ASG LLC
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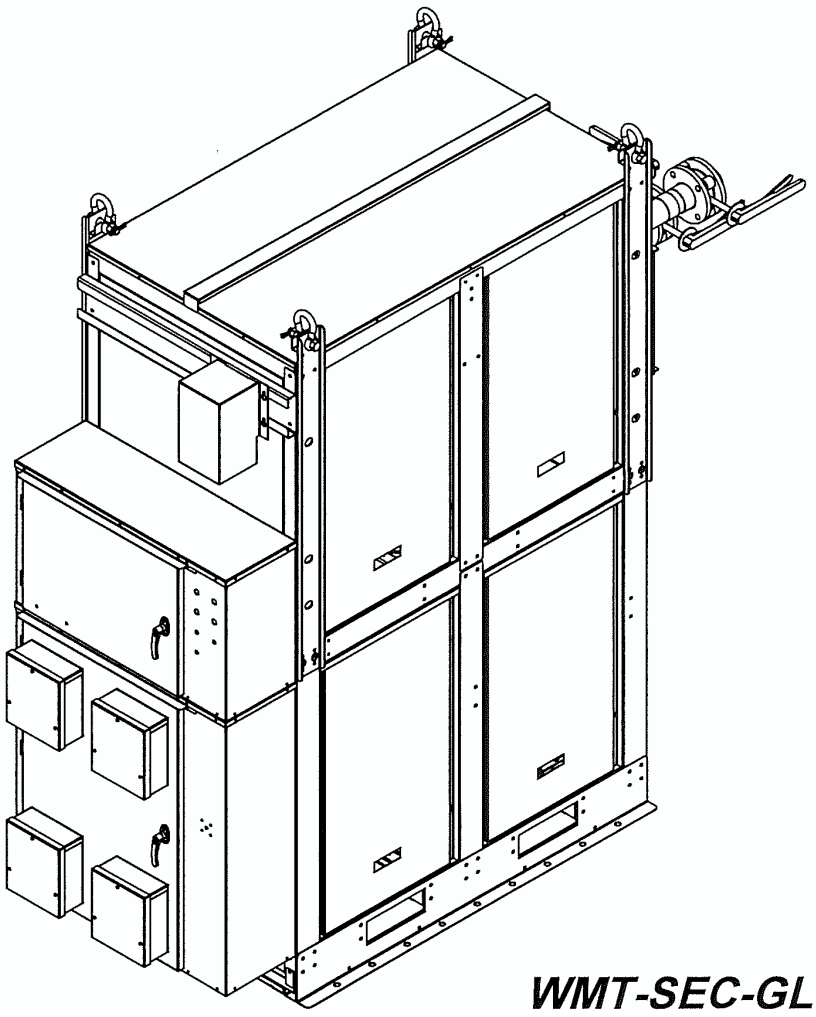
STRUCTURAL FRAMING DESIGN CHECK

WMT-SEC-GLY-52-160_Calcs

March 01, 2024

TRACY S MITCHELL
LICENSE
No 79115
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

PROJECT NO: 241779



WMT-SEC-GLY-52-160

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APPENDIX OF SUPPORTING INFORMATION

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DESCRIPTION

These structural calculations are for the gravity (dead, live, and snow) loads, wind loads, and seismic loads placed on the exterior framing and shell of a stand-alone machine house with house refrigeration equipment. The equipment house will rest upon the roof of an existing building. **It is the responsibility of the building designer or engineer to verify that the new or existing structure can properly support the weight of the new unit and possible snow drifting loads due to the unit's length oF Building**

SCOPE OF WORK

These calculations will be performed for the structural framing of the refrigeration machine house. The structural framing will include the roof sheathing, roof purlins, wall posts, wall sheathing, floor sheathing, and components necessary to support the interior racks and other equipment. These calculations do **NOT** include checking of the existing structure for the weight of the new unit.

CODE & DESIGN REFERENCES

1. International Building Code, 2015.
2. **ASCE 7-16**, Minimum Design Loads for Buildings and Other Structures
3. AISC, Manual of Steel Construction, 14th Edition.
4. AISI, North American Specification for the Design of Cold-Formed Steel, 2007.
5.

GRAVITY LOAD DESIGN

DEAD LOADS

9' LENGTH UNIT

Total Weight:	**~10,000 lbs**
Steel Frame Weight:	300 lbs
Equipment Weight:	8000 lbs
Misc Items	1700 lbs

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LIVE LOADS

PER ASCE 7-16 ROOF LIVE LOAD = 20 PSF, MINIMUM.

SPECIFIED = 30 PSF

SNOW LOADS

Design for the maximum snow load capacity.

Pf = 100 psf

SNOW DRIFTING LOADS

There are no snow drifting loads on the unit itself, only on the adjacent roof framing of the building.

CHECK 18 GAGE ROOF DECKING

Dead Load:	Self weight		(included in staad)
Live Load	LL	=	30 psf
Snow load	SL	=	100 psf

fb / Fb = Actual Stress / 0.66 fy

= 0.44/ (33ksi/1.67)

= 0.02 < 1.0

Therefore, **18 GAGE STEELS ADEQUATE**

CHECK ROOF CENTER MEMBER

Span = 5'-0" (60")

Roof Center Member= Unistrut with channel Section 2.625" x 0.625" x 18 GA (.05") light gage

(Fy =33 ksi)

Roof Dead Load = 2 psf (Self weight Metal Sheet)

Roof Live Load = 30 psf

Roof Snow Load =100 psf (Controls)

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Max Moment = 5.5 kip-inches

Max Shear = 370 lbs.

Actual fb = M/ Sx = 5.5 k" / 0.29 in^3 = 18.96 ksi

Allowable Fb = Fy / 1.67 = 33 ksi / 1.67 = 19.8 ksi > 16.67 ksi (96% stressed)

Therefore, Unistrut with channel Section 2.625" x 0.625" x 18 GA (.05") light gage ADEQUATE

CHECK ROOF END BRACKET

Span = 2'-11" (35")

Mx = 3.35 kip-inches ….From Staad

Max Shear = 95 lbs.

Actual fb = Mx/Sx = 3.35 k" / 0.40 in*^3 = 8.38 ksi

Allowable Fb = Fy/1.67 = 19.8 ksi >> 8.38 ksi (ADEQUATE – 42% stressed)

Therefore, End Bracket 2.750" x 1.938"x1.5" x 14 gage Bracket ADEQUATE

CHECK ROOF SIDE BRACKET

Span = 5'-0" (60")

Mx = 0.71 kip-inches ….From Staad

Max Shear = 50 lbs.

Actual fb = Mx/Sx = 0.71 k" / 0.41 in*^3 = 1.73 ksi

Allowable Fb = Fy/1.67 = 19.8 ksi >> 1.73 ksi (ADEQUATE – 0.09% stressed)

Therefore, Roof Side 2.752" x 1.875"x1.5" x 14 gage ADEQUATE

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CHECK FLOOR FRAMING

Mx = 1.32 kip-inches ….From Staad

Max Shear = 150 lbs.

Actual fb = Mx/Sx = 1.32 k" / 0.83 in*^3 = 1.59 ksi

Allowable Fb = Fy/1.67 = 19.8 ksi >> 1.59 ksi (ADEQUATE – 0.08 % stressed)

Therefore, End Rail 4" x 2"x 14 gage ADEQUATE

CHECK FLOOR FRAMING

Mx = 4.94 kip-inches ….From Staad

Max Shear = 270 lbs.

Actual fb = Mx/Sx = 4.94 k" / 0.70 in^3 = 7.05 ksi

Allowable Fb = Fy/1.67 = 19.8 ksi >> 7.05 ksi (ADEQUATE – 0.36% stressed)

Therefore, End Rail 3.750" x 2" x 14 gage ADEQUATE

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LATERAL LOADS (WIND)

The lateral load resisting system of the machine house consists of the 18 Gauge roof Metal sheathing acting as a horizontal diaphragm which distributes the lateral loads out to the exterior walls. The vertical wall posts on all sides with the 18 Gauge Metal sheathing act as vertical shear walls which resist any lateral forces and transfer them to the base frame.

The weight of the unit will resist any sliding or overturning moments for the lateral forces as shown in the calculations.

WIND LOADS (MWFRS)

- Wind Exposure "C" (Commercial Area)
- Importance Factor, Iw = 1.0
- **175 mph wind speed**

See attached wind load calculation spreadsheet. For the height of this building the minimum wind load of 16 psf will NOT control the design for exposure C. The end zone distance 2/2E is 2.42', so increase the total wind load by 10% to be conservative.

Pw = (15.1 + 32.3) = 47.4 psf

Wind load at roof edge = ½ x 4.17' x 0.6 x 47.4 psf = 60 plf

Wind load at end shear walls, $V_L = V_R = wL/2$ = (60 plf x 6') / 2 = **180 lbs**.

Roof Diaphragm uniform load = $V_L = V_R$ / B = 180 lbs / (3.0') = **60 plf**

Capacity of 18 Gauge Sheating = 60 plf << 485 plf

CHECK WIND OVERTURNING MOMENT

P = 0.6 x 47.4 psf = 28.44 psf

Total W1 = 28.44 psf x 3.0' x 4.17' length = 356 lbs. (Mech House Unit)

Moment Arm1 =4.17' / 2 = 2.09'

Overturning Moment = 356 x 2.09' = 744 ft-lbs

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Unit Weight = 10,000 lbs

Moment Arm = Depth / 2 = 4.14' / 2 = 2.09'

Resisting Moment = 10,000 lbs x 2.09' = 20,900 ft-lbs

SAFETY FACTOR = RM / OTM = 20,900 / 744 ft-lbs = 28.09 > 1.50 (ADEQUATE)

(No anchorage required for steel frame base)

Wind Loads Component & Cladding

See wind loads based upon tributary area on wind load calculation spreadsheet and utilizing a wind speed of 175 mph to match MWFRS maximum wind speed.

Check Post

-span = 50" = 4.17'

-tributary area = l x w = 4.17' x 2.5' = 11 sf

Or = l^2 / 3 = (4.17' x 4.17') / 3 = 8 sf

Pw = - 98.03 psf (ASCE 7-16, Figure 6-3, Method 1, Comp & Cladding)

Wind load = -98.03 psf x 0.6 = -58.82 plf

Mx = 2.27 kip-inches

Actual bending stress, fb = Mx / Sx = 2.27 k" / 0.23 in^3 = 9.87 ksi

Allowable bending stress = Fy / 1.67 = 33 ksi / 1.67 = **19.8 ksi >> 9.87 ksi (OK)**

-**Maximum Vertical Load** (roof dead load + snow load) = 205 **lbs**

-Kx = Ky = 0.8

-Lx = Ly = 50"

- rx = 1.90, ry = 0.53

-KLx / rx = 0.8 x 50" / 1.90 = 21.05

-Kly / ry = 0.8 x 50" / 0.50 = 80 < 200 (OK) – CONTROLS

-Lamda = SQRT [(Fy / Fe) where Fe = (pi^2) x E / (Kl/r)^2]

Fe = (3.142)^2 x 29,500 / (80)^2 = 45.50

Lamda = (33 / 45.50) ^ ½ = 0.85 < 1.50

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Therefore, Fn = [0.658 ^ Lambda^2] x Fy = [0.658^ (0.85)^2] x 33 ksi = 24.39 ksi

Pn = Ae x Fn/ Safety Factor = 0.42 in^2 x 24.39 ksi / 1.80 = 5.69 kips allowable

fa / Fa = 0.205 kips / 5.69 kips = ~ 0.04

MAXIMUM UNITY CHECK

fa / Fa + fb/ Fb = 0.04 + 0.50 = 0.54 < 1.0 (OK) (54% STRESSED)

THEREFORE, ALL POST 4.125" X 1.19" X 1.152"X 18 GAGE ADEQUATE

Check Coner Post

-span = 46" = 3.83'

-tributary area = l x w = 3.83' x 1.5' = 6 sf

Or = l^2 / 3 = (3.83' x 3.83') / 3 = 3.80 sf

Pw = - 98.03 psf (ASCE 7-16, Figure 6-3, Method 1, Comp & Cladding)

Wind load = -98.03 psf x 0.6 = -58.82 plf

Mx = 4.95 kip-inches

Actual bending stress, fb = Mx / Sx = 4.95 k" / 0.42 in^3 = 11.79 ksi

Allowable bending stress = Fy / 1.67 = 33 ksi / 1.67 = **19.8 ksi >> 11.79 ksi (OK)**

-**Maximum Vertical Load** (roof dead load + snow load) = 300 **lbs**

-Kx = Ky = 0.8

-Lx = Ly = 46"

- rx = 1.90, ry = 0.53

-KLx / rx = 0.8 x 46" / 1.90 = 19.36

-Kly / ry = 0.8 x 50" / 0.50 = 74 < 200 (OK) – CONTROLS

-Lamda = SQRT [(Fy / Fe) where Fe = (pi^2) x E / (Kl/r)^2]

Fe = (3.142)^2 x 29,500 / (75)^2 = 51.77

Lamda = (33 / 51.77) ^ ½ = 0.80 < 1.50

Therefore, Fn = [0.658 ^ Lambda^2] x Fy = [0.658^ (0.80)^2] x 33 ksi = 25.25 ksi

Pn = Ae x Fn/ Safety Factor = 0.92 in^2 x 25.25 ksi / 1.80 = 12.90 kips allowable

fa / Fa = 0.300 kips / 12.90 kips = ~ 0.02

MAXIMUM UNITY CHECK

fa / Fa + fb/ Fb = 0.02 + 0.59 = 0.61 < 1.0 (OK) (54% STRESSED)

THEREFORE, ALL POST 4.125" X 1.125" X 1.125"X 14 GAGE ADEQUATE

WIND LOADING ANALYSIS - Main Wind-Force Resisting System

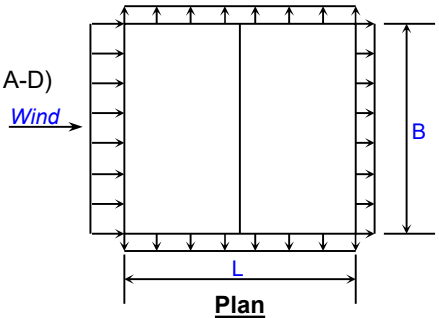
Per ASCE 7-16 Code for Enclosed or Partially Enclosed Buildings

Using Method 2: Analytical Procedure (Section 27 & 28) for Low-Rise Buildings

Job Name:	WMT-SEC-GLY-52-160	Subject:	Equipment House		
Job Number:	241779	Originator:	SR	Checker:	TSM

Input Data:

Wind Speed, V =	175	mph (Wind Map, Figure 26.5-1A-D)
Bldg. Classification =	II	(Table 1.5-1 Risk Category)
Exposure Category =	C	(Sect. 26.7)
Ridge Height, hr =	37.83	ft. (hr >= he)
Eave Height, he =	37.75	ft. (he <= hr)
Building Width =	3.00	ft. (Normal to Building Ridge)
Building Length =	5.00	ft. (Parallel to Building Ridge)
Roof Type =	Monoslope	(Gable or Monoslope)
Topo. Factor, Kzt =	1.00	(Sect. 26.8 & Figure 26.8-1)
Direct. Factor, Kd =	0.85	(Table 26.6)
Enclosed? (Y/N)	Y	(Sect. 26.2 & Table 26.11-1)
Hurricane Region?	Y	



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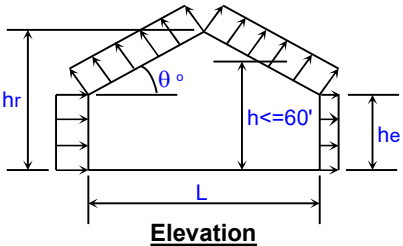


Elevation

Resulting Parameters and Coefficients:

Roof Angle, θ =	1.53	deg.
Mean Roof Ht., h =	37.75	ft. (h = he, for angle <=10 deg.)

Check Criteria for a Low-Rise Building:

1. Is h <= 60' ? Yes, O.K. 2. Is h <= Lesser of L or B? No, Violation!

External Pressure Coeff's., GCpf (Fig. 28.4-1):
(For values, see following wind load tabulations.)
Positive & Negative Internal Pressure Coefficients, GCpi (Table 26.13-1):

+GCpi Coef. =	0.18	(positive internal pressure)
-GCpi Coef. =	-0.18	(negative internal pressure)

If h < 15 then: Kh = 2.01*(15/zg)^(2/α) (Table 26.10-1)
If h >= 15 then: Kh = 2.01*(z/zg)^(2/α) (Table 26.10-1)

α =	9.50	(Table 26.11-1)
zg =	900	(Table 26.11-1)
Kh =	1.03	(Kh = Kz evaluated at z = h)

Velocity Pressure: qz = 0.00256*Kz*Kzt*Kd*V^2 (Sect. 26.10.1, Eq. 26.10-1)
qh = 68.70 psf qh = 0.00256*Kh*Kzt*Kd*V^2 (qz evaluated at z = h)
Design Net External Wind Pressures (Sect. 28.4.1):
p = qh*[(GCpf) - (+/-GCpi)] (psf, Eq. 28.3-1)

Wall and Roof End Zone Widths 'a' and '2*a' (Fig. 28.3-1):

a =	3.00	ft.
2*a =	6.00	ft.

MWFRS Wind Load for Load Case A				MWFRS Wind Load for Load Case B			
Surface	GCpf	p = Net Pressures (psf)		Surface	*GCpf	p = Net Pressures (psf)	
		(w/ +GCpi)	(w/ -GCpi)			(w/ +GCpi)	(w/ -GCpi)
Zone 1	0.40	15.11	39.85	Zone 1	-0.45	-43.28	-18.55
Zone 2	-0.69	-59.77	-35.04	Zone 2	-0.69	-59.77	-35.04
Zone 3	-0.37	-37.79	-13.05	Zone 3	-0.37	-37.79	-13.05
Zone 4	-0.29	-32.29	-7.56	Zone 4	-0.45	-43.28	-18.55
Zone 5	---	---	---	Zone 5	0.40	15.11	39.85
Zone 6	---	---	---	Zone 6	-0.29	-32.29	-7.56
Zone 1E	0.61	29.54	54.27	Zone 1E	-0.48	-45.34	-20.61
Zone 2E	-1.07	-85.88	-61.14	Zone 2E	-1.07	-85.88	-61.14
Zone 3E	-0.53	-48.78	-24.05	Zone 3E	-0.53	-48.78	-24.05
Zone 4E	-0.43	-41.91	-17.18	Zone 4E	-0.48	-45.34	-20.61
Zone 5E	---	---	---	Zone 5E	0.61	29.54	54.27
Zone 6E	---	---	---	Zone 6E	-0.43	-41.91	-17.18

*Note: Use roof angle θ = 0 degrees for Longitudinal Direction.

For Case A when GCpf is neg. in Zones 2/2E:
Zones 2/2E dist. = 1.50 ft.

For Case B when GCpf is neg. in Zones 2/2E:
Zones 2/2E dist. = 2.50 ft.

Remainder of roof Zones 2/2E extending to ridge line shall use roof Zones 3/3E pressure coefficients.

MWFRS Wind Load for Load Case A, Torsional Case				MWFRS Wind Load for Case B, Torsional Case			
Surface	GCpf	p = Net Pressure (psf)		Surface	GCpf	p = Net Pressure (psf)	
		(w/ +GCpi)	(w/ -GCpi)			(w/ +GCpi)	(w/ -GCpi)
Zone 1T	---	3.78	9.96	Zone 1T	---	-10.82	-4.64
Zone 2T	---	-14.94	-8.76	Zone 2T	---	-14.94	-8.76
Zone 3T	---	-9.45	-3.26	Zone 3T	---	-9.45	-3.26
Zone 4T	---	-8.07	-1.89	Zone 4T	---	-10.82	-4.64
Zone 5T	---	---	---	Zone 5T	---	3.78	9.96
Zone 6T	---	---	---	Zone 6T	---	-8.07	-1.89

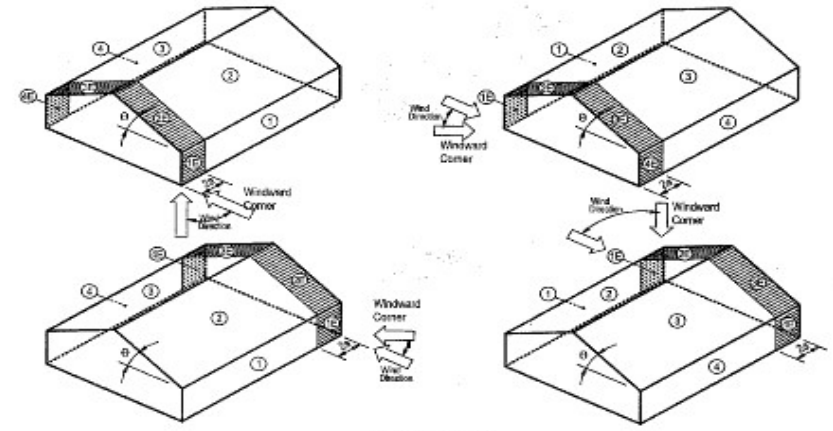
Notes: 1. For Load Case A (Transverse), Load Case B (Longitudinal), and Torsional Cases:

Zone 1 is windward wall for interior zone.	Zone 1E is windward wall for end zone.
Zone 2 is windward roof for interior zone.	Zone 2E is windward roof for end zone.
Zone 3 is leeward roof for interior zone.	Zone 3E is leeward roof for end zone.
Zone 4 is leeward wall for interior zone.	Zone 4E is leeward wall for end zone.
Zones 5 and 6 are sidewalls.	Zone 5E & 6E is sidewalls for end zone.
Zone 1T is windward wall for torsional case	Zone 2T is windward roof for torsional case.
Zone 3T is leeward roof for torsional case	Zone 4T is leeward wall for torsional case.

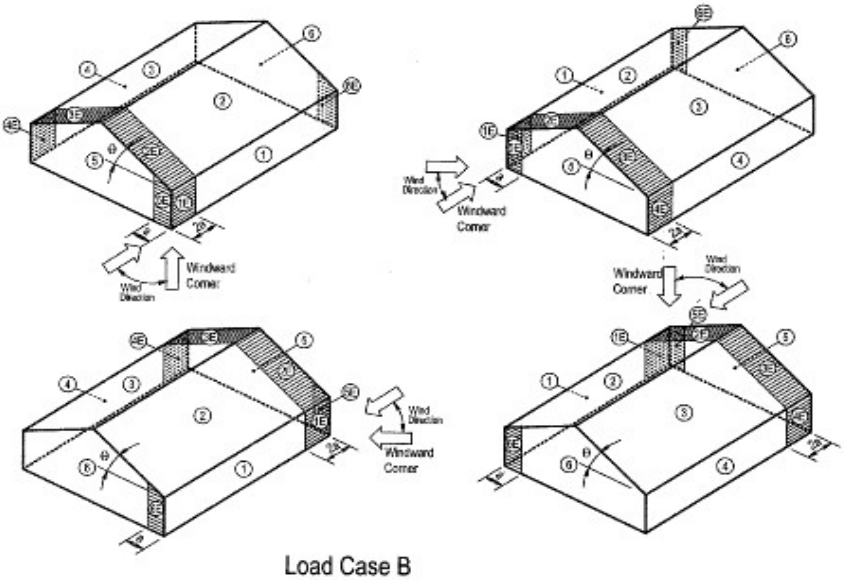
Zones 5T and 6T are sidewalls for torsional case.

2. (+) and (-) signs signify wind pressures acting toward & away from respective surfaces.
3. Building must be designed for all wind directions using the 8 load cases shown below. The load cases are applied to each building corner in turn as the reference corner.
4. Wind loads for torsional cases are 25% of respective transverse or longitudinal zone load values. Torsional loading shall apply to all 8 basic load cases applied at each reference corner.
   Exception: One-story buildings with "h" <= 30', buildings <= 2 stories framed with light frame construction, and buildings <=2 stories designed with flexible diaphragms need not be designed for torsional load cases.
5. Per Code Section 28.4.4, the minimum wind load for MWFRS shall not be less than 16 psf.

Low-Rise Buildings
h <= 60'

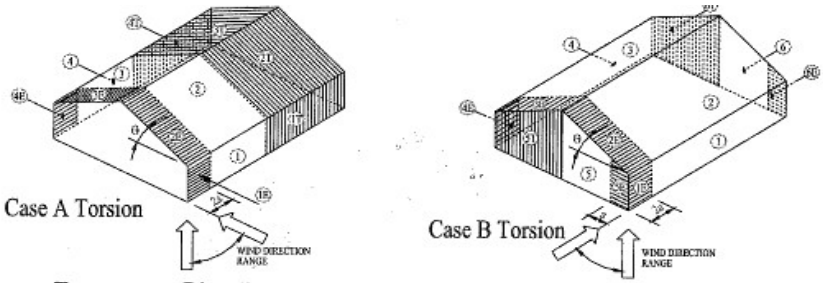


Load Case A



Load Case B

Basic Load Cases



Transverse Direction

Longitudinal Direction

Torsional Load Cases

WIND LOADING ANALYSIS - Wall Components and Cladding

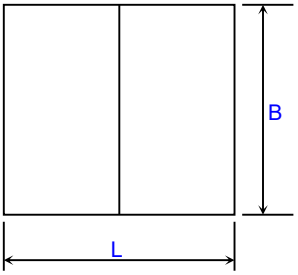
Per ASCE 7-16 Code for Buildings of Any Height

Using Part 1 & 3: Analytical Procedure (Section 30.4 & 30.6)

Job Name:	WMT-SEC-GLY-52-160	Subject:	Wind Components		
Job Number:	231070	Originator:	SR	Checker:	TSM

Input Data:

Wind Speed, V =	175	mph (Wind Map, Figure 26.5-1A-D)
Bldg. Classification =	II	(Table 1.5-1 Risk Category)
Exposure Category =	C	(Sect. 26.7)
Ridge Height, hr =	37.83	ft. (hr >= he)
Eave Height, he =	37.75	ft. (he <= hr)
Building Width =	3.00	ft. (Normal to Building Ridge)
Building Length =	5.00	ft. (Parallel to Building Ridge)
Roof Type =	Monoslope	(Gable or Monoslope)
Topo. Factor, Kzt =	1.00	(Sect. 26.8 & Figure 26.8-1)
Direct. Factor, Kd =	0.85	(Table 26.6)
Enclosed? (Y/N)	Y	(Sect. 28.6-1 & Figure 26.11-1)
Hurricane Region?	Y	
Component Name =	Wall	(Girt, Siding, Wall, or Fastener)
Effective Area, Ae =	11	ft.^2 (Area Tributary to C&C)



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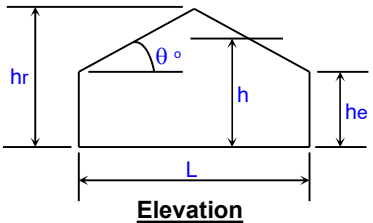


Elevation

Resulting Parameters and Coefficients:

Roof Angle, θ =	1.53	deg.
Mean Roof Ht., h =	37.75	ft. (h = he, for roof angle <=10 deg.)

Wall External Pressure Coefficients, GCp:

GCp Zone 4 Pos. =	0.89	(Fig. 30.3-1, GCp is reduced by 10% for roof angle <=10 deg.)
GCp Zone 5 Pos. =	0.89	(Fig. 30.3-1, GCp is reduced by 10% for roof angle <=10 deg.)
GCp Zone 4 Neg. =	-0.98	(Fig. 30.3-1, GCp is reduced by 10% for roof angle <=10 deg.)
GCp Zone 5 Neg. =	-1.25	(Fig. 30.3-1, GCp is reduced by 10% for roof angle <=10 deg.)

Positive & Negative Internal Pressure Coefficients, GCpi (Figure 26.13-1):

+GCpi Coef. =	0.18	(positive internal pressure)
-GCpi Coef. =	-0.18	(negative internal pressure)

If z <= 15 then: Kz = 2.01*(15/zg)^(2/α) , If z > 15 then: Kz = 2.01*(z/zg)^(2/α) (Table 30.3-1)

α =	9.50	(Table 26.11-1)
zg =	900	(Table 26.11-1)
Kh =	1.03	(Kh = Kz evaluated at z = h)

Velocity Pressure: qz = 0.00256*Kz*Kzt*Kd*V^2 (Sect. 30.3.2, Eq. 30.3-1)

qh = 68.70 psf qh = 0.00256*Kh*Kzt*Kd*V^2 (qz evaluated at z = h)

Design Net External Wind Pressures (Sect. 30.4 & 30.6):

For h <= 60 ft.: p = qh*((GCp) - (+/-GCpi)) (psf)

For h > 60 ft.: p = q*(GCp) - qi*(+/-GCpi) (psf)

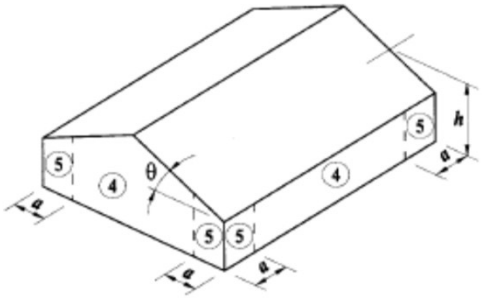
where: q = qz for windward walls, q = qh for leeward walls and side walls

qi = qh for all walls (conservatively assumed per Sect. 30.6)

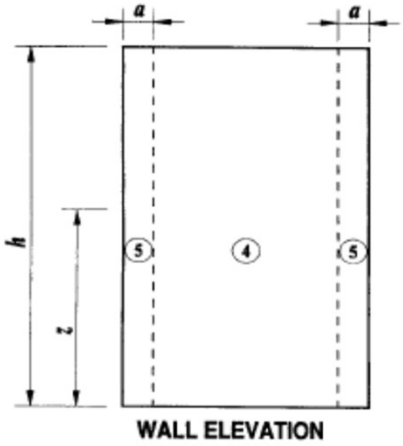
Wind Load Tabulation for Wall Components & Cladding							
Component	z (ft.)	Kh	qh (psf)	p = Net Design Pressures (psf)			
				Zone 4 (+)	Zone 4 (-)	Zone 5 (+)	Zone 5 (-)
Wall	0	1.03	68.70	73.75	-79.93	73.75	-98.03
	15.00	1.03	68.70	73.75	-79.93	73.75	-98.03
	20.00	1.03	68.70	73.75	-79.93	73.75	-98.03
	25.00	1.03	68.70	73.75	-79.93	73.75	-98.03
	30.00	1.03	68.70	73.75	-79.93	73.75	-98.03
	35.00	1.03	68.70	73.75	-79.93	73.75	-98.03
For z = hr:	37.83	1.03	68.70	73.75	-79.93	73.75	-98.03
For z = he:	37.75	1.03	68.70	73.75	-79.93	73.75	-98.03
For z = h:	37.75	1.03	68.70	73.75	-79.93	73.75	-98.03

Notes: 1. (+) and (-) signs signify wind pressures acting toward & away from respective surfaces.
2. Width of Zone 5 (end zones), 'a' = 3.00 ft.
3. Per Code Section 30.2.2, the minimum wind load for C&C shall not be less than 16 psf.
4. References : a. ASCE 7-16, "Minimum Design Loads for Buildings and Other Structures".
b. "Guide to the Use of the Wind Load Provisions of ASCE 7-02"
by: Kishor C. Mehta and James M. Delahay (2004).

Wall Components and Cladding:



Wall Zones for Buildings with h <= 60 ft.



Wall Zones for Buildings with h > 60 ft.

Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

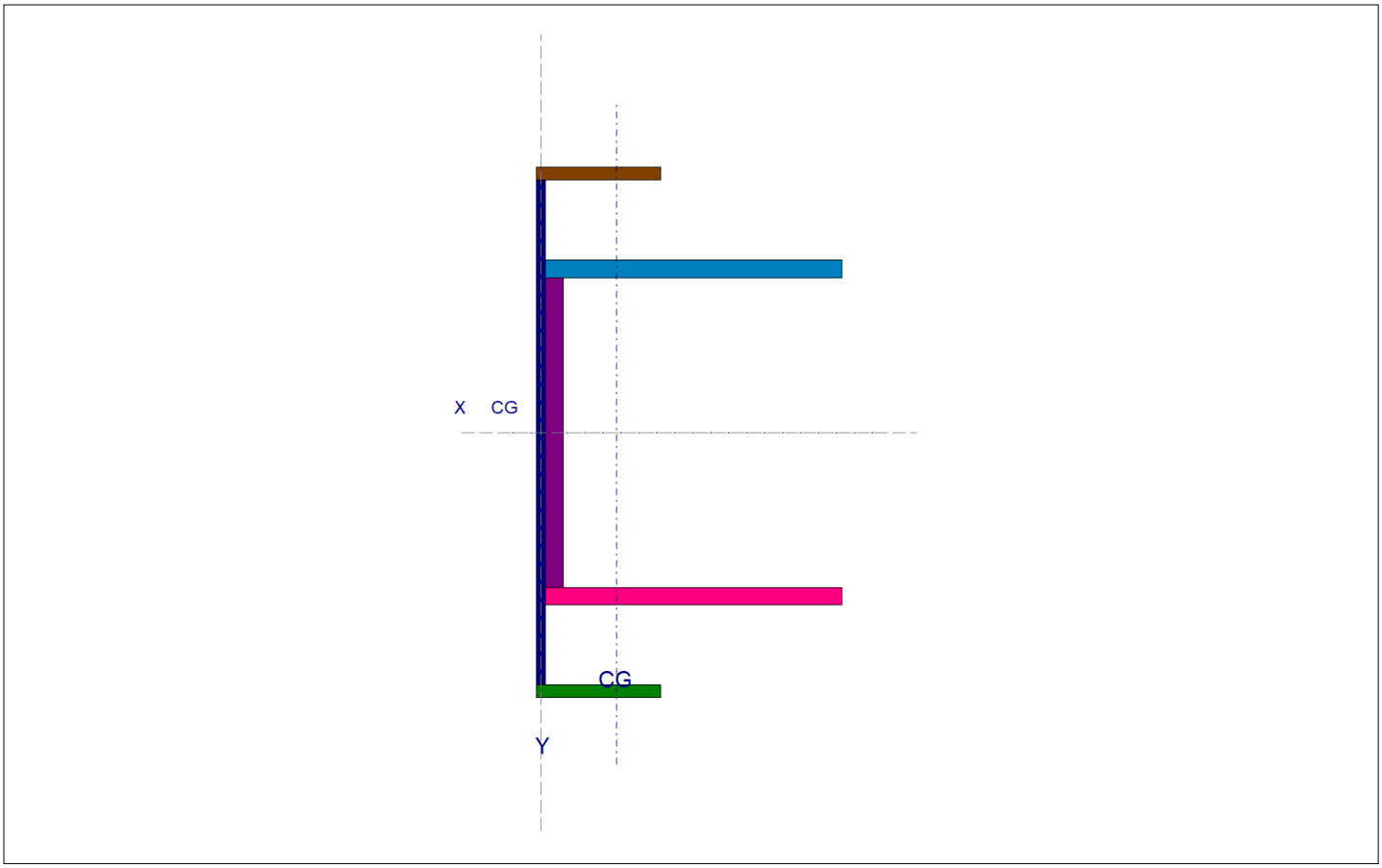
Project File: walmart.ec6

DESCRIPTION: Copy of X503

Final Section Properties

Total Area	:	0.5643 in^2	Ixx	:	0.3780 in^4	Sxx : - Y	: 0.2815 in^3
			Iyy	:	0.1168 in^4	Sxx : +Y	: 0.2815 in^3
Calculated final C.G. distance from Datum :						Syy : - X	: 0.2867 in^3
X cg Dist.	:	0.3823 in	Zxx	:	0.4208 in^3	Syy : +X	: 0.1028 in^3
Y cg Dist.	:	0.0 in	Zyy	:	0.1933 in^3		
Edge Distances from CG. :						r xx	: 0.8185 in
+X	:	1.136 in	+Y	:	1.343 in	r yy	: 0.4549 in
-X	:	-0.4073 in	-Y	:	-1.343 in		

Rotation of All Components @ 0.00 deg CCW



Rectangular & Circular Shapes

Rectangular Shape : 1	Height =	2.625 in	Width =	0.050 in	Rotation =	0 deg CCW
	Area =	0.131 in^2	Xcg =	0.000 in		
			Ycg =	0.000 in		

Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

Project File: walmart.ec6

DESCRIPTION: Copy of X503

Rectangular Shape : 2	Height =	0.630 in	Width =	0.050 in	Rotation =	90 deg CCW	
	Area =	0.032 in^2	Xcg =	0.288 in			
			Ycg =	1.313 in			
Rectangular Shape : 3	Height =	0.630 in	Width =	0.050 in	Rotation =	90 deg CCW	
	Area =	0.032 in^2	Xcg =	0.288 in			
			Ycg =	-1.313 in			
Rectangular Shape : 4	Height =	1.625 in	Width =	0.080 in	Rotation =	0 deg CCW	
	Area =	0.130 in^2	Xcg =	0.080 in			
			Ycg =	0.000 in			
Rectangular Shape : 5	Height =	1.500 in	Width =	0.080 in	Rotation =	90 deg CCW	
	Area =	0.120 in^2	Xcg =	0.780 in			
			Ycg =	0.830 in			
Rectangular Shape : 6	Height =	1.500 in	Width =	0.080 in	Rotation =	90 deg CCW	
	Area =	0.120 in^2	Xcg =	0.780 in			
			Ycg =	-0.830 in			

Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

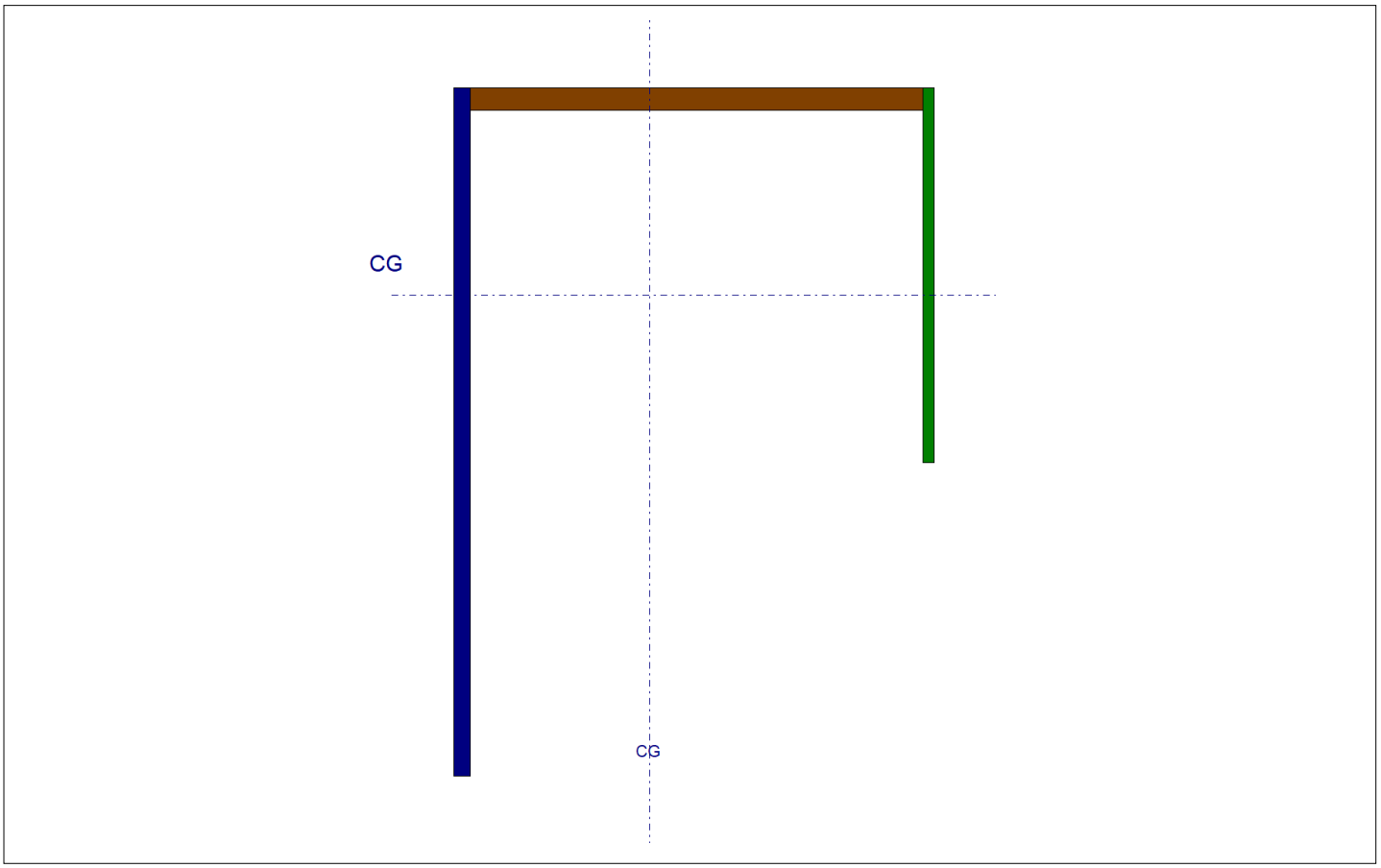
Project File: SECTION.ec6

DESCRIPTION: 300(ROOF FRAME SIDE)

Final Section Properties

Total Area	:	0.490 in^2	Ixx	:	0.3223 in^4	Sxx : - Y	: 0.1661 in^3
			Iyy	:	0.3255 in^4	Sxx : +Y	: 0.3895 in^3
Calculated final C.G. distance from Datum :						Syy : - X	: 0.4098 in^3
X cg Dist.	:	-1.116 in	Zxx	:	0.3308 in^3	Syy : +X	: 0.2817 in^3
Y cg Dist.	:	0.6343 in	Zyy	:	0.3603 in^3		
Edge Distances from CG. :						r xx	: 0.8110 in
+X	:	1.156 in	+Y	:	0.8275 in	r yy	: 0.8151 in
-X	:	-0.7943 in	-Y	:	-1.940 in		

Rotation of All Components @ 0.00 deg CCW



Rectangular & Circular Shapes

Rectangular Shape : 1	Height =	2.752 in	Width =	0.080 in	Rotation =	0 deg CCW
	Area =	0.220 in^2	Xcg =	-1.870 in		
			Ycg =	0.070 in		

Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

Project File: SECTION.ec6

DESCRIPTION: 300(ROOF FRAME SIDE)

Rectangular Shape : 2	Height =	1.875 in	Width =	0.080 in	Rotation =	90 deg CCW	
	Area =	0.150 in^2	Xcg =	-0.900 in			
			Ycg =	1.410 in			
Rectangular Shape : 3	Height =	1.498 in	Width =	0.080 in	Rotation =	0 deg CCW	
	Area =	0.120 in^2	Xcg =	0.000 in			
			Ycg =	0.700 in			
Rectangular Shape : 4	Height =	0.000 in	Width =	0.000 in	Rotation =	0 deg CCW	
	Area =	0.000 in^2	Xcg =	0.000 in			
			Ycg =	0.000 in			
Rectangular Shape : 5	Height =	0.000 in	Width =	0.000 in	Rotation =	0 deg CCW	
	Area =	0.000 in^2	Xcg =	0.000 in			
			Ycg =	0.000 in			

Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

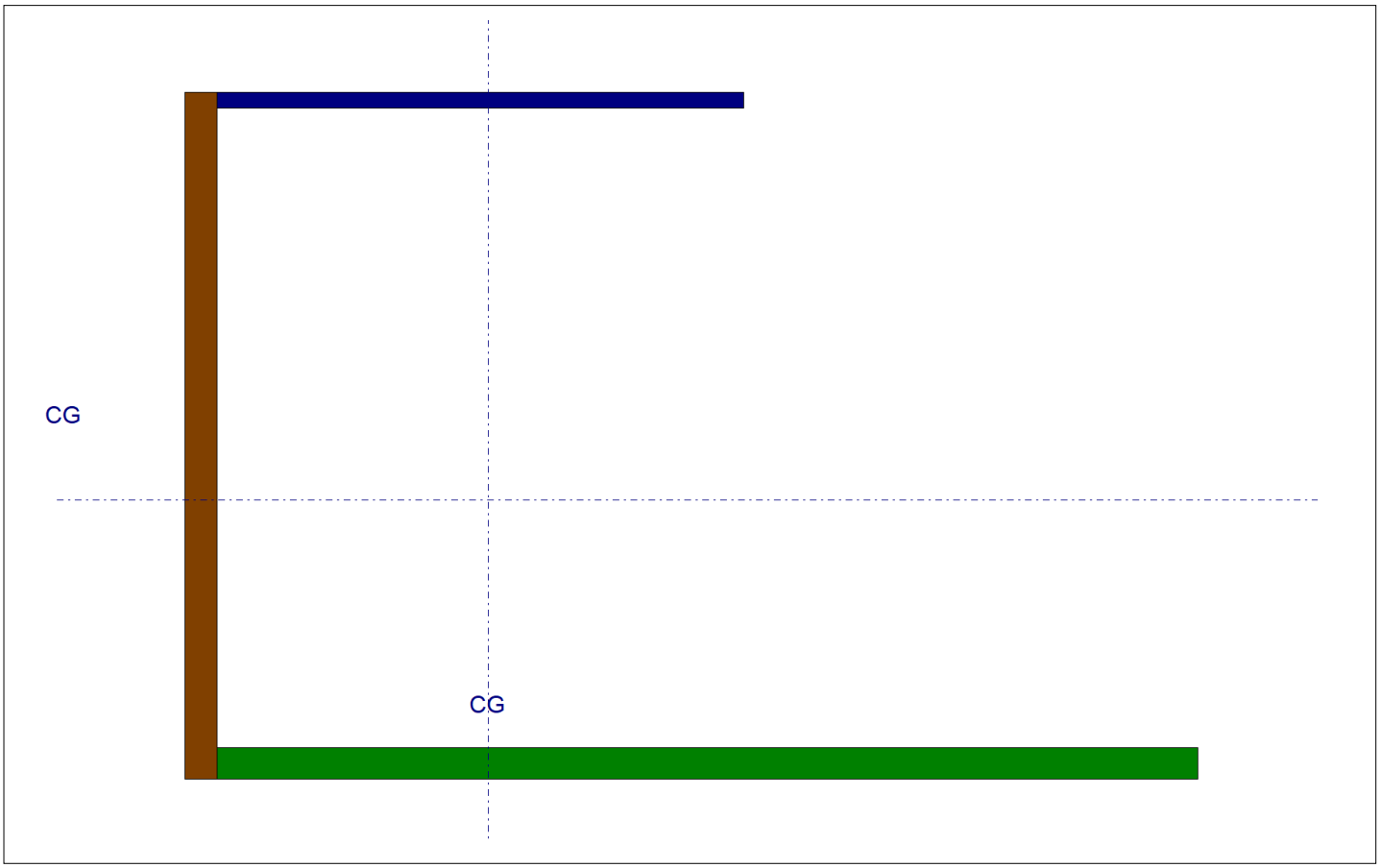
Project File: SECTION.ec6

DESCRIPTION: 301(ROOF FRAME END)

Final Section Properties

Total Area	:	0.4950 in^2	Ixx	:	0.3215 in^4	Sxx : - Y	: 0.4057 in^3
			Iyy	:	0.3448 in^4	Sxx : +Y	: 0.2752 in^3
Calculated final C.G. distance from Datum :						Syy : - X	: 0.3997 in^3
X cg Dist.	:	0.03256 in	Zxx	:	0.3569 in^3	Syy : +X	: 0.1758 in^3
Y cg Dist.	:	-1.117 in	Zyy	:	0.3459 in^3		
Edge Distances from CG. :						r xx	: 0.8059 in
+X	:	1.961 in	+Y	:	1.168 in	r yy	: 0.8345 in
-X	:	-0.8626 in	-Y	:	-0.7924 in		

Rotation of All Components @ 0.00 deg CCW



Rectangular & Circular Shapes

Rectangular Shape : 1	Height =	1.500 in	Width =	0.080 in	Rotation =	90 deg CCW	
	Area =	0.120 in^2	Xcg =	0.000 in			
			Ycg =	0.000 in			

Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

Project File: SECTION.ec6

DESCRIPTION: 301(ROOF FRAME END)

Rectangular Shape : 2	Height =	1.938 in	Width =	0.080 in	Rotation =	0 deg CCW	
	Area =	0.155 in^2	Xcg =	-0.790 in			
			Ycg =	-0.940 in			
Rectangular Shape : 3	Height =	2.750 in	Width =	0.080 in	Rotation =	90 deg CCW	
	Area =	0.220 in^2	Xcg =	0.630 in			
			Ycg =	-1.850 in			
Rectangular Shape : 4	Height =	0.000 in	Width =	0.000 in	Rotation =	0 deg CCW	
	Area =	0.000 in^2	Xcg =	0.000 in			
			Ycg =	0.000 in			
Rectangular Shape : 5	Height =	0.000 in	Width =	0.000 in	Rotation =	0 deg CCW	
	Area =	0.000 in^2	Xcg =	0.000 in			
			Ycg =	0.000 in			

Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

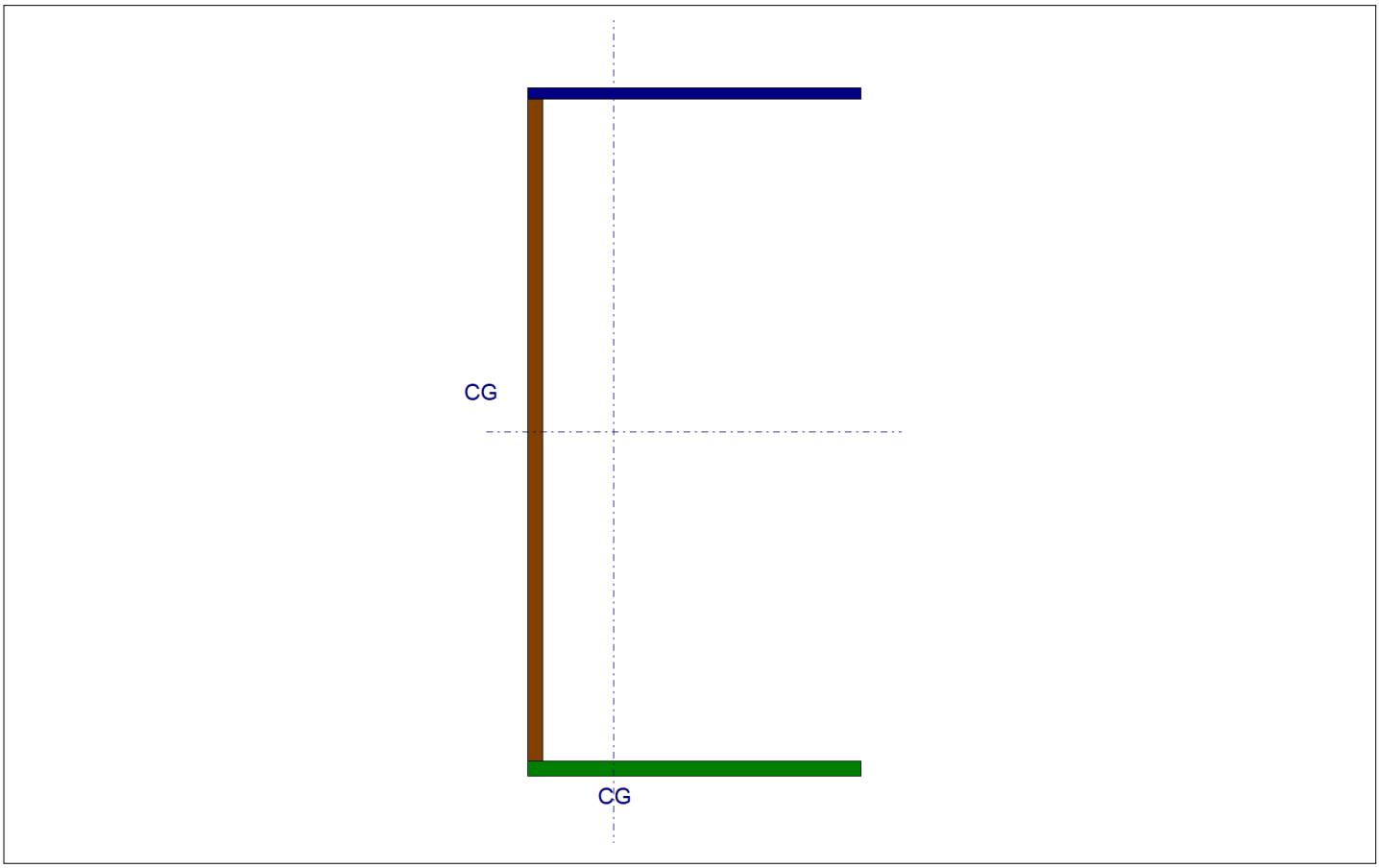
Project File: SECTION.ec6

DESCRIPTION: 106(END RAIL-MIDDLE)

Final Section Properties

Total Area	:	0.640 in^2	Ixx	:	1.733 in^4	Sxx : - Y	: 0.8383 in^3
			Iyy	:	0.2528 in^4	Sxx : +Y	: 0.8342 in^3
Calculated final C.G. distance from Datum :						Syy : - X	: 0.4884 in^3
X cg Dist.	:	-0.3125 in	Zxx	:	0.9664 in^3	Syy : +X	: 0.1719 in^3
Y cg Dist.	:	-0.9350 in	Zyy	:	0.3067 in^3		
Edge Distances from CG. :						r xx	: 1.645 in
+X	:	1.471 in	+Y	:	2.077 in	r yy	: 0.6284 in
-X	:	-0.5175 in	-Y	:	-2.067 in		

Rotation of All Components @ 0.00 deg CCW



Rectangular & Circular Shapes

Rectangular Shape : 1	Height =	2.000 in	Width =	0.080 in	Rotation =	90 deg CCW
	Area =	0.160 in^2	Xcg =	0.170 in		
			Ycg =	1.090 in		

Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

Project File: SECTION.ec6

DESCRIPTION: 106(END RAIL-MIDDLE)

Rectangular Shape : 2	Height =	4.000 in	Width =	0.080 in	Rotation =	0 deg CCW	
	Area =	0.320 in^2	Xcg =	-0.790 in			
			Ycg =	-0.940 in			
Rectangular Shape : 3	Height =	2.000 in	Width =	0.080 in	Rotation =	90 deg CCW	
	Area =	0.160 in^2	Xcg =	0.160 in			
			Ycg =	-2.950 in			
Rectangular Shape : 4	Height =	0.000 in	Width =	0.000 in	Rotation =	0 deg CCW	
	Area =	0.000 in^2	Xcg =	0.000 in			
			Ycg =	0.000 in			
Rectangular Shape : 5	Height =	0.000 in	Width =	0.000 in	Rotation =	0 deg CCW	
	Area =	0.000 in^2	Xcg =	0.000 in			
			Ycg =	0.000 in			

Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

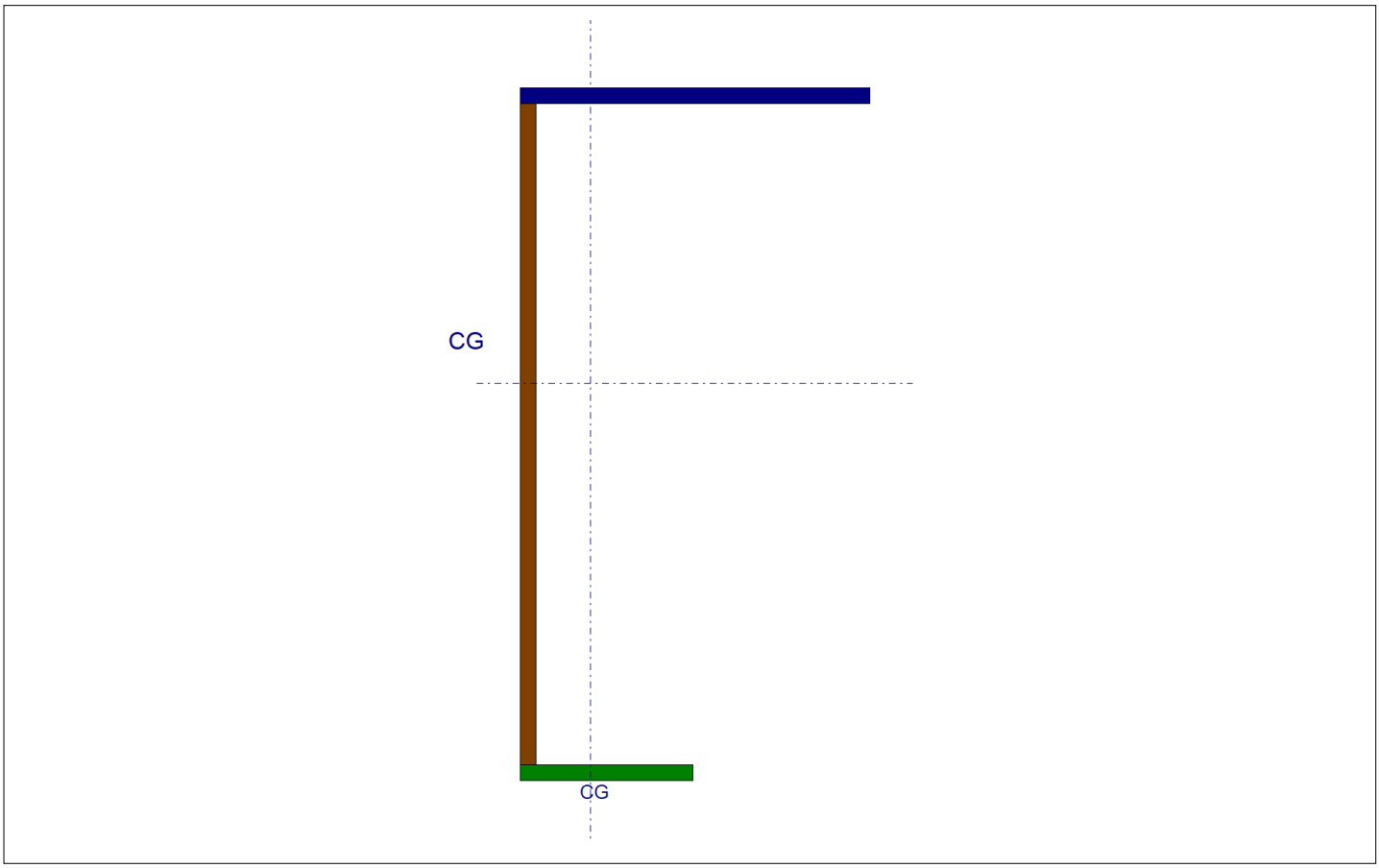
Project File: SECTION.ec6

DESCRIPTION: 108(END RAIL)

Final Section Properties

Total Area	:	0.540 in^2	Ixx	:	1.194 in^4	Sxx : - Y	: 0.5317 in^3
			Iyy	:	0.1572 in^4	Sxx : +Y	: 0.7055 in^3
Calculated final C.G. distance from Datum :						Syy : - X	: 0.3996 in^3
X cg Dist.	:	-0.4389 in	Zxx	:	0.7229 in^3	Syy : +X	: 0.09845 in^3
Y cg Dist.	:	-0.6511 in	Zyy	:	0.1927 in^3		
Edge Distances from CG. :						r xx	: 1.487 in
+X	:	1.597 in	+Y	:	1.693 in	r yy	: 0.5396 in
-X	:	-0.3934 in	-Y	:	-2.247 in		

Rotation of All Components @ 0.00 deg CCW



Rectangular & Circular Shapes

Rectangular Shape : 1	Height =	2.000 in	Width =	0.080 in	Rotation =	90 deg CCW
	Area =	0.160 in^2	Xcg =	0.170 in		
			Ycg =	0.990 in		

Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

Project File: SECTION.ec6

DESCRIPTION: 108(END RAIL)

Rectangular Shape : 2	Height =	3.750	in	Width =	0.080	in	Rotation = 0 deg CCW
	Area =	0.300	in^2	Xcg =	-0.790	in	
				Ycg =	-0.940	in	
Rectangular Shape : 3	Height =	1.000	in	Width =	0.080	in	Rotation = 90 deg CCW
	Area =	0.080	in^2	Xcg =	-0.340	in	
				Ycg =	-2.850	in	
Rectangular Shape : 4	Height =	0.000	in	Width =	0.000	in	Rotation = 0 deg CCW
	Area =	0.000	in^2	Xcg =	0.000	in	
				Ycg =	0.000	in	
Rectangular Shape : 5	Height =	0.000	in	Width =	0.000	in	Rotation = 0 deg CCW
	Area =	0.000	in^2	Xcg =	0.000	in	
				Ycg =	0.000	in	

Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

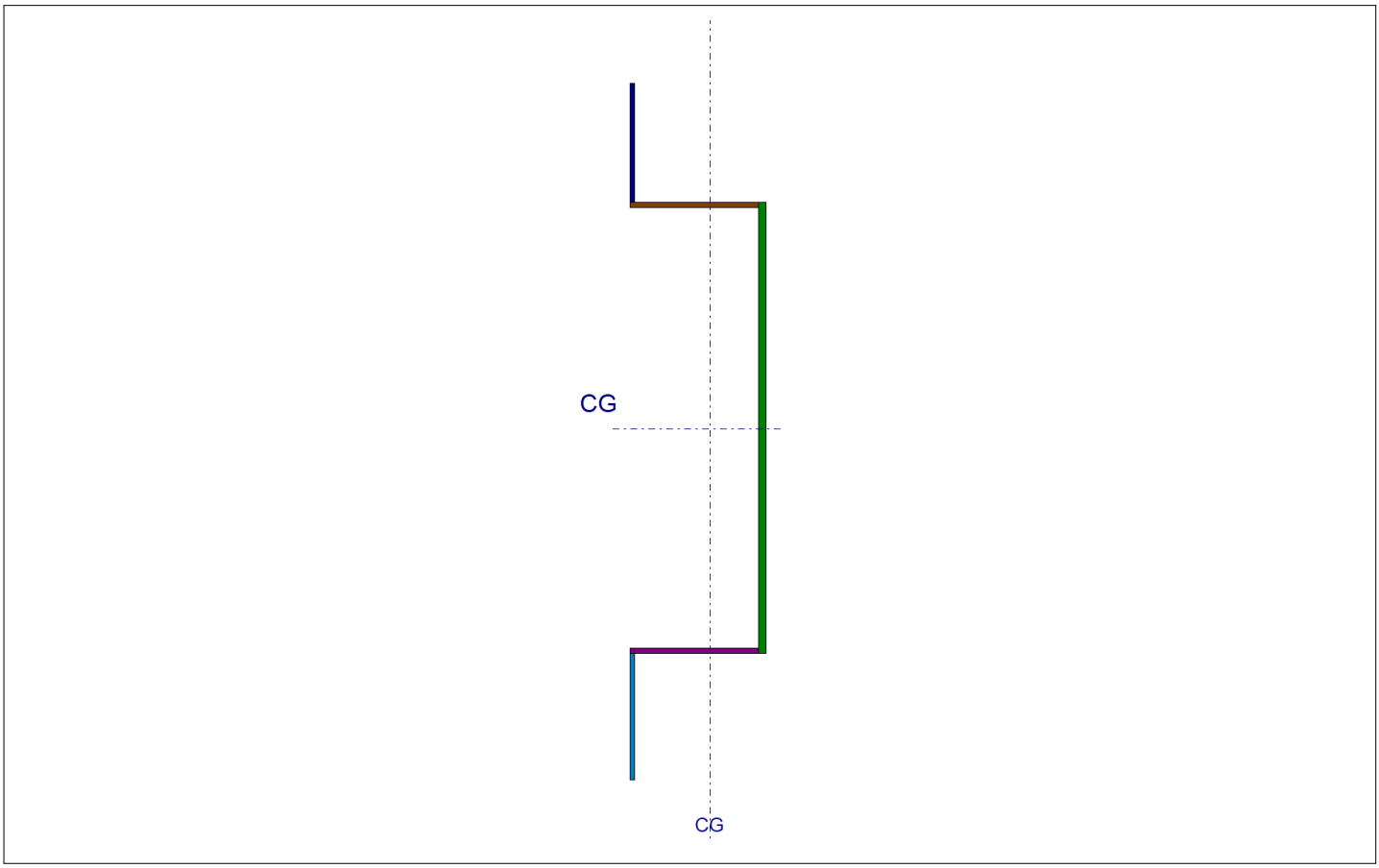
Project File: SECTION.ec6

DESCRIPTION: 103(POST)

Final Section Properties

Total Area	:	0.4237 in^2	Ixx	:	1.529 in^4	Sxx : - Y	: 0.4760 in^3
			Iyy	:	0.1197 in^4	Sxx : +Y	: 0.4808 in^3
Calculated final C.G. distance from Datum :						Syy : - X	: 0.1612 in^3
X cg Dist.	:	0.7129 in	Zxx	:	0.7282 in^3	Syy : +X	: 0.2342 in^3
Y cg Dist.	:	-2.604 in	Zyy	:	0.2033 in^3		
Edge Distances from CG. :						r xx	: 1.90 in
+X	:	0.5111 in	+Y	:	3.180 in	r yy	: 0.5316 in
-X	:	-0.7428 in	-Y	:	-3.212 in		

Rotation of All Components @ 0.00 deg CCW



Rectangular & Circular Shapes

Rectangular Shape : 1	Height =	1.152 in	Width =	0.048 in	Rotation =	0 deg CCW	
	Area =	0.055 in^2	Xcg =	0.000 in			
			Ycg =	0.000 in			

Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

Project File: SECTION.ec6

DESCRIPTION: 103(POST)

Rectangular Shape : 2	Height =	1.199 in	Width =	0.048 in	Rotation =	90 deg CCW	
	Area =	0.058 in^2	Xcg =	0.560 in			
			Ycg =	-0.560 in			
Rectangular Shape : 3	Height =	4.125 in	Width =	0.048 in	Rotation =	0 deg CCW	
	Area =	0.198 in^2	Xcg =	1.200 in			
			Ycg =	-2.600 in			
Rectangular Shape : 4	Height =	1.199 in	Width =	0.048 in	Rotation =	90 deg CCW	
	Area =	0.058 in^2	Xcg =	0.560 in			
			Ycg =	-4.630 in			
Rectangular Shape : 5	Height =	1.152 in	Width =	0.048 in	Rotation =	0 deg CCW	
	Area =	0.055 in^2	Xcg =	0.000 in			
			Ycg =	-5.240 in			

Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

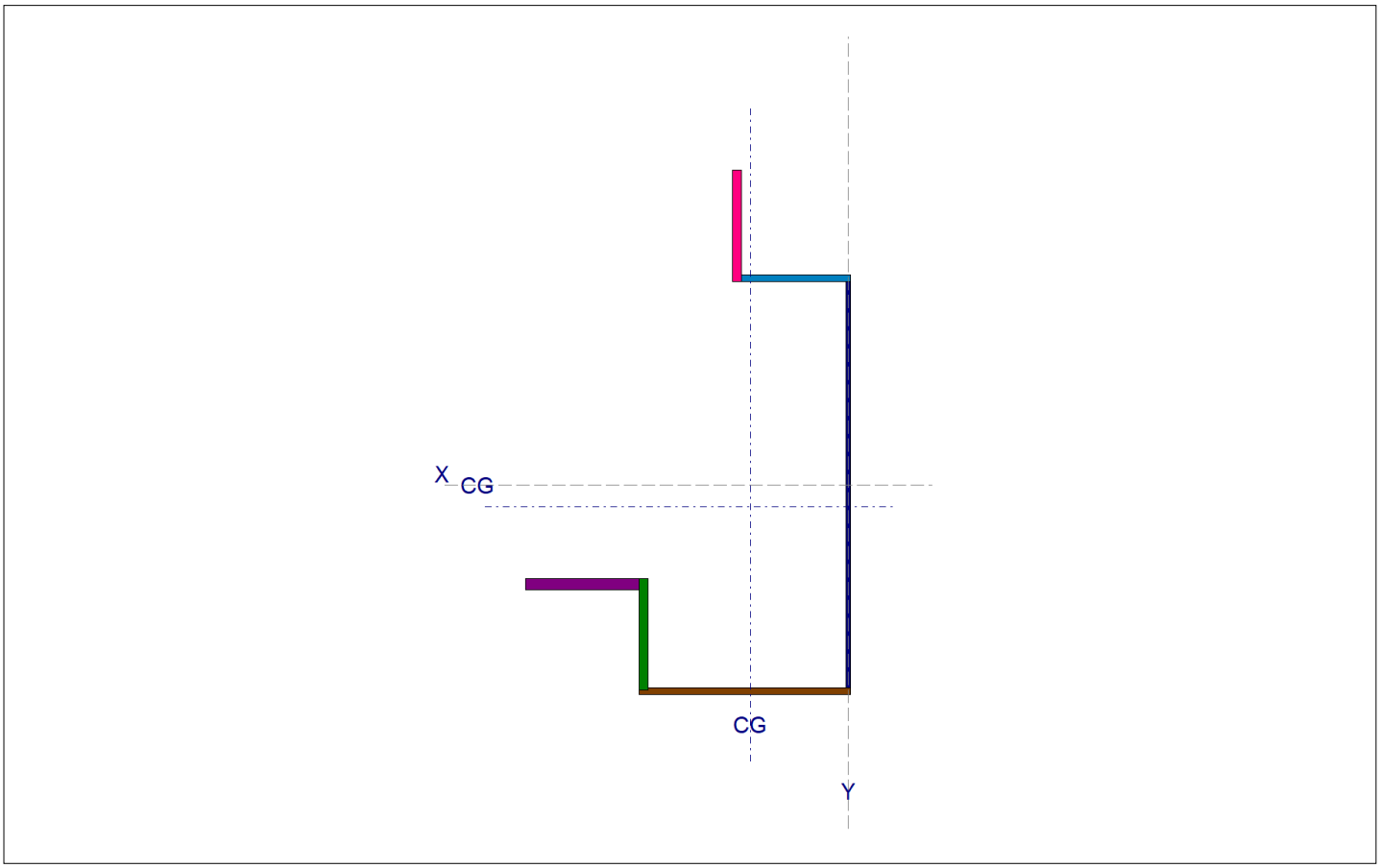
Project File: walmart.ec6

DESCRIPTION: Post

Final Section Properties

Total Area	:	0.9163 in^2	Ixx	:	2.497 in^4	Sxx : - Y	: 1.326 in^3
			Iyy	:	0.9481 in^4	Sxx : +Y	: 0.7375 in^3
Calculated final C.G. distance from Datum :						Syy : - X	: 0.4227 in^3
X cg Dist.	:	-0.9814 in	Zxx	:	1.248 in^3	Syy : +X	: 0.9282 in^3
Y cg Dist.	:	-0.2327 in	Zyy	:	0.8053 in^3		
Edge Distances from CG. :						r xx	: 1.651 in
+X	:	1.021 in	+Y	:	3.385 in	r yy	: 1.017 in
-X	:	-2.243 in	-Y	:	-1.882 in		

Rotation of All Components @ 0.00 deg CCW



Rectangular & Circular Shapes

Rectangular Shape : 1	Height =	4.125 in	Width =	0.080 in	Rotation =	0 deg CCW
	Area =	0.330 in^2	Xcg =	0.000 in		
			Ycg =	0.000 in		

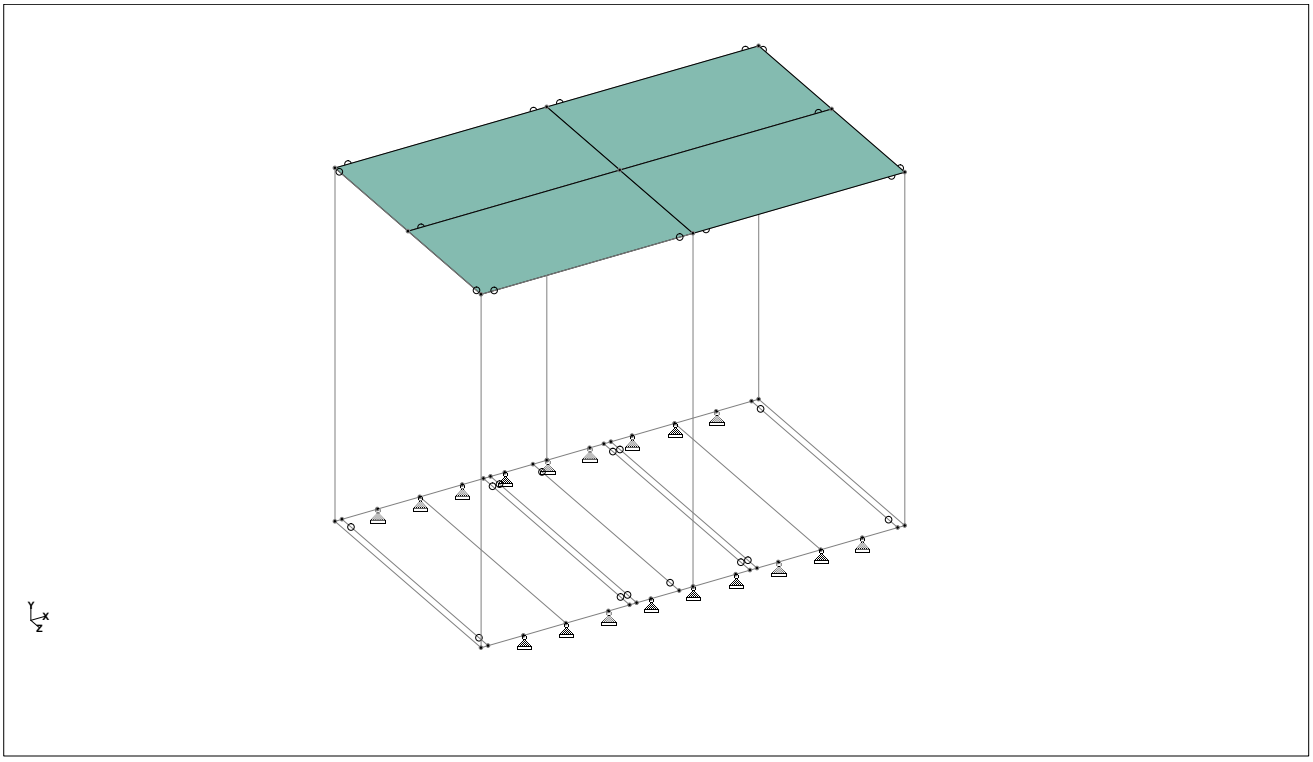
Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

Project File: walmart.ec6

DESCRIPTION: Post

Rectangular Shape : 2	Height =	2.125 in	Width =	0.080 in	Rotation =	90 deg CCW	
	Area =	0.170 in^2	Xcg =	-1.035 in			
			Ycg =	-2.063 in			
Rectangular Shape : 3	Height =	1.125 in	Width =	0.080 in	Rotation =	0 deg CCW	
	Area =	0.090 in^2	Xcg =	-2.050 in			
			Ycg =	-1.500 in			
Rectangular Shape : 4	Height =	1.125 in	Width =	0.130 in	Rotation =	90 deg CCW	
	Area =	0.146 in^2	Xcg =	-2.670 in			
			Ycg =	-1.000 in			
Rectangular Shape : 5	Height =	1.125 in	Width =	0.080 in	Rotation =	90 deg CCW	
	Area =	0.090 in^2	Xcg =	-0.523 in			
			Ycg =	2.063 in			
Rectangular Shape : 6	Height =	1.125 in	Width =	0.080 in	Rotation =	0 deg CCW	
	Area =	0.090 in^2	Xcg =	-1.125 in			
			Ycg =	2.590 in			



Whole Structure

Beams

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
1	1	15	0.083	5	0
2	1	3	2.980	6	0
3	2	4	2.980	6	0
4	3	16	0.083	5	0
5	5	38	0.500	5	0
6	6	39	0.500	5	0
7	5	6	2.980	7	0
8	7	40	0.167	5	0
9	8	41	0.167	5	0
10	7	8	2.980	7	0
11	9	32	0.162	5	0
12	10	31	0.162	5	0
13	9	10	2.980	7	0
14	11	19	0.083	5	0
15	12	20	0.083	5	0
16	11	12	2.980	7	0
17	13	36	0.490	5	0
18	14	37	0.490	5	0
19	13	14	2.980	7	0

Beams Cont...

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
20	15	34	0.417	5	0
21	16	35	0.417	5	0
22	15	16	2.980	13	0
23	17	7	0.083	5	0
24	18	8	0.083	5	0
25	17	18	2.980	13	0
26	19	46	0.250	5	0
27	20	47	0.250	5	0
28	19	20	2.980	13	0
29	21	2	0.083	5	0
30	22	4	0.083	5	0
31	21	22	2.980	13	0
32	1	23	4.167	2	0
33	2	24	4.167	2	0
34	3	25	4.167	2	0
35	4	26	4.167	2	0
36	25	29	2.495	9	0
37	26	28	1.490	12	0
38	24	30	2.495	10	0
39	23	27	1.490	11	0
40	27	25	1.490	11	0
41	28	24	1.490	12	0
42	27	33	2.495	8	0
43	29	26	2.495	9	0
44	30	23	2.495	10	0
45	31	43	0.005	5	0
46	29	31	4.167	3	0
47	32	42	0.005	5	0
48	30	32	4.167	4	0
49	33	28	2.495	8	0
56	34	5	0.500	5	0
57	35	6	0.500	5	0
58	36	21	0.417	5	0
59	37	22	0.417	5	0
60	38	17	0.250	5	0
61	39	18	0.250	5	0
62	40	9	0.333	5	0
63	41	10	0.333	5	0
64	42	44	0.500	5	0
65	43	45	0.500	5	0
66	44	11	0.167	5	0
67	45	12	0.167	5	0
68	46	13	0.500	5	0
69	47	14	0.500	5	0

Section Properties

Prop	Section	Area (in^2)	I_{yy} (in^4)	I_{zz} (in^4)	J (in^4)	Material
2	100	0.860	0.659	2.622	0.002	STEEL
3	103	0.424	0.110	1.592	0.000	STEEL
4	109	0.417	0.096	1.561	0.000	STEEL
5	107	1.040	0.684	7.389	0.002	STEEL
6	108	0.540	0.130	1.216	0.001	STEEL
7	106	0.640	0.254	1.759	0.001	STEEL
8	303	0.186	0.005	0.180	0.000	STEEL
9	304	0.490	0.199	0.443	0.001	STEEL
10	300	0.490	0.199	0.443	0.001	STEEL
11	305	0.495	0.183	0.644	0.001	STEEL
12	301	0.495	0.214	0.485	0.001	STEEL
13	104	0.485	0.025	1.211	0.001	STEEL

Plate Thickness

Prop	Node A (in)	Node B (in)	Node C (in)	Node D (in)	Material
1	0.050	0.050	0.050	0.050	STEEL

Materials

Mat	Name	E (kip/in^2)	ν	Density (kip/in^3)	α (/°F)
1	STEEL	29E+3	0.300	0.000	6E -6
2	CONCRETE	3.15E+3	0.170	8.68e-05	5.5E -6
3	ALUMINUM	10E+3	0.330	9.8e-05	12.8E -6
4	STAINLESSSTEEL	28E+3	0.300	0.000	9.9E -6
5	STEEL_36_KSI	29E+3	0.300	0.000	6.5E -6
6	STEEL_50_KSI	29E+3	0.300	0.000	6.5E -6
7	STEEL_275_NMM2	29.7E+3	0.300	0.000	6.67E -6
8	STEEL_355_NMM2	29.7E+3	0.300	0.000	6.67E -6
9	Q235	29.9E+3	0.300	0.000	6.67E -6
10	Q345	29.9E+3	0.300	0.000	6.67E -6
11	Q355	29.9E+3	0.300	0.000	6.67E -6
12	Q390	29.9E+3	0.300	0.000	6.67E -6
13	Q420	29.9E+3	0.300	0.000	6.67E -6
14	Q460	29.9E+3	0.300	0.000	6.67E -6
15	TIMBER	1.5E+3	0.150	0.000	3E -6

Supports

Node	X (kip/in)	Y (kip/in)	Z (kip/in)	rX (kip-ft/deg)	rY (kip-ft/deg)	rZ (kip-ft/deg)
5	Fixed	Fixed	Fixed	-	-	-
6	Fixed	Fixed	Fixed	-	-	-
13	Fixed	Fixed	Fixed	-	-	-
14	Fixed	Fixed	Fixed	-	-	-
34	Fixed	Fixed	Fixed	-	-	-
35	Fixed	Fixed	Fixed	-	-	-
36	Fixed	Fixed	Fixed	-	-	-
37	Fixed	Fixed	Fixed	-	-	-
38	Fixed	Fixed	Fixed	-	-	-
39	Fixed	Fixed	Fixed	-	-	-
40	Fixed	Fixed	Fixed	-	-	-
41	Fixed	Fixed	Fixed	-	-	-
42	Fixed	Fixed	Fixed	-	-	-
43	Fixed	Fixed	Fixed	-	-	-
44	Fixed	Fixed	Fixed	-	-	-
45	Fixed	Fixed	Fixed	-	-	-
46	Fixed	Fixed	Fixed	-	-	-
47	Fixed	Fixed	Fixed	-	-	-

Primary Load Cases

Number	Name	Type
1	DL	Dead
2	LL	Live
3	WL-X	Wind
4	WL-Z	Wind
5	SL	Snow

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
6	COMB - 1 DEAD	1	DL	1.00
7	COMB - 1 DEAD + 1 LIVE	1	DL	1.00
		2	LL	1.00
8	COMB - 1 DEAD + 1 SNOW	1	DL	1.00
		5	SL	1.00
9	COMB - 1 DEAD + 0.75 LIVE	1	DL	1.00
		2	LL	0.75
10	COMB - 1 DEAD + 0.75 LIVE + 0.75 SNO\	1	DL	1.00
		2	LL	0.75
		5	SL	0.75

Combination Load Cases Cont...

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
		3	WL-X	0.60
12	COMB - 1 DEAD + 0.6 WIND (2)	1	DL	1.00
		4	WL-Z	0.60
13	COMB - 1 DEAD + 0.75 LIVE + 0.45 WINI	1	DL	1.00
		2	LL	0.75
		3	WL-X	0.45
14	COMB - 1 DEAD + 0.75 LIVE + 0.45 WINI	1	DL	1.00
		2	LL	0.75
		4	WL-Z	0.45
15	COMB - 1 DEAD + 0.75 LIVE + 0.45 WINI	1	DL	1.00
		2	LL	0.75
		3	WL-X	0.45
		5	SL	0.75
16	COMB - 1 DEAD + 0.75 LIVE + 0.45 WINI	1	DL	1.00
		2	LL	0.75
		4	WL-Z	0.45
		5	SL	0.75
17	COMB - 0.6 DEAD + 0.6 WIND (1)	1	DL	0.60
		3	WL-X	0.60
18	COMB - 0.6 DEAD + 0.6 WIND (2)	1	DL	0.60
		4	WL-Z	0.60
19	COMB - 0.6 DEAD	1	DL	0.60

1 DL : Beam Loads

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
2	UNI lbf/ft	GY	-2.500	-	-	-	-
3	UNI lbf/ft	GY	-3.000	-	-	-	-
7	UNI lbf/ft	GY	-5.000	-	-	-	-
10	UNI lbf/ft	GY	-4.000	-	-	-	-
16	UNI lbf/ft	GY	-4.000	-	-	-	-
19	UNI lbf/ft	GY	-5.000	-	-	-	-

1 DL : Selfweight

Direction	Factor	Assigned Geometry
Y	-1.000	ALL

2 LL : Beam Loads

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
2	UNI lbf/ft	GY	-50.000	-	-	-	-
3	UNI lbf/ft	GY	-50.000	-	-	-	-
7	UNI lbf/ft	GY	-92.000	-	-	-	-
10	UNI lbf/ft	GY	-68.000	-	-	-	-
13	UNI lbf/ft	GY	-68.000	-	-	-	-
16	UNI lbf/ft	GY	-84.000	-	-	-	-
19	UNI lbf/ft	GY	-92.000	-	-	-	-

2 LL : One Way Loads

Load (ksi)	Min Ht. (ft)	Max Ht. (ft)	Min X (ft)	Max X (ft)	Min Y (ft)	Max Y (ft)
-0.000	4.000	4.200	-	-	-	-

3 WL-X : Beam Loads

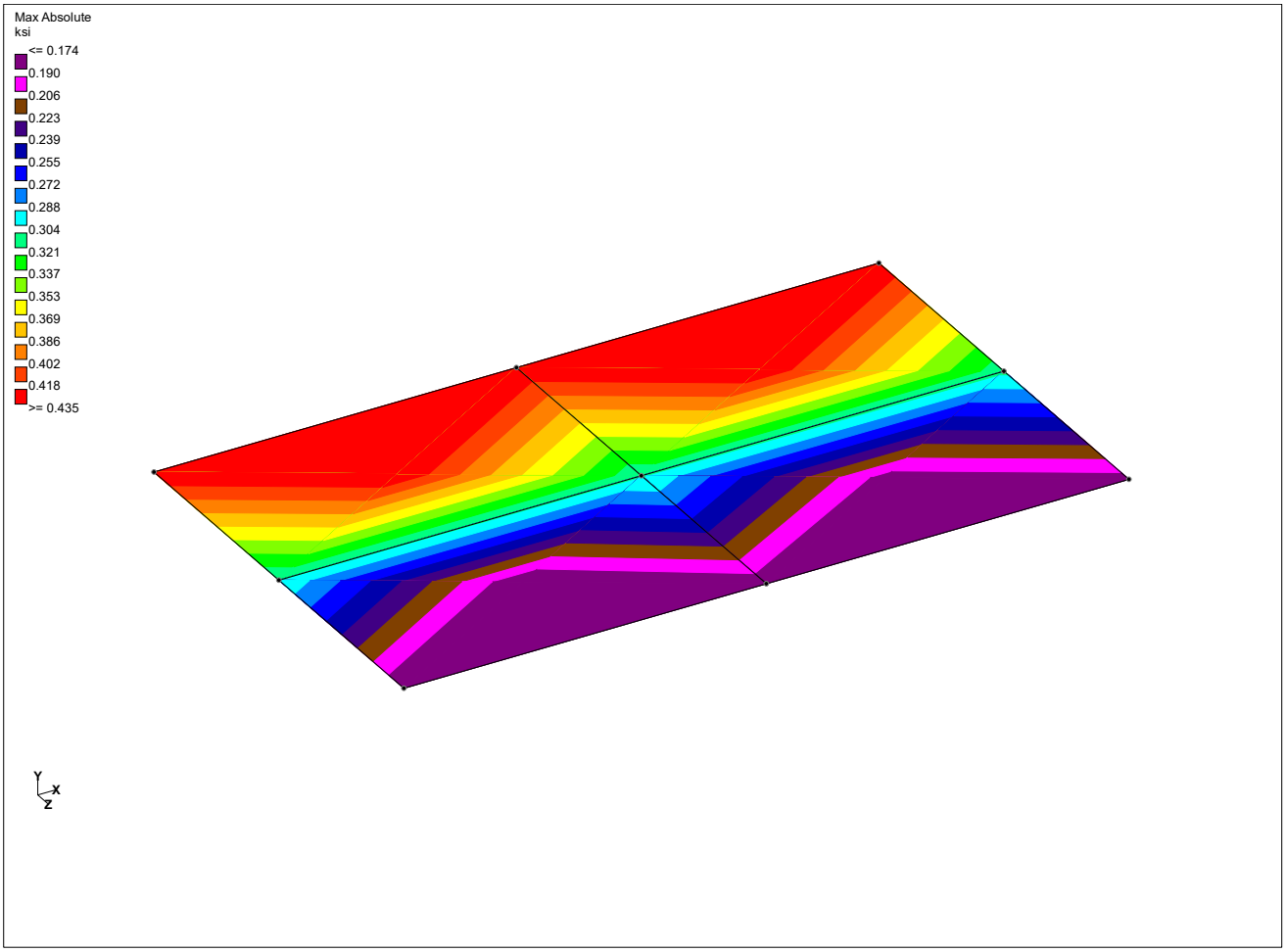
Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
32	UNI lbf/ft	GX	88.500	-	-	-	-
34	UNI lbf/ft	GX	88.500	-	-	-	-

4 WL-Z : Beam Loads

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
32	UNI lbf/ft	GZ	-74.000	-	-	-	-
33	UNI lbf/ft	GZ	-74.000	-	-	-	-
48	UNI lbf/ft	GZ	-147.000	-	-	-	-

5 SL : One Way Loads

Load (ksi)	Min Ht. (ft)	Max Ht. (ft)	Min X (ft)	Max X (ft)	Min Y (ft)	Max Y (ft)
-0.001	4.000	4.200	-	-	-	-



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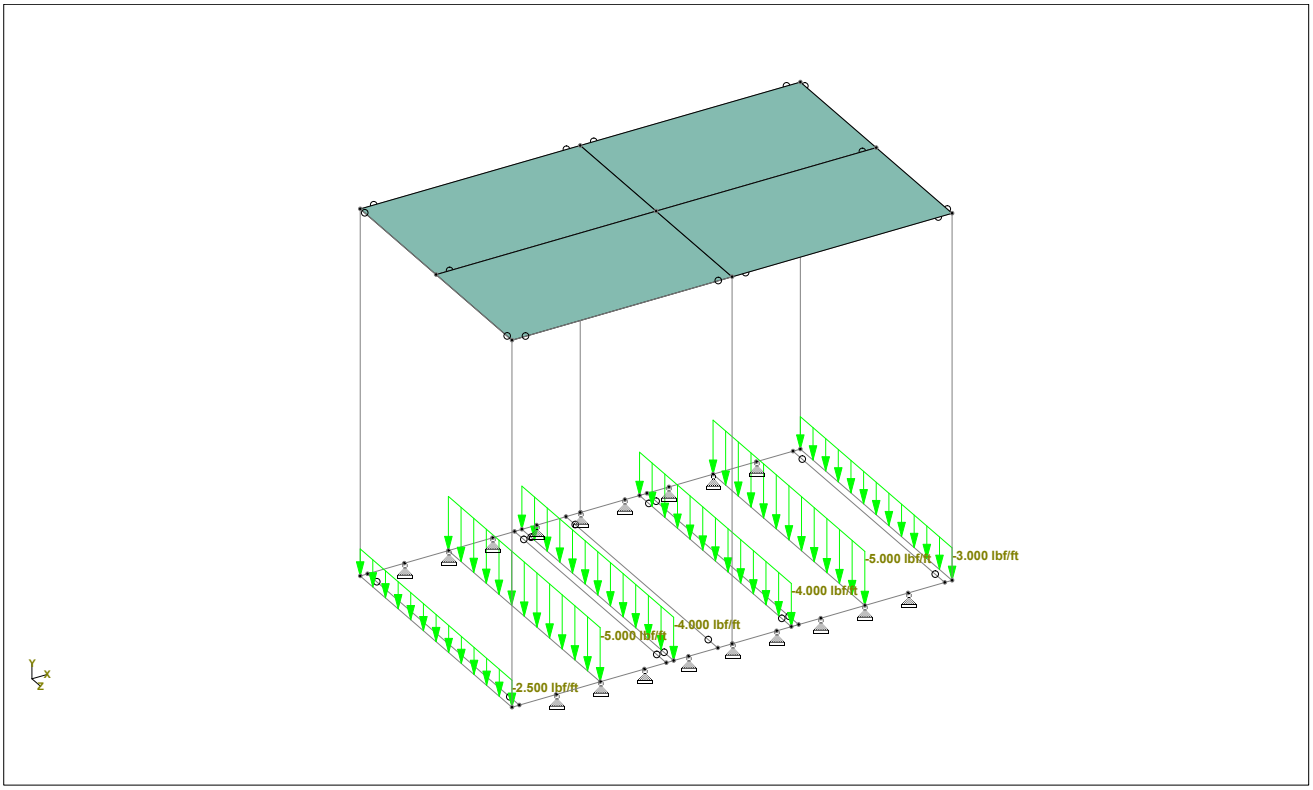
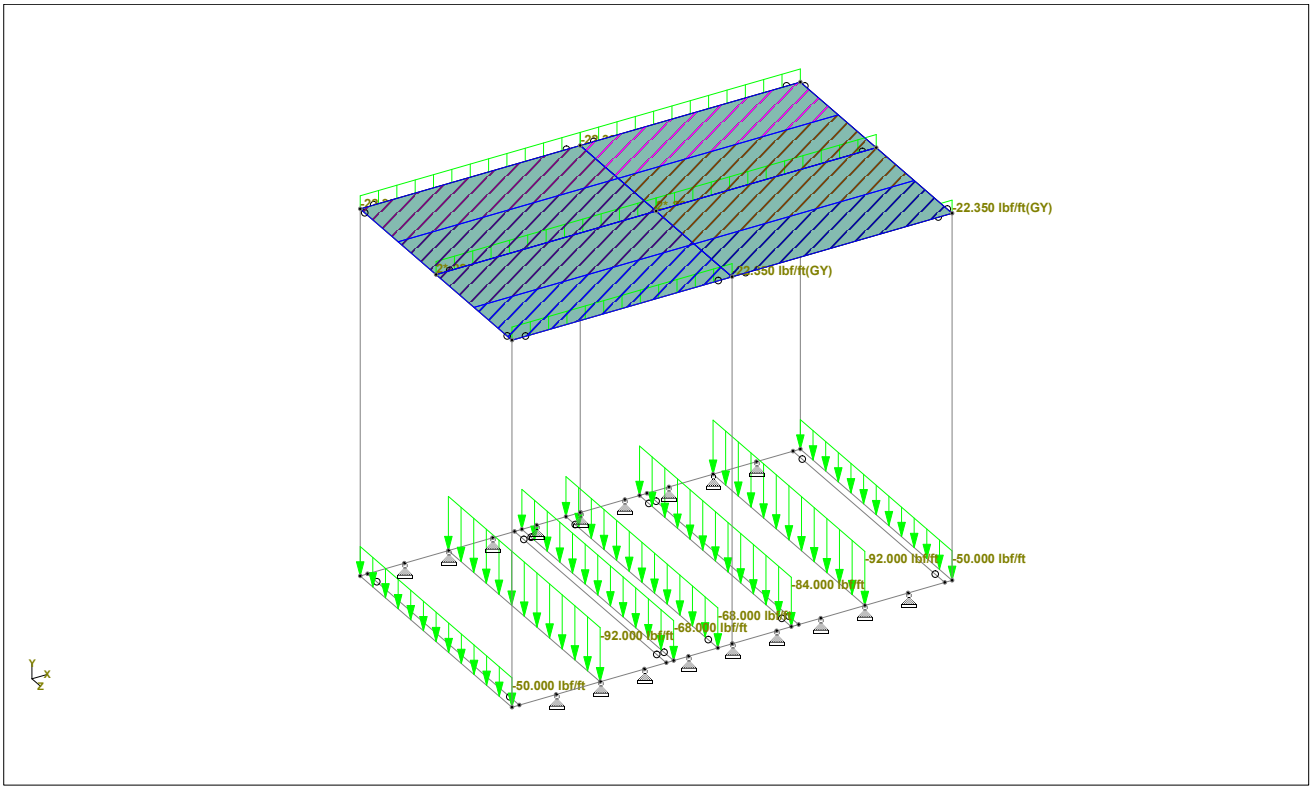


Whole Structure



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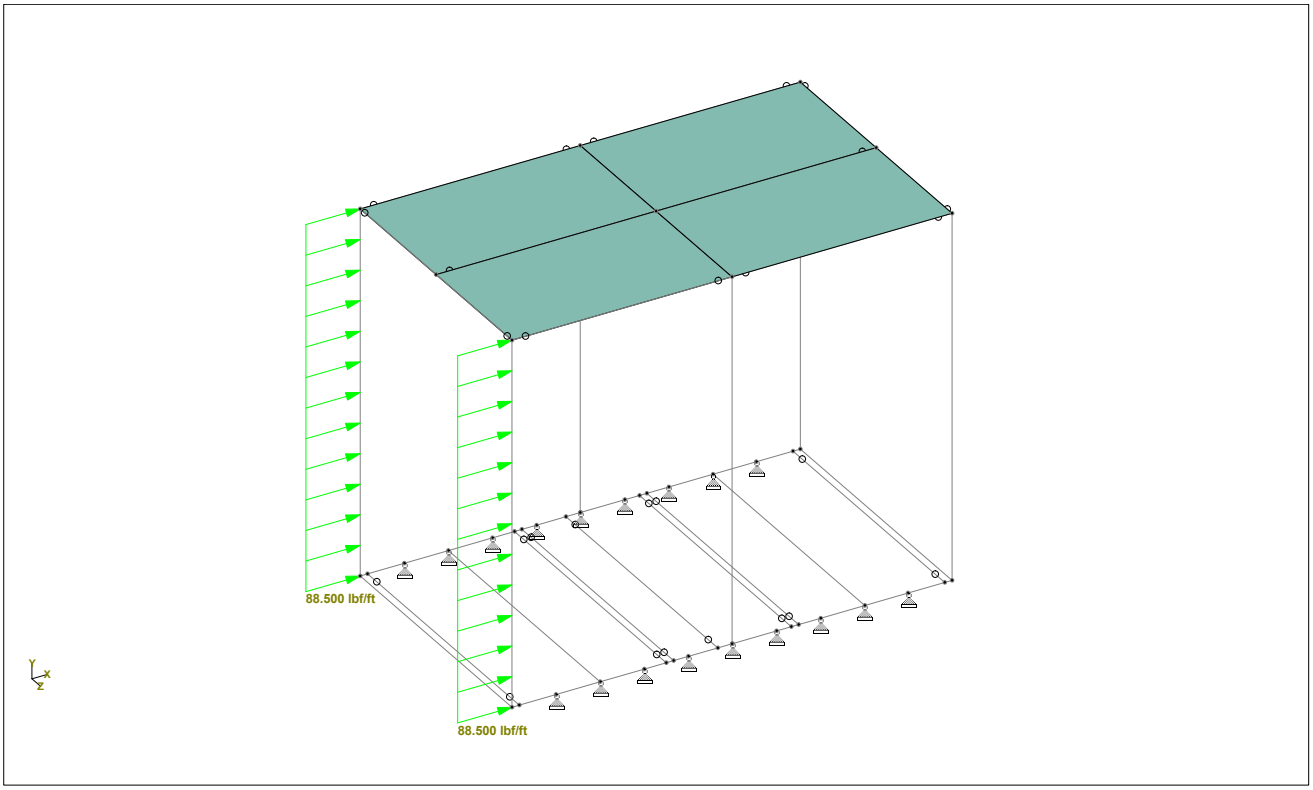

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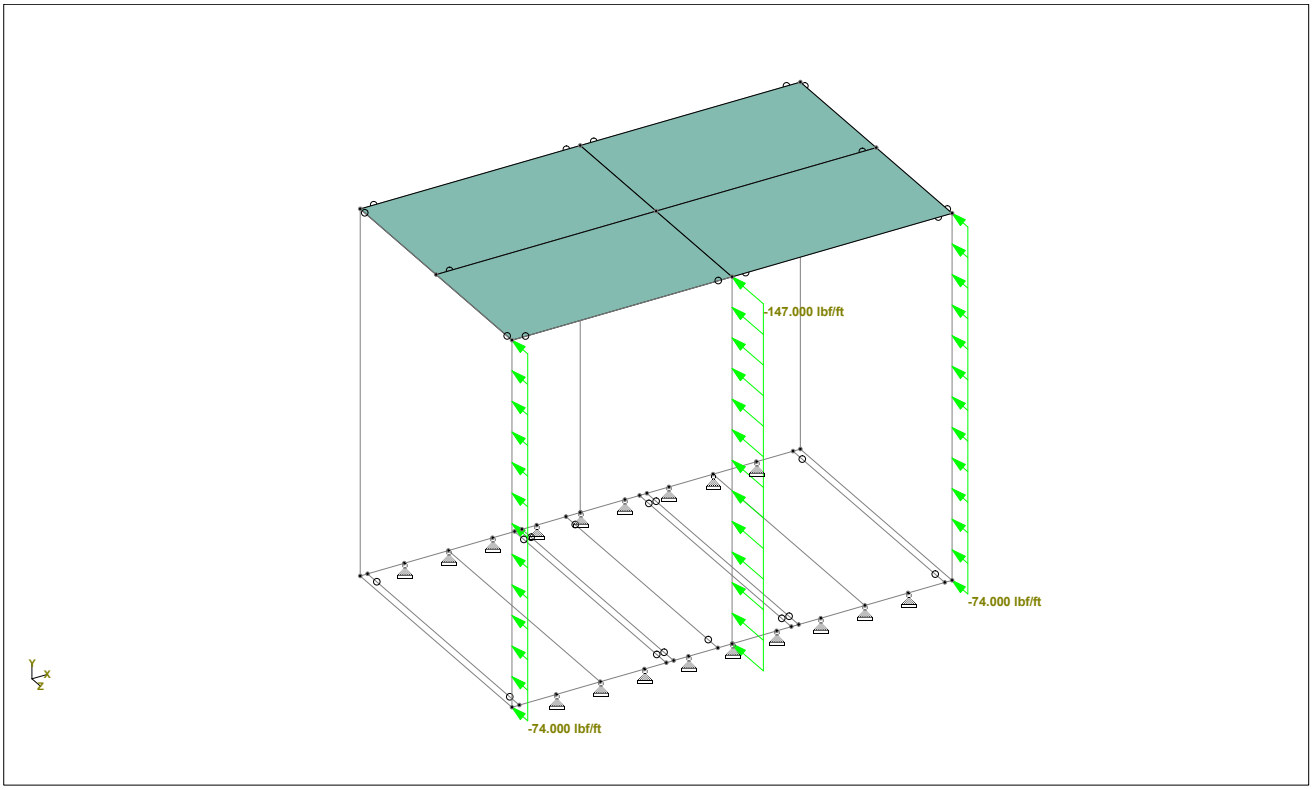
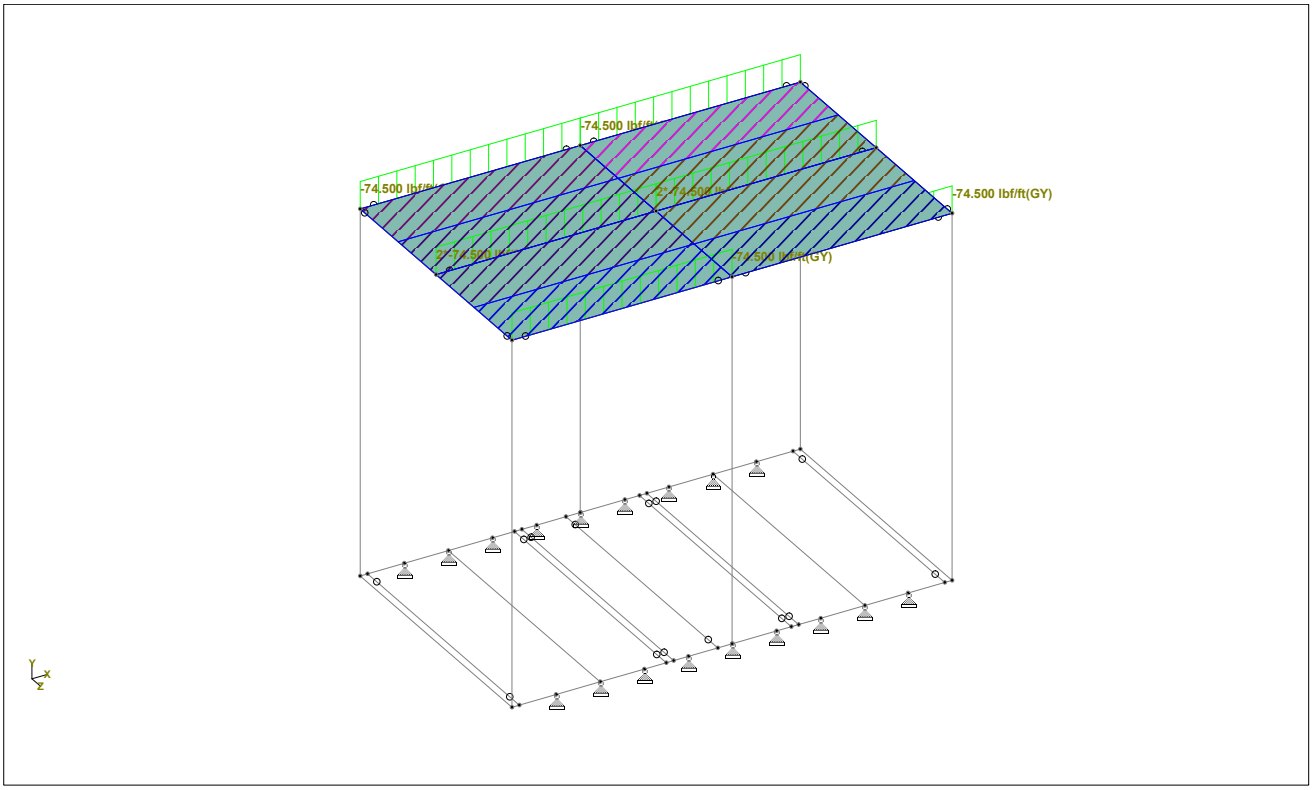


Whole Structure



Whole Structure

Beam Force Detail Summary

Sign convention as diagrams:- positive above line, negative below line except Fx where positive is compression. Distance d is given from beam end A.

				Axial	Shear		Torsion	Bending	
	Beam	L/C	d (ft)	Fx (lb)	Fy (lb)	Fz (lb)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
Max Fx	35	8:COMB - 1 DE	0	**299.461**	-2.592	0.775	0.000	-0.021	-0.151
Min Fx	29	3:WL-X	0	**-53.796**	-0.062	0.030	0.000	-0.000	2.689
Max Fy	57	16:COMB - 1 D	0	0	**642.268**	112.778	-0.001	-0.528	3.032
Min Fy	56	3:WL-X	0	0	**-984.923**	-0.041	0.000	0.000	-4.674
Max Fz	33	4:WL-Z	0	-1.030	4.296	**319.455**	0.000	-8.261	0.216
Min Fz	47	4:WL-Z	0	0.003	10.722	**-311.278**	-0.038	-0.002	-0.024
Max Mx	5	4:WL-Z	0	0	133.576	-67.457	**0.039**	0.319	0.631
Min Mx	14	4:WL-Z	0	0	36.113	-18.746	**-0.038**	-0.011	-0.024
Max My	48	4:WL-Z	2.083	1.393	0.003	-1.217	-0.000	**3.782**	-0.000
Min My	33	4:WL-Z	0	-1.030	4.296	319.455	0.000	**-8.261**	0.216
Max Mz	3	4:WL-Z	2.980	51.825	-427.864	-9.281	-0.000	-0.163	**7.042**
Min Mz	3	4:WL-Z	0	51.825	-427.864	-9.281	-0.000	0.169	**-8.258**

Beam End Force Summary

The signs of the forces at end B of each beam have been reversed. For example: this means that the Min Fx entry gives the largest tension value for an beam.

				Axial	Shear		Torsion	Bending	
	Beam	Node	L/C	Fx (lb)	Fy (lb)	Fz (lb)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
Max Fx	35	4	8:COMB - 1 DE	**299.461**	-2.592	0.775	0.000	-0.021	-0.151
Min Fx	29	21	3:WL-X	**-53.796**	-0.062	0.030	0.000	-0.000	2.689
Max Fy	57	35	16:COMB - 1 D	0	**642.268**	112.778	-0.001	-0.528	3.032
Min Fy	56	34	3:WL-X	0	**-984.923**	-0.041	0.000	0.000	-4.674
Max Fz	33	2	4:WL-Z	-1.030	4.296	**319.455**	0.000	-8.261	0.216
Min Fz	47	32	4:WL-Z	0.003	10.722	**-311.278**	-0.038	-0.002	-0.024
Max Mx	5	5	4:WL-Z	0	133.576	-67.457	**0.039**	0.319	0.631
Min Mx	14	11	4:WL-Z	0	36.113	-18.746	**-0.038**	-0.011	-0.024
Max My	56	5	4:WL-Z	-0	-497.881	268.580	-0.003	**0.353**	0.631
Min My	33	2	4:WL-Z	-1.030	4.296	319.455	0.000	**-8.261**	0.216
Max Mz	3	4	4:WL-Z	51.825	-427.864	-9.281	-0.000	-0.163	**7.042**
Min Mz	3	2	4:WL-Z	51.825	-427.864	-9.281	-0.000	0.169	**-8.258**

Plate Center Principal Stress Summary

			Principal		Von Mis		Tresca	
	Plate	L/C	Top (ksi)	Bottom (ksi)	Top (ksi)	Bottom (ksi)	Top (ksi)	Bottom (ksi)
Max (t)	52	4:WL-Z	**0.435**	-0.164	0.378	0.425	0.435	0.482
Max (b)	54	4:WL-Z	0.435	**-0.164**	0.378	0.425	0.435	0.482
Max VM (t)	52	4:WL-Z	0.435	-0.164	**0.378**	0.425	0.435	0.482
Max VM (b)	53	4:WL-Z	0.118	0.053	0.127	**0.505**	0.134	0.530
Tresca (t)	52	4:WL-Z	0.435	-0.164	0.378	0.425	**0.435**	0.482
Tresca (b)	53	4:WL-Z	0.118	0.053	0.127	0.505	0.134	**0.530**