

PSE CONSULTING ENGINEERS INC.

STRUCTURAL ENGINEERING CALCULATIONS

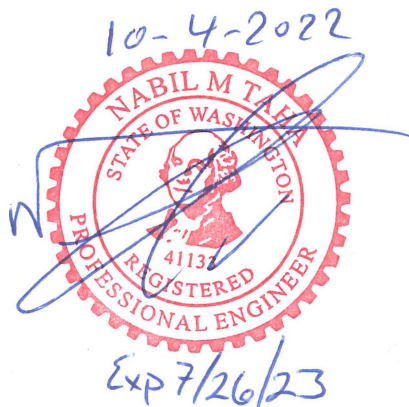
PROJECT: Stainless Cable & Railing

PROJECT LOCATION: Washington State

PSE PROJECT NUMBER: Stainless Cable & Railing
222-801

DATE: October 4, 2022

BY: Adel Elfayoumy, Ph.D., P.E.
BY: Nabil Taha, Ph.D., P.E.



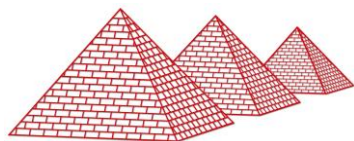
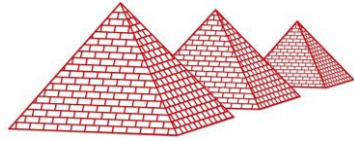


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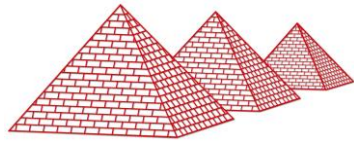
References:

1- Literature:

- a. 2018 International Building Code (IBC)
- b. 2018 Washington State Building Code based on 2018 International Building Code (IBC)
- c. Aluminum Design Manual ADMI-15, The Aluminum Association.

2- Software:

- a. RISA 3D Version 14.0.1
RISA Technologies,
26212 Dimension Dr. Suite 200



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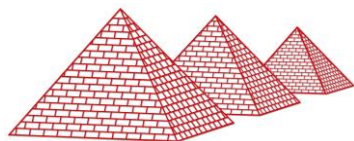
Design Criteria:

1- Location: Washington State

2- Live Load on Handrail & guards:

- a. Uniform Distributed load 50 p/f
- b. Single Concentrated load 200 lbs

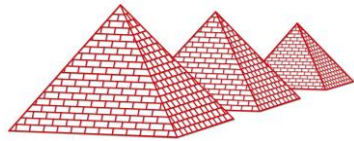
****Other criteria assumed as stated in design calculations.**



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POST TO BASE PLATE CONNECTION
ANALYSIS & DESIGN:

Pages 1,000 - 1,199



Post Height = 42"
Post Spacing = 5-ft
Applied Load = 50 plf @ guard rail level

Total Load @ post = 50 plf x 5 ft = 250 lbs

Moment @ post base = 50 lbs x 42" / 12" = 875 lb.ft

Tension (T) = Compression (C)

$T=C = \text{Moment} / \text{distance between T \& C}$

$T=C = 875 \times 12 / (49 \text{ mm} / 25.5) = 5,443 \text{ lbs}$

1/4" Dia. Trox Plus type F Screw J429 GR8

Screw Tensile strength - 150,000 psi

Screw Yield strength = 130,000 psi

Nominal strength = 150,000 / 2.0 = 75,000 psi

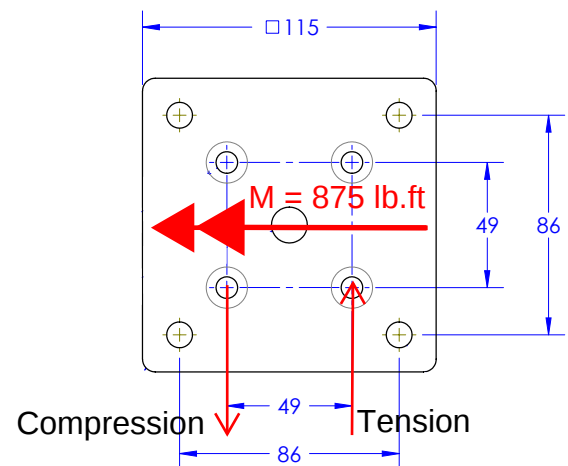
Tensile strength of (1/4" Dia.) screw = screw Area x Nominal strength

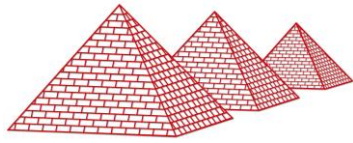
$$= 0.049 \text{ in}^2 \times 75,000 = 3,679 \text{ lb}$$

2-1/4" Screws capacity = 2 x 3,679 lbs = 7,358 lbs > 5,443 lbs (OK)

Shear strength of (1/4" Dia.) Screw = $0.049 \text{ in}^2 \times 75,000 \times 0.75 = 2,756 \text{ lbs}$

4-5/16" Screw Tensile Capacity = 4 x 2,756 lbs = 11,024 lbs > 250 lbs (OK)





5/16" Dia. Trox Plus type F Screw J429 GR8

Tensile strength of (5/16" Dia.) Screw = $0.076 \text{ in}^2 \times 75,000 = 5,749 \text{ lbs}$

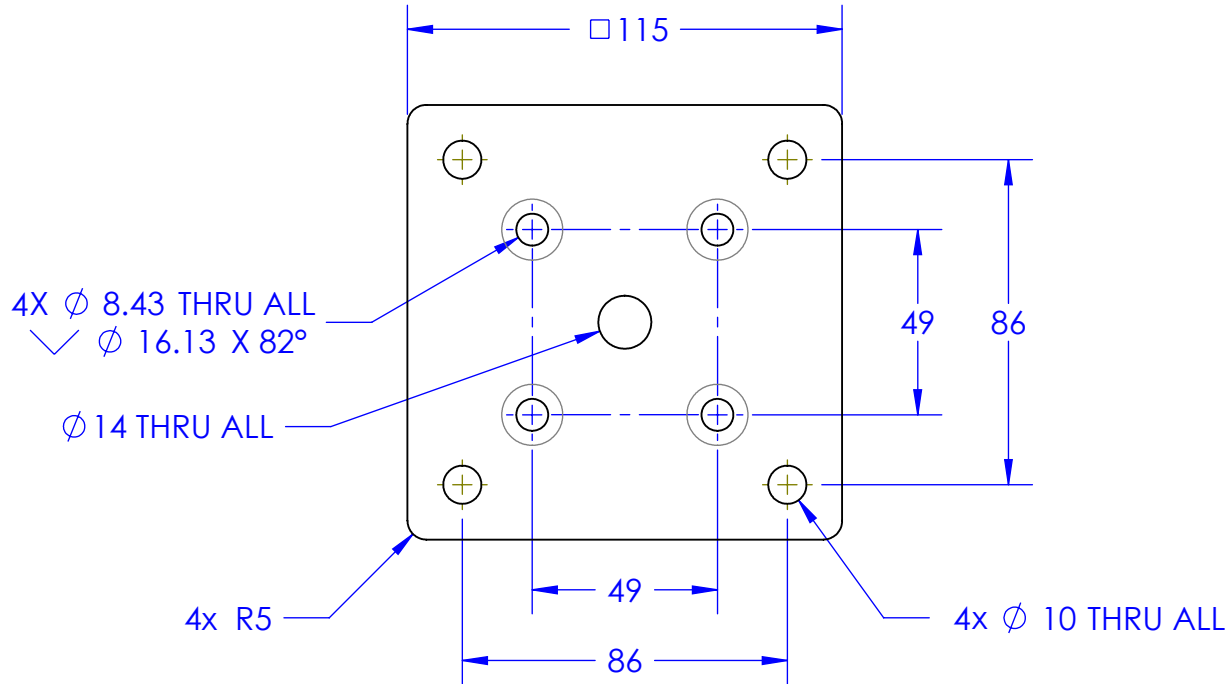
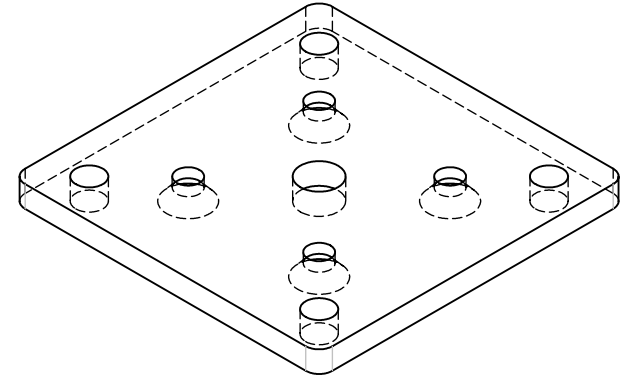
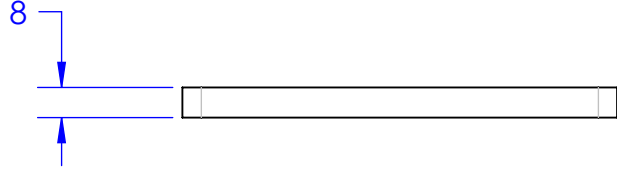
2-5/16" Screw Tensile Capacity = $2 \times 5,749 \text{ lbs} = 11,499 \text{ lbs} > 5,443 \text{ lbs (OK)}$

Shear strength of (5/16" Dia.) Screw = $0.076 \text{ in}^2 \times 75,000 \times 0.75 = 4,275 \text{ lbs}$

4-5/16" Screw Tensile Capacity = $4 \times 4,275 \text{ lbs} = 17,100 \text{ lbs} > 250 \text{ lbs (OK)}$

10-600-00

DWG. NO.



PROPRIETARY AND CONFIDENTIAL
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		UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN Millimeters TOLERANCES: x = 0.1 x.x = 0.1 x.xx = 0.01 x.xxx = 0.005	DRAWN	NAME	DATE	Stainless Cable & Railing, Inc. 888-686-7245 (RAIL) TITLE: Base Plate			
			CHECKED	GM	04/29/08				
			ENG APPR.						
			MFG APPR.						
			Q.A.						
		INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:			SIZE A DWG. NO. 03-009-01 REV PR2 SCALE: 1:2 WEIGHT: SHEET 1 OF 1			
		MATERIAL 6082 T6 Alu	Powdercoating to meet or exceed AAMA2604 Salt Spray Resistance						
		FINISH Powdercoat							
NEXT ASSY	USED ON								
APPLICATION									
		DO NOT SCALE DRAWING							

SAE J429

SAE J429 covers the mechanical and material requirements for inch series fasteners used in automotive and related industries in sizes to 1-1/2" inclusive.

Below is a basic summary of the most common grades. SAE J429 covers a number of other grades and grade variations not covered in this summary, including 4, 5.1, 5.2, 8.1, and 8.2.

J429 Mechanical Properties

Grade	Nominal Size, inches	Full Size Proofload, psi	Yield Strength, min, psi	Tensile Strength, min, psi	Elong, min, %	RA, min, %	Core Hardness, Rockwell	Tempering Temperature, min
1	1/4 thru 1-1/2	33,000	36,000	60,000	18	35	B7 to B100	N/A
2	1/4 thru 3/4	55,000	57,000	74,000	18	35	B80 to B100	N/A
	Over 3/4 thru 1-1/2	33,000	36,000	60,000	18	35	B70 to B100	
5	1/4 thru 1	85,000	92,000	120,000	14	35	C25 to C34	800F
	Over 1 thru 1-1/2	74,000	81,000	105,000	14	35	C19 to C30	
8	1/4 thru 1-1/2	120,000	130,000	150,000	12	35	C33 to C39	800F

Grade 2 requirements for sizes 1/4" thru 3/4" apply only to bolts 6" and shorter, and to studs of all lengths. For bolts longer than 6", Grade 1 requirements shall apply.

J429 Chemical Requirements

Grade	Material	Carbon, %	Phosphorus, %	Sulfur, %	Grade Marking
1	Low or Medium Carbon Steel	0.55 max	0.030 max	0.050 max	None
2	Low or Medium Carbon Steel	0.15 - 0.55	0.030 max	0.050 max	None
5	Medium Carbon Steel	0.28 - 0.55	0.030 max	0.050 max	
8	Medium Carbon Alloy Steel	0.28 - 0.55	0.030 max	0.050 max	

J429 Recommended Hardware

Nuts	Washers
J995	N/A

Alternate Grades

For fasteners larger than 1-1/2" in diameter, the following ASTM grades should be considered.

SAE J429 Grade	ASTM Equivalent
Grade 1	A307 Grades A or B
Grade 2	A307 Grades A or B
Grade 5	A449
Grade 8	A354 Grade BD
This chart compares SAE and ASTM specifications that are similar but not identical in diameters through 1½".	