www.hilti.co.uk

Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	J08870 - Typical UC Anchor	Date:	22/05/2026
Fastening Point:			

Specifier's comments:

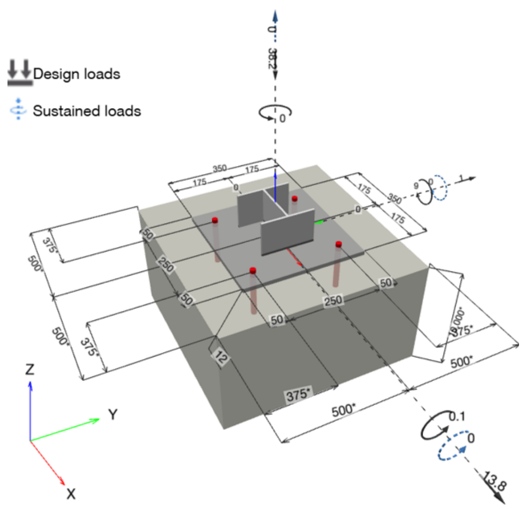
1 Anchor Design

1.1 Input data

Anchor type and size:	**HIT-RE 500 V4 + HAS-U 5.8 M16**
Return period (service life in years):	50
Item number:	2223830 HAS-U 5.8 M16x190 (insert) / 2287557 HIT-RE 500 V4 (mortar)
Specification text:	HILTI HAS-U 5.8 THREADED ROD WITH HIT-RE 500 V4 INJECTION MORTAR WITH 125 MM EMBEDMENT HEF, M16, STEEL GALVANIZED, HAMMER DRILL BIT INSTALLATION PER ETA 20/0541
Effective embedment depth:	$h_{ef,act}$ = 125.0 mm ($h_{ef,limit}$ = - mm)
Material:	5.8
Approval No.:	ETA 20/0541
Issued I Valid:	10/09/2025 | -
Proof:	Design Method EN 1992-4, Chemical
Stand-off installation:	e_b = 0.0 mm (no stand-off); t = 12.0 mm
Baseplate[CBFEM] :	l_x x l_y x t = 350.0 mm x 350.0 mm x 12.0 mm;
Profile:	Advance UKC, 152 x 152 x 23; (L x W x T x FT) = 152.4 mm x 152.2 mm x 5.8 mm x 6.8 mm
Base material:	cracked concrete, C20/25, $f_{c,cyl}$ = 20.00 N/mm^2; h =10,000.0 mm, Temp. short/long: 0/0 °C, partial material safety factor γ_c = 1.500; $\gamma_{c,seismic}$ = 1.500
Installation:	**Hammer 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

[CBFEM] - The anchor calculation is based on a component-based Finite Element Method (CBFEM)

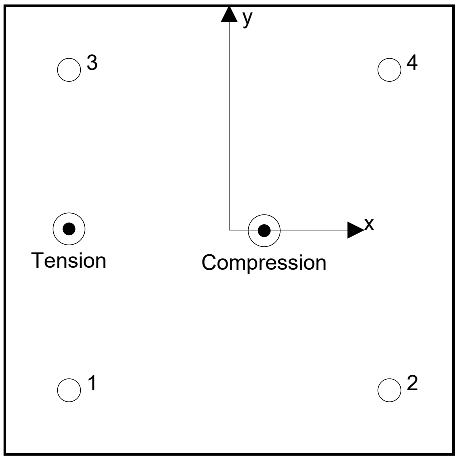
Geometry [mm] & Loading [kN, kNm]



1.1.1 Load combination

Case	Description	Forces [kN] / Moments [kNm]	Seismic	Fire	Max. Util. Anchor [%]
1	Combination 1	$N = -38.200$; $V_x = 13.800$; $V_y = 1.000$; $M_x = 0.100$; $M_y = 9.000$; $M_z = 0.000$; $N_{sus} = 0.000$; $M_{x,sus} = 0.000$; $M_{y,sus} = 0.000$;	no	no	66

1.2 Load case/Resulting anchor forces



Anchor reactions [kN]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	19.230	3.480	3.453	0.432
2	0.000	3.451	3.448	0.145
3	19.511	3.450	3.449	0.068
4	0.000	3.469	3.450	0.355

Resulting tension force in (x/y)=(-125.0/0.9): 38.741 [kN]
Resulting compression force in (x/y)=(27.3/-0.5): 80.169 [kN]

Anchor forces are calculated based on a component-based Finite Element Method (CBFEM)

1.3 Tension load (EN 1992-4, Section 7.2.1)

	Load [kN]	Capacity [kN]	Utilization β_N [%]	Status
Steel failure*	19.511	52.333	38	OK
Combined pullout-concrete cone failure**	38.741	76.425	51	OK
Concrete Breakout failure**	38.741	63.200	62	OK
Splitting failure**	N/A	N/A	N/A	N/A

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

1.3.1 Steel failure

$N_{Rk,s}$ [kN]	γ_{Ms}	$N_{Rd,s}$ [kN]	N_{Ed} [kN]
78.500	1.500	52.333	19.511

1.3.2 Combined pullout-concrete cone failure

$A_{p,N}$ [mm^2]	$A^0_{p,N}$ [mm^2]	$\tau_{Rk,ucr,20}$ [N/mm^2]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]	$f_{c,cyl}$ [N/mm^2]
234,375	140,625	17.00	375.0	187.5	375.0	20.00

ψ_c	$\tau_{Rk,cr}$ [N/mm^2]	k_3	$\tau_{Rk,c}$ [N/mm^2]	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.000	11.00	7.700	7.66	1.000	1.000

$e_{c1,N}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
0.0	1.000	0.9	0.995	1.000	1.000

ψ^0_{sus}	α_{sus}	ψ_{sus}
0.880	0.000	1.000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	γ_{Mp}	$N_{Rd,p}$ [kN]	N_{Ed} [kN]
69.115	114.637	1.500	76.425	38.741

Group anchor ID
1, 3

1.3.3 Concrete Breakout failure

$A_{c,N}$ [mm^2]	$A^0_{c,N}$ [mm^2]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]	$f_{c,cyl}$ [N/mm^2]
234,375	140,625	187.5	375.0	20.00

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	z [mm]
0.0	1.000	0.9	0.995	1.000	1.000	152.3

$\psi_{M,N}$	k_1	$N^0_{Rk,c}$ [kN]	γ_{Mc}	$N_{Rd,c}$ [kN]	N_{Ed} [kN]
1.188	7.700	48.125	1.500	63.200	38.741

Group anchor ID
1, 3

1.4 Shear load (EN 1992-4, Section 7.2.2)

	Load [kN]	Capacity [kN]	Utilization β_V [%]	Status
Steel failure (without lever arm)*	3.480	37.680	10	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout failure**	13.836	178.241	8	OK
Concrete edge failure in direction x+**	13.809	44.702	31	OK

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

1.4.1 Steel failure (without lever arm)

$V^0_{Rk,s}$ [kN]	k_7	$V_{Rk,s}$ [kN]	γ_{Ms}	$V_{Rd,s}$ [kN]	V_{Ed} [kN]
47.100	1.000	47.100	1.250	37.680	3.480

1.4.2 Pryout failure (concrete cone relevant)

$A_{c,N}$ [mm^2]	$A^0_{c,N}$ [mm^2]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]	k_8	$f_{c,cyl}$ [N/mm^2]
390,625	140,625	187.5	375.0	2.000	20.00

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

k_1	$N^0_{Rk,c}$ [kN]	$\gamma_{Mc,p}$	$V_{Rd,cp}$ [kN]	V_{Ed} [kN]
7.700	48.125	1.500	178.241	13.836

Group anchor ID
1-4

1.4.3 Concrete edge failure in direction x+

l_f [mm]	d_{nom} [mm]	k_9	α	β	$f_{c,cyl}$ [N/mm^2]	c_1 [mm]
125.0	16.00	1.700	0.058	0.053	20.00	375.0

$A_{c,V}$ [mm^2]	$A^0_{c,V}$ [mm^2]	$\psi_{s,V}$	$\psi_{h,V}$	$e_{c,V}$ [mm]	$\psi_{ec,V}$
562,500	632,812	0.900	1.000	0.0	1.000

α_V [°]	$\psi_{\alpha,V}$	$\psi_{re,V}$
2.07	1.000	1.000

$V^0_{Rk,c}$ [kN]	γ_{Mc}	$V_{Rd,c}$ [kN]	V_{Ed} [kN]
83.775	1.500	44.702	13.809

Group anchor ID
2, 4

1.5 Combined tension and shear loads (EN 1992-4, Section 7.2.3)

Steel failure

β_N	β_V	α	Utilization $\beta_{N,V}$ [%]	Status
0.373	0.092	2.000	15	OK

$\beta_N^{\alpha} + \beta_V^{\alpha} \leq 1.0$

Concrete failure

β_N	β_V	α	Utilization $\beta_{N,V}$ [%]	Status
0.613	0.309	1.500	66	OK

$\beta_N^{\alpha} + \beta_V^{\alpha} \leq 1.0$

1.6 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (EN1992-4, ACI318, IS1946, 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 base 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 metric units. When inputs are displayed in imperial units, the user should be aware that the equations remain in their metric format.
- Checking the transfer of loads into the base material is required in accordance with EN 1992-4, Annex A!
- The design is only valid if the clearance hole in the fixture is not larger than the value given in Table 6.1 of EN 1992-4! For larger diameters of the clearance hole see section 6.2.2 of EN 1992-4!
- 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.
- For the determination of the $\psi_{re,v}$ (concrete edge failure) the minimum concrete cover defined in the design settings is used as the concrete cover of the edge reinforcement.
- Characteristic bond resistances depend on short- and long-term temperatures.
- Edge reinforcement is not required to avoid splitting failure
- The anchor design methods in PROFIS Engineering require rigid baseplates, as per current regulations (EN1992-4, AS5216, etc.). This means that the baseplate should be sufficiently rigid to prevent load re-distribution to the anchors due to elastic/plastic displacements. The user accepts that the baseplate is considered close to rigid by engineering judgment."
- The characteristic bond resistances depend on the return period (service life in years): 50

1.7 Installation data

Baseplate, steel: S 355; E = 210,000.00 N/mm^2; f_{yk} = 355.00 N/mm^2
Profile: Advance UKC, 152 x 152 x 23; (L x W x T x FT) = 152.4 mm x 152.2 mm x 5.8 mm x 6.8 mm
Hole diameter in the fixture (pre-setting) : d_f = 18.0 mm
Hole diameter in the fixture (through fastening) : d_f = 20.0 mm
Plate thickness (input): 12.0 mm

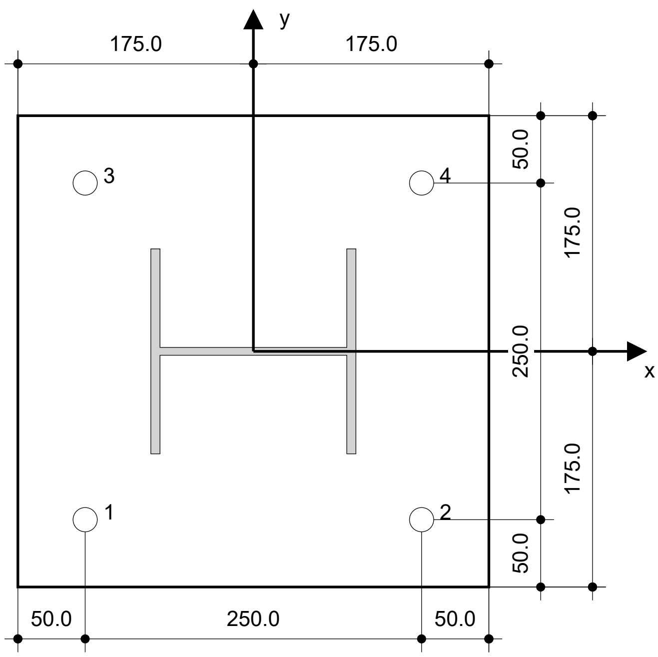
Anchor type and size: HIT-RE 500 V4 + HAS-U 5.8 M16
Item number: 2223830 HAS-U 5.8 M16x190 (insert) / 2287557 HIT-RE 500 V4 (mortar)
Maximum installation torque: 80 Nm
Hole diameter in the base material: 18.0 mm
Hole depth in the base material: 125.0 mm
Minimum thickness of the base material: 161.0 mm

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

Hilti HAS-U 5.8 threaded rod with HIT-RE 500 V4 injection mortar with 125 mm embedment hef, M16, Steel galvanized, Hammer drill bit installation per ETA 20/0541

1.7.1 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 [mm]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-125.0	-125.0	375.0	625.0	375.0	625.0
2	125.0	-125.0	625.0	375.0	375.0	625.0
3	-125.0	125.0	375.0	625.0	625.0	375.0
4	125.0	125.0	625.0	375.0	625.0	375.0

Company:		Page:	7
Address:		Specifier:	
Phone I Fax:		E-Mail:	
Design:	J08870 - Typical UC Anchor	Date:	22/05/2026
Fastening Point:			

2 Baseplate design

2.1 Input data

Baseplate:	Shape: Rectangular l_x x l_y x t = 350.0 mm x 350.0 mm x 12.0 mm Calculation: CBFEM Material: S 355; F_y = 355.00 N/mm²; ε_{lim} = 5.00%
Anchor type and size:	HIT-RE 500 V4 + HAS-U 5.8 M16, h_{ef} = 125.0 mm
Anchor stiffness:	The anchor is modelled considering stiffness values determined from load displacement curves tested in an independent laboratory. Please note that no simple replacement of the anchor is possible as the anchor stiffness has a major impact on the load distribution results.
Design method:	EN based design using component-based FEM
Stand-off installation:	e_b = 0.0 mm (No stand-off); t = 12.0 mm
Profile:	152 x 152 x 23; (L x W x T x FT) = 152.4 mm x 152.2 mm x 5.8 mm x 6.8 mm Material: S 355; F_y = 355.00 N/mm²; ε_{lim} = 5.00% Eccentricity x: 0.0 mm Eccentricity y: 0.0 mm
Base material:	Cracked concrete; C20/25; $f_{c,cyl}$ = 20.00 N/mm²; h = 10,000.0 mm; E = 30,000.00 N/mm²; G = 12,500.00 N/mm²; ν = 0.20
Welds (profile to baseplate):	Type of redistribution: Plastic Material: S 235
Mesh size:	Number of elements on edge: 8 Min. size of element: 10.0 mm Max size of element: 50.0 mm

2.2 Summary

	Description	Profile		Baseplate			Concrete [%]
		σ_{Ed} [N/mm²]	ε_{Pl} [%]	σ_{Ed} [N/mm²]	ε_{Pl} [%]	Hole bearing [%]	
1	Combination 1	254.79	0.00	175.25	0.00	2	29

2.3 Baseplate plate classification

Results below are displayed for the decisive load combinations: Combination 1

Anchor tension forces	Equivalent rigid baseplate (CBFEM)	Component-based Finite Element Method (CBFEM) baseplate
Anchor 1	10.312 kN	19.230 kN
Anchor 2	-0.002 kN	0.000 kN
Anchor 3	10.423 kN	19.511 kN
Anchor 4	-0.002 kN	0.000 kN

User accepted to consider the selected baseplate as rigid by his/her engineering judgement. This means the anchor design guidelines can be applied.

2.4 Profile/Stiffeners/Plate

Profile and stiffeners are verified at the level of the steel to concrete connection. The connection design does not replace the steel design for critical cross sections, which should be performed outside of PROFIS Engineering.

2.4.1 Equivalent stress and plastic strain

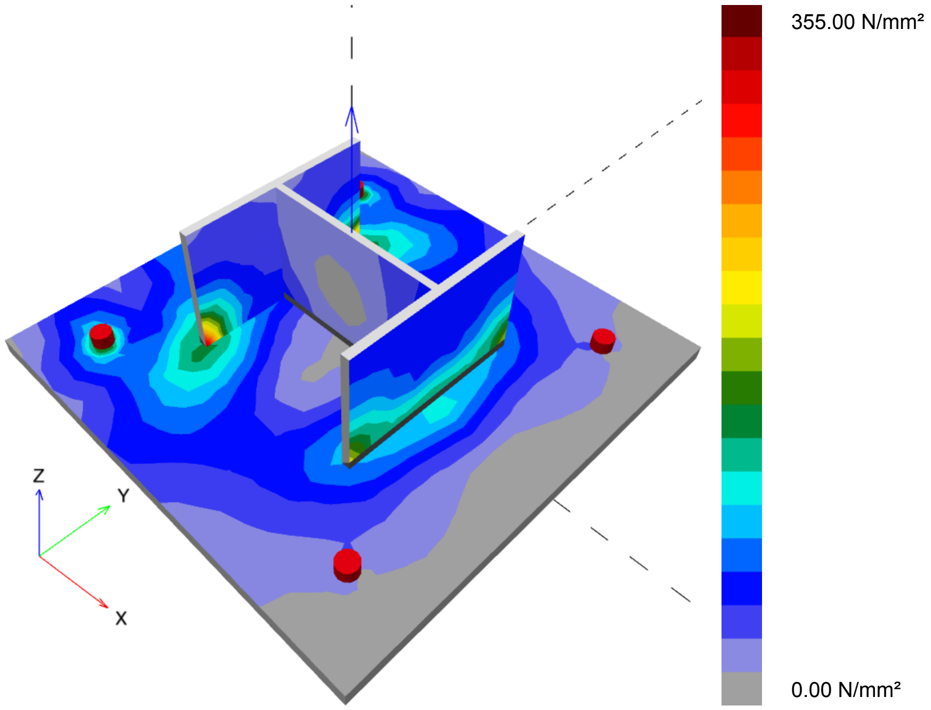
Limit state criteria as per EN1993-1-5 Annex C.8, (1) 2.

Results

Part	Load combination	Material	σ_{Ed} [N/mm²]	ε_{Pl} [%]	f_y [N/mm²]	γ_{M0}	f_y/γ_{M0} [N/mm²]	ε_{lim} [%]	Status
Plate	Combination 1	S 355	175.25	0.00	355.00	1.00	355.00	5.00	OK
Profile	Combination 1	S 355	185.84	0.00	355.00	1.00	355.00	5.00	OK
Profile	Combination 1	S 355	254.79	0.00	355.00	1.00	355.00	5.00	OK
Profile	Combination 1	S 355	138.98	0.00	355.00	1.00	355.00	5.00	OK

2.4.1.1 Equivalent stress

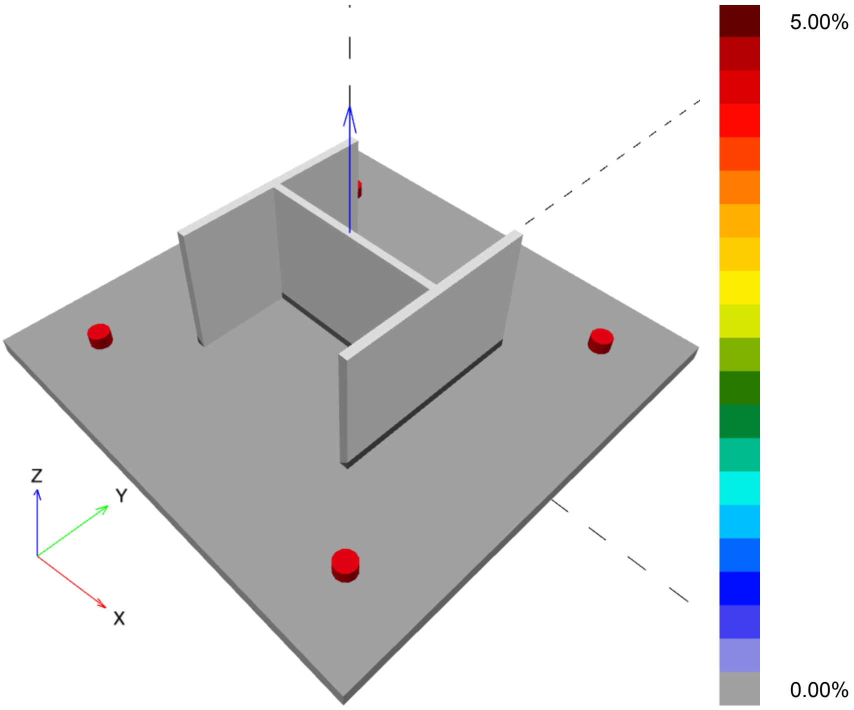
Results below are displayed for the decisive load combination: 1 - Combination 1



Company:		Page:	11
Address:		Specifier:	
Phone I Fax:		E-Mail:	
Design:	J08870 - Typical UC Anchor	Date:	22/05/2026
Fastening Point:			

2.4.1.2 Plastic strain

Results below are displayed for the decisive load combination: 1 - Combination 1



2.4.2 Hole bearing

Decisive load combination: 1 - Combination 1

Plate hole bearing resistance, EN1993-1 - 8 section 3.6.1:

Results

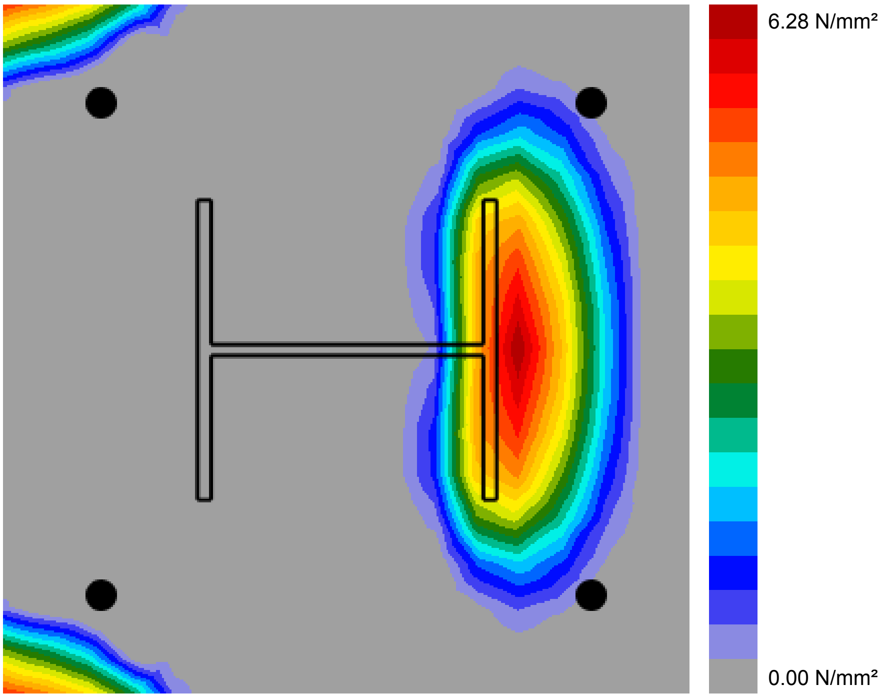
	V_{Ed} [kN]	$F_{b,Rd}$ [kN]	Utilisation [%]	Status
Anchor 1	3.480	175.580	2	OK
Anchor 2	3.451	188.160	2	OK
Anchor 3	3.450	174.256	2	OK
Anchor 4	3.468	188.160	2	OK

2.5 Concrete

Decisive load combination: 1 - Combination 1

According to EN1992-1-1 section 6.7(4), the concrete should have sufficient reinforcement to take into account the tensile forces that develop due to the fixture attachment. The definition of the reinforcement in the concrete is not within the scope of PROFIS Engineering.

2.5.1 Compression in concrete under the baseplate



2.5.2 Verification of compression in concrete under the baseplate around the profile as per EN1992-1 section 6.7 and EN1993-1-8, section 6.2.5

Results

σ [N/mm²]	f_{jd} [N/mm²]	Utilisation [%]	Status
6.50	22.78	29	OK

2.6 Symbol explanation

ε_{lim}	Limit plastic strain
ε_{Pl}	Plastic strain from CBFEM results
$F_{b,Rd}$	Plate bearing resistance EN 1993-1-8 tab. 3.4
f_{jd}	The ultimate bearing strength of the concrete block
f_y	Yield strength
γ_{M0}	Steel safety factor gamma M0
σ	Average stress in concrete
σ_{Ed}	Equivalent stress
V_{Ed}	Anchor shear force

2.7 Warnings

- By using the CBFEM calculation functionality of PROFIS Engineering you may act outside the applicable design codes and your specified baseplate may not behave rigidly. Please, have the results validated by a professional designer and/or structural engineer to ensure suitability and adequacy for your specific jurisdiction and project requirements.
- The anchor is modelled considering stiffness values determined from load displacement curves tested in an independent laboratory. Please note that no simple replacement of the anchor is possible as the anchor stiffness has a major impact on the load distribution results.

3 Summary of results

Design of the baseplate, anchor, welds and other elements are based on CBFEM (component based finite element method) and Eurocode regulations.

	Load combination	Max. utilisation	Status
Anchors	Combination 1	66%	OK
Baseplate	Combination 1	50%	OK
Concrete	Combination 1	29%	OK
Profile	Combination 1	72%	OK

Fastening meets the design criteria!

4 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.