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

PRCNC20220578

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

Structural Calculations for

SOUTHERN BLEACHER COMPANY

Graham, Texas

Cascade Christian School Grandstands

Puyallup, Washington

BrooksRansom ASSOCIATES

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GAYLORD R. RANSOM
STATE OF WASHINGTON
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER
2987

EXPIRES 02/03/2026

Job No. 22172
2022-04-22
REVISED 2024-01-26

DESIGN PARAMETERS: **Puyallup WA**

I. GOVERNING CODES:

1. IBC 2018 Edition

II. BASIC STRESSES:

1.	LT. WT. CONC. (110 PCF)	F'c =	NA	PSI
2.	NORM. WT. CONC	F'c =	3,000	PSI
3.	CMU	F'm =	NA	PSI
4.	REINFORCING STEEL			
	a. No. 3 & SMALLER	Fy =	40,000	PSI
	b. No. 4 & LARGER	Fy =	60,000	PSI
5.	WF BEAMS	Fy =	50,000	PSI
6.	STRUCTURAL ANGLES	Fy =	50,000	PSI
7.	STEEL RODS	Fy =	50,000	PSI
8.	HSS TUBE STEEL	Fy =	46,000	PSI
9.	STRUCTURAL BOLTS	Gr. =	A307	UNO
10.	ANCHOR BOLTS	Gr. =	A307	UNO
11.	ALUMINUM PLANKING (6063-T6)	Fy =	25,000	PSI
12.	ALUMINUM SHAPES (6061-T6)	Fy =	35,000	PSI
13.	FOUNDATION BEARING CAPACITY		0	PSF

III. DESIGN LOAD SUMMARY

1.	RISK CATEGORY (ASCE 7-16 TABLE 1.5-1)		TYPE III	
2.	GRANDSTAND			
	a. DEAD LOADS		10	PSF
	b. LIVE LOADS		100	PSF
	c. SEAT BOARDS		120	PLF
	d. SWAY (PERPENDICULAR)		10	PLF
	e. SWAY (PARALLEL)		24	PLF
	f. GUARDRAIL		50	PLF
	g. HANDRAIL		200	LBS
3.	PRESSBOX			
	a. ROOF DEAD LOADS		15	PSF
	b. FLOOR DEAD LOADS		10	PSF
	c. ROOF LIVE LOADS		20	PSF
	d. FLOOR LIVE LOADS		100	PSF
	e. WALL DEAD LOADS		10	PSF
4.	WIND LOADS			
	a. WIND SPEED, V_{ULT}		115	MPH
	b. EXPOSURE CATEGORY		C	
	c. WIND FORCE	SEE "WIND LOAD PRESSURES"		

Hazards by Location

Search Information

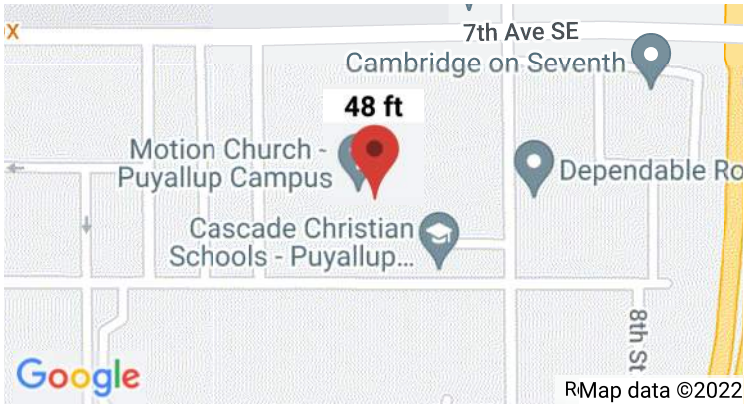
Address: 601 9th Ave SE, Puyallup, WA 98372

Coordinates: 47.1849634, -122.2870963

Elevation: 48 ft

Timestamp: 2022-04-06T16:29:52.624Z

Hazard Type: Snow



ASCE 7-16

Ground Snow Load ⚠ 18 lb/sqft

The reported ground snow load applies at the query location of 48 feet up to a maximum elevation of 40 feet with a tolerance of 100 feet.

ASCE 7-10

Ground Snow Load ⚠ 15 lb/sqft

The reported ground snow load applies at the query location of 48 feet up to a maximum elevation of 400 feet.

ASCE 7-05

Ground Snow Load ⚠ 15 lb/sqft

The reported ground snow load applies at the query location of 48 feet up to a maximum elevation of 400 feet.

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 interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer.

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.

1.1

Hazards by Location

Search Information

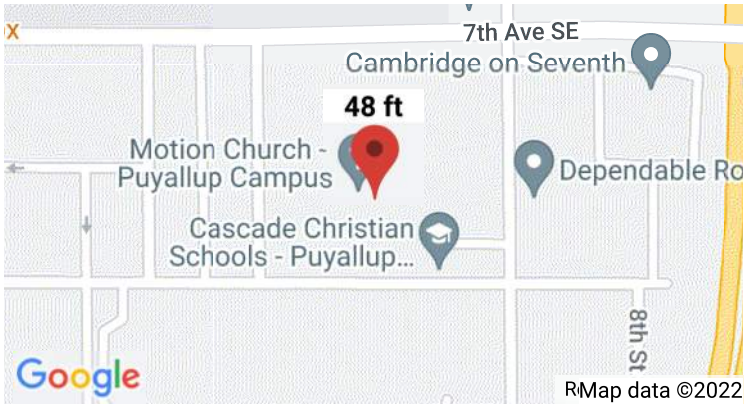
Address: 601 9th Ave SE, Puyallup, WA 98372

Coordinates: 47.1849634, -122.2870963

Elevation: 48 ft

Timestamp: 2022-04-06T16:30:33.757Z

Hazard Type: Wind



ASCE 7-16

MRI 10-Year	67 mph
MRI 25-Year	73 mph
MRI 50-Year	78 mph
MRI 100-Year	82 mph
Risk Category I	92 mph
Risk Category II	97 mph
Risk Category III	104 mph
Risk Category IV	108 mph

ASCE 7-10

MRI 10-Year	72 mph
MRI 25-Year	79 mph
MRI 50-Year	85 mph
MRI 100-Year	91 mph
Risk Category I	100 mph
Risk Category II	110 mph
Risk Category III-IV	115 mph

ASCE 7-05

ASCE 7-05 Wind Speed	85 mph

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Disclaimer

Hazard loads are interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer. Per ASCE 7, islands and coastal areas outside the last contour should use the last wind speed contour of the coastal area – in some cases, this website will extrapolate past the last wind speed contour and therefore, provide a wind speed that is slightly higher. NOTE: For queries near wind-borne debris region boundaries, the resulting determination is sensitive to rounding which may affect whether or not it is considered to be within a wind-borne debris region.

Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

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1,2

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.

Hazards by Location

Search Information

Address: 601 9th Ave SE, Puyallup, WA 98372

Coordinates: 47.1849634, -122.2870963

Elevation: 48 ft

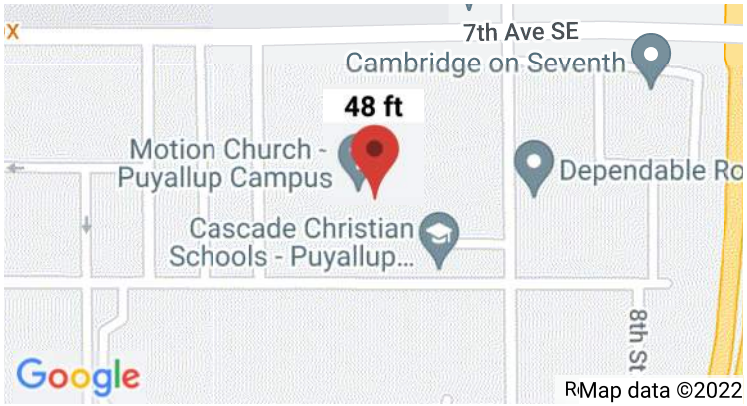
Timestamp: 2022-04-06T16:31:02.635Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: III

Site Class: D-default



Basic Parameters

Name	Value	Description
S_S	1.267	MCE_R ground motion (period=0.2s)
S_1	0.436	MCE_R ground motion (period=1.0s)
S_{MS}	1.521	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	1.014	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.914	Coefficient of risk (0.2s)
CR_1	0.898	Coefficient of risk (1.0s)
PGA	0.5	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.6	Site modified peak ground acceleration

1,4

T_L	6	Long-period transition period (s)
SsRT	1.267	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.386	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.436	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.486	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)

* See Section 11.4.8

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Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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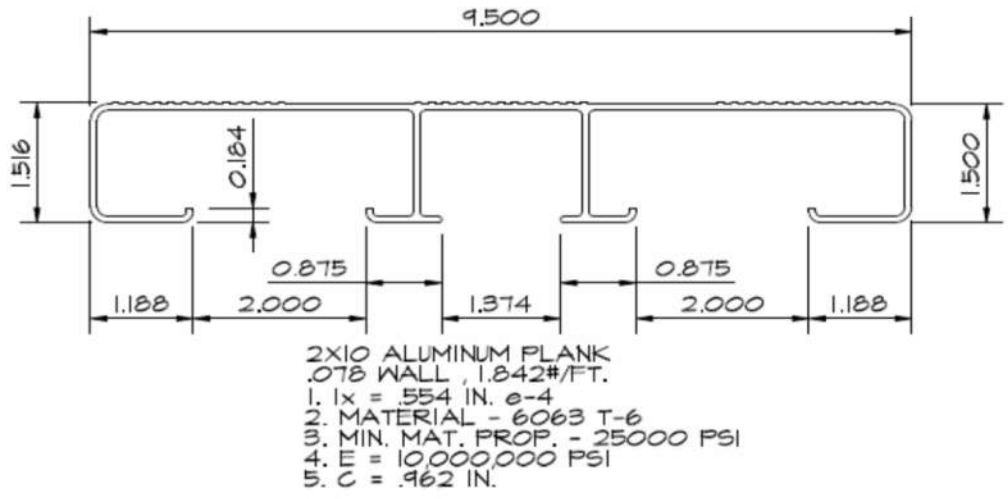
CHECK FOOTBOARD (Aluminum Design Manual, 2015)

PLANK PROPERTIES

Member size =	***2x10***	
L =	***6***	*FT*



$S_{x\ Top}$ =	***1.004***	IN^3	I_x =	***0.554***	IN^4
$S_{xBottom}$ =	***0.578***	IN^3	I_y =	***13.918***	IN^4
S_y =	***2.930***	IN^3	b_1 =	***3.470***	*IN*
t =	***0.078***	*IN*	b_2 =	***0.845***	*IN*
Self Weight =	***1.842***	*PLF*			

LOADS

Load case is: ***4 spans***

w_{DL} =	***1.84***	*PLF*
Uniform $_{LL}$ =	***100.00***	*PSF*
w_{LL} =	***79.17***	*PLF*

MOMENTS

M_{b+x} =	***283.56***	*# * FT*
M_{b-x} =	***351.95***	*# * FT*

(Maximum moments calculated based on critical skip loading for number of spans indicated above)

BENDING STRESSES

$f_{b\ +x\ top}$ =	**3.39**	KSI (Comp.)
$f_{b\ +x\ bot}$ =	**5.89**	KSI (Tens.)
$f_{b\ -x\ top}$ =	**4.21**	KSI (Tens.)
$f_{b\ -x\ bot}$ =	**7.31**	KSI (Comp.)

ALLOWABLE BENDING STRESS

** BOTH EDGES SUPPORTED*
(ADM 2015, Table 2-21, Sec. B5.5.1)

λ_1 =	**34.70**
λ_2 =	**93.00**

*** SUPPORTED ONE EDGE*
(ADM 2015, Table 2-21, Sec. B5.4.1)

λ_1 =	**7.30**
λ_2 =	**12.60**

*Top Flange (Compression) **

$\lambda_{top} = b_1 / t$ =	**44.49**	λ2>(b/t)>λ1
F =	**21.23**	KSI (ADM 2015, Table 2-21, Sec. B5.5.1)

*Bottom Flange (Compression) ***

$\lambda_{bot} = b_2 / t$ =	**10.83**	λ2>(b/t)>λ1
F =	**13.26**	KSI (ADM 2015, Table 2-21, Sec. B5.4.1)

All Flanges (Tension)

F =	**22.70**	KSI (ADM 2015, Table 2-21, Sec. B5.5.1)

STRESS RATIO CHECKS

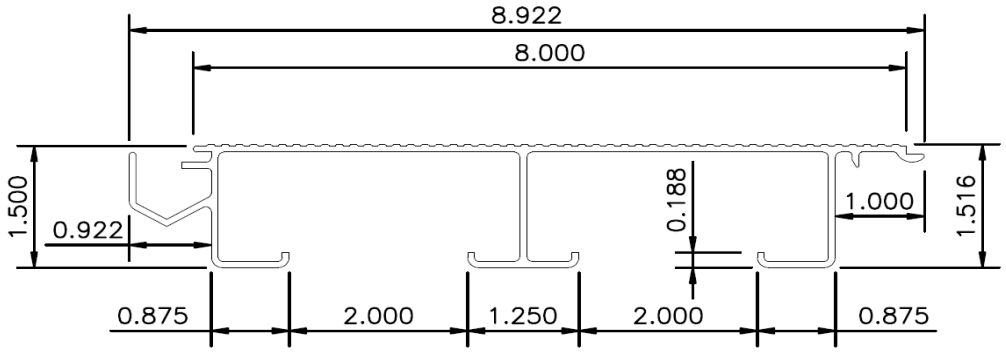
Stress Ratio (Compression) =	**0.55**	< 1.00
Stress Ratio (Tension) =	**0.30**	< 1.00
Max Deflection =	**0.31 in.**	< L/200
		(Section 303.6 ICC 300-2012)

2 x 10 ADEQUATE FOR DESIGN

CHECK FOOTBOARD (Aluminum Design Manual, 2015)

PLANK PROPERTIES

Member size =	***2x8 INTER***	
L =	***6***	*FT*



2X8 ALUMINUM INTERLOCKING DECK PLANK
.078 WALL , 1.746#/FT.
1. Ix = .479 IN. e-4
2. MATERIAL - 6063 T-6
3. MIN. MAT. PROP. - 25000 PSI
4. E = 10,000,000 PSI
5. C = .981 IN.

$S_{x\,Top}$ =	***0.895***	IN^3	I_x =	***0.479***	IN^4
$S_{xBottom}$ =	***0.488***	IN^3	I_y =	***14.117***	IN^4
S_y =	***2.720***	IN^3	b_1 =	***3.259***	*IN*
t =	***0.078***	*IN*	b_2 =	***0.625***	*IN*
Self Weight =	***1.746***	*PLF*			

LOADS

Load case is: ***4 spans***

w_{DL} =	***1.75***	*PLF*
Uniform $_{LL}$ =	***100***	*PSF*
w_{LL} =	***66.67***	*PLF*

MOMENTS

M_{b+x} =	***239.33***	*# * FT*
M_{b-x} =	***297.13***	*# * FT*

(Maximum moments calculated based on critical skip loading for number of spans indicated above)

BENDING STRESSES

$f_{b+x\,top}$ =	***3.21***	*KSI (Comp.)*
$f_{b+x\,bot}$ =	***5.89***	*KSI (Tens.)*
$f_{b-x\,top}$ =	***3.98***	*KSI (Tens.)*
$f_{b-x\,bot}$ =	***7.31***	*KSI (Comp.)*

ALLOWABLE BENDING STRESS

* BOTH EDGES SUPPORTED (ADM 2015, Table 2-21, Sec. B5.5.1)		** SUPPORTED ONE EDGE (ADM 2015, Table 2-21, Sec. B5.4.1)	
λ_1 =	**34.70**	λ_1 =	**7.30**
λ_2 =	**93.00**	λ_2 =	**12.60**

*Top Flange (Compression) **

$\lambda_{top} = b_1 / t$ =	**41.78**	λ2>(b/t)>λ1
F =	**21.63**	KSI (ADM 2015, Table 2-21, Sec. B5.5.1)

*Bottom Flange (Compression) ***

$\lambda_{bot} = b_2 / t$ =	**8.01**	λ2>(b/t)>λ1
F =	**14.75**	KSI (ADM 2015, Table 2-21, Sec. B5.4.1)

Both Flanges (Tension)

F =	**22.70**	KSI (ADM 2015, Table 2-21, Sec. B5.5.1)

STRESS RATIO CHECKS

Stress Ratio (Compression) =	**0.50**	< 1.00 (Comp. Stress in Top Flange Governs)
Stress Ratio (Tension) =	**0.30**	< 1.00
Max Deflection =	**0.305 in.**	< L/200 (Section 303.6 ICC 300-2012)

2 x 8 INTER ADEQUATE FOR DESIGN

Table 2-21
ALLOWABLE STRESSES F/Ω (k/in^2) FOR BUILDING-TYPE STRUCTURES (UNWELDED)

Axial Tension	Section	F/Ω
axial tension stress on net effective area	D.2b	15.4
axial tension stress on gross area	D.2a	15.2
Shear or torsion		
Shear or torsion rupture	G, H.2	9.2
Bearing		
bolts or rivets on holes	J.3.6a, J.4.6	30.8
bolts on slots, pins on holes, flat surfaces	J.3.6b, J.6.5, J.8	20.5
screws in holes	J.5.5.1	20.0

6063 - T6 B221, B241, B429 0.000 to 1.000 in. thick

F_{ty} =	25	k/in^2
F_{cy} =	25	k/in^2
F_{tu} =	30	k/in^2
E =	10,100	k/in^2
k_t =	1	

		λ	F/Ω for $\lambda \le \lambda_1$	λ_1	F/Ω for $\lambda_1 < \lambda < \lambda_2$	λ_2	F/Ω for $\lambda \ge \lambda_2$
Axial Compression - member buckling	E.2	kL/r	15.2	18.2	$0.00022\lambda^2 - 0.133\lambda + 17.5$	78	$51{,}352/\lambda^2$
Flexure - lateral-torsional buckling	F.4	see F.4.2		-	see F.4	78	$60{,}414/\lambda^2$
Elements - Uniform Compression							
flat elements supported on one edge in columns whose buckling axis is not an axis of symmetry	B.5.4.1	b/t	15.2	7.3	$19.0 - 0.530\lambda$	15	$2{,}417/\lambda^2$
flat elements supported on one edge in all other columns and all beams	B.5.4.1	b/t	15.2	7.3	$19.0 - 0.530\lambda$	12.6	$155/\lambda$
flat elements supported on both edges	B.5.4.2	b/t	15.2	22.8	$19.0 - 0.170\lambda$	39	$484/\lambda$
flat elements supported on both edges and with an intermediate stiffener	B.5.4.4	λ_s	15.2	18.2	$16.7 - 0.088\lambda$	78	$60{,}414/\lambda^2$
round hollow elements	B.5.4.5	R_b/t	15.2	31.2	$18.5 - 0.593\lambda^{1/2}$	189	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.4.6	λ_{eq}	15.2	36.5	$19.0 - 0.106\lambda$	63	$775/\lambda$
Elements - Flexural Compression							
flat elements supported on both edges	B.5.5.1	b/t	22.7	34.7	$27.9 - 0.150\lambda$	93	$1{,}298/\lambda$
flat elements supported on tension edge, compression edge free	B.5.5.2	b/t	22.7	6.5	$27.9 - 0.810\lambda$	23	$4{,}932/\lambda^2$
flat elements supported on both edges and with a longitudinal stiffener	B.5.5.3	b/t	22.7	77.8	$27.9 - 0.067\lambda$	208	$2{,}910/\lambda$
pipes and round tubes	B.5.5.4	R_b/t	$27.7 - 1.70\lambda^{1/2}$	70.0	$18.5 - 0.593\lambda^{1/2}$	189	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.5.5	λ_{eq}	M_{np}/S_{xc}	36.5	see B.5.5.5	74	$696/\lambda$
Elements - Shear							
flat elements supported on both edges	G.2	b/t	9.1	38.7	$11.5 - 0.062\lambda$	76	$38{,}665/\lambda^2$
flat elements supported on one edge	G.3	b/t	9.1	16.1	$11.5 - 0.150\lambda$	32	$6{,}713/\lambda^2$
pipes and round or oval tubes	G.4	λ_p*	9.1	72.2	$15.0 - 0.081\lambda$	76	$50{,}264/\lambda^2$
Torsion - pipes and round or oval tubes	H.2.1	λ_p*	9.1	38.7	$11.5 - 0.062\lambda$	76	$38{,}665/\lambda^2$

*$\lambda_p = 2.9(R_b/t)^{5/8}(L/R_b)^{1/4}$
†$k_n = (1+\lambda^{1/2}/35)^2$

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FRESNO, CALIFORNIA 93711
(559)449-8444 FAX (559)449-8404

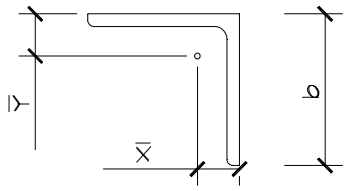
By:
Date:
Job no:
Sheet
Of:

FOOTBOARD ANGLE

MEMBER SIZE **L2 x 2 x 3/16**

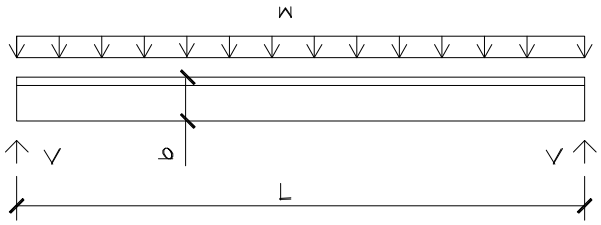
S_N =	**0.188**	IN^3
F_y =	**50000**	PSI
b =	**2**	IN
(thickness) t =	**0.1875**	IN
I_y =	**0.271**	IN^4
I_x =	**0.271**	IN^4
x =	**0.561**	IN
y =	**0.561**	IN
(Unbraced Length) l =	**30**	IN
C_b =	**1**	
E =	**29000000**	PSI
L=	**30**	IN

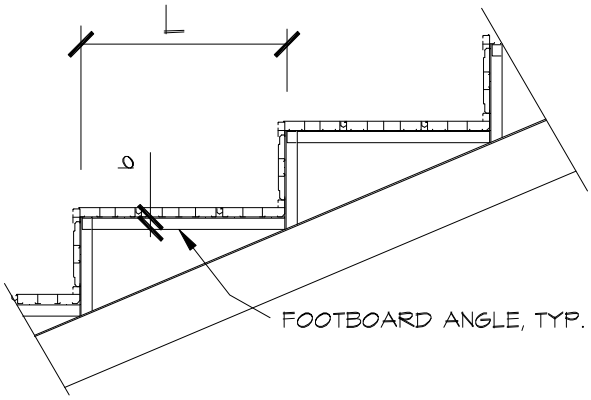
O1.	*Equal Angle No Restraint Bending Single Axis*
O2.	*Equal Angle Restraint @ Max Moment Bending Single Axis*
O3.	*Equal Angle Bending Principle Axis*
O4.	*Unequal Angle Bending Principle Axis*
1.	*Yield*
2.	*Lateral Torsional Buckling*
3.	*Leg Local Buckling*



ANGLE FLEXURE CHECKS

Select :Compression Flange	**Bending About X Axis**
Select: (Angle Type)	**Equal Angle**
Select: (Angle,Restraint,Bending)	**O3.**





w =	**630**	PLF	
V =	**787.5**	#	
M =	**393.75**	#*FT	← *Moment - Partial End Fixity*
f_b = M / S_N =	**25132.98**	PSI	

w_{DL} = 5 PSF

w_{LL} = 100 PSF > 120 PLF for this L

Trib. Width = 6 FT

STRESS CHECK

M_n =(Smallest of 1,2,3) =	**1148.65**	#*FT	
M_n / Ω_b =	**687.81**	#*FT	
F_b = (M_n / Ω_b) / S_N =	**43903.04**	PSI	
MEMBER CHECK	**0.57**	**< 1.0 OK!**	

USE: **L2 x 2 x 3/16**

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FRESNO, CALIFORNIA 93711
(559)449-8444 FAX (559)449-8404

By:
Date:
Job no:
Sheet 7 Of:

RAIL LOADINGS;

IBC/ICC; 50 PLF UNIFORM LOAD ANY DIRECTION @ TOP
OR
200# POINT LOAD @ ANY LOCATION

STANDARD 1 5/8" Ø HANDRAIL (6063- T6)

$$R_b \,/\, t = \frac{0.830}{0.080} = 10.375$$

$$S_1\ MAX = 33 > 10.375$$

$$F_b = 17.7 \quad ksi$$

$$MOMENT = F_b \times S_X$$

$$= 17{,}700 \times 0.1689 = 2{,}989.53 \quad in \cdot lb$$

$$= 249.13 \quad ft \cdot lb$$

$$= 0.249 \quad k \cdot ft$$

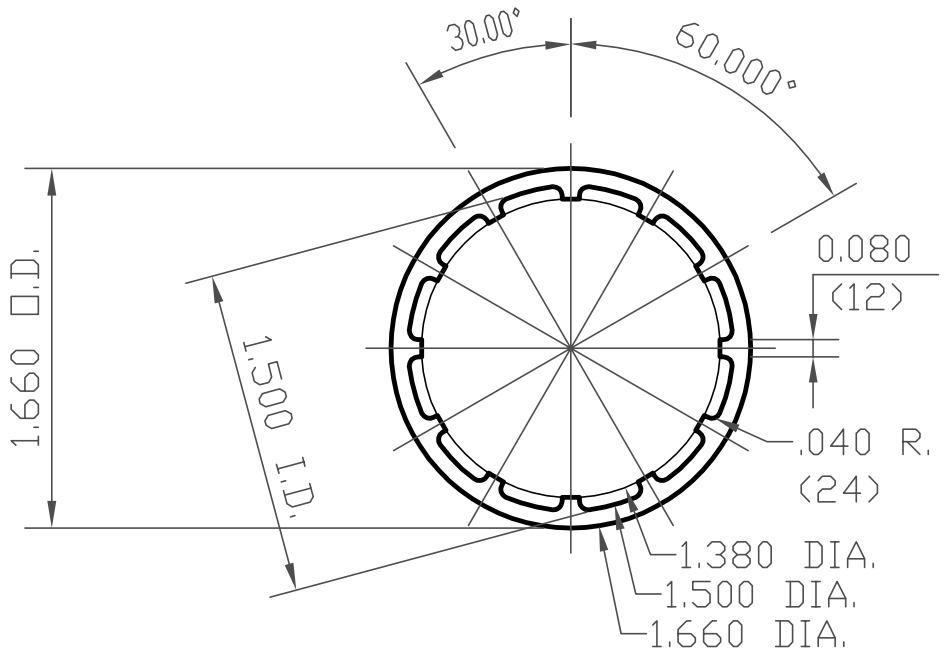
FOR MULTI – SPAN CONDITIONS (2 *OR MORE*);

$$M_P @ CL = \frac{13 \cdot P \cdot l}{64}$$

$$M_W CONTINUOUS = \frac{w \cdot l^2}{8}$$

CODE	MAX L FOR PT.	MAX L FOR w	DESIGN L
IBC/ICC	6.13'	6.31'	6' 1-1/2"

FOR POINT, $P \cdot l = 1225.85$ *FOR UNIFORM*, $w \cdot l^2 = 1992$



AREA .465 , .558#/FT.

1. Ix = .1402 IN. e-4
2. MATERIAL - 6063 T-6
3. MIN. MAT. PROP. - 25000 PSI
4. E = 10,000,000 PSI
5. C = 0.830 IN.
6. Sx = .1689 IN. e-3

1 5/8" O.D. ALUMINUM RAIL DETAIL

NOT TO SCALE

6063 T6

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(559)449-8444 FAX: (559)449-8404

By:

Date:

Job no:

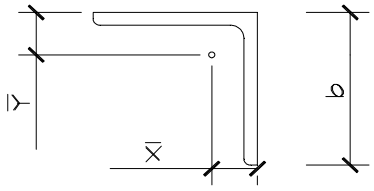
Sheet

HANDRAIL ANGLE MEMBERS - TO STEEL STRINGERS

@ FRONT WALK

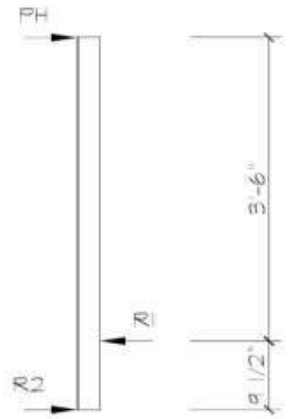
MEMBER SIZE	L 3 x 3 x 1/4	
S_N =	0.569	IN^3
F_y =	50000	PSI
b =	3	IN
(thickness) t =	0.25	IN
I_y =	1.23	IN^4
I_x =	1.23	IN^4
x =	0.836	IN
y =	0.836	IN
(Unbraced Length) l =	42	IN
C_b =	1	
E =	29000000	PSI
L=	42	IN

O1.	Equal Angle No Restraint Bending Single Axis
O2.	Equal Angle Restraint @ Max Moment Bending Single Axis
O3.	Equal Angle Bending Principle Axis
O4.	Unequal Angle Bending Principle Axis
1.	Yield
2.	Lateral Torsional Buckling
3.	Leg Local Buckling



ANGLE FLEXURE CHECKS

Select :Compression Flange	Bending About X Axis
Select: (Angle Type)	Equal Angle
Select: (Angle,Restraint,Bending)	O1.



P =	300	#
M = P*L =	1050	#*FT
f_b =M /S_N =	22144.11	PSI

w LL =	50	PLF
P LL =	200	#
Trib. Width =	6	FT

STRESS CHECK

M_n =(Smallest of 1,2,3) =	2557.81	#*FT
M_n / Ω_b =	1531.62	#*FT
F_b = (M_n / Ω_b) / S_N =	32301.36	PSI
MEMBER CHECK	0.69	LESS THAN 1.0 OK!

USE: **L 3 x 3 x 1/4**

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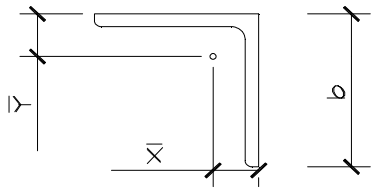
By:
Date:
Job no:

HANDRAIL ANGLE MEMBERS - TO STEEL STRINGERS

@ SIDES

MEMBER SIZE	L 3 x 3 x 1/4	
S_N =	0.569	IN^3
F_y =	50000	PSI
b =	3	IN
(thickness) t =	0.25	IN
I_y =	1.23	IN^4
I_x =	1.23	IN^4
x =	0.836	IN
y =	0.836	IN
(Unbraced Length) l =	64	IN
C_b =	1	
E =	29000000	PSI
L=	64	IN

O1.	Equal Angle No Restraint Bending Single Axis
O2.	Equal Angle Restraint @ Max Moment Bending Single Axis
O3.	Equal Angle Bending Principle Axis
O4.	Unequal Angle Bending Principle Axis
1.	Yield
2.	Lateral Torsional Buckling
3.	Leg Local Buckling



ANGLE FLEXURE CHECKS

Select :Compression Flange	Bending About X Axis
Select: (Angle Type)	Equal Angle
Select: (Angle,Restraint,Bending)	O1.

P =	250	#
M = P*L =	1333.33	#*FT
f_b =M /S_N =	28119.51	PSI

w LL =	50	PLF
P LL =	200	#
Trib. Width =	5	FT

STRESS CHECK

M_n =(Smallest of 1,2,3) =	2469.05	#*FT
M_n / Ω_b =	1478.47	#*FT
F_b = (M_n / Ω_b) / S_N =	31180.45	PSI
MEMBER CHECK	0.90	LESS THAN 1.0 OK!

USE: **L 3 x 3 x 1/4**

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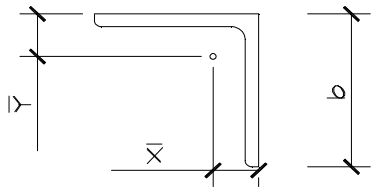
By:
Date:
Job no:

HANDRAIL ANGLE MEMBERS - TO STEEL STRINGERS

@ BACK

MEMBER SIZE	L 3 x 3 x 1/4	
S_N =	0.569	IN^3
F_y =	50000	PSI
b =	3	IN
(thickness) t =	0.25	IN
I_y =	1.23	IN^4
I_x =	1.23	IN^4
x =	0.836	IN
y =	0.836	IN
(Unbraced Length) l =	67	IN
C_b =	1	
E =	29000000	PSI
L=	59	IN

O1.	Equal Angle No Restraint Bending Single Axis
O2.	Equal Angle Restraint @ Max Moment Bending Single Axis
O3.	Equal Angle Bending Principle Axis
O4.	Unequal Angle Bending Principle Axis
1.	Yield
2.	Lateral Torsional Buckling
3.	Leg Local Buckling



ANGLE FLEXURE CHECKS

Select :Compression Flange	Bending About X Axis
Select: (Angle Type)	Equal Angle
Select: (Angle,Restraint,Bending)	O1.

P =	300	#
M = P*L =	1475.00	#*FT
f_b =M /S_N =	31107.21	PSI

w LL =	50	PLF
P LL =	200	#
Trib. Width =	6	FT

STRESS CHECK

M_n =(Smallest of 1,2,3) =	2456.32	#*FT
M_n / Ω_b =	1470.85	#*FT
F_b = (M_n / Ω_b) / S_N =	31019.69	PSI
MEMBER CHECK	1.00	<= 1.0 OK!

USE: **L 3 x 3 x 1/4**

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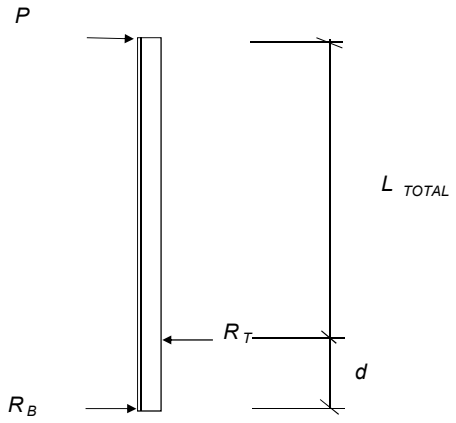
By:
Date:
Job no:

HANDRAIL ANGLE MEMBERS - TO STEEL STRINGERS

5/8" DIA. CONNECTION BOLTS

@ BACK

P =	**300**	#	
L_{TOTAL} =	**59**	IN	
d =	**8**	IN	
R_T =	**2212.50**	#	
5/8" DIA. A307 BOLT			
T_{ALLOW} =	**6900**	#	**OK >** R_T



@ FRONT & SIDE

BY OBSERVATION, LOADS TO BOLTS ARE
LESS THAN @ BACK. THEREFORE, OK

USE: 5/8 " DIA. A307 BOLTS

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By:
Date:
Job no:

WIND LOAD PRESSURES (PARTIALLY ENCLOSED) **Puyallup WA**

MWFRS STRINGER LOADING

I. DESIGN PARAMETERS

• RISK CATEGORY	TYPE III	
• MEAN STRUCTURE HEIGHT, h	10.00	FT (ASCE 7-16 FIG. 27.4-1)
• PEAK STRUCTURE HEIGHT, Z	20.00	FT (ASCE 7-16 FIG. 27.4-1)
• SLOPE OF GRANDSTAND	16 : 24	(RISE : RUN)
• SLOPE ANGLE OF GRANDSTAND,θ	33.69	DEGREES
• LENGTH OF GRANDSTAND	156.00	FT
• DEPTH OF GRANDSTAND	27.08	FT
• LONGITUDINAL WIND, L/B	5.76	(ASCE 7-16 FIG. 27.4-1)
• TRANSVERSE WIND, L/B	0.17	(ASCE 7-16 FIG. 27.4-1)
• TRANSVERSE WIND, h/L	0.37	(ASCE 7-16 FIG. 27.4-1)

II. WIND LOAD PARAMETERS

• BASIC WIND SPEED, V	115	MPH (ASCE 7-16 FIG. 26.5-1)
• WIND DIRECTIONALITY FACTOR, K_d	0.85	(ASCE 7-16 TABLE 26.6-1)
• EXPOSURE CATEGORY	C	(ASCE 7-16 SEC. 26.7.3)
• VELOCITY PRESSURE EXPOSURE COEFFICIENT, K_Z	0.90	(ASCE 7-16 TABLE 27.3-1)
• TOPOGRAPHIC FACTOR, K_{ZT}	1.00	(ASCE 7-16 FIG. 26.8-1)
• GUST EFFECT FACTOR, G	0.85	(ASCE 7-16 SEC. 26.9)
• INTERNAL PRESSURE COEFFICIENT, GC_{pi}	0.55	± (ASCE 7-16 TABLE 26.11-1)

III. VELOCITY PRESSURE

• VELOCITY PRESSURE, $q_z = 0.00256K_zK_{zt}K_dV^2$	25.90	PSF (ASCE 7-16 EQN. 27.3-1)

IV. EXTERNAL PRESSURE COEFFICIENTS, C_P

• WINDWARD WALL	0.80	(ASCE 7-16 FIG. 27.4-1)
• LEEWARD WALL (LONGITUDINAL WIND)	-0.20	(ASCE 7-16 FIG. 27.4-1)
• LEEWARD WALL (TRANSVERSE WIND)	-0.50	(ASCE 7-16 FIG. 27.4-1)
• WINDWARD ROOF (POSITIVE or NEGATIVE)	-0.18	(ASCE 7-16 FIG. 27.4-1)
• WINDWARD ROOF (NEGATIVE)	-0.70	(ASCE 7-16 FIG. 27.4-1)
• LEEWARD ROOF	-0.60	(ASCE 7-16 FIG. 27.4-1)
• FLAT ROOF CASE 1	-0.90	(ASCE 7-16 FIG. 27.4-1)
• FLAT ROOF CASE 2	-0.18	(ASCE 7-16 FIG. 27.4-1)

V. DESIGN WIND PRESSURES, $P = qGC_p - q_i(GC_{pi})$ (ASCE 7-16 EQN. 27.4-1)

• WINDWARD WALL	31.86	PSF
• LEEWARD WALL (LONGITUDINAL WIND)	-18.65	PSF
• LEEWARD WALL (TRANSVERSE WIND)	-25.25	PSF
• WINDWARD ROOF (POSITIVE or NEGATIVE)	-18.21	PSF
• WINDWARD ROOF (NEGATIVE)	-29.66	PSF
• LEEWARD ROOF	-27.45	PSF
• FLAT ROOF CASE 1	-34.06	PSF
• FLAT ROOF CASE 2	-18.21	PSF

WIND LOAD PRESSURES (OPEN) **Puyallup WA**

MWFRS STRINGER LOADING

I. DESIGN PARAMETERS

• RISK CATEGORY	TYPE III	
• MEAN STRUCTURE HEIGHT, h	31.00	FT (ASCE 7-16 FIG. 27.4-1)
• PEAK STRUCTURE HEIGHT, Z	32.25	FT (ASCE 7-16 FIG. 27.4-1)
• SLOPE OF ROOF COVER	1 : 12	(RISE : RUN)
• SLOPE ANGLE OF ROOF COVER,θ	4.76	DEGREES
• LENGTH OF ROOF COVER	156.00	FT
• DEPTH OF ROOF COVER	26.50	FT
• LONGITUDINAL WIND, L/B	5.89	(ASCE 7-16 FIG. 27.4-1)
• TRANSVERSE WIND, L/B	0.17	(ASCE 7-16 FIG. 27.4-1)
• TRANSVERSE WIND, h/L	1.17	(ASCE 7-16 FIG. 27.4-1)

II. WIND LOAD PARAMETERS

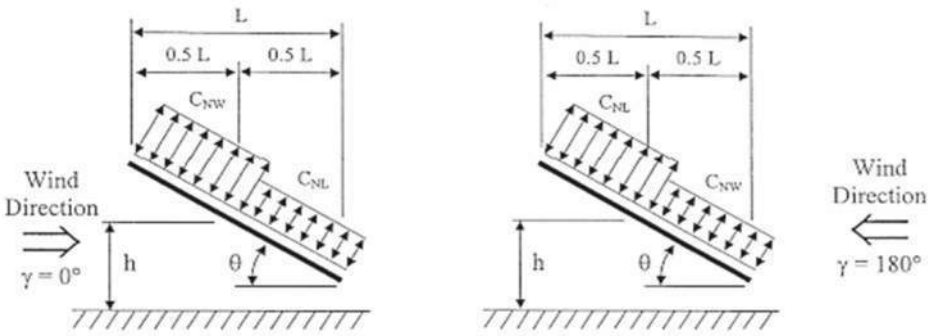
• BASIC WIND SPEED, V	115	MPH (ASCE 7-16 FIG. 26.5-1)
• WIND DIRECTIONALITY FACTOR, K_d	0.85	(ASCE 7-16 TABLE 26.6-1)
• EXPOSURE CATEGORY	C	(ASCE 7-16 SEC. 26.7.3)
• VELOCITY PRESSURE EXPOSURE COEFFICIENT, K_Z	0.98	(ASCE 7-16 TABLE 27.3-1)
• TOPOGRAPHIC FACTOR, K_{ZT}	1.00	(ASCE 7-16 FIG. 26.8-1)
• GUST EFFECT FACTOR, G	0.85	(ASCE 7-16 SEC. 26.9)

III. VELOCITY PRESSURE

• VELOCITY PRESSURE, $q_z = 0.00256K_zK_{zt}K_dV^2$	28.20	PSF (ASCE 7-16 EQN. 27.3-1)

IV. NET PRESSURE COEFFICIENTS, C_N

	C_{NW}	C_{NL}
• CASE A CLEAR WIND FLOW, γ = 0°	1.2	0.3
• CASE B CLEAR WIND FLOW, γ = 0°	-1.1	-0.1
• CASE A CLEAR WIND FLOW, γ = 180°	1.2	0.3
• CASE B CLEAR WIND FLOW, γ = 180°	-1.1	-0.1



V. DESIGN WIND PRESSURES, $P = q_hGC_N$ (ASCE 7-16 EQN. 27.4-3)

	C_{NW}	C_{NL}
• CASE A CLEAR WIND FLOW, γ = 0°	28.77 PSF	7.19 PSF
• CASE B CLEAR WIND FLOW, γ = 0°	-26.37 PSF	-2.4 PSF
• CASE A CLEAR WIND FLOW, γ = 180°	28.77 PSF	7.19 PSF
• CASE B CLEAR WIND FLOW, γ = 180°	-26.37 PSF	-2.4 PSF

WIND LOAD PRESSURES (PARTIALLY ENCLOSED) **Puyallup WA**

MWFRS LOADING

I. DESIGN PARAMETERS

• RISK CATEGORY	TYPE III	
• MEAN STRUCTURE HEIGHT, h	9.00	FT (ASCE 7-16 FIG. 27.3-1)
• PEAK STRUCTURE HEIGHT, Z (FROM GRADE)	20.00	FT (ASCE 7-16 FIG. 27.3-1)
• ROOF SLOPE	2 : 12	(RISE : RUN)
• ROOF SLOPE ANGLE ,θ	9.46	DEGREES
• LENGTH	24.00	FT
• DEPTH	8.00	FT
• LONGITUDINAL WIND, L/B	3.00	(ASCE 7-16 FIG. 27.3-1)
• TRANSVERSE WIND, L/B	0.33	(ASCE 7-16 FIG. 27.3-1)
• TRANSVERSE WIND, h/L	1.13	(ASCE 7-16 FIG. 27.3-1)

II. WIND LOAD PARAMETERS

• BASIC WIND SPEED, V	115	MPH (ASCE 7-16 FIG. 26.5-1)
• WIND DIRECTIONALITY FACTOR, K_d	0.85	(ASCE 7-16 TABLE 26.6-1)
• EXPOSURE CATEGORY	C	(ASCE 7-16 SEC. 26.7.3)
• VELOCITY PRESSURE EXPOSURE COEFFICIENT, K_Z	0.90	(ASCE 7-16 TABLE 27.3-1)
• TOPOGRAPHIC FACTOR, K_{ZT}	1.00	(ASCE 7-16 FIG. 26.8-1)
• GUST EFFECT FACTOR, G	0.85	(ASCE 7-16 SEC. 26.9)
• INTERNAL PRESSURE COEFFICIENT, GC_{pi}	0.55	± (ASCE 7-16 TABLE 26.11-1)

III. VELOCITY PRESSURE

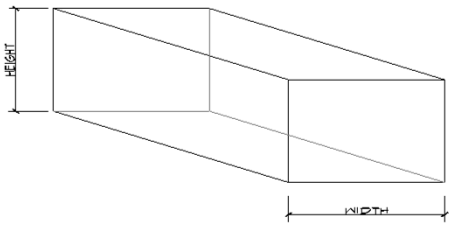
• VELOCITY PRESSURE, $q_z = 0.00256K_zK_{zt}K_dV^2$	25.90	PSF (ASCE 7-16 EQN. 27.3-1)

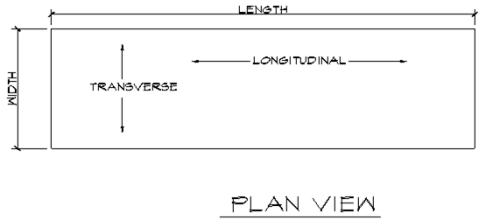
IV. EXTERNAL PRESSURE COEFFICIENTS, C_P

• WINDWARD WALL	0.80	(ASCE 7-16 FIG. 27.3-1)
• LEEWARD WALL (LONGITUDINAL WIND)	-0.20	(ASCE 7-16 FIG. 27.3-1)
• LEEWARD WALL (TRANSVERSE WIND)	-0.50	(ASCE 7-16 FIG. 27.3-1)
• FLAT ROOF (CASE 1)	-0.90	(ASCE 7-16 FIG. 27.3-1)
• FLAT ROOF (CASE 2)	-0.18	(ASCE 7-16 FIG. 27.3-1)

V. DESIGN WIND PRESSURES, $P = qGC_p - q_i(GC_{pi})$ (ASCE 7-16 EQN. 27.3-1)

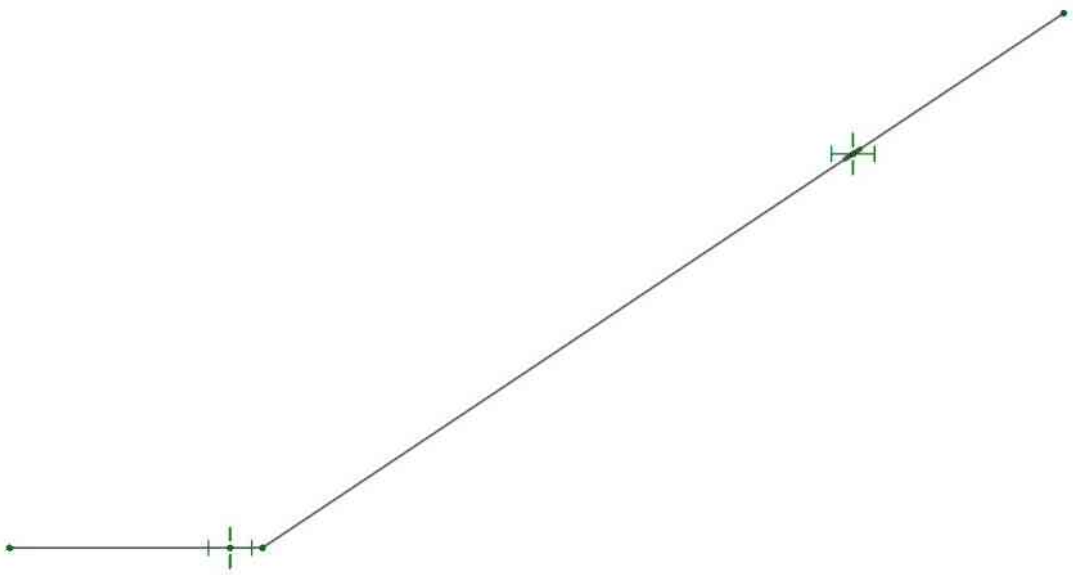
• WINDWARD WALL	31.86	PSF
• LEEWARD WALL (LONGITUDINAL WIND)	-18.65	PSF
• LEEWARD WALL (TRANSVERSE WIND)	-25.25	PSF
• FLAT ROOF (CASE 1)	-34.06	PSF
• FLAT ROOF (CASE 2)	-18.21	PSF





PLAN VIEW

DESIGN LOADS @ STRINGER **Puyallup WA**

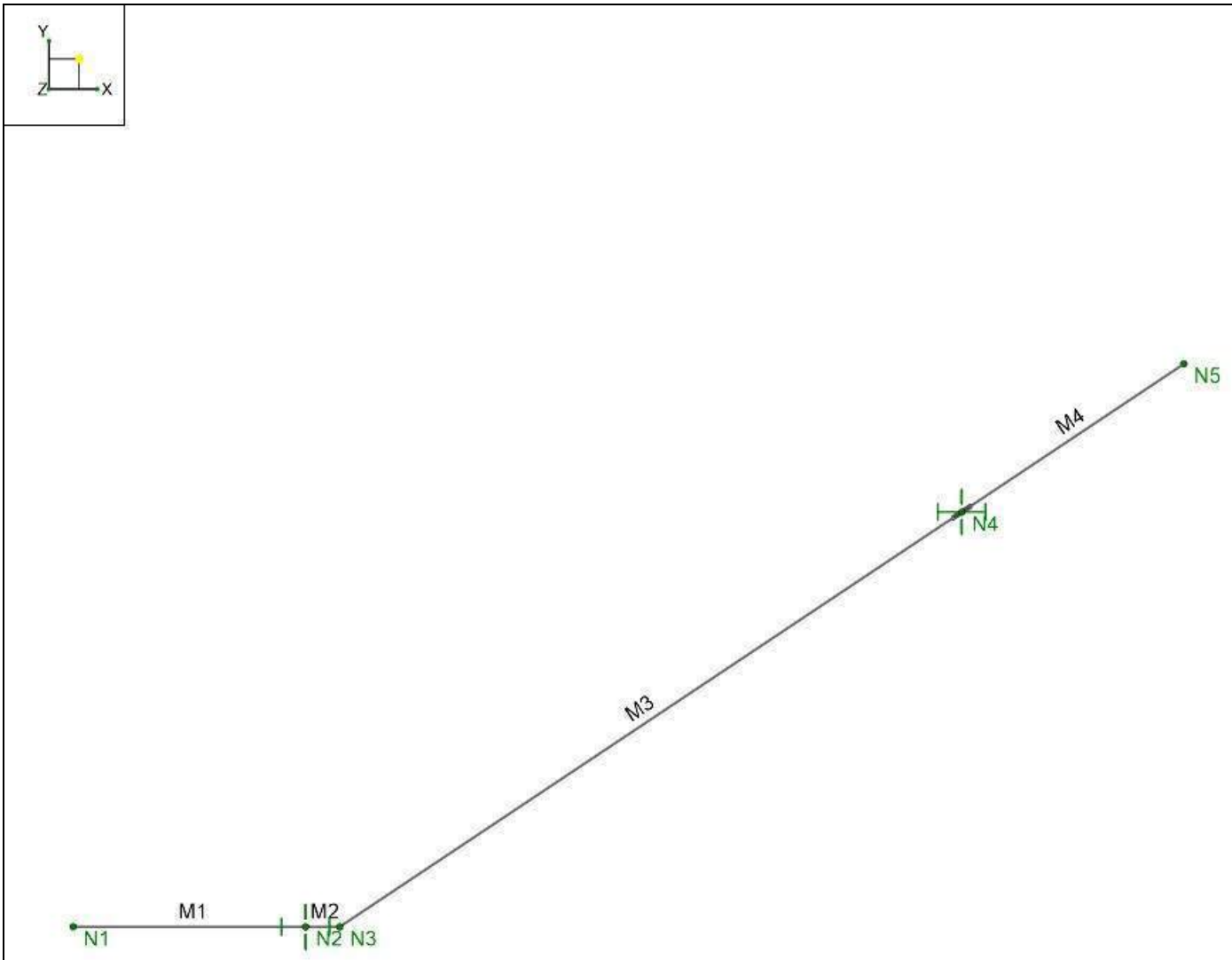


Review Loads

Rise =	16	in	} See "Stringer Dead Loads"
Run =	24	in	
Stringer Spacing =	6	ft	

Dead Loads:				
W_{DL} =	10	psf x Stringer spacing =	**0.060**	**klf**
Live Loads:				
W_{LL} =	100	psf x Stringer spacing =	**0.600**	**klf**
Sway Loads:				
$W_{SWAY\ (II)}$ =	24	plf x Stringer spacing x (12/Run) =	**0.072**	**klf**

Wind Loads @ Stringer: **See "Wind Load Pressures"**



		SK-1
		Apr 15, 2022
		STRINGERS.r3d

Model Settings

Solution

Members

Number of Reported Sections	5
Number of Internal Sections	100
Member Area Load Mesh Size (in^2)	144
Consider Shear Deformation	Yes
Consider Torsional Warping	Yes

Wall Panels

Approximate Mesh Size (in)	12
Transfer Forces Between Intersecting Wood Walls	Yes
Increase Wood Wall Nailing Capacity for Wind Loads	Yes
Include P-Delta for Walls	Yes
Optimize Masonry and Wood Walls	Yes
Maximum Number of Iterations	3

Processor Core Utilization

Single	No
Multiple (Optimum)	Yes
Maximum	No

Axis

Vertical Global Axis

Global Axis corresponding to vertical direction	Y
Convert Existing Data	Yes

Default Member Orientation

Default Global Plane for z-axis	XZ

Plate Axis

Plate Local Axis Orientation	Nodal

Codes

Hot Rolled Steel	AISC 14th (360-10): ASD
Stiffness Adjustment	Yes (Iterative)
Notional Annex	None
Connections	None
Cold Formed Steel	None
Stiffness Adjustment	Yes (Iterative)
Wood	None
Temperature	< 100F
Concrete	None
Masonry	None
Aluminum	None
Structure Type	Building
Stiffness Adjustment	Yes (Iterative)
Stainless	None
Stiffness Adjustment	Yes (Iterative)

Concrete

Compression Stress Block	Rectangular Stress Block
Analyze using Cracked Sections	Yes
Leave room for horizontal rebar splices (2*d bar spacing)	No

Model Settings (Continued)

List forces which were ignored for design in the Detail Report	Yes

Rebar

Column Min Steel	1
Column Max Steel	8
Rebar Material Spec	ASTM A615
Warn if beam-column framing arrangement is not understood	No

Shear Reinforcement

Number of Shear Regions	4
Region 2 & 3 Spacing Increase Increment (in)	4

Seismic

RISA-3D Seismic Load Options

Code	ASCE 7-16
Risk Category	III
Drift Cat	Other
Base Elevation (ft)	
Include the weight of the structure in base shear calcs	Yes

Site Parameters

S_1 (g)	1
SD_1 (g)	1
SD_s (g)	1
T_L (sec)	5

Structure Characteristics

T Z (sec)	
T X (sec)	
C_tX	0.02
C_tExp. Z	0.75
C_tExp. X	0.75
R Z	3
R X	3
Ω_0Z	1
Ω_0X	1
C_dZ	1
C_dX	1
ρ Z	1
ρ X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e⁵°F⁻¹]	Density [k/ft³]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A36 Gr.36	29000	11154	0.3	0.65	0.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
3	A992	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
4	A500 Gr.42	29000	11154	0.3	0.65	0.49	42	1.4	58	1.3
5	A500 Gr.46	29000	11154	0.3	0.65	0.49	46	1.4	58	1.3

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in²]	Iyy [in⁴]	Izz [in⁴]	J [in⁴]
1	STRINGERS	W10X12	Beam	Wide Flange	A992	Typical	3.54	2.18	53.8	0.055

Node Coordinates

	Label	X [ft]	Y [ft]	Z [ft]	Detach From Diaphragm
1	N1	0	4	0	
2	N2	5.6667	4	0	
3	N3	6.5	4	0	
4	N4	21.667	14.11133	0	
5	N5	27.08333	17.7224	0	

Node Boundary Conditions

	Node Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot [k-ft/rad]
1	N2	Reaction	Reaction	Reaction	Fixed
2	N4		Reaction	Reaction	Fixed

Member Primary Data

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
1	M1	N1	N2	STRINGERS	Beam	Wide Flange	A992	Typical
2	M2	N2	N3	STRINGERS	Beam	Wide Flange	A992	Typical
3	M3	N3	N4	STRINGERS	Beam	Wide Flange	A992	Typical
4	M4	N4	N5	STRINGERS	Beam	Wide Flange	A992	Typical

Hot Rolled Steel Design Parameters

	Label	Shape	Length [ft]	Lb y-y [ft]	Lcomp top [ft]	Lcomp bot [ft]	K y-y	K z-z	Function
1	M1	STRINGERS	5.667	3.5	3.5		2.1	2.1	Lateral
2	M2	STRINGERS	0.833	3.5	3.5		1	1	Lateral
3	M3	STRINGERS	18.228	3.5	3.5	9	1	1	Lateral
4	M4	STRINGERS	6.51	3.5	3.5		2.1	2.1	Lateral

Member Distributed Loads (BLC 1 : DEAD LOADS)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	PY	-0.06	-0.06	0	%100
2	M2	PY	-0.06	-0.06	0	%100
3	M3	PY	-0.06	-0.06	0	%100
4	M4	PY	-0.06	-0.06	0	%100

Member Distributed Loads (BLC 2 : LIVE LOADS(UNIFORM))

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	PY	-0.6	-0.6	0	%100
2	M2	PY	-0.6	-0.6	0	%100
3	M3	PY	-0.6	-0.6	0	%100
4	M4	PY	-0.6	-0.6	0	%100

Member Distributed Loads (BLC 3 : SWAY LOADS)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	Z	0.072	0.072	0	%100
2	M2	Z	0.072	0.072	0	%100
3	M3	Z	0.072	0.072	0	%100
4	M4	Z	0.072	0.072	0	%100

Member Distributed Loads (BLC 4 : WIND LOADS FTB)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M3	PX	0.178	0.178	0	%100
2	M4	PX	0.178	0.178	0	%100

Member Distributed Loads (BLC 5 : WIND LOADS UPLIFT)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	y	0.165	0.165	0	%100
2	M2	y	0.165	0.165	0	%100
3	M3	y	0.165	0.165	0	%100
4	M4	y	0.165	0.165	0	%100

Basic Load Cases

	BLC Description	Category	Distributed
1	DEAD LOADS	DL	4
2	LIVE LOADS(UNIFORM)	LL	4
3	SWAY LOADS	OL1	4
4	WIND LOADS FTB	WLX	2
5	WIND LOADS UPLIFT	WL-X	4

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor
1	DL								
2		Yes	Y	DL	1				
3									
4	DL + LL								
5		Yes	Y	DL	1	LL	1		
6									
7	DL + LL + SWAYZ								
8		Yes	Y	DL	1	OL1	0.75	LL	0.75
9									
10									
11	DL + LL+ WLFTB								
12		Yes	Y	DL	1	WLX	0.45	LL	0.75
13									
14	DL + WLFTB								

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor
15		Yes	Y	DL	1	WLX	0.6		
16		Yes	Y	DL	0.6	WLX	0.6		
17									
18	DL + LL- WLFTB								
19		Yes	Y	DL	1	WLX	-0.45	LL	0.75
20									
21	DL - WLFTB								
22		Yes	Y	DL	1	WLX	-0.6		
23		Yes	Y	DL	0.6	WLX	-0.6		
24									
25	DL + LL + WLUP								
26		Yes	Y	DL	1	WL-X	0.45	LL	0.75
27									
28	DL + WLUP								
29		Yes	Y	DL	1	WL-X	0.6		
30		Yes	Y	DL	0.6	WL-X	0.6		
31									
32	DL		Y	DL	1				
33	LL		Y	LL	1				
34	SWAY		Y	OL1	1				
35	WLFTB		Y	WLX	1				
36	WLUP		Y	WL-X	1				

Envelope Node Reactions

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N2	max	1.436	23	9.079	5	0	30	NC	NC	0	30	0	30
2		min	-1.436	15	-0.3	30	-0.816	8	NC	NC	0	2	0	2
3	N4	max	0	30	8.521	5	0	30	NC	NC	0	30	0	30
4		min	0	2	-1.375	30	-0.844	8	NC	NC	0	2	0	2
5	Totals:	max	1.436	23	17.6	5	0	30						
6		min	-1.436	15	-1.675	30	-1.66	8						

Envelope AISC 14TH (360-10): ASD Member Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
1	M1	W10X12	0.464	5.667	8	0.1	5.667	y	5	42.085	105.988	4.296	31.207	2.326	H1-1b
2	M2	W10X12	0.541	0	8	0.142	0	y	5	80.467	105.988	4.296	31.207	1.195	H1-1b
3	M3	W10X12	0.668	17.978	8	0.113	17.978	y	5	30.32	105.988	4.296	15.74	1	H1-1b
4	M4	W10X12	0.462	0	8	0.076	0	y	5	42.085	105.988	4.296	31.207	2.328	H1-1b

Load Combinations

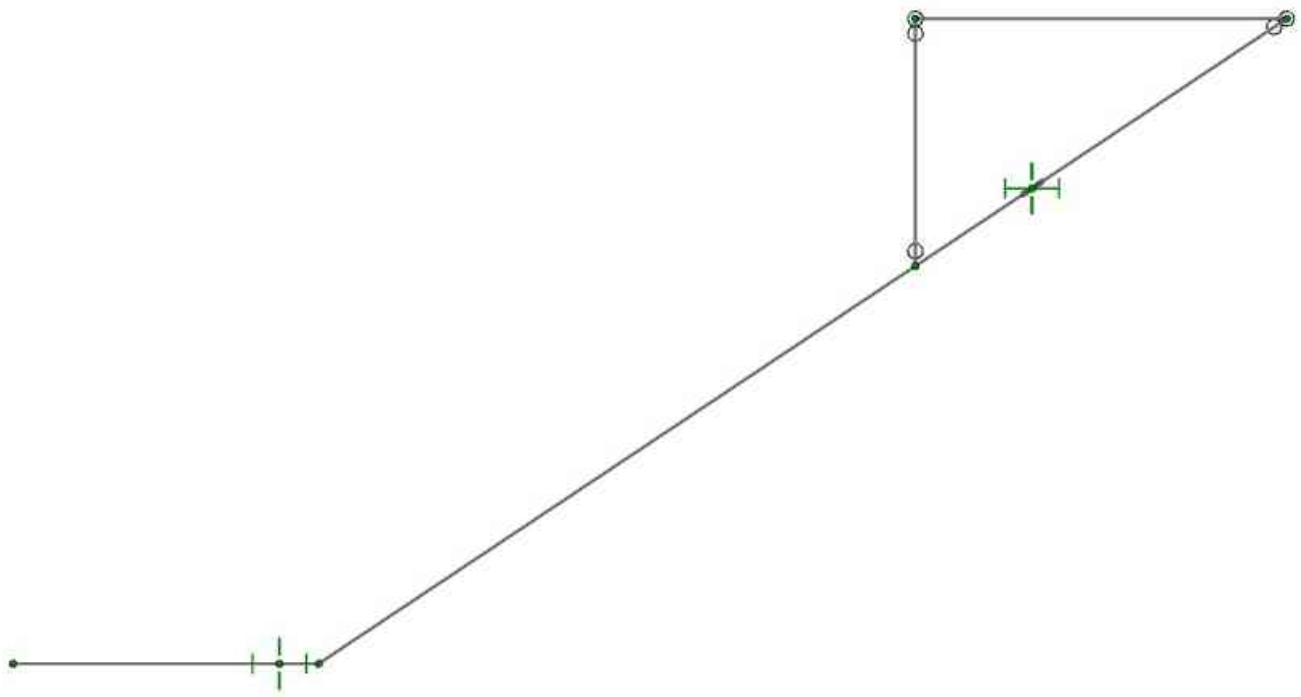
	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor
1	DL								
2			Y	DL	1				
3									
4	DL + LL								
5			Y	DL	1	LL	1		
6									
7	DL + LL + SWAYZ								
8			Y	DL	1	OL1	0.75	LL	0.75
9									
10									
11	DL + LL+ WLFTB								
12			Y	DL	1	WLX	0.45	LL	0.75
13									
14	DL + WLFTB								
15			Y	DL	1	WLX	0.6		
16			Y	DL	0.6	WLX	0.6		
17									
18	DL + LL- WLFTB								
19			Y	DL	1	WLX	-0.45	LL	0.75
20									
21	DL - WLFTB								
22			Y	DL	1	WLX	-0.6		
23			Y	DL	0.6	WLX	-0.6		
24									
25	DL + LL + WLUP								
26			Y	DL	1	WL-X	0.45	LL	0.75
27									
28	DL + WLUP								
29			Y	DL	1	WL-X	0.6		
30			Y	DL	0.6	WL-X	0.6		
31									
32	DL	Yes	Y	DL	1				
33	LL	Yes	Y	LL	1				
34	SWAY	Yes	Y	OL1	1				
35	WLFTB	Yes	Y	WLX	1				
36	WLUP	Yes	Y	WL-X	1				

Node Reactions

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	32	N2	0	0.825	0	NC	0	0
2	32	N4	0	0.775	0	NC	0	0
3	32	Totals:	0	1.6	0			
4	32	COG (ft):	X: 13.427	Y: 9.146	Z: 0			
5	33	N2	0	8.254	0	NC	0	0
6	33	N4	0	7.747	0	NC	0	0
7	33	Totals:	0	16	0			
8	33	COG (ft):	X: 13.427	Y: 9.146	Z: 0			
9	34	N2	0	0	-1.081	NC	0	0
10	34	N4	0	0	-1.132	NC	0	0
11	34	Totals:	0	0	-2.213			
12	34	COG (ft):	NC	NC	NC			
13	35	N2	-2.393	-1.016	0	NC	0	0
14	35	N4	0	1.016	0	NC	0	0
15	35	Totals:	-2.393	0	0			

Node Reactions (Continued)

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
16	35	COG (ft):	NC	NC	NC			
17	36	N2	2.214	-1.325	0	NC	0	0
18	36	N4	0	-3.067	0	NC	0	0
19	36	Totals:	2.214	-4.392	0			
20	36	COG (ft):	X: 13.415	Y: 9.138	Z: 0			



Review Loads

Rise =	16	in	} See "Stringer Dead Loads"
Run =	24	in	
Stringer Spacing =	6	ft	
Pressbox Length =	24.00	ft	} See "Wind Load Pressures"
Pressbox Width =	8.00	ft	
Pressbox Height =	9.00	ft	
Pressbox Roof Weight =	15	psf	} See "Design Load Summary"
Pressbox Wall Weight =	10	psf	
Pressbox Floor Weight =	10	psf	

Review Loads Cont.

Dead Loads:				
$W_{DL\ (Grand.)}$ =	10	psf x Stringer spacing =	**0.060**	**klf**
$P_{DL(PB\ Roof)}$ =	15	psf x Stringer spacing x PB Width / 2 =	**0.360**	**Kips**
$P_{DL(PB\ Floor)}$ =	10	psf x Stringer spacing x PB Width / 2 =	**0.240**	**Kips**
Live Loads:				
$W_{LL\ (Grand.)}$ =	100	psf x Stringer spacing =	**0.600**	**klf**
$P_{LL(PB\ Roof)}$ =	20	psf x Stringer spacing x PB Width / 2 =	**0.480**	**Kips**
$P_{LL(PB\ Floor)}$ =	100	psf x Stringer spacing x PB Width / 2 =	**2.400**	**Kips**
Sway Loads:				
$W_{SWAY\ (II)}$ =	24	plf x Stringer spacing x (12/Run) =	**0.072**	**klf**
$W_{SWAY\ (\perp)}$ =	10	plf x Stringer spacing x (12/Run) =	**0.030**	**klf**

Wind Loads @ Stringer:

See "Wind Load Pressures"

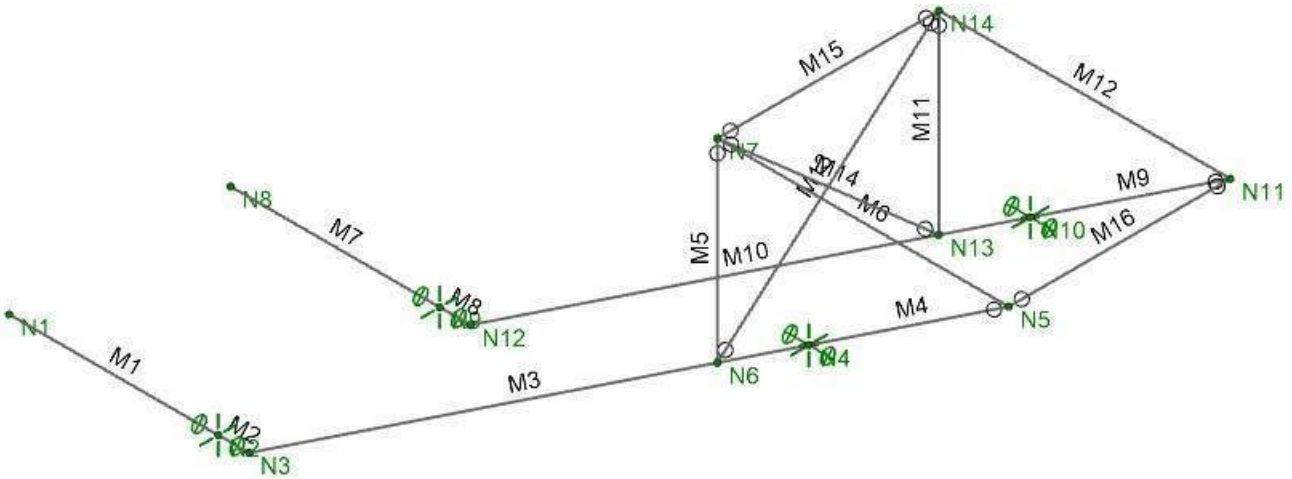
Wind Loads @ Pressbox (MWFRS):

Windward case 1&2

$P_{WL\ (Roof)}$ =	57.11	psf x PB Length/2 x PB Height/2 =	**3.084**	**Kips**
$P_{WL\ (End\ Flr.)}$ =	57.11	psf x Stringer Spacing/2 x PB Height/2 =	**0.771**	**Kips**
$P_{WL\ (Total\ End)}$ =			**3.855**	**Kips**
$P_{WL\ (Int.\ Flr.)}$ =	57.11	psf x Stringer Spacing x PB Height/2 =	**1.542**	**Kips**
T = C =	($P_{WL\ (Roof)}$ x	PB Height/2) / (PB Width/2) =	**3.469**	**Kips**

Leeward (Lateral Wall Loading):

$P_{WL\ (Roof)}$ =	57.11	psf x PB Length/2 x PB Height/2 =	**3.084**	**Kips**
$P_{WL\ (End\ Flr.)}$ =	57.11	psf x Stringer Spacing/2 x PB Height/2 =	**0.771**	**Kips**
$P_{WL\ (Total\ End)}$ =			**3.855**	**Kips**
$P_{WL\ (Int.\ Flr.)}$ =	57.11	psf x Stringer Spacing x PB Height/2 =	**1.542**	**Kips**
T = C =	($P_{WL\ (Roof)}$ x	PB Height/2) / (PB Width/2) =	**3.469**	**Kips**



		SK-1
		Apr 15, 2022
		STRINGERS@PB.r3d

Model Settings

Solution

Members

Number of Reported Sections	5
Number of Internal Sections	100
Member Area Load Mesh Size (in^2)	144
Consider Shear Deformation	Yes
Consider Torsional Warping	Yes

Wall Panels

Approximate Mesh Size (in)	12
Transfer Forces Between Intersecting Wood Walls	Yes
Increase Wood Wall Nailing Capacity for Wind Loads	Yes
Include P-Delta for Walls	Yes
Optimize Masonry and Wood Walls	Yes
Maximum Number of Iterations	3

Processor Core Utilization

Single	No
Multiple (Optimum)	Yes
Maximum	No

Axis

Vertical Global Axis

Global Axis corresponding to vertical direction	Y
Convert Existing Data	Yes

Default Member Orientation

Default Global Plane for z-axis	XZ

Plate Axis

Plate Local Axis Orientation	Nodal

Codes

Hot Rolled Steel	AISC 14th (360-10): ASD
Stiffness Adjustment	Yes (Iterative)
Notional Annex	None
Connections	None
Cold Formed Steel	None
Stiffness Adjustment	Yes (Iterative)
Wood	None
Temperature	< 100F
Concrete	None
Masonry	None
Aluminum	None
Structure Type	Building
Stiffness Adjustment	Yes (Iterative)
Stainless	None
Stiffness Adjustment	Yes (Iterative)

Concrete

Compression Stress Block	Rectangular Stress Block
Analyze using Cracked Sections	Yes
Leave room for horizontal rebar splices (2*d bar spacing)	No

Model Settings (Continued)

List forces which were ignored for design in the Detail Report	Yes

Rebar

Column Min Steel	1
Column Max Steel	8
Rebar Material Spec	ASTM A615
Warn if beam-column framing arrangement is not understood	No

Shear Reinforcement

Number of Shear Regions	4
Region 2 & 3 Spacing Increase Increment (in)	4

Seismic

RISA-3D Seismic Load Options

Code	ASCE 7-16
Risk Category	III
Drift Cat	Other
Base Elevation (ft)	
Include the weight of the structure in base shear calcs	Yes

Site Parameters

S_1 (g)	1
SD_1 (g)	1
SD_s (g)	1
T_L (sec)	5

Structure Characteristics

T Z (sec)	
T X (sec)	
C_tX	0.02
C_tExp. Z	0.75
C_tExp. X	0.75
R Z	3
R X	3
Ω_0Z	1
Ω_0X	1
C_dZ	1
C_dX	1
ρ Z	1
ρ X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e⁵°F⁻¹]	Density [k/ft³]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A36 Gr.36	29000	11154	0.3	0.65	0.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
3	A992	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
4	A500 Gr.42	29000	11154	0.3	0.65	0.49	42	1.4	58	1.3
5	A500 Gr.46	29000	11154	0.3	0.65	0.49	46	1.4	58	1.3

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in²]	Iyy [in⁴]	Izz [in⁴]	J [in⁴]
1	STRINGERS	W10X12	Beam	Wide Flange	A992	Typical	3.54	2.18	53.8	0.055
2	vert	W10X12	Column	Wide Flange	A992	Typical	3.54	2.18	53.8	0.055
3	crossbracing	L2x2x3	VBrace	Single Angle	A992	Typical	0.722	0.271	0.271	0.009
4	channel	C8X11.5	Beam	Channel	A992	Typical	3.37	1.31	32.5	0.13

Node Coordinates

	Label	X [ft]	Y [ft]	Z [ft]	Detach From Diaphragm
1	N1	0	4	0	
2	N2	5.6667	4	0	
3	N3	6.5	4	0	
4	N4	21.667	14.11133	0	
5	N5	27.08333	17.7224	0	
6	N6	19.188768	12.459176	0	
7	N7	19.188768	17.7224	0	
8	N8	0	4	-6	
9	N9	5.6667	4	-6	
10	N10	21.667	14.11133	-6	
11	N11	27.08333	17.7224	-6	
12	N12	6.5	4	-6	
13	N13	19.188768	12.459176	-6	
14	N14	19.188768	17.7224	-6	

Node Boundary Conditions

	Node Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot [k-ft/rad]
1	N2	Reaction	Reaction	Reaction	Fixed
2	N4		Reaction	Reaction	Fixed
3	N9	Reaction	Reaction	Reaction	Fixed
4	N10		Reaction	Reaction	Fixed

Member Primary Data

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
1	M1	N1	N2	STRINGERS	Beam	Wide Flange	A992	Typical
2	M2	N2	N3	STRINGERS	Beam	Wide Flange	A992	Typical
3	M3	N3	N4	STRINGERS	Beam	Wide Flange	A992	Typical
4	M4	N4	N5	STRINGERS	Beam	Wide Flange	A992	Typical
5	M5	N6	N7	vert	Column	Wide Flange	A992	Typical
6	M6	N7	N5	STRINGERS	Beam	Wide Flange	A992	Typical
7	M7	N8	N9	STRINGERS	Beam	Wide Flange	A992	Typical
8	M8	N9	N12	STRINGERS	Beam	Wide Flange	A992	Typical
9	M9	N10	N11	STRINGERS	Beam	Wide Flange	A992	Typical
10	M10	N12	N10	STRINGERS	Beam	Wide Flange	A992	Typical

Member Primary Data (Continued)

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
11	M11	N13	N14	vert	Column	Wide Flange	A992	Typical
12	M12	N14	N11	STRINGERS	Beam	Wide Flange	A992	Typical
13	M13	N6	N14	crossbracing	VBrace	Single Angle	A992	Typical
14	M14	N7	N13	crossbracing	VBrace	Single Angle	A992	Typical
15	M15	N7	N14	channel	Beam	Channel	A992	Typical
16	M16	N11	N5	channel	Beam	Channel	A992	Typical

Hot Rolled Steel Design Parameters

	Label	Shape	Length [ft]	Lb y-y [ft]	Lcomp top [ft]	Lcomp bot [ft]	K y-y	K z-z	Function
1	M1	STRINGERS	5.667	3.5	3.5		2.1	2.1	Lateral
2	M2	STRINGERS	0.833	3.5	3.5		1	1	Lateral
3	M3	STRINGERS	18.228	3.5	3.5	6	1	1	Lateral
4	M4	STRINGERS	6.51	3.5	3.5		2.1	2.1	Lateral
5	M5	vert	5.263		Lbyy		1	1	Lateral
6	M6	STRINGERS	7.895		Lbyy		1	1	Lateral
7	M7	STRINGERS	5.667	3.5	3.5		2.1	2.1	Lateral
8	M8	STRINGERS	0.833	3.5	3.5		1	1	Lateral
9	M9	STRINGERS	6.51	3.5	3.5		2.1	2.1	Lateral
10	M10	STRINGERS	18.228	3.5	3.5	6	1	1	Lateral
11	M11	vert	5.263		Lbyy		1	1	Lateral
12	M12	STRINGERS	7.895		Lbyy		1	1	Lateral
13	M13	crossbracing	7.981		Lbyy		1	1	Lateral
14	M14	crossbracing	7.981		Lbyy		1	1	Lateral
15	M15	channel	6		Lbyy		1	1	Lateral
16	M16	channel	6		Lbyy		1	1	Lateral

Member Distributed Loads (BLC 1 : DEAD LOADS)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	PY	-0.06	-0.06	0	%100
2	M2	PY	-0.06	-0.06	0	%100
3	M3	PY	-0.06	-0.06	0	15.25
4	M6	PY	-0.06	-0.06	0	%100
5	M7	PY	-0.06	-0.06	0	%100
6	M8	PY	-0.06	-0.06	0	%100
7	M10	PY	-0.06	-0.06	0	15.25
8	M12	PY	-0.06	-0.06	0	%100

Member Distributed Loads (BLC 2 : LIVE LOADS(UNIFORM))

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	PY	-0.6	-0.6	0	%100
2	M2	PY	-0.6	-0.6	0	%100
3	M3	PY	-0.6	-0.6	0	15.25
4	M6	PY	-0.6	-0.6	0	%100
5	M7	PY	-0.6	-0.6	0	%100
6	M8	PY	-0.6	-0.6	0	%100
7	M10	PY	-0.6	-0.6	0	15.25
8	M12	PY	-0.6	-0.6	0	%100

Member Distributed Loads (BLC 3 : SWAY LOADS)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	Z	0.072	0.072	0	%100
2	M2	Z	0.072	0.072	0	%100
3	M3	Z	0.072	0.072	0	15.25
4	M7	Z	0.072	0.072	0	%100
5	M8	Z	0.072	0.072	0	%100
6	M10	Z	0.072	0.072	0	15.25

Member Distributed Loads (BLC 4 : WIND LOADS FTB)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M3	PX	0.178	0.178	0	15.25
2	M5	PX	0.178	0.178	0	%100
3	M10	PX	0.178	0.178	0	15.25
4	M11	PX	0.178	0.178	0	%100

Member Distributed Loads (BLC 5 : WIND LOADS UPLIFT)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	y	0.165	0.165	0	%100
2	M2	y	0.165	0.165	0	%100
3	M3	y	0.165	0.165	0	%100
4	M4	y	0.165	0.165	0	%100
5	M7	y	0.165	0.165	0	%100
6	M8	y	0.165	0.165	0	%100
7	M9	y	0.165	0.165	0	%100
8	M10	y	0.165	0.165	0	%100

Node Loads and Enforced Displacements (BLC 1 : DEAD LOADS)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	N5	L	Y	-0.36
2	N7	L	Y	-0.36
3	N11	L	Y	-0.36
4	N14	L	Y	-0.36

Node Loads and Enforced Displacements (BLC 2 : LIVE LOADS(UNIFORM))

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	N5	L	Y	-0.48
2	N7	L	Y	-0.48
3	N11	L	Y	-0.48
4	N14	L	Y	-0.48

Node Loads and Enforced Displacements (BLC 4 : WIND LOADS FTB)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	N5	L	Y	-3.469
2	N7	L	Y	3.469
3	N7	L	X	0.771
4	N7	L	X	3.084
5	N14	L	X	1.542

Node Loads and Enforced Displacements (BLC 5 : WIND LOADS UPLIFT)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	N5	L	Y	3.469
2	N7	L	Y	-3.469
3	N7	L	X	-0.771
4	N7	L	X	-3.084
5	N14	L	X	-1.542

Basic Load Cases

	BLC Description	Category	Nodal	Distributed
1	DEAD LOADS	DL	4	8
2	LIVE LOADS(UNIFORM)	LL	4	8
3	SWAY LOADS	OL1		6
4	WIND LOADS FTB	WLX	5	4
5	WIND LOADS UPLIFT	WL-X	5	8

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor
1	DL	Yes	Y	DL	1				
2									
3	DL + LL	Yes	Y	DL	1	LL	1		
4									
5	DL + LL + SWAYZ	Yes	Y	DL	1	OL1	0.75	LL	0.75
6									
7	DL + LL + SWAYZ	Yes	Y	DL	1	WLX	0.45	LL	0.75
8									
9	DL + WLFTB	Yes	Y	DL	1	WLX	0.6		
10		Yes	Y	DL	0.6	WLX	0.6		
11									
12	DL + LL- WLFTB	Yes	Y	DL	1	WLX	-0.45	LL	0.75
13									
14	DL - WLFTB	Yes	Y	DL	1	WLX	-0.6		
15		Yes	Y	DL	0.6	WLX	-0.6		
16									
17	DL + LL + WLUP	Yes	Y	DL	1	WL-X	0.45	LL	0.75
18									
19	DL + WLUP	Yes	Y	DL	1	WL-X	0.6		
20		Yes	Y	DL	0.6	WL-X	0.6		
21									
22	DL		Y	DL	1				
23	LL		Y	LL	1				
24	SWAY		Y	OL1	1				
25	WLFTB		Y	WLX	1				
26	WLUP		Y	WL-X	1				

Envelope Node Reactions

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N2	max	3.778	15	9.625	12	0.003	12	NC	NC	0	20	0	20
2		min	-3.778	9	-3.19	10	-0.844	5	NC	NC	0	1	0	1
3	N4	max	0	20	11.111	7	0.022	17	NC	NC	0	20	0	20
4		min	0	1	-3.885	20	-0.215	5	NC	NC	0	1	0	1
5	N9	max	2.391	14	8.923	3	0.001	12	NC	NC	0	20	0	20
6		min	-2.391	10	-0.973	10	-0.854	5	NC	NC	0	1	0	1

Envelope Node Reactions (Continued)

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
7	N10	max	0	20	10.632	3	0.005	7	NC	NC	0	20	0	20
8		min	0	1	-1.695	20	-0.436	5	NC	NC	0	1	0	1
9	Totals:	max	6.169	14	39.11	3	0	7						
10		min	-6.169	9	-2.457	20	-2.349	5						

Envelope AISC 14TH (360-10): ASD Member Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
1	M1	W10X12	0.464	5.667	5	0.1	5.667	y	3	42.085	105.988	4.296	31.207	2.326	H1-1b
2	M2	W10X12	0.539	0	5	0.181	0	y	12	80.467	105.988	4.296	31.207	1.186	H1-1b
3	M3	W10X12	0.93	15.169	9	0.191	15.357	y	7	30.32	105.988	4.296	23.856	1	H1-1b
4	M4	W10X12	0.584	0	7	0.07	6.26	y	7	42.085	105.988	4.296	31.207	1.667	H1-1b
5	M5	W10X12	0.643	0	7	0.106	0	y	7	64.782	105.988	4.296	31.207	1.694	H1-1b
6	M6	W10X12	0.241	3.947	3	0.069	7.895	y	3	36.511	105.988	4.296	22.053	1.136	H1-1b
7	M7	W10X12	0.464	5.667	5	0.1	5.667	y	3	42.085	105.988	4.296	31.207	2.326	H1-1b
8	M8	W10X12	0.538	0	5	0.138	0	y	3	80.467	105.988	4.296	31.207	1.188	H1-1b
9	M9	W10X12	0.419	0	3	0.05	6.26	y	3	42.085	105.988	4.296	31.207	1.667	H1-1b
10	M10	W10X12	0.681	8.802	5	0.185	17.978	y	3	30.32	105.988	4.296	29.727	1	H1-1b
11	M11	W10X12	0.336	0	7	0.056	0	y	7	64.782	105.988	4.296	31.207	1.722	H1-1b
12	M12	W10X12	0.241	3.947	3	0.069	7.895	y	3	36.511	105.988	4.296	22.053	1.136	H1-1b
13	M13	L2x2x3	0.011	7.981	5	0.007	7.981	y	5	1.79	21.617	0.515	0.678	1	H2-1*
14	M14	L2x2x3	0.002	7.981	17	0.01	7.981	y	9	1.79	21.617	0.515	0.678	1	H2-1*
15	M15	C8X11.5	0.002	6	5	0.043	6	y	19	37.983	100.898	3.098	17.546	1	H1-1b*
16	M16	C8X11.5	0	6	5	0.043	6	y	19	37.983	100.898	3.098	17.546	1	H1-1b*

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor
1	DL		Y	DL	1				
2									
3	DL + LL		Y	DL	1	LL	1		
4									
5	DL + LL + SWAYZ		Y	DL	1	OL1	0.75	LL	0.75
6									
7	DL + LL + SWAYZ		Y	DL	1	WLX	0.45	LL	0.75
8									
9	DL + WLFTB		Y	DL	1	WLX	0.6		
10			Y	DL	0.6	WLX	0.6		
11									
12	DL + LL- WLFTB		Y	DL	1	WLX	-0.45	LL	0.75
13									
14	DL - WLFTB		Y	DL	1	WLX	-0.6		
15			Y	DL	0.6	WLX	-0.6		
16									
17	DL + LL + WLUP		Y	DL	1	WL-X	0.45	LL	0.75
18									
19	DL + WLUP		Y	DL	1	WL-X	0.6		
20			Y	DL	0.6	WL-X	0.6		
21									
22	DL	Yes	Y	DL	1				
23	LL	Yes	Y	LL	1				
24	SWAY	Yes	Y	OL1	1				
25	WLFTB	Yes	Y	WLX	1				
26	WLUP	Yes	Y	WL-X	1				

Node Reactions

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	22	N2	0	0.759	0	NC	0	0
2	22	N4	0	1.586	0	NC	0	0
3	22	N9	0	0.759	0	NC	0	0
4	22	N10	0	1.586	0	NC	0	0
5	22	Totals:	0	4.69	0			
6	22	COG (ft):	X: 16.487	Y: 12.358	Z: -3			
7	23	N2	0	8.165	0	NC	0	0
8	23	N4	0	9.045	0	NC	0	0
9	23	N9	0	8.165	0	NC	0	0
10	23	N10	0	9.045	0	NC	0	0
11	23	Totals:	0	34.42	0			
12	23	COG (ft):	X: 14.077	Y: 10.413	Z: -3			
13	24	N2	0	-0.001	-1.144	NC	0	0
14	24	N4	0	-0.005	-0.418	NC	0	0
15	24	N9	0	0.001	-1.144	NC	0	0
16	24	N10	0	0.005	-0.426	NC	0	0
17	24	Totals:	0	0	-3.132			
18	24	COG (ft):	NC	NC	NC			
19	25	N2	-6.296	-6.075	0.004	NC	0	0
20	25	N4	0	6.118	0.049	NC	0	0
21	25	N9	-3.985	-2.383	-0.003	NC	0	0
22	25	N10	0	2.341	-0.051	NC	0	0
23	25	Totals:	-10.281	0	0			
24	25	COG (ft):	NC	NC	NC			
25	26	N2	6.068	3.679	0.001	NC	0	0

Node Reactions (Continued)

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
26	26	N4	0	-8.037	0.057	NC	0	0
27	26	N9	3.758	-0.002	-0.003	NC	0	0
28	26	N10	0	-4.424	-0.054	NC	0	0
29	26	Totals:	9.826	-8.784	0			
30	26	COG (ft):	X: 16.538	Y: 9.142	Z: -3			

Horizontal Beams -

$V\rightarrow_{WL\,1}$= 6.296 kips per stringer (from Risa Reactions @ thrust Row)

$V\rightarrow_{WL\,2}$= 3.985 kips per stringer (from Risa Reactions @ thrust Row)

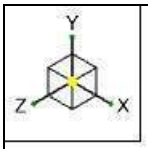
$V\rightarrow_{WL\,3}$= 2.393 kips per stringer (from Risa Reactions @ thrust Row)

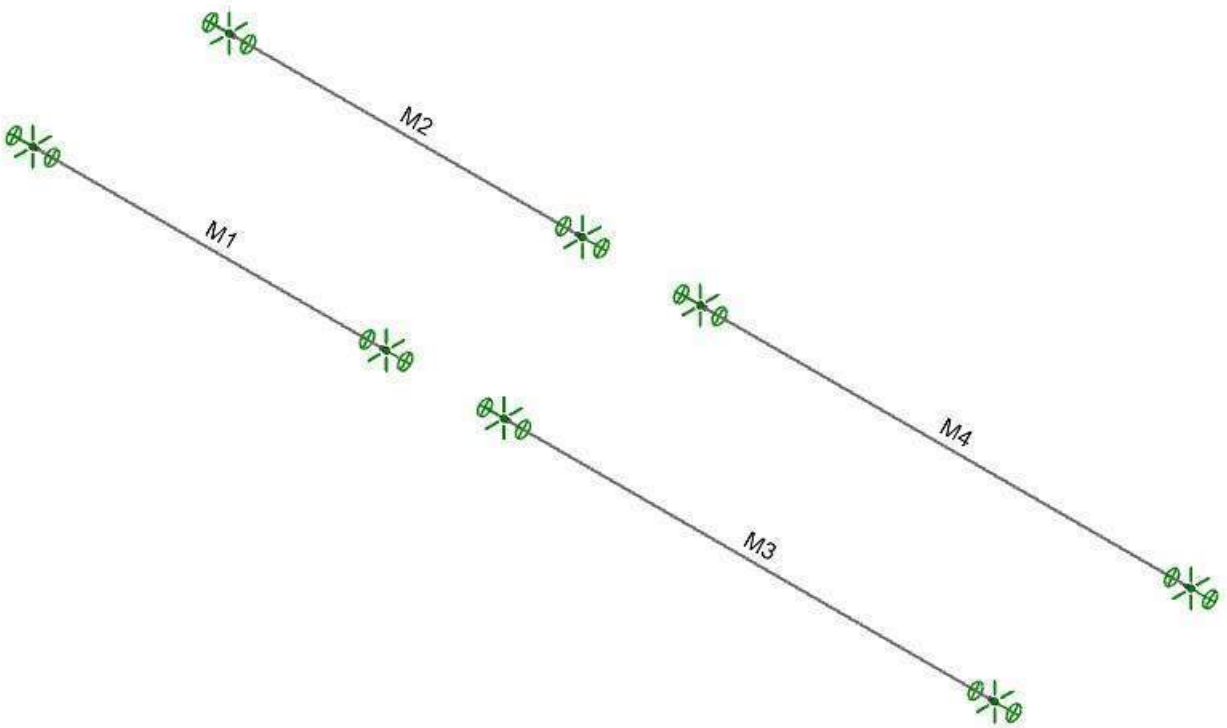
@ PB

Row	W shape	$I_{y\text{-}y}$		ratio of lateral thrust to W shape	portion of $V\rightarrow_{WL1}$ to W shape	portion of $V\rightarrow_{WL2}$ to W shape
A	**W14x43**	45.20	in^4	0.500	3.15 kips	1.99 kips
B	**W14x43**	45.20	in^4	0.500	3.15 kips	1.99 kips
		0.00	in^4	0.000	0.00 kips	0.00 kips
		0.00	in^4	0.000	0.00 kips	0.00 kips
	$\sum I_{y\text{-}y}$ =	90.40	in^4			

NOT @ PB

Row	W shape	$I_{y\text{-}y}$		ratio of lateral thrust to W shape	portion of $V\rightarrow_{WL3}$ to W shape
A	**W14x30**	19.60	in^4	0.500	1.20 kips
B	**W14x30**	19.60	in^4	0.500	1.20 kips
		0.00	in^4	0.000	0.00 kips
		0.00	in^4	0.000	0.00 kips
	$\sum I_{y\text{-}y}$ =	39.20	in^4		





BRA		SK-4
		Apr 15, 2022
		HORIZ BEAMS A B.r3d

Model Settings

Solution

Members

Number of Reported Sections	5
Number of Internal Sections	100
Member Area Load Mesh Size (in^2)	144
Consider Shear Deformation	Yes
Consider Torsional Warping	Yes

Wall Panels

Approximate Mesh Size (in)	12
Transfer Forces Between Intersecting Wood Walls	Yes
Increase Wood Wall Nailing Capacity for Wind Loads	Yes
Include P-Delta for Walls	Yes
Optimize Masonry and Wood Walls	Yes
Maximum Number of Iterations	3

Processor Core Utilization

Single	No
Multiple (Optimum)	Yes
Maximum	No

Axis

Vertical Global Axis

Global Axis corresponding to vertical direction	Y
Convert Existing Data	Yes

Default Member Orientation

Default Global Plane for z-axis	XZ

Plate Axis

Plate Local Axis Orientation	Nodal

Codes

Hot Rolled Steel	AISC 14th (360-10): ASD
Stiffness Adjustment	Yes (Iterative)
Notional Annex	None
Connections	AISC 14th (360-10): ASD
Cold Formed Steel	None
Stiffness Adjustment	Yes (Iterative)
Wood	None
Temperature	< 100F
Concrete	None
Masonry	None
Aluminum	None
Structure Type	Building
Stiffness Adjustment	Yes (Iterative)
Stainless	None
Stiffness Adjustment	Yes (Iterative)

Concrete

Compression Stress Block	Rectangular Stress Block
Analyze using Cracked Sections	Yes
Leave room for horizontal rebar splices (2*d bar spacing)	No

Model Settings (Continued)

List forces which were ignored for design in the Detail Report	Yes

Rebar

Column Min Steel	1
Column Max Steel	8
Rebar Material Spec	ASTM A615
Warn if beam-column framing arrangement is not understood	No

Shear Reinforcement

Number of Shear Regions	4
Region 2 & 3 Spacing Increase Increment (in)	4

Seismic

RISA-3D Seismic Load Options

Code	ASCE 7-10
Risk Category	I or II
Drift Cat	Other
Base Elevation (ft)	
Include the weight of the structure in base shear calcs	Yes

Site Parameters

S_1 (g)	0
SD_1 (g)	1
SD_s (g)	0
T_L (sec)	-1

Structure Characteristics

T Z (sec)	
T X (sec)	
C_tX	0.035
C_tExp. Z	0
C_tExp. X	0
R Z	1
R X	1
Ω_0Z	1
Ω_0X	1
C_dZ	1
C_dX	1
ρ Z	1
ρ X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e⁵°F⁻¹]	Density [k/ft³]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A36 Gr.36	29000	11154	0.3	0.65	0.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	0.3	0.65	0.49	50	1.1	58	1.2
3	A992	29000	11154	0.3	0.65	0.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	0.3	0.65	0.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	0.3	0.65	0.49	46	1.2	58	1.1

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in²]	Iyy [in⁴]	Izz [in⁴]	J [in⁴]
1	HORIZ ROW A	W14X30	Beam	Wide Flange	A572 Gr.50	Typical	8.85	19.6	291	0.38
2	HORIZ ROW B	W14X30	Beam	Wide Flange	A572 Gr.50	Typical	8.85	19.6	291	0.38
3	HORIZ ROWA@PB	W14X43	Beam	Wide Flange	A572 Gr.50	Typical	12.6	45.2	428	1.05
4	HORIZ ROWB@PB	W14X43	Beam	Wide Flange	A572 Gr.50	Typical	12.6	45.2	428	1.05

Node Coordinates

	Label	X [ft]	Y [ft]	Z [ft]	Detach From Diaphragm
1	N1	0	0	0	
2	N2	18	0	0	
3	N3	0	0	-10	
4	N4	18	0	-10	
5	N5	24	0	0	
6	N6	49	0	0	
7	N7	24	0	-10	
8	N8	49	0	-10	

Node Boundary Conditions

	Node Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot [k-ft/rad]
1	N1	Reaction	Reaction	Reaction	Fixed
2	N2		Reaction	Reaction	Fixed
3	N3	Reaction	Reaction	Reaction	Fixed
4	N4		Reaction	Reaction	Fixed
5	N5	Reaction	Reaction	Reaction	Fixed
6	N6		Reaction	Reaction	Fixed
7	N7	Reaction	Reaction	Reaction	Fixed
8	N8		Reaction	Reaction	Fixed

Member Primary Data

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
1	M1	N1	N2	HORIZ ROW A	Beam	Wide Flange	A572 Gr.50	Typical
2	M2	N3	N4	HORIZ ROW B	Beam	Wide Flange	A572 Gr.50	Typical
3	M3	N5	N6	HORIZ ROWA@PB	Beam	Wide Flange	A572 Gr.50	Typical
4	M4	N7	N8	HORIZ ROWB@PB	Beam	Wide Flange	A572 Gr.50	Typical

Hot Rolled Steel Design Parameters

	Label	Shape	Length [ft]	Lb y-y [ft]	Lcomp top [ft]	Lcomp bot [ft]	K y-y	K z-z	Function
1	M1	HORIZ ROW A	18	6	Lbyy	6	1	1	Lateral
2	M2	HORIZ ROW B	18	6	Lbyy	6	1	1	Lateral
3	M3	HORIZ ROWA@PB	25	6	Lbyy	6	1	1	Lateral
4	M4	HORIZ ROWB@PB	25	6	Lbyy	6	1	1	Lateral

Node Loads and Enforced Displacements (BLC 1 : DEAD LOADS)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	N1	L	Y	-0.825
2	N2	L	Y	-0.825
3	N3	L	Y	-0.775
4	N4	L	Y	-0.775
5	N5	L	Y	-0.759
6	N6	L	Y	-0.759
7	N7	L	Y	-1.586
8	N8	L	Y	-1.586

Node Loads and Enforced Displacements (BLC 2 : LIVE LOADS)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	N1	L	Y	-8.253
2	N2	L	Y	-8.253
3	N3	L	Y	-7.747
4	N4	L	Y	-7.747
5	N5	L	Y	-8.165
6	N6	L	Y	-8.165
7	N7	L	Y	-9.045
8	N8	L	Y	-9.045

Node Loads and Enforced Displacements (BLC 3 : WIND LOADS)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	N1	L	Y	1.325
2	N1	L	Z	1.197
3	N2	L	Y	1.325
4	N2	L	Z	1.197
5	N3	L	Y	3.067
6	N3	L	Z	1.197
7	N4	L	Z	1.197
8	N4	L	Y	3.067
9	N5	L	Z	3.149
10	N5	L	Y	6.087
11	N6	L	Z	3.149
12	N6	L	Y	6.087
13	N7	L	Y	8.071
14	N7	L	Z	3.149
15	N8	L	Z	3.149
16	N8	L	Y	8.071

Member Point Loads (BLC 1 : DEAD LOADS)

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]
1	M1	Y	-0.825	6
2	M1	Y	-0.825	12
3	M2	Y	-0.775	6
4	M2	Y	-0.775	12
5	M3	Y	-0.759	18
6	M3	Y	-0.759	6
7	M3	Y	-0.759	12
8	M4	Y	-1.586	18
9	M4	Y	-1.586	12
10	M4	Y	-1.586	6

Member Point Loads (BLC 2 : LIVE LOADS)

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]
1	M1	Y	-8.253	12
2	M1	Y	-8.253	6
3	M2	Y	-7.747	6
4	M2	Y	-7.747	12
5	M3	Y	-8.165	12
6	M3	Y	-8.165	6
7	M3	Y	-8.165	18
8	M4	Y	-9.045	6
9	M4	Y	-9.045	12
10	M4	Y	-9.045	18

Member Point Loads (BLC 3 : WIND LOADS)

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]
1	M1	Z	1.197	12
2	M1	Z	1.197	6
3	M1	Y	1.325	6
4	M1	Y	1.325	12
5	M2	Z	1.197	12
6	M2	Z	1.197	6
7	M2	Y	3.067	12
8	M2	Y	3.067	6
9	M3	Y	2.383	6
10	M3	Y	2.383	12
11	M3	Y	2.383	18
12	M3	Z	1.99	6
13	M3	Z	1.99	12
14	M3	Z	1.99	18
15	M4	Y	4.424	6
16	M4	Y	4.424	12
17	M4	Y	4.424	18
18	M4	Z	1.99	6
19	M4	Z	1.99	12
20	M4	Z	1.99	18

Basic Load Cases

	BLC Description	Category	Y Gravity	Nodal	Point
1	DEAD LOADS	DL	-1	8	10
2	LIVE LOADS	LL		8	10
3	WIND LOADS	WL		16	20

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor
1	DL + LL	Yes	Y	DL	1	LL	1		
2	DL+0.75LL+0.75WL	Yes	Y	DL	1	LL	0.75	WL	0.45
3	0.6DL+1.0WL	Yes	Y	DL	0.6	WL	0.6		
4	1.0DL+1.0WL	Yes	Y	DL	1	WL	0.6		

Envelope Node Reactions

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	0	4	18.42	1	0	1	NC	NC	0	4	0	4
2		min	0	1	-0.442	3	-1.436	3	NC	NC	0	1	0	1
3	N2	max	0	4	18.42	1	0	1	NC	NC	0	4	0	4
4		min	0	1	-0.442	3	-1.436	3	NC	NC	0	1	0	1
5	N3	max	0	4	17.308	1	0	1	NC	NC	0	4	0	4
6		min	0	1	-2.592	3	-1.436	3	NC	NC	0	1	0	1
7	N4	max	0	4	17.308	1	0	1	NC	NC	0	4	0	4
8		min	0	1	-2.592	3	-1.436	3	NC	NC	0	1	0	1
9	N5	max	0	4	23.371	1	0	1	NC	NC	0	4	0	4
10		min	0	1	-4.402	3	-3.752	3	NC	NC	0	1	0	1
11	N6	max	0	4	22.3	1	0	1	NC	NC	0	4	0	4
12		min	0	1	-4.285	3	-3.609	3	NC	NC	0	1	0	1
13	N7	max	0	4	27.741	1	0	1	NC	NC	0	4	0	4
14		min	0	1	-6.232	3	-3.752	3	NC	NC	0	1	0	1
15	N8	max	0	4	26.465	1	0	1	NC	NC	0	4	0	4
16		min	0	1	-6.028	3	-3.609	3	NC	NC	0	1	0	1
17	Totals:	max	0	4	171.33	1	0	1						
18		min	0	1	-27.015	3	-20.465	3						

Envelope AISC 14TH (360-10): ASD Member Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
1	M1	W14X30	0.491	8.75	2	0.125	17.5	y	1	135.198	264.97	22.43	114.57	1	H1-1b
2	M2	W14X30	0.457	8.75	1	0.118	17.5	y	1	135.198	264.97	22.43	114.57	1	H1-1b
3	M3	W14X43	0.708	11.74	2	0.173	0	y	1	217.47	377.246	43.164	173.653	1	H1-1b
4	M4	W14X43	0.798	11.74	1	0.205	0	y	1	217.47	377.246	43.164	173.653	1	H1-1b

ROOF FRAMING

ZEE PURLINS

@ 3'-0" BAY O.C. SPAN = 18'-0" MAX

$W_{DL} = 10\,PSF\,(3') = 30\,PLF$

$W_{LL} = 20\,PSF\,(3') = 60\,PLF$

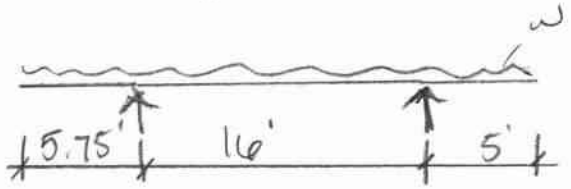
$\Sigma W = 90\,PLF$

∴ USE Z 8 × 2½ × 14GA

GF = 151 PLF ✓

ROOF BEAMS

@ 18' BAY O.C.



$W_{DL} = 15\,PSF\,(18') = 270\,PLF$

$W_{LL} = 20\,PSF\,(18') = 360\,PLF$

$W_{wL} = 26.37\,PSF\,(18') = 474.66\,PLF$

∴ USE W12×19

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By:

Date:

Job no.

Sheet

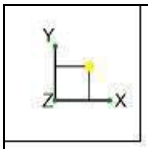
Of:

FLEXOSPAN - CEE AND ZEE LOAD TABLES

Allowable Uniform Loads In Pounds Per Lineal Foot

CEE		Simple Span						ZEE		Simple Span						3 or More Spans, Std. Lap					
		16 Gauge		14 Gauge		12 Gauge				16 Gauge		14 Gauge		12 Gauge		16 Gauge		14 Gauge		12 Gauge	
Section	Bay	2 1/2" Flan	3 1/2" Flan	2 1/2" Flan	3 1/2" Flan	2 1/2" Flan	3 1/2" Flan	Section	Bay	2 1/2" Fl.	3 1/2" Fl.	2 1/2" Fl.	3 1/2" Fl.	2 1/2" Fl.	3 1/2" Fl.	2 1/2" Fl.	3 1/2" Fl.	2 1/2" Fl.	3 1/2" Fl.	2 1/2" Fl.	3 1/2" Fl.
6" Web	10 ft	251	-	331	-	480	-	6" Web	10 ft	254	-	331	-	499	-	-	-	-	-	-	-
	12 ft	174	-	230	-	333	-		12 ft	126	-	230	-	346	-	-	-	-	-	-	-
	14 ft	128	-	169	-	244	-		14 ft	129	-	169	-	254	-	-	-	-	-	-	-
	15 ft	111	-	147	-	213	-		15 ft	113	-	147	-	221	-	176	-	235	-	357	-
	18 ft	77	-	102	-	148	-		18 ft	78	-	102	-	154	-	118	-	157	-	238	-
	20 ft	62	-	82	-	120	-		20 ft	63	-	82	-	124	-	94	-	124	-	188	-
	22 ft	51	-	68	-	99	-		22 ft	52	-	68	-	103	-	76	-	101	-	153	-
	24 ft	43	-	57	-	83	-		24 ft	44	-	57	-	86	-	63	-	84	-	126	-
	25 ft	40	-	53	-	76	-		25 ft	40	-	53	-	79	-	58	-	76	-	116	-
	28 ft	32	-	42	-	61	-		28 ft	32	-	42	-	63	-	46	-	60	-	91	-
8" Web	12 ft	260	269	341	365	493	545	8" Web	12 ft	260	265	340	364	510	545	-	-	-	-	-	-
	14 ft	191	198	250	268	362	400		14 ft	191	195	250	267	374	401	-	-	-	-	-	-
	15 ft	166	172	218	233	315	349		15 ft	166	169	218	233	326	349	-	-	-	-	-	-
	18 ft	115	119	151	162	219	242		18 ft	115	117	151	161	226	242	156	158	222	235	345	368
	20 ft	93	97	122	131	177	196		20 ft	93	95	122	131	183	196	127	129	178	188	275	293
	22 ft	77	80	101	108	146	162		22 ft	77	78	101	108	151	162	105	107	145	154	223	238
	24 ft	65	67	85	91	123	136		24 ft	65	66	85	91	127	136	88	90	121	129	185	198
	25 ft	60	62	78	84	113	125		25 ft	59	61	78	83	117	125	81	83	111	118	170	181
	28 ft	47	49	62	67	90	100		28 ft	47	48	62	66	93	100	65	66	87	93	133	142
	30 ft	41	43	54	58	78	87		30 ft	41	42	54	58	81	87	56	57	76	81	115	123
10" Web	20 ft	115	-	168	173	243	266	10" Web	20 ft	115	119	168	-	250	266	131	133	217	-	365	387
	22 ft	95	-	139	143	200	220		24 ft	80	82	116	-	173	185	96	97	154	-	248	263
	24 ft	80	-	116	120	168	185		25 ft	74	76	107	-	160	170	89	91	142	-	228	242
	25 ft	74	-	107	111	155	170		28 ft	59	60	85	-	127	136	72	74	114	-	179	191
	28 ft	59	-	85	88	124	136		30 ft	51	52	74	-	111	118	64	65	99	-	155	165
	30 ft	51	-	74	77	108	118		32 ft	45	46	65	-	97	104	56	58	87	-	135	144
	32 ft	45	-	65	67	94	104		35 ft	37	38	54	-	81	87	48	49	73	-	112	119
	34 ft	40	-	58	60	84	92		38 ft	32	33	46	-	69	73	41	42	61	-	94	101
	35 ft	37	-	54	56	79	87	12" Web	20 ft	-	-	183	203	301	345	-	-	210	220	418	463
	38 ft	32	-	46	48	67	73		24 ft	-	-	127	141	209	239	-	-	153	162	289	324
12" Web	20 ft	-	-	185	206	293	344		25 ft	-	-	117	130	192	220	-	-	142	151	265	299
	24 ft	-	-	128	143	203	239		28 ft	-	-	93	103	153	176	-	-	116	124	210	238
	25 ft	-	-	118	132	187	220		30 ft	-	-	81	90	133	153	-	-	102	109	183	207
	28 ft	-	-	94	105	149	175		32 ft	-	-	71	79	117	134	-	-	90	97	160	181
	30 ft	-	-	82	91	130	153		35 ft	-	-	59	66	98	112	-	-	76	82	133	151
	32 ft	-	-	72	80	114	134		37 ft	-	-	53	59	88	100	-	-	68	74	119	135
	34 ft	-	-	64	71	101	119		40 ft	-	-	45	50	75	86	-	-	59	64	101	115
	35 ft	-	-	60	67	95	112														
	38 ft	-	-	51	57	81	95														
	40 ft	-	-	46	51	73	86														

Notes: 1.The weight of the section has not been subtracted from these values. 2. Both flanges of member must be fully braced. 3. These loads are based on the transfer of the support loads directly to the web of the section by the use of clips or plates. For flanges bearing directly on structural, contact factory for section selection. 4. See back page for weights per lineal foot of memebers shown here. 5. Loads shown are stress governing. When deflection limits are specified, contact factory. 6. These sample calculations are very basic. Many different variables can affect loading. For instance; drift loading, building height, geographic location, etc. Please consult Flexospan if special conditions exist. 7. The selection of sections for your application is subject to final approval by your design professional. 8. Capacity values have been calculated in accordance with the AISI 2001 design manual. 9. Values shown in the load tables for three or more spans are based on uniform bay spacings. If non-uniform bay spacings exist, contact factory. UNCONTROLLED COPY



		SK-5
		Apr 15, 2022
		ROOFBEAM.r3d

Model Settings

Solution

Members

Number of Reported Sections	5
Number of Internal Sections	100
Member Area Load Mesh Size (in^2)	144
Consider Shear Deformation	Yes
Consider Torsional Warping	Yes

Wall Panels

Approximate Mesh Size (in)	12
Transfer Forces Between Intersecting Wood Walls	Yes
Increase Wood Wall Nailing Capacity for Wind Loads	Yes
Include P-Delta for Walls	Yes
Optimize Masonry and Wood Walls	Yes
Maximum Number of Iterations	3

Processor Core Utilization

Single	No
Multiple (Optimum)	Yes
Maximum	No

Axis

Vertical Global Axis

Global Axis corresponding to vertical direction	Y
Convert Existing Data	Yes

Default Member Orientation

Default Global Plane for z-axis	XZ

Plate Axis

Plate Local Axis Orientation	Nodal

Codes

Hot Rolled Steel	AISC 14th (360-10): ASD
Stiffness Adjustment	Yes (Iterative)
Notional Annex	None
Connections	AISC 14th (360-10): ASD
Cold Formed Steel	None
Stiffness Adjustment	Yes (Iterative)
Wood	None
Temperature	< 100F
Concrete	None
Masonry	None
Aluminum	None
Structure Type	Building
Stiffness Adjustment	Yes (Iterative)
Stainless	None
Stiffness Adjustment	Yes (Iterative)

Concrete

Compression Stress Block	Rectangular Stress Block
Analyze using Cracked Sections	Yes
Leave room for horizontal rebar splices (2*d bar spacing)	No

Model Settings (Continued)

List forces which were ignored for design in the Detail Report	Yes

Rebar

Column Min Steel	1
Column Max Steel	8
Rebar Material Spec	ASTM A615
Warn if beam-column framing arrangement is not understood	No

Shear Reinforcement

Number of Shear Regions	4
Region 2 & 3 Spacing Increase Increment (in)	4

Seismic

RISA-3D Seismic Load Options

Code	ASCE 7-16
Risk Category	I or II
Drift Cat	Other
Base Elevation (ft)	
Include the weight of the structure in base shear calcs	Yes

Site Parameters

S_1 (g)	1
SD_1 (g)	1
SD_S (g)	1
T_L (sec)	5

Structure Characteristics

T Z (sec)	
T X (sec)	
C_tX	0.02
C_tExp. Z	0.75
C_tExp. X	0.75
R Z	3
R X	3
Ω_0Z	1
Ω_0X	1
C_dZ	1
C_dX	1
ρ Z	1
ρ X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e⁵°F⁻¹]	Density [k/ft³]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A36 Gr.36	29000	11154	0.3	0.65	0.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
3	A992	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
4	A500 Gr.42	29000	11154	0.3	0.65	0.49	42	1.4	58	1.3
5	A500 Gr.46	29000	11154	0.3	0.65	0.49	46	1.4	58	1.3

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in²]	Iyy [in⁴]	Izz [in⁴]	J [in⁴]
1	ROOFBEAM	W12X19	Beam	Wide Flange	A992	Typical	5.57	3.76	130	0.18

Node Coordinates

	Label	X [ft]	Y [ft]	Z [ft]	Detach From Diaphragm
1	N1	0	0	0	
2	N2	5.75	0	0	
3	N3	21.75	0	0	
4	N4	26.75	0	0	

Node Boundary Conditions

	Node Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot [k-ft/rad]
1	N2	Reaction	Reaction	Reaction	Fixed
2	N3		Reaction	Reaction	Fixed

Member Primary Data

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
1	M1	N1	N2	ROOFBEAM	Beam	Wide Flange	A992	Typical
2	M2	N2	N3	ROOFBEAM	Beam	Wide Flange	A992	Typical
3	M3	N3	N4	ROOFBEAM	Beam	Wide Flange	A992	Typical

Hot Rolled Steel Design Parameters

	Label	Shape	Length [ft]	Lb y-y [ft]	Lcomp top [ft]	Lcomp bot [ft]	K y-y	K z-z	Function
1	M1	ROOFBEAM	5.75	3	3	6.33	2.1	2.1	Lateral
2	M2	ROOFBEAM	16	3	3	6.25	1	1	Lateral
3	M3	ROOFBEAM	5	3	3		2.1	2.1	Lateral

Member Distributed Loads (BLC 1 : DEAD LOADS)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	Y	-0.27	-0.27	0	%100
2	M2	Y	-0.27	-0.27	0	%100
3	M3	Y	-0.27	-0.27	0	%100

Member Distributed Loads (BLC 2 : LIVE LOADS(FULL))

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	Y	-0.36	-0.36	0	%100
2	M2	Y	-0.36	-0.36	0	%100
3	M3	Y	-0.36	-0.36	0	%100

Member Distributed Loads (BLC 3 : LIVE LOADS(ON/OFF))

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	Y	-0.36	-0.36	0	%100
2	M3	Y	-0.36	-0.36	0	%100

Member Distributed Loads (BLC 4 : LIVE LOADS(OFF/ON))

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M2	Y	-0.36	-0.36	0	%100

Member Distributed Loads (BLC 5 : WIND UPLIFT LOADS)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	Y	0.475	0.475	0	%100
2	M2	Y	0.475	0.475	0	%100
3	M3	Y	0.475	0.475	0	%100

Basic Load Cases

	BLC Description	Category	Distributed
1	DEAD LOADS	None	3
2	LIVE LOADS(FULL)	None	3
3	LIVE LOADS(ON/OFF)	None	2
4	LIVE LOADS(OFF/ON)	None	1
5	WIND UPLIFT LOADS	None	3

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor
1	DL+LL(FULL)	Yes	Y	1	1	2	1
2	DL+LL(ON/OFF)	Yes	Y	1	1	3	1
3	DL+LL(OFF/ON)	Yes	Y	1	1	4	1
4	0.6DL+WLUP	Yes	Y	1	0.6	5	0.6
5							
6	DL		Y	1	1		
7	LL		Y	2	1		
8	WLUP		Y	5	1		

Envelope Node Reactions

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N2	max	0	4	8.296	1	0	4	NC	NC	0	4	0	4
2		min	0	1	-1.62	4	0	1	NC	NC	0	1	0	1
3	N3	max	0	4	8.031	1	0	4	NC	NC	0	4	0	4
4		min	0	1	-1.568	4	0	1	NC	NC	0	1	0	1
5	Totals:	max	0	4	16.327	1	0	4						
6		min	0	1	-3.188	4	0	1						

Envelope AISC 14TH (360-10): ASD Member Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
1	M1	W12X19	0.191	5.333	2	0.059	5.333	y	2	89.697	166.766	7.435	46.981	1	H1-1b
2	M2	W12X19	0.265	7.629	3	0.087	15.583	y	3	66.47	166.766	7.435	61.208	1	H1-1b
3	M3	W12X19	0.128	0	2	0.055	0	y	1	89.697	166.766	7.435	61.627	2.326	H1-1b

Load Combinations

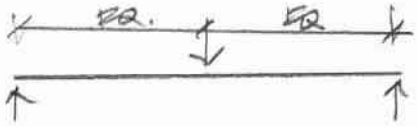
	Description	Solve	P-Delta	BLC	Factor	BLC	Factor
1	DL+LL(FULL)		Y	1	1	2	1
2	DL+LL(ON/OFF)		Y	1	1	3	1
3	DL+LL(OFF/ON)		Y	1	1	4	1
4	0.6DL+WLUP		Y	1	0.6	5	0.6
5							
6	DL	Yes	Y	1	1		
7	LL	Yes	Y	2	1		
8	WLUP	Yes	Y	5	1		

Node Reactions

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	6	N2	0	3.556	0	NC	0	0
2	6	N3	0	3.442	0	NC	0	0
3	6	Totals:	0	6.997	0			
4	6	COG (ft):	X: 13.62	Y: 0	Z: 0			
5	7	N2	0	4.741	0	NC	0	0
6	7	N3	0	4.589	0	NC	0	0
7	7	Totals:	0	9.33	0			
8	7	COG (ft):	X: 13.62	Y: 0	Z: 0			
9	8	N2	0	-6.255	0	NC	0	0
10	8	N3	0	-6.055	0	NC	0	0
11	8	Totals:	0	-12.31	0			
12	8	COG (ft):	X: 13.62	Y: 0	Z: 0			

HEADER BEAM 1

SPAN = 36'-0"



$P_{DL} = 3.556^{k}$

$P_{LL} = 4.741^{k}$

$P_{W\uparrow} = -6.255^{k}$

∴ USE W18×46

HEADER BEAM 2

SPAN = 25'-0"

$P_{DL} = 3.556^{k}\left(12.5/18\right) = 2.47^{k}$

$P_{LL} = 4.741^{k}\ (\text{"}) = 3.293^{k}$

$P_{W\uparrow} = -6.255^{k}\ (\text{"}) = 4.344^{k}$

∴ USE W18×35

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Date:

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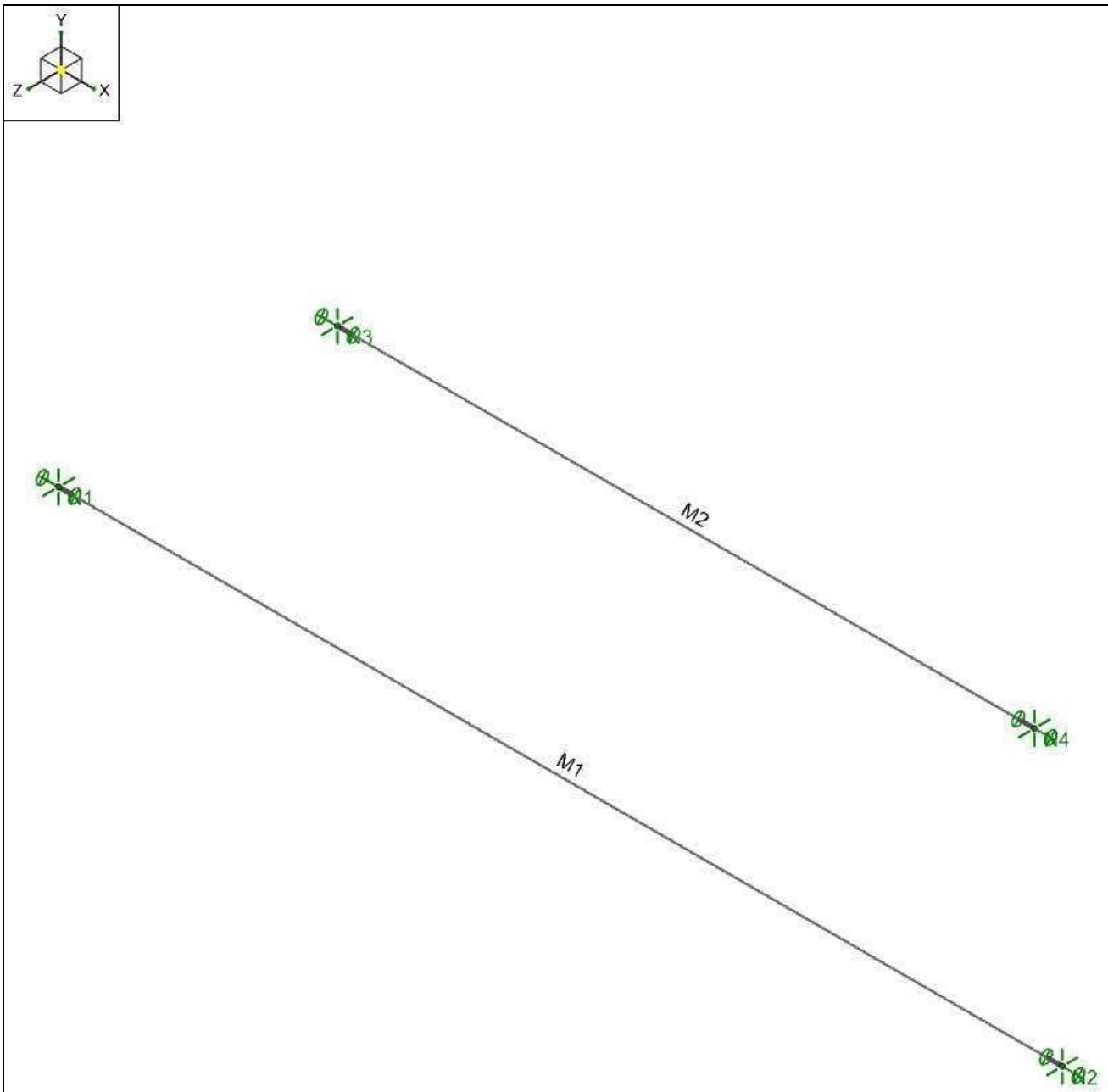
Sheet

Of:



		SK-6
		Apr 15, 2022
		ROOFHEADERBEAM.r3d

Model Settings

Solution

Members

Number of Reported Sections	5
Number of Internal Sections	100
Member Area Load Mesh Size (in^2)	144
Consider Shear Deformation	Yes
Consider Torsional Warping	Yes

Wall Panels

Approximate Mesh Size (in)	12
Transfer Forces Between Intersecting Wood Walls	Yes
Increase Wood Wall Nailing Capacity for Wind Loads	Yes
Include P-Delta for Walls	Yes
Optimize Masonry and Wood Walls	Yes
Maximum Number of Iterations	3

Processor Core Utilization

Single	No
Multiple (Optimum)	Yes
Maximum	No

Axis

Vertical Global Axis

Global Axis corresponding to vertical direction	Y
Convert Existing Data	Yes

Default Member Orientation

Default Global Plane for z-axis	XZ

Plate Axis

Plate Local Axis Orientation	Nodal

Codes

Hot Rolled Steel	AISC 14th (360-10): ASD
Stiffness Adjustment	Yes (Iterative)
Notional Annex	None
Connections	AISC 14th (360-10): ASD
Cold Formed Steel	AISI S100-10: ASD
Stiffness Adjustment	Yes (Iterative)
Wood	AWC NDS-12: ASD
Temperature	< 100F
Concrete	ACI 318-11
Masonry	ACI 530-11: ASD
Aluminum	AA ADM1-10: ASD
Structure Type	Building
Stiffness Adjustment	Yes (Iterative)
Stainless	None
Stiffness Adjustment	Yes (Iterative)

Concrete

Column Design

Analysis Methodology	Exact Integration Method
Parme Beta Factor	0.65

Model Settings (Continued)

Compression Stress Block	Rectangular Stress Block
Analyze using Cracked Sections	Yes
Leave room for horizontal rebar splices (2*d bar spacing)	No
List forces which were ignored for design in the Detail Report	Yes

Rebar

Column Min Steel	1
Column Max Steel	8
Rebar Material Spec	ASTM A615
Warn if beam-column framing arrangement is not understood	No

Shear Reinforcement

Number of Shear Regions	4
Region 2 & 3 Spacing Increase Increment (in)	4

Seismic

RISA-3D Seismic Load Options

Code	ASCE 7-10
Risk Category	I or II
Drift Cat	Other
Base Elevation (ft)	
Include the weight of the structure in base shear calcs	Yes

Site Parameters

S_1 (g)	1
SD_1 (g)	1
SD_S (g)	1
T_L (sec)	5

Structure Characteristics

T Z (sec)	
T X (sec)	
C_tX	0.02
C_tExp. Z	0.75
C_tExp. X	0.75
R Z	3
R X	3
Ω_0Z	1
Ω_0X	1
C_dZ	1
C_dX	1
ρ Z	1
ρ X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e⁵°F⁻¹]	Density [k/ft³]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A36 Gr.36	29000	11154	0.3	0.65	0.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
3	A992	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
4	A500 Gr.42	29000	11154	0.3	0.65	0.49	42	1.4	58	1.3
5	A500 Gr.46	29000	11154	0.3	0.65	0.49	46	1.4	58	1.3

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in²]	Iyy [in⁴]	Izz [in⁴]	J [in⁴]
1	ROOFHEADER1	W18X46	Beam	Wide Flange	A992	Typical	13.5	22.5	712	1.22
2	ROOFHEADER2	W18X35	Beam	Wide Flange	A992	Typical	10.3	15.3	510	0.506

Node Coordinates

	Label	X [ft]	Y [ft]	Z [ft]	Detach From Diaphragm
1	N1	0	0	0	
2	N2	36	0	0	
3	N3	0	0	-10	
4	N4	25	0	-10	

Node Boundary Conditions

	Node Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot [k-ft/rad]
1	N1	Reaction	Reaction	Reaction	Fixed
2	N2		Reaction	Reaction	Fixed
3	N3	Reaction	Reaction	Reaction	Fixed
4	N4		Reaction	Reaction	Fixed

Member Primary Data

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
1	M1	N1	N2	ROOFHEADER1	Beam	Wide Flange	A992	Typical
2	M2	N3	N4	ROOFHEADER2	Beam	Wide Flange	A992	Typical

Hot Rolled Steel Design Parameters

	Label	Shape	Length [ft]	Lb y-y [ft]	Lcomp top [ft]	Lcomp bot [ft]	K y-y	K z-z	Function
1	M1	ROOFHEADER1	36	18	18	18	1	1	Lateral
2	M2	ROOFHEADER2	25	12.5	12.5	12.5	1	1	Lateral

Member Point Loads (BLC 1 : DEAD LOADS)

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]
1	M1	Y	-3.556	18
2	M2	Y	-2.468	12.5

Member Point Loads (BLC 2 : LIVE LOADS)

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]
1	M1	Y	-4.741	18
2	M2	Y	-3.29	12.5

Member Point Loads (BLC 3 : WIND UPLIFT LOADS)

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]
1	M1	Y	6.255	18
2	M2	Y	4.341	12.5

Basic Load Cases

	BLC Description	Category	Point
1	DEAD LOADS	None	2
2	LIVE LOADS	None	2
3	WIND UPLIFT LOADS	None	2

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor
1	DL+LL	Yes	Y	1	1	2	1
2	0.6DL+WLUP	Yes	Y	1	0.6	3	0.6
3							
4	DL		Y	1	1		
5	LL		Y	2	1		
6	WLUP		Y	3	1		

Envelope Node Reactions

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	0	2	4.148	1	0	2	NC	NC	0	2	0	2
2		min	0	1	-0.81	2	0	1	NC	NC	0	1	0	1
3	N2	max	0	2	4.148	1	0	2	NC	NC	0	2	0	2
4		min	0	1	-0.81	2	0	1	NC	NC	0	1	0	1
5	N3	max	0	2	2.879	1	0	2	NC	NC	0	2	0	2
6		min	0	1	-0.562	2	0	1	NC	NC	0	1	0	1
7	N4	max	0	2	2.879	1	0	2	NC	NC	0	2	0	2
8		min	0	1	-0.562	2	0	1	NC	NC	0	1	0	1
9	Totals:	max	0	2	14.055	1	0	2						
10		min	0	1	-2.743	2	0	1						

Envelope AISC 14TH (360-10): ASD Member Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
1	M1	W18X46	0.819	17.5	1	0.032	35	y	1	72.486	404.192	29.192	91.131	1	H1-1b
2	M2	W18X35	0.364	12	1	0.027	24	y	1	98.623	308.383	20.11	98.811	1	H1-1b

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor
1	DL+LL		Y	1	1	2	1
2	0.6DL+WLUP		Y	1	0.6	3	0.6
3							
4	DL	Yes	Y	1	1		
5	LL	Yes	Y	2	1		
6	WLUP	Yes	Y	3	1		

Node Reactions

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	4	N1	0	1.778	0	NC	0	0
2	4	N2	0	1.778	0	NC	0	0
3	4	N3	0	1.234	0	NC	0	0
4	4	N4	0	1.234	0	NC	0	0
5	4	Totals:	0	6.024	0			
6	4	COG (ft):	X: 15.747	Y: 0	Z: -4.097			
7	5	N1	0	2.37	0	NC	0	0
8	5	N2	0	2.37	0	NC	0	0
9	5	N3	0	1.645	0	NC	0	0
10	5	N4	0	1.645	0	NC	0	0
11	5	Totals:	0	8.031	0			
12	5	COG (ft):	X: 15.747	Y: 0	Z: -4.097			
13	6	N1	0	-3.127	0	NC	0	0
14	6	N2	0	-3.127	0	NC	0	0
15	6	N3	0	-2.17	0	NC	0	0
16	6	N4	0	-2.17	0	NC	0	0
17	6	Totals:	0	-10.596	0			
18	6	COG (ft):	X: 15.747	Y: 0	Z: -4.097			

COLUMNS

$H_t = 28.0'$

@ STAND

$P_{DL} = 6.399^k$

$P_{LL} = 38.649^k$

$P_{WL\,UP\ LRFD} = -21.106^k$

@ ROOF

$P_{DL} = 3.012^k$

$P_{LL} = 4.015^k$

$P_{WL\,UP\ LRFD} = -5.297^k$

$\Sigma P_{DL} = 9.411^k$

$\Sigma P_{LL} = 42.664^k$

$\Sigma P_{WL\,UP\ LRFD} = -26.403^k$

$T = C = 5.943^k \left(14'/18'\right) = 4.622^k$ DUE TO SWAY

$\Sigma R_{x\,N\ DL+LL+Tk} = 56.697^k$

TRY HSS 8x8x¼

$kl/r = \dfrac{(1.0)(28)(12)}{3.15} = 106.67 \quad \therefore P_{ALLW} = 92.5^k$ ✓

$\therefore$ USE HSS 8x8x¼ → @ 'B' ROW

&

HSS 8x8x⅜ → @ 'A' ROW

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By:

Date:

Job no.

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Of:

WIND BRACE @ 'B' ROW

V_{WL} STAND $= 57.1\,PSF\,(8' \times 9') = 4.112^{k}$

V_{WL} ROOF $= 28.77\,PSF\,(4' \times 26.50'/2) = 1.525^{k}$

$V_{WL} = 5.64^{k}$

OR V_{SWAY} @ STAND $= 0.844^{k}/6\,(169') = 23.773^{k}$ (ASD LEVEL)

$\frac{23.773^{k}}{4\ \text{BAYS BRACED MIN}} = 5.943^{k}$ ← CONTROLS

BRACES:

$\alpha = \frac{\sqrt{14^2 + 18^2}}{18} = 1.267$

$F = 5.943^{k}(1.267) = 7.53^{k}$

L3x3x¼ TENSION ONLY → $\frac{P_n}{\Omega_t} = 31.0^{k} > F$ ∴ OK

∴ USE L3x3x¼

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FOUNDATIONS

$Q_S = 1.50$ KSF

@ ROW A

@ NON-ROOF COL.

$R_{XN\ DL+LL} = 18.42^k(2) = 36.84^k$

$R_{XN\ WL\uparrow} = 0.442^k(2) = 0.884^k$

$V_{WL\rightarrow} = 1.436^k(3) = 4.308^k$

∴ USE 5'-9" SQ. x 18" THK. w/ 20" SOIL
w/ 7 #5's E.W.

@ ROOF COL. TYP

$R_{XN\ DL+LL} = 36.84^k + 4.148^k(2) = 45.136^k$

$R_{XN\ WL\uparrow} = 0.884^k + 0.81^k(2) = 2.504^k$

$V_{WL\rightarrow} = 4.308^k + \underbrace{(0.6)(28.77\ PSF)(4' \times 36')}_{2.486^k} = 6.794^k$

∴ USE 6'-3" SQ. x 18" THK. w/ 20" SOIL
w/ 8 #5's E.W.

@ ROOF COL. PB ~~AREA~~

$R_{XN\ DL+LL} = 41.791^k + 4.148^k + 2.879^k = 48.818^k$

$R_{XN\ WL\uparrow} = 5.136^k + 0.81^k + 0.562^k = 6.508^k$

$V_{WL\rightarrow} = 3.778^k + 2.391^k(2) + 1.436^k = 9.996^k$

∴ USE 7'-3" SQ x 18" THK w/ 20" SOIL
w/ 9 #5's E.W.

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By:
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SPREAD FOOTING TEMPLATE ROW A
FOR non roof
SOUTHERN BLEACHER COMPANY

DL+LL (KIPS)	0
OVERTURNING T=C (KIPS)	-0.884
REACTION SHEAR (KIPS)	4.308
THICKNESS OF FOOTING (INCHES)	18
SOIL OVER FOOTING (INCHES)	20
DIAMETER OF CONCRETE PIER (IN)	24
HEIGHT OF PIER ABOVE SOIL (INCHES)	25
ALLOWABLE SOIL BEARING (PSF)	1500
SOIL UNITS WEIGHT (PCF)	110
OVERTURNING ARM (FEET)	5.25
OTM (KIP FEET)	22.617
FOOTING WIDTH TO TRY (FT)	5.5

LOAD	ARM	WT	MR
DL+LL	2.75	0	0
T=C	2.75	-0.88	-2.43
PIER	2.75	1.77	4.86
FTG	2.75	6.81	18.72
SOIL	2.75	4.97	13.67

TOTAL MR (KIP FEET)	34.811	
F.S. OVERTURN	1.54	<--
TOTAL FOOTING WEIGHT (KIPS)	12.658	
RESULTANT (FT)	0.963	
e (FT)	1.787	
FOOTING Sx (FT^3)	27.729167	
P/A (KSF)	0.418	
P*e/Sx	0.816	
DL+LL PRESSURE (KSF)	0.000	<--
OVERTURN PRESSURE #1 (KSF)	1.234	<--
OVERTURN PRESSURE #2 (KSF)	-0.397	<--
PRESSURE IF #2 IS NEGATIVE	1.593	<--

SPREAD FOOTING TEMPLATE ROW A
FOR ROOF
SOUTHERN BLEACHER COMPANY

DL+LL (KIPS)	0
OVERTURNING T=C (KIPS)	-2.504
REACTION SHEAR (KIPS)	6.794
THICKNESS OF FOOTING (INCHES)	18
SOIL OVER FOOTING (INCHES)	20
DIAMETER OF CONCRETE PIER (IN)	24
HEIGHT OF PIER ABOVE SOIL (INCHES)	6
ALLOWABLE SOIL BEARING (PSF)	1500
SOIL UNITS WEIGHT (PCF)	110
OVERTURNING ARM (FEET)	3.6666667
OTM (KIP FEET)	24.911333
FOOTING WIDTH TO TRY (FT)	6

LOAD	ARM	WT	MR
DL+LL	3.00	0	0
T=C	3.00	-2.50	-7.51
PIER	3.00	1.02	3.06
FTG	3.00	8.10	24.30
SOIL	3.00	6.02	18.07

TOTAL MR (KIP FEET)	37.922	
F.S. OVERTURN	1.52	<--
TOTAL FOOTING WEIGHT (KIPS)	12.641	
RESULTANT (FT)	1.029	
e (FT)	1.971	
FOOTING Sx (FT^3)	36	
P/A (KSF)	0.351	
P*e/Sx	0.692	
DL+LL PRESSURE (KSF)	0.000	<--
OVERTURN PRESSURE #1 (KSF)	1.043	<--
OVERTURN PRESSURE #2 (KSF)	-0.341	<--
PRESSURE IF #2 IS NEGATIVE	1.365	<--

SPREAD FOOTING TEMPLATE ROW A
FOR ROOF PB

SOUTHERN BLEACHER COMPANY

DL+LL (KIPS)	0
OVERTURNING T=C (KIPS)	-6.508
REACTION SHEAR (KIPS)	9.996
THICKNESS OF FOOTING (INCHES)	18
SOIL OVER FOOTING (INCHES)	20
DIAMETER OF CONCRETE PIER (IN)	24
HEIGHT OF PIER ABOVE SOIL (INCHES)	6
ALLOWABLE SOIL BEARING (PSF)	1500
SOIL UNITS WEIGHT (PCF)	110
OVERTURNING ARM (FEET)	3.6666667
OTM (KIP FEET)	36.652
FOOTING WIDTH TO TRY (FT)	7.25

LOAD	ARM	WT	MR
DL+LL	3.63	0	0
T=C	3.63	-6.51	-23.59
PIER	3.63	1.02	3.70
FTG	3.63	11.83	42.87
SOIL	3.63	9.06	32.84

TOTAL MR (KIP FEET)	55.823	
F.S. OVERTURN	1.52	<--
TOTAL FOOTING WEIGHT (KIPS)	15.400	
RESULTANT (FT)	1.245	
e (FT)	2.380	
FOOTING Sx (FT^3)	63.513021	
P/A (KSF)	0.293	
P*e/Sx	0.577	
DL+LL PRESSURE (KSF)	0.000	<--
OVERTURN PRESSURE #1 (KSF)	0.870	<--
OVERTURN PRESSURE #2 (KSF)	-0.284	<--
PRESSURE IF #2 IS NEGATIVE	1.137	<--

@ ROW B

$R_{XN_{DL+LL}} = 9.411^k + 42.664^k = 52.075^k$

$V_{SWAY} = 5.943^k$

$T=C = 4.622^k$

$WL_{\uparrow} = 0.6(-26.403^k) = -15.844^k$

∴ USE 6'-3" SQ. × 18" THK. + 18" SOIL
w/ 8 #5's EW.

@ ROW B @ PB AREA

$R_{XN_{DL+LL}} = 45.049^k + 8.296^k = 53.345^k$

$V_{SWAY} = 5.943^k$

$T=C = 4.622^k$

$WL_{\uparrow} = 8.824^k + 1.62^k = 10.444^k$

∴ USE 6'-3" SQ × 18" THK × 18" SOIL
w/ 8 #5's EW.

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SPREAD FOOTING TEMPLATE ROW B

FOR

SOUTHERN BLEACHER COMPANY

REACTION DOWN (KIPS)	52.075	
REACTION UPLIFT (KIPS)	-4.622	
REACTION SHEAR (KIPS)	5.943	
THICKNESS OF FOOTING (INCHES)	18	
SOIL OVER FOOTING (INCHES)	18	
DIAMETER OF CONCRETE PIER (IN)	24	
HEIGHT OF PIER ABOVE SOIL (INCHES)	6	
ALLOWABLE SOIL BEARING (PSF)	1500	
ALLOWABLE FRICTION (PSF)	100	<--
SOIL UNITS WEIGHT (PCF)	110	
OVERTURNING ARM (FEET)	3.5	
OTM (KIP FEET)	20.8005	
FOOTING WIDTH TO TRY (FT)	6.25	

ELEMENT	ARM	WT	MR
UPLIFT	3.13	-4.62	-14.44
PIER	3.13	0.94	2.94
FTG	3.13	8.79	27.47
SOIL	3.13	10.28	32.13
FRICTION 1	4.17	0.94	3.91
FRICTION 2	6.25	0.94	5.86

TOTAL MR (KIP FEET)	57.863	
F.S. OVERTURN	2.78	<--
TOTAL FOOTING WEIGHT (KIPS)	17.266	
RESULTANT (FT)	2.147	
e (FT)	0.978	
FOOTING Sx (FT^3)	40.690104	
P/A (KSF)	0.442	
P*e/Sx	0.415	
DL+LL PRESSURE (KSF)	1.333	<--
OVERTURN PRESSURE #1 (KSF)	0.857	<--
OVERTURN PRESSURE #2 (KSF)	0.027	<--
PRESSURE IF #2 IS NEGATIVE	0.858	<--

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By:

Date:

Job no.

SPREAD FOOTING TEMPLATE ROW B PB

FOR

SOUTHERN BLEACHER COMPANY

REACTION DOWN (KIPS)	53.345	
REACTION UPLIFT (KIPS)	-4.622	
REACTION SHEAR (KIPS)	5.943	
THICKNESS OF FOOTING (INCHES)	18	
SOIL OVER FOOTING (INCHES)	18	
DIAMETER OF CONCRETE PIER (IN)	24	
HEIGHT OF PIER ABOVE SOIL (INCHES)	6	
ALLOWABLE SOIL BEARING (PSF)	1500	
ALLOWABLE FRICTION (PSF)	100	<--
SOIL UNITS WEIGHT (PCF)	110	
OVERTURNING ARM (FEET)	3.5	
OTM (KIP FEET)	20.8005	
FOOTING WIDTH TO TRY (FT)	6.25	

ELEMENT	ARM	WT	MR
UPLIFT	3.13	-4.62	-14.44
PIER	3.13	0.94	2.94
FTG	3.13	8.79	27.47
SOIL	3.13	10.28	32.13
FRICTION 1	4.17	0.94	3.91
FRICTION 2	6.25	0.94	5.86

TOTAL MR (KIP FEET)	57.863	
F.S. OVERTURN	2.78	<--
TOTAL FOOTING WEIGHT (KIPS)	17.266	
RESULTANT (FT)	2.147	
e (FT)	0.978	
FOOTING Sx (FT^3)	40.690104	
P/A (KSF)	0.442	
P*e/Sx	0.415	
DL+LL PRESSURE (KSF)	1.366	<--
OVERTURN PRESSURE #1 (KSF)	0.857	<--
OVERTURN PRESSURE #2 (KSF)	0.027	<--
PRESSURE IF #2 IS NEGATIVE	0.858	<--