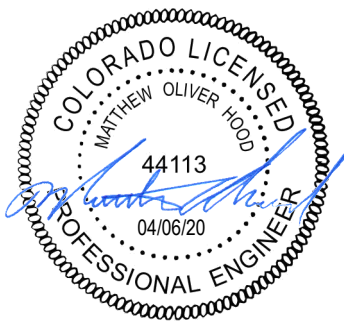


Structural Engineering Calculations

Steamboat Springs Middle School Steamboat Springs, CO



SUPPORTING YOUR VISION

JIRSA | HEDRICK
Structural Engineers

Prepared For: TAB Associates

Date: April 6, 2020

Table of Contents

Steamboat Springs Middle School

Calculation Index

<u>Item</u>	<u>Pages</u>
Design Loads.....	1 – 6
Gravity Framing.....	7 – 56
Lateral Analysis.....	57 – 136

Design Loads



PROJECT NO. 20191103 SHEET _____ OF _____
 PROJECT Steamboat Schools BY VSW
 SUBJECT Design Loads - SSMS DATE 4/6/2020

Design Code: 2015 IBC w/ Routt County Amendments

Design Loads - Gravity

Roof

Dead Load

Roofing	3 psf	*
Insulation	2 psf	*
Metal Deck	3 psf	
Joists	3 psf	*
Beams	2 psf	
MEP/Sprinklers	5 psf	*
Miscellaneous	7 psf	*
Total =	25 psf	20 psf SDL*

Mechanical Area (as req'd)

Mechanical Equipment	40 psf
6" concrete	75 psf
Roof DL	25 psf
Total =	140 psf 135 psf SDL

Snow Load

Uniform roof snow	65 psf (plus drift)
Ground snow	90 psf

Design Loads - Lateral

Wind Loads

Occupancy Category	III
Wind Speed	120 mph (ASCE 7-10)
Exposure	C

Seismic Loads

$I_E = 1.25$
Seismic Design Category B
Site Class D
$T_L = 4 \text{ sec}$
$S_S = 0.27$
$S_1 = 0.074$
$S_{MS} = 0.428$
$S_{M1} = 0.178$
$S_{DS} = 0.285$
$S_{D1} = 0.119$

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Schools				Job Ref.	
	Section Middle School – Snow Drift				Sheet no./rev. 1	
	Calc. by VSW	Date 3/10/2020	Chk'd by	Date	App'd by	Date

SNOW DRIFT - MIDDLE SCHOOL

SNOW LOADING

In accordance with ASCE7-10

Tedds calculation version 1.0.09

Building details

Roof type Flat
Width of roof b = **60.00** ft

Ground snow load

Ground snow load (Figure 7-1) $p_g = \mathbf{90.00}$ lb/ft²
Density of snow $\gamma = \min(0.13 \times p_g / 1\text{ft} + 14\text{lb/ft}^3, 30\text{lb/ft}^3) = \mathbf{25.70}$ lb/ft³
Terrain type Sect. 26.7 C
Exposure condition (Table 7-2) Fully exposed
Exposure factor (Table 7-2) $C_e = \mathbf{0.90}$
Thermal condition (Table 7-3) Structures kept just above freezing
Thermal factor (Table 7-3) $C_t = \mathbf{1.10}$
Importance category (Table 1.5-1) III
Importance factor (Table 1.5-2) $I_s = \mathbf{1.10}$
Min snow load for low slope roofs (Sect 7.3.4) $p_{f_min} = I_s \times 20 \text{ lb/ft}^2 = \mathbf{22.00}$ lb/ft²
Flat roof snow load (Sect 7.3) $p_f = 0.7 \times C_e \times C_t \times I_s \times p_g = \mathbf{68.61}$ lb/ft²

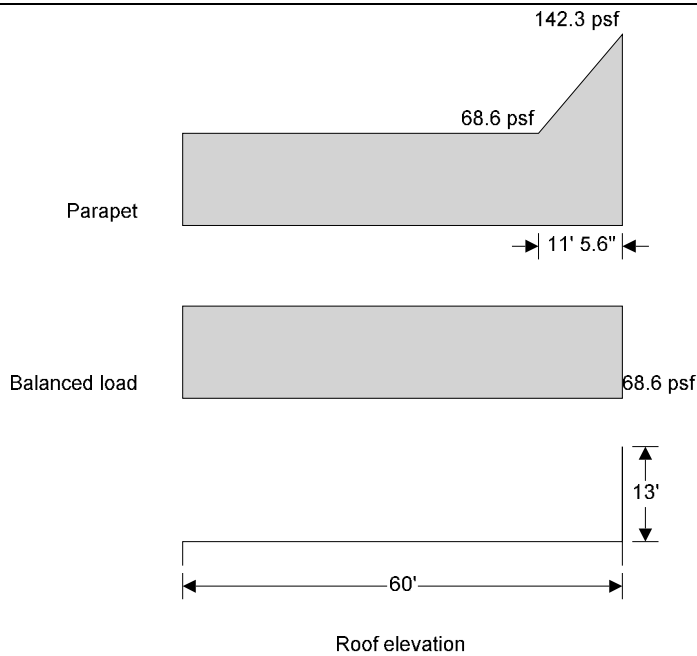
Right parapet

Balanced snow load height $h_b = p_f / \gamma = \mathbf{2.67}$ ft
Height of right parapet $h_{pptR} = \mathbf{13.00}$ ft
Height from balance load to top of right parapet $h_{c_pptR} = h_{pptR} - h_b = \mathbf{10.33}$ ft
Length of roof - right parapet $l_{u_pptR} = b = \mathbf{60.00}$ ft
Drift height windward drift - right parapet $h_{d_pptR} = 0.75 \times (0.43 \times (\max(20 \text{ ft}, l_{u_pptR}) \times 1\text{ft}^2)^{1/3} \times (p_g / 1\text{lb/ft}^2 + 10)^{1/4} - 1.5\text{ft}) = \mathbf{2.87}$ ft
Drift height - right parapet $h_{d_pptR} = \min(h_{d_pptR}, h_{pptR} - h_b) = \mathbf{2.87}$ ft
Drift width $W_{d_pptR} = \min(4 \times h_{d_pptR}, 8 \times (h_{pptR} - h_b), b) = \mathbf{11.47}$ ft
Drift surcharge load - right parapet $p_{d_pptR} = h_{d_pptR} \times \gamma = \mathbf{73.70}$ lb/ft²



Jirsa Hedrick Structural Engineers
8490 E Crescent Pkwy Suite 250
Greenwood Village, CO 80111

Project				Job Ref.	
Steamboat Schools					
Section				Sheet no./rev.	
Middle School – Snow Drift				2	
Calc. by	Date	Chk'd by	Date	App'd by	Date
VSW	3/10/2020				



WIND LOADS - MWFRS

115 MPH

EXPOSURE C

HEIGHT = 15' + 2' PARAPET

LENGTH = 70', WIDTH = 51'

$$q = .00256(0.85)(1)(0.85)(115^2) \\ = 25 \text{ psf}$$

$$P = qG C_p - q_i(G C_{pi})$$

$$G = 0.85$$

$$C_p = 0.8 \text{ (WINDWARD)} \\ - 0.37 \text{ (LEEWARD)}$$

$$G C_{pi} = + 0.18$$

$$P = 25 \text{ psf} (.85 \times 0.8) + 25 \text{ psf} (0.18) = 21.5 \text{ psf} \\ 25 \text{ psf} (.85 \times .37) - 25 \text{ psf} (0.18) = 12.4 \text{ psf}$$

$$34 \text{ psf} = 20 \text{ psf ASD}$$

$$20 \text{ psf} (15')/2 = 150 \text{ plf (ROOF)} \\ 20 \text{ psf} (2.5')(2) = 100 \text{ plf (PARAPET)}$$

$$V = 250 \text{ plf}$$

Search Information

Address:39610 Amethyst Dr, Steamboat Springs, CO 80487, USA

Coordinates:40.49504410000001, -106.8186289

Elevation:6851 ft

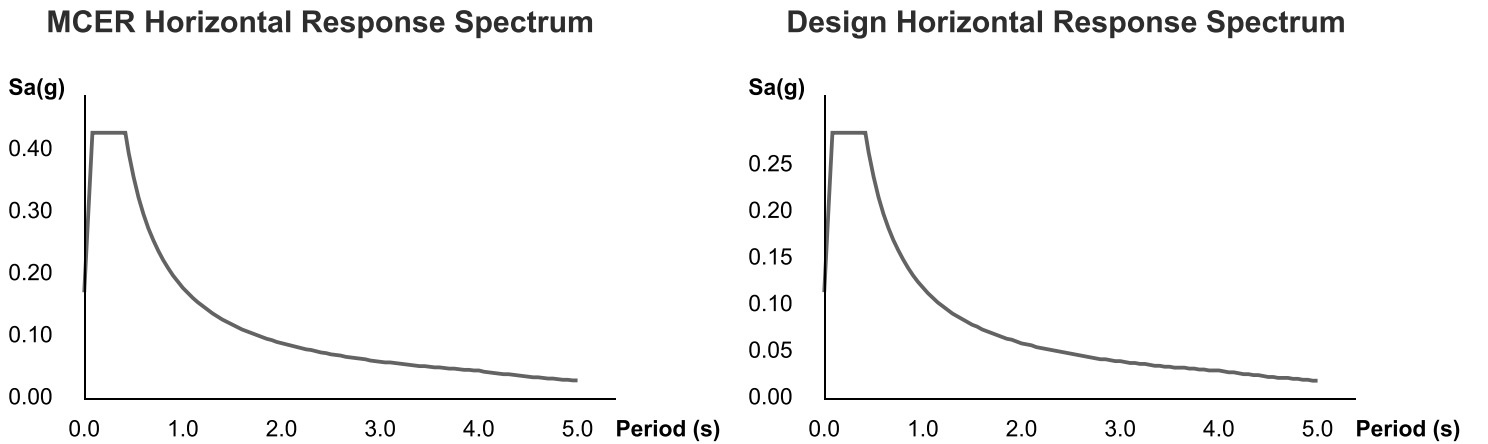
Timestamp:2020-03-04T21:36:38.338Z

Hazard Type:Seismic

Reference Document:ASCE7-10

Risk Category:II

Site Class:D



Basic Parameters

Name	Value	Description
S _S	0.27	MCE _R ground motion (period=0.2s)
S ₁	0.074	MCE _R ground motion (period=1.0s)
S _{MS}	0.428	Site-modified spectral acceleration value
S _{M1}	0.178	Site-modified spectral acceleration value
S _{DS}	0.285	Numeric seismic design value at 0.2s SA
S _{D1}	0.119	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	B	Seismic design category
F _a	1.584	Site amplification factor at 0.2s
F _v	2.4	Site amplification factor at 1.0s

CR_S	0.901	Coefficient of risk (0.2s)
CR_1	0.9	Coefficient of risk (1.0s)
PGA	0.15	MCE_G peak ground acceleration
F_{PGA}	1.499	Site amplification factor at PGA
PGA_M	0.225	Site modified peak ground acceleration
T_L	4	Long-period transition period (s)
SsRT	0.27	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.3	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.074	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.083	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](#).

While the information presented on this website is believed to be correct, ATC and its sponsors and contributors assume no responsibility or liability for its accuracy. The material presented in the report should not be used or relied upon for any specific application without competent examination and verification of its accuracy, suitability and applicability by engineers or other licensed professionals. ATC does not intend that the use of this information replace the sound judgment of such competent professionals, having experience and knowledge in the field of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the results of the report provided by this website. Users of the information from this website assume all liability arising from such use. Use of the output of this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the report.

Gravity Framing



RAM Structural System



RAM Steel 17.00.01.09

DataBase: Middle School - North End Addition

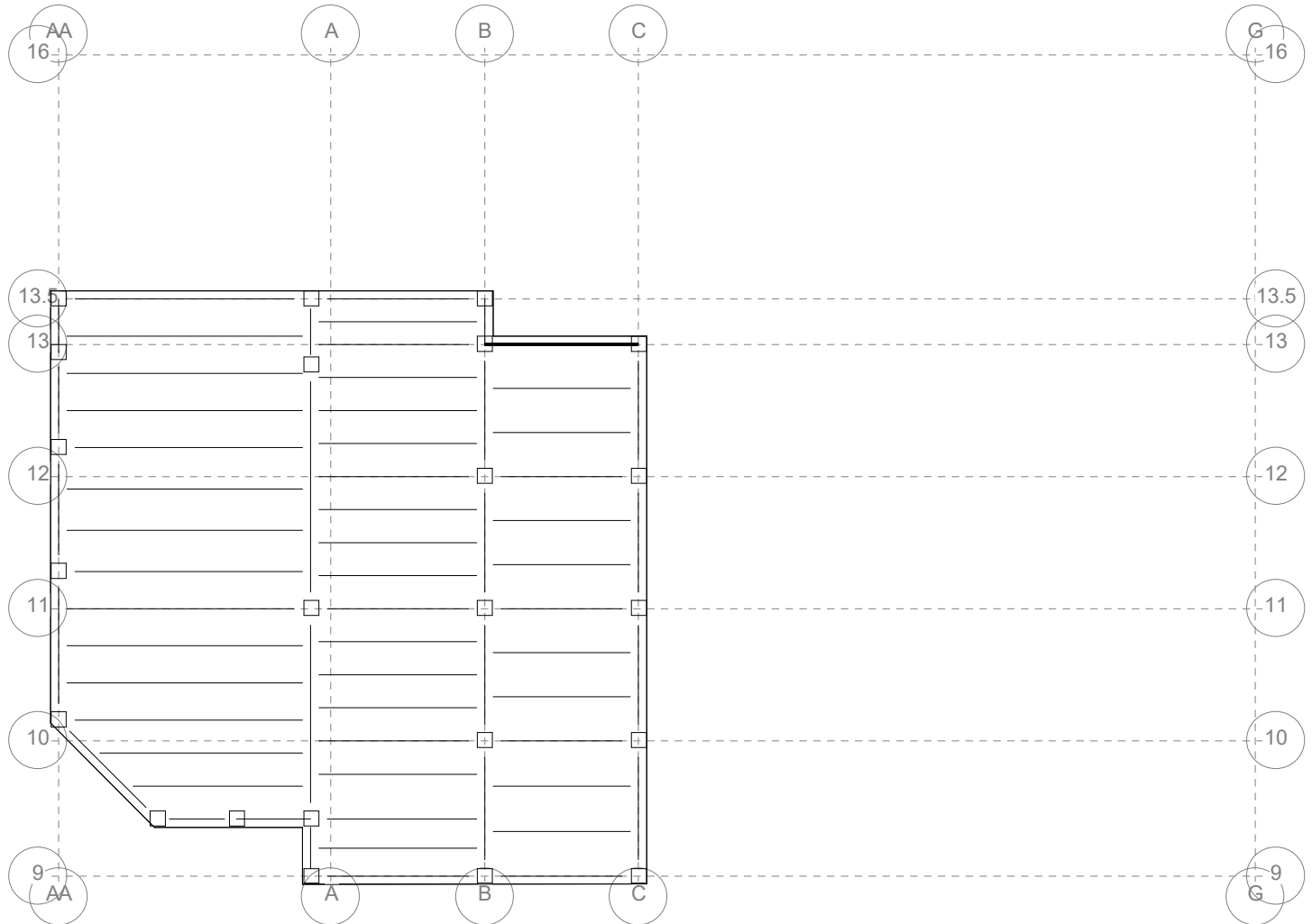
Building Code: IBC

Floor Map

03/26/20 11:32:20

Steel Code: AISC 360-16 LRFD

Floor Type: Roof





RAM Structural System



RAM Steel 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Floor Map

Page 2/2

03/26/20 11:32:20

Steel Code: AISC 360-16 LRFD

Surface Loads

	Label	DL psf	CDL psf	LL psf	Reduction Type	PLL psf	CLL psf	Mass DL psf
	Dead	20.0	0.0	0.0	Reducible	0.0	0.0	20.0



RAM Structural System



RAM Steel 17.00.01.09

DataBase: Middle School - North End Addition

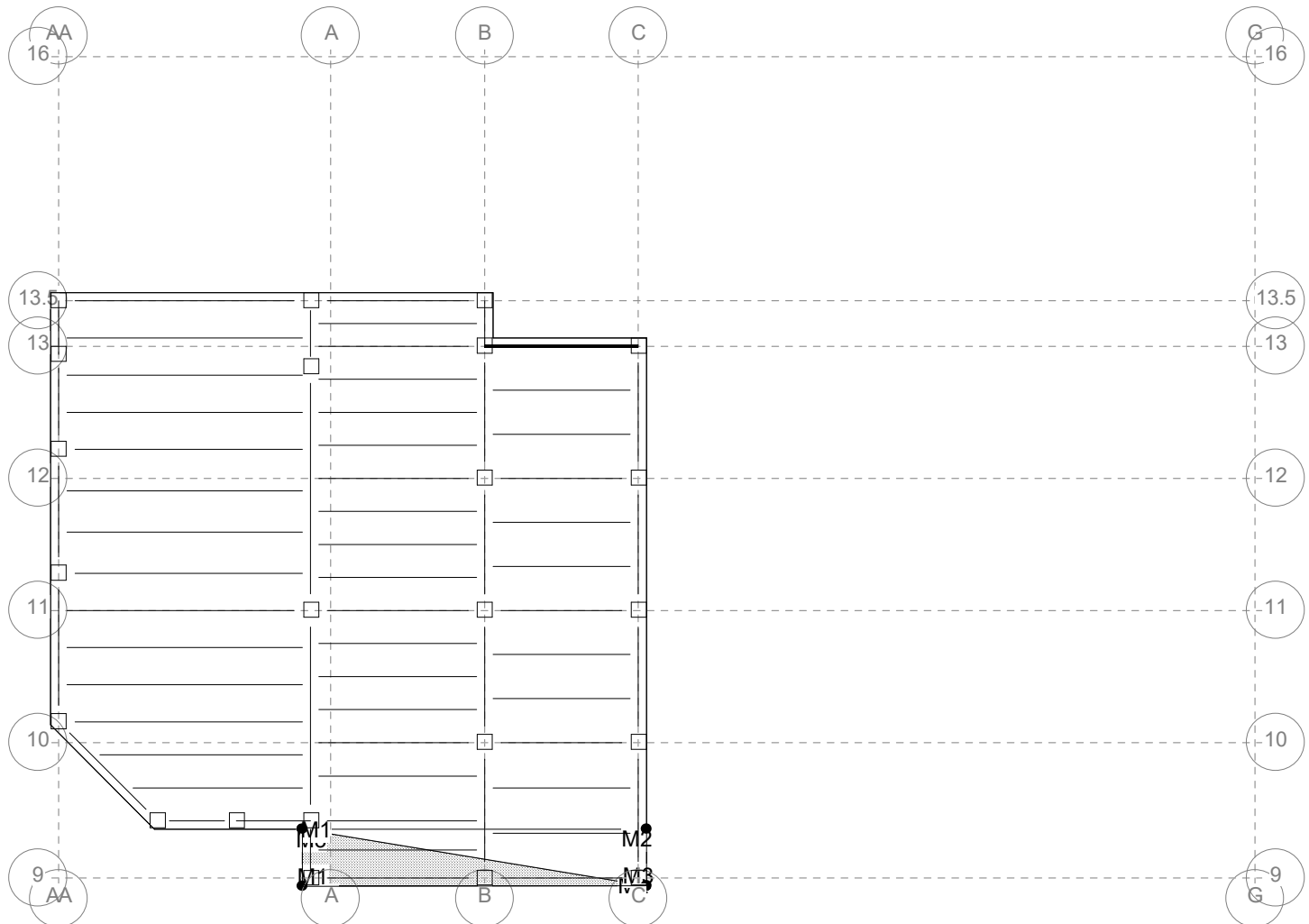
Building Code: IBC

Floor Map

03/26/20 11:32:20

Steel Code: AISC 360-16 LRFD

Floor Type: Roof





RAM Structural System



RAM Steel 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Floor Map

Page 2/2

03/26/20 11:32:20

Steel Code: AISC 360-16 LRFD

Snow Loads

	Label	Type	Magnitude	Magnitude	Magnitude
			1	2	3
			psf	psf	psf
	Roof Snow	Constant	72.000	---	---
	Snow Drift	Drift	142.000	142.000	68.000
	Snow Drift 2	Drift	68.000	68.000	142.000



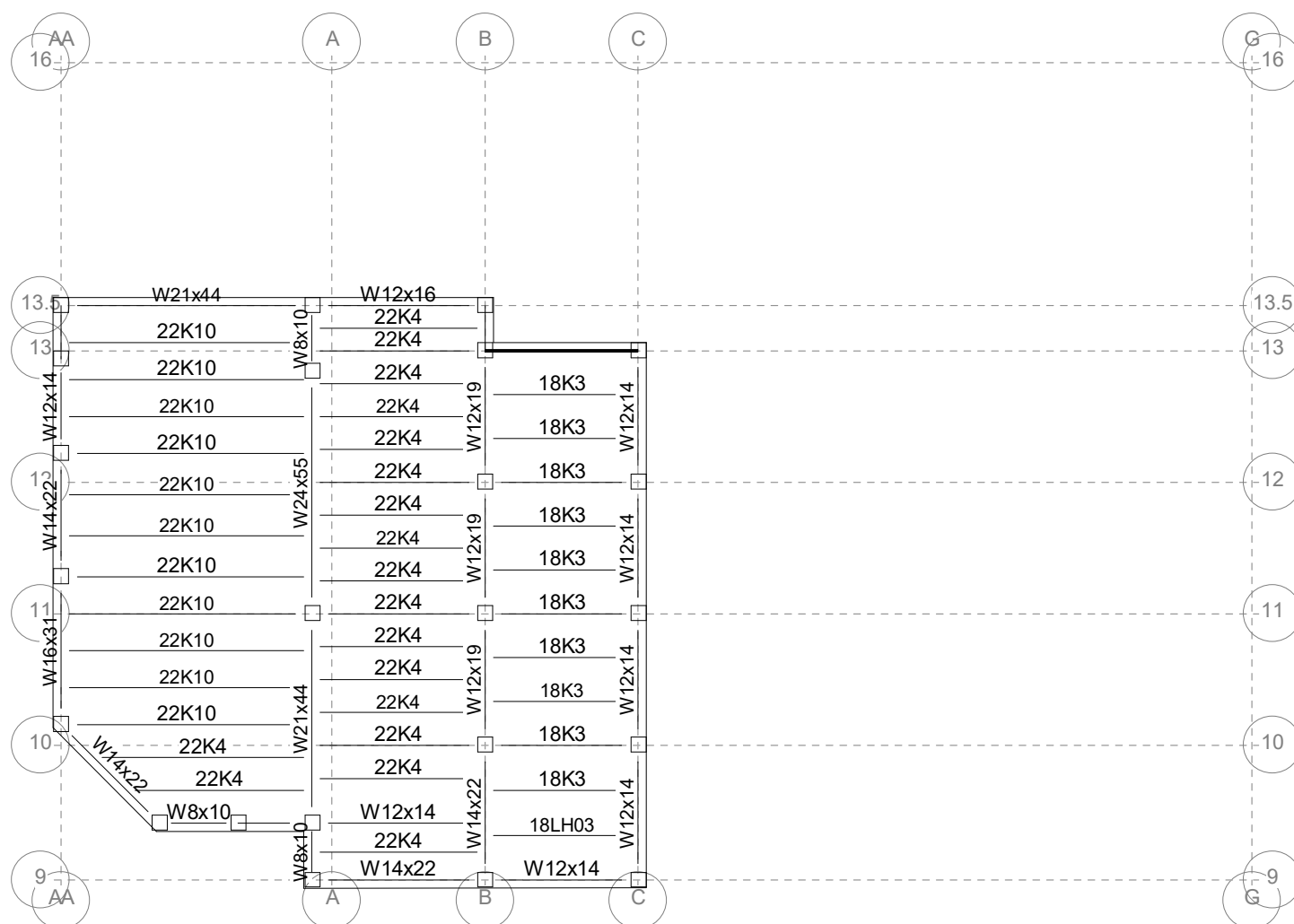
DataBase: Middle School - North End Addition

Building Code: IBC

03/26/20 11:32:20

Steel Code: AISC 360-16 LRFD

Beam Designs





RAM Structural System



Gravity Beam Design

RAM Steel 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

03/26/20 11:32:20

Steel Code: AISC 360-16 LRFD

Floor Type: Roof**Beam Number = 8****SPAN INFORMATION (ft): I-End (-2.42,32.50) J-End (-2.42,62.00)**Beam Size (Optimum) = W24X55 Fy = 50.0 ksi

Total Beam Length (ft) = 29.50

Mp (kip-ft) = 558.33

POINT LOADS (kips):

Dist	DL	RedLL	Red%	NonRLL	StorLL	Red%	RoofLL	Red%	PartL
4.000	0.97	0.00	0.0	0.00	0.00	0.0	3.04	Snow	0.00
4.500	1.67	0.00	0.0	0.00	0.00	0.0	5.23	Snow	0.00
8.000	0.97	0.00	0.0	0.00	0.00	0.0	3.04	Snow	0.00
9.500	1.76	0.00	0.0	0.00	0.00	0.0	5.50	Snow	0.00
12.000	0.97	0.00	0.0	0.00	0.00	0.0	3.04	Snow	0.00
14.500	1.76	0.00	0.0	0.00	0.00	0.0	5.50	Snow	0.00
16.000	0.97	0.00	0.0	0.00	0.00	0.0	3.04	Snow	0.00
19.500	1.67	0.00	0.0	0.00	0.00	0.0	5.23	Snow	0.00
20.000	0.97	0.00	0.0	0.00	0.00	0.0	3.04	Snow	0.00
24.000	0.97	0.00	0.0	0.00	0.00	0.0	3.04	Snow	0.00
24.000	1.58	0.00	0.0	0.00	0.00	0.0	4.95	Snow	0.00
28.000	0.97	0.00	0.0	0.00	0.00	0.0	3.04	Snow	0.00
28.500	1.58	0.00	0.0	0.00	0.00	0.0	4.95	Snow	0.00

LINE LOADS (k/ft):

Load	Dist	DL	LL	Red%	Type	PartL
1	0.000	0.055	0.000	---	NonR	0.000
	29.500	0.055	0.000			0.000

SHEAR (Ultimate): Max Vu (1.2DL+1.6LL) = 58.65 kips 0.90Vn = 251.69 kips**MOMENTS (Ultimate):**

Span	Cond	LoadCombo	Mu kip-ft	@ ft	Lb ft	Cb	Phi	Phi*Mn kip-ft
Center	Max +	1.2DL+1.6LL	408.8	14.5	2.5	1.02	0.90	502.50
Controlling		1.2DL+1.6LL	408.8	14.5	2.5	1.02	0.90	502.50

REACTIONS (kips):

	Left	Right
DL reaction	8.34	10.10
Max +LL reaction	23.55	29.08
Max +total reaction (factored)	47.69	58.65

DEFLECTIONS:

				Ratio
Dead load (in)	at 14.75 ft =	-0.280	L/D = 1263	
Live load (in)	at 14.75 ft =	-0.802	L/D = 441 > 360	0.82
Net Total load (in)	at 14.75 ft =	-1.083	L/D = 327	



RAM Structural System



RAM Steel 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Gravity Beam Design

03/26/20 11:32:20

Steel Code: AISC 360-16 LRFD

Floor Type: Roof**Beam Number = 12****SPAN INFORMATION (ft): I-End (-33.00,19.00) J-End (-33.00,37.00)**

Beam Size (Optimum) = W16X31 Fy = 50.0 ksi

Total Beam Length (ft) = 18.00

Mp (kip-ft) = 225.00

POINT LOADS (kips):

Dist	DL	RedLL	Red%	NonRLL	StorLL	Red%	RoofLL	Red%	PartL
4.500	1.58	0.00	0.0	0.00	0.00	0.0	4.95	Snow	0.00
9.000	1.58	0.00	0.0	0.00	0.00	0.0	4.95	Snow	0.00
13.500	1.58	0.00	0.0	0.00	0.00	0.0	4.95	Snow	0.00

LINE LOADS (k/ft):

Load	Dist	DL	LL	Red%	Type	PartL
1	0.000	0.003	0.000	---	NonR	0.000
	18.000	0.003	0.000			0.000
2	0.000	0.020	0.000	0.0%	Red	0.000
	18.000	0.020	0.000			0.000
3	0.000	0.000	0.073	---	Snow	0.000
	18.000	0.000	0.073			0.000
4	0.000	0.031	0.000	---	NonR	0.000
	18.000	0.031	0.000			0.000

SHEAR (Ultimate): Max Vu (1.2DL+1.6LL) = 16.37 kips 1.00Vn = 131.18 kips**MOMENTS (Ultimate):**

Span	Cond	LoadCombo	Mu kip-ft	@ ft	Lb ft	Cb	Phi	Phi*Mn kip-ft
Center	Max +	1.2DL+1.6LL	95.8	9.0	4.5	1.11	0.90	202.50
Controlling		1.2DL+1.6LL	95.8	9.0	4.5	1.11	0.90	202.50

REACTIONS (kips):

	Left	Right
DL reaction	2.86	2.86
Max +LL reaction	8.08	8.08
Max +total reaction (factored)	16.37	16.37

DEFLECTIONS:

				Ratio
Dead load (in)	at 9.00 ft =	-0.084	L/D = 2561	
Live load (in)	at 9.00 ft =	-0.243	L/D = 889	
Net Total load (in)	at 9.00 ft =	-0.327 < -0.375	L/D = 660	0.87



RAM Structural System



Gravity Column Design Summary

RAM Steel 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

04/06/20 11:18:23

Steel Code: AISC360-16 LRFD

Column Line -33.00ft-19.00ft

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	30.8	6.4	5.5	8	0.59 Eq H1-1a	90.0	46	HSS5X5X5/16

Column Line -33.00ft-37.00ft

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	29.6	-5.8	4.3	12	0.53 Eq H1-1a	90.0	46	HSS5X5X5/16

Column Line -33.00ft-52.00ft

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	24.6	-3.9	3.9	12	0.75 Eq H1-1a	90.0	46	HSS4X4X5/16

Column Line -21.00ft-7.00ft

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	9.4	1.6	-1.5	10	0.23 Eq H1-1b	90.0	46	HSS4X4X5/16

Column Line -2.42ft--0.00ft

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	11.2	1.5	2.6	1	0.30 Eq H1-1b	90.0	46	HSS4X4X5/16

Column Line -2.42ft-32.50ft

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	67.3	16.5	-3.6	17	0.79 Eq H1-1a	90.0	46	HSS5X5X1/2

Column Line -2.42ft-62.00ft

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	61.2	-23.6	0.0	12	0.83 Eq H1-1a	90.0	46	HSS5X5X1/2

Column Line -2.42ft-70.00ft

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	17.8	-3.6	-2.9	10	0.28 Eq H1-1b	90.0	46	HSS5X5X5/16

Column Line B-9

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	28.1	8.0	2.8	6	0.84 Eq H1-1a	90.0	46	HSS5X5X3/16

Column Line B-10

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	29.5	-5.9	2.5	15	0.49 Eq H1-1a	90.0	46	HSS5X5X5/16

Column Line B-11

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
-------	----	-----	-----	----	-----------------	-------	----	------



RAM Structural System



Gravity Column Design Summary

RAM Steel 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 2/2

04/06/20 11:18:23

Steel Code: AISC360-16 LRFD

Roof	28.1	6.0	2.7	14	0.89	Eq H1-1a	90.0	46	HSS6X6X1/8
------	------	-----	-----	----	------	----------	------	----	------------

Column Line B-12

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	28.1	6.0	2.7	14	0.89 Eq H1-1a	90.0	46	HSS6X6X1/8

Column Line C-9

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	17.3	3.9	-3.2	1	0.83 Eq H1-1a	90.0	50	HSS5X5X1/8

Column Line C-10

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	18.0	-3.0	-3.0	12	0.76 Eq H1-1a	90.0	50	HSS5X5X1/8

Column Line C-11

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	17.4	2.8	-3.0	8	0.73 Eq H1-1a	90.0	50	HSS5X5X1/8

Column Line C-12

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	17.4	2.8	-3.0	8	0.73 Eq H1-1a	90.0	50	HSS5X5X1/8

Column Line C-13

Level	Pu	Mux	Muy	LC	Interaction Eq.	Angle	Fy	Size
Roof	8.5	-3.1	0.0	1	0.60 Eq H1-1a	90.0	50	HSS4X4X1/8



RAM Structural System



Base Plate Design Summary

RAM Steel 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

04/06/20 11:18:40

Steel Code: AISC360-16 LRFD

BASE PLATES:

Design Code: AISC360-16 LRFD

Plate Fy (ksi) _____ 36.000

Minimum Dimension From Face of Column to Edge of Plate (in) _____ 1.000

Minimum Dimension From Side of Column to Edge of Plate (in) _____ 1.000

Increment of Plate Dimensions (in) _____ 0.500

Increment of Plate Thickness (in) _____ 0.250

Minimum Footing Dimension Parallel to Web (ft) _____ 5.00

Minimum Footing Dimension Perpendicular to Web (ft) _____ 5.00

Keep Base Plate Square: _____ Y

Column Line	Column Size	Fy (ksi)	N (in)	B (in)	tp (in)
-33.00ft-19.00ft	HSS5X5X5/16	36	7.00	7.00	0.250
-33.00ft-37.00ft	HSS5X5X5/16	36	7.00	7.00	0.500
-33.00ft-52.00ft	HSS4X4X5/16	36	6.00	6.00	0.500
-21.00ft-7.00ft	HSS4X4X5/16	36	6.00	6.00	0.250
-2.42ft--0.00ft	HSS4X4X5/16	36	6.00	6.00	0.250
-2.42ft-32.50ft	HSS5X5X1/2	36	7.00	7.00	0.500
-2.42ft-62.00ft	HSS5X5X1/2	36	7.00	7.00	0.500
-2.42ft-70.00ft	HSS5X5X5/16	36	7.00	7.00	0.250
B-9	HSS5X5X3/16	36	7.00	7.00	0.250
B-10	HSS5X5X5/16	36	7.00	7.00	0.500
B-11	HSS6X6X1/8	36	8.00	8.00	0.250
B-12	HSS6X6X1/8	36	8.00	8.00	0.250
C-9	HSS5X5X1/8	36	7.00	7.00	0.250
C-10	HSS5X5X1/8	36	7.00	7.00	0.250
C-11	HSS5X5X1/8	36	7.00	7.00	0.250
C-12	HSS5X5X1/8	36	7.00	7.00	0.250
C-13	HSS4X4X1/8	36	6.00	6.00	0.250



Spread Footing Design Summary

RAM Foundation v17.00.01.09
 DataBase: Middle School - North End Addition
 Building Code: IBC

Date: 04/06/20 11:27:28
 Design Code: ACI318-14

Grid	Orientation Col/Foot	Dimensions (ft)		f'c/fy ksi	Bottom Reinforcement		Top Reinforcement	
		Length	Width		Parallel to Length	Parallel to Width	Parallel to Length	Parallel to Width
(-33.00 - 19.00)	90.00/90.00	4.00	4.00	4.00/60.00	5-#5	5-#5	None	None
(-33.00 - 37.00)	90.00/90.00	4.00	4.00	4.00/60.00	5-#5	5-#5	None	None
(-33.00 - 52.00)	90.00/90.00	4.00	4.00	4.00/60.00	5-#5	5-#5	None	None
(-21.00 - 7.00)	90.00/90.00	4.00	4.00	4.00/60.00	5-#5	5-#5	None	None
(-2.42 - -0.00)	90.00/90.00	4.00	4.00	4.00/60.00	5-#5	5-#5	None	None
(-2.42 - 32.50)	90.00/90.00	6.00	6.00	4.00/60.00	6-#5	6-#5	None	None
(-2.42 - 62.00)	90.00/90.00	6.00	6.00	4.00/60.00	6-#5	6-#5	None	None
(-2.42 - 70.00)	90.00/90.00	4.00	4.00	4.00/60.00	5-#5	5-#5	None	None
(B - 9)	90.00/90.00	4.00	4.00	4.00/60.00	5-#5	5-#5	None	None
(B - 10)	90.00/90.00	4.00	4.00	4.00/60.00	5-#5	5-#5	None	None
(B - 11)	90.00/90.00	4.00	4.00	4.00/60.00	5-#5	5-#5	None	None
(B - 12)	90.00/90.00	4.00	4.00	4.00/60.00	5-#5	5-#5	None	None

Note: Number between () in reinforcement is quantity of bars in center strip of rectangular footing



Jirsa Hedrick Structural Engineers
8490 E Crescent Pkwy Suite 250
Greenwood Village, CO 80111

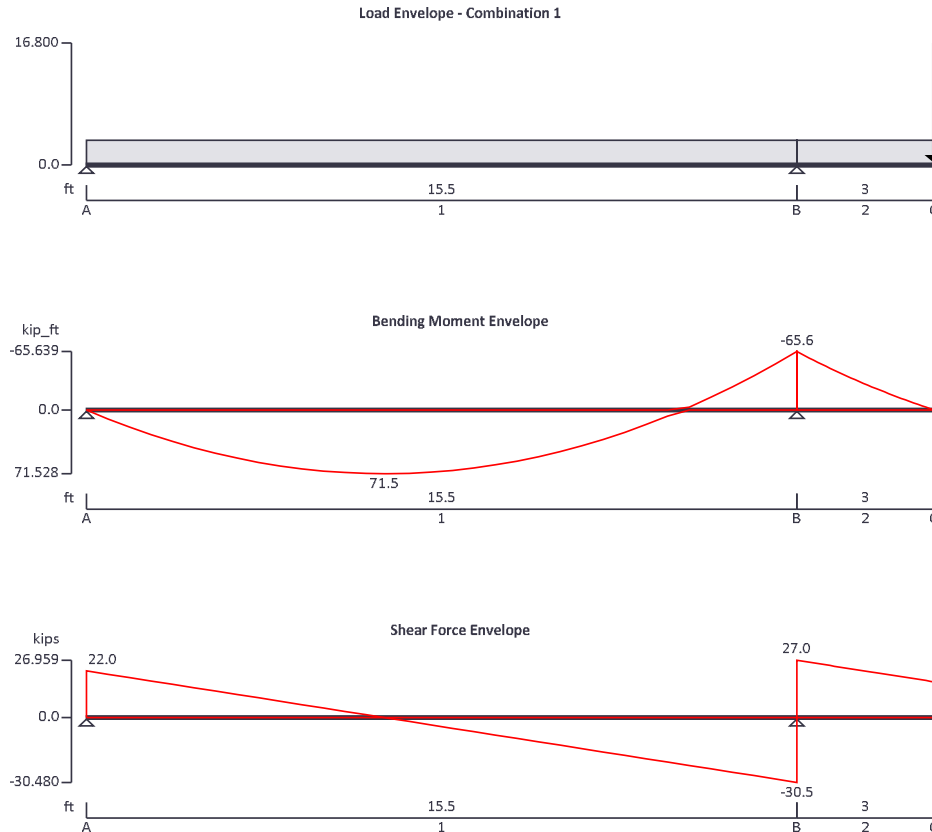
Project Steamboat Schools				Job Ref. 20191103	
Section Strawberry Park Existing Framing				Sheet no./rev. 1	
Calc. by VSW	Date 3/26/2020	Chk'd by	Date	App'd by	Date

STEEL BEAM - GRID 9-10

STEEL BEAM ANALYSIS & DESIGN (AISC360-10)

In accordance with AISC360-10 using the LRFD method

Tedds calculation version 3.0.14



Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free
Support C	Vertically free
	Rotationally free

Applied loading

Beam loads	Dead self weight of beam $\times$ 1
	DL - Dead full UDL 0.4 kips/ft
	SL - Snow full UDL 1.8 kips/ft
	Pd - Dead point load 2 kips at 222.00 in
	Ps - Snow point load 9 kips at 222.00 in

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project				Job Ref.	
	Steamboat Schools				20191103	
	Section				Sheet no./rev.	
	Strawberry Park Existing Framing				2	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	VSW	3/26/2020				

Load combinations

Load combination 1

Support A

Dead $\times$ 1.20
Live $\times$ 1.60
Roof live $\times$ 1.60
Snow $\times$ 1.60
Dead $\times$ 1.20
Live $\times$ 1.60
Roof live $\times$ 1.60
Snow $\times$ 1.60

Support B

Dead $\times$ 1.20
Live $\times$ 1.60
Roof live $\times$ 1.60
Snow $\times$ 1.60
Dead $\times$ 1.20
Live $\times$ 1.60
Roof live $\times$ 1.60
Snow $\times$ 1.60

Support C

Dead $\times$ 1.20
Live $\times$ 1.60
Roof live $\times$ 1.60
Snow $\times$ 1.60

Analysis results

Maximum moment

$M_{max} = 71.5$ kips_{ft}

$M_{min} = -65.6$ kips_{ft}

Maximum moment span 1

$M_{s1_max} = 71.5$ kips_{ft}

$M_{s1_min} = -65.6$ kips_{ft}

Maximum moment span 2

$M_{s2_max} = 0$ kips_{ft}

$M_{s2_min} = -65.6$ kips_{ft}

Maximum shear

$V_{max} = 27$ kips

$V_{min} = -30.5$ kips

Maximum shear span 1

$V_{s1_max} = 22$ kips

$V_{s1_min} = -30.5$ kips

Maximum shear span 2

$V_{s2_max} = 27$ kips

$V_{s2_min} = 16.8$ kips

Deflection

$\delta_{max} = 0.4$ in

$\delta_{min} = 0.1$ in

Deflection span 1

$\delta_{s1_max} = 0.4$ in

$\delta_{s1_min} = 0$ in

Deflection span 2

$\delta_{s2_max} = 0$ in

$\delta_{s2_min} = 0.1$ in

Maximum reaction at support A

$R_{A_max} = 22$ kips

$R_{A_min} = 22$ kips

Unfactored dead load reaction at support A

$R_{A_Dead} = 2.8$ kips

Unfactored snow load reaction at support A

$R_{A_Snow} = 11.7$ kips

Maximum reaction at support B

$R_{B_max} = 57.4$ kips

$R_{B_min} = 57.4$ kips

Unfactored dead load reaction at support B

$R_{B_Dead} = 7$ kips

Unfactored snow load reaction at support B

$R_{B_Snow} = 30.6$ kips

Maximum reaction at support C

$R_{C_max} = 0$ kips

$R_{C_min} = 0$ kips

Section details

Section type

W 12x22 (AISC 15th Edn (v15.0))

ASTM steel designation

A992

Steel yield stress

$F_y = 50$ ksi

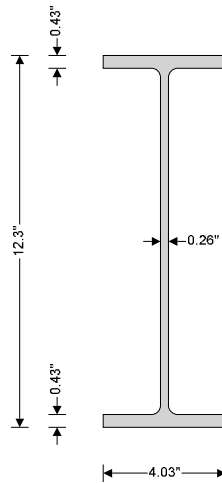
Steel tensile stress

$F_u = 65$ ksi

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project				Job Ref.	
	Steamboat Schools				20191103	
	Section				Sheet no./rev.	
	Strawberry Park Existing Framing				3	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	VSW	3/26/2020				

Modulus of elasticity

E = 29000 ksi



Resistance factors

Resistance factor for tensile yielding

$\phi_{ty} = 0.90$

Resistance factor for tensile rupture

$\phi_{tr} = 0.75$

Resistance factor for compression

$\phi_c = 0.90$

Resistance factor for flexure

$\phi_b = 0.90$

Lateral bracing

Span 1 has continuous lateral bracing

Span 2 has continuous lateral bracing

Cantilever tip is unbraced

Cantilever support is continuous with lateral and torsional restraint

Classification of sections for local buckling - Section B4.1

Classification of flanges in flexure - Table B4.1b (case 10)

Width to thickness ratio

$b_f / (2 \times t_f) = 4.74$

Limiting ratio for compact section

$\lambda_{pff} = 0.38 \times \sqrt{E / F_y} = 9.15$

Limiting ratio for non-compact section

$\lambda_{rff} = 1.0 \times \sqrt{E / F_y} = 24.08$ Compact

Classification of web in flexure - Table B4.1b (case 15)

Width to thickness ratio

$(d - 2 \times k) / t_w = 41.73$

Limiting ratio for compact section

$\lambda_{pwf} = 3.76 \times \sqrt{E / F_y} = 90.55$

Limiting ratio for non-compact section

$\lambda_{rwf} = 5.70 \times \sqrt{E / F_y} = 137.27$ Compact

Section is compact in flexure

Design of members for shear - Chapter G

Required shear strength

$V_r = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 30.480$ kips

Web area

$A_w = d \times t_w = 3.198$ in²

Web plate buckling coefficient

$k_v = 5$

Web shear coefficient - eq G2-3

$C_v = 1$

Nominal shear strength – eq G2-1

$V_n = 0.6 \times F_y \times A_w \times C_v = 95.940$ kips

Resistance factor for shear

$\phi_v = 1.00$

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project				Job Ref.	
	Steamboat Schools				20191103	
	Section				Sheet no./rev.	
	Strawberry Park Existing Framing				4	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	VSW	3/26/2020				

Design shear strength

$$V_c = \phi_v \times V_n = \mathbf{95.940 \text{ kips}}$$

PASS - Design shear strength exceeds required shear strength

Design of members for flexure in the major axis at span 1 - Chapter F

Required flexural strength

$$M_r = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = \mathbf{71.528 \text{ kips_ft}}$$

Yielding - Section F2.1

Nominal flexural strength for yielding - eq F2-1

$$M_{nyld} = M_p = F_y \times Z_x = \mathbf{122.083 \text{ kips_ft}}$$

Nominal flexural strength

$$M_n = M_{nyld} = \mathbf{122.083 \text{ kips_ft}}$$

Design flexural strength

$$M_c = \phi_b \times M_n = \mathbf{109.875 \text{ kips_ft}}$$

PASS - Design flexural strength exceeds required flexural strength

Design of members for vertical deflection

Consider deflection due to dead, live, roof live and snow loads

Limiting deflection

$$\delta_{lim} = L_{s1} / 240 = \mathbf{0.775 \text{ in}}$$

Maximum deflection span 1

$$\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) = \mathbf{0.394 \text{ in}}$$

PASS - Maximum deflection does not exceed deflection limit



Jirsa Hedrick Structural Engineers
8490 E Crescent Pkwy Suite 250
Greenwood Village, CO 80111

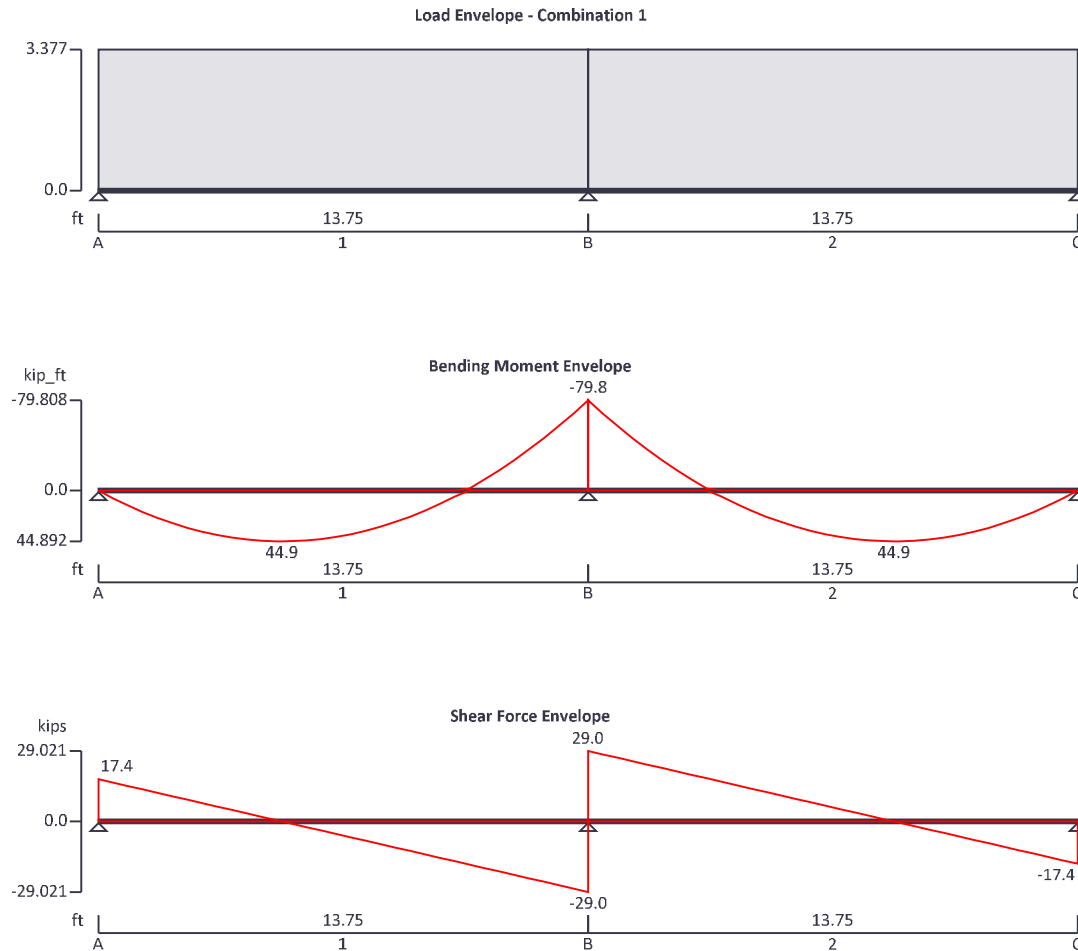
Project				Job Ref.	
Steamboat Schools				20191103	
Section				Sheet no./rev.	
Strawberry Park Existing Framing				5	
Calc. by	Date	Chk'd by	Date	App'd by	Date
VSW	3/26/2020				

STEEL BEAM - GRID 10-12

STEEL BEAM ANALYSIS & DESIGN (AISC360-10)

In accordance with AISC360-10 using the LRFD method

Tedds calculation version 3.0.14



Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free
Support C	Vertically restrained
	Rotationally free

Applied loading

Beam loads	Dead self weight of beam $\times$ 1
	DL - Dead full UDL 0.4 kips/ft

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project				Job Ref.	
	Steamboat Schools				20191103	
	Section				Sheet no./rev.	
	Strawberry Park Existing Framing				6	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	VSW	3/26/2020				

SL - Snow full UDL 1.8 kips/ft

Load combinations

Load combination 1

Support A

Dead × 1.20
Live × 1.60
Roof live × 1.60
Snow × 1.60
Dead × 1.20
Live × 1.60
Roof live × 1.60
Snow × 1.60

Support B

Dead × 1.20
Live × 1.60
Roof live × 1.60
Snow × 1.60
Dead × 1.20
Live × 1.60
Roof live × 1.60
Snow × 1.60

Support C

Dead × 1.20
Live × 1.60
Roof live × 1.60
Snow × 1.60

Analysis results

Maximum moment

$M_{max} = 44.9$ kips_ft

$M_{min} = -79.8$ kips_ft

Maximum moment span 1

$M_{s1_max} = 44.9$ kips_ft

$M_{s1_min} = -79.8$ kips_ft

Maximum moment span 2

$M_{s2_max} = 44.9$ kips_ft

$M_{s2_min} = -79.8$ kips_ft

Maximum shear

$V_{max} = 29$ kips

$V_{min} = -29$ kips

Maximum shear span 1

$V_{s1_max} = 17.4$ kips

$V_{s1_min} = -29$ kips

Maximum shear span 2

$V_{s2_max} = 29$ kips

$V_{s2_min} = -17.4$ kips

Deflection

$\delta_{max} = 0.3$ in

$\delta_{min} = 0$ in

Deflection span 1

$\delta_{s1_max} = 0.3$ in

$\delta_{s1_min} = 0$ in

Deflection span 2

$\delta_{s2_max} = 0.3$ in

$\delta_{s2_min} = 0$ in

Maximum reaction at support A

$R_{A_max} = 17.4$ kips

$R_{A_min} = 17.4$ kips

Unfactored dead load reaction at support A

$R_{A_Dead} = 2.1$ kips

Unfactored snow load reaction at support A

$R_{A_Snow} = 9.3$ kips

Maximum reaction at support B

$R_{B_max} = 58$ kips

$R_{B_min} = 58$ kips

Unfactored dead load reaction at support B

$R_{B_Dead} = 7.1$ kips

Unfactored snow load reaction at support B

$R_{B_Snow} = 30.9$ kips

Maximum reaction at support C

$R_{C_max} = 17.4$ kips

$R_{C_min} = 17.4$ kips

Unfactored dead load reaction at support C

$R_{C_Dead} = 2.1$ kips

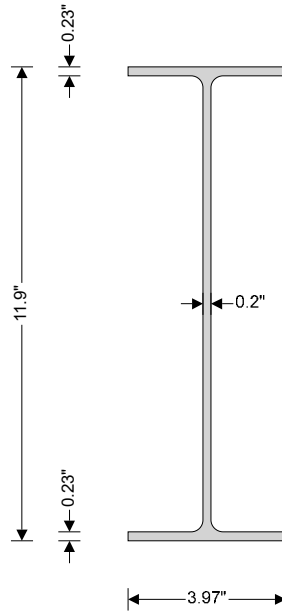
Unfactored snow load reaction at support C

$R_{C_Snow} = 9.3$ kips

Project				Job Ref.	
Steamboat Schools				20191103	
Section				Sheet no./rev.	
Strawberry Park Existing Framing				7	
Calc. by	Date	Chk'd by	Date	App'd by	Date
VSW	3/26/2020				

Section details

Section type	W 12x14 (AISC 15th Edn (v15.0))
ASTM steel designation	A992
Steel yield stress	$F_y = 50$ ksi
Steel tensile stress	$F_u = 65$ ksi
Modulus of elasticity	$E = 29000$ ksi



Resistance factors

Resistance factor for tensile yielding	$\phi_{ty} = 0.90$
Resistance factor for tensile rupture	$\phi_{tr} = 0.75$
Resistance factor for compression	$\phi_c = 0.90$
Resistance factor for flexure	$\phi_b = 0.90$

Lateral bracing

Span 1 has continuous lateral bracing
Span 2 has continuous lateral bracing

Classification of sections for local buckling - Section B4.1

Classification of flanges in flexure - Table B4.1b (case 10)

Width to thickness ratio	$b_f / (2 \times t_f) = 8.82$	
Limiting ratio for compact section	$\lambda_{pff} = 0.38 \times \sqrt{E / F_y} = 9.15$	
Limiting ratio for non-compact section	$\lambda_{rff} = 1.0 \times \sqrt{E / F_y} = 24.08$	Compact

Classification of web in flexure - Table B4.1b (case 15)

Width to thickness ratio	$(d - 2 \times k) / t_w = 54.25$	
Limiting ratio for compact section	$\lambda_{pwf} = 3.76 \times \sqrt{E / F_y} = 90.55$	
Limiting ratio for non-compact section	$\lambda_{rwf} = 5.70 \times \sqrt{E / F_y} = 137.27$	Compact

Section is compact in flexure

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Schools				Job Ref. 20191103	
	Section Strawberry Park Existing Framing				Sheet no./rev. 8	
	Calc. by VSW	Date 3/26/2020	Chk'd by	Date	App'd by	Date

Design of members for shear - Chapter G

Required shear strength	$V_r = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 29.021$ kips
Web area	$A_w = d \times t_w = 2.38$ in ²
Web plate buckling coefficient	$k_v = 5$
Web shear coefficient - eq G2-3	$C_v = 1$
Nominal shear strength – eq G2-1	$V_n = 0.6 \times F_y \times A_w \times C_v = 71.400$ kips
Resistance factor for shear	$\phi_v = 0.90$
Design shear strength	$V_c = \phi_v \times V_n = 64.260$ kips

PASS - Design shear strength exceeds required shear strength

Design of members for flexure in the major axis at span 1 - Chapter F

Required flexural strength	$M_r = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = 79.808$ kips_ft
----------------------------	---

Yielding - Section F2.1

Nominal flexural strength for yielding - eq F2-1	$M_{nyld} = M_p = F_y \times Z_x = 72.5$ kips_ft
Nominal flexural strength	$M_n = M_{nyld} = 72.500$ kips_ft
Design flexural strength	$M_o = \phi_b \times M_n = 65.250$ kips_ft

FAIL - Required flexural strength exceeds design flexural strength

Design of members for vertical deflection

Consider deflection due to dead, live, roof live and snow loads

Limiting deflection	$\delta_{lim} = L_{s1} / 240 = 0.688$ in
Maximum deflection span 1	$\delta = \max(\text{abs}(\delta_{\max}), \text{abs}(\delta_{\min})) = 0.288$ in

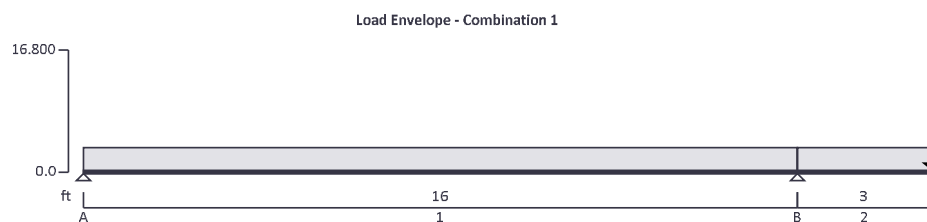
PASS - Maximum deflection does not exceed deflection limit

STEEL BEAM - GRID 12-13

STEEL BEAM ANALYSIS & DESIGN (AISC360-10)

In accordance with AISC360-10 using the LRFD method

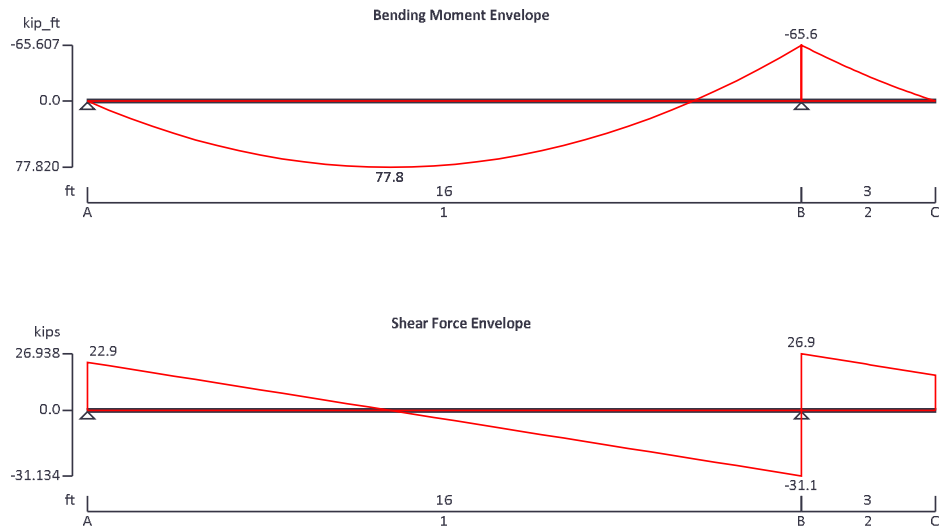
Tedds calculation version 3.0.14





Jirsa Hedrick Structural Engineers
8490 E Crescent Pkwy Suite 250
Greenwood Village, CO 80111

Project				Job Ref.	
Steamboat Schools				20191103	
Section				Sheet no./rev.	
Strawberry Park Existing Framing				9	
Calc. by	Date	Chk'd by	Date	App'd by	Date
VSW	3/26/2020				



Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free
Support C	Vertically free
	Rotationally free

Applied loading

Beam loads	Dead self weight of beam $\times 1$
	DL - Dead full UDL 0.4 kips/ft
	SL - Snow full UDL 1.8 kips/ft
	Pd - Dead point load 2 kips at 228.00 in
	Ps - Snow point load 9 kips at 228.00 in

Load combinations

Load combination 1	Support A	Dead $\times 1.20$
		Live $\times 1.60$
		Roof live $\times 1.60$
		Snow $\times 1.60$
		Dead $\times 1.20$
		Live $\times 1.60$
		Roof live $\times 1.60$
		Snow $\times 1.60$
	Support B	Dead $\times 1.20$
		Live $\times 1.60$
		Roof live $\times 1.60$
		Snow $\times 1.60$

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Schools				Job Ref. 20191103	
	Section Strawberry Park Existing Framing				Sheet no./rev. 10	
	Calc. by VSW	Date 3/26/2020	Chk'd by	Date	App'd by	Date

Support C

Dead × 1.20
Live × 1.60
Roof live × 1.60
Snow × 1.60
Dead × 1.20
Live × 1.60
Roof live × 1.60
Snow × 1.60

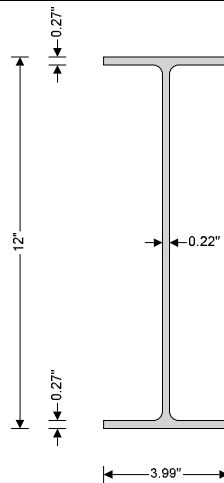
Analysis results

Maximum moment	$M_{max} = 77.8 \text{ kips_ft}$	$M_{min} = -65.6 \text{ kips_ft}$
Maximum moment span 1	$M_{s1_max} = 77.8 \text{ kips_ft}$	$M_{s1_min} = -65.6 \text{ kips_ft}$
Maximum moment span 2	$M_{s2_max} = 0 \text{ kips_ft}$	$M_{s2_min} = -65.6 \text{ kips_ft}$
Maximum shear	$V_{max} = 26.9 \text{ kips}$	$V_{min} = -31.1 \text{ kips}$
Maximum shear span 1	$V_{s1_max} = 22.9 \text{ kips}$	$V_{s1_min} = -31.1 \text{ kips}$
Maximum shear span 2	$V_{s2_max} = 26.9 \text{ kips}$	$V_{s2_min} = 16.8 \text{ kips}$
Deflection	$\delta_{max} = 0.7 \text{ in}$	$\delta_{min} = 0.2 \text{ in}$
Deflection span 1	$\delta_{s1_max} = 0.7 \text{ in}$	$\delta_{s1_min} = 0 \text{ in}$
Deflection span 2	$\delta_{s2_max} = 0 \text{ in}$	$\delta_{s2_min} = 0.2 \text{ in}$
Maximum reaction at support A	$R_{A_max} = 22.9 \text{ kips}$	$R_{A_min} = 22.9 \text{ kips}$
Unfactored dead load reaction at support A	$R_{A_Dead} = 2.8 \text{ kips}$	
Unfactored snow load reaction at support A	$R_{A_Snow} = 12.2 \text{ kips}$	
Maximum reaction at support B	$R_{B_max} = 58.1 \text{ kips}$	$R_{B_min} = 58.1 \text{ kips}$
Unfactored dead load reaction at support B	$R_{B_Dead} = 7.1 \text{ kips}$	
Unfactored snow load reaction at support B	$R_{B_Snow} = 31 \text{ kips}$	
Maximum reaction at support C	$R_{C_max} = 0 \text{ kips}$	$R_{C_min} = 0 \text{ kips}$

Section details

Section type	W 12x16 (AISC 15th Edn (v15.0))
ASTM steel designation	A992
Steel yield stress	$F_y = 50 \text{ ksi}$
Steel tensile stress	$F_u = 65 \text{ ksi}$
Modulus of elasticity	$E = 29000 \text{ ksi}$

Project Steamboat Schools				Job Ref. 20191103	
Section Strawberry Park Existing Framing				Sheet no./rev. 11	
Calc. by VSW	Date 3/26/2020	Chk'd by	Date	App'd by	Date



Resistance factors

Resistance factor for tensile yielding	$\phi_{ty} = 0.90$
Resistance factor for tensile rupture	$\phi_{tr} = 0.75$
Resistance factor for compression	$\phi_c = 0.90$
Resistance factor for flexure	$\phi_b = 0.90$

Lateral bracing

Span 1 has continuous lateral bracing
Span 2 has continuous lateral bracing
Cantilever tip is unbraced
Cantilever support is continuous with lateral and torsional restraint

Classification of sections for local buckling - Section B4.1

Classification of flanges in flexure - Table B4.1b (case 10)

Width to thickness ratio	$b_f / (2 \times t_f) = 7.53$	
Limiting ratio for compact section	$\lambda_{pff} = 0.38 \times \sqrt{E / F_y} = 9.15$	
Limiting ratio for non-compact section	$\lambda_{rff} = 1.0 \times \sqrt{E / F_y} = 24.08$	Compact

Classification of web in flexure - Table B4.1b (case 15)

Width to thickness ratio	$(d - 2 \times k) / t_w = 49.41$	
Limiting ratio for compact section	$\lambda_{pwf} = 3.76 \times \sqrt{E / F_y} = 90.55$	
Limiting ratio for non-compact section	$\lambda_{rwf} = 5.70 \times \sqrt{E / F_y} = 137.27$	Compact

Section is compact in flexure

Design of members for shear - Chapter G

Required shear strength	$V_r = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 31.134 \text{ kips}$
Web area	$A_w = d \times t_w = 2.64 \text{ in}^2$
Web plate buckling coefficient	$k_v = 5$
Web shear coefficient - eq G2-3	$C_v = 1$
Nominal shear strength – eq G2-1	$V_n = 0.6 \times F_y \times A_w \times C_v = 79.200 \text{ kips}$
Resistance factor for shear	$\phi_v = 1.00$
Design shear strength	$V_c = \phi_v \times V_n = 79.200 \text{ kips}$

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project				Job Ref.	
	Steamboat Schools				20191103	
	Section				Sheet no./rev.	
	Strawberry Park Existing Framing				12	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	VSW	3/26/2020				

PASS - Design shear strength exceeds required shear strength

Design of members for flexure in the major axis at span 1 - Chapter F

Required flexural strength $M_r = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = 77.82 \text{ kips_ft}$

Yielding - Section F2.1

Nominal flexural strength for yielding - eq F2-1 $M_{nyld} = M_p = F_y \times Z_x = 83.75 \text{ kips_ft}$

Nominal flexural strength $M_n = M_{nyld} = 83.750 \text{ kips_ft}$

Design flexural strength $M_c = \phi_b \times M_n = 75.375 \text{ kips_ft}$

FAIL - Required flexural strength exceeds design flexural strength

Design of members for vertical deflection

Consider deflection due to dead, live, roof live and snow loads

Limiting deflection $\delta_{lim} = L_{s1} / 240 = 0.8 \text{ in}$

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) = 0.701 \text{ in}$

PASS - Maximum deflection does not exceed deflection limit

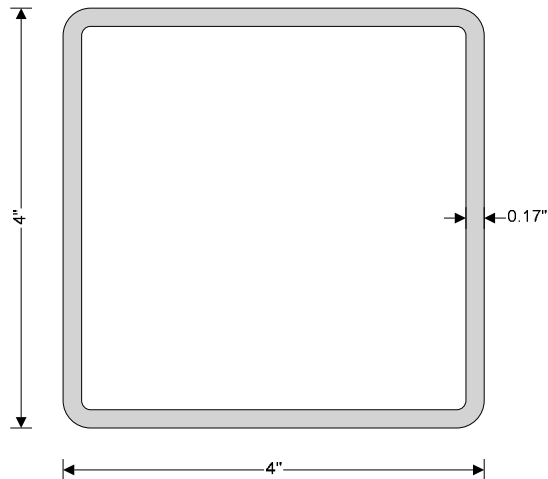
 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Schools				Job Ref. 20191103	
	Section Strawberry Park Existing Framing				Sheet no./rev. 13	
	Calc. by VSW	Date 3/26/2020	Chk'd by	Date	App'd by	Date

STEEL COLUMN - GRID 9

STEEL COLUMN DESIGN

In accordance with AISC360-10 and the LRFD method

Tedds calculation version 1.0.10



Column and loading details

Column details

Column section

HSS 4x4x3/16

Design loading

Required axial strength

$P_r = 23$ kips (Compression)

Moment about x axis at end 1

$M_{x1} = 0.0$ kips_ft

Moment about x axis at end 2

$M_{x2} = 0.0$ kips_ft

Maximum moment about x axis

$M_x = \max(\text{abs}(M_{x1}), \text{abs}(M_{x2})) = 0.0$ kips_ft

Moment about y axis at end 1

$M_{y1} = 0.0$ kips_ft

Moment about y axis at end 2

$M_{y2} = 0.0$ kips_ft

Maximum moment about y axis

$M_y = \max(\text{abs}(M_{y1}), \text{abs}(M_{y2})) = 0.0$ kips_ft

Maximum shear force parallel to y axis

$V_{ry} = 0.0$ kips

Maximum shear force parallel to x axis

$V_{rx} = 0.0$ kips

Material details

Steel grade

A500 Gr. B

Yield strength

$F_y = 46$ ksi

Ultimate strength

$F_u = 58$ ksi

Modulus of elasticity

$E = 29000$ ksi

Shear modulus of elasticity

$G = 11200$ ksi

Unbraced lengths

For buckling about x axis

$L_x = 168$ in

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Schools				Job Ref. 20191103	
	Section Strawberry Park Existing Framing				Sheet no./rev. 14	
	Calc. by VSW	Date 3/26/2020	Chk'd by	Date	App'd by	Date

For buckling about y axis $L_y = 168$ in

For torsional buckling $L_z = 168$ in

Effective length factors

For buckling about x axis $K_x = 1.00$

For buckling about y axis $K_y = 1.00$

For torsional buckling $K_z = 1.00$

Section classification

Section classification for local buckling (cl. B4)

Critical flange width $b = b_f - 3 \times t = 3.478$ in

Critical web width $h = d - 3 \times t = 3.478$ in

Width to thickness ratio of flange (compression) $\lambda_{f_c} = b / t = 19.989$

Width to thickness ratio of web (compression) $\lambda_{w_c} = h / t = 19.989$

Width to thickness ratio of flange (major flexure) $\lambda_{f_{fx}} = b / t = 19.989$

Width to thickness ratio of web (major flexure) $\lambda_{w_{fx}} = h / t = 19.989$

Width to thickness ratio of flange (minor flexure) $\lambda_{f_{fy}} = h / t = 19.989$

Width to thickness ratio of web (minor flexure) $\lambda_{w_{fy}} = b / t = 19.989$

Compression

Limit for nonslender section $\lambda_{r_c} = 1.40 \times \sqrt{E / F_y} = 35.152$

The section is nonslender in compression

Slenderness

Member slenderness

Slenderness ratio about x axis $SR_x = K_x \times L_x / r_x = 108.4$

Slenderness ratio about y axis $SR_y = K_y \times L_y / r_y = 108.4$

Reduction factor for slender elements

Reduction factor for slender elements (E7)

The section does not contain any slender elements therefore:-

Slender element reduction factor $Q = 1.0$

Compressive strength

Flexural buckling about x axis (cl. E3)

Elastic critical buckling stress $F_{ex} = (\pi^2 \times E) / (SR_x)^2 = 24.4$ ksi

Reduction factor $Q_x = Q = 1.000$

Flexural buckling stress about x axis $F_{crx} = Q_x \times (0.658^{Q_x \times F_y / F_{ex}}) \times F_y = 20.9$ ksi

Nominal flexural buckling strength $P_{nx} = F_{crx} \times A_g = 53.8$ kips

Flexural buckling about y axis (cl. E3)

Elastic critical buckling stress $F_{ey} = (\pi^2 \times E) / (SR_y)^2 = 24.4$ ksi

Reduction factor $Q_y = Q = 1.000$

Flexural buckling stress about y axis $F_{cry} = Q_y \times (0.658^{Q_y \times F_y / F_{ey}}) \times F_y = 20.9$ ksi

Nominal flexural buckling strength $P_{ny} = F_{cry} \times A_g = 53.8$ kips

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project				Job Ref.	
	Steamboat Schools				20191103	
	Section				Sheet no./rev.	
	Strawberry Park Existing Framing				15	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	VSW	3/26/2020				

Design compressive strength (cl.E1)

Resistance factor for compression

$$\phi_c = 0.90$$

Design compressive strength

$$P_c = \phi_c \times \min(P_{nx}, P_{ny}) = 48.5 \text{ kips}$$

PASS - The design compressive strength exceeds the required compressive strength



Jirsa Hedrick Structural Engineers
8490 E Crescent Pkwy Suite 250
Greenwood Village, CO 80111

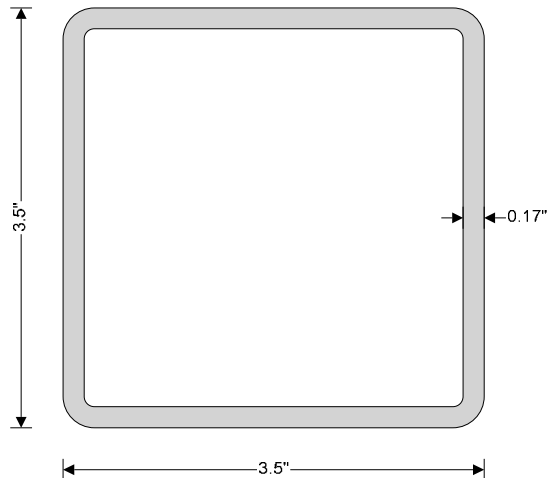
Project				Job Ref.	
Steamboat Schools				20191103	
Section				Sheet no./rev.	
Strawberry Park Existing Framing				16	
Calc. by	Date	Chk'd by	Date	App'd by	Date
VSW	3/26/2020				

STEEL COLUMN - GRID 13

STEEL COLUMN DESIGN

In accordance with AISC360-10 and the LRFD method

Tedds calculation version 1.0.10



Column and loading details

Column details

Column section

HSS 3-1/2x3-1/2x3/16

Design loading

Required axial strength

$P_r = 23$ kips (Compression)

Moment about x axis at end 1

$M_{x1} = 0.0$ kips_ft

Moment about x axis at end 2

$M_{x2} = 0.0$ kips_ft

Maximum moment about x axis

$M_x = \max(\text{abs}(M_{x1}), \text{abs}(M_{x2})) = 0.0$ kips_ft

Moment about y axis at end 1

$M_{y1} = 0.0$ kips_ft

Moment about y axis at end 2

$M_{y2} = 0.0$ kips_ft

Maximum moment about y axis

$M_y = \max(\text{abs}(M_{y1}), \text{abs}(M_{y2})) = 0.0$ kips_ft

Maximum shear force parallel to y axis

$V_{ry} = 0.0$ kips

Maximum shear force parallel to x axis

$V_{rx} = 0.0$ kips

Material details

Steel grade

A500 Gr. B

Yield strength

$F_y = 46$ ksi

Ultimate strength

$F_u = 58$ ksi

Modulus of elasticity

$E = 29000$ ksi

Shear modulus of elasticity

$G = 11200$ ksi

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Schools				Job Ref. 20191103	
	Section Strawberry Park Existing Framing				Sheet no./rev. 17	
	Calc. by VSW	Date 3/26/2020	Chk'd by	Date	App'd by	Date

Unbraced lengths

For buckling about x axis	$L_x = 168$ in
For buckling about y axis	$L_y = 168$ in
For torsional buckling	$L_z = 168$ in

Effective length factors

For buckling about x axis	$K_x = 1.00$
For buckling about y axis	$K_y = 1.00$
For torsional buckling	$K_z = 1.00$

Section classification

Section classification for local buckling (cl. B4)

Critical flange width	$b = b_f - 3 \times t = 2.978$ in
Critical web width	$h = d - 3 \times t = 2.978$ in
Width to thickness ratio of flange (compression)	$\lambda_{f_c} = b / t = 17.115$
Width to thickness ratio of web (compression)	$\lambda_{w_c} = h / t = 17.115$
Width to thickness ratio of flange (major flexure)	$\lambda_{f_{fx}} = b / t = 17.115$
Width to thickness ratio of web (major flexure)	$\lambda_{w_{fx}} = h / t = 17.115$
Width to thickness ratio of flange (minor flexure)	$\lambda_{f_{fy}} = h / t = 17.115$
Width to thickness ratio of web (minor flexure)	$\lambda_{w_{fy}} = b / t = 17.115$

Compression

Limit for nonslender section	$\lambda_{r_c} = 1.40 \times \sqrt{E / F_y} = 35.152$
------------------------------	---

The section is nonslender in compression

Slenderness

Member slenderness

Slenderness ratio about x axis	$SR_x = K_x \times L_x / r_x = 124.4$
Slenderness ratio about y axis	$SR_y = K_y \times L_y / r_y = 124.4$

Reduction factor for slender elements

Reduction factor for slender elements (E7)

The section does not contain any slender elements therefore:-

Slender element reduction factor	$Q = 1.0$
----------------------------------	-----------

Compressive strength

Flexural buckling about x axis (cl. E3)

Elastic critical buckling stress	$F_{ex} = (\pi^2 \times E) / (SR_x)^2 = 18.5$ ksi
Flexural buckling stress about x axis	$F_{crx} = 0.877 \times F_{ex} = 16.2$ ksi
Nominal flexural buckling strength	$P_{nx} = F_{crx} \times A_g = 36.3$ kips

Flexural buckling about y axis (cl. E3)

Elastic critical buckling stress	$F_{ey} = (\pi^2 \times E) / (SR_y)^2 = 18.5$ ksi
Flexural buckling stress about y axis	$F_{cry} = 0.877 \times F_{ey} = 16.2$ ksi
Nominal flexural buckling strength	$P_{ny} = F_{cry} \times A_g = 36.3$ kips

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project				Job Ref.	
	Steamboat Schools				20191103	
	Section				Sheet no./rev.	
	Strawberry Park Existing Framing				18	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	VSW	3/26/2020				

Design compressive strength (cl.E1)

Resistance factor for compression

$$\phi_c = 0.90$$

Design compressive strength

$$P_c = \phi_c \times \min(P_{nx}, P_{ny}) = 32.7 \text{ kips}$$

PASS - The design compressive strength exceeds the required compressive strength

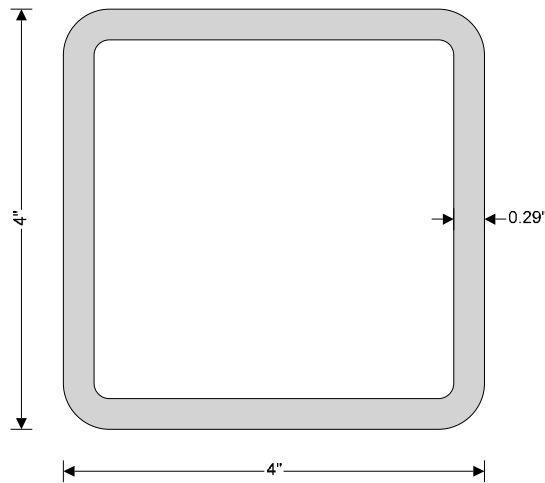
 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Schools				Job Ref. 20191103	
	Section Strawberry Park Existing Framing				Sheet no./rev. 19	
	Calc. by VSW	Date 3/26/2020	Chk'd by	Date	App'd by	Date

STEEL COLUMN - GRID 10, 11, 12

STEEL COLUMN DESIGN

In accordance with AISC360-10 and the LRFD method

Tedds calculation version 1.0.10



Column and loading details

Column details

Column section

HSS 4x4x5/16

Design loading

Required axial strength

$P_r = 60$ kips (Compression)

Moment about x axis at end 1

$M_{x1} = 0.0$ kips_ft

Moment about x axis at end 2

$M_{x2} = 0.0$ kips_ft

Maximum moment about x axis

$M_x = \max(\text{abs}(M_{x1}), \text{abs}(M_{x2})) = 0.0$ kips_ft

Moment about y axis at end 1

$M_{y1} = 0.0$ kips_ft

Moment about y axis at end 2

$M_{y2} = 0.0$ kips_ft

Maximum moment about y axis

$M_y = \max(\text{abs}(M_{y1}), \text{abs}(M_{y2})) = 0.0$ kips_ft

Maximum shear force parallel to y axis

$V_{ry} = 0.0$ kips

Maximum shear force parallel to x axis

$V_{rx} = 0.0$ kips

Material details

Steel grade

A500 Gr. B

Yield strength

$F_y = 46$ ksi

Ultimate strength

$F_u = 58$ ksi

Modulus of elasticity

$E = 29000$ ksi

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project				Job Ref.	
	Steamboat Schools				20191103	
	Section				Sheet no./rev.	
	Strawberry Park Existing Framing				20	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	VSW	3/26/2020				

Shear modulus of elasticity

$$G = 11200 \text{ ksi}$$

Unbraced lengths

For buckling about x axis

$$L_x = 168 \text{ in}$$

For buckling about y axis

$$L_y = 168 \text{ in}$$

For torsional buckling

$$L_z = 168 \text{ in}$$

Effective length factors

For buckling about x axis

$$K_x = 1.00$$

For buckling about y axis

$$K_y = 1.00$$

For torsional buckling

$$K_z = 1.00$$

Section classification

Section classification for local buckling (cl. B4)

Critical flange width

$$b = b_f - 3 \times t = 3.127 \text{ in}$$

Critical web width

$$h = d - 3 \times t = 3.127 \text{ in}$$

Width to thickness ratio of flange (compression)

$$\lambda_{f_c} = b / t = 10.746$$

Width to thickness ratio of web (compression)

$$\lambda_{w_c} = h / t = 10.746$$

Width to thickness ratio of flange (major flexure)

$$\lambda_{f_{fx}} = b / t = 10.746$$

Width to thickness ratio of web (major flexure)

$$\lambda_{w_{fx}} = h / t = 10.746$$

Width to thickness ratio of flange (minor flexure)

$$\lambda_{f_{fy}} = h / t = 10.746$$

Width to thickness ratio of web (minor flexure)

$$\lambda_{w_{fy}} = b / t = 10.746$$

Compression

Limit for nonslender section

$$\lambda_{r_c} = 1.40 \times \sqrt{(E / F_y)} = 35.152$$

The section is nonslender in compression

Slenderness

Member slenderness

Slenderness ratio about x axis

$$SR_x = K_x \times L_x / r_x = 112.8$$

Slenderness ratio about y axis

$$SR_y = K_y \times L_y / r_y = 112.8$$

Reduction factor for slender elements

Reduction factor for slender elements (E7)

The section does not contain any slender elements therefore:-

Slender element reduction factor

$$Q = 1.0$$

Compressive strength

Flexural buckling about x axis (cl. E3)

Elastic critical buckling stress

$$F_{ex} = (\pi^2 \times E) / (SR_x)^2 = 22.5 \text{ ksi}$$

Reduction factor

$$Q_x = Q = 1.000$$

Flexural buckling stress about x axis

$$F_{crx} = Q_x \times (0.658^{Q_x \times F_y / F_{ex}}) \times F_y = 19.6 \text{ ksi}$$

Nominal flexural buckling strength

$$P_{nx} = F_{crx} \times A_g = 80.2 \text{ kips}$$

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project				Job Ref.	
	Steamboat Schools				20191103	
	Section				Sheet no./rev.	
	Strawberry Park Existing Framing				21	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	VSW	3/26/2020				

Flexural buckling about y axis (cl. E3)

Elastic critical buckling stress

$$F_{ey} = (\pi^2 \times E) / (SR_y)^2 = \mathbf{22.5 \text{ ksi}}$$

Reduction factor

$$Q_y = Q = \mathbf{1.000}$$

Flexural buckling stress about y axis

$$F_{cry} = Q_y \times (0.658^{Q_y \times F_y / F_{ey}}) \times F_y = \mathbf{19.6 \text{ ksi}}$$

Nominal flexural buckling strength

$$P_{ny} = F_{cry} \times A_g = \mathbf{80.2 \text{ kips}}$$

Design compressive strength (cl.E1)

Resistance factor for compression

$$\phi_c = \mathbf{0.90}$$

Design compressive strength

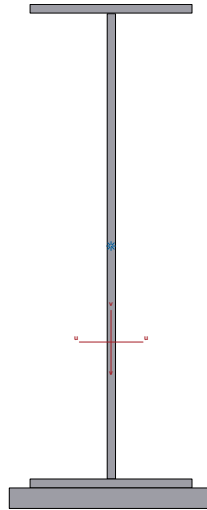
$$P_c = \phi_c \times \min(P_{nx}, P_{ny}) = \mathbf{72.2 \text{ kips}}$$

PASS - The design compressive strength exceeds the required compressive strength

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Schools				Job Ref. 20191103	
	Section SSMS - Beam Cover Plate				Sheet no./rev. 1	
	Calc. by VSW	Date 3/26/2020	Chk'd by	Date	App'd by	Date

CALCULATION OF SECTION PROPERTIES

Tedds calculation version 2.0.07



Area

$$A = 6.58 \text{ in}^2$$

2nd moment of area

$$I_{uu} = 146. \text{ in}^4$$

$$I_{vv} = 7.56 \text{ in}^4$$

$$I_{xx} = 146. \text{ in}^4$$

$$I_{yy} = 7.56 \text{ in}^4$$

Radius of gyration

$$r_{uu} = 4.70 \text{ in}$$

$$r_{vv} = 1.07 \text{ in}$$

$$r_{xx} = 4.70 \text{ in}$$

$$r_{yy} = 1.07 \text{ in}$$

Plastic section modulus (only shapes with all rectangles at 90 degs)

$$Z_{xx} = 24.7 \text{ in}^3$$

$$Z_{yy} = 5.01 \text{ in}^3$$

Distance to combined centroid

$$X_e = 0.00 \text{ in}$$

$$Y_e = -2.36 \text{ in}$$

Distance to equal axis area (only shapes with all rectangles at 90 degs)

$$X_p = 0.00 \text{ in}$$

$$Y_p = -5.75 \text{ in}$$

Elastic section modulus

$$S_{xx} = 17.5 \text{ in}^3$$

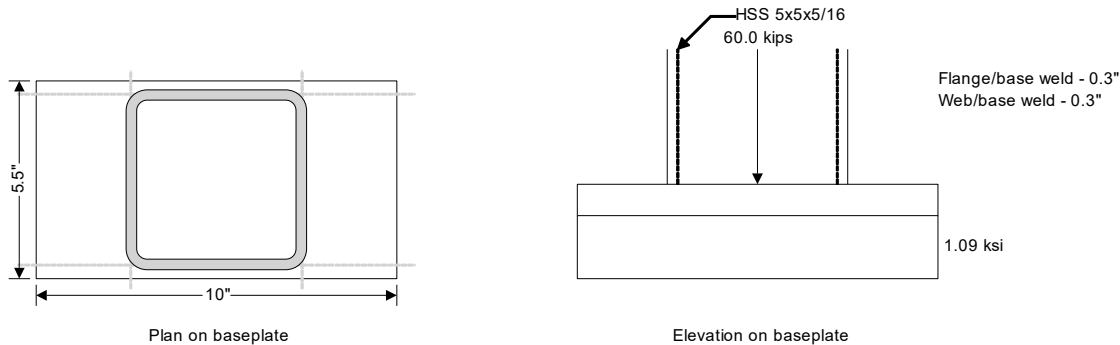
$$S_{yy} = 3.02 \text{ in}^3$$

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Schools		Job Ref. 20191103	
	Section SSMS - Grid B Baseplate Check		Sheet no./rev. 1	
	Calc. by VSW	Date 3/26/2020	Chk'd by	Date
			App'd by	Date

COLUMN BASE PLATE DESIGN

In accordance with AISC Steel Design Guide 1 and AISC 360-10

Tedds calculation version 2.1.02



Design forces and moments

Axial force	$P_u = 60.0$ kips (Compression)	Shear force	$F_v = 0.0$ kips
Bending moment	$M_u = 0.0$ kip_in		

Column details

Column section	HSS 5x5x5/16		
Depth	$d = 5$ in	Breadth	$b_f = 5$ in
Flange thickness	$t_f = 0.291$ in	Web thickness	$t_w = 0.291$ in

Baseplate details

Depth	$N = 10$ in	Breadth	$B = 5.5$ in
Thickness	$t_p = 0.875$ in	Design strength	$F_y = 36.0$ ksi

Foundation geometry

Member thickness	$h_a = 12$ in	Baseplate to left edge found	$x_{ce1} = 24$ in
Baseplate to right edge found	$x_{ce2} = 24$ in	Baseplate to bot edge found	$y_{ce1} = 24$ in
Baseplate to top edge found	$y_{ce2} = 24$ in		
Min tensile strength, base plate	$F_{yCol} = 50$ ksi	$F_y = 36$ ksi	Min tensile strength, column

Comp strength of concrete	$f'_c = 3$ ksi
---------------------------	----------------

Strength reduction factors

Compression	$\phi_c = 0.65$	Flexure	$\phi_b = 0.90$
Weld shear	$\phi_v = 0.75$		

Plate cantilever dimensions

Area of base plate	$A_1 = 55$ in ²	Max area supporting surface	$A_2 = 2088$ in ²
Nominal strength of conc	$P_p = 280.5$ kips	Plate bending coefficient X	$X = 0.33$
Cantilever distance m	$m = 2.625$ in	Cantilever distance n	$n = 0.375$ in
Max bending line cantilever	$l = 2.625$ in		

Plate thickness

Required plate thickness	$t_{p,req} = 0.681$ in	Specified plate thickness	$t_p = 0.875$ in
--------------------------	------------------------	---------------------------	------------------

PASS - Thickness of plate exceeds required thickness

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Schools				Job Ref. 20191103	
	Section SSMS - Grid B Baseplate Check				Sheet no./rev. 2	
	Calc. by VSW	Date 3/26/2020	Chk'd by	Date	App'd by	Date

Design bearing strength (AISC 360-05-J8)

Design bearing strength $P_p = 280.50$ kips

Factored bearing strength $\phi_c P_p = 182.33$ kips

PASS - Allowable bearing stress exceeds applied bearing stress

Flange weld

Flange weld leg length $t_{fw} = 0.3125$ in

Tension capacity of flange $P_{tf} = 72.8$ kips

Force in tension flange $F_{tf} = -16.6$ kips

Critical force in flange $F_f = 0.0$ kips

Flange weld force per in $R_{wf} = 0.0$ kips/in

Electrode classification No. $F_{EXX} = 70.0$ ksi

Design weld stress $\phi F_{nw} = 47.250$ ksi

Design strength of weld/in $\phi R_{nf} = 10.4$ kips/in

PASS - Available strength of flange weld exceeds force in flange weld

COLUMNS ON GRID B

B/10, 11, 12 - HSS4x4x3/16

B/9 - HSS4x4x3/16 + MASONRY PILASTER

B/13 - HSS3 1/2 x 3 1/2 x 3/16

LRFD REACTIONS

$P_u = 23K$ GRIDS 9 & 13 $\rightarrow$ COLUMNS OK. SEE TEDDS

$P_u = 40K$ GRIDS 10, 11, 12

$\rightarrow$ COLUMNS N.G.

$\rightarrow$ ADD PLATES PER CALC. ON
STRAWBERRY PARK

$\Rightarrow$ OK BY INSPECTION

B/C LOAD WAS HIGHER

& SAME (E) COLUMN SIZE

BEAM COVER PLATE

FROM GRID 10-12 BEAM

$$\phi M_{n req'd} = 79.8K \cdot ft \times 12 \text{ in}/ft = 958K \cdot in$$

$$958K \cdot in = \phi F_y Z_{req'd}$$

$$\frac{958K \cdot in}{.9 \times 36KSI} = 29.6 in^3$$

$$PL \text{ } 1/2 \times 5 \Rightarrow Z = 33.4 in^3 \text{ OK}$$

$$q = \frac{VQ}{I}$$

$$V = 30K$$

$$I = 146 in^4$$

$$Q = A\bar{y}$$

$$q = \frac{30K(9.82 in^3)}{146 in^4} = 2K/in$$

$$Q = 4.16 in^2 (2.36 \text{ in}) = 9.82 in^3$$

$$\begin{aligned} 1/4 \text{ FILLLET WELD} \times 2 \text{ in} @ 12 \text{ in} &= 11.1K/ft \times 2 \text{ SIDES} \\ &= 22.2K/ft \\ &\rightarrow \text{SPACE @ } 8 \text{ in} \end{aligned}$$

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Springs Schools				Job Ref. 20191103	
	Section SSMS - Offset Footings at Grid B				Sheet no./rev. 1	
	Calc. by VSW	Date 3/16/2020	Chk'd by	Date	App'd by	Date

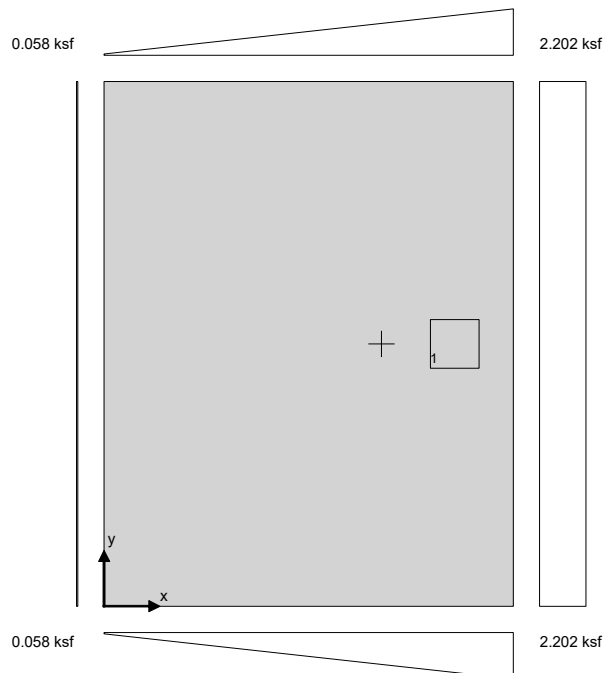
FOUNDATION ANALYSIS & DESIGN (ACI318)

In accordance with ACI318-14

Tedds calculation version 3.2.09

FOOTING ANALYSIS

Length of foundation	$L_x = 7$ ft
Width of foundation	$L_y = 9$ ft
Foundation area	$A = L_x \times L_y = 63$ ft ²
Depth of foundation	$h = 12$ in
Depth of soil over foundation	$h_{\text{soil}} = 48$ in
Density of concrete	$\gamma_{\text{conc}} = 150.0$ lb/ft ³



Column no.1 details

Length of column	$l_{x1} = 10.00$ in
Width of column	$l_{y1} = 10.00$ in
position in x-axis	$x_1 = 72.00$ in
position in y-axis	$y_1 = 54.00$ in

Soil properties

Gross allowable bearing pressure	$q_{\text{allow_Gross}} = 2.5$ ksf
Density of soil	$\gamma_{\text{soil}} = 120.0$ lb/ft ³
Angle of internal friction	$\phi_b = 30.0$ deg
Design base friction angle	$\delta_{bb} = 30.0$ deg
Coefficient of base friction	$\tan(\delta_{bb}) = 0.577$
Self weight	$F_{\text{swt}} = h \times \gamma_{\text{conc}} = 150$ psf

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Springs Schools		Job Ref. 20191103	
	Section SSMS - Offset Footings at Grid B		Sheet no./rev. 2	
	Calc. by VSW	Date 3/16/2020	Chk'd by	Date
			App'd by	Date

Soil weight

$$F_{\text{soil}} = h_{\text{soil}} \times \gamma_{\text{soil}} = \mathbf{480 \text{ psf}}$$

Column no.1 loads

Dead load in z

$$F_{Dz1} = \mathbf{7.9 \text{ kips}}$$

Snow load in z

$$F_{Sz1} = \mathbf{23.6 \text{ kips}}$$

Footing analysis for soil and stability

Load combinations per ASCE 7-10

1.0D (0.410)

1.0D + 1.0S (0.881)

Combination 4 results: 1.0D + 1.0S

Forces on foundation

Force in z-axis

$$F_{dz} = \gamma_D \times A \times (F_{\text{swt}} + F_{\text{soil}}) + \gamma_D \times F_{Dz1} + \gamma_S \times F_{Sz1} = \mathbf{71.2 \text{ kips}}$$

Moments on foundation

Moment in x-axis, about x is 0

$$M_{dx} = \gamma_D \times (A \times (F_{\text{swt}} + F_{\text{soil}}) \times L_x / 2) + \gamma_D \times (F_{Dz1} \times x_1) + \gamma_S \times (F_{Sz1} \times x_1) = \mathbf{328.0 \text{ kip_ft}}$$

Moment in y-axis, about y is 0

$$M_{dy} = \gamma_D \times (A \times (F_{\text{swt}} + F_{\text{soil}}) \times L_y / 2) + \gamma_D \times (F_{Dz1} \times y_1) + \gamma_S \times (F_{Sz1} \times y_1) = \mathbf{320.4 \text{ kip_ft}}$$

Uplift verification

Vertical force

$$F_{dz} = \mathbf{71.2 \text{ kips}}$$

PASS - Foundation is not subject to uplift

Bearing resistance

Eccentricity of base reaction

Eccentricity of base reaction in x-axis

$$e_{dx} = M_{dx} / F_{dz} - L_x / 2 = \mathbf{13.277 \text{ in}}$$

Eccentricity of base reaction in y-axis

$$e_{dy} = M_{dy} / F_{dz} - L_y / 2 = \mathbf{0 \text{ in}}$$

Pad base pressures

$$q_1 = F_{dz} \times (1 - 6 \times e_{dx} / L_x - 6 \times e_{dy} / L_y) / (L_x \times L_y) = \mathbf{0.058 \text{ ksf}}$$

$$q_2 = F_{dz} \times (1 - 6 \times e_{dx} / L_x + 6 \times e_{dy} / L_y) / (L_x \times L_y) = \mathbf{0.058 \text{ ksf}}$$

$$q_3 = F_{dz} \times (1 + 6 \times e_{dx} / L_x - 6 \times e_{dy} / L_y) / (L_x \times L_y) = \mathbf{2.202 \text{ ksf}}$$

$$q_4 = F_{dz} \times (1 + 6 \times e_{dx} / L_x + 6 \times e_{dy} / L_y) / (L_x \times L_y) = \mathbf{2.202 \text{ ksf}}$$

Minimum base pressure

$$q_{\text{min}} = \min(q_1, q_2, q_3, q_4) = \mathbf{0.058 \text{ ksf}}$$

Maximum base pressure

$$q_{\text{max}} = \max(q_1, q_2, q_3, q_4) = \mathbf{2.202 \text{ ksf}}$$

Allowable bearing capacity

Allowable bearing capacity

$$Q_{\text{allow}} = Q_{\text{allow_Gross}} = \mathbf{2.5 \text{ ksf}}$$

$$q_{\text{max}} / Q_{\text{allow}} = \mathbf{0.881}$$

PASS - Allowable bearing capacity exceeds design base pressure

FOOTING DESIGN (ACI318)

In accordance with ACI318-14

Material details

Compressive strength of concrete

$$f'_c = \mathbf{4000 \text{ psi}}$$

Yield strength of reinforcement

$$f_y = \mathbf{60000 \text{ psi}}$$

Cover to reinforcement

$$C_{\text{nom}} = \mathbf{3 \text{ in}}$$

Concrete type

$$\mathbf{\text{Normal weight}}$$

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Springs Schools				Job Ref. 20191103	
	Section SSMS - Offset Footings at Grid B				Sheet no./rev. 3	
	Calc. by VSW	Date 3/16/2020	Chk'd by	Date	App'd by	Date

Concrete modification factor $\lambda = 1.00$
Column type Concrete

Analysis and design of concrete footing

Load combinations per ASCE 7-10

1.4D (0.109)
1.2D + 1.0L + 1.6S (0.465)

Combination 6 results: 1.2D + 1.0L + 1.6S

Forces on foundation

Ultimate force in z-axis $F_{uz} = \gamma_D \times A \times (F_{swt} + F_{soil}) + \gamma_D \times F_{Dz1} + \gamma_S \times F_{Sz1} = 94.9$ kips

Moments on foundation

Ultimate moment in x-axis, about x is 0 $M_{ux} = \gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_x / 2) + \gamma_D \times (F_{Dz1} \times x_1) + \gamma_S \times (F_{Sz1} \times x_1) = 450.2$ kip_ft

Ultimate moment in y-axis, about y is 0 $M_{uy} = \gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_y / 2) + \gamma_D \times (F_{Dz1} \times y_1) + \gamma_S \times (F_{Sz1} \times y_1) = 427.0$ kip_ft

Eccentricity of base reaction

Eccentricity of base reaction in x-axis $e_{ux} = M_{ux} / F_{uz} - L_x / 2 = 14.941$ in

Eccentricity of base reaction in y-axis $e_{uy} = M_{uy} / F_{uz} - L_y / 2 = 0$ in

Length of bearing in x-axis $L'_{xu} = \min(L_x, 3 \times (L_x / 2 - \text{abs}(e_{ux}))) = 81.176$ in

Pad base pressures

$q_{u1} = 0 \text{ kN/m}^2 = 0$ ksf

$q_{u2} = 0 \text{ kN/m}^2 = 0$ ksf

$q_{u3} = 2 \times F_{uz} / (3 \times L_y \times (L_x / 2 - e_{ux})) = 3.117$ ksf

$q_{u4} = 2 \times F_{uz} / (3 \times L_y \times (L_x / 2 - e_{ux})) = 3.117$ ksf

Minimum ultimate base pressure $q_{umin} = \min(q_{u1}, q_{u2}, q_{u3}, q_{u4}) = 0$ ksf

Maximum ultimate base pressure $q_{umax} = \max(q_{u1}, q_{u2}, q_{u3}, q_{u4}) = 3.117$ ksf

Shear diagram, x axis (kips)



Moment diagram, x axis (kip_ft)



Moment design, x direction, positive moment

Ultimate bending moment $M_{u.x.max} = 3.478$ kip_ft

Tension reinforcement provided 10 No.5 bottom bars (11.2 in c/c)

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Springs Schools		Job Ref. 20191103	
	Section SSMS - Offset Footings at Grid B		Sheet no./rev. 4	
	Calc. by VSW	Date 3/16/2020	Chk'd by	Date
			App'd by	Date

Area of tension reinforcement provided	$A_{sx,bot,prov} = 3.1 \text{ in}^2$
Minimum area of reinforcement (8.6.1.1)	$A_{s,min} = 0.0018 \times L_y \times h = 2.333 \text{ in}^2$
	PASS - Area of reinforcement provided exceeds minimum
Maximum spacing of reinforcement (8.7.2.2)	$s_{max} = \min(2 \times h, 18 \text{ in}) = 18 \text{ in}$
	PASS - Maximum permissible reinforcement spacing exceeds actual spacing
Depth to tension reinforcement	$d = h - C_{nom} - \phi_{y,bot} - \phi_{x,bot} / 2 = 8.062 \text{ in}$
Depth of compression block	$a = A_{sx,bot,prov} \times f_y / (0.85 \times f'_c \times L_y) = 0.507 \text{ in}$
Neutral axis factor	$\beta_1 = 0.85$
Depth to neutral axis	$c = a / \beta_1 = 0.596 \text{ in}$
Strain in tensile reinforcement (8.3.3.1)	$\epsilon_t = 0.003 \times d / c - 0.003 = 0.03759$
	PASS - Tensile strain exceeds minimum required, 0.004
Nominal moment capacity	$M_n = A_{sx,bot,prov} \times f_y \times (d - a / 2) = 121.043 \text{ kip_ft}$
Flexural strength reduction factor	$\phi_f = \min(\max(0.65 + (\epsilon_t - 0.002) \times (250 / 3), 0.65), 0.9) = 0.900$
Design moment capacity	$\phi M_n = \phi_f \times M_n = 108.939 \text{ kip_ft}$
	$M_{u,x,max} / \phi M_n = 0.032$
	PASS - Design moment capacity exceeds ultimate moment load
Footing geometry factor (13.3.3.3)	$\beta_f = L_y / L_x = 1.286$
Area of reinf. req. for uniform distribution (CRSI)	$A_{sreq} = (M_{u,x,max} / (\phi_f \times f_y \times (d - a / 2))) \times 2 \times \beta_f / (\beta_f + 1) = 0.111 \text{ in}^2$
	PASS - Reinforcement can be distributed uniformly
Moment design, x direction, negative moment	
Ultimate bending moment	$M_{u,x,min} = -17.833 \text{ kip_ft}$
Tension reinforcement provided	10 No.6 top bars (11.2 in c/c)
Area of tension reinforcement provided	$A_{sx,top,prov} = 4.4 \text{ in}^2$
Minimum area of reinforcement (8.6.1.1)	$A_{s,min} = 0.0018 \times L_y \times h = 2.333 \text{ in}^2$
	PASS - Area of reinforcement provided exceeds minimum
Maximum spacing of reinforcement (8.7.2.2)	$s_{max} = \min(2 \times h, 18 \text{ in}) = 18 \text{ in}$
	PASS - Maximum permissible reinforcement spacing exceeds actual spacing
Depth to tension reinforcement	$d = h - C_{nom} - \phi_{x,top} / 2 = 8.625 \text{ in}$
Depth of compression block	$a = A_{sx,top,prov} \times f_y / (0.85 \times f'_c \times L_y) = 0.719 \text{ in}$
Neutral axis factor	$\beta_1 = 0.85$
Depth to neutral axis	$c = a / \beta_1 = 0.846 \text{ in}$
Strain in tensile reinforcement (8.3.3.1)	$\epsilon_t = 0.003 \times d / c - 0.003 = 0.02759$
	PASS - Tensile strain exceeds minimum required, 0.004
Nominal moment capacity	$M_n = A_{sx,top,prov} \times f_y \times (d - a / 2) = 181.842 \text{ kip_ft}$
Flexural strength reduction factor	$\phi_f = \min(\max(0.65 + (\epsilon_t - 0.002) \times (250 / 3), 0.65), 0.9) = 0.900$
Design moment capacity	$\phi M_n = \phi_f \times M_n = 163.657 \text{ kip_ft}$
	$\text{abs}(M_{u,x,min}) / \phi M_n = 0.109$
	PASS - Design moment capacity exceeds ultimate moment load
One-way shear design, x direction	
Ultimate shear force	$V_{u,x} = 11.922 \text{ kips}$
Depth to reinforcement	$d_v = \min(h - C_{nom} - \phi_{x,bot} / 2, h - C_{nom} - \phi_{x,top} / 2) = 8.625 \text{ in}$
Shear strength reduction factor	$\phi_v = 0.75$
Nominal shear capacity (Eq. 22.5.5.1)	$V_n = 2 \times \lambda \times \sqrt{f'_c \times 1 \text{ psi}} \times L_y \times d_v = 117.826 \text{ kips}$

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Springs Schools				Job Ref. 20191103	
	Section SSMS - Offset Footings at Grid B				Sheet no./rev. 5	
	Calc. by VSW	Date 3/16/2020	Chk'd by	Date	App'd by	Date

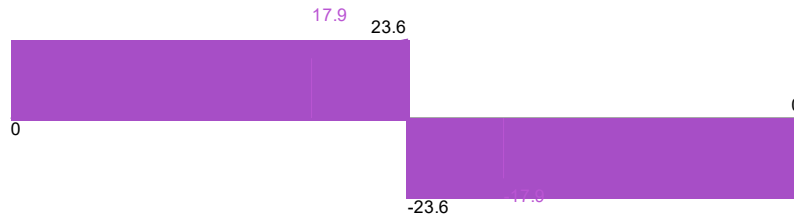
Design shear capacity

$$\phi V_n = \phi_v \times V_n = \mathbf{88.37 \text{ kips}}$$

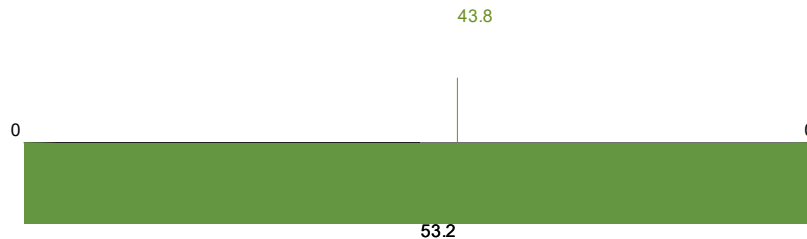
$$V_{u,x} / \phi V_n = \mathbf{0.135}$$

PASS - Design shear capacity exceeds ultimate shear load

Shear diagram, y axis (kips)



Moment diagram, y axis (kip_ft)



Moment design, y direction, positive moment

Ultimate bending moment

$$M_{u,y,max} = \mathbf{43.774 \text{ kip_ft}}$$

Tension reinforcement provided

$$\mathbf{8 \text{ No.5 bottom bars (11.0 in c/c)}}$$

Area of tension reinforcement provided

$$A_{sy,bot,prov} = \mathbf{2.48 \text{ in}^2}$$

Minimum area of reinforcement (8.6.1.1)

$$A_{s,min} = 0.0018 \times L_x \times h = \mathbf{1.814 \text{ in}^2}$$

PASS - Area of reinforcement provided exceeds minimum

Maximum spacing of reinforcement (8.7.2.2)

$$s_{max} = \min(2 \times h, 18 \text{ in}) = \mathbf{18 \text{ in}}$$

PASS - Maximum permissible reinforcement spacing exceeds actual spacing

Depth to tension reinforcement

$$d = h - c_{nom} - \phi_{y,bot} / 2 = \mathbf{8.688 \text{ in}}$$

Depth of compression block

$$a = A_{sy,bot,prov} \times f_y / (0.85 \times f'_c \times L_x) = \mathbf{0.521 \text{ in}}$$

Neutral axis factor

$$\beta_1 = \mathbf{0.85}$$

Depth to neutral axis

$$c = a / \beta_1 = \mathbf{0.613 \text{ in}}$$

Strain in tensile reinforcement (8.3.3.1)

$$\epsilon_t = 0.003 \times d / c - 0.003 = \mathbf{0.03952}$$

PASS - Tensile strain exceeds minimum required, 0.004

Nominal moment capacity

$$M_n = A_{sy,bot,prov} \times f_y \times (d - a / 2) = \mathbf{104.495 \text{ kip_ft}}$$

Flexural strength reduction factor

$$\phi_f = \min(\max(0.65 + (\epsilon_t - 0.002) \times (250 / 3), 0.65), 0.9) = \mathbf{0.900}$$

Design moment capacity

$$\phi M_n = \phi_f \times M_n = \mathbf{94.045 \text{ kip_ft}}$$

$$M_{u,y,max} / \phi M_n = \mathbf{0.465}$$

PASS - Design moment capacity exceeds ultimate moment load

One-way shear design, y direction

Ultimate shear force

$$V_{u,y} = \mathbf{17.912 \text{ kips}}$$

Depth to reinforcement

$$d_v = h - c_{nom} - \phi_{x,bot} - \phi_{y,bot} / 2 = \mathbf{8.062 \text{ in}}$$

Shear strength reduction factor

$$\phi_v = \mathbf{0.75}$$

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Springs Schools				Job Ref. 20191103	
	Section SSMS - Offset Footings at Grid B				Sheet no./rev. 6	
	Calc. by VSW	Date 3/16/2020	Chk'd by	Date	App'd by	Date

Nominal shear capacity (Eq. 22.5.5.1)

$$V_n = 2 \times \lambda \times \sqrt{f'_c \times 1 \text{ psi}} \times L_x \times d_v = \mathbf{85.666 \text{ kips}}$$

Design shear capacity

$$\phi V_n = \phi_v \times V_n = \mathbf{64.25 \text{ kips}}$$

$$V_{u,y} / \phi V_n = \mathbf{0.279}$$

PASS - Design shear capacity exceeds ultimate shear load

Two-way shear design at column 1

Depth to reinforcement

$$d_{v2} = \mathbf{8.375 \text{ in}}$$

Shear perimeter length (22.6.4)

$$l_{xp} = \mathbf{21.187 \text{ in}}$$

Shear perimeter width (22.6.4)

$$l_{yp} = \mathbf{18.375 \text{ in}}$$

Shear perimeter (22.6.4)

$$b_o = 2 \times l_{x,perim} + l_{y,perim} = \mathbf{60.750 \text{ in}}$$

Shear area

$$A_p = l_{x,perim} \times l_{y,perim} = \mathbf{389.320 \text{ in}^2}$$

Surcharge loaded area

$$A_{sur} = A_p - l_{x1} \times l_{y1} = \mathbf{289.320 \text{ in}^2}$$

Ultimate bearing pressure at center of shear area

$$q_{up,avg} = \mathbf{2.819 \text{ ksf}}$$

Ultimate shear load

$$F_{up} = \gamma_D \times F_{Dz1} + \gamma_S \times F_{Sz1} + \gamma_D \times A_p \times F_{swt} + \gamma_D \times A_{sur} \times F_{soil} - q_{up,avg} \times A_p = \mathbf{41.280 \text{ kips}}$$

Ultimate shear stress from vertical load

$$v_{ug} = \max(F_{up} / (b_o \times d_{v2}), 0 \text{ psi}) = \mathbf{81.134 \text{ psi}}$$

Column geometry factor (Table 22.6.5.2)

$$\beta = l_{y1} / l_{x1} = \mathbf{1.00}$$

Column location factor (22.6.5.3)

$$\alpha_s = \mathbf{30}$$

Concrete shear strength (22.6.5.2)

$$v_{cpa} = (2 + 4 / \beta) \times \lambda \times \sqrt{f'_c \times 1 \text{ psi}} = \mathbf{379.473 \text{ psi}}$$

$$v_{cpb} = (\alpha_s \times d_{v2} / b_o + 2) \times \lambda \times \sqrt{f'_c \times 1 \text{ psi}} = \mathbf{388.062 \text{ psi}}$$

$$v_{cpc} = 4 \times \lambda \times \sqrt{f'_c \times 1 \text{ psi}} = \mathbf{252.982 \text{ psi}}$$

$$v_{cp} = \min(v_{cpa}, v_{cpb}, v_{cpc}) = \mathbf{252.982 \text{ psi}}$$

Shear strength reduction factor

$$\phi_v = \mathbf{0.75}$$

Nominal shear stress capacity (Eq. 22.6.1.2)

$$v_n = v_{cp} = \mathbf{252.982 \text{ psi}}$$

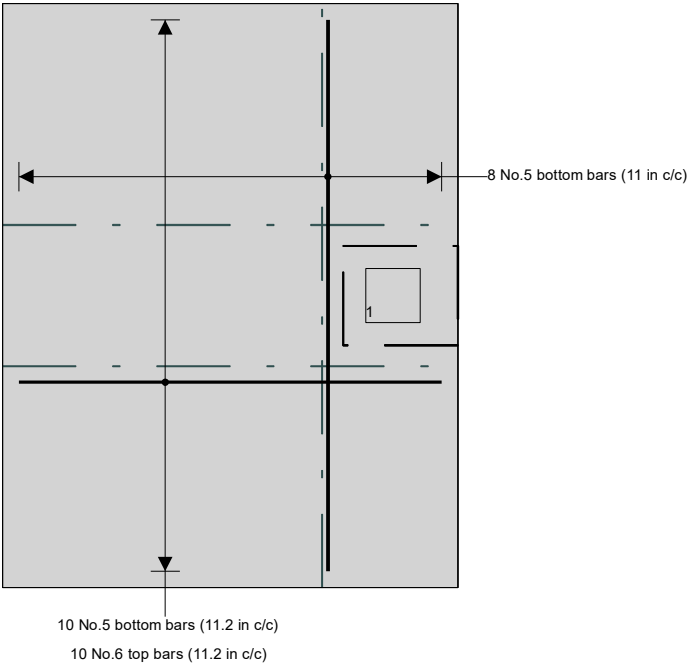
Design shear stress capacity (8.5.1.1(d))

$$\phi v_n = \phi_v \times v_n = \mathbf{189.737 \text{ psi}}$$

$$v_{ug} / \phi v_n = \mathbf{0.428}$$

PASS - Design shear stress capacity exceeds ultimate shear stress load

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project				Job Ref.	
	Steamboat Springs Schools				20191103	
	Section				Sheet no./rev.	
	SSMS - Offset Footings at Grid B				7	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	VSW	3/16/2020				

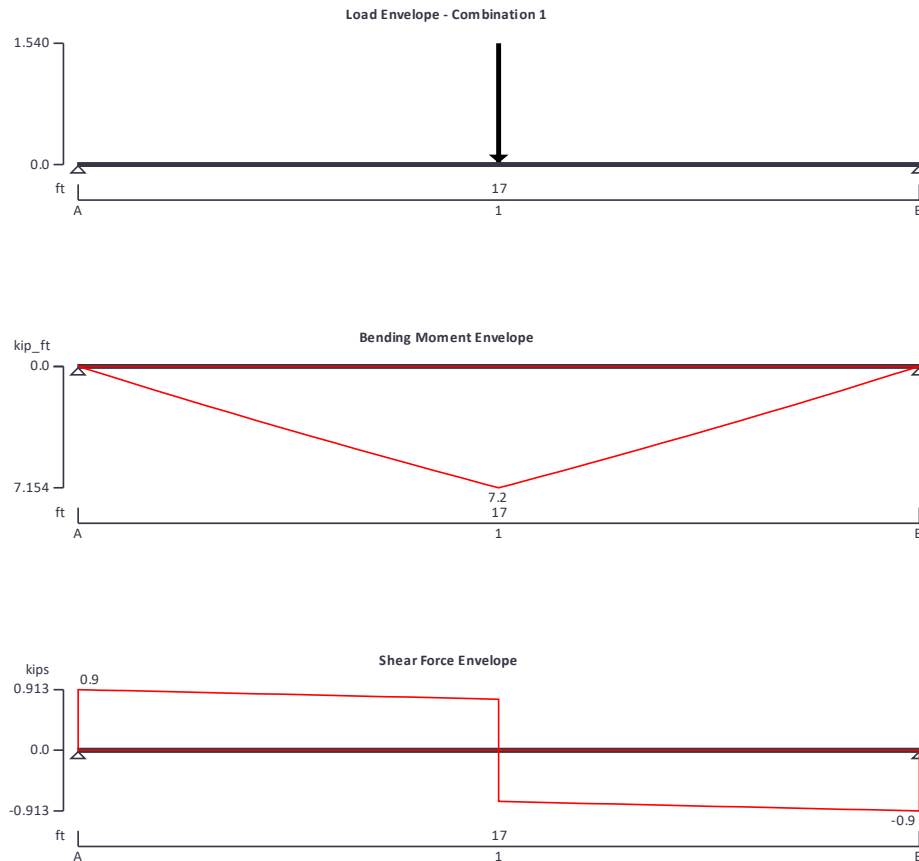


 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Middle School				Job Ref. 20191103	
	Section Partition Beam				Sheet no./rev. 1	
	Calc. by VSW	Date 4/3/2020	Chk'd by	Date	App'd by	Date

STEEL BEAM ANALYSIS & DESIGN (AISC360-10)

In accordance with AISC360-10 using the LRFD method

Tedds calculation version 3.0.14



Support conditions

Support A

Vertically restrained

Rotationally free

Support B

Vertically restrained

Rotationally free

Applied loading

Beam loads

Dead self weight of beam $\times 1$

Door - Dead point load 1.1 kips at 102.00 in

Load combinations

Load combination 1

Support A

Dead $\times 1.40$

Live $\times 1.60$

Roof live $\times 1.60$

Snow $\times 1.60$

Dead $\times 1.40$

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Middle School				Job Ref. 20191103	
	Section Partition Beam				Sheet no./rev. 2	
	Calc. by VSW	Date 4/3/2020	Chk'd by	Date	App'd by	Date

Support B

Live $\times 1.60$
Roof live $\times 1.60$
Snow $\times 1.60$
Dead $\times 1.40$
Live $\times 1.60$
Roof live $\times 1.60$
Snow $\times 1.60$

Analysis results

Maximum moment

$M_{\max} = 7.2$ kips_{ft}

$M_{\min} = 0$ kips_{ft}

Maximum shear

$V_{\max} = 0.9$ kips

$V_{\min} = -0.9$ kips

Deflection

$\delta_{\max} = 0.1$ in

$\delta_{\min} = 0$ in

Maximum reaction at support A

$R_{A_{\max}} = 0.9$ kips

$R_{A_{\min}} = 0.9$ kips

Unfactored dead load reaction at support A

$R_{A_{\text{Dead}}} = 0.7$ kips

Maximum reaction at support B

$R_{B_{\max}} = 0.9$ kips

$R_{B_{\min}} = 0.9$ kips

Unfactored dead load reaction at support B

$R_{B_{\text{Dead}}} = 0.7$ kips

Section details

Section type

W 10x12 (AISC 15th Edn (v15.0))

ASTM steel designation

A992

Steel yield stress

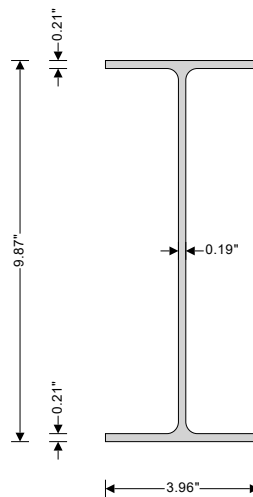
$F_y = 50$ ksi

Steel tensile stress

$F_u = 65$ ksi

Modulus of elasticity

$E = 29000$ ksi



Resistance factors

Resistance factor for tensile yielding

$\phi_{ty} = 0.90$

Resistance factor for tensile rupture

$\phi_{tr} = 0.75$

Resistance factor for compression

$\phi_c = 0.90$

Resistance factor for flexure

$\phi_b = 0.90$

Lateral bracing

Span 1 has lateral bracing at supports only

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Middle School				Job Ref. 20191103	
	Section Partition Beam				Sheet no./rev. 3	
	Calc. by VSW	Date 4/3/2020	Chk'd by	Date	App'd by	Date

Classification of sections for local buckling - Section B4.1

Classification of flanges in flexure - Table B4.1b (case 10)

Width to thickness ratio	$b_f / (2 \times t_f) = 9.43$	
Limiting ratio for compact section	$\lambda_{pff} = 0.38 \times \sqrt{E / F_y} = 9.15$	
Limiting ratio for non-compact section	$\lambda_{rff} = 1.0 \times \sqrt{E / F_y} = 24.08$	Nonslender

Classification of web in flexure - Table B4.1b (case 15)

Width to thickness ratio	$(d - 2 \times k) / t_w = 46.58$	
Limiting ratio for compact section	$\lambda_{pwf} = 3.76 \times \sqrt{E / F_y} = 90.55$	
Limiting ratio for non-compact section	$\lambda_{rwf} = 5.70 \times \sqrt{E / F_y} = 137.27$	Compact

Section is nonslender in flexure

Design of members for shear - Chapter G

Required shear strength	$V_r = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 0.913$ kips
Web area	$A_w = d \times t_w = 1.875$ in ²
Web plate buckling coefficient	$k_v = 5$
Web shear coefficient - eq G2-3	$C_v = 1$
Nominal shear strength – eq G2-1	$V_n = 0.6 \times F_y \times A_w \times C_v = 56.259$ kips
Resistance factor for shear	$\phi_v = 1.00$
Design shear strength	$V_c = \phi_v \times V_n = 56.259$ kips

PASS - Design shear strength exceeds required shear strength

Design of members for flexure in the major axis - Chapter F

Required flexural strength	$M_r = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = 7.154$ kips_ft
----------------------------	--

Compression flange local buckling - Section F3.2

	$\lambda = b_f / (2 \times t_f) = 9.429$
	$\lambda_{pff} = 0.38 \times \sqrt{E / F_y} = 9.152$
	$\lambda_{rff} = 1.0 \times \sqrt{E / F_y} = 24.083$
Plastic moment	$M_p = F_y \times Z_x = 52.500$ kips_ft
Nominal flexural strength for compression flange local buckling - eq F3-2	$M_{ncfb} = [M_p - (M_p - 0.7 \times F_y \times S_x) \times (\lambda - \lambda_{pff}) / (\lambda_{rff} - \lambda_{pff})] = 52.116$ kips_ft

Lateral-torsional buckling - Section F2.2

Unbraced length	$L_b = L_{s1} = 204$ in
Limiting unbraced length for yielding - eq F2-5	$L_p = 1.76 \times r_y \times \sqrt{E / F_y} = 33.273$ in
Distance between flange centroids	$h_o = d - t_f = 9.66$ in
	$c = 1$
	$r_{ts} = \sqrt{[(I_y \times C_w) / S_x]} = 0.983$ in

Limiting unbraced length for inelastic LTB - eq F2-6

$$L_r = 1.95 \times r_{ts} \times E / (0.7 \times F_y) \times \sqrt{[(J \times c / (S_x \times h_o)) + \sqrt{((J \times c / (S_x \times h_o))^2 + 6.76 \times (0.7 \times F_y / E)^2)}] = 96.617 \text{ in}}$$

Cross-section mono-symmetry parameter	$R_m = 1.000$
Moment at quarter point of segment	$M_A = 3.729$ kips_ft
Moment at center-line of segment	$M_B = 7.154$ kips_ft
Moment at three quarter point of segment	$M_C = 3.729$ kips_ft
Maximum moment in segment	$M_{\text{abs}} = 7.154$ kips_ft

 Jirsa Hedrick Structural Engineers 8490 E Crescent Pkwy Suite 250 Greenwood Village, CO 80111	Project Steamboat Middle School				Job Ref. 20191103	
	Section Partition Beam				Sheet no./rev. 4	
	Calc. by VSW	Date 4/3/2020	Chk'd by	Date	App'd by	Date

Lateral torsional buckling modification factor - eq F1-1 $C_b = 12.5 \times M_{abs} / [2.5 \times M_{abs} + 3 \times M_A + 4 \times M_B + 3 \times M_C] = \mathbf{1.298}$

Critical flexural stress - eq F2-4 $F_{cr} = C_b \times \pi^2 \times E / (L_b / r_{ts})^2 \times \sqrt{[1 + 0.078 \times J \times c / (S_x \times h_o)] \times (L_b / r_{ts})^2} = \mathbf{14.297 \text{ ksi}}$

Nominal flexural strength for lateral torsional buckling - eq F2-2 $M_{nlb} = F_{cr} \times S_x = \mathbf{12.987 \text{ kips_ft}}$

Nominal flexural strength $M_n = \min(M_{nlb}, M_{ncfb}) = \mathbf{12.987 \text{ kips_ft}}$

Design flexural strength $M_c = \phi_b \times M_n = \mathbf{11.688 \text{ kips_ft}}$

PASS - Design flexural strength exceeds required flexural strength

Design of members for vertical deflection

Consider deflection due to dead, live, roof live and snow loads

Limiting deflection $\delta_{lim} = \min(0.25 \text{ in}, L_{s1} / 360) = \mathbf{0.25 \text{ in}}$

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) = \mathbf{0.139 \text{ in}}$

PASS - Maximum deflection does not exceed deflection limit

Lateral Analysis

SSMS - Lateral Plan

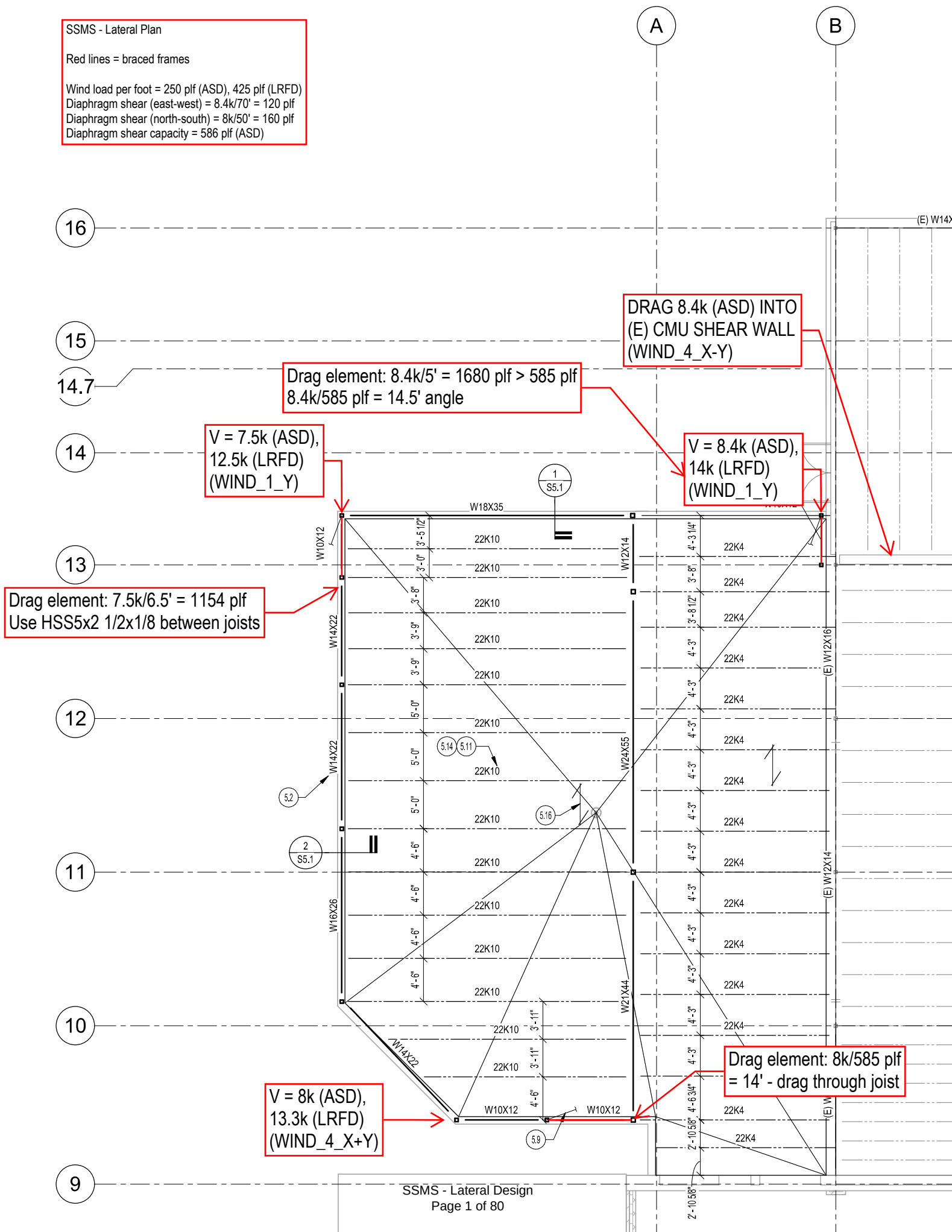
Red lines = braced frames

Wind load per foot = 250 plf (ASD), 425 plf (LRFD)

Diaphragm shear (east-west) = $8.4k/70' = 120$ plf

Diaphragm shear (north-south) = $8k/50' = 160$ plf

Diaphragm shear capacity = 586 plf (ASD)





RAM Structural System



Database: Middle School - North End Addition

Loads and Applied Forces

04/06/20 11:19:15

LOAD CASE: WIND

Wind ASCE 7-10
 Exposure: C
 Basic Wind Speed (mph): 120.0
 Apply Directionality Factor, $K_d = 0.85$
 Use Topography Factor, $K_{zt} = 1.00$
 Use Calculated Frequency for X-Dir.
 Use Calculated Frequency for Y-Dir.
 Gust Factor for Rigid Structures, G: Use Calculated G for X-Dir.
 Gust Factor for Rigid Structures, G: Use Calculated G for Y-Dir.
 Damping Ratio for Flexible Structures = 0.01
 Mean Roof Height (ft): Top Story Height + Parapet = 17.00
 Ground Level: Base

WIND PRESSURES:

X-Direction: Natural Frequency = 3.552 Structure is Rigid
 Y-Direction: Natural Frequency = 2.064 Structure is Rigid
 $C_{p\text{Windward}} = 0.80$ $q_{\text{Leeward}} (q_h) = 27.31 \text{ psf}$
 $GC_{pn} (\text{Parapet}):$ Windward = 1.50 Leeward = -1.00

Height ft	Kz	Kzt	qz psf	Gust Factor G		CpLeeward		Pressure (psf)	
				X	Y	X	Y	X	Y
17.00	0.872	1.000	27.309	----	----	----	----	68.274	68.274
15.00	0.849	1.000	26.599	0.872	0.872	-0.499	-0.500	30.455	30.473
0.00	0.849	1.000	26.599	0.872	0.872	-0.499	-0.500	30.455	30.473

Windward and Leeward Wind Pressures for Semirigid Diaphragms:

Story	Diaph. #	Windward Pressure (psf)		Leeward Pressure (psf)	
		X	Y	X	Y
Roof	1	18.564	18.562	11.890	11.911

APPLIED DIAPHRAGM FORCES

Type: Wind_ASCE710_1_X

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	26.28	0.00	2.17	35.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	26.277	0.000
		26.28	0.00



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 2/27

04/06/20 11:19:15

APPLIED STORY FORCES

Type: Wind_ASCE710_1_X

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	26.28	0.00
		<u>26.28</u>	<u>0.00</u>

APPLIED DIAPHRAGM FORCES

Type: Wind_ASCE710_1_Y

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	0.00	26.41	2.17	35.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	0.000	26.408
		<u>0.00</u>	<u>26.41</u>

APPLIED STORY FORCES

Type: Wind_ASCE710_1_Y

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	0.00	26.41
		<u>0.00</u>	<u>26.41</u>

APPLIED DIAPHRAGM FORCES

Type: Wind_ASCE710_2_X+E

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	19.71	0.00	2.17	45.80

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	19.708	0.000
		<u>19.71</u>	<u>0.00</u>



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 3/27

04/06/20 11:19:15

APPLIED STORY FORCES

Type: Wind_ASCE710_2_X+E

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	19.71	0.00
		19.71	0.00

APPLIED DIAPHRAGM FORCES

Type: Wind_ASCE710_2_X-E

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	19.71	0.00	2.17	24.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	19.708	0.000
		19.71	0.00

APPLIED STORY FORCES

Type: Wind_ASCE710_2_X-E

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	19.71	0.00
		19.71	0.00

APPLIED DIAPHRAGM FORCES

Type: Wind_ASCE710_2_Y+E

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	0.00	19.81	13.02	35.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	0.000	19.806
		0.00	19.81



RAM Structural System



RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 4/27

04/06/20 11:19:15

APPLIED STORY FORCES

Type: Wind_ASCE710_2_Y+E

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	0.00	19.81
		0.00	19.81

APPLIED DIAPHRAGM FORCES

Type: Wind_ASCE710_2_Y-E

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	0.00	19.81	-8.68	35.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	0.000	19.806
		0.00	19.81

APPLIED STORY FORCES

Type: Wind_ASCE710_2_Y-E

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	0.00	19.81
		0.00	19.81

APPLIED DIAPHRAGM FORCES

Type: Wind_ASCE710_3_X+Y

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	19.71	19.81	2.17	35.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	19.708	19.806
		19.71	19.81



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 5/27

04/06/20 11:19:15

APPLIED STORY FORCES

Type: Wind_ASCE710_3_X+Y

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	19.71	19.81
		19.71	19.81

APPLIED DIAPHRAGM FORCES

Type: Wind_ASCE710_3_X-Y

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	19.71	-19.81	2.17	35.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	19.708	-19.806
		19.71	-19.81

APPLIED STORY FORCES

Type: Wind_ASCE710_3_X-Y

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	19.71	-19.81
		19.71	-19.81

APPLIED DIAPHRAGM FORCES

Type: Wind_ASCE710_4_X+Y_CW

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	14.78	14.85	-8.68	45.80

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	14.781	14.855
		14.78	14.85



RAM Structural System



RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 6/27

04/06/20 11:19:15

APPLIED STORY FORCES

Type: Wind_ASCE710_4_X+Y_CW

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	14.78	14.85
		<u>14.78</u>	<u>14.85</u>

APPLIED DIAPHRAGM FORCES

Type: Wind_ASCE710_4_X+Y_CCW

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	14.78	14.85	13.02	24.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	14.781	14.855
		<u>14.78</u>	<u>14.85</u>

APPLIED STORY FORCES

Type: Wind_ASCE710_4_X+Y_CCW

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	14.78	14.85
		<u>14.78</u>	<u>14.85</u>

APPLIED DIAPHRAGM FORCES

Type: Wind_ASCE710_4_X-Y_CW

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	14.78	-14.85	13.02	45.80

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	14.781	-14.855
		<u>14.78</u>	<u>-14.85</u>



RAM Structural System

RAM Frame 17.00.01.09
DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 7/27
04/06/20 11:19:15

APPLIED STORY FORCES

Type: Wind_ASCE710_4_X-Y_CW

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	14.78	-14.85
		14.78	-14.85

APPLIED DIAPHRAGM FORCES

Type: Wind_ASCE710_4_X-Y_CCW

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	14.78	-14.85	-8.68	24.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	14.781	-14.855
		14.78	-14.85

APPLIED STORY FORCES

Type: Wind_ASCE710_4_X-Y_CCW

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	14.78	-14.85
		14.78	-14.85



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 8/27

04/06/20 11:19:15

LOAD CASE: SEISMIC

Seismic ASCE 7-10 Equivalent Lateral Force
 Site Class: D Importance Factor: 1.00 Ss: 0.270 g S1: 0.074 g TL: 4.00 s
 Fa: 1.584 Fv: 2.400 SDs: 0.285 g SD1: 0.118 g
 Occupancy Category: III Seismic Design Category: B
 Provisions for: Force
 Ground Level: Base

Dir	Eccent	R	Ta Equation	Building Period-T
X	+ And -	3.3	Std,Ct=0.020,x=0.75	Calculated
Y	+ And -	3.3	Std,Ct=0.030,x=0.75	Calculated

Dir	Ta	Cu	T	T-used	Cs	Cs(max)	Cs(min)	Cs-used	k
					Eq12.8-2	Eq12.8-3	Eq12.8-5		
X	0.152	1.663	0.282	0.254	0.088	0.144	0.013	0.088	1.000
Dir	Ta	Cu	T	T-used	Cs	Cs(max)	Cs(min)	Cs-used	k
					Eq12.8-2	Eq12.8-3	Eq12.8-5		
Y	0.229	1.663	0.484	0.380	0.088	0.096	0.013	0.088	1.000

Total Building Weight (kips) = 139.50

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_X+E_F

Level	Diaph.#	Ht	Fx	Fy	X	Y
		ft	kips	kips	ft	ft
Roof	1	15.00	12.24	0.00	5.73	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx	Sum Fy
		kips	kips
Roof	1	12.238	0.000
		<u>12.24</u>	<u>0.00</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_X+E_F

Level	Ht	Fx	Fy
	ft	kips	kips
Roof	15.00	12.24	0.00
		<u>12.24</u>	<u>0.00</u>



RAM Structural System

RAM Frame 17.00.01.09
DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 9/27
04/06/20 11:19:15

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_X_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	12.24	0.00	5.73	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	12.238	0.000
		<u>12.24</u>	<u>0.00</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_X_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	12.24	0.00
		<u>12.24</u>	<u>0.00</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	0.00	12.24	9.35	39.60

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	0.000	12.238
		<u>0.00</u>	<u>12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	0.00	12.24
		<u>0.00</u>	<u>12.24</u>



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 10/27

04/06/20 11:19:15

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	0.00	12.24	2.11	39.60

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	0.000	12.238
		<u>0.00</u>	<u>12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	0.00	12.24
		<u>0.00</u>	<u>12.24</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_X_+E_0.3Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	12.24	3.67	9.35	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	12.238	3.671
		<u>12.24</u>	<u>3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_X_+E_0.3Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	12.24	3.67
		<u>12.24</u>	<u>3.67</u>



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 11/27

04/06/20 11:19:15

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_X_+E_-0.3Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	12.24	-3.67	9.35	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	12.238	-3.671
		<u>12.24</u>	<u>-3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_X_+E_-0.3Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	12.24	-3.67
		<u>12.24</u>	<u>-3.67</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-X_+E_0.3Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-12.24	3.67	9.35	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-12.238	3.671
		<u>-12.24</u>	<u>3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-X_+E_0.3Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-12.24	3.67
		<u>-12.24</u>	<u>3.67</u>



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 12/27

04/06/20 11:19:15

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-X_+E_-0.3Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-12.24	-3.67	9.35	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-12.238	-3.671
		<u>-12.24</u>	<u>-3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-X_+E_-0.3Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-12.24	-3.67
		<u>-12.24</u>	<u>-3.67</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_0.3X_+E_Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	3.67	12.24	9.35	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	3.671	12.238
		<u>3.67</u>	<u>12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_0.3X_+E_Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	3.67	12.24
		<u>3.67</u>	<u>12.24</u>



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 13/27

04/06/20 11:19:15

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_0.3X_+E_-Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	3.67	-12.24	9.35	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	3.671	-12.238
		<u>3.67</u>	<u>-12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_0.3X_+E_-Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	3.67	-12.24
		<u>3.67</u>	<u>-12.24</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-0.3X_+E_Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-3.67	12.24	9.35	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-3.671	12.238
		<u>-3.67</u>	<u>12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-0.3X_+E_Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-3.67	12.24
		<u>-3.67</u>	<u>12.24</u>



RAM Structural System

RAM Frame 17.00.01.09
DataBase: Middle School - North End AdditionPage 14/27
04/06/20 11:19:15

Loads and Applied Forces

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-0.3X_+E_-Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-3.67	-12.24	9.35	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-3.671	-12.238
		<u>-3.67</u>	<u>-12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-0.3X_+E_-Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-3.67	-12.24
		<u>-3.67</u>	<u>-12.24</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_X_+E_0.3Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	12.24	3.67	2.11	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	12.238	3.671
		<u>12.24</u>	<u>3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_X_+E_0.3Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	12.24	3.67
		<u>12.24</u>	<u>3.67</u>



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 15/27

04/06/20 11:19:15

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_X_+E_-0.3Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	12.24	-3.67	2.11	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	12.238	-3.671
		<u>12.24</u>	<u>-3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_X_+E_-0.3Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	12.24	-3.67
		<u>12.24</u>	<u>-3.67</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-X_+E_0.3Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-12.24	3.67	2.11	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-12.238	3.671
		<u>-12.24</u>	<u>3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-X_+E_0.3Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-12.24	3.67
		<u>-12.24</u>	<u>3.67</u>



RAM Structural System

RAM Frame 17.00.01.09
DataBase: Middle School - North End AdditionPage 16/27
04/06/20 11:19:15

Loads and Applied Forces

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-X_+E_-0.3Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-12.24	-3.67	2.11	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-12.238	-3.671
		<u>-12.24</u>	<u>-3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-X_+E_-0.3Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-12.24	-3.67
		<u>-12.24</u>	<u>-3.67</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_0.3X_+E_Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	3.67	12.24	2.11	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	3.671	12.238
		<u>3.67</u>	<u>12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_0.3X_+E_Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	3.67	12.24
		<u>3.67</u>	<u>12.24</u>



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 17/27

04/06/20 11:19:15

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_0.3X_+E_-Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	3.67	-12.24	2.11	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	3.671	-12.238
		<u>3.67</u>	<u>-12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_0.3X_+E_-Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	3.67	-12.24
		<u>3.67</u>	<u>-12.24</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-0.3X_+E_Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-3.67	12.24	2.11	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-3.671	12.238
		<u>-3.67</u>	<u>12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-0.3X_+E_Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-3.67	12.24
		<u>-3.67</u>	<u>12.24</u>



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 18/27

04/06/20 11:19:15

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-0.3X_+E_-Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-3.67	-12.24	2.11	43.20

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-3.671	-12.238
		<u>-3.67</u>	<u>-12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-0.3X_+E_-Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-3.67	-12.24
		<u>-3.67</u>	<u>-12.24</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_X_-E_0.3Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	12.24	3.67	9.35	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	12.238	3.671
		<u>12.24</u>	<u>3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_X_-E_0.3Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	12.24	3.67
		<u>12.24</u>	<u>3.67</u>



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 19/27

04/06/20 11:19:15

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_X_-E_-0.3Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	12.24	-3.67	9.35	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	12.238	-3.671
		<u>12.24</u>	<u>-3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_X_-E_-0.3Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	12.24	-3.67
		<u>12.24</u>	<u>-3.67</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-X_-E_0.3Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-12.24	3.67	9.35	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-12.238	3.671
		<u>-12.24</u>	<u>3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-X_-E_0.3Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-12.24	3.67
		<u>-12.24</u>	<u>3.67</u>



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 20/27

04/06/20 11:19:15

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-X_-E_-0.3Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-12.24	-3.67	9.35	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-12.238	-3.671
		<u>-12.24</u>	<u>-3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-X_-E_-0.3Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-12.24	-3.67
		<u>-12.24</u>	<u>-3.67</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_0.3X_-E_Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	3.67	12.24	9.35	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	3.671	12.238
		<u>3.67</u>	<u>12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_0.3X_-E_Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	3.67	12.24
		<u>3.67</u>	<u>12.24</u>



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 21/27

04/06/20 11:19:15

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_0.3X_-E_-Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	3.67	-12.24	9.35	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	3.671	-12.238
		<u>3.67</u>	<u>-12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_0.3X_-E_-Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	3.67	-12.24
		<u>3.67</u>	<u>-12.24</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-0.3X_-E_Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-3.67	12.24	9.35	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-3.671	12.238
		<u>-3.67</u>	<u>12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-0.3X_-E_Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-3.67	12.24
		<u>-3.67</u>	<u>12.24</u>



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 22/27

04/06/20 11:19:15

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-0.3X_-E_-Y_+E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-3.67	-12.24	9.35	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-3.671	-12.238
		<u>-3.67</u>	<u>-12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-0.3X_-E_-Y_+E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-3.67	-12.24
		<u>-3.67</u>	<u>-12.24</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_X_-E_0.3Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	12.24	3.67	2.11	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	12.238	3.671
		<u>12.24</u>	<u>3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_X_-E_0.3Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	12.24	3.67
		<u>12.24</u>	<u>3.67</u>



RAM Structural System



DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 23/27

04/06/20 11:19:15

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_X_-E_-0.3Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	12.24	-3.67	2.11	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	12.238	-3.671
		<u>12.24</u>	<u>-3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_X_-E_-0.3Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	12.24	-3.67
		<u>12.24</u>	<u>-3.67</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-X_-E_0.3Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-12.24	3.67	2.11	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-12.238	3.671
		<u>-12.24</u>	<u>3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-X_-E_0.3Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-12.24	3.67
		<u>-12.24</u>	<u>3.67</u>



RAM Structural System

RAM Frame 17.00.01.09
DataBase: Middle School - North End AdditionPage 24/27
04/06/20 11:19:15

Loads and Applied Forces

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-X_-E_-0.3Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-12.24	-3.67	2.11	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-12.238	-3.671
		<u>-12.24</u>	<u>-3.67</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-X_-E_-0.3Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-12.24	-3.67
		<u>-12.24</u>	<u>-3.67</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_0.3X_-E_Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	3.67	12.24	2.11	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	3.671	12.238
		<u>3.67</u>	<u>12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_0.3X_-E_Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	3.67	12.24
		<u>3.67</u>	<u>12.24</u>



RAM Structural System

RAM Frame 17.00.01.09
DataBase: Middle School - North End AdditionPage 25/27
04/06/20 11:19:15

Loads and Applied Forces

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_0.3X_-E_-Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	3.67	-12.24	2.11	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	3.671	-12.238
		<u>3.67</u>	<u>-12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_0.3X_-E_-Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	3.67	-12.24
		<u>3.67</u>	<u>-12.24</u>

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-0.3X_-E_Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-3.67	12.24	2.11	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-3.671	12.238
		<u>-3.67</u>	<u>12.24</u>

APPLIED STORY FORCES

Type: EQ_ASCE710_-0.3X_-E_Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-3.67	12.24
		<u>-3.67</u>	<u>12.24</u>



RAM Structural System

RAM Frame 17.00.01.09
DataBase: Middle School - North End Addition

Loads and Applied Forces

Page 26/27
04/06/20 11:19:15

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE710_-0.3X_-E_-Y_-E_F

Level	Diaph.#	Ht ft	Fx kips	Fy kips	X ft	Y ft
Roof	1	15.00	-3.67	-12.24	2.11	36.00

Applied Loads for Pseudo-Flexible or Semirigid Diaphragms:

Story	Diaph #	Sum Fx kips	Sum Fy kips
Roof	1	-3.671	-12.238
		-3.67	-12.24

APPLIED STORY FORCES

Type: EQ_ASCE710_-0.3X_-E_-Y_-E_F

Level	Ht ft	Fx kips	Fy kips
Roof	15.00	-3.67	-12.24
		-3.67	-12.24



RAM Structural System



Loads and Applied Forces

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Page 27/27

04/06/20 11:19:15

LOAD MULTIPLIERS FOR ECCENTRIC LOADING ON SEMIRIGID DIAPHRAGM:SEISMIC AND RESPONSE SPECTRA LOAD CASES

Story : Roof Diaph. #: 1

Loading Direction	Top Region	Bottom Region	Left Region	Right Region
+X	1.19	0.80	---	---
-X	0.81	1.20	---	---
+Y	---	---	0.79	1.19
-Y	---	---	1.21	0.81



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

04/06/20 11:20:22

Building Code: IBC

STEEL COLUMN INFORMATION:

Column Number: 9**Frame Number: 1**

Level Top: Roof

Column Line (-2.42,7.00)

Bot: Base

Fy (ksi) = 46.00

Column Size = HSS5X5X5/16

Elastic Modulus (ksi) = 29000

Orientation (deg) = 0.00

Length (ft) = 15.00

INPUT PARAMETERS:

		Top	Bottom
Fixity	Major Axis:	Fix	Fix
	Minor Axis:	Fix	Fix
	Torsion:	Fix	Fix
Joint Face Dist (in):			
	Major:	4.93	0.00
	Minor:	0.00	0.00
Rigid End Zone (in):			
	Major:	0.00	0.00 (Ignore)
	Minor:	0.00	0.00 (Ignore)

Member Force Output:

At Face of Joint

P-Delta: Yes

Scale Factor: 1.00

Ground Level: Base

LOAD CASE DEFINITIONS:

D	DeadLoad	RAMUSER
Sp	PosSnowLoad	RAMUSER
W1	WIND	Wind_ASCE710_1_X
W2	WIND	Wind_ASCE710_1_Y
W3	WIND	Wind_ASCE710_2_X+E
W4	WIND	Wind_ASCE710_2_X-E
W5	WIND	Wind_ASCE710_2_Y+E
W6	WIND	Wind_ASCE710_2_Y-E
W7	WIND	Wind_ASCE710_3_X+Y
W8	WIND	Wind_ASCE710_3_X-Y
W9	WIND	Wind_ASCE710_4_X+Y_CW
W10	WIND	Wind_ASCE710_4_X+Y_CCW
W11	WIND	Wind_ASCE710_4_X-Y_CW
W12	WIND	Wind_ASCE710_4_X-Y_CCW
E1	SEISMIC	EQ_ASCE710_X_+E_F
E2	SEISMIC	EQ_ASCE710_X_-E_F
E3	SEISMIC	EQ_ASCE710_Y_+E_F
E4	SEISMIC	EQ_ASCE710_Y_-E_F
E5	SEISMIC	EQ_ASCE710_X_+E_0.3Y_+E_F
E6	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_+E_F
E7	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_+E_F
E8	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_+E_F

CSMS - Lateral Design



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 2/36

04/06/20 11:20:22

E9	SEISMIC	EQ_ASCE710_0.3X_+E_Y_+E_F
E10	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_+E_F
E11	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_+E_F
E12	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_+E_F
E13	SEISMIC	EQ_ASCE710_X_+E_0.3Y_-E_F
E14	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_-E_F
E15	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_-E_F
E16	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_-E_F
E17	SEISMIC	EQ_ASCE710_0.3X_+E_Y_-E_F
E18	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_-E_F
E19	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_-E_F
E20	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_-E_F
E21	SEISMIC	EQ_ASCE710_X_-E_0.3Y_+E_F
E22	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_+E_F
E23	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_+E_F
E24	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_+E_F
E25	SEISMIC	EQ_ASCE710_0.3X_-E_Y_+E_F
E26	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_+E_F
E27	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_+E_F
E28	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_+E_F
E29	SEISMIC	EQ_ASCE710_X_-E_0.3Y_-E_F
E30	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_-E_F
E31	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_-E_F
E32	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_-E_F
E33	SEISMIC	EQ_ASCE710_0.3X_-E_Y_-E_F
E34	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_-E_F
E35	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_-E_F
E36	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_-E_F

LOAD COMBINATIONS: IBC 2015 / ASCE 7-10 LRFD

No. of Generated Combinations: 314

No. of Generated Combinations Selected to Use: 314

MEMBER FORCE MAXIMA AND MINIMA

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
	kips	kip-ft	kip-ft	kips	kips	kip-ft
Max @ T:	49.59	0.68	0.00	0.08	0.07	0.04
LC:	12	96	91	36	40	36
Max @ B:	49.59	1.08	1.35	0.08	0.07	0.04
LC:	12	36	76	36	40	36
Maximum:	49.59	1.08	1.35	0.08	0.07	0.04
LC:	12	36	76	36	40	36
@ (ft):	0.41	15.00	15.00	0.41	0.00	0.41



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 3/36

04/06/20 11:20:22

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
Min @ T:	7.43	-0.96	-0.00	-0.05	-0.06	-0.04
LC:	266	36	31	96	76	96
Min @ B:	7.43	-0.90	-1.39	-0.05	-0.06	-0.04
LC:	266	96	40	96	76	96
Minimum:	7.43	-0.96	-1.39	-0.05	-0.06	-0.04
LC:	266	36	40	96	76	96
@ (ft):	0.41	0.41	15.00	0.41	0.00	0.41



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 4/36

04/06/20 11:20:22

STEEL COLUMN INFORMATION:

Column Number: 20**Frame Number: 1**

Level Top: Roof

Column Line (-11.42,7.00)

Bot: Base

Fy (ksi) = 50.00

Column Size = HSS4X4X5/16

Elastic Modulus (ksi) = 29000

Orientation (deg) = 0.00

Length (ft) = 15.00

INPUT PARAMETERS:

		Top	Bottom
Fixity	Major Axis:	Fix	Fix
	Minor Axis:	Fix	Fix
	Torsion:	Fix	Fix
Joint Face Dist (in):			
	Major:	4.93	0.00
	Minor:	0.00	0.00
Rigid End Zone (in):			
	Major:	0.00	0.00 (Ignore)
	Minor:	0.00	0.00 (Ignore)

Member Force Output:

At Face of Joint

P-Delta: Yes

Scale Factor: 1.00

Ground Level: Base

LOAD CASE DEFINITIONS:

D	DeadLoad	RAMUSER
Sp	PosSnowLoad	RAMUSER
W1	WIND	Wind_ASCE710_1_X
W2	WIND	Wind_ASCE710_1_Y
W3	WIND	Wind_ASCE710_2_X+E
W4	WIND	Wind_ASCE710_2_X-E
W5	WIND	Wind_ASCE710_2_Y+E
W6	WIND	Wind_ASCE710_2_Y-E
W7	WIND	Wind_ASCE710_3_X+Y
W8	WIND	Wind_ASCE710_3_X-Y
W9	WIND	Wind_ASCE710_4_X+Y_CW
W10	WIND	Wind_ASCE710_4_X+Y_CCW
W11	WIND	Wind_ASCE710_4_X-Y_CW
W12	WIND	Wind_ASCE710_4_X-Y_CCW
E1	SEISMIC	EQ_ASCE710_X_+E_F
E2	SEISMIC	EQ_ASCE710_X_-E_F
E3	SEISMIC	EQ_ASCE710_Y_+E_F
E4	SEISMIC	EQ_ASCE710_Y_-E_F
E5	SEISMIC	EQ_ASCE710_X_+E_0.3Y_+E_F
E6	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_+E_F
E7	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_+E_F
E8	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_+E_F

CSMS - Lateral Design



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 5/36

04/06/20 11:20:22

E9	SEISMIC	EQ_ASCE710_0.3X_+E_Y_+E_F
E10	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_+E_F
E11	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_+E_F
E12	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_+E_F
E13	SEISMIC	EQ_ASCE710_X_+E_0.3Y_-E_F
E14	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_-E_F
E15	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_-E_F
E16	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_-E_F
E17	SEISMIC	EQ_ASCE710_0.3X_+E_Y_-E_F
E18	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_-E_F
E19	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_-E_F
E20	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_-E_F
E21	SEISMIC	EQ_ASCE710_X_-E_0.3Y_+E_F
E22	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_+E_F
E23	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_+E_F
E24	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_+E_F
E25	SEISMIC	EQ_ASCE710_0.3X_-E_Y_+E_F
E26	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_+E_F
E27	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_+E_F
E28	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_+E_F
E29	SEISMIC	EQ_ASCE710_X_-E_0.3Y_-E_F
E30	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_-E_F
E31	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_-E_F
E32	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_-E_F
E33	SEISMIC	EQ_ASCE710_0.3X_-E_Y_-E_F
E34	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_-E_F
E35	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_-E_F
E36	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_-E_F

LOAD COMBINATIONS: IBC 2015 / ASCE 7-10 LRFD

No. of Generated Combinations: 314

No. of Generated Combinations Selected to Use: 314

MEMBER FORCE MAXIMA AND MINIMA

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
	kips	kip-ft	kip-ft	kips	kips	kip-ft
Max @ T:	23.48	0.86	0.00	0.04	0.02	0.01
LC:	48	24	31	84	76	49
Max @ B:	23.48	0.43	0.78	0.04	0.02	0.01
LC:	48	84	76	84	76	49
Maximum:	23.48	0.86	0.78	0.04	0.02	0.01
LC:	48	24	76	84	76	49
@ (ft):	0.41	0.41	15.00	0.41	0.00	0.41



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 6/36

04/06/20 11:20:22

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
Min @ T:	-21.59	-0.29	-0.00	-0.10	-0.03	-0.01
LC:	84	84	91	24	40	85
Min @ B:	-21.59	-0.66	-0.80	-0.10	-0.03	-0.01
LC:	84	48	40	24	40	85
Minimum:	-21.59	-0.66	-0.80	-0.10	-0.03	-0.01
LC:	84	48	40	24	40	85
@ (ft):	0.41	15.00	15.00	0.41	0.00	0.41



RAM Structural System



RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Member Force Envelope

Page 7/36

04/06/20 11:20:22

STEEL BEAM INFORMATION:**Beam Number: 63**

Level: Roof

Fy (ksi) = 50.00

Length (ft) = 9.00

Elastic Modulus (ksi) = 29000

Frame Number: 1

I-End (-11.42,7.00)

J-End (-2.42,7.00)

Beam Size = W10X12

INPUT PARAMETERS:

Fixity Major Axis:

Minor Axis:

Torsion:

Rigid End Zone (in):

I-End

Fix

Fix

Fix

0.00

J-End

Fix

Fix

Fix

0.00 (Ignore)

Member Force Output:

P-Delta: Yes

Ground Level: Base

At Face of Joint

Scale Factor: 1.00

LOAD CASE DEFINITIONS:

D	DeadLoad	RAMUSER
Sp	PosSnowLoad	RAMUSER
W1	WIND	Wind_ASCE710_1_X
W2	WIND	Wind_ASCE710_1_Y
W3	WIND	Wind_ASCE710_2_X+E
W4	WIND	Wind_ASCE710_2_X-E
W5	WIND	Wind_ASCE710_2_Y+E
W6	WIND	Wind_ASCE710_2_Y-E
W7	WIND	Wind_ASCE710_3_X+Y
W8	WIND	Wind_ASCE710_3_X-Y
W9	WIND	Wind_ASCE710_4_X+Y_CW
W10	WIND	Wind_ASCE710_4_X+Y_CCW
W11	WIND	Wind_ASCE710_4_X-Y_CW
W12	WIND	Wind_ASCE710_4_X-Y_CCW
E1	SEISMIC	EQ_ASCE710_X_+E_F
E2	SEISMIC	EQ_ASCE710_X_-E_F
E3	SEISMIC	EQ_ASCE710_Y_+E_F
E4	SEISMIC	EQ_ASCE710_Y_-E_F
E5	SEISMIC	EQ_ASCE710_X_+E_0.3Y_+E_F
E6	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_+E_F
E7	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_+E_F
E8	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_+E_F
E9	SEISMIC	EQ_ASCE710_0.3X_+E_Y_+E_F
E10	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_+E_F
E11	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_+E_F
E12	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_+E_F
E13	SEISMIC	EQ_ASCE710_X_+E_0.3Y_-E_F

CSMS - Lateral Design

Page 35 of 80



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 8/36

04/06/20 11:20:22

E14	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_-E_F
E15	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_-E_F
E16	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_-E_F
E17	SEISMIC	EQ_ASCE710_0.3X_+E_Y_-E_F
E18	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_-E_F
E19	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_-E_F
E20	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_-E_F
E21	SEISMIC	EQ_ASCE710_X_-E_0.3Y_+E_F
E22	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_+E_F
E23	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_+E_F
E24	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_+E_F
E25	SEISMIC	EQ_ASCE710_0.3X_-E_Y_+E_F
E26	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_+E_F
E27	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_+E_F
E28	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_+E_F
E29	SEISMIC	EQ_ASCE710_X_-E_0.3Y_-E_F
E30	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_-E_F
E31	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_-E_F
E32	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_-E_F
E33	SEISMIC	EQ_ASCE710_0.3X_-E_Y_-E_F
E34	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_-E_F
E35	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_-E_F
E36	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_-E_F

LOAD COMBINATIONS: IBC 2015 / ASCE 7-10 LRFD

No. of Generated Combinations: 314

No. of Generated Combinations Selected to Use: 314

MEMBER FORCE MAXIMA AND MINIMA

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
	kips	kip-ft	kip-ft	kips	kips	kip-ft
Max @ i:	9.15	0.34	0.08	2.01	0.07	0.00
LC:	96	84	36	24	96	91
Max @ j:	4.49	0.74	0.07	-0.17	0.11	0.00
LC:	96	96	96	96	96	91
Maximum:	9.15	4.00	0.15	2.01	0.11	0.00
LC:	96	24	36	24	96	91
@ (ft):	0.00	4.82	6.75	0.17	6.75	0.00
Min @ i:	-9.56	-0.56	-0.07	0.19	-0.08	-0.00
LC:	36	48	96	84	36	31
Min @ j:	-4.65	-0.78	-0.08	-1.90	-0.11	-0.00
LC:	36	36	36	12	36	31



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 9/36

04/06/20 11:20:22

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
Minimum:	-9.56	-0.78	-0.15	-1.90	-0.11	-0.00
LC:	36	36	96	12	36	31
@ (ft):	0.00	8.79	6.75	8.79	6.75	6.75



RAM Structural System



RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Member Force Envelope

Page 10/36

04/06/20 11:20:22

STEEL BRACE INFORMATION:

Brace Number: 10

Story Top: Roof

Bot: Base

Fy (ksi) = 46.00

Length (ft) = 17.49

Elastic Modulus (ksi) = 29000

Frame Number: 1

I-End (ft): (-11.42,7.00)

J-End (ft): (-2.42,7.00)

Brace Size = HSS4X4X5/16

INPUT PARAMETERS:

Fixity

Major Axis:

Minor Axis:

Torsion:

Member Force Output:

P-Delta: Yes

Ground Level: Base

Top

Pin

Pin

Pin

Bottom

Pin

Pin

Pin

At Centerline of Joint

Scale Factor: 1.00

LOAD CASE DEFINITIONS:

D	DeadLoad	RAMUSER
Sp	PosSnowLoad	RAMUSER
W1	WIND	Wind_ASCE710_1_X
W2	WIND	Wind_ASCE710_1_Y
W3	WIND	Wind_ASCE710_2_X+E
W4	WIND	Wind_ASCE710_2_X-E
W5	WIND	Wind_ASCE710_2_Y+E
W6	WIND	Wind_ASCE710_2_Y-E
W7	WIND	Wind_ASCE710_3_X+Y
W8	WIND	Wind_ASCE710_3_X-Y
W9	WIND	Wind_ASCE710_4_X+Y_CW
W10	WIND	Wind_ASCE710_4_X+Y_CCW
W11	WIND	Wind_ASCE710_4_X-Y_CW
W12	WIND	Wind_ASCE710_4_X-Y_CCW
E1	SEISMIC	EQ_ASCE710_X_+E_F
E2	SEISMIC	EQ_ASCE710_X_-E_F
E3	SEISMIC	EQ_ASCE710_Y_+E_F
E4	SEISMIC	EQ_ASCE710_Y_-E_F
E5	SEISMIC	EQ_ASCE710_X_+E_0.3Y_+E_F
E6	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_+E_F
E7	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_+E_F
E8	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_+E_F
E9	SEISMIC	EQ_ASCE710_0.3X_+E_Y_+E_F
E10	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_+E_F
E11	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_+E_F
E12	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_+E_F
E13	SEISMIC	EQ_ASCE710_X_+E_0.3Y_-E_F
E14	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_-E_F



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 11/36

04/06/20 11:20:22

E15	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_-E_F
E16	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_-E_F
E17	SEISMIC	EQ_ASCE710_0.3X_+E_Y_-E_F
E18	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_-E_F
E19	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_-E_F
E20	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_-E_F
E21	SEISMIC	EQ_ASCE710_X_-E_0.3Y_+E_F
E22	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_+E_F
E23	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_+E_F
E24	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_+E_F
E25	SEISMIC	EQ_ASCE710_0.3X_-E_Y_+E_F
E26	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_+E_F
E27	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_+E_F
E28	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_+E_F
E29	SEISMIC	EQ_ASCE710_X_-E_0.3Y_-E_F
E30	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_-E_F
E31	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_-E_F
E32	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_-E_F
E33	SEISMIC	EQ_ASCE710_0.3X_-E_Y_-E_F
E34	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_-E_F
E35	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_-E_F
E36	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_-E_F

LOAD COMBINATIONS: IBC 2015 / ASCE 7-10 LRFD

No. of Generated Combinations: 314

No. of Generated Combinations Selected to Use: 314

MEMBER FORCE MAXIMA AND MINIMA

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
	kips	kip-ft	kip-ft	kips	kips	kip-ft
Max @ T:	26.64	0.00	0.00	0.00	0.00	0.00
LC:	36	1	1	84	76	1
Max @ B:	26.64	0.00	0.00	0.00	0.00	0.00
LC:	36	1	1	84	76	1
Maximum:	26.64	0.00	0.00	0.00	0.00	0.00
LC:	36	1	1	84	76	1
@ (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Min @ T:	-25.32	0.00	0.00	-0.00	-0.00	0.00
LC:	96	1	1	48	40	1
Min @ B:	-25.32	0.00	0.00	-0.00	-0.00	0.00
LC:	96	1	1	48	40	1
Minimum:	-25.32	0.00	0.00	-0.00	-0.00	0.00



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 12/36

04/06/20 11:20:22

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
LC:	96	1	1	48	40	1
@ (ft):	0.00	0.00	0.00	0.00	0.00	0.00



RAM Structural System



RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Member Force Envelope

Page 13/36

04/06/20 11:20:22

STEEL COLUMN INFORMATION:**Column Number: 12****Frame Number: 2**

Level Top: Roof

Column Line (-33.00,70.00)

Bot: Base

Fy (ksi) = 46.00

Column Size = HSS4X4X5/16

Elastic Modulus (ksi) = 29000

Orientation (deg) = 90.00

Length (ft) = 15.00

INPUT PARAMETERS:

		Top	Bottom
Fixity	Major Axis:	Fix	Fix
	Minor Axis:	Fix	Fix
	Torsion:	Fix	Fix
Joint Face Dist (in):			
	Major:	4.93	0.00
	Minor:	0.00	0.00
Rigid End Zone (in):			
	Major:	0.00	0.00 (Ignore)
	Minor:	0.00	0.00 (Ignore)

Member Force Output:

At Face of Joint

P-Delta: Yes

Scale Factor: 1.00

Ground Level: Base

LOAD CASE DEFINITIONS:

D	DeadLoad	RAMUSER
Sp	PosSnowLoad	RAMUSER
W1	WIND	Wind_ASCE710_1_X
W2	WIND	Wind_ASCE710_1_Y
W3	WIND	Wind_ASCE710_2_X+E
W4	WIND	Wind_ASCE710_2_X-E
W5	WIND	Wind_ASCE710_2_Y+E
W6	WIND	Wind_ASCE710_2_Y-E
W7	WIND	Wind_ASCE710_3_X+Y
W8	WIND	Wind_ASCE710_3_X-Y
W9	WIND	Wind_ASCE710_4_X+Y_CW
W10	WIND	Wind_ASCE710_4_X+Y_CCW
W11	WIND	Wind_ASCE710_4_X-Y_CW
W12	WIND	Wind_ASCE710_4_X-Y_CCW
E1	SEISMIC	EQ_ASCE710_X_+E_F
E2	SEISMIC	EQ_ASCE710_X_-E_F
E3	SEISMIC	EQ_ASCE710_Y_+E_F
E4	SEISMIC	EQ_ASCE710_Y_-E_F
E5	SEISMIC	EQ_ASCE710_X_+E_0.3Y_+E_F
E6	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_+E_F
E7	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_+E_F
E8	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_+E_F

CSMS - Lateral Design



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 14/36

04/06/20 11:20:22

E9	SEISMIC	EQ_ASCE710_0.3X_+E_Y_+E_F
E10	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_+E_F
E11	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_+E_F
E12	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_+E_F
E13	SEISMIC	EQ_ASCE710_X_+E_0.3Y_-E_F
E14	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_-E_F
E15	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_-E_F
E16	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_-E_F
E17	SEISMIC	EQ_ASCE710_0.3X_+E_Y_-E_F
E18	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_-E_F
E19	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_-E_F
E20	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_-E_F
E21	SEISMIC	EQ_ASCE710_X_-E_0.3Y_+E_F
E22	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_+E_F
E23	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_+E_F
E24	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_+E_F
E25	SEISMIC	EQ_ASCE710_0.3X_-E_Y_+E_F
E26	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_+E_F
E27	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_+E_F
E28	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_+E_F
E29	SEISMIC	EQ_ASCE710_X_-E_0.3Y_-E_F
E30	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_-E_F
E31	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_-E_F
E32	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_-E_F
E33	SEISMIC	EQ_ASCE710_0.3X_-E_Y_-E_F
E34	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_-E_F
E35	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_-E_F
E36	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_-E_F

LOAD COMBINATIONS: IBC 2015 / ASCE 7-10 LRFD

No. of Generated Combinations: 314

No. of Generated Combinations Selected to Use: 314

MEMBER FORCE MAXIMA AND MINIMA

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
	kips	kip-ft	kip-ft	kips	kips	kip-ft
Max @ T:	11.75	0.49	0.00	0.12	0.02	0.09
LC:	4	88	88	28	46	28
Max @ B:	11.75	0.89	0.34	0.12	0.02	0.09
LC:	4	28	46	28	46	28
Maximum:	11.75	0.89	0.34	0.12	0.02	0.09
LC:	4	28	46	28	46	28
@ (ft):	0.41	15.00	15.00	0.41	0.00	0.41



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 15/36

04/06/20 11:20:22

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
Min @ T:	2.16	-0.97	-0.00	-0.08	-0.02	-0.08
LC:	276	4	28	88	82	88
Min @ B:	2.16	-0.75	-0.31	-0.08	-0.02	-0.08
LC:	276	88	82	88	82	88
Minimum:	2.16	-0.97	-0.31	-0.08	-0.02	-0.08
LC:	276	4	82	88	82	88
@ (ft):	0.41	0.41	15.00	0.41	0.00	0.41



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 16/36

04/06/20 11:20:22

STEEL COLUMN INFORMATION:

Column Number: 19**Frame Number: 2**

Level Top: Roof

Column Line (-33.00,63.50)

Bot: Base

Fy (ksi) = 46.00

Column Size = HSS4X4X5/16

Elastic Modulus (ksi) = 29000

Orientation (deg) = 90.00

Length (ft) = 15.00

INPUT PARAMETERS:

		Top	Bottom
Fixity	Major Axis:	Fix	Fix
	Minor Axis:	Fix	Fix
	Torsion:	Fix	Fix
Joint Face Dist (in):			
	Major:	4.93	0.00
	Minor:	0.00	0.00
Rigid End Zone (in):			
	Major:	0.00	0.00 (Ignore)
	Minor:	0.00	0.00 (Ignore)

Member Force Output:

At Face of Joint

P-Delta: Yes

Scale Factor: 1.00

Ground Level: Base

LOAD CASE DEFINITIONS:

D	DeadLoad	RAMUSER
Sp	PosSnowLoad	RAMUSER
W1	WIND	Wind_ASCE710_1_X
W2	WIND	Wind_ASCE710_1_Y
W3	WIND	Wind_ASCE710_2_X+E
W4	WIND	Wind_ASCE710_2_X-E
W5	WIND	Wind_ASCE710_2_Y+E
W6	WIND	Wind_ASCE710_2_Y-E
W7	WIND	Wind_ASCE710_3_X+Y
W8	WIND	Wind_ASCE710_3_X-Y
W9	WIND	Wind_ASCE710_4_X+Y_CW
W10	WIND	Wind_ASCE710_4_X+Y_CCW
W11	WIND	Wind_ASCE710_4_X-Y_CW
W12	WIND	Wind_ASCE710_4_X-Y_CCW
E1	SEISMIC	EQ_ASCE710_X_+E_F
E2	SEISMIC	EQ_ASCE710_X_-E_F
E3	SEISMIC	EQ_ASCE710_Y_+E_F
E4	SEISMIC	EQ_ASCE710_Y_-E_F
E5	SEISMIC	EQ_ASCE710_X_+E_0.3Y_+E_F
E6	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_+E_F
E7	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_+E_F
E8	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_+E_F

CSMS - Lateral Design



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 17/36

04/06/20 11:20:22

E9	SEISMIC	EQ_ASCE710_0.3X_+E_Y_+E_F
E10	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_+E_F
E11	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_+E_F
E12	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_+E_F
E13	SEISMIC	EQ_ASCE710_X_+E_0.3Y_-E_F
E14	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_-E_F
E15	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_-E_F
E16	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_-E_F
E17	SEISMIC	EQ_ASCE710_0.3X_+E_Y_-E_F
E18	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_-E_F
E19	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_-E_F
E20	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_-E_F
E21	SEISMIC	EQ_ASCE710_X_-E_0.3Y_+E_F
E22	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_+E_F
E23	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_+E_F
E24	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_+E_F
E25	SEISMIC	EQ_ASCE710_0.3X_-E_Y_+E_F
E26	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_+E_F
E27	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_+E_F
E28	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_+E_F
E29	SEISMIC	EQ_ASCE710_X_-E_0.3Y_-E_F
E30	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_-E_F
E31	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_-E_F
E32	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_-E_F
E33	SEISMIC	EQ_ASCE710_0.3X_-E_Y_-E_F
E34	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_-E_F
E35	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_-E_F
E36	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_-E_F

LOAD COMBINATIONS: IBC 2015 / ASCE 7-10 LRFD

No. of Generated Combinations: 314

No. of Generated Combinations Selected to Use: 314

MEMBER FORCE MAXIMA AND MINIMA

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
	kips	kip-ft	kip-ft	kips	kips	kip-ft
Max @ T:	36.37	1.32	0.00	0.03	0.01	0.07
LC:	40	16	28	76	75	28
Max @ B:	36.37	0.60	0.19	0.03	0.01	0.07
LC:	40	76	39	76	75	28
Maximum:	36.37	1.32	0.19	0.03	0.01	0.07
LC:	40	16	39	76	75	28
@ (ft):	0.41	0.41	15.00	0.41	0.00	0.41



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 18/36

04/06/20 11:20:22

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
Min @ T:	-25.83	-0.43	-0.00	-0.14	-0.01	-0.07
LC:	76	76	88	16	39	88
Min @ B:	-25.83	-1.07	-0.18	-0.14	-0.01	-0.07
LC:	76	16	75	16	39	88
Minimum:	-25.83	-1.07	-0.18	-0.14	-0.01	-0.07
LC:	76	16	75	16	39	88
@ (ft):	0.41	15.00	15.00	0.41	0.00	0.41



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 19/36

04/06/20 11:20:22

STEEL BEAM INFORMATION:

Beam Number: 62

Level: Roof

Fy (ksi) = 50.00

Length (ft) = 6.50

Elastic Modulus (ksi) = 29000

Frame Number: 2

I-End (-33.00,63.50)

J-End (-33.00,70.00)

Beam Size = W10X12

INPUT PARAMETERS:

Fixity Major Axis:

Minor Axis:

Torsion:

Rigid End Zone (in):

I-End

Fix

Fix

Fix

0.00

J-End

Fix

Fix

Fix

0.00 (Ignore)

Member Force Output:

P-Delta: Yes

Ground Level: Base

At Face of Joint

Scale Factor: 1.00

LOAD CASE DEFINITIONS:

D	DeadLoad	RAMUSER
Sp	PosSnowLoad	RAMUSER
W1	WIND	Wind_ASCE710_1_X
W2	WIND	Wind_ASCE710_1_Y
W3	WIND	Wind_ASCE710_2_X+E
W4	WIND	Wind_ASCE710_2_X-E
W5	WIND	Wind_ASCE710_2_Y+E
W6	WIND	Wind_ASCE710_2_Y-E
W7	WIND	Wind_ASCE710_3_X+Y
W8	WIND	Wind_ASCE710_3_X-Y
W9	WIND	Wind_ASCE710_4_X+Y_CW
W10	WIND	Wind_ASCE710_4_X+Y_CCW
W11	WIND	Wind_ASCE710_4_X-Y_CW
W12	WIND	Wind_ASCE710_4_X-Y_CCW
E1	SEISMIC	EQ_ASCE710_X_+E_F
E2	SEISMIC	EQ_ASCE710_X_-E_F
E3	SEISMIC	EQ_ASCE710_Y_+E_F
E4	SEISMIC	EQ_ASCE710_Y_-E_F
E5	SEISMIC	EQ_ASCE710_X_+E_0.3Y_+E_F
E6	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_+E_F
E7	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_+E_F
E8	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_+E_F
E9	SEISMIC	EQ_ASCE710_0.3X_+E_Y_+E_F
E10	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_+E_F
E11	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_+E_F
E12	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_+E_F
E13	SEISMIC	EQ_ASCE710_X_+E_0.3Y_-E_F

CSMS - Lateral Design

Page 47 of 80



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 20/36

04/06/20 11:20:22

E14	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_-E_F
E15	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_-E_F
E16	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_-E_F
E17	SEISMIC	EQ_ASCE710_0.3X_+E_Y_-E_F
E18	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_-E_F
E19	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_-E_F
E20	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_-E_F
E21	SEISMIC	EQ_ASCE710_X_-E_0.3Y_+E_F
E22	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_+E_F
E23	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_+E_F
E24	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_+E_F
E25	SEISMIC	EQ_ASCE710_0.3X_-E_Y_+E_F
E26	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_+E_F
E27	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_+E_F
E28	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_+E_F
E29	SEISMIC	EQ_ASCE710_X_-E_0.3Y_-E_F
E30	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_-E_F
E31	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_-E_F
E32	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_-E_F
E33	SEISMIC	EQ_ASCE710_0.3X_-E_Y_-E_F
E34	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_-E_F
E35	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_-E_F
E36	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_-E_F

LOAD COMBINATIONS: IBC 2015 / ASCE 7-10 LRFD

No. of Generated Combinations: 314

No. of Generated Combinations Selected to Use: 314

MEMBER FORCE MAXIMA AND MINIMA

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
	kips	kip-ft	kip-ft	kips	kips	kip-ft
Max @ i:	3.46	0.64	0.10	7.44	0.08	0.00
LC:	88	28	88	16	28	88
Max @ j:	1.14	0.58	0.07	-0.34	0.04	0.00
LC:	92	88	28	88	28	88
Maximum:	3.46	13.43	0.15	7.44	0.08	0.00
LC:	88	4	28	16	28	88
@ (ft):	0.00	2.02	3.25	0.17	0.17	3.25
Min @ i:	-3.62	-0.55	-0.11	0.90	-0.08	-0.00
LC:	28	88	28	76	88	28
Min @ j:	-1.16	-0.64	-0.07	-3.55	-0.04	-0.00
LC:	32	28	88	4	88	28



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 21/36

04/06/20 11:20:22

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
Minimum:	-3.62	-0.64	-0.14	-3.55	-0.08	-0.00
LC:	28	28	88	4	88	28
@ (ft):	0.00	6.33	3.25	6.33	0.17	0.00



RAM Structural System



RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Member Force Envelope

Page 22/36

04/06/20 11:20:22

STEEL BRACE INFORMATION:

Brace Number: 11

Story Top: Roof

Bot: Base

Fy (ksi) = 46.00

Length (ft) = 16.35

Elastic Modulus (ksi) = 29000

Frame Number: 2

I-End (ft): (-33.00,63.50)

J-End (ft): (-33.00,70.00)

Brace Size = HSS4X4X5/16

INPUT PARAMETERS:

Fixity

Major Axis:

Minor Axis:

Torsion:

Member Force Output:

P-Delta: Yes

Ground Level: Base

Top

Pin

Pin

Pin

Bottom

Pin

Pin

Pin

At Centerline of Joint

Scale Factor: 1.00

LOAD CASE DEFINITIONS:

D	DeadLoad	RAMUSER
Sp	PosSnowLoad	RAMUSER
W1	WIND	Wind_ASCE710_1_X
W2	WIND	Wind_ASCE710_1_Y
W3	WIND	Wind_ASCE710_2_X+E
W4	WIND	Wind_ASCE710_2_X-E
W5	WIND	Wind_ASCE710_2_Y+E
W6	WIND	Wind_ASCE710_2_Y-E
W7	WIND	Wind_ASCE710_3_X+Y
W8	WIND	Wind_ASCE710_3_X-Y
W9	WIND	Wind_ASCE710_4_X+Y_CW
W10	WIND	Wind_ASCE710_4_X+Y_CCW
W11	WIND	Wind_ASCE710_4_X-Y_CW
W12	WIND	Wind_ASCE710_4_X-Y_CCW
E1	SEISMIC	EQ_ASCE710_X_+E_F
E2	SEISMIC	EQ_ASCE710_X_-E_F
E3	SEISMIC	EQ_ASCE710_Y_+E_F
E4	SEISMIC	EQ_ASCE710_Y_-E_F
E5	SEISMIC	EQ_ASCE710_X_+E_0.3Y_+E_F
E6	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_+E_F
E7	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_+E_F
E8	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_+E_F
E9	SEISMIC	EQ_ASCE710_0.3X_+E_Y_+E_F
E10	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_+E_F
E11	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_+E_F
E12	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_+E_F
E13	SEISMIC	EQ_ASCE710_X_+E_0.3Y_-E_F
E14	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_-E_F



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 23/36

04/06/20 11:20:22

E15	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_-E_F
E16	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_-E_F
E17	SEISMIC	EQ_ASCE710_0.3X_+E_Y_-E_F
E18	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_-E_F
E19	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_-E_F
E20	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_-E_F
E21	SEISMIC	EQ_ASCE710_X_-E_0.3Y_+E_F
E22	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_+E_F
E23	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_+E_F
E24	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_+E_F
E25	SEISMIC	EQ_ASCE710_0.3X_-E_Y_+E_F
E26	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_+E_F
E27	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_+E_F
E28	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_+E_F
E29	SEISMIC	EQ_ASCE710_X_-E_0.3Y_-E_F
E30	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_-E_F
E31	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_-E_F
E32	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_-E_F
E33	SEISMIC	EQ_ASCE710_0.3X_-E_Y_-E_F
E34	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_-E_F
E35	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_-E_F
E36	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_-E_F

LOAD COMBINATIONS: IBC 2015 / ASCE 7-10 LRFD

No. of Generated Combinations: 314

No. of Generated Combinations Selected to Use: 314

MEMBER FORCE MAXIMA AND MINIMA

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
	kips	kip-ft	kip-ft	kips	kips	kip-ft
Max @ T:	32.28	0.00	0.00	0.00	0.00	0.00
LC:	28	1	1	76	39	1
Max @ B:	32.28	0.00	0.00	0.00	0.00	0.00
LC:	28	1	1	76	39	1
Maximum:	32.28	0.00	0.00	0.00	0.00	0.00
LC:	28	1	1	76	39	1
@ (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Min @ T:	-30.33	0.00	0.00	-0.00	-0.00	0.00
LC:	88	1	1	40	75	1
Min @ B:	-30.33	0.00	0.00	-0.00	-0.00	0.00
LC:	88	1	1	40	75	1
Minimum:	-30.33	0.00	0.00	-0.00	-0.00	0.00



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 24/36

04/06/20 11:20:22

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
LC:	88	1	1	40	75	1
@ (ft):	0.00	0.00	0.00	0.00	0.00	0.00



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 25/36

04/06/20 11:20:22

STEEL COLUMN INFORMATION:

Column Number: 4**Frame Number: 3**

Level Top: Roof

Column Line (18.67,64.50)

Bot: Base

Fy (ksi) = 46.00

Column Size = HSS5X5X5/16

Elastic Modulus (ksi) = 29000

Orientation (deg) = 90.00

Length (ft) = 15.00

INPUT PARAMETERS:

		Top	Bottom
Fixity	Major Axis:	Fix	Fix
	Minor Axis:	Fix	Fix
	Torsion:	Fix	Fix
Joint Face Dist (in):			
	Major:	0.00	0.00
	Minor:	0.00	0.00
Rigid End Zone (in):			
	Major:	0.00	0.00 (Ignore)
	Minor:	0.00	0.00 (Ignore)

Member Force Output:

At Face of Joint

P-Delta: Yes

Scale Factor: 1.00

Ground Level: Base

LOAD CASE DEFINITIONS:

D	DeadLoad	RAMUSER
Sp	PosSnowLoad	RAMUSER
W1	WIND	Wind_ASCE710_1_X
W2	WIND	Wind_ASCE710_1_Y
W3	WIND	Wind_ASCE710_2_X+E
W4	WIND	Wind_ASCE710_2_X-E
W5	WIND	Wind_ASCE710_2_Y+E
W6	WIND	Wind_ASCE710_2_Y-E
W7	WIND	Wind_ASCE710_3_X+Y
W8	WIND	Wind_ASCE710_3_X-Y
W9	WIND	Wind_ASCE710_4_X+Y_CW
W10	WIND	Wind_ASCE710_4_X+Y_CCW
W11	WIND	Wind_ASCE710_4_X-Y_CW
W12	WIND	Wind_ASCE710_4_X-Y_CCW
E1	SEISMIC	EQ_ASCE710_X_+E_F
E2	SEISMIC	EQ_ASCE710_X_-E_F
E3	SEISMIC	EQ_ASCE710_Y_+E_F
E4	SEISMIC	EQ_ASCE710_Y_-E_F
E5	SEISMIC	EQ_ASCE710_X_+E_0.3Y_+E_F
E6	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_+E_F
E7	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_+E_F
E8	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_+E_F

CSMS - Lateral Design



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 26/36

04/06/20 11:20:22

E9	SEISMIC	EQ_ASCE710_0.3X_+E_Y_+E_F
E10	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_+E_F
E11	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_+E_F
E12	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_+E_F
E13	SEISMIC	EQ_ASCE710_X_+E_0.3Y_-E_F
E14	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_-E_F
E15	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_-E_F
E16	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_-E_F
E17	SEISMIC	EQ_ASCE710_0.3X_+E_Y_-E_F
E18	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_-E_F
E19	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_-E_F
E20	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_-E_F
E21	SEISMIC	EQ_ASCE710_X_-E_0.3Y_+E_F
E22	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_+E_F
E23	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_+E_F
E24	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_+E_F
E25	SEISMIC	EQ_ASCE710_0.3X_-E_Y_+E_F
E26	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_+E_F
E27	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_+E_F
E28	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_+E_F
E29	SEISMIC	EQ_ASCE710_X_-E_0.3Y_-E_F
E30	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_-E_F
E31	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_-E_F
E32	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_-E_F
E33	SEISMIC	EQ_ASCE710_0.3X_-E_Y_-E_F
E34	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_-E_F
E35	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_-E_F
E36	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_-E_F

LOAD COMBINATIONS: IBC 2015 / ASCE 7-10 LRFD

No. of Generated Combinations: 314

No. of Generated Combinations Selected to Use: 314

MEMBER FORCE MAXIMA AND MINIMA

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
	kips	kip-ft	kip-ft	kips	kips	kip-ft
Max @ T:	18.14	0.00	0.25	0.04	0.07	0.05
LC:	15	40	3	52	87	38
Max @ B:	15.58	1.30	0.17	0.05	0.06	0.05
LC:	25	52	49	76	49	36
Maximum:	18.14	1.30	0.25	0.05	0.07	0.05
LC:	15	52	3	76	87	38
@ (ft):	0.00	15.00	0.00	3.75	0.00	0.00



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 27/36

04/06/20 11:20:22

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
Min @ T:	2.01	-0.00	-0.09	-0.04	-0.09	-0.05
LC:	75	76	63	40	3	98
Min @ B:	-1.26	-1.30	-0.08	-0.05	-0.02	-0.04
LC:	85	40	85	40	85	96
Minimum:	-1.26	-1.30	-0.19	-0.05	-0.09	-0.05
LC:	85	40	51	40	3	98
@ (ft):	11.25	15.00	3.75	3.75	0.00	0.00



RAM Structural System



RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Member Force Envelope

Page 28/36

04/06/20 11:20:22

STEEL COLUMN INFORMATION:**Column Number: 17****Frame Number: 3**

Level Top: Roof

Column Line (18.67,70.00)

Bot: Base

Fy (ksi) = 46.00

Column Size = HSS4X4X5/16

Elastic Modulus (ksi) = 29000

Orientation (deg) = 90.00

Length (ft) = 15.00

INPUT PARAMETERS:

		Top	Bottom
Fixity	Major Axis:	Fix	Fix
	Minor Axis:	Fix	Fix
	Torsion:	Fix	Fix
Joint Face Dist (in):			
	Major:	0.00	0.00
	Minor:	0.00	0.00
Rigid End Zone (in):			
	Major:	0.00	0.00 (Ignore)
	Minor:	0.00	0.00 (Ignore)

Member Force Output:

At Face of Joint

P-Delta: Yes

Scale Factor: 1.00

Ground Level: Base

LOAD CASE DEFINITIONS:

D	DeadLoad	RAMUSER
Sp	PosSnowLoad	RAMUSER
W1	WIND	Wind_ASCE710_1_X
W2	WIND	Wind_ASCE710_1_Y
W3	WIND	Wind_ASCE710_2_X+E
W4	WIND	Wind_ASCE710_2_X-E
W5	WIND	Wind_ASCE710_2_Y+E
W6	WIND	Wind_ASCE710_2_Y-E
W7	WIND	Wind_ASCE710_3_X+Y
W8	WIND	Wind_ASCE710_3_X-Y
W9	WIND	Wind_ASCE710_4_X+Y_CW
W10	WIND	Wind_ASCE710_4_X+Y_CCW
W11	WIND	Wind_ASCE710_4_X-Y_CW
W12	WIND	Wind_ASCE710_4_X-Y_CCW
E1	SEISMIC	EQ_ASCE710_X_+E_F
E2	SEISMIC	EQ_ASCE710_X_-E_F
E3	SEISMIC	EQ_ASCE710_Y_+E_F
E4	SEISMIC	EQ_ASCE710_Y_-E_F
E5	SEISMIC	EQ_ASCE710_X_+E_0.3Y_+E_F
E6	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_+E_F
E7	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_+E_F
E8	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_+E_F

CSMS - Lateral Design



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 29/36

04/06/20 11:20:22

E9	SEISMIC	EQ_ASCE710_0.3X_+E_Y_+E_F
E10	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_+E_F
E11	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_+E_F
E12	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_+E_F
E13	SEISMIC	EQ_ASCE710_X_+E_0.3Y_-E_F
E14	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_-E_F
E15	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_-E_F
E16	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_-E_F
E17	SEISMIC	EQ_ASCE710_0.3X_+E_Y_-E_F
E18	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_-E_F
E19	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_-E_F
E20	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_-E_F
E21	SEISMIC	EQ_ASCE710_X_-E_0.3Y_+E_F
E22	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_+E_F
E23	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_+E_F
E24	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_+E_F
E25	SEISMIC	EQ_ASCE710_0.3X_-E_Y_+E_F
E26	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_+E_F
E27	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_+E_F
E28	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_+E_F
E29	SEISMIC	EQ_ASCE710_X_-E_0.3Y_-E_F
E30	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_-E_F
E31	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_-E_F
E32	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_-E_F
E33	SEISMIC	EQ_ASCE710_0.3X_-E_Y_-E_F
E34	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_-E_F
E35	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_-E_F
E36	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_-E_F

LOAD COMBINATIONS: IBC 2015 / ASCE 7-10 LRFD

No. of Generated Combinations: 314

No. of Generated Combinations Selected to Use: 314

MEMBER FORCE MAXIMA AND MINIMA

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
	kips	kip-ft	kip-ft	kips	kips	kip-ft
Max @ T:	39.70	-0.00	0.00	0.05	0.01	0.09
LC:	28	270	35	52	47	40
Max @ B:	39.70	0.71	0.14	0.05	0.01	0.09
LC:	28	52	47	52	47	40
Maximum:	39.70	0.71	0.14	0.05	0.01	0.09
LC:	28	52	47	52	47	40
@ (ft):	0.00	15.00	15.00	0.00	0.00	0.00



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 30/36

04/06/20 11:20:22

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
Min @ T:	-37.29	-0.00	-0.00	-0.05	-0.01	-0.08
LC:	88	4	71	40	83	76
Min @ B:	-37.29	-0.71	-0.12	-0.05	-0.01	-0.08
LC:	88	40	83	40	83	76
Minimum:	-37.29	-0.71	-0.12	-0.05	-0.01	-0.08
LC:	88	40	83	40	83	76
@ (ft):	0.00	15.00	15.00	0.00	0.00	0.00



RAM Structural System



RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Member Force Envelope

Page 31/36

04/06/20 11:20:22

STEEL BEAM INFORMATION:

Beam Number: 52

Level: Roof

Fy (ksi) = 50.00

Length (ft) = 5.50

Elastic Modulus (ksi) = 29000

Frame Number: 3

I-End (18.67,64.50)

J-End (18.67,70.00)

Beam Size = W10X12

INPUT PARAMETERS:

Fixity Major Axis:

Minor Axis:

Torsion:

Rigid End Zone (in):

I-End

Pin

Pin

Fix

0.00

J-End

Pin

Pin

Fix

0.00 (Ignore)

Member Force Output:

P-Delta: Yes

Ground Level: Base

At Face of Joint

Scale Factor: 1.00

LOAD CASE DEFINITIONS:

D	DeadLoad	RAMUSER
Sp	PosSnowLoad	RAMUSER
W1	WIND	Wind_ASCE710_1_X
W2	WIND	Wind_ASCE710_1_Y
W3	WIND	Wind_ASCE710_2_X+E
W4	WIND	Wind_ASCE710_2_X-E
W5	WIND	Wind_ASCE710_2_Y+E
W6	WIND	Wind_ASCE710_2_Y-E
W7	WIND	Wind_ASCE710_3_X+Y
W8	WIND	Wind_ASCE710_3_X-Y
W9	WIND	Wind_ASCE710_4_X+Y_CW
W10	WIND	Wind_ASCE710_4_X+Y_CCW
W11	WIND	Wind_ASCE710_4_X-Y_CW
W12	WIND	Wind_ASCE710_4_X-Y_CCW
E1	SEISMIC	EQ_ASCE710_X_+E_F
E2	SEISMIC	EQ_ASCE710_X_-E_F
E3	SEISMIC	EQ_ASCE710_Y_+E_F
E4	SEISMIC	EQ_ASCE710_Y_-E_F
E5	SEISMIC	EQ_ASCE710_X_+E_0.3Y_+E_F
E6	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_+E_F
E7	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_+E_F
E8	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_+E_F
E9	SEISMIC	EQ_ASCE710_0.3X_+E_Y_+E_F
E10	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_+E_F
E11	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_+E_F
E12	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_+E_F
E13	SEISMIC	EQ_ASCE710_X_+E_0.3Y_-E_F



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 32/36

04/06/20 11:20:22

E14	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_-E_F
E15	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_-E_F
E16	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_-E_F
E17	SEISMIC	EQ_ASCE710_0.3X_+E_Y_-E_F
E18	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_-E_F
E19	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_-E_F
E20	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_-E_F
E21	SEISMIC	EQ_ASCE710_X_-E_0.3Y_+E_F
E22	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_+E_F
E23	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_+E_F
E24	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_+E_F
E25	SEISMIC	EQ_ASCE710_0.3X_-E_Y_+E_F
E26	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_+E_F
E27	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_+E_F
E28	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_+E_F
E29	SEISMIC	EQ_ASCE710_X_-E_0.3Y_-E_F
E30	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_-E_F
E31	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_-E_F
E32	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_-E_F
E33	SEISMIC	EQ_ASCE710_0.3X_-E_Y_-E_F
E34	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_-E_F
E35	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_-E_F
E36	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_-E_F

LOAD COMBINATIONS: IBC 2015 / ASCE 7-10 LRFD

No. of Generated Combinations: 314

No. of Generated Combinations Selected to Use: 314

MEMBER FORCE MAXIMA AND MINIMA

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
	kips	kip-ft	kip-ft	kips	kips	kip-ft
Max @ i:	8.80	0.00	0.00	2.44	0.09	0.00
LC:	76	1	1	2	40	35
Max @ j:	11.98	0.00	0.00	-0.37	0.05	0.00
LC:	76	1	1	245	49	35
Maximum:	11.98	6.28	0.24	2.44	0.09	0.00
LC:	76	2	40	2	40	35
@ (ft):	2.75	2.75	2.75	0.00	0.00	0.00
Min @ i:	-9.28	0.00	0.00	0.36	-0.08	-0.00
LC:	40	1	1	245	76	71
Min @ j:	-12.67	0.00	0.00	-2.50	-0.05	-0.00
LC:	40	1	1	2	85	71



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 33/36

04/06/20 11:20:22

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
Minimum:	-12.67	-0.00	-0.23	-2.50	-0.08	-0.00
LC:	40	2	76	2	76	71
@ (ft):	2.75	5.50	2.75	5.50	0.00	2.75



RAM Structural System



RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Member Force Envelope

Page 34/36

04/06/20 11:20:22

STEEL BRACE INFORMATION:

Brace Number: 6

Story Top: Roof

Bot: Base

Fy (ksi) = 46.00

Length (ft) = 15.98

Elastic Modulus (ksi) = 29000

Frame Number: 3

I-End (ft): (18.67,70.00)

J-End (ft): (18.67,64.50)

Brace Size = HSS4X4X5/16

INPUT PARAMETERS:

Fixity

Major Axis:

Minor Axis:

Torsion:

Member Force Output:

P-Delta: Yes

Ground Level: Base

Top

Pin

Pin

Pin

Bottom

Pin

Pin

Pin

At Centerline of Joint

Scale Factor: 1.00

LOAD CASE DEFINITIONS:

D	DeadLoad	RAMUSER
Sp	PosSnowLoad	RAMUSER
W1	WIND	Wind_ASCE710_1_X
W2	WIND	Wind_ASCE710_1_Y
W3	WIND	Wind_ASCE710_2_X+E
W4	WIND	Wind_ASCE710_2_X-E
W5	WIND	Wind_ASCE710_2_Y+E
W6	WIND	Wind_ASCE710_2_Y-E
W7	WIND	Wind_ASCE710_3_X+Y
W8	WIND	Wind_ASCE710_3_X-Y
W9	WIND	Wind_ASCE710_4_X+Y_CW
W10	WIND	Wind_ASCE710_4_X+Y_CCW
W11	WIND	Wind_ASCE710_4_X-Y_CW
W12	WIND	Wind_ASCE710_4_X-Y_CCW
E1	SEISMIC	EQ_ASCE710_X_+E_F
E2	SEISMIC	EQ_ASCE710_X_-E_F
E3	SEISMIC	EQ_ASCE710_Y_+E_F
E4	SEISMIC	EQ_ASCE710_Y_-E_F
E5	SEISMIC	EQ_ASCE710_X_+E_0.3Y_+E_F
E6	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_+E_F
E7	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_+E_F
E8	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_+E_F
E9	SEISMIC	EQ_ASCE710_0.3X_+E_Y_+E_F
E10	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_+E_F
E11	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_+E_F
E12	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_+E_F
E13	SEISMIC	EQ_ASCE710_X_+E_0.3Y_-E_F
E14	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_-E_F



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 35/36

04/06/20 11:20:22

E15	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_-E_F
E16	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_-E_F
E17	SEISMIC	EQ_ASCE710_0.3X_+E_Y_-E_F
E18	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_-E_F
E19	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_-E_F
E20	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_-E_F
E21	SEISMIC	EQ_ASCE710_X_-E_0.3Y_+E_F
E22	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_+E_F
E23	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_+E_F
E24	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_+E_F
E25	SEISMIC	EQ_ASCE710_0.3X_-E_Y_+E_F
E26	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_+E_F
E27	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_+E_F
E28	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_+E_F
E29	SEISMIC	EQ_ASCE710_X_-E_0.3Y_-E_F
E30	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_-E_F
E31	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_-E_F
E32	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_-E_F
E33	SEISMIC	EQ_ASCE710_0.3X_-E_Y_-E_F
E34	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_-E_F
E35	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_-E_F
E36	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_-E_F

LOAD COMBINATIONS: IBC 2015 / ASCE 7-10 LRFD

No. of Generated Combinations: 314

No. of Generated Combinations Selected to Use: 314

MEMBER FORCE MAXIMA AND MINIMA

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
	kips	kip-ft	kip-ft	kips	kips	kip-ft
Max @ T:	42.04	0.00	0.00	0.00	0.00	0.00
LC:	40	1	1	40	83	1
Max @ B:	42.04	0.00	0.00	0.00	0.00	0.00
LC:	40	1	1	40	83	1
Maximum:	42.04	0.00	0.00	0.00	0.00	0.00
LC:	40	1	1	40	83	1
@ (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Min @ T:	-39.88	0.00	0.00	-0.00	-0.00	0.00
LC:	76	1	1	52	47	1
Min @ B:	-39.88	0.00	0.00	-0.00	-0.00	0.00
LC:	76	1	1	52	47	1
Minimum:	-39.88	0.00	0.00	-0.00	-0.00	0.00



RAM Structural System



Member Force Envelope

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 36/36

04/06/20 11:20:22

	P	Mmajor	Mminor	Vmajor	Vminor	Tors
LC:	76	1	1	52	47	1
@ (ft):	0.00	0.00	0.00	0.00	0.00	0.00



RAM Structural System



Code Check Summary

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

04/06/20 11:20:22

Steel Code: AISC360-16 LRFD

CRITERIA:

Rigid End Zones: Ignore Effects
 Member Force Output: At Face of Joint
 P-Delta: Yes Scale Factor: 1.00
 Ground Level: Base
 Mesh Criteria :
 Max. Distance Between Nodes on Mesh Line (ft) : 4.00
 Merge Node Tolerance (in) : 0.0100
 Geometry Tolerance (in) : 0.0050
 Walls Out-of-plane Stiffness Not Included in Analysis.
 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 f2 Use Full Factor (f2 = 0.7) on Snow in Combination with Seismic
 Live Load factor f1 (0.5 or 1.0) 0.500
 Sds (for Ev) 0.200
 RhoX 1.000
 RhoY 1.000

LOAD CASE DEFINITIONS:

D	DeadLoad	RAMUSER
Sp	PosSnowLoad	RAMUSER
W1	WIND	Wind_ASCE710_1_X
W2	WIND	Wind_ASCE710_1_Y
W3	WIND	Wind_ASCE710_2_X+E
W4	WIND	Wind_ASCE710_2_X-E
W5	WIND	Wind_ASCE710_2_Y+E
W6	WIND	Wind_ASCE710_2_Y-E
W7	WIND	Wind_ASCE710_3_X+Y
W8	WIND	Wind_ASCE710_3_X-Y
W9	WIND	Wind_ASCE710_4_X+Y_CW
W10	WIND	Wind_ASCE710_4_X+Y_CCW
W11	WIND	Wind_ASCE710_4_X-Y_CW
W12	WIND	Wind_ASCE710_4_X-Y_CCW
E1	SEISMIC	EQ_ASCE710_X_+E_F
E2	SEISMIC	EQ_ASCE710_X_-E_F
E3	SEISMIC	EQ_ASCE710_Y_+E_F
E4	SEISMIC	EQ_ASCE710_Y_-E_F
E5	SEISMIC	EQ_ASCE710_X_+E_0.3Y_+E_F
E6	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_+E_F
E7	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_+E_F
E8	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_+E_F
E9	SEISMIC	EQ_ASCE710_0.3X_+E_Y_+E_F
E10	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_+E_F
E11	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_+E_F



RAM Structural System



Code Check Summary

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 2/10

04/06/20 11:20:22

Steel Code: AISC360-16 LRFD

E12	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_+E_F
E13	SEISMIC	EQ_ASCE710_X_+E_0.3Y_-E_F
E14	SEISMIC	EQ_ASCE710_X_+E_-0.3Y_-E_F
E15	SEISMIC	EQ_ASCE710_-X_+E_0.3Y_-E_F
E16	SEISMIC	EQ_ASCE710_-X_+E_-0.3Y_-E_F
E17	SEISMIC	EQ_ASCE710_0.3X_+E_Y_-E_F
E18	SEISMIC	EQ_ASCE710_0.3X_+E_-Y_-E_F
E19	SEISMIC	EQ_ASCE710_-0.3X_+E_Y_-E_F
E20	SEISMIC	EQ_ASCE710_-0.3X_+E_-Y_-E_F
E21	SEISMIC	EQ_ASCE710_X_-E_0.3Y_+E_F
E22	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_+E_F
E23	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_+E_F
E24	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_+E_F
E25	SEISMIC	EQ_ASCE710_0.3X_-E_Y_+E_F
E26	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_+E_F
E27	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_+E_F
E28	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_+E_F
E29	SEISMIC	EQ_ASCE710_X_-E_0.3Y_-E_F
E30	SEISMIC	EQ_ASCE710_X_-E_-0.3Y_-E_F
E31	SEISMIC	EQ_ASCE710_-X_-E_0.3Y_-E_F
E32	SEISMIC	EQ_ASCE710_-X_-E_-0.3Y_-E_F
E33	SEISMIC	EQ_ASCE710_0.3X_-E_Y_-E_F
E34	SEISMIC	EQ_ASCE710_0.3X_-E_-Y_-E_F
E35	SEISMIC	EQ_ASCE710_-0.3X_-E_Y_-E_F
E36	SEISMIC	EQ_ASCE710_-0.3X_-E_-Y_-E_F

LOAD COMBINATIONS: IBC 2015 / ASCE 7-10 LRFD

- 1 * 1.400 D
- 2 * 1.200 D + 1.600 Sp
- 3 * 1.200 D + 1.600 Sp + 0.500 W1
- 4 * 1.200 D + 1.600 Sp + 0.500 W2
- 5 * 1.200 D + 1.600 Sp + 0.500 W3
- 6 * 1.200 D + 1.600 Sp + 0.500 W4
- 7 * 1.200 D + 1.600 Sp + 0.500 W5
- 8 * 1.200 D + 1.600 Sp + 0.500 W6
- 9 * 1.200 D + 1.600 Sp + 0.500 W7
- 10 * 1.200 D + 1.600 Sp + 0.500 W8
- 11 * 1.200 D + 1.600 Sp + 0.500 W9
- 12 * 1.200 D + 1.600 Sp + 0.500 W10
- 13 * 1.200 D + 1.600 Sp + 0.500 W11
- 14 * 1.200 D + 1.600 Sp + 0.500 W12
- 15 * 1.200 D + 1.600 Sp - 0.500 W1
- 16 * 1.200 D + 1.600 Sp - 0.500 W2
- 17 * 1.200 D + 1.600 Sp - 0.500 W3
- 18 * 1.200 D + 1.600 Sp - 0.500 W4
- 19 * 1.200 D + 1.600 Sp - 0.500 W5

SAP5 - Lateral Design



RAM Structural System



Code Check Summary

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 3/10

04/06/20 11:20:22

Steel Code: AISC360-16 LRFD

20	*	1.200 D + 1.600 Sp - 0.500 W6
21	*	1.200 D + 1.600 Sp - 0.500 W7
22	*	1.200 D + 1.600 Sp - 0.500 W8
23	*	1.200 D + 1.600 Sp - 0.500 W9
24	*	1.200 D + 1.600 Sp - 0.500 W10
25	*	1.200 D + 1.600 Sp - 0.500 W11
26	*	1.200 D + 1.600 Sp - 0.500 W12
27	*	1.200 D + 0.500 Sp + 1.000 W1
28	*	1.200 D + 0.500 Sp + 1.000 W2
29	*	1.200 D + 0.500 Sp + 1.000 W3
30	*	1.200 D + 0.500 Sp + 1.000 W4
31	*	1.200 D + 0.500 Sp + 1.000 W5
32	*	1.200 D + 0.500 Sp + 1.000 W6
33	*	1.200 D + 0.500 Sp + 1.000 W7
34	*	1.200 D + 0.500 Sp + 1.000 W8
35	*	1.200 D + 0.500 Sp + 1.000 W9
36	*	1.200 D + 0.500 Sp + 1.000 W10
37	*	1.200 D + 0.500 Sp + 1.000 W11
38	*	1.200 D + 0.500 Sp + 1.000 W12
39	*	1.200 D + 0.500 Sp - 1.000 W1
40	*	1.200 D + 0.500 Sp - 1.000 W2
41	*	1.200 D + 0.500 Sp - 1.000 W3
42	*	1.200 D + 0.500 Sp - 1.000 W4
43	*	1.200 D + 0.500 Sp - 1.000 W5
44	*	1.200 D + 0.500 Sp - 1.000 W6
45	*	1.200 D + 0.500 Sp - 1.000 W7
46	*	1.200 D + 0.500 Sp - 1.000 W8
47	*	1.200 D + 0.500 Sp - 1.000 W9
48	*	1.200 D + 0.500 Sp - 1.000 W10
49	*	1.200 D + 0.500 Sp - 1.000 W11
50	*	1.200 D + 0.500 Sp - 1.000 W12
51	*	1.200 D + 1.000 W1
52	*	1.200 D + 1.000 W2
53	*	1.200 D + 1.000 W3
54	*	1.200 D + 1.000 W4
55	*	1.200 D + 1.000 W5
56	*	1.200 D + 1.000 W6
57	*	1.200 D + 1.000 W7
58	*	1.200 D + 1.000 W8
59	*	1.200 D + 1.000 W9
60	*	1.200 D + 1.000 W10
61	*	1.200 D + 1.000 W11
62	*	1.200 D + 1.000 W12
63	*	1.200 D - 1.000 W1
64	*	1.200 D - 1.000 W2
65	*	1.200 D - 1.000 W3



RAM Structural System



Code Check Summary

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 4/10

04/06/20 11:20:22

Steel Code: AISC360-16 LRFD

66	*	1.200 D - 1.000 W4
67	*	1.200 D - 1.000 W5
68	*	1.200 D - 1.000 W6
69	*	1.200 D - 1.000 W7
70	*	1.200 D - 1.000 W8
71	*	1.200 D - 1.000 W9
72	*	1.200 D - 1.000 W10
73	*	1.200 D - 1.000 W11
74	*	1.200 D - 1.000 W12
75	*	0.900 D + 1.000 W1
76	*	0.900 D + 1.000 W2
77	*	0.900 D + 1.000 W3
78	*	0.900 D + 1.000 W4
79	*	0.900 D + 1.000 W5
80	*	0.900 D + 1.000 W6
81	*	0.900 D + 1.000 W7
82	*	0.900 D + 1.000 W8
83	*	0.900 D + 1.000 W9
84	*	0.900 D + 1.000 W10
85	*	0.900 D + 1.000 W11
86	*	0.900 D + 1.000 W12
87	*	0.900 D - 1.000 W1
88	*	0.900 D - 1.000 W2
89	*	0.900 D - 1.000 W3
90	*	0.900 D - 1.000 W4
91	*	0.900 D - 1.000 W5
92	*	0.900 D - 1.000 W6
93	*	0.900 D - 1.000 W7
94	*	0.900 D - 1.000 W8
95	*	0.900 D - 1.000 W9
96	*	0.900 D - 1.000 W10
97	*	0.900 D - 1.000 W11
98	*	0.900 D - 1.000 W12
99	*	1.240 D + 0.700 Sp + 1.000 E1
100	*	1.240 D + 0.700 Sp + 1.000 E2
101	*	1.240 D + 0.700 Sp + 1.000 E3
102	*	1.240 D + 0.700 Sp + 1.000 E4
103	*	1.240 D + 0.700 Sp + 1.000 E5
104	*	1.240 D + 0.700 Sp + 1.000 E6
105	*	1.240 D + 0.700 Sp + 1.000 E7
106	*	1.240 D + 0.700 Sp + 1.000 E8
107	*	1.240 D + 0.700 Sp + 1.000 E9
108	*	1.240 D + 0.700 Sp + 1.000 E10
109	*	1.240 D + 0.700 Sp + 1.000 E11
110	*	1.240 D + 0.700 Sp + 1.000 E12
111	*	1.240 D + 0.700 Sp + 1.000 E13



RAM Structural System



Code Check Summary

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 5/10

04/06/20 11:20:22

Steel Code: AISC360-16 LRFD

112	*	1.240 D + 0.700 Sp + 1.000 E14
113	*	1.240 D + 0.700 Sp + 1.000 E15
114	*	1.240 D + 0.700 Sp + 1.000 E16
115	*	1.240 D + 0.700 Sp + 1.000 E17
116	*	1.240 D + 0.700 Sp + 1.000 E18
117	*	1.240 D + 0.700 Sp + 1.000 E19
118	*	1.240 D + 0.700 Sp + 1.000 E20
119	*	1.240 D + 0.700 Sp + 1.000 E21
120	*	1.240 D + 0.700 Sp + 1.000 E22
121	*	1.240 D + 0.700 Sp + 1.000 E23
122	*	1.240 D + 0.700 Sp + 1.000 E24
123	*	1.240 D + 0.700 Sp + 1.000 E25
124	*	1.240 D + 0.700 Sp + 1.000 E26
125	*	1.240 D + 0.700 Sp + 1.000 E27
126	*	1.240 D + 0.700 Sp + 1.000 E28
127	*	1.240 D + 0.700 Sp + 1.000 E29
128	*	1.240 D + 0.700 Sp + 1.000 E30
129	*	1.240 D + 0.700 Sp + 1.000 E31
130	*	1.240 D + 0.700 Sp + 1.000 E32
131	*	1.240 D + 0.700 Sp + 1.000 E33
132	*	1.240 D + 0.700 Sp + 1.000 E34
133	*	1.240 D + 0.700 Sp + 1.000 E35
134	*	1.240 D + 0.700 Sp + 1.000 E36
135	*	1.240 D + 0.700 Sp - 1.000 E1
136	*	1.240 D + 0.700 Sp - 1.000 E2
137	*	1.240 D + 0.700 Sp - 1.000 E3
138	*	1.240 D + 0.700 Sp - 1.000 E4
139	*	1.240 D + 0.700 Sp - 1.000 E5
140	*	1.240 D + 0.700 Sp - 1.000 E6
141	*	1.240 D + 0.700 Sp - 1.000 E7
142	*	1.240 D + 0.700 Sp - 1.000 E8
143	*	1.240 D + 0.700 Sp - 1.000 E9
144	*	1.240 D + 0.700 Sp - 1.000 E10
145	*	1.240 D + 0.700 Sp - 1.000 E11
146	*	1.240 D + 0.700 Sp - 1.000 E12
147	*	1.240 D + 0.700 Sp - 1.000 E13
148	*	1.240 D + 0.700 Sp - 1.000 E14
149	*	1.240 D + 0.700 Sp - 1.000 E15
150	*	1.240 D + 0.700 Sp - 1.000 E16
151	*	1.240 D + 0.700 Sp - 1.000 E17
152	*	1.240 D + 0.700 Sp - 1.000 E18
153	*	1.240 D + 0.700 Sp - 1.000 E19
154	*	1.240 D + 0.700 Sp - 1.000 E20
155	*	1.240 D + 0.700 Sp - 1.000 E21
156	*	1.240 D + 0.700 Sp - 1.000 E22
157	*	1.240 D + 0.700 Sp - 1.000 E23

SSMS - Lateral Design

Page 69 of 80



RAM Structural System



Code Check Summary

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 6/10

04/06/20 11:20:22

Steel Code: AISC360-16 LRFD

158	*	1.240 D + 0.700 Sp - 1.000 E24
159	*	1.240 D + 0.700 Sp - 1.000 E25
160	*	1.240 D + 0.700 Sp - 1.000 E26
161	*	1.240 D + 0.700 Sp - 1.000 E27
162	*	1.240 D + 0.700 Sp - 1.000 E28
163	*	1.240 D + 0.700 Sp - 1.000 E29
164	*	1.240 D + 0.700 Sp - 1.000 E30
165	*	1.240 D + 0.700 Sp - 1.000 E31
166	*	1.240 D + 0.700 Sp - 1.000 E32
167	*	1.240 D + 0.700 Sp - 1.000 E33
168	*	1.240 D + 0.700 Sp - 1.000 E34
169	*	1.240 D + 0.700 Sp - 1.000 E35
170	*	1.240 D + 0.700 Sp - 1.000 E36
171	*	1.240 D + 1.000 E1
172	*	1.240 D + 1.000 E2
173	*	1.240 D + 1.000 E3
174	*	1.240 D + 1.000 E4
175	*	1.240 D + 1.000 E5
176	*	1.240 D + 1.000 E6
177	*	1.240 D + 1.000 E7
178	*	1.240 D + 1.000 E8
179	*	1.240 D + 1.000 E9
180	*	1.240 D + 1.000 E10
181	*	1.240 D + 1.000 E11
182	*	1.240 D + 1.000 E12
183	*	1.240 D + 1.000 E13
184	*	1.240 D + 1.000 E14
185	*	1.240 D + 1.000 E15
186	*	1.240 D + 1.000 E16
187	*	1.240 D + 1.000 E17
188	*	1.240 D + 1.000 E18
189	*	1.240 D + 1.000 E19
190	*	1.240 D + 1.000 E20
191	*	1.240 D + 1.000 E21
192	*	1.240 D + 1.000 E22
193	*	1.240 D + 1.000 E23
194	*	1.240 D + 1.000 E24
195	*	1.240 D + 1.000 E25
196	*	1.240 D + 1.000 E26
197	*	1.240 D + 1.000 E27
198	*	1.240 D + 1.000 E28
199	*	1.240 D + 1.000 E29
200	*	1.240 D + 1.000 E30
201	*	1.240 D + 1.000 E31
202	*	1.240 D + 1.000 E32
203	*	1.240 D + 1.000 E33



RAM Structural System



Code Check Summary

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 7/10

04/06/20 11:20:22

Steel Code: AISC360-16 LRFD

204	*	1.240 D + 1.000 E34
205	*	1.240 D + 1.000 E35
206	*	1.240 D + 1.000 E36
207	*	1.240 D - 1.000 E1
208	*	1.240 D - 1.000 E2
209	*	1.240 D - 1.000 E3
210	*	1.240 D - 1.000 E4
211	*	1.240 D - 1.000 E5
212	*	1.240 D - 1.000 E6
213	*	1.240 D - 1.000 E7
214	*	1.240 D - 1.000 E8
215	*	1.240 D - 1.000 E9
216	*	1.240 D - 1.000 E10
217	*	1.240 D - 1.000 E11
218	*	1.240 D - 1.000 E12
219	*	1.240 D - 1.000 E13
220	*	1.240 D - 1.000 E14
221	*	1.240 D - 1.000 E15
222	*	1.240 D - 1.000 E16
223	*	1.240 D - 1.000 E17
224	*	1.240 D - 1.000 E18
225	*	1.240 D - 1.000 E19
226	*	1.240 D - 1.000 E20
227	*	1.240 D - 1.000 E21
228	*	1.240 D - 1.000 E22
229	*	1.240 D - 1.000 E23
230	*	1.240 D - 1.000 E24
231	*	1.240 D - 1.000 E25
232	*	1.240 D - 1.000 E26
233	*	1.240 D - 1.000 E27
234	*	1.240 D - 1.000 E28
235	*	1.240 D - 1.000 E29
236	*	1.240 D - 1.000 E30
237	*	1.240 D - 1.000 E31
238	*	1.240 D - 1.000 E32
239	*	1.240 D - 1.000 E33
240	*	1.240 D - 1.000 E34
241	*	1.240 D - 1.000 E35
242	*	1.240 D - 1.000 E36
243	*	0.860 D + 1.000 E1
244	*	0.860 D + 1.000 E2
245	*	0.860 D + 1.000 E3
246	*	0.860 D + 1.000 E4
247	*	0.860 D + 1.000 E5
248	*	0.860 D + 1.000 E6
249	*	0.860 D + 1.000 E7



RAM Structural System



Code Check Summary

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 8/10

04/06/20 11:20:22

Steel Code: AISC360-16 LRFD

250	*	0.860 D + 1.000 E8
251	*	0.860 D + 1.000 E9
252	*	0.860 D + 1.000 E10
253	*	0.860 D + 1.000 E11
254	*	0.860 D + 1.000 E12
255	*	0.860 D + 1.000 E13
256	*	0.860 D + 1.000 E14
257	*	0.860 D + 1.000 E15
258	*	0.860 D + 1.000 E16
259	*	0.860 D + 1.000 E17
260	*	0.860 D + 1.000 E18
261	*	0.860 D + 1.000 E19
262	*	0.860 D + 1.000 E20
263	*	0.860 D + 1.000 E21
264	*	0.860 D + 1.000 E22
265	*	0.860 D + 1.000 E23
266	*	0.860 D + 1.000 E24
267	*	0.860 D + 1.000 E25
268	*	0.860 D + 1.000 E26
269	*	0.860 D + 1.000 E27
270	*	0.860 D + 1.000 E28
271	*	0.860 D + 1.000 E29
272	*	0.860 D + 1.000 E30
273	*	0.860 D + 1.000 E31
274	*	0.860 D + 1.000 E32
275	*	0.860 D + 1.000 E33
276	*	0.860 D + 1.000 E34
277	*	0.860 D + 1.000 E35
278	*	0.860 D + 1.000 E36
279	*	0.860 D - 1.000 E1
280	*	0.860 D - 1.000 E2
281	*	0.860 D - 1.000 E3
282	*	0.860 D - 1.000 E4
283	*	0.860 D - 1.000 E5
284	*	0.860 D - 1.000 E6
285	*	0.860 D - 1.000 E7
286	*	0.860 D - 1.000 E8
287	*	0.860 D - 1.000 E9
288	*	0.860 D - 1.000 E10
289	*	0.860 D - 1.000 E11
290	*	0.860 D - 1.000 E12
291	*	0.860 D - 1.000 E13
292	*	0.860 D - 1.000 E14
293	*	0.860 D - 1.000 E15
294	*	0.860 D - 1.000 E16
295	*	0.860 D - 1.000 E17



RAM Structural System



Code Check Summary

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 9/10

04/06/20 11:20:22

Steel Code: AISC360-16 LRFD

296	*	0.860 D - 1.000 E18
297	*	0.860 D - 1.000 E19
298	*	0.860 D - 1.000 E20
299	*	0.860 D - 1.000 E21
300	*	0.860 D - 1.000 E22
301	*	0.860 D - 1.000 E23
302	*	0.860 D - 1.000 E24
303	*	0.860 D - 1.000 E25
304	*	0.860 D - 1.000 E26
305	*	0.860 D - 1.000 E27
306	*	0.860 D - 1.000 E28
307	*	0.860 D - 1.000 E29
308	*	0.860 D - 1.000 E30
309	*	0.860 D - 1.000 E31
310	*	0.860 D - 1.000 E32
311	*	0.860 D - 1.000 E33
312	*	0.860 D - 1.000 E34
313	*	0.860 D - 1.000 E35
314	*	0.860 D - 1.000 E36

* = Load combination currently selected to use

Frame #1:

Level: Roof

Col. #	Pu kip	Mux kip-ft	Muy kip-ft	Vux kip	Vuy kip	LC	Interact.	Fy ksi	Size
9	49.59	0.71	0.43	0.08	-0.03	9	0.45 H1-1a	46	HSS5X5X5/16
20	23.48	-0.66	-0.44	-0.10	-0.01	48	0.42 H1-1a	50	HSS4X4X5/16

Beam #	Pu kip	Mux kip-ft	Muy kip-ft	Vux kip	Vuy kip	LC	Interact.	Fy ksi	Size
63	8.96	2.04	-0.12	2.01	0.05	48	0.29 H1-1a	50	W10X12

Brace #	Pu kip	Mux kip-ft	Muy kip-ft	Vux kip	Vuy kip	LC	Interact.	Fy ksi	Size
10	26.64	0.00	0.00	-0.00	-0.00	36	0.57 Axial	46	HSS4X4X5/16

Frame #2:

Level: Roof

Col. #	Pu kip	Mux kip-ft	Muy kip-ft	Vux kip	Vuy kip	LC	Interact.	Fy ksi	Size
12	11.75	0.00	0.00	0.12	0.02	4	0.18 Axial	46	HSS4X4X5/16
19	36.37	-1.04	-0.05	-0.14	0.00	40	0.62 H1-1a	46	HSS4X4X5/16



RAM Structural System



Code Check Summary

RAM Frame 17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Page 10/10

04/06/20 11:20:22

Steel Code: AISC360-16 LRFD

Beam #	Pu kip	Mux kip-ft	Muy kip-ft	Vux kip	Vuy kip	LC	Interact.	Fy ksi	Size
62	-0.59	13.47	0.07	7.44	-0.03	4	0.30 H1-1b	50	W10X12

Brace #	Pu kip	Mux kip-ft	Muy kip-ft	Vux kip	Vuy kip	LC	Interact.	Fy ksi	Size
11	32.28	0.00	0.00	-0.00	0.00	28	0.60 Axial	46	HSS4X4X5/16

Frame #3:

Level: Roof

Col. #	Pu kip	Mux kip-ft	Muy kip-ft	Vux kip	Vuy kip	LC	Interact.	Fy ksi	Size
4	18.14	0.00	0.00	0.00	-0.09	15	0.15 Axial	46	HSS5X5X5/16
17	39.70	0.71	-0.03	-0.05	0.00	28	0.66 H1-1a	46	HSS4X4X5/16

Beam #	Pu kip	Mux kip-ft	Muy kip-ft	Vux kip	Vuy kip	LC	Interact.	Fy ksi	Size
52	-5.21	6.28	0.14	-2.50	0.01	16	0.17 H1-1b	50	W10X12

Brace #	Pu kip	Mux kip-ft	Muy kip-ft	Vux kip	Vuy kip	LC	Interact.	Fy ksi	Size
6	42.04	0.00	0.00	-0.00	-0.00	40	0.75 Axial	46	HSS4X4X5/16



Continuous Foundation Design Envelope

RAM Foundation v17.00.01.09

DataBase: Middle School - North End Addition

Building Code: IBC

Date: 04/06/20 11:27:28
Design Code: ACI318-14

Footing Mark: 35

LONGITUDINAL DIRECTION

Location ft	Positive Flexure			Negative Flexure			Critical Section Shear		
	Mu kip-ft	Phi Mn kip-ft	As Req. in ²	Mu kip-ft	Phi Mn kip-ft	As Req. in ²	Vu kip	Phi Vn kip	As Req. in ² /ft
0.000	0.00	240.41	2.59	-0.00	-252.29	2.59	29.09	117.40	0.00
0.990	27.47	240.41	2.59	-1.76	-252.29	2.59	31.88	117.40	0.00
1.000	27.80	240.41	2.59	-1.80	-252.29	2.59	36.54	117.40	0.00
1.865	58.38	240.41	2.59	-6.25	-252.29	2.59	34.21	117.40	0.00
2.708	86.28	240.41	2.59	-13.19	-252.29	2.59	31.93	117.40	0.00
3.000	95.48	240.41	2.59	-16.19	-252.29	2.59	31.14	117.40	0.00
3.292	94.26	240.41	2.59	-14.59	-252.29	2.59	16.95	117.40	0.00
4.135	92.61	240.41	2.59	-12.65	-252.29	2.59	14.68	117.40	0.00
5.000	88.93	240.41	2.59	-11.65	-252.29	2.59	12.34	117.40	0.00
5.010	88.87	240.41	2.59	-11.64	-252.29	2.59	12.32	117.40	0.00
7.490	67.05	240.41	2.59	-10.40	-252.29	2.59	12.14	117.40	0.00
8.000	60.50	240.41	2.59	-8.75	-252.29	2.59	13.52	117.40	0.00
8.365	55.40	240.41	2.59	-7.21	-252.29	2.59	14.50	117.40	0.00
9.208	46.75	240.41	2.59	-2.34	-252.29	2.59	16.78	117.40	0.00
9.500	98.06	240.41	2.59	-16.19	-252.29	2.59	31.14	117.40	0.00
9.792	88.87	240.41	2.59	-13.19	-252.29	2.59	31.93	117.40	0.00
10.635	60.97	240.41	2.59	-6.25	-252.29	2.59	34.21	117.40	0.00
11.000	48.32	240.41	2.59	-4.05	-252.29	2.59	35.19	117.40	0.00
11.510	30.00	240.41	2.59	-1.76	-252.29	2.59	36.57	117.40	0.00
12.500	0.00	240.41	2.59	-0.00	-252.29	2.59	31.65	117.40	0.00

Note: Locations in bold font are under a column

TRANSVERSE DIRECTION

Location ft	Top Flexure			Bottom Flexure			Punching Shear		
	Mu kip-ft	Phi Mn kip-ft	As Req. in ²	Mu kip-ft	Phi Mn kip-ft	As Req. in ²	Vu kip	Phi Vn kip	
0.00	2.25	56.97	0.52	21.63	54.18	0.52			
1.00	2.25	56.97	0.52	21.63	54.18	0.52			



Continuous Foundation Design Envelope

Page 2/6
Date: 04/06/20 11:27:28
Design Code: ACI318-14

RAM Foundation v17.00.01.09
DataBase: Middle School - North End Addition
Building Code: IBC

Location	Mu	Phi Mn	As Req.	Mu	Phi Mn	As Req.	Vu	Phi Vn
1.00	7.83	199.95	2.07	18.20	190.18	2.07		
5.00	7.83	199.95	2.07	18.20	190.18	2.07	36.96	418.80
5.00	6.74	153.60	1.64	10.91	146.09	1.64		
8.00	6.74	153.60	1.64	10.91	146.09	1.64		
8.00	5.88	170.91	1.56	13.58	162.54	1.56		
11.00	5.88	170.91	1.56	13.58	162.54	1.56	48.18	418.80
11.00	3.37	76.80	0.82	7.66	73.05	0.82		
12.50	3.37	76.80	0.82	7.66	73.05	0.82		

Soil Stress Under Foundation

Location	Stress	Ld Co #	Location	Stress	Ld Co #	Location	Stress	Ld Co #
ft	ksf		ft	ksf		ft	ksf	
0.00	2.34	623	0.99	1.67	623	1.00	1.66	623
1.86	1.28	527	2.71	1.19	551	3.00	1.16	551
3.29	1.13	551	4.14	1.05	551	5.00	0.96	551
5.01	0.96	551	7.49	0.94	539	8.00	0.99	539
8.36	1.03	539	9.21	1.12	539	9.50	1.15	539
9.79	1.18	539	10.64	1.30	515	11.00	1.35	515
11.51	1.71	611	12.50	2.46	611			

Note: Locations in bold font are under a column



Continuous Foundation Design Envelope

Footing Mark: 36

LONGITUDINAL DIRECTION

Location ft	Positive Flexure			Negative Flexure			Critical Section Shear		
	Mu kip-ft	Phi Mn kip-ft	As Req. in ²	Mu kip-ft	Phi Mn kip-ft	As Req. in ²	Vu kip	Phi Vn kip	As Req. in ² /ft
0.000	0.00	159.93	1.65	-0.00	-167.85	1.56	24.79	70.44	0.00
1.000	23.98	159.93	1.65	-1.08	-167.85	1.56	30.65	70.44	0.00
3.969	107.84	159.93	1.65	-17.00	-167.85	1.56	25.84	70.44	0.00
4.000	108.65	159.93	1.65	-17.27	-167.85	1.56	26.97	70.44	0.00
4.842	129.80	159.93	1.65	-25.30	-167.85	1.56	28.94	70.44	0.00
5.688	149.87	159.93	1.65	-34.91	-167.85	1.56	29.22	70.44	0.00
6.000	157.00	159.93	1.65	-38.85	-167.85	1.56	28.55	70.44	0.00
6.313	93.06	159.93	1.65	0.00	-167.85	1.56	21.85	70.44	0.00
7.158	76.27	159.93	1.65	0.00	-167.85	1.56	20.55	70.44	0.00
8.000	68.75	159.93	1.56	-0.85	-167.85	1.56	21.92	70.44	0.00
8.031	69.35	159.93	1.56	-1.16	-167.85	1.56	21.97	70.44	0.00
9.490	95.44	159.93	1.56	-15.30	-167.85	1.56	24.33	70.44	0.00
10.000	103.76	159.93	1.56	-20.46	-167.85	1.56	25.15	70.44	0.00
10.363	109.42	159.93	1.56	-24.23	-167.85	1.56	25.74	70.44	0.00
11.208	121.77	159.93	1.56	-34.17	-167.85	1.56	27.11	70.44	0.00
11.500	126.73	159.93	1.56	-38.85	-167.85	1.56	27.58	70.44	0.00
11.792	119.42	159.93	1.56	-35.16	-167.85	1.56	25.27	70.44	0.00
12.637	98.02	159.93	1.56	-25.52	-167.85	1.56	26.01	70.44	0.00
13.000	88.93	159.93	1.56	-21.85	-167.85	1.56	25.32	70.44	0.00
13.510	76.36	159.93	1.56	-17.18	-167.85	1.56	25.04	70.44	0.00
15.000	41.93	159.93	1.56	-6.74	-167.85	1.56	24.32	70.44	0.00
17.500	0.00	159.93	1.56	-0.00	-167.85	1.56	18.79	70.44	0.00

Note: Locations in bold font are under a column

TRANSVERSE DIRECTION

Top Flexure Bottom Flexure Punching Shear



Continuous Foundation Design Envelope

Page 4/6
Date: 04/06/20 11:27:28
Design Code: ACI318-14

RAM Foundation v17.00.01.09
DataBase: Middle School - North End Addition
Building Code: IBC

Location ft	Mu kip-ft	Phi Mn kip-ft	As Req. in ²	Mu kip-ft	Phi Mn kip-ft	As Req. in ²	Vu kip	Phi Vn kip
0.00	3.24	197.12	3.28	12.51	187.41	3.28		
4.00	3.24	197.12	3.28	12.51	187.41	3.28		
4.00	2.40	193.04	3.93	4.54	183.48	3.93		
8.00	2.40	193.04	3.93	4.54	183.48	3.93	59.78	427.62
8.00	1.62	107.22	1.64	2.47	101.92	1.64		
10.00	1.62	107.22	1.64	2.47	101.92	1.64		
10.00	1.92	154.29	2.84	3.28	146.64	2.84		
13.00	1.92	154.29	2.84	3.28	146.64	2.84	40.09	419.92
13.00	3.64	215.24	3.69	5.83	204.65	3.69		
17.50	3.64	215.24	3.69	5.83	204.65	3.69		

Location ft	Stress ksf	Ld Co #	Location ft	Stress ksf	Ld Co #
0.00	2.40	623	3.97	1.22	527
4.00	1.21	551	5.69	1.07	556
6.00	1.04	556	7.16	0.95	556
8.00	0.88	556	9.49	0.84	557
10.00	0.85	557	11.21	0.90	539
11.50	0.91	539	12.64	0.97	515
13.00	0.99	515	15.00	1.10	515
17.50	1.34	611			

Note: Locations in bold font are under a column



Continuous Foundation Design Envelope

Footing Mark: 37

LONGITUDINAL DIRECTION

Location ft	Positive Flexure			Negative Flexure			Critical Section Shear		
	Mu kip-ft	Phi Mn kip-ft	As Req. in ²	Mu kip-ft	Phi Mn kip-ft	As Req. in ²	Vu kip	Phi Vn kip	As Req. in ² /ft
0.000	0.00	240.41	2.59	-0.00	-252.29	2.59	5.66	117.40	0.00
0.490	2.45	240.41	2.59	-0.43	-252.29	2.59	9.74	117.40	0.00
1.000	7.07	240.41	2.59	-1.80	-252.29	2.59	12.75	117.40	0.00
1.365	11.54	240.41	2.59	-3.35	-252.29	2.59	17.48	117.40	0.00
2.208	25.33	240.41	2.59	-8.77	-252.29	2.59	19.84	117.40	0.00
2.500	31.00	240.41	2.59	-11.55	-252.29	2.59	19.05	117.40	0.00
2.792	29.67	240.41	2.59	-12.27	-252.29	2.59	14.06	117.40	0.00
3.635	30.34	240.41	2.59	-15.80	-252.29	2.59	11.79	117.40	0.00
4.000	31.34	240.41	2.59	-17.48	-252.29	2.59	10.80	117.40	0.00
4.510	33.35	240.41	2.59	-19.92	-252.29	2.59	10.10	117.40	0.00
7.000	50.14	240.41	2.59	-30.14	-252.29	2.59	12.36	117.40	0.00
9.469	53.96	240.41	2.59	-22.05	-252.29	2.59	15.69	117.40	0.00
10.000	52.64	240.41	2.59	-19.58	-252.29	2.59	18.16	117.40	0.00
10.344	51.37	240.41	2.59	-18.54	-252.29	2.59	23.46	117.40	0.00
11.188	46.92	240.41	2.59	-14.28	-252.29	2.59	27.71	117.40	0.00
11.500	71.44	240.41	2.59	-12.59	-252.29	2.59	38.54	117.40	0.00
11.813	59.26	240.41	2.59	-8.61	-252.29	2.59	39.39	117.40	0.00
12.656	28.20	240.41	2.59	-3.25	-252.29	2.59	37.95	117.40	0.00
13.000	18.02	240.41	2.59	-1.80	-252.29	2.59	30.10	117.40	0.00
13.531	5.87	240.41	2.59	-0.40	-252.29	2.59	23.59	117.40	0.00
14.000	0.00	240.41	2.59	-0.00	-252.29	2.59	13.14	117.40	0.00

Note: Locations in bold font are under a column

TRANSVERSE DIRECTION

Location ft	Top Flexure			Bottom Flexure			Punching Shear		
	Mu kip-ft	Phi Mn kip-ft	As Req. in ²	Mu kip-ft	Phi Mn kip-ft	As Req. in ²	Vu kip	Phi Vn kip	
0.00	2.25	56.97	0.52	8.51	54.18	0.52			



Continuous Foundation Design Envelope

Page 6/6
Date: 04/06/20 11:27:28
Design Code: ACI318-14

RAM Foundation v17.00.01.09
DataBase: Middle School - North End Addition
Building Code: IBC

Location	Mu	Phi Mn	As Req.	Mu	Phi Mn	As Req.	Vu	Phi Vn
1.00	2.25	56.97	0.52	8.51	54.18	0.52		
1.00	5.88	170.91	1.56	13.09	162.54	1.56		
4.00	5.88	170.91	1.56	13.09	162.54	1.56	24.09	418.80
4.00	13.49	307.21	3.28	27.01	292.18	3.28		
10.00	13.49	307.21	3.28	27.01	292.18	3.28		
10.00	5.67	170.91	1.56	21.36	162.54	1.56		
13.00	5.67	170.91	1.56	21.36	162.54	1.56	69.91	426.48

Soil Stress Under Foundation

Location	Stress ksf	Ld Co #	Location	Stress ksf	Ld Co #	Location	Stress ksf	Ld Co #
0.00	1.31	535	0.49	1.27	535	1.00	1.23	535
1.36	1.20	535	2.21	1.13	535	2.50	1.11	535
2.79	1.08	535	3.64	1.01	535	4.00	0.98	535
4.51	0.97	559	7.00	1.07	512	9.47	1.43	547
10.00	1.54	547	10.34	1.61	547	11.19	1.78	547
11.50	1.84	547	11.81	1.90	547	12.66	2.07	547
13.00	2.14	547	13.53	2.25	547	14.00	2.50	619

Note: Locations in bold font are under a column