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Address:		Specifier:	
Phone I Fax:	|	E-Mail:	sayantani.nitk@gmail.com
Design:	Concrete - Oct 29, 2025	Date:	10/29/2025
Fastening point:			

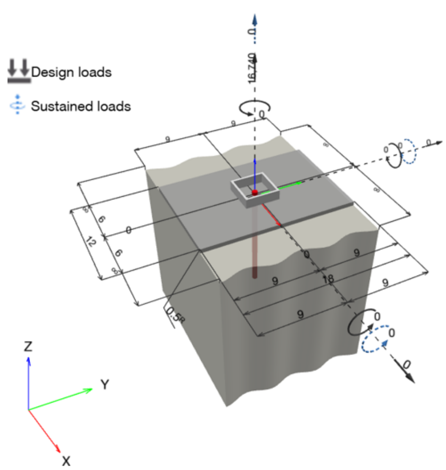
Specifier's comments:

1 Input data

Anchor type and diameter:	**HIT-RE 500 V3 + Rebar A706 Gr.60 #5**
Item number:	not available (element) / 2123401 HIT-RE 500 V3 (adhesive)
Specification text:	#5 Rebar with Hilti HIT-RE 500 V3 + Rebar A706 Gr.60 with 12 in nominal embedment depth per ICC-ES ESR-3814 , Hammer drill bit installation per MPII,
Effective embedment depth:	$h_{ef,act}$ = 12.000 in. ($h_{ef,limit}$ = - in.)
Material:	ASTM A 706 Gr.60
Evaluation Service Report:	ESR-3814
Issued I Valid:	1/1/2025 | 1/1/2027
Proof:	Design Method ACI 318-19 / Chem
Shear edge breakout verification:	Row closest to edge (Case 3 only from ACI 318-19 Fig. R.17.7.2.1b)
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.500 in.
Anchor plate^R :	l_x x l_y x t = 12.000 in. x 18.000 in. x 0.500 in.; (Recommended plate thickness: not calculated)
Profile:	Square HSS (AISC), HSS4X4X.25; (L x W x T) = 4.000 in. x 4.000 in. x 0.250 in.
Base material:	uncracked concrete, 8000, f_c' = 8,000 psi; h = 420.000 in., Temp. short/long: 32/32 °F
Installation:	**Hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: present, shear: not present; no supplemental splitting reinforcement present edge reinforcement: > No. 4 bar with stirrups

^{R} - The anchor calculation is based on a rigid anchor plate assumption.

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



1.1 Design results

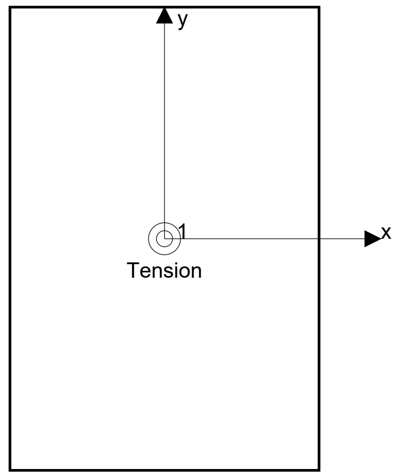
Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	N = 16,740; V_x = 0; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	no	117

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	16,740	0	0	0

Max. concrete compressive strain: - [‰]
Max. concrete compressive stress: - [psi]
Resulting tension force in (x/y)=(0.000/0.000): 16,740 [lb]
Resulting compression force in (x/y)=(-/-): 0 [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*	16,740	18,599	91	OK
Bond Strength**	16,740	14,353	117	not recommended
Sustained Tension Load Bond Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	16,740	23,174	73	OK

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

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3.1 Steel Strength

N_{sa} = ESR value — refer to ICC-ES ESR-3814

$\phi\ N_{sa} \geq N_{ua}$ — ACI 318-19 Table 17.5.2

Variables

$A_{se,N}$ [in.^{2}]	f_{uta} [psi]
0.31	80,000

Calculations

N_{sa} [lb]
24,799

Results

N_{sa} [lb]	ϕ_{steel}	$\phi\ N_{sa}$ [lb]	N_{ua} [lb]
24,799	0.750	18,599	16,740

3.2 Bond Strength

$N_a = \left(\frac{A_{Na}}{A_{Na0}}\right) \psi_{ed,Na}\ \psi_{cp,Na}\ N_{ba}$ — ACI 318-19 Eq. (17.6.5.1a)

$\phi\ N_a \geq N_{ua}$ — ACI 318-19 Table 17.5.2

A_{Na} see ACI 318-19, Section 17.6.5.1, Fig. R 17.6.5.1(b)

$A_{Na0} = (2\ c_{Na})^2$ — ACI 318-19 Eq. (17.6.5.1.2a)

$c_{Na} = 10\ d_a \sqrt{\frac{\tau_{uncr}}{1100}}$ — ACI 318-19 Eq. (17.6.5.1.2b)

$\psi_{ed,Na} = 0.7 + 0.3 \left(\frac{c_{a,min}}{c_{Na}}\right) \leq 1.0$ — ACI 318-19 Eq. (17.6.5.4.1b)

$\psi_{cp,Na} = MAX\left(\frac{c_{a,min}}{c_{ac}}, \frac{c_{Na}}{c_{ac}}\right) \leq 1.0$ — ACI 318-19 Eq. (17.6.5.5.1b)

$N_{ba} = \lambda_a \cdot \tau_{k,c} \cdot \pi \cdot d_a \cdot h_{ef}$ — ACI 318-19 Eq. (17.6.5.2.1)

Supplementary reinforcement is present. Why not use factor 1.0?

Variables

$\tau_{k,c,uncr}$ [psi]	d_a [in.]	h_{ef} [in.]	$c_{a,min}$ [in.]	$\alpha_{overhead}$	$\tau_{k,c}$ [psi]
2,300	0.625	12.000	9.000	1.000	2,300

c_{ac} [in.]	λ_a
22.093	1.000

Calculations

c_{Na} [in.]	A_{Na} [in.^{2}]	A_{Na0} [in.^{2}]	$\psi_{ed,Na}$
8.998	323.83	323.83	1.000

$\psi_{cp,Na}$	N_{ba} [lb]
0.407	54,203

Results

N_a [lb]	ϕ_{bond}	$\phi\ N_a$ [lb]	N_{ua} [lb]
22,081	0.650	14,353	16,740

17.6.5.5 *Bond splitting factor, $\psi_{cp,Na}$*

17.6.5.5.1 Modification factor for adhesive anchors designed for uncracked concrete in accordance with 17.6.5.1 without supplementary reinforcement to control splitting, $\psi_{cp,Na}$, shall be determined by (a) or (b) where c_{ac} is defined in 17.9.5

(a) If $c_{a,min} \geq c_{ac}$, then $\psi_{cp,Na} = 1.0$ (17.6.5.5.1a)

(b) If $c_{a,min} < c_{ac}$, then $\psi_{cp,Na} = \frac{c_{a,min}}{c_{ac}} \geq \frac{c_{Na}}{c_{ac}}$ (17.6.5.5.1b)

CODE

17.6.5.5.2 For all other cases, $\psi_{cp,Na}$ shall be taken as 1.0.

3.3 Concrete Breakout Failure

$N_{cb} = \left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b$ ACI 318-19 Eq. (17.6.2.1a)

$\phi\ N_{cb} \geq N_{ua}$ ACI 318-19 Table 17.5.2

A_{Nc} see ACI 318-19, Section 17.6.2.1, Fig. R 17.6.2.1(b)

$A_{Nc0} = 9\ h_{ef}^2$ ACI 318-19 Eq. (17.6.2.1.4)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5h_{ef}}\right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.4.1b)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5h_{ef}}{c_{ac}}\right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.6.1b)

$N_b = k_c\ \lambda_a\ \sqrt{f'_c}\ h_{ef}^{1.5}$ ACI 318-19 Eq. (17.6.2.2.1)

Variables

h_{ef} [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f'_c [psi]
12.000	9.000	1.000	22.093	24	1.000	8,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
648.00	1,296.00	0.850	0.815	89,234

Results

N_{cb} [lb]	$\phi_{concrete}$	$\phi\ N_{cb}$ [lb]	N_{ua} [lb]
30,898	0.750	23,174	16,740

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4 Shear load

	Load V_{ua} [lb]	Capacity ϕ V_n [lb]	Utilization $\beta_V = V_{ua}/\phi$ V_n	Status
Steel Strength*	N/A	N/A	N/A	N/A
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength (Bond Strength controls)*	N/A	N/A	N/A	N/A
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

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

5 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (EN1992-4, AS5216, 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 FEM 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!
- The equations presented in this report are based on imperial units. When inputs are displayed in metric units, the user should be aware that the equations remain in their imperial format.
- 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.
- Design Strengths of adhesive anchor systems are influenced by the cleaning method. Refer to the INSTRUCTIONS FOR USE given in the Evaluation Service Report for cleaning and installation instructions.
- For additional information about ACI 318 strength design provisions, please go to https://viewer.joomag.com/profis-design-guide-us-en-summer-2021/0841849001625154758?short&/
- Installation of Hilti adhesive anchor systems shall be performed by personnel trained to install Hilti adhesive anchors. Reference ACI 318-19, Section 26.7.

Fastening does not meet the design criteria!

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6 Installation data

Profile: Square HSS (AISC), HSS4X4X.25; (L x W x T) = 4.000 in. x 4.000 in. x 0.250 in.

Hole diameter in the fixture: d_f = 0.625 in.

Plate thickness (input): 0.500 in.

Recommended plate thickness: not calculated

Drilling method: Hammer drilled

Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

Anchor type and diameter: HIT-RE 500 V3 + Rebar A706 Gr.60 #5

Item number: not available (element) / 2123401 HIT-RE 500 V3 (adhesive)

Maximum installation torque: -

Hole diameter in the base material: 0.750 in.

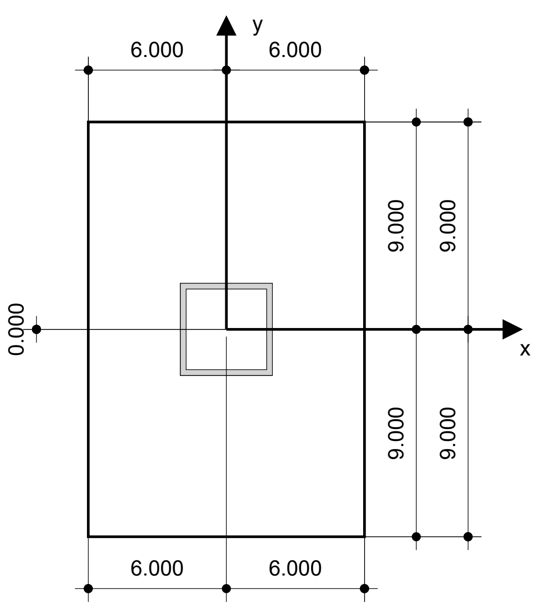
Hole depth in the base material: 12.000 in.

Minimum thickness of the base material: 13.500 in.

#5 Rebar with Hilti HIT-RE 500 V3 + Rebar A706 Gr.60 with 12 in nominal embedment depth per ICC-ES ESR-3814 , Hammer drill bit installation per MPII

6.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Compressed air with required accessories to blow from the bottom of the hole • Proper diameter wire brush	• Dispenser including cassette and mixer • For deep installations, a piston plug is necessary • Torque wrench



Coordinates Anchor [in.]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	0.000	0.000	-	-	9.000	9.000

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7 Remarks; Your Cooperation Duties

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