WILCO (SHELL PACKAGE)

W 11TH & WILLOW CREEK
EUGENE, OREGON 97402

DECEMBER 19, 2022
JOB# 22-0690

STRUCTURAL CALCULATIONS
BY

STABILITY ENGINEERING INC.
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12/19/2022

⚠ This is a beta release of the new ATC Hazards by Location website. Please contact us with feedback.

ℹ The ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Hazards by Location

Search Information

Address: W 11th Ave & Willow Creek Rd, Eugene, OR 97402, USA

Coordinates: 44.0482492, -123.1781955

Elevation: 393 ft

Timestamp: 2022-11-30T21:23:18.969Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: II

Site Class: D-default

Basic Parameters

Name	Value	Description
S_S	0.748	MCE_R ground motion (period=0.2s)
S_1	0.424	MCE_R ground motion (period=1.0s)
S_{MS}	0.899	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	0.599	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.201	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.872	Coefficient of risk (0.2s)
CR_1	0.86	Coefficient of risk (1.0s)
PGA	0.357	MCE_G peak ground acceleration
F_{PGA}	1.243	Site amplification factor at PGA

PGA_M	0.444	Site modified peak ground acceleration
T_L	16	Long-period transition period (s)
SsRT	0.748	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.858	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.424	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.493	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.706	Factored deterministic acceleration value (1.0s)
PGAd	0.591	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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STABILITY ENGINEERING INC.
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p: 541.223.5360 f: 541.223.5278

PROJECT: 22-0690 DATE: 11/30/22

GENERAL BUILDING DATA Name: PS

		Plate Max. Ht(ft)	Roof Ht(ft)
	Roof	0	0
Occupancy Category 2	3rd fl	0	0
	2nd fl	25	25
	1st fl	0	

LATERAL LOAD SUMMARY

-----WIND(OSSC 19, SIMPLIFIED)-----

Basic Wind Speed: 98 mph — Wind Exposure: C
Adjustment Factor: 1.35 — Roof Slope: 0.25 12
Important Factor: 1 — $P_s=\lambda \times I_w \times K_{zt} \times P_{net30}$ — Degrees: 1.193489
K_{zt} #: 1.00 — Load combination factor: .6*W

		Zones									
		Horizontal Pressures				Vertical Pressures				Overhangs	
		A	B	C	D	E	F	G	H	E_{OH}	G_{OH}
Load Case I	P_{net30}	15.3	-7.9	10.1	-4.7	-18.3	-10.4	-12.8	-8.1	-25.7	-20.1
	P_s	20.6	-10.6	13.6	-6.3	-24.8	-14.0	-17.3	-10.9	-34.6	-27.1

-----SEISMIC(OSSC 19)-----

Seismic Design Category: D
The short period spectral acceleration (S_s): 0.748
1-sec spectral acceleration (S_1): 0.424
Design Spectral Analysis Short Period Time(S_{DS}): 0.60
Design Spectral Analysis 1-sec Time(S_{D1}): 0.54

Seismic Soil Classification Sx: D
Lateral Resisting Factor (R): 5
Importance Factor (I): 1
Structural Period (T): 0.2236

Roof Dead Load(psf): 15
Exterior wall Dead Load(psf): 12
Floor Dead Load(psf): 12
Interior wall Dead Load(psf): 10

Total Dead Load(K): 0 (W)

Design Base Shear(K): **0** (**0.12** x W)

Out of plane forces = (.4)*SDS*(Ie)*(Wp)>(.1)(Wp) = .24(Wp)

TABLE 1609.3
BASIC DESIGN WIND SPEED, *V*, FOR RISK CATEGORY I, II, III AND IV BUILDINGS AND OTHER STRUCTURES

COUNTY	RISK CATEGORY I BASIC DESIGN WIND SPEED (MPH)	RISK CATEGORY II BASIC DESIGN WIND SPEED (MPH)	RISK CATEGORY III BASIC DESIGN WIND SPEED (MPH)	RISK CATEGORY IV BASIC DESIGN WIND SPEED (MPH)
Baker	97	103	110	114
Benton	90	96	102	107
Clackamas Clackamas special wind region[a]	92 115	98 120	105 130	109 130
Clatsop Clatsop special wind region[a]	91 125	96 135	102 145	107 145
Columbia Columbia special wind region[a]	91 115	97 120	103 130	107 130
Coos Coos special wind region[a, b]	89 115[b]	95 120[b]	101 130[b]	106 130[b]
Crook Crook special wind region[a]	93 100	100 110	106 115	111 115
Curry Curry special wind region[a]	88 125	94 135	101 145	105 145
Deschutes Deschutes special wind region[a]	93 100	99 110	106 115	110 115
Douglas Douglas special wind region[a, b]	91 115[b]	97 120[b]	103 130[b]	108 130[b]
Gilliam[d]	94[d]	100[d]	107[d]	111[d]
Grant	95	101	108	113
Harney	94	101	108	112
Hood River[c] Hood River N.45.5° special wind region[a, c] Hood River S.45.5° special wind region[a]	92[c] 115[c] 100	98[c] 120[c] 110	105[c] 130[c] 115	109[c] 130[c] 115
Jackson	90	96	103	107
Jefferson Jefferson special wind region[a]	93 100	99 110	106 115	110 115
Josephine	89	95	102	106
Klamath Klamath special wind region[a]	91 100	98 110	104 115	108 115
Lake	93	99	106	111
Lane Lane special wind region[a, b]	91 115[b]	98 120[b]	105 130[b]	110 130[b]
Lincoln Lincoln special wind region[a]	90 125	96 135	102 145	106 145
Linn	92	98	104	108
Malheur	96	102	109	113
Marion	92	98	104	108
Morrow[d]	94[d]	101[d]	108[d]	112[d]
Multnomah[c] Multnomah special wind region[a, c]	92[c] 115[c]	98[c] 120[c]	105[c] 130[c]	110[c] 130[c]
Polk	90	97	103	107

(continued)

Oregon Snow Loading

The design ground snow of any location in the state of Oregon may be determined by entering the latitude and longitude of your site into the boxes below. The tool provides the design ground snow load (pg in ASCE7*) for your site. The design ground snow load values can also be viewed on the online map. Users are strongly recommended to review the Map Usage Notes.

Ground snow loads are very sensitive to geographic location, and particularly sensitive to elevation. It is recommended that the latitude and longitude values be entered with a precision of 0.001 (about 105 yards).

* ASCE Standard (ASCE/SEI 7-10) *Minimum Design Loads for Buildings and Other Structures* published by the American Society of Civil Engineers.

Latitude - Longitude Lookup

Results

Latitude:	44.0482492
Longitude:	-123.1781955
Snow Load:	11.0 psf
Modeled Elevation:	416 ft

Site Elevation versus Modeled Grid Elevation

Site elevation refers to the elevation (above sea level, in feet) of the location for which the snow load is required. The modeled grid elevation is the average elevation of the 4 km (about 2-1/2 miles) grid cell that was used in the snow load modeling. In relatively flat terrain, the two elevations will likely be the same or very similar. In sloped or mountainous terrain, the two elevations may be quite different.

The design ground snow load may be underreported for some locations where the site elevation is higher than the modeled grid elevation. Consult the Map Usage Notes if your site elevation is more than 100 ft. above the modeled grid elevation shown, or if your site is at or near the top of a hill.

Oregon Design Ground Snow Load Look Up Results

It is important that the user of this tool understand the principals and limitations of the modeling used to create it. Ground snow loads can vary dramatically over short distances due to changes in precipitation and elevation. It is critical to use good engineering judgment when interpreting and using the results reported by this tool. The user is recommended to review the online map, to gain a better understanding of the variations and range of magnitudes of the ground snow loads in the vicinity of the site location.

In remote regions at high elevation, reliable snow data was not available during the creation of the map. A site-specific case study is required to determine the design ground snow load in these areas. The ground snow load values on the map are based on extrapolation, and are not recommended for design. See the Map Usage Notes for the regions that require a site-specific case study.

It is recommended that the local building official having jurisdiction at the site be consulted for minimum design ground snow or roof snow loads.

The reported design ground snow loads must be adjusted as required by Chapter 7 of ASCE7* for site exposure, roof slope, roof configuration, etc. Only the properly adjusted loads can be used to design roof structural elements.

Oregon requires a minimum roof snow load of 20 psf (pm in ASCE7*) for all roofs, plus a 5 psf rain-on-snow surcharge for many roof types, resulting in a 25 psf minimum roof design load for most roofs. See the Map Usage Notes or *Snow Load Analysis for Oregon, Part II* for further information.

* ASCE Standard (ASCE/SEI 7-10) Minimum Design Loads for Buildings and Other Structures published by the American Society of Civil Engineers.

11/30/2022	Project:	22-0690

STABILITY ENGINEERING INC.

By: Paul Schroeder

SNOW LOADING LOCATION: Front Wall Parapet

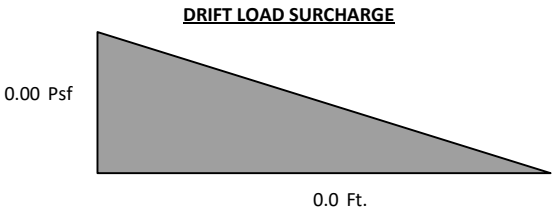
Pg (PSF)	11	Site Ground Snow Load
TERRAIN CATEGORY	C	ASCE 7-16; Section 26.7
Ce	0.9	ASCE 7-16; Table 7.3-1
Ct	1.0	ASCE 7-16; Table 7.3-2
I	1.0	ASCE 7-16; Table 1.5-2
Pf (PSF)	6.93	
RAIN (PSF)	5	ASCE 7-16; Section 7.10
PITCH (X:12)	0.25	
Slippery (Y/N)	N	(Y/N)
Cs	1.00	ASCE 7-10; Figure 7.4-1
Ps (MIN)	25.0	

SNOW DRIFT (LEEWARD) (WHERE APPLICABLE)

ASCE 7-16; Section 7.7

HEIGHT (FT.)	1.33
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	0
Hd	-1.5
Hb	0.4
Hc	0.9
Wd	-6.0
Pd	-23.1
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE

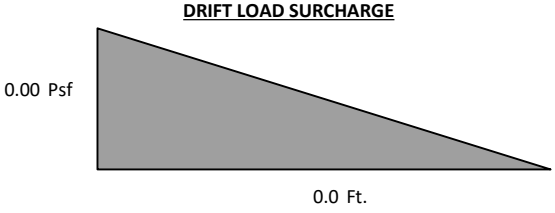


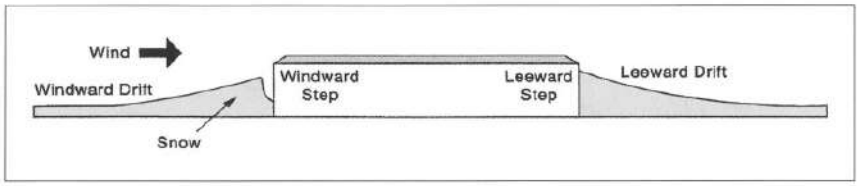
SNOW DRIFT (WINDWARD) (WHERE APPLICABLE)

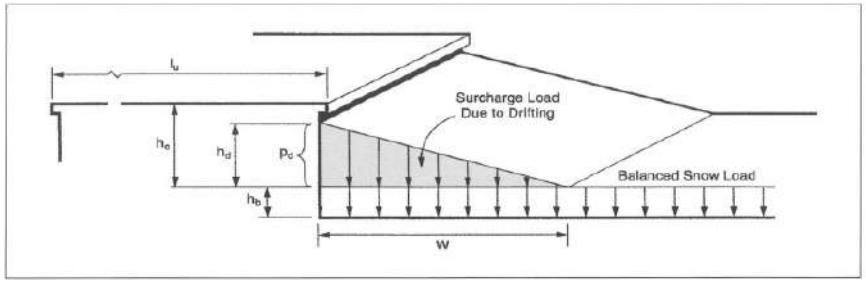
ASCE 7-16; Section 7.7

HEIGHT (FT.)	1.33
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	164.67
Hd	2.7
Hb	0.4
Hc	0.9
Wd	3.5
Pd	13.6
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE







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STABILITY ENGINEERING INC.

By: Paul Schroeder

SNOW LOADING LOCATION: Front Wall Façade

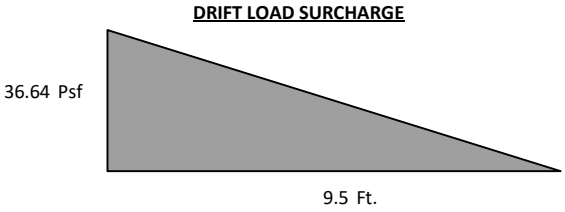
Pg (PSF)	11	Site Ground Snow Load
TERRAIN CATEGORY	C	ASCE 7-16; Section 26.7
Ce	0.9	ASCE 7-16; Table 7.3-1
Ct	1.0	ASCE 7-16; Table 7.3-2
I	1.0	ASCE 7-16; Table 1.5-2
Pf (PSF)	6.93	
RAIN (PSF)	5	ASCE 7-16; Section 7.10
PITCH (X:12)	0.25	
Slippery (Y/N)	N	(Y/N)
Cs	1.00	ASCE 7-10; Figure 7.4-1
Ps (MIN)	25.0	

SNOW DRIFT (LEEWARD) (WHERE APPLICABLE)

ASCE 7-16; Section 7.7

HEIGHT (FT.)	6.33
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	164.67
Hd	3.5
Hb	0.4
Hc	5.9
Wd	14.2
Pd	54.7
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE

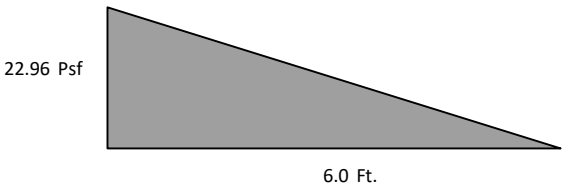


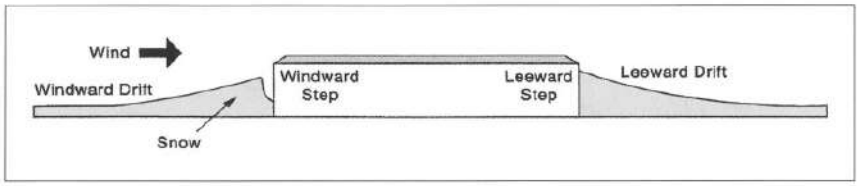
SNOW DRIFT (WINDWARD) (WHERE APPLICABLE)

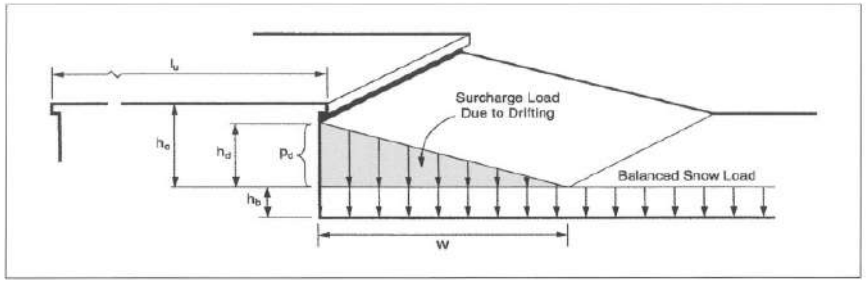
ASCE 7-16; Section 7.7

HEIGHT (FT.)	14.67
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	164.67
Hd	2.7
Hb	0.4
Hc	14.2
Wd	10.6
Pd	41.0
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE







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STABILITY ENGINEERING INC.

By: Paul Schroeder

SNOW LOADING LOCATION: Side Wall Parapet Grid A

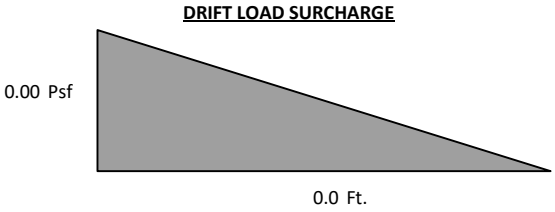
Pg (PSF)	11	Site Ground Snow Load
TERRAIN CATEGORY	C	ASCE 7-16; Section 26.7
Ce	0.9	ASCE 7-16; Table 7.3-1
Ct	1.0	ASCE 7-16; Table 7.3-2
I	1.0	ASCE 7-16; Table 1.5-2
Pf (PSF)	6.93	
RAIN (PSF)	5	ASCE 7-16; Section 7.10
PITCH (X:12)	0.25	
Slippery (Y/N)	N	(Y/N)
Cs	1.00	ASCE 7-10; Figure 7.4-1
Ps (MIN)	25.0	

SNOW DRIFT (LEEWARD) (WHERE APPLICABLE)

ASCE 7-16; Section 7.7

HEIGHT (FT.)	4.5
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	0
Hd	-1.5
Hb	0.4
Hc	4.1
Wd	-6.0
Pd	-23.1
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE

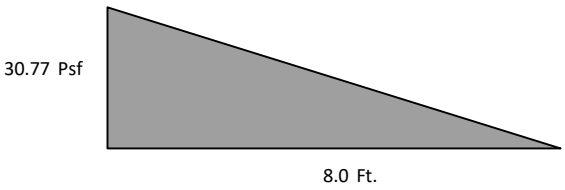


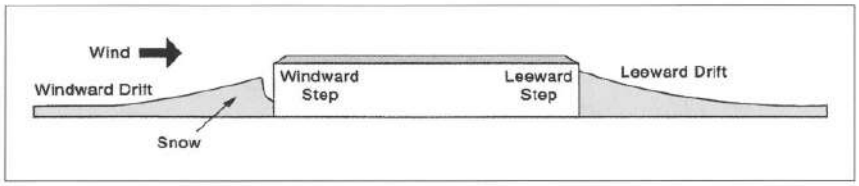
SNOW DRIFT (WINDWARD) (WHERE APPLICABLE)

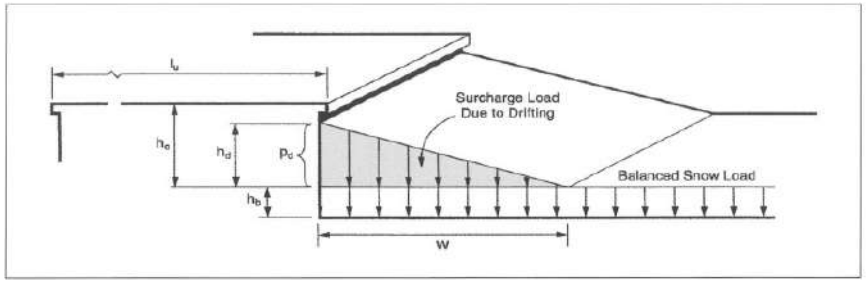
ASCE 7-16; Section 7.7

HEIGHT (FT.)	4.5
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	240
Hd	3.2
Hb	0.4
Hc	4.1
Wd	12.7
Pd	48.8
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE







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SNOW LOADING LOCATION: Side Wall Parapet Grid B

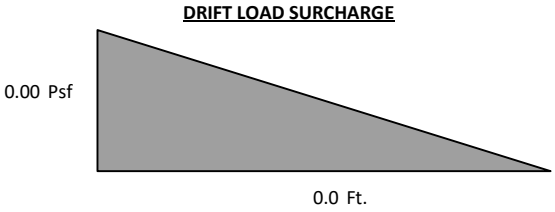
Pg (PSF)	11	Site Ground Snow Load
TERRAIN CATEGORY	C	ASCE 7-16; Section 26.7
Ce	0.9	ASCE 7-16; Table 7.3-1
Ct	1.0	ASCE 7-16; Table 7.3-2
I	1.0	ASCE 7-16; Table 1.5-2
Pf (PSF)	6.93	
RAIN (PSF)	5	ASCE 7-16; Section 7.10
PITCH (X:12)	0.25	
Slippery (Y/N)	N	(Y/N)
Cs	1.00	ASCE 7-10; Figure 7.4-1
Ps (MIN)	25.0	

SNOW DRIFT (LEEWARD) (WHERE APPLICABLE)

ASCE 7-16; Section 7.7

HEIGHT (FT.)	3.9
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	0
Hd	-1.5
Hb	0.4
Hc	3.5
Wd	-6.0
Pd	-23.1
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE

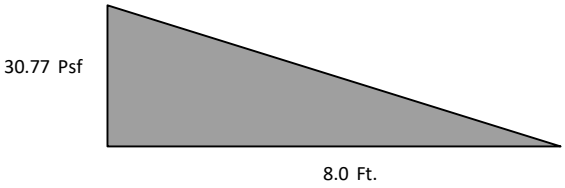


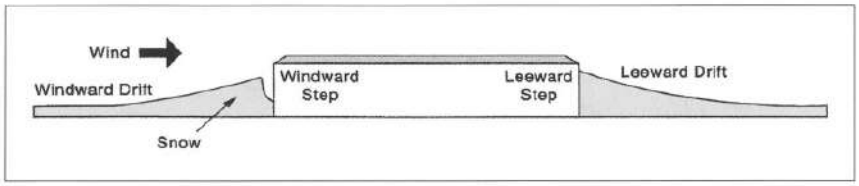
SNOW DRIFT (WINDWARD) (WHERE APPLICABLE)

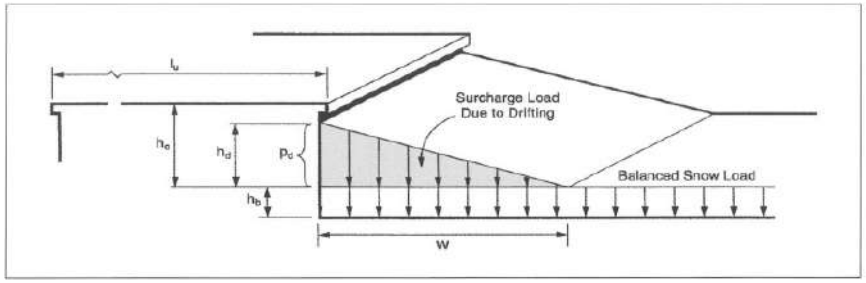
ASCE 7-16; Section 7.7

HEIGHT (FT.)	3.9
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	240
Hd	3.2
Hb	0.4
Hc	3.5
Wd	12.7
Pd	48.8
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE







12/19/2022 Project: 22-0690

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SNOW LOADING LOCATION: Side Wall Parapet Grid C

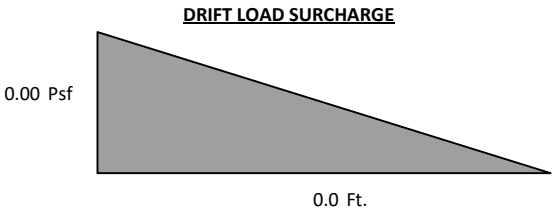
Pg (PSF)	11	Site Ground Snow Load
TERRAIN CATEGORY	C	ASCE 7-16; Section 26.7
Ce	0.9	ASCE 7-16; Table 7.3-1
Ct	1.0	ASCE 7-16; Table 7.3-2
I	1.0	ASCE 7-16; Table 1.5-2
Pf (PSF)	6.93	
RAIN (PSF)	5	ASCE 7-16; Section 7.10
PITCH (X:12)	0.25	
Slippery (Y/N)	N	(Y/N)
Cs	1.00	ASCE 7-10; Figure 7.4-1
Ps (MIN)	25.0	

SNOW DRIFT (LEEWARD) (WHERE APPLICABLE)

ASCE 7-16; Section 7.7

HEIGHT (FT.)	3.25
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	0
Hd	-1.5
Hb	0.4
Hc	2.8
Wd	-6.0
Pd	-23.1
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE

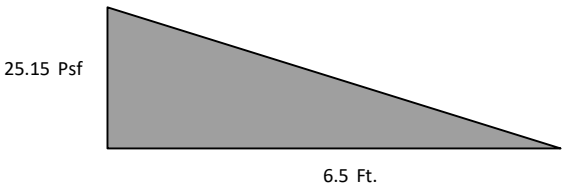


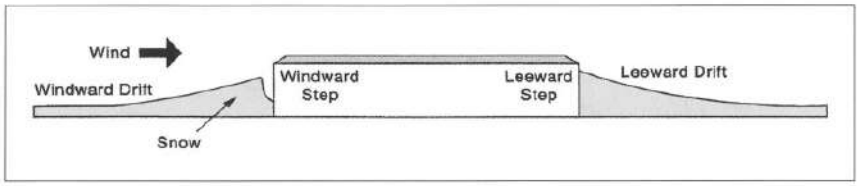
SNOW DRIFT (WINDWARD) (WHERE APPLICABLE)

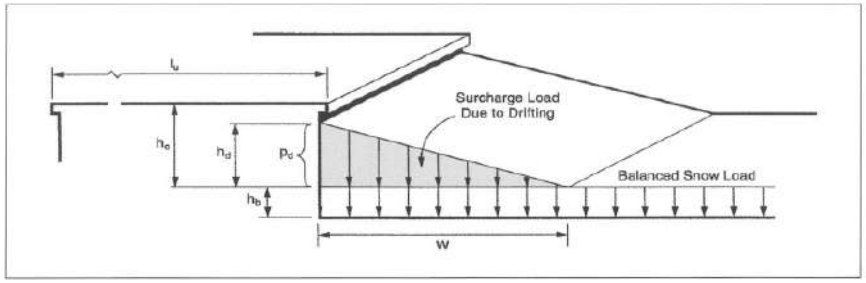
ASCE 7-16; Section 7.7

HEIGHT (FT.)	3.25
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	240
Hd	3.2
Hb	0.4
Hc	2.8
Wd	11.2
Pd	43.2
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE







12/19/2022 Project: 22-0690

STABILITY ENGINEERING INC.

By: Paul Schroeder

SNOW LOADING LOCATION: Side Wall Parapet Grid D

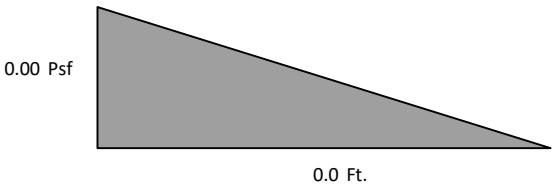
Pg (PSF)	11	Site Ground Snow Load
TERRAIN CATEGORY	C	ASCE 7-16; Section 26.7
Ce	0.9	ASCE 7-16; Table 7.3-1
Ct	1.0	ASCE 7-16; Table 7.3-2
I	1.0	ASCE 7-16; Table 1.5-2
Pf (PSF)	6.93	
RAIN (PSF)	5	ASCE 7-16; Section 7.10
PITCH (X:12)	0.25	
Slippery (Y/N)	N	(Y/N)
Cs	1.00	ASCE 7-10; Figure 7.4-1
Ps (MIN)	25.0	

SNOW DRIFT (LEEWARD) (WHERE APPLICABLE)

ASCE 7-16; Section 7.7

HEIGHT (FT.)	2.67
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	0
Hd	-1.5
Hb	0.4
Hc	2.2
Wd	-6.0
Pd	-23.1
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE

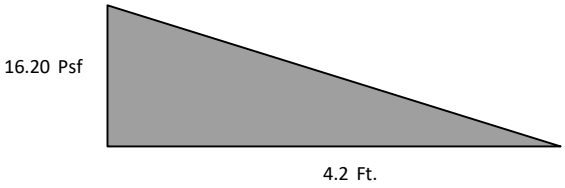


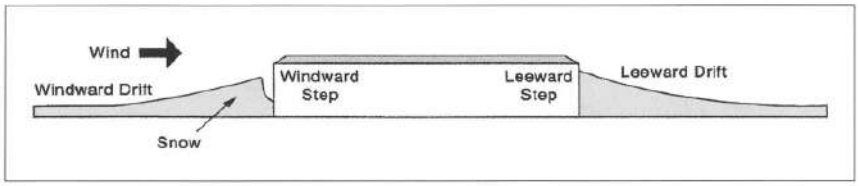
SNOW DRIFT (WINDWARD) (WHERE APPLICABLE)

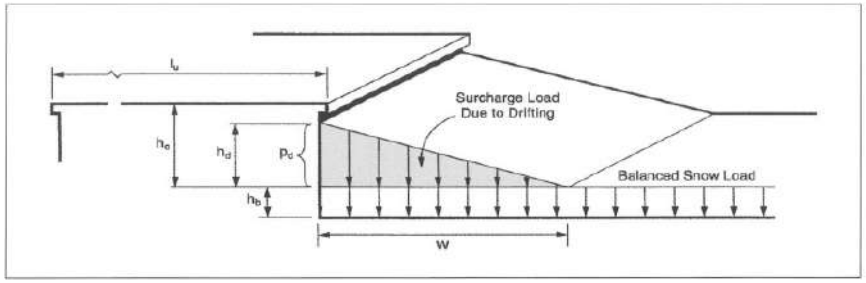
ASCE 7-16; Section 7.7

HEIGHT (FT.)	2.67
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	240
Hd	3.2
Hb	0.4
Hc	2.2
Wd	8.9
Pd	34.3
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE







12/19/2022 Project: 22-0690

STABILITY ENGINEERING INC.

By: Paul Schroeder

SNOW LOADING LOCATION: Side Wall Parapet Grid E

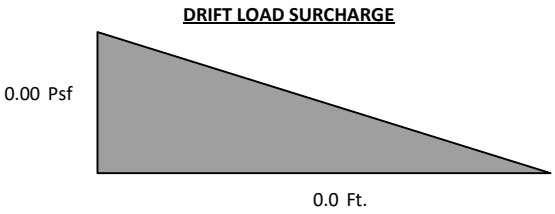
Pg (PSF)	11	Site Ground Snow Load
TERRAIN CATEGORY	C	ASCE 7-16; Section 26.7
Ce	0.9	ASCE 7-16; Table 7.3-1
Ct	1.0	ASCE 7-16; Table 7.3-2
I	1.0	ASCE 7-16; Table 1.5-2
Pf (PSF)	6.93	
RAIN (PSF)	5	ASCE 7-16; Section 7.10
PITCH (X:12)	0.25	
Slippery (Y/N)	N	(Y/N)
Cs	1.00	ASCE 7-10; Figure 7.4-1
Ps (MIN)	25.0	

SNOW DRIFT (LEEWARD) (WHERE APPLICABLE)

ASCE 7-16; Section 7.7

HEIGHT (FT.)	2
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	0
Hd	-1.5
Hb	0.4
Hc	1.6
Wd	-6.0
Pd	-23.1
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE

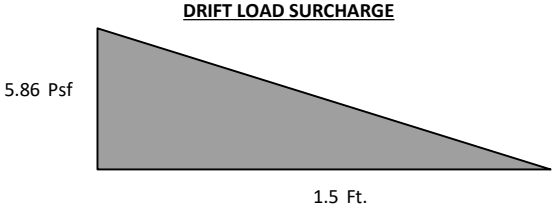


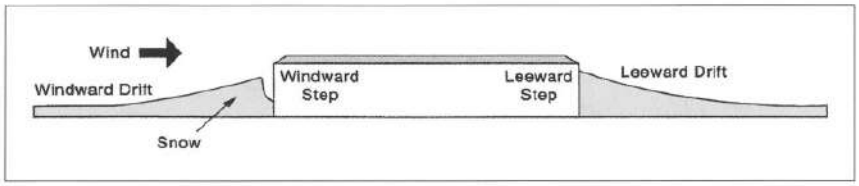
SNOW DRIFT (WINDWARD) (WHERE APPLICABLE)

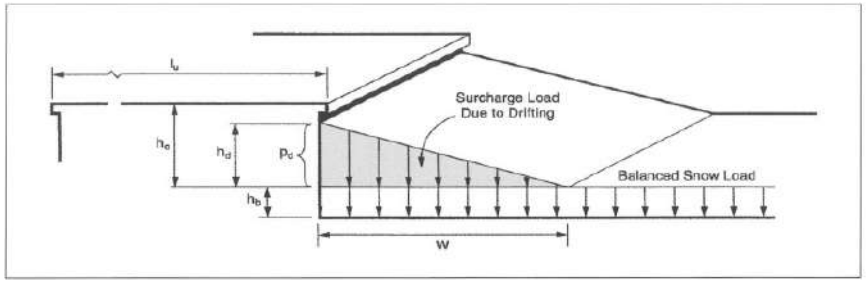
ASCE 7-16; Section 7.7

HEIGHT (FT.)	2
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	240
Hd	3.2
Hb	0.4
Hc	1.6
Wd	6.2
Pd	23.9
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE







12/19/2022 Project: 22-0690

STABILITY ENGINEERING INC.

By: Paul Schroeder

SNOW LOADING LOCATION: Side Wall Parapet Grid F

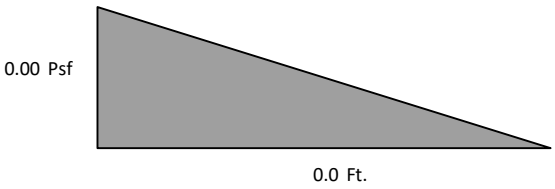
Pg (PSF)	11	Site Ground Snow Load
TERRAIN CATEGORY	C	ASCE 7-16; Section 26.7
Ce	0.9	ASCE 7-16; Table 7.3-1
Ct	1.0	ASCE 7-16; Table 7.3-2
I	1.0	ASCE 7-16; Table 1.5-2
Pf (PSF)	6.93	
RAIN (PSF)	5	ASCE 7-16; Section 7.10
PITCH (X:12)	0.25	
Slippery (Y/N)	N	(Y/N)
Cs	1.00	ASCE 7-10; Figure 7.4-1
Ps (MIN)	25.0	

SNOW DRIFT (LEEWARD) (WHERE APPLICABLE)

ASCE 7-16; Section 7.7

HEIGHT (FT.)	1.33
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	0
Hd	-1.5
Hb	0.4
Hc	0.9
Wd	-6.0
Pd	-23.1
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE

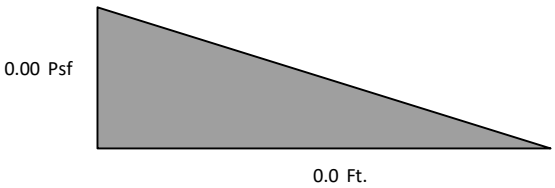


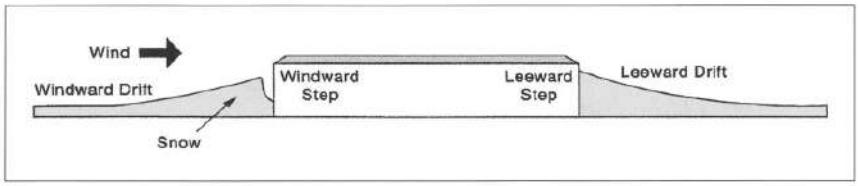
SNOW DRIFT (WINDWARD) (WHERE APPLICABLE)

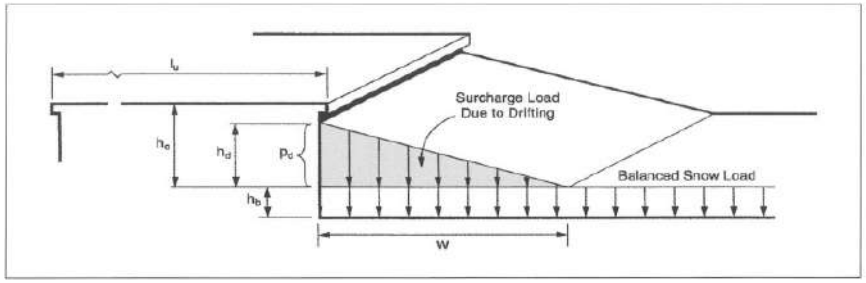
ASCE 7-16; Section 7.7

HEIGHT (FT.)	1.33
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	240
Hd	3.2
Hb	0.4
Hc	0.9
Wd	3.5
Pd	13.6
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE







11/30/2022 Project: 22-0690

STABILITY ENGINEERING INC.

By: Paul Schroeder

SNOW LOADING LOCATION: Back Wall Parapet

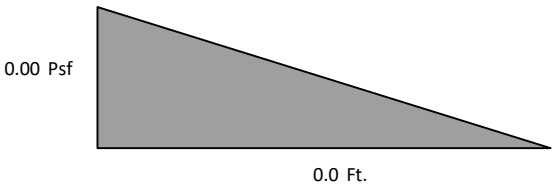
Pg (PSF)	11	Site Ground Snow Load
TERRAIN CATEGORY	C	ASCE 7-16; Section 26.7
Ce	0.9	ASCE 7-16; Table 7.3-1
Ct	1.0	ASCE 7-16; Table 7.3-2
I	1.0	ASCE 7-16; Table 1.5-2
Pf (PSF)	6.93	
RAIN (PSF)	5	ASCE 7-16; Section 7.10
PITCH (X:12)	0.25	
Slippery (Y/N)	N	(Y/N)
Cs	1.00	ASCE 7-10; Figure 7.4-1
Ps (MIN)	25.0	

SNOW DRIFT (LEEWARD) (WHERE APPLICABLE)

ASCE 7-16; Section 7.7

HEIGHT (FT.)	4.5
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	0
Hd	-1.5
Hb	0.4
Hc	4.1
Wd	-6.0
Pd	-23.1
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE

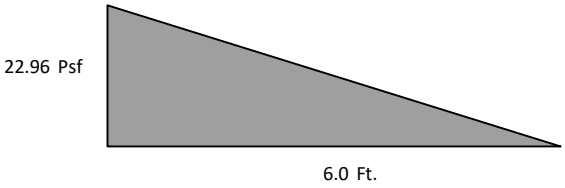


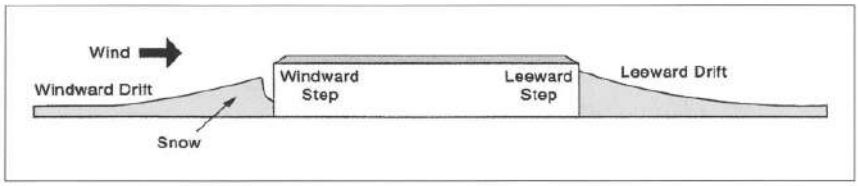
SNOW DRIFT (WINDWARD) (WHERE APPLICABLE)

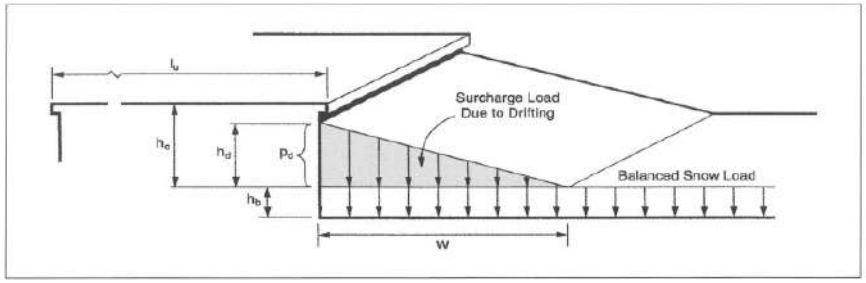
ASCE 7-16; Section 7.7

HEIGHT (FT.)	4.5
DENSITY (PCF)	15.43
Lu (FT.)(25' MIN)	164.67
Hd	2.7
Hb	0.4
Hc	4.1
Wd	10.6
Pd	41.0
Ps (BALANCED)	6.9

DRIFT LOAD SURCHARGE







Project: 22-0690

Location: Drift Resultant Force (B to D)
Multi-Loaded Multi-Span Beam
[2015 International Building Code(2015 NDS)]
1.5 IN x 3.5 IN x 11.4 FT (5.7 + 5.7)
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 701.3%
Controlling Factor: Moment

Paul Schroeder
StruCalc 9.0
777 NE 2nd Street
Corvallis, OR 97330

StruCalc Version 10.0.1.6 11/30/2022 2:21:22 PM

DEFLECTIONS	Center		Right	
Live Load	0.03	IN L/2432	-0.01	IN L/6020
Dead Load	0.00	in	0.00	in
Total Load	0.03	IN L/2324	-0.01	IN L/6659

Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180

REACTIONS	A	B	C
Live Load	46 lb	40 lb	0 lb
Dead Load	2 lb	8 lb	2 lb
Total Load	48 lb	48 lb	2 lb
Uplift (1.5 F.S)	**0 lb**	**0 lb**	**-3 lb**
Bearing Length	0.05 in	0.05 in	0.00 in

BEAM DATA	Center	Right
Span Length	5.7 ft	5.7 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	5.7 ft	5.7 ft
Live Load Duration Factor	1.15	
Notch Depth	0.00	

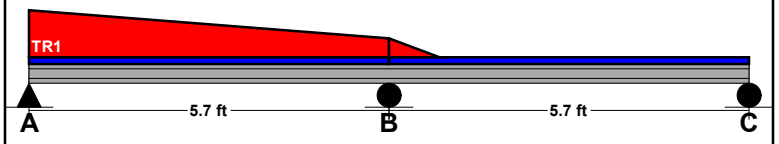
MATERIAL PROPERTIES
#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi	Fb' = 1553 psi
	Cd=1.15 CF=1.50	
Shear Stress:	Fv = 180 psi	Fv' = 207 psi
	Cd=1.15	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 625 psi	Fc - ⊥' = 625 psi

Controlling Moment: 49 ft-lb
2.22 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: 41 lb
At a distance d from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	0.38 in3	3.06 in3
Area (Shear):	0.3 in2	5.25 in2
Moment of Inertia (deflection):	0.53 in4	5.36 in4
Moment:	49 ft-lb	396 ft-lb
Shear:	41 lb	725 lb

LOADING DIAGRAM



UNIFORM LOADS	Center	Right
Uniform Live Load	0 plf	0 plf
Uniform Dead Load	0 plf	0 plf
Beam Self Weight	1 plf	1 plf
Total Uniform Load	1 plf	1 plf

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One
Left Live Load	25 plf
Left Dead Load	0 plf
Right Live Load	3.1 plf
Right Dead Load	0 plf
Load Start	0 ft
Load End	5.7 ft
Load Length	5.7 ft

RIGHT SPAN

Load Number	One
Left Live Load	3.1 plf
Left Dead Load	0 plf
Right Live Load	0 plf
Right Dead Load	0 plf
Load Start	0 ft
Load End	0.8 ft
Load Length	0.8 ft

Project: 22-0690

Location: Drift Resultant Force (D to F)
Multi-Loaded Multi-Span Beam
[2015 International Building Code(2015 NDS)]
1.5 IN x 3.5 IN x 11.4 FT (5.7 + 5.7)
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 488.8%
Controlling Factor: Moment

Paul Schroeder
StruCalc 9.0
777 NE 2nd Street
Corvallis, OR 97330

StruCalc Version 10.0.1.6 11/30/2022 2:22:58 PM

DEFLECTIONS	Center		Right	
Live Load	0.04	IN L/1736	-0.02	IN L/4194
Dead Load	0.00	in	0.00	in
Total Load	0.04	IN L/1680	-0.02	IN L/4497

Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180

REACTIONS	A	B	C
Live Load	60 lb	70 lb	1 lb
Dead Load	2 lb	8 lb	2 lb
Total Load	62 lb	78 lb	3 lb
Uplift (1.5 F.S)	**0 lb**	**0 lb**	**-5 lb**
Bearing Length	0.07 in	0.08 in	0.00 in

BEAM DATA	Center	Right
Span Length	5.7 ft	5.7 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	5.7 ft	5.7 ft
Live Load Duration Factor	1.15	
Notch Depth	0.00	

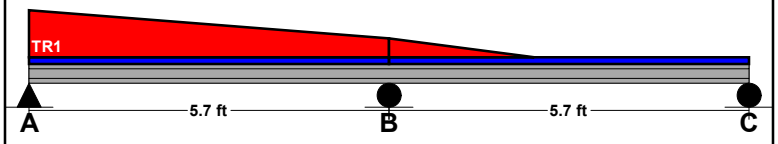
MATERIAL PROPERTIES
#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi	Fb' = 1553 psi
	Cd=1.15 CF=1.50	
Shear Stress:	Fv = 180 psi	Fv' = 207 psi
	Cd=1.15	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 625 psi	Fc - ⊥' = 625 psi

Controlling Moment: 67 ft-lb
2.28 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: -55 lb
At a distance d from right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:	Req'd	Provided
Section Modulus:	0.52 in3	3.06 in3
Area (Shear):	0.4 in2	5.25 in2
Moment of Inertia (deflection):	0.74 in4	5.36 in4
Moment:	67 ft-lb	396 ft-lb
Shear:	-55 lb	725 lb

LOADING DIAGRAM



UNIFORM LOADS	Center	Right
Uniform Live Load	0 plf	0 plf
Uniform Dead Load	0 plf	0 plf
Beam Self Weight	1 plf	1 plf
Total Uniform Load	1 plf	1 plf

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number	One
Left Live Load	30.8 plf
Left Dead Load	0 plf
Right Live Load	8.9 plf
Right Dead Load	0 plf
Load Start	0 ft
Load End	5.7 ft
Load Length	5.7 ft

RIGHT SPAN

Load Number	One
Left Live Load	8.9 plf
Left Dead Load	0 plf
Right Live Load	0 plf
Right Dead Load	0 plf
Load Start	0 ft
Load End	2.3 ft
Load Length	2.3 ft

11/30/2022	Project:	22-0690
	Load Direction:	Front to Back

STABILITY ENGINEERING INC.

By: Paul Schroeder

Diaphragm Wind loads (ASD):

Roof Height:	0.0	FT	(diaphragm to top)
Wall Height:	22.0	FT	(grade to diaphragm)
Parapet Height:	3.0	FT	(diaphragm to top)
Tributary Width:	240.0	FT	(wall/chord length)
Centroid Dist. (L-R)	120.0	FT	

Roof Wind Load:	0.0	PLF
Wall Wind Load:	96.3	PLF
Par. Wind Load:	26.3	PLF

Total Wind Load:	122.6	PLF
Total Wind Shear:	29.4	K

Diaphragm Design Criteria (ASD):

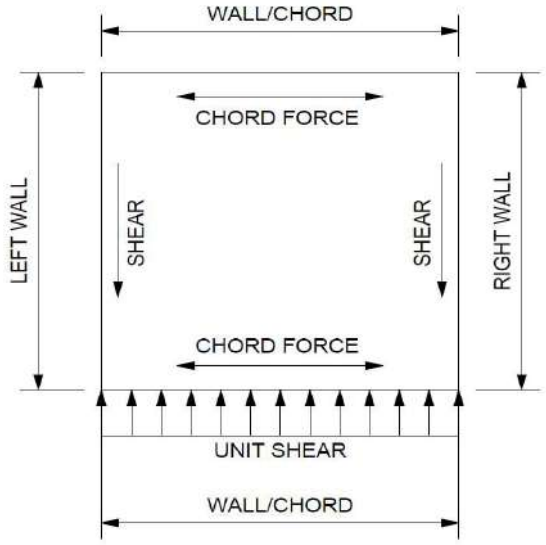
Wind (Wall)	8.16	PSF
Wind (Roof)	3.8	PSF
End Wall	17.6	FT
Roof (DL)	20	PSF
Floor (DL)	62.5	PSF
Ext. Wall (DL)	88	PSF
Int. Wall (DL)	10	PSF
Seismic Acc.	0.084	#F/#M

Diaphragm Seismic loads (ASD):

Roof Area:	37121.0	SQ.FT.	(total)
Floor Area:	0.0	SQ.FT.	(total)
Ext. Wall Length:	480.0	FT	(parr. to chord)
Int. Wall Length:	0.0	FT	(total)

Roof Seismic Load:	62.4	K
Floor Seismic Load:	0.0	K
Wall Seismic Load:	49.7	K

Total Seismic Shear:	112.0	K



Diaphragm Analysis (ASD):

Left Side of Diaphragm:

Diaphragm Depth:	154.7	FT	(total)
Controlling Shear:	56.0	K	
Unit Shear Load:	362.2	PLF	(parallel)

Right Side of Diaphragm:

Diaphragm Depth:	154.7	FT	(total)
Controlling Shear:	56.0	K	
Unit Shear Load:	362.2	PLF	(parallel)

Diaphragm Chord:

Depth at Center:	154.7	FT	(total)
Unit Shear Load:	466.8	PLF	(perpendicular)
Maximum Moment:	3361	K-FT	
Chord Force:	21.7	K	
Unit Shear Load:	90.5	PLF	(parallel)

11/30/2022	Project:	22-0690
	Load Direction:	Left to Right

STABILITY ENGINEERING INC.

By: Paul Schroeder

Diaphragm Wind loads (ASD):

Roof Height:	0.0	FT	(diaphragm to top)
Wall Height:	22.0	FT	(grade to diaphragm)
Parapet Height:	3.0	FT	(diaphragm to top)
Tributary Width:	154.7	FT	(wall/chord length)
Centroid Dist. (L-R)	77.3	FT	

Roof Wind Load:	0.0	PLF
Wall Wind Load:	100.0	PLF
Par. Wind Load:	27.3	PLF

Total Wind Load:	127.2	PLF
Total Wind Shear:	19.7	K

Diaphragm Design Criteria (ASD):

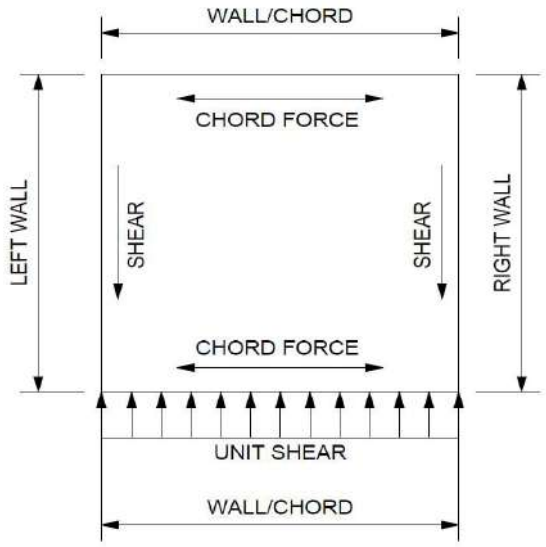
Wind (Wall)	8.16	PSF
Wind (Roof)	3.8	PSF
End Wall	17.6	FT
Roof (DL)	20	PSF
Floor (DL)	62.5	PSF
Ext. Wall (DL)	88	PSF
Int. Wall (DL)	10	PSF
Seismic Acc.	0.084	#F/#M

Diaphragm Seismic loads (ASD):

Roof Area:	37121.0	SQ.FT.	(total)
Floor Area:	0.0	SQ.FT.	(total)
Ext. Wall Length:	309.3	FT	(parr. to chord)
Int. Wall Length:	0.0	FT	(total)

Roof Seismic Load:	62.4	K
Floor Seismic Load:	0.0	K
Wall Seismic Load:	32.0	K

Total Seismic Shear:	94.4	K



Diaphragm Analysis (ASD):

Left Side of Diaphragm:

Diaphragm Depth:	240.0	FT	(total)
Controlling Shear:	47.2	K	
Unit Shear Load:	196.6	PLF	(parallel)

Right Side of Diaphragm:

Diaphragm Depth:	240.0	FT	(total)
Controlling Shear:	47.2	K	
Unit Shear Load:	196.6	PLF	(parallel)

Diaphragm Chord:

Depth at Center:	240.0	FT	(total)
Unit Shear Load:	610.2	PLF	(perpendicular)
Maximum Moment:	1825	K-FT	
Chord Force:	7.6	K	
Unit Shear Load:	49.2	PLF	(parallel)

Roof Diaphragm Attachment Reqts

Max Shear = 362 plf

Try Hilti X-HSN-24 Fasteners w/ 36/7/4 Pattern
(20ga Deck + 24" O.C. Seam.)

Capacity = 749 plf ≥ 362 plf ∴ O.K.

Diaphragm Deflection

Allowable wall Deflection: $\Delta_{wall} = \frac{H_w^2 (f_m)(.33)}{(.01)(E_w)(t_w)}$

$H_w = 23.67'$ (max.)
$f_m = 1500$ psi
$E_w = 1{,}350{,}000$
$t_w = 7.625"$

$\Delta_{wall} = 2.7"$

Δ_A (Story Drift) $= .007\, H_w = 1.66"$ ← Controls
[ASCE; Table 12.12-1]

Flextural Deflection (worst case)

$\Delta_f = \frac{.013 \times w \times L_s^4 \times 1728}{E \times I}$

$\Delta_f = .114"$

$w = 272.3$ plf
$L_s = 240'$
$E = 29.5 \times 10^6$
$I_{chords} = (2)(15")\times\left(\frac{(240' \times 12)}{2}\right)^2$

$= 6{,}220{,}800\ in^4$

Web Deflection (worst case)

$\Delta_w = \frac{Q_{Avg} \cdot L \cdot F}{10^6}$

$Q_{Avg} = \frac{362 \text{ plf} + 0}{2} = 181$ plf

$\Delta_w = .319"$

$L = \frac{240'}{2} = 120'$

$F = 9.2 + 11(R) = 14.7$
$R = .5$

$.319" + .114" = .433" \leq 1.5"$ ∴ O.K.

Diaphragm chord

Try 3½x3½x¼" Angles w/ ½"x3" Splice plates.

$F_y = 36\,KSI$

$T_{capacity} = \frac{36\,KSI\,(1.5\,in^2)}{1.67} = 33K \geq 21.7\,kip$ ∴ O.K.

Out of Plane Wall Anchorage

$F_{p\Omega} = (.4)(SDS)(Ie)(wp)(\Omega)(.7)$ — 2.0 For Anchors; .7 ← ASD

$F_{p\Omega} = (.4)(.599)(1.0)(wp)(2.0)(.7)$

$= .335\,wp$

$F_{p\Omega} = (.335)(88psf \times 14.75') = 435\,plf$ (ASD w/ Ω)

Try anchors @ 3'-0" O.C.

Load = 435 plf (3' O.C.) = 1305 lbs/anchor (Tension)

Steel Plate w/ (2) 5/8" anchors

Masonry Breakout (Tension): $B_{AB} = 1.25\,A_{pt}\sqrt{f'm}$ ← 1500 psi

$A_{pt} = 59\,in^2$

((2) Anchors) $B_{AB} = 2856\,lbs$

Steel yeilding (Tension): $B_{AS} = (.6)(.31\,in^2)(36KSI) = 6{,}696\,lbs$

Masonry Crushing (Shear): $B_{VC} = 350\sqrt[4]{f'm}\,A_b$

$A_b = .31\,in^2$ $B_{VC} = 1625\,lbs$

Bolt Pryout: $B_{pr} = 2.5A_{pt}\sqrt{f'm}$ ⇒ Does not control

Steel yeilding (shear): $B_{VS} = .36(.31\,in^2)(36KSI) = 4{,}000\,lbs$

Max Shear ⇒ SL = (25psf + 38psf)(3')(3') = 567 lbs

DL = 20psf (3')(3') = 180 lbs

Combined Stress: $\frac{1305\,lb}{2856\,lbs} + \frac{362plf*3'}{1626(2)} = .79 \leq 1.0$ ∴ O.K.

Anchorage of Joists w/ 5/8" Anchors

$F_{p\perp} = 435$ plf $(6') = 2610$ lbs / JOIST (Shear)

Masonry Breakout (shear) $B_{Vb} = 1.25 A_{pv} \sqrt{f'm}$

$= 1.25(22.5 in^2)(\sqrt{1500})$

$= 3.3K \geq 2610$ lbs $\therefore$ O.K.

Masonry Crushing: $B_{Vc} = 350 \sqrt[4]{f'm\ A_b}$ * 3 anchors

$= 350 \sqrt[4]{(1500)(.31)}$ * 3 anchors

$= 4875$ lbs ≥ 2610 lbs $\therefore$ O.K.

* USE (3) anchors @ EA. JOIST

Masonry Slender Wall

Project File: 21-0834.ec6

DESCRIPTION: FRONT CMU WALL W/ 16" PARAPET (TYP.)

Code References

Calculations per ACI 530-13, IBC 2015, CBC 2016, ASCE 7-10
Load Combinations Used : ASCE 7-16

General Information

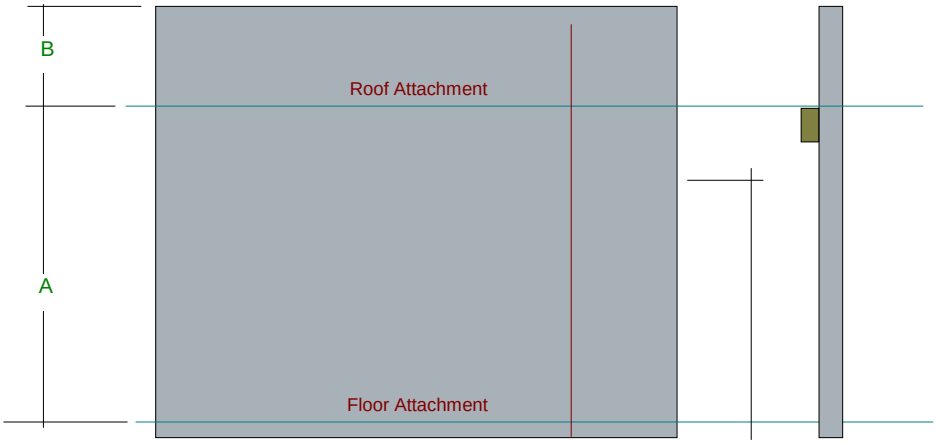
Calculations per ACI 530-13, IBC 2015, CBC 2016, ASCE 7-10

Construction Type :	Grouted Hollow Concrete Masonry							
F'm	=	1.50 ksi	Nom. Wall Thickness	8 in	Temp Diff across thickness	=		deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625 in	Min Allow Out-of-plane Defl Ra	=	0.0	
Fr - Rupture	=	163.0 psi	Rebar "d" distance	3.8125 in				
Em = f'm *	=	900.0	Lower Level Rebar . . .		Minimum Vertical Steel %	=	0.0020	
Max % of ρ bal.	=	0.006990	Bar Size #	5				
Grout Density	=	140 pcf	Bar Spacing	24 in				
Block Weight	Normal Weight							
Wall Weight	=	86.0 psf						
Wall is Solid Grouted								

One-Story Wall Dimensions

A Clear Height	=	23.670 ft
B Parapet height	=	1.330 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	4.0 in	0.310			0.3880	k/ft
Concentric Load							k/ft

Lateral Loads

Wind Loads :

Full area WIND load 13.6 psf

Seismic Loads :

Wall Weight Seismic Load Input Method : ASCE seismic factors entered

SDS Value per ASCE 12.11.1 S_{DS} * I = .599

Fp = Wall Wt. * 0.2396 = 20.606 psf

Masonry Slender Wall

Project File: 21-0834.ec6

DESCRIPTION: FRONT CMU WALL W/ 16" PARAPET (TYP.)

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +0.8316D+E	Maximum Bending Stress Rat	0.5971		
		Max Mu	1.50 k-ft	Phi * Mn	2.512 k-ft
PASS	Service Deflection Check E Only	Actual Defl. Ratio L/	1,179	Allowable Defl. Ratio	240.0
		Max. Deflection	0.2408 in		
PASS	Axial Load Check +1.268D+0.20S+E	Max Pu / Ag	20.827 psi	Max. Allow. Defl.	1.184 in
		Location	12.230 ft	0.05 * f'm	75.0 psi
	Reinforcing Limit Check	Actual As/bd	0.003388	Max Allow As/bd	0.006990

Maximum Reactions *for Load Combination...*

Top Horizontal	E Only	0.2720 k
Base Horizontal	E Only	0.2431 k
Vertical Reaction	+D+S	2.848 k

Design Maximum Combinations - Moments

Results reported for "Strip Width" = 12 in.

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	Bar 'd'
+1.40D at 22.88 to 23.67	0.689	6.867	1.58	0.14	0.90	2.39	0.155	0.0034	0.0069	0.00
+1.20D at 22.88 to 23.67	0.591	6.867	1.58	0.12	0.90	2.37	0.155	0.0034	0.0069	0.00
+1.20D+0.50S at 22.88 to 23.67	0.785	6.867	1.58	0.19	0.90	2.41	0.155	0.0034	0.0069	0.00
+1.20D+0.50W at 11.84 to 12.62	1.731	6.867	1.58	0.55	0.90	2.64	0.155	0.0034	0.0065	0.00
+1.20D-0.50W at 10.26 to 11.05	1.893	6.867	1.58	0.42	0.90	2.68	0.155	0.0034	0.0064	0.00
+1.20D+1.60S at 22.88 to 23.67	1.211	6.867	1.58	0.33	0.90	2.51	0.155	0.0034	0.0067	0.00
+1.20D+1.60S+0.50W at 13.41 to 14.	2.189	6.867	1.58	0.67	0.90	2.75	0.155	0.0034	0.0063	0.00
+1.20D+1.60S-0.50W at 22.88 to 23.6	1.211	6.867	1.58	0.34	0.90	2.51	0.155	0.0034	0.0067	0.00
+1.20D+W at 11.84 to 12.62	1.731	6.867	1.58	1.03	0.90	2.64	0.155	0.0034	0.0065	0.00
+1.20D-W at 11.05 to 11.84	1.812	6.867	1.58	0.91	0.90	2.66	0.155	0.0034	0.0065	0.00
+1.20D+0.50S+W at 11.84 to 12.62	1.925	6.867	1.58	1.07	0.90	2.68	0.155	0.0034	0.0064	0.00
+1.20D+0.50S-W at 11.05 to 11.84	2.006	6.867	1.58	0.88	0.90	2.70	0.155	0.0034	0.0064	0.00
+0.90D+W at 11.84 to 12.62	1.298	6.867	1.58	1.01	0.90	2.54	0.155	0.0034	0.0067	0.00
+0.90D-W at 11.05 to 11.84	1.359	6.867	1.58	0.92	0.90	2.55	0.155	0.0034	0.0066	0.00
+1.268D+0.20S+E at 11.84 to 12.62	1.907	6.867	1.58	1.55	0.90	2.68	0.155	0.0034	0.0064	0.00
+1.268D+0.20S-E at 11.05 to 11.84	1.993	6.867	1.58	1.39	0.90	2.70	0.155	0.0034	0.0064	0.00
+0.8316D+E at 11.84 to 12.62	1.199	6.867	1.58	1.50	0.90	2.51	0.155	0.0034	0.0067	0.00
+0.8316D-E at 11.05 to 11.84	1.256	6.867	1.58	1.41	0.90	2.53	0.155	0.0034	0.0067	0.00

Design Maximum Combinations - Deflections

Results reported for "Strip Width" = 12 in.

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 Only at 13.41 to 14.20	1.306	1.58	0.06	443.30	32.74	443.300	0.011	26,062.4
+D+S at 13.41 to 14.20	1.694	1.58	0.14	443.30	33.63	443.300	0.025	11,513.6
+D+0.750S at 13.41 to 14.20	1.597	1.58	0.12	443.30	33.41	443.300	0.021	13,389.7
+D+0.60W at 11.84 to 12.62	1.442	1.58	0.63	443.30	33.05	443.300	0.108	2,629.9
+D-0.60W at 11.05 to 11.84	1.510	1.58	0.53	443.30	33.21	443.300	0.087	3,272.7
+D+0.450W at 11.84 to 12.62	1.442	1.58	0.49	443.30	33.05	443.300	0.084	3,394.1
+D-0.450W at 11.05 to 11.84	1.510	1.58	0.38	443.30	33.21	443.300	0.062	4,547.1
+D+0.750S+0.450W at 11.84 to 12.62	1.733	1.58	0.54	443.30	33.72	443.300	0.094	3,016.9
+D+0.750S-0.450W at 11.05 to 11.84	1.801	1.58	0.34	443.30	33.88	443.300	0.053	5,378.1

Masonry Slender Wall

Project File: 21-0834.ec6

DESCRIPTION: FRONT CMU WALL W/ 16" PARAPET (TYP.)

+0.60D+0.60W at 11.84 to 12.62	0.865	1.58	0.61	443.30	31.71	443.300	0.103	2,760.7
+0.60D-0.60W at 11.05 to 11.84	0.906	1.58	0.54	443.30	31.81	443.300	0.090	3,146.9
+D+0.70E at 11.84 to 12.62	1.442	1.58	1.08	443.30	33.05	443.300	0.183	1,555.0
+D-0.70E at 11.05 to 11.84	1.510	1.58	0.97	443.30	33.21	443.300	0.161	1,759.0

Design Maximum Combinations - Deflections

Results reported for "Strip Width" = 12 in.

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+0.750S+0.5250E at 11.84 to 12.62	1.733	1.58	0.88	443.30	33.72	443.300	0.150	1,888.9
+D+0.750S-0.5250E at 11.05 to 11.84	1.801	1.58	0.67	443.30	33.88	443.300	0.109	2,604.5
+0.60D+0.70E at 11.84 to 12.62	0.865	1.58	1.05	443.30	31.71	443.300	0.177	1,605.2
+0.60D-0.70E at 11.05 to 11.84	0.906	1.58	0.98	443.30	31.81	443.300	0.164	1,728.3
S Only at 13.41 to 14.20	0.388	1.58	0.08	443.30	30.58	443.300	0.013	21,082.2
W Only at 11.05 to 11.84	0.000	1.58	0.94	443.30	29.64	443.300	0.159	1,787.0
-W at 11.05 to 11.84	0.000	1.58	0.94	443.30	29.64	443.300	0.159	1,787.0
E Only at 11.05 to 11.84	0.000	1.58	1.43	443.30	29.64	443.300	0.241	1,179.5
E Only * -1.0 at 11.05 to 11.84	0.000	1.58	1.43	443.30	29.64	443.300	0.241	1,179.5

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.00 k	2.460 k
+D+S	0.0 k	0.01 k	2.848 k
+D+0.750S	0.0 k	0.01 k	2.751 k
+D+0.60W	0.1 k	0.10 k	2.460 k
+D-0.60W	0.1 k	0.11 k	2.460 k
+D+0.450W	0.1 k	0.08 k	2.460 k
+D-0.450W	0.1 k	0.09 k	2.460 k
+D+0.750S+0.450W	0.1 k	0.07 k	2.751 k
+D+0.750S-0.450W	0.1 k	0.09 k	2.751 k
+0.60D+0.60W	0.1 k	0.11 k	1.476 k
+0.60D-0.60W	0.1 k	0.11 k	1.476 k
+D+0.70E	0.2 k	0.19 k	2.460 k
+D-0.70E	0.2 k	0.20 k	2.460 k
+D+0.750S+0.5250E	0.1 k	0.14 k	2.751 k
+D+0.750S-0.5250E	0.1 k	0.15 k	2.751 k
+0.60D+0.70E	0.2 k	0.19 k	1.476 k
+0.60D-0.70E	0.2 k	0.19 k	1.476 k
S Only	0.0 k	0.01 k	0.388 k
W Only	0.2 k	0.18 k	0.000 k
-W	0.2 k	0.18 k	0.000 k
E Only	0.2 k	0.27 k	0.000 k
E Only * -1.0	0.2 k	0.27 k	0.000 k

Masonry Slender Wall

Project File: 21-0834.ec6

DESCRIPTION: BACK CMU WALL W/ 54" PARAPET (TYP.)

Code References

Calculations per ACI 530-13, IBC 2015, CBC 2016, ASCE 7-10
Load Combinations Used : ASCE 7-16

General Information

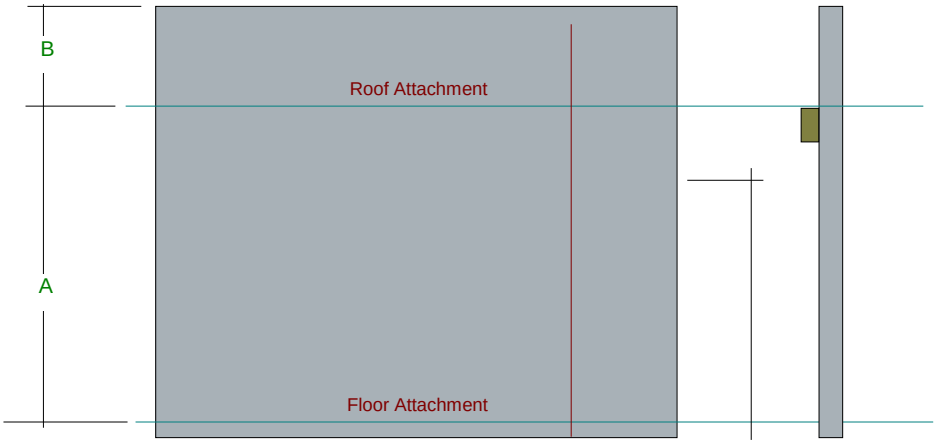
Calculations per ACI 530-13, IBC 2015, CBC 2016, ASCE 7-10

Construction Type :	Grouted Hollow Concrete Masonry							
F'm	=	1.50 ksi	Nom. Wall Thickness	8 in	Temp Diff across thickness	=		deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625 in	Min Allow Out-of-plane Defl Ra	=	0.0	
Fr - Rupture	=	163.0 psi	Rebar "d" distance	3.8125 in				
Em = f'm *	=	900.0	Lower Level Rebar . . .		Minimum Vertical Steel %	=	0.0020	
Max % of ρ bal.	=	0.006910	Bar Size #	5				
Grout Density	=	140 pcf	Bar Spacing	24 in				
Block Weight	Normal Weight							
Wall Weight	=	86.0 psf						
Wall is Solid Grouted								

One-Story Wall Dimensions

A	Clear Height	=	20.50 ft
B	Parapet height	=	4.50 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	4.0 in	0.310			0.4990	k/ft
Concentric Load							k/ft

Lateral Loads

Wind Loads :
Full area WIND load 13.6 psf

Seismic Loads :
Wall Weight Seismic Load Input Method : ASCE seismic factors entered

SDS Value per ASCE 12.11.1 S_{DS} * I = .599

Fp = Wall Wt. * 0.2396 = 20.606 psf

Masonry Slender Wall

Project File: 21-0834.ec6

DESCRIPTION: BACK CMU WALL W/ 54" PARAPET (TYP.)

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +0.8316D+E	Maximum Bending Stress Rat	0.4059		
		Max Mu	1.031 k-ft	Phi * Mn	2.539 k-ft
PASS	Service Deflection Check E Only	Actual Defl. Ratio L/ Max. Deflection	2,035 0.1209 in	Allowable Defl. Ratio	240.0
		Max Pu / Ag	23.771 psi	Max. Allow. Defl.	1.025 in
PASS	Axial Load Check +1.268D+0.20S+E	Location	9.908 ft	0.05 * f'm	75.0 psi
	Reinforcing Limit Check	Actual As/bd	0.003388	Max Allow As/bd	0.006910

Maximum Reactions *for Load Combination...*

Top Horizontal	E Only	0.3141 k
Base Horizontal	E Only	0.2010 k
Vertical Reaction	+D+S	2.959 k

Design Maximum Combinations - Moments

Results reported for "Strip Width" = 12 in.

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	Bar 'd'
+1.40D at 19.82 to 20.50	1.058	6.867	1.58	0.14	0.90	2.48	0.155	0.0034	0.0068	0.00
+1.20D at 19.82 to 20.50	0.907	6.867	1.58	0.12	0.90	2.44	0.155	0.0034	0.0068	0.00
+1.20D+0.50S at 19.82 to 20.50	1.156	6.867	1.58	0.21	0.90	2.50	0.155	0.0034	0.0067	0.00
+1.20D+0.50W at 10.25 to 10.93	1.894	6.867	1.58	0.39	0.90	2.68	0.155	0.0034	0.0064	0.00
+1.20D-0.50W at 8.20 to 8.88	2.106	6.867	1.58	0.27	0.90	2.73	0.155	0.0034	0.0064	0.00
+1.20D+1.60S at 19.82 to 20.50	1.705	6.867	1.58	0.39	0.90	2.63	0.155	0.0034	0.0065	0.00
+1.20D+1.60S+0.50W at 12.30 to 12.	2.481	6.867	1.58	0.55	0.90	2.81	0.155	0.0034	0.0062	0.00
+1.20D+1.60S-0.50W at 19.82 to 20.5	1.705	6.867	1.58	0.46	0.90	2.63	0.155	0.0034	0.0065	0.00
+1.20D+W at 9.57 to 10.25	1.965	6.867	1.58	0.72	0.90	2.69	0.155	0.0034	0.0064	0.00
+1.20D-W at 8.88 to 9.57	2.035	6.867	1.58	0.60	0.90	2.71	0.155	0.0034	0.0064	0.00
+1.20D+0.50S+W at 10.25 to 10.93	2.144	6.867	1.58	0.77	0.90	2.74	0.155	0.0034	0.0064	0.00
+1.20D+0.50S-W at 8.88 to 9.57	2.285	6.867	1.58	0.56	0.90	2.77	0.155	0.0034	0.0063	0.00
+0.90D+W at 9.57 to 10.25	1.474	6.867	1.58	0.70	0.90	2.58	0.155	0.0034	0.0066	0.00
+0.90D-W at 8.88 to 9.57	1.526	6.867	1.58	0.61	0.90	2.59	0.155	0.0034	0.0066	0.00
+1.268D+0.20S+E at 9.57 to 10.25	2.177	6.867	1.58	1.08	0.90	2.74	0.155	0.0034	0.0063	0.00
+1.268D+0.20S-E at 8.88 to 9.57	2.251	6.867	1.58	0.92	0.90	2.76	0.155	0.0034	0.0063	0.00
+0.8316D+E at 9.57 to 10.25	1.362	6.867	1.58	1.04	0.90	2.55	0.155	0.0034	0.0066	0.00
+0.8316D-E at 8.88 to 9.57	1.410	6.867	1.58	0.95	0.90	2.56	0.155	0.0034	0.0066	0.00

Design Maximum Combinations - Deflections

Results reported for "Strip Width" = 12 in.

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 Only at 11.62 to 12.30	1.461	1.58	0.06	443.30	33.10	443.300	0.008	30,178.3
+D+S at 11.62 to 12.30	1.960	1.58	0.16	443.30	34.24	443.300	0.021	11,505.0
+D+0.750S at 11.62 to 12.30	1.835	1.58	0.14	443.30	33.95	443.300	0.018	13,620.0
+D+0.60W at 10.25 to 10.93	1.579	1.58	0.45	443.30	33.37	443.300	0.057	4,349.4
+D-0.60W at 9.57 to 10.25	1.637	1.58	0.34	443.30	33.50	443.300	0.041	6,026.9
+D+0.450W at 10.25 to 10.93	1.579	1.58	0.35	443.30	33.37	443.300	0.044	5,537.2
+D-0.450W at 9.57 to 10.25	1.637	1.58	0.24	443.30	33.50	443.300	0.029	8,586.7
+D+0.750S+0.450W at 10.25 to 10.93	1.953	1.58	0.42	443.30	34.22	443.300	0.054	4,527.6
+D+0.750S-0.450W at 8.88 to 9.57	2.070	1.58	0.19	443.30	34.49	443.300	0.019	12,628.3

Masonry Slender Wall

Project File: 21-0834.ec6

DESCRIPTION: BACK CMU WALL W/ 54" PARAPET (TYP.)

+0.60D+0.60W at 9.57 to 10.25	0.982	1.58	0.42	443.30	31.99	443.300	0.053	4,638.3
+0.60D-0.60W at 9.57 to 10.25	0.982	1.58	0.36	443.30	31.99	443.300	0.044	5,633.3
+D+0.70E at 9.57 to 10.25	1.637	1.58	0.75	443.30	33.50	443.300	0.094	2,620.0
+D-0.70E at 9.57 to 10.25	1.637	1.58	0.65	443.30	33.50	443.300	0.078	3,146.5

Design Maximum Combinations - Deflections

Results reported for "Strip Width" = 12 in.

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+0.750S+0.5250E at 10.25 to 10.93	1.953	1.58	0.64	443.30	34.22	443.300	0.082	2,986.1
+D+0.750S-0.5250E at 8.88 to 9.57	2.070	1.58	0.42	443.30	34.49	443.300	0.047	5,191.2
+0.60D+0.70E at 9.57 to 10.25	0.982	1.58	0.72	443.30	31.99	443.300	0.090	2,728.7
+0.60D-0.70E at 9.57 to 10.25	0.982	1.58	0.66	443.30	31.99	443.300	0.081	3,045.1
S Only at 11.62 to 12.30	0.499	1.58	0.10	443.30	30.84	443.300	0.013	18,931.0
W Only at 9.57 to 10.25	0.000	1.58	0.65	443.30	29.64	443.300	0.080	3,082.8
-W at 9.57 to 10.25	0.000	1.58	0.65	443.30	29.64	443.300	0.080	3,082.8
E Only at 9.57 to 10.25	0.000	1.58	0.98	443.30	29.64	443.300	0.121	2,034.7
E Only * -1.0 at 9.57 to 10.25	0.000	1.58	0.98	443.30	29.64	443.300	0.121	2,034.7

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.01 k	2.460 k
+D+S	0.0 k	0.01 k	2.959 k
+D+0.750S	0.0 k	0.01 k	2.834 k
+D+0.60W	0.1 k	0.12 k	2.460 k
+D-0.60W	0.1 k	0.13 k	2.460 k
+D+0.450W	0.1 k	0.09 k	2.460 k
+D-0.450W	0.1 k	0.10 k	2.460 k
+D+0.750S+0.450W	0.1 k	0.08 k	2.834 k
+D+0.750S-0.450W	0.0 k	0.10 k	2.834 k
+0.60D+0.60W	0.1 k	0.12 k	1.476 k
+0.60D-0.60W	0.1 k	0.13 k	1.476 k
+D+0.70E	0.1 k	0.22 k	2.460 k
+D-0.70E	0.1 k	0.23 k	2.460 k
+D+0.750S+0.5250E	0.1 k	0.15 k	2.834 k
+D+0.750S-0.5250E	0.1 k	0.18 k	2.834 k
+0.60D+0.70E	0.1 k	0.22 k	1.476 k
+0.60D-0.70E	0.1 k	0.22 k	1.476 k
S Only	0.0 k	0.01 k	0.499 k
W Only	0.1 k	0.21 k	0.000 k
-W	0.1 k	0.21 k	0.000 k
E Only	0.2 k	0.31 k	0.000 k
E Only * -1.0	0.2 k	0.31 k	0.000 k

OUT OF PLANE LOADS @ LARGE OPENINGS

14'-0" OPENING: WL = 13.6psf
EL = 20.6psf
SL = 25psf (31'/2 + 16.67'/2) = 596plf
DL = 596plf (20plf/25plf) = 477plf

TRY 32" PILASTERS (EA SIDE OF OPENING)

*SEE FOLLOWING RISA CALCULATIONS

Node Coordinates

	Label	X [ft]	Y [ft]	Z [ft]	Detach From Diaphragm
1	N1	0.667	0	0	
2	N2	20	0	0	
3	N3	0.667	23.667	0	
4	N4	20	23.667	0	
5	N5	3.333	0	0	
6	N6	3.333	10	0	
7	N7	17.333	0	0	
8	N8	17.333	10	0	

Node Boundary Conditions

	Node Label	X [k/in]	Y [k/in]	Z [k/in]
1	N3	Reaction	Reaction	Reaction
2	N4	Reaction	Reaction	Reaction

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	Deflection 1	Yes	Y	DL	1										
2	Deflection 2	Yes	Y	LL	1										
3	Deflection 3	Yes	Y	DL	1	LL	1								
4	ASCE ASD 1	Yes	Y	DL	1										
5	ASCE ASD 2	Yes	Y	DL	1	LL	1	LLS	1						
6	ASCE ASD 3 (a)	Yes	Y	DL	1	RLL	1								
7	ASCE ASD 3 (b)	Yes	Y	DL	1	SL	1	SLN	1						
8	ASCE ASD 4 (a)	Yes	Y	DL	1	LL	0.75	LLS	0.75	RLL	0.75				
9	ASCE ASD 4 (b)	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75		
10	ASCE ASD 5 (a) (a)	Yes	Y	DL	1	WLX	0.6								
11	ASCE ASD 5 (a) (b)	Yes	Y	DL	1	WLZ	0.6								
12	ASCE ASD 5 (a) (c)	Yes	Y	DL	1	WLX	-0.6								
13	ASCE ASD 5 (a) (d)	Yes	Y	DL	1	WLZ	-0.6								
14	ASCE ASD 6 (a) (a)	Yes	Y	DL	1	WLX	0.45	LL	0.75	LLS	0.75	RLL	0.75		
15	ASCE ASD 6 (a) (b)	Yes	Y	DL	1	WLZ	0.45	LL	0.75	LLS	0.75	RLL	0.75		
16	ASCE ASD 6 (a) (c)	Yes	Y	DL	1	WLX	-0.45	LL	0.75	LLS	0.75	RLL	0.75		
17	ASCE ASD 6 (a) (d)	Yes	Y	DL	1	WLZ	-0.45	LL	0.75	LLS	0.75	RLL	0.75		
18	ASCE ASD 6 (b) (a)	Yes	Y	DL	1	WLX	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
19	ASCE ASD 6 (b) (b)	Yes	Y	DL	1	WLZ	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
20	ASCE ASD 6 (b) (c)	Yes	Y	DL	1	WLX	-0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
21	ASCE ASD 6 (b) (d)	Yes	Y	DL	1	WLZ	-0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
22	ASCE ASD 6 (c) (a)	Yes	Y	DL	1	WLX	0.45	LL	0.75	LLS	0.75				
23	ASCE ASD 6 (c) (b)	Yes	Y	DL	1	WLZ	0.45	LL	0.75	LLS	0.75				
24	ASCE ASD 6 (c) (c)	Yes	Y	DL	1	WLX	-0.45	LL	0.75	LLS	0.75				
25	ASCE ASD 6 (c) (d)	Yes	Y	DL	1	WLZ	-0.45	LL	0.75	LLS	0.75				
26	ASCE ASD 7 (a)	Yes	Y	DL	0.6	WLX	0.6								
27	ASCE ASD 7 (b)	Yes	Y	DL	0.6	WLZ	0.6								
28	ASCE ASD 7 (c)	Yes	Y	DL	0.6	WLX	-0.6								
29	ASCE ASD 7 (d)	Yes	Y	DL	0.6	WLZ	-0.6								
30	ASCE ASD 8 (a)	Yes	Y	DL	1	ELX	0.7								
31	ASCE ASD 8 (b)	Yes	Y	DL	1	ELZ	0.7								
32	ASCE ASD 8 (c)	Yes	Y	DL	1	ELX	-0.7								
33	ASCE ASD 8 (d)	Yes	Y	DL	1	ELZ	-0.7								
34	ASCE ASD 9 (a)	Yes	Y	DL	1	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
35	ASCE ASD 9 (b)	Yes	Y	DL	1	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
36	ASCE ASD 9 (c)	Yes	Y	DL	1	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
37	ASCE ASD 9 (d)	Yes	Y	DL	1	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
38	ASCE ASD 10 (a)	Yes	Y	DL	0.6	ELX	0.7								
39	ASCE ASD 10 (b)	Yes	Y	DL	0.6	ELZ	0.7								
40	ASCE ASD 10 (c)	Yes	Y	DL	0.6	ELX	-0.7								
41	ASCE ASD 10 (d)	Yes	Y	DL	0.6	ELZ	-0.7								

Wall Panel Data

	Label	A Node	B Node	C Node	D Node	Material Type	Material Set	Thickness [in]	Design Rule	Panel/Spacing
1	WP1	N1	N3	N4	N2	Masonry	Gen Masonry	8	Typical	8

Diaphragms

	Node Label	Plane	Inactive	No Wind/Drift
1	N1	ZX		
2	N3	ZX		

Wall Panel Surface Loads (BLC 3 : Seismic Load Z)

	Wall Panel Label	Direction	Top Magnitude [ksf, F]	Bottom Magnitude [ksf, F]	Start Location [ft]	Height [ft]
1	WP1	Z	-0.021	-0.021	0	0

Wall Panel Surface Loads (BLC 4 : Wind Load Z)

	Wall Panel Label	Direction	Top Magnitude [ksf, F]	Bottom Magnitude [ksf, F]	Start Location [ft]	Height [ft]
1	WP1	Z	-0.014	-0.014	0	0

Wall Panel Point Loads

No Data to Print...

Wall Panel Distributed Loads (BLC 1 : Snow Load)

	Wall Label	Direction	Start Magnitude [k/ft, F]	End Magnitude [k/ft, F]	Start Location [(ft, %)]	End Location [(ft, %)]
1	WP1(23.667ft)	Y	-0.596	-0.596	0	19.333

Wall Panel Distributed Loads (BLC 2 : Dead Load)

	Wall Label	Direction	Start Magnitude [k/ft, F]	End Magnitude [k/ft, F]	Start Location [(ft, %)]	End Location [(ft, %)]
1	WP1(23.667ft)	Y	-0.477	-0.477	0	19.333

Envelope Wall Panel Forces

	Wall Label	Elevation [ft]		Axial [k]	LC	x Shear [k]	LC	z Shear [k]	LC	x-x Moment [k-ft]	LC	z-z Moment [k-ft]	LC
1	WP1	0	max	15.439	7	0	7	3.095	39	0.002	41	0.059	7
2		0	min	0	2	0	2	-3.095	33	-0.002	31	0	2

Envelope Node Reactions

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N3	max	0	2	10.727	7	1.681	31	0	41	0	41	0	41
2		min	-2.943	7	0	2	-1.681	33	0	1	0	1	0	1
3	N4	max	2.943	7	10.721	7	1.681	31	0	41	0	41	0	41

Envelope Node Reactions (Continued)

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
4		min	0	2	0	2	-1.681	33	0	1	0	1	0	1
5	WP1	max	0	7	15.439	7	3.237	39	0	41	0.002	39	0.059	7
6		min	0	2	0	2	-3.237	41	0	1	-0.002	41	0	2
7	Totals:	max	0	37	36.887	7	6.598	31						
8		min	0	26	0	2	-6.598	33						

Envelope Node Displacements

	Node Label		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
1	N1	max	0	2	0	2	0	41	1.33e-2	41	0	39	0	41
2		min	0	7	0	7	0	39	-1.33e-2	31	0	33	0	1
3	N2	max	0	7	0	2	0	41	1.33e-2	41	0	41	0	41
4		min	0	2	0	7	0	39	-1.33e-2	31	0	31	0	1
5	N3	max	0	7	0	2	0	33	9.225e-3	39	0	31	0	41
6		min	0	2	0	7	0	31	-9.225e-3	33	0	33	0	1
7	N4	max	0	2	0	2	0	33	9.222e-3	39	0	33	0	41
8		min	0	7	0	7	0	31	-9.222e-3	33	0	31	0	1
9	N5	max	0	7	0	2	0	41	1.377e-2	41	0	39	0	41
10		min	0	2	0	7	0	39	-1.377e-2	31	0	33	0	1
11	N6	max	0	2	0	2	1.046	41	9.006e-4	39	1.722e-3	39	0	41
12		min	-0.002	7	-0.007	7	-1.046	31	-9.006e-4	33	-1.722e-3	33	0	1
13	N7	max	0	2	0	2	0	41	1.377e-2	41	0	41	0	41
14		min	0	7	0	7	0	39	-1.377e-2	31	0	31	0	1
15	N8	max	0.002	7	0	2	1.045	41	9.e-4	39	1.725e-3	41	0	41
16		min	0	2	-0.007	7	-1.045	31	-9.e-4	33	-1.725e-3	31	0	1

TMS 402-16: ASD Wall Panel Masonry Code Checks (In-Plane)

	Wall Panel	Region	Design Rule	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP1	R1	Typical	0.324	7	0.46	7	0.11	0.675	0.082
2		R2	<Custom>	0.041	7	inf	1	0.269	0.5	0
3		R3	Typical	0.324	7	0.46	7	0.11	0.675	0.082

TMS 402-16: ASD Wall Panel Masonry Code Checks (Out-of-Plane)

	Wall Panel	Region	Design Rule	Combined UC	LC	Shear UC	LC	Fa[ksi]	Fb[ksi]	Fv[ksi]
1	WP1	R1	Typical	0.885	31	0.081	39	0.11	0.675	0.078
2		R2	<Custom>	0.635	31	0.048	31	0.269	0.675	0.044
3		R3	Typical	0.886	31	0.081	39	0.11	0.675	0.078

Masonry Wall Reinforcement

	Wall	Region	Hor. Bar Size	Vert. Bar Size	Boundary Reinf.
1	WP1	R1	#5@11 oc	#5@8" oc (ef)	2-#5
2		R2	#5@48 oc	#5@24" oc (ctr)	1-#5
3		R3	#5@11 oc	#5@8" oc (ef)	2-#5

Wall Panel TMS 402-16: ASD Masonry Code Checks for Lintels

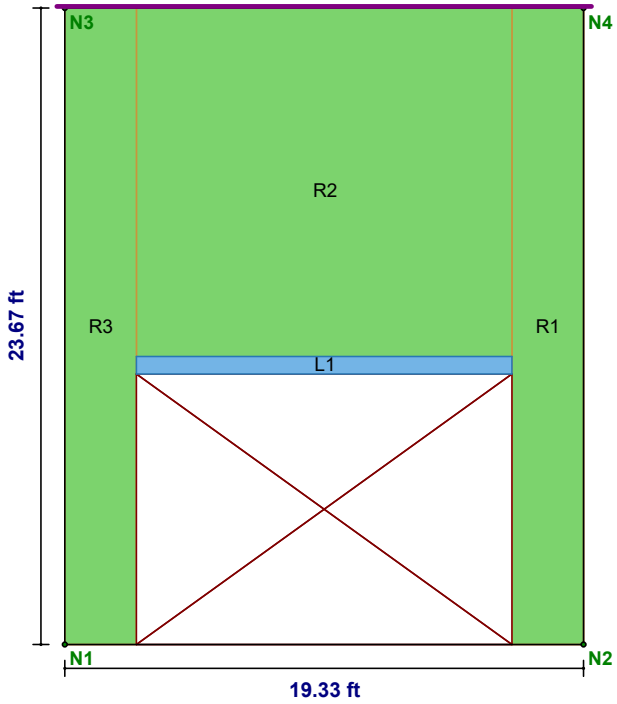
	Wall Panel	Lintel	Design Rule	Flexure UC	LC	Shear UC	LC	Fvm[ksi]	Fvs[ksi]	Fm[ksi]	Fs[ksi]
1	WP1	L1	Typical	0.105	7	0.151	7	0.077	0	0.5	32

Masonry Lintel Reinforcement

	Wall	Lintel	Flex. Steel	Stirrup
1	WP1	L1	2-#5	Not Reqd.

Detail Report: WP1

Masonry Wall



CRITERIA		GEOMETRY		MATERIALS	
Code:	TMS 402-16: ASD	**Total Height (ft):**	23.667	**Material Type:**	Masonry
Special Insp:	Yes	**Total Length (ft):**	19.333	**Material Set:**	Gen Masonry
Design Rule:	Typical	**Total Lintel Depth (in):**	24	**Masonry f'm (ksi):**	1.5
Seismic Design Rule:	Special	**Block Nom Width:**	8"	**Masonry Em (ksi):**	1050
Wall Area:	NCMA	**Block Grouting:**	Fully Grouted	**Steel fy (ksi):**	60
Transfer In?:	No	**1.5 Shear Factor:**	No	**Steel E (ksi):**	29000
Transfer Out?:	No			**Material Name:**	Gen Masonry
K:	1			**Material Density:**	0.08 k/ft^3
Use Cracked?:	Yes			**Mortar Type:**	Type M or S
In Icr Factor:	0.5			**Cement Type:**	Portland, Lime/Mortar
Out Icr Factor:	0.5				
Custom Regions:	Yes				

REGION RESULTS

Region	UC Max In Plane	LC	UC Shear In Plane	LC	UC Max Out Plane	LC	UC Shear Out Plane	LC
R1	0.324	7	0.46	7	0.885	31	0.081	39
R2	0.041	7	9.999+	1	0.635	31	0.048	31
R3	0.324	7	0.46	7	0.886	31	0.081	39

REINFORCEMENT RESULTS

Region	Vertical Reinforcement	Horizontal Reinforcement	Boundary Reinforcement
R1	#5@8" oc e.f.	#5@11 oc	2-#5 ctr
R2	#5@24" oc ctr	#5@48 oc	1-#5 ctr
R3	#5@8" oc e.f.	#5@11 oc	2-#5 ctr

LINTEL REINFORCEMENT RESULTS

Lintel	Flexural Reinforcement	Shear Reinforcement
L1	2-#5	Not Reqd.

Project: 22-0690

Location: Typical Truss (For Load Only)
Roof Beam
[2015 International Building Code(2015 NDS)]
1.5 IN x 3.5 IN x 30.93 FT (Actual 30.9 FT)
#2 - Douglas-Fir-Larch - Dry Use
Section Inadequate By: 29964.4%
Controlling Factor: Deflection / Depth Required 30.89 In.

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DEFLECTIONS Center

Live Load	342.89	IN L/1
Dead Load	277.17	in
Total Load	620.06	IN L/1

Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180

REACTIONS

	A		B	
Live Load	2208	lb	2208	lb
Dead Load	1784	lb	1784	lb
Total Load	3992	lb	3992	lb
Bearing Length	4.26	in	4.26	in

BEAM DATA

Span Length	30.9	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	0	ft
Roof Pitch	0.2512	
Roof Duration Factor	1.15	
Beam End Elevation Difference	0.64	ft

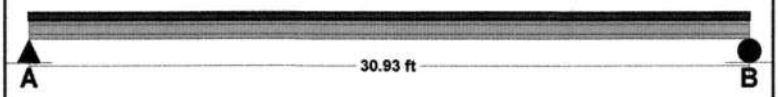
MATERIAL PROPERTIES
#2 - Douglas-Fir-Larch

	Base Values		Adjusted	
Bending Stress:	Fb = 900	psi	Fb' = 1553	psi
	Cd=1.15 CF=1.50			
Shear Stress:	Fv = 180	psi	Fv' = 207	psi
	Cd=1.15			
Modulus of Elasticity:	E = 1600	ksi	E' = 1600	ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 625	psi	Fc - ⊥' = 625	psi

Controlling Moment: 30869 ft-lb
15.465 ft from left support
Created by combining all dead and live loads.
Controlling Shear: -3991 lb
At a distance d from support.
Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	238.6 in3	3.06 in3
Area (Shear):	28.92 in2	5.25 in2
Moment of Inertia (deflection):	1611.27 in4	5.36 in4
Moment:	30869 ft-lb	396 ft-lb
Shear:	-3991 lb	725 lb

LOADING DIAGRAM



ROOF LOADING
Side One:

Roof Live Load:	LL =	25	psf
Roof Dead Load:	DL =	20	psf
Tributary Width:	TW =	5.7	ft

Side Two:

Roof Live Load:	LL =	0	psf
Roof Dead Load:	DL =	0	psf
Tributary Width:	TW =	0	ft
Wall Load:	WALL =	0	plf

SLOPE/PITCH ADJUSTED LENGTHS AND LOADS

Adjusted Beam Length:	Ladj =	30.94	ft
Beam Self Weight:	BSW =	1	plf
Beam Uniform Live Load:	wL =	143	plf
Beam Uniform Dead Load:	wD_adj =	115	plf
Total Uniform Load:	wT =	258	plf

Project: 22-0690

Location: Typical Girder Truss (For Loads Only)
Multi-Loaded Multi-Span Beam
[2015 International Building Code(2015 NDS)]
1.5 IN x 3.5 IN x 34.3 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Inadequate By: 318116.4%
Controlling Factor: Deflection / Depth Required 122.13 In.

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DEFLECTIONS	Center	
Live Load	3238.20	IN L/0
Dead Load	2219.22	in
Total Load	5457.41	IN L/0

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240

REACTIONS	A	B
Live Load	13037 lb	13043 lb
Dead Load	8938 lb	8941 lb
Total Load	21975 lb	21984 lb
Bearing Length	23.44 in	23.45 in

BEAM DATA	Center
Span Length	34.3 ft
Unbraced Length-Top	0 ft
Unbraced Length-Bottom	34.3 ft
Live Load Duration Factor	1.00
Notch Depth	0.00

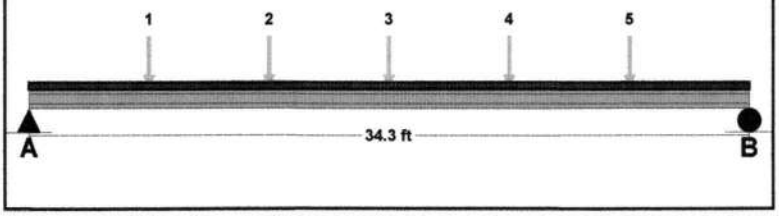
MATERIAL PROPERTIES
#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi	Fb' = 1350 psi
	Cd=1.00 CF=1.50	
Shear Stress:	Fv = 180 psi	Fv' = 180 psi
	Cd=1.00	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 625 psi	Fc - ⊥' = 625 psi

Controlling Moment: 226034 ft-lb
17.15 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: -21984 lb
At a distance d from right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	2009.2 in3	3.06 in3
Area (Shear):	183.2 in2	5.25 in2
Moment of Inertia (deflection):	17054.41 in4	5.36 in4
Moment:	226034 ft-lb	345 ft-lb
Shear:	-21984 lb	630 lb

LOADING DIAGRAM



UNIFORM LOADS	Center
Uniform Live Load	0 plf
Uniform Dead Load	0 plf
Beam Self Weight	1 plf
Total Uniform Load	1 plf

POINT LOADS - CENTER SPAN

Load Number	One *	Two *	Three *	Four *	Five *
Live Load	5216 lb	5216 lb	5216 lb	5216 lb	5216 lb
Dead Load	3568 lb	3568 lb	3568 lb	3568 lb	3568 lb
Location	5.72 ft	11.43 ft	17.15 ft	22.87 ft	28.6 ft

* Load obtained from Load Tracker. See Summary Report for details.

Project: 22-0690

Location: Typical End Column
Column
[2015 International Building Code(AISC 14th Ed ASD)]
HSS 8 x 4 x 3/8 x 22.5 FT /ASTM A500-GR.B-46
Section Adequate By: 27.4%

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VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	13037	lb
Dead Load:	Vert-DL-Rxn =	9562	lb
Total Load:	Vert-TL-Rxn =	22599	lb

COLUMN DATA

Total Column Length:	22.5	ft
Unbraced Length (X-Axis) Lx:	22.5	ft
Unbraced Length (Y-Axis) Ly:	22.5	ft
Column End Condition-K (e):	1	
Load Eccentricity (X-Axis) - ex:	1.2	in
Load Eccentricity (Y-Axis) - ey:	2	in

COLUMN PROPERTIES

HSS 8 x 4 x 3/8 - Rectangular

Steel Yield Strength:	Fy =	46	ksi		
Modulus of Elasticity:	E =	29000	ksi		
Column Section:	dx =	8	in	dy =	4 in
Column Wall Thickness:	t =	0.349	in		
Area:	A =	7.58	in		
Moment of Inertia (deflection):	Ix =	58.7	in4	Iy =	19.6 in4
Section Modulus:	Sx =	14.7	in3	Sy =	9.8 in3
Plastic Section Modulus:	Zx =	18.8	in3	Zy =	11.5 in3
Rad. of Gyration:	rx =	2.78	in	ry =	1.61 in

Column Compression Calculations:

KL/r Ratio:	KLx/rx =	97.12	KLy/ry =	167.7
Controlling Direction for Compr. Calcs: (Y-Y Axis)				
Flexural Buckling Stress:	Fcr =	8.93 ksi		
Controlling Equation	F7-1			
Nominal Compressive Strength:	Pc =	41 kip		

Column Bending Calculations per AISC 14th Edition Steel Manual:

Controlling Load Case: Axial Total Load (D + L)

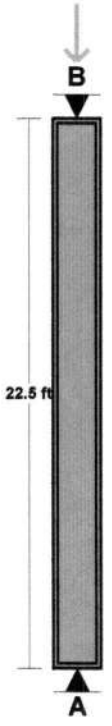
Eccentricity Moment:	Mx-ex =	2198 ft-lb	My-ey =	3663 ft-lb
Lateral Moment + Eccentricity:	Mrx =	2198 ft-lb	Mry =	3663 ft-lb
Flange Buckling Ratio:	FBR =	8.46		
Allow. Flange Buckling Ratio:	AFBR =	28.12		
Allow. FBR for Non-Compact:	NC =	35.15		
Web Buckling Ratio:	WBRX =	19.92	WBRY =	0
Allow. WBR for Eqn. F7-5:	AWBR =	60.76		
Nmnl. Flex. Str. w/ Sfty Factor:	Mcx =	43.2 ft-kip	Mcy =	26.4 ft-kip
Controlling Equation	F7-1		F7-1	

Combined Stress Calculations:

H1-1a Controls : 0.73

Controlling Combined Stress Factor: 0.73

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	13037 lb *
Dead Load:	PD =	8938 lb *
Column Self Weight:	CSW =	624 lb
Total Axial Load:	PT =	22599 lb

* Load obtained from Load Tracker. See Summary Report for details.

Project: 22-0690

Location: FTG. @ Typical End Column Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 4.5 FT x 4.5 FT x 12.00 IN
Reinforcement: #5 Bars @ 15.00 IN. O.C. E/W / (4) min.
Section Footing Design Adequate

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs =	1500	psf
Concrete Compressive Strength:	F'c =	2500	psi
Reinforcing Steel Yield Strength:	Fy =	60000	psi
Concrete Reinforcement Cover:	c =	3	in

FOOTING SIZE

Width:	W =	4.5	ft
Length:	L =	4.5	ft
Depth:	Depth =	12	in
Effective Depth to Top Layer of Steel:	d =	8.06	in

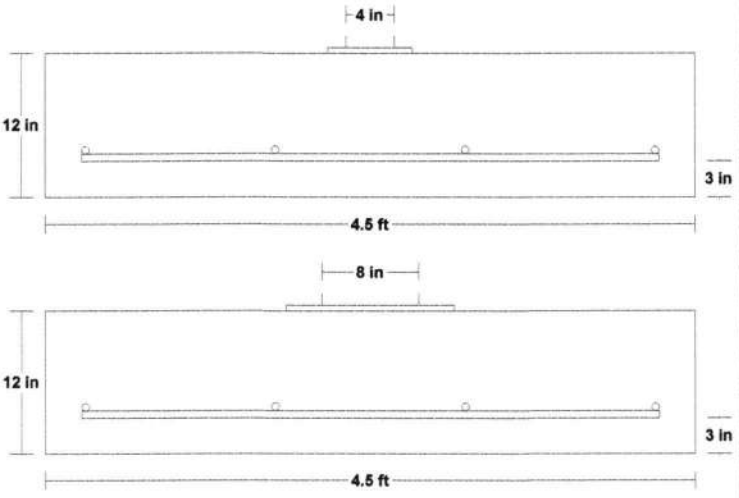
COLUMN AND BASEPLATE SIZE

Column Type:	Steel		
Column Width:	m =	8	in
Column Depth:	n =	4	in
Baseplate Width:	bsw =	14	in
Baseplate Length:	bsl =	7	in

FOOTING CALCULATIONS

Bearing Calculations:			
Ultimate Bearing Pressure:	Qu =	1116	psf
Effective Allowable Soil Bearing Pressure:	Qe =	1350	psf
Required Footing Area:	Areq =	16.74	sf
Area Provided:	A =	20.25	sf
Baseplate Bearing:			
Bearing Required:	Bear =	32334	lb
Allowable Bearing:	Bear-A =	270725	lb
Beam Shear Calculations (One Way Shear):			
Beam Shear:	Vu1 =	9693	lb
Allowable Beam Shear:	Vc1 =	32653	lb
Punching Shear Calculations (Two Way Shear):			
Critical Perimeter:	Bo =	65.25	in
Punching Shear:	Vu2 =	29467	lb
Allowable Punching Shear (ACI 11-35):	vc2-a =	78912	lb
Allowable Punching Shear (ACI 11-36):	vc2-b =	136962	lb
Allowable Punching Shear (ACI 11-37):	vc2-c =	78912	lb
Controlling Allowable Punching Shear:	vc2 =	78912	lb
Bending Calculations:			
Factored Moment:	Mu =	176057	in-lb
Nominal Moment Strength:	Mn =	513025	in-lb
Reinforcement Calculations:			
Concrete Compressive Block Depth:	a =	0.64	in
Steel Required Based on Moment:	As(1) =	0.41	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	1.17	in2
Controlling Reinforcing Steel:	As-reqd =	1.17	in2
Selected Reinforcement:	#5's @ 15.0 in. o.c. e/w (4) Min.		
Reinforcement Area Provided:	As =	1.23	in2
Development Length Calculations:			
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	21.25	in

LOADING DIAGRAM



FOOTING LOADING

Live Load:	PL =	13037	lb *
Dead Load:	PD =	9562	lb *
Total Load:	PT =	22599	lb *
Ultimate Factored Load:	Pu =	32334	lb
Footing plus soil above footing weight:	Wt =	2936	lb

* Load obtained from Load Tracker. See Summary Report for details.

Project: 22-0690

Location: Typical Column
Column
[2015 International Building Code(AISC 14th Ed ASD)]
HSS 7 x 7 x 3/8 x 22.5 FT /ASTM A500-GR.B-46
Section Adequate By: 22.4%

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VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	30496	lb
Dead Load:	Vert-DL-Rxn =	22185	lb
Total Load:	Vert-TL-Rxn =	52681	lb

COLUMN DATA

Total Column Length:	22.5	ft
Unbraced Length (X-Axis) Lx:	22.5	ft
Unbraced Length (Y-Axis) Ly:	22.5	ft
Column End Condition-K (e):	1	
Load Eccentricity (X-Axis) - ex:	3.5	in
Load Eccentricity (Y-Axis) - ey:	1.2	in

COLUMN PROPERTIES

HSS 7 x 7 x 3/8 - Square

Steel Yield Strength:	Fy =	46	ksi		
Modulus of Elasticity:	E =	29000	ksi		
Column Section:	dx =	7	in	dy =	7 in
Column Wall Thickness:	t =	0.349	in		
Area:	A =	8.97	in		
Moment of Inertia (deflection):	Ix =	65	in4	Iy =	65 in4
Section Modulus:	Sx =	18.6	in3	Sy =	18.6 in3
Plastic Section Modulus:	Zx =	22.1	in3	Zy =	22.1 in3
Rad. of Gyration:	rx =	2.69	in	ry =	2.69 in

Column Compression Calculations:

KL/r Ratio:	KLx/rx =	100.37		KLy/ry =	100.37
Controlling Direction for Compr. Calcs: (Y-Y Axis)					
Flexural Buckling Stress:	Fcr =	23.36	ksi		
Controlling Equation	F7-1				
Nominal Compressive Strength:	Pc =	125	kip		

Column Bending Calculations per AISC 14th Edition Steel Manual:

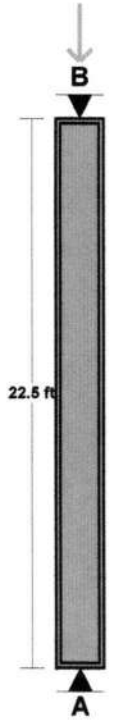
Controlling Load Case: Axial Total Load (D + L)					
Eccentricity Moment:	Mx-ex =	15150	ft-lb	My-ey =	5194 ft-lb
Lateral Moment + Eccentricity:	Mrx =	15150	ft-lb	Mry =	5194 ft-lb
Flange Buckling Ratio:	FBR =	17.06			
Allow. Flange Buckling Ratio:	AFBR =	28.12			
Allow. FBR for Non-Compact:	NC =	35.15			
Web Buckling Ratio:	WBRX =	17.06		WBRY =	0
Allow. WBR for Eqn. F7-5:	AWBR =	60.76			
Nmnl. Flex. Str. w/ Sfty Factor:	Mcx =	50.7	ft-kip	Mcy =	50.7 ft-kip
Controlling Equation	F7-1			F7-1	

Combined Stress Calculations:

H1-1a Controls : 0.78

Controlling Combined Stress Factor: 0.78

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	30496	lb *
Dead Load:	PD =	21447	lb *
Column Self Weight:	CSW =	738	lb
Total Axial Load:	PT =	52681	lb

* Load obtained from Load Tracker. See Summary Report for details.

Project: 22-0690

Location: FTG. @ Typical Column Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 6.75 FT x 6.75 FT x 14.00 IN
Reinforcement: #5 Bars @ 12.00 IN. O.C. E/W / (7) min.
Section Footing Design Adequate

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs = 1500	psf
Concrete Compressive Strength:	F'c = 2500	psi
Reinforcing Steel Yield Strength:	Fy = 60000	psi
Concrete Reinforcement Cover:	c = 3	in

FOOTING SIZE

Width:	W = 6.75	ft
Length:	L = 6.75	ft
Depth:	Depth = 14	in
Effective Depth to Top Layer of Steel:	d = 10.06	in

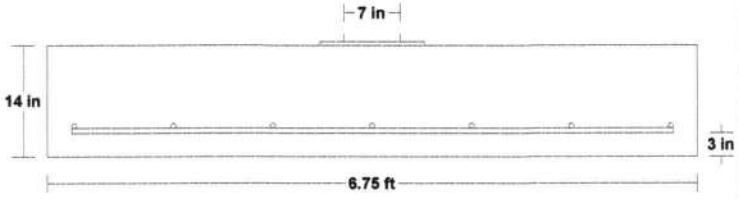
COLUMN AND BASEPLATE SIZE

Column Type:	Steel	
Column Width:	m = 7	in
Column Depth:	n = 7	in
Baseplate Width:	bsw = 13	in
Baseplate Length:	bsl = 13	in

FOOTING CALCULATIONS

Bearing Calculations:			
Ultimate Bearing Pressure:	Qu =	1156	psf
Effective Allowable Soil Bearing Pressure:	Qe =	1325	psf
Required Footing Area:	Areq =	39.76	sf
Area Provided:	A =	45.56	sf
Baseplate Bearing:			
Bearing Required:	Bear =	75416	lb
Allowable Bearing:	Bear-A =	466863	lb
Beam Shear Calculations (One Way Shear):			
Beam Shear:	Vu1 =	23684	lb
Allowable Beam Shear:	Vc1 =	61130	lb
Punching Shear Calculations (Two Way Shear):			
Critical Perimeter:	Bo =	80.25	in
Punching Shear:	Vu2 =	70789	lb
Allowable Punching Shear (ACI 11-35):	vc2-a =	181691	lb
Allowable Punching Shear (ACI 11-36):	vc2-b =	212445	lb
Allowable Punching Shear (ACI 11-37):	vc2-c =	121127	lb
Controlling Allowable Punching Shear:	vc2 =	121127	lb
Bending Calculations:			
Factored Moment:	Mu =	586682	in-lb
Nominal Moment Strength:	Mn =	1122982	in-lb
Reinforcement Calculations:			
Concrete Compressive Block Depth:	a =	0.75	in
Steel Required Based on Moment:	As(1) =	1.10	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	2.04	in2
Controlling Reinforcing Steel:	As-reqd =	2.04	in2
Selected Reinforcement:	#5's @ 12.0 in. o.c. e/w (7) Min.		
Reinforcement Area Provided:	As =	2.15	in2
Development Length Calculations:			
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	32.5	in

LOADING DIAGRAM



FOOTING LOADING

Live Load:	PL = 30496	lb *
Dead Load:	PD = 22185	lb *
Total Load:	PT = 52681	lb *
Ultimate Factored Load:	Pu = 75416	lb
Footing plus soil above footing weight:	Wt = 7708	lb

* Load obtained from Load Tracker. See Summary Report for details.

Baseplate Design

HSS 8X4 : Load = 22,559 lbs (Try 14" x 9" Plate)

$$t_p = L\sqrt{\frac{3.33\,P_q}{F_y \cdot B \cdot N}}$$

$$= 3.25\sqrt{\frac{3.33\,(22.56K)}{(36KSI)(14")(9")}} = .42$$

$\therefore$ 3/4" O.K.

HSS 7X7 : Load = 52.68K (Try 13" x 13" Plate)

$$t_p = 3.25\sqrt{\frac{3.33\,(52.68K)}{(36KSI)(13")(13")}} = .55$$

$\therefore$ 3/4" O.K.

Pilaster Ftg's

14'-0" Main opening (32" Pilaster)

SL = 596plf x "L" + 596plf (7') = 596 (L) + 4172

DL = 477plf (L) + 477 (7') + 88psf (15') (7')
+ 88psf (25') (L)

= 12,579 lbs + 2,677 (L)

Try L = 4' (Ftg Length = 5'-4") (16" of Ftg Is in opening)

SL = 6556 lbs

DL = 23287 lbs

Project: 22-0690

Location: Typical Pilaster Footing (1500)
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 4.25 FT x 5.33 FT x 12.00 IN
Reinforcement in Long Direction: #5 Bars @ 14.00 IN. O.C. / (4) min.
Reinforcement in Short Direction-center band (Equal to width of short side): #5 Bars @ 14.00 IN. O.C. / (5) min.
Reinforcement in Short Direction-outside bands: #5 Bars @ 0.00 IN. O.C. / () Each band.
Section Footing Design Adequate

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs = 1500	psf
Concrete Compressive Strength:	F'c = 2500	psi
Reinforcing Steel Yield Strength:	Fy = 60000	psi
Concrete Reinforcement Cover:	c = 3	in

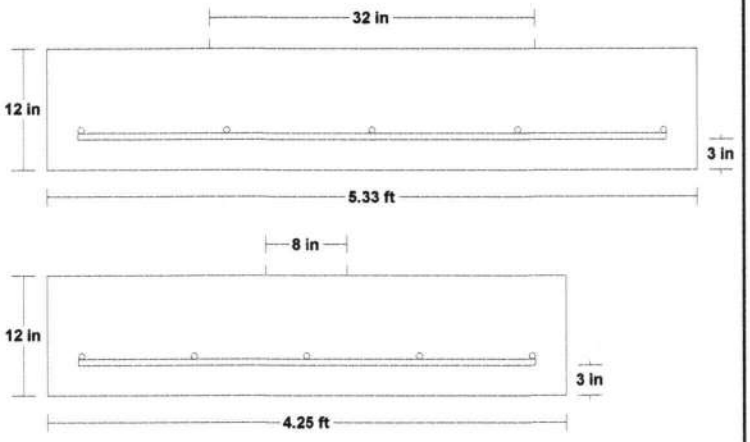
FOOTING SIZE

Width:	W = 4.25	ft
Length:	L = 5.33	ft
Depth:	Depth = 12	in
Effective Depth to Top Layer of Steel:	d = 8.06	in

COLUMN AND BASEPLATE SIZE

Column Type:	Concrete	
Column Width:	m = 8	in
Column Depth:	n = 32	in

LOADING DIAGRAM



FOOTING CALCULATIONS

Bearing Calculations:			
Ultimate Bearing Pressure:	Qu =	1317	psf
Effective Allowable Soil Bearing Pressure:	Qe =	1350	psf
Required Footing Area:	Areq =	22.11	sf
Area Provided:	A =	22.65	sf
Baseplate Bearing:			
Bearing Required:	Bear =	38434	lb
Allowable Bearing:	Bear-A =	707200	lb
Beam Shear Calculations (One Way Shear):			
Beam Shear:	Vu1 =	10127	lb
Allowable Beam Shear:	Vc1 =	38676	lb
Punching Shear Calculations (Two Way Shear):			
Critical Perimeter:	Bo =	112.25	in
Punching Shear:	Vu2 =	30852	lb
Allowable Punching Shear (ACI 11-35):	vc2-a =	101814	lb
Allowable Punching Shear (ACI 11-36):	vc2-b =	165382	lb
Allowable Punching Shear (ACI 11-37):	vc2-c =	135752	lb
Controlling Allowable Punching Shear:	vc2 =	101814	lb

FOOTING LOADING

Live Load:	PL = 6556	lb
Dead Load:	PD = 23287	lb
Total Load:	PT = 29843	lb
Ultimate Factored Load:	Pu = 38434	lb
Footing plus soil above footing weight:	Wt = 3285	lb

Short Direction:

Bending Calculations:			
Factored Moment:	Mu =	174178	in-lb
Nominal Moment Strength:	Mn =	639500	in-lb
Reinforcement Calculations:			
Concrete Compressive Block Depth:	a =	0.68	in
Steel Required Based on Moment:	As(1) =	0.40	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	1.38	in2
Controlling Reinforcing Steel:	As-reqd =	1.38	in2
Selected Reinforcement:	Short Dir: #5's @ 14.0 in. o.c.(5) Min.		
Reinforcement Area Provided:	As =	1.53	in2
Development Length Calculations:			
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	18.5	in

Long Direction:

Bending Calculations:			
Factored Moment:	Mu =	76724	in-lb
Nominal Moment Strength:	Mn =	511774	in-lb
Reinforcement Calculations:			
Concrete Compressive Block Depth:	a =	0.68	in
Steel Required Based on Moment:	As(1) =	0.18	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	1.1	in2
Controlling Reinforcing Steel:	As-reqd =	1.1	in2
Selected Reinforcement:	Long Dir: #5's @ 14.0 in. o.c.(4) Min.		
Reinforcement Area Provided:	As =	1.23	in2
Development Length Calculations:			
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	12.98	in

Loads on Cont ftg's

Front Wall Ftg (worst case):

SL = 595 plf + .5(7.4')(30psf) = 706 plf
DL = 477 plf
Wall = 2,200 plf

Side walls:

SL = 180 plf
DL = 57 plf
Wall = 2,200 plf

Back wall ftg.

SL = 25psf (15.5') = 388plf
DL = 20 psf (15.5') = 310plf
Wall = 2,200plf

Project: 22-0690

Location: Front Wall (Worst Case) (2000)
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 27.0 IN Wide x 12.0 IN Deep Continuous Footing With 8.0 IN Thick x 16.0 IN Tall Stemwall
LongitudinalReinforcement: (2) Continuous #5 Bars
TransverseReinforcement: #5 Bars @ 14.00 IN. O.C. (unnecessary)
Section Footing Design Adequate

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs = 2000	psf
Concrete Compressive Strength:	F'c = 2500	psi
Reinforcing Steel Yield Strength:	Fy = 60000	psi
Concrete Reinforcement Cover:	c = 3	in

FOOTING SIZE

Width:	W = 27	in
Depth:	Depth = 12	in
Effective Depth to Top Layer of Steel:	d = 8.06	in

STEMWALL SIZE

Stemwall Width:	8 in
Stemwall Height:	16 in
Stemwall Weight:	150 pcf

FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure:	Qu = 1563	psf
Effective Allowable Soil Bearing Pressure:	Qe = 1850	psf
Width Required:	Wreq = 1.9	ft

Beam Shear Calculations (One Way Shear):

Beam Shear:	Vu1 = 240	lb
Allowable Beam Shear:	Vc1 = 7256	lb

Transverse Direction:

Bending Calculations:

Factored Moment:	Mu = 11026	in-lb
Nominal Moment Strength:	Mn = 0	in-lb

Reinforcement Calculations:

Concrete Compressive Block Depth:	a = 0.61	in
Steel Required Based on Moment:	As(1) = 0.03	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4)	As(2) = 0.26	in2
Controlling Reinforcing Steel:	As-reqd = 0.26	in2
Selected Reinforcement:	Trans: #5's @ 14.0 in. o.c.	
Reinforcement Area Provided:	As = 0.26	in2

Development Length Calculations:

Development Length Required:	Ld = 15	in
Development Length Supplied:	Ld-sup = 8.5	in

Longitudinal Direction:

Reinforcement Calculations:

Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) = 0.58	in2
Controlling Reinforcing Steel:	As-reqd = 0.58	in2
Selected Reinforcement:	Longitudinal: (2) Cont. #5 Bars	
Reinforcement Area Provided:	As = 0.61	in2

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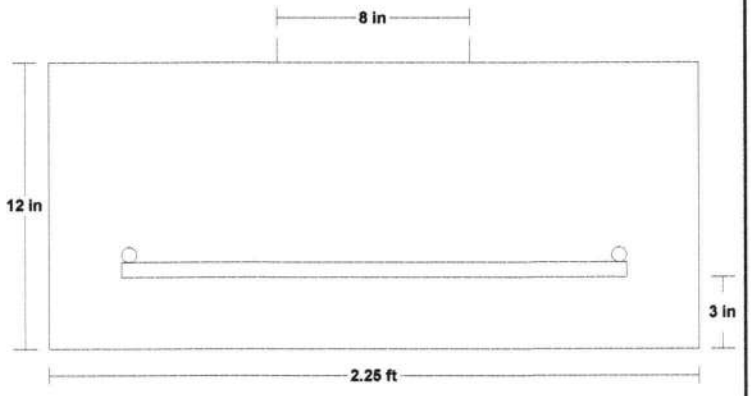

FOOTING LOADING

Live Load:	PL = 706	plf
Dead Load:	PD = 2677	plf
Total Load:	PT = 3516	plf
Ultimate Factored Load:	Pu = 4502	plf

Project: 22-0690

Location: Side Wall (2000)
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 24.0 IN Wide x 12.0 IN Deep Continuous Footing With 8.0 IN Thick x 16.0 IN Tall Stemwall
LongitudinalReinforcement: (2) Continuous #5 Bars
TransverseReinforcement: #5 Bars @ 14.00 IN. O.C. (unnecessary)
Section Footing Design Adequate

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs = 2000	psf
Concrete Compressive Strength:	F'c = 2500	psi
Reinforcing Steel Yield Strength:	Fy = 60000	psi
Concrete Reinforcement Cover:	c = 3	in

FOOTING SIZE

Width:	W = 24	in
Depth:	Depth = 12	in
Effective Depth to Top Layer of Steel:	d = 8.06	in

STEMWALL SIZE

Stemwall Width:	8 in
Stemwall Height:	16 in
Stemwall Weight:	150 pcf

FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure:	Qu = 1285	psf
Effective Allowable Soil Bearing Pressure:	Qe = 1850	psf
Width Required:	Wreq = 1.39	ft

Beam Shear Calculations (One Way Shear):

Beam Shear:	Vu1 = 0	lb
Allowable Beam Shear:	Vc1 = 7256	lb

Transverse Direction:

Bending Calculations:

Factored Moment:	Mu = 6972	in-lb
Nominal Moment Strength:	Mn = 0	in-lb

Reinforcement Calculations:

Concrete Compressive Block Depth:	a = 0.61	in
Steel Required Based on Moment:	As(1) = 0.02	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4)	As(2) = 0.26	in2
Controlling Reinforcing Steel:	As-reqd = 0.26	in2
Selected Reinforcement:	Trans: #5's @ 14.0	in. o.c.
Reinforcement Area Provided:	As = 0.26	in2

Development Length Calculations:

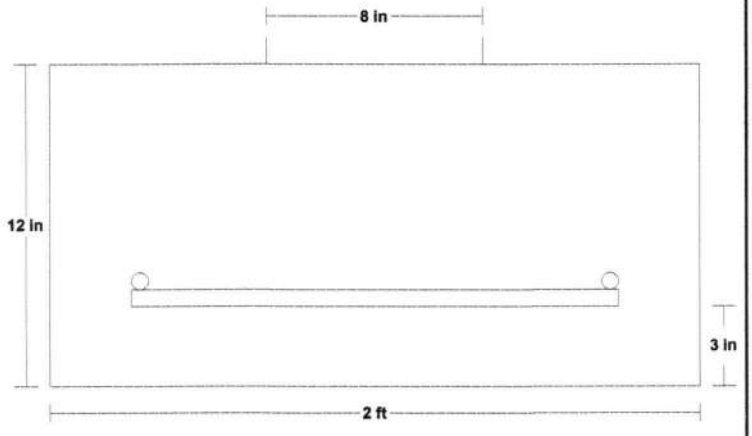
Development Length Required:	Ld = 15	in
Development Length Supplied:	Ld-sup = 7	in

Longitudinal Direction:

Reinforcement Calculations:

Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) = 0.52	in2
Controlling Reinforcing Steel:	As-reqd = 0.52	in2
Selected Reinforcement:	Longitudinal: (2) Cont. #5 Bars	
Reinforcement Area Provided:	As = 0.61	in2

LOADING DIAGRAM



FOOTING LOADING

Live Load:	PL = 180	plf
Dead Load:	PD = 2257	plf
Total Load:	PT = 2570	plf
Ultimate Factored Load:	Pu = 3346	plf

Project: 22-0690

Location: Back Wall (Worst Case) (2000)
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 24.0 IN Wide x 12.0 IN Deep Continuous Footing With 8.0 IN Thick x 16.0 IN Tall Stemwall
LongitudinalReinforcement: (2) Continuous #5 Bars
TransverseReinforcement: #5 Bars @ 14.00 IN. O.C. (unnecessary)
Section Footing Design Adequate

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs = 2000	psf
Concrete Compressive Strength:	F'c = 2500	psi
Reinforcing Steel Yield Strength:	Fy = 60000	psi
Concrete Reinforcement Cover:	c = 3	in

FOOTING SIZE

Width:	W = 24	in
Depth:	Depth = 12	in
Effective Depth to Top Layer of Steel:	d = 8.06	in

STEMWALL SIZE

Stemwall Width:	8	in
Stemwall Height:	16	in
Stemwall Weight:	150	pcf

FOOTING CALCULATIONS

Bearing Calculations:

Ultimate Bearing Pressure:	Qu =	1516	psf
Effective Allowable Soil Bearing Pressure:	Qe =	1850	psf
Width Required:	Wreq =	1.64	ft

Beam Shear Calculations (One Way Shear):

Beam Shear:	Vu1 =	0	lb
Allowable Beam Shear:	Vc1 =	7256	lb

Transverse Direction:

Bending Calculations:

Factored Moment:	Mu =	7902	in-lb
Nominal Moment Strength:	Mn =	0	in-lb

Reinforcement Calculations:

Concrete Compressive Block Depth:	a =	0.61	in
Steel Required Based on Moment:	As(1) =	0.02	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4)	As(2) =	0.26	in2
Controlling Reinforcing Steel:	As-reqd =	0.26	in2
Selected Reinforcement:	Trans: #5's @ 14.0 in. o.c.		
Reinforcement Area Provided:	As =	0.26	in2

Development Length Calculations:

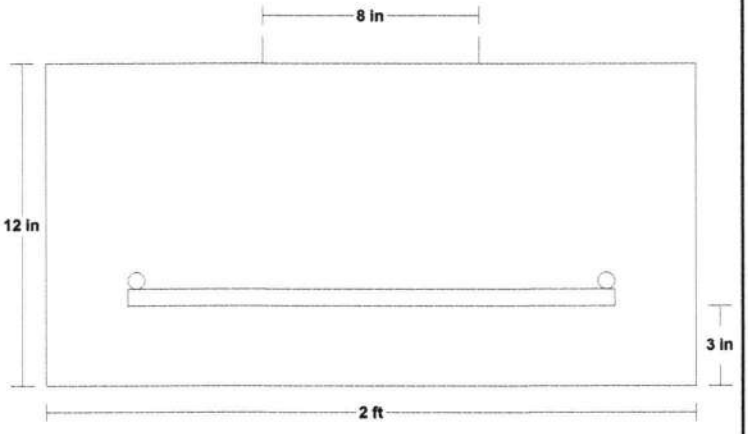
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	7	in

Longitudinal Direction:

Reinforcement Calculations:

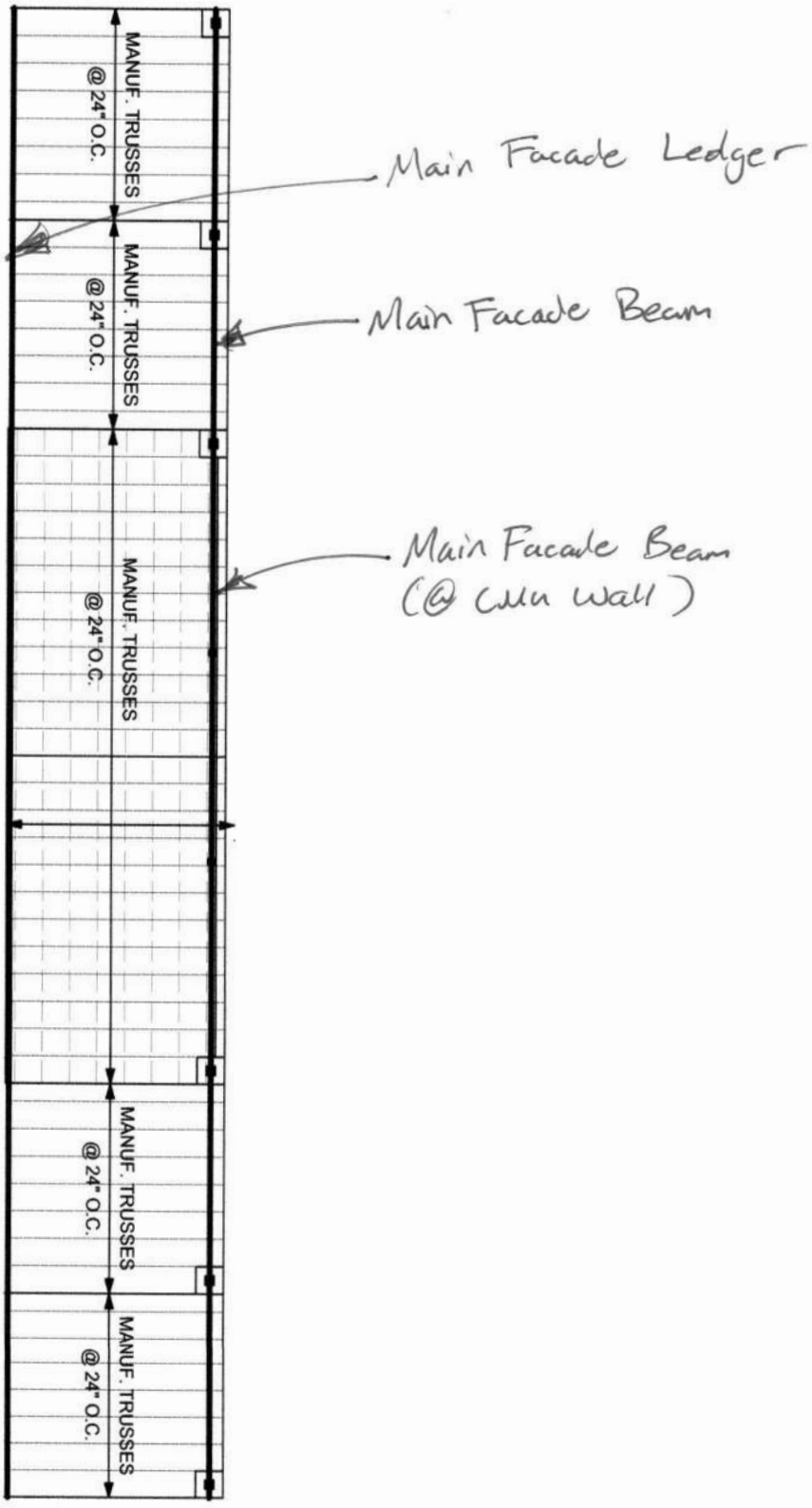
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	0.52	in2
Controlling Reinforcing Steel:	As-reqd =	0.52	in2
Selected Reinforcement:	Longitudinal: (2) Cont. #5 Bars		
Reinforcement Area Provided:	As =	0.61	in2

LOADING DIAGRAM



FOOTING LOADING

Live Load:	PL = 388	plf	
Dead Load:	PD = 2510	plf	
Total Load:	PT = 3031	plf	
Ultimate Factored Load:	Pu = 3793	plf	


MANUF. TRUSSES @ 24" O.C.
MANUF. TRUSSES @ 24" O.C.
MANUF. TRUSSES @ 24" O.C.
MANUF. TRUSSES @ 24" O.C.
MANUF. TRUSSES @ 24" O.C.
Main Facade Ledger
Main Facade Beam
Main Facade Beam
(@ CMU Wall)

Project: 22-0690

Location: Snow Drift @ Facade Beam (For Loads)
Multi-Loaded Multi-Span Beam
[2015 International Building Code(2015 NDS)]
1.5 IN x 3.5 IN x 16.0 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Inadequate By: 189.2%
Controlling Factor: Deflection / Depth Required 4.99 In.

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DEFLECTIONS	Center
Live Load	1.54 IN L/124
Dead Load	0.20 in
Total Load	1.74 IN L/111

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240

REACTIONS	A	B
Live Load	140 lb	34 lb
Dead Load	9 lb	9 lb
Total Load	149 lb	43 lb
Bearing Length	0.16 in	0.05 in

BEAM DATA	Center
Span Length	16 ft
Unbraced Length-Top	0 ft
Unbraced Length-Bottom	16 ft
Live Load Duration Factor	1.00
Notch Depth	0.00

MATERIAL PROPERTIES
#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 900 psi	Fb' = 1350 psi
	Cd=1.00 CF=1.50	
Shear Stress:	Fv = 180 psi	Fv' = 180 psi
	Cd=1.00	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 625 psi	Fc - ⊥' = 625 psi

Controlling Moment: 353 ft-lb
5.44 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: 143 lb
At a distance d from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	3.14 in3	3.06 in3
Area (Shear):	1.19 in2	5.25 in2
Moment of Inertia (deflection):	15.5 in4	5.36 in4
Moment:	353 ft-lb	345 ft-lb
Shear:	143 lb	630 lb

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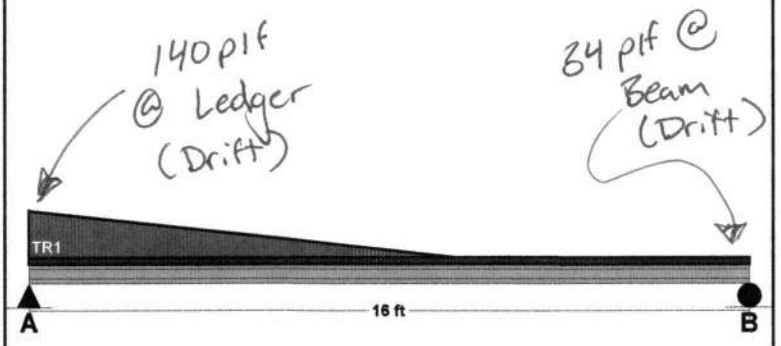

UNIFORM LOADS	Center
Uniform Live Load	0 plf
Uniform Dead Load	0 plf
Beam Self Weight	1 plf
Total Uniform Load	1 plf

TRAPEZOIDAL LOADS - CENTER SPAN	
Load Number	One
Left Live Load	36.6 plf
Left Dead Load	0 plf
Right Live Load	0 plf
Right Dead Load	0 plf
Load Start	0 ft
Load End	9.5 ft
Load Length	9.5 ft

LOADS ON FAÇADE BEAMS/LEDGERS

MAIN FAÇADE BEAM:

L=15'-4"
SL=25psf*8' + 34plf (DRIFT) = 234plf
DL=20psf*8' + 12psf*10' = 280plf

MAIN FAÇADE BEAM (@ CMU WALL):

L=7'-8"
SL=25psf*8' + 34plf (DRIFT) = 234plf
DL=20psf*8' + 12psf*21' = 412plf

FAÇADE LEDGER (WORST CASE):

SL=25psf*8' + 140plf (DRIFT) = 340plf
DL=20psf*8' + 8psf*21' = 328plf
TOTAL = 668plf

TRY 3/4" ANCHOR BOLTS @ 12" O.C.
CAP = 780(1.15) = 897lb/Anchor
897plf > 668plf THEREFORE O.K.

*USE P.T. 4X12 MIN. LEDGER W/ 3/4"
TITEN HD'S @ 12" O.C. (STAGGERED)
(MIN. EMBED = 6")

Project: 22-0690

Location: Main Facade Beam
Multi-Loaded Multi-Span Beam
[2015 International Building Code(2015 NDS)]
5.5 IN x 12.0 IN x 15.33 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 95.6%
Controlling Factor: Moment

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DEFLECTIONS	Center	
Live Load	0.20	IN L/902
Dead Load	0.26	in
Total Load	0.46	IN L/400

Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/120

REACTIONS	A	B
Live Load	1794 lb	1794 lb
Dead Load	2256 lb	2256 lb
Total Load	4050 lb	4050 lb
Bearing Length	1.13 in	1.13 in

BEAM DATA	Center
Span Length	15.33 ft
Unbraced Length-Top	0 ft
Unbraced Length-Bottom	15.33 ft
Live Load Duration Factor	1.15
Camber Adj. Factor	1.5
Camber Required	0.38
Notch Depth	0.00

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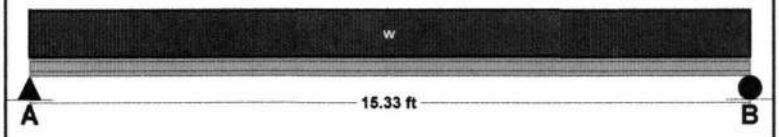

UNIFORM LOADS	Center
Uniform Live Load	234 plf
Uniform Dead Load	280 plf
Beam Self Weight	14 plf
Total Uniform Load	528 plf

MATERIAL PROPERTIES
24F-V4 - Visually Graded Western Species

	Base Values		Adjusted	
Bending Stress:	Fb =	2400 psi	*Controlled by:*	
	Fb_cmpr =	1850 psi	Fb' =	2760 psi
	Cd=1.15			
Shear Stress:	Fv =	265 psi	Fv' =	305 psi
	Cd=1.15			
Modulus of Elasticity:	E =	1800 ksi	E' =	1800 ksi
Comp. ⊥ to Grain:	Fc - ⊥ =	650 psi	Fc - ⊥' =	650 psi

Controlling Moment: 15520 ft-lb
7.66 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: -3564 lb
At a distance d from right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	67.48 in3	132 in3
Area (Shear):	17.54 in2	66 in2
Moment of Inertia (deflection):	237.88 in4	792 in4
Moment:	15520 ft-lb	30360 ft-lb
Shear:	-3564 lb	13409 lb

Project: 22-0690

Location: Main Facade Beam (@ CMU Wall)
Multi-Loaded Multi-Span Beam
[2015 International Building Code(2015 NDS)]
5.5 IN x 12.0 IN x 7.67 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 443.7%
Controlling Factor: Moment

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DEFLECTIONS	Center	
Live Load	0.01	IN L/7202
Dead Load	0.02	in
Total Load	0.04	IN L/2552

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240

REACTIONS	A	B
Live Load	897 lb	897 lb
Dead Load	1635 lb	1635 lb
Total Load	2532 lb	2532 lb
Bearing Length	0.71 in	0.71 in

BEAM DATA	Center
Span Length	7.67 ft
Unbraced Length-Top	0 ft
Unbraced Length-Bottom	7.67 ft
Live Load Duration Factor	1.00
Camber Adj. Factor	1.5
Camber Required	0.03
Notch Depth	0.00

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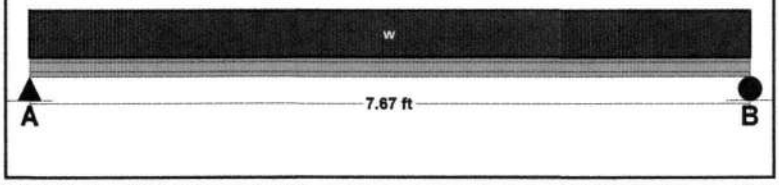


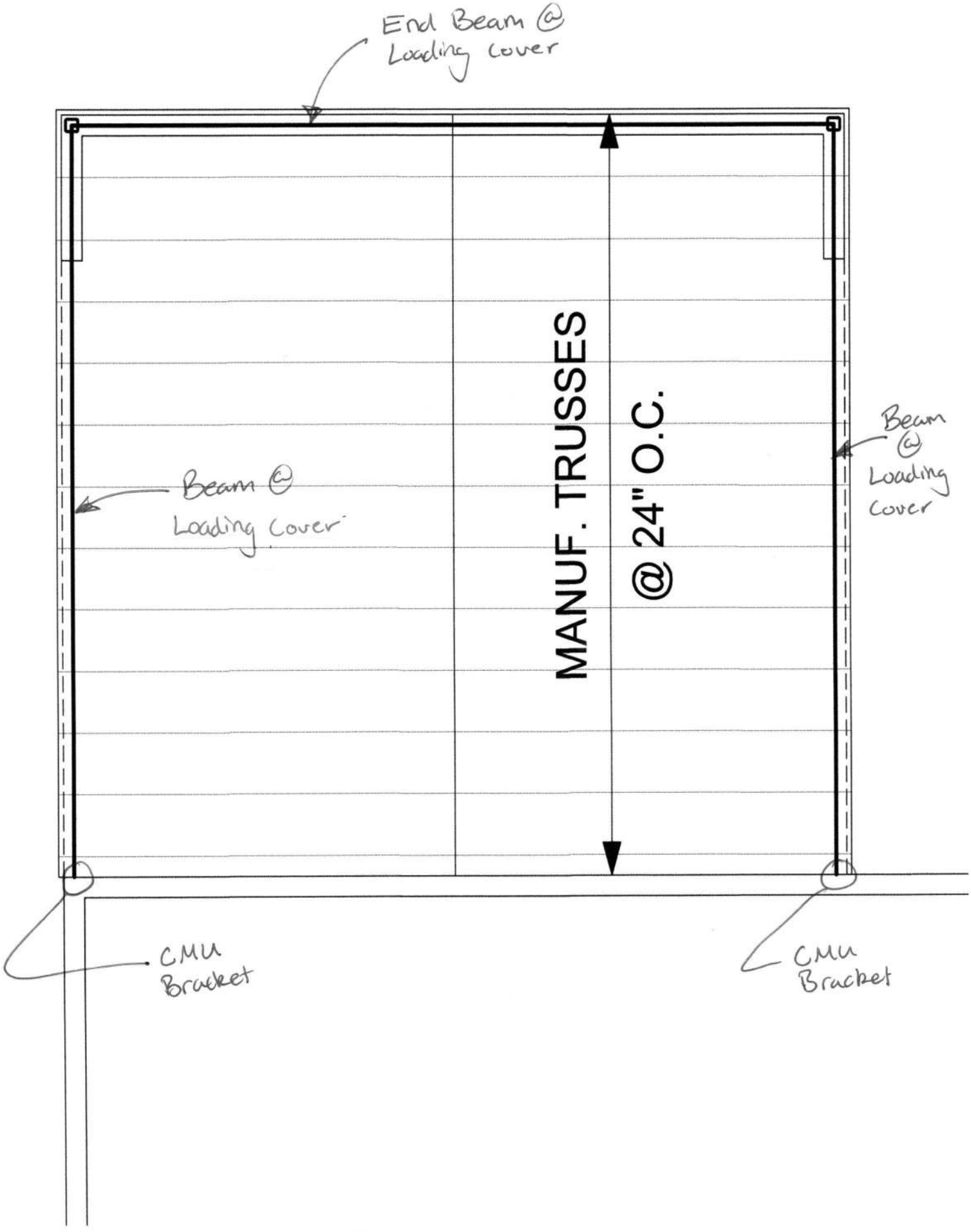
UNIFORM LOADS	Center
Uniform Live Load	234 plf
Uniform Dead Load	412 plf
Beam Self Weight	14 plf
Total Uniform Load	660 plf

MATERIAL PROPERTIES
24F-V4 - Visually Graded Western Species

	Base Values		Adjusted	
Bending Stress:	Fb =	2400 psi	*Controlled by:*	
	Fb_cmpr =	1850 psi	Fb' =	2400 psi
	Cd=1.00			
Shear Stress:	Fv =	265 psi	Fv' =	265 psi
	Cd=1.00			
Modulus of Elasticity:	E =	1800 ksi	E' =	1800 ksi
Comp. ⊥ to Grain:	Fc - ⊥ =	650 psi	Fc - ⊥' =	650 psi

Controlling Moment: 4856 ft-lb
3.84 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: 1874 lb
At a distance d from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	24.28 in3	132 in3
Area (Shear):	10.61 in2	66 in2
Moment of Inertia (deflection):	74.47 in4	792 in4
Moment:	4856 ft-lb	26400 ft-lb
Shear:	1874 lb	11660 lb


End Beam @ Loading Cover
MANUF. TRUSSES @ 24" O.C.
Beam @ Loading Cover
Beam @ Loading Cover
CMU Bracket
CMU Bracket

Project: 22-0690

Location: Ftg. @ Facade Beam
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 3.5 FT x 3.5 FT x 12.00 IN
Reinforcement: #5 Bars @ 17.00 IN. O.C. E/W / (3) min.
Section Footing Design Adequate

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs =	1500 psf
Concrete Compressive Strength:	F'c =	2500 psi
Reinforcing Steel Yield Strength:	Fy =	60000 psi
Concrete Reinforcement Cover:	c =	3 in

FOOTING SIZE

Width:	W =	3.5 ft
Length:	L =	3.5 ft
Depth:	Depth =	12 in
Effective Depth to Top Layer of Steel:	d =	8.06 in

COLUMN AND BASEPLATE SIZE

Column Type:	Masonry
Column Width:	m = 24 in
Column Depth:	n = 24 in

FOOTING CALCULATIONS

Bearing Calculations:			
Ultimate Bearing Pressure:	Qu =	1094	psf
Effective Allowable Soil Bearing Pressure:	Qe =	1350	psf
Required Footing Area:	Areq =	9.93	sf
Area Provided:	A =	12.25	sf
Baseplate Bearing:			
Bearing Required:	Bear =	17515	lb
Allowable Bearing:	Bear-A =	1591200	lb
Beam Shear Calculations (One Way Shear):			
Beam Shear:	Vu1 =	391	lb
Allowable Beam Shear:	Vc1 =	25397	lb
Punching Shear Calculations (Two Way Shear):			
Critical Perimeter:	Bo =	128.25	in
Punching Shear:	Vu2 =	7308	lb
Allowable Punching Shear (ACI 11-35):	vc2-a =	232654	lb
Allowable Punching Shear (ACI 11-36):	vc2-b =	175057	lb
Allowable Punching Shear (ACI 11-37):	vc2-c =	155102	lb
Controlling Allowable Punching Shear:	vc2 =	155102	lb
Bending Calculations:			
Factored Moment:	Mu =	46916	in-lb
Nominal Moment Strength:	Mn =	385150	in-lb
Reinforcement Calculations:			
Concrete Compressive Block Depth:	a =	0.62	in
Steel Required Based on Moment:	As(1) =	0.11	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	0.91	in2
Controlling Reinforcing Steel:	As-reqd =	0.91	in2
Selected Reinforcement:	#5's @ 17.0 in. o.c. e/w (3) Min.		
Reinforcement Area Provided:	As =	0.92	in2
Development Length Calculations:			
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	12	in

Note: Plain concrete adequate for bending, therefore adequate development length not required.

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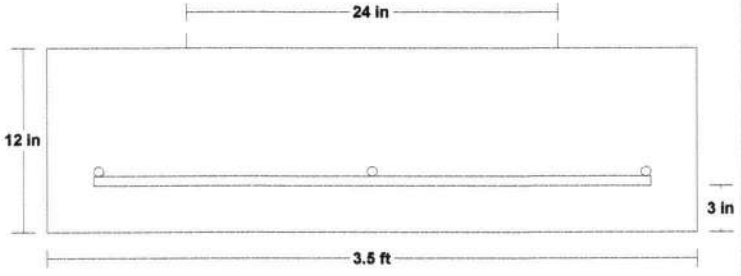

FOOTING LOADING

Live Load:	PL =	3588 lb *
Dead Load:	PD =	9812 lb *
Total Load:	PT =	13400 lb *
Ultimate Factored Load:	Pu =	17515 lb
Footing plus soil above footing weight:	Wt =	1776 lb

* Load obtained from Load Tracker. See Summary Report for details.

Project: 22-0690

Location: Beam @ Loading Cover
Multi-Loaded Multi-Span Beam
[2015 International Building Code(2015 NDS)]
5.5 IN x 19.5 IN x 24.33 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 72.3%
Controlling Factor: Moment

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DEFLECTIONS	Center
Live Load	0.48 IN L/604
Dead Load	0.28 in
Total Load	0.76 IN L/383

Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180

REACTIONS	A	B
Live Load	5847 lb	4196 lb
Dead Load	2631 lb	2631 lb
Total Load	8478 lb	6827 lb
Bearing Length	2.37 in	1.91 in

BEAM DATA	Center
Span Length	24.33 ft
Unbraced Length-Top	0 ft
Unbraced Length-Bottom	24.33 ft
Live Load Duration Factor	1.15
Camber Adj. Factor	1
Camber Required	0.28
Notch Depth	0.00

MATERIAL PROPERTIES
24F-V4 - Visually Graded Western Species

	Base Values	Adjusted
Bending Stress:	Fb = 2400 psi	*Controlled by:*
	Fb_cmpr = 1850 psi	Fb' = 2573 psi
	Cd=1.15 Cv=0.93	
Shear Stress:	Fv = 265 psi	Fv' = 305 psi
	Cd=1.15	
Modulus of Elasticity:	E = 1800 ksi	E' = 1800 ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 650 psi	Fc - ⊥' = 650 psi

Controlling Moment: 43366 ft-lb
11.68 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: 7060 lb
At a distance d from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	202.28 in3	348.56 in3
Area (Shear):	34.75 in2	107.25 in2
Moment of Inertia (deflection):	1595.98 in4	3398.48 in4
Moment:	43366 ft-lb	74725 ft-lb
Shear:	7060 lb	21790 lb

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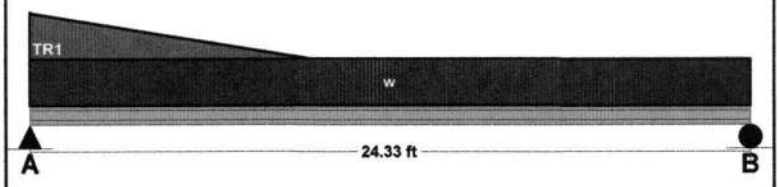

UNIFORM LOADS	Center
Uniform Live Load	321 plf
Uniform Dead Load	193 plf
Beam Self Weight	23 plf
Total Uniform Load	537 plf

TRAPEZOIDAL LOADS - CENTER SPAN	
Load Number	One
Left Live Load	470 plf
Left Dead Load	0 plf
Right Live Load	0 plf
Right Dead Load	0 plf
Load Start	0 ft
Load End	9.5 ft
Load Length	9.5 ft

* ECCOQ6-SDS2.5 Cap = 12K ∴ O.K. (@ "B")

* Custom Bracket similar to HGUM w/ (12) 5/8" Anchors @ "A"

Project: 22-0690

Location: End Beam @ Loading Cover
Multi-Loaded Multi-Span Beam
[2015 International Building Code(2015 NDS)]
5.5 IN x 12.0 IN x 24.67 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 198.4%
Controlling Factor: Deflection

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DEFLECTIONS	Center	
Live Load	0.29	IN L/1013
Dead Load	0.26	in
Total Load	0.55	IN L/537

Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180

REACTIONS	A	B
Live Load	617 lb	617 lb
Dead Load	547 lb	547 lb
Total Load	1164 lb	1164 lb
Bearing Length	0.33 in	0.33 in

BEAM DATA	Center
Span Length	24.67 ft
Unbraced Length-Top	0 ft
Unbraced Length-Bottom	24.67 ft
Live Load Duration Factor	1.15
Camber Adj. Factor	1
Camber Required	0.26
Notch Depth	0.00

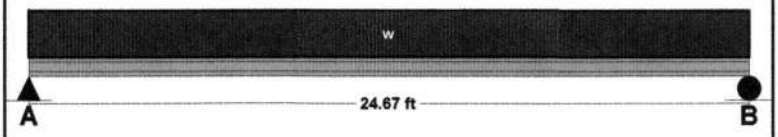
MATERIAL PROPERTIES
24F-V4 - Visually Graded Western Species

	Base Values		Adjusted	
Bending Stress:	Fb =	2400 psi	*Controlled by:*	
	Fb_cmpr =	1850 psi	Fb' =	2697 psi
	Cd=1.15 Cv=0.98			
Shear Stress:	Fv =	265 psi	Fv' =	305 psi
	Cd=1.15			
Modulus of Elasticity:	E =	1800 ksi	E' =	1800 ksi
Comp. ⊥ to Grain:	Fc - ⊥ =	650 psi	Fc - ⊥' =	650 psi

Controlling Moment: 7174 ft-lb
12.34 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: 1070 lb
At a distance d from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	31.92 in3	132 in3
Area (Shear):	5.27 in2	66 in2
Moment of Inertia (deflection):	265.45 in4	792 in4
Moment:	7174 ft-lb	29665 ft-lb
Shear:	1070 lb	13409 lb

LOADING DIAGRAM



UNIFORM LOADS	Center	
Uniform Live Load	50	plf
Uniform Dead Load	30	plf
Beam Self Weight	14	plf
Total Uniform Load	94	plf

Project: 22-0690

Location: Column @ Loading Cover Beam
Column
[2015 International Building Code(AISC 14th Ed ASD)]
HSS 4 x 4 x 3/16 x 10.0 FT /ASTM A500-GR.B-46
Section Adequate By: 77.3%

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VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	4813	lb
Dead Load:	Vert-DL-Rxn =	3272	lb
Total Load:	Vert-TL-Rxn =	8085	lb

COLUMN DATA

Total Column Length:	10	ft
Unbraced Length (X-Axis) Lx:	10	ft
Unbraced Length (Y-Axis) Ly:	10	ft
Column End Condition-K (e):	1	
Load Eccentricity (X-Axis) - ex:	0.9	in
Load Eccentricity (Y-Axis) - ey:	0.9	in

COLUMN PROPERTIES

HSS 4 x 4 x 3/16 - Square

Steel Yield Strength:	Fy =	46	ksi		
Modulus of Elasticity:	E =	29000	ksi		
Column Section:	dx =	4	in	dy =	4 in
Column Wall Thickness:	t =	0.174	in		
Area:	A =	2.58	in		
Moment of Inertia (deflection):	Ix =	6.21	in4	Iy =	6.21 in4
Section Modulus:	Sx =	3.1	in3	Sy =	3.1 in3
Plastic Section Modulus:	Zx =	3.67	in3	Zy =	3.67 in3
Rad. of Gyration:	rx =	1.55	in	ry =	1.55 in

Column Compression Calculations:

KL/r Ratio:	KLx/rx =	77.42		KLy/ry =	77.42
Controlling Direction for Compr. Calcs: (Y-Y Axis)					
Flexural Buckling Stress:	Fcr =	30.74	ksi		
Controlling Equation	F7-1				
Nominal Compressive Strength:	Pc =	47	kip		

Column Bending Calculations per AISC 14th Edition Steel Manual:

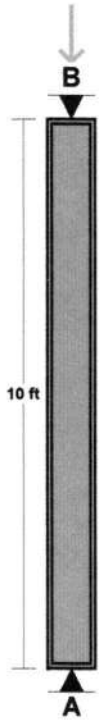
Controlling Load Case: Axial Total Load (D + L)					
Eccentricity Moment:	Mx-ex =	599	ft-lb	My-ey =	599 ft-lb
Lateral Moment + Eccentricity:	Mrx =	599	ft-lb	Mry =	599 ft-lb
Flange Buckling Ratio:	FBR =	19.99			
Allow. Flange Buckling Ratio:	AFBR =	28.12			
Allow. FBR for Non-Compact:	NC =	35.15			
Web Buckling Ratio:	WBRX =	19.99		WBRY =	0
Allow. WBR for Eqn. F7-5:	AWBR =	60.76			
Nmnl. Flex. Str. w/ Sfty Factor:	Mcx =	8.4	ft-kip	Mcy =	8.4 ft-kip
Controlling Equation	F7-1			F7-1	

Combined Stress Calculations:

H1-1b Controls : 0.23

Controlling Combined Stress Factor: 0.23

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	4813	lb *
Dead Load:	PD =	3178	lb *
Column Self Weight:	CSW =	94	lb
Total Axial Load:	PT =	8085	lb

* Load obtained from Load Tracker. See Summary Report for details.

Project: 22-0690

Location: Ftg. @ Loading Cover Column
Footing
[2015 International Building Code(2015 NDS)]
Footing Size: 3.0 FT x 3.0 FT x 12.00 IN
Reinforcement: #5 Bars @ 14.00 IN. O.C. E/W / (3) min.
Section Footing Design Adequate

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FOOTING PROPERTIES

Allowable Soil Bearing Pressure:	Qs =	1500 psf
Concrete Compressive Strength:	F'c =	2500 psi
Reinforcing Steel Yield Strength:	Fy =	60000 psi
Concrete Reinforcement Cover:	c =	3 in

FOOTING SIZE

Width:	W =	3 ft
Length:	L =	3 ft
Depth:	Depth =	12 in
Effective Depth to Top Layer of Steel:	d =	8.06 in

COLUMN AND BASEPLATE SIZE

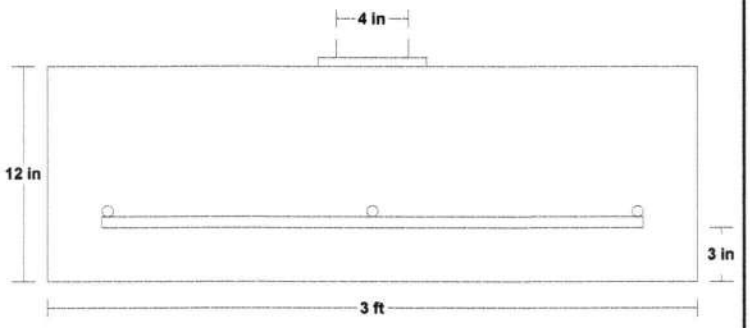
Column Type:	Steel	
Column Width:	m =	4 in
Column Depth:	n =	4 in
Baseplate Width:	bsw =	6 in
Baseplate Length:	bsl =	6 in

FOOTING CALCULATIONS

Bearing Calculations:			
Ultimate Bearing Pressure:	Qu =	898	psf
Effective Allowable Soil Bearing Pressure:	Qe =	1350	psf
Required Footing Area:	Areq =	5.99	sf
Area Provided:	A =	9.00	sf
Baseplate Bearing:			
Bearing Required:	Bear =	11627	lb
Allowable Bearing:	Bear-A =	99450	lb
Beam Shear Calculations (One Way Shear):			
Beam Shear:	Vu1 =	2402	lb
Allowable Beam Shear:	Vc1 =	21769	lb
Punching Shear Calculations (Two Way Shear):			
Critical Perimeter:	Bo =	52.25	in
Punching Shear:	Vu2 =	10096	lb
Allowable Punching Shear (ACI 11-35):	vc2-a =	94785	lb
Allowable Punching Shear (ACI 11-36):	vc2-b =	129101	lb
Allowable Punching Shear (ACI 11-37):	vc2-c =	63190	lb
Controlling Allowable Punching Shear:	vc2 =	63190	lb
Bending Calculations:			
Factored Moment:	Mu =	38798	in-lb
Nominal Moment Strength:	Mn =	382590	in-lb
Reinforcement Calculations:			
Concrete Compressive Block Depth:	a =	0.72	in
Steel Required Based on Moment:	As(1) =	0.09	in2
Min. Code Req'd Reinf. Shrink./Temp. (ACI-10.5.4):	As(2) =	0.78	in2
Controlling Reinforcing Steel:	As-reqd =	0.78	in2
Selected Reinforcement:	#5's @ 14.0 in. o.c. e/w (3) Min.		
Reinforcement Area Provided:	As =	0.92	in2
Development Length Calculations:			
Development Length Required:	Ld =	15	in
Development Length Supplied:	Ld-sup =	12.5	in

Note: Plain concrete adequate for bending, therefore adequate development length not required.

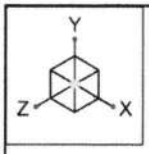
LOADING DIAGRAM

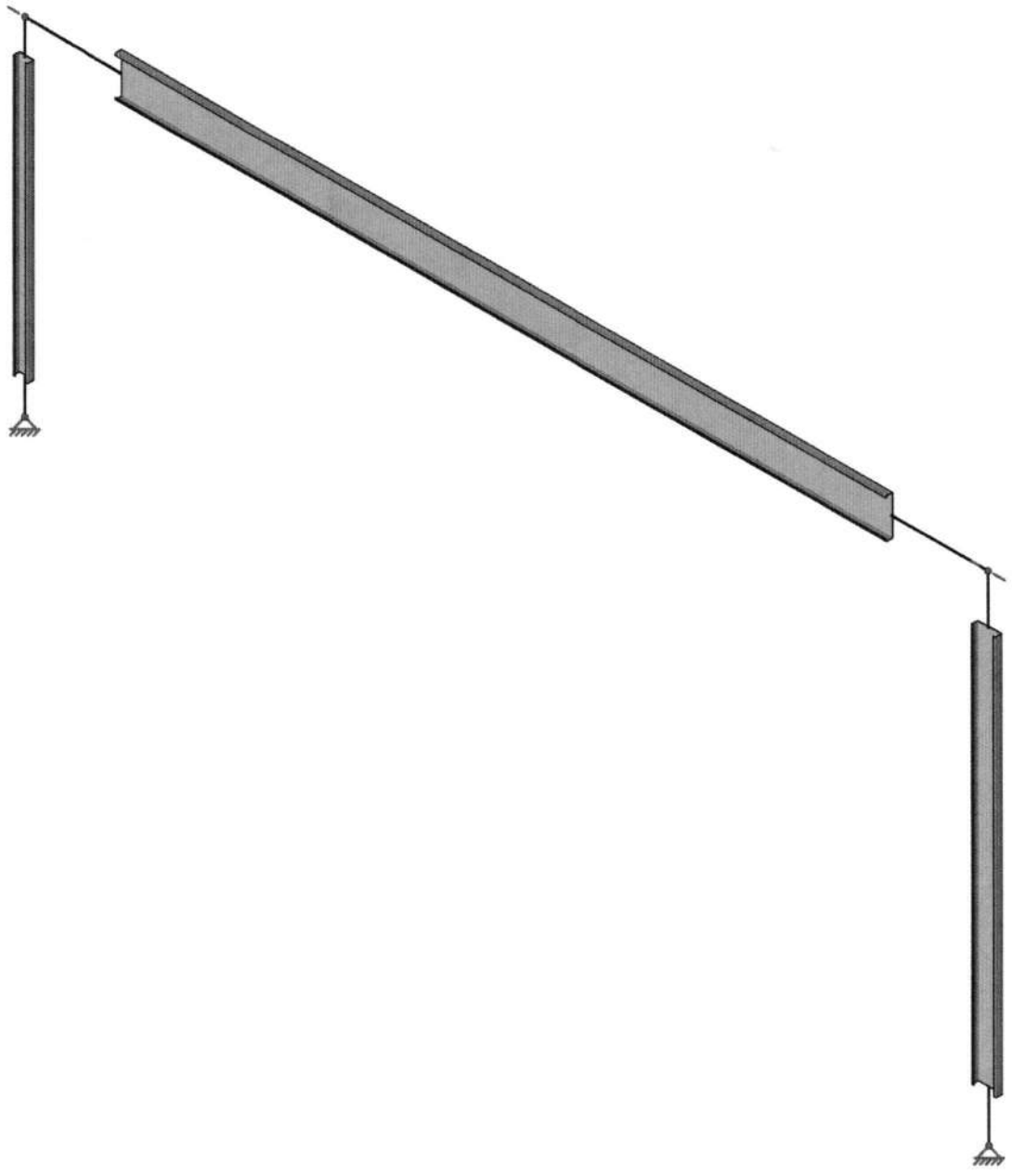


FOOTING LOADING

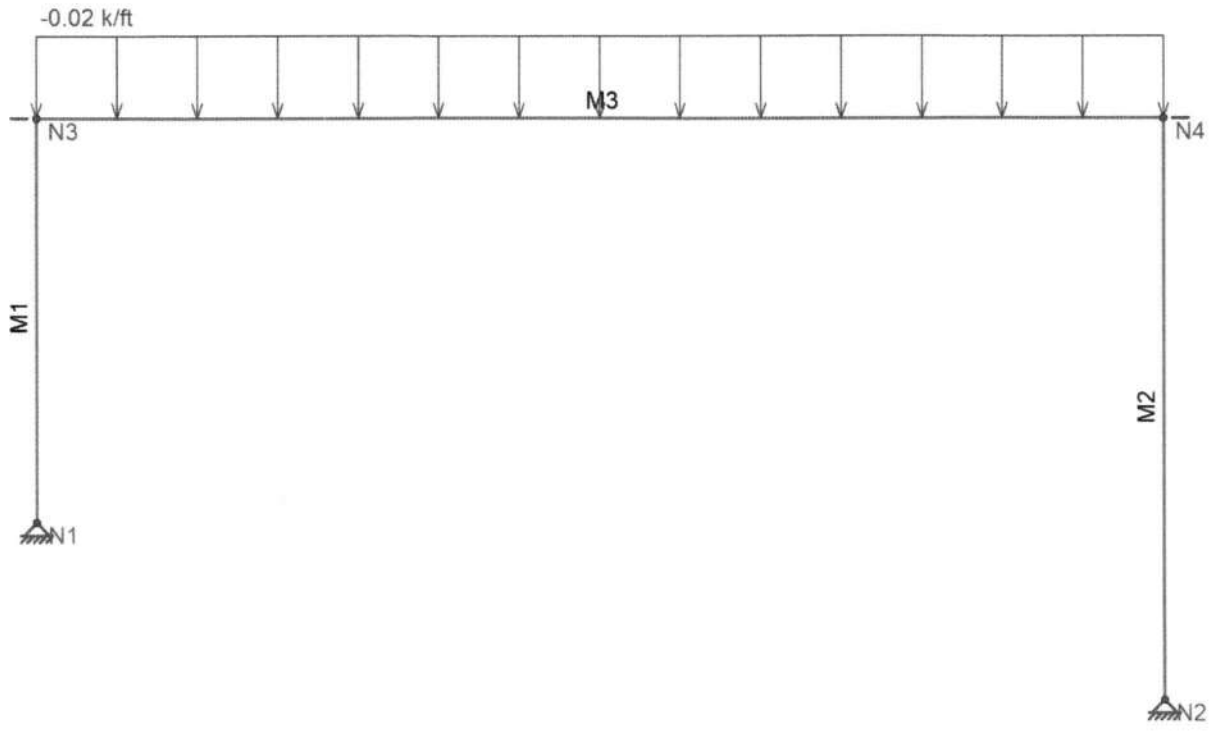
Live Load:	PL =	4813 lb *
Dead Load:	PD =	3272 lb *
Total Load:	PT =	8085 lb *
Ultimate Factored Load:	Pu =	11627 lb
Footing plus soil above footing weight:	Wt =	1305 lb

* Load obtained from Load Tracker. See Summary Report for details.



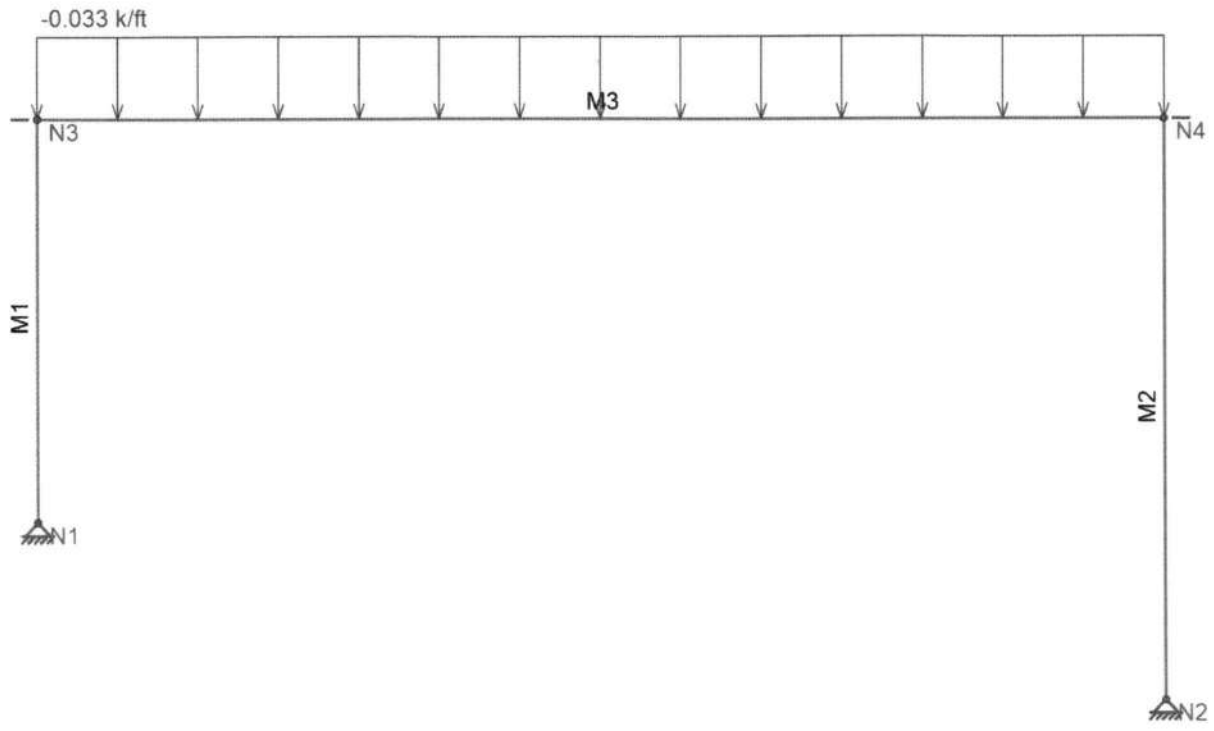


Stability Engineering Inc	Corner Wall Facade	ISOMETRIC1
PS		Dec 19, 2022
22-0690		22-0690 Corner Wall Facade.r3d



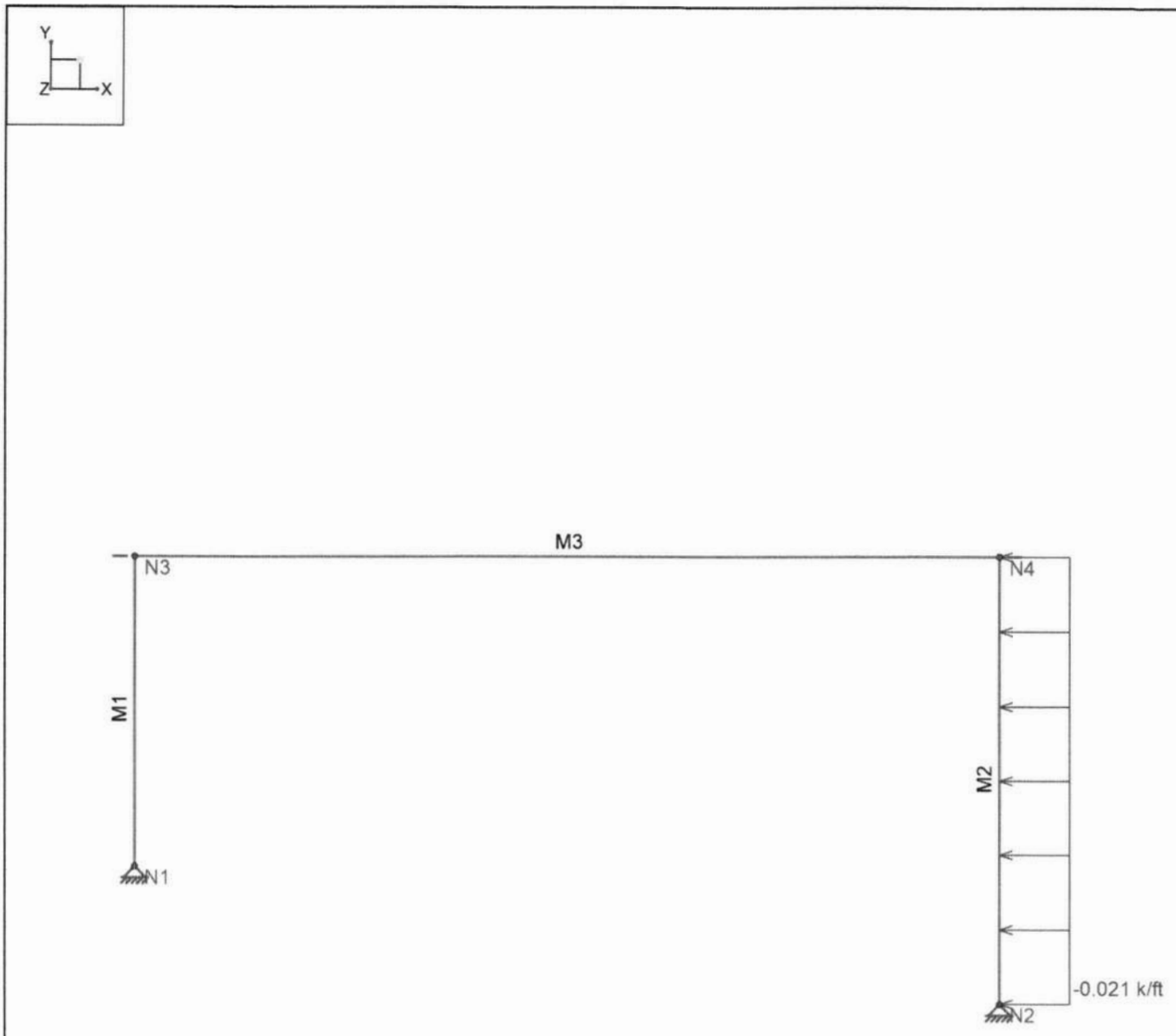
Loads: BLC 1, Dead Load

Stability Engineering Inc	Corner Wall Facade	DEAD LOAD1
PS		Dec 19, 2022
22-0690		22-0690 Corner Wall Facade.r3d



Loads: BLC 2, Snow Load

Stability Engineering Inc	Corner Wall Facade	SNOW LOAD1
PS		Dec 19, 2022
22-0690		22-0690 Corner Wall Facade.r3d



Loads: BLC 3, Wind Load

Stability Engineering Inc	Corner Wall Facade	WIND LOAD1
PS		Dec 19, 2022
22-0690		22-0690 Corner Wall Facade.r3d

Node Coordinates

	Label	X [ft]	Y [ft]	Z [ft]	Detach From Diaphragm
1	N1	0	3.2	0	
2	N2	20	0	0	
3	N3	0	10.4	0	
4	N4	20	10.4	0	

Node Boundary Conditions

	Node Label	X [k/in]	Y [k/in]	Z [k/in]
1	ALL			Fixed
2	N1	Reaction	Reaction	Fixed
3	N2	Reaction	Reaction	Fixed
4	N3	Reaction		
5	N4	Reaction		

Member Primary Data

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
1	M1	N1	N3	Front Facade Stud	VBrace	CS	A653 SS Gr33	Typical
2	M2	N2	N4	Back Facade Wall	VBrace	CS	A653 SS Gr50/1	Typical
3	M3	N3	N4	Facade Rafter	Beam	CS	A653 SS Gr33	Typical

Member Point Loads

No Data to Print...

Member Distributed Loads (BLC 1 : Dead Load)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M3	Y	-0.02	-0.02	0	%100

Member Distributed Loads (BLC 2 : Snow Load)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M3	Y	-0.033	-0.033	0	%100

Member Distributed Loads (BLC 3 : Wind Load)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M2	X	-0.021	-0.021	0	%100

Member Area Loads

No Data to Print...

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	Deflection 1	Yes	Y	DL	1										
2	Deflection 2	Yes	Y	LL	1										
3	Deflection 3	Yes	Y	DL	1	LL	1								
4	ASCE ASD 1	Yes	Y	DL	1										
5	ASCE ASD 2	Yes	Y	DL	1	LL	1	LLS	1						
6	ASCE ASD 3 (a)	Yes	Y	DL	1	RLL	1								

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
7	ASCE ASD 3 (b)	Yes	Y	DL	1	SL	1	SLN	1						
8	ASCE ASD 4 (a)	Yes	Y	DL	1	LL	0.75	LLS	0.75	RLL	0.75				
9	ASCE ASD 4 (b)	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75		
10	ASCE ASD 5 (a) (a)	Yes	Y	DL	1	WL	0.6								
11	ASCE ASD 5 (a) (b)	Yes	Y	DL	1	WL	-0.6								
12	ASCE ASD 6 (a) (a)	Yes	Y	DL	1	WL	0.45	LL	0.75	LLS	0.75	RLL	0.75		
13	ASCE ASD 6 (a) (b)	Yes	Y	DL	1	WL	-0.45	LL	0.75	LLS	0.75	RLL	0.75		
14	ASCE ASD 6 (b) (a)	Yes	Y	DL	1	WL	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
15	ASCE ASD 6 (b) (b)	Yes	Y	DL	1	WL	-0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
16	ASCE ASD 6 (c) (a)	Yes	Y	DL	1	WL	0.45	LL	0.75	LLS	0.75				
17	ASCE ASD 6 (c) (b)	Yes	Y	DL	1	WL	-0.45	LL	0.75	LLS	0.75				
18	ASCE ASD 7 (a)	Yes	Y	DL	0.6	WL	0.6								
19	ASCE ASD 7 (b)	Yes	Y	DL	0.6	WL	-0.6								

Envelope Node Reactions

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	0.055	7	0.553	7	NC	NC	0	19	0	19	0	19
2		min	0	2	0	2	NC	NC	0	1	0	1	0	1
3	N2	max	0.035	18	0.603	7	NC	NC	0	19	0	19	0	19
4		min	-0.107	15	0	2	NC	NC	0	1	0	1	0	1
5	N3	max	0	2	0	19	0	19	0	19	0	19	0	19
6		min	-0.055	7	0	1	0	1	0	1	0	1	0	1
7	N4	max	0.124	14	0	19	0	19	0	19	LOCKED		0	19
8		min	-0.058	19	0	1	0	1	0	1	LOCKED		0	1
9	Totals:	max	0.131	18	1.157	7	0	19						
10		min	-0.131	11	0	2	0	1						

Envelope Node Displacements

	Node Label		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
1	N1	max	0	2	0	2	0	19	0	19	0	19	2.922e-3	7
2		min	0	7	0	7	0	1	0	1	0	1	0	2
3	N2	max	0	15	0	2	0	19	0	19	0	19	8.182e-5	18
4		min	0	18	0	7	0	1	0	1	0	1	-2.789e-3	15
5	N3	max	0	7	0	2	0	19	0	19	0	19	0	2
6		min	0	2	-0.004	7	0	1	0	1	0	1	-5.937e-3	7
7	N4	max	0	19	0	2	0	19	0	19	0	19	5.322e-3	7
8		min	0	14	-0.005	7	0	1	0	1	0	1	0	2

Envelope Member End Reactions

	Member	Member End		Axial[k]	LC	y Shear[k]	LC	z Shear[k]	LC	Torque[k-ft]	LC	y-y Moment[k-ft]	LC	z-z Moment[k-ft]	LC
1	M1	I	max	0.553	7	0	2	0	19	0	19	0	19	0	19
2			min	0	2	-0.055	7	0	1	0	1	0	1	0	1
3		J	max	0.543	7	0	2	0	19	0	19	0	19	0.396	7
4			min	0	2	-0.055	7	0	1	0	1	0	1	0	2
5	M2	I	max	0.603	7	0.107	15	0	19	0	19	0	19	0	19
6			min	0	2	-0.035	18	0	1	0	1	0	1	0	1
7		J	max	0.584	7	0.124	14	0	19	0	19	0	19	0	2
8			min	0	2	-0.058	19	0	1	0	1	0	1	-0.806	7
9	M3	I	max	0	19	0.543	7	0	19	0	19	0	19	0.396	7
10			min	0	1	0	2	0	1	0	1	0	1	0	2
11		J	max	0	19	0	2	0	19	0	19	0	19	0.806	7
12			min	0	1	-0.584	7	0	1	0	1	0	1	0	2

Envelope Beam Deflections

	Member Label	Span		Location [ft]	y' [in]	(n) L'/y' Ratio	LC
1	M3	1	max	19.792	-0.003	NC	18
2		1	min	9.792	-0.462	519	7

Envelope AISI S100-16: ASD Member Cold Formed Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pn/Om[k]	Tn/Om[k]	Mnyy/Om[k-ft]	Mnzz/Om[k-ft]	Vny/Om[k]	Vnz/Om[k]	Cb	Eqn
1	M1	362S162-54	0.766	7.2	7	0.024	7.2	y	7	2.926	8.339	0.197	0.682	2.341	1.88	1.667	H1.2-1
2	M2	600S162-54	0.709	10.4	7	0.044	10.4	y	14	1.618	16.647	0.372	2.313	2.822	2.848	1.667	H1.2-1
3	M3	1000S162-68	0.592	9.583	7	0.175	20	y	7	0.608	19.326	0.307	3.749	3.345	2.238	1	H1.2-1