

## Structural Calculations

Project #21174

### Lee's Summit Mo' Betta's

Lee's Summit, Missouri

Prepared For:

Babcock Design  
Attn: Lou Phung, Jamin Kunz, and ShaeLee Rasmussen  
52 Exchange Place  
Salt Lake City, UT 84111



**Structural Calculations**  
**Project #21174**

**Lee's Summit Mo' Betta's**

**Babcock Design**

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# 1. DESIGN CRITERIA

## Project Information

|                      |                                                |
|----------------------|------------------------------------------------|
| Address / Location * | = Northwest Chipman Road & Northwest Ward Road |
| City (County)        | = Lee's Summit (Jackson)                       |
| State, Zip code      | = Missouri, 64063                              |

## Jurisdiction

|                                  |                                          |
|----------------------------------|------------------------------------------|
| Jurisdiction                     | = #N/A                                   |
| Building Code                    | = Utah Administrative Code (UAC) HB310   |
| Model Building Code              | = International Building Code 2018       |
| Use and occupancy classification | = Business (B)                           |
| Risk Category                    | = Not occupancy categories I, III, or IV |

## Environmental load parameters

### Earthquake

|                     |             |                             |
|---------------------|-------------|-----------------------------|
| Mapped short period | Ss= 0.099 g | 2018 IBC Figure 1613.2.1(1) |
| Mapped 1-sec period | S1= 0.068 g | 2018 IBC Figure 1613.2.1(2) |
| Site class          | = D         | 2018 IBC §1613.3.2          |

### Wind

|                             |               |                           |
|-----------------------------|---------------|---------------------------|
| Ult. design wind speed      | Vult= 103 mph | 2018 IBC Figure 1609.3(1) |
| Exposure category           | = C           | 2018 IBC §1609.4.3        |
| Roof slope                  | = 0:12        | 0 deg                     |
| Base elevation of structure | = 0:12 ft     |                           |
| Roof type                   | = All others  |                           |

### Snow

|                           |            |              |
|---------------------------|------------|--------------|
| Elevation above sea level | = 998 ft   |              |
| Ground snow load          | Pg= 20 psf | Jurisdiction |



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## 2.1 LOADS - SNOW LOADS

### Ground snow loads

(ASCE 7-16 Ch. 7.2)

|                  |     |                 |
|------------------|-----|-----------------|
| Basis            | =   | Outside of Utah |
| County           | =   | Jackson         |
| Elevation        | =   | 998 ft          |
| Ground snow load | Pg= | 20 psf          |

### Flat snow loads

(ASCE 7-16 Ch. 7.3)

|                          |     |                                                                            |
|--------------------------|-----|----------------------------------------------------------------------------|
| Basis                    | =   | Outside of Utah                                                            |
| Roof exposure definition | =   | Not fully exposed or sheltered                                             |
| Roof exposure            | =   | Partially Exposed                                                          |
| Terrain category (wind)  | =   | C                                                                          |
| Snow Exposure factor     | Ce= | 1                                                                          |
| Roof thermal condition   | =   | Not just kept above freezing, unheated, kept below freezing, or greenhouse |
| Thermal factor           | Ct= | 1 ASCE 7-16 Table 7.3-2                                                    |
| Risk category            | =   | II 2018 IBC Table 1604.5                                                   |
| Snow importance factor   | Is= | 1 ASCE 7-16 Table 1.5-2                                                    |
| Flat roof snow load      | Pf= | 14 psf ASCE 7-16 Eq 7.3-1                                                  |

### Sloped roof snow loads

(ASCE 7-16 Ch. 7.4)

|                                 |        |                                                                                                       |
|---------------------------------|--------|-------------------------------------------------------------------------------------------------------|
| Basis                           | =      | Outside of Utah                                                                                       |
| Roof surface                    | =      | Non-Slippery (Asphalt shingles, wood shingles, shakes, aggregate or mineral granule surface membrane) |
| Roof slope                      | =      | 0                                                                                                     |
| Roof temperature classification | =      | Warm                                                                                                  |
| Roof slope factor               | Cs=    | 1 ASCE 7-16 §7.4                                                                                      |
| Eave snow load                  | Peave= | psf                                                                                                   |
| Balanced snow load              | Ps=    | 14 psf ASCE 7-16 Eq 7.4-1                                                                             |

### Drifts on lower roofs (aerodynamic shade)

(ASCE 7-16 Ch. 7.8)

|                                       |     |                               |
|---------------------------------------|-----|-------------------------------|
| 1. Drift surcharge                    |     |                               |
| Vertical distance to adjacent surface | =   | 14.25 ft ASCE 7-16 Fig. 7.8-2 |
| Upper roof length                     | Lu= | 36 ft ASCE 7-16 Fig. 7.8-2    |
| Lower surface length                  | LI= | 4 ft ASCE 7-16 Fig. 7.8-2     |



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|                                     |               |                |
|-------------------------------------|---------------|----------------|
| Snow drift surcharge load (average) | Pd= 30.26 psf | ASCE 7-16 §7.8 |
| Design drift width                  | w= 4 ft       | ASCE 7-16 §7.8 |
| Drift load plus balanced snow       | P= 44.26 psf  | ASCE 7-16 §7.8 |

## 2. Drift surcharge

|                                       |                |                      |
|---------------------------------------|----------------|----------------------|
| Vertical distance to adjacent surface | = 14.666 ft    | ASCE 7-16 Fig. 7.8-2 |
| Upper roof length                     | Lu= 75.5 ft    | ASCE 7-16 Fig. 7.8-2 |
| Lower surface length                  | Ll= 11.833 ft  | ASCE 7-16 Fig. 7.8-2 |
| Snow drift surcharge load (average)   | Pd= 45.706 psf | ASCE 7-16 §7.8       |
| Design drift width                    | w= 11.013 ft   | ASCE 7-16 §7.8       |
| Drift load plus balanced snow         | P= 59.706 psf  | ASCE 7-16 §7.8       |

## Roof Projections and Parapets

(ASCE 7-16 Ch. 7.8)

### 1. Parapet snow load

|                                        |               |                      |
|----------------------------------------|---------------|----------------------|
| Height of parapet                      | = 5.5 ft      | ASCE 7-16 Fig. 7.8-2 |
| Clear height to top of parapet         | Hc= 4.6566 ft | ASCE 7-16 Fig. 7.8-2 |
| Roof length (upwind of the projection) | L= 82 ft      | ASCE 7-16 Fig. 7.8-2 |
| Windward drift height                  | Hd= 2.154 ft  | ASCE 7-16 Fig. 7.8-2 |
| Design drift height                    | Hd= 2.154 ft  | ASCE 7-16 Fig. 7.8-2 |
| Design drift width                     | w= 8.6162 ft  | ASCE 7-16 §7.8       |
| Drift load plus balanced snow          | P= 49.757 psf | ASCE 7-16 §7.8       |

### 2. Parapet snow load

|                                        |               |                      |
|----------------------------------------|---------------|----------------------|
| Height of parapet                      | = 4.5 ft      | ASCE 7-16 Fig. 7.8-2 |
| Clear height to top of parapet         | Hc= 3.6566 ft | ASCE 7-16 Fig. 7.8-2 |
| Roof length (upwind of the projection) | L= 82 ft      | ASCE 7-16 Fig. 7.8-2 |
| Windward drift height                  | Hd= 2.154 ft  | ASCE 7-16 Fig. 7.8-2 |
| Design drift height                    | Hd= 2.154 ft  | ASCE 7-16 Fig. 7.8-2 |
| Design drift width                     | w= 8.6162 ft  | ASCE 7-16 §7.8       |
| Drift load plus balanced snow          | P= 49.757 psf | ASCE 7-16 §7.8       |

## Manual snow loads

(Estimated)

|                     | Snow Load | Description |
|---------------------|-----------|-------------|
| 1. Manual snow load | P= 20 psf | Live Roof   |
| 2. Manual snow load | P= 48 psf | 0           |
| 3. Manual snow load | P= 0 psf  | 0           |



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## 2.2 LOADS - LOAD SETS

### Roof dead loads

(2018 IBC 1606, ASCE 7-16 Table C3-1)

|                        |                |    |     |                      |
|------------------------|----------------|----|-----|----------------------|
| Adhered Membrane       | =              | 2  | psf | Estimated            |
| OBS Sheathing (15/32") | =              | 1  | psf | ASCE 7-16 Table C3-1 |
| Mechanical             | =              | 2  | psf | Estimated            |
| 4" Rigid Insulation    | =              | 6  | psf | Estimated            |
| 11-7/8" I-Joists       | =              | 2  | psf | Estimated            |
| 1/2 Gyp board          |                | 2  | psf | ASCE 7-16 Table C3-1 |
| Misc.                  |                | 1  | psf | Estimated            |
| Roof DL No.1           | <b>Total =</b> | 17 | psf |                      |

### Floor dead loads

(2018 IBC 1606, ASCE 7-16 Table C3-1)

|                          |                |    |     |                      |
|--------------------------|----------------|----|-----|----------------------|
| OBS Sheathing (23/32")   | =              | 2  | psf | ASCE 7-16 Table C3-1 |
| 11-7/8" I-Joists         | =              | 2  | psf | Estimated            |
| Seismic Partition walls  | =              | 5  | psf | Estimated            |
| Finished Flooring        | =              | 2  | psf | Estimated            |
| 1/2 Gyp board            | =              | 2  | psf | ASCE 7-16 Table C3-1 |
| Mechanical               | =              | 2  | psf | Estimated            |
| 1" Gypcrete              | =              | 9  | psf | ASCE 7-16 Table C3-1 |
| Fibrous glass Insulation | =              | 1  | psf | ASCE 7-16 Table C3-1 |
| Floor DL No.1            | <b>Total =</b> | 26 | psf |                      |

### Wall dead loads

(2018 IBC 1606, ASCE 7-16 Table C3-1)

|                                             |   |    |     |                      |
|---------------------------------------------|---|----|-----|----------------------|
| Interior stud walls                         | = | 12 | psf | ASCE 7-16 Table C3-1 |
| Exterior 2x6 @ 16-in, 5/8" gypsum, insulate | = | 12 | psf | ASCE 7-16 Table C3-1 |
| Exterior stud walls with brick veneer       | = | 40 | psf | Estimated            |

### Roof live loads

(2018 IBC 1606, ASCE 7-16 Table C3-1)

|                              | Unif.    | Conc.  | Ref.                  |
|------------------------------|----------|--------|-----------------------|
| Roof (ordinary construction) | = 20 psf | 300 lb | 2018 IBC Table 1607.1 |

### Floor live loads

(2018 IBC 1606, ASCE 7-16 Table C3-1)

|                                 | Unif.     | Conc.  | Ref.                  |
|---------------------------------|-----------|--------|-----------------------|
| Residential (1-2 unit dwelling) | = 40 psf  | 0 lb   | 2018 IBC Table 1607.1 |
| Stairs and exits                | = 100 psf | 300 lb | 2018 IBC Table 1607.1 |



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Manual Snow 1 = 20 0 Live Roof

### Load Sets

| Live Load (occupancy or use)    | (psf) | Dead Load     | (psf) | Abbrev.   |
|---------------------------------|-------|---------------|-------|-----------|
| Flat roof snow load             | 14    | Roof DL No.1  | 17    | S 14 17   |
| Residential (1-2 unit dwelling) | 40    | Floor DL No.1 | 26    | L 40 26   |
| Assembly                        | 100   | Floor DL No.1 | 26    | A 100 26  |
| Stairs and exits                | 100   | Floor DL No.1 | 26    | Ex 100 26 |
| Corridor                        | 100   | Floor DL No.1 | 26    | Co 100 26 |
| Deck                            | 60    | Floor DL No.1 | 26    | De 60 26  |
| Manual Snow 1                   | 20    | Roof DL No.1  | 17    | Lr 20 17  |



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## 2.3 LOADS - SEISMIC

### Seismic Design Criteria

(2018 IBC 1613.3, ASCE 7-16 Chap. 11)

#### Mapped acceleration parameters

|                        |   |         |
|------------------------|---|---------|
| Mapped short period    | = | 0.099 g |
| Mapped 1.0 sec. period | = | 0.068 g |

#### Design acceleration Parameters

|                             |   |       |                               |
|-----------------------------|---|-------|-------------------------------|
| Site class                  | = | D     | 2018 IBC §1613.3.2            |
| Site coefficient            | = | 1.672 | 2018 IBC Table 1613.3.3(1)    |
| Site coefficient            | = | 2.445 | 2018 IBC Table 1613.3.3(2)    |
| Adjusted short period       | = | 0.166 | 2018 IBC §1613.3.3 Eq. 16-37  |
| Adjusted 1.0 sec period     | = | 0.166 | 2018 IBC §1613.3.3 Eq. 16-38  |
| Design short period         | = | 0.110 | 2018 IBC §1613.3.4 Eq. 16-39  |
| Design 1.0 sec period       | = | 0.111 | 2018 IBC §1613.3.4 Eq. 16-40  |
| Risk Category               | = | II    | 2018 IBC Table 1604.5         |
| IBC Seismic design category | = | B     | 2018 IBC Table 1613.3.5(1, 2) |

### Equivalent Lateral Force Procedure

(ASCE 7-16 Chap. 12.8)

|                                | Primary LFRS                                                                                                  |
|--------------------------------|---------------------------------------------------------------------------------------------------------------|
| Basic structural system        | = A. Bearing Wall Systems                                                                                     |
| Seismic force-resisting system | = 15. Light frame walls sheathed with wood structural panels rated for shear resistance or shear panels (wood |

#### Structural design parameters

|                                 |     |       |                          |
|---------------------------------|-----|-------|--------------------------|
| Horiz. Combination of LRFS      | =   | 0     | ASCE 7-16 §12.2.2-12.2.3 |
| Response modification factor    | R=  | 6.5   | ASCE 7-16 Table 12.2-1   |
| System overstrength factor      | Ω=  | 3     | ASCE 7-16 Table 12.2-1   |
| Deflection amplification factor | Cd= | 4     | ASCE 7-16 Table 12.2-1   |
| Building height limit           | =   | NL ft | ASCE 7-16 Table 12.2-1   |

#### Fundamental period

|                                |     |                              |      |                        |
|--------------------------------|-----|------------------------------|------|------------------------|
| Structure type                 | =   | All other structural Systems |      |                        |
| Approximate period parameter   | Ct= | 0.02                         |      | ASCE 7-16 Table 12.8-2 |
| Approximate period parameter   | x=  | 0.75                         |      | ASCE 7-16 Table 12.8-2 |
| Height above base              | hn= | 18.5                         | ft   | ASCE 7-16 §12.8.2.1    |
| Approximate fundamental period | Ta= | 0.18                         | sec. | ASCE 7-16 Eq. 12.8-7   |
| Approximate fundamental freq.  | n=  | 5.61                         | hz   |                        |
| Long period transition period  | TL= | 12                           | sec. | ASCE 7-16 Figure 22-12 |
| Structure period exponent      | k=  | 1                            |      | ASCE 7-16 §12.8.3      |

#### Seismic base shear



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|                                 |                    |                             |
|---------------------------------|--------------------|-----------------------------|
| Seismic importance factor       | $I_e = 1$          | ASCE 7-16 Table 1.5-2       |
| Seismic response coefficient    | $C_{smin} = 0.010$ | ASCE 7-16 Eq. 12.8-5-12.8-6 |
| Seismic response coefficient    | $C_{smax} = 0.096$ | ASCE 7-16 Eq. 12.8-3-12.8-4 |
| Seismic response coefficient    | $C_s = 0.017$      | ASCE 7-16 Eq. 12.8-2        |
| Seismic base shear (LRFD Total) | $V = 0 \text{ k}$  | ASCE 7-16 Eq. 12.8-1        |



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### Dead loads

(2018 IBC 1606, ASCE 7-16 Chap. 12.7.2, Table C3-1)

|                                             |   |    |     |                   |
|---------------------------------------------|---|----|-----|-------------------|
| Effective seismic snow weight               | = | 0  | psf | ASCE 7-16 §12.7.2 |
| Roof DL No.1                                | = | 17 | psf |                   |
| Floor DL No.1                               | = | 26 | psf |                   |
| Interior stud walls                         | = | 12 | psf |                   |
| Exterior 2x6 @ 16-in, 5/8" gypsum, insulate | = | 12 | psf |                   |
| Exterior stud walls with brick veneer       | = | 40 | psf |                   |

### Weight Parameters

| Level         | Exterior Wall     |               |               | Roof      |              | Floor     |              | Total(N-S)    |
|---------------|-------------------|---------------|---------------|-----------|--------------|-----------|--------------|---------------|
|               | Trib. Height (ft) | Wall Per (ft) | Veneer P (ft) | Area (sf) | Weight (psf) | Area (sf) | Weight (psf) | Weight (lbs)  |
| 1             | 8                 | 0             | 245           | 0         | 17           | 0         | 26           | 78400         |
| <b>Total=</b> |                   |               |               |           |              |           |              | <b>78,400</b> |

### Seismic Lateral Loads

(ASCE 7-16 Chap. 12.8.3)

| Level | Height (ft) | Floor (in) | Hx <sup>k</sup> (ft) | Cvx | Fx (lb) | Vx (Shear walls) |          |
|-------|-------------|------------|----------------------|-----|---------|------------------|----------|
|       |             |            |                      |     |         | LRFD (lb)        | ASD (lb) |
| 1     | 16.0        | 30.0       | 16.0                 | 1.0 | 1.3     | 1.3              | 0.9      |



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## 2.4 LOADS - WIND

### Design wind pressure

(2018 IBC 1606, ASCE 7-16 Chap. 26)

#### Terrain exposure

|                            |   |                                                                                                                             |
|----------------------------|---|-----------------------------------------------------------------------------------------------------------------------------|
| Surface roughness (upwind) | = | Open terrain with scattered obstructions having heights generally less than 30 ft. This category includes flat open country |
| Exposure category          | = | C 2018 IBC §1609.4.                                                                                                         |
| Terrain exp. Constant      | = | 9.5 ASCE 7-16 Table 26.11-1                                                                                                 |
| Terrain exp. Constant      | = | 900 ft ASCE 7-16 Table 26.11-1                                                                                              |
| Terrain exp. Constant      | = | 15 ft ASCE 7-16 Table 26.11-1                                                                                               |
| Topographic factor         | = | 1 ASCE 7-16 §26.8                                                                                                           |

#### Basic wind pressure

|                            |   |                                            |
|----------------------------|---|--------------------------------------------|
| Ultimate design wind speed | = | 103 mph ATC Hazards Map or 2018 IBC Figure |
| Structure type             | = | Building - MWFRS                           |
| Wind directionality factor | = | 0.85 ASCE 7-16 Table 26.6-1                |
| Risk category              | = | II 2018 IBC Table 1604.5                   |

|                           |   |                                                                                             |
|---------------------------|---|---------------------------------------------------------------------------------------------|
| Approx. fundamental freq. | = | 5.6 hz                                                                                      |
| Structure type            | = | Rigid ASCE 7-16 §26.2                                                                       |
| Gust effect factor        | = | 0.85 ASCE 7-16 §26.11                                                                       |
| Enclosure                 | = | A building where $A_o$ is less than the smaller of $0.01A_g$ or 4 sq ft and $A_{oi}/A_{gi}$ |
| Enclosure classification  | = | Enclosed ASCE 7-16 §26.12                                                                   |
| Internal pressure coeff.  | = | 0.18 ASCE 7-16 §26.13                                                                       |
| Velocity pressure         | = | 19.2 psf                                                                                    |

#### Elevation Geometry

| Level | Trib. Height (ft) | Horiz. Dim. (ft) |      | Max roof Elev. (ft) | Front Proj. A (sf) |        | Side Proj. A (sf) |        |
|-------|-------------------|------------------|------|---------------------|--------------------|--------|-------------------|--------|
|       |                   | Front            | Side |                     | Gable              | Sloped | Gable             | Sloped |

#### Directional Procedure

(ASCE 7-16 Chap. 27)

| Method used for MWFRS: |            |           |               |               | Directional Procedure |           |               |               |
|------------------------|------------|-----------|---------------|---------------|-----------------------|-----------|---------------|---------------|
| Level                  | Front      |           |               |               | Side                  |           |               |               |
|                        | Walls (lb) | Roof (lb) | Fx (ASD) (lb) | Vx (ASD) (lb) | Walls (lb)            | Roof (lb) | Fx (ASD) (lb) | Vx (ASD) (lb) |
| 1                      | 8          | 0         | 8             | 8             | 3                     | 0         | 3             | 3             |



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### Components and cladding

(ASCE 7-10 Chap. 30.4)

|                                               |                              |                   |
|-----------------------------------------------|------------------------------|-------------------|
| Roof mean height                              | h= 16 ft                     | ASCE 7-16 §26.3   |
| Total height to top of wall                   | h(w)= 16 ft                  |                   |
| Effective wind area (component)               | A <sub>eff</sub> = 96.667 sf | ASCE 7-16 §26.2   |
| <b>Design Wall C&amp;C pressures (ASD)</b>    |                              |                   |
| End zones                                     | p= 14.163 psf                | ASCE 7-16 §30.2.2 |
| Interior zones                                | p= 12.715 psf                | ASCE 7-16 §30.2.2 |
| <b>Design Parapet C&amp;C pressures (ASD)</b> |                              |                   |
| Parapet height                                | = 7 ft                       |                   |
| Is par. Ht. at least 3' around bldg?          | = Yes                        |                   |
| <b>Windward Parapet (Load Case A)</b>         |                              |                   |
| End and Interior zones                        | p= 32.089 psf                | ASCE 7-16 §30.8   |
| <b>Leeward Parapet (Load Case B)</b>          |                              |                   |
| End zones                                     | p= 27.771 psf                | ASCE 7-16 §30.8   |
| Interior zones                                | p= 26.208 psf                | ASCE 7-16 §30.8   |



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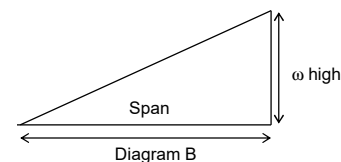
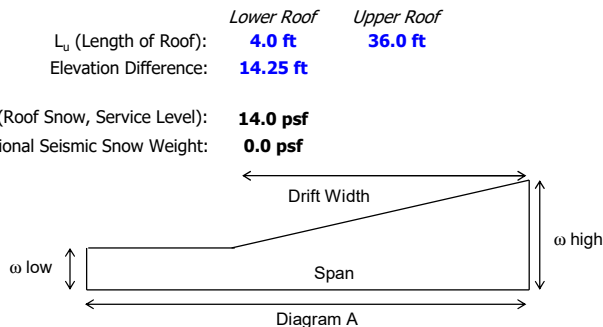
Leeward and Windward Snow Drift Based on ASCE 7-16

Sht Number: **GD-**  
Job Number: **21174**  
Date: **1/14/2022**  
By: **GN**

Project: **Project name here**  
Description: **Typical Snow Load and Drift**

### GENERAL INPUT AND OUTPUT:

|                               |                |               |                  |                                                   |                 |
|-------------------------------|----------------|---------------|------------------|---------------------------------------------------|-----------------|
| City: <b>Lee's Summit</b>     |                | Load Factors: |                  | Snow Load Density $\gamma$ : 16.60 pcf            |                 |
| Is project in Utah?           | <b>No</b>      | DL            | <b>1.00</b>      | SL                                                | <b>1.00</b>     |
| Elevation at Site:            | <b>1000 ft</b> |               |                  |                                                   |                 |
| $p_g$ (SEAU Ground Snow Load) | 20.0 psf       | <b>20 psf</b> | <---Manual Entry |                                                   |                 |
| $C_e$ (Exposure Factor):      | <b>1.0</b>     |               |                  | Windward                                          | Leeward         |
| $C_t$ (Thermal Factor):       | <b>1.0</b>     |               |                  | h <sub>d</sub> (Potential Drift Height):          | 0.92 ft         |
| $I_s$ (Importance Factor):    | <b>1.0</b>     |               |                  | Maximum Drift Height:                             | 0.92 ft         |
|                               |                |               |                  | Drift Width:                                      | 3.69 ft         |
|                               |                |               |                  | Controlling Drift                                 | Leeward         |
|                               |                |               |                  | Max Snow Load (Uniform and Drift, Service Level): | <b>44.3 psf</b> |
|                               |                |               |                  | Maximum Drift Weight (Service Level):             | <b>30.3 psf</b> |
|                               |                |               |                  | Drift Width:                                      | <b>7.29 ft</b>  |



Description: **Joist Perpendicular to Wall**

### Equivalent Uniform Snow Load (Increased Per Load Factors Given Above)

#### INPUT:

|                     |               |                        |          |                       |                |
|---------------------|---------------|------------------------|----------|-----------------------|----------------|
| Typ. Member Span =  | <b>6.0 ft</b> | Additional Max Drift = | 30.3 psf | Roof Uniform DL =     | <b>0.0 psf</b> |
| Roof Uniform Snow = | 14.0 psf      | Drift Length =         | 7.3 ft   | DL Increased for LF = | <b>0.0 psf</b> |

#### OUTPUT:

For Typ. Uniform Roof Snow + DL Load:

|                    |            |
|--------------------|------------|
| Moment =           | 63.0 lb-ft |
| Max Shear React. = | 42.0 lbs   |

For Add. Drift Loading:

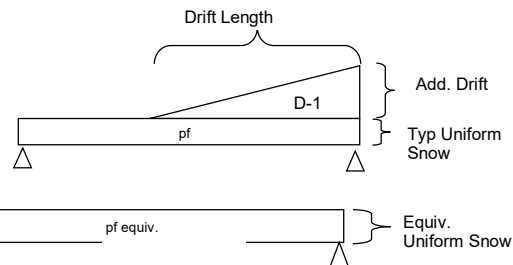
|                         |                      |                     |
|-------------------------|----------------------|---------------------|
| Max Add. Shear React. = | 60.52 lbs Drift Side | 30.3 lbs Other Side |
|-------------------------|----------------------|---------------------|

Max Loading for Typ Uniform + Add. Drift

|                      |                       |
|----------------------|-----------------------|
| Max Total Moment =   | 0.132 k-ft            |
| Max Shear Reaction = | 0.103 kips Drift Side |
| Min Shear Reaction = | 0.072 kips Other Side |

Equivalent Uniform Snow Load

|         |          |
|---------|----------|
| For V = | 34.2 plf |
| For M = | 29.3 plf |



Equivalent Uniform Snow Load For Design =

**34 plf**

See Diagram 'B' Above



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Hip and Gable Roof Snow Loads Based on ASCE 7-16

G-14

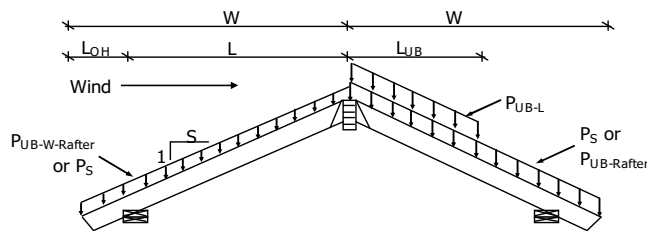
Sht Number: **GD-**  
Job Number: **21174**  
Date: **1/14/2022**  
By: **GN**

Project: **Project name here**  
Description: **Load at 4:12 Shed Roof**

### GENERAL INPUT AND OUTPUT:

|                                       |                       |               |             |                                                    |                 |
|---------------------------------------|-----------------------|---------------|-------------|----------------------------------------------------|-----------------|
| City                                  | <b>Salt Lake City</b> | Load Factors: |             |                                                    |                 |
| Is project in Utah?                   | <b>Yes</b>            | DL            | <b>1.00</b> | SL                                                 | <b>1.00</b>     |
| Elevation at Site:                    | <b>4200 ft</b>        |               |             | W (Eave to Ridge):                                 | 26.00 feet      |
| $p_g$ (SEAU Ground Snow Load)         | 28.0 psf              |               |             | Snow Load Density $g$ :                            | 17.64 pcf       |
|                                       |                       |               |             | S (Roof Slope):                                    | 3               |
|                                       |                       |               |             | $h_b$ (Snow Depth):                                | 1.11 feet       |
| Roof Slope:                           | <b>4:12</b>           |               |             |                                                    |                 |
| L (Horiz Dist Support to Ridge)       | <b>25.0 ft</b>        |               |             | $P_{UB-W}$ (Windward Unbal. Snow):                 | <b>5.9 psf</b>  |
| $L_{OH}$ (Horiz Dist Eave to Support) | <b>1.0 ft</b>         |               |             | $P_{UB-W-Rafter}$ (Windward Unbal. Snow):          | <b>5.9 psf</b>  |
|                                       |                       |               |             |                                                    |                 |
| $C_e$ (Exposure Factor):              | <b>1.00</b>           |               |             | $h_{d-L}$ (Leeward Drift Height):                  | 1.66 feet       |
| $C_t$ (Thermal Factor):               | <b>1.00</b>           |               |             | $L_{UB}$ (Unbalanced Surcharge Length):            | 7.68 feet       |
| $C_s$ (Roof Slope Factor):            | 1.00                  |               |             | $P_{UB-L}$ (Leeward Unbal. Snow Surcharge):        | <b>16.9 psf</b> |
| $I_s$ (Importance Factor):            | <b>1.00</b>           |               |             | $P_{UB-L-Rafter}$ (Leeward Unbal. Snow Surcharge): | <b>16.9 psf</b> |
|                                       |                       |               |             |                                                    |                 |
| $P_f$ (Flat Roof Snow Load)           | <b>19.6 psf</b>       |               |             | $P_{UB-Rafter}$ (Rafter Unbal. Roof Snow):         | <b>19.6 psf</b> |
| $P_s$ (Sloped Roof Snow):             | <b>19.6 psf</b>       |               |             | $P_{Eave}$ (Eave Sloped Roof Snow):                | <b>19.6 psf</b> |
| Additional Seismic Snow Weight:       | <b>0.0 psf</b>        |               |             |                                                    |                 |

### ROOF RAFTER SYSTEM



Roof Uniform DL = **20.0 psf**  
DL Increased for Slope and LF = **21.1 psf**

**1.00 Ft Trib**

$P_{SL}$  (Sliding Snow Load): --  
 $W_{Upper}$  Roof Sliding:  
 $W_{Upper}$  Roof Drift:  
Elevation Difference:

|                   |                    |                   |                                    |
|-------------------|--------------------|-------------------|------------------------------------|
| $R_L$ = 364.5 lbs | $R_C$ = 954.3 lbs  | $R_R$ = 570.0 lbs | <-- Case 1: Unbalanced Load        |
| $R_L$ = 305.0 lbs | $R_C$ = 525.4 lbs  | $R_R$ = 305.0 lbs | <-- Case 2: 2x $P_f$ at Eaves Only |
| $R_L$ = 550.0 lbs | $R_C$ = 1015.4 lbs | $R_R$ = 550.0 lbs | <-- Case 3: $P_s$ Across Entire Sp |

☐ Check Sliding Snow and Drift

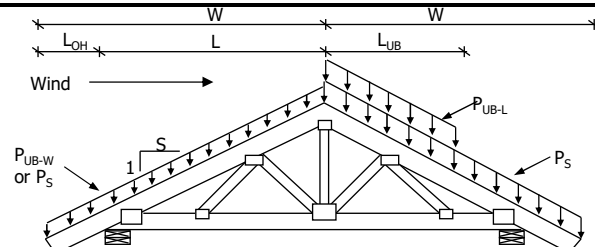
|                        |                           |                        |                                    |
|------------------------|---------------------------|------------------------|------------------------------------|
| $V_{max}$ = 508.5 lbs  | @ 1.0' from Left: Case 3  | $V_{max}$ = 616.6 lbs  | @ 0.0' from Left of Ridge: Case 1  |
| $M_{max}$ = 3168 lb-ft | @ 13.5' from Left: Case 3 | $M_{max}$ = 3423 lb-ft | @ 12.0' from Left of Ridge: Case 1 |

#### Equivalent Uniform Snow Load

|                  |                  |
|------------------|------------------|
| For V = 40.6 plf | For V = 49.2 plf |
| For M = 40.7 plf | For M = 44.0 plf |

Equivalent Uniform Load For Rafter Design = **49.25 PSF**  $R_{MAX}$  = 1015.4 lbs  $R_{MIN}$  = 305.0 lbs

### ROOF TRUSS SYSTEM



Roof Uniform DL = **20.0 psf**  
DL Increased for Slope and LF = **21.1 psf**

**1.00 Ft Trib**

|                    |                    |                                      |
|--------------------|--------------------|--------------------------------------|
| $R_L$ = 841.6 lbs  | $R_R$ = 1047.1 lbs | <-- Case 1: Unbalanced Load          |
| $R_L$ = 567.7 lbs  | $R_R$ = 567.7 lbs  | <-- Case 2: 2x $P_f$ at Eaves Only   |
| $R_L$ = 1057.7 lbs | $R_R$ = 1057.7 lbs | <-- Case 3: $P_s$ Across Entire Span |

|                         |                                    |
|-------------------------|------------------------------------|
| $V_{max}$ = 1017.0 lbs  | @ 51.0' from Left of Ridge: Case 3 |
| $M_{max}$ = 12693 lb-ft | @ 26.0' from Left of Ridge: Case 3 |

#### Equivalent Uniform Snow Load

|                  |
|------------------|
| For V = 40.7 plf |
| For M = 40.7 plf |

Equivalent Uniform Load For Truss Design = **40.68 PSF**  $R_{MAX}$  = 1057.7 lbs  $R_{MIN}$  = 567.7 lbs

Unbalanced Snow Loads



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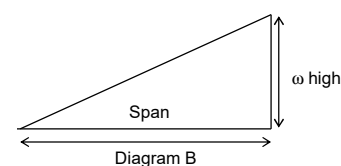
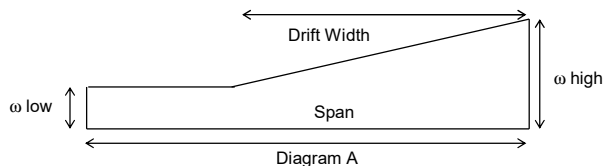
Leeward and Windward Snow Drift Based on ASCE 7-16

Sht Number: **GD-**  
Job Number: **21174**  
Date: **1/14/2022**  
By: **GN**

Project: **Project name here**  
Description: **Typical Snow Load and Drift**

### GENERAL INPUT AND OUTPUT:

| GENERAL INPUT AND OUTPUT:         |              |            | Load Factors:    |                                                   |                                       |           |  |
|-----------------------------------|--------------|------------|------------------|---------------------------------------------------|---------------------------------------|-----------|--|
| City                              | Lee's Summit |            | DL               | SL                                                | Snow Load Density $\gamma$ :          | 16.60 pcf |  |
| Is project in Utah?               | No           |            | 1.00             | 1.00                                              | $h_b$ (Snow Depth):                   | 0.84 ft   |  |
| Elevation at Site:                | 1000 ft      |            |                  |                                                   | $h_c$ (Roof to Snow):                 | 24.66 ft  |  |
| $p_g$ (SEAU Ground Snow Load)     | 20.0 psf     | 20 psf     | <---Manual Entry |                                                   |                                       |           |  |
| $C_e$ (Exposure Factor):          | 1.0          |            |                  | $h_d$ (Potential Drift Height):                   | Windward                              | Leeward   |  |
| $C_t$ (Thermal Factor):           | 1.0          |            |                  | Maximum Drift Height:                             | 0.92 ft                               | 1.79 ft   |  |
| $I_s$ (Importance Factor):        | 1.0          |            |                  | Drift Width:                                      | 0.92 ft                               | 1.79 ft   |  |
|                                   |              |            |                  |                                                   | 3.69 ft                               | 7.17 ft   |  |
|                                   |              |            |                  |                                                   | Controlling Drift                     |           |  |
|                                   |              |            |                  |                                                   | Leeward                               |           |  |
|                                   | Lower Roof   | Upper Roof |                  |                                                   |                                       |           |  |
| $L_u$ (Length of Roof):           | 4.0 ft       | 35.0 ft    |                  | Max Snow Load (Uniform and Drift, Service Level): | 43.7 psf                              |           |  |
| Elevation Difference:             | 25.50 ft     |            |                  |                                                   |                                       |           |  |
|                                   |              |            |                  |                                                   | Maximum Drift Weight (Service Level): | 29.7 psf  |  |
| $P_f$ (Roof Snow, Service Level): | 14.0 psf     |            |                  |                                                   | Drift Width:                          | 7.17 ft   |  |
| Additional Seismic Snow Weight:   | 0.0 psf      |            |                  |                                                   |                                       |           |  |



Description: **Joist Perpendicular to Wall**

### Equivalent Uniform Snow Load (Increased Per Load Factors Given Above)

#### INPUT:

|                     |               |                        |          |                       |                |
|---------------------|---------------|------------------------|----------|-----------------------|----------------|
| Typ. Member Span =  | <b>6.0 ft</b> | Additional Max Drift = | 29.7 psf | Roof Uniform DL =     | <b>0.0 psf</b> |
| Roof Uniform Snow = | 14.0 psf      | Drift Length =         | 7.2 ft   | DL Increased for LF = | <b>0.0 psf</b> |

#### OUTPUT:

For Typ. Uniform Roof Snow + DL Load:

|                    |            |
|--------------------|------------|
| Moment =           | 63.0 lb-ft |
| Max Shear React. = | 42.0 lbs   |

For Add. Drift Loading:

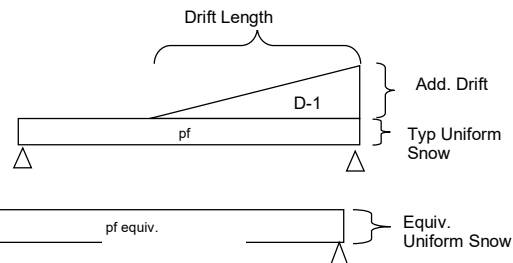
|                         |                      |                     |
|-------------------------|----------------------|---------------------|
| Max Add. Shear React. = | 59.49 lbs Drift Side | 29.7 lbs Other Side |
|-------------------------|----------------------|---------------------|

Max Loading for Typ Uniform + Add. Drift

|                      |                       |
|----------------------|-----------------------|
| Max Total Moment =   | 0.131 k-ft            |
| Max Shear Reaction = | 0.101 kips Drift Side |
| Min Shear Reaction = | 0.072 kips Other Side |

Equivalent Uniform Snow Load

|         |          |
|---------|----------|
| For V = | 33.8 plf |
| For M = | 29.1 plf |



Equivalent Uniform Snow Load For Design =

**34 plf**

See Diagram 'B' Above



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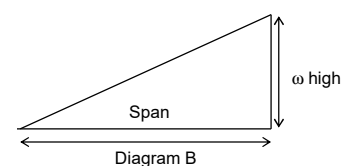
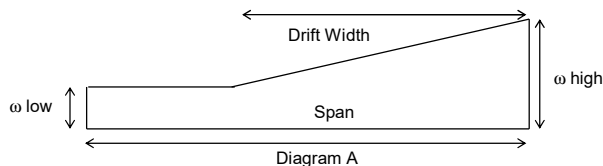
Leeward and Windward Snow Drift Based on ASCE 7-16

Sht Number: **GD-**  
Job Number: **21174**  
Date: **1/14/2022**  
By: **GN**

Project: **Project name here**  
Description: **Typical Snow Load and Drift**

### GENERAL INPUT AND OUTPUT:

| GENERAL INPUT AND OUTPUT:         |              |            | Load Factors:    |                                                   |                                       |           |  |
|-----------------------------------|--------------|------------|------------------|---------------------------------------------------|---------------------------------------|-----------|--|
| City                              | Lee's Summit |            | DL               | SL                                                | Snow Load Density $\gamma$ :          | 16.60 pcf |  |
| Is project in Utah?               | No           |            | 1.00             | 1.00                                              | $h_b$ (Snow Depth):                   | 0.84 ft   |  |
| Elevation at Site:                | 1000 ft      |            |                  |                                                   | $h_c$ (Roof to Snow):                 | 24.66 ft  |  |
| $p_g$ (SEAU Ground Snow Load)     | 20.0 psf     | 20 psf     | <---Manual Entry |                                                   |                                       |           |  |
| $C_e$ (Exposure Factor):          | 1.0          |            |                  | $h_d$ (Potential Drift Height):                   | Windward                              | Leeward   |  |
| $C_t$ (Thermal Factor):           | 1.0          |            |                  | Maximum Drift Height:                             | 0.92 ft                               | 2.71 ft   |  |
| $I_s$ (Importance Factor):        | 1.0          |            |                  | Drift Width:                                      | 0.92 ft                               | 2.71 ft   |  |
|                                   |              |            |                  |                                                   | 3.69 ft                               | 10.82 ft  |  |
|                                   |              |            |                  |                                                   | Controlling Drift                     |           |  |
|                                   |              |            |                  |                                                   | Leeward                               |           |  |
|                                   | Lower Roof   | Upper Roof |                  |                                                   |                                       |           |  |
| $L_u$ (Length of Roof):           | 12.0 ft      | 73.0 ft    |                  | Max Snow Load (Uniform and Drift, Service Level): | 58.9 psf                              |           |  |
| Elevation Difference:             | 25.50 ft     |            |                  |                                                   |                                       |           |  |
|                                   |              |            |                  |                                                   | Maximum Drift Weight (Service Level): | 44.9 psf  |  |
| $P_f$ (Roof Snow, Service Level): | 14.0 psf     |            |                  |                                                   | Drift Width:                          | 10.82 ft  |  |
| Additional Seismic Snow Weight:   | 0.0 psf      |            |                  |                                                   |                                       |           |  |



Description: **Joist Perpendicular to Wall**

### Equivalent Uniform Snow Load (Increased Per Load Factors Given Above)

#### INPUT:

|                     |               |                        |          |                       |                |
|---------------------|---------------|------------------------|----------|-----------------------|----------------|
| Typ. Member Span =  | <b>6.0 ft</b> | Additional Max Drift = | 44.9 psf | Roof Uniform DL =     | <b>0.0 psf</b> |
| Roof Uniform Snow = | 14.0 psf      | Drift Length =         | 10.8 ft  | DL Increased for LF = | <b>0.0 psf</b> |

#### OUTPUT:

For Typ. Uniform Roof Snow + DL Load:

|                    |            |
|--------------------|------------|
| Moment =           | 63.0 lb-ft |
| Max Shear React. = | 42.0 lbs   |

For Add. Drift Loading:

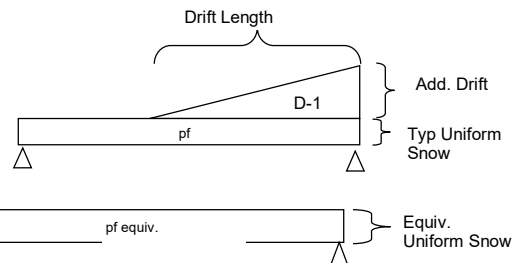
|                         |                      |                     |
|-------------------------|----------------------|---------------------|
| Max Add. Shear React. = | 89.84 lbs Drift Side | 44.9 lbs Other Side |
|-------------------------|----------------------|---------------------|

Max Loading for Typ Uniform + Add. Drift

|                      |                       |
|----------------------|-----------------------|
| Max Total Moment =   | 0.166 k-ft            |
| Max Shear Reaction = | 0.132 kips Drift Side |
| Min Shear Reaction = | 0.087 kips Other Side |

Equivalent Uniform Snow Load

|         |          |
|---------|----------|
| For V = | 43.9 plf |
| For M = | 36.8 plf |



Equivalent Uniform Snow Load For Design =

**44 plf**

See Diagram 'B' Above

**MecaWind v2333**Software Developer: Meca Enterprises Inc., [www.meca.biz](http://www.meca.biz), Copyright © 2018

Calculations Prepared by:

Date: Jan 14, 2022

FileLocation : K:\2021\21174\canopy.wnd

**Basic Wind Parameters**

|                    |             |                      |          |
|--------------------|-------------|----------------------|----------|
| Wind Load Standard | = ASCE 7-16 | Exposure Category    | = C      |
| Wind Design Speed  | = 103.0 mph | Risk Category        | = III    |
| Structure Type     | = Other     | Other Structure Type | = Canopy |

**General Wind Settings**

|           |                                               |               |
|-----------|-----------------------------------------------|---------------|
| Incl_LF   | = Include ASD Load Factor of 0.6 in Pressures | = True        |
| DynType   | = Dynamic Type of Structure                   | = Rigid       |
| NF        | = Natural Frequency of Structure (Mode 1)     | = 1.000 Hz    |
| Zg        | = Altitude (Ground Elevation) above Sea Level | = 1000.000 ft |
| Bdist     | = Base Elevation of Structure                 | = 0.000 ft    |
| Reacs     | = Show the Base Reactions in the output       | = False       |
| MWFRSType | = MWFRS Method Selected                       | = Ch 27 Pt 1  |

**Topographic Factor per Fig 26.8-1**

|      |                       |         |
|------|-----------------------|---------|
| Topo | = Topographic Feature | = None  |
| Kzt  | = Topographic Factor  | = 1.000 |

**Building Inputs**

|                               |             |                      |             |
|-------------------------------|-------------|----------------------|-------------|
| h : Mean Building Roof Height | = 19.000 ft | he: Mean Eave Height | = 19.000 ft |
| hc: Mean Canopy Height        | = 9.500 ft  |                      |             |

**Exposure Constants per Table 26.11-1:**

|                                  |       |                                |            |
|----------------------------------|-------|--------------------------------|------------|
| Alpha: Const from Table 26.11-1= | 9.500 | Zg: Const from Table 26.11-1=  | 900.000 ft |
| At: Const from Table 26.11-1=    | 0.105 | Bt: Const from Table 26.11-1=  | 1.000      |
| Am: Const from Table 26.11-1=    | 0.154 | Bm: Const from Table 26.11-1=  | 0.650      |
| C: Const from Table 26.11-1=     | 0.200 | Eps: Const from Table 26.11-1= | 0.200      |

**Components and Cladding (C&C) Calculations per Ch 30 Part 7:**

|    |                                             |             |
|----|---------------------------------------------|-------------|
| h  | = Mean Roof Height of Building              | = 19.000 ft |
| LF | = Load Factor based upon ASD Design         | = 0.60      |
| qh | = (0.00256 * Kh * Kzt * Kd * Ke * V^2) * LF | = 13.34 psf |

**Wind Pressures for C&C on a Canopy per Ch 30 Part 7 and Sec 30.11****Wind Pressures for C&C on Canopy per Ch 30 Part 7 & Fig 30.11-1A/B****All wind pressures include a load factor of 0.6**

| Description     | Zone           | Width<br>ft | Span<br>ft | Area<br>ft | 1/3<br>Rule | GCp<br>Pos | GCp<br>Neg | P<br>Min<br>psf | P<br>Max<br>psf |
|-----------------|----------------|-------------|------------|------------|-------------|------------|------------|-----------------|-----------------|
| Upper surface   | Upper Surface  | 4.000       | 11.500     | 46.000     | No          | 0.667      | -0.835     | -11.14          | 9.60            |
| Lower Surface   | Lower Surface  | 4.000       | 11.500     | 46.000     | No          | 0.667      | -0.701     | -9.60           | 9.60            |
| Upper and Lower | Upr & Lwr Surf | 4.000       | 11.500     | 46.000     | No          | 0.734      | -0.484     | -9.60           | 9.80            |

Area = Span Length x Effective Width  
 1/3 Rule = Effective width need not be less than 1/3 of the span length  
 GCp = External Pressure Coefficients taken from Fig 30.11-1A/B  
 P = Wind Pressure:  $qh \cdot GCp$  [Eqn 30.11-1]  
 Zone = 'Upr & Lwr Surf' is simultaneous contributions from both Upper & Lower  
 \*Per Para 30.2.2 the Minimum Pressure for C&C is 9.60 psf [0.460 kPa] {Includes LF}



## Search Information

**Address:** NW Chipman Rd & NW Ward Rd, Lee's Summit, MO 64063, USA

**Coordinates:** 38.9254596, -94.3940394

**Elevation:** 998 ft

**Timestamp:** 2021-11-17T22:18:46.336Z

**Hazard Type:** Seismic

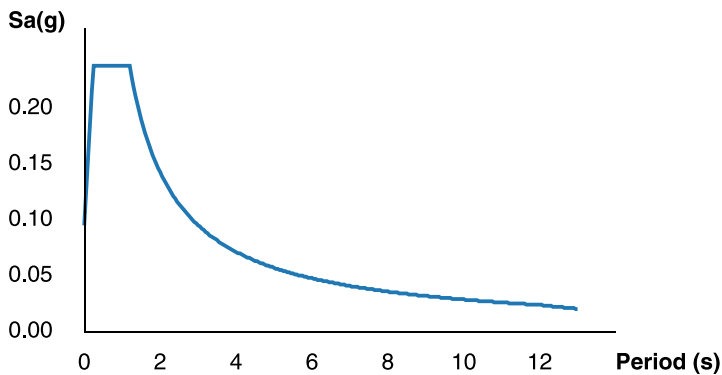
**Reference Document:** ASCE7-16

**Risk Category:** II

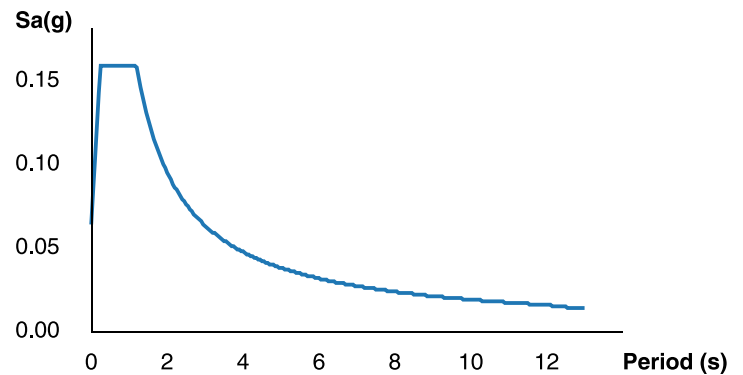
**Site Class:** E



### MCER Horizontal Response Spectrum



### Design Horizontal Response Spectrum



## Basic Parameters

| Name     | Value | Description                               |
|----------|-------|-------------------------------------------|
| $S_S$    | 0.099 | $MCE_R$ ground motion (period=0.2s)       |
| $S_1$    | 0.068 | $MCE_R$ ground motion (period=1.0s)       |
| $S_{MS}$ | 0.238 | Site-modified spectral acceleration value |
| $S_{M1}$ | 0.285 | Site-modified spectral acceleration value |
| $S_{DS}$ | 0.159 | Numeric seismic design value at 0.2s SA   |
| $S_{D1}$ | 0.19  | Numeric seismic design value at 1.0s SA   |

## Additional Information

| Name  | Value | Description                       |
|-------|-------|-----------------------------------|
| SDC   | C     | Seismic design category           |
| $F_a$ | 2.4   | Site amplification factor at 0.2s |
| $F_v$ | 4.2   | Site amplification factor at 1.0s |

|           |       |                                                                                          |
|-----------|-------|------------------------------------------------------------------------------------------|
| $CR_S$    | 0.927 | Coefficient of risk (0.2s)                                                               |
| $CR_1$    | 0.877 | Coefficient of risk (1.0s)                                                               |
| PGA       | 0.047 | $MCE_G$ peak ground acceleration                                                         |
| $F_{PGA}$ | 2.4   | Site amplification factor at PGA                                                         |
| $PGA_M$   | 0.113 | Site modified peak ground acceleration                                                   |
| $T_L$     | 12    | Long-period transition period (s)                                                        |
| SsRT      | 0.099 | Probabilistic risk-targeted ground motion (0.2s)                                         |
| SsUH      | 0.107 | Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years) |
| SsD       | 1.5   | Factored deterministic acceleration value (0.2s)                                         |
| S1RT      | 0.068 | Probabilistic risk-targeted ground motion (1.0s)                                         |
| S1UH      | 0.077 | Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years) |
| S1D       | 0.6   | Factored deterministic acceleration value (1.0s)                                         |
| PGAd      | 0.5   | Factored deterministic acceleration value (PGA)                                          |

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

## Disclaimer

Hazard loads are provided by the U.S. Geological Survey [Seismic Design Web Services](#).

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## DUNN ASSOCIATES

### Wood Structural Panel Capacity Based on the 2012 NDS

|             |           |
|-------------|-----------|
| Sht Number: | 1         |
| Job Number: | 21174     |
| Date:       | 1/14/2022 |
| By:         | GAN       |

Job Description: **MOBETTA'S**

Application Description: **Typical Roof Sheathing**

#### INPUT

Panel Thickness **7/8" (32 oc)**  
Panel Type **OSB**  
Support Width **1.50"**

$C_D$  **1.00**  $C_t$  **1.00**  
 $C_{M,EI}$  **1.00**  $C_G$  **1.00**  
 $C_{M,fb,V}$  **1.00**  $C_S$  **1.00**

Limiting  
Deflection Ratio **L/360**

Panel Grade

☒ Regular

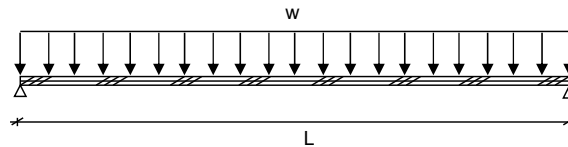
☐ Structural I

Span Type

☒ Single Span

☐ Double Span

☐ Triple Span



**SCHEMATIC REPRESENTATION**

#### REFERENCE DESIGN VALUES

Panel Shear Str.  $F_v$  (lb/Q) (lb/ft)

Strength Axis Parallel to Supports: 300 lb/ft  
Strength Axis Perpendicular to Supports: 300 lb/ft

Panel Bending Str.  $F_b$  (lb-in/ft)

Strength Axis Parallel to Supports: 1,050 lb-in/ft  
Strength Axis Perpendicular to Supports: 1,028 lb-in/ft

Panel Stiffness EI (lb-in<sup>2</sup>/ft)

Strength Axis Parallel to Supports: 650,000 lb-in<sup>2</sup>/ft  
Strength Axis Perpendicular to Supports: 376,000 lb-in<sup>2</sup>/ft

#### ALLOWABLE LOAD EQUATIONS

$$w_{V,all} = \frac{x F_v (I_b / Q)}{(s - s_w)} C_D C_m C_t C_G \quad w_{M,all} = \frac{x F_b S}{s^2} C_D C_m C_t C_G C_s$$

where ,

$x = 24$  (1 span)  
 $x = 19.2$  (2 span)  
 $x = 20$  (3 span)  
 $s$  = Support Spacing (in.)  
 $s_w$  = Support Width (in.)

$$w_{\Delta,all} = \frac{s}{R_{\Delta} (s - s_w + SW)^4} C_m C_t C_G$$

where ,

$x = 921.6$  (1 span)  
 $x = 2220$  (2 span)  
 $x = 1743$  (3 span)  
 $s$  = Support Spacing (in.)  
 $s_w$  = Support Width (in.)  
 $SW$  = Support Width Factor  
= 0.25 for 2" Nominal Framing  
= 0.625 for 4" Nominal Framing  
 $R_{\Delta}$  = Denom. of Defl. Ratio  
(Such as 240 for L/240)

#### ALLOWABLE PANEL LOADS

| Panel Type & Rating | Load Governed by   | Allowable Uniform Load (psf) on Panel                                         |        |          |        |        |        |                                       |        |        |
|---------------------|--------------------|-------------------------------------------------------------------------------|--------|----------|--------|--------|--------|---------------------------------------|--------|--------|
|                     |                    | Stress Parallel to Strength Axis<br>(Strength Axis Perpendicular to Supports) |        |          |        |        |        | Stress Perpendicular to Strength Axis |        |        |
|                     |                    | 12" oc                                                                        | 16" oc | 19.2" oc | 24" oc | 32" oc | 48" oc | 12" oc                                | 16" oc | 24" oc |
| 7/8" (32 oc)        | Bending            | 700                                                                           | 394    | 273      | 175    | 98     | 44     | 685                                   | 385    | 171    |
|                     | Shear              | 686                                                                           | 497    | 407      | 320    | 236    | 155    | 686                                   | 497    | 320    |
|                     | L/360              | 1495.2                                                                        | 562.5  | 307.7    | 149.1  | 59.6   | 16.7   | 864.9                                 | 325.4  | 86.2   |
|                     | <b>Controlling</b> | 686                                                                           | 394    | 273      | 149    | 60     | 17     | 685                                   | 325    | 86     |

|  |  | Add SW? |  | Design |  | LL Reduction |  | Def. Defaults |       |
|--|--|---------|--|--------|--|--------------|--|---------------|-------|
|  |  | NO      |  | ASD    |  | Yes          |  | LL            | L/480 |
|  |  |         |  |        |  |              |  | TL            | L/360 |

| Location                      |           |                                        |              |           |                  |                     | Beam Loads |                      |                    |                      |                         |                       |               |                         |                       |             | Adj. Factors |                                                                                              | Beam Size                        |                                    | Def.                                                             | Support                                       |                                      |                                                  |                      |              |                                                          |        | Post Reaction |                   | Manual Override |                   |        |  |  |
|-------------------------------|-----------|----------------------------------------|--------------|-----------|------------------|---------------------|------------|----------------------|--------------------|----------------------|-------------------------|-----------------------|---------------|-------------------------|-----------------------|-------------|--------------|----------------------------------------------------------------------------------------------|----------------------------------|------------------------------------|------------------------------------------------------------------|-----------------------------------------------|--------------------------------------|--------------------------------------------------|----------------------|--------------|----------------------------------------------------------|--------|---------------|-------------------|-----------------|-------------------|--------|--|--|
| Beam or Header Qty in Project | Beam Name | Description                            | Span Lengths |           |                  | L <sub>u</sub> (ft) | Beam Slope | Load Start Trib (ft) | Load End Trib (ft) | Load Set             | X <sub>start</sub> (ft) | X <sub>end</sub> (ft) | Continuous DL |                         |                       | Point Loads |              | C <sub>D</sub><br>C <sub>t</sub><br>Flat use (Y/N)<br>Wet use (Y/N)<br>Span Loaded Ctrl Load | C <sub>r</sub><br>C <sub>i</sub> | Bending (+)<br>DCR<br>Shear<br>DCR | Max LL Limit (in)<br>Actual LL<br>Max TL Limit (in)<br>Actual TL | PL Left Post<br>PL Cntr Post<br>PL Right Post | Column Group<br><br>Column Bld Level | L <sub>ux</sub> (ft)                             | L <sub>uy</sub> (ft) | Support Size | OOP DCR<br><br>Req'd Brng (in)<br>Support Capacity (lbs) | LL (L) | DL (L)        | LL (L)            | DL (L)          |                   |        |  |  |
|                               |           |                                        | Left (ft)    | Cntr (ft) | Right Cant. (ft) |                     |            |                      |                    |                      |                         |                       | Load (plf)    | X <sub>start</sub> (ft) | X <sub>end</sub> (ft) | PL Ref      | x (ft)       |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          | LL (C) | DL (C)        | T Left Reac (lbs) | DL (C)          | T Left Reac (lbs) | DL (C) |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    |                      |                         |                       |               |                         |                       |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    |                      |                         |                       |               |                         |                       |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    |                      |                         |                       |               |                         |                       |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               | HDR-1     | Grid A                                 |              | 8.25      |                  | 8.25                | 0:12       | 17.5                 | 17.5               | Lr 20 17             | 0.0                     | 8.3                   | 156           | 0.0                     | 8.3                   |             |              | 1                                                                                            | 1                                |                                    | 2x6 Wall                                                         | (3) 1¼" x 9¼" LVL                             | Bending (+)<br>41%<br>Shear<br>36%   | L/480<br>L/1879 (0.05)<br>L/360<br>L/819 (0.12)  |                      | 2x6 Trim     | 14.85                                                    | 1.00   | (1)T (3)K     | 0%<br>0.84"       | #N/A            | 1444<br>3315      | 1871   |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | S 14 17              | 0.0                     | 8.3                   |               | 0.0                     | 8.3                   |             |              | 1                                                                                            | 1                                |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | S 14 17              | 0.0                     | 8.3                   |               | 0.0                     | 8.3                   |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 8.3                   |               | 0.0                     | 8.3                   |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 8.3                   |               | 0.0                     | 8.3                   |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 8.3                   | Self Wt.      | 0.0                     | plf                   |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               | HDR-2     | Grid C                                 |              | 13.5      |                  | 13.5                | 0:12       | 17.5                 | 17.5               | Lr 20 17             | 0.0                     | 13.5                  | 156           | 0.0                     | 13.5                  |             |              | 1                                                                                            | 1                                |                                    | 2x6 Wall                                                         | (3) 1¼" x 11½" LVL                            | Bending (+)<br>70%<br>Shear<br>46%   | L/480<br>L/907 (0.18)<br>L/360<br>L/395 (0.41)   |                      | 2x6 Trim     | 14.64                                                    | 1.00   | (1)T (4)K     | 0%<br>1.38"       | #N/A            | 2363<br>5424      | 3062   |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | S 14 17              | 0.0                     | 13.5                  |               | 0.0                     | 13.5                  |             |              | 1                                                                                            | 1                                |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | S 14 17              | 0.0                     | 13.5                  |               | 0.0                     | 13.5                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 13.5                  |               | 0.0                     | 13.5                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 13.5                  |               | 0.0                     | 13.5                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 13.5                  | Self Wt.      | 0.0                     | plf                   |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               | HDR-3     | Grid C 18' span                        |              | 18        |                  | 18                  | 0:12       | 17.5                 | 17.5               | Lr 20 17             | 0.0                     | 18.0                  | 156           | 0.0                     | 18.0                  |             |              | 1                                                                                            | 1                                |                                    | 2x6 Wall                                                         | (3) 1¼" x 16" LVL                             | Bending (+)<br>73%<br>Shear<br>45%   | L/480<br>L/936 (0.23)<br>L/360<br>L/408 (0.53)   |                      | 2x6 Trim     | 14.29                                                    | 1.00   | (1)T (4)K     | 0%<br>1.84"       | #N/A            | 3150<br>7232      | 4082   |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | S 14 17              | 0.0                     | 18.0                  |               | 0.0                     | 18.0                  |             |              | 1                                                                                            | 1                                |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | S 14 17              | 0.0                     | 18.0                  |               | 0.0                     | 18.0                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 18.0                  |               | 0.0                     | 18.0                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 18.0                  |               | 0.0                     | 18.0                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 18.0                  | Self Wt.      | 0.0                     | plf                   |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               | HDR-4     | Corner condition 1-B9 along B9         |              | 10.75     |                  | 10.75               | 0:12       | 8                    | 8                  | Lr 20 17             | 0.0                     | 10.8                  | 156           | 0.0                     | 10.8                  |             |              | 1                                                                                            | 1                                |                                    | STEEL                                                            | HSS6X4X1/4                                    | Bending (+)<br>31%<br>Shear<br>5%    | L/480<br>L/1626 (0.08)<br>L/360<br>L/576 (0.22)  |                      | STEEL        | 16.00                                                    | 1.00   | HSS4X4X1/4    |                   | 31746           | 860<br>2430       | 1570   |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | S 14 17              | 0.0                     | 10.8                  |               | 0.0                     | 10.8                  |             |              | 1                                                                                            | 1                                |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | S 14 17              | 0.0                     | 10.8                  |               | 0.0                     | 10.8                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 10.8                  |               | 0.0                     | 10.8                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 10.8                  |               | 0.0                     | 10.8                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 10.8                  | Self Wt.      | 0.0                     | plf                   |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               | BM-1      | Girder truss                           |              | 34.25     |                  | 34.25               | 0:12       | 5.0834               | 5.0834             | Lr 20 17             | 0.0                     | 34.3                  | 156           | 0.0                     | 34.3                  |             |              | 1                                                                                            | 1                                |                                    | GLB                                                              | 6¾" x 24" GLB                                 | Bending (+)<br>45%<br>Shear<br>21%   | L/480<br>L/1828 (0.22)<br>L/360<br>L/540 (0.76)  |                      | 2x6 Post     | 13.63                                                    | 1.00   | (1) 6x6       | 1.34"             | #N/A            | 1742<br>5893      | 4152   |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | S 14 17              | 0.0                     | 34.3                  |               | 0.0                     | 34.3                  |             |              | 1                                                                                            | 1                                |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | S 14 17              | 0.0                     | 34.3                  |               | 0.0                     | 34.3                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 34.3                  |               | 0.0                     | 34.3                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 34.3                  |               | 0.0                     | 34.3                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 34.3                  | Self Wt.      | 0.0                     | plf                   |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               | BM-2      | Girder truss 2                         |              | 34.25     |                  | 34.25               | 0:12       | 5.375<br>9.33        | 5.375<br>9.33      | Lr 20 17<br>Lr 20 17 | 0.0<br>16.3             | 34.3<br>34.3          | 40<br>40      | 0.0<br>0.0              | 34.3<br>34.3          |             |              | 1                                                                                            | 1                                |                                    | GLB                                                              | 5½" x 24" V8-GLB                              | Bending (+)<br>85%<br>Shear<br>31%   | L/480<br>L/938 (0.44)<br>L/360<br>L/394 (1.04)   |                      | 2x6 Post     | 13.63                                                    | 1.00   | (1) 6x6       | 1.64"             | #N/A            | 2215<br>5468      | 3253   |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | S 14 17              | 0.0                     | 34.3                  |               | 0.0                     | 34.3                  |             |              | 1                                                                                            | 1                                |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | S 14 17              | 0.0                     | 34.3                  |               | 0.0                     | 34.3                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 34.3                  |               | 0.0                     | 34.3                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 34.3                  |               | 0.0                     | 34.3                  |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 34.3                  | Self Wt.      | 0.0                     | plf                   |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               | HDR-5     | Typical 3ft header on grid 5.5 and B2. |              | 3.33      |                  | 3.33                | 0:12       | 5.5                  | 5.5                | Lr 20 17             | 0.0                     | 3.3                   | 156           | 0.0                     | 3.3                   |             |              | 1                                                                                            | 1                                |                                    | 2x6 Wall                                                         | (3) 2x8                                       | Bending (+)<br>16%<br>Shear<br>20%   | L/480<br>L/20640 (0)<br>L/360<br>L/6315 (0.01)   |                      | 2x6 Trim     | 15.02                                                    | 1.00   | (1)T (2)K     | 0%<br>0.4"        | #N/A            | 184<br>599        | 416    |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | S 14 17              | 0.0                     | 3.3                   |               | 0.0                     | 3.3                   |             |              | 1                                                                                            | 1                                |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | S 14 17              | 0.0                     | 3.3                   |               | 0.0                     | 3.3                   |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 3.3                   |               | 0.0                     | 3.3                   |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 3.3                   |               | 0.0                     | 3.3                   |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               |           |                                        |              |           |                  |                     |            |                      |                    | L 40 26              | 0.0                     | 3.3                   | Self Wt.      | 0.0                     | plf                   |             |              |                                                                                              |                                  |                                    |                                                                  |                                               |                                      |                                                  |                      |              |                                                          |        |               |                   |                 |                   |        |  |  |
|                               | HDR-6     | Drive through header                   |              | 6         |                  | 6                   | 0:12       | 17.5                 | 17.5               | Lr 20 17             | 0.0                     | 6.0                   | 156           | 0.0                     | 6.0                   |             |              | 1                                                                                            | 1                                |                                    | 2x6 Wall                                                         | (3) 2x12                                      | Bending (+)<br>59%<br>Shear<br>53%   | L/480<br>L/4143 (0.02)<br>L/360<br>L/1805 (0.04) |                      | 2x6 Trim     | 14.69                                                    | 1.00   | (1)T (2)K     | 0%                |                 |                   |        |  |  |















Project File: cantilever canopy.ec6

DUNN ASSOCIATES INC.

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**DESCRIPTION:** 4' cantilever over 11.5' opening

## CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

## Material Properties

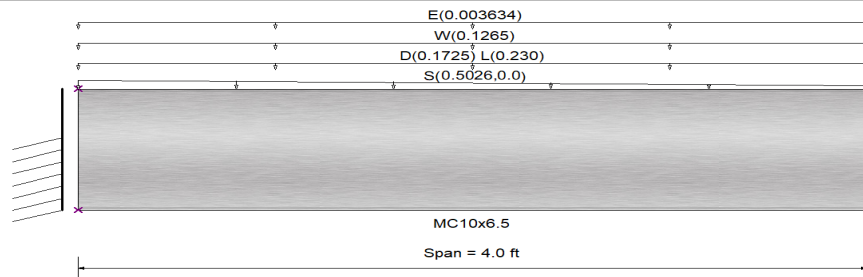
Analysis Method : Allowable Strength Design

Beam Bracing : Completely Unbraced

Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi

E: Modulus : 29,000.0 ksi



## Applied Loads

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

### Beam self weight calculated and added to loading

Load for Span Number 1

Varying Uniform Load : S= 0.04370->0.0 ksf, Extent = 0.0 -->> 4.0 ft, Trib Width = 11.50 ft, (Snow)

Uniform Load :  $D = 0.0150$ ,  $L = 0.020$  ksf, Tributary Width = 11.50 ft, (Dead load)

Uniform Load :  $W = 0.0110$  ksf, Tributary Width = 11.50 ft, (Wind)

Uniform Load :  $E = 0.000316$  ksf, Tributary Width = 11.50 ft, (Seismic)

## DESIGN SUMMARY

**Design OK**

|                                                 |                          |                                               |                          |
|-------------------------------------------------|--------------------------|-----------------------------------------------|--------------------------|
| <b>Maximum Bending Stress Ratio = 0.812 : 1</b> |                          | <b>Maximum Shear Stress Ratio = 0.079 : 1</b> |                          |
| Section used for this span                      | <b>MC10x6.5</b>          | Section used for this span                    | <b>MC10x6.5</b>          |
| Ma : Applied                                    | 3.832 k-ft               | Va : Applied                                  | 2.167 k                  |
| Mn / Omega : Allowable                          | 4.718 k-ft               | Vn/Omega : Allowable                          | 27.305 k                 |
| Load Combination                                | +D+0.750L+0.750S+0.5250E | Load Combination                              | +D+0.750L+0.750S+0.5250E |
| Location of maximum on span                     | 0.000ft                  | Location of maximum on span                   | 0.000 ft                 |
| Span # where maximum occurs                     | Span # 1                 | Span # where maximum occurs                   | Span # 1                 |
| <b>Maximum Deflection</b>                       |                          |                                               |                          |
| Max Downward Transient Deflection               | 0.019 in                 | Ratio = 5,022                                 | >=360                    |
| Max Upward Transient Deflection                 | 0.000 in                 | Ratio = 0                                     | <360                     |
| Max Downward Total Deflection                   | 0.038 in                 | Ratio = 2545                                  | >=180                    |
| Max Upward Total Deflection                     | 0.000 in                 | Ratio = 0                                     | <180                     |
|                                                 |                          | Span: 1 : L Only                              |                          |
|                                                 |                          | Span: 1 : +D+0.750L+0.750S+0.5250E            |                          |

### Maximum Forces & Stresses for Load Combinations

[illegible]

## Steel Beam

Project File: cantilever canopy.ec6

LIC# : KW-06015170, Build:20.21.10.4

DUNN ASSOCIATES INC.

(c) ENERCALC INC 1983-2021

**DESCRIPTION:** 4' cantilever over 11.5' opening

### Maximum Forces & Stresses for Load Combinations

| Load Combination         | Segment Length | Span # | Max Stress Ratios |       | Summary of Moment Values |        |        |      |           |      |      | Summary of Shear Values |              |       |
|--------------------------|----------------|--------|-------------------|-------|--------------------------|--------|--------|------|-----------|------|------|-------------------------|--------------|-------|
|                          |                |        | M                 | V     | Mmax +                   | Mmax - | Ma Max | Mnx  | Mnx/Omega | Cb   | Rm   | Va Max                  | VnxVnx/Omega |       |
| Dsgn. L = 4.00 ft        | 4.00 ft        | 1      | 0.400             | 0.035 |                          | -1.89  | 1.89   | 7.88 | 4.72      | 1.00 | 1.00 | 0.94                    | 45.60        | 27.31 |
| +D+0.750S+0.450W         |                |        |                   |       |                          |        |        |      |           |      |      |                         |              |       |
| Dsgn. L = 4.00 ft        | 4.00 ft        | 1      | 0.613             | 0.062 |                          | -2.89  | 2.89   | 7.88 | 4.72      | 1.00 | 1.00 | 1.70                    | 45.60        | 27.31 |
| +0.60D+0.60W             |                |        |                   |       |                          |        |        |      |           |      |      |                         |              |       |
| Dsgn. L = 4.00 ft        | 4.00 ft        | 1      | 0.311             | 0.027 |                          | -1.47  | 1.47   | 7.88 | 4.72      | 1.00 | 1.00 | 0.73                    | 45.60        | 27.31 |
| +D+0.70E                 |                |        |                   |       |                          |        |        |      |           |      |      |                         |              |       |
| Dsgn. L = 4.00 ft        | 4.00 ft        | 1      | 0.308             | 0.027 |                          | -1.45  | 1.45   | 7.88 | 4.72      | 1.00 | 1.00 | 0.73                    | 45.60        | 27.31 |
| +D+0.750L+0.750S+0.5250E |                |        |                   |       |                          |        |        |      |           |      |      |                         |              |       |
| Dsgn. L = 4.00 ft        | 4.00 ft        | 1      | 0.812             | 0.079 |                          | -3.83  | 3.83   | 7.88 | 4.72      | 1.00 | 1.00 | 2.17                    | 45.60        | 27.31 |
| +0.60D+0.70E             |                |        |                   |       |                          |        |        |      |           |      |      |                         |              |       |
| Dsgn. L = 4.00 ft        | 4.00 ft        | 1      | 0.186             | 0.016 |                          | -0.88  | 0.88   | 7.88 | 4.72      | 1.00 | 1.00 | 0.44                    | 45.60        | 27.31 |

### Overall Maximum Deflections

| Load Combination         | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|--------------------------|------|---------------|------------------|------------------|---------------|------------------|
| +D+0.750L+0.750S+0.5250E | 1    | 0.0377        | 4.000            |                  | 0.0000        | 0.000            |

### Vertical Reactions

| Load Combination         | Support 1 | Support 2 | Support notation : Far left is #: | Values in KIPS |
|--------------------------|-----------|-----------|-----------------------------------|----------------|
| Overall MAXimum          | 2.167     |           |                                   |                |
| Overall MINimum          | -0.015    |           |                                   |                |
| D Only                   | 0.716     |           |                                   |                |
| +D+L                     | 1.636     |           |                                   |                |
| +D+S                     | 1.721     |           |                                   |                |
| +D+0.750L                | 1.406     |           |                                   |                |
| +D+0.750L+0.750S         | 2.160     |           |                                   |                |
| +D+0.60W                 | 1.020     |           |                                   |                |
| +D+0.450W                | 0.944     |           |                                   |                |
| +D+0.750S+0.450W         | 1.698     |           |                                   |                |
| +0.60D+0.60W             | 0.733     |           |                                   |                |
| +D+0.70E                 | 0.726     |           |                                   |                |
| +D+0.750L+0.750S+0.5250E | 2.167     |           |                                   |                |
| +0.60D+0.70E             | 0.440     |           |                                   |                |
| L Only                   | 0.920     |           |                                   |                |
| S Only                   | 1.005     |           |                                   |                |
| W Only                   | 0.506     |           |                                   |                |
| E Only                   | 0.015     |           |                                   |                |

## Wood Column

Project File: cantilever canopy.ec6

LIC# : KW-06015170, Build:20.21.10.4

DUNN ASSOCIATES INC.

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DESCRIPTION: --None--

### Code References

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16  
 Load Combinations Used : ASCE 7-16

### General Information

|                                                           |  |                         |             |                     |      |                                              |                          |                |
|-----------------------------------------------------------|--|-------------------------|-------------|---------------------|------|----------------------------------------------|--------------------------|----------------|
| Analysis Method                                           |  | Allowable Stress Design |             | Wood Section Name   |      | 4x6                                          |                          |                |
| End Fixities                                              |  | Top & Bottom Pinned     |             | Wood Grading/Manuf. |      | Graded Lumber                                |                          |                |
| Overall Column Height                                     |  | 16 ft                   |             | Wood Member Type    |      | Sawn                                         |                          |                |
| ( Used for non-slender calculations )                     |  |                         |             |                     |      |                                              |                          |                |
| Wood Species                                              |  |                         |             | Exact Width         |      | 3.50 in                                      |                          |                |
| Wood Grade                                                |  |                         |             | Exact Depth         |      | 5.50 in                                      |                          |                |
| Fb +                                                      |  | 1,500.0 psi             | Fv          | 150.0 psi           | Area | 19.250 in^2                                  | Cf or Cv for Bending     | 1.0            |
| Fb -                                                      |  | 1,500.0 psi             | Ft          | 1,000.0 psi         | Ix   | 48.526 in^4                                  | Cf or Cv for Compression | 1.0            |
| Fc - Prll                                                 |  | 1,000.0 psi             | Density     | 33.0 pcf            | Iy   | 19.651 in^4                                  | Cf or Cv for Tension     | 1.0            |
| Fc - Perp                                                 |  | 1,000.0 psi             |             |                     |      |                                              | Cm : Wet Use Factor      | 1.0            |
|                                                           |  |                         |             |                     |      |                                              | Ct : Temperature Fact    | 1.0            |
| E : Modulus of Elasticity . . .                           |  | x-x Bending             | y-y Bending | Axial               |      |                                              | Cfu : Flat Use Factor    | 1.0            |
| Basic                                                     |  | 1,400.0                 | 1,400.0     | 1,400.0 ksi         |      |                                              | Kf : Built-up columns    | 1.0 NDS 15.3.2 |
| Minimum                                                   |  | 1,400.0                 | 1,400.0     |                     |      |                                              | Use Cr : Repetitive ?    | No             |
| Brace condition for deflection (buckling) along columns : |  |                         |             |                     |      |                                              |                          |                |
|                                                           |  |                         |             | X-X (width) axis :  |      | Fully braced against buckling ABOUT Y-Y Axis |                          |                |
|                                                           |  |                         |             | Y-Y (depth) axis :  |      | Fully braced against buckling ABOUT X-X Axis |                          |                |

### Applied Loads

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

Column self weight included : 70.583 lbs \* Dead Load Factor

AXIAL LOADS . . .

Axial Load at 16.0 ft, D = 0.530, S = 0.5010 k

BENDING LOADS . . .

Moment acting about X-X axis at 10.0 ft, L = 1.437 k-ft

### DESIGN SUMMARY

Bending & Shear Check Results

**PASS** Max. Axial+Bending Stress Ratio = **0.4076 : 1**  
 Load Combination +D+L  
 Governing NDS Formula:  $1.1C_D + M_x$ , NDS Eq. 3.9-3  
 Location of max.above base 9.987 ft  
 At maximum location values are .  
 Applied Axial 0.6006 k  
 Applied Mx 0.8969 k-ft  
 Applied My 0.0 k-ft  
 Fc : Allowable 1,000.0 psi

Maximum SERVICE Lateral Load Reactions . .

|               |           |                  |           |
|---------------|-----------|------------------|-----------|
| Top along Y-Y | 0.08981 k | Bottom along Y-Y | 0.08981 k |
| Top along X-X | 0.0 k     | Bottom along X-X | 0.0 k     |

Maximum SERVICE Load Lateral Deflections . . .

|                             |           |    |          |            |
|-----------------------------|-----------|----|----------|------------|
| Along Y-Y                   | 0.2669 in | at | 7.087 ft | above base |
| for load combination : +D+L |           |    |          |            |
| Along X-X                   | 0.0 in    | at | 0.0 ft   | above base |
| for load combination : n/a  |           |    |          |            |

Other Factors used to calculate allowable stresses . . .

|         |             |         |
|---------|-------------|---------|
| Bending | Compression | Tension |
|---------|-------------|---------|

**PASS** Maximum Shear Stress Ratio = **0.04666 : 1**  
 Load Combination +D+L  
 Location of max.above base 16.0 ft  
 Applied Design Shear 6.998 psi  
 Allowable Shear 150.0 psi

### Load Combination Results

| Load Combination | C <sub>D</sub> | C <sub>P</sub> | Maximum Axial + Bending Stress Ratios |        |          | Maximum Shear Ratios |        |          |
|------------------|----------------|----------------|---------------------------------------|--------|----------|----------------------|--------|----------|
|                  |                |                | Stress Ratio                          | Status | Location | Stress Ratio         | Status | Location |
| D Only           | 0.900          | 1.000          | 0.03467                               | PASS   | 0.0 ft   | 0.0                  | PASS   | 16.0 ft  |
| +D+L             | 1.000          | 1.000          | 0.4076                                | PASS   | 9.987 ft | 0.04666              | PASS   | 16.0 ft  |
| +D+S             | 1.150          | 1.000          | 0.04976                               | PASS   | 0.0 ft   | 0.0                  | PASS   | 16.0 ft  |
| +D+0.750L        | 1.250          | 1.000          | 0.2446                                | PASS   | 9.987 ft | 0.02799              | PASS   | 16.0 ft  |
| +D+0.750L+0.750S | 1.150          | 1.000          | 0.2671                                | PASS   | 9.987 ft | 0.03043              | PASS   | 16.0 ft  |
| +D+0.750S        | 1.600          | 1.000          | 0.03170                               | PASS   | 0.0 ft   | 0.0                  | PASS   | 16.0 ft  |
| +0.60D           | 1.600          | 1.000          | 0.01170                               | PASS   | 0.0 ft   | 0.0                  | PASS   | 16.0 ft  |

Wood Column

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LIC# : KW-06015170, Build:20.21.10.4

DUNN ASSOCIATES INC.

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DESCRIPTION: --None--

Maximum Reactions

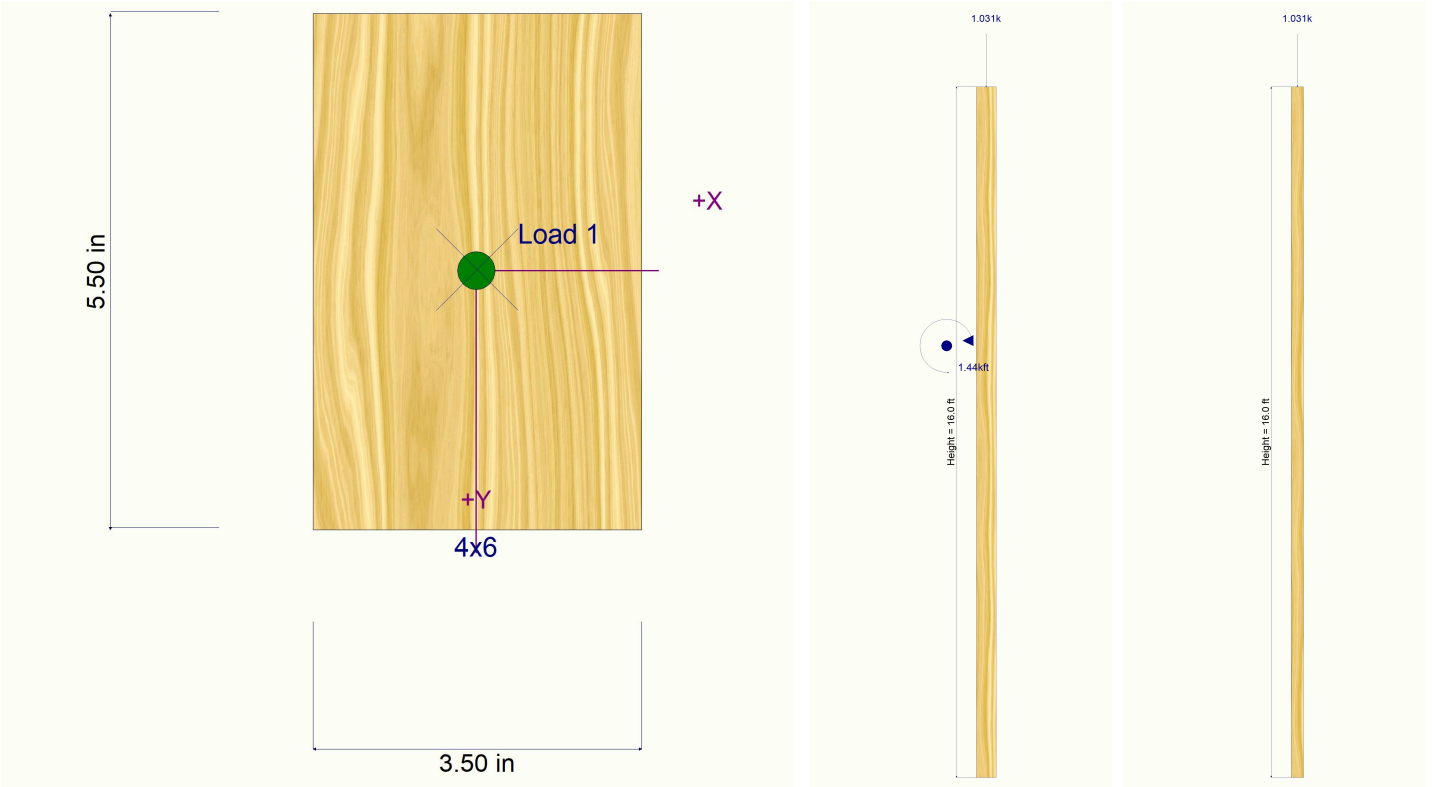
Note: Only non-zero reactions are listed.

| Load Combination | X-X Axis Reaction |       | k | Y-Y Axis Reaction |        | Axial Reaction | My - End Moments |       | k-ft | Mx - End Moments |       |
|------------------|-------------------|-------|---|-------------------|--------|----------------|------------------|-------|------|------------------|-------|
|                  | @ Base            | @ Top |   | @ Base            | @ Top  |                | @ Base           | @ Top |      | @ Base           | @ Top |
| D Only           |                   |       |   |                   |        | 0.601          |                  |       |      |                  |       |
| +D+L             |                   |       |   | 0.090             | -0.090 | 0.601          |                  |       |      |                  |       |
| +D+S             |                   |       |   |                   |        | 1.102          |                  |       |      |                  |       |
| +D+0.750L        |                   |       |   | 0.067             | -0.067 | 0.601          |                  |       |      |                  |       |
| +D+0.750L+0.750S |                   |       |   | 0.067             | -0.067 | 0.976          |                  |       |      |                  |       |
| +D+0.750S        |                   |       |   |                   |        | 0.976          |                  |       |      |                  |       |
| +0.60D           |                   |       |   |                   |        | 0.360          |                  |       |      |                  |       |
| L Only           |                   |       |   | 0.090             | -0.090 |                |                  |       |      |                  |       |
| S Only           |                   |       |   |                   |        | 0.501          |                  |       |      |                  |       |

Maximum Deflections for Load Combinations

| Load Combination | Max. X-X Deflection | Distance | Max. Y-Y Deflection | Distance |
|------------------|---------------------|----------|---------------------|----------|
| D Only           | 0.0000 in           | 0.000ft  | 0.000 in            | 0.000 ft |
| +D+L             | 0.0000 in           | 0.000ft  | 0.267 in            | 7.087 ft |
| +D+S             | 0.0000 in           | 0.000ft  | 0.000 in            | 0.000 ft |
| +D+0.750L        | 0.0000 in           | 0.000ft  | 0.200 in            | 7.087 ft |
| +D+0.750L+0.750S | 0.0000 in           | 0.000ft  | 0.200 in            | 7.087 ft |
| +D+0.750S        | 0.0000 in           | 0.000ft  | 0.000 in            | 0.000 ft |
| +0.60D           | 0.0000 in           | 0.000ft  | 0.000 in            | 0.000 ft |
| L Only           | 0.0000 in           | 0.000ft  | 0.267 in            | 7.087 ft |
| S Only           | 0.0000 in           | 0.000ft  | 0.000 in            | 0.000 ft |

Sketches



## Steel Beam

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LIC# : KW-06015170, Build:20.21.10.4

DUNN ASSOCIATES INC.

(c) ENERCALC INC 1983-2021

**DESCRIPTION:** INFILL ANGLES

## CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

## Material Properties

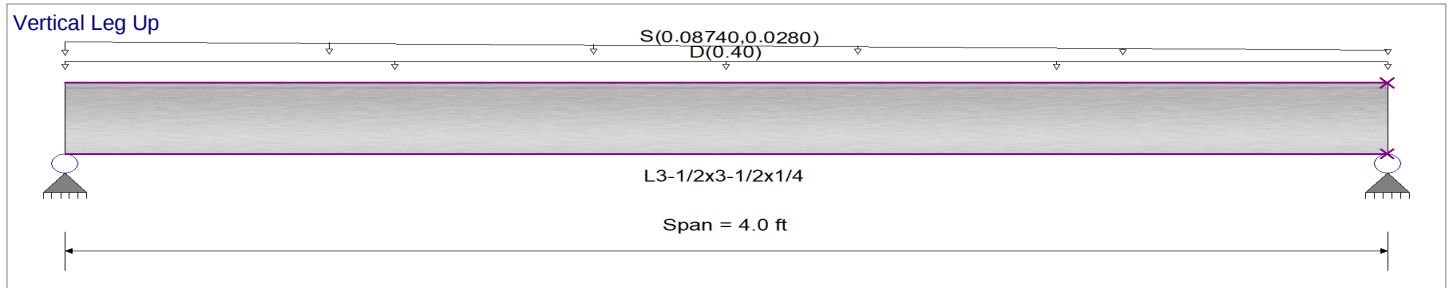
Analysis Method : Allowable Strength Design

Fy : Steel Yield : 50.0 ksi

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

E: Modulus : 29,000.0 ksi

Bending Axis : Major Axis Bending



## Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.20 ksf, Tributary Width = 2.0 ft

Varying Uniform Load : S = 0.04370->0.0140 ksf, Extent = 0.0 --> 4.0 ft, Trib Width = 2.0 ft, (snow)

## DESIGN SUMMARY

**Design OK**

|                                   |  |  |                        |  |  |                              |  |  |                  |  |  |
|-----------------------------------|--|--|------------------------|--|--|------------------------------|--|--|------------------|--|--|
| Maximum Bending Stress Ratio =    |  |  | 0.327 : 1              |  |  | Maximum Shear Stress Ratio = |  |  | 0.059 : 1        |  |  |
| Section used for this span        |  |  | L3-1/2x3-1/2x1/4       |  |  | Section used for this span   |  |  | L3-1/2x3-1/2x1/4 |  |  |
| Ma : Applied                      |  |  | 0.916 k-ft             |  |  | Va : Applied                 |  |  | 0.9352 k         |  |  |
| Mn / Omega : Allowable            |  |  | 2.803 k-ft             |  |  | Vn/Omega : Allowable         |  |  | 15.719 k         |  |  |
| Load Combination                  |  |  | +D+S                   |  |  | Load Combination             |  |  | +D+S             |  |  |
| Location of maximum on span       |  |  | 1.977 ft               |  |  | Location of maximum on span  |  |  | 0.000 ft         |  |  |
| Span # where maximum occurs       |  |  | Span # 1               |  |  | Span # where maximum occurs  |  |  | Span # 1         |  |  |
| Maximum Deflection                |  |  |                        |  |  |                              |  |  |                  |  |  |
| Max Downward Transient Deflection |  |  | 0.006 in Ratio = 8,333 |  |  | >=360                        |  |  |                  |  |  |
| Max Upward Transient Deflection   |  |  | 0.000 in Ratio = 0     |  |  | <360                         |  |  | Span: 1 : S Only |  |  |
| Max Downward Total Deflection     |  |  | 0.046 in Ratio = 1051  |  |  | >=180                        |  |  | Span: 1 : +D+S   |  |  |
| Max Upward Total Deflection       |  |  | 0.000 in Ratio = 0     |  |  | <180                         |  |  |                  |  |  |

## Maximum Forces & Stresses for Load Combinations

| Load Combination  |        | Max Stress Ratios |       | Summary of Moment Values |        |        |      |           |      |      | Summary of Shear Values |               |       |
|-------------------|--------|-------------------|-------|--------------------------|--------|--------|------|-----------|------|------|-------------------------|---------------|-------|
| Segment Length    | Span # | M                 | V     | Mmax +                   | Mmax - | Ma Max | Mnx  | Mnx/Omega | Cb   | Rm   | Va Max                  | Vnx/Vnx/Omega |       |
| D Only            |        |                   |       |                          |        |        |      |           |      |      |                         |               |       |
| Dsgn. L = 4.00 ft | 1      | 0.285             | 0.051 | 0.80                     |        | 0.80   | 4.68 | 2.80      | 1.00 | 1.00 | 0.80                    | 26.25         | 15.72 |
| +D+S              |        |                   |       |                          |        |        |      |           |      |      |                         |               |       |
| Dsgn. L = 4.00 ft | 1      | 0.327             | 0.059 | 0.92                     |        | 0.92   | 4.68 | 2.80      | 1.00 | 1.00 | 0.94                    | 26.25         | 15.72 |
| +D+0.750S         |        |                   |       |                          |        |        |      |           |      |      |                         |               |       |
| Dsgn. L = 4.00 ft | 1      | 0.316             | 0.057 | 0.89                     |        | 0.89   | 4.68 | 2.80      | 1.00 | 1.00 | 0.90                    | 26.25         | 15.72 |
| +0.60D            |        |                   |       |                          |        |        |      |           |      |      |                         |               |       |
| Dsgn. L = 4.00 ft | 1      | 0.171             | 0.031 | 0.48                     |        | 0.48   | 4.68 | 2.80      | 1.00 | 1.00 | 0.48                    | 26.25         | 15.72 |

## Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|------------------|------|---------------|------------------|------------------|---------------|------------------|
| +D+S             | 1    | 0.0457        | 2.000            |                  | 0.0000        | 0.000            |

## Vertical Reactions

Support notation : Far left is #:

Values in KIPS

| Load Combination | Support 1 | Support 2 |
|------------------|-----------|-----------|
| Overall MAXimum  | 0.935     | 0.896     |
| Overall MINimum  | -0.135    | -0.096    |
| D Only           | 0.800     | 0.800     |
| +D+S             | 0.935     | 0.896     |
| +D+0.750S        | 0.901     | 0.872     |

**Steel Beam**

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LIC# : KW-06015170, Build:20.21.10.4

DUNN ASSOCIATES INC.

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**DESCRIPTION:** INFILL ANGLES

**Vertical Reactions**

Support notation : Far left is #.

Values in KIPS

| Load Combination | Support 1 | Support 2 |
|------------------|-----------|-----------|
| +0.60D           | 0.480     | 0.480     |
| S Only           | 0.135     | 0.096     |

## 20 ga PLB™-36 Grade 50 Roof Deck

### Seismic Diaphragm Shear

For Both Ends Lapped Deck



Hilti X-ENP19 PAF Connections to Supports  
36 / 7 Perpendicular Connection Pattern to Supports  
PunchLok II Connection (VSC2) Sidelap Connections

A572 GR50 Support Member or Equivalent  
0.265 ≤ Support Thickness (in.)  
3 in. Minimum Deck End Bearing Length

#### LRFD Design Seismic Diaphragm Shear Strength $\Phi S_n$ (plf)

2 Span Condition

| Sidelap<br>Connection<br>Spacing (in.) | Span  |       |       |       |       |       |        |        |        |
|----------------------------------------|-------|-------|-------|-------|-------|-------|--------|--------|--------|
|                                        | 4'-0" | 5'-0" | 6'-0" | 7'-0" | 8'-0" | 9'-0" | 10'-0" | 11'-0" | 12'-0" |
| 4                                      | 2713  | 2713  | 2713  | 2713  | 2496  | 1972  | 1597   | 1320   | 1109   |
| 6                                      | 2652  | 2626  | 2608  | 2594  | 2496  | 1972  | 1597   | 1320   | 1109   |
| 8                                      | 2441  | 2454  | 2371  | 2392  | 2333  | 1972  | 1597   | 1320   | 1109   |
| 12                                     | 2101  | 2035  | 1988  | 1953  | 1926  | 1905  | 1597   | 1320   | 1109   |
| 18                                     | 1860  | 1833  | 1612  | 1628  | 1639  | 1500  | 1523   | 1320   | 1109   |
| 24                                     | 1556  | 1590  | 1379  | 1432  | 1284  | 1338  | 1225   | 1276   | 1109   |
| 36                                     | 1556  | 1303  | 1115  | 1213  | 1080  | 972   | 1059   | 972    | 898    |

#### Average Connection Spacing to Supports at Parallel Chords & Collectors (in.)

| Sidelap<br>Connection<br>Spacing (in.) | Span  |       |       |       |       |       |        |        |        |
|----------------------------------------|-------|-------|-------|-------|-------|-------|--------|--------|--------|
|                                        | 4'-0" | 5'-0" | 6'-0" | 7'-0" | 8'-0" | 9'-0" | 10'-0" | 11'-0" | 12'-0" |
| 4                                      | 7     | 7     | 7     | 7     | 7     | 9     | 9      | 9      | 9      |
| 6                                      | 8     | 8     | 7     | 7     | 7     | 9     | 12     | 14     | 14     |
| 8                                      | 8     | 8     | 8     | 8     | 8     | 9     | 12     | 15     | 18     |
| 12                                     | 10    | 10    | 10    | 9     | 10    | 10    | 12     | 15     | 18     |
| 18                                     | 12    | 12    | 12    | 12    | 12    | 14    | 12     | 15     | 18     |
| 24                                     | 16    | 15    | 14    | 14    | 16    | 15    | 15     | 15     | 18     |
| 36                                     | 16    | 20    | 24    | 17    | 19    | 22    | 20     | 22     | 24     |

#### Seismic or Wind Diaphragm Shear Stiffness, $G'$ (kip/in.)

2 Span Condition

| Sidelap<br>Connection<br>Spacing (in.) | Span  |       |       |       |       |       |        |        |        |
|----------------------------------------|-------|-------|-------|-------|-------|-------|--------|--------|--------|
|                                        | 4'-0" | 5'-0" | 6'-0" | 7'-0" | 8'-0" | 9'-0" | 10'-0" | 11'-0" | 12'-0" |
| 4                                      | 237   | 235   | 234   | 232   | 232   | 231   | 230    | 230    | 230    |
| 6                                      | 222   | 219   | 217   | 215   | 213   | 212   | 211    | 210    | 210    |
| 8                                      | 212   | 210   | 204   | 203   | 199   | 199   | 196    | 197    | 194    |
| 12                                     | 197   | 190   | 186   | 182   | 179   | 177   | 175    | 173    | 172    |
| 18                                     | 187   | 182   | 169   | 167   | 166   | 157   | 157    | 156    | 150    |
| 24                                     | 176   | 172   | 159   | 158   | 148   | 149   | 141    | 142    | 136    |
| 36                                     | 176   | 160   | 146   | 147   | 138   | 129   | 132    | 125    | 119    |

## 20 ga PLB™-36 Grade 50 Roof Deck

### Diaphragm Shear & Wind Uplift Interaction

For Both Ends Lapped Deck

with MWFRS Design Net Wind Uplift (LRFD) of 12 psf



Hilti X-ENP19 PAF Connections to Supports

36 / 7 Perpendicular Connection Pattern to Supports

PunchLok II Connection (VSC2) Sidelap Connections

A572 GR50 Support Member or Equivalent

0.265 ≤ Support Thickness (in.)

3 in. Minimum Deck End Bearing Length

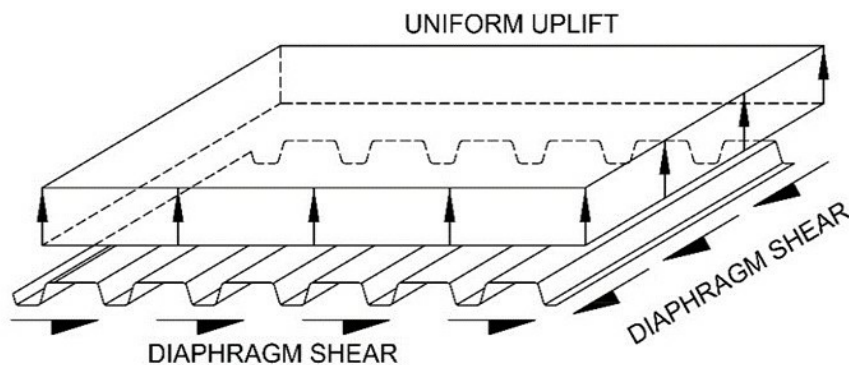
#### LRFD Design Combined Wind Uplift & Diaphragm Shear Strength $\Phi S_n$ (plf)

2 Span Condition

| Sidelap Connection Spacing (in.) | Span  |       |       |       |       |       |        |        |        |
|----------------------------------|-------|-------|-------|-------|-------|-------|--------|--------|--------|
|                                  | 4'-0" | 5'-0" | 6'-0" | 7'-0" | 8'-0" | 9'-0" | 10'-0" | 11'-0" | 12'-0" |
| 4                                | 3024  | 3005  | 2986  | 2966  | 2496  | 1972  | 1597   | 1320   | 1109   |
| 6                                | 2974  | 2933  | 2900  | 2873  | 2496  | 1972  | 1597   | 1320   | 1109   |
| 8                                | 2742  | 2746  | 2646  | 2658  | 2496  | 1972  | 1597   | 1320   | 1109   |
| 12                               | 2366  | 2286  | 2228  | 2184  | 2149  | 1972  | 1597   | 1320   | 1109   |
| 18                               | 2096  | 2061  | 1810  | 1825  | 1834  | 1677  | 1597   | 1320   | 1109   |
| 24                               | 1753  | 1788  | 1549  | 1606  | 1439  | 1497  | 1369   | 1320   | 1109   |
| 36                               | 1753  | 1464  | 1250  | 1360  | 1209  | 1086  | 1183   | 1085   | 1001   |

#### Average Connection Spacing to Supports at Parallel Chords & Collectors (in.)

| Sidelap Connection Spacing (in.) | Span  |       |       |       |       |       |        |        |        |
|----------------------------------|-------|-------|-------|-------|-------|-------|--------|--------|--------|
|                                  | 4'-0" | 5'-0" | 6'-0" | 7'-0" | 8'-0" | 9'-0" | 10'-0" | 11'-0" | 12'-0" |
| 4                                | 7     | 7     | 7     | 7     | 8     | 9     | 9      | 9      | 9      |
| 6                                | 8     | 8     | 7     | 7     | 8     | 10    | 12     | 14     | 14     |
| 8                                | 8     | 8     | 8     | 8     | 8     | 10    | 12     | 15     | 18     |
| 12                               | 10    | 10    | 10    | 9     | 10    | 10    | 12     | 15     | 18     |
| 18                               | 12    | 12    | 12    | 12    | 12    | 12    | 12     | 15     | 18     |
| 24                               | 16    | 15    | 14    | 14    | 16    | 14    | 15     | 15     | 18     |
| 36                               | 16    | 20    | 18    | 17    | 19    | 22    | 17     | 19     | 21     |



Tables generated using V1.0.3 of calculator based on AISI S310-16.

Date: 1/11/2022

NOTICE: Design defects that could cause injury or death may result from relying on the information in this document without independent verification by a qualified professional. The information in this document is provided "AS IS". Nucor Corporation and its affiliates expressly disclaim: (i) any and all representations, warranties and conditions and (ii) all liability arising out of or related to this document and the information in it.



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## 2.3 LOADS - SEISMIC

### Seismic Design Criteria

(2018 IBC 1613.3, ASCE 7-16 Chap. 11)

#### Mapped acceleration parameters

|                        |   |         |
|------------------------|---|---------|
| Mapped short period    | = | 0.099 g |
| Mapped 1.0 sec. period | = | 0.068 g |

#### Design acceleration Parameters

|                             |   |       |                               |
|-----------------------------|---|-------|-------------------------------|
| Site class                  | = | D     | 2018 IBC §1613.3.2            |
| Site coefficient            | = | 1.672 | 2018 IBC Table 1613.3.3(1)    |
| Site coefficient            | = | 2.445 | 2018 IBC Table 1613.3.3(2)    |
| Adjusted short period       | = | 0.166 | 2018 IBC §1613.3.3 Eq. 16-37  |
| Adjusted 1.0 sec period     | = | 0.166 | 2018 IBC §1613.3.3 Eq. 16-38  |
| Design short period         | = | 0.110 | 2018 IBC §1613.3.4 Eq. 16-39  |
| Design 1.0 sec period       | = | 0.111 | 2018 IBC §1613.3.4 Eq. 16-40  |
| Risk Category               | = | II    | 2018 IBC Table 1604.5         |
| IBC Seismic design category | = | B     | 2018 IBC Table 1613.3.5(1, 2) |

### Equivalent Lateral Force Procedure

(ASCE 7-16 Chap. 12.8)

|                                | Primary LFRS                                                                                                  |
|--------------------------------|---------------------------------------------------------------------------------------------------------------|
| Basic structural system        | = A. Bearing Wall Systems                                                                                     |
| Seismic force-resisting system | = 15. Light frame walls sheathed with wood structural panels rated for shear resistance or shear panels (wood |

#### Structural design parameters

|                                 |     |       |                          |
|---------------------------------|-----|-------|--------------------------|
| Horiz. Combination of LRFS      | =   | 0     | ASCE 7-16 §12.2.2-12.2.3 |
| Response modification factor    | R=  | 6.5   | ASCE 7-16 Table 12.2-1   |
| System overstrength factor      | Ω=  | 3     | ASCE 7-16 Table 12.2-1   |
| Deflection amplification factor | Cd= | 4     | ASCE 7-16 Table 12.2-1   |
| Building height limit           | =   | NL ft | ASCE 7-16 Table 12.2-1   |

#### Fundamental period

|                                |                                |           |                        |
|--------------------------------|--------------------------------|-----------|------------------------|
| Structure type                 | = All other structural Systems |           |                        |
| Approximate period parameter   | Ct=                            | 0.02      | ASCE 7-16 Table 12.8-2 |
| Approximate period parameter   | x=                             | 0.75      | ASCE 7-16 Table 12.8-2 |
| Height above base              | hn=                            | 18.5 ft   | ASCE 7-16 §12.8.2.1    |
| Approximate fundamental period | Ta=                            | 0.18 sec. | ASCE 7-16 Eq. 12.8-7   |
| Approximate fundamental freq.  | n=                             | 5.61 hz   |                        |
| Long period transition period  | TL=                            | 12 sec.   | ASCE 7-16 Figure 22-12 |
| Structure period exponent      | k=                             | 1         | ASCE 7-16 §12.8.3      |

#### Seismic base shear



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|                                 |              |       |                             |
|---------------------------------|--------------|-------|-----------------------------|
| Seismic importance factor       | $I_e =$      | 1     | ASCE 7-16 Table 1.5-2       |
| Seismic response coefficient    | $C_{smin} =$ | 0.010 | ASCE 7-16 Eq. 12.8-5-12.8-6 |
| Seismic response coefficient    | $C_{smax} =$ | 0.096 | ASCE 7-16 Eq. 12.8-3-12.8-4 |
| Seismic response coefficient    | $C_s =$      | 0.017 | ASCE 7-16 Eq. 12.8-2        |
| Seismic base shear (LRFD Total) | $V =$        | 0 k   | ASCE 7-16 Eq. 12.8-1        |



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### Dead loads

(2018 IBC 1606, ASCE 7-16 Chap. 12.7.2, Table C3-1)

|                                             |   |    |     |                   |
|---------------------------------------------|---|----|-----|-------------------|
| Effective seismic snow weight               | = | 0  | psf | ASCE 7-16 §12.7.2 |
| Roof DL No.1                                | = | 17 | psf |                   |
| Floor DL No.1                               | = | 26 | psf |                   |
| Interior stud walls                         | = | 12 | psf |                   |
| Exterior 2x6 @ 16-in, 5/8" gypsum, insulate | = | 12 | psf |                   |
| Exterior stud walls with brick veneer       | = | 40 | psf |                   |

### Weight Parameters

| Level         | Exterior Wall     |               |               | Roof      |              | Floor     |              | Total(N-S)    |
|---------------|-------------------|---------------|---------------|-----------|--------------|-----------|--------------|---------------|
|               | Trib. Height (ft) | Wall Per (ft) | Veneer P (ft) | Area (sf) | Weight (psf) | Area (sf) | Weight (psf) | Weight (lbs)  |
| 1             | 8                 | 0             | 245           | 0         | 17           | 0         | 26           | 78400         |
| <b>Total=</b> |                   |               |               |           |              |           |              | <b>78,400</b> |

### Seismic Lateral Loads

(ASCE 7-16 Chap. 12.8.3)

| Level | Height (ft) | Floor (in) | Hx <sup>k</sup> (ft) | Cvx | Fx (lb) | Vx (Shear walls) |          |
|-------|-------------|------------|----------------------|-----|---------|------------------|----------|
|       |             |            |                      |     |         | LRFD (lb)        | ASD (lb) |
| 1     | 16.0        | 30.0       | 16.0                 | 1.0 | 1.3     | 1.3              | 0.9      |



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## 3.1 LFRS - WOOD SHEATHING / DIAPHRAGMS

### Sheathing Analysis

APA Engineered Wood Construction Guide, Form No. D510 Section 4.7

| Location | Applied loads (OOP) |          |          | Sheathing |        | Support Spacing (in) |   | Allow    | Result |
|----------|---------------------|----------|----------|-----------|--------|----------------------|---|----------|--------|
|          | Label               | LL (psf) | DL (psf) | Size      | Rating |                      |   | LL (psf) |        |
| Roof     | S 14 17             | 14       | 17       | 7/8"      | 32 oc  | 24                   | 0 | 223      | OK 6%  |
| Floor    | L 40 26             | 40       | 26       | 23/32"    | 48/24  | 16                   | 0 | 325      | OK 12% |

### Diaphragm Parameters

| Level | Seismic<br>Fpx | Transverse (front) |                    | Longitudinal (side) |                    | Sheathing |       | Diaphragm |          |
|-------|----------------|--------------------|--------------------|---------------------|--------------------|-----------|-------|-----------|----------|
|       |                | Wind<br>MWFRS      | Horz.<br>dim. (ft) | Wind<br>MWFRS       | Horz.<br>dim. (ft) | Mark      | Panel | Nailing   | Blocking |

### Diaphragm Analysis

| Level                        | Max<br>Span (ft) | Reaction Load (lb) |         | Diaphragr<br>Line L (ft) | Layout | Wind    |             | Seismic |             |
|------------------------------|------------------|--------------------|---------|--------------------------|--------|---------|-------------|---------|-------------|
|                              |                  | Wind               | Seismic |                          |        | v (plf) | Allow (plf) | v (plf) | Allow (plf) |
| Transverse direction (N-S)   |                  |                    |         |                          |        |         |             |         |             |
| 1                            | 83               |                    |         | 35                       |        |         |             |         |             |
| Longitudinal direction (E-W) |                  |                    |         |                          |        |         |             |         |             |
| 1                            | 35               |                    |         | 83                       |        |         |             |         |             |

### Chord Analysis

| Max                          |           |            | Chord      |                    |            |
|------------------------------|-----------|------------|------------|--------------------|------------|
| Level                        | Span (ft) | Depth (ft) | Force (lb) | Collector Type     | Allow (lb) |
| Transverse direction (N-S)   |           |            |            |                    |            |
| 1                            | 83        | 35         | 0          | TP Splice (20) 16d | 4512       |
| Longitudinal direction (E-W) |           |            |            |                    |            |
| 1                            | 35        | 83         | 0          | TP Splice (20) 16d | 4512       |

### Strut Analysis

| Level                        | Line        | Depth (ft) | Strut       | Strut      | Collector Type     | Allow (lb) |
|------------------------------|-------------|------------|-------------|------------|--------------------|------------|
|                              | Length (ft) |            | Length (ft) | Force (lb) |                    |            |
| Transverse direction (N-S)   |             |            |             |            |                    |            |
| 1                            | 35          | 83         | 17          | 0          | TP Splice (20) 16d | 4512       |
| Longitudinal direction (E-W) |             |            |             |            |                    |            |
| 1                            | 83          | 35         | 41          | 0          | TP Splice (20) 16d | 4512       |



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## 3.2 LFRS - WOOD SHEAR WALLS

### Level 1 - Transverse LRFS (IBC 2018 Sec. 2305)

|                            |   |       |    |
|----------------------------|---|-------|----|
| Wind lateral load (ASD)    | = | 7,776 | lb |
| Seismic lateral load (ASD) | = | 932   | lb |

### Transverse Shear Distribution

| Line | %   | Wind  | Seismic | $\rho$ |
|------|-----|-------|---------|--------|
| 1    | 3%  | 234   | 28      | 1      |
| 2    | 17% | 1,341 | 161     | 1      |
| 3    | 20% | 1,525 | 183     | 1      |
| 4    | 24% | 1,903 | 228     | 1      |
| 5    | 28% | 2,148 | 257     | 1      |
| 6    | 8%  | 626   | 75      | 1      |

### Transverse shear walls

| Wall Segment  |             |             |                 |                           |              |      |         |               |           |
|---------------|-------------|-------------|-----------------|---------------------------|--------------|------|---------|---------------|-----------|
| Line & Option | Length (ft) | Height (ft) | Wind Load (plf) | Seismic Demand Load (plf) | Demand (plf) | Type | % Allow | $\Delta$ (in) | HD (kips) |
| 1             | 6.1667      | 16          | 42              | 5                         | 42           | SW-1 | 0.1     | 1.3           | 327       |
| 2             | 5           | 16          | 362             | 43                        | 362          | SW-1 | 0.4     | 3.0           | 5,783     |
| 3             | 7.5         | 16          | 203             | 24                        | 203          | SW-4 | 0.6     | 2.4           | 2,951     |
| 4             | 8.75        | 16          | 217             | 26                        | 217          | SW-4 | 0.6     | 2.6           | 3,092     |
| 5             | 13          | 16          | 165             | 20                        | 165          | SW-4 | 0.5     | 1.8           | 1,945     |
| 6             | 7.5         | 16          | 20              | 2                         | 20           | SW-1 | 0.1     | 1.1           | 0         |
| 6             | 14.66       | 16          | 20              | 2                         | 20           | SW-1 | 0.1     | 0.7           | 0         |
| 6             | 9.1667      | 16          | 20              | 2                         | 20           | SW-1 | 0.1     | 0.8           | 0         |
| 0             | 0           | 16          |                 |                           |              | #N/A |         |               |           |
| 0             | 0           | 16          |                 |                           |              | #N/A |         |               |           |



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### Level 1 - Longitudinal LRFS (IBC 2018 Sec. 2305)

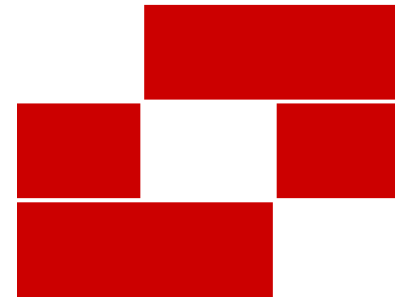
|                            |   |       |    |
|----------------------------|---|-------|----|
| Wind lateral load (ASD)    | = | 2,703 | lb |
| Seismic lateral load (ASD) | = | 932   | lb |

### Longitudinal Shear Distribution

| Line | %   | Wind  | Seismic | $\rho$ |
|------|-----|-------|---------|--------|
| A    | 47% | 1,275 | 440     | 1      |
| C    | 53% | 1,428 | 492     | 1      |

### Longitudinal shear walls

| Wall Segment  |             |             |                 |                           |              |      |             |               |           |
|---------------|-------------|-------------|-----------------|---------------------------|--------------|------|-------------|---------------|-----------|
| Line & Option | Length (ft) | Height (ft) | Wind Load (plf) | Seismic Demand Load (plf) | Demand (plf) | Type | Allow (plf) | $\Delta$ (in) | HD (kips) |
| A             | 7.66        | 16          | 24              | 8                         | 24           | SW-1 | 7%          | 1.2           | 0         |
| A             | 8           | 16          | 24              | 8                         | 24           | SW-1 | 7%          | 1.1           | 0         |
| A             | 15.5        | 16          | 24              | 8                         | 24           | SW-1 | 7%          | 0.7           | 0         |
| A             | 13.8        | 16          | 24              | 8                         | 24           | SW-1 | 7%          | 0.7           | 0         |
| A             | 7.66        | 16          | 24              | 8                         | 24           | SW-1 | 7%          | 1.2           | 0         |
| O             | 0           | 16          |                 |                           |              | #N/A |             |               |           |
| C             | 5.5         | 16          | 27              | 9                         | 27           | SW-1 | 7%          | 1.3           | 119       |
| C             | 8.33        | 16          | 27              | 9                         | 27           | SW-1 | 7%          | 1.1           | 0         |
| C             | 8           | 16          | 27              | 9                         | 27           | SW-1 | 7%          | 1.1           | 0         |
| C             | 32.5        | 16          | 27              | 9                         | 27           | SW-1 | 7%          | 0.4           | 0         |



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| sheet information: |             |      |
|--------------------|-------------|------|
| revisions:         | Δ           |      |
| num.               | description | date |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |
| project number:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | MO-53LEE |
| project status:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |          |
| original drawing is 24" x 36"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          |
| current as of: 11/17/2021 10:00:16 AM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |
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| project information:                                                  |     |
|-----------------------------------------------------------------------|-----|
| MO-53 LEE - LEE'S SUMMIT                                              | for |
| MOBETTAH'S (SHELL)                                                    |     |
| NORTHWEST CHIPMAN ROAD & NORTHWEST WARD ROAD<br>LEE'S SUMMIT, MO, USA |     |

sheet title:

LEVEL 1 SHELL PLAN

sheet number:

AS112

KEYNOTES

- HOSE BIB - COORDINATE WITH MECHANICAL
- PROPOSED LOCATION OF GAS METER - COORDINATE WITH MECHANICAL
- ELECTRICAL GEAR - COORDINATE WITH ELECTRICAL
- CONCRETE SLAB OVER GRAVEL BASE AND OVER VAPOR BARRIER (REFER TO SHEET A112 FOR INTERIOR IMPROVEMENTS) - COORDINATE WITH SLAB PLAN AND STRUCTURALLY
- LOCKABLE EXTERIOR ROOF ACCESS LADDER - SEE DETAILS
- 2 X 2 - 1/4" DEEP VENEER GLAZING FRAME
- CO2 INFILL BOX; COORDINATE WITH OWNER
- ROOF DRAINS - COORDINATE WITH MECHANICAL
- 
- 

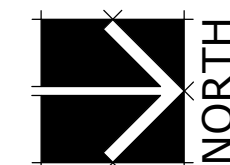
FLOOR PLAN GENERAL NOTES:

- DRAWINGS & SPECIFICATIONS ARE COMPLEMENTARY COMPONENTS OF THE CONTRACT DOCUMENTS. REVIEW ALL DRAWINGS AND SPECIFICATIONS FOR THE COMPLETE SCOPE OF WORK. NOTIFY ARCHITECT IMMEDIATELY FOR CLARIFICATION IF INCONSISTENCIES, CONTRADICTIONS OR OMISSIONS ARE DISCOVERED.
- DO NOT SCALE DRAWINGS. IF DIMENSIONAL INFORMATION IS REQUIRED & NOT FOUND, NOTIFY ARCHITECT IMMEDIATELY FOR CLARIFICATION BEFORE PROCEEDING WITH CONSTRUCTION.
- ALL DIMENSIONS ARE TO COLUMN CENTERLINES, TO GRIDLINES OR TO FACE OF FRAMING UNLESS NOTED OTHERWISE.
- UNLESS NOTED OTHERWISE CLEAR DIMENSIONS INDICATE DIMENSION BETWEEN FINISHES.
- CONTRACTOR SHALL NOTIFY THE ARCHITECT OF DISCREPANCIES IN THE DOCUMENTS, AND OF ANY FIELD CONDITIONS THAT DEVIATE FROM THE DOCUMENTS.
- THE ARCHITECT'S APPROVAL MUST BE OBTAINED FOR ANY DEVIATIONS FROM THE CONSTRUCTION DOCUMENTS, INCLUDING BUT NOT LIMITED TO CHANGES IN DIMENSIONS, DESIGN, MATERIALS, PRODUCTS, AND FINISHES. IN NO CASE MAY THE CONTRACTOR MAKE THESE CHANGES WITHOUT THE APPROVAL OF THE ARCHITECT.
- SHOP DRAWINGS AND OTHER SUBMITTALS ARE TO BE PRESENTED TO THE ARCHITECT FOR REVIEW PRIOR TO EXECUTION OF WORK. ALLOW APPROPRIATE TIME FOR REVIEW.
- SEE DOOR AND WINDOW SCHEDULES FOR SIZES, TYPES, AND FINISHES, HARDWARE, ETC.
- FOR BUILDING CODE REQUIREMENTS OR FIRE/SMOKE REQUIREMENTS, SEE 'G' SHEETS.
- ALL FIRE RATED WALLS TO BE LABELED AS FIRE RATED. LABEL TO BE PLACED ABOVE CEILING LINE.
- ANY COLUMN FURRING TO BE TIGHT TO COLUMN UNDO.
- ALL CONSTRUCTION SHALL CONFORM TO AND STRICTLY COMPLY WITH ALL APPLICABLE CODES, COVENANTS, RESTRICTIONS, AND OTHER REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION OVER THE PROJECT.
- IN NO EVENT SHALL THE CONTRACTOR SUBMIT A STANDARD CONSTRUCTION DETAIL FOR A DETAIL SPECIFIED IN THESE DOCUMENTS WITHOUT THE APPROVAL IN WRITING FROM THE ARCHITECT. THE CONTRACTOR SHALL BRING ALL WORK INTO CONFORMITY WITH THE CONSTRUCTION DOCUMENTS, AS THE ARCHITECT ORDERS, BEFORE APPROVAL OF THAT PORTION OF THE PROJECT WILL BE GRANTED.
- CONTRACTOR TO COORDINATE ALL FLOOR PENETRATIONS WITH ALL TRADES.
- COORDINATE WITH ELECTRICAL DRAWINGS FOR POWER, DATA, AND OTHER SYSTEM LOCATIONS AND REQUIREMENTS.
- THESE DIMENSIONS AND OTHER F.F.E. SHOWN ON DRAWINGS IS FOR INFORMATION ONLY AND IS ONLY TO BE USED FOR REFERENCE ONLY. THE CONTRACTOR SHALL COORDINATE THE FINAL LOCATION OF ELECTRICAL OUTLETS AND OTHER NEEDS WITH THE OWNER AND ARCHITECT, PRIOR TO INSTALLATION.

A 1,297.17 sf  
C 1,452.45 sf

1 83.02 sf  
2 474.51 sf  
3 541.21 sf  
4 675.33 sf  
5 762.5 sf  
6 222.06 sf

1 LEVEL 1 -SHELL PLAN  
1/4" = 1'-0"



THIS SHEET DESCRIBES THE CORE AND SHELL  
FOR THIS PROJECT; COORDINATE WITH SHEET A112  
AS FOR INTERIOR IMPROVMENTS



DUNN ASSOCIATES, INC.  
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Wood Shear Wall Schedule per NDS SDPWS-2008

L-10  
Sheet No: \_\_\_\_\_  
Job No: \_09  
Date: 1/21/2022  
By: \_

Denoted as SW-2 in the drawings.

Assumes studs at 16" o.c.

| ASD<br>Seismic<br>Capacity<br>plf | Ga<br>OSB | Ga<br>Ply |
|-----------------------------------|-----------|-----------|
| 260                               | 15        | 11        |
| 380                               | 22        | 14        |
| 490                               | 28        | 17        |
| 640                               | 42        | 21        |
| 760                               | 44        | 28        |
| 980                               | 56        | 34        |
| 1280                              | 84        | 42        |
| 310                               | 22        | 14        |
| 460                               | 30        | 17        |
| 600                               | 37        | 19        |
| 770                               | 52        | 23        |
| 920                               | 60        | 34        |
| 1200                              | 74        | 38        |
| 1540                              | 104       | 46        |
| 340                               | 19        | 13        |
| 510                               | 26        | 16        |
| 665                               | 33        | 18        |
| 870                               | 48        | 22        |
| 1020                              | 52        | 32        |
| 1330                              | 66        | 36        |
| 1740                              | 96        | 44        |

| Wood Shear Wall Schedule               |                                 |                                         |           |              |       |                                                            |                                            |                                                      |                       |             |         |       |                                       |
|----------------------------------------|---------------------------------|-----------------------------------------|-----------|--------------|-------|------------------------------------------------------------|--------------------------------------------|------------------------------------------------------|-----------------------|-------------|---------|-------|---------------------------------------|
| Mark                                   | Sheathing<br>Panel<br>Thickness | # of Faces<br>of Wall to be<br>Sheathed | Nailing   |              |       | Studs<br>and Blocking<br>Size at Adjoining<br>Panel Joints | Sill Plate Nailing<br><br>Sill to Blocking | Framing Anchor<br>Connector<br>Blocking to Top Plate | Foundation Attachment |             |         |       | Hold Down<br><br>T=C<br>kips<br>(ASD) |
|                                        |                                 |                                         | Nail Size | Spacing (in) |       |                                                            |                                            |                                                      | Sole Plate            | Anchor Bolt | Spacing | Embed |                                       |
|                                        |                                 |                                         |           | Panel Edges  | Field |                                                            |                                            |                                                      |                       |             |         |       |                                       |
| SDC ABCDEF<br>Plywood<br>Fully blocked |                                 |                                         |           |              |       |                                                            |                                            |                                                      |                       |             |         |       |                                       |
| SW-1                                   | 7/16"                           | 1                                       | 8d        | 6            | 12    | 2x                                                         | (1) Row 16d at 8"oc                        | (1) A34 at 16"oc                                     | 2x                    | 5/8"        | 48"oc   | 6"    |                                       |
| SW-2                                   | 7/16"                           | 1                                       | 8d        | 4            | 12    | 3x                                                         | (2) Row 16d at 10"oc                       | (1) A34 at 16"oc                                     | 2x                    | 5/8"        | 40"oc   | 6"    |                                       |
| SW-3                                   | 7/16"                           | 1                                       | 8d        | 3            | 12    | 3x                                                         | (2) Row 16d at 8"oc                        | (2) A34 at 16"oc                                     | 2x                    | 5/8"        | 32"oc   | 6"    |                                       |
| SW-4                                   | 7/16"                           | 1                                       | 8d        | 2            | 12    | 3x                                                         | (2) Row 16d at 6"oc                        | (2) A34 at 16"oc                                     | 2x                    | 5/8"        | 24"oc   | 6"    |                                       |
| SW-5                                   | 7/16"                           | 2                                       | 8d        | 4            | 12    | 3x                                                         | (3) Row 16d at 7.5"oc                      | (2) A34 at 16"oc                                     | 3x                    | 5/8"        | 24"oc   | 6"    |                                       |
| SW-6                                   | 7/16"                           | 2                                       | 8d        | 3            | 12    | 3x                                                         | (3) Row 16d at 6"oc                        | (3) A34 at 16"oc                                     | 3x                    | 5/8"        | 16"oc   | 6"    |                                       |
| SW-7                                   | 7/16"                           | 2                                       | 8d        | 2            | 12    | 3x                                                         | (5) Row 16d at 6"oc                        | (4) A34 at 16"oc                                     | 3x                    | 5/8"        | 16"oc   | 6"    |                                       |
|                                        |                                 |                                         |           |              |       |                                                            |                                            |                                                      |                       |             |         |       |                                       |
| SW-11                                  | 15/32"                          | 1                                       | 10d       | 6            | 12    | 2x                                                         | (1) Row 16d at 6"oc                        | (1) A34 at 16"oc                                     | 2x                    | 5/8"        | 48"oc   | 6"    |                                       |
| SW-12                                  | 15/32"                          | 1                                       | 10d       | 4            | 12    | 3x                                                         | (2) Row 16d at 8"oc                        | (2) A34 at 16"oc                                     | 2x                    | 5/8"        | 32"oc   | 6"    |                                       |
| SW-13                                  | 15/32"                          | 1                                       | 10d       | 3            | 12    | 3x                                                         | (2) Row 16d at 6"oc                        | (2) A34 at 16"oc                                     | 2x                    | 5/8"        | 24"oc   | 6"    |                                       |
| SW-14                                  | 15/32"                          | 1                                       | 10d       | 2            | 12    | 3x                                                         | (3) Row 16d at 7.5"oc                      | (2) A34 at 16"oc                                     | 2x                    | 5/8"        | 16"oc   | 6"    |                                       |
| SW-15                                  | 15/32"                          | 2                                       | 10d       | 4            | 12    | 3x                                                         | (3) Row 16d at 6"oc                        | (3) A34 at 16"oc                                     | 3x                    | 5/8"        | 24"oc   | 6"    |                                       |
| SW-16                                  | 15/32"                          | 2                                       | 10d       | 3            | 12    | 3x                                                         | (4) Row 16d at 6"oc                        | (3) A34 at 16"oc                                     | 3x                    | 5/8"        | 16"oc   | 6"    |                                       |
| SW-17                                  | 15/32"                          | 2                                       | 10d       | 2            | 12    | 3x                                                         | (5) Row 16d at 6"oc                        | (4) A34 at 16"oc                                     | 3x                    | 5/8"        | 8" oc   | 6"    |                                       |
|                                        |                                 |                                         |           |              |       |                                                            |                                            |                                                      |                       |             |         |       |                                       |
| SW-21                                  | 19/32"                          | 1                                       | 10d       | 6            | 12    | 2x                                                         | (1) Row 16d at 6"oc                        | (1) A34 at 16"oc                                     | 2x                    | 5/8"        | 48" oc  | 6"    |                                       |
| SW-22                                  | 19/32"                          | 1                                       | 10d       | 4            | 12    | 3x                                                         | (2) Row 16d at 8"oc                        | (2) A34 at 16"oc                                     | 2x                    | 5/8"        | 32" oc  | 6"    |                                       |
| SW-23                                  | 19/32"                          | 1                                       | 10d       | 3            | 12    | 3x                                                         | (2) Row 16d at 6"oc                        | (2) A34 at 16"oc                                     | 2x                    | 5/8"        | 24" oc  | 6"    |                                       |
| SW-24                                  | 19/32"                          | 1                                       | 10d       | 2            | 12    | 3x                                                         | (3) Row 16d at 6"oc                        | (3) A34 at 16"oc                                     | 2x                    | 5/8"        | 16" oc  | 6"    |                                       |
| SW-25                                  | 19/32"                          | 2                                       | 10d       | 4            | 12    | 3x                                                         | (3) Row 16d at 6"oc                        | (3) A34 at 16"oc                                     | 3x                    | 5/8"        | 16" oc  | 6"    |                                       |
| SW-26                                  | 19/32"                          | 2                                       | 10d       | 3            | 12    | 3x                                                         | (4) Row 16d at 6"oc                        | (4) A34 at 16"oc                                     | 3x                    | 5/8"        | 16" oc  | 6"    |                                       |
| SW-27                                  | 19/32"                          | 2                                       | 10d       | 2            | 12    | 3x                                                         | (6) Row 16d at 6"oc                        | (5) A34 at 16"oc                                     | 3x                    | 5/8"        | 8" oc   | 6"    |                                       |

| Cub | ASD<br>Seismic<br>plf | Ga<br>OSB | Ga<br>Ply |
|-----|-----------------------|-----------|-----------|
| 0.8 | 240                   | 192       | 15        |
| 0.6 | 240                   | 144       | 15        |

values based on studs at 24" oc

|                                    |       |   |                  |   |    |    |                     |                  |    |      |        |    |
|------------------------------------|-------|---|------------------|---|----|----|---------------------|------------------|----|------|--------|----|
| SDC ABCDEF<br>Plywood<br>Unblocked |       |   | Height <= 16'-0" |   |    |    |                     |                  |    |      |        |    |
| SW-31                              | 7/16" | 1 | 8d               | 6 | 6  | 2x | (1) Row 16d at 8"oc | (1) A34 at 32"oc | 2x | 5/8" | 48" oc | 6" |
| SW-32                              | 7/16" | 1 | 8d               | 6 | 12 | 2x | (1) Row 16d at 8"oc | (1) A34 at 32"oc | 2x | 5/8" | 48" oc | 6" |

|     |    |    |
|-----|----|----|
| 260 | 13 | 10 |
| 380 | 19 | 13 |
| 490 | 25 | 15 |
| 640 | 39 | 20 |

|                                                         |                 |   |     |   |    |    |                      |                  |    |      |        |    |
|---------------------------------------------------------|-----------------|---|-----|---|----|----|----------------------|------------------|----|------|--------|----|
| SDC ABCDEF<br>Plywood<br>Over Gypboard<br>Fully Blocked |                 |   |     |   |    |    |                      |                  |    |      |        |    |
| SW-33                                                   | 1/16" or 15/32" | 1 | 10d | 6 | 12 | 2x | (1) Row 16d at 8"oc  | (1) A34 at 16"oc | 2x | 5/8" | 48" oc | 6" |
| SW-34                                                   | 1/16" or 15/32" | 1 | 10d | 4 | 12 | 3x | (2) Row 16d at 10"oc | (1) A34 at 16"oc | 2x | 5/8" | 40" oc | 6" |
| SW-35                                                   | 1/16" or 15/32" | 1 | 10d | 3 | 12 | 3x | (2) Row 16d at 8"oc  | (2) A34 at 16"oc | 2x | 5/8" | 32" oc | 6" |
| SW-36                                                   | 1/16" or 15/32" | 1 | 10d | 2 | 12 | 3x | (2) Row 16d at 6"oc  | (2) A34 at 16"oc | 2x | 5/8" | 24"oc  | 6" |

| Cub | ASD<br>Seismic<br>plf | Ga<br>OSB | Ga<br>Ply |
|-----|-----------------------|-----------|-----------|
| 0.8 | 260                   | 208       | 13        |
| 0.6 | 260                   | 156       | 13        |

|                                                     |                 |   |     |   |    |    |                     |                     |    |      |        |    |
|-----------------------------------------------------|-----------------|---|-----|---|----|----|---------------------|---------------------|----|------|--------|----|
| SDC ABCDEF<br>Plywood<br>Over Gypboard<br>Unblocked |                 |   |     |   |    |    |                     |                     |    |      |        |    |
| SW-37                                               | 1/16" or 15/32" | 1 | 10d | 6 | 6  | 2x | (1) Row 16d at 8"oc | (1) A34 at 19.2" oc | 2x | 5/8" | 48" oc | 6" |
| SW-38                                               | 1/16" or 15/32" | 1 | 10d | 7 | 12 | 2x | (1) Row 16d at 8"oc | (1) A34 at 32" oc   | 2x | 5/8" | 48" oc | 6" |

|     |     |
|-----|-----|
| 125 | 6.5 |
| 150 | 7.5 |

|                                       |      |   |           |   |   |    |                     |                   |    |      |        |    |
|---------------------------------------|------|---|-----------|---|---|----|---------------------|-------------------|----|------|--------|----|
| SDC ABCD<br>Gypboard<br>Fully Blocked |      |   |           |   |   |    |                     |                   |    |      |        |    |
| SW-41                                 | 1/2" | 1 | 5d cooler | 7 | 7 | 2x | (1) Row 16d at 8"oc | (1) A34 at 32" oc | 2x | 5/8" | 48" oc | 6" |
| SW-42                                 | 1/2" | 1 | 5d cooler | 4 | 4 | 2x | (1) Row 16d at 8"oc | (1) A34 at 32" oc | 2x | 5/8" | 48" oc | 6" |



DUNN ASSOCIATES, INC.  
Consulting Structural Engineers

# Wood Shear Wall Schedule per NDS SDPWS-2008

L-11

Sheet No: \_\_\_\_\_  
Job No: 09  
Date: 1/21/2022  
By: \_

|     |     |               |      |   |           |   |   |    |                     |                   |    |      |        |    |
|-----|-----|---------------|------|---|-----------|---|---|----|---------------------|-------------------|----|------|--------|----|
| 100 | 5.5 | Unblocked     |      |   |           |   |   |    |                     |                   |    |      |        |    |
|     |     | SW-43         | 1/2" | 1 | 5d cooler | 7 | 7 | 2x | (1) Row 16d at 8"oc | (1) A34 at 32" oc | 2x | 5/8" | 48" oc | 6" |
| 125 | 6.5 | SW-44         | 1/2" | 1 | 5d cooler | 4 | 4 | 2x | (1) Row 16d at 8"oc | (1) A34 at 32" oc | 2x | 5/8" | 48" oc | 6" |
|     |     | Fully Blocked |      |   |           |   |   |    |                     |                   |    |      |        |    |
| 145 | 7.5 | SW-45         | 5/8" | 1 | 6d cooler | 7 | 7 | 2x | (1) Row 16d at 8"oc | (1) A34 at 32" oc | 2x | 5/8" | 48" oc | 6" |
|     |     | SW-46         | 5/8" | 1 | 6d cooler | 4 | 4 | 2x | (1) Row 16d at 8"oc | (1) A34 at 32" oc | 2x | 5/8" | 48" oc | 6" |
| 175 | 8.5 | Unblocked     |      |   |           |   |   |    |                     |                   |    |      |        |    |
|     |     | SW-47         | 5/8" | 1 | 6d cooler | 7 | 7 | 2x | (1) Row 16d at 8"oc | (1) A34 at 32" oc | 2x | 5/8" | 48" oc | 6" |
| 145 | 7.5 | SW-48         | 5/8" | 1 | 6d cooler | 4 | 4 | 2x | (1) Row 16d at 8"oc | (1) A34 at 32" oc | 2x | 5/8" | 48" oc | 6" |

Use 3x at 350 plf  
and above

Use 3x  
at dbl sided  
walls

Other Adjustments to Consider

IBC 2012  
ASD Values

If "Wet" or "Green" 0.5 Ga factor

If 4 or 5 ply plywood 1.2 Ga factor

If Other Species Modify per SG

at (2) 2x option Use 16d at same spacing

Specify OSB, not Plywood to control deflection

Thickness of rim board needs to be determined

## Alternate Sill Nails and Blocking 8-2020

| Sill Nailing | Blocking                         |
|--------------|----------------------------------|
| 1R@8         | 1 1/2"LSL                        |
| 1R@6         | 1 1/2"LSL                        |
| 2R@10        | 1 3/4"LSL                        |
| 2R@8         | 1 3/4"LSL                        |
| 2R@6         | 1 3/4"LSL                        |
| 3R@7.5       | 3 1/2"LSL OR 1 3/4 W/ ADDL BLOCK |
| 3R@6         | 3 1/2"LSL OR 1 3/4 W/ ADDL BLOCK |
| 3R@6         | 3 1/2"LSL OR 1 3/4 W/ ADDL BLOCK |
| 4R@6         | 3 1/2"LSL OR 1 3/4 W/ ADDL BLOCK |
| 4R@6         | 3 1/2"LSL OR 1 3/4 W/ ADDL BLOCK |
| 5R@6         | 3 1/2"LSL                        |
| 6R@6         | 3 1/2"LSL                        |

## VERSA-LAM® Beams

### Closest Allowable Nail Spacing

| VERSA-LAM® & VERSA-RIM® Products |                                                             |
|----------------------------------|-------------------------------------------------------------|
| Nail Size                        | Nailing Parallel to Glue Lines (Narrow Face) <sup>(1)</sup> |
|                                  | VERSA-L AM®                                                 |
| Nail Size                        | Nailing Perpendicular to Glue Lines (Wide Face)             |

Nailing Parallel to Glue Lines  
(Narrow Face)



| Sill Plate Nailing           |            | Framing Anchor                      |            | Anchor bolts |          |
|------------------------------|------------|-------------------------------------|------------|--------------|----------|
| 16d                          | 174# each  | Simpson A35 (values updated 8-2020) | 650# each  | BOLTS        | 2x       |
| 1.25" penetration            | good for   | 4.5" long                           | good for   | 5/8"         | 1,485.00 |
| per ft                       | plf        | (1) A35 at 16" o.c.                 | 487.5      | 48           | 371.25   |
| 1.5 (1) Row 16d at 8"oc      | 261        | (2) A35 at 16" o.c.                 | 975        | 40           | 445.50   |
| 2 (1) Row 16d at 6"oc        | 348        | (3) A35 at 16" o.c.                 | 1462.5     | 32           | 556.88   |
| 2.4 (1) Row 16d at 5"oc      | 417.6      |                                     |            | 24           | 742.50   |
| 3 (1) Row 16d at 4"oc        | 522        | (1) A35 at 19.2" o.c.               | 406.25     | 16           | 1,113.75 |
| 4 (1) Row 16d at 3"oc        | 696        | (2) A35 at 19.2" o.c.               | 812.5      | 8            | 2,227.50 |
| 4.8 (2) Row 16d at 5"oc      | 835.2      | (3) A35 at 19.2" o.c.               | 1218.75    | 2x           | 2,844.00 |
| 6 (2) Row 16d at 4"oc        | 1044       |                                     |            | 3/4"         | 2,039.00 |
| 6 (3) Row 16d at 6"oc        | 1044       | Simpson LS70                        | 915# each  | 48           | 509.75   |
| 7.2 (3) Row 16d at 5"oc      | 1252.8     | 6.375"long                          | 1372       | 40           | 611.70   |
| 8 (2) Row 16d at 3"oc        | 1392       | (2) LS70 at 16" o.c.                |            | 32           | 764.63   |
| 9 (3) Row 16d at 4"oc        | 1566       |                                     |            | 24           | 1,019.50 |
| 12 (3) Row 16d at 3"oc       | 2088       | Simpson LS90                        | 1040# each | 16           | 1,529.25 |
|                              |            | 7.875" long                         |            | 8            | 3,058.50 |
| 20d                          | 212 # each | (1) at 16" o.c.                     | 780        |              |          |
| 1.5" penetration             | good for   | 2 don't fit                         |            |              |          |
| per ft                       | plf        |                                     |            |              |          |
| 1.50 (1) Row 20d at 8" o.c.  | 318        | (1)LS90 and (1)LS70                 | 1466       |              |          |
| 2.40 (1) Row 20d at 5" o.c.  | 508.8      | at 16" o.c.                         |            |              |          |
| 3.00 (1) Row 20d at 4" o.c.  | 636        |                                     |            |              |          |
| 4.80 (2) Rows 20d at 5" o.c. | 1017.6     |                                     |            |              |          |
| 6.00 (2) Rows 20d at 4" o.c. | 1272       |                                     |            |              |          |
| 7.20 (3) Rows 20d at 5" o.c. | 1526.4     |                                     |            |              |          |

Simpson A34 (values updated 8-2020)

## CONCRETE FOOTING SCHEDULE (2500 psf B.P.)

| Mark   | Width | Length | Depth | Reinforcing Crosswise |      |        |         | Reinforcing Lengthwise |      |        |         |
|--------|-------|--------|-------|-----------------------|------|--------|---------|------------------------|------|--------|---------|
|        |       |        |       | No                    | Size | Length | Spacing | No                     | Size | Length | Spacing |
| FC-1.5 | 1.5'  | CONT.  | 12"   | --                    | --   | --     | --      | ( 2 )                  | # 4  | CONT   | EQ      |
| FC-2.0 | 2.0'  | CONT.  | 12"   | --                    | --   | --     | --      | ( 3 )                  | # 4  | CONT   | EQ      |
| FC-2.5 | 2.5'  | CONT.  | 12"   | --                    | # 5  | 2.0'   | 14"     | ( 3 )                  | # 5  | CONT   | EQ      |
| FC-3.0 | 3.0'  | CONT.  | 12"   | --                    | # 5  | 2.5'   | 14"     | ( 3 )                  | # 5  | CONT   | EQ      |
| FC-3.5 | 3.5'  | CONT.  | 12"   | --                    | # 5  | 3.0'   | 14"     | ( 3 )                  | # 5  | CONT   | EQ      |
| FC-4.0 | 4.0'  | CONT.  | 12"   | --                    | # 5  | 3.5'   | 14"     | ( 4 )                  | # 5  | CONT   | EQ      |
| FC-4.5 | 4.5'  | CONT.  | 12"   | --                    | # 5  | 4.0'   | 14"     | ( 4 )                  | # 5  | CONT   | EQ      |
| FC-5.0 | 5.0'  | CONT.  | 12"   | --                    | # 5  | 4.5'   | 14"     | ( 5 )                  | # 5  | CONT   | EQ      |

Note: Not all footings were used on this project

|         |      |       |     |    |     |      |     |       |     |      |    |
|---------|------|-------|-----|----|-----|------|-----|-------|-----|------|----|
| FTS-1.5 | 1.5' | CONT. | 12" | -- | --  | --   | --  | ( 2 ) | # 4 | CONT | EQ |
| FTS-2.0 | 2.0' | CONT. | 12" | -- | --  | --   | --  | ( 3 ) | # 4 | CONT | EQ |
| FTS-2.5 | 2.5' | CONT. | 12" | -- | # 5 | 2.0' | 14" | ( 3 ) | # 5 | CONT | EQ |
| FTS-3.0 | 3.0' | CONT. | 12" | -- | # 5 | 2.5' | 14" | ( 3 ) | # 5 | CONT | EQ |
| FTS-3.5 | 3.5' | CONT. | 12" | -- | # 5 | 3.0' | 14" | ( 3 ) | # 5 | CONT | EQ |

Note: Not all footings were used on this project

|         |       |       |     |        |      |       |    |        |      |       |    |
|---------|-------|-------|-----|--------|------|-------|----|--------|------|-------|----|
| FS-3.0  | 3.0'  | 3.0'  | 12" | ( 3 )  | # 5  | 2.5'  | EQ | ( 3 )  | # 5  | 2.5'  | EQ |
| FS-3.5  | 3.5'  | 3.5'  | 12" | ( 3 )  | # 5  | 3.0'  | EQ | ( 3 )  | # 5  | 3.0'  | EQ |
| FS-4.0  | 4.0'  | 4.0'  | 12" | ( 4 )  | # 5  | 3.5'  | EQ | ( 4 )  | # 5  | 3.5'  | EQ |
| FS-4.5  | 4.5'  | 4.5'  | 12" | ( 4 )  | # 5  | 4.0'  | EQ | ( 4 )  | # 5  | 4.0'  | EQ |
| FS-5.0  | 5.0'  | 5.0'  | 12" | ( 5 )  | # 5  | 4.5'  | EQ | ( 5 )  | # 5  | 4.5'  | EQ |
| FS-5.5  | 5.5'  | 5.5'  | 13" | ( 6 )  | # 5  | 5.0'  | EQ | ( 6 )  | # 5  | 5.0'  | EQ |
| FS-6.0  | 6.0'  | 6.0'  | 15" | ( 7 )  | # 5  | 5.5'  | EQ | ( 7 )  | # 5  | 5.5'  | EQ |
| FS-6.5  | 6.5'  | 6.5'  | 16" | ( 8 )  | # 5  | 6.0'  | EQ | ( 8 )  | # 5  | 6.0'  | EQ |
| FS-7.0  | 7.0'  | 7.0'  | 17" | ( 6 )  | # 6  | 6.5'  | EQ | ( 6 )  | # 6  | 6.5'  | EQ |
| FS-7.5  | 7.5'  | 7.5'  | 18" | ( 7 )  | # 6  | 7.0'  | EQ | ( 7 )  | # 6  | 7.0'  | EQ |
| FS-8.0  | 8.0'  | 8.0'  | 18" | ( 8 )  | # 6  | 7.5'  | EQ | ( 8 )  | # 6  | 7.5'  | EQ |
| FS-8.5  | 8.5'  | 8.5'  | 20" | ( 9 )  | # 6  | 8.0'  | EQ | ( 9 )  | # 6  | 8.0'  | EQ |
| FS-9.0  | 9.0'  | 9.0'  | 21" | ( 10 ) | # 6  | 8.5'  | EQ | ( 10 ) | # 6  | 8.5'  | EQ |
| FS-9.5  | 9.5'  | 9.5'  | 22" | ( 11 ) | # 6  | 9.0'  | EQ | ( 11 ) | # 6  | 9.0'  | EQ |
| FS-10.0 | 10.0' | 10.0' | 23" | ( 9 )  | # 7  | 9.5'  | EQ | ( 9 )  | # 7  | 9.5'  | EQ |
| FS-10.5 | 10.5' | 10.5' | 24" | ( 10 ) | # 7  | 10.0' | EQ | ( 10 ) | # 7  | 10.0' | EQ |
| FS-11.0 | 11.0' | 11.0' | 25" | ( 11 ) | # 7  | 10.5' | EQ | ( 11 ) | # 7  | 10.5' | EQ |
| FS-11.5 | 11.5' | 11.5' | 26" | ( 12 ) | # 7  | 11.0' | EQ | ( 12 ) | # 7  | 11.0' | EQ |
| FS-12.0 | 12.0' | 12.0' | 27" | ( 10 ) | # 8  | 11.5' | EQ | ( 10 ) | # 8  | 11.5' | EQ |
| FS-12.5 | 12.5' | 12.5' | 28" | ( 11 ) | # 8  | 12.0' | EQ | ( 11 ) | # 8  | 12.0' | EQ |
| FS-13.0 | 13.0' | 13.0' | 29" | ( 11 ) | # 8  | 12.5' | EQ | ( 11 ) | # 8  | 12.5' | EQ |
| FS-13.5 | 13.5' | 13.5' | 30" | ( 12 ) | # 8  | 13.0' | EQ | ( 12 ) | # 8  | 13.0' | EQ |
| FS-14.0 | 14.0' | 14.0' | 30" | ( 11 ) | # 9  | 13.5' | EQ | ( 11 ) | # 9  | 13.5' | EQ |
| FS-14.5 | 14.5' | 14.5' | 31" | ( 11 ) | # 9  | 14.0' | EQ | ( 11 ) | # 9  | 14.0' | EQ |
| FS-15.0 | 15.0' | 15.0' | 33" | ( 12 ) | # 9  | 14.5' | EQ | ( 12 ) | # 9  | 14.5' | EQ |
| FS-15.5 | 15.5' | 15.5' | 34" | ( 13 ) | # 9  | 15.0' | EQ | ( 13 ) | # 9  | 15.0' | EQ |
| FS-16.0 | 16.0' | 16.0' | 35" | ( 14 ) | # 9  | 15.5' | EQ | ( 14 ) | # 9  | 15.5' | EQ |
| FS-16.5 | 16.5' | 16.5' | 35" | ( 12 ) | # 10 | 16.0' | EQ | ( 12 ) | # 10 | 16.0' | EQ |
| FS-17.0 | 17.0' | 17.0' | 36" | ( 12 ) | # 10 | 16.5' | EQ | ( 12 ) | # 10 | 16.5' | EQ |
| FS-17.5 | 17.5' | 17.5' | 38" | ( 13 ) | # 10 | 17.0' | EQ | ( 13 ) | # 10 | 17.0' | EQ |

Note: Not all footings were used on this project

CAD: Start with the typical schedule for 2500 psf soil  
 Z:\Schedules\Concrete\Footing\SCD\_C2500-S2500.dwg



RAM Structural System



RAM Steel 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

Building Code: IBC

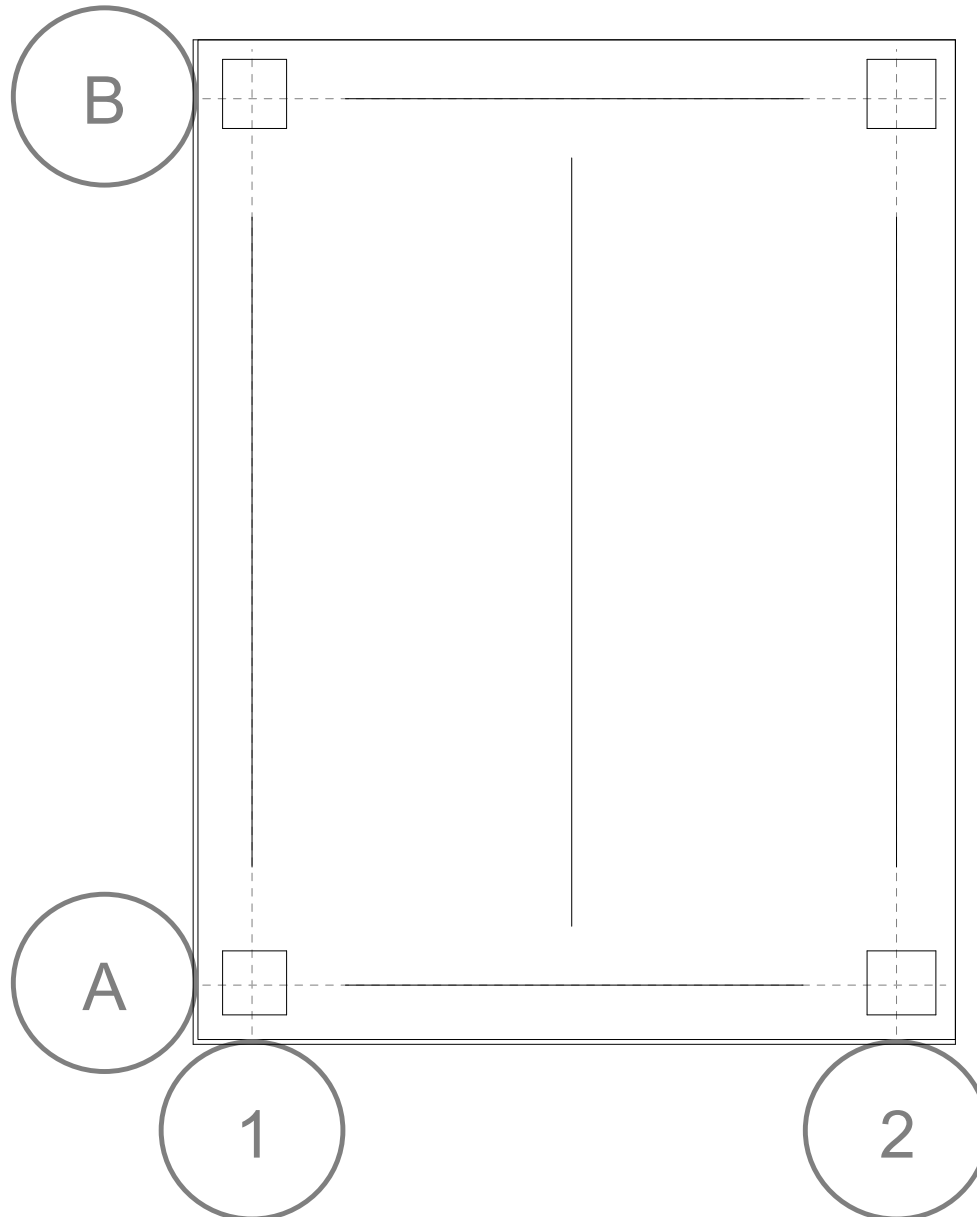
## Floor Map

T-1

01/14/22 16:20:40

Steel Code: AISC 360-16 LRFD

**Floor Type: Roof**





RAM Structural System



RAM Steel 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

Building Code: IBC

## Floor Map

T-2

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01/14/22 16:20:40

Steel Code: AISC 360-16 LRFD

### Surface Loads

|                                                                                   | Label      | DL<br>psf | CDL<br>psf | LL Reduction<br>psf Type | PLL<br>psf | CLL<br>psf | Mass DL<br>psf |
|-----------------------------------------------------------------------------------|------------|-----------|------------|--------------------------|------------|------------|----------------|
|  | Misc loads | 5.0       | 0.0        | 20.0 Roof                | 0.0        | 0.0        | 5.0            |



RAM Structural System



RAM Steel 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

Building Code: IBC

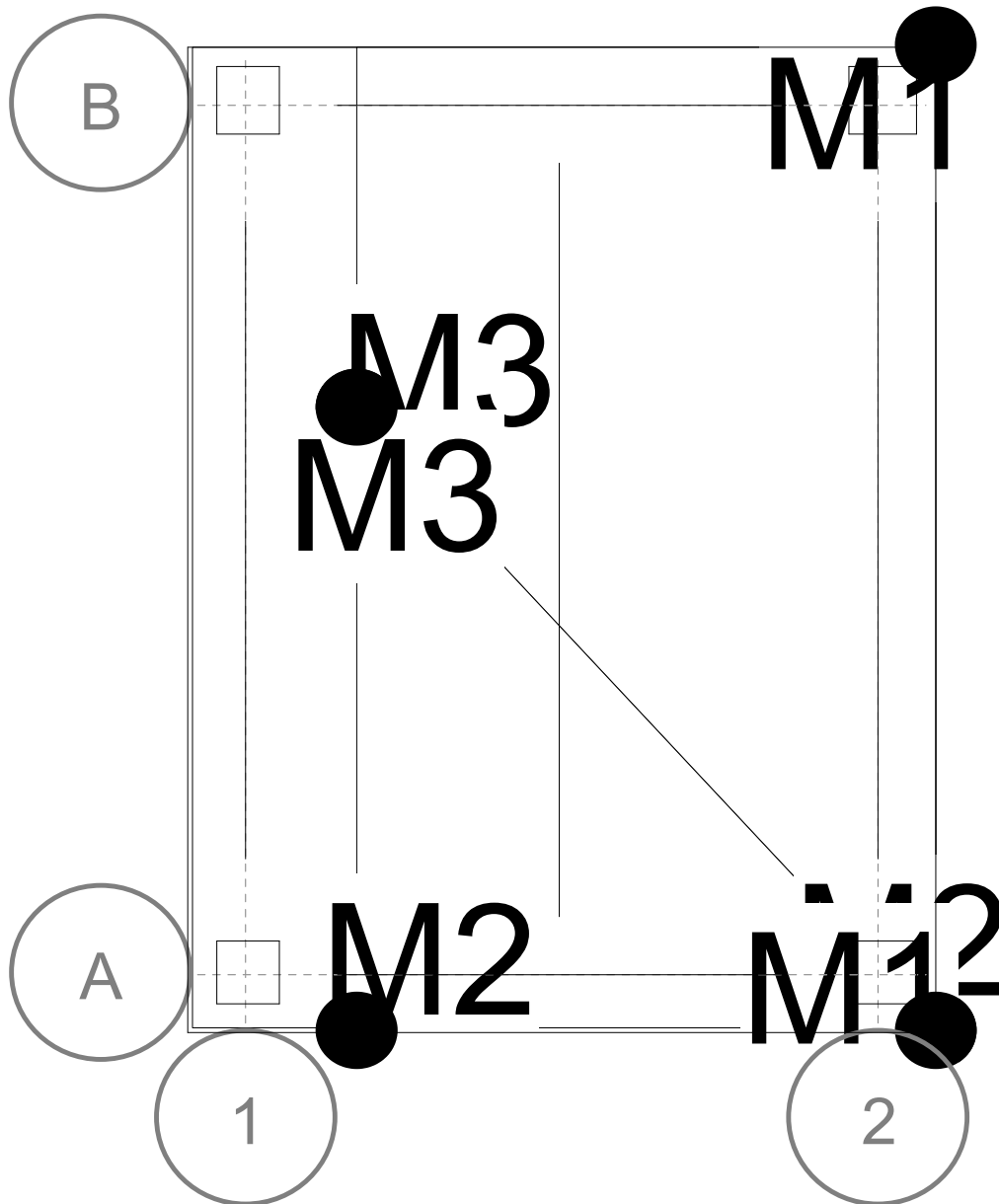
## Floor Map

T-3

01/14/22 16:20:40

Steel Code: AISC 360-16 LRFD

**Floor Type: Roof**





RAM Structural System



RAM Steel 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

Building Code: IBC

## Floor Map

T-4

Page 2/2

01/14/22 16:20:40

Steel Code: AISC 360-16 LRFD

### Snow Loads

|  | Label        | Type     | Magnitude 1<br>psf | Magnitude 2<br>psf | Magnitude 3<br>psf |
|--|--------------|----------|--------------------|--------------------|--------------------|
|  | Snow Load    | Constant | 14.000             | ---                | ---                |
|  | Canopy drift | Drift    | 59.000             | 59.000             | 14.000             |
|  | Canopy drift | Drift    | 59.000             | 59.000             | 14.000             |

## 20 Gage PLB™-36 Grade 50

### Uniform Design Load Table, LRFD (psf)

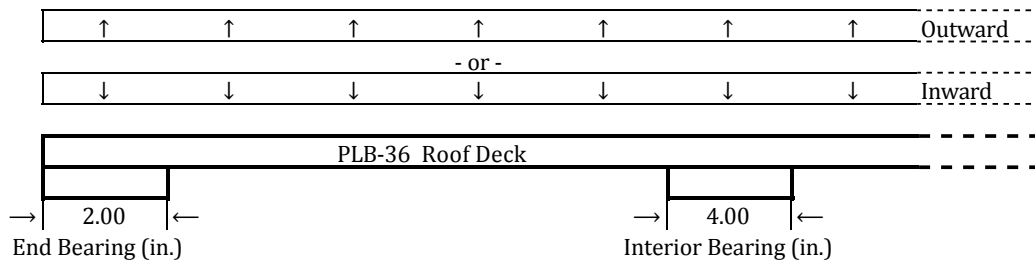
For End Lapped Deck



T-5

36/7 Connection Pattern to Supports with  
Hilti X-ENP-19 PAF

Support Member A992 GR50  
 $0.265 \leq t_2$  (in.)



#### Inward Uniform Design Load Table, LRFD (psf)

| Span | Span  | 5'-0" | 5'-6" | 6'-0" | 6'-6" | 7'-0" | 7'-6" | 8'-0" | 8'-6" |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1    | ΦWn   | 276   | 228   | 192   | 163   | 141   | 123   | 108   | 95    |
|      | L/240 | 115   | 86    | 66    | 52    | 42    | 34    | 28    | 23    |
| 2    | ΦWn   | 280   | 232   | 195   | 167   | 144   | 126   | 110   | 98    |
|      | L/240 | 292   | 219   | 169   | 133   | 106   | 86    | 71    | 59    |
| 3    | ΦWn   | 348   | 288   | 243   | 208   | 179   | 156   | 138   | 122   |
|      | L/240 | 229   | 172   | 132   | 104   | 83    | 68    | 56    | 47    |

#### Outward (Uplift) Uniform Design Load Table, LRFD (psf)

| Span | Span  | 5'-0" | 5'-6" | 6'-0" | 6'-6" | 7'-0" | 7'-6" | 8'-0" | 8'-6" |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1    | ΦWn   | 285   | 235   | 198   | 168   | 145   | 126   | 111   | 98    |
|      | ΦRn   | 483   | 439   | 402   | 371   | 345   | 322   | 302   | 284   |
|      | L/240 | 121   | 91    | 70    | 55    | 44    | 36    | 30    | 25    |
| 2    | ΦWn   | 272   | 225   | 190   | 162   | 140   | 122   | 107   | 95    |
|      | ΦRn   | 386   | 351   | 322   | 297   | 276   | 257   | 241   | 227   |
|      | L/240 | 277   | 208   | 160   | 126   | 101   | 82    | 68    | 56    |
| 3    | ΦWn   | 337   | 280   | 236   | 201   | 174   | 152   | 134   | 118   |
|      | ΦRn   | 439   | 399   | 366   | 338   | 313   | 293   | 274   | 258   |
|      | L/240 | 217   | 163   | 125   | 99    | 79    | 64    | 53    | 44    |

#### Steel Deck Properties

| t      | Fy  | wdd  | Id+                  | Id-                  | Se+                  | Se-                  | ΦMn+      | ΦMn-      | ΦVn    |
|--------|-----|------|----------------------|----------------------|----------------------|----------------------|-----------|-----------|--------|
| in     | ksi | psf  | in. <sup>4</sup> /ft | in. <sup>4</sup> /ft | in. <sup>3</sup> /ft | in. <sup>3</sup> /ft | lbs-ft/ft | lbs-ft/ft | lbs/ft |
| 0.0359 | 50  | 2.30 | 0.219                | 0.231                | 0.230                | 0.237                | 862       | 889       | 4894   |

Where:  $W \leq \Phi W_n$

W = Required strength of the governing LRFD load combination  
 $\Phi W_n$  = Design strength governed by the steel deck  
 $\Phi R_n$  = Design strength governed by connection strength

Steel Deck Uniform V1.0.5 in accordance with AISI S100-16 and AISI S310-16.

Date: 1/11/2022

NOTICE: Design defects that could cause injury or death may result from relying on the information in this document without independent verification by a qualified professional. The information in this document is provided "AS IS". Nucor Corporation and its affiliates expressly disclaim: (i) any and all representations, warranties and conditions and (ii) all liability arising out of or related to this document and the information in it.



RAM Structural System



RAM Steel 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

Building Code: IBC

## Floor Map

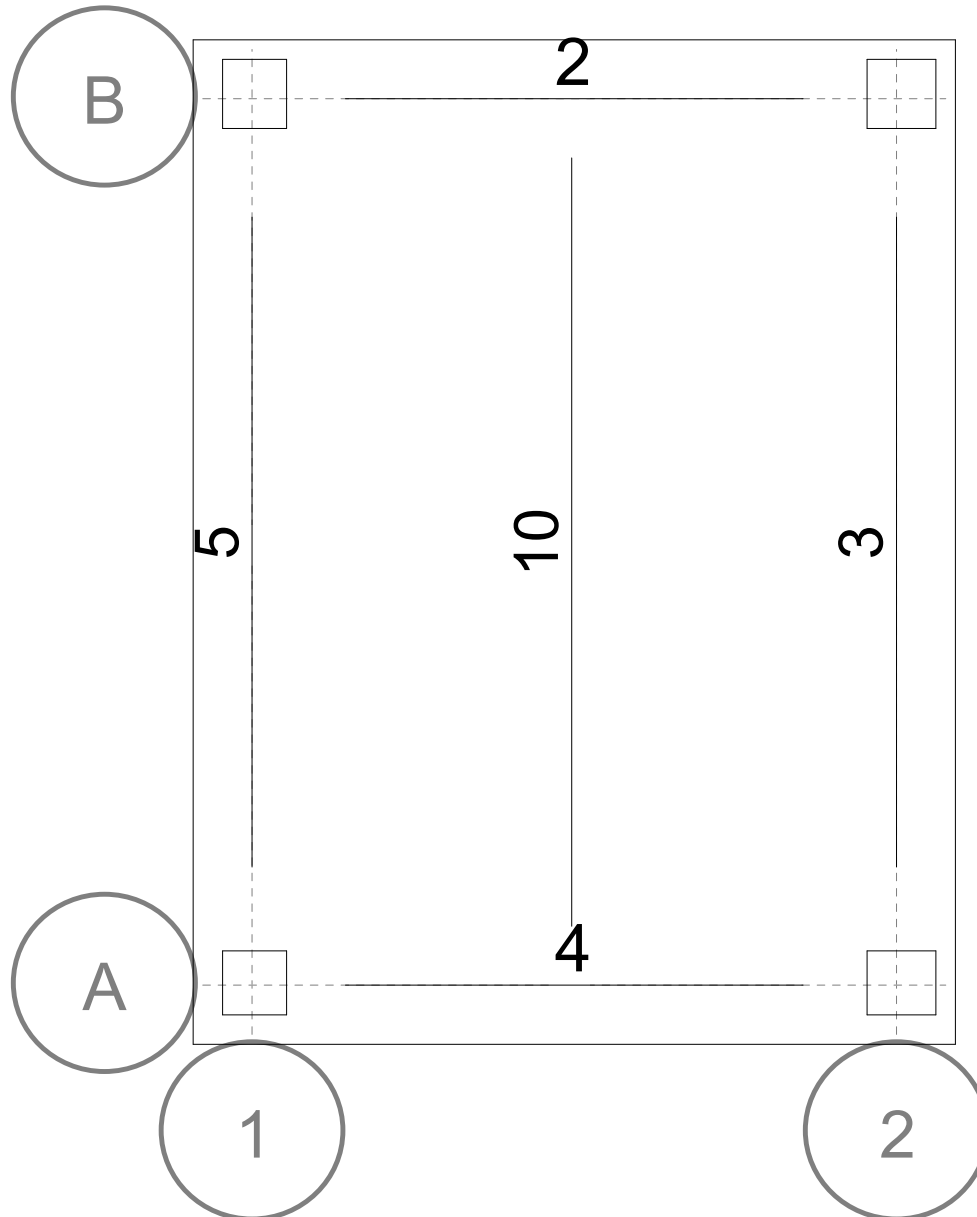
T-6

01/14/22 16:22:41

Steel Code: AISC 360-16 LRFD

**Floor Type: Roof**

**Beam Numbers**





RAM Steel 17.02.01.23  
Dunn Associates, Inc.  
DataBase: Freestanding canopy  
Building Code: IBC

## Gravity Beam Design

T-7

01/11/22 13:59:25  
Steel Code: AISC 360-16 LRFD

**Floor Type: Roof** **Beam Number = 10**

**SPAN INFORMATION (ft): I-End (5.50,0.00) J-End (5.50,15.08)**

Beam Size (User Selected) = W12X16 Fy = 50.0 ksi  
Total Beam Length (ft) = 15.08  
Mp (kip-ft) = 83.75

### LINE LOADS (k/ft):

| Load | Dist   | DL    | LL    | Red% | Type | PartL |
|------|--------|-------|-------|------|------|-------|
| 1    | 0.000  | 0.016 | 0.000 | ---  | NonR | 0.000 |
|      | 15.083 | 0.016 | 0.000 |      |      | 0.000 |
| 2    | 0.000  | 0.000 | 0.131 | ---  | Snow | 0.000 |
|      | 6.033  | 0.000 | 0.071 |      |      | 0.000 |
| 3    | 0.000  | 0.000 | 0.005 | ---  | Snow | 0.000 |
|      | 15.083 | 0.000 | 0.005 |      |      | 0.000 |
| 4    | 6.033  | 0.000 | 0.071 | ---  | Snow | 0.000 |
|      | 7.295  | 0.000 | 0.061 |      |      | 0.000 |
| 5    | 7.296  | 0.000 | 0.061 | ---  | Snow | 0.000 |
|      | 8.557  | 0.000 | 0.056 |      |      | 0.000 |
| 6    | 8.558  | 0.000 | 0.056 | ---  | Snow | 0.000 |
|      | 9.820  | 0.000 | 0.055 |      |      | 0.000 |
| 7    | 9.820  | 0.000 | 0.055 | ---  | Snow | 0.000 |
|      | 15.083 | 0.000 | 0.055 |      |      | 0.000 |
| 8    | 0.000  | 0.000 | 0.151 | ---  | Snow | 0.000 |
|      | 2.065  | 0.000 | 0.113 |      |      | 0.000 |
| 9    | 0.082  | 0.000 | 0.000 | ---  | Snow | 0.000 |
|      | 2.065  | 0.000 | 0.015 |      |      | 0.000 |
| 10   | 2.066  | 0.000 | 0.128 | ---  | Snow | 0.000 |
|      | 4.049  | 0.000 | 0.111 |      |      | 0.000 |
| 11   | 4.050  | 0.000 | 0.111 | ---  | Snow | 0.000 |
|      | 6.033  | 0.000 | 0.104 |      |      | 0.000 |
| 12   | 6.033  | 0.000 | 0.105 | ---  | Snow | 0.000 |
|      | 15.083 | 0.000 | 0.105 |      |      | 0.000 |
| 13   | 0.000  | 0.016 | 0.000 | ---  | NonR | 0.000 |
|      | 15.083 | 0.016 | 0.000 |      |      | 0.000 |

### USER-SPECIFIED DEMAND/CAPACITY LIMITS:

Strength: 0.960

**SHEAR (Ultimate): Max Vu (1.2DL+1.6LL) = 2.82 kips 1.00Vn = 79.20 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 | 9.4          | 7.2     | 0.0      | 1.00 | 0.90 | 75.38            |
| Controlling |       | 1.2DL+1.6LL | 9.4          | 7.2     | 0.0      | 1.00 | 0.90 | 75.38            |

### REACTIONS (kips):



## Gravity Beam Design

---

|                                | <b>Left</b> | <b>Right</b> |
|--------------------------------|-------------|--------------|
| DL reaction                    | 0.25        | 0.25         |
| Max +LL reaction               | 1.58        | 1.31         |
| Max +total reaction (factored) | 2.82        | 2.38         |

### DEFLECTIONS:

|                     |              |        |                              | <b>Ratio</b> |
|---------------------|--------------|--------|------------------------------|--------------|
| Dead load (in)      | at 7.54 ft = | -0.013 | L/D = $\frac{1427}{2} > 360$ | 0.03         |
| Live load (in)      | at 7.47 ft = | -0.071 | L/D = $\frac{2537}{2} > 600$ | 0.24         |
| Net Total load (in) | at 7.47 ft = | -0.084 | L/D = $\frac{2154}{2} > 360$ | 0.17         |



**TABLES SELECTED:**

Master Steel Table: ramaisc  
Default Steel Table: ramaisc  
Alternate Steel Table: ramaisc

**UNBRACED LENGTH:**

Check Unbraced Length  
Do Not Consider Point of Inflection as Brace Point  
Noncomposite/Precomposite Beam Design:  
    Deck Perpendicular to Beam Braces flange  
    Deck Parallel to Beam does not Brace flange  
Use  $C_b=1$  for all Simple Span Beams  
Use  $C_b=1$  for all Cantilevers

**SPAN/DEPTH CRITERIA:**

Maximum Span/Depth Ratio (ft/ft): 24.00

**COMPOSITE IEFF:**

Do Not Reduce  $I_{eff}$  per AISC 360 Commentary

**DEMAND/CAPACITY LIMITS:**

|             | Strength | Deflection |
|-------------|----------|------------|
| Steel Beam: | 0.960    | 1.000      |
| C-Beams:    | 0.960    | 1.000      |

**DEFLECTION CRITERIA:**

| Default Criteria              | L/d   | delta (in) |
|-------------------------------|-------|------------|
| Unshored                      |       |            |
| Initial (Construction Load):  | 300.0 | 0.0        |
| Post Composite                |       |            |
| Live Load:                    | 480.0 | 0.0        |
| Total Superimposed:           | 480.0 | 0.0        |
| Total (Init+Superimp-Camber): | 360.0 | 0.0        |
| Shored                        |       |            |
| Dead Load:                    | 0.0   | 0.0        |
| Live Load:                    | 480.0 | 0.0        |
| Total Load:                   | 360.0 | 0.0        |
| Noncomposite                  |       |            |
| Dead Load:                    | 360.0 | 0.0        |
| Live Load:                    | 600.0 | 0.0        |
| Total Load:                   | 360.0 | 0.0        |
| Perimeter w/ Glazing Criteria |       |            |
| Unshored                      |       |            |
| Initial (Construction Load):  | 300.0 | 0.0        |
| Post Composite                |       |            |
| Live Load:                    | 600.0 | 0.4        |
| Total Superimposed:           | 480.0 | 0.5        |
| Total (Init+Superimp-Camber): | 360.0 | 0.0        |



|                               |       |            |
|-------------------------------|-------|------------|
| Shored                        |       |            |
| Dead Load:                    | 0.0   | 0.0        |
| Live Load:                    | 600.0 | 0.4        |
| Total Load:                   | 480.0 | 0.5        |
| Noncomposite                  |       |            |
| Dead Load:                    | 360.0 | 0.0        |
| Live Load:                    | 600.0 | 0.4        |
| Total Load:                   | 480.0 | 0.5        |
| Roof Framing Criteria         |       |            |
|                               | L/d   | delta (in) |
| Unshored                      |       |            |
| Initial (Construction Load):  | 300.0 | 0.0        |
| Post Composite                |       |            |
| Live Load:                    | 480.0 | 0.0        |
| Total Superimposed:           | 480.0 | 0.0        |
| Total (Init+Superimp-Camber): | 360.0 | 0.0        |
| Shored                        |       |            |
| Dead Load:                    | 0.0   | 0.0        |
| Live Load:                    | 360.0 | 0.0        |
| Total Load:                   | 240.0 | 0.0        |
| Noncomposite                  |       |            |
| Dead Load:                    | 240.0 | 0.0        |
| Live Load:                    | 360.0 | 0.0        |
| Total Load:                   | 240.0 | 0.0        |

Note: 0.0 indicates No Limit

**CAMBER CRITERIA FOR COMPOSITE BEAMS:**

Do not Camber Beams with Span < 24.0 ft  
Do not Camber Beams with Weight < 27.0 lbs/ft  
Do not Camber Beams with Weight > 200.0 lbs/ft  
Do not Camber Beams with Depth < 14.0 in  
Do not Camber Beams with Depth > 36.0 in  
Do not Camber Beams with Cantilevers  
Percent of Dead Load used for Camber: 75.00  
(For Unshored Composite the specified % of Construction DL is used)  
Camber Increment (in): 0.250  
Minimum Camber (in): 0.500  
Maximum Camber (in): 2.500

**CAMBER CRITERIA FOR NONCOMPOSITE BEAMS:**

Do not Camber Beams with Span < 24.0 ft  
Do not Camber Beams with Weight < 27.0 lbs/ft  
Do not Camber Beams with Weight > 200.0 lbs/ft  
Do not Camber Beams with Depth < 14.0 in  
Do not Camber Beams with Depth > 36.0 in  
Do not Camber Beams with Cantilevers



RAM Steel 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

Building Code: IBC

## Beam Design Criteria

T-11

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01/14/22 16:22:41

Steel Code: AISC 360-16 LRFD

Percent of Dead Load used for Camber: 75.00

Camber Increment (in): 0.250

Minimum Camber (in): 0.500

Maximum Camber (in): 2.500

### **STUD CRITERIA:**

Stud Distribution: Use Optimum

Maximum % of Full Composite Allowed: 75.00

Minimum % of Full Composite Allowed - Short Span: 30.00

Minimum % of Full Composite Allowed - Long Span: 30.00

Long Span Defined as Span Greater Than: 30.00 ft

Maximum Rows of Studs Allowed: 2

Minimum Flange Width for 2 Rows of Studs (in): 5.500

Minimum Flange Width for 3 Rows of Studs (in): 8.500

Maximum Stud Spacing - Deck Parallel: Per Code

Maximum Stud Spacing - Deck Not Parallel: Per Code

Ductility of Shear Connection:

Option to enforce AISC 360-16 Commentary I3.2d(1) for Spans greater than 30' not selected

### **WEB OPENING CRITERIA:**

Stiffener Fy (ksi): 36.000

Stiffener Dimensions

Minimum Width (in): 1.000

Minimum Thickness (in): 0.250

Increment of Width (in): 0.250

Increment of Thickness (in): 0.125

Increment of Length (in): 1.000

Allow Stiffeners on One Side of web

Allow Stiffeners on Two Sides of web



**STEEL BEAM DESIGN SUMMARY:**

Demand/Capacity Limits for: Strength: 0.960 Deflection: 1.000

**Floor Type: Roof**

| Bm # | Length<br>ft | +Mu<br>kip-ft | -Mu<br>kip-ft | $\Phi M_n$<br>kip-ft | Fy<br>ksi | Beam Size     | Studs |
|------|--------------|---------------|---------------|----------------------|-----------|---------------|-------|
| 2    | 11.00        | 8.8           | 0.0           | 88.5                 | 50.0      | HSS10X6X1/4 u |       |
| 3    | 15.08        | 10.3          | 0.0           | 88.5                 | 50.0      | HSS10X6X1/4 u |       |
| 4    | 11.00        | 10.5          | 0.0           | 88.5                 | 50.0      | HSS10X6X1/4 u |       |
| 5    | 15.08        | 4.9           | 0.0           | 88.5                 | 50.0      | HSS10X6X1/4 u |       |
| 10   | 15.08        | 10.6          | 0.0           | 88.5                 | 50.0      | HSS10X6X1/4 u |       |

\* after Size denotes beam failed stress/capacity criteria.

# after Size denotes beam failed deflection criteria.

u after Size denotes this size has been assigned by the User.



RAM Steel 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

Building Code: IBC

## **Beam Framing Check**

T-13

01/14/22 16:22:41

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### **Floor Type: Roof**

Number of Warnings on the Floor = 0



# Gravity Column Design Criteria

T-14

RAM Steel 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

Building Code: IBC

01/14/22 16:25:57

Steel Code: AISC360-16 LRFD

## DEFAULT SPLICE LEVELS:

| Level | Splice |
|-------|--------|
| Roof  | Y      |

## DEMAND/CAPACITY LIMIT FOR STRENGTH:

Columns: 0.860

Baseplates: 1.000

## DESIGN DEFAULTS:

Maximum Angle from column axis at which beam reaction is not split  
between column sides for calculating unbalanced moments: 30.0 deg.

Skip-load the Live Load around Column

## STANDARD COLUMN TRIAL GROUPS:

|           | Trial Group 1 | Trial Group 2 | Trial Group 3 |
|-----------|---------------|---------------|---------------|
| I Section | W14           | W12           | W10           |
| Rect. HSS | HSS10X10      | HSS8X8        | HSS6X6        |
| Round HSS | HSS10         | HSS8.625      | HSS6          |

## HANGING COLUMN TRIAL GROUPS:

|              | Trial Group 1 | Trial Group 2 | Trial Group 3 |
|--------------|---------------|---------------|---------------|
| I Section    | W12           | W10           | W8            |
| Rect. HSS    | HSS10X10      | HSS8X8        | HSS6X6        |
| Round HSS    | HSS10         | HSS7.625      | HSS6          |
| Channel      | C12           | C12           | C12           |
| Tee          | WT22          | WT20X16       | WT20X12       |
| Flat Bar     | FlatBar       | FlatBar       | FlatBar       |
| Round Bar    | RoundBar      | RoundBar      | RoundBar      |
| Single Angle | L8X8          | L6X6          | L4X4          |
| Double Angle | 2L8X8         | 2L6X6         | 2L4X4         |

## COLUMN BRACING:

Deck Does Not Brace Column

Maximum Angle from column axis from which beam braces column: 45.0 deg.

## BASE PLATES:

Design Code: AISC360-16 LRFD

|                                                                   |        |
|-------------------------------------------------------------------|--------|
| Plate Fy (ksi) _____                                              | 36.000 |
| Minimum Dimension From Face of Column to Edge of Plate (in) _____ | 6.000  |
| Minimum Dimension From Side of Column to Edge of Plate (in) _____ | 2.000  |
| Increment of Plate Dimensions (in) _____                          | 1.000  |
| Increment of Plate Thickness (in) _____                           | 0.250  |
| Minimum Footing Dimension Parallel to Web (ft) _____              | 2.00   |
| Minimum Footing Dimension Perpendicular to Web (ft) _____         | 2.00   |
| Keep Base Plate Square: _____                                     | N      |



Current Date: 1/14/2022 4:27 PM

Units system: English

File name: K:\2021\21174\Ram Connection\Freestanding canopy fixed base OCC.rcnx

## Steel connections

### Results

Connection name : Pinned BP  
Connection ID : 1

Family: Column - Base (CB)  
Type: Base plate  
Description: Braced Frame Base Plate  
Design code: AISC 360-16 LRFD, ACI 318-11

#### DEMANDS

| Description | Pu<br>[kip] | Mu22<br>[kip*ft] | Mu33<br>[kip*ft] | Vu2<br>[kip] | Vu3<br>[kip] | Load type |
|-------------|-------------|------------------|------------------|--------------|--------------|-----------|
| C           | 15.54       | 0.00             | 0.00             | 0.34         | 0.28         | Design    |

#### Design for major axis Base plate (AISC 360-16 LRFD)

#### GEOMETRIC CONSIDERATIONS

| Dimensions                   | Unit     | Value | Min. value | Max. value | Sta. | References |
|------------------------------|----------|-------|------------|------------|------|------------|
| <u>Base plate</u>            |          |       |            |            |      |            |
| Distance from anchor to edge | [in]     | 1.62  | 0.25       | --         | ✓    |            |
| Weld size                    | [1/16in] | 5     | 2          | --         | ✓    | table J2.4 |

#### DESIGN CHECK

| Verification                                 | Unit                   | Capacity | Demand | Ctrl EQ | Ratio | References                                                |
|----------------------------------------------|------------------------|----------|--------|---------|-------|-----------------------------------------------------------|
| <u>Concrete base</u>                         |                        |          |        |         |       |                                                           |
| Axial bearing                                | [Kip/in <sup>2</sup> ] | 3.32     | 0.00   | C       | 0.00  | DG1 3.1.1;                                                |
| <u>Base plate</u>                            |                        |          |        |         |       |                                                           |
| Flexural yielding (bearing interface)        | [Kip*ft/ft]            | 6.33     | 0.00   | C       | 0.00  | DG1 Eq. 3.3.13                                            |
| Flexural yielding (tension interface)        | [Kip*ft/ft]            | 6.33     | 2.37   | C       | 0.37  | DG1 Eq. 3.3.13                                            |
| <u>Column</u>                                |                        |          |        |         |       |                                                           |
| Weld capacity                                | [Kip/ft]               | 125.29   | 9.32   | C       | 0.07  | p. 8-9,<br>Sec. J2.5,<br>Sec. J2.4,<br>HSS Manual p. 7-10 |
| Elastic method weld shear and axial capacity | [Kip/ft]               | 125.29   | 10.98  | C       | 0.09  | p. 8-9,<br>Sec. J2.5,<br>Sec. J2.4                        |
| <b>Ratio</b>                                 | <b>0.37</b>            |          |        |         |       |                                                           |

**Design for minor axis  
Base plate (AISC 360-16 LRFD)**

**GEOMETRIC CONSIDERATIONS**

| Dimensions                   | Unit     | Value | Min. value | Max. value | Sta. | References |
|------------------------------|----------|-------|------------|------------|------|------------|
| <u>Base plate</u>            |          |       |            |            |      |            |
| Distance from anchor to edge | [in]     | 1.62  | 0.25       | --         | ✓    |            |
| Weld size                    | [1/16in] | 5     | 2          | --         | ✓    | table J2.4 |

**DESIGN CHECK**

| Verification                                 | Unit                   | Capacity | Demand | Ctrl EQ | Ratio | References                                                |
|----------------------------------------------|------------------------|----------|--------|---------|-------|-----------------------------------------------------------|
| <u>Concrete base</u>                         |                        |          |        |         |       |                                                           |
| Axial bearing                                | [Kip/in <sup>2</sup> ] | 3.32     | 0.00   | C       | 0.00  | DG1 3.1.1;                                                |
| <u>Base plate</u>                            |                        |          |        |         |       |                                                           |
| Flexural yielding (bearing interface)        | [Kip*ft/ft]            | 6.33     | 0.00   | C       | 0.00  | DG1 Eq. 3.3.13                                            |
| Flexural yielding (tension interface)        | [Kip*ft/ft]            | 6.33     | 2.37   | C       | 0.37  | DG1 Eq. 3.3.13                                            |
| <u>Column</u>                                |                        |          |        |         |       |                                                           |
| Weld capacity                                | [Kip/ft]               | 125.29   | 9.32   | C       | 0.07  | p. 8-9,<br>Sec. J2.5,<br>Sec. J2.4,<br>HSS Manual p. 7-10 |
| Elastic method weld shear and axial capacity | [Kip/ft]               | 125.29   | 10.98  | C       | 0.09  | p. 8-9,<br>Sec. J2.5,<br>Sec. J2.4                        |
| <b>Ratio</b>                                 | <b>0.37</b>            |          |        |         |       |                                                           |

**Major axis  
Anchors**

**GEOMETRIC CONSIDERATIONS**

| Dimensions       | Unit        | Value | Min. value | Max. value | Sta. | References |
|------------------|-------------|-------|------------|------------|------|------------|
| <u>Anchors</u>   |             |       |            |            |      |            |
| Anchor spacing   | [in]        | 11.00 | 3.00       | --         | ✓    | Sec. D.8.1 |
| Concrete cover   | [in]        | 12.12 | 3.00       | --         | ✓    | Sec. 7.7.1 |
| Effective length | [in]        | 8.49  | --         | 11.51      | ✓    |            |
| <b>Ratio</b>     | <b>0.37</b> |       |            |            |      |            |

**DESIGN CHECK**

| Verification                            | Unit  | Capacity | Demand | Ctrl EQ | Ratio | References                               |
|-----------------------------------------|-------|----------|--------|---------|-------|------------------------------------------|
| Anchor tension                          | [Kip] | 31.36    | 3.89   | C       | 0.12  | Eq. D-2                                  |
| Breakout of anchor in tension           | [Kip] | 19.52    | 3.89   | C       | 0.20  | Eq. D-3,<br>Sec. D.3.3.4.4               |
| Breakout of group of anchors in tension | [Kip] | 41.51    | 15.54  | C       | 0.37  | Eq. D-4,<br>Sec. D.3.3.4.4               |
| Pullout of anchor in tension            | [Kip] | 16.07    | 3.89   | C       | 0.24  | Sec. D.3.3.4.4                           |
| Anchor shear                            | [Kip] | 13.04    | 0.09   | C       | 0.01  | Eq. D-29,<br>Sec. D.6.1.3                |
| Breakout of anchor in shear             | [Kip] | 12.81    | 0.09   | C       | 0.01  | Table D.4.1.1,<br>Sec. D.4.3             |
| Breakout of group of anchors in shear   | [Kip] | 16.40    | 0.34   | C       | 0.02  | Table D.4.1.1,<br>Sec. D.4.3             |
| Pryout of anchor in shear               | [Kip] | 52.05    | 0.09   | C       | 0.00  | Eq. D-3,<br>Table D.4.1.1,<br>Sec. D.4.3 |
| Pryout of group of anchors in shear     | [Kip] | 110.70   | 0.34   | C       | 0.00  | Eq. D-4,<br>Table D.4.1.1,<br>Sec. D.4.3 |
| Interaction of tensile and shear forces | [Kip] | 1.20     | 0.00   | C       | 0.00  | Eq. D-2,<br>Eq. D-3,<br>Sec. D.3.3.4.4,  |

Eq. D-4,  
Eq. D-29,  
Sec. D.6.1.3,  
Table D.4.1.1,  
Sec. D.4.3,  
Sec. D.7

### ⚠ WARNINGS

- Amplified seismic load combinations are required to satisfy ACI 318-11 Sec. D.3.3.4.3 (d) and Sec. D.3.3.5.3 (c).

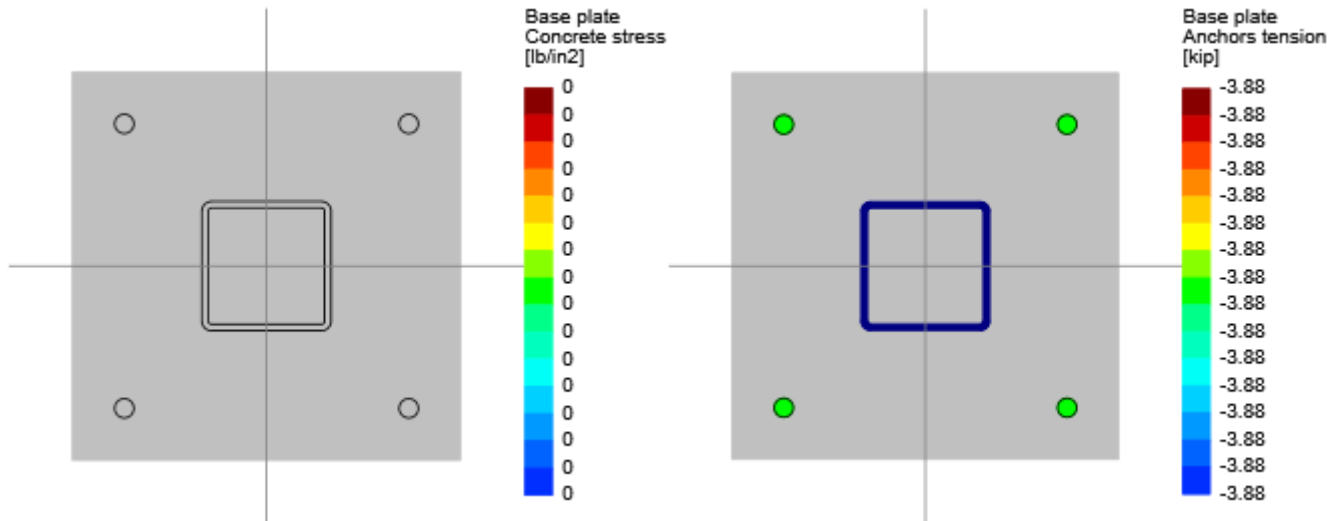
| GEOMETRIC CONSIDERATIONS |             | Minor axis<br>Anchors |            |            |      |            |
|--------------------------|-------------|-----------------------|------------|------------|------|------------|
| Dimensions               | Unit        | Value                 | Min. value | Max. value | Sta. | References |
| <u>Anchors</u>           |             |                       |            |            |      |            |
| Anchor spacing           | [in]        | 11.00                 | 3.00       | --         | ✓    | Sec. D.8.1 |
| Concrete cover           | [in]        | 12.12                 | 3.00       | --         | ✓    | Sec. 7.7.1 |
| Effective length         | [in]        | 8.49                  | --         | 11.51      | ✓    |            |
| <b>Ratio</b>             | <b>0.37</b> |                       |            |            |      |            |

| DESIGN CHECK                            |       |          |        |         |       |                                                                                                                                |
|-----------------------------------------|-------|----------|--------|---------|-------|--------------------------------------------------------------------------------------------------------------------------------|
| Verification                            | Unit  | Capacity | Demand | Ctrl EQ | Ratio | References                                                                                                                     |
| Anchor tension                          | [Kip] | 31.36    | 3.89   | C       | 0.12  | Eq. D-2                                                                                                                        |
| Breakout of anchor in tension           | [Kip] | 19.52    | 3.89   | C       | 0.20  | Eq. D-3,<br>Sec. D.3.3.4.4                                                                                                     |
| Breakout of group of anchors in tension | [Kip] | 41.51    | 15.54  | C       | 0.37  | Eq. D-4,<br>Sec. D.3.3.4.4                                                                                                     |
| Pullout of anchor in tension            | [Kip] | 16.07    | 3.89   | C       | 0.24  | Sec. D.3.3.4.4                                                                                                                 |
| Anchor shear                            | [Kip] | 13.04    | 0.07   | C       | 0.01  | Eq. D-29,<br>Sec. D.6.1.3                                                                                                      |
| Breakout of anchor in shear             | [Kip] | 12.81    | 0.07   | C       | 0.01  | Table D.4.1.1,<br>Sec. D.4.3                                                                                                   |
| Breakout of group of anchors in shear   | [Kip] | 16.40    | 0.28   | C       | 0.02  | Table D.4.1.1,<br>Sec. D.4.3                                                                                                   |
| Pryout of anchor in shear               | [Kip] | 52.05    | 0.07   | C       | 0.00  | Eq. D-3,<br>Table D.4.1.1,<br>Sec. D.4.3                                                                                       |
| Pryout of group of anchors in shear     | [Kip] | 110.70   | 0.28   | C       | 0.00  | Eq. D-4,<br>Table D.4.1.1,<br>Sec. D.4.3                                                                                       |
| Interaction of tensile and shear forces | [Kip] | 1.20     | 0.00   | C       | 0.00  | Eq. D-2,<br>Eq. D-3,<br>Sec. D.3.3.4.4,<br>Eq. D-4,<br>Eq. D-29,<br>Sec. D.6.1.3,<br>Table D.4.1.1,<br>Sec. D.4.3,<br>Sec. D.7 |

### ⚠ WARNINGS

- Amplified seismic load combinations are required to satisfy ACI 318-11 Sec. D.3.3.4.3 (d) and Sec. D.3.3.5.3 (c).

**Global critical strength ratio** **0.37**

**Major axis****Maximum compression and tension (C)**


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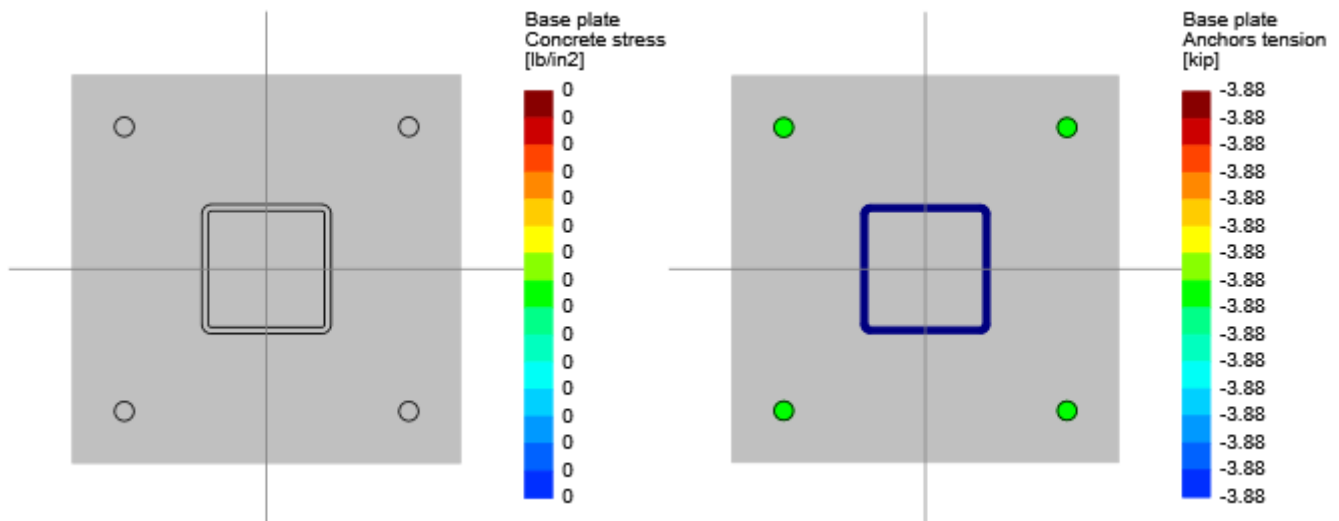
|                          |         |          |
|--------------------------|---------|----------|
| Maximum bearing pressure | 0.00    | [lb/in2] |
| Minimum bearing pressure | 0.00    | [lb/in2] |
| Maximum anchor tension   | 3.89    | [kip]    |
| Minimum anchor tension   | 3.89    | [kip]    |
| Neutral axis angle       | 0.00    | [deg]    |
| Bearing length           | -1.2E31 | [in]     |

---

**Anchors tensions**

| Anchor | Transverse<br>[in] | Longitudinal<br>[in] | Shear<br>[kip] | Tension<br>[kip] |
|--------|--------------------|----------------------|----------------|------------------|
| 1      | -5.50              | -5.50                | 0.09           | 3.89             |
| 2      | -5.50              | 5.50                 | 0.09           | 3.89             |
| 3      | 5.50               | 5.50                 | 0.09           | 3.89             |
| 4      | 5.50               | -5.50                | 0.09           | 3.89             |

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**Minor axis****Maximum compression and tension (C)**


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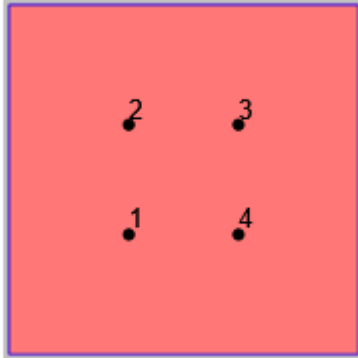
|                          |      |          |
|--------------------------|------|----------|
| Maximum bearing pressure | 0.00 | [lb/in2] |
| Minimum bearing pressure | 0.00 | [lb/in2] |
| Maximum anchor tension   | 3.89 | [kip]    |
| Minimum anchor tension   | 3.89 | [kip]    |

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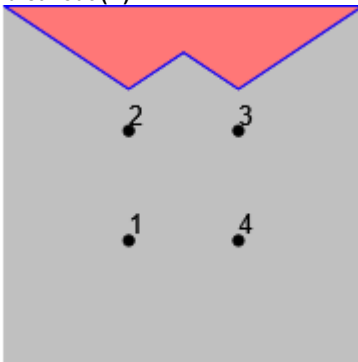
Neutral axis angle                      0.00    [deg]  
 Bearing length                         -1.2E31    [in]

**Anchor tensions**

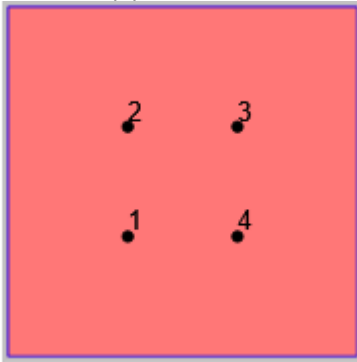
| Anchor | Transverse<br>[in] | Longitudinal<br>[in] | Shear<br>[kip] | Tension<br>[kip] |
|--------|--------------------|----------------------|----------------|------------------|
| 1      | -5.50              | -5.50                | 0.07           | 3.89             |
| 2      | -5.50              | 5.50                 | 0.07           | 3.89             |
| 3      | 5.50               | 5.50                 | 0.07           | 3.89             |
| 4      | 5.50               | -5.50                | 0.07           | 3.89             |

**Major axis****Results for tensile breakout (C)**

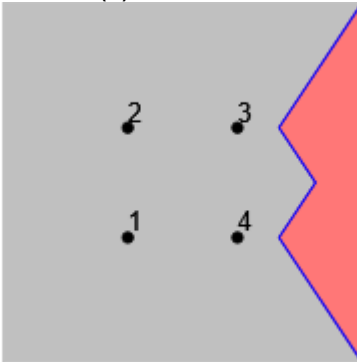
| Group | Area<br>[in2] | Tension<br>[kip] | Anchors    |
|-------|---------------|------------------|------------|
| 1     | 1225.00       | 15.54            | 1, 2, 3, 4 |

**Results for shear breakout (C)**

| Group | Area<br>[in2] | Shear<br>[kip] | Anchors    |
|-------|---------------|----------------|------------|
| 1     | 432.00        | 0.34           | 1, 2, 3, 4 |
| 2     | 432.00        | 0.17           | 2, 3       |

**Minor axis****Results for tensile breakout (C)**

| Group | Area<br>[in <sup>2</sup> ] | Tension<br>[kip] | Anchors    |
|-------|----------------------------|------------------|------------|
| 1     | 1225.00                    | 15.54            | 1, 2, 3, 4 |

**Results for shear breakout (C)**

| Group | Area<br>[in <sup>2</sup> ] | Shear<br>[kip] | Anchors    |
|-------|----------------------------|----------------|------------|
| 1     | 432.00                     | 0.28           | 1, 2, 3, 4 |
| 2     | 432.00                     | 0.14           | 3, 4       |



RAM Structural System



RAM Foundation v17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

**Foundation Design Criteria**

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Date: 01/14/22 16:35:10

**REINFORCEMENT PROPERTIES TABLE: ramastm****CODE**

ACI318-14

Check ACI 318-14 Sec 13.3.3.3.b (Center Strip Reinforcement)

**FORCES**

Forces in Gravity Members are Material Specific.

Forces on Gravity Steel members and Gravity 'Other' columns are from RAM Steel.

Forces on Gravity Concrete members and Gravity 'Other' walls are from RAM Concrete.

**DESIGN METHOD**

Footings designed based on soil capacity.

Design Pile Caps Based on Pile Load.

**DESIGN OPTIONS**

Include Moment Due to Shear in Column for Spread Footings \_\_\_\_\_ False  
 Include Moment Due to Shear in Column for Continuous Footings \_\_\_\_\_ False  
 Include Moment Due to Shear in Column for Pile Caps \_\_\_\_\_ False  
 Include Spread Footing Self-Weight When Checking Soil Stress \_\_\_\_\_ True  
 Keep Spread Footing Square During Optimization \_\_\_\_\_ True  
 Increase Spread Footing Size to Prevent Uplift in Concrete Load Combinations \_\_\_\_\_ False  
 Max Width to Depth Ratio for Design of Continuous Footing as Beam \_\_\_\_\_ Not Defined

**REINFORCEMENT**

Clear Bar Spacing-Shear (in)                      Max:    CODE        Min:    CODE  
 Clear Bar Spacing-Flexure (in)                      Max:    CODE        Min:    CODE  
 Reinforcement Ratio                                      Max:    CODE        Min:    CODE  
 Clear Bar Cover (in)                                      Top:    CODE    Bottom:    CODE    Side:    CODE  
 Bar Sizes Considered - Shear: #3: #4: #5: #6: #7: #8: #9: #10: #11: #14: #18  
 Bar Sizes Considered - Flexure: #3: #4: #5: #6: #7: #8: #9: #10: #11: #14: #18

**REINFORCEMENT SELECTION**

Min. number of bars in footing \_\_\_\_\_ 3  
 Keep all bars in spread footing layer the same \_\_\_\_\_ True  
 Adjacent bars in continuous footing may differ in size by \_\_\_\_\_ 0  
 Segment Spacing Increment (in) \_\_\_\_\_ 12.00  
 Shear Bar Spacing Increment (in) \_\_\_\_\_ 2.00  
 Selection Method \_\_\_\_\_ Min reinf area  
 For Square Spread Footings Keep Same Quantity and Size Bars for Layer \_\_\_\_\_ True

**OPTIMIZATION CRITERIA - SPREAD/CONTINUOUS**

Min. Dimensions Edge of Base Plate to Edge of Footing (in) \_\_\_\_\_ 12.00



RAM Structural System



# Foundation Design Criteria

T-22

RAM Foundation v17.02.01.23

Page 2/2

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

Date: 01/14/22 16:35:10

|                                          |       |
|------------------------------------------|-------|
| Min. Plan Dimensions (in) _____          | 18.00 |
| Pan Dimension Increment (in) _____       | 3.00  |
| Min. Thickness (in) _____                | 12.00 |
| Thickness Increment (in) _____           | 1.00  |
| Uplift Safety Factor Minimum Ratio _____ | 1.00  |

## OPTIMIZATION CRITERIA - PILE/PILE CAP

Edge to Center of Pile Spacing is Maximum of:

|                                    |       |
|------------------------------------|-------|
| Multiple of Pile Dimension _____   | 0.00  |
| Edge to Center Distance (in) _____ | 21.00 |
| Clear from Face of Pile (in) _____ | 9.00  |

Center to Center Spacing of Piles is Maximum of:

|                                      |       |
|--------------------------------------|-------|
| Multiple of Pile Dimension _____     | 3.00  |
| Center to Center Distance (in) _____ | 36.00 |
| Clear from Face of Pile (in) _____   | 24.00 |

Min. Thickness (in) \_\_\_\_\_ 24.00

Thickness Increment (in) \_\_\_\_\_ 6.00

## PILE DEFINITIONS

| Label | Diameter (in) | Compression (kip) | Capacity      |             |
|-------|---------------|-------------------|---------------|-------------|
|       |               |                   | Tension (kip) | Shear (kip) |

## PILE CONFIGURATION

| Label                 | Rows Parallel to |       |
|-----------------------|------------------|-------|
|                       | Major            | Minor |
| 3 Pile Group          | 3                | 0     |
| 5 Pile Group          | 5                | 0     |
| 7 Pile Group          | 7                | 0     |
| 8 Pile Group          | 8                | 0     |
| 2 Pile Group          | 2                | 1     |
| 5 Pile Group Sqr. Cap | 5                | 0     |

## SOIL DEFINITIONS

Fixed Capacities (ksf) : 2.50



**CRITERIA:**

Rigid End Zones: Ignore Effects  
Member Force Output: At Face of Joint  
P-Delta: Yes Scale Factor (DL): 1.20 Scale Factor (LL): 1.00  
Scale Factor (Roof): 1.00 Scale Factor (Snow): 0.70  
Ground Level: Base  
Use Reduced Stiffness for Steel Members (AISC 360):  $\tau_b = 1.00$

**LOAD CASE DEFINITIONS:**

|     |             |                        |
|-----|-------------|------------------------|
| D   | DeadLoad    | RAMUSER                |
| Sp  | PosSnowLoad | RAMUSER                |
| ND1 | notional    | NL_AISC360_DL_X        |
| ND2 | notional    | NL_AISC360_DL_Y        |
| W13 | Wind drift  | Wind_ASCE716_1_X       |
| W14 | Wind drift  | Wind_ASCE716_1_Y       |
| W15 | Wind drift  | Wind_ASCE716_2_X+E     |
| W16 | Wind drift  | Wind_ASCE716_2_X-E     |
| W17 | Wind drift  | Wind_ASCE716_2_Y+E     |
| W18 | Wind drift  | Wind_ASCE716_2_Y-E     |
| W19 | Wind drift  | Wind_ASCE716_3_X+Y     |
| W20 | Wind drift  | Wind_ASCE716_3_X-Y     |
| W21 | Wind drift  | Wind_ASCE716_4_X+Y_CW  |
| W22 | Wind drift  | Wind_ASCE716_4_X+Y_CCW |
| W23 | Wind drift  | Wind_ASCE716_4_X-Y_CW  |
| W24 | Wind drift  | Wind_ASCE716_4_X-Y_CCW |
| E5  | ELF drift   | EQ_ASCE716_X_+E_F      |
| E6  | ELF drift   | EQ_ASCE716_X_-E_F      |
| E7  | ELF drift   | EQ_ASCE716_Y_+E_F      |
| E8  | ELF drift   | EQ_ASCE716_Y_-E_F      |

**Displacements for semirigid diaphragm are reported based on nodal displacements near to selected point.**

**RESULTS:**

**Location (ft): (10.800, 14.800)**

| Story | LdC | Displacement |         | Story Drift |         | Drift Ratio |        |
|-------|-----|--------------|---------|-------------|---------|-------------|--------|
|       |     | X<br>in      | Y<br>in | X<br>in     | Y<br>in | X           | Y      |
| Roof  | D   | 0.0000       | -0.0000 | 0.0000      | -0.0000 | 0.0000      | 0.0000 |
|       | Sp  | 0.0007       | 0.0001  | 0.0007      | 0.0001  | 0.0000      | 0.0000 |
|       | ND1 | 0.0017       | 0.0000  | 0.0017      | 0.0000  | 0.0000      | 0.0000 |
|       | ND2 | -0.0000      | 0.0017  | -0.0000     | 0.0017  | 0.0000      | 0.0000 |



| Story | LdC | Displacement |         | Story Drift |         | Drift Ratio |        |
|-------|-----|--------------|---------|-------------|---------|-------------|--------|
|       | W13 | 0.3785       | 0.0002  | 0.3785      | 0.0002  | 0.0035      | 0.0000 |
|       | W14 | -0.0005      | 0.2927  | -0.0005     | 0.2927  | 0.0000      | 0.0027 |
|       | W15 | 0.3266       | -0.0288 | 0.3266      | -0.0288 | 0.0030      | 0.0003 |
|       | W16 | 0.2411       | 0.0291  | 0.2411      | 0.0291  | 0.0022      | 0.0003 |
|       | W17 | -0.0250      | 0.2363  | -0.0250     | 0.2363  | 0.0002      | 0.0022 |
|       | W18 | 0.0243       | 0.2028  | 0.0243      | 0.2028  | 0.0002      | 0.0019 |
|       | W19 | 0.2835       | 0.2197  | 0.2835      | 0.2197  | 0.0026      | 0.0020 |
|       | W20 | 0.2842       | -0.2194 | 0.2842      | -0.2194 | 0.0026      | 0.0020 |
|       | W21 | 0.2632       | 0.1305  | 0.2632      | 0.1305  | 0.0024      | 0.0012 |
|       | W22 | 0.1621       | 0.1990  | 0.1621      | 0.1990  | 0.0015      | 0.0018 |
|       | W23 | 0.2637       | -0.1988 | 0.2637      | -0.1988 | 0.0024      | 0.0018 |
|       | W24 | 0.1626       | -0.1303 | 0.1626      | -0.1303 | 0.0015      | 0.0012 |
|       | E5  | 0.1090       | -0.0035 | 0.1090      | -0.0035 | 0.0010      | 0.0000 |
|       | E6  | 0.0986       | 0.0036  | 0.0986      | 0.0036  | 0.0009      | 0.0000 |
|       | E7  | -0.0041      | 0.1082  | -0.0041     | 0.1082  | 0.0000      | 0.0010 |
|       | E8  | 0.0038       | 0.1028  | 0.0038      | 0.1028  | 0.0000      | 0.0010 |

**Location (ft): (10.800, 0.000)**

| Story | LdC | Displacement |         | Story Drift |         | Drift Ratio |        |
|-------|-----|--------------|---------|-------------|---------|-------------|--------|
|       |     | X            | Y       | X           | Y       | X           | Y      |
|       |     | in           | in      | in          | in      |             |        |
| Roof  | D   | 0.0000       | 0.0000  | 0.0000      | 0.0000  | 0.0000      | 0.0000 |
|       | Sp  | 0.0006       | 0.0002  | 0.0006      | 0.0002  | 0.0000      | 0.0000 |
|       | ND1 | 0.0017       | 0.0000  | 0.0017      | 0.0000  | 0.0000      | 0.0000 |
|       | ND2 | 0.0000       | 0.0017  | 0.0000      | 0.0017  | 0.0000      | 0.0000 |
|       | W13 | 0.3790       | 0.0002  | 0.3790      | 0.0002  | 0.0035      | 0.0000 |
|       | W14 | 0.0005       | 0.2928  | 0.0005      | 0.2928  | 0.0000      | 0.0027 |
|       | W15 | 0.2412       | -0.0288 | 0.2412      | -0.0288 | 0.0022      | 0.0003 |
|       | W16 | 0.3273       | 0.0290  | 0.3273      | 0.0290  | 0.0030      | 0.0003 |
|       | W17 | 0.0252       | 0.2363  | 0.0252      | 0.2363  | 0.0002      | 0.0022 |
|       | W18 | -0.0245      | 0.2028  | -0.0245     | 0.2028  | 0.0002      | 0.0019 |
|       | W19 | 0.2846       | 0.2197  | 0.2846      | 0.2197  | 0.0026      | 0.0020 |
|       | W20 | 0.2839       | -0.2194 | 0.2839      | -0.2194 | 0.0026      | 0.0020 |
|       | W21 | 0.1625       | 0.1305  | 0.1625      | 0.1305  | 0.0015      | 0.0012 |
|       | W22 | 0.2644       | 0.1990  | 0.2644      | 0.1990  | 0.0024      | 0.0018 |
|       | W23 | 0.1620       | -0.1988 | 0.1620      | -0.1988 | 0.0015      | 0.0018 |
|       | W24 | 0.2639       | -0.1303 | 0.2639      | -0.1303 | 0.0024      | 0.0012 |
|       | E5  | 0.0987       | -0.0035 | 0.0987      | -0.0035 | 0.0009      | 0.0000 |
|       | E6  | 0.1092       | 0.0036  | 0.1092      | 0.0036  | 0.0010      | 0.0000 |
|       | E7  | 0.0042       | 0.1082  | 0.0042      | 0.1082  | 0.0000      | 0.0010 |
|       | E8  | -0.0038      | 0.1028  | -0.0038     | 0.1028  | 0.0000      | 0.0010 |

**Location (ft): (0.000, 0.000)**



| Story | LdC | Displacement |         | Story Drift |         | Drift Ratio |        |
|-------|-----|--------------|---------|-------------|---------|-------------|--------|
|       |     | X<br>in      | Y<br>in | X<br>in     | Y<br>in | X           | Y      |
| Roof  | D   | 0.0000       | 0.0000  | 0.0000      | 0.0000  | 0.0000      | 0.0000 |
|       | Sp  | 0.0006       | 0.0003  | 0.0006      | 0.0003  | 0.0000      | 0.0000 |
|       | ND1 | 0.0017       | -0.0000 | 0.0017      | -0.0000 | 0.0000      | 0.0000 |
|       | ND2 | 0.0000       | 0.0017  | 0.0000      | 0.0017  | 0.0000      | 0.0000 |
|       | W13 | 0.3789       | -0.0002 | 0.3789      | -0.0002 | 0.0035      | 0.0000 |
|       | W14 | 0.0005       | 0.2920  | 0.0005      | 0.2920  | 0.0000      | 0.0027 |
|       | W15 | 0.2338       | 0.0363  | 0.2338      | 0.0363  | 0.0022      | 0.0003 |
|       | W16 | 0.3347       | -0.0366 | 0.3347      | -0.0366 | 0.0031      | 0.0003 |
|       | W17 | 0.0296       | 0.1978  | 0.0296      | 0.1978  | 0.0003      | 0.0018 |
|       | W18 | -0.0287      | 0.2402  | -0.0287     | 0.2402  | 0.0003      | 0.0022 |
|       | W19 | 0.2846       | 0.2188  | 0.2846      | 0.2188  | 0.0026      | 0.0020 |
|       | W20 | 0.2838       | -0.2191 | 0.2838      | -0.2191 | 0.0026      | 0.0020 |
|       | W21 | 0.1538       | 0.2074  | 0.1538      | 0.2074  | 0.0014      | 0.0019 |
|       | W22 | 0.2732       | 0.1209  | 0.2732      | 0.1209  | 0.0025      | 0.0011 |
|       | W23 | 0.1531       | -0.1211 | 0.1531      | -0.1211 | 0.0014      | 0.0011 |
|       | W24 | 0.2726       | -0.2076 | 0.2726      | -0.2076 | 0.0025      | 0.0019 |
|       | E5  | 0.0977       | 0.0044  | 0.0977      | 0.0044  | 0.0009      | 0.0000 |
|       | E6  | 0.1100       | -0.0045 | 0.1100      | -0.0045 | 0.0010      | 0.0000 |
|       | E7  | 0.0049       | 0.1018  | 0.0049      | 0.1018  | 0.0000      | 0.0009 |
|       | E8  | -0.0045      | 0.1086  | -0.0045     | 0.1086  | 0.0000      | 0.0010 |

**TORSIONAL IRREGULARITY DATA:**

**X-Axis:**

| Story | LdC | Drift<br>in | Coord<br>ft | Drift<br>in | Coord<br>ft   | Max/Min | Max/Ave |
|-------|-----|-------------|-------------|-------------|---------------|---------|---------|
| Roof  | E6  | 0.1100      | (0.00 0.00) | 0.0986      | (10.80 14.80) | 1.117   | 1.055   |

**Y-Axis:**

| Story | LdC | Drift<br>in | Coord<br>ft | Drift<br>in | Coord<br>ft   | Max/Min | Max/Ave |
|-------|-----|-------------|-------------|-------------|---------------|---------|---------|
| Roof  | E7  | 0.1018      | (0.00 0.00) | 0.1082      | (10.80 14.80) | 1.062   | 1.030   |



RAM Structural System



# Criteria, Mass and Exposure Data

T-26

RAM Frame 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy

01/21/22 12:00:22

## CRITERIA:

Rigid End Zones: Ignore Effects  
 Member Force Output: At Face of Joint  
 P-Delta: Yes Scale Factor (DL): 1.20 Scale Factor (LL): 1.00  
 Scale Factor (Roof): 1.00 Scale Factor (Snow): 0.70

Ground Level: Base

### Mesh Criteria :

Max. Distance Between Nodes on Mesh Line (ft) : 3.00

Merge Node Tolerance (in) : 0.0100

Geometry Tolerance (in) : 0.0010

Walls Out-of-plane Stiffness Not Included in Analysis.

Use Reduced Stiffness for Steel Members (AISC 360):  $\tau_b = 1.00$ 

Sign considered for Dynamic Load Case Results.

Rigid Links Included at Fixed Beam-to-Wall Locations

Eigenvalue Analysis : Eigen Vectors (Subspace Iteration)

## DIAPHRAGM DATA:

| Story | Diaph # | Diaph Type |
|-------|---------|------------|
| Roof  | 1       | Semirigid  |

Disconnect Internal Nodes of Beams: Yes

Disconnect Nodes outside Slab Boundary: Yes

### Semirigid Diaphragm Parameters:

Use Slab Edges for Exterior Boundary

Calculate Diaphragm Mass

Hard Node Density Factor: 1.00

## STORY MASS DATA:

### Includes Self Mass of:

Beams

Columns (Half mass of columns above and below)

Walls (Half mass of walls above and below)

Slabs/Deck

### Calculated Values:

| Story | Diaph # | Weight<br>kips | Mass<br>k-s2/ft | MMI<br>ft-k-s2 | Xm<br>ft | Ym<br>ft | EccX<br>ft | EccY<br>ft |
|-------|---------|----------------|-----------------|----------------|----------|----------|------------|------------|
| Roof  | 1       | 2.53           | 0.08            | 4              | 5.50     | 7.54     | 0.65       | 0.85       |

| Story | Diaph # | Combine |
|-------|---------|---------|
| Roof  | 1       | None    |

### Distributed Mass Values for Pseudo-Flexible or Meshed Diaphragms:

| Story | Diaph # | Total Weight<br>kips | Total Mass<br>k-s2/ft |
|-------|---------|----------------------|-----------------------|
| Roof  | 1       | 2.53                 | 0.079                 |



RAM Structural System



# Criteria, Mass and Exposure Data

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RAM Frame 17.02.01.23

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Dunn Associates, Inc.

DataBase: Freestanding canopy

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## WIND EXPOSURE DATA:

### Calculated Values:

| Story | Diaph # | Building Extents (ft) |       |       |       | Expose | Parapet<br>ft |
|-------|---------|-----------------------|-------|-------|-------|--------|---------------|
|       |         | Min X                 | Max X | Min Y | Max Y |        |               |
| Roof  | 1       | -1.00                 | 12.00 | -1.00 | 16.08 | Full   | 0.00          |

## STORY GRAVITY LOADS DATA:

### Includes Weight of:

Beams  
Columns  
Walls  
Slabs/Deck

### Live Load Reduction (Calculated)

Reducible : 0.00 %  
Storage : 0.00 %

### Calculated Values:

| Story | Diaph # | Dead | Xc   | Yc   | Live | Xc   | Yc   |
|-------|---------|------|------|------|------|------|------|
|       |         | kips | ft   | ft   | kips | ft   | ft   |
| Roof  | 1       | 2.79 | 5.50 | 7.54 | 0.00 | 0.00 | 0.00 |

| Story | Diaph # | Snow | Xc   | Yc   | Combine |
|-------|---------|------|------|------|---------|
|       |         | kips | ft   | ft   |         |
| Roof  | 1       | 7.76 | 6.35 | 7.40 | None    |



RAM Structural System

**ASCE 7 Stability Coefficients**

T-28

RAM Frame 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy

01/21/22 12:00:22

**CRITERIA:**

Rigid End Zones: Ignore Effects  
 Member Force Output: At Face of Joint  
 P-Delta: Yes Scale Factor (DL): 1.20 Scale Factor (LL): 1.00  
 Scale Factor (Roof): 1.00 Scale Factor (Snow): 0.70

Ground Level: Base

Mesh Criteria :

Max. Distance Between Nodes on Mesh Line (ft) : 3.00

Merge Node Tolerance (in) : 0.0100

Geometry Tolerance (in) : 0.0010

Walls Out-of-plane Stiffness Not Included in Analysis.

Use Reduced Stiffness for Steel Members (AISC 360):  $\tau_b = 1.00$ 

Sign considered for Dynamic Load Case Results.

Rigid Links Included at Fixed Beam-to-Wall Locations

Eigenvalue Analysis : Eigen Vectors (Subspace Iteration)

**STABILITY COEFFICIENTS:ASCE 7-10 Eq. (12.8-16)** $\beta = 1.00$ 

Cd : X-Dir = 3.00 Y-Dir = 3.00

Note that the reported drifts are unfactored elastic story drift values.

Calculated vertical load includes dead, live and roof loads. Live loads are reduced with live load reduction factors.

Calculated vertical load is the sum of the total vertical load at and above story.

**Vertical Load Factors:**

Dead Load : 1.00 Live Load : 1.00 Roof Load : 1.00 Snow Load : 1.00

**LOAD CASE: ELF drift****Type : EQ\_ASCE716\_X\_+E\_F**

| Level | Diaph. # | Ht<br>ft | Shear X<br>kips | Shear Y<br>kips | Drift X<br>in | Drift Y<br>in | Vertical Load<br>kips |
|-------|----------|----------|-----------------|-----------------|---------------|---------------|-----------------------|
| Roof  | 1        | 9.00     | 0.34            | 0.00            | 0.10          | -0.00         | 10.41                 |

| Level | Diaph. # | $\theta_x$ | $\theta_y$ | $\theta_x/(1+\theta_x)$ | $\theta_y/(1+\theta_y)$ | $\theta_{xmax}$ | $\theta_{ymax}$ |
|-------|----------|------------|------------|-------------------------|-------------------------|-----------------|-----------------|
| Roof  | 1        | 0.000      | 0.000      | 0.000                   | 0.000                   | 0.167           | 0.167           |

**Type : EQ\_ASCE716\_X\_-E\_F**

| Level | Diaph. # | Ht<br>ft | Shear X<br>kips | Shear Y<br>kips | Drift X<br>in | Drift Y<br>in | Vertical Load<br>kips |
|-------|----------|----------|-----------------|-----------------|---------------|---------------|-----------------------|
| Roof  | 1        | 9.00     | 0.34            | 0.00            | 0.10          | 0.00          | 10.41                 |

| Level | Diaph. # | $\theta_x$ | $\theta_y$ | $\theta_x/(1+\theta_x)$ | $\theta_y/(1+\theta_y)$ | $\theta_{xmax}$ | $\theta_{ymax}$ |
|-------|----------|------------|------------|-------------------------|-------------------------|-----------------|-----------------|
| Roof  | 1        | 0.000      | 0.000      | 0.000                   | 0.000                   | 0.167           | 0.167           |

**Type : EQ\_ASCE716\_Y\_+E\_F**



RAM Structural System

**ASCE 7 Stability Coefficients**

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Dunn Associates, Inc.

DataBase: Freestanding canopy

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| Level | Diaph. # | Ht<br>ft | Shear X<br>kips | Shear Y<br>kips | Drift X<br>in | Drift Y<br>in | Vertical Load<br>kips |
|-------|----------|----------|-----------------|-----------------|---------------|---------------|-----------------------|
| Roof  | 1        | 9.00     | -0.00           | 0.34            | 0.00          | 0.11          | 10.41                 |

| Level | Diaph. # | $\theta_x$ | $\theta_y$ | $\theta_x/(1+\theta_x)$ | $\theta_y/(1+\theta_y)$ | $\theta_{xmax}$ | $\theta_{ymax}$ |
|-------|----------|------------|------------|-------------------------|-------------------------|-----------------|-----------------|
| Roof  | 1        | 0.000      | 0.000      | 0.000                   | 0.000                   | 0.167           | 0.167           |

**Type : EQ\_ASCE716\_Y\_-E\_F**

| Level | Diaph. # | Ht<br>ft | Shear X<br>kips | Shear Y<br>kips | Drift X<br>in | Drift Y<br>in | Vertical Load<br>kips |
|-------|----------|----------|-----------------|-----------------|---------------|---------------|-----------------------|
| Roof  | 1        | 9.00     | 0.00            | 0.34            | -0.00         | 0.11          | 10.41                 |

| Level | Diaph. # | $\theta_x$ | $\theta_y$ | $\theta_x/(1+\theta_x)$ | $\theta_y/(1+\theta_y)$ | $\theta_{xmax}$ | $\theta_{ymax}$ |
|-------|----------|------------|------------|-------------------------|-------------------------|-----------------|-----------------|
| Roof  | 1        | 0.000      | 0.000      | 0.000                   | 0.000                   | 0.167           | 0.167           |



RAM Structural System



# Redundancy Factors Summary

T-30

RAM Frame 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy

01/21/22 12:01:57

## CODE: IBC 2000/2003

### CRITERIA:

Rigid End Zones: Ignore Effects  
 P-Delta: Yes Scale Factor (DL): 1.20 Scale Factor (LL): 1.00  
 Scale Factor (Roof): 1.00 Scale Factor (Snow): 0.70

Ground Level: Base

#### Mesh Criteria :

Max. Distance Between Nodes on Mesh Line (ft) : 3.00

Merge Node Tolerance (in) : 0.0100

Geometry Tolerance (in) : 0.0010

Walls Out-of-plane Stiffness Not Included in Analysis.

Use Reduced Stiffness for Steel Members (AISC 360):  $\tau_b = 1.00$ 

Sign considered for Dynamic Load Case Results.

Rigid Links Included at Fixed Beam-to-Wall Locations

Eigenvalue Analysis : Eigen Vectors (Subspace Iteration)

Use Area of Each Level for  $A_i$ 

Maximum Angle from Parallel between adjacent bays for which Column is  
 considered 'common to two bays': 10.0 deg

| Load Case: E1 |         | ELF EQ_ASCE716_X_+E_F |          |       |       |         |         |
|---------------|---------|-----------------------|----------|-------|-------|---------|---------|
| Level         | Story V | Area Ai               | ElementV | ri    | Rhoi  | Element | Diaph.# |
|               | kips    | ft²                   | kips     |       |       |         |         |
| Roof          | 0.00    | 0.00                  | 0.00     | 0.000 | 0.000 | -----   | --      |

ri = 0.000

Rho = 1.000

| Load Case: E2 |         | ELF EQ_ASCE716_X_-E_F |          |       |       |         |         |
|---------------|---------|-----------------------|----------|-------|-------|---------|---------|
| Level         | Story V | Area Ai               | ElementV | ri    | Rhoi  | Element | Diaph.# |
|               | kips    | ft²                   | kips     |       |       |         |         |
| Roof          | 0.00    | 0.00                  | 0.00     | 0.000 | 0.000 | -----   | --      |

ri = 0.000

Rho = 1.000

| Load Case: E3 |         | ELF EQ_ASCE716_Y_+E_F |          |       |       |         |         |
|---------------|---------|-----------------------|----------|-------|-------|---------|---------|
| Level         | Story V | Area Ai               | ElementV | ri    | Rhoi  | Element | Diaph.# |
|               | kips    | ft²                   | kips     |       |       |         |         |
| Roof          | 0.00    | 0.00                  | 0.00     | 0.000 | 0.000 | -----   | --      |

ri = 0.000

Rho = 1.000

| Load Case: E4 |         | ELF EQ_ASCE716_Y_-E_F |          |       |       |         |         |
|---------------|---------|-----------------------|----------|-------|-------|---------|---------|
| Level         | Story V | Area Ai               | ElementV | ri    | Rhoi  | Element | Diaph.# |
|               | kips    | ft²                   | kips     |       |       |         |         |
| Roof          | 0.00    | 0.00                  | 0.00     | 0.000 | 0.000 | -----   | --      |



RAM Structural System



## Redundancy Factors Summary

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DataBase: Freestanding canopy

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ri = 0.000

Rho = 1.000



RAM Structural System



RAM Frame 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy

**Frame Model Data**

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**STORY DATA:**

| Level | Story Label | Layout Type | Height<br>ft |
|-------|-------------|-------------|--------------|
| 1     | Roof        | Roof        | 9.00         |

**FRAME MEMBERS****Frame #0:****Level: Roof****Steel Column:**

| # | X<br>ft | Y<br>ft | Z<br>ft | RigMaj<br>in | RigMin<br>in | Fixity<br>xyt | Fy<br>ksi | Section    |
|---|---------|---------|---------|--------------|--------------|---------------|-----------|------------|
| 1 | 0.000   | 15.083  | 9.000   | 6.10         | 6.10         | FFF           | 50        | HSS5X5X1/4 |
|   | 0.000   | 15.083  | 0.000   | 0.00         | 0.00         | PPF           |           |            |
| 2 | 11.000  | 15.083  | 9.000   | 6.10         | 6.10         | FFF           | 50        | HSS5X5X1/4 |
|   | 11.000  | 15.083  | 0.000   | 0.00         | 0.00         | PPF           |           |            |
| 3 | 11.000  | 0.000   | 9.000   | 6.10         | 6.10         | FFF           | 50        | HSS5X5X1/4 |
|   | 11.000  | 0.000   | 0.000   | 0.00         | 0.00         | PPF           |           |            |
| 4 | 0.000   | 0.000   | 9.000   | 6.10         | 6.10         | FFF           | 50        | HSS5X5X1/4 |
|   | 0.000   | 0.000   | 0.000   | 0.00         | 0.00         | PPF           |           |            |

**Steel Beam / Horiz Brace:**

| # | X<br>ft | Y<br>ft | Z<br>ft | RigEnd<br>in | Fixity<br>xyt | Fy<br>ksi | Section | T-O |
|---|---------|---------|---------|--------------|---------------|-----------|---------|-----|
| 2 | 0.000   | 15.083  | 9.000   | 2.50         | FFF           | 50        | W12X26  | --- |
|   | 11.000  | 15.083  | 9.000   | 2.50         | FFF           |           |         |     |
| 3 | 11.000  | 0.000   | 9.000   | 2.50         | FFF           | 50        | W12X26  | --- |
|   | 11.000  | 15.083  | 9.000   | 2.50         | FFF           |           |         |     |
| 4 | 0.000   | 0.000   | 9.000   | 2.50         | FFF           | 50        | W12X26  | --- |
|   | 11.000  | 0.000   | 9.000   | 2.50         | FFF           |           |         |     |
| 5 | 0.000   | 0.000   | 9.000   | 2.50         | FFF           | 50        | W12X26  | --- |
|   | 0.000   | 15.083  | 9.000   | 2.50         | FFF           |           |         |     |

**NODES:**

| #  | X<br>ft | Y<br>ft | Z<br>ft | Fdtn | Diaphr<br>(Diaph.# - Story Name) |
|----|---------|---------|---------|------|----------------------------------|
| 1  | 0.000   | 0.000   | 9.000   | N    | 1 - Roof                         |
| 2  | 0.000   | 15.083  | 9.000   | N    | 1 - Roof                         |
| 3  | 11.000  | 0.000   | 9.000   | N    | 1 - Roof                         |
| 4  | 11.000  | 15.083  | 9.000   | N    | 1 - Roof                         |
| 5  | 0.000   | 0.000   | 0.000   | Y    | --                               |
| 6  | 0.000   | 15.083  | 0.000   | Y    | --                               |
| 7  | 11.000  | 0.000   | 0.000   | Y    | --                               |
| 8  | 11.000  | 15.083  | 0.000   | Y    | --                               |
| 11 | 8.250   | 15.083  | 9.000   | N    | 1 - Roof                         |



RAM Structural System



## Frame Model Data

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DataBase: Freestanding canopy

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| #  | X      | Y      | Z     | Fdtn | Diaphr   |
|----|--------|--------|-------|------|----------|
| 12 | 5.500  | 15.083 | 9.000 | N    | 1 - Roof |
| 13 | 11.000 | 12.569 | 9.000 | N    | 1 - Roof |
| 17 | 11.000 | 7.542  | 9.000 | N    | 1 - Roof |
| 18 | 11.000 | 5.028  | 9.000 | N    | 1 - Roof |
| 46 | 11.000 | 10.056 | 9.000 | N    | 1 - Roof |
| 54 | 0.000  | 7.542  | 9.000 | N    | 1 - Roof |
| 56 | 0.000  | 5.028  | 9.000 | N    | 1 - Roof |
| 64 | 5.500  | 0.000  | 9.000 | N    | 1 - Roof |
| 71 | 8.250  | 0.000  | 9.000 | N    | 1 - Roof |
| 72 | 2.750  | 15.083 | 9.000 | N    | 1 - Roof |
| 73 | 0.000  | 12.569 | 9.000 | N    | 1 - Roof |
| 74 | 0.000  | 10.056 | 9.000 | N    | 1 - Roof |
| 77 | 0.000  | 2.514  | 9.000 | N    | 1 - Roof |
| 81 | 2.750  | 0.000  | 9.000 | N    | 1 - Roof |
| 85 | 11.000 | 2.514  | 9.000 | N    | 1 - Roof |



**CRITERIA:**

Rigid End Zones: Ignore Effects  
Member Force Output: At Face of Joint  
P-Delta: Yes Scale Factor (DL): 1.20 Scale Factor (LL): 1.00  
Scale Factor (Roof): 1.00 Scale Factor (Snow): 0.70  
Ground Level: Base  
Mesh Criteria :  
Max. Distance Between Nodes on Mesh Line (ft) : 3.00  
Merge Node Tolerance (in) : 0.0100  
Geometry Tolerance (in) : 0.0010  
Walls Out-of-plane Stiffness Not Included in Analysis.  
Use Reduced Stiffness for Steel Members (AISC 360):  $\tau_b = 1.00$   
Sign considered for Dynamic Load Case Results.  
Rigid Links Included at Fixed Beam-to-Wall Locations  
Eigenvalue Analysis : Eigen Vectors (Subspace Iteration)

**LOAD COMBINATION CRITERIA:**

Snow Factor  $f_2$  Use Full Factor ( $f_2 = 0.7$ ) on Snow in Combination with Seismic  
Notional Loads Consider with all Combinations in direction of lateral load  
Live Load factor  $f_1$  (0.5 or 1.0) 0.500  
Sds (for Ev) 0.079  
RhoX 1.300  
RhoY 1.300

**LOAD CASE DEFINITIONS:**

|     |             |                        |
|-----|-------------|------------------------|
| D   | DeadLoad    | RAMUSER                |
| Sp  | PosSnowLoad | RAMUSER                |
| W1  | MWFRS       | Wind_ASCE716_1_X       |
| W2  | MWFRS       | Wind_ASCE716_1_Y       |
| W3  | MWFRS       | Wind_ASCE716_2_X+E     |
| W4  | MWFRS       | Wind_ASCE716_2_X-E     |
| W5  | MWFRS       | Wind_ASCE716_2_Y+E     |
| W6  | MWFRS       | Wind_ASCE716_2_Y-E     |
| W7  | MWFRS       | Wind_ASCE716_3_X+Y     |
| W8  | MWFRS       | Wind_ASCE716_3_X-Y     |
| W9  | MWFRS       | Wind_ASCE716_4_X+Y_CW  |
| W10 | MWFRS       | Wind_ASCE716_4_X+Y_CCW |
| W11 | MWFRS       | Wind_ASCE716_4_X-Y_CW  |
| W12 | MWFRS       | Wind_ASCE716_4_X-Y_CCW |
| E1  | ELF         | EQ_ASCE716_X_+E_F      |
| E2  | ELF         | EQ_ASCE716_X_-E_F      |
| E3  | ELF         | EQ_ASCE716_Y_+E_F      |
| E4  | ELF         | EQ_ASCE716_Y_-E_F      |
| ND1 | notional    | NL_AISC360_DL_X        |
| ND2 | notional    | NL_AISC360_DL_Y        |
| NR1 | notional    | NL_AISC360_Rf_X        |
| NR2 | notional    | NL_AISC360_Rf_Y        |



**LOAD COMBINATIONS: IBC 2018 / ASCE 7-16 LRFD**

|    |   |                                                                                |
|----|---|--------------------------------------------------------------------------------|
| 1  | * | 1.400 D + 1.400 ND1                                                            |
| 2  | * | 1.400 D + 1.400 ND2                                                            |
| 3  | * | 1.400 D - 1.400 ND1                                                            |
| 4  | * | 1.400 D - 1.400 ND2                                                            |
| 5  | * | 1.200 D - 1.200 ND1 + 1.600 Sp - 1.600 NR1                                     |
| 6  | * | 1.200 D - 1.200 ND2 + 1.600 Sp - 1.600 NR2                                     |
| 7  | * | 1.200 D + 1.200 ND1 + 1.600 Sp + 1.600 NR1                                     |
| 8  | * | 1.200 D + 1.200 ND2 + 1.600 Sp + 1.600 NR2                                     |
| 9  | * | 1.200 D + 1.200 ND1 + 1.600 Sp + 1.600 NR1 + 0.500 W1                          |
| 10 | * | 1.200 D + 1.200 ND2 + 1.600 Sp + 1.600 NR2 + 0.500 W2                          |
| 11 | * | 1.200 D + 1.200 ND1 + 1.600 Sp + 1.600 NR1 + 0.500 W3                          |
| 12 | * | 1.200 D + 1.200 ND1 + 1.600 Sp + 1.600 NR1 + 0.500 W4                          |
| 13 | * | 1.200 D + 1.200 ND2 + 1.600 Sp + 1.600 NR2 + 0.500 W5                          |
| 14 | * | 1.200 D + 1.200 ND2 + 1.600 Sp + 1.600 NR2 + 0.500 W6                          |
| 15 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 1.600 Sp + 1.273 NR1 + 0.969 NR2 + 0.500 W7  |
| 16 | * | 1.200 D + 0.955 ND1 - 0.727 ND2 + 1.600 Sp + 1.273 NR1 - 0.969 NR2 + 0.500 W8  |
| 17 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 1.600 Sp + 1.273 NR1 + 0.969 NR2 + 0.500 W9  |
| 18 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 1.600 Sp + 1.273 NR1 + 0.969 NR2 + 0.500 W10 |
| 19 | * | 1.200 D + 0.955 ND1 - 0.727 ND2 + 1.600 Sp + 1.273 NR1 - 0.969 NR2 + 0.500 W11 |
| 20 | * | 1.200 D + 0.955 ND1 - 0.727 ND2 + 1.600 Sp + 1.273 NR1 - 0.969 NR2 + 0.500 W12 |
| 21 | * | 1.200 D - 1.200 ND1 + 1.600 Sp - 1.600 NR1 - 0.500 W1                          |
| 22 | * | 1.200 D - 1.200 ND2 + 1.600 Sp - 1.600 NR2 - 0.500 W2                          |
| 23 | * | 1.200 D - 1.200 ND1 + 1.600 Sp - 1.600 NR1 - 0.500 W3                          |
| 24 | * | 1.200 D - 1.200 ND1 + 1.600 Sp - 1.600 NR1 - 0.500 W4                          |
| 25 | * | 1.200 D - 1.200 ND2 + 1.600 Sp - 1.600 NR2 - 0.500 W5                          |
| 26 | * | 1.200 D - 1.200 ND2 + 1.600 Sp - 1.600 NR2 - 0.500 W6                          |
| 27 | * | 1.200 D - 0.955 ND1 - 0.727 ND2 + 1.600 Sp - 1.273 NR1 - 0.969 NR2 - 0.500 W7  |
| 28 | * | 1.200 D - 0.955 ND1 + 0.727 ND2 + 1.600 Sp - 1.273 NR1 + 0.969 NR2 - 0.500 W8  |
| 29 | * | 1.200 D - 0.955 ND1 - 0.727 ND2 + 1.600 Sp - 1.273 NR1 - 0.969 NR2 - 0.500 W9  |
| 30 | * | 1.200 D - 0.955 ND1 - 0.727 ND2 + 1.600 Sp - 1.273 NR1 - 0.969 NR2 - 0.500 W10 |
| 31 | * | 1.200 D - 0.955 ND1 + 0.727 ND2 + 1.600 Sp - 1.273 NR1 + 0.969 NR2 - 0.500 W11 |
| 32 | * | 1.200 D - 0.955 ND1 + 0.727 ND2 + 1.600 Sp - 1.273 NR1 + 0.969 NR2 - 0.500 W12 |
| 33 | * | 1.200 D + 1.200 ND1 + 0.500 Sp + 0.500 NR1 + 1.000 W1                          |
| 34 | * | 1.200 D + 1.200 ND2 + 0.500 Sp + 0.500 NR2 + 1.000 W2                          |
| 35 | * | 1.200 D + 1.200 ND1 + 0.500 Sp + 0.500 NR1 + 1.000 W3                          |
| 36 | * | 1.200 D + 1.200 ND1 + 0.500 Sp + 0.500 NR1 + 1.000 W4                          |
| 37 | * | 1.200 D + 1.200 ND2 + 0.500 Sp + 0.500 NR2 + 1.000 W5                          |
| 38 | * | 1.200 D + 1.200 ND2 + 0.500 Sp + 0.500 NR2 + 1.000 W6                          |
| 39 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 0.500 Sp + 0.398 NR1 + 0.303 NR2 + 1.000 W7  |
| 40 | * | 1.200 D + 0.955 ND1 - 0.727 ND2 + 0.500 Sp + 0.398 NR1 - 0.303 NR2 + 1.000 W8  |
| 41 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 0.500 Sp + 0.398 NR1 + 0.303 NR2 + 1.000 W9  |
| 42 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 0.500 Sp + 0.398 NR1 + 0.303 NR2 + 1.000 W10 |
| 43 | * | 1.200 D + 0.955 ND1 - 0.727 ND2 + 0.500 Sp + 0.398 NR1 - 0.303 NR2 + 1.000 W11 |
| 44 | * | 1.200 D + 0.955 ND1 - 0.727 ND2 + 0.500 Sp + 0.398 NR1 - 0.303 NR2 + 1.000 W12 |
| 45 | * | 1.200 D - 1.200 ND1 + 0.500 Sp - 0.500 NR1 - 1.000 W1                          |



## Code Check Summary

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RAM Frame 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy

Building Code: IBC

01/21/22 12:02:45

Steel Code: AISC360-16 LRFD

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|    |   |                                                                                |
|----|---|--------------------------------------------------------------------------------|
| 46 | * | 1.200 D - 1.200 ND2 + 0.500 Sp - 0.500 NR2 - 1.000 W2                          |
| 47 | * | 1.200 D - 1.200 ND1 + 0.500 Sp - 0.500 NR1 - 1.000 W3                          |
| 48 | * | 1.200 D - 1.200 ND1 + 0.500 Sp - 0.500 NR1 - 1.000 W4                          |
| 49 | * | 1.200 D - 1.200 ND2 + 0.500 Sp - 0.500 NR2 - 1.000 W5                          |
| 50 | * | 1.200 D - 1.200 ND2 + 0.500 Sp - 0.500 NR2 - 1.000 W6                          |
| 51 | * | 1.200 D - 0.955 ND1 - 0.727 ND2 + 0.500 Sp - 0.398 NR1 - 0.303 NR2 - 1.000 W7  |
| 52 | * | 1.200 D - 0.955 ND1 + 0.727 ND2 + 0.500 Sp - 0.398 NR1 + 0.303 NR2 - 1.000 W8  |
| 53 | * | 1.200 D - 0.955 ND1 - 0.727 ND2 + 0.500 Sp - 0.398 NR1 - 0.303 NR2 - 1.000 W9  |
| 54 | * | 1.200 D - 0.955 ND1 - 0.727 ND2 + 0.500 Sp - 0.398 NR1 - 0.303 NR2 - 1.000 W10 |
| 55 | * | 1.200 D - 0.955 ND1 + 0.727 ND2 + 0.500 Sp - 0.398 NR1 + 0.303 NR2 - 1.000 W11 |
| 56 | * | 1.200 D - 0.955 ND1 + 0.727 ND2 + 0.500 Sp - 0.398 NR1 + 0.303 NR2 - 1.000 W12 |
| 57 | * | 1.200 D + 1.200 ND1 + 1.000 W1                                                 |
| 58 | * | 1.200 D + 1.200 ND2 + 1.000 W2                                                 |
| 59 | * | 1.200 D + 1.200 ND1 + 1.000 W3                                                 |
| 60 | * | 1.200 D + 1.200 ND1 + 1.000 W4                                                 |
| 61 | * | 1.200 D + 1.200 ND2 + 1.000 W5                                                 |
| 62 | * | 1.200 D + 1.200 ND2 + 1.000 W6                                                 |
| 63 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 1.000 W7                                     |
| 64 | * | 1.200 D + 0.955 ND1 - 0.727 ND2 + 1.000 W8                                     |
| 65 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 1.000 W9                                     |
| 66 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 1.000 W10                                    |
| 67 | * | 1.200 D + 0.955 ND1 - 0.727 ND2 + 1.000 W11                                    |
| 68 | * | 1.200 D + 0.955 ND1 - 0.727 ND2 + 1.000 W12                                    |
| 69 | * | 1.200 D - 1.200 ND1 - 1.000 W1                                                 |
| 70 | * | 1.200 D - 1.200 ND2 - 1.000 W2                                                 |
| 71 | * | 1.200 D - 1.200 ND1 - 1.000 W3                                                 |
| 72 | * | 1.200 D - 1.200 ND1 - 1.000 W4                                                 |
| 73 | * | 1.200 D - 1.200 ND2 - 1.000 W5                                                 |
| 74 | * | 1.200 D - 1.200 ND2 - 1.000 W6                                                 |
| 75 | * | 1.200 D - 0.955 ND1 - 0.727 ND2 - 1.000 W7                                     |
| 76 | * | 1.200 D - 0.955 ND1 + 0.727 ND2 - 1.000 W8                                     |
| 77 | * | 1.200 D - 0.955 ND1 - 0.727 ND2 - 1.000 W9                                     |
| 78 | * | 1.200 D - 0.955 ND1 - 0.727 ND2 - 1.000 W10                                    |
| 79 | * | 1.200 D - 0.955 ND1 + 0.727 ND2 - 1.000 W11                                    |
| 80 | * | 1.200 D - 0.955 ND1 + 0.727 ND2 - 1.000 W12                                    |
| 81 | * | 0.900 D + 0.900 ND1 + 1.000 W1                                                 |
| 82 | * | 0.900 D + 0.900 ND2 + 1.000 W2                                                 |
| 83 | * | 0.900 D + 0.900 ND1 + 1.000 W3                                                 |
| 84 | * | 0.900 D + 0.900 ND1 + 1.000 W4                                                 |
| 85 | * | 0.900 D + 0.900 ND2 + 1.000 W5                                                 |
| 86 | * | 0.900 D + 0.900 ND2 + 1.000 W6                                                 |
| 87 | * | 0.900 D + 0.716 ND1 + 0.545 ND2 + 1.000 W7                                     |
| 88 | * | 0.900 D + 0.716 ND1 - 0.545 ND2 + 1.000 W8                                     |
| 89 | * | 0.900 D + 0.716 ND1 + 0.545 ND2 + 1.000 W9                                     |
| 90 | * | 0.900 D + 0.716 ND1 + 0.545 ND2 + 1.000 W10                                    |
| 91 | * | 0.900 D + 0.716 ND1 - 0.545 ND2 + 1.000 W11                                    |




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|     |   |                                                       |
|-----|---|-------------------------------------------------------|
| 92  | * | 0.900 D + 0.716 ND1 - 0.545 ND2 + 1.000 W12           |
| 93  | * | 0.900 D - 0.900 ND1 - 1.000 W1                        |
| 94  | * | 0.900 D - 0.900 ND2 - 1.000 W2                        |
| 95  | * | 0.900 D - 0.900 ND1 - 1.000 W3                        |
| 96  | * | 0.900 D - 0.900 ND1 - 1.000 W4                        |
| 97  | * | 0.900 D - 0.900 ND2 - 1.000 W5                        |
| 98  | * | 0.900 D - 0.900 ND2 - 1.000 W6                        |
| 99  | * | 0.900 D - 0.716 ND1 - 0.545 ND2 - 1.000 W7            |
| 100 | * | 0.900 D - 0.716 ND1 + 0.545 ND2 - 1.000 W8            |
| 101 | * | 0.900 D - 0.716 ND1 - 0.545 ND2 - 1.000 W9            |
| 102 | * | 0.900 D - 0.716 ND1 - 0.545 ND2 - 1.000 W10           |
| 103 | * | 0.900 D - 0.716 ND1 + 0.545 ND2 - 1.000 W11           |
| 104 | * | 0.900 D - 0.716 ND1 + 0.545 ND2 - 1.000 W12           |
| 105 | * | 1.216 D + 1.216 ND1 + 0.700 Sp + 0.700 NR1 + 1.300 E1 |
| 106 | * | 1.216 D + 1.216 ND1 + 0.700 Sp + 0.700 NR1 + 1.300 E2 |
| 107 | * | 1.216 D + 1.216 ND2 + 0.700 Sp + 0.700 NR2 + 1.300 E3 |
| 108 | * | 1.216 D + 1.216 ND2 + 0.700 Sp + 0.700 NR2 + 1.300 E4 |
| 109 | * | 1.216 D - 1.216 ND1 + 0.700 Sp - 0.700 NR1 - 1.300 E1 |
| 110 | * | 1.216 D - 1.216 ND1 + 0.700 Sp - 0.700 NR1 - 1.300 E2 |
| 111 | * | 1.216 D - 1.216 ND2 + 0.700 Sp - 0.700 NR2 - 1.300 E3 |
| 112 | * | 1.216 D - 1.216 ND2 + 0.700 Sp - 0.700 NR2 - 1.300 E4 |
| 113 | * | 1.216 D + 1.216 ND1 + 1.300 E1                        |
| 114 | * | 1.216 D + 1.216 ND1 + 1.300 E2                        |
| 115 | * | 1.216 D + 1.216 ND2 + 1.300 E3                        |
| 116 | * | 1.216 D + 1.216 ND2 + 1.300 E4                        |
| 117 | * | 1.216 D - 1.216 ND1 - 1.300 E1                        |
| 118 | * | 1.216 D - 1.216 ND1 - 1.300 E2                        |
| 119 | * | 1.216 D - 1.216 ND2 - 1.300 E3                        |
| 120 | * | 1.216 D - 1.216 ND2 - 1.300 E4                        |
| 121 | * | 0.884 D + 0.884 ND1 + 1.300 E1                        |
| 122 | * | 0.884 D + 0.884 ND1 + 1.300 E2                        |
| 123 | * | 0.884 D + 0.884 ND2 + 1.300 E3                        |
| 124 | * | 0.884 D + 0.884 ND2 + 1.300 E4                        |
| 125 | * | 0.884 D - 0.884 ND1 - 1.300 E1                        |
| 126 | * | 0.884 D - 0.884 ND1 - 1.300 E2                        |
| 127 | * | 0.884 D - 0.884 ND2 - 1.300 E3                        |
| 128 | * | 0.884 D - 0.884 ND2 - 1.300 E4                        |

\* = Load combination currently selected to use

**Frame #0:**

**Level: Roof**

| Col.<br># | Pu<br>kip | Mux<br>kip-ft | Muy<br>kip-ft | Vux<br>kip | Vuy<br>kip | LC | Interact.  | Fy<br>ksi | Size       |
|-----------|-----------|---------------|---------------|------------|------------|----|------------|-----------|------------|
| 1         | 2.07      | 2.25          | -1.78         | -0.34      | 0.03       | 52 | 0.15 H1-1b | 50        | HSS5X5X1/4 |
| 2         | 2.57      | -1.95         | 2.24          | 0.05       | -0.33      | 39 | 0.16 H1-1b | 50        | HSS5X5X1/4 |



RAM Frame 17.02.01.23  
 Dunn Associates, Inc.  
 DataBase: Freestanding canopy  
 Building Code: IBC

## Code Check Summary

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Steel Code: AISC360-16 LRFD

| Col.   | Pu     | Mux        | Muy        | Vux     | Vuy     | LC | Interact.            | Fy     | Size       |
|--------|--------|------------|------------|---------|---------|----|----------------------|--------|------------|
| 3      | 2.70   | -2.28      | 1.95       | 0.34    | -0.05   | 40 | 0.16 H1-1b           | 50     | HSS5X5X1/4 |
| 4      | 2.25   | 1.78       | -2.29      | -0.03   | 0.34    | 51 | 0.15 H1-1b           | 50     | HSS5X5X1/4 |
| Beam # | Pu kip | Mux kip-ft | Muy kip-ft | Vux kip | Vuy kip | LC | Interact.            | Fy ksi | Size       |
| 2      | 0.12   | 7.27       | 0.01       | -1.96   | 0.01    | 9  | 0.05<br>H1-3a(H1-1b) | 50     | W12X26     |
| 3      | 0.16   | 8.64       | -0.01      | 2.68    | 0.00    | 10 | 0.06<br>H1-3a(H1-1b) | 50     | W12X26     |
| 4      | 0.13   | 8.93       | -0.01      | -2.33   | -0.01   | 9  | 0.06<br>H1-3a(H1-1b) | 50     | W12X26     |
| 5      | 0.10   | 3.91       | -0.03      | 1.37    | -0.00   | 17 | 0.03 H1-1b           | 50     | W12X26     |



# Seismic Provisions Member Code Check Summary

T-39

RAM Structural System 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy

Building Code: IBC

01/21/22 12:06:48

Steel Code: AISC341-16 - LRFD

## Criteria

$C_d/I_e = 4.0$

BRBF and SCBF - Required Column Strength based on Larger of Strength and Capacity Limited Seismic Forces.

## Frame #0:

**Story:Roof**                      **Column: 1**                      **Type: Ordinary Moment Resisting Frame**

Size:HSS5X5X1/4       $F_y$  (ksi): 50.00

D1.4a Required Strength --- OK

D2.5b Column Splices - Required Strength

D2.5c Required Shear Strength

**Story:Roof**                      **Column: 2**                      **Type: Ordinary Moment Resisting Frame**

Size:HSS5X5X1/4       $F_y$  (ksi): 50.00

D1.4a Required Strength --- OK

D2.5b Column Splices - Required Strength

D2.5c Required Shear Strength

**Story:Roof**                      **Column: 3**                      **Type: Ordinary Moment Resisting Frame**

Size:HSS5X5X1/4       $F_y$  (ksi): 50.00

D1.4a Required Strength --- OK

D2.5b Column Splices - Required Strength

D2.5c Required Shear Strength

**Story:Roof**                      **Column: 4**                      **Type: Ordinary Moment Resisting Frame**

Size:HSS5X5X1/4       $F_y$  (ksi): 50.00

D1.4a Required Strength --- OK

D2.5b Column Splices - Required Strength

D2.5c Required Shear Strength

**Story:Roof**                      **Beam: 2**                      **Type: Ordinary Moment Resisting Frame**

Size:W12X26       $F_y$  (ksi): 50.00

**Story:Roof**                      **Beam: 3**                      **Type: Ordinary Moment Resisting Frame**

Size:W12X26       $F_y$  (ksi): 50.00

**Story:Roof**                      **Beam: 4**                      **Type: Ordinary Moment Resisting Frame**

Size:W12X26       $F_y$  (ksi): 50.00

**Story:Roof**                      **Beam: 5**                      **Type: Ordinary Moment Resisting Frame**

Size:W12X26       $F_y$  (ksi): 50.00



RAM Frame 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

Building Code: IBC

## Frame Reaction Envelope

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01/14/22 16:32:09

### CRITERIA:

Rigid End Zones: Ignore Effects  
Member Force Output: At Face of Joint  
P-Delta: Yes Scale Factor (DL): 1.20 Scale Factor (LL): 1.00  
Scale Factor (Roof): 1.00 Scale Factor (Snow): 0.70  
Ground Level: Base  
Mesh Criteria :  
Max. Distance Between Nodes on Mesh Line (ft) : 3.00  
Merge Node Tolerance (in) : 0.0100  
Geometry Tolerance (in) : 0.0010  
Walls Out-of-plane Stiffness Not Included in Analysis.  
Use Reduced Stiffness for Steel Members (AISC 360):  $\tau_b = 1.00$   
Sign considered for Dynamic Load Case Results.  
Rigid Links Included at Fixed Beam-to-Wall Locations  
Eigenvalue Analysis : Eigen Vectors (Subspace Iteration)

### LOAD COMBINATION CRITERIA:

Roof Live Load: Snow  
Snow Factor f2 Use Full Factor ( $f_2 = 0.7$ ) on Snow in Combination with Seismic  
Notional Loads Consider with all Combinations in direction of lateral load  
Live Load factor f1 (0.5 or 1.0) 0.500  
Sds (for Ev) 0.079  
RhoX 1.300  
RhoY 1.300

### LOAD CASE DEFINITIONS:

|     |             |                        |
|-----|-------------|------------------------|
| D   | DeadLoad    | RAMUSER                |
| Sp  | PosSnowLoad | RAMUSER                |
| W1  | MWFRS       | Wind_ASCE716_1_X       |
| W2  | MWFRS       | Wind_ASCE716_1_Y       |
| W3  | MWFRS       | Wind_ASCE716_2_X+E     |
| W4  | MWFRS       | Wind_ASCE716_2_X-E     |
| W5  | MWFRS       | Wind_ASCE716_2_Y+E     |
| W6  | MWFRS       | Wind_ASCE716_2_Y-E     |
| W7  | MWFRS       | Wind_ASCE716_3_X+Y     |
| W8  | MWFRS       | Wind_ASCE716_3_X-Y     |
| W9  | MWFRS       | Wind_ASCE716_4_X+Y_CW  |
| W10 | MWFRS       | Wind_ASCE716_4_X+Y_CCW |
| W11 | MWFRS       | Wind_ASCE716_4_X-Y_CW  |
| W12 | MWFRS       | Wind_ASCE716_4_X-Y_CCW |
| E1  | ELF         | EQ_ASCE716_X_+E_F      |
| E2  | ELF         | EQ_ASCE716_X_-E_F      |
| E3  | ELF         | EQ_ASCE716_Y_+E_F      |
| E4  | ELF         | EQ_ASCE716_Y_-E_F      |
| ND1 | notional    | NL_AISC360_DL_X        |
| ND2 | notional    | NL_AISC360_DL_Y        |
| NR1 | notional    | NL_AISC360_Rf_X        |



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NR2      notional      NL\_AISC360\_Rf\_Y

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**LOAD COMBINATIONS:      IBC 2018 / ASCE 7-16 LRFD**

|    |   |                                                                                |
|----|---|--------------------------------------------------------------------------------|
| 1  | * | 1.400 D + 1.400 ND1                                                            |
| 2  | * | 1.400 D + 1.400 ND2                                                            |
| 3  | * | 1.400 D - 1.400 ND1                                                            |
| 4  | * | 1.400 D - 1.400 ND2                                                            |
| 5  | * | 1.200 D - 1.200 ND1 + 1.600 Sp - 1.600 NR1                                     |
| 6  | * | 1.200 D - 1.200 ND2 + 1.600 Sp - 1.600 NR2                                     |
| 7  | * | 1.200 D + 1.200 ND1 + 1.600 Sp + 1.600 NR1                                     |
| 8  | * | 1.200 D + 1.200 ND2 + 1.600 Sp + 1.600 NR2                                     |
| 9  | * | 1.200 D + 1.200 ND1 + 1.600 Sp + 1.600 NR1 + 0.500 W1                          |
| 10 | * | 1.200 D + 1.200 ND2 + 1.600 Sp + 1.600 NR2 + 0.500 W2                          |
| 11 | * | 1.200 D + 1.200 ND1 + 1.600 Sp + 1.600 NR1 + 0.500 W3                          |
| 12 | * | 1.200 D + 1.200 ND1 + 1.600 Sp + 1.600 NR1 + 0.500 W4                          |
| 13 | * | 1.200 D + 1.200 ND2 + 1.600 Sp + 1.600 NR2 + 0.500 W5                          |
| 14 | * | 1.200 D + 1.200 ND2 + 1.600 Sp + 1.600 NR2 + 0.500 W6                          |
| 15 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 1.600 Sp + 1.273 NR1 + 0.969 NR2 + 0.500 W7  |
| 16 | * | 1.200 D + 0.955 ND1 - 0.727 ND2 + 1.600 Sp + 1.273 NR1 - 0.969 NR2 + 0.500 W8  |
| 17 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 1.600 Sp + 1.273 NR1 + 0.969 NR2 + 0.500 W9  |
| 18 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 1.600 Sp + 1.273 NR1 + 0.969 NR2 + 0.500 W10 |
| 19 | * | 1.200 D + 0.955 ND1 - 0.727 ND2 + 1.600 Sp + 1.273 NR1 - 0.969 NR2 + 0.500 W11 |
| 20 | * | 1.200 D + 0.955 ND1 - 0.727 ND2 + 1.600 Sp + 1.273 NR1 - 0.969 NR2 + 0.500 W12 |
| 21 | * | 1.200 D - 1.200 ND1 + 1.600 Sp - 1.600 NR1 - 0.500 W1                          |
| 22 | * | 1.200 D - 1.200 ND2 + 1.600 Sp - 1.600 NR2 - 0.500 W2                          |
| 23 | * | 1.200 D - 1.200 ND1 + 1.600 Sp - 1.600 NR1 - 0.500 W3                          |
| 24 | * | 1.200 D - 1.200 ND1 + 1.600 Sp - 1.600 NR1 - 0.500 W4                          |
| 25 | * | 1.200 D - 1.200 ND2 + 1.600 Sp - 1.600 NR2 - 0.500 W5                          |
| 26 | * | 1.200 D - 1.200 ND2 + 1.600 Sp - 1.600 NR2 - 0.500 W6                          |
| 27 | * | 1.200 D - 0.955 ND1 - 0.727 ND2 + 1.600 Sp - 1.273 NR1 - 0.969 NR2 - 0.500 W7  |
| 28 | * | 1.200 D - 0.955 ND1 + 0.727 ND2 + 1.600 Sp - 1.273 NR1 + 0.969 NR2 - 0.500 W8  |
| 29 | * | 1.200 D - 0.955 ND1 - 0.727 ND2 + 1.600 Sp - 1.273 NR1 - 0.969 NR2 - 0.500 W9  |
| 30 | * | 1.200 D - 0.955 ND1 - 0.727 ND2 + 1.600 Sp - 1.273 NR1 - 0.969 NR2 - 0.500 W10 |
| 31 | * | 1.200 D - 0.955 ND1 + 0.727 ND2 + 1.600 Sp - 1.273 NR1 + 0.969 NR2 - 0.500 W11 |
| 32 | * | 1.200 D - 0.955 ND1 + 0.727 ND2 + 1.600 Sp - 1.273 NR1 + 0.969 NR2 - 0.500 W12 |
| 33 | * | 1.200 D + 1.200 ND1 + 0.500 Sp + 0.500 NR1 + 1.000 W1                          |
| 34 | * | 1.200 D + 1.200 ND2 + 0.500 Sp + 0.500 NR2 + 1.000 W2                          |
| 35 | * | 1.200 D + 1.200 ND1 + 0.500 Sp + 0.500 NR1 + 1.000 W3                          |
| 36 | * | 1.200 D + 1.200 ND1 + 0.500 Sp + 0.500 NR1 + 1.000 W4                          |
| 37 | * | 1.200 D + 1.200 ND2 + 0.500 Sp + 0.500 NR2 + 1.000 W5                          |
| 38 | * | 1.200 D + 1.200 ND2 + 0.500 Sp + 0.500 NR2 + 1.000 W6                          |
| 39 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 0.500 Sp + 0.398 NR1 + 0.303 NR2 + 1.000 W7  |
| 40 | * | 1.200 D + 0.955 ND1 - 0.727 ND2 + 0.500 Sp + 0.398 NR1 - 0.303 NR2 + 1.000 W8  |
| 41 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 0.500 Sp + 0.398 NR1 + 0.303 NR2 + 1.000 W9  |
| 42 | * | 1.200 D + 0.955 ND1 + 0.727 ND2 + 0.500 Sp + 0.398 NR1 + 0.303 NR2 + 1.000 W10 |
| 43 | * | 1.200 D + 0.955 ND1 - 0.727 ND2 + 0.500 Sp + 0.398 NR1 - 0.303 NR2 + 1.000 W11 |



## Frame Reaction Envelope

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RAM Frame 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

01/14/22 16:32:09

Building Code: IBC

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|    |   |                                                                                  |
|----|---|----------------------------------------------------------------------------------|
| 44 | * | $1.200 D + 0.955 ND1 - 0.727 ND2 + 0.500 Sp + 0.398 NR1 - 0.303 NR2 + 1.000 W12$ |
| 45 | * | $1.200 D - 1.200 ND1 + 0.500 Sp - 0.500 NR1 - 1.000 W1$                          |
| 46 | * | $1.200 D - 1.200 ND2 + 0.500 Sp - 0.500 NR2 - 1.000 W2$                          |
| 47 | * | $1.200 D - 1.200 ND1 + 0.500 Sp - 0.500 NR1 - 1.000 W3$                          |
| 48 | * | $1.200 D - 1.200 ND1 + 0.500 Sp - 0.500 NR1 - 1.000 W4$                          |
| 49 | * | $1.200 D - 1.200 ND2 + 0.500 Sp - 0.500 NR2 - 1.000 W5$                          |
| 50 | * | $1.200 D - 1.200 ND2 + 0.500 Sp - 0.500 NR2 - 1.000 W6$                          |
| 51 | * | $1.200 D - 0.955 ND1 - 0.727 ND2 + 0.500 Sp - 0.398 NR1 - 0.303 NR2 - 1.000 W7$  |
| 52 | * | $1.200 D - 0.955 ND1 + 0.727 ND2 + 0.500 Sp - 0.398 NR1 + 0.303 NR2 - 1.000 W8$  |
| 53 | * | $1.200 D - 0.955 ND1 - 0.727 ND2 + 0.500 Sp - 0.398 NR1 - 0.303 NR2 - 1.000 W9$  |
| 54 | * | $1.200 D - 0.955 ND1 - 0.727 ND2 + 0.500 Sp - 0.398 NR1 - 0.303 NR2 - 1.000 W10$ |
| 55 | * | $1.200 D - 0.955 ND1 + 0.727 ND2 + 0.500 Sp - 0.398 NR1 + 0.303 NR2 - 1.000 W11$ |
| 56 | * | $1.200 D - 0.955 ND1 + 0.727 ND2 + 0.500 Sp - 0.398 NR1 + 0.303 NR2 - 1.000 W12$ |
| 57 | * | $1.200 D + 1.200 ND1 + 1.000 W1$                                                 |
| 58 | * | $1.200 D + 1.200 ND2 + 1.000 W2$                                                 |
| 59 | * | $1.200 D + 1.200 ND1 + 1.000 W3$                                                 |
| 60 | * | $1.200 D + 1.200 ND1 + 1.000 W4$                                                 |
| 61 | * | $1.200 D + 1.200 ND2 + 1.000 W5$                                                 |
| 62 | * | $1.200 D + 1.200 ND2 + 1.000 W6$                                                 |
| 63 | * | $1.200 D + 0.955 ND1 + 0.727 ND2 + 1.000 W7$                                     |
| 64 | * | $1.200 D + 0.955 ND1 - 0.727 ND2 + 1.000 W8$                                     |
| 65 | * | $1.200 D + 0.955 ND1 + 0.727 ND2 + 1.000 W9$                                     |
| 66 | * | $1.200 D + 0.955 ND1 + 0.727 ND2 + 1.000 W10$                                    |
| 67 | * | $1.200 D + 0.955 ND1 - 0.727 ND2 + 1.000 W11$                                    |
| 68 | * | $1.200 D + 0.955 ND1 - 0.727 ND2 + 1.000 W12$                                    |
| 69 | * | $1.200 D - 1.200 ND1 - 1.000 W1$                                                 |
| 70 | * | $1.200 D - 1.200 ND2 - 1.000 W2$                                                 |
| 71 | * | $1.200 D - 1.200 ND1 - 1.000 W3$                                                 |
| 72 | * | $1.200 D - 1.200 ND1 - 1.000 W4$                                                 |
| 73 | * | $1.200 D - 1.200 ND2 - 1.000 W5$                                                 |
| 74 | * | $1.200 D - 1.200 ND2 - 1.000 W6$                                                 |
| 75 | * | $1.200 D - 0.955 ND1 - 0.727 ND2 - 1.000 W7$                                     |
| 76 | * | $1.200 D - 0.955 ND1 + 0.727 ND2 - 1.000 W8$                                     |
| 77 | * | $1.200 D - 0.955 ND1 - 0.727 ND2 - 1.000 W9$                                     |
| 78 | * | $1.200 D - 0.955 ND1 - 0.727 ND2 - 1.000 W10$                                    |
| 79 | * | $1.200 D - 0.955 ND1 + 0.727 ND2 - 1.000 W11$                                    |
| 80 | * | $1.200 D - 0.955 ND1 + 0.727 ND2 - 1.000 W12$                                    |
| 81 | * | $0.900 D + 0.900 ND1 + 1.000 W1$                                                 |
| 82 | * | $0.900 D + 0.900 ND2 + 1.000 W2$                                                 |
| 83 | * | $0.900 D + 0.900 ND1 + 1.000 W3$                                                 |
| 84 | * | $0.900 D + 0.900 ND1 + 1.000 W4$                                                 |
| 85 | * | $0.900 D + 0.900 ND2 + 1.000 W5$                                                 |
| 86 | * | $0.900 D + 0.900 ND2 + 1.000 W6$                                                 |
| 87 | * | $0.900 D + 0.716 ND1 + 0.545 ND2 + 1.000 W7$                                     |
| 88 | * | $0.900 D + 0.716 ND1 - 0.545 ND2 + 1.000 W8$                                     |
| 89 | * | $0.900 D + 0.716 ND1 + 0.545 ND2 + 1.000 W9$                                     |



## Frame Reaction Envelope

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RAM Frame 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

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Building Code: IBC

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|     |   |                                                         |
|-----|---|---------------------------------------------------------|
| 90  | * | $0.900 D + 0.716 ND1 + 0.545 ND2 + 1.000 W10$           |
| 91  | * | $0.900 D + 0.716 ND1 - 0.545 ND2 + 1.000 W11$           |
| 92  | * | $0.900 D + 0.716 ND1 - 0.545 ND2 + 1.000 W12$           |
| 93  | * | $0.900 D - 0.900 ND1 - 1.000 W1$                        |
| 94  | * | $0.900 D - 0.900 ND2 - 1.000 W2$                        |
| 95  | * | $0.900 D - 0.900 ND1 - 1.000 W3$                        |
| 96  | * | $0.900 D - 0.900 ND1 - 1.000 W4$                        |
| 97  | * | $0.900 D - 0.900 ND2 - 1.000 W5$                        |
| 98  | * | $0.900 D - 0.900 ND2 - 1.000 W6$                        |
| 99  | * | $0.900 D - 0.716 ND1 - 0.545 ND2 - 1.000 W7$            |
| 100 | * | $0.900 D - 0.716 ND1 + 0.545 ND2 - 1.000 W8$            |
| 101 | * | $0.900 D - 0.716 ND1 - 0.545 ND2 - 1.000 W9$            |
| 102 | * | $0.900 D - 0.716 ND1 - 0.545 ND2 - 1.000 W10$           |
| 103 | * | $0.900 D - 0.716 ND1 + 0.545 ND2 - 1.000 W11$           |
| 104 | * | $0.900 D - 0.716 ND1 + 0.545 ND2 - 1.000 W12$           |
| 105 | * | $1.216 D + 1.216 ND1 + 0.700 Sp + 0.700 NR1 + 1.300 E1$ |
| 106 | * | $1.216 D + 1.216 ND1 + 0.700 Sp + 0.700 NR1 + 1.300 E2$ |
| 107 | * | $1.216 D + 1.216 ND2 + 0.700 Sp + 0.700 NR2 + 1.300 E3$ |
| 108 | * | $1.216 D + 1.216 ND2 + 0.700 Sp + 0.700 NR2 + 1.300 E4$ |
| 109 | * | $1.216 D - 1.216 ND1 + 0.700 Sp - 0.700 NR1 - 1.300 E1$ |
| 110 | * | $1.216 D - 1.216 ND1 + 0.700 Sp - 0.700 NR1 - 1.300 E2$ |
| 111 | * | $1.216 D - 1.216 ND2 + 0.700 Sp - 0.700 NR2 - 1.300 E3$ |
| 112 | * | $1.216 D - 1.216 ND2 + 0.700 Sp - 0.700 NR2 - 1.300 E4$ |
| 113 | * | $1.216 D + 1.216 ND1 + 1.300 E1$                        |
| 114 | * | $1.216 D + 1.216 ND1 + 1.300 E2$                        |
| 115 | * | $1.216 D + 1.216 ND2 + 1.300 E3$                        |
| 116 | * | $1.216 D + 1.216 ND2 + 1.300 E4$                        |
| 117 | * | $1.216 D - 1.216 ND1 - 1.300 E1$                        |
| 118 | * | $1.216 D - 1.216 ND1 - 1.300 E2$                        |
| 119 | * | $1.216 D - 1.216 ND2 - 1.300 E3$                        |
| 120 | * | $1.216 D - 1.216 ND2 - 1.300 E4$                        |
| 121 | * | $0.884 D + 0.884 ND1 + 1.300 E1$                        |
| 122 | * | $0.884 D + 0.884 ND1 + 1.300 E2$                        |
| 123 | * | $0.884 D + 0.884 ND2 + 1.300 E3$                        |
| 124 | * | $0.884 D + 0.884 ND2 + 1.300 E4$                        |
| 125 | * | $0.884 D - 0.884 ND1 - 1.300 E1$                        |
| 126 | * | $0.884 D - 0.884 ND1 - 1.300 E2$                        |
| 127 | * | $0.884 D - 0.884 ND2 - 1.300 E3$                        |
| 128 | * | $0.884 D - 0.884 ND2 - 1.300 E4$                        |

\* = Load combination currently selected to use

### REACTION MAXIMA AND MINIMA:

Frame #0:



RAM Frame 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

Building Code: IBC

## Frame Reaction Envelope

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| <b>Node</b> |      | <b>Rx</b>   | <b>Ry</b>   | <b>Rz</b>   | <b>Mxx</b>    | <b>Myy</b>    | <b>Tzz</b>    |
|-------------|------|-------------|-------------|-------------|---------------|---------------|---------------|
|             |      | <b>kips</b> | <b>kips</b> | <b>kips</b> | <b>kip-ft</b> | <b>kip-ft</b> | <b>kip-ft</b> |
| 5           | Max: | 0.31        | 0.24        | 3.77        | 2.18          | 2.85          | 0.12          |
|             | LC:  | 45          | 46          | 5           | 34            | 45            | 43            |
|             | Min: | -0.31       | -0.24       | 0.89        | -2.18         | -2.85         | -0.12         |
|             | LC:  | 33          | 34          | 121         | 46            | 33            | 55            |
| 6           | Max: | 0.31        | 0.24        | 3.21        | 2.18          | 2.85          | 0.12          |
|             | LC:  | 45          | 46          | 5           | 34            | 45            | 54            |
|             | Min: | -0.31       | -0.24       | 0.89        | -2.18         | -2.85         | -0.12         |
|             | LC:  | 33          | 34          | 121         | 46            | 33            | 42            |
| 7           | Max: | 0.31        | 0.24        | 5.24        | 2.18          | 2.85          | 0.12          |
|             | LC:  | 45          | 46          | 5           | 34            | 45            | 41            |
|             | Min: | -0.31       | -0.24       | 0.89        | -2.18         | -2.85         | -0.12         |
|             | LC:  | 33          | 34          | 121         | 46            | 33            | 53            |
| 8           | Max: | 0.31        | 0.24        | 4.81        | 2.18          | 2.85          | 0.12          |
|             | LC:  | 45          | 46          | 5           | 34            | 45            | 56            |
|             | Min: | -0.31       | -0.24       | 0.89        | -2.18         | -2.85         | -0.12         |
|             | LC:  | 33          | 34          | 121         | 46            | 33            | 44            |



# Frame Reaction Envelope

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RAM Frame 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

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Bentley Building Code: IBC

## CRITERIA:

Rigid End Zones: Ignore Effects  
Member Force Output: At Face of Joint  
P-Delta: Yes Scale Factor (DL): 1.20 Scale Factor (LL): 1.00  
Scale Factor (Roof): 1.00 Scale Factor (Snow): 0.70  
Ground Level: Base  
Mesh Criteria :  
Max. Distance Between Nodes on Mesh Line (ft) : 3.00  
Merge Node Tolerance (in) : 0.0100  
Geometry Tolerance (in) : 0.0010  
Walls Out-of-plane Stiffness Not Included in Analysis.  
Use Reduced Stiffness for Steel Members (AISC 360):  $\tau_b = 1.00$   
Sign considered for Dynamic Load Case Results.  
Rigid Links Included at Fixed Beam-to-Wall Locations  
Eigenvalue Analysis : Eigen Vectors (Subspace Iteration)

## LOAD COMBINATION CRITERIA:

Roof Live Load: Snow  
Snow Factor  $f_2$  Use Reduced Factor ( $f_2 = 0.2$ ) on Snow in Combination with Seismic  
Notional Loads Consider with all Combinations in direction of lateral load  
Live Load factor  $f_1$  (0.5 or 1.0) 0.500  
Sds (for Ev) 0.079  
Omega\_o 1.250

## LOAD CASE DEFINITIONS:

|     |             |                   |
|-----|-------------|-------------------|
| D   | DeadLoad    | RAMUSER           |
| Sp  | PosSnowLoad | RAMUSER           |
| E1  | ELF         | EQ_ASCE716_X_+E_F |
| E2  | ELF         | EQ_ASCE716_X_-E_F |
| E3  | ELF         | EQ_ASCE716_Y_+E_F |
| E4  | ELF         | EQ_ASCE716_Y_-E_F |
| ND1 | notional    | NL_AISC360_DL_X   |
| ND2 | notional    | NL_AISC360_DL_Y   |
| NR1 | notional    | NL_AISC360_Rf_X   |
| NR2 | notional    | NL_AISC360_Rf_Y   |

## LOAD COMBINATIONS: IBC 2018 / ASCE 7-16 LRFD

|   |   |                                                       |
|---|---|-------------------------------------------------------|
| 1 | * | 1.216 D + 1.216 ND1 + 0.200 Sp + 0.200 NR1 + 1.250 E1 |
| 2 | * | 1.216 D + 1.216 ND1 + 0.200 Sp + 0.200 NR1 + 1.250 E2 |
| 3 | * | 1.216 D + 1.216 ND2 + 0.200 Sp + 0.200 NR2 + 1.250 E3 |
| 4 | * | 1.216 D + 1.216 ND2 + 0.200 Sp + 0.200 NR2 + 1.250 E4 |
| 5 | * | 1.216 D - 1.216 ND1 + 0.200 Sp - 0.200 NR1 - 1.250 E1 |
| 6 | * | 1.216 D - 1.216 ND1 + 0.200 Sp - 0.200 NR1 - 1.250 E2 |
| 7 | * | 1.216 D - 1.216 ND2 + 0.200 Sp - 0.200 NR2 - 1.250 E3 |
| 8 | * | 1.216 D - 1.216 ND2 + 0.200 Sp - 0.200 NR2 - 1.250 E4 |



# Frame Reaction Envelope

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RAM Frame 17.02.01.23

Dunn Associates, Inc.

DataBase: Freestanding canopy cantilevered column

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Building Code: IBC

|    |   |                                |
|----|---|--------------------------------|
| 9  | * | 1.216 D + 1.216 ND1 + 1.250 E1 |
| 10 | * | 1.216 D + 1.216 ND1 + 1.250 E2 |
| 11 | * | 1.216 D + 1.216 ND2 + 1.250 E3 |
| 12 | * | 1.216 D + 1.216 ND2 + 1.250 E4 |
| 13 | * | 1.216 D - 1.216 ND1 - 1.250 E1 |
| 14 | * | 1.216 D - 1.216 ND1 - 1.250 E2 |
| 15 | * | 1.216 D - 1.216 ND2 - 1.250 E3 |
| 16 | * | 1.216 D - 1.216 ND2 - 1.250 E4 |
| 17 | * | 0.884 D + 0.884 ND1 + 1.250 E1 |
| 18 | * | 0.884 D + 0.884 ND1 + 1.250 E2 |
| 19 | * | 0.884 D + 0.884 ND2 + 1.250 E3 |
| 20 | * | 0.884 D + 0.884 ND2 + 1.250 E4 |
| 21 | * | 0.884 D - 0.884 ND1 - 1.250 E1 |
| 22 | * | 0.884 D - 0.884 ND1 - 1.250 E2 |
| 23 | * | 0.884 D - 0.884 ND2 - 1.250 E3 |
| 24 | * | 0.884 D - 0.884 ND2 - 1.250 E4 |

\* = Load combination currently selected to use

Code checks requiring Ecl use (+ 1.000 Ecl) for LRFD and (+ 0.700 Ecl) for ASD in a set of generated load combinations independent of the combinations shown above.

## REACTION MAXIMA AND MINIMA:

### Frame #0:

| Node |      | Rx<br>kips | Ry<br>kips | Rz<br>kips | Mxx<br>kip-ft | Myy<br>kip-ft | Tzz<br>kip-ft |
|------|------|------------|------------|------------|---------------|---------------|---------------|
| 5    | Max: | 0.11       | 0.10       | 1.54       | 0.96          | 0.98          | 0.01          |
|      | LC:  | 6          | 8          | 1          | 4             | 6             | 1             |
|      | Min: | -0.11      | -0.10      | 0.89       | -0.96         | -0.98         | -0.01         |
|      | LC:  | 2          | 4          | 17         | 8             | 2             | 5             |
| 6    | Max: | 0.11       | 0.11       | 1.47       | 0.96          | 0.98          | 0.02          |
|      | LC:  | 5          | 8          | 1          | 4             | 5             | 6             |
|      | Min: | -0.11      | -0.11      | 0.89       | -0.96         | -0.98         | -0.02         |
|      | LC:  | 1          | 4          | 17         | 8             | 1             | 2             |
| 7    | Max: | 0.11       | 0.10       | 1.72       | 0.96          | 0.98          | 0.01          |
|      | LC:  | 6          | 7          | 1          | 3             | 6             | 1             |
|      | Min: | -0.11      | -0.10      | 0.89       | -0.96         | -0.98         | -0.01         |
|      | LC:  | 2          | 3          | 17         | 7             | 2             | 5             |
| 8    | Max: | 0.11       | 0.10       | 1.67       | 0.96          | 0.98          | 0.02          |
|      | LC:  | 5          | 7          | 1          | 3             | 5             | 6             |
|      | Min: | -0.11      | -0.10      | 0.89       | -0.96         | -0.98         | -0.02         |
|      | LC:  | 1          | 3          | 17         | 7             | 1             | 2             |

