

Zeyn B. Uzman, PE, SE, PEng

305 Charleston Greene

Malvern, PA 19355

(217) 652-6737

JOB TITLE Julie Kubiak Pergola

JOB NO. MO0018Z

SHEET NO. _____

CALCULATED BY _____

DATE _____

CHECKED BY _____

DATE _____

CS2018 Ver 2018.11.30

www.struware.com

RELEASE FOR CONSTRUCTION

AS NOTED FOR PLAN REVIEW
DEVELOPMENT SERVICES

LEE'S SUMMIT, MISSOURI

03/25/2024

STRUCTURAL CALCULATIONS

FOR

Julie Kubiak Pergola

Lee's Summitt, Missouri



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MOTOR SPECIFICATION	A400
REVISIONS	A500
NOTES	

FRAME: BRONZE
LOUVERS: BRONZE
SYSTEM: 8" BEAMS & 5.5" GUTTERS
ELEVATION: ELEVATED DECK

DURING SUCH PERIODS OF TIME AS ARE DESIGNATED BY THE U.S. WEATHER BUREAU AS A HIGH WIND OR SNOW ADVISORY FOR THE AREA, THIS SYSTEM MUST BE LOCKED IN THE OPEN POSITION WITH THE LOUVER BLADES VERTICAL. THE STRUCTURE SHALL ALSO NOT BE WALKED UPON AND IS NOT DESIGNED FOR HUMAN ACTIVITY OR STORAGE.

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION

DATE
10/16/23

DRAWN BY
I&S

SCALE

SHEET NO.

A 100

PRESENTED BY
KC OUTDOOR STRUCTURE

PROJECT
JULIE KUBIAK

ADDRESS
1605 NE BALL DR LEE'S
SUMMIT, MO 64086

CONTRACT NO.
2109083

STRUXURE™

STRUXURE INC.
154 ETHAN ALLEN DRIVE
DAHLONEGA, GA 30533



03/25/2024

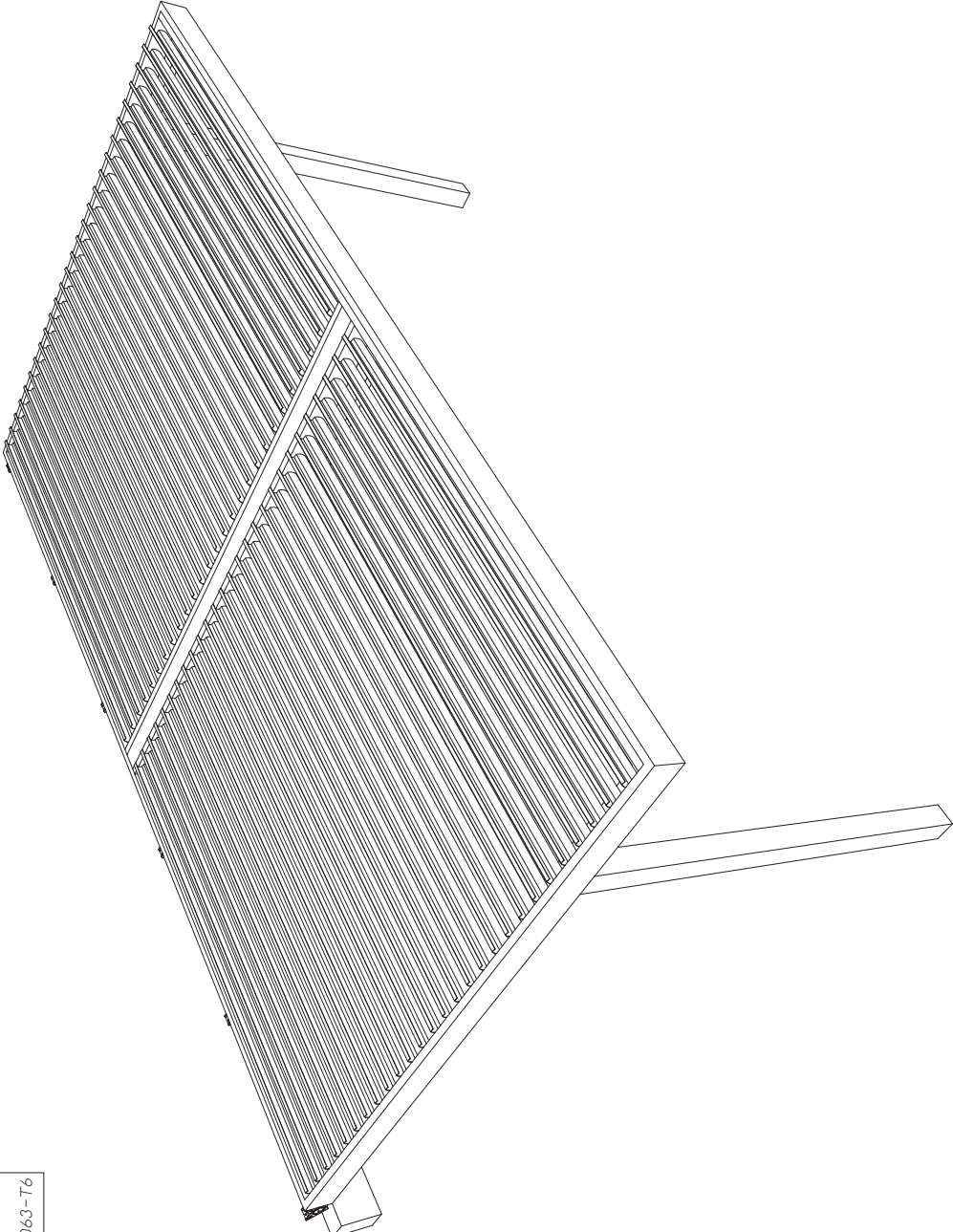
STRUCTURE
154 E. MAIN ST. N.W.
DAKOTA, GA. 30133
(800) 390-5158

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION	DATE	DRAWN BY	SCALE	SHEET NO.
PERSPECTIVE VIEW	10/16/23	I&S	N.T.S.	

A 101

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6

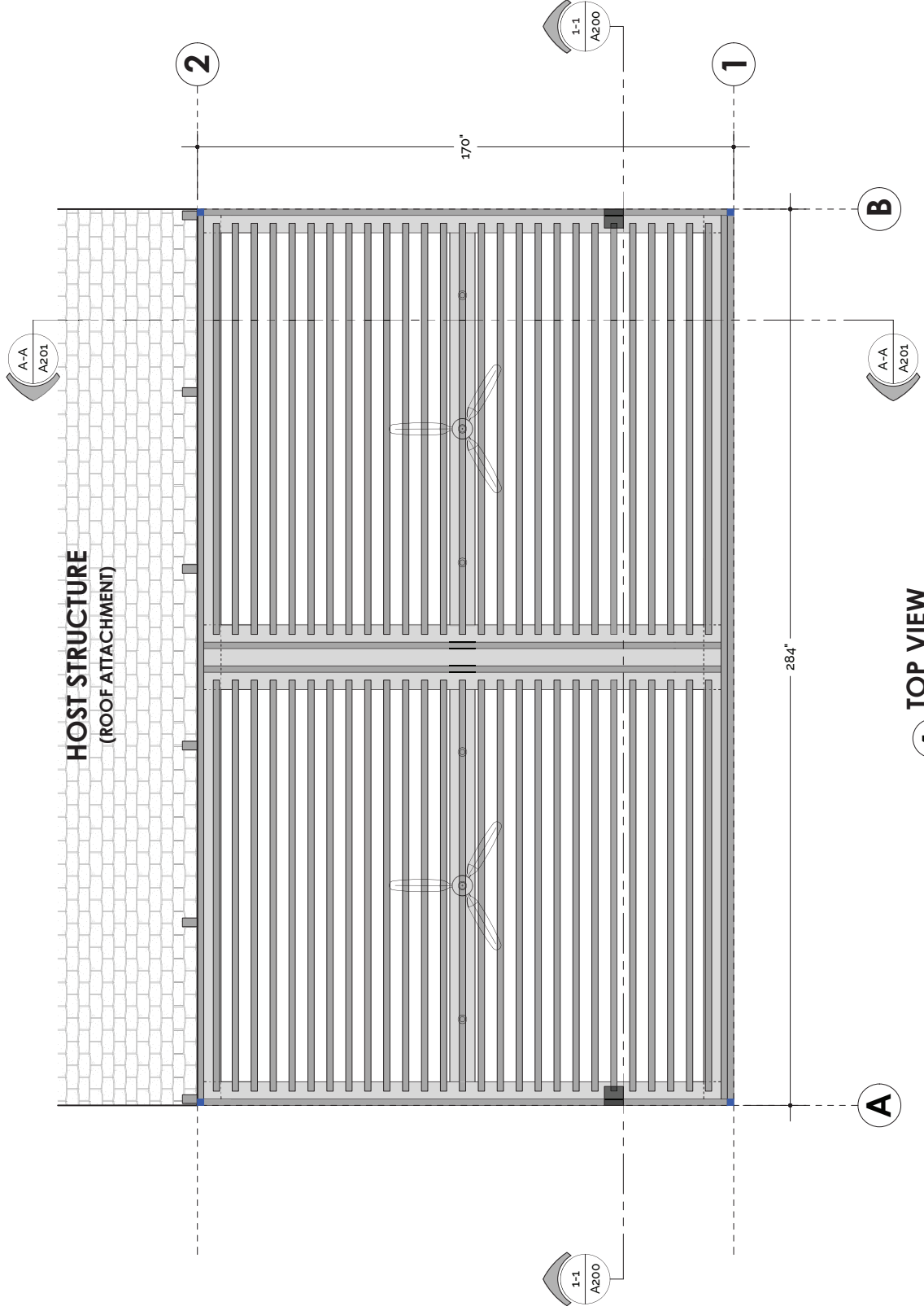


LEGEND

STUB KUBIAK
14 E. MAIN ST.
DAHLGREN, MO 64086
(800) 310-5558

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION	TOP VIEW
DATE	10/16/23
DRAWN BY	I&S
SCALE	3/8" = 1'-0"
SHEET NO.	A 102



1 TOP VIEW
SCALE: 3/8" = 1'-0"

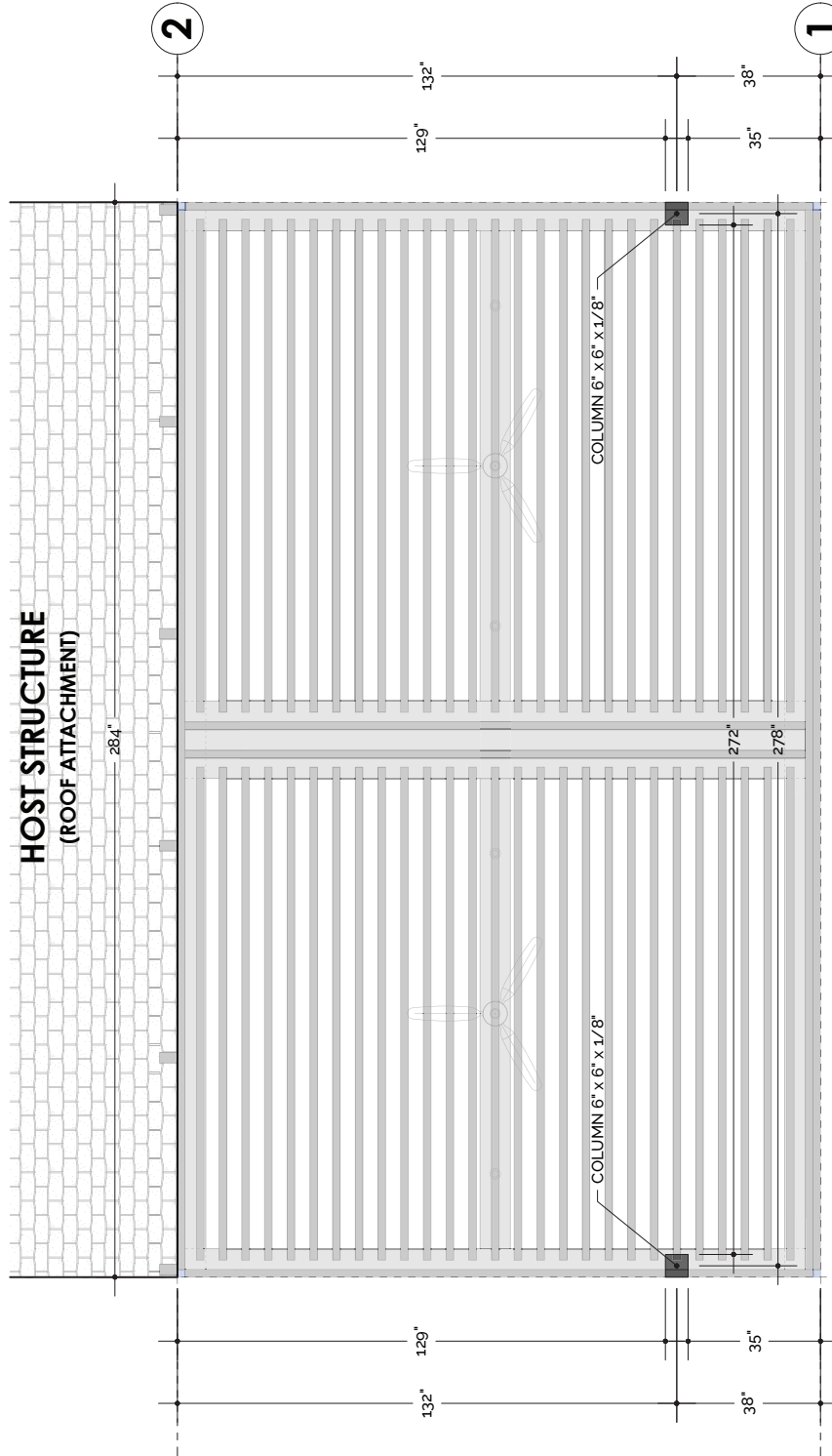
ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6

03/20/2024

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6

STUB KUBIAK
14 E. MAIN ST.
DAHLGREN, MO 64083
(800) 310-5558

HOST STRUCTURE
(ROOF ATTACHMENT)



JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION
POST LAYOUT
VIEW

DATE
10/16/23

DRAWN BY
I&S

SCALE
3/8" = 1'-0"

SHEET NO.

A 103



1 POST LAYOUT VIEW

SCALE: 3/8" = 1'-0"

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6

STUB KUBIAK
14 E. MAIN ST., SUITE 100
DAHLGREN, MO 64083
(800) 310-5598

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION
BEAM LAYOUT
VIEW

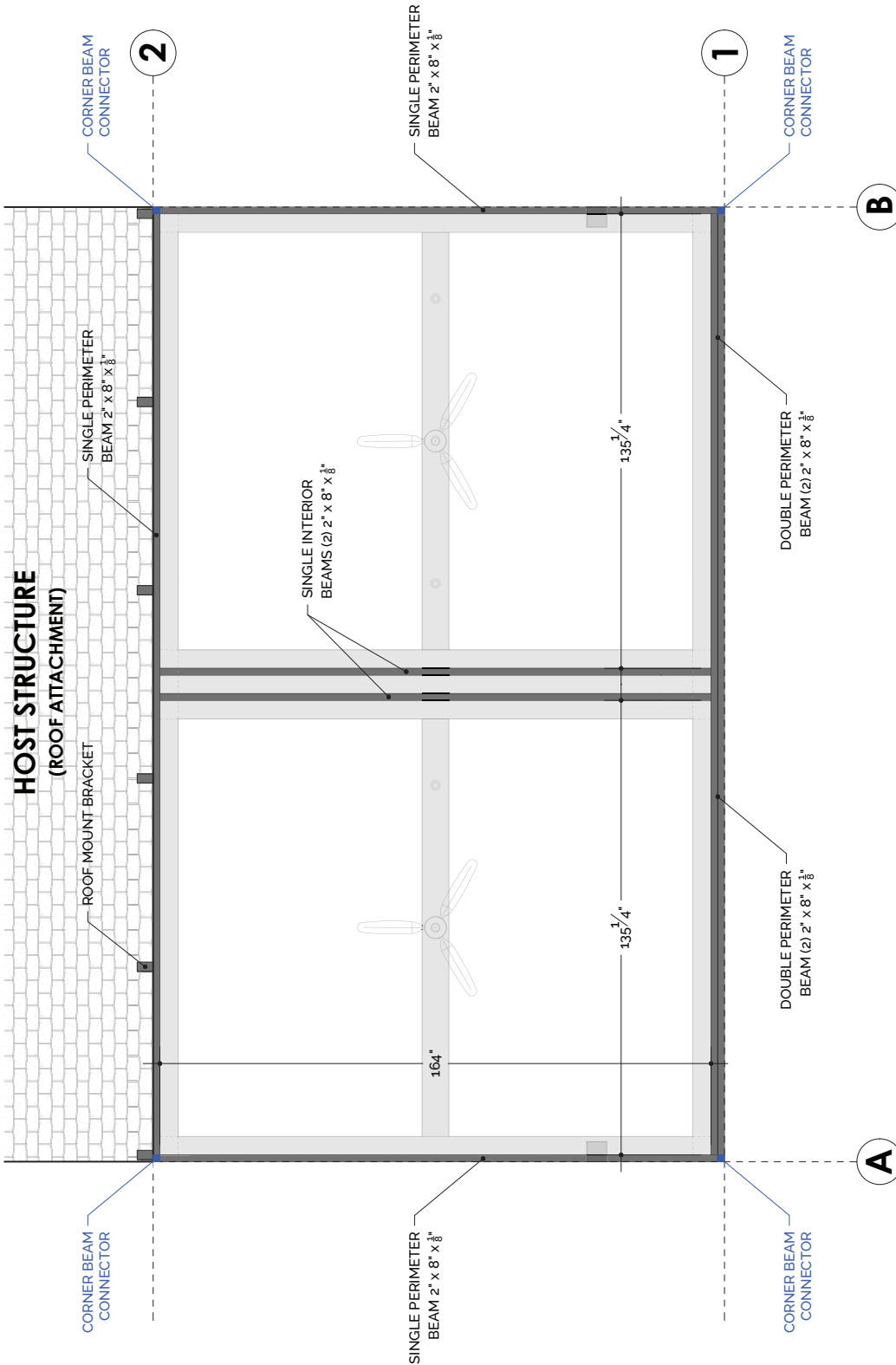
DATE
10/16/23

DRAWN BY
J&S

SCALE
3/8" = 1'-0"

SHEET NO.

A 104



1 BEAM LAYOUT VIEW

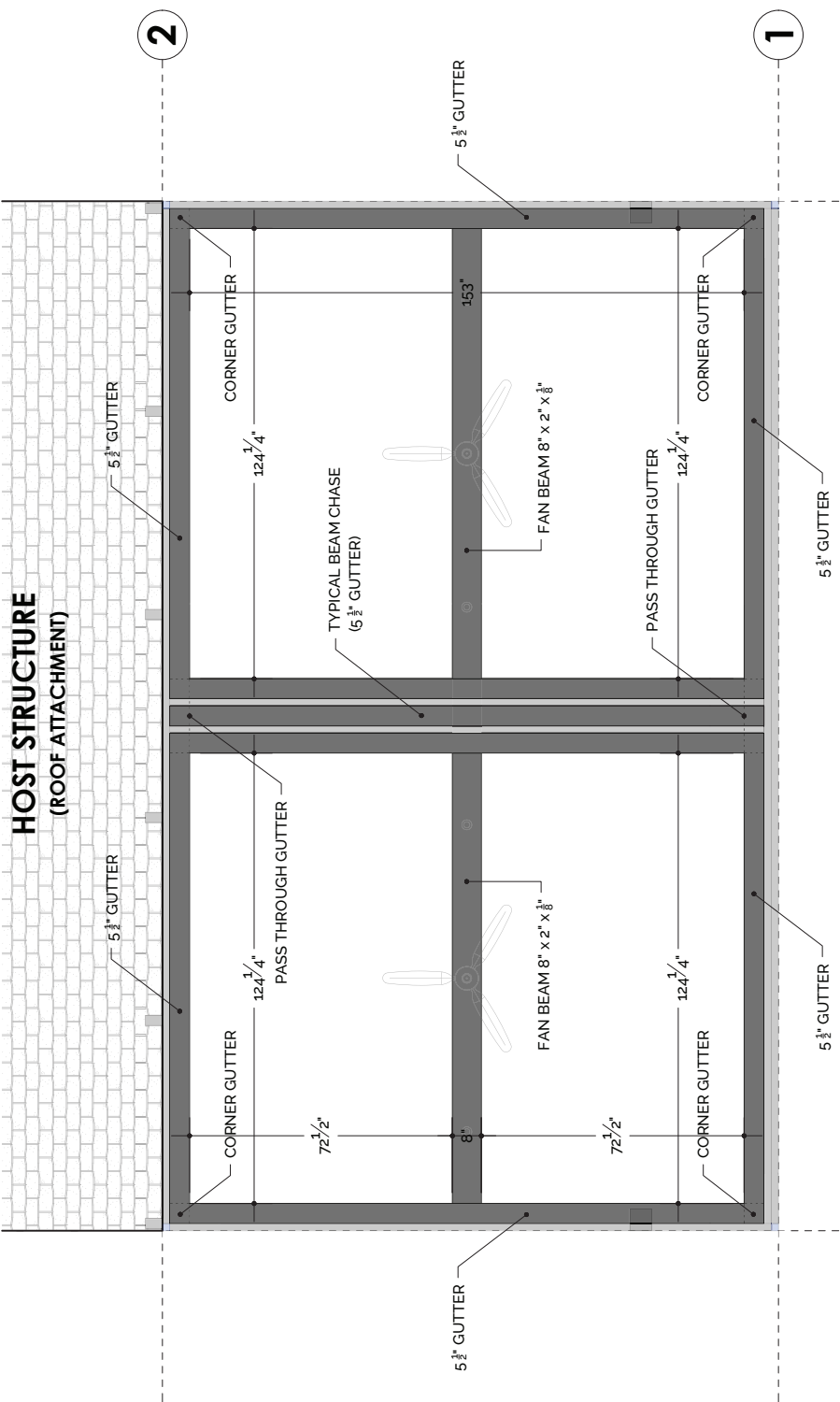
SCALE: 3/8" = 1'-0"

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6

STUB JULIE
14 E. MAIN ST. SUITE 100
DAVENPORT, MO 64003
(800) 310-5558

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION	GUTTER LAYOUT VIEW
DATE	10/16/23
DRAWN BY	I&S
SCALE	3/8" = 1'-0"
SHEET NO.	A 105



1 GUTTER LAYOUT VIEW
SCALE: 3/8" = 1'-0"

STUB KUBIAK
14 E. MAIN ST.
DAVENPORT, IA 52002
(319) 390-5558

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION
FAN & LIGHTS
LAYOUT VIEW

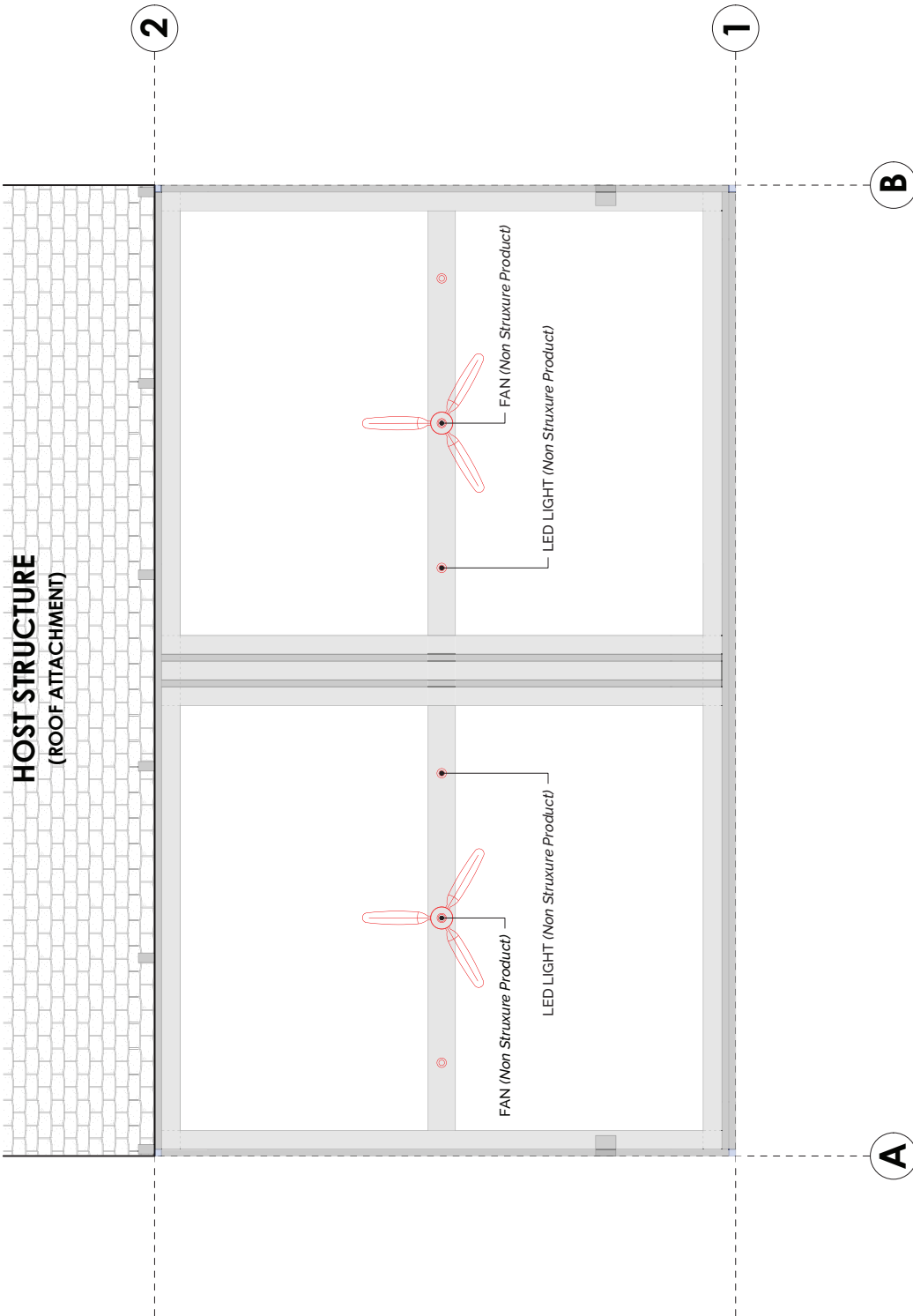
DATE
10/16/23

DRAWN BY
I&S

SCALE
3/8" = 1'-0"

SHEET NO.

A 106



1 FAN & LIGHTS LAYOUT VIEW

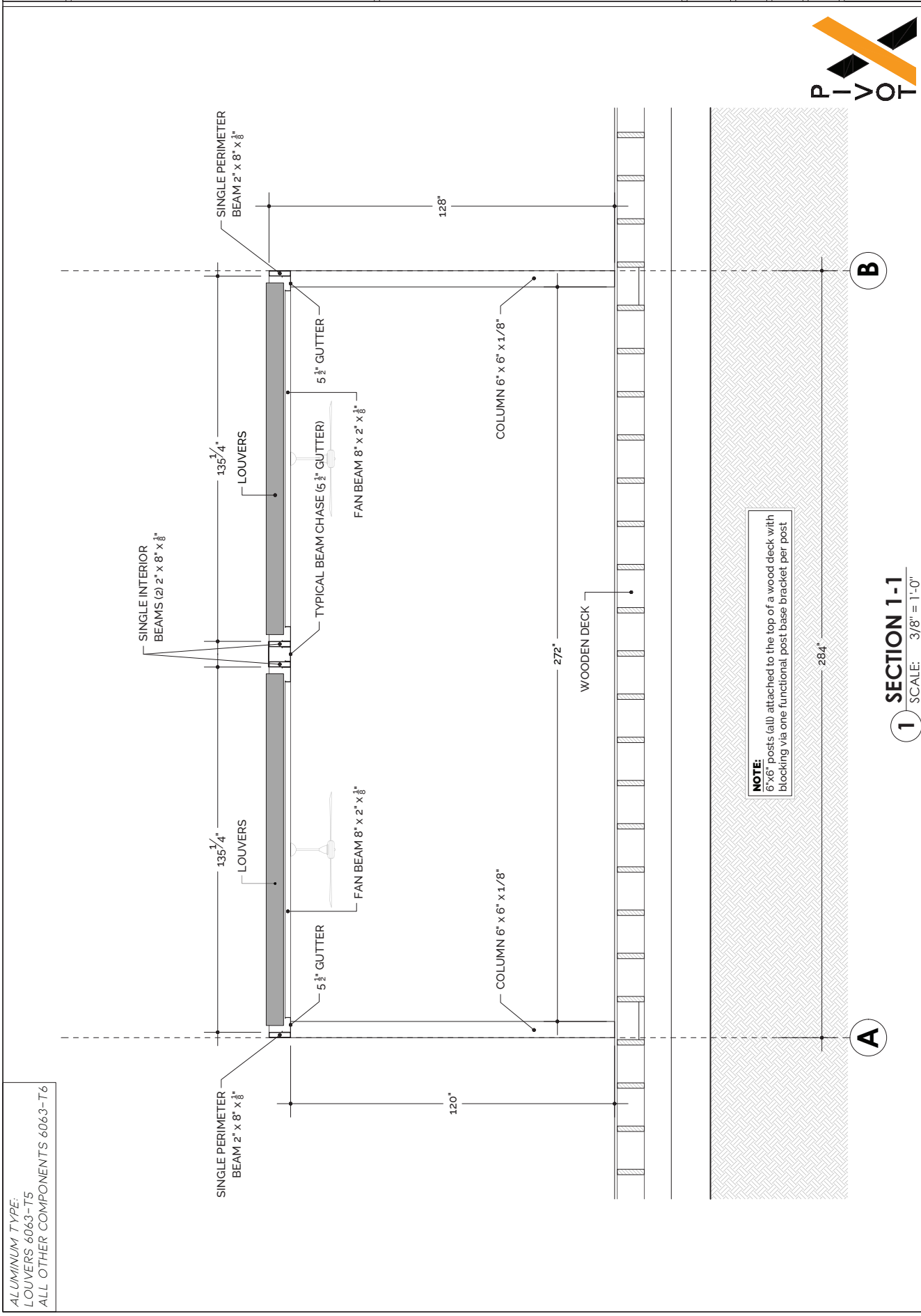
SCALE: 3/8" = 1'-0"

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6

14 E. MAIN ST.
DAHLGREN, MO 64033
(800) 310-5558

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION	SECTION 1-1
DATE	10/16/23
DRAWN BY	I&S
SCALE	3/8" = 1'-0"
SHEET NO.	A 200



B

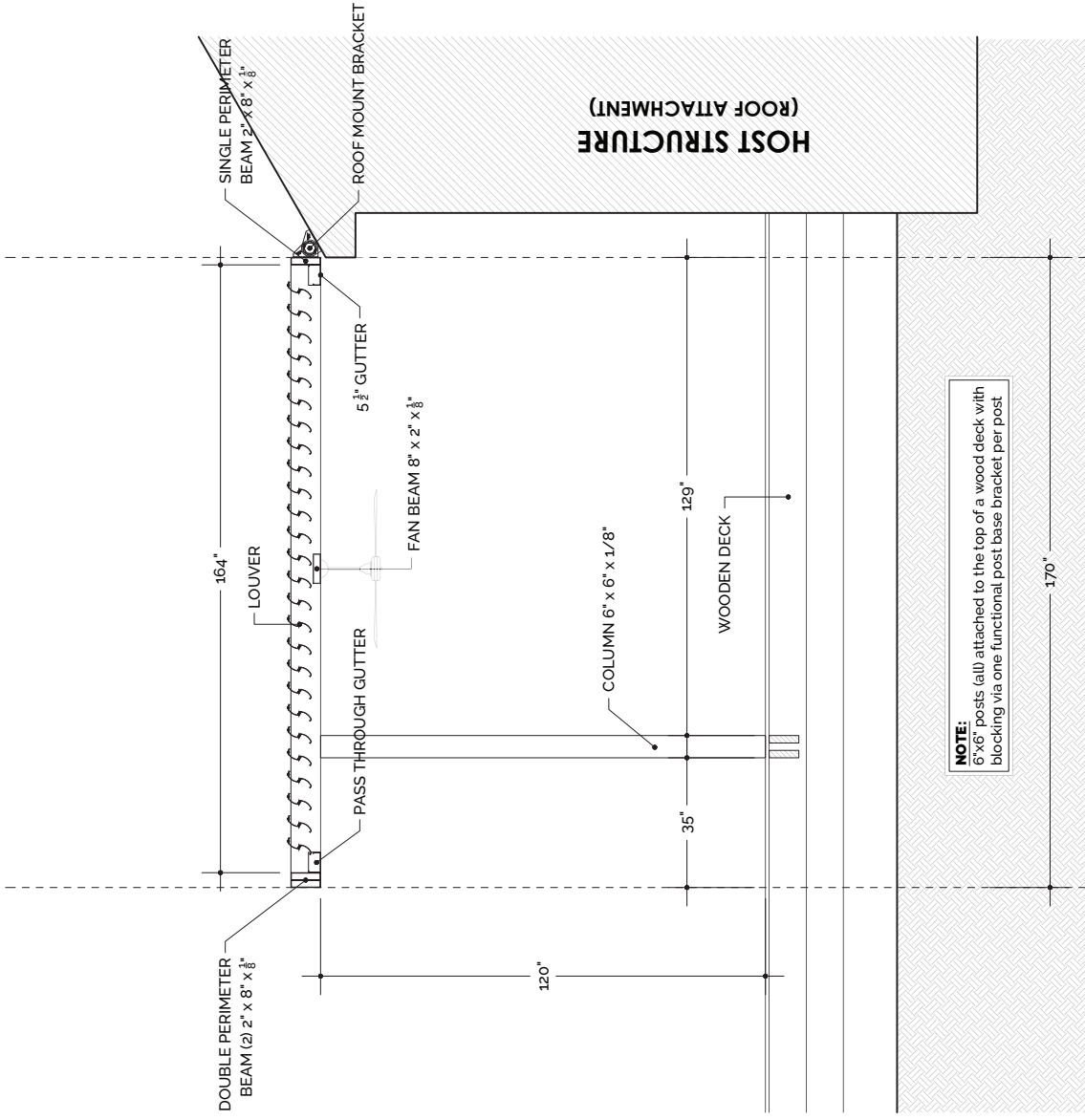
A

1 SECTION 1-1
SCALE: 3/8" = 1'-0"

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6

STUB JULIE
14 E. MAIN ST.
DAHLGREN, MO 64083
PH: 660.310.5158
F: 660.310.5159



1 SECTION A-A
SCALE: 3/8" = 1'-0"

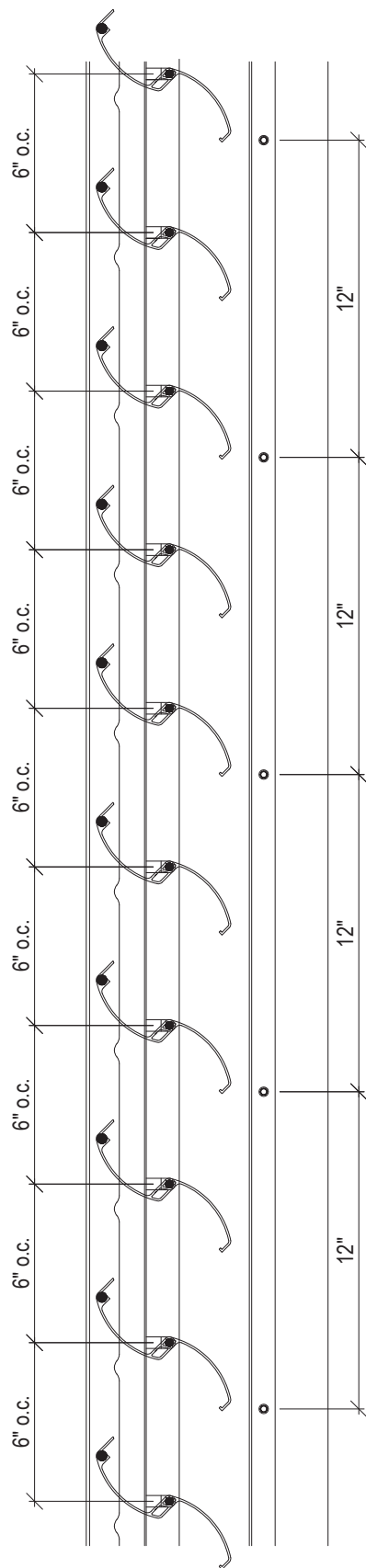
2

1

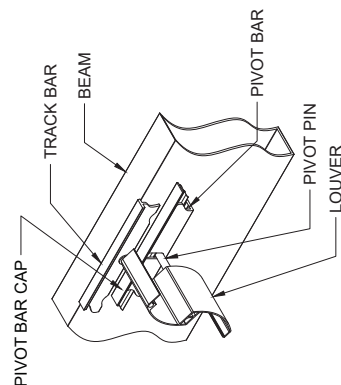
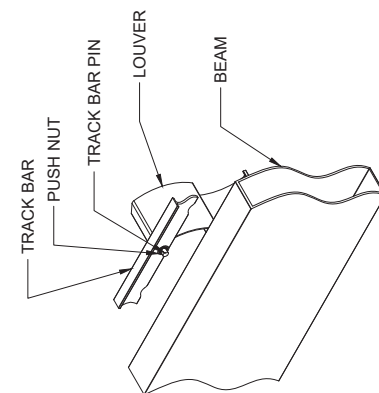
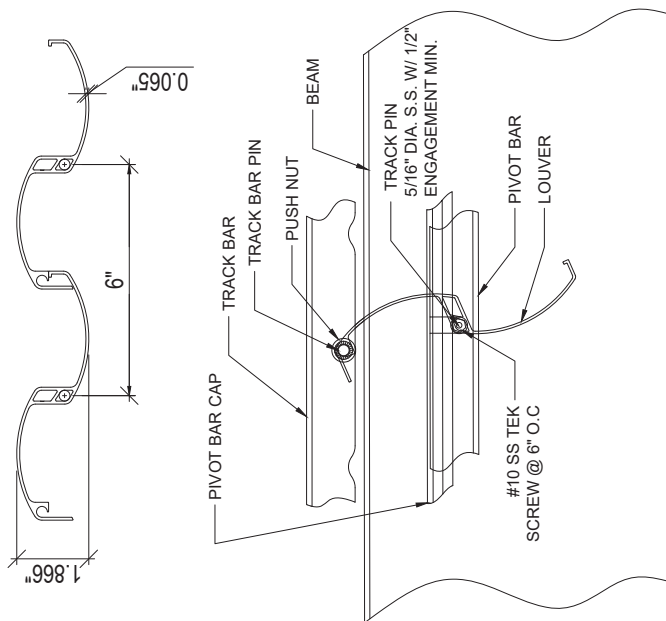
JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION	SECTION A-A
DATE	10/16/23
DRAWN BY	I&S
SCALE	3/8" = 1'-0"
SHEET NO.	A 201

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6



LOUVERS DETAIL



SIDE VIEW

ISOMETRIC OUT-SIDE VIEW

ISOMETRIC IN-SIDE VIEW

DESCRIPTION DETAILS
DATE 10/16/23
DRAWN BY I&S
SCALE N.T.S.
SHEET NO.

A300

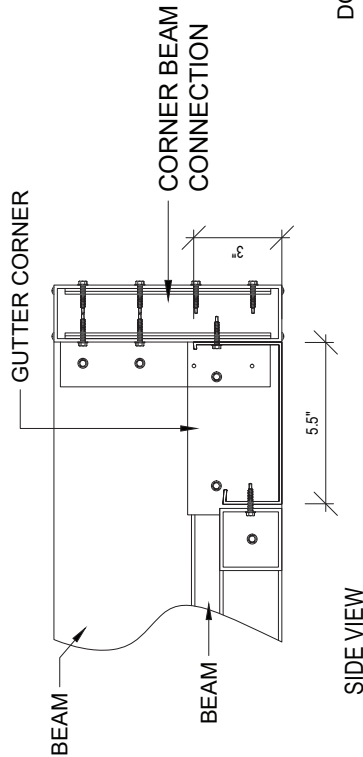
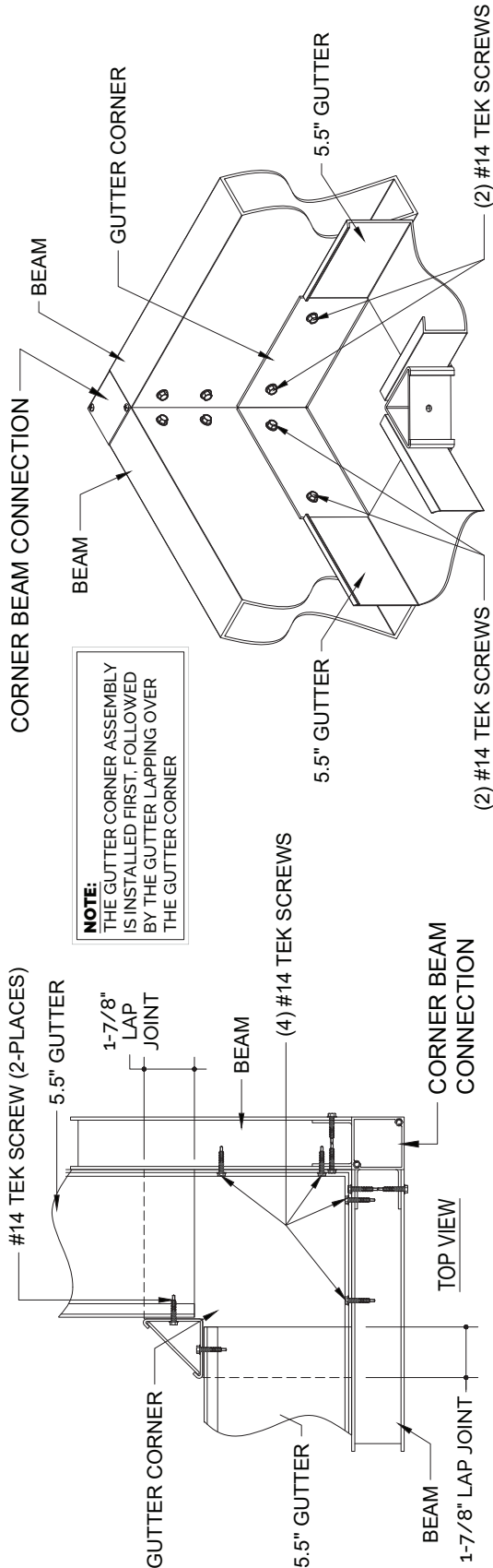
JULIE KUBIAK
1605 NE BALL DR LEE'S
SUMMIT, MO 64086

05 NE BALL DR LEE
SUMMIT, MO 64086

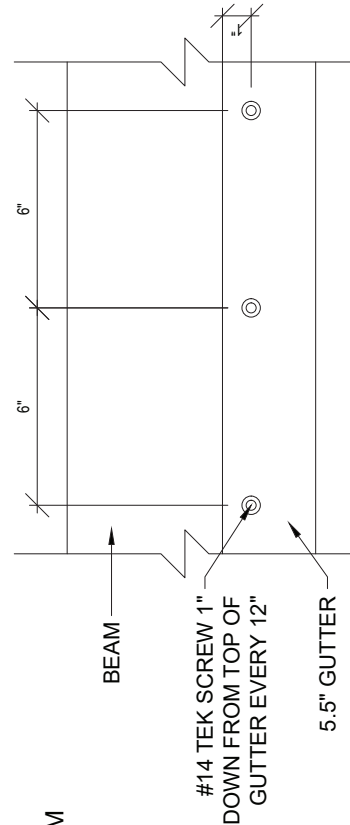
03/25/2024

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6

STRUCTURE
154 E. MAIN ST.
DAVENPORT, MO 64003
(800) 300-5588



ISOMETRIC VIEW



SIDE VIEW

GUTTER CORNER ASSEMBLY

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION
DETAILS

DATE
10/16/23

DRAWN BY
I&S

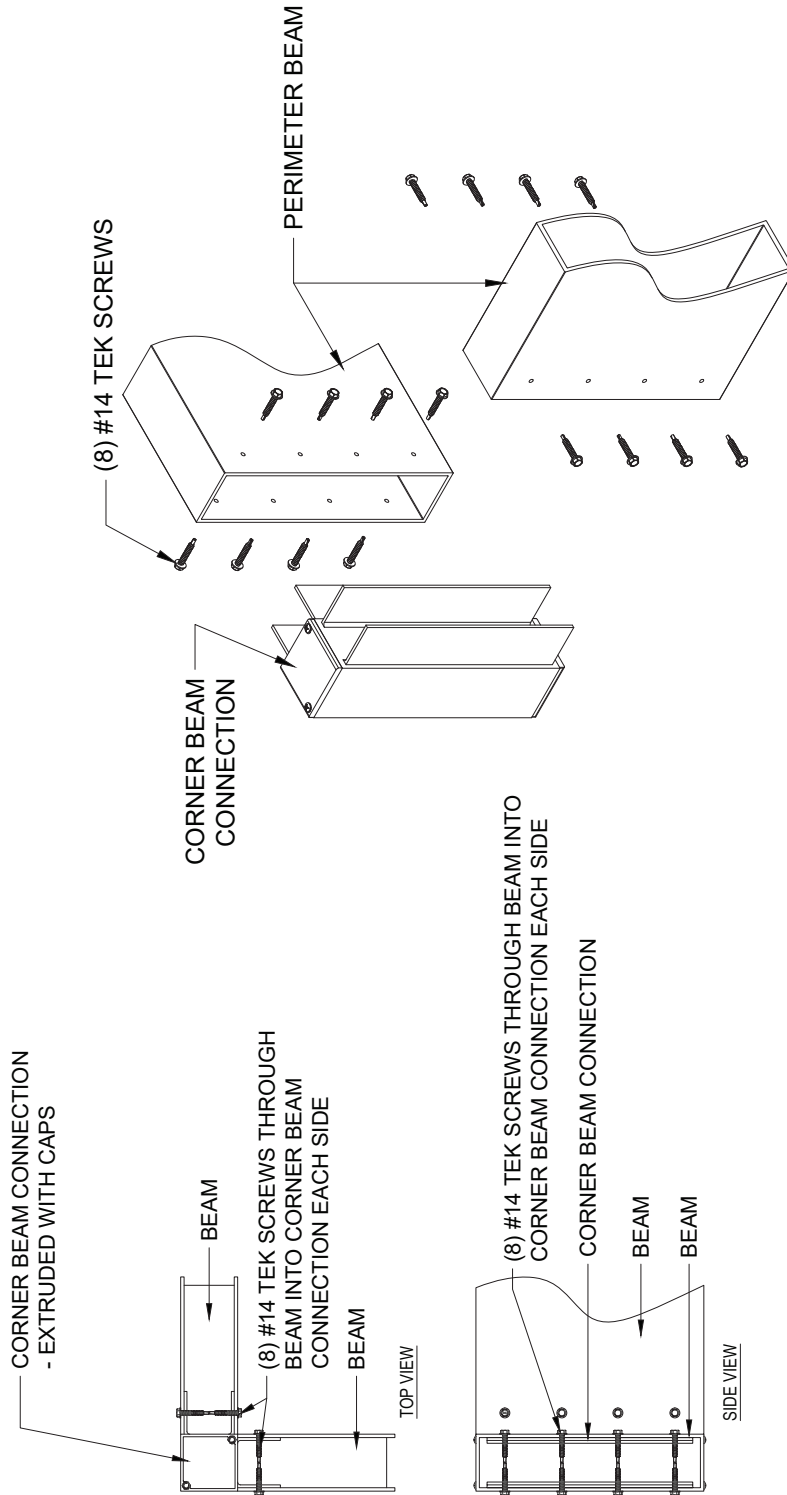
SCALE
N.T.S.

SHEET NO.

A 301

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6

STRUCTURE
154 E. MAIN ST.
DAVENPORT, MO 64086
(800) 305-5181



JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

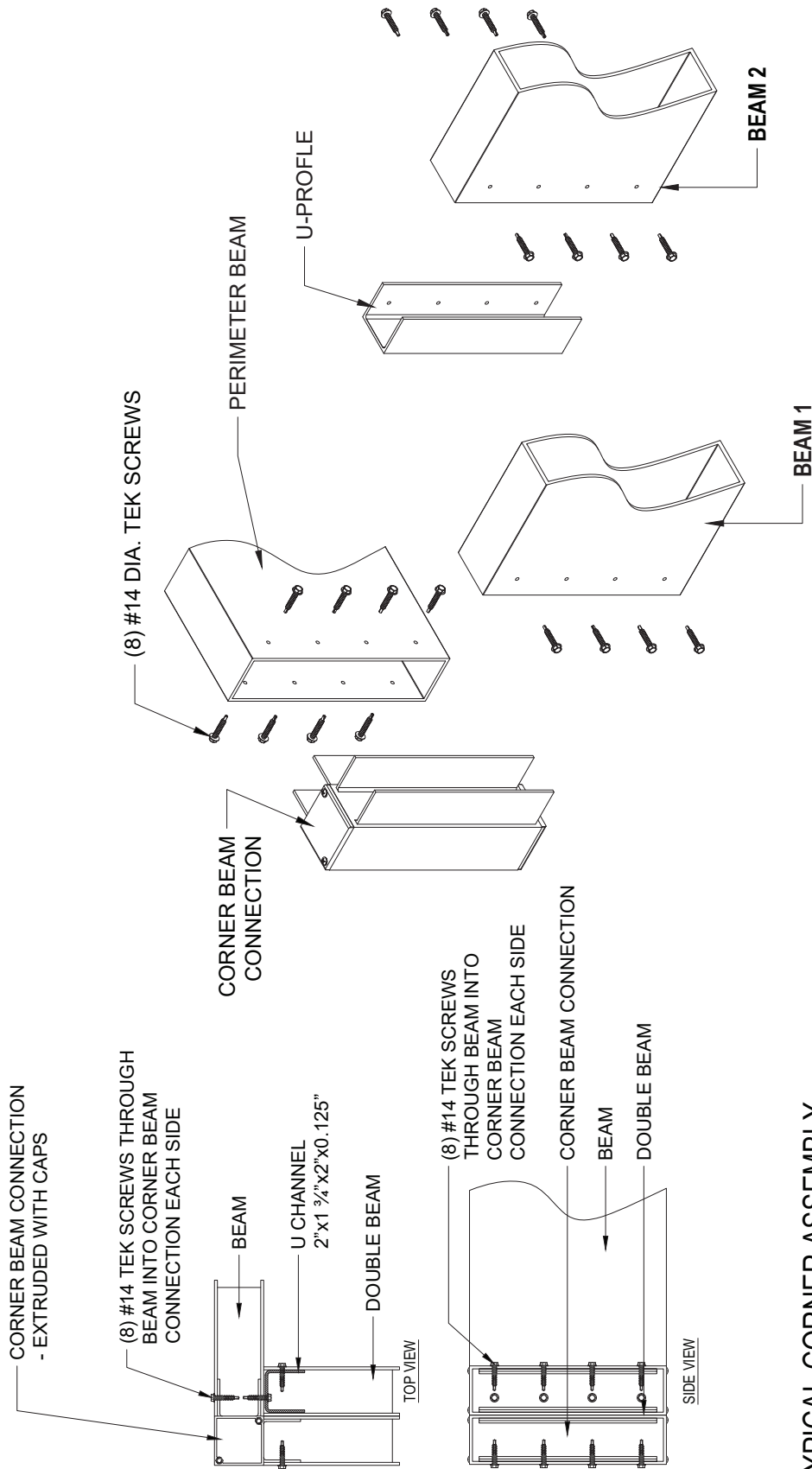
DESCRIPTION
DETAILS
DATE 10/16/23
DRAWN BY I&S
SCALE N.T.S.
SHEET NO.

A 302

TYPICAL CORNER ASSEMBLY

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6

STRUCTURE
154 E. MAIN ST.
DAVENPORT, MO 64003
(800) 302-5588



TYPICAL CORNER ASSEMBLY
DOUBLE PERIMETER BEAM TO BEAM

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION	DETAILS
DATE	10/16/23
DRAWN BY	I&S
SCALE	N.T.S.
SHEET NO.	

A 303

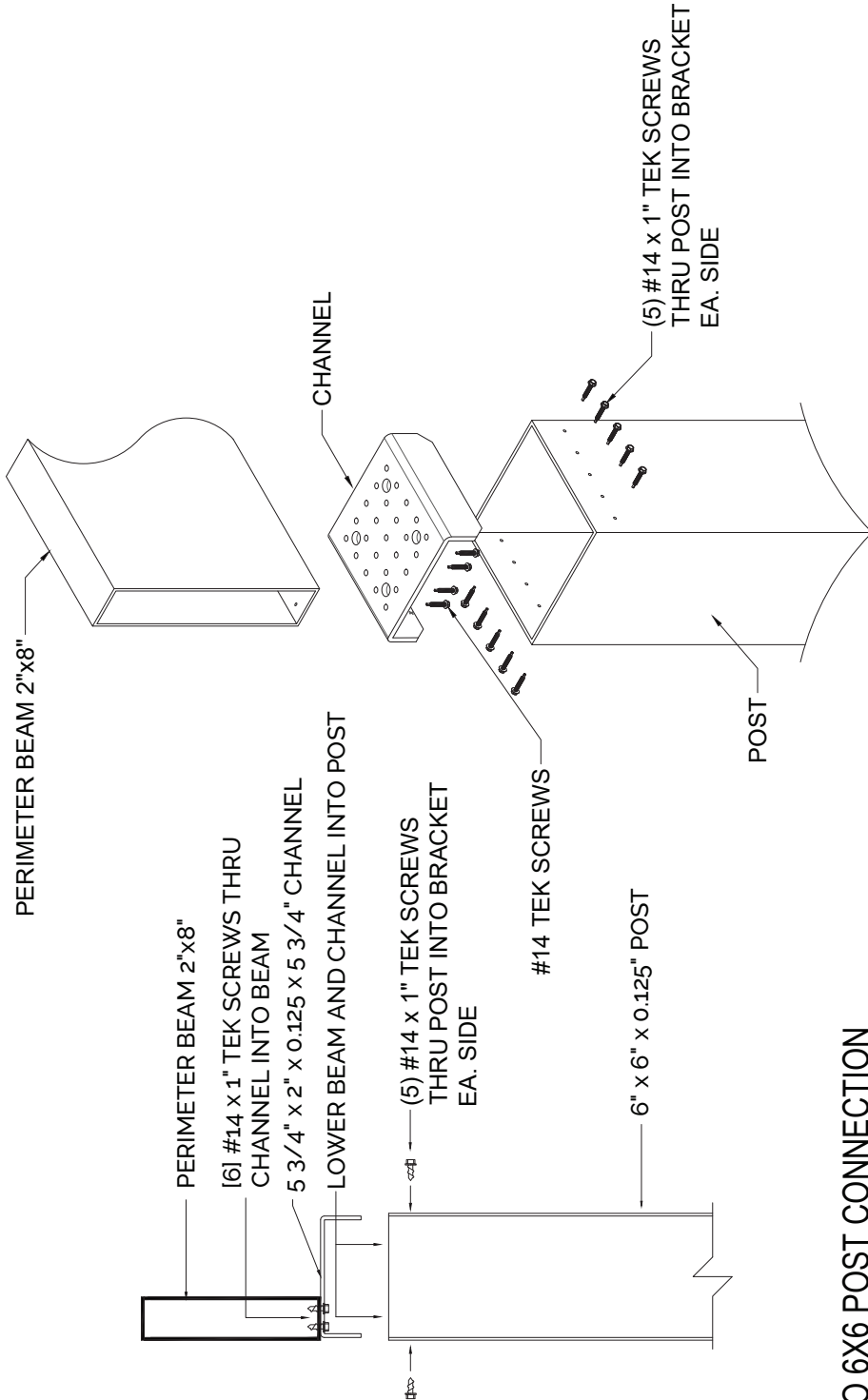
ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6

STRUCTURE
154 E. MAIN ST.
DAVENPORT, MO 64003
(800) 300-5588

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION
DETAILS
DATE 10/16/23
DRAWN BY I&S
SCALE N.T.S.
SHEET NO.

A 304



SINGLE BEAM TO 6X6 POST CONNECTION

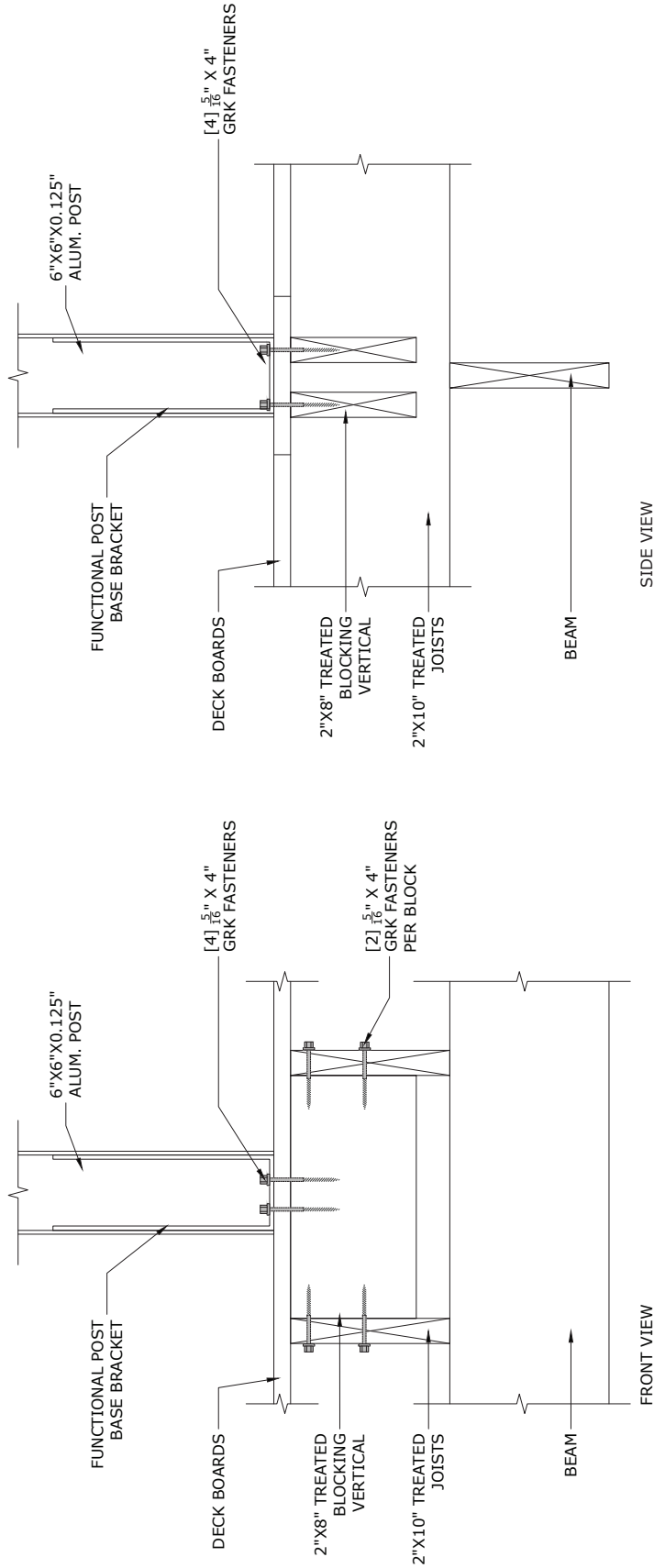
STUBS
154 E. MAIN ST.
DAVENPORT, IA 52001
(319) 302-5588

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION	DETAILS
DATE	10/16/23
DRAWN BY	I&S
SCALE	N.T.S.
SHEET NO.	

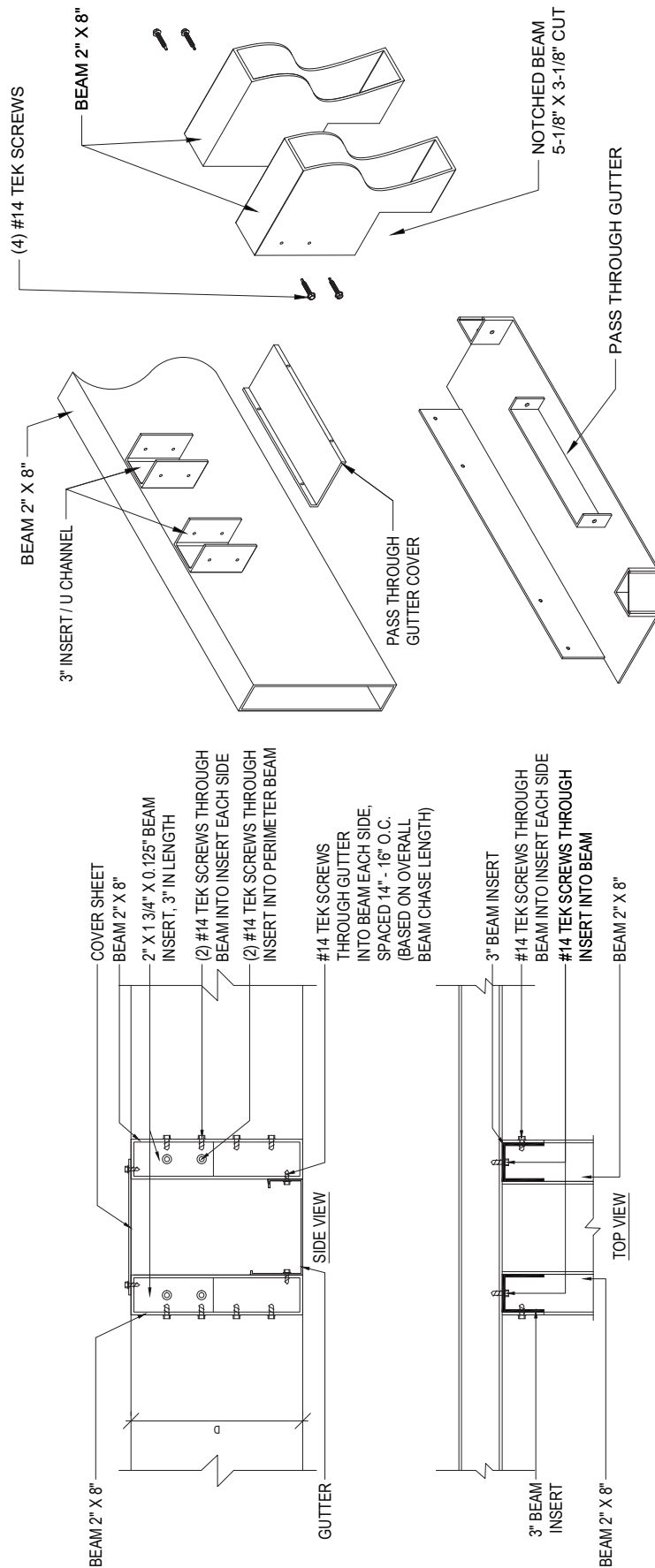
A 305

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6



6X6 POST MOUNTING TO DECK BOARDS

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6



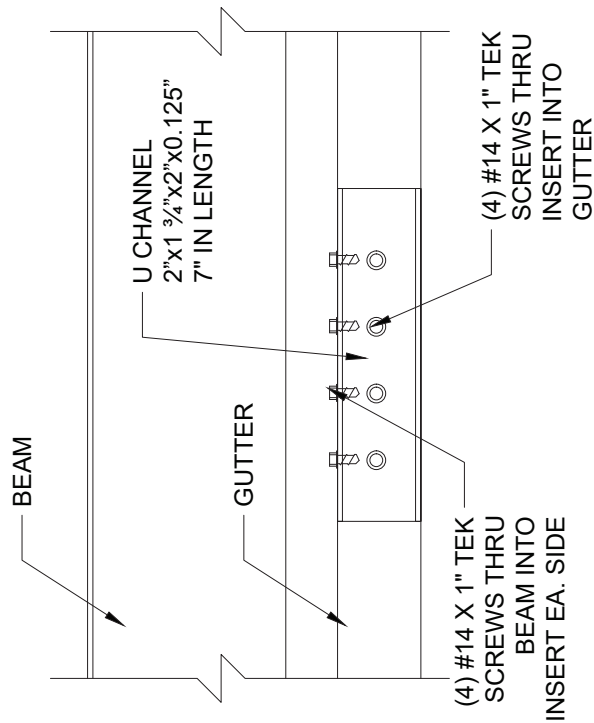
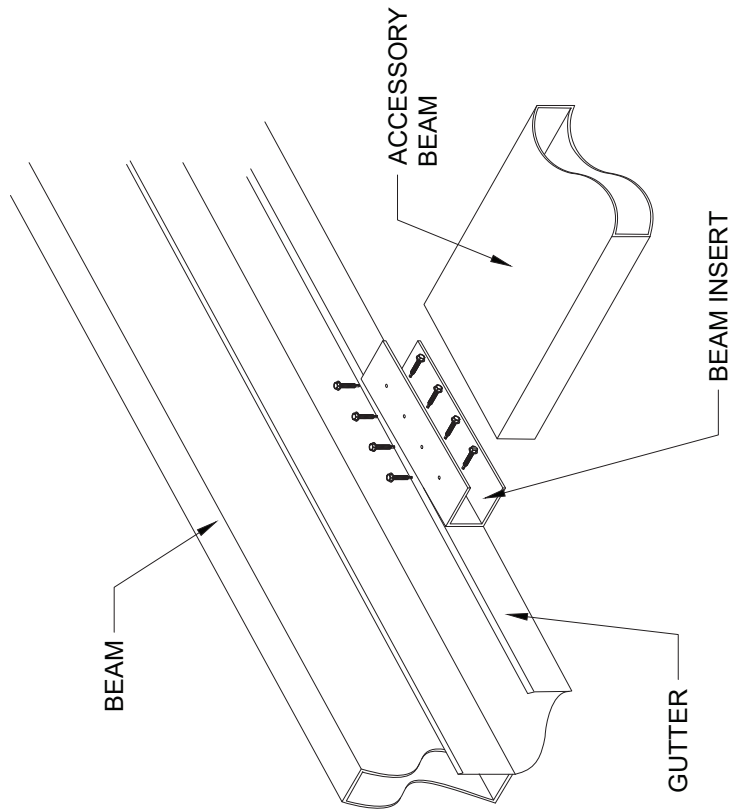
TYPICAL BEAM CHASE TO BEAM CONNECTION
PASS THROUGH GUTTER

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION
DETAILS
DATE 10/16/23
DRAWN BY I&S
SCALE N.T.S.
SHEET NO.

A 306

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6



FAN BEAM CONNECTION

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION

DETAILS

DATE

10/16/23

DRAWN BY

I&S

SCALE

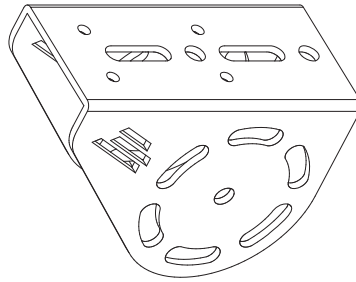
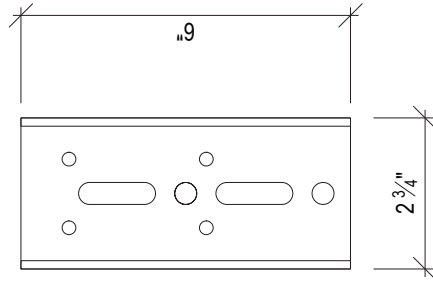
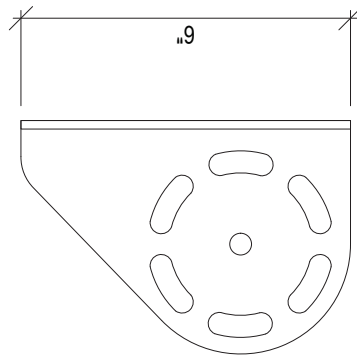
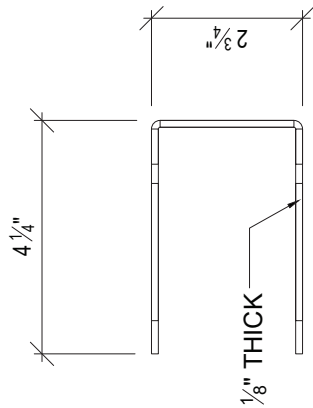
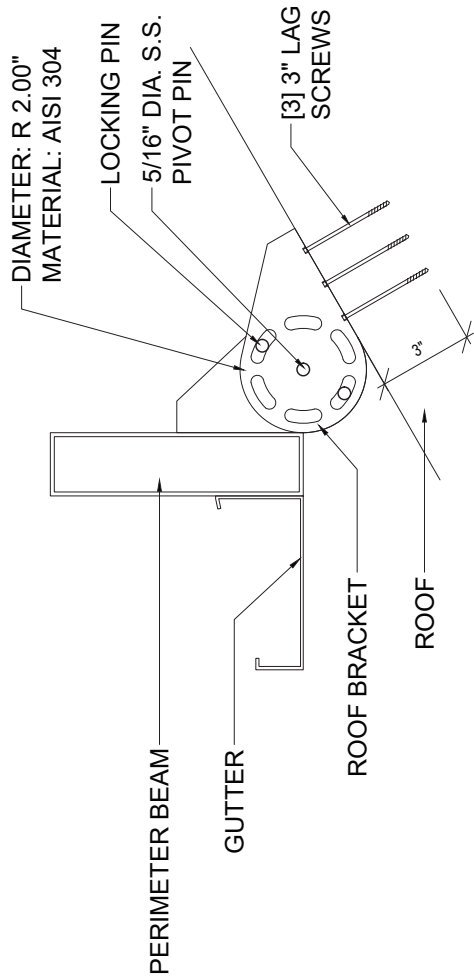
N.T.S.

SHEET NO.

A 307

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6

STRUCTURE
154 E. N. MILLER
DAVENPORT, MO 64003
(800) 305-5188



ROOF MOUNT PIVOT BRACKET

NOTE: PERIMETER BEAM ATTACHED TO PIVOT MOUNT BY [4] #14 X 1" SS TEK SCREWS. PIVOT MOUNT ATTACHED TO ROOF RAFTERS BY [3] 1/4" DIAMETER STAINLESS STEEL LAG SCREWS WITH MINIMUM 1-1/2" THREAD PENETRATION, 0.75" EDGE DISTANCE, 1" APART MIN., INTO SOUTHERN YELLOW PINE #2 WOOD (G=0.55) OR BETTER.

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

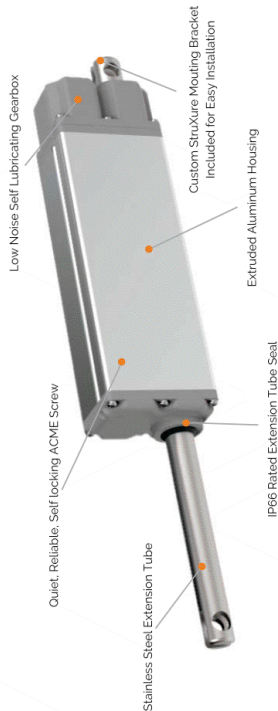
DESCRIPTION
DETAILS
DATE 10/16/23
DRAWN BY I&S
SCALE N.T.S.
SHEET NO.

A 308

STURXURE
154 E. MAIN ST.
DAHON, MO 64086
(800) 300-5588

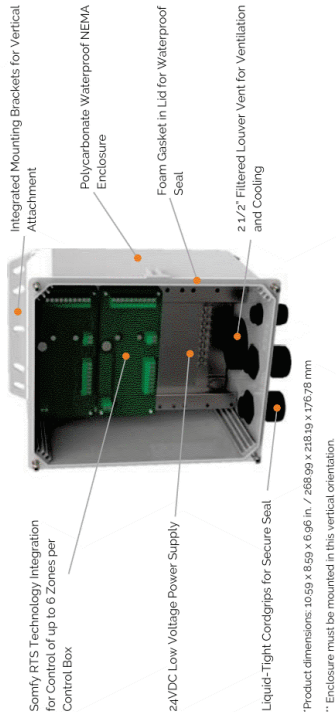
STURXURE
OUTDOOR

LOUVERED ROOF MOTOR



SOMFY TECHNICAL SPECIFICATIONS			
VOLTAGE			
Input Voltage	IVDCI	24	
LOAD			
Static Load (F _x), max.	IN/lbsI	2500 / 562	
Dynamic Load (F _x), max.	IN/lbsI	2500 / 562	
STROKE			
Stroke length, standard	ImmI	135	
CURRENT			
Current consumption, rated load	IAI	1.875	
GENERAL DATA			
Speed, no load	Imm/sl	3.4	
Speed, rated load	Imm/sl	2.8	
Operating temperature limits	°CI	-10°/60	
Service life	ICyclesI	± 10,000	
Sound level	IdBAI	± 70	
Lead screw type		ACME	
Protection Class		IP66	
Certificates		CE (EN60601-1)	
Insulation		CLASS III	

LOUVERED PERGOLA CONTROL



*Product dimensions: 10.59" x 8.59" x 6.06" in. / 268.99 x 218.19 x 175.78 mm
-- Enclosure must be mounted in this vertical orientation.

COMPONENT RATINGS AND CERTIFICATIONS			
POWER SUPPLY			
Input Voltage	IVACI	115/230	
Input Voltage Frequency Range	IHzI	47 - 63	
Output Voltage	IVDCI	24	
Voltage Adjustable Range	IVDCI	21.6 - 28.8V	
Current Range	IAI	0 - 14.6	
Rated Power	IWI	350.4	
Safety Standard	IUL CertificationI	UL 60950-1	
POWER SUPPLY CABLE (NOT SHOWN)			
Safety Standard	IETL CertificationI	#370291	
Voltage Rating	IVI	300	
Temperature Rating	I°FI	-40 to 158	
ENCLOSURE			
Safety Standard	IUL CertificationI	UL 508A	
	IFile NumberI	E32937	
Temperature Range	I°FI	-40 to 257	
Impact Resistance	in/lbI	500	
Dielectric Strength	Ivolts/milI	380	
UV Rating	IUL CertificationI	UL 746C	
Flammability Rating	IUL CertificationI	UL 94	

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION	MOTOR
SPECIFICATION	
DATE	10/16/23
DRAWN BY	I&S
SCALE	N.T.S.
SHEET NO.	

A 400

ALUMINUM TYPE:
LOUVERS 6063-T5
ALL OTHER COMPONENTS 6063-T6

	DATE:	REVISION:
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

NOTES:

JULIE KUBIAK
1605 NE BALL DR. LEE'S
SUMMIT, MO 64086

DESCRIPTION
REVISIONS

DATE
10/16/23

DRAWN BY
I&S

SCALE
N.T.S.

SHEET NO.

A 500

Zeyn B. Uzman, PE, SE, PEEng

305 Charleston Greene

Malvern, PA 19355

(217) 652-6737

03/25/2024

JOB TITLE Julie Kubiak Pergola

JOB NO. MO0018Z

SHEET NO.

CALCULATED BY

DATE

CHECKED BY

DATE

www.struware.com

Code Search

Code: International Building Code 2018**Occupancy:**

Occupancy Group = R Residential

Risk Category & Importance Factors:

Risk Category = II

Wind factor = 1.00

Snow factor = 1.00

Seismic factor = 1.00

Type of Construction:

Fire Rating:

Roof = 0.0 hr

Floor = 0.0 hr

Building Geometry:Roof angle (θ) 0.00 / 12 0.0 deg

Building length (L) 23.7 ft

Least width (B) 14.2 ft

Mean Roof Ht (h) 10.0 ft

Parapet ht above grd 0.0 ft

Minimum parapet ht 0.0 ft

Live Loads:**Roof** 0 to 200 sf: 20 psf

200 to 600 sf: 24 - 0.02Area, but not less than 12 psf

over 600 sf: 12 psf

Floor:

Typical Floor N/A

Partitions N/A

Zeyn B. Uzman, PE, SE, PEng

305 Charleston Greene

Malvern, PA 19355

(215) 652-6737

03/25/2024

JOB TITLE Julie Kubiak Pergola

JOB NO. MO0018Z

SHEET NO.

CALCULATED BY

DATE

CHECKED BY

DATE

Wind Loads :

ASCE 7- 16

Ultimate Wind Speed	109 mph
Nominal Wind Speed	84.4 mph
Risk Category	II
Exposure Category	C
Enclosure Classif.	Open Building
Internal pressure	+/-0.00
Directionality (Kd)	0.85
Kh case 1	0.849
Kh case 2	0.849
Type of roof	Monoslope

Topographic Factor (Kzt)

Topography	Flat
Hill Height (H)	80.0 ft
Half Hill Length (Lh)	100.0 ft
Actual H/Lh	= 0.80
Use H/Lh	= 0.50
Modified Lh	= 160.0 ft
From top of crest: x =	50.0 ft
Bldg up/down wind?	downwind

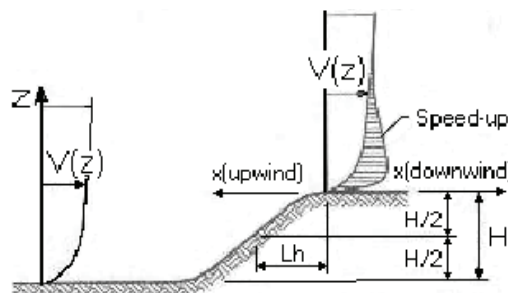
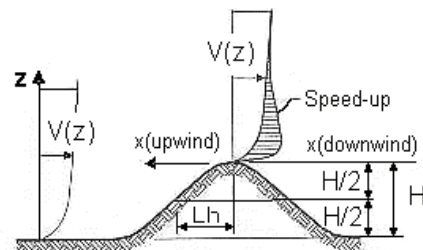
$$H/Lh = 0.50 \quad K_1 = 0.000$$

$$x/Lh = 0.31 \quad K_2 = 0.792$$

$$z/Lh = 0.09 \quad K_3 = 1.000$$

At Mean Roof Ht:

$$K_{zt} = (1 + K_1 K_2 K_3)^2 = 1.00$$

**ESCARPMENT****2D RIDGE or 3D AXISYMMETRICAL HILL****Gust Effect Factor**

h =	10.0 ft
B =	14.2 ft
/z (0.6h) =	15.0 ft

Flexible structure if natural frequency < 1 Hz (T > 1 second).

If building h/B > 4 then may be flexible and should be investigated.

$$h/B = 0.71$$

Rigid structure (low rise bldg)

G = 0.85 Using rigid structure default**Rigid Structure**

$\bar{e}$ =	0.20
ℓ =	500 ft
z_{min} =	15 ft
c =	0.20
g_Q, g_v =	3.4
L_z =	427.1 ft
Q =	0.95
I_z =	0.23
G =	0.90 use G = 0.85

Flexible or Dynamically Sensitive Structure

34 rcy (η_1) =	0.0 Hz
Damping ratio (β) =	0
f_b =	0.65
f_a =	0.15
V_z =	92.0
N_1 =	0.00
R_n =	0.000
R_h =	28.282
R_B =	28.282
R_L =	28.282
g_R =	0.000
R =	0.000
Gf =	0.000
η =	0.000
η =	0.000
η =	0.000
h =	10.0 ft

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Enclosure Classification**Test for Enclosed Building:** $A_o < 0.01A_g$ or 4 sf, whichever is smaller**Test for Open Building:**

All walls are at least 80% open.

 $A_o \geq 0.8A_g$ **Test for Partially Enclosed Building:**

Predominately open on one side only

Input		Test	
Ao	500.0 sf	$A_o \geq 1.1A_{oi}$	NO
Ag	600.0 sf	$A_o > 4'$ or $0.01A_g$	YES
Aoi	1000.0 sf	$A_{oi} / A_{gi} \leq 0.20$	YES
Agi	10000.0 sf		

Building is NOT
Partially Enclosed

Conditions to qualify as Partially Enclosed Building. Must satisfy all of the following:

 $A_o \geq 1.1A_{oi}$ $A_o >$ smaller of 4' or 0.01 Ag $A_{oi} / A_{gi} \leq 0.20$

Where:

Ao = the total area of openings in a wall that receives positive external pressure.

Ag = the gross area of that wall in which Ao is identified.

Aoi = the sum of the areas of openings in the building envelope (walls and roof) not including Ao.

Agi = the sum of the gross surface areas of the building envelope (walls and roof) not including Ag.

Test for Partially Open Building:

A building that does not qualify as open, enclosed or partially enclosed.

(This type building will have same wind pressures as an enclosed building.)

Reduction Factor for large volume partially enclosed buildings (Ri) :

If the partially enclosed building contains a single room that is unpartitioned , the internal pressure coefficient may be multiplied by the reduction factor Ri.

Total area of all wall & roof openings (Aog):

0 sf

Unpartitioned internal volume (Vi) :

0 cf

Ri = 1.00

Ground Elevation Factor (Ke)

Grd level above sea level = 0.0 ft

Constant = 0.00256

Adj Constant = 0.00256

Ke = 1.0000

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Wind Loads - Open Buildings: $0.25 \leq h/L \leq 1.0$

Ultimate Wind Pressures

Type of roof = Monoslope Free Roofs
Wind Flow = ClearG = 0.85
Roof Angle = 0.0 deg**Main Wind Force Resisting System**

Kz = Kh (case 2) = 0.85

Base pressure (qh) = **21.9 psf**

NOTE: The code requires the MWFRS be designed for a minimum pressure of 16 psf.

Roof pressures - Wind Normal to Ridge

Wind Flow	Load Case		Wind Direction $\gamma = 0 \text{ \& } 180 \text{ deg}$	
			Cnw	Cnl
Clear Wind Flow	A	Cn =	1.20	0.30
		p =	22.4 psf	5.6 psf
	B	Cn =	-1.10	-0.10
		p =	-20.5 psf	-1.9 psf

- NOTE: 1). Cnw and Cnl denote combined pressures from top and bottom roof surfaces.
2). Cnw is pressure on windward half of roof. Cnl is pressure on leeward half of roof.
3). Positive pressures act toward the roof. Negative pressures act away from the roof.

Roof pressures - Wind Parallel to Ridge, $\gamma = 90 \text{ deg}$

Wind Flow	Load Case		Horizontal Distance from Windward Edge		
			$\leq h$	$>h \leq 2h$	$> 2h$
Clear Wind Flow	A	Cn =	-0.80	-0.60	-0.30
		p =	-14.9 psf	-11.2 psf	-5.6 psf
	B	Cn =	0.80	0.50	0.30
		p =	14.9 psf	9.3 psf	5.6 psf

h = 10.0 ft
2h = 20.0 ft**Fascia Panels -Horizontal pressures**

qp = 21.9 psf

Windward fascia: 32.9 psf (GCpn = +1.5)
Leeward fascia: -21.9 psf (GCpn = -1.0)**Components & Cladding - roof pressures**

Kz = Kh (case 1) = 0.85

a = 3.0 ft

 $a^2 = 9.0 \text{ sf}$ Base pressure (qh) = **21.9 psf** $4a^2 = 36.0 \text{ sf}$

G = 0.85

	Effective Wind Area	Clear Wind Flow					
		zone 3		zone 2		zone 1	
		positive	negative	positive	negative	positive	negative
C_N	$\leq 9 \text{ sf}$	2.40	-3.30	1.80	-1.70	1.20	-1.10
	$>9, \leq 36 \text{ sf}$	1.80	-1.70	1.80	-1.70	1.20	-1.10
	$> 36 \text{ sf}$	1.20	-1.10	1.20	-1.10	1.20	-1.10
Wind pressure	$\leq 9 \text{ sf}$	44.8 psf	-61.6 psf	33.6 psf	-31.7 psf	22.4 psf	-20.5 psf
	$>9, \leq 36 \text{ sf}$	33.6 psf	-31.7 psf	33.6 psf	-31.7 psf	22.4 psf	-20.5 psf
	$> 36 \text{ sf}$	22.4 psf	-20.5 psf	22.4 psf	-20.5 psf	22.4 psf	-20.5 psf

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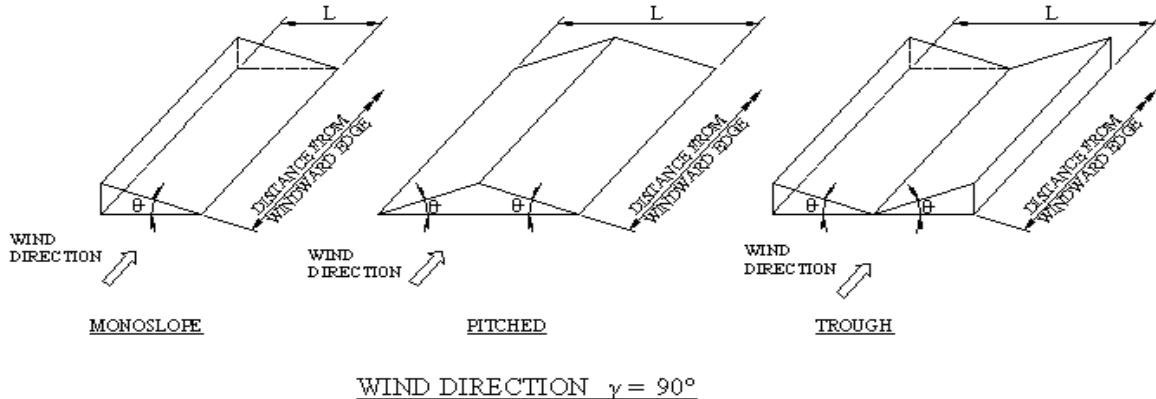
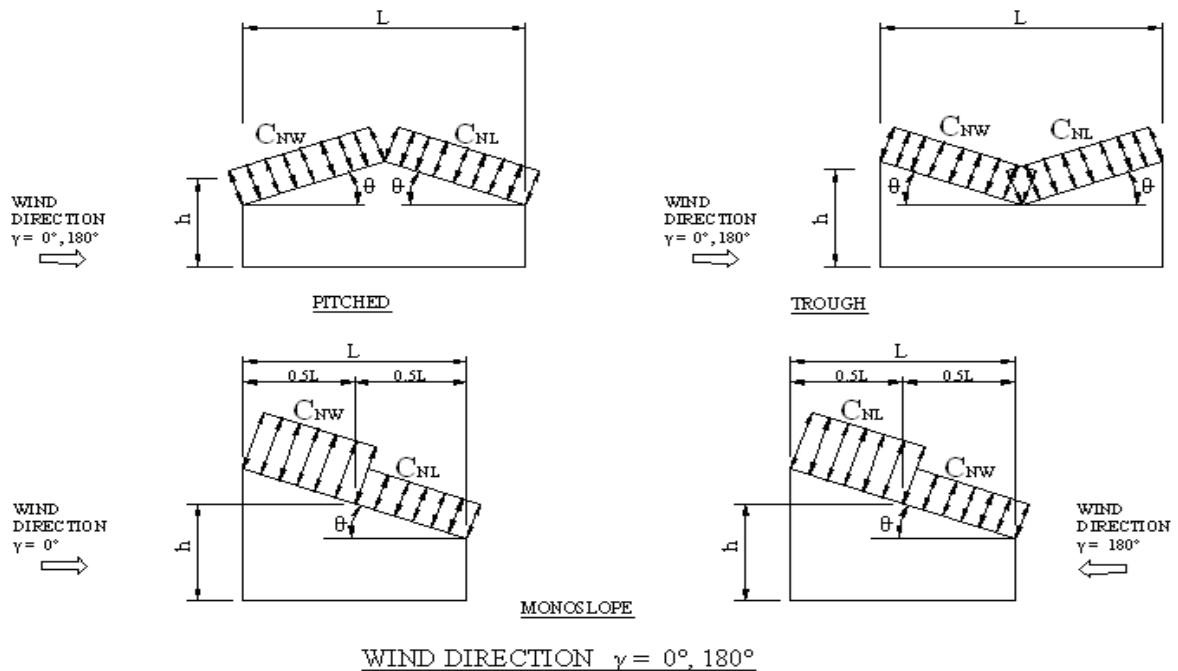
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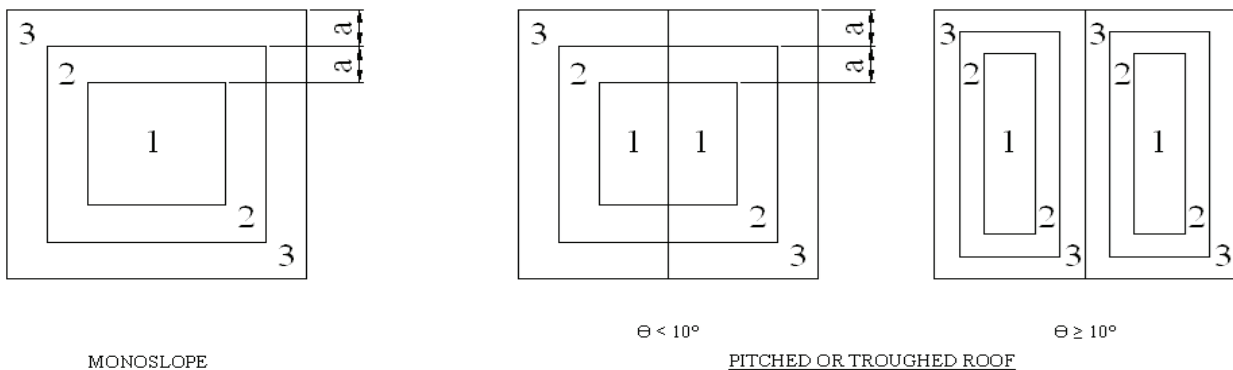
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Location of Wind Pressure Zones



MAIN WIND FORCE RESISTING SYSTEM



COMPONENTS AND CLADDING

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Snow Loads : ASCE 7- 16

Nominal Snow Forces

Roof slope = 0.0 deg
 Horiz. eave to ridge dist (W) = 14.2 ft
 Roof length parallel to ridge (L) = 23.7 ft

Type of Roof Monoslope
 Ground Snow Load $P_g = 20.0$ psf
 Risk Category = II
 Importance Factor $I = 1.0$
 Thermal Factor $C_t = 1.20$
 Exposure Factor $C_e = 1.1$

$P_f = 0.7 \cdot C_e \cdot C_t \cdot I \cdot P_g = 18.5$ psf
 Unobstructed Slippery Surface yes

Sloped-roof Factor $C_s = 1.00$
 Balanced Snow Load = **18.5 psf**

Rain on Snow Surcharge Angle 0.28 deg
 Code Maximum Rain Surcharge 5.0 psf
 Rain on Snow Surcharge = 5.0 psf
 Ps plus rain surcharge = 23.5 psf
 Minimum Snow Load $P_m = 20.0$ psf

Uniform Roof Design Snow Load = **23.5 psf**

Near ground level surface balanced snow load = **20.0 psf**

NOTE: Alternate spans of continuous beams shall be loaded with half the design roof snow load so as to produce the greatest possible effect - see code for loading diagrams and exceptions for gable roofs..

Windward Snow Drifts 1 - Against walls, parapets, etc

Upwind fetch $l_u = 15.0$ ft
 Projection height $h = 4.5$ ft
 Snow density $g = 16.6$ pcf
 Balanced snow height $h_b = 1.11$ ft
 $h_d = 0.92$ ft
 $h_c = 3.39$ ft

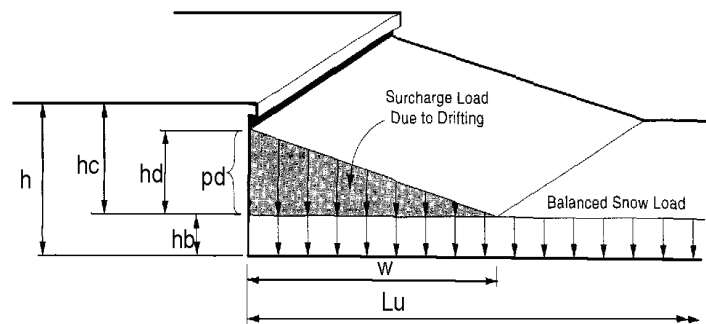
$h_c/h_b > 0.2 = 3.0$ Therefore, design for drift
 Drift height (h_d) = 0.92 ft
 Drift width $w = 3.69$ ft
 Surcharge load: $pd = \gamma \cdot h_d = 15.3$ psf
 Balanced Snow load: = 18.5 psf

33.8 psf

Windward Snow Drifts 2 - Against walls, parapets, etc

Upwind fetch $l_u = 0.0$ ft
 Projection height $h = 0.0$ ft
 Snow density $g = 16.6$ pcf
 Balanced snow height $h_b = 1.11$ ft
 $h_d = 0.92$ ft
 $h_c = -1.11$ ft

$h_c/h_b < 0.2 = -1.0$ $l_u < 15'$, drift not req'd
 Drift height (h_c) = 0.00 ft
 Drift width $w = -8.91$ ft
 Surcharge load: $pd = \gamma \cdot h_d = 0.0$ psf
 Balanced Snow load: = 18.5 psf



Note: If bottom of projection is at least 2 feet above h_b then snow drift is not required.

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Seismic Loads:

IBC 2018

Strength Level Forces

Risk Category : II
Importance Factor (I) : 1.00

Site Class :) - code default

Ss (0.2 sec) = 10.00 %g
S1 (1.0 sec) = 6.80 %g

Fa = 1.600

Sms = 0.160

SDS = 0.107

Design Category = A

Fv = 2.400

Sm1 = 0.163

SD1 = 0.109

Design Category = B

Seismic Design Category = B

Redundancy Coefficient p = 1.30

Number of Stories: 1

Structure Type: All other building systems

Horizontal Struct Irregularities: No plan Irregularity

Vertical Structural Irregularities: No vertical Irregularity

Flexible Diaphragms: No

Building System: **Cantilevered Column Systems detailed to conform to the requirements for:**Seismic resisting system: **Timber frames**System Structural Height Limit: **35 ft**

Actual Structural Height (hn) = 10.0 ft

DESIGN COEFFICIENTS AND FACTORS

Response Modification Coefficient (R) = 1.5

Over-Strength Factor (Ω_o) = 1.5

Deflection Amplification Factor (Cd) = 1.5

SDS = 0.107

SD1 = 0.109

Seismic Load Effect (E) = $E_h +/ - E_v = p Q_E +/ - 0.2 S_{DS} D$ = $1.3 Q_E +/ - 0.000 D$ Q_E = horizontal seismic forceSpecial Seismic Load Effect (E_m) = $E_m h +/ - E_v = \Omega_o Q_E +/ - 0.2 S_{DS} D$ = $1.5 Q_E +/ - 0.021 D$

D = dead load

PERMITTED ANALYTICAL PROCEDURES**Simplified Analysis** - Use Equivalent Lateral Force Analysis**Equivalent Lateral-Force Analysis** - PermittedBuilding period coef. (C_T) = 0.020 $C_u = 1.68$ Approx fundamental period (T_a) = $C_T h_n^x = 0.112 \text{ sec}$ $x = 0.75$ $T_{max} = C_u T_a = 0.189$

User calculated fundamental period (T) = sec

Use T = 0.112

Long Period Transition Period (TL) = ASCE7 map = 12

Seismic response coef. (C_s) = $S_{DS} I / R = 0.071$ need not exceed $C_s = S_{d1} I / R T = 0.645$ but not less than $C_s = 0.010$ USE $C_s = 0.071$

Design Base Shear V = 0.071W

Model & Seismic Response Analysis

- Permitted (see code for procedure)

ALLOWABLE STORY DRIFT

Structure Type: All other structures

Allowable story drift $\Delta a = 0.020 h_{sx}$ where h_{sx} is the story height below level x

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Design Loads:

D = 5 psf
 Lr = 0 psf
 S = 18 psf
 W = -61.6 psf
 EQ = 119 lbs

44.8 psf

Aluminium Louvers:

6063-T5

$F_y = 16,000$ psi
 $E = 10,100,000$ psi

Aluminum Structural:

6063-T6

$F_y = 25,000$ psi
 $E = 10,100,000$ psi

Load Combinations:

D+Lr = 5.0 psf
 D+S = 23.5 psf
 D+0.6W = 31.9 psf
 D+0.75Lr+0.45W = 25.1 psf
 D+0.75S+0.45W = 39.0 psf
 0.6D+0.6W = -33.9 psf

n = 1
 b = 24 in
 I = 0.03125

Louver:

L = 11.25 ft
 Trib Width = 0.50 ft
 Mmax = 308.55 ft-lb
 Vmax = 109.71 lb
 I = 0.68 in⁴
 y = 0.93 in
 S = 0.731 in³

Fy = 4467 psi OK

Limit = 2.250 in L/60

D = 1.023 in OK

Section = Louver

Fan Beam

L = 11.25 ft
 Trib Width = 1.00 ft
 Mmax = 140.63 ft-lb
 Vmax = 50.00 lb
 I = 1.87 in⁴
 y = 1.000 in
 S = 1.870 in³

Fy = 5207 psi OK

Limit = 1.543 in L/20

D = 0.095 in OK

Section = 8x2x.125 tube

Support Beam

L = 14.16666667 ft
 Trib Width = 5.00 ft
 Mmax = 3996.61 ft-lb
 Vmax = 1128.45 lb
 I = 17.4 in⁴
 y = 4 in
 S = 4.35 in³

Fy = 18191 psi OK

Limit = 0.971 in L/175

D = 0.493 in OK

Section = 8x2x.125 tube

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Header:

L = 23.16666667 ft
Trib Width = 5.00 ft

Mmax = 9803.44 ft-lb
Vmax = 1692.68 lb
I = 34.8 in⁴
y = 4 in
S = 8.7 in³

Fy = 22311.3 psi OK

Limit = 1.589 in L/175

D = 1.347 in OK

Section = (2) 8x2x0.125

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Column

6x6x0.125

Height = 10 ft
 Trib Width = 11.83 ft
 Trib Depth = 7.08 ft
 Defl Limit = $L/170 = 0.71$ in
 DL = 1 psf
 WL = 0 psf
 $W_{total} = 12$ psf
 EQ = 30 lbs
 End Rxn's = 59 lbs
 Moment = 148 ft-lb = 1775 in-lb
 Sx >= 0.043 in³ 5.63 in³ OK
 Ix >= 0.256 in⁴ 16.90 in⁴ OK
 Axial Force = 2257 lb
 Moment M_x = 298 lb-ft
 Moment M_y = 298 lb-ft
 k = 1 F_{ex} = 71329.4 psi
 L_x = 10 ft λ = 37
 L_y = 10 ft F_{cy} = 35000 psi
 r_x = 3.21 in B_c = 35272
 r_y = 3.21 in D_c = 208
 kL/r_x = 37 C_c = 69
 kL/r_y = 37 λ₁ = 1
 λ₂ = 69

Limit State = INELASTIC BUCKLING

F_c = 25295.37473 psi
 A_g = 3.9 in²
 P_{nc} = 60248.98344 lb
 F_b = 9697 psi
 S_{xc} = 5.63 in³
 M_{nx} = 4549 lb-ft
 S_{yc} = 5.63 in³
 M_{ny} = 4549 lb-ft

Interaction 0.1685 <= 1 OK