

Fleming Structural PLLC

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JOB TITLE MASS UNITS - IN

EDINBURGH, IN

JOB NO. 2021-84

SHEET NO.

CALCULATED BY PDF

DATE 2/16/2022

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CS2018 Ver 2021.08.20

Storage Express LLC

305 County Line Rd.
Edinburgh, IN 46124

STRUCTURAL CALCULATIONS

FOR

GROUND SUPPORT ANCHORAGE

MASS UNITS - IN

EDINBURGH, IN 46124



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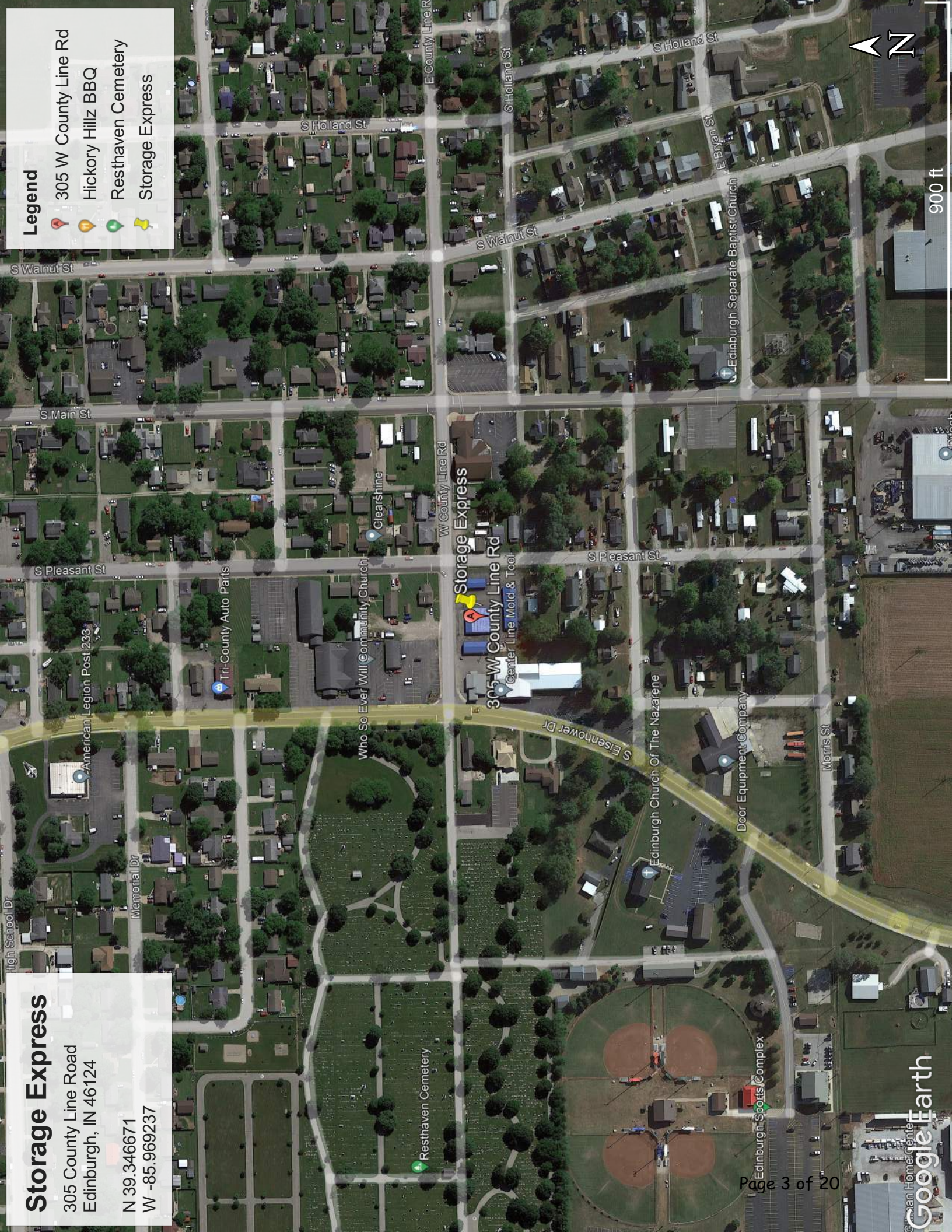
Storage Express

305 County Line Road
Edinburg, IN 46124

N 39.346671
W -85.969237

Legend

-  305 W County Line Rd
-  Hickory Hillz BBQ
-  Resthaven Cemetary
-  Storage Express



DesignCriteriabyZIP

Design Criteria

Location: 305 County Line Road
Edinburgh, IN 46124
Latitude: 39.3467 **Longitude:** -85.9693

General: Occupancy Category:

Wind Speed: ASCE7-16 Wind Results:
Risk Category I: 99
Risk Category II: 106
Risk Category III: 112
Risk Category IV: 117

ASCE7-10 Wind Results:
Risk Category I: 105
Risk Category II: 115
Risk Category III: 120
MRI 10 Year: 76
MRI 25 Year: 84
MRI 50 Year: 90
MRI 100 Year: 96

ASCE7-05 Wind Results: Located within the 90 mph contour. Interpolation between these two contours yields a basic wind speed of 90*.

Wind Importance Factor (I_w):
1.00 (Non-Hurricane Prone Region)

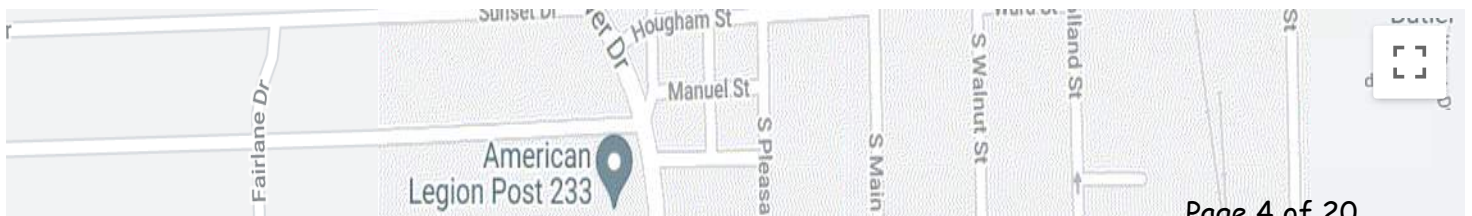
Ground Snow(ASCE7-10): 20

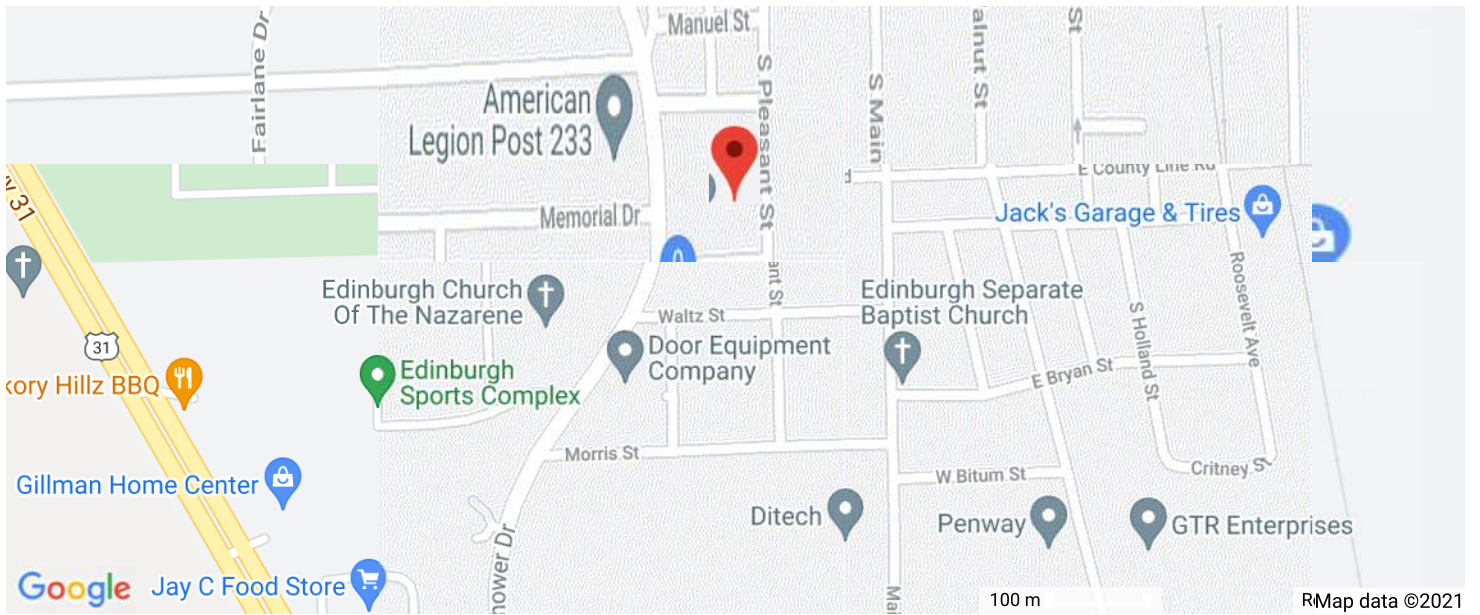
Ground Snow(ASCE7-16): 20

Seismic:

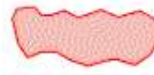
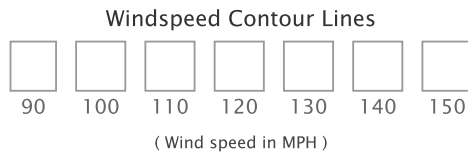
risk category:

Seismic Result: ss=0.17
sds=0.181
s1=0.091
sd1=0.146





LEGEND



Hatched Areas
 Special Wind Area
 Contact the local building official for design windspeed information.

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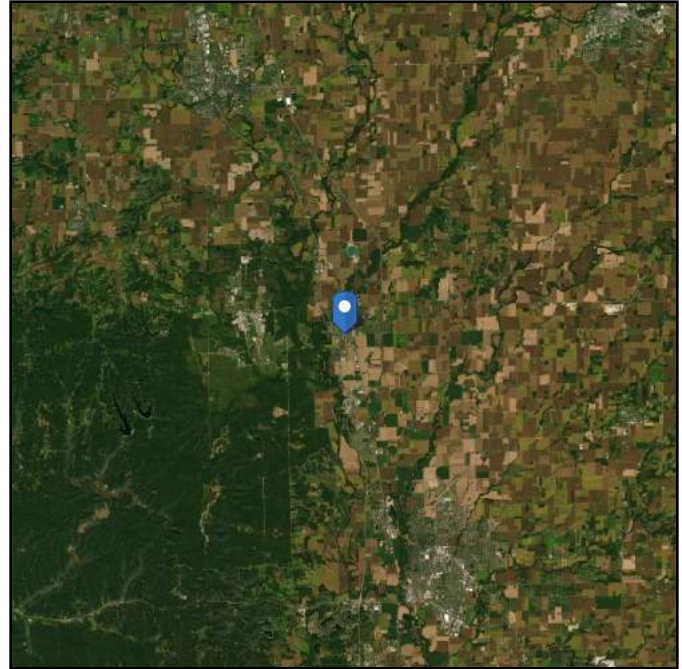
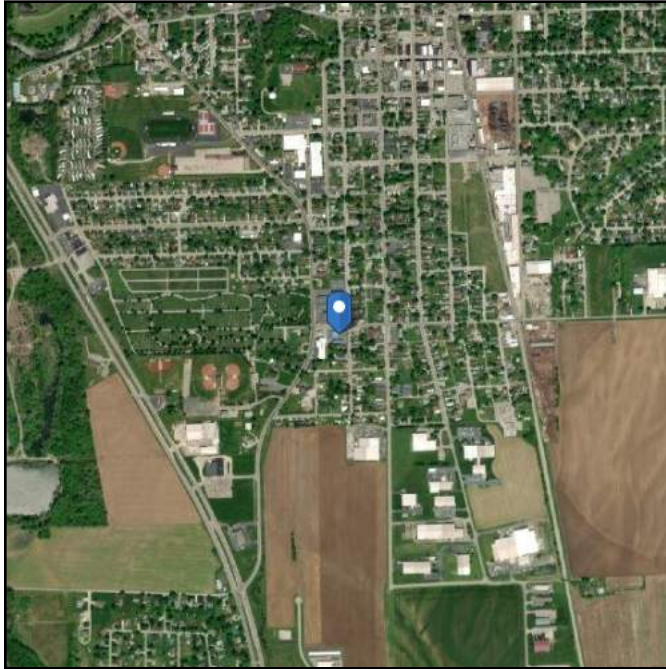
[TOS](#) [Privacy](#) [Refunds](#)

ASCE 7 Hazards Report

Address:
No Address at This
Location

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

Elevation: 668.39 ft (NAVD 88)
Latitude: 39.346671
Longitude: -85.969237



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 Sourced Accessed:

ASCE/SEI 7-10, Thu Dec 02,2021, Fig. 26.5-1A and Figs. CC-1–CC-4, and Section 26.5.2, incorporating errata of March 12, 2014

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).

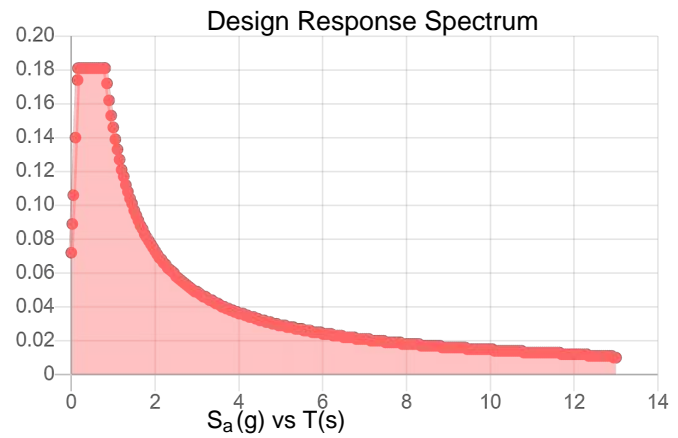
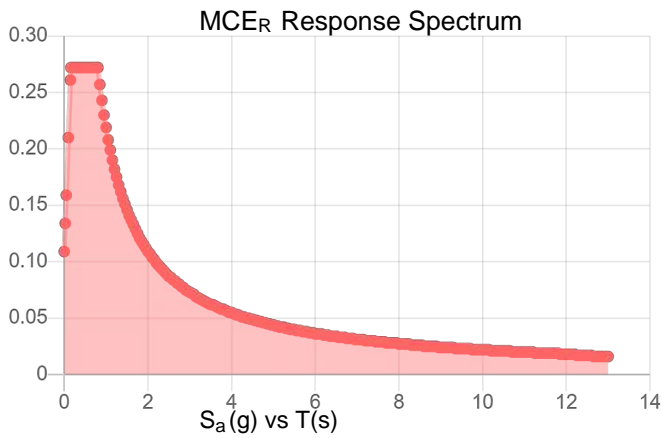
Site is not in a hurricane-prone region as defined in ASCE/SEI 7-10 Section 26.2.

Site Soil Class: D - Stiff Soil

Results:

S_s :	0.17	S_{DS} :	0.181
S_1 :	0.091	S_{D1} :	0.146
F_a :	1.6	T_L :	12
F_v :	2.4	PGA :	0.078
S_{MS} :	0.272	PGA _M :	0.125
S_{M1} :	0.219	F _{PGA} :	1.6
		I_e :	1

Seismic Design Category C



Data Accessed: Thu Dec 02 2021

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 : 20 lb/ft²
Elevation: 668.4 ft
Data Source: ASCE/SEI 7-10, Fig. 7-1.
Date Accessed: Thu Dec 02 2021

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.

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www.struware.com

CODE SUMMARY**Code:** International Building Code 2012 /ASCE 7-10**Live Loads:**

Roof 0 to 200 sf: 20 psf
 200 to 600 sf: 24 - 0.02Area, but not less than 12 psf
 over 600 sf: 12 psf

Typical Floor 125 psf
 Partitions N/A

Dead Loads:

Floor 10.0 psf
 Roof 10.0 psf

Wind Design Data:

Ultimate Design Wind Speed 115 mph
 Nominal Design Wind Speed 89.08 mph
 Risk Category II
 Mean Roof Ht (h) 10.0 ft
 Exposure Category C
 Enclosure Classif. Enclosed Building
 Internal pressure Coef. +/-0.18
 Directionality (Kd) 0.85

Roof Snow Loads:

Design Uniform Roof Snow load = 20.0 psf
 Flat Roof Snow Load Pf = 16.8 psf
 Balanced Snow Load Ps = 16.8 psf
 Ground Snow Load Pg = 20.0 psf
 Importance Factor I = 1.00
 Snow Exposure Factor Ce = 1.00
 Thermal Factor Ct = 1.20
 Sloped-roof Factor Cs = 1.00
 Drift Surcharge load Pd = 0.0 psf
 Width of Snow Drift w = 0.0 ft

Earthquake Design Data:

Risk Category = II
 Importance Factor I = 1.00
 Mapped spectral response acceleration Ss = 17.00
 S1 = 9.10
 Site Class = D
 Spectral Response Coef. Sds = 0.181
 Sd1 = 0.146
 Seismic Design Category = C
 Basic Structural System = Bearing Wall Systems
 Seismic Resisting System = Light frame (cold-formed steel) walls with wood panels or steel sheets
 Design Base Shear V = 0.028W
 Seismic Response Coef. Cs = 0.028
 Response Modification Factor R = 6.5
 Analysis Procedure = Equivalent Lateral-Force Analysis

CODE SUMMARY- continued

Component and cladding ultimate wind pressures

Roof Area	Surface Pressure (psf)			
	10 sf	50 sf	100 sf	500 sf
Negative Zone 1	-28.8	-27.1	-26.4	-26.4
Negative Zone 2	-48.4	-36.4	-31.3	-31.3
Negative Zone 3	-72.8	-43.7	-31.3	-31.3
Positive All Zones	16.0	16.0	16.0	16.0
Overhang Zone 1&2	-41.5	-39.8	-39.1	-26.9
Overhang Zone 3	-68.4	-34.2	-19.5	-19.5

Overhang soffit pressure equals adj wall pressure (which includes internal pressure of 4.4 psf)

Parapet Area	Solid Parapet Pressure (psf)					
	10 sf	20 sf	50 sf	100 sf	200 sf	500 sf
CASE A: Zone 2 :	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3 :	0.0	0.0	0.0	0.0	0.0	0.0
CASE B: Edge zones 2 :	0.0	0.0	0.0	0.0	0.0	0.0
Corner zones 3 :	0.0	0.0	0.0	0.0	0.0	0.0

Wall Area	Surface Pressure (psf)			
	10 sf	100 sf	200 sf	500 sf
Negative Zone 4	-28.6	-24.7	-23.5	-22.0
Negative Zone 5	-35.2	-27.4	-25.1	-22.0
Positive Zone 4 & 5	26.4	22.5	21.3	19.8

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Wind Loads - MWFRS $h \leq 60'$ (Low-rise Buildings) except for open buildings

$K_z = K_h$ (case 1) = 0.85
 Base pressure (qh) = **24.4 psf**
 $G_{Cpi} = +/-0.18$

Edge Strip (a) = 3.0 ft
 End Zone (2a) = 6.0 ft
 Zone 2 length = 5.0 ft

Wind Pressure Coefficients

Surface	CASE A			CASE B		
	GCpf	$\theta = 1.2$ deg w/-GCpi	w/+GCpi	GCpf	w/-GCpi	w/+GCpi
1	0.40	0.58	0.22	-0.45	-0.27	-0.63
2	-0.69	-0.51	-0.87	-0.69	-0.51	-0.87
3	-0.37	-0.19	-0.55	-0.37	-0.19	-0.55
4	-0.29	-0.11	-0.47	-0.45	-0.27	-0.63
5				0.40	0.58	0.22
6				-0.29	-0.11	-0.47
1E	0.61	0.79	0.43	-0.48	-0.30	-0.66
2E	-1.07	-0.89	-1.25	-1.07	-0.89	-1.25
3E	-0.53	-0.35	-0.71	-0.53	-0.35	-0.71
4E	-0.43	-0.25	-0.61	-0.48	-0.30	-0.66
5E				0.61	0.79	0.43
6E				-0.43	-0.25	-0.61

Ultimate Wind Surface Pressures (psf)

1	14.2	5.4	-6.6	-15.4
2	-12.5	-21.3	-12.5	-21.3
3	-4.6	-13.4	-4.6	-13.4
4	-2.7	-11.5	-6.6	-15.4
5			14.2	5.4
6			-2.7	-11.5
1E	19.3	10.5	-7.3	-16.1
2E	-21.7	-30.5	-21.7	-30.5
3E	-8.6	-17.3	-8.6	-17.3
4E	-6.1	-14.9	-7.3	-16.1
5E			19.3	10.5
6E			-6.1	-14.9

Parapet

Windward parapet = 0.0 psf (GCpn = +1.5)
 Leeward parapet = 0.0 psf (GCpn = -1.0)

Windward roof overhangs = 17.1 psf (upward) add to windward roof pressure

Horizontal MWFRS Simple Diaphragm Pressures (psf)

Transverse direction (normal to L)

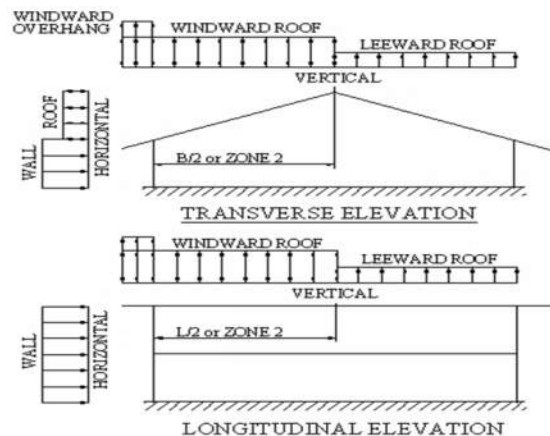
Interior Zone: Wall 16.9 psf
 Roof -7.8 psf **
 End Zone: Wall 25.4 psf
 Roof -13.2 psf **

Longitudinal direction (parallel to L)

Interior Zone: Wall 16.9 psf
 End Zone: Wall 25.4 psf

** NOTE: Total horiz force shall not be less than that determined by neglecting roof forces (except for MWFRS moment frames).

The code requires the MWFRS be designed for a min ultimate force of 16 psf multiplied by the wall area plus an 8 psf force applied to the vertical projection of the roof.



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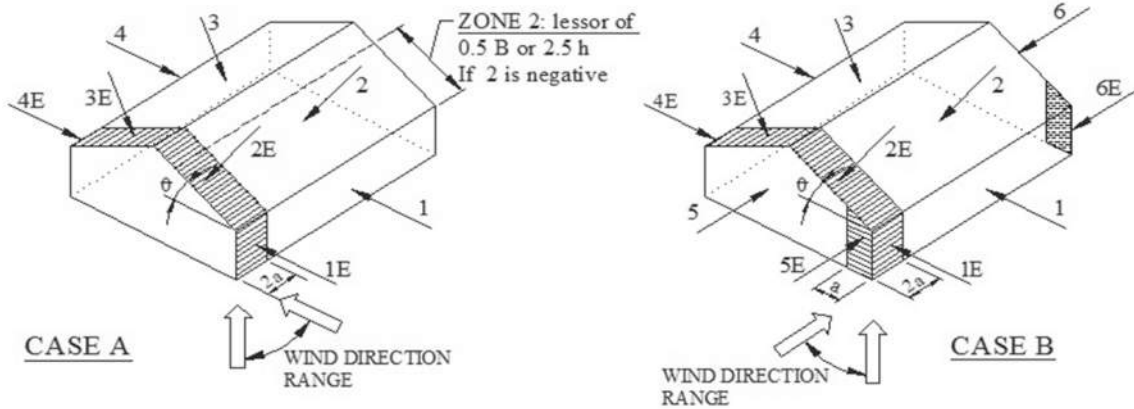
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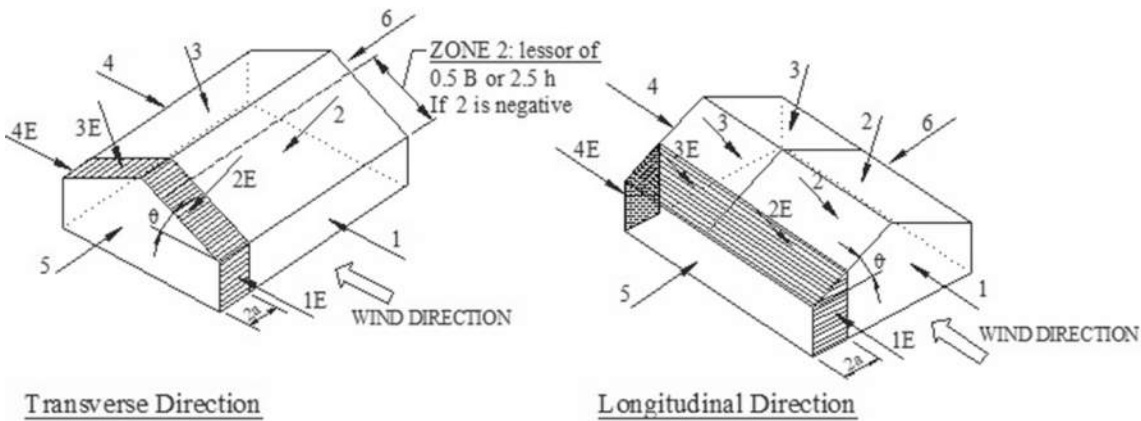
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NOTE: Torsional loads are 25% of zones 1 - 6. See code for loading diagram.
 Exception: One story buildings $h < 30'$ and 1 to 2 story buildings framed with light-frame construction or with flexible diaphragms need not be designed for the torsional load case.

ASCE 7-98 & ASCE 7-10 (& later) - MWFRS wind pressure zones



NOTE: Torsional loads are 25% of zones 1 - 4. See code for loading diagram.
 Exception: One story buildings $h < 30'$ and 1 to 2 story buildings framed with light-frame construction or with flexible diaphragms need not be designed for the torsional load case.

ASCE 7-02 and ASCE 7-05 - MWFRS wind pressure zones

3.6.4.3 Technical Data

Kwik-Flex Screw Allowable Pull-Out Values (Tension)^{1,2,3}

Screw Size	Drill Point Type	Pullout (lb)												
		Steel Gauge or Thickness (in.)										Aluminum Thickness (in.)		
		18 GA	16 GA	14 GA	12 GA	1/8	3/16	1/4	5/16	3/8	1/2	1/8	1/4	3/8
10-16	3	158	200	254	638	677	-	-	-	-	-	306	-	-
12-14	3	158	210	284	460	620	1159	-	-	-	-	210	914	-
1/4-14	3	159	212	274	480	740	1015	-	-	-	-	240	969	-
1/4-20	4	-	206	260	500	765	1045	1215	1275	-	-	230	700	1473

1 Steel members shall conform to ASTM A 36. Aluminum members shall be 6063-T5 aluminum alloy.

2 Based on using a safety factor of 3.0.

3 Refer to Section 3.6.4.5 for maximum drilling capacities.

Kwik-Flex Self-Drilling Screws 3.6.4

Kwik-Flex Screw Allowable Shear Values^{1,2,3}

Screw Size	Drill Point Type	Shear (lb)								
		Steel Gauge or Thickness - Fastened Material - Base Material							Aluminum Thickness (in.)	
		1/8"-1/4"	18-14 GA	16-16 GA	14-14 GA	1/8"-3/16"	3/16"-1/4"	1/4"-12 GA	1/8"-1/8"	1/8"-1/4"
10-16	3	545	693	585	-	-	-	-	587	-
12-14	3	526	847	662	727	-	-	-	335	475
1/4-14	3	558	925	672	967	635	-	-	405	590
1/4-20	4	540	835	633	980	670	715	660	395	570

1 Steel members shall conform to ASTM A 36. Aluminum members shall be 6063-T5 aluminum alloy.

2 Based on using a safety factor of 3.0.

3 Refer to Section 3.6.4.5 for maximum drilling capacities.

3.6.4.4 Installation Instructions

For general discussion of Hilti Screw Fastener installation, reference Section 3.6.1.7. For specific Kwik-Flex spacing and edge distance recommendations, reference the following table.

Kwik-Flex Screw Specification Table

Fastener Size/Diameter	Fastened Material	Minimum Spacing (in.)	Minimum Edge Distance (in.)
No. 10	Steel	5/8	9/32
	Aluminum	15/32	3/8
No. 12	Steel	11/16	3/8
	Aluminum	9/16	7/16
1/4 Inch	Steel	3/4	3/8
	Aluminum	5/8	1/2

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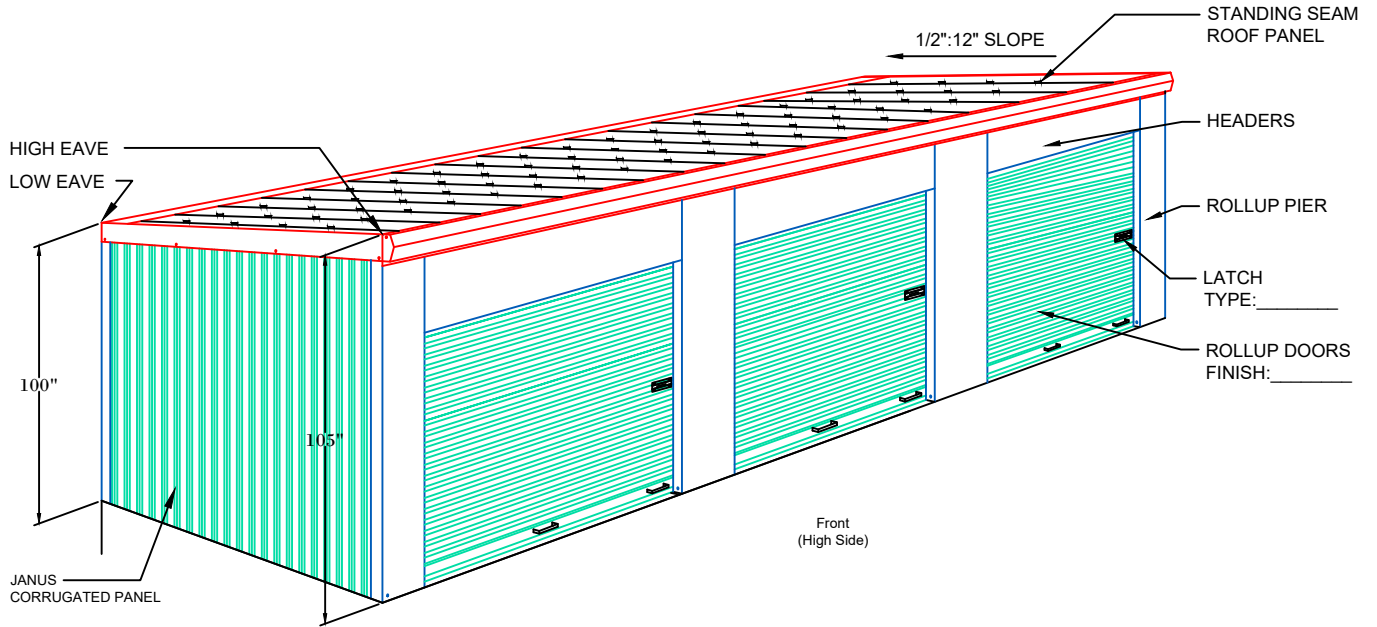
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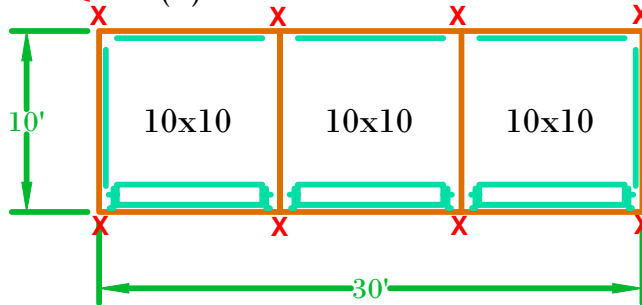
UNIT LAYOUT & SOIL ANCHOR ARRANGEMENT

30'x10' MASS PORTABLE BUILDING COMPONENT SELECTION



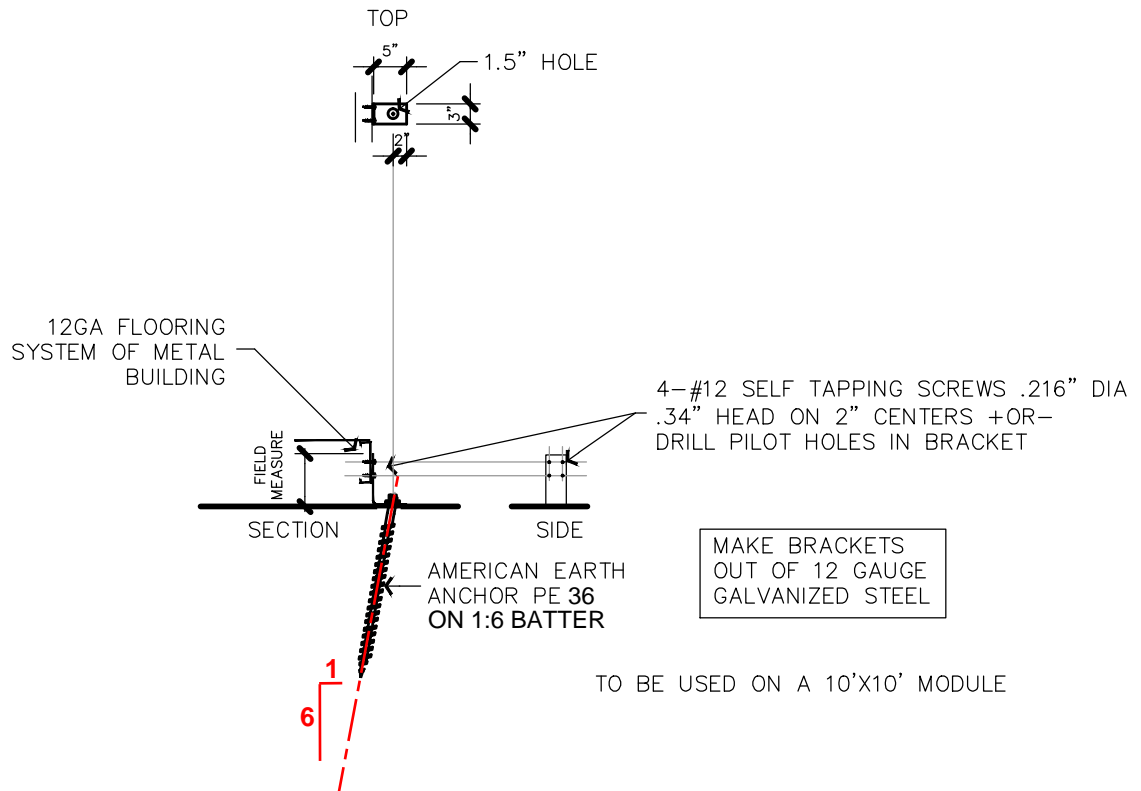
PE36 SOIL ANCHOR (TYP)

TWO UNIT CONFIGURATION (3)- 10x10 - SIDE ENTRY



BUILDING LOADS PER IBC 2012	
ROOF LIVE LOAD	20PSF
ROOF SNOW LOAD	30PSF
FLOOR LOAD (Equally distributed)	125PSF
DESIGN WIND SPEED*	115mph

NOTE: MASS UNIT LOCATION ON SITE WITH EXISTING ASPHALT PARKING LOT IN GOOD CONDITION = PE36 ANCHOR IN SOIL CLASS 1



BUILDING ANCHOR DETAIL

(NOTE: PROVIDE 8-ANCHORS FOR 30'x10' BLDG LAYOUT)



American Earth Anchors

The best screw you will have in the dirt™

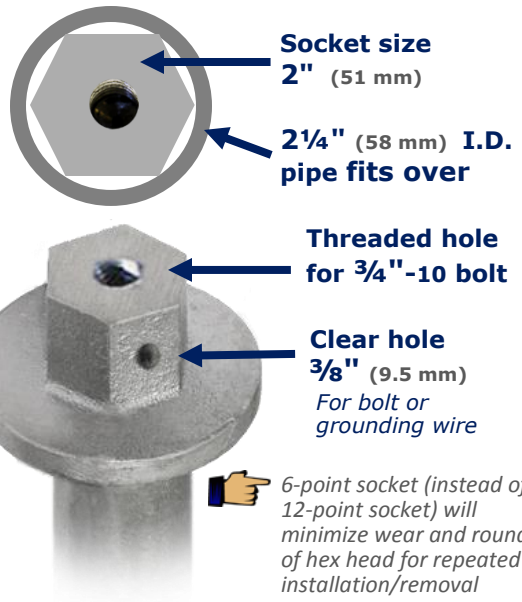
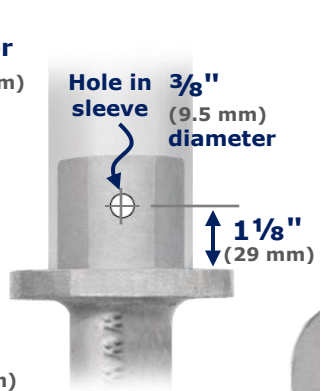
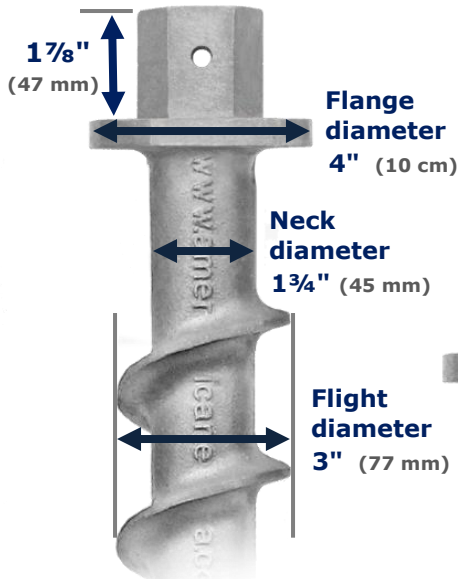
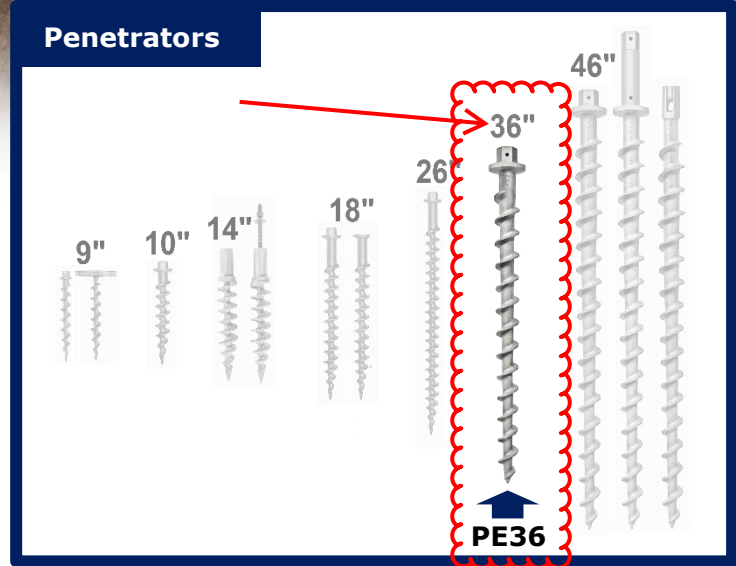
americanearthanchors.com

QUICK REFERENCE

PE36 | Specifications

36" Penetrator™

- Aircraft-quality cast aluminum 356 alloy
- Heat-treated to T6 specification
- Install with 2" or 51 mm socket
- Removable/reusable



LOAD CAPACITY

Pullout strength with flight fully embedded

Soil Class 1	Soil Class 2	Soil Class 3	Soil Class 4	Soil Class 4
Hardpan Asphalt	Sandy gravel Very dense sand	Silty/clayey sand Silty gravel	Loose/med dense sands Loose sands Firm clays	Loose fine un- compacted sand
8,400 lb 37.4 kN	6,000 lb 26.7 kN	2,100 lb 9.34 kN	1,000 lb 4.45 kN	350 lb 1.56 kN

Soil classification per ASTM D-2487/2488

6-point socket (instead of 12-point socket) will minimize wear and rounding of hex head for repeated installation/removal

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QR-PE36 Mar 2018



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Contact us for CUSTOM WORK
Size, length, shape, material,
prototypes, cable assemblies

866-520-8511
1-508-520-8511
Page 17 of 20

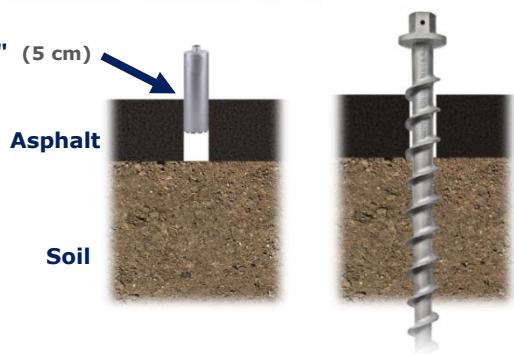
PE36

Installation

Through asphalt

Drill PILOT HOLE through asphalt

Diameter: 2" (5 cm)



Installation methods

(Images show PE46, but method is the same)



Impact wrench

Watch the video: Click [here](#) or visit [aeavideo.com](#)



Power take-off

Watch the video: Click [here](#) or visit [aeavideo.com](#)

Attachment accessories



TIE-OFF CABLE PE-TC46



Can be doubled over to make large loop around structural member

4x4 lumber 3 1/2" x 3 1/2" (9 cm x 9 cm)

BRACKETS



For PIPE legs



For SQUARE legs



SLEEVES



Your 2 1/4" I.D. (58 mm) pipe fits over and rests on flange



We can make custom brackets - send us your requirements



IN MASS UNITS:

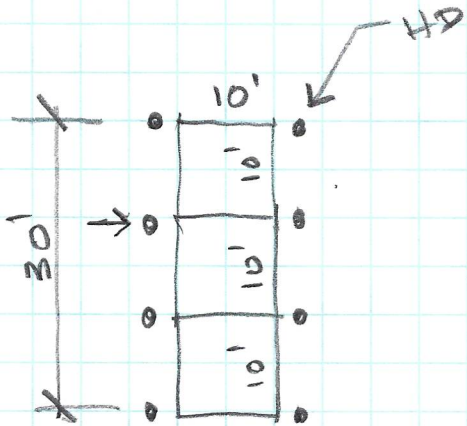
SDC C → Wind Governs

MUF RS: $V = 115$ mph

$$P = 14,2 - (-11,5) = 25,7 \text{ psf}$$

$$ASD = 0,60 \times 25,7 = 15 \text{ psf}$$

∴ Use 20 psf (min.) conservative



$$∴ F = 10' \times 5' \times 0,020 = 1,0 \text{ k}$$

LC = D+W (Gov. Ld Comb.)

$$P = \frac{F \times 10}{10} = F = 1,0 \text{ k/EA. Loc}$$

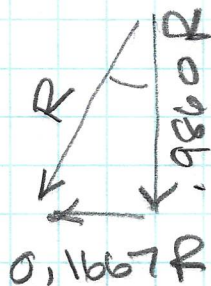
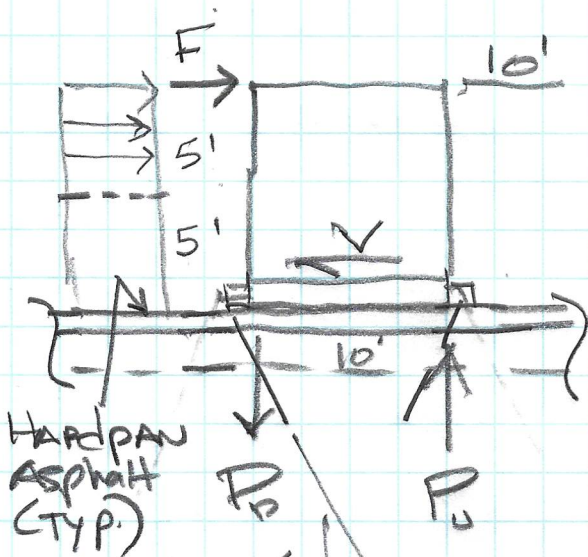
$$V = F = 1,0 \text{ k} \div 2 = 0,5 \text{ k/EA. Loc}$$

on 1:4 Batter:

$$\text{HORIZ} = 0,1667 R$$

$$\text{VERT} = 0,9860 R$$

Use 36" Anchor Depth (Min.)



FOR AE #30: Soil CLASS #1: $R = 8400 \#$ <Use>

⇒ HARD PAN ASPHALT <Use>

$$\text{HORIZ} = 0,1667 \times 8400 = 1400 \# / \text{Anchor} > 0,50 \text{ k} \text{ (OK)}$$

$$\text{VERT} = 0,986 \times 8400 = 8282 \# / \text{Anchor} > 1,0 \text{ k} \text{ (OK)}$$

$$\Rightarrow \text{F.S.} = 8,2 \text{ (OK)}$$

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END OF CALCULATIONS