Company:	Matrix Consulting Engineers	Page:	1
Address:	Unit 7, BBIC, Innovation Way, Barnsley S75 1JL	Specifier:	Liam Hoyland
Phone I Fax:	0784984288 |	E-Mail:	info@matrixce.co.uk
Design:	Masonry - 4 Oct 2022 (1)	Date:	05/10/2022
Fastening Point:			

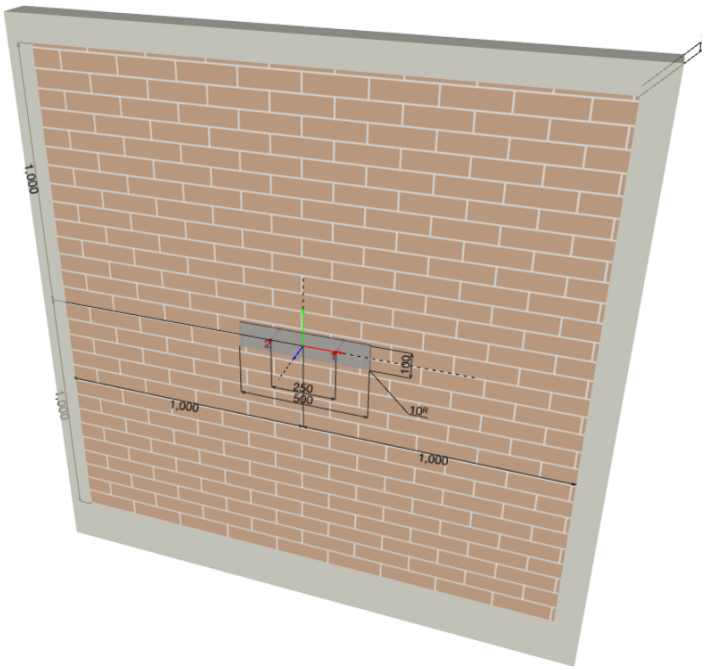
Specifier's comments:

1 Input data

Anchor type and size:	**HIT-HY 270 + HIT-IC (5.8) M10, HIT-SC 18x85**
Item number:	47936 HIT-IC M10x80 (insert) / 2092828 HIT-HY 270 (mortar) / 360486 HIT-SC 18x85 (sieve sleeve)
Effective embedment depth:	$h_{ef,act}$ = 80.0 mm ($h_{ef,limit}$ = 80.0 mm)
Material:	5.8
Approval No.:	Hilti Technical Data
Issued I Valid:	- | -
Proof:	Design Method ETAG 029, Annex C
Stand-off installation:	e_b = 0.0 mm (no stand-off); t = 10.0 mm
Baseplate[R] :	l_x x l_y x t = 500.0 mm x 100.0 mm x 10.0 mm; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	Brick layout: Stretcher; Brick: England Nostell Red Multi (hollow brick), Clay, L x W x H: 215.0 mm x 102.0 mm x 65.0 mm; $f_{b,v}$ = 70.00 N/mm^2; E_{wall} = 8,806.05 N/mm^2 Mortar: M10 - M20; Vertical joints filled: YES; vertical: 6.0 mm; horizontal: 6.0 mm
Installation/Use:	Installation condition: Dry; Use condition: Dry; Cleaning: compressed air Temp. short/long: 40/24 °C

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

Geometry [mm]



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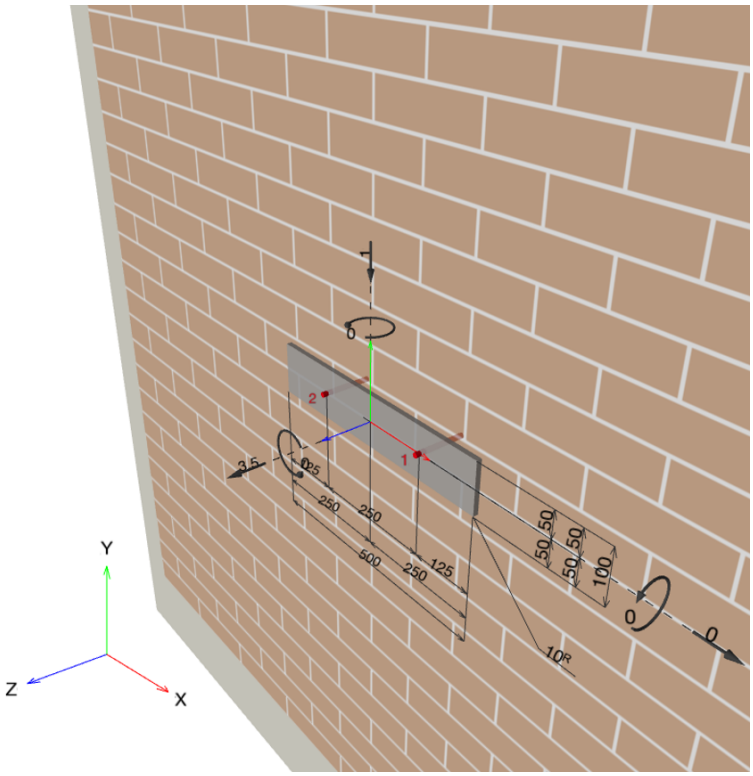
Geometry [mm] & Loading [kN, kNm]



1.1 Load combination

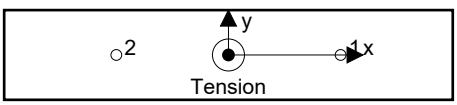
Case	Description	Forces [kN] / Moments [kNm]	Seismic	Fire	Max. Util. Anchor [%]
1	Load case: Design loads	N = 3.500; V_x = 0.000; V_y = -1.000; M_x = 0.000; M_y = 0.000; M_z = 0.000;	no	no	305

2 Load case/Resulting anchor forces

Anchor reactions [kN]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	1.750	0.500	0.000	-0.500
2	1.750	0.500	0.000	-0.500



max. compressive strain:	- [‰]
max. compressive stress:	- [N/mm^2]
resulting tension force in (x/y)=(0.0/0.0):	3.500 [kN]
resulting compression force in (x/y)=(0.0/0.0):	0.000 [kN]

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

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3 Tension load (ETAG 029 Annex C, Section C.5.2.1)

	Load [kN]	Capacity [kN]	Utilization β_N [%]	Status
Steel failure*	1.750	4.867	36	OK
Pull-out failure*	1.750	3.200	55	OK
Brick breakout**	3.500	6.400	55	OK
Pullout of one brick*	1.750	3.427	52	OK

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

3.1 Steel failure

$N_{Rk,s}$ [kN]	$\gamma_{M,s}$	$N_{Rd,s}$ [kN]	N_{Sd} [kN]
7.300	1.500	4.867	1.750

3.2 Pull-out failure

$N_{Rk,p}$ [kN]	α_j	$\gamma_{M,m}$	$N_{Rd,p}$ [kN]	N_{Sd} [kN]
8.000	1.000	2.500	3.200	1.750

3.3 Brick breakout

$s_{\parallel}$ [mm]	$s_{\perp}$ [mm]	$s_{cr,\parallel}$ [mm]	$s_{cr,\perp}$ [mm]	c [mm]	c_{cr} [mm]
250.0	0.0	215.0	140.0	∞	105.0

$N_{Rk,b}$ [kN]	α_j	$\alpha_{g,N}$	$\gamma_{M,m}$	$N_{Rd,b}$ [kN]	N_{Sd} [kN]
8.000	1.000	2.000	2.500	6.400	3.500

3.4 Pullout of one brick

A^H_{act} [mm²]	A^V_{act} [mm²]	f_{vko} [N/mm²]	σ_d [N/mm²]
43,860	13,260	0.30	0.00

$N_{Rk,pb}$ [kN]	$\gamma_{M,m}$	$N_{Rd,pb}$ [kN]	N_{Sd} [kN]
8.568	2.500	3.427	1.750

4 Shear load (ETAG 029 Annex C, Section C.5.2.2)

	Load [kN]	Capacity [kN]	Utilization β_V [%]	Status
Steel failure (without lever arm)*	0.500	12.000	5	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Local brick failure**	1.000	9.600	11	OK
Brick edge failure in direction x-**	0.500	0.200	250	not recommended
Pushing out of one brick in direction **	N/A	N/A	N/A	N/A

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

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4.1 Steel failure (without lever arm)

$V_{Rk,s}$ [kN]	$\gamma_{M,s}$	$V_{Rd,s}$ [kN]	V_{Sd} [kN]
15.000	1.250	12.000	0.500

4.2 Local brick failure

$s_{\parallel}$ [mm]	$s_{\perp}$ [mm]	$s_{cr,\parallel}$ [mm]	$s_{cr,\perp}$ [mm]	c [mm]	c_{cr} [mm]
250.0	0.0	215.0	140.0	∞	105.0

$\alpha_{g,V}$	α_j	$V_{Rk,b}$ [kN]	$\gamma_{M,m}$	$V_{Rd,b}$ [kN]	V_{Sd} [kN]
2.000	1.000	12.000	2.500	9.600	1.000

4.3 Brick edge failure in direction x-

$V_{Rk,c,\parallel}$ [kN]	$V_{Rk,c,\perp}$ [kN]	$\alpha_{g,V}$	$\gamma_{M,m}$	$V_{Rd,c}$ [kN]	V_{Sd} [kN]
0.003	12.000	1.000	2.500	0.200	0.500

5 Combined tension and shear loads (ETAG 029 Annex C, Section C.5.2.3)

β_N	β_V	Utilization $\beta_{N,V}$ [%]	Status
0.547	2.500	305	not recommended

$\beta_N + \beta_V <= 1$

6 Warnings

- The anchor design methods in PROFIS Engineering require rigid baseplates 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 baseplate are not considered - the baseplate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required baseplate thickness with CBFEM to limit the stress of the baseplate based on the assumptions explained above. The proof if the rigid baseplate 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!
- 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. ETAG 029) is the responsibility of the user.
- The Young's modulus of the wall E_{wall} (not plastered!) is determined in accordance to EN 1996-1-1:2012
- 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!
- Please note that, for ETA approved masonry units, the resistance and parameters are only valid for that particular brick (hollow/solid) or for bricks of the same base material with larger size and larger compressive strength (solid), according to ETAG 029.

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Fastening does not meet the design criteria!

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7 Installation data

Baseplate, steel: S 235; E = 210,000.00 N/mm^2; f_{yk} = 235.00 N/mm^2

Profile: no profile

Hole diameter in the fixture: d_f = 12.0 mm

Plate thickness (input): 10.0 mm

Recommended plate thickness: not calculated

Drilling method: Drilled in rotary mode

Cleaning: compressed air

Anchor type and size: HIT-HY 270 + HIT-IC (5.8) M10, HIT-SC 18x85

Item number: 47936 HIT-IC M10x80 (insert) / 2092828 HIT-HY 270 (mortar) / 360486 HIT-SC 18x85 (sieve sleeve)

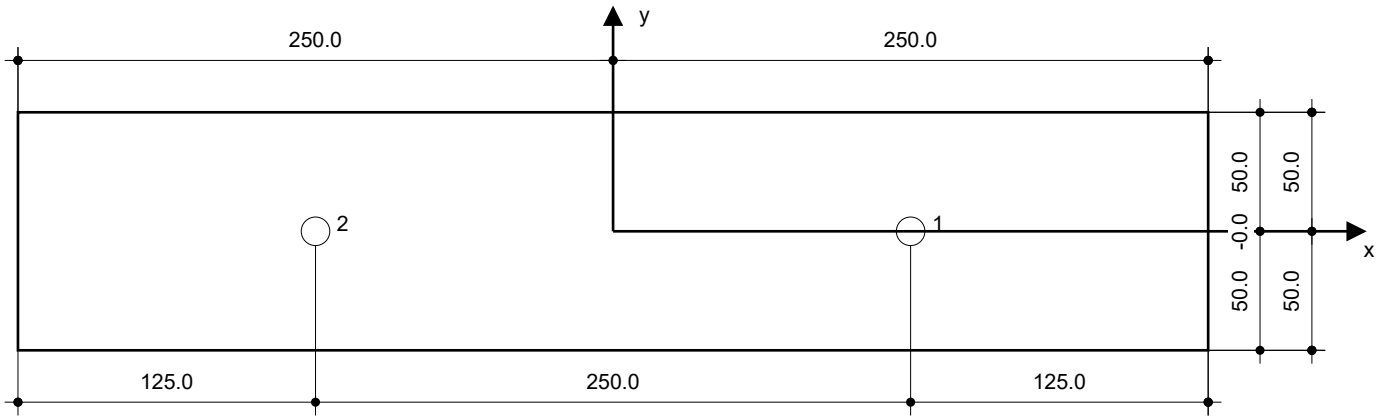
Maximum installation torque: 4 Nm

Hole diameter in the base material: 18.0 mm

Hole depth in the base material: 95.0 mm

Minimum thickness of the base material: 115.0 mm

Hilti HIT-IC insert with HIT-HY 270 injection mortar and 1 HIT-SC 18x85 sieve sleeve(s) with 80 mm embedment h_ef, M10, Steel galvanized, Rotary drilling installation per instruction for use



Coordinates Anchor [mm]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	125.0	-0.0	1,125.0	875.0	1,000.0	1,000.0
2	-125.0	0.0	875.0	1,125.0	1,000.0	1,000.0

8 Remarks; Your Cooperation Duties

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