STRUCTURAL ENGINEERING CALCULATIONS FOR HANDI-HUT SHELTER

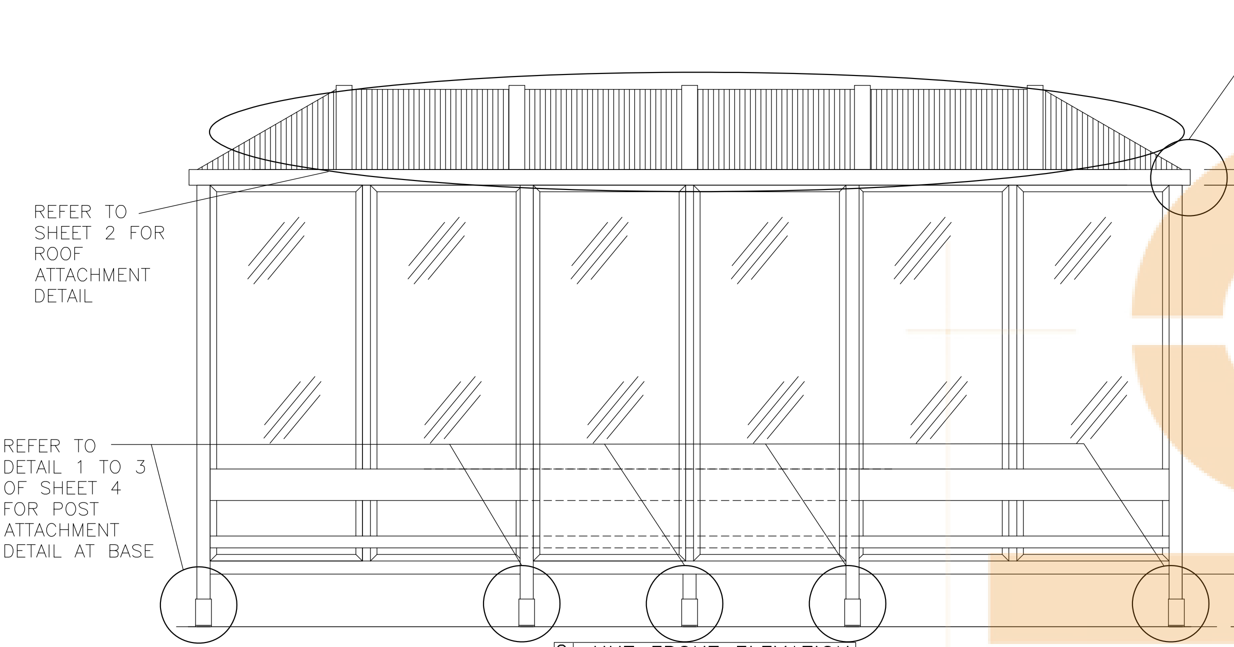
PROJECT:

PROJECT LOCATION:

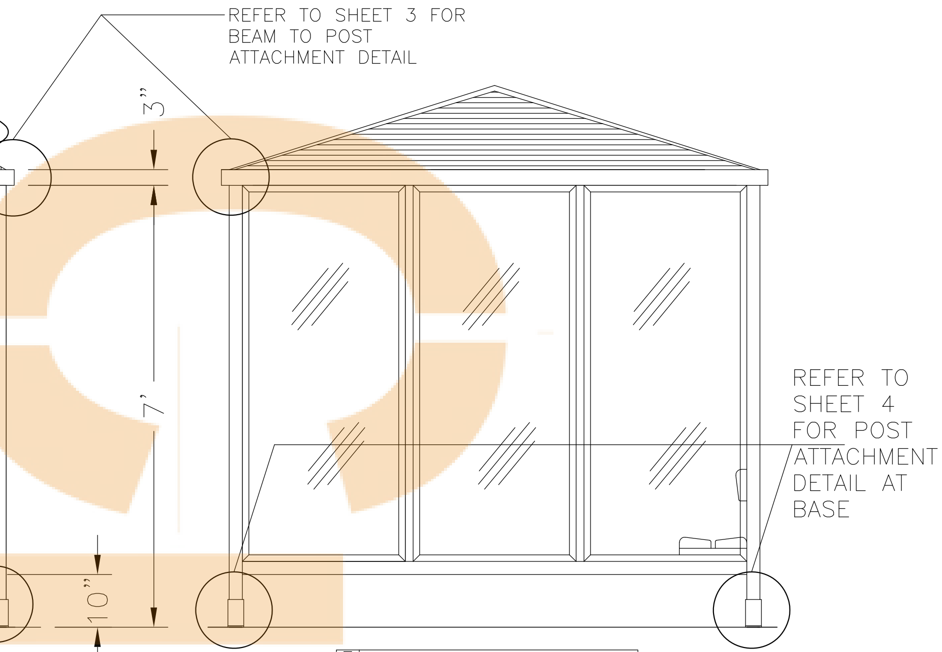
PSE PROJECT NUMBER:

DATE: 5TH

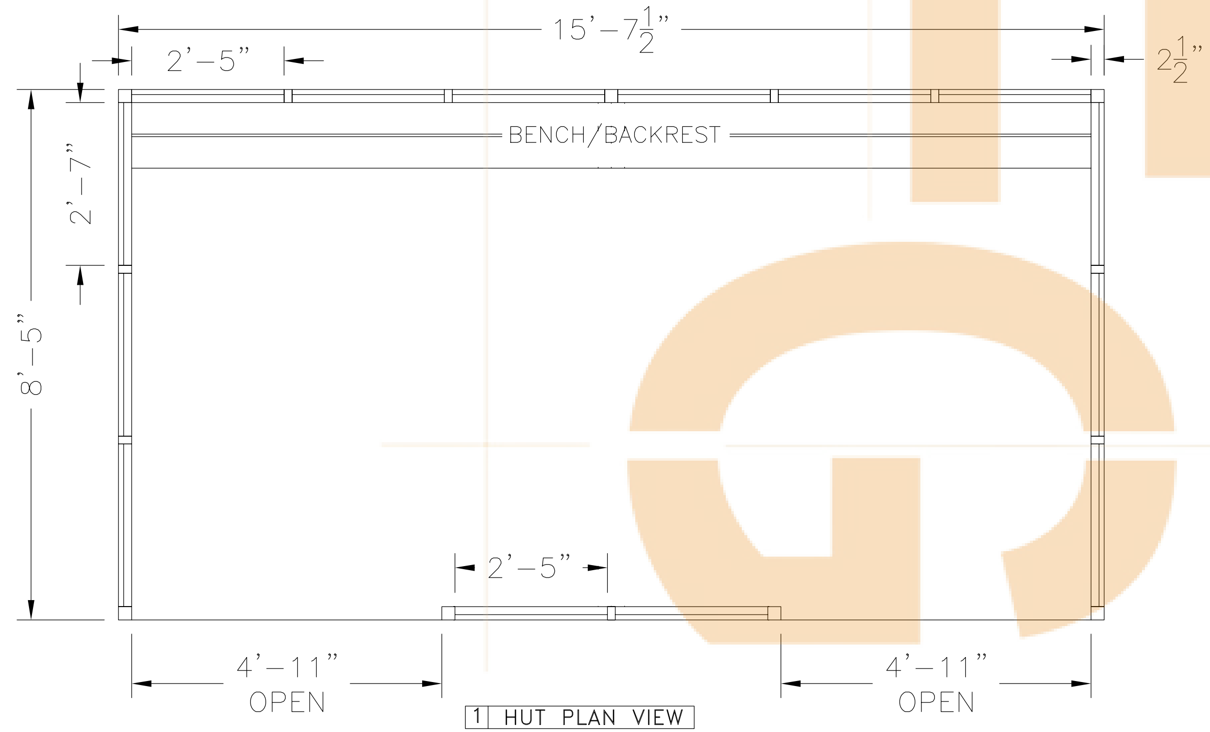
BY:



2 HUT FRONT ELEVATION
SCALE: NTS



3 HUT SIDE ELEVATION
SCALE: NTS



1 HUT PLAN VIEW
SCALE: NTS

6-3WSPH-M1

ALUMINUM: 6063-T52

GLAZING: 1/4" CLEAR TEMPERED GLASS
ROOF PANELS: 1/4" POLYCARBONATE

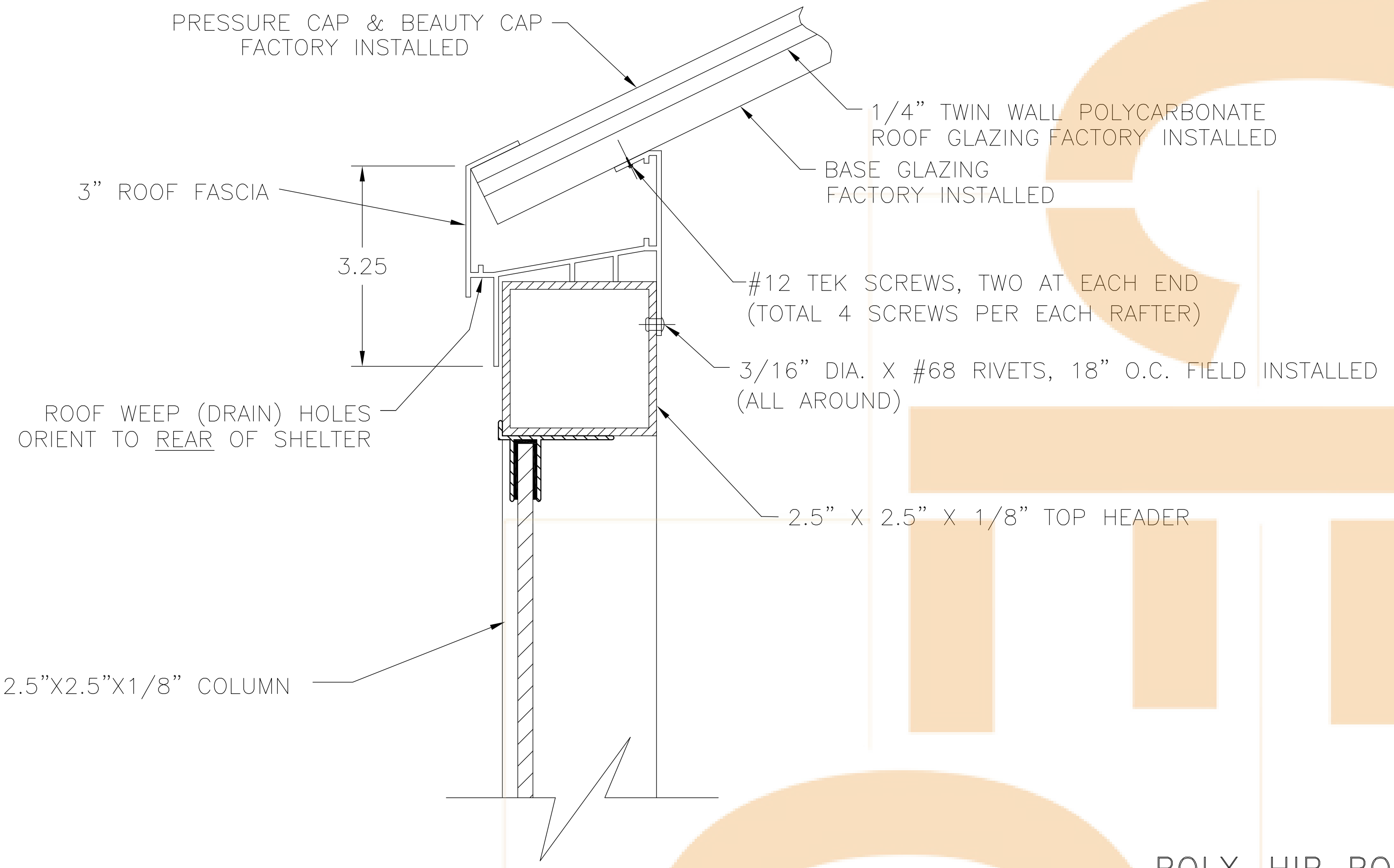
BENCH/BACKREST: EXTRUDED ALUMINUM

SHEET 1

RECOMMENDED PAD SIZE-17'-7" X 9'-6" X 6" THICK MINIMUM

POLYCARBONATE HIP ROOF
PASSENGER SHELTER

handi-hut inc



POLY–HIP ROOF ATTACHMENT DETAIL
3" FASCIA

SHEET 2

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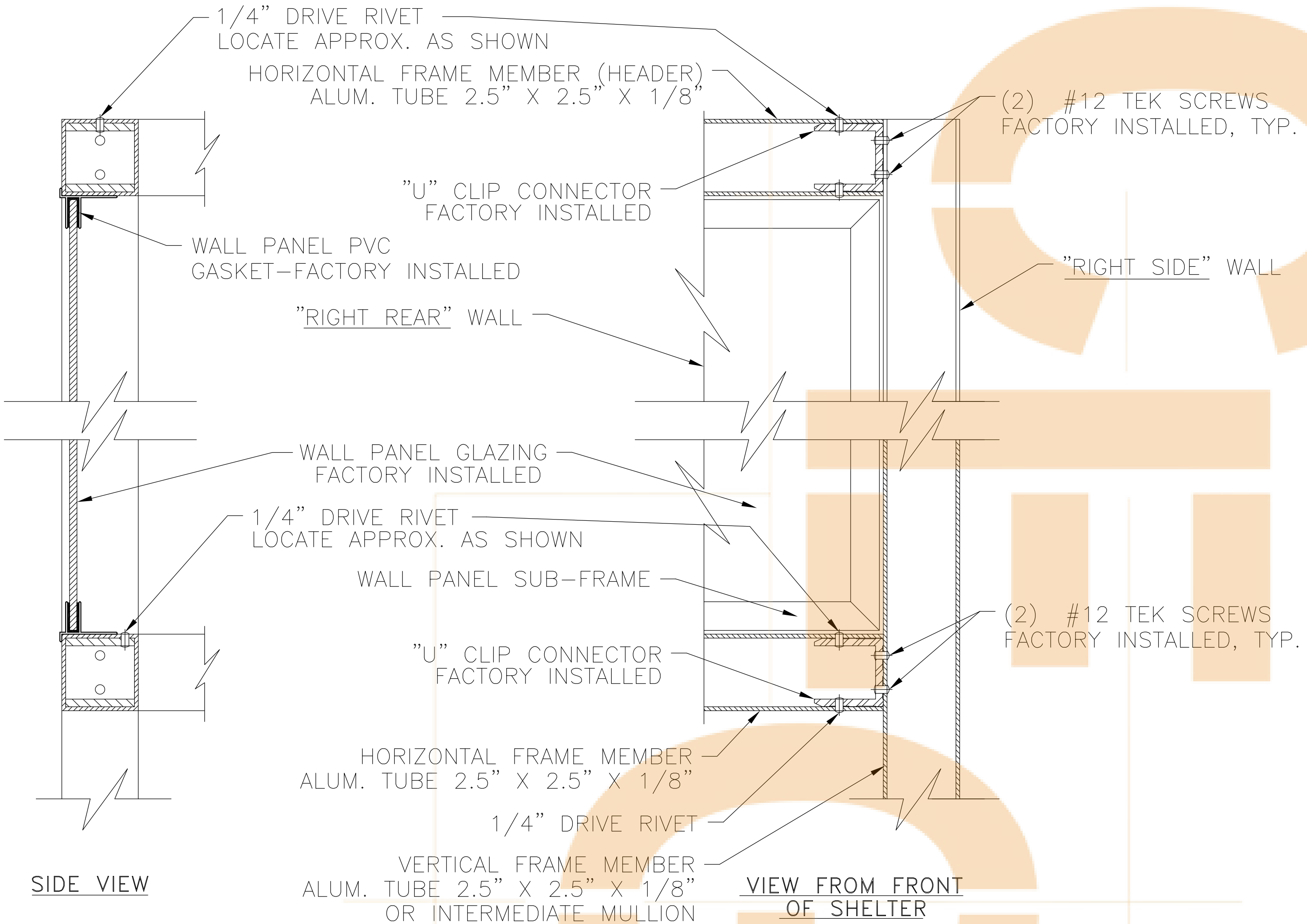

1. WALL PANEL CONNECTION DETAIL

TYPICAL FOR ALL
WALL PANEL CONNECTIONS

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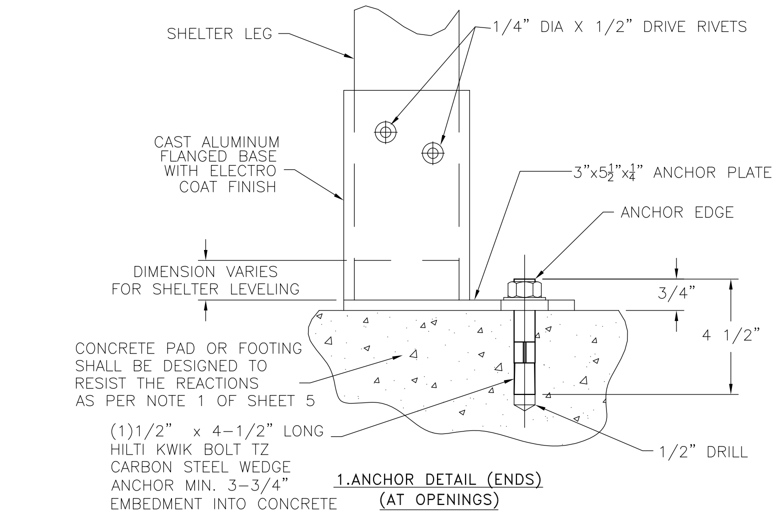
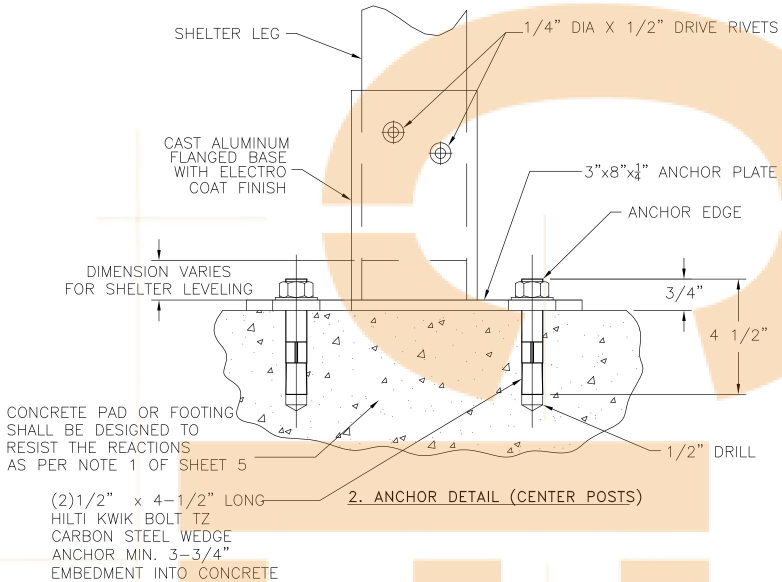
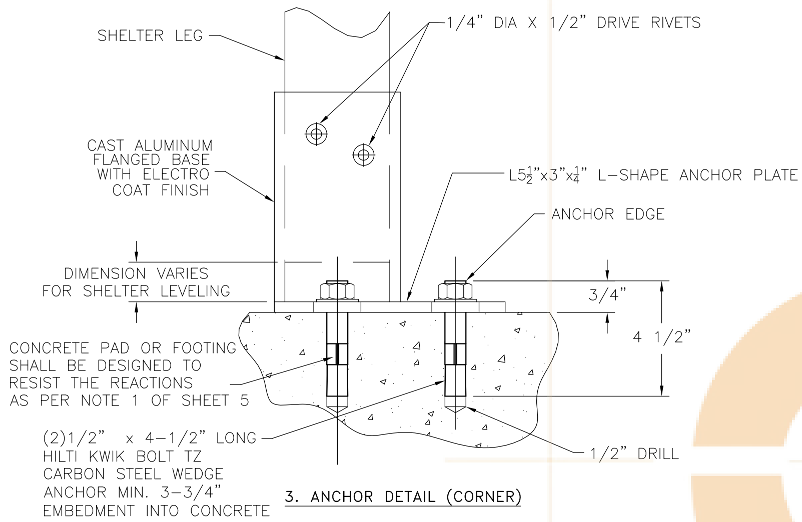
SHEET 3



1.ANCHOR DETAIL (ENDS)
(AT OPENINGS)



2. ANCHOR DETAIL (CENTER POSTS)



3. ANCHOR DETAIL (CORNER)

GENERAL SHEET NOTES:

1. **Where Aluminum is in contact or fastened to dissimilar materials, direct contact between the aluminum and other material shall be prevented as specified in Aluminum Design Manual, 2015 Part 1: Specification for Aluminum structures - sections M7.1 through M7.3 or by placing a compatible, nonporus isolator between the aluminum and other material.**
2. **All carbon steel anchor bolts shall be Zinc plated as per above note 1.**

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SHEET 4

1. FOOTING REACTIONS

The owner/user/builder should use the services of
a local licensed engineer to design
the concrete pad or footing to support
the following loads:

- Dead Load:
  - o Vertical = 250 lbs, (down);
  - o Horizontal =100lbs, Tension & Compression;
- Roof Live Load:
  - o Vertical =1100 lbs, (down);
  - o Horizontal = 250 lbs, Tension & Compression;
- Wind Load (case 1):
  - o Vertical = 800 lbs, (up and down);
  - o Horizontal = 455 lbs, Tension & Compression;
  - o Moment = 650 lbs-ft, (In all four perpendicular directions);
- Wind Load (case 2):
  - o Vertical = 650 lbs, (up & down);
  - o Horizontal = 350 lbs, Tension & Compression;
  - o Moment = 400 lbs-ft, (In all four perpendicular directions);

- The above are the reactions due to the basic un-factored loads according to ASCE7-10
- All wind loads are at strength level
- Use 2015 International Building Code load combinations to determine design loads

SHEET 5

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TITLE	FOOTING REACTIONS		
SIZE	FSCM NO.	DWG NO.	REV
SCALE		SHET	

Table of Contents:

References:

1- Literature:

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

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

2- Software:

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

b. HILTI PROFIS ANCHOR 3.0.73

VILLAGE of LOS LUNAS NEW MEXICO

Building Permits and Inspections

Building in the Village of Los Lunas? You may be required to submit a building permit to the Community Development Department! Applications for building permits and mobile home placement permits can be found with our Forms and Applications.

There are a number of projects that require a building permit, including:

- New commercial construction
- New residential construction
- Commercial tenant improvements
- Commercial change in occupancy
- Reroofing

Depending on the project, residential remodeling and accessory structures may also require a building permit.

The Village Building Permitting wing of the Code Enforcement Division reviews structural plans and provides structural inspection, and coordinates with the Fire Marshal for fire plan review and inspections. New Mexico Construction Industries Division (NM CID) reviews plumbing, mechanical and electrical. There are a number of aspects of development, such as drainage and landscaping, which may be reviewed by the Village engineer or the Public Works Department. If you have questions about what documents need to be submitted with your building permit, contact the Community Development Department so that we can help you prepare a complete and successful application.

The New Mexico Manufactured Housing Division (NM MHD) reviews plans and inspects manufactured housing in the Village of Los Lunas. A Los Lunas mobile home placement permit will still be required be required to place the manufactured home in the Village limits.

If your building project or manufactured home placement is within a FEMA special flood hazard area, you will also be required to submit an elevation certificate and comply with flood zone regulations. Please visit our FEMA Information page to learn more.

Approved Building Codes

The Village of Los Lunas uses the most current building codes adopted by the state of NM. When the state adopts a new code year, the Village adopts the same year by reference. Currently, the Village utilizes the 2015 International Building Code, International Residential Code, and International Fire Code.

For more information on current NM building codes, please refer to state regulations.

Outside Agency Contacts

New Mexico CID/MHD

Albuquerque Office: 5500 San Antonio Dr. Suite F, Albuquerque, NM 87109. (CID) 505-222-9800 (MHD) 505-222-9870

Design Criteria:

1- Location:

2- Seismic:

RC	II
SDC	D
Site Class	D
Sms	0.655
Sm1	0.310
Sds	0.437
Sd1	0.207
Ie	1.00
R	1.25

3- Wind (Ultimate): 115 mph (3s gust)
Exposure C

4- Roof Live Load: 20 psf

5- Soil Bearing Capacity: NA

6- Gravity Loads: DL Roof: 3 psf

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

** Other criteria assumed as stated in design calculations.

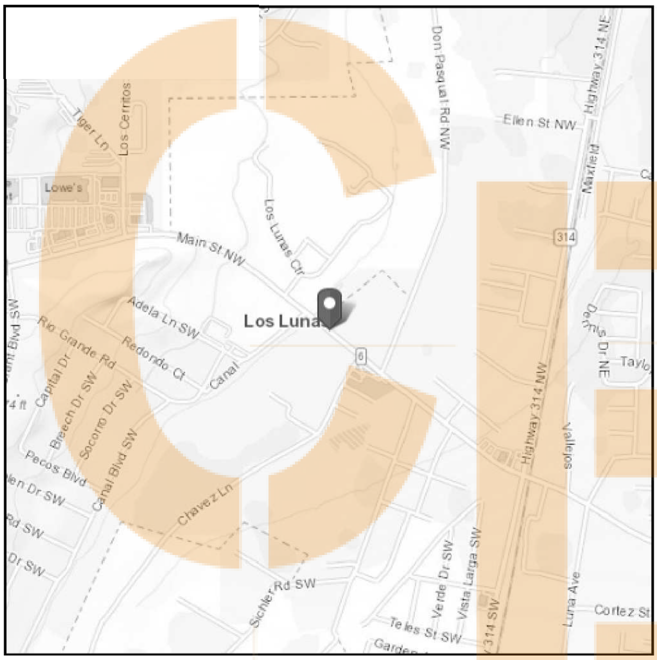
AMERICAN SOCIETY OF CIVIL ENGINEERS

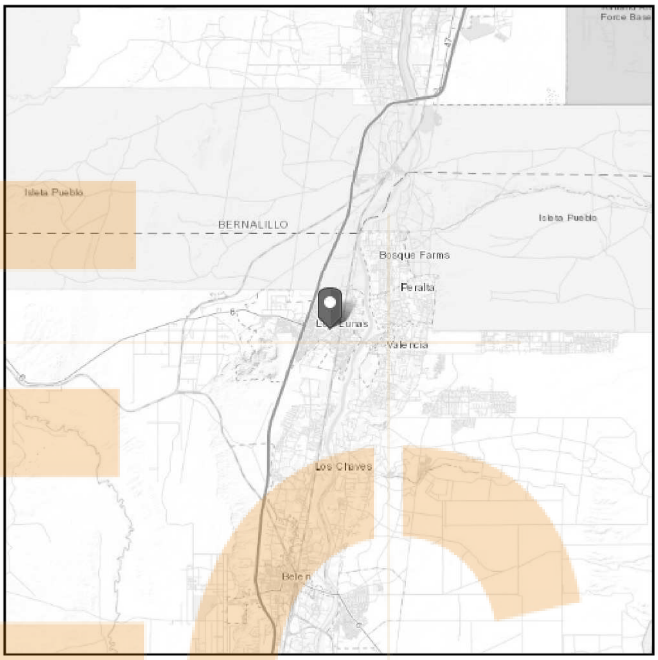
ASCE 7 Hazards Report

Address:
Los Lunas
New Mexico,

Standard: ASCE/SEI 7-10
Risk Category: II
Soil Class: D - Stiff Soil

Elevation: 770.45 ft (NAVD 88)
Latitude: 34.81187
Longitude: -106.74294





Wind

Results:

Wind Speed	115 Vmph
10-year MRI	76 Vmph
25-year MRI	84 Vmph
50-year MRI	90 Vmph
100-year MRI	96 Vmph

Data Source: ASCE/SEI 7-10, Fig. 26.5-1A and Figs. CC-1–CC-4, and Section 26.5.2, incorporating errata of March 12, 2014
Date Accessed: Thu Jan 20 2022

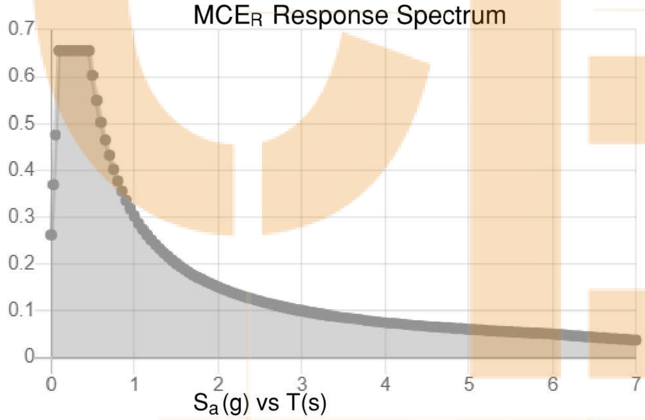
Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-10 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

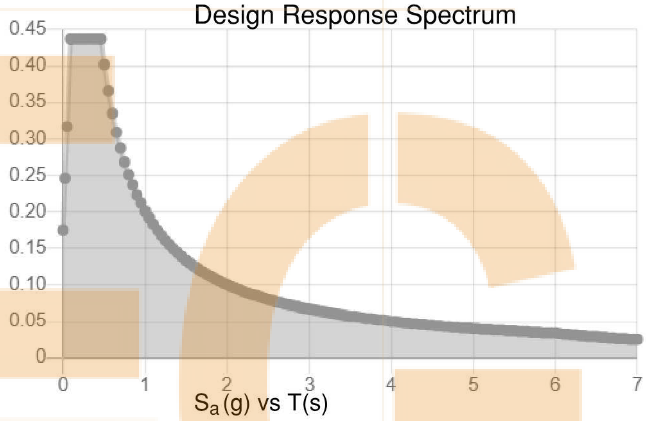
Site is not in a hurricane-prone region as defined in ASCE/SEI 7-10 Section 26.2.

Seismic

Site Soil Class:	D - Stiff Soil		
Results:			
S_S :	0.456	S_{DS} :	0.437
S_1 :	0.133	S_{D1} :	0.201
F_a :	1.435	T_L :	6
F_v :	2.268	PGA :	0.189
S_{MS} :	0.655	PGA_M :	0.268
S_{M1} :	0.302	F_{PGA} :	1.423
		I_e :	1

Seismic Design Category D





Data Accessed: **Thu Jan 20 2022**

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-10, incorporating Supplement 1 and errata of March 31, 2013, and ASCE/SEI 7-10 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-10 Ch. 21 are available from USGS.

Snow

Results:

Ground Snow Load, p_g :	5 lb/ft ^{2}
Elevation:	770.5 ft
Data Source:	ASCE/SEI 7-10, Fig. 7-1.
Date Accessed:	Thu Jan 20 2022

Values provided are ground snow loads. In areas designated "case study required," extreme local variations in ground snow loads preclude mapping at this scale. Site-specific case studies are required to establish ground snow loads at elevations not covered.

2018 IBC SEISMIC DESIGN

EQUIVALENT LATERAL FORCE PROCEDURE

JOB NUMBER ____________

DESIGNER ____________

Design Information

DATA	VALUE	SOURCE
Site Class	D	Site conditions, geotech report
S_s=	0.456	Seismic Design Parameters (Software)
S_1=	0.133	Seismic Design Parameters (Software)
S_{MS}=	0.655	Seismic Design Parameters (Calculated)
S_{M1}=	0.310	Seismic Design Parameters (Calculated)
I_E	1.0	ASCE 7-16 Table 1.5-2
Risk Category	2	ASCE 7-16 Table 1.5-1
R	1.25	ASCE 7-16 Table 15.4-2
h_n	9	Height per ASCE 7-16
C_t	0.02	ASCE 7-16 Table 12.8-2
Omega	2	ASCE 7-16 Table 15.4-2
W	3	As per page 1004 (psf)
T_L	6	Long-period Transition period (Software)

S_{MS}: Max considered spectral response acceleration for short periods
S_{M1}: Max considered spectral response acceleration for 1-second period
I_E : Seismic importance factor
R: Response modification factor

1) Design spectral response acceleration

S_{DS}: 5% Damped spectral response acceleration at short periods
S_{D1}: 5% Damped spectral response acceleration at 1 second period

S_{DS}=2/3(S_{ms}) S_{DS}= 2/3 X 0.655 S_{DS}= 0.437 [ASCE 7-16 Eq. 11.4-3]
S_{D1}=2/3(S_{m1}) S_{D1}= 2/3 X 0.310422 S_{D1}= 0.207 [ASCE 7-16 Eq. 11.4-4]

2) Seismic design category

From Table 11.6-1 ASCE 7-16 = C
From Table 11.6-2 ASCE 7-16 = D

Governing Design Category D

3) Determine design base shear (V)

A. ASCE 7-16, 11.4.8 Exception
Ts= 0.473926718

$T = T_a = C_t (h_n^x)$ [ASCE 7-16, 12.8.2.1, Eq. 12.8-7]

T_a : Approximate Fundamental Period

T= 0.020 X9$^{0.75}$ T= 0.104

For Site Class D/D-Default: T is < 1.5 Ts
For site class D/-default Cs shall be calculated per Eq. 12.8-2

Equivalent Force Procedure
[ASCE 7-16, 12.8.1]

$V = C_s \times W$

C_s : Seismic Response Coefficient
W : Total dead load and other applicable loads

B. [ASCE 7-16, 12.8.1.1, Eq. 12.8-2]

$C_S = \frac{S_{DS}}{R / I}$ $C_S = \frac{0.437}{1.25}$ 1.0 C_S= 0.349

C. Nor greater than

$C_S = \frac{S_{D1}}{T (R / I)}$ [ASCE 7-16, 12.8.1.1, Eq. 12.8-3] **OR** $C_S = \frac{S_{D1} * T_L}{T^2 (R / I)}$ [ASCE 7-16, 12.8.1.1, Eq. 12.8-4]

$C_S = \frac{0.207 \text{ X } 1}{0.104 \text{ X } 1.25}$ $C_S = \frac{0.207 \text{ X } 6 \text{ X}1}{0.011 \text{ X } 1.25}$

C_S= 1.593 C_S= 91.977

D. Nor less than [ASCE 7-16, 12.8.1.1, Eq. 12.8-5]

C_S = 0.044 (S_{DS}) (I) C_S = 0.044 X 0.437 X1 C_S= 0.01921

Governing C_s = $\boxed{0.349}$

V= Cs x W V = 0.349 X W Refer to sheet two for W and Calculated V

V= Cs x W V = 1.048 Psf As per ASCE 7-16 12.8.1

E_{mh} = Omega x V **V = 2.096 Psf** **As per ASCE 7-16 12.4.3.1**

WIND LOAD GOVERNS THE DESIGN AS PER PAGES 1001, 1002 & 1003

SHELTER ANALYSIS & DESIGN
Page 1,000 – 1,499

MecaWind v2400

Calculations Prepared by:
Date: Jan 20, 2022

Basic Wind Parameters

```
Wind Load Standard              = ASCE 7-10  Exposure Category            = C
Wind Design Speed               = 115.0 mph  Risk Category                = II
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    = Hipped     W       : Width Perp to Ridge    = 8.500 ft
L       : Length Along Ridge    = 15.625 ft  EHt     : Eave Height            = 7.000 ft
Hip     : Ridge Hipped Length   = 11.000 ft  RE      : Roof Entry Method      = Slope
Slope   : Slope of Roof         = 6.0 :12    Theta   : Roof Slope             = 26.57 Deg
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
```

Main Wind Force Resisting System (MWFRS) Calculations per Ch 27 Part 1:

```
EHt        = Eave Height                                            = 7.000 ft
RHt        = Ridge Height                                           = 9.125 ft
h          = Mean Roof Height:  0.5*(EHt+RHt)                       = 8.063 ft
Zh         = Mean Roof Height for Kh:  h + Base_Dist                = 8.063 ft
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
GCPi       = Ref Table 26.11-1 for Enclosed Building                = +/-0.18
RA         = Roof Area                                              = 153.21 sq ft
LF         = Load Factor based upon STRENGTH Design                 = 1.00
qh         = (0.00256 * Kh * Kzt * Kd * V^2) * LF                   = 24.43 psf
qin        = For Negative Internal Pressure of Enclosed Building use qh*LF = 24.43 psf
qip        = For Positive Internal Pressure of Enclosed Building use qh*LF = 24.43 psf
```

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           = 0.962
G2         = 0.925*((1+0.7*Izm*3.4*Q)/(1+0.7*3.4*Izm))              = 0.905
```

Gust Factor Used in Analysis

```
G          = Lessor Of G1 Or G2                                     = 0.850
```

MWFRS Wind Normal to Ridge (Ref Fig 27.4-1)

```
h          = Mean Roof Height Of Building                           = 8.063 ft
RHt        = Ridge Height Of Roof                                   = 9.125 ft
B          = Horizontal Dimension Of Building Normal To Wind Direction = 15.625 ft
L          = Horizontal Dimension Of building Parallel To Wind Direction = 8.500 ft
L/B        = Ratio Of L/B used For Cp determination                 = 0.544
h/L        = Ratio Of h/L used For Cp determination                 = 0.949
Slope      = Slope of Roof                                          = 26.57 Deg
OH_Top_+Y  = Overhang Top +Y (Leeward)                              = -0.6, -0.6
OH_Top_-Y  = Overhang Top Windward Edge                             = 0.08, -0.42
Roof_LW    = Roof (Leeward)                                         = -0.6, -0.6
```

Roof_WW	= Roof (Windward)	= 0.08, -0.42
Roof_X	= **Roof +/-X Coeff (0 to h/2) (0.000 ft to 4.031 ft)	= -0.18, -1.217
Roof_X_1	= Roof +/-X Coeff (h/2 to h) (4.031 ft to 8.063 ft)	= -0.18, -0.721
Roof_X_2	= Roof +/-X Coeff (h/2 to h) (4.031 ft to 8.063 ft)	= -0.18, -0.721
Roof_X_3	= Roof +/-X Coeff (h to 2h) (8.063 ft to 8.500 ft)	= -0.18, -0.679
Roof_X_4	= Roof +/-X Coeff (h to 2h) (8.063 ft to 8.500 ft)	= -0.18, -0.679

**Includes Reduction Factor 0.96 For roof area, applied To Cp=-1.3 For h/L>=1 & (0 To h/2)

Cp_WW	= Windward Wall Coefficient (All L/B Values)	= 0.80
Cp_LW	= Leward Wall Coefficient Using L/B	= -0.50
Cp_SW	= Side Wall Coefficient (All L/B values)	= -0.70
GCpn_WW	= Parapet Combined Net Pressure Coefficient (Windward Parapet)	= 1.50
GCpn_LW	= Parapet Combined Net Pressure Coefficient (Leeward Parapet)	= -1.00

Wall Wind Pressures based On Positive Internal Pressure (+GCPi) - Normal to Ridge
All wind pressures include a load factor of 1.0

Elev ft	Kz	Kzt	qz psf	GCPi	Windward Press psf	Leeward Press psf	Side Press psf	Total Press psf	Minimum Pressure* psf
7.00	0.849	1.000	24.43	0.18	12.21	-14.78	-18.93	26.99	16.00

Wall Wind Pressures based on Negative Internal Pressure (-GCPi) - Normal to Ridge
All wind pressures include a load factor of 1.0

Elev ft	Kz	Kzt	qz psf	GCPi	Windward Press psf	Leeward Press psf	Side Press psf	Total Press psf	Minimum Pressure* psf
7.00	0.849	1.000	24.43	-0.18	21.01	-5.99	-10.14	26.99	16.00

Notes Wall Pressures:

Kz	= Velocity Press Exp Coeff	Kzt	= Topographical Factor
qz	= 0.00256*Kz*Kzt*Kd*V^2	GCPi	= Internal Press Coefficient
Side	= qh * G * Cp_SW - qip * +GCPi	Windward	= qz * G * Cp_WW - qip * +GCPi
Leeward	= qh * G * Cp_LW - qip * +GCPi	Total	= Windward Press - Leeward Press

* Minimum Pressure: Para 27.4.7 no less than 16.00 psf (Incl LF) applied to Walls
+ Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

Roof Wind Pressures for Positive & Negative Internal Pressure (+/- GCPi) - Normal to Ridge
All wind pressures include a load factor of 1.0

Roof Var	Start Dist ft	End Dist ft	Cp_min	Cp_max	GCPi	Pressure Pn_min* psf	Pressure Pp_min* psf	Pressure Pn_max psf	Pressure Pp_max psf
OH_Top_+Y	N/A	N/A	-0.600	-0.600	0.180	-8.06	-16.86	-8.06	-16.86
OH_Top_-Y	N/A	N/A	0.080	-0.420	0.180	6.06	-2.74	-4.32	-13.12
Roof_LW	N/A	N/A	-0.600	-0.600	0.180	-8.06	-16.86	-8.06	-16.86
Roof_WW	N/A	N/A	0.080	-0.420	0.180	6.06	-2.74	-4.32	-13.12
Roof_X (+X)	0.000	4.031	-0.180	-1.217	0.180	0.66	-8.13	-20.88	-29.68
Roof_X (-X)	0.000	4.031	-0.180	-1.217	0.180	0.66	-8.13	-20.88	-29.68
Roof_X_1 (+X)	4.031	8.063	-0.180	-0.721	0.180	0.66	-8.13	-10.57	-19.36
Roof_X_2 (-X)	4.031	8.063	-0.180	-0.721	0.180	0.66	-8.13	-10.57	-19.36
Roof_X_3 (+X)	8.063	8.500	-0.180	-0.679	0.180	0.66	-8.13	-9.71	-18.50
Roof_X_4 (-X)	8.063	8.500	-0.180	-0.679	0.180	0.66	-8.13	-9.71	-18.50

Notes Roof Pressures:

Start Dist	= Start Dist from Windward Edge	End Dist	= End Dist from Windward Edge
Cp_Max	= Largest Coefficient Magnitude	Cp_Min	= Smallest Coefficient Magnitude
Pp_max	= qh*G*Cp_max - qip*(+GCPi)	Pn_max	= qh*G*Cp_max - qin*(-GCpi)
Pp_min*	= qh*G*Cp_min - qip*(+GCPi)	Pn_min*	= qh*G*Cp_min - qin*(-GCPi)

OH = Overhang X = Dir along Ridge Y = Dir Perpendcular to Ridge Z = Vertical
* The smaller uplift pressures due to Cp_Min can become critical when wind is combined with roof live load or snow load; load combinations are given in ASCE 7
+ Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

MWFRS Wind Parallel to Ridge (Ref Fig 27.4-1}

h	= Mean Roof Height Of Building	= 8.063 ft
RHt	= Ridge Height Of Roof	= 9.125 ft
B	= Horizontal Dimension Of Building Normal To Wind Direction	= 8.500 ft
L	= Horizontal Dimension Of building Parallel To Wind Direction	= 15.625 ft
L/B	= Ratio Of L/B used For Cp determination	= 1.838
h/L	= Ratio Of h/L used For Cp determination	= 0.516
Slope	= Slope of Roof	= 26.57 Deg
Hip_End	= **Hipped End Coeff (0 to h/2) (0.000 ft to 2.313 ft)	= -0.18, -0.911

Hip_End_1 = Hipped End Coeff (h to 2h) (13.313 ft to 15.625 ft) = -0.18, -0.506
Roof = **Roof Coeff (0 to h/2) (0.000 ft to 4.031 ft) = -0.18, -0.911
Roof_1 = Roof Coeff (h/2 to h) (4.031 ft to 8.063 ft) = -0.18, -0.894
Roof_2 = Roof Coeff (h/2 to h) (4.031 ft to 8.063 ft) = -0.18, -0.894
Roof_3 = Roof Coeff (h to 2h) (8.063 ft to 15.625 ft) = -0.18, -0.506
Roof_4 = Roof Coeff (h to 2h) (8.063 ft to 15.625 ft) = -0.18, -0.506
**Includes Reduction Factor 0.96 For roof area, applied To Cp=-1.3 For h/L>=1 & (0 To h/2)
Cp_WW = Windward Wall Coefficient (All L/B Values) = 0.80
Cp_LW = Leward Wall Coefficient Using L/B = -0.33
Cp_SW = Side Wall Coefficient (All L/B values) = -0.70
GCpn_WW = Parapet Combined Net Pressure Coefficient (Windward Parapet) = 1.50
GCpn_LW = Parapet Combined Net Pressure Coefficient (Leeward Parapet) = -1.00

Wall Wind Pressures based On Positive Internal Pressure (+GCPi) - Parallel to Ridge
All wind pressures include a load factor of 1.0

Elev ft	Kz	Kzt	qz psf	GCPi	Windward Press psf	Leeward Press psf	Side Press psf	Total Press psf	Minimum Pressure* psf
7.00	0.849	1.000	24.43	0.18	12.21	-11.30	-18.93	23.51	16.00

Wall Wind Pressures based on Negative Internal Pressure (-GCPi) - Parallel to Ridge
All wind pressures include a load factor of 1.0

Elev ft	Kz	Kzt	qz psf	GCPi	Windward Press psf	Leeward Press psf	Side Press psf	Total Press psf	Minimum Pressure* psf
7.00	0.849	1.000	24.43	-0.18	21.01	-2.50	-10.14	23.51	16.00

Notes Wall Pressures:
Kz = Velocity Press Exp Coeff   Kzt = Topographical Factor
qz = 0.00256*Kz*Kzt*Kd*V^2   GCPi = Internal Press Coefficient
Side = qh * G * Cp_SW - qip * +GCPi   Windward = qz * G * Cp_WW - qip * +GCPi
Leeward = qh * G * Cp_LW - qip * +GCPi   Total = Windward Press - Leeward Press
* Minimum Pressure: Para 27.4.7 no less than 16.00 psf (Incl LF) applied to Walls
+ Pressures Acting TOWARD Surface   - Pressures Acting AWAY from Surface

Roof Wind Pressures for Positive & Negative Internal Pressure (+/- GCPi) - Parallel to Ridge
All wind pressures include a load factor of 1.0

Roof Var	Start Dist ft	End Dist ft	Cp_min	Cp_max	GCPi	Pressure Pn_min* psf	Pressure Pp_min* psf	Pressure Pn_max psf	Pressure Pp_max psf
Hip_End (-X)	0.000	2.313	-0.180	-0.911	0.180	0.66	-8.13	-14.53	-23.32
Hip_End_1 (+X)	13.313	15.625	-0.180	-0.506	0.180	0.66	-8.13	-6.12	-14.91
Roof (+Y)	0.000	4.031	-0.180	-0.911	0.180	0.66	-8.13	-14.53	-23.32
Roof (-Y)	0.000	4.031	-0.180	-0.911	0.180	0.66	-8.13	-14.53	-23.32
Roof_1 (+Y)	4.031	8.063	-0.180	-0.894	0.180	0.66	-8.13	-14.16	-22.95
Roof_2 (-Y)	4.031	8.063	-0.180	-0.894	0.180	0.66	-8.13	-14.16	-22.95
Roof_3 (+Y)	8.063	15.625	-0.180	-0.506	0.180	0.66	-8.13	-6.12	-14.91
Roof_4 (-Y)	8.063	15.625	-0.180	-0.506	0.180	0.66	-8.13	-6.12	-14.91

Notes Roof Pressures:
Start Dist = Start Dist from Windward Edge   End Dist = End Dist from Windward Edge
Cp_Max = Largest Coefficient Magnitude   Cp_Min = Smallest Coefficient Magnitude
Pp_max = qh*G*Cp_max - qip*(+GCPi)   Pn_max = qh*G*Cp_max - qin*(-GCpi)
Pp_min* = qh*G*Cp_min - qip*(+GCPi)   Pn_min* = qh*G*Cp_min - qin*(-GCpi)
OH = Overhang   X = Dir along Ridge   Y = Dir Perpendcular to Ridge   Z = Vertical
* The smaller uplift pressures due to Cp_Min can become critical when wind is combined with roof live load or snow load; load combinations are given in ASCE 7
+ Pressures Acting TOWARD Surface   - Pressures Acting AWAY from Surface

Job: Handi Hut 222-4012

Page:
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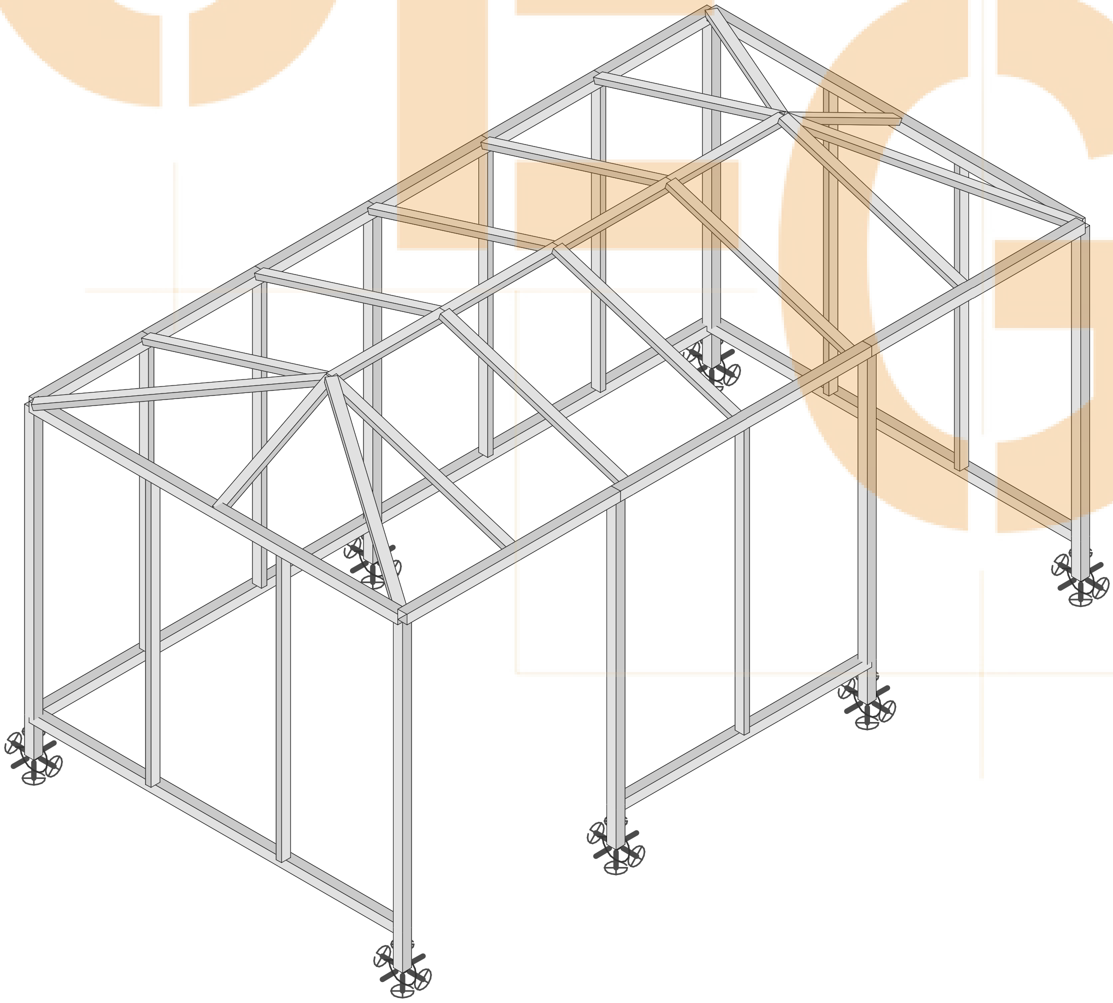
Date:

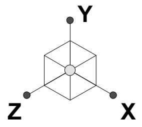
Shelter Design

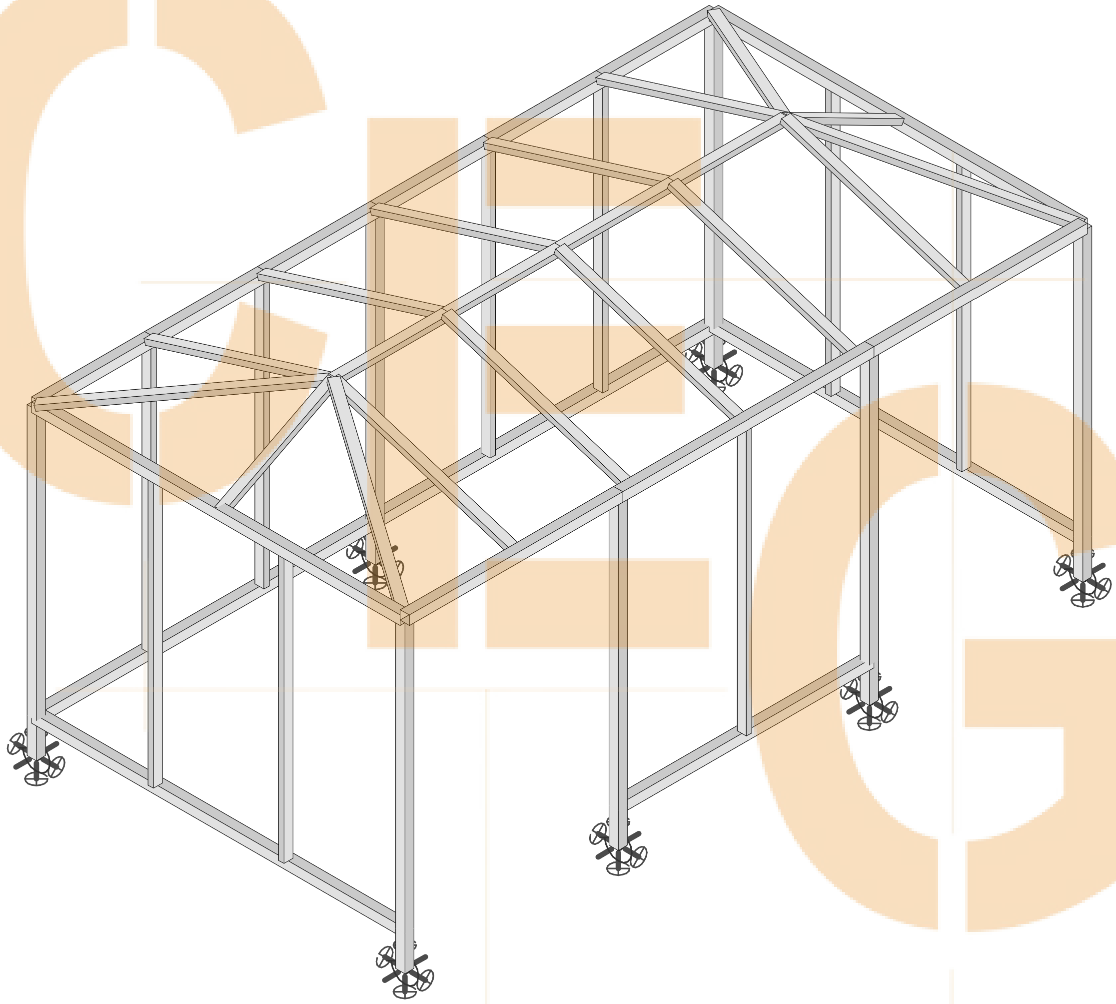
Dead Load (DL) **3** psf

Roof Live Load **20.0** psf

Wind Load (WL) = As per page 1,001, 1,002 & 1003

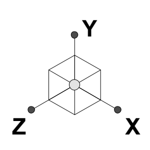


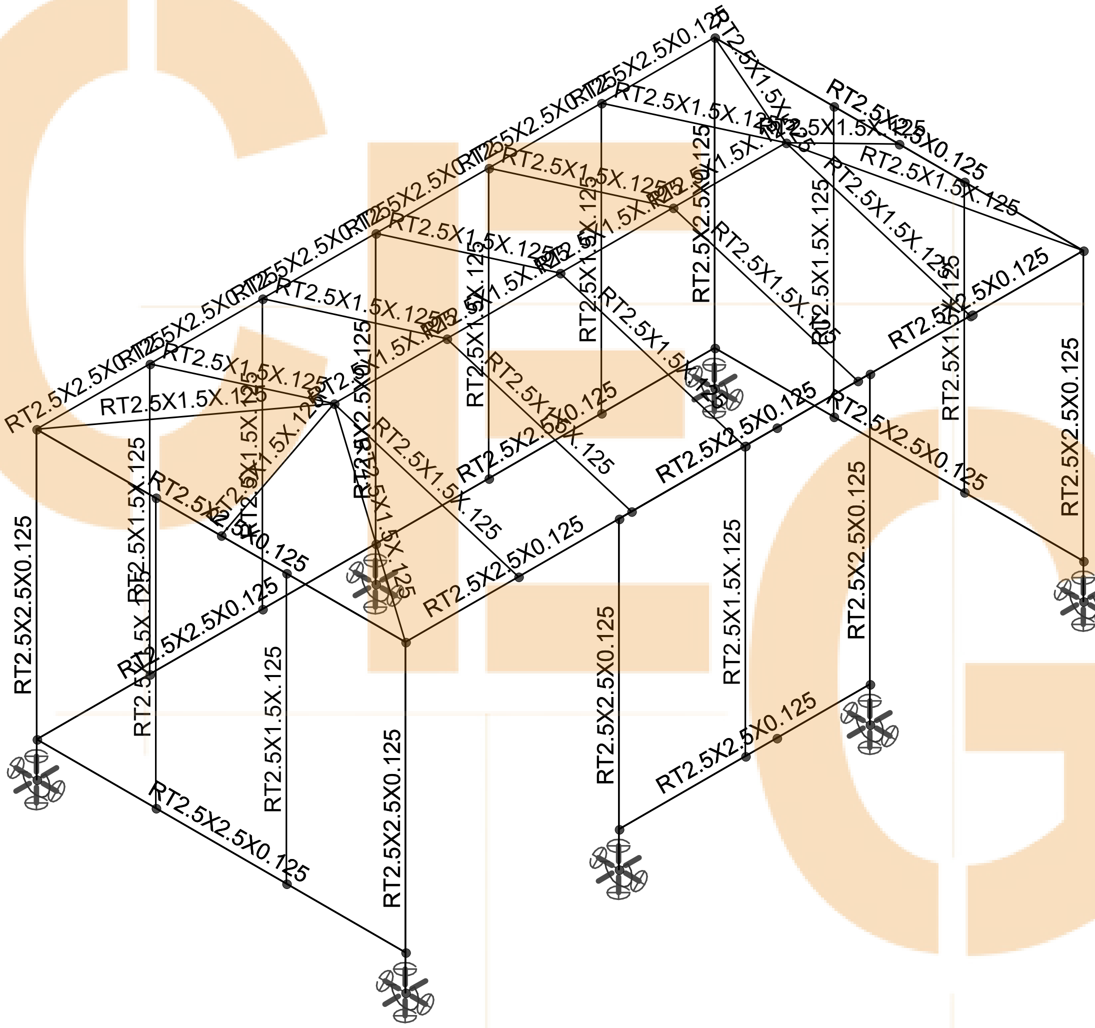




Envelope Only Solution

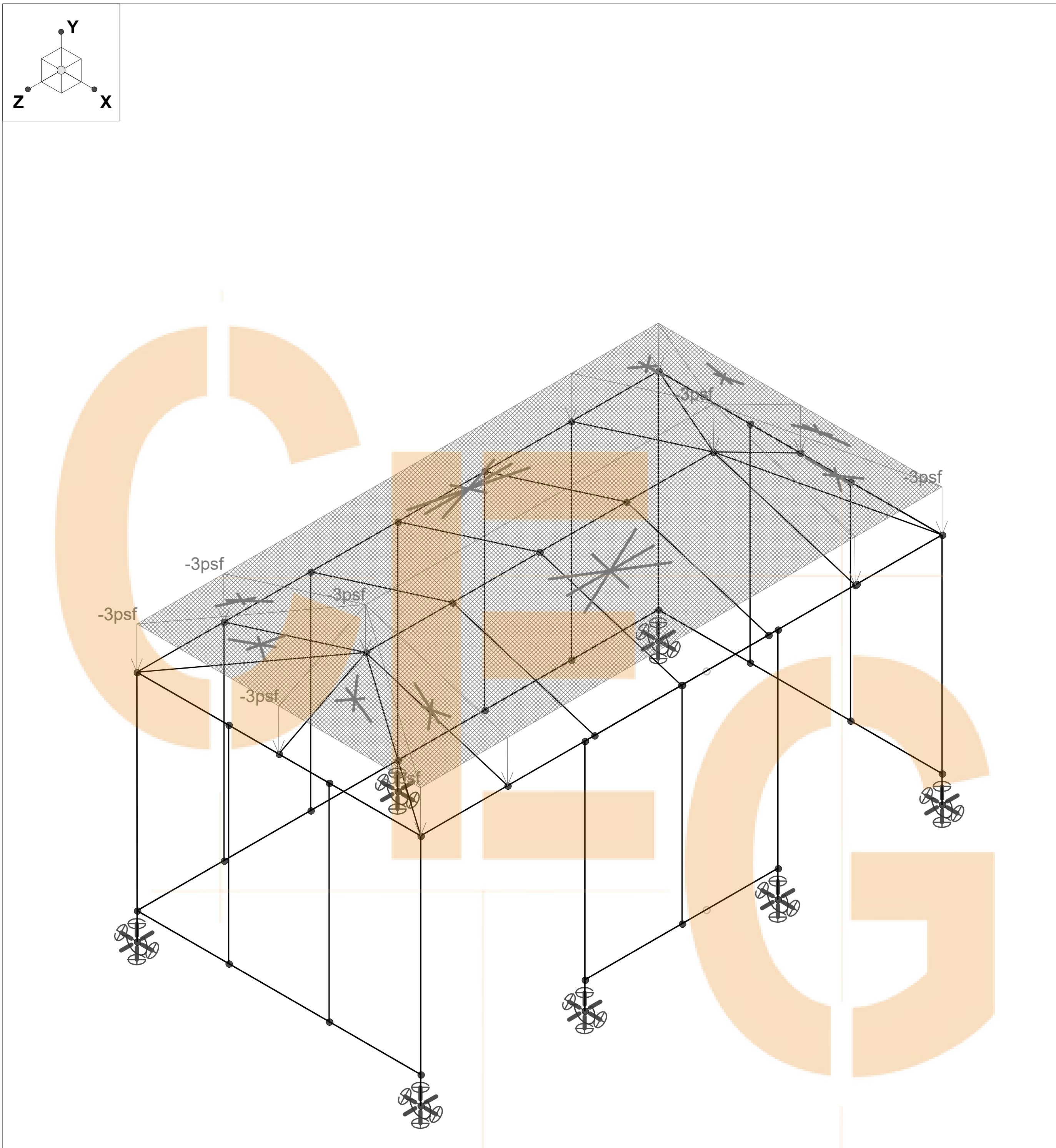
	6-3WSPH-M-1	SK - 1
HANDI HUT 222-411		





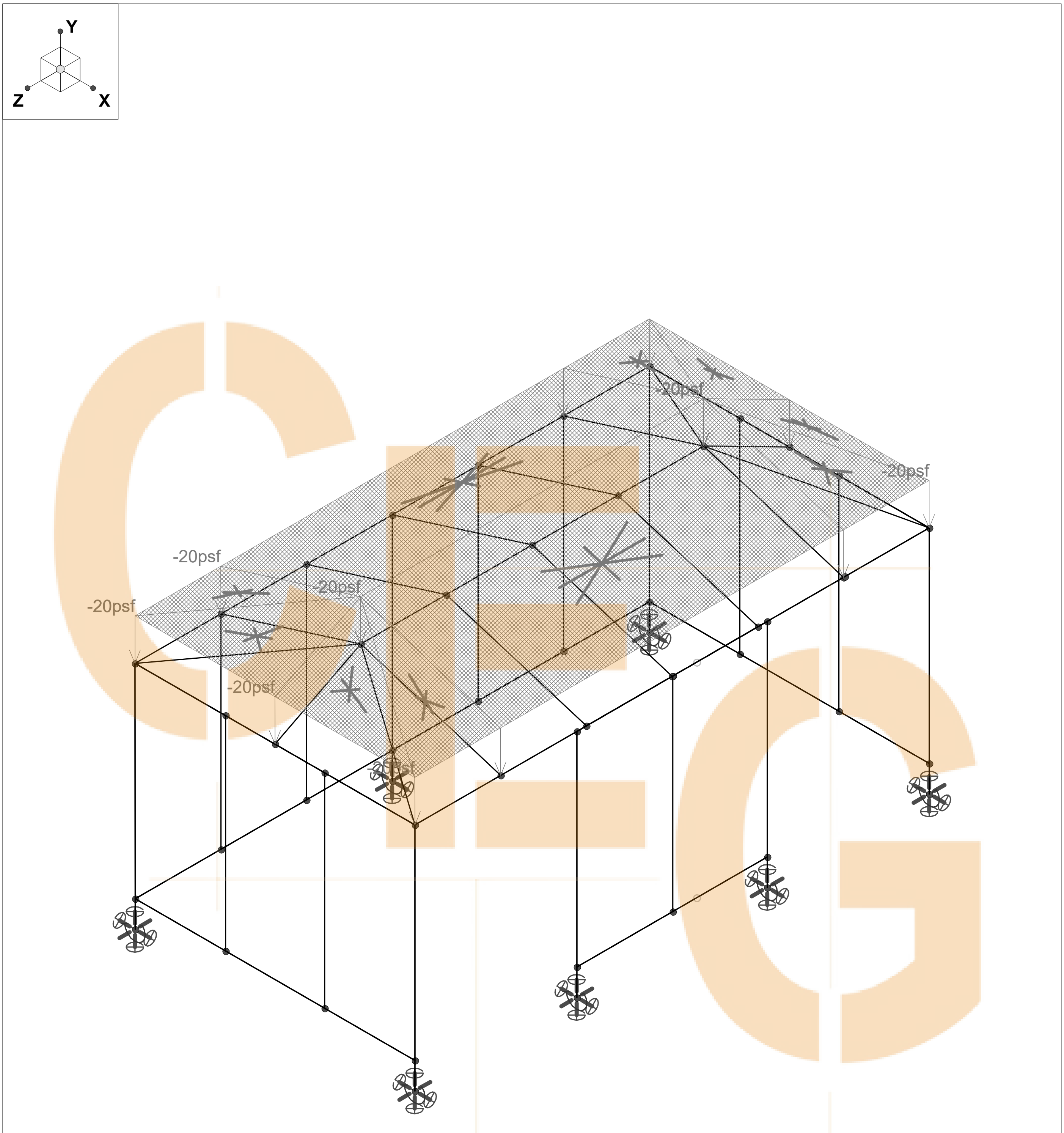
Envelope Only Solution

	6-3WSPH-M-1	SK - 2
HANDI HUT 222-411		
		6-3WSPH-M1 TX.R3D



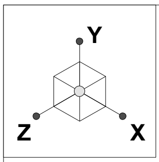
Loads: BLC 1, DL
Envelope Only Solution

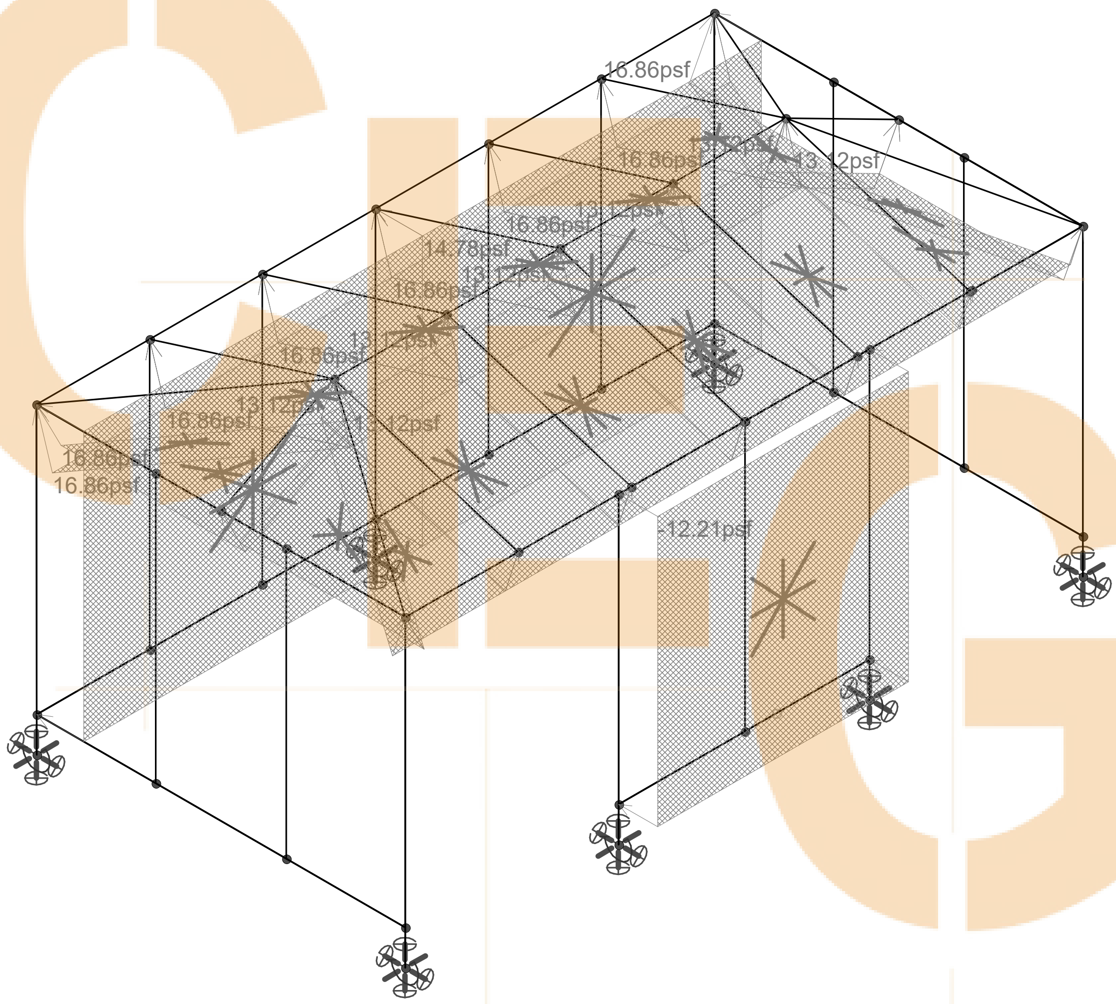
	6-3WSPH-M-1	SK - 3
HANDI HUT 222-411		6-3WSPH-M1 TX.R3D



Loads: BLC 2, RLL
Envelope Only Solution

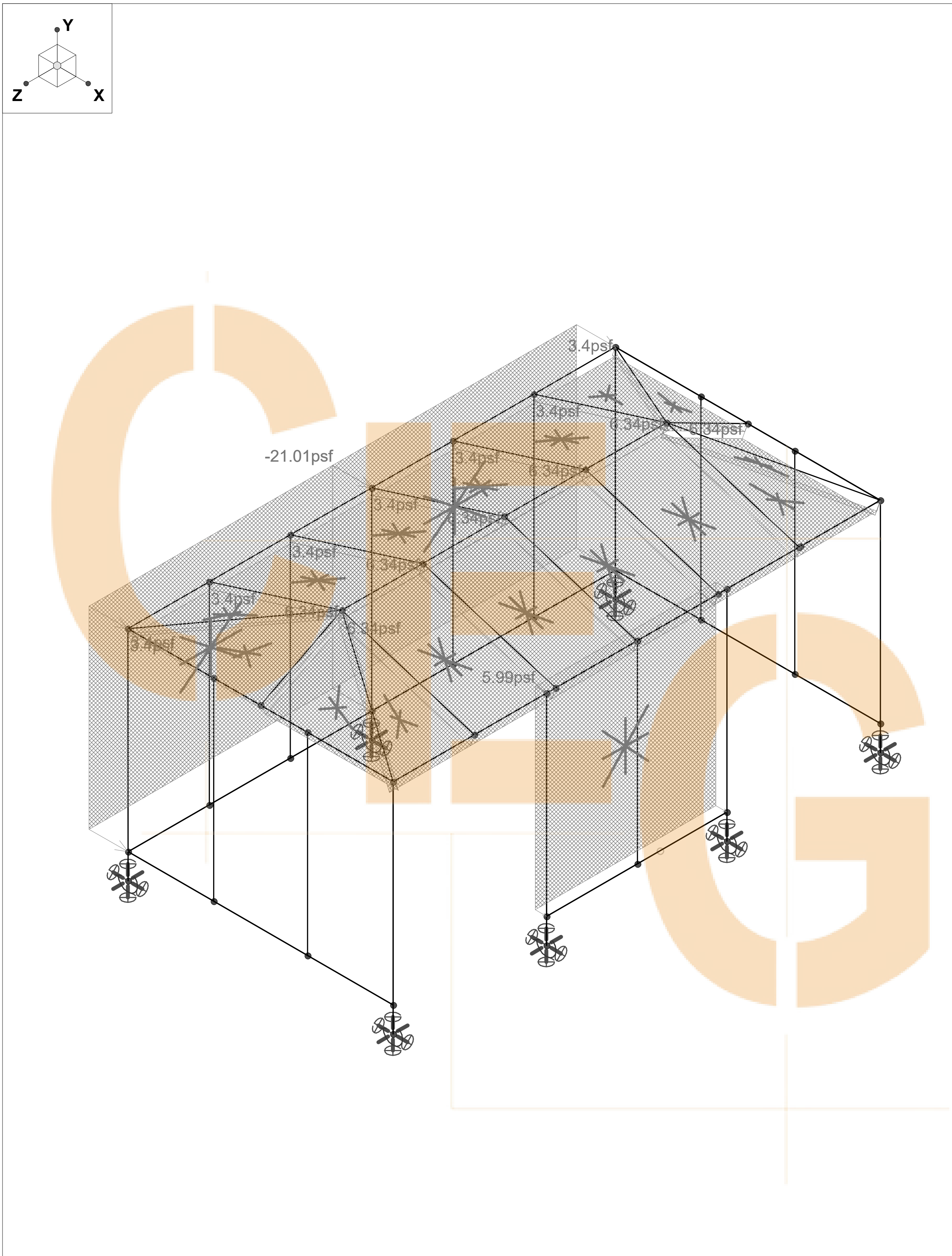
	6-3WSPH-M-1	SK - 4
HANDI HUT 222-411		6-3WSPH-M1 TX.R3D





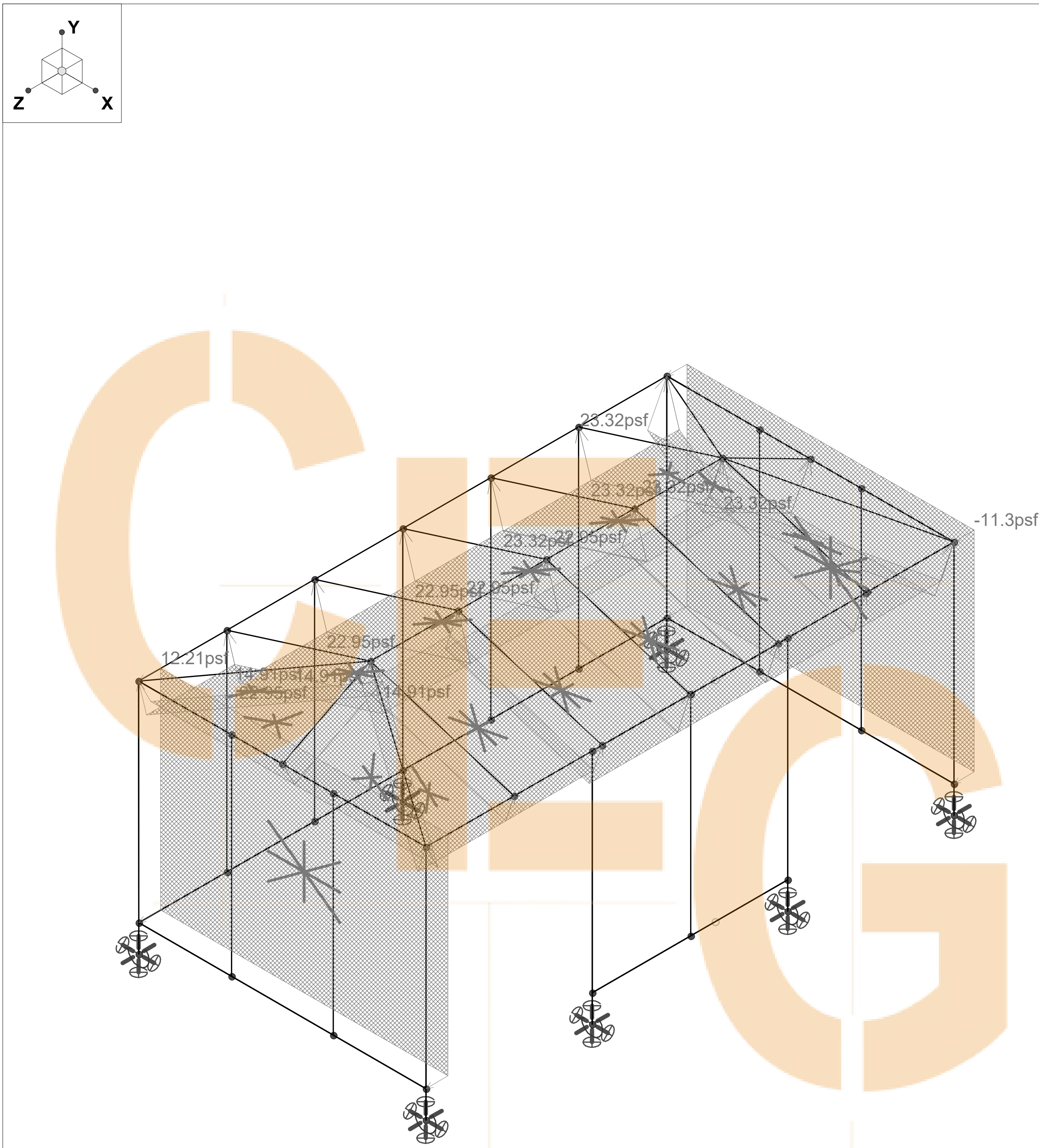
Loads: BLC 3, WLX (+GCpi)
Envelope Only Solution

	6-3WSPH-M-1	SK - 5
HANDI HUT 222-411		6-3WSPH-M1 TX.R3D



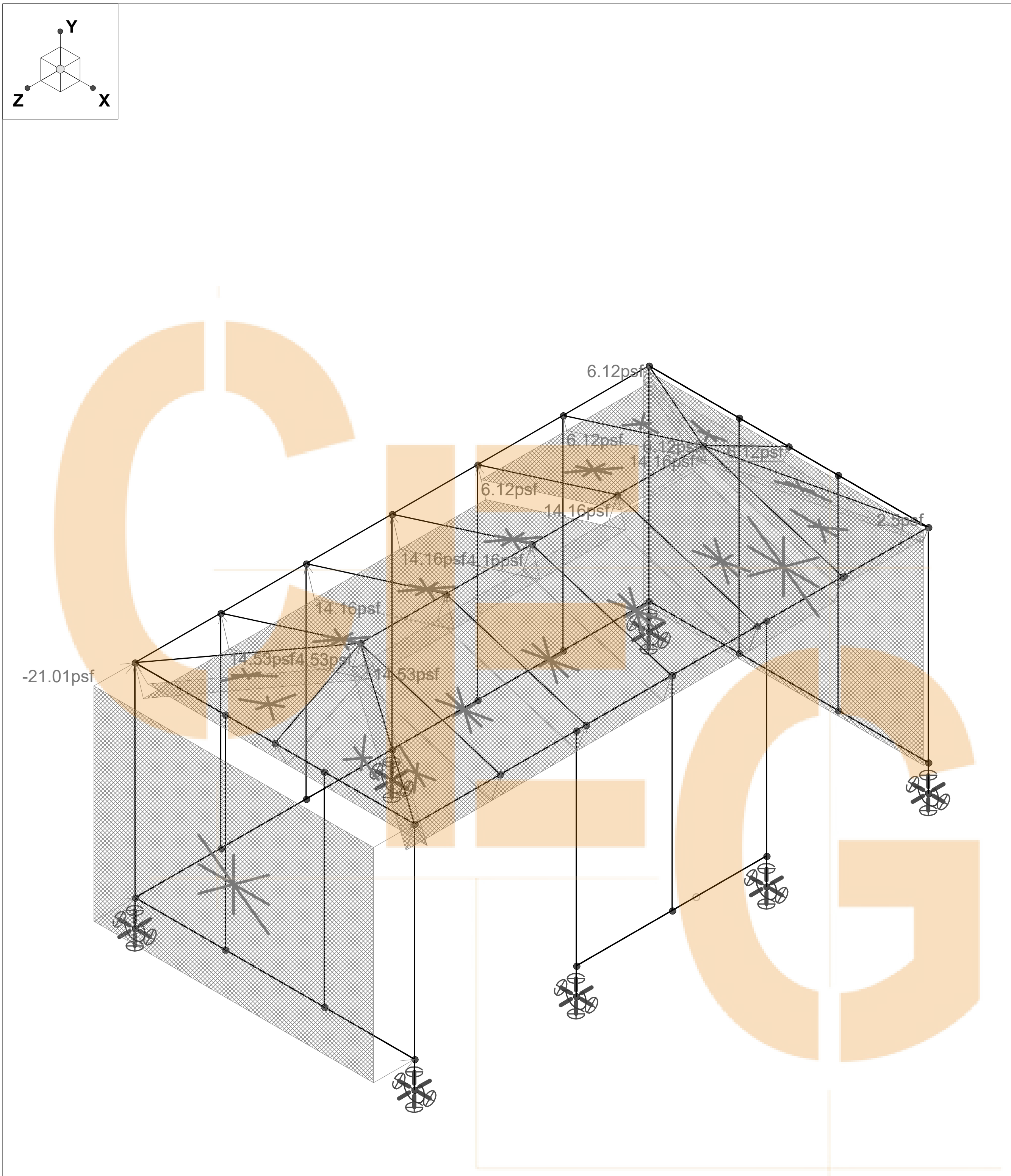
Loads: BLC 4, WLX (-GCpi)
Envelope Only Solution

	6-3WSPH-M-1	SK - 6
HANDI HUT 222-411		6-3WSPH-M1 TX.R3D



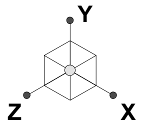
Loads: BLC 5, WLZ (+GCpi)
Envelope Only Solution

	6-3WSPH-M-1	SK - 7
HANDI HUT 222-411		6-3WSPH-M1 TX.R3D



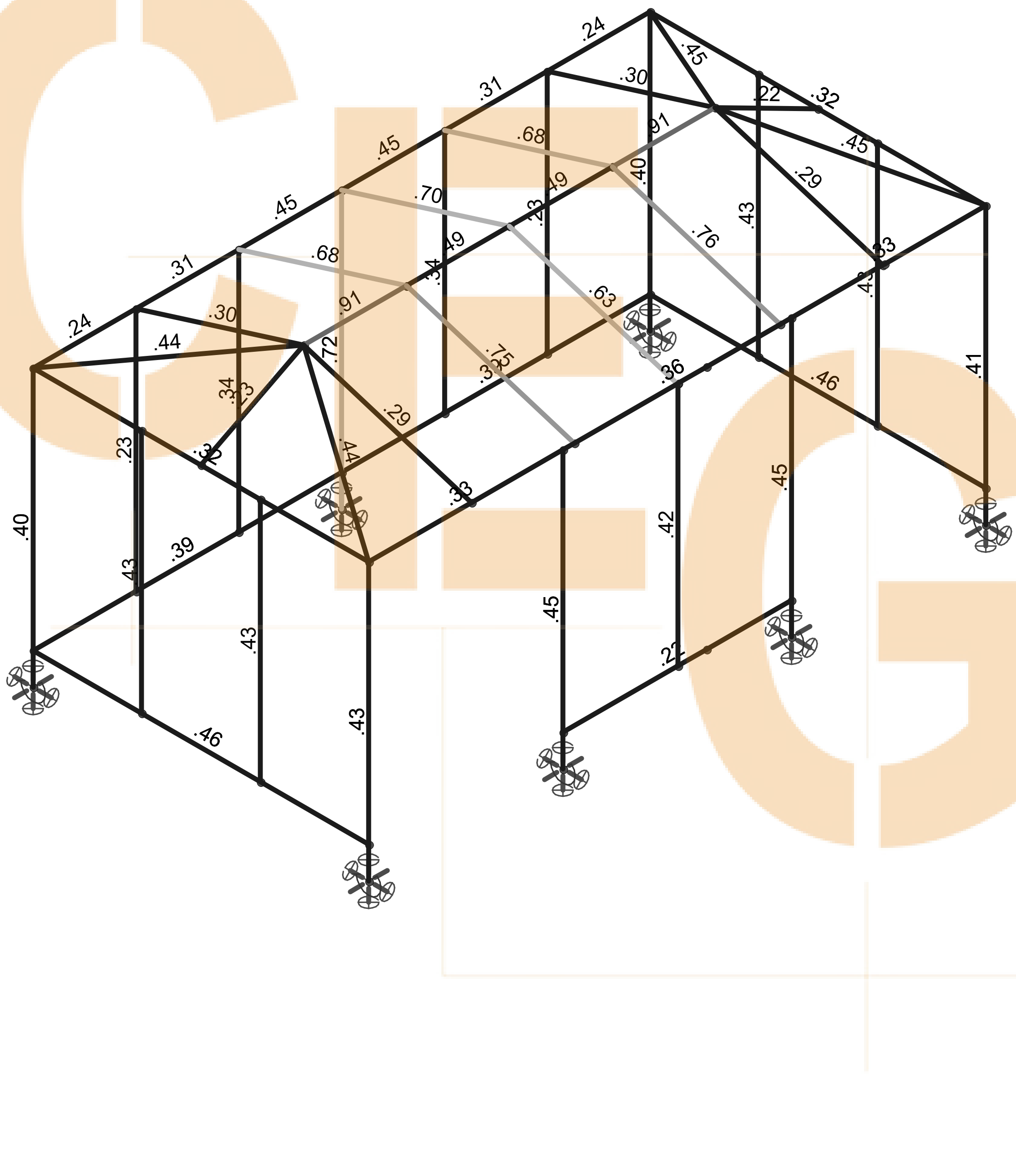
Loads: BLC 6, WLZ (-GCpi)
Envelope Only Solution

	6-3WSPH-M-1	SK - 8
HANDI HUT 222-411		6-3WSPH-M1 TX.R3D



Code Check
(Env)

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



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

	6-3WSPH-M-1	SK - 9
HANDI HUT 222-411		6-3WSPH-M1 TX.R3D

IIIRISA A NEMETSCHEK COMPANY

Company :
Designer :
Job Number : HANDI HUT 222-411
Model Name : 6-3WSPH-M-1

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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	Rafter	RT2.5X1.5X.1...	Beam	Rectangular Tubes	6063-T5	Typical	.938	.337	.767	.711
2	Corner Col...	RT2.5X2.5X0....	Column	Rectangular Tubes	6063-T5	Typical	1.19	1.12	1.12	1.67
3	Mid Column	RT2.5X1.5X.1...	Column	Rectangular Tubes	6063-T5	Typical	.938	.337	.767	.711
4	Frame Me...	RT2.5X2.5X0....	Beam	Rectangular Tubes	6063-T5	Typical	1.19	1.12	1.12	1.67
5	Middle Fra...	RT 3X2.5X0.1...	Beam	Rectangular Tubes	6063-T5	Typical	1.313	1.296	1.726	2.22

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
1	N1	2.244	0.804598	14.625	0	
2	N2	2.244	7	14.625	0	
3	N3	5.256	0.804598	14.625	0	
4	N4	5.256	7	14.625	0	
5	N5	8	0	14.625	0	
6	N6	-.5	7	12.0205	0	
7	N7	8	7	9.705	0	
8	N8	8	7	12.0205	0	
9	N9	3.75	7.	14.625	0	
10	N10	8	0.804598	14.625	0	
11	N11	8	0	9.705	0	
12	N12	8	0.804598	9.705	0	
13	N13	8	0.804598	6.792	0	
14	N14	8	0.804598	6.069	0	
15	N15	8	0.804598	3.92	0	
16	N16	8	0	3.92	0	
17	N17	8	0	-1	0	
18	N18	8	0.804598	-1.	0	
19	N19	8	7.	14.625	0	
20	N20	8	7	6.792	0	
21	N21	8	7	6.069	0	
22	N22	8	7	3.92	0	
23	N23	8	7	-1	0	
24	N24	-.5	0	14.625	0	
25	N25	-.5	0.804598	14.625	0	
26	N26	-.5	7.	14.625	0	
27	N27	-.5	0.804598	12.0205	0	
28	N28	-.5	0.804598	9.42	0	
29	N29	-.5	0	6.8125	0	
30	N30	-.5	0.804598	6.8125	0	
31	N31	-.5	0.804598	4.205	0	
32	N32	-.5	0.804598	1.6075	0	
33	N33	-.5	0	-1	0	
34	N34	-.5	0.804598	-1	0	
35	N35	-.5	7	-1	0	
36	N36	-.5	7	9.42	0	
37	N37	8	7	9.42	0	
38	N38	-.5	7	6.8125	0	

Company	:	
Designer	:	
Job Number	:	HANDI HUT 222-411
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Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
39	N39	8	7	6.8125	0	
40	N40	-.5	7	4.205	0	
41	N41	8	7	4.205	0	
42	N42	-.5	7	1.6075	0	
43	N43	8	7	1.6075	0	
44	N44	3.75	8.33	12.0205	0	
45	N45	3.75	8.33	9.42	0	
46	N46	3.75	8.33	6.8125	0	
47	N47	3.75	8.33	4.205	0	
48	N48	3.75	8.33	1.6075	0	
49	N49	3.75	7	-1	0	
50	N50	5.256	7	-1	0	
51	N51	2.244	7	-1	0	
52	N52	5.256	0.804598	-1	0	
53	N53	2.244	0.804598	-1	0	
54	N54	8	7	1.558667	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	Mid Column	6.195			1						Lateral
2	M2	Mid Column	6.195			1						Lateral
3	M3	Frame Mem...	8.5			1						Lateral
4	M5	Corner Colu...	7			1						Lateral
5	M6	Frame Mem...	8.5			1						Lateral
6	M7	Rafter	4.453	4.5	4.5	1						Lateral
7	M8	Rafter	4.453	4.5	4.5	1						Lateral
8	M9	Rafter	2.924	4.5	4.5	1						Lateral
9	M11	Frame Mem...	5.785			1						Lateral
10	M15	Corner Colu...	7			1						Lateral
11	M16	Mid Column	6.195			1						Lateral
12	M18	Corner Colu...	7			1						Lateral
13	M20	Corner Colu...	7			1						Lateral
14	M22	Corner Colu...	7			1						Lateral
15	M25	Corner Colu...	7			1						Lateral
16	M26	Rafter	4.453	4.5	4.5	1						Lateral
17	M27	Rafter	4.453	4.5	4.5	1						Lateral
18	M28	Rafter	4.453	4.5	4.5	1						Lateral
19	M29	Rafter	4.453	4.5	4.5	1						Lateral
20	M30	Rafter	4.453	4.5	4.5	1						Lateral
21	M31	Rafter	4.453	4.5	4.5	1						Lateral
22	M32	Rafter	4.453	4.5	4.5	1						Lateral
23	M33	Rafter	4.453	4.5	4.5	1						Lateral
24	M34	Rafter	2.601	4.5	4.5	1						Lateral
25	M35	Rafter	2.607	4.5	4.5	1						Lateral
26	M36	Rafter	2.607	4.5	4.5	1						Lateral
27	M37	Rafter	2.598	4.5	4.5	1						Lateral
28	M39	Frame Mem...	8.5			1						Lateral
29	M40	Mid Column	6.195			1						Lateral
30	M41	Mid Column	6.195			1						Lateral
31	M43	Frame Mem...	7.813			1						Lateral
32	M46	Frame Mem...	7.813			1						Lateral
33	M49	Rafter	5.159	4.5	4.5	1						Lateral
34	M50	Rafter	5.159	4.5	4.5	1						Lateral
35	M51	Rafter	5.16	4.5	4.5	1						Lateral
36	M52	Rafter	5.16	4.5	4.5	1						Lateral
37	M53	Rafter	2.927	4.5	4.5	1						Lateral
38	M54	Frame Mem...	8.5			1						Lateral

Aluminum Design Parameters (Continued)

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
39	M55	Frame Mem...	2.605			1						Lateral
40	M56	Frame Mem...	2.601			1						Lateral
41	M57	Frame Mem...	2.607			1						Lateral
42	M58	Frame Mem...	2.607			1						Lateral
43	M59	Frame Mem...	2.598			1						Lateral
44	M60	Frame Mem...	2.607			1						Lateral
45	M61	Frame Mem...	4.92			1						Lateral
46	M63	Frame Mem...	5.785			1						Lateral
47	M65	Frame Mem...	4.92			1						Lateral
48	M66	Mid Column	6.195			1						Lateral
49	M67	Mid Column	6.195			1						Lateral
50	M68	Mid Column	6.195			1						Lateral
51	M69	Mid Column	6.195			1						Lateral
52	M70	Corner Colu...	7			1						Lateral
53	M71	Middle Frame	8.5									Lateral

Member Area Loads (BLC 1 : DL)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N9	N44	N19		Y	Two Way	-3
2	N19	N44	N8		Y	Two Way	-3
3	N44	N48	N43	N8	Y	Two Way	-3
4	N48	N23	N43		Y	Two Way	-3
5	N26	N44	N9		Y	Two Way	-3
6	N26	N6	N44		Y	Two Way	-3
7	N6	N42	N48	N44	Y	Two Way	-3
8	N48	N42	N35		Y	Two Way	-3
9	N23	N48	N49		Y	Two Way	-3
10	N48	N35	N49		Y	Two Way	-3

Member Area Loads (BLC 2 : RLL)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N9	N44	N19		Y	Two Way	-20
2	N19	N44	N8		Y	Two Way	-20
3	N44	N48	N43	N8	Y	Two Way	-20
4	N48	N23	N43		Y	Two Way	-20
5	N26	N44	N9		Y	Two Way	-20
6	N26	N6	N44		Y	Two Way	-20
7	N6	N42	N48	N44	Y	Two Way	-20
8	N48	N42	N35		Y	Two Way	-20
9	N23	N48	N49		Y	Two Way	-20
10	N48	N35	N49		Y	Two Way	-20

Member Area Loads (BLC 3 : WLX (+GCpi))

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N44	N9	N19		Perp	Two Way	13.12
2	N44	N19	N8		Perp	Two Way	13.12
3	N44	N8	N37	N45	Perp	Two Way	13.12
4	N45	N37	N39	N46	Perp	Two Way	13.12
5	N46	N39	N41	N47	Perp	Two Way	13.12
6	N47	N41	N43	N48	Perp	Two Way	13.12
7	N48	N54	N23		Perp	Two Way	13.12
8	N49	N48	N23		Perp	Two Way	13.12
9	N26	N9	N44		Perp	Two Way	16.86
10	N26	N44	N6		Perp	Two Way	16.86
11	N6	N44	N45	N36	Perp	Two Way	16.86
12	N36	N45	N46	N38	Perp	Two Way	16.86

Company :
Designer :
Job Number : HANDI HUT 222-411
Model Name : 6-3WSPH-M-1

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Member Area Loads (BLC 3 : WLX (+GCpi)) (Continued)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
13	N38	N46	N47	N40	Perp	Two Way	16.86
14	N40	N47	N48	N42	Perp	Two Way	16.86
15	N42	N48	N35		Perp	Two Way	16.86
16	N35	N48	N49		Perp	Two Way	16.86
17	N38	N30	N25	N26	Perp	Two Way	14.78
18	N38	N35	N34	N30	Perp	Two Way	14.78
19	N7	N12	N15	N22	Perp	Two Way	-12.21

Member Area Loads (BLC 4 : WLX (-GCpi))

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N44	N9	N19		Perp	Two Way	6.34
2	N44	N19	N8		Perp	Two Way	6.34
3	N44	N8	N37	N45	Perp	Two Way	6.34
4	N45	N37	N39	N46	Perp	Two Way	6.34
5	N46	N39	N41	N47	Perp	Two Way	6.34
6	N47	N41	N43	N48	Perp	Two Way	6.34
7	N48	N54	N23		Perp	Two Way	6.34
8	N49	N48	N23		Perp	Two Way	6.34
9	N26	N9	N44		Perp	Two Way	3.4
10	N26	N44	N6		Perp	Two Way	3.4
11	N6	N44	N45	N36	Perp	Two Way	3.4
12	N36	N45	N46	N38	Perp	Two Way	3.4
13	N38	N46	N47	N40	Perp	Two Way	3.4
14	N40	N47	N48	N42	Perp	Two Way	3.4
15	N42	N48	N35		Perp	Two Way	3.4
16	N35	N48	N49		Perp	Two Way	3.4
17	N38	N30	N25	N26	Perp	Two Way	-21.01
18	N38	N35	N34	N30	Perp	Two Way	-21.01
19	N7	N12	N15	N22	Perp	Two Way	5.99

Member Area Loads (BLC 5 : WLZ (+GCpi))

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N44	N9	N19		Perp	Two Way	14.91
2	N44	N19	N8		Perp	Two Way	14.91
3	N44	N26	N9		Perp	Two Way	14.91
4	N6	N26	N44		Perp	Two Way	14.91
5	N44	N8	N37	N45	Perp	Two Way	14.91
6	N6	N44	N45	N36	Perp	Two Way	22.95
7	N46	N45	N37	N39	Perp	Two Way	22.95
8	N36	N45	N46	N38	Perp	Two Way	22.95
9	N47	N46	N39	N41	Perp	Two Way	22.95
10	N38	N46	N47	N40	Perp	Two Way	22.95
11	N48	N47	N41	N43	Perp	Two Way	23.32
12	N40	N47	N48	N42	Perp	Two Way	23.32
13	N48	N43	N23		Perp	Two Way	23.32
14	N49	N48	N23		Perp	Two Way	23.32
15	N42	N48	N35		Perp	Two Way	23.32
16	N35	N48	N49		Perp	Two Way	23.32
17	N23	N18	N34	N35	Perp	Two Way	-11.3
18	N26	N25	N10	N19	Perp	Two Way	12.21

Member Area Loads (BLC 6 : WLZ (-GCpi))

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N44	N9	N19		Perp	Two Way	14.53
2	N44	N19	N8		Perp	Two Way	14.53
3	N44	N26	N9		Perp	Two Way	14.53
4	N6	N26	N44		Perp	Two Way	14.53

Member Area Loads (BLC 6 : WLZ (-GCpi)) (Continued)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
5	N44	N8	N37	N45	Perp	Two Way	14.53
6	N6	N44	N45	N36	Perp	Two Way	14.53
7	N46	N45	N37	N39	Perp	Two Way	14.16
8	N36	N45	N46	N38	Perp	Two Way	14.16
9	N47	N46	N39	N41	Perp	Two Way	14.16
10	N38	N46	N47	N40	Perp	Two Way	14.16
11	N48	N47	N41	N43	Perp	Two Way	14.16
12	N40	N47	N48	N42	Perp	Two Way	6.12
13	N48	N43	N23		Perp	Two Way	6.12
14	N49	N48	N23		Perp	Two Way	6.12
15	N42	N48	N35		Perp	Two Way	6.12
16	N35	N48	N49		Perp	Two Way	6.12
17	N23	N18	N34	N35	Perp	Two Way	2.5
18	N26	N25	N10	N19	Perp	Two Way	-21.01

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-X	.6																
7	IBC 16-13 (a)	Yes	Y		DL	1	WL-X	.45					R...	.75										
8	IBC 16-15	Yes	Y		DL	.6	WL-X	.6																
9	IBC 16-12 (a)	Yes	Y		DL	1	WL+Z	.6																
10	IBC 16-13 (b)	Yes	Y		DL	1	WL+Z	.45					R...	.75										
11	IBC 16-15	Yes	Y		DL	.6	WL+Z	.6																
12	IBC 16-12 (a)	Yes	Y		DL	1	WL-Z	.6																
13	IBC 16-13 (a)	Yes	Y		DL	1	WL-Z	.45					R...	.75										
14	IBC 16-15	Yes	Y		DL	.6	WL-Z	.6																
15	DL		Y		DL	1.25																		
16	RLL		Y		RLL	1.25																		
17	WL+X		Y		WL+X	1.25																		
18	WL-X		Y		WL-X	1.25																		
19	WL+Z		Y		WL+Z	1.25																		
20	WL-Z		Y		WL-Z	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	N5	max	213.538	5	478.124	7	192.138	14	302.861	14	146.824	12	232.748	6
2		min	-271.299	6	-246.454	5	-124.978	9	-227.868	9	-87.223	11	-188.5	3
3	N11	max	121.968	5	420.502	2	70.125	14	93.985	14	41.258	7	279.706	7
4		min	-98.817	7	-149.584	14	-113.504	2	-86.329	9	-51.864	5	-283.969	5
5	N24	max	128.443	4	569.902	2	91.671	14	150.03	14	99.128	8	230.771	8
6		min	-153.221	8	-199.566	8	-101.563	10	-134.935	9	-114.559	12	-187.387	3
7	N17	max	213.352	5	477.015	7	53.19	12	150.168	12	23.506	14	232.711	6
8		min	-271.289	6	-246.421	5	-123.11	11	-230.439	11	-82.092	9	-188.591	3
9	N16	max	122.097	5	421.498	2	113.777	2	89.368	12	52.162	5	280.414	7
10		min	-99.305	7	-225.831	11	-94.315	11	-98.18	11	-41.407	7	-283.899	5
11	N29	max	261.549	3	681.989	2	186.975	12	151.434	12	15.402	12	514.495	8
12		min	-381.753	8	-266.552	11	-198.144	9	-151.091	9	-14.223	9	-381.883	4
13	N33	max	128.359	4	569.472	2	133.672	13	131.404	12	69.614	3	230.73	8
14		min	-153.149	8	-264.126	11	-119.458	11	-139.953	11	-99.12	8	-187.504	3
15	Totals:	max	1160.128	5	3586.988	2	714.312	14						
16		min	-1379.532	6	-1216.219	11	-714.312	9						

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	M37	RT2.5X1....	.912	2.598	2	.127	2.598	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
2	M34	RT2.5X1....	.911	0	2	.127	0	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
3	M31	RT2.5X1....	.762	0	2	.184	0	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
4	M27	RT2.5X1....	.752	0	2	.182	0	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
5	M70	RT2.5X2....	.716	0	6	.124	0	y	8	7004.164	11539....	724.04	724.04	3090.909	3090.909	2....	H.1-1
6	M28	RT2.5X1....	.700	4.453	2	.093	4.453	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
7	M30	RT2.5X1....	.681	4.453	2	.197	4.453	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
8	M26	RT2.5X1....	.681	4.453	2	.197	4.453	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
9	M29	RT2.5X1....	.628	0	2	.099	0	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
10	M35	RT2.5X1....	.490	2.102	2	.076	0	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
11	M36	RT2.5X1....	.490	.532	2	.075	2.607	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
12	M3	RT2.5X2....	.456	8.5	8	.147	8.5	z	14	5528.073	11539....	724.04	724.04	3090.909	3090.909	3.9	H.1-1
13	M39	RT2.5X2....	.456	8.5	8	.100	8.5	z	11	5528.073	11539....	724.04	724.04	3090.909	3090.909	3....	H.1-1
14	M57	RT2.5X2....	.452	2.607	2	.068	2.607	y	7	10566....	11539....	724.04	724.04	3090.909	3090.909	2....	H.1-1
15	M58	RT2.5X2....	.452	0	2	.068	0	y	7	10566....	11539....	724.04	724.04	3090.909	3090.909	2....	H.1-1
16	M18	RT2.5X2....	.448	0	7	.129	0	y	5	7004.164	11539....	724.04	724.04	3090.909	3090.909	2....	H.1-1
17	M15	RT2.5X2....	.448	0	7	.128	0	y	5	7004.164	11539....	724.04	724.04	3090.909	3090.909	2....	H.1-1
18	M51	RT2.5X1....	.447	0	2	.066	0	z	7	5353.013	9090.909	363.005	495.581	3090.909	1636.364	1....	H.1-1
19	M52	RT2.5X1....	.446	0	2	.073	0	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	1....	H.1-1
20	M50	RT2.5X1....	.445	0	2	.072	0	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	1....	H.1-1
21	M49	RT2.5X1....	.445	0	2	.066	0	z	7	5353.013	9090.909	363.005	495.581	3090.909	1636.364	1....	H.1-1
22	M1	RT2.5X1....	.433	0	8	.055	.063	y	14	3130.212	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
23	M41	RT2.5X1....	.433	6.195	8	.032	0	z	6	3130.212	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
24	M5	RT2.5X2....	.432	0	14	.315	0	z	12	7004.164	11539....	724.04	724.04	3090.909	3090.909	3.2	H.1-1
25	M2	RT2.5X1....	.429	6.195	6	.053	6.132	y	14	3130.212	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
26	M40	RT2.5X1....	.429	0	6	.038	0	z	6	3130.212	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
27	M16	RT2.5X1....	.416	6.195	2	.021	0	y	5	3130.212	9090.909	363.005	495.581	3090.909	1636.364	1....	H.1-1
28	M20	RT2.5X2....	.410	7	7	.181	0	z	9	7004.164	11539....	724.04	724.04	3090.909	3090.909	2....	H.1-1
29	M22	RT2.5X2....	.404	.857	8	.225	0	z	14	7004.164	11539....	724.04	724.04	3090.909	3090.909	2....	H.1-1
30	M25	RT2.5X2....	.404	.857	8	.220	0	y	8	7004.164	11539....	724.04	724.04	3090.909	3090.909	2....	H.1-1
31	M43	RT2.5X2....	.386	7.813	7	.201	0	z	8	6408.056	11539....	724.04	724.04	3090.909	3090.909	2....	H.1-1
32	M46	RT2.5X2....	.385	0	7	.201	7.813	z	8	6408.056	11539....	724.04	724.04	3090.909	3090.909	2....	H.1-1
33	M63	RT2.5X2....	.355	0	2	.410	5.785	y	2	7932.15	11539....	724.04	724.04	3090.909	3090.909	1....	H.1-1
34	M67	RT2.5X1....	.344	6.195	2	.052	0	y	8	3130.212	9090.909	363.005	495.581	3090.909	1636.364	1....	H.1-1
35	M68	RT2.5X1....	.343	6.195	2	.052	0	y	8	3130.212	9090.909	363.005	495.581	3090.909	1636.364	1....	H.1-1
36	M61	RT2.5X2....	.331	4.92	2	.090	2.611	z	6	8619.528	11539....	724.04	724.04	3090.909	3090.909	2....	H.1-1
37	M65	RT2.5X2....	.329	0	2	.090	2.309	z	6	8619.528	11539....	724.04	724.04	3090.909	3090.909	2....	H.1-1
38	M6	RT2.5X2....	.322	8.5	8	.092	0	z	12	5528.073	11539....	724.04	724.04	3090.909	3090.909	3....	H.1-1
39	M54	RT2.5X2....	.322	0	8	.044	4.25	y	6	5528.073	11539....	724.04	724.04	3090.909	3090.909	3....	H.1-1
40	M59	RT2.5X2....	.315	0	2	.096	0	z	2	10575....	11539....	724.04	724.04	3090.909	3090.909	1....	H.1-1
41	M56	RT2.5X2....	.313	2.601	2	.096	0	z	2	10572....	11539....	724.04	724.04	3090.909	3090.909	1....	H.1-1
42	M32	RT2.5X1....	.299	0	2	.078	0	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
43	M7	RT2.5X1....	.298	0	2	.078	0	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
44	M33	RT2.5X1....	.292	4.453	2	.102	4.453	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
45	M8	RT2.5X1....	.290	4.453	2	.102	4.453	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
46	M60	RT2.5X2....	.242	0	2	.053	0	z	8	10566....	11539....	724.04	724.04	3090.909	3090.909	1....	H.1-1
47	M55	RT2.5X2....	.241	2.605	2	.053	2.605	z	8	10568....	11539....	724.04	724.04	3090.909	3090.909	1....	H.1-1
48	M9	RT2.5X1....	.226	0	2	.042	0	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1
49	M66	RT2.5X1....	.226	3.161	6	.041	0	y	6	3130.212	9090.909	363.005	495.581	3090.909	1636.364	1....	H.1-1
50	M69	RT2.5X1....	.226	3.161	6	.041	0	y	6	3130.212	9090.909	363.005	495.581	3090.909	1636.364	1....	H.1-1
51	M11	RT2.5X2....	.224	2.893	2	.090	5.785	y	7	7932.15	11539....	724.04	724.04	3090.909	3090.909	1....	H.1-1
52	M53	RT2.5X1....	.224	0	2	.042	0	z	2	5353.013	9090.909	363.005	495.581	3090.909	1636.364	2....	H.1-1

TYPICAL SHELTER ANCHORAGE DESIGN

Page 1,500 – 1,999

ANCHORAGE DESIGN

Project Number	HANDI HUT 222-411	Sheet	1,500		
Project Name		Designed by		Date	
Subject		Checked by		Date	

ANCHORS @ MIDDLE

						Design Loads	
Horizontal	=	-382	lbs	As per page 1018	x 1.6	-611.2	lbs
Vertical	=	-267	lbs		x 1.6	-427.2	lbs
Moment	=	-382	lb-ft		x 1.6	-611.2	lb-ft

USE [(2) 1/2" ø Hilti Kwik Bolt TZ Carbon Steel Anchors , min 3 3/4" embedment, as per pages 1501 to 1511]

Hilti PROFIS Engineering 3.0.74

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Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	HANDIHUT 222-411 (1)	Date:	1/25/2022
Fastening point:			

Specifier's comments:

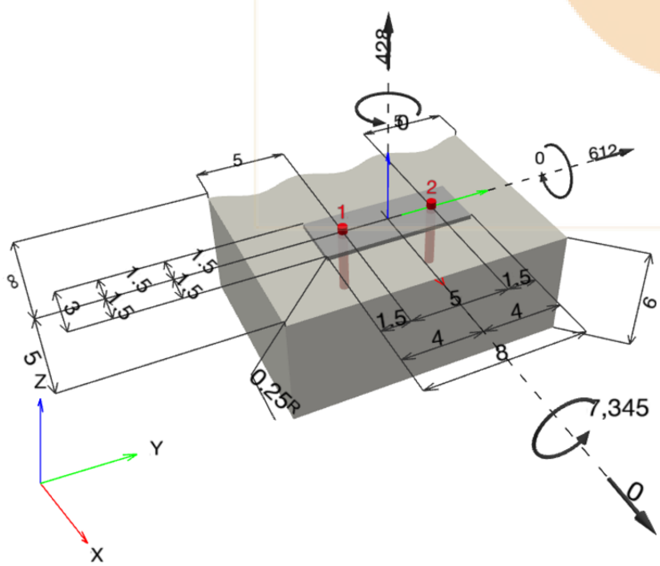
1 Input data

Anchor type and diameter:	**Kwik Bolt TZ - CS 1/2 (3 1/4)**
Item number:	not available
Effective embedment depth:	$h_{ef,act}$ = 3.250 in., h_{nom} = 3.625 in.
Material:	Carbon Steel
Evaluation Service Report:	ESR-1917
Issued I Valid:	1/1/2020 | 5/1/2021
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.250 in.
Anchor plate[R] :	l_x x l_y x t = 3.000 in. x 8.000 in. x 0.250 in.; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, 3000, f_c' = 3,000 psi; h = 6.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar

Application also possible with Kwik Bolt TZ2 - CS 1/2 (3 1/4) under the selected boundary conditions.
More information in section Alternative fastening data of this report.

R - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [in.] & Loading [lb, in.lb]



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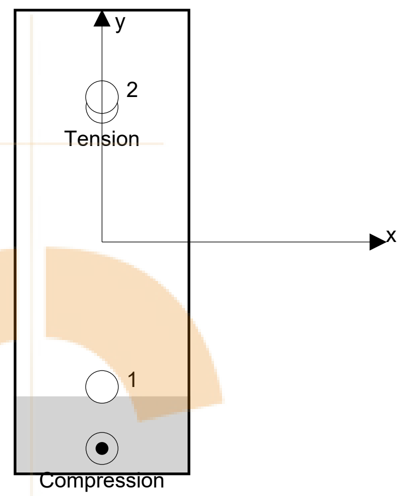
Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	HANDIHUT 222-411 (1)	Date:	1/25/2022
Fastening point:			

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 428; V_x = 0; V_y = 612;$ $M_x = 7{,}345; M_y = 0; M_z = 0;$	no	42

2 Load case/Resulting anchor forces



Anchor reactions [lb]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	52	306	0	306
2	1,454	306	0	306

max. concrete compressive strain: 0.13 [‰]
max. concrete compressive stress: 547 [psi]
resulting tension force in (x/y)=(0.000/2.327): 1,506 [lb]
resulting compression force in (x/y)=(0.000/-3.562): 1,078 [lb]

Anchor forces are calculated based on the assumption of a rigid anchor plate.

3 Tension load

	Load N_{ua} [lb]	Capacity ϕ N_n [lb]	Utilization $\beta_N = N_{ua}/\phi$ N_n	Status
Steel Strength*	1,454	8,029	19	OK
Pullout Strength*	1,454	3,500	42	OK
Concrete Breakout Failure**	1,506	3,631	42	OK

* highest loaded anchor **anchor group (anchors in tension)

Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	HANDIHUT 222-411 (1)	Date:	1/25/2022
Fastening point:			

3.1 Steel Strength

N_{sa} = ESR value refer to ICC-ES ESR-1917

$\phi\ N_{sa} \geq N_{ua}$ ACI 318-14 Table 17.3.1.1

Variables

$A_{se,N}$ [in.^{2}]	f_{uta} [psi]
0.10	106,000

Calculations

N_{sa} [lb]
10,705

Results

N_{sa} [lb]	ϕ_{steel}	$\phi\ N_{sa}$ [lb]	N_{ua} [lb]
10,705	0.750	8,029	1,454

3.2 Pullout Strength

$N_{pn,f'_c} = N_{p,2500}\ \lambda_a\ (f_c'/2500)^{0.5}$ refer to ICC-ES ESR-1917

$\phi\ N_{pn,f'_c} \geq N_{ua}$ ACI 318-14 Table 17.3.1.1

Variables

f'_c [psi]	λ_a	$N_{p,2500}$ [lb]
3,000	1.000	4,915

Calculations

$(f_c'/2500)^{0.5}$
1.095

Results

N_{pn,f'_c} [lb]	$\phi_{concrete}$	$\phi\ N_{pn,f'_c}$ [lb]	N_{ua} [lb]
5,384	0.650	3,500	1,454

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3.3 Concrete Breakout Failure

$N_{cbg} = \left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ec,N}\ \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b$ — ACI 318-14 Eq. (17.4.2.1b)

$\phi\ N_{cbg} \geq N_{ua}$ — ACI 318-14 Table 17.3.1.1

A_{Nc} see ACI 318-14, Section 17.4.2.1, Fig. R 17.4.2.1(b)

$A_{Nc0} = 9\ h_{ef}^2$ — ACI 318-14 Eq. (17.4.2.1c)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2\ e'_N}{3\ h_{ef}}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.2.4)

$\psi_{ed,N} = 0.7 + 0.3\left(\frac{c_{a,min}}{1.5h_{ef}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.2.5b)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5h_{ef}}{c_{ac}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.2.7b)

$N_b = k_c\ \lambda_a\ \sqrt{f'_c}\ h_{ef}^{1.5}$ — ACI 318-14 Eq. (17.4.2.2a)

Variables

h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$
3.250	0.000	2.327	5.000	1.000

c_{ac} [in.]	k_c	λ_a	f'_c [psi]
7.500	17	1.000	3,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
143.81	95.06	1.000	0.677	1.000	1.000	5,455

Results

N_{cbg} [lb]	$\phi_{concrete}$	$\phi\ N_{cbg}$ [lb]	N_{ua} [lb]
5,587	0.650	3,631	1,506

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4 Shear load

	Load V_{ua} [lb]	Capacity ϕ V_n [lb]	Utilization $\beta_V = V_{ua}/\phi$ V_n	Status
Steel Strength*	306	3,572	9	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	612	11,554	6	OK
Concrete edge failure in direction y+**	612	2,070	30	OK

* highest loaded anchor **anchor group (relevant anchors)

4.1 Steel Strength

V_{sa} = ESR value refer to ICC-ES ESR-1917
ϕ $V_{steel} \geq V_{ua}$ ACI 318-14 Table 17.3.1.1

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]
0.10	106,000

Calculations

V_{sa} [lb]
5,495

Results

V_{sa} [lb]	ϕ $_{steel}$	ϕ V_{sa} [lb]	V_{ua} [lb]
5,495	0.650	3,572	306

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4.2 Pryout Strength

$V_{cpg} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ec,N}\ \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b \right]$ ACI 318-14 Eq. (17.5.3.1b)

$\phi\ V_{cpg} \geq V_{ua}$ ACI 318-14 Table 17.3.1.1

A_{Nc} see ACI 318-14, Section 17.4.2.1, Fig. R 17.4.2.1(b)

$A_{Nc0} = 9\ h_{ef}^2$ ACI 318-14 Eq. (17.4.2.1c)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2\ e_N'}{3\ h_{ef}}}\right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.4)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5h_{ef}}\right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.5b)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5h_{ef}}{c_{ac}}\right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.7b)

$N_b = k_c\ \lambda_a \sqrt{f_c'}\ h_{ef}^{1.5}$ ACI 318-14 Eq. (17.4.2.2a)

Variables

k_{cp}	h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
2	3.250	0.000	0.000	5.000

$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f_c' [psi]
1.000	7.500	17	1.000	3,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
143.81	95.06	1.000	1.000	1.000	1.000	5,455

Results

V_{cpg} [lb]	$\phi_{concrete}$	$\phi\ V_{cpg}$ [lb]	V_{ua} [lb]
16,506	0.700	11,554	612

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4.3 Concrete edge failure in direction y+

$V_{cb} = \left(\frac{A_{Vc}}{A_{Vc0}}\right) \psi_{ed,V}\ \psi_{c,V}\ \psi_{h,V}\ \psi_{parallel,V}\ V_b$ ACI 318-14 Eq. (17.5.2.1a)

$\phi\ V_{cb} \geq V_{ua}$ ACI 318-14 Table 17.3.1.1

A_{Vc} see ACI 318-14, Section 17.5.2.1, Fig. R 17.5.2.1(b)

$A_{Vc0} = 4.5\ c_{a1}^2$ ACI 318-14 Eq. (17.5.2.1c)

$\psi_{ed,V} = 0.7 + 0.3\left(\frac{c_{a2}}{1.5c_{a1}}\right) \leq 1.0$ ACI 318-14 Eq. (17.5.2.6b)

$\psi_{h,V} = \sqrt{\frac{1.5c_{a1}}{h_a}} \geq 1.0$ ACI 318-14 Eq. (17.5.2.8)

$V_b = \left(7\left(\frac{l_e}{d_a}\right)^{0.2} \sqrt{d_a}\right) \lambda_a \sqrt{f'_c}\ c_{a1}^{1.5}$ ACI 318-14 Eq. (17.5.2.2a)

Variables

c_{a1} [in.]	c_{a2} [in.]	$\psi_{c,V}$	h_a [in.]	l_e [in.]
5.000	5.000	1.000	6.000	3.250

λ_a	d_a [in.]	f'_c [psi]	$\psi_{parallel,V}$
1.000	0.500	3,000	1.000

Calculations

A_{Vc} [in.^{2}]	A_{Vc0} [in.^{2}]	$\psi_{ed,V}$	$\psi_{h,V}$	V_b [lb]
75.00	112.50	0.900	1.118	4,407

Results

V_{cb} [lb]	$\phi_{concrete}$	$\phi\ V_{cb}$ [lb]	V_{ua} [lb]
2,957	0.700	2,070	612

5 Combined tension and shear loads

β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
0.415	0.296	5/3	37	OK

$\beta_{NV} = \beta_N^{\zeta} + \beta_V^{\zeta} <= 1$

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6 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member. Condition B applies where such supplementary reinforcement is not provided, or where pullout or pryout strength governs.
- Refer to the manufacturer's product literature for cleaning and installation instructions.
- For additional information about ACI 318 strength design provisions, please go to https://submittals.us.hilti.com/PROFISAnchorDesignGuide/
- Hilti post-installed anchors shall be installed in accordance with the Hilti Manufacturer's Printed Installation Instructions (MPII). Reference ACI 318-14, Section 17.8.1.

Fastening meets the design criteria!

7 Installation data

Profile: no profile

Hole diameter in the fixture: d_f = 0.562 in.

Plate thickness (input): 0.250 in.

Recommended plate thickness: not calculated

Drilling method: Hammer drilled

Cleaning: Manual cleaning of the drilled hole according to instructions for use is required.

Anchor type and diameter: Kwik Bolt TZ - CS 1/2 (3 1/4)

Item number: not available

Maximum installation torque: 480 in.lb

Hole diameter in the base material: 0.500 in.

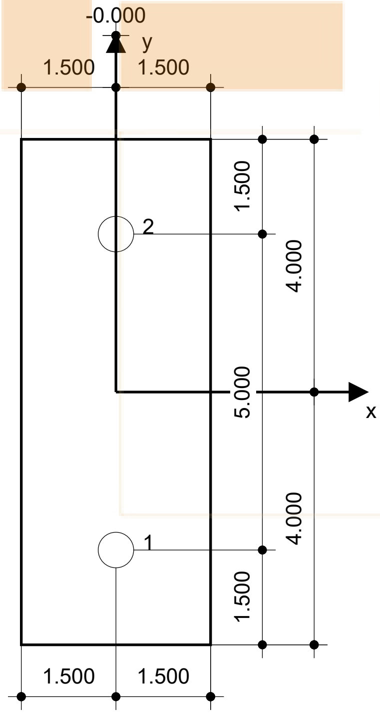
Hole depth in the base material: 4.000 in.

Minimum thickness of the base material: 6.000 in.

Hilti KB-TZ stud anchor with 3.625 in embedment, 1/2 (3 1/4), Carbon steel, installation per ESR-1917

7.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Manual blow-out pump	• Torque controlled cordless impact tool • Torque wrench • Hammer



Coordinates Anchor [in.]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	0.000	-2.500	-	5.000	5.000	10.000
2	0.000	2.500	-	5.000	10.000	5.000

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8 Alternative fastening

8.1 Alternative fastening data

Anchor type and diameter:	**Kwik Bolt TZ2 - CS 1/2 (3 1/4)**
Item number:	2210255 KB-TZ2 1/2x4 1/2
Effective embedment depth:	$h_{ef,act}$ = 3.250 in., h_{nom} = 3.750 in.
Material:	Carbon Steel
Evaluation Service Report:	ESR-4266
Issued I Valid:	7/1/2021 | 12/1/2021
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.250 in.
Anchor plate^R :	l_x x l_y x t = 3.000 in. x 8.000 in. x 0.250 in.; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, 3000, f_c' = 3,000 psi; h = 6.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar

Max. Utilization with Kwik Bolt TZ2 - CS 1/2 (3 1/4): 42 %
Fastening meets the design criteria!

8.2 Installation data

Profile: no profile
Hole diameter in the fixture: d_f = 0.562 in.
Plate thickness (input): 0.250 in.
Recommended plate thickness: not calculated
Drilling method: Hammer drilled
Cleaning: Manual cleaning of the drilled hole according to instructions for use is required.

Anchor type and diameter: Kwik Bolt TZ2 - CS 1/2 (3 1/4)
Item number: 2210255 KB-TZ2 1/2x4 1/2
Maximum installation torque: 602 in.lb
Hole diameter in the base material: 0.500 in.
Hole depth in the base material: 4.250 in.
Minimum thickness of the base material: 5.500 in.

Hilti KB-TZ2 stud anchor with 3.75 in embedment, 1/2 (3 1/4), Carbon steel, installation per ESR-4266

8.2.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Manual blow-out pump	• Torque controlled cordless impact tool • Torque wrench • Hammer

9 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
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ANCHORAGE DESIGN

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Subject		Checked by		Date	

ANCHORS @ DOOR LOCATION

						Design Loads	
Horizontal	=	-272	lbs	As per page 1018	x 1.6	-435.2	lbs
Vertical	=	-247	lbs		x 1.6	-395.2	lbs
Moment	=	-284	lb-ft		x 1.6	-454.4	lb-ft

USE [(1) 1/2" ø Hilti Kwik Bolt TZ Carbon Steel Anchors , min 3 3/4" embedment, as per pages 1513 to 1523]

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Specifier's comments:

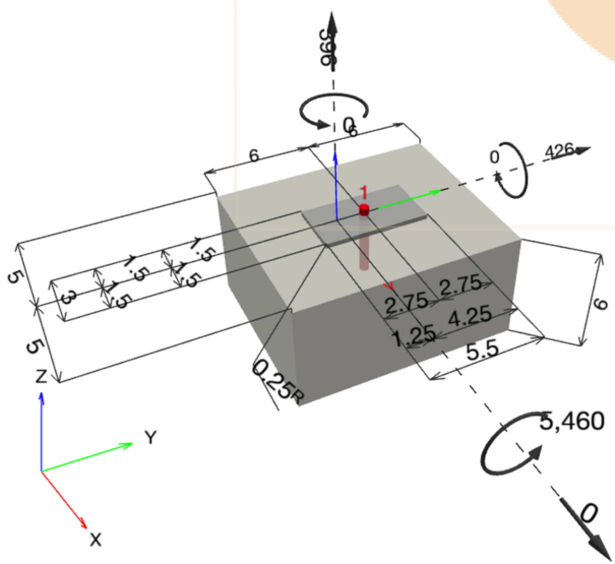
1 Input data

Anchor type and diameter:	**Kwik Bolt TZ - CS 1/2 (3 1/4)**
Item number:	not available
Effective embedment depth:	$h_{ef,act}$ = 3.250 in., h_{nom} = 3.625 in.
Material:	Carbon Steel
Evaluation Service Report:	ESR-1917
Issued I Valid:	1/1/2020 | 5/1/2021
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.250 in.
Anchor plate[R] :	l_x x l_y x t = 3.000 in. x 5.500 in. x 0.250 in.; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, 3000, f_c' = 3,000 psi; h = 6.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar

Application also possible with Kwik Bolt TZ2 - CS 1/2 (3 1/4) under the selected boundary conditions.
More information in section Alternative fastening data of this report.

R - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [in.] & Loading [lb, in.lb]



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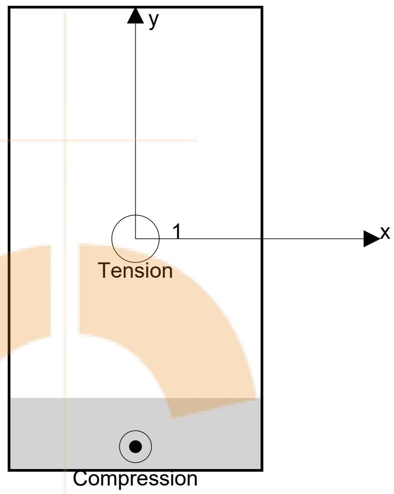
1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	N = 396; V_x = 0; V_y = 426; M_x = 5,460; M_y = 0; M_z = 0;	no	68

2 Load case/Resulting anchor forces



Anchor reactions [lb]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	2,367	426	0	426

max. concrete compressive strain:	0.36 [‰]
max. concrete compressive stress:	1,557 [psi]
resulting tension force in (x/y)=(0.000/0.000):	2,367 [lb]
resulting compression force in (x/y)=(0.000/-2.469):	1,971 [lb]

Anchor forces are calculated based on the assumption of a rigid anchor plate.

3 Tension load

	Load N_{ua} [lb]	**Capacity ϕ N_n [lb]**	**Utilization $\beta_N = N_{ua}/\phi$ N_n**	**Status**
Steel Strength*	2,367	8,029	30	OK
Pullout Strength*	2,367	3,500	68	OK
Concrete Breakout Failure**	2,367	3,546	67	OK

* highest loaded anchor **anchor group (anchors in tension)

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3.1 Steel Strength

N_{sa} = ESR value refer to ICC-ES ESR-1917
$\phi\ N_{sa} \geq N_{ua}$ ACI 318-14 Table 17.3.1.1

Variables

$A_{se,N}$ [in.^{2}]	f_{uta} [psi]
0.10	106,000

Calculations

N_{sa} [lb]
10,705

Results

N_{sa} [lb]	ϕ_{steel}	$\phi\ N_{sa}$ [lb]	N_{ua} [lb]
10,705	0.750	8,029	2,367

3.2 Pullout Strength

$N_{pn,f'_c} = N_{p,2500}\ \lambda_a\ (f_c'/2500)^{0.5}$ refer to ICC-ES ESR-1917
$\phi\ N_{pn,f'_c} \geq N_{ua}$ ACI 318-14 Table 17.3.1.1

Variables

f'_c [psi]	λ_a	$N_{p,2500}$ [lb]
3,000	1.000	4,915

Calculations

$(f_c'/2500)^{0.5}$
1.095

Results

N_{pn,f'_c} [lb]	$\phi_{concrete}$	$\phi\ N_{pn,f'_c}$ [lb]	N_{ua} [lb]
5,384	0.650	3,500	2,367

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3.3 Concrete Breakout Failure

$N_{cb} = \left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b$ ACI 318-14 Eq. (17.4.2.1a)

$\phi\ N_{cb} \geq N_{ua}$ ACI 318-14 Table 17.3.1.1

A_{Nc} see ACI 318-14, Section 17.4.2.1, Fig. R 17.4.2.1(b)

$A_{Nc0} = 9\ h_{ef}^2$ ACI 318-14 Eq. (17.4.2.1c)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5h_{ef}}\right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.5b)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5h_{ef}}{c_{ac}}\right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.7b)

$N_b = k_c\ \lambda_a\ \sqrt{f'_c}\ h_{ef}^{1.5}$ ACI 318-14 Eq. (17.4.2.2a)

Variables

h_{ef} [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f'_c [psi]
3.250	5.000	1.000	7.500	17	1.000	3,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
95.06	95.06	1.000	1.000	5,455

Results

N_{cb} [lb]	$\phi_{concrete}$	$\phi\ N_{cb}$ [lb]	N_{ua} [lb]
5,455	0.650	3,546	2,367

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4 Shear load

	Load V_{ua} [lb]	Capacity ϕV_n [lb]	Utilization $\beta_V = V_{ua}/\phi V_n$	Status
Steel Strength*	426	3,572	12	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	426	7,638	6	OK
Concrete edge failure in direction y+**	426	1,748	25	OK

* highest loaded anchor **anchor group (relevant anchors)

4.1 Steel Strength

V_{sa} = ESR value refer to ICC-ES ESR-1917

$\phi V_{steel} \geq V_{ua}$ ACI 318-14 Table 17.3.1.1

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]
0.10	106,000

Calculations

V_{sa} [lb]
5,495

Results

V_{sa} [lb]	ϕ_{steel}	ϕV_{sa} [lb]	V_{ua} [lb]
5,495	0.650	3,572	426

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4.2 Pryout Strength

$V_{cp} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b \right]$ ACI 318-14 Eq. (17.5.3.1a)

$\phi\ V_{cp} \geq V_{ua}$ ACI 318-14 Table 17.3.1.1

A_{Nc} see ACI 318-14, Section 17.4.2.1, Fig. R 17.4.2.1(b)

$A_{Nc0} = 9\ h_{ef}^2$ ACI 318-14 Eq. (17.4.2.1c)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5h_{ef}} \right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.5b)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5h_{ef}}{c_{ac}} \right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.7b)

$N_b = k_c\ \lambda_a\ \sqrt{f'_c}\ h_{ef}^{1.5}$ ACI 318-14 Eq. (17.4.2.2a)

Variables

k_{cp}	h_{ef} [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$
2	3.250	5.000	1.000

c_{ac} [in.]	k_c	λ_a	f'_c [psi]
7.500	17	1.000	3,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
95.06	95.06	1.000	1.000	5,455

Results

V_{cp} [lb]	$\phi_{concrete}$	$\phi\ V_{cp}$ [lb]	V_{ua} [lb]
10,911	0.700	7,638	426

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4.3 Concrete edge failure in direction y+

$V_{cb} = \left(\frac{A_{Vc}}{A_{Vc0}}\right) \psi_{ed,V} \; \psi_{c,V} \; \psi_{h,V} \; \psi_{parallel,V} \; V_b$ ACI 318-14 Eq. (17.5.2.1a)

$\phi \; V_{cb} \geq V_{ua}$ ACI 318-14 Table 17.3.1.1

A_{Vc} see ACI 318-14, Section 17.5.2.1, Fig. R 17.5.2.1(b)

$A_{Vc0} = 4.5 \; c_{a1}^2$ ACI 318-14 Eq. (17.5.2.1c)

$\psi_{ed,V} = 0.7 + 0.3\left(\frac{c_{a2}}{1.5c_{a1}}\right) \leq 1.0$ ACI 318-14 Eq. (17.5.2.6b)

$\psi_{h,V} = \sqrt{\frac{1.5c_{a1}}{h_a}} \geq 1.0$ ACI 318-14 Eq. (17.5.2.8)

$V_b = \left(7 \left(\frac{l_e}{d_a}\right)^{0.2} \sqrt{d_a}\right) \lambda_a \; \sqrt{f'_c} \; c_{a1}^{1.5}$ ACI 318-14 Eq. (17.5.2.2a)

Variables

c_{a1} [in.]	c_{a2} [in.]	$\psi_{c,V}$	h_a [in.]	l_e [in.]
4.000	5.000	1.000	6.000	3.250

λ_a	d_a [in.]	f'_c [psi]	$\psi_{parallel,V}$
1.000	0.500	3,000	1.000

Calculations

A_{Vc} [in.^{2}]	A_{Vc0} [in.^{2}]	$\psi_{ed,V}$	$\psi_{h,V}$	V_b [lb]
60.00	72.00	0.950	1.000	3,154

Results

V_{cb} [lb]	$\phi_{concrete}$	$\phi \; V_{cb}$ [lb]	V_{ua} [lb]
2,497	0.700	1,748	426

5 Combined tension and shear loads

β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
0.676	0.244	5/3	62	OK

$\beta_{NV} = \beta_N^{\zeta} + \beta_V^{\zeta} <= 1$

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6 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member. Condition B applies where such supplementary reinforcement is not provided, or where pullout or pryout strength governs.
- Refer to the manufacturer's product literature for cleaning and installation instructions.
- For additional information about ACI 318 strength design provisions, please go to https://submittals.us.hilti.com/PROFISAnchorDesignGuide/
- Hilti post-installed anchors shall be installed in accordance with the Hilti Manufacturer's Printed Installation Instructions (MPII). Reference ACI 318-14, Section 17.8.1.

Fastening meets the design criteria!

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7 Installation data

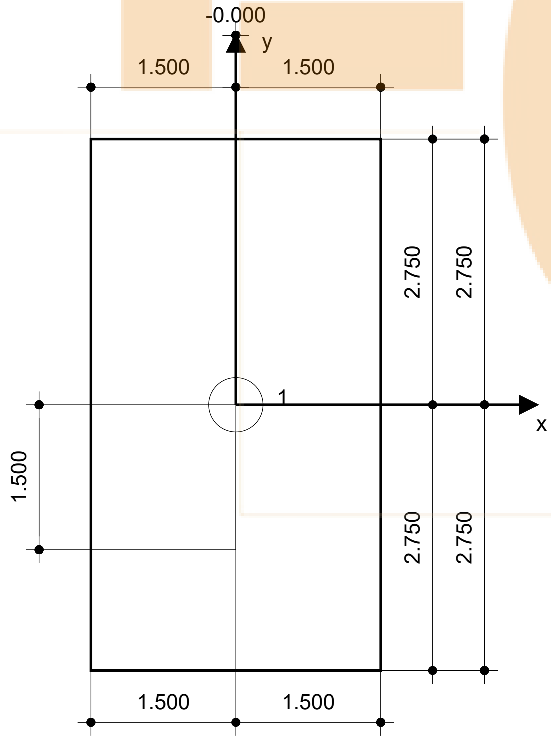
Profile: no profile
Hole diameter in the fixture: d_f = 0.562 in.
Plate thickness (input): 0.250 in.
Recommended plate thickness: not calculated
Drilling method: Hammer drilled
Cleaning: Manual cleaning of the drilled hole according to instructions for use is required.

Anchor type and diameter: Kwik Bolt TZ - CS 1/2 (3 1/4)
Item number: not available
Maximum installation torque: 480 in.lb
Hole diameter in the base material: 0.500 in.
Hole depth in the base material: 4.000 in.
Minimum thickness of the base material: 6.000 in.

Hilti KB-TZ stud anchor with 3.625 in embedment, 1/2 (3 1/4), Carbon steel, installation per ESR-1917

7.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Manual blow-out pump	• Torque controlled cordless impact tool • Torque wrench • Hammer



Coordinates Anchor [in.]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-0.000	0.000	5.000	5.000	6.000	6.000

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8 Alternative fastening

8.1 Alternative fastening data

Anchor type and diameter:	**Kwik Bolt TZ2 - CS 1/2 (3 1/4)**
Item number:	2210255 KB-TZ2 1/2x4 1/2
Effective embedment depth:	$h_{ef,act}$ = 3.250 in., h_{nom} = 3.750 in.
Material:	Carbon Steel
Evaluation Service Report:	ESR-4266
Issued I Valid:	7/1/2021 | 12/1/2021
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.250 in.
Anchor plate^R :	l_x x l_y x t = 3.000 in. x 5.500 in. x 0.250 in.; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, 3000, f_c' = 3,000 psi; h = 6.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar

Max. Utilization with Kwik Bolt TZ2 - CS 1/2 (3 1/4): 67 %
Fastening meets the design criteria!

8.2 Installation data

Anchor type and diameter: Kwik Bolt TZ2 - CS 1/2 (3 1/4)
Item number: 2210255 KB-TZ2 1/2x4 1/2
Maximum installation torque: 602 in.lb
Hole diameter in the base material: 0.500 in.
Hole depth in the base material: 4.250 in.
Minimum thickness of the base material: 5.500 in.

Profile: no profile
Hole diameter in the fixture: d_f = 0.562 in.
Plate thickness (input): 0.250 in.
Recommended plate thickness: not calculated
Drilling method: Hammer drilled
Cleaning: Manual cleaning of the drilled hole according to instructions for use is required.

Hilti KB-TZ2 stud anchor with 3.75 in embedment, 1/2 (3 1/4), Carbon steel, installation per ESR-4266

8.2.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Manual blow-out pump	• Torque controlled cordless impact tool • Torque wrench • Hammer

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9 Remarks; Your Cooperation Duties

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PROJECT Conclusion:

The Project is Twin wall polycarbonate roof Glazing with Glass wall panels.
The Shelter is Adequate for assigned loading condition and the member sizes as shown in the drawings.