.48
Span # 2	2	12.500	-28.96	58.62	0.49
+1.20D+1.60S+0.80W					
Span # 1	1	15.830	-19.38	58.62	0.33
Span # 2	2	12.500	-19.73	58.62	0.34
+1.20D+0.50Lr+0.50L+1.60W, LL Comb					
Span # 1	1	15.830	-19.81	58.62	0.34
Span # 2	2	12.500	-20.16	58.62	0.34
+1.20D+0.50Lr+0.50L+1.60W, LL Comb					
Span # 1	1	15.830	-27.87	58.62	0.48
Span # 2	2	12.500	-28.53	58.62	0.49

Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-Way Slab in Pump Room-

Load Combination / Segment Length	Span #	Location (ft) in Span	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
+1.20D+0.50Lr+0.50L+1.60W, LL Comb					
Span # 1	1	15.830	-28.30	58.62	0.48
Span # 2	2	12.500	-28.96	58.62	0.49
+1.20D+0.50L+0.50S+1.60W, LL Comb I					
Span # 1	1	15.830	-19.81	58.62	0.34
Span # 2	2	12.500	-20.16	58.62	0.34
+1.20D+0.50L+0.50S+1.60W, LL Comb I					
Span # 1	1	15.830	-27.87	58.62	0.48
Span # 2	2	12.500	-28.53	58.62	0.49
+1.20D+0.50L+0.50S+1.60W, LL Comb I					
Span # 1	1	15.830	-28.30	58.62	0.48
Span # 2	2	12.500	-28.96	58.62	0.49
+1.20D+0.50L+0.20S+E, LL Comb Run (					
Span # 1	1	15.830	-19.81	58.62	0.34
Span # 2	2	12.500	-20.16	58.62	0.34
+1.20D+0.50L+0.20S+E, LL Comb Run (					
Span # 1	1	15.830	-27.87	58.62	0.48
Span # 2	2	12.500	-28.53	58.62	0.49
+1.20D+0.50L+0.20S+E, LL Comb Run (					
Span # 1	1	15.830	-28.30	58.62	0.48
Span # 2	2	12.500	-28.96	58.62	0.49
+0.90D+1.60W+1.60H					
Span # 1	1	15.830	-14.54	58.62	0.25
Span # 2	2	12.500	-14.80	58.62	0.25
+0.90D+E+1.60H					
Span # 1	1	15.830	-14.54	58.62	0.25
Span # 2	2	12.500	-14.80	58.62	0.25

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L, LL Comb Run (L")	1	0.1388	7.651	D+L, LL Comb Run (L")	-0.0019	16.038
D+L, LL Comb Run (L)	2	0.0246	6.042	D+L, LL Comb Run (L")	-0.0066	1.042

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	1	0.00	10.00	8.22	8.22	0.00	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.08	10.00	8.18	8.18	0.62	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.15	10.00	8.13	8.13	1.23	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.23	10.00	8.09	8.09	1.84	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.30	10.00	8.05	8.05	2.45	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.38	10.00	8.01	8.01	3.06	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.45	10.00	7.97	7.97	3.66	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.53	10.00	7.93	7.93	4.26	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.60	10.00	7.89	7.89	4.86	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.68	10.00	7.85	7.85	5.45	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.75	10.00	7.80	7.80	6.04	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.83	10.00	7.76	7.76	6.62	0.98	24.85	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.90	10.00	7.72	7.72	7.21	0.89	24.58	Vu < PhiVc/2	Not Reqd	24.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.98	10.00	7.68	7.68	7.79	0.82	24.34	Vu < PhiVc/2	Not Reqd	24.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.06	10.00	7.64	7.64	8.37	0.76	24.14	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.13	10.00	7.60	7.60	8.94	0.71	23.97	Vu < PhiVc/2	Not Reqd	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.21	10.00	7.56	7.56	9.51	0.66	23.81	Vu < PhiVc/2	Not Reqd	23.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.28	10.00	7.51	7.51	10.08	0.62	23.68	Vu < PhiVc/2	Not Reqd	23.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.36	10.00	7.47	7.47	10.64	0.59	23.56	Vu < PhiVc/2	Not Reqd	23.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.43	10.00	7.43	7.43	11.21	0.55	23.45	Vu < PhiVc/2	Not Reqd	23.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.51	10.00	7.39	7.39	11.77	0.52	23.36	Vu < PhiVc/2	Not Reqd	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.58	10.00	7.35	7.35	12.32	0.50	23.27	Vu < PhiVc/2	Not Reqd	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.66	10.00	7.31	7.31	12.87	0.47	23.19	Vu < PhiVc/2	Not Reqd	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.73	10.00	7.27	7.27	13.42	0.45	23.12	Vu < PhiVc/2	Not Reqd	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.81	10.00	7.23	7.23	13.97	0.43	23.05	Vu < PhiVc/2	Not Reqd	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.88	10.00	7.18	7.18	14.50	0.41	22.99	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0

Concrete Beam

Description : One-Way Slab in Pump Room-

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	1	1.96	10.00	7.14	7.14	15.05	0.40	22.93	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.04	10.00	7.10	7.10	15.59	0.38	22.88	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.11	10.00	7.06	7.06	16.12	0.36	22.83	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.19	10.00	7.02	7.02	16.65	0.35	22.79	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.26	10.00	6.98	6.98	17.18	0.34	22.75	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.34	10.00	6.94	6.94	17.70	0.33	22.71	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.41	10.00	6.89	6.89	18.23	0.32	22.67	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.49	10.00	6.85	6.85	18.74	0.30	22.64	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.56	10.00	6.81	6.81	19.26	0.29	22.60	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.64	10.00	6.77	6.77	19.77	0.29	22.57	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.71	10.00	6.73	6.73	20.28	0.28	22.54	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.79	10.00	6.69	6.69	20.79	0.27	22.51	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.86	10.00	6.65	6.65	21.29	0.26	22.49	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.94	10.00	6.61	6.61	21.79	0.25	22.46	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.02	10.00	6.56	6.56	22.28	0.25	22.44	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.09	10.00	6.52	6.52	22.78	0.24	22.42	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.17	10.00	6.48	6.48	23.27	0.23	22.40	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.24	10.00	6.44	6.44	23.76	0.23	22.38	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.32	10.00	6.40	6.40	24.24	0.22	22.36	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.39	10.00	6.36	6.36	24.72	0.21	22.34	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.47	10.00	6.32	6.32	25.20	0.21	22.32	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.54	10.00	6.28	6.28	25.67	0.20	22.30	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.62	10.00	6.23	6.23	26.14	0.20	22.29	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.69	10.00	6.19	6.19	26.61	0.19	22.27	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.77	10.00	6.15	6.15	27.08	0.19	22.25	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.84	10.00	6.11	6.11	27.54	0.18	22.24	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.92	10.00	6.07	6.07	28.00	0.18	22.23	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.00	10.00	6.03	6.03	28.45	0.18	22.21	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.07	10.00	5.99	5.99	28.91	0.17	22.20	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.15	10.00	5.94	5.94	29.36	0.17	22.19	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.22	10.00	5.90	5.90	29.80	0.17	22.17	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.30	10.00	5.86	5.86	30.25	0.16	22.16	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.37	10.00	5.82	5.82	30.69	0.16	22.15	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.45	10.00	5.78	5.78	31.12	0.15	22.14	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.52	10.00	5.74	5.74	31.56	0.15	22.13	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.60	10.00	5.70	5.70	31.99	0.15	22.12	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.67	10.00	5.66	5.66	32.42	0.15	22.11	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.75	10.00	5.61	5.61	32.84	0.14	22.10	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.82	10.00	5.57	5.57	33.26	0.14	22.09	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.90	10.00	5.53	5.53	33.68	0.14	22.08	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.98	10.00	5.49	5.49	34.10	0.13	22.07	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.05	10.00	5.45	5.45	34.51	0.13	22.06	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.13	10.00	5.41	5.41	34.92	0.13	22.06	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.20	10.00	5.37	5.37	35.33	0.13	22.05	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.28	10.00	5.33	5.33	35.73	0.12	22.04	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.35	10.00	5.28	5.28	36.13	0.12	22.03	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.43	10.00	5.24	5.24	36.53	0.12	22.02	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.50	10.00	5.20	5.20	36.92	0.12	22.02	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.58	10.00	5.16	5.16	37.31	0.12	22.01	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.65	10.00	5.12	5.12	37.70	0.11	22.00	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.73	10.00	5.08	5.08	38.08	0.11	22.00	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.80	10.00	5.04	5.04	38.46	0.11	21.99	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.88	10.00	4.99	4.99	38.84	0.11	21.98	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.96	10.00	4.95	4.95	39.21	0.11	21.98	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0

Concrete Beam

Description : One-Way Slab in Pump Room-

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	1	6.03	10.00	4.91	4.91	39.59	0.10	21.97	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.11	10.00	4.87	4.87	39.96	0.10	21.97	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.18	10.00	4.83	4.83	40.32	0.10	21.96	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.26	10.00	4.79	4.79	40.68	0.10	21.95	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.33	10.00	4.75	4.75	41.04	0.10	21.95	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.41	10.00	4.71	4.71	41.40	0.09	21.94	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.48	10.00	4.66	4.66	41.75	0.09	21.94	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.56	10.00	3.00	3.00	42.01	0.06	21.83	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.63	10.00	2.96	2.96	42.23	0.06	21.82	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.71	10.00	2.92	2.92	42.45	0.06	21.82	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.78	10.00	2.88	2.88	42.67	0.06	21.82	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.86	10.00	2.84	2.84	42.89	0.06	21.81	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.94	10.00	2.80	2.80	43.10	0.05	21.81	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.01	10.00	2.76	2.76	43.31	0.05	21.80	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.09	10.00	2.71	2.71	43.52	0.05	21.80	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.16	10.00	2.67	2.67	43.72	0.05	21.80	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.24	10.00	2.63	2.63	43.92	0.05	21.79	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.31	10.00	2.59	2.59	44.12	0.05	21.79	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.39	10.00	2.55	2.55	44.31	0.05	21.79	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.46	10.00	2.51	2.51	44.50	0.05	21.78	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.54	10.00	2.47	2.47	44.69	0.05	21.78	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.61	10.00	2.42	2.42	44.87	0.05	21.78	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.69	10.00	2.38	2.38	45.05	0.04	21.78	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.76	10.00	2.34	2.34	45.23	0.04	21.77	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.84	10.00	2.30	2.30	45.41	0.04	21.77	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.92	10.00	2.26	2.26	45.58	0.04	21.77	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.40D	1	7.99	10.00	-2.26	2.26	7.18	0.26	22.50	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.07	10.00	-5.65	5.65	44.70	0.11	21.98	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.14	10.00	-5.70	5.70	44.27	0.11	21.98	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.22	10.00	-5.74	5.74	43.84	0.11	21.99	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.29	10.00	-5.78	5.78	43.41	0.11	22.00	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.37	10.00	-5.82	5.82	42.97	0.11	22.00	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.44	10.00	-5.86	5.86	42.53	0.11	22.01	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.52	10.00	-5.90	5.90	42.09	0.12	22.02	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.59	10.00	-5.94	5.94	41.64	0.12	22.02	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.67	10.00	-5.98	5.98	41.19	0.12	22.03	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.74	10.00	-6.03	6.03	40.74	0.12	22.04	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.82	10.00	-6.07	6.07	40.28	0.13	22.04	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.89	10.00	-6.11	6.11	39.82	0.13	22.05	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.97	10.00	-6.15	6.15	39.36	0.13	22.06	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.05	10.00	-6.19	6.19	38.90	0.13	22.07	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.12	10.00	-6.23	6.23	38.43	0.14	22.08	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.20	10.00	-6.27	6.27	37.96	0.14	22.08	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.27	10.00	-6.32	6.32	37.48	0.14	22.09	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.35	10.00	-6.36	6.36	37.01	0.14	22.10	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.42	10.00	-6.40	6.40	36.52	0.15	22.11	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.50	10.00	-6.44	6.44	36.04	0.15	22.12	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.57	10.00	-6.48	6.48	35.55	0.15	22.13	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.65	10.00	-6.52	6.52	35.06	0.15	22.14	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.72	10.00	-6.56	6.56	34.57	0.16	22.15	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.80	10.00	-6.60	6.60	34.07	0.16	22.16	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.87	10.00	-6.65	6.65	33.57	0.16	22.17	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.95	10.00	-6.69	6.69	33.07	0.17	22.19	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.03	10.00	-6.73	6.73	32.57	0.17	22.20	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0

Concrete Beam

Description : One-Way Slab in Pump Room-

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	1	10.10	10.00	-6.77	6.77	32.06	0.18	22.21	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.18	10.00	-6.81	6.81	31.55	0.18	22.22	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.25	10.00	-6.85	6.85	31.03	0.18	22.24	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.33	10.00	-6.89	6.89	30.51	0.19	22.25	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.40	10.00	-6.93	6.93	29.99	0.19	22.27	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.48	10.00	-6.98	6.98	29.47	0.20	22.28	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.55	10.00	-7.02	7.02	28.94	0.20	22.30	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.63	10.00	-7.06	7.06	28.41	0.21	22.31	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.70	10.00	-7.10	7.10	27.88	0.21	22.33	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.78	10.00	-7.14	7.14	27.34	0.22	22.35	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.85	10.00	-7.18	7.18	26.80	0.22	22.37	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.93	10.00	-7.22	7.22	26.26	0.23	22.39	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.01	10.00	-7.27	7.27	25.71	0.24	22.41	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.08	10.00	-7.31	7.31	25.16	0.24	22.43	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.16	10.00	-7.35	7.35	24.61	0.25	22.45	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.23	10.00	-7.39	7.39	24.05	0.26	22.47	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.31	10.00	-7.43	7.43	23.49	0.26	22.50	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.38	10.00	-7.47	7.47	22.93	0.27	22.53	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.46	10.00	-7.51	7.51	22.37	0.28	22.55	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.53	10.00	-15.30	15.30	21.54	0.59	23.58	PhiVc/2 < Vu <=	Not Reqd 1	23.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.61	10.00	-15.34	15.34	20.39	0.63	23.70	PhiVc/2 < Vu <=	Not Reqd 1	23.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.68	10.00	-15.38	15.38	19.23	0.67	23.83	PhiVc/2 < Vu <=	Not Reqd 1	23.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.76	10.00	-15.42	15.42	18.07	0.71	23.98	PhiVc/2 < Vu <=	Not Reqd 1	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.83	10.00	-15.46	15.46	16.90	0.76	24.15	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.91	10.00	-15.51	15.51	15.74	0.82	24.34	PhiVc/2 < Vu <=	Not Reqd 1	24.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.99	10.00	-15.55	15.55	14.57	0.89	24.56	PhiVc/2 < Vu <=	Not Reqd 1	24.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.06	10.00	-15.59	15.59	13.39	0.97	24.83	PhiVc/2 < Vu <=	Not Reqd 1	24.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.14	10.00	-15.63	15.63	12.22	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.21	10.00	-15.67	15.67	11.04	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.29	10.00	-15.71	15.71	9.85	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.36	10.00	-15.75	15.75	8.67	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.44	10.00	-15.79	15.79	7.48	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.51	10.00	-15.84	15.84	6.29	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.59	10.00	-15.88	15.88	5.09	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.66	10.00	-15.92	15.92	3.89	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.74	10.00	-15.96	15.96	2.69	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.81	10.00	-16.00	16.00	1.49	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.89	10.00	-16.04	16.04	0.28	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.97	10.00	-16.08	16.08	0.93	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.04	10.00	-16.12	16.12	2.14	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.12	10.00	-16.17	16.17	3.36	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.19	10.00	-16.21	16.21	4.58	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.27	10.00	-16.25	16.25	5.81	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.34	10.00	-16.29	16.29	7.03	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.42	10.00	-16.33	16.33	8.26	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.49	10.00	-16.37	16.37	9.49	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.57	10.00	-16.41	16.41	10.73	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.64	10.00	-16.46	16.46	11.97	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.72	10.00	-16.50	16.50	13.21	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.79	10.00	-16.54	16.54	14.46	0.95	23.99	PhiVc/2 < Vu <=	Not Reqd 1	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.87	10.00	-16.58	16.58	15.70	0.88	23.81	PhiVc/2 < Vu <=	Not Reqd 1	23.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.95	10.00	-16.62	16.62	16.95	0.82	23.65	PhiVc/2 < Vu <=	Not Reqd 1	23.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.02	10.00	-16.66	16.66	18.21	0.76	23.52	PhiVc/2 < Vu <=	Not Reqd 1	23.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.10	10.00	-16.70	16.70	19.47	0.72	23.40	PhiVc/2 < Vu <=	Not Reqd 1	23.4	0.0	0.0

Concrete Beam

Description : One-Way Slab in Pump Room-

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	1	14.17	10.00	-16.74	16.74	20.73	0.67	23.30	PhiVc/2 < Vu <=	Not Reqd 1	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.25	10.00	-16.79	16.79	21.99	0.64	23.20	PhiVc/2 < Vu <=	Not Reqd 1	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.32	10.00	-16.83	16.83	23.26	0.60	23.12	PhiVc/2 < Vu <=	Not Reqd 1	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.40	10.00	-16.87	16.87	24.53	0.57	23.05	PhiVc/2 < Vu <=	Not Reqd 1	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.47	10.00	-16.91	16.91	25.80	0.55	22.98	PhiVc/2 < Vu <=	Not Reqd 1	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.55	10.00	-16.95	16.95	27.08	0.52	22.92	PhiVc/2 < Vu <=	Not Reqd 1	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.62	10.00	-16.99	16.99	28.36	0.50	22.87	PhiVc/2 < Vu <=	Not Reqd 1	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.70	10.00	-17.03	17.03	29.64	0.48	22.82	PhiVc/2 < Vu <=	Not Reqd 1	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.77	10.00	-17.07	17.07	30.92	0.46	22.77	PhiVc/2 < Vu <=	Not Reqd 1	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.85	10.00	-17.12	17.12	32.21	0.44	22.73	PhiVc/2 < Vu <=	Not Reqd 1	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.93	10.00	-17.16	17.16	33.51	0.43	22.69	PhiVc/2 < Vu <=	Not Reqd 1	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.00	10.00	-17.20	17.20	34.80	0.41	22.65	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.08	10.00	-17.24	17.24	36.10	0.40	22.62	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.15	10.00	-17.28	17.28	37.40	0.39	22.58	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.23	10.00	-17.32	17.32	38.70	0.37	22.55	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.30	10.00	-17.36	17.36	40.01	0.36	22.53	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.38	10.00	-17.41	17.41	41.32	0.35	22.50	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.45	10.00	-17.45	17.45	42.63	0.34	22.47	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.53	10.00	-17.49	17.49	43.95	0.33	22.45	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.60	10.00	-17.53	17.53	45.27	0.32	22.43	PhiVc/2 < Vu <=	Not Reqd 1	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.68	10.00	-17.57	17.57	46.59	0.31	22.41	PhiVc/2 < Vu <=	Not Reqd 1	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.75	10.00	-17.61	17.61	47.92	0.31	22.39	PhiVc/2 < Vu <=	Not Reqd 1	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	15.83	10.00	15.37	15.37	49.25	0.26	22.27	PhiVc/2 < Vu <=	Not Reqd 1	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	15.89	10.00	15.34	15.34	48.34	0.26	22.28	PhiVc/2 < Vu <=	Not Reqd 1	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	15.95	10.00	15.31	15.31	47.42	0.27	22.30	PhiVc/2 < Vu <=	Not Reqd 1	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.01	10.00	15.28	15.28	46.51	0.27	22.31	PhiVc/2 < Vu <=	Not Reqd 1	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.07	10.00	15.25	15.25	45.60	0.28	22.32	PhiVc/2 < Vu <=	Not Reqd 1	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.13	10.00	15.22	15.22	44.70	0.28	22.33	PhiVc/2 < Vu <=	Not Reqd 1	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.19	10.00	15.19	15.19	43.79	0.29	22.35	PhiVc/2 < Vu <=	Not Reqd 1	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.25	10.00	15.16	15.16	42.89	0.29	22.36	PhiVc/2 < Vu <=	Not Reqd 1	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.31	10.00	15.13	15.13	41.99	0.30	22.37	PhiVc/2 < Vu <=	Not Reqd 1	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.37	10.00	15.10	15.10	41.09	0.31	22.39	PhiVc/2 < Vu <=	Not Reqd 1	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.43	10.00	15.07	15.07	40.19	0.31	22.40	PhiVc/2 < Vu <=	Not Reqd 1	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.48	10.00	15.04	15.04	39.29	0.32	22.42	PhiVc/2 < Vu <=	Not Reqd 1	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.54	10.00	15.01	15.01	38.40	0.33	22.44	PhiVc/2 < Vu <=	Not Reqd 1	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.60	10.00	14.98	14.98	37.51	0.33	22.45	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.66	10.00	14.95	14.95	36.62	0.34	22.47	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.72	10.00	14.92	14.92	35.73	0.35	22.49	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.78	10.00	14.89	14.89	34.84	0.36	22.51	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.84	10.00	14.86	14.86	33.96	0.36	22.53	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.90	10.00	14.83	14.83	33.07	0.37	22.55	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.96	10.00	14.80	14.80	32.19	0.38	22.58	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.02	10.00	14.77	14.77	31.31	0.39	22.60	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.08	10.00	14.74	14.74	30.43	0.40	22.63	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.14	10.00	14.71	14.71	29.56	0.41	22.66	PhiVc/2 < Vu <=	Not Reqd 1	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.20	10.00	14.68	14.68	28.68	0.43	22.69	PhiVc/2 < Vu <=	Not Reqd 1	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.26	10.00	14.65	14.65	27.81	0.44	22.72	PhiVc/2 < Vu <=	Not Reqd 1	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.32	10.00	14.61	14.61	26.94	0.45	22.75	PhiVc/2 < Vu <=	Not Reqd 1	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.38	10.00	14.58	14.58	26.07	0.47	22.78	PhiVc/2 < Vu <=	Not Reqd 1	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.44	10.00	14.55	14.55	25.20	0.48	22.82	PhiVc/2 < Vu <=	Not Reqd 1	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.50	10.00	14.52	14.52	24.34	0.50	22.86	PhiVc/2 < Vu <=	Not Reqd 1	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.56	10.00	14.49	14.49	23.47	0.51	22.90	PhiVc/2 < Vu <=	Not Reqd 1	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.62	10.00	14.46	14.46	22.61	0.53	22.95	PhiVc/2 < Vu <=	Not Reqd 1	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.68	10.00	14.43	14.43	21.74	0.55	23.00	PhiVc/2 < Vu <=	Not Reqd 1	23.0	0.0	0.0

Printed: 11 JAN 2014, 1:09PM

Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-Way Slab in Pump Room-

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	2	17.73	10.00	14.40	14.40	20.89	0.57	23.05	PhiVc/2 < Vu <=	Not Reqd 1	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.79	10.00	14.37	14.37	20.04	0.60	23.11	PhiVc/2 < Vu <=	Not Reqd 1	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.85	10.00	14.34	14.34	19.18	0.62	23.17	PhiVc/2 < Vu <=	Not Reqd 1	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.91	10.00	14.31	14.31	18.33	0.65	23.24	PhiVc/2 < Vu <=	Not Reqd 1	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.97	10.00	14.28	14.28	17.48	0.68	23.32	PhiVc/2 < Vu <=	Not Reqd 1	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.03	10.00	14.25	14.25	16.63	0.71	23.40	PhiVc/2 < Vu <=	Not Reqd 1	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.09	10.00	14.22	14.22	15.78	0.75	23.49	PhiVc/2 < Vu <=	Not Reqd 1	23.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.15	10.00	14.19	14.19	14.94	0.79	23.59	PhiVc/2 < Vu <=	Not Reqd 1	23.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.21	10.00	14.16	14.16	14.09	0.84	23.70	PhiVc/2 < Vu <=	Not Reqd 1	23.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.27	10.00	14.13	14.13	13.25	0.89	23.83	PhiVc/2 < Vu <=	Not Reqd 1	23.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.33	10.00	14.10	14.10	12.41	0.95	23.97	PhiVc/2 < Vu <=	Not Reqd 1	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.39	10.00	3.75	3.75	12.19	0.26	22.26	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.45	10.00	3.72	3.72	11.96	0.26	22.27	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.51	10.00	3.69	3.69	11.74	0.26	22.28	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.57	10.00	3.66	3.66	11.52	0.26	22.29	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.63	10.00	3.63	3.63	11.31	0.27	22.29	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.69	10.00	3.60	3.60	11.09	0.27	22.30	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.75	10.00	3.57	3.57	10.88	0.27	22.31	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.81	10.00	3.54	3.54	10.67	0.28	22.31	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.87	10.00	3.51	3.51	10.46	0.28	22.32	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.93	10.00	3.48	3.48	10.25	0.28	22.33	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.98	10.00	3.45	3.45	10.04	0.29	22.34	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.04	10.00	3.42	3.42	9.84	0.29	22.35	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.10	10.00	3.39	3.39	9.64	0.29	22.36	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.16	10.00	3.36	3.36	9.43	0.30	22.36	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.22	10.00	3.33	3.33	9.24	0.30	22.37	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.28	10.00	3.30	3.30	9.04	0.30	22.38	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.34	10.00	3.27	3.27	8.84	0.31	22.39	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.40	10.00	3.24	3.24	8.65	0.31	22.40	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.46	10.00	3.21	3.21	8.46	0.32	22.41	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.52	10.00	3.18	3.18	8.27	0.32	22.42	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.58	10.00	3.15	3.15	8.08	0.32	22.43	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.64	10.00	3.12	3.12	7.89	0.33	22.44	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.70	10.00	3.09	3.09	7.71	0.33	22.46	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.76	10.00	3.06	3.06	7.53	0.34	22.47	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.82	10.00	3.02	3.02	7.35	0.34	22.48	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.88	10.00	2.99	2.99	7.17	0.35	22.49	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.94	10.00	2.96	2.96	6.99	0.35	22.50	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.00	10.00	2.93	2.93	6.81	0.36	22.52	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.06	10.00	2.90	2.90	6.64	0.36	22.53	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.12	10.00	2.87	2.87	6.47	0.37	22.55	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.18	10.00	2.84	2.84	6.30	0.38	22.56	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.23	10.00	2.81	2.81	6.13	0.38	22.58	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.29	10.00	2.78	2.78	5.96	0.39	22.59	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.35	10.00	2.75	2.75	5.80	0.40	22.61	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.41	10.00	2.72	2.72	5.63	0.40	22.63	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.47	10.00	2.69	2.69	5.47	0.41	22.64	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.53	10.00	2.66	2.66	5.31	0.42	22.66	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.59	10.00	2.63	2.63	5.16	0.43	22.68	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.65	10.00	2.60	2.60	5.00	0.43	22.70	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.71	10.00	2.57	2.57	4.85	0.44	22.72	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.77	10.00	2.54	2.54	4.69	0.45	22.75	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.83	10.00	2.51	2.51	4.54	0.46	22.77	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.89	10.00	2.48	2.48	4.39	0.47	22.79	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0

Concrete Beam

Description : One-Way Slab in Pump Room-

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	2	20.95	10.00	2.45	2.45	4.25	0.48	22.82	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.01	10.00	2.42	2.42	4.10	0.49	22.85	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.07	10.00	2.39	2.39	3.96	0.50	22.87	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.13	10.00	2.36	2.36	3.82	0.51	22.90	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.19	10.00	2.33	2.33	3.68	0.53	22.94	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.25	10.00	2.30	2.30	3.54	0.54	22.97	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.31	10.00	2.27	2.27	3.41	0.56	23.00	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.37	10.00	2.24	2.24	3.27	0.57	23.04	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.43	10.00	2.21	2.21	3.14	0.59	23.08	Vu < PhiVc/2	Not Reqd	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.48	10.00	2.18	2.18	3.01	0.60	23.12	Vu < PhiVc/2	Not Reqd	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.54	10.00	2.15	2.15	2.88	0.62	23.17	Vu < PhiVc/2	Not Reqd	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.60	10.00	2.12	2.12	2.75	0.64	23.22	Vu < PhiVc/2	Not Reqd	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.66	10.00	2.09	2.09	2.63	0.66	23.27	Vu < PhiVc/2	Not Reqd	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.72	10.00	2.06	2.06	2.51	0.68	23.32	Vu < PhiVc/2	Not Reqd	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.78	10.00	2.03	2.03	2.38	0.71	23.38	Vu < PhiVc/2	Not Reqd	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.84	10.00	2.00	2.00	2.26	0.74	23.45	Vu < PhiVc/2	Not Reqd	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.90	10.00	1.97	1.97	2.15	0.76	23.52	Vu < PhiVc/2	Not Reqd	23.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	21.96	10.00	1.94	1.94	2.03	0.80	23.60	Vu < PhiVc/2	Not Reqd	23.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.02	10.00	1.91	1.91	1.92	0.83	23.68	Vu < PhiVc/2	Not Reqd	23.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.08	10.00	1.88	1.88	1.80	0.87	23.78	Vu < PhiVc/2	Not Reqd	23.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.14	10.00	1.85	1.85	1.69	0.91	23.88	Vu < PhiVc/2	Not Reqd	23.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.20	10.00	1.82	1.82	1.58	0.96	24.00	Vu < PhiVc/2	Not Reqd	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.26	10.00	1.79	1.79	1.48	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.32	10.00	1.75	1.75	1.37	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.38	10.00	1.72	1.72	1.27	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.44	10.00	1.69	1.69	1.17	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.50	10.00	1.66	1.66	1.07	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.56	10.00	1.63	1.63	0.97	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.62	10.00	1.60	1.60	0.87	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.68	10.00	1.57	1.57	0.78	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.73	10.00	1.54	1.54	0.68	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.79	10.00	1.52	1.52	3.07	0.41	22.65	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.85	10.00	1.50	1.50	2.98	0.42	22.67	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.91	10.00	1.48	1.48	2.89	0.43	22.68	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	22.97	10.00	1.45	1.45	2.80	0.43	22.70	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.03	10.00	1.43	1.43	2.71	0.44	22.72	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.09	10.00	1.41	1.41	2.63	0.45	22.74	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.15	10.00	1.39	1.39	2.55	0.46	22.76	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.21	10.00	1.37	1.37	2.46	0.46	22.78	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.27	10.00	1.35	1.35	2.38	0.47	22.80	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.33	10.00	1.33	1.33	2.30	0.48	22.82	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.39	10.00	1.31	1.31	2.22	0.49	22.84	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.45	10.00	1.29	1.29	2.15	0.50	22.87	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.51	10.00	1.27	1.27	2.07	0.51	22.89	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.57	10.00	1.25	1.25	2.00	0.52	22.92	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.63	10.00	1.23	1.23	1.92	0.53	22.95	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.40D	2	23.69	10.00	-1.22	1.22	10.03	0.10	21.96	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.40D	2	23.75	10.00	-1.24	1.24	9.96	0.10	21.97	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.40D	2	23.81	10.00	-1.27	1.27	9.89	0.11	21.98	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.40D	2	23.87	10.00	-1.29	1.29	9.81	0.11	21.99	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.40D	2	23.93	10.00	-1.32	1.32	9.73	0.11	22.00	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.98	10.00	-1.34	1.34	10.63	0.11	21.98	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.04	10.00	-1.37	1.37	10.55	0.11	21.99	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.10	10.00	-1.40	1.40	10.47	0.11	22.00	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0

Concrete Beam

Description : One-Way Slab in Pump Room-

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	2	24.16	10.00	-1.43	1.43	10.38	0.12	22.01	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.22	10.00	-1.46	1.46	10.30	0.12	22.02	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.28	10.00	-1.49	1.49	10.21	0.12	22.03	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.34	10.00	-1.52	1.52	10.12	0.13	22.04	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.40	10.00	-1.55	1.55	10.03	0.13	22.06	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.46	10.00	-1.58	1.58	9.93	0.13	22.07	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.52	10.00	-1.61	1.61	9.84	0.14	22.08	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.58	10.00	-1.65	1.65	9.74	0.14	22.09	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.64	10.00	-1.68	1.68	9.64	0.14	22.11	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.70	10.00	-1.71	1.71	9.54	0.15	22.12	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.76	10.00	-1.74	1.74	9.44	0.15	22.14	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.82	10.00	-1.77	1.77	9.34	0.16	22.15	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.88	10.00	-1.80	1.80	9.23	0.16	22.17	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.94	10.00	-1.83	1.83	9.12	0.17	22.18	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.00	10.00	-1.86	1.86	9.01	0.17	22.20	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.06	10.00	-1.89	1.89	8.90	0.18	22.21	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.12	10.00	-1.92	1.92	8.79	0.18	22.23	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.18	10.00	-1.95	1.95	8.67	0.19	22.25	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.23	10.00	-1.98	1.98	8.56	0.19	22.27	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.29	10.00	-2.01	2.01	8.44	0.20	22.28	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.35	10.00	-2.04	2.04	8.32	0.20	22.30	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.41	10.00	-2.07	2.07	8.19	0.21	22.32	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.47	10.00	-2.10	2.10	8.07	0.22	22.35	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.53	10.00	-2.13	2.13	7.94	0.22	22.37	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.59	10.00	-2.16	2.16	7.82	0.23	22.39	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.65	10.00	-2.19	2.19	7.69	0.24	22.41	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.71	10.00	-2.22	2.22	7.56	0.24	22.44	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.77	10.00	-2.25	2.25	7.42	0.25	22.46	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.83	10.00	-2.28	2.28	7.29	0.26	22.49	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.89	10.00	-2.31	2.31	7.15	0.27	22.52	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.95	10.00	-2.34	2.34	7.01	0.28	22.55	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.01	10.00	-2.37	2.37	6.87	0.29	22.58	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.07	10.00	-2.40	2.40	6.73	0.30	22.61	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.13	10.00	-2.43	2.43	6.59	0.31	22.65	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.19	10.00	-2.46	2.46	6.44	0.32	22.68	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.25	10.00	-2.49	2.49	6.29	0.33	22.72	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.31	10.00	-2.52	2.52	6.14	0.34	22.76	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.37	10.00	-2.55	2.55	5.99	0.35	22.80	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.43	10.00	-2.58	2.58	5.84	0.37	22.85	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.48	10.00	-2.61	2.61	5.69	0.38	22.89	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.54	10.00	-2.64	2.64	5.53	0.40	22.94	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.60	10.00	-2.67	2.67	5.37	0.41	23.00	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.66	10.00	-2.70	2.70	5.21	0.43	23.06	Vu < PhiVc/2	Not Reqd	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.72	10.00	-2.73	2.73	5.05	0.45	23.12	Vu < PhiVc/2	Not Reqd	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.78	10.00	-2.76	2.76	4.89	0.47	23.19	Vu < PhiVc/2	Not Reqd	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.84	10.00	-2.79	2.79	4.72	0.49	23.26	Vu < PhiVc/2	Not Reqd	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.90	10.00	-2.82	2.82	4.55	0.52	23.34	Vu < PhiVc/2	Not Reqd	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.96	10.00	-2.85	2.85	4.38	0.54	23.42	Vu < PhiVc/2	Not Reqd	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.02	10.00	-2.88	2.88	4.21	0.57	23.51	Vu < PhiVc/2	Not Reqd	23.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.08	10.00	-2.92	2.92	4.04	0.60	23.61	Vu < PhiVc/2	Not Reqd	23.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.14	10.00	-2.95	2.95	3.87	0.63	23.72	Vu < PhiVc/2	Not Reqd	23.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.20	10.00	-2.98	2.98	3.69	0.67	23.85	Vu < PhiVc/2	Not Reqd	23.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.26	10.00	-3.01	3.01	3.51	0.71	23.98	Vu < PhiVc/2	Not Reqd	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.32	10.00	-3.04	3.04	3.32	0.76	24.14	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0

Printed: 11 JAN 2014, 1:09PM

Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMIN~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-Way Slab in Pump Room-

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	2	27.38	10.00	-3.07	3.07	3.15	0.81	24.31	Vu < PhiVc/2	Not Reqd	24.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.44	10.00	-3.10	3.10	2.97	0.87	24.50	Vu < PhiVc/2	Not Reqd	24.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.50	10.00	-3.13	3.13	2.78	0.94	24.72	Vu < PhiVc/2	Not Reqd	24.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.56	10.00	-3.16	3.16	2.60	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.62	10.00	-3.19	3.19	2.41	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.68	10.00	-3.22	3.22	2.22	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.73	10.00	-3.25	3.25	2.02	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.79	10.00	-3.28	3.28	1.83	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.85	10.00	-3.31	3.31	1.63	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.91	10.00	-3.34	3.34	1.44	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.97	10.00	-3.37	3.37	1.24	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	28.03	10.00	-3.40	3.40	1.03	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	28.09	10.00	-3.43	3.43	0.83	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	28.15	10.00	-3.46	3.46	0.63	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	28.21	10.00	-3.49	3.49	0.42	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	28.27	10.00	-3.52	3.52	0.21	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	28.33	10.00	-3.55	3.55	0.00	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0

Printed: 11 JAN 2014, 1:11PM
File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Concrete Beam

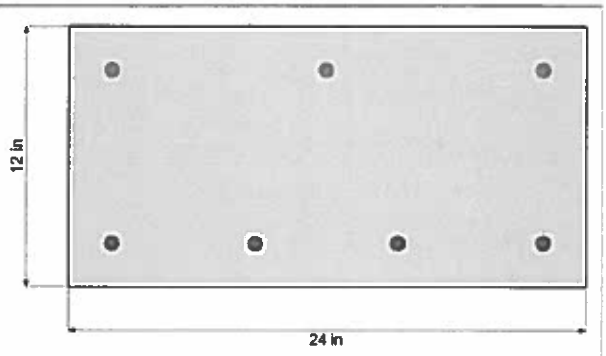
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

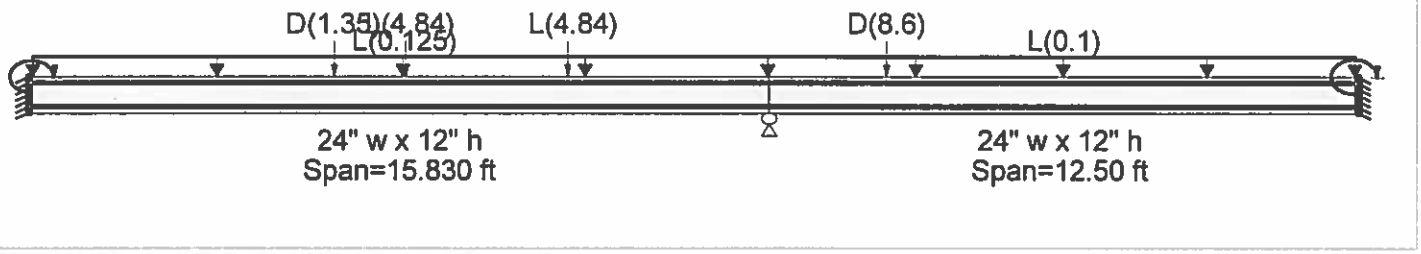
Description : One-Way Slab in Pump Room- Moment from Load Case 2

Material Properties

f'c	=	4.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	=	474.342 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	# 3
			Number of Resisting Legs Per Stirrup	=	2

Load Combination ASCE 7-02





Cross Section & Reinforcing Details

Rectangular Section, Width = 24.0 in, Height = 12.0 in

Span #1 Reinforcing....
- 4-#6 at 2.0 in from Bottom, from 0.0 to 15.830 ft in this span
- 3-#6 at 2.0 in from Top, from 0.0 to 15.830 ft in this span

Span #2 Reinforcing....
- 4-#6 at 2.0 in from Bottom, from 0.0 to 12.50 ft in this span
- 3-#6 at 2.0 in from Top, from 0.0 to 12.50 ft in this span

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads

Load for Span Number 1
- Uniform Load : L = 0.1250 k/ft, Tributary Width = 1.0 ft, (Live Load)
- Point Load : D = 1.350 k @ 6.50 ft, (Blower Load)
- Point Load : L = 4.840 k @ 8.0 ft, (Forklift Tire)
- Point Load : L = 4.840 k @ 11.50 ft, (Forklift Tire (front axle))
- Moment : H = -34.0 k-ft, Location = 0.0 ft from left end of this span, (Moment from Walls)

Load for Span Number 2
- Uniform Load : L = 0.10 k/ft, Tributary Width = 1.0 ft, (Live Load (Light Manufacturing))
- Point Load : D = 8.60 k @ 2.50 ft, (Pump Load)
- Moment : H = 34.70 k-ft, Location = 12.50 ft from left end of this span, (Moment from Walls)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.728 : 1**

Section used for this span	Typical Section
Mu : Applied	-42.687 k-ft
Mn * Phi : Allowable	58.620 k-ft
Load Combination	1.20D+0.50Lr+1.60L+1.60H, LL Comb Run (L*)
Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.044 in	Ratio =	4285
Max Upward L+Lr+S Deflection	-0.025 in	Ratio =	6076
Max Downward Total Deflection	0.051 in	Ratio =	3756
Max Upward Total Deflection	-0.002 in	Ratio =	61813

Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	7.880	20.750	4.047
D Only	2.758	12.073	3.334
L Only, LL Comb Run (*L)	-0.054	0.592	0.712
L Only, LL Comb Run (L*)	5.235	7.990	-1.566

Printed: 11 JAN 2014, 1:11PM

Concrete Beam

File = p:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-Way Slab in Pump Room- Moment from Load Case 2

Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
L Only, LL Comb Run (LL)	5.180	8.582	-0.853
D+L, LL Comb Run (*L)	2.704	12.665	4.047
D+L, LL Comb Run (L*)	7.880	20.219	1.726
D+L, LL Comb Run (LL)	7.856	20.750	2.468
H Only	0.000	-0.000	0.000

Shear Stirrup Requirements

Entire Beam Span Length : PhiVc/2 < Vu <= PhiVc, Req'd Vs = Not Reqd 11.5.6.1, use stirrups spaced at 0.000 in

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Location (ft) in Span	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	15.830	-42.69	58.62	0.73
Span # 2	2	12.500	54.16	74.81	0.72
+1.40D					
Span # 1	1	15.830	-16.90	58.62	0.29
Span # 2	2	12.500	-17.23	58.62	0.29
+1.20D+0.50Lr+1.60L+1.60H, LL Comb					
Span # 1	1	15.830	-15.39	58.62	0.26
Span # 2	2	12.500	41.06	74.81	0.55
+1.20D+0.50Lr+1.60L+1.60H, LL Comb					
Span # 1	1	15.830	-42.69	58.62	0.73
Span # 2	2	12.500	54.16	74.81	0.72
+1.20D+0.50Lr+1.60L+1.60H, LL Comb					
Span # 1	1	15.830	-42.23	58.62	0.72
Span # 2	2	12.500	51.49	74.81	0.69
+1.20D+1.60L+0.50S+1.60H, LL Comb F					
Span # 1	1	15.830	-15.39	58.62	0.26
Span # 2	2	12.500	41.06	74.81	0.55
+1.20D+1.60L+0.50S+1.60H, LL Comb F					
Span # 1	1	15.830	-42.69	58.62	0.73
Span # 2	2	12.500	54.16	74.81	0.72
+1.20D+1.60L+0.50S+1.60H, LL Comb F					
Span # 1	1	15.830	-42.23	58.62	0.72
Span # 2	2	12.500	51.49	74.81	0.69
+1.20D+1.60Lr+0.50L, LL Comb Run (*					
Span # 1	1	15.830	-14.77	58.62	0.25
Span # 2	2	12.500	-15.06	58.62	0.26
+1.20D+1.60Lr+0.50L, LL Comb Run (L					
Span # 1	1	15.830	-20.76	58.62	0.35
Span # 2	2	12.500	-21.29	58.62	0.36
+1.20D+1.60Lr+0.50L, LL Comb Run (L					
Span # 1	1	15.830	-21.05	58.62	0.36
Span # 2	2	12.500	-21.58	58.62	0.37
+1.20D+1.60Lr+0.80W, LL Comb Run (*					
Span # 1	1	15.830	-14.48	58.62	0.25
Span # 2	2	12.500	-14.77	58.62	0.25
+1.20D+1.60Lr+0.80W, LL Comb Run (L					
Span # 1	1	15.830	-14.48	58.62	0.25
Span # 2	2	12.500	-14.77	58.62	0.25
+1.20D+1.60Lr+0.80W, LL Comb Run (L					
Span # 1	1	15.830	-14.48	58.62	0.25
Span # 2	2	12.500	-14.77	58.62	0.25
+1.20D+0.50L+1.60S, LL Comb Run (*L					
Span # 1	1	15.830	-14.77	58.62	0.25
Span # 2	2	12.500	-15.06	58.62	0.26
+1.20D+0.50L+1.60S, LL Comb Run (L*					
Span # 1	1	15.830	-20.76	58.62	0.35
Span # 2	2	12.500	-21.29	58.62	0.36
+1.20D+0.50L+1.60S, LL Comb Run (LL					
Span # 1	1	15.830	-21.05	58.62	0.36
Span # 2	2	12.500	-21.58	58.62	0.37
+1.20D+1.60S+0.80W					
Span # 1	1	15.830	-14.48	58.62	0.25
Span # 2	2	12.500	-14.77	58.62	0.25
+1.20D+0.50Lr+0.50L+1.60W, LL Comb					
Span # 1	1	15.830	-14.77	58.62	0.25

Printed: 11 JAN 2014, 1:11PM

Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-Way Slab in Pump Room- Moment from Load Case 2

Load Combination / Segment Length	Span #	Location (ft) in Span	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 2	2	12.500	-15.06	58.62	0.26
+1.20D+0.50Lr+0.50L+1.60W, LL Comb					
Span # 1	1	15.830	-20.76	58.62	0.35
Span # 2	2	12.500	-21.29	58.62	0.36
+1.20D+0.50Lr+0.50L+1.60W, LL Comb					
Span # 1	1	15.830	-21.05	58.62	0.36
Span # 2	2	12.500	-21.58	58.62	0.37
+1.20D+0.50L+0.50S+1.60W, LL Comb I					
Span # 1	1	15.830	-14.77	58.62	0.25
Span # 2	2	12.500	-15.06	58.62	0.26
+1.20D+0.50L+0.50S+1.60W, LL Comb I					
Span # 1	1	15.830	-20.76	58.62	0.35
Span # 2	2	12.500	-21.29	58.62	0.36
+1.20D+0.50L+0.50S+1.60W, LL Comb I					
Span # 1	1	15.830	-21.05	58.62	0.36
Span # 2	2	12.500	-21.58	58.62	0.37
+1.20D+0.50L+0.20S+E, LL Comb Run (					
Span # 1	1	15.830	-14.77	58.62	0.25
Span # 2	2	12.500	-15.06	58.62	0.26
+1.20D+0.50L+0.20S+E, LL Comb Run (					
Span # 1	1	15.830	-20.76	58.62	0.35
Span # 2	2	12.500	-21.29	58.62	0.36
+1.20D+0.50L+0.20S+E, LL Comb Run (					
Span # 1	1	15.830	-21.05	58.62	0.36
Span # 2	2	12.500	-21.58	58.62	0.37
+0.90D+1.60W+1.60H					
Span # 1	1	15.830	-10.86	58.62	0.19
Span # 2	2	12.500	46.67	74.81	0.62
+0.90D+E+1.60H					
Span # 1	1	15.830	-10.86	58.62	0.19
Span # 2	2	12.500	46.67	74.81	0.62

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L, LL Comb Run (L*)	1	0.0506	8.179		0.0000	0.000
D+L, LL Comb Run (*L)	2	0.0144	5.208		0.0000	0.000

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	1	0.00	10.00	11.69	11.69	42.69	0.23	22.19	PhiVc/2 < Vu <=	Not Reqd 1	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.08	10.00	11.64	11.64	41.81	0.23	22.20	PhiVc/2 < Vu <=	Not Reqd 1	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.15	10.00	11.60	11.60	40.93	0.24	22.21	PhiVc/2 < Vu <=	Not Reqd 1	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.23	10.00	11.56	11.56	40.06	0.24	22.23	PhiVc/2 < Vu <=	Not Reqd 1	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.30	10.00	11.52	11.52	39.19	0.24	22.24	PhiVc/2 < Vu <=	Not Reqd 1	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.38	10.00	11.48	11.48	38.32	0.25	22.25	PhiVc/2 < Vu <=	Not Reqd 1	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.45	10.00	11.44	11.44	37.46	0.25	22.26	PhiVc/2 < Vu <=	Not Reqd 1	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.53	10.00	11.40	11.40	36.60	0.26	22.27	PhiVc/2 < Vu <=	Not Reqd 1	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.60	10.00	11.36	11.36	35.74	0.26	22.29	PhiVc/2 < Vu <=	Not Reqd 1	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.68	10.00	11.31	11.31	34.88	0.27	22.30	PhiVc/2 < Vu <=	Not Reqd 1	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.75	10.00	11.27	11.27	34.03	0.28	22.31	PhiVc/2 < Vu <=	Not Reqd 1	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.83	10.00	11.23	11.23	33.19	0.28	22.33	PhiVc/2 < Vu <=	Not Reqd 1	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.90	10.00	11.19	11.19	32.34	0.29	22.34	PhiVc/2 < Vu <=	Not Reqd 1	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.98	10.00	11.15	11.15	31.50	0.29	22.36	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.06	10.00	11.11	11.11	30.66	0.30	22.38	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.13	10.00	11.07	11.07	29.82	0.31	22.40	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.21	10.00	11.02	11.02	28.99	0.32	22.41	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.28	10.00	10.98	10.98	28.16	0.33	22.43	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.36	10.00	10.94	10.94	27.34	0.33	22.46	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.43	10.00	10.90	10.90	26.51	0.34	22.48	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.51	10.00	10.86	10.86	25.69	0.35	22.50	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.58	10.00	10.82	10.82	24.87	0.36	22.53	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.66	10.00	10.78	10.78	24.06	0.37	22.55	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0

Printed: 11 JAN 2014, 1:11PM

Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-Way Slab in Pump Room- Moment from Load Case 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	1	1.73	10.00	10.74	10.74	23.25	0.38	22.58	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.81	10.00	10.69	10.69	22.44	0.40	22.61	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.88	10.00	10.65	10.65	21.64	0.41	22.65	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.96	10.00	10.61	10.61	20.84	0.42	22.68	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.04	10.00	10.57	10.57	20.04	0.44	22.72	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.11	10.00	10.53	10.53	19.24	0.46	22.76	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.19	10.00	10.49	10.49	18.45	0.47	22.80	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.26	10.00	10.45	10.45	17.66	0.49	22.85	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.34	10.00	10.41	10.41	16.88	0.51	22.90	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.41	10.00	10.36	10.36	16.09	0.54	22.96	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.49	10.00	10.32	10.32	15.31	0.56	23.02	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.56	10.00	10.28	10.28	14.54	0.59	23.09	Vu < PhiVc/2	Not Reqd	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.64	10.00	10.24	10.24	13.76	0.62	23.16	Vu < PhiVc/2	Not Reqd	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.71	10.00	10.20	10.20	12.99	0.65	23.25	Vu < PhiVc/2	Not Reqd	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.79	10.00	10.16	10.16	12.23	0.69	23.34	Vu < PhiVc/2	Not Reqd	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.86	10.00	10.12	10.12	11.46	0.74	23.45	Vu < PhiVc/2	Not Reqd	23.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.94	10.00	10.07	10.07	10.70	0.78	23.57	Vu < PhiVc/2	Not Reqd	23.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.02	10.00	10.03	10.03	9.94	0.84	23.71	Vu < PhiVc/2	Not Reqd	23.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.09	10.00	9.99	9.99	9.19	0.91	23.87	Vu < PhiVc/2	Not Reqd	23.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.17	10.00	9.95	9.95	8.44	0.98	24.06	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.24	10.00	9.91	9.91	7.69	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.32	10.00	9.87	9.87	6.94	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.39	10.00	9.83	9.83	6.20	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.47	10.00	9.79	9.79	5.46	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.54	10.00	9.74	9.74	4.72	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.62	10.00	9.70	9.70	3.99	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.69	10.00	9.66	9.66	3.26	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.77	10.00	9.62	9.62	2.53	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.84	10.00	9.58	9.58	1.81	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.92	10.00	9.54	9.54	1.09	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.00	10.00	9.50	9.50	0.37	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.07	10.00	9.46	9.46	0.34	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.15	10.00	9.41	9.41	1.05	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.22	10.00	9.37	9.37	1.76	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.30	10.00	9.33	9.33	2.47	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.37	10.00	9.29	9.29	3.17	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.45	10.00	9.25	9.25	3.87	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.52	10.00	9.21	9.21	4.56	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.60	10.00	9.17	9.17	5.25	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.67	10.00	9.12	9.12	5.94	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.75	10.00	9.08	9.08	6.63	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.82	10.00	9.04	9.04	7.31	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.90	10.00	9.00	9.00	7.99	0.94	24.73	Vu < PhiVc/2	Not Reqd	24.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.98	10.00	8.96	8.96	8.67	0.86	24.47	Vu < PhiVc/2	Not Reqd	24.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.05	10.00	8.92	8.92	9.34	0.80	24.25	Vu < PhiVc/2	Not Reqd	24.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.13	10.00	8.88	8.88	10.01	0.74	24.07	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.20	10.00	8.84	8.84	10.68	0.69	23.90	Vu < PhiVc/2	Not Reqd	23.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.28	10.00	8.79	8.79	11.35	0.65	23.76	Vu < PhiVc/2	Not Reqd	23.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.35	10.00	8.75	8.75	12.01	0.61	23.63	Vu < PhiVc/2	Not Reqd	23.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.43	10.00	8.71	8.71	12.67	0.57	23.52	Vu < PhiVc/2	Not Reqd	23.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.50	10.00	8.67	8.67	13.32	0.54	23.42	Vu < PhiVc/2	Not Reqd	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.58	10.00	8.63	8.63	13.97	0.51	23.33	Vu < PhiVc/2	Not Reqd	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.65	10.00	8.59	8.59	14.62	0.49	23.25	Vu < PhiVc/2	Not Reqd	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.73	10.00	8.55	8.55	15.27	0.47	23.17	Vu < PhiVc/2	Not Reqd	23.2	0.0	0.0

Concrete Beam

Description : One-Way Slab in Pump Room- Moment from Load Case 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	1	5.80	10.00	8.50	8.50	15.91	0.45	23.10	Vu < PhiVc/2	Not Reqd	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.88	10.00	8.46	8.46	16.55	0.43	23.04	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.96	10.00	8.42	8.42	17.19	0.41	22.98	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.03	10.00	8.38	8.38	17.82	0.39	22.92	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.11	10.00	8.34	8.34	18.45	0.38	22.87	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.18	10.00	8.30	8.30	19.08	0.36	22.83	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.26	10.00	8.26	8.26	19.70	0.35	22.78	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.33	10.00	8.22	8.22	20.32	0.34	22.74	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.41	10.00	8.17	8.17	20.94	0.33	22.70	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.48	10.00	8.13	8.13	21.55	0.31	22.67	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.56	10.00	6.47	6.47	22.07	0.24	22.44	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.63	10.00	6.43	6.43	22.56	0.24	22.41	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.71	10.00	6.39	6.39	23.04	0.23	22.39	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.78	10.00	6.35	6.35	23.52	0.22	22.37	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.86	10.00	6.31	6.31	24.00	0.22	22.35	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	6.94	10.00	6.27	6.27	24.47	0.21	22.33	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.01	10.00	6.22	6.22	24.94	0.21	22.32	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.09	10.00	6.18	6.18	25.41	0.20	22.30	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.16	10.00	6.14	6.14	25.87	0.20	22.28	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.24	10.00	6.10	6.10	26.34	0.19	22.27	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.31	10.00	6.06	6.06	26.79	0.19	22.25	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.39	10.00	6.02	6.02	27.25	0.18	22.24	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.46	10.00	5.98	5.98	27.70	0.18	22.22	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.54	10.00	5.93	5.93	28.15	0.18	22.21	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.61	10.00	5.89	5.89	28.60	0.17	22.20	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.69	10.00	5.85	5.85	29.04	0.17	22.18	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.76	10.00	5.81	5.81	29.48	0.16	22.17	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.84	10.00	5.77	5.77	29.91	0.16	22.16	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.92	10.00	5.73	5.73	30.35	0.16	22.15	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	7.99	10.00	5.69	5.69	30.78	0.15	22.14	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.07	10.00	-2.19	2.19	30.45	0.06	21.83	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.14	10.00	-2.23	2.23	30.29	0.06	21.83	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.22	10.00	-2.27	2.27	30.12	0.06	21.84	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.29	10.00	-2.31	2.31	29.95	0.06	21.84	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.37	10.00	-2.35	2.35	29.77	0.07	21.85	Vu < PhiVc/2	Not Reqd	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.44	10.00	-2.39	2.39	29.59	0.07	21.85	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.52	10.00	-2.43	2.43	29.41	0.07	21.86	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.59	10.00	-2.47	2.47	29.22	0.07	21.86	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.67	10.00	-2.52	2.52	29.04	0.07	21.87	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.74	10.00	-2.56	2.56	28.84	0.07	21.87	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.82	10.00	-2.60	2.60	28.65	0.08	21.88	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.89	10.00	-2.64	2.64	28.45	0.08	21.89	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	8.97	10.00	-2.68	2.68	28.25	0.08	21.89	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.05	10.00	-2.72	2.72	28.05	0.08	21.90	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.12	10.00	-2.76	2.76	27.84	0.08	21.90	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.20	10.00	-2.81	2.81	27.63	0.08	21.91	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.27	10.00	-2.85	2.85	27.42	0.09	21.92	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.35	10.00	-2.89	2.89	27.20	0.09	21.92	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.42	10.00	-2.93	2.93	26.98	0.09	21.93	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.50	10.00	-2.97	2.97	26.76	0.09	21.94	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.57	10.00	-3.01	3.01	26.54	0.09	21.94	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.65	10.00	-3.05	3.05	26.31	0.10	21.95	Vu < PhiVc/2	Not Reqd	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.72	10.00	-3.09	3.09	26.08	0.10	21.96	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.80	10.00	-3.14	3.14	25.84	0.10	21.96	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0

Concrete Beam

Description : One-Way Slab in Pump Room- Moment from Load Case 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	1	9.87	10.00	-3.18	3.18	25.60	0.10	21.97	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	9.95	10.00	-3.22	3.22	25.36	0.11	21.98	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.03	10.00	-3.26	3.26	25.12	0.11	21.99	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.10	10.00	-3.30	3.30	24.87	0.11	21.99	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.18	10.00	-3.34	3.34	24.62	0.11	22.00	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.25	10.00	-3.38	3.38	24.37	0.12	22.01	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.33	10.00	-3.42	3.42	24.11	0.12	22.02	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.40	10.00	-3.47	3.47	23.85	0.12	22.03	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.48	10.00	-3.51	3.51	23.59	0.12	22.04	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.55	10.00	-3.55	3.55	23.32	0.13	22.05	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.63	10.00	-3.59	3.59	23.05	0.13	22.06	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.70	10.00	-3.63	3.63	22.78	0.13	22.07	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.78	10.00	-3.67	3.67	22.51	0.14	22.08	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.85	10.00	-3.71	3.71	22.23	0.14	22.09	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	10.93	10.00	-3.76	3.76	21.95	0.14	22.10	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.01	10.00	-3.80	3.80	21.66	0.15	22.11	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.08	10.00	-3.84	3.84	21.37	0.15	22.12	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.16	10.00	-3.88	3.88	21.08	0.15	22.14	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.23	10.00	-3.92	3.92	20.79	0.16	22.15	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.31	10.00	-3.96	3.96	20.49	0.16	22.16	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.38	10.00	-4.00	4.00	20.19	0.17	22.18	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.46	10.00	-4.04	4.04	19.89	0.17	22.19	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.53	10.00	-11.83	11.83	19.32	0.51	23.31	PhiVc/2 < Vu <=	Not Reqd 1	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.61	10.00	-11.87	11.87	18.43	0.54	23.40	PhiVc/2 < Vu <=	Not Reqd 1	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.68	10.00	-11.91	11.91	17.53	0.57	23.50	PhiVc/2 < Vu <=	Not Reqd 1	23.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.76	10.00	-11.95	11.95	16.63	0.60	23.61	PhiVc/2 < Vu <=	Not Reqd 1	23.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.83	10.00	-11.99	11.99	15.73	0.64	23.73	PhiVc/2 < Vu <=	Not Reqd 1	23.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.91	10.00	-12.04	12.04	14.83	0.68	23.86	PhiVc/2 < Vu <=	Not Reqd 1	23.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	11.99	10.00	-12.08	12.08	13.92	0.72	24.02	PhiVc/2 < Vu <=	Not Reqd 1	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.06	10.00	-12.12	12.12	13.00	0.78	24.19	PhiVc/2 < Vu <=	Not Reqd 1	24.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.14	10.00	-12.16	12.16	12.09	0.84	24.40	Vu < PhiVc/2	Not Reqd	24.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.21	10.00	-12.20	12.20	11.17	0.91	24.63	Vu < PhiVc/2	Not Reqd	24.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.29	10.00	-12.24	12.24	10.25	1.00	24.91	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.36	10.00	-12.28	12.28	9.33	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.44	10.00	-12.33	12.33	8.40	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.51	10.00	-12.37	12.37	7.47	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.59	10.00	-12.41	12.41	6.53	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.66	10.00	-12.45	12.45	5.60	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.74	10.00	-12.49	12.49	4.66	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.81	10.00	-12.53	12.53	3.71	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.89	10.00	-12.57	12.57	2.77	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	12.97	10.00	-12.61	12.61	1.82	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.04	10.00	-12.66	12.66	0.87	1.00	24.93	PhiVc/2 < Vu <=	Not Reqd 1	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.12	10.00	-12.70	12.70	0.09	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.19	10.00	-12.74	12.74	1.05	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.27	10.00	-12.78	12.78	2.01	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.34	10.00	-12.82	12.82	2.97	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.42	10.00	-12.86	12.86	3.94	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.49	10.00	-12.90	12.90	4.91	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.57	10.00	-12.94	12.94	5.89	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.64	10.00	-12.99	12.99	6.87	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.72	10.00	-13.03	13.03	7.85	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.79	10.00	-13.07	13.07	8.83	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	13.87	10.00	-13.11	13.11	9.81	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0

Printed: 11 JAN 2014, 1:11PM
File = p:\OGDENC~1\04310O~1\ADMIN~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Concrete Beam

Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-Way Slab in Pump Room- Moment from Load Case 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	1	13.95	10.00	-13.15	13.15	10.81	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.02	10.00	-13.19	13.19	11.80	0.93	23.94	PhiVc/2 < Vu <=	Not Reqd 1	23.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.10	10.00	-13.23	13.23	12.80	0.86	23.76	PhiVc/2 < Vu <=	Not Reqd 1	23.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.17	10.00	-13.28	13.28	13.79	0.80	23.61	PhiVc/2 < Vu <=	Not Reqd 1	23.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.25	10.00	-13.32	13.32	14.80	0.75	23.49	PhiVc/2 < Vu <=	Not Reqd 1	23.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.32	10.00	-13.36	13.36	15.80	0.70	23.37	PhiVc/2 < Vu <=	Not Reqd 1	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.40	10.00	-13.40	13.40	16.81	0.66	23.27	PhiVc/2 < Vu <=	Not Reqd 1	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.47	10.00	-13.44	13.44	17.82	0.63	23.19	PhiVc/2 < Vu <=	Not Reqd 1	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.55	10.00	-13.48	13.48	18.84	0.60	23.11	PhiVc/2 < Vu <=	Not Reqd 1	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.62	10.00	-13.52	13.52	19.85	0.57	23.03	PhiVc/2 < Vu <=	Not Reqd 1	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.70	10.00	-13.56	13.56	20.88	0.54	22.97	PhiVc/2 < Vu <=	Not Reqd 1	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.77	10.00	-13.61	13.61	21.90	0.52	22.91	PhiVc/2 < Vu <=	Not Reqd 1	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.85	10.00	-13.65	13.65	22.93	0.50	22.86	PhiVc/2 < Vu <=	Not Reqd 1	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	14.93	10.00	-13.69	13.69	23.96	0.48	22.81	PhiVc/2 < Vu <=	Not Reqd 1	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.00	10.00	-13.73	13.73	24.99	0.46	22.76	PhiVc/2 < Vu <=	Not Reqd 1	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.08	10.00	-13.77	13.77	26.03	0.44	22.72	PhiVc/2 < Vu <=	Not Reqd 1	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.15	10.00	-13.81	13.81	27.07	0.43	22.68	PhiVc/2 < Vu <=	Not Reqd 1	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.23	10.00	-13.85	13.85	28.11	0.41	22.65	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.30	10.00	-13.90	13.90	29.16	0.40	22.61	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.38	10.00	-13.94	13.94	30.20	0.38	22.58	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.45	10.00	-13.98	13.98	31.26	0.37	22.55	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.53	10.00	-14.02	14.02	32.31	0.36	22.52	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.60	10.00	-14.06	14.06	33.37	0.35	22.50	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.68	10.00	-14.10	14.10	34.43	0.34	22.47	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	15.75	10.00	-14.14	14.14	35.50	0.33	22.45	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	15.83	10.00	14.03	14.03	36.56	0.32	22.42	PhiVc/2 < Vu <=	Not Reqd 1	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	15.89	10.00	14.00	14.00	35.73	0.33	22.44	PhiVc/2 < Vu <=	Not Reqd 1	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	15.95	10.00	13.97	13.97	34.90	0.33	22.46	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.01	10.00	13.94	13.94	34.07	0.34	22.47	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.07	10.00	13.91	13.91	33.24	0.35	22.49	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.13	10.00	13.88	13.88	32.41	0.36	22.51	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.19	10.00	13.85	13.85	31.58	0.37	22.53	PhiVc/2 < Vu <=	Not Reqd 1	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.25	10.00	13.82	13.82	30.76	0.37	22.56	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.31	10.00	13.79	13.79	29.94	0.38	22.58	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.37	10.00	13.76	13.76	29.12	0.39	22.60	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.43	10.00	13.73	13.73	28.30	0.40	22.63	PhiVc/2 < Vu <=	Not Reqd 1	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.48	10.00	13.70	13.70	27.48	0.42	22.66	PhiVc/2 < Vu <=	Not Reqd 1	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.54	10.00	13.67	13.67	26.67	0.43	22.69	PhiVc/2 < Vu <=	Not Reqd 1	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.60	10.00	13.64	13.64	25.86	0.44	22.72	PhiVc/2 < Vu <=	Not Reqd 1	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.66	10.00	13.61	13.61	25.04	0.45	22.75	PhiVc/2 < Vu <=	Not Reqd 1	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.72	10.00	13.58	13.58	24.24	0.47	22.79	PhiVc/2 < Vu <=	Not Reqd 1	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.78	10.00	13.55	13.55	23.43	0.48	22.82	PhiVc/2 < Vu <=	Not Reqd 1	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.84	10.00	13.52	13.52	22.62	0.50	22.86	PhiVc/2 < Vu <=	Not Reqd 1	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.90	10.00	13.49	13.49	21.82	0.52	22.91	PhiVc/2 < Vu <=	Not Reqd 1	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	16.96	10.00	13.46	13.46	21.02	0.53	22.95	PhiVc/2 < Vu <=	Not Reqd 1	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.02	10.00	13.43	13.43	20.22	0.55	23.00	PhiVc/2 < Vu <=	Not Reqd 1	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.08	10.00	13.40	13.40	19.42	0.58	23.05	PhiVc/2 < Vu <=	Not Reqd 1	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.14	10.00	13.37	13.37	18.62	0.60	23.11	PhiVc/2 < Vu <=	Not Reqd 1	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.20	10.00	13.34	13.34	17.83	0.62	23.17	PhiVc/2 < Vu <=	Not Reqd 1	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.26	10.00	13.31	13.31	17.03	0.65	23.24	PhiVc/2 < Vu <=	Not Reqd 1	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.32	10.00	13.28	13.28	16.24	0.68	23.32	PhiVc/2 < Vu <=	Not Reqd 1	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.38	10.00	13.25	13.25	15.45	0.71	23.40	PhiVc/2 < Vu <=	Not Reqd 1	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.44	10.00	13.22	13.22	14.66	0.75	23.49	PhiVc/2 < Vu <=	Not Reqd 1	23.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.50	10.00	13.19	13.19	13.88	0.79	23.59	PhiVc/2 < Vu <=	Not Reqd 1	23.6	0.0	0.0

Concrete Beam

Description : One-Way Slab in Pump Room- Moment from Load Case 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	2	17.56	10.00	13.16	13.16	13.10	0.84	23.70	PhiVc/2 < Vu <=	Not Reqd 1	23.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.62	10.00	13.13	13.13	12.31	0.89	23.83	PhiVc/2 < Vu <=	Not Reqd 1	23.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.68	10.00	13.10	13.10	11.53	0.95	23.97	PhiVc/2 < Vu <=	Not Reqd 1	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.73	10.00	13.07	13.07	10.75	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.79	10.00	13.04	13.04	9.98	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.85	10.00	13.01	13.01	9.20	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.91	10.00	12.98	12.98	8.43	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	17.97	10.00	12.95	12.95	7.66	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.03	10.00	12.92	12.92	6.89	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.09	10.00	12.89	12.89	6.12	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.15	10.00	12.85	12.85	5.35	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.21	10.00	12.82	12.82	4.59	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.27	10.00	12.79	12.79	3.83	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.33	10.00	12.76	12.76	3.07	1.00	24.10	PhiVc/2 < Vu <=	Not Reqd 1	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.39	10.00	2.41	2.41	2.92	0.69	23.33	Vu < PhiVc/2	Not Reqd	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.45	10.00	2.38	2.38	2.78	0.71	23.40	Vu < PhiVc/2	Not Reqd	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.51	10.00	2.35	2.35	2.64	0.74	23.47	Vu < PhiVc/2	Not Reqd	23.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.57	10.00	2.32	2.32	2.50	0.77	23.55	Vu < PhiVc/2	Not Reqd	23.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.63	10.00	2.29	2.29	2.36	0.81	23.63	Vu < PhiVc/2	Not Reqd	23.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.69	10.00	2.26	2.26	2.23	0.85	23.73	Vu < PhiVc/2	Not Reqd	23.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.75	10.00	2.23	2.23	2.09	0.89	23.83	Vu < PhiVc/2	Not Reqd	23.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.81	10.00	2.20	2.20	1.96	0.94	23.95	Vu < PhiVc/2	Not Reqd	23.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.87	10.00	2.17	2.17	1.83	0.99	24.08	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.93	10.00	2.14	2.14	1.70	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	18.98	10.00	2.11	2.11	1.57	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.04	10.00	2.08	2.08	1.45	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.10	10.00	2.05	2.05	1.33	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.16	10.00	2.02	2.02	1.21	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.22	10.00	1.99	1.99	1.09	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.28	10.00	1.96	1.96	0.97	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.34	10.00	1.93	1.93	0.85	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.40	10.00	1.90	1.90	0.74	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.46	10.00	1.87	1.87	0.63	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.52	10.00	1.84	1.84	0.52	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.58	10.00	1.81	1.81	0.41	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.64	10.00	1.78	1.78	0.30	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.70	10.00	1.75	1.75	0.20	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.76	10.00	1.72	1.72	0.09	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.82	10.00	1.69	1.69	0.01	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.88	10.00	1.66	1.66	0.11	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	19.94	10.00	1.63	1.63	0.21	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.00	10.00	1.60	1.60	0.30	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.06	10.00	1.57	1.57	0.40	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.12	10.00	1.54	1.54	0.49	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.18	10.00	1.51	1.51	0.58	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.23	10.00	1.48	1.48	0.67	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	20.29	10.00	1.45	1.45	0.75	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.40D	2	20.35	10.00	-1.43	1.43	10.56	0.11	22.00	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.40D	2	20.41	10.00	-1.45	1.45	10.47	0.12	22.01	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.40D	2	20.47	10.00	-1.48	1.48	10.38	0.12	22.02	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.40D	2	20.53	10.00	-1.50	1.50	10.29	0.12	22.03	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.40D	2	20.59	10.00	-1.53	1.53	10.20	0.12	22.04	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0
+1.40D	2	20.65	10.00	-1.55	1.55	10.11	0.13	22.05	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.40D	2	20.71	10.00	-1.57	1.57	10.02	0.13	22.06	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0

Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-Way Slab in Pump Room- Moment from Load Case 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.40D	2	20.77	10.00	-1.60	1.60	9.92	0.13	22.07	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.40D	2	20.83	10.00	-1.62	1.62	9.83	0.14	22.08	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.40D	2	20.89	10.00	-1.65	1.65	9.73	0.14	22.10	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.40D	2	20.95	10.00	-1.67	1.67	9.63	0.14	22.11	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.40D	2	21.01	10.00	-1.70	1.70	9.53	0.15	22.12	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.40D	2	21.07	10.00	-1.72	1.72	9.43	0.15	22.13	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.40D	2	21.13	10.00	-1.74	1.74	9.33	0.16	22.14	Vu < PhiVc/2	Not Reqd	22.1	0.0	0.0
+1.40D	2	21.19	10.00	-1.77	1.77	9.22	0.16	22.16	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.40D	2	21.25	10.00	-1.79	1.79	9.12	0.16	22.17	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.40D	2	21.31	10.00	-1.82	1.82	9.01	0.17	22.18	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.40D	2	21.37	10.00	-1.84	1.84	8.90	0.17	22.20	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.40D	2	21.43	10.00	-1.86	1.86	8.79	0.18	22.21	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.40D	2	21.48	10.00	-1.89	1.89	8.68	0.18	22.23	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.40D	2	21.54	10.00	-1.91	1.91	8.57	0.19	22.24	Vu < PhiVc/2	Not Reqd	22.2	0.0	0.0
+1.40D	2	21.60	10.00	-1.94	1.94	8.45	0.19	22.26	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.40D	2	21.66	10.00	-1.96	1.96	8.34	0.20	22.28	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.40D	2	21.72	10.00	-1.99	1.99	8.22	0.20	22.29	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.40D	2	21.78	10.00	-2.01	2.01	8.10	0.21	22.31	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.40D	2	21.84	10.00	-2.03	2.03	7.98	0.21	22.33	Vu < PhiVc/2	Not Reqd	22.3	0.0	0.0
+1.40D	2	21.90	10.00	-2.06	2.06	7.86	0.22	22.35	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.40D	2	21.96	10.00	-2.08	2.08	7.73	0.22	22.37	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.40D	2	22.02	10.00	-2.11	2.11	7.61	0.23	22.39	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.40D	2	22.08	10.00	-2.13	2.13	7.48	0.24	22.41	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.40D	2	22.14	10.00	-2.15	2.15	7.36	0.24	22.44	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.40D	2	22.20	10.00	-2.18	2.18	7.23	0.25	22.46	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.40D	2	22.26	10.00	-2.20	2.20	7.10	0.26	22.48	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.40D	2	22.32	10.00	-2.23	2.23	6.96	0.27	22.51	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.40D	2	22.38	10.00	-2.25	2.25	6.83	0.27	22.54	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.40D	2	22.44	10.00	-2.28	2.28	6.70	0.28	22.56	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.40D	2	22.50	10.00	-2.30	2.30	6.56	0.29	22.59	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.40D	2	22.56	10.00	-2.32	2.32	6.42	0.30	22.62	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.40D	2	22.62	10.00	-2.35	2.35	6.28	0.31	22.66	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.40D	2	22.68	10.00	-2.37	2.37	6.14	0.32	22.69	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.40D	2	22.73	10.00	-2.40	2.40	6.00	0.33	22.73	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.40D	2	22.79	10.00	-2.42	2.42	5.86	0.34	22.77	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.40D	2	22.85	10.00	-2.44	2.44	5.71	0.36	22.81	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.40D	2	22.91	10.00	-2.47	2.47	5.57	0.37	22.85	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.40D	2	22.97	10.00	-2.49	2.49	5.42	0.38	22.90	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.40D	2	23.03	10.00	-2.52	2.52	5.27	0.40	22.94	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.40D	2	23.09	10.00	-2.54	2.54	5.12	0.41	23.00	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.40D	2	23.15	10.00	-2.57	2.57	4.97	0.43	23.05	Vu < PhiVc/2	Not Reqd	23.1	0.0	0.0
+1.40D	2	23.21	10.00	-2.59	2.59	4.81	0.45	23.11	Vu < PhiVc/2	Not Reqd	23.1	0.0	0.0
+1.40D	2	23.27	10.00	-2.61	2.61	4.66	0.47	23.17	Vu < PhiVc/2	Not Reqd	23.2	0.0	0.0
+1.40D	2	23.33	10.00	-2.64	2.64	4.50	0.49	23.24	Vu < PhiVc/2	Not Reqd	23.2	0.0	0.0
+1.40D	2	23.39	10.00	-2.66	2.66	4.35	0.51	23.31	Vu < PhiVc/2	Not Reqd	23.3	0.0	0.0
+1.40D	2	23.45	10.00	-2.69	2.69	4.19	0.53	23.39	Vu < PhiVc/2	Not Reqd	23.4	0.0	0.0
+1.40D	2	23.51	10.00	-2.71	2.71	4.03	0.56	23.48	Vu < PhiVc/2	Not Reqd	23.5	0.0	0.0
+1.40D	2	23.57	10.00	-2.73	2.73	3.86	0.59	23.58	Vu < PhiVc/2	Not Reqd	23.6	0.0	0.0
+1.40D	2	23.63	10.00	-2.76	2.76	3.70	0.62	23.68	Vu < PhiVc/2	Not Reqd	23.7	0.0	0.0
+1.40D	2	23.69	10.00	-2.78	2.78	3.53	0.66	23.80	Vu < PhiVc/2	Not Reqd	23.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.75	10.00	-2.81	2.81	3.76	0.62	23.68	Vu < PhiVc/2	Not Reqd	23.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.81	10.00	-2.84	2.84	3.60	0.66	23.80	Vu < PhiVc/2	Not Reqd	23.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.87	10.00	-2.87	2.87	3.43	0.70	23.94	Vu < PhiVc/2	Not Reqd	23.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	23.93	10.00	-2.90	2.90	3.26	0.74	24.08	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0

Concrete Beam

Description : One-Way Slab in Pump Room- Moment from Load Case 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	2	23.98	10.00	-2.93	2.93	3.08	0.79	24.25	Vu < PhiVc/2	Not Reqd	24.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.04	10.00	-2.96	2.96	2.90	0.85	24.44	Vu < PhiVc/2	Not Reqd	24.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.10	10.00	-2.99	2.99	2.73	0.91	24.65	Vu < PhiVc/2	Not Reqd	24.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.16	10.00	-3.02	3.02	2.55	0.99	24.89	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.22	10.00	-3.05	3.05	2.37	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.28	10.00	-3.08	3.08	2.18	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.34	10.00	-3.12	3.12	2.00	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.40	10.00	-3.15	3.15	1.81	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.46	10.00	-3.18	3.18	1.63	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.52	10.00	-3.21	3.21	1.44	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.58	10.00	-3.24	3.24	1.24	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.64	10.00	-3.27	3.27	1.05	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.70	10.00	-3.30	3.30	0.86	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.76	10.00	-3.33	3.33	0.66	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.82	10.00	-3.36	3.36	0.46	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.88	10.00	-3.39	3.39	0.26	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	24.94	10.00	-3.42	3.42	0.06	1.00	24.93	Vu < PhiVc/2	Not Reqd	24.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.00	10.00	-3.45	3.45	0.15	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.06	10.00	-3.48	3.48	0.35	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.12	10.00	-3.51	3.51	0.56	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.18	10.00	-3.54	3.54	0.77	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.23	10.00	-3.57	3.57	0.98	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.29	10.00	-3.60	3.60	1.20	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.35	10.00	-3.63	3.63	1.41	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.41	10.00	-3.66	3.66	1.63	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.47	10.00	-3.69	3.69	1.85	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.53	10.00	-3.72	3.72	2.07	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.59	10.00	-3.75	3.75	2.29	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.65	10.00	-3.78	3.78	2.51	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.71	10.00	-3.81	3.81	2.74	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.77	10.00	-3.84	3.84	2.97	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.83	10.00	-3.87	3.87	3.20	1.00	24.10	Vu < PhiVc/2	Not Reqd	24.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.89	10.00	-3.90	3.90	3.43	0.95	23.98	Vu < PhiVc/2	Not Reqd	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	25.95	10.00	-3.93	3.93	3.66	0.89	23.84	Vu < PhiVc/2	Not Reqd	23.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.01	10.00	-3.96	3.96	3.90	0.85	23.73	Vu < PhiVc/2	Not Reqd	23.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.07	10.00	-3.99	3.99	4.13	0.80	23.62	Vu < PhiVc/2	Not Reqd	23.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.13	10.00	-4.02	4.02	4.37	0.77	23.53	Vu < PhiVc/2	Not Reqd	23.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.19	10.00	-4.05	4.05	4.61	0.73	23.44	Vu < PhiVc/2	Not Reqd	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.25	10.00	-4.08	4.08	4.86	0.70	23.36	Vu < PhiVc/2	Not Reqd	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.31	10.00	-4.11	4.11	5.10	0.67	23.29	Vu < PhiVc/2	Not Reqd	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.37	10.00	-4.14	4.14	5.34	0.65	23.23	Vu < PhiVc/2	Not Reqd	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.43	10.00	-4.17	4.17	5.59	0.62	23.17	Vu < PhiVc/2	Not Reqd	23.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.48	10.00	-4.20	4.20	5.84	0.60	23.11	Vu < PhiVc/2	Not Reqd	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.54	10.00	-4.23	4.23	6.09	0.58	23.06	Vu < PhiVc/2	Not Reqd	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.60	10.00	-4.26	4.26	6.35	0.56	23.02	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.66	10.00	-4.29	4.29	6.60	0.54	22.97	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.72	10.00	-4.32	4.32	6.86	0.53	22.93	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.78	10.00	-4.35	4.35	7.12	0.51	22.89	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.84	10.00	-4.39	4.39	7.38	0.50	22.86	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.90	10.00	-4.42	4.42	7.64	0.48	22.82	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	26.96	10.00	-4.45	4.45	7.90	0.47	22.79	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.02	10.00	-4.48	4.48	8.17	0.46	22.76	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.08	10.00	-4.51	4.51	8.43	0.45	22.73	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.14	10.00	-4.54	4.54	8.70	0.43	22.71	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0

Printed: 11 JAN 2014, 1:11PM

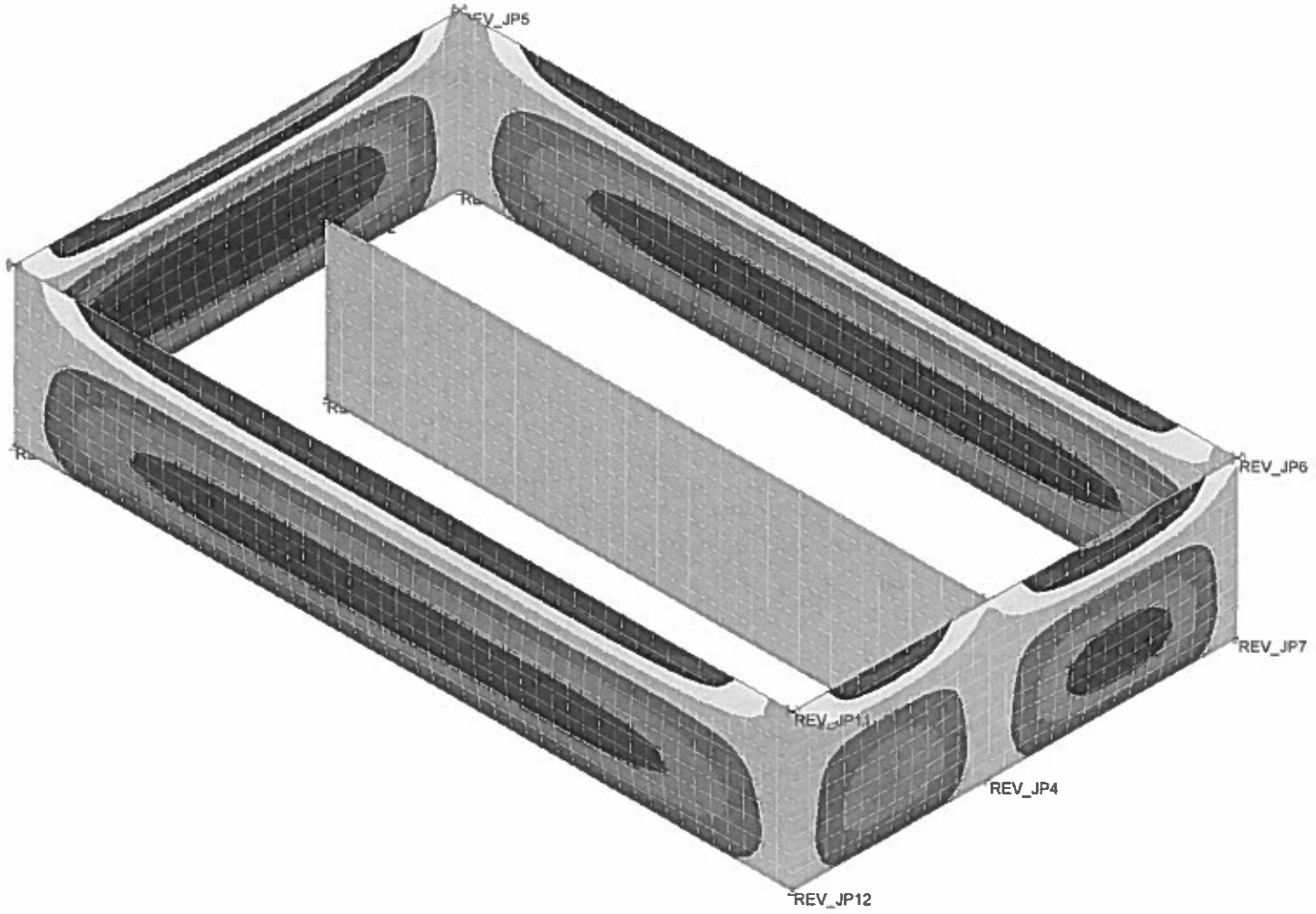
Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-Way Slab in Pump Room- Moment from Load Case 2

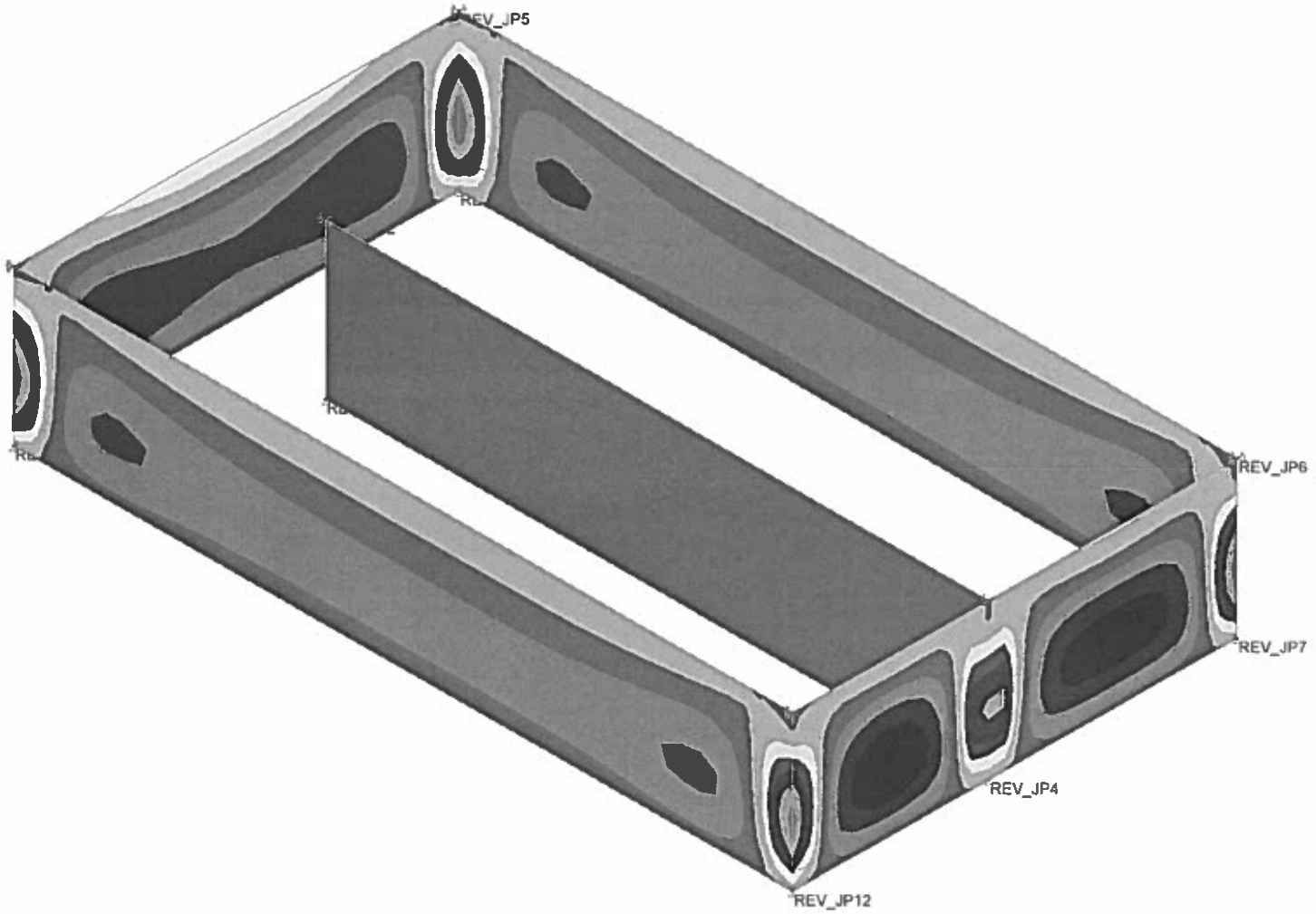
Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	2	27.20	10.00	-4.57	4.57	8.97	0.42	22.68	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.26	10.00	-4.60	4.60	9.25	0.41	22.66	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.32	10.00	-4.63	4.63	9.52	0.40	22.63	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.38	10.00	-4.66	4.66	9.80	0.40	22.61	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.44	10.00	-4.69	4.69	10.08	0.39	22.59	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.50	10.00	-4.72	4.72	10.36	0.38	22.57	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.56	10.00	-4.75	4.75	10.64	0.37	22.55	Vu < PhiVc/2	Not Reqd	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.62	10.00	-4.78	4.78	10.92	0.36	22.53	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.68	10.00	-4.81	4.81	11.21	0.36	22.51	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.73	10.00	-4.84	4.84	11.49	0.35	22.50	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.79	10.00	-4.87	4.87	11.78	0.34	22.48	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.85	10.00	-4.90	4.90	12.07	0.34	22.47	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.91	10.00	-4.93	4.93	12.36	0.33	22.45	Vu < PhiVc/2	Not Reqd	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	27.97	10.00	-4.96	4.96	12.66	0.33	22.44	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	28.03	10.00	-4.99	4.99	12.96	0.32	22.42	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	28.09	10.00	-5.02	5.02	13.25	0.32	22.41	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	28.15	10.00	-5.05	5.05	13.55	0.31	22.40	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	28.21	10.00	-5.08	5.08	13.85	0.31	22.39	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	28.27	10.00	-5.11	5.11	14.16	0.30	22.37	Vu < PhiVc/2	Not Reqd	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	28.33	10.00	-5.14	5.14	41.06	0.10	21.97	Vu < PhiVc/2	Not Reqd	22.0	0.0	0.0



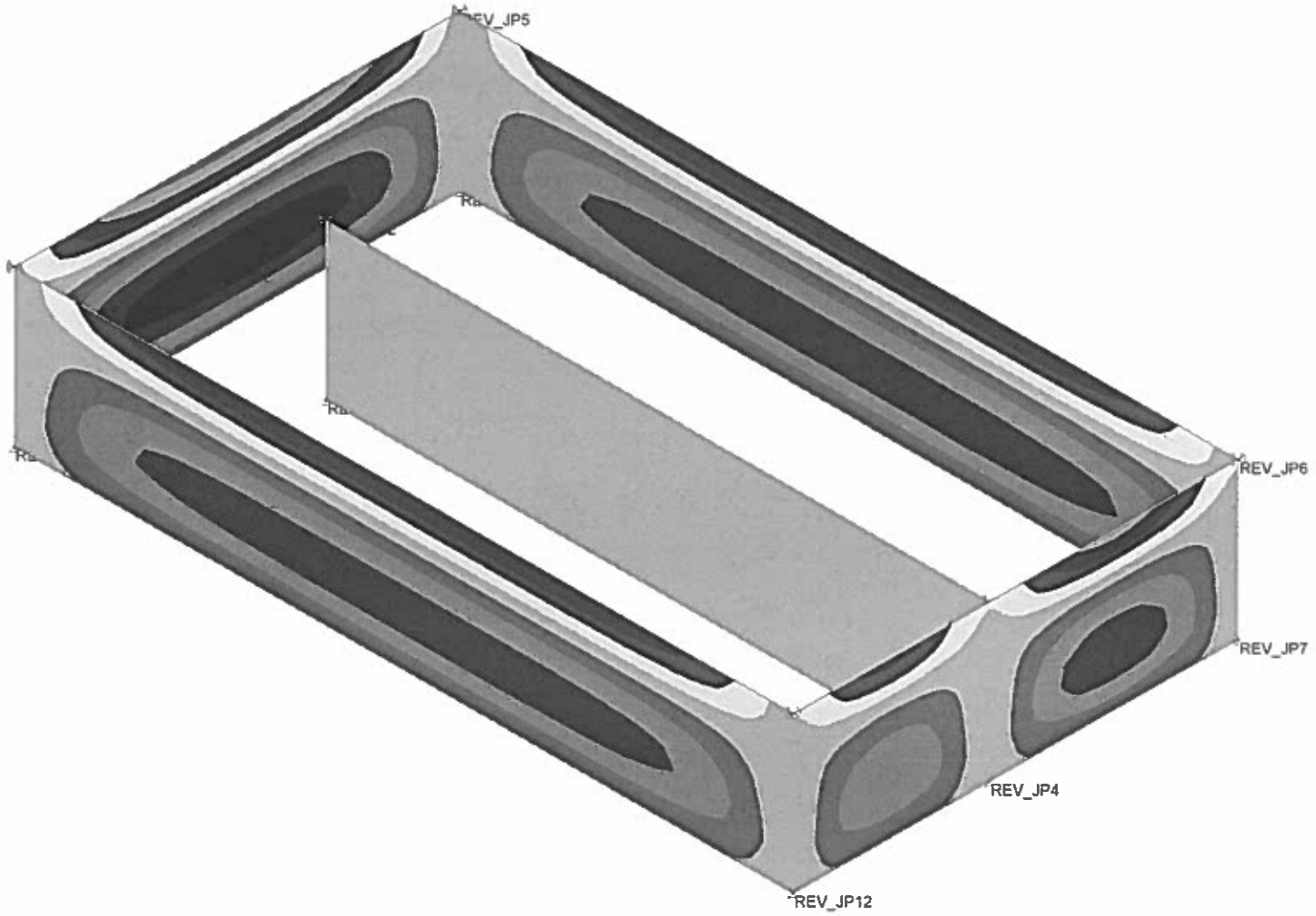
Results for LC 8, ASCE Strength 5 (a)

	Pump Vault	SK - 7
	Load Case 1	Jan 10, 2014 at 9:17 PM
		Pump Vault Case 1.r3d



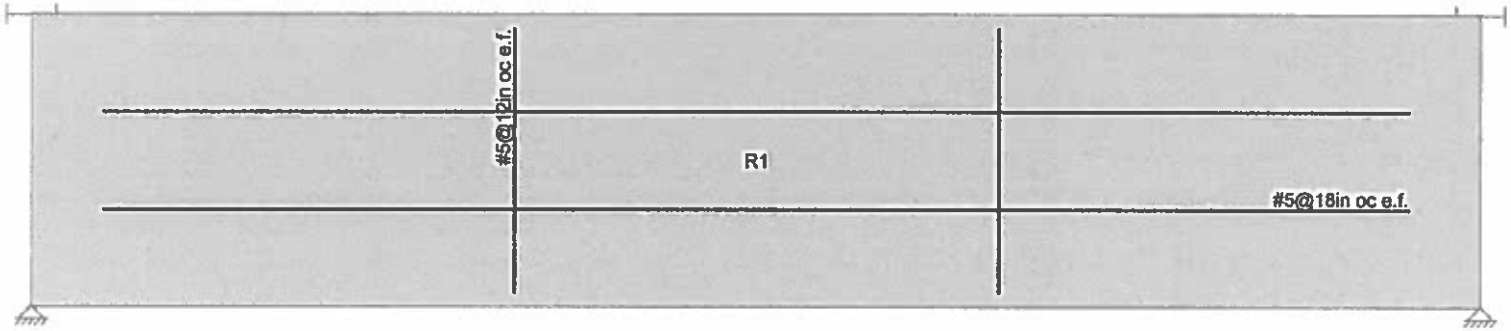
Results for LC 8, ASCE Strength 5 (a)

	Pump Vault	SK - 5
	Load Case 1	Jan 10, 2014 at 9:16 PM
		Pump Vault Case 1.r3d

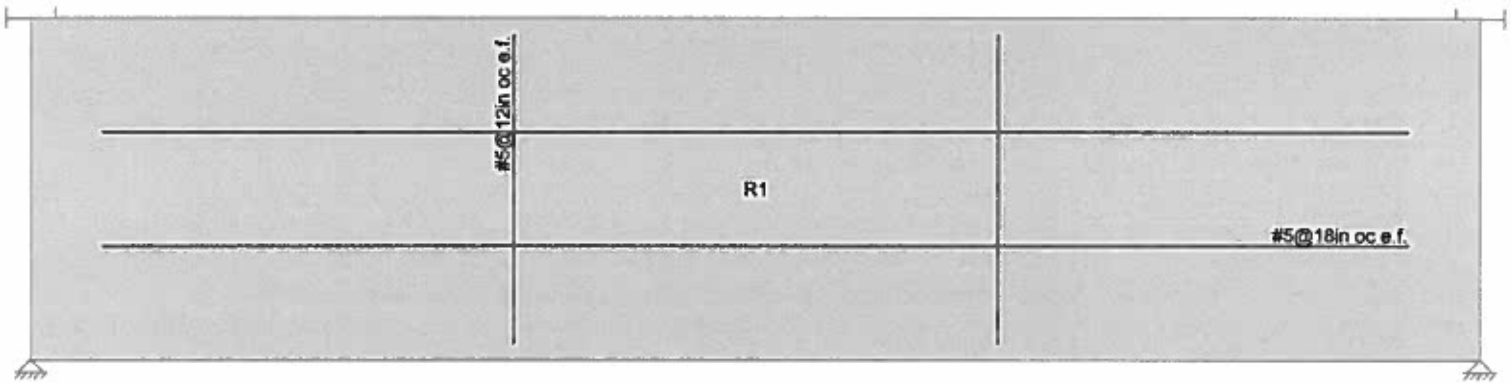


Results for LC 8, ASCE Strength 5 (a)

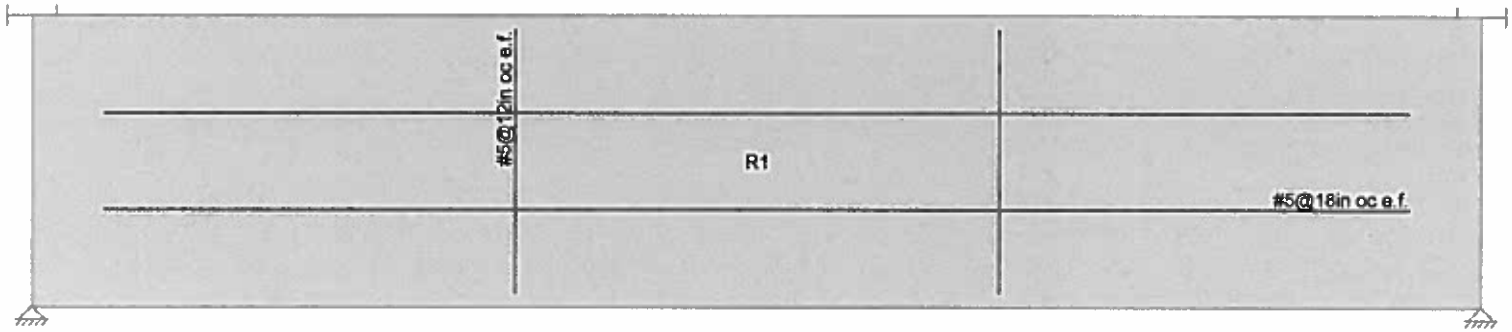
	Pump Vault	SK - 6
	Load Case 1	Jan 10, 2014 at 9:16 PM
		Pump Vault Case 1.r3d



	Pump Vault	Wall Panel: REV_W4
		Jan 10, 2014 at 9:17 PM
		Pump Vault Case 1.r3d

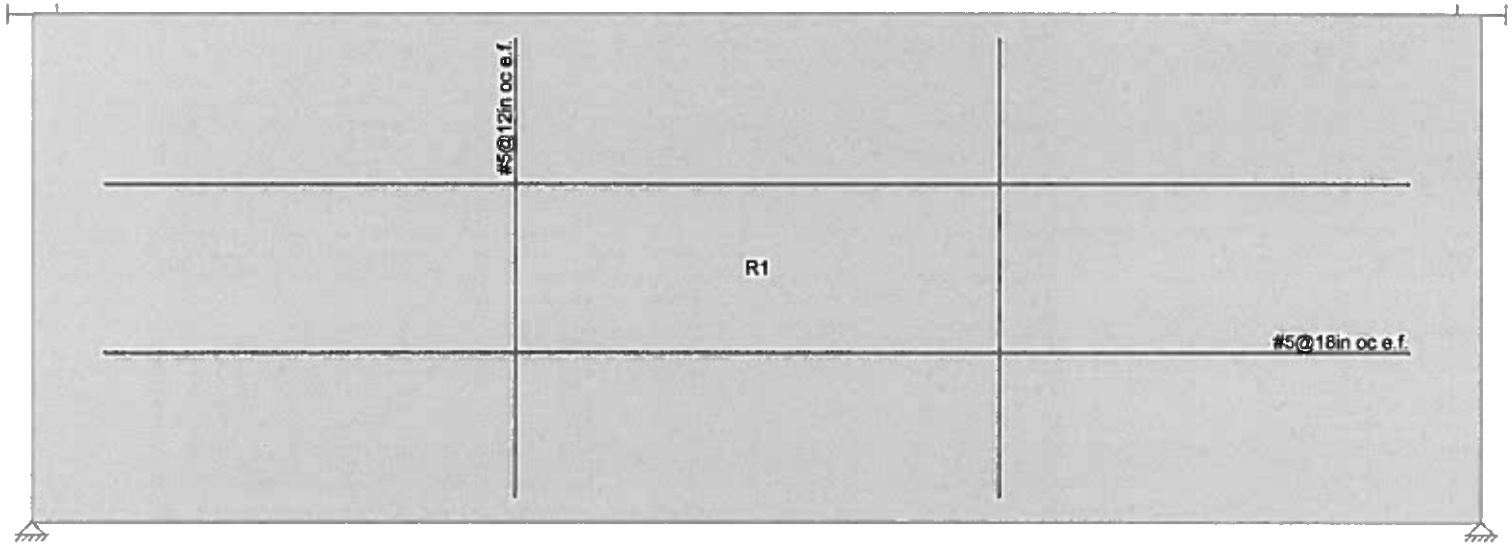


	Pump Vault	Wall Panel: REV_W1
		Jan 10, 2014 at 9:17 PM
		Pump Vault Case 1.r3d

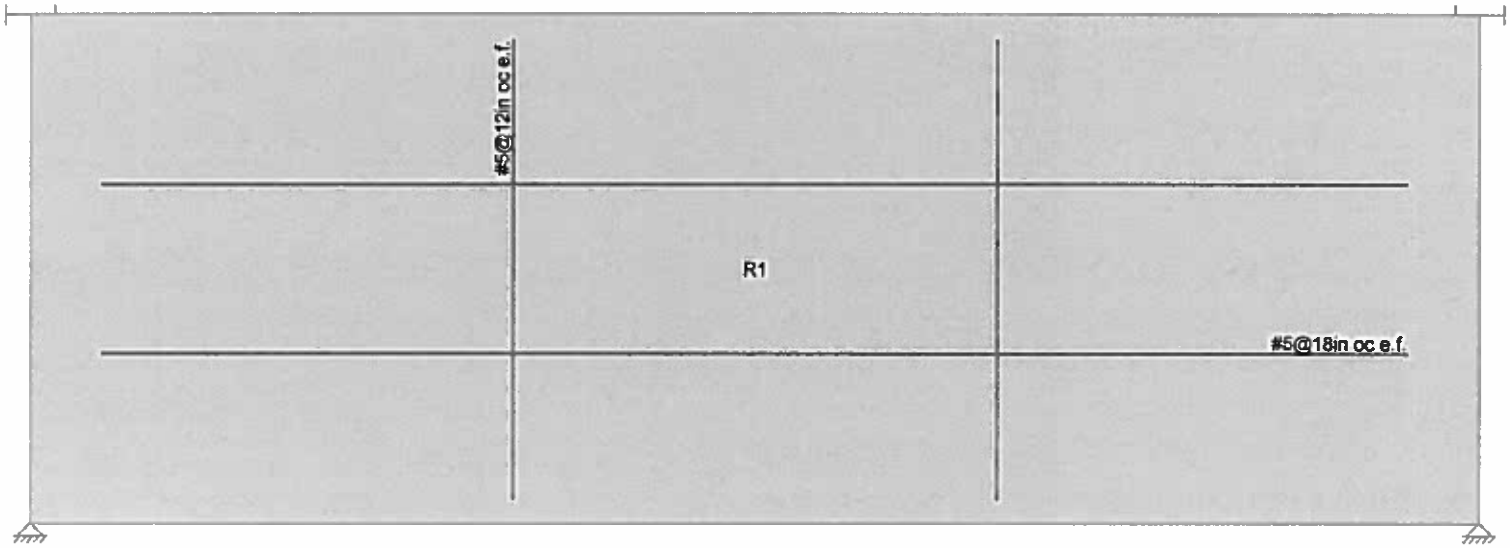


425

	Pump Vault	Wall Panel: REV_W2
		Jan 10, 2014 at 9:17 PM
		Pump Vault Case 1.r3d



	Pump Vault	Wall Panel: REV_W5
		Jan 10, 2014 at 9:17 PM
		Pump Vault Case 1.r3d



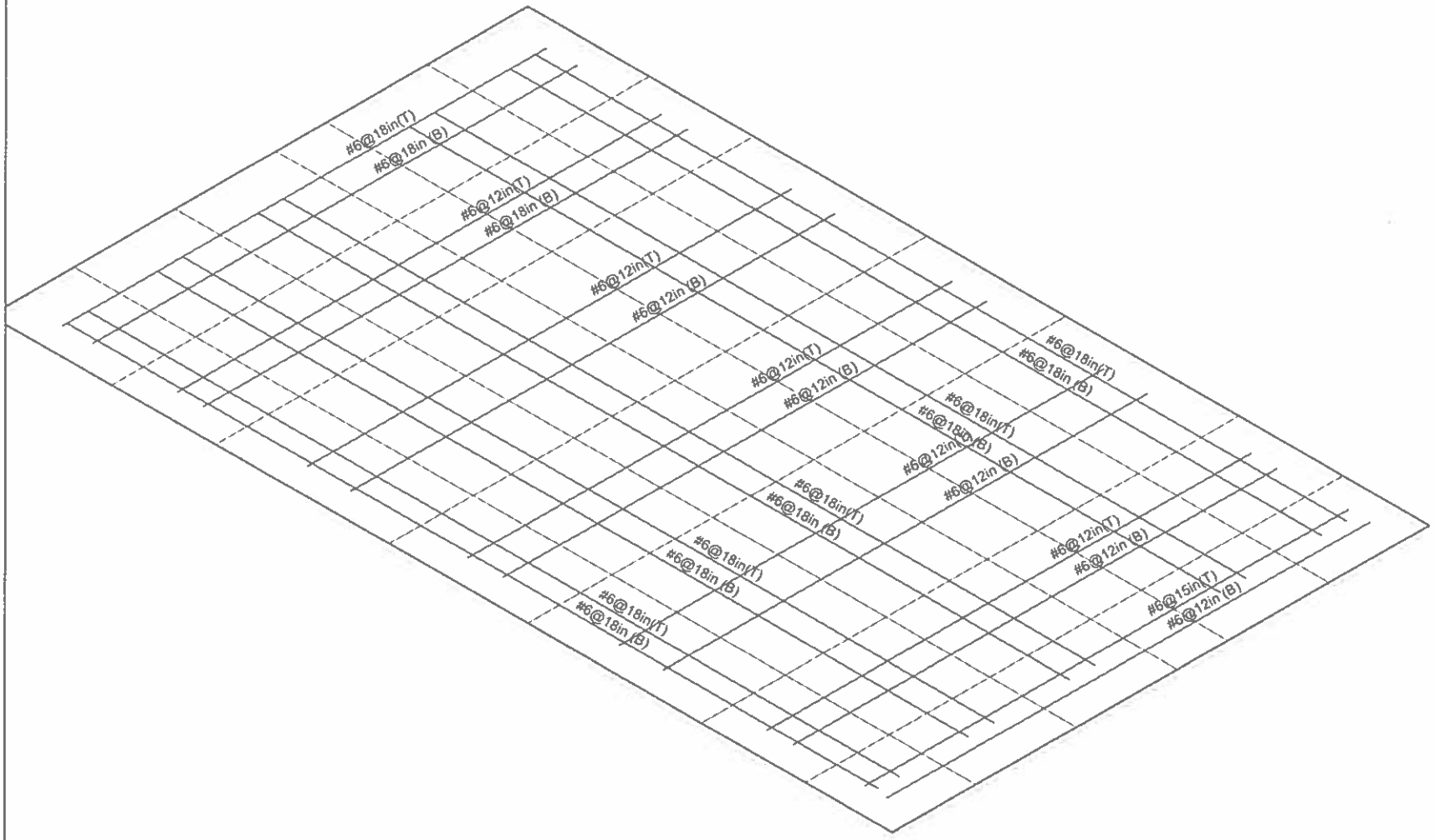
	Pump Vault	Wall Panel: REV_W3
		Jan 10, 2014 at 9:18 PM
		Pump Vault Case 1.r3d

Strip Reinforcing

	Label	UC Top	Top Bars	Governing Desi...	UC Bot	Bot Bars/Mid...	Governin...	UC Shear	Governin...
1	DS1	.642	#6@18in	DS1-X13	.155	#6@18in	DS1-X48	.314	DS1-X5
2	DS2	.631	#6@12in	DS2-X14	.699	#6@18in	DS2-X28	.481	DS2-X5
3	DS3	.704	#6@12in	DS3-X14	.795	#6@12in	DS3-X28	.585	DS3-X29
4	DS4	.712	#6@12in	DS4-X14	.829	#6@12in	DS4-X28	.583	DS4-X29
5	DS5	.703	#6@12in	DS5-X14	.797	#6@12in	DS5-X28	.577	DS5-X29
6	DS6	.656	#6@12in	DS6-X13	.663	#6@12in	DS6-X28	.5	DS6-X30
7	DS7	.702	#6@15in	DS7-X14	.583	#6@12in	DS7-X28	.355	DS7-X26
8	DS8	.316	#6@18in	DS8-X43	.233	#6@18in	DS8-X3	.203	DS8-X48
9	DS9	.461	#6@18in	DS9-X42	.4	#6@18in	DS9-X3	.285	DS9-X3
10	DS10	.399	#6@18in	DS10-X43	.446	#6@18in	DS10-X3	.282	DS10-X3
11	DS11	.431	#6@18in	DS11-X7	.42	#6@18in	DS11-X3	.29	DS11-X9
12	DS12	.423	#6@18in	DS12-X43	.355	#6@18in	DS12-X3	.282	DS12-X3
13	DS13	.364	#6@18in	DS13-X43	.273	#6@18in	DS13-X3	.191	DS13-X3

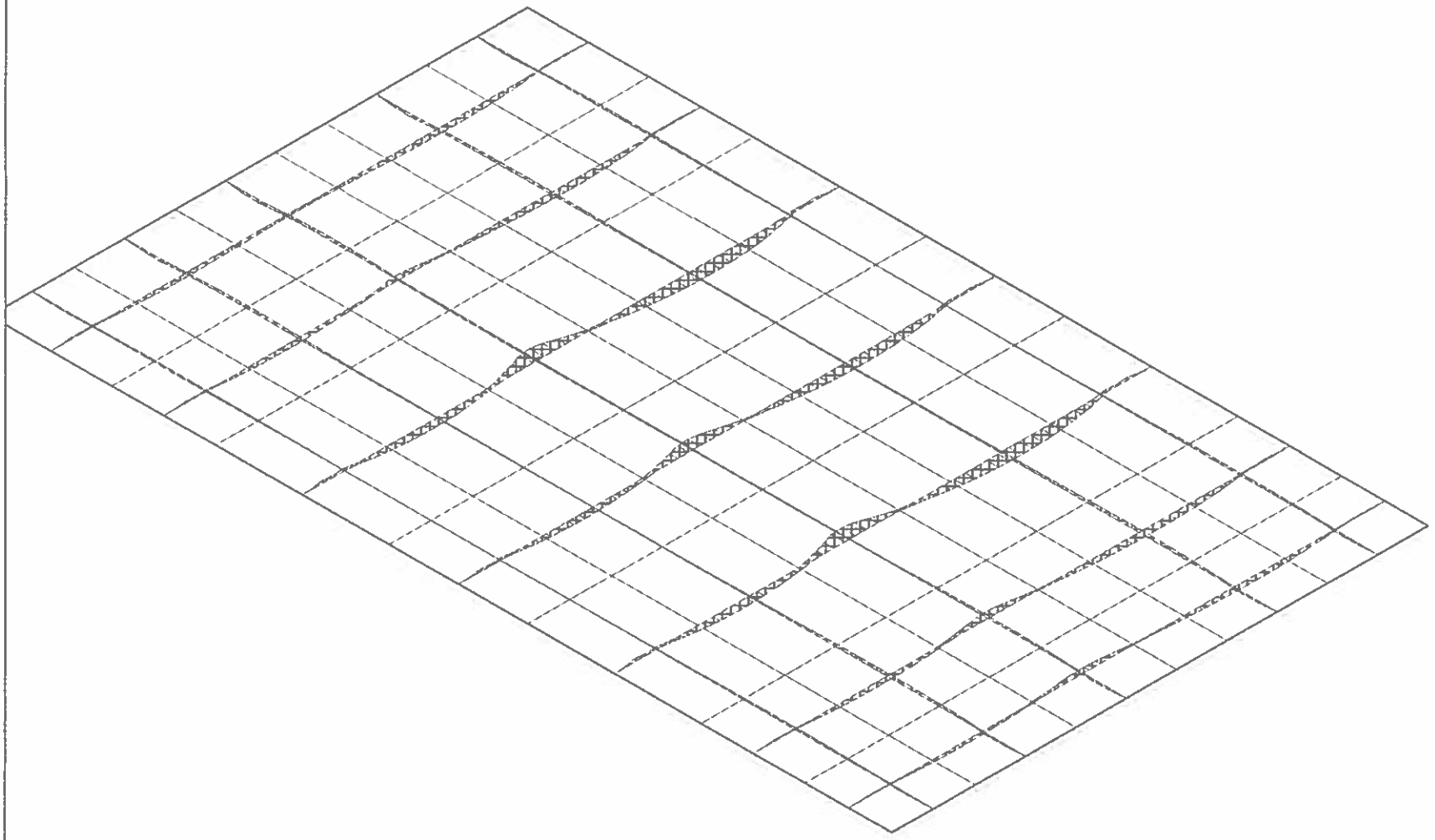
Slab Soil Pressures

	LC	Label	UC	Soil Pressure[ksf]	Allowable Bearing[ksf]	Point
1	1	S1	.797	1.993	2.5	N201
2	22	S1	.659	1.648	2.5	N199
3	23	S1	.797	1.993	2.5	N201
4	24	S1	.723	1.807	2.5	N200
5	25	S1	.781	1.953	2.5	N200
6	26	S1	.659	1.648	2.5	N199
7	27	S1	.791	1.978	2.5	N201
8	28	S1	.821	2.052	2.5	N201
9	29	S1	.756	1.891	2.5	N201
10	30	S1	.689	1.723	2.5	N199
11	31	S1	.684	1.709	2.5	N200
12	32	S1	.697	1.743	2.5	N201
13	33	S1	.663	1.658	2.5	N201
14	34	S1	.805	2.014	2.5	N202
15	35	S1	.769	1.922	2.5	N201
16	36	S1	.839	2.098	2.5	N201
17	37	S1	.814	2.034	2.5	N201
18	38	S1	.822	2.054	2.5	N202
19	39	S1	.798	1.996	2.5	N201
20	40	S1	.869	2.171	2.5	N201
21	41	S1	.843	2.108	2.5	N201
22	42	S1	.785	1.964	2.5	N202
23	43	S1	.734	1.835	2.5	N201
24	44	S1	.804	2.01	2.5	N201
25	45	S1	.779	1.947	2.5	N201
26	46	S1	.434	1.085	2.5	N202
27	47	S1	.421	1.054	2.5	N200
28	48	S1	.444	1.11	2.5	N201
29	49	S1	.41	1.025	2.5	N201
30	50	S1	.434	1.085	2.5	N202
31	51	S1	.421	1.054	2.5	N200
32	52	S1	.444	1.11	2.5	N201
33	53	S1	.41	1.025	2.5	N201



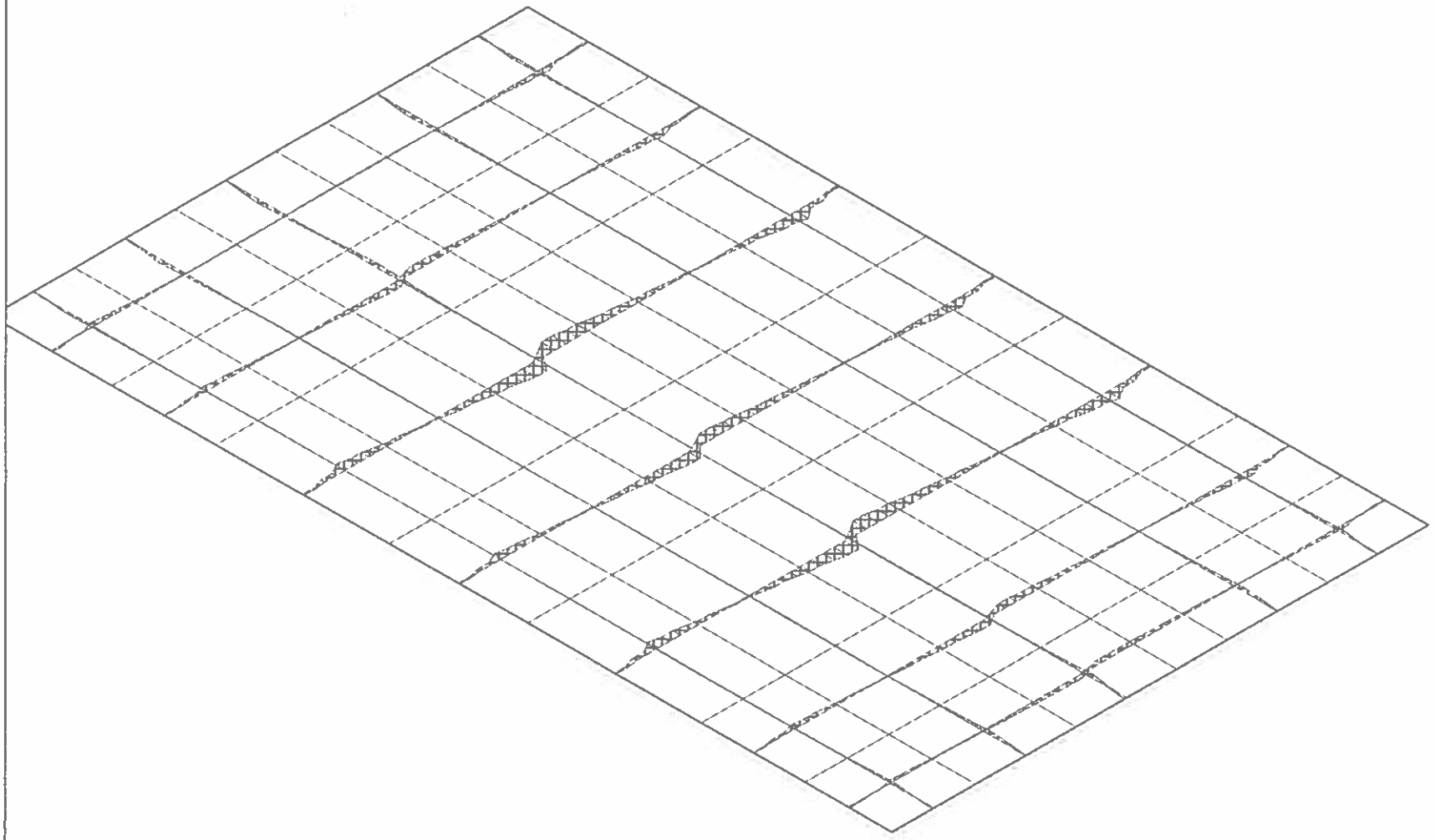
Results for LC 1, Service

	Pump Vault Load Case 1	SK - 1
		Jan 10, 2014 at 9:07 PM
		Pump Vault Case 1.r3d



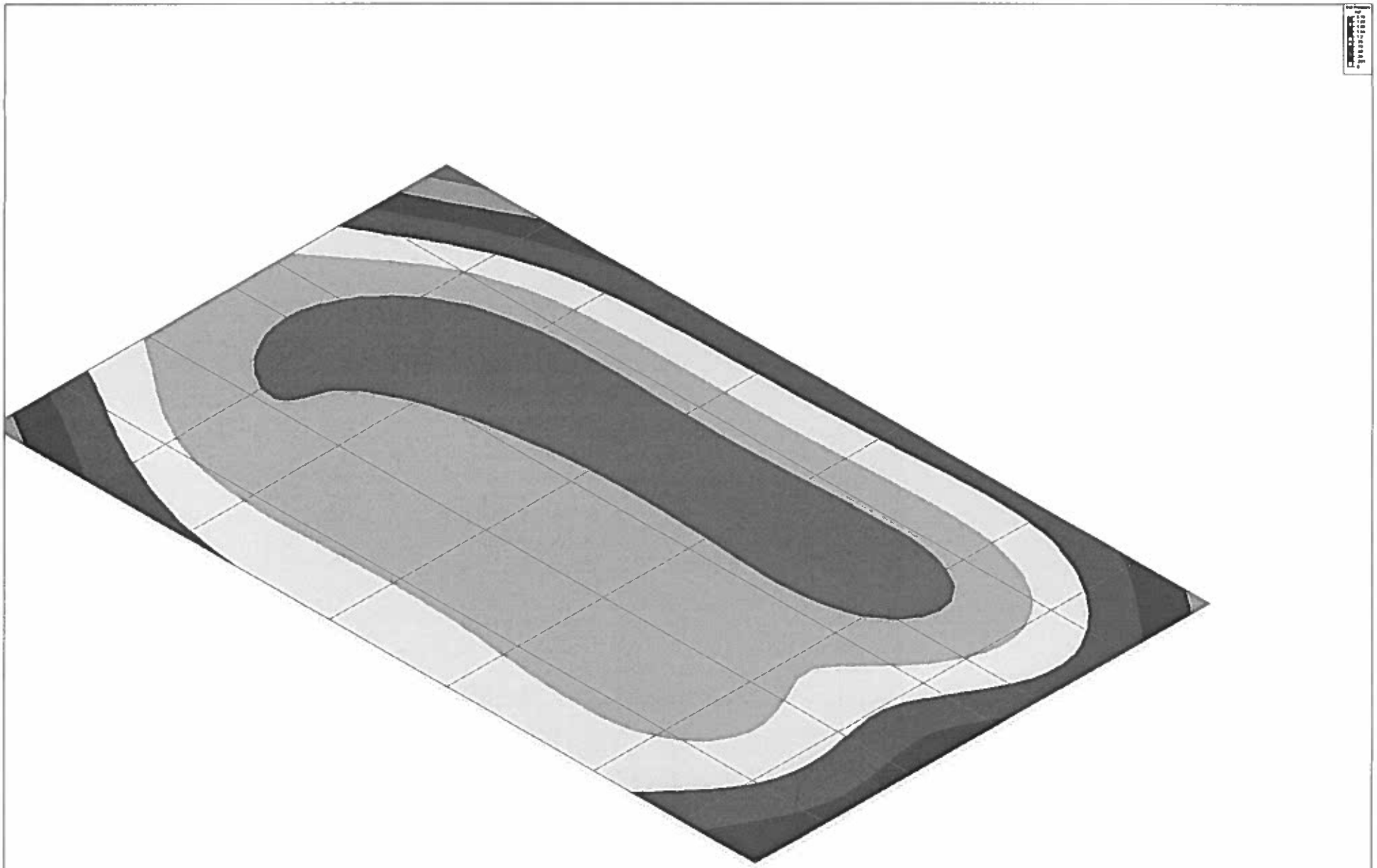
Results for LC 1, Service
Strip Moments(k-ft)

	Pump Vault Load Case 1	SK - 2
		Jan 10, 2014 at 9:08 PM
	Load Case 1	Pump Vault Case 1.r3d



Results for LC 1, Service
Strip Shears(k)

	Pump Vault Load Case 1	SK - 3
		Jan 10, 2014 at 9:09 PM
	Load Case 1	Pump Vault Case 1.r3d



Results for LC 36, ASCE 6 (b) (c)

	Pump Vault Load Case 1	SK - 4
		Jan 10, 2014 at 9:11 PM
	Load Case 1	Pump Vault Case 1.r3d

Wall Panel ACI 318-11: Concrete Code Checks (Out Plane)

	Wall Panel	Region	Max UC	LC	Shear UC	LC	Pn*phi[k/ft]	Mn*phi[k-ft/ft]	Vn*phi[k/ft]
1	REV_W1	R1	.066 (Ext)	13	.048	13	NC	13.432	9.351
2	REV_W2	R1	.398 (Ext)	1	.239	1	NC	13.331	11.138
3	REV_W3	R1	.449 (Ext)	8	.297	8	NC	13.515	9.274
4	REV_W4	R1	.405 (Ext)	9	.243	9	NC	13.331	9.339
5	REV_W5	R1	.291 (Ext)	8	.231	8	NC	13.515	9.264

Wall Panel ACI 318-11: Concrete Code Checks (In Plane)

	Wall Panel	Region	Max UC	LC	Shear UC	LC	Pn*phi[k]	Mn*phi[k-ft]	Vn*phi[k]
1	REV_W1	R1	.055	3	.029	8	11554.847	12844.752	1453.818
2	REV_W2	R1	.036	3	.031	8	13548.369	NC	1627.044
3	REV_W3	R1	.022	6	.013	15	7737.541	NC	928.179
4	REV_W4	R1	.03	6	.013	8	13548.369	NC	1627.044
5	REV_W5	R1	.024	3	.011	15	7737.541	NC	928.179

Neutralization Vault Calculations

Printed: 13 JAN 2014, 11:34AM

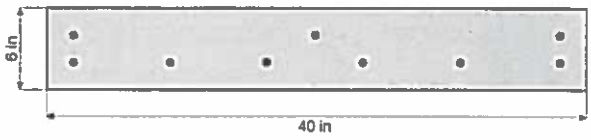
Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

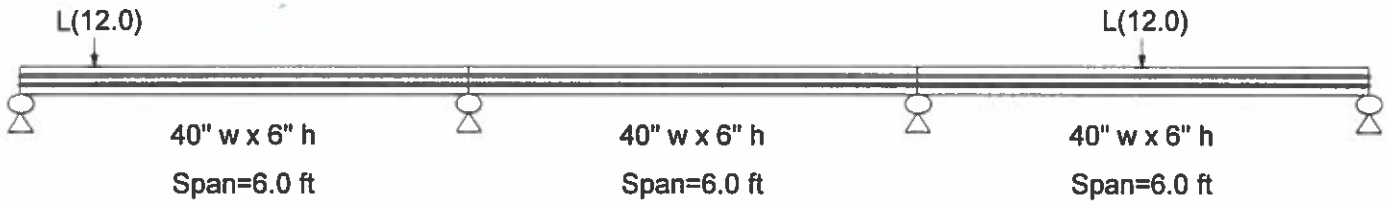
Description : One-way slab at Chemical Room- H 15 Loading

Material Properties

f'c	=	4.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	=	474.342 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size # =	#	3
			Number of Resisting Legs Per Stirrup =		2



Load Combination ASCE 7-02



Cross Section & Reinforcing Details

Rectangular Section, Width = 40.0 in, Height = 6.0 in

Span #1 Reinforcing....
6-#5 at 2.0 in from Bottom, from 0.0 to 6.0 ft in this span
3-#5 at 2.0 in from Top, from 0.0 to 6.0 ft in this span

Span #2 Reinforcing....
6-#5 at 2.0 in from Bottom, from 0.0 to 6.0 ft in this span
3-#5 at 2.0 in from Top, from 0.0 to 6.0 ft in this span

Span #3 Reinforcing....
6-#5 at 2.0 in from Bottom, from 0.0 to 6.0 ft in this span
3-#5 at 2.0 in from Top, from 0.0 to 6.0 ft in this span

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads

Loads on all spans...

Point Load : L = 12.0 k, Starting at : 1.0 ft and placed every 14.0 ft thereafter

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = 0.736 : 1

Section used for this span	Typical Section
Mu : Applied	24.445 k-ft
Mn * Phi : Allowable	33.234 k-ft
Load Combination	+1.20D+0.50Lr+1.60L+1.60H
Location of maximum on span	3.000 ft
Span # where maximum occurs	Span # 3

Maximum Deflection

Max Downward L+Lr+S Deflection	0.051 in	Ratio =	1415
Max Upward L+Lr+S Deflection	-0.018 in	Ratio =	4011
Max Downward Total Deflection	0.053 in	Ratio =	1370
Max Upward Total Deflection	-0.018 in	Ratio =	4035

Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum	10.496	2.149	10.739	4.966
D Only	0.580	1.595	1.595	0.580
L Only	9.889	0.722	8.890	4.500
D+L	10.496	2.149	10.739	4.966

Shear Stirrup Requirements

Entire Beam Span Length : PhiVc/2 < Vu <= PhiVc, Req'd Vs = Not Reqd 11.5.6.1, use stirrups spaced at 0.000 in

Maximum Forces & Stresses for Load Combinations

Concrete Beam

File = p:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-way slab at Chemical Room- H 15 Loading

Load Combination / Segment Length	Span #	Location (ft) in Span	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	6.000	16.20	33.23	0.49
Span # 2	2	6.000	-11.21	24.50	0.46
Span # 3	3	6.000	24.45	33.23	0.74
+1.40D					
Span # 1	1	6.000	-1.16	24.50	0.05
Span # 2	2	6.000	-1.22	24.50	0.05
Span # 3	3	6.000	-1.22	24.50	0.05
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	6.000	16.20	33.23	0.49
Span # 2	2	6.000	-11.21	24.50	0.46
Span # 3	3	6.000	24.45	33.23	0.74
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	6.000	16.20	33.23	0.49
Span # 2	2	6.000	-11.21	24.50	0.46
Span # 3	3	6.000	24.45	33.23	0.74
+1.20D+1.60Lr+0.50L					
Span # 1	1	6.000	5.44	33.23	0.16
Span # 2	2	6.000	-4.19	24.50	0.17
Span # 3	3	6.000	8.18	33.23	0.25
+1.20D+1.60Lr+0.80W					
Span # 1	1	6.000	-0.99	24.50	0.04
Span # 2	2	6.000	-1.04	24.50	0.04
Span # 3	3	6.000	-1.04	24.50	0.04
+1.20D+0.50L+1.60S					
Span # 1	1	6.000	5.44	33.23	0.16
Span # 2	2	6.000	-4.19	24.50	0.17
Span # 3	3	6.000	8.18	33.23	0.25
+1.20D+1.60S+0.80W					
Span # 1	1	6.000	-0.99	24.50	0.04
Span # 2	2	6.000	-1.04	24.50	0.04
Span # 3	3	6.000	-1.04	24.50	0.04
+1.20D+0.50Lr+0.50L+1.60W					
Span # 1	1	6.000	5.44	33.23	0.16
Span # 2	2	6.000	-4.19	24.50	0.17
Span # 3	3	6.000	8.18	33.23	0.25
+1.20D+0.50L+0.50S+1.60W					
Span # 1	1	6.000	5.44	33.23	0.16
Span # 2	2	6.000	-4.19	24.50	0.17
Span # 3	3	6.000	8.18	33.23	0.25
+1.20D+0.50L+0.20S+E					
Span # 1	1	6.000	5.44	33.23	0.16
Span # 2	2	6.000	-4.19	24.50	0.17
Span # 3	3	6.000	8.18	33.23	0.25
+0.90D+1.60W+1.60H					
Span # 1	1	6.000	-0.74	24.50	0.03
Span # 2	2	6.000	-0.78	24.50	0.03
Span # 3	3	6.000	-0.78	24.50	0.03
+0.90D+E+1.60H					
Span # 1	1	6.000	-0.74	24.50	0.03
Span # 2	2	6.000	-0.78	24.50	0.03
Span # 3	3	6.000	-0.78	24.50	0.03

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.0213	2.550	D+L	-0.0013	6.150
D+L	2	0.0025	6.150	D+L	-0.0178	3.450
D+L	3	0.0525	3.150		0.0000	3.450

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	0.00	4.00	16.35	16.35	0.00	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.05	4.00	16.33	16.33	0.82	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.10	4.00	16.32	16.32	1.63	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.15	4.00	16.30	16.30	2.45	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.20	4.00	16.29	16.29	3.26	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0

Concrete Beam

Description : One-way slab at Chemical Room- H 15 Loading

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	0.25	4.00	16.27	16.27	4.08	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.30	4.00	16.26	16.26	4.89	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.35	4.00	16.24	16.24	5.70	0.95	19.39	PhiVc/2 < Vu <=	Not Reqd 1	19.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.40	4.00	16.23	16.23	6.52	0.83	18.76	PhiVc/2 < Vu <=	Not Reqd 1	18.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.45	4.00	16.22	16.22	7.33	0.74	18.28	PhiVc/2 < Vu <=	Not Reqd 1	18.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.50	4.00	16.20	16.20	8.14	0.66	17.89	PhiVc/2 < Vu <=	Not Reqd 1	17.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.55	4.00	16.19	16.19	8.95	0.60	17.57	PhiVc/2 < Vu <=	Not Reqd 1	17.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.60	4.00	16.17	16.17	9.76	0.55	17.31	PhiVc/2 < Vu <=	Not Reqd 1	17.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.65	4.00	16.16	16.16	10.56	0.51	17.09	PhiVc/2 < Vu <=	Not Reqd 1	17.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.70	4.00	16.14	16.14	11.37	0.47	16.90	PhiVc/2 < Vu <=	Not Reqd 1	16.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.75	4.00	16.13	16.13	12.18	0.44	16.73	PhiVc/2 < Vu <=	Not Reqd 1	16.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.80	4.00	16.11	16.11	12.98	0.41	16.58	PhiVc/2 < Vu <=	Not Reqd 1	16.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.85	4.00	16.10	16.10	13.79	0.39	16.46	PhiVc/2 < Vu <=	Not Reqd 1	16.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.90	4.00	16.09	16.09	14.59	0.37	16.34	PhiVc/2 < Vu <=	Not Reqd 1	16.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.95	4.00	16.07	16.07	15.40	0.35	16.24	PhiVc/2 < Vu <=	Not Reqd 1	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.00	4.00	-3.14	3.14	16.20	0.06	14.76	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.05	4.00	-3.16	3.16	16.04	0.07	14.76	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.10	4.00	-3.17	3.17	15.89	0.07	14.77	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.15	4.00	-3.19	3.19	15.73	0.07	14.77	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.20	4.00	-3.20	3.20	15.57	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.25	4.00	-3.22	3.22	15.41	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.30	4.00	-3.23	3.23	15.25	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.35	4.00	-3.25	3.25	15.08	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.40	4.00	-3.26	3.26	14.92	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.45	4.00	-3.27	3.27	14.76	0.07	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.50	4.00	-3.29	3.29	14.59	0.08	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.55	4.00	-3.30	3.30	14.43	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.60	4.00	-3.32	3.32	14.26	0.08	14.83	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.65	4.00	-3.33	3.33	14.10	0.08	14.83	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.70	4.00	-3.35	3.35	13.93	0.08	14.84	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.75	4.00	-3.36	3.36	13.76	0.08	14.85	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.80	4.00	-3.38	3.38	13.59	0.08	14.85	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.85	4.00	-3.39	3.39	13.42	0.08	14.86	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.90	4.00	-3.40	3.40	13.25	0.09	14.87	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.95	4.00	-3.42	3.42	13.08	0.09	14.88	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.00	4.00	-3.43	3.43	12.91	0.09	14.88	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.05	4.00	-3.45	3.45	12.74	0.09	14.89	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.10	4.00	-3.46	3.46	12.57	0.09	14.90	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.15	4.00	-3.48	3.48	12.39	0.09	14.91	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.20	4.00	-3.49	3.49	12.22	0.10	14.92	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.25	4.00	-3.51	3.51	12.05	0.10	14.93	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.30	4.00	-3.52	3.52	11.87	0.10	14.94	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.35	4.00	-3.54	3.54	11.69	0.10	14.95	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.40	4.00	-3.55	3.55	11.52	0.10	14.96	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.45	4.00	-3.56	3.56	11.34	0.10	14.97	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.50	4.00	-3.58	3.58	11.16	0.11	14.98	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.55	4.00	-3.59	3.59	10.98	0.11	14.99	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.60	4.00	-3.61	3.61	10.80	0.11	15.00	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.65	4.00	-3.62	3.62	10.62	0.11	15.01	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.70	4.00	-3.64	3.64	10.44	0.12	15.03	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.75	4.00	-3.65	3.65	10.26	0.12	15.04	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.80	4.00	-3.67	3.67	10.07	0.12	15.05	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.85	4.00	-3.68	3.68	9.89	0.12	15.07	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.90	4.00	-3.69	3.69	9.71	0.13	15.08	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0

Concrete Beam

Description : One-way slab at Chemical Room- H 15 Loading

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	2.95	4.00	-3.71	3.71	9.52	0.13	15.10	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.00	4.00	-3.72	3.72	9.33	0.13	15.12	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.05	4.00	-3.74	3.74	9.15	0.14	15.13	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.10	4.00	-3.75	3.75	8.96	0.14	15.15	Vu < PhiVc/2	Not Reqd	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.15	4.00	-3.77	3.77	8.77	0.14	15.17	Vu < PhiVc/2	Not Reqd	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.20	4.00	-3.78	3.78	8.58	0.15	15.19	Vu < PhiVc/2	Not Reqd	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.25	4.00	-3.80	3.80	8.39	0.15	15.21	Vu < PhiVc/2	Not Reqd	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.30	4.00	-3.81	3.81	8.20	0.15	15.23	Vu < PhiVc/2	Not Reqd	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.35	4.00	-3.83	3.83	8.01	0.16	15.25	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.40	4.00	-3.84	3.84	7.82	0.16	15.28	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.45	4.00	-3.85	3.85	7.63	0.17	15.30	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.50	4.00	-3.87	3.87	7.44	0.17	15.33	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.55	4.00	-3.88	3.88	7.24	0.18	15.35	Vu < PhiVc/2	Not Reqd	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.60	4.00	-3.90	3.90	7.05	0.18	15.38	Vu < PhiVc/2	Not Reqd	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.65	4.00	-3.91	3.91	6.85	0.19	15.42	Vu < PhiVc/2	Not Reqd	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.70	4.00	-3.93	3.93	6.66	0.20	15.45	Vu < PhiVc/2	Not Reqd	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.75	4.00	-3.94	3.94	6.46	0.20	15.48	Vu < PhiVc/2	Not Reqd	15.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.80	4.00	-3.96	3.96	6.26	0.21	15.52	Vu < PhiVc/2	Not Reqd	15.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.85	4.00	-3.97	3.97	6.06	0.22	15.56	Vu < PhiVc/2	Not Reqd	15.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.90	4.00	-3.98	3.98	5.87	0.23	15.60	Vu < PhiVc/2	Not Reqd	15.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.95	4.00	-4.00	4.00	5.67	0.24	15.65	Vu < PhiVc/2	Not Reqd	15.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.00	4.00	-4.01	4.01	5.47	0.24	15.70	Vu < PhiVc/2	Not Reqd	15.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.05	4.00	-4.03	4.03	5.26	0.26	15.75	Vu < PhiVc/2	Not Reqd	15.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.10	4.00	-4.04	4.04	5.06	0.27	15.81	Vu < PhiVc/2	Not Reqd	15.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.15	4.00	-4.06	4.06	4.86	0.28	15.88	Vu < PhiVc/2	Not Reqd	15.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.20	4.00	-4.07	4.07	4.66	0.29	15.94	Vu < PhiVc/2	Not Reqd	15.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.25	4.00	-4.09	4.09	4.45	0.31	16.02	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.30	4.00	-4.10	4.10	4.25	0.32	16.10	Vu < PhiVc/2	Not Reqd	16.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.35	4.00	-4.12	4.12	4.04	0.34	16.19	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.40	4.00	-4.13	4.13	3.84	0.36	16.30	Vu < PhiVc/2	Not Reqd	16.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.45	4.00	-4.14	4.14	3.63	0.38	16.41	Vu < PhiVc/2	Not Reqd	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.50	4.00	-4.16	4.16	3.42	0.41	16.54	Vu < PhiVc/2	Not Reqd	16.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.55	4.00	-4.17	4.17	3.21	0.43	16.68	Vu < PhiVc/2	Not Reqd	16.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.60	4.00	-4.19	4.19	3.01	0.46	16.85	Vu < PhiVc/2	Not Reqd	16.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.65	4.00	-4.20	4.20	2.80	0.50	17.04	Vu < PhiVc/2	Not Reqd	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.70	4.00	-4.22	4.22	2.58	0.54	17.26	Vu < PhiVc/2	Not Reqd	17.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.75	4.00	-4.23	4.23	2.37	0.59	17.53	Vu < PhiVc/2	Not Reqd	17.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.80	4.00	-4.25	4.25	2.16	0.65	17.84	Vu < PhiVc/2	Not Reqd	17.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.85	4.00	-4.26	4.26	1.95	0.73	18.23	Vu < PhiVc/2	Not Reqd	18.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.90	4.00	-4.27	4.27	1.74	0.82	18.71	Vu < PhiVc/2	Not Reqd	18.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.95	4.00	-4.29	4.29	1.52	0.94	19.34	Vu < PhiVc/2	Not Reqd	19.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.00	4.00	-4.30	4.30	1.31	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.05	4.00	-4.32	4.32	1.09	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.10	4.00	-4.33	4.33	0.88	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.15	4.00	-4.35	4.35	0.66	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.20	4.00	-4.36	4.36	0.44	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.25	4.00	-4.38	4.38	0.22	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.30	4.00	-4.39	4.39	0.00	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.35	4.00	-4.41	4.41	0.22	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.40	4.00	-4.42	4.42	0.44	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.45	4.00	-4.43	4.43	0.66	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.50	4.00	-4.45	4.45	0.88	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.55	4.00	-4.46	4.46	1.10	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.60	4.00	-4.48	4.48	1.31	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0

Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-way slab at Chemical Room- H 15 Loading

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	5.65	4.00	-4.49	4.49	1.55	0.96	19.47	Vu < PhiVc/2	Not Reqd	19.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.70	4.00	-4.51	4.51	1.78	0.85	18.84	Vu < PhiVc/2	Not Reqd	18.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.75	4.00	-4.52	4.52	2.00	0.75	18.36	Vu < PhiVc/2	Not Reqd	18.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.80	4.00	-4.54	4.54	2.23	0.68	17.97	Vu < PhiVc/2	Not Reqd	18.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.85	4.00	-4.55	4.55	2.46	0.62	17.65	Vu < PhiVc/2	Not Reqd	17.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.90	4.00	-4.56	4.56	2.68	0.57	17.39	Vu < PhiVc/2	Not Reqd	17.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.95	4.00	-4.58	4.58	2.91	0.52	17.16	Vu < PhiVc/2	Not Reqd	17.2	0.0	0.0
+1.40D	2	6.00	4.00	1.01	1.01	1.22	0.28	15.87	Vu < PhiVc/2	Not Reqd	15.9	0.0	0.0
+1.40D	2	6.05	4.00	1.00	1.00	1.17	0.28	15.91	Vu < PhiVc/2	Not Reqd	15.9	0.0	0.0
+1.40D	2	6.10	4.00	0.98	0.98	1.12	0.29	15.95	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.40D	2	6.15	4.00	0.96	0.96	1.07	0.30	15.99	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.40D	2	6.20	4.00	0.95	0.95	1.02	0.31	16.04	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.40D	2	6.25	4.00	0.93	0.93	0.97	0.32	16.08	Vu < PhiVc/2	Not Reqd	16.1	0.0	0.0
+1.40D	2	6.30	4.00	0.91	0.91	0.93	0.33	16.14	Vu < PhiVc/2	Not Reqd	16.1	0.0	0.0
+1.40D	2	6.35	4.00	0.90	0.90	0.88	0.34	16.19	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.40D	2	6.40	4.00	0.88	0.88	0.84	0.35	16.25	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.40D	2	6.45	4.00	0.86	0.86	0.80	0.36	16.31	Vu < PhiVc/2	Not Reqd	16.3	0.0	0.0
+1.40D	2	6.50	4.00	0.85	0.85	0.75	0.37	16.38	Vu < PhiVc/2	Not Reqd	16.4	0.0	0.0
+1.40D	2	6.55	4.00	0.83	0.83	0.71	0.39	16.45	Vu < PhiVc/2	Not Reqd	16.5	0.0	0.0
+1.40D	2	6.60	4.00	0.81	0.81	0.67	0.40	16.53	Vu < PhiVc/2	Not Reqd	16.5	0.0	0.0
+1.40D	2	6.65	4.00	0.80	0.80	0.63	0.42	16.62	Vu < PhiVc/2	Not Reqd	16.6	0.0	0.0
+1.40D	2	6.70	4.00	0.78	0.78	0.59	0.44	16.72	Vu < PhiVc/2	Not Reqd	16.7	0.0	0.0
+1.40D	2	6.75	4.00	0.76	0.76	0.55	0.46	16.83	Vu < PhiVc/2	Not Reqd	16.8	0.0	0.0
+1.40D	2	6.80	4.00	0.74	0.74	0.51	0.48	16.94	Vu < PhiVc/2	Not Reqd	16.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	6.85	4.00	-0.74	0.74	3.67	0.07	14.77	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	6.90	4.00	-0.75	0.75	3.70	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	6.95	4.00	-0.77	0.77	3.74	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.00	4.00	-0.78	0.78	3.78	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.05	4.00	-0.80	0.80	3.82	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.10	4.00	-0.81	0.81	3.86	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.15	4.00	-0.83	0.83	3.90	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.20	4.00	-0.84	0.84	3.94	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.25	4.00	-0.86	0.86	3.98	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.30	4.00	-0.87	0.87	4.03	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.35	4.00	-0.88	0.88	4.07	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.40	4.00	-0.90	0.90	4.12	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.45	4.00	-0.91	0.91	4.16	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.50	4.00	-0.93	0.93	4.21	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.55	4.00	-0.94	0.94	4.25	0.07	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.60	4.00	-0.96	0.96	4.30	0.07	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.65	4.00	-0.97	0.97	4.35	0.07	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.70	4.00	-0.99	0.99	4.40	0.07	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.75	4.00	-1.00	1.00	4.45	0.07	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.80	4.00	-1.01	1.01	4.50	0.08	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.85	4.00	-1.03	1.03	4.55	0.08	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.90	4.00	-1.04	1.04	4.60	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.95	4.00	-1.06	1.06	4.65	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.00	4.00	-1.07	1.07	4.71	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.05	4.00	-1.09	1.09	4.76	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.10	4.00	-1.10	1.10	4.82	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.15	4.00	-1.12	1.12	4.87	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.20	4.00	-1.13	1.13	4.93	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.25	4.00	-1.15	1.15	4.99	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.30	4.00	-1.16	1.16	5.04	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0

Concrete Beam

File = p:\OGDENC~1\04310~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-way slab at Chemical Room- H 15 Loading

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	2	8.35	4.00	-1.17	1.17	5.10	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.40	4.00	-1.19	1.19	5.16	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.45	4.00	-1.20	1.20	5.22	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.50	4.00	-1.22	1.22	5.28	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.55	4.00	-1.23	1.23	5.34	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.60	4.00	-1.25	1.25	5.40	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.65	4.00	-1.26	1.26	5.47	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.70	4.00	-1.28	1.28	5.53	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.75	4.00	-1.29	1.29	5.59	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.80	4.00	-1.30	1.30	5.66	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.85	4.00	-1.32	1.32	5.72	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.90	4.00	-1.33	1.33	5.79	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.95	4.00	-1.35	1.35	5.86	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.00	4.00	-1.36	1.36	5.93	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.05	4.00	-1.38	1.38	5.99	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.10	4.00	-1.39	1.39	6.06	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.15	4.00	-1.41	1.41	6.13	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.20	4.00	-1.42	1.42	6.20	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.25	4.00	-1.44	1.44	6.28	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.30	4.00	-1.45	1.45	6.35	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.35	4.00	-1.46	1.46	6.42	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.40	4.00	-1.48	1.48	6.49	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.45	4.00	-1.49	1.49	6.57	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.50	4.00	-1.51	1.51	6.64	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.55	4.00	-1.52	1.52	6.72	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.60	4.00	-1.54	1.54	6.80	0.08	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.65	4.00	-1.55	1.55	6.87	0.08	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.70	4.00	-1.57	1.57	6.95	0.08	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.75	4.00	-1.58	1.58	7.03	0.07	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.80	4.00	-1.59	1.59	7.11	0.07	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.85	4.00	-1.61	1.61	7.19	0.07	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.90	4.00	-1.62	1.62	7.27	0.07	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.95	4.00	-1.64	1.64	7.35	0.07	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.00	4.00	-1.65	1.65	7.43	0.07	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.05	4.00	-1.67	1.67	7.52	0.07	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.10	4.00	-1.68	1.68	7.60	0.07	14.81	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.15	4.00	-1.70	1.70	7.68	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.20	4.00	-1.71	1.71	7.77	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.25	4.00	-1.73	1.73	7.86	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.30	4.00	-1.74	1.74	7.94	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.35	4.00	-1.75	1.75	8.03	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.40	4.00	-1.77	1.77	8.12	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.45	4.00	-1.78	1.78	8.21	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.50	4.00	-1.80	1.80	8.30	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.55	4.00	-1.81	1.81	8.39	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.60	4.00	-1.83	1.83	8.48	0.07	14.80	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.65	4.00	-1.84	1.84	8.57	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.70	4.00	-1.86	1.86	8.66	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.75	4.00	-1.87	1.87	8.75	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.80	4.00	-1.88	1.88	8.85	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.85	4.00	-1.90	1.90	8.94	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.90	4.00	-1.91	1.91	9.04	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.95	4.00	-1.93	1.93	9.13	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.00	4.00	-1.94	1.94	9.21	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0

Concrete Beam

Description : One-way slab at Chemical Room- H 15 Loading

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	2	11.05	4.00	-1.96	1.96	9.33	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.10	4.00	-1.97	1.97	9.43	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.15	4.00	-1.99	1.99	9.53	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.20	4.00	-2.00	2.00	9.63	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.25	4.00	-2.02	2.02	9.73	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.30	4.00	-2.03	2.03	9.83	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.35	4.00	-2.04	2.04	9.93	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.40	4.00	-2.06	2.06	10.03	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.45	4.00	-2.07	2.07	10.14	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.50	4.00	-2.09	2.09	10.24	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.55	4.00	-2.10	2.10	10.34	0.07	14.77	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.60	4.00	-2.12	2.12	10.45	0.07	14.77	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.65	4.00	-2.13	2.13	10.56	0.07	14.77	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.70	4.00	-2.15	2.15	10.66	0.07	14.77	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.75	4.00	-2.16	2.16	10.77	0.07	14.77	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.80	4.00	-2.17	2.17	10.88	0.07	14.77	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.85	4.00	-2.19	2.19	10.99	0.07	14.77	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.90	4.00	-2.20	2.20	11.10	0.07	14.77	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.95	4.00	-2.22	2.22	11.21	0.07	14.77	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.00	4.00	12.36	12.36	11.32	0.36	16.32	PhiVc/2 < Vu <=	Not Reqd 1	16.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.05	4.00	12.34	12.34	10.70	0.38	16.43	PhiVc/2 < Vu <=	Not Reqd 1	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.10	4.00	12.33	12.33	10.09	0.41	16.55	PhiVc/2 < Vu <=	Not Reqd 1	16.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.15	4.00	12.31	12.31	9.47	0.43	16.69	PhiVc/2 < Vu <=	Not Reqd 1	16.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.20	4.00	12.30	12.30	8.85	0.46	16.84	PhiVc/2 < Vu <=	Not Reqd 1	16.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.25	4.00	12.28	12.28	8.24	0.50	17.02	PhiVc/2 < Vu <=	Not Reqd 1	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.30	4.00	12.27	12.27	7.63	0.54	17.23	PhiVc/2 < Vu <=	Not Reqd 1	17.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.35	4.00	12.26	12.26	7.01	0.58	17.47	PhiVc/2 < Vu <=	Not Reqd 1	17.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.40	4.00	12.24	12.24	6.40	0.64	17.76	PhiVc/2 < Vu <=	Not Reqd 1	17.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.45	4.00	12.23	12.23	5.79	0.70	18.10	PhiVc/2 < Vu <=	Not Reqd 1	18.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.50	4.00	12.21	12.21	5.18	0.79	18.53	PhiVc/2 < Vu <=	Not Reqd 1	18.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.55	4.00	12.20	12.20	4.57	0.89	19.08	PhiVc/2 < Vu <=	Not Reqd 1	19.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.60	4.00	12.18	12.18	3.96	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.65	4.00	12.17	12.17	3.35	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.70	4.00	12.15	12.15	2.74	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.75	4.00	12.14	12.14	2.13	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.80	4.00	12.12	12.12	1.53	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.85	4.00	12.11	12.11	0.92	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.90	4.00	12.10	12.10	0.32	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.95	4.00	12.08	12.08	0.29	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.00	4.00	12.07	12.07	0.89	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.05	4.00	12.05	12.05	1.50	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.10	4.00	12.04	12.04	2.10	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.15	4.00	12.02	12.02	2.70	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.20	4.00	12.01	12.01	3.30	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.25	4.00	11.99	11.99	3.90	1.00	19.65	PhiVc/2 < Vu <=	Not Reqd 1	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.30	4.00	11.98	11.98	4.50	0.89	19.06	PhiVc/2 < Vu <=	Not Reqd 1	19.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.35	4.00	11.97	11.97	5.10	0.78	18.51	PhiVc/2 < Vu <=	Not Reqd 1	18.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.40	4.00	11.95	11.95	5.70	0.70	18.08	PhiVc/2 < Vu <=	Not Reqd 1	18.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.45	4.00	11.94	11.94	6.29	0.63	17.73	PhiVc/2 < Vu <=	Not Reqd 1	17.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.50	4.00	11.92	11.92	6.89	0.58	17.44	PhiVc/2 < Vu <=	Not Reqd 1	17.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.55	4.00	11.91	11.91	7.48	0.53	17.19	PhiVc/2 < Vu <=	Not Reqd 1	17.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.60	4.00	11.89	11.89	8.08	0.49	16.99	PhiVc/2 < Vu <=	Not Reqd 1	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.65	4.00	11.88	11.88	8.67	0.46	16.81	PhiVc/2 < Vu <=	Not Reqd 1	16.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.70	4.00	11.86	11.86	9.27	0.43	16.65	PhiVc/2 < Vu <=	Not Reqd 1	16.7	0.0	0.0

Concrete Beam

Description : One-way slab at Chemical Room- H 15 Loading

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	3	13.75	4.00	11.85	11.85	9.86	0.40	16.52	PhiVc/2 < Vu <=	Not Reqd 1	16.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.80	4.00	11.83	11.83	10.45	0.38	16.39	PhiVc/2 < Vu <=	Not Reqd 1	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.85	4.00	11.82	11.82	11.04	0.36	16.29	PhiVc/2 < Vu <=	Not Reqd 1	16.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.90	4.00	11.81	11.81	11.63	0.34	16.19	PhiVc/2 < Vu <=	Not Reqd 1	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.95	4.00	11.79	11.79	12.22	0.32	16.10	PhiVc/2 < Vu <=	Not Reqd 1	16.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.00	4.00	11.78	11.78	12.81	0.31	16.02	PhiVc/2 < Vu <=	Not Reqd 1	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.05	4.00	11.76	11.76	13.40	0.29	15.95	PhiVc/2 < Vu <=	Not Reqd 1	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.10	4.00	11.75	11.75	13.99	0.28	15.88	PhiVc/2 < Vu <=	Not Reqd 1	15.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.15	4.00	11.73	11.73	14.58	0.27	15.82	PhiVc/2 < Vu <=	Not Reqd 1	15.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.20	4.00	11.72	11.72	15.16	0.26	15.77	PhiVc/2 < Vu <=	Not Reqd 1	15.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.25	4.00	11.70	11.70	15.75	0.25	15.72	PhiVc/2 < Vu <=	Not Reqd 1	15.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.30	4.00	11.69	11.69	16.33	0.24	15.67	PhiVc/2 < Vu <=	Not Reqd 1	15.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.35	4.00	11.68	11.68	16.92	0.23	15.62	PhiVc/2 < Vu <=	Not Reqd 1	15.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.40	4.00	11.66	11.66	17.50	0.22	15.58	PhiVc/2 < Vu <=	Not Reqd 1	15.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.45	4.00	11.65	11.65	18.08	0.21	15.54	PhiVc/2 < Vu <=	Not Reqd 1	15.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.50	4.00	11.63	11.63	18.67	0.21	15.51	PhiVc/2 < Vu <=	Not Reqd 1	15.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.55	4.00	11.62	11.62	19.25	0.20	15.47	PhiVc/2 < Vu <=	Not Reqd 1	15.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.60	4.00	11.60	11.60	19.83	0.20	15.44	PhiVc/2 < Vu <=	Not Reqd 1	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.65	4.00	11.59	11.59	20.41	0.19	15.41	PhiVc/2 < Vu <=	Not Reqd 1	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.70	4.00	11.57	11.57	20.99	0.18	15.38	PhiVc/2 < Vu <=	Not Reqd 1	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.75	4.00	11.56	11.56	21.56	0.18	15.35	PhiVc/2 < Vu <=	Not Reqd 1	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.80	4.00	11.54	11.54	22.14	0.17	15.33	PhiVc/2 < Vu <=	Not Reqd 1	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.85	4.00	11.53	11.53	22.72	0.17	15.30	PhiVc/2 < Vu <=	Not Reqd 1	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.90	4.00	11.52	11.52	23.30	0.16	15.28	PhiVc/2 < Vu <=	Not Reqd 1	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.95	4.00	11.50	11.50	23.87	0.16	15.26	PhiVc/2 < Vu <=	Not Reqd 1	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.00	4.00	11.49	11.49	24.45	0.16	15.24	PhiVc/2 < Vu <=	Not Reqd 1	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.05	4.00	-7.73	7.73	24.06	0.11	14.98	PhiVc/2 < Vu <=	Not Reqd 1	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.10	4.00	-7.74	7.74	23.67	0.11	14.99	PhiVc/2 < Vu <=	Not Reqd 1	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.15	4.00	-7.76	7.76	23.28	0.11	15.00	PhiVc/2 < Vu <=	Not Reqd 1	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.20	4.00	-7.77	7.77	22.90	0.11	15.01	PhiVc/2 < Vu <=	Not Reqd 1	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.25	4.00	-7.79	7.79	22.51	0.12	15.02	PhiVc/2 < Vu <=	Not Reqd 1	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.30	4.00	-7.80	7.80	22.12	0.12	15.03	PhiVc/2 < Vu <=	Not Reqd 1	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.35	4.00	-7.81	7.81	21.73	0.12	15.05	PhiVc/2 < Vu <=	Not Reqd 1	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.40	4.00	-7.83	7.83	21.34	0.12	15.06	PhiVc/2 < Vu <=	Not Reqd 1	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.45	4.00	-7.84	7.84	20.94	0.12	15.07	PhiVc/2 < Vu <=	Not Reqd 1	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.50	4.00	-7.86	7.86	20.55	0.13	15.09	PhiVc/2 < Vu <=	Not Reqd 1	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.55	4.00	-7.87	7.87	20.16	0.13	15.10	PhiVc/2 < Vu <=	Not Reqd 1	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.60	4.00	-7.89	7.89	19.76	0.13	15.12	PhiVc/2 < Vu <=	Not Reqd 1	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.65	4.00	-7.90	7.90	19.37	0.14	15.13	PhiVc/2 < Vu <=	Not Reqd 1	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.70	4.00	-7.92	7.92	18.97	0.14	15.15	PhiVc/2 < Vu <=	Not Reqd 1	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.75	4.00	-7.93	7.93	18.58	0.14	15.16	PhiVc/2 < Vu <=	Not Reqd 1	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.80	4.00	-7.95	7.95	18.18	0.15	15.18	PhiVc/2 < Vu <=	Not Reqd 1	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.85	4.00	-7.96	7.96	17.78	0.15	15.20	PhiVc/2 < Vu <=	Not Reqd 1	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.90	4.00	-7.97	7.97	17.39	0.15	15.22	PhiVc/2 < Vu <=	Not Reqd 1	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.95	4.00	-7.99	7.99	16.99	0.16	15.24	PhiVc/2 < Vu <=	Not Reqd 1	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.00	4.00	-8.00	8.00	16.59	0.16	15.26	PhiVc/2 < Vu <=	Not Reqd 1	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.05	4.00	-8.02	8.02	16.19	0.17	15.28	PhiVc/2 < Vu <=	Not Reqd 1	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.10	4.00	-8.03	8.03	15.79	0.17	15.31	PhiVc/2 < Vu <=	Not Reqd 1	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.15	4.00	-8.05	8.05	15.38	0.17	15.33	PhiVc/2 < Vu <=	Not Reqd 1	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.20	4.00	-8.06	8.06	14.98	0.18	15.36	PhiVc/2 < Vu <=	Not Reqd 1	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.25	4.00	-8.08	8.08	14.58	0.18	15.39	PhiVc/2 < Vu <=	Not Reqd 1	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.30	4.00	-8.09	8.09	14.17	0.19	15.42	PhiVc/2 < Vu <=	Not Reqd 1	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.35	4.00	-8.10	8.10	13.77	0.20	15.45	PhiVc/2 < Vu <=	Not Reqd 1	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.40	4.00	-8.12	8.12	13.36	0.20	15.48	PhiVc/2 < Vu <=	Not Reqd 1	15.5	0.0	0.0

Printed: 13 JAN 2014, 11:34AM
File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Licensee : SUNRISE ENGINEERING

Concrete Beam

Lic. # : KW-06005617

Description : One-way slab at Chemical Room- H 15 Loading

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	3	16.45	4.00	-8.13	8.13	12.96	0.21	15.51	PhiVc/2 < Vu <=	Not Reqd 1	15.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.50	4.00	-8.15	8.15	12.55	0.22	15.55	PhiVc/2 < Vu <=	Not Reqd 1	15.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.55	4.00	-8.16	8.16	12.14	0.22	15.59	PhiVc/2 < Vu <=	Not Reqd 1	15.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.60	4.00	-8.18	8.18	11.73	0.23	15.64	PhiVc/2 < Vu <=	Not Reqd 1	15.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.65	4.00	-8.19	8.19	11.32	0.24	15.68	PhiVc/2 < Vu <=	Not Reqd 1	15.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.70	4.00	-8.21	8.21	10.91	0.25	15.73	PhiVc/2 < Vu <=	Not Reqd 1	15.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.75	4.00	-8.22	8.22	10.50	0.26	15.78	PhiVc/2 < Vu <=	Not Reqd 1	15.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.80	4.00	-8.24	8.24	10.09	0.27	15.84	PhiVc/2 < Vu <=	Not Reqd 1	15.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.85	4.00	-8.25	8.25	9.68	0.28	15.91	PhiVc/2 < Vu <=	Not Reqd 1	15.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.90	4.00	-8.26	8.26	9.27	0.30	15.98	PhiVc/2 < Vu <=	Not Reqd 1	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.95	4.00	-8.28	8.28	8.85	0.31	16.05	PhiVc/2 < Vu <=	Not Reqd 1	16.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.00	4.00	-8.29	8.29	8.44	0.33	16.13	PhiVc/2 < Vu <=	Not Reqd 1	16.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.05	4.00	-8.31	8.31	8.02	0.35	16.23	PhiVc/2 < Vu <=	Not Reqd 1	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.10	4.00	-8.32	8.32	7.61	0.36	16.33	PhiVc/2 < Vu <=	Not Reqd 1	16.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.15	4.00	-8.34	8.34	7.19	0.39	16.44	PhiVc/2 < Vu <=	Not Reqd 1	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.20	4.00	-8.35	8.35	6.77	0.41	16.57	PhiVc/2 < Vu <=	Not Reqd 1	16.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.25	4.00	-8.37	8.37	6.36	0.44	16.72	PhiVc/2 < Vu <=	Not Reqd 1	16.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.30	4.00	-8.38	8.38	5.94	0.47	16.88	Vu < PhiVc/2	Not Reqd	16.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.35	4.00	-8.39	8.39	5.52	0.51	17.07	Vu < PhiVc/2	Not Reqd	17.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.40	4.00	-8.41	8.41	5.10	0.55	17.30	Vu < PhiVc/2	Not Reqd	17.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.45	4.00	-8.42	8.42	4.68	0.60	17.56	Vu < PhiVc/2	Not Reqd	17.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.50	4.00	-8.44	8.44	4.26	0.66	17.88	Vu < PhiVc/2	Not Reqd	17.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.55	4.00	-8.45	8.45	3.83	0.74	18.27	Vu < PhiVc/2	Not Reqd	18.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.60	4.00	-8.47	8.47	3.41	0.83	18.75	Vu < PhiVc/2	Not Reqd	18.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.65	4.00	-8.48	8.48	2.99	0.95	19.37	Vu < PhiVc/2	Not Reqd	19.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.70	4.00	-8.50	8.50	2.56	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.75	4.00	-8.51	8.51	2.14	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.80	4.00	-8.53	8.53	1.71	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.85	4.00	-8.54	8.54	1.28	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.90	4.00	-8.55	8.55	0.86	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	17.95	4.00	-8.57	8.57	0.43	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	18.00	4.00	-8.58	8.58	0.00	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0

Printed: 13 JAN 2014, 11:36AM

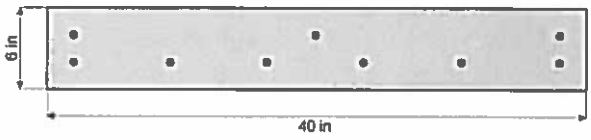
Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

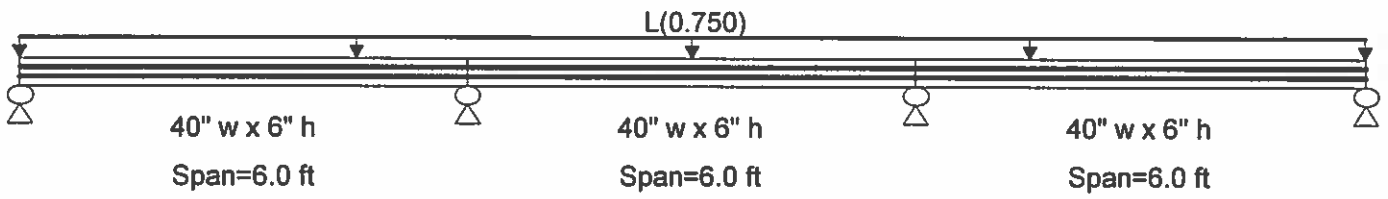
Description : One-way slab at Chemical Room- 250 psf LL

Material Properties

f'c	=	4.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	=	474.342 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	# 3
			Number of Resisting Legs Per Stirrup	=	2



Load Combination ASCE 7-02



Cross Section & Reinforcing Details

Rectangular Section, Width = 40.0 in, Height = 6.0 in

Span #1 Reinforcing....
6-#5 at 2.0 in from Bottom, from 0.0 to 6.0 ft in this span
3-#5 at 2.0 in from Top, from 0.0 to 6.0 ft in this span

Span #2 Reinforcing....
6-#5 at 2.0 in from Bottom, from 0.0 to 6.0 ft in this span
3-#5 at 2.0 in from Top, from 0.0 to 6.0 ft in this span

Span #3 Reinforcing....
6-#5 at 2.0 in from Bottom, from 0.0 to 6.0 ft in this span
3-#5 at 2.0 in from Top, from 0.0 to 6.0 ft in this span

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Loads on all spans...
L = 0.250
Uniform Load on ALL spans : L = 0.250 ksf, Tributary Width = 3.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.248 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward L+Lr+S Deflection	0.007 in Ratio = 9747
Mu : Applied	-6.084 k-ft	Max Upward L+Lr+S Deflection	-0.005 in Ratio = 15099
Mn * Phi : Allowable	24.499 k-ft	Max Downward Total Deflection	0.009 in Ratio = 7973
Load Combination	20D+0.50Lr+1.60L+1.60H, LL Comb Run (*LL)	Max Upward Total Deflection	-0.005 in Ratio = 15911
Location of maximum on span	0.000 ft		
Span # where maximum occurs	Span # 3		

Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum	2.605	6.995	6.995	2.605
D Only	0.580	1.595	1.595	0.580
L Only, LL Comb Run (**L)	0.075	-0.450	2.925	1.950
L Only, LL Comb Run (*L*)	-0.225	2.475	2.475	-0.225
L Only, LL Comb Run (*LL)	-0.150	2.025	5.400	1.725
L Only, LL Comb Run (L**)	1.950	2.925	-0.450	0.075
L Only, LL Comb Run (L*L)	2.025	2.475	2.475	2.025
L Only, LL Comb Run (LL*)	1.725	5.400	2.025	-0.150
L Only, LL Comb Run (LLL)	1.800	4.950	4.950	1.800

Printed: 13 JAN 2014, 11:36AM

Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-way slab at Chemical Room- 250 psf LL

Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4
D+L, LL Comb Run (**L)	0.655	1.145	4.520	2.530
D+L, LL Comb Run (*L*)	0.355	4.070	4.070	0.355
D+L, LL Comb Run (*LL)	0.430	3.620	6.995	2.305
D+L, LL Comb Run (L**)	2.530	4.520	1.145	0.655
D+L, LL Comb Run (L*L)	2.605	4.070	4.070	2.605
D+L, LL Comb Run (LL*)	2.305	6.995	3.620	0.430
D+L, LL Comb Run (LLL)	2.380	6.545	6.545	2.380

Shear Stirrup Requirements

Entire Beam Span Length : Vu < PhiVc/2, Req'd Vs = Not Reqd, use stirrups spaced at 0.000 in

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Location (ft) in Span	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	6.000	-5.81	24.50	0.24
Span # 2	2	6.000	-6.08	24.50	0.25
Span # 3	3	6.000	-6.08	24.50	0.25
+1.40D					
Span # 1	1	6.000	-1.16	24.50	0.05
Span # 2	2	6.000	-1.22	24.50	0.05
Span # 3	3	6.000	-1.22	24.50	0.05
+1.20D+0.50Lr+1.60L+1.60H, LL Comb					
Span # 1	1	6.000	1.15	33.23	0.03
Span # 2	2	6.000	-3.85	24.50	0.16
Span # 3	3	6.000	-3.92	24.50	0.16
+1.20D+0.50Lr+1.60L+1.60H, LL Comb					
Span # 1	1	6.000	-3.13	24.50	0.13
Span # 2	2	6.000	-3.20	24.50	0.13
Span # 3	3	6.000	-3.20	24.50	0.13
+1.20D+0.50Lr+1.60L+1.60H, LL Comb					
Span # 1	1	6.000	-2.42	24.50	0.10
Span # 2	2	6.000	-5.83	24.50	0.24
Span # 3	3	6.000	-6.08	24.50	0.25
+1.20D+0.50Lr+1.60L+1.60H, LL Comb					
Span # 1	1	6.000	-3.67	24.50	0.15
Span # 2	2	6.000	-3.92	24.50	0.16
Span # 3	3	6.000	1.15	33.23	0.03
+1.20D+0.50Lr+1.60L+1.60H, LL Comb					
Span # 1	1	6.000	5.20	33.23	0.16
Span # 2	2	6.000	-3.20	24.50	0.13
Span # 3	3	6.000	5.20	33.23	0.16
+1.20D+0.50Lr+1.60L+1.60H, LL Comb					
Span # 1	1	6.000	-5.81	24.50	0.24
Span # 2	2	6.000	-6.08	24.50	0.25
Span # 3	3	6.000	-2.48	24.50	0.10
+1.20D+0.50Lr+1.60L+1.60H, LL Comb					
Span # 1	1	6.000	-5.10	24.50	0.21
Span # 2	2	6.000	-5.36	24.50	0.22
Span # 3	3	6.000	-5.36	24.50	0.22
+1.20D+1.60L+0.50S+1.60H, LL Comb F					
Span # 1	1	6.000	1.15	33.23	0.03
Span # 2	2	6.000	-3.85	24.50	0.16
Span # 3	3	6.000	-3.92	24.50	0.16
+1.20D+1.60L+0.50S+1.60H, LL Comb F					
Span # 1	1	6.000	-3.13	24.50	0.13
Span # 2	2	6.000	-3.20	24.50	0.13
Span # 3	3	6.000	-3.20	24.50	0.13
+1.20D+1.60L+0.50S+1.60H, LL Comb F					
Span # 1	1	6.000	-2.42	24.50	0.10
Span # 2	2	6.000	-5.83	24.50	0.24
Span # 3	3	6.000	-6.08	24.50	0.25
+1.20D+1.60L+0.50S+1.60H, LL Comb F					
Span # 1	1	6.000	-3.67	24.50	0.15
Span # 2	2	6.000	-3.92	24.50	0.16
Span # 3	3	6.000	1.15	33.23	0.03
+1.20D+1.60L+0.50S+1.60H, LL Comb F					
Span # 1	1	6.000	5.20	33.23	0.16

Printed: 13 JAN 2014, 11:36AM

File = p:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Concrete Beam

Lic. # : KW-06005617 Licensee : SUNRISE ENGINEERING

Description : One-way slab at Chemical Room- 250 psf LL

Load Combination Segment Length	Span #	Location (ft) in Span	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 2	2	6.000	-3.20	24.50	0.13
Span # 3	3	6.000	5.20	33.23	0.16
+1.20D+1.60L+0.50S+1.60H, LL Comb F					
Span # 1	1	6.000	-5.81	24.50	0.24
Span # 2	2	6.000	-6.08	24.50	0.25
Span # 3	3	6.000	-2.48	24.50	0.10
+1.20D+1.60L+0.50S+1.60H, LL Comb F					
Span # 1	1	6.000	-5.10	24.50	0.21
Span # 2	2	6.000	-5.36	24.50	0.22
Span # 3	3	6.000	-5.36	24.50	0.22
+1.20D+1.60Lr+0.50L, LL Comb Run (*					
Span # 1	1	6.000	-0.77	24.50	0.03
Span # 2	2	6.000	-1.89	24.50	0.08
Span # 3	3	6.000	-1.94	24.50	0.08
+1.20D+1.60Lr+0.50L, LL Comb Run (*					
Span # 1	1	6.000	-1.66	24.50	0.07
Span # 2	2	6.000	-1.72	24.50	0.07
Span # 3	3	6.000	-1.72	24.50	0.07
+1.20D+1.60Lr+0.50L, LL Comb Run (*					
Span # 1	1	6.000	-1.44	24.50	0.06
Span # 2	2	6.000	-2.51	24.50	0.10
Span # 3	3	6.000	-2.62	24.50	0.11
+1.20D+1.60Lr+0.50L, LL Comb Run (L					
Span # 1	1	6.000	-1.83	24.50	0.07
Span # 2	2	6.000	-1.94	24.50	0.08
Span # 3	3	6.000	-0.82	24.50	0.03
+1.20D+1.60Lr+0.50L, LL Comb Run (L					
Span # 1	1	6.000	2.19	33.23	0.07
Span # 2	2	6.000	-1.72	24.50	0.07
Span # 3	3	6.000	-1.72	24.50	0.07
+1.20D+1.60Lr+0.50L, LL Comb Run (L					
Span # 1	1	6.000	-2.50	24.50	0.10
Span # 2	2	6.000	-2.62	24.50	0.11
Span # 3	3	6.000	-1.49	24.50	0.06
+1.20D+1.60Lr+0.50L, LL Comb Run (L					
Span # 1	1	6.000	-2.28	24.50	0.09
Span # 2	2	6.000	-2.39	24.50	0.10
Span # 3	3	6.000	-2.39	24.50	0.10
+1.20D+1.60Lr+0.80W, LL Comb Run (*					
Span # 1	1	6.000	-0.99	24.50	0.04
Span # 2	2	6.000	-1.04	24.50	0.04
Span # 3	3	6.000	-1.04	24.50	0.04
+1.20D+1.60Lr+0.80W, LL Comb Run (*					
Span # 1	1	6.000	-0.99	24.50	0.04
Span # 2	2	6.000	-1.04	24.50	0.04
Span # 3	3	6.000	-1.04	24.50	0.04
+1.20D+1.60Lr+0.80W, LL Comb Run (*					
Span # 1	1	6.000	-0.99	24.50	0.04
Span # 2	2	6.000	-1.04	24.50	0.04
Span # 3	3	6.000	-1.04	24.50	0.04
+1.20D+1.60Lr+0.80W, LL Comb Run (L					
Span # 1	1	6.000	-0.99	24.50	0.04
Span # 2	2	6.000	-1.04	24.50	0.04
Span # 3	3	6.000	-1.04	24.50	0.04
+1.20D+1.60Lr+0.80W, LL Comb Run (L					
Span # 1	1	6.000	-0.99	24.50	0.04
Span # 2	2	6.000	-1.04	24.50	0.04
Span # 3	3	6.000	-1.04	24.50	0.04
+1.20D+1.60Lr+0.80W, LL Comb Run (L					
Span # 1	1	6.000	-0.99	24.50	0.04
Span # 2	2	6.000	-1.04	24.50	0.04
Span # 3	3	6.000	-1.04	24.50	0.04
+1.20D+1.60Lr+0.80W, LL Comb Run (L					
Span # 1	1	6.000	-0.99	24.50	0.04
Span # 2	2	6.000	-1.04	24.50	0.04
Span # 3	3	6.000	-1.04	24.50	0.04
+1.20D+0.50L+1.60S, LL Comb Run (**					
Span # 1	1	6.000	-0.77	24.50	0.03
Span # 2	2	6.000	-1.89	24.50	0.08

Printed: 13 JAN 2014, 11:36AM

Concrete Beam

File = p:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : One-way slab at Chemical Room- 250 psf LL

Load Combination / Segment Length	Span #	Location (ft) in Span	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 3	3	6.000	-1.94	24.50	0.08
+1.20D+0.50L+1.60S, LL Comb Run (*L					
Span # 1	1	6.000	-1.66	24.50	0.07
Span # 2	2	6.000	-1.72	24.50	0.07
Span # 3	3	6.000	-1.72	24.50	0.07
+1.20D+0.50L+1.60S, LL Comb Run (*L					
Span # 1	1	6.000	-1.44	24.50	0.06
Span # 2	2	6.000	-2.51	24.50	0.10
Span # 3	3	6.000	-2.62	24.50	0.11
+1.20D+0.50L+1.60S, LL Comb Run (L*					
Span # 1	1	6.000	-1.83	24.50	0.07
Span # 2	2	6.000	-1.94	24.50	0.08
Span # 3	3	6.000	-0.82	24.50	0.03
+1.20D+0.50L+1.60S, LL Comb Run (L*					
Span # 1	1	6.000	2.19	33.23	0.07
Span # 2	2	6.000	-1.72	24.50	0.07
Span # 3	3	6.000	-1.72	24.50	0.07
+1.20D+0.50L+1.60S, LL Comb Run (LL					
Span # 1	1	6.000	-2.50	24.50	0.10
Span # 2	2	6.000	-2.62	24.50	0.11
Span # 3	3	6.000	-1.49	24.50	0.06
+1.20D+0.50L+1.60S, LL Comb Run (LL					
Span # 1	1	6.000	-2.28	24.50	0.09
Span # 2	2	6.000	-2.39	24.50	0.10
Span # 3	3	6.000	-2.39	24.50	0.10
+1.20D+1.60S+0.80W					
Span # 1	1	6.000	-0.99	24.50	0.04
Span # 2	2	6.000	-1.04	24.50	0.04
Span # 3	3	6.000	-1.04	24.50	0.04
+1.20D+0.50Lr+0.50L+1.60W, LL Comb					
Span # 1	1	6.000	-0.77	24.50	0.03
Span # 2	2	6.000	-1.89	24.50	0.08
Span # 3	3	6.000	-1.94	24.50	0.08
+1.20D+0.50Lr+0.50L+1.60W, LL Comb					
Span # 1	1	6.000	-1.66	24.50	0.07
Span # 2	2	6.000	-1.72	24.50	0.07
Span # 3	3	6.000	-1.72	24.50	0.07
+1.20D+0.50Lr+0.50L+1.60W, LL Comb					
Span # 1	1	6.000	-1.44	24.50	0.06
Span # 2	2	6.000	-2.51	24.50	0.10
Span # 3	3	6.000	-2.62	24.50	0.11
+1.20D+0.50Lr+0.50L+1.60W, LL Comb					
Span # 1	1	6.000	-1.83	24.50	0.07
Span # 2	2	6.000	-1.94	24.50	0.08
Span # 3	3	6.000	-0.82	24.50	0.03
+1.20D+0.50Lr+0.50L+1.60W, LL Comb					
Span # 1	1	6.000	2.19	33.23	0.07
Span # 2	2	6.000	-1.72	24.50	0.07
Span # 3	3	6.000	-1.72	24.50	0.07
+1.20D+0.50Lr+0.50L+1.60W, LL Comb					
Span # 1	1	6.000	-2.50	24.50	0.10
Span # 2	2	6.000	-2.62	24.50	0.11
Span # 3	3	6.000	-1.49	24.50	0.06
+1.20D+0.50Lr+0.50L+1.60W, LL Comb					
Span # 1	1	6.000	-2.28	24.50	0.09
Span # 2	2	6.000	-2.39	24.50	0.10
Span # 3	3	6.000	-2.39	24.50	0.10
+1.20D+0.50L+0.50S+1.60W, LL Comb I					
Span # 1	1	6.000	-0.77	24.50	0.03
Span # 2	2	6.000	-1.89	24.50	0.08
Span # 3	3	6.000	-1.94	24.50	0.08
+1.20D+0.50L+0.50S+1.60W, LL Comb I					
Span # 1	1	6.000	-1.66	24.50	0.07
Span # 2	2	6.000	-1.72	24.50	0.07
Span # 3	3	6.000	-1.72	24.50	0.07
+1.20D+0.50L+0.50S+1.60W, LL Comb I					
Span # 1	1	6.000	-1.44	24.50	0.06
Span # 2	2	6.000	-2.51	24.50	0.10
Span # 3	3	6.000	-2.62	24.50	0.11

Printed: 13 JAN 2014, 11:36AM

Concrete Beam

File = p:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : One-way slab at Chemical Room- 250 psf LL

Load Combination / Segment Length	Span #	Location (ft) in Span	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
+1.20D+0.50L+0.50S+1.60W, LL Comb I					
Span # 1	1	6.000	-1.83	24.50	0.07
Span # 2	2	6.000	-1.94	24.50	0.08
Span # 3	3	6.000	-0.82	24.50	0.03
+1.20D+0.50L+0.50S+1.60W, LL Comb I					
Span # 1	1	6.000	2.19	33.23	0.07
Span # 2	2	6.000	-1.72	24.50	0.07
Span # 3	3	6.000	-1.72	24.50	0.07
+1.20D+0.50L+0.50S+1.60W, LL Comb I					
Span # 1	1	6.000	-2.50	24.50	0.10
Span # 2	2	6.000	-2.62	24.50	0.11
Span # 3	3	6.000	-1.49	24.50	0.06
+1.20D+0.50L+0.50S+1.60W, LL Comb I					
Span # 1	1	6.000	-2.28	24.50	0.09
Span # 2	2	6.000	-2.39	24.50	0.10
Span # 3	3	6.000	-2.39	24.50	0.10
+1.20D+0.50L+0.20S+E, LL Comb Run (					
Span # 1	1	6.000	-0.77	24.50	0.03
Span # 2	2	6.000	-1.89	24.50	0.08
Span # 3	3	6.000	-1.94	24.50	0.08
+1.20D+0.50L+0.20S+E, LL Comb Run (					
Span # 1	1	6.000	-1.66	24.50	0.07
Span # 2	2	6.000	-1.72	24.50	0.07
Span # 3	3	6.000	-1.72	24.50	0.07
+1.20D+0.50L+0.20S+E, LL Comb Run (					
Span # 1	1	6.000	-1.44	24.50	0.06
Span # 2	2	6.000	-2.51	24.50	0.10
Span # 3	3	6.000	-2.62	24.50	0.11
+1.20D+0.50L+0.20S+E, LL Comb Run (					
Span # 1	1	6.000	-1.83	24.50	0.07
Span # 2	2	6.000	-1.94	24.50	0.08
Span # 3	3	6.000	-0.82	24.50	0.03
+1.20D+0.50L+0.20S+E, LL Comb Run (					
Span # 1	1	6.000	2.19	33.23	0.07
Span # 2	2	6.000	-1.72	24.50	0.07
Span # 3	3	6.000	-1.72	24.50	0.07
+1.20D+0.50L+0.20S+E, LL Comb Run (					
Span # 1	1	6.000	-2.50	24.50	0.10
Span # 2	2	6.000	-2.62	24.50	0.11
Span # 3	3	6.000	-1.49	24.50	0.06
+1.20D+0.50L+0.20S+E, LL Comb Run (					
Span # 1	1	6.000	-2.28	24.50	0.09
Span # 2	2	6.000	-2.39	24.50	0.10
Span # 3	3	6.000	-2.39	24.50	0.10
+0.90D+1.60W+1.60H					
Span # 1	1	6.000	-0.74	24.50	0.03
Span # 2	2	6.000	-0.78	24.50	0.03
Span # 3	3	6.000	-0.78	24.50	0.03
+0.90D+E+1.60H					
Span # 1	1	6.000	-0.74	24.50	0.03
Span # 2	2	6.000	-0.78	24.50	0.03
Span # 3	3	6.000	-0.78	24.50	0.03

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L, LL Comb Run (L*L)	1	0.0090	2.850	D+L, LL Comb Run (L*L)	-0.0005	6.150
D+L, LL Comb Run (*L*)	2	0.0051	2.850	D+L, LL Comb Run (L*L)	-0.0037	4.350
D+L, LL Comb Run (L*L)	3	0.0090	3.150		0.0000	4.350

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	1	0.00	4.00	3.94	3.94	0.00	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.05	4.00	3.86	3.86	0.19	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.10	4.00	3.79	3.79	0.39	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.15	4.00	3.71	3.71	0.57	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.20	4.00	3.64	3.64	0.76	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0

Printed: 13 JAN 2014, 11:36AM

Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : One-way slab at Chemical Room- 1250 psf LL

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	1	0.25	4.00	3.56	3.56	0.94	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.30	4.00	3.49	3.49	1.11	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.35	4.00	3.41	3.41	1.29	0.88	19.05	Vu < PhiVc/2	Not Reqd	19.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.40	4.00	3.34	3.34	1.46	0.77	18.42	Vu < PhiVc/2	Not Reqd	18.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.45	4.00	3.27	3.27	1.62	0.67	17.93	Vu < PhiVc/2	Not Reqd	17.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.50	4.00	3.19	3.19	1.78	0.60	17.54	Vu < PhiVc/2	Not Reqd	17.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.55	4.00	3.12	3.12	1.94	0.54	17.22	Vu < PhiVc/2	Not Reqd	17.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.60	4.00	3.04	3.04	2.09	0.48	16.95	Vu < PhiVc/2	Not Reqd	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.65	4.00	2.97	2.97	2.24	0.44	16.73	Vu < PhiVc/2	Not Reqd	16.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.70	4.00	2.89	2.89	2.39	0.40	16.53	Vu < PhiVc/2	Not Reqd	16.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.75	4.00	2.82	2.82	2.53	0.37	16.36	Vu < PhiVc/2	Not Reqd	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.80	4.00	2.74	2.74	2.67	0.34	16.21	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.85	4.00	2.67	2.67	2.81	0.32	16.08	Vu < PhiVc/2	Not Reqd	16.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.90	4.00	2.60	2.60	2.94	0.29	15.96	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	0.95	4.00	2.52	2.52	3.07	0.27	15.85	Vu < PhiVc/2	Not Reqd	15.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.00	4.00	2.45	2.45	3.19	0.26	15.76	Vu < PhiVc/2	Not Reqd	15.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.05	4.00	2.37	2.37	3.31	0.24	15.67	Vu < PhiVc/2	Not Reqd	15.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.10	4.00	2.30	2.30	3.43	0.22	15.59	Vu < PhiVc/2	Not Reqd	15.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.15	4.00	2.22	2.22	3.54	0.21	15.51	Vu < PhiVc/2	Not Reqd	15.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.20	4.00	2.15	2.15	3.65	0.20	15.45	Vu < PhiVc/2	Not Reqd	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.25	4.00	2.07	2.07	3.76	0.18	15.38	Vu < PhiVc/2	Not Reqd	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.30	4.00	2.00	2.00	3.86	0.17	15.32	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.35	4.00	1.92	1.92	3.96	0.16	15.27	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.40	4.00	1.85	1.85	4.05	0.15	15.22	Vu < PhiVc/2	Not Reqd	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.45	4.00	1.78	1.78	4.14	0.14	15.17	Vu < PhiVc/2	Not Reqd	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.50	4.00	1.70	1.70	4.23	0.13	15.12	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.55	4.00	1.63	1.63	4.31	0.13	15.08	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.60	4.00	1.55	1.55	4.39	0.12	15.04	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.65	4.00	1.48	1.48	4.47	0.11	15.00	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.70	4.00	1.40	1.40	4.54	0.10	14.96	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.75	4.00	1.33	1.33	4.61	0.10	14.92	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.80	4.00	1.25	1.25	4.67	0.09	14.89	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.85	4.00	1.18	1.18	4.73	0.08	14.85	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.90	4.00	1.11	1.11	4.79	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	1.95	4.00	1.03	1.03	4.84	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.00	4.00	0.96	0.96	4.89	0.07	14.76	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.05	4.00	0.88	0.88	4.94	0.06	14.73	Vu < PhiVc/2	Not Reqd	14.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.10	4.00	0.81	0.81	4.98	0.05	14.70	Vu < PhiVc/2	Not Reqd	14.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.15	4.00	0.73	0.73	5.02	0.05	14.67	Vu < PhiVc/2	Not Reqd	14.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.20	4.00	0.66	0.66	5.05	0.04	14.65	Vu < PhiVc/2	Not Reqd	14.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.25	4.00	0.58	0.58	5.08	0.04	14.62	Vu < PhiVc/2	Not Reqd	14.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.30	4.00	0.51	0.51	5.11	0.03	14.59	Vu < PhiVc/2	Not Reqd	14.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.35	4.00	0.43	0.43	5.14	0.03	14.57	Vu < PhiVc/2	Not Reqd	14.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.40	4.00	0.36	0.36	5.16	0.02	14.54	Vu < PhiVc/2	Not Reqd	14.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.45	4.00	-0.37	0.37	0.05	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.50	4.00	-0.39	0.39	0.07	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.55	4.00	-0.40	0.40	0.09	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.60	4.00	-0.42	0.42	0.11	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.65	4.00	-0.49	0.49	3.93	0.04	14.64	Vu < PhiVc/2	Not Reqd	14.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.70	4.00	-0.57	0.57	3.90	0.05	14.67	Vu < PhiVc/2	Not Reqd	14.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.75	4.00	-0.64	0.64	3.87	0.06	14.71	Vu < PhiVc/2	Not Reqd	14.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.80	4.00	-0.72	0.72	3.84	0.06	14.75	Vu < PhiVc/2	Not Reqd	14.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.85	4.00	-0.79	0.79	3.80	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	2.90	4.00	-0.86	0.86	3.77	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0

Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Description : One-way slab at Chemical Room- 250 psf LL

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	1	2.95	4.00	-0.94	0.94	3.71	0.08	14.86	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.00	4.00	-1.01	1.01	3.66	0.09	14.90	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.05	4.00	-1.09	1.09	3.61	0.10	14.95	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.10	4.00	-1.16	1.16	3.55	0.11	14.99	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.15	4.00	-1.24	1.24	3.49	0.12	15.04	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.20	4.00	-1.31	1.31	3.43	0.13	15.09	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.25	4.00	-1.39	1.39	3.36	0.14	15.14	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.30	4.00	-1.46	1.46	3.29	0.15	15.19	Vu < PhiVc/2	Not Reqd	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.35	4.00	-1.54	1.54	3.22	0.16	15.25	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.40	4.00	-1.61	1.61	3.14	0.17	15.31	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.45	4.00	-1.68	1.68	3.06	0.18	15.38	Vu < PhiVc/2	Not Reqd	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.50	4.00	-1.76	1.76	2.97	0.20	15.45	Vu < PhiVc/2	Not Reqd	15.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.55	4.00	-1.83	1.83	2.88	0.21	15.53	Vu < PhiVc/2	Not Reqd	15.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.60	4.00	-1.91	1.91	2.79	0.23	15.61	Vu < PhiVc/2	Not Reqd	15.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.65	4.00	-1.98	1.98	2.69	0.25	15.71	Vu < PhiVc/2	Not Reqd	15.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.70	4.00	-2.06	2.06	2.59	0.26	15.81	Vu < PhiVc/2	Not Reqd	15.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.75	4.00	-2.13	2.13	2.48	0.29	15.92	Vu < PhiVc/2	Not Reqd	15.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.80	4.00	-2.21	2.21	2.38	0.31	16.04	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.85	4.00	-2.28	2.28	2.26	0.34	16.18	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.90	4.00	-2.35	2.35	2.15	0.37	16.33	Vu < PhiVc/2	Not Reqd	16.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	3.95	4.00	-2.43	2.43	2.03	0.40	16.51	Vu < PhiVc/2	Not Reqd	16.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.00	4.00	-2.50	2.50	1.90	0.44	16.71	Vu < PhiVc/2	Not Reqd	16.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.05	4.00	-2.58	2.58	1.78	0.48	16.95	Vu < PhiVc/2	Not Reqd	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.10	4.00	-2.65	2.65	1.65	0.54	17.23	Vu < PhiVc/2	Not Reqd	17.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.15	4.00	-2.73	2.73	1.51	0.60	17.57	Vu < PhiVc/2	Not Reqd	17.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.20	4.00	-2.80	2.80	1.37	0.68	17.98	Vu < PhiVc/2	Not Reqd	18.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.25	4.00	-2.88	2.88	1.23	0.78	18.49	Vu < PhiVc/2	Not Reqd	18.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.30	4.00	-2.95	2.95	1.09	0.91	19.16	Vu < PhiVc/2	Not Reqd	19.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.35	4.00	-3.03	3.03	0.94	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.40	4.00	-3.10	3.10	0.78	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.45	4.00	-3.17	3.17	0.63	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.50	4.00	-3.25	3.25	0.47	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.55	4.00	-3.32	3.32	0.30	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.60	4.00	-3.40	3.40	0.13	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.65	4.00	-3.47	3.47	0.04	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.70	4.00	-3.55	3.55	0.21	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.75	4.00	-3.62	3.62	0.39	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.80	4.00	-3.70	3.70	0.58	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.85	4.00	-3.77	3.77	0.76	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.90	4.00	-3.84	3.84	0.95	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	4.95	4.00	-3.92	3.92	1.15	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.00	4.00	-3.99	3.99	1.34	0.99	19.60	Vu < PhiVc/2	Not Reqd	19.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.05	4.00	-4.07	4.07	1.55	0.88	19.01	Vu < PhiVc/2	Not Reqd	19.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.10	4.00	-4.14	4.14	1.75	0.79	18.54	Vu < PhiVc/2	Not Reqd	18.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.15	4.00	-4.22	4.22	1.96	0.72	18.17	Vu < PhiVc/2	Not Reqd	18.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.20	4.00	-4.29	4.29	2.17	0.66	17.86	Vu < PhiVc/2	Not Reqd	17.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.25	4.00	-4.37	4.37	2.39	0.61	17.61	Vu < PhiVc/2	Not Reqd	17.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.30	4.00	-4.44	4.44	2.61	0.57	17.39	Vu < PhiVc/2	Not Reqd	17.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.35	4.00	-4.52	4.52	2.83	0.53	17.20	Vu < PhiVc/2	Not Reqd	17.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.40	4.00	-4.59	4.59	3.06	0.50	17.03	Vu < PhiVc/2	Not Reqd	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.45	4.00	-4.66	4.66	3.29	0.47	16.89	Vu < PhiVc/2	Not Reqd	16.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.50	4.00	-4.74	4.74	3.53	0.45	16.76	Vu < PhiVc/2	Not Reqd	16.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.55	4.00	-4.81	4.81	3.77	0.43	16.65	Vu < PhiVc/2	Not Reqd	16.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.60	4.00	-4.89	4.89	4.01	0.41	16.55	Vu < PhiVc/2	Not Reqd	16.5	0.0	0.0

Concrete Beam

Description : One-way slab at Chemical Room- 250 psf LL

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	1	5.65	4.00	-4.96	4.96	4.26	0.39	16.45	Vu < PhiVc/2	Not Reqd	16.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.70	4.00	-5.04	5.04	4.51	0.37	16.37	Vu < PhiVc/2	Not Reqd	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.75	4.00	-5.11	5.11	4.76	0.36	16.29	Vu < PhiVc/2	Not Reqd	16.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.80	4.00	-5.19	5.19	5.02	0.34	16.22	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.85	4.00	-5.26	5.26	5.28	0.33	16.16	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.90	4.00	-5.33	5.33	5.54	0.32	16.10	Vu < PhiVc/2	Not Reqd	16.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	1	5.95	4.00	-5.41	5.41	5.81	0.31	16.04	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.00	4.00	5.07	5.07	6.08	0.28	15.87	Vu < PhiVc/2	Not Reqd	15.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.05	4.00	5.00	5.00	5.83	0.29	15.91	Vu < PhiVc/2	Not Reqd	15.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.10	4.00	4.92	4.92	5.58	0.29	15.96	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.15	4.00	4.85	4.85	5.34	0.30	16.00	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.20	4.00	4.77	4.77	5.10	0.31	16.05	Vu < PhiVc/2	Not Reqd	16.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.25	4.00	4.70	4.70	4.86	0.32	16.10	Vu < PhiVc/2	Not Reqd	16.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.30	4.00	4.62	4.62	4.63	0.33	16.16	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.35	4.00	4.55	4.55	4.40	0.34	16.22	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.40	4.00	4.47	4.47	4.18	0.36	16.29	Vu < PhiVc/2	Not Reqd	16.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.45	4.00	4.40	4.40	3.95	0.37	16.36	Vu < PhiVc/2	Not Reqd	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.50	4.00	4.32	4.32	3.74	0.39	16.44	Vu < PhiVc/2	Not Reqd	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.55	4.00	4.25	4.25	3.52	0.40	16.53	Vu < PhiVc/2	Not Reqd	16.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.60	4.00	4.18	4.18	3.31	0.42	16.62	Vu < PhiVc/2	Not Reqd	16.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.65	4.00	4.10	4.10	3.10	0.44	16.72	Vu < PhiVc/2	Not Reqd	16.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.70	4.00	4.03	4.03	2.90	0.46	16.84	Vu < PhiVc/2	Not Reqd	16.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.75	4.00	3.95	3.95	2.70	0.49	16.97	Vu < PhiVc/2	Not Reqd	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.80	4.00	3.88	3.88	2.50	0.52	17.12	Vu < PhiVc/2	Not Reqd	17.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.85	4.00	3.80	3.80	2.31	0.55	17.29	Vu < PhiVc/2	Not Reqd	17.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.90	4.00	3.73	3.73	2.12	0.59	17.48	Vu < PhiVc/2	Not Reqd	17.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	6.95	4.00	3.65	3.65	1.94	0.63	17.71	Vu < PhiVc/2	Not Reqd	17.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.00	4.00	3.58	3.58	1.76	0.68	17.97	Vu < PhiVc/2	Not Reqd	18.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.05	4.00	3.51	3.51	1.58	0.74	18.28	Vu < PhiVc/2	Not Reqd	18.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.10	4.00	3.43	3.43	1.41	0.81	18.67	Vu < PhiVc/2	Not Reqd	18.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.15	4.00	3.36	3.36	1.24	0.90	19.14	Vu < PhiVc/2	Not Reqd	19.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.20	4.00	3.28	3.28	1.07	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.25	4.00	3.21	3.21	0.91	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.30	4.00	3.13	3.13	0.75	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.35	4.00	3.06	3.06	0.60	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.40	4.00	2.98	2.98	0.45	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.45	4.00	2.91	2.91	0.30	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.50	4.00	2.83	2.83	0.16	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.55	4.00	2.76	2.76	0.02	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.60	4.00	2.69	2.69	0.12	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.65	4.00	2.61	2.61	0.25	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.70	4.00	2.54	2.54	0.38	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.75	4.00	2.46	2.46	0.51	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.80	4.00	2.39	2.39	0.63	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.85	4.00	2.31	2.31	0.75	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.90	4.00	2.24	2.24	0.86	0.87	18.96	Vu < PhiVc/2	Not Reqd	19.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	7.95	4.00	2.16	2.16	0.97	0.74	18.31	Vu < PhiVc/2	Not Reqd	18.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.00	4.00	2.09	2.09	1.08	0.65	17.81	Vu < PhiVc/2	Not Reqd	17.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.05	4.00	2.02	2.02	1.18	0.57	17.40	Vu < PhiVc/2	Not Reqd	17.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.10	4.00	1.94	1.94	1.28	0.51	17.07	Vu < PhiVc/2	Not Reqd	17.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.15	4.00	1.87	1.87	1.37	0.45	16.79	Vu < PhiVc/2	Not Reqd	16.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.20	4.00	1.79	1.79	1.46	0.41	16.55	Vu < PhiVc/2	Not Reqd	16.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.25	4.00	1.72	1.72	1.55	0.37	16.35	Vu < PhiVc/2	Not Reqd	16.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.30	4.00	1.64	1.64	1.64	0.33	16.17	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0

Concrete Beam

Description : One-way slab at Chemical Room- 250 psf LL

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	2	8.35	4.00	1.57	1.57	1.72	0.30	16.01	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.40	4.00	1.49	1.49	1.79	0.28	15.87	Vu < PhiVc/2	Not Reqd	15.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.45	4.00	1.42	1.42	1.87	0.25	15.75	Vu < PhiVc/2	Not Reqd	15.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.50	4.00	1.34	1.34	1.93	0.23	15.63	Vu < PhiVc/2	Not Reqd	15.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.55	4.00	1.27	1.27	2.00	0.21	15.53	Vu < PhiVc/2	Not Reqd	15.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.60	4.00	1.20	1.20	2.06	0.19	15.43	Vu < PhiVc/2	Not Reqd	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.65	4.00	1.12	1.12	2.12	0.18	15.34	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.70	4.00	1.05	1.05	2.17	0.16	15.26	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.75	4.00	0.97	0.97	2.22	0.15	15.18	Vu < PhiVc/2	Not Reqd	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.80	4.00	0.90	0.90	2.27	0.13	15.11	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.85	4.00	0.82	0.82	2.31	0.12	15.04	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.90	4.00	0.75	0.75	2.35	0.11	14.97	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	8.95	4.00	0.67	0.67	2.39	0.09	14.91	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.00	4.00	-0.60	0.60	0.82	0.24	15.70	Vu < PhiVc/2	Not Reqd	15.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.05	4.00	-0.67	0.67	2.39	0.09	14.91	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.10	4.00	-0.75	0.75	2.35	0.11	14.97	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.15	4.00	-0.82	0.82	2.31	0.12	15.04	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.20	4.00	-0.90	0.90	2.27	0.13	15.11	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.25	4.00	-0.97	0.97	2.22	0.15	15.18	Vu < PhiVc/2	Not Reqd	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.30	4.00	-1.05	1.05	2.17	0.16	15.26	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.35	4.00	-1.12	1.12	2.12	0.18	15.34	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.40	4.00	-1.20	1.20	2.06	0.19	15.43	Vu < PhiVc/2	Not Reqd	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.45	4.00	-1.27	1.27	2.00	0.21	15.53	Vu < PhiVc/2	Not Reqd	15.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.50	4.00	-1.34	1.34	1.93	0.23	15.63	Vu < PhiVc/2	Not Reqd	15.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.55	4.00	-1.42	1.42	1.87	0.25	15.75	Vu < PhiVc/2	Not Reqd	15.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.60	4.00	-1.49	1.49	1.79	0.28	15.87	Vu < PhiVc/2	Not Reqd	15.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.65	4.00	-1.57	1.57	1.72	0.30	16.01	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.70	4.00	-1.64	1.64	1.64	0.33	16.17	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.75	4.00	-1.72	1.72	1.55	0.37	16.35	Vu < PhiVc/2	Not Reqd	16.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.80	4.00	-1.79	1.79	1.46	0.41	16.55	Vu < PhiVc/2	Not Reqd	16.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.85	4.00	-1.87	1.87	1.37	0.45	16.79	Vu < PhiVc/2	Not Reqd	16.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.90	4.00	-1.94	1.94	1.28	0.51	17.07	Vu < PhiVc/2	Not Reqd	17.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	9.95	4.00	-2.02	2.02	1.18	0.57	17.40	Vu < PhiVc/2	Not Reqd	17.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.00	4.00	-2.09	2.09	1.08	0.65	17.81	Vu < PhiVc/2	Not Reqd	17.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.05	4.00	-2.16	2.16	0.97	0.74	18.31	Vu < PhiVc/2	Not Reqd	18.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.10	4.00	-2.24	2.24	0.86	0.87	18.96	Vu < PhiVc/2	Not Reqd	19.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.15	4.00	-2.31	2.31	0.75	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.20	4.00	-2.39	2.39	0.63	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.25	4.00	-2.46	2.46	0.51	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.30	4.00	-2.54	2.54	0.38	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.35	4.00	-2.61	2.61	0.25	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.40	4.00	-2.69	2.69	0.12	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.45	4.00	-2.76	2.76	0.02	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.50	4.00	-2.83	2.83	0.16	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.55	4.00	-2.91	2.91	0.30	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.60	4.00	-2.98	2.98	0.45	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.65	4.00	-3.06	3.06	0.60	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.70	4.00	-3.13	3.13	0.75	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.75	4.00	-3.21	3.21	0.91	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.80	4.00	-3.28	3.28	1.07	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.85	4.00	-3.36	3.36	1.24	0.90	19.14	Vu < PhiVc/2	Not Reqd	19.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.90	4.00	-3.43	3.43	1.41	0.81	18.67	Vu < PhiVc/2	Not Reqd	18.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	10.95	4.00	-3.51	3.51	1.58	0.74	18.28	Vu < PhiVc/2	Not Reqd	18.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.00	4.00	-3.58	3.58	1.75	0.68	17.97	Vu < PhiVc/2	Not Reqd	18.0	0.0	0.0

Concrete Beam

Description : One-way slab at Chemical Room- 250 psf LL

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	2	11.05	4.00	-3.65	3.65	1.94	0.63	17.71	Vu < PhiVc/2	Not Reqd	17.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.10	4.00	-3.73	3.73	2.12	0.59	17.48	Vu < PhiVc/2	Not Reqd	17.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.15	4.00	-3.80	3.80	2.31	0.55	17.29	Vu < PhiVc/2	Not Reqd	17.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.20	4.00	-3.88	3.88	2.50	0.52	17.12	Vu < PhiVc/2	Not Reqd	17.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.25	4.00	-3.95	3.95	2.70	0.49	16.97	Vu < PhiVc/2	Not Reqd	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.30	4.00	-4.03	4.03	2.90	0.46	16.84	Vu < PhiVc/2	Not Reqd	16.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.35	4.00	-4.10	4.10	3.10	0.44	16.72	Vu < PhiVc/2	Not Reqd	16.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.40	4.00	-4.18	4.18	3.31	0.42	16.62	Vu < PhiVc/2	Not Reqd	16.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.45	4.00	-4.25	4.25	3.52	0.40	16.53	Vu < PhiVc/2	Not Reqd	16.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.50	4.00	-4.32	4.32	3.74	0.39	16.44	Vu < PhiVc/2	Not Reqd	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.55	4.00	-4.40	4.40	3.95	0.37	16.36	Vu < PhiVc/2	Not Reqd	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.60	4.00	-4.47	4.47	4.18	0.36	16.29	Vu < PhiVc/2	Not Reqd	16.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.65	4.00	-4.55	4.55	4.40	0.34	16.22	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.70	4.00	-4.62	4.62	4.63	0.33	16.16	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.75	4.00	-4.70	4.70	4.86	0.32	16.10	Vu < PhiVc/2	Not Reqd	16.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.80	4.00	-4.77	4.77	5.10	0.31	16.05	Vu < PhiVc/2	Not Reqd	16.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.85	4.00	-4.85	4.85	5.34	0.30	16.00	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.90	4.00	-4.92	4.92	5.58	0.29	15.96	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	2	11.95	4.00	-5.00	5.00	5.83	0.29	15.91	Vu < PhiVc/2	Not Reqd	15.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.00	4.00	5.48	5.48	6.08	0.30	15.99	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.05	4.00	5.41	5.41	5.81	0.31	16.04	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.10	4.00	5.33	5.33	5.54	0.32	16.10	Vu < PhiVc/2	Not Reqd	16.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.15	4.00	5.26	5.26	5.28	0.33	16.16	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.20	4.00	5.19	5.19	5.02	0.34	16.22	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.25	4.00	5.11	5.11	4.76	0.36	16.29	Vu < PhiVc/2	Not Reqd	16.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.30	4.00	5.04	5.04	4.51	0.37	16.37	Vu < PhiVc/2	Not Reqd	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.35	4.00	4.96	4.96	4.26	0.39	16.45	Vu < PhiVc/2	Not Reqd	16.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.40	4.00	4.89	4.89	4.01	0.41	16.55	Vu < PhiVc/2	Not Reqd	16.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.45	4.00	4.81	4.81	3.77	0.43	16.65	Vu < PhiVc/2	Not Reqd	16.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.50	4.00	4.74	4.74	3.53	0.45	16.76	Vu < PhiVc/2	Not Reqd	16.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.55	4.00	4.66	4.66	3.29	0.47	16.89	Vu < PhiVc/2	Not Reqd	16.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.60	4.00	4.59	4.59	3.06	0.50	17.03	Vu < PhiVc/2	Not Reqd	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.65	4.00	4.52	4.52	2.83	0.53	17.20	Vu < PhiVc/2	Not Reqd	17.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.70	4.00	4.44	4.44	2.61	0.57	17.39	Vu < PhiVc/2	Not Reqd	17.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.75	4.00	4.37	4.37	2.39	0.61	17.61	Vu < PhiVc/2	Not Reqd	17.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.80	4.00	4.29	4.29	2.17	0.66	17.86	Vu < PhiVc/2	Not Reqd	17.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.85	4.00	4.22	4.22	1.96	0.72	18.17	Vu < PhiVc/2	Not Reqd	18.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.90	4.00	4.14	4.14	1.75	0.79	18.54	Vu < PhiVc/2	Not Reqd	18.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	12.95	4.00	4.07	4.07	1.55	0.88	19.01	Vu < PhiVc/2	Not Reqd	19.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.00	4.00	3.99	3.99	1.34	0.99	19.60	Vu < PhiVc/2	Not Reqd	19.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.05	4.00	3.92	3.92	1.15	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.10	4.00	3.84	3.84	0.95	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.15	4.00	3.77	3.77	0.76	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.20	4.00	3.70	3.70	0.58	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.25	4.00	3.62	3.62	0.39	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.30	4.00	3.55	3.55	0.21	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.35	4.00	3.47	3.47	0.04	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.40	4.00	3.40	3.40	0.13	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.45	4.00	3.32	3.32	0.30	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.50	4.00	3.25	3.25	0.47	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.55	4.00	3.17	3.17	0.63	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.60	4.00	3.10	3.10	0.78	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.65	4.00	3.03	3.03	0.94	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.70	4.00	2.95	2.95	1.09	0.91	19.16	Vu < PhiVc/2	Not Reqd	19.2	0.0	0.0

Concrete Beam

Description : One-way slab at Chemical Room- 250 psf LL

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	3	13.75	4.00	2.88	2.88	1.23	0.78	18.49	Vu < PhiVc/2	Not Reqd	18.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.80	4.00	2.80	2.80	1.37	0.68	17.98	Vu < PhiVc/2	Not Reqd	18.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.85	4.00	2.73	2.73	1.51	0.60	17.57	Vu < PhiVc/2	Not Reqd	17.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.90	4.00	2.65	2.65	1.65	0.54	17.23	Vu < PhiVc/2	Not Reqd	17.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	13.95	4.00	2.58	2.58	1.78	0.48	16.95	Vu < PhiVc/2	Not Reqd	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.00	4.00	2.50	2.50	1.90	0.44	16.71	Vu < PhiVc/2	Not Reqd	16.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.05	4.00	2.43	2.43	2.03	0.40	16.51	Vu < PhiVc/2	Not Reqd	16.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.10	4.00	2.35	2.35	2.15	0.37	16.33	Vu < PhiVc/2	Not Reqd	16.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.15	4.00	2.28	2.28	2.26	0.34	16.18	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.20	4.00	2.21	2.21	2.38	0.31	16.04	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.25	4.00	2.13	2.13	2.48	0.29	15.92	Vu < PhiVc/2	Not Reqd	15.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.30	4.00	2.06	2.06	2.59	0.26	15.81	Vu < PhiVc/2	Not Reqd	15.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.35	4.00	1.98	1.98	2.69	0.25	15.71	Vu < PhiVc/2	Not Reqd	15.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.40	4.00	1.91	1.91	2.79	0.23	15.61	Vu < PhiVc/2	Not Reqd	15.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.45	4.00	1.83	1.83	2.88	0.21	15.53	Vu < PhiVc/2	Not Reqd	15.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.50	4.00	1.76	1.76	2.97	0.20	15.45	Vu < PhiVc/2	Not Reqd	15.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.55	4.00	1.68	1.68	3.06	0.18	15.38	Vu < PhiVc/2	Not Reqd	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.60	4.00	1.61	1.61	3.14	0.17	15.31	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.65	4.00	1.54	1.54	3.22	0.16	15.25	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.70	4.00	1.46	1.46	3.29	0.15	15.19	Vu < PhiVc/2	Not Reqd	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.75	4.00	1.39	1.39	3.36	0.14	15.14	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.80	4.00	1.31	1.31	3.43	0.13	15.09	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.85	4.00	1.24	1.24	3.49	0.12	15.04	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.90	4.00	1.16	1.16	3.55	0.11	14.99	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	14.95	4.00	1.09	1.09	3.61	0.10	14.95	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.00	4.00	1.01	1.01	3.66	0.09	14.90	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.05	4.00	0.94	0.94	3.71	0.08	14.86	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.10	4.00	0.86	0.86	3.76	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.15	4.00	0.79	0.79	3.80	0.07	14.78	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.20	4.00	0.72	0.72	3.84	0.06	14.75	Vu < PhiVc/2	Not Reqd	14.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.25	4.00	0.64	0.64	3.87	0.06	14.71	Vu < PhiVc/2	Not Reqd	14.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.30	4.00	0.57	0.57	3.90	0.05	14.67	Vu < PhiVc/2	Not Reqd	14.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.35	4.00	0.49	0.49	3.93	0.04	14.64	Vu < PhiVc/2	Not Reqd	14.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.40	4.00	0.42	0.42	0.11	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.45	4.00	0.40	0.40	0.09	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.50	4.00	0.39	0.39	0.07	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.55	4.00	0.37	0.37	0.05	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.60	4.00	-0.36	0.36	5.16	0.02	14.54	Vu < PhiVc/2	Not Reqd	14.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.65	4.00	-0.43	0.43	5.14	0.03	14.57	Vu < PhiVc/2	Not Reqd	14.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.70	4.00	-0.51	0.51	5.11	0.03	14.59	Vu < PhiVc/2	Not Reqd	14.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.75	4.00	-0.58	0.58	5.08	0.04	14.62	Vu < PhiVc/2	Not Reqd	14.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.80	4.00	-0.66	0.66	5.05	0.04	14.65	Vu < PhiVc/2	Not Reqd	14.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.85	4.00	-0.73	0.73	5.02	0.05	14.67	Vu < PhiVc/2	Not Reqd	14.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.90	4.00	-0.81	0.81	4.98	0.05	14.70	Vu < PhiVc/2	Not Reqd	14.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	15.95	4.00	-0.88	0.88	4.94	0.06	14.73	Vu < PhiVc/2	Not Reqd	14.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.00	4.00	-0.96	0.96	4.89	0.07	14.76	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.05	4.00	-1.03	1.03	4.84	0.07	14.79	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.10	4.00	-1.11	1.11	4.79	0.08	14.82	Vu < PhiVc/2	Not Reqd	14.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.15	4.00	-1.18	1.18	4.73	0.08	14.85	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.20	4.00	-1.25	1.25	4.67	0.09	14.89	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.25	4.00	-1.33	1.33	4.61	0.10	14.92	Vu < PhiVc/2	Not Reqd	14.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.30	4.00	-1.40	1.40	4.54	0.10	14.96	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.35	4.00	-1.48	1.48	4.47	0.11	15.00	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.40	4.00	-1.55	1.55	4.55	0.12	15.04	Vu < PhiVc/2	Not Reqd	15.0	0.0	0.0

Concrete Beam

Description : One-way slab at Chemical Room- 250 psf LL

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H, I	3	16.45	4.00	-1.63	1.63	4.31	0.13	15.08	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.50	4.00	-1.70	1.70	4.23	0.13	15.12	Vu < PhiVc/2	Not Reqd	15.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.55	4.00	-1.78	1.78	4.14	0.14	15.17	Vu < PhiVc/2	Not Reqd	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.60	4.00	-1.85	1.85	4.05	0.15	15.22	Vu < PhiVc/2	Not Reqd	15.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.65	4.00	-1.92	1.92	3.96	0.16	15.27	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.70	4.00	-2.00	2.00	3.86	0.17	15.32	Vu < PhiVc/2	Not Reqd	15.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.75	4.00	-2.07	2.07	3.76	0.18	15.38	Vu < PhiVc/2	Not Reqd	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.80	4.00	-2.15	2.15	3.65	0.20	15.45	Vu < PhiVc/2	Not Reqd	15.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.85	4.00	-2.22	2.22	3.54	0.21	15.51	Vu < PhiVc/2	Not Reqd	15.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.90	4.00	-2.30	2.30	3.43	0.22	15.59	Vu < PhiVc/2	Not Reqd	15.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	16.95	4.00	-2.37	2.37	3.31	0.24	15.67	Vu < PhiVc/2	Not Reqd	15.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.00	4.00	-2.45	2.45	3.19	0.26	15.76	Vu < PhiVc/2	Not Reqd	15.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.05	4.00	-2.52	2.52	3.07	0.27	15.85	Vu < PhiVc/2	Not Reqd	15.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.10	4.00	-2.60	2.60	2.94	0.29	15.96	Vu < PhiVc/2	Not Reqd	16.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.15	4.00	-2.67	2.67	2.81	0.32	16.08	Vu < PhiVc/2	Not Reqd	16.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.20	4.00	-2.74	2.74	2.67	0.34	16.21	Vu < PhiVc/2	Not Reqd	16.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.25	4.00	-2.82	2.82	2.53	0.37	16.36	Vu < PhiVc/2	Not Reqd	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.30	4.00	-2.89	2.89	2.39	0.40	16.53	Vu < PhiVc/2	Not Reqd	16.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.35	4.00	-2.97	2.97	2.24	0.44	16.73	Vu < PhiVc/2	Not Reqd	16.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.40	4.00	-3.04	3.04	2.09	0.48	16.95	Vu < PhiVc/2	Not Reqd	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.45	4.00	-3.12	3.12	1.94	0.54	17.22	Vu < PhiVc/2	Not Reqd	17.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.50	4.00	-3.19	3.19	1.78	0.60	17.54	Vu < PhiVc/2	Not Reqd	17.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.55	4.00	-3.27	3.27	1.62	0.67	17.93	Vu < PhiVc/2	Not Reqd	17.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.60	4.00	-3.34	3.34	1.46	0.77	18.42	Vu < PhiVc/2	Not Reqd	18.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.65	4.00	-3.41	3.41	1.29	0.88	19.05	Vu < PhiVc/2	Not Reqd	19.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.70	4.00	-3.49	3.49	1.11	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.75	4.00	-3.56	3.56	0.94	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.80	4.00	-3.64	3.64	0.76	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.85	4.00	-3.71	3.71	0.57	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.90	4.00	-3.79	3.79	0.39	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	17.95	4.00	-3.86	3.86	0.19	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H, I	3	18.00	4.00	-3.94	3.94	0.00	1.00	19.65	Vu < PhiVc/2	Not Reqd	19.7	0.0	0.0

Printed: 17 JAN 2014, 1:36AM

Concrete Beam

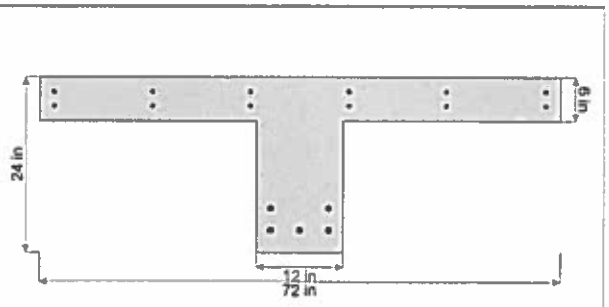
File = p:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

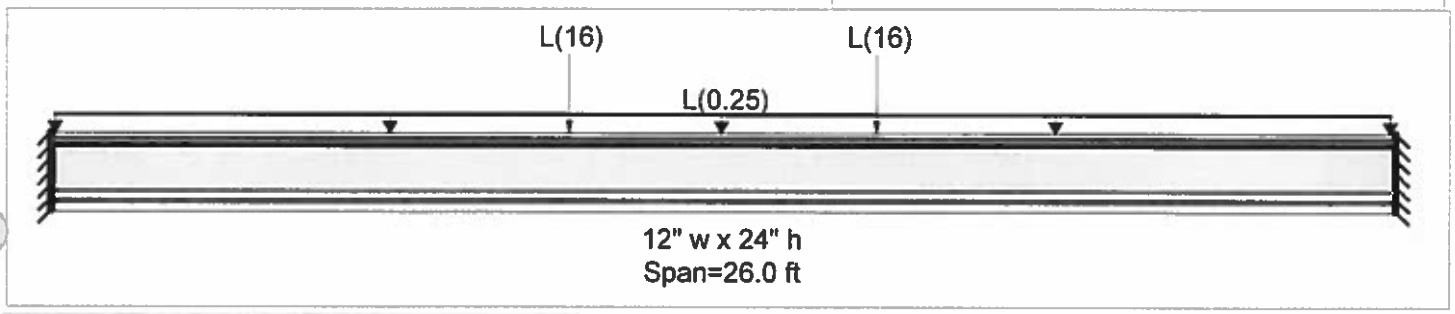
Description : T-Beam Over Chemical Room

Material Properties

f'c	=	4.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c^1/2 * 7.50	=	474.342 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	# 4
			Number of Resisting Legs Per Stirrup	=	2

Load Combination ASCE 7-02





Cross Section & Reinforcing Details

Tee Section, Stem Width = 12.0 in, Total Height = 24.0 in, Top Flange Width = 72.0 in, Flange Thickness = 6.0 in

Span #1 Reinforcing....

3-#7 at 3.0 in from Bottom, from 0.0 to 26.0 ft in this span
6-#5 at 2.0 in from Top, from 0.0 to 26.0 ft in this span
2-#7 at 6.0 in from Bottom, from 0.0 to 26.0 ft in this span
6-#5 at 4.0 in from Top, from 0.0 to 26.0 ft in this span

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : L = 0.250 k/ft, Tributary Width = 1.0 ft
Point Load : L = 16.0 k @ 10.0 ft, (HS20 Loading)
Point Load : L = 16.0 k @ 16.0 ft, (HS20 Loading 2)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.709 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward L+Lr+S Deflection	0.133 in Ratio = 2352
Mu : Applied	-224.180 k-ft	Max Upward L+Lr+S Deflection	0.000 in Ratio = 0 <360
Mn * Phi : Allowable	316.045 k-ft	Max Downward Total Deflection	0.148 in Ratio = 2107
Load Combination	+1.20D+0.50Lr+1.60L+1.60H	Max Upward Total Deflection	0.000 in Ratio = 999 <180
Location of maximum on span	26.000 ft		
Span # where maximum occurs	Span # 1		

Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	27.732	27.733
D Only	8.483	8.482
L Only	19.250	19.250
D+L	27.732	27.733

Shear Stirrup Requirements

Between 0.00 to 10.00 ft, PhiVc < Vu, Req'd Vs = 4.171, use stirrups spaced at 10.000 in
Between 10.05 to 15.95 ft, Vu < PhiVc/2, Req'd Vs = Not Reqd, use stirrups spaced at 0.000 in
Between 16.00 to 25.94 ft, PhiVc < Vu, Req'd Vs = 14.849, use stirrups spaced at 10.000 in

Maximum Forces & Stresses for Load Combinations

Concrete Beam

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : T-Beam Over Chemical Room

Load Combination / Segment Length	Span #	Location (ft) in Span	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	26.000	-224.18	316.05	0.71
+1.40D					
Span # 1	1	26.000	-51.46	316.05	0.16
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	26.000	-224.18	316.05	0.71
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	26.000	-224.18	316.05	0.71
+1.20D+1.60Lr+0.50L					
Span # 1	1	26.000	-100.38	316.05	0.32
+1.20D+1.60Lr+0.80W					
Span # 1	1	26.000	-44.11	316.05	0.14
+1.20D+0.50L+1.60S					
Span # 1	1	26.000	-100.38	316.05	0.32
+1.20D+1.60S+0.80W					
Span # 1	1	26.000	-44.11	316.05	0.14
+1.20D+0.50Lr+0.50L+1.60W					
Span # 1	1	26.000	-100.38	316.05	0.32
+1.20D+0.50L+0.50S+1.60W					
Span # 1	1	26.000	-100.38	316.05	0.32
+1.20D+0.50L+0.20S+E					
Span # 1	1	26.000	-100.38	316.05	0.32
+0.90D+1.60W+1.60H					
Span # 1	1	26.000	-33.08	316.05	0.10
+0.90D+E+1.60H					
Span # 1	1	26.000	-33.08	316.05	0.10

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.1480	13.260		0.0000	0.000

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	0.00	22.00	40.98	40.98	224.18	0.34	26.13	PhiVc < Vu	14.849	52.5	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.06	22.00	40.91	40.91	221.81	0.34	26.15	PhiVc < Vu	14.759	52.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.12	22.00	40.84	40.84	219.45	0.34	26.17	PhiVc < Vu	14.669	52.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.17	22.00	40.77	40.77	217.09	0.34	26.19	PhiVc < Vu	14.579	52.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.23	22.00	40.71	40.71	214.74	0.35	26.22	PhiVc < Vu	14.489	52.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.29	22.00	40.64	40.64	212.39	0.35	26.24	PhiVc < Vu	14.398	52.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.35	22.00	40.57	40.57	210.04	0.35	26.26	PhiVc < Vu	14.306	52.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.40	22.00	40.50	40.50	207.70	0.36	26.29	PhiVc < Vu	14.214	52.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.46	22.00	40.43	40.43	205.36	0.36	26.31	PhiVc < Vu	14.122	52.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.52	22.00	40.36	40.36	203.03	0.36	26.34	PhiVc < Vu	14.029	52.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.58	22.00	40.30	40.30	200.70	0.37	26.36	PhiVc < Vu	13.935	52.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.64	22.00	40.23	40.23	198.37	0.37	26.39	PhiVc < Vu	13.841	52.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.69	22.00	40.16	40.16	196.05	0.38	26.41	PhiVc < Vu	13.746	52.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.75	22.00	40.09	40.09	193.73	0.38	26.44	PhiVc < Vu	13.651	52.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.81	22.00	40.02	40.02	191.42	0.38	26.47	PhiVc < Vu	13.555	52.9	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.87	22.00	39.95	39.95	189.11	0.39	26.49	PhiVc < Vu	13.459	52.9	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.92	22.00	39.89	39.89	186.80	0.39	26.52	PhiVc < Vu	13.362	52.9	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	0.98	22.00	39.82	39.82	184.50	0.40	26.55	PhiVc < Vu	13.264	53.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.04	22.00	39.75	39.75	182.20	0.40	26.58	PhiVc < Vu	13.166	53.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.10	22.00	39.68	39.68	179.91	0.40	26.61	PhiVc < Vu	13.067	53.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.16	22.00	39.61	39.61	177.62	0.41	26.64	PhiVc < Vu	12.967	53.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.21	22.00	39.54	39.54	175.33	0.41	26.68	PhiVc < Vu	12.867	53.1	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.27	22.00	39.48	39.48	173.05	0.42	26.71	PhiVc < Vu	12.765	53.1	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.33	22.00	39.41	39.41	170.77	0.42	26.74	PhiVc < Vu	12.663	53.1	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.39	22.00	39.34	39.34	168.49	0.43	26.78	PhiVc < Vu	12.560	53.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.44	22.00	39.27	39.27	166.22	0.43	26.81	PhiVc < Vu	12.456	53.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.50	22.00	39.20	39.20	163.95	0.44	26.85	PhiVc < Vu	12.351	53.3	11.0	10.0

Concrete Beam

File = p:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : T-Beam Over Chemical Room

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	1.56	22.00	39.13	39.13	161.69	0.44	26.89	PhiVc < Vu	12.246	53.3	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.62	22.00	39.07	39.07	159.43	0.45	26.93	PhiVc < Vu	12.139	53.3	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.68	22.00	39.00	39.00	157.18	0.45	26.97	PhiVc < Vu	12.031	53.4	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.73	22.00	38.93	38.93	154.93	0.46	27.01	PhiVc < Vu	11.922	53.4	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.79	22.00	38.86	38.86	152.68	0.47	27.05	PhiVc < Vu	11.812	53.4	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.85	22.00	38.79	38.79	150.44	0.47	27.09	PhiVc < Vu	11.701	53.5	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.91	22.00	38.72	38.72	148.20	0.48	27.13	PhiVc < Vu	11.589	53.5	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	1.96	22.00	38.66	38.66	145.96	0.49	27.18	PhiVc < Vu	11.476	53.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.02	22.00	38.59	38.59	143.73	0.49	27.23	PhiVc < Vu	11.361	53.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.08	22.00	38.52	38.52	141.50	0.50	27.27	PhiVc < Vu	11.244	53.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.14	22.00	38.45	38.45	139.28	0.51	27.32	PhiVc < Vu	11.127	53.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.20	22.00	38.38	38.38	137.06	0.51	27.37	PhiVc < Vu	11.008	53.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.25	22.00	38.31	38.31	134.84	0.52	27.43	PhiVc < Vu	10.887	53.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.31	22.00	38.24	38.24	132.63	0.53	27.48	PhiVc < Vu	10.765	53.9	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.37	22.00	38.18	38.18	130.42	0.54	27.54	PhiVc < Vu	10.641	53.9	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.43	22.00	38.11	38.11	128.22	0.54	27.59	PhiVc < Vu	10.515	54.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.48	22.00	38.04	38.04	126.02	0.55	27.65	PhiVc < Vu	10.387	54.1	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.54	22.00	37.97	37.97	123.82	0.56	27.71	PhiVc < Vu	10.257	54.1	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.60	22.00	37.90	37.90	121.63	0.57	27.78	PhiVc < Vu	10.125	54.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.66	22.00	37.83	37.83	119.44	0.58	27.84	PhiVc < Vu	9.991	54.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.72	22.00	37.77	37.77	117.26	0.59	27.91	PhiVc < Vu	9.855	54.3	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.77	22.00	37.70	37.70	115.08	0.60	27.98	PhiVc < Vu	9.716	54.4	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.83	22.00	37.63	37.63	112.90	0.61	28.05	PhiVc < Vu	9.575	54.5	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.89	22.00	37.56	37.56	110.73	0.62	28.13	PhiVc < Vu	9.431	54.5	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	2.95	22.00	37.49	37.49	108.56	0.63	28.21	PhiVc < Vu	9.284	54.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.00	22.00	37.42	37.42	106.40	0.64	28.29	PhiVc < Vu	9.134	54.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.06	22.00	37.36	37.36	104.24	0.66	28.38	PhiVc < Vu	8.981	54.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.12	22.00	37.29	37.29	102.08	0.67	28.46	PhiVc < Vu	8.824	54.9	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.18	22.00	37.22	37.22	99.93	0.68	28.56	PhiVc < Vu	8.664	55.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.24	22.00	37.15	37.15	97.78	0.70	28.65	PhiVc < Vu	8.50	55.1	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.29	22.00	37.08	37.08	95.64	0.71	28.75	PhiVc < Vu	8.332	55.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.35	22.00	37.01	37.01	93.50	0.73	28.86	PhiVc < Vu	8.159	55.3	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.41	22.00	36.95	36.95	91.36	0.74	28.96	PhiVc < Vu	7.982	55.4	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.47	22.00	36.88	36.88	89.23	0.76	29.08	PhiVc < Vu	7.80	55.5	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.52	22.00	36.81	36.81	87.10	0.77	29.20	PhiVc < Vu	7.612	55.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.58	22.00	36.74	36.74	84.97	0.79	29.32	PhiVc < Vu	7.419	55.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.64	22.00	36.67	36.67	82.85	0.81	29.45	PhiVc < Vu	7.220	55.9	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.70	22.00	36.60	36.60	80.74	0.83	29.59	PhiVc < Vu	7.014	56.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.76	22.00	36.54	36.54	78.62	0.85	29.74	PhiVc < Vu	6.801	56.1	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.81	22.00	36.47	36.47	76.51	0.87	29.89	PhiVc < Vu	6.580	56.3	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.87	22.00	36.40	36.40	74.41	0.90	30.05	PhiVc < Vu	6.351	56.4	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.93	22.00	36.33	36.33	72.31	0.92	30.22	PhiVc < Vu	6.113	56.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	3.99	22.00	36.26	36.26	70.21	0.95	30.40	PhiVc < Vu	5.865	56.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.04	22.00	36.19	36.19	68.12	0.97	30.59	PhiVc < Vu	5.607	57.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.10	22.00	36.13	36.13	66.03	1.00	30.77	PhiVc < Vu	5.358	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.16	22.00	36.06	36.06	63.94	1.00	30.77	PhiVc < Vu	5.290	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.22	22.00	35.99	35.99	61.86	1.00	30.77	PhiVc < Vu	5.221	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.28	22.00	35.92	35.92	59.78	1.00	30.77	PhiVc < Vu	5.153	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.33	22.00	35.85	35.85	57.71	1.00	30.77	PhiVc < Vu	5.085	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.39	22.00	35.78	35.78	55.64	1.00	30.77	PhiVc < Vu	5.016	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.45	22.00	35.72	35.72	53.58	1.00	30.77	PhiVc < Vu	4.948	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.51	22.00	35.65	35.65	51.51	1.00	30.77	PhiVc < Vu	4.880	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.56	22.00	35.58	35.58	49.46	1.00	30.77	PhiVc < Vu	4.811	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.62	22.00	35.51	35.51	47.41	1.00	30.77	PhiVc < Vu	4.743	57.2	11.0	10.0

Concrete Beam

Description : T-Beam Over Chemical Room

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	4.68	22.00	35.44	35.44	45.35	1.00	30.77	PhiVc < Vu	4.675	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.74	22.00	35.37	35.37	43.31	1.00	30.77	PhiVc < Vu	4.606	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.80	22.00	35.31	35.31	41.27	1.00	30.77	PhiVc < Vu	4.538	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.85	22.00	35.24	35.24	39.23	1.00	30.77	PhiVc < Vu	4.470	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.91	22.00	35.17	35.17	37.19	1.00	30.77	PhiVc < Vu	4.401	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	4.97	22.00	35.10	35.10	35.16	1.00	30.77	PhiVc < Vu	4.333	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.03	22.00	35.03	35.03	33.14	1.00	30.77	PhiVc < Vu	4.264	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.08	22.00	34.96	34.96	31.12	1.00	30.77	PhiVc < Vu	4.196	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.14	22.00	34.90	34.90	29.10	1.00	30.77	PhiVc < Vu	4.128	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.20	22.00	34.83	34.83	27.08	1.00	30.77	PhiVc < Vu	4.059	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.26	22.00	34.76	34.76	25.07	1.00	30.77	PhiVc < Vu	3.991	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.32	22.00	34.69	34.69	23.07	1.00	30.77	PhiVc < Vu	3.923	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.37	22.00	34.62	34.62	21.06	1.00	30.77	PhiVc < Vu	3.854	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.43	22.00	34.55	34.55	19.07	1.00	30.77	PhiVc < Vu	3.786	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.49	22.00	34.49	34.49	17.07	1.00	30.77	PhiVc < Vu	3.718	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.55	22.00	34.42	34.42	15.08	1.00	30.77	PhiVc < Vu	3.649	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.60	22.00	34.35	34.35	13.09	1.00	30.77	PhiVc < Vu	3.581	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.66	22.00	34.28	34.28	11.11	1.00	30.77	PhiVc < Vu	3.513	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.72	22.00	34.21	34.21	9.13	1.00	30.77	PhiVc < Vu	3.444	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.78	22.00	34.14	34.14	7.16	1.00	30.77	PhiVc < Vu	3.376	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.84	22.00	34.08	34.08	5.19	1.00	30.77	PhiVc < Vu	3.308	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.89	22.00	34.01	34.01	3.22	1.00	30.77	PhiVc < Vu	3.239	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	5.95	22.00	33.94	33.94	1.26	1.00	30.77	PhiVc < Vu	3.171	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.01	21.00	33.87	33.87	0.70	1.00	28.34	PhiVc < Vu	5.534	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.07	21.00	33.80	33.80	2.66	1.00	28.34	PhiVc < Vu	5.466	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.12	21.00	33.73	33.73	4.61	1.00	28.34	PhiVc < Vu	5.397	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.18	21.00	33.67	33.67	6.55	1.00	28.34	PhiVc < Vu	5.329	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.24	21.00	33.60	33.60	8.50	1.00	28.34	PhiVc < Vu	5.261	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.30	21.00	33.53	33.53	10.44	1.00	28.34	PhiVc < Vu	5.192	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.36	21.00	33.46	33.46	12.37	1.00	28.34	PhiVc < Vu	5.124	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.41	21.00	33.39	33.39	14.30	1.00	28.34	PhiVc < Vu	5.056	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.47	21.00	33.32	33.32	16.23	1.00	28.34	PhiVc < Vu	4.987	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.53	21.00	33.26	33.26	18.15	1.00	28.34	PhiVc < Vu	4.919	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.59	21.00	33.19	33.19	20.07	1.00	28.34	PhiVc < Vu	4.850	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.64	21.00	33.12	33.12	21.99	1.00	28.34	PhiVc < Vu	4.782	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.70	21.00	33.05	33.05	23.90	1.00	28.34	PhiVc < Vu	4.714	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.76	21.00	32.98	32.98	25.81	1.00	28.34	PhiVc < Vu	4.645	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.82	21.00	32.91	32.91	27.71	1.00	28.34	PhiVc < Vu	4.577	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.88	21.00	32.85	32.85	29.61	1.00	28.34	PhiVc < Vu	4.509	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.93	21.00	32.78	32.78	31.51	1.00	28.34	PhiVc < Vu	4.440	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	6.99	21.00	32.71	32.71	33.40	1.00	28.34	PhiVc < Vu	4.372	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.05	21.00	32.64	32.64	35.29	1.00	28.34	PhiVc < Vu	4.304	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.11	21.00	32.57	32.57	37.17	1.00	28.34	PhiVc < Vu	4.235	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.16	21.00	32.50	32.50	39.05	1.00	28.34	PhiVc < Vu	4.167	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.22	21.00	32.44	32.44	40.93	1.00	28.34	PhiVc < Vu	4.099	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.28	21.00	32.37	32.37	42.80	1.00	28.34	PhiVc < Vu	4.030	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.34	21.00	32.30	32.30	44.67	1.00	28.34	PhiVc < Vu	3.962	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.40	21.00	32.23	32.23	46.53	1.00	28.34	PhiVc < Vu	3.894	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.45	21.00	32.16	32.16	48.39	1.00	28.34	PhiVc < Vu	3.825	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.51	21.00	32.09	32.09	50.25	1.00	28.34	PhiVc < Vu	3.757	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.57	21.00	32.02	32.02	52.10	1.00	28.34	PhiVc < Vu	3.689	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.63	21.00	31.96	31.96	53.95	1.00	28.34	PhiVc < Vu	3.620	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.68	21.00	31.89	31.89	55.79	1.00	28.34	PhiVc < Vu	3.552	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.74	21.00	31.82	31.82	57.60	0.97	28.15	PhiVc < Vu	3.674	53.3	10.5	10.0

Concrete Beam

File = p:\OGDENC~1\04310~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : T-Beam Over Chemical Room

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	7.80	21.00	31.75	31.75	59.47	0.93	27.97	PhiVc < Vu	3.784	53.2	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.86	21.00	31.68	31.68	61.30	0.90	27.80	PhiVc < Vu	3.884	53.0	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.92	21.00	31.61	31.61	63.13	0.88	27.64	PhiVc < Vu	3.974	52.8	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	7.97	21.00	31.55	31.55	64.96	0.85	27.49	PhiVc < Vu	4.054	52.7	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.03	21.00	31.48	31.48	66.78	0.82	27.35	PhiVc < Vu	4.126	52.6	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.09	21.00	31.41	31.41	68.59	0.80	27.22	PhiVc < Vu	4.191	52.4	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.15	21.00	31.34	31.34	70.41	0.78	27.09	PhiVc < Vu	4.248	52.3	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.20	21.00	31.27	31.27	72.21	0.76	26.97	PhiVc < Vu	4.299	52.2	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.26	21.00	31.20	31.20	74.02	0.74	26.86	PhiVc < Vu	4.343	52.1	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.32	21.00	31.14	31.14	75.82	0.72	26.75	PhiVc < Vu	4.383	52.0	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.38	21.00	31.07	31.07	77.62	0.70	26.65	PhiVc < Vu	4.416	51.9	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.44	21.00	31.00	31.00	79.41	0.68	26.55	PhiVc < Vu	4.446	51.8	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.49	21.00	30.93	30.93	81.20	0.67	26.46	PhiVc < Vu	4.470	51.7	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.55	21.00	30.86	30.86	82.98	0.65	26.37	PhiVc < Vu	4.491	51.6	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.61	21.00	30.79	30.79	84.77	0.64	26.29	PhiVc < Vu	4.507	51.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.67	21.00	30.73	30.73	86.54	0.62	26.21	PhiVc < Vu	4.520	51.4	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.72	21.00	30.66	30.66	88.32	0.61	26.13	PhiVc < Vu	4.529	51.3	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.78	21.00	30.59	30.59	90.09	0.59	26.05	PhiVc < Vu	4.536	51.3	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.84	21.00	30.52	30.52	91.85	0.58	25.98	PhiVc < Vu	4.539	51.2	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.90	21.00	30.45	30.45	93.61	0.57	25.91	PhiVc < Vu	4.539	51.1	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	8.96	21.00	30.38	30.38	95.37	0.56	25.85	PhiVc < Vu	4.537	51.0	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.01	21.00	30.32	30.32	97.12	0.55	25.78	PhiVc < Vu	4.532	51.0	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.07	21.00	30.25	30.25	98.87	0.54	25.72	PhiVc < Vu	4.525	50.9	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.13	21.00	30.18	30.18	100.62	0.52	25.66	PhiVc < Vu	4.516	50.9	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.19	21.00	30.11	30.11	102.36	0.51	25.61	PhiVc < Vu	4.504	50.8	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.24	21.00	30.04	30.04	104.10	0.51	25.55	PhiVc < Vu	4.490	50.8	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.30	21.00	29.97	29.97	105.83	0.50	25.50	PhiVc < Vu	4.475	50.7	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.36	21.00	29.91	29.91	107.56	0.49	25.45	PhiVc < Vu	4.458	50.6	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.42	21.00	29.84	29.84	109.29	0.48	25.40	PhiVc < Vu	4.439	50.6	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.48	21.00	29.77	29.77	111.01	0.47	25.35	PhiVc < Vu	4.418	50.6	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.53	21.00	29.70	29.70	112.73	0.46	25.31	PhiVc < Vu	4.396	50.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.59	21.00	29.63	29.63	114.44	0.45	25.26	PhiVc < Vu	4.372	50.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.65	21.00	29.56	29.56	116.15	0.45	25.22	PhiVc < Vu	4.347	50.4	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.71	21.00	29.50	29.50	117.86	0.44	25.18	PhiVc < Vu	4.321	50.4	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.76	21.00	29.43	29.43	119.56	0.43	25.13	PhiVc < Vu	4.293	50.3	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.82	21.00	29.36	29.36	121.26	0.42	25.09	PhiVc < Vu	4.264	50.3	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.88	21.00	29.29	29.29	122.95	0.42	25.06	PhiVc < Vu	4.234	50.3	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	9.94	21.00	29.22	29.22	124.64	0.41	25.02	PhiVc < Vu	4.203	50.2	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	10.00	21.00	29.15	29.15	126.33	0.40	24.98	PhiVc < Vu	4.171	50.2	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	10.05	21.00	3.49	3.49	126.65	0.05	22.98	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.11	21.00	3.42	3.42	126.85	0.05	22.98	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.17	21.00	3.35	3.35	127.04	0.05	22.97	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.23	21.00	3.28	3.28	127.23	0.05	22.97	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.28	21.00	3.21	3.21	127.42	0.04	22.96	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.34	21.00	3.14	3.14	127.61	0.04	22.95	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.40	21.00	3.08	3.08	127.79	0.04	22.95	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.46	21.00	3.01	3.01	127.96	0.04	22.94	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.52	21.00	2.94	2.94	128.13	0.04	22.94	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.57	21.00	2.87	2.87	128.30	0.04	22.93	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.63	21.00	2.80	2.80	128.46	0.04	22.93	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.69	21.00	2.73	2.73	128.62	0.04	22.92	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.75	21.00	2.67	2.67	128.78	0.04	22.92	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.80	21.00	2.60	2.60	128.93	0.04	22.91	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.86	21.00	2.53	2.53	129.08	0.03	22.90	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0

Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : T-Beam Over Chemical Room

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	10.92	21.00	2.46	2.46	129.22	0.03	22.90	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.98	21.00	2.39	2.39	129.37	0.03	22.89	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.04	21.00	2.32	2.32	129.50	0.03	22.89	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.09	21.00	2.26	2.26	129.63	0.03	22.88	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.15	21.00	2.19	2.19	129.76	0.03	22.88	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.21	21.00	2.12	2.12	129.89	0.03	22.87	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.27	21.00	2.05	2.05	130.01	0.03	22.87	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.32	21.00	1.98	1.98	130.12	0.03	22.86	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.38	21.00	1.91	1.91	130.24	0.03	22.86	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.44	21.00	1.85	1.85	130.34	0.02	22.85	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.50	21.00	1.78	1.78	130.45	0.02	22.85	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.56	21.00	1.71	1.71	130.55	0.02	22.84	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.61	21.00	1.64	1.64	130.65	0.02	22.84	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.67	21.00	1.57	1.57	130.74	0.02	22.83	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.73	21.00	1.50	1.50	130.83	0.02	22.82	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.79	21.00	1.44	1.44	130.91	0.02	22.82	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.84	21.00	1.37	1.37	130.99	0.02	22.81	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.90	21.00	1.30	1.30	131.07	0.02	22.81	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.96	21.00	1.23	1.23	131.14	0.02	22.80	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.02	21.00	1.16	1.16	131.21	0.02	22.80	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.08	21.00	1.09	1.09	131.28	0.01	22.79	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.13	21.00	1.03	1.03	131.34	0.01	22.79	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.19	21.00	0.96	0.96	131.40	0.01	22.78	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.25	21.00	0.89	0.89	131.45	0.01	22.78	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.31	21.00	0.82	0.82	131.50	0.01	22.77	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.36	21.00	0.75	0.75	131.55	0.01	22.77	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.42	21.00	0.68	0.68	131.59	0.01	22.76	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.48	21.00	0.62	0.62	131.62	0.01	22.76	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.54	21.00	0.55	0.55	131.66	0.01	22.75	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.60	21.00	0.48	0.48	131.69	0.01	22.75	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.65	21.00	0.41	0.41	131.71	0.01	22.74	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.71	21.00	0.34	0.34	131.73	0.00	22.74	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.77	21.00	0.27	0.27	131.75	0.00	22.73	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.83	21.00	0.21	0.21	131.77	0.00	22.73	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.88	21.00	0.14	0.14	131.78	0.00	22.72	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.94	21.00	0.07	0.07	131.78	0.00	22.72	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.00	21.00	-0.00	0.00	131.78	0.00	22.71	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.06	21.00	-0.07	0.07	131.78	0.00	22.72	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.12	21.00	-0.14	0.14	131.78	0.00	22.72	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.17	21.00	-0.21	0.21	131.77	0.00	22.73	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.23	21.00	-0.27	0.27	131.75	0.00	22.73	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.29	21.00	-0.34	0.34	131.73	0.00	22.74	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.35	21.00	-0.41	0.41	131.71	0.01	22.74	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.40	21.00	-0.48	0.48	131.69	0.01	22.75	Vu < PhiVc/2	Not Reqd	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.46	21.00	-0.55	0.55	131.66	0.01	22.75	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.52	21.00	-0.62	0.62	131.62	0.01	22.76	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.58	21.00	-0.68	0.68	131.59	0.01	22.76	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.64	21.00	-0.75	0.75	131.55	0.01	22.77	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.69	21.00	-0.82	0.82	131.50	0.01	22.77	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.75	21.00	-0.89	0.89	131.45	0.01	22.78	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.81	21.00	-0.96	0.96	131.40	0.01	22.78	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.87	21.00	-1.03	1.03	131.34	0.01	22.79	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.92	21.00	-1.09	1.09	131.28	0.01	22.79	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.98	21.00	-1.16	1.16	131.22	0.02	22.80	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0

Concrete Beam

Description : T-Beam Over Chemical Room

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	14.04	21.00	-1.23	1.23	131.14	0.02	22.80	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.10	21.00	-1.30	1.30	131.07	0.02	22.81	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.16	21.00	-1.37	1.37	130.99	0.02	22.81	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.21	21.00	-1.44	1.44	130.91	0.02	22.82	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.27	21.00	-1.50	1.50	130.83	0.02	22.82	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.33	21.00	-1.57	1.57	130.74	0.02	22.83	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.39	21.00	-1.64	1.64	130.65	0.02	22.84	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.44	21.00	-1.71	1.71	130.55	0.02	22.84	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.50	21.00	-1.78	1.78	130.45	0.02	22.85	Vu < PhiVc/2	Not Reqd	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.56	21.00	-1.85	1.85	130.34	0.02	22.85	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.62	21.00	-1.91	1.91	130.24	0.03	22.86	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.68	21.00	-1.98	1.98	130.12	0.03	22.86	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.73	21.00	-2.05	2.05	130.01	0.03	22.87	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.79	21.00	-2.12	2.12	129.89	0.03	22.87	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.85	21.00	-2.19	2.19	129.76	0.03	22.88	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.91	21.00	-2.26	2.26	129.63	0.03	22.88	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.96	21.00	-2.32	2.32	129.50	0.03	22.89	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.02	21.00	-2.39	2.39	129.37	0.03	22.89	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.08	21.00	-2.46	2.46	129.22	0.03	22.90	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.14	21.00	-2.53	2.53	129.08	0.03	22.90	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.20	21.00	-2.60	2.60	128.93	0.04	22.91	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.25	21.00	-2.67	2.67	128.78	0.04	22.92	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.31	21.00	-2.73	2.73	128.62	0.04	22.92	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.37	21.00	-2.80	2.80	128.46	0.04	22.93	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.43	21.00	-2.87	2.87	128.30	0.04	22.93	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.48	21.00	-2.94	2.94	128.13	0.04	22.94	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.54	21.00	-3.01	3.01	127.96	0.04	22.94	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.60	21.00	-3.08	3.08	127.79	0.04	22.95	Vu < PhiVc/2	Not Reqd	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.66	21.00	-3.14	3.14	127.61	0.04	22.95	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.72	21.00	-3.21	3.21	127.42	0.04	22.96	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.77	21.00	-3.28	3.28	127.23	0.05	22.97	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.83	21.00	-3.35	3.35	127.04	0.05	22.97	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.89	21.00	-3.42	3.42	126.85	0.05	22.98	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.95	21.00	-3.49	3.49	126.65	0.05	22.98	Vu < PhiVc/2	Not Reqd	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	16.00	21.00	-29.15	29.15	126.33	0.40	24.98	PhiVc < Vu	4.171	50.2	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.06	21.00	-29.22	29.22	124.64	0.41	25.02	PhiVc < Vu	4.203	50.2	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.12	21.00	-29.29	29.29	122.95	0.42	25.06	PhiVc < Vu	4.234	50.3	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.18	21.00	-29.36	29.36	121.26	0.42	25.09	PhiVc < Vu	4.265	50.3	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.24	21.00	-29.43	29.43	119.56	0.43	25.13	PhiVc < Vu	4.293	50.3	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.29	21.00	-29.50	29.50	117.86	0.44	25.18	PhiVc < Vu	4.321	50.4	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.35	21.00	-29.56	29.56	116.15	0.45	25.22	PhiVc < Vu	4.347	50.4	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.41	21.00	-29.63	29.63	114.44	0.45	25.26	PhiVc < Vu	4.372	50.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.47	21.00	-29.70	29.70	112.73	0.46	25.31	PhiVc < Vu	4.396	50.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.52	21.00	-29.77	29.77	111.01	0.47	25.35	PhiVc < Vu	4.418	50.6	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.58	21.00	-29.84	29.84	109.29	0.48	25.40	PhiVc < Vu	4.439	50.6	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.64	21.00	-29.91	29.91	107.56	0.49	25.45	PhiVc < Vu	4.458	50.6	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.70	21.00	-29.97	29.97	105.83	0.50	25.50	PhiVc < Vu	4.475	50.7	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.76	21.00	-30.04	30.04	104.10	0.51	25.55	PhiVc < Vu	4.490	50.8	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.81	21.00	-30.11	30.11	102.36	0.51	25.61	PhiVc < Vu	4.504	50.8	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.87	21.00	-30.18	30.18	100.62	0.52	25.66	PhiVc < Vu	4.516	50.9	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.93	21.00	-30.25	30.25	98.87	0.54	25.72	PhiVc < Vu	4.525	50.9	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	16.99	21.00	-30.32	30.32	97.12	0.55	25.78	PhiVc < Vu	4.532	51.0	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.04	21.00	-30.38	30.38	95.37	0.56	25.85	PhiVc < Vu	4.537	51.0	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.10	21.00	-30.45	30.45	93.63	0.57	25.91	PhiVc < Vu	4.539	51.1	10.5	10.0

Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : T-Beam Over Chemical Room

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	17.16	21.00	-30.52	30.52	91.85	0.58	25.98	PhiVc < Vu	4.539	51.2	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.22	21.00	-30.59	30.59	90.09	0.59	26.05	PhiVc < Vu	4.536	51.3	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.28	21.00	-30.66	30.66	88.32	0.61	26.13	PhiVc < Vu	4.529	51.3	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.33	21.00	-30.73	30.73	86.54	0.62	26.21	PhiVc < Vu	4.520	51.4	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.39	21.00	-30.79	30.79	84.77	0.64	26.29	PhiVc < Vu	4.507	51.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.45	21.00	-30.86	30.86	82.99	0.65	26.37	PhiVc < Vu	4.491	51.6	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.51	21.00	-30.93	30.93	81.20	0.67	26.46	PhiVc < Vu	4.470	51.7	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.56	21.00	-31.00	31.00	79.41	0.68	26.55	PhiVc < Vu	4.446	51.8	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.62	21.00	-31.07	31.07	77.62	0.70	26.65	PhiVc < Vu	4.416	51.9	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.68	21.00	-31.14	31.14	75.82	0.72	26.75	PhiVc < Vu	4.383	52.0	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.74	21.00	-31.20	31.20	74.02	0.74	26.86	PhiVc < Vu	4.343	52.1	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.80	21.00	-31.27	31.27	72.21	0.76	26.97	PhiVc < Vu	4.299	52.2	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.85	21.00	-31.34	31.34	70.41	0.78	27.09	PhiVc < Vu	4.248	52.3	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.91	21.00	-31.41	31.41	68.59	0.80	27.22	PhiVc < Vu	4.191	52.4	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	17.97	21.00	-31.48	31.48	66.78	0.82	27.35	PhiVc < Vu	4.126	52.6	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.03	21.00	-31.55	31.55	64.96	0.85	27.49	PhiVc < Vu	4.054	52.7	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.08	21.00	-31.61	31.61	63.13	0.88	27.64	PhiVc < Vu	3.974	52.8	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.14	21.00	-31.68	31.68	61.30	0.90	27.80	PhiVc < Vu	3.884	53.0	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.20	21.00	-31.75	31.75	59.47	0.93	27.97	PhiVc < Vu	3.784	53.2	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.26	21.00	-31.82	31.82	57.63	0.97	28.15	PhiVc < Vu	3.674	53.3	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.32	21.00	-31.89	31.89	55.79	1.00	28.34	PhiVc < Vu	3.552	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.37	21.00	-31.96	31.96	53.95	1.00	28.34	PhiVc < Vu	3.620	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.43	21.00	-32.03	32.03	52.10	1.00	28.34	PhiVc < Vu	3.689	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.49	21.00	-32.09	32.09	50.25	1.00	28.34	PhiVc < Vu	3.757	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.55	21.00	-32.16	32.16	48.39	1.00	28.34	PhiVc < Vu	3.825	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.60	21.00	-32.23	32.23	46.53	1.00	28.34	PhiVc < Vu	3.894	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.66	21.00	-32.30	32.30	44.67	1.00	28.34	PhiVc < Vu	3.962	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.72	21.00	-32.37	32.37	42.80	1.00	28.34	PhiVc < Vu	4.030	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.78	21.00	-32.44	32.44	40.93	1.00	28.34	PhiVc < Vu	4.099	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.84	21.00	-32.50	32.50	39.05	1.00	28.34	PhiVc < Vu	4.167	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.89	21.00	-32.57	32.57	37.17	1.00	28.34	PhiVc < Vu	4.235	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	18.95	21.00	-32.64	32.64	35.29	1.00	28.34	PhiVc < Vu	4.304	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.01	21.00	-32.71	32.71	33.40	1.00	28.34	PhiVc < Vu	4.372	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.07	21.00	-32.78	32.78	31.51	1.00	28.34	PhiVc < Vu	4.440	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.12	21.00	-32.85	32.85	29.61	1.00	28.34	PhiVc < Vu	4.509	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.18	21.00	-32.91	32.91	27.71	1.00	28.34	PhiVc < Vu	4.577	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.24	21.00	-32.98	32.98	25.81	1.00	28.34	PhiVc < Vu	4.645	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.30	21.00	-33.05	33.05	23.90	1.00	28.34	PhiVc < Vu	4.714	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.36	21.00	-33.12	33.12	21.99	1.00	28.34	PhiVc < Vu	4.782	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.41	21.00	-33.19	33.19	20.07	1.00	28.34	PhiVc < Vu	4.851	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.47	21.00	-33.26	33.26	18.15	1.00	28.34	PhiVc < Vu	4.919	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.53	21.00	-33.32	33.32	16.23	1.00	28.34	PhiVc < Vu	4.987	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.59	21.00	-33.39	33.39	14.30	1.00	28.34	PhiVc < Vu	5.056	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.64	21.00	-33.46	33.46	12.37	1.00	28.34	PhiVc < Vu	5.124	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.70	21.00	-33.53	33.53	10.44	1.00	28.34	PhiVc < Vu	5.192	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.76	21.00	-33.60	33.60	8.50	1.00	28.34	PhiVc < Vu	5.261	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.82	21.00	-33.67	33.67	6.55	1.00	28.34	PhiVc < Vu	5.329	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.88	21.00	-33.73	33.73	4.61	1.00	28.34	PhiVc < Vu	5.397	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.93	21.00	-33.80	33.80	2.66	1.00	28.34	PhiVc < Vu	5.466	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	19.99	21.00	-33.87	33.87	0.70	1.00	28.34	PhiVc < Vu	5.534	53.5	10.5	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.05	22.00	-33.94	33.94	1.26	1.00	30.77	PhiVc < Vu	3.171	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.11	22.00	-34.01	34.01	3.22	1.00	30.77	PhiVc < Vu	3.239	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.16	22.00	-34.08	34.08	5.19	1.00	30.77	PhiVc < Vu	3.308	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.22	22.00	-34.14	34.14	7.16	1.00	30.77	PhiVc < Vu	3.376	57.2	11.0	10.0

Concrete Beam

Description : T-Beam Over Chemical Room

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	20.28	22.00	-34.21	34.21	9.13	1.00	30.77	PhiVc < Vu	3.444	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.34	22.00	-34.28	34.28	11.11	1.00	30.77	PhiVc < Vu	3.513	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.40	22.00	-34.35	34.35	13.09	1.00	30.77	PhiVc < Vu	3.581	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.45	22.00	-34.42	34.42	15.08	1.00	30.77	PhiVc < Vu	3.649	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.51	22.00	-34.49	34.49	17.07	1.00	30.77	PhiVc < Vu	3.718	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.57	22.00	-34.55	34.55	19.07	1.00	30.77	PhiVc < Vu	3.786	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.63	22.00	-34.62	34.62	21.06	1.00	30.77	PhiVc < Vu	3.854	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.68	22.00	-34.69	34.69	23.07	1.00	30.77	PhiVc < Vu	3.923	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.74	22.00	-34.76	34.76	25.07	1.00	30.77	PhiVc < Vu	3.991	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.80	22.00	-34.83	34.83	27.08	1.00	30.77	PhiVc < Vu	4.059	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.86	22.00	-34.90	34.90	29.10	1.00	30.77	PhiVc < Vu	4.128	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.92	22.00	-34.96	34.96	31.12	1.00	30.77	PhiVc < Vu	4.196	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	20.97	22.00	-35.03	35.03	33.14	1.00	30.77	PhiVc < Vu	4.265	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.03	22.00	-35.10	35.10	35.16	1.00	30.77	PhiVc < Vu	4.333	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.09	22.00	-35.17	35.17	37.19	1.00	30.77	PhiVc < Vu	4.401	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.15	22.00	-35.24	35.24	39.23	1.00	30.77	PhiVc < Vu	4.470	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.20	22.00	-35.31	35.31	41.27	1.00	30.77	PhiVc < Vu	4.538	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.26	22.00	-35.37	35.37	43.31	1.00	30.77	PhiVc < Vu	4.606	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.32	22.00	-35.44	35.44	45.35	1.00	30.77	PhiVc < Vu	4.675	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.38	22.00	-35.51	35.51	47.40	1.00	30.77	PhiVc < Vu	4.743	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.44	22.00	-35.58	35.58	49.46	1.00	30.77	PhiVc < Vu	4.811	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.49	22.00	-35.65	35.65	51.51	1.00	30.77	PhiVc < Vu	4.880	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.55	22.00	-35.72	35.72	53.58	1.00	30.77	PhiVc < Vu	4.948	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.61	22.00	-35.78	35.78	55.64	1.00	30.77	PhiVc < Vu	5.016	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.67	22.00	-35.85	35.85	57.71	1.00	30.77	PhiVc < Vu	5.085	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.72	22.00	-35.92	35.92	59.78	1.00	30.77	PhiVc < Vu	5.153	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.78	22.00	-35.99	35.99	61.86	1.00	30.77	PhiVc < Vu	5.221	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.84	22.00	-36.06	36.06	63.94	1.00	30.77	PhiVc < Vu	5.290	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.90	22.00	-36.13	36.13	66.03	1.00	30.77	PhiVc < Vu	5.358	57.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	21.96	22.00	-36.19	36.19	68.12	0.97	30.59	PhiVc < Vu	5.607	57.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.01	22.00	-36.26	36.26	70.21	0.95	30.40	PhiVc < Vu	5.865	56.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.07	22.00	-36.33	36.33	72.31	0.92	30.22	PhiVc < Vu	6.113	56.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.13	22.00	-36.40	36.40	74.41	0.90	30.05	PhiVc < Vu	6.351	56.4	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.19	22.00	-36.47	36.47	76.51	0.87	29.89	PhiVc < Vu	6.580	56.3	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.24	22.00	-36.54	36.54	78.62	0.85	29.74	PhiVc < Vu	6.801	56.1	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.30	22.00	-36.60	36.60	80.74	0.83	29.59	PhiVc < Vu	7.014	56.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.36	22.00	-36.67	36.67	82.85	0.81	29.45	PhiVc < Vu	7.220	55.9	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.42	22.00	-36.74	36.74	84.97	0.79	29.32	PhiVc < Vu	7.419	55.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.48	22.00	-36.81	36.81	87.10	0.77	29.20	PhiVc < Vu	7.612	55.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.53	22.00	-36.88	36.88	89.23	0.76	29.08	PhiVc < Vu	7.80	55.5	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.59	22.00	-36.95	36.95	91.36	0.74	28.96	PhiVc < Vu	7.982	55.4	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.65	22.00	-37.01	37.01	93.50	0.73	28.86	PhiVc < Vu	8.159	55.3	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.71	22.00	-37.08	37.08	95.64	0.71	28.75	PhiVc < Vu	8.332	55.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.76	22.00	-37.15	37.15	97.78	0.70	28.65	PhiVc < Vu	8.50	55.1	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.82	22.00	-37.22	37.22	99.93	0.68	28.56	PhiVc < Vu	8.664	55.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.88	22.00	-37.29	37.29	102.08	0.67	28.46	PhiVc < Vu	8.824	54.9	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	22.94	22.00	-37.36	37.36	104.24	0.66	28.38	PhiVc < Vu	8.981	54.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.00	22.00	-37.42	37.42	106.40	0.64	28.29	PhiVc < Vu	9.134	54.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.05	22.00	-37.49	37.49	108.56	0.63	28.21	PhiVc < Vu	9.284	54.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.11	22.00	-37.56	37.56	110.73	0.62	28.13	PhiVc < Vu	9.431	54.5	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.17	22.00	-37.63	37.63	112.90	0.61	28.05	PhiVc < Vu	9.575	54.5	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.23	22.00	-37.70	37.70	115.08	0.60	27.98	PhiVc < Vu	9.716	54.4	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.28	22.00	-37.77	37.77	117.26	0.59	27.91	PhiVc < Vu	9.855	54.3	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.34	22.00	-37.83	37.83	119.45	0.58	27.84	PhiVc < Vu	9.991	54.2	11.0	10.0

Concrete Beam

File = p:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_C~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : T-Beam Over Chemical Room

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	23.40	22.00	-37.90	37.90	121.63	0.57	27.78	PhiVc < Vu	10.125	54.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.46	22.00	-37.97	37.97	123.82	0.56	27.71	PhiVc < Vu	10.257	54.1	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.52	22.00	-38.04	38.04	126.02	0.55	27.65	PhiVc < Vu	10.387	54.1	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.57	22.00	-38.11	38.11	128.22	0.54	27.59	PhiVc < Vu	10.515	54.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.63	22.00	-38.18	38.18	130.42	0.54	27.54	PhiVc < Vu	10.641	53.9	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.69	22.00	-38.24	38.24	132.63	0.53	27.48	PhiVc < Vu	10.765	53.9	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.75	22.00	-38.31	38.31	134.84	0.52	27.43	PhiVc < Vu	10.887	53.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.80	22.00	-38.38	38.38	137.06	0.51	27.37	PhiVc < Vu	11.008	53.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.86	22.00	-38.45	38.45	139.28	0.51	27.32	PhiVc < Vu	11.127	53.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.92	22.00	-38.52	38.52	141.50	0.50	27.27	PhiVc < Vu	11.245	53.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	23.98	22.00	-38.59	38.59	143.73	0.49	27.23	PhiVc < Vu	11.361	53.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.04	22.00	-38.66	38.66	145.96	0.49	27.18	PhiVc < Vu	11.476	53.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.09	22.00	-38.72	38.72	148.20	0.48	27.13	PhiVc < Vu	11.589	53.5	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.15	22.00	-38.79	38.79	150.44	0.47	27.09	PhiVc < Vu	11.701	53.5	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.21	22.00	-38.86	38.86	152.68	0.47	27.05	PhiVc < Vu	11.812	53.4	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.27	22.00	-38.93	38.93	154.93	0.46	27.01	PhiVc < Vu	11.922	53.4	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.32	22.00	-39.00	39.00	157.18	0.45	26.97	PhiVc < Vu	12.031	53.4	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.38	22.00	-39.07	39.07	159.43	0.45	26.93	PhiVc < Vu	12.139	53.3	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.44	22.00	-39.13	39.13	161.69	0.44	26.89	PhiVc < Vu	12.246	53.3	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.50	22.00	-39.20	39.20	163.95	0.44	26.85	PhiVc < Vu	12.351	53.3	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.56	22.00	-39.27	39.27	166.22	0.43	26.81	PhiVc < Vu	12.456	53.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.61	22.00	-39.34	39.34	168.49	0.43	26.78	PhiVc < Vu	12.560	53.2	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.67	22.00	-39.41	39.41	170.77	0.42	26.74	PhiVc < Vu	12.663	53.1	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.73	22.00	-39.48	39.48	173.05	0.42	26.71	PhiVc < Vu	12.765	53.1	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.79	22.00	-39.54	39.54	175.33	0.41	26.68	PhiVc < Vu	12.867	53.1	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.84	22.00	-39.61	39.61	177.62	0.41	26.64	PhiVc < Vu	12.967	53.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.90	22.00	-39.68	39.68	179.91	0.40	26.61	PhiVc < Vu	13.067	53.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	24.96	22.00	-39.75	39.75	182.20	0.40	26.58	PhiVc < Vu	13.166	53.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.02	22.00	-39.82	39.82	184.50	0.40	26.55	PhiVc < Vu	13.264	53.0	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.08	22.00	-39.89	39.89	186.80	0.39	26.52	PhiVc < Vu	13.362	52.9	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.13	22.00	-39.95	39.95	189.11	0.39	26.49	PhiVc < Vu	13.459	52.9	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.19	22.00	-40.02	40.02	191.42	0.38	26.47	PhiVc < Vu	13.556	52.9	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.25	22.00	-40.09	40.09	193.73	0.38	26.44	PhiVc < Vu	13.651	52.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.31	22.00	-40.16	40.16	196.05	0.38	26.41	PhiVc < Vu	13.746	52.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.36	22.00	-40.23	40.23	198.37	0.37	26.39	PhiVc < Vu	13.841	52.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.42	22.00	-40.30	40.30	200.70	0.37	26.36	PhiVc < Vu	13.935	52.8	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.48	22.00	-40.36	40.36	203.03	0.36	26.34	PhiVc < Vu	14.029	52.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.54	22.00	-40.43	40.43	205.36	0.36	26.31	PhiVc < Vu	14.122	52.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.60	22.00	-40.50	40.50	207.70	0.36	26.29	PhiVc < Vu	14.214	52.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.65	22.00	-40.57	40.57	210.04	0.35	26.26	PhiVc < Vu	14.306	52.7	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.71	22.00	-40.64	40.64	212.39	0.35	26.24	PhiVc < Vu	14.398	52.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.77	22.00	-40.71	40.71	214.74	0.35	26.22	PhiVc < Vu	14.489	52.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.83	22.00	-40.77	40.77	217.09	0.34	26.19	PhiVc < Vu	14.579	52.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.88	22.00	-40.84	40.84	219.45	0.34	26.17	PhiVc < Vu	14.669	52.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	25.94	22.00	-40.91	40.91	221.81	0.34	26.15	PhiVc < Vu	14.759	52.6	11.0	10.0
+1.20D+1.60L+0.50S+1.60H	1	26.00	22.00	-40.98	40.98	224.18	0.34	26.13	PhiVc < Vu	14.849	52.5	11.0	10.0

Printed: 30 JAN 2014, 11:00AM

Cantilevered Retaining Wall

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Neutralization Vault- No Water No Lid just dirt

Criteria

Retained Height	=	9.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Vertical component of active Lateral soil pressure options:
NOT USED for Soil Pressure.
NOT USED for Sliding Resistance.
USED for Overturning Resistance.

Soil Data

ASCE 7-10

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	65.0 psf/ft
Toe Active Pressure	=	65.0 psf/ft
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Friction Coeff btwn Ftg & Soil	=	0.400
Soil height to ignore for passive pressure	=	12.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf

NOT Used To Resist Sliding & Overturning

Surcharge Over Toe	=	0.0 psf

NOT Used for Sliding & Overturning

Lateral Load Applied to Stem

Lateral Load	=	0.0 plf
...Height to Top	=	6.00 ft
...Height to Bottom	=	5.00 ft
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	1.50 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	1.00 ft
Footing Type		Line
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	1,802.0 lbs
Axial Live Load	=	222.0 lbs
Axial Load Eccentricity	=	0.0 in

Design Summary

Wall Stability Ratios

Overturning	=	2.39 OK
Sliding	=	0.70 UNSTABLE!

Slab Resists All Sliding !

Total Bearing Load	=	5,834 lbs
...resultant ecc.	=	5.95 in
Soil Pressure @ Toe	=	1,308 psf OK
Soil Pressure @ Heel	=	487 psf OK
Allowable	=	2,500 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	1,590 psf
ACI Factored @ Heel	=	592 psf
Footing Shear @ Toe	=	37.3 psi OK
Footing Shear @ Heel	=	8.7 psi OK
Allowable	=	75.0 psi

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	3,217.5 lbs
less 100% Passive Force	= -	0.0 lbs
less 100% Friction Force	= -	2,240.8 lbs
Added Force Req'd	=	972.7 lbs NG
....for 1.5 : 1 Stability	=	2,581.5 lbs NG

Load Factors

Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Top Stem

Stem OK

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	in =	12.00
Rebar Size	=	# 5
Rebar Spacing	in =	9.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.685
Total Force @ Section	lbs =	4,212.0
Moment....Actual	ft-l =	12,636.0
Moment.....Allowable	ft-l =	18,444.8
Shear.....Actual	psi =	34.5
Shear.....Allowable	psi =	100.6
Wall Weight	psf =	150.0
Rebar Depth 'd'	in =	10.19
Lap splice if above	in =	17.44
Lap splice if below	in =	7.13
Hook embed into footing	in =	7.13

Concrete Data

f'c	psi =	4,500.0
Fy	psi =	60,000.0

Printed: 30 JAN 2014, 11:00AM

Cantilevered Retaining Wall

File = P:\OGDENC~1\04310~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Neutralization Vault- No Water No Lid just dirt

Footing Dimensions & Strengths

Toe Width	=	4.00 ft
Heel Width	=	2.50
Total Footing Width	=	6.50
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	1,590	592	psf
Mu' : Upward	=	11,081	752	ft-lb
Mu' : Downward	=	1,440	1,539	ft-lb
Mu: Design	=	9,641	787	ft-lb
Actual 1-Way Shear	=	37.34	8.70	psi
Allow 1-Way Shear	=	75.00	75.00	psi

Toe Reinforcing = # 5 @ 12.00 in
Heel Reinforcing = # 5 @ 18.00 in
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: #4@ 7.25 in, #5@ 11.00 in, #6@ 15.75 in, #7@ 21.25 in, #8@ 28.00 in, #9@ 35
Heel: Not req'd, Mu < S * Fr
Key: No key defined

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-lb		.....RESISTING..... Force lbs	Distance ft	Moment ft-lb
Heel Active Pressure	=	3,250.0	3.33	10,833.3	Soil Over Heel	= 1,485.0	5.75	8,538.8
Surcharge over Heel	=				Sloped Soil Over Heel	=		
Toe Active Pressure	=	-32.5	0.33	-10.8	Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	= 1,802.0	4.50	8,109.0
Added Lateral Load	=				* Axial Live Load on Stem	= 222.0	4.50	999.0
Load @ Stem Above Soil	=				Soil Over Toe	=		
					Surcharge Over Toe	=		
					Stem Weight(s)	= 1,350.0	4.50	6,075.0
					Earth @ Stem Transitions	=		
					Footing Weight	= 975.0	3.25	3,168.8
					Key Weight	=		
					Vert. Component	=	6.50	
Total	=	3,217.5	O.T.M. =	10,822.5	Total	= 5,612.0 lbs	R.M. =	25,891.5

Resisting/Overturning Ratio = 2.39
Vertical Loads used for Soil Pressure = 5,834.0 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Printed: 30 JAN 2014, 11:02AM

Cantilevered Retaining Wall

File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Neutralization Vault- Water Only No Lid Dirt

ASCE 7-10

Criteria

Retained Height	=	9.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	0.00 in
Water height over heel	=	8.0 ft

Vertical component of active Lateral soil pressure options:
NOT USED for Soil Pressure.
NOT USED for Sliding Resistance.
USED for Overturning Resistance.

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	0.0 psf/ft
Toe Active Pressure	=	0.0 psf/ft
Passive Pressure	=	0.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Friction Coeff btwn Ftg & Soil	=	0.400
Soil height to ignore for passive pressure	=	12.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf

NOT Used To Resist Sliding & Overturning

Surcharge Over Toe	=	0.0 psf

NOT Used for Sliding & Overturning

Lateral Load Applied to Stem

Lateral Load	=	0.0 plf
...Height to Top	=	6.00 ft
...Height to Bottom	=	5.00 ft
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	1.50 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	1.00 ft
Footing Type		Line
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	1,802.0 lbs
Axial Live Load	=	222.0 lbs
Axial Load Eccentricity	=	0.0 in

Design Summary

Wall Stability Ratios

Overturning	=	3.60 OK
Sliding	=	1.28 Ratio < 1.5!

Slab Resists All Sliding !

Total Bearing Load	=	8,309 lbs
...resultant ecc.	=	9.89 in
Soil Pressure @ Toe	=	2,251 psf OK
Soil Pressure @ Heel	=	306 psf OK
Allowable	=	2,500 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	2,725 psf
ACI Factored @ Heel	=	370 psf
Footing Shear @ Toe	=	18.6 psi OK
Footing Shear @ Heel	=	9.6 psi OK
Allowable	=	75.0 psi

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	2,527.2 lbs
less 100% Passive Force	= -	0.0 lbs
less 100% Friction Force	= -	3,230.8 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	556.0 lbs NG

Load Factors

Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Top Stem

Stem OK

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	in =	12.00
Rebar Size	=	# 5
Rebar Spacing	in =	9.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.472
Total Force @ Section	lbs =	3,194.9
Moment....Actual	ft-l =	8,519.7
Moment.....Allowable	ft-l =	18,041.6
Shear.....Actual	psi =	26.1
Shear.....Allowable	psi =	75.0
Wall Weight	psf =	150.0
Rebar Depth 'd'	in =	10.19
Lap splice if above	in =	23.40
Lap splice if below	in =	6.00
Hook embed into footing	in =	6.00

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

Printed: 30 JAN 2014, 11:02AM

Cantilevered Retaining Wall

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Neutralization Vault- Water Only No Lid Dirt

Footing Dimensions & Strengths

Toe Width	=	1.50 ft
Heel Width	=	5.00
Total Footing Width	=	6.50
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	2,725	370	psf
Mu' : Upward	=	2,862	6,825	ft-lb
Mu' : Downward	=	203	10,944	ft-lb
Mu: Design	=	2,660	4,119	ft-lb
Actual 1-Way Shear	=	18.64	9.59	psi
Allow 1-Way Shear	=	75.00	75.00	psi

Toe Reinforcing = # 5 @ 12.00 in
Heel Reinforcing = # 5 @ 18.00 in
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: #4@ 13.25 in, #5@ 20.50 in, #6@ 29.00 in, #7@ 39.25 in, #8@ 48.25 in, #9@ 4
Heel: #4@ 11.75 in, #5@ 18.25 in, #6@ 25.75 in, #7@ 35.25 in, #8@ 46.25 in, #9@ 4
Key: No key defined

Summary of Overturning & Resisting Forces & Moments

		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-lb			.....RESISTING..... Force lbs	Distance ft	Moment ft-lb
Item									
*Heel Active Pressure	=	2,527.2	3.00	7,581.6	Soil Over Heel	=	3,960.0	4.50	17,820.0
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Toe Active Pressure	=		0.33		Surcharge Over Heel	=			
Surcharge Over Toe	=				Adjacent Footing Load	=			
Adjacent Footing Load	=				Axial Dead Load on Stem	=	1,802.0	2.00	3,604.0
Added Lateral Load	=				* Axial Live Load on Stem	=	222.0	2.00	444.0
Load @ Stem Above Soil	=				Soil Over Toe	=			
					Surcharge Over Toe	=			
					Stem Weight(s)	=	1,350.0	2.00	2,700.0
					Earth @ Stem Transitions	=			
					Footing Weight	=	975.0	3.25	3,168.8
					Key Weight	=			
					Vert. Component	=		6.50	
Total	=	2,527.2	O.T.M. =	7,581.6	Total =		8,087.0 lbs	R.M. =	27,292.8

Resisting/Overturning Ratio = 3.60
Vertical Loads used for Soil Pressure = 8,309.0 lbs

*Includes water table effect

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Printed: 30 JAN 2014, 11:06AM

Cantilevered Retaining Wall

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Neutralization Vault- Water Only No Lid Dirt

ASCE 7-10

Criteria

Retained Height	=	9.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	0.00 in
Water height over heel	=	8.0 ft

Vertical component of active Lateral soil pressure options:
NOT USED for Soil Pressure.
NOT USED for Sliding Resistance.
USED for Overturning Resistance.

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	0.0 psf/ft
Toe Active Pressure	=	0.0 psf/ft
Passive Pressure	=	0.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Friction Coeff btwn Ftg & Soil	=	0.400
Soil height to ignore for passive pressure	=	12.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf

NOT Used To Resist Sliding & Overturning

Surcharge Over Toe	=	0.0 psf

NOT Used for Sliding & Overturning

Axial Load Applied to Stem

Axial Dead Load	=	1,802.0 lbs
Axial Live Load	=	222.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 plf
...Height to Top	=	6.00 ft
...Height to Bottom	=	5.00 ft
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	1.50 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	1.00 ft
Footing Type		Line
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	3.60 OK
Sliding	=	1.28 Ratio < 1.5!

Slab Resists All Sliding !

Total Bearing Load	=	8,309 lbs
...resultant ecc.	=	9.89 in
Soil Pressure @ Toe	=	2,251 psf OK
Soil Pressure @ Heel	=	306 psf OK
Allowable	=	2,500 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	2,725 psf
ACI Factored @ Heel	=	370 psf
Footing Shear @ Toe	=	18.6 psi OK
Footing Shear @ Heel	=	9.6 psi OK
Allowable	=	75.0 psi

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	2,527.2 lbs
less 100% Passive Force	= -	0.0 lbs
less 100% Friction Force	= -	3,230.8 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	556.0 lbs NG

Load Factors

Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Top Stem

Stem OK

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	in =	12.00
Rebar Size	=	# 5
Rebar Spacing	in =	9.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.472
Total Force @ Section	lbs =	3,194.9
Moment....Actual	ft-l =	8,519.7
Moment.....Allowable	ft-l =	18,041.6
Shear.....Actual	psi =	26.1
Shear.....Allowable	psi =	75.0
Wall Weight	psf =	150.0
Rebar Depth 'd'	in =	10.19
Lap splice if above	in =	23.40
Lap splice if below	in =	6.00
Hook embed into footing	in =	6.00

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

Printed: 30 JAN 2014, 11:06AM

Cantilevered Retaining Wall

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\OWTP_R~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Neutralization Vault- Water Only No Lid Dirt

Footing Dimensions & Strengths

Toe Width	=	1.50 ft
Heel Width	=	5.00
Total Footing Width	=	6.50
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	2,725	370	psf
Mu' : Upward	=	2,862	6,825	ft-lb
Mu' : Downward	=	203	10,944	ft-lb
Mu: Design	=	2,660	4,119	ft-lb
Actual 1-Way Shear	=	18.64	9.59	psi
Allow 1-Way Shear	=	75.00	75.00	psi

Toe Reinforcing = # 5 @ 12.00 in
Heel Reinforcing = # 5 @ 18.00 in
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: #4@ 13.25 in, #5@ 20.50 in, #6@ 29.00 in, #7@ 39.25 in, #8@ 48.25 in, #9@ 4
Heel: #4@ 11.75 in, #5@ 18.25 in, #6@ 25.75 in, #7@ 35.25 in, #8@ 46.25 in, #9@ 4
Key: No key defined

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-lb		.....RESISTING..... Force lbs	Distance ft	Moment ft-lb
*Heel Active Pressure	=	2,527.2	3.00	7,581.6	Soil Over Heel	= 3,960.0	4.50	17,820.0
Surcharge over Heel	=				Sloped Soil Over Heel	=		
Toe Active Pressure	=		0.33		Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	= 1,802.0	2.00	3,604.0
Added Lateral Load	=				* Axial Live Load on Stem	= 222.0	2.00	444.0
Load @ Stem Above Soil	=				Soil Over Toe	=		
					Surcharge Over Toe	=		
					Stem Weight(s)	= 1,350.0	2.00	2,700.0
					Earth @ Stem Transitions	=		
					Footing Weight	= 975.0	3.25	3,168.8
					Key Weight	=		
					Vert. Component	=	6.50	
Total	=	2,527.2	O.T.M. =	7,581.6	Total =	8,087.0 lbs	R.M. =	27,292.8

Resisting/Overturning Ratio = 3.60
Vertical Loads used for Soil Pressure = 8,309.0 lbs

*Includes water table effect

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

MISCELLANEOUS CALCULATIONS

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title: OWTP Canopy
Engineer:
Project Descr: Exterior Canopy

Project ID:

Printed: 30 JAN 2014, 11:13AM

Steel Beam

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\canopy.ec6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

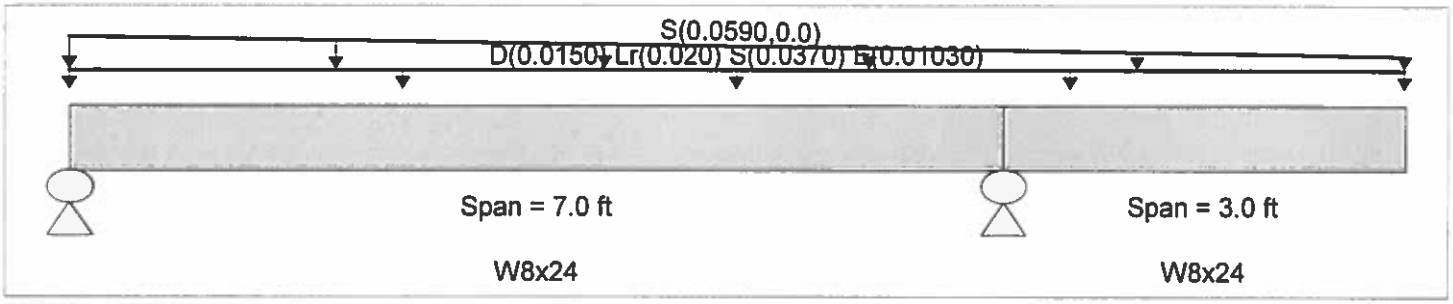
Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : 1ft Model Section for Canopy Loading

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending
Load Combination ASCE 7-02

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Loads on all spans...
Uniform Load on ALL spans : D = 0.0150, Lr = 0.020, S = 0.0370, E = 0.01030 k/ft
Varying Uniform Load : S(S,E) = 0.0590->0.0 k/ft, Extent = 0.0 –>> 10.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.008 : 1	Maximum Shear Stress Ratio =	0.008 : 1
Section used for this span	W8x24	Section used for this span	W8x24
Ma : Applied	0.436 k-ft	Va : Applied	0.3294 k
Mn / Omega : Allowable	57.635 k-ft	Vn/Omega : Allowable	38.857 k
Load Combination	+D+S+H	Load Combination	+D+S+H
Location of maximum on span	2.962ft	Location of maximum on span	7.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.001 in	Ratio =	64,934
Max Upward L+Lr+S Deflection	-0.001 in	Ratio =	71,378
Max Downward Total Deflection	0.002 in	Ratio =	48123
Max Upward Total Deflection	-0.001 in	Ratio =	69128

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 7.00 ft	1	0.001	0.002	0.06	-0.07	0.07	96.25	57.63	1.39	1.00	0.06	58.29	38.86
Dsgn. L = 3.00 ft	2	0.001	0.001		-0.07	0.07	96.25	57.63	1.00	1.00	0.05	58.29	38.86
+D+L+H													
Dsgn. L = 7.00 ft	1	0.001	0.002	0.06	-0.07	0.07	96.25	57.63	1.39	1.00	0.06	58.29	38.86
Dsgn. L = 3.00 ft	2	0.001	0.001		-0.07	0.07	96.25	57.63	1.00	1.00	0.05	58.29	38.86
+D+Lr+H													
Dsgn. L = 7.00 ft	1	0.003	0.004	0.14	-0.16	0.16	96.25	57.63	1.39	1.00	0.15	58.29	38.86
Dsgn. L = 3.00 ft	2	0.003	0.003		-0.16	0.16	96.25	57.63	1.00	1.00	0.11	58.29	38.86
+D+S+H													
Dsgn. L = 7.00 ft	1	0.008	0.008	0.44	-0.26	0.44	96.25	57.63	1.22	1.00	0.33	58.29	38.86
Dsgn. L = 3.00 ft	2	0.005	0.005		-0.26	0.26	96.25	57.63	1.00	1.00	0.18	58.29	38.86
+D+0.750Lr+0.750L+H													
Dsgn. L = 7.00 ft	1	0.002	0.003	0.12	-0.14	0.14	96.25	57.63	1.39	1.00	0.12	58.29	38.86
Dsgn. L = 3.00 ft	2	0.002	0.002		-0.14	0.14	96.25	57.63	1.00	1.00	0.09	58.29	38.86
+D+0.750L+0.750S+H													
Dsgn. L = 7.00 ft	1	0.006	0.007	0.34	-0.21	0.34	96.25	57.63	1.22	1.00	0.26	58.29	38.86
Dsgn. L = 3.00 ft	2	0.004	0.004		-0.21	0.21	96.25	57.63	1.00	1.00	0.15	58.29	38.86
+D+W+H													
Dsgn. L = 7.00 ft	1	0.001	0.002	0.06	-0.07	0.07	96.25	57.63	1.39	1.00	0.06	58.29	38.86
Dsgn. L = 3.00 ft	2	0.001	0.001		-0.07	0.07	96.25	57.63	1.00	1.00	0.05	58.29	38.86
+D+0.70E+H													
Dsgn. L = 7.00 ft	1	0.002	0.002	0.09	-0.10	0.10	96.25	57.63	1.39	1.00	0.09	58.29	38.86

Steel Beam

Description : 1ft Model Section for Canopy Loading

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
Dsgn. L = 3.00 ft	2	0.002	0.002		-0.10	0.10	96.25	57.63	1.00	1.00	0.07	58.29	38.86
+D+0.750Lr+0.750L+0.750W+H													
Dsgn. L = 7.00 ft	1	0.002	0.003	0.12	-0.14	0.14	96.25	57.63	1.39	1.00	0.12	58.29	38.86
Dsgn. L = 3.00 ft	2	0.002	0.002		-0.14	0.14	96.25	57.63	1.00	1.00	0.09	58.29	38.86
+D+0.750Lr+0.750L+0.5250E+H													
Dsgn. L = 7.00 ft	1	0.003	0.004	0.14	-0.16	0.16	96.25	57.63	1.39	1.00	0.15	58.29	38.86
Dsgn. L = 3.00 ft	2	0.003	0.003		-0.16	0.16	96.25	57.63	1.00	1.00	0.11	58.29	38.86
+D+0.750L+0.750S+0.750W+H													
Dsgn. L = 7.00 ft	1	0.006	0.007	0.34	-0.21	0.34	96.25	57.63	1.22	1.00	0.26	58.29	38.86
Dsgn. L = 3.00 ft	2	0.004	0.004		-0.21	0.21	96.25	57.63	1.00	1.00	0.15	58.29	38.86
+D+0.750L+0.750S+0.5250E+H													
Dsgn. L = 7.00 ft	1	0.006	0.007	0.36	-0.24	0.36	96.25	57.63	1.23	1.00	0.28	58.29	38.86
Dsgn. L = 3.00 ft	2	0.004	0.004		-0.24	0.24	96.25	57.63	1.00	1.00	0.16	58.29	38.86
+0.60D+W+H													
Dsgn. L = 7.00 ft	1	0.001	0.001	0.04	-0.04	0.04	96.25	57.63	1.39	1.00	0.04	58.29	38.86
Dsgn. L = 3.00 ft	2	0.001	0.001		-0.04	0.04	96.25	57.63	1.00	1.00	0.03	58.29	38.86
+0.60D+0.70E+H													
Dsgn. L = 7.00 ft	1	0.001	0.002	0.07	-0.07	0.07	96.25	57.63	1.39	1.00	0.07	58.29	38.86
Dsgn. L = 3.00 ft	2	0.001	0.001		-0.07	0.07	96.25	57.63	1.00	1.00	0.05	58.29	38.86

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr+S	1	0.0017	3.285		0.0000	0.000
	2	0.0000	3.285	D+Lr+S	-0.0010	3.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	0.360	0.655	
D Only	0.043	0.107	
Lr Only	0.057	0.143	
S Only	0.260	0.405	
Lr+S	0.317	0.548	
E Only	0.029	0.074	
D+Lr	0.100	0.250	
D+S	0.303	0.512	
D+Lr+S	0.360	0.655	
D+E	0.072	0.181	
D+Lr+E	0.129	0.324	

Steel Column

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\canopy.ec6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : Stair Column Support

General Information

Steel Section Name :	HSS5x5x3/16	Overall Column Height	12.50 ft
Analysis Method :	Allowable Strength	Top & Bottom Fixity	Top Free, Bottom Fixed
Steel Stress Grade			
Fy : Steel Yield	36.0 ksi		
E : Elastic Bending Modulus	29,000.0 ksi		
Load Combination :	ASCE 7-02		

Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for X-X Axis buckling = 12.50 ft, K = 2.1
Y-Y (depth) axis :
Unbraced Length for Y-Y Axis buckling = 12.50 ft, K = 2.1

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 149.439 lbs * Dead Load Factor
AXIAL LOADS . . .
Stair Area is 8x11.5 ft. DL 55psf. LL 100psf.: Axial Load at 12.50 ft, D = 5.10, L = 9.20 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = 0.7570 : 1
Load Combination +D+L+H
Location of max.above base 0.0 ft
At maximum location values are . . .
Pa : Axial 14.449 k
Pn / Omega : Allowable 19.087 k
Ma-x : Applied 0.0 k-ft
Mn-x / Omega : Allowable 10.581 k-ft
Ma-y : Applied 0.0 k-ft
Mn-y / Omega : Allowable 10.581 k-ft

PASS Maximum Shear Stress Ratio = 0.0 : 1
Load Combination
Location of max.above base 0.0 ft
At maximum location values are . . .
Va : Applied 0.0 k
Vn / Omega : Allowable 0.0 k

Maximum SERVICE Load Reactions . .

Top along X-X	0.0 k
Bottom along X-X	0.0 k
Top along Y-Y	0.0 k
Bottom along Y-Y	0.0 k

Maximum SERVICE Load Deflections . . .

Along Y-Y 0.0 in at 0.0 ft above base
for load combination :

Along X-X 0.0 in at 0.0 ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio	Status	Location
D Only	0.275	PASS	0.00 ft	0.000	PASS	0.00 ft
+D+L+H	0.757	PASS	0.00 ft	0.000	PASS	0.00 ft
+D+Lr+H	0.275	PASS	0.00 ft	0.000	PASS	0.00 ft
+D+S+H	0.275	PASS	0.00 ft	0.000	PASS	0.00 ft
+D+0.750Lr+0.750L+H	0.637	PASS	0.00 ft	0.000	PASS	0.00 ft
+D+0.750L+0.750S+H	0.637	PASS	0.00 ft	0.000	PASS	0.00 ft
+D+W+H	0.275	PASS	0.00 ft	0.000	PASS	0.00 ft
+D+0.70E+H	0.275	PASS	0.00 ft	0.000	PASS	0.00 ft
+D+0.750Lr+0.750L+0.750W+H	0.637	PASS	0.00 ft	0.000	PASS	0.00 ft
+D+0.750Lr+0.750L+0.5250E+H	0.637	PASS	0.00 ft	0.000	PASS	0.00 ft
+D+0.750L+0.750S+0.750W+H	0.637	PASS	0.00 ft	0.000	PASS	0.00 ft
+D+0.750L+0.750S+0.5250E+H	0.637	PASS	0.00 ft	0.000	PASS	0.00 ft
+0.60D+W+H	0.165	PASS	0.00 ft	0.000	PASS	0.00 ft
+0.60D+0.70E+H	0.165	PASS	0.00 ft	0.000	PASS	0.00 ft

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project Descr:

Project ID:

Printed: 27 DEC 2013, 9:43AM

Steel Column

File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\canopy.ec6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Lic. # : KW-06005517 — Licensee : SUNRISE ENGINEERING

Description : Stair Column Support

Maximum Reactions - Unfactored

Note: Only non-zero reactions are listed.

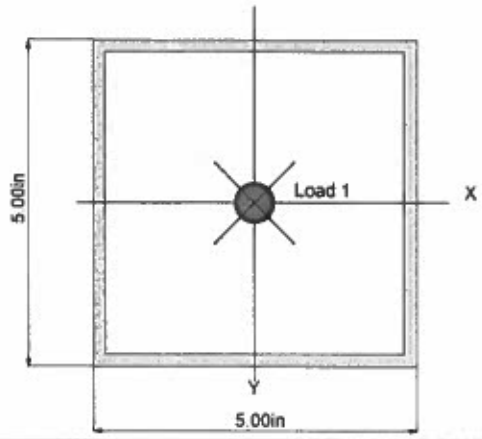
Load Combination	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Axial Reaction @ Base
D Only		k		k	5.249 k
L Only		k		k	9.200 k
D+L		k		k	14.449 k

Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
L Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
D+L	0.0000 in	0.000 ft	0.000 in	0.000 ft

Steel Section Properties : HSS5x5x3/16

Depth	=	5.000 in	I xx	=	12.60 in^4	J	=	19.900 in^4
			S xx	=	5.03 in^3			
Width	=	5.000 in	R xx	=	1.960 in			
Wall Thick	=	0.187 in	Zx	=	5.890 in^3			
Area	=	3.280 in^2	I yy	=	12.600 in^4	C	=	8.080 in^3
Weight	=	11.955 plf	S yy	=	5.030 in^3			
			R yy	=	1.960 in			
Ycg	=	0.000 in						



Loads are total entered value. Arrows do not reflect absolute direction.

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project Descr:

Project ID:

Printed: 24 DEC 2013, 1:57PM

Steel Beam

File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\canopy.ec6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

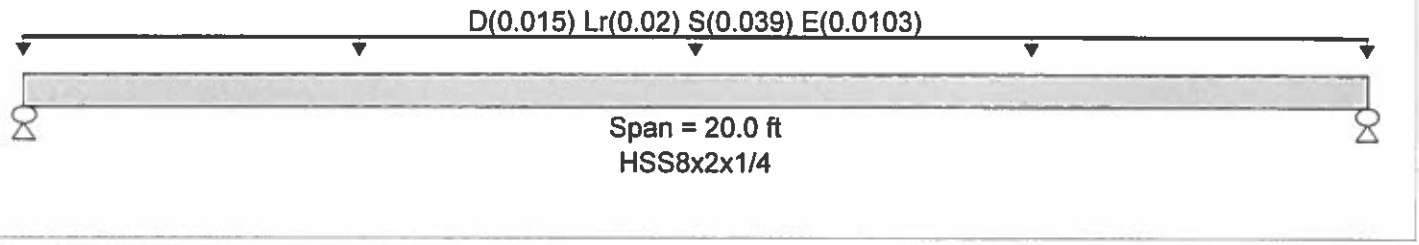
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : Exterior Beam Aesthetic

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending
Load Combination ASCE 7-02

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.0150, Lr = 0.020, S = 0.0390, E = 0.01030 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.112 : 1	Maximum Shear Stress Ratio =	0.009 : 1
Section used for this span	HSS8x2x1/4	Section used for this span	HSS8x2x1/4
Ma : Applied	2.700 k-ft	Va : Applied	0.540 k
Mn / Omega : Allowable	24.152 k-ft	Vn/Omega : Allowable	61.119 k
Load Combination	+D+S+H	Load Combination	+D+S+H
Location of maximum on span	10.000ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.171 in	Ratio =	1,401
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.325 in	Ratio =	739
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 20.00 ft +D+L+H	1	0.031	0.002	0.75		0.75	40.33	24.15	1.14	1.00	0.15	102.07	61.12
Dsgn. L = 20.00 ft +D+Lr+H	1	0.031	0.002	0.75		0.75	40.33	24.15	1.14	1.00	0.15	102.07	61.12
Dsgn. L = 20.00 ft +D+S+H	1	0.072	0.006	1.75		1.75	40.33	24.15	1.14	1.00	0.35	102.07	61.12
Dsgn. L = 20.00 ft +D+0.750Lr+0.750L+H	1	0.112	0.009	2.70		2.70	40.33	24.15	1.14	1.00	0.54	102.07	61.12
Dsgn. L = 20.00 ft +D+0.750L+0.750S+H	1	0.062	0.005	1.50		1.50	40.33	24.15	1.14	1.00	0.30	102.07	61.12
Dsgn. L = 20.00 ft +D+W+H	1	0.092	0.007	2.21		2.21	40.33	24.15	1.14	1.00	0.44	102.07	61.12
Dsgn. L = 20.00 ft +D+0.70E+H	1	0.031	0.002	0.75		0.75	40.33	24.15	1.14	1.00	0.15	102.07	61.12
Dsgn. L = 20.00 ft +D+0.750Lr+0.750L+0.750W+H	1	0.046	0.004	1.11		1.11	40.33	24.15	1.14	1.00	0.22	102.07	61.12
Dsgn. L = 20.00 ft +D+0.750Lr+0.750L+0.5250E+H	1	0.062	0.005	1.50		1.50	40.33	24.15	1.14	1.00	0.30	102.07	61.12
Dsgn. L = 20.00 ft +D+0.750L+0.750S+0.750W+H	1	0.073	0.006	1.77		1.77	40.33	24.15	1.14	1.00	0.35	102.07	61.12
Dsgn. L = 20.00 ft +D+0.750L+0.750S+0.5250E+H	1	0.092	0.007	2.21		2.21	40.33	24.15	1.14	1.00	0.44	102.07	61.12
Dsgn. L = 20.00 ft +0.60D+W+H	1	0.103	0.008	2.48		2.48	40.33	24.15	1.14	1.00	0.50	102.07	61.12

Steel Beam

Description : Exterior Beam Aesthetic

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
Dsgn. L = 20.00 ft +0.60D+0.70E+H	1	0.019	0.001	0.45		0.45	40.33	24.15	1.14	1.00	0.09	102.07	61.12
Dsgn. L = 20.00 ft	1	0.034	0.003	0.81		0.81	40.33	24.15	1.14	1.00	0.16	102.07	61.12

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr+S	1	0.3249	10.100		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.740	0.740
D Only	0.150	0.150
Lr Only	0.200	0.200
S Only	0.390	0.390
Lr+S	0.590	0.590
E Only	0.103	0.103
D+Lr	0.350	0.350
D+S	0.540	0.540
D+Lr+S	0.740	0.740
D+E	0.253	0.253
D+Lr+E	0.453	0.453

Steel Beam

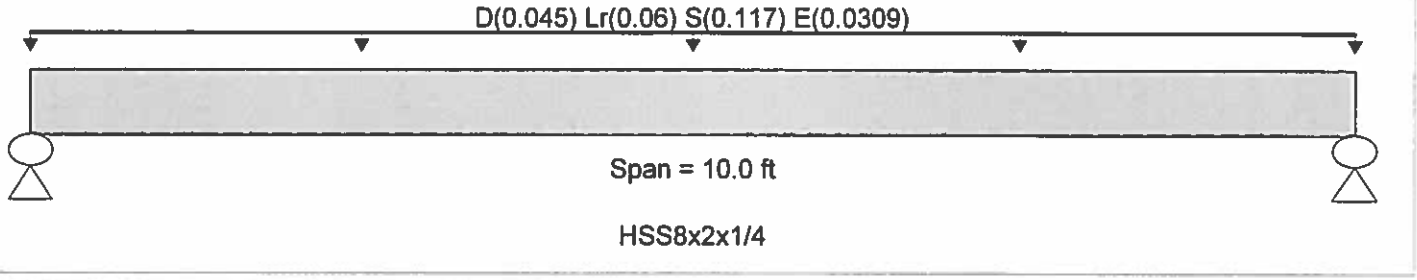
Lic. # : KW-06005617

Description : Exterior Beam Aesthetic Cantilevered

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending
Load Combination ASCE 7-02

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.0150, Lr = 0.020, S = 0.0390, E = 0.01030 ksf, Tributary Width = 3.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.084 : 1	Maximum Shear Stress Ratio =	0.013 : 1
Section used for this span	HSS8x2x1/4	Section used for this span	HSS8x2x1/4
Ma : Applied	2.025 k-ft	Va : Applied	0.810 k
Mn / Omega : Allowable	24.152 k-ft	Vn/Omega : Allowable	61.119 k
Load Combination	+D+S+H	Load Combination	+D+S+H
Location of maximum on span	5.000 ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.032 in	Ratio =	3,737
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.061 in	Ratio =	1970
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 10.00 ft	1	0.023	0.004	0.56		0.56	40.33	24.15	1.14	1.00	0.23	102.07	61.12
+D+L+H													
Dsgn. L = 10.00 ft	1	0.023	0.004	0.56		0.56	40.33	24.15	1.14	1.00	0.23	102.07	61.12
+D+Lr+H													
Dsgn. L = 10.00 ft	1	0.054	0.009	1.31		1.31	40.33	24.15	1.14	1.00	0.53	102.07	61.12
+D+S+H													
Dsgn. L = 10.00 ft	1	0.084	0.013	2.03		2.03	40.33	24.15	1.14	1.00	0.81	102.07	61.12
+D+0.750Lr+0.750L+H													
Dsgn. L = 10.00 ft	1	0.047	0.007	1.13		1.13	40.33	24.15	1.14	1.00	0.45	102.07	61.12
+D+0.750L+0.750S+H													
Dsgn. L = 10.00 ft	1	0.069	0.011	1.66		1.66	40.33	24.15	1.14	1.00	0.66	102.07	61.12
+D+W+H													
Dsgn. L = 10.00 ft	1	0.023	0.004	0.56		0.56	40.33	24.15	1.14	1.00	0.23	102.07	61.12
+D+0.70E+H													
Dsgn. L = 10.00 ft	1	0.034	0.005	0.83		0.83	40.33	24.15	1.14	1.00	0.33	102.07	61.12
+D+0.750Lr+0.750L+0.750W+H													
Dsgn. L = 10.00 ft	1	0.047	0.007	1.13		1.13	40.33	24.15	1.14	1.00	0.45	102.07	61.12
+D+0.750Lr+0.750L+0.5250E+H													
Dsgn. L = 10.00 ft	1	0.055	0.009	1.33		1.33	40.33	24.15	1.14	1.00	0.53	102.07	61.12
+D+0.750L+0.750S+0.750W+H													
Dsgn. L = 10.00 ft	1	0.069	0.011	1.66		1.66	40.33	24.15	1.14	1.00	0.66	102.07	61.12
+D+0.750L+0.750S+0.5250E+H													
Dsgn. L = 10.00 ft	1	0.077	0.012	1.86		1.86	40.33	24.15	1.14	1.00	0.74	102.07	61.12
+0.60D+W+H													

Steel Beam

Description : Exterior Beam Aesthetic Cantilevered

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
Dsgn. L = 10.00 ft +0.60D+0.70E+H	1	0.014	0.002	0.34		0.34	40.33	24.15	1.14	1.00	0.14	102.07	61.12
Dsgn. L = 10.00 ft	1	0.025	0.004	0.61		0.61	40.33	24.15	1.14	1.00	0.24	102.07	61.12

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr+S	1	0.0609	5.050		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.110	1.110
D Only	0.225	0.225
Lr Only	0.300	0.300
S Only	0.585	0.585
Lr+S	0.885	0.885
E Only	0.155	0.155
D+Lr	0.525	0.525
D+S	0.810	0.810
D+Lr+S	1.110	1.110
D+E	0.380	0.380
D+Lr+E	0.680	0.680

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project Descr:

Project ID:

Printed: 20 DEC 2013, 12:08PM

Steel Beam

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\canopy.ec6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

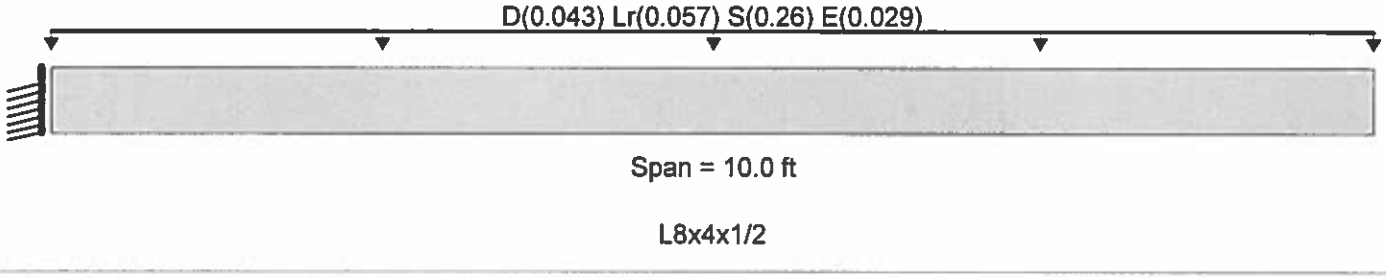
Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Cantilevered Canopy Support Anchored to Wall

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending
Load Combination ASCE 7-02

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.0430, Lr = 0.0570, S = 0.260, E = 0.0290 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.541 : 1	Maximum Shear Stress Ratio =	0.042 : 1
Section used for this span	L8x4x1/2	Section used for this span	L8x4x1/2
Ma : Applied	15.150 k-ft	Va : Applied	3.030 k
Mn / Omega : Allowable	27.996 k-ft	Vn/Omega : Allowable	71.856 k
Load Combination	+D+S+H	Load Combination	+D+S+H
Location of maximum on span	0.000ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.500 in	Ratio =	479
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.692 in	Ratio =	347
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 10.00 ft	1	0.077	0.006		-2.15	2.15	46.75	28.00	1.00	1.00	0.43	120.00	71.86
+D+L+H													
Dsgn. L = 10.00 ft	1	0.077	0.006		-2.15	2.15	46.75	28.00	1.00	1.00	0.43	120.00	71.86
+D+Lr+H													
Dsgn. L = 10.00 ft	1	0.179	0.014		-5.00	5.00	46.75	28.00	1.00	1.00	1.00	120.00	71.86
+D+S+H													
Dsgn. L = 10.00 ft	1	0.541	0.042		-15.15	15.15	46.75	28.00	1.00	1.00	3.03	120.00	71.86
+D+0.750Lr+0.750L+H													
Dsgn. L = 10.00 ft	1	0.153	0.012		-4.29	4.29	46.75	28.00	1.00	1.00	0.86	120.00	71.86
+D+0.750L+0.750S+H													
Dsgn. L = 10.00 ft	1	0.425	0.033		-11.90	11.90	46.75	28.00	1.00	1.00	2.38	120.00	71.86
+D+W+H													
Dsgn. L = 10.00 ft	1	0.077	0.006		-2.15	2.15	46.75	28.00	1.00	1.00	0.43	120.00	71.86
+D+0.70E+H													
Dsgn. L = 10.00 ft	1	0.113	0.009		-3.17	3.17	46.75	28.00	1.00	1.00	0.63	120.00	71.86
+D+0.750Lr+0.750L+0.750W+H													
Dsgn. L = 10.00 ft	1	0.153	0.012		-4.29	4.29	46.75	28.00	1.00	1.00	0.86	120.00	71.86
+D+0.750Lr+0.750L+0.5250E+H													
Dsgn. L = 10.00 ft	1	0.180	0.014		-5.05	5.05	46.75	28.00	1.00	1.00	1.01	120.00	71.86
+D+0.750L+0.750S+0.750W+H													
Dsgn. L = 10.00 ft	1	0.425	0.033		-11.90	11.90	46.75	28.00	1.00	1.00	2.38	120.00	71.86
+D+0.750L+0.750S+0.5250E+H													
Dsgn. L = 10.00 ft	1	0.452	0.035		-12.66	12.66	46.75	28.00	1.00	1.00	2.53	120.00	71.86
+0.60D+W+H													

Steel Beam

Description : Cantilevered Canopy Support Anchored to Wall

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
Dsgn. L = 10.00 ft +0.60D+0.70E+H	1	0.046	0.004		-1.29	1.29	46.75	28.00	1.00	1.00	0.26	120.00	71.86
Dsgn. L = 10.00 ft	1	0.082	0.006		-2.31	2.31	46.75	28.00	1.00	1.00	0.46	120.00	71.86

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr+S	1	0.6923	10.000		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	3.600	
D Only	0.430	
Lr Only	0.570	
S Only	2.600	
Lr+S	3.170	
E Only	0.290	
D+Lr	1.000	
D+S	3.030	
D+Lr+S	3.600	
D+E	0.720	
D+Lr+E	1.290	

Title Block Line 1
You can change this area using the "Settings" menu item and then using the "Printing & Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project Descr:

Project ID:

Printed: 20 DEC 2013, 12:13PM

Steel Beam

File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\canopy.ec6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

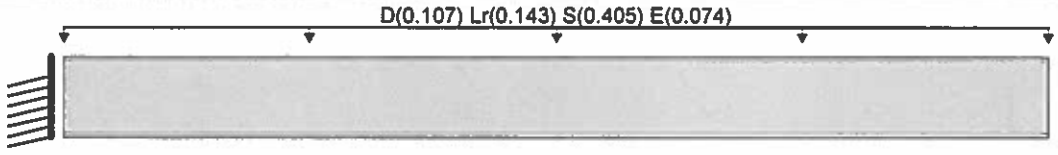
Lic. # : KW-06005617
Licensee : SUNRISE ENGINEERING

Description : Cantilivered Canopy Support

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending
Load Combination ASCE 7-02

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Span = 6.0 ft

W8x24

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.1070, Lr = 0.1430, S = 0.4050, E = 0.0740 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.160 : 1	Maximum Shear Stress Ratio =	0.079 : 1
Section used for this span	W8x24	Section used for this span	W8x24
Ma : Applied	9.216 k-ft	Va : Applied	3.072 k
Mn / Omega : Allowable	57.635 k-ft	Vn/Omega : Allowable	38.857 k
Load Combination	+D+S+H	Load Combination	+D+S+H
Location of maximum on span	0.000ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.047 in	Ratio =	3,056
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.076 in	Ratio =	1890
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 6.00 ft	1	0.033	0.017		-1.93	1.93	96.25	57.63	1.00	1.00	0.64	58.29	38.86
+D+L+H													
Dsgn. L = 6.00 ft	1	0.033	0.017		-1.93	1.93	96.25	57.63	1.00	1.00	0.64	58.29	38.86
+D+Lr+H													
Dsgn. L = 6.00 ft	1	0.078	0.039		-4.50	4.50	96.25	57.63	1.00	1.00	1.50	58.29	38.86
+D+S+H													
Dsgn. L = 6.00 ft	1	0.160	0.079		-9.22	9.22	96.25	57.63	1.00	1.00	3.07	58.29	38.86
+D+0.750Lr+0.750L+H													
Dsgn. L = 6.00 ft	1	0.067	0.033		-3.86	3.86	96.25	57.63	1.00	1.00	1.29	58.29	38.86
+D+0.750L+0.750S+H													
Dsgn. L = 6.00 ft	1	0.128	0.063		-7.39	7.39	96.25	57.63	1.00	1.00	2.46	58.29	38.86
+D+W+H													
Dsgn. L = 6.00 ft	1	0.033	0.017		-1.93	1.93	96.25	57.63	1.00	1.00	0.64	58.29	38.86
+D+0.70E+H													
Dsgn. L = 6.00 ft	1	0.050	0.025		-2.86	2.86	96.25	57.63	1.00	1.00	0.95	58.29	38.86
+D+0.750Lr+0.750L+0.750W+H													
Dsgn. L = 6.00 ft	1	0.067	0.033		-3.86	3.86	96.25	57.63	1.00	1.00	1.29	58.29	38.86
+D+0.750Lr+0.750L+0.5250E+H													
Dsgn. L = 6.00 ft	1	0.079	0.039		-4.56	4.56	96.25	57.63	1.00	1.00	1.52	58.29	38.86
+D+0.750L+0.750S+0.750W+H													
Dsgn. L = 6.00 ft	1	0.128	0.063		-7.39	7.39	96.25	57.63	1.00	1.00	2.46	58.29	38.86
+D+0.750L+0.750S+0.5250E+H													
Dsgn. L = 6.00 ft	1	0.140	0.069		-8.09	8.09	96.25	57.63	1.00	1.00	2.70	58.29	38.86
+0.60D+W+H													

Steel Beam

File = P:\OGDENC~1\043100~1\ADMINI~1\SPREAD~1\STRUCT~1\canopy.ec6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

Description : Cantilivered Canopy Support

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
Dsgn. L = 6.00 ft +0.60D+0.70E+H	1	0.020	0.010		-1.16	1.16	96.25	57.63	1.00	1.00	0.39	58.29	38.86
Dsgn. L = 6.00 ft	1	0.036	0.018		-2.09	2.09	96.25	57.63	1.00	1.00	0.70	58.29	38.86

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr+S	1	0.0762	6.000		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	3.930	
D Only	0.642	
Lr Only	0.858	
S Only	2.430	
Lr+S	3.288	
E Only	0.444	
D+Lr	1.500	
D+S	3.072	
D+Lr+S	3.930	
D+E	1.086	
D+Lr+E	1.944	

Title Block Line 1
You can change this area using the "Settings" menu item and then using the "Printing & Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project Descr:

Project ID:

Printed: 20 DEC 2013, 12:10PM

Steel Beam

File = P:\OGDENC~1\04310O~1\ADMINI~1\SPREAD~1\STRUCT~1\canopy.ec6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.8.31

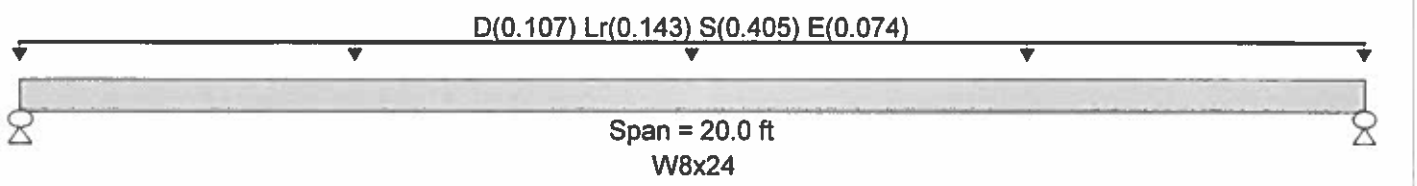
Lic. # : KW-06005617 — Licensee : SUNRISE ENGINEERING

Description : Canopy Support Beam (Main)

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending
Load Combination ASCE 7-02

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.1070, Lr = 0.1430, S = 0.4050, E = 0.0740 k/ft, Tributary Width = 1.0 ft, (Loading From Canopy)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.660 : 1	Maximum Shear Stress Ratio =	0.132 : 1
Section used for this span	W8x24	Section used for this span	W8x24
Ma : Applied	25.600 k-ft	Va : Applied	5.120 k
Mn / Omega : Allowable	38.778 k-ft	Vn/Omega : Allowable	38.857 k
Load Combination	+D+S+H	Load Combination	+D+S+H
Location of maximum on span	10.000 ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.612 in	Ratio =	391
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.991 in	Ratio =	242
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 20.00 ft +D+L+H	1	0.138	0.028	5.35		5.35	64.76	38.78	1.14	1.00	1.07	58.29	38.86
Dsgn. L = 20.00 ft +D+Lr+H	1	0.138	0.028	5.35		5.35	64.76	38.78	1.14	1.00	1.07	58.29	38.86
Dsgn. L = 20.00 ft +D+S+H	1	0.322	0.064	12.50		12.50	64.76	38.78	1.14	1.00	2.50	58.29	38.86
Dsgn. L = 20.00 ft +D+0.750Lr+0.750L+H	1	0.660	0.132	25.60		25.60	64.76	38.78	1.14	1.00	5.12	58.29	38.86
Dsgn. L = 20.00 ft +D+0.750L+0.750S+H	1	0.276	0.055	10.71		10.71	64.76	38.78	1.14	1.00	2.14	58.29	38.86
Dsgn. L = 20.00 ft +D+W+H	1	0.530	0.106	20.54		20.54	64.76	38.78	1.14	1.00	4.11	58.29	38.86
Dsgn. L = 20.00 ft +D+0.70E+H	1	0.138	0.028	5.35		5.35	64.76	38.78	1.14	1.00	1.07	58.29	38.86
Dsgn. L = 20.00 ft +D+0.750Lr+0.750L+0.750W+H	1	0.205	0.041	7.94		7.94	64.76	38.78	1.14	1.00	1.59	58.29	38.86
Dsgn. L = 20.00 ft +D+0.750Lr+0.750L+0.5250E+H	1	0.276	0.055	10.71		10.71	64.76	38.78	1.14	1.00	2.14	58.29	38.86
Dsgn. L = 20.00 ft +D+0.750L+0.750S+0.750W+H	1	0.326	0.065	12.66		12.66	64.76	38.78	1.14	1.00	2.53	58.29	38.86
Dsgn. L = 20.00 ft +D+0.750L+0.750S+0.5250E+H	1	0.530	0.106	20.54		20.54	64.76	38.78	1.14	1.00	4.11	58.29	38.86
Dsgn. L = 20.00 ft +0.60D+W+H	1	0.580	0.116	22.48		22.48	64.76	38.78	1.14	1.00	4.50	58.29	38.86

Steel Beam

Description : Canopy Support Beam (Main)

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
Dsgn. L = 20.00 ft +0.60D+0.70E+H	1	0.083	0.017	3.21		3.21	64.76	38.78	1.14	1.00	0.64	58.29	38.86
Dsgn. L = 20.00 ft	1	0.150	0.030	5.80		5.80	64.76	38.78	1.14	1.00	1.16	58.29	38.86

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+Lr+S	1	0.9911	10.100		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	6.550	6.550
D Only	1.070	1.070
Lr Only	1.430	1.430
S Only	4.050	4.050
Lr+S	5.480	5.480
E Only	0.740	0.740
D+Lr	2.500	2.500
D+S	5.120	5.120
D+Lr+S	6.550	6.550
D+E	1.810	1.810
D+Lr+E	3.240	3.240

MONORAIL BEAM ANALYSIS

For S-shaped Underhung Monorails Analyzed as Simple-Spans with / without Overhang
Per AISC 9th Edition ASD Manual and CMAA Specification No. 74 (2004)

Job Name:	Ogden City Water Treatment Plant	Subject:			
Job Number:		Originator:		Checker:	

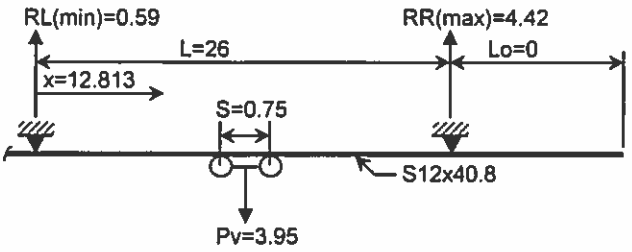
Input:

Monorail Size: 12x50 common

Select: S12x40.8

Design Parameters:

Beam Fy =	36	ksi
Beam Simple-Span, L =	26.0000	ft.
Unbraced Length, Lb =	26.0000	ft.
Bending Coef., Cb =	1.00	
Overhang Length, Lo =	0.0000	ft.
Unbraced Length, Lbo =	0.0000	ft.
Bending Coef., Cbo =	1.00	
Lifted Load, P =	3.000	kips
Trolley Weight, Wt =	0.400	kips
Hoist Weight, Wh =	0.100	kips
Vert. Impact Factor, Vi =	15	%
Horz. Load Factor, HLF =	10	%
Total No. Wheels, Nw =	4	
Wheel Spacing, S =	0.7500	ft.
Distance on Flange, a =	0.3750	in.



Nomenclature

S12x40.8 Member Properties:

A =	11.90	in.^2	d/Af =	3.46	
d =	12.000	in.	Ix =	270.00	in.^4
tw =	0.462	in.	Sx =	45.10	in.^3
bf =	5.250	in.	Iy =	13.50	in.^4
tf =	0.659	in.	Sy =	5.13	in.^3
k=	1.438	in.	J =	1.690	in.^4
rt =	1.240	in.	Cw =	434.0	in.^6

Support Reactions: (no overhang)

RR(max) =	4.42	= Pv*(L-S/2)/L+w/1000*L/2
RL(min) =	0.59	= Pv*(S/2)/L+w/1000*L/2

Results:

Parameters and Coefficients:

Pv =	3.950	kips	Pv = P*(1+Vi/100)+Wt+Wh (vertical load)
Pw =	0.988	kips/wheel	Pw = Pv/Nw (load per trolley wheel)
Ph =	0.300	kips	Ph = HLF*P (horizontal load)
ta =	0.503	in.	ta = tf-bf/24+a/6 (for S-shape)
λ =	0.157		λ = 2*a/(bf-tw)
Cxo =	-0.849		Cxo = -1.096+1.095*λ+0.192*e^(-6.0*λ)
Cx1 =	0.600		Cx1 = 3.965-4.835*λ-3.965*e^(-2.675*λ)
Czo =	0.165		Czo = -0.981-1.479*λ+1.120*e^(1.322*λ)
Cz1 =	1.947		Cz1 = 1.810-1.150*λ+1.060*e^(-7.70*λ)

Bending Moments for Simple-Span:

x =	12.813	ft.	x = 1/2*(L-S/2) (location of max. moments from left end of simple-span)
Mx =	28.39	ft-kips	Mx = (Pv/2)/(2*L)*(L-S/2)^2+w/1000*x/2*(L-x)
My =	1.89	ft-kips	My = (Ph/2)/(2*L)*(L-S/2)^2

Lateral Flange Bending Moment from Torsion for Simple-Span: (per USS Steel Design Manual, 1981)

e =	6.000	in.	e = d/2 (assume horiz. load taken at bot. flange)
at =	25.786		at = SQRT(E*Cw/(J*G)) , E=29000 ksi and G=11200 ksi
Mt =	0.17	ft-kips	Mt = Ph*e*at/(2*(d-tf))*TANH(L*12/(2*at))/12

X-axis Stresses for Simple-Span:

fbx =	7.55	ksi	fbx = Mx/Sx	
Lb/rt =	251.61		Lb/rt = Lb*12/rt	
Fbx =	11.12	ksi	Fbx = 12000*Cb/(Lb*12*(d/Af)) <= 0.60*Fy	fbx <= Fbx, O.K.

(continued)

Y-axis Stresses for Simple-Span:

fby =	4.43	ksi	fby = My/Sy	
fwns =	0.80	ksi	fwns = Mt*12/(Sy/2) (warping normal stress)	
fby(total) =	5.23	ksi	fby(total) = fby+fwns	
Fby =	27.00	ksi	Fby = 0.75*Fy	fby <= Fby, O.K.

Combined Stress Ratio for Simple-Span:

S.R. =	0.873	S.R. = fbx/Fbx+fby(total)/Fby	S.R. <= 1.0, O.K.

Vertical Deflection for Simple-Span:

Pv =	3.500	kips	Pv = P+Wh+Wt (without vertical impact)	
Δ(max) =	0.3361	in.	Δ(max) = Pv/2*(L-S)/2/(24*E*I)*(3*L^2-4*((L-S)/2)^2)+5*w/12000*L^4/(384*E*I)	
Δ(ratio) =	L/928		Δ(ratio) = L*12/Δ(max)	
Δ(allow) =	0.6933	in.	Δ(allow) = L*12/450	Defl.(max) <= Defl.(allow), O.K.

Bending Moments for Overhang:

Mx =	N.A.	ft-kips	Mx = (Pv/2)*(Lo+(Lo-S))+w/1000*Lo^2/2
My =	N.A.	ft-kips	My = (Ph/2)*(Lo+(Lo-S))

Lateral Flange Bending Moment from Torsion for Overhang: (per USS Steel Design Manual, 1981)

e =	N.A.	in.	e = d/2 (assume horiz. load taken at bot. flange)
at =	N.A.		at = SQRT(E*Cw/(J*G)) , E=29000 ksi and G=11200 ksi
Mt =	N.A.	ft-kips	Mt = Ph*e*at/(d-tf)*TANH(Lo*12/at)/12

X-axis Stresses for Overhang:

fbx =	N.A.	ksi	fbx = Mx/Sx
Lbo/rt =	N.A.		Lbo/rt = Lbo*12/rt
Fbx =	N.A.	ksi	Fbx = 0.66*Fy

Y-axis Stresses for Overhang:

fby =	N.A	ksi	fby = My/Sy
fwns =	N.A.	ksi	fwns = Mt*12/(Sy/2) (warping normal stress)
fby(total) =	N.A.	ksi	fby(total) = fby+fwns
Fby =	N.A.	ksi	Fby = 0.75*Fy

Combined Stress Ratio for Overhang:

S.R. =	N.A.	S.R. = fbx/Fbx+fby(total)/Fby

Vertical Deflection for Overhang: (assuming full design load, Pv without impact, at end of overhang)

Pv =	N.A.	kips	Pv = P+Wh+Wt (without vertical impact)
Δ(max) =	N.A.	in.	Δ(max) = Pv*Lo^2*(L+Lo)/(3*E*I)+w/12000*Lo*(4*Lo^2*L-L^3+3*Lo^3)/(24*E*I)
Δ(ratio) =	N.A.		Δ(ratio) = Lo*12/Δ(max)
Δ(allow) =	N.A.	in.	Δ(allow) = Lo*12/450

Bottom Flange Bending (simplified):

be =	7.908	in.	Min. of: be = 12*tf or S*12 (effective flange bending length)
tf2 =	0.859	in.	tf2 = tf+(bf/2-tw/2)/2*(1/6) (flange thk. at web based on 1:6 slope of flange)
am =	1.815	in.	am = (bf/2-tw/2)-(k-tf2) (where: k-tf2 = radius of fillet)
Mf =	1.792	in.-kips	Mf = Pw*am
Sf =	0.572	in.^3	Sf = be*tf^2/6
fb =	3.13	ksi	fb = Mf/Sf
Fb =	27.00	ksi	Fb = 0.75*Fy — fb <= Fb, O.K.

(continued)

Bottom Flange Bending per CMAA Specification No. 74 (2004): (Note: torsion is neglected)

Local Flange Bending Stress @ Point 0: (Sign convention: + = tension, - = compression)

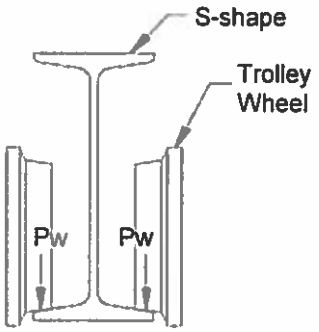
σxo =	-3.32	ksi	σxo = Cxo*Pw/ta^2
σzo =	0.64	ksi	σzo = Czo*Pw/ta^2

Local Flange Bending Stress @ Point 1:

σx1 =	2.34	ksi	σx1 = Cx1*Pw/ta^2
σz1 =	7.61	ksi	σz1 = Cz1*Pw/ta^2

Local Flange Bending Stress @ Point 2:

σx2 =	3.32	ksi	σx2 = -σxo
σz2 =	-0.64	ksi	σz2 = -σzo



Resultant Biaxial Stress @ Point 0:

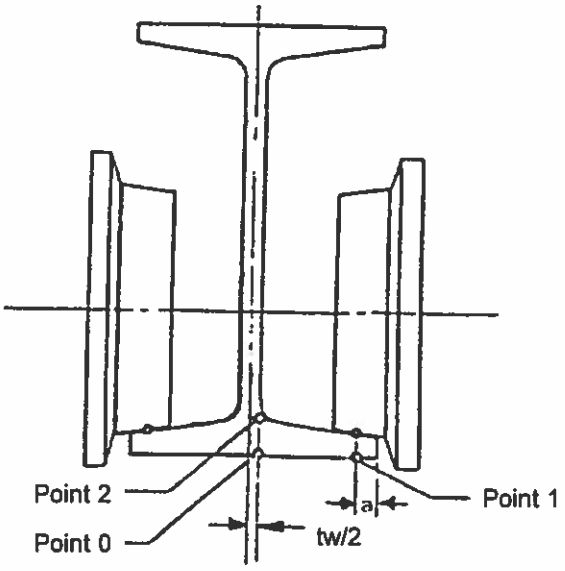
σz =	12.47	ksi	σz = fbx+fby+0.75*σzo	
σx =	-2.49	ksi	σx = 0.75*σxo	
τxz =	0.00	ksi	τxz = 0 (assumed negligible)	
σto =	13.88	ksi	σto = SQRT(σx^2+σz^2-σx*σz+3*τxz^2)	<= Fb = 0.66*Fy = 23.76 ksi, O.K.

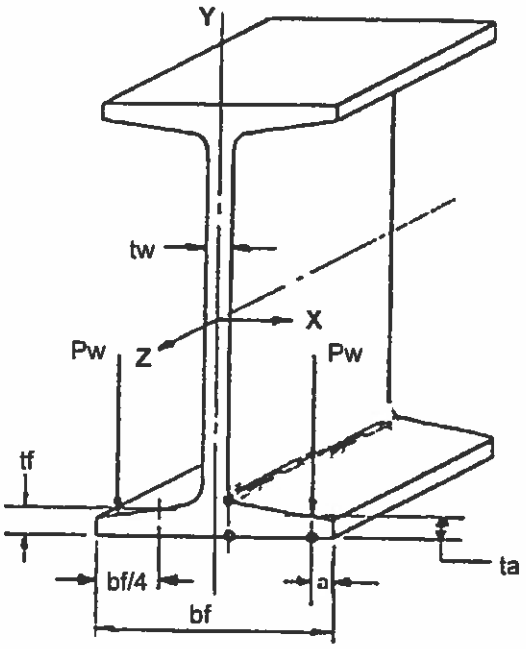
Resultant Biaxial Stress @ Point 1:

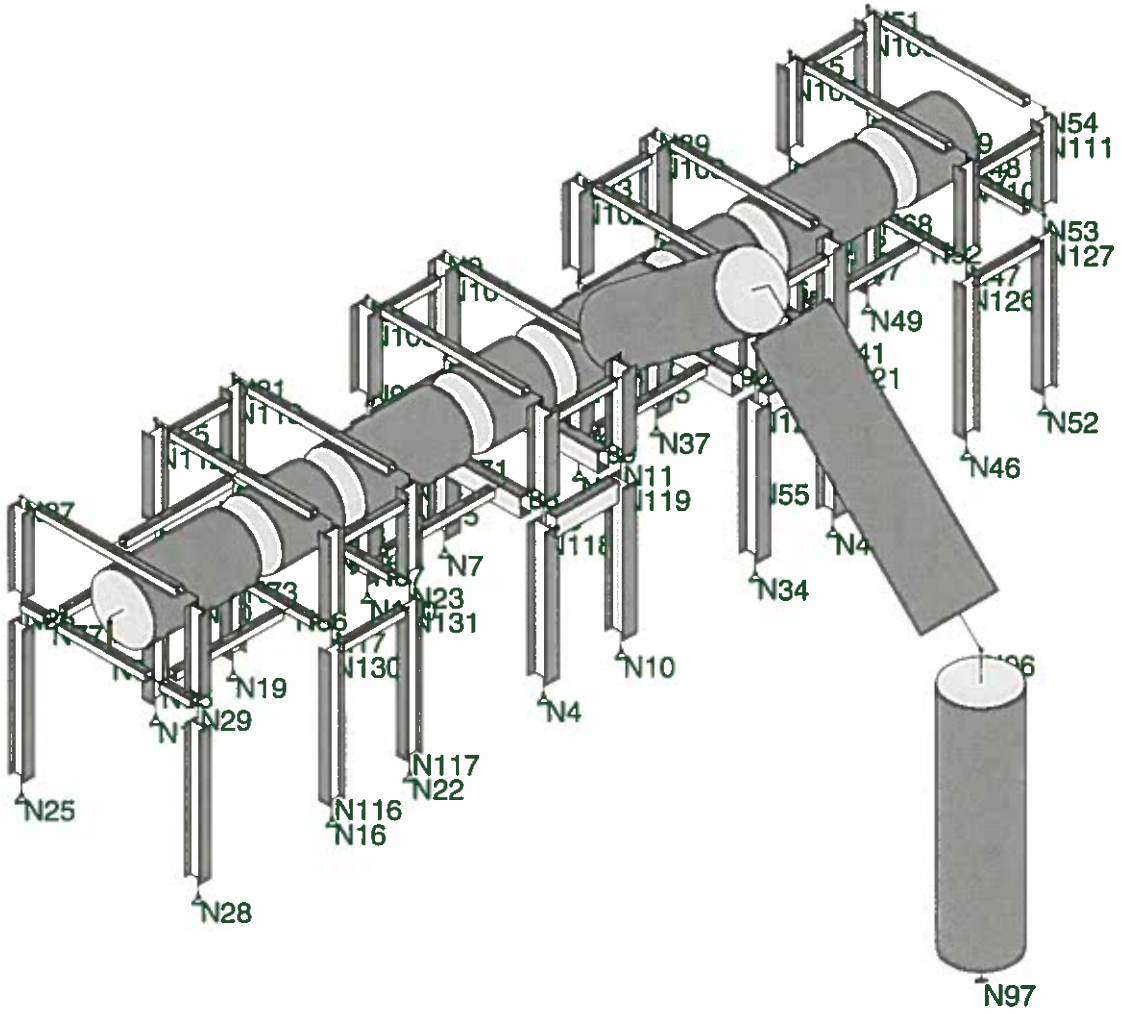
σz =	17.69	ksi	σz = fbx+fby+0.75*σz1	
σx =	1.76	ksi	σx = 0.75*σx1	
τxz =	0.00	ksi	τxz = 0 (assumed negligible)	
σt1 =	16.88	ksi	σt1 = SQRT(σx^2+σz^2-σx*σz+3*τxz^2)	<= Fb = 0.66*Fy = 23.76 ksi, O.K.

Resultant Biaxial Stress @ Point 2:

σz =	11.50	ksi	σz = fbx+fby+0.75*σz2	
σx =	2.49	ksi	σx = 0.75*σx2	
τxz =	0.00	ksi	τxz = 0 (assumed negligible)	
σt2 =	10.48	ksi	σt2 = SQRT(σx^2+σz^2-σx*σz+3*τxz^2)	<= Fb = 0.66*Fy = 23.76 ksi, O.K.





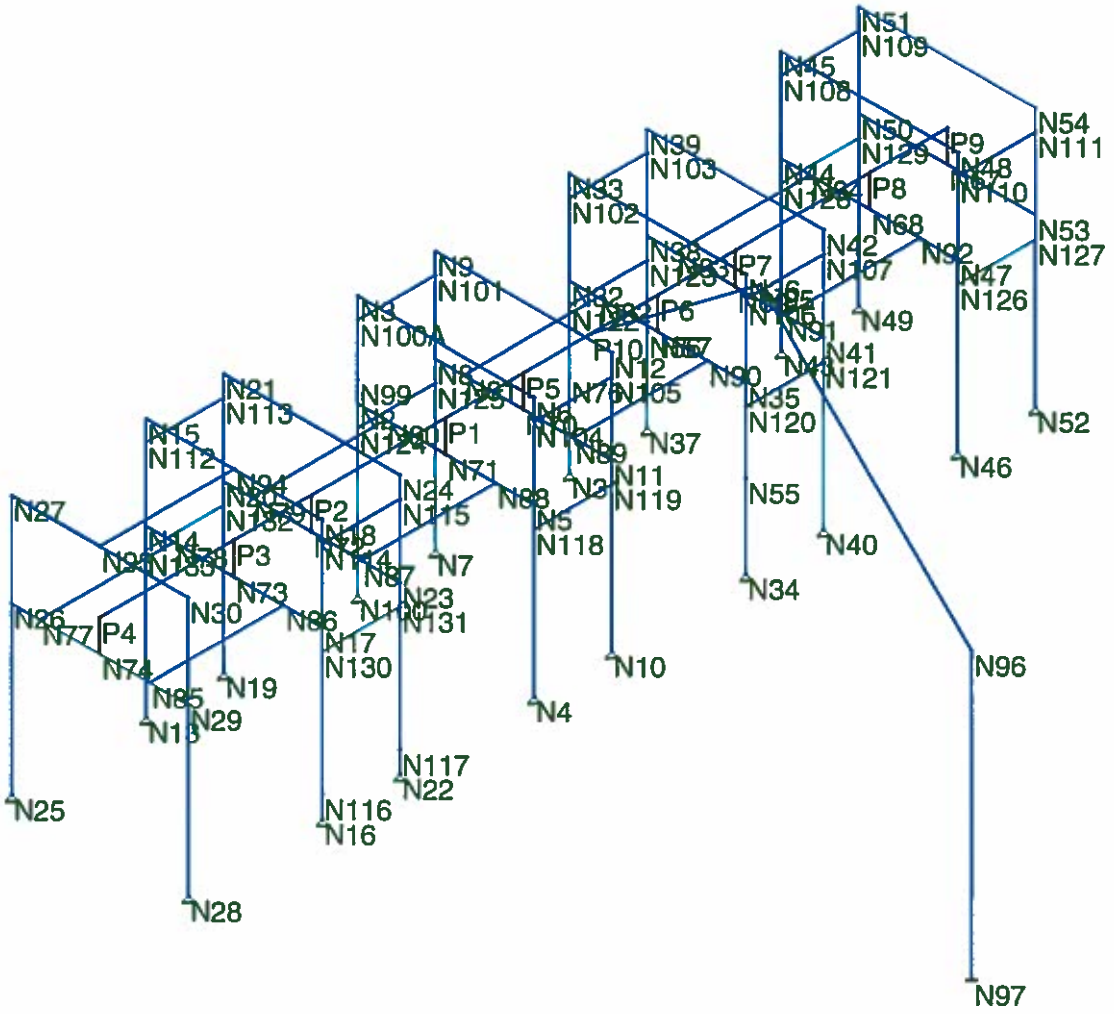


Pipe Support Calculations

491

Results for LC 4, ASCE Strength 5 (b)

	OWTP Pipe Rack Support Structure	SK - 1
		Jan 30, 2014 at 10:55 AM
		Pipe Rack REV32.r3d



Results for LC 4, ASCE Strength 5 (b)

	OWTP Pipe Rack Support Structure	SK - 2
		Jan 30, 2014 at 10:57 AM
	LC 4: Worst Case Bending	Pipe Rack REV32.r3d

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E...	Density[k/ft...	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	65	1.1
3	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	.3	.65	.49	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	.3	.65	.49	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	.3	.65	.49	35	1.6	60	1.2

Cold Formed Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Density[k/ft^3]	Yield[ksi]	Fu[ksi]
1	A570 Gr.33	29500	11346	.3	.65	.49	33	52
2	A607 C1 Gr.55	29500	11346	.3	.65	.49	55	70

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design R...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	M. Columns	W10x39	Column	Wide Flange	A992	Typical	11.5	45	209	.976
2	2nd Columns	W8x24	Column	Wide Flange	A992	Typical	7.08	18.3	82.7	.346
3	M. Pipe Supp	HSS10x6x5	Beam	SquareTube	A500 Gr.B Rect	Typical	8.76	53.3	118	118
4	2nd Pipe Sup...	HSS4x4x4	Beam	SquareTube	A500 Gr.B Rect	Typical	3.37	7.8	7.8	12.8
5	M. Horz. Brace	HSS10x6x5	Beam	Tube	A500 Gr.B Rect	Typical	8.76	53.3	118	118
6	Pipe	36" Pipe	Beam	Pipe	A36 Gr.36	Typical	41.97	6658.921	6658.921	13317....
7	Top Steel	HSS4x4x4	Beam	SquareTube	A500 Gr.B Rect	Typical	3.37	7.8	7.8	12.8
8	2nd Horiz Br...	HSS4x4x8	Beam	SquareTube	A500 Gr.B Rect	Typical	6.02	11.9	11.9	21
9	M	HSS4x4x4	Beam	SquareTube	A500 Gr.B Rect	Typical	3.37	7.8	7.8	12.8

Design Size and Code Check Parameters

	Label	Max Depth[in]	Min Depth[in]	Max Width[in]	Min Width[in]	Max Bending Chk	Max Shear Chk
1	Typical					1	1
2	DR1					1	1

Frame / HR Column Seismic Design Rule

	Label	Frame Ductility	Overstrength Reqd
1	OCBF	Minimal	Yes
2	SCBF	High	Yes
3	OMF	Minimal	Yes
4	IMF	Moderate	Yes
5	SMF-RBS	High	Yes

HR Beam Seismic Design Rule

	Label	Moment Connection	Overstrength Reqd	Z Factor	Hinge Location[in]
1	OCBF	Other/None			
2	SCBF	Other/None			
3	OMF	BUEEP			12
4	IMF	BFP	Yes		12
5	SMF-RBS	RBS	Yes	.685	14.625

HR Brace Seismic Design Rule

	Label	Overstrength Reqd	KL/r
1	OCBF		
2	SCBF		Yes
3	OMF		
4	IMF		
5	SMF-RBS		

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
1	N1	Reaction	Reaction	Reaction				
2	N7	Reaction	Reaction	Reaction				
3	N4	Reaction	Reaction	Reaction				
4	N10	Reaction	Reaction	Reaction				
5	N13	Reaction	Reaction	Reaction				
6	N16	Reaction	Reaction	Reaction				
7	N19	Reaction	Reaction	Reaction				
8	N22	Reaction	Reaction	Reaction				
9	N25	Reaction	Reaction	Reaction				
10	N28	Reaction	Reaction	Reaction				
11	N31	Reaction	Reaction	Reaction				
12	N34	Reaction	Reaction	Reaction				
13	N37	Reaction	Reaction	Reaction				
14	N40	Reaction	Reaction	Reaction				
15	N43	Reaction	Reaction	Reaction				
16	N46	Reaction	Reaction	Reaction				
17	N49	Reaction	Reaction	Reaction				
18	N52	Reaction	Reaction	Reaction				
19	N97	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	M. Columns	7.849									Lateral
2	M2	M. Columns	4.412									Lateral
3	M3	M. Columns	7.849									Lateral
4	M4	M. Columns	4.412									Lateral
5	M5	Top Steel	8.334									Lateral
6	M6	M. Pipe Supp	8.334									Lateral
7	M7	M. Columns	7.849									Lateral
8	M8	M. Columns	4.412									Lateral
9	M9	M. Columns	7.849									Lateral
10	M10	M. Columns	4.412									Lateral
11	M11	Top Steel	8.334									Lateral
12	M21	Top Steel	8.334									Lateral
13	M22	2nd Pipe Su...	8.334									Lateral
14	M27	Top Steel	8.334									Lateral
15	M28	2nd Pipe Su...	8.334									Lateral
16	M37	Top Steel	8.334									Lateral
17	M39	M. Columns	7.849									Lateral
18	M40	M. Columns	4.412									Lateral
19	M41	M. Columns	7.849									Lateral
20	M42	M. Columns	4.412									Lateral
21	M43	Top Steel	8.334									Lateral
22	M45	M. Columns	7.849									Lateral
23	M46	M. Columns	4.412									Lateral
24	M47	M. Columns	7.849									Lateral

Hot Rolled Steel Design Parameters (Continued)

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
25	M48	M. Columns	4.412									Lateral
26	M49	Top Steel	8.334									Lateral
27	M50	M. Pipe Supp	8.334									Lateral
28	M59	Top Steel	8.334									Lateral
29	M60	2nd Pipe Su...	8.334									Lateral
30	M65	Top Steel	8.334									Lateral
31	M66	2nd Pipe Su...	8.334									Lateral
32	M85A	M. Pipe Supp	8.334									Lateral
33	M86A	M. Pipe Supp	8.334									Lateral
34	M88	Pipe	6.333									Lateral
35	M89	Pipe	3.667									Lateral
36	M90	Pipe	6.334									Lateral
37	M91	Pipe	3.667									Lateral
38	M92	Pipe	6.333									Lateral
39	M93	Pipe	3.667									Lateral
40	M94	Pipe	6.333									Lateral
41	M95	Pipe	3.661									Lateral
42	M89A	2nd Pipe Su...	6.334									Lateral
43	M90A	2nd Pipe Su...	6.333									Lateral
44	M91A	2nd Pipe Su...	6.333									Lateral
45	M92A	2nd Pipe Su...	6.333									Lateral
46	M93A	2nd Pipe Su...	6.334									Lateral
47	M94A	2nd Pipe Su...	6.333									Lateral
48	M95A	2nd Pipe Su...	6.333									Lateral
49	M96	2nd Pipe Su...	6.333									Lateral
50	M97A	Top Steel	6.334									Lateral
51	M98A	Pipe	10									Lateral
52	M99A	Pipe	14.142									Lateral
53	M100A	Pipe	13.5									Lateral
54	M93B	2nd Columns	7.849									Lateral
55	M94B	2nd Columns	4.412									Lateral
56	M95B	2nd Columns	4.412									Lateral
57	M96A	2nd Columns	7.849									Lateral
58	M97B	2nd Columns	4.412									Lateral
59	M98B	2nd Columns	7.849									Lateral
60	M99B	2nd Columns	4.412									Lateral
61	M100B	2nd Columns	7.849									Lateral
62	M93C	2nd Columns	7.849									Lateral
63	M94C	2nd Columns	4.412									Lateral
64	M95C	2nd Columns	7.849									Lateral
65	M96B	2nd Columns	4.412									Lateral
66	M97C	2nd Columns	7.849									Lateral
67	M98C	2nd Columns	4.412									Lateral
68	M99C	2nd Columns	7.849									Lateral
69	M100C	2nd Columns	4.412									Lateral
70	M97D	2nd Columns	4.412									Lateral
71	M98D	2nd Columns	7.849									Lateral
72	M99D	2nd Columns	4.412									Lateral
73	M100D	2nd Columns	7.849									Lateral
74	M99E	2nd Pipe Su...	1.34									Lateral
75	M100E	2nd Pipe Su...	5.18									Lateral
76	M101A	2nd Pipe Su...	1.814									Lateral
77	M98E	Top Steel	3.667									Lateral
78	M99F	Top Steel	3.667									Lateral
79	M100F	Top Steel	3.667									Lateral
80	M101B	Top Steel	3.667									Lateral
81	M102A	Top Steel	3.667									Lateral

Hot Rolled Steel Design Parameters (Continued)

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
82	M103A	Top Steel	3.667									Lateral
83	M100G	Top Steel	3.667									Lateral
84	M101C	Top Steel	3.667									Lateral
85	M96C	M. Pipe Supp	3.667									Lateral
86	M97E	M. Pipe Supp	3.667									Lateral
87	M98F	M. Pipe Supp	3.667									Lateral
88	M99G	M. Pipe Supp	3.667									Lateral
89	M100H	2nd Horiz B...	3.667									Lateral
90	M101D	2nd Horiz B...	3.667									Lateral
91	M102B	2nd Horiz B...	3.667									Lateral
92	M103B	2nd Horiz B...	3.667									Lateral

Load Combinations

	Description	Sol...	PDelta	SR...	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	ASCE Strength 1	Yes	Y		DL	1.4																
2	ASCE Strength 2 (a)	Yes	Y		DL	1.2	LL	1.6	LLS	1.6												
3	ASCE Strength 5 (a)	Yes	Y		DL	1.2	ELX	1	LL	.5	LLS	1										
4	ASCE Strength 5 (b)	Yes	Y		DL	1.2	ELZ	1	LL	.5	LLS	1										
5	ASCE Strength 5 (c)	Yes	Y		DL	1.2	ELX	-1	LL	.5	LLS	1										
6	ASCE Strength 5 (d)	Yes	Y		DL	1.2	ELZ	-1	LL	.5	LLS	1										
7	ASCE Strength 7 (a)	Yes	Y		DL	.9	ELX	1														
8	ASCE Strength 7 (b)	Yes	Y		DL	.9	ELZ	1														
9	ASCE Strength 7 (c)	Yes	Y		DL	.9	ELX	-1														
10	ASCE Strength 7 (d)	Yes	Y		DL	.9	ELZ	-1														

Load Combination Design

	Description	ASIF	CD	ABIF	Service	Hot Rolled	Cold For...	Wood	Concrete	Masonry	Footings	Aluminum	Connecti...
1	ASCE Stren...					Yes	Yes		Yes	Yes	Yes		Yes
2	ASCE Stren...					Yes	Yes		Yes	Yes	Yes		Yes
3	ASCE Stren...					Yes	Yes		Yes	Yes	Yes		Yes
4	ASCE Stren...					Yes	Yes		Yes	Yes	Yes		Yes
5	ASCE Stren...					Yes	Yes		Yes	Yes	Yes		Yes
6	ASCE Stren...					Yes	Yes		Yes	Yes	Yes		Yes
7	ASCE Stren...					Yes	Yes		Yes	Yes	Yes		Yes
8	ASCE Stren...					Yes	Yes		Yes	Yes	Yes		Yes
9	ASCE Stren...					Yes	Yes		Yes	Yes	Yes		Yes
10	ASCE Stren...					Yes	Yes		Yes	Yes	Yes		Yes

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	4	N1	.469	19.253	-2.838	0	0	0
2	4	N7	.962	-3.781	-3.077	0	0	0
3	4	N4	-.538	16.98	-2.341	0	0	0
4	4	N10	.134	-3.773	-2.563	0	0	0
5	4	N13	.018	10.534	-2.152	0	0	0
6	4	N16	-.157	9.745	-1.765	0	0	0
7	4	N19	.027	-6.276	-2.307	0	0	0
8	4	N22	-.132	-4.821	-1.903	0	0	0
9	4	N25	-.08	2.882	-.336	0	0	0
10	4	N28	-.465	4.077	-.269	0	0	0
11	4	N31	1.535	18.289	-2.849	0	0	0
12	4	N34	1.24	8.716	-2.348	0	0	0
13	4	N37	2.588	-1.787	-3.132	0	0	0

Joint Reactions (Continued)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
14	4	N40	2.194	-9.701	-2.57	0	0	0
15	4	N43	.252	10.851	-2.094	0	0	0
16	4	N46	.252	7.135	-1.576	0	0	0
17	4	N49	.479	-6.244	-2.332	0	0	0
18	4	N52	.444	-5.978	-1.717	0	0	0
19	4	N97	4.577	-55.653	-11.975	-180.245	-104.506	-63.719
20	4	Totals:	13.8	10.447	-50.143			
21	4	COG (ft):	X: -70.735	Y: -51.365	Z: 8.344			

Member Section Forces

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Mo...	z-z Mo...
1	4	M1	1	19.253	-.471	-3.069	0	0	0
2			2	19.16	-.471	-3.054	0	-6.008	.923
3			3	19.068	-.471	-3.039	0	-11.987	1.847
4			4	18.976	-.471	-3.025	0	-17.937	2.77
5			5	7.609	-.15	-1.754	.523	-2.477	4.116
6	4	M2	1	1.215	-2.052	-.276	-.408	.157	-7.407
7			2	1.163	-2.052	-.268	-.408	-.143	-5.144
8			3	1.111	-2.052	-.259	-.408	-.433	-2.88
9			4	1.059	-2.052	-.251	-.408	-.714	-.617
10			5	.567	-1.762	-.096	.099	-.032	1.392
11	4	M3	1	16.98	.538	-2.509	0	0	0
12			2	16.887	.538	-2.494	0	-4.909	-1.055
13			3	16.795	.538	-2.479	0	-9.789	-2.111
14			4	16.703	.538	-2.464	0	-14.64	-3.166
15			5	7.3	.195	-2.866	-.652	-2.714	-3.326
16	4	M4	1	1.166	1.993	-.063	.399	-.388	7.159
17			2	1.114	1.993	-.054	.399	-.453	4.96
18			3	1.062	1.993	-.046	.399	-.508	2.761
19			4	1.01	1.993	-.037	.399	-.553	.562
20			5	.583	1.762	-.078	-.037	.003	-1.364
21	4	M5	1	1.762	.567	-.092	.017	.099	1.098
22			2	1.762	.411	-.068	.017	-.084	-.022
23			3	1.762	-.21	.024	.017	-.221	-.849
24			4	1.762	-.427	.057	.017	-.122	-.083
25			5	1.762	-.583	.081	.017	.037	1.07
26	4	M6	1	-1.899	6.392	-1.467	2.023	.931	12.315
27			2	-1.292	6.635	-3.699	.242	-1.987	-1.611
28			3	-1.292	6.258	-3.642	-.315	-9.813	-14.751
29			4	-1.123	-6.255	3.364	-.315	-2.816	-1.993
30			5	-1.795	-6.131	2.786	-1.165	1.051	11.232
31	4	M7	1	-3.781	-.958	-3.029	0	0	0
32			2	-3.873	-.958	-3.014	0	-5.929	1.879
33			3	-3.965	-.958	-2.999	0	-11.828	3.759
34			4	-4.057	-.958	-2.984	0	-17.698	5.638
35			5	6.995	-1.278	-4.042	.64	-3.633	7.094
36	4	M8	1	.415	-1.565	.012	-.484	-.719	-5.627
37			2	.364	-1.565	.02	-.484	-.701	-3.901
38			3	.312	-1.565	.029	-.484	-.674	-2.174
39			4	.26	-1.565	.037	-.484	-.638	-.448
40			5	.598	-1.855	-.092	.075	-.016	1.533
41	4	M9	1	-3.773	-.131	-2.524	0	0	0
42			2	-3.865	-.131	-2.509	0	-4.938	.256
43			3	-3.957	-.131	-2.494	0	-9.847	.512
44			4	-4.049	-.131	-2.479	0	-14.726	.768
45			5	5.039	.201	-1.913	-.596	-2.285	.139

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Mo...	z-z Mo...
46	4	M10	1	.434	1.623	-.175	.362	-.018	6.188
47			2	.382	1.623	-.166	.362	-.206	4.398
48			3	.331	1.623	-.158	.362	-.385	2.607
49			4	.279	1.623	-.149	.362	-.554	.817
50			5	.552	1.855	-.083	-.052	-.013	-1.247
51	4	M11	1	1.855	.598	-.088	0	.075	1.224
52			2	1.855	.442	-.063	0	-.099	.039
53			3	1.855	-.179	.028	0	-.226	-.852
54			4	1.855	-.396	.061	0	-.117	-.151
55			5	1.855	-.552	.086	0	.052	.938
56	4	M21	1	.435	.406	-.263	.422	.168	.61
57			2	.435	.25	-.238	.422	-.369	-.174
58			3	.468	.222	-.233	.422	-.86	-.665
59			4	.468	-.36	.246	-.335	-.306	.004
60			5	.468	-.515	.271	-.335	.249	1.016
61	4	M22	1	-.731	.894	-1.539	1.682	.427	1.913
62			2	-.212	1.309	-.712	.34	-.379	-.475
63			3	-.212	-1.285	.472	.34	-1.769	-2.892
64			4	-.16	-1.616	.477	-.251	-.642	-.161
65			5	-.704	-1.326	1.637	-1.156	.55	2.91
66	4	M27	1	.785	.536	-.073	.039	.012	.922
67			2	.785	.38	-.049	.039	-.131	-.133
68			3	.785	-.241	.043	.039	-.228	-.895
69			4	.785	-.458	.076	.039	-.09	-.064
70			5	.785	-.614	.1	.039	.109	1.154
71	4	M28	1	-.445	1.569	-2.44	1.493	.543	2.202
72			2	-1.052	1.135	-.179	.436	-.79	-.438
73			3	-1.052	-.97	.818	.436	-2	-2.273
74			4	-.932	-1.301	.823	-.28	-.291	-.197
75			5	-.261	-1.616	1.518	-1.112	.534	2.757
76	4	M37	1	1.009	.517	.072	.515	-.101	.538
77			2	1.009	.361	.097	.515	.059	-.476
78			3	1.009	-.58	-.157	.515	.407	-1.242
79			4	.977	-.797	-.125	-.429	.128	.295
80			5	.977	-.953	-.1	-.429	-.09	2.218
81	4	M39	1	18.289	-1.597	-3.137	0	0	0
82			2	18.197	-1.597	-3.122	0	-6.141	3.133
83			3	18.105	-1.597	-3.107	0	-12.253	6.266
84			4	18.012	-1.579	-2.938	0	-18.032	9.365
85			5	6.81	-1.134	-3.042	.76	-3.556	12.917
86	4	M40	1	1.331	-1.019	-.103	-.559	-.304	-2.333
87			2	1.28	-1.019	-.094	-.559	-.413	-1.209
88			3	1.228	-1.019	-.086	-.559	-.513	-.085
89			4	1.176	-1.019	-.078	-.559	-.603	1.039
90			5	.714	-.597	-.126	.218	-.035	1.789
91	4	M41	1	8.716	-1.268	-2.456	0	0	0
92			2	8.624	-1.268	-2.441	0	-4.805	2.488
93			3	8.531	-1.268	-2.427	0	-9.582	4.977
94			4	8.439	-1.261	-2.354	0	-14.215	7.452
95			5	-.588	-1.533	-3.185	-.597	-3	11.227
96	4	M42	1	.965	.716	.061	.356	-.716	2.463
97			2	.913	.716	.069	.356	-.644	1.674
98			3	.861	.716	.077	.356	-.564	.884
99			4	.809	.716	.086	.356	-.474	.094
100			5	.436	.596	-.048	.11	.006	-.535
101	4	M43	1	.596	.714	-.124	.015	.218	1.689
102			2	.596	.558	-.1	.015	-.031	.263

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Mo...	z-z Mo...
103			3	.596	-.063	-.008	.015	-.234	-.87
104			4	.596	-.28	.025	.015	-.202	-.411
105			5	.596	-.436	.049	.015	-.11	.436
106	4	M45	1	-1.787	-2.579	-3.102	0	0	0
107			2	-1.879	-2.579	-3.087	0	-6.072	5.061
108			3	-1.971	-2.581	-3.087	0	-12.115	10.121
109			4	-2.063	-2.581	-3.072	0	-18.157	15.186
110			5	8.824	-3.017	-2.819	.743	-3.776	19.789
111	4	M46	1	.596	-.805	-.225	-.549	.118	-1.885
112			2	.545	-.805	-.216	-.549	-.125	-.996
113			3	.493	-.805	-.208	-.549	-.359	-.108
114			4	.441	-.805	-.2	-.549	-.584	.781
115			5	.749	-1.227	-.125	.218	-.028	2.044
116	4	M47	1	-9.701	-2.151	-2.474	0	0	0
117			2	-9.793	-2.151	-2.459	0	-4.84	4.221
118			3	-9.885	-2.151	-2.444	0	-9.651	8.443
119			4	-9.978	-2.151	-2.429	0	-14.432	12.664
120			5	-1.266	-1.897	-1.59	-.489	-2.5	15.603
121	4	M48	1	.338	1.105	-.234	.287	.243	4.532
122			2	.286	1.105	-.225	.287	-.011	3.313
123			3	.234	1.105	-.217	.287	-.255	2.094
124			4	.182	1.105	-.209	.287	-.49	.875
125			5	.402	1.226	-.049	.089	0	-.503
126	4	M49	1	1.226	.749	-.122	.008	.218	1.839
127			2	1.226	.593	-.097	.008	-.027	.341
128			3	1.226	-.029	-.006	.008	-.224	-.864
129			4	1.226	-.246	.027	.008	-.187	-.476
130			5	1.226	-.402	.052	.008	-.089	.299
131	4	M50	1	2.194	8.227	-2.585	2.818	1.293	20.759
132			2	1.222	7.759	-5.215	.841	-3.14	4.359
133			3	-3.599	7.382	-5.158	.841	-13.902	-11.123
134			4	-3.599	1.979	3.726	-.486	-.96	-6.06
135			5	-3.006	1.607	1.343	-2.183	.776	-9.819
136	4	M59	1	.226	.723	-.084	.069	.035	1.612
137			2	.226	.567	-.059	.069	-.13	.167
138			3	.226	-.054	.033	.069	-.248	-.986
139			4	.226	-.271	.065	.069	-.13	-.545
140			5	.226	-.427	.09	.069	.048	.283
141	4	M60	1	-.374	.873	-3.307	1.534	.77	2.535
142			2	.598	1.153	-.646	.624	-.934	.391
143			3	.598	.822	-.596	.624	-2.184	-1.376
144			4	-.237	.197	-.204	-.467	-1.317	-.667
145			5	-.831	.383	2.295	-1.001	.695	-1.332
146	4	M65	1	.544	.737	-.083	.072	.046	1.698
147			2	.544	.581	-.058	.072	-.118	.224
148			3	.544	-.041	.033	.072	-.235	-.956
149			4	.544	-.258	.066	.072	-.116	-.543
150			5	.544	-.414	.091	.072	.063	.257
151	4	M66	1	.335	1.426	-.81	.912	.603	3.345
152			2	.335	1.397	-.805	.912	-1.079	.404
153			3	-.637	1.066	-.755	.912	-2.662	-1.872
154			4	-.637	.181	.621	-.695	-.893	-.807
155			5	-.637	.152	.67	-.695	.495	-1.154
156	4	M85A	1	-.288	6.579	-4.042	1.23	1.124	12.841
157			2	-1.032	6.286	-2.561	1.197	-3.807	-.229
158			3	-1.898	5.909	-2.504	1.197	-9.429	-12.644
159			4	-1.898	-4.342	3.719	-.219	-1.694	-2.555

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Mo...	z-z Mo...
160			5	-1.418	-4.603	1.726	-1.547	.959	6.64
161	4	M86A	1	.107	5.478	-2.931	2.03	1.32	15.206
162			2	.851	5.534	-4.374	.97	-3.507	3.375
163			3	-1.77	5.157	-4.317	-1.365	-12.517	-7.474
164			4	-1.77	1.528	1.119	-1.365	-3.625	-4.804
165			5	-2.251	1.555	3.235	-.936	.953	-7.826
166	4	M88	1	2.208	7.234	-7.92	-12.281	54.937	30.008
167			2	2.444	5.779	-7.92	-12.281	42.397	19.707
168			3	2.68	4.324	-7.92	-12.281	29.858	11.709
169			4	2.915	2.869	-7.92	-12.281	17.319	6.015
170			5	3.151	1.414	-7.92	-12.281	4.78	2.625
171	4	M89	1	2.2	3.193	-.601	-1.397	5.713	1.749
172			2	2.337	2.351	-.601	-1.397	5.162	-.792
173			3	2.473	1.508	-.601	-1.397	4.612	-2.561
174			4	2.609	.666	-.601	-1.397	4.061	-3.557
175			5	2.746	-.177	-.601	-1.397	3.511	-3.781
176	4	M90	1	1.61	2.087	-.549	-1.081	3.372	-4.564
177			2	1.846	.632	-.549	-1.081	2.502	-6.716
178			3	2.082	-.824	-.549	-1.081	1.632	-6.564
179			4	2.317	-2.279	-.549	-1.081	.762	-4.108
180			5	2.553	-3.734	-.549	-1.081	-.108	.653
181	4	M91	1	9.206	4.903	-8.077	-11.786	-54.715	33.49
182			2	9.07	4.06	-8.077	-11.786	-62.12	29.382
183			3	8.933	3.218	-8.077	-11.786	-69.525	26.046
184			4	8.797	2.375	-8.077	-11.786	-76.929	23.482
185			5	8.66	1.533	-8.077	-11.786	-84.334	21.691
186	4	M92	1	14.878	11.409	-14.395	-21.199	-83.946	25.702
187			2	14.642	9.955	-14.395	-21.199	-106.737	8.789
188			3	14.406	8.5	-14.395	-21.199	-129.529	-5.819
189			4	-13.813	4.888	5.115	4.711	-27.135	50.794
190			5	-14.048	3.433	5.115	4.711	-19.037	44.207
191	4	M93	1	-8.618	6.682	.548	-.627	-25.609	48.802
192			2	-8.754	5.839	.548	-.627	-25.107	43.063
193			3	-8.89	4.997	.548	-.627	-24.604	38.096
194			4	-9.027	4.154	.548	-.627	-24.102	33.901
195			5	-9.163	3.312	.548	-.627	-23.599	30.479
196	4	M94	1	-.276	8.337	5.391	7.266	-28.79	35.502
197			2	-.512	6.882	5.391	7.266	-20.255	23.454
198			3	-.747	5.427	5.391	7.266	-11.72	13.71
199			4	-.983	3.972	5.391	7.266	-3.184	6.27
200			5	-1.219	2.517	5.391	7.266	5.351	1.133
201	4	M95	1	-.83	2.81	-.975	-1.92	4.055	2.289
202			2	-.966	1.968	-.975	-1.92	3.163	.102
203			3	-1.103	1.127	-.975	-1.92	2.27	-1.314
204			4	-1.239	.286	-.975	-1.92	1.378	-1.961
205			5	-1.375	-.555	-.975	-1.92	.486	-1.838
206	4	M97	1	.293	.835	-.389	-1.296	1.739	-.363
207			2	.293	.835	-.389	-1.296	1.593	-.676
208			3	.293	.835	-.389	-1.296	1.447	-.989
209			4	.293	.835	-.389	-1.296	1.302	-1.302
210			5	.293	.835	-.389	-1.296	1.156	-1.615
211	4	M98	1	5.025	4.821	-8.887	-5.191	18.354	-.629
212			2	5.025	4.821	-8.887	-5.191	15.021	-2.437
213			3	5.025	4.821	-8.887	-5.191	11.689	-4.245
214			4	5.025	4.821	-8.887	-5.191	8.356	-6.052
215			5	5.025	4.821	-8.887	-5.191	5.023	-7.86
216	4	M99	1	3.252	2.621	-5.431	-6.573	12.741	-1.512

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Mo...	z-z Mo...
217			2	3.252	2.621	-5.431	-6.573	10.705	-2.495
218			3	3.252	2.621	-5.431	-6.573	8.668	-3.478
219			4	3.252	2.621	-5.431	-6.573	6.631	-4.461
220			5	3.252	2.621	-5.431	-6.573	4.595	-5.443
221	4	M100	1	9.877	.866	-6.222	.388	13.336	-.064
222			2	9.877	.866	-6.222	.388	11.003	-.389
223			3	9.877	.866	-6.222	.388	8.67	-.714
224			4	9.877	.866	-6.222	.388	6.337	-1.038
225			5	9.877	.866	-6.222	.388	4.004	-1.363
226	4	M101	1	12.139	-.169	-7.005	.221	13.98	-.731
227			2	12.139	-.169	-7.005	.221	11.353	-.668
228			3	12.139	-.169	-7.005	.221	8.726	-.604
229			4	12.139	-.169	-7.005	.221	6.099	-.541
230			5	12.139	-.169	-7.005	.221	3.472	-.478
231	4	M102	1	1.779	-.12	-.952	.933	2.302	-.094
232			2	1.779	-.12	-.952	.933	1.945	-.05
233			3	1.779	-.12	-.952	.933	1.588	-.005
234			4	1.779	-.12	-.952	.933	1.231	.04
235			5	1.779	-.12	-.952	.933	.874	.085
236	4	M103	1	2.264	-.051	-1.137	-.139	2.486	.239
237			2	2.264	-.051	-1.137	-.139	2.06	.258
238			3	2.264	-.051	-1.137	-.139	1.633	.277
239			4	2.264	-.051	-1.137	-.139	1.207	.296
240			5	2.264	-.051	-1.137	-.139	.78	.316
241	4	M104	1	3.735	-.552	-2.556	.108	4.483	.257
242			2	3.735	-.552	-2.556	.108	3.524	.464
243			3	3.735	-.552	-2.556	.108	2.566	.671
244			4	3.735	-.552	-2.556	.108	1.608	.878
245			5	3.735	-.552	-2.556	.108	.649	1.085
246	4	M104A	1	.549	-1.377	-.972	-.487	-.455	-3.901
247			2	.549	-1.377	-.972	-.487	-.82	-3.384
248			3	.549	-1.377	-.972	-.487	-1.184	-2.868
249			4	.549	-1.377	-.972	-.487	-1.548	-2.351
250			5	.549	-1.377	-.972	-.487	-1.913	-1.835
251	4	M89A	1	-.81	.529	.518	.138	-1.496	1.598
252			2	-.814	.508	.518	.138	-.676	.777
253			3	-.817	.486	.518	.138	.144	-.009
254			4	-.821	.464	.518	.138	.964	-.761
255			5	-.824	.442	.518	.138	1.785	-1.479
256	4	M90A	1	2.257	.403	.61	.197	-2.068	1.432
257			2	2.254	.381	.61	.197	-1.103	.811
258			3	2.25	.36	.61	.197	-.137	.225
259			4	2.247	.338	.61	.197	.829	-.328
260			5	2.243	.316	.61	.197	1.795	-.845
261	4	M91A	1	1.469	.217	.748	.088	-2.386	.644
262			2	1.466	.195	.748	.088	-1.202	.318
263			3	1.462	.173	.748	.088	-.019	.026
264			4	1.459	.152	.748	.088	1.165	-.231
265			5	1.455	.13	.748	.088	2.349	-.454
266	4	M92A	1	-2.644	.395	.965	-.035	-2.905	.876
267			2	-2.648	.374	.965	-.035	-1.377	.268
268			3	-2.652	.352	.965	-.035	.15	-.307
269			4	-2.655	.33	.965	-.035	1.678	-.847
270			5	-2.659	.308	.965	-.035	3.206	-1.352
271	4	M93A	1	-1.101	.404	-.545	-.162	1.542	1.193
272			2	-1.104	.382	-.545	-.162	.679	.57
273			3	-1.108	.361	-.545	-.162	-.185	-.018

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Mo...	z-z Mo...
274			4	-1.111	.339	-.545	-.162	-1.048	-.572
275			5	-1.115	.317	-.545	-.162	-1.911	-1.091
276	4	M94A	1	.644	.284	-.671	-.194	2.155	.94
277			2	.641	.263	-.671	-.194	1.093	.507
278			3	.637	.241	-.671	-.194	.031	.108
279			4	.634	.219	-.671	-.194	-1.031	-.256
280			5	.63	.197	-.671	-.194	-2.093	-.585
281	4	M95A	1	-2.05	.186	-.485	-.068	1.48	.475
282			2	-2.053	.165	-.485	-.068	.713	.197
283			3	-2.057	.143	-.485	-.068	-.055	-.046
284			4	-2.06	.121	-.485	-.068	-.823	-.255
285			5	-2.064	.099	-.485	-.068	-1.591	-.429
286	4	M96	1	-2.441	.3	-.601	-.005	1.704	.68
287			2	-2.445	.278	-.601	-.005	.753	.223
288			3	-2.448	.256	-.601	-.005	-.198	-.2
289			4	-2.452	.234	-.601	-.005	-1.149	-.588
290			5	-2.455	.213	-.601	-.005	-2.1	-.942
291	4	M97A	1	-.345	.317	.032	-.044	-.142	.959
292			2	-.348	.295	.032	-.044	-.092	.475
293			3	-.352	.273	.032	-.044	-.041	.025
294			4	-.355	.251	.032	-.044	.009	-.391
295			5	-.359	.23	.032	-.044	.059	-.772
296	4	M98A	1	-65.602	6.155	10.791	-75.407	-61.325	-3.356
297			2	-66.981	4.317	10.861	-75.407	-34.259	-16.446
298			3	-68.359	2.479	10.931	-75.407	-7.02	-24.941
299			4	-69.738	.641	11	-75.407	20.394	-28.841
300			5	-71.116	-1.197	11.07	-75.407	47.982	-28.147
301	4	M99A	1	-81.849	2.44	10.94	-58.164	-67.863	-28.147
302			2	-79.552	.143	11.038	-58.164	-29.012	-32.714
303			3	-77.254	-2.154	11.136	-58.164	10.187	-29.158
304			4	-74.957	-4.452	11.235	-58.164	49.735	-17.479
305			5	-72.659	-6.749	11.333	-58.164	89.63	2.322
306	4	M100A	1	-68.059	4.548	-11.515	-104.506	-22.25	-2.322
307			2	-64.958	4.548	-11.609	-104.506	-61.273	-17.671
308			3	-61.856	4.548	-11.703	-104.506	-100.613	-33.021
309			4	-58.754	4.548	-11.797	-104.506	-140.271	-48.37
310			5	-55.653	4.548	-11.891	-104.506	-180.245	-63.719
311	4	M93B	1	-.235	-2.53	-.177	.304	.305	-6.177
312			2	-6.446	-2.209	-.034	0	.198	-13.088
313			3	-6.39	-2.219	-.034	0	.132	-8.743
314			4	-6.333	-2.228	-.034	0	.066	-4.381
315			5	-6.276	-2.237	-.034	0	0	0
316	4	M94B	1	-1.805	-.081	.622	-.239	-1.823	4.278
317			2	-1.837	-.075	.622	-.239	-1.137	4.364
318			3	-1.869	-.07	.622	-.239	-.45	4.444
319			4	-1.901	-.065	.622	-.239	.236	4.519
320			5	.536	-.077	.785	.012	1.053	.051
321	4	M95B	1	.406	-.265	-.435	.168	.683	-.466
322			2	2.957	-.297	-.597	-.182	.154	-4.76
323			3	2.989	-.302	-.597	-.182	-.505	-4.429
324			4	3.02	-.308	-.597	-.182	-1.164	-4.093
325			5	3.052	-.313	-.597	-.182	-1.823	-3.75
326	4	M96A	1	3.949	-1.864	.138	.245	-.032	-5.689
327			2	10.364	-2.238	0	0	.004	-13.256
328			3	10.421	-2.247	0	0	.003	-8.855
329			4	10.478	-2.256	0	0	.001	-4.437
330			5	10.534	-2.266	0	0	0	0

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Mo...	z-z Mo...
331	4	M97B	1	.515	-.271	.468	-.249	-1.094	-.38
332			2	2.722	-.228	.685	.216	-.59	-4.03
333			3	2.754	-.233	.685	.216	.166	-3.776
334			4	2.786	-.238	.685	.216	.921	-3.516
335			5	2.818	-.243	.685	.216	1.677	-3.251
336	4	M98B	1	4.146	-1.895	-.02	-.335	-1.116	-4.68
337			2	9.574	-1.822	.174	0	-1.032	-10.828
338			3	9.631	-1.831	.174	0	-.691	-7.243
339			4	9.688	-1.841	.174	0	-.35	-3.641
340			5	9.745	-1.87	.182	0	0	0
341	4	M99B	1	-1.383	-.18	-.569	.217	1.479	3.223
342			2	-1.415	-.175	-.569	.217	.851	3.419
343			3	-1.447	-.17	-.569	.217	.223	3.61
344			4	-1.479	-.165	-.569	.217	-.405	3.794
345			5	.614	-.101	-.786	-.109	-1.285	-.022
346	4	M100B	1	.234	-1.708	.309	-.317	-1.235	-4.588
347			2	-4.992	-1.832	.126	0	-.74	-10.855
348			3	-4.935	-1.841	.126	0	-.492	-7.252
349			4	-4.878	-1.85	.126	0	-.245	-3.631
350			5	-4.821	-1.851	.123	0	0	0
351	4	M93C	1	10.851	-2.211	.325	0	0	0
352			2	10.794	-2.201	.325	0	.638	4.329
353			3	10.738	-2.192	.325	0	1.275	8.64
354			4	10.681	-2.183	.325	0	1.913	12.932
355			5	4.248	-3.319	.05	.44	2.436	6.68
356	4	M94C	1	3.375	0	.417	-.331	-.037	4.596
357			2	3.344	.006	.417	-.331	.424	4.592
358			3	3.312	.011	.417	-.331	.884	4.582
359			4	3.28	.016	.417	-.331	1.344	4.567
360			5	.723	-.087	.227	.035	1.649	.083
361	4	M95C	1	-6.244	-2.262	.427	0	0	0
362			2	-6.3	-2.253	.427	0	.839	4.431
363			3	-6.357	-2.244	.427	0	1.677	8.843
364			4	-6.414	-2.235	.427	0	2.516	13.237
365			5	-.184	-1.044	.696	.343	3.462	4.886
366	4	M96B	1	-1.61	-.228	.357	-.26	.06	3.839
367			2	-1.642	-.223	.357	-.26	.454	4.087
368			3	-1.674	-.217	.357	-.26	.848	4.33
369			4	-1.706	-.212	.357	-.26	1.242	4.567
370			5	.737	-.088	.545	.046	1.788	.086
371	4	M97C	1	7.135	-1.633	.3	0	0	0
372			2	7.079	-1.623	.3	0	.588	3.195
373			3	7.022	-1.614	.3	0	1.176	6.371
374			4	6.965	-1.605	.3	0	1.764	9.53
375			5	2.117	-2.339	.452	-.414	2.68	4.659
376	4	M98C	1	2.499	-.035	-.381	.282	1.209	3.276
377			2	2.467	-.03	-.381	.282	.788	3.312
378			3	2.435	-.025	-.381	.282	.368	3.342
379			4	2.403	-.02	-.381	.282	-.053	3.367
380			5	.427	-.091	-.225	-.048	-.321	-.054
381	4	M99C	1	-5.978	-1.668	.395	0	0	0
382			2	-6.035	-1.659	.395	0	.774	3.264
383			3	-6.092	-1.65	.395	0	1.549	6.51
384			4	-6.149	-1.64	.395	0	2.323	9.738
385			5	-1.504	-.869	.246	-.298	2.774	3.536
386	4	M100C	1	-1.353	-.196	-.388	.197	1.515	2.729
387			2	-1.385	-.191	-.388	.197	1.087	2.943

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Mo...	z-z Mo...
388			3	-1.417	-.186	-.388	.197	.66	3.151
389			4	-1.448	-.181	-.388	.197	.232	3.354
390			5	.414	-.09	-.544	-.063	-.348	-.057
391	4	M97D	1	.515	1.008	.067	-.101	.503	.706
392			2	.547	1.008	.061	-.101	.574	-.406
393			3	.579	1.008	.056	-.101	.639	-1.517
394			4	.611	1.008	.051	-.101	.698	-2.629
395			5	.643	1.008	.046	-.101	.751	-3.741
396	4	M98D	1	2.655	-.087	-.329	0	2.725	-.681
397			2	2.712	-.087	-.338	0	2.071	-.511
398			3	2.769	-.087	-.347	0	1.399	-.341
399			4	2.826	-.087	-.356	0	.708	-.17
400			5	2.882	-.087	-.366	0	0	0
401	4	M99D	1	.952	-.978	.096	.09	.412	-2.381
402			2	.984	-.978	.091	.09	.515	-1.302
403			3	1.016	-.978	.085	.09	.612	-.223
404			4	1.047	-.978	.08	.09	.704	.856
405			5	1.079	-.978	.075	.09	.789	1.935
406	4	M100D	1	3.85	-.475	-.269	0	2.256	-3.731
407			2	3.907	-.475	-.278	0	1.719	-2.798
408			3	3.964	-.475	-.287	0	1.164	-1.865
409			4	4.02	-.475	-.297	0	.591	-.933
410			5	4.077	-.475	-.306	0	0	0
411	4	M99E	1	-1.089	2.008	-.348	1.973	.101	3.06
412			2	-1.089	2.003	-.347	1.973	-.015	2.388
413			3	-1.089	1.999	-.346	1.973	-.131	1.718
414			4	-1.089	1.994	-.346	1.973	-.247	1.049
415			5	-1.089	1.989	-.345	1.973	-.363	.382
416	4	M100E	1	-1.607	1.459	-1.155	.375	1.133	.519
417			2	-1.607	1.441	-1.152	.375	-.36	-1.358
418			3	-1.607	1.423	-1.149	.375	-1.85	-3.212
419			4	-1.055	-2.319	1.403	-.274	-.747	-2.188
420			5	-1.055	-2.337	1.406	-.274	1.071	.827
421	4	M101A	1	-.512	-2.744	.307	-1.467	-.47	.665
422			2	-.512	-2.75	.308	-1.467	-.331	1.911
423			3	-.512	-2.757	.309	-1.467	-.191	3.16
424			4	-.512	-2.763	.31	-1.467	-.051	4.411
425			5	-.512	-2.769	.311	-1.467	.09	5.666
426	4	M98E	1	.145	.44	.291	.035	-.507	.808
427			2	.143	.428	.291	.035	-.24	.41
428			3	.141	.415	.291	.035	.026	.024
429			4	.139	.402	.291	.035	.292	-.351
430			5	.137	.39	.291	.035	.559	-.714
431	4	M99F	1	-.058	.41	.421	.047	-.778	.706
432			2	-.06	.397	.421	.047	-.391	.336
433			3	-.062	.385	.421	.047	-.005	-.023
434			4	-.064	.372	.421	.047	.381	-.37
435			5	-.066	.36	.421	.047	.767	-.705
436	4	M100F	1	-.05	.376	-.232	.041	.436	.643
437			2	-.052	.363	-.232	.041	.224	.304
438			3	-.054	.35	-.232	.041	.011	-.023
439			4	-.056	.338	-.232	.041	-.201	-.338
440			5	-.058	.325	-.232	.041	-.414	-.642
441	4	M101B	1	-.143	.321	-.121	.039	.247	.523
442			2	-.145	.309	-.121	.039	.136	.234
443			3	-.147	.296	-.121	.039	.025	-.043
444			4	-.149	.284	-.121	.039	-.087	-.309

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Mo...	z-z Mo...
445			5	-.151	.271	-.121	.039	-.198	-.563
446	4	M102A	1	-.123	2.525	.183	.035	-.365	4.572
447			2	-.125	2.512	.183	.035	-.198	2.263
448			3	-.127	2.499	.183	.035	-.03	-.034
449			4	-.129	2.487	.183	.035	.138	-2.319
450			5	-.131	2.474	.183	.035	.306	-4.593
451	4	M103A	1	-.084	1.944	-.161	-.004	.329	3.516
452			2	-.086	1.932	-.161	-.004	.182	1.739
453			3	-.088	1.919	-.161	-.004	.035	-.026
454			4	-.09	1.907	-.161	-.004	-.112	-1.779
455			5	-.092	1.894	-.161	-.004	-.259	-3.522
456	4	M100G	1	.014	2.519	.164	.032	-.35	4.591
457			2	.012	2.506	.164	.032	-.2	2.288
458			3	.01	2.494	.164	.032	-.049	-.004
459			4	.008	2.481	.164	.032	.101	-2.285
460			5	.006	2.469	.164	.032	.251	-4.554
461	4	M101C	1	-.059	2.175	-.216	.035	.465	3.947
462			2	-.061	2.163	-.216	.035	.267	1.959
463			3	-.063	2.15	-.216	.035	.069	-.018
464			4	-.065	2.138	-.216	.035	-.128	-1.983
465			5	-.067	2.125	-.216	.035	-.326	-3.937
466	4	M96C	1	-.575	9.311	-.34	.553	.652	17.164
467			2	-.581	9.279	-.34	.553	.34	8.643
468			3	-.586	9.246	-.34	.553	.028	.151
469			4	-.591	9.213	-.34	.553	-.284	-8.31
470			5	-.597	9.18	-.34	.553	-.596	-16.741
471	4	M97E	1	-.898	8.935	-.296	1.029	.597	16.665
472			2	-.903	8.902	-.296	1.029	.325	8.488
473			3	-.908	8.87	-.296	1.029	.054	.342
474			4	-.914	8.837	-.296	1.029	-.217	-7.774
475			5	-.919	8.804	-.296	1.029	-.489	-15.861
476	4	M98F	1	-.244	11.111	.41	.898	-.76	20.346
477			2	-.249	11.078	.41	.898	-.384	10.176
478			3	-.254	11.045	.41	.898	-.009	.035
479			4	-.26	11.012	.41	.898	.367	-10.075
480			5	-.265	10.979	.41	.898	.743	-20.156
481	4	M99G	1	1.035	11.275	.317	.743	-.523	20.125
482			2	1.029	11.242	.317	.743	-.232	9.804
483			3	1.024	11.209	.317	.743	.059	-.487
484			4	1.019	11.176	.317	.743	.349	-10.748
485			5	1.013	11.144	.317	.743	.64	-20.979
486	4	M100H	1	-.79	4.791	-.194	.175	.414	8.754
487			2	-.793	4.769	-.194	.175	.236	4.372
488			3	-.797	4.746	-.194	.175	.058	.01
489			4	-.801	4.724	-.194	.175	-.12	-4.331
490			5	-.804	4.701	-.194	.175	-.298	-8.651
491	4	M101D	1	-1.234	6.377	.213	.161	-.44	11.672
492			2	-1.238	6.354	.213	.161	-.244	5.836
493			3	-1.242	6.332	.213	.161	-.048	.021
494			4	-1.245	6.309	.213	.161	.147	-5.773
495			5	-1.249	6.287	.213	.161	.343	-11.547
496	4	M102B	1	-.145	5.372	-.178	.064	.335	9.797
497			2	-.149	5.349	-.178	.064	.172	4.882
498			3	-.152	5.327	-.178	.064	.009	-.011
499			4	-.156	5.304	-.178	.064	-.154	-4.885
500			5	-.16	5.282	-.178	.064	-.317	-9.737
501	4	M103B	1	.261	-6.268	.15	.101	-.304	-11.566

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Mo...	z-z Mo...
502			2	.265	-6.291	.15	.101	-.166	-5.81
503			3	.269	-6.313	.15	.101	-.029	-.032
504			4	.272	-6.336	.15	.101	.108	5.765
505			5	.276	-6.358	.15	.101	.245	11.584

Member Section Stresses

	LC	Member Label	Sec	Axial[k...	y Shea...	z Shea...	y top Bending[ksi]	y bot Bending[...	z top Bending[...	z bot Bending[ksi]
1	4	M1	1	1.674	-.151	-.362	0	0	0	0
2			2	1.666	-.151	-.361	-.263	.263	-6.401	6.401
3			3	1.658	-.151	-.359	-.526	.526	-12.77	12.77
4			4	1.65	-.151	-.357	-.789	.789	-19.109	19.109
5			5	.662	-.048	-.207	-1.172	1.172	-2.638	2.638
6	4	M2	1	.106	-.657	-.033	2.11	-2.11	.168	-.168
7			2	.101	-.657	-.032	1.465	-1.465	-.152	.152
8			3	.097	-.657	-.031	.82	-.82	-.462	.462
9			4	.092	-.657	-.03	.176	-.176	-.761	.761
10			5	.049	-.564	-.011	-.396	.396	-.034	.034
11	4	M3	1	1.476	.172	-.296	0	0	0	0
12			2	1.468	.172	-.295	.301	-.301	-5.23	5.23
13			3	1.46	.172	-.293	.601	-.601	-10.429	10.429
14			4	1.452	.172	-.291	.902	-.902	-15.596	15.596
15			5	.635	.062	-.338	.947	-.947	-2.891	2.891
16	4	M4	1	.101	.638	-.007	-2.039	2.039	-.414	.414
17			2	.097	.638	-.006	-1.412	1.412	-.482	.482
18			3	.092	.638	-.005	-.786	.786	-.541	.541
19			4	.088	.638	-.004	-.16	.16	-.59	.59
20			5	.051	.564	-.009	.388	-.388	.003	-.003
21	4	M5	1	.523	.369	-.06	-3.379	3.379	.303	-.303
22			2	.523	.267	-.044	.067	-.067	-.259	.259
23			3	.523	-.137	.016	2.612	-2.612	-.679	.679
24			4	.523	-.278	.037	.256	-.256	-.375	.375
25			5	.523	-.379	.053	-3.293	3.293	.115	-.115
26	4	M6	1	-.217	1.203	-.492	-6.262	6.262	.629	-.629
27			2	-.147	1.249	-1.24	.819	-.819	-1.342	1.342
28			3	-.147	1.178	-1.221	7.501	-7.501	-6.628	6.628
29			4	-.128	-1.178	1.127	1.013	-1.013	-1.902	1.902
30			5	-.205	-1.154	.934	-5.711	5.711	.71	-.71
31	4	M7	1	-.329	-.306	-.358	0	0	0	0
32			2	-.337	-.306	-.356	-.535	.535	-6.316	6.316
33			3	-.345	-.306	-.354	-1.07	1.07	-12.601	12.601
34			4	-.353	-.306	-.352	-1.606	1.606	-18.854	18.854
35			5	.608	-.409	-.477	-2.02	2.02	-3.87	3.87
36	4	M8	1	.036	-.501	.001	1.602	-1.602	-.766	.766
37			2	.032	-.501	.002	1.111	-1.111	-.747	.747
38			3	.027	-.501	.003	.619	-.619	-.718	.718
39			4	.023	-.501	.004	.128	-.128	-.679	.679
40			5	.052	-.594	-.011	-.437	.437	-.017	.017
41	4	M9	1	-.328	-.042	-.298	0	0	0	0
42			2	-.336	-.042	-.296	-.073	.073	-5.261	5.261
43			3	-.344	-.042	-.294	-.146	.146	-10.49	10.49
44			4	-.352	-.042	-.293	-.219	.219	-15.688	15.688
45			5	.438	.064	-.226	-.04	.04	-2.434	2.434
46	4	M10	1	.038	.519	-.021	-1.762	1.762	-.019	.019
47			2	.033	.519	-.02	-1.252	1.252	-.219	.219
48			3	.029	.519	-.019	-.742	.742	-.41	.41
49			4	.024	.519	-.018	-.233	.233	-.59	.59

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[k...	y Shea...	z Shea...	y top Bending[ksi]	y bot Bending[...	z top Bending[...	z bot Bending[ksi]
50			5	.048	.594	-.01	.355	-.355	-.014	.014
51	4	M11	1	.55	.389	-.057	-3.766	3.766	.229	-.229
52			2	.55	.288	-.041	-.121	.121	-.304	.304
53			3	.55	-.116	.018	2.622	-2.622	-.694	.694
54			4	.55	-.258	.04	.464	-.464	-.361	.361
55			5	.55	-.359	.056	-2.886	2.886	.159	-.159
56	4	M21	1	.129	.264	-.171	-1.878	1.878	.517	-.517
57			2	.129	.163	-.155	.535	-.535	-1.136	1.136
58			3	.139	.144	-.152	2.047	-2.047	-2.646	2.646
59			4	.139	-.234	.16	-.011	.011	-.942	.942
60			5	.139	-.335	.176	-3.125	3.125	.766	-.766
61	4	M22	1	-.217	.581	-1.001	-5.886	5.886	1.314	-1.314
62			2	-.063	.851	-.463	1.46	-1.46	-1.167	1.167
63			3	-.063	-.835	.307	8.9	-8.9	-5.443	5.443
64			4	-.048	-1.05	.31	.495	-.495	-1.974	1.974
65			5	-.209	-.862	1.064	-8.954	8.954	1.694	-1.694
66	4	M27	1	.233	.348	-.048	-2.838	2.838	.036	-.036
67			2	.233	.247	-.032	.409	-.409	-.404	.404
68			3	.233	-.157	.028	2.754	-2.754	-.702	.702
69			4	.233	-.298	.049	.198	-.198	-.276	.276
70			5	.233	-.399	.065	-3.55	3.55	.336	-.336
71	4	M28	1	-.132	1.02	-1.586	-6.777	6.777	1.67	-1.67
72			2	-.312	.738	-.116	1.346	-1.346	-2.43	2.43
73			3	-.312	-.631	.532	6.994	-6.994	-6.155	6.155
74			4	-.277	-.846	.535	.605	-.605	-.895	.895
75			5	-.077	-1.05	.987	-8.483	8.483	1.644	-1.644
76	4	M37	1	.299	.336	.047	-1.656	1.656	-.312	.312
77			2	.299	.234	.063	1.466	-1.466	.18	-.18
78			3	.299	-.377	-.102	3.822	-3.822	1.251	-1.251
79			4	.29	-.518	-.081	-.906	.906	.394	-.394
80			5	.29	-.62	-.065	-6.826	6.826	-.277	.277
81	4	M39	1	1.59	-.511	-.37	0	0	0	0
82			2	1.582	-.511	-.369	-.892	.892	-6.542	6.542
83			3	1.574	-.511	-.367	-1.784	1.784	-13.054	13.054
84			4	1.566	-.505	-.347	-2.667	2.667	-19.21	19.21
85			5	.592	-.363	-.359	-3.679	3.679	-3.788	3.788
86	4	M40	1	.116	-.326	-.012	.665	-.665	-.324	.324
87			2	.111	-.326	-.011	.344	-.344	-.44	.44
88			3	.107	-.326	-.01	.024	-.024	-.546	.546
89			4	.102	-.326	-.009	-.296	.296	-.642	.642
90			5	.062	-.191	-.015	-.509	.509	-.038	.038
91	4	M41	1	.758	-.406	-.29	0	0	0	0
92			2	.75	-.406	-.288	-.709	.709	-5.119	5.119
93			3	.742	-.406	-.287	-1.417	1.417	-10.208	10.208
94			4	.734	-.404	-.278	-2.122	2.122	-15.143	15.143
95			5	-.051	-.49	-.376	-3.197	3.197	-3.196	3.196
96	4	M42	1	.084	.229	.007	-.701	.701	-.763	.763
97			2	.079	.229	.008	-.477	.477	-.686	.686
98			3	.075	.229	.009	-.252	.252	-.6	.6
99			4	.07	.229	.01	-.027	.027	-.504	.504
100			5	.038	.191	-.006	.152	-.152	.007	-.007
101	4	M43	1	.177	.464	-.081	-5.198	5.198	.671	-.671
102			2	.177	.363	-.065	-.809	.809	-.096	.096
103			3	.177	-.041	-.005	2.678	-2.678	-.721	.721
104			4	.177	-.182	.016	1.264	-1.264	-.622	.622
105			5	.177	-.283	.032	-1.342	1.342	-.337	.337
106	4	M45	1	-.155	-.825	-.366	0	0	0	0

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[k...	y Shea...	z Shea...	y top Bending[ksi]	y bot Bending[...	z top Bending[...	z bot Bending[ksi]
107			2	-.163	-.825	-.364	-1.441	1.441	-6.469	6.469
108			3	-.171	-.826	-.364	-2.882	2.882	-12.906	12.906
109			4	-.179	-.826	-.363	-4.325	4.325	-19.343	19.343
110			5	.767	-.966	-.333	-5.636	5.636	-4.023	4.023
111	4	M46	1	.052	-.258	-.027	.537	-.537	.126	-.126
112			2	.047	-.258	-.026	.284	-.284	-.133	.133
113			3	.043	-.258	-.025	.031	-.031	-.382	.382
114			4	.038	-.258	-.024	-.222	.222	-.622	.622
115			5	.065	-.393	-.015	-.582	.582	-.03	.03
116	4	M47	1	-.844	-.688	-.292	0	0	0	0
117			2	-.852	-.688	-.29	-1.202	1.202	-5.156	5.156
118			3	-.86	-.688	-.289	-2.404	2.404	-10.282	10.282
119			4	-.868	-.688	-.287	-3.607	3.607	-15.375	15.375
120			5	-.11	-.607	-.188	-4.443	4.443	-2.663	2.663
121	4	M48	1	.029	.354	-.028	-1.291	1.291	.259	-.259
122			2	.025	.354	-.027	-.943	.943	-.011	.011
123			3	.02	.354	-.026	-.596	.596	-.271	.271
124			4	.016	.354	-.025	-.249	.249	-.522	.522
125			5	.035	.392	-.006	.143	-.143	0	0
126	4	M49	1	.364	.487	-.079	-5.659	5.659	.67	-.67
127			2	.364	.385	-.063	-1.049	1.049	-.082	.082
128			3	.364	-.019	-.004	2.659	-2.659	-.691	.691
129			4	.364	-.16	.018	1.465	-1.465	-.575	.575
130			5	.364	-.261	.034	-.92	.92	-.274	.274
131	4	M50	1	.251	1.549	-.866	-10.556	10.556	.873	-.873
132			2	.139	1.461	-1.748	-2.216	2.216	-2.121	2.121
133			3	-.411	1.39	-1.729	5.656	-5.656	-9.39	9.39
134			4	-.411	.373	1.249	3.081	-3.081	-.649	.649
135			5	-.343	.303	.45	4.993	-4.993	.524	-.524
136	4	M59	1	.067	.47	-.054	-4.959	4.959	.107	-.107
137			2	.067	.369	-.038	-.513	.513	-.399	.399
138			3	.067	-.035	.021	3.033	-3.033	-.762	.762
139			4	.067	-.176	.043	1.676	-1.676	-.401	.401
140			5	.067	-.278	.059	-.872	.872	.146	-.146
141	4	M60	1	-.111	.567	-2.15	-7.8	7.8	2.37	-2.37
142			2	.178	.749	-.42	-1.202	1.202	-2.874	2.874
143			3	.178	.534	-.387	4.234	-4.234	-6.721	6.721
144			4	-.07	.128	-.132	2.051	-2.051	-4.053	4.053
145			5	-.246	.249	1.492	4.099	-4.099	2.14	-2.14
146	4	M65	1	.162	.479	-.054	-5.223	5.223	.141	-.141
147			2	.162	.378	-.038	-.69	.69	-.362	.362
148			3	.162	-.026	.022	2.942	-2.942	-.722	.722
149			4	.162	-.168	.043	1.671	-1.671	-.357	.357
150			5	.162	-.269	.059	-.79	.79	.192	-.192
151	4	M66	1	.099	.927	-.526	-10.293	10.293	1.856	-1.856
152			2	.099	.908	-.523	-1.244	1.244	-3.32	3.32
153			3	-.189	.693	-.491	5.761	-5.761	-8.189	8.189
154			4	-.189	.118	.404	2.482	-2.482	-2.749	2.749
155			5	-.189	.099	.436	3.55	-3.55	1.522	-1.522
156	4	M85A	1	-.033	1.239	-1.355	-6.529	6.529	.759	-.759
157			2	-.118	1.183	-.858	.116	-.116	-2.571	2.571
158			3	-.217	1.112	-.839	6.429	-6.429	-6.368	6.368
159			4	-.217	-.817	1.246	1.299	-1.299	-1.144	1.144
160			5	-.162	-.867	.579	-3.376	3.376	.647	-.647
161	4	M86A	1	.012	1.031	-.982	-7.732	7.732	.891	-.891
162			2	.097	1.042	-1.466	-1.716	1.716	-2.369	2.369
163			3	-.202	.971	-1.447	3.8	-3.8	-8.454	8.454

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[k...	y Shea...	z Shea...	y top Bending[ksi]	y bot Bending[...	z top Bending[...	z bot Bending[ksi]
164			4	-.202	.288	.375	2.443	-2.443	-2.448	2.448
165			5	-.257	.293	1.084	3.979	-3.979	.644	-.644
166	4	M88	1	.053	.345	-.377	-.973	.973	1.782	-1.782
167			2	.058	.275	-.377	-.639	.639	1.375	-1.375
168			3	.064	.206	-.377	-.38	.38	.969	-.969
169			4	.069	.137	-.377	-.195	.195	.562	-.562
170			5	.075	.067	-.377	-.085	.085	.155	-.155
171	4	M89	1	.052	.152	-.029	-.057	.057	.185	-.185
172			2	.056	.112	-.029	.026	-.026	.167	-.167
173			3	.059	.072	-.029	.083	-.083	.15	-.15
174			4	.062	.032	-.029	.115	-.115	.132	-.132
175			5	.065	-.008	-.029	.123	-.123	.114	-.114
176	4	M90	1	.038	.099	-.026	.148	-.148	.109	-.109
177			2	.044	.03	-.026	.218	-.218	.081	-.081
178			3	.05	-.039	-.026	.213	-.213	.053	-.053
179			4	.055	-.109	-.026	.133	-.133	.025	-.025
180			5	.061	-.178	-.026	-.021	.021	-.004	.004
181	4	M91	1	.219	.234	-.385	-1.086	1.086	-1.775	1.775
182			2	.216	.193	-.385	-.953	.953	-2.015	2.015
183			3	.213	.153	-.385	-.845	.845	-2.255	2.255
184			4	.21	.113	-.385	-.762	.762	-2.495	2.495
185			5	.206	.073	-.385	-.704	.704	-2.736	2.736
186	4	M92	1	.354	.544	-.686	-.834	.834	-2.723	2.723
187			2	.349	.474	-.686	-.285	.285	-3.462	3.462
188			3	.343	.405	-.686	.189	-.189	-4.202	4.202
189			4	-.329	.233	.244	-1.648	1.648	-.88	.88
190			5	-.335	.164	.244	-1.434	1.434	-.618	.618
191	4	M93	1	-.205	.318	.026	-1.583	1.583	-.831	.831
192			2	-.209	.278	.026	-1.397	1.397	-.814	.814
193			3	-.212	.238	.026	-1.236	1.236	-.798	.798
194			4	-.215	.198	.026	-1.1	1.1	-.782	.782
195			5	-.218	.158	.026	-.989	.989	-.766	.766
196	4	M94	1	-.007	.397	.257	-1.152	1.152	-.934	.934
197			2	-.012	.328	.257	-.761	.761	-.657	.657
198			3	-.018	.259	.257	-.445	.445	-.38	.38
199			4	-.023	.189	.257	-.203	.203	-.103	.103
200			5	-.029	.12	.257	-.037	.037	.174	-.174
201	4	M95	1	-.02	.134	-.046	-.074	.074	.132	-.132
202			2	-.023	.094	-.046	-.003	.003	.103	-.103
203			3	-.026	.054	-.046	.043	-.043	.074	-.074
204			4	-.03	.014	-.046	.064	-.064	.045	-.045
205			5	-.033	-.026	-.046	.06	-.06	.016	-.016
206	4	M97	1	0	0	0	0	0	0	0
207			2	0	0	0	0	0	0	0
208			3	0	0	0	0	0	0	0
209			4	0	0	0	0	0	0	0
210			5	0	0	0	0	0	0	0
211	4	M98	1	0	0	0	0	0	0	0
212			2	0	0	0	0	0	0	0
213			3	0	0	0	0	0	0	0
214			4	0	0	0	0	0	0	0
215			5	0	0	0	0	0	0	0
216	4	M99	1	0	0	0	0	0	0	0
217			2	0	0	0	0	0	0	0
218			3	0	0	0	0	0	0	0
219			4	0	0	0	0	0	0	0
220			5	0	0	0	0	0	0	0

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[k...	y Shea...	z Shea...	y top Bending[ksi]	y bot Bending[...	z top Bending[...	z bot Bending[ksi]
221	4	M100	1	0	0	0	0	0	0	0
222			2	0	0	0	0	0	0	0
223			3	0	0	0	0	0	0	0
224			4	0	0	0	0	0	0	0
225			5	0	0	0	0	0	0	0
226	4	M101	1	0	0	0	0	0	0	0
227			2	0	0	0	0	0	0	0
228			3	0	0	0	0	0	0	0
229			4	0	0	0	0	0	0	0
230			5	0	0	0	0	0	0	0
231	4	M102	1	0	0	0	0	0	0	0
232			2	0	0	0	0	0	0	0
233			3	0	0	0	0	0	0	0
234			4	0	0	0	0	0	0	0
235			5	0	0	0	0	0	0	0
236	4	M103	1	0	0	0	0	0	0	0
237			2	0	0	0	0	0	0	0
238			3	0	0	0	0	0	0	0
239			4	0	0	0	0	0	0	0
240			5	0	0	0	0	0	0	0
241	4	M104	1	0	0	0	0	0	0	0
242			2	0	0	0	0	0	0	0
243			3	0	0	0	0	0	0	0
244			4	0	0	0	0	0	0	0
245			5	0	0	0	0	0	0	0
246	4	M104A	1	0	0	0	0	0	0	0
247			2	0	0	0	0	0	0	0
248			3	0	0	0	0	0	0	0
249			4	0	0	0	0	0	0	0
250			5	0	0	0	0	0	0	0
251	4	M89A	1	-.24	.344	.337	-4.918	4.918	-4.603	4.603
252			2	-.241	.33	.337	-2.392	2.392	-2.079	2.079
253			3	-.242	.316	.337	.029	-.029	.444	-.444
254			4	-.244	.302	.337	2.343	-2.343	2.968	-2.968
255			5	-.245	.287	.337	4.55	-4.55	5.491	-5.491
256	4	M90A	1	.67	.262	.397	-4.407	4.407	-6.364	6.364
257			2	.669	.248	.397	-2.496	2.496	-3.392	3.392
258			3	.668	.234	.397	-.691	.691	-.421	.421
259			4	.667	.22	.397	1.008	-1.008	2.551	-2.551
260			5	.666	.205	.397	2.6	-2.6	5.522	-5.522
261	4	M91A	1	.436	.141	.486	-1.983	1.983	-7.342	7.342
262			2	.435	.127	.486	-.979	.979	-3.699	3.699
263			3	.434	.113	.486	-.081	.081	-.057	.057
264			4	.433	.099	.486	.711	-.711	3.585	-3.585
265			5	.432	.084	.486	1.396	-1.396	7.227	-7.227
266	4	M92A	1	-.785	.257	.627	-2.696	2.696	-8.938	8.938
267			2	-.786	.243	.627	-.823	.823	-4.237	4.237
268			3	-.787	.229	.627	.944	-.944	.463	-.463
269			4	-.788	.215	.627	2.605	-2.605	5.163	-5.163
270			5	-.789	.2	.627	4.16	-4.16	9.864	-9.864
271	4	M93A	1	-.327	.263	-.354	-3.671	3.671	4.744	-4.744
272			2	-.328	.249	-.354	-1.755	1.755	2.088	-2.088
273			3	-.329	.234	-.354	.055	-.055	-.568	.568
274			4	-.33	.22	-.354	1.759	-1.759	-3.224	3.224
275			5	-.331	.206	-.354	3.356	-3.356	-5.88	5.88
276	4	M94A	1	.191	.185	-.436	-2.891	2.891	6.631	-6.631
277			2	.19	.171	-.436	-1.559	1.559	3.363	-3.363

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[k...	y Shea...	z Shea...	y top Bending[ksi]	y bot Bending[...	z top Bending[...	z bot Bending[ksi]
278			3	.189	.157	-.436	-.333	.333	.095	-.095
279			4	.188	.142	-.436	.787	-.787	-3.173	3.173
280			5	.187	.128	-.436	1.8	-1.8	-6.441	6.441
281	4	M95A	1	-.608	.121	-.315	-1.461	1.461	4.555	-4.555
282			2	-.609	.107	-.315	-.606	.606	2.193	-2.193
283			3	-.61	.093	-.315	.142	-.142	-.17	.17
284			4	-.611	.079	-.315	.784	-.784	-2.533	2.533
285			5	-.612	.064	-.315	1.321	-1.321	-4.895	4.895
286	4	M96	1	-.724	.195	-.391	-2.092	2.092	5.243	-5.243
287			2	-.725	.181	-.391	-.685	.685	2.317	-2.317
288			3	-.726	.167	-.391	.616	-.616	-.61	.61
289			4	-.727	.152	-.391	1.811	-1.811	-3.536	3.536
290			5	-.729	.138	-.391	2.899	-2.899	-6.462	6.462
291	4	M97A	1	-.102	.206	.021	-2.951	2.951	-.437	.437
292			2	-.103	.192	.021	-1.46	1.46	-.282	.282
293			3	-.104	.178	.021	-.076	.076	-.127	.127
294			4	-.105	.163	.021	1.202	-1.202	.028	-.028
295			5	-.106	.149	.021	2.374	-2.374	.183	-.183
296	4	M98A	1	-1.563	.293	.514	.109	-.109	-1.989	1.989
297			2	-1.596	.206	.518	.533	-.533	-1.111	1.111
298			3	-1.629	.118	.521	.809	-.809	-.228	.228
299			4	-1.662	.031	.524	.936	-.936	.662	-.662
300			5	-1.694	-.057	.528	.913	-.913	1.556	-1.556
301	4	M99A	1	-1.95	.116	.521	.913	-.913	-2.201	2.201
302			2	-1.895	.007	.526	1.061	-1.061	-.941	.941
303			3	-1.841	-.103	.531	.946	-.946	.33	-.33
304			4	-1.786	-.212	.535	.567	-.567	1.613	-1.613
305			5	-1.731	-.322	.54	-.075	.075	2.907	-2.907
306	4	M100A	1	-1.622	.217	-.549	.075	-.075	-.722	.722
307			2	-1.548	.217	-.553	.573	-.573	-1.988	1.988
308			3	-1.474	.217	-.558	1.071	-1.071	-3.264	3.264
309			4	-1.4	.217	-.562	1.569	-1.569	-4.55	4.55
310			5	-1.326	.217	-.567	2.067	-2.067	-5.847	5.847
311	4	M93B	1	-.033	-1.302	-.034	3.554	-3.554	.65	-.65
312			2	-.911	-1.137	-.006	7.53	-7.53	.421	-.421
313			3	-.903	-1.142	-.006	5.03	-5.03	.281	-.281
314			4	-.894	-1.147	-.006	2.52	-2.52	.14	-.14
315			5	-.886	-1.151	-.006	0	0	0	0
316	4	M94B	1	-.255	-.041	.12	-2.461	2.461	-3.885	3.885
317			2	-.259	-.039	.12	-2.511	2.511	-2.423	2.423
318			3	-.264	-.036	.12	-2.557	2.557	-.96	.96
319			4	-.268	-.033	.12	-2.6	2.6	.503	-.503
320			5	.076	-.04	.151	-.03	.03	2.245	-2.245
321	4	M95B	1	.057	-.136	-.084	.268	-.268	1.455	-1.455
322			2	.418	-.153	-.115	2.738	-2.738	.328	-.328
323			3	.422	-.156	-.115	2.548	-2.548	-1.076	1.076
324			4	.427	-.158	-.115	2.355	-2.355	-2.481	2.481
325			5	.431	-.161	-.115	2.158	-2.158	-3.885	3.885
326	4	M96A	1	.558	-.959	.027	3.273	-3.273	-.068	.068
327			2	1.464	-1.152	0	7.626	-7.626	.008	-.008
328			3	1.472	-1.157	0	5.095	-5.095	.006	-.006
329			4	1.48	-1.161	0	2.553	-2.553	.003	-.003
330			5	1.488	-1.166	0	0	0	0	0
331	4	M97B	1	.073	-.14	.09	.218	-.218	-2.331	2.331
332			2	.385	-.117	.132	2.319	-2.319	-1.258	1.258
333			3	.389	-.12	.132	2.172	-2.172	.353	-.353
334			4	.394	-.123	.132	2.023	-2.023	1.964	-1.964

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[k...	y Shea...	z Shea...	y top Bending[ksi]	y bot Bending[...	z top Bending[...	z bot Bending[ksi]
335			5	.398	-.125	.132	1.87	-1.87	3.574	-3.574
336	4	M98B	1	.586	-.976	-.004	2.693	-2.693	-2.378	2.378
337			2	1.352	-.938	.033	6.23	-6.23	-2.2	2.2
338			3	1.36	-.943	.033	4.167	-4.167	-1.473	1.473
339			4	1.368	-.947	.033	2.095	-2.095	-.746	.746
340			5	1.376	-.963	.035	0	0	0	0
341	4	M99B	1	-.195	-.093	-.109	-1.854	1.854	3.151	-3.151
342			2	-.2	-.09	-.109	-1.967	1.967	1.813	-1.813
343			3	-.204	-.088	-.109	-2.077	2.077	.474	-.474
344			4	-.209	-.085	-.109	-2.183	2.183	-.864	.864
345			5	.087	-.052	-.151	.013	-.013	-2.738	2.738
346	4	M100B	1	.033	-.879	.059	2.64	-2.64	-2.631	2.631
347			2	-.705	-.943	.024	6.245	-6.245	-1.577	1.577
348			3	-.697	-.947	.024	4.172	-4.172	-1.049	1.049
349			4	-.689	-.952	.024	2.089	-2.089	-.522	.522
350			5	-.681	-.952	.024	0	0	0	0
351	4	M93C	1	1.533	-1.138	.062	0	0	0	0
352			2	1.525	-1.133	.062	-2.491	2.491	1.359	-1.359
353			3	1.517	-1.128	.062	-4.971	4.971	2.718	-2.718
354			4	1.509	-1.124	.062	-7.44	7.44	4.077	-4.077
355			5	.6	-1.708	.01	-3.843	3.843	5.192	-5.192
356	4	M94C	1	.477	0	.08	-2.644	2.644	-.078	.078
357			2	.472	.003	.08	-2.642	2.642	.903	-.903
358			3	.468	.006	.08	-2.636	2.636	1.884	-1.884
359			4	.463	.008	.08	-2.628	2.628	2.865	-2.865
360			5	.102	-.045	.044	-.048	.048	3.515	-3.515
361	4	M95C	1	-.882	-1.165	.082	0	0	0	0
362			2	-.89	-1.16	.082	-2.549	2.549	1.787	-1.787
363			3	-.898	-1.155	.082	-5.088	5.088	3.574	-3.574
364			4	-.906	-1.15	.082	-7.616	7.616	5.361	-5.361
365			5	-.026	-.538	.134	-2.811	2.811	7.377	-7.377
366	4	M96B	1	-.227	-.117	.069	-2.209	2.209	.129	-.129
367			2	-.232	-.115	.069	-2.352	2.352	.968	-.968
368			3	-.236	-.112	.069	-2.491	2.491	1.807	-1.807
369			4	-.241	-.109	.069	-2.627	2.627	2.646	-2.646
370			5	.104	-.045	.105	-.049	.049	3.811	-3.811
371	4	M97C	1	1.008	-.84	.058	0	0	0	0
372			2	1	-.836	.058	-1.838	1.838	1.253	-1.253
373			3	.992	-.831	.058	-3.666	3.666	2.507	-2.507
374			4	.984	-.826	.058	-5.483	5.483	3.76	-3.76
375			5	.299	-1.204	.087	-2.681	2.681	5.71	-5.71
376	4	M98C	1	.353	-.018	-.073	-1.885	1.885	2.576	-2.576
377			2	.348	-.016	-.073	-1.905	1.905	1.68	-1.68
378			3	.344	-.013	-.073	-1.923	1.923	.784	-.784
379			4	.339	-.01	-.073	-1.937	1.937	-.112	.112
380			5	.06	-.047	-.043	.031	-.031	-.684	.684
381	4	M99C	1	-.844	-.859	.076	0	0	0	0
382			2	-.852	-.854	.076	-1.878	1.878	1.65	-1.65
383			3	-.86	-.849	.076	-3.746	3.746	3.301	-3.301
384			4	-.868	-.844	.076	-5.603	5.603	4.951	-4.951
385			5	-.212	-.447	.047	-2.034	2.034	5.913	-5.913
386	4	M100C	1	-.191	-.101	-.075	-1.57	1.57	3.228	-3.228
387			2	-.196	-.098	-.075	-1.693	1.693	2.317	-2.317
388			3	-.2	-.096	-.075	-1.813	1.813	1.406	-1.406
389			4	-.205	-.093	-.075	-1.929	1.929	.495	-.495
390			5	.058	-.046	-.105	.033	-.033	-.741	.741
391	4	M97D	1	.073	.519	.013	-.406	.406	1.073	-1.073

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[k...	y Shea...	z Shea...	y top Bending[ksi]	y bot Bending[...	z top Bending[...	z bot Bending[ksi]
392			2	.077	.519	.012	.233	-.233	1.223	-1.223
393			3	.082	.519	.011	.873	-.873	1.362	-1.362
394			4	.086	.519	.01	1.513	-1.513	1.488	-1.488
395			5	.091	.519	.009	2.152	-2.152	1.601	-1.601
396	4	M98D	1	.375	-.045	-.063	.392	-.392	5.807	-5.807
397			2	.383	-.045	-.065	.294	-.294	4.413	-4.413
398			3	.391	-.045	-.067	.196	-.196	2.981	-2.981
399			4	.399	-.045	-.069	.098	-.098	1.51	-1.51
400			5	.407	-.045	-.07	0	0	0	0
401	4	M99D	1	.134	-.504	.018	1.37	-1.37	.879	-.879
402			2	.139	-.504	.017	.749	-.749	1.098	-1.098
403			3	.143	-.504	.016	.128	-.128	1.305	-1.305
404			4	.148	-.504	.015	-.492	.492	1.5	-1.5
405			5	.152	-.504	.014	-1.113	1.113	1.682	-1.682
406	4	M100D	1	.544	-.245	-.052	2.147	-2.147	4.808	-4.808
407			2	.552	-.245	-.054	1.61	-1.61	3.664	-3.664
408			3	.56	-.245	-.055	1.073	-1.073	2.481	-2.481
409			4	.568	-.245	-.057	.537	-.537	1.26	-1.26
410			5	.576	-.245	-.059	0	0	0	0
411	4	M99E	1	-.323	1.305	-.226	-9.415	9.415	.312	-.312
412			2	-.323	1.302	-.226	-7.348	7.348	-.047	.047
413			3	-.323	1.299	-.225	-5.286	5.286	-.404	.404
414			4	-.323	1.296	-.225	-3.228	3.228	-.761	.761
415			5	-.323	1.293	-.224	-1.175	1.175	-1.116	1.116
416	4	M100E	1	-.477	.948	-.751	-1.598	1.598	3.486	-3.486
417			2	-.477	.937	-.749	4.178	-4.178	-1.108	1.108
418			3	-.477	.925	-.747	9.883	-9.883	-5.691	5.691
419			4	-.313	-1.508	.912	6.731	-6.731	-2.299	2.299
420			5	-.313	-1.519	.914	-2.545	2.545	3.297	-3.297
421	4	M101A	1	-.152	-1.784	.199	-2.047	2.047	-1.447	1.447
422			2	-.152	-1.788	.2	-5.88	5.88	-1.018	1.018
423			3	-.152	-1.792	.201	-9.723	9.723	-.588	.588
424			4	-.152	-1.796	.201	-13.573	13.573	-.156	.156
425			5	-.152	-1.8	.202	-17.433	17.433	.277	-.277
426	4	M98E	1	.043	.286	.189	-2.487	2.487	-1.559	1.559
427			2	.043	.278	.189	-1.263	1.263	-.74	.74
428			3	.042	.27	.189	-.074	.074	.08	-.08
429			4	.041	.262	.189	1.079	-1.079	.899	-.899
430			5	.041	.253	.189	2.196	-2.196	1.719	-1.719
431	4	M99F	1	-.017	.267	.274	-2.171	2.171	-2.393	2.393
432			2	-.018	.258	.274	-1.032	1.032	-1.204	1.204
433			3	-.018	.25	.274	.071	-.071	-.016	.016
434			4	-.019	.242	.274	1.138	-1.138	1.172	-1.172
435			5	-.02	.234	.274	2.17	-2.17	2.36	-2.36
436	4	M100F	1	-.015	.244	-.151	-1.977	1.977	1.343	-1.343
437			2	-.015	.236	-.151	-.935	.935	.689	-.689
438			3	-.016	.228	-.151	.071	-.071	.035	-.035
439			4	-.017	.22	-.151	1.042	-1.042	-.619	.619
440			5	-.017	.211	-.151	1.977	-1.977	-1.273	1.273
441	4	M101B	1	-.042	.209	-.079	-1.609	1.609	.759	-.759
442			2	-.043	.201	-.079	-.72	.72	.418	-.418
443			3	-.044	.193	-.079	.133	-.133	.076	-.076
444			4	-.044	.184	-.079	.951	-.951	-.266	.266
445			5	-.045	.176	-.079	1.733	-1.733	-.608	.608
446	4	M102A	1	-.036	1.641	.119	-14.068	14.068	-1.124	1.124
447			2	-.037	1.633	.119	-6.964	6.964	-.608	.608
448			3	-.038	1.625	.119	.104	-.104	-.092	.092

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[k...	y Shea...	z Shea...	y top Bending[ksi]	y bot Bending[...	z top Bending[...	z bot Bending[ksi]
449			4	-.038	1.617	.119	7.136	-7.136	.425	-.425
450			5	-.039	1.608	.119	14.133	-14.133	.941	-.941
451	4	M103A	1	-.025	1.264	-.104	-10.819	10.819	1.013	-1.013
452			2	-.026	1.256	-.104	-5.352	5.352	.561	-.561
453			3	-.026	1.248	-.104	.079	-.079	.108	-.108
454			4	-.027	1.239	-.104	5.475	-5.475	-.345	.345
455			5	-.027	1.231	-.104	10.836	-10.836	-.798	.798
456	4	M100G	1	.004	1.638	.107	-14.127	14.127	-1.076	1.076
457			2	.004	1.629	.107	-7.039	7.039	-.614	.614
458			3	.003	1.621	.107	.014	-.014	-.152	.152
459			4	.002	1.613	.107	7.03	-7.03	.31	-.31
460			5	.002	1.605	.107	14.012	-14.012	.772	-.772
461	4	M101C	1	-.018	1.414	-.14	-12.146	12.146	1.43	-1.43
462			2	-.018	1.406	-.14	-6.028	6.028	.822	-.822
463			3	-.019	1.398	-.14	.055	-.055	.213	-.213
464			4	-.019	1.39	-.14	6.103	-6.103	-.395	.395
465			5	-.02	1.381	-.14	12.114	-12.114	-1.004	1.004
466	4	M96C	1	-.066	1.753	-.114	-8.727	8.727	.44	-.44
467			2	-.066	1.747	-.114	-4.395	4.395	.229	-.229
468			3	-.067	1.741	-.114	-.077	.077	.019	-.019
469			4	-.068	1.734	-.114	4.225	-4.225	-.192	.192
470			5	-.068	1.728	-.114	8.512	-8.512	-.403	.403
471	4	M97E	1	-.102	1.682	-.099	-8.474	8.474	.403	-.403
472			2	-.103	1.676	-.099	-4.316	4.316	.22	-.22
473			3	-.104	1.67	-.099	-.174	.174	.037	-.037
474			4	-.104	1.664	-.099	3.953	-3.953	-.147	.147
475			5	-.105	1.657	-.099	8.065	-8.065	-.33	.33
476	4	M98F	1	-.028	2.092	.137	-10.345	10.345	-.514	.514
477			2	-.028	2.085	.137	-5.174	5.174	-.26	.26
478			3	-.029	2.079	.137	-.018	.018	-.006	.006
479			4	-.03	2.073	.137	5.123	-5.123	.248	-.248
480			5	-.03	2.067	.137	10.249	-10.249	.502	-.502
481	4	M99G	1	.118	2.123	.106	-10.233	10.233	-.353	.353
482			2	.118	2.116	.106	-4.985	4.985	-.157	.157
483			3	.117	2.11	.106	.248	-.248	.04	-.04
484			4	.116	2.104	.106	5.465	-5.465	.236	-.236
485			5	.116	2.098	.106	10.667	-10.667	.432	-.432
486	4	M100H	1	-.131	1.978	-.08	-17.655	17.655	.834	-.834
487			2	-.132	1.968	-.08	-8.817	8.817	.475	-.475
488			3	-.132	1.959	-.08	-.021	.021	.117	-.117
489			4	-.133	1.95	-.08	8.734	-8.734	-.242	.242
490			5	-.134	1.941	-.08	17.447	-17.447	-.601	.601
491	4	M101D	1	-.205	2.632	.088	-23.54	23.54	-.886	.886
492			2	-.206	2.623	.088	-11.771	11.771	-.492	.492
493			3	-.206	2.614	.088	-.043	.043	-.097	.097
494			4	-.207	2.604	.088	11.643	-11.643	.297	-.297
495			5	-.207	2.595	.088	23.287	-23.287	.692	-.692
496	4	M102B	1	-.024	2.217	-.073	-19.758	19.758	.675	-.675
497			2	-.025	2.208	-.073	-9.847	9.847	.346	-.346
498			3	-.025	2.199	-.073	.023	-.023	.018	-.018
499			4	-.026	2.189	-.073	9.851	-9.851	-.311	.311
500			5	-.027	2.18	-.073	19.638	-19.638	-.64	.64
501	4	M103B	1	.043	-2.587	.062	23.327	-23.327	-.612	.612
502			2	.044	-2.597	.062	11.717	-11.717	-.335	.335
503			3	.045	-2.606	.062	.065	-.065	-.059	.059
504			4	.045	-2.615	.062	-11.628	11.628	.218	-.218
505			5	.046	-2.625	.062	-23.363	23.363	.495	-.495

Material Takeoff

	Material	Size	Pieces	Length[ft]	Weight[K]
1	General				
2	LINK		9	13.5	0
3	Total General		9	13.5	0
4					
5	Hot Rolled Steel				
6	A36 Gr.36	36" Pipe	11	77.6	11.1
7	A500 Gr.B Rect	HSS10x6x5	8	48	1.4
8	A500 Gr.B Rect	HSS4x4x8	4	14.7	.3
9	A500 Gr.B Rect	HSS4x4x4	33	203	2.3
10	A992	W10x39	16	98.1	3.8
11	A992	W8x24	20	122.6	3
12	Total HR Steel		92	564	21.9