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Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Masonry - Jan 17, 2023	Date:	1/17/2023
Fastening point:			

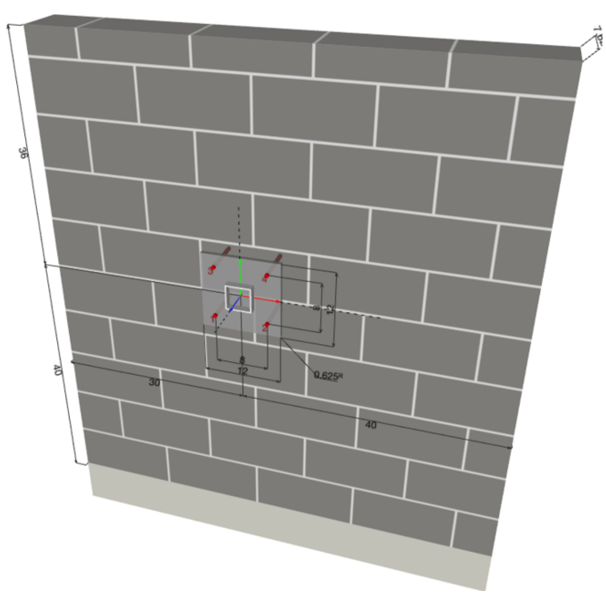
Specifier's comments:

1 Input data

Anchor type and diameter:	**HY 270 + threaded rod 316/304 5/8**
Item number:	2045007 HAS-R 316 SS 5/8"x7 5/8" (element) / 2194247 HIT-HY 270 (adhesive)
Effective embedment depth:	h_{ef} = 5.625 in.
Material:	ASTM F 593
Evaluation Service Report:	ESR-4143
Issued I Valid:	3/1/2021 | 1/1/2022
Proof:	Design Method ASD Masonry
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.625 in.
Anchor plate[R] :	l_x x l_y x t = 12.000 in. x 12.000 in. x 0.625 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:	Grout-filled CMU, L x W x H: 16.000 in. x 8.000 in. x 8.000 in.;
	Joints: vertical: 0.375 in.; horizontal: 0.375 in.
	Base material temperature: 68 °F
Installation:	Face installation
Seismic loads	no

[R] - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [in.]



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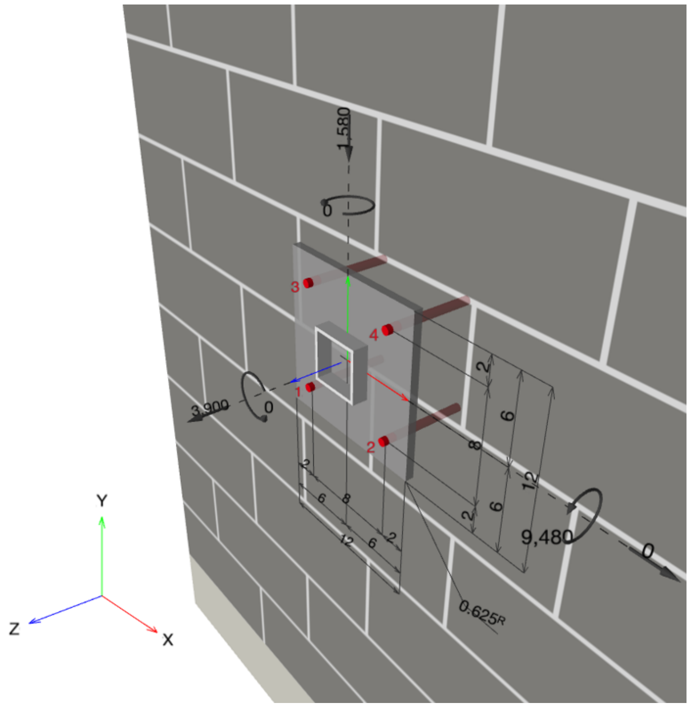
Geometry [in.] & Loading [lb, in.lb]



1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	N = 3,900; V_x = 0; V_y = -1,580; M_x = 9,480; M_y = 0; M_z = 0;	no	191

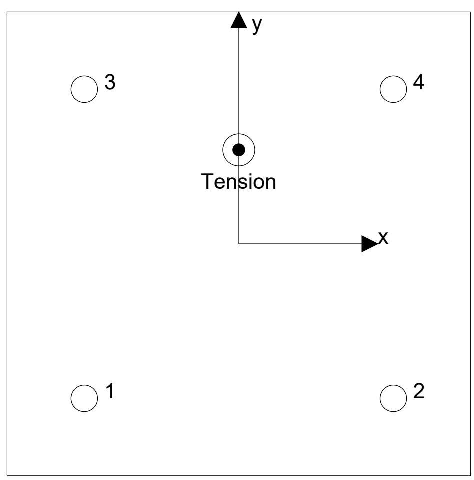
2 Load case/Resulting anchor forces

Load case: Service loads

Anchor reactions [lb]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	383	395	0	-395
2	383	395	0	-395
3	1,567	395	0	-395
4	1,567	395	0	-395



max. compressive strain: - [‰]
max. compressive stress: - [psi]
resulting tension force in (x/y)=(0.000/2.431): 3,900 [lb]
resulting compression force in (x/y)=(0.000/0.000): 0 [lb]

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

3 Tension load (Most utilized anchor 3)

	Load P_s [lb]	Capacity P_t [lb]	Utilization $\beta_P = P_s/P_t$ [%]	Status
Steel strength	1,567	10,125	16	OK
Bond strength	1,567	1,050	150	not recommended

3.1 Steel strength

$P_{t,s}$ = ESR Value   refer to ICC-ES ESR-4143

$P_{t,s} \geq P_s$

Results

$P_{t,s}$ [lb]	P_s [lb]
10,125	1,567

3.2 Bond strength

$P_{t,b,Base}$ = ESR Value   refer to ICC-ES ESR-4143

$P_{t,b} = P_{t,b,Base} \cdot f_{red,E} \cdot f_{red,s} \cdot f_{red,Temp} \cdot f_{red,Bedjoint}$

$P_{t,b} \geq P_s$

Variables

c_{min} [in.]	c_{cr} [in.]	s_{min} [in.]	s_{cr} [in.]	Temperature [°F]
4.000	20.000	4.000	22.500	68

Results

$P_{t,b}$ [lb]	$P_{t,b,Base}$ [lb]	P_s [lb]	$f_{red,E}$	$f_{red,S}$	$f_{red,Temp}$	$f_{red,Bedjoint}$
1,050	2,840	1,567	1.000	0.370	1.000	1.000

4 Shear load (Most utilized anchor 3)

	Load V_s [lb]	Capacity V_t [lb]	Utilization $\beta_V = V_s/V_t$ [%]	Status
Steel strength	395	5,215	8	OK
Bond strength para and perp, (Dir. x-)[1]	-	-	41	OK

[1]Shear utilization may result from parallel and perpendicular shear (see details)

4.1 Steel strength

$V_{t,s}$ = ESR Value refer to ICC-ES ESR-4143
$V_{t,s} \geq V_s$

Results

$V_{t,s}$ [lb]	V_s [lb]
5,215	395

4.2 Bond strength parallel

$V_{t,b,Base,||}$ = ESR Value refer to ICC-ES ESR-4143
$V_{t,b,||} = V_{t,b,Base,||} \cdot f_{red,E,||} \cdot f_{red,s,||} \cdot f_{red,Temp}$
$V_{t,b,||} \geq V_{s,||}$

Variables

c_{min} [in.]	c_{cr} [in.]	s_{min} [in.]	s_{cr} [in.]	Temperature [°F]
4.000	20.000	4.000	22.500	68

Results

$V_{t,b,||}$ [lb]	$V_{t,b,Base,||}$ [lb]	$V_{s,||}$ [lb]	$f_{red,E,||}$	$f_{red,S,||}$	$f_{red,Temp}$	Utilization $\beta_{V,||}$ [%]
967	2,615	-395	1.000	0.370	1.000	41

4.3 Bond strength perpendicular

$V_{t,b,Base,\perp}$ = ESR Value refer to ICC-ES ESR-4143
$V_{t,b,\perp} = V_{t,b,Base,\perp} \cdot f_{red,E,\perp} \cdot f_{red,s,\perp} \cdot f_{red,Temp}$
$V_{t,b,\perp} \geq V_{s,\perp}$

Variables

c_{min} [in.]	c_{cr} [in.]	s_{min} [in.]	s_{cr} [in.]	Temperature [°F]
4.000	20.000	4.000	22.500	68

Results

$V_{t,b,\perp}$ [lb]	$V_{t,b,Base,\perp}$ [lb]	$V_{s,\perp}$ [lb]	$f_{red,E,\perp}$	$f_{red,S,\perp}$	$f_{red,Temp}$	Utilization $\beta_{V,\perp}$ [%]
0	2,615	0	0.000	0.000	1.000	0

4.4 Shear interaction

$\beta_{V,\parallel} = \frac{V_{s,\parallel}}{V_{t,\parallel}}$	$\beta_{V,\perp} = \frac{V_{s,\perp}}{V_{t,\perp}}$	δ	Utilization β_V [%]	Status
0.408	0.000	1.000	41	OK

$\beta_V = \beta_{V,\parallel}^{\delta} + \beta_{V,\perp}^{\delta} <= 1.0$

5 Combined tension and shear loads (Most utilized anchor 3)

$\beta_P = \frac{P_s}{P_t}$	$\beta_{V,\parallel} = \frac{V_{s,\parallel}}{V_{t,\parallel}}$	$\beta_{V,\perp} = \frac{V_{s,\perp}}{V_{t,\perp}}$	α	Utilization $\beta_{P,V}$ [%]	Status
1.493	0.408	0.000	1.000	191	not recommended

$\beta_{P,V} = \beta_P^{\alpha} + \beta_{V,\parallel}^{\alpha} + \beta_{V,\perp}^{\alpha} <= 1.0$

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!
- Refer to the manufacturer's product literature for cleaning and installation instructions.
- For additional information about ACI 318 strength design provisions, please go to https://submittals.us.hilti.com/PROFISAnchorDesignGuide/
- The min. sizes of the bricks, the masonry compressive strength, the type / strength of the mortar and the grout (in case of fully grouted CMU walls) has to fulfill the requirements given in the relevant ESR-approval or in the PTG.
- Only the local load transfer from the anchor(s) to the wall is considered, a further load transfer in the wall is not covered by PROFIS!
- Wall is assumed as being perfectly aligned vertically – checking required(!): Noncompliance can lead to significantly different distribution of forces and higher tension loads than those calculated by PROFIS. Masonry wall must not have any damages (neither visible nor not visible)! While installation, the positioning of the anchors needs to be maintained as in the design phase i.e. either relative to the brick or relative to the mortar joints.
- The effect of the joints on the compressive stress distribution on the plate / bricks was not taken into consideration.
- If no significant resistance is felt over the entire depth of the hole when drilling (e.g. in unfilled butt joints), the anchor should not be set at this position or the area should be assessed and reinforced. Hilti recommends the anchoring in masonry always with sieve sleeve. Anchors can only be installed without sieve sleeves in solid bricks when it is guaranteed that it has not any hole or void.
- The accessories and installation remarks listed on this report are for the information of the user only. In any case, the instructions for use provided with the product have to be followed to ensure a proper installation.
- The compliance with current standards (e.g. 2018, 2015, 2012, 2009 and 2006 IBC) is the responsibility of the user.
- Drilling method (hammer, rotary) to be in accordance with the approval!
- Masonry needs to be built in a regular way in accordance with state-of the art guidelines!
- Warnings/Notes - OST in Masonry HNA!

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Fastening does not meet the design criteria!

7 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 = 0.687 in.

Plate thickness (input): 0.625 in.

Drilling method: Drilled in hammer mode

Anchor type and diameter: HY 270 + threaded rod 316/304 5/8

Item number: 2045007 HAS-R 316 SS 5/8"x7 5/8" (element) / 2194247 HIT-HY 270 (adhesive)

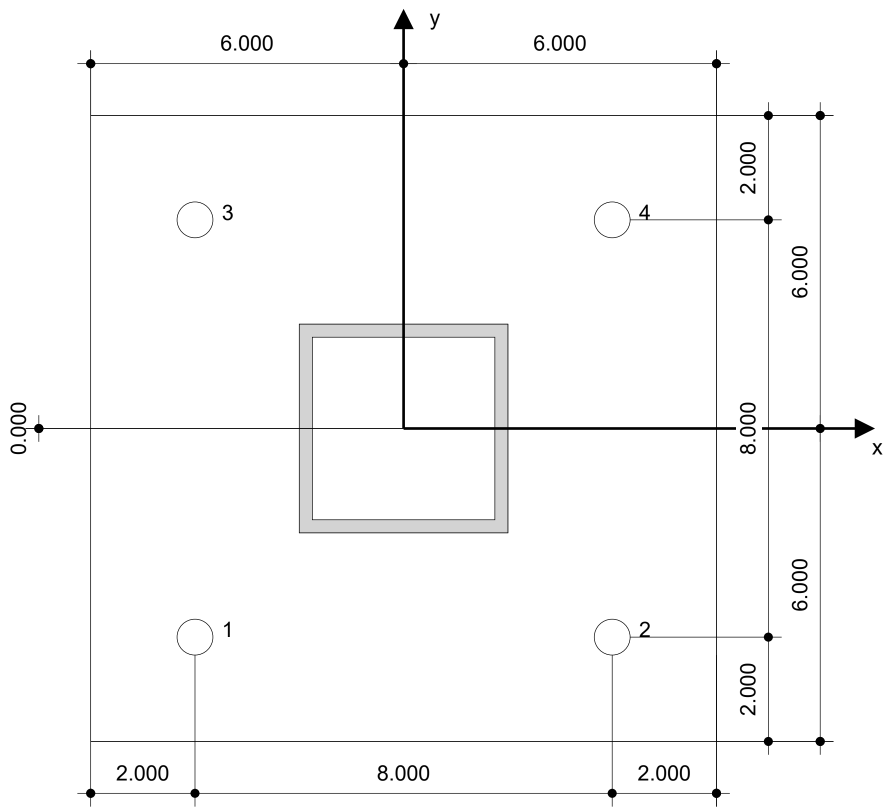
Maximum installation torque: 90 in.lb

Hole diameter in the base material: 0.750 in.

Hole depth in the base material: 5.625 in.

Minimum thickness of the base material: 7.625 in.

Hilti HIT-V threaded rod with HIT-HY 270 injection mortar with 5.625 in embedment h_ef, 5/8, Stainless steel, Hammer drilled installation per ESR-4143



Coordinates Anchor [in.]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-4.000	-4.000	26.000	44.000	36.000	40.000
2	4.000	-4.000	34.000	36.000	36.000	40.000
3	-4.000	4.000	26.000	44.000	44.000	32.000
4	4.000	4.000	34.000	36.000	44.000	32.000

8 Remarks; Your Cooperation Duties

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