Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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European Technical Assessment

ETA-12/0060 of 8 December 2016

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	Simpson Strong-Tie® - Screw Anchor THD
Product family to which the construction product belongs	Concrete screw for use in concrete
Manufacturer	SIMPSON STRONG -TIE® GmbH Hubert-Vergölst-Straße 6-14 61231 Bad Nauheim DEUTSCHLAND
Manufacturing plant	Simpson Strong-Tie Manufacturing Facilities
This European Technical Assessment contains	14 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	Guideline for European technical approval of "Metal anchors for use in concrete", ETAG 001 Part 3: "Undercut anchors", April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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Specific Part

1 Technical description of the product

The Simpson Strong-Tie® - Screw Anchor THD is an anchor made of galvanised or mechanically zinc coated steel of sizes 8, 10, 12, 16 and 20. The anchor is screwed into a predrilled cylindrical drill hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

Product and product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic values and Displacements under tension and shear loads	See Annex C 1 and C 2

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	See Annex C 3 and C 4

3.3 Safety in use (BWR 4)

The essential characteristics regarding Safety in use are included under the Basic Works Requirement Mechanical resistance and stability.

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with guideline for European technical approval ETAG 001, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 8 December 2016 by Deutsches Institut für Bautechnik

Andreas Kummerow
p.p. Head of Department

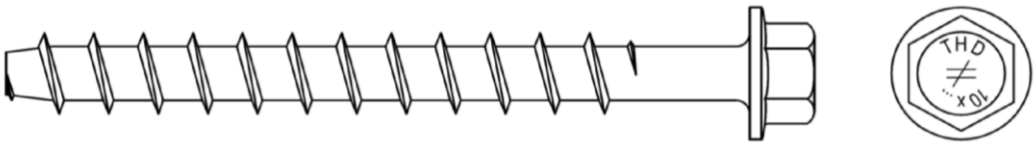
beglaubigt:
Baderschneider

Deutsches Institut für Bautechnik

DIBt

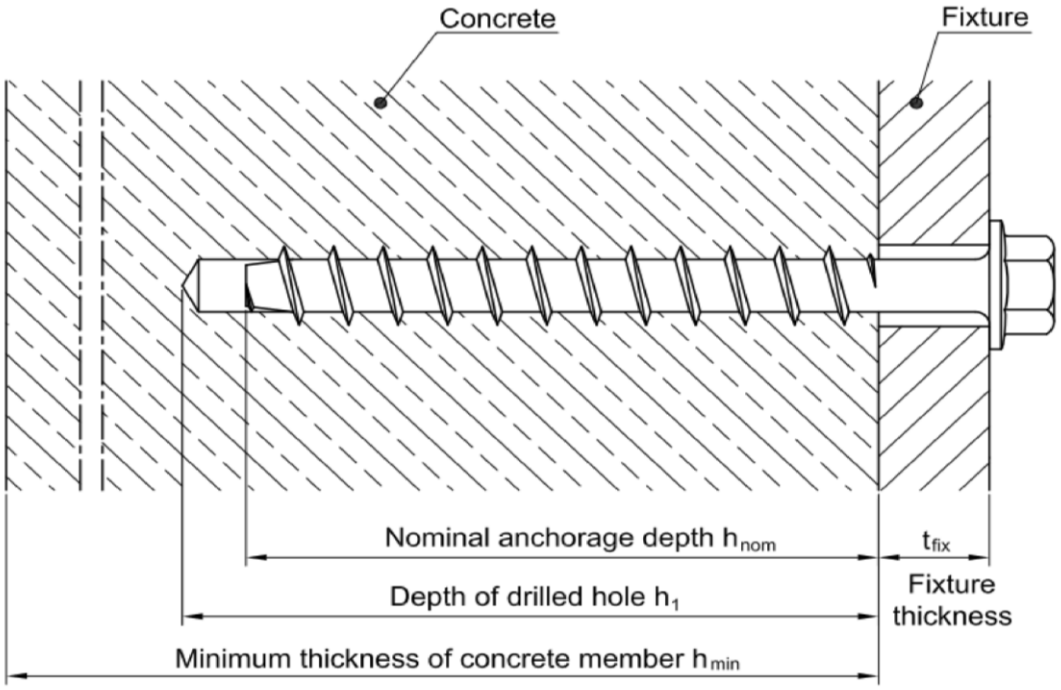
Simpson Strong-Tie®

Screw anchor THD



THD8…THD20

Screw anchor THD after installation



Simpson Strong-Tie®	**Annex A1**
Product description Installation condition	

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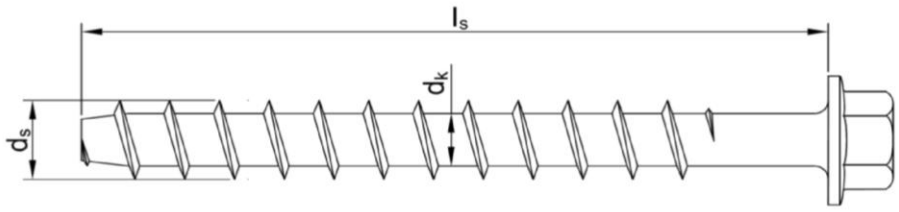
Simpson Strong-Tie®

Screw anchor THD



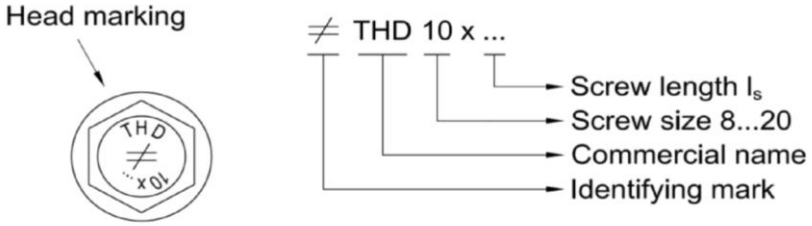


Table A1: Materials

Part	Designation	Material [1) 2)]
Screw anchor	THD	Carbon steel, cold formed

1) zinc electroplated ≥ 5 µm according EN ISO 4042; passivated
2) mechanical galvanized ≥ 12 µm according EN ISO 12683; Type 1

Table A2: Dimensions

Screw size	Screw length l_s [mm]	Outer diameter d_s [mm]	Core diameter d_k [mm]
THD8	70…200	10,3	7,6
THD10	80…200	12,5	9,6
THD12	100…400	14,4	11,3
THD16	120…400	19,6	15,3
THD20	140…400	23,5	19,3

Simpson Strong-Tie® Screw anchor THD	Annex A2
Product description Materials and dimensions	

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Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads: All sizes and emdedment depths.
- Fire exposure: All sizes and emdedment depths.

Base materials:

- Cracked and non-cracked concrete.
- Reinforced or unreinforced normal weight concrete of strength classes C20/25 to C50/60 according to EN 206-1: 2000

Use conditions (Environmental conditions):

- Structures subject to dry indoor conditions.

Design:

- Anchorages are to be designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.)
- Anchorages under static or quasi-static actions are to be designed in accordance with:
  - ETAG 001, Annex C, design method A, Edition August 2010 or
  - CEN/TS 1992-4:2009, design method A
- Anchorages under fire exposures are to be designed in accordance with:
  - EOTA Technical Report TR 020, Edition Mai 2004 or
  - CEN/TS 1992-4:2009, Annex D
  - It must be ensured that local spalling of the concrete cover does not occur.

Installation:

- Screw installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Use of the screw only as supplied by the manufacturer.
- Screw installation in accordance with manufacturer's specifications and drawings.
- Edge distances and spacings not less than the specified values without minus tolerances.
- Hole drilling by hammer-drilling.
- Cleaning of the drill hole
- In case of aborted hole, drilling of new hole at a minimum distance of twice the depth of the aborted hole, or smaller distance provided the aborted drill hole is filled with high strength non-shrinkage mortar. No shear or oblique tension loads are allowed in the direction of a not filled aborted hole.
- The fixture is fully pressed on the concrete surface without intermediate layers.
- After installation further turning of the screw is not possible.
- The head of the screw is fully supported on the fixture and is not damaged.
- The screw may be used only once.

Simpson Strong-Tie® Screw anchor THD	Annex B1
Intendend Use Specifications	

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Simpson Strong-Tie®

Screw anchor THD

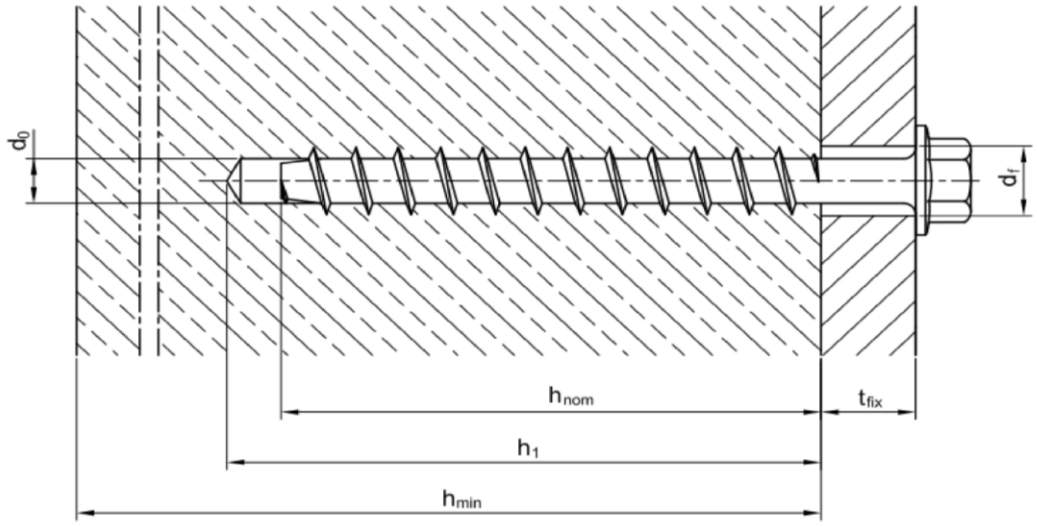

Table B1: Installation data

Simpson Strong-Tie® Screw anchor THD		Screw size				
		8	10	12	16	20
Nominal diameter of drill bit	d_0 [mm]	8	10	12	16	20
Cutting diameter of drill bit	$d_{cut} \leq$ [mm]	8,45	10,45	12,5	16,5	20,55
Depth of drill hole	$h_1 \geq$ [mm]	75	85	105	130	160
Nominal anchorage depth	$h_{nom} \geq$ [mm]	65	75	95	115	135
Minimum thickness of concrete member	$h_{min} \geq$ [mm]	105	125	150	180	220
Clearance hole diameter in the fixture	$d_f \leq$ [mm]	12	14	16	22	26
Width across flats	SW [mm]	13	15	18	24	30
Installation with torque wrench	T_{inst} [Nm]	- [1)]	75	- [1)]	280	350
Installation with impact srew driver	$T_{SD} \leq$ [Nm]	Recommend impact screw driver with max. power output specified according manufacturer's instructions				
		200	515			

[1)] Installation with impact srew driver only.

Simpson Strong-Tie® Screw anchor THD	Annex B2
Intended use Installation parameter	

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Table B2: Minimum thickness of concrete member, minimum spacing and edge distance

Simpson Strong-Tie® Screw anchor THD			Screw size 8	10	12	16	20
Cracked concrete	Minimum member thickness	h_{min} [mm]	105	125	150	180	220
	Minimum edge distance	c_{min} [mm]	50	60	80	100	120
	Minimum spacing	s_{min} [mm]	50	60	80	100	120
Non-cracked concrete	Minimum member thickness	h_{min} [mm]	105	125	150	180	220
	Minimum edge distance	c_{min} [mm]	50	60	80	100	120
	Minimum spacing	s_{min} [mm]	50	60	80	100	120

Simpson Strong-Tie®	Annex B3
Intended use Minimum thickness of concrete, minimum spacing and edge distances	

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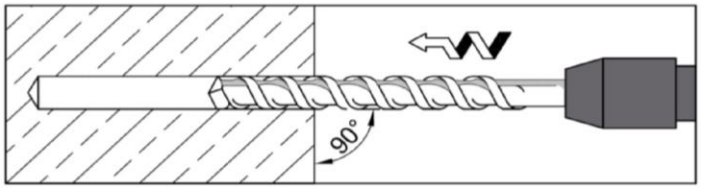
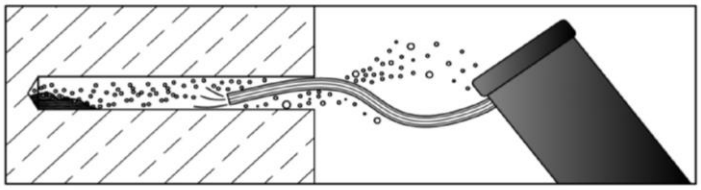
Simpson Strong-Tie®
Screw anchor THD

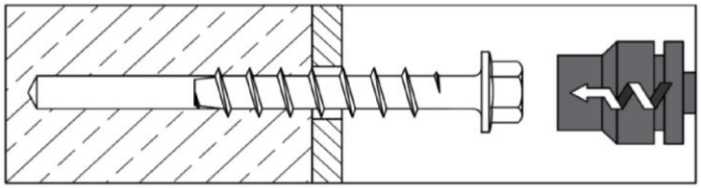
Installation instructions



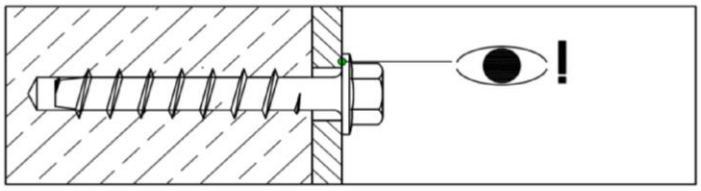
1. Drill hole



2. Clean hole



3. Setting screw anchor with an impact screw driver



4. Check connection

Simpson Strong-Tie® **Screw anchor THD**	**Annex B4**
Intended use Installation instructions	

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Table C1: Characteristic resistance under tension loads for static and quasi-static loads

Simpson Strong-Tie® Screw anchor THD				Screw size 8	10	12	16	20
Steel failure								
Characteristic resistance	$N_{Rk,s}$	[kN]		35,1	54,9	75,7	140,1	220,7
Partial safety factor	γ_{Ms} 1)	[-]		1,4				
Pull-out failure								
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]		6,0	7,5	12,0	25,0	35,0
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]		7,5	10,5	25,0	30,0	50,0
Increasing factors for $N_{Rk,p}$	Ψ_C	C30/37		1,22				
		C40/50		1,41				
		C50/60		1,55				
Installation safety factor	γ_2 3) = γ_{inst} 2)	[-]		1,2				
Concrete cone failure and splitting failure								
Effective anchorage depth	h_{ef}	[mm]		47	55	70	86	102
Factor for cracked concrete	k_{cr} 2)	[-]		7,2				
Factor for non-cracked concrete	k_{ucr} 2)	[-]		10,1				
Characteristic spacing	$s_{cr,N}$	[mm]		3 h_{ef}				
	$s_{cr,sp}$	[mm]						
Characteristic edge distance	$c_{cr,N}$	[mm]		1,5 h_{ef}				
	$c_{cr,sp}$	[mm]						
Installation safety factor	γ_2 3) = γ_{inst} 2)	[-]		1,2				

1) In absence of other national regulations
2) Parameter relevant only for design according to CEN/TS 1992-4:2009
3) Parameter relevant only for design according to ETAG 001, Annex C

Table C2: Displacements under tension loads

Simpson Strong-Tie® Screw anchor THD				Screw size 8	10	12	16	20
Cracked concrete C20/25 to C50/60	Tension load	N	[kN]	2,4	3,0	4,8	9,9	13,9
	Displacement	δ_{N0}	[mm]	0,1	0,1	0,2	0,2	0,3
		$\delta_{N\infty}$	[mm]	0,3	0,4	0,6	0,4	0,6
Non-cracked concrete C20/25 to C50/60	Tension load	N	[kN]	3,0	4,2	9,9	11,9	19,8
	Displacement	δ_{N0}	[mm]	0,1	0,1	0,1	0,2	0,3
		$\delta_{N\infty}$	[mm]	0,3	0,4	0,6	0,4	0,6

Simpson Strong-Tie®

Performance
Characteristic resistance for tension loads / displacements

Annex C1

Deutsches Institut für Bautechnik DIBt

Table C3: Characteristic resistance under shear loads for static and quasi-static action

Simpson Strong-Tie® Screw anchor THD			Screw size 8	10	12	16	20
Steel failure without lever arm							
Characteristic resistance	$V_{Rk,s}$	[kN]	17,5	27,4	37,8	70	110,4
Partial safety factor	γ_{Ms} 1)	[-]	1,5				
k-factor	k_2 2)	[-]	0,8				
Steel failure with lever arm							
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	40	79	128	322,3	637,5
Partial safety factor	γ_{Ms} 1)	[-]	1,5				
Concrete pry-out failure							
k-factor	k 3) = k_3 2)	[-]	2				
Installation safety factor	γ_2 3) = γ_{inst} 2)	[-]	1,0				
Concrete edge failure							
Effective length of anchor in shear loading	$l_f = h_{ef}$	[mm]	47	55	70	86	102
Effective diameter of anchor	d_{nom}	[mm]	7,7	9,6	11,3	15,3	19,3

1) In absence of other national regulations
2) Parameter relevant only for design according to CEN/TS 1992-4:2009
3) Parameter relevant only for design according to ETAG 001, Annex C

Table C4: Displacements under shear loads

Simpson Strong-Tie® Screw anchor THD				Screw size 8	10	12	16	20
Cracked and **non-cracked concrete** C20/25 to C50/60	Shear load	V	[kN]	8,3	13,0	18,0	33,3	52,6
	Displacement	δ_{V0}	[mm]	2,0	2,2	2,5	2,7	3,0
		$\delta_{V\infty}$	[mm]	3,0	3,3	3,8	4,1	4,5

Simpson Strong-Tie® Screw anchor THD	Annex C2
Performance Characteristic resistance for shear loads / displacements	

Deutsches Institut für Bautechnik DIBt

Table C5: Characteristic tension resistance in cracked and non-cracked concrete C20/25 to C50/60 under fire exposure

Simpson Strong-Tie® Screw anchor THD				Screw size 8	10	12	16	20
Steel failure								
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	0,5	1,1	2,0	3,7	5,8
	R60	$N_{Rk,s,fi}$	[kN]	0,4	0,9	1,5	2,8	4,4
	R90	$N_{Rk,s,fi}$	[kN]	0,3	0,7	1,3	2,4	3,8
	R120	$N_{Rk,s,fi}$	[kN]	0,2	0,6	1,0	1,8	2,9
Pullout failure								
Characteristic resistance	R30…R90	$N_{Rk,p,fi}$	[kN]	1,5	1,9	3,0	6,3	8,8
	R120	$N_{Rk,p,fi}$	[kN]	1,2	1,5	2,4	5,0	7,0
Concrete failure								
Characteristic resistance	R30…R90	$N^0_{Rk,p,fi}$	[kN]	2,7	4,0	7,4	12,2	18,7
	R120	$N^0_{Rk,p,fi}$	[kN]	2,2	3,2	5,9	9,7	14,9
Edge distance	R30…R120	$c_{cr,N,fi}$	[mm]	$2\ h_{ef}$				
	R30…R120	$c_{min,fi}$	[mm]	Fire exposure from more than one side: $c_{min,fi} \geq 300$mm				
Anchor spacing	R30…R120	$s_{cr,N,fi}$	[mm]	$2\ c_{cr,N,fi}$				
		$s_{min,fi}$	[mm]	50	60	80	100	120

In absence of other national regulations a partial safety factor for resistance under fire exposure of $\gamma_{M,fi} = 1,0$ is recommended.

Simpson Strong-Tie® Screw anchor THD	Annex C3
Performance Characteristic values of tension load under fire exposure	

Deutsches Institut für Bautechnik DIBt

Table C6: Characteristic shear resistance in cracked and non-cracked concrete C20/25 to C50/60 under fire exposure

Simpson Strong-Tie® Screw anchor THD				Screw size 8	10	12	16	20
Steel failure without lever arm								
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	0,5	1,1	2,0	3,7	5,8
	R60	$V_{Rk,s,fi}$	[kN]	0,4	0,9	1,5	2,8	4,4
	R90	$V_{Rk,s,fi}$	[kN]	0,3	0,7	1,3	2,4	3,8
	R120	$V_{Rk,s,fi}$	[kN]	0,2	0,6	1,0	1,8	2,9
Steel failure with lever arm								
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	0,5	1,6	3,4	8,5	16,8
	R60	$M^0_{Rk,s,fi}$	[Nm]	0,5	1,4	2,5	6,4	12,6
	R90	$M^0_{Rk,s,fi}$	[Nm]	0,4	1,0	2,2	5,5	10,9
	R120	$M^0_{Rk,s,fi}$	[Nm]	0,3	0,8	1,7	4,3	8,4
Concrete pry-out failure								
R30…R120		k	[-]	2				

Concrete edge failure

The initial value $V^0_{Rk,c,fi}$ of the characteristic resistance in concrete C20/25 to C50/60 under fire exposure may be determined by:

$V^0_{Rk,c,fi} = 0.25 \times V^0_{Rk,c}$ (≤ R90) $V^0_{Rk,c,fi} = 0.25 \times V^0_{Rk,c}$ (R120)

With $V^0_{Rk,c}$ equal to the characteristic resistance in non-cracked concrete C20/25 under normal temperatures.

In absence of other national regulations a partial safety factor for resistance under fire exposure of $\gamma_{M,fi} = 1,0$ is recommended.

Simpson Strong-Tie® Screw anchor THD	Annex C4
Performance Characteristic values of shear load under fire exposure	