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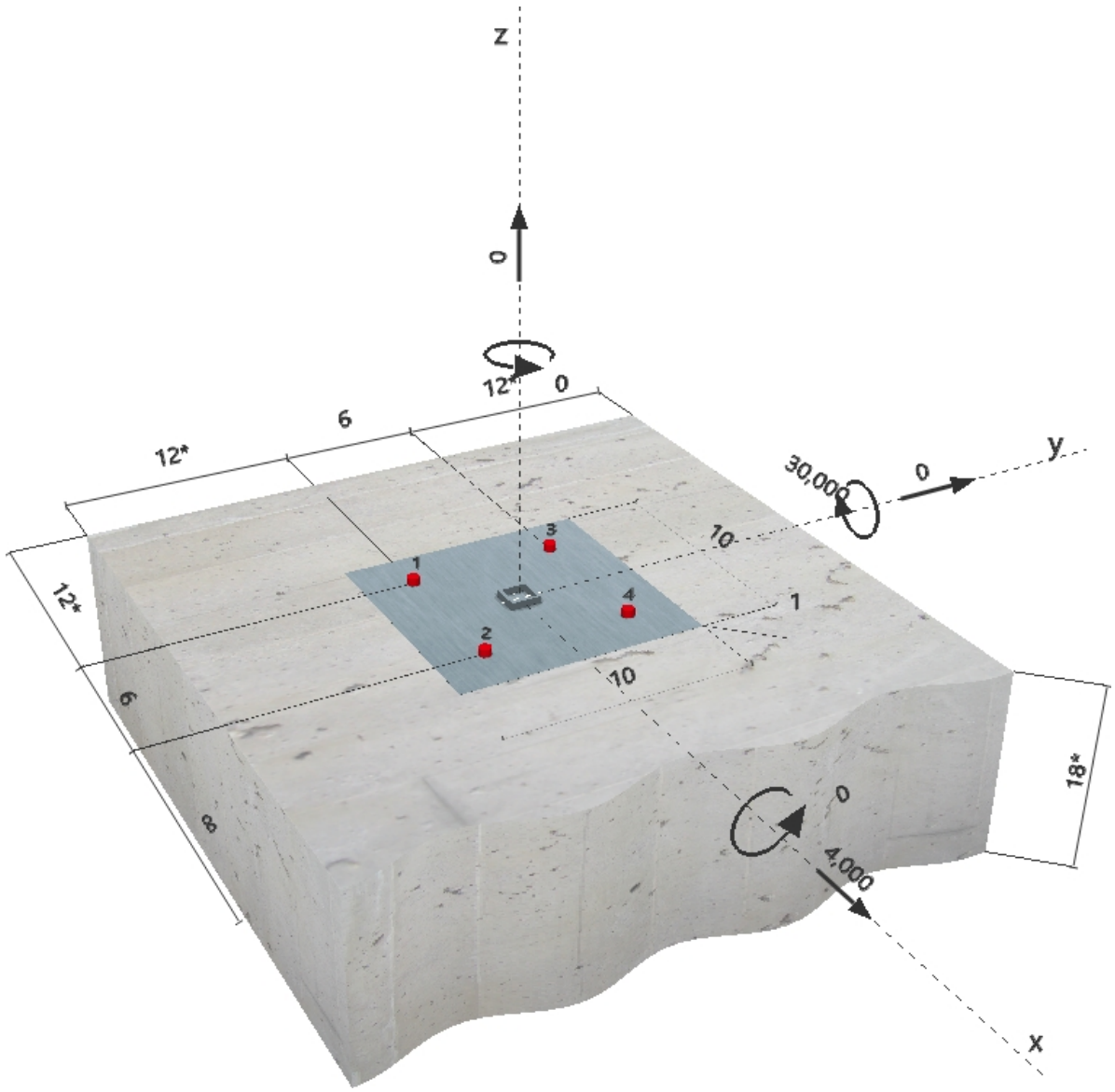
Specifier's comments:

1 Input data

Anchor type and size:	**AWS D1.1 GR. B 1/2**
Effective embedment depth:	h_{ef} = 4.724 in.
Material:	
Proof:	Design method ACI 318-08 / CIP
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 1.000 in.
Baseplate:	l_x x l_y x t = 10.000 in. x 10.000 in. x 1.000 in.; (Recommended plate thickness: not calculated
Profile:	Square HSS (AISC); (L x W x T) = 1.250 in. x 1.250 in. x 0.125 in.
Base material:	cracked concrete, 6000, f_c' = 6000 psi; h = 18.000 in.
Reinforcement:	tension: condition B, shear: condition B; edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	no

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



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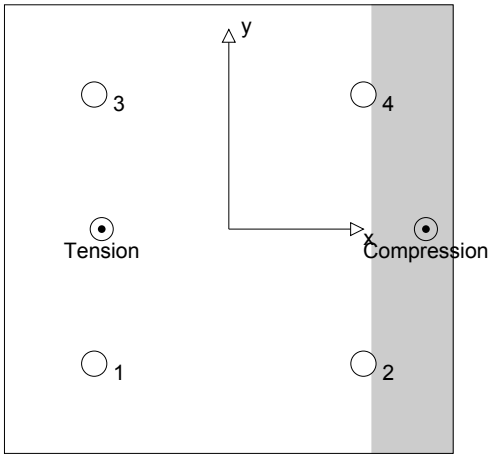
2 Load case/Resulting anchor forces

Load case: Design loads



Anchor reactions [lb]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	2018	1000	1000	0
2	58	1000	1000	0
3	2018	1000	1000	0
4	58	1000	1000	0

max. concrete compressive strain: 0.10 [‰]
max. concrete compressive stress: 456 [psi]
resulting tension force in (x/y)=(-2.832/0.000): 4152 [lb]
resulting compression force in (x/y)=(4.392/0.000): 4152 [lb]

3 Tension load

	Load N_{ua} [lb]	Capacity ϕN_n [lb]	Utilisation $\beta_N = N_{ua}/\phi N_n$	Status
Steel failure*	2018	9555	22	OK
Pull-out failure*	2018	19790	11	OK
Concrete cone failure**	4152	19341	22	OK
Concrete side-face blowout, direction **	N/A	N/A	N/A	N/A

* most unfavourable anchor **anchor group (anchors in tension)

3.1 Steel failure

$N_{sa} = A_{se,N} f_{uta}$ ACI 318-08 Eq. (D-3)
$\phi N_{sa} \geq N_{ua}$ ACI 318-08 Eq. (D-1)

Variables

$A_{se,N}$ [in.^{2}]	f_{uta} [psi]
0.20	65000

Calculations

N_{sa} [lb]
12740

Results

N_{sa} [lb]	ϕ steel	ϕN_{sa} [lb]	N_{ua} [lb]
12740	0.750	9555	2018

3.2 Pull-out failure

$N_{pN} = \psi_{c,p} N_p$ ACI 318-08 Eq. (D-14)
$N_p = 8 A_{brg} f_c'$ ACI 318-08 Eq. (D-15)
$\phi N_{pN} \geq N_{ua}$ ACI 318-08 Eq. (D-1)

Variables

$\psi_{c,p}$	A_{brg} [in.^{2}]	f_c' [psi]
1.000	0.59	6000

Calculations

N_p [lb]
28272

Results

N_{pn} [lb]	ϕ concrete	ϕN_{pn} [lb]	N_{ua} [lb]
28272	0.700	19790	2018

3.3 Concrete cone 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 318-08 Eq. (D-5)

$\phi N_{cbg} \geq N_{ua}$ ACI 318-08 Eq. (D-1)

A_{Nc} see ACI 318-08, Part D.5.2.1, Fig. RD.5.2.1(b)

$A_{Nc0} = 9 h_{ef}^2$ ACI 318-08 Eq. (D-6)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2 e'_N}{3 h_{ef}}}\right) \leq 1.0$ ACI 318-08 Eq. (D-9)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}}\right) \leq 1.0$ ACI 318-08 Eq. (D-11)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}}\right) \leq 1.0$ ACI 318-08 Eq. (D-13)

$N_b = k_c \lambda \sqrt{f'_c} h_{ef}^{1.5}$ ACI 318-08 Eq. (D-7)

Variables

h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$
4.724	2.832	0.000	12.000	1.000

c_{ac} [in.]	k_c	λ	f'_c [psi]
0.000	24	1	6000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
406.96	200.88	0.714	1.000	1.000	1.000	19090

Results

N_{cbg} [lb]	ϕ concrete	ϕN_{cbg} [lb]	N_{ua} [lb]
27631	0.700	19341	4152

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4 Shear load

	Load V_{ua} [lb]	Capacity ϕV_n [lb]	Utilisation $\beta_V = V_{ua}/\phi V_n$	Status
Steel failure*	1000	8281	13	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout failure**	4000	54144	8	OK
Concrete edge failure in direction y+**	4000	48315	9	OK

* most unfavourable anchor **anchor group (relevant anchors)

4.1 Steel failure

$V_{sa} = A_{se,V} f_{uta}$ ACI 318-08 Eq. (D-19)
$\phi V_{steel} \geq V_{ua}$ ACI 318-08 Eq. (D-2)

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]
0.20	65000

Calculations

V_{sa} [lb]
12740

Results

V_{sa} [lb]	ϕ steel	ϕV_{sa} [lb]	V_{ua} [lb]
12740	0.650	8281	1000

4.2 Pryout failure

$V_{cpg} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \right]$ ACI 318-08 Eq. (D-31)
$\phi V_{cpg} \geq V_{ua}$ ACI 318-08 Eq. (D-2)
A_{Nc} see ACI 318-08, Part D.5.2.1, Fig. RD.5.2.1(b)
$A_{Nc0} = 9 h_{ef}^2$ ACI 318-08 Eq. (D-6)
$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2 e'_N}{3 h_{ef}}} \right) \leq 1.0$ ACI 318-08 Eq. (D-9)
$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0$ ACI 318-08 Eq. (D-11)
$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0$ ACI 318-08 Eq. (D-13)
$N_b = k_c \lambda \sqrt{f'_c} h_{ef}^{1.5}$ ACI 318-08 Eq. (D-7)

Variables

k_{cp}	h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
2	4.724	0.000	0.000	12.000

$\psi_{c,N}$	c_{ac} [in.]	k_c	λ	f'_c [psi]
1.000	-	24	1	6000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
406.96	200.88	1.000	1.000	1.000	1.000	19090

Results

V_{cpg} [lb]	ϕ concrete	ϕV_{cpg} [lb]	V_{ua} [lb]
77348	0.700	54144	4000

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4.3 Concrete edge failure in direction y+

$V_{cbg} = \left(\frac{A_{Vc}}{A_{Vc0}}\right) \psi_{ec,V} \psi_{ed,V} \psi_{c,V} \psi_{h,V} \psi_{parallel,V} V_b$ ACI 318-08 Eq. (D-22)

$\phi V_{cbg} \geq V_{ua}$ ACI 318-08 Eq. (D-2)

A_{Vc} see ACI 318-08, Part D.6.2.1, Fig. RD.6.2.1(b)

$A_{Vc0} = 4.5 c_{a1}^2$ ACI 318-08 Eq. (D-23)

$\psi_{ec,V} = \left(\frac{1}{1 + \frac{2e'_v}{3c_{a1}}}\right) \leq 1.0$ ACI 318-08 Eq. (D-26)

$\psi_{ed,V} = 0.7 + 0.3\left(\frac{c_{a2}}{1.5c_{a1}}\right) \leq 1.0$ ACI 318-08 Eq. (D-28)

$\psi_{h,V} = \sqrt{\frac{1.5c_{a1}}{h_a}} \geq 1.0$ ACI 318-08 Eq. (D-29)

$V_b = \left(8 \left(\frac{l_e}{d_a}\right)^{0.2} \sqrt{d_a}\right) \lambda \sqrt{f'_c} c_{a1}^{1.5}$ ACI 318-08 Eq. (D-25)

Variables

c_{a1} [in.]	c_{a2} [in.]	e_{cV} [in.]	$\psi_{c,V}$	h_a [in.]
18.000	12.000	0.000	1.000	18.000

l_e [in.]	λ	d_a [in.]	f'_c [psi]	$\psi_{parallel,V}$
4.000	1.000	0.500	6000	2.000

Calculations

A_{Vc} [in.^{2}]	A_{Vc0} [in.^{2}]	$\psi_{ec,V}$	$\psi_{ed,V}$	$\psi_{h,V}$	V_b [lb]
810.00	1458.00	1.000	1.000	1.225	50720

Results

V_{cbg} [lb]	$\phi_{concrete}$	ϕV_{cbg} [lb]	V_{ua} [lb]
69021	0.700	48315	4000

5 Combined tension and shear loads

β_N	β_V	ζ	Utilisation $\beta_{N,V}$ [%]	Status
0.215	0.121	5/3	11	OK

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

6 Warnings

- The anchor design methods in PROFIS Anchor require rigid anchor plates per current regulations (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 Anchor calculates the minimum required anchor plate thickness with FEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid base plate assumption is valid is not carried out by PROFIS Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies when supplementary reinforcement is used. The Φ factor is increased for non-steel Design Strengths except Pullout Strength and Pryout Strength. Condition B applies when supplementary reinforcement is not used and for Pullout Strength and Pryout Strength. Refer to your local standard.
- Checking the transfer of loads into the base material and the shear resistance are required in accordance with ACI 318 or the relevant standard!

Fastening meets the design criteria!

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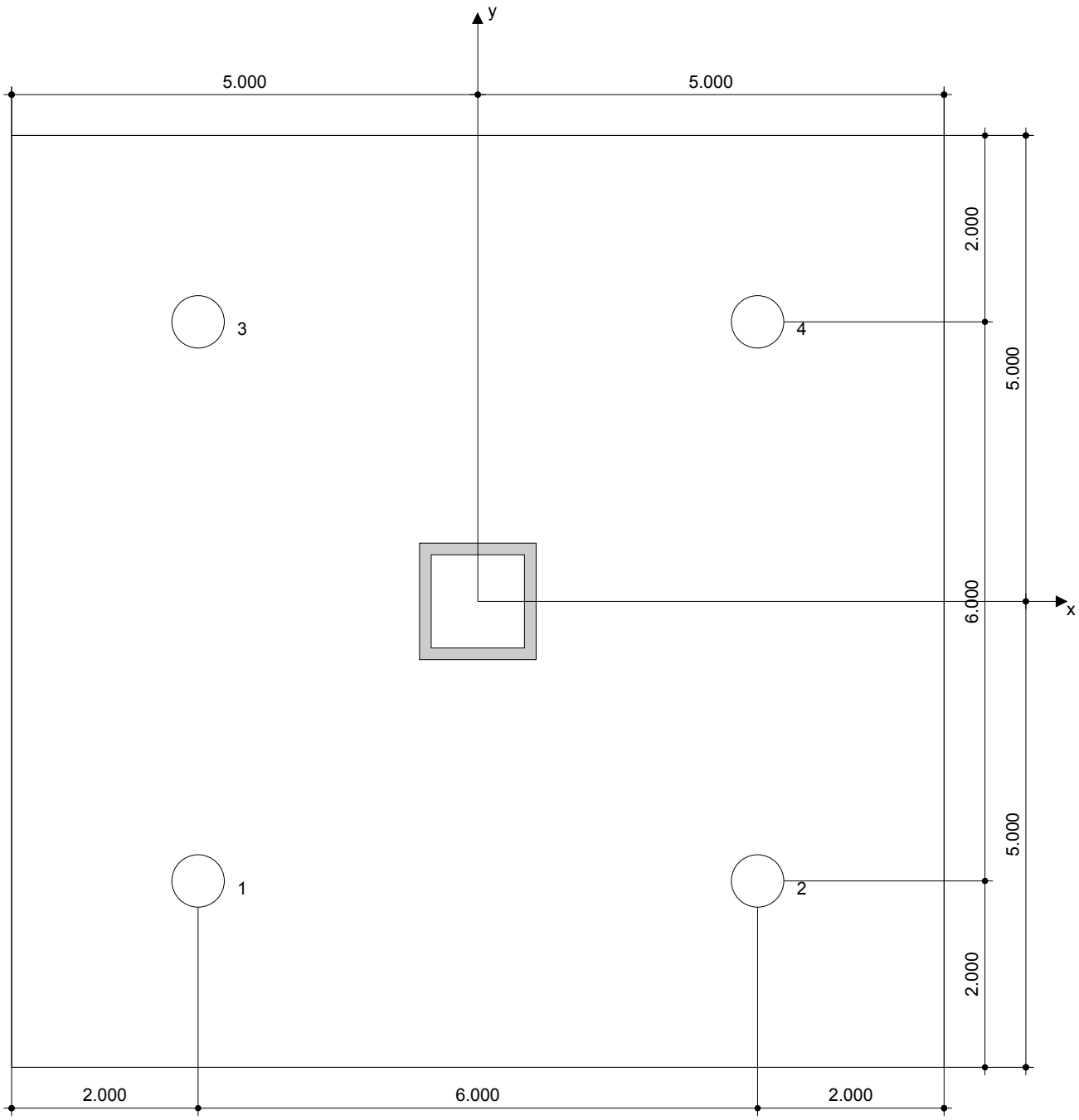
7 Installation data

Baseplate, steel: -
Profile: Square HSS (AISC); 1.250 x 1.250 x 0.125 in.
Hole diameter in the fixture: d_f = 0.563 in.
Plate thickness (input): 1.000 in.
Recommended plate thickness: not calculated
Drilling method: -
Cleaning: No cleaning of the drilled hole is required

Anchor type and size: AWS D1.1 GR. B 1/2
Installation torque: -
Hole diameter in the base material: - in.
Hole depth in the base material: 4.724 in.
Minimum thickness of the base material: 5.537 in.



Coordinates Anchor in.

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-3.000	-3.000	12.000	-	12.000	18.000
2	3.000	-3.000	18.000	-	12.000	18.000
3	-3.000	3.000	12.000	-	18.000	12.000
4	3.000	3.000	18.000	-	18.000	12.000

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8 Remarks; Your Cooperation Duties

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