

Structural Closeout Assistance

KL&A, Inc.

1717 Washington Avenue, Suite 100
Golden, Colorado 80401
Telephone: (303) 384-9910

October 25, 2023

Matt Disney
Deneuve Construction Services
2334 Spruce St., Suite B
Boulder, CO 80302

Re: Failed Inspection Report

Dear Mr. Disney:

The purpose of this letter is to provide a response to a failed county inspection report dated July 31st, 2023, for the Steamboat Basecamp project located at 1901 Curve Plaza in Steamboat Springs, Colorado. A copy of the inspection report is enclosed for record.

KL&A understands that multiple light pole standards were installed around the site. The light pole bases are 18" diameter, extend 2'-0" above grade and embed 5'-0" minimum into grade. The light poles are 4" diameter x20'-0" tall. Anchor bolts supplied by the light pole manufacturer with the poles are 3/4" diameter x17" long 'L-Bolts'.

KL&A understands that the concrete bases were cast in place before the light poles and anchor bolts were delivered to the site. KL&A is aware that Deneuve substituted 5/8" diameter all-thread rod for the manufacturer supplied L-Bolts. The threaded rod was installed with a nut at the bottom and 18" embedment.

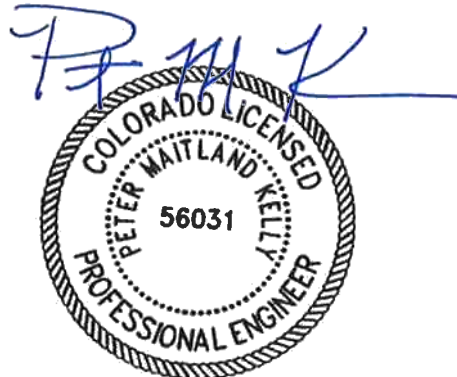
KL&A performed calculations for the pole anchorage, attached. Per the calculation, the 5/8" diameter all-thread rods are adequate for the demand loads on the light standards.

If you have any questions, please feel free to call.

Sincerely,



Andrew Smith, PE, SE
Project Engineer



Reviewed By: Peter Kelly, PE, SE
Project Manager, Engineer of Record



FOR REFERENCE ONLY

INSPECTION REPORT

Report Issued: Jul 31, 2023

Inspection Result: **FAILED**

Permit Number: SPREL221585

Issuance Date: Oct 25, 2022

Property Address: 1901 CURVE PLZ;

Applicant: CENTRAL ELECTRIC, LLC

Contractor: CENTRAL ELECTRIC, LLC 2659 Jacob Cir #4 STEAMBOAT SPGS,, CO 80487
(970) 846-8379

To construct: Steamboat basecamp
Temp power and new electrical for new building

On this day we have inspected your construction for **Electrical Rough-in Inspection** and we find the following result of the inspection. If there are any questions, please call the inspector at the address below.

Comments: While on site for ceiling rough inspection noticed uninspected parking lot pole bases on closer examination notice telltale sign of yellow paint on the end of all thread as opposed to UL listed anchor bolts. Correctional will require demolition of pole bases and inspected installation or an engineer special inspection letter stating that all thread for anchor bolts will suffice.

Corrections:

Sincerely,

Tom Cook
Electrical Plan Reviewer/Inspector
tcook@co.routt.co.us



STANDARD LIGHTPOLE ANCHORAGE

WIND DESIGN LOADS

RISK CATEGORY : II

BASIC WIND SPEED, $V = 115$ MPH ($V_{ASD} = 84$ MPH)

EXPOSURE CATEGORY : C

WIND DIRECTIONALITY FACTOR,

$$K_d = 1.0$$

TOPOGRAPHIC FACTOR,

$$K_{zt} = 1.0$$

VELOCITY PRESSURE EXPOSURE COEFFICIENT,

$$K_z = 0.94$$

GROUND ELEVATION FACTOR,

$$K_e = 0.785$$

VELOCITY PRESSURE, $q_h = 0.00256 K_z K_{zt} K_d K_e V^2 = \underline{25 \text{ PSF}}$

ASCE 7-16 §29.4 - WIND LOADS ON OTHER STRUCTURES

$$F = q_z G C_f A_f$$

GUST EFFECT FACTOR, $G = 0.85$

POLE : FORCE COEFFICIENT, $C_f = 1.2$

PROJECTED AREA, $A_f = 0.33 \text{ FT}^2/\text{FT}$

$$F_{\text{POLE}} = q_h G C_f A_f = 8.5 \text{ PLF}$$

FIXTURES : FORCE COEFFICIENT, $C_f = 1.3$

PROJECTED AREA, $A_f = 2(0.57 \text{ ft}^2) = 1.14 \text{ FT}^2$

$$F_{\text{FIXTURES}} = q_h G C_f A_f = 32 \#$$

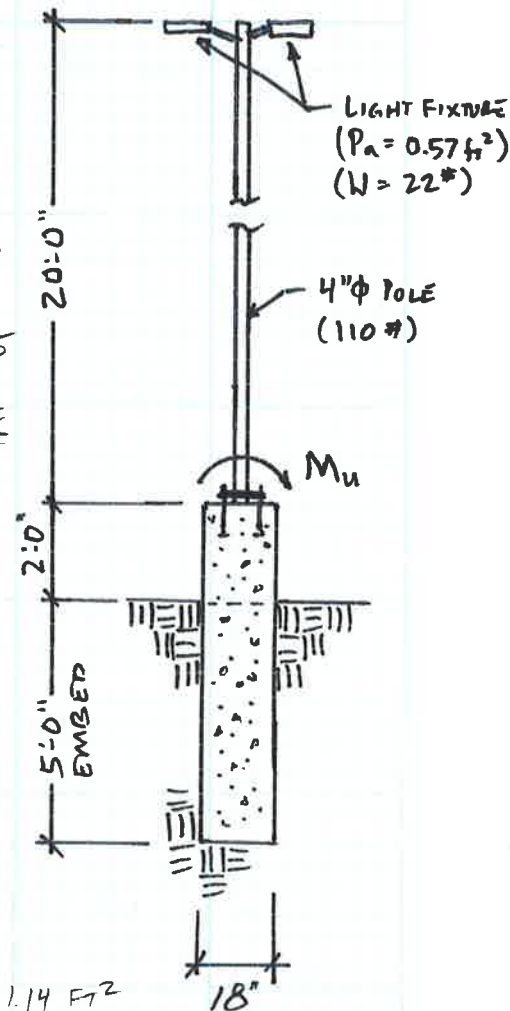
$$\text{MOMENT @ BASE, } M_u = F_{\text{FIXTURE}} H_{\text{FIXTURE}} + \frac{F_{\text{POLE}} H_{\text{POLE}}^2}{2}$$

$$M_u = \underline{2340 \text{ FT-LB}}$$

SHEAR @ BASE

$$V_u = F_{\text{FIXTURE}} + F_{\text{POLE}} H_{\text{POLE}}$$

$$V_u = \underline{202 \#}$$



CALCULATIONS CONTINUE FOLLOWING PAGES



KL&A

Engineers & Builders

Title STEAMBOAT BASE CAMP Date 10/23 Job no. 21304

Subject LIGHTPOLE ANCHORAGE By APS Sheet 2 of 2

STANDARD LIGHTPOLE ANCHORAGE (CONT.)

BASE PLATE REACTIONS

$$M_u = 2,340 \text{ Ft-LB} \approx 28080 \text{ IN-LB}$$

$$V_u = 202 \#$$

BASE PLATE & ANCHOR BOLT DIMENSIONS

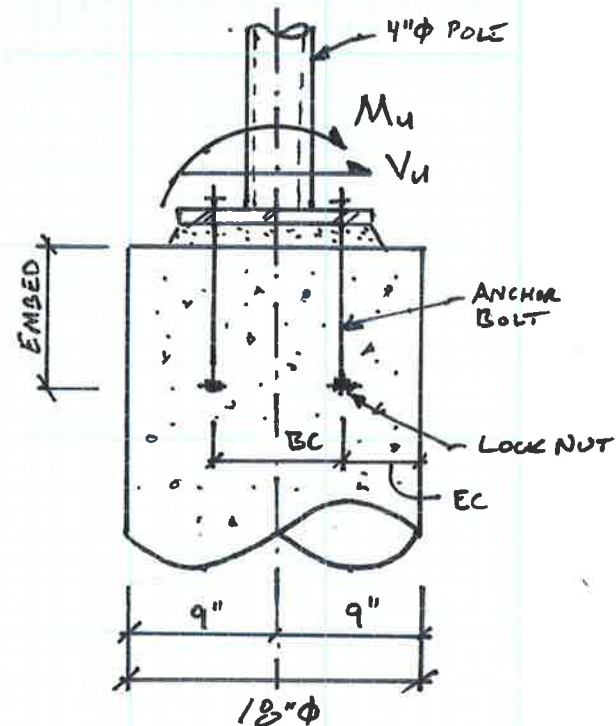
BOLT CIRCLE, $BC = 8"$ (DIAGONAL)

EDGE COVER, $EC = 5"$

EMBEDMENT = $18"$

ANCHOR BOLT DIAMETER, $d_b = 5/8"$ ϕ

ANCHOR BOLT GRADE = F1554, GR 36
(ASSUMED)



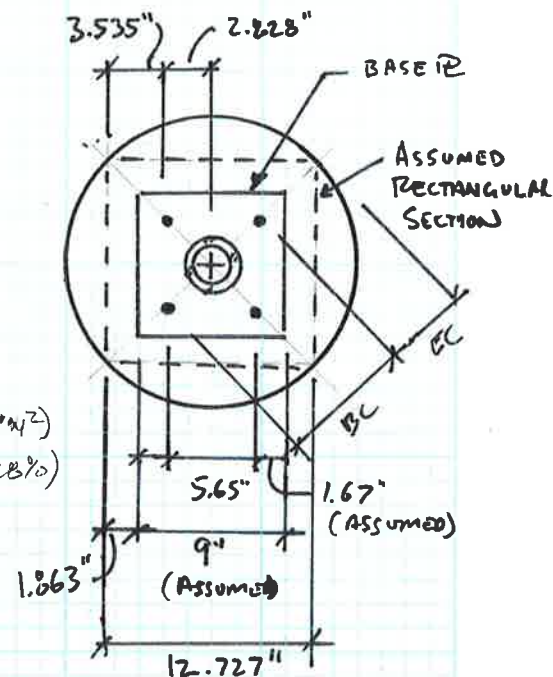
5/8" ϕ ALL THREAD ROD
w/ 18" EMBED OKAY

SEE HILTI PROFIS OUTPUT
FOLLOWING PAGES

$$T_{BOLT} = 2,100 \#$$

$$\phi R_n = \phi F_u A_b = 0.75(0.75(58 \text{ ksi}))(0.226 \text{ in}^2) = 7.373 \#$$

(DCR = 28%)



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Company:

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Phone | Fax:

Design:

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Specifier:

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Specifier's comments:

1 Input data

Anchor type and diameter:

Hex Head ASTM F 1554 GR. 36 5/8

Item number:

not available

Effective embedment depth:

 $h_{ef} = 18.000$ in.

Material:

ASTM F 1554

Evaluation Service Report:

Hilti Technical Data

Issued | Valid:

- | -

Proof:

Design Method ACI 318-14 / CIP

Stand-off installation:

without clamping (anchor); restraint level (anchor plate): 2.00; $e_b = 1.500$ in.; $t = 0.500$ in.

Hilti Grout: CB-G EG, epoxy, $f_{c,Grout} = 14,939$ psi

Anchor plate^R:

 $l_x \times l_y \times t = 9.000$ in. x 9.000 in. x 0.500 in.; (Recommended plate thickness: not calculated)

Profile:

Round HSS (AISC), HSS4X.125; (L x W x T) = 4.000 in. x 4.000 in. x 0.125 in.

Base material:

cracked concrete, 4000, $f'_c = 4,000$ psi; $h = 84.000$ in.

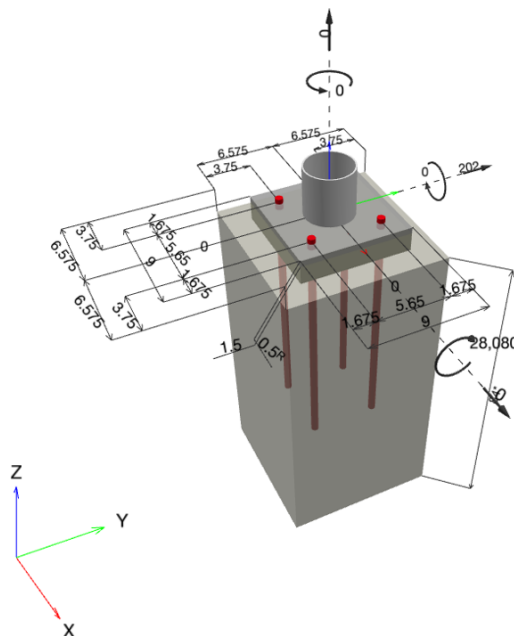
Reinforcement:

tension: condition B, shear: condition B;

edge reinforcement: none or $\leq$ No. 4 bar

^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 = 0; V _x = 0; V _y = 202; M _x = -28,080; M _y = 0; M _z = 0;	no	63

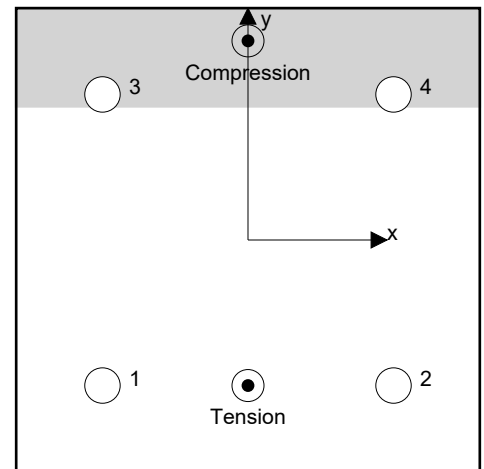
2 Load case/Resulting anchor forces

Anchor reactions [lb]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	2,099	50	0	50
2	2,099	50	0	50
3	0	50	0	50
4	0	50	0	50

max. concrete compressive strain: 0.11 [‰]
max. concrete compressive stress: 490 [psi]
resulting tension force in (x/y)=(0.000/-2.825): 4,197 [lb]
resulting compression force in (x/y)=(0.000/3.865): 4,197 [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*	2,099	9,831	22	OK
Pullout Strength*	2,099	10,170	21	OK
Concrete Breakout Failure**	4,197	6,685	63	OK
Concrete Side-Face Blowout, direction y-**	4,197	22,393	19	OK

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

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3.1 Steel Strength

$$N_{sa} = A_{se,N} f_{uta} \quad \text{ACI 318-14 Eq. (17.4.1.2)}$$

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

Variables

$A_{se,N}$ [in. ²]	f_{uta} [psi]
0.23	58,000

Calculations

N_{sa} [lb]
13,108

Results

N_{sa} [lb]	ϕ_{steel}	ϕN_{sa} [lb]	N_{ua} [lb]
13,108	0.750	9,831	2,099

3.2 Pullout Strength

$$N_{pN} = \psi_{c,p} N_p \quad \text{ACI 318-14 Eq. (17.4.3.1)}$$

$$N_p = 8 A_{brg} f'_c \quad \text{ACI 318-14 Eq. (17.4.3.4)}$$

$$\phi N_{pN} \geq N_{ua} \quad \text{ACI 318-14 Table 17.3.1.1}$$

Variables

$\psi_{c,p}$	A_{brg} [in. ²]	λ_a	f'_c [psi]
1.000	0.45	1.000	4,000

Calculations

N_p [lb]
14,528

Results

N_{pn} [lb]	$\phi_{concrete}$	ϕN_{pn} [lb]	N_{ua} [lb]
14,528	0.700	10,170	2,099

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3.3 Concrete Breakout Failure

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

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

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

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

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

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

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

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

Variables

h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$
6.267	0.000	0.000	3.750	1.000
c_{ac} [in.]	k_c	λ_a	f_c [psi]	
-	24	1.000	4,000	

Calculations

A_{Nc} [in. ²]	A_{Nc0} [in. ²]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
172.92	353.44	1.000	1.000	0.820	1.000	23,812

Results

N_{cbg} [lb]	$\phi_{concrete}$	ϕN_{cbg} [lb]	N_{ua} [lb]
9,549	0.700	6,685	4,197

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3.4 Concrete Side-Face Blowout, direction y-

$$N_{sb} = 160 c_{a1} \sqrt{A_{brg}} \lambda_a \sqrt{f'_c} \quad \text{ACI 318-14 Eq. (17.4.4.1)}$$

$$N_{sbg} = \alpha_{group} N_{sb} \quad \text{ACI 318-14 Eq. (17.4.4.2)}$$

$$\phi N_{sbg} \geq N_{ua} \quad \text{ACI 318-14 Table 17.3.1.1}$$

$$\alpha_{group} = \left(1 + \frac{s}{6 c_{a1}} \right) \quad \text{see ACI 318-14, Section 17.4.4.2, Eq. (17.4.4.2)}$$

Variables

c_{a1} [in.]	c_{a2} [in.]	A_{brg} [in. ²]	λ_a	f'_c [psi]	s [in.]
3.750	3.750	0.45	1.000	4,000	5.650

Calculations

α_{group}	N_{sb} [lb]
1.251	25,569

Results

N_{sbg} [lb]	$\phi_{concrete}$	ϕN_{sbg} [lb]	$N_{ua,edge}$ [lb]
31,989	0.700	22,393	4,197



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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*	50	4,090	2	OK
Steel failure (with lever arm)*	50	495	11	OK
Pryout Strength**	202	25,823	1	OK
Concrete edge failure in direction y+**	202	2,837	8	OK

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

4.1 Steel Strength

$$V_{sa} = 0.6 A_{se,V} f_{uta} \quad \text{ACI 318-14 Eq. (17.5.1.2b)}$$

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

Variables

$A_{se,V}$ [in. ²]	f_{uta} [psi]
0.23	58,000

Calculations

V_{sa} [lb]
7,865

Results

V_{sa} [lb]	ϕ_{steel}	ϕ_{eb}	ϕV_{sa} [lb]	V_{ua} [lb]
7,865	0.650	0.800	4,090	50

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4.2 Steel failure (with lever arm)

V_s^M	$= \frac{\alpha_M \cdot M_s}{L_b}$	bending equation for stand-off
M_s	$= M_s^0 \left(1 - \frac{N_{ua}}{\phi N_{sa}} \right)$	resultant flexural resistance of anchor
M_s^0	$= (1.2) (S) (f_{u,min})$	characteristic flexural resistance of anchor
$\left(1 - \frac{N_{ua}}{\phi N_{sa}} \right)$		reduction for tensile force acting simultaneously with a shear force on the anchor
S	$= \frac{\pi(d)^3}{32}$	elastic section modulus of anchor bolt at concrete surface
L_b	$= z + (n)(d_0)$	internal lever arm adjusted for spalling of the surface concrete
ϕV_s^M	$\geq V_{ua}$	ACI 318-14 Table 17.3.1.1

Variables

α_M	$f_{u,min}$ [psi]	N_{ua} [lb]	ϕN_{sa} [lb]	z [in.]	n	d_0 [in.]
2.00	58,000	2,099	9,831	1.750	0.500	0.625

Calculations

M_s^0 [in.lb]	$\left(1 - \frac{N_{ua}}{\phi N_{sa}} \right)$	M_s [in.lb]	L_b [in.]
998	0.787	785	2.062

Results

V_s^M [lb]	ϕ_{steel}	ϕV_s^M [lb]	V_{ua} [lb]
761	0.650	495	50

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4.3 Pryout Strength

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

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

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

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

$$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2 e_{c1,N}}{3 h_{ef}}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.4.2.4)}$$

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

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

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

Variables

k_{cp}	h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
2	2.500	0.000	0.000	3.750
$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f'_c [psi]
1.000	∞	24	1.000	4,000

Calculations

A_{Nc} [in. ²]	A_{Nc0} [in. ²]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
172.92	56.25	1.000	1.000	1.000	1.000	6,000

Results

V_{cp} [lb]	$\phi_{concrete}$	ϕV_{cp} [lb]	V_{ua} [lb]
36,890	0.700	25,823	202

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4.4 Concrete edge failure in direction y+

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

$$\phi V_{cbg} \geq V_{ua} \quad \text{ACI 318-14 Table 17.3.1.1}$$

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

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

$$\psi_{ec,V} = \left(\frac{1}{1 + \frac{2e_v}{3c_{a1}}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.5.2.5)}$$

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

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

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

Variables

c_{a1} [in.]	c_{a2} [in.]	e_{cV} [in.]	$\psi_{c,V}$	h_a [in.]
3.750	3.750	0.000	1.000	84.000
l_e [in.]	λ_a	d_a [in.]	f'_c [psi]	$\psi_{parallel,V}$
5.000	1.000	0.625	4,000	1.000

Calculations

A_{Vc} [in. ²]	A_{Vc0} [in. ²]	$\psi_{ec,V}$	$\psi_{ed,V}$	$\psi_{h,V}$	V_b [lb]
73.97	63.28	1.000	0.900	1.000	3,852

Results

V_{cbg} [lb]	$\phi_{concrete}$	ϕV_{cbg} [lb]	V_{ua} [lb]
4,053	0.700	2,837	202

5 Combined tension and shear loads

β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
0.628	0.102	5/3	49	OK

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



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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.
- ACI 318 does not specifically address anchor bending when a stand-off condition exists. PROFIS Engineering calculates a shear load corresponding to anchor bending when stand-off exists and includes the results as a shear Design Strength!
- For additional information about ACI 318 strength design provisions, please go to <https://submittals.us.hilti.com/PROFISAnchorDesignGuide/>

Fastening meets the design criteria!

7 Installation data

Profile: Round HSS (AISC), HSS4X.125; (L x W x T) = 4.000 in. x 4.000 in. x 0.125 in.

Hole diameter in the fixture: $d_f = 0.687$ in.

Plate thickness (input): 0.500 in.

Recommended plate thickness: not calculated

Anchor type and diameter: Hex Head ASTM F 1554 GR. 36 5/8

Item number: not available

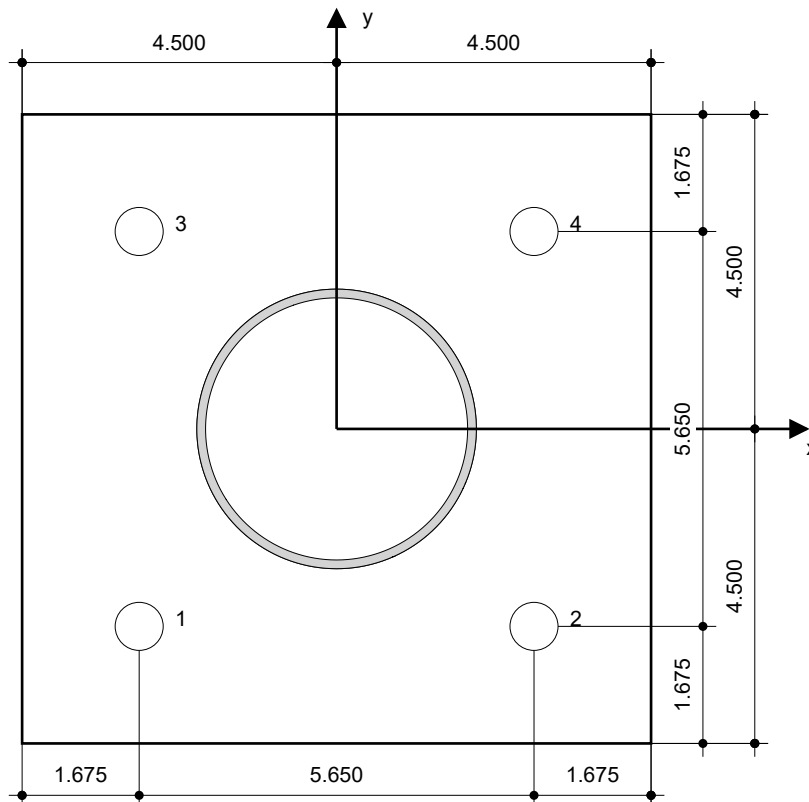
Maximum installation torque: -

Hole diameter in the base material: - in.

Hole depth in the base material: 18.000 in.

Minimum thickness of the base material: 18.922 in.

Hilti Hex Head headed stud anchor with 18 in embedment, 5/8, Steel galvanized, installation per instruction for use



Coordinates Anchor [in.]

Anchor	x	y	c _{-x}	c _{+x}	c _{-y}	c _{+y}
1	-2.825	-2.825	3.750	9.400	3.750	9.400
2	2.825	-2.825	9.400	3.750	3.750	9.400
3	-2.825	2.825	3.750	9.400	9.400	3.750
4	2.825	2.825	9.400	3.750	9.400	3.750



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Fastening point:			

8 Remarks; Your Cooperation Duties

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