STRUCTURAL ENGINEERING CALCULATIONS

PROJECT:

PROJECT LOCATION:

PSE PROJECT NUMBER:

DATE:

BY:

Table of Contents:

Subject: **Page:**

References:

1- Literature:

a. Based on International Building Code 2015 (IBC).

b. Aluminum Design Manual, ADMI -15, Aluminum Association

2- Software:

a. RISA 3D Version 17.1,
RISA Technologies,
26212 Dimension Dr. Suite 200

Quickly Find What You Need:

Adopted Codes

City Adopts 2015 International Codes and 2017 National Electric Codes

On September 26, 2017 the City of Cleburne adopted the 2015 International Building Codes and the 2017 National Energy Code with amendments.

The new codes will become effective **January 1, 2018.**

The complete codes are available for review in the Community Development Department. Community Development is located on the 1st Floor of City Hall, 10 N. Robinson Street Cleburne, Texas 76033. Please feel free contact staff with any questions or concerns by calling 817-645-0955.

To review the approved amendments to each of the adopted codes, please use the links below.

2015 International Building Code

2015 International Residential Code

2015 International Energy Conversational Code

2015 International Fuel Gas Code

2015 International Mechanical Code

2015 International Plumbing Code

2015 International Existing Building Code

2015 International Fire Code

2017 National Electrical Code

Community Development

Hours

Monday - Friday

8 a.m. - 5 p.m.

Staff Directory

Design Criteria:

1- Location:

2- Seismic:

RC	III
SDC	B
Site Class	D
Sms	0.123
Sm1	0.113
Sds	0.085
Sd1	0.075
Ie	1.25
R	1.25

3- Wind (Ultimate): 120 mph (3s gust)
Exposure C

4- Roof Live Load: 20 psf

5- Soil Bearing Capacity: 1500 psf

6- Gravity Loads: DL Roof : 3 psf

7- Deflection Criteria: Roof TL Deflection: L/180

** Other criteria assumed as stated in design calculations.

PROJECT ETC 222-405 PAGE :
CLIENT : DESIGN BY :
JOB NO. : DATE : REVIEW BY :

Seismic Analysis Based on 2016 CBC/2015 IBC (Equivalent Lateral Force Procedure, ASCE 7-10)

INPUT DATA

Typical floor height	h =	11	*ft, (3.4 m)*
Typical floor weight	w_x =	20	*kips, (89.0 kN)*
Number of floors	n =	1	
Importance factor (ASCE 11.5.1)	I_e =	1.25	
Design spectral response	S_{DS} =	0	g
	S_{D1} =	0.075	g
Mapped spectral response	S_1 =	0.047	g
The coefficient (ASCE Tab 12.8-2)	C_t =	0.02	
The coefficient(ASCE Tab. 12.2.1)	R =	1.25	

DESIGN SUMMARY

Total base shear *(1 kips = 4.448 kN)*

V	=	0.09 W, (SD)	=	2	k, (SD)
	=	0.06 W, (ASD)	=	1	k, (ASD)
Seismic design category			=	B	

h_n =	11.0	*ft, (3.4 m)*
W =	20	*kips, (89.0 kN)*
k =	1.00	, (ASCE 12.8.3, page 91)
$\Sigma w_x h^k$ =	220	
x =	0.75	, (ASCE Tab 12.8-2)
$T_a = C_t (h_n)^x$ =	0.12	Sec, (ASCE 12.8.2.1)

VERTICAL DISTRIBUTION OF LATERAL FORCES

Level No.	Level Name	Floor to floor Height (ft)	Height h_x (ft)	Weight w_x (k)	$w_x h_x^k$	C_{vx}	Lateral force @ each level F_x (k)	V_x (k)	O. M. (k-ft)	Diaphragm force ΣF_i (k)	ΣW_i (k)	F_{px} (k)
1	Roof		11.0	20	220	1.000	1.7			1.7	20	1
		11.00						1.7				
	Ground		0.0						19			

COLUMN SUPPORTED CANOPY DESIGN

Page 1,000 – 1,499

MecaWind v2400

Calculations Prepared by:
Date: Jan 29, 2022

Basic Wind Parameters
```
Wind Load Standard          = ASCE 7-10  Exposure Category        = C
Wind Design Speed           = 120.0 mph  Risk Category            = II
Structure Type              = Building   Building Type            = Op
```

General Wind Settings
```
Incl_LF   = Include ASD Load Factor of 0.6 in Pressures          = False
DynType   = Dynamic Type of Structure                            = Rigid
Alt       = Altitude (Ground Elevation) above Sea Level          = 0.000 f
Bdist     = Base Elevation of Structure                          = 0.000 f
SDB       = Simple Diaphragm Building                            = False
Reacs     = Show the Base Reactions in the output                = False
MWFRSType = MWFRS Method Selected                                = Ch 27 P
```

Topographic Factor per Fig 26.8-1
```
Topo      = Topographic Feature                                  = None
Kzt       = Topographic Factor                                   = 1.000
```

Building Inputs
```
RoofType: Roof Type          = MonoSlope  h      : Mean Roof Height     = 11
L       : Width Normal to Ridge = 16.500 ft  D   : Length Along Ridge   = 10
WindFlow: Wind Flow Method   = Clear      Slope  : Slope of Roof        = 0.
```

Exposure Constants per Table 26.9-1:
```
Alpha: Const from Table 26.9-1  = 9.500   Zg:   Const from Table 26.9-1  = 90
At:    Const from Table 26.9-1  = 0.105   Bt:   Const from Table 26.9-1  = 1.
Am:    Const from Table 26.9-1  = 0.154   Bm:   Const from Table 26.9-1  = 0.
C:     Const from Table 26.9-1  = 0.200   Eps:  Const from Table 26.9-1  = 0.
```

Gust Factor Calculation:
```
Gust Factor Category I Rigid Structures - Simplified Method
G1        = For Rigid Structures (Nat. Freq.>1 Hz) use 0.85      = 0.85
Gust Factor Category II Rigid Structures - Complete Analysis
Zm        = Max(0.6 * Ht, Zmin)                                  = 15.000
Izm       = Cc * (33 / Zm) ^ 0.167                               = 0.228
Lzm       = L * (Zm / 33) ^ Eps                                  = 427.057
Q         = (1 / (1 + 0.63 * ((B + Ht) / Lzm)^0.63))^0.5         = 0.955
G2        = 0.925*((1+0.7*Izm*3.4*Q)/(1+0.7*3.4*Izm))            = 0.902
Gust Factor Used in Analysis
G         = Lessor Of G1 Or G2                                   = 0.850
```

Main Wind Force Resisting System (MWFRS) Calculations per Ch 27 Part 1:
```
LF        = Load Factor based upon STRENGTH Design               = 1.00
Zh        = Mean Roof Height for Kh:  h + Base_Dist              = 11.330
Kh        = Since Zh<15 ft [4.572 m] --> 2.01 * (15/zg)^(2/Alpha) = 0.849
Kzt       = Topographic Factor is 1 since no Topographic feature specified = 1.000
Kd        = Wind Directionality Factor per Table 26.6-1          = 0.85
qh        = (0.00256 * Kh * Kzt * Kd * V^2) * LF                 = 26.60 p
```

MWFRS Pressures per Fig 27.4-4 on Monoslope Free Roof - Wind Dir 0 Deg
All wind pressures include a load factor of 1.0

Load Case	Cnw	Cnl	Pnw psf	Pnl psf
Load Case A	1.200	0.300	27.13	6.78
Load Case B	-1.100	-0.100	-24.87	-2.26

Notes:
Pnw = Pressure on windward portion of roof: qh*G*Cnw*LF {Eqn 27.4-4}
Pnl = Pressure On Leeward portion Of roof: qh*G*Cnl*LF [Eqn 27.4-4]
All wind pressures include a load factor of 1.0
+ Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

Open Building Along Ridge Pressures per Fig 27.4-7 - Wind 90 Deg
All wind pressures include a load factor of 1.0

Roof Var	Start Dist ft	End Dist ft	CnA	CnB	Pressure PnA psf	Pressure PnB psf
Roof	0.000	11.330	-0.800	0.800	-18.09	18.09

Notes Roof Pressures:
Start Dist = Start Dist from Windward Edge End Dist = End Dist from Windward Ed
CnA = Cn for Load Case A CnB = Cn for Load Case B
PnA = qh*G*CnA {Eqn 27.4-3} PnB = qh*g*CnB {Eqn 27.4-3]
+ Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

MWFRS Pressures per Fig 27.4-4 on Monoslope Free Roof - Wind Dir 180 Deg
All wind pressures include a load factor of 1.0

Load Case	Cnw	Cnl	Pnw psf	Pnl psf
Load Case A	1.200	0.300	27.13	6.78
Load Case B	-1.100	-0.100	-24.87	-2.26

Notes:
Pnw = Pressure on windward portion of roof: qh*G*Cnw*LF {Eqn 27.4-4}
Pnl = Pressure On Leeward portion Of roof: qh*G*Cnl*LF [Eqn 27.4-4]
All wind pressures include a load factor of 1.0
+ Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

Project Number	ETC 222-405	Sheet	
Project Name		Designed by	Date
Subject	DESIGN LOADS	Checked by	Date

TRIB WIDTH **10** **ft**

LOAD CALCULATION (DEAD & LIVE)

DEAD LOAD (W)	=	3	psf	x	10	=	30.00	plf
LIVE LOAD	=	20	psf	x	10	=	200.00	plf

WIND LOAD CASE A

WINDWARD	=	27.13	psf	x	10		=	271.30	plf
LEEWARD	=	6.78	psf	x	10		=	67.80	plf
ALONG THE RIDGE	=	18.09	1.33	x	10		=	240.60	lbs

(depth of beam 8") / 6" = 1.33

WIND LOAD CASE B

WINDWARD	=	-24.87	psf	x	10	=	-248.70	plf
LEEWARD	=	-2.26	psf	x	10	=	-22.60	plf
ALONG THE RIDGE	=	-18.09	1.33	x	10	=	-240.60	lbs

(depth of beam 8") / 6" = 1.33

SEISMIC LOADS

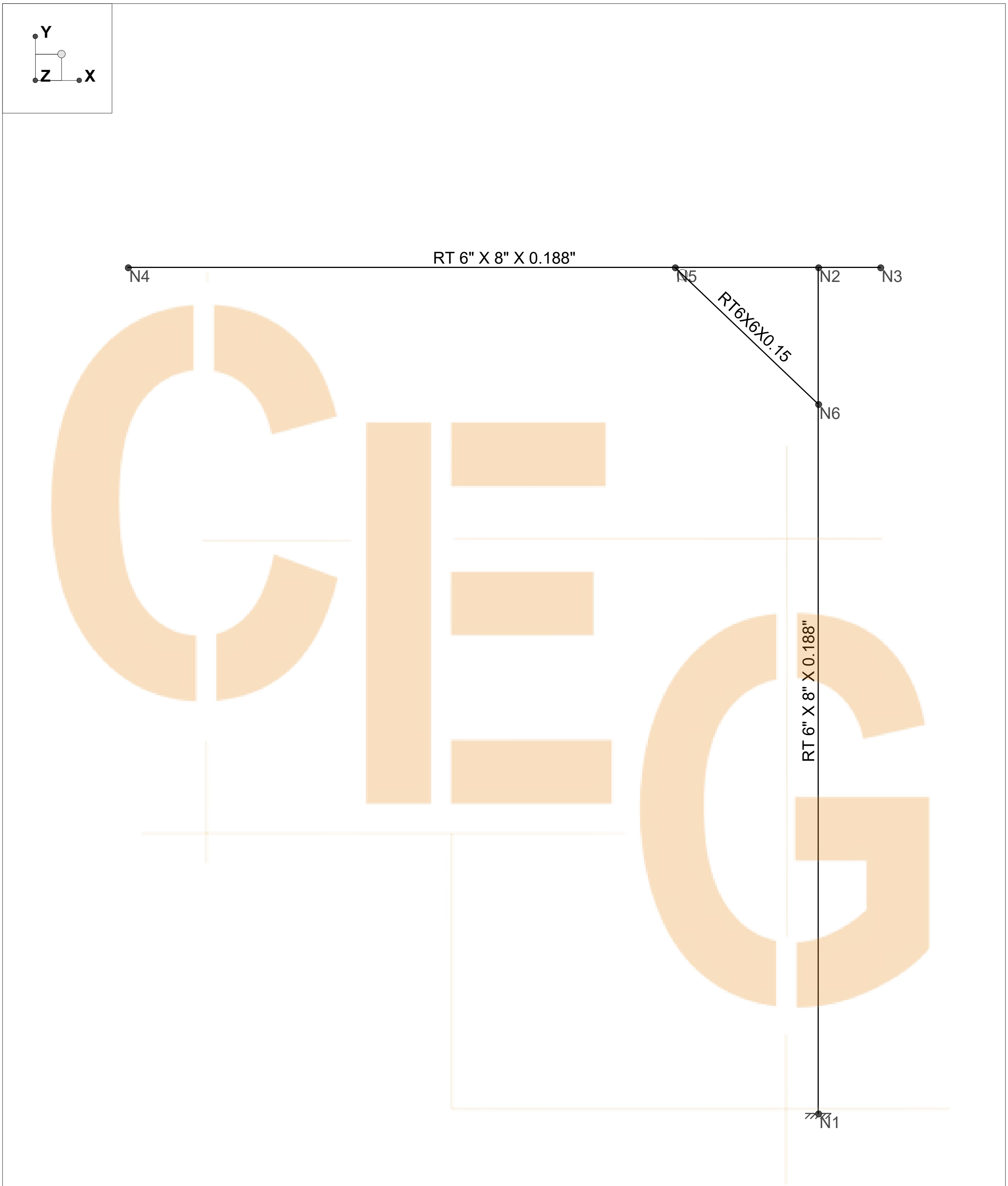
LATERAL SEISMIC FORCE **V = Cs x W**

Seismic Co-efficient (ASD) (As per page = **Cs =** 0.09

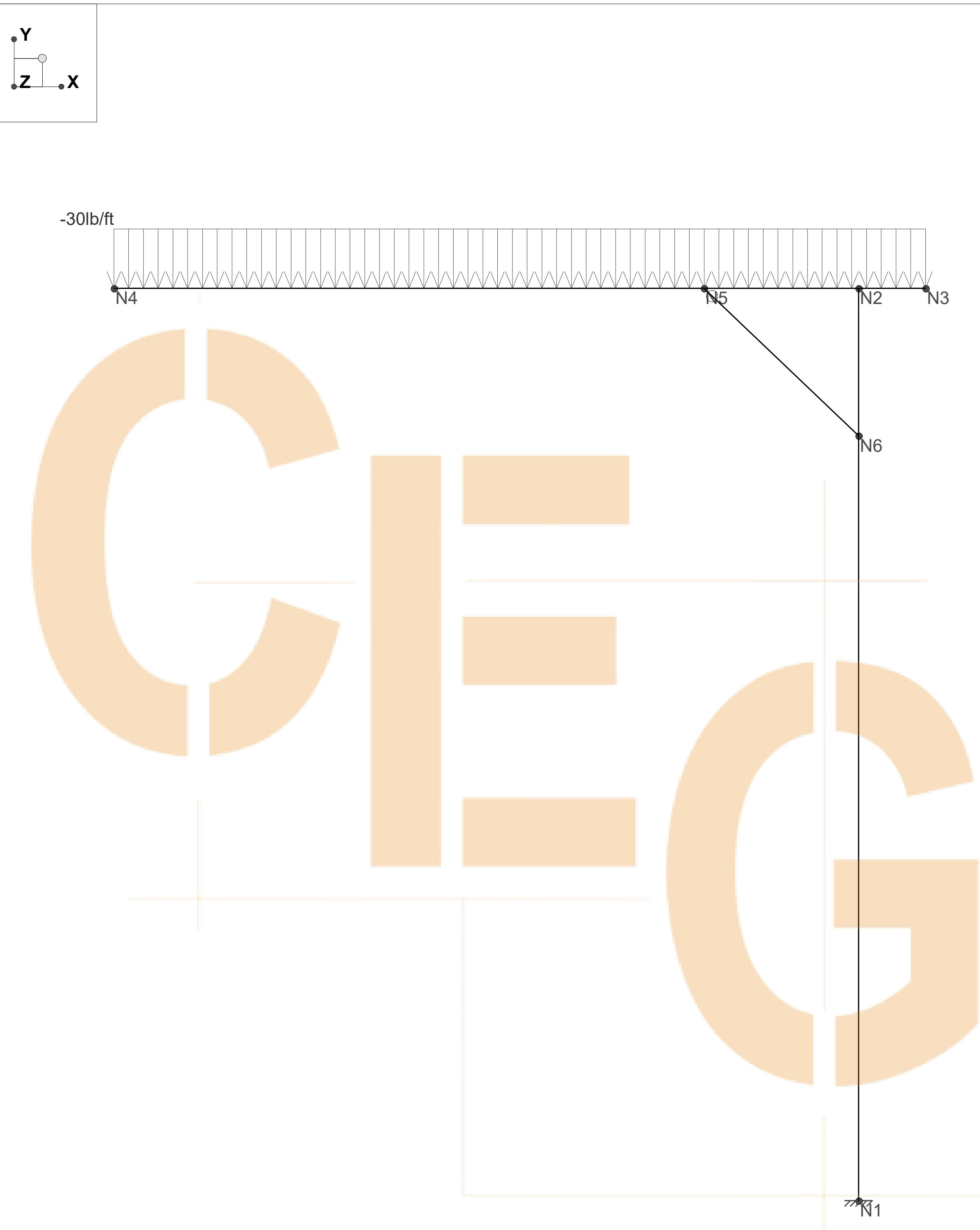
W, Weight of the Component W = 30.00 plf

V = 2.70 plf

USE = 3.00 plf

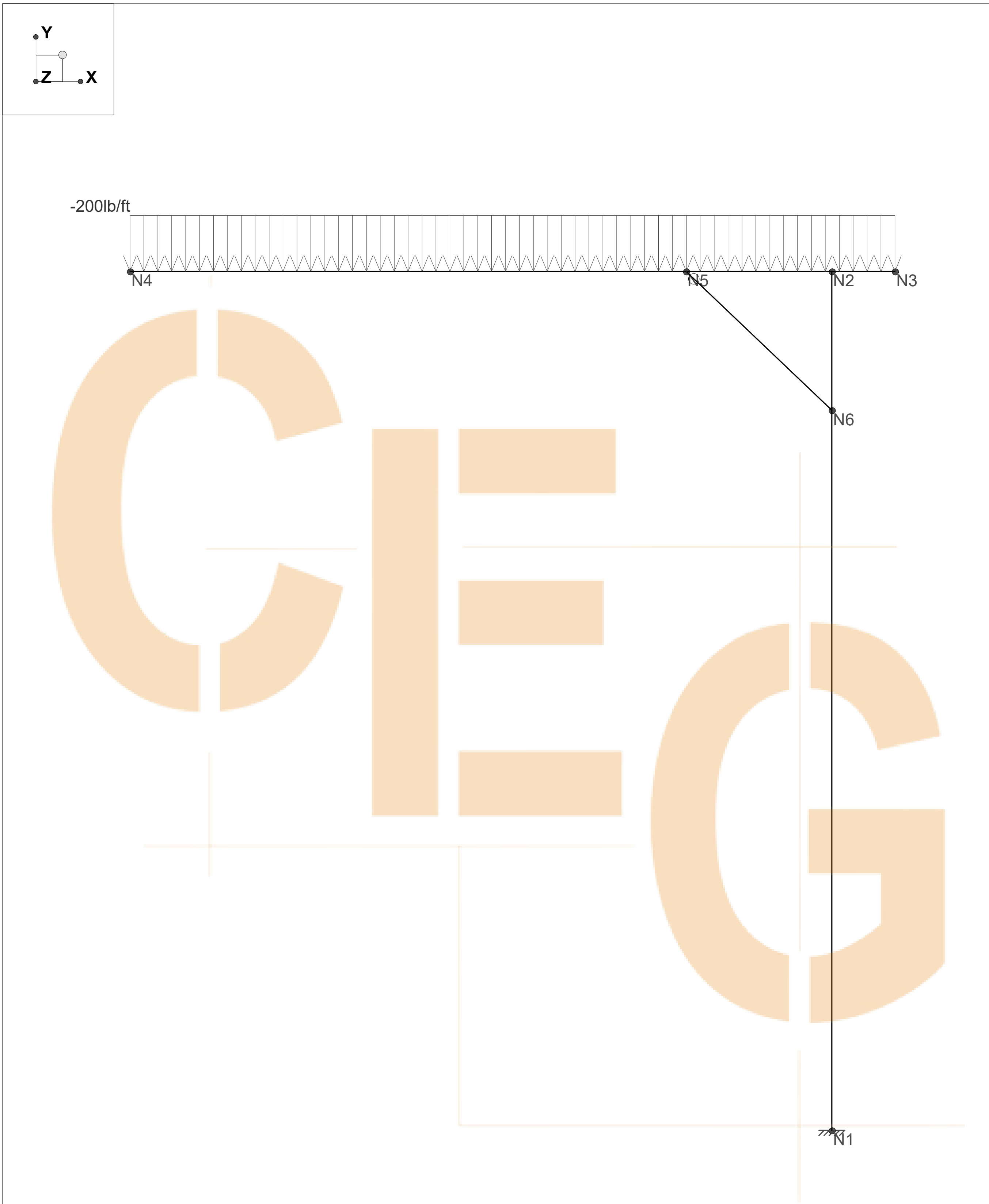


	Canopy 1 @ section A1	SK - 1
East Texas 222-405		Canopy # 1.r3d



Loads: BLC 1, DL
Envelope Only Solution

	Canopy 1 @ section A1	SK - 2
East Texas 222-405		Canopy # 1.r3d



Loads: BLC 2, RLL
Envelope Only Solution

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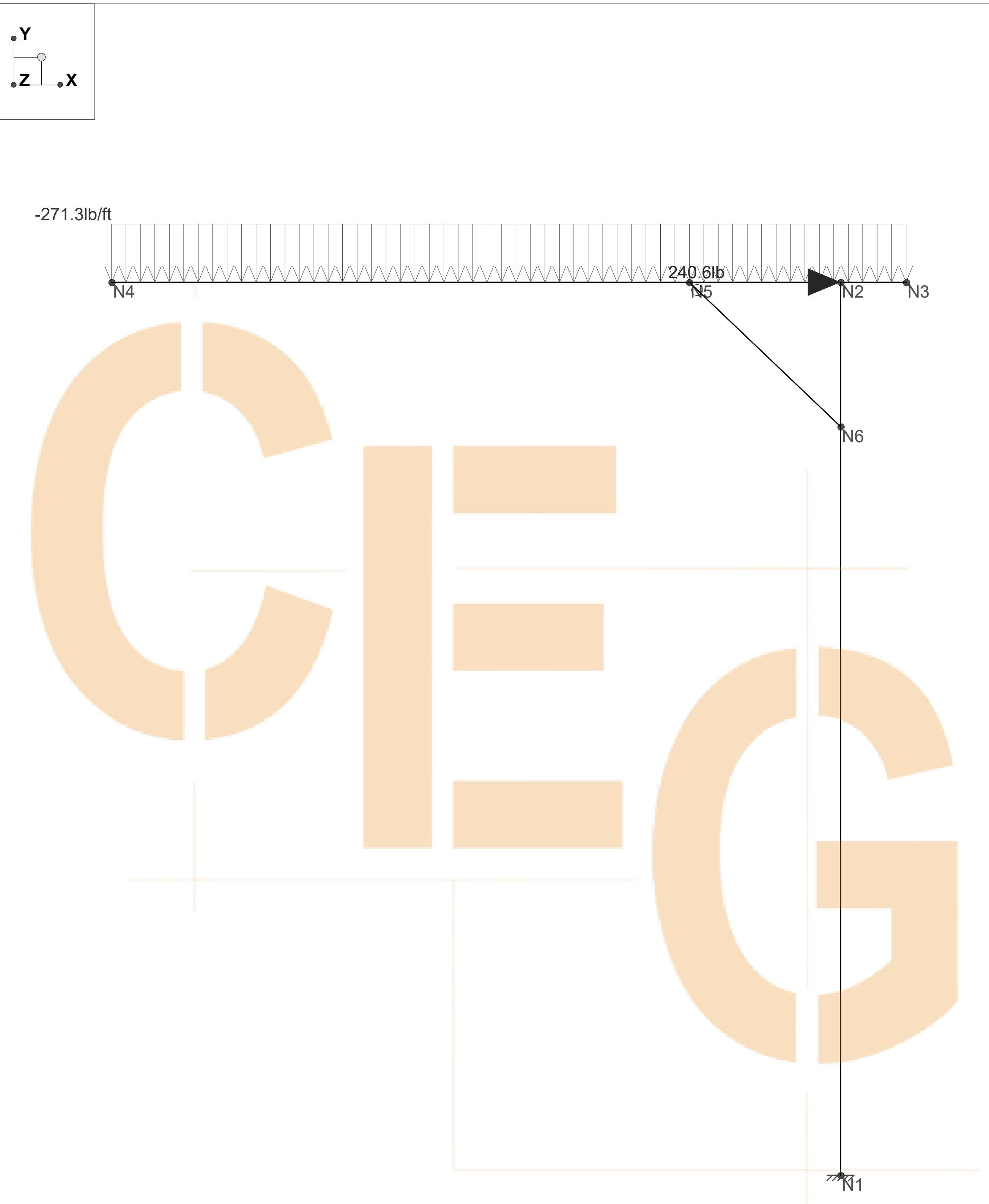
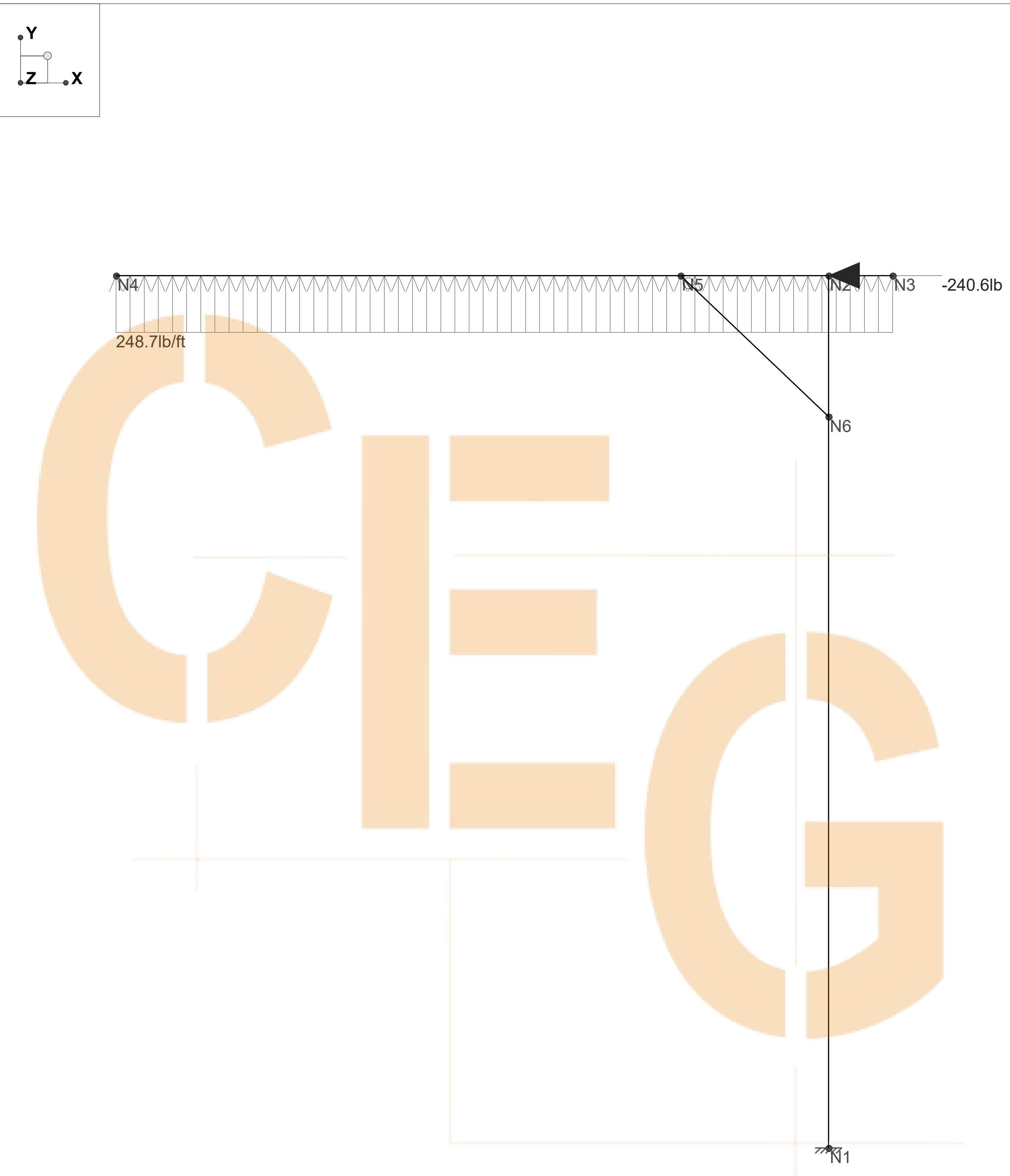
East Texas 222-405		
		Canopy # 1.r3d



Loads: BLC 3, WLA
Envelope Only Solution

	Canopy 1 @ section A1	SK - 4
East Texas 222-405		Canopy # 1.r3d



Loads: BLC 4, WLB
Envelope Only Solution

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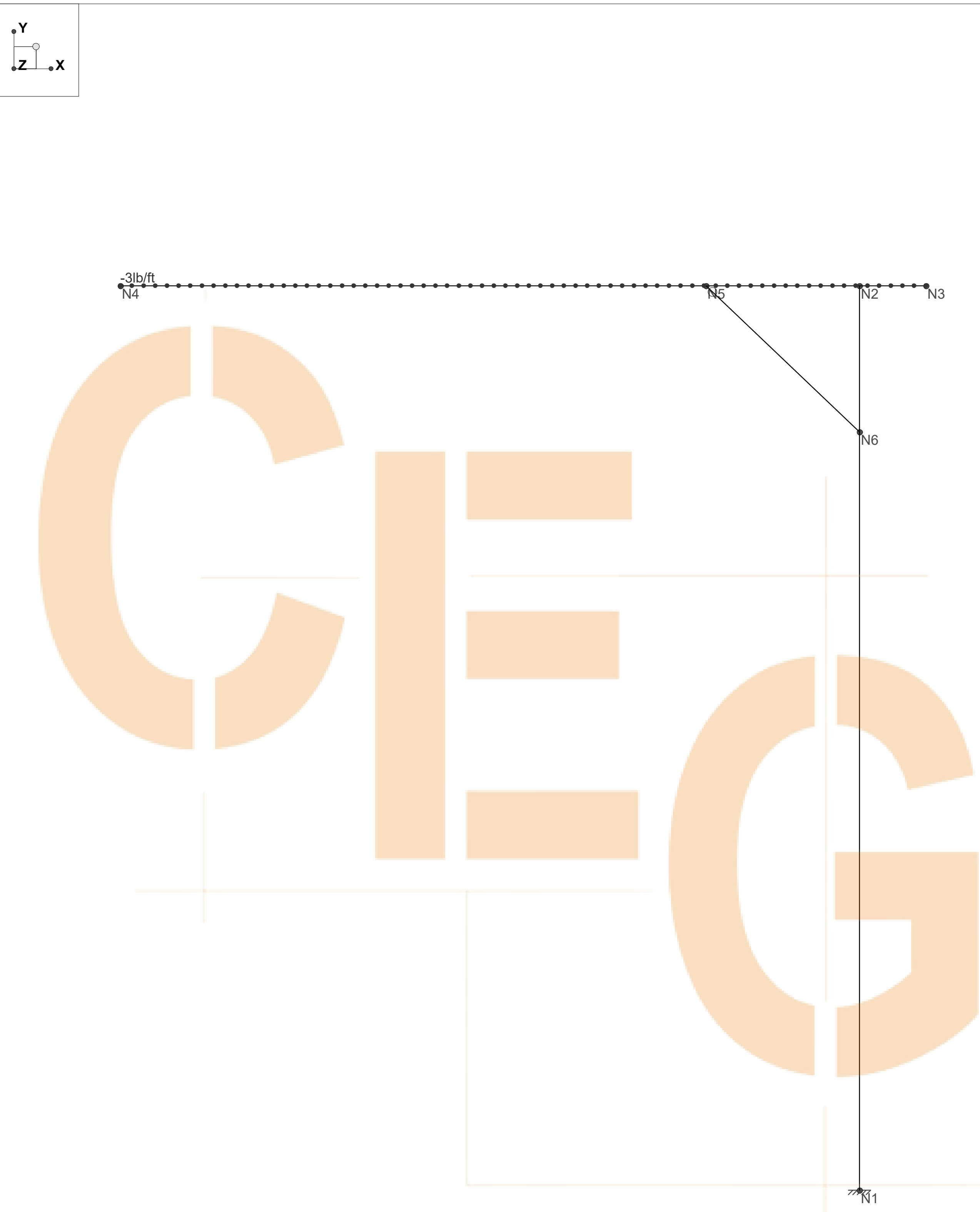
East Texas 222-405		Canopy # 1.r3d



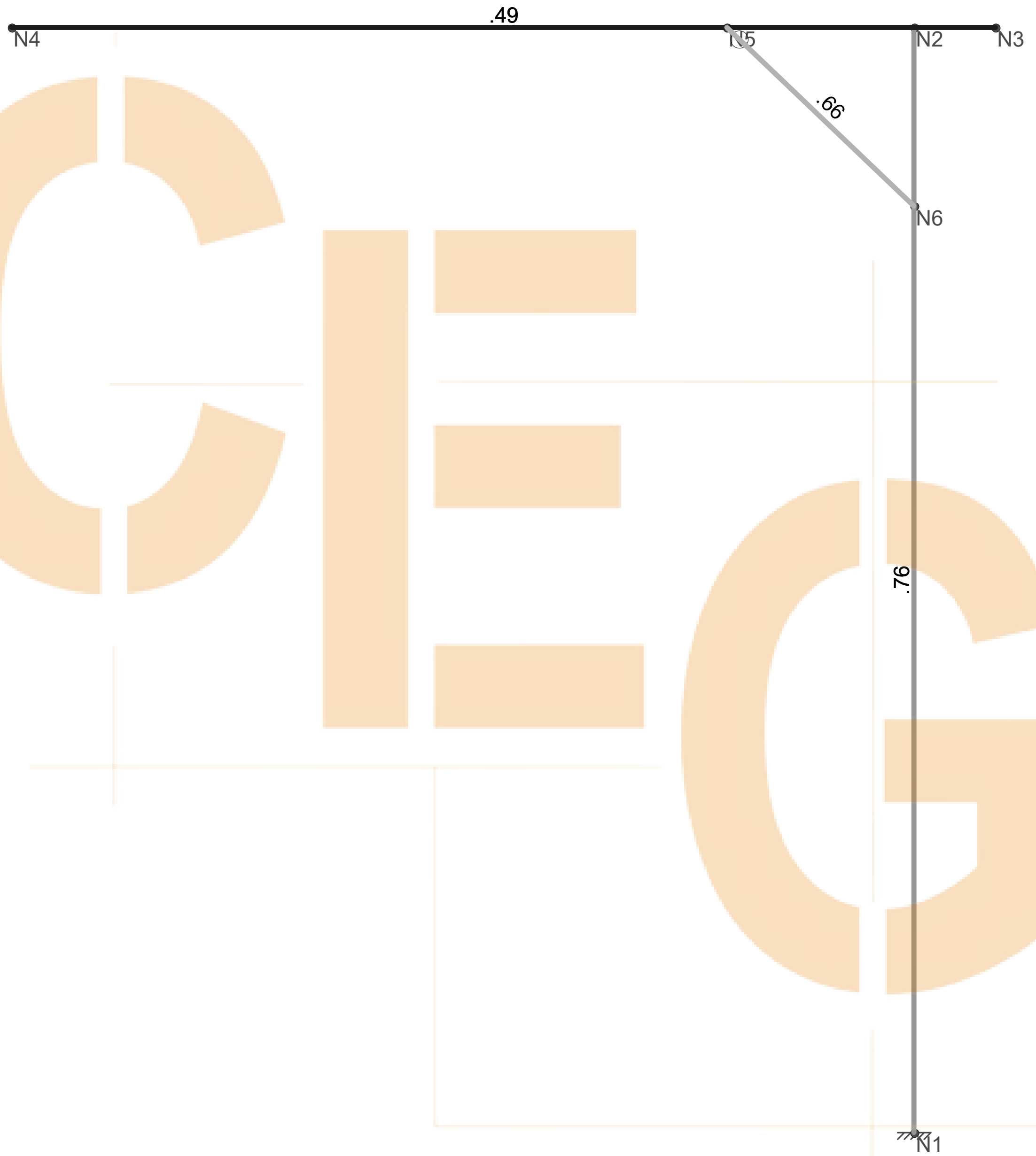
Loads: BLC 5, ELZ
Envelope Only Solution

	Canopy 1 @ section A1	SK -
East Texas 222-405		Canopy # 1.r3d

Y
Z X

Code Check
(Env)

	No Calc
	> 1.0
	.90-1.0
	.75-.90
	.50-.75
	0.-.50



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

	Canopy 1 @ section A1	SK - 7
East Texas 222-405		Canopy # 1.r3d

RISA	Company	:		11:28 AM
A NEMETSCHEK COMPANY	Designer	:		Checked By:
	Job Number	:	East Texas 222-405	
	Model Name	:	Canopy 1 @ section A1	

Aluminum Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (...	Density[...	Table B.4	kt	Ftu[ksi]	Fty[ksi]	Fcy[ksi]	Fsu[ksi]	Ct
1	3003-H14	10100	3787.5	.33	1.3	.173	Table B....	1	19	16	13	12	141
2	6061-T6	10100	3787.5	.33	1.3	.173	Table B....	1	38	35	35	24	141
3	6063-T5	10100	3787.5	.33	1.3	.173	Table B....	1	22	16	16	13	141
4	6063-T6	10100	3787.5	.33	1.3	.173	Table B....	1	30	25	25	19	141
5	5052-H34	10200	3787.5	.33	1.3	.173	Table B....	1	34	26	24	20	141
6	6061-T6 W	10100	3787.5	.33	1.3	.173	Table B....	1	24	15	15	15	141

Aluminum Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	C1	RT 6" X 8" X ...	Column	Rectangular Tubes	6061-T6	Typical	5.123	30.985	48.311	56.893
2	B1	RT 6" X 8" X ...	Beam	Rectangular Tubes	6061-T6	Typical	5.123	30.985	48.311	56.893
3	KNEE BR...	RT6X6X0.15	VBrace	Rectangular Tubes	6061-T6	Typical	3.51	20.033	20.033	30.03

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
1	N1	18.17	0	0	0	
2	N2	18.17	11.33	0	0	
3	N3	19.003333	11.33	0	0	
4	N4	8.92	11.33	0	0	
5	N5	16.25	11.33	0	0	
6	N6	18.17	9.5	0	0	

Aluminum Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
1	M2	C1	11.33									Lateral
2	M3A	B1	10.083			Lbyy						Lateral
3	M3	KNEE BRA...	2.652									Lateral

Member Area Loads

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
No Data to Print ...						

Load Combinations

	Description	Solve	PDe...	S...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	IBC 16-8	Yes	Y		DL	1																		
2	IBC 16-10 (a)	Yes	Y		DL	1	RLL	1																
3	IBC 16-12 (a)	Yes	Y		DL	1	WL...	.6																
4	IBC 16-13 (a)	Yes	Y		DL	1	WL...	.45					R...	.75										
5	IBC 16-15	Yes	Y		DL	.6	WL...	.6																
6	IBC 16-12 (b)	Yes	Y		DL	1	ELZ	.7																
7	IBC 16-12 (a)	Yes	Y		DL	1	WL-Y	.6																
8	IBC 16-13 (a)	Yes	Y		DL	1	WL-Y	.45					R...	.75										
9	IBC 16-15	Yes	Y		DL	.6	WL-Y	.6																
10	DL ONLY		Y		DL	1.25																		
11	RLL ONLY		Y		RLL	1.25																		
12	WL+Y		Y		WL+Y	1.25																		
13	WL-Y		Y		WL-Y	1.25																		

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	144.36	9	3188.827	4	14.117	6	.163	6	.061	6	3.573	9
2		min	-144.36	3	-1237.453	9	0	1	0	1	0	1	-13.445	4
3	Totals:	max	144.36	9	3188.827	4	14.117	6						
4		min	-144.36	3	-1237.453	9	0	1						

Envelope AA ADM1-15: ASD - Building Aluminum Code Checks

	Member	Shape	Code C...	Loc[ft]	LC	Shear ...	Loc[ft]	Dir	LC	Pnc/O...	Pnt/Om...	Mny/O...	Mnz/O...	Vny/O...	Vnz/O...	Cb	Eqn
1	M2	RT 6" X 8...	.765	0	4	.154	9.56	y	4	70633....	99825....	12.303	18.68	34008....	25156....	1....	H.1-1
2	M3	RT6X6X0...	.664	2.652	4	.079	2.652	y	4	53545....	68400	8.489	8.489	20492....	20492....	1....	H.1-1
3	M3A	RT 6" X 8...	.494	7.352	4	.141	7.352	y	4	76341....	99825....	12.303	18.68	34008....	25156....	1....	H.1-1

Envelope Member Section Forces

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k...	LC	y-y Mom...	LC	z-z Moment[k-ft]	LC
1	M2	1	max	3188.827	4	158.65	9	0	9	.061	6	.163	6	13.445	4
2			min	-1237.453	9	-107.176	5	-14.332	6	0	1	0	1	-3.573	9
3		2	max	3171.415	4	158.65	9	0	9	.061	6	.123	6	13.416	4
4			min	-1247.9	9	-107.176	5	-14.332	6	0	1	0	1	-4.022	9
5		3	max	3154.003	4	158.65	9	0	9	.061	6	.082	6	13.386	4
6			min	-1258.347	9	-107.176	5	-14.332	6	0	1	0	1	-4.472	9
7		4	max	3136.591	4	158.65	9	0	9	.061	6	.041	6	13.356	4
8			min	-1268.794	9	-107.176	5	-14.332	6	0	1	0	1	-4.921	9
9		5	max	1677.926	9	5229.415	4	1.937	6	.022	6	.006	6	.174	9
10			min	-3507.707	4	-1979.756	9	0	1	0	1	0	1	-.49	4
11	M3A	1	max	0	9	0	9	0	9	0	9	0	9	0	9
12			min	0	1	0	1	0	1	0	1	0	1	0	1
13		2	max	0	9	321.486	9	0	9	0	9	0	9	.979	4
14			min	0	1	-777.002	4	-3.529	6	0	1	-.004	6	-.405	9
15		3	max	0	9	642.972	9	0	9	0	9	0	9	3.917	4
16			min	0	1	-1554.004	4	-7.058	6	0	1	-.018	6	-1.621	9
17		4	max	2080.742	9	4736.216	4	5.505	6	0	9	0	9	7.171	4
18			min	-5614.771	4	-1944.716	9	0	1	-.006	6	-.03	6	-2.97	9
19		5	max	0	9	0	9	0	9	0	9	0	9	0	9
20			min	0	1	0	1	0	1	0	1	0	1	0	1
21	M3	1	max	8628.788	4	617.407	9	0	9	.009	6	0	9	0	9
22			min	-3551.07	9	-1604.175	4	-16.76	6	0	1	0	1	0	1
23		2	max	8630.715	4	616.194	9	0	9	.009	6	0	9	1.064	4
24			min	-3549.914	9	-1606.197	4	-16.76	6	0	1	-.011	6	-.409	9
25		3	max	8632.642	4	614.981	9	0	9	.009	6	0	9	2.13	4
26			min	-3548.758	9	-1608.219	4	-16.76	6	0	1	-.022	6	-.817	9
27		4	max	8634.569	4	613.768	9	0	9	.009	6	0	9	3.197	4
28			min	-3547.602	9	-1610.24	4	-16.76	6	0	1	-.033	6	-1.225	9
29		5	max	8636.496	4	612.555	9	0	9	.009	6	0	9	4.266	4
30			min	-3546.446	9	-1612.262	4	-16.76	6	0	1	-.044	6	-1.631	9

Envelope Member Section Deflections Service

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y' Ratio	LC	(n) L/z' Ratio	LC
1	M2	1	max	0	9	0	9	0	9	0	9	NC	9	NC	9
2			min	0	1	0	1	0	1	0	1	NC	1	NC	1
3		2	max	.001	9	.066	9	.004	6	0	9	4884.875	6	NC	9
4			min	-.003	4	-.239	4	0	1	-1.149e-4	6	569.606	4	NC	1
5		3	max	.002	9	.274	9	.015	6	0	9	1222.973	6	NC	9
6			min	-.005	4	-.954	4	0	1	-2.298e-4	6	142.549	4	8930.122	6
7		4	max	.003	9	.641	9	.031	6	0	9	544.183	6	NC	9

Envelope Member Section Deflections Service (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y' Ratio	LC	(n) L/z' Ratio	LC
8			min	-.008	4	-2.144	4	0	1	-3.446e-4	6	63.406	4	4417.217	6
9		5	max	.003	9	1.166	9	.048	6	0	9	310.047	6	NC	9
10			min	-.007	4	-3.765	4	0	1	-4.127e-4	6	36.113	4	2808.154	6
11	M3A	1	max	1.167	9	2.12	9	0	9	0	9	153.114	6	NC	9
12			min	-3.768	4	-6.291	4	-.101	6	-5.333e-4	6	17.839	4	2145.794	6
13		2	max	1.167	9	1.5	9	0	9	0	9	209.178	6	NC	9
14			min	-3.768	4	-4.474	4	-.086	6	-5.333e-4	6	24.368	4	2922.168	6
15		3	max	1.167	9	.893	9	0	9	0	9	326.662	6	NC	9
16			min	-3.768	4	-2.689	4	-.071	6	-5.333e-4	6	38.043	4	4539.748	6
17		4	max	1.167	9	.334	9	0	9	0	9	5611.739	6	NC	9
18			min	-3.768	4	-1.02	4	-.057	6	-5.323e-4	6	658.211	4	NC	1
19		5	max	1.166	9	.491	4	0	9	0	9	NC	9	NC	9
20			min	-3.765	4	-.16	9	-.044	6	-5.251e-4	6	NC	1	NC	1
21	M3	1	max	.582	9	1.082	9	0	9	0	9	NC	9	NC	9
22			min	-1.924	4	-3.443	4	-.058	6	-8.097e-5	6	NC	1	NC	1
23		2	max	.583	9	.948	9	0	9	0	9	NC	8	NC	9
24			min	-1.926	4	-3.036	4	-.053	6	-8.841e-5	6	3183.048	4	NC	1
25		3	max	.584	9	.816	9	0	9	0	9	NC	6	NC	9
26			min	-1.929	4	-2.633	4	-.047	6	-9.586e-5	6	1989.113	4	NC	1
27		4	max	.585	9	.687	9	0	9	0	9	NC	6	NC	9
28			min	-1.931	4	-2.238	4	-.042	6	-1.033e-4	6	2272.829	4	NC	1
29		5	max	.586	9	.563	9	0	9	0	9	NC	9	NC	9
30			min	-1.933	4	-1.855	4	-.037	6	-1.107e-4	6	NC	1	NC	1

FOOTING FORCE DESIGN @ CANOPY

Project Number	ETC 222-405	Sheet			
Project Name		Designed by		Date	
Subject	Footing Force design	Checked by		Date	

Maximum Moment in colum	=	13.445	k-ft	As per page 1012
Height of Column	=	11.33	ft	
Force, f=	=	1.187	kips	

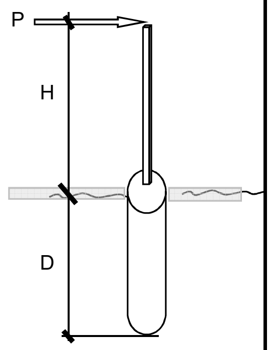
USE [2'-6" x 5'-6" Deep footing]

	FOOTING DESIGN		PAGE :
CLIENT :			DESIGN BY :
JOB NO. :		DATE :	REVIEW BY :

Flagpole Footing Design Based on Chapter 18 of IBC & CBC

INPUT DATA & DESIGN SUMMARY

IS FOOTING RESTRAINED @ GRADE LEVEL ? (1=YES,0=NO)		0	no
LATERAL FORCE @ TOP OF POLE	P =	1.2	k
HEIGHT OF POLE ABOVE GRADE	H =	11.33	ft
DIAMETER OF POLE FOOTING	B =	2.5	ft
LATERAL SOIL BEARING CAPACITY	S =	0.2	ksf / ft
ISOLATED POLE FACTOR (IBC 1804.3.1 or UBC note 3 on Tab 18-I-A)	F =	2	
FIRST TRIAL DEPTH ===>	D =	2	ft



Use 2.5 ft dia x 5.29 ft deep footing unrestrained @ ground level

ANALYSIS

LATERAL BEARING @ BOTTOM : $S_3 = FS \quad Min(D \;,\; 12')$

LATERAL BEARING @ D/3 : $S_1 = FS \quad Min\left(\frac{D}{3} \;,\; 12'\right)$

$$A = \frac{2.34P}{BS_1}$$

REQUIRD DEPTH : $$D = \begin{cases} \frac{A}{2}\left[1+\sqrt{1+\frac{4.36H}{A}}\right] & \text{, FOR NONCONSTRAINED} \\ \sqrt{\frac{4.25PH}{BS_3}} & \text{, FOR CONSTRAINED} \end{cases}$$

			NONCONSTRAINED		CONSTRAINED	
LATERAL FORCE @ TOP OF POLE	P	=>	1.20	k	1.20	k
HEIGHT OF POLE ABOVE GRADE	H	=>	11.3	ft	11.3	ft
DIAMETER OF POLE FOOTING	B	=>	2.50	ft	2.50	ft
LATERAL SOIL BEARING CAPACITY	FS	=>	0.40	ksf / ft	0.40	ksf / ft
1ST TRIAL	TRY D_1	=>	2.00	ft	2.00	ft
LAT SOIL BEARING @ 1/3 D	S_1	=>	0.27	ksf	0.27	ksf
LAT SOIL BEARING @ 1.0 D	S_3	=>	0.80	ksf	0.80	ksf
CONSTANT 2.34P/(BS_1)	A	=>	4.21	-		-
REQD FOOTING DEPTH	RQRD D	=>	9.62	ft	5.38	ft
2ND TRIAL :	TRY D2	=>	5.81	ft	3.69	ft
LAT SOIL BEARING @ 1/3 D	S_1	=>	0.77	ksf	0.49	ksf
LAT SOIL BEARING @ 1.0 D	S_3	=>	2.32	ksf	1.48	ksf
CONSTANT 2.34P/(BS_1)	A	=>	1.45	-		-
REQD FOOTING DEPTH	RQRD D	=>	5.02	ft	3.96	ft
3RD TRIAL :	TRY D3	=>	5.41	ft	3.82	ft
LAT SOIL BEARING @ 1/3 D	S_1	=>	0.72	ksf	0.51	ksf
LAT SOIL BEARING @ 1.0 D	S_3	=>	2.17	ksf	1.53	ksf
CONSTANT 2.34P/(BS_1)	A	=>	1.56	-		-
REQD FOOTING DEPTH	RQRD D	=>	5.23	ft	3.89	ft
4TH TRIAL :	TRY D4	=>	5.32	ft	3.86	ft
LAT SOIL BEARING @ 1/3 D	S_1	=>	0.71	ksf	0.51	ksf
LAT SOIL BEARING @ 1.0 D	S_3	=>	2.13	ksf	1.54	ksf
CONSTANT 2.34P/(BS_1)	A	=>	1.58	-		-
REQD FOOTING DEPTH	RQRD D	=>	5.28	ft	3.87	ft
5TH TRIAL :	TRY D5	=>	5.30	ft	3.86	ft
LAT SOIL BEARING @ 1/3 D	S_1	=>	0.71	ksf	0.52	ksf
LAT SOIL BEARING @ 1.0 D	S_3	=>	2.12	ksf	1.55	ksf
CONSTANT 2.34P/(BS_1)	A	=>	1.59	-		-
REQD FOOTING DEPTH	RQRD D	=>	5.29	ft	3.87	ft

PROJECT :		PAGE :	
CLIENT :		DESIGN BY :	
JOB NO. :	DATE :	REVIEW BY :	

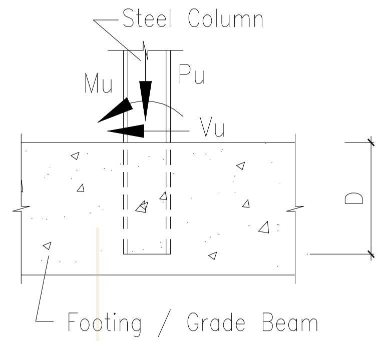
Fixed Moment Condition Design Based on ACI 318-14

INPUT DATA & DESIGN SUMMARY

COLUMN SHAPE (Tube, Pipe, or WF) & SIZE — None <== Tube

d	A	b_f
9.0	18.7	9.0

CONCRETE STRENGTH	f_c' =	3	ksi
FACTORED SHEAR LOAD	V_u =	0.145	kips
FACTORED MOMENT	M_u =	13.445	ft-kips
FACTORED VERTICAL LOAD (negative for uplift)	P_u =	3.189	kips
EMBEDMENT DEPTH	D =	18	in



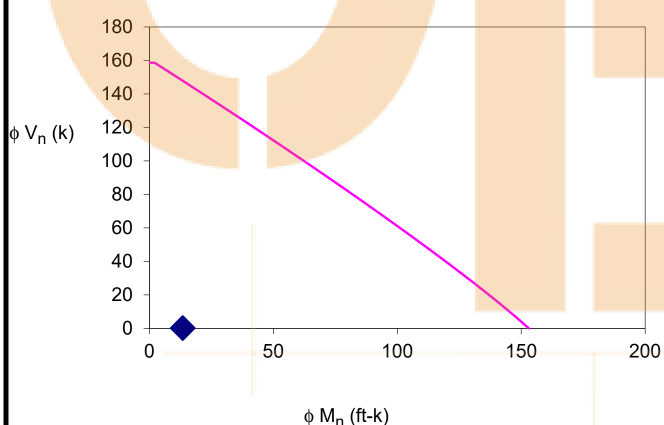
THE FIXED MOMENT DESIGN IS ADEQUATE.

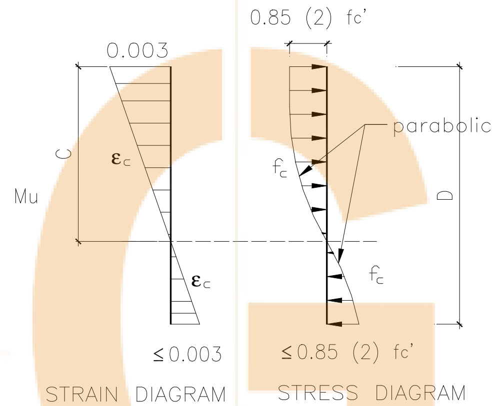
(A_{vf} = **0.0** in^2 , Required Area of Shear Studs or Welded Reinforcement)

(Edge of Concrete Footing / Grade Beam must be wider than "b_f")

ANALYSIS

CHECK BASE FLEXURAL & SHEAR CAPACITY (ACI 318 21 & 22)





$$\varepsilon_o = \frac{2f'_c}{E_c} 0.85 Min\left(\sqrt{\frac{A_2}{A_1}}\ ,\ 2\right)\ ,\ E_c = 57\sqrt{f'_c}$$

$$f_c = \begin{cases} 0.85 Min\left(\sqrt{\frac{A_2}{A_1}}\ ,\ 2\right) f'_c \left[2\left(\frac{\varepsilon_c}{\varepsilon_o}\right) - \left(\frac{\varepsilon_c}{\varepsilon_o}\right)^2\right]\ ,\ for\ \ 0<\varepsilon_c<\varepsilon_o \\ 0.85 Min\left(\sqrt{\frac{A_2}{A_1}}\ ,\ 2\right) f'_c\ ,\ for\ \ \varepsilon_c \ge \varepsilon_o \end{cases}$$

ϕ M_n = 153 ft-kips @ V_u = 0 kips

\> M_u = 13 ft-kips [Satisfactory]

ϕ $V_{n,max}$ = 158.65 kips, when C = 12.4 in

\> V_u = 0.145 ft-kips [Satisfactory]

where ϕ = 0.65 , (ACI 318 21.2)

Bearing factor = 2, (ACI 318 14.5.1.1)

b = effective bearing width = 95% b_f = 8.55 in

CHECK VERTICAL CAPACITY

ϕ P_n = End Bering + Friction = 256.4 kips > P_u = 3.189 kips [Satisfactory]

where End Bering = 0.65 (2) 0.85 f_c' A = 62.0 kips, (ACI 318 14.5.1.1)

Friction = 0.75 MAX(0.2f_c' A_c , 800 A_c) = 194.4 kips, (ACI 318 22.9.4)

A = 19 in^2, end bearing area

A_c = 0.5 (2d + 2b_f) D = 324 in^2, (0.5 for concrete cracked)

A_{vf} = $P_{u,Friction}$ / (ϕ f_y μ) = 0.0 in^2 , Required Area of Shear Studs or Welded Reinforcement

where ϕ = 0.75 , (ACI 318 21.2)

μ = 0.70 , (ACI 318 22.9.4.2)

f_y = 60 ks

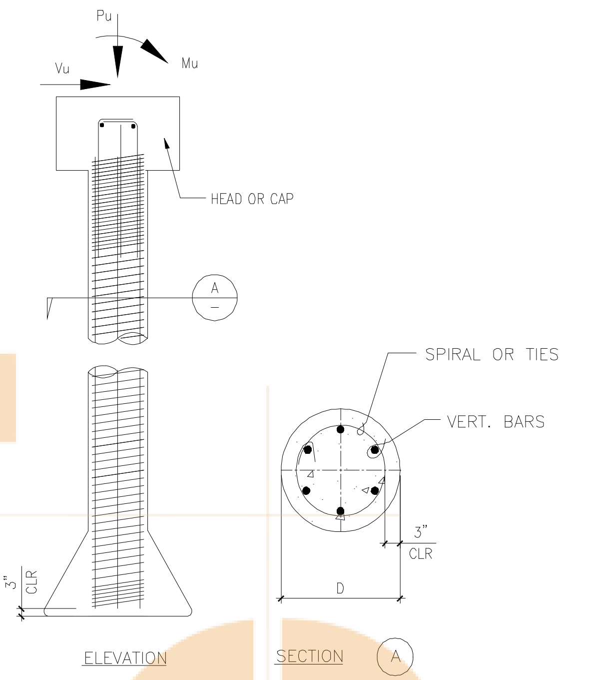
PROJECT :		PAGE :	
CLIENT :		DESIGN BY :	
JOB NO. :	DATE :	REVIEW BY :	

Concrete Pier (Isolated Deep Foundation) Design Based on ACI 318-14

INPUT DATA & DESIGN SUMMARY

CONCRETE STRENGTH	f_c'	=	3	ksi
VERT. REBAR YIELD STRESS	f_y	=	60	ksi
PIER DIAMETER	D	=	30	in
PIER LENGTH	L	=	5.5	ft
FACTORED AXIAL LOAD	P_u	=	3.189	k
FACTORED MOMENT LOAD	M_u	=	13.445	ft-k
FACTORED SHEAR LOAD	V_u	=	0.145	k
PIER VERT. REINF.	6	#	8	
SEISMIC DESIGN (ACI 18.13.4) ?			NO	
LATERAL REINF. OPTION (0=Spirals, 1=Ties)			1	Ties
LATERAL REINFORCEMENT	# 4	@	9	in o.c.

(spacing 4.5 in o.c. at top end of 2.5 ft.)
(2015 IBC 1810.3.9)



THE PIER DESIGN IS ADEQUATE.

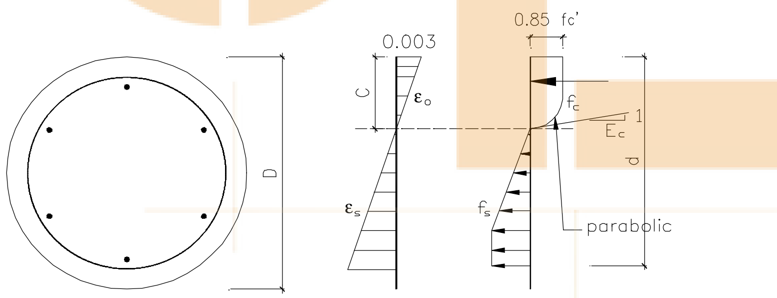
ANALYSIS

CHECK PIER LIMITATIONS

f_c' = 3 ksi > 2.5 ksi
[Satisfactory] (2015 IBC Table 1808.8.1)

D = 30 in > MAX(L / 12 , 24 in)
[Satisfactory] (2015 IBC 1810.2.2)

CHECK FLEXURAL & AXIAL CAPACITY



STRAIN DIAGRAM FORCE DIAGRAM

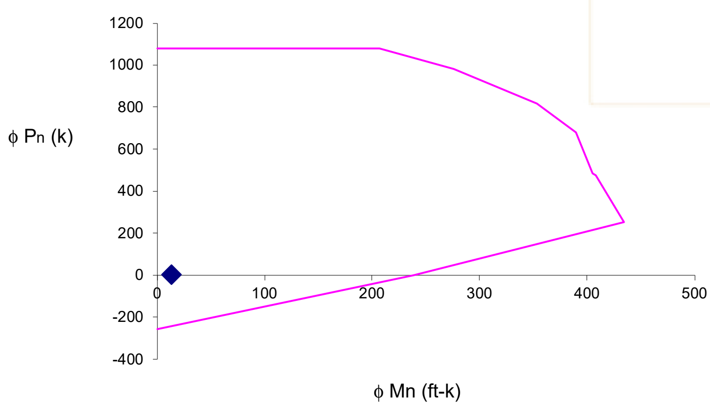
$$\varepsilon_o = \frac{2\left(0.85 f'_c\right)}{E_c} \ , \ E_c = 57\sqrt{f'_c} \ , \ E_s = 29000 ksi$$

$$f_c = \begin{cases} 0.85 f'_c \left[2\left(\frac{\varepsilon_c}{\varepsilon_o}\right) - \left(\frac{\varepsilon_c}{\varepsilon_o}\right)^2 \right] \ , \ for \ \ 0 < \varepsilon_c < \varepsilon_o \\ 0.85 f'_c \ , \ for \ \ \varepsilon_c \ge \varepsilon_o \end{cases}$$

$$f_s = \begin{cases} \varepsilon_s E_s \ , \ for \ \ \varepsilon_s \le \varepsilon_y \\ f_y \ , \ for \ \ \varepsilon_s > \varepsilon_y \end{cases}$$

ϕP_{max} =F ϕ [0.85 f_c' (A_g - A_{st}) + f_y A_{st}] = 1078.9 kips., (at max axial load, ACI 318-14 22.4) > Pu [Satisfactory]

where F = 0.8 , ACI 318-14 22.4.2
ϕ = 0.65 (ACI 318-14 21.2)
A_g = 707 in^2. A_{st} = 4.74 in^2.



	ϕ Pn (kips)	ϕ Mn (ft-kips)
AT COMPRESSION ONLY	1079	0
AT MAXIMUM LOAD	1079	207
AT 0 % TENSION	980	276
AT 25 % TENSION	816	353
AT 50 % TENSION	679	390
AT ε_t = 0.002	483	405
AT BALANCED CONDITION	475	408
AT ε_t = 0.005	251	434
AT FLEXURE ONLY	0	239
AT TENSION ONLY	-256	0

(cont'd)

$a = C_b \beta_1$ = 13 in (at balanced strain condition, ACI 21.2.2)

ϕ = 0.75 + (ε_t - 0.002) (50), for Spiral
0.65 + (ε_t - 0.002) (250 / 3), for Ties = 0.656 (ACI 318-14 21.2)

where C_b = d ε_c / (ε_c + ε_s) = 15 in ε_t = 0.002069 ε_c = 0.003

d = 26 in, (ACI 20.6) β_1 = 0.85 (ACI 318-14 22.2.2.4.3)

$\phi M_n = 0.9 M_n$ = 239 ft-kips @ P_n = 0, (ACI 318-14 21.2) ,& $\varepsilon_{t,max}$ = 0.004, (ACI 318-14, Sec. 21.2.3)

ϕM_n = 241 ft-kips @ P_u = 3 kips > Mu **[Satisfactory]**

ρ_{max} = 0.08 (ACI 318-14 10.6) ρ_{provd} = 0.007

ρ_{min} = 0.005 (2015 IBC 1810.3.9.4.2) **[Satisfactory]**

CHECK SHEAR CAPACITY

$\phi V_n = \phi (V_s + V_c)$ = 96 kips, (ACI 318-14 22.5)

> Vu **[Satisfactory]**

where ϕ = 0.75 (ACI 318-14 21.2)

A_0 = 531 in^2. A_v = 0.40 in^2. f_y = 60 ksi

V_c = $2 (f_c')^{0.5} A_0$ = 58.2 kips, (ACI 318-14 22.5)

V_s = MIN (d f_y A_v / s , 8 $(f_c')^{0.5} A_0$) = 69.3 kips, (ACI 318-14 22.5.1)

s_{max} = 12 (2015 IBC 1810.3.9.4.2) s_{provd} = 9 in

s_{min} = 1 **[Satisfactory]**

ρ_s = 0.12 f_c' / f_{yt} = 0.006 > $\rho_{s,provd}$ = 0.005 **[Satisfactory]** (ACI 318-14 18.13.4.3 & 18.7.5.1)

KNEE BRACE CONNECTION DESIGN

Project Number	East Texas 222-405	Sheet			
Project Name		Designed by		Date	
Subject	Design Loads	Checked by		Date	

We have maximum Axial compression force of	=	2.08	k	As per page 1012
we have maximum Axial tension force of	=	5.62	k	As per page 1012

compression force Resisted by 6x8x0.188 welded Gussets

CHECKING THE BOLTS TO RESIST TENSION

Capacity of two 1/2" dia box bolt	=	3280	x	2	As per page 1025	
	=	6560	>	5615		OK

USE [[4] 1/2" ø SS type -C Box expansion bolt at top & fully welded to column typical all brace tube]

BEAM TO COLUMN CONNECTION DESIGN

Max.moment, M	=	4.27	k-ft	As per page 1012
Force, f	=	2.13	kips	

Aluminium properties of 6061-T6

F_{ty}	=	35.00	ksi
F_{sy}	=	21.00	ksi
Allowable Shear Stress of Shear plane (50%)	=	10.5	ksi
Shear area for 1/2" bolts	=	0.1963	in^2

Capacity of two 1/2" dia SS through bolt

= 2.0606 < 2.133 OK

USE [[4] 1/2" ø SS through bolts for beam to column connection]

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DIVISION: 05 00 00—METALS
SECTION: 05 05 27—METAL CONNECTORS

REPORT HOLDER:

LNA SOLUTIONS—A KEE SAFETY LOGISTIC LTD

EVALUATION SUBJECT:

BOXBOLT® TYPE C BLIND FASTENERS

ICC-ES Evaluation Report

ESR-3217

Reissued April 2019

This report is subject to renewal April 2021.

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DIVISION: 05 00 00—METALS
Section: 05 05 27—Metal Connectors

REPORT HOLDER:

LNA SOLUTIONS—A KEE SAFETY LOGISTIC LTD

EVALUATION SUBJECT:

BOXBOLT® TYPE C BLIND FASTENERS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2015, 2012 and 2009 *International Building Code®* (IBC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)†

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Property evaluated:

Structural

2.0 USES

BoxBolt® Type C Blind Fasteners are designed for connecting structural steel to hollow structural section (HSS) steel members and other structural steel elements where access is difficult or is restricted to one side only. BoxBolt® Type C fasteners are intended for use with rectangular or square HSS members and are recognized for resisting static dominant tension and shear loads in bearing-type connections, and for resisting static dominant lateral loads in slip-critical connections, where static dominant loads include load combinations with gravity and wind loads for structures assigned to all Seismic Design Categories and load combinations with seismic loads for structures assigned to Seismic Design Category (SDC) A, B or C. The BoxBolt® Type C Blind Fasteners are alternatives to bolts described in Section J3 of AISC 360, which is referenced in Section 2205.1 of the IBC.

BoxBolt® Type C Blind Fasteners may also be used to resist load combinations with seismic loads for structures assigned to Seismic Design Categories (SDCs) D, E and F, based on cyclic test data in accordance with Sections 3.0 and 4.4 of the ICC-ES Acceptance Criteria for Expansion Bolts in Structural Steel Connections (AC437).

3.0 DESCRIPTION

3.1 General:

BoxBolt® Type C Blind Fasteners are assembled from four components, consisting of the core bolt (or set screw), the body (or shell), the shoulder (or collar), and the cone (or conical nut). The steel core bolt features a full-length threaded shank and a hexagonal head. The body is a steel segmented hollow cylinder, with four slits along the length of the cylinder, and are located at 90 degrees from each other. The collar is a steel flat hexagonal element with a circular hole at its center. The cone is a steel circular internally threaded nut with knurling on one end for interacting with the body. Nominal BoxBolt® diameters include $^1/_2$ inch (12.0 mm), $^5/_8$ inch (16.0 mm), and $^3/_4$ inch (20.0 mm), with each diameter of bolt available in three lengths. Figure 1 provides a picture of the BoxBolt®. Table 1 provides part codes, dimensions and installation information. Table 2 provides BoxBolt® Type C fastener strength information.

3.2 Materials:

3.2.1 Core Bolt: The core bolt is manufactured from steel complying with ISO 4017, Class 8.8 in accordance with ISO 898-1, having a specified tensile strength, F_u, of 116,030 psi (800 MP_a) for the M12 and M16 bolts, and 120,380 psi (830 MP_a) for the M20 bolts.

3.2.2 Body, Collar and Cone: The body, collar, and cone are manufactured from steel complying with BS EN 10083 Grade C22E (1.1151).

3.2.3 Finish: All components are hot dip galvanized in accordance with BS EN ISO 1461 with a mean coating thickness of 2.2 mil (55 μm), as described in the report holder's quality documentation.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The BoxBolt® Type C Blind Fasteners are alternatives to bolts described in Section J3 of AISC 360, which is referenced in Section 2205.1 of the IBC, for bearing-type connections and for slip-critical connections.

The design of the BoxBolt® Type C Blind Fasteners must comply with this report, Section J3 of AISC 360 and the information for the BoxBolt® provided in Tables 1 and 2 of this report.

For BoxBolt® Type C Blind Fasteners used in structures assigned to Seismic Design Categories (SDCs) D, E and F, the fasteners are intended to be used as force-controlled components and are not expected to undergo inelastic deformations. The construction documents (including structural calculations and engineering plans) specifying the BoxBolt® Type C Blind Fasteners, must consider this requirement for a force-controlled behavior, and additional requirements in AISC 341, as applicable.

The load-carrying capacity of a connection utilizing BoxBolt® Type C Blind Fasteners depends on the fasteners' capacities as shown in Table 2, the affected

elements of members and connecting elements, and the interaction between the fasteners and the connected elements. All applicable limit states of a connection must be checked to determine the load-carrying capacity of the connection. The available strength of a connection is limited by the governing limit state (or the limit state with the least available strength), which occurs in the weakest component in the connection, typically the steel section itself in the case of thin steel sections, or the BoxBolt® in the case of thick wall steel sections, or a combination of the two.

Connections subjected to combined static tension loading and static shear-bearing loading must comply with the following:

$$\left(\frac{Tension\ Demand}{Tension\ Capacity}\right)^2 + \left(\frac{Shear\ Demand}{Shear\ Capacity}\right)^2 \leq 1.0$$

4.2 Installation:

The BoxBolt® Type C Blind Fasteners must be installed in accordance with the details noted in this section, the manufacturer's installation instructions and the approved plans. In case of a conflict between this report and the report holder's installation instructions, the most restrictive requirement governs.

1. Holes must be drilled into the sections to be connected, ensuring that the resulting holes have the correct diameter, spacing and edge distance according to the report holder's published specifications, this evaluation report and the correct design requirements for the connection, as indicated in the approved plans. Holes must be standard diameter holes conforming to AISC 360, where the bolt hole diameters must be no greater than the bolt shell diameter plus $^1/_{16}$ inch (1.6 mm).
2. Burrs in the holes must be removed before insertion of the BoxBolt® Type C Blind Fasteners.
3. The structural steel elements to be fastened adjacent to each other must be positioned to ensure:
   a. That the two sections are lined up and rest one against the other without any gap. Clamps must be used as necessary to hold the two sections together and prevent formation of gaps.
   b. That the holes are aligned, using a mandrel if necessary.
4. The core bolts must be positioned in the holes. The collar must rest flat against the section with no gap.
5. The collar must be held in position using a suitable open-ended wrench, and then the core bolt must be tightened to the specified torque, as noted in Table 1 of this report.
6. The tightening tool must then be removed and the tightening torque on the bolt must be verified. If necessary, the tightening torque must be corrected.

4.3 Special Inspection:

Special inspection is required in accordance with 2015 and 2012 IBC Sections 1704.3, 1705.1.1 and 1705.2 (2009 IBC Sections 1704.3, 1704.15 and 1705), as applicable). The report holder must submit inspection procedures to verify proper installation of the BoxBolts® Type C Blind Fasteners. Where BoxBolts® Type C Blind Fasteners are used for seismic or wind load resistance, special inspection must comply with 2015 IBC Sections 1705.11, 1705.12 and 1705.13 (2012 IBC Sections 1705.10, 1705.11 and 1705.12; 2009 IBC Sections 1706, 1707 and 1708; as applicable).

4.4 Packaging:

Each package of the BoxBolt® Type C Blind Fasteners must include the following information: installation and safety instructions, minimum and maximum fixing ranges (or the total thickness of elements to be connected), installation torque, design loads and special inspection requirements.

5.0 CONDITIONS OF USE

The BoxBolt® Type C Blind Fasteners described in this report comply with, or are suitable alternatives to what is specified in, the codes noted in Section 1.0 of this report, subject to the following conditions:

5.1 Steel structures utilizing BoxBolt® Type C Blind Fasteners must be designed in accordance with the IBC including its referenced standards (such as AISC 360 and AISC 341) and this evaluation report; and must be installed in accordance with this evaluation report and the report holder's installation instructions. In case of a conflict between this evaluation report and the report holder's installation instructions, the most restrictive requirement governs.

5.2 Calculations and details, justifying the use of the BoxBolt® Type C Blind Fasteners is in compliance with the applicable code and this evaluation report, including showing that the BoxBolt® fasteners, the affected elements of members and connecting elements are adequate to resist the applied loads, must be submitted to the code official for approval. The calculations and details must be signed and sealed by a registered design professional, when required by the statutes of the jurisdiction in which the project is to be constructed.

5.3 **Fire-resistive Construction:** Where not otherwise prohibited in the code, BoxBolt® Type C Fasteners are permitted for use with fire-resistance-rated construction provided that at least one of the following conditions is fulfilled:

- The BoxBolt® fasteners are used to resist wind or seismic forces only.
- BoxBolt® fasteners that support a fire-resistance-rated envelope or a fire-resistance-rated membrane, are protected by approved fire-resistance-rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
- The BoxBolt® fasteners are used to support nonstructural elements.

5.4 Special inspection must be provided as specified in Section 4.3 of this report.

5.5 For BoxBolt® Type C Blind Fasteners used in structures assigned to Seismic Design Categories (SDCs) D, E and F, the fasteners are intended to be used as force-controlled components and are not expected to undergo inelastic deformations, and the design professional must consider this force-controlled behavior in his design.

5.6 The BoxBolt® Type C Fasteners addressed in this evaluation report are manufactured under a quality program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Expansion Bolts in Structural Steel Connections (AC437), dated October 2014 (editorially revised December 2016).

7.0 IDENTIFICATION

7.1 The BoxBolt® Type C fastener package is labeled with the product part number, quantity, batch number, image of the product, report holder's name (LNA Solutions—A Kee Safety Logistic Ltd.), and the evaluation report number (ESR-3217).The fastener is identified by a nine-character alphanumeric part number (BQXGALXXC). The first three characters (BQX) indicate the length of the fastener (Size 1, 2, or 3). The second three characters (GAL) indicate the fasteners are coated with a hot dip galvanized coating. The last three characters (XXC) indicate the diameter and type of fastener, where XX is the numeric diameter in millimeters (12, 16 or 20), and C identifies the fastener as a Type C fastener. Each core bolt is stamped with a head marking of "ATBX". Each collar is stamped with "BOXBOLT" and part number.

7.2 The report holder's contact information is the following:

LNA SOLUTIONS—A KEE SAFETY LOGISTIC LTD
3924A VARSITY DRIVE
ANN ARBOR, MICHIGAN 48108
(888) 724-2323
www.LNASolutions.com
jclements@lnasolutions.com

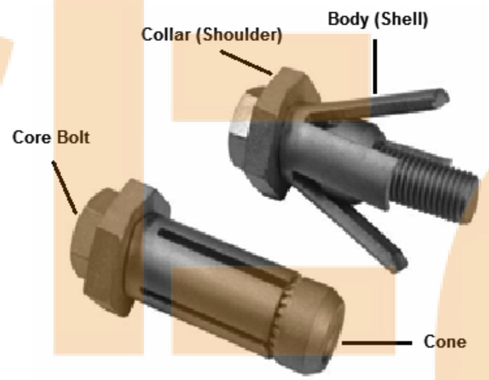


FIGURE 1—TYPICAL BOX BOLT® TYPE C BLIND FASTENER

TABLE 1—BOXBOLT® TYPE C BLIND FASTENER DIMENSIONAL AND INSTALLATION INFORMATION[1]

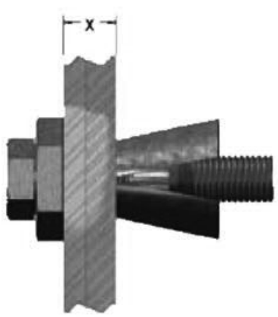
PART NUMBER AND DESCRIPTION			DIMENSIONAL INFORMATION[3]							INSTALLATION INFORMATION[3]	
BoxBolt® (Part Code)	BoxBolt® (Core Bolt Diameter)	Description[2]	Core Bolt Length	Clamping Range (dim x) Min	Clamping Range (dim x) Max	Across Flats of Shoulder	Collar Thickness	Dim A	Dim B	Dim C Drill Dia	Torque (ft-lb)
BQ1GAL12C	$^{1}/_{2}$" (12 mm)	$^{1}/_{2}$" BoxBolt® Size 1	$2^{3}/_{16}$" (55 mm)	$^{1}/_{2}$"	$^{15}/_{16}$"	1" (26 mm)	$^{5}/_{16}$" (8.4 mm)	$2^{1}/_{16}$" (52 mm)	$1^{1}/_{8}$"	$^{13}/_{16}$"	60
BQ2GAL12C	$^{1}/_{2}$" (12 mm)	$^{1}/_{2}$" BoxBolt® Size 2	$3^{1}/_{8}$" (80 mm)	$^{3}/_{4}$"	$1^{7}/_{8}$"	1" (26 mm)	$^{5}/_{16}$" (8.4 mm)	$2^{1}/_{16}$" (52 mm)	$1^{1}/_{8}$"	$^{13}/_{16}$"	60
BQ3GAL12C	$^{1}/_{2}$" (12 mm)	$^{1}/_{2}$" BoxBolt® Size 3	4" (100 mm)	$1^{1}/_{2}$"	$2^{11}/_{16}$"	1" (26 mm)	$^{5}/_{16}$" (8.4 mm)	$2^{1}/_{16}$" (52 mm)	$1^{1}/_{8}$"	$^{13}/_{16}$"	60
BQ1GAL16C	$^{5}/_{8}$" (16 mm)	$^{5}/_{8}$" BoxBolt® Size 1	3" (75 mm)	$^{5}/_{8}$"	$1^{3}/_{8}$"	$1^{7}/_{16}$" (36 mm)	$^{3}/_{8}$" (9.4 mm)	$2^{11}/_{16}$" (68 mm)	$1^{3}/_{8}$"	$1^{1}/_{16}$"	140
BQ2GAL16C	$^{5}/_{8}$" (16 mm)	$^{5}/_{8}$" BoxBolt® Size 2	4" (100 mm)	1"	$2^{5}/_{16}$"	$1^{7}/_{16}$" (36 mm)	$^{3}/_{8}$" (9.4 mm)	$2^{11}/_{16}$" (68 mm)	$1^{3}/_{8}$"	$1^{1}/_{16}$"	140
BQ3GAL16C	$^{5}/_{8}$" (16 mm)	$^{5}/_{8}$" BoxBolt® Size 3	$4^{3}/_{4}$" (120 mm)	2"	$3^{1}/_{16}$"	$1^{7}/_{16}$" (36 mm)	$^{3}/_{8}$" (9.4 mm)	$2^{11}/_{16}$" (68 mm)	$1^{3}/_{8}$"	$1^{1}/_{16}$"	140
BQ1GAL20C	$^{3}/_{4}$" (20 mm)	$^{3}/_{4}$" BoxBolt® Size 1	4" (100 mm)	$^{3}/_{4}$"	$1^{13}/_{16}$"	$1^{13}/_{16}$" (46 mm)	$^{7}/_{16}$" (11.4 mm)	$3^{7}/_{16}$" (87 mm)	$1^{3}/_{4}$"	$1^{3}/_{8}$"	220
BQ2GAL20C	$^{3}/_{4}$" (20 mm)	$^{3}/_{4}$" BoxBolt® Size 2	$5^{1}/_{8}$" (130 mm)	$1^{5}/_{16}$"	3"	$1^{13}/_{16}$" (46 mm)	$^{7}/_{16}$" (11.4 mm)	$3^{7}/_{16}$" (87 mm)	$1^{3}/_{4}$"	$1^{3}/_{8}$"	220
BQ3GAL20C	$^{3}/_{4}$" (20 mm)	$^{3}/_{4}$" BoxBolt® Size 3	6" (150 mm)	$2^{9}/_{16}$"	4"	$1^{13}/_{16}$" (46 mm)	$^{7}/_{16}$" (11.4 mm)	$3^{7}/_{16}$" (87 mm)	$1^{3}/_{4}$"	$1^{3}/_{8}$"	220

For **SI:** 1 inch = 25.4mm; 1 lbf = 4.448N; 1 ft-lb = 1.356 N-m.

[1]When dimensions are expressed in both US Customary and SI units; BoxBolt® dimensions in US Customary units are converted from the corresponding SI units.

[2]BoxBolt® size is determined by core bolt length.

[3]Dimension "X" is the total thickness of the connected steel elements (or the grip); "A" is the minimum spacing between fasteners; "B" is the minimum edge distance for the fasteners; and "C" is the standard hole diameters for the fasteners.



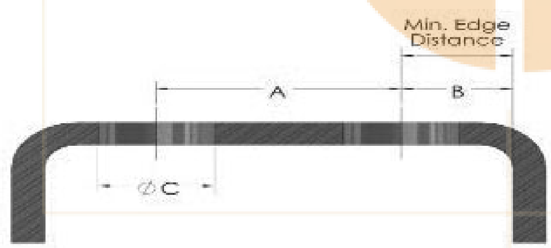


TABLE 2—BOXBOLT® TYPE C BLIND FASTENER STRENGTH INFORMATION

PART CODE	LRFD STRENGTHS[1] (lbf)						ASD STRENGTHS[2] (lbf)					
	Static Dominant Loads[3]			Seismic SDC D, E or F[4]			Static Dominant Loads[3]			Seismic SDC D, E or F[4]		
	Shear-bearing	Shear-slip resistance	Tension	Shear-bearing	Shear-slip resistance	Tension	Shear-bearing	Shear-slip resistance	Tension	Shear-bearing	Shear-slip resistance	Tension
BQ1GAL12C	7680	150	5250	6900	150	4730	4800	90	3280	4320	100	2960
BQ2GAL12C	7680	150	5250	6900	150	4730	4800	90	3280	4230	100	2960
BQ3GAL12C	7680	150	5250	6900	150	4730	4800	90	3280	4320	100	2960
BQ1GAL16C	12200	170	13100	11000	170	11400	7650	110	8230	6870	110	7120
BQ2GAL16C	12200	170	13100	11000	170	11400	7650	110	8230	6870	110	7120
BQ3GAL16C	12200	170	13100	11000	170	11400	7650	110	8230	6870	110	7120
BQ1GAL20C	17600	790	15000	11800	790	13500	11000	490	9400	7380	500	8470
BQ2GAL20C	17600	790	15000	11800	790	13500	11000	490	9400	7380	500	8470
BQ3GAL20C	17600	790	15000	11800	790	13500	11000	490	9400	7380	500	8470

For **SI:** 1 lbf = 4.448N.

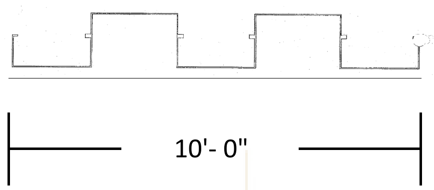
[1]Load and Resistance Factor Design (LRFD) strengths are derived in accordance AC437, Sections 3.4, 3.5, 3.7 and 3.8, based on test data per AC437 Section 4.0.
[2]Allowable Strength Design (ASD) strengths are derived in accordance AC437, Sections 3.4, 3.5, 3.9 and 3.10, based on test data per AC437 Section 4.0.
[3]Static dominant loads include load combinations with gravity and wind loads for structures assigned to all Seismic Design Categories and load combinations with seismic loads for structures assigned to Seismic Design Category (SDC) A, B or C.
[4]Seismic SDC D, E or F refer to load combinations with seismic loads for structures assigned to Seismic Design Category (SDC) D, E or F.

DECK DESIGN @ CANOPY 01 SECTION A1

Project Number	East Texas 222 - 405	Sheet	1,501		
Project Name		Designed by		Date	
Subject	DECK DESIGN	Checked by		Date	

Deck Design

Max Span on Deck = 10 ft



WL on Deck = 34.572 psf
RLL on Deck = 20 psf

For 10.0 ft Span

Allowable Wind Load =	**73.0**	**>**	**34.6**	psf
Allowable Live Load =	**75.0**	**>**	**20.0**	psf

USE [2 3/4" x 6" x 0.078" Aluminum Decking] as per page 1027

Deck Fastner Design

Uplift on Deck = 34.572 psf X $\frac{6"}{12"/ft}$ X $\frac{8.00 \text{ ft}}{2}$ = **34.6 Lbs**

Pull out strength of Steel Binder Heavy guage #12 screws = 996 lbs as per page 1028

Allowable Pull Out = 996 lbs/4 (factor of Safety) = **249.0 Lbs** **>** **34.6 Lbs**

SAFE

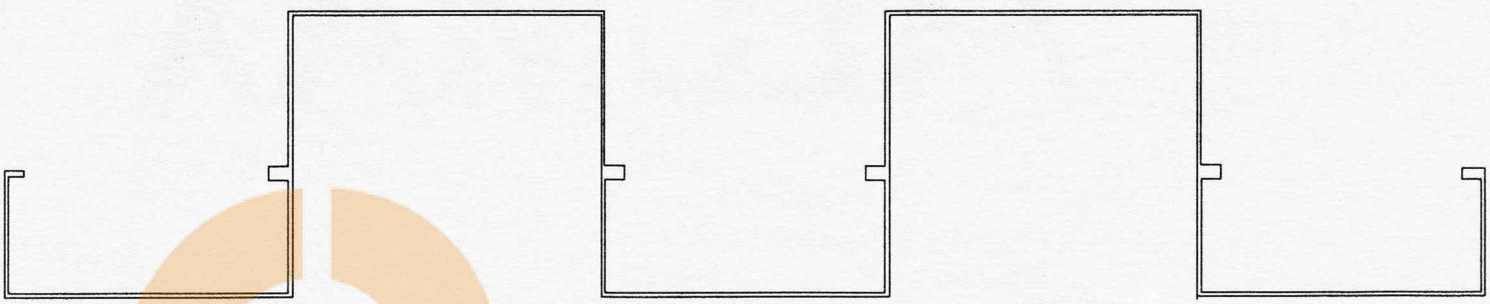
USE [2 #12 screws @6" o.c.]

WALKWAY COVER DECKS

SAFETY FACTOR OF 1.95 FROM ULTIMATE STRESS
CHARTS SHOW TOTAL ALLOWABLE LOAD PER BENT.
ALL PROFILES ARE 6063-T6 IN ACCORDANCE WITH ASTM STDS. WELD STRESS IN ACCORDANCE WITH ALUMINUM ASSOCIATION STANDARDS. ALL DESIGN STRESS AND FACTORS OF SAFETY.

1502

1027



6″ DECK

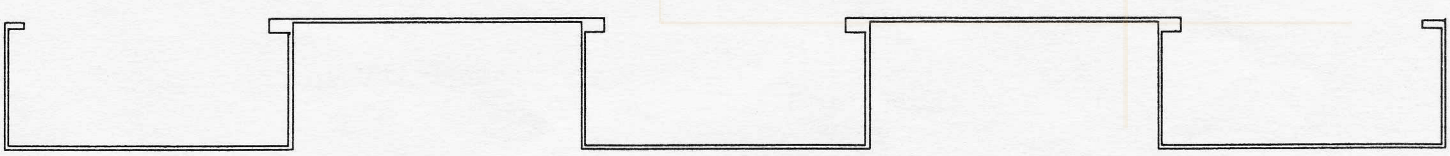
Span (FT.)	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Gravity *	57	51	46	41	38	34	31	29	26	24	23	21	20	18	17	16	15	14
Wind *	68	61	54	49	45	41	37	34	31	29	27	25	23	22	20	19	18	17
L/180 *	69	58	49	42	36	32	28	24	22	19	17	15	14	12	11	10	9	9

* (PFS)

4-1/2″ DECK

Span (FT.)	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Gravity *	75	64	55	48	42	38	33	30	27	25	22	21	19	17	16	15	14	13
Wind *	89	76	65	57	50	44	39	35	32	29	26	24	22	20	19	18	16	15
L/180 *	95	75	60	49	40	34	28	24	21	18	15	14	12	11	9	8	8	7

* (PSF)

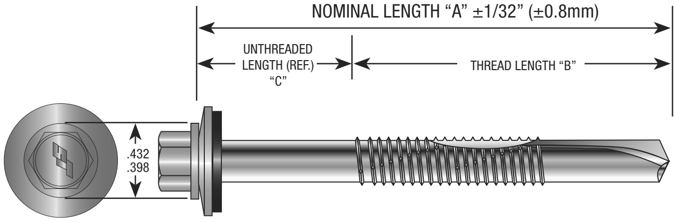


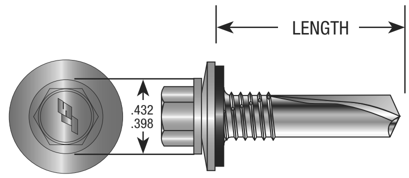
2-3/4″ DECK

Span (FT.)	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Gravity *	118	93	75	62	52	45	38	34	29	26	23	21	19	17	16
Wind *	114	90	73	61	51	43	37	33	29	25	23	20	18	17	15
L/180 *	123	86	63	47	36	29	23	19	15	13	11	9	8	7	6

* (PSF)

Steelbinder® Heavy Gauge





SPECIFICATIONS SUMMARY

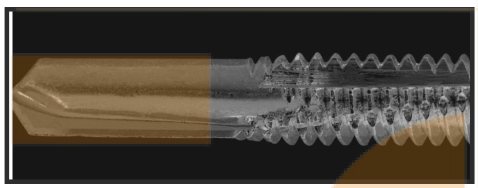
#12-24 Dimensions:

Drill Point: #4/#5
Major Diameter: .215”/.209”
Minor Diameter: .164” REF
Hex Across Flats: .311/.305

SIZE	HEAD STYLE	CARTON QTY.	WEIGHT/M
12-24 x 7/8”	HWH	2500	12.0
12-24 x 1-1/4”	HWH	2500	12.6
12-24 x 1-1/2”	HWH	2000	16.2
12-24 x 2”	HWH	1500	22.1

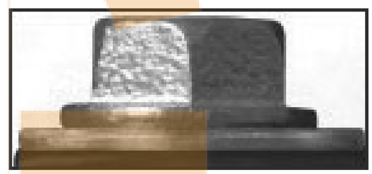
PERFORMANCE DATA

PULL OUT STRENGTH VALUE (LBS. ULT.)		MATERIAL			
		HRS Primed Only		HRS PLATE	
	NOM. GAUGE	14	12	3/16”	1/4”
	THICKNESS	.070	.106	.187	.250
#12-24 HEAVY GAUGE		924	1627	2556	3298

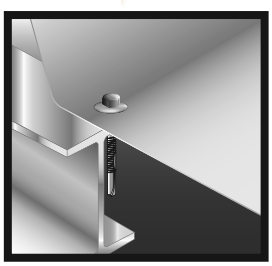


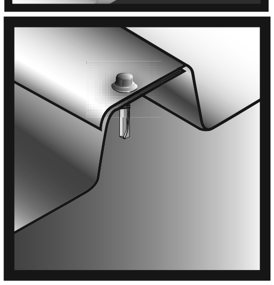
Long Drill point assures proper clearance of heavy gauge metal before any thread engagement begins

PULL OVER STRENGTH VALUE (LBS. ULT.)	DESIGNATION	MATERIAL		
		AZ55 GALVALUME		
	NOM. GAUGE	26	24	22
	THICKNESS	.019	.024	.032
BONDED WASHER (14mm O.D.)		801	996	1258
(.398/.432 HWH DIA.)		775	956	1078



HWH with EPDM bonded washer provides a secure seal to prevent leaks.





- Fastener lengths over 1-1/4”are designed to penetrate steel thickness up to .500”. 12-24 x 7/8” is designed to drill up to .250”.
- Thread to point ratio engineered to provide maximum pull out strength in heavy gauge steel.
- EPDM rubber is vulcanized to steel washer. Moisture has no place to penetrate. The washer provides a secure seal even when driven at an angle.
- Applications include metal deck to structural steel or bar joists, & retrofit clips to structural steel.
- Fastener is also available without a bonded sealing washer.

NOTES: *1. HRS (Hot Rolled Steel)*
2. All strength values shown are ultimate values, expressed in LBS. Apply an appropriate safety factor to obtain design limits.

SEALTITE BUILDING FASTENERS
www.sealtite.com

6357 Reynolds Road
P.O. Box 4515, Tyler, Texas 75712
800-352-4864 • 800-352-3940 Fax
903-592-2826 • 903-592-1583 Fax

9950 Princeton Glendale Rd.
Cincinnati, OH 45246
800-944-8920 • 800-944-4183 Fax
513-874-5905 • 513-874-5903 Fax

DESIGN OF COLUMN SUPPORTED CANOPY 1 @ SECTION A2

Project Number	ETC 222-405	Sheet	
Project Name		Designed by	Date
Subject	DESIGN LOADS	Checked by	Date

TRIB WIDTH **10** **ft**

LOAD CALCULATION (DEAD & LIVE)

DEAD LOAD (W)	=	3	psf	x	10	=	30.00 plf
LIVE LOAD	=	20	psf	x	10	=	200.00 plf

WIND LOAD CASE A

WINDWARD	=	27.13	psf	x	10		=	271.30 plf
LEEWARD	=	6.78	psf	x	10		=	67.80 plf
ALONG THE RIDGE	=	18.09	1.33	x		10	=	240.60 lbs

(depth of beam 8") / 6" = 1.33

WIND LOAD CASE B

WINDWARD	=	-24.87	psf	x	10		=	-248.70 plf
LEEWARD	=	-2.26	psf	x	10		=	-22.60 plf
ALONG THE RIDGE	=	-18.09	1.33	x		10	=	-240.60 lbs

(depth of beam 8") / 6" = 1.33

SEISMIC LOADS

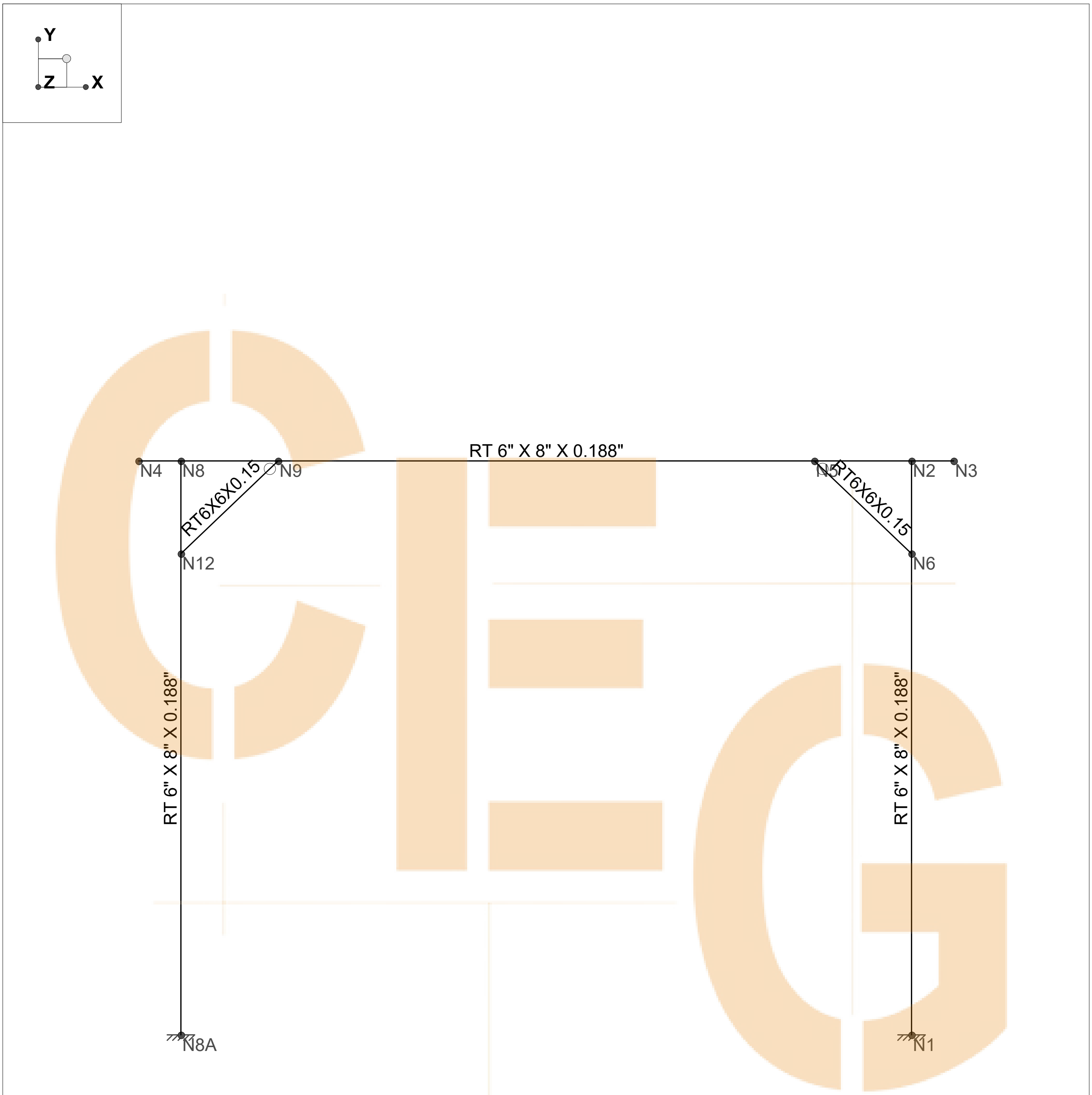
LATERAL SEISMIC FORCE **V = Cs x W**

Seismic Co-efficient (ASD) (As per page = **Cs =** 0.09

W, Weight of the Component W = 30.00 plf

V = 2.70 plf

USE = 3.00 plf



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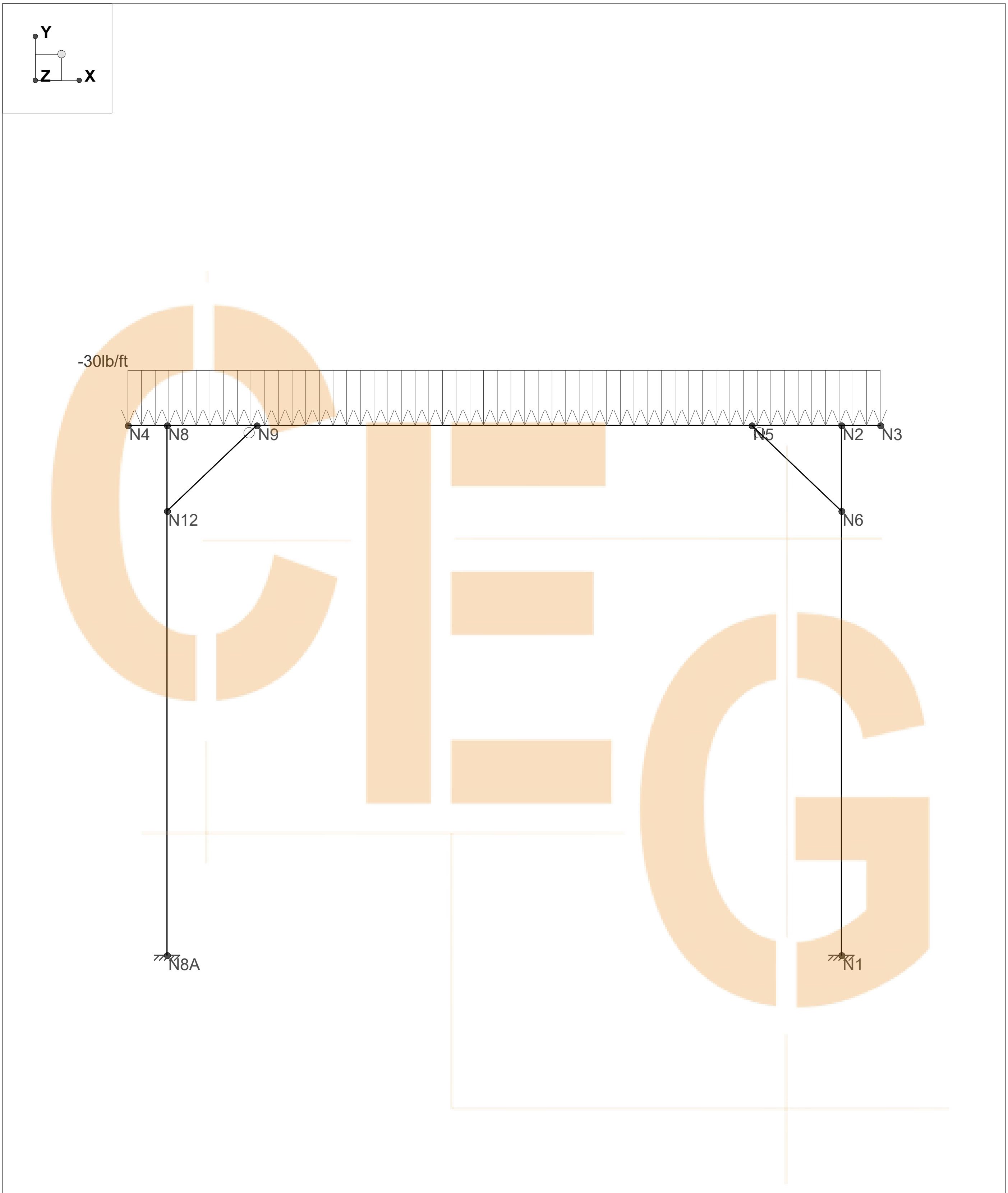
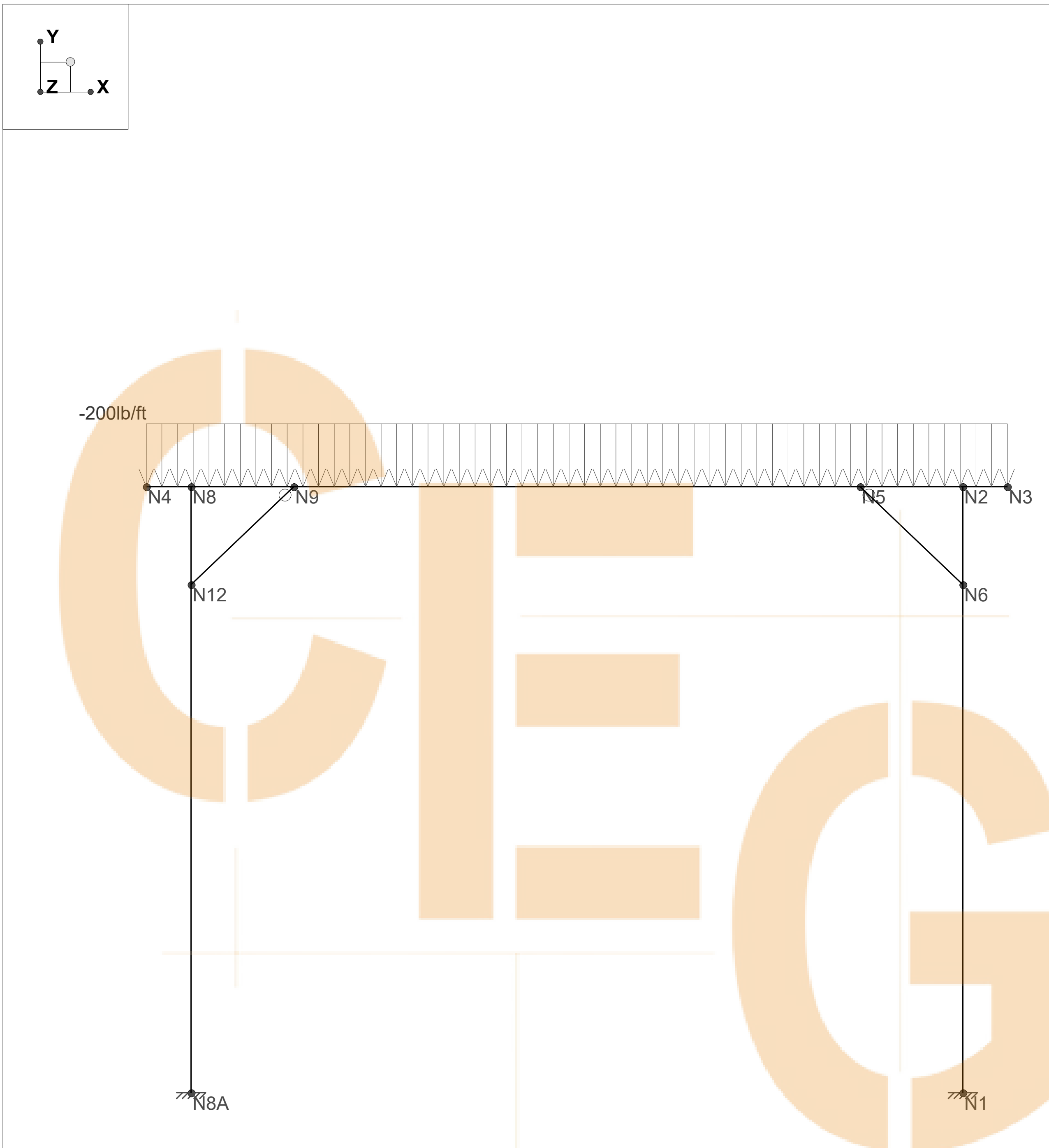
East Texas 222-405		Canopy # 1 SECTION A2.r3d



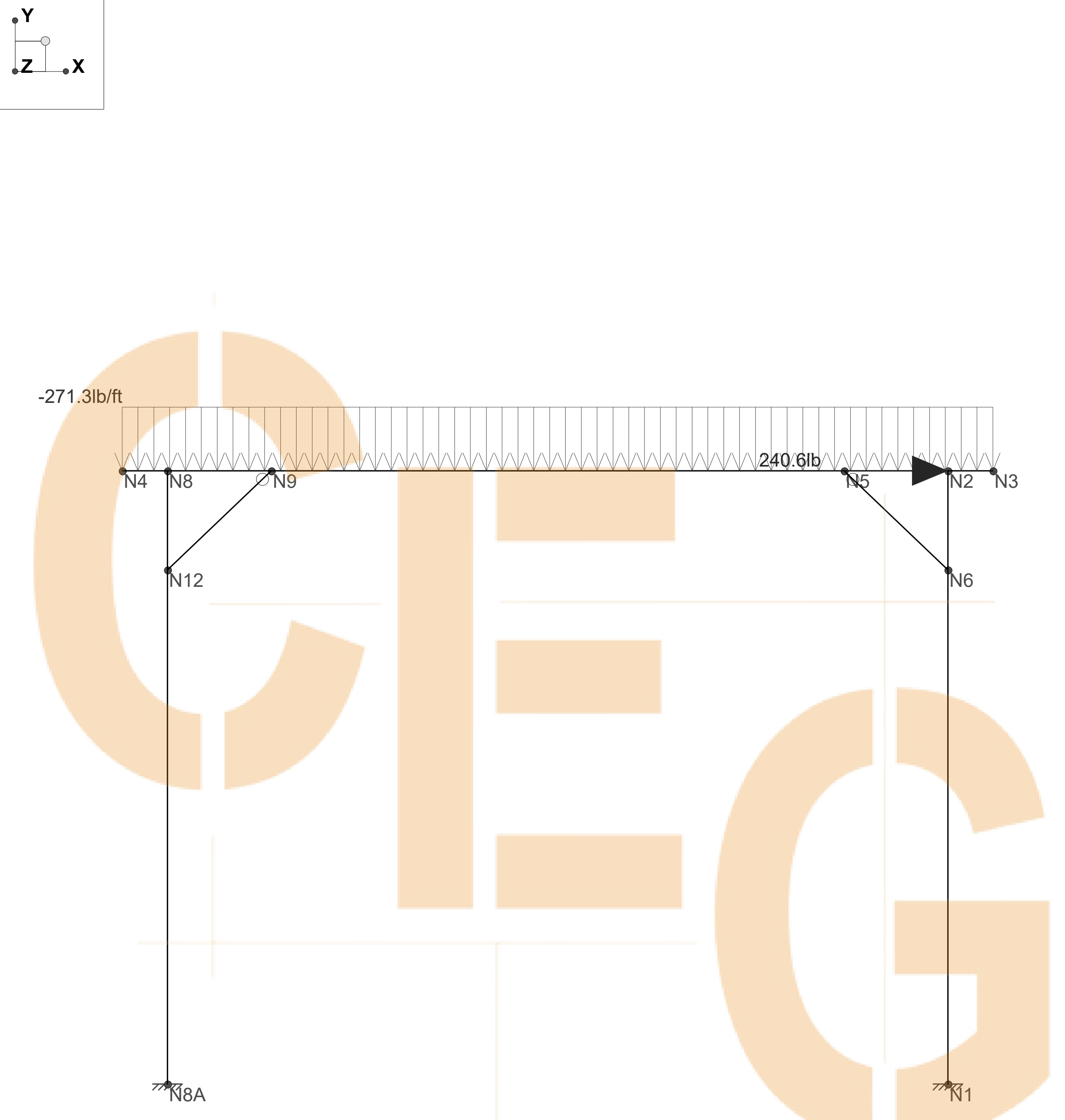
Loads: BLC 1, DL

	Canopy 1 @ section A1	SK - 2
East Texas 222-405		Canopy # 1 SECTION A2.r3d



Loads: BLC 2, RLL

	Canopy 1 @ section A1	SK - 3
East Texas 222-405		Canopy # 1 SECTION A2.r3d



Loads: BLC 3, WLA

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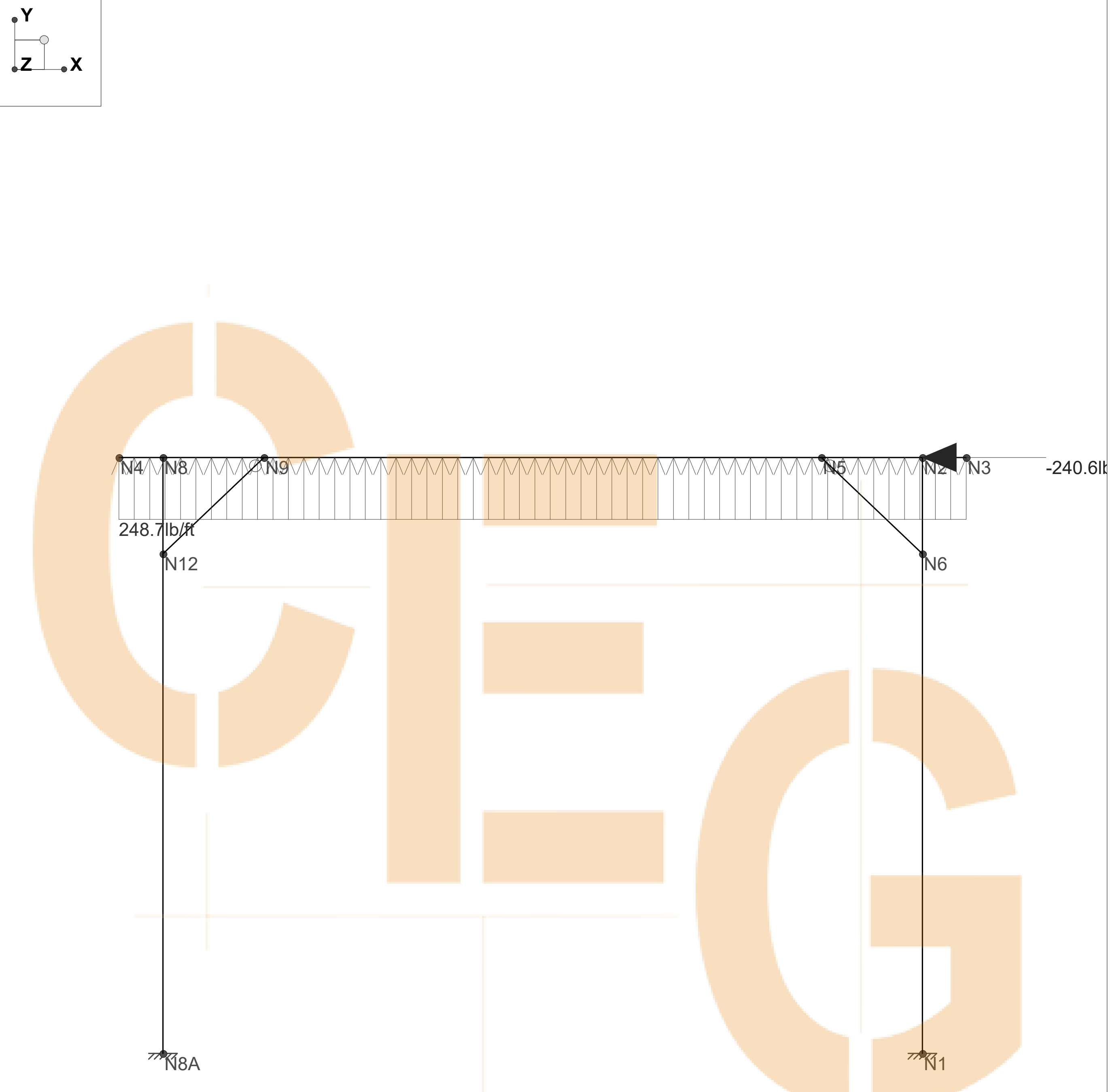

Loads: BLC 4, WLB

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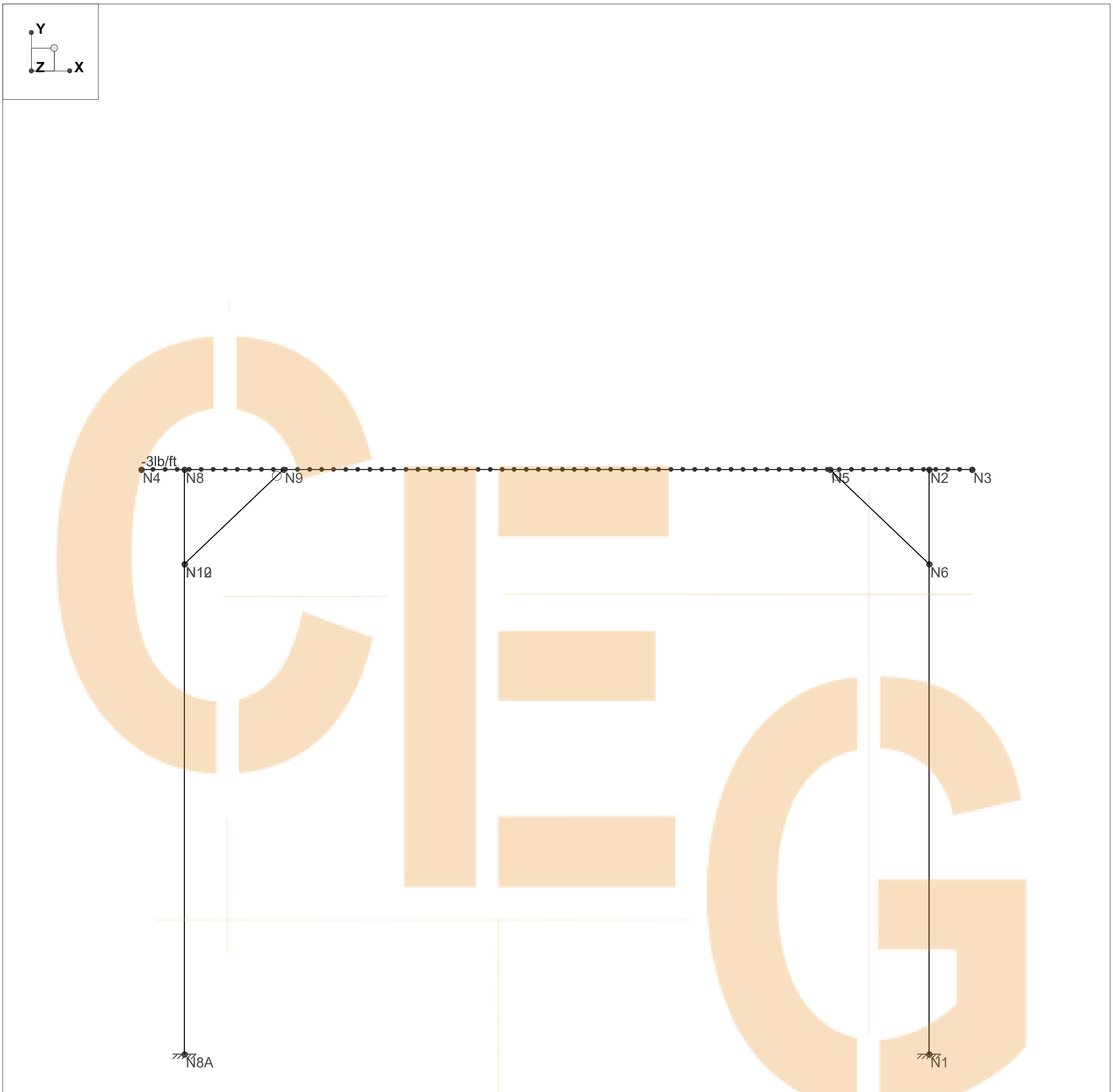

Loads: BLC 5, ELZ

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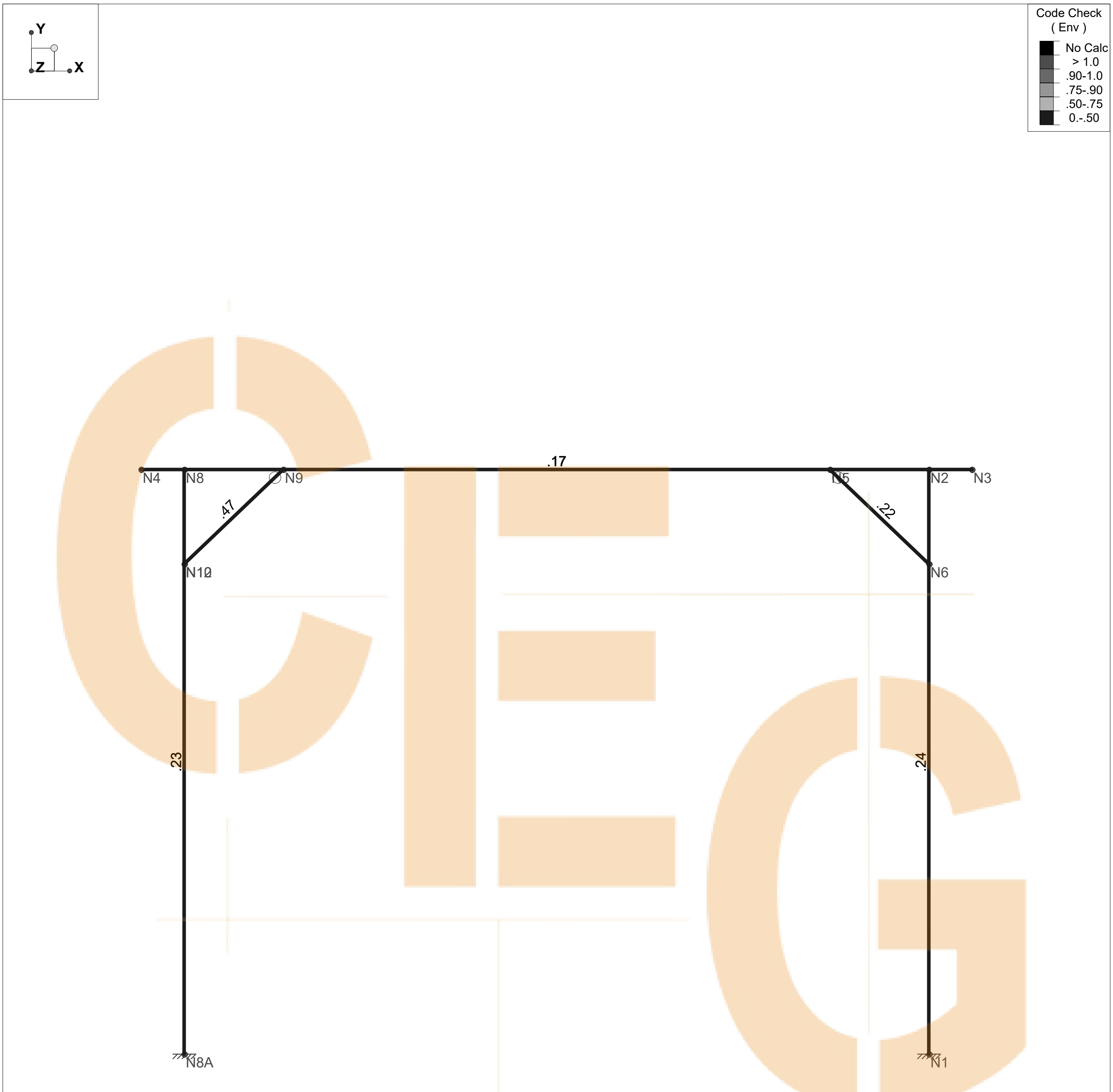
East Texas 222-405		Canopy # 1 SECTION A2.r3d



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

	Canopy 1 @ section A2	SK - 7
East Texas 222-405		Canopy # 1 SECTION A2.r3d

Aluminum Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (...	Density[...	Table B.4	kt	Ftu[ksi]	Fty[ksi]	Fcy[ksi]	Fsu[ksi]	Ct
1	3003-H14	10100	3787.5	.33	1.3	.173	Table B....	1	19	16	13	12	141
2	6061-T6	10100	3787.5	.33	1.3	.173	Table B....	1	38	35	35	24	141
3	6063-T5	10100	3787.5	.33	1.3	.173	Table B....	1	22	16	16	13	141
4	6063-T6	10100	3787.5	.33	1.3	.173	Table B....	1	30	25	25	19	141
5	5052-H34	10200	3787.5	.33	1.3	.173	Table B....	1	34	26	24	20	141
6	6061-T6 W	10100	3787.5	.33	1.3	.173	Table B....	1	24	15	15	15	141

Aluminum Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	C1	RT 6" X 8" X ...	Column	Rectangular Tubes	6061-T6	Typical	5.123	30.985	48.311	56.893
2	B1	RT 6" X 8" X ...	Beam	Rectangular Tubes	6061-T6	Typical	5.123	30.985	48.311	56.893
3	KNEE BR...	RT6X6X0.15	VBrace	Rectangular Tubes	6061-T6	Typical	3.51	20.033	20.033	30.03

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
1	N1	18.17	0	0	0	
2	N2	18.17	11.33	0	0	
3	N3	19.003333	11.33	0	0	
4	N4	2.903333	11.33	0	0	
5	N5	16.25	11.33	0	0	
6	N6	18.17	9.5	0	0	
7	N8	3.736333	11.33	0	0	
8	N8A	3.736333	0	0	0	
9	N9	5.656333	11.33	0	0	
10	N10	3.736333	9.5	0	0	
11	N12	3.736333	9.5	0	0	

Aluminum Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
1	M2	C1	11.33									Lateral
2	M3A	B1	16.1			Lbyy						Lateral
3	M3	KNEE BRA...	2.652									Lateral
4	M4	C1	11.33									Lateral
5	M5	KNEE BRA...	2.652									Lateral

Member Area Loads

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
No Data to Print ...						

Load Combinations

	Description	Solve	PDe...	S...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	IBC 16-8	Yes	Y		DL	1																		
2	IBC 16-10 (a)	Yes	Y		DL	1	RLL	1																
3	IBC 16-12 (a)	Yes	Y		DL	1	WL...	.6																
4	IBC 16-13 (a)	Yes	Y		DL	1	WL...	.45					R...	.75										
5	IBC 16-15	Yes	Y		DL	.6	WL...	.6																
6	IBC 16-12 (b)	Yes	Y		DL	1	ELZ	.7																
7	IBC 16-12 (a)	Yes	Y		DL	1	WL-Y	.6																
8	IBC 16-13 (a)	Yes	Y		DL	1	WL-Y	.45					R...	.75										
9	IBC 16-15	Yes	Y		DL	.6	WL-Y	.6																

Load Combinations (Continued)

	Description	Solve	PDe...	S...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
10	DL ONLY		Y		DL	1.25																		
11	RLL ONLY		Y		RLL	1.25																		
12	WL+Y		Y		WL+Y	1.25																		
13	WL-Y		Y		WL-Y	1.25																		

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	358.45	9	2595.78	4	16.438	6	.182	6	.021	6	2.884	4
2		min	-713.743	4	-1020.016	9	0	1	0	1	0	1	-1.577	9
3	N8A	max	605.473	4	2528.396	4	17.372	6	.206	6	0	9	.566	9
4		min	-214.09	9	-936.262	9	0	1	0	1	-.028	6	-2.094	4
5	Totals:	max	144.36	9	5124.176	4	33.81	6						
6		min	-144.36	3	-1956.278	9	0	1						

Envelope AA ADM1-15: ASD - Building Aluminum Code Checks

	Member	Shape	Code C...	Loc[ft]	LC	Shear ...	Loc[ft]	Dir	LC	Pnc/O...	Pnt/Om...	Mny/O...	Mnz/O...	Vny/O...	Vnz/O...	Cb	Eqn
1	M2	RT 6" X 8...	.245	9.442	4	.042	9.56	y	4	70633....	99825....	12.303	18.68	34008....	25156....	1....	H.1-1
2	M3A	RT 6" X 8...	.172	7.882	4	.048	13.249	y	4	42627....	99825....	12.303	18.68	34008....	25156....	1....	H.1-1
3	M3	RT6X6X0...	.217	2.652	4	.024	2.652	y	4	53545....	68400	8.489	8.489	20492....	20492....	1....	H.1-1
4	M4	RT 6" X 8...	.230	9.442	4	.018	0	y	4	70633....	99825....	12.303	18.68	34008....	25156....	1....	H.1-1
5	M5	RT6X6X0...	.473	2.652	4	.068	2.652	y	4	53545....	68400	8.489	8.489	20492....	20492....	1....	H.1-1

Envelope Member Section Forces

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k...	LC	y-y Mom...	LC	z-z Moment[k-ft]	LC
1	M2	1	max	2595.78	4	357.095	9	0	9	.021	6	.182	6	1.577	9
2			min	-1020.016	9	-718.409	4	-16.633	6	0	1	0	1	-2.884	4
3		2	max	2578.369	4	357.095	9	0	9	.021	6	.135	6	.566	9
4			min	-1030.463	9	-718.409	4	-16.633	6	0	1	0	1	-.849	4
5		3	max	2560.957	4	357.095	9	0	9	.021	6	.088	6	1.186	4
6			min	-1040.91	9	-718.409	4	-16.633	6	0	1	0	1	-.446	9
7		4	max	2543.545	4	357.095	9	0	9	.021	6	.041	6	3.22	4
8			min	-1051.357	9	-718.409	4	-16.633	6	0	1	0	1	-1.457	9
9		5	max	219.271	9	1421.499	4	0	9	.007	6	0	9	.038	4
10			min	-231.815	3	-657.515	9	-10.207	6	0	1	-.005	6	-.01	9
11	M3A	1	max	0	9	0	9	0	9	0	9	0	9	0	9
12			min	0	1	0	1	0	1	0	1	0	1	0	1
13		2	max	605.473	4	1206.502	4	8.91	6	.006	6	.011	6	.232	9
14			min	-214.09	9	-471.546	9	0	1	0	1	0	1	-.594	4
15		3	max	605.473	4	42.13	7	.457	6	.006	6	.03	6	1.098	9
16			min	-214.09	9	-42.569	5	0	1	0	1	0	1	-2.954	4
17		4	max	605.473	4	555.084	9	0	9	.006	6	.015	6	.015	5
18			min	-214.09	9	-1274.766	4	-7.995	6	0	1	0	1	-.464	2
19		5	max	0	9	0	9	0	9	0	9	0	9	0	9
20			min	0	1	0	1	0	1	0	1	0	1	0	1
21	M3	1	max	3400.27	4	229.25	9	0	9	.002	6	0	9	0	9
22			min	-1623.717	9	-486.641	4	-6.533	6	0	1	0	1	0	1
23		2	max	3402.196	4	228.037	9	0	9	.002	6	0	9	.323	4
24			min	-1622.561	9	-488.663	4	-6.533	6	0	1	-.004	6	-.152	9
25		3	max	3404.123	4	226.824	9	0	9	.002	6	0	9	.648	4
26			min	-1621.405	9	-490.685	4	-6.533	6	0	1	-.009	6	-.302	9
27		4	max	3406.05	4	225.611	9	0	9	.002	6	0	9	.974	4
28			min	-1620.248	9	-492.706	4	-6.533	6	0	1	-.013	6	-.452	9
29		5	max	3407.977	4	224.398	9	0	9	.002	6	0	9	1.301	4
30			min	-1619.092	9	-494.728	4	-6.533	6	0	1	-.017	6	-.602	9

Company	:		
Designer	:		3:03 PM
Job Number	:	East Texas 222-405	Checked By:
Model Name	:	Canopy 1 @ section A2	

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k...	LC	y-y Mom...	LC	z-z Moment[k-ft]	LC
31	M4	1	max	2528.396	4	606.91	4	0	9	0	9	.206	6	2.094	4
32			min	-936.262	9	-214.36	9	-17.599	6	-.028	6	0	1	-.566	9
33		2	max	2510.984	4	606.91	4	0	9	0	9	.156	6	.465	2
34			min	-946.709	9	-214.36	9	-17.599	6	-.028	6	0	1	.041	9
35		3	max	2493.572	4	606.91	4	0	9	0	9	.106	6	.648	9
36			min	-957.156	9	-214.36	9	-17.599	6	-.028	6	0	1	-1.344	4
37		4	max	2476.16	4	606.91	4	0	9	0	9	.056	6	1.256	9
38			min	-967.603	9	-214.36	9	-17.599	6	-.028	6	0	1	-3.063	4
39		5	max	-6.75	9	.02	4	.005	6	0	9	0	6	0	7
40			min	-11.249	1	-.005	7	0	1	0	1	0	1	0	4
41	M5	1	max	2134.719	4	556.792	9	17.639	6	.009	6	0	9	0	9
42			min	-829.734	9	-1380.279	4	0	1	0	1	0	1	0	1
43		2	max	2136.646	4	555.579	9	17.639	6	.009	6	.012	6	.916	4
44			min	-828.578	9	-1382.301	4	0	1	0	1	0	1	-.369	9
45		3	max	2138.573	4	554.366	9	17.639	6	.009	6	.023	6	1.833	4
46			min	-827.422	9	-1384.323	4	0	1	0	1	0	1	-.737	9
47		4	max	2140.5	4	553.153	9	17.639	6	.009	6	.035	6	2.752	4
48			min	-826.266	9	-1386.345	4	0	1	0	1	0	1	-1.104	9
49		5	max	2142.427	4	551.939	9	17.639	6	.009	6	.047	6	3.672	4
50			min	-825.11	9	-1388.366	4	0	1	0	1	0	1	-1.47	9

Envelope Member Section Deflections Service

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y' Ratio	LC	(n) L/z' Ratio	LC
1	M2	1	max	0	9	0	9	0	9	0	9	NC	9	NC	9
2			min	0	1	0	1	0	1	0	1	NC	1	NC	1
3		2	max	0	9	.042	4	.005	6	0	9	NC	9	NC	9
4			min	-.002	4	-.023	9	0	1	-4.014e-5	6	5829.382	4	NC	1
5		3	max	.002	9	.113	4	.017	6	0	9	NC	8	NC	9
6			min	-.004	4	-.066	9	0	1	-8.028e-5	6	1770.378	4	8056.794	6
7		4	max	.003	9	.143	4	.034	6	0	9	NC	6	NC	9
8			min	-.006	4	-.094	9	0	1	-1.204e-4	6	1542.016	4	4006.504	6
9		5	max	.003	9	.086	3	.053	6	0	9	NC	9	NC	9
10			min	-.007	4	-.076	9	0	1	-1.433e-4	6	2643.973	8	2557.052	6
11	M3A	1	max	.087	3	.041	9	0	9	0	9	NC	8	NC	9
12			min	-.077	9	-.055	4	-.068	6	-5.187e-4	6	2547.29	4	NC	1
13		2	max	.087	3	.076	9	0	9	0	9	NC	6	NC	9
14			min	-.077	9	-.173	4	-.066	6	-5.241e-4	6	1418.624	4	NC	1
15		3	max	.086	3	.093	9	0	9	0	9	7170.848	6	NC	9
16			min	-.076	9	-.241	4	-.064	6	-5.411e-4	6	866.278	4	NC	1
17		4	max	.086	3	.043	9	0	9	0	9	NC	6	NC	9
18			min	-.076	9	-.126	4	-.059	6	-5.581e-4	6	1510.968	4	NC	1
19		5	max	.086	3	.02	4	0	9	0	9	NC	9	NC	9
20			min	-.076	9	-.005	9	-.052	6	-5.695e-4	6	NC	1	NC	1
21	M3	1	max	.102	4	.031	5	0	9	0	9	NC	9	NC	9
22			min	-.071	9	-.055	8	-.057	6	-3.082e-4	6	NC	1	NC	1
23		2	max	.102	4	.044	5	0	9	0	9	NC	9	NC	9
24			min	-.071	9	-.046	8	-.053	6	-3.101e-4	6	NC	1	NC	1
25		3	max	.101	4	.057	3	0	9	0	9	NC	9	NC	9
26			min	-.07	9	-.051	9	-.049	6	-3.12e-4	6	6534.924	4	NC	1
27		4	max	.1	4	.068	3	0	9	0	9	NC	9	NC	9
28			min	-.07	9	-.057	9	-.045	6	-3.139e-4	6	7463.709	4	NC	1
29		5	max	.099	4	.084	4	0	9	0	9	NC	9	NC	9
30			min	-.069	9	-.062	9	-.041	6	-3.158e-4	6	NC	1	NC	1
31	M4	1	max	0	9	0	9	0	9	0	9	NC	9	NC	9
32			min	0	1	0	1	0	1	0	1	NC	1	NC	1
33		2	max	0	9	.007	9	.005	6	5.272e-5	6	NC	9	NC	9
34			min	-.002	4	-.029	4	0	1	0	1	2866.707	4	NC	1

Envelope Member Section Deflections Service (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y' Ratio	LC	(n) L/z' Ratio	LC
35		3	max	.002	9	.013	9	.019	6	1.054e-4	6	NC	9	NC	9
36			min	-.004	4	-.071	4	0	1	0	1	1257.077	4	7051.968	6
37		4	max	.002	9	-.004	9	.039	6	1.582e-4	6	NC	9	NC	9
38			min	-.006	4	-.079	2	0	1	0	1	1122.287	4	3476.288	6
39		5	max	.047	9	.087	3	.067	6	0	9	NC	8	NC	9
40			min	-.078	4	-.077	9	0	1	-2.595e-5	6	1563.534	3	2018.336	6
41	M5	1	max	.053	2	.099	9	.067	6	3.906e-4	6	NC	9	NC	9
42			min	-.001	5	-.146	4	0	1	0	1	NC	1	NC	1
43		2	max	.052	2	.075	9	.062	6	3.833e-4	6	NC	8	NC	9
44			min	-.002	5	-.095	4	0	1	0	1	3698.578	4	NC	1
45		3	max	.052	2	.052	9	.057	6	3.759e-4	6	NC	6	NC	9
46			min	-.002	5	-.058	3	0	1	0	1	2311.217	4	NC	1
47		4	max	.052	2	.041	8	.052	6	3.686e-4	6	NC	8	NC	9
48			min	-.002	5	-.029	5	0	1	0	1	2640.793	4	NC	1
49		5	max	.051	2	.042	8	.047	6	3.613e-4	6	NC	9	NC	9
50			min	-.003	5	-.008	5	0	1	0	1	NC	1	NC	1

FOOTING FORCE DESIGN @ CANOPY1 SECTION A2

Project Number	ETC 222-405	Sheet			
Project Name		Designed by		Date	
Subject	Footing Force design	Checked by		Date	

Maximum Moment in colum	=	2.884	k-ft	As per page 1038
Height of Column	=	11.33	ft	
Force, f=	=	0.255	kips	

USE [2'-0" x 4'-0" Deep footing]

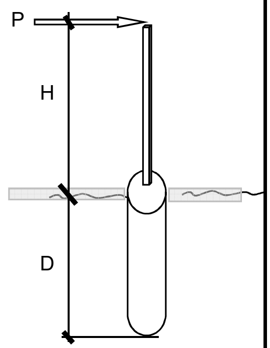
FOOTING DESIGN

CLIENT :			PAGE :
JOB NO. :	DATE :		DESIGN BY :
			REVIEW BY :

Flagpole Footing Design Based on Chapter 18 of IBC & CBC

INPUT DATA & DESIGN SUMMARY

IS FOOTING RESTRAINED @ GRADE LEVEL ? (1=YES,0=NO)		0	no
LATERAL FORCE @ TOP OF POLE	P =	0.255	k
HEIGHT OF POLE ABOVE GRADE	H =	11.33	ft
DIAMETER OF POLE FOOTING	B =	2	ft
LATERAL SOIL BEARING CAPACITY	S =	0.15	ksf / ft
ISOLATED POLE FACTOR (IBC 1804.3.1 or UBC note 3 on Tab 18-I-A)	F =	2	
FIRST TRIAL DEPTH ===>	D =	4	ft



Use 2 ft dia x 3.63 ft deep footing unrestrained @ ground level

ANALYSIS

LATERAL BEARING @ BOTTOM : $S_3 = FS \quad Min(D \ , \ 12')$

LATERAL BEARING @ D/3 : $S_1 = FS \quad Min\left(\frac{D}{3} \ , \ 12'\right)$

$$A = \frac{2.34P}{BS_1}$$

REQUIRD DEPTH :

$$D = \begin{cases} \frac{A}{2}\left[1+\sqrt{1+\frac{4.36H}{A}}\right] & \text{, FOR NONCONSTRAINED} \\ \sqrt{\frac{4.25PH}{BS_3}} & \text{, FOR CONSTRAINED} \end{cases}$$

		NONCONSTRAINED		CONSTRAINED	
LATERAL FORCE @ TOP OF POLE	P =>	0.26	k	0.26	k
HEIGHT OF POLE ABOVE GRADE	H =>	11.3	ft	11.3	ft
DIAMETER OF POLE FOOTING	B =>	2.00	ft	2.00	ft
LATERAL SOIL BEARING CAPACITY	FS =>	0.30	ksf / ft	0.30	ksf / ft
1ST TRIAL	TRY D_1 =>	4.00	ft	4.00	ft
LAT SOIL BEARING @ 1/3 D	S_1 =>	0.40	ksf	0.40	ksf
LAT SOIL BEARING @ 1.0 D	S_3 =>	1.20	ksf	1.20	ksf
CONSTANT 2.34P/(BS_1)	A =>	0.75	-		-
REQD FOOTING DEPTH	RQRD D =>	3.43	ft	2.26	ft
2ND TRIAL :	TRY D2=>	3.72	ft	3.13	ft
LAT SOIL BEARING @ 1/3 D	S_1 =>	0.37	ksf	0.31	ksf
LAT SOIL BEARING @ 1.0 D	S_3 =>	1.11	ksf	0.94	ksf
CONSTANT 2.34P/(BS_1)	A =>	0.80	-		-
REQD FOOTING DEPTH	RQRD D =>	3.58	ft	2.56	ft
3RD TRIAL :	TRY D3=>	3.65	ft	2.84	ft
LAT SOIL BEARING @ 1/3 D	S_1 =>	0.36	ksf	0.28	ksf
LAT SOIL BEARING @ 1.0 D	S_3 =>	1.09	ksf	0.85	ksf
CONSTANT 2.34P/(BS_1)	A =>	0.82	-		-
REQD FOOTING DEPTH	RQRD D =>	3.61	ft	2.68	ft
4TH TRIAL :	TRY D4=>	3.63	ft	2.76	ft
LAT SOIL BEARING @ 1/3 D	S_1 =>	0.36	ksf	0.28	ksf
LAT SOIL BEARING @ 1.0 D	S_3 =>	1.09	ksf	0.83	ksf
CONSTANT 2.34P/(BS_1)	A =>	0.82	-		-
REQD FOOTING DEPTH	RQRD D =>	3.62	ft	2.72	ft
5TH TRIAL :	TRY D5=>	3.63	ft	2.74	ft
LAT SOIL BEARING @ 1/3 D	S_1 =>	0.36	ksf	0.27	ksf
LAT SOIL BEARING @ 1.0 D	S_3 =>	1.09	ksf	0.82	ksf
CONSTANT 2.34P/(BS_1)	A =>	0.82	-		-
REQD FOOTING DEPTH	RQRD D =>	3.63	ft	2.73	ft

PROJECT :
CLIENT :
JOB NO. : DATE :

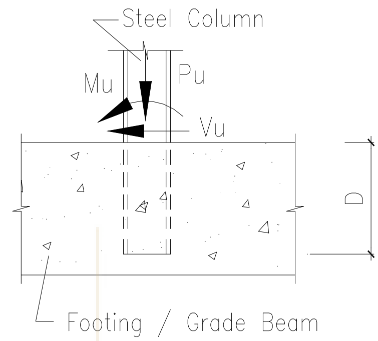
PAGE :
DESIGN BY :
REVIEW BY :

Fixed Moment Condition Design Based on ACI 318-14

INPUT DATA & DESIGN SUMMARY

COLUMN SHAPE (Tube, Pipe, or WF) & SIZE	None	< == Tube	d	A	b_f
			9.0	18.7	9.0

CONCRETE STRENGTH	f_c' =	3	ksi
FACTORED SHEAR LOAD	V_u =	0.714	kips
FACTORED MOMENT	M_u =	2.884	ft-kips
FACTORED VERTICAL LOAD (negative for uplift)	P_u =	2.595	kips
EMBEDMENT DEPTH	D =	18	in



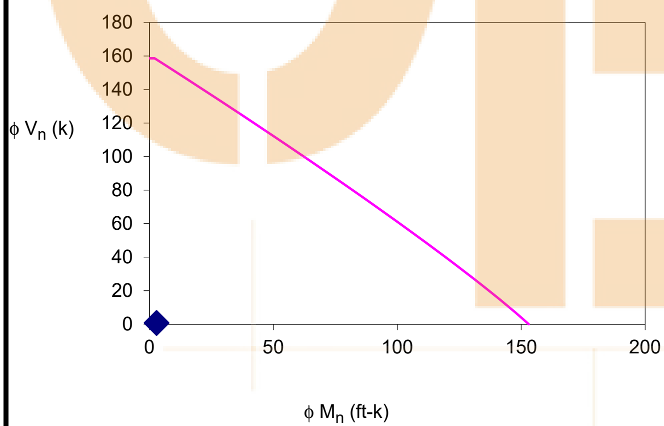
THE FIXED MOMENT DESIGN IS ADEQUATE.

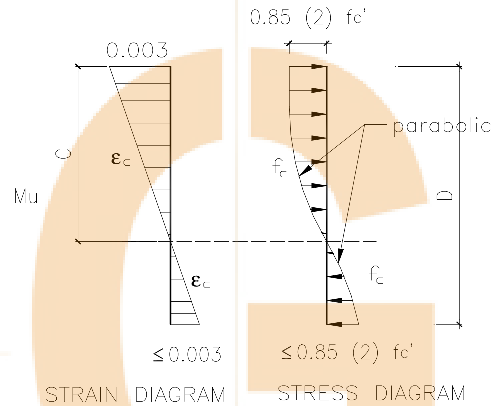
(A_{vf} = **0.0** in^2 , Required Area of Shear Studs or Welded Reinforcement)

(Edge of Concrete Footing / Grade Beam must be wider than "b_f")

ANALYSIS

CHECK BASE FLEXURAL & SHEAR CAPACITY (ACI 318 21 & 22)





$$\varepsilon_o = \frac{2 f_c'}{E_c} 0.85 Min\left(\sqrt{\frac{A_2}{A_1}}\ ,\ 2\right)\ ,\ E_c = 57\sqrt{f_c'}$$

$$f_c = \begin{cases} 0.85 Min\left(\sqrt{\frac{A_2}{A_1}}\ ,\ 2\right) f_c' \left[2\left(\frac{\varepsilon_c}{\varepsilon_o}\right) - \left(\frac{\varepsilon_c}{\varepsilon_o}\right)^2\right]\ ,\ for\ \ 0 < \varepsilon_c < \varepsilon_o \\ 0.85 Min\left(\sqrt{\frac{A_2}{A_1}}\ ,\ 2\right) f_c'\ ,\ for\ \ \varepsilon_c \geq \varepsilon_o \end{cases}$$

ϕM_n = 153 ft-kips @ V_u = 1 kips

\> M_u = 3 ft-kips

[Satisfactory]

$\phi V_{n,max}$ = 158.65 kips, when C = 12.4 in

\> V_u = 0.714 ft-kips [Satisfactory]

where ϕ = 0.65 , (ACI 318 21.2)

Bearing factor = 2, (ACI 318 14.5.1.1)

b = effective bearing width = 95% b_f = 8.55 in

CHECK VERTICAL CAPACITY

ϕP_n = End Bering + Friction = 256.4 kips > P_u = 2.595 kips [Satisfactory]

where End Bering = 0.65 (2) 0.85 f_c' A = 62.0 kips, (ACI 318 14.5.1.1)

Friction = 0.75 MAX(0.2f_c' A_c , 800 A_c) = 194.4 kips, (ACI 318 22.9.4)

A = 19 in^2, end bearing area

A_c = 0.5 (2d + 2b_f) D = 324 in^2, (0.5 for concrete cracked)

A_{vf} = $P_{u,Friction}$ / (ϕ f_y μ) = 0.0 in^2 , Required Area of Shear Studs or Welded Reinforcement

where ϕ = 0.75 , (ACI 318 21.2)

μ = 0.70 , (ACI 318 22.9.4.2)

f_y = 60 ks

PROJECT :
CLIENT :
JOB NO. : DATE :

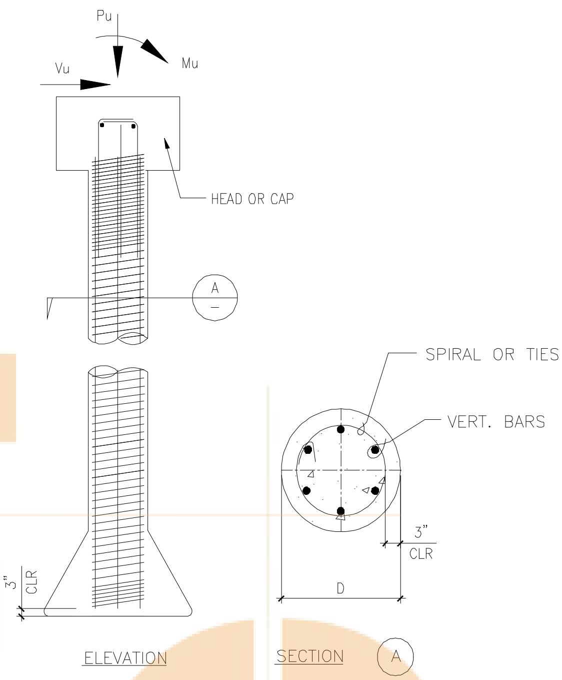
PAGE :
DESIGN BY :
REVIEW BY :

Concrete Pier (Isolated Deep Foundation) Design Based on ACI 318-14

INPUT DATA & DESIGN SUMMARY

CONCRETE STRENGTH	f_c'	=	3	ksi
VERT. REBAR YIELD STRESS	f_y	=	60	ksi
PIER DIAMETER	D	=	24	in
PIER LENGTH	L	=	5.5	ft
FACTORED AXIAL LOAD	P_u	=	2.595	k
FACTORED MOMENT LOAD	M_u	=	2.884	ft-k
FACTORED SHEAR LOAD	V_u	=	0.714	k
PIER VERT. REINF.	6	#	6	
SEISMIC DESIGN (ACI 18.13.4) ?			NO	
LATERAL REINF. OPTION (0=Spirals, 1=Ties)			1	Ties
LATERAL REINFORCEMENT	# 4	@	9	in o.c.

(spacing 4.5 in o.c. at top end of 2.0 ft.)
(2015 IBC 1810.3.9)



THE PIER DESIGN IS ADEQUATE.

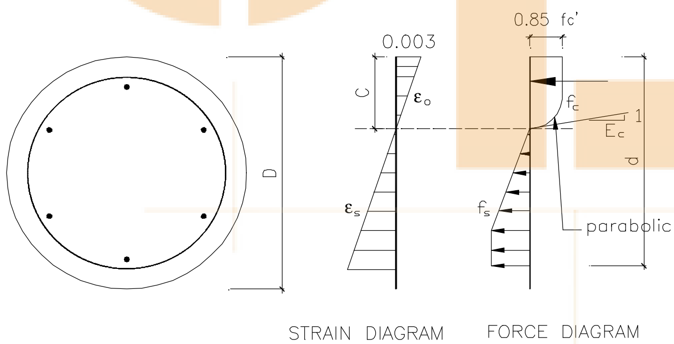
ANALYSIS

CHECK PIER LIMITATIONS

f_c' = 3 ksi **>** 2.5 ksi
[Satisfactory] (2015 IBC Table 1808.8.1)

D = 24 in **>** MAX(L / 12 , 24 in)
[Satisfactory] (2015 IBC 1810.2.2)

CHECK FLEXURAL & AXIAL CAPACITY



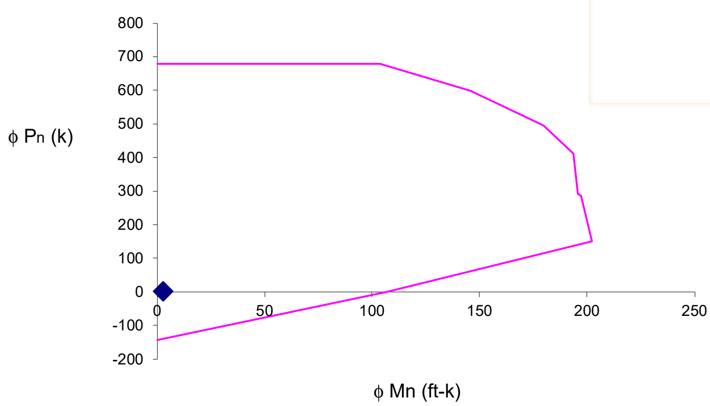
$$\varepsilon_o = \frac{2\left(0.85 f_c'\right)}{E_c} \ , \ E_c = 57\sqrt{f_c'} \ , \ E_s = 29000 ksi$$

$$f_c = \begin{cases} 0.85 f_c'\left[2\left(\frac{\varepsilon_c}{\varepsilon_o}\right) - \left(\frac{\varepsilon_c}{\varepsilon_o}\right)^2\right] \ , \ for \ \ 0 < \varepsilon_c < \varepsilon_o \\ 0.85 f_c' \ , \ for \ \ \varepsilon_c \ge \varepsilon_o \end{cases}$$

$$f_s = \begin{cases} \varepsilon_s E_s \ , \ for \ \ \varepsilon_s \le \varepsilon_y \\ f_y \ , \ for \ \ \varepsilon_s > \varepsilon_y \end{cases}$$

$\phi P_{max} = F \ \phi\left[0.85 f_c' (A_g - A_{st}) + f_y A_{st}\right]$ = 678.74 kips., (at max axial load, ACI 318-14 22.4) **>** Pu **[Satisfactory]**

where F = 0.8 , ACI 318-14 22.4.2
ϕ = 0.65 (ACI 318-14 21.2)
A_g = 452 in^2. A_{st} = 2.64 in^2.



	ϕ Pn (kips)	ϕ Mn (ft-kips)
AT COMPRESSION ONLY	679	0
AT MAXIMUM LOAD	679	104
AT 0 % TENSION	598	146
AT 25 % TENSION	496	180
AT 50 % TENSION	412	194
AT ε_t = 0.002	291	196
AT BALANCED CONDITION	287	197
AT ε_t = 0.005	150	202
AT FLEXURE ONLY	0	107
AT TENSION ONLY	-143	0

(cont'd)

$a = C_b \beta_1 =$ 10 in (at balanced strain condition, ACI 21.2.2)

$\phi =$ $0.75 + (\varepsilon_t - 0.002)(50)$, for Spiral ; $0.65 + (\varepsilon_t - 0.002)(250/3)$, for Ties $=$ 0.656 (ACI 318-14 21.2)

where $C_b = d\,\varepsilon_c / (\varepsilon_c + \varepsilon_s) =$ 12 in $\varepsilon_t =$ 0.002069 $\varepsilon_c =$ 0.003

$d =$ 20.1 in, (ACI 20.6) $\beta_1 =$ 0.85 (ACI 318-14 22.2.2.4.3)

$\phi M_n = 0.9 M_n =$ 107 ft-kips @ $P_n = 0$, (ACI 318-14 21.2) ,& $\varepsilon_{t,max} = 0.004$, (ACI 318-14, Sec. 21.2.3)

$\phi M_n =$ 108 ft-kips @ $P_u =$ 3 kips > M_u **[Satisfactory]**

ρ_{max} = 0.08 (ACI 318-14 10.6) ρ_{provd} = 0.006

ρ_{min} = 0.005 (2015 IBC 1810.3.9.4.2) **[Satisfactory]**

CHECK SHEAR CAPACITY

$\phi V_n = \phi (V_s + V_c) =$ 66 kips, (ACI 318-14 22.5)

> V_u **[Satisfactory]**

where $\phi =$ 0.75 (ACI 318-14 21.2)

$A_0 =$ 318 in^2. $A_v =$ 0.40 in^2. $f_y =$ 60 ksi

$V_c = 2 (f_c')^{0.5} A_0 =$ 34.8 kips, (ACI 318-14 22.5)

$V_s = \mathrm{MIN}(d\, f_y\, A_v / s\,,\ 8 (f_c')^{0.5} A_0) =$ 53.7 kips, (ACI 318-14 22.5.1)

s_{max} = 9 (2015 IBC 1810.3.9.4.2) s_{provd} = 9 in

s_{min} = 1 **[Satisfactory]**

$\rho_s = 0.12 f_c' / f_{yt} =$ 0.006 > $\rho_{s,provd}$ = 0.005 **[Satisfactory]** (ACI 318-14 18.13.4.3 & 18.7.5.1)

KNEE BRACE CONNECTION DESIGN

Project Number	East Texas 222-405	Sheet			
Project Name		Designed by		Date	
Subject	Design Loads	Checked by		Date	

We have maximum Axial compression force of = 0.61 k As per page 1038
we have maximum Axial tension force of = 0.22 k As per page 1038

compression force Resisted by 6x8x0.188 welded Gussets

CHECKING THE BOLTS TO RESIST TENSION

Capacity of two 1/2" dia box bolt = 3280 x 2 As per page 1052

= 6560 > 215 OK

USE [[4] 1/2" ø SS type -C Box expansion bolt at top & fully welded to column typical all brace tube]

BEAM TO COLUMN CONNECTION DESIGN

Max.moment, M = 1.31 k-ft As per page 1038

Force, f = 0.66 kips

Aluminium properties of 6061-T6

F_{ty} = 35.00 ksi

F_{sy} = 21.00 ksi

Allowable Shear Stress of Shear plane (50%) = 10.5 ksi

Shear area for 1/2" bolts = 0.1963 in^2

Capacity of two 1/2" dia SS through bolt

= 2.0606 < 0.655 OK

USE [[4] 1/2" ø SS through bolts for beam to column connection]

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DIVISION: 05 00 00—METALS
SECTION: 05 05 27—METAL CONNECTORS

REPORT HOLDER:

LNA SOLUTIONS—A KEE SAFETY LOGISTIC LTD

EVALUATION SUBJECT:

BOXBOLT® TYPE C BLIND FASTENERS

ICC EVALUATION SERVICE

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Reissued April 2019

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DIVISION: 05 00 00—METALS
Section: 05 05 27—Metal Connectors

REPORT HOLDER:

LNA SOLUTIONS—A KEE SAFETY LOGISTIC LTD

EVALUATION SUBJECT:

BOXBOLT® TYPE C BLIND FASTENERS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2015, 2012 and 2009 *International Building Code®* (IBC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)†

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Property evaluated:

Structural

2.0 USES

BoxBolt® Type C Blind Fasteners are designed for connecting structural steel to hollow structural section (HSS) steel members and other structural steel elements where access is difficult or is restricted to one side only. BoxBolt® Type C fasteners are intended for use with rectangular or square HSS members and are recognized for resisting static dominant tension and shear loads in bearing-type connections, and for resisting static dominant lateral loads in slip-critical connections, where static dominant loads include load combinations with gravity and wind loads for structures assigned to all Seismic Design Categories and load combinations with seismic loads for structures assigned to Seismic Design Category (SDC) A, B or C. The BoxBolt® Type C Blind Fasteners are alternatives to bolts described in Section J3 of AISC 360, which is referenced in Section 2205.1 of the IBC.

BoxBolt® Type C Blind Fasteners may also be used to resist load combinations with seismic loads for structures assigned to Seismic Design Categories (SDCs) D, E and F, based on cyclic test data in accordance with Sections 3.0 and 4.4 of the ICC-ES Acceptance Criteria for Expansion Bolts in Structural Steel Connections (AC437).

3.0 DESCRIPTION

3.1 General:

BoxBolt® Type C Blind Fasteners are assembled from four components, consisting of the core bolt (or set screw), the body (or shell), the shoulder (or collar), and the cone (or conical nut). The steel core bolt features a full-length threaded shank and a hexagonal head. The body is a steel segmented hollow cylinder, with four slits along the length of the cylinder, and are located at 90 degrees from each other. The collar is a steel flat hexagonal element with a circular hole at its center. The cone is a steel circular internally threaded nut with knurling on one end for interacting with the body. Nominal BoxBolt® diameters include $^1/_2$ inch (12.0 mm), $^5/_8$ inch (16.0 mm), and $^3/_4$ inch (20.0 mm), with each diameter of bolt available in three lengths. Figure 1 provides a picture of the BoxBolt®. Table 1 provides part codes, dimensions and installation information. Table 2 provides BoxBolt® Type C fastener strength information.

3.2 Materials:

3.2.1 Core Bolt: The core bolt is manufactured from steel complying with ISO 4017, Class 8.8 in accordance with ISO 898-1, having a specified tensile strength, F_u, of 116,030 psi (800 MP_a) for the M12 and M16 bolts, and 120,380 psi (830 MP_a) for the M20 bolts.

3.2.2 Body, Collar and Cone: The body, collar, and cone are manufactured from steel complying with BS EN 10083 Grade C22E (1.1151).

3.2.3 Finish: All components are hot dip galvanized in accordance with BS EN ISO 1461 with a mean coating thickness of 2.2 mil (55 μm), as described in the report holder's quality documentation.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The BoxBolt® Type C Blind Fasteners are alternatives to bolts described in Section J3 of AISC 360, which is referenced in Section 2205.1 of the IBC, for bearing-type connections and for slip-critical connections.

The design of the BoxBolt® Type C Blind Fasteners must comply with this report, Section J3 of AISC 360 and the information for the BoxBolt® provided in Tables 1 and 2 of this report.

For BoxBolt® Type C Blind Fasteners used in structures assigned to Seismic Design Categories (SDCs) D, E and F, the fasteners are intended to be used as force-controlled components and are not expected to undergo inelastic deformations. The construction documents (including structural calculations and engineering plans) specifying the BoxBolt® Type C Blind Fasteners, must consider this requirement for a force-controlled behavior, and additional requirements in AISC 341, as applicable.

The load-carrying capacity of a connection utilizing BoxBolt® Type C Blind Fasteners depends on the fasteners' capacities as shown in Table 2, the affected

elements of members and connecting elements, and the interaction between the fasteners and the connected elements. All applicable limit states of a connection must be checked to determine the load-carrying capacity of the connection. The available strength of a connection is limited by the governing limit state (or the limit state with the least available strength), which occurs in the weakest component in the connection, typically the steel section itself in the case of thin steel sections, or the BoxBolt® in the case of thick wall steel sections, or a combination of the two.

Connections subjected to combined static tension loading and static shear-bearing loading must comply with the following:

$$\left(\frac{Tension\ Demand}{Tension\ Capacity}\right)^2 + \left(\frac{Shear\ Demand}{Shear\ Capacity}\right)^2 \leq 1.0$$

4.2 Installation:

The BoxBolt® Type C Blind Fasteners must be installed in accordance with the details noted in this section, the manufacturer's installation instructions and the approved plans. In case of a conflict between this report and the report holder's installation instructions, the most restrictive requirement governs.

1. Holes must be drilled into the sections to be connected, ensuring that the resulting holes have the correct diameter, spacing and edge distance according to the report holder's published specifications, this evaluation report and the correct design requirements for the connection, as indicated in the approved plans. Holes must be standard diameter holes conforming to AISC 360, where the bolt hole diameters must be no greater than the bolt shell diameter plus $^1/_{16}$ inch (1.6 mm).
2. Burrs in the holes must be removed before insertion of the BoxBolt® Type C Blind Fasteners.
3. The structural steel elements to be fastened adjacent to each other must be positioned to ensure:
   a. That the two sections are lined up and rest one against the other without any gap. Clamps must be used as necessary to hold the two sections together and prevent formation of gaps.
   b. That the holes are aligned, using a mandrel if necessary.
4. The core bolts must be positioned in the holes. The collar must rest flat against the section with no gap.
5. The collar must be held in position using a suitable open-ended wrench, and then the core bolt must be tightened to the specified torque, as noted in Table 1 of this report.
6. The tightening tool must then be removed and the tightening torque on the bolt must be verified. If necessary, the tightening torque must be corrected.

4.3 Special Inspection:

Special inspection is required in accordance with 2015 and 2012 IBC Sections 1704.3, 1705.1.1 and 1705.2 (2009 IBC Sections 1704.3, 1704.15 and 1705), as applicable). The report holder must submit inspection procedures to verify proper installation of the BoxBolts® Type C Blind Fasteners. Where BoxBolts® Type C Blind Fasteners are used for seismic or wind load resistance, special inspection must comply with 2015 IBC Sections 1705.11, 1705.12 and 1705.13 (2012 IBC Sections 1705.10, 1705.11 and 1705.12; 2009 IBC Sections 1706, 1707 and 1708; as applicable).

4.4 Packaging:

Each package of the BoxBolt® Type C Blind Fasteners must include the following information: installation and safety instructions, minimum and maximum fixing ranges (or the total thickness of elements to be connected), installation torque, design loads and special inspection requirements.

5.0 CONDITIONS OF USE

The BoxBolt® Type C Blind Fasteners described in this report comply with, or are suitable alternatives to what is specified in, the codes noted in Section 1.0 of this report, subject to the following conditions:

5.1 Steel structures utilizing BoxBolt® Type C Blind Fasteners must be designed in accordance with the IBC including its referenced standards (such as AISC 360 and AISC 341) and this evaluation report; and must be installed in accordance with this evaluation report and the report holder's installation instructions. In case of a conflict between this evaluation report and the report holder's installation instructions, the most restrictive requirement governs.

5.2 Calculations and details, justifying the use of the BoxBolt® Type C Blind Fasteners is in compliance with the applicable code and this evaluation report, including showing that the BoxBolt® fasteners, the affected elements of members and connecting elements are adequate to resist the applied loads, must be submitted to the code official for approval. The calculations and details must be signed and sealed by a registered design professional, when required by the statutes of the jurisdiction in which the project is to be constructed.

5.3 **Fire-resistive Construction:** Where not otherwise prohibited in the code, BoxBolt® Type C Fasteners are permitted for use with fire-resistance-rated construction provided that at least one of the following conditions is fulfilled:

- The BoxBolt® fasteners are used to resist wind or seismic forces only.
- BoxBolt® fasteners that support a fire-resistance-rated envelope or a fire-resistance-rated membrane, are protected by approved fire-resistance-rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
- The BoxBolt® fasteners are used to support nonstructural elements.

5.4 Special inspection must be provided as specified in Section 4.3 of this report.

5.5 For BoxBolt® Type C Blind Fasteners used in structures assigned to Seismic Design Categories (SDCs) D, E and F, the fasteners are intended to be used as force-controlled components and are not expected to undergo inelastic deformations, and the design professional must consider this force-controlled behavior in his design.

5.6 The BoxBolt® Type C Fasteners addressed in this evaluation report are manufactured under a quality program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Expansion Bolts in Structural Steel Connections (AC437), dated October 2014 (editorially revised December 2016).

7.0 IDENTIFICATION

7.1 The BoxBolt® Type C fastener package is labeled with the product part number, quantity, batch number, image of the product, report holder's name (LNA Solutions—A Kee Safety Logistic Ltd.), and the evaluation report number (ESR-3217).The fastener is identified by a nine-character alphanumeric part number (BQXGALXXC). The first three characters (BQX) indicate the length of the fastener (Size 1, 2, or 3). The second three characters (GAL) indicate the fasteners are coated with a hot dip galvanized coating. The last three characters (XXC) indicate the diameter and type of fastener, where XX is the numeric diameter in millimeters (12, 16 or 20), and C identifies the fastener as a Type C fastener. Each core bolt is stamped with a head marking of "ATBX". Each collar is stamped with "BOXBOLT" and part number.

7.2 The report holder's contact information is the following:

LNA SOLUTIONS—A KEE SAFETY LOGISTIC LTD
3924A VARSITY DRIVE
ANN ARBOR, MICHIGAN 48108
(888) 724-2323
www.LNASolutions.com
jclements@lnasolutions.com

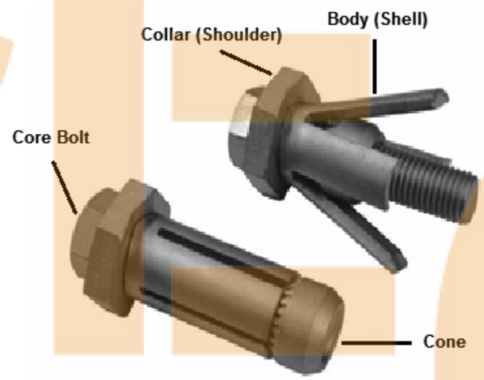


FIGURE 1—TYPICAL BOX BOLT® TYPE C BLIND FASTENER

TABLE 1—BOXBOLT® TYPE C BLIND FASTENER DIMENSIONAL AND INSTALLATION INFORMATION[1]

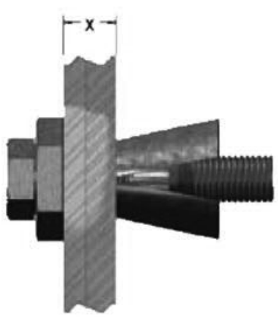
PART NUMBER AND DESCRIPTION			DIMENSIONAL INFORMATION[3]							INSTALLATION INFORMATION[3]	
BoxBolt® (Part Code)	BoxBolt® (Core Bolt Diameter)	Description[2]	Core Bolt Length	Clamping Range (dim x) Min	Clamping Range (dim x) Max	Across Flats of Shoulder	Collar Thickness	Dim A	Dim B	Dim C Drill Dia	Torque (ft-lb)
BQ1GAL12C	1/2" (12 mm)	1/2" BoxBolt® Size 1	2 3/16" (55 mm)	1/2"	15/16"	1" (26 mm)	5/16" (8.4 mm)	2 1/16" (52 mm)	1 1/8"	13/16"	60
BQ2GAL12C	1/2" (12 mm)	1/2" BoxBolt® Size 2	3 1/8" (80 mm)	3/4"	1 7/8"	1" (26 mm)	5/16" (8.4 mm)	2 1/16" (52 mm)	1 1/8"	13/16"	60
BQ3GAL12C	1/2" (12 mm)	1/2" BoxBolt® Size 3	4" (100 mm)	1 1/2"	2 11/16"	1" (26 mm)	5/16" (8.4 mm)	2 1/16" (52 mm)	1 1/8"	13/16"	60
BQ1GAL16C	5/8" (16 mm)	5/8" BoxBolt® Size 1	3" (75 mm)	5/8"	1 3/8"	1 7/16" (36 mm)	3/8" (9.4 mm)	2 11/16" (68 mm)	1 3/8"	1 1/16"	140
BQ2GAL16C	5/8" (16 mm)	5/8" BoxBolt® Size 2	4" (100 mm)	1"	2 5/16"	1 7/16" (36 mm)	3/8" (9.4 mm)	2 11/16" (68 mm)	1 3/8"	1 1/16"	140
BQ3GAL16C	5/8" (16 mm)	5/8" BoxBolt® Size 3	4 3/4" (120 mm)	2"	3 1/16"	1 7/16" (36 mm)	3/8" (9.4 mm)	2 11/16" (68 mm)	1 3/8"	1 1/16"	140
BQ1GAL20C	3/4" (20 mm)	3/4" BoxBolt® Size 1	4" (100 mm)	3/4"	1 13/16"	1 13/16" (46 mm)	7/16" (11.4 mm)	3 7/16" (87 mm)	1 3/4"	1 3/8"	220
BQ2GAL20C	3/4" (20 mm)	3/4" BoxBolt® Size 2	5 1/8" (130 mm)	1 5/16"	3"	1 13/16" (46 mm)	7/16" (11.4 mm)	3 7/16" (87 mm)	1 3/4"	1 3/8"	220
BQ3GAL20C	3/4" (20 mm)	3/4" BoxBolt® Size 3	6" (150 mm)	2 9/16"	4"	1 13/16" (46 mm)	7/16" (11.4 mm)	3 7/16" (87 mm)	1 3/4"	1 3/8"	220

For **SI:** 1 inch = 25.4mm; 1 lbf = 4.448N; 1 ft-lb = 1.356 N-m.

[1]When dimensions are expressed in both US Customary and SI units; BoxBolt® dimensions in US Customary units are converted from the corresponding SI units.

[2]BoxBolt® size is determined by core bolt length.

[3]Dimension “X” is the total thickness of the connected steel elements (or the grip); "A" is the minimum spacing between fasteners; "B" is the minimum edge distance for the fasteners; and “C” is the standard hole diameters for the fasteners.



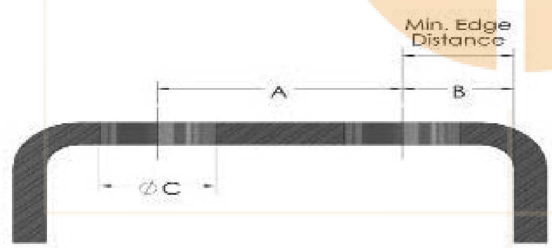


TABLE 2—BOXBOLT® TYPE C BLIND FASTENER STRENGTH INFORMATION

PART CODE	LRFD STRENGTHS[1] (lbf)						ASD STRENGTHS[2] (lbf)					
	Static Dominant Loads[3]			Seismic SDC D, E or F[4]			Static Dominant Loads[3]			Seismic SDC D, E or F[4]		
	Shear-bearing	Shear-slip resistance	Tension	Shear-bearing	Shear-slip resistance	Tension	Shear-bearing	Shear-slip resistance	Tension	Shear-bearing	Shear-slip resistance	Tension
BQ1GAL12C	7680	150	5250	6900	150	4730	4800	90	3280	4320	100	2960
BQ2GAL12C	7680	150	5250	6900	150	4730	4800	90	3280	4230	100	2960
BQ3GAL12C	7680	150	5250	6900	150	4730	4800	90	3280	4320	100	2960
BQ1GAL16C	12200	170	13100	11000	170	11400	7650	110	8230	6870	110	7120
BQ2GAL16C	12200	170	13100	11000	170	11400	7650	110	8230	6870	110	7120
BQ3GAL16C	12200	170	13100	11000	170	11400	7650	110	8230	6870	110	7120
BQ1GAL20C	17600	790	15000	11800	790	13500	11000	490	9400	7380	500	8470
BQ2GAL20C	17600	790	15000	11800	790	13500	11000	490	9400	7380	500	8470
BQ3GAL20C	17600	790	15000	11800	790	13500	11000	490	9400	7380	500	8470

For **SI:** 1 lbf = 4.448N.

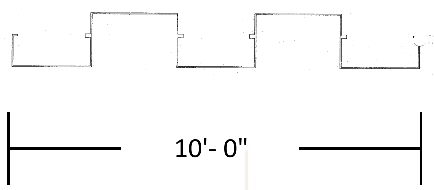
[1]Load and Resistance Factor Design (LRFD) strengths are derived in accordance AC437, Sections 3.4, 3.5, 3.7 and 3.8, based on test data per AC437 Section 4.0.
[2]Allowable Strength Design (ASD) strengths are derived in accordance AC437, Sections 3.4, 3.5, 3.9 and 3.10, based on test data per AC437 Section 4.0.
[3]Static dominant loads include load combinations with gravity and wind loads for structures assigned to all Seismic Design Categories and load combinations with seismic loads for structures assigned to Seismic Design Category (SDC) A, B or C.
[4]Seismic SDC D, E or F refer to load combinations with seismic loads for structures assigned to Seismic Design Category (SDC) D, E or F.

DECK DESIGN @ CANOPY 01 SECTION A1

Project Number	East Texas 222 - 405	Sheet	1,501		
Project Name		Designed by		Date	
Subject	DECK DESIGN	Checked by		Date	

Deck Design

Max Span on Deck = 10 ft



WL on Deck = 34.572 psf
RLL on Deck = 20 psf

For 10.0 ft Span

Allowable Wind Load =	**73.0**	**>**	**34.6**	psf
Allowable Live Load =	**75.0**	**>**	**20.0**	psf

USE [2 3/4" x 6" x 0.078" Aluminum Decking] as per page 1054

Deck Fastner Design

Uplift on Deck = 34.572 psf X $\frac{6"}{12"/ft}$ X $\frac{8.00 \text{ ft}}{2}$ = **34.6 Lbs**

Pull out strength of Steel Binder Heavy guage #12 screws = 996 lbs as per page 1055

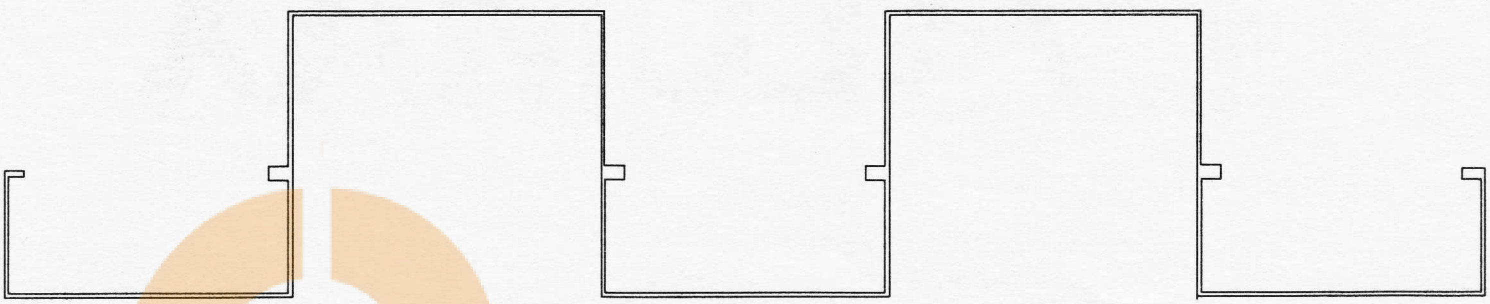
Allowable Pull Out = 996 lbs/4 (factor of Safety) = **249.0 Lbs** > **34.6 Lbs**

SAFE

USE [2 #12 screws @6" o.c.]

WALKWAY COVER DECKS

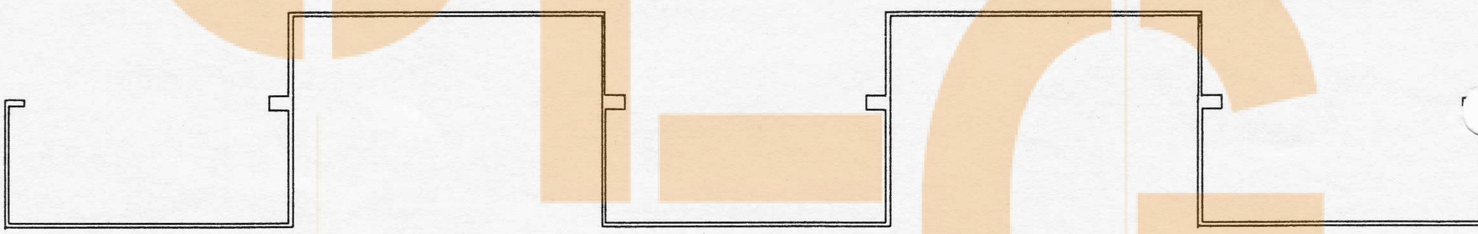
SAFETY FACTOR OF 1.95 FROM ULTIMATE STRESS CHARTS SHOW TOTAL ALLOWABLE LOAD PER BENT. ALL PROFILES ARE 6063-T6 IN ACCORDANCE WITH ASTM STDS. WELD STRESS IN ACCORDANCE WITH ALUMINUM ASSOCIATION STANDARDS. ALL DESIGN STRESS AND FACTORS OF SAFETY.



6″ DECK

Span (FT.)	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Gravity *	57	51	46	41	38	34	31	29	26	24	23	21	20	18	17	16	15	14
Wind *	68	61	54	49	45	41	37	34	31	29	27	25	23	22	20	19	18	17
L/180 *	69	58	49	42	36	32	28	24	22	19	17	15	14	12	11	10	9	9

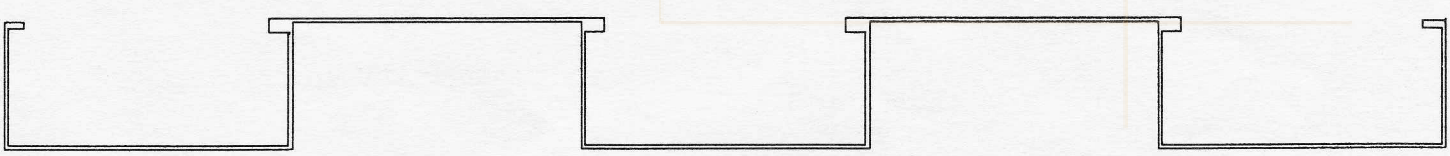
* (PFS)



4-1/2″ DECK

Span (FT.)	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Gravity *	75	64	55	48	42	38	33	30	27	25	22	21	19	17	16	15	14	13
Wind *	89	76	65	57	50	44	39	35	32	29	26	24	22	20	19	18	16	15
L/180 *	95	75	60	49	40	34	28	24	21	18	15	14	12	11	9	8	8	7

* (PSF)

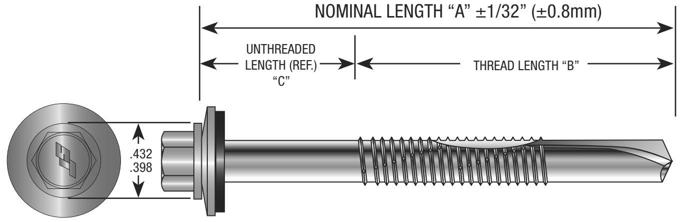


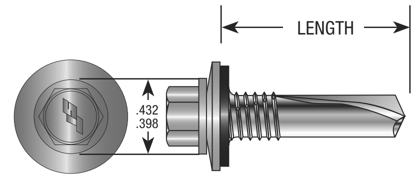
2-3/4″ DECK

Span (FT.)	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Gravity *	118	93	75	62	52	45	38	34	29	26	23	21	19	17	16
Wind *	114	90	73	61	51	43	37	33	29	25	23	20	18	17	15
L/180 *	123	86	63	47	36	29	23	19	15	13	11	9	8	7	6

* (PSF)

Steelbinder® Heavy Gauge





SPECIFICATIONS SUMMARY

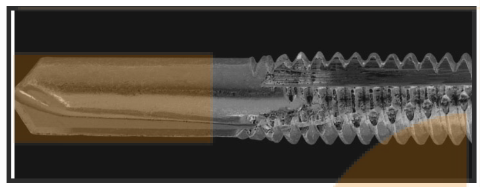
#12-24 Dimensions:

Drill Point: #4/#5
Major Diameter: .215"/.209"
Minor Diameter: .164" REF
Hex Across Flats: .311/.305

SIZE	HEAD STYLE	CARTON QTY.	WEIGHT/M
12-24 x 7/8"	HWH	2500	12.0
12-24 x 1-1/4"	HWH	2500	12.6
12-24 x 1-1/2"	HWH	2000	16.2
12-24 x 2"	HWH	1500	22.1

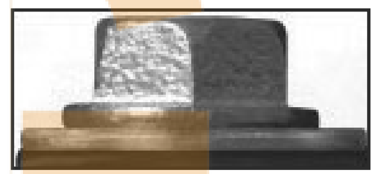
PERFORMANCE DATA

PULL OUT STRENGTH VALUE (LBS. ULT.)		MATERIAL			
		HRS Primed Only		HRS PLATE	
	NOM. GAUGE	14	12	3/16"	1/4"
	THICKNESS	.070	.106	.187	.250
#12-24 HEAVY GAUGE		924	1627	2556	3298

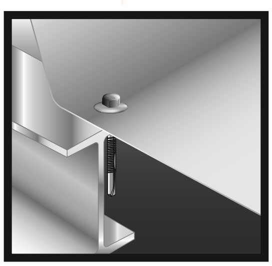


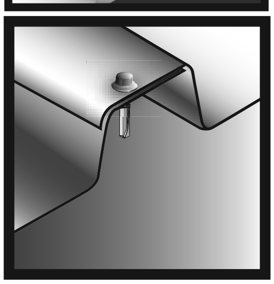
Long Drill point assures proper clearance of heavy gauge metal before any thread engagement begins

PULL OVER STRENGTH VALUE (LBS. ULT.)	DESIGNATION	MATERIAL		
		AZ55 GALVALUME		
	NOM. GAUGE	26	24	22
	THICKNESS	.019	.024	.032
BONDED WASHER (14mm O.D.)		801	996	1258
(.398/.432 HWH DIA.)		775	956	1078



HWH with EPDM bonded washer provides a secure seal to prevent leaks.





- Fastener lengths over 1-1/4"are designed to penetrate steel thickness up to .500". 12-24 x 7/8" is designed to drill up to .250".
- Thread to point ratio engineered to provide maximum pull out strength in heavy gauge steel.
- EPDM rubber is vulcanized to steel washer. Moisture has no place to penetrate. The washer provides a secure seal even when driven at an angle.
- Applications include metal deck to structural steel or bar joists, & retrofit clips to structural steel.
- Fastener is also available without a bonded sealing washer.

NOTES: *1. HRS (Hot Rolled Steel)*
2. All strength values shown are ultimate values, expressed in LBS. Apply an appropriate safety factor to obtain design limits.

SEALTITE BUILDING FASTENERS
www.sealtite.com

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BOTH SIDE CANTILEVER CANOPY

Page 1,056 - 1101

DESIGN OF COLUMN SUPPORTED CANOPY 6 @ SECTION F

Project Number	ETC 222-405	Sheet	
Project Name		Designed by	Date
Subject	DESIGN LOADS	Checked by	Date

TRIB WIDTH **10** **ft**

LOAD CALCULATION (DEAD & LIVE)

DEAD LOAD (W)	=	3	psf	x	10	=	30.00	plf
LIVE LOAD	=	20	psf	x	10	=	200.00	plf

WIND LOAD CASE A

WINDWARD	=	27.13	psf	x	10		=	271.30	plf
LEEWARD	=	6.78	psf	x	10		=	67.80	plf
ALONG THE RIDGE	=	18.09		1.33	x	10	=	240.60	lbs

(depth of beam 8") / 6" = 1.33

WIND LOAD CASE B

WINDWARD	=	-24.87	psf	x	10		=	-248.70	plf
LEEWARD	=	-2.26	psf	x	10		=	-22.60	plf
ALONG THE RIDGE	=	-18.09		1.33	x	10	=	-240.60	lbs

(depth of beam 8") / 6" = 1.33

SEISMIC LOADS

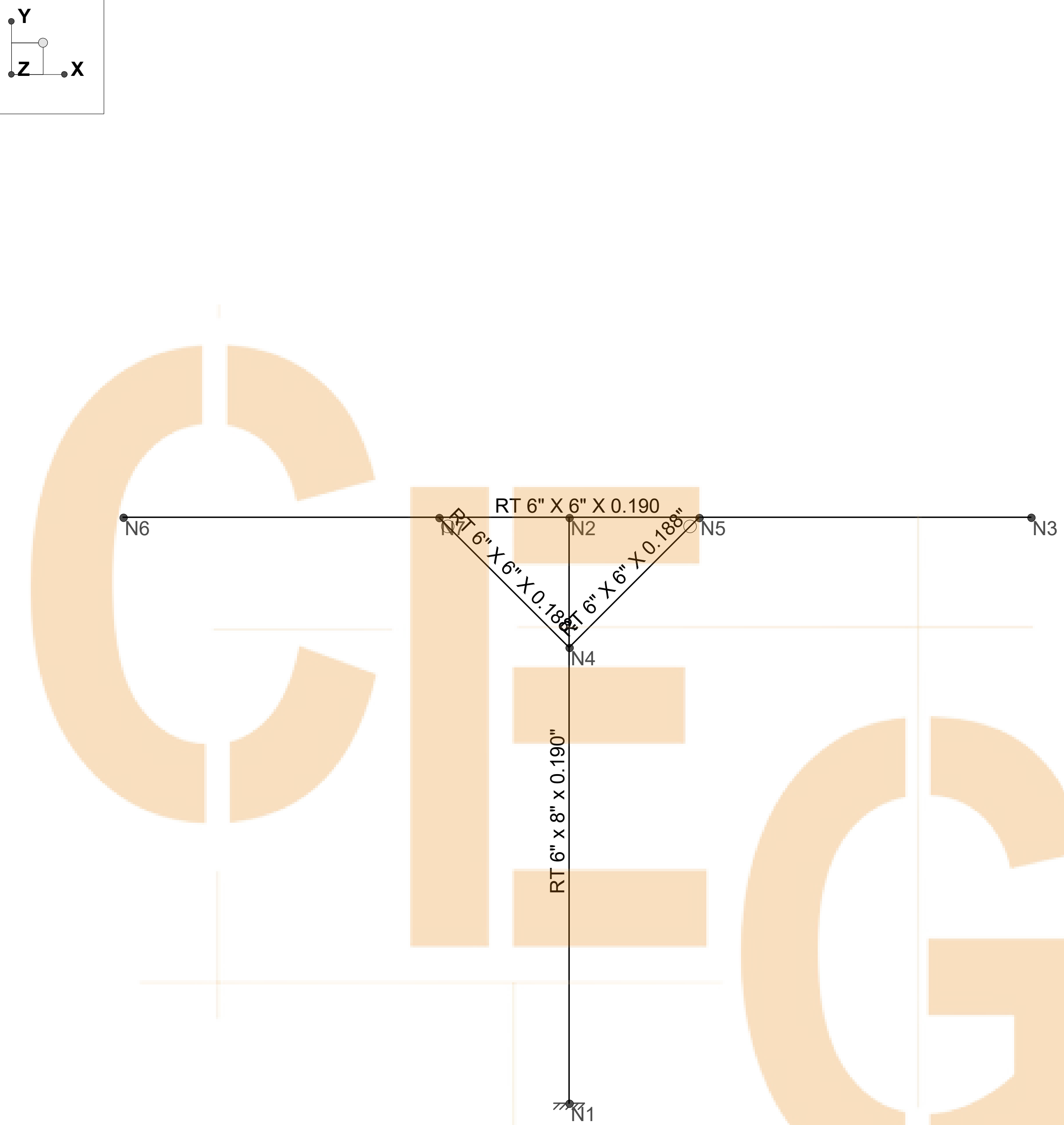
LATERAL SEISMIC FORCE **V = Cs x W**

Seismic Co-efficient (ASD) (As per page = **Cs =** 0.09

W, Weight of the Component W = 30.00 plf

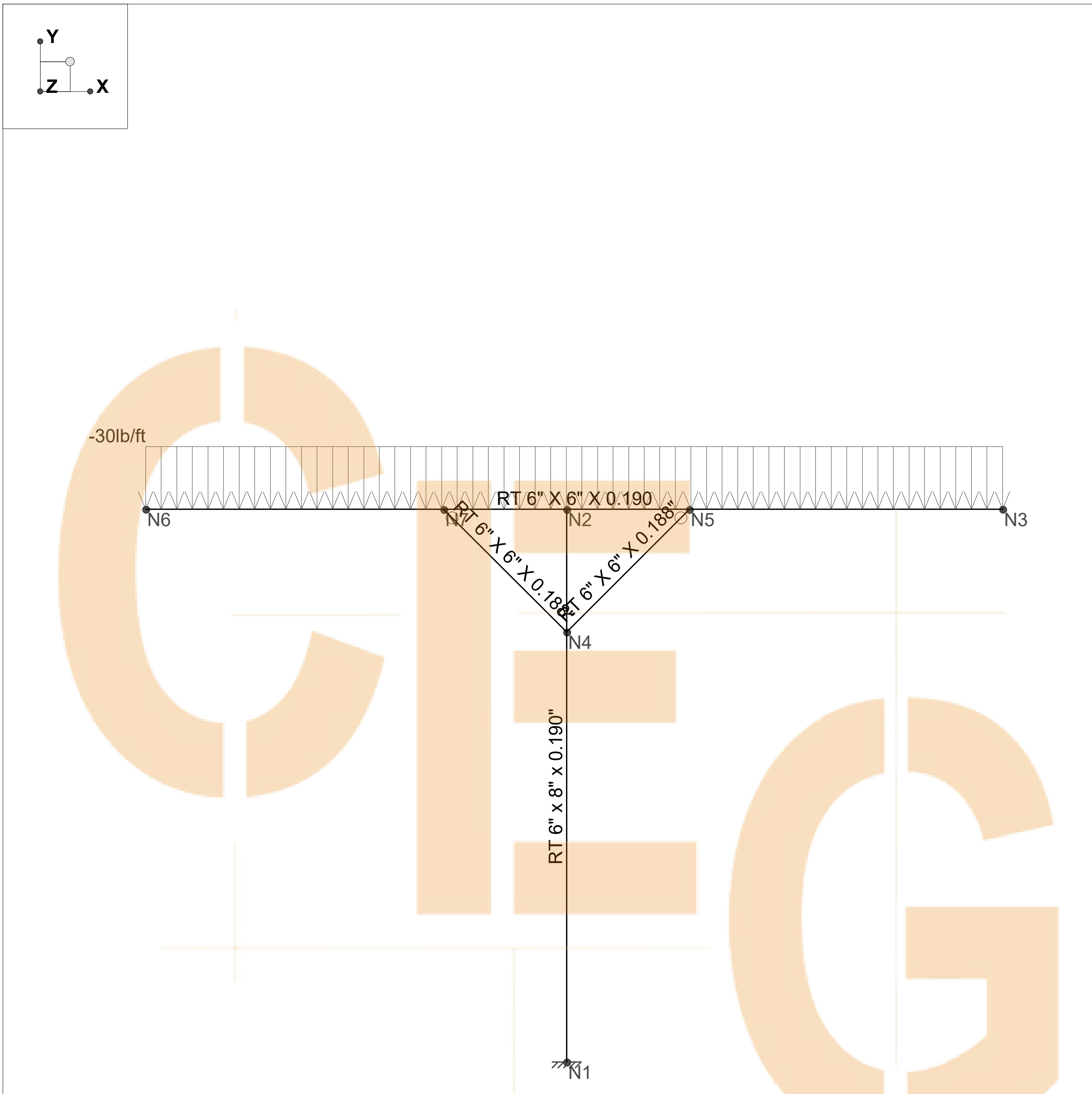
V = 2.70 plf

USE = 3.00 plf



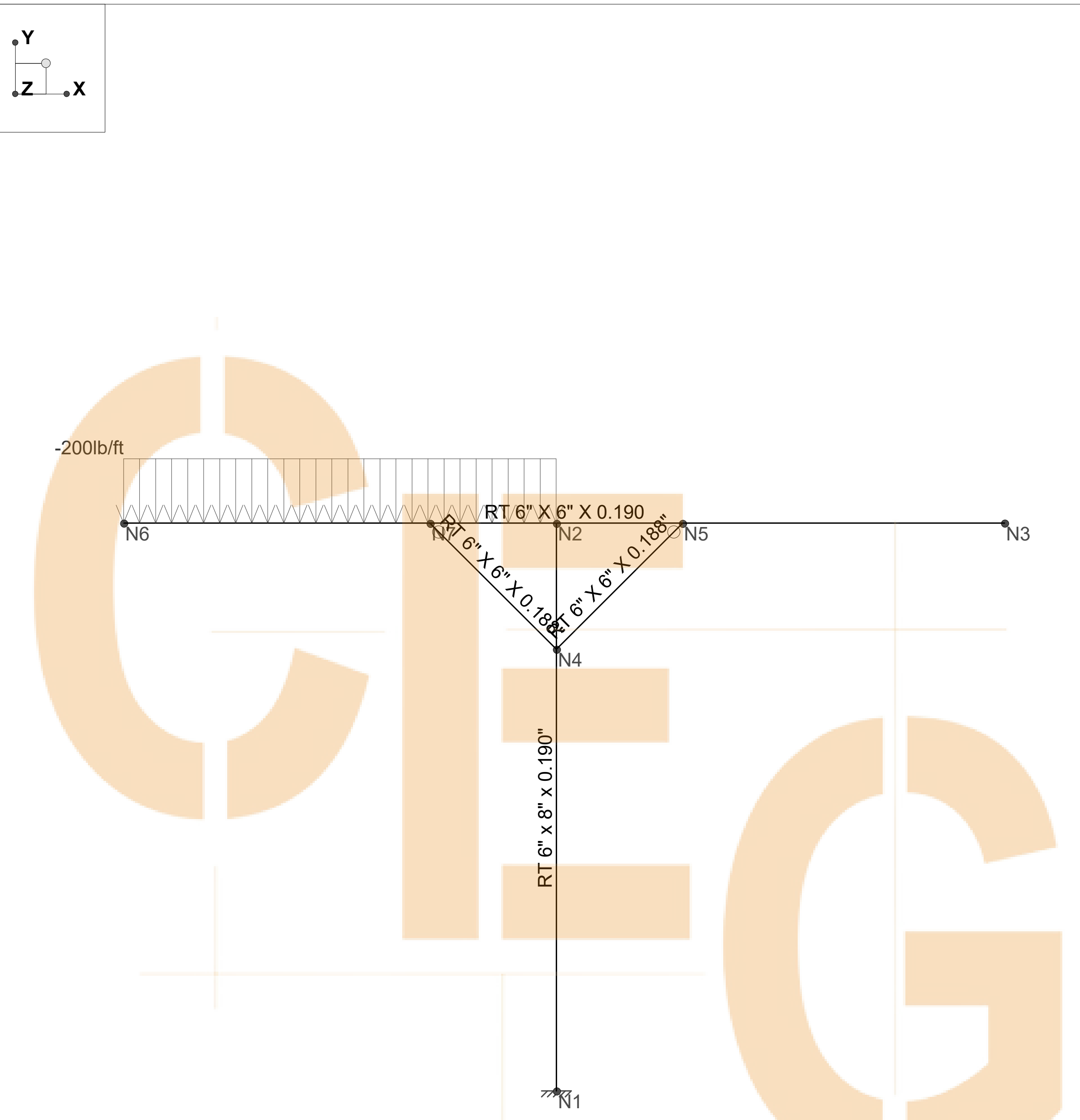
Envelope Only Solution

	CNOPY SECTION F	SK - 1
EAST TEXAS 222-405		both side cantilever HALF LOAD.r...



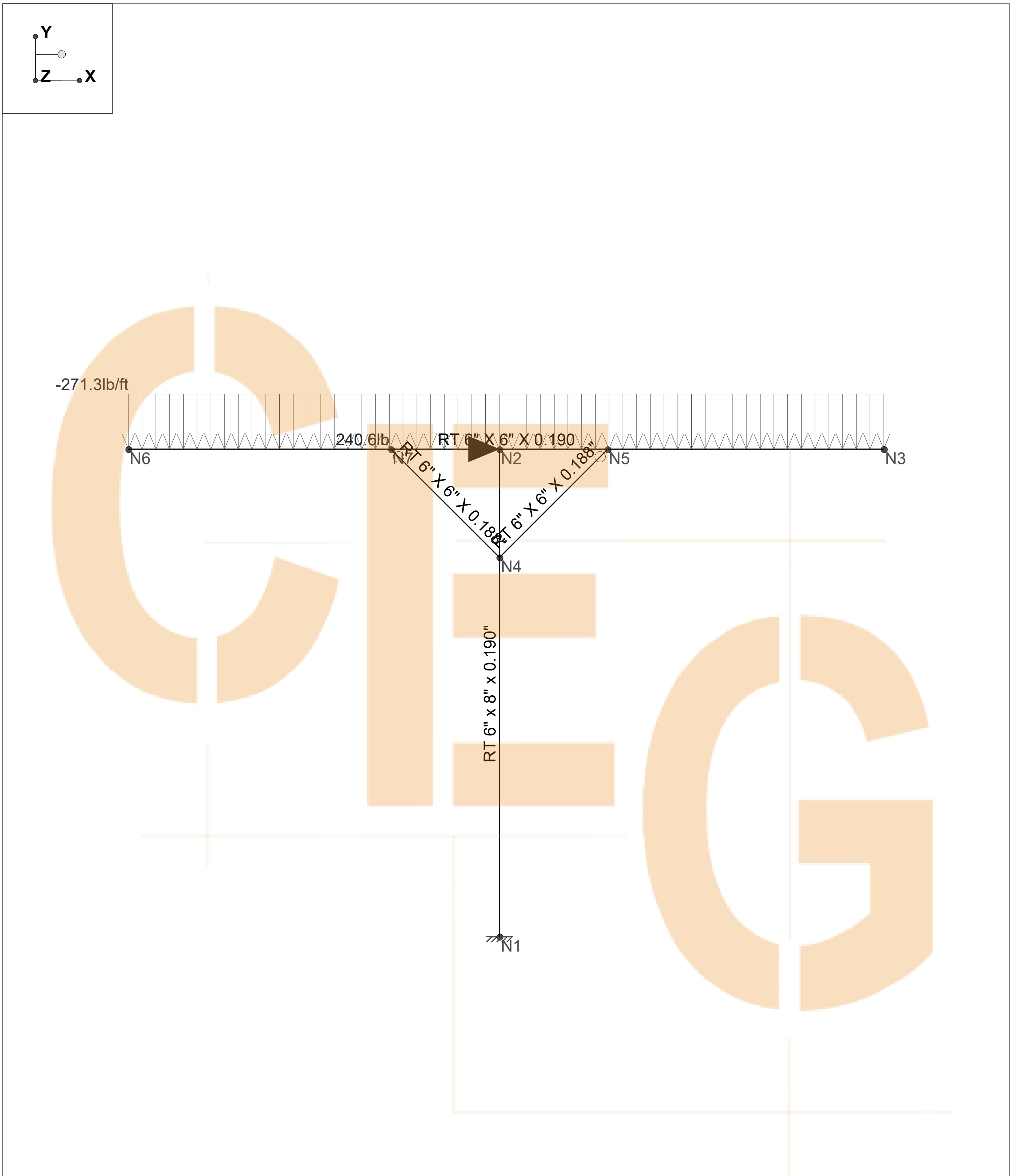
Loads: BLC 1, DL
Envelope Only Solution

	CNOPY SECTION F	SK - 2
EAST TEXAS 222-405		both side cantilever HALF LOAD.r...



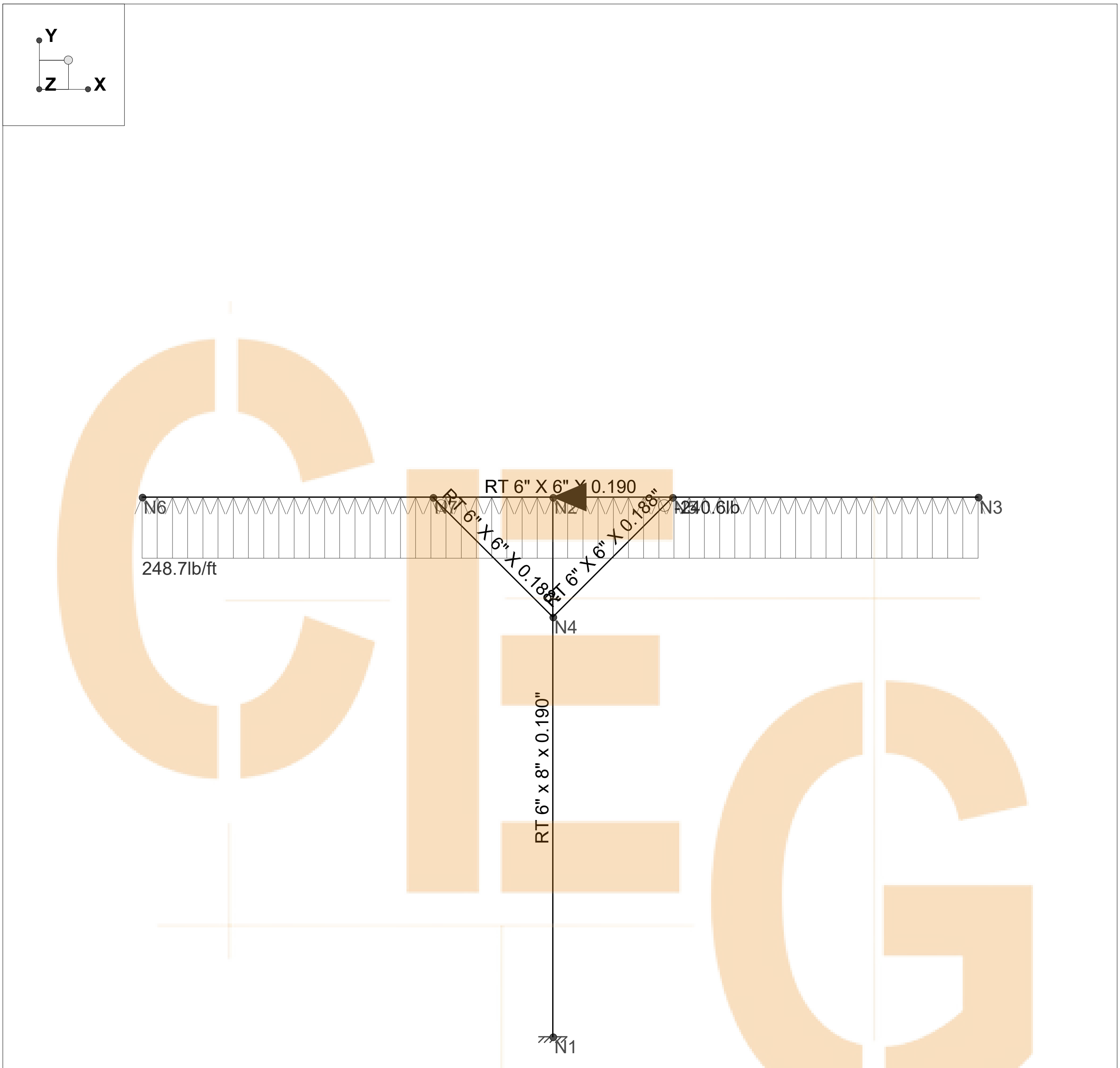
Loads: BLC 2, RLL
Envelope Only Solution

	CNOPY SECTION F	SK - 3
EAST TEXAS 222-405		both side cantilever HALF LOAD.r...



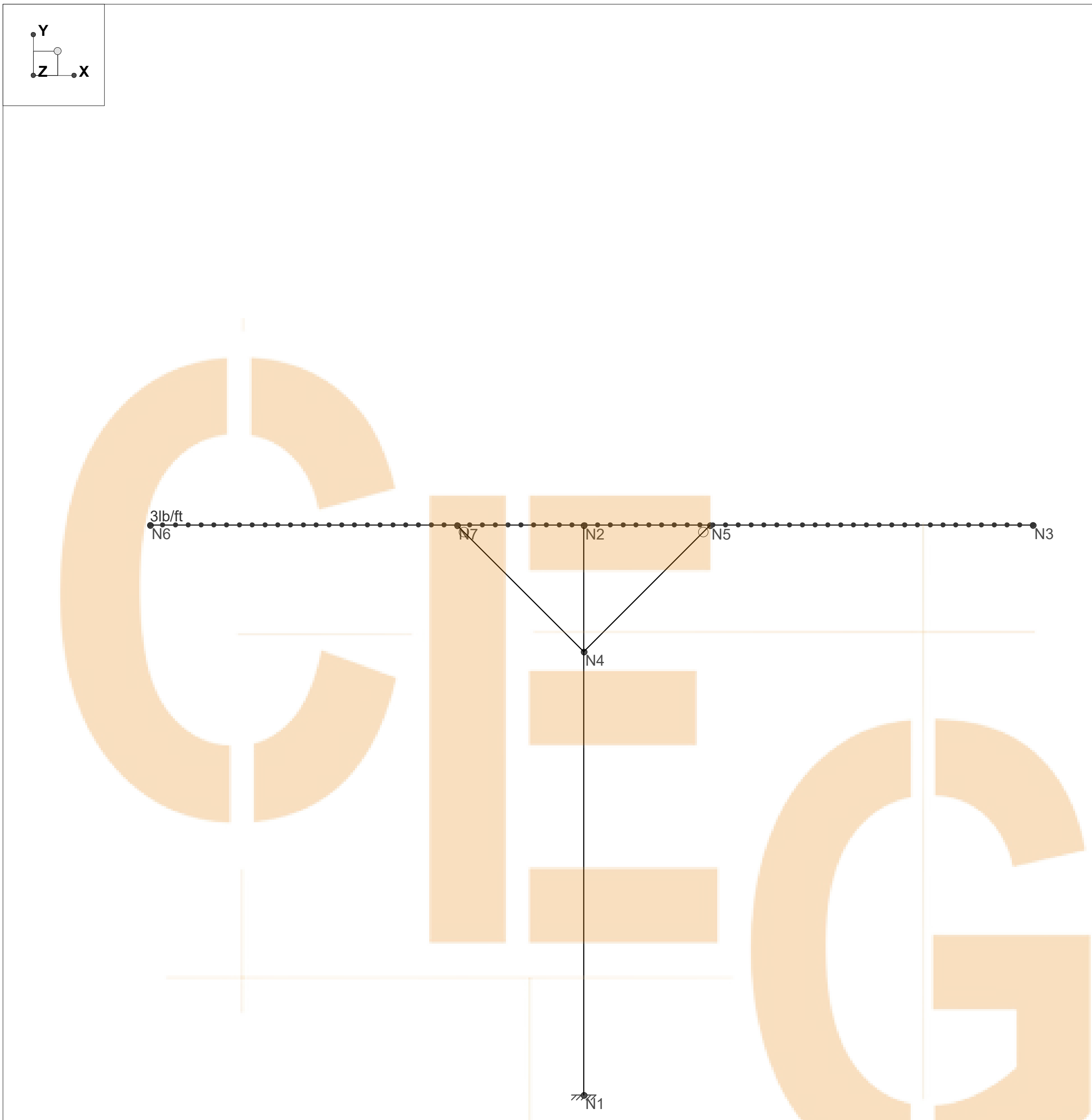
Loads: BLC 3, WLA
Envelope Only Solution

	CNOPY SECTION F	SK - 4
EAST TEXAS 222-405		both side cantilever HALF LOAD.r...



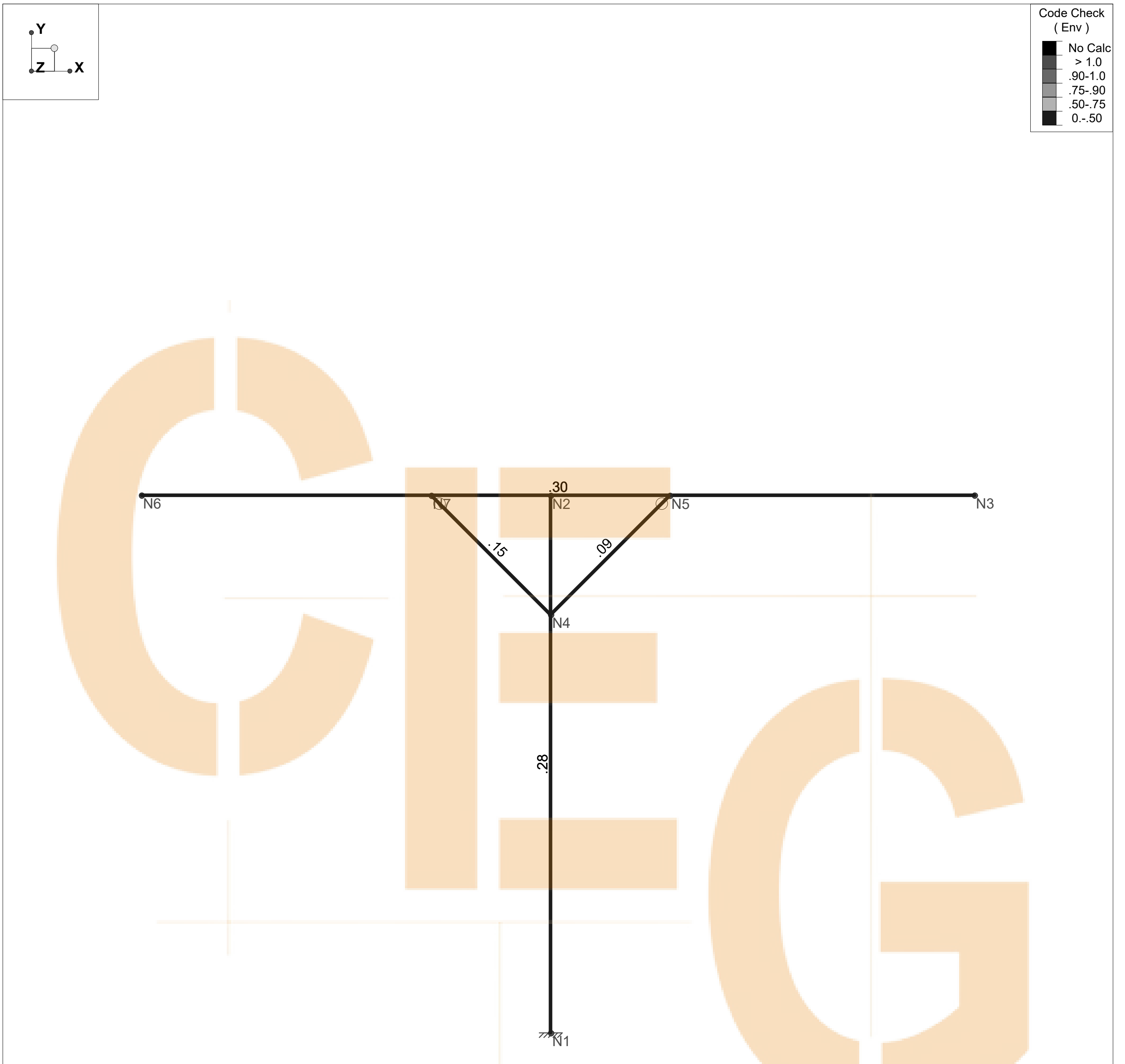
Loads: BLC 4, WLB
Envelope Only Solution

	CNOPY SECTION F	SK - 5
EAST TEXAS 222-405		both side cantilever HALF LOAD.r...



Loads: BLC 5, EL
Envelope Only Solution

	CNOPY SECTION F	SK -
EAST TEXAS 222-405		both side cantilever FULL LOAD -...



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

	CNOPY SECTION F	SK - 1
EAST TEXAS 222-405		
		both side cantilever HALF LOAD.r...

Company	:
Designer	:
Job Number	: EAST TEXAS 222-405
Model Name	: CNOPY SECTION F

2:31 PM
Checked By:

Aluminum Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (...	Density[...	Table B.4	kt	Ftu[ksi]	Fty[ksi]	Fcy[ksi]	Fsu[ksi]	Ct
1	3003-H14	10100	3787.5	.33	1.3	.173	Table B....	1	19	16	13	12	141
2	6061-T6	10100	3787.5	.33	1.3	.173	Table B....	1	38	35	35	24	141
3	6063-T5	10100	3787.5	.33	1.3	.173	Table B....	1	22	16	16	13	141
4	6063-T6	10100	3787.5	.33	1.3	.173	Table B....	1	30	25	25	19	141
5	5052-H34	10200	3787.5	.33	1.3	.173	Table B....	1	34	26	24	20	141
6	6061-T6 W	10100	3787.5	.33	1.3	.173	Table B....	1	24	15	15	15	141
7	6061-T6 haz	10100	3787.5	.33	1.3	.173	Table B....	1	29	23	23	18	141

Aluminum Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	C1	RT 6" x 8" x 0...	Column	Rectangular Tubes	6061-T6	Typical	5.176	31.285	48.786	57.446
2	B1	RT 6" X 6" X ...	Beam	Rectangular Tubes	6061-T6	Typical	4.416	24.869	24.869	37.263
3	KNEE BR...	RT 6" X 6" X ...	VBrace	Rectangular Tubes	6061-T6	Typical	4.371	24.632	24.632	36.909

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
1	N1	17.166667	3.663	0	0	
2	N2	17.166667	12.662997	0	0	
3	N3	24.266667	12.662997	0	0	
4	N4	17.166667	10.662997	0	0	
5	N5	19.166667	12.662997	0	0	
6	N6	10.316667	12.662997	0	0	
7	N7	15.166667	12.662997	0	0	

Aluminum Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	C1	9									Lateral
2	M2	B1	13.95	.408		.083	.083	.417				Lateral
3	M3	KNEE BRA...	2.828									Lateral
4	M4	KNEE BRA...	2.828									Lateral
5	M5	KNEE BRA...	2.828									Lateral
6	M6	KNEE BRA...	2.828									Lateral

Member Area Loads

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]
No Data to Print ...						

Load Combinations

	Description	Solve	PDe...	S...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	IBC 16-8	Yes	Y		DL	1																		
2	IBC 16-10 (a)	Yes	Y		DL	1	RLL	1																
3	IBC 16-12 (a)	Yes	Y		DL	1	WL...	.6																
4	IBC 16-13 (a)	Yes	Y		DL	1	WL...	.45					R...	.75										
5	IBC 16-15	Yes	Y		DL	.6	WL...	.6																
6	IBC 16-12 (b)	Yes	Y		DL	1	ELZ	.7																
7	IBC 16-12 (a)	Yes	Y		DL	1	WL-Y	.6																
8	IBC 16-13 (a)	Yes	Y		DL	1	WL-Y	.45					R...	.75										
9	IBC 16-15	Yes	Y		DL	.6	WL-Y	.6																
10	DL ONLY		Y		DL	1.25																		
11	RLL ONLY		Y		RLL	1.25																		

Company :
Designer :
Job Number : EAST TEXAS 222-405
Model Name : CNOPY SECTION F

2:31 PM
Checked By:

Load Combinations (Continued)

	Description	Solve	PDe...	S...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
12	WL+Y		Y		WL+Y	1.25																		
13	WL-Y		Y		WL-Y	1.25																		

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N1	max	144.36	9	3308.568	4	0	9	0	9	2.481	6	1728.83	3
2		min	-144.36	3	-1734.83	9	-19.53	6	-178.148	6	0	1	-4840.959	2
3	Totals:	max	144.36	9	3308.568	4	0	9						
4		min	-144.36	3	-1734.83	9	-19.53	6						

Envelope AA ADM1-15: ASD - Building Aluminum Code Checks

	Member	Shape	Code C...	Loc[ft]	LC	Shear ...	Loc[ft]	Dir	LC	Pnc/O...	Pnt/Om...	Mny/O...	Mnz/O...	Vny/O...	Vnz/O...	Cb	Eqn
1	M1	RT 6" x 8...	.279	0	2	.040	7.031	y	2	82274....	100857...	12561....	18963....	34477....	25395....	1....	H.1-1
2	M2	RT 6" X 6...	.302	4.941	4	.088	4.941	y	4	45572....	86047.59	12888....	12888....	25395....	25395....	1	H.1-1
3	M5	RT 6" X 6...	.090	0	8	.014	2.828	y	2	81118....	85171....	12699....	12699....	25156....	25156....	1....	H.1-1
4	M6	RT 6" X 6...	.153	0	2	.020	0	y	2	81118....	85171....	12699....	12699....	25156....	25156....	1....	H.1-1

Envelope Member Section Forces

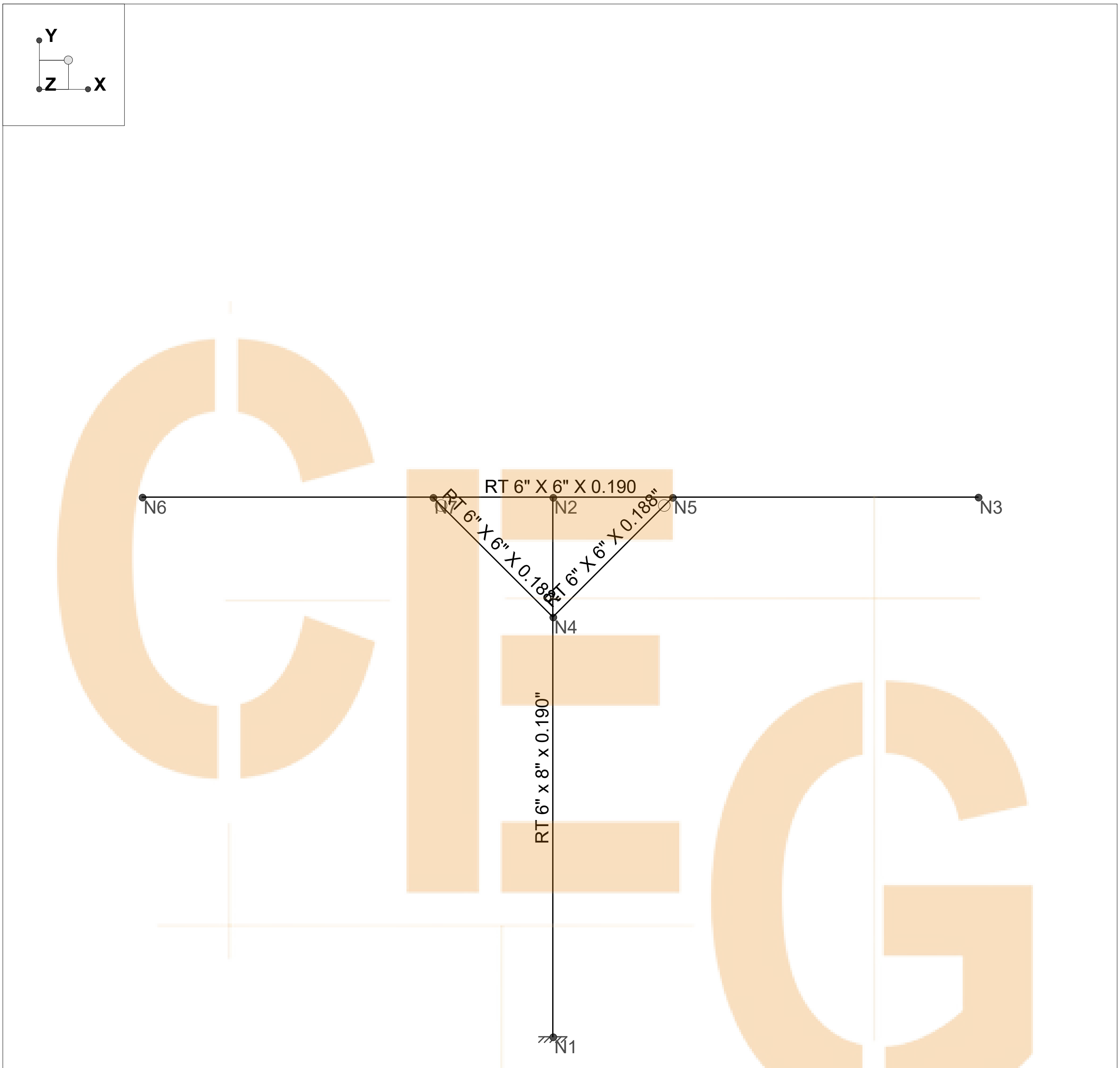
	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[l...	LC	y-y Mom...	LC	z-z Moment[lb-ft]	LC
1	M1	1	max	3308.568	4	140.799	7	19.767	6	2.481	6	0	9	4840.959	2
2			min	-1734.83	9	-152.367	3	0	1	0	1	-178.148	6	-1728.83	3
3		2	max	3294.594	4	140.799	7	19.767	6	2.481	6	0	9	4798.462	2
4			min	-1743.214	9	-152.367	3	0	1	0	1	-133.673	6	-1386.005	3
5		3	max	3280.62	4	140.799	7	19.767	6	2.481	6	0	9	4755.966	2
6			min	-1751.599	9	-152.367	3	0	1	0	1	-89.198	6	-1043.18	3
7		4	max	3266.646	4	140.799	7	19.767	6	2.481	6	0	9	4713.469	2
8			min	-1759.983	9	-152.367	3	0	1	0	1	-44.723	6	-700.355	3
9		5	max	1410.961	9	1390.042	2	4.614	6	.522	6	0	9	71.632	3
10			min	-2489.13	4	-204.425	3	0	1	0	1	-3.524	6	-447.417	2
11	M2	1	max	0	9	0	9	0	9	0	9	0	9	0	9
12			min	0	1	0	1	0	1	0	1	0	1	0	1
13		2	max	0	9	446.542	9	4.882	6	0	9	8.514	6	1869.313	4
14			min	0	1	-1072.001	4	0	1	0	1	0	1	-778.663	9
15		3	max	1508.159	9	773.97	9	0	9	0	9	17.636	6	163.426	2
16			min	-2376.397	3	-1194.182	3	-2.041	6	-1.937	6	0	1	-11.449	5
17		4	max	0	9	690.8	3	0	9	0	9	8.514	6	1204.646	3
18			min	0	1	-446.542	9	-4.882	6	0	1	0	1	-778.699	9
19		5	max	0	9	0	9	0	9	0	9	0	9	0	9
20			min	0	1	0	1	0	1	0	1	0	1	0	1
21	M5	1	max	3502.889	3	160.71	3	0	9	2.739	6	22.741	6	439.721	3
22			min	-2243.694	9	-348.696	2	-8.04	6	0	1	0	1	-1001.096	2
23		2	max	3500.267	3	158.087	3	0	9	2.739	6	17.056	6	327.009	3
24			min	-2245.268	9	-351.319	2	-8.04	6	0	1	0	1	-753.604	2
25		3	max	3497.645	3	155.465	3	0	9	2.739	6	11.371	6	216.152	3
26			min	-2246.841	9	-353.941	2	-8.04	6	0	1	0	1	-504.257	2
27		4	max	3495.022	3	152.842	3	0	9	2.739	6	5.685	6	107.149	3
28			min	-2248.415	9	-356.563	2	-8.04	6	0	1	0	1	-253.056	2
29		5	max	3492.4	3	150.22	3	0	9	2.739	6	0	9	0	9
30			min	-2249.988	9	-359.186	2	-8.04	6	0	1	0	1	0	1
31	M6	1	max	4925.972	4	491.375	2	7.236	6	0	9	0	9	1374.985	2
32			min	-2134.797	9	-15.446	9	0	1	-2.244	6	-20.466	6	-52.587	9
33		2	max	4923.35	4	488.753	2	7.236	6	0	9	0	9	1028.457	2
34			min	-2136.371	9	-17.019	9	0	1	-2.244	6	-15.349	6	-41.109	9
35		3	max	4920.728	4	486.131	2	7.236	6	0	9	0	9	683.784	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[l...	LC	y-y Mom...	LC	z-z Moment[lb-ft]	LC
36			min	-2137.944	9	-18.592	9	0	1	-2.244	6	-10.233	6	-28.519	9
37		4	max	4918.105	4	483.508	2	7.236	6	0	9	0	9	340.965	2
38			min	-2139.518	9	-20.166	9	0	1	-2.244	6	-5.116	6	-14.816	9
39		5	max	4915.483	4	480.886	2	7.236	6	0	9	0	9	0	9
40			min	-2141.091	9	-21.739	9	0	1	-2.244	6	0	1	0	1

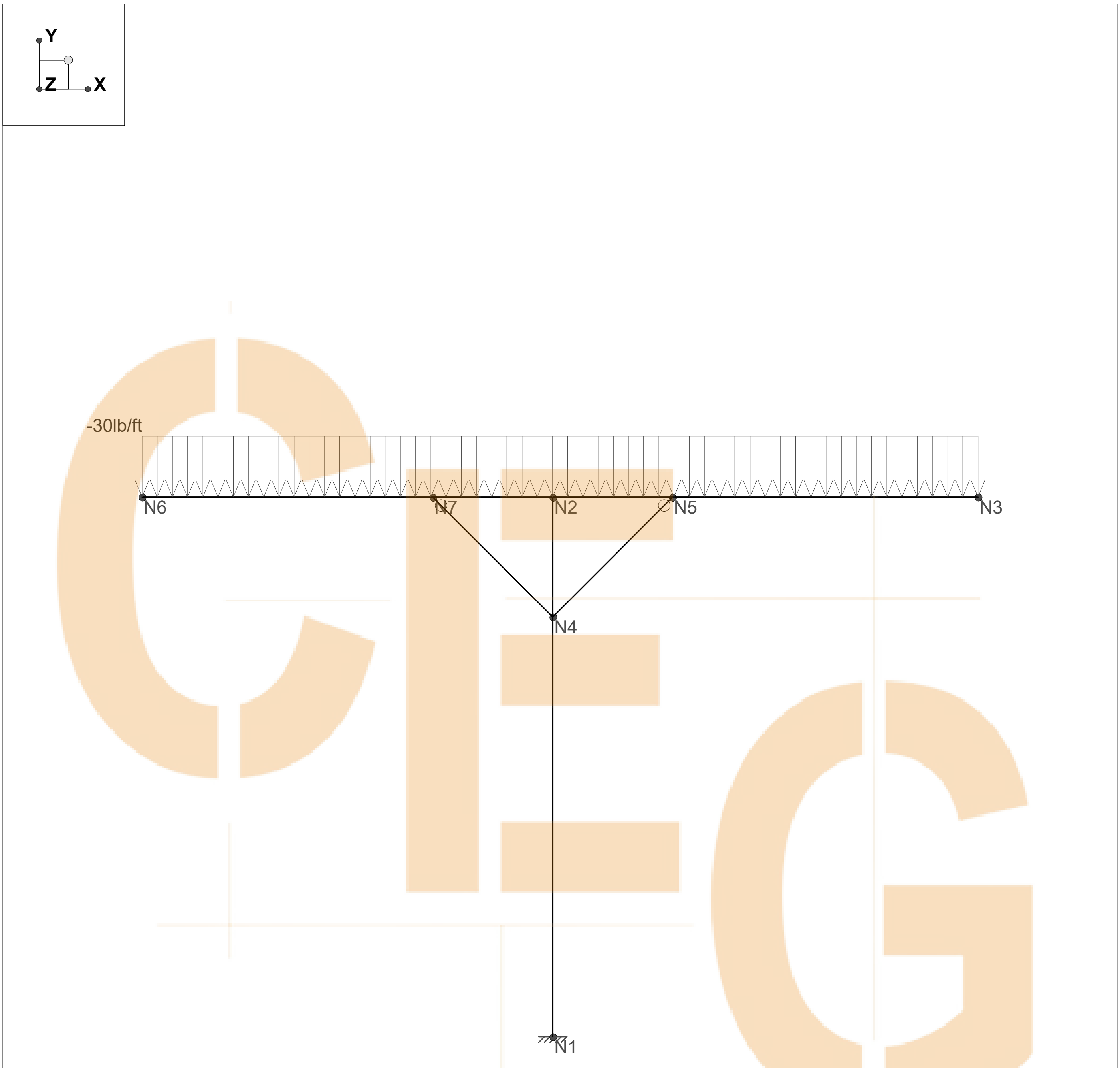
Envelope Member Section Deflections Service

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y' Ratio	LC	(n) L/z' Ratio	LC
1	M1	1	max	0	9	0	9	0	9	0	9	NC	9	NC	9
2			min	0	1	0	1	0	1	0	1	NC	1	NC	1
3		2	max	.001	9	.018	3	0	9	0	9	NC	6	NC	9
4			min	-.002	4	-.054	2	-.003	6	-3.695e-6	6	2014.384	2	NC	1
5		3	max	.002	9	.067	3	0	9	0	9	NC	6	NC	9
6			min	-.004	4	-.214	2	-.01	6	-7.389e-6	6	505.343	2	NC	1
7		4	max	.003	9	.14	3	0	9	0	9	NC	6	NC	9
8			min	-.006	4	-.479	2	-.021	6	-1.108e-5	6	225.299	2	5132.796	6
9		5	max	.003	9	.224	3	0	9	0	9	NC	6	NC	9
10			min	-.005	4	-.824	2	-.033	6	-1.219e-5	6	131.089	2	3280.683	6
11	M2	1	max	.223	3	.047	5	.034	6	4.47e-4	6	NC	9	NC	9
12			min	-.825	2	-1.31	2	0	1	0	1	71.216	2	NC	1
13		2	max	.223	3	.075	5	.033	6	4.47e-4	6	NC	9	NC	9
14			min	-.825	2	-.576	2	0	1	0	1	103.55	2	NC	1
15		3	max	.224	3	.017	8	.033	6	4.44e-4	6	NC	8	NC	9
16			min	-.824	2	-.009	3	0	1	0	1	620.358	4	NC	1
17		4	max	.226	3	.54	2	.034	6	4.477e-4	6	NC	6	NC	9
18			min	-.823	2	-.205	3	0	1	0	1	109.534	8	NC	1
19		5	max	.226	3	1.065	8	.037	6	4.477e-4	6	NC	4	NC	9
20			min	-.823	2	-.529	3	0	1	0	1	80.6	8	NC	1
21	M5	1	max	.101	3	.362	2	.022	6	2.991e-4	6	NC	9	NC	9
22			min	-.367	2	-.109	3	0	1	0	1	NC	1	NC	1
23		2	max	.1	3	.467	2	.025	6	2.971e-4	6	NC	9	NC	9
24			min	-.367	2	-.136	3	0	1	0	1	NC	1	NC	1
25		3	max	.099	3	.575	2	.028	6	2.951e-4	6	NC	9	NC	9
26			min	-.368	2	-.164	3	0	1	0	1	9702.471	2	NC	1
27		4	max	.099	3	.685	2	.031	6	2.931e-4	6	NC	9	NC	9
28			min	-.368	2	-.193	3	0	1	0	1	NC	1	NC	1
29		5	max	.098	3	.796	2	.034	6	2.911e-4	6	NC	9	NC	9
30			min	-.368	2	-.222	3	0	1	0	1	NC	1	NC	1
31	M6	1	max	.362	2	.101	3	0	9	0	9	NC	9	NC	9
32			min	-.109	3	-.367	2	-.022	6	-3.154e-4	6	NC	1	NC	1
33		2	max	.361	2	.127	3	0	9	0	9	NC	9	NC	9
34			min	-.11	3	-.473	2	-.025	6	-3.137e-4	6	8153.012	2	NC	1
35		3	max	.36	2	.152	3	0	9	0	9	NC	9	NC	9
36			min	-.111	3	-.583	2	-.028	6	-3.121e-4	6	7139.868	2	NC	1
37		4	max	.359	2	.178	3	0	9	0	9	NC	9	NC	9
38			min	-.112	3	-.696	2	-.03	6	-3.105e-4	6	NC	1	NC	1
39		5	max	.358	2	.203	3	0	9	0	9	NC	9	NC	9
40			min	-.112	3	-.809	2	-.033	6	-3.088e-4	6	NC	1	NC	1



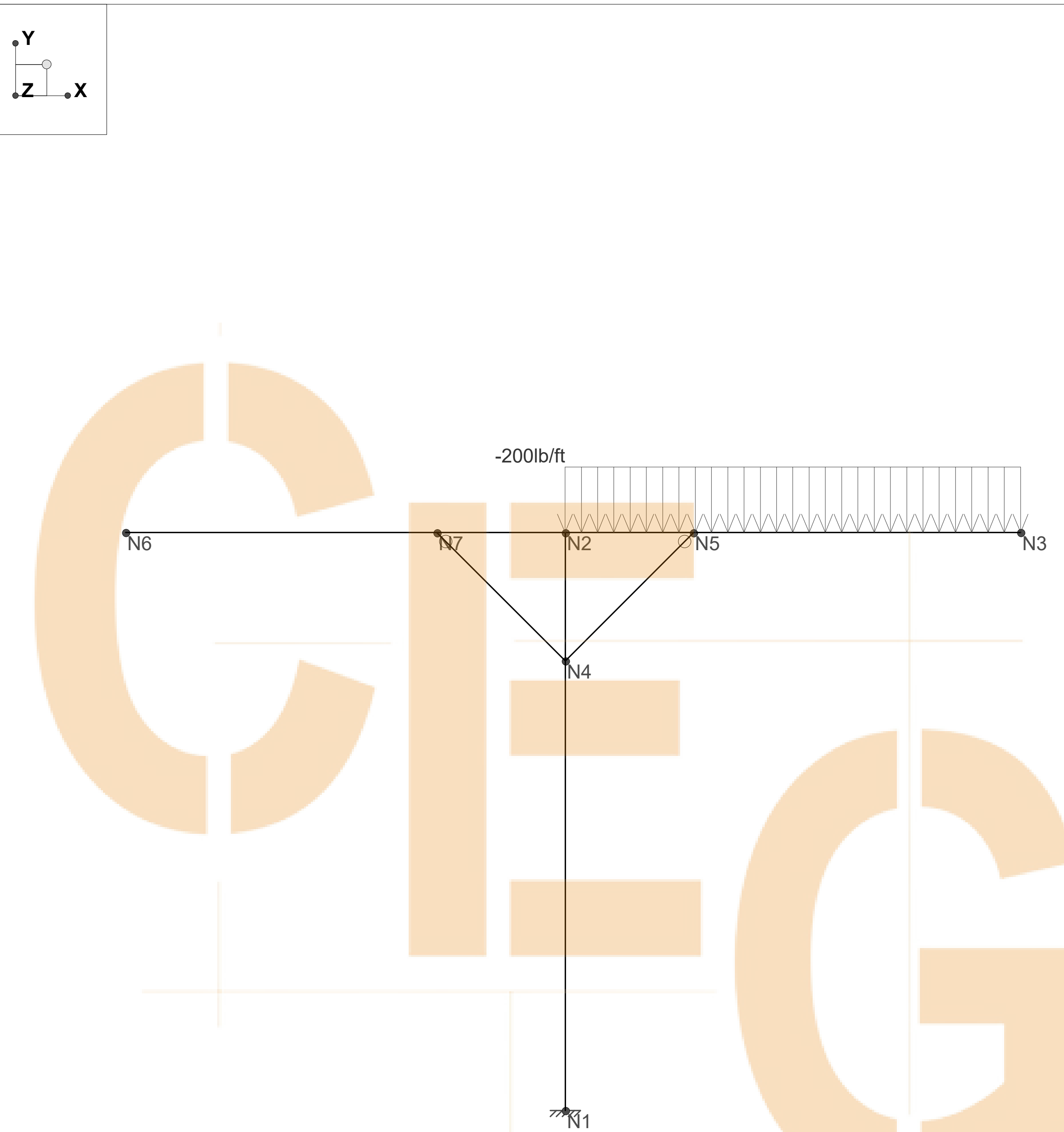
Envelope Only Solution

	CNOPY SECTION F	SK - 1
EAST TEXAS 222-405		both side cantilever HALF LOAD -...



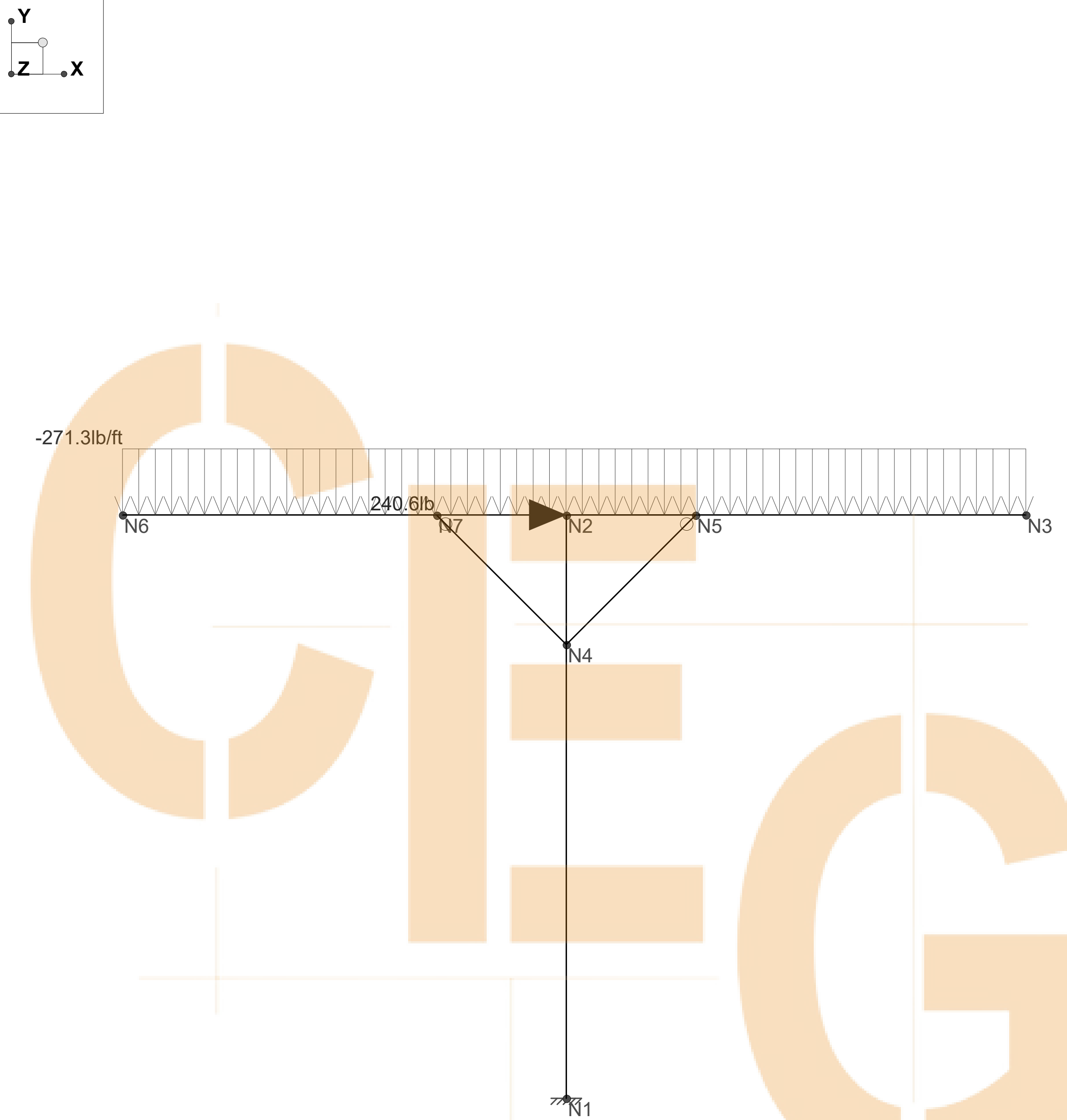
Loads: BLC 1, DL
Envelope Only Solution

	CNOPY SECTION F	SK - 2
EAST TEXAS 222-405		both side cantilever HALF LOAD -...



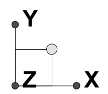
Loads: BLC 2, RLL
Envelope Only Solution

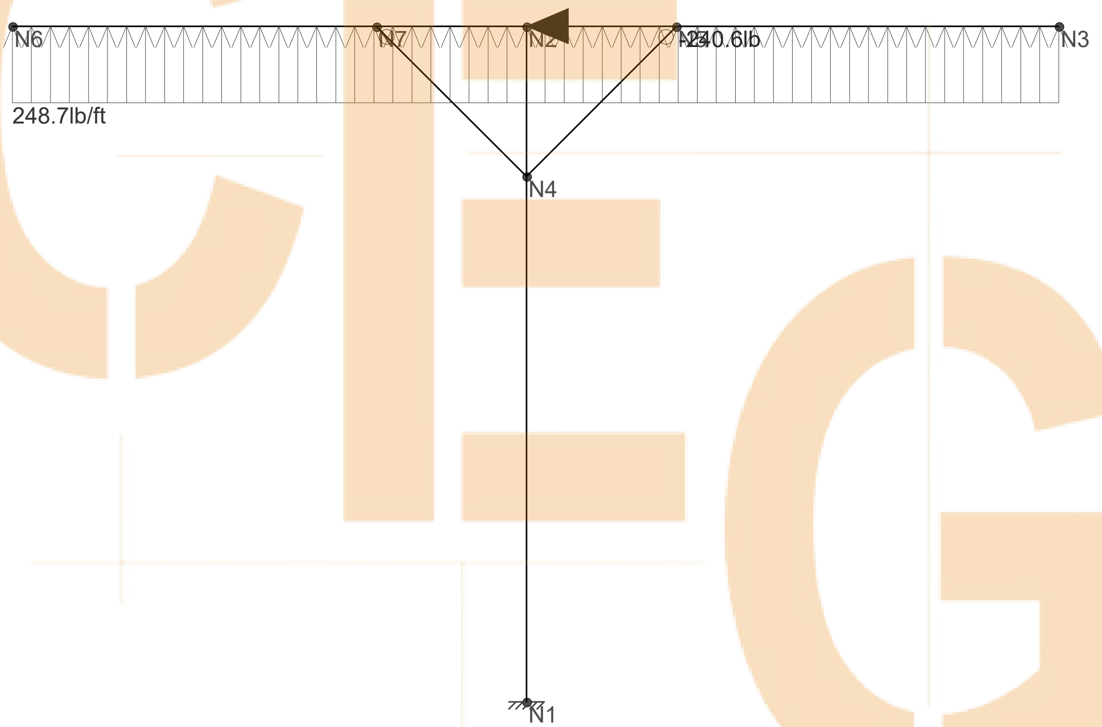
	CNOPY SECTION F	SK - 3
EAST TEXAS 222-405		both side cantilever HALF LOAD -...



Loads: BLC 3, WLA
Envelope Only Solution

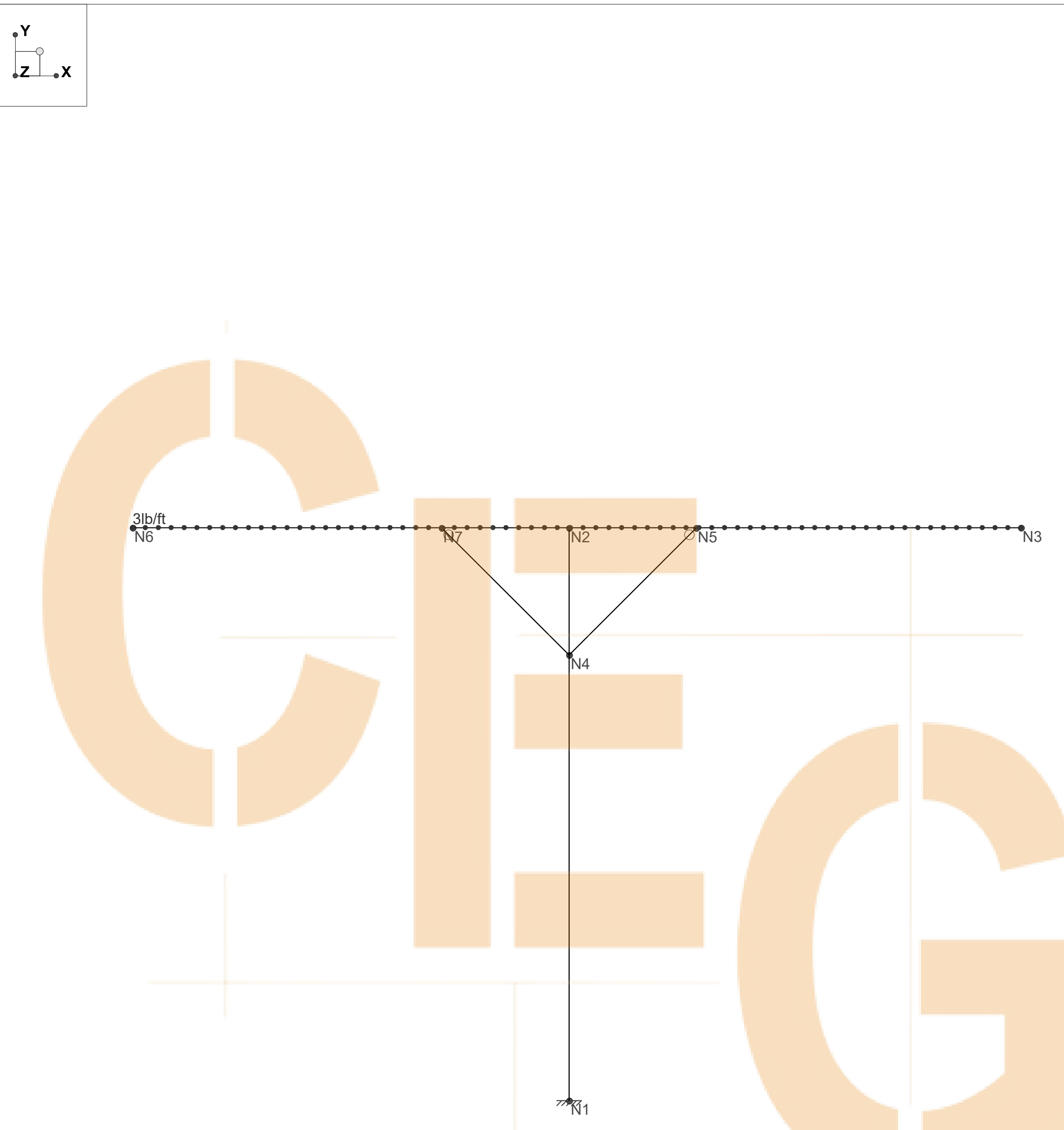
	CNOPY SECTION F	SK - 4
EAST TEXAS 222-405		
		both side cantilever HALF LOAD -...





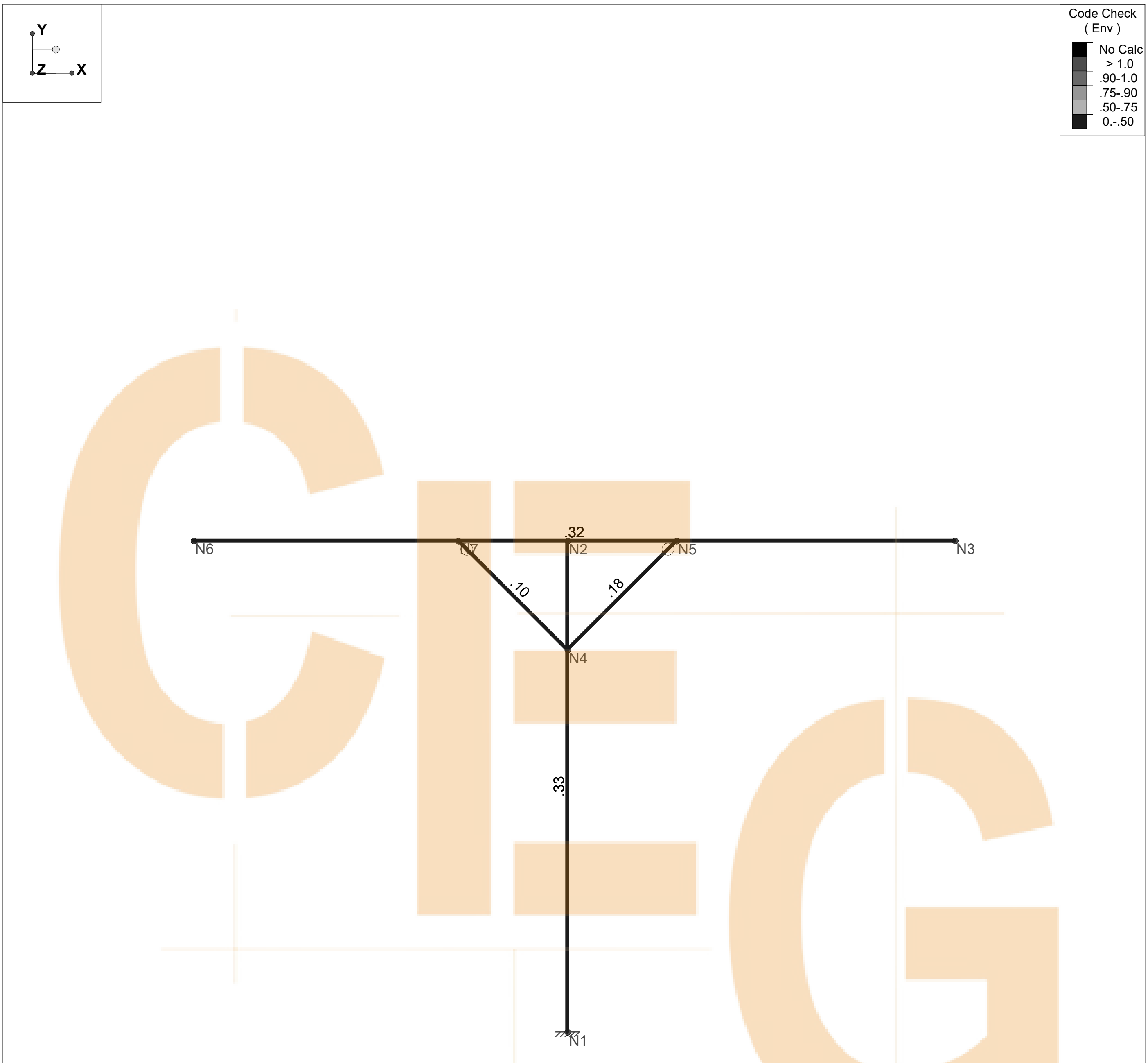
Loads: BLC 4, WLB
Envelope Only Solution

	CNOPY SECTION F	SK - 5
EAST TEXAS 222-405		both side cantilever HALF LOAD -...



Loads: BLC 5, EL
Envelope Only Solution

	CNOPY SECTION F	SK -
EAST TEXAS 222-405		both side cantilever FULL LOAD -...



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

	CNOPY SECTION F	SK - 1
EAST TEXAS 222-405		both side cantilever HALF LOAD -...

Company :
Designer :
Job Number : EAST TEXAS 222-405
Model Name : CNOPY SECTION F

2:28 PM
Checked By:

Aluminum Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (...	Density[...	Table B.4	kt	Ftu[ksi]	Fty[ksi]	Fcy[ksi]	Fsu[ksi]	Ct
1	3003-H14	10100	3787.5	.33	1.3	.173	Table B....	1	19	16	13	12	141
2	6061-T6	10100	3787.5	.33	1.3	.173	Table B....	1	38	35	35	24	141
3	6063-T5	10100	3787.5	.33	1.3	.173	Table B....	1	22	16	16	13	141
4	6063-T6	10100	3787.5	.33	1.3	.173	Table B....	1	30	25	25	19	141
5	5052-H34	10200	3787.5	.33	1.3	.173	Table B....	1	34	26	24	20	141
6	6061-T6 W	10100	3787.5	.33	1.3	.173	Table B....	1	24	15	15	15	141
7	6061-T6 haz	10100	3787.5	.33	1.3	.173	Table B....	1	29	23	23	18	141

Aluminum Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	C1	RT 6" x 8" x 0...	Column	Rectangular Tubes	6061-T6	Typical	5.176	31.285	48.786	57.446
2	B1	RT 6" X 6" X ...	Beam	Rectangular Tubes	6061-T6	Typical	4.416	24.869	24.869	37.263
3	KNEE BR...	RT 6" X 6" X ...	VBrace	Rectangular Tubes	6061-T6	Typical	4.371	24.632	24.632	36.909

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
1	N1	17.166667	3.663	0	0	
2	N2	17.166667	12.662997	0	0	
3	N3	24.266667	12.662997	0	0	
4	N4	17.166667	10.662997	0	0	
5	N5	19.166667	12.662997	0	0	
6	N6	10.316667	12.662997	0	0	
7	N7	15.166667	12.662997	0	0	

Aluminum Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	C1	9									Lateral
2	M2	B1	13.95	.408		.083	.083	.417				Lateral
3	M3	KNEE BRA...	2.828									Lateral
4	M4	KNEE BRA...	2.828									Lateral
5	M5	KNEE BRA...	2.828									Lateral
6	M6	KNEE BRA...	2.828									Lateral

Member Area Loads

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]
No Data to Print ...						

Load Combinations

	Description	Solve	PDe...	S...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	IBC 16-8	Yes	Y		DL	1																		
2	IBC 16-10 (a)	Yes	Y		DL	1	RLL	1																
3	IBC 16-12 (a)	Yes	Y		DL	1	WL...	.6																
4	IBC 16-13 (a)	Yes	Y		DL	1	WL...	.45					R...	.75										
5	IBC 16-15	Yes	Y		DL	.6	WL...	.6																
6	IBC 16-12 (b)	Yes	Y		DL	1	ELZ	.7																
7	IBC 16-12 (a)	Yes	Y		DL	1	WL-Y	.6																
8	IBC 16-13 (a)	Yes	Y		DL	1	WL-Y	.45					R...	.75										
9	IBC 16-15	Yes	Y		DL	.6	WL-Y	.6																
10	DL ONLY		Y		DL	1.25																		
11	RLL ONLY		Y		RLL	1.25																		

RISA A NEMETSCHEK COMPANY

Company :
Designer :
Job Number : EAST TEXAS 222-405
Model Name : CNOPY SECTION F

2:28 PM
Checked By:

Load Combinations (Continued)

	Description	Solve	PDe...	S...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
12	WL+Y		Y		WL+Y	1.25																		
13	WL-Y		Y		WL-Y	1.25																		

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N1	max	144.36	9	3346.068	4	0	9	0	9	2.481	6	5409.845	4
2		min	-144.36	3	-1734.83	9	-19.53	6	-178.148	6	0	1	-1478.681	9
3	Totals:	max	144.36	9	3346.068	4	0	9						
4		min	-144.36	3	-1734.83	9	-19.53	6						

Envelope AA ADM1-15: ASD - Building Aluminum Code Checks

	Member	Shape	Code C...	Loc[ft]	LC	Shear ...	Loc[ft]	Dir	LC	Pnc/O...	Pnt/Om...	Mny/O...	Mnz/O...	Vny/O...	Vnz/O...	Cb	Eqn
1	M1	RT 6" x 8...	.326	0	4	.045	7.031	y	2	82274....	100857...	12561....	18963....	34477....	25395....	1....	H.1-1
2	M2	RT 6" X 6...	.325	8.719	4	.096	8.719	y	4	45572....	86047.59	12888....	12888....	25395....	25395....	1	H.1-1
3	M5	RT 6" X 6...	.178	0	4	.021	0	y	2	81118....	85171....	12699....	12699....	25156....	25156....	1....	H.1-1
4	M6	RT 6" X 6...	.098	0	2	.016	2.828	y	2	81118....	85171....	12699....	12699....	25156....	25156....	1....	H.1-1

Envelope Member Section Forces

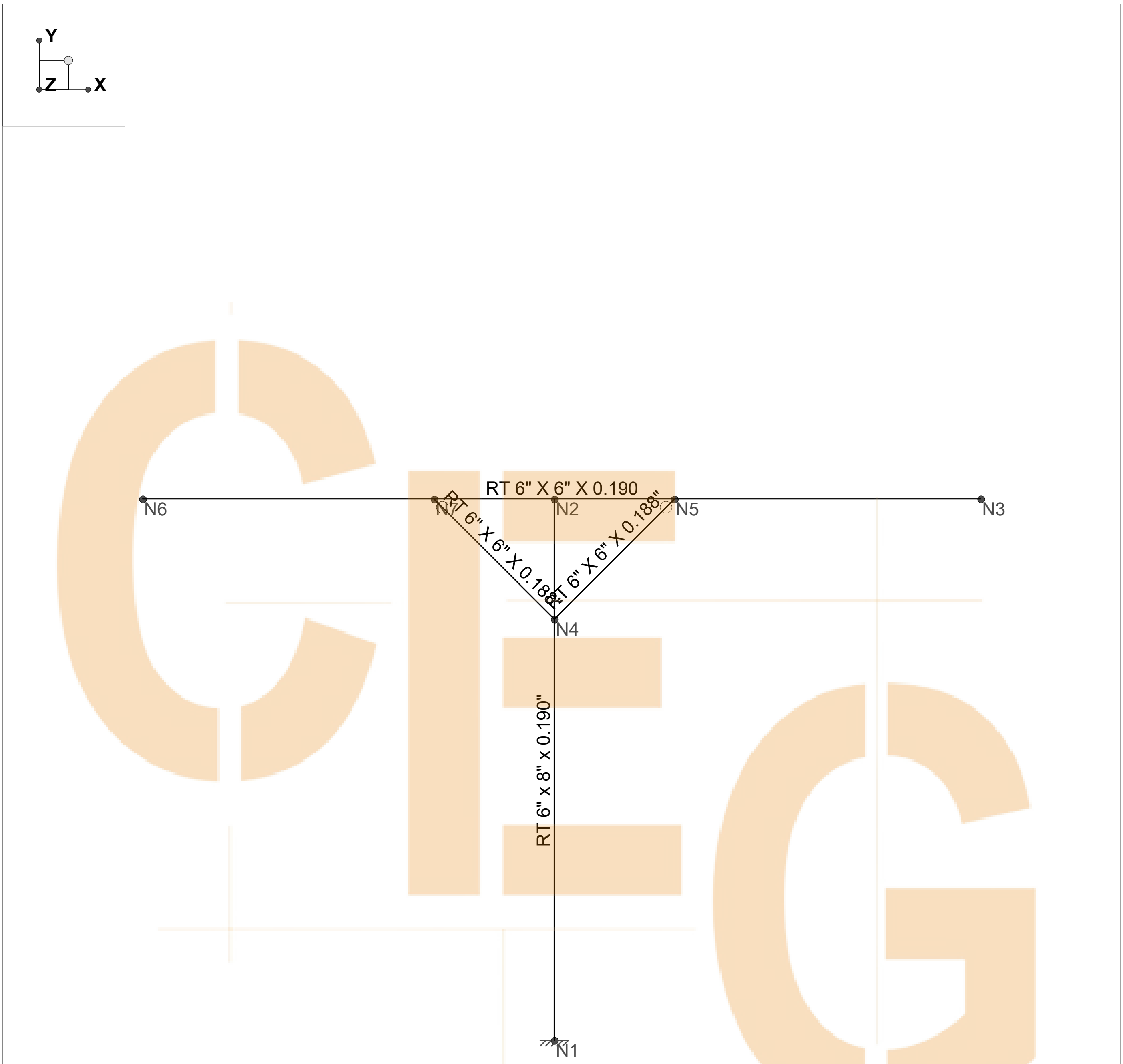
	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[l...	LC	y-y Mom...	LC	z-z Moment[lb-ft]	LC
1	M1	1	max	3346.068	4	140.799	7	19.767	6	2.481	6	0	9	1478.681	9
2			min	-1734.83	9	-152.367	3	0	1	0	1	-178.148	6	-5409.845	4
3		2	max	3332.094	4	140.799	7	19.767	6	2.481	6	0	9	1163.211	9
4			min	-1743.214	9	-152.367	3	0	1	0	1	-133.673	6	-5292.427	2
5		3	max	3318.12	4	140.799	7	19.767	6	2.481	6	0	9	847.74	9
6			min	-1751.599	9	-152.367	3	0	1	0	1	-89.198	6	-5244.341	2
7		4	max	3304.146	4	140.799	7	19.767	6	2.481	6	0	9	532.27	9
8			min	-1759.983	9	-152.367	3	0	1	0	1	-44.723	6	-5196.256	2
9		5	max	1410.961	9	153.757	9	4.614	6	.522	6	0	9	512.279	2
10			min	-2579.565	4	-1542.8	2	0	1	0	1	-3.524	6	-52.643	9
11	M2	1	max	0	9	0	9	0	9	0	9	0	9	0	9
12			min	0	1	0	1	0	1	0	1	0	1	0	1
13		2	max	0	9	446.542	9	4.882	6	0	9	8.514	6	1204.589	3
14			min	0	1	-690.8	3	0	1	0	1	0	1	-778.663	9
15		3	max	1508.159	9	773.97	9	0	9	0	9	17.636	6	11.433	7
16			min	-3430.491	4	-1913.905	4	-2.041	6	-1.937	6	0	1	-161.523	2
17		4	max	0	9	1072.001	4	0	9	0	9	8.514	6	1869.4	4
18			min	0	1	-446.542	9	-4.882	6	0	1	0	1	-778.699	9
19		5	max	0	9	0	9	0	9	0	9	0	9	0	9
20			min	0	1	0	1	0	1	0	1	0	1	0	1
21	M5	1	max	5252.908	4	537.881	2	0	9	2.739	6	22.741	6	1506.524	2
22			min	-2243.694	9	-101.128	9	-8.04	6	0	1	0	1	-294.934	9
23		2	max	5250.286	4	535.259	2	0	9	2.739	6	17.056	6	1127.111	2
24			min	-2245.268	9	-102.701	9	-8.04	6	0	1	0	1	-222.869	9
25		3	max	5247.664	4	532.637	2	0	9	2.739	6	11.371	6	749.553	2
26			min	-2246.841	9	-104.275	9	-8.04	6	0	1	0	1	-149.692	9
27		4	max	5245.041	4	530.014	2	0	9	2.739	6	5.685	6	373.85	2
28			min	-2248.415	9	-105.848	9	-8.04	6	0	1	0	1	-75.402	9
29		5	max	5242.419	4	527.392	2	0	9	2.739	6	0	9	0	9
30			min	-2249.988	9	-107.422	9	-8.04	6	0	1	0	1	0	1
31	M6	1	max	3321.978	3	45.789	3	7.236	6	0	9	0	9	114.675	3
32			min	-2134.797	9	-387.577	2	0	1	-2.244	6	-20.466	6	-1111.068	2
33		2	max	3319.356	3	43.166	3	7.236	6	0	9	0	9	83.225	3
34			min	-2136.371	9	-390.2	2	0	1	-2.244	6	-15.349	6	-836.083	2
35		3	max	3316.733	3	40.544	3	7.236	6	0	9	0	9	53.629	3

Envelope Member Section Forces (Continued)

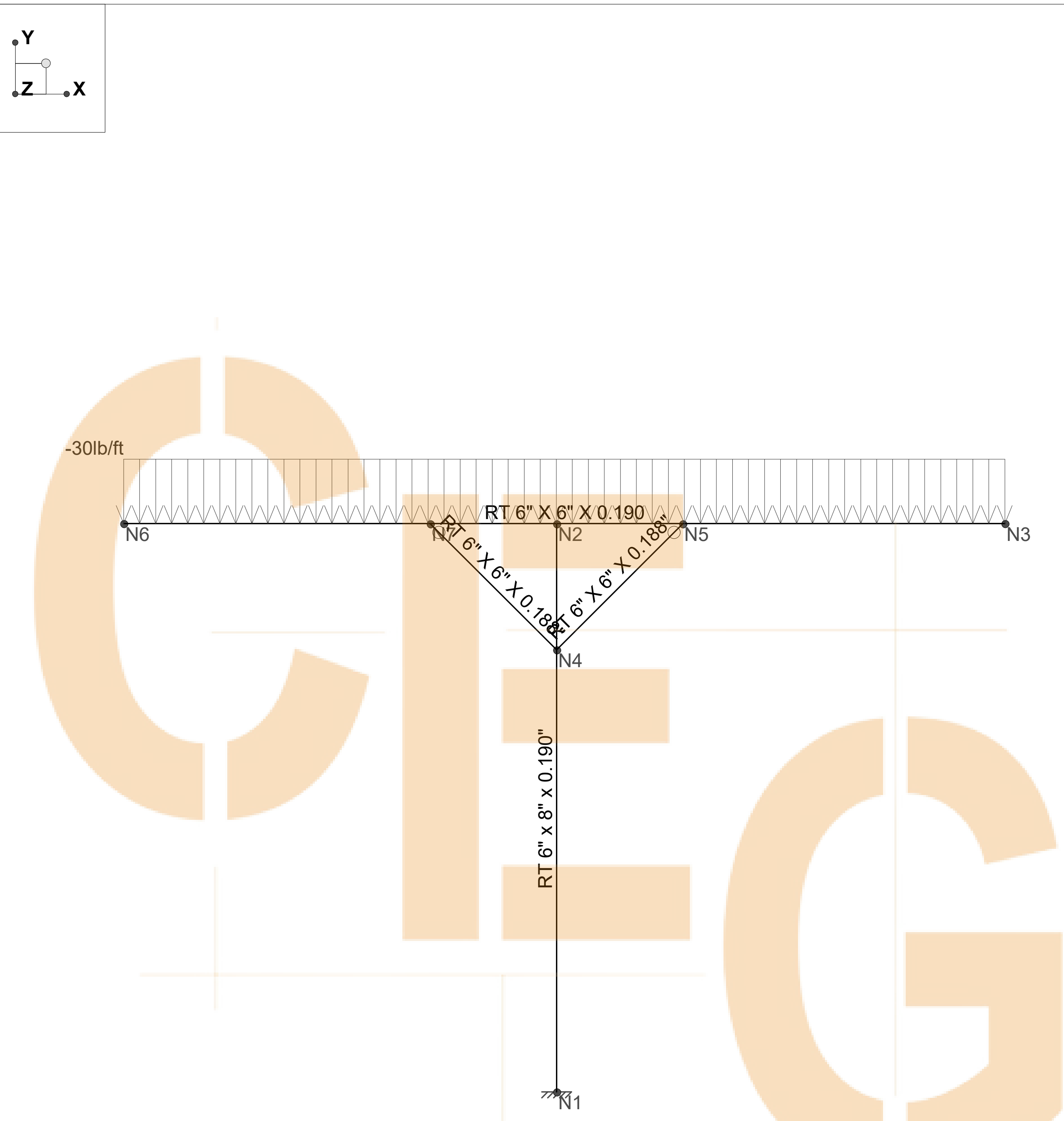
	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[l...	LC	y-y Mom...	LC	z-z Moment[lb-ft]	LC
36			min	-2137.944	9	-392.822	2	0	1	-2.244	6	-10.233	6	-559.243	2
37		4	max	3314.111	3	37.921	3	7.236	6	0	9	0	9	25.887	3
38			min	-2139.518	9	-395.444	2	0	1	-2.244	6	-5.116	6	-280.548	2
39		5	max	3311.489	3	35.299	3	7.236	6	0	9	0	9	0	9
40			min	-2141.091	9	-398.067	2	0	1	-2.244	6	0	1	0	1

Envelope Member Section Deflections Service

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y' Ratio	LC	(n) L/z' Ratio	LC
1	M1	1	max	0	9	0	9	0	9	0	9	NC	9	NC	9
2			min	0	1	0	1	0	1	0	1	NC	1	NC	1
3		2	max	.001	9	.059	4	0	9	0	9	NC	6	NC	9
4			min	-.002	4	-.016	9	-.003	6	-3.695e-6	6	1823.916	4	NC	1
5		3	max	.002	9	.236	2	0	9	0	9	NC	6	NC	9
6			min	-.004	4	-.057	9	-.01	6	-7.389e-6	6	458.137	2	NC	1
7		4	max	.003	9	.529	2	0	9	0	9	NC	6	NC	9
8			min	-.006	4	-.117	9	-.021	6	-1.108e-5	6	204.27	2	5132.796	6
9		5	max	.003	9	.909	2	0	9	0	9	NC	6	NC	9
10			min	-.005	4	-.187	9	-.033	6	-1.219e-5	6	118.863	2	3280.683	6
11	M2	1	max	.908	2	1.117	2	.034	6	4.47e-4	6	NC	9	NC	9
12			min	-.186	9	-.082	7	0	1	0	1	NC	1	NC	1
13		2	max	.908	2	.557	2	.033	6	4.47e-4	6	NC	9	NC	9
14			min	-.186	9	-.072	7	0	1	0	1	299.144	2	NC	1
15		3	max	.909	2	.006	9	.033	6	4.44e-4	6	NC	8	NC	9
16			min	-.187	9	-.025	4	0	1	0	1	586.48	4	NC	1
17		4	max	.91	2	.156	9	.034	6	4.477e-4	6	NC	6	NC	9
18			min	-.188	9	-.691	2	0	1	0	1	92.592	2	NC	1
19		5	max	.91	2	.389	9	.037	6	4.477e-4	6	4765.72	6	NC	9
20			min	-.188	9	-1.52	4	0	1	0	1	63.736	2	NC	1
21	M5	1	max	.399	2	.091	9	.022	6	2.991e-4	6	NC	9	NC	9
22			min	-.086	9	-.405	2	0	1	0	1	NC	1	NC	1
23		2	max	.398	2	.113	9	.025	6	2.971e-4	6	NC	9	NC	9
24			min	-.085	9	-.522	2	0	1	0	1	7438.763	2	NC	1
25		3	max	.397	2	.136	9	.028	6	2.951e-4	6	NC	9	NC	9
26			min	-.085	9	-.643	2	0	1	0	1	6513.898	2	NC	1
27		4	max	.396	2	.159	9	.031	6	2.931e-4	6	NC	9	NC	9
28			min	-.084	9	-.767	2	0	1	0	1	NC	1	NC	1
29		5	max	.395	2	.182	9	.034	6	2.911e-4	6	NC	9	NC	9
30			min	-.084	9	-.892	2	0	1	0	1	NC	1	NC	1
31	M6	1	max	.091	9	.399	2	0	9	0	9	NC	9	NC	9
32			min	-.405	2	-.086	9	-.022	6	-3.154e-4	6	NC	1	NC	1
33		2	max	.091	9	.516	2	0	9	0	9	NC	9	NC	9
34			min	-.405	2	-.107	9	-.025	6	-3.137e-4	6	NC	1	NC	1
35		3	max	.092	9	.635	2	0	9	0	9	NC	9	NC	9
36			min	-.405	2	-.128	9	-.028	6	-3.121e-4	6	8747.449	2	NC	1
37		4	max	.092	9	.756	2	0	9	0	9	NC	9	NC	9
38			min	-.405	2	-.149	9	-.03	6	-3.105e-4	6	NC	1	NC	1
39		5	max	.093	9	.879	2	0	9	0	9	NC	9	NC	9
40			min	-.406	2	-.17	9	-.033	6	-3.088e-4	6	NC	1	NC	1

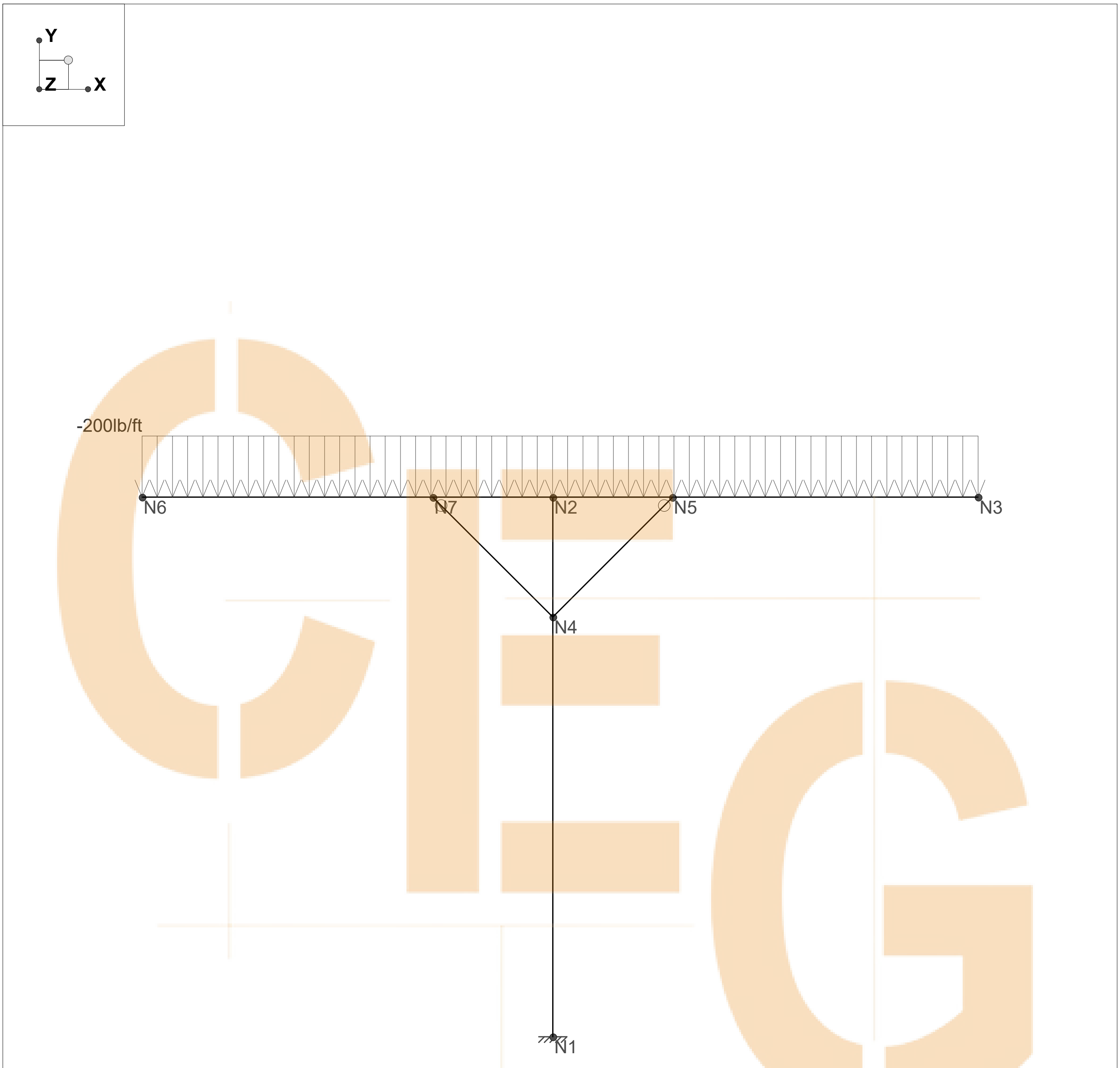


	CNOPY SECTION F	SK - 1
EAST TEXAS 222-405		both side cantilever FULL LOAD -...



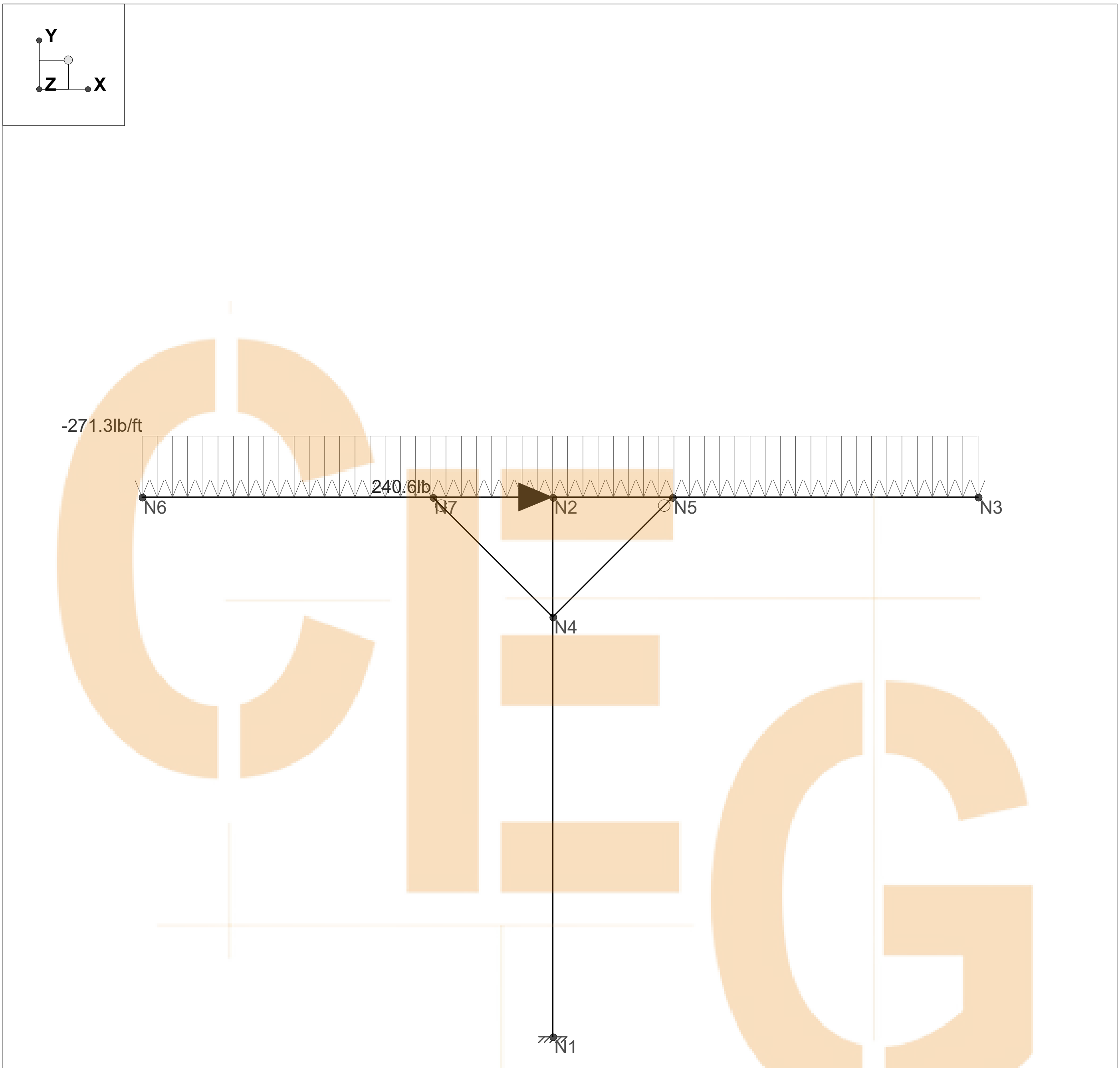
Loads: BLC 1, DL

	CNOPY SECTION F	SK - 2
EAST TEXAS 222-405		
		both side cantilever FULL LOAD -...



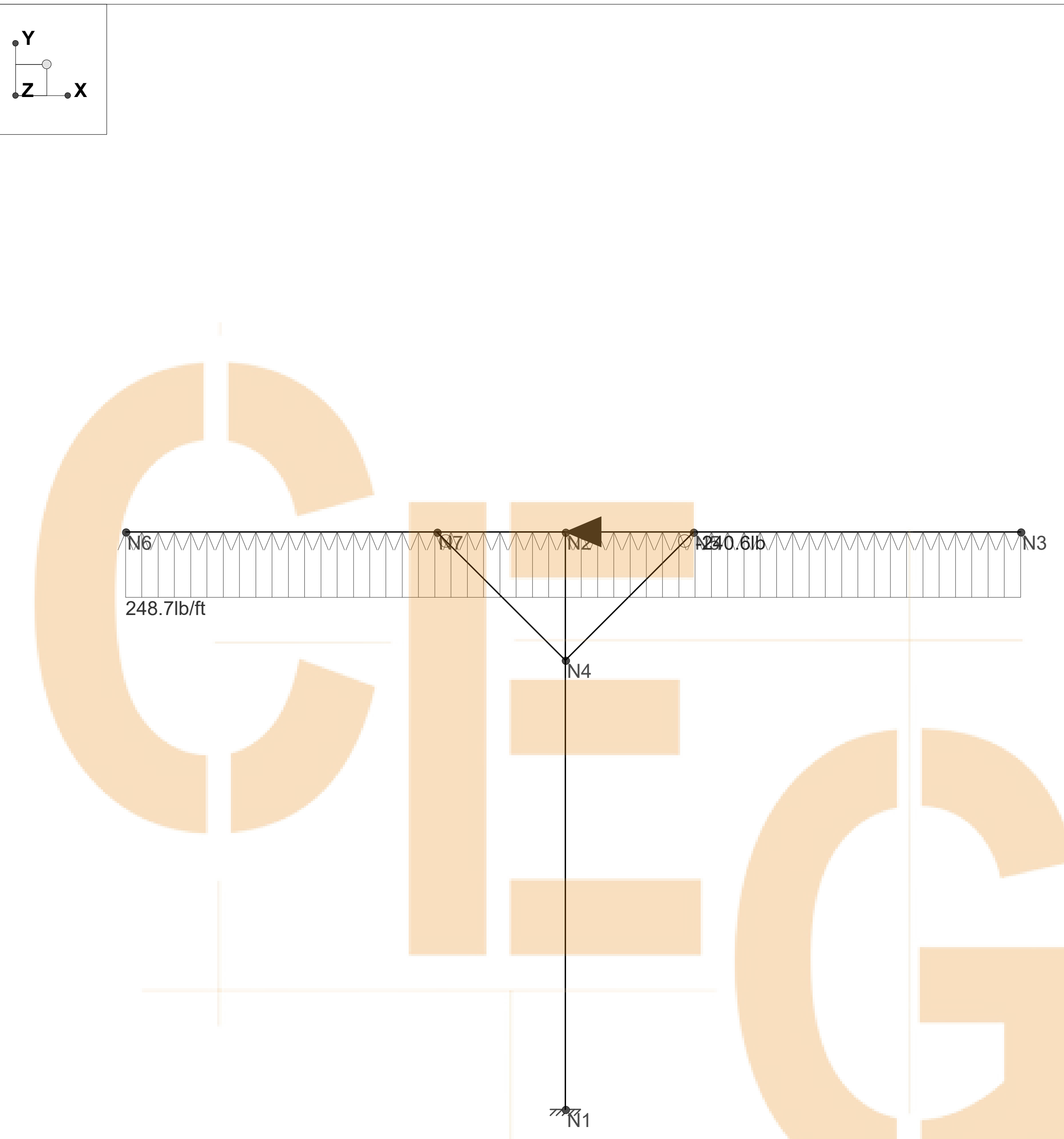
Loads: BLC 2, RLL

	CNOPY SECTION F	SK - 3
EAST TEXAS 222-405		both side cantilever FULL LOAD -...



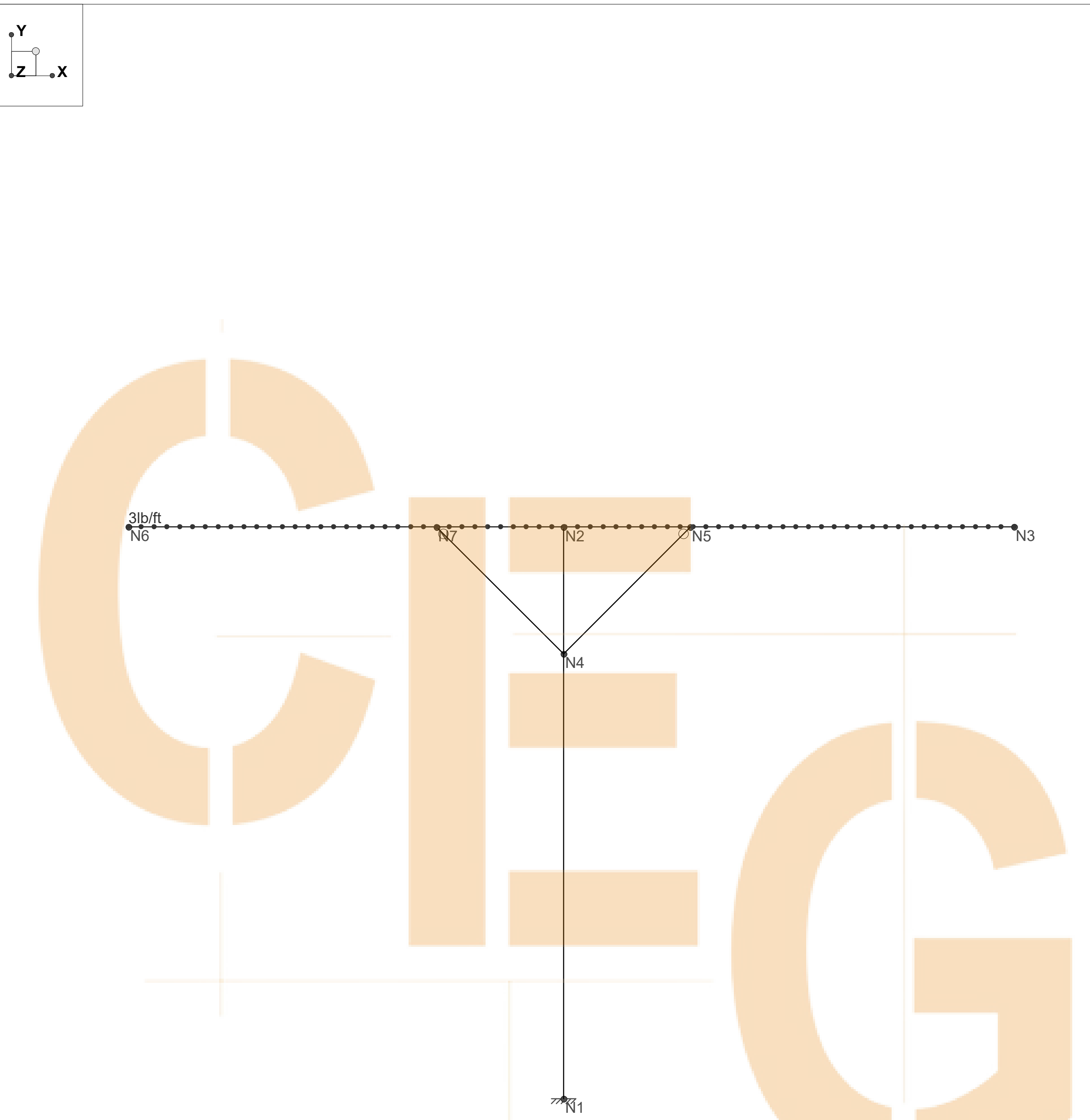
Loads: BLC 3, WLA

	CNOPY SECTION F	SK - 4
EAST TEXAS 222-405		both side cantilever FULL LOAD -...



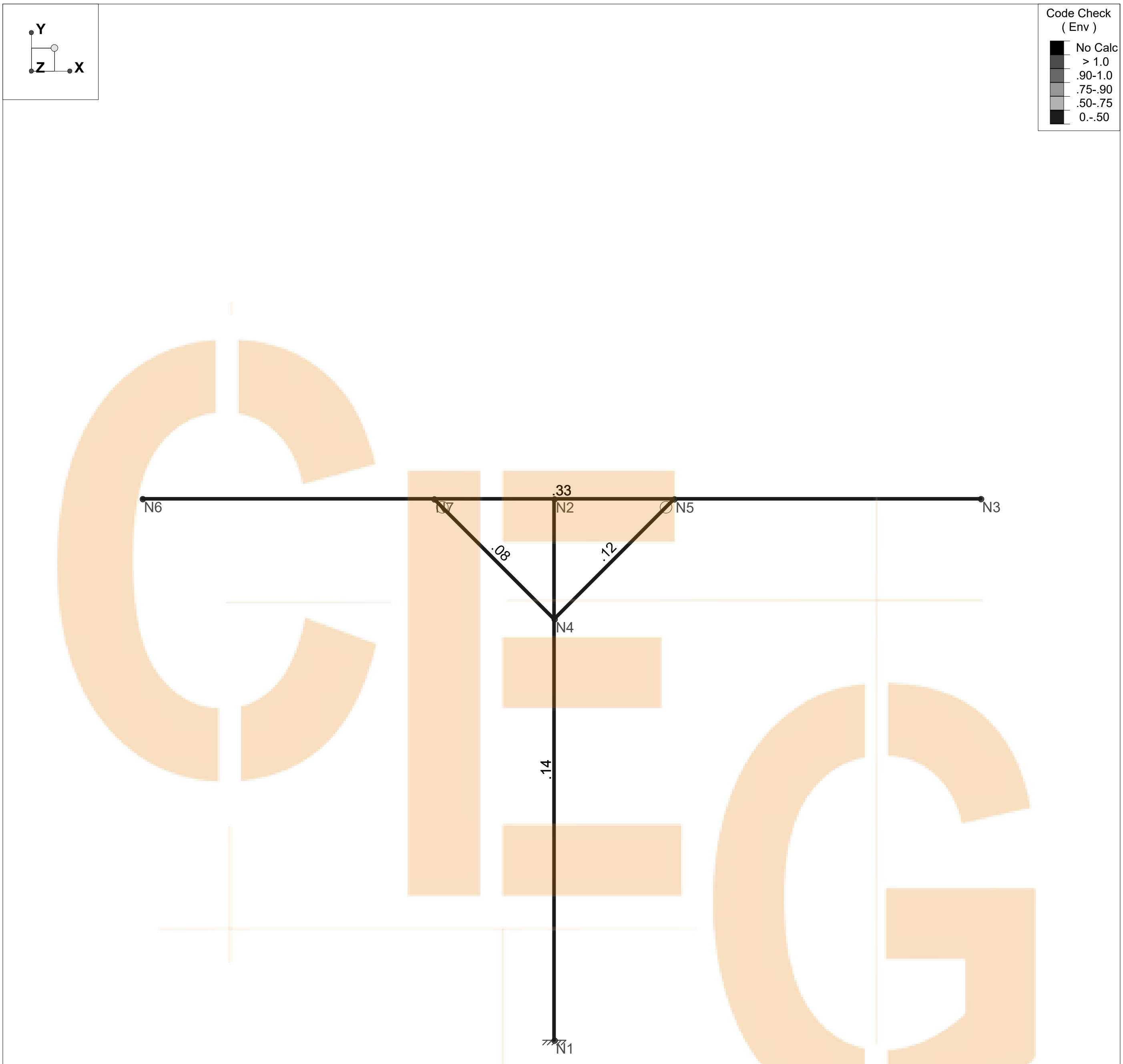
Loads: BLC 4, WLB

	CNOPY SECTION F	SK - 5
EAST TEXAS 222-405		both side cantilever FULL LOAD -...



Loads: BLC 5, EL
Envelope Only Solution

	CNOPY SECTION F	SK -
EAST TEXAS 222-405		
		both side cantilever FULL LOAD -...



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

	CNOPY SECTION F	SK - 1
EAST TEXAS 222-405		both side cantilever FULL LOAD -...

RISA A NEMETSCHEK COMPANY

Company :
Designer :
Job Number : EAST TEXAS 222-405
Model Name : CNOPY SECTION F

2:25 PM
Checked By:

Aluminum Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (...	Density[...	Table B.4	kt	Ftu[ksi]	Fty[ksi]	Fcy[ksi]	Fsu[ksi]	Ct
1	3003-H14	10100	3787.5	.33	1.3	.173	Table B....	1	19	16	13	12	141
2	6061-T6	10100	3787.5	.33	1.3	.173	Table B....	1	38	35	35	24	141
3	6063-T5	10100	3787.5	.33	1.3	.173	Table B....	1	22	16	16	13	141
4	6063-T6	10100	3787.5	.33	1.3	.173	Table B....	1	30	25	25	19	141
5	5052-H34	10200	3787.5	.33	1.3	.173	Table B....	1	34	26	24	20	141
6	6061-T6 W	10100	3787.5	.33	1.3	.173	Table B....	1	24	15	15	15	141
7	6061-T6 haz	10100	3787.5	.33	1.3	.173	Table B....	1	29	23	23	18	141

Aluminum Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	C1	RT 6" x 8" x 0...	Column	Rectangular Tubes	6061-T6	Typical	5.176	31.285	48.786	57.446
2	B1	RT 6" X 6" X ...	Beam	Rectangular Tubes	6061-T6	Typical	4.416	24.869	24.869	37.263
3	KNEE BR...	RT 6" X 6" X ...	VBrace	Rectangular Tubes	6061-T6	Typical	4.371	24.632	24.632	36.909

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
1	N1	17.166667	3.663	0	0	
2	N2	17.166667	12.662997	0	0	
3	N3	24.266667	12.662997	0	0	
4	N4	17.166667	10.662997	0	0	
5	N5	19.166667	12.662997	0	0	
6	N6	10.316667	12.662997	0	0	
7	N7	15.166667	12.662997	0	0	

Aluminum Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	C1	9									Lateral
2	M2	B1	13.95	.408		.083	.083	.417				Lateral
3	M3	KNEE BRA...	2.828									Lateral
4	M4	KNEE BRA...	2.828									Lateral
5	M5	KNEE BRA...	2.828									Lateral
6	M6	KNEE BRA...	2.828									Lateral

Member Area Loads

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]
No Data to Print ...						

Load Combinations

	Description	Solve	PDe...	S...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	IBC 16-8	Yes	Y		DL	1																		
2	IBC 16-10 (a)	Yes	Y		DL	1	RLL	1																
3	IBC 16-12 (a)	Yes	Y		DL	1	WL...	.6																
4	IBC 16-13 (a)	Yes	Y		DL	1	WL...	.45					R...	.75										
5	IBC 16-15	Yes	Y		DL	.6	WL...	.6																
6	IBC 16-12 (b)	Yes	Y		DL	1	ELZ	.7																
7	IBC 16-12 (a)	Yes	Y		DL	1	WL-Y	.6																
8	IBC 16-13 (a)	Yes	Y		DL	1	WL-Y	.45					R...	.75										
9	IBC 16-15	Yes	Y		DL	.6	WL-Y	.6																
10	DL ONLY		Y		DL	1.25																		
11	RLL ONLY		Y		RLL	1.25																		

Load Combinations (Continued)

	Description	Solve	PDe...	S...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
12	WL+Y		Y		WL+Y	1.25																		
13	WL-Y		Y		WL-Y	1.25																		

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N1	max	144.36	9	4373.568	4	0	9	0	9	2.481	6	1728.83	3
2		min	-144.36	3	-1734.83	9	-19.53	6	-178.148	6	0	1	-1478.681	9
3	Totals:	max	144.36	9	4373.568	4	0	9						
4		min	-144.36	3	-1734.83	9	-19.53	6						

Envelope AA ADM1-15: ASD - Building Aluminum Code Checks

	Member	Shape	Code C...	Loc[ft]	LC	Shear ...	Loc[ft]	Dir	LC	Pnc/O...	Pnt/Om...	Mny/O...	Mnz/O...	Vny/O...	Vnz/O...	Cb	Eqn
1	M1	RT 6" x 8...	.140	0	4	.007	7.031	y	4	82274....	100857...	12561....	18963....	34477....	25395....	1....	H.1-1
2	M2	RT 6" X 6...	.329	8.719	4	.094	8.719	y	4	45572....	86047.59	12888....	12888....	25395....	25395....	1	H.1-1
3	M5	RT 6" X 6...	.116	0	4	.009	0	y	4	81118....	85171....	12699....	12699....	25156....	25156....	1....	H.1-1
4	M6	RT 6" X 6...	.081	0	4	.003	0	y	4	81118....	85171....	12699....	12699....	25156....	25156....	1....	H.1-1

Envelope Member Section Forces

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[l...	LC	y-y Mom...	LC	z-z Moment[lb-ft]	LC
1	M1	1	max	4373.568	4	140.799	7	19.767	6	2.481	6	0	9	1478.681	9
2			min	-1734.83	9	-152.367	3	0	1	0	1	-178.148	6	-1728.83	3
3		2	max	4359.594	4	140.799	7	19.767	6	2.481	6	0	9	1163.211	9
4			min	-1743.214	9	-152.367	3	0	1	0	1	-133.673	6	-1386.005	3
5		3	max	4345.62	4	140.799	7	19.767	6	2.481	6	0	9	847.74	9
6			min	-1751.599	9	-152.367	3	0	1	0	1	-89.198	6	-1098.303	4
7		4	max	4331.646	4	140.799	7	19.767	6	2.481	6	0	9	532.27	9
8			min	-1759.983	9	-152.367	3	0	1	0	1	-44.723	6	-827.3	4
9		5	max	1410.961	9	153.757	9	4.614	6	.522	6	0	9	92.771	4
10			min	-3376.939	4	-247.836	4	0	1	0	1	-3.524	6	-52.643	9
11	M2	1	max	0	9	0	9	0	9	0	9	0	9	0	9
12			min	0	1	0	1	0	1	0	1	0	1	0	1
13		2	max	0	9	446.542	9	4.882	6	0	9	8.514	6	1869.313	4
14			min	0	1	-1072.001	4	0	1	0	1	0	1	-778.663	9
15		3	max	1508.159	9	773.97	9	0	9	0	9	17.636	6	11.433	7
16			min	-3708.622	4	-1848.865	4	-2.041	6	-1.937	6	0	1	-11.449	5
17		4	max	0	9	1072.001	4	0	9	0	9	8.514	6	1869.4	4
18			min	0	1	-446.542	9	-4.882	6	0	1	0	1	-778.699	9
19		5	max	0	9	0	9	0	9	0	9	0	9	0	9
20			min	0	1	0	1	0	1	0	1	0	1	0	1
21	M5	1	max	5440.664	4	226.177	4	0	9	2.739	6	22.741	6	624.89	4
22			min	-2243.694	9	-101.128	9	-8.04	6	0	1	0	1	-294.934	9
23		2	max	5438.042	4	223.554	4	0	9	2.739	6	17.056	6	465.886	4
24			min	-2245.268	9	-102.701	9	-8.04	6	0	1	0	1	-222.869	9
25		3	max	5435.419	4	220.932	4	0	9	2.739	6	11.371	6	308.736	4
26			min	-2246.841	9	-104.275	9	-8.04	6	0	1	0	1	-149.692	9
27		4	max	5432.797	4	218.31	4	0	9	2.739	6	5.685	6	153.441	4
28			min	-2248.415	9	-105.848	9	-8.04	6	0	1	0	1	-75.402	9
29		5	max	5430.175	4	215.687	4	0	9	2.739	6	0	9	0	9
30			min	-2249.988	9	-107.422	9	-8.04	6	0	1	0	1	0	1
31	M6	1	max	5134.041	4	86.775	4	7.236	6	0	9	0	9	230.603	4
32			min	-2134.797	9	-15.446	9	0	1	-2.244	6	-20.466	6	-52.587	9
33		2	max	5131.419	4	84.153	4	7.236	6	0	9	0	9	170.171	4
34			min	-2136.371	9	-17.019	9	0	1	-2.244	6	-15.349	6	-41.109	9
35		3	max	5128.796	4	81.53	4	7.236	6	0	9	0	9	111.593	4

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[l...	LC	y-y Mom...	LC	z-z Moment[lb-ft]	LC
36			min	-2137.944	9	-18.592	9	0	1	-2.244	6	-10.233	6	-28.519	9
37		4	max	5126.174	4	78.908	4	7.236	6	0	9	0	9	54.869	4
38			min	-2139.518	9	-20.166	9	0	1	-2.244	6	-5.116	6	-14.816	9
39		5	max	5123.551	4	76.286	4	7.236	6	0	9	0	9	0	9
40			min	-2141.091	9	-21.739	9	0	1	-2.244	6	0	1	0	1

Envelope Member Section Deflections Service

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y' Ratio	LC	(n) L/z' Ratio	LC
1	M1	1	max	0	9	0	9	0	9	0	9	NC	9	NC	9
2			min	0	1	0	1	0	1	0	1	NC	1	NC	1
3		2	max	.001	9	.018	3	0	9	0	9	NC	8	NC	9
4			min	-.003	4	-.016	9	-.003	6	-3.695e-6	6	5899.326	3	NC	1
5		3	max	.002	9	.067	3	0	9	0	9	NC	6	NC	9
6			min	-.006	4	-.057	9	-.01	6	-7.389e-6	6	1603.046	3	NC	1
7		4	max	.003	9	.14	3	0	9	0	9	NC	6	NC	9
8			min	-.008	4	-.117	9	-.021	6	-1.108e-5	6	773.716	3	5132.796	6
9		5	max	.003	9	.224	4	0	9	0	9	NC	6	NC	9
10			min	-.007	4	-.187	9	-.033	6	-1.219e-5	6	481.307	4	3280.683	6
11	M2	1	max	.223	3	.047	5	.034	6	4.47e-4	6	NC	9	NC	9
12			min	-.186	9	-.183	8	0	1	0	1	875.686	8	NC	1
13		2	max	.223	3	.075	5	.033	6	4.47e-4	6	NC	9	NC	9
14			min	-.186	9	-.072	7	0	1	0	1	1109.534	2	NC	1
15		3	max	.225	4	.006	9	.033	6	4.44e-4	6	3965.79	6	NC	9
16			min	-.187	9	-.011	4	0	1	0	1	455.881	4	NC	1
17		4	max	.227	4	.156	9	.034	6	4.477e-4	6	NC	6	NC	9
18			min	-.188	9	-.246	4	0	1	0	1	687.469	5	NC	1
19		5	max	.227	4	.389	9	.037	6	4.477e-4	6	NC	8	NC	9
20			min	-.188	9	-.679	4	0	1	0	1	278.034	4	NC	1
21	M5	1	max	.101	3	.091	9	.022	6	2.991e-4	6	NC	9	NC	9
22			min	-.086	9	-.11	4	0	1	0	1	NC	1	NC	1
23		2	max	.1	3	.113	9	.025	6	2.971e-4	6	NC	9	NC	9
24			min	-.085	9	-.138	4	0	1	0	1	NC	1	NC	1
25		3	max	.099	3	.136	9	.028	6	2.951e-4	6	NC	9	NC	9
26			min	-.085	9	-.167	4	0	1	0	1	NC	1	NC	1
27		4	max	.099	3	.159	9	.031	6	2.931e-4	6	NC	9	NC	9
28			min	-.084	9	-.197	4	0	1	0	1	NC	1	NC	1
29		5	max	.098	3	.182	9	.034	6	2.911e-4	6	NC	9	NC	9
30			min	-.084	9	-.228	4	0	1	0	1	NC	1	NC	1
31	M6	1	max	.091	9	.101	3	0	9	0	9	NC	9	NC	9
32			min	-.11	4	-.086	9	-.022	6	-3.154e-4	6	NC	1	NC	1
33		2	max	.091	9	.127	3	0	9	0	9	NC	9	NC	9
34			min	-.111	4	-.107	9	-.025	6	-3.137e-4	6	NC	1	NC	1
35		3	max	.092	9	.152	3	0	9	0	9	NC	9	NC	9
36			min	-.113	4	-.128	9	-.028	6	-3.121e-4	6	NC	1	NC	1
37		4	max	.092	9	.178	3	0	9	0	9	NC	9	NC	9
38			min	-.114	4	-.149	9	-.03	6	-3.105e-4	6	NC	1	NC	1
39		5	max	.093	9	.203	3	0	9	0	9	NC	9	NC	9
40			min	-.115	4	-.17	9	-.033	6	-3.088e-4	6	NC	1	NC	1

FOOTING FORCE DESIGN @ CANOPY 6

Project Number	ETC 222-405	Sheet			
Project Name		Designed by		Date	
Subject	Footing Force design	Checked by		Date	

Maximum Moment in colum	=	5.409	k-ft	As per page 1075
Height of Column	=	9	ft	
Force, f=	=	0.601	kips	

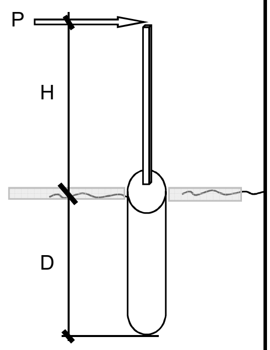
USE [2'-0" x 5'-0" Deep footing]

	FOOTING DESIGN		PAGE :
CLIENT :			DESIGN BY :
JOB NO. :		DATE :	REVIEW BY :

Flagpole Footing Design Based on Chapter 18 of IBC & CBC

INPUT DATA & DESIGN SUMMARY

IS FOOTING RESTRAINED @ GRADE LEVEL ? (1=YES,0=NO)		0	no
LATERAL FORCE @ TOP OF POLE	P =	0.601	k
HEIGHT OF POLE ABOVE GRADE	H =	9	ft
DIAMETER OF POLE FOOTING	B =	2	ft
LATERAL SOIL BEARING CAPACITY	S =	0.15	ksf / ft
ISOLATED POLE FACTOR (IBC 1804.3.1 or UBC note 3 on Tab 18-I-A)	F =	2	
FIRST TRIAL DEPTH ===>	D =	2	ft



Use 2 ft dia x 4.67 ft deep footing unrestrained @ ground level

ANALYSIS

LATERAL BEARING @ BOTTOM : $S_3 = FS \quad Min(D \ , \ 12')$

LATERAL BEARING @ D/3 : $S_1 = FS \quad Min\left(\frac{D}{3} \ , \ 12'\right)$

$$A = \frac{2.34P}{BS_1}$$

REQUIRD DEPTH :

$$D = \begin{cases} \frac{A}{2}\left[1+\sqrt{1+\frac{4.36H}{A}}\right] & \text{, FOR NONCONSTRAINED} \\ \sqrt{\frac{4.25PH}{BS_3}} & \text{, FOR CONSTRAINED} \end{cases}$$

		NONCONSTRAINED		CONSTRAINED	
LATERAL FORCE @ TOP OF POLE	P =>	0.60	k	0.60	k
HEIGHT OF POLE ABOVE GRADE	H =>	9.0	ft	9.0	ft
DIAMETER OF POLE FOOTING	B =>	2.00	ft	2.00	ft
LATERAL SOIL BEARING CAPACITY	FS =>	0.30	ksf / ft	0.30	ksf / ft
1ST TRIAL	TRY D_1 =>	2.00	ft	2.00	ft
LAT SOIL BEARING @ 1/3 D	S_1 =>	0.20	ksf	0.20	ksf
LAT SOIL BEARING @ 1.0 D	S_3 =>	0.60	ksf	0.60	ksf
CONSTANT 2.34P/(BS_1)	A =>	3.52	-		-
REQD FOOTING DEPTH	RQRD D =>	7.89	ft	4.38	ft
2ND TRIAL :	TRY D2=>	4.94	ft	3.19	ft
LAT SOIL BEARING @ 1/3 D	S_1 =>	0.49	ksf	0.32	ksf
LAT SOIL BEARING @ 1.0 D	S_3 =>	1.48	ksf	0.96	ksf
CONSTANT 2.34P/(BS_1)	A =>	1.42	-		-
REQD FOOTING DEPTH	RQRD D =>	4.51	ft	3.47	ft
3RD TRIAL :	TRY D3=>	4.73	ft	3.33	ft
LAT SOIL BEARING @ 1/3 D	S_1 =>	0.47	ksf	0.33	ksf
LAT SOIL BEARING @ 1.0 D	S_3 =>	1.42	ksf	1.00	ksf
CONSTANT 2.34P/(BS_1)	A =>	1.49	-		-
REQD FOOTING DEPTH	RQRD D =>	4.63	ft	3.39	ft
4TH TRIAL :	TRY D4=>	4.68	ft	3.36	ft
LAT SOIL BEARING @ 1/3 D	S_1 =>	0.47	ksf	0.34	ksf
LAT SOIL BEARING @ 1.0 D	S_3 =>	1.40	ksf	1.01	ksf
CONSTANT 2.34P/(BS_1)	A =>	1.50	-		-
REQD FOOTING DEPTH	RQRD D =>	4.66	ft	3.38	ft
5TH TRIAL :	TRY D5=>	4.67	ft	3.37	ft
LAT SOIL BEARING @ 1/3 D	S_1 =>	0.47	ksf	0.34	ksf
LAT SOIL BEARING @ 1.0 D	S_3 =>	1.40	ksf	1.01	ksf
CONSTANT 2.34P/(BS_1)	A =>	1.51	-		-
REQD FOOTING DEPTH	RQRD D =>	4.67	ft	3.37	ft

PROJECT :		PAGE :	
CLIENT :		DESIGN BY :	
JOB NO. :	DATE :	REVIEW BY :	

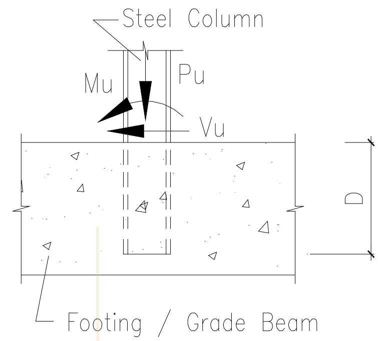
Fixed Moment Condition Design Based on ACI 318-14

INPUT DATA & DESIGN SUMMARY

COLUMN SHAPE (Tube, Pipe, or WF) & SIZE None <== Tube

d	A	b_f
9.0	18.7	9.0

CONCRETE STRENGTH	f_c' =	3	ksi
FACTORED SHEAR LOAD	V_u =	0.145	kips
FACTORED MOMENT	M_u =	5.409	ft-kips
FACTORED VERTICAL LOAD (negative for uplift)	P_u =	4.38	kips
EMBEDMENT DEPTH	D =	18	in



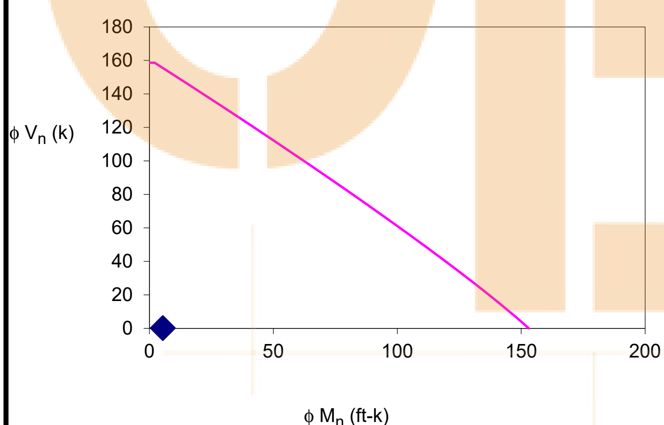
THE FIXED MOMENT DESIGN IS ADEQUATE.

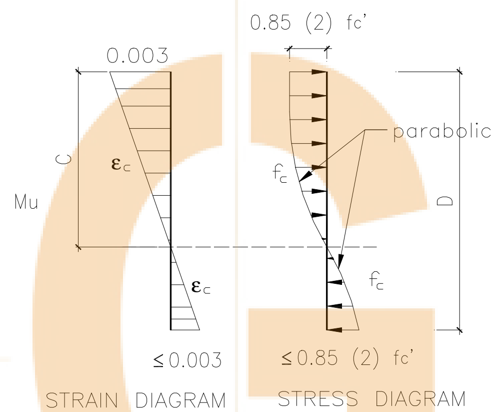
(A_{vf} = **0.0** in^2 , Required Area of Shear Studs or Welded Reinforcement)

(Edge of Concrete Footing / Grade Beam must be wider than "b_f")

ANALYSIS

CHECK BASE FLEXURAL & SHEAR CAPACITY (ACI 318 21 & 22)





$$\varepsilon_o = \frac{2f'_c}{E_c} 0.85 Min\left(\sqrt{\frac{A_2}{A_1}}\ ,\ 2\right)\ ,\ E_c = 57\sqrt{f'_c}$$

$$f_c = \begin{cases} 0.85 Min\left(\sqrt{\frac{A_2}{A_1}}\ ,\ 2\right) f'_c \left[2\left(\frac{\varepsilon_c}{\varepsilon_o}\right) - \left(\frac{\varepsilon_c}{\varepsilon_o}\right)^2\right]\ ,\ for\ \ 0 < \varepsilon_c < \varepsilon_o \\ 0.85 Min\left(\sqrt{\frac{A_2}{A_1}}\ ,\ 2\right) f'_c\ ,\ for\ \ \varepsilon_c \geq \varepsilon_o \end{cases}$$

ϕM_n = 153 ft-kips @ V_u = 0 kips

> M_u = 5 ft-kips [Satisfactory]

$\phi V_{n,max}$ = 158.65 kips, when C = 12.4 in

> V_u = 0.145 ft-kips [Satisfactory]

where ϕ = 0.65 , (ACI 318 21.2)
Bearing factor = 2, (ACI 318 14.5.1.1)
b = effective bearing width = 95% b_f = 8.55 in

CHECK VERTICAL CAPACITY

ϕP_n = End Bering + Friction = 256.4 kips > P_u = 4.38 kips [Satisfactory]

where End Bering = 0.65 (2) 0.85 f_c' A = 62.0 kips, (ACI 318 14.5.1.1)

Friction = 0.75 MAX(0.2f_c' A_c , 800 A_c) = 194.4 kips, (ACI 318 22.9.4)

A = 19 in^2, end bearing area

A_c = 0.5 (2d + 2b_f) D = 324 in^2, (0.5 for concrete cracked)

A_{vf} = $P_{u,Friction}$ / (ϕ f_y μ) = 0.0 in^2 , Required Area of Shear Studs or Welded Reinforcement

where ϕ = 0.75 , (ACI 318 21.2)
μ = 0.70 , (ACI 318 22.9.4.2)
f_y = 60 ks

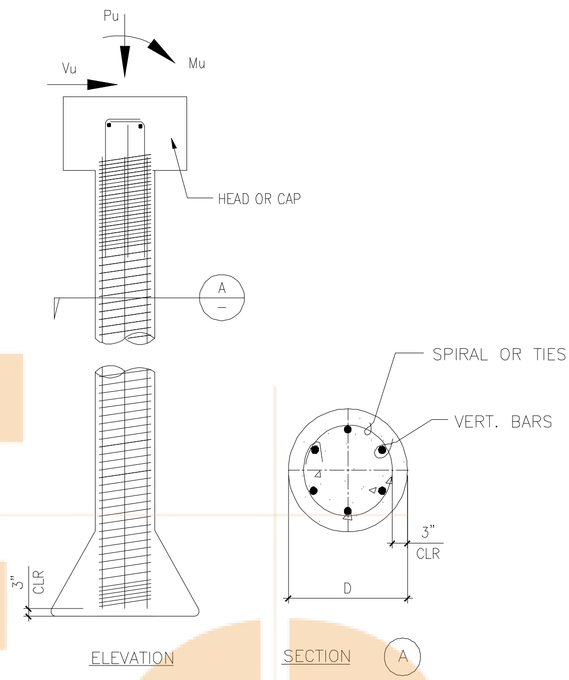
PROJECT :		PAGE :	
CLIENT :		DESIGN BY :	
JOB NO. :	DATE :	REVIEW BY :	

Concrete Pier (Isolated Deep Foundation) Design Based on ACI 318-14

INPUT DATA & DESIGN SUMMARY

CONCRETE STRENGTH	f_c'	=	3	ksi
VERT. REBAR YIELD STRESS	f_y	=	60	ksi
PIER DIAMETER	D	=	24	in
PIER LENGTH	L	=	5	ft
FACTORED AXIAL LOAD	P_u	=	4.38	k
FACTORED MOMENT LOAD	M_u	=	5.409	ft-k
FACTORED SHEAR LOAD	V_u	=	0.145	k
PIER VERT. REINF.	6	#	6	
SEISMIC DESIGN (ACI 18.13.4) ?			NO	
LATERAL REINF. OPTION (0=Spirals, 1=Ties)			1	Ties
LATERAL REINFORCEMENT	# 4	@	9	in o.c.

(spacing 4.5 in o.c. at top end of 2.0 ft.)
(2015 IBC 1810.3.9)



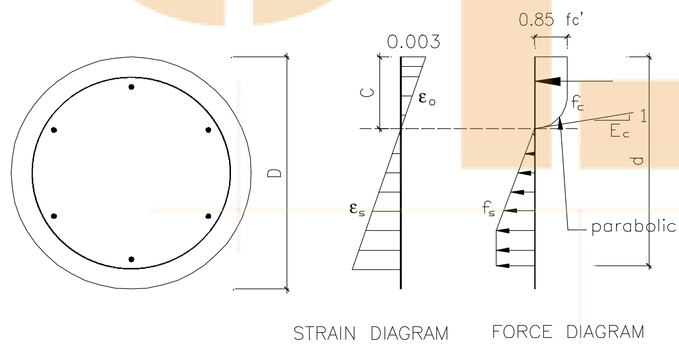
THE PIER DESIGN IS ADEQUATE.

ANALYSIS

CHECK PIER LIMITATIONS

f_c' =	3	ksi	>	2.5	ksi
		[Satisfactory]		(2015 IBC Table 1808.8.1)	
D =	24	in	>	MAX(L / 12 , 24 in)	
		[Satisfactory]		(2015 IBC 1810.2.2)	

CHECK FLEXURAL & AXIAL CAPACITY



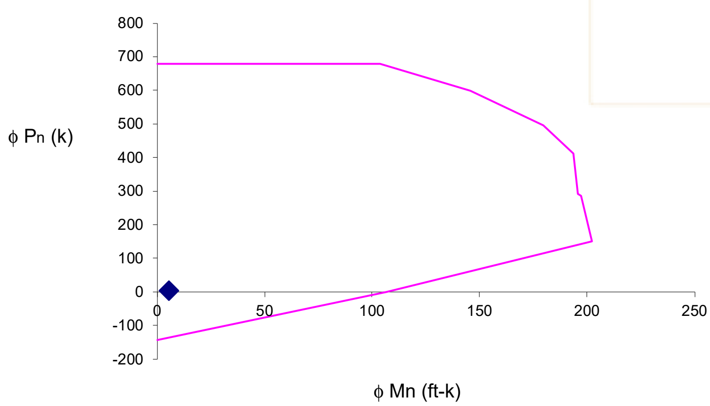
$$\varepsilon_o = \frac{2\left(0.85 f_c'\right)}{E_c} \ , \ E_c = 57\sqrt{f_c'} \ , \ E_s = 29000 ksi$$

$$f_c = \begin{cases} 0.85 f_c'\left[2\left(\frac{\varepsilon_c}{\varepsilon_o}\right) - \left(\frac{\varepsilon_c}{\varepsilon_o}\right)^2\right] \ , & for \quad 0 < \varepsilon_c < \varepsilon_o \\ 0.85 f_c' \ , & for \quad \varepsilon_c \geq \varepsilon_o \end{cases}$$

$$f_s = \begin{cases} \varepsilon_s E_s \ , & for \quad \varepsilon_s \leq \varepsilon_y \\ f_y \ , & for \quad \varepsilon_s > \varepsilon_y \end{cases}$$

$\phi P_{max} = F \ \phi \ [0.85 f_c' (A_g - A_{st}) + f_y A_{st}]$ = 678.74 kips., (at max axial load, ACI 318-14 22.4) > Pu **[Satisfactory]**

where F = 0.8 , ACI 318-14 22.4.2
ϕ = 0.65 (ACI 318-14 21.2)
A_g = 452 in^2. A_{st} = 2.64 in^2.



	ϕ Pn (kips)	ϕ Mn (ft-kips)
AT COMPRESSION ONLY	679	0
AT MAXIMUM LOAD	679	104
AT 0 % TENSION	598	146
AT 25 % TENSION	496	180
AT 50 % TENSION	412	194
AT ε_t = 0.002	291	196
AT BALANCED CONDITION	287	197
AT ε_t = 0.005	150	202
AT FLEXURE ONLY	0	107
AT TENSION ONLY	-143	0

(cont'd)

$a = C_b \beta_1$ = 10 in (at balanced strain condition, ACI 21.2.2)

ϕ = { $0.75 + (\varepsilon_t - 0.002)(50)$, for Spiral ; $0.65 + (\varepsilon_t - 0.002)(250 / 3)$, for Ties } = 0.656 (ACI 318-14 21.2)

where $C_b = d\,\varepsilon_c / (\varepsilon_c + \varepsilon_s)$ = 12 in ε_t = 0.002069 ε_c = 0.003

d = 20.1 in, (ACI 20.6) β_1 = 0.85 (ACI 318-14 22.2.2.4.3)

$\phi M_n = 0.9 M_n$ = 107 ft-kips @ $P_n = 0$, (ACI 318-14 21.2) ,& $\varepsilon_{t,max} = 0.004$, (ACI 318-14, Sec. 21.2.3)

ϕM_n = 110 ft-kips @ P_u = 4 kips > M_u **[Satisfactory]**

ρ_{max} = 0.08 (ACI 318-14 10.6) ρ_{provd} = 0.006

ρ_{min} = 0.005 (2015 IBC 1810.3.9.4.2) **[Satisfactory]**

CHECK SHEAR CAPACITY

$\phi V_n = \phi (V_s + V_c)$ = 66 kips, (ACI 318-14 22.5)

> V_u **[Satisfactory]**

where ϕ = 0.75 (ACI 318-14 21.2)

A_0 = 318 in^2. A_v = 0.40 in^2. f_y = 60 ksi

V_c = $2 (f_c')^{0.5} A_0$ = 34.8 kips, (ACI 318-14 22.5)

V_s = MIN $(d\, f_y A_v / s\ ,\ 8 (f_c')^{0.5} A_0)$ = 53.7 kips, (ACI 318-14 22.5.1)

s_{max} = 9 (2015 IBC 1810.3.9.4.2) s_{provd} = 9 in

s_{min} = 1 **[Satisfactory]**

ρ_s = $0.12 f_c' / f_{yt}$ = 0.006 > $\rho_{s,provd}$ = 0.005 **[Satisfactory]** (ACI 318-14 18.13.4.3 & 18.7.5.1)

KNEE BRACE CONNECTION DESIGN

Project Number	East Texas 222-405	Sheet			
Project Name		Designed by		Date	
Subject	Design Loads	Checked by		Date	

We have maximum Axial compression force of = 5.44 k As per page 1085

we have maximum Axial tension force of = 2.25 k As per page 1085

compression force Resisted by 6x8x0.188 welded Gussets

CHECKING THE BOLTS TO RESIST TENSION

Capacity of two 1/2" dia box bolt = 3280 x 2 As per page 1098

= 6560 > 2249 OK

USE [[4] 1/2" ø SS type -C Box expansion bolt at top & fully welded to column typical all brace tube]

BEAM TO COLUMN CONNECTION DESIGN

Max.moment, M = 5.41 k-ft As per page 1075

Force, f = 2.70 kips

Aluminium properties of 6061-T6

F_{ty} = 35.00 ksi

F_{sy} = 21.00 ksi

Allowable Shear Stress of Shear plane (50%) = 10.5 ksi

Shear area for 1/2" bolts = 0.1963 in^2

Capacity of two 1/2" dia SS through bolt

= 2.0606 < 2.705 OK

USE [[4] 1/2" ø SS through bolts for beam to column connection]

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DIVISION: 05 00 00—METALS
SECTION: 05 05 27—METAL CONNECTORS

REPORT HOLDER:

LNA SOLUTIONS—A KEE SAFETY LOGISTIC LTD

EVALUATION SUBJECT:

BOXBOLT® TYPE C BLIND FASTENERS

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ICC-ES Evaluation Report

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Reissued April 2019
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DIVISION: 05 00 00—METALS
Section: 05 05 27—Metal Connectors

REPORT HOLDER:

LNA SOLUTIONS—A KEE SAFETY LOGISTIC LTD

EVALUATION SUBJECT:

BOXBOLT® TYPE C BLIND FASTENERS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2015, 2012 and 2009 *International Building Code®* (IBC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)†

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Property evaluated:

Structural

2.0 USES

BoxBolt® Type C Blind Fasteners are designed for connecting structural steel to hollow structural section (HSS) steel members and other structural steel elements where access is difficult or is restricted to one side only. BoxBolt® Type C fasteners are intended for use with rectangular or square HSS members and are recognized for resisting static dominant tension and shear loads in bearing-type connections, and for resisting static dominant lateral loads in slip-critical connections, where static dominant loads include load combinations with gravity and wind loads for structures assigned to all Seismic Design Categories and load combinations with seismic loads for structures assigned to Seismic Design Category (SDC) A, B or C. The BoxBolt® Type C Blind Fasteners are alternatives to bolts described in Section J3 of AISC 360, which is referenced in Section 2205.1 of the IBC.

BoxBolt® Type C Blind Fasteners may also be used to resist load combinations with seismic loads for structures assigned to Seismic Design Categories (SDCs) D, E and F, based on cyclic test data in accordance with Sections 3.0 and 4.4 of the ICC-ES Acceptance Criteria for Expansion Bolts in Structural Steel Connections (AC437).

3.0 DESCRIPTION

3.1 General:

BoxBolt® Type C Blind Fasteners are assembled from four components, consisting of the core bolt (or set screw), the body (or shell), the shoulder (or collar), and the cone (or conical nut). The steel core bolt features a full-length threaded shank and a hexagonal head. The body is a steel segmented hollow cylinder, with four slits along the length of the cylinder, and are located at 90 degrees from each other. The collar is a steel flat hexagonal element with a circular hole at its center. The cone is a steel circular internally threaded nut with knurling on one end for interacting with the body. Nominal BoxBolt® diameters include $^1/_2$ inch (12.0 mm), $^5/_8$ inch (16.0 mm), and $^3/_4$ inch (20.0 mm), with each diameter of bolt available in three lengths. Figure 1 provides a picture of the BoxBolt®. Table 1 provides part codes, dimensions and installation information. Table 2 provides BoxBolt® Type C fastener strength information.

3.2 Materials:

3.2.1 Core Bolt: The core bolt is manufactured from steel complying with ISO 4017, Class 8.8 in accordance with ISO 898-1, having a specified tensile strength, F_u, of 116,030 psi (800 MP_a) for the M12 and M16 bolts, and 120,380 psi (830 MP_a) for the M20 bolts.

3.2.2 Body, Collar and Cone: The body, collar, and cone are manufactured from steel complying with BS EN 10083 Grade C22E (1.1151).

3.2.3 Finish: All components are hot dip galvanized in accordance with BS EN ISO 1461 with a mean coating thickness of 2.2 mil (55 μm), as described in the report holder's quality documentation.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The BoxBolt® Type C Blind Fasteners are alternatives to bolts described in Section J3 of AISC 360, which is referenced in Section 2205.1 of the IBC, for bearing-type connections and for slip-critical connections.

The design of the BoxBolt® Type C Blind Fasteners must comply with this report, Section J3 of AISC 360 and the information for the BoxBolt® provided in Tables 1 and 2 of this report.

For BoxBolt® Type C Blind Fasteners used in structures assigned to Seismic Design Categories (SDCs) D, E and F, the fasteners are intended to be used as force-controlled components and are not expected to undergo inelastic deformations. The construction documents (including structural calculations and engineering plans) specifying the BoxBolt® Type C Blind Fasteners, must consider this requirement for a force-controlled behavior, and additional requirements in AISC 341, as applicable.

The load-carrying capacity of a connection utilizing BoxBolt® Type C Blind Fasteners depends on the fasteners' capacities as shown in Table 2, the affected

elements of members and connecting elements, and the interaction between the fasteners and the connected elements. All applicable limit states of a connection must be checked to determine the load-carrying capacity of the connection. The available strength of a connection is limited by the governing limit state (or the limit state with the least available strength), which occurs in the weakest component in the connection, typically the steel section itself in the case of thin steel sections, or the BoxBolt® in the case of thick wall steel sections, or a combination of the two.

Connections subjected to combined static tension loading and static shear-bearing loading must comply with the following:

$$\left(\frac{Tension\ Demand}{Tension\ Capacity}\right)^2 + \left(\frac{Shear\ Demand}{Shear\ Capacity}\right)^2 \leq 1.0$$

4.2 Installation:

The BoxBolt® Type C Blind Fasteners must be installed in accordance with the details noted in this section, the manufacturer's installation instructions and the approved plans. In case of a conflict between this report and the report holder's installation instructions, the most restrictive requirement governs.

1. Holes must be drilled into the sections to be connected, ensuring that the resulting holes have the correct diameter, spacing and edge distance according to the report holder's published specifications, this evaluation report and the correct design requirements for the connection, as indicated in the approved plans. Holes must be standard diameter holes conforming to AISC 360, where the bolt hole diameters must be no greater than the bolt shell diameter plus $^1/_{16}$ inch (1.6 mm).
2. Burrs in the holes must be removed before insertion of the BoxBolt® Type C Blind Fasteners.
3. The structural steel elements to be fastened adjacent to each other must be positioned to ensure:
   a. That the two sections are lined up and rest one against the other without any gap. Clamps must be used as necessary to hold the two sections together and prevent formation of gaps.
   b. That the holes are aligned, using a mandrel if necessary.
4. The core bolts must be positioned in the holes. The collar must rest flat against the section with no gap.
5. The collar must be held in position using a suitable open-ended wrench, and then the core bolt must be tightened to the specified torque, as noted in Table 1 of this report.
6. The tightening tool must then be removed and the tightening torque on the bolt must be verified. If necessary, the tightening torque must be corrected.

4.3 Special Inspection:

Special inspection is required in accordance with 2015 and 2012 IBC Sections 1704.3, 1705.1.1 and 1705.2 (2009 IBC Sections 1704.3, 1704.15 and 1705), as applicable). The report holder must submit inspection procedures to verify proper installation of the BoxBolts® Type C Blind Fasteners. Where BoxBolts® Type C Blind Fasteners are used for seismic or wind load resistance, special inspection must comply with 2015 IBC Sections 1705.11, 1705.12 and 1705.13 (2012 IBC Sections 1705.10, 1705.11 and 1705.12; 2009 IBC Sections 1706, 1707 and 1708; as applicable).

4.4 Packaging:

Each package of the BoxBolt® Type C Blind Fasteners must include the following information: installation and safety instructions, minimum and maximum fixing ranges (or the total thickness of elements to be connected), installation torque, design loads and special inspection requirements.

5.0 CONDITIONS OF USE

The BoxBolt® Type C Blind Fasteners described in this report comply with, or are suitable alternatives to what is specified in, the codes noted in Section 1.0 of this report, subject to the following conditions:

5.1 Steel structures utilizing BoxBolt® Type C Blind Fasteners must be designed in accordance with the IBC including its referenced standards (such as AISC 360 and AISC 341) and this evaluation report; and must be installed in accordance with this evaluation report and the report holder's installation instructions. In case of a conflict between this evaluation report and the report holder's installation instructions, the most restrictive requirement governs.

5.2 Calculations and details, justifying the use of the BoxBolt® Type C Blind Fasteners is in compliance with the applicable code and this evaluation report, including showing that the BoxBolt® fasteners, the affected elements of members and connecting elements are adequate to resist the applied loads, must be submitted to the code official for approval. The calculations and details must be signed and sealed by a registered design professional, when required by the statutes of the jurisdiction in which the project is to be constructed.

5.3 **Fire-resistive Construction:** Where not otherwise prohibited in the code, BoxBolt® Type C Fasteners are permitted for use with fire-resistance-rated construction provided that at least one of the following conditions is fulfilled:

- The BoxBolt® fasteners are used to resist wind or seismic forces only.
- BoxBolt® fasteners that support a fire-resistance-rated envelope or a fire-resistance-rated membrane, are protected by approved fire-resistance-rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
- The BoxBolt® fasteners are used to support nonstructural elements.

5.4 Special inspection must be provided as specified in Section 4.3 of this report.

5.5 For BoxBolt® Type C Blind Fasteners used in structures assigned to Seismic Design Categories (SDCs) D, E and F, the fasteners are intended to be used as force-controlled components and are not expected to undergo inelastic deformations, and the design professional must consider this force-controlled behavior in his design.

5.6 The BoxBolt® Type C Fasteners addressed in this evaluation report are manufactured under a quality program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Expansion Bolts in Structural Steel Connections (AC437), dated October 2014 (editorially revised December 2016).

7.0 IDENTIFICATION

7.1 The BoxBolt® Type C fastener package is labeled with the product part number, quantity, batch number, image of the product, report holder's name (LNA Solutions—A Kee Safety Logistic Ltd.), and the evaluation report number (ESR-3217).The fastener is identified by a nine-character alphanumeric part number (BQXGALXXC). The first three characters (BQX) indicate the length of the fastener (Size 1, 2, or 3). The second three characters (GAL) indicate the fasteners are coated with a hot dip galvanized coating. The last three characters (XXC) indicate the diameter and type of fastener, where XX is the numeric diameter in millimeters (12, 16 or 20), and C identifies the fastener as a Type C fastener. Each core bolt is stamped with a head marking of "ATBX". Each collar is stamped with "BOXBOLT" and part number.

7.2 The report holder's contact information is the following:

LNA SOLUTIONS—A KEE SAFETY LOGISTIC LTD
3924A VARSITY DRIVE
ANN ARBOR, MICHIGAN 48108
(888) 724-2323
www.LNASolutions.com
jclements@lnasolutions.com

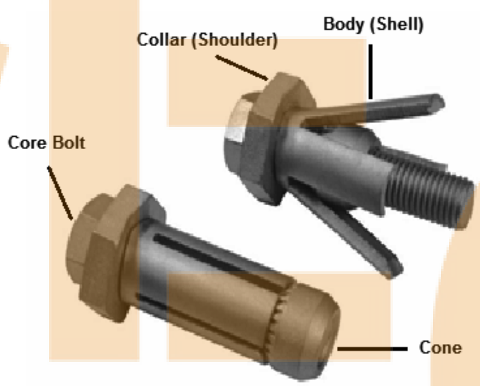


FIGURE 1—TYPICAL BOX BOLT® TYPE C BLIND FASTENER

TABLE 1—BOXBOLT® TYPE C BLIND FASTENER DIMENSIONAL AND INSTALLATION INFORMATION[1]

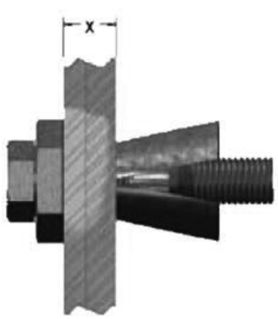
PART NUMBER AND DESCRIPTION			DIMENSIONAL INFORMATION[3]							INSTALLATION INFORMATION[3]	
BoxBolt® (Part Code)	BoxBolt® (Core Bolt Diameter)	Description[2]	Core Bolt Length	Clamping Range (dim x) Min	Clamping Range (dim x) Max	Across Flats of Shoulder	Collar Thickness	Dim A	Dim B	Dim C Drill Dia	Torque (ft-lb)
BQ1GAL12C	1/2" (12 mm)	1/2" BoxBolt® Size 1	2 3/16" (55 mm)	1/2"	15/16"	1" (26 mm)	5/16" (8.4 mm)	2 1/16" (52 mm)	1 1/8"	13/16"	60
BQ2GAL12C	1/2" (12 mm)	1/2" BoxBolt® Size 2	3 1/8" (80 mm)	3/4"	1 7/8"	1" (26 mm)	5/16" (8.4 mm)	2 1/16" (52 mm)	1 1/8"	13/16"	60
BQ3GAL12C	1/2" (12 mm)	1/2" BoxBolt® Size 3	4" (100 mm)	1 1/2"	2 11/16"	1" (26 mm)	5/16" (8.4 mm)	2 1/16" (52 mm)	1 1/8"	13/16"	60
BQ1GAL16C	5/8" (16 mm)	5/8" BoxBolt® Size 1	3" (75 mm)	5/8"	1 3/8"	1 7/16" (36 mm)	3/8" (9.4 mm)	2 11/16" (68 mm)	1 3/8"	1 1/16"	140
BQ2GAL16C	5/8" (16 mm)	5/8" BoxBolt® Size 2	4" (100 mm)	1"	2 5/16"	1 7/16" (36 mm)	3/8" (9.4 mm)	2 11/16" (68 mm)	1 3/8"	1 1/16"	140
BQ3GAL16C	5/8" (16 mm)	5/8" BoxBolt® Size 3	4 3/4" (120 mm)	2"	3 1/16"	1 7/16" (36 mm)	3/8" (9.4 mm)	2 11/16" (68 mm)	1 3/8"	1 1/16"	140
BQ1GAL20C	3/4" (20 mm)	3/4" BoxBolt® Size 1	4" (100 mm)	3/4"	1 13/16"	1 13/16" (46 mm)	7/16" (11.4 mm)	3 7/16" (87 mm)	1 3/4"	1 3/8"	220
BQ2GAL20C	3/4" (20 mm)	3/4" BoxBolt® Size 2	5 1/8" (130 mm)	1 5/16"	3"	1 13/16" (46 mm)	7/16" (11.4 mm)	3 7/16" (87 mm)	1 3/4"	1 3/8"	220
BQ3GAL20C	3/4" (20 mm)	3/4" BoxBolt® Size 3	6" (150 mm)	2 9/16"	4"	1 13/16" (46 mm)	7/16" (11.4 mm)	3 7/16" (87 mm)	1 3/4"	1 3/8"	220

For **SI:** 1 inch = 25.4mm; 1 lbf = 4.448N; 1 ft-lb = 1.356 N-m.

[1]When dimensions are expressed in both US Customary and SI units; BoxBolt® dimensions in US Customary units are converted from the corresponding SI units.

[2]BoxBolt® size is determined by core bolt length.

[3]Dimension "X" is the total thickness of the connected steel elements (or the grip); "A" is the minimum spacing between fasteners; "B" is the minimum edge distance for the fasteners; and "C" is the standard hole diameters for the fasteners.



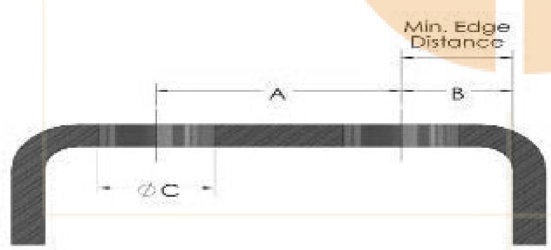


TABLE 2—BOXBOLT® TYPE C BLIND FASTENER STRENGTH INFORMATION

PART CODE	LRFD STRENGTHS[1] (lbf)						ASD STRENGTHS[2] (lbf)					
	Static Dominant Loads[3]			Seismic SDC D, E or F[4]			Static Dominant Loads[3]			Seismic SDC D, E or F[4]		
	Shear-bearing	Shear-slip resistance	Tension	Shear-bearing	Shear-slip resistance	Tension	Shear-bearing	Shear-slip resistance	Tension	Shear-bearing	Shear-slip resistance	Tension
BQ1GAL12C	7680	150	5250	6900	150	4730	4800	90	3280	4320	100	2960
BQ2GAL12C	7680	150	5250	6900	150	4730	4800	90	3280	4230	100	2960
BQ3GAL12C	7680	150	5250	6900	150	4730	4800	90	3280	4320	100	2960
BQ1GAL16C	12200	170	13100	11000	170	11400	7650	110	8230	6870	110	7120
BQ2GAL16C	12200	170	13100	11000	170	11400	7650	110	8230	6870	110	7120
BQ3GAL16C	12200	170	13100	11000	170	11400	7650	110	8230	6870	110	7120
BQ1GAL20C	17600	790	15000	11800	790	13500	11000	490	9400	7380	500	8470
BQ2GAL20C	17600	790	15000	11800	790	13500	11000	490	9400	7380	500	8470
BQ3GAL20C	17600	790	15000	11800	790	13500	11000	490	9400	7380	500	8470

For **SI:** 1 lbf = 4.448N.

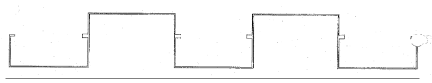
[1]Load and Resistance Factor Design (LRFD) strengths are derived in accordance AC437, Sections 3.4, 3.5, 3.7 and 3.8, based on test data per AC437 Section 4.0.
[2]Allowable Strength Design (ASD) strengths are derived in accordance AC437, Sections 3.4, 3.5, 3.9 and 3.10, based on test data per AC437 Section 4.0.
[3]Static dominant loads include load combinations with gravity and wind loads for structures assigned to all Seismic Design Categories and load combinations with seismic loads for structures assigned to Seismic Design Category (SDC) A, B or C.
[4]Seismic SDC D, E or F refer to load combinations with seismic loads for structures assigned to Seismic Design Category (SDC) D, E or F.

DECK DESIGN @ CANOPY 01 SECTION A1

Project Number	East Texas 222 - 405	Sheet	1,501		
Project Name		Designed by		Date Sub-	
ject	DECK DESIGN	Checked by		Date	

Deck Design

Max Span on Deck = 10 ft



WL on Deck = 34.572 psf
RLL on Deck = 20 psf

10'- 0"

For 10.0 ft Span

Allowable Wind Load =	**73.0**	**>**	**34.6**	psf
Allowable Live Load =	**75.0**	**>**	**20.0**	psf

USE [2 3/4" x 6" x 0.078" Aluminum Decking] as per page 1100

Deck Fastner Design

Uplift on Deck = 34.572 psf X $\frac{6"}{12"/ft}$ X $\frac{8.00\ ft}{2}$ = **34.6 Lbs**

Pull out strength of Steel Binder Heavy guage #12 screws = 996 lbs as per page 1101

Allowable Pull Out = 996 lbs/4 (factor of Safety) = **249.0 Lbs** > **34.6 Lbs**

SAFE

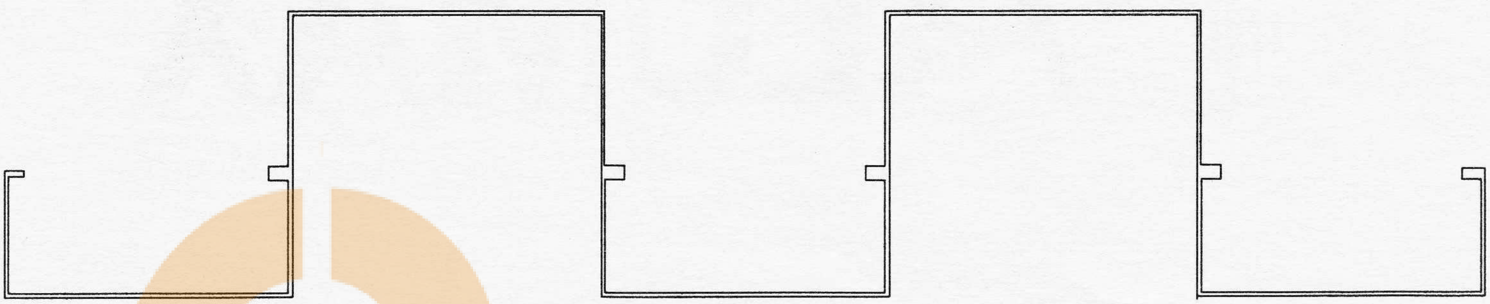
USE [2 #12 screws @6" o.c.]

SAFETY FACTOR OF 1.95 FROM ULTIMATE STRESS
CHARTS SHOW TOTAL ALLOWABLE LOAD PER BENT.
ALL PROFILES ARE 6063-T6 IN ACCORDANCE WITH ASTM STDS. WELD STRESS IN ACCORDANCE WITH ALUMINUM ASSOCIATION STANDARDS. ALL DESIGN STRESS AND FACTORS OF SAFETY.

1502

1100

WALKWAY COVER DECKS



6″ DECK

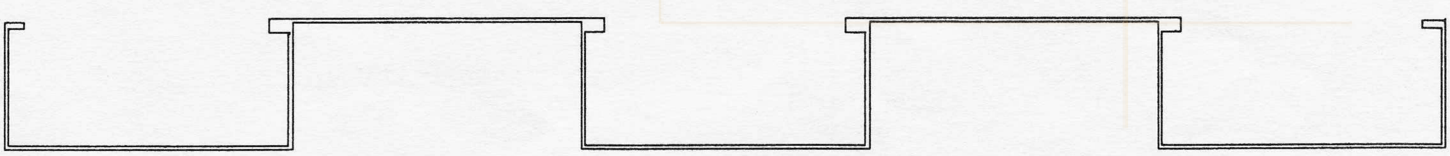
Span (FT.)	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Gravity *	57	51	46	41	38	34	31	29	26	24	23	21	20	18	17	16	15	14
Wind *	68	61	54	49	45	41	37	34	31	29	27	25	23	22	20	19	18	17
L/180 *	69	58	49	42	36	32	28	24	22	19	17	15	14	12	11	10	9	9

* (PFS)

4-1/2″ DECK

Span (FT.)	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Gravity *	75	64	55	48	42	38	33	30	27	25	22	21	19	17	16	15	14	13
Wind *	89	76	65	57	50	44	39	35	32	29	26	24	22	20	19	18	16	15
L/180 *	95	75	60	49	40	34	28	24	21	18	15	14	12	11	9	8	8	7

* (PSF)

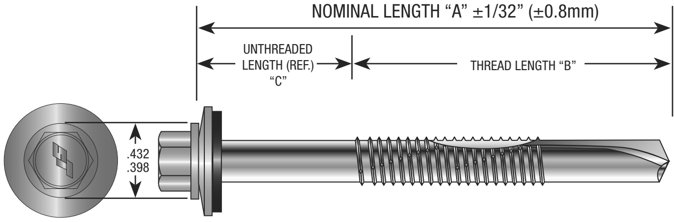


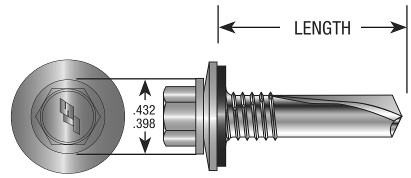
2-3/4″ DECK

Span (FT.)	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Gravity *	118	93	75	62	52	45	38	34	29	26	23	21	19	17	16
Wind *	114	90	73	61	51	43	37	33	29	25	23	20	18	17	15
L/180 *	123	86	63	47	36	29	23	19	15	13	11	9	8	7	6

* (PSF)

Steelbinder® Heavy Gauge





SPECIFICATIONS SUMMARY

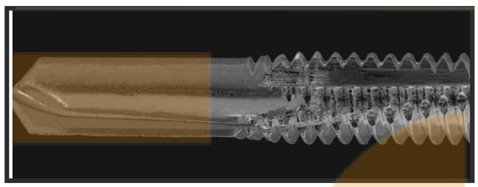
#12-24 Dimensions:

Drill Point: #4/#5
Major Diameter: .215"/.209"
Minor Diameter: .164" REF
Hex Across Flats: .311/.305

SIZE	HEAD STYLE	CARTON QTY.	WEIGHT/M
12-24 x 7/8"	HWH	2500	12.0
12-24 x 1-1/4"	HWH	2500	12.6
12-24 x 1-1/2"	HWH	2000	16.2
12-24 x 2"	HWH	1500	22.1

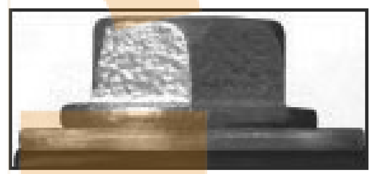
PERFORMANCE DATA

PULL OUT STRENGTH VALUE (LBS. ULT.)		MATERIAL			
		HRS Primed Only		HRS PLATE	
	NOM. GAUGE	14	12	3/16"	1/4"
	THICKNESS	.070	.106	.187	.250
#12-24 HEAVY GAUGE		924	1627	2556	3298

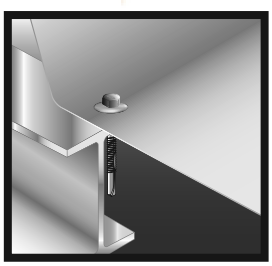


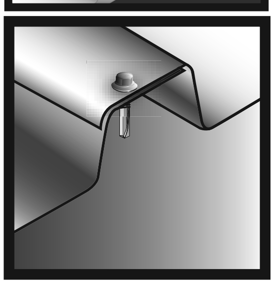
Long Drill point assures proper clearance of heavy gauge metal before any thread engagement begins

PULL OVER STRENGTH VALUE (LBS. ULT.)	DESIGNATION	MATERIAL		
		AZ55 GALVALUME		
	NOM. GAUGE	26	24	22
	THICKNESS	.019	.024	.032
BONDED WASHER (14mm O.D.)		801	996	1258
(.398/.432 HWH DIA.)		775	956	1078



HWH with EPDM bonded washer provides a secure seal to prevent leaks.





- Fastener lengths over 1-1/4"are designed to penetrate steel thickness up to .500". 12-24 x 7/8" is designed to drill up to .250".
- Thread to point ratio engineered to provide maximum pull out strength in heavy gauge steel.
- EPDM rubber is vulcanized to steel washer. Moisture has no place to penetrate. The washer provides a secure seal even when driven at an angle.
- Applications include metal deck to structural steel or bar joists, & retrofit clips to structural steel.
- Fastener is also available without a bonded sealing washer.

NOTES: *1. HRS (Hot Rolled Steel)*
2. All strength values shown are ultimate values, expressed in LBS. Apply an appropriate safety factor to obtain design limits.

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903-592-2826 • 903-592-1583 Fax

9950 Princeton Glendale Rd.
Cincinnati, OH 45246
800-944-8920 • 800-944-4183 Fax
513-874-5905 • 513-874-5903 Fax

WALL SUPPORTED CANOPY ANALYSIS AND DESIGN

MecaWind v2400

Calculations Prepared by:
Date: Jan 29, 2022

Basic Wind Parameters

Wind Load Standard	= ASCE 7-10	Exposure Category	= C
Wind Design Speed	= 120.0 mph	Risk Category	= III
Structure Type	= Building	Building Type	= Enclosed

General Wind Settings

Incl_LF	= Include ASD Load Factor of 0.6 in Pressures	= False
DynType	= Dynamic Type of Structure	= Rigid
Alt	= Altitude (Ground Elevation) above Sea Level	= 0.000 ft
Bdist	= Base Elevation of Structure	= 0.000 ft
SDB	= Simple Diaphragm Building	= False
Reacs	= Show the Base Reactions in the output	= False
MWFRSType	= MWFRS Method Selected	= Ch 27 Pt 1

Topographic Factor per Fig 26.8-1

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

Building Inputs

RoofType: Building Roof Type	= Flat	RfHt	: Roof Height	= 17.000 ft
W : Building Width	= 100.000 ft	L	: Building Length	= 100.000 ft
Par : Is there a Parapet	= False			

Exposure Constants per Table 26.9-1:

Alpha:	Const from Table 26.9-1	= 9.500	Zg:	Const from Table 26.9-1	= 900.000 ft
At:	Const from Table 26.9-1	= 0.105	Bt:	Const from Table 26.9-1	= 1.000
Am:	Const from Table 26.9-1	= 0.154	Bm:	Const from Table 26.9-1	= 0.650
C:	Const from Table 26.9-1	= 0.200	Eps:	Const from Table 26.9-1	= 0.200

Gust Factor Calculation:

Gust Factor Category I Rigid Structures - Simplified Method

G1	= For Rigid Structures (Nat. Freq.>1 Hz) use 0.85	= 0.85

Gust Factor Category II Rigid Structures - Complete Analysis

Zm	= Max(0.6 * Ht, Zmin)	= 15.000 ft
Izm	= Cc * (33 / Zm) ^ 0.167	= 0.228
Lzm	= L * (Zm / 33) ^ Eps	= 427.057
Q	= (1 / (1 + 0.63 * ((B + Ht) / Lzm)^0.63))^0.5	= 0.884
G2	= 0.925*((1+0.7*Izm*3.4*Q)/(1+0.7*3.4*Izm))	= 0.864

Gust Factor Used in Analysis

G	= Lessor Of G1 Or G2	= 0.850

Components and Cladding (C&C) Calculations per Ch 30 Part 1:

Zh	= Mean Roof Height for Kh: h + Base_Dist	= 17.000 ft
Kh	= Since 15 ft [4.572 m] < Zh < Zg --> 2.01 * (Zh/zg)^(2/Alpha)	= 0.872
Kzt	= Topographic Factor is 1 since no Topographic feature specified	= 1.000
Kd	= Wind Directionality Factor per Table 26.6-1	= 0.85
GCPi	= Ref Table 26.11-1 for Enclosed Building	= +/-0.18
LF	= Load Factor based upon STRENGTH Design	= 1.00
qh	= (0.00256 * Kh * Kzt * Kd * V^2) * LF	= 27.31 psf
LHD	= Least Horizontal Dimension: Min(B, L)	= 100.000 ft
a1	= Min(0.1 * LHD, 0.4 * h)	= 6.800 ft
a	= Max(a1, 0.04 * LHD, 3 ft [0.9 m])	= 6.800 ft
h/B	= Ratio of mean roof height to least hor dim: h / B	= 0.170

Wind Pressures for C&C Ch 30 Pt 1
All wind pressures include a load factor of 1.0

Description ft	Zone	Width ft	Span ft	Area sq ft	1/3 Rule	Ref Fig	GCp Max	GCp Min	p Max psf	p Min psf
	3	5.000	6.500	32.50	No	30.4-2A	0.249	-1.930	16.00	-57.62

```
Area      = Span Length x Effective Width
1/3 Rule = Effective width need not be less than 1/3 of the span length
GCp       = External Pressure Coefficients taken from Figures 30.4-1 through 30.4-7
p         = Wind Pressure:  qh*(GCp - GCpi)  [Eqn 30.4-1]*
*Per Para 30.2.2 the Minimum Pressure for C&C is 16.00 psf [0.766 kPa] {Includes LF}
Since Roof Slope <= 10 Deg, the GCp value is reduced by 10%
```

DESIGN LOADS FOR CANOPY #6

Project Number	ETC 222- 405	Sheet	
Project Name		Designed by	Date
Subject	DESIGN LOADS	Checked by	Date

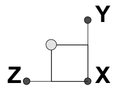
TRIB WIDTH = 3.2 feet

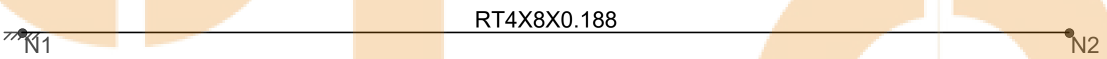
LOAD CALCULATION (DEAD & ROOF LIVE)

DEAD LOAD (W)	=	3	psf	x	3.2	ft	=	9.6	plf
ROOF LIVE LOAD	=	20	psf	x	3.2	ft	=	64	plf

WIND LOAD CASE A & CASE B

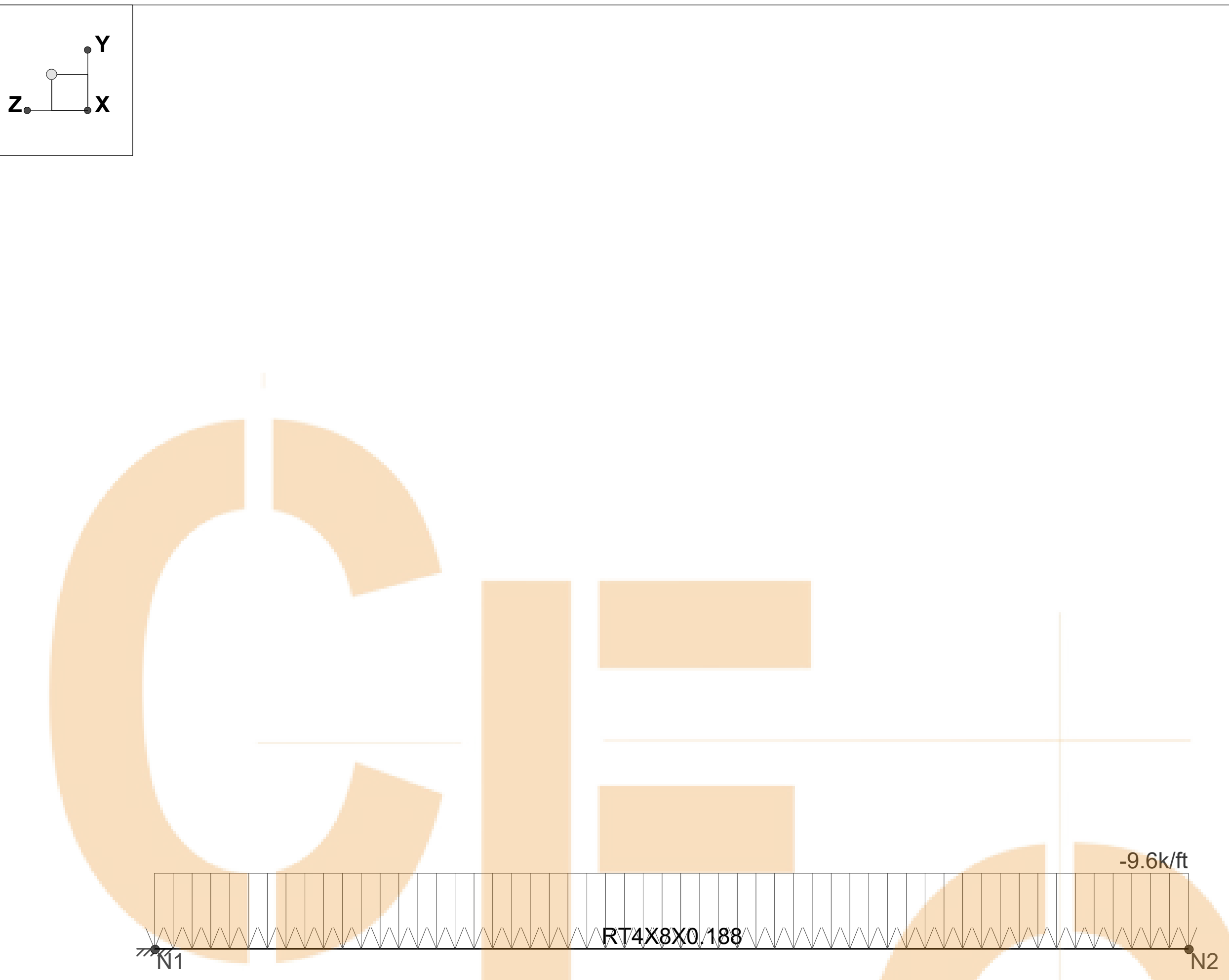
WIND LOAD A	=	16	psf	x	3.2	ft	=	51.2	plf
WIND LOAD B	=	-57.62	psf	x	3.2	ft	=	-184.38	plf





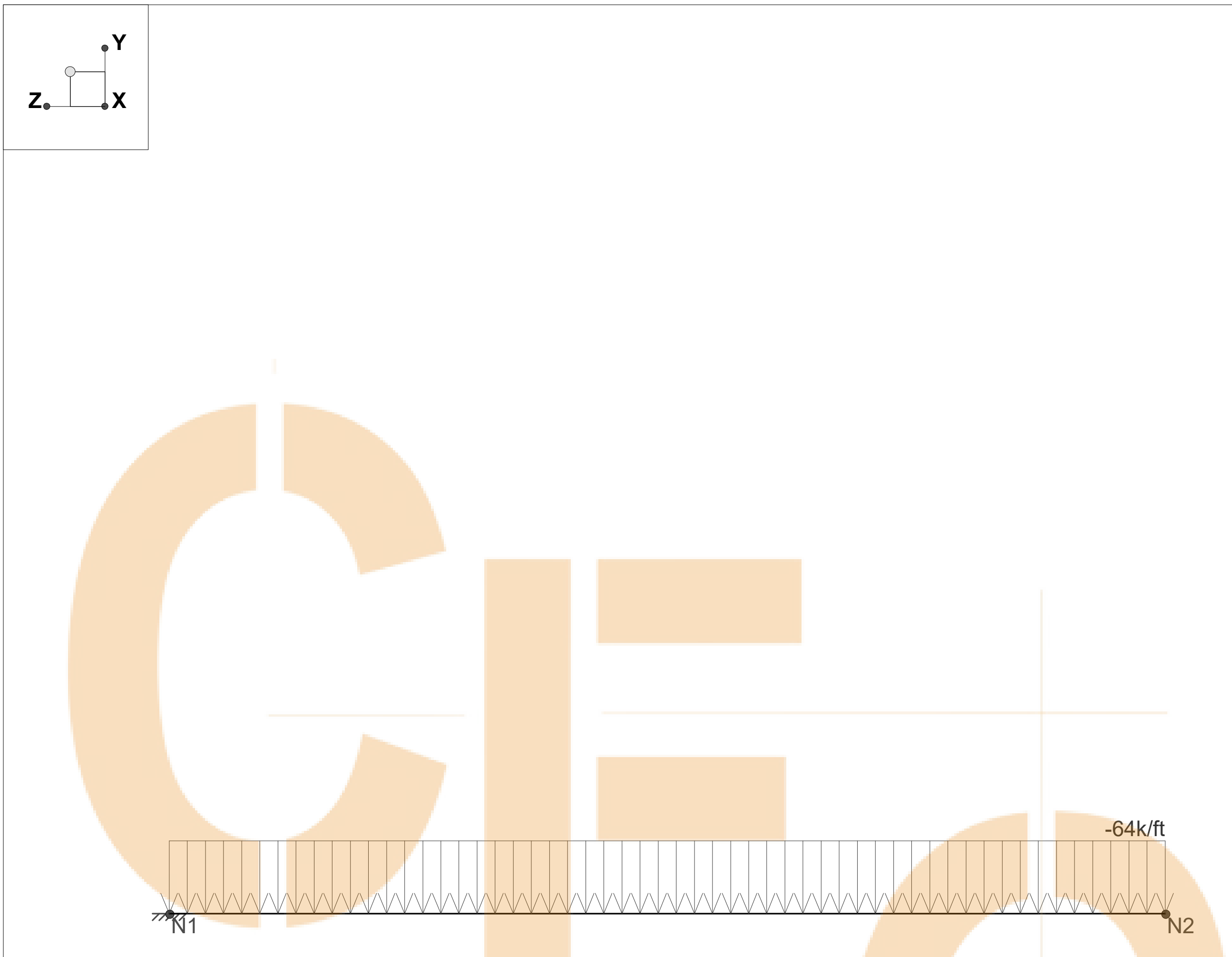
Envelope Only Solution

	CANOPY 4	SK - 1
EAST TEXAS 222-405		SUNSHADE LAYOUT #3.r3d



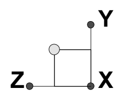
Loads: BLC 1, DL
Envelope Only Solution

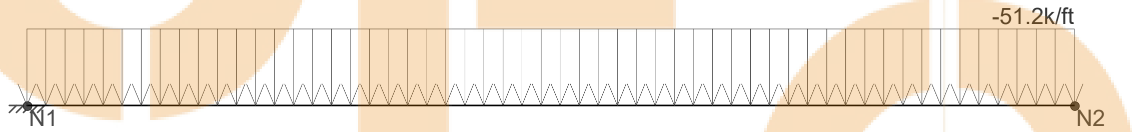
	CANOPY 4	SK - 2
EAST TEXAS 222-405		
		SUNSHADE LAYOUT #3.r3d



Loads: BLC 2, RLL
Envelope Only Solution

	CANOPY 4	SK - 3
EAST TEXAS 222-405		SUNSHADE LAYOUT #3.r3d



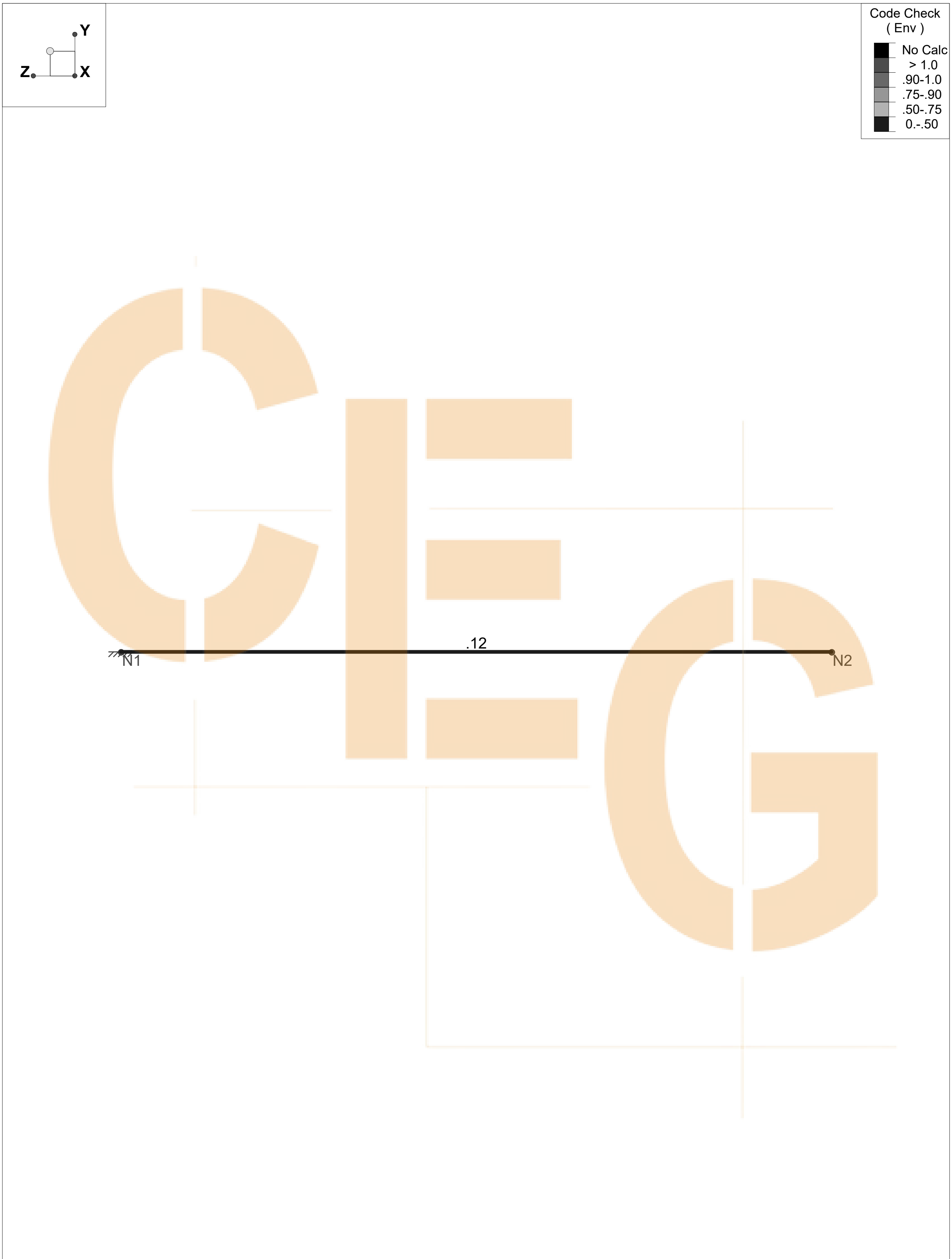


Loads: BLC 4, WLA
Envelope Only Solution

	CANOPY 4	SK - 4
EAST TEXAS 222-405		SUNSHADE LAYOUT #3.r3d

Loads: BLC 5, WLB
Envelope Only Solution

	CANOPY 4	SK - 5
EAST TEXAS 222-405		SUNSHADE LAYOUT #3.r3d



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

	CANOPY 4	SK - 6
EAST TEXAS 222-405		SUNSHADE LAYOUT #3.r3d

Aluminum Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (...	Density[...	Table B.4	kt	Ftu[ksi]	Fty[ksi]	Fcy[ksi]	Fsu[ksi]	Ct
1	3003-H14	10100	3787.5	.33	1.3	.173	Table B....	1	19	16	13	12	141
2	6061-T6	10100	3787.5	.33	1.3	.173	Table B....	1	38	35	35	24	141
3	6063-T5	10100	3787.5	.33	1.3	.173	Table B....	1	22	16	16	13	141
4	6063-T6	10100	3787.5	.33	1.3	.173	Table B....	1	30	25	25	19	141
5	5052-H34	10200	3787.5	.33	1.3	.173	Table B....	1	34	26	24	20	141
6	6061-T6 W	10100	3787.5	.33	1.3	.173	Table B....	1	24	15	15	15	141
7	6061-T6 haz	10100	3787.5	.33	1.3	.173	Table B....	1	29	23	23	18	141

Aluminum Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	B1	RT4X8X0.188	Beam	Rectangular Tubes	6061-T6 h...	Typical	4.37	12.4	36.8	28.7
2	Louvers	RT2X6X0.125	Beam	Rectangular Tubes	6061-T6	Typical	1.94	1.43	8.28	3.91

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
1	N2	0	0	-5	0	
2	N1	0	0	0	0	

Aluminum Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	B1	5			Lbyy						Lateral

Member Area Loads

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]
No Data to Print ...						

Load Combinations

	Description	Solve	PDe...	S...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	IBC 16-8	Yes	Y		DL	1																		
2	IBC 16-10 (a)	Yes	Y		DL	1	RLL	1																
3	IBC 16-12 (a)	Yes	Y		DL	1	WL...	.6																
4	IBC 16-13 (a)	Yes	Y		DL	1	WL...	.45					R...	.75										
5	IBC 16-15	Yes	Y		DL	.6	WL...	.6																
6	IBC 16-12 (a)	Yes	Y		DL	1	WL-Y	.6																
7	IBC 16-13 (a)	Yes	Y		DL	1	WL-Y	.45					R...	.75										
8	IBC 16-15	Yes	Y		DL	.6	WL-Y	.6																
9	DL		Y		DL	1.25																		
10	RLL		Y		RLL	1.25																		
11	WL+Y		Y		WL+Y	1.25																		
12	WL-Y		Y		WL-Y	1.25																		

Envelope Joint Reactions

	Joint		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	8	.429	4	0	8	1.074	4	0	8	0	8
2		min	0	1	-.509	8	0	1	-1.272	8	0	1	0	1
3	Totals:	max	0	8	.429	4	0	8						
4		min	0	1	-.509	8	0	1						

Envelope AA ADM1-15: ASD - Building Aluminum Code Checks

	Member	Shape	Code C...	Loc[ft]	LC	Shear ...	Loc[ft]	Dir	LC	Pnc/O...	Pnt/Om...	Mny/O...	Mnz/O...	Vny/O...	Vnz/O...	Cb	Eqn
1	M1	RT4X8X0...	.119	5	8	.022	5	y	8	51.453	60.915	5.497	10.687	23.384	10.805	2....	H.1-1

Envelope Member Section Forces

	Member	Sec		Axial[k]	LC	y Shear[k]	LC	z Shear[k]	LC	Torque[k...	LC	y-y Mom...	LC	z-z Moment[k-ft]	LC
1	M1	1	max	0	8	0	8	0	8	0	8	0	8	0	8
2			min	0	1	0	1	0	1	0	1	0	1	0	1
3		2	max	0	8	.127	8	0	8	0	8	0	8	.067	4
4			min	0	1	-.107	4	0	1	0	1	0	1	-.079	8
5		3	max	0	8	.254	8	0	8	0	8	0	8	.268	4
6			min	0	1	-.215	4	0	1	0	1	0	1	-.318	8
7		4	max	0	8	.381	8	0	8	0	8	0	8	.604	4
8			min	0	1	-.322	4	0	1	0	1	0	1	-.715	8
9		5	max	0	8	.509	8	0	8	0	8	0	8	1.074	4
10			min	0	1	-.429	4	0	1	0	1	0	1	-1.272	8

Envelope Member Section Deflections Service

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y' Ratio	LC	(n) L/z' Ratio	LC
1	M1	1	max	0	8	.048	8	0	8	0	8	8637.79	1	NC	8
2			min	0	1	-.04	4	0	1	0	1	1260.493	8	NC	1
3		2	max	0	8	.032	8	0	8	0	8	NC	1	NC	8
4			min	0	1	-.027	4	0	1	0	1	1880.181	8	NC	1
5		3	max	0	8	.017	8	0	8	0	8	NC	7	NC	8
6			min	0	1	-.014	4	0	1	0	1	3515.947	8	NC	1
7		4	max	0	8	.005	8	0	8	0	8	NC	8	NC	8
8			min	0	1	-.004	4	0	1	0	1	NC	1	NC	1
9		5	max	0	8	0	8	0	8	0	8	NC	8	NC	8
10			min	0	1	0	1	0	1	0	1	NC	1	NC	1

ANCHOR DESIGN @ SECTION D

Project Number	ETC 222-405	Sheet			
Project Name		Designed by		Date	
Subject	CONNECTION	Checked by		Date	

CAPACITY OF 1/2" ø SS BOX BOLTS

CHECK FOR TENSILE CAPACITY OF ANCHORS

Moment acting on the member	=	1271.52	lbs.ft			
Moment arm (4.5"/12)	=	0.375	ft			
Tensile force acting on the member	=	3390.72	lbs	As per page 1,102		
Allowable Tensile Capacity of Anchor	=	3280.00	lbs			
Number of Anchors provided	=	4.00	Nos			
Total allowable Tensile capacity of Anchor	=	13120.00	lbs			
Check for Tensile capacity of Anchors with force acting on the member	=	3390.72	<		13120.00	lbs
			SAFE			

USE [(4) 1/2" ø SS THROUGH BOLTS FOR CONNECTING BEAM TO WALL FOR SECTION D]

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Reissued 04/2019

This report is subject to renewal 04/2021.

DIVISION: 05 00 00—METALS

SECTION: 05 05 27—METAL CONNECTORS

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LNA SOLUTIONS—A KEE SAFETY LOGISTIC LTD

EVALUATION SUBJECT:

BOXBOLT® TYPE C BLIND FASTENERS

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DIVISION: 05 00 00—METALS
Section: 05 05 27—Metal Connectors

REPORT HOLDER:

LNA SOLUTIONS—A KEE SAFETY LOGISTIC LTD

EVALUATION SUBJECT:

BOXBOLT® TYPE C BLIND FASTENERS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2015, 2012 and 2009 *International Building Code®* (IBC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)†

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Property evaluated:

Structural

2.0 USES

BoxBolt® Type C Blind Fasteners are designed for connecting structural steel to hollow structural section (HSS) steel members and other structural steel elements where access is difficult or is restricted to one side only. BoxBolt® Type C fasteners are intended for use with rectangular or square HSS members and are recognized for resisting static dominant tension and shear loads in bearing-type connections, and for resisting static dominant lateral loads in slip-critical connections, where static dominant loads include load combinations with gravity and wind loads for structures assigned to all Seismic Design Categories and load combinations with seismic loads for structures assigned to Seismic Design Category (SDC) A, B or C. The BoxBolt® Type C Blind Fasteners are alternatives to bolts described in Section J3 of AISC 360, which is referenced in Section 2205.1 of the IBC.

BoxBolt® Type C Blind Fasteners may also be used to resist load combinations with seismic loads for structures assigned to Seismic Design Categories (SDCs) D, E and F, based on cyclic test data in accordance with Sections 3.0 and 4.4 of the ICC-ES Acceptance Criteria for Expansion Bolts in Structural Steel Connections (AC437).

3.0 DESCRIPTION

3.1 General:

BoxBolt® Type C Blind Fasteners are assembled from four components, consisting of the core bolt (or set screw), the body (or shell), the shoulder (or collar), and the cone (or conical nut). The steel core bolt features a full-length threaded shank and a hexagonal head. The body is a steel segmented hollow cylinder, with four slits along the length of the cylinder, and are located at 90 degrees from each other. The collar is a steel flat hexagonal element with a circular hole at its center. The cone is a steel circular internally threaded nut with knurling on one end for interacting with the body. Nominal BoxBolt® diameters include $^1/_2$ inch (12.0 mm), $^5/_8$ inch (16.0 mm), and $^3/_4$ inch (20.0 mm), with each diameter of bolt available in three lengths. Figure 1 provides a picture of the BoxBolt®. Table 1 provides part codes, dimensions and installation information. Table 2 provides BoxBolt® Type C fastener strength information.

3.2 Materials:

3.2.1 Core Bolt: The core bolt is manufactured from steel complying with ISO 4017, Class 8.8 in accordance with ISO 898-1, having a specified tensile strength, F_u, of 116,030 psi (800 MP_a) for the M12 and M16 bolts, and 120,380 psi (830 MP_a) for the M20 bolts.

3.2.2 Body, Collar and Cone: The body, collar, and cone are manufactured from steel complying with BS EN 10083 Grade C22E (1.1151).

3.2.3 Finish: All components are hot dip galvanized in accordance with BS EN ISO 1461 with a mean coating thickness of 2.2 mil (55 μm), as described in the report holder's quality documentation.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The BoxBolt® Type C Blind Fasteners are alternatives to bolts described in Section J3 of AISC 360, which is referenced in Section 2205.1 of the IBC, for bearing-type connections and for slip-critical connections.

The design of the BoxBolt® Type C Blind Fasteners must comply with this report, Section J3 of AISC 360 and the information for the BoxBolt® provided in Tables 1 and 2 of this report.

For BoxBolt® Type C Blind Fasteners used in structures assigned to Seismic Design Categories (SDCs) D, E and F, the fasteners are intended to be used as force-controlled components and are not expected to undergo inelastic deformations. The construction documents (including structural calculations and engineering plans) specifying the BoxBolt® Type C Blind Fasteners, must consider this requirement for a force-controlled behavior, and additional requirements in AISC 341, as applicable.

The load-carrying capacity of a connection utilizing BoxBolt® Type C Blind Fasteners depends on the fasteners' capacities as shown in Table 2, the affected

elements of members and connecting elements, and the interaction between the fasteners and the connected elements. All applicable limit states of a connection must be checked to determine the load-carrying capacity of the connection. The available strength of a connection is limited by the governing limit state (or the limit state with the least available strength), which occurs in the weakest component in the connection, typically the steel section itself in the case of thin steel sections, or the BoxBolt® in the case of thick wall steel sections, or a combination of the two.

Connections subjected to combined static tension loading and static shear-bearing loading must comply with the following:

$$\left(\frac{Tension\ Demand}{Tension\ Capacity}\right)^2 + \left(\frac{Shear\ Demand}{Shear\ Capacity}\right)^2 \leq 1.0$$

4.2 Installation:

The BoxBolt® Type C Blind Fasteners must be installed in accordance with the details noted in this section, the manufacturer's installation instructions and the approved plans. In case of a conflict between this report and the report holder's installation instructions, the most restrictive requirement governs.

1. Holes must be drilled into the sections to be connected, ensuring that the resulting holes have the correct diameter, spacing and edge distance according to the report holder's published specifications, this evaluation report and the correct design requirements for the connection, as indicated in the approved plans. Holes must be standard diameter holes conforming to AISC 360, where the bolt hole diameters must be no greater than the bolt shell diameter plus $^{1}/_{16}$ inch (1.6 mm).
2. Burrs in the holes must be removed before insertion of the BoxBolt® Type C Blind Fasteners.
3. The structural steel elements to be fastened adjacent to each other must be positioned to ensure:
   a. That the two sections are lined up and rest one against the other without any gap. Clamps must be used as necessary to hold the two sections together and prevent formation of gaps.
   b. That the holes are aligned, using a mandrel if necessary.
4. The core bolts must be positioned in the holes. The collar must rest flat against the section with no gap.
5. The collar must be held in position using a suitable open-ended wrench, and then the core bolt must be tightened to the specified torque, as noted in Table 1 of this report.
6. The tightening tool must then be removed and the tightening torque on the bolt must be verified. If necessary, the tightening torque must be corrected.

4.3 Special Inspection:

Special inspection is required in accordance with 2015 and 2012 IBC Sections 1704.3, 1705.1.1 and 1705.2 (2009 IBC Sections 1704.3, 1704.15 and 1705), as applicable). The report holder must submit inspection procedures to verify proper installation of the BoxBolts® Type C Blind Fasteners. Where BoxBolts® Type C Blind Fasteners are used for seismic or wind load resistance, special inspection must comply with 2015 IBC Sections 1705.11, 1705.12 and 1705.13 (2012 IBC Sections 1705.10, 1705.11 and 1705.12; 2009 IBC Sections 1706, 1707 and 1708; as applicable).

4.4 Packaging:

Each package of the BoxBolt® Type C Blind Fasteners must include the following information: installation and safety instructions, minimum and maximum fixing ranges (or the total thickness of elements to be connected), installation torque, design loads and special inspection requirements.

5.0 CONDITIONS OF USE

The BoxBolt® Type C Blind Fasteners described in this report comply with, or are suitable alternatives to what is specified in, the codes noted in Section 1.0 of this report, subject to the following conditions:

5.1 Steel structures utilizing BoxBolt® Type C Blind Fasteners must be designed in accordance with the IBC including its referenced standards (such as AISC 360 and AISC 341) and this evaluation report; and must be installed in accordance with this evaluation report and the report holder's installation instructions. In case of a conflict between this evaluation report and the report holder's installation instructions, the most restrictive requirement governs.

5.2 Calculations and details, justifying the use of the BoxBolt® Type C Blind Fasteners is in compliance with the applicable code and this evaluation report, including showing that the BoxBolt® fasteners, the affected elements of members and connecting elements are adequate to resist the applied loads, must be submitted to the code official for approval. The calculations and details must be signed and sealed by a registered design professional, when required by the statutes of the jurisdiction in which the project is to be constructed.

5.3 **Fire-resistive Construction:** Where not otherwise prohibited in the code, BoxBolt® Type C Fasteners are permitted for use with fire-resistance-rated construction provided that at least one of the following conditions is fulfilled:

- The BoxBolt® fasteners are used to resist wind or seismic forces only.
- BoxBolt® fasteners that support a fire-resistance-rated envelope or a fire-resistance-rated membrane, are protected by approved fire-resistance-rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
- The BoxBolt® fasteners are used to support nonstructural elements.

5.4 Special inspection must be provided as specified in Section 4.3 of this report.

5.5 For BoxBolt® Type C Blind Fasteners used in structures assigned to Seismic Design Categories (SDCs) D, E and F, the fasteners are intended to be used as force-controlled components and are not expected to undergo inelastic deformations, and the design professional must consider this force-controlled behavior in his design.

5.6 The BoxBolt® Type C Fasteners addressed in this evaluation report are manufactured under a quality program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Expansion Bolts in Structural Steel Connections (AC437), dated October 2014 (editorially revised December 2016).

7.0 IDENTIFICATION

7.1 The BoxBolt® Type C fastener package is labeled with the product part number, quantity, batch number, image of the product, report holder's name (LNA Solutions—A Kee Safety Logistic Ltd.), and the evaluation report number (ESR-3217).The fastener is identified by a nine-character alphanumeric part number (BQXGALXXC). The first three characters (BQX) indicate the length of the fastener (Size 1, 2, or 3). The second three characters (GAL) indicate the fasteners are coated with a hot dip galvanized coating. The last three characters (XXC) indicate the diameter and type of fastener, where XX is the numeric diameter in millimeters (12, 16 or 20), and C identifies the fastener as a Type C fastener. Each core bolt is stamped with a head marking of "ATBX". Each collar is stamped with "BOXBOLT" and part number.

7.2 The report holder's contact information is the following:

LNA SOLUTIONS—A KEE SAFETY LOGISTIC LTD
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ANN ARBOR, MICHIGAN 48108
(888) 724-2323
www.LNASolutions.com
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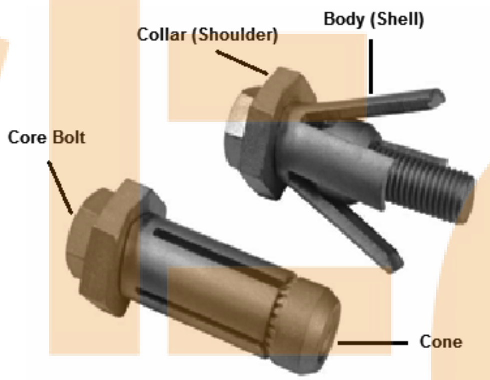


FIGURE 1—TYPICAL BOX BOLT® TYPE C BLIND FASTENER

1119.

TABLE 1—BOXBOLT® TYPE C BLIND FASTENER DIMENSIONAL AND INSTALLATION INFORMATION[1]

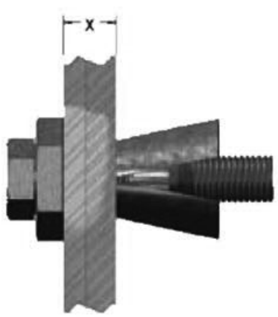
PART NUMBER AND DESCRIPTION			DIMENSIONAL INFORMATION[3]							INSTALLATION INFORMATION[3]	
BoxBolt® (Part Code)	BoxBolt® (Core Bolt Diameter)	Description[2]	Core Bolt Length	Clamping Range (dim x) Min	Clamping Range (dim x) Max	Across Flats of Shoulder	Collar Thickness	Dim A	Dim B	Dim C Drill Dia	Torque (ft-lb)
BQ1GAL12C	1/2" (12 mm)	1/2" BoxBolt® Size 1	2 3/16" (55 mm)	1/2"	15/16"	1" (26 mm)	5/16" (8.4 mm)	2 1/16" (52 mm)	1 1/8"	13/16"	60
BQ2GAL12C	1/2" (12 mm)	1/2" BoxBolt® Size 2	3 1/8" (80 mm)	3/4"	1 7/8"	1" (26 mm)	5/16" (8.4 mm)	2 1/16" (52 mm)	1 1/8"	13/16"	60
BQ3GAL12C	1/2" (12 mm)	1/2" BoxBolt® Size 3	4" (100 mm)	1 1/2"	2 11/16"	1" (26 mm)	5/16" (8.4 mm)	2 1/16" (52 mm)	1 1/8"	13/16"	60
BQ1GAL16C	5/8" (16 mm)	5/8" BoxBolt® Size 1	3" (75 mm)	5/8"	1 3/8"	1 7/16" (36 mm)	3/8" (9.4 mm)	2 11/16" (68 mm)	1 3/8"	1 1/16"	140
BQ2GAL16C	5/8" (16 mm)	5/8" BoxBolt® Size 2	4" (100 mm)	1"	2 5/16"	1 7/16" (36 mm)	3/8" (9.4 mm)	2 11/16" (68 mm)	1 3/8"	1 1/16"	140
BQ3GAL16C	5/8" (16 mm)	5/8" BoxBolt® Size 3	4 3/4" (120 mm)	2"	3 1/16"	1 7/16" (36 mm)	3/8" (9.4 mm)	2 11/16" (68 mm)	1 3/8"	1 1/16"	140
BQ1GAL20C	3/4" (20 mm)	3/4" BoxBolt® Size 1	4" (100 mm)	3/4"	1 13/16"	1 13/16" (46 mm)	7/16" (11.4 mm)	3 7/16" (87 mm)	1 3/4"	1 3/8"	220
BQ2GAL20C	3/4" (20 mm)	3/4" BoxBolt® Size 2	5 1/8" (130 mm)	1 5/16"	3"	1 13/16" (46 mm)	7/16" (11.4 mm)	3 7/16" (87 mm)	1 3/4"	1 3/8"	220
BQ3GAL20C	3/4" (20 mm)	3/4" BoxBolt® Size 3	6" (150 mm)	2 9/16"	4"	1 13/16" (46 mm)	7/16" (11.4 mm)	3 7/16" (87 mm)	1 3/4"	1 3/8"	220

For **SI:** 1 inch = 25.4mm; 1 lbf = 4.448N; 1 ft-lb = 1.356 N-m.

[1]When dimensions are expressed in both US Customary and SI units; BoxBolt® dimensions in US Customary units are converted from the corresponding SI units.

[2]BoxBolt® size is determined by core bolt length.

[3]Dimension “X” is the total thickness of the connected steel elements (or the grip); "A" is the minimum spacing between fasteners; "B" is the minimum edge distance for the fasteners; and “C” is the standard hole diameters for the fasteners.



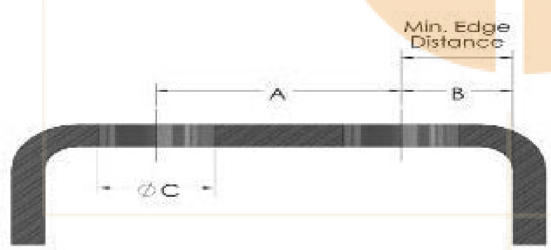


TABLE 2—BOXBOLT® TYPE C BLIND FASTENER STRENGTH INFORMATION

PART CODE	LRFD STRENGTHS[1] (lbf)						ASD STRENGTHS[2] (lbf)					
	Static Dominant Loads[3]			Seismic SDC D, E or F[4]			Static Dominant Loads[3]			Seismic SDC D, E or F[4]		
	Shear-bearing	Shear-slip resistance	Tension	Shear-bearing	Shear-slip resistance	Tension	Shear-bearing	Shear-slip resistance	Tension	Shear-bearing	Shear-slip resistance	Tension
BQ1GAL12C	7680	150	5250	6900	150	4730	4800	90	3280	4320	100	2960
BQ2GAL12C	7680	150	5250	6900	150	4730	4800	90	3280	4230	100	2960
BQ3GAL12C	7680	150	5250	6900	150	4730	4800	90	3280	4320	100	2960
BQ1GAL16C	12200	170	13100	11000	170	11400	7650	110	8230	6870	110	7120
BQ2GAL16C	12200	170	13100	11000	170	11400	7650	110	8230	6870	110	7120
BQ3GAL16C	12200	170	13100	11000	170	11400	7650	110	8230	6870	110	7120
BQ1GAL20C	17600	790	15000	11800	790	13500	11000	490	9400	7380	500	8470
BQ2GAL20C	17600	790	15000	11800	790	13500	11000	490	9400	7380	500	8470
BQ3GAL20C	17600	790	15000	11800	790	13500	11000	490	9400	7380	500	8470

For **SI:** 1 lbf = 4.448N.

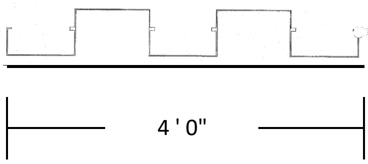
[1]Load and Resistance Factor Design (LRFD) strengths are derived in accordance AC437, Sections 3.4, 3.5, 3.7 and 3.8, based on test data per AC437 Section 4.0.
[2]Allowable Strength Design (ASD) strengths are derived in accordance AC437, Sections 3.4, 3.5, 3.9 and 3.10, based on test data per AC437 Section 4.0.
[3]Static dominant loads include load combinations with gravity and wind loads for structures assigned to all Seismic Design Categories and load combinations with seismic loads for structures assigned to Seismic Design Category (SDC) A, B or C.
[4]Seismic SDC D, E or F refer to load combinations with seismic loads for structures assigned to Seismic Design Category (SDC) D, E or F.

DECK DESIGN - CANOPY #4 SECTION D

Project Number	ETC 222-405	Sheet			
Project Name		Designed by		Date	
Subject	DECK DESIGN	Checked by		Date	

Deck Design

Max Span on Deck = 4 ft



WL on Deck = 34.572 psf
RLL on Deck = 20 psf

For 4 ft Span

Allowable Wind Load =	**114.0**	**>**	**34.6** psf
Allowable Live Load =	**118.0**	**>**	**20.0** psf

USE [2 3/4" x 6" x 0.078" Aluminum Decking] as per page 1,122

Deck Fastner Design

Uplift on Deck = 34.572 psf X $\frac{6"}{12"/ft}$ X $\frac{4.00\ ft}{2}$ = **34.6 Lbs**

Pull out strength of Steel Binder Heavy guage #12 screws = 996 lbs as per page 1,123

Allowable Pull Out = 996 lbs/4 (factor of Safety) = **249.0 Lbs** **>** **34.6 Lbs**

SAFE

USE [2 #12 screws @6" o.c.]

WALKWAY COVER DECKS

SAFETY FACTOR OF 1.95 FROM ULTIMATE STRESS
CHARTS SHOW TOTAL ALLOWABLE LOAD PER BENT. 1502
ALL PROFILES ARE 6063-T6 IN ACCORDANCE WITH ASTM STDS. WELD STRESS IN ACCORDANCE WITH ALUMINUM ASSOCIATION STANDARDS. ALL DESIGN STRESS AND FACTORS OF SAFETY.

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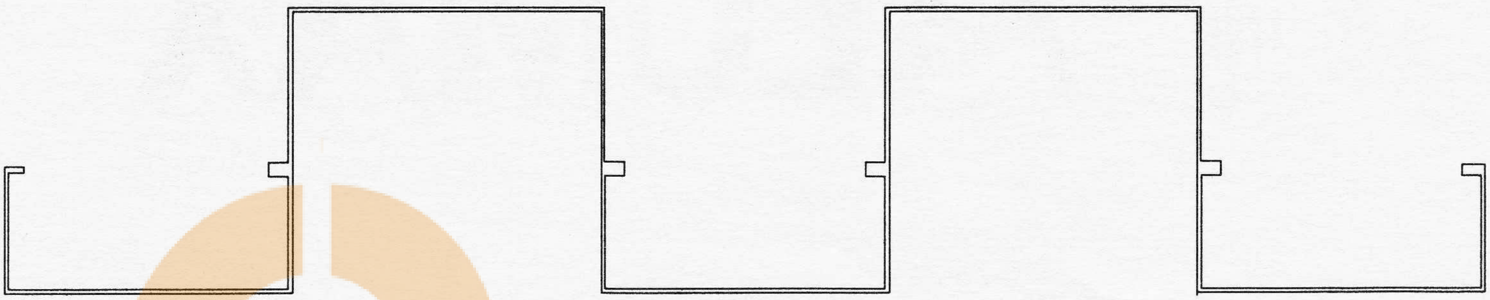
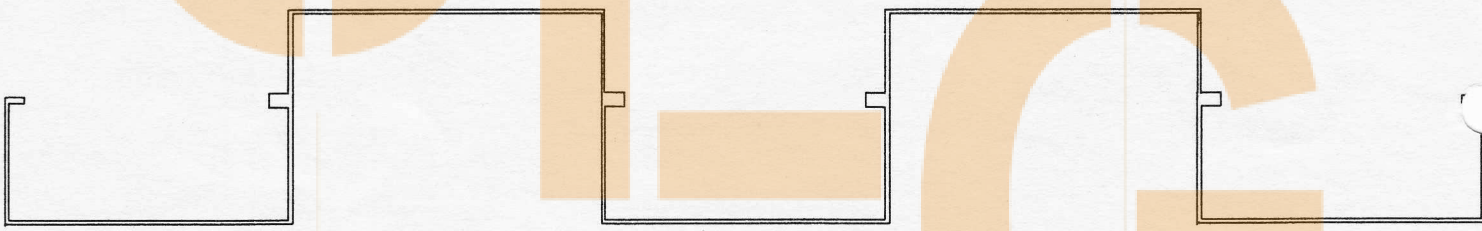


6″ DECK

Span (FT.)	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Gravity *	57	51	46	41	38	34	31	29	26	24	23	21	20	18	17	16	15	14
Wind *	68	61	54	49	45	41	37	34	31	29	27	25	23	22	20	19	18	17
L/180 *	69	58	49	42	36	32	28	24	22	19	17	15	14	12	11	10	9	9

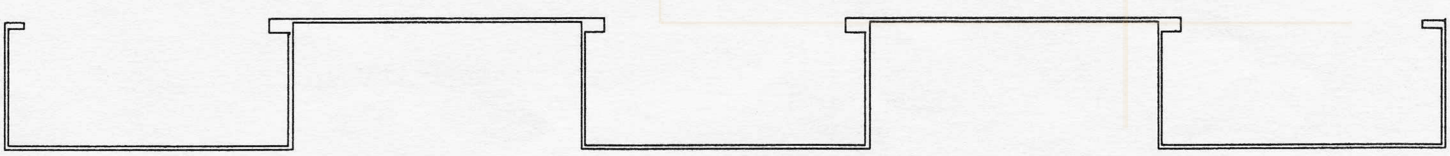
* (PFS)



4-1/2″ DECK

Span (FT.)	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Gravity *	75	64	55	48	42	38	33	30	27	25	22	21	19	17	16	15	14	13
Wind *	89	76	65	57	50	44	39	35	32	29	26	24	22	20	19	18	16	15
L/180 *	95	75	60	49	40	34	28	24	21	18	15	14	12	11	9	8	8	7

* (PSF)

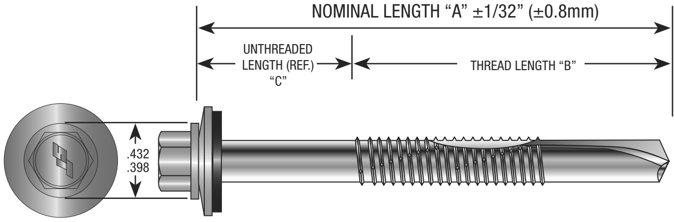


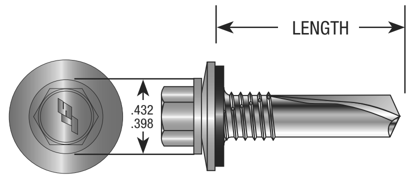
2-3/4″ DECK

Span (FT.)	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Gravity *	118	93	75	62	52	45	38	34	29	26	23	21	19	17	16
Wind *	114	90	73	61	51	43	37	33	29	25	23	20	18	17	15
L/180 *	123	86	63	47	36	29	23	19	15	13	11	9	8	7	6

* (PSF)

Steelbinder® Heavy Gauge





SPECIFICATIONS SUMMARY

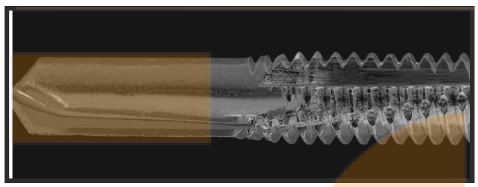
#12-24 Dimensions:

Drill Point: #4/#5
Major Diameter: .215"/.209"
Minor Diameter: .164" REF
Hex Across Flats: .311/.305

SIZE	HEAD STYLE	CARTON QTY.	WEIGHT/M
12-24 x 7/8"	HWH	2500	12.0
12-24 x 1-1/4"	HWH	2500	12.6
12-24 x 1-1/2"	HWH	2000	16.2
12-24 x 2"	HWH	1500	22.1

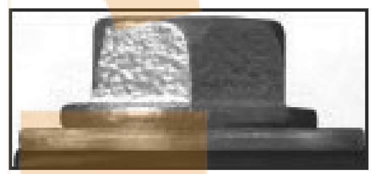
PERFORMANCE DATA

PULL OUT STRENGTH VALUE (LBS. ULT.)		MATERIAL			
		HRS Primed Only		HRS PLATE	
	NOM. GAUGE	14	12	3/16"	1/4"
	THICKNESS	.070	.106	.187	.250
#12-24 HEAVY GAUGE		924	1627	2556	3298

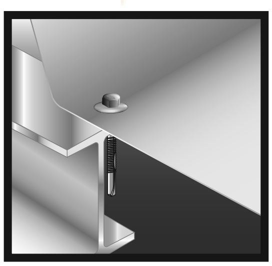


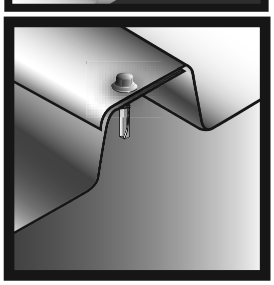
Long Drill point assures proper clearance of heavy gauge metal before any thread engagement begins

PULL OVER STRENGTH VALUE (LBS. ULT.)	DESIGNATION	MATERIAL		
		AZ55 GALVALUME		
	NOM. GAUGE	26	24	22
	THICKNESS	.019	.024	.032
BONDED WASHER (14mm O.D.)		801	996	1258
(.398/.432 HWH DIA.)		775	956	1078



HWH with EPDM bonded washer provides a secure seal to prevent leaks.





- Fastener lengths over 1-1/4"are designed to penetrate steel thickness up to .500". 12-24 x 7/8" is designed to drill up to .250".
- Thread to point ratio engineered to provide maximum pull out strength in heavy gauge steel.
- EPDM rubber is vulcanized to steel washer. Moisture has no place to penetrate. The washer provides a secure seal even when driven at an angle.
- Applications include metal deck to structural steel or bar joists, & retrofit clips to structural steel.
- Fastener is also available without a bonded sealing washer.

NOTES: *1. HRS (Hot Rolled Steel)*
2. All strength values shown are ultimate values, expressed in LBS. Apply an appropriate safety factor to obtain design limits.

SEALTITE BUILDING FASTENERS
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513-874-5905 • 513-874-5903 Fax