Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	sustainedload_try	Date:	8/1/2023
Fastening Point:			

Specifier's comments:

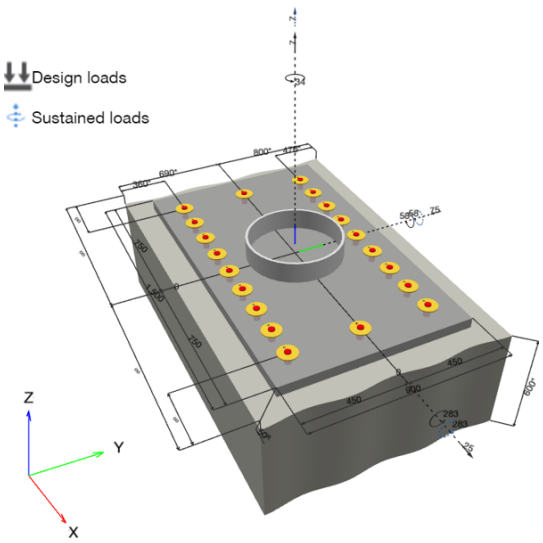
1 Input data

Anchor type and size:	**HIT-RE 500 V3 + HAS-U 8.8 HDG M30**
Return period (service life in years):	50
Item number:	not available (insert) / 2123403 HIT-RE 500 V3 (mortar)
Hilti Filling Set or any suitable annular gap filling solution	
Effective embedment depth:	$h_{ef,act}$ = 320.0 mm ($h_{ef,limit}$ = - mm)
Material:	8.8
Approval No.:	ETA 16/0143
Issued I Valid:	14/5/2019 | -
Proof:	Engineering judgement SOFA BOND - based on ETAG BOND testing
Stand-off installation:	e_b = 0.0 mm (no stand-off); t = 50.0 mm
Baseplate[R] :	l_x x l_y x t = 1,500.0 mm x 900.0 mm x 50.0 mm; (Recommended plate thickness: not calculated)
Profile:	Circular hollow section, 457x12.7CHS; (L x W x T) = 457.0 mm x 457.0 mm x 12.7 mm
Base material:	uncracked concrete, 50MPa, $f_{c,cube}$ = 60.00 N/mm^2; h = 600.0 mm, Temp. short/long: 0/0 °C
Installation:	**automatic cleaned drilled hole, Installation condition: Dry**
Reinforcement:	Reinforcement spacing < 150 mm (any Ø) or < 100 mm (Ø <= 10 mm) with longitudinal edge reinforcement d >= 12.0 [mm] + close mesh (stirrups, hangers) s <= 100.0 [mm] Reinforcement to control splitting according to EOTA TR 029, 5.2.2.6 present.

Application also possible with HVU2 + HAS-U 8.8 HDG M30 under the selected boundary conditions.
More information in section Alternative fastening data of this report.

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

Geometry [mm] & Loading [kN, kNm]



Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	sustainedload_try	Date:	8/1/2023
Fastening Point:			

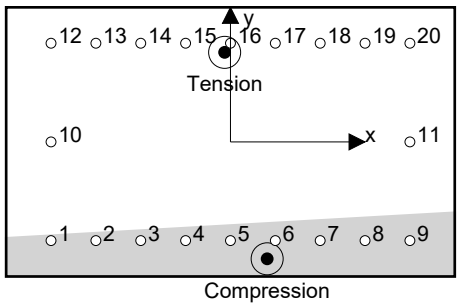
1.1 Load combination

Case	Description	Forces [kN] / Moments [kNm]	Seismic	Fire	Max. Util. Anchor [%]
1	dnm	N = 7.000; V_x = 25.000; V_y = -75.000; M_x = 283.000; M_y = 58.000; M_z = 34.000;	no	no	57

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	0.000	8.246	3.335	-7.542
2	0.000	7.389	3.335	-6.594
3	0.000	6.557	3.335	-5.646
4	0.000	5.762	3.335	-4.698
5	0.000	5.019	3.335	-3.750
6	0.000	4.356	3.335	-2.802
7	0.000	3.816	3.335	-1.854
8	0.000	3.456	3.335	-0.906
9	0.000	3.336	3.335	0.042
10	21.481	7.645	1.250	-7.542
11	16.805	1.251	1.250	0.042
12	44.073	7.588	-0.835	-7.542
13	43.489	6.646	-0.835	-6.594
14	42.904	5.707	-0.835	-5.646
15	42.320	4.772	-0.835	-4.698
16	41.735	3.842	-0.835	-3.750
17	41.150	2.924	-0.835	-2.802
18	40.566	2.034	-0.835	-1.854
19	39.981	1.233	-0.835	-0.906
20	39.397	0.836	-0.835	0.042



max. concrete compressive strain: 0.13 [‰]
max. concrete compressive stress: 3.90 [N/mm^2]
resulting tension force in (x/y)=(-19.5/299.5): 413.901 [kN]
resulting compression force in (x/y)=(122.7/-390.9): 406.901 [kN]

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

Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	sustainedload_try	Date:	8/1/2023
Fastening Point:			

3 Tension load (EOTA TR 029, Section 5.2.2)

	Load [kN]	Capacity [kN]	Utilization β_N [%]	Status
Steel failure*	44.073	299.200	15	OK
Combined pullout-concrete cone failure**	413.901	894.452	47	OK
Concrete Breakout failure**	413.901	782.782	53	OK
Splitting failure**	413.901	1,188.894	35	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]
448.800	1.500	299.200	44.073

3.2 Combined pullout-concrete cone failure

$A_{p,N}$ [mm²]	$A^0_{p,N}$ [mm²]	$\tau_{Rk,ucr,25}$ [N/mm²]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]
2,196,746	672,000	14.00	819.8	409.9	470.0

ψ_c	$\tau_{Rk,ucr}$ [N/mm²]	k	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.091	15.28	3.200	1.000	1.000

$e_{c1,N}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
19.5	0.955	29.5	0.933	1.000	1.000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{M,p}$	$N_{Rd,p}$ [kN]	N_{Sd} [kN]
460.861	1,341.678	1.500	894.452	413.901

Group anchor ID
10-20

3.3 Concrete Breakout failure

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]
2,685,600	921,600	480.0	960.0

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
19.5	0.961	29.5	0.942	0.994	1.000

k_1	$N^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$N_{Rd,c}$ [kN]	N_{Sd} [kN]
10.100	447.839	1.500	782.782	413.901

Group anchor ID
10-20

3.4 Splitting failure

$A_{c,N}$ [mm^2]	$A^0_{c,N}$ [mm^2]	$c_{cr,sp}$ [mm]	$s_{cr,sp}$ [mm]	$\psi_{h,sp}$		
2,072,896	614,656	392.0	784.0	1.333		

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	k_1
19.5	0.953	29.5	0.930	1.000	1.000	10.100

$N^0_{Rk,c}$ [kN]	$\gamma_{M,sp}$	$N_{Rd,sp}$ [kN]	N_{Sd} [kN]
447.839	1.500	1,188.894	413.901

Group anchor ID
10-20

Company:		Page:	5
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	sustainedload_try	Date:	8/1/2023
Fastening Point:			

4 Shear load (EOTA TR 029, Section 5.2.3)

	Load [kN]	Capacity [kN]	Utilization β_V [%]	Status
Steel failure (without lever arm)*	8.246	179.520	5	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout failure**	79.057	812.435	10	OK
Concrete edge failure in direction y-**	80.901	249.148	33	OK

* 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	8.246

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-factor
3,218,400	921,600	480.0	960.0	2.000

$e_{c1,V}$ [mm]	$\Psi_{ec1,N}$	$e_{c2,V}$ [mm]	$\Psi_{ec2,N}$	$\Psi_{s,N}$	$\Psi_{re,N}$
408.0	0.541	136.0	0.779	0.925	1.000

$N^0_{Rk,c}$ [kN]	$\gamma_{M,c,p}$	$V_{Rd,cp}$ [kN]	V_{Sd} [kN]
447.839	1.500	812.435	79.057

Group anchor ID
1-20

4.3 Concrete edge failure in direction y-

l_f [mm]	d_{nom} [mm]	k_1	α	β
320.0	30.00	2.400	0.094	0.061

c_1 [mm]	$A_{c,V}$ [mm^2]	$A^0_{c,V}$ [mm^2]
360.0	1,231,200	583,200

$\Psi_{s,V}$	$\Psi_{h,V}$	$\Psi_{\alpha,V}$	$e_{c,V}$ [mm]	$\Psi_{ec,V}$	$\Psi_{re,V}$
1.000	1.000	1.063	266.2	0.670	1.000

$V^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$V_{Rd,c}$ [kN]	V_{Sd} [kN]
248.547	1.500	249.148	80.901

Company:		Page:	6
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	sustainedload_try	Date:	8/1/2023
Fastening Point:			

5 Combined tension and shear loads (EOTA TR 029, Section 5.2.4)

Steel failure

β_N	β_V	α_N	α_V	Utilization $\beta_{N,V}$ [%]	Status
0.529	0.325	1.500	0.000	57	OK

$\beta_N^{\alpha_N} + \beta_V^{\alpha_V} \leq 1.0$

6 Displacements (highest loaded anchor)

Short term loading:

N_{Sk}	=	32.647 [kN]	δ_N	=	0.0866 [mm]
V_{Sk}	=	5.621 [kN]	δ_V	=	0.1686 [mm]
			δ_{NV}	=	0.1896 [mm]

Long term loading:

N_{Sk}	=	32.647 [kN]	δ_N	=	0.2057 [mm]
V_{Sk}	=	5.621 [kN]	δ_V	=	0.2810 [mm]
			δ_{NV}	=	0.3483 [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!
- Checking the transfer of loads into the base material is required in accordance with EOTA TR 029, Section 7!
- The design is only valid if the clearance hole in the fixture is not larger than the value given in Table 4.1 of EOTA TR029! For larger diameters of the clearance hole see Chapter 1.1. of EOTA TR029!
- Your design has selected filled holes. Please ensure that there is a proper method to fill the annular gap between the fixture and HIT-RE 500 V3 + 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 SOFA 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
- An SLS-check is not performed for SOFA and has to be provided by the user!
- The characteristic bond resistances depend on the return period (service life in years): 50

Company:		Page:	7
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	sustainedload_try	Date:	8/1/2023
Fastening Point:			

Fastening meets the design criteria!

Company:		Page:	8
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	sustainedload_try	Date:	8/1/2023
Fastening Point:			

8 Installation data

Baseplate, steel: Grade 300; E = 200,000.00 N/mm^2; f_{yk} = 280.00 N/mm^2

Profile: Circular hollow section, 457x12.7CHS; (L x W x T) = 457.0 mm x 457.0 mm x 12.7 mm

Hole diameter in the fixture: d_f = 33.0 mm

Plate thickness (input): 50.0 mm

Recommended plate thickness: not calculated

Drilling method: SafeSet - automatic cleaning

Cleaning: Automatically performed while drilling

Anchor type and size: HIT-RE 500 V3 + HAS-U 8.8 HDG M30

Item number: not available (insert) / 2123403 HIT-RE 500 V3 (mortar)

Maximum installation torque: 300 Nm

Hole diameter in the base material: 35.0 mm

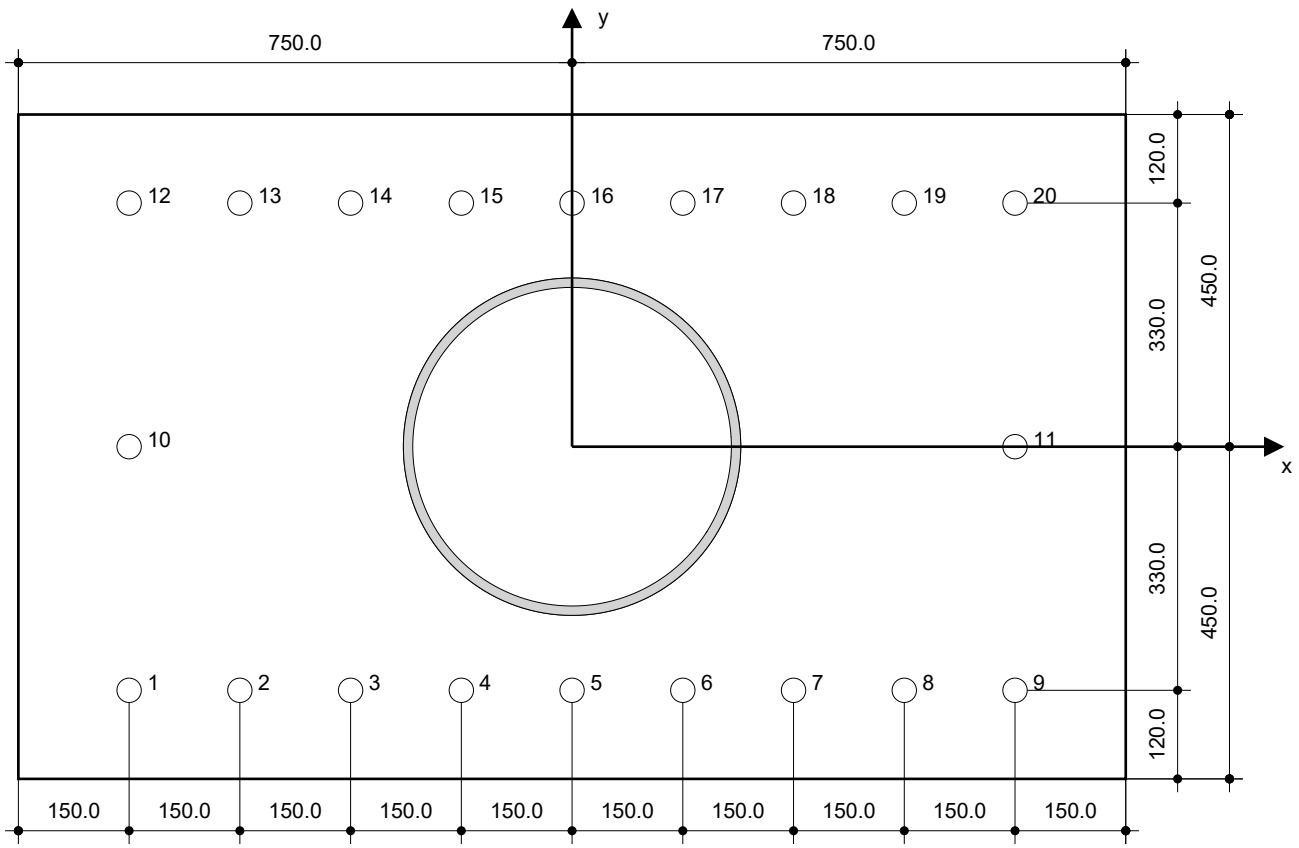
Hole depth in the base material: 320.0 mm

Minimum thickness of the base material: 390.0 mm

Hilti HAS-U threaded rod with HIT-RE 500 V3 injection mortar with 320 mm embedment h_ef, M30, Hot dip galvanized, SAFEset - automatic cleaning installation per ETA 16/0143, 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



Company:		Page:	9
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	sustainedload_try	Date:	8/1/2023
Fastening Point:			

Coordinates Anchor [mm]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-600.0	-330.0	-	-	360.0	1,130.0
2	-450.0	-330.0	-	-	360.0	1,130.0
3	-300.0	-330.0	-	-	360.0	1,130.0
4	-150.0	-330.0	-	-	360.0	1,130.0
5	0.0	-330.0	-	-	360.0	1,130.0
6	150.0	-330.0	-	-	360.0	1,130.0
7	300.0	-330.0	-	-	360.0	1,130.0
8	450.0	-330.0	-	-	360.0	1,130.0
9	600.0	-330.0	-	-	360.0	1,130.0
10	-600.0	0.0	-	-	690.0	800.0
11	600.0	0.0	-	-	690.0	800.0
12	-600.0	330.0	-	-	1,020.0	470.0
13	-450.0	330.0	-	-	1,020.0	470.0
14	-300.0	330.0	-	-	1,020.0	470.0
15	-150.0	330.0	-	-	1,020.0	470.0
16	0.0	330.0	-	-	1,020.0	470.0
17	150.0	330.0	-	-	1,020.0	470.0
18	300.0	330.0	-	-	1,020.0	470.0
19	450.0	330.0	-	-	1,020.0	470.0
20	600.0	330.0	-	-	1,020.0	470.0

Company:		Page:	10
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	sustainedload_try	Date:	8/1/2023
Fastening Point:			

9 Alternative fastening

9.1 Alternative fastening data

Anchor type and size:	**HVU2 + HAS-U 8.8 HDG M30**
Return period (service life in years):	50
Item number:	2223918 HAS-U 8.8 HDG M30x380 (insert) / 2164562 HVU2 M30x270 (capsule)
Hilti Filling Set or any suitable annular gap filling solution	
Effective embedment depth:	$h_{ef,act}$ = 270.0 mm, h_{nom} = 270.0 mm
Material:	8.8
Approval No.:	ETA-16/0515
Issued I Valid:	23/8/2022 | -
Proof:	Engineering judgement SOFA BOND - based on ETAG BOND testing
Stand-off installation:	e_b = 0.0 mm (no stand-off); t = 50.0 mm
Baseplate^R :	l_x x l_y x t = 1,500.0 mm x 900.0 mm x 50.0 mm; (Recommended plate thickness: not calculated)
Profile:	Circular hollow section, 457x12.7CHS; (L x W x T) = 457.0 mm x 457.0 mm x 12.7 mm
Base material:	uncracked concrete, 50MPa, $f_{c,cube}$ = 60.00 N/mm^2; h = 600.0 mm, Temp. short/long: 0/0 °C
Installation:	**automatic cleaned drilled hole, Installation condition: Dry**
Reinforcement:	Reinforcement spacing < 150 mm (any Ø) or < 100 mm (Ø <= 10 mm) with longitudinal edge reinforcement d >= 12.0 [mm] + close mesh (stirrups, hangers) s <= 100.0 [mm] Reinforcement to control splitting according to EOTA TR 029, 5.2.2.6 present.

Max. Utilisation with HVU2 + HAS-U 8.8 HDG M30: 68 %
Fastening meets the design criteria!

Company:		Page:	11
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	sustainedload_try	Date:	8/1/2023
Fastening Point:			

9.2 Installation data

Baseplate, steel: Grade 300; E = 200,000.00 N/mm^2; f_{yk} = 280.00 N/mm^2
Profile: Circular hollow section, 457x12.7CHS; (L x W x T) = 457.0 mm x 457.0 mm x 12.7 mm
Hole diameter in the fixture: d_f = 33.0 mm
Plate thickness (input): 50.0 mm
Recommended plate thickness: not calculated
Drilling method: SafeSet - automatic cleaning
Cleaning: Automatically performed while drilling

Anchor type and size: HVU2 + HAS-U 8.8 HDG M30
Item number: 2223918 HAS-U 8.8 HDG M30x380 (insert) / 2164562 HVU2 M30x270 (capsule)
Maximum installation torque: 300 Nm
Hole diameter in the base material: 35.0 mm
Hole depth in the base material: 270.0 mm
Minimum thickness of the base material: 340.0 mm

Hilti HAS-U threaded rod with HVU2 capsule mortar with 270 mm embedment h_ef, M30, Hot dip galvanized, SAFEset - automatic cleaning installation per ETA-16/0515, with annular gaps filled with Hilti Filling Set or any suitable gap solutions

9.2.1 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	• HVA square drive shafts • Hilti Filling Set • Torque wrench

10 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.