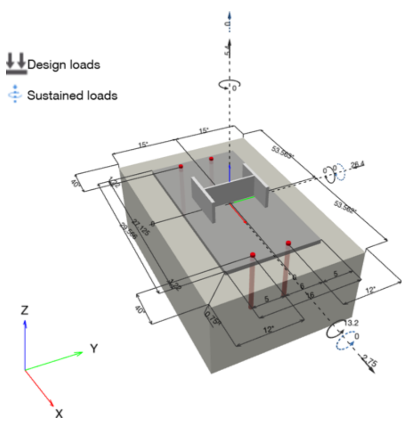
Specifier's comments:

1 Input data

Anchor type and diameter:	**HIT-RE 500 V3 + HAS-B-105 HDG (ASTM F1554 Gr.105) 3/4**
Item number:	2197976 HAS-B-105 HDG 3/4"x14" (element) / 2123401 HIT-RE 500 V3 (adhesive)
Specification text:	Hilti ∅ 3/4 in HIT-RE 500 V3 + HAS-B-105 HDG (ASTM F1554 Gr.105) with 10.039 in nominal embedment depth per ICC-ES ESR-3814 , Hammer drill bit installation per MPII,
Effective embedment depth:	$h_{ef,act}$ = 10.039 in. ($h_{ef,limit}$ = - in.)
Material:	ASTM F1554 Grade 105
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 = 0.750 in.
Anchor plate^R :	l_x x l_y x t = 29.566 in. x 16.000 in. x 0.750 in.; (Recommended plate thickness: not calculated)
Profile:	W shape (AISC), W10X39; (L x W x T x FT) = 9.920 in. x 7.990 in. x 0.315 in. x 0.530 in.
Base material:	cracked concrete, 3000, f_c' = 3,000 psi; h = 14.000 in., Temp. short/long: 32/32 °F
Installation:	**Hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: not 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 [kip, ft.kip]



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Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Upper Katz - Column Connection Design	Date:	8/21/2025
Fastening point:			

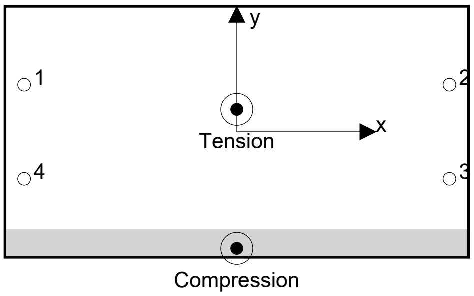
1.1 Design results

Case	Description	Forces [kip] / Moments [ft.kip]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 5.400$; $V_x = 2.750$; $V_y = -26.400$; $M_x = 13.20000$; $M_y = 0.00000$; $M_z = 0.00000$;	no	217

2 Load case/Resulting anchor forces

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

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	8.267	6.636	0.687	-6.600
2	8.267	6.636	0.687	-6.600
3	2.934	6.636	0.687	-6.600
4	2.934	6.636	0.687	-6.600



Max. concrete compressive strain: 0.16 [‰]
Max. concrete compressive stress: 677 [psi]
Resulting tension force in (x/y)=(0.000/1.428): 22.404 [kip]
Resulting compression force in (x/y)=(0.000/-7.434): 17.004 [kip]

Anchor forces are calculated based on the assumption of a rigid anchor plate.

3 Tension load

	Load N_{ua} [kip]	Capacity ϕ N_n [kip]	Utilization $\beta_N = N_{ua}/\phi$ N_n	Status
Steel Strength*	8.267	31.361	27	OK
Bond Strength**	22.404	44.654	51	OK
Sustained Tension Load Bond Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	22.404	31.262	72	OK

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

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]
0.33	125,000

Calculations

N_{sa} [kip]
41.815

Results

N_{sa} [kip]	ϕ_{steel}	$\phi\ N_{sa}$ [kip]	N_{ua} [kip]
41.815	0.750	31.361	8.267

3.2 Bond Strength

$N_{ag} = \left(\frac{A_{Na}}{A_{Na0}}\right) \psi_{ec1,Na}\ \psi_{ec2,Na}\ \psi_{ed,Na}\ \psi_{cp,Na}\ N_{ba}$	ACI 318-19 Eq. (17.6.5.1b)
$\phi\ N_{ag} \geq N_{ua}$	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)
$\psi_{ec,Na} = \left(\frac{1}{1 + \frac{e_N'}{c_{Na}}}\right) \leq 1.0$	ACI 318-19 Eq. (17.6.5.3.1)
$\psi_{ed,Na} = 0.7 + 0.3 \left(\frac{c_{a,min}}{c_{Na}}\right) \leq 1.0$	ACI 318-19 Eq. (17.6.5.4.1b)
$\psi_{cp,Na} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{c_{Na}}{c_{ac}}\right) \leq 1.0$	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)

Variables

$\tau_{k,c,uncr}$ [psi]	d_a [in.]	h_{ef} [in.]	$c_{a,min}$ [in.]	$\alpha_{overhead}$	$\tau_{k,c}$ [psi]
2,229	0.750	10.039	12.000	1.000	1,285

$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	c_{ac} [in.]	λ_a
0.000	1.428	25.235	1.000

Calculations

c_{Na} [in.]	A_{Na} [in.^{2}]	A_{Na0} [in.^{2}]	$\psi_{ed,Na}$
10.629	1,158.88	451.89	1.000

$\psi_{ec1,Na}$	$\psi_{ec2,Na}$	$\psi_{cp,Na}$	N_{ba} [kip]
1.000	0.882	1.000	30.388

Results

N_{ag} [kip]	ϕ_{bond}	$\phi\ N_{ag}$ [kip]	N_{ua} [kip]
68.699	0.650	44.654	22.404

3.3 Concrete Breakout Failure

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

$\phi\ N_{cbg} \geq N_{ua}$ 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)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2\ e'_N}{3\ h_{ef}}}\right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.3.1)

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

$\psi_{cp,N} = \mathrm{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5h_{ef}}{c_{ac}}\right) \leq 1.0$ 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.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$
10.039	0.000	1.428	12.000	1.000

c_{ac} [in.]	k_c	λ_a	f'_c [psi]
25.235	17	1.000	3,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [kip]
1,717.29	907.10	1.000	0.913	0.939	1.000	29.619

Results

N_{cbg} [kip]	$\phi_{concrete}$	$\phi\ N_{cbg}$ [kip]	N_{ua} [kip]
48.095	0.650	31.262	22.404

4 Shear load

	Load V_{ua} [kip]	Capacity ϕ V_n [kip]	Utilization $\beta_V = V_{ua}/\phi$ V_n	Status
Steel Strength*	6.636	16.308	41	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength (Concrete Breakout Strength controls)**	26.543	73.719	37	OK
Concrete edge failure in direction x+**	26.543	14.126	188	not recommended

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

4.1 Steel Strength

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

ϕ $V_{steel} \geq V_{ua}$ ACI 318-19 Table 17.5.2

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]
0.33	125,000

Calculations

V_{sa} [kip]
25.090

Results

V_{sa} [kip]	ϕ $_{steel}$	ϕ V_{sa} [kip]	V_{ua} [kip]
25.090	0.650	16.308	6.636

4.2 Pryout Strength (Concrete Breakout Strength controls)

$V_{cpg} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ec,N} \; \psi_{ed,N} \; \psi_{c,N} \; \psi_{cp,N} \; N_b \right]$ ACI 318-19 Eq. (17.7.3.1b)

$\phi \; V_{cpg} \geq V_{ua}$ 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)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2 \; e_N'}{3 \; h_{ef}}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.3.1)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5h_{ef}} \right) \leq 1.0$ 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

k_{cp}	h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
2	10.039	0.000	0.000	12.000

$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f_c' [psi]
1.000	25.235	17	1.000	3,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [kip]
1,717.29	907.10	1.000	1.000	0.939	1.000	29.619

Results

V_{cpg} [kip]	$\phi_{concrete}$	$\phi \; V_{cpg}$ [kip]	V_{ua} [kip]
105.313	0.700	73.719	26.543

4.3 Concrete edge failure in direction x+

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 318-19 Eq. (17.7.2.1b)
$\phi\ V_{cbg} \geq V_{ua}$		ACI 318-19 Table 17.5.2
A_{Vc}	see ACI 318-19, Section 17.7.2.1, Fig. R 17.7.2.1(b)*	
A_{Vc0}	$= 4.5\ c_{a1}^2$	ACI 318-19 Eq. (17.7.2.1.3)
$\psi_{ec,V}$	$= \left(\frac{1}{1 + \frac{e_V'}{1.5c_{a1}}}\right) \leq 1.0$	ACI 318-19 Eq. (17.7.2.3.1)
$\psi_{ed,V}$	$= 0.7 + 0.3\left(\frac{c_{a2}}{1.5c_{a1}}\right) \leq 1.0$	ACI 318-19 Eq. (17.7.2.4.1b)
$\psi_{h,V}$	$= \sqrt{\frac{1.5c_{a1}}{h_a}} \geq 1.0$	ACI 318-19 Eq. (17.7.2.6.1)
V_b	$= 9\ \lambda_a\ \sqrt{f_c'}\ c_{a1}^{1.5}$	ACI 318-19 Eq. (17.7.2.2.1b)

Variables

c_{a1} [in.]	c_{a2} [in.]	e_{cV} [in.]	$\psi_{c,V}$	h_a [in.]
9.333	12.000	0.000	1.400	14.000

l_e [in.]	λ_a	d_a [in.]	f_c' [psi]	$\psi_{parallel,V}$
6.000	1.000	0.750	3,000	1.000

Calculations

A_{Vc} [in.^{2}]	A_{Vc0} [in.^{2}]	$\psi_{ec,V}$	$\psi_{ed,V}$	$\psi_{h,V}$	V_b [kip]
420.00	392.00	1.000	0.957	1.000	14.056

Results

V_{cbg} [kip]	$\phi_{concrete}$	$\phi\ V_{cbg}$ [kip]	V_{ua} [kip]
20.180	0.700	14.126	26.543

*Anchor row defined by: Anchor 2, 3; Case 3 controls

5 Combined tension and shear loads, per ACI 318-19 section 17.8

β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
0.717	1.879	1.000	217	not recommended

$\beta_{NV} = (\beta_N + \beta_V) / 1.2 <= 1$

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!
- 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!

7 Installation data

Profile: W shape (AISC), W10X39; (L x W x T x FT) = 9.920 in. x 7.990 in. x 0.315 in. x 0.530 in.

Hole diameter in the fixture: d_f = 0.812 in.

Plate thickness (input): 0.750 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 + HAS-B-105 HDG (ASTM F1554 Gr.105) 3/4

Item number: 2197976 HAS-B-105 HDG 3/4"x14" (element) / 2123401 HIT-RE 500 V3 (adhesive)

Maximum installation torque: 0.10000 ft.kip

Hole diameter in the base material: 0.875 in.

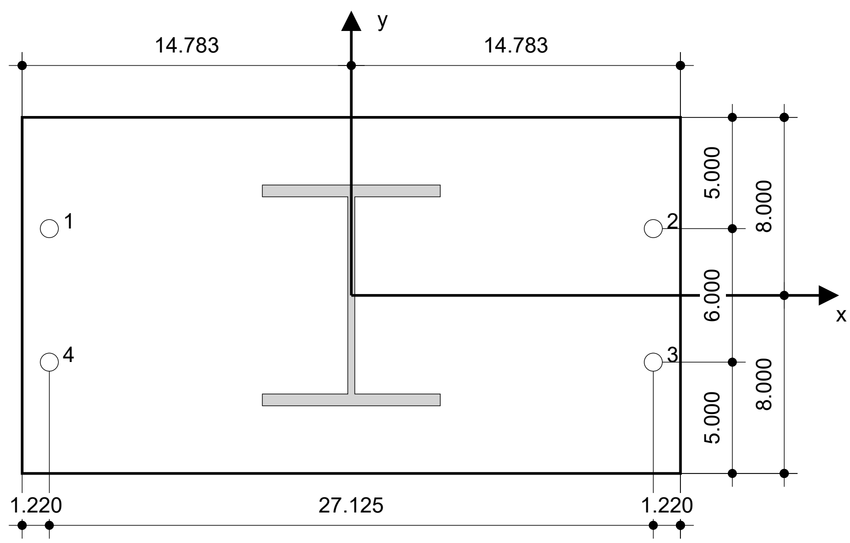
Hole depth in the base material: 10.039 in.

Minimum thickness of the base material: 11.789 in.

Hilti ∅ 3/4 in HIT-RE 500 V3 + HAS-B-105 HDG (ASTM F1554 Gr.105) with 10.03937 in nominal embedment depth per ICC-ES ESR-3814 , Hammer drill bit installation per MPII

7.1 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 • Torque wrench



Coordinates Anchor [in.]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-13.562	3.000	40.000	67.125	18.000	12.000
2	13.562	3.000	67.125	40.000	18.000	12.000
3	13.562	-3.000	67.125	40.000	12.000	18.000
4	-13.562	-3.000	40.000	67.125	12.000	18.000

8 Remarks; Your Cooperation Duties

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