

May 28, 2026

Bryce Tolene

LEVER Architecture

4713 N. Albina Ave. 4th Floor

Re: PSU School of Art + Design – Demolition of Existing Buildings

Dear Bryce:

Attached please find calculation sheets 1 through 9, which verify the structural adequacy of the PSU School of Art + Design – Demolition of Existing Buildings project as shown on Drawings S001 through S301, dated May 28, 2026. The design is based on the requirements of the 2025 OSSC, which is based on the 2024 IBC.

If you have any questions or need further information, please call me.

Sincerely,

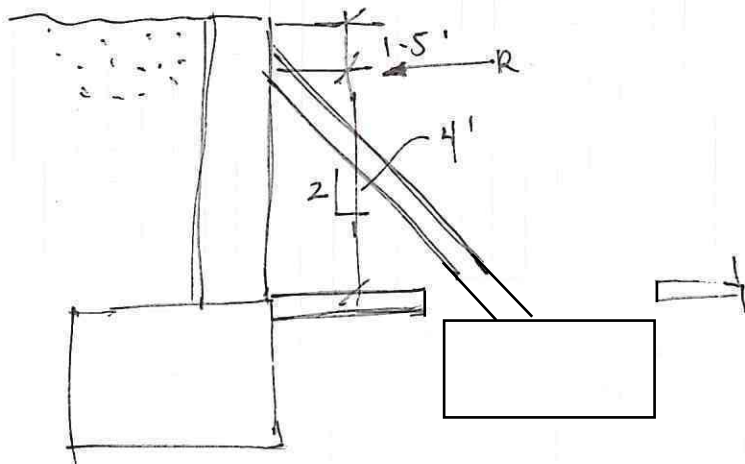


Kolton Mahr

Project No. 10022500786



WALL SECTION :



$$\sum M_B = 0$$

$$R \cdot (4-x) - \frac{1}{2} P_q \cdot H^2 \cdot H/3 = 0$$

$$R = \frac{P_q \cdot H^3}{6(4-x)}$$

$$\left\{ \begin{array}{l} H = 5.5 \text{ ft} \\ x = 1.5 \text{ ft} \\ P_q = 75 \text{ pcf} \quad (60 \text{ pcf} + 15 \text{ pcf SEISMIC}) \end{array} \right.$$

$$R = \frac{75 \text{ pcf} \times 5.5 \text{ ft}^3}{6(5.5 \text{ ft} - 1.5 \text{ ft})} = 520 \text{ plf}$$

CHECK R @ 6 FT O.C.:

$$M_{u, \text{wall}} = 1.6 \times 520 \text{ plf} \times 6 \text{ ft}^2 / 8 = 3744 \text{ lb-ft}$$

$$P_{\text{grace}} = R / \cos(\theta) \cdot S \quad (\theta = \tan^{-1}(2) = 63.4^\circ)$$

$$= 520 / \cos 63.4^\circ \cdot 6 \text{ ft}$$

$$= 6980 \text{ lb}$$

REACTION @ FOOTING:

$$H = R \& S = 3120 \text{ lb}$$

$$V = 2H = 6240 \text{ lb}$$

CONCRETE WALL

$$b = 18''$$

$$d = 10''$$

$$f'_c = 3000 \text{ psi}$$

$$S = 18 \times 10^2 / 6 = 300$$

$$M_u = 5 \sqrt{f'_c} S$$

$$= 5 \sqrt{3000} 300 / 12 = 6950 \text{ lb-ft}$$

$$\phi M_u = 0.6 \times 6950 = 4170 \text{ lb-ft}$$

$$D/C = 3744 / 4110 = 0.91 \text{ OK}$$

TRY 3' WIDE x 3.5' LONG x 2' THICK CONCRETE FOOTING.

$$A = 3' \times 3.5' = 10.5 \text{ FT}^2$$

$$V/A = 6240 / 10.5 = 600 \text{ pcf}$$

ALLOWABLE BEARING = 1500 pcf OK

SLIDING:

COEFFICIENT OF FRICTION = 0.25
PASSIVE PRESSURE = 150 pcf

$$P = V + W_{\text{FOOTING}}$$

$$= 6240 + 3 \times 3.5 \times 2 \times 150 \text{ pcf}$$

$$= 9390 \text{ lb}$$

$$uP = 0.25 \times 9390 = 2350 \text{ lb}$$

$$\text{PASSIVE} = \frac{1}{2} \times 150 \text{ pcf} \times T^2 \times W$$

$$= \frac{1}{2} \times 150 \times 2^2 \times 3$$

$$= 900 \text{ LB}$$

$$\text{TOTAL SLIDING} = uP + \text{PASSIVE}$$

$$= 2350 + 900$$

$$= 3250 \text{ LB}$$

$$F.O.S = 3250 / 3120 = 1.04 \text{ OK}$$

OVERTURNING →

FOOTING OVERTURNING:

$$e < L/6 = 3.5'/6 = 0.583$$

$$M = V \cdot x$$

$$P_o = V + W_F$$

$$e = M/P_o$$

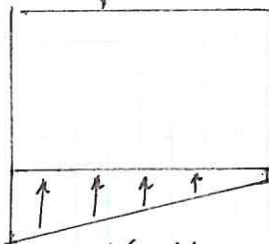
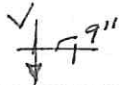
$$= \frac{V \cdot x}{V + W_F}$$

$$x_{max} = \frac{e(V + W_F)}{V}$$

$$= \frac{0.583(6240 + 3150)}{6240}$$

$$= 0.877 \text{ ft}$$

$$\text{TRY } x = 9'' \text{ MAX}$$



$$q_{max} = \frac{V}{A} + \frac{V \cdot x}{S}$$

$$A = 3' \times 3.5' = 10.5 \text{ ft}^2$$

$$S = 3' \times 3.5'^2/6 = 6.125 \text{ ft}^3$$

$$q_{max} = \frac{6240}{10.5} + \frac{6240 \times 9'/12}{6.125}$$

$$= 1360 \text{ psf} < 1500$$

OK

CHECK FTG. STRENGTH:

$$\begin{aligned} M_u &= 1.6 \times 1500 \text{ psf} \times 3' \times (3.5'/2 + 9'')^2/2 \\ &= 22,500 \text{ lb-ft} \\ &= 270 \text{ k-in} = 90 \text{ k-in/ft} \end{aligned}$$

$$\phi M_n = \phi A_s f_y (d - a/2)$$

$$a = \frac{A_s f_y}{0.85 f'_c b} = \frac{0.44 \times 12'/10 \times 60,000}{0.85 \times 3000 \times 12}$$

$$= 1.03 \text{ in}$$

$$d = 24'' - 3'' - 0.75''/2 = 20.625 \text{ in}$$

$$\begin{aligned} \phi M_n &= 0.9 \times 0.44 \times 12'/10 \times 60 \times (20.6 - 1.03/2) \\ &= 572 \text{ k-in} \end{aligned}$$

$$D/C = 90/572 = 0.16 \text{ OK}$$

$$\begin{aligned} V_u &= 1.6 \times 1500 \text{ psf} \times 3' \times (3.5'/2 + 9'') \\ &= 18,000 \text{ lb} \\ &= 6 \text{ k/ft} \end{aligned}$$

$$\phi V_n = \phi \times \sqrt{f'_c} \times b \times d$$

$$= 0.75 \sqrt{3000} \times 12 \times 20.6/1000$$

$$= 10.2 \text{ k/ft}$$

$$D/C = 6/10.2 = 0.6 \text{ OK}$$

$$A_{s, min} = 0.0018 \times A_g$$

$$= 0.0018 \times 12'' \times 24''$$

$$= 0.52 \text{ in}^2/\text{ft}$$

$$A_s = 0.44 \text{ in}^2 \times 12'/10 = 0.53 \text{ in}^2/\text{ft} \text{ OK}$$

USE #6 @ 10' o.c. & 3,000 psi conc.

CHECK WOOD BRACE

$$P_{brace} = 6980 \text{ Lb}$$

6x6 #2 D.F. POST

$$A = 30.25 \text{ in}^2$$

$$f = F/4 = 230 \text{ psi}$$

$$F_c' = F_c \times C_D \times C_M \times C_t \times C_F \times C_i \times C_p$$

$$\left. \begin{array}{l} F_c = 1350 \text{ psi} \\ C_D = 0.9 \\ C_M = 0.8 \\ C_t = 1.0 \\ C_F = 1.0 \\ C_i = 0.8 \\ C_p = 0.96 \end{array} \right\} F_c^* = 778 \text{ psi}$$

$$F_c' = 746 \text{ psi}$$

$$F_{cE} = \frac{0.822 E'_{min}}{(l_e/d)^2}$$

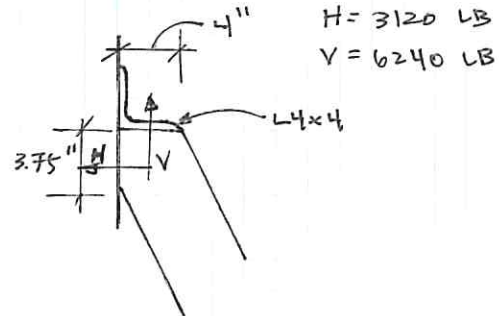
$$\left. \begin{array}{l} l_e = 54 \text{ in} \\ d = 5.5 \text{ in} \\ E'_{min} = 580,000 \times 0.9 \times 0.95 = 496,000 \end{array} \right\}$$

$$F_{cE} = \frac{0.822 \times 496,000}{(54/5.5)^2} = 4229 \text{ psi}$$

$$C_p = 0.96$$

$$f/F = 230/746 = 0.31 \text{ OK}$$

CONN. AT WALL



$$f_{c\perp} = 6240 / (4 \times 5.5) = 283 \text{ psi}$$

$$\begin{aligned} F_{c\perp}' &= F_{c\perp} \times C_M \times C_t \times C_i \\ &= 650 \times 0.67 \times 1.0 \times 1.0 \\ &= 435 \text{ psi} \end{aligned}$$

$$f/F = 283/435 = 0.65 \text{ OK}$$

BEARING @ ANGLE TO GRAIN:

$$F_{\theta}' = \frac{F_c^* F_{c\perp}'}{F_c^* \sin^2 \theta + F_{c\perp}' \cos^2 \theta}$$

$$\theta = \tan^{-1}(1/2) = 26.5^\circ$$

$$F_c^* = 778 \text{ psi}$$

$$F_{c\perp}' = 435 \text{ psi}$$

$$F_{\theta}' = \frac{778 \times 435}{778 \sin^2 26.5 + 435 \cos^2 26.5}$$

$$F_{\theta}' = 672 \text{ psi}$$

$$A_{b, req} = V/F_{\theta}' = \frac{6240}{672} = 9.3 \text{ in}$$

$$l_b = A_{b, req} / 5.5 = 1.7"$$

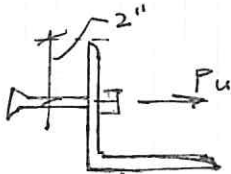
$$e = l_b/2 = 0.85"$$



ANGLE & ANCHORS

ANGLE & ANCHORAGE TO WALL/FTG:

REACTION @ WALL CONTROLS ($V = 24$)



$$V_u = 1.6 \times 6240 = 10,000 \text{ lb}$$

$$M_u = V_u \cdot e$$

$$= 10,000 \times 0.85" = 8500 \text{ lb-in}$$

$$P_u = M_u / 2" = 8500 / 2" = 4250 \text{ lb}$$

CHECK ANGLE

$$\phi M_n = \frac{0.9 \times b \times t^2}{4} \times F_y$$

$$b = 8 \text{ in}$$

$$t_{min} = \sqrt{\frac{4 M_u}{0.9 F_y b}}$$

$$= \sqrt{\frac{4 \times 8500}{0.9 \times 36,000 \times 8}}$$

$$= 0.362 \text{ in}$$

$$\text{USE } t = 0.375 \text{ in}$$

$$\boxed{L 4 \times 4 \times 3/8}$$

ANCHOR DESIGN:

$$V_u = 10,000 \text{ lb}$$

$$P_u = 4,250 \text{ lb}$$

SEE ANCHOR DESIGN
OUTPUT:

$3/4"$ DIA $\times$ $4 1/4"$ EFF. EMBED
SIMPSON STRONG-BOLT 2
EXPANSION ANCHOR
D/C = 0.95



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Company:		Date:	4/30/2026
Engineer:		Page:	1/5
Project:			
Address:			
Phone:			
E-mail:			

1. Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General

Design method: ACI 318-19
Units: Imperial units

Anchor Information:

Anchor type: Torque controlled expansion anchor
Material: Carbon Steel
Diameter (inch): 0.750
Nominal Embedment depth (inch): 5.000
Effective Embedment depth, h_{ef} (inch): 4.250
Code report: ICC-ES ESR-3037
Anchor category: 1
Anchor ductility: Yes
 h_{min} (inch): 7.48
 c_{ac} (inch): 7.08
 c_{min} (inch): 6.00
 s_{min} (inch): 3.50

Base Material

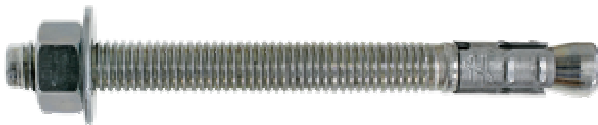
Concrete: Normal-weight
Concrete thickness, h (inch): 12.00
State: Cracked
Compressive strength, f'_c (psi): 3000
 $\Psi_{c,v}$: 1.0
Reinforcement condition: Supplementary reinforcement not present
Supplemental edge reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Base Plate

Length x Width x Thickness (inch): 4.00 x 8.00 x 0.38

Recommended Anchor

Anchor Name: Strong-Bolt® 2 - 3/4"Ø CS Strong-Bolt 2, h_{nom} : 5" (127mm)
Code Report: ICC-ES ESR-3037





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Load and Geometry

Load factor source: ACI 318 Section 5.3

Load combination: not set

Seismic design: No

Anchors subjected to sustained tension: Not applicable

Apply entire shear load at front row: No

Anchors only resisting wind and/or seismic loads: No

Strength level loads:

N_{ua} [lb]: 4250

V_{uax} [lb]: -10000

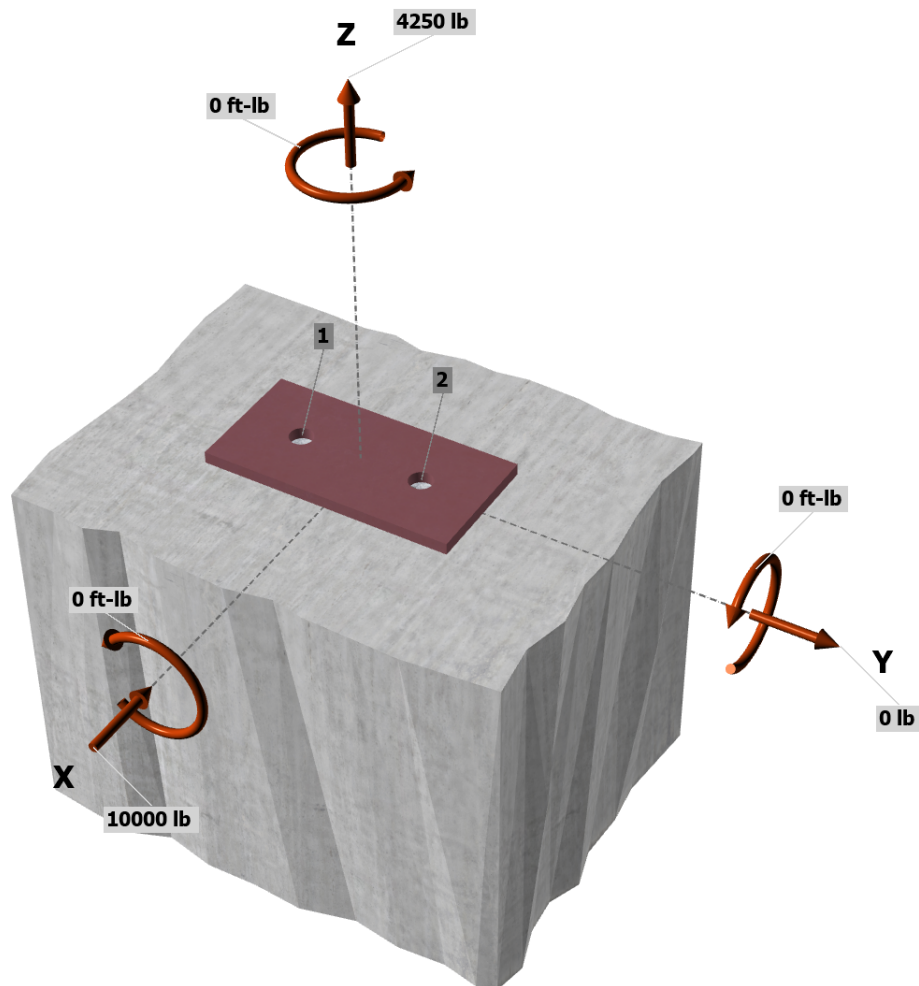
V_{uay} [lb]: 0

M_{ux} [ft-lb]: 0

M_{uy} [ft-lb]: 0

M_{uz} [ft-lb]: 0

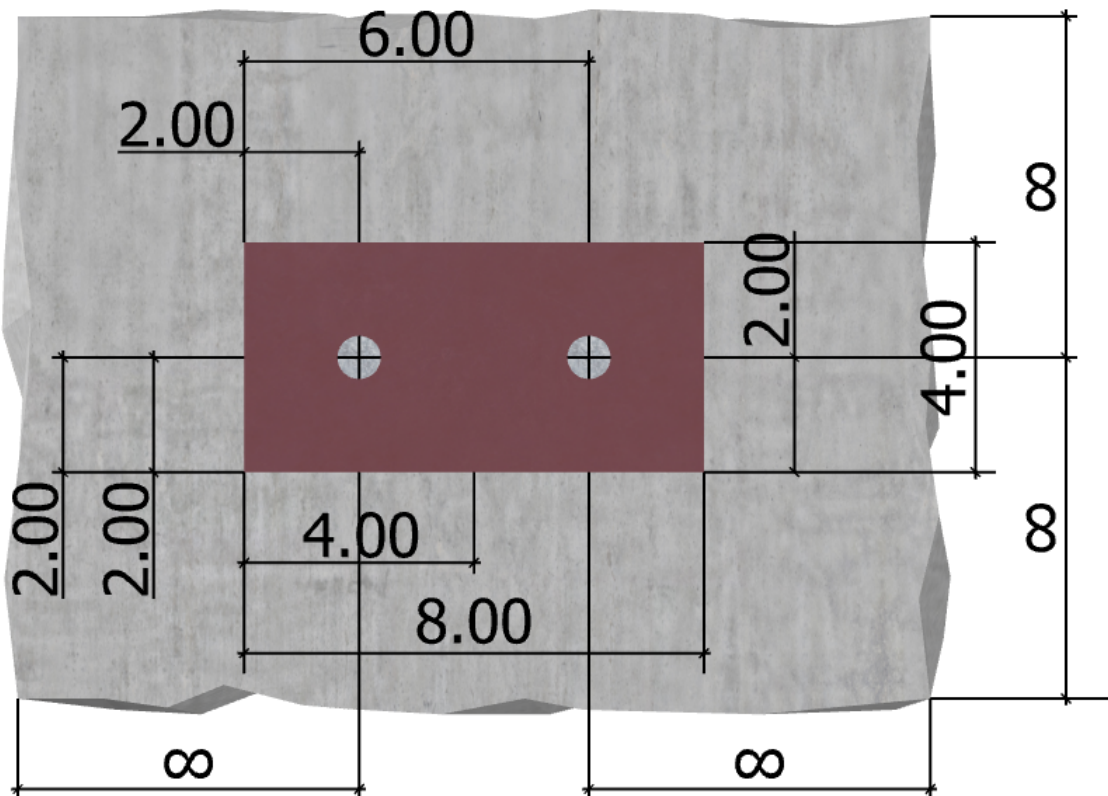
<Figure 1>





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<Figure 2>





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3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2 + (V_{uay})^2}$ (lb)
1	2125.0	-5000.0	0.0	5000.0
2	2125.0	-5000.0	0.0	5000.0
Sum	4250.0	-10000.0	0.0	10000.0

Maximum concrete compression strain (%): 0.00

Maximum concrete compression stress (psi): 0

Resultant tension force (lb): 4250

Resultant compression force (lb): 0

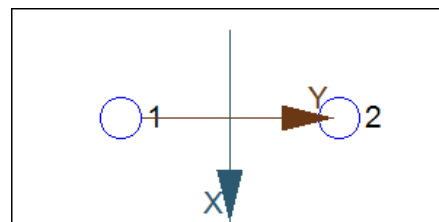
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00

Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00

Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. 17.6.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
29700	0.75	22275

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.6.2)

$$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5} \text{ (Eq. 17.6.2.2.1)}$$

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	3000	4.250	8158

$$\phi N_{cbg} = \phi (A_{Nc} / A_{Nco}) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \text{ (Sec. 17.5.1.2 & Eq. 17.6.2.1a)}$$

A_{Nc} (in ²)	A_{Nco} (in ²)	$c_{a,min}$ (in)	$\psi_{ec,N}$	$\psi_{ed,N}$	$\psi_{c,N}$	$\psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
213.56	162.56	-	1.000	1.000	1.00	1.000	8158	0.65	6966

6. Pullout Strength of Anchor in Tension (Sec. 17.6.3)

$$\phi N_{pn} = \phi \psi_{c,P} \lambda_a N_p (f'_c / 2,500)^n \text{ (Sec. 17.5.1.2, Eq. 17.6.3.1 & Code Report)}$$

$\psi_{c,P}$	λ_a	N_p (lb)	f'_c (psi)	n	ϕ	ϕN_{pn} (lb)
1.0	1.00	7010	3000	0.50	0.65	4991

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com



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8. Steel Strength of Anchor in Shear (Sec. 17.7.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
14480	1.0	0.65	9412

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.7.3)

$\phi V_{cp} = \phi k_{cp} N_{cbg} = \phi k_{cp} (A_{Nc} / A_{Nco}) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b$ (Sec. 17.5.1.2 & Eq. 17.7.3.1b)

k_{cp}	A_{Nc} (in ²)	A_{Nco} (in ²)	$\psi_{ec,N}$	$\psi_{ed,N}$	$\psi_{c,N}$	$\psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cp} (lb)
2.0	213.56	162.56	1.000	1.000	1.000	1.000	8158	0.70	15005

11. Results

Interaction of Tensile and Shear Forces (Sec. R17.8)

Tension	Factored Load, N _{ua} (lb)	Design Strength, ϕN _n (lb)	Ratio	Status	
Steel	2125	22275	0.10	Pass	
Concrete breakout	4250	6966	0.61	Pass (Governs)	
Pullout	2125	4991	0.43	Pass	
Shear	Factored Load, V _{ua} (lb)	Design Strength, ϕV _n (lb)	Ratio	Status	
Steel	5000	9412	0.53	Pass	
Pryout	10000	15005	0.67	Pass (Governs)	
Interaction check	(N _{ua} /ϕN _{ua}) ^{5/3}	(V _{ua} /ϕV _{ua}) ^{5/3}	Combined Ratio	Permissible	Status
Sec. R17.8	0.44	0.51	94.7%	1.0	Pass

3/4"Ø CS Strong-Bolt 2, hnom:5" (127mm) meets the selected design criteria.

12. Warnings

- Designer must exercise own judgement to determine if this design is suitable.
- Refer to manufacturer's product literature for hole cleaning and installation instructions.