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Design:	Concrete - 31 May 2023	Date:	01/06/2023
Fastening Point:			

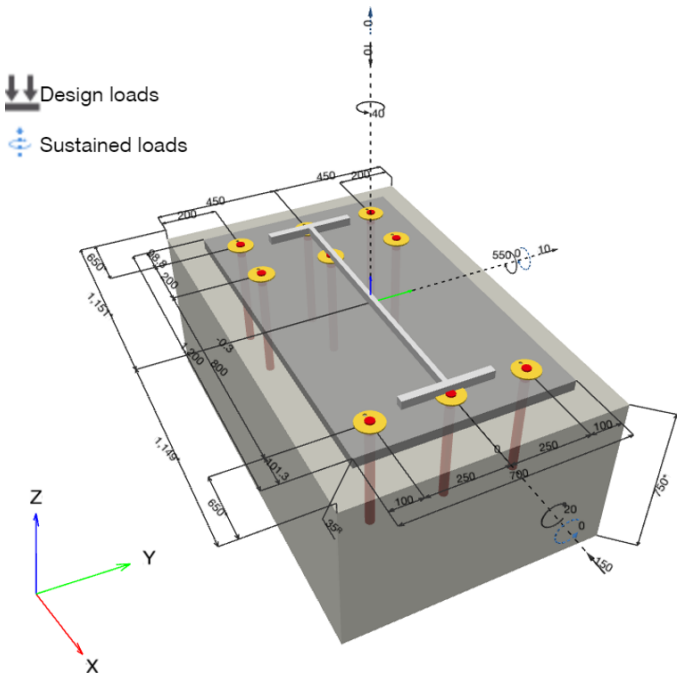
Specifier's comments:

1 Input data

Anchor type and size:	**HIT-HY 200-A + HAS-U 8.8 HDG M30**
Return period (service life in years):	50
Item number:	not available (insert) / 2022696 HIT-HY 200-A (mortar)
Hilti Filling Set or any suitable annular gap filling solution	
Effective embedment depth:	$h_{ef,act}$ = 360.0 mm ($h_{ef,limit}$ = - mm)
Material:	8.8
Approval No.:	ETA 11/0493
Issued I Valid:	10/12/2021 | -
Proof:	SOFA design method + fib (07/2011) - after ETAG BOND testing
Stand-off installation:	e_b = 0.0 mm (no stand-off); t = 35.0 mm
Baseplate[R] :	l_x x l_y x t = 1,200.0 mm x 700.0 mm x 35.0 mm; (Recommended plate thickness: not calculated)
Profile:	Advance UKB, 1016 x 305 x 249 ; (L x W x T x FT) = 980.1 mm x 300.0 mm x 16.5 mm x 26.0 mm
Base material:	cracked concrete, C40/50, $f_{c,cyl}$ = 40.00 N/mm^2; h = 750.0 mm, Temp. short/long: 0/0 °C
Installation:	**automatic cleaned drilled hole, Installation condition: Dry**
Reinforcement:	No reinforcement or Reinforcement spacing >= 150 mm (any Ø) or >= 100 mm (Ø <= 10 mm) no longitudinal edge reinforcement

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

Geometry [mm] & Loading [kN, kNm]



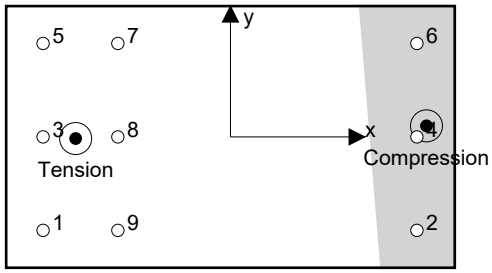
1.1 Load combination

Case	Description	Forces [kN] / Moments [kNm]	Seismic	Fire	Max. Util. Anchor [%]
1	Combination 1	N = -10.000; V_x = -150.000; V_y = 10.000; M_x = -20.000; M_y = 550.000; M_z = 40.000;	no	no	338

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	111.740	13.549	-11.678	-6.871
2	0.000	17.538	-11.678	13.085
3	109.197	18.028	-16.667	-6.871
4	0.000	21.189	-16.667	13.085
5	106.653	22.720	-21.656	-6.871
6	0.000	25.302	-21.656	13.085
7	81.745	21.846	-21.656	-2.880
8	84.288	16.914	-16.667	-2.880
9	86.832	12.028	-11.678	-2.880



max. concrete compressive strain: 0.28 [‰]
max. concrete compressive stress: 8.43 [N/mm²]
resulting tension force in (x/y)=(-414.1/-4.4): 580.455 [kN]
resulting compression force in (x/y)=(524.4/29.6): 590.455 [kN]

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

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3 Tension load SOFA (fib (07/2011), section 16.2.1)

	Load [kN]	Capacity [kN]	Utilization β_N [%]	Status
Steel failure*	111.740	299.200	38	OK
Combined pullout-concrete cone failure**	580.455	208.807	278	not recommended
Concrete Breakout failure**	580.455	172.118	338	not recommended
Splitting failure**	580.455	389.616	149	not recommended

* 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]
448.800	1.500	299.200	111.740

3.2 Combined pullout-concrete cone failure

$A_{p,N}$ [mm²]	$A^0_{p,N}$ [mm²]	$\psi_{A,Np}$	$\tau_{Rk,ucr,25}$ [N/mm²]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]
1,016,564	864,000	0.123	18.00	929.5	464.8	200.0

ψ_c	$\tau_{Rk,cr}$ [N/mm²]	max $\tau_{Rk,cr}$ [N/mm²]	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.072	9.65	9.80	1.035	1.018

$e_{c1,N}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
12.9	0.973	4.4	0.991	0.829	1.000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{M,p}$	$N_{Rd,p}$ [kN]	N_{Sd} [kN]
327.280	313.210	1.500	208.807	580.455

Group anchor ID
1, 3, 5, 7-9

3.3 Concrete Breakout failure

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$\psi_{A,N}$	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]
1,152,000	1,166,400	0.988	540.0	1,080.0

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
12.9	0.977	4.4	0.992	0.811	1.000

k_1	$N^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$N_{Rd,c}$ [kN]	N_{Sd} [kN]
7.700	332.640	1.500	172.118	580.455

Group anchor ID
1, 3, 5, 7-9

3.4 Splitting failure

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$\psi_{A,N}$	$c_{cr,sp}$ [mm]	$s_{cr,sp}$ [mm]	$\psi_{h,sp}$
828,000	518,400	1.597	360.0	720.0	1.331

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	k_1
12.9	0.965	4.4	0.988	0.867	1.000	7.700

$N^0_{Rk,c}$ [kN]	$\gamma_{M,sp}$	$N_{Rd,sp}$ [kN]	N_{Sd} [kN]
332.640	1.500	389.616	580.455

Group anchor ID
1, 3, 5, 7-9

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4 Shear load SOFA (fib (07/2011), section 16.2.2)

	Load [kN]	Capacity [kN]	Utilization β_V [%]	Status
Steel failure (without lever arm)*	25.302	179.520	15	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout failure*	21.846	44.399	50	OK
Concrete edge failure in direction x-**	54.083	24.923	218	not recommended

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

4.1 Steel failure (without lever arm)

$V_{Rk,s}$ [kN]	$\gamma_{M,s}$	$V_{Rd,s}$ [kN]	V_{Sd} [kN]
224.400	1.250	179.520	25.302

4.2 Pryout failure (concrete cone relevant)

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$\psi_{A,N}$	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]	k_4
143,956	1,166,400	0.123	540.0	1,080.0	2.000

$e_{c1,V}$ [mm]	$\psi_{ec1,N}$	$e_{c2,V}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
0.0	1.000	0.0	1.000	0.811	1.000

$N^0_{Rk,c}$ [kN]	$\gamma_{M,c,p}$	$V_{Rd,cp}$ [kN]	V_{Sd} [kN]
332.640	1.500	44.399	21.846

Group anchor ID
7

4.3 Concrete edge failure in direction x-

l_f [mm]	d_{nom} [mm]	k_V	α	β
240.0	30.00	1.700	0.069	0.057

c_1 [mm]	c_1' [mm]	$A_{c,V}$ [mm²]	$A^0_{c,V}$ [mm²]	$\psi_{A,V}$
1,650.0	500.0	675,000	1,125,000	0.600

$\psi_{s,V}$	$\psi_{h,V}$	$\psi_{\alpha,V}$	$e_{c,V}$ [mm]	$\psi_{ec,V}$	$\psi_{re,V}$	$\psi_{90°,V}$
0.780	1.000	1.213	39.2	0.950	1.000	2.500

$V^0_{Rk,c}$ [kN]	n_1	$\gamma_{M,c}$	$V_{Rd,c}$ [kN]	V_{Sd} [kN]
207.906	3	1.500	24.923	54.083

Note: Resistance limit acc. to fib (07/2011) Eq. (10.2-6) is governing

5 Combined tension and shear loads SOFA (fib (07/2011), section 10.3)

	β_N	β_V	α	Utilization $\beta_{N,V}$ [%]	Status
steel	0.373	0.141	2.000	16	OK
concrete	3.372	2.170	1.500	939	not recommended

$\beta_N^{\alpha} + \beta_V^{\alpha} <= 1$

6 Displacements (highest loaded anchor)

Short term loading:

N_{Sk} = 0.000 [kN] δ_N = 0.0000 [mm]

V_{Sk} = 18.742 [kN] δ_V = 0.5623 [mm]

δ_{NV} = 0.5623 [mm]

Long term loading:

N_{Sk} = 0.000 [kN] δ_N = 0.0000 [mm]

V_{Sk} = 18.742 [kN] δ_V = 0.9371 [mm]

δ_{NV} = 0.9371 [mm]

Comments: Tension displacements are valid with half of the required installation torque moment for uncracked concrete! Shear displacements are valid without friction between the concrete and the baseplate! The gap due to the drilled hole and clearance hole tolerances are not included in this calculation!

The acceptable anchor displacements depend on the fastened construction and must be defined by the designer!

7 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!
- Your design has selected filled holes. Please ensure that there is a proper method to fill the annular gap between the fixture and HIT-HY 200-A + HAS-U 8.8 HDG M30and contact Hilti in case of any questions.
- The accessory list in this report is 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.
- Characteristic bond resistances depend on short- and long-term temperatures.
- The design method fib (07/2011) assumes that no hole clearance between the anchors and the fixture is present. This can be achieved by filling the gap with mortar of sufficient compressive strength (e.g. by using the Hilti Filling set) or by other suitable means
- The compliance with current standards (e.g. EN 1993, AS 4100:1998, etc.) is the responsibility of the user
- Checking the transfer of loads into the base material is required in accordance with fib (07/2011)!
- The characteristic bond resistances depend on the return period (service life in years): 50

Fastening does not meet the design criteria!

8 Installation data

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

Profile: Advance UKB, 1016 x 305 x 249 ; (L x W x T x FT) = 980.1 mm x 300.0 mm x 16.5 mm x 26.0 mm

Hole diameter in the fixture: d_f = 33.0 mm

Plate thickness (input): 35.0 mm

Recommended plate thickness: not calculated

Drilling method: SafeSet - automatic cleaning

Cleaning: Automatically performed while drilling

Anchor type and size: HIT-HY 200-A + HAS-U 8.8 HDG M30

Item number: not available (insert) / 2022696 HIT-HY 200-A (mortar)

Maximum installation torque: 300 Nm

Hole diameter in the base material: 35.0 mm

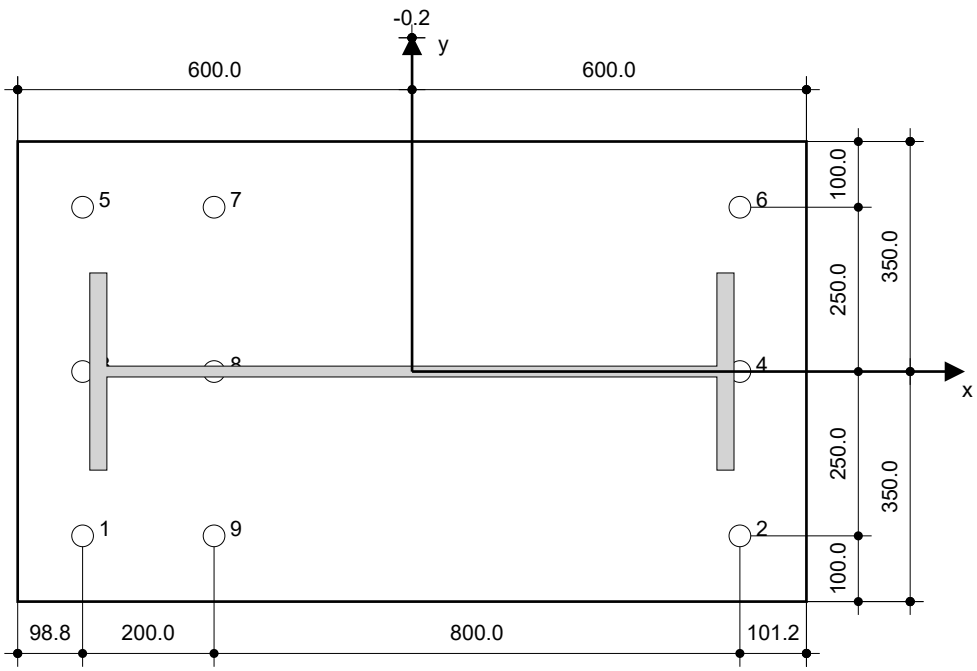
Hole depth in the base material: 360.0 mm

Minimum thickness of the base material: 430.0 mm

Hilti HAS-U threaded rod with HIT-HY 200 injection mortar with 360 mm embedment h_ef, M30, Hot dip galvanized, SAFEset - automatic cleaning installation per ETA 11/0493, with annular gaps filled with Hilti Filling Set or any suitable gap solutions

8.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit for SAFEset - automatic cleaning (TE-CD / TE-YD) • Vacuum cleaner	• No accessory required	• Dispenser including cassette and mixer • Hilti Filling Set • Torque wrench



Coordinates Anchor [mm]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-501.2	-250.0	650.0	1,650.0	200.0	700.0
2	498.8	-250.0	1,650.0	650.0	200.0	700.0
3	-501.2	0.0	650.0	1,650.0	450.0	450.0
4	498.8	0.0	1,650.0	650.0	450.0	450.0
5	-501.2	250.0	650.0	1,650.0	700.0	200.0

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
6	498.8	250.0	1,650.0	650.0	700.0	200.0
7	-301.2	250.0	850.0	1,450.0	700.0	200.0
8	-301.2	0.0	850.0	1,450.0	450.0	450.0
9	-301.2	-250.0	850.0	1,450.0	200.0	700.0

9 Remarks; Your Cooperation Duties

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