



STRUCTURAL CALCULATIONS

PROJECT NAME: KE USA Hanger Rod Canopy -- High Wind
PROJECT ADDRESS: General USA Area
PROJECT NO: 20294A

CLIENT: Curtis LaRose
COMPANY: KE USA Inc.
 38 Pond Lane Suite B
 Middlebury, VT 05753

DATE: Dec 03, 2020

HW Engineering License and Non-Disclosure and Reproduction Agreement

IMPORTANT NOTICE TO BUILDING AND SAFETY PERSONNEL - The enclosed calculations and hard copy prints ("Enclosed") are copyright protected by HW Engineering. It is understood that while the Enclosed may be required for verification of structural design and approval, it is not necessary for the manufacture or construction of the structure or its components. It is the express wish of HW Engineering that these proprietary calculations not be returned or redistributed to anyone other than the copyrighted owner as referenced in the ownership paragraph below and that any unnecessary submitted copies be returned or destroyed.

Ownership: This document and the Enclosed are copyrighted by HW Engineering, 8887 W Flamingo Rd, Suite 101, Las Vegas, NV 89147. All rights reserved. This is not a sale or transference; all right, title and interest in the Document (in both electronic file and hard copy) belong to HW Engineering.



12.03.2020

REV	DATE	BY	DESCRIPTION
Δ			
Δ			
Δ			
Δ			
Δ			



Project:	KE USA Hanger Rod Canopy – High Wind	
Job Number:	20294A	Date:
Part:		Revised:
Designer:	YW	Page:

KE USA HANGER ROD CANOPY – High Wind
ALUMINUM STRUCTURE EVALUATION
ASCE 7-16 & IBC 2018

EVALUATION SUMMARY AND RECOMMENDATIONS

This calculation package addresses the Structural Evaluation of hanger rod canopies manufactured by KE USA, Inc. Evaluation is solely based on the ASCE 7-16 Components and Cladding provisions for attached canopies on low-rise buildings as referenced in the current International Building Code 2018 (IBC2018).

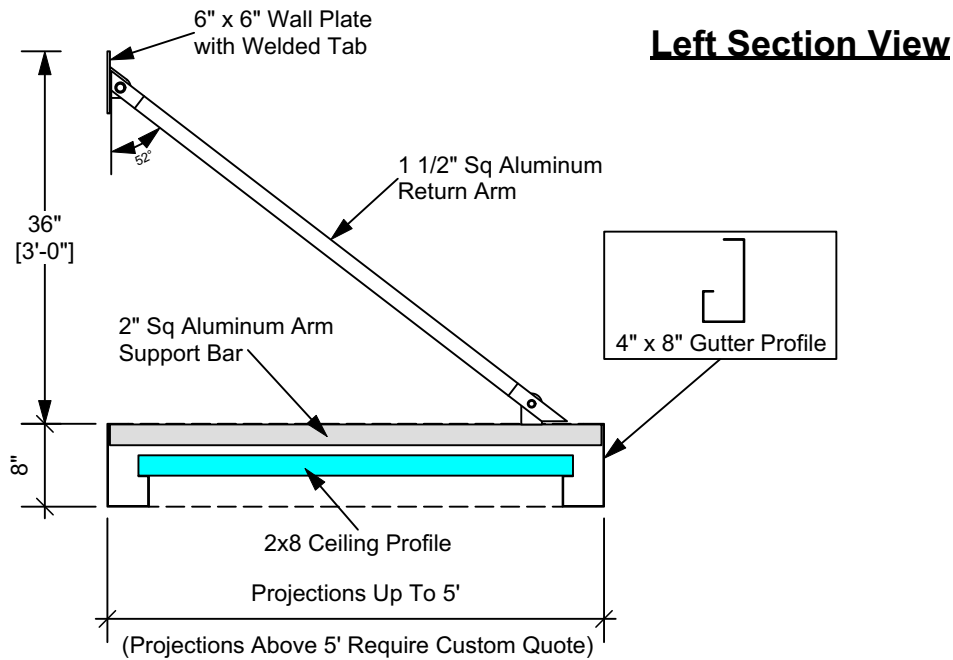
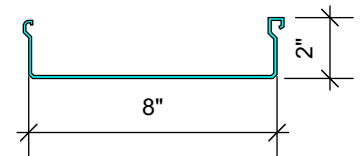
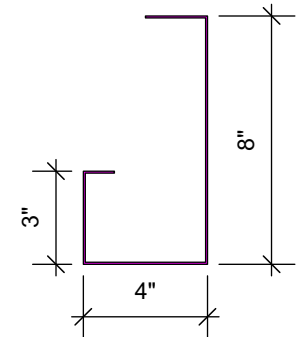
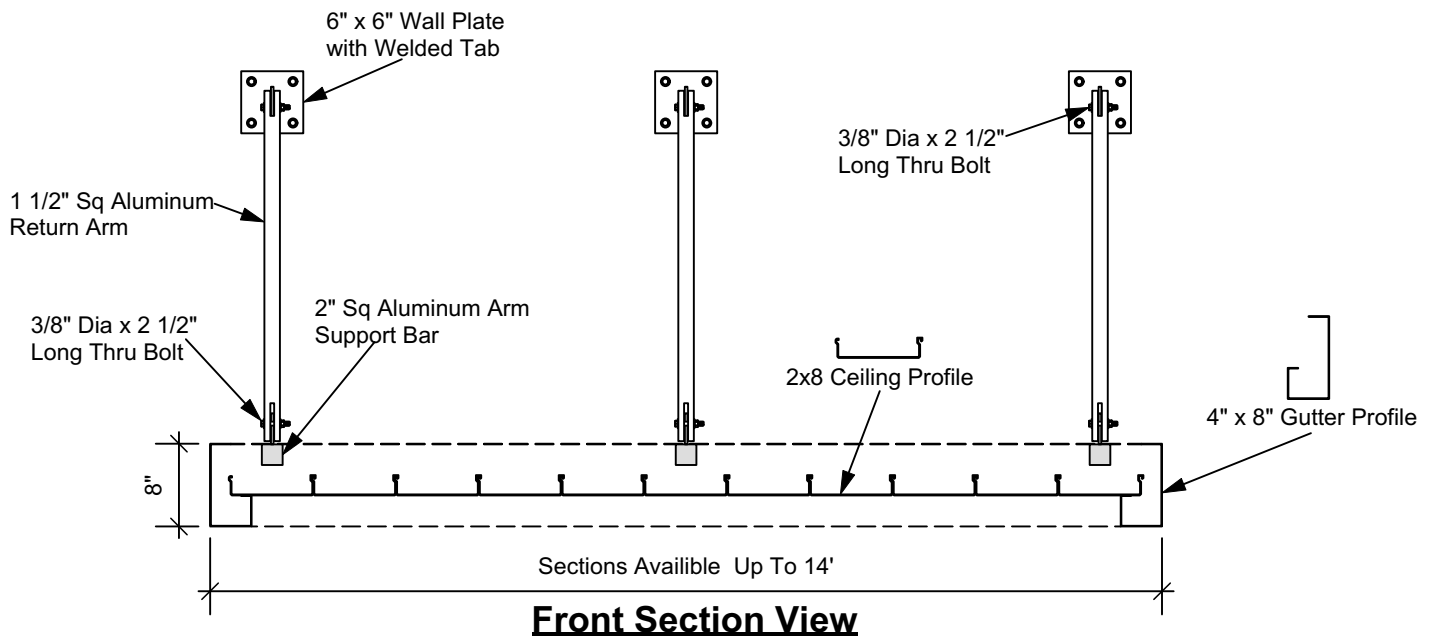
The intent of this report is to provide calculation to justify the structural efficiency under ultimate wind speed at exposure C based on the current ASCE 7-16 and IBC2018 requirements.

The analysis and design of the awning system included herein were performed with the use of a 3D frame analysis and computer design program – **SAP2000**. It is a structural analysis program developed by Computers and Structures, Inc. Detailed information about the software can be found at the Computers and Structures, Inc. website.

Various load cases and combinations were considered during our structural engineering analysis. Aluminum Design ASD design specifications were used to check the structural capacities of these members based on an applicable minimum yield stress. The demand/capacity ratio of each framing member was calculated and found to be less than 1.0 for all members.

Through our investigation, HW ENGINEERING arrived at the following conclusions and recommendations:

1. Maximum spacing between return arms was taken to be 7 feet.
2. Critical member to member connections were checked and calculated. Reaction outputs were provided to assist site specific anchorage solution.
3. The frames should be anchored securely to the walls of existing building to prevent uplift and lateral shear forces per support reactions listed in this document.
4. Unit is assumed to be attached canopy on buildings, canopy mean roof height no more than 15 feet.
5. Unit is analyzed with an ultimate design wind speed of 160 mph and a canopy roof snow load of 30 psf.
6. All aluminum material grade should be 6061-T6 unless noted otherwise.

**Primary Canopy Profiles****2x8 Ceiling Profile****4" x 8" Gutter Profile****Product Description:**

KE Commercial offers several Hanger Rod Canopy models to accomodate your architectural needs.

Product Specifications:

- All framing material to be 6061 T6 Aluminum.
- All Product is Powder Coated In House with your choice of RAL colors, See our Coating Specifications.
- All frame to frame connections to be welded and ground smooth as required.
- Scupper Drains @ Each End of Canopy To Divert Water.
- Integrated 2" x 8" Ceiling Panel System.
- Continious 8" x 4" Gutter Profile Around Perimeter To Maximize Water Diversion.



COMMERCIAL DIVISION
38 Pond Lane Suite B
Middlebury, VT 05753
Tel: 802-388-7309
Fax: 802-388-9625

Date: 8/26/20

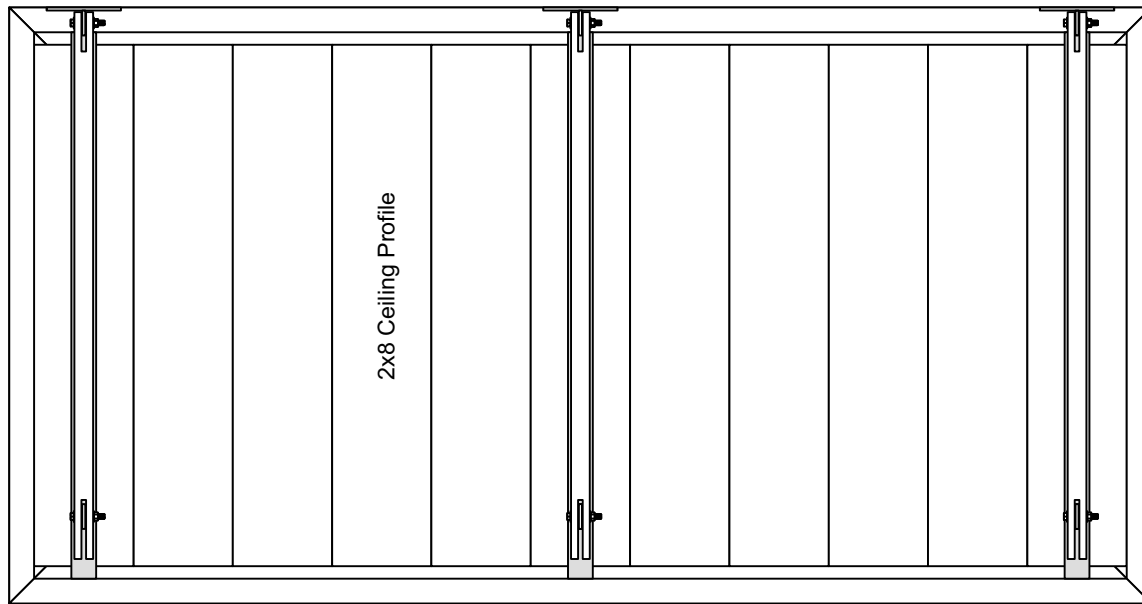
Revision #: R0001

Product:

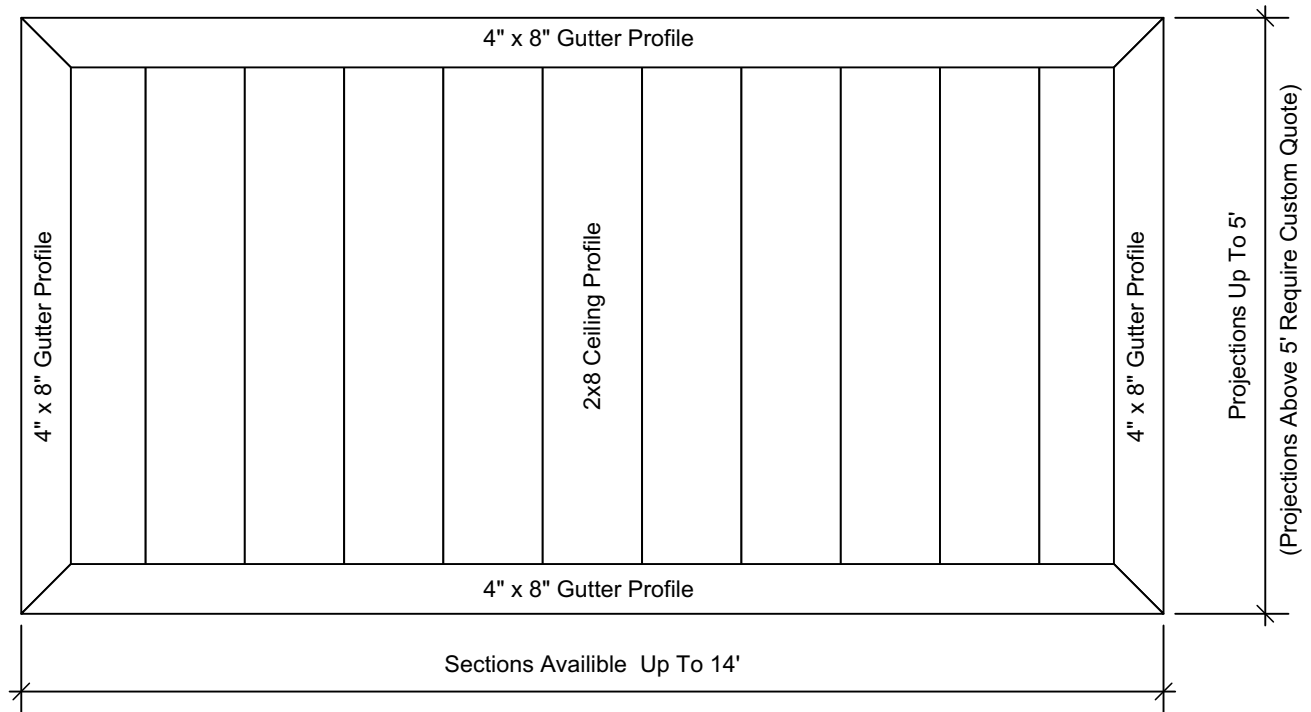
Hanger Rod Canopy

Sheet #

1 of 5

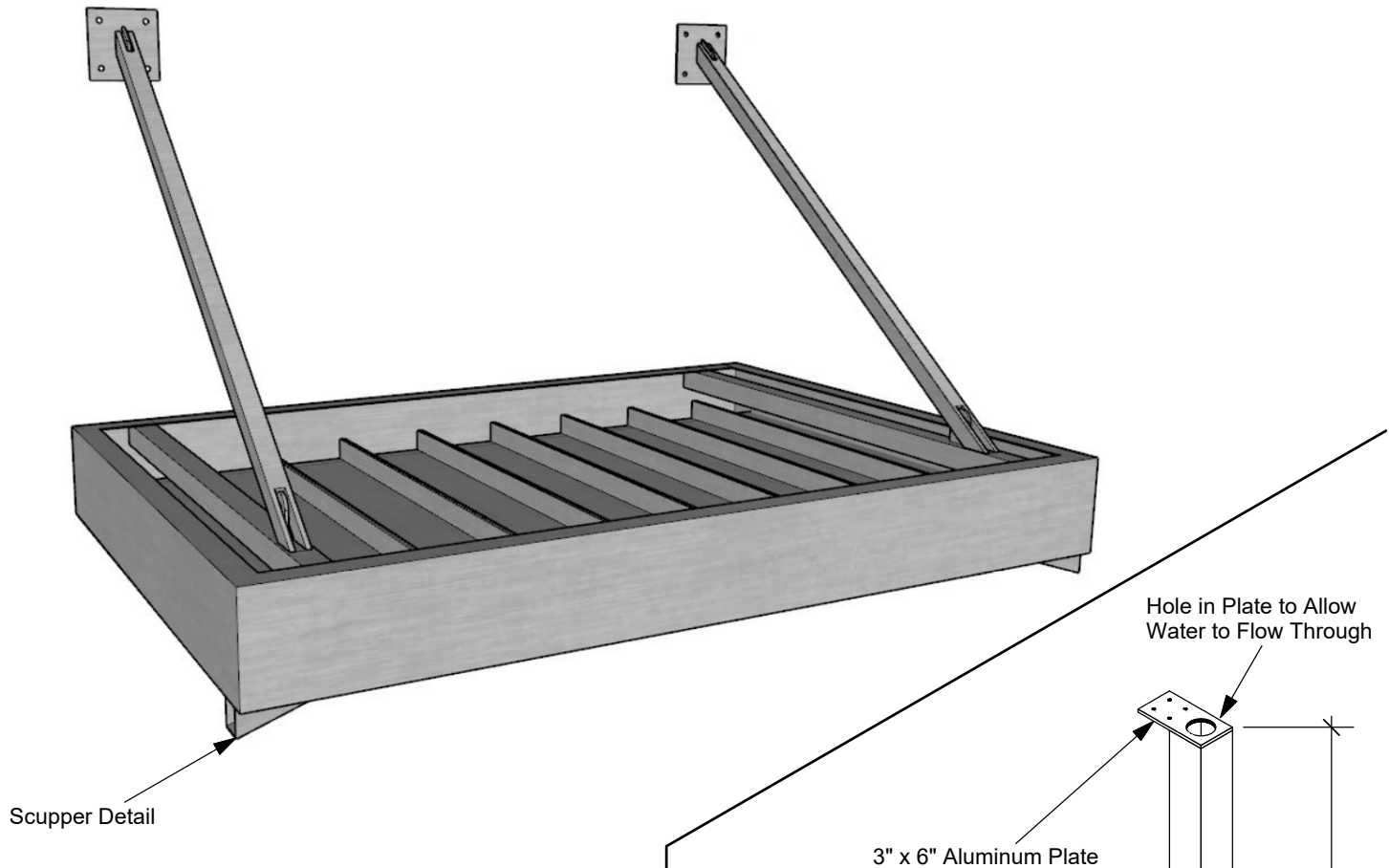


Top of Canopy



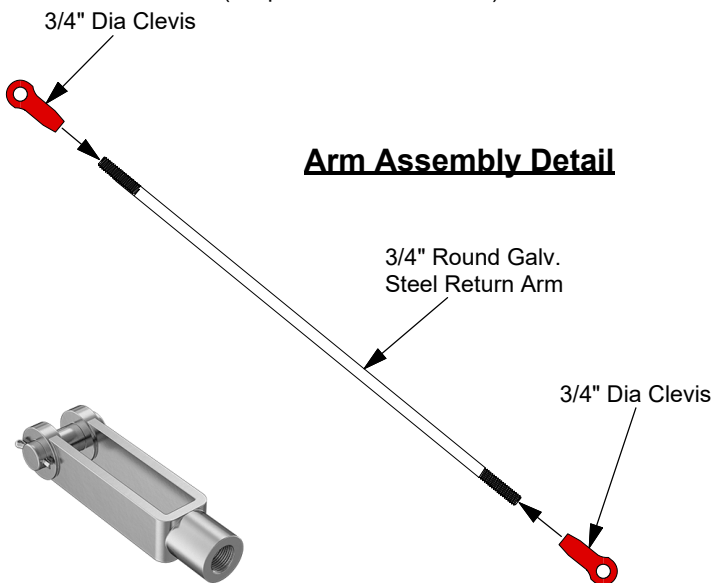
Bottom of Canopy

Standard Hanger Rod Canopy 3D View



Optional Return Arm Option

(Request Quote if Desired)



Arm Assembly Detail

3/4" Dia Clevis

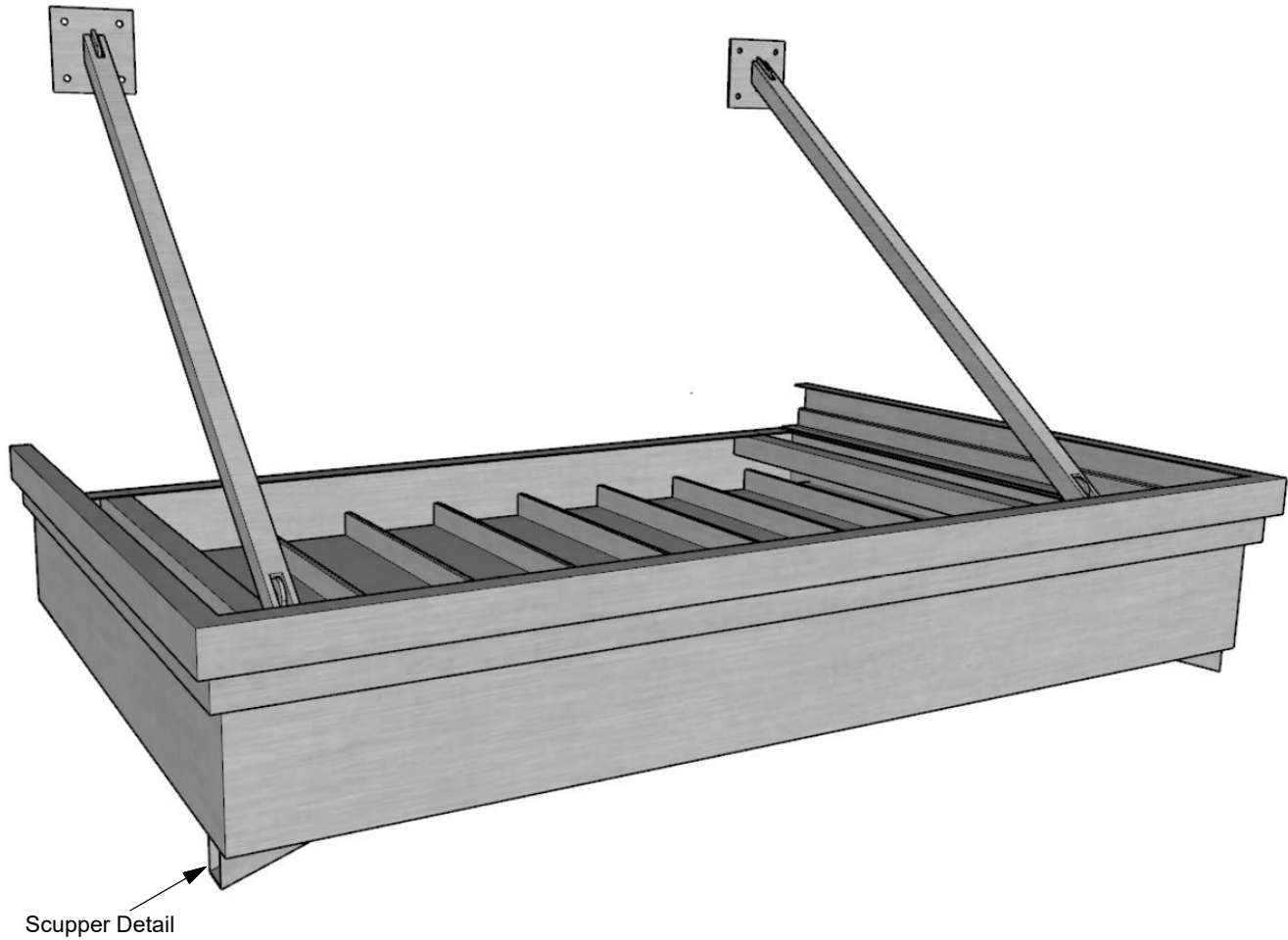
3" Sq Aluminum Tube

Optional Down Spout

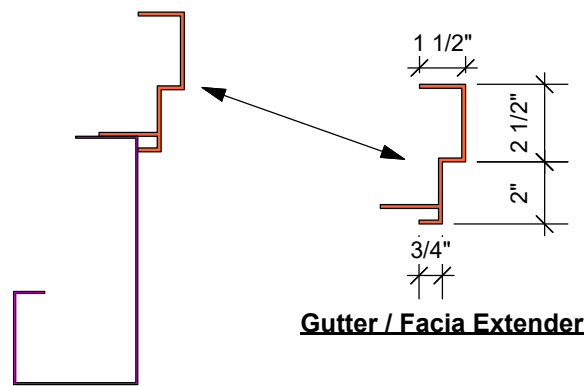
(Pricing Available Apon Request)

T.B.D. Based On Site Conditions

Hanger Rod Canopy 3D View Facia Extender Applied

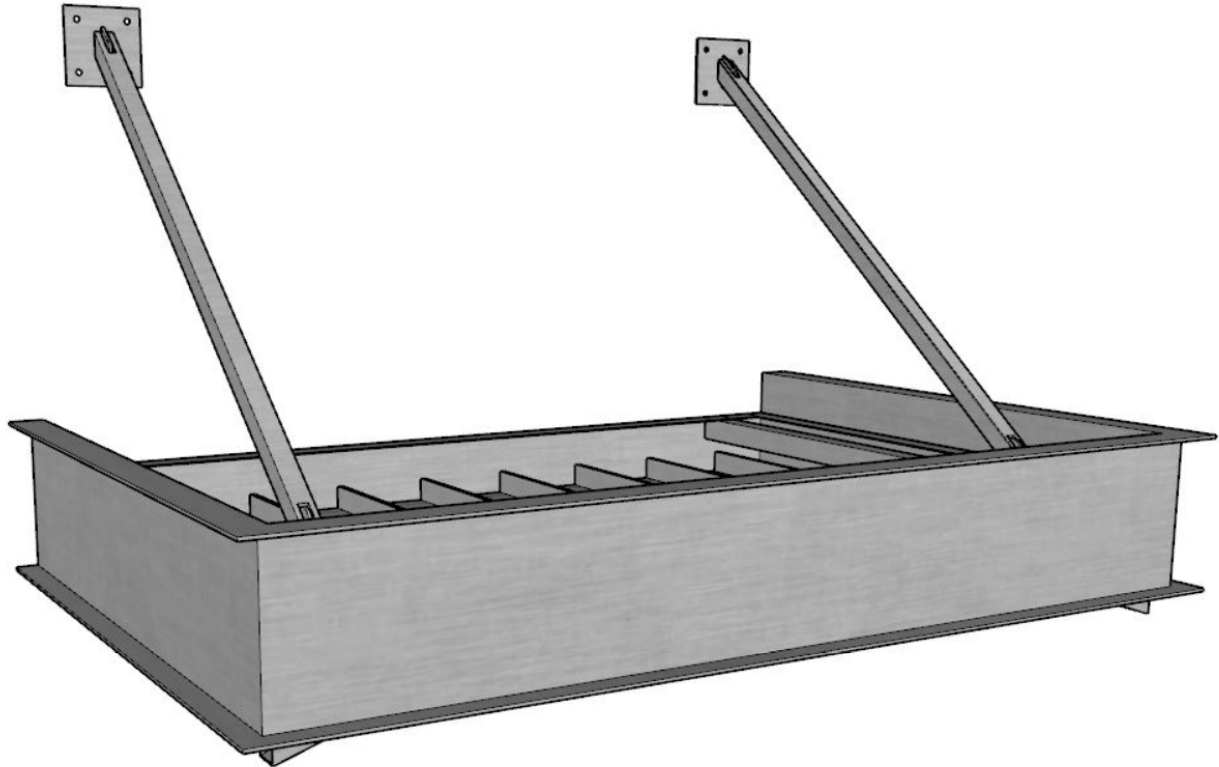


Pricing Available Apon Request

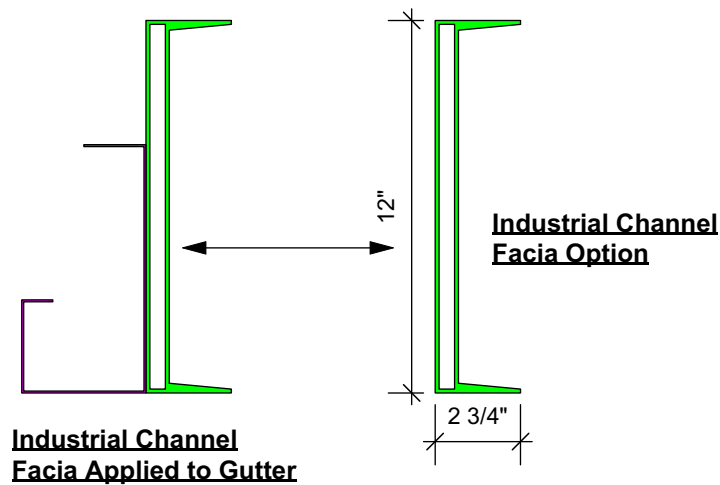


Gutter / Facia Extender Applied

Hanger Rod Canopy 3D View
Industrial C Channel Facia Applied



Pricing Available Apon Request



Project:	KE USA Hanger Rod Canopy – High Wind	
Job Number:	20294A	Date:
Part:		Revised:
Designer:	YW	Page:

Basis for Design

1.1 BUILDING CODE: 2018 International Building Code

1.2 GRAVITY DESIGN:

CANOPY LOADING

DEAD LOAD (PSF)	5psf
LIVE LOAD (PSF)	20psf
ROOF SNOW(PSF)	30psf

1.3 LATERAL DESIGN:

WIND LOADING

Basic Wind Speed (3s – Gust)	160mph
Risk Category	II
Exposure Category	C

SEISMIC LOADING

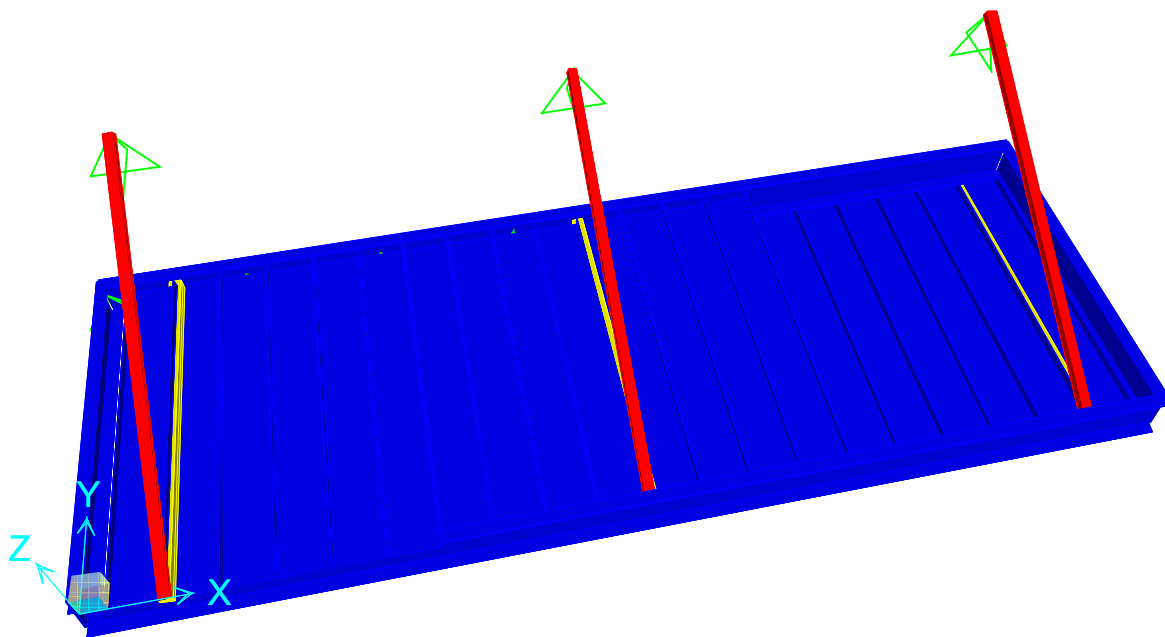
Due to the light weight of the framing, seismic loads do not control lateral design

2.1 ALUMINUM DESIGN:

Extruded 6061-T6 with minimum yield stress equal to 35 ksi.
ER4043 electrodes/rods shall be used for all aluminum to aluminum welds.

3.1 INSPECTION, SPECIAL INSPECTION, AND STRUCTURAL OBSERVATION:

AS REQUIRED BY THE GOVERNING MUNICIPALITY.



3D VIEW



Project:	KE USA Hanger Rod Canopy – High Wind	
Job Number:	20294A	Date:
Part:		Revised:
Designer:	YW	Page:

Design Loads

Design Dead Loads

Canopy frame self weight. Framing weight will be included in to computer model automatically. Add 2psf for miscellaneous dead load. Total dead load no more than 5psf

$$DL = 5\text{psf}$$

Design Live Loads

$$LL = 20\text{psf} \quad (\text{Non_reducible per ASCE 7-16 Table 4.3-1})$$

Design Snow Loads

$$SN = 30\text{psf}$$

Design Wind Loads

Wind parameters: 160 mph wind speed, exposure C. Wind loads are based on IBC2018/ASCE 7-16 Component and Cladding for attached canopies.

$$V = 160\text{mph}$$

Design wind speed

$$K_d = 0.85$$

Wind directionality factor, Table 26.6-1

$$K_{zt} = 1.0$$

Topographic factor, Section 26.8

$$K_e = 1.0$$

Ground elevation factor, Section 26.9

$$K_h = 0.85$$

Velocity pressure exposure coefficient, Table 26.10-1, exposure C
Canopy mean roof height no more than 15'-0"

$$c = 0.00256 \frac{\text{hr}^2 \text{ lbf}}{\text{mi}^2 \text{ ft}^2}$$

Constant for Eq. 26.10-1

$$q_h = c K_d K_{zt} K_e K_h V^2$$

Eq. 26.10-1

$$q_h = 47.35\text{psf}$$

Velocity Pressure

$$GC_p = \begin{pmatrix} -1.1 \\ 0.75 \end{pmatrix}$$

Net coefficient, Fig. 30.11-1

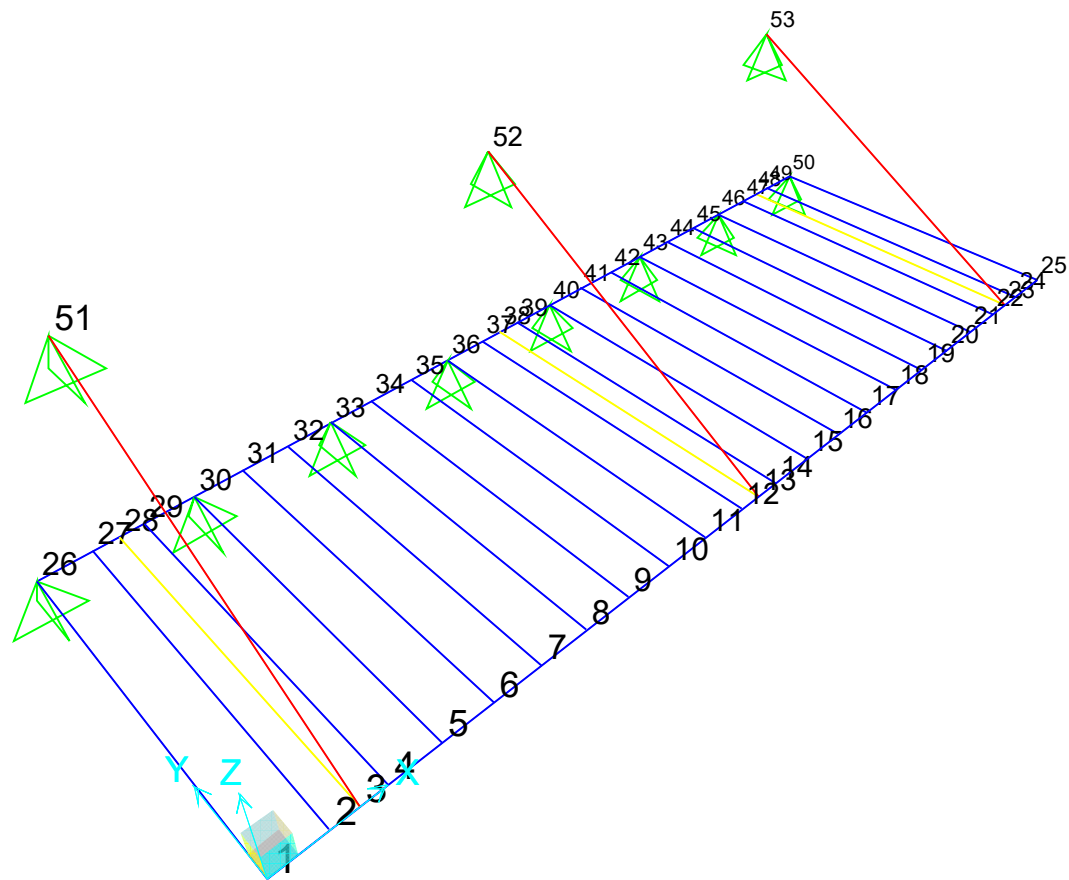
$$p = q_h GC_p = \begin{pmatrix} -52.08 \\ 35.51 \end{pmatrix} \text{psf} \quad \text{Design wind pressure}$$

Design wind force shall be not less than 16psf according as section 30.2.2 of ASCE 7-16

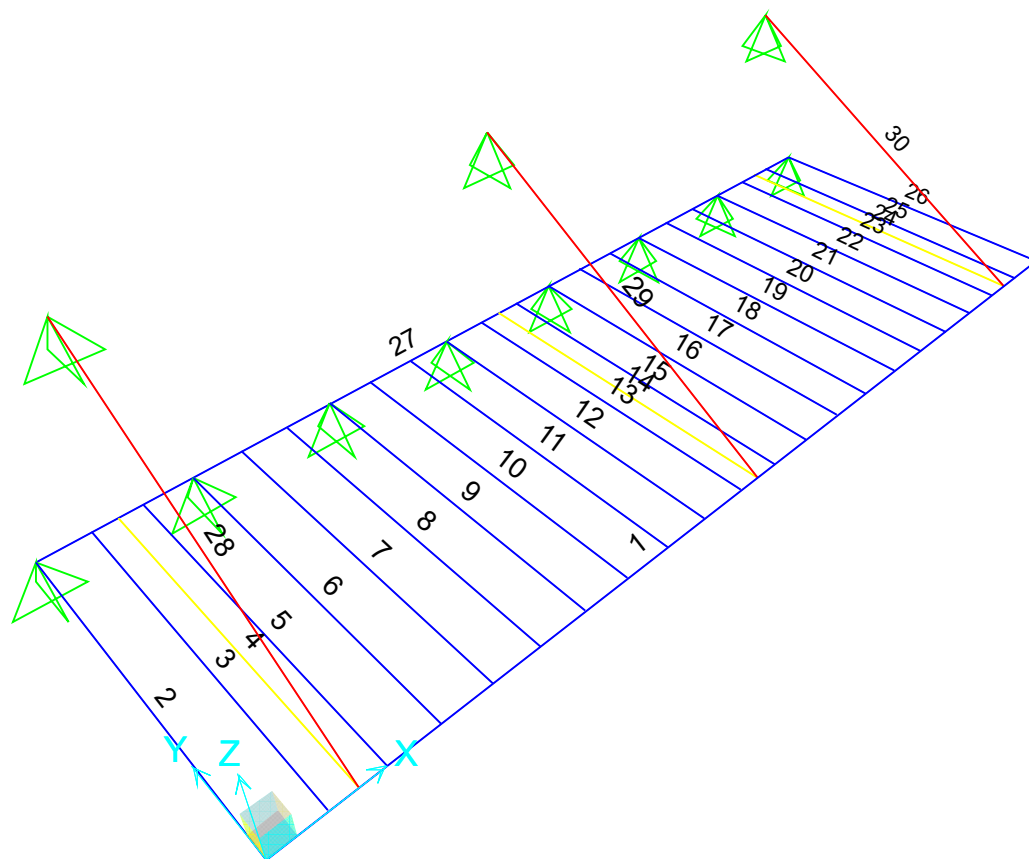
$$P_{\min} = 16\text{psf}$$

Design Seismic Loads

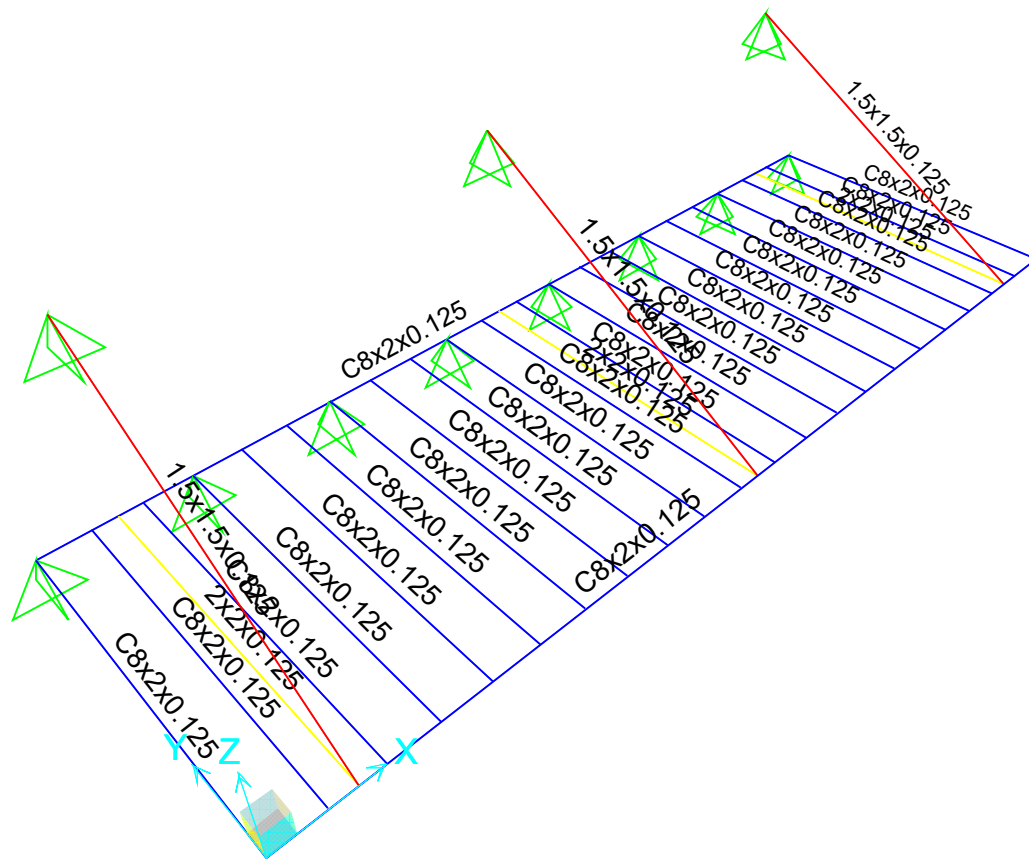
Due to the light weight of framing, seismic loads do not control lateral design.



JOINT LABEL



FRAME LABEL



FRAME SECTION

Table: Material Properties 03c - Aluminum Data

Material	AlumType	Alloy	Fcy Kip/in2	Fty Kip/in2	Ftu Kip/in2	Fsu Kip/in2	SSHysType	CoupModType
6061T6	Wrought	6061-T6	35	35	38	24	Kinematic	Von Mises

Table: Frame Section Properties 01 - General

SectionName	Material	Shape	t3 in	t2 in	tf in	tw in
1.5x1.5x0.125	6061T6	Box/Tube	1.5	1.5	0.125	0.125
2x2x0.125	6061T6	Box/Tube	2	2	0.125	0.125
C8x2x0.125	6061T6	Channel	8	2	0.125	0.125

SectionName	Area in2	TorsConst in4	I33 in4	I22 in4	I23 in4	AS2 in2	AS3 in2
1.5x1.5x0.125	0.69	0.32	0.22	0.22	0	0.38	0.38
2x2x0.125	0.94	0.82	0.55	0.55	0	0.5	0.5
C8x2x0.125	1.47	0.007496	12.6	0.46	0	1	0.5

SectionName	S33 in3	S22 in3	Z33 in3	Z22 in3	R33 in	R22 in	EccV2 in
1.5x1.5x0.125	0.29	0.29	0.36	0.36	0.5637	0.5637	
2x2x0.125	0.55	0.55	0.66	0.66	0.7672	0.7672	
C8x2x0.125	3.15	0.28	3.85	0.49	2.9291	0.5583	0.8959

SectionName	ConcCol	ConcBeam	Color	TotalWt Kip	TotalMass Kip-s2/in	FromFile	AMod
1.5x1.5x0.125	No	No	Red	0.014	3.666E-05	No	1
2x2x0.125	No	No	Yellow	0.017	4.286E-05	No	1
C8x2x0.125	No	No	Blue	0.238	0.0006178	No	1

SectionName	A2Mod	A3Mod	JMod	I2Mod	I3Mod	MMod	WMod
1.5x1.5x0.125	1	1	1	1	1	1	1
2x2x0.125	1	1	1	1	1	1	1
C8x2x0.125	1	1	1	1	1	1	1

Table: Load Pattern Definitions

LoadPat	DesignType	SelfWtMult	AutoLoad	GUID	Notes
DEAD	Dead	1			
SN	Snow	0			
Wup	Wind	0	None		
Wdown	Wind	0	None		
W16	Wind	0	None		

Table: Load Case Definitions

Case	Type	InitialCond	ModalCase	BaseCase	MassSource	DesTypeOpt	DesignType
DEAD	LinStatic	Zero				Prog Det	Dead
SN	LinStatic	Zero				Prog Det	Snow
Wup	LinStatic	Zero				Prog Det	Wind

Case	Type	InitialCond	ModalCase	BaseCase	MassSource	DesTypeOpt	DesignType
Wdown	LinStatic	Zero				Prog Det	Wind
W16	LinStatic	Zero				Prog Det	Wind

Case	DesActOpt	DesignAct	AutoType	RunCase	CaseStatus	GUID
DEAD	Prog Det	Non-Composite	None	Yes	Finished	
SN	Prog Det	Short-Term Composite	None	Yes	Finished	
Wup	Prog Det	Short-Term Composite	None	Yes	Finished	
Wdown	Prog Det	Short-Term Composite	None	Yes	Finished	
W16	Prog Det	Short-Term Composite	None	Yes	Finished	

Table: Combination Definitions

ComboName	ComboType	AutoDesign	CaseType	CaseName	ScaleFactor	AlumDesign
DL+SN	Linear Add	No	Linear Static	DEAD	1	Strength
DL+SN			Linear Static	SN	1	
DL+0.6Wup	Linear Add	No	Linear Static	DEAD	1	Strength
DL+0.6Wup			Linear Static	Wup	0.6	
DL+0.6Wdown	Linear Add	No	Linear Static	DEAD	1	Strength
DL+0.6Wdown			Linear Static	Wdown	0.6	
0.6DL+0.6Wup	Linear Add	No	Linear Static	DEAD	0.6	Strength
0.6DL+0.6Wup			Linear Static	Wup	0.6	
0.6DL+0.6Wdown	Linear Add	No	Linear Static	DEAD	0.6	Strength
0.6DL+0.6Wdown			Linear Static	Wdown	0.6	
DL+0.75(SN+0.6Wup)	Linear Add	No	Linear Static	DEAD	1	Strength
DL+0.75(SN+0.6Wup)			Linear Static	SN	0.75	
DL+0.75(SN+0.6Wup)			Linear Static	Wup	0.45	
DL+0.75(SN+0.6Wdown)	Linear Add	No	Linear Static	DEAD	1	Strength
DL+0.75(SN+0.6Wdown)			Linear Static	SN	0.75	
DL+0.75(SN+0.6Wdown)			Linear Static	Wdown	0.45	
DL+0.6W16	Linear Add	No	Linear Static	DEAD	1	Strength
DL+0.6W16			Linear Static	W16	0.6	
0.6DL+0.6W16	Linear Add	No	Linear Static	DEAD	0.6	Strength
0.6DL+0.6W16			Linear Static	W16	0.6	
DL+0.75(SN+0.6W16)	Linear Add	No	Linear Static	DEAD	1	Strength
DL+0.75(SN+0.6W16)			Linear Static	SN	0.75	
DL+0.75(SN+0.6W16)			Linear Static	W16	0.45	

Table: Frame Loads - Distributed

Frame	LoadPat	CoordSys	Type	Dir	DistType	RelDistA	RelDistB	FOverLA Lb/ft	FOverLB Lb/ft
2	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	0.67	0.67
2	W16	GLOBAL	Force	X	RelDist	0	1	10.67	10.67
2	Wup	Local	Force	2	RelDist	0	1	-17.36	-17.36
2	Wdown	Local	Force	2	RelDist	0	1	11.84	11.84
2	SN	GLOBAL	Force	Gravity	RelDist	0	1	10	10
1	W16	GLOBAL	Force	Y Proj	RelDist	0	1	10.67	10.67
26	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	0.67	0.67
26	Wup	Local	Force	2	RelDist	0	1	17.36	17.36
26	Wdown	Local	Force	2	RelDist	0	1	-11.84	-11.84
26	SN	GLOBAL	Force	Gravity	RelDist	0	1	10	10

Frame	LoadPat	CoordSys	Type	Dir	DistType	RelDistA	RelDistB	FOverLA Lb/ft	FOverLB Lb/ft
3	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
3	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
3	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
3	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
5	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
5	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
5	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
5	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
6	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
6	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
6	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
6	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
7	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
7	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
7	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
7	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
8	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
8	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
8	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
8	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
9	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
9	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
9	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
9	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
10	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
10	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
10	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
10	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
11	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
11	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
11	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
11	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
12	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
12	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
12	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
12	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
13	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
13	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
13	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
13	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
16	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
16	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
16	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
16	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
17	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
17	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
17	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
17	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
18	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
18	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
18	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
18	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20

Frame	LoadPat	CoordSys	Type	Dir	DistType	RelDistA	RelDistB	FOverLA Lb/ft	FOverLB Lb/ft
19	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
19	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
19	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
19	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
20	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
20	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
20	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
20	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
21	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
21	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
21	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
21	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
22	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
22	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
22	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
22	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
23	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
23	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
23	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
23	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
25	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
25	Wup	Local	Force	3	RelDist	0	1	-34.72	-34.72
25	Wdown	Local	Force	3	RelDist	0	1	23.67	23.67
25	SN	GLOBAL	Force	Gravity	RelDist	0	1	20	20
15	DEAD	GLOBAL	Force	Gravity	RelDist	0	1	1.33	1.33
15	SN	GLOBAL	Force	Gravity	RelDist	0	1	10	10
15	Wup	Local	Force	3	RelDist	0	1	-17.94	-17.94
15	Wdown	Local	Force	3	RelDist	0	1	12.23	12.23

Table: Preferences - Aluminum Design

THDesign	SRatioLimit	Provision	LatFact	UseLatFact	Bridge	OmegaTy	OmegaTr	OmegaC
Envelopes	1	ASD	1.23	No	No	1.65	1.95	1.65
OmegaBo	OmegaBr	OmegaVo	OmegaVr					
1.65	1.95	1.65	1.95					

Table: Aluminum Design 1 - Summary Data

Frame	DesignSect	DesignType	Status	Combo	Location in	SRLimit
28	1.5x1.5x0.125	Brace	No Messages	0.6DL+0.6Wup	69.971	1
29	1.5x1.5x0.125	Brace	No Messages	0.6DL+0.6Wup	69.971	1
30	1.5x1.5x0.125	Brace	No Messages	0.6DL+0.6Wup	69.971	1
4	2x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	0	1
14	2x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	0	1
24	2x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	0	1
2	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	0	1
1	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	84	1
26	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	0	1

Frame	DesignSect	DesignType	Status	Combo	Location in	SRLimit
27	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	80	1
3	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	40	1
5	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	40	1
6	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	20	1
7	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	40	1
8	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	40	1
9	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	20	1
10	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	40	1
11	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	40	1
12	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	20	1
13	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	20	1
16	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	20	1
17	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	40	1
18	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	40	1
19	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	20	1
20	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	40	1
21	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	40	1
22	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	20	1
23	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	40	1
25	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	40	1
15	C8x2x0.125	Beam	No Messages	DL+0.75(SN+0.6Wdown)	20	1

Frame	CombinedE q	TotalRatio	PRatio	MMajRatio	MMinRatio	VMajRatio	VMinRatio
28	(H.1-1)	0.224622	0.209312	0.011146	0.004164	0.000598	0.000107
29	(H.1-1)	0.404013	0.387009	0.01694	6.5E-05	0.000743	1.676E-06
30	(H.1-1)	0.223333	0.208126	0.011102	0.004106	0.000597	0.000106
4	(H.1-1)	0.047789	0.020553	0.02467	0.002566	0.000277	0.000213
14	(H.1-1)	0.078713	0.037546	0.041166	1.229E-06	0.000975	3.071E-08
24	(H.1-1)	0.047601	0.020463	0.024579	0.00256	0.000274	0.000212
2	(H.1-1)	0.063812	0.018956	0.001044	0.043812	0.003888	0.00143
1	(H.1-1)	0.284053	0.004475	0.078783	0.200794	0.038567	0.079102
26	(H.1-1)	0.063506	0.018863	0.001044	0.0436	0.003888	0.001423
27	(H.1-1)	0.238069	0.001468	0.004019	0.232582	0.006694	0.056512
3	(H.1-1)	0.188905	0.01373	0.007293	0.167881	0.003071	0.003782
5	(H.1-1)	0.196678	0.015831	0.010795	0.170051	0.003818	0.003787
6	(H.1-1)	0.188051	0.026054	0.009783	0.152213	0.002612	0.003739
7	(H.1-1)	0.179676	0.00287	0.002489	0.174317	4.6E-05	0.003776
8	(H.1-1)	0.174909	3.6E-05	0.000338	0.174535	7E-05	0.003773
9	(H.1-1)	0.158386	8.3E-05	0.000151	0.158153	4.5E-05	0.004049
10	(H.1-1)	0.174635	5E-05	4.5E-05	0.17454	2.3E-05	0.003773
11	(H.1-1)	0.181121	0.004202	0.002415	0.174504	0.000195	0.003773
12	(H.1-1)	0.210616	0.038526	0.01502	0.15707	0.003971	0.003997
13	(H.1-1)	0.215499	0.027308	0.024692	0.163499	0.005486	0.0045
16	(H.1-1)	0.210037	0.038532	0.015021	0.156484	0.003972	0.004027
17	(H.1-1)	0.181122	0.004203	0.002419	0.1745	0.000194	0.003773
18	(H.1-1)	0.174635	5E-05	4.6E-05	0.174539	2.2E-05	0.003773
19	(H.1-1)	0.158356	8.1E-05	0.000145	0.15813	4.4E-05	0.004048
20	(H.1-1)	0.174899	3.6E-05	0.000329	0.174534	6.8E-05	0.003773
21	(H.1-1)	0.179624	0.002857	0.00245	0.174317	4.8E-05	0.003775
22	(H.1-1)	0.187897	0.025937	0.009747	0.152213	0.002602	0.003739
23	(H.1-1)	0.196562	0.01576	0.010754	0.170048	0.003803	0.003787
25	(H.1-1)	0.188801	0.013671	0.007252	0.167878	0.003055	0.003782
15	(H.1-1)	0.145502	0.027303	0.024699	0.0935	0.005488	0.002509

Frame	P Kip	MMajor Kip-in	MMinor Kip-in	VMajor Kip	VMinor Kip	T Kip-in	Pnt Kip
28	-0.48	-0.076	-0.029	0.002301	0.0004123	0	13.397
29	-0.887	-0.115	0.0004512	0.002857	-6.448E-06	0	13.397
30	-0.477	-0.076	0.028	0.002297	-0.0004065	0	13.397
4	-0.162	0.312	-0.033	0.001493	-0.001145	0	18.269
14	-0.296	0.524	-1.581E-05	0.00525	-1.653E-07	0	18.269
24	-0.161	0.311	0.033	0.001474	0.001142	0	18.269
2	-0.124	0.02	-0.245	0.038	-0.008249	0	28.622
1	-0.069	4.308	-1.121	-0.38	0.456	0	28.622
26	-0.123	-0.02	-0.244	-0.038	-0.008209	0	28.622
27	-0.018	-0.22	-1.299	0.066	0.326	0	28.622
3	-0.09	-0.205	-0.938	0.03	-0.022	0	28.622
5	-0.103	0.304	-0.95	-0.038	-0.022	0	28.622
6	-0.17	-0.275	-0.85	-0.026	0.022	0	28.622
7	-0.019	-0.05	-0.974	-0.0004575	-0.022	0	28.622
8	0.001039	-0.009524	-0.975	0.0006908	-0.022	0	28.622
9	0.00237	0.004247	-0.883	0.0004447	0.023	0	28.622
10	0.001442	0.001254	-0.975	0.0002222	-0.022	0	28.622
11	-0.027	0.061	-0.975	0.001919	-0.022	0	28.622
12	-0.252	0.423	-0.877	0.039	0.023	0	28.622
13	-0.178	0.695	-0.913	0.054	0.026	0	28.622
16	-0.252	-0.423	-0.874	-0.039	0.023	0	28.622
17	-0.027	-0.061	-0.975	-0.001914	-0.022	0	28.622
18	0.001435	-0.00129	-0.975	-0.0002167	-0.022	0	28.622
19	0.002308	-0.004095	-0.883	-0.0004297	0.023	0	28.622
20	0.001028	0.009253	-0.975	-0.0006666	-0.022	0	28.622
21	-0.019	0.05	-0.974	0.0004769	-0.022	0	28.622
22	-0.169	0.274	-0.85	0.026	0.022	0	28.622
23	-0.103	-0.303	-0.95	0.038	-0.022	0	28.622
25	-0.089	0.204	-0.938	-0.03	-0.022	0	28.622
15	-0.178	-0.695	-0.522	-0.054	0.014	0	28.622

Frame	Pnc Kip	MnMajor Kip-in	MnMinor Kip-in	VnMajor Kip	VnMinor Kip	ErrMsg
28	2.291	6.834	6.927	3.846	3.846	No Messages
29	2.291	6.793	6.927	3.846	3.846	No Messages
30	2.291	6.834	6.927	3.846	3.846	No Messages
4	7.87	12.667	12.865	5.385	5.385	No Messages
14	7.87	12.733	12.865	5.385	5.385	No Messages
24	7.87	12.666	12.865	5.385	5.385	No Messages
2	6.53	19.217	5.585	9.865	5.769	No Messages
1	15.517	54.681	5.585	9.865	5.769	No Messages
26	6.53	19.217	5.585	9.865	5.769	No Messages
27	12.288	54.681	5.585	9.865	5.769	No Messages
3	6.53	28.152	5.585	9.865	5.769	No Messages
5	6.53	28.152	5.585	9.865	5.769	No Messages
6	6.53	28.152	5.585	9.865	5.769	No Messages
7	6.53	20.086	5.585	9.865	5.769	No Messages
8	6.53	28.152	5.585	9.865	5.769	No Messages
9	6.53	28.152	5.585	9.865	5.769	No Messages
10	6.53	28.152	5.585	9.865	5.769	No Messages
11	6.53	25.313	5.585	9.865	5.769	No Messages
12	6.53	28.152	5.585	9.865	5.769	No Messages
13	6.53	28.152	5.585	9.865	5.769	No Messages
16	6.53	28.152	5.585	9.865	5.769	No Messages

Frame	Pnc Kip	MnMajor Kip-in	MnMinor Kip-in	VnMajor Kip	VnMinor Kip	ErrMsg
17	6.53	25.293	5.585	9.865	5.769	No Messages
18	6.53	28.152	5.585	9.865	5.769	No Messages
19	6.53	28.152	5.585	9.865	5.769	No Messages
20	6.53	28.152	5.585	9.865	5.769	No Messages
21	6.53	20.231	5.585	9.865	5.769	No Messages
22	6.53	28.152	5.585	9.865	5.769	No Messages
23	6.53	28.152	5.585	9.865	5.769	No Messages
25	6.53	28.152	5.585	9.865	5.769	No Messages
15	6.53	28.152	5.585	9.865	5.769	No Messages

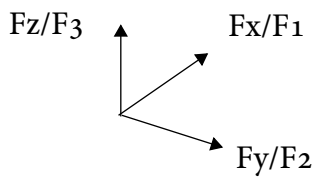
Table: Joint Reactions

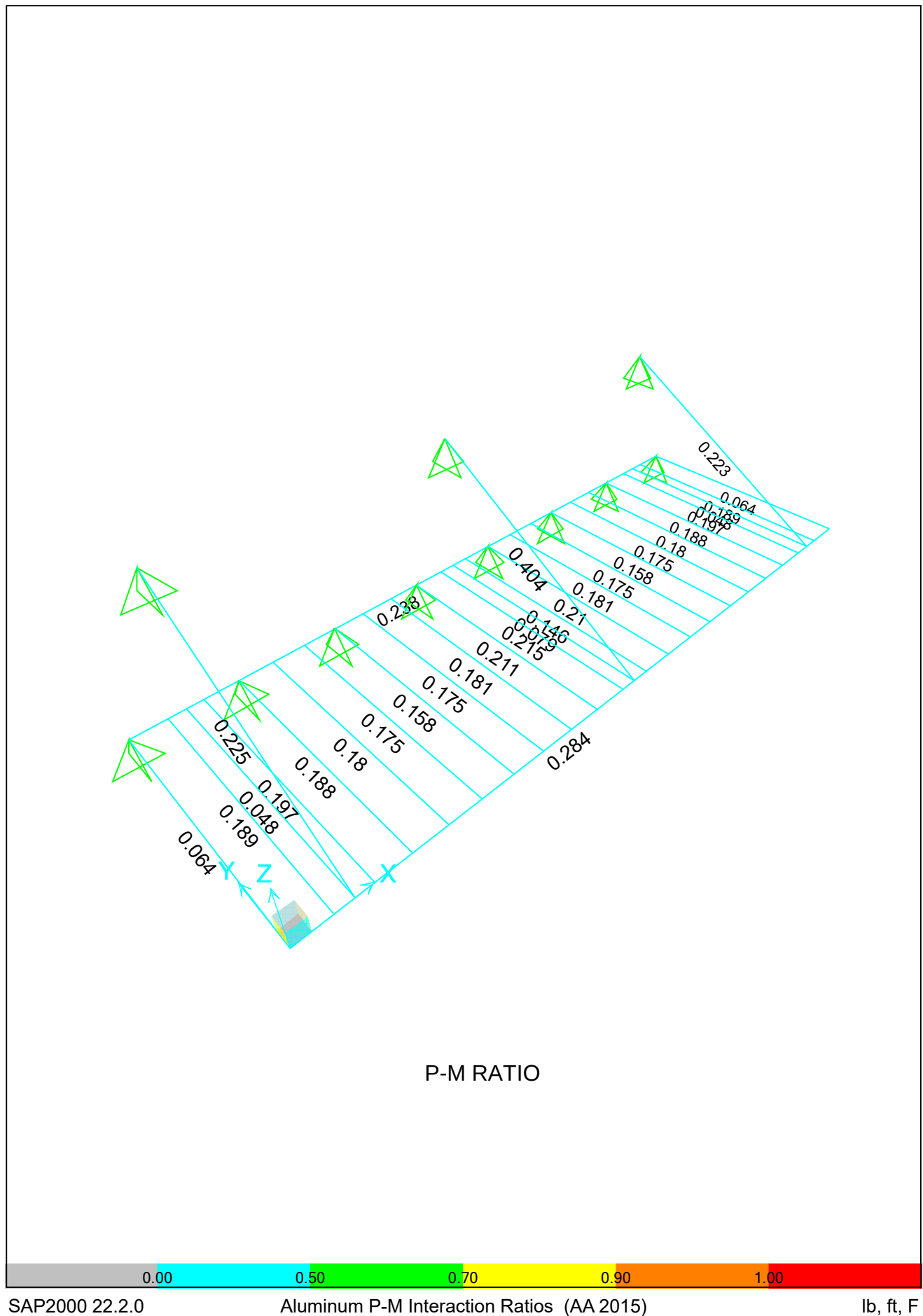
Joint	OutputCase	CaseType	F1 Lb	F2 Lb	F3 Lb
26	DL+SN	Combination	12.4	-211.2	48.5
26	DL+0.6Wup	Combination	-8.7	147.1	-28.3
26	DL+0.6Wdown	Combination	9.4	-160.4	37.6
26	0.6DL+0.6Wup	Combination	-9.5	161.4	-32.6
26	0.6DL+0.6Wdown	Combination	8.6	-146.1	33.3
26	DL+0.75(SN+0.6Wup)	Combination	1.8	-30.2	9.7
26	DL+0.75(SN+0.6Wdown)	Combination	15.3	-260.8	59.1
26	DL+0.6W16	Combination	-15.0	-34.7	11.0
26	0.6DL+0.6W16	Combination	-15.8	-20.4	6.6
26	DL+0.75(SN+0.6W16)	Combination	-3.0	-166.6	39.2
30	DL+SN	Combination	-33.6	-330.8	248.0
30	DL+0.6Wup	Combination	23.2	229.8	-182.1
30	DL+0.6Wdown	Combination	-25.5	-251.3	186.9
30	0.6DL+0.6Wup	Combination	25.5	252.3	-197.0
30	0.6DL+0.6Wdown	Combination	-23.2	-228.8	172.0
30	DL+0.75(SN+0.6Wup)	Combination	-4.9	-47.7	30.7
30	DL+0.75(SN+0.6Wdown)	Combination	-41.4	-408.5	307.5
30	DL+0.6W16	Combination	-8.5	-70.1	37.3
30	0.6DL+0.6W16	Combination	-6.2	-47.6	22.4
30	DL+0.75(SN+0.6W16)	Combination	-28.7	-272.6	195.3
33	DL+SN	Combination	1.2	3.7	150.0
33	DL+0.6Wup	Combination	-0.9	-2.8	-109.6
33	DL+0.6Wdown	Combination	0.9	2.8	113.1
33	0.6DL+0.6Wup	Combination	-1.0	-3.0	-118.8
33	0.6DL+0.6Wdown	Combination	0.9	2.6	104.0
33	DL+0.75(SN+0.6Wup)	Combination	0.2	0.4	18.9
33	DL+0.75(SN+0.6Wdown)	Combination	1.5	4.6	186.0
33	DL+0.6W16	Combination	-2.3	-12.6	22.8
33	0.6DL+0.6W16	Combination	-2.3	-12.8	13.7
33	DL+0.75(SN+0.6W16)	Combination	-0.9	-6.9	118.2
36	DL+SN	Combination	47.3	-487.2	167.2
36	DL+0.6Wup	Combination	-33.7	347.2	-117.9
36	DL+0.6Wdown	Combination	35.9	-369.3	126.9
36	0.6DL+0.6Wup	Combination	-36.8	378.7	-129.0
36	0.6DL+0.6Wdown	Combination	32.8	-337.7	115.9
36	DL+0.75(SN+0.6Wup)	Combination	6.4	-65.6	23.1
36	DL+0.75(SN+0.6Wdown)	Combination	58.6	-603.0	206.7

Joint	OutputCase	CaseType	F1 Lb	F2 Lb	F3 Lb
36	DL+0.6W16	Combination	5.3	-91.6	27.7
36	0.6DL+0.6W16	Combination	2.2	-60.1	16.6
36	DL+0.75(SN+0.6W16)	Combination	35.6	-394.7	132.3
40	DL+SN	Combination	-47.3	-487.3	157.6
40	DL+0.6Wup	Combination	33.7	347.2	-108.3
40	DL+0.6Wdown	Combination	-35.9	-369.3	120.4
40	0.6DL+0.6Wup	Combination	36.8	378.8	-119.4
40	0.6DL+0.6Wdown	Combination	-32.8	-337.8	109.3
40	DL+0.75(SN+0.6Wup)	Combination	-6.4	-65.6	23.1
40	DL+0.75(SN+0.6Wdown)	Combination	-58.6	-603.1	194.7
40	DL+0.6W16	Combination	-10.0	-92.1	27.7
40	0.6DL+0.6W16	Combination	-6.9	-60.6	16.6
40	DL+0.75(SN+0.6W16)	Combination	-39.2	-395.2	125.1
43	DL+SN	Combination	-1.2	3.6	150.4
43	DL+0.6Wup	Combination	0.9	-2.7	-110.0
43	DL+0.6Wdown	Combination	-0.9	2.7	113.4
43	0.6DL+0.6Wup	Combination	1.0	-2.9	-119.2
43	0.6DL+0.6Wdown	Combination	-0.8	2.5	104.3
43	DL+0.75(SN+0.6Wup)	Combination	-0.2	0.4	18.9
43	DL+0.75(SN+0.6Wdown)	Combination	-1.5	4.4	186.4
43	DL+0.6W16	Combination	-2.4	-12.4	22.8
43	0.6DL+0.6W16	Combination	-2.3	-12.6	13.7
43	DL+0.75(SN+0.6W16)	Combination	-2.6	-6.9	118.5
46	DL+SN	Combination	33.5	-329.4	248.0
46	DL+0.6Wup	Combination	-23.1	228.4	-182.1
46	DL+0.6Wdown	Combination	25.4	-250.3	186.9
46	0.6DL+0.6Wup	Combination	-25.4	250.9	-197.1
46	0.6DL+0.6Wdown	Combination	23.1	-227.8	172.0
46	DL+0.75(SN+0.6Wup)	Combination	4.9	-47.7	30.7
46	DL+0.75(SN+0.6Wdown)	Combination	41.3	-406.6	307.5
46	DL+0.6W16	Combination	3.9	-71.3	37.3
46	0.6DL+0.6W16	Combination	1.6	-48.8	22.4
46	DL+0.75(SN+0.6W16)	Combination	25.2	-272.4	195.3
50	DL+SN	Combination	-12.3	-210.2	48.5
50	DL+0.6Wup	Combination	8.6	146.1	-28.3
50	DL+0.6Wdown	Combination	-9.4	-159.7	37.6
50	0.6DL+0.6Wup	Combination	9.4	160.4	-32.7
50	0.6DL+0.6Wdown	Combination	-8.5	-145.4	33.3
50	DL+0.75(SN+0.6Wup)	Combination	-1.8	-30.2	9.7
50	DL+0.75(SN+0.6Wdown)	Combination	-15.2	-259.5	59.1
50	DL+0.6W16	Combination	-3.1	-45.5	10.8
50	0.6DL+0.6W16	Combination	-2.2	-31.2	6.5
50	DL+0.75(SN+0.6W16)	Combination	-10.5	-173.9	39.1
51	DL+SN	Combination	-0.5	537.5	326.0
51	DL+0.6Wup	Combination	0.4	-373.5	-223.0
51	DL+0.6Wdown	Combination	-0.4	408.2	248.0
51	0.6DL+0.6Wup	Combination	0.4	-410.0	-245.9
51	0.6DL+0.6Wdown	Combination	-0.4	371.6	225.2
51	DL+0.75(SN+0.6Wup)	Combination	-0.1	77.3	48.7
51	DL+0.75(SN+0.6Wdown)	Combination	-0.6	663.6	402.0
51	DL+0.6W16	Combination	-0.1	91.1	56.9
51	0.6DL+0.6W16	Combination	0.0	54.6	34.1

Joint	OutputCase	CaseType	F1 Lb	F2 Lb	F3 Lb
51	DL+0.75(SN+0.6W16)	Combination	-0.4	425.8	258.6
52	DL+SN	Combination	0.0	976.3	590.1
52	DL+0.6Wup	Combination	0.0	-695.6	-416.9
52	DL+0.6Wdown	Combination	0.0	740.0	447.8
52	0.6DL+0.6Wup	Combination	0.0	-758.8	-455.8
52	0.6DL+0.6Wdown	Combination	0.0	676.8	408.9
52	DL+0.75(SN+0.6Wup)	Combination	0.0	131.5	81.3
52	DL+0.75(SN+0.6Wdown)	Combination	0.0	1208.2	729.8
52	DL+0.6W16	Combination	0.0	158.2	97.3
52	0.6DL+0.6W16	Combination	0.0	94.9	58.4
52	DL+0.75(SN+0.6W16)	Combination	0.0	771.8	466.9
53	DL+SN	Combination	0.5	535.2	324.6
53	DL+0.6Wup	Combination	-0.4	-371.2	-221.6
53	DL+0.6Wdown	Combination	0.4	406.6	247.1
53	0.6DL+0.6Wup	Combination	-0.4	-407.7	-244.5
53	0.6DL+0.6Wdown	Combination	0.4	370.1	224.3
53	DL+0.75(SN+0.6Wup)	Combination	0.1	77.4	48.7
53	DL+0.75(SN+0.6Wdown)	Combination	0.6	660.7	400.2
53	DL+0.6W16	Combination	0.1	91.4	57.1
53	0.6DL+0.6W16	Combination	0.0	54.9	34.3
53	DL+0.75(SN+0.6W16)	Combination	0.4	424.3	257.7

Reaction Direction





Project:	KE USA Hanger Rod Canopy – High Wind	
Job Number:	20294A	Date:
Part:		Revised:
Designer:	YW	Page:

Connection Check

Typical upper attachment check

maximum reaction from analysis, worst case considered below

$$F_x := 0\text{ lbf} \quad F_y := 1208.21\text{ lbf} \quad F_z := 729.77\text{ lbf}$$

maximum shear and tension

$$V_{\text{REC}} := \sqrt{F_x^2 + F_z^2} \quad T_{\text{REC}} := F_y$$

$$V_{\text{REC}} = 730\text{ lbf} \quad T_{\text{REC}} = 1208\text{ lbf} \quad \text{worst case}$$

$$\text{attachment horizontal spacing in model} \quad d := 72\text{ in}$$

$$\text{attachment horizontal trib. width} \quad D := 72\text{ in}$$

$$\text{attachment vertical spacing in model} \quad s := 36\text{ in}$$

$$\text{attachment vertical trib. width} \quad S := 37\text{ in}$$

$$V_{\text{max}} := V_{\text{REC}} \cdot \frac{D}{d} \quad T_{\text{max}} := T_{\text{REC}} \cdot \frac{D}{d} \cdot \frac{s}{S} \quad V_{\text{max}} = 730\text{ lbf} \quad T_{\text{max}} = 1176\text{ lbf}$$

Tab plate check

$$\text{plate information} \quad F_y := 36\text{ ksi} \quad F_u := 58\text{ ksi} \quad \text{A36 plate}$$

$$w := 3\text{ in} \quad t := \frac{3}{8}\text{ in} \quad d_{\text{hole}} := \frac{7}{16}\text{ in} \quad d := \frac{3}{8}\text{ in} \quad LC := 1.375\text{ in} \quad a := LC - \frac{d_{\text{hole}}}{2} \quad a = 1.156\text{ in}$$

$$b := \frac{w}{2} - \frac{d_{\text{hole}}}{2} \quad b = 1.281\text{ in} \quad b_{\text{eff}} := \min(2 \cdot t + 0.63\text{ in}, b) \quad b_{\text{eff}} = 1.281\text{ in}$$

check tensile rupture on the net effective area

$$P_n := 2 \cdot t \cdot b_{\text{eff}} \cdot F_u \quad P_n = 55.734\text{ kip} \quad \Omega_t := 2.0$$

$$T_a := \frac{P_n}{\Omega_t} \quad T_a = 27.867\text{ kip}$$

$$\text{check_T} := \text{if}(T_a \geq T_{\text{max}}, \text{"Tension is Ok"}, \text{"NG"})$$

check_T = "Tension is Ok"

check shear rupture

$$A_{\text{sf}} := 2 \cdot t \cdot \left(a + \frac{d}{2}\right) \quad A_{\text{sf}} = 1.008\text{ in}^2$$

$$V_n := 0.6 \cdot F_u \cdot A_{\text{sf}} \quad V_n = 35.072\text{ kip} \quad \Omega_{\text{sf}} := 2.0$$

$$V_a := \frac{V_n}{\Omega_{\text{sf}}} \quad V_a = 17.536\text{ kip}$$

$$\text{check_V} := \text{if}(V_a \geq T_{\text{max}}, \text{"Shear rupture is Ok"}, \text{"NG"})$$

check_V = "Shear rupture is Ok"

Project:	KE USA Hanger Rod Canopy – High Wind	
Job Number:	20294A	Date:
Part:		Revised:
Designer:	YW	Page:

check bearing

$$A_{pb} := t \cdot d \quad A_{pb} = 0.141 \cdot \text{in}^2$$

$$R_n := 1.8 \cdot F_y \cdot A_{pb} \quad R_n = 9.112 \cdot \text{kip} \quad \Omega_t := 2.0$$

$$P_a := \frac{R_n}{\Omega_t} \quad P_a = 4.6 \cdot \text{kip}$$

$$\text{check_bearing} := \text{if}(P_a \geq T_{\max}, \text{"Bearing is Ok"}, \text{"NG"}) \quad \text{check_bearing} = \text{"Bearing is Ok"}$$

check tensile yielding

$$A_g := w \cdot t \quad A_g = 1.125 \cdot \text{in}^2$$

$$P_n := F_y \cdot A_g \quad P_n = 40.5 \cdot \text{kip} \quad \Omega_y := 1.67$$

$$T_y := \frac{P_n}{\Omega_y} \quad T_y = 24.251 \cdot \text{kip}$$

$$\text{check_yielding} := \text{if}(T_y \geq T_{\max}, \text{"Tensile yielding is Ok"}, \text{"NG"})$$

$$\text{check_yielding} = \text{"Tensile yielding is Ok"}$$

3/16" welding for tab plate to back wall plate

welding information $t_w := \frac{3}{16} \cdot \text{in} \quad D := \frac{t_w}{\frac{1}{16} \cdot \text{in}} \quad D = 3 \quad L_w := 3 \cdot \text{in}$

allowable welding strength $3" \text{ welding used for conservative design}$

$$F_{\text{weld}} := 0.928 \cdot \frac{\text{kip}}{\text{in}} \cdot D \cdot L_w \quad F_{\text{weld}} = 8.352 \cdot \text{kip}$$

$$\text{check_welding} := \text{if}(F_{\text{weld}} \geq T_{\max}, \text{"Welding is OK"}, \text{"NG"})$$

$$\text{check_welding} = \text{"Welding is OK"}$$

Wall plate connection check

Use (4) 3/8" dia. A307 thru bolt or equivalent bolt wall plate to **stud or metal backing** (by others)

$$V_a := 1.48 \text{kip} \quad T_a := 2.48 \text{kip}$$

$$\text{check_bolt} := \text{if}(V_a > V_{\max} \wedge T_a > T_{\max}, \text{"Bolt is sufficient!"}, \text{"NG!!!"})$$

$$\text{check_bolt} = \text{"Bolt is sufficient!"}$$

Use (4) 3/8" dia. x4" lag screws or equivalent screws for wall plate to **wood beam or wood blocking** (by others)

$$n := 4 \quad \text{number of screws}$$

$$T_E := \left(2 + \frac{9}{32}\right) \text{in} \quad \text{Penetration into wood for a conservative design}$$

Project:	KE USA Hanger Rod Canopy – High Wind	
Job Number:	20294A	Date:
Part:		Revised:
Designer:	YW	Page:

$$P_{\max} := \sqrt{T_{\max}^2 + V_{\max}^2} \quad P_{\max} = 1384 \cdot \text{lbf} \quad \text{maximum force to screws}$$

$$Z_{\text{penp}} := 180 \cdot \text{lbf} \quad Z_{\text{par}} := 280 \cdot \text{lbf} \quad W := 305 \cdot \frac{\text{lbf}}{\text{in}}$$

$$C_D := 1.6 \text{ for wind} \quad C_M := 1.0 \quad C_{\Delta} := 1.0 \quad C_t := 1.0 \quad C_g := 1.0 \quad \theta := \text{atan}\left(\frac{T_{\max}}{V_{\max}}\right)$$

$$Z1 := Z_{\text{penp}} \cdot C_D \cdot C_M \cdot C_{\Delta} \cdot C_t \cdot C_g \quad Z1 = 288 \cdot \text{lbf}$$

$$Z2 := Z_{\text{par}} \cdot C_D \cdot C_M \cdot C_{\Delta} \cdot C_t \cdot C_g \quad Z2 = 448 \cdot \text{lbf}$$

$$Z := \frac{Z1 \cdot Z2}{Z1 \cdot \cos(\theta)^2 + Z2 \cdot \sin(\theta)^2} \quad Z = 319.8 \cdot \text{lbf}$$

$$W1 := W \cdot T_E \cdot C_D \cdot C_M \cdot C_t \quad W1 = 1.113 \cdot \text{kip}$$

$$Z_{\theta} := \frac{n \cdot W1 \cdot Z}{W1 \cdot \cos(\theta)^2 + Z \cdot \sin(\theta)^2} \quad Z_{\theta} = 2634 \cdot \text{lbf}$$

$$\text{check} := \text{if}(P_{\max} < Z_{\theta}, \text{"Lag screw is Ok"}, \text{"NG"})$$

check = "Lag screw is Ok"

Use (4) 1/2" dia. x 3-1/2" nominal embed. SS SIMPSON TITEN HD or equivalent screws for wall plate to masonry wall (by others)

$$S_{\text{crit}} := 8 \text{ in} \quad S_{\text{min}} := 4 \text{ in} \quad S := 4 \text{ in} \quad \text{fac}_{t,\text{min}} := 0.79 \quad \text{fac}_{v,\text{min}} := 0.86 \quad n := 4$$

$$\text{fac}_t := \frac{1 - \text{fac}_{t,\text{min}}}{S_{\text{crit}} - S_{\text{min}}} \cdot (S - S_{\text{min}}) + \text{fac}_{t,\text{min}} \quad \text{tension reduction factor due to anchor spacing}$$

$$\text{fac}_v := \frac{1 - \text{fac}_{v,\text{min}}}{S_{\text{crit}} - S_{\text{min}}} \cdot (S - S_{\text{min}}) + \text{fac}_{v,\text{min}} \quad \text{shear reduction factor due to anchor spacing}$$

$$T_a := \min(665 \text{ lbf} \cdot \text{fac}_t, 665 \text{ lbf}) \quad V_a := \min(990 \text{ lbf} \cdot \text{fac}_v, 990 \text{ lbf}) \quad \text{According to ESR-1056}$$

$$\text{Ratio} := \left(\frac{T_{\max}}{n \cdot T_a} \right) + \left(\frac{V_{\max}}{n \cdot V_a} \right) \quad \text{Ratio} = 0.774$$

$$\text{check_anchor} := \text{if}(\text{Ratio} \leq 1, \text{"Anchor is sufficient!"}, \text{"NG"})$$

check_anchor = "Anchor is sufficient!"

Use (4) 3/8" dia. x 2-1/2" nominal embed. SS SIMPSON TITEN HD or equivalent screws for wall plate to concrete wall (by others). See attached report.

Project:	KE USA Hanger Rod Canopy – High Wind	
Job Number:	20294A	Date:
Part:		Revised:
Designer:	YW	Page:

Typical lower attachment check

maximum reaction from analysis, worst case considered below

$$F_x := 58.58 \text{ lbf} \quad F_y := 603.07 \text{ lbf} \quad F_z := 307.49 \text{ lbf}$$

maximum shear and tension

$$V_{\text{REC}} := \sqrt{F_x^2 + F_z^2} \quad T_{\text{REC}} := F_y$$

$$V_{\text{REC}} = 313 \cdot \text{lbf} \quad T_{\text{REC}} = 603 \cdot \text{lbf} \quad \text{worst case}$$

$$\text{attachment horizontal spacing in model} \quad d := 24 \cdot \text{in}$$

$$\text{attachment horizontal trib. width} \quad D := 24 \cdot \text{in}$$

$$\text{attachment vertical spacing in model} \quad s := 36 \cdot \text{in}$$

$$\text{attachment vertical trib. width} \quad S := 37 \cdot \text{in}$$

$$V_{\text{max}} := V_{\text{REC}} \cdot \frac{D}{d} \quad T_{\text{max}} := T_{\text{REC}} \cdot \frac{D}{d} \cdot \frac{s}{S} \quad V_{\text{max}} = 313 \cdot \text{lbf} \quad T_{\text{max}} = 587 \cdot \text{lbf}$$

Use (1) 3/8" dia. A307 thru bolt or equivalent bolt to **stud or metal backing** (by others)

$$V_a := 1.48 \text{ kip} \quad T_a := 2.48 \text{ kip}$$

$$\text{check_bolt} := \text{if}(V_a > V_{\text{max}} \wedge T_a > T_{\text{max}}, \text{"Bolt is sufficient!"}, \text{"NG!!!"})$$

$$\text{check_bolt} = \text{"Bolt is sufficient!"}$$

Use (1) 3/8" dia. x4" lag screws or equivalent screws to **wood beam or wood blocking** (by others)

$$n := 1 \quad \text{Number of screws}$$

$$T_E := \left(2 + \frac{9}{32}\right) \text{ in} \quad \text{Penetration into wood for a conservative design}$$

$$P_{\text{max}} := \sqrt{T_{\text{max}}^2 + V_{\text{max}}^2} \quad P_{\text{max}} = 665 \cdot \text{lbf} \quad \text{maximum force to screws}$$

$$Z_{\text{penp}} := 180 \cdot \text{lbf} \quad Z_{\text{par}} := 280 \cdot \text{lbf} \quad W := 305 \cdot \frac{\text{lbf}}{\text{in}}$$

$$C_D := 1.6 \quad \text{for wind} \quad C_M := 1.0 \quad C_{\Delta} := 1.0 \quad C_t := 1.0 \quad C_g := 1.0 \quad \theta := \text{atan}\left(\frac{T_{\text{max}}}{V_{\text{max}}}\right)$$

$$Z1 := Z_{\text{penp}} \cdot C_D \cdot C_M \cdot C_{\Delta} \cdot C_t \cdot C_g \quad Z1 = 288 \cdot \text{lbf}$$

$$Z2 := Z_{\text{par}} \cdot C_D \cdot C_M \cdot C_{\Delta} \cdot C_t \cdot C_g \quad Z2 = 448 \cdot \text{lbf}$$

$$Z := \frac{Z1 \cdot Z2}{Z1 \cdot \cos(\theta)^2 + Z2 \cdot \sin(\theta)^2} \quad Z = 312.7 \cdot \text{lbf}$$

Project:	KE USA Hanger Rod Canopy – High Wind	
Job Number:	20294A	Date:
Part:		Revised:
Designer:	YW	Page:

$$W1 := W \cdot T_E \cdot C_D \cdot C_M \cdot C_t \quad W1 = 1.113 \cdot \text{kip}$$

$$Z_\theta := \frac{n \cdot W1 \cdot Z}{W1 \cdot \cos(\theta)^2 + Z \cdot \sin(\theta)^2} \quad Z_\theta = 710 \cdot \text{lbf}$$

$$\text{check} := \text{if}(P_{\max} < Z_\theta, \text{"Lag screw is Ok"}, \text{"NG"})$$

check = "Lag screw is Ok"

Use (2) 1/2" dia. x 3-1/2" nominal embed. SS SIMPSON TITEN HD or equivalent screws for to masonry wall (by others)

$$S_{\text{crit}} := 8\text{in} \quad S_{\text{min}} := 4\text{in} \quad S := 4\text{in} \quad \text{fac}_{t,\text{min}} := 0.79 \quad \text{fac}_{v,\text{min}} := 0.86$$

$$\text{fac}_t := \frac{1 - \text{fac}_{t,\text{min}}}{S_{\text{crit}} - S_{\text{min}}} \cdot (S - S_{\text{min}}) + \text{fac}_{t,\text{min}} \quad \text{tension reduction factor due to anchor spacing}$$

$$\text{fac}_v := \frac{1 - \text{fac}_{v,\text{min}}}{S_{\text{crit}} - S_{\text{min}}} \cdot (S - S_{\text{min}}) + \text{fac}_{v,\text{min}} \quad \text{shear reduction factor due to anchor spacing}$$

$$T_a := \min(665\text{lbf} \cdot \text{fac}_t, 665\text{lbf}) \quad V_a := \min(990\text{lbf} \cdot \text{fac}_v, 990\text{lbf}) \quad \text{According to ESR-1056}$$

$$n := 2 \quad \text{number of screws}$$

$$\text{Ratio} := \left(\frac{T_{\max}}{n \cdot T_a} \right) + \left(\frac{V_{\max}}{n \cdot V_a} \right) \quad \text{Ratio} = 0.742$$

$$\text{check_anchor} := \text{if}(\text{Ratio} \leq 1, \text{"Anchor is sufficient!"}, \text{"NG"})$$

check_anchor = "Anchor is sufficient!"

Use (1) 3/8" dia. x 2-1/2" nominal embed. SS SIMPSON TITEN HD or equivalent screws for wall plate to concrete wall (by others). See attached report.

Frame to frame

Use typical 1/8" all around fillet welding for frame to frame, well sufficient.



Anchor Designer™
Software
 Version 2.8.7094.15

Company:	HW Engineering	Date:	11/30/2020
Engineer:	YW	Page:	1/5
Project:	KE USA Hanger Rod Canopy		
Address:	8887 W Flamingo Rd		
Phone:	702-202-0061		
E-mail:	yijie@hwengineeringusa.com		

1. Project information

Customer company:
 Customer contact name:
 Customer e-mail:
 Comment:

Project description: Top attachment to concrete wall design
 Location:
 Fastening description:

2. Input Data & Anchor Parameters

General

Design method: ACI 318-14
 Units: Imperial units

Anchor Information:

Anchor type: Concrete screw
 Material: Stainless Steel
 Diameter (inch): 0.375
 Nominal Embedment depth (inch): 2.500
 Effective Embedment depth, h_{ef} (inch): 1.400
 Code report: IAPMO UES ER-493
 Anchor category: 1
 Anchor ductility: Yes
 h_{min} (inch): 4.00
 c_{ac} (inch): 4.50
 C_{min} (inch): 1.75
 S_{min} (inch): 3.00

Base Material

Concrete: Normal-weight
 Concrete thickness, h (inch): 4.00
 State: Uncracked
 Compressive strength, f'_c (psi): 2500
 $\Psi_{c,v}$: 1.4
 Reinforcement condition: B tension, B shear
 Supplemental reinforcement: No
 Reinforcement provided at corners: No
 Ignore concrete breakout in tension: No
 Ignore concrete breakout in shear: No
 Ignore 6do requirement: Not applicable
 Build-up grout pad: No

Base Plate

Length x Width x Thickness (inch): 6.00 x 6.00 x 0.13

Recommended Anchor

Anchor Name: Titen HD® Stainless Steel - 3/8"Ø SS Titen HD, h_{nom} : 2.5" (64mm)
 Code Report: IAPMO UES ER-493



Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com



Anchor Designer™
Software
Version 2.8.7094.15

Company:	HW Engineering	Date:	11/30/2020
Engineer:	YW	Page:	2/5
Project:	KE USA Hanger Rod Canopy		
Address:	8887 W Flamingo Rd		
Phone:	702-202-0061		
E-mail:	yijie@hwengineeringusa.com		

Load and Geometry

Load factor source: ACI 318 Section 5.3

Load combination: not set

Seismic design: No

Anchors subjected to sustained tension: Not applicable

Apply entire shear load at front row: No

Anchors only resisting wind and/or seismic loads: No

Strength level loads:

N_{ua} [lb]: 2014

V_{uax} [lb]: 0

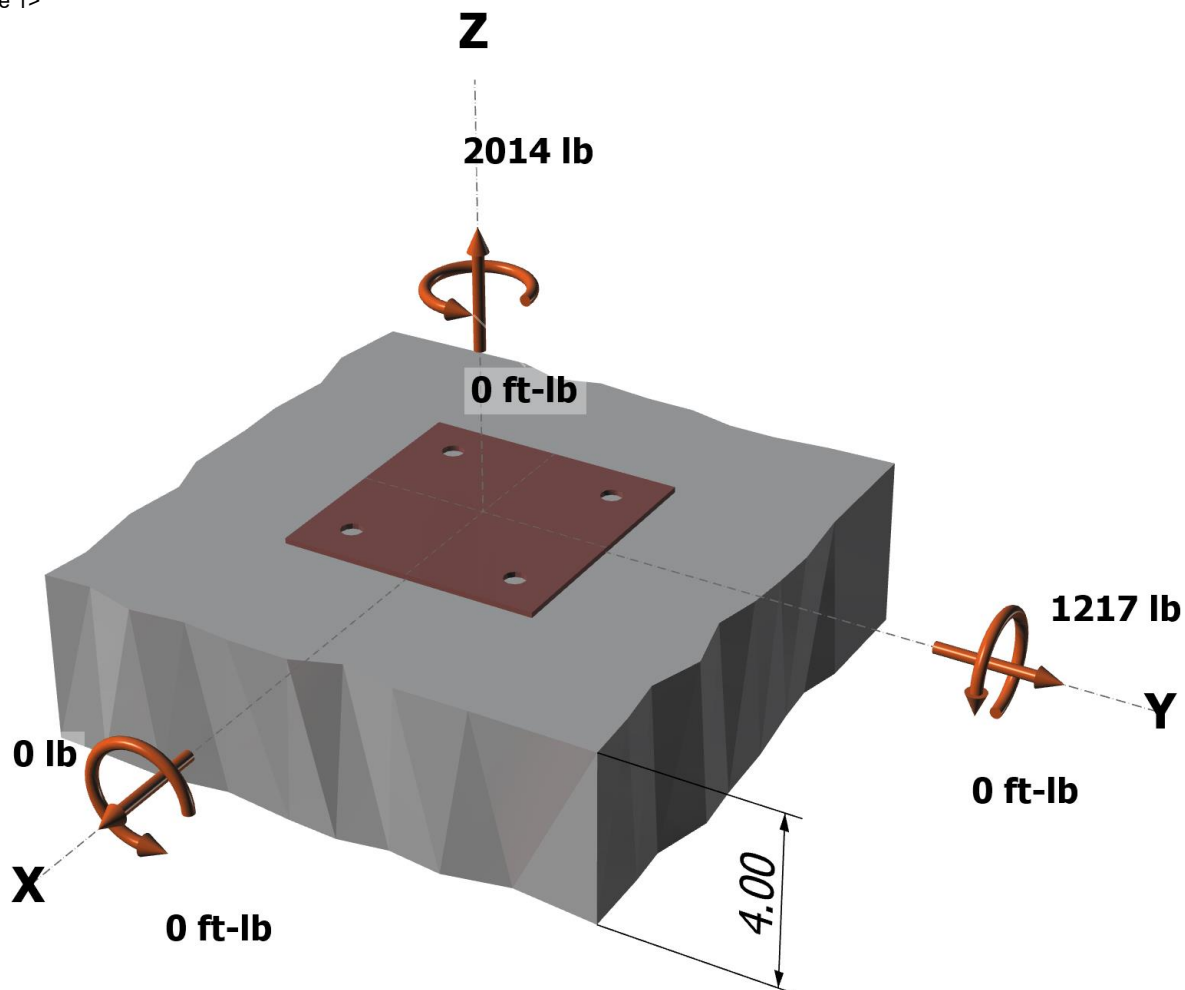
V_{uay} [lb]: 1217

M_{ux} [ft-lb]: 0

M_{uy} [ft-lb]: 0

M_{uz} [ft-lb]: 0

<Figure 1>



Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

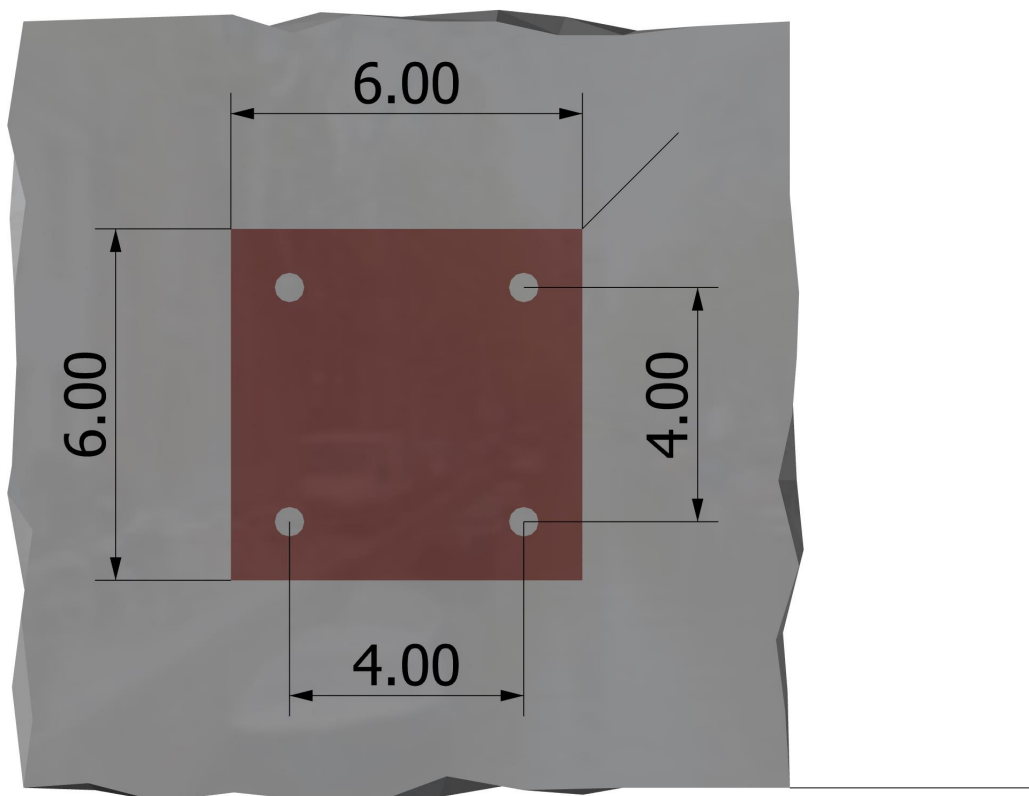
Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com



Anchor Designer™
Software
 Version 2.8.7094.15

Company:	HW Engineering	Date:	11/30/2020
Engineer:	YW	Page:	3/5
Project:	KE USA Hanger Rod Canopy		
Address:	8887 W Flamingo Rd		
Phone:	702-202-0061		
E-mail:	yijie@hwengineeringusa.com		

<Figure 2>



Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com

Company:	HW Engineering	Date:	11/30/2020
Engineer:	YW	Page:	4/5
Project:	KE USA Hanger Rod Canopy		
Address:	8887 W Flamingo Rd		
Phone:	702-202-0061		
E-mail:	yijie@hwengineeringusa.com		

3. Resulting Anchor Forces

Anchor	Tension load, N _{ua} (lb)	Shear load x, V _{uax} (lb)	Shear load y, V _{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2 + (V_{uay})^2}$ (lb)
1	503.5	0.0	304.3	304.3
2	503.5	0.0	304.3	304.3
3	503.5	0.0	304.3	304.3
4	503.5	0.0	304.3	304.3
Sum	2014.0	0.0	1217.0	1217.0

Maximum concrete compression strain (%): 0.00

Maximum concrete compression stress (psi): 0

Resultant tension force (lb): 2014

Resultant compression force (lb): 0

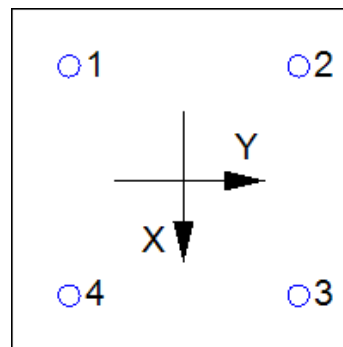
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00

Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00

Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N _{sa} (lb)	φ	φN _{sa} (lb)
12177	0.75	9133

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5} \text{ (Eq. 17.4.2.2a)}$$

k _c	λ _a	f' _c (psi)	h _{ef} (in)	N _b (lb)
27.0	1.00	2500	1.400	2236

$$\phi N_{cbg} = \phi (A_{Nc} / A_{Nco}) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \text{ (Sec. 17.3.1 \& Eq. 17.4.2.1b)}$$

A _{Nc} (in ²)	A _{Nco} (in ²)	c _{a,min} (in)	ψ _{ec,N}	ψ _{ed,N}	ψ _{c,N}	ψ _{cp,N}	N _b (lb)	φ	φN _{cbg} (lb)
67.24	17.64	-	1.000	1.000	1.00	1.000	2236	0.65	5541

8. Steel Strength of Anchor in Shear (Sec. 17.5.1)

V _{sa} (lb)	φ _{grout}	φ	φ _{grout} φ V _{sa} (lb)
3790	1.0	0.65	2464

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.5.3)

$$\phi V_{cp} = \phi k_{cp} N_{cbg} = \phi k_{cp} (A_{Nc} / A_{Nco}) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \text{ (Sec. 17.3.1 \& Eq. 17.5.3.1b)}$$

k _{cp}	A _{Nc} (in ²)	A _{Nco} (in ²)	ψ _{ec,N}	ψ _{ed,N}	ψ _{c,N}	ψ _{cp,N}	N _b (lb)	φ	φV _{cp} (lb)
1.0	67.24	17.64	1.000	1.000	1.000	1.000	2236	0.70	5967

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com



Anchor Designer™
Software
 Version 2.8.7094.15

Company:	HW Engineering	Date:	11/30/2020
Engineer:	YW	Page:	5/5
Project:	KE USA Hanger Rod Canopy		
Address:	8887 W Flamingo Rd		
Phone:	702-202-0061		
E-mail:	yijie@hwengineeringusa.com		

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.6.)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status	
Steel	504	9133	0.06	Pass	
Concrete breakout	2014	5541	0.36	Pass (Governs)	
Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status	
Steel	304	2464	0.12	Pass	
Pryout	1217	5967	0.20	Pass (Governs)	
Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. 17.6..1	0.36	0.00	36.3%	1.0	Pass

3/8"Ø SS Titen HD, hnom:2.5" (64mm) meets the selected design criteria.

12. Warnings

- Minimum spacing and edge distance requirement of 6da per ACI 318 Sections 17.7.1 and 17.7.2 for torqued cast-in-place anchor is waived per designer option.
- Designer must exercise own judgement to determine if this design is suitable.
- Refer to manufacturer's product literature for hole cleaning and installation instructions.

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com



Anchor Designer™
Software
 Version 2.8.7094.15

Company:	HW Engineering	Date:	11/30/2020
Engineer:	YW	Page:	1/5
Project:	KE USA Hanger Rod Canopy		
Address:	8887 W Flamingo Rd		
Phone:	702-202-0061		
E-mail:	yijie@hwengineeringusa.com		

1. Project information

Customer company:
 Customer contact name:
 Customer e-mail:
 Comment:

Project description: Lower attachment to concrete wall design
 Location:
 Fastening description:

2. Input Data & Anchor Parameters

General

Design method: ACI 318-14
 Units: Imperial units

Anchor Information:

Anchor type: Concrete screw
 Material: Stainless Steel
 Diameter (inch): 0.375
 Nominal Embedment depth (inch): 2.500
 Effective Embedment depth, h_{ef} (inch): 1.400
 Code report: IAPMO UES ER-493
 Anchor category: 1
 Anchor ductility: Yes
 h_{min} (inch): 4.00
 c_{ac} (inch): 4.50
 C_{min} (inch): 1.75
 S_{min} (inch): 3.00

Base Material

Concrete: Normal-weight
 Concrete thickness, h (inch): 4.00
 State: Uncracked
 Compressive strength, f'_c (psi): 2500
 $\Psi_{c,v}$: 1.4
 Reinforcement condition: B tension, B shear
 Supplemental reinforcement: No
 Reinforcement provided at corners: No
 Ignore concrete breakout in tension: No
 Ignore concrete breakout in shear: No
 Ignore 6do requirement: Not applicable
 Build-up grout pad: No

Base Plate

Length x Width x Thickness (inch): 6.00 x 6.00 x 0.13

Recommended Anchor

Anchor Name: Titen HD® Stainless Steel - 3/8"Ø SS Titen HD, h_{nom} : 2.5" (64mm)
 Code Report: IAPMO UES ER-493



Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com



Anchor Designer™
Software
Version 2.8.7094.15

Company:	HW Engineering	Date:	11/30/2020
Engineer:	YW	Page:	2/5
Project:	KE USA Hanger Rod Canopy		
Address:	8887 W Flamingo Rd		
Phone:	702-202-0061		
E-mail:	yijie@hwengineeringusa.com		

Load and Geometry

Load factor source: ACI 318 Section 5.3

Load combination: not set

Seismic design: No

Anchors subjected to sustained tension: Not applicable

Apply entire shear load at front row: No

Anchors only resisting wind and/or seismic loads: No

Strength level loads:

N_{ua} [lb]: 1065

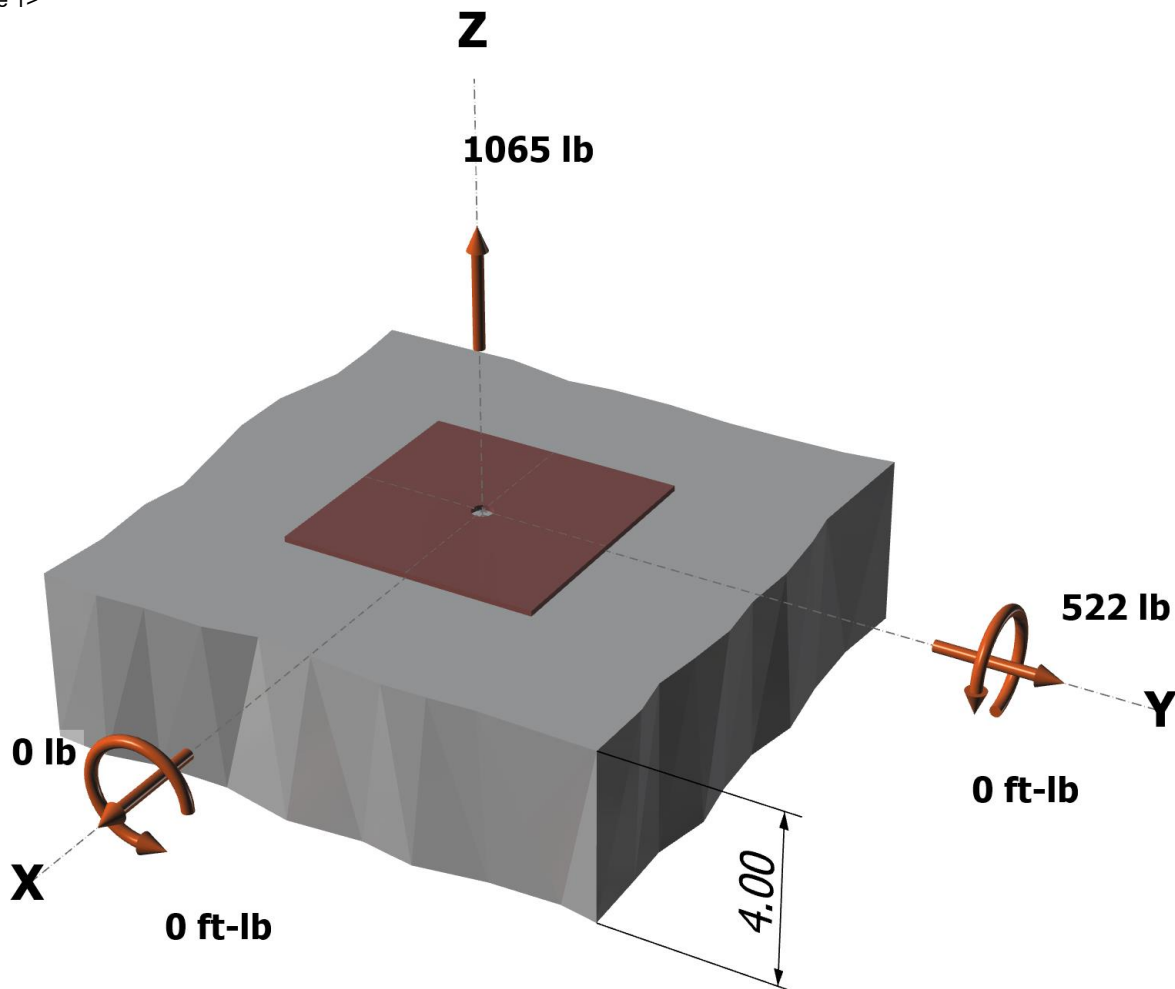
V_{uax} [lb]: 0

V_{uay} [lb]: 522

M_{ux} [ft-lb]: 0

M_{uy} [ft-lb]: 0

<Figure 1>

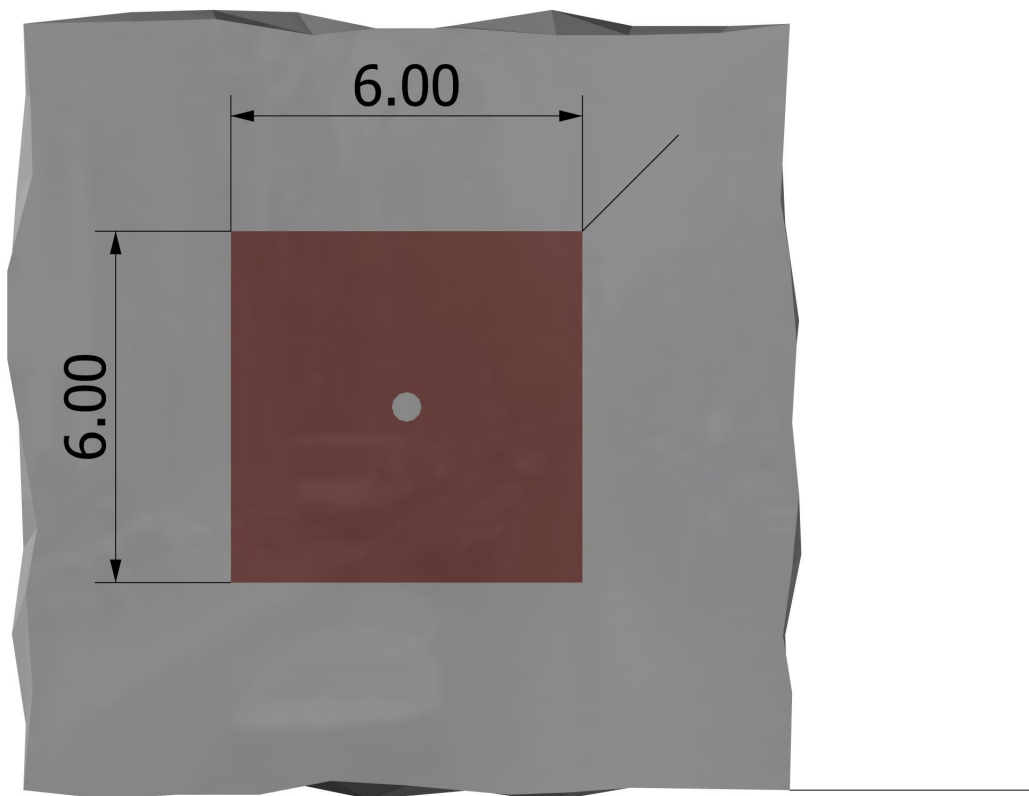


Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com

Company:	HW Engineering	Date:	11/30/2020
Engineer:	YW	Page:	3/5
Project:	KE USA Hanger Rod Canopy		
Address:	8887 W Flamingo Rd		
Phone:	702-202-0061		
E-mail:	yijie@hwengineeringusa.com		

<Figure 2>





Anchor Designer™
Software
Version 2.8.7094.15

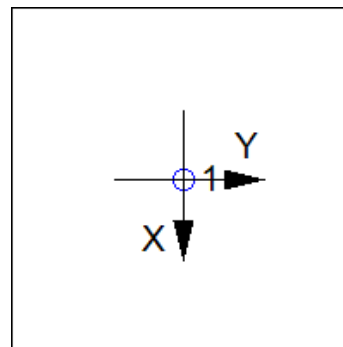
Company:	HW Engineering	Date:	11/30/2020
Engineer:	YW	Page:	4/5
Project:	KE USA Hanger Rod Canopy		
Address:	8887 W Flamingo Rd		
Phone:	702-202-0061		
E-mail:	yijie@hwengineeringusa.com		

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2 + (V_{uay})^2}$ (lb)
1	1065.0	0.0	522.0	522.0
Sum	1065.0	0.0	522.0	522.0

Maximum concrete compression strain (%): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 1065
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
12177	0.75	9133

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5} \text{ (Eq. 17.4.2.2a)}$$

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
27.0	1.00	2500	1.400	2236

$$\phi N_{cb} = \phi (A_{Nc} / A_{Nco}) \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \text{ (Sec. 17.3.1 & Eq. 17.4.2.1a)}$$

A_{Nc} (in ²)	A_{Nco} (in ²)	$c_{a,min}$ (in)	$\psi_{ed,N}$	$\psi_{c,N}$	$\psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
17.64	17.64	-	1.000	1.00	1.000	2236	0.65	1454

8. Steel Strength of Anchor in Shear (Sec. 17.5.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout} \phi V_{sa}$ (lb)
3790	1.0	0.65	2464

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.5.3)

$$\phi V_{cp} = \phi k_{cp} N_{cb} = \phi k_{cp} (A_{Nc} / A_{Nco}) \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \text{ (Sec. 17.3.1 & Eq. 17.5.3.1a)}$$

k_{cp}	A_{Nc} (in ²)	A_{Nco} (in ²)	$\psi_{ed,N}$	$\psi_{c,N}$	$\psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cp} (lb)
1.0	17.64	17.64	1.000	1.000	1.000	2236	0.70	1565

11. Results

Interaction of Tensile and Shear Forces (Sec. R17.6)

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com



Anchor Designer™
Software
 Version 2.8.7094.15

Company:	HW Engineering	Date:	11/30/2020
Engineer:	YW	Page:	5/5
Project:	KE USA Hanger Rod Canopy		
Address:	8887 W Flamingo Rd		
Phone:	702-202-0061		
E-mail:	yijie@hwengineeringusa.com		

Tension	Factored Load, N _{ua} (lb)	Design Strength, ϕN _n (lb)	Ratio	Status	
Steel	1065	9133	0.12	Pass	
Concrete breakout	1065	1454	0.73	Pass (Governs)	
Shear	Factored Load, V _{ua} (lb)	Design Strength, ϕV _n (lb)	Ratio	Status	
Steel	522	2464	0.21	Pass	
Pryout	522	1565	0.33	Pass (Governs)	
Interaction check	(N _{ua} /ϕN _{ua}) ^{5/3}	(V _{ua} /ϕV _{ua}) ^{5/3}	Combined Ratio	Permissible	Status
Sec. R17.6	0.60	0.16	75.6%	1.0	Pass

3/8"Ø SS Titen HD, hnom:2.5" (64mm) meets the selected design criteria.

12. Warnings

- Minimum spacing and edge distance requirement of 6da per ACI 318 Sections 17.7.1 and 17.7.2 for torqued cast-in-place anchor is waived per designer option.
- Designer must exercise own judgement to determine if this design is suitable.
- Refer to manufacturer's product literature for hole cleaning and installation instructions.

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com

Typical Tie Back Attachment			
	Fx	Fy	Fz
Reaction(lbs)	0	1209	730
Wall or Backing	Connection		
Metal	(4) 3/8" Dia A307 Thru Bolt		
Wood	(4) 3/8" Dia x 4" Lag Screws		
Masonry	(4) 1/2" Dia x 3-1/2" Nominal Embed. SS SIMPSON TITEN HD		
Concrete	(4) 3/8" Dia x 2-1/2" Nomina Embed. SS SIMPSON TITEN HD		
Typical Lower Attachment			
	Fx	Fy	Fz
Reaction(lbs)	59	604	308
Wall or Backing	Connection		
Metal	(1) 3/8" Dia A307 Thru Bolt at 24"O.C.		
Wood	(1) 3/8" Dia x 4" Lag Screws at 24" O.C.		
Masonry	(2) 1/2" Dia x 3-1/2" Nominal Embed. SS SIMPSON TITEN HD at 24" O.C.		
Concrete	(1) 3/8" Dia x 2-1/2" Nomina Embed. SS SIMPSON TITEN HD at 24" O.C.		

Reaction Direction

