

|                                                                                                                                                     |                    |                                                                                                                                      |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------|------|
|  DEPT OF BLDGS 321185427 Job Number<br><b>Tedds</b><br><b>SILMAN</b> |                    |  ES582377173 Scan Code :<br>346 43RD STREET<br>19248 |      |
| Section                                                                                                                                             |                    | Sheet no./rev.<br>1                                                                                                                  |      |
| Calc. by<br>ALW                                                                                                                                     | Date<br>11/20/2019 | Chk'd by                                                                                                                             | Date |
| App'd by                                                                                                                                            |                    | Date                                                                                                                                 |      |

**SNOW LOADING**

In accordance with ASCE7-10

Tedds calculation version 1.0.09

**Building details**

Roof type Flat  
Width of roof b = 49.67 ft

**Ground snow load**

Ground snow load (Figure 7-1)  $p_g = 25.00 \text{ lb/ft}^2$   
Density of snow  $\gamma = \min(0.13 \times p_g / 1 \text{ ft} + 14 \text{ lb/ft}^3, 30 \text{ lb/ft}^3) = 17.25 \text{ lb/ft}^3$   
Terrain type Sect. 26.7 B  
Exposure condition (Table 7-2) Partially exposed  
Exposure factor (Table 7-2)  $C_e = 1.00$   
Thermal condition (Table 7-3) All  
Thermal factor (Table 7-3)  $C_t = 1.00$   
Importance category (Table 1.5-1) II  
Importance factor (Table 1.5-2)  $I_s = 1.00$

Min snow load for low slope roofs (Sect 7.3.4)  $p_{f\_min} = I_s \times 20 \text{ lb/ft}^2 = 20.00 \text{ lb/ft}^2$

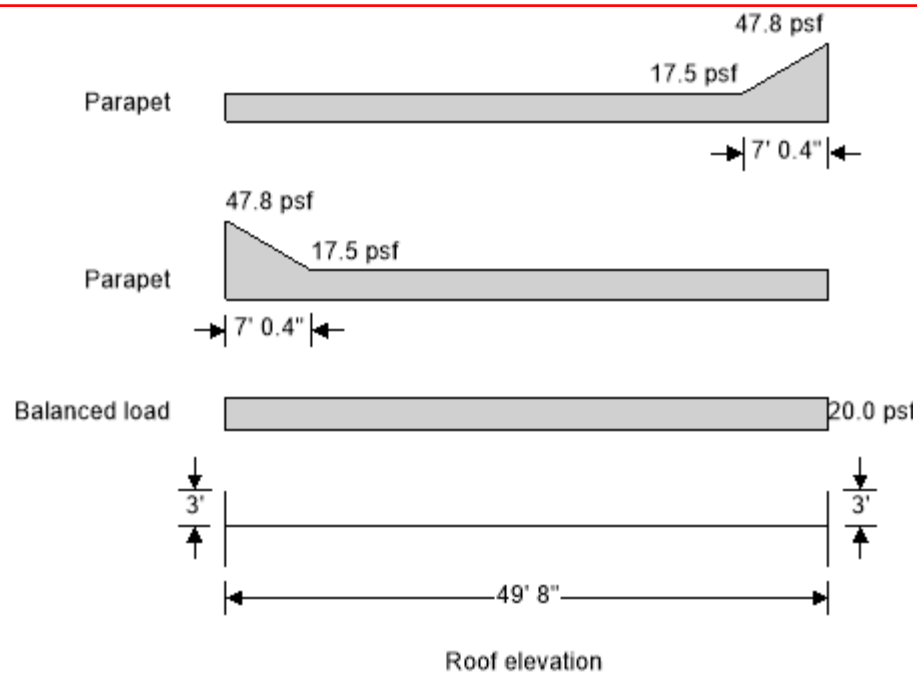
Flat roof snow load (Sect 7.3)  $p_f = 0.7 \times C_e \times C_t \times I_s \times p_g = 17.50 \text{ lb/ft}^2$

**Left parapet**

Balanced snow load height  $h_b = p_f / \gamma = 1.01 \text{ ft}$   
Height of left parapet  $h_{pptL} = 3.00 \text{ ft}$   
Height from balance load to top of left parapet  $h_{c\_pptL} = h_{pptL} - h_b = 1.99 \text{ ft}$   
Length of roof - left parapet  $l_{u\_pptL} = b = 49.67 \text{ ft}$   
Drift height windward drift - left parapet  $h_{d\_l\_pptL} = 0.75 \times (0.43 \times (\max(20 \text{ ft}, l_{u\_pptL}) \times 1 \text{ ft}^2)^{1/3} \times (p_g / 1 \text{ lb/ft}^2 + 10)^{1/4} - 1.5 \text{ ft}) = 1.76 \text{ ft}$   
Drift height - left parapet  $h_{d\_pptL} = \min(h_{d\_l\_pptL}, h_{pptL} - h_b) = 1.76 \text{ ft}$   
Drift width  $W_{d\_pptL} = \min(4 \times h_{d\_l\_pptL}, 8 \times (h_{pptL} - h_b), b) = 7.03 \text{ ft}$   
Drift surcharge load - left parapet  $p_{d\_pptL} = h_{d\_pptL} \times \gamma = 30.33 \text{ lb/ft}^2$

**Right parapet**

Height of right parapet  $h_{pptR} = 3.00 \text{ ft}$   
Height from balance load to top of right parapet  $h_{c\_pptR} = h_{pptR} - h_b = 1.99 \text{ ft}$   
Length of roof - right parapet  $l_{u\_pptR} = b = 49.67 \text{ ft}$   
Drift height windward drift - right parapet  $h_{d\_l\_pptR} = 0.75 \times (0.43 \times (\max(20 \text{ ft}, l_{u\_pptR}) \times 1 \text{ ft}^2)^{1/3} \times (p_g / 1 \text{ lb/ft}^2 + 10)^{1/4} - 1.5 \text{ ft}) = 1.76 \text{ ft}$   
Drift height - right parapet  $h_{d\_pptR} = \min(h_{d\_l\_pptR}, h_{pptR} - h_b) = 1.76 \text{ ft}$   
Drift width  $W_{d\_pptR} = \min(4 \times h_{d\_l\_pptR}, 8 \times (h_{pptR} - h_b), b) = 7.03 \text{ ft}$   
Drift surcharge load - right parapet  $p_{d\_pptR} = h_{d\_pptR} \times \gamma = 30.33 \text{ lb/ft}^2$



## Marino\WARE® Product Submittal Data

**PRODUCT NAME:** 800S200-33

**MARINO\WARE PART #** 800SJ20

**05.40.00 Cold-Formed Metal Framing**

### PROPERTIES:

|                         |      |                                  |        |
|-------------------------|------|----------------------------------|--------|
| <b>A. Web (in)</b>      | 8"   | <b>Yield Strength Fy (KSI)</b>   | 33     |
| <b>B. Flange (in)</b>   | 2"   | <b>Tensile Strength Fu (KSI)</b> | 45     |
| <b>C. Lip (in)</b>      | 5/8" | <b>Design Thickness (in)</b>     | 0.0346 |
| <b>Mils</b>             | 33   | <b>Minimum Thickness (in)</b>    | 0.0329 |
| <b>Available Finish</b> | G60  | <b>Gauge</b>                     | 20     |

### SECTION PROPERTIES

#### GROSS SECTION PROPERTIES

|                                                                  |       |
|------------------------------------------------------------------|-------|
| Cross Sectional Area: <b>A</b> (in <sup>2</sup> )                | 0.448 |
| Weight of Member: (lb/ft)                                        | 1.52  |
| Moment of Inertia: <b>I<sub>x</sub></b> (in <sup>4</sup> )       | 4.096 |
| Section Modulus: <b>S<sub>x</sub></b> (in <sup>3</sup> )         | 1.024 |
| Radius of Gyration: <b>R<sub>x</sub></b> (in)                    | 3.023 |
| Gross Moment of Inertia: <b>I<sub>y</sub></b> (in <sup>4</sup> ) | 0.227 |
| Gross Radius of Gyration: <b>R<sub>y</sub></b> (in)              | 0.712 |

#### EFFECTIVE SECTION PROPERTIES

|                                                                         |       |
|-------------------------------------------------------------------------|-------|
| Moment of Inertia-Deflection: <b>I<sub>xe</sub></b> (in <sup>4</sup> )  | 4.10  |
| Section Modulus: <b>S<sub>xe</sub></b> (in <sup>3</sup> )               | 0.82  |
| Allowable Bending Moment: <b>M<sub>a</sub></b> (in-k)                   | 16.12 |
| Allowable strong axis shear away from punch: <b>V<sub>ag</sub></b> (lb) | 474   |
| Allowable strong axis shear at punch: <b>V<sub>anet</sub></b> (lb)      | 474   |

#### TORSIONAL SECTION PROPERTIES

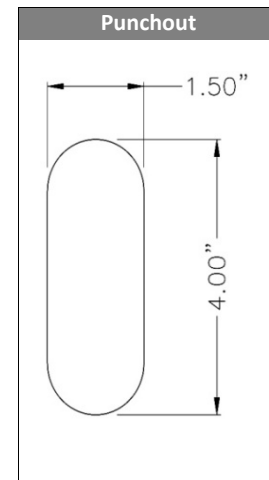
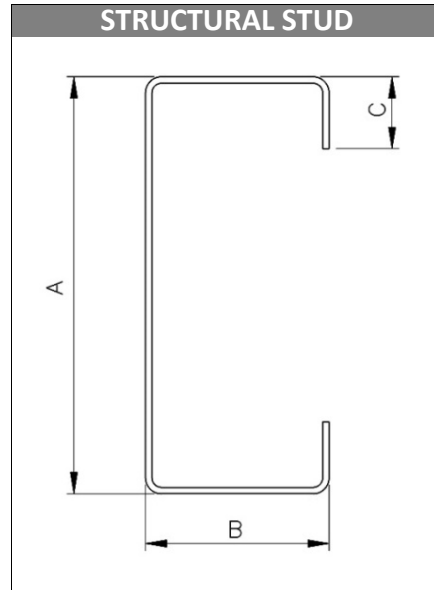
|                                                                                           |        |
|-------------------------------------------------------------------------------------------|--------|
| St. Venant Torsional Constant: <b>J<sub>x1000</sub></b> (in <sup>4</sup> )                | 0.179  |
| Torsional Warping Constant: <b>C<sub>w</sub></b> (in <sup>6</sup> )                       | 2.971  |
| Shear Center to Centroid on Principal X-axis: <b>X<sub>o</sub></b> (in)                   | -1.288 |
| Shear Center to Mid-Plane of the Web: <b>m</b> (in)                                       | 0.817  |
| Radius of Gyration on the Centroid Principal axis: <b>R<sub>o</sub></b> (in)              | 3.363  |
| Torsional Flexural Constant: <b>β</b> [1-(x <sub>o</sub> /R <sub>o</sub> ) <sup>2</sup> ] | 0.853  |

### CODES & STANDARDS

- AISI S100-12 & ICC ES ESR-4062
- Framing meets ASTM A 1003, A 653, & C 955
- Meets IBC 2015 & 2012, FBC 2014, CSSA code compliant

### GREEN INFO

- LEED v3 & LEED v4 credits available
- Contact Technical Services for more information.



## Marino\WARE® Product Submittal Data

**PRODUCT NAME:** 1200S200-97

**MARINO\WARE PART #** 120SJ12

### 05.40.00 Cold-Formed Metal Framing

#### PROPERTIES:

|                         |      |                                  |        |
|-------------------------|------|----------------------------------|--------|
| <b>A. Web (in)</b>      | 12"  | <b>Yield Strength Fy (KSI)</b>   | 50     |
| <b>B. Flange (in)</b>   | 2"   | <b>Tensile Strength Fu (KSI)</b> | 65     |
| <b>C. Lip (in)</b>      | 5/8" | <b>Design Thickness (in)</b>     | 0.1017 |
| <b>Mils</b>             | 97   | <b>Minimum Thickness (in)</b>    | 0.0966 |
| <b>Available Finish</b> | G60  | <b>Gauge</b>                     | 12     |

#### SECTION PROPERTIES

##### GROSS SECTION PROPERTIES

|                                                       |        |
|-------------------------------------------------------|--------|
| Cross Sectional Area: <b>A</b> (in <sup>2</sup> )     | 1.677  |
| Weight of Member: (lb/ft)                             | 5.71   |
| Moment of Inertia: <b>Ix</b> (in <sup>4</sup> )       | 30.417 |
| Section Modulus: <b>Sx</b> (in <sup>3</sup> )         | 5.069  |
| Radius of Gyration: <b>Rx</b> (in)                    | 4.258  |
| Gross Moment of Inertia: <b>Iy</b> (in <sup>4</sup> ) | 0.635  |
| Gross Radius of Gyration: <b>Ry</b> (in)              | 0.615  |

##### EFFECTIVE SECTION PROPERTIES

|                                                              |        |
|--------------------------------------------------------------|--------|
| Moment of Inertia-Deflection: <b>Ixe</b> (in <sup>4</sup> )  | 30.18  |
| Section Modulus: <b>Sxe</b> (in <sup>3</sup> )               | 4.66   |
| Allowable Bending Moment: <b>Ma</b> (in-k)                   | 139.51 |
| Allowable strong axis shear away from punch: <b>Vag</b> (lb) | 8147   |
| Allowable strong axis shear at punch: <b>Vanet</b> (lb)      | 7411   |

##### TORSIONAL SECTION PROPERTIES

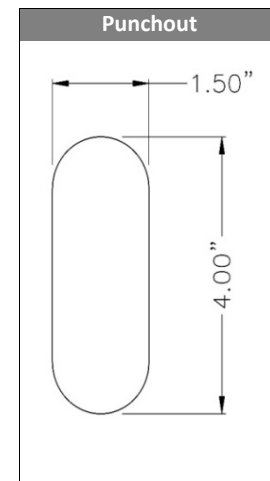
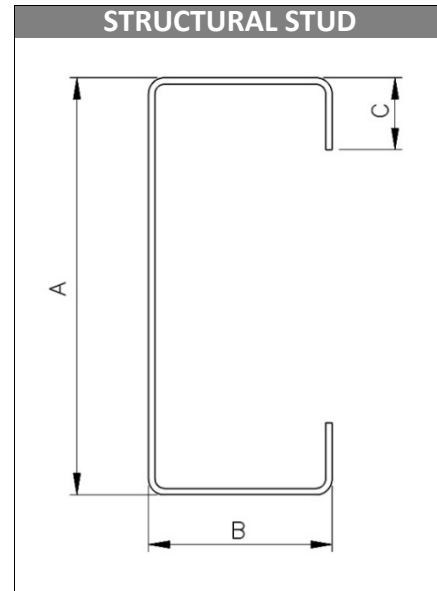
|                                                                   |        |
|-------------------------------------------------------------------|--------|
| St. Venant Torsional Constant: <b>Jx1000</b> (in <sup>4</sup> )   | 5.783  |
| Torsional Warping Constant: <b>Cw</b> (in <sup>6</sup> )          | 19.150 |
| Shear Center to Centroid on Principal X-axis: <b>Xo</b> (in)      | -0.987 |
| Shear Center to Mid-Plane of the Web: <b>m</b> (in)               | 0.656  |
| Radius of Gyration on the Centroid Principal axis: <b>Ro</b> (in) | 4.414  |
| Torsional Flexural Constant: <b>β</b> [1-(xo/Ro) <sup>2</sup> ]   | 0.950  |

#### CODES & STANDARDS

- AISI S100-12 & ICC ES ESR-4062
- Framing meets ASTM A 1003, A 653, & C 955
- Meets IBC 2015 & 2012, FBC 2014, CSSA code compliant

#### GREEN INFO

- LEED v3 & LEED v4 credits available
- Contact Technical Services for more information.





RAM Structural System

Bentley

RAM SBeam v06.00.00

# Gravity Beam Design

11/25/19 10:25:47

## STEEL CODE: AISC 360-10 LRFD

### SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (7.00,0.00)

Beam Size (User Selected) = W12X14 Fy = 50.0 ksi  
 Total Beam Length (ft) = 7.00  
 Mp (kip-ft) = 72.50  
 Top flange braced by decking.

### LINE LOADS (k/ft):

| Load | Dist (ft) | DL    | LL    | PartL |
|------|-----------|-------|-------|-------|
| 1    | 0.000     | 0.014 | 0.000 | 0.000 |
|      | 7.000     | 0.014 | 0.000 | 0.000 |
| 2    | 0.000     | 0.074 | 0.200 | 0.000 |
|      | 7.000     | 0.074 | 0.200 | 0.000 |
| 3    | 0.000     | 0.167 | 0.450 | 0.000 |
|      | 7.000     | 0.167 | 0.450 | 0.000 |

MEMBER SELF-WEIGHT

**STAIR LANDING LOADS**  
 DL= 37 PSF  
 LL= 100 PSF  
 TRIB. FLOOR WIDTH = 2 FT

**STAIR LOADS**  
 DL= 37 PSF  
 LL= 100 PSF  
 TRIB. STAIR WIDTH = 4.5 FT

**SHEAR (Ultimate):** Max Vu (1.2DL+1.6LL) = 4.71 kips 0.90Vn = 64.26 kips

### MOMENTS (Ultimate):

| Span        | Cond  | LoadCombo   | Mu<br>kip-ft | @<br>ft | Lb<br>ft | Cb   | Phi  | Phi*Mn<br>kip-ft |
|-------------|-------|-------------|--------------|---------|----------|------|------|------------------|
| Center      | Max + | 1.2DL+1.6LL | 8.2          | 3.5     | 0.0      | 1.00 | 0.90 | 65.25 ✓          |
| Controlling |       | 1.2DL+1.6LL | 8.2          | 3.5     | 0.0      | 1.00 | 0.90 | 65.25 ✓          |

### REACTIONS (kips):

|                                | Left | Right |
|--------------------------------|------|-------|
| DL reaction                    | 0.89 | 0.89  |
| Max +LL reaction               | 2.27 | 2.27  |
| Max +total reaction (factored) | 4.71 | 4.71  |

### DEFLECTIONS:

|                     |    |           |        |       |         |
|---------------------|----|-----------|--------|-------|---------|
| Dead load (in)      | at | 3.50 ft = | -0.005 | L/D = | 15658 ✓ |
| Live load (in)      | at | 3.50 ft = | -0.014 | L/D = | 6146 ✓  |
| Net Total load (in) | at | 3.50 ft = | -0.019 | L/D = | 4414 ✓  |



RAM Structural System

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RAM SBeam v06.00.00

# Gravity Beam Design

11/25/19 10:28:59

## STEEL CODE: AISC 360-10 LRFD

### SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (13.00,0.00)

Beam Size (User Selected) = W12X19 Fy = 50.0 ksi  
 Total Beam Length (ft) = 13.00  
 Mp (kip-ft) = 102.92  
 Top flange not braced by decking.

### POINT LOADS (kips):

| Dist (ft) | DL   | LL   | PartL | Flange Bracing<br>Top | Bottom |
|-----------|------|------|-------|-----------------------|--------|
| 4.000     | 2.76 | 5.61 | 0.00  | Yes                   | No     |

MEMBER REACTIONS FROM  
W12X14. SEE APPENDIX 4.

### LINE LOADS (k/ft):

| Load | Dist (ft) | DL    | LL    | PartL |
|------|-----------|-------|-------|-------|
| 1    | 0.000     | 0.019 | 0.000 | 0.000 |
|      | 13.000    | 0.019 | 0.000 | 0.000 |
| 2    | 0.000     | 0.233 | 0.613 | 0.000 |
|      | 13.000    | 0.233 | 0.613 | 0.000 |
| 3    | 0.000     | 0.173 | 0.175 | 0.000 |
|      | 13.000    | 0.173 | 0.175 | 0.000 |

MEMBER SELF-WEIGHT

**ROOF LOADING**  
 DL= 38 PSF  
 LL= 100 PSF  
 TRIB FLOOR WIDTH= 6.125 FT

**BULKHEAD WALL LOADING**  
 DL= 173 PLF  
 LL= 175 PLF

**SHEAR (Ultimate):** Max Vu (1.2DL+1.6LL) = 20.02 kips 1.00Vn = 86.01 kips

### MOMENTS (Ultimate):

| Span        | Cond  | LoadCombo   | Mu<br>kip-ft | @<br>ft | Lb<br>ft | Cb   | Phi  | Phi*Mn<br>kip-ft |
|-------------|-------|-------------|--------------|---------|----------|------|------|------------------|
| Center      | Max + | 1.2DL+1.6LL | 66.0         | 4.4     | 9.0      | 1.28 | 0.90 | 66.37 ✓          |
| Controlling |       | 1.2DL+1.6LL | 66.0         | 4.4     | 9.0      | 1.28 | 0.90 | 66.37 ✓          |

### REACTIONS (kips):

|                                | Left  | Right |
|--------------------------------|-------|-------|
| DL reaction                    | 4.67  | 3.61  |
| Max +LL reaction               | 9.01  | 6.85  |
| Max +total reaction (factored) | 20.02 | 15.29 |

### DEFLECTIONS:

|                     |    |           |        |       |        |
|---------------------|----|-----------|--------|-------|--------|
| Dead load (in)      | at | 6.24 ft = | -0.119 | L/D = | 1307 ✓ |
| Live load (in)      | at | 6.24 ft = | -0.230 | L/D = | 679 ✓  |
| Net Total load (in) | at | 6.24 ft = | -0.349 | L/D = | 447 ✓  |



RAM Structural System

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RAM SBeam v06.00.00

# Gravity Beam Design

11/25/19 10:32:26

## STEEL CODE: AISC 360-10 LRFD

### SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (19.00,0.00)

Beam Size (User Selected) = W12X22 Fy = 50.0 ksi  
 Total Beam Length (ft) = 19.00  
 Mp (kip-ft) = 122.08  
 Top flange not braced by decking.

### POINT LOADS (kips):

| Dist (ft) | DL   | LL   | PartL | Flange Bracing<br>Top | Bottom |
|-----------|------|------|-------|-----------------------|--------|
| 12.250    | 4.67 | 9.01 | 0.00  | Yes                   | No     |

MEMBER REACTIONS FROM  
W12X19. SEE APPENDIX 5.

MEMBER SELF-WEIGHT

### LINE LOADS (k/ft):

| Load | Dist (ft) | DL    | LL    | PartL |
|------|-----------|-------|-------|-------|
| 1    | 0.000     | 0.022 | 0.000 | 0.000 |
|      | 19.000    | 0.022 | 0.000 | 0.000 |
| 2    | 0.000     | 0.025 | 0.067 | 0.000 |
|      | 19.000    | 0.025 | 0.067 | 0.000 |
| 3    | 0.000     | 0.025 | 0.067 | 0.000 |
|      | 12.250    | 0.025 | 0.067 | 0.000 |
| 4    | 12.250    | 0.167 | 0.450 | 0.000 |
|      | 19.000    | 0.167 | 0.450 | 0.000 |
| 5    | 12.250    | 0.040 | 0.000 | 0.000 |
|      | 19.000    | 0.040 | 0.000 | 0.000 |

#### ROOF LOADING

DL= 38 PSF  
LL= 100 PSF  
TRIB FLOOR WIDTH= 8 IN

#### ROOF LOADING

DL= 38 PSF  
LL= 100 PSF  
TRIB FLOOR WIDTH= 8 IN

#### STAIR LOADING

DL= 37 PSF  
LL= 100 PSF  
TRIB STAIR WIDTH= 4.5 FT

BULKHEAD WALL LOADING  
DL= 40 PLF

**SHEAR (Ultimate):** Max Vu (1.2DL+1.6LL) = 20.38 kips 1.00Vn = 95.94 kips

### MOMENTS (Ultimate):

| Span        | Cond  | LoadCombo   | Mu<br>kip-ft | @<br>ft | Lb<br>ft | Cb   | Phi  | Phi*Mn<br>kip-ft |
|-------------|-------|-------------|--------------|---------|----------|------|------|------------------|
| Center      | Max + | 1.2DL+1.6LL | 111.8        | 12.3    | 12.3     | 1.58 | 0.90 | 68.51            |
| Controlling |       | 1.2DL+1.6LL | 111.8        | 12.3    | 12.3     | 1.58 | 0.90 | 68.51            |

### REACTIONS (kips):

|                                | Left  | Right |
|--------------------------------|-------|-------|
| DL reaction                    | 2.56  | 4.71  |
| Max +LL reaction               | 4.93  | 9.21  |
| Max +total reaction (factored) | 10.97 | 20.38 |

### DEFLECTIONS:

|                     |    |            |        |       |     |
|---------------------|----|------------|--------|-------|-----|
| Dead load (in)      | at | 10.17 ft = | -0.307 | L/D = | 742 |
| Live load (in)      | at | 10.17 ft = | -0.595 | L/D = | 383 |
| Net Total load (in) | at | 10.17 ft = | -0.903 | L/D = | 253 |

## Marino\WARE® Product Submittal Data

**PRODUCT NAME:** 1000S200-68

**MARINO\WARE PART #** 100SJ14

**05.40.00 Cold-Formed Metal Framing**

### PROPERTIES:

|                         |      |                                  |        |
|-------------------------|------|----------------------------------|--------|
| <b>A. Web (in)</b>      | 10"  | <b>Yield Strength Fy (KSI)</b>   | 50     |
| <b>B. Flange (in)</b>   | 2"   | <b>Tensile Strength Fu (KSI)</b> | 65     |
| <b>C. Lip (in)</b>      | 5/8" | <b>Design Thickness (in)</b>     | 0.0713 |
| <b>Mils</b>             | 68   | <b>Minimum Thickness (in)</b>    | 0.0677 |
| <b>Available Finish</b> | G60  | <b>Gauge</b>                     | 14     |

### SECTION PROPERTIES

#### GROSS SECTION PROPERTIES

|                                                                  |        |
|------------------------------------------------------------------|--------|
| Cross Sectional Area: <b>A</b> (in <sup>2</sup> )                | 1.050  |
| Weight of Member: (lb/ft)                                        | 3.57   |
| Moment of Inertia: <b>I<sub>x</sub></b> (in <sup>4</sup> )       | 13.994 |
| Section Modulus: <b>S<sub>x</sub></b> (in <sup>3</sup> )         | 2.799  |
| Radius of Gyration: <b>R<sub>x</sub></b> (in)                    | 3.652  |
| Gross Moment of Inertia: <b>I<sub>y</sub></b> (in <sup>4</sup> ) | 0.460  |
| Gross Radius of Gyration: <b>R<sub>y</sub></b> (in)              | 0.662  |

#### EFFECTIVE SECTION PROPERTIES

|                                                                         |       |
|-------------------------------------------------------------------------|-------|
| Moment of Inertia-Deflection: <b>I<sub>xe</sub></b> (in <sup>4</sup> )  | 13.67 |
| Section Modulus: <b>S<sub>xe</sub></b> (in <sup>3</sup> )               | 2.42  |
| Allowable Bending Moment: <b>M<sub>a</sub></b> (in-k)                   | 72.46 |
| Allowable strong axis shear away from punch: <b>V<sub>ag</sub></b> (lb) | 3345  |
| Allowable strong axis shear at punch: <b>V<sub>anet</sub></b> (lb)      | 3345  |

#### TORSIONAL SECTION PROPERTIES

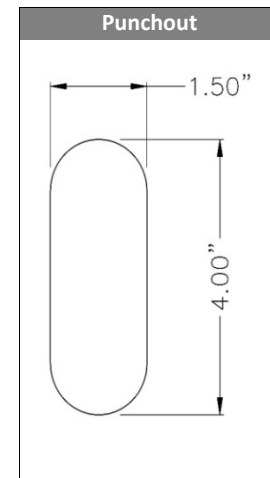
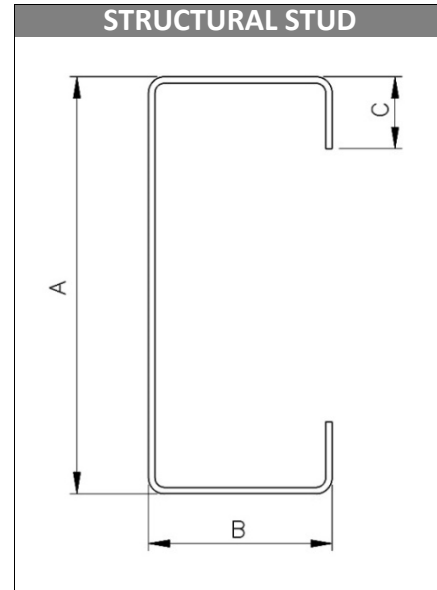
|                                                                                           |        |
|-------------------------------------------------------------------------------------------|--------|
| St. Venant Torsional Constant: <b>J<sub>x1000</sub></b> (in <sup>4</sup> )                | 1.779  |
| Torsional Warping Constant: <b>C<sub>w</sub></b> (in <sup>6</sup> )                       | 9.401  |
| Shear Center to Centroid on Principal X-axis: <b>X<sub>o</sub></b> (in)                   | -1.120 |
| Shear Center to Mid-Plane of the Web: <b>m</b> (in)                                       | 0.729  |
| Radius of Gyration on the Centroid Principal axis: <b>R<sub>o</sub></b> (in)              | 3.876  |
| Torsional Flexural Constant: <b>β</b> [1-(x <sub>o</sub> /R <sub>o</sub> ) <sup>2</sup> ] | 0.917  |

### CODES & STANDARDS

- AISI S100-12 & ICC ES ESR-4062
- Framing meets ASTM A 1003, A 653, & C 955
- Meets IBC 2015 & 2012, FBC 2014, CSSA code compliant

### GREEN INFO

- LEED v3 & LEED v4 credits available
- Contact Technical Services for more information.





RAM Structural System

Bentley

RAM SBeam v06.00.00

# Gravity Beam Design

11/25/19 10:44:29

## STEEL CODE: AISC 360-10 LRFD

### SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (7.00,0.00)

Beam Size (User Selected) = W10X15 Fy = 50.0 ksi  
 Total Beam Length (ft) = 7.00  
 Mp (kip-ft) = 66.67  
 Top flange braced by decking.

### LINE LOADS (k/ft):

| Load | Dist (ft) | DL    | LL    | PartL |
|------|-----------|-------|-------|-------|
| 1    | 0.000     | 0.015 | 0.000 | 0.000 |
|      | 7.000     | 0.015 | 0.000 | 0.000 |
| 2    | 0.000     | 0.076 | 0.200 | 0.000 |
|      | 7.000     | 0.076 | 0.200 | 0.000 |
| 3    | 0.000     | 0.167 | 0.450 | 0.000 |
|      | 7.000     | 0.167 | 0.450 | 0.000 |

MEMBER SELF-WEIGHT

#### STAIR LANDING LOADS

DL= 37 PSF  
 LL= 100 PSF  
 TRIB. FLOOR WIDTH = 2 FT

#### STAIR LOADS

DL= 37 PSF  
 LL= 100 PSF  
 TRIB. STAIR WIDTH = 4.5 FT

**SHEAR (Ultimate):** Max Vu (1.2DL+1.6LL) = 4.72 kips 1.00Vn = 69.00 kips

### MOMENTS (Ultimate):

| Span        | Cond  | LoadCombo   | Mu<br>kip-ft | @<br>ft | Lb<br>ft | Cb   | Phi  | Phi*Mn<br>kip-ft |
|-------------|-------|-------------|--------------|---------|----------|------|------|------------------|
| Center      | Max + | 1.2DL+1.6LL | 8.3          | 3.5     | 0.0      | 1.00 | 0.90 | 60.00 ✓          |
| Controlling |       | 1.2DL+1.6LL | 8.3          | 3.5     | 0.0      | 1.00 | 0.90 | 60.00 ✓          |

### REACTIONS (kips):

|                                | Left | Right |
|--------------------------------|------|-------|
| DL reaction                    | 0.90 | 0.90  |
| Max +LL reaction               | 2.27 | 2.27  |
| Max +total reaction (factored) | 4.72 | 4.72  |

### DEFLECTIONS:

|                     |    |           |        |       |        |
|---------------------|----|-----------|--------|-------|--------|
| Dead load (in)      | at | 3.50 ft = | -0.007 | L/D = | 12042  |
| Live load (in)      | at | 3.50 ft = | -0.018 | L/D = | 4780 ✓ |
| Net Total load (in) | at | 3.50 ft = | -0.025 | L/D = | 3422 ✓ |



RAM Structural System

Bentley

RAM SBeam v06.00.00

# Gravity Beam Design

11/25/19 10:49:19

## STEEL CODE: AISC 360-10 LRFD

### SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (13.00,0.00)

Beam Size (User Selected) = W10X17 Fy = 50.0 ksi  
 Total Beam Length (ft) = 13.00  
 Mp (kip-ft) = 77.92  
 Top flange not braced by decking.

### POINT LOADS (kips):

| Dist (ft) | DL   | LL   | PartL | Flange Bracing<br>Top Bottom |
|-----------|------|------|-------|------------------------------|
| 9.000     | 0.90 | 2.27 | 0.00  | Yes No                       |

MEMBER REACTIONS FROM  
W10X15. SEE APPENDIX 8.

### LINE LOADS (k/ft):

| Load | Dist (ft) | DL    | LL    | PartL |
|------|-----------|-------|-------|-------|
| 1    | 0.000     | 0.017 | 0.000 | 0.000 |
|      | 13.000    | 0.017 | 0.000 | 0.000 |
| 2    | 0.000     | 0.123 | 0.245 | 0.000 |
|      | 13.000    | 0.123 | 0.245 | 0.000 |

MEMBER SELF-WEIGHT

FLOOR LOADING  
DL= 20 PSF  
LL= 40 PSF  
TRIB FLOOR WIDTH= 6.125 FT

**SHEAR (Ultimate):** Max Vu (1.2DL+1.6LL) = 6.90 kips 1.00Vn = 72.72 kips

### MOMENTS (Ultimate):

| Span        | Cond  | LoadCombo   | Mu<br>kip-ft | @<br>ft | Lb<br>ft | Cb   | Phi  | Phi*Mn<br>kip-ft |
|-------------|-------|-------------|--------------|---------|----------|------|------|------------------|
| Center      | Max + | 1.2DL+1.6LL | 23.1         | 9.0     | 9.0      | 1.30 | 0.90 | 56.20            |
| Controlling |       | 1.2DL+1.6LL | 23.1         | 9.0     | 9.0      | 1.30 | 0.90 | 56.20            |

### REACTIONS (kips):

|                                | Left | Right |
|--------------------------------|------|-------|
| DL reaction                    | 1.19 | 1.53  |
| Max +LL reaction               | 2.29 | 3.16  |
| Max +total reaction (factored) | 5.09 | 6.90  |

### DEFLECTIONS:

|                     |    |           |        |       |      |
|---------------------|----|-----------|--------|-------|------|
| Dead load (in)      | at | 6.76 ft = | -0.062 | L/D = | 2510 |
| Live load (in)      | at | 6.76 ft = | -0.128 | L/D = | 1223 |
| Net Total load (in) | at | 6.76 ft = | -0.190 | L/D = | 822  |



RAM Structural System

Bentley

RAM SBeam v06.00.00

# Gravity Beam Design

11/25/19 10:52:35

## STEEL CODE: AISC 360-10 LRFD

### SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (19.00,0.00)

Beam Size (User Selected) = W10X19 Fy = 50.0 ksi  
 Total Beam Length (ft) = 19.00  
 Mp (kip-ft) = 90.00  
 Top flange not braced by decking.

### POINT LOADS (kips):

| Dist (ft) | DL   | LL   | PartL | Flange Bracing<br>Top Bottom |
|-----------|------|------|-------|------------------------------|
| 12.250    | 1.19 | 2.29 | 0.00  | Yes No                       |

MEMBER REACTIONS FROM  
W10X17. SEE APPENDIX 9.

MEMBER SELF-WEIGHT

### LINE LOADS (k/ft):

| Load | Dist (ft) | DL    | LL    | PartL |
|------|-----------|-------|-------|-------|
| 1    | 0.000     | 0.019 | 0.000 | 0.000 |
|      | 19.000    | 0.019 | 0.000 | 0.000 |
| 2    | 0.000     | 0.014 | 0.027 | 0.000 |
|      | 19.000    | 0.014 | 0.027 | 0.000 |
| 3    | 0.000     | 0.014 | 0.027 | 0.000 |
|      | 12.250    | 0.014 | 0.027 | 0.000 |
| 4    | 12.250    | 0.170 | 0.450 | 0.000 |
|      | 19.000    | 0.170 | 0.450 | 0.000 |

#### FLOOR LOADING

DL=20 PSF  
LL= 40 PSF  
TRIB FLOOR WIDTH= 8 IN

#### FLOOR LOADING

DL= 20 PSF  
LL= 40 PSF  
TRIB FLOOR WIDTH= 8 IN

#### STAIR LOADING

DL= 37 PSF  
LL= 100 PSF  
TRIB STAIR WIDTH= 4.5 FT

**SHEAR (Ultimate): Max Vu (1.2DL+1.6LL) = 9.44 kips 1.00Vn = 76.50 kips**

### MOMENTS (Ultimate):

| Span        | Cond  | LoadCombo   | Mu<br>kip-ft | @<br>ft | Lb<br>ft | Cb   | Phi  | Phi*Mn<br>kip-ft |
|-------------|-------|-------------|--------------|---------|----------|------|------|------------------|
| Center      | Max + | 1.2DL+1.6LL | 40.8         | 12.3    | 12.3     | 1.55 | 0.90 | 55.39 ✓          |
| Controlling |       | 1.2DL+1.6LL | 40.8         | 12.3    | 12.3     | 1.55 | 0.90 | 55.39 ✓          |

### REACTIONS (kips):

|                                | Left | Right |
|--------------------------------|------|-------|
| DL reaction                    | 1.06 | 2.08  |
| Max +LL reaction               | 1.83 | 4.34  |
| Max +total reaction (factored) | 4.20 | 9.44  |

### DEFLECTIONS:

|                     |    |            |        |       |       |
|---------------------|----|------------|--------|-------|-------|
| Dead load (in)      | at | 10.17 ft = | -0.189 | L/D = | 1205  |
| Live load (in)      | at | 10.26 ft = | -0.362 | L/D = | 630 ✓ |
| Net Total load (in) | at | 10.26 ft = | -0.551 | L/D = | 413 ✓ |



RAM Structural System

Bentley

RAM SBeam v06.00.00

# Gravity Beam Design

11/25/19 11:12:50

## STEEL CODE: AISC 360-10 LRFD

### SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (6.25,0.00)

Beam Size (User Selected) = W10X17

Fy = 50.0 ksi

Total Beam Length (ft) = 6.25

Mp (kip-ft) = 77.92

Top flange not braced by decking.

### LINE LOADS (k/ft):

| Load | Dist (ft) | DL    | LL    | PartL |
|------|-----------|-------|-------|-------|
| 1    | 0.000     | 0.017 | 0.000 | 0.000 |
|      | 6.250     | 0.017 | 0.000 | 0.000 |
| 2    | 0.000     | 0.110 | 0.220 | 0.000 |
|      | 6.250     | 0.110 | 0.220 | 0.000 |
| 3    | 3.000     | 0.040 | 0.080 | 0.000 |
|      | 6.250     | 0.040 | 0.080 | 0.000 |
| 4    | 0.000     | 0.148 | 0.400 | 0.000 |
|      | 3.000     | 0.148 | 0.400 | 0.000 |

MEMBER SELF-WEIGHT

#### FLOOR LOADING

DL=20 PSF  
LL= 40 PSF  
TRIB FLOOR WIDTH= 5.5 FT

#### FLOOR LOADING

DL=20 PSF  
LL= 40 PSF  
TRIB FLOOR WIDTH= 2 FT

#### STAIR LOADING

DL=37 PSF  
LL= 100 PSF  
TRIB STAIR WIDTH= 4 FT

SHEAR (Ultimate): Max Vu (1.2DL+1.6LL) = 3.59 kips 1.00Vn = 72.72 kips

### MOMENTS (Ultimate):

| Span        | Cond  | LoadCombo   | Mu<br>kip-ft | @<br>ft | Lb<br>ft | Cb   | Phi  | Phi*Mn<br>kip-ft |
|-------------|-------|-------------|--------------|---------|----------|------|------|------------------|
| Center      | Max + | 1.2DL+1.6LL | 4.9          | 2.7     | 6.3      | 1.15 | 0.90 | 63.87 ✓          |
| Controlling |       | 1.2DL+1.6LL | 4.9          | 2.7     | 6.3      | 1.15 | 0.90 | 63.87 ✓          |

### REACTIONS (kips):

|                                | Left | Right |
|--------------------------------|------|-------|
| DL reaction                    | 0.77 | 0.60  |
| Max +LL reaction               | 1.67 | 1.17  |
| Max +total reaction (factored) | 3.59 | 2.59  |

### DEFLECTIONS:

|                     |    |           |        |       |         |
|---------------------|----|-----------|--------|-------|---------|
| Dead load (in)      | at | 3.06 ft = | -0.003 | L/D = | 23840 ✓ |
| Live load (in)      | at | 3.03 ft = | -0.007 | L/D = | 11524 ✓ |
| Net Total load (in) | at | 3.03 ft = | -0.010 | L/D = | 7769 ✓  |



RAM Structural System

Bentley

RAM SBeam v06.00.00

# Gravity Beam Design

11/25/19 11:22:20

## STEEL CODE: AISC 360-10 LRFD

### SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (19.00,0.00)

Beam Size (User Selected) = W10X17 Fy = 50.0 ksi  
 Total Beam Length (ft) = 19.00  
 Mp (kip-ft) = 77.92  
 Top flange not braced by decking.

### POINT LOADS (kips):

| Dist (ft) | DL   | LL   | PartL | Flange Bracing<br>Top Bottom |                                               |
|-----------|------|------|-------|------------------------------|-----------------------------------------------|
| 15.000    | 0.07 | 0.13 | 0.00  | Yes No                       | MEMBER REACTION FROM (2) 1000-S200-68         |
| 11.000    | 0.60 | 1.17 | 0.00  | Yes No                       | MEMBER REACTION FROM W10X17. SEE APPENDIX 11. |

### LINE LOADS (k/ft):

| Load | Dist (ft) | DL    | LL    | PartL |                                                                    |
|------|-----------|-------|-------|-------|--------------------------------------------------------------------|
| 1    | 0.000     | 0.017 | 0.000 | 0.000 | MEMBER SELF-WEIGHT                                                 |
|      | 19.000    | 0.017 | 0.000 | 0.000 | FLOOR LOADING<br>DL=20 PSF<br>LL= 40 PSF<br>TRIB FLOOR WIDTH= 8 IN |
| 2    | 0.000     | 0.014 | 0.027 | 0.000 | FLOOR LOADING<br>DL=20 PSF<br>LL= 40 PSF<br>TRIB FLOOR WIDTH= 8 IN |
|      | 19.000    | 0.014 | 0.027 | 0.000 | FLOOR LOADING<br>DL=20 PSF<br>LL= 40 PSF<br>TRIB FLOOR WIDTH= 8 IN |
| 3    | 0.000     | 0.014 | 0.027 | 0.000 | FLOOR LOADING<br>DL=20 PSF<br>LL= 40 PSF<br>TRIB FLOOR WIDTH= 8 IN |
|      | 11.000    | 0.014 | 0.027 | 0.000 | FLOOR LOADING<br>DL=20 PSF<br>LL= 40 PSF<br>TRIB FLOOR WIDTH= 8 IN |
| 4    | 11.000    | 0.014 | 0.027 | 0.000 | FLOOR LOADING<br>DL=20 PSF<br>LL= 40 PSF<br>TRIB FLOOR WIDTH= 8 IN |
|      | 15.000    | 0.014 | 0.027 | 0.000 | FLOOR LOADING<br>DL=20 PSF<br>LL= 40 PSF<br>TRIB FLOOR WIDTH= 8 IN |

**SHEAR (Ultimate):** Max Vu (1.2DL+1.6LL) = 2.85 kips 1.00Vn = 72.72 kips

### MOMENTS (Ultimate):

| Span        | Cond  | LoadCombo   | Mu<br>kip-ft | @<br>ft | Lb<br>ft | Cb   | Phi  | Phi*Mn<br>kip-ft |   |
|-------------|-------|-------------|--------------|---------|----------|------|------|------------------|---|
| Center      | Max + | 1.2DL+1.6LL | 18.6         | 11.0    | 11.0     | 1.48 | 0.90 | 47.42            | ✓ |
| Controlling |       | 1.2DL+1.6LL | 18.6         | 11.0    | 11.0     | 1.48 | 0.90 | 47.42            | ✓ |

### REACTIONS (kips):

|                                | Left | Right |
|--------------------------------|------|-------|
| DL reaction                    | 0.69 | 0.78  |
| Max +LL reaction               | 1.02 | 1.20  |
| Max +total reaction (factored) | 2.46 | 2.85  |

### DEFLECTIONS:

|                     |    |           |        |       |      |   |
|---------------------|----|-----------|--------|-------|------|---|
| Dead load (in)      | at | 9.79 ft = | -0.118 | L/D = | 1931 | ✓ |
| Live load (in)      | at | 9.79 ft = | -0.189 | L/D = | 1207 | ✓ |
| Net Total load (in) | at | 9.79 ft = | -0.307 | L/D = | 743  | ✓ |



RAM Structural System

Bentley

RAM SBeam v06.00.00

# Gravity Beam Design

11/25/19 11:45:51

## STEEL CODE: AISC 360-10 LRFD

### SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (19.00,0.00)

Beam Size (User Selected) = W10X19 Fy = 50.0 ksi  
 Total Beam Length (ft) = 19.00  
 Mp (kip-ft) = 90.00  
 Top flange not braced by decking.

### POINT LOADS (kips):

| Dist (ft) | DL   | LL   | PartL | Flange Bracing |        |
|-----------|------|------|-------|----------------|--------|
|           |      |      |       | Top            | Bottom |
| 12.250    | 1.53 | 3.16 | 0.00  | Yes            | No     |
| 11.000    | 0.77 | 1.67 | 0.00  | Yes            | No     |

MEMBER REACTION FROM W10X17. SEE APPENDIX 9.

MEMBER REACTION FROM W10X17. SEE APPENDIX 11.

MEMBER SELF-WEIGHT

### LINE LOADS (k/ft):

| Load | Dist (ft) | DL    | LL    | PartL |  |
|------|-----------|-------|-------|-------|--|
| 1    | 0.000     | 0.019 | 0.000 | 0.000 |  |
|      | 19.000    | 0.019 | 0.000 | 0.000 |  |
| 2    | 0.000     | 0.014 | 0.027 | 0.000 |  |
|      | 12.250    | 0.014 | 0.027 | 0.000 |  |
| 3    | 12.250    | 0.074 | 0.200 | 0.000 |  |
|      | 19.000    | 0.074 | 0.200 | 0.000 |  |
| 4    | 0.000     | 0.014 | 0.027 | 0.000 |  |
|      | 11.000    | 0.014 | 0.027 | 0.000 |  |

#### FLOOR LOADING

DL=20 PSF  
 LL= 40 PSF  
 TRIB FLOOR WIDTH= 8 IN

#### STAIR LANDING LOADING

DL=37 PSF  
 LL= 100 PSF  
 TRIB FLOOR WIDTH= 2 FT

#### FLOOR LOADING

DL=20 PSF  
 LL= 40 PSF  
 TRIB FLOOR WIDTH= 8 IN

**SHEAR (Ultimate):** Max Vu (1.2DL+1.6LL) = 9.44 kips 1.00Vn = 76.50 kips

### MOMENTS (Ultimate):

| Span        | Cond  | LoadCombo   | Mu<br>kip-ft | @<br>ft | Lb<br>ft | Cb   | Phi  | Phi*Mn<br>kip-ft |
|-------------|-------|-------------|--------------|---------|----------|------|------|------------------|
| Center      | Max + | 1.2DL+1.6LL | 53.9         | 12.3    | 6.8      | 1.58 | 0.90 | 81.00 ✓          |
| Controlling |       | 1.2DL+1.6LL | 53.4         | 11.0    | 11.0     | 1.59 | 0.90 | 65.95 ✓          |

### REACTIONS (kips):

|                                | Left | Right |
|--------------------------------|------|-------|
| DL reaction                    | 1.36 | 2.12  |
| Max +LL reaction               | 2.50 | 4.31  |
| Max +total reaction (factored) | 5.64 | 9.44  |

### DEFLECTIONS:

|                     |    |            |        |       |     |   |
|---------------------|----|------------|--------|-------|-----|---|
| Dead load (in)      | at | 10.07 ft = | -0.248 | L/D = | 919 | ✓ |
| Live load (in)      | at | 10.07 ft = | -0.489 | L/D = | 466 | ✓ |
| Net Total load (in) | at | 10.07 ft = | -0.737 | L/D = | 309 | ✓ |



Subject: LOT LINE RETAINING WALL

Project: 346 43RD STREET  
 Job No.: 19248  
 Made By: WEISHAAR, ADRIENNE  
 Date: 25-Nov-19  
 Checked By:

### Cantilever Retaining Wall Stability Check

#### Soil Data

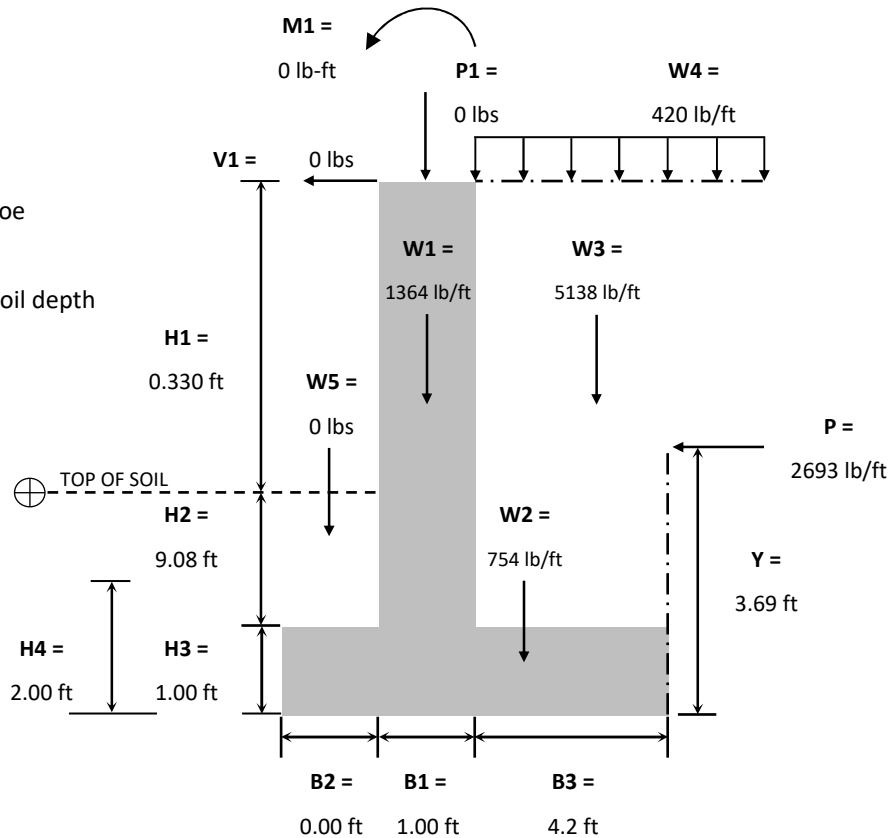
|         |                                       | Unit Weight | Int Friction | w. Conc | Soil                     |
|---------|---------------------------------------|-------------|--------------|---------|--------------------------|
| 130 pcf | w - soil unit weight                  |             |              |         |                          |
| 30 deg  | phi - soil internal angle of friction | 110-120     | 33-40        | 0.5-0.6 | Sand or gravel, no fines |
| 0 deg   | del - surface angle incline           | 120-130     | 25-35        | 0.4-0.5 | Sand or gravel, w/ fines |
| 0.45    | coeff. friction w/Concrete            | 110-120     | 23-30        | 0.3-0.4 | Silty sand, high clay    |
| 0.866   | cosine (phi)                          | 100-120     | 25-35        | 0.2-0.4 | Medium or stiff clay     |
| 1.000   | cosine (del)                          | 90-110      | 20-25        | 0.2-0.3 | Soft clay, silt          |
| 0.333   | Ca - Coeff. of active pressure        |             |              |         |                          |
| 3.000   | Cp - Coeff. of passive pressure       |             |              |         |                          |

#### Wall Geometry

|          |                                  |
|----------|----------------------------------|
| 0.3 ft   | H1 - soil retained               |
| 9.1 ft   | H2 - soil depth above toe        |
| 1.0 ft   | H3 - footing thickness           |
| 2.0 ft   | H4 - passive pressure soil depth |
| 1.00 ft  | B1 - wall width                  |
| 0.00 ft  | B2 - toe width                   |
| 4.2 ft   | B3 - heel width                  |
| 10.4 ft  | H - total height                 |
| 5.200 ft | B - total base                   |
| 145 pcf  | Concrete unit weight             |

#### External Loads

|            |                      |
|------------|----------------------|
| 0 lb/ft    | P <sub>applied</sub> |
| 0 lb/ft    | V <sub>applied</sub> |
| 0 lb-ft/ft | M <sub>applied</sub> |
| 100.0 psf  | Surcharge            |



#### Stability Factor of Safety Checks

|      |                  |    |             |
|------|------------------|----|-------------|
| 1.5  | F.S. overturning |    |             |
| 1.5  | F.S. sliding     |    |             |
| 2.00 | Mr / Mo          | OK | Overturning |
| 1.57 | (PP+F)/(Ph+V)    | OK | Sliding     |

#### QUICK SUMMARY

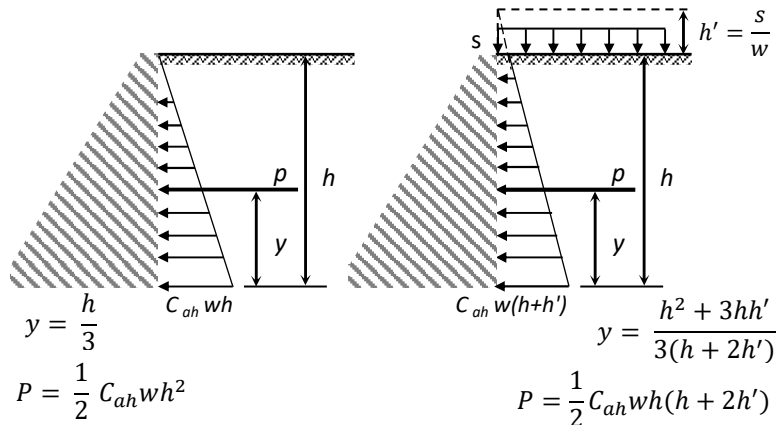
|                               |      |             |
|-------------------------------|------|-------------|
| Total Resisting Moment        | Mr   | 19872 lb-ft |
| Total Resisting Sliding Force | PP+F | 4234 lbs    |
| Factored Moment at Wall Stem  | Mu   | 12.00 k-ft  |
| Overturning Moment            | OK   |             |
| Sliding Force                 | OK   |             |



### Load Calculations

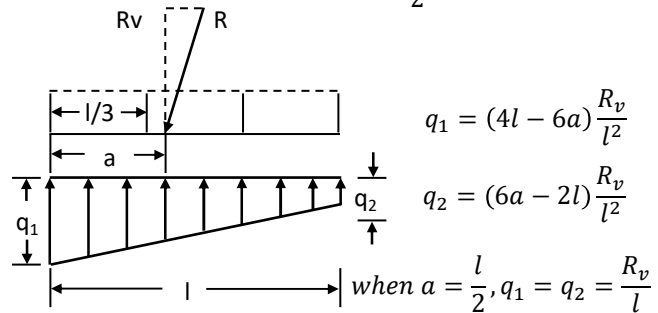
- Lateral soil force and overturning moment

|            |                                          |
|------------|------------------------------------------|
| 0.77 ft    | $H_{\text{prime}}$ - converted surcharge |
| 3.69 ft    | Y - distance to soil load resultant      |
| 2693 lbs   | P - soil load resultant                  |
| 9940 lb-ft | $M_o$ , soil + surcharge                 |
| 0 lb-ft    | $M_o$ , external load                    |
| 9940 lb-ft | Total overturning Moment                 |



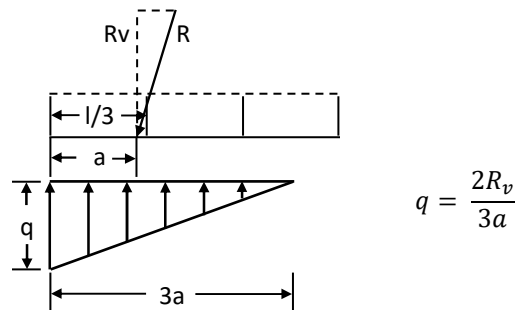
- Wall restoring forces

| Component          | Weight (lbs)    | Arm (ft)      | Moment (lb-ft)     |
|--------------------|-----------------|---------------|--------------------|
| w1 (concrete)      | 1364            | 0.50          | 682                |
| w2 (concrete)      | 754             | 2.60          | 1960               |
| w3 (heel soil)     | 5138            | 3.10          | 15927              |
| w4 (surcharge)     | 420             | 3.10          | 1302               |
| w5 (toe soil)      | 0               | 0.00          | 0                  |
| P applied          | 0               | 0.50          | 0                  |
| <b>Vert. force</b> | <b>7676 lbs</b> | <b>Moment</b> | <b>19872 lb-ft</b> |



- Lateral sliding resistance

|          |                                     |
|----------|-------------------------------------|
| 780 lbs  | Passive pressure sliding resistance |
| 3454 lbs | Soil friction force                 |
| 4234 lbs | Total sliding resistance            |

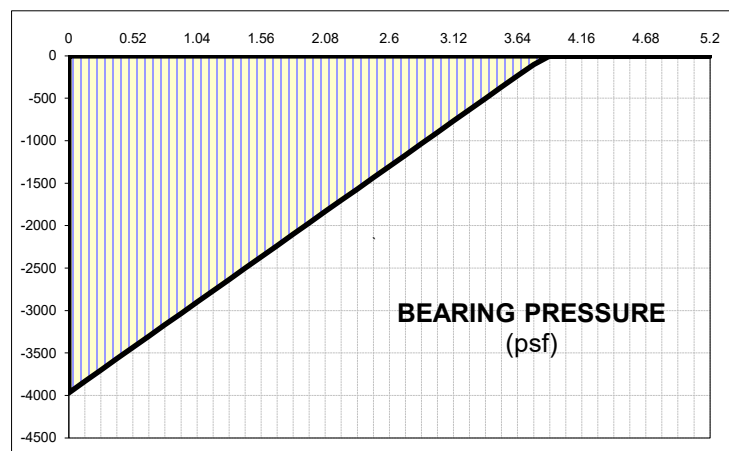


- Soil Bearing

|       |                    |                         |
|-------|--------------------|-------------------------|
| a     | 1.29 ft            | Distance to resultant   |
|       | 1.73 ft to 3.47 ft | Middle third of footing |
| $q_1$ | 3967 psf           | Bearing pressure @ Toe  |
| $q_2$ | N.A.               | Bearing pressure @ Heel |

- Factored (1.6) Stem Load Forces

|            |                             |
|------------|-----------------------------|
| 9.410 ft   | $H_1 + H_2$                 |
| 3.36 ft    | line of action (above base) |
| 2230 lbs   | P (arm only)                |
| 2230 lbs   | Ph (arm only)               |
| 12.00 k-ft | Mu (arm moment)             |





Subject: BEAM BEARING PLATE

Project: 346 43RD STREET  
 Job No.: 19248  
 Made By: WEISHAAR, ADRIENNE  
 Date: 11/25/2019  
 Checked By:

## BEAM BEARING PLATE DESIGN

v2.0

Based on AISC ASD 9th edition, pages 2-141 to 144 and specification chapter K

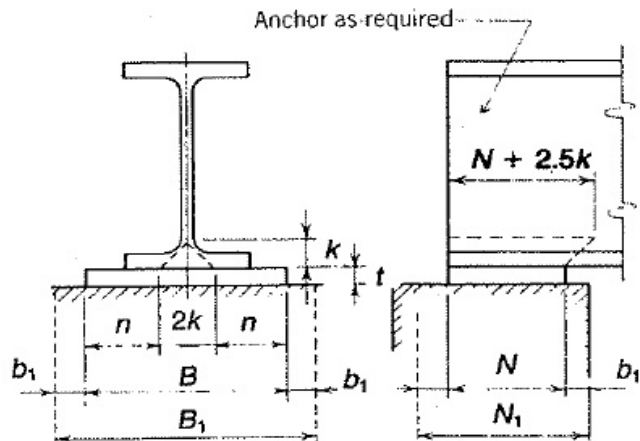
Limitations: Wide-flange sections; simple end-bearing condition; allowable concrete stress by ASD per AISC manual

### BEAM PROPERTIES

W12X22 Beam cross section

12.30 in beam depth  
 4.03 in flange width ( $b_f$ )  
 0.73 in dist from bott of bm to web toe ( $k$ )  
 0.26 in web thickness ( $t_w$ )  
 0.43 in flange thickness ( $t_f$ )

50 ksi  $F_y$  (steel beam)



### SUPPORT PROPERTIES

36 ksi  $F_y$  (plate)

CMU Bearing Type (Brick, Concrete, Limestone or CMU)  
 2000 psi  $f'_c$  (for concrete) or  $f'_m$  (for CMU)

0.50 ksi Allowable bearing pressure, place-holder to determine  $A_1$

7.00 in Ledge depth ( $N_1$ )

1.00 in Least distance from edge of support to edge of plate ( $b_1$ )

### LOADING

14 kips  $R$ , service load (unfactored)

SEE PLAN FOR LOCATION OF  
 LOADING AND APPENDIX 6  
 FOR BEAM END REACTIONS.  
 DL=4.71 K  
 LL=9.21 K

REVISED BEARING PLATE  
 DESIGN FOR W12X22  
 MEMBERS AT ROOF. SEE  
 ROOF PLAN FOR  
 LOCATIONS.

### ALLOWABLE UNIFORM LOADS ON BEAM

16 kips  $R_1$   
 9 k/in  $R_2$   
 21 kips  $R_3$   
 2 k/in  $R_4$

### BEAM BEARING PLATE DESIGN RESULTS

B 8.00 in  
 N 6.00 in  
 $t_{plate}$  0.63 in

BEARING PLATE DESIGN **OK**  
 LOCAL WEB YIELDING **OK**  
 LOCAL WEB CRIPPLING **OK**

### BEARING PLATE DESIGN

|                    |                                                                       |         |
|--------------------|-----------------------------------------------------------------------|---------|
| 28 in <sup>2</sup> | A <sub>1</sub> (full area of (concrete) support)                      | Governs |
| 13 in <sup>2</sup> | A <sub>2</sub>                                                        |         |
| 0 in <sup>2</sup>  | A <sub>1</sub> (less than full area of (concrete) support)            | N/A     |
| 6.00 in            | N (max.)                                                              |         |
| 4.67 in            | B (based on governing A <sub>1</sub> )                                |         |
| 8.00 in            | B (optional user input)                                               |         |
| 8.00 in            | B (max. of all values)                                                |         |
| 8.00 in            | B (rounded up)                                                        |         |
| 48 in <sup>2</sup> | A <sub>1</sub>                                                        |         |
| 3.28 in            | n                                                                     |         |
| 0.292 ksi          | Actual Bearing Pressure (f <sub>p</sub> )                             | OK      |
| 0.500 ksi          | Allowable Bearing Pressure (F <sub>p</sub> ) calculated               |         |
|                    | Allowable Bearing Pressure (F <sub>p</sub> ) (optional user override) |         |
| 0.59 in            | req'd thickness of plate (t)                                          |         |

### LOCAL WEB YIELDING

|         |        |    |
|---------|--------|----|
| 0.00 in | Min. N | OK |
|---------|--------|----|

### LOCAL WEB CRIPPLING

|         |                 |    |
|---------|-----------------|----|
| 0.00 in | Min. N          | OK |
| 75 kips | R (max.) (K1-4) | OK |
| 38 kips | R (max.) (K1-5) | OK |

### No Transverse Stiffeners Required

### TRANSVERSE STIFFENERS

The stiffeners are designed as a compression member with a cross section composed by two stiffeners and the web strip

|                   |                                                        |
|-------------------|--------------------------------------------------------|
| 1.34 in           | Minimum width of each stiffener plus t <sub>w</sub> /2 |
| 0.06 in           | Minimum thickness of the stiffener                     |
| 1.80 in           | Stiffener Width                                        |
|                   | Thickness of each stiffener                            |
| 9.23 in           | Effective length of a stiffener                        |
| 3.12 in           | Width of the strip web considered                      |
| 0 in <sup>4</sup> | Inertia of the cross section                           |
| 1 in <sup>2</sup> | Area of the cross section                              |
| 36 ksi            | F <sub>y</sub> of the Stiffner                         |
| 0.00              | r <sub>y</sub>                                         |
| #DIV/0!           | KL/r <sub>y</sub>                                      |
| 133.68            | 4.71√(E/F <sub>y</sub> )                               |



Subject: BEAM BEARING PLATE

Project: 346 43RD STREET  
Job No.: 19248  
Made By: WEISHAAR, ADRIENNE  
Date: 11/25/2019  
Checked By: \_\_\_\_\_

#DIV/0!  $F_e$   
#DIV/0!  $F_{cr}$   
#DIV/0!  $P_n/\Omega_c$

# BEAM BEARING PLATE DESIGN

v2.0

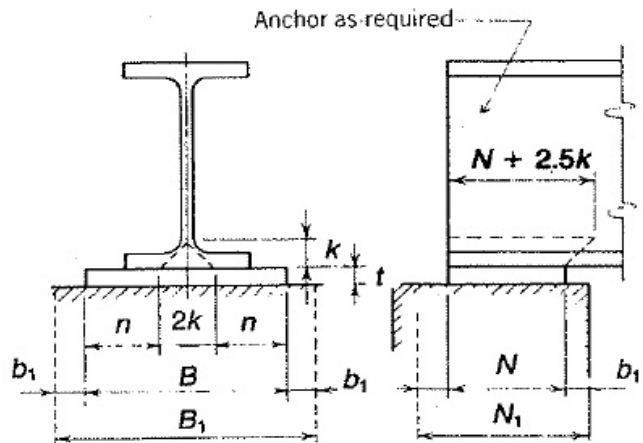
Based on AISC ASD 9th edition, pages 2-141 to 144 and specification chapter K

Limitations: Wide-flange sections; simple end-bearing condition; allowable concrete stress by ASD per AISC manual

## BEAM PROPERTIES

W10X19 Beam cross section

|          |                                         |
|----------|-----------------------------------------|
| 10.20 in | beam depth                              |
| 4.02 in  | flange width ( $b_f$ )                  |
| 0.70 in  | dist from bott of bm to web toe ( $k$ ) |
| 0.25 in  | web thickness ( $t_w$ )                 |
| 0.40 in  | flange thickness ( $t_f$ )              |

50 ksi  $F_y$  (steel beam)


## SUPPORT PROPERTIES

36 ksi  $F_y$  (plate)

|          |                                                  |
|----------|--------------------------------------------------|
| CMU      | Bearing Type (Brick, Concrete, Limestone or CMU) |
| 2000 psi | $f'_c$ (for concrete) or $f'_m$ (for CMU)        |

0.50 ksi Allowable bearing pressure, place-holder to determine  $A_1$ 

7.00 in Ledge depth ( $N_1$ )

1.00 in Least distance from edge of support to edge of plate ( $b_1$ )

ORIGINAL BEARING PLATE DESIGN PER TYP. DETAIL ON S-200.01

## LOADING

7 kips  $R$ , service load (unfactored)

## ALLOWABLE UNIFORM LOADS ON BEAM

|         |       |
|---------|-------|
| 14 kips | $R_1$ |
| 8 k/in  | $R_2$ |
| 19 kips | $R_3$ |
| 3 k/in  | $R_4$ |

## BEAM BEARING PLATE DESIGN RESULTS

|             |         |
|-------------|---------|
| $B$         | 8.00 in |
| $N$         | 6.00 in |
| $t_{plate}$ | 0.50 in |

|                      |    |
|----------------------|----|
| BEARING PLATE DESIGN | OK |
| LOCAL WEB YIELDING   | OK |
| LOCAL WEB CRIPPLING  | OK |

### BEARING PLATE DESIGN

|                    |                                                                       |         |
|--------------------|-----------------------------------------------------------------------|---------|
| 14 in <sup>2</sup> | A <sub>1</sub> (full area of (concrete) support)                      | Governs |
| 13 in <sup>2</sup> | A <sub>2</sub>                                                        |         |
| 0 in <sup>2</sup>  | A <sub>1</sub> (less than full area of (concrete) support)            | N/A     |
| 6.00 in            | N (max.)                                                              |         |
| 2.33 in            | B (based on governing A <sub>1</sub> )                                |         |
| 8.00 in            | B (optional user input)                                               |         |
| 8.00 in            | B (max. of all values)                                                |         |
| 8.00 in            | B (rounded up)                                                        |         |
| 48 in <sup>2</sup> | A <sub>1</sub>                                                        |         |
| 3.31 in            | n                                                                     |         |
| 0.146 ksi          | Actual Bearing Pressure (f <sub>p</sub> )                             | OK      |
| 0.500 ksi          | Allowable Bearing Pressure (F <sub>p</sub> ) calculated               |         |
|                    | Allowable Bearing Pressure (F <sub>p</sub> ) (optional user override) |         |
| 0.42 in            | req'd thickness of plate (t)                                          |         |

### LOCAL WEB YIELDING

|         |        |    |
|---------|--------|----|
| 0.00 in | Min. N | OK |
|---------|--------|----|

### LOCAL WEB CRIPPLING

|         |                 |    |
|---------|-----------------|----|
| 0.00 in | Min. N          | OK |
| 76 kips | R (max.) (K1-4) | OK |
| 38 kips | R (max.) (K1-5) | OK |

### No Transverse Stiffeners Required

### TRANSVERSE STIFFENERS

The stiffeners are designed as a compression member with a cross section composed by two stiffeners and the web strip

|                   |                                                        |
|-------------------|--------------------------------------------------------|
| 1.34 in           | Minimum width of each stiffener plus t <sub>w</sub> /2 |
| 0.06 in           | Minimum thickness of the stiffener                     |
| 1.80 in           | Stiffener Width                                        |
|                   | Thickness of each stiffener                            |
| 7.65 in           | Effective length of a stiffener                        |
| 3.00 in           | Width of the strip web considered                      |
| 0 in <sup>4</sup> | Inertia of the cross section                           |
| 1 in <sup>2</sup> | Area of the cross section                              |
| 36 ksi            | F <sub>y</sub> of the Stiffner                         |
| 0.00              | r <sub>y</sub>                                         |
| #DIV/0!           | KL/r <sub>y</sub>                                      |
| 133.68            | 4.71√(E/F <sub>y</sub> )                               |



Subject: BEAM BEARING PLATE

Project: 346 43RD STREET  
Job No.: 19248  
Made By: WEISHAAR, ADRIENNE  
Date: 11/25/2019  
Checked By: \_\_\_\_\_

#DIV/0!  $F_e$   
#DIV/0!  $F_{cr}$   
#DIV/0!  $P_n/\Omega_c$

PROJECT 346 43 RD STREET PROJECT NO. 19248 PAGE 1/1  
SUBJECT ECCENTRIC WALL FOOTINGS BY ALW DATE 11/26/2019

### PARTIALLY GROUTED CMU

#### CUMULATIVE WALL LOADS

DL = 2693 PLF

LL = 2090 PLF

DL + LL = 4783 PLF

SEE LOCATION ON PLAN FOR  
MAX WALL LOADS.  
PARTIALLY GROUTED CMU  
WALL LOAD = 49 PSF

ALLOWABLE SOIL BEARING CAPACITY = 6 KSF

#### ECCENTRIC FOOTING

- ASSUME ONLY FOOTING UNDER WALL = 1 FT  
WALL LOADS  $\leq$  6 KLF ✓

SEE LOCATION ON PLAN FOR  
MAX WALL LOADS. FULLY  
GROUTED CMU WALL LOAD =  
75 PSF

### FULLY GROUTED CMU

DL = 3551 PLF

LL = 2090 PLF

DL + LL = 5641 PLF  $\leq$  6 KLF ✓

GW &amp; GW-2 SERIES | 19-W-4 &amp; 19-W-2 (1-3/16" ON CENTER) SPACING | RECTANGULAR BAR

CARBON &amp; GALVANIZED STEEL LOAD TABLE

| Series Type<br>& Name | BB Height<br>& Thickness | LBS./SF |        | Load | Clear Span |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-----------------------|--------------------------|---------|--------|------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                       |                          | 19-W-4  | 19-W-2 |      | 12"        | 18"   | 24"   | 30"   | 36"   | 42"   | 48"   | 54"   | 60"   | 66"   | 72"   | 78"   | 84"   | 90"   | 96"   | 102"  | 108"  | 114"  | 120"  |
| GW-75-A               | 3/4" x 1/8"              | 4.1     | 5.0    | U    | 1421       | 631   | 355   | 227   | 158   | 116   | 89    | 70    | 57    | 47    | 39    | 34    | 29    | 25    | 22    | 20    | 18    | 16    | 14    |
|                       |                          |         |        | D    | 0.025      | 0.056 | 0.099 | 0.155 | 0.224 | 0.304 | 0.398 | 0.502 | 0.623 | 0.752 | 0.883 | 1.061 | 1.217 | 1.382 | 1.575 | 1.824 | 2.064 | 2.277 | 2.446 |
|                       |                          |         |        | C    | 710        | 474   | 355   | 284   | 237   | 203   | 178   | 158   | 142   | 129   | 118   | 109   | 101   | 95    | 89    | 84    | 79    | 75    | 71    |
|                       |                          |         |        | D    | 0.020      | 0.045 | 0.079 | 0.124 | 0.179 | 0.243 | 0.319 | 0.403 | 0.496 | 0.600 | 0.713 | 0.837 | 0.969 | 1.121 | 1.274 | 1.442 | 1.610 | 1.798 | 1.985 |
| GW-75                 | 3/4" x 3/16"             | 5.8     | 6.7    | U    | 2131       | 947   | 533   | 341   | 237   | 174   | 133   | 105   | 85    | 70    | 59    | 50    | 43    | 38    | 33    | 29    | 26    | 24    | 21    |
|                       |                          |         |        | D    | 0.025      | 0.056 | 0.099 | 0.155 | 0.224 | 0.304 | 0.397 | 0.502 | 0.619 | 0.746 | 0.891 | 1.040 | 1.203 | 1.401 | 1.575 | 1.764 | 1.987 | 2.277 | 2.446 |
|                       |                          |         |        | C    | 1066       | 710   | 533   | 426   | 355   | 304   | 266   | 237   | 213   | 194   | 178   | 164   | 152   | 142   | 133   | 125   | 118   | 112   | 107   |
|                       |                          |         |        | D    | 0.020      | 0.045 | 0.079 | 0.124 | 0.179 | 0.243 | 0.317 | 0.403 | 0.496 | 0.602 | 0.717 | 0.839 | 0.972 | 1.117 | 1.269 | 1.431 | 1.603 | 1.790 | 1.994 |
| GW-100-A              | 1" x 1/8"                | 5.2     | 6.1    | U    | 2526       | 1123  | 632   | 404   | 281   | 206   | 158   | 125   | 101   | 84    | 70    | 60    | 52    | 45    | 39    | 35    | 31    | 28    | 25    |
|                       |                          |         |        | D    | 0.019      | 0.042 | 0.075 | 0.116 | 0.168 | 0.228 | 0.298 | 0.378 | 0.465 | 0.566 | 0.668 | 0.789 | 0.920 | 1.049 | 1.177 | 1.346 | 1.499 | 1.680 | 1.842 |
|                       |                          |         |        | C    | 1263       | 842   | 632   | 505   | 421   | 361   | 316   | 281   | 253   | 230   | 211   | 194   | 180   | 168   | 158   | 149   | 140   | 133   | 126   |
|                       |                          |         |        | D    | 0.015      | 0.034 | 0.060 | 0.093 | 0.134 | 0.182 | 0.238 | 0.302 | 0.373 | 0.451 | 0.537 | 0.628 | 0.728 | 0.836 | 0.954 | 1.079 | 1.203 | 1.344 | 1.485 |
| GW-100                | 1" x 3/16"               | 7.5     | 8.4    | U    | 3790       | 1684  | 947   | 606   | 421   | 309   | 237   | 187   | 152   | 125   | 105   | 90    | 77    | 67    | 59    | 52    | 47    | 42    | 38    |
|                       |                          |         |        | D    | 0.019      | 0.042 | 0.074 | 0.116 | 0.168 | 0.228 | 0.298 | 0.377 | 0.467 | 0.562 | 0.669 | 0.789 | 0.908 | 1.042 | 1.187 | 1.334 | 1.515 | 1.681 | 1.867 |
|                       |                          |         |        | C    | 1895       | 1263  | 947   | 758   | 632   | 541   | 474   | 421   | 379   | 345   | 316   | 292   | 271   | 253   | 237   | 223   | 211   | 199   | 189   |
|                       |                          |         |        | D    | 0.015      | 0.034 | 0.060 | 0.093 | 0.134 | 0.182 | 0.238 | 0.302 | 0.372 | 0.451 | 0.537 | 0.630 | 0.731 | 0.839 | 0.954 | 1.077 | 1.209 | 1.341 | 1.486 |
| GW-125-A              | 1-1/4" x 1/8"            | 6.3     | 7.2    | U    | 3947       | 1754  | 987   | 631   | 439   | 322   | 247   | 195   | 158   | 130   | 110   | 93    | 81    | 70    | 62    | 55    | 49    | 44    | 39    |
|                       |                          |         |        | D    | 0.015      | 0.034 | 0.060 | 0.093 | 0.134 | 0.182 | 0.239 | 0.302 | 0.373 | 0.449 | 0.538 | 0.626 | 0.734 | 0.836 | 0.958 | 1.083 | 1.213 | 1.352 | 1.472 |
|                       |                          |         |        | C    | 1973       | 1316  | 987   | 789   | 658   | 564   | 493   | 439   | 395   | 359   | 329   | 304   | 282   | 263   | 247   | 232   | 219   | 208   | 197   |
|                       |                          |         |        | D    | 0.012      | 0.027 | 0.048 | 0.074 | 0.107 | 0.146 | 0.191 | 0.242 | 0.298 | 0.361 | 0.429 | 0.504 | 0.584 | 0.670 | 0.764 | 0.860 | 0.964 | 1.077 | 1.189 |
| GW-125                | 1-1/4" x 3/16"           | 9.1     | 10.0   | U    | 5921       | 2631  | 1480  | 947   | 658   | 483   | 370   | 292   | 237   | 196   | 164   | 140   | 121   | 105   | 93    | 82    | 73    | 66    | 59    |
|                       |                          |         |        | D    | 0.015      | 0.034 | 0.060 | 0.093 | 0.134 | 0.182 | 0.238 | 0.301 | 0.373 | 0.451 | 0.535 | 0.629 | 0.731 | 0.836 | 0.958 | 1.077 | 1.205 | 1.352 | 1.484 |
|                       |                          |         |        | C    | 2960       | 1974  | 1480  | 1184  | 987   | 846   | 740   | 658   | 592   | 538   | 493   | 455   | 423   | 395   | 370   | 348   | 329   | 312   | 296   |
|                       |                          |         |        | D    | 0.012      | 0.027 | 0.048 | 0.074 | 0.107 | 0.146 | 0.191 | 0.241 | 0.298 | 0.360 | 0.429 | 0.503 | 0.584 | 0.671 | 0.763 | 0.860 | 0.965 | 1.077 | 1.191 |
| GW-150-A              | 1-1/2" x 1/8"            | 7.4     | 8.3    | U    | 5684       | 2526  | 1421  | 910   | 632   | 464   | 355   | 281   | 227   | 188   | 158   | 135   | 116   | 101   | 89    | 79    | 70    | 63    | 57    |
|                       |                          |         |        | D    | 0.012      | 0.028 | 0.050 | 0.078 | 0.112 | 0.152 | 0.198 | 0.252 | 0.310 | 0.376 | 0.447 | 0.526 | 0.608 | 0.698 | 0.796 | 0.901 | 1.003 | 1.121 | 1.245 |
|                       |                          |         |        | C    | 2842       | 1895  | 1421  | 1137  | 947   | 812   | 711   | 632   | 568   | 517   | 474   | 437   | 406   | 379   | 355   | 334   | 316   | 299   | 284   |
|                       |                          |         |        | D    | 0.010      | 0.022 | 0.040 | 0.062 | 0.089 | 0.122 | 0.159 | 0.201 | 0.248 | 0.301 | 0.358 | 0.419 | 0.487 | 0.559 | 0.635 | 0.717 | 0.805 | 0.896 | 0.992 |
| GW-150                | 1-1/2" x 3/16"           | 10.8    | 11.7   | U    | 8526       | 3789  | 2132  | 1364  | 947   | 696   | 533   | 421   | 341   | 282   | 237   | 202   | 174   | 152   | 133   | 118   | 105   | 94    | 85    |
|                       |                          |         |        | D    | 0.012      | 0.028 | 0.050 | 0.078 | 0.112 | 0.152 | 0.199 | 0.251 | 0.310 | 0.376 | 0.447 | 0.525 | 0.608 | 0.700 | 0.793 | 0.897 | 1.003 | 1.115 | 1.238 |
|                       |                          |         |        | C    | 4263       | 2842  | 2132  | 1705  | 1421  | 1218  | 1066  | 947   | 853   | 775   | 711   | 656   | 609   | 568   | 533   | 502   | 474   | 449   | 426   |
|                       |                          |         |        | D    | 0.010      | 0.022 | 0.040 | 0.062 | 0.089 | 0.122 | 0.159 | 0.201 | 0.248 | 0.300 | 0.358 | 0.420 | 0.487 | 0.558 | 0.636 | 0.718 | 0.805 | 0.897 | 0.992 |
| GW-175                | 1-3/4" x 3/16"           | 12.5    | 13.4   | U    | 11605      | 5158  | 2901  | 1857  | 1289  | 947   | 725   | 573   | 464   | 384   | 322   | 275   | 237   | 206   | 181   | 161   | 143   | 129   | 116   |
|                       |                          |         |        | D    | 0.011      | 0.024 | 0.043 | 0.067 | 0.096 | 0.130 | 0.170 | 0.215 | 0.266 | 0.322 | 0.383 | 0.450 | 0.522 | 0.598 | 0.680 | 0.771 | 0.860 | 0.963 | 1.064 |
|                       |                          |         |        | C    | 5803       | 3868  | 2901  | 2321  | 1934  | 1658  | 1451  | 1289  | 1161  | 1055  | 967   | 893   | 829   | 774   | 725   | 683   | 645   | 611   | 580   |
|                       |                          |         |        | D    | 0.009      | 0.019 | 0.034 | 0.053 | 0.077 | 0.104 | 0.136 | 0.172 | 0.213 | 0.257 | 0.306 | 0.360 | 0.417 | 0.479 | 0.545 | 0.615 | 0.690 | 0.768 | 0.851 |
| GW-200                | 2" x 3/16"               | 14.1    | 15.0   | U    | 15158      | 6737  | 3790  | 2425  | 1684  | 1237  | 947   | 749   | 606   | 501   | 421   | 359   | 309   | 269   | 237   | 210   | 187   | 168   | 152   |
|                       |                          |         |        | D    | 0.009      | 0.021 | 0.037 | 0.058 | 0.084 | 0.114 | 0.149 | 0.189 | 0.233 | 0.282 | 0.335 | 0.394 | 0.456 | 0.523 | 0.596 | 0.673 | 0.754 | 0.840 | 0.934 |
|                       |                          |         |        | C    | 7579       | 5053  | 3790  | 3032  | 2526  | 2165  | 1895  | 1684  | 1516  | 1378  | 1263  | 1166  | 1083  | 1011  | 947   | 892   | 842   | 798   | 758   |
|                       |                          |         |        | D    | 0.007      | 0.017 | 0.030 | 0.047 | 0.067 | 0.091 | 0.119 | 0.151 | 0.186 | 0.225 | 0.268 | 0.315 | 0.365 | 0.419 | 0.476 | 0.538 | 0.603 | 0.672 | 0.745 |
| GW-225                | 2-1/4" x 3/16"           | 15.8    | 16.7   | U    | 19184      | 8526  | 4796  | 3070  | 2132  | 1566  | 1199  | 947   | 767   | 634   | 533   | 454   | 392   | 341   | 300   | 266   | 237   | 213   | 192   |
|                       |                          |         |        | D    | 0.008      | 0.019 | 0.033 | 0.052 | 0.074 | 0.101 | 0.132 | 0.168 | 0.207 | 0.250 | 0.298 | 0.350 | 0.406 | 0.465 | 0.530 | 0.599 | 0.671 | 0.748 | 0.828 |
|                       |                          |         |        | C    | 9592       | 6395  | 4796  | 3837  | 3197  | 2741  | 2398  | 2132  | 1918  | 1744  | 1599  | 1476  | 1370  | 1279  | 1199  | 1128  | 1066  | 1010  | 959   |
|                       |                          |         |        | D    | 0.007      | 0.015 | 0.026 | 0.041 | 0.060 | 0.081 | 0.106 | 0.134 | 0.165 | 0.200 | 0.238 | 0.280 | 0.324 | 0.372 | 0.424 | 0.478 | 0.536 | 0.598 | 0.662 |
| GW-250                | 2-1/2" x 3/16"           | 17.4    | 18.3   | U    | 23684      | 10526 | 5921  | 3790  | 2632  | 1933  | 1480  | 1170  | 947   | 783   | 658   | 561   | 483   | 421   | 370   | 328   | 292   | 262   | 237   |
|                       |                          |         |        | D    | 0.007      | 0.017 | 0.030 | 0.047 | 0.067 | 0.091 | 0.119 | 0.151 | 0.186 | 0.225 | 0.268 | 0.315 | 0.365 | 0.419 | 0.477 | 0.538 | 0.602 | 0.671 | 0.745 |
|                       |                          |         |        | C    | 11842      | 7895  | 5921  | 4737  | 3947  | 3383  | 2961  | 2632  | 2368  | 2153  | 1974  | 1822  | 1692  | 1579  | 1480  | 1393  | 1316  | 1247  | 1184  |
|                       |                          |         |        | D    | 0.006      | 0.013 | 0.024 | 0.037 | 0.054 | 0.073 | 0.095 | 0.121 | 0.149 | 0.180 | 0.215 | 0.252 | 0.292 | 0.335 | 0.381 | 0.430 | 0.483 | 0.538 | 0.596 |

U - Uniform Load - Lbs. per Square Foot

D - Deflection - in Inches

C - Concentrated Load - Lbs. per Square Foot of Width at Mid Span

- Spans and loading values to the left of the bolded black line produce a deflection of 1/4" or less under a uniform load of 100 lbs. per square foot, allowing for safe pedestrian comfort. Span and loading values to the right of the bolded black line are applicable to other types of loads at the discretion of a licensed engineer.
- For Grating with a serrated surface (1" bearing bar height or taller), subtract 1/4" from the bearing bar height requirement and reference that loading information listed in the table. For example, a 1-1/2" x 3/16" serrated bearing bar height and thickness would have the same strength and loading values as a 1-1/4" x 3/16" smooth (non-serrated) bearing bar height and thickness.
- Loading and deflection values are theoretical and based on a maximum allowable fiber stress of 18,000 PSI, E = 29,000,000 PSI.
- Technical information provided is theoretical and for evaluation by technically skilled persons only, with any use thereof to be at their independent discretion and risk. McNICHOLS shall have no responsibility or liability for results obtained or damages resulting from improper evaluation or use of Bar Grating.

Superior Service, Quality and Performance ... That's The Hole Story®!





RAM Structural System

Bentley

RAM SBeam v06.00.00

# Gravity Beam Design

11/25/19 16:27:37

## STEEL CODE: AISC 360-10 LRFD

### SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (7.25,0.00)

Beam Size (User Selected) = MC6X15.1 Fy = 50.0 ksi  
 Total Beam Length (ft) = 7.25  
 Mp (kip-ft) = 40.96  
 Top flange not braced by decking.

### LINE LOADS (k/ft):

| Load | Dist (ft) | DL    | LL    | PartL |                                                                         |
|------|-----------|-------|-------|-------|-------------------------------------------------------------------------|
| 1    | 0.000     | 0.015 | 0.000 | 0.000 | MEMBER SELF-WEIGHT                                                      |
|      | 7.250     | 0.015 | 0.000 | 0.000 |                                                                         |
| 2    | 0.000     | 0.010 | 0.150 | 0.000 | LANDING LOADS<br>DL=7.5 PSF<br>LL=100 PSF<br>TRIB. LANDING WIDTH= 1.5FT |
|      | 7.250     | 0.010 | 0.150 | 0.000 |                                                                         |

**SHEAR (Ultimate): Max Vu (1.2DL+1.6LL) = 0.98 kips 0.90Vn = 51.19 kips**

### MOMENTS (Ultimate):

| Span        | Cond  | LoadCombo   | Mu<br>kip-ft | @<br>ft | Lb<br>ft | Cb   | Phi  | Phi*Mn<br>kip-ft |
|-------------|-------|-------------|--------------|---------|----------|------|------|------------------|
| Center      | Max + | 1.2DL+1.6LL | 1.8          | 3.6     | 7.3      | 1.14 | 0.90 | 36.59 ✓          |
| Controlling |       | 1.2DL+1.6LL | 1.8          | 3.6     | 7.3      | 1.14 | 0.90 | 36.59 ✓          |

### REACTIONS (kips):

|                                | Left | Right |
|--------------------------------|------|-------|
| DL reaction                    | 0.09 | 0.09  |
| Max +LL reaction               | 0.54 | 0.54  |
| Max +total reaction (factored) | 0.98 | 0.98  |

### DEFLECTIONS:

|                     |    |           |        |       |       |   |
|---------------------|----|-----------|--------|-------|-------|---|
| Dead load (in)      | at | 3.63 ft = | -0.002 | L/D = | 40250 | ✓ |
| Live load (in)      | at | 3.63 ft = | -0.013 | L/D = | 6737  | ✓ |
| Net Total load (in) | at | 3.63 ft = | -0.015 | L/D = | 5771  | ✓ |



RAM Structural System

Bentley

RAM SBeam v06.00.00

# Gravity Beam Design

11/25/19 16:29:54

## STEEL CODE: AISC 360-10 LRFD

### SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (16.50,0.00)

Beam Size (User Selected) = MC6X15.1 Fy = 50.0 ksi  
 Total Beam Length (ft) = 16.50  
 Mp (kip-ft) = 40.96  
 Top flange not braced by decking.

### POINT LOADS (kips):

| Dist (ft) | DL   | LL   | PartL | Flange Bracing<br>Top | Bottom |
|-----------|------|------|-------|-----------------------|--------|
| 13.500    | 0.09 | 0.54 | 0.00  | Yes                   | No     |

MEMBER REACTION FROM  
MC6X15.1. SEE APPENDIX 16

### LINE LOADS (k/ft):

| Load | Dist (ft) | DL    | LL    | PartL |
|------|-----------|-------|-------|-------|
| 1    | 0.000     | 0.015 | 0.000 | 0.000 |
|      | 16.500    | 0.015 | 0.000 | 0.000 |
| 2    | 0.000     | 0.010 | 0.150 | 0.000 |
|      | 16.500    | 0.010 | 0.150 | 0.000 |

MEMBER SELF-WEIGHT

LANDING LOADS  
DL=7.5 PSF  
LL=100 PSF  
TRIB. LANDING WIDTH= 1.5FT

**SHEAR (Ultimate):** Max Vu (1.2DL+1.6LL) = 3.02 kips **0.90Vn = 51.19 kips**

### MOMENTS (Ultimate):

| Span        | Cond  | LoadCombo   | Mu<br>kip-ft | @<br>ft | Lb<br>ft | Cb   | Phi  | Phi*Mn<br>kip-ft |
|-------------|-------|-------------|--------------|---------|----------|------|------|------------------|
| Center      | Max + | 1.2DL+1.6LL | 10.7         | 8.9     | 13.5     | 1.13 | 0.90 | 28.45            |
| Controlling |       | 1.2DL+1.6LL | 10.7         | 8.9     | 13.5     | 1.13 | 0.90 | 28.45            |

### REACTIONS (kips):

|                                | Left | Right |
|--------------------------------|------|-------|
| DL reaction                    | 0.22 | 0.28  |
| Max +LL reaction               | 1.34 | 1.68  |
| Max +total reaction (factored) | 2.41 | 3.02  |

### DEFLECTIONS:

|                     |    |           |        |       |      |
|---------------------|----|-----------|--------|-------|------|
| Dead load (in)      | at | 8.41 ft = | -0.069 | L/D = | 2889 |
| Live load (in)      | at | 8.41 ft = | -0.410 | L/D = | 483  |
| Net Total load (in) | at | 8.41 ft = | -0.478 | L/D = | 414  |



RAM Structural System

Bentley

RAM SBeam v06.00.00

# Gravity Beam Design

11/25/19 16:33:33

## STEEL CODE: AISC 360-10 LRFD

### SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (10.00,0.00)

Beam Size (Optimum) = MC6X6.5 Fy = 50.0 ksi  
 Total Beam Length (ft) = 10.00  
 Mp (kip-ft) = 17.83  
 Top flange not braced by decking.

### POINT LOADS (kips):

| Dist (ft) | DL   | LL   | PartL | Flange Bracing<br>Top Bottom |
|-----------|------|------|-------|------------------------------|
| 3.000     | 0.22 | 1.34 | 0.00  | Yes No                       |

MEMBER REACTION FROM  
MC6X15.1. SEE APPENDIX 17

### LINE LOADS (k/ft):

| Load | Dist (ft) | DL    | LL    | PartL |
|------|-----------|-------|-------|-------|
| 1    | 0.000     | 0.007 | 0.000 | 0.000 |
|      | 10.000    | 0.007 | 0.000 | 0.000 |
| 2    | 3.000     | 0.010 | 0.150 | 0.000 |
|      | 10.000    | 0.010 | 0.150 | 0.000 |

MEMBER SELF-WEIGHT

LANDING LOADS  
DL=7.5 PSF  
LL=100 PSF  
TRIB. LANDING WIDTH= 1.5FT

**SHEAR (Ultimate):** Max Vu (1.2DL+1.6LL) = 2.34 kips **0.90Vn = 25.11 kips**

### MOMENTS (Ultimate):

| Span        | Cond  | LoadCombo   | Mu<br>kip-ft | @<br>ft | Lb<br>ft | Cb   | Phi  | Phi*Mn<br>kip-ft |
|-------------|-------|-------------|--------------|---------|----------|------|------|------------------|
| Center      | Max + | 1.2DL+1.6LL | 7.0          | 3.0     | 7.0      | 1.32 | 0.90 | 11.77            |
| Controlling |       | 1.2DL+1.6LL | 7.0          | 3.0     | 7.0      | 1.32 | 0.90 | 11.77            |

### REACTIONS (kips):

|                                | Left | Right |
|--------------------------------|------|-------|
| DL reaction                    | 0.21 | 0.14  |
| Max +LL reaction               | 1.31 | 1.08  |
| Max +total reaction (factored) | 2.34 | 1.91  |

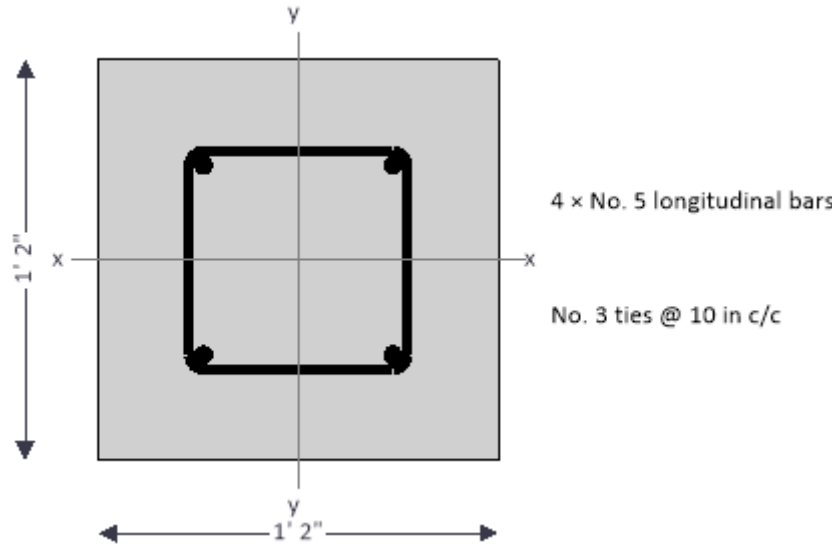
### DEFLECTIONS:

|                     |    |           |        |       |      |
|---------------------|----|-----------|--------|-------|------|
| Dead load (in)      | at | 4.70 ft = | -0.030 | L/D = | 3987 |
| Live load (in)      | at | 4.75 ft = | -0.205 | L/D = | 586  |
| Net Total load (in) | at | 4.75 ft = | -0.235 | L/D = | 511  |

|                                                                                  |                    |                            |      |                     |      |
|----------------------------------------------------------------------------------|--------------------|----------------------------|------|---------------------|------|
|  |                    | Project<br>346 43RD STREET |      | Job Ref.<br>19248   |      |
|                                                                                  |                    | Section                    |      | Sheet no./rev.<br>1 |      |
| Calc. by<br>ALW                                                                  | Date<br>11/25/2019 | Chk'd by                   | Date | App'd by            | Date |

### RC RECTANGULAR COLUMN DESIGN (ACI318-11)

Tedds calculation version 2.2.02



#### Applied loads

Ultimate axial force acting on column

$P_{u,act} = 2.41$  kips

#### Geometry of column

Depth of column (larger dimension of column)

$h = 14.0$  in

Width of column (smaller dimension of column)

$b = 14.0$  in

Clear cover to reinforcement (both sides)

$c_c = 3.0$  in

Unsupported height of column about x axis

$l_{ux} = 3.5$  ft

Effective height factor about x axis

$k_x = 1.00$

Column state about the x axis

Unbraced

Unsupported height of column about y axis

$l_{uy} = 3.5$  ft

Effective height factor about y axis

$k_y = 1.00$

Column state about the y axis

Unbraced

#### Check on overall column dimensions

Column dimensions are OK -  $h < 4b$

#### Reinforcement of column

Numbers of bars of longitudinal steel

$N = 4$

Longitudinal steel bar diameter number

$D_{bar\_num} = 5$

Diameter of longitudinal bar

$D_{long} = 0.625$  in

Stirrup bar diameter number

$D_{stir\_num} = 3$

Diameter of stirrup bar

$D_{stir} = 0.375$  in

Specified yield strength of reinforcement

$f_y = 60000$  psi

Specified compressive strength of concrete

$f'_c = 4000$  psi

Modulus of elasticity of bar reinforcement

$E_s = 29 \times 10^6$  psi

Modulus of elasticity of concrete

$E_c = 57000 \times f'_c^{1/2} \times (1\text{psi})^{1/2} = 3604997$  psi

Yield strain

$\epsilon_y = f_y / E_s = 0.00207$

Ultimate design strain

$$\epsilon_c = 0.003 \text{ in/in}$$

**Check for minimum area of steel - 10.9.1**

Gross area of column

$$A_g = h \times b = 196.000 \text{ in}^2$$

Area of steel

$$A_{st} = N \times (\pi \times D_{long}^2) / 4 = 1.227 \text{ in}^2$$

Minimum area of steel required

$$A_{st\_min} = 0.01 \times A_g = 1.960 \text{ in}^2$$

$A_{st} < A_{st\_min}$ , FAIL - Minimum steel check

**Check for maximum area of steel - 10.9.1**

Permissible maximum area of steel

$$A_{st\_max} = 0.08 \times A_g = 15.680 \text{ in}^2$$

**BC1604.2**  
How will deficiency be remedied?

$A_{st} < A_{st\_max}$ , PASS - Maximum steel check

**Slenderness check about x axis**

Radius of gyration

$$r_x = 0.3 \times h = 4.2 \text{ in}$$

Actual slenderness ratio

$$S_{rx\_act} = k_x \times l_{ux} / r_x = 10$$

Slenderness ratio is less than 22, slenderness effects may be neglected

**Slenderness check about y axis**

Radius of gyration

$$r_y = 0.3 \times b = 4.2 \text{ in}$$

Actual slenderness ratio

$$S_{ry\_act} = k_y \times l_{uy} / r_y = 10$$

Slenderness ratio is less than 22, slenderness effects may be neglected

**Axial load capacity of axially loaded column**

Strength reduction factor

$$\phi = 0.65$$

Area of steel on compression face

$$A'_s = A_{st} / 2 = 0.614 \text{ in}^2$$

Area of steel on tension face

$$A_s = A_{st} / 2 = 0.614 \text{ in}^2$$

Net axial load capacity of column

$$P_n = 0.8 \times (0.85 \times f'_c \times (A_g - A_{st}) + f_y \times A_{st}) = 588.687 \text{ kips}$$

Ultimate axial load capacity of column

$$P_u = \phi \times P_n = 382.646 \text{ kips}$$

PASS : Column is safe in axial loading

**Design of column ties - 7.10.5**

Spacing of lateral ties

$$S_{v\_ties} = 10.000 \text{ in}$$

16 times longitudinal bar diameter

$$S_{v1} = 16 \times D_{long} = 10.000 \text{ in}$$

48 times tie bar diameter

$$S_{v2} = 48 \times D_{stir} = 18.000 \text{ in}$$

Least column dimension

$$S_{v3} = \min(h, b) = 14.000 \text{ in}$$

Required tie spacing

$$s = \min(S_{v1}, S_{v2}, S_{v3}) = 10.000 \text{ in}$$

$S_{v\_ties} < s$  PASS

SEE CALC. ON NEXT SHEET

PROJECT 346 43RD STREETPROJECT NO. 19248PAGE 1/1SUBJECT CONCRETE PIERBY ALWDATE 12/26/2019

CONCRETE PIER

14" x 14" x 3.5 FT

 $P_u = 2.5 \text{ KIPS}$  $f'_c = 4000 \text{ PSI}$ 

UNREINFORCED COMPRESSION STRESS IN COLUMN

$$\frac{2.5 \text{ KIPS} \times 1000 \text{ LB/KIP}}{(14 \text{ IN} \times 14 \text{ IN})} = 12.76 \text{ PSI} < 4000 \text{ PSI}$$

PER ACI 318-11 SECTION 10.8.4  $A_g \text{ REDUCED} > 0.5 A_g$ 

$$A_g = 196 \text{ IN}^2$$

$$A_{ST} = 1.227 \text{ IN}^2 \quad (4 - \#5 \text{ LONG. BARS})$$

$$A_{g-\text{REDUCED}} = \frac{A_{ST}}{0.01} = 122.72 \text{ IN}^2$$

$$A_{g-\text{REDUCED}} = 0.63 A_g \quad \checkmark$$

MIN. REINFORCEMENT OKAY

PROJECT 346 43RD STREET

PROJECT NO. 1924B

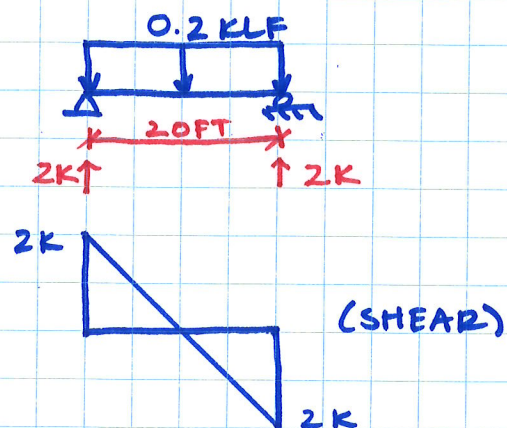
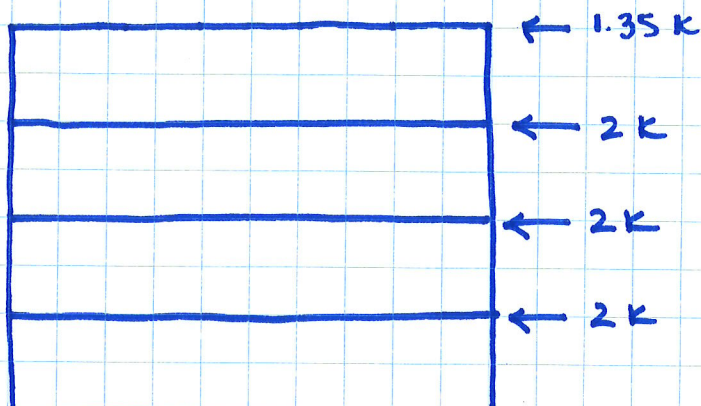
PAGE 1/2

SUBJECT DIAPHRAGM CHECK

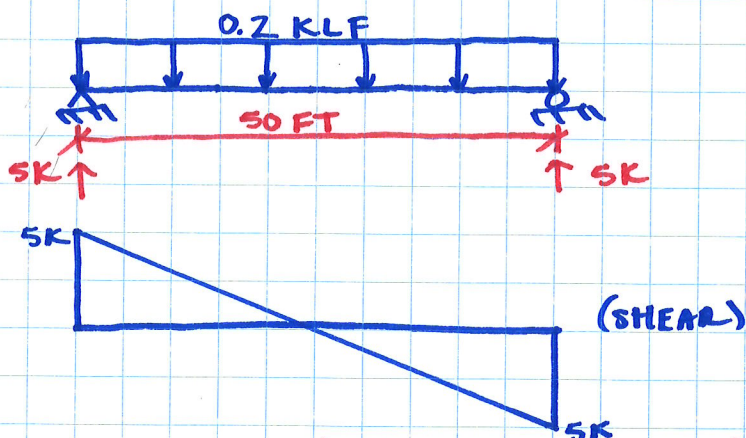
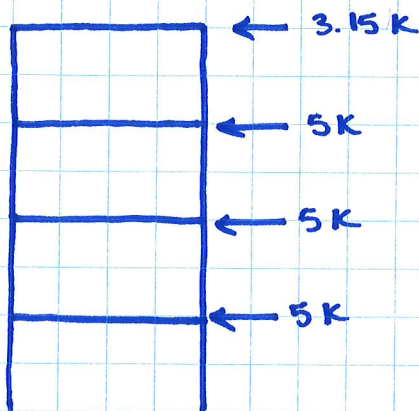
BY ALW

DATE 11/27/2019

## EAST + WEST LATERAL SYSTEM (WIND)



## NORTH + SOUTH LATERAL SYSTEM (WIND)



STRUCTO - CRETE PRODUCT DATA (SEE APPENDIX 23)

PER TABLE 4

WIND  $\phi = 0.7$ 

SEISMIC  $\phi = 0.65$ 

PER TABLE 5

 $S_u = 1395 \text{ PLF}$ 
 $V_s = 1395 \text{ PLF} \times 0.7 = 976.5 \text{ PLF} > 200 \text{ PLF} \checkmark$

PROJECT 346 43RD STREET

PROJECT NO. 19248

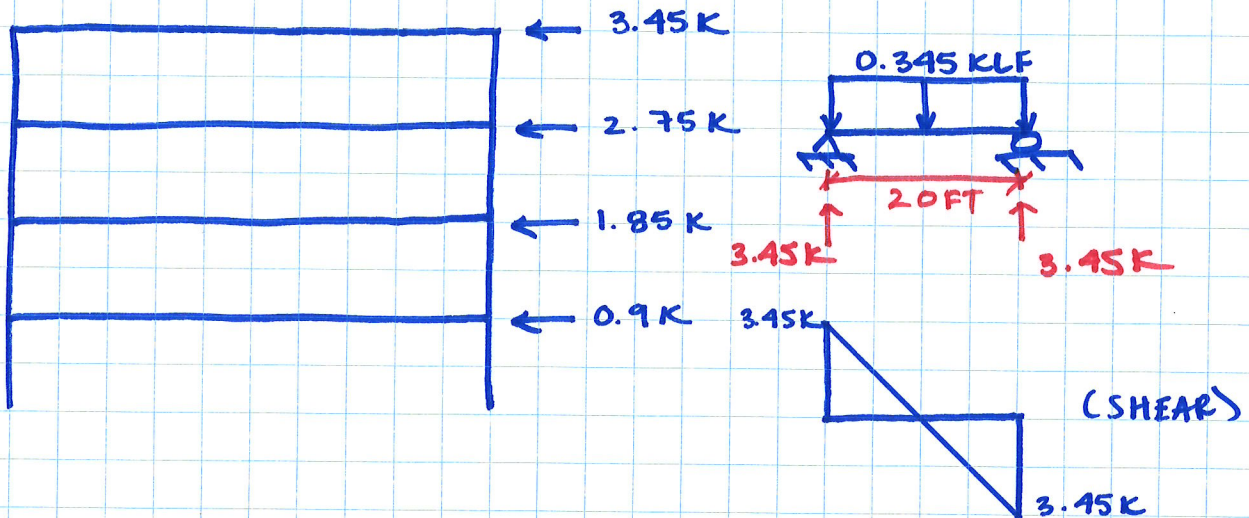
PAGE 2/2

SUBJECT DIAPHRAGM CHECK

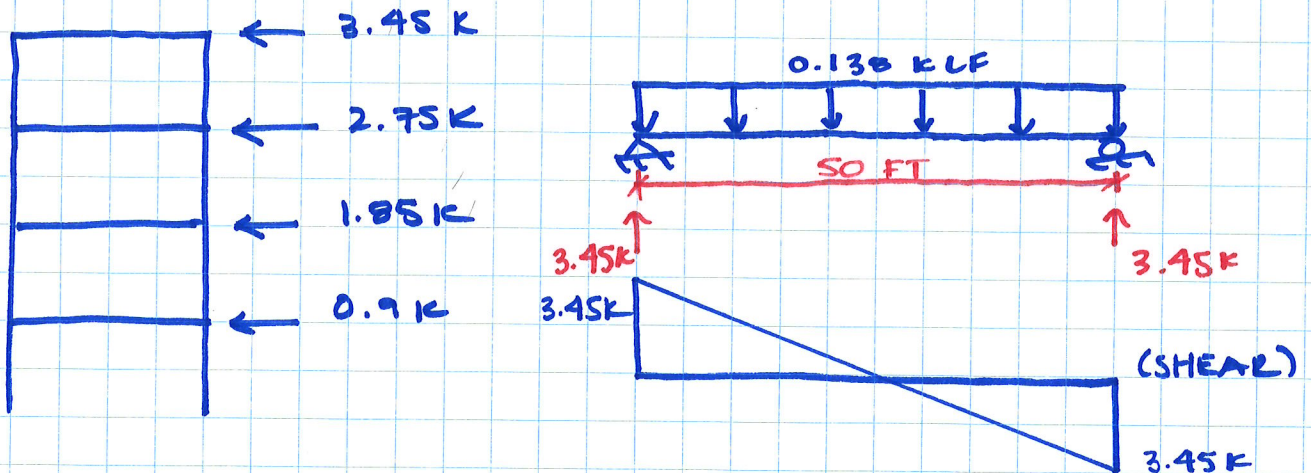
BY ALW

DATE 11/27/2019

### E. + W. LATERAL SYSTEM (SEISMIC)



### N. + S. LATERAL SYSTEM (SEISMIC)



SEE APPENDIX 23 FOR STRUCTO-CRETE PRODUCT DATA

TABLE A  
SEISMIC  $\phi = 0.65$

TABLE S  
 $S_u = 1395 \text{ PLF}$   
 $V_s = 1395 \text{ PLF} \times 0.65 = 907 \text{ PLF} > 345 \text{ PLF} \checkmark$



**Pei Evaluation Service®** is an accredited ISO Standard 17065 Product Certifier, accredited by the IAS. This **Product Evaluation Report** represents a product that **Pei ES** has Evaluated. This product has a Product Evaluation Service Agreement & Follow-up Inspection Service Agreement. This **Product Evaluation Report** in no way implies warranty for this product or relieves **United States Gypsum Company** of their liabilities for this product. This **PER** is an official document if it is within one year of the Initial or Re-Approval date.

PER-13067

**Initial Approval**  
October, 2013

**Re-Approved**  
July, 2019

See all **Pei ES** Reports at: [www.p-e-i.com](http://www.p-e-i.com)

### Report Owner

#### United States Gypsum Company

700 North Highway 45  
Libertyville, IL 60048

### Product

#### USG Structural Panel Concrete Subfloor

(a.k.a. 3/4" STRUCTO-CRETE® Structural Concrete Panels)

### Approved Manufacturing Locations

#### USG Structural Technologies, LLC

309 Hallberg Street  
Delavan, WI 53115

### For Evaluation Report Questions

USG Contact: Manny Hurtado, Building Codes Manager

Phone: 847-970-5179

Email: [mhurtado@usg.com](mailto:mhurtado@usg.com)

### General Details

The approved manufacturing plant has an approved Q.C. Manual to manufacture USG Structural Panel Concrete Subfloor and is audited quarterly by *Progressive Engineering Inc.* USG Structural Panel Concrete Subfloor is also known as 3/4" STRUCTO-CRETE® Structural Concrete Panels, and the contents of this **PER** are applicable to both product names.

### Product Description

USG Structural Panel Concrete Subfloor is a noncombustible concrete sheathing panel used in conjunction with cold-formed steel, wood, or hot-rolled steel framing to form a load bearing structural floor or wall system. USG Structural Panel Concrete Subfloor is a nominal 3/4" [19mm] thick x 4' [1220mm] wide x 8' [2440mm] long. The floor panels have a Tongue and Groove edge along the 8' [2440mm] sides and the wall panels are square edged. The panels have a maximum weight of 5.3psf [25.9 kg/m<sup>2</sup>] from the manufacturing plant. The panels are a composite material consisting of alkali-resistant fiberglass and a cementitious binder.

USG Structural Panel Concrete Subfloor are noncombustible per ASTM E136 (CAN CSA S114) and have a mold resistance value of no less than 10 per ASTM D3273 and a rating of 1 or less per ASTM G21. This products have also been shown to be termite resistant when tested in accordance with AWPA Standard E1-13 exposure C, and comply with the VOC emission requirements of the California Department of Public Health CDPH/EHLB/Standard Method Version 1.1 (Emission testing method for CA Specification 01350).

### Product Application

USG Structural Panel Concrete Subfloor is used as a single floor or as the subfloor (Concrete Subfloor) in conjunction with an underlayment to form a structural floor system to resist gravity loading, floor diaphragm loading and concentrated loading as typically found in Residential and Commercial Type I or Type II Construction. Product may also be used in wall applications in accordance with Table 8 and Table 9.

### Framing

Cold-formed steel framing shall comply with AISI and have minimum yield strength of 50 ksi [345 MPa], minimum 18 ga. [40mil] or 0.0403" [1.0236mm] thickness, and minimum G60 galvanized coating. Member flanges must have a minimum width of 1-5/8" [41.27mm]. As an alternative, SPF lumber, 1/8" [3mm] or 1/4" [6mm] steel framing may also be used in conjunction with the fasteners and edge distance listed in Table 2. Typical frame spacing ranges from 12" o.c. [305mm] to 24" o.c. [610mm] for floors. See Table 4 and Table 5 for floor diaphragm shear design values.

### Compliance

| International Residential Code |                  | International Building Code |                         |
|--------------------------------|------------------|-----------------------------|-------------------------|
| 2012 -                         | Section R301.1.3 | 2012 -                      | Section 703.5.1         |
|                                | Section R301.7   |                             | Section 703.5.2         |
| 2015 -                         | Section R301.1.3 |                             | Section 1607.1 (Table)  |
|                                | Section R301.7   |                             | Section 1607.4          |
| 2018 -                         | Section R301.1.3 | 2015                        | Section 703.5.1         |
|                                | Section R301.7   |                             | Section 703.5.2         |
| 2018 -                         | Section R301.1.3 |                             | Section 1607.1 (Table)  |
|                                | Section R301.7   |                             | Section 1607.3 & 1607.4 |
| 2018 -                         | Section R301.1.3 | 2018                        | Section 703.5.1         |
|                                | Section R301.7   |                             | Section 703.5.2         |
| 2018 -                         | Section R301.1.3 |                             | Section 1607.1 (Table)  |
|                                | Section R301.7   |                             | Section 1607.3 & 1607.4 |

- Meets or exceeds the requirements of ICC-ES AC 318 Structural Cementitious Floor Sheathing Panels, Effective July 1, 2009.
- Meets or exceeds the requirements of ICC-ES AC 319 Horizontal Diaphragms Consisting of Structural Cementitious Floor Sheathing Panels Attached to Cold-formed Steel Framing—Approved June 2005, Editorially Revised January 2012.

### Compliance Continued

- Meets the requirements of Table R301.7 Allowable Deflection of Structural Members for Joist Spacing of 24" [610mm] o.c. per the 2012, 2015 & 2018 IRC.
- Meets or exceeds the requirements for noncombustible core in accordance with Section 703.5.1 of the 2012, 2015 & 2018 IBC.
- Meets or exceeds the requirements for materials having a structural base of noncombustible material when tested in accordance with ASTM E 136 as defined in 2012, 2015 & 2018 IBC Section 703.5.2 and CAN CSA S114.
- Meets the requirements of Section R301.1.3 Engineered Design for otherwise conventional construction for buildings per the 2012, 2015 & 2018 IRC.
- For Canadian applications suitability needs to be reviewed by Architect or Engineer of record prior to use.
- Meets or exceeds the requirements of the 2012, 2015 & 2018 IBC Table 1607.1 and 2012 Ontario Building Code Table 4.1.5.9; Minimum Uniformly Distributed Live Loads and Minimum Concentrated Live Loads, when installed per manufacturer's instructions.
- Surface Burning Characteristics - Flame Spread Index of 0 / Smoke Development Index of 0 or less when tested in accordance with ASTM E 84.
- Meets & exceeds requirements for concentrated load per ICC AC308 when tested in accordance with ASTM E661 using a 1" [25mm] and 3" [76mm] loading diameter for Wet & Dry conditions.
- Meets and exceeds the requirements of the 2012, 2015 & 2018 IBC, Section 1607.3 Uniform live loads and Section 1607.4, Concentrated Live Load of 2,000 Lbs.

### General Product Installation

1. USG Structural Panel Concrete Subfloor is to be installed and maintained during construction following this report and the USG installation instructions. Installation instructions must be made easily available to the product installer.
2. When cutting USG Structural Panel Concrete Subfloor, safety glasses and a NIOSH approved N-95 dust mask should be worn at all times due to dust produced by the cutting of this product.
3. Fasteners shall be flush or slightly below the surface and care must be taken to not strip out in the framing. No fastener shall be installed within 2" [51mm] of the corner of a panel and shall not be closer than the minimum distance from panel edges indicated in Table 2 of this **PER**.
4. The tongue and groove joints shall be oriented perpendicular to the framing.
5. The 3/4" [19mm] USG Structural Panel Concrete Subfloor is fastened to the cold-formed steel, hot-rolled steel, or wood floor framing with the applicable fasteners indicated in Table 2 of this report.
6. Install panels in a running board pattern bridging a minimum of 2 framing spans. The minimum panel width, measured parallel to the framing, shall be no less than 24" [610mm].
7. Fasteners are applied as shown on the following Screw pattern A, B & C diagrams.
8. Up to a 6" [152mm] x 6" [152mm] cutout through the panels is allowed without blocking. Up to a 44" [1118mm] x 44" [1118mm] cutout is allowed with sufficient blocking around the perimeter of the opening. Larger openings shall be designed by the Engineer of record and are beyond the scope of this report.
9. USG Structural Panel Concrete Subfloor must be protected from construction abrasive wear and impact after panel installation until the floor has its final finish applied. Refer to the USG Installation Instructions.
10. USG Structural Panel Concrete Subfloor must have blocked edges for panels that are less than 24" wide. The Katz blocking should be fastened through the panel and with the blocking into the joist with a recommended fastener.

### Product Storage

USG Structural Panel Concrete Subfloor shall be stored in a dry location. Placement of the palletized product must be on level firm ground or a floor capable of carrying the approximate 3,400 lb. [1545kg] pallet weight. Pallets shall not be stacked more than three high and must be stacked with direct alignment on the pallet below it. If a dry location is unavailable, cover pallets with a waterproof tarp or covering. Sub-freezing temperature may cause the panels to freeze together. Should this happen, move the panels to a warmer location to thaw out. Do not use tools or chemicals to loosen the panels as this will cause damage to the panels and will void the performance ratings described in this **PER**.

### Product Labeling

Each bundle shipped of USG Structural Panel Concrete Subfloor that are covered by this **PER**, must have a label attached with at least the following information:

1. USG Name and Location / Plant Number
2. Date of manufacture
3. This **PER** Number & *Pei* **ES** Logo

### Acceptable Evaluation Marks



**Table 1: Physical and Mechanical Properties**  
**USG Structural Panel Concrete Subfloor**

|                                                                          | Test Standard | Requirements                                                                 | Tested Values                                                                |
|--------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Concentrated Load, Wet or Dry                                            | ASTM E661     | 550 lb [2.45 kN] Static<br>0.108" [2.7 mm] max. deflection @ 200lb [0.89 kN] | 804 lb [3.58 kN] Static<br>0.066" [1.7 mm] max. deflection @ 200lb [0.89 kN] |
| Fastener Lateral Resistance <sup>1</sup>                                 | ASTM D1761    | Dry >210 lb [0.93 kN]<br>Wet >160 lb [0.71 kN]                               | Dry: 776 lb [3.45 kN]<br>Wet: 800 lb [3.56 kN]                               |
| Density - Oven Dried <sup>2</sup>                                        | ASTM C1185    | minimum 75 lb/ft <sup>3</sup> [1200 kg/m <sup>3</sup> ]                      | 78.6 lb/ft <sup>3</sup> [1258 kg/m <sup>3</sup> ]                            |
| Weight, 3/4" [19mm]                                                      | ASTM D1037    |                                                                              | 5.3 lb/ft <sup>2</sup> [25.9 kg/m <sup>2</sup> ]                             |
| Thickness as Delivered                                                   | ASTM D1293    |                                                                              | 10.5                                                                         |
| pH Value                                                                 | ASTM C1185    | <0.10%                                                                       | 0.06%                                                                        |
| Linear Variation with Change in Moisture<br>25% to 90% Relative Humidity | ASTM D1037    | ≤ 3.0%                                                                       | 0.04%                                                                        |
| Thickness Swell                                                          | ASTM C1185    | Minimum of 75% retention of Physical Properties                              | 100% Retention                                                               |
| Freeze/Thaw resistance                                                   | ASTM D3273    | 10                                                                           | 10                                                                           |
| Mold Resistance                                                          | ASTM G21      | ≤ 1                                                                          | ≤ 1                                                                          |
| Water Absorption <sup>3</sup>                                            | ASTM E136     | <15.0%                                                                       | 9%                                                                           |
| Noncombustibility                                                        | ASTM E84      | Must Pass                                                                    | Passed                                                                       |
| Surface burning Characteristics                                          | ASTM C1185    | 0 Flame Spread / Smoke Developed Index 5                                     | 0 Flame Spread / Smoke Developed Index 0                                     |
| Long Term Durability                                                     | ASTM C1185    | min. 75% retention of physical properties                                    | 100%                                                                         |
| Water Durability                                                         | ASTM C1185    | min. 70% retention of physical properties                                    | 83%                                                                          |
| Water Vapor Transmission (Method B)                                      | ASTM E96      |                                                                              | Permeance 1.4 Perm                                                           |

**Notes:**

1. Fastener Lateral Resistance measured with applicable fasteners in Table 2.
2. Density Measured at Equilibrium Conditioning per Section 5.2.3.1-Tested 28 days after manufacturing
3. Absorption Measured from Equilibrium Conditioning followed by immersion in Water for 48 hours

**Table 2: Acceptable Diaphragm Fasteners<sup>1</sup>**  
**USG Structural Panel Concrete Subfloor**

| Minimum Framing                      | Minimum Edge Distance | Manufacturer                        | Part No.   | Type                                                          |
|--------------------------------------|-----------------------|-------------------------------------|------------|---------------------------------------------------------------|
| 16ga [1.438mm] Cold-Formed Steel     | 1/2" [13mm]           | Grabber Construction Products, Inc. | CGH8158LG  | #8 x 1-5/8" winged self-drilling screw                        |
|                                      |                       | Simpson Strong-Tie Company, Inc.    | CBSDQ158S  | #8 x 1-5/8" winged self-drilling screw                        |
| 18ga [1.0236mm] Cold-Formed Steel    | 1" [25mm]             | Grabber Construction Products, Inc. | CGH8158LG  | #8 x 1-5/8" winged self-drilling screw                        |
| 1/8" Hot Rolled Steel<br>min. 50 ksi | 1" [25mm]             | Aerosmith                           | 5724HPG    | .145" dia. x 1-1/4" lg. power actuated fastener               |
|                                      |                       | Hilti                               | X-U 32MX   | .157" dia. x 1-1/4" lg. power actuated fastener               |
|                                      |                       | DeWalt                              | 50458-PWR  | .157" dia. x 1-1/4" lg. power actuated fastener               |
| 1/4" A36 Hot Rolled Steel            | 3/4" [19mm]           | Grabber Construction Products, Inc. | CC12250LRG | #12 x 2-1/2" winged self-drilling screw                       |
|                                      |                       | Muro North America                  | RSM645     | M6 x 45mm winged self-drilling screw                          |
|                                      |                       | Simpson Strong-Tie Company, Inc.    | TBG1260S   | #12 x 2-3/8", Flat Head, Strong-Drive® TB WOOD-TO-STEEL screw |
| SPF Lumber<br>(Min. S.G. = 0.42)     | 5/8" [16mm]           | Grabber Construction Products, Inc. | C8200L2M   | #8 x 2", Flat Head, Type 17, Nibs, GrabberGard,               |
|                                      |                       | Simpson Strong-Tie Company, Inc.    | WSNTLG2S   | #8 x 2", Flat Head, Twin threads, Nibs                        |
|                                      | 1/2" [13mm]           | Senco <sup>2</sup>                  | GL24AABF   | 8d Ring Shank Nails                                           |

**Notes:**

1. Fastener pull-through capacity of 581-lbs [2584N] may be applied to all listed fasteners. Capacity is based on **ultimate tested value** for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).
2. Senco 8d ring shank nails are manufactured with a length of 2-3/8" [60mm], a head diameter of 0.266" [6.8mm], and a shank diameter of 0.113" [2.9mm]. Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.
3. Screw lengths shown are minimums

## Floor Usage

**Table 3: Uniform Live Load Performance Rating<sup>2</sup>**

**USG Structural Panel Concrete Subfloor**

| Span Rating           | Conditions | Live Load Rating <sup>1</sup><br>(PSF) |
|-----------------------|------------|----------------------------------------|
| <b>12"</b><br>[305mm] | Dry or Wet | 512<br>[24.5 kPa]                      |
| <b>16"</b><br>[406mm] | Dry or Wet | 283<br>[13.5 kPa]                      |
| <b>24"</b><br>[610mm] | Dry or Wet | 120<br>[5.7 kPa]                       |

**Notes:**

1. Live load ratings have been determined from testing based upon a minimum 120 psf [5.7 Kpa] service live load for the 24" [610mm] span rating and a maximum panel live load deflection =  $L/360$ . A factor of safety of 3.0 applied.

2. A minimum of two framing spans required per panel piece.

3. Tabulated live load ratings are valid for a service level dead load of 10 psf [0.5 Kpa] or less.

**Table 4 - Safety Factors and Resistance Factors for Diaphragms**

**USG Structural Panel Concrete Subfloor**

| Framing Type        | Fastener Type   | Earthquake        |                  |                              | Wind              |                  |                              |
|---------------------|-----------------|-------------------|------------------|------------------------------|-------------------|------------------|------------------------------|
|                     |                 | $\Omega$<br>(ASD) | $\phi$<br>(LRFD) | $\phi$<br>(LSD) <sup>4</sup> | $\Omega$<br>(ASD) | $\phi$<br>(LRFD) | $\phi$<br>(LSD) <sup>4</sup> |
| Steel <sup>1</sup>  | Screws          | 2.50              | 0.65             | 0.60                         | 2.35              | 0.70             | 0.65                         |
| Wood <sup>2,3</sup> | Screws or Nails | 3.30              | 0.50             | --                           | 2.35              | 0.70             | --                           |

**Notes:**

1. **Tabulated values have been evaluated for horizontal diaphragm use only.**

2. Safety factors and resistance factors for USG Structural Panel Concrete Subfloor diaphragms installed over cold-formed and hot-rolled steel framing are based upon Table D5 of AISI S100-2007.

3. Safety factors and resistance factors for USG Structural Panel Concrete Subfloor diaphragms installed over wood studs are based on the worst case of the standard factors from the American Wood Council Special Design Provisions for Wind and Seismic (AWC SDPWS-2008) and those tabulated for steel framing.

4. Earthquake factors for installations over wood construction are based upon the wind factors modified by a factor of 1.4 to match the general seismic strength reduction observed in Tables 4.2A, 4.2B, 4.2C, and 4.2D of AWC SDPWS-2008.

5. Limit States Design (LSD) shall be used in combination with the load combinations found in the National Building Code of Canada (NBCC).

**Table 5: Simple Beam Diaphragm Testing**  
**USG Structural Panel Concrete Subfloor**

| Fastener Spacing |                | Joist           |                | Screw Pattern <sup>2,3</sup> | Panel Blocking                             | S <sub>u</sub> - Ultimate Shear Strength (plf) | X     | Aspect Ratio |
|------------------|----------------|-----------------|----------------|------------------------------|--------------------------------------------|------------------------------------------------|-------|--------------|
| Perimeter        | Field          | Gauge *         | Spacing        |                              |                                            |                                                |       |              |
| 4"<br>[102mm]    | 12"<br>[305mm] | 16<br>[1.438mm] | 16"<br>[407mm] | B                            | None                                       | 1462<br>[21.3 kN/m]                            | 0.443 | 3:1          |
| 6"<br>[152mm]    |                |                 |                |                              |                                            | 1395<br>[20.4 kN.m]                            | 0.421 |              |
| 4"<br>[102mm]    | 12"<br>[305mm] | 16<br>[1.438mm] | 24"<br>[610mm] | B                            | None                                       | 1341<br>[19.6 kNm]                             | 0.476 | 3:1          |
| 6"<br>[152mm]    |                |                 |                |                              |                                            | 1053<br>[15.4 kNm]                             | 0.397 |              |
| 6"<br>[152mm]    | 12"<br>[305mm] | 16<br>[1.438mm] | 24"<br>[610mm] | C                            | 4" [102mm] wide x<br>16ga. [1.438mm] Strap | 1468<br>[21.4 kNm]                             | 0.180 | 4:1          |

**Notes:**

1. Refer to Table 4 of this **PER** for applicable diaphragm safety ( $\Omega$ ) and load resistance ( $\phi$ ) factors corresponding to ASD, LRFD, and/or LSD design methods.

2. **Screw Pattern B** - Panel fasteners must be inset 2" [51mm] from the corners. Fastener edge distance at all panel edges must comply with distances in Table 2, as well as exception to the tongue and groove joints where the framing joists are perpendicular to the joint. The fasteners should be kept flush or slightly below the surface of the panel. At the T&G panel joists where the framing joists are perpendicular to the joint, one (1) panel fastener is required. One fastener should be 1" [25mm] and the other 2" [51mm] from the panel edge.

3. **Screw Pattern C** - Panels shall be fastened as described in Screw Pattern B with the addition of fasteners at 6" [152mm] o.c. along the metal Strap Blocking on both sides of seam.

\* The values shown apply to 18 ga. Framing using the minimum of 1" [25mm] edge distance as shown in Table 2.

**Deflection Equation for Simple Beam Diaphragm**

$$\Delta = \frac{5Vl^3}{8EAb} + \frac{Vl}{4Gt} + Xle_n$$

Where: V = Unit shear in the direction under consideration, plf

$l$  = Diaphragm length, ft.

$b$  = Diaphragm width, ft.

E = Elastic modulus of steel rim chords, 29,500,000psi

A = Net area of steel rim chord cross section, in<sup>2</sup>

G = Shear modulus of **USG** Structural Panel Concrete Subfloor for shear, 285,714 psi

t = Effective thickness of **USG** Structural Panel Concrete Subfloor for shear, 0.73 in.

$e_n$  = Screw joint slippage at load per screw on perimeter of interior panel

$$e_n @ 0.20S_u = 0.011$$

$$e_n @ 0.33S_u = 0.019$$

$$e_n @ 0.60S_u = 0.032$$

$$e_n @ S_u = 0.084$$

X = Slip Co-efficient. See Table 5 above.

**Table 6: Cantilever Floor Diaphragm Testing**  
**USG Structural Panel Concrete Subfloor**

| Fastener Spacing |                | Joist Spacing  | Screw Pattern <sup>3,4</sup> | Panel Blocking                             | S <sub>u</sub> - Ultimate Shear Strength (plf)* | X     |
|------------------|----------------|----------------|------------------------------|--------------------------------------------|-------------------------------------------------|-------|
| Perimeter        | Field          |                |                              |                                            |                                                 |       |
| 6"<br>[152mm]    | 12"<br>[305mm] | 24"<br>[610mm] | B                            | None                                       | 487<br>[7.1 kN/m]                               | 0.518 |
| 8"<br>[203mm]    | 12"<br>[305mm] | 24"<br>[610mm] | B                            | None                                       | 475<br>[6.9 kN/m]                               | 0.511 |
| 4"<br>[102mm]    | 12"<br>[305mm] | 24"<br>[610mm] | A                            | None                                       | 713<br>[10.4 kN/m]                              | 0.732 |
| 6"<br>[152mm]    | 12"<br>[305mm] |                |                              |                                            | 525<br>[7.7 kN/m]                               | 0.625 |
| 8"<br>[203mm]    | 12"<br>[305mm] |                |                              |                                            | 465<br>[6.8 kN/m]                               | 0.754 |
| 4"<br>[102mm]    | 12"<br>[305mm] | 16"<br>[406mm] | A                            | None                                       | 975<br>[14.2 kN/m]                              | 0.833 |
| 6"<br>[152mm]    | 12"<br>[305mm] |                |                              |                                            | 915<br>[13.4 kN/m]                              | 0.765 |
| 8"<br>[203mm]    | 12"<br>[305mm] |                |                              |                                            | 860<br>[12.6 kN/m]                              | 0.702 |
| 4"<br>[102mm]    | 12"<br>[305mm] | 12"<br>[305mm] | A                            | None                                       | 1121<br>[16.4 kN/m]                             | 0.759 |
| 6"<br>[152mm]    | 12"<br>[305mm] |                |                              |                                            | 940<br>[13.7 kN/m]                              | 0.541 |
| 8"<br>[203mm]    | 12"<br>[305mm] |                |                              |                                            | 772<br>[11.3 kN/m]                              | 0.484 |
| 6"<br>[152mm]    | 12"<br>[305mm] | 24" [610mm]    | C                            | 4" [102mm] wide x<br>16ga. [1.438mm] Strap | 1148<br>[19.8 kN/m]                             | 0.354 |

**Notes:**

1. Refer to Table 4 of this PER for applicable diaphragm safety (Ω) and load resistance (φ) factors corresponding to ASD, LRFD, and/or LSD design methods.

2. 2 to 1 maximum Aspect Ratio

3. **Screw Pattern A & B** - Panel fasteners must be inset 2" [51mm] from the corners. Fastener edge distance at all panel edges must comply with Table 2 distances with exception to the tongue and groove joints where the framing joists are perpendicular to the joint. The fasteners should be kept flush or slightly below the surface of the panel. At the T&G panel joists where the framing joists are perpendicular to the joint, two (2) panel fasteners are required for Pattern A and one (1) fastener for Pattern B. One fastener should be 1" [25mm] and the other 2" [51mm] from the panel edge.

4. **Screw Pattern C** - Panels shall be fastened as described in Screw Pattern B with the addition of fasteners at 6" [152mm] o.c. along the metal Strap Blocking on both sides of seam.

**Deflection Equation for Cantilever Diaphragm**

$$\Delta = \frac{5V(2l)^3}{8EAb} + \frac{V(2l)}{4Gt} + X(2l)e_n$$

Where: V = Unit shear in the direction under consideration, plf

ℓ = Diaphragm length, ft.

b = Diaphragm width, ft.

E = Elastic modulus of steel rim chords, 29,500,000psi

A = Net area of steel rim chord cross section, in<sup>2</sup>

G = Shear modulus of USG Structural Panel Concrete Subfloor for shear, 285,714 psi

t = Effective thickness of USG Structural Panel Concrete Subfloor for shear, 0.73 in.

e<sub>n</sub> = Screw joint slippage at load per screw on perimeter of interior panel

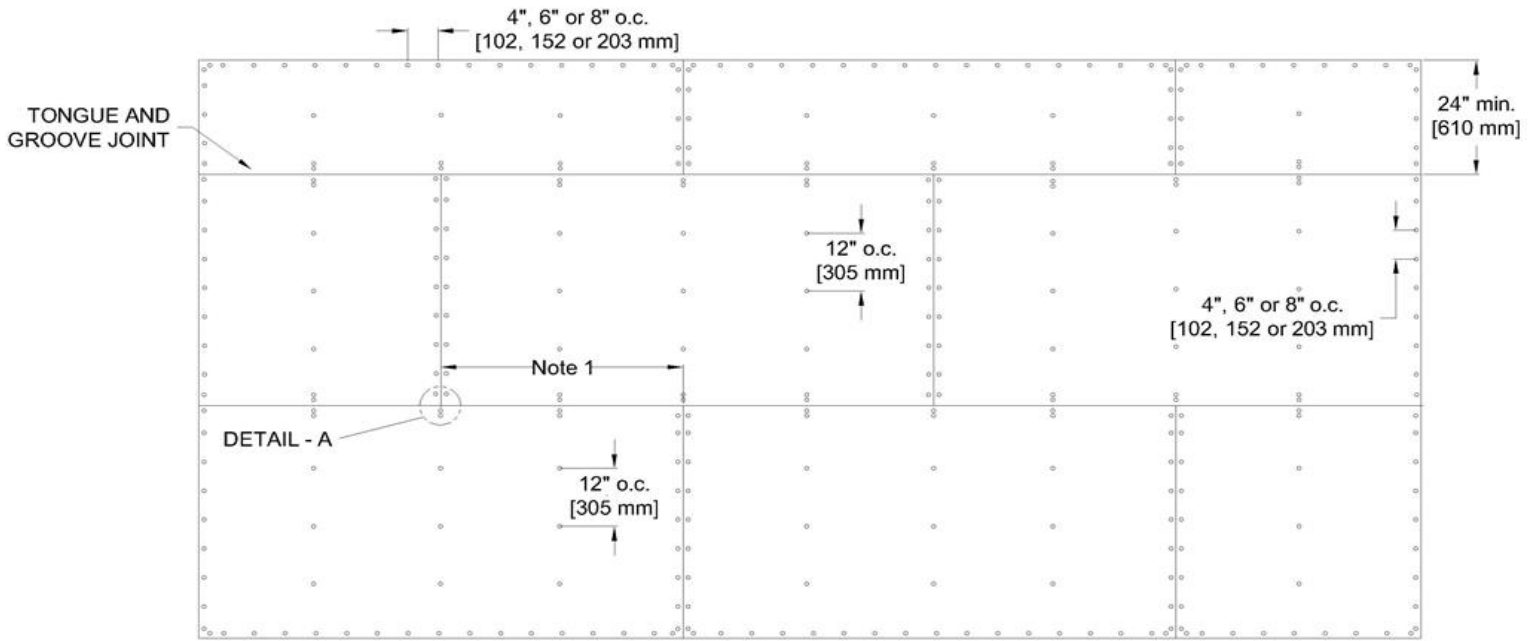
$$e_n @ 0.20S_u = 0.011$$

$$e_n @ 0.33S_u = 0.019$$

$$e_n @ 0.60S_u = 0.032$$

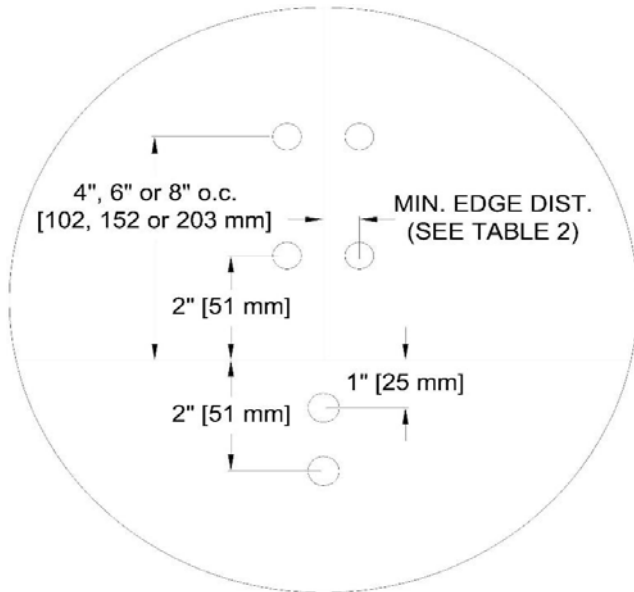
$$e_n @ S_u = 0.084$$

X = Slip Co-efficient. See Table 6 above.

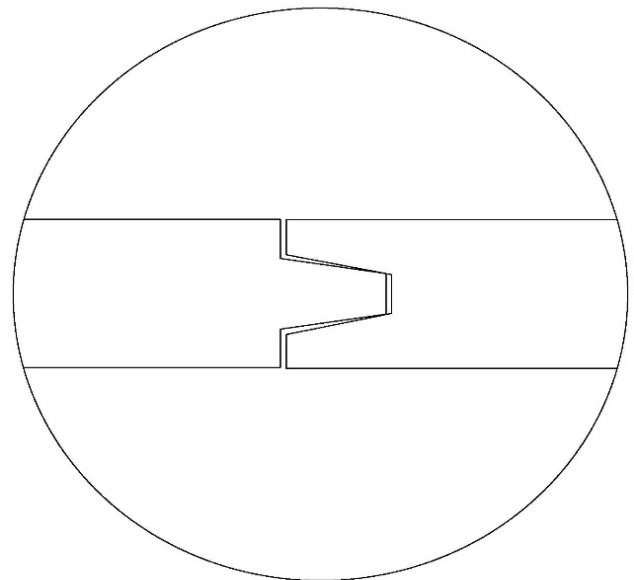


1. Two Span offset of Seams w/o Blocking, One Span w/ Blocking.

## Screw Pattern A

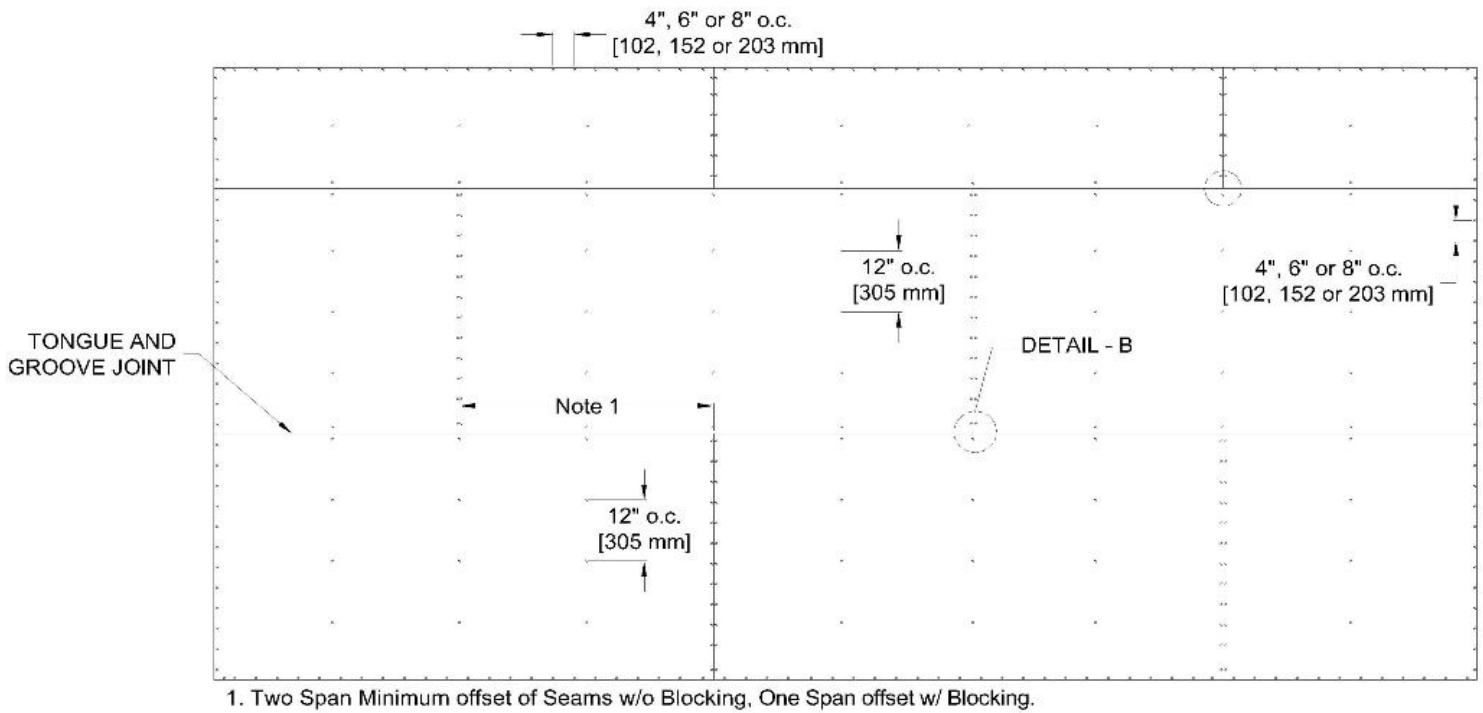


DETAIL - A

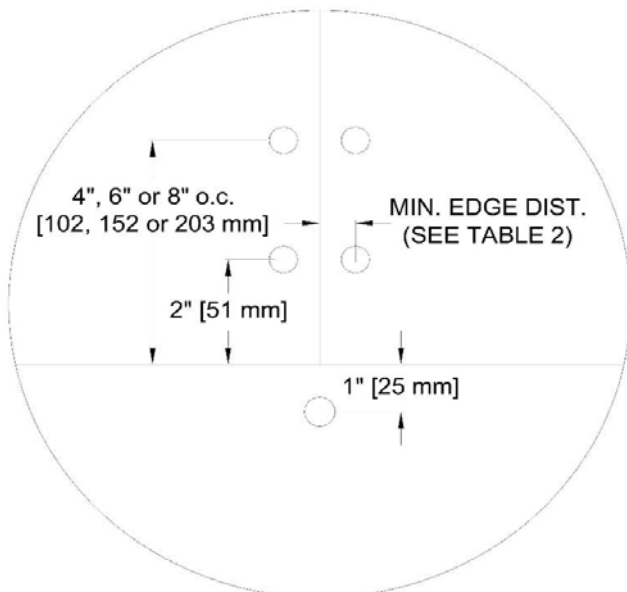


Tongue & Groove

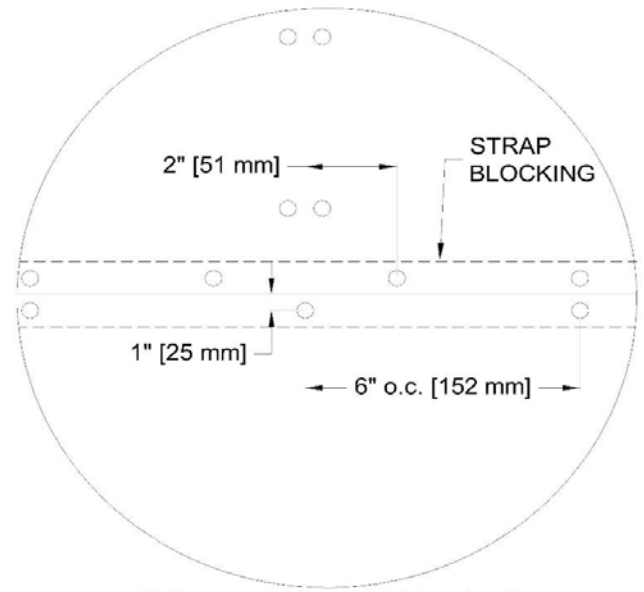
**Figure 1 - Screw Pattern "A" Details**



## Screw Pattern B



### DETAIL - B



### Strap Block Detail for Screw Pattern C

**Figure 2 - Screw Pattern "B" & "C" Details**

**Table 7: Floor Anchorage Options - USG Structural Panel Concrete Subfloor<sup>1,2,3</sup>**  
Nominal Withdrawal Capacities per Anchor

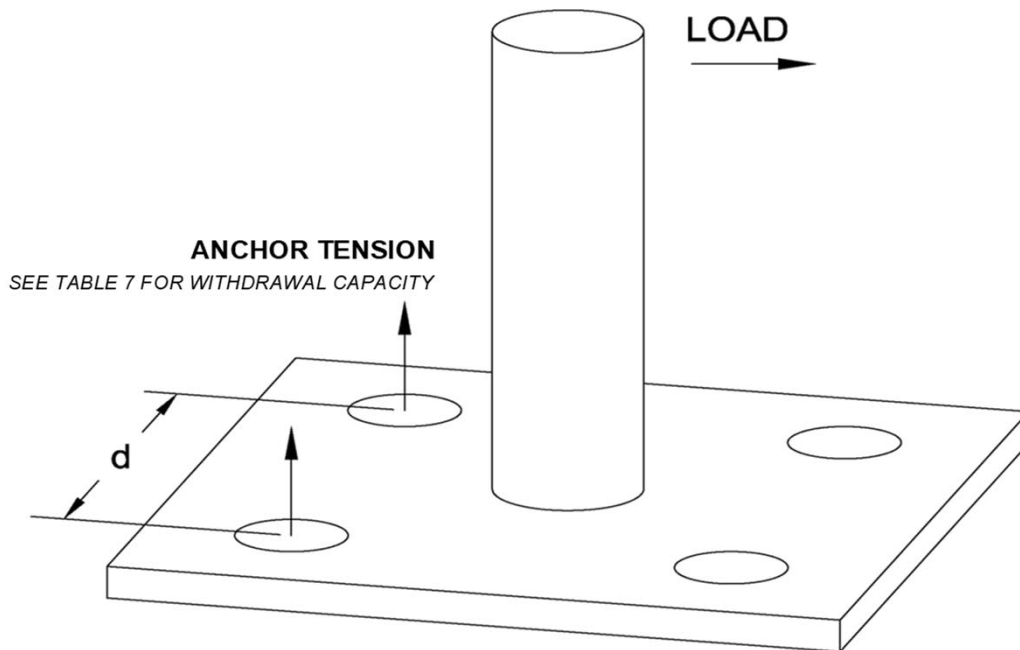
| Anchor Type                     | ASTM D 1037 Value (1 Layer) | Subfloor Layers | Distance Between Bolts, d |          |          |          |         |         |         |         |
|---------------------------------|-----------------------------|-----------------|---------------------------|----------|----------|----------|---------|---------|---------|---------|
|                                 |                             |                 | 2"                        | 4"       | 6"       | 8"       | 51mm    | 102mm   | 152mm   | 203mm   |
| 3/8" SnapToggle <sup>®4</sup>   | 1481 lb [6588 N]            | 1               | 927 lb                    | 1072 lb  | 1154 lb  | 1166 lb  | 4124 N  | 4768 N  | 5133 N  | 5187 N  |
|                                 |                             | 2               | 1719 lb*                  | 1719 lb* | 1719 lb* | 1719 lb* | 7646 N* | 7646 N* | 7646 N* | 7646 N* |
| 1/2" SnapToggle <sup>®5</sup>   | 1616 lb [7188 N]            | 1               | 948 lb                    | 1085 lb  | 1166 lb  | 1176 lb  | 4217 N  | 4826 N  | 5187 N  | 5231 N  |
|                                 |                             | 2               | 1843 lb                   | 2088 lb  | 2273 lb  | 2400 lb  | 8198 N  | 9287 N  | 10111 N | 10676 N |
| 1/4"x3" Peel Rivet <sup>6</sup> | 758 lb [3372 N]             | 1               | 636 lb                    | 668 lb   | 668 lb   | 668 lb   | 2829 N  | 2971 N  | 2971 N  | 2971 N  |

For ASD designs use minimum  $\Omega = 4.0$ ; For LRFD designs use maximum  $\phi = 0.40$

**Notes:**

1. TOGGLER Anchor System and peel rivet capacity is based on random anchors purchased from a distributor and have not been evaluated for installations other than that described in Table 7 and Figure 3. This **PER** verifies the USG Structural Panel Concrete Subfloor capacity only, and actual toggler anchor capacity without panel failure shall be verified by the engineer or designer of record through the SnapToggle anchor or peel rivet manufacturer.
2. TOGGLER Anchor System shall be installed with a maximum torque setting of 200 in-lb [23 N-m].
3. Anchors have been evaluated for use general component connections to the USG Structural Panel Concrete Subfloor (i.e. auditorium seating, lightweight equipment, etc.). Final application must be reviewed and approved by the engineer or designer of record.
4. TOGGLER Anchor System 3/8" SnapToggle<sup>®</sup> (Item No. BC) w/ a Grade 8 Hex Head Bolt. Ultimate withdrawal occurred at a maximum tested shear per pair of 232 lb [1032 N] for one-layer and 430 lb [1913 N] for two layers.
5. TOGGLER Anchor System 1/2" SnapToggle<sup>®</sup> (Item No. BD) w/ a Grade 5 Hex Head Bolt. Ultimate withdrawal occurred at a maximum tested shear per pair of 294 lb [1308 N] for one-layer and 600 lb [2669 N] for two layers.
6. Peel Rivets manufactured by SFS Intec (Part No. TPR-L-6, 3x76). Ultimate withdrawal occurred at a maximum tested shear per pair of 167 lb [743 N] for a single layer of USG Structural Panel Concrete Subfloor.

\* Denotes Toggler Failure by Strip out.



**Figure 3 - Typical Toggler Bolt Application**

## Wall Usage

**Table 8**

Tested Static Wall Shear Values using 16ga. [54mil] or 0.0538" [1.438mm] X 3-5/8" [92mm] flange Steel Studs **16"** [406mm] o.c.

| Sides Sheathed | Strap at Seam | Sheathing Orientation | Fastener Spacing |                | Ultimate Load in plf | G' Lbs./in | Ultimate Load kN/m | G' N/mm |
|----------------|---------------|-----------------------|------------------|----------------|----------------------|------------|--------------------|---------|
|                |               |                       | Perimeter        | Field          |                      |            |                    |         |
| Single         | no            | Vertical              | 8"<br>[203mm]    | 12"<br>[305mm] | 914                  | 6185       | 13.3               | 1083    |
| Single         | no            | Vertical              | 6"<br>[152mm]    | 12"<br>[305mm] | 1320                 | 7416       | 19.2               | 1299    |
| Single         | no            | Vertical              | 4"<br>[102mm]    | 12"<br>[305mm] | 1726                 | 8647       | 25.1               | 1514    |
| Single         | yes           | Horizontal            | 8"<br>[203mm]    | 12"<br>[305mm] | 984                  | 5535       | 14.3               | 969     |
| Single         | yes           | Horizontal            | 6"<br>[152mm]    | 12"<br>[305mm] | 1402                 | 7269       | 20.4               | 1273    |
| Single         | yes           | Horizontal            | 4"<br>[102mm]    | 12"<br>[305mm] | 1821                 | 9003       | 26.5               | 1577    |
| Double         | yes           | Horizontal            | 8"<br>[203mm]    | 12"<br>[305mm] | 1901                 | 13287      | 27.7               | 2327    |
| Double         | yes           | Horizontal            | 6"<br>[152mm]    | 12"<br>[305mm] | 2625                 | 22677      | 38.2               | 3971    |
| Double         | yes           | Horizontal            | 4"<br>[102mm]    | 12"<br>[305mm] | 3349                 | 32067      | 48.8               | 5616    |

**Note:**

1. The Ultimate Load does not include a safety factor and walls have not been evaluated for cyclic design loads.

**Table 9**

Tested Static Wall Shear Values using 16ga. [54mil] or 0.0538" [1.438mm] X 3-5/8" [92mm] flange Steel Studs **24"** [610mm] o.c.

| Sides Sheathed | Strap at Seam | Sheathing Orientation | Fastener Spacing |                | Ultimate Load in plf | G' Lbs./in | Ultimate Load kN/m | G' N/mm |
|----------------|---------------|-----------------------|------------------|----------------|----------------------|------------|--------------------|---------|
|                |               |                       | Perimeter        | Field          |                      |            |                    |         |
| Single         | no            | Vertical              | 8"<br>[203mm]    | 12"<br>[305mm] | 819                  | 5882       | 11.9               | 1030    |
| Single         | no            | Vertical              | 6"<br>[152mm]    | 12"<br>[305mm] | 1201                 | 7736       | 17.5               | 1355    |
| Single         | no            | Vertical              | 4"<br>[102mm]    | 12"<br>[305mm] | 1584                 | 9590       | 23.1               | 1679    |
| Single         | yes           | Horizontal            | 8"<br>[203mm]    | 12"<br>[305mm] | 906                  | 5117       | 13.2               | 896     |
| Single         | yes           | Horizontal            | 6"<br>[152mm]    | 12"<br>[305mm] | 1292                 | 7384       | 18.8               | 1293    |
| Single         | yes           | Horizontal            | 4"<br>[102mm]    | 12"<br>[305mm] | 1679                 | 9590       | 24.5               | 1679    |
| Double         | yes           | Horizontal            | 8"<br>[203mm]    | 12"<br>[305mm] | 1730                 | 11684      | 25.2               | 2046    |
| Double         | yes           | Horizontal            | 6"<br>[152mm]    | 12"<br>[305mm] | 2432                 | 19945      | 35.4               | 3493    |
| Double         | yes           | Horizontal            | 4"<br>[102mm]    | 12"<br>[305mm] | 3135                 | 28207      | 45.7               | 4940    |

**Note:**

1. The Ultimate Load does not include a safety factor and walls have not been evaluated for cyclic design loads.



Subject: Seismic Parameters

Project: 346 43rd St  
 Job No.:  
 Made By: CY  
 Date: 11/20/2019  
 Checked By:

Based on ASCE 7-10 &amp; Section 1613 NYC BC 2014

v1.1

**Seismic Parameters**

## Accelerations

| D     | Site Class | ----                               |
|-------|------------|------------------------------------|
| 0.281 | <b>Ss</b>  | Short Period Spectral Acceleration |
| 0.073 | <b>S1</b>  | 1 Second Spectral Acceleration     |
| 1.57  | <b>Fa</b>  | Short Period Site Coefficient      |
| 2.4   | <b>Fv</b>  | Long Period Site Coefficient       |
| 0.441 | <b>Sms</b> | Adjusted Ss                        |
| 0.175 | <b>Sm1</b> | Adjusted S1                        |
| 0.294 | <b>Sds</b> | Design Ss                          |
| 0.117 | <b>Sd1</b> | Design S1                          |

## Building Period

| Steel moment-resisting frames | Structure Type               |
|-------------------------------|------------------------------|
| 0.028                         | <b>Ct</b>                    |
| 0.800                         | <b>x</b>                     |
| 41.1 ft                       | <b>h</b> Roof Height         |
| 0.55 s                        | <b>Ta</b> Approximate Period |
|                               | <b>T override</b>            |
| 0.55 s                        | <b>T to use</b>              |

T from analysis must be less than  $T_a$  \*  
 Cu from table below

ASCE 7-10 Table 12.8-1

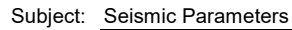
| Sds        | Cu  |
|------------|-----|
| $\geq 0.4$ | 1.4 |
| 0.3        | 1.4 |
| 0.2        | 1.5 |
| 0.15       | 1.6 |
| $\leq 0.1$ | 1.7 |

## Seismic Response Coefficient

|              |                                |                              |                                          |
|--------------|--------------------------------|------------------------------|------------------------------------------|
| 3.5          | <b>R</b>                       | Response Modification Factor | <-ASCE 7-10, steel ordinary moment frame |
| I or II      | <b>Risk Category/Occupancy</b> |                              |                                          |
| 1            | <b>I</b>                       | Seismic Importance Factor    |                                          |
| 0.084        | <b>Cs</b>                      |                              |                                          |
| 0.061        | <b>Cs max</b>                  |                              |                                          |
| 0.013        | <b>Cs min</b>                  |                              |                                          |
| <b>0.061</b> | <b>Cs</b>                      |                              |                                          |

## Seismic Design Category

|   |                                     |
|---|-------------------------------------|
| B | <b>Based on <math>S_{Ds}</math></b> |
| B | <b>Based on <math>S_{D1}</math></b> |



Project: 346 43rd St

Job No.: \_\_\_\_\_

Made By: CY

Date: 11/20/2019

Checked By: \_\_\_\_\_

Floor and roof diaphragms shall be designed to resist design seismic forces from the structural analysis, but shall not be less than that determined in accordance with Eq. 12.10-1 as follows:

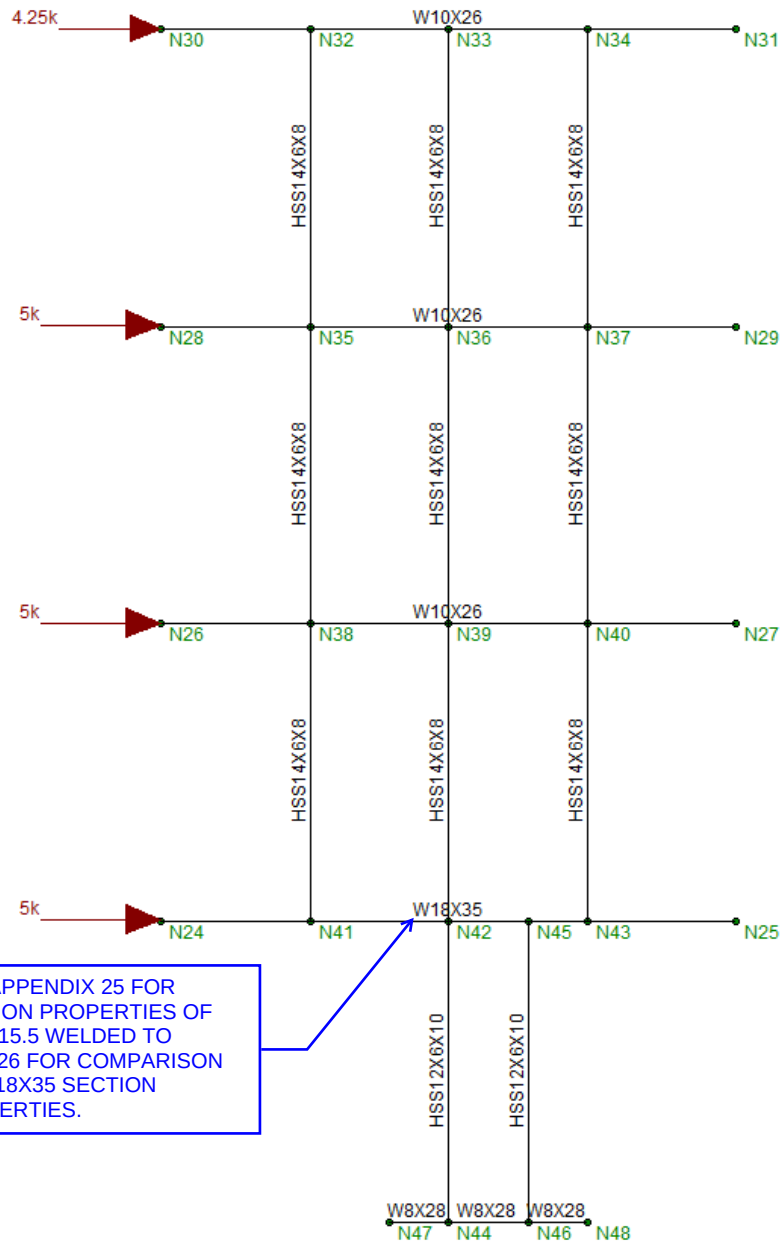
THESE LENGTHS WERE  
ADJUSTED TO ACCOUNT FOR  
ROOF BULKHEAD ABOVE

$$F_{pn} = \frac{\sum_{i=n}^n F_i}{\sum_{i=n}^n w_i} w_{pn} \quad (12.10-1)$$

| Story    | Elev, ft | Height, h <sub>x</sub> | Weight, w <sub>x</sub> | w <sub>x</sub> * h <sub>x</sub> <sup>k</sup> | % Total | F <sub>x</sub> | F <sub>px</sub> | length  | F      | width   | F     |
|----------|----------|------------------------|------------------------|----------------------------------------------|---------|----------------|-----------------|---------|--------|---------|-------|
| ROOF     | 89.1 ft  | 40.1 ft                | 69.8 k                 | 3060.1                                       | 39%     | 6.9 k          | 6.9 k           | 62.7 ft | 6.3 k  | 26.8 ft | 2.7 k |
| 3rd      | 79.1 ft  | 30.1 ft                | 74.6 k                 | 2436.6                                       | 31%     | 5.5 k          | 6.4 k           | 49.7 ft | 9.9 k  | 20.0 ft | 4.0 k |
| 2nd      | 69.1 ft  | 20.1 ft                | 74.6 k                 | 1612.3                                       | 20%     | 3.7 k          | 5.5 k           | 49.7 ft | 9.9 k  | 20.0 ft | 4.0 k |
| 1st      | 59.1 ft  | 10.1 ft                | 74.9 k                 | 802.2                                        | 10%     | 1.8 k          | 4.6 k           | 49.7 ft | 10.0 k | 20.0 ft | 4.0 k |
| bsmt     | 49.0 ft  | 0.0 ft                 |                        | 0.0                                          | 0%      | 0.0 k          | 0.0 k           |         |        |         |       |
|          |          |                        |                        | 0.0                                          | 0%      | 0.0 k          | 0.0 k           |         |        |         |       |
|          |          |                        |                        | 0.0                                          | 0%      | 0.0 k          | 0.0 k           |         |        |         |       |
|          |          |                        |                        | 0.0                                          | 0%      | 0.0 k          | 0.0 k           |         |        |         |       |
|          |          |                        |                        | 0.0                                          | 0%      | 0.0 k          | 0.0 k           |         |        |         |       |
|          |          |                        |                        | 0.0                                          | 0%      | 0.0 k          | 0.0 k           |         |        |         |       |
|          |          |                        |                        | 0.0                                          | 0%      | 0.0 k          | 0.0 k           |         |        |         |       |
|          |          |                        |                        | 0.0                                          | 0%      | 0.0 k          | 0.0 k           |         |        |         |       |
|          |          |                        |                        | 0.0                                          | 0%      | 0.0 k          | 0.0 k           |         |        |         |       |
|          |          |                        |                        | 0.0                                          | 0%      | 0.0 k          | 0.0 k           |         |        |         |       |
| <b>W</b> |          |                        | 293.9 k                | 7911.2                                       | 1.00    | 17.9 k         |                 |         |        |         |       |
| <b>V</b> |          |                        | 17.9 k                 |                                              |         |                | <b>V</b>        | 36.1 k  |        | 14.7 k  |       |

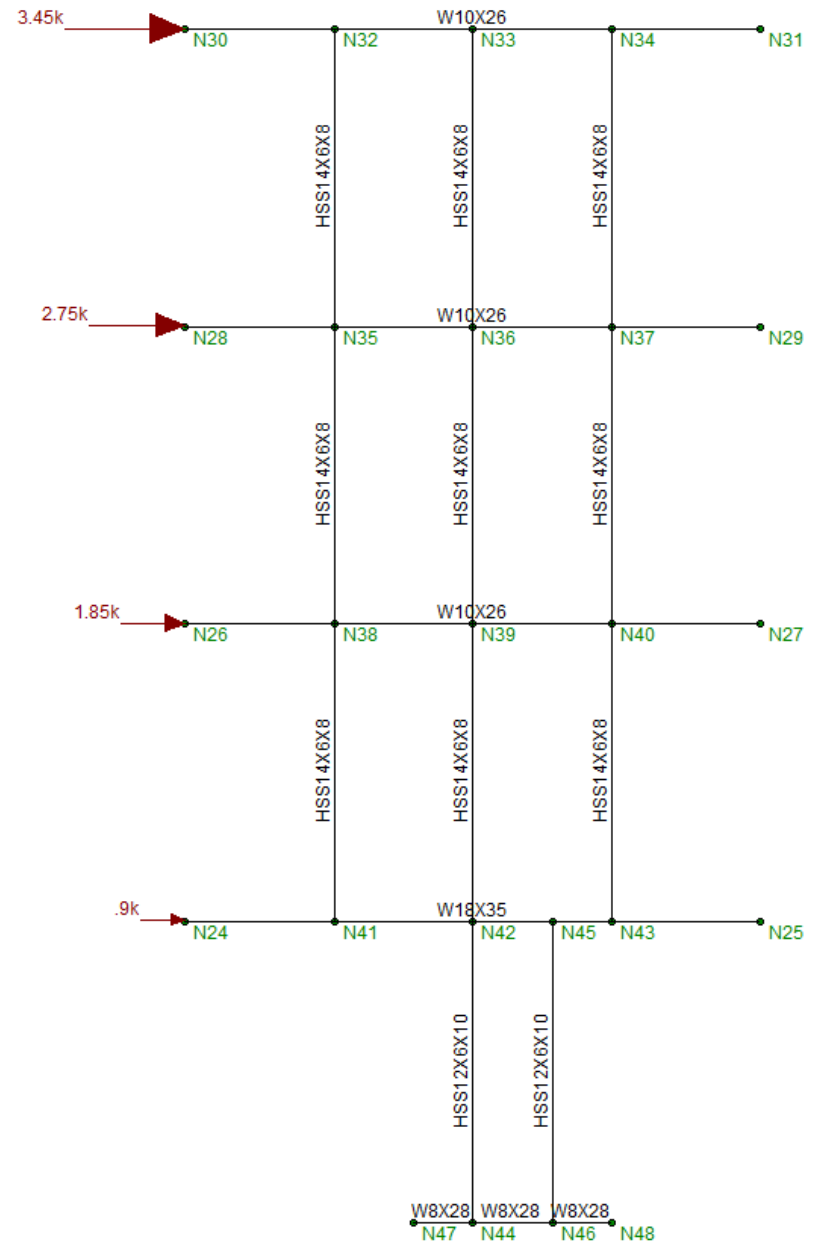
2 of 3

## WIND LOADING

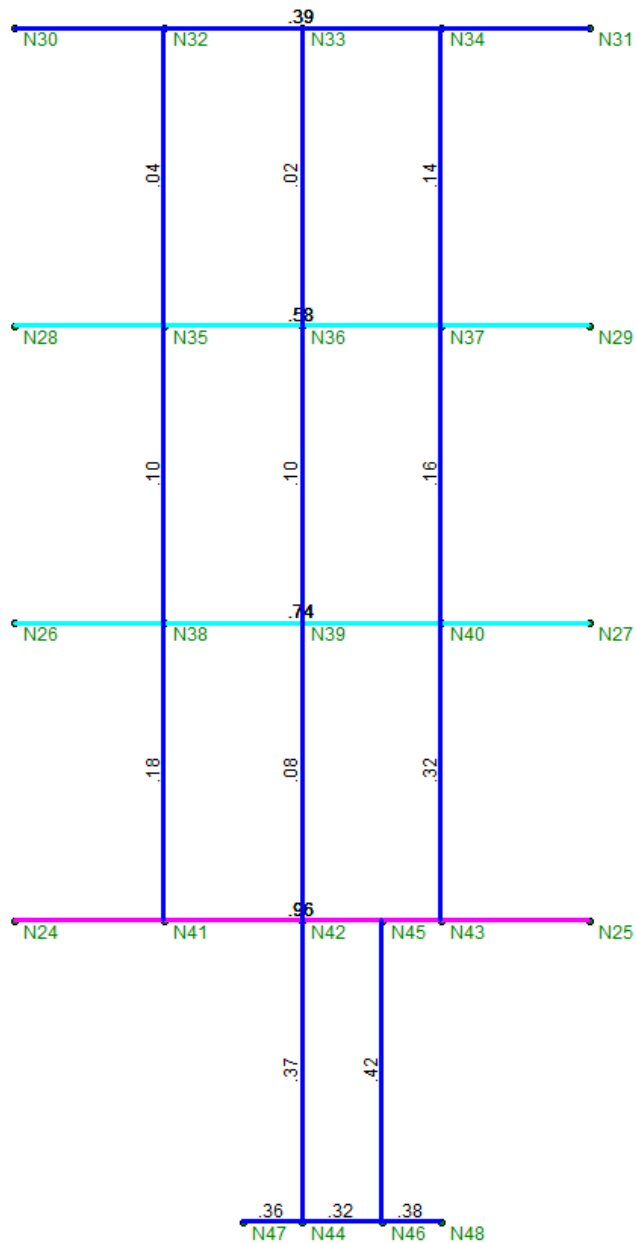


SEE APPENDIX 25 FOR SECTION PROPERTIES OF WT8X15.5 WELDED TO W10X26 FOR COMPARISON TO W18X35 SECTION PROPERTIES.

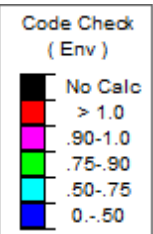
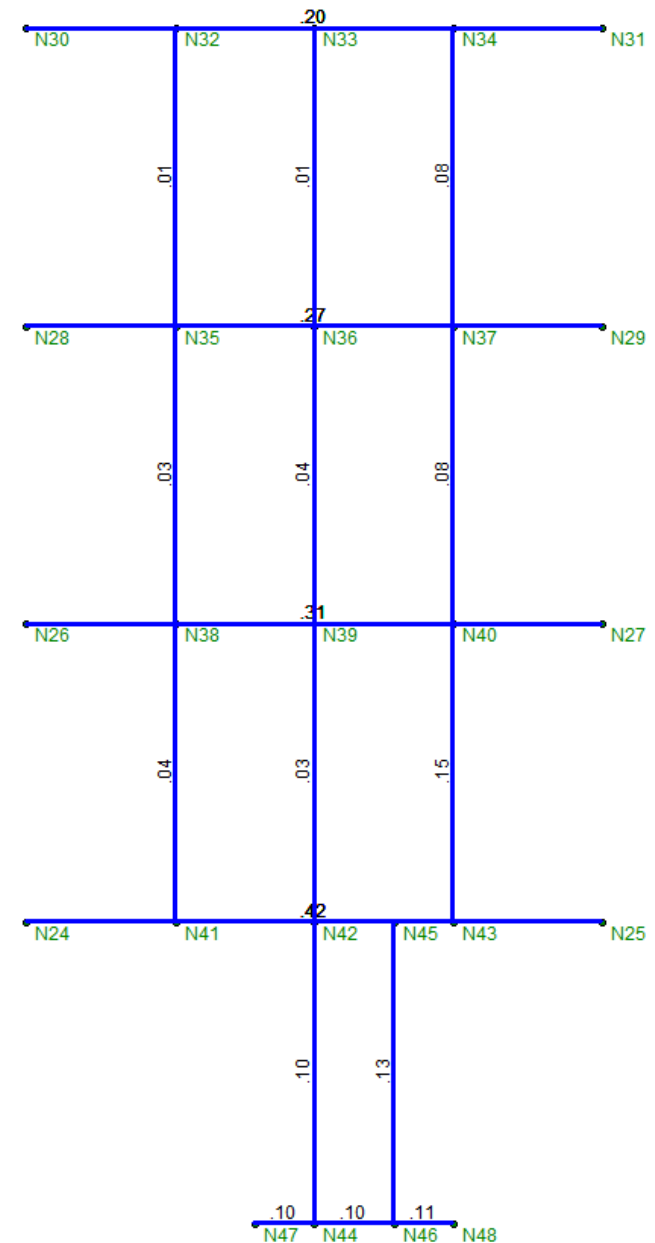
## SEISMIC LOADING



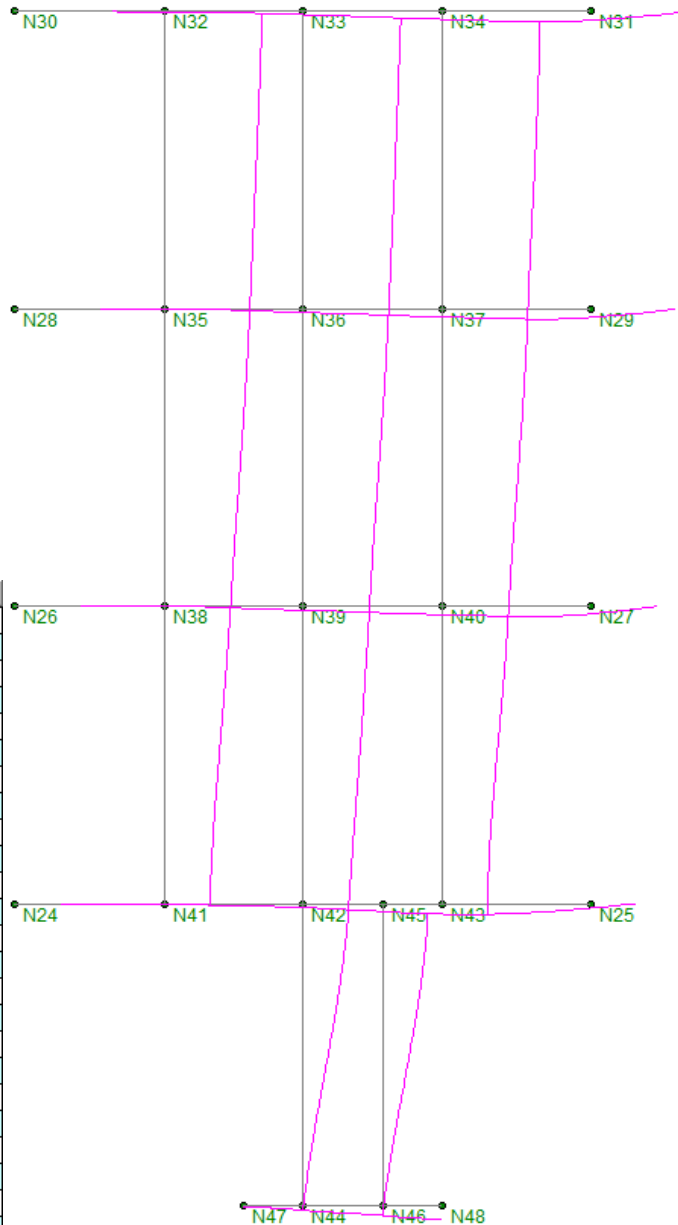
## WIND UNIT



## SEISMIC UNIT



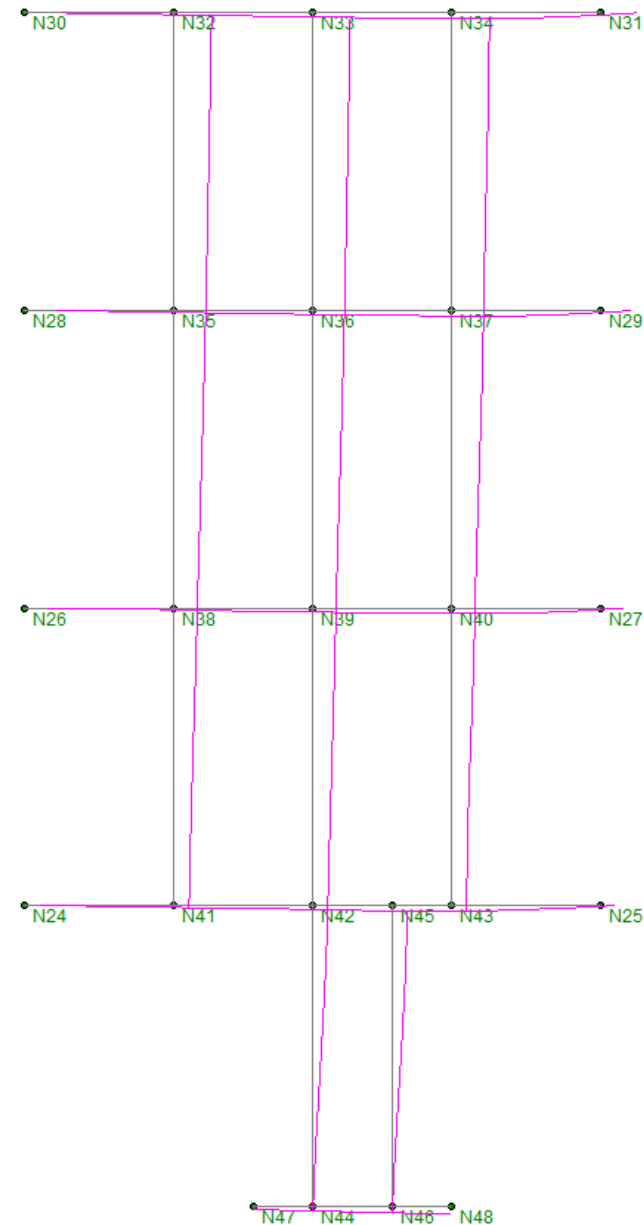
## WIND DRIFT



LC=0.6DL+WL

| L... | Joint Label | X [in] | Y [in] |
|------|-------------|--------|--------|
| 11   | N24         | .463   | 0      |
| 11   | N25         | .46    | 0      |
| 11   | N26         | .671   | 0      |
| 11   | N27         | .667   | 0      |
| 11   | N28         | .865   | 0      |
| 11   | N29         | .862   | 0      |
| 11   | N30         | .99    | 0      |
| 11   | N31         | .986   | 0      |
| 11   | N32         | .988   | -.018  |
| 11   | N33         | .987   | -.063  |
| 11   | N34         | .986   | -.101  |
| 11   | N35         | .864   | -.017  |
| 11   | N36         | .863   | -.063  |
| 11   | N37         | .862   | -.102  |
| 11   | N38         | .67    | -.016  |
| 11   | N39         | .669   | -.061  |
| 11   | N40         | .667   | -.104  |
| 11   | N41         | .462   | -.014  |
| 11   | N42         | .459   | -.059  |
| 11   | N43         | .46    | -.106  |
| 11   | N44         | .001   | -.055  |
| 11   | N45         | .459   | -.102  |
| 11   | N46         | .001   | -.106  |
| 11   | N47         | 0      | -.023  |
| 11   | N48         | 0      | -.141  |

## SEISMIC DRIFT



LC=0.6DL+0.7E

| L... | Joint Label | X [in] | Y [in] |
|------|-------------|--------|--------|
| 12   | N24         | .151   | 0      |
| 12   | N25         | .151   | 0      |
| 12   | N26         | .234   | 0      |
| 12   | N27         | .233   | 0      |
| 12   | N28         | .32    | 0      |
| 12   | N29         | .318   | 0      |
| 12   | N30         | .379   | 0      |
| 12   | N31         | .377   | 0      |
| 12   | N32         | .378   | -.023  |
| 12   | N33         | .377   | -.044  |
| 12   | N34         | .377   | -.056  |
| 12   | N35         | .319   | -.023  |
| 12   | N36         | .319   | -.044  |
| 12   | N37         | .318   | -.056  |
| 12   | N38         | .234   | -.022  |
| 12   | N39         | .233   | -.044  |
| 12   | N40         | .233   | -.056  |
| 12   | N41         | .151   | -.022  |
| 12   | N42         | .15    | -.043  |
| 12   | N43         | .151   | -.057  |
| 12   | N44         | 0      | -.042  |
| 12   | N45         | .15    | -.057  |
| 12   | N46         | 0      | -.059  |
| 12   | N47         | 0      | -.032  |
| 12   | N48         | 0      | -.07   |

### NOTE:

DEFLECTION LIMIT FOR SEISMIC LOADING BASED ON DRAWINGS IS 1", WHICH IS THE STRUCTURAL GAP BETWEEN ADJACENT BUILDINGS. TO ACCOUNT FOR  $C_d = 3$ , STORY DRIFT IN RISA WAS KEPT TO .33" MAX.

\*DESIGN COMPLIANT TO CURRENT 1" BUILDING SEPARATION AS NOTED ON DESIGN DOCUMENTS



Company :  
 Designer :  
 Job Number:

Jan 10, 2020  
 11:01 AM  
 Checked By: \_\_\_\_\_

### Section Properties: Section1

#### Section Information:

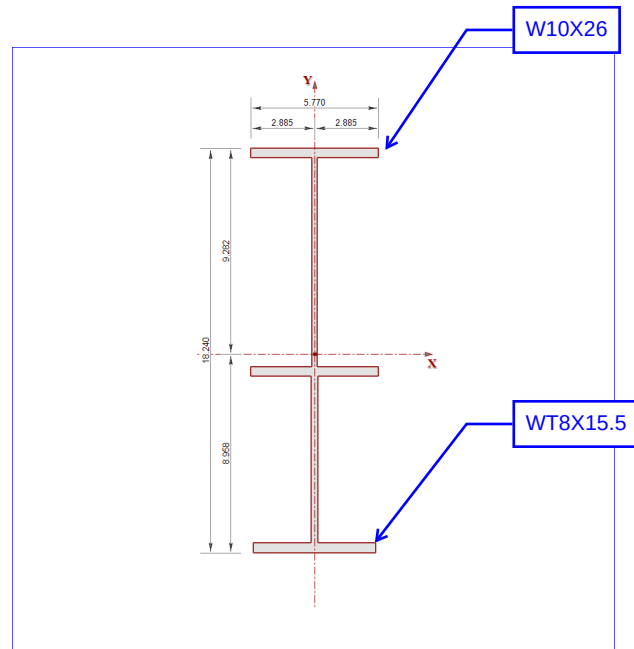
|                  |   |           |
|------------------|---|-----------|
| Material Type    | = | General   |
| Shape Type       | = | Arbitrary |
| Number of Shapes | = | 1         |

#### Basic Properties:

|                          |   |        |    |
|--------------------------|---|--------|----|
| Total Width              | = | 5.770  | in |
| Total Height             | = | 18.240 | in |
| Centroid, X <sub>o</sub> | = | 0.000  | in |
| Centroid, Y <sub>o</sub> | = | -4.132 | in |
| X-Bar (Right)            | = | 2.885  | in |
| X-Bar (Left)             | = | 2.885  | in |
| Y-Bar (Top)              | = | 9.282  | in |
| Y-Bar (Bot)              | = | 8.958  | in |
| Max Thick                | = | 18.240 | in |

#### Equivalent Properties:

|                          |   |        |                 |
|--------------------------|---|--------|-----------------|
| Area, A <sub>x</sub>     | = | 12.023 | in <sup>2</sup> |
| Inertia, I <sub>xx</sub> | = | 512.49 | in <sup>4</sup> |
| Inertia, I <sub>yy</sub> | = | 20.315 | in <sup>4</sup> |
| Inertia, I <sub>xy</sub> | = | -0.000 | in <sup>4</sup> |
| S <sub>x</sub> (Top)     | = | 55.216 | in <sup>3</sup> |
| S <sub>x</sub> (Bot)     | = | 57.207 | in <sup>3</sup> |
| S <sub>y</sub> (Left)    | = | 7.042  | in <sup>3</sup> |
| S <sub>y</sub> (Right)   | = | 7.042  | in <sup>3</sup> |
| r <sub>x</sub>           | = | 6.529  | in              |
| r <sub>y</sub>           | = | 1.300  | in              |
| Plastic Z <sub>x</sub>   | = | 64.884 | in <sup>3</sup> |
| Plastic Z <sub>y</sub>   | = | 10.989 | in <sup>3</sup> |
| Torsional J              | = | 0.591  | in <sup>4</sup> |
| As-xx Def                | = | 1.000  |                 |
| As-yy Def                | = | 1.000  |                 |
| As-xx Stress             | = | 1.000  |                 |
| As-yy Stress             | = | 1.000  |                 |



Section Diagram

SECTION PROPERTIES OF WT8X15.5 WELDED TO W10X26. ARE COMPARABLE TO SECTION PROPERTIES OF W18X35 ON FOLLOWING SHEET.

Company :  
Designer :  
Job Number:

Jan 10, 2020  
11:04 AM  
Checked By: \_\_\_\_\_

### Section Properties: Section3

#### Section Information:

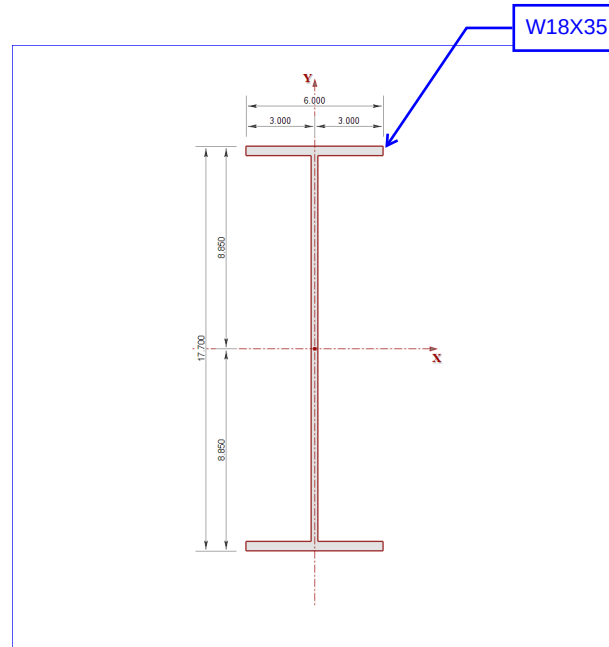
|                  |   |           |
|------------------|---|-----------|
| Material Type    | = | General   |
| Shape Type       | = | Arbitrary |
| Number of Shapes | = | 1         |

#### Basic Properties:

|                          |   |        |    |
|--------------------------|---|--------|----|
| Total Width              | = | 6.000  | in |
| Total Height             | = | 17.700 | in |
| Centroid, X <sub>o</sub> | = | 0.000  | in |
| Centroid, Y <sub>o</sub> | = | 0.000  | in |
| X-Bar (Right)            | = | 3.000  | in |
| X-Bar (Left)             | = | 3.000  | in |
| Y-Bar (Top)              | = | 8.850  | in |
| Y-Bar (Bot)              | = | 8.850  | in |
| Max Thick                | = | 0.425  | in |

#### Equivalent Properties:

|                          |   |            |                 |
|--------------------------|---|------------|-----------------|
| Area, A <sub>x</sub>     | = | 10.300     | in <sup>2</sup> |
| Inertia, I <sub>xx</sub> | = | 510.00     | in <sup>4</sup> |
| Inertia, I <sub>yy</sub> | = | 15.300     | in <sup>4</sup> |
| Inertia, I <sub>xy</sub> | = | 0.000      | in <sup>4</sup> |
| S <sub>x</sub> (Top)     | = | 57.627     | in <sup>3</sup> |
| S <sub>x</sub> (Bot)     | = | 57.627     | in <sup>3</sup> |
| S <sub>y</sub> (Left)    | = | 5.100      | in <sup>3</sup> |
| S <sub>y</sub> (Right)   | = | 5.100      | in <sup>3</sup> |
| r <sub>x</sub>           | = | 7.037      | in              |
| r <sub>y</sub>           | = | 1.219      | in              |
| Plastic Z <sub>x</sub>   | = | 66.500     | in <sup>3</sup> |
| Plastic Z <sub>y</sub>   | = | 8.060      | in <sup>3</sup> |
| Torsional J              | = | <No Calc.> |                 |
| As-xx Def                | = | 1.000      |                 |
| As-yy Def                | = | 1.000      |                 |
| As-xx Stress             | = | 1.000      |                 |
| As-yy Stress             | = | 1.000      |                 |



Section Diagram

SECTION PROPERTIES OF  
W18X35

PROJECT 346 43RD STREET

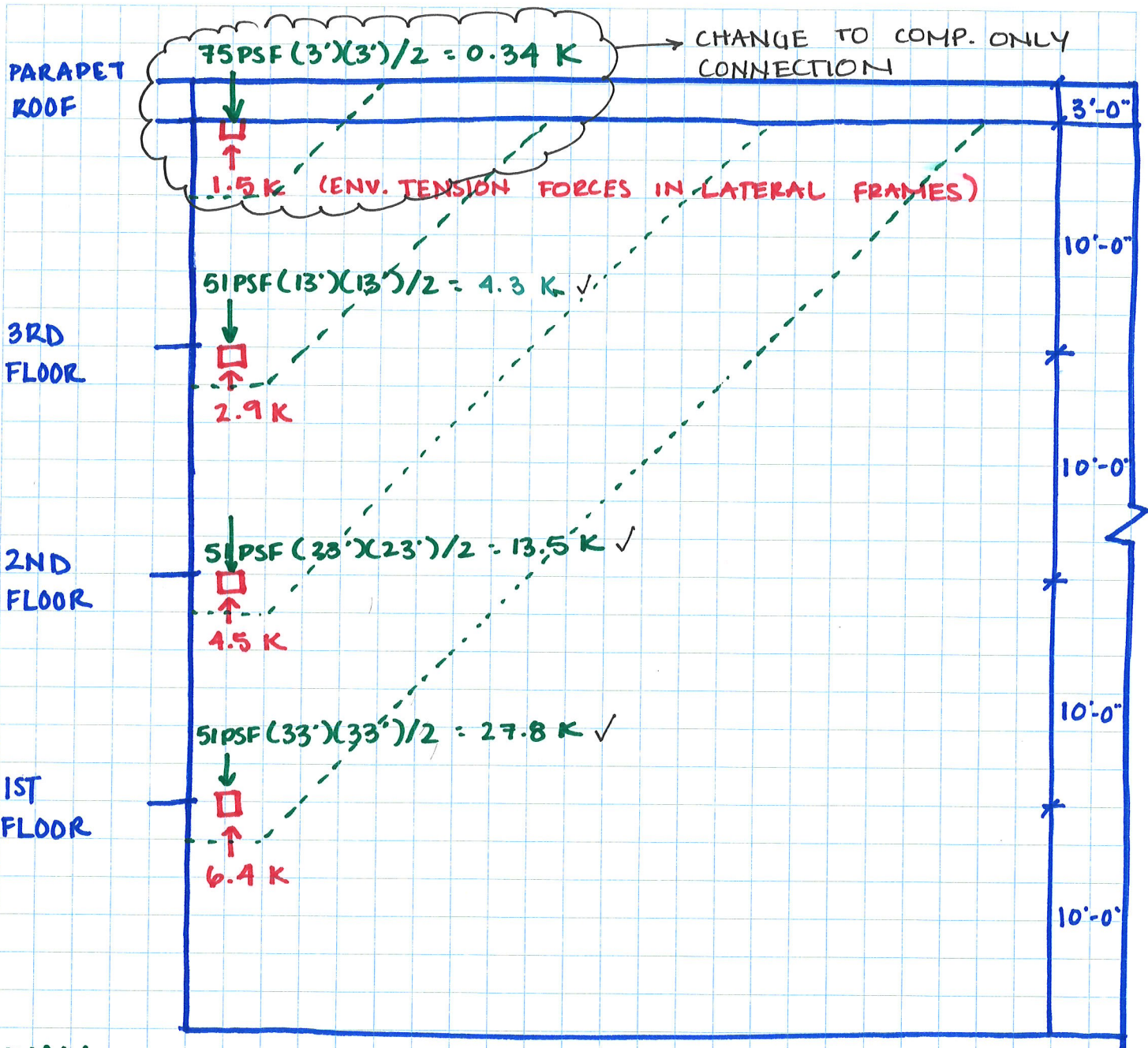
PROJECT NO. 19248

PAGE 1/2

SUBJECT UPLIFT @ LATERAL FRAMES

BY ALW

DATE 01/10/2020



### WALL

8" CMU LW GROUT @ 24" = 51 PSF

### PARAPET

8" CMU LW FULLY GROUTED = 75 PSF

PROJECT 346 43RD STREET

PROJECT NO. 19248

PAGE 2/2

SUBJECT UPLIFT @ LATERAL FRAMES BY ALW

DATE 01/10/2020

REDISTRIBUTION OF FORCES W/ COMP. ONLY CONNECTION @ ROOF

PARAPET  
ROOF

$0.34 \text{ K} > 0 \text{ K} \checkmark$   
↓  
↑  
 $0 \text{ K}$

3RD  
FLOOR

$4.3 \text{ K} > 3.2 \text{ K} \checkmark$   
↓  
↑  
 $3.2 \text{ K}$

2ND  
FLOOR

$13.5 \text{ K} > 4.9 \text{ K} \checkmark$   
↓  
↑  
 $4.9 \text{ K}$

1ST  
FLOOR

$27.8 \text{ K} > 7.2 \text{ K} \checkmark$   
↓  
↑  
 $7.2 \text{ K}$

RISA REACTIONS WITH  
COMPRESSION ONLY  
CONNECTION AT ROOF  
LEVEL

