DLF ENGINEERS INC.
P.O. Box 717, Windsor, CA 95492 • (707) 838-1505 • Fax: (707) 838-1970

ENGINEERING CALCULATION SHEET

CUSTOMER _____

LOCATION _____

SHEET NO. COVER
JOB NO. 5255.2.1.25
DATE 11-24-25
BY JFG CHK'D JFG

PRCTI20251723

AutoZone #10668
Building Alterations
4423 South Meridian
Puyallup, Washington 98373

City of Puyallup
Development & Permitting Services
ISSUED PERMIT
Building | Planning
Engineering | Public Works
Fire | Traffic

City of Puyallup
Building
REVIEWED FOR COMPLIANCE
SKinnear
03/02/2026
8:36:04 AM

Calculations required to be provided by the Permittee on site for all Inspections

Contents	Sheets
Calculations	1 – 58

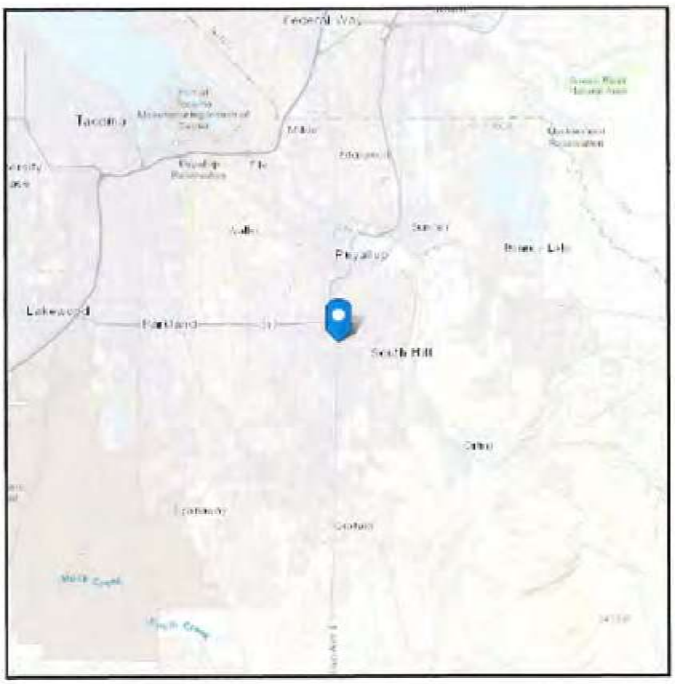
Exp: 05-09-26
Dated: 11-24-25
Sheets: 1 – 58

ASCE Hazards Report

Address:
4423 S Meridian
Puyallup, Washington
98373

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Default (see Section 11.4.3)

Latitude: 47.149035
Longitude: -122.29181
Elevation: 452.0614648531055 ft (NAVD 88)



Wind

Results:

Wind Speed	97 Vmph
10-year MRI	67 Vmph
25-year MRI	73 Vmph
50-year MRI	78 Vmph
100-year MRI	83 Vmph

Data Source: ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed: Sun Nov 23 2025

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Seismic

Site Soil Class: D - Default (see Section 11.4.3)

Results:

S_S :	1.259	S_{D1} :	N/A
S_1 :	0.435	T_L :	6
F_a :	1.2	PGA :	0.5
F_v :	N/A	PGA_M :	0.6
S_{MS} :	1.511	F_{PGA} :	1.2
S_{M1} :	N/A	I_e :	1
S_{DS} :	1.007	C_v :	1.352

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Sun Nov 23 2025

Date Source: USGS Seismic Design Maps

Table R301.2(1)
Climatic and Geographical Design Criteria

Ground Snow Load	Wind Design		Seismic Design Category [f]	Subject to Damage from			Winter Design Temp [e]	Ice Shield Underlay [h]	Flood Hazards [g]	Air Freeze Index [i]	Mean Annual Temp [j]
	Speed [d] (mph)	Topographical effects [k]		Weathering [a]	Frost Line Depth [b]	Termites [c]					
20 lbs/ft	85	No	D-1	Moderate	12 inches	Slight to Moderate	17°	No	Puyallup Municipal Code 21.07	250	50°

ASCE 7-16 CHAPTER 11, 12, 13 SEISMIC DESIGN CRITERIA

Response Spectral Acc (0.2 sec) S_s =	1.259 g		Figure 22-1, 22-3, 22-5, 22-6
Response Spectral Acc.(1.0 sec) S_1 =	0.435 g		Figure 22-2, 22-4,22-5, 22-6
Soil Site Class	D (Default)		
Short-Period Site Coefficient F_a =	1.2		Table 11.4-1
Long-Period Site Coefficient F_v (Per Geotech) =	N/A	* Note N/A refers to F_v found using ASCE 7-16	
Long-Period Site Coefficient F_v =	1.865		Table 11.4-2
Max Considered Earthquake Acc. $S_{MS} = F_a.S_s$		= 1.511 g	Equation 11.4-1
Max Considered Earthquake Acc. $S_{M1} = F_v.S_1$		= 0.811 g	Equation 11.4-2
@ 5% Damped Design S_{DS} = 2/3(SMS)		= 1.007 g	Equation 11.4-3
S_{D1} = 2/3(S_{M1})		= 0.541 g	Equation 11.4-4
Building Risk Category	II, Standard		Table 1.5-1

Design Category Consideration:

Seismic Design Category for 0.1 sec	D		Table 11.6-1
Seismic Design Category for 1.0 sec	D		Table 11.6-2
S1 < .75g	NA		
Since Ta < .8Ts (see below), SDC =	D	Control (exception of Section 11.6 does not apply)	
Seismic Design Category D			

13.3 Seismic Demands on Nonstructural Components - Mech Units

$$F_p = \frac{0.4a_pS_{DS}W_p(1+2z/h)}{(R_p/I_p)} \quad (13.3\text{-}1)$$

S_{DS} = 1.007

a_p = 2.5 R_p = 6 T-13.5-1 or 13.6-1

I_p = 1.0 13.1.3

z = 21 ft h = 21 ft F_p = 0.504 Wp

Max $F_p = 1.6S_{DS}I_pW_p$ = 1.612Wp (13.3-2)

Min $F_p = 0.3S_{DS}I_pW_p$ = 0.302Wp (13.3-3)

F_p = 0.504 Wp

13.3 Seismic Demands on Nonstructural Components - Nonstructural Walls

$$F_p = \frac{0.4a_pS_{DS}W_p(1+2z/h)}{(R_p/I_p)} \quad (13.3\text{-}1)$$

S_{DS} = 1.007

a_p = ~~2.5~~ 1.0 R_p = ~~6~~ 2.5 T-13.5-1 or 13.6-1

I_p = 1.0 13.1.3

z = 21 ft h = 21 ft F_p = 0.504 Wp

Max $F_p = 1.6S_{DS}I_pW_p$ = 1.612Wp (13.3-2)

Min $F_p = 0.3S_{DS}I_pW_p$ = 0.302Wp (13.3-3)

F_p = ~~0.504 Wp~~ 0.483

12.11.1 Design for Out-of-Plane Forces

$F_p = 0.40S_{DS}IW_w$ 12.11.1

= 0.403(W)

15.3 Nonbuilding Structures

Response Modification Coef. R = 1.25 ← TRASH ENCLOSURE ROOF

Importance factor I_e = 1

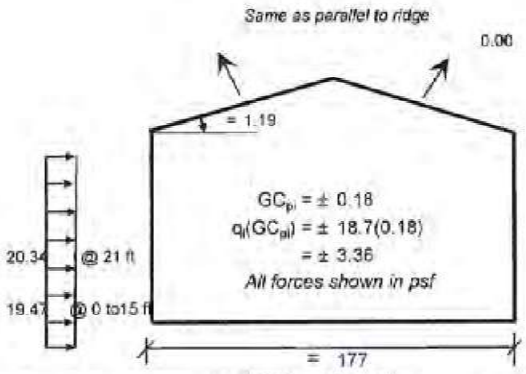
For flexible nonbuilding, C_s =	0.806 W	Min Requirement from Section 12.8	
Min C_s =	$0.044S_{DS}.I$	= 0.044	(15.4-1)
or C_s =	$0.8\ S_1 I/R$	N/A, S1<0.6	(15.4-2)
V =	0.806 W		
For rigid nonbuilding, C_s =	$0.3\ S_{DS}\ I$		(15.4-5)

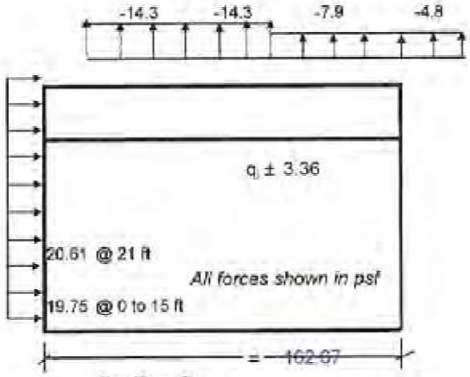
27 Directional Procedure, Part 1:Enclosed and Partially Enclosed Rigid Buildings. (All Heights)
27.4. MWFRS

Velocity pressure q_z = .00256 K_z K_{zt} K_d $Ke V^2$ (26.10-1)
Exposure C Total Bldg Ht h = 21.00 ft Ref Parapet Ht=
Roof Pitch = 0.25 :12
Exposure coefficient K_z = Section 26.10.1, from Table 26.10-1= 0.91
Topography factor K_{zt} = 1.00 26.8.2, Figure 26.8-1 Gnd Elev= 0.0 ft
Directionality factor K_d = 0.85 26.6, Table 26.6-1 Ke= 1.000
Building & Structure Risk Category = II, standard IBC T-1604.5
Wind Speed V = 97 mph Fig. 26.5-1B, MRI = 700 yrs
q_z = 20.47 K_z psf
Internal Pressure Coefficient (GC_{pi}) = ± 0.18 Table 26.13-1, for Enclosed Building
Gust effect factor G = 0.85 26.11.1
Pressures for MWFRS p = qGC_p - q_i (GC_{pi}) (27.3-1)

Wall and Roof External pressure Coefficients C_p from Fig. 27.3-1

Wind Normal to Ridge (⊥ to 177) L/B = 1.09 h/L = 21/177 = 0.12 θ= 1.2
Windward wall C_p = 0.80 Windward roof C_p =
Leeward wall C_p = -0.48 for L/B = 1.09 Leeward roof C_p =
Side wall C_p = -0.70 or Roof C_p = -0.90 -0.90 -0.50 -0.30
Wind Parallel to Ridge (⊥ to 162.67) L/B = 0.92
Windward wall C_p = 0.80 h/L = 21/162.67 0.13
Leeward wall C_p = -0.50 for L/B = 0.92 Roof C_p = -0.90 -0.90 -0.50 -0.30
Side wall C_p = -0.70 for dist 0 11 21 42





p = qGC_p - q_i (GC_{pi}) (27.3-1) For Exp C
where q = q_z for windward at height z z_g = 900 ∝ = 9.5
q = q_h for leeward wall, side wall and roof @21 ft $K_z = 2.01(z/z_g)^{2/\alpha}$
q_i = q_h for enclosed building @21 ft K_z (min) = $2.01(15/z_g)^{2/\alpha}$

Roof Ht, h = 21 ft				Normal to Ridge ⊥ to 177			Parallel to ridge ⊥ to 162.67		
	Height	K_h	q_h	C_p	q_hGC_p		C_p	q_hGC_p	
Leeward wall	all	0.911	18.66	-0.482382	-7.65		-0.50	-7.93	
Side wall	all	0.911	18.66	-0.70	-11.10		-0.70	-11.10	
Roof	WW		Or	-0.90	-14.3	fr 0 - 10.5	-0.90	-14.27	fr 0 - 10.5
	LW			-0.90	-14.3	fr >10.5	-0.90	-14.27	fr >10.5
				-0.50	-7.93	fr 21-42	-0.50	-7.93	fr 21-42
				-0.30	-4.76	fr 42	-0.30	-4.76	fr 42

				Normal to Ridge ⊥ to 177			Parallel to ridge ⊥ to 162.67		
	z, Ht. (ft)	K_z	q_z	C_p	$p = q_zGC_p$	WW+LW	C_p	$p = q_zGC_p$	WW+LW
Windward wall	0 to 15	0.849	17.38	0.80	11.82	19.47	0.80	11.82	19.75
	21.0	0.911	18.66	0.80	12.69	20.34	0.80	12.69	20.61

30 COMPONENTS AND CLADDING

Part 1: Low-rise building and building with h ≤ 60ft

Gnd Elev= 0.00 ft

Total Bldg Ht h = 21 ft — Exp = C

Roof Pitch = 0.25 :12 — θ= 1.2

Topography factor K_{zt} = 1.00 — 26.8.2, Figure 26.8-1

Directionality factor K_d = 0.85 — 26.6, Table 26.6-1

Building & Structure Risk Category = II, standard — Table 1.5-1

Wind Speed V = 97 MPH — Fig. 26.5B, MRI = 700 yrs

Velocity pressure q_z = .00256 K_z K_{zt} K_e KeV^2 — Ke= 1.00

q_z = 20.47 K_z

at mean roof high h = 21.0 ft — Part 1 or 2 may be used

K_h = 0.91 — Tbl 26.10-1

velocity at mean roof height, q_h = 18.63

$p = q_h(GC_p - GC_{pi})$ — Eq 30.3-2

Internal pressure, Gpi = ± 0.18 — Enclosed Building — Table 26.13-1

Effective Area for wall element= 0 SQ.FT — Effective Area=Span Length/3 or Area Tributary to Fastener

Since θ=1.2 10% Reduction — For wall GC_p — Fig. 30.3-1

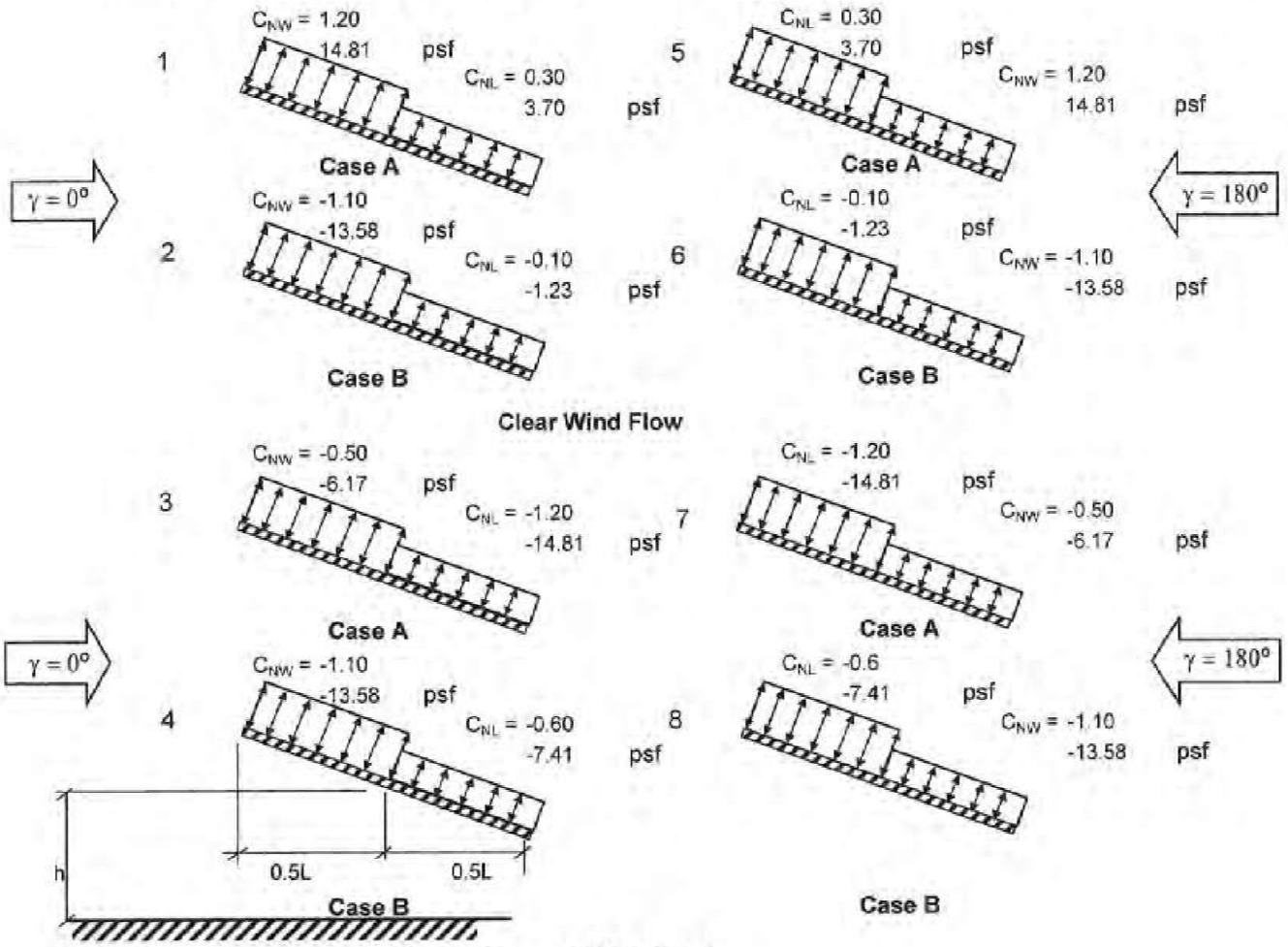
Flat/Gable Roof Θ ≤ 7 — Fig.30.3-2A

Roof effective area = 0 SQ.FT

Overhang effective area = 0 SQ.FT

$p = q_h(GC_p - GC_{pi})$	Roof			Wall	
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
$-GC_p$	-1.70	-2.30	-3.20	-0.99	-1.26
$+GC_p$	0.30	0.30	0.30	0.90	0.90
Negative design pressure p	-35.02	-46.20	-62.97	-21.80	-26.83
Positive design pressure p	8.94	8.94	8.94	20.12	20.12

27.4.3, Design Wind Load on Open Structures with Monoslope



Obstructed Wind Flow

ASCE 7-16 Figure 27.3-4

$p = q_h G C_N$ (27.4-3)

$q_z = .00256 K_z K_{zt} K_d K_e V^2$ (27.3-1)

Roof Angle =	1.2	°		
Total Bldg Ht h =	10	FT	Exp = C	Gnd Elev= 5000.00 ft
Exposure coefficient K_z =	0.85		T-26.10-1	K_e= 0.83444
Topography factor K_{zt} =	1.00		T-26.8-1	
Directionality factor K_d =	0.85		T-26.6-1	
Building & Structure Risk Category =	II, standard		IBC T-1604.5	
Wind Speed V =	97	MPH	Fig. 26.5-1B, MRI = 700 yrs	
q_z =	14.52	PSF		
Gust Effect factor G =	0.85		26.9	

C_N = Net pressure coefficient from Fig 27.3-4

p = 12.34 C_N PSF

1. C_{NW} and C_{NL} denote net pressures (contributions from top and bottom surfaces) for windward and leeward half of roof surfaces, respectively.

2. Clear wind flow denotes relatively unobstructed wind flow with blockage less than or equal to 50%. Obstructed wind flow denotes objects below roof inhibiting wind flow (>50% blockage).

4. Plus and minus signs signify pressures acting towards and away from the top roof surface, respectively

DLF ENGINEERS INC.

DLF Job #5255.2.1.25
AutoZone #10668
Puyallup, WA

Vertical Load – Wall or Ceiling Self Weight
Dead Load = 8.0 psf

Lateral Load to Wall

Use 5 psf minimum lateral load

Restroom Ceiling Joist

Joist span 8'-0" ±

w = 8 psf DL + 20 psf LL
w = 1.33(8 + 10)
w = 11 plf + 27 plf
w = 38 plf or 200# Point Load

Use min C6" x 1⅝" x 18 ga joists at 16" o.c.

Interior Non-bearing walls

Max Wall height ht = 21'-0"

Lateral Load to wall use 5 psf.

w = 5 psf x 1.33'
w = 6.7 plf

Use min C6" x 1⅝" x 18 ga studs at 16"o.c.

Interior Non-bearing wall header up 15'-0"

Max Wall height above header ht = 21.00– 7.17 = 13.83'

Max Header Length L = 15'-0"
w = 8psf (13.83) = 115 plf

Use min Dbl C8" x 1⅝x 16 ga box header

Interior Non-bearing wall header up 32'-6"

Max Wall height above header ht = 21.0– 7.17 = 13.83'

Max Header Length L = 32'-6"
w = 8psf (10.83) = 115 plf

Use min Dbl C14" x 1⅝x 12ga box header

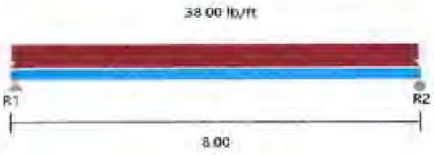
P.O. Box 717, Windsor, CA 95492 • (707) 838-1505 • Fax: (707) 838-1970 • E-mail: Jacob@dlfengineers.com

Project Name: Restroom Ceiling Joist Case 1
Model: Restroom Ceiling Joist - Uniform Load
Code: IBC 2021(AISI S100-16 w/S2-20)

Date: 11/23/2025
Simpson Strong-Tie® CFS Designer™ 6.0.3.0

Section: 600S162-43 (33 ksi) Single C Stud (punched)
Maxo = 1271.1 ft-lb **Va =** 1415.7 lb **I =** 2.32 in^4

Loads have not been modified for strength checks
Loads have not been modified for deflection calculations



Deflection Ratio = No Limit

Bridging Connectors - Design Method =AISI S100

Span	Axial KyLy, KtLt	Flexual, Distortional	Connector	Stress Ratio
Span	NA	48.0", 96.0"	SUBH3.25 (Max)	-

Web Crippling

Support	Load (lb)	Bearing (in)	Pa (lb)	M (ft-lbs)	Max Int.	Stiffener?
R1*	152.00	1.00	239.8	0.0	0.33	NO
R2*	152.00	1.00	239.8	0.0	0.33	NO

"*" after support means punched near support

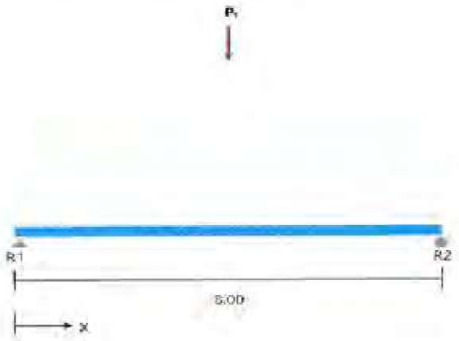
	Code Check	Required	Allowed	Interaction	Notes
Span	Max. Axial, lbs	0.0(t)	-	0%	KΦ=0.00 lb-in/in Max KL/r = N/A
	Max. Shear, lbs	152.0	1240.3	12%	Shear (Punched)
	Max. Moment (MaFy, Ma-dist), ft-lbs	304.0	1087.9	28%	Ma-dist (control),KΦ=0.00 lb-in/in
	Moment Stability, ft-lbs	304.0	1224.4	25%	
	Shear/Moment	0.24	1.00	24%	Shear 0.0, Moment 304.0
	Axial/Moment	0.28	1.00	28%	Axial 0.0(c), Moment 304.0
	Deflection Span	L/1873	-	-	Δ= 0.0513"

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie Connector	Connector Interaction	Anchor Interaction
R1	0.0	152.0	By Others & Anchorage Designed by Engineer	NA	NA
R2	0.0	152.0	By Others & Anchorage Designed by Engineer	NA	NA

* Reference catalog for connector and anchor requirement notes as well as screw placement requirements

Project Name: Restroom Ceiling Joist Case 2
Model: Restroom Ceiling Joist - 200# Point Load
Code: IBC 2021(AISI S100-16 w/S2-20)

Date: 11/23/2025
Simpson Strong-Tie® CFS Designer™ 6.0.3.0



Section: 600S162-43 (33 ksi) Single C Stud (punched)
Maxo = 1271.1 ft-lb **Va =** 1415.7 lb I = 2.32 in^4

Loads have not been modified for strength checks
Loads have not been modified for deflection calculations

Deflection Ratio = No Limit

Bridging Connectors - Design Method =AISI S100

Span	Axial KyLy, KtLt	Flexual, Distortional	Connector	Stress Ratio
Span	NA	48.0", 96.0"	SUBH3.25 (Max)	-

Web Crippling

Support	Load (lb)	Bearing (in)	Pa (lb)	M (ft-lbs)	Max Int.	Stiffener?
R1*	100.00	1.00	239.8	0.0	0.22	NO
R2*	100.00	1.00	239.8	0.0	0.22	NO
P1*	200.00	1.50	602.8	400.0	0.37	NO

"*" after support means punched near support

Point Loads	P1
Load(lb)	200.00
X-Dist.(ft)	4.00

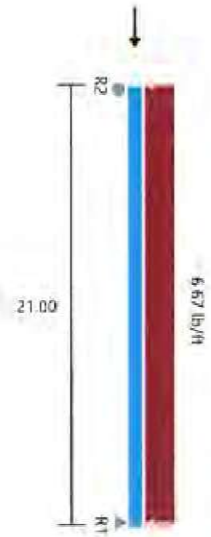
	Code Check	Required	Allowed	Interaction	Notes
Span	Max. Axial, lbs	0.0(t)	-	0%	KΦ=0.00 lb-in/in Max KL/r = N/A
	Max. Shear, lbs	100.0	1240.3	8%	Shear (Punched)
	Max. Moment (MaFy, Ma-dist), ft-lbs	400.0	1087.9	37%	Ma-dist (control),KΦ=0.00 lb-in/in
	Moment Stability, ft-lbs	400.0	1241.8	32%	
	Shear/Moment	0.32	1.00	32%	Shear 100.0, Moment 400.0
	Axial/Moment	0.37	1.00	37%	Axial 0.0(c), Moment 400.0
	Deflection Span	L/1779	-	-	Δ= 0.0540"

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie Connector	Connector Interaction	Anchor Interaction
R1	0.0	100.0	By Others & Anchorage Designed by Engineer	NA	NA
R2	0.0	100.0	By Others & Anchorage Designed by Engineer	NA	NA

* Reference catalog for connector and anchor requirement notes as well as screw placement requirements

Project Name: Interior Non-Bearing Wall Stud
Model: Wall Stud –1
Code: IBC 2021(AISI S100-16 w/S2-20)

Date: 11/23/2025
Simpson Strong-Tie® CFS Designer™ 6.0.3.0



Section : 600S162-43 (33 ksi) @ 16" o.c. Single C Stud (punched)
Maxo = 1271.1 ft-lb **Va =** 1415.7 lb **I =** 2.32 in^4

Loads have not been modified for strength checks
Loads have not been modified for deflection calculations

Deflection Ratio = No Limit

Bridging Connectors - Design Method =AISI S100

Span	Axial KyLy, KtLt	Flexual, Distortional	Connector	Stress Ratio
Span	48.0", 48.0"	48.0", 252.0"	LSUBH3.25 (Min)	0.12

Web Crippling

Support	Load (lb)	Bearing (in)	Pa (lb)	M (ft-lbs)	Max Int.	Stiffener?
R2	70.00	1.00	259.1	0.0	0.14	NO
R1	70.00	1.00	259.1	0.0	0.14	NO

"A" after support means punched near support

Gravity Load

Type	Load (lb)
Uniform	10.67plf

	Code Check	Required	Allowed	Interaction	Notes
Span	Max. Axial, lbs	224.0(c)	2651.9(c)	8%	KΦ=0.00 lb-in/in Max KL/r = 111
	Max. Shear, lbs	70.0	1240.3	6%	Shear (Punched)
	Max. Moment (MaFy, Ma-dist), ft-lbs	367.5	1087.9	34%	Ma-dist (control),KΦ=0.00 lb-in/in
	Moment Stability, ft-lbs	367.5	1219.4	30%	
	Shear/Moment	0.29	1.00	29%	Shear 0.0, Moment 367.5
	Axial/Moment	0.39	1.00	39%	Axial 119.8(c), Moment 365.7
	Deflection Span	L/590	-	-	Δ= 0.4270"

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie Connector	Connector Interaction	Anchor Interaction
R2	70.0	0.0	By Others & Anchorage Designed by Engineer	NA	NA
R1	70.0	224.0	By Others & Anchorage Designed by Engineer	NA	NA

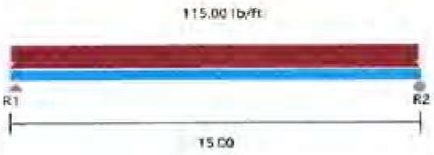
* Reference catalog for connector and anchor requirement notes as well as screw placement requirements

Project Name: Non-bearing Wall Header 15 ft 0 in Span
Model: Non-bearing Wall Header 15-0"
Code: IBC 2021(AISI S100-16 w/S2-20)

Date: 11/23/2025
Simpson Strong-Tie® CFS Designer™ 6.0.3.0

Section: (2) 800S162-54 (50 ksi) Boxed C Stud (punched)
Maxo = 6131.8 ft-lb **Va =** 4182.6 lb **I =** 11.20 in^4

Loads have not been modified for strength checks
Loads have not been modified for deflection calculations



Deflection Ratio = No Limit

Bridging Connectors - Design Method =AISI S100

Span	Axial KyLy, KtLt	Flexual, Distortional	Connector	Stress Ratio
Span	NA	60.0", N/A	N/A	-

Web Crippling

Support	Load (lb)	Bearing (in)	Pa (lb)	M (ft-lbs)	Max Int.	Stiffener?
R1*	862.50	1.00	1088.0	0.0	0.41	NO
R2*	862.50	1.00	1088.0	0.0	0.41	NO

"*" after support means punched near support

	Code Check	Required	Allowed	Interaction	Notes
Span	Max. Axial, lbs	0.0(t)	-	0%	KΦ=0.00 lb-in/in Max KL/r = N/A
	Max. Shear, lbs	862.5	4182.6	21%	Shear (Punched)
	Max. Moment (MaFy, Ma-dist), ft-lbs	3234.4	6131.8	53%	
	Moment Stability, ft-lbs	3234.4	6131.8	53%	
	Shear/Moment	0.53	1.00	53%	Shear 0.0, Moment 3234.4
	Axial/Moment	0.53	1.00	53%	Axial 0.0(c), Moment 3234.4
	Deflection Span	L/454	-	-	Δ= 0.3965"

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie Connector	Connector Interaction	Anchor Interaction
R1	0.0	862.5	By Others & Anchorage Designed by Engineer	NA	NA
R2	0.0	862.5	By Others & Anchorage Designed by Engineer	NA	NA

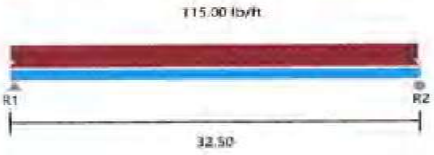
* Reference catalog for connector and anchor requirement notes as well as screw placement requirements

Project Name: Non-bearing Wall Header 32 ft 6 in Span
Model: Non-bearing Wall Header 32-6"
Code: IBC 2021(AISI S100-16 w/S2-20)

Date: 11/23/2025
Simpson Strong-Tie® CFS Designer™ 6.0.3.0

Section: (2) 1400S162-97 (50 ksi) Boxed C Stud (punched)
Maxo = 24523.6 ft-lb **Va =** 13878.6 lb **I =** 77.79 in^4

Loads have not been modified for strength checks
Loads have not been modified for deflection calculations



Deflection Ratio = No Limit

Bridging Connectors - Design Method =AISI S100

Span	Axial KyLy, KtLt	Flexual, Distortional	Connector	Stress Ratio
Span	NA	48.0", N/A	N/A	-

Web Crippling

Support	Load (lb)	Bearing (in)	Pa (lb)	M (ft-lbs)	Max Int.	Stiffener?
R1*	1868.75	1.00	3079.4	0.0	0.32	NO
R2*	1868.75	1.00	3079.4	0.0	0.32	NO

"*" after support means punched near support

	Code Check	Required	Allowed	Interaction	Notes
Span	Max. Axial, lbs	0.0(t)	-	0%	KΦ=0.00 lb-in/in Max KL/r = N/A
	Max. Shear, lbs	1868.8	13878.6	13%	Shear (Punched)
	Max. Moment (MaFy, Ma-dist), ft-lbs	15183.6	24523.6	62%	
	Moment Stability, ft-lbs	15183.6	24523.6	62%	
	Shear/Moment	0.62	1.00	62%	Shear 0.0, Moment 15183.6
	Axial/Moment	0.62	1.00	62%	Axial 0.0(c), Moment 15183.6
	Deflection Span	L/310	-	-	Δ= 1.2579"

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie Connector	Connector Interaction	Anchor Interaction
R1	0.0	1868.8	By Others & Anchorage Designed by Engineer	NA	NA
R2	0.0	1868.8	By Others & Anchorage Designed by Engineer	NA	NA

* Reference catalog for connector and anchor requirement notes as well as screw placement requirements

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E-mail: Jacob@dlfengineers.com

ENGINEERING CALCULATION SHEET

SHEET NO. 15
CUSTOMER
JOB NO.
DATE
LOCATION
BY CHK'D

(N) OPNG @ INTERIOR CONC WALL

- (2) (N) OPNG'S IN ± 176' OF SOLID CONC WALL
(E) WALL TO BE REMOVED = 7'+8' = 15'
PER (E) IBC SECTION 503.4 ± 10%
CHANGE IN DEMAND-CAPACITY RATIO (176'(.1) = 17.6' ≥ 15'
NO ALTERATIONS REQ TO BLDG SHELL

(N) STEEL H-FRAME

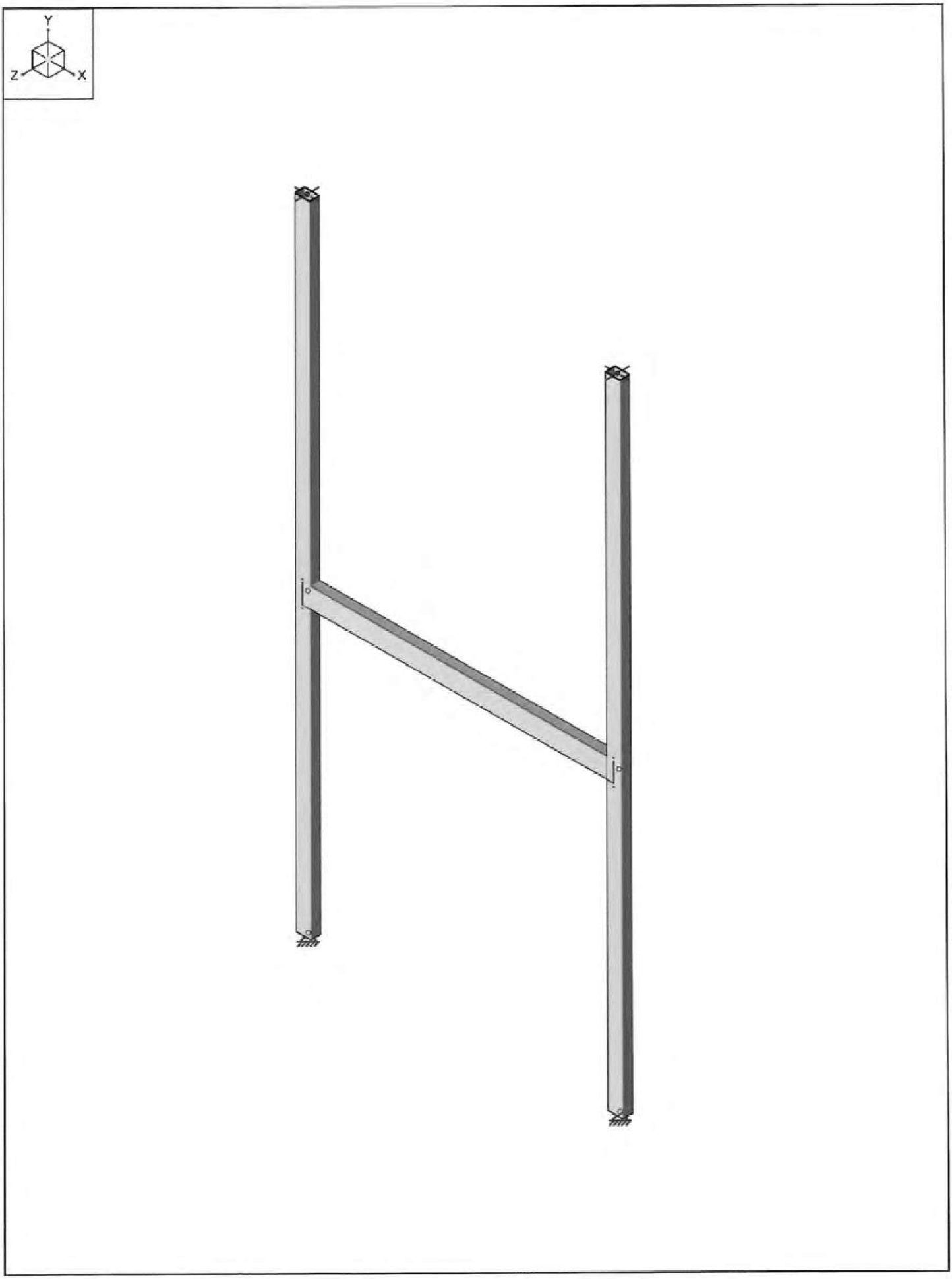
VERTICAL LOAD

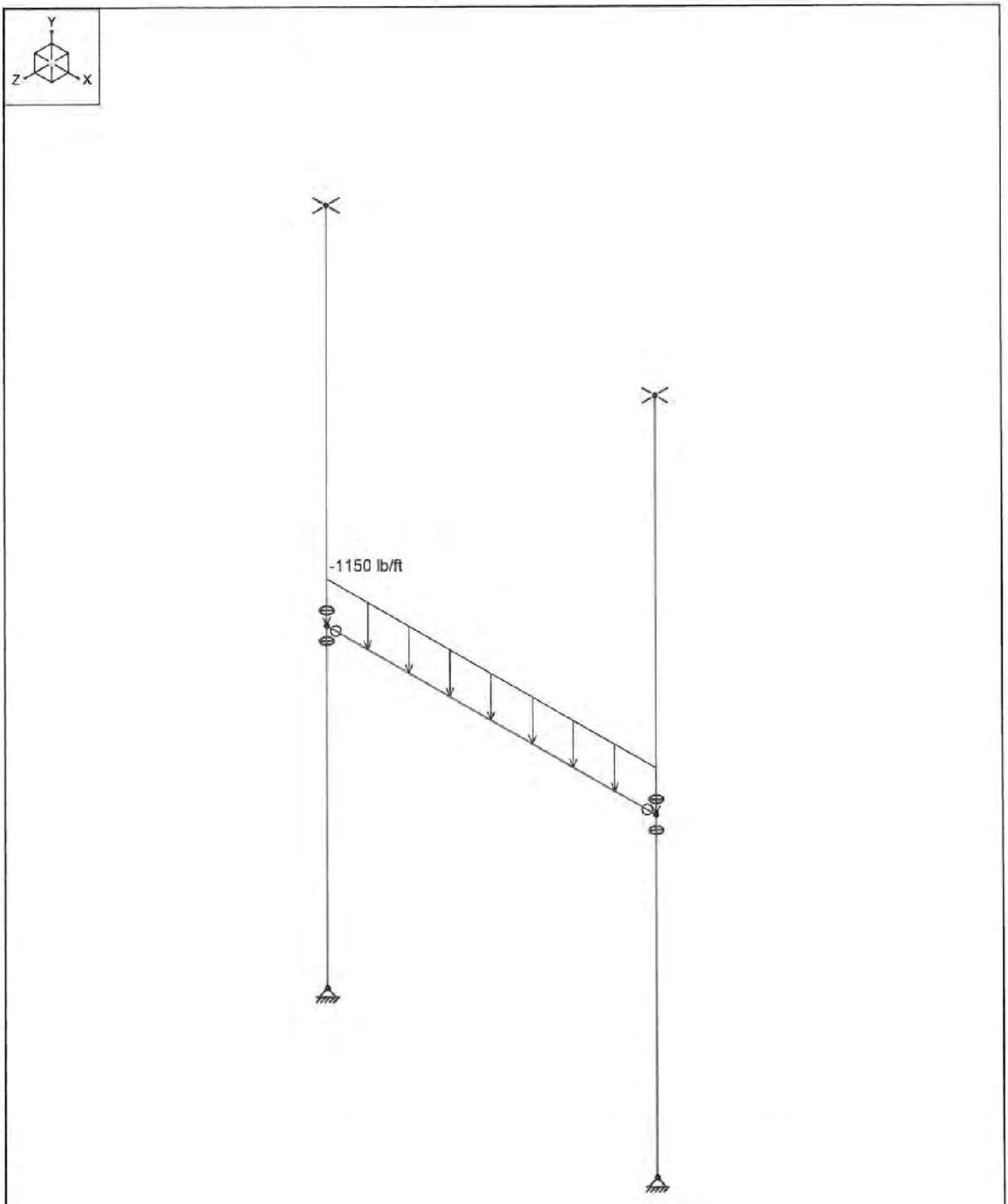
ROOF DL = 10.0 PSF → $w_{DL} = (35/2)(10) = 175$ PLF
ROOF LL = 20.0 PSF → $w_{LL} = (35/2)(20) = 350$ PLF
WALL DL = (6/12)(150 PCF) = 75 PSF → $w_{DL} = (21-8')(75) = 975$ PLF
SNOW = 20.0 PSF → $w_{SN} = (35/2)(20) = 350$ PLF

LATERAL LOAD

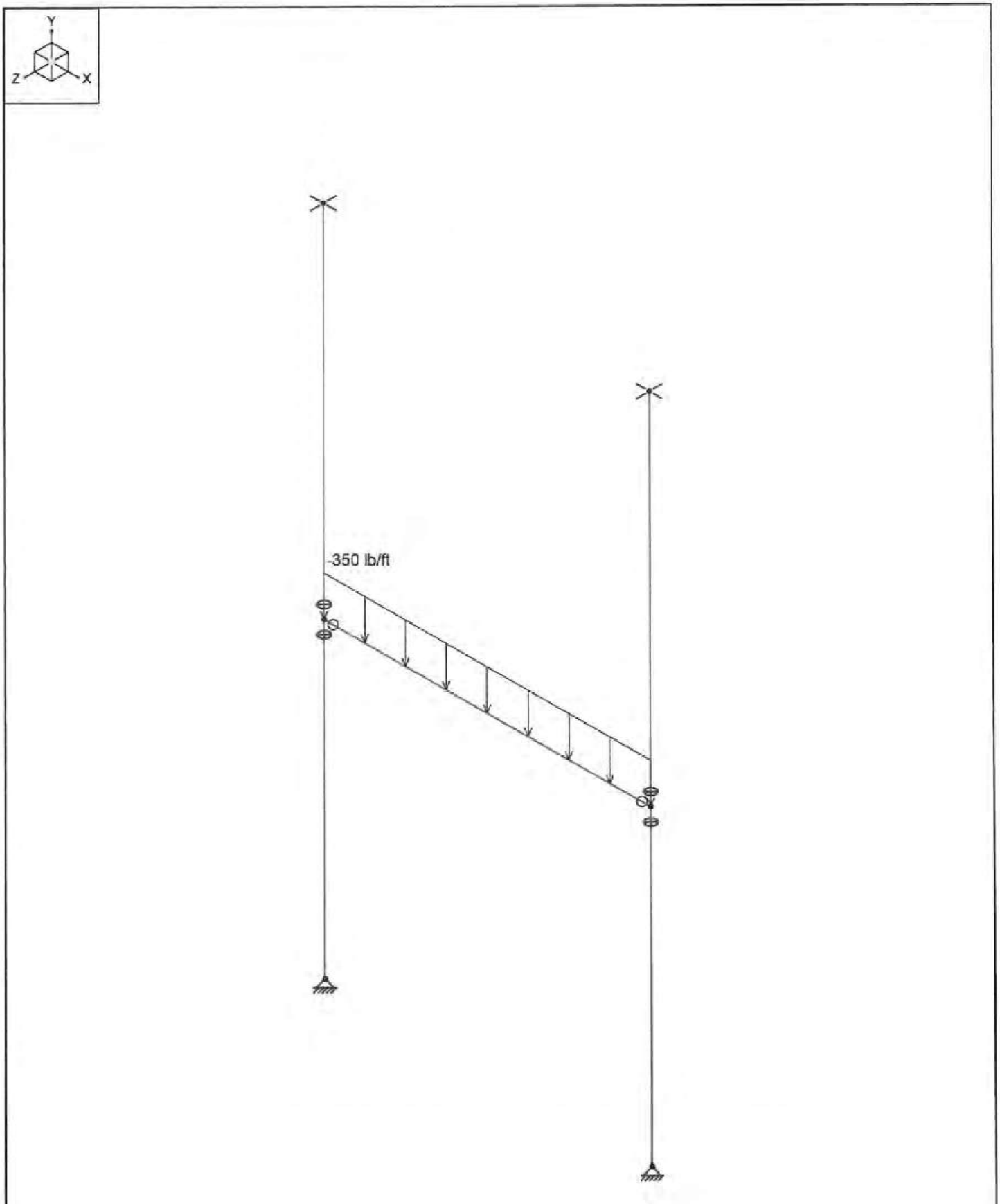
WIND → N/A
SEISMIC → $0.403(975/2) = 200$ PLF
↑ ½ WALL LOAD TO ROOF
½ WALL LOAD TO HEADER

∴ USE HSS8x4x1/4 HEADER
& HSS6x4x1/4 COLUMN.

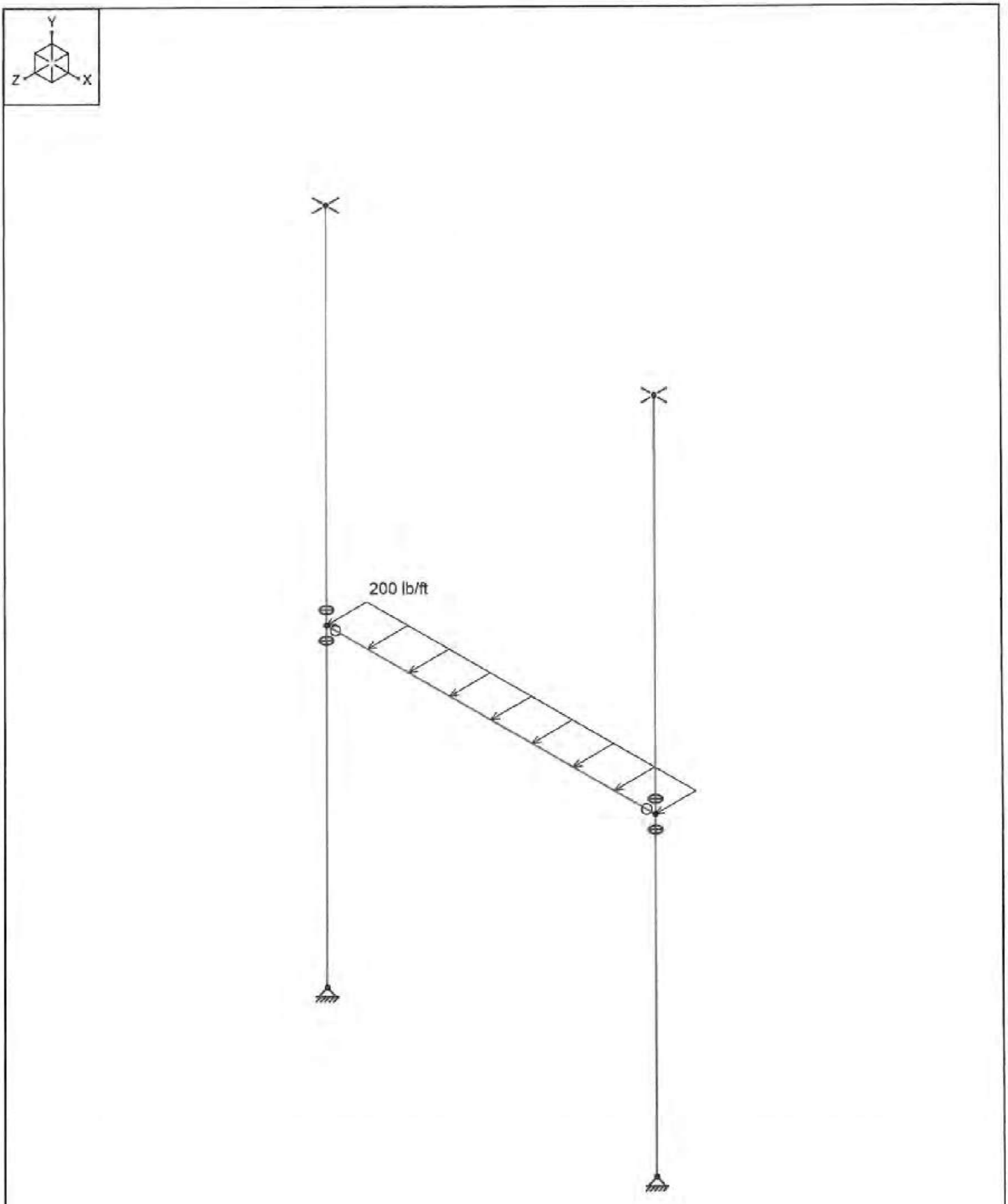

Y
Z
X



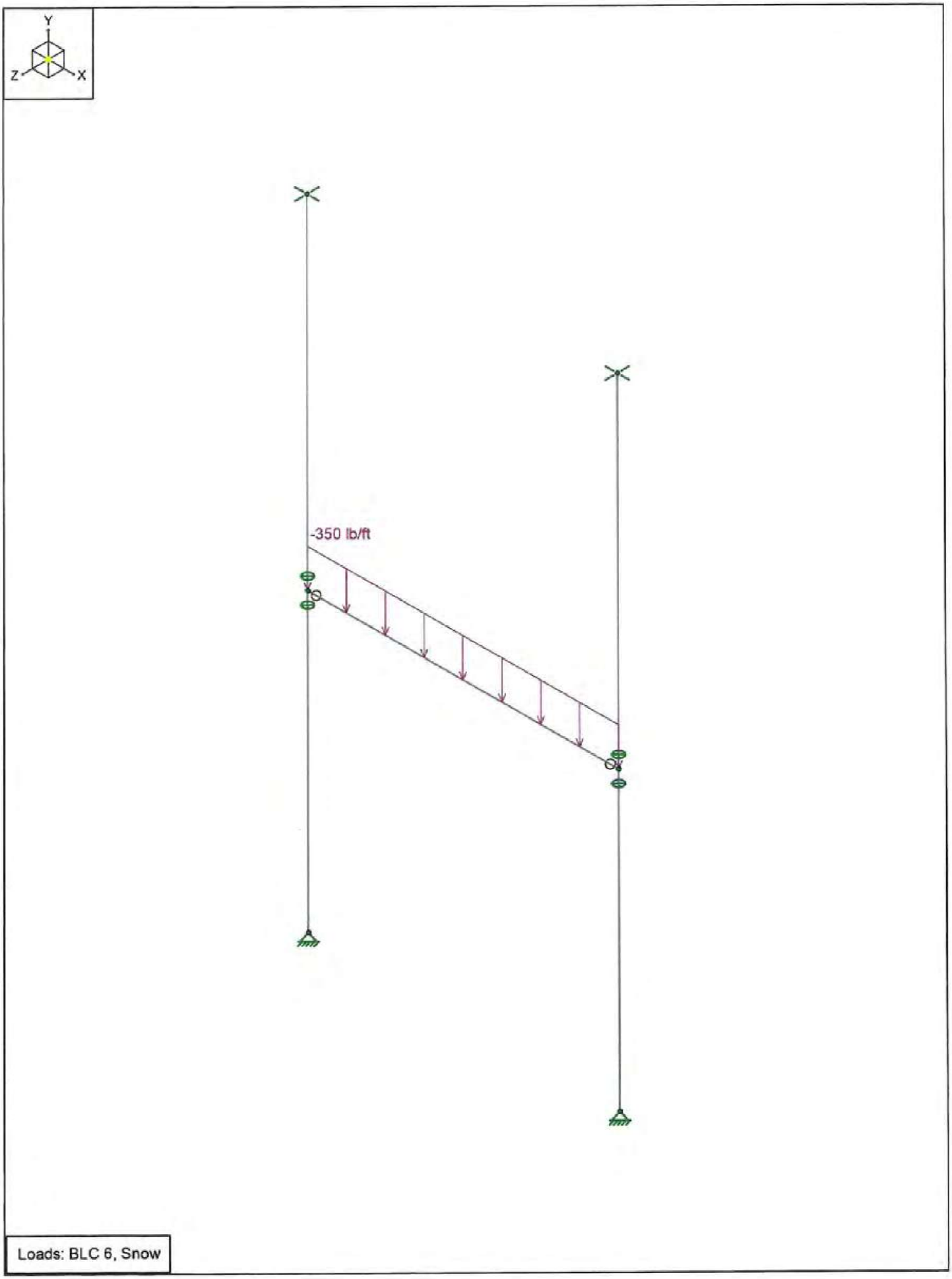
Loads: BLC 2, Dead Load



Loads: BLC 3, Live Roof



Loads: BLC 5, EQ


Y
Z
X
-350 lb/ft
Loads: BLC 6, Snow

Load Combinations

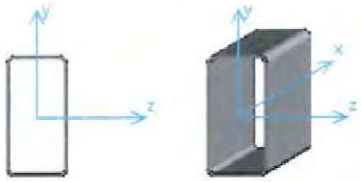
	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	Deflection 1	Yes	Y	DL	1												
2	Deflection 2	Yes	Y	LL	1												
3	Deflection 3	Yes	Y	DL	1	LL	1										
4	IBC 21/ASCE Strength 1	Yes	Y	DL	1.4												
5	IBC 21/ASCE Strength 2 (a)	Yes	Y	DL	1.2	LL	1.6	LLS	1.6	RLL	0.5						
6	IBC 21/ASCE Strength 2 (b)	Yes	Y	DL	1.2	LL	1.6	LLS	1.6	SL	0.5	SLN	0.5				
7	IBC 21/ASCE Strength 2 (c)	Yes	Y	DL	1.2	LL	1.6	LLS	1.6								
8	IBC 21/ASCE Strength 3 (a)	Yes	Y	DL	1.2	RLL	1.6	LL	0.5	LLS	1						
9	IBC 21/ASCE Strength 3 (c)	Yes	Y	DL	1.2	SL	1.6	SLN	1.6	LL	0.5	LLS	1				
10	IBC 21/ASCE Strength 3 (b) (a)	Yes	Y	DL	1.2	RLL	1.6	WL	0.5								
11	IBC 21/ASCE Strength 3 (b) (b)	Yes	Y	DL	1.2	RLL	1.6	WL	-0.5								
12	IBC 21/ASCE Strength 3 (d) (a)	Yes	Y	DL	1.2	SL	1.6	SLN	1.6	WL	0.5						
13	IBC 21/ASCE Strength 3 (d) (b)	Yes	Y	DL	1.2	SL	1.6	SLN	1.6	WL	-0.5						
14	IBC 21/ASCE Strength 3 (f) (a)	Yes	Y	DL	1.2	WL	0.5										
15	IBC 21/ASCE Strength 3 (f) (b)	Yes	Y	DL	1.2	WL	-0.5										
16	IBC 21/ASCE Strength 4 (a) (a)	Yes	Y	DL	1.2	WL	1	LL	0.5	LLS	1	RLL	0.5				
17	IBC 21/ASCE Strength 4 (a) (b)	Yes	Y	DL	1.2	WL	-1	LL	0.5	LLS	1	RLL	0.5				
18	IBC 21/ASCE Strength 4 (b) (a)	Yes	Y	DL	1.2	WL	1	LL	0.5	LLS	1	SL	0.5	SLN	0.5		
19	IBC 21/ASCE Strength 4 (b) (b)	Yes	Y	DL	1.2	WL	-1	LL	0.5	LLS	1	SL	0.5	SLN	0.5		
20	IBC 21/ASCE Strength 4 (c) (a)	Yes	Y	DL	1.2	WL	1	LL	0.5	LLS	1						
21	IBC 21/ASCE Strength 4 (c) (b)	Yes	Y	DL	1.2	WL	-1	LL	0.5	LLS	1						
22	IBC 21/ASCE Strength 5 (a)	Yes	Y	DL	0.9	WL	1										
23	IBC 21/ASCE Strength 5 (b)	Yes	Y	DL	0.9	WL	-1										
24	IBC 21/ASCE Strength 6 (a)	Yes	Y	DL	1.2	Sds*DL	0.2	EL	1	LL	0.5	LLS	1	SL	0.2	SLN	0.2
25	IBC 21/ASCE Strength 6 (b)	Yes	Y	DL	1.2	Sds*DL	0.2	EL	-1	LL	0.5	LLS	1	SL	0.2	SLN	0.2
26	IBC 21/ASCE Strength 7 (a)	Yes	Y	DL	0.9	Sds*DL	-0.2	EL	1								
27	IBC 21/ASCE Strength 7 (b)	Yes	Y	DL	0.9	Sds*DL	-0.2	EL	-1								

Envelope AISC 15th (360-16): LRFD Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	phi*Pnc [lb]	phi*Pnt [lb]	phi*Mn y-y [lb-ft]	phi*Mn z-z [lb-ft]	Cb	Eqn
1	M1	HSS8X4X4	0.56	5.05	25	0.12	10	y	13	152492.99	216936	26719.3	45885	1.14	H1-1b
2	M2	HSS6X4X4	0.43	9.32	25	0.02	9.32	z	25	41437.41	178020	22252.5	29145.42	1	H1-1a
3	M3	HSS6X4X4	0.43	9.32	25	0.02	9.32	z	25	41437.41	178020	22252.5	29145.42	1	H1-1a

Detail Report: M1

Load Combination: Envelope **Code check:** 0.559 (LC 25)



Input Data

Shape:	HSS8X4X4	**I Node:**	N5
Member Type:	Beam	**J Node:**	N4
Length (ft):	10	**I Release:**	BenPIN
Material Type:	Hot Rolled Steel	**J Release:**	BenPIN
Design Rule:	Typical	**I Offset:**	N/A
Internal Sections:	100	**J Offset:**	N/A
Design Code:	AISC 15th (360-16): LRFD	**T/C Only:**	Both Way

Material Properties

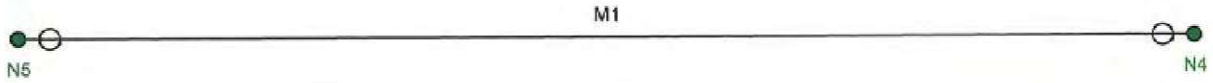
Material:	A500 Gr.B Rect	**Therm. Coeff. (/1E5 F):**	0.65	**F_u (ksi):**	58
E (ksi):	29000	**Density (k/ft^3):**	0.527	**R_t:**	1.3
G (ksi):	11154	**F_y (ksi):**	46		
Nu:	0.3	**R_y:**	1.4		

Shape Properties

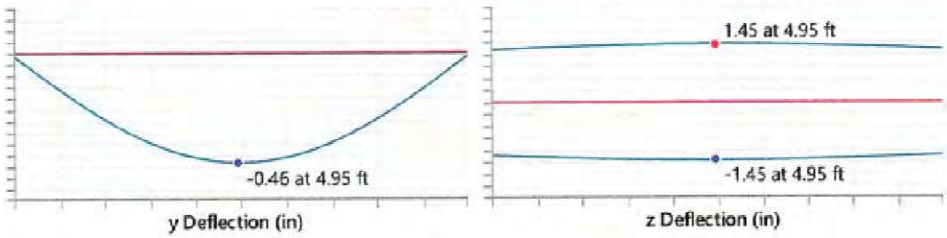
d (in):	8	**I_{yy} (in^4):**	14.4	**J (in^4):**	35.3
b_f (in):	4	**I_{zz} (in^4):**	42.5		
t (in):	0.233	**Area (in^2):**	5.24		

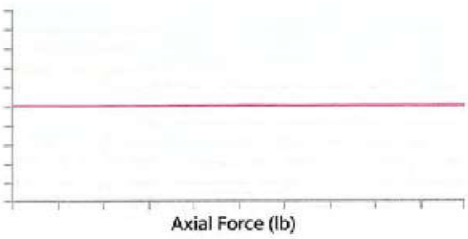
Design Properties

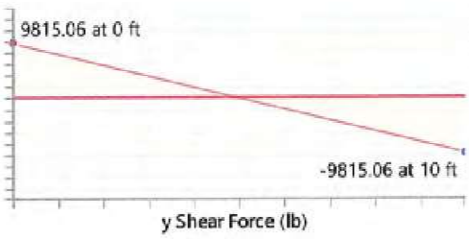
$L_{b\ y-y}$ (ft):	10	**K_{y-y}:**	1	**Seismic DR:**	None
$L_{b\ z-z}$ (ft):	10	**K_{z-z}:**	1	**Max Defl Ratio:**	L/268
$L_{comp\ top}$:	Lbyy	**y sway:**	No	**Max Defl Location:**	4.949
$L_{comp\ bot}$ (ft):	10	**z sway:**	No	**Span:**	1
L_{torque} (ft):	10	**Function:**	Lateral	**τ_b:**	1

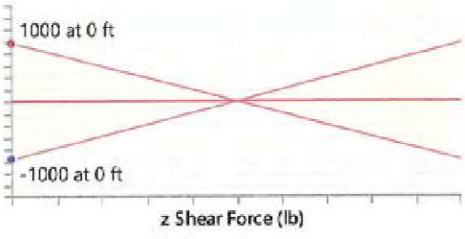


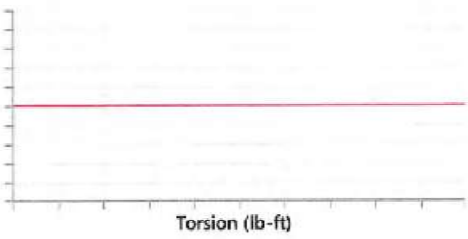
Diagrams:

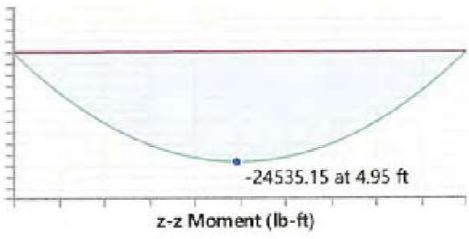


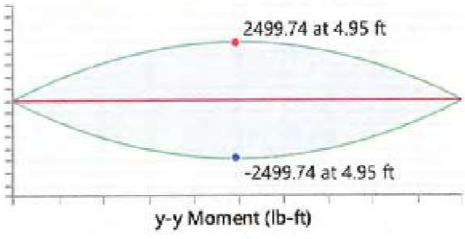


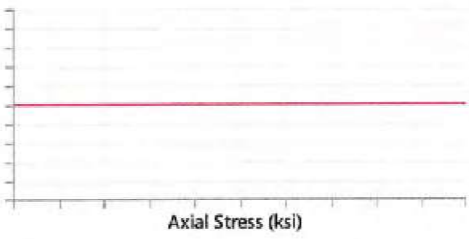


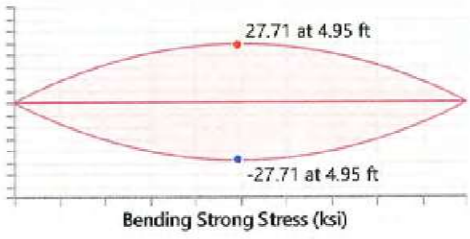


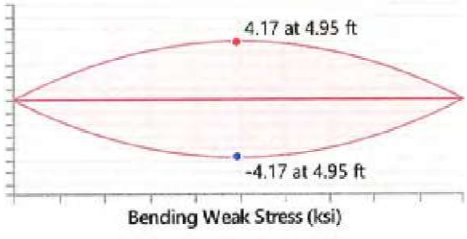










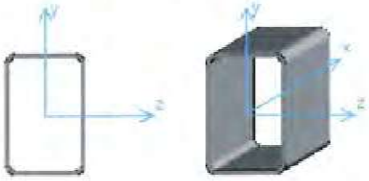


AISC 15th (360-16): LRFD Code Check

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	25	-	-	-	-
Applied Loading - Shear + Torsion	13	-	-	-	-
Axial Tension Analysis	25	0 lb	2.169e+5 lb	-	-
Axial Compression Analysis	25	0 lb	1.525e+5 lb	-	-
Flexural Analysis (Strong Axis)	25	21353.879 lb-ft	45885 lb-ft	-	-
Flexural Analysis (Weak Axis)	-	2499.745 lb-ft	26719.299 lb-ft	-	-
Shear Analysis (Major Axis y)	13	9815.062 lb	84512.289 lb	**0.116**	**PASS**
Shear Analysis (Minor Axis z)	13	0 lb	38210.531 lb	**0**	**PASS**
Bending & Axial Interaction Check (UC Bending Max)	25	-	-	**0.559**	**PASS**
Torsional Analysis	25	0 lb-ft	28121.986 lb-ft	**0**	**PASS**

Detail Report: M2

Load Combination: Envelope **Code check:** 0.433 (LC 25)



Input Data

Shape:	HSS6X4X4	**I Node:**	N1
Member Type:	Column	**J Node:**	N2
Length (ft):	20.5	**I Release:**	Fixed
Material Type:	Hot Rolled Steel	**J Release:**	Fixed
Design Rule:	Typical	**I Offset:**	N/A
Internal Sections:	100	**J Offset:**	N/A
Design Code:	AISC 15th (360-16): LRFD	**T/C Only:**	Both Way

Material Properties

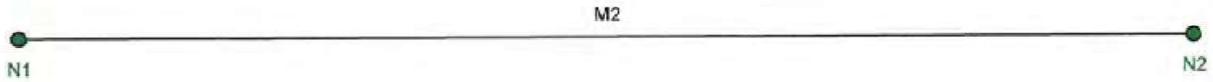
Material:	A500 Gr.B Rect	**Therm. Coeff. (/1E5 F):**	0.65	**F_u (ksi):**	58
E (ksi):	29000	**Density (k/ft^3):**	0.527	**R_t:**	1.3
G (ksi):	11154	**F_y (ksi):**	46		
Nu:	0.3	**R_y:**	1.4		

Shape Properties

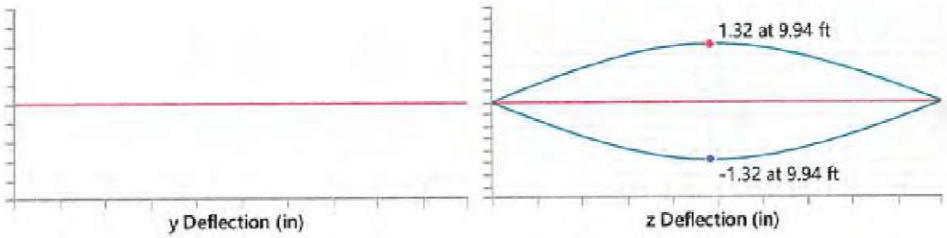
d (in):	6	**I_{yy} (in^4):**	11.1	**J (in^4):**	23.6
b_f (in):	4	**I_{zz} (in^4):**	20.9		
t (in):	0.233	**Area (in^2):**	4.3		

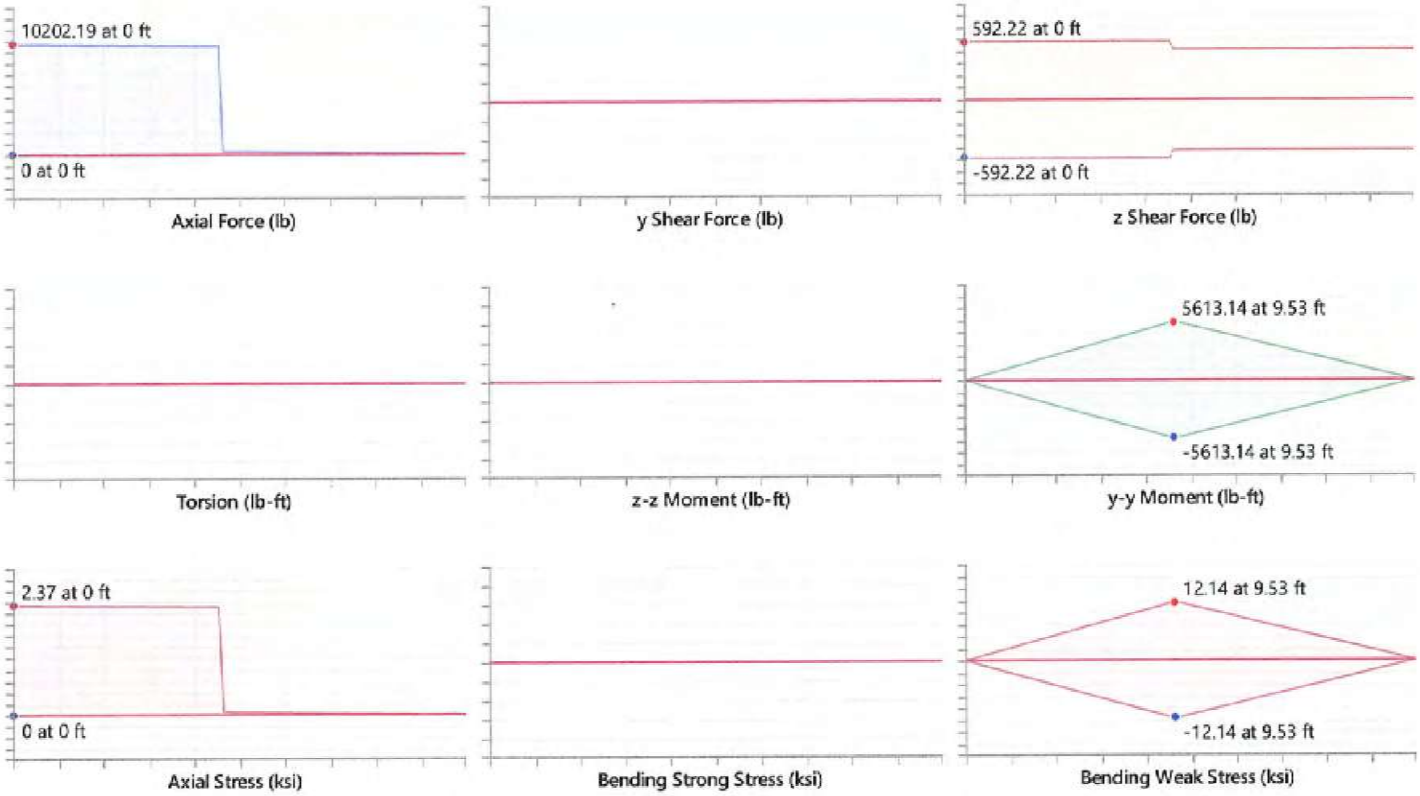
Design Properties

$L_{b\ y-y}$ (ft):	20.5	**K_{y-y}:**	1	**Seismic DR:**	None
$L_{b\ z-z}$ (ft):	20.5	**K_{z-z}:**	1	**Max Defl Ratio:**	L/186
$L_{comp\ top}$ (ft):	20.5	**y sway:**	No	**Max Defl Location:**	9.939
$L_{comp\ bot}$ (ft):	20.5	**z sway:**	No	**Span:**	N/A
L_{torque} (ft):	20.5	**Function:**	Lateral	**τ_b:**	1



Diagrams:





AISC 15th (360-16): LRFD Code Check

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	25	-	-	-	-
Applied Loading - Shear + Torsion	25	-	-	-	-
Axial Tension Analysis	25	0 lb	1.78e+5 lb	-	-
Axial Compression Analysis	25	8789.021 lb	41437.414 lb	-	-
Flexural Analysis (Strong Axis)	25	0 lb-ft	29145.424 lb-ft	-	-
Flexural Analysis (Weak Axis)	-	5518.38 lb-ft	22252.5 lb-ft	-	-
Shear Analysis (Major Axis y)	25	0 lb	61361.41 lb	0	PASS
Shear Analysis (Minor Axis z)	25	592.216 lb	38210.531 lb	0.015	PASS
Bending & Axial Interaction Check (UC Bending Max)	25	-	-	0.433	PASS
Torsional Analysis	25	0 lb-ft	20854.539 lb-ft	0	PASS

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E-mail: Jacob@dlfengineers.com

ENGINEERING CALCULATION SHEET

SHEET NO. 27
CUSTOMER
JOB NO.
DATE
LOCATION
BY CHK'D

H-FRAME CONNECTIONS

BEAM TO WALL

SHEAR LOAD TO ANCHORS = [1.2 (1150PLF) + 1.6(350 PLF)] 1' = 1940#

TENSION " " = 200PLF (1') = 200#

∴ ANCHOR TO (E) CONC WALL
W/ (2) 5/8"Ø FISH GR 36 MIN
EMBED 4" W/ SIMPSON SET-36

BEAM TO COLUMN

V_{MAX} = 9.82 KIPS

3/16" WELD G.F. 4.17 KIPS/IN (LRFD)

9.82/4.17 = 2.4" WELD REQ O.K.

SIMPSON Strong-Tie

Anchor Designer™ for Concrete Software

Version 3.4.2506.1

Company:		Date:	11/24/2025
Engineer:		Page:	1
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

Project description:
Location:
Design name: Design

Comment:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-19
Units: Imperial units

Anchor Information:
Anchor type: Bonded anchor
Material: F1554 Grade 36
Diameter (inch): 0.625
Effective Embedment depth, h_{ef} (inch): 4.000
Code report: ICC-ES ESR-4057
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 5.38
c_{ac} (inch): 8.37
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 6.00
State: Uncracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.4
Reinforcement condition: B tension, B shear
Supplemental edge reinforcement: No
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Hole condition: Dry concrete
Inspection: Continuous
Temperature range, Short/Long: 150/110°F
Reduced installation torque (for AT-3G): Not applicable
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 3.00 x 17.00 x 0.38

Recommended Anchor
Anchor Name: SET-3G™ - SET-3G w/ 5/8"Ø F1554 Gr. 36
Code Report: ICC-ES ESR-4057

SIMPSON Strong-Tie

Anchor Designer™ for Concrete Software
Version 3.4.2506.1

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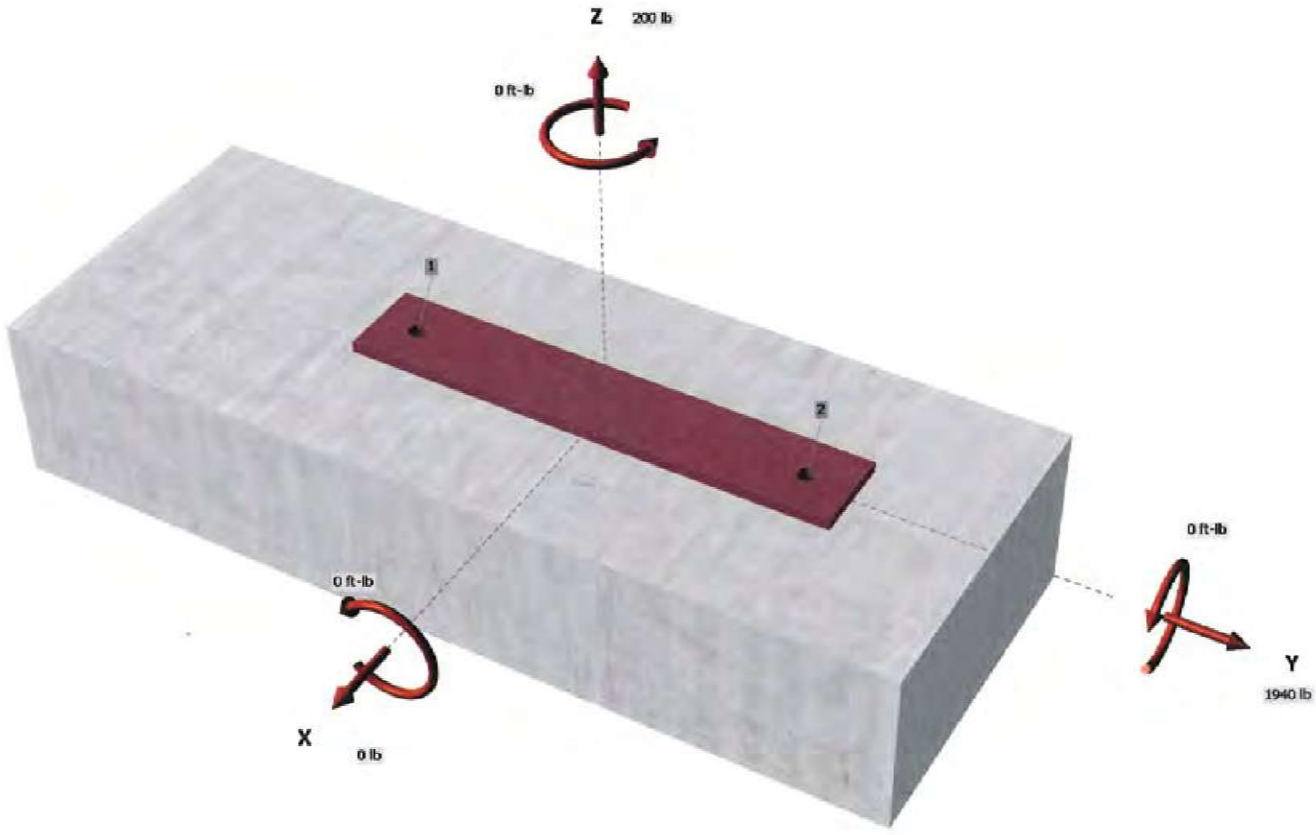
Project:			
Address:			
Phone:			
E-mail:			

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: Yes
Anchors subjected to sustained tension: No
Ductility section for tension: 17.10.5.2 not applicable
Ductility section for shear: 17.10.6.2 not applicable
Ω_0 factor: not set
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

Strength level loads:

N_{ua} [lb]:	200
V_{uax} [lb]:	0
V_{uay} [lb]:	1940
M_{ux} [ft-lb]:	0
M_{uy} [ft-lb]:	0
M_{uz} [ft-lb]:	0

<Figure 1>



SIMPSON Strong-Tie Anchor Designer™ for Concrete Software
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Company:		Date:	11/24/2025
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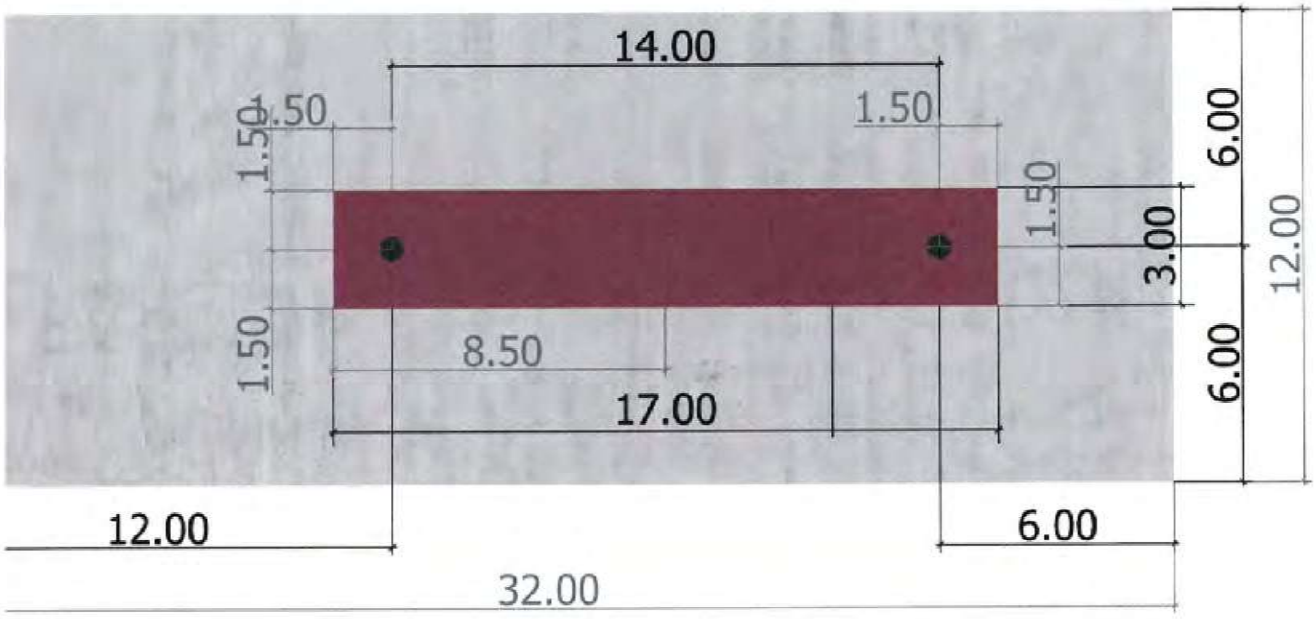
<Figure 2>

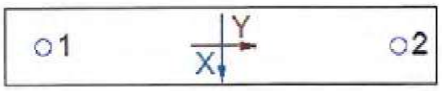


3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	100.0	0.0	970.0	970.0
2	100.0	0.0	970.0	970.0
Sum	200.0	0.0	1940.0	1940.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 200
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



SIMPSON Strong-Tie Anchor Designer™ for Concrete Software Version 3.4.2506.1

Company:		Date:	11/24/2025
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4. Steel Strength of Anchor in Tension (Sec. 17.6.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
13110	0.75	9833

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.6.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.6.2.2.1)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
24.0	1.00	2500	4.000	9600

$0.75\phi N_{cbg} = 0.75\phi \, (A_{Nc} / A_{Nco}) \, \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.5.1.2 & Eq. 17.6.2.1a)

A_{Nc} (in²)	A_{Nco} (in²)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	$0.75\phi N_{cbg}$ (lb)
288.00	144.00	6.00	1.000	1.000	1.00	0.717	9600	0.65	6707

6. Adhesive Strength of Anchor in Tension (Sec. 17.6.5)

$\tau_{k,uncr} = \tau_{k,uncr} f_{short\text{-}term} K_{sat} \alpha_{N,seis} (f'_c / 2{,}500)^n$

$\tau_{k,uncr}$ (psi)	$f_{short\text{-}term}$	K_{sat}	$\alpha_{N,seis}$	f'_c (psi)	n	$\tau_{k,uncr}$ (psi)
2162	1.00	1.00	1.00	2500	0.35	2162

$N_{ba} = \lambda_a \tau_{uncr} \pi d_a h_{ef}$ (Eq. 17.6.5.2.1)

λ_a	τ_{uncr} (psi)	d_a (in)	h_{ef} (in)	N_{ba} (lb)
1.00	2162	0.63	4.000	16980

$0.75\phi N_{ag} = 0.75\phi \, (A_{Na} / A_{Nao}) \, \Psi_{ec,Na} \Psi_{ed,Na} \Psi_{cp,Na} N_{ba}$ (Sec. 17.5.1.2 & Eq. 17.6.5.1b)

A_{Na} (in²)	A_{Nao} (in²)	c_{Na} (in)	$c_{a,min}$ (in)	$\Psi_{ec,Na}$	$\Psi_{ed,Na}$	$\Psi_{cp,Na}$	N_{ba} (lb)	ϕ	$0.75\phi N_{ag}$ (lb)
345.15	307.10	8.76	6.00	1.000	0.905	1.000	16980	0.65	8424

7. Steel Strength of Anchor in Shear (Sec. 17.7.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\alpha_{V,seis}$	$\phi_{grout} \alpha_{V,seis} \phi V_{sa}$ (lb)
7865	1.0	0.65	0.75	3834

8. Concrete Breakout Strength of Anchor in Shear (Sec. 17.7.2)

Shear perpendicular to edge in y-direction:

$V_{by} = \min|7(l_e / d_a)^{0.2} \sqrt{d_a} \lambda_a \sqrt{f'_c} c_{a1}^{1.5};\ 9\lambda_a \sqrt{f'_c} c_{a1}^{1.5}|$ (Eq. 17.7.2.2.1a & Eq. 17.7.2.2.1b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
4.00	0.625	1.00	2500	4.00	3209

$\phi V_{cby} = \phi \, (A_{Vc} / A_{Vco}) \, \Psi_{ed,V} \Psi_{c,V} \Psi_{h,V} V_{by}$ (Sec. 17.5.1.2 & Eq. 17.7.2.1a)

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cby} (lb)
72.00	72.00	1.000	1.400	1.000	3209	0.70	3145

Shear parallel to edge in x-direction:

$V_{by} = \min|7(l_e / d_a)^{0.2} \sqrt{d_a} \lambda_a \sqrt{f'_c} c_{a1}^{1.5};\ 9\lambda_a \sqrt{f'_c} c_{a1}^{1.5}|$ (Eq. 17.7.2.2.1a & Eq. 17.7.2.2.1b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
4.00	0.625	1.00	2500	6.00	5895

$\phi V_{cbgx} = \phi \, (2)(A_{Vc} / A_{Vco}) \, \Psi_{ec,V} \Psi_{ed,V} \Psi_{c,V} \Psi_{h,V} V_{by}$ (Sec. 17.5.1.2, 17.7.2.1(c) & Eq. 17.7.2.1b)

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgx} (lb)
174.00	162.00	1.000	1.000	1.400	1.225	5895	0.70	15199

9. Concrete Pryout Strength of Anchor in Shear (Sec. 17.7.3)

$\phi V_{cpg} = \phi \min|k_{cp} N_{ag};\ k_{cp} N_{cbg}| = \phi \min|k_{cp} (A_{Na} / A_{Nao}) \, \Psi_{ec,Na} \Psi_{ed,Na} \Psi_{cp,Na} N_{ba};\ k_{cp} (A_{Nc} / A_{Nco}) \, \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b|$ (Sec. 17.5.1.2 & Eq. 17.7.3.1b)

k_{cp}	A_{Na} (in²)	A_{Nao} (in²)	$\Psi_{ed,Na}$	$\Psi_{ec,Na}$	$\Psi_{cp,Na}$	N_{ba} (lb)	N_a (lb)
2.0	345.15	307.10	0.905	1.000	1.000	16980	17279

SIMPSON StrongTie Anchor Designer™ for Concrete Software
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A_{Nc} (in²)	A_{Nco} (in²)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ
288.00	144.00	1.000	1.000	1.000	0.717	9600	13758	0.70

ϕV_{cbg} (lb)
19261

10. Results

Interaction of Tensile and Shear Forces (Sec. R17.8)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	100	9833	0.01	Pass
Concrete breakout	**200**	**6707**	**0.03**	**Pass (Governs)**
Adhesive	200	8424	0.02	Pass

Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status
Steel	970	3834	0.25	Pass
T Concrete breakout y+	**1940**	**3145**	**0.62**	**Pass (Governs)**
|| Concrete breakout x-	1940	15199	0.13	Pass
Pryout	1940	19261	0.10	Pass

Interaction check	$(N_{ua}/\phi N_{ua})^{5/3}$	$(V_{ua}/\phi V_{ua})^{5/3}$	Utilization Ratio	Permissible	Status
Sec. R17.8	0.00	0.45	45.0%	1.0	Pass

SET-3G w/ 5/8"Ø F1554 Gr. 36 with hef = 4.000 inch meets the selected design criteria.

11. Warnings

- Per designer input, the tensile component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor tensile force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.10.5.2 for tension need not be satisfied – designer to verify.

- Per designer input, the shear component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor shear force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.10.6.2 for shear need not be satisfied – designer to verify.

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer's product literature for hole cleaning and installation instructions.

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E-mail: Jacob@dlfengineers.com

ENGINEERING CALCULATION SHEET

SHEET NO. 33
CUSTOMER
JOB NO.
DATE
LOCATION
BY CHK'D

(N) ROOF TOP MECH UNITS

-RTU WT = 1184# + 120# = 1304#
(120# = Σ CURB)

-ERV UNIT = 661# + 120# = 781#.

-PLACE (N) UNITS OVER (E) BLD COLUMNS OR AT LOCATIONS OF (E) UNITS.

FIND MAX ADDITIONAL LOAD TO GLB.

ROOF D = 10.0 PSF
ROOF Lr = 20.0 PSF = REDUCIBLE
ROOF SN = 20.0 PSF NON REDUCIBLE

TOTAL LOAD AT GLB PER L.C. D+SN.

D+SN = 35'(10+12)(42') = 32,340#
(10+12 = Σ TRIB; 42' = Σ BEAM SPAN)

5% OF D+SN = .05(32,340#) = 1617#

MAX ADDITIONAL LOAD @ (1) GLB = 1304# ≤ 1617#

∴ (E) IBC SECTION 503.3 ≤ 5% INCREASE IN DESIGN LOADING, NO ALTERATIONS REQ TO SHELL BLDG.

ANCHORAGE

SEISMIC → Fp = .353(1304#) = 460#

WIND → w = 1.9(19)(7.25')(5.75')(.6) = 905#

Mot = 905#(5.75'/2) = 2601 #-ft (GOVERNS)

MR = 1304#(.6)(5.17/2) = 2022 #-ft

T = C = M/d = (2601 - 2022)/5.17 = 111# = NOMINAL

USE SDS 1/4 x 4 1/2 (S) SHORT SIDE (8), (8) LONG SIDE

YORK® 3-12.5 York® Sun™ Core

Project Name: **AutoZone 10668 - Puyallup, WA** Unit Model #: **WXE12A4A3AS6F244S1**

Quantity: **7** Tag #: **460V 10T HP** System: **WXE12A4A3AS6F244S1**

Cooling Performance		
Total gross capacity	128.0	MBH
Sensible gross capacity	108.6	MBH
Total net capacity	121.5	MBH
Sensible net capacity	102.1	MBH
Efficiency (at ARI)	11.20	EER
Integrated eff. (at ARI)	14.40	IEER
Ambient DB temp.	95.0	°F
Entering DB temp.	80.0	°F
Entering WB temp.	67.0	°F
Evap Coil Leaving DB temp.	54.9	°F
Evap Coil Leaving WB temp.	54.9	°F
Unit Leaving DB temp.	56.4	°F
Unit Leaving WB temp.	56.4	°F
Leaving air temp dew point	54.9	°F
Power input (w/o blower)	9.10	kW
Sound power	86	dB(a)

Refrigerant		
Refrigerant type	R-454B	
Sys1	10 lb	14 oz
Sys2	11 lb	2 oz

Heat Pump Performance		
Supply air	4000	cfm
Ambient DB temp.	47	°F
Entering DB temp.	60	°F
Leaving DB temp.	86	°F
Air temp. rise	26	°F
Design Gross Capacity	112.4	MBH
Design Power Input	7.48	kW
Capacity @ 47(°F)	113.00	MBH
COP @ 47(°F)	3.40	COP
Capacity @ 17(°F)	65.00	MBH
COP @ 17(°F)	2.25	COP

Supply Air Blower Performance		
Supply air	4000	cfm
Ext. static pressure	0.6	IWG
Blower speed	780	rpm
Max BHP of Motor (including service factor)	2.40	HP
Duct location	Bottom	
Motor rating	2.40	HP
Actual required BHP	2.05	HP
Power input	1.91	kW
Elevation	0	ft
Drive type	BELT	

Electrical Data		
Power supply	460-3-60	
Unit min circuit ampacity	25	A
Unit min over-current protection	30	A
Unit max over-current protection	30	A

Dimensions & Weight		
Hgt 55 in	Len 87 in	Wth 62 in
Weight with factory installed options		1184 lb

Clearances					
Right	18 in	Front	48 in	Rear	36 in
Top	72 in	Bottom	1 in	Left	12 in

Note: Please refer to the tech guide for listed maximum static pressures

10 Ton

- All units are manufactured at an ISO 9001 registered facility and each rooftop is completely computer-run tested prior to shipment.

Unit Features

- Refrigerant Detection System (RDS) is Factory Installed
- Unit Cabinet Constructed of Powder Painted Steel, Certified At 750 Hours Salt Spray Test (ASTM B-117 Standards)
- Either supply and/or return can be field converted from vertical to horizontal configuration without cutting panels.
- Full perimeter base rails with built in rigging capabilities
- Scroll Compressors
- Standard Static Belt Drive Blower
- Solid Core Liquid Line Filter Driers
- Unit Ships with 2" Throwaway Filters
- Replacement Filters: 4 - (20" x 20"). Unit accepts 2" wide filters.
- Single Point Power Connection
- Short Circuit Current: 5kA RMS Symmetrical

Standard Unit Controller

- An Integrated Low-Ambient Control, Anti-Short Cycle Protection, Lead-Lag, Fan On and Fan off Delays, Low Voltage Protection, Allows all units to operate in the cooling mode down to 0 °F outdoor ambient without additional components or intervention.
- Safety Monitoring - Monitors the high and low-pressure switches, the freezestats, the gas valve, if applicable, and the temperature limit switch on gas and electric heat units. The unit control board will alarm on ignition failures, safety lockouts and repeated limit switch trips.

Warranty

- One (1) Year Limited Warranty on the Complete Unit
- Five (5) Year Warranty - Compressors

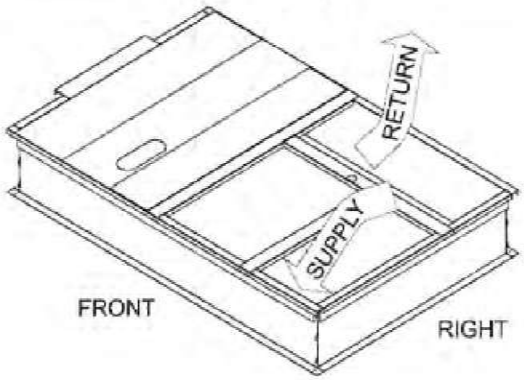
3-12.5 York® Sun™ Core

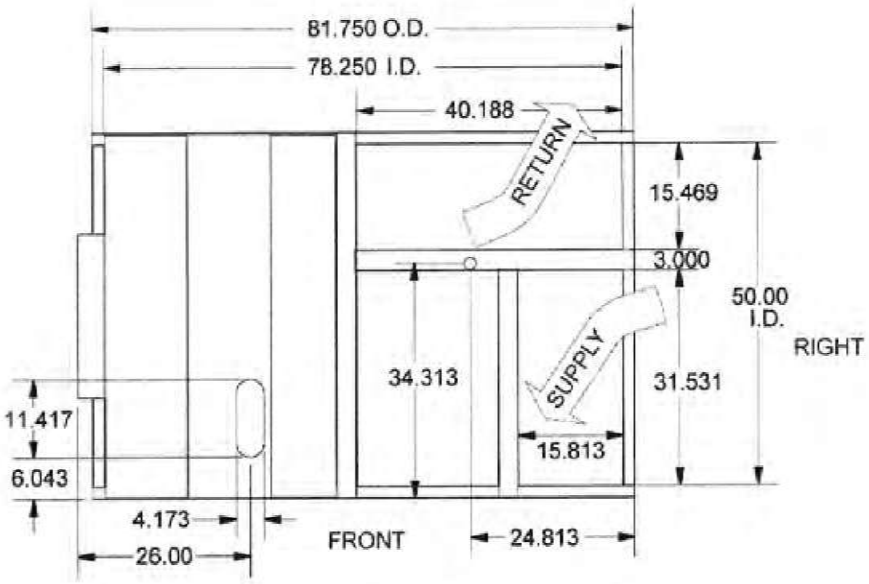
Project Name: **AutoZone 10668 - Puyallup, WA**

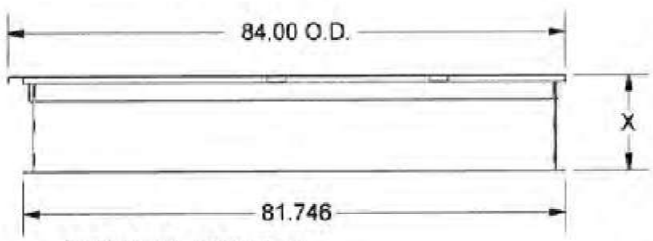
Unit Model #: **WXE12A4A3AS6F244S1**

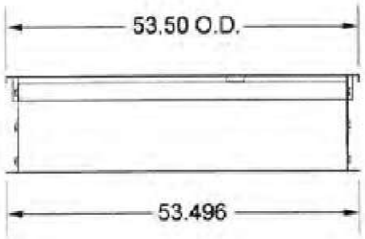
Quantity: **7** Tag #: **460V 10T HP**

1RC0457 Roof Curb









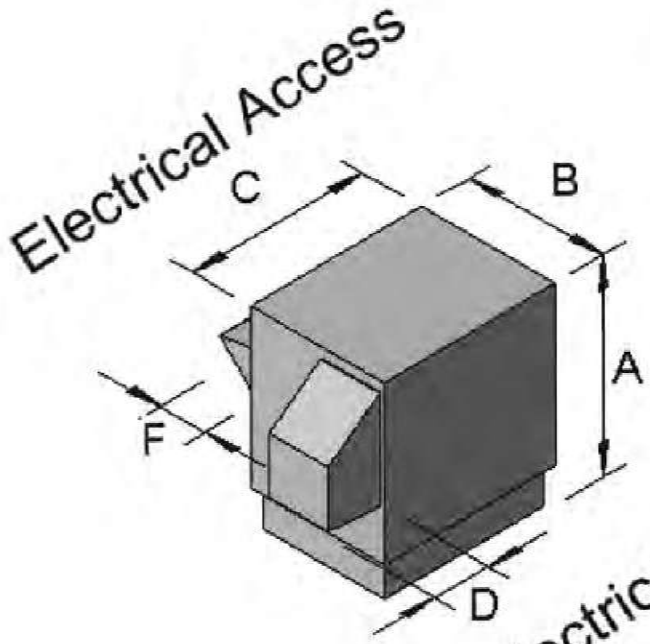
1RC0457 X= 14" Height
1RC0459 X= 24" Height

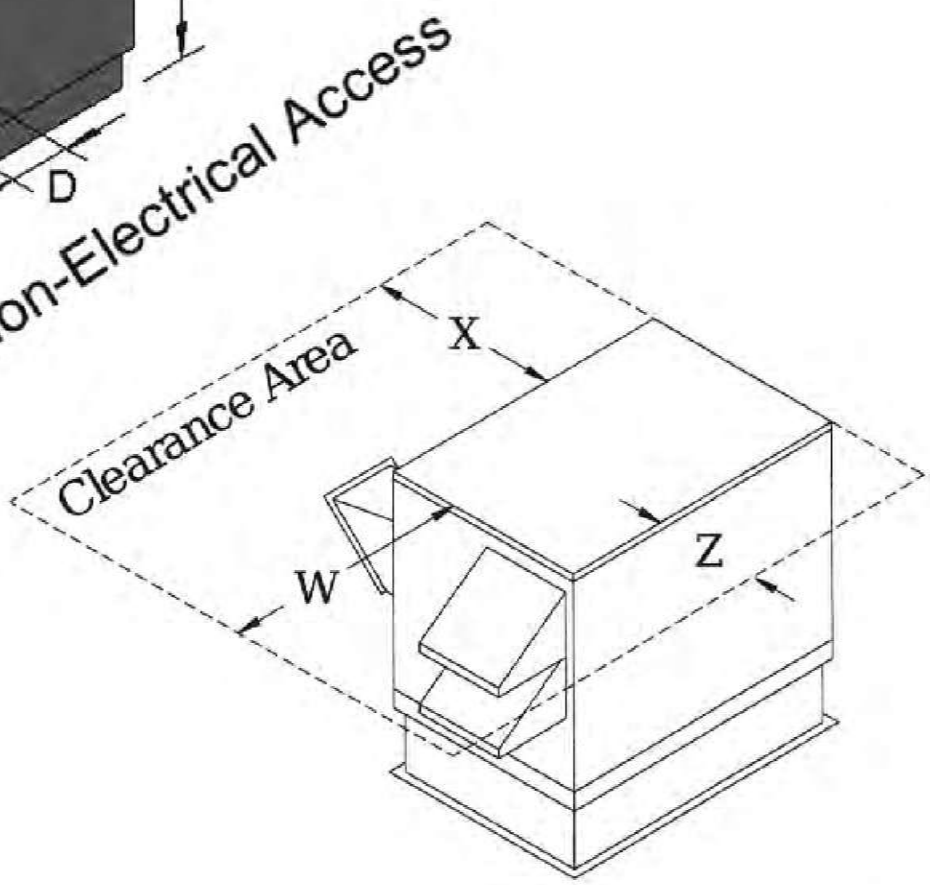
Notes:
1. Sides, ends, unit locator and cross support are 18-G90. Deck pans, R/A & S/A supports are 20-G90.
2. Full perimeter wood nailer.
3. Insulated deck pans.

Unit Models used with 1RC0457, 1RC0459 Roof Curb

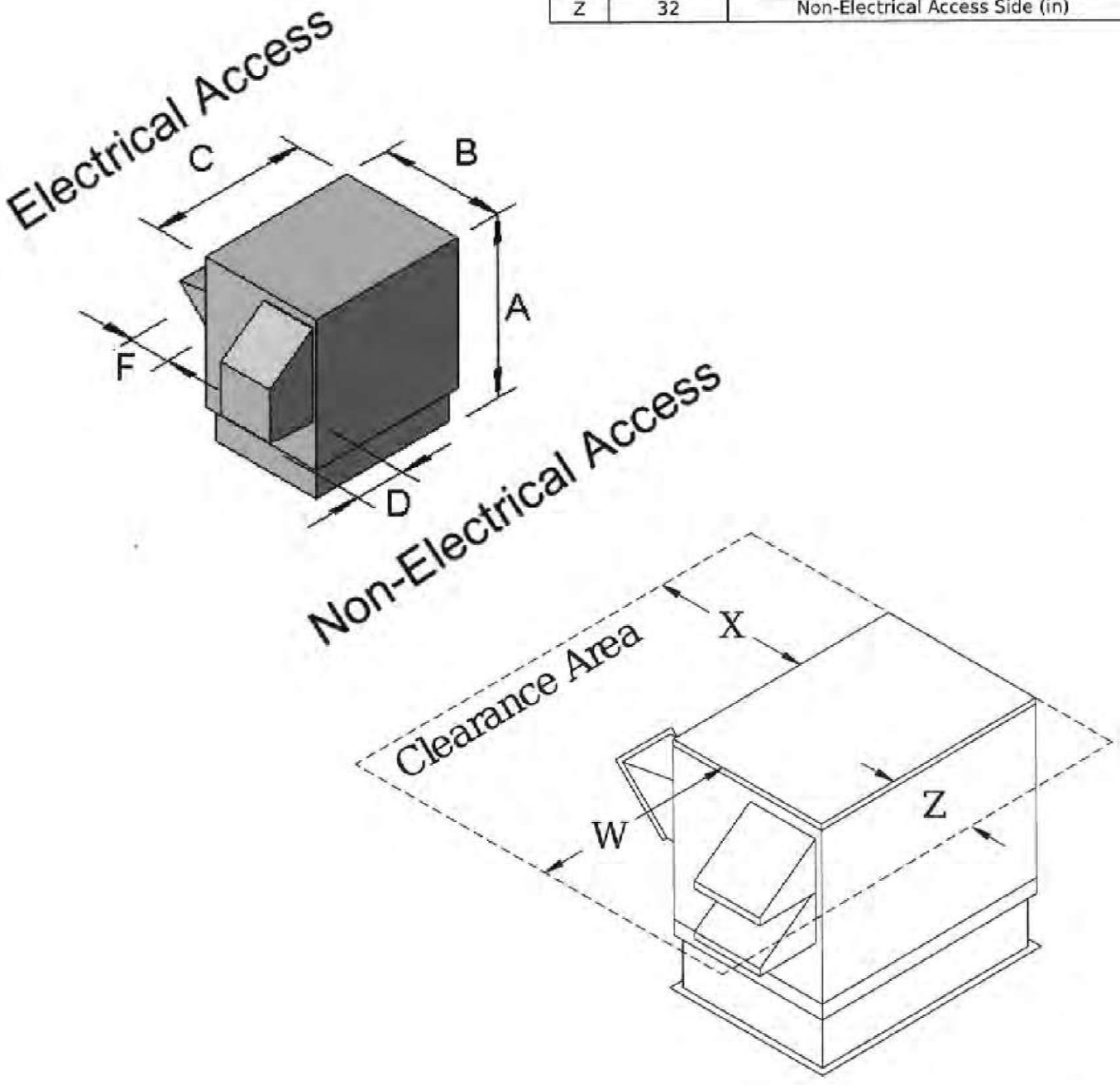
ZX08	ZY07
ZX09	ZY08
ZX12	ZY09
ZX14	ZY12

Dimensions and Weights		
Label	**Value**	**Description**
-	661	Weight w/o accessories (lbs)
A	46.4	Overall Height (in)
B	51	Overall Width (in)
C	62	Overall Length (in)
D	12.2	Outdoor Air Weatherhood (in)
F	14.8	Exhaust Air Weatherhood (in)
W	28	Outdoor Air Intake End (in)
X	42	Electrical Access Side (in)
Y	32	Return Air Intake End (in)
Z	32	Non-Electrical Access Side (in)





Dimensions and Weights		
Label	**Value**	**Description**
-	270	Weight w/o accessories (lbs)
A	40.2	Overall Height (in)
B	33.7	Overall Width (in)
C	46.1	Overall Length (in)
D	12.2	Outdoor Air Weatherhood (in)
F	14.8	Exhaust Air Weatherhood (in)
W	24	Outdoor Air Intake End (in)
X	32	Electrical Access Side (in)
Y	32	Return Air Intake End (in)
Z	32	Non-Electrical Access Side (in)



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E-mail: Jacob@dlfengineers.com

ENGINEERING CALCULATION SHEET

SHEET NO. 38
CUSTOMER
JOB NO.
DATE
LOCATION
BY CHK'D

TRASH ENCLOSURE

TE ROOF

ROOF DL = 5.0 PSF + SELF WT.

ROOF LL = 20.0 PSF

WIND = 15.0 PSF

SEISMIC = 0.806 W

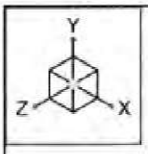
∴ USE W6x20 BEAMS & HSS 4x4x1/4 COLUMNS.

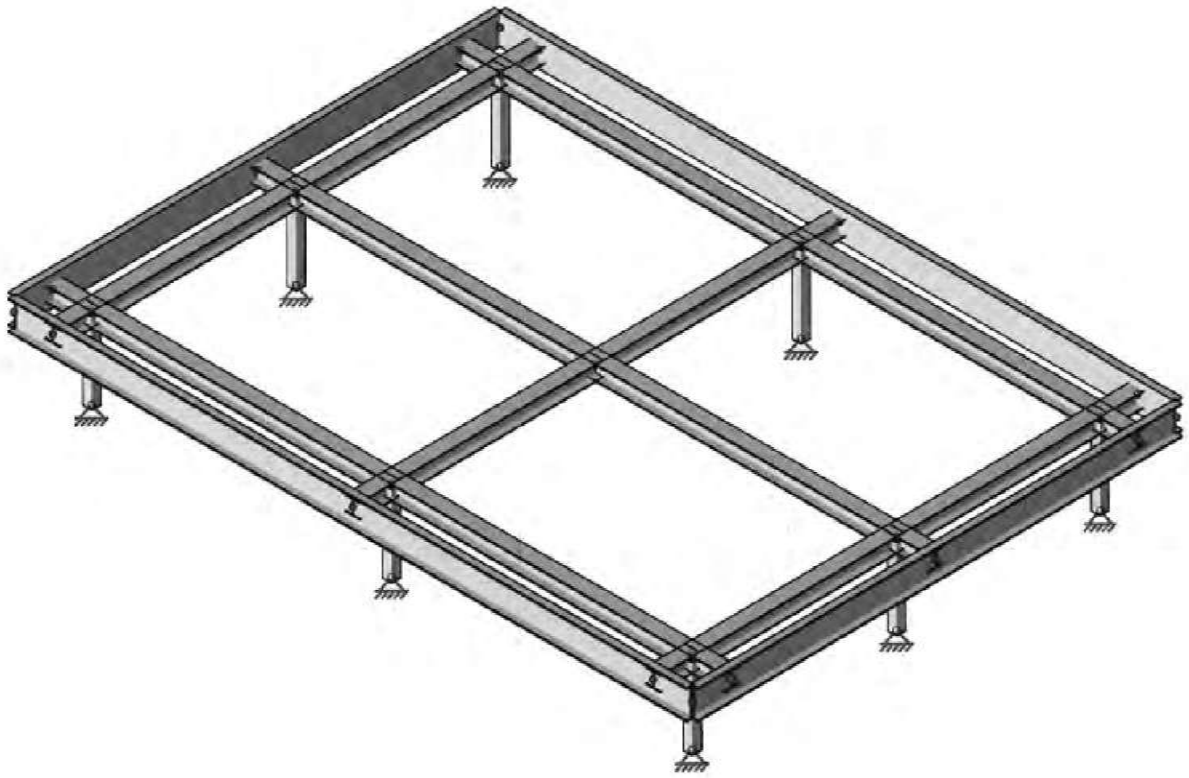
CMU WALL

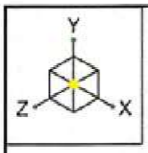
WIND → SAY 30 PSF, BLDG C&C WIND LOAD 27.0 PSF

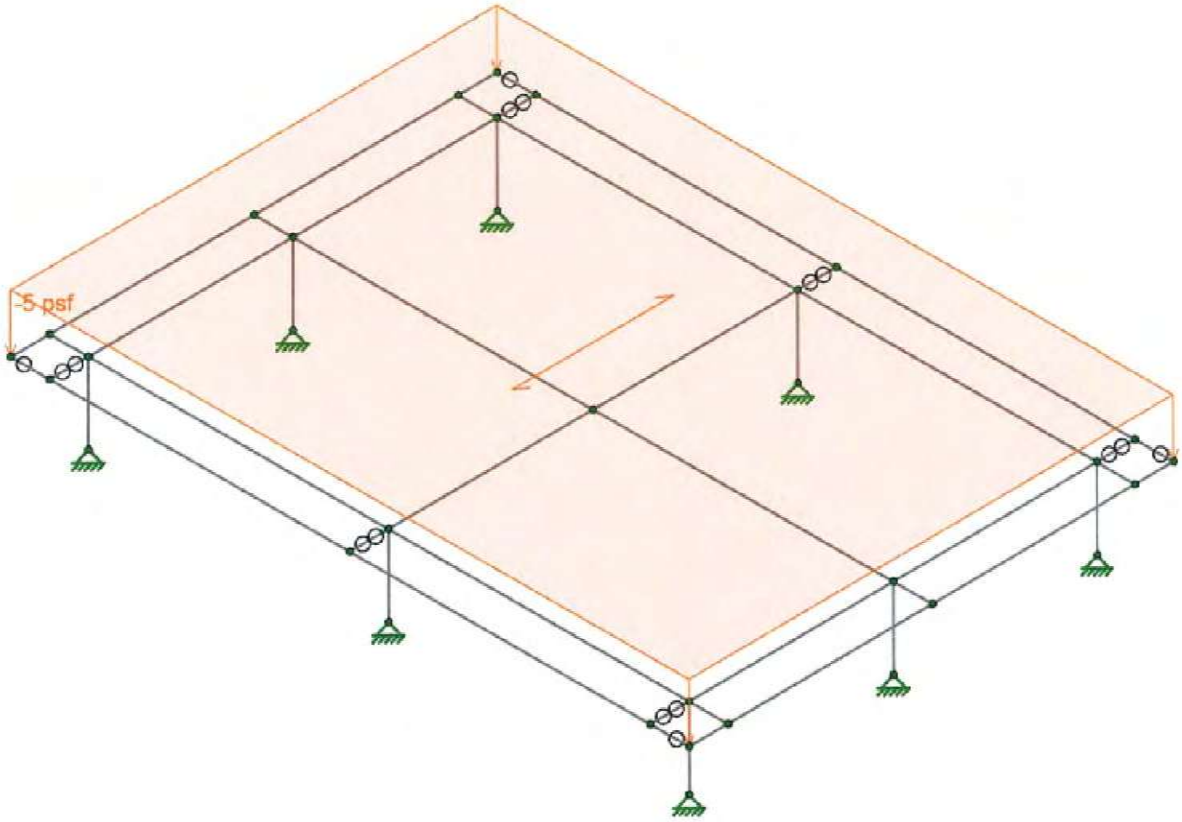
SEISMIC → V = 0.403 (84PSF) = 34 PSF ← CONTROLS

∴ USE 8" FULLY GROUTED CMU WALL w/ #5 @ 16"OC VERT & #4 @ 24"OC HORIZ.

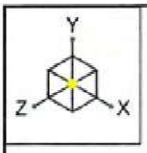

Y
Z
X

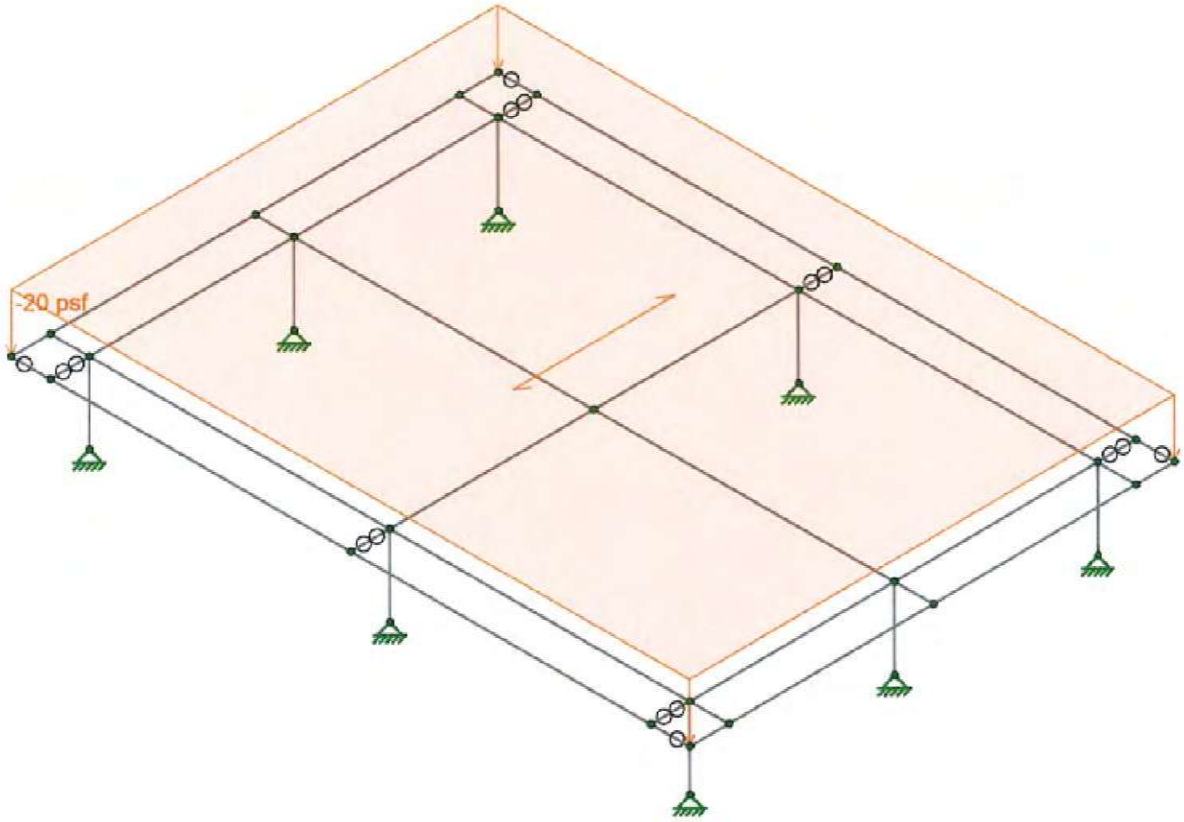




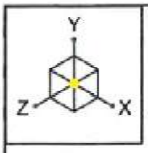


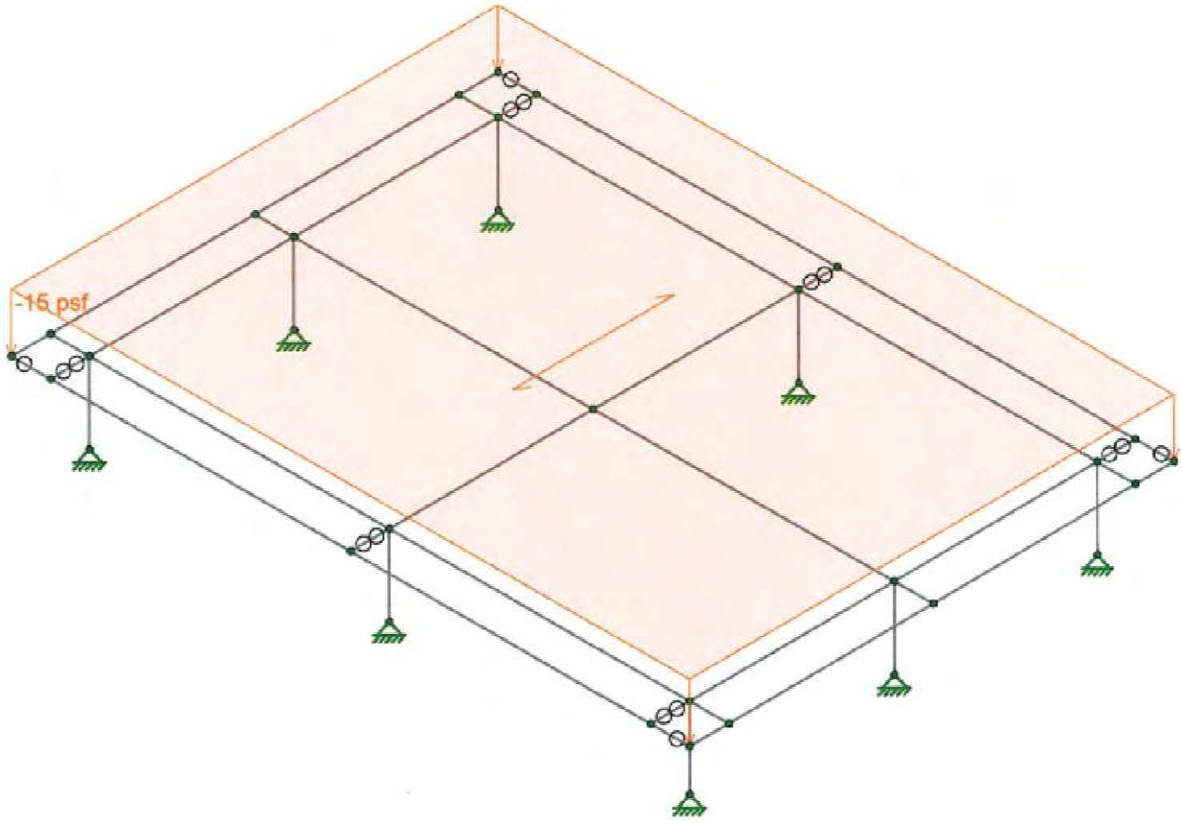
Loads: BLC 2, Dead Load



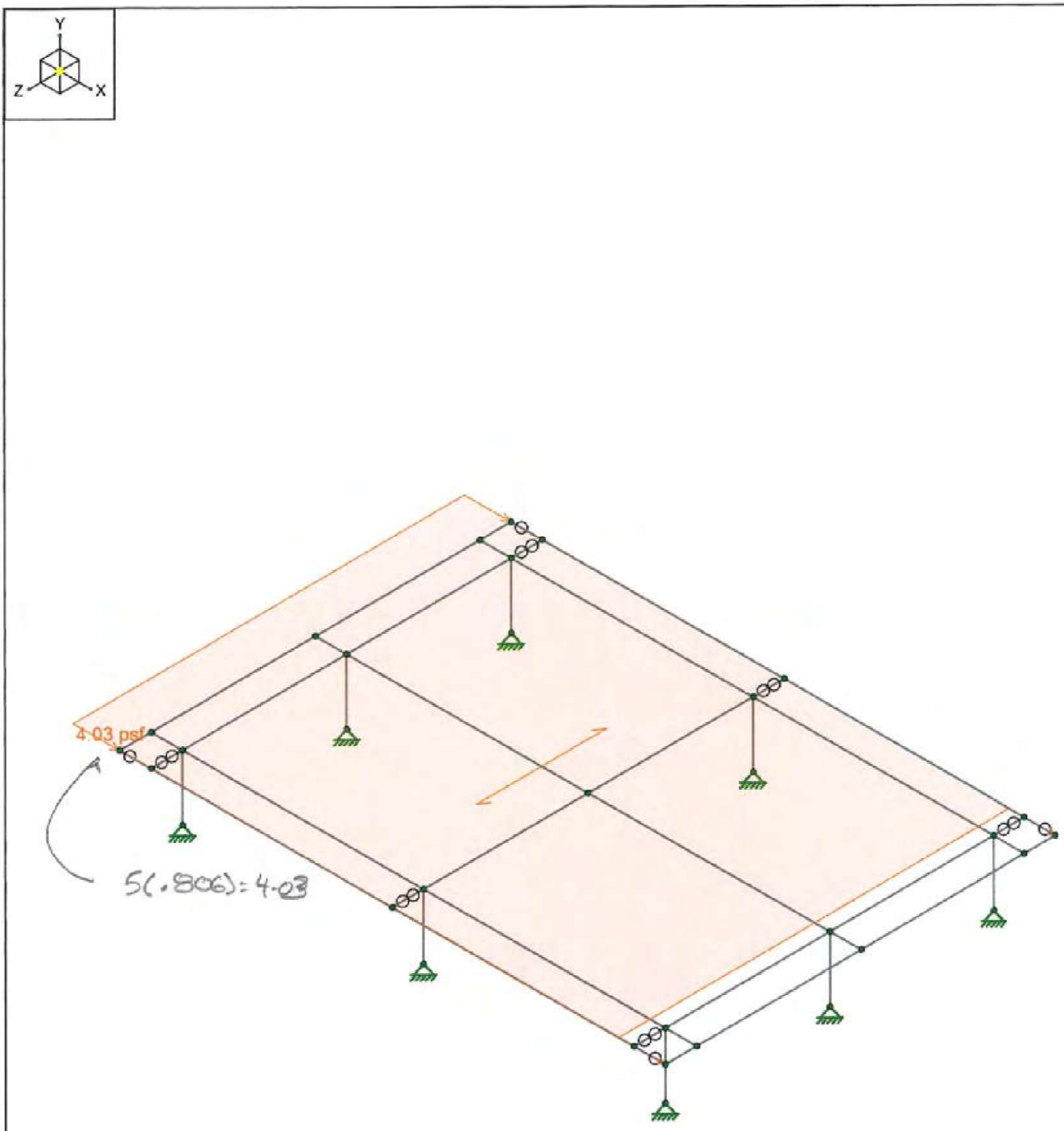


Loads: BLC 3, Roof Live Load

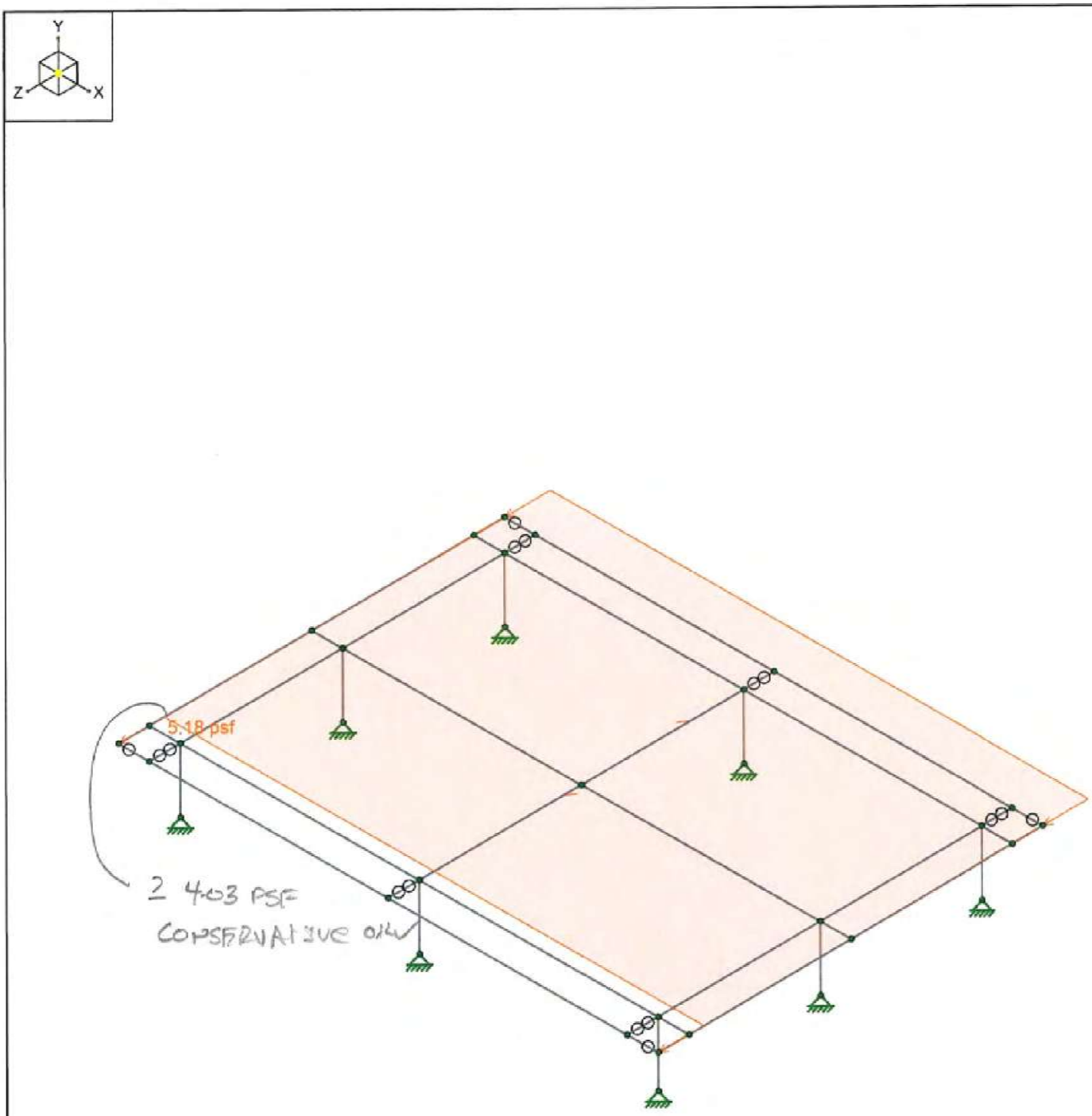




Loads: BLC 4, Wind



Loads: BLC 5, EQx



Loads: BLC 6, EQz

Load Combinations

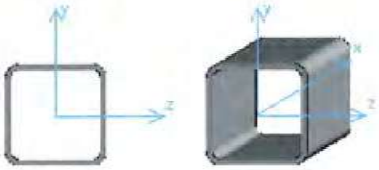
	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	Deflection 1	Yes	Y	DL	1								
2	Deflection 2	Yes	Y	RLL	1								
3	Deflection 3	Yes	Y	DL	1	RLL	1						
4	ASCE Strength 3 (b) (a)	Yes	Y	DL	1.2	RLL	1.6	WL	0.5				
5	ASCE Strength 3 (b) (b)	Yes	Y	DL	1.2	RLL	1.6	WL	-0.5				
6	ASCE Strength 3 (d) (a)	Yes	Y	DL	1.2	WL	0.5						
7	ASCE Strength 3 (d) (b)	Yes	Y	DL	1.2	WL	-0.5						
8	ASCE Strength 3 (f) (a)	Yes	Y	DL	1.2	RL	1.6	WL	0.5				
9	ASCE Strength 3 (f) (b)	Yes	Y	DL	1.2	RL	1.6	WL	-0.5				
10	ASCE Strength 4 (a) (a)	Yes	Y	DL	1.2	WL	1	LL	0.5	LLS	1	RLL	0.5
11	ASCE Strength 4 (a) (b)	Yes	Y	DL	1.2	WL	-1	LL	0.5	LLS	1	RLL	0.5
12	ASCE Strength 4 (b) (a)	Yes	Y	DL	1.2	WL	1	LL	0.5	LLS	1		
13	ASCE Strength 4 (b) (b)	Yes	Y	DL	1.2	WL	-1	LL	0.5	LLS	1		
14	ASCE Strength 4 (c) (a)	Yes	Y	DL	1.2	WL	1	LL	0.5	LLS	1	RL	0.5
15	ASCE Strength 4 (c) (b)	Yes	Y	DL	1.2	WL	-1	LL	0.5	LLS	1	RL	0.5
16	ASCE Strength 5 (a)	Yes	Y	DL	0.9	WL	1						
17	ASCE Strength 5 (b)	Yes	Y	DL	0.9	WL	-1						
18	ASCE Strength 6 (a)	Yes	Y	DL	1.2	Sds*DL	0.2	ELX	1	LL	0.5	LLS	1
19	ASCE Strength 6 (b)	Yes	Y	DL	1.2	Sds*DL	0.2	ELZ	1	LL	0.5	LLS	1
20	ASCE Strength 6 (c)	Yes	Y	DL	1.2	Sds*DL	0.2	ELX	-1	LL	0.5	LLS	1
21	ASCE Strength 6 (d)	Yes	Y	DL	1.2	Sds*DL	0.2	ELZ	-1	LL	0.5	LLS	1
22	ASCE Strength 7 (a)	Yes	Y	DL	0.9	Sds*DL	-0.2	ELX	1				
23	ASCE Strength 7 (b)	Yes	Y	DL	0.9	Sds*DL	-0.2	ELZ	1				
24	ASCE Strength 7 (c)	Yes	Y	DL	0.9	Sds*DL	-0.2	ELX	-1				
25	ASCE Strength 7 (d)	Yes	Y	DL	0.9	Sds*DL	-0.2	ELZ	-1				
26	ASCE Strength 6 (os-a)	Yes	Y	DL	1.2	Sds*DL	0.2	Ω*ELX	1	LL	0.5	LLS	1
27	ASCE Strength 6 (os-b)	Yes	Y	DL	1.2	Sds*DL	0.2	Ω*ELZ	1	LL	0.5	LLS	1
28	ASCE Strength 6 (os-c)	Yes	Y	DL	1.2	Sds*DL	0.2	Ω*ELX	-1	LL	0.5	LLS	1
29	ASCE Strength 6 (os-d)	Yes	Y	DL	1.2	Sds*DL	0.2	Ω*ELZ	-1	LL	0.5	LLS	1
30	ASCE Strength 7 (os-a)	Yes	Y	DL	0.9	Sds*DL	-0.2	Ω*ELX	1				
31	ASCE Strength 7 (os-b)	Yes	Y	DL	0.9	Sds*DL	-0.2	Ω*ELZ	1				
32	ASCE Strength 7 (os-c)	Yes	Y	DL	0.9	Sds*DL	-0.2	Ω*ELX	-1				
33	ASCE Strength 7 (os-d)	Yes	Y	DL	0.9	Sds*DL	-0.2	Ω*ELZ	-1				

Envelope AISC 15th (360-16): LRFD Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	phi*Pnc [lb]	phi*Pnt [lb]	phi*Mn y-y [lb-ft]	phi*Mn z-z [lb-ft]	Cb	Eqn
1	M28	HSS4X4X4	0.21	0	21	0.03	2.75	z	21	135171.43	139518	16180.5	16180.5	1.66	H1-1b
2	M42	HSS4X4X4	0.21	0	19	0.03	2.75	z	19	135171.43	139518	16180.5	16180.5	1.66	H1-1b
3	M1	C12X20.7	0.17	11.7	4	0.01	0	y	4	11289.83	196992	7437.64	21820.13	1.14	H1-1b
4	M3	C12X20.7	0.17	11.7	4	0.01	0	y	4	11289.83	196992	7437.64	21820.13	1.14	H1-1b
5	M24	HSS4X4X4	0.17	0	4	0.02	2.75	y	4	135171.43	139518	16180.5	16180.5	1.66	H1-1b
6	M23	HSS4X4X4	0.17	0	4	0.02	2.75	y	4	135171.43	139518	16180.5	16180.5	1.66	H1-1b
7	M19	W6X20	0.13	7	4	0.03	0	y	4	210359.1	264150	25200	55875	2.13	H1-1b
8	M27	W6X20	0.13	0	4	0.03	7	y	4	210359.1	264150	25200	55875	2.11	H1-1b
9	M14	HSS4X4X4	0.11	0	19	0.02	2.75	y	18	135171.43	139518	16180.5	16180.5	1.66	H1-1b
10	M17	HSS4X4X4	0.11	0	21	0.02	2.75	y	20	135171.43	139518	16180.5	16180.5	1.66	H1-1b
11	M15	HSS4X4X4	0.11	0	21	0.02	2.75	y	18	135171.43	139518	16180.5	16180.5	1.66	H1-1b
12	M16	HSS4X4X4	0.11	0	19	0.02	2.75	y	20	135171.43	139518	16180.5	16180.5	1.66	H1-1b
13	M4	C12X20.7	0.07	8.25	4	0.01	8.25	y	4	21817.99	196992	7437.64	34816.93	1.26	H1-1b
14	M2	C12X20.7	0.07	8.41	4	0.01	8.41	y	4	21817.99	196992	7437.64	34816.34	1.26	H1-1b
15	M22	W6X20	0.07	1.4	4	0.04	1.4	y	4	162113.37	264150	25200	55875	1.53	H1-1b
16	M5	W6X20	0.04	21.76	18	0.03	11.7	y	4	162113.37	264150	25200	55875	2.85	H1-1b
17	M7	W6X20	0.04	1.4	20	0.03	11.46	y	4	162113.37	264150	25200	55875	2.71	H1-1b
18	M33	W6X20	0.04	0	19	0.01	6.36	y	21	210359.1	264150	25200	55875	2.35	H1-1b
19	M25	W6X20	0.04	7	21	0.01	0.64	y	19	210359.1	264150	25200	55875	2.38	H1-1b
20	M26	W6X20	0.04	7	21	0.01	0.64	y	19	210359.1	264150	25200	55875	2.38	H1-1b
21	M30	W6X20	0.04	0	19	0.01	6.36	y	21	210359.1	264150	25200	55875	2.35	H1-1b
22	M38	W6X20	0	0	19	0.02	1.33	z	18	241187.13	243018	23184	51405	1.14	H1-1b*
23	M39	W6X20	0	0	21	0.02	1.33	z	20	241187.13	243018	23184	51405	1.14	H1-1b*
24	M41	W6X20	0	0	21	0.02	1.33	z	18	241187.13	243018	23184	51405	1.14	H1-1b*
25	M36	W6X20	0	0	19	0.02	1.33	z	20	241187.13	243018	23184	51405	1.14	H1-1b*
26	M40	W6X20	0	0	25	0	1.33	y	18	241187.13	243018	23184	51405	1.14	H1-1b*
27	M37	W6X20	0	0	23	0	1.33	y	20	241187.13	243018	23184	51405	1.14	H1-1b*

Detail Report: M28

Load Combination: Envelope **Code check:** 0.207 (LC 21)



Input Data

Shape:	HSS4X4X4	**I Node:**	N14
Member Type:	Column	**J Node:**	N37
Length (ft):	2.75	**I Release:**	Fixed
Material Type:	Hot Rolled Steel	**J Release:**	Fixed
Design Rule:	Typical	**I Offset:**	N/A
Internal Sections:	100	**J Offset:**	N/A
Design Code:	AISC 15th (360-16): LRFD	**T/C Only:**	Both Way

Material Properties

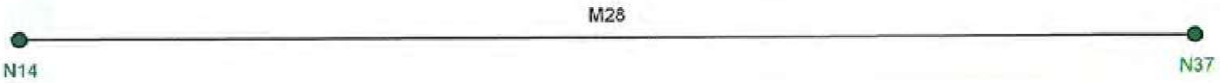
Material:	A500 Gr.B Rect	**Therm. Coeff. (/1E5 F):**	0.65	**F_u (ksi):**	58
E (ksi):	29000	**Density (k/ft^3):**	0.527	**R_t:**	1.3
G (ksi):	11154	**F_y (ksi):**	46		
Nu:	0.3	**R_y:**	1.4		

Shape Properties

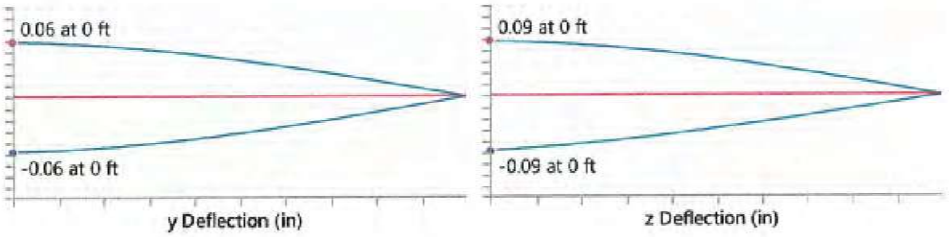
d (in):	4	**I_{yy} (in^4):**	7.8	**J (in^4):**	12.8
b_f (in):	4	**I_{zz} (in^4):**	7.8		
t (in):	0.233	**Area (in^2):**	3.37		

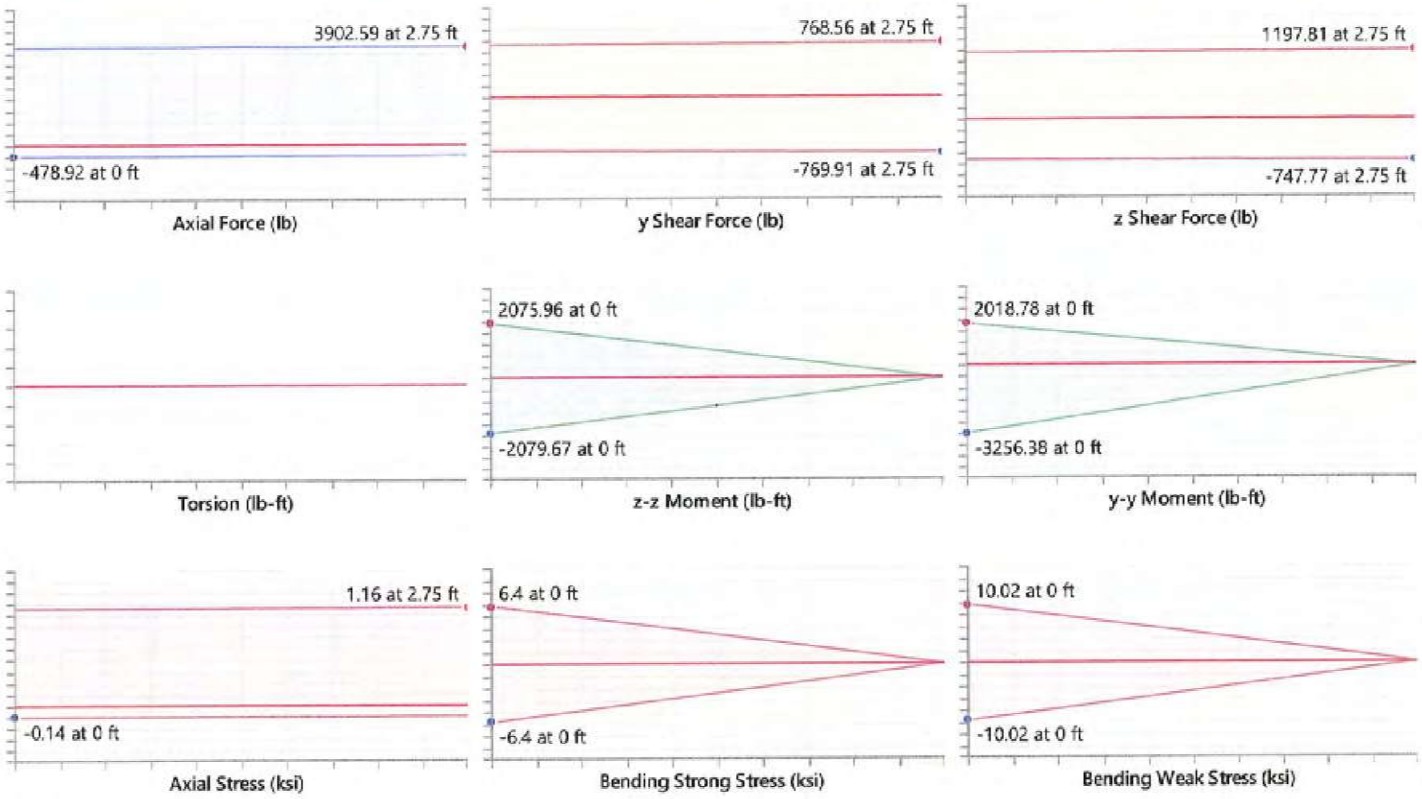
Design Properties

$L_{b\ y-y}$ (ft):	2.75	**K_{y-y}:**	1	**Seismic DR:**	None
$L_{b\ z-z}$ (ft):	2.75	**K_{z-z}:**	1	**Max Defl Ratio:**	L/2177
$L_{comp\ top}$:	Lbyy	**y sway:**	No	**Max Defl Location:**	1.167
$L_{comp\ bot}$ (ft):	2.75	**z sway:**	No	**Span:**	N/A
L_{torque} (ft):	2.75	**Function:**	Lateral	**τ_b:**	1



Diagrams:





AISC 15th (360-16): LRFD Code Check

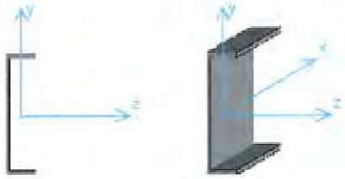
Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	21	-	-	-	-
Applied Loading - Shear + Torsion	21	-	-	-	-
Axial Tension Analysis	21	0 lb	1.395e+5 lb	-	-
Axial Compression Analysis	21	1477.981 lb	1.352e+5 lb	-	-
Flexural Analysis (Strong Axis)	21	1.891 lb-ft	16180.5 lb-ft	-	-
Flexural Analysis (Weak Axis)	-	3256.379 lb-ft	16180.5 lb-ft	-	-
Shear Analysis (Major Axis y)	21	0.688 lb	38210.531 lb	1.8e-5	PASS
Shear Analysis (Minor Axis z)	21	1197.806 lb	38210.531 lb	0.031	PASS
Bending & Axial Interaction Check (UC Bending Max)	21	-	-	0.207	PASS
Torsional Analysis	21	0 lb-ft	13587.092 lb-ft	0	PASS

Company : DLF Engineers
Designer : JFG
Job Number :
Model Name :

11/23/2025
3:44:40 PM
Checked By : _____

Detail Report: M1

Load Combination: Envelope **Code check:** 0.174 (LC 4)



Input Data

Shape:	C12X20.7	**I Node:**	N3
Member Type:	Beam	**J Node:**	N1
Length (ft):	23.16	**I Release:**	BenPIN
Material Type:	Hot Rolled Steel	**J Release:**	BenPIN
Design Rule:	Typical	**I Offset:**	N/A
Internal Sections:	100	**J Offset:**	N/A
Design Code:	AISC 15th (360-16): LRFD	**T/C Only:**	Both Way

Material Properties

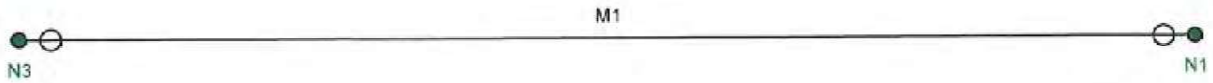
Material:	A36 Gr.36	**Therm. Coeff. (/1E5 F):**	0.65	**F_u (ksi):**	58
E (ksi):	29000	**Density (k/ft^3):**	0.49	**R_t:**	1.2
G (ksi):	11154	**F_y (ksi):**	36		
Nu:	0.3	**R_y:**	1.5		

Shape Properties

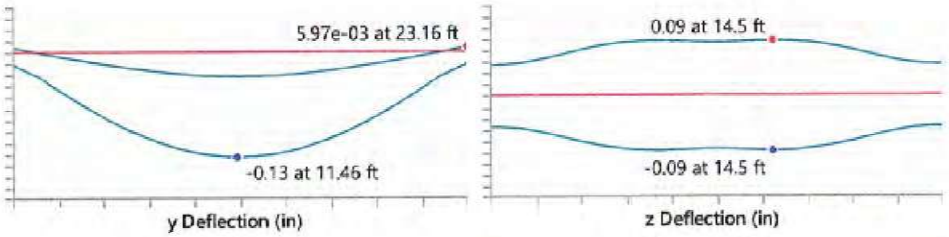
d (in):	12	**I_{zz} (in^4):**	129	**J (in^4):**	0.369
b_f (in):	2.94	**Area (in^2):**	6.08	**$\bar{x}$ (in):**	0.698
t_f (in):	0.501	**Z_{yy} (in^3):**	3.47	**e_o (in):**	0.87
t_w (in):	0.282	**Z_{zz} (in^3):**	25.6		
I_{yy} (in^4):	3.86	**C_w (in^6):**	112		

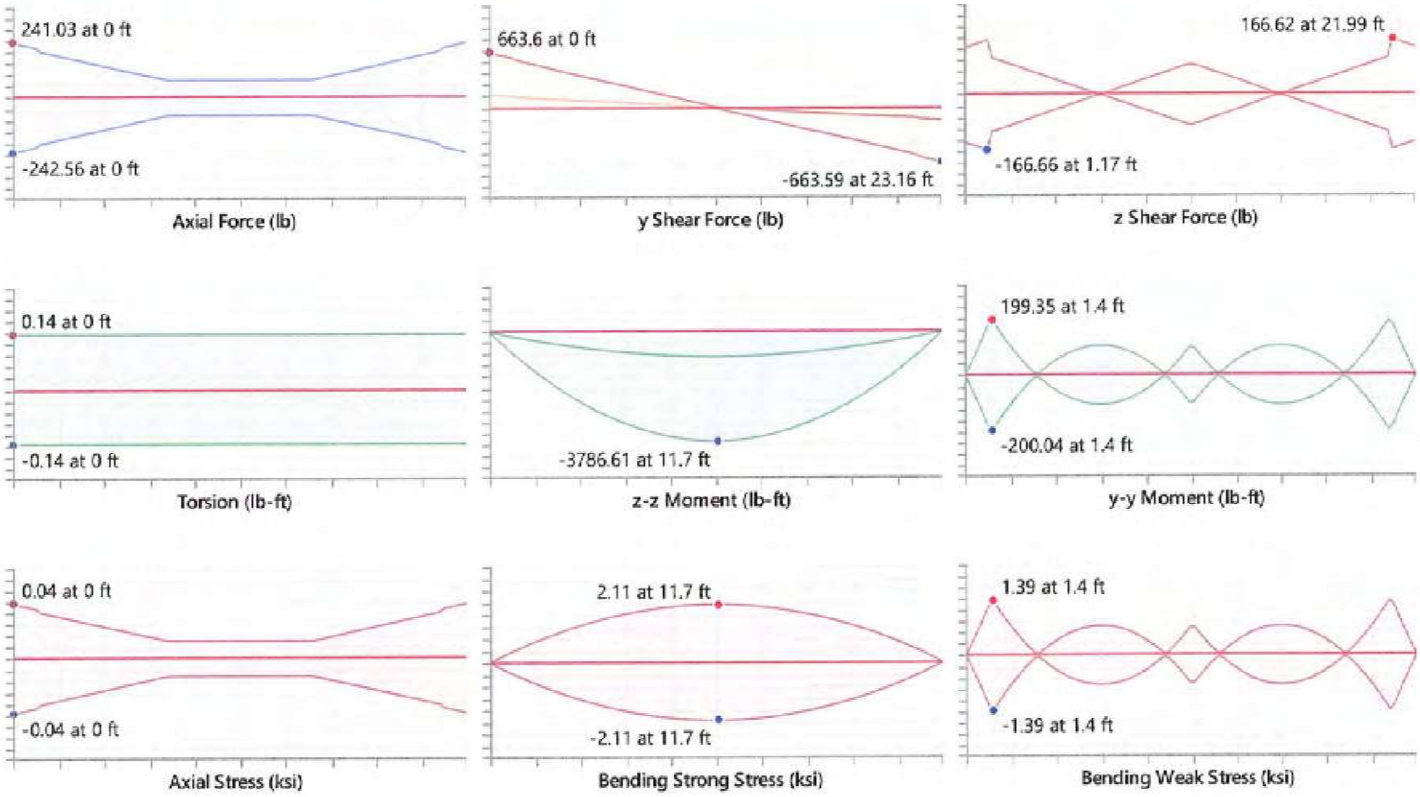
Design Properties

$L_{b\ y-y}$ (ft):	23.16	**K_{y-y}:**	1	**Seismic DR:**	None
$L_{b\ z-z}$ (ft):	23.16	**K_{z-z}:**	1	**Max Defl Ratio:**	L/2256
$L_{comp\ top}$:	Lbyy	**y sway:**	No	**Max Defl Location:**	11.697
$L_{comp\ bot}$ (ft):	23.16	**z sway:**	No	**Span:**	1
L_{torque} (ft):	23.16	**Function:**	Lateral	**τ_b:**	1



Diagrams:



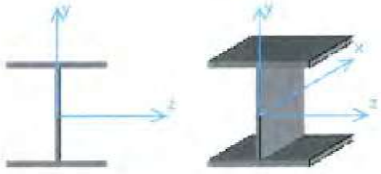


AISC 15th (360-16): LRFD Code Check

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	4	-	-	-	-
Applied Loading - Shear + Torsion	4	-	-	-	-
Axial Tension Analysis	4	0 lb	1.97e+5 lb	-	-
Axial Compression Analysis	4	4.587 lb	11289.834 lb	-	-
Flexural Analysis (Strong Axis)	4	3786.61 lb-ft	21820.129 lb-ft	-	-
Flexural Analysis (Weak Axis)	4	1.835 lb-ft	7437.645 lb-ft	-	-
Shear Analysis (Major Axis y)	4	663.758 lb	65784.961 lb	0.01	PASS
Shear Analysis (Minor Axis z)	4	1.51 lb	57267.906 lb	2.637e-5	PASS
Bending & Axial Interaction Check (UC Bending Max)	4	-	-	0.174	PASS

Detail Report: M19

Load Combination: Envelope **Code check:** 0.132 (LC 4)



Input Data

Shape:	W6X20	**I Node:**	N16
Member Type:	Beam	**J Node:**	N33
Length (ft):	7	**I Release:**	Fixed
Material Type:	Hot Rolled Steel	**J Release:**	Fixed
Design Rule:	Typical	**I Offset:**	N/A
Internal Sections:	100	**J Offset:**	N/A
Design Code:	AISC 15th (360-16): LRFD	**T/C Only:**	Both Way

Material Properties

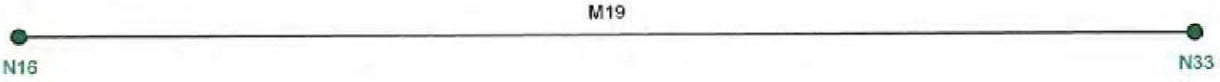
Material:	A992	**Therm. Coeff. (/1E5 F):**	0.65	**F_u (ksi):**	65
E (ksi):	29000	**Density (k/ft^3):**	0.49	**R_t:**	1.1
G (ksi):	11154	**F_y (ksi):**	50		
Nu:	0.3	**R_y:**	1.1		

Shape Properties

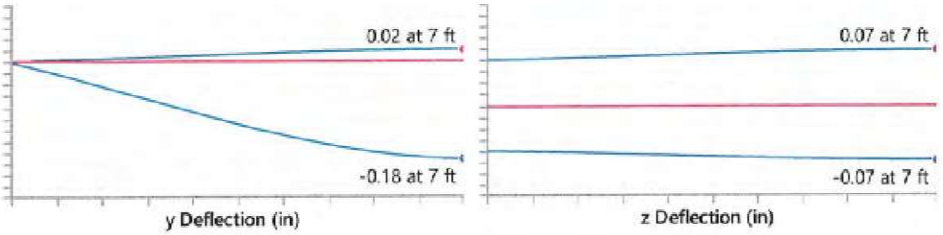
d (in):	6.2	**Area (in^2):**	5.87	**r_T (in):**	1.64
b_f (in):	6.02	**Z_{yy} (in^3):**	6.72	**J (in^4):**	0.24
t_f (in):	0.365	**Z_{zz} (in^3):**	14.9	**k_{det} (in):**	0.875
t_w (in):	0.26	**C_w (in^6):**	113	**k_{des} (in):**	0.615
I_{yy} (in^4):	13.3	**W_{no} (in^2):**	8.78		
I_{zz} (in^4):	41.4	**S_w (in^4):**	4.82		

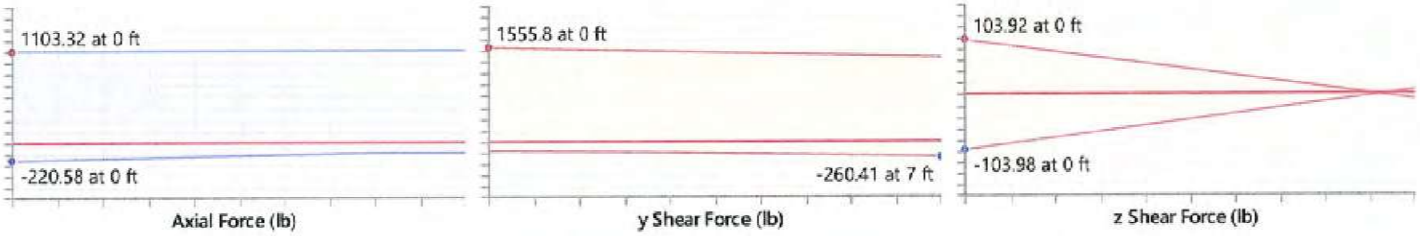
Design Properties

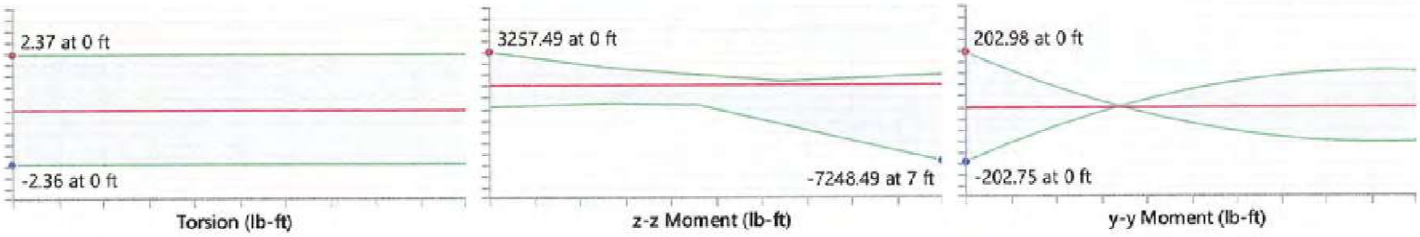
$L_{b\ y\text{-}y}$ (ft):	7	**$K_{y\text{-}y}$:**	1	**Seismic DR:**	None
$L_{b\ z\text{-}z}$ (ft):	7	**$K_{z\text{-}z}$:**	1	**Max Defl Ratio:**	L/2214
$L_{comp\ top}$:	Lbyy	**y sway:**	No	**Max Defl Location:**	7
$L_{comp\ bot}$ (ft):	7	**z sway:**	No	**Span:**	1
L_{torque} (ft):	7	**Function:**	Lateral	**τ_b:**	1

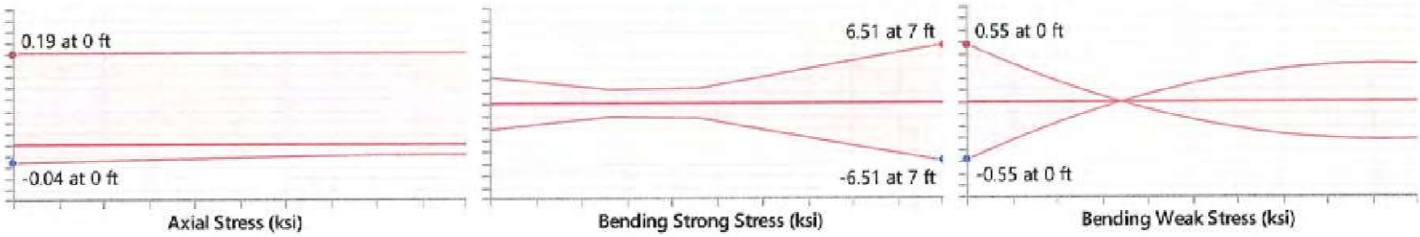


Diagrams:









AISC 15th (360-16): LRFD Code Check

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	4	-	-	-	-
Applied Loading - Shear + Torsion	4	-	-	-	-
Axial Tension Analysis	4	0 lb	2.642e+5 lb	-	-
Axial Compression Analysis	4	1103.324 lb	2.104e+5 lb	-	-
Flexural Analysis (Strong Axis)	4	7248.485 lb-ft	55875 lb-ft	-	-
Flexural Analysis (Weak Axis)	4	0.564 lb-ft	25200 lb-ft	-	-
Shear Analysis (Major Axis y)	4	1555.798 lb	48360 lb	0.032	PASS
Shear Analysis (Minor Axis z)	4	0.361 lb	1.187e+5 lb	3.044e-6	PASS
Bending & Axial Interaction Check (UC Bending Max)	4	-	-	0.132	PASS

Envelope Node Reactions

	Node Label		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N49	max	767.92	20	3902.74	4	747.61	25	0	25	0	25	0	25
2		min	-766.59	22	-448.43	17	-1193.93	19	0	1	0	1	0	1
3	N37	max	766.58	24	3902.59	4	1193.93	21	0	25	0	25	0	25
4		min	-767.91	18	-448.39	17	-747.61	23	0	1	0	1	0	1
5	N35	max	909.21	4	3440.98	4	723.2	21	0	25	0	25	0	25
6		min	-540.75	22	-181.98	17	-723.17	19	0	1	0	1	0	1
7	N36	max	540.75	24	3440.6	4	723.17	21	0	25	0	25	0	25
8		min	-909.14	4	-181.89	17	-723.2	19	0	1	0	1	0	1
9	N20	max	599.41	20	2018.1	4	574.49	25	0	25	0	25	0	25
10		min	-553.78	22	44.57	25	-590.34	19	0	1	0	1	0	1
11	N22	max	553.77	24	2017.83	4	590.34	21	0	25	0	25	0	25
12		min	-599.41	18	44.55	23	-574.49	23	0	1	0	1	0	1
13	N23	max	600.14	20	2006.92	4	590.29	21	0	25	0	25	0	25
14		min	-553.52	22	43.94	23	-574.48	23	0	1	0	1	0	1
15	N21	max	553.52	24	2006.8	4	574.48	25	0	25	0	25	0	25
16		min	-600.15	18	43.93	25	-590.29	19	0	1	0	1	0	1
17	Totals:	max	5034.59	24	22736.57	4	5478.31	21						
18		min	-5034.59	22	-165.93	17	-5478.31	19						

* REACTIONS ARE NOMINAL

WELD HSS4x4x1/4 TO PL1/2 x6"SQ EMBED w/ (2) 5/8"Ø x8" LONG STUDS INTO (N) FULLY GROUTED CMU WALL

Project Name/Number : Trash Enclosu
Title :
Dsgnr: JFG
Description....
Trash Enclosure

Date: 29 APR 2025

This Wall in File: X:\x\DLFSTRUC\Retain Pro Files\Year 2025\5255.2.1.25\Trash Enclosure.RPX

Cantilevered Retaining Wall

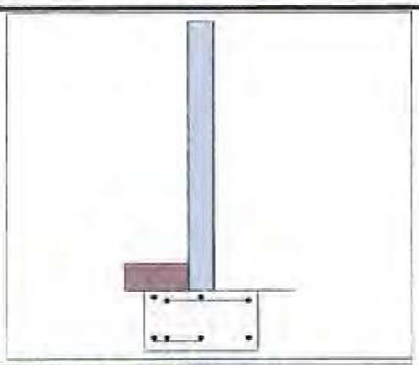
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	0.00 ft
Wall height above soil	=	6.67 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	8.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	100.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing||Soil Friction	=	0.300
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
NOT Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	6.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Stem Weight Seismic Load

F_p / W_p Weight Multiplier = 0.403 g

Added seismic base force 158.1 lbs

Design Summary

Wall Stability Ratios

Overturning	=	2.43	OK
Sliding	=	2.94	OK
Total Bearing Load	=	1,321 lbs	
...resultant ecc.	=	7.83 in	
Soil Pressure @ Toe	=	1,039 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	1,500 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,455 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	4.9 psi	OK
Footing Shear @ Heel	=	1.0 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	197.4 lbs	
less 100% Passive Force	= -	184.7 lbs	
less 100% Friction Force	= -	396.3 lbs	
Added Force Req'd	=	0.0 lbs	OK
....for 1.5 Stability	=	0.0 lbs	OK

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

	Bottom
	Stem OK
Design Height Above Ftg ft =	0.00
Wall Material Above "Ht" =	Masonry
Design Method =	LRFD
Thickness =	8.00
Rebar Size =	# 5
Rebar Spacing =	16.00
Rebar Placed at =	4 in
Design Data	
fb/FB + fa/Fa =	0.207
Total Force @ Section	
Service Level lbs =	
Strength Level lbs =	225.8
Moment....Actual	
Service Level ft-# =	
Strength Level ft-# =	753.0
Moment.....Allowable =	3,621.9
Shear.....Actual	
Service Level psi =	
Strength Level psi =	2.5
Shear.....Allowable psi =	69.7
Anet (Masonry) in2 =	91.50
Rebar Depth 'd' in =	4.00
Masonry Data	
f'm psi =	1,500
Fy psi =	60,000
Solid Grouting =	Yes
Modular Ratio 'n' =	21.48
Wall Weight psf =	84.0
Equiv. Solid Thick. in =	7.60
Masonry Block Type =	Normal Weight
Masonry Design Method =	LRFD
Concrete Data	
f'c psi =	
Fy psi =	

This Wall in File: X:\x\DLFSTRUC\Retain Pro Files\Year 2025\5255.2.1.25\Trash Enclosure.RPX

Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Footing Data

Toe Width	=	1.17 ft
Heel Width	=	1.83
Total Footing Width	=	3.00
Footing Thickness	=	18.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 40,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 3.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,455	0 psf
Mu' : Upward	=	10,066	34 ft-#
Mu' : Downward	=	3,759	236 ft-#
Mu: Design	=	526	202 ft-#
Actual 1-Way Shear	=	4.92	0.99 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 4 @ 6.17 in	
Heel Reinforcing	=	# 4 @ 6.17 in	
Key Reinforcing	=	None Spec'd	
Footing Torsion, Tu	=	0.00 ft-lbs	
Footing Allow. Torsion, phi Tu	=	0.00 ft-lbs	

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 6.17 in, #5@ 9.56 in, #6@ 13.58 in, #7@ 18.51 in, #8@ 24.38 in, #9@ 30.
Heel: #4@ 6.17 in, #5@ 9.56 in, #6@ 13.58 in, #7@ 18.51 in, #8@ 24.38 in, #9@ 30.
Key: No key defined

Min footing T&S reinf Area	1.17	in2
Min footing T&S reinf Area per foot	0.39	in2 /ft
If one layer of horizontal bars:	If two layers of horizontal bars:	
#4@ 6.17 in	#4@ 12.35 in	
#5@ 9.57 in	#5@ 19.14 in	
#6@ 13.58 in	#6@ 27.16 in	

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		39.4	0.50	19.7	Soil Over HL (ab. water tbl)	0.0	2.42	0.0
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		2.42	0.0
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Hee	=		
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	=	85.6	0.58	49.9
	=				Surcharge Over Toe	=		
Seismic Stem Self Wt		158.1	4.84	764.2	Stem Weight(s)	=	560.3	1.50	840.4
					Earth @ Stem Transitions	=			
Total	=	197.4	**O.T.M.** =	783.9	Footing Weight	=	675.0	1.50	1,012.5
					Key Weight	=			
					Vert. Component	=			
					Total =		1,320.8 lbs	**R.M.**=	1,902.8

Resisting/Overturning Ratio = **2.43**
Vertical Loads used for Soil Pressure = 1,320.8 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

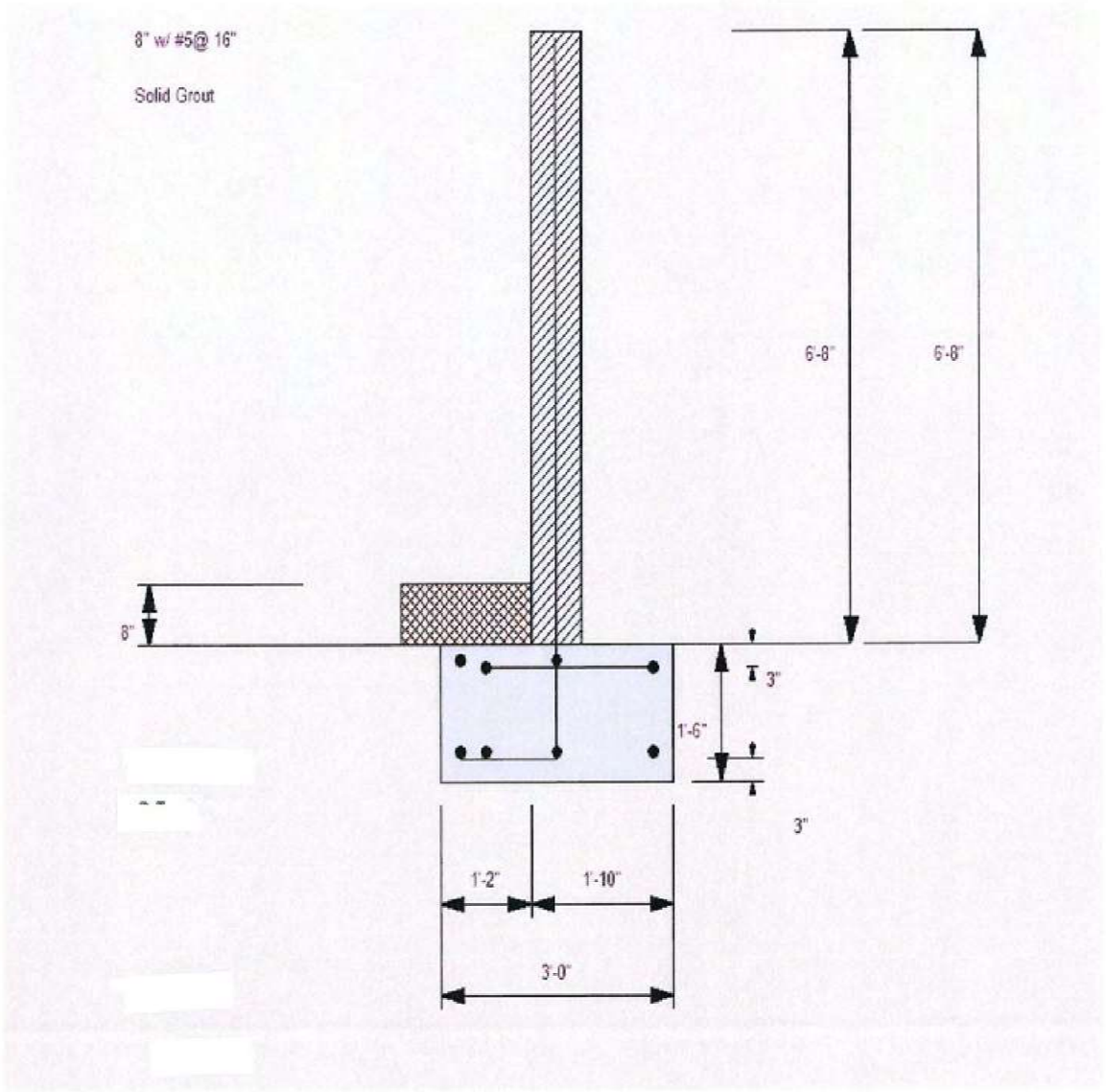
Tilt

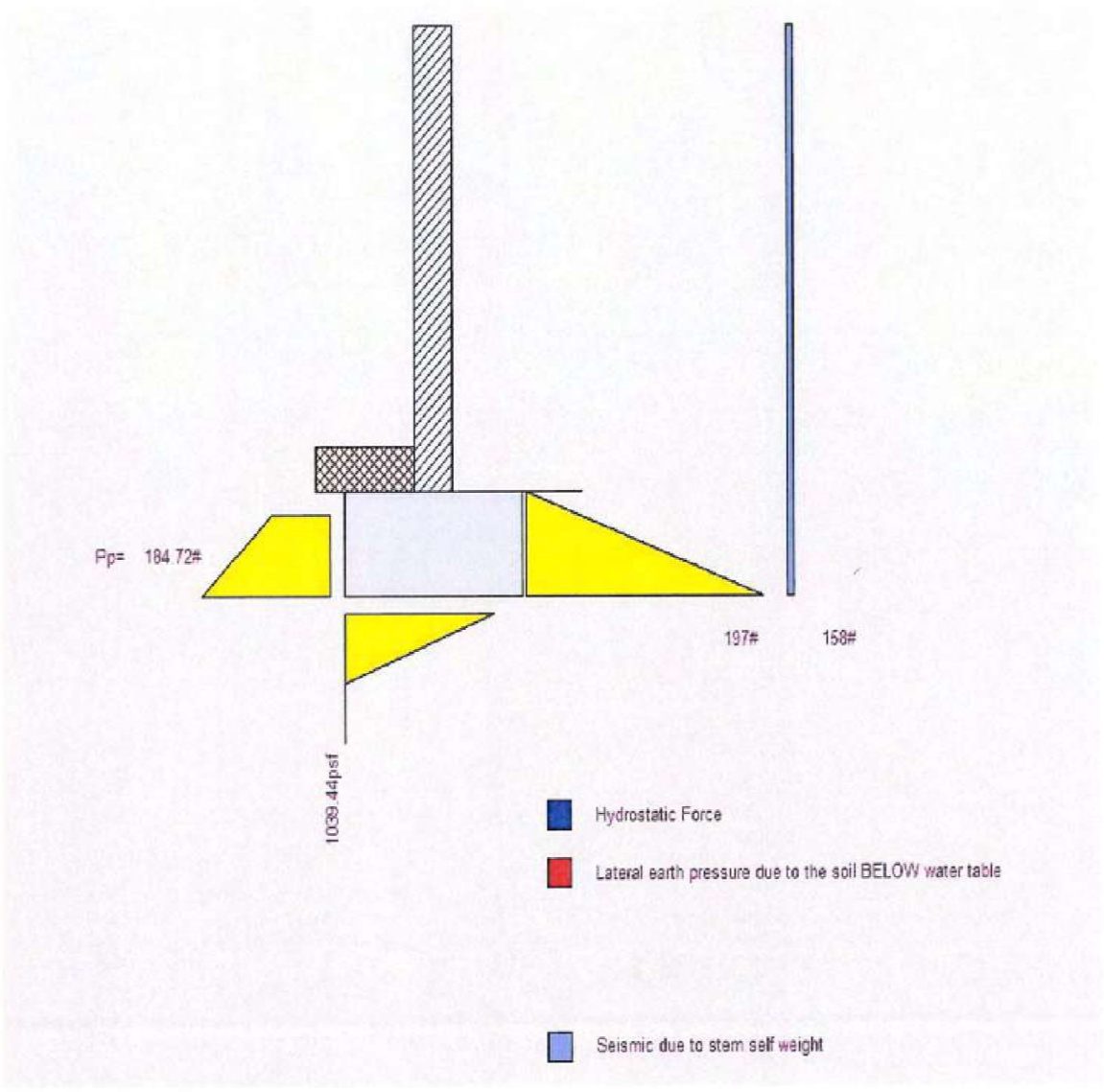
Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.064	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe because the wall would then tend to rotate into the retained soil.


8" w/ #5@ 16"
Solid Grout
6'-8"
6'-8"
8"
3"
1'-6"
3"
1'-2"
1'-10"
3'-0"


Pp= 184.72#
197#
158#
1039.44psf
Hydrostatic Force
Lateral earth pressure due to the soil BELOW water table
Seismic due to stem self weight