HILTI HIT-HY 270 Injection System

MFPA Fire Assessment

GS 6.1/19-035-5 (30.10.2020)

MFPA Leipzig GmbH

Testing, Inspection and Certification Authority for
Construction Products and Construction Types

Center for Innovation and Calculation

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Object: Assessment of the load bearing behaviour of metal injection anchors Hilti HIT-HY 270 for use in masonry under tensile loading and one-sided fire loading according to the standard-time-temperature-curve - abbreviated version

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This document covers 19 pages, including 0 appendices.

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I Objective and request

MFPA Leipzig GmbH was ordered by Hilti AG to assess the load bearing behaviour of metal injection anchors Hilti HIT-HY 270 for use in masonry under tensile loading and one-sided fire loading according to the standard-time-temperature-curve acc. to [N1]. The assessment bases on results of fire tests.
The document at hand contains a summary of the design concept in case of fire and the corresponding characteristic tensile load bearing capacities. For a detailed derivation of the load bearing capacity values, please see [G1]. The documents GS 6.1/19-035-1-r1 [G2] and GS 6.1/19-035-2-r1 [G3] dated 24.04.2020 become invalid with the date of issue of the present advisory opinion.

1 Description of the construction

The injection system Hilti HIT-HY 270 is a bonded anchor for use in masonry, consisting of a mortar cartridge Hilti HIT-HY 270,

- a threaded rod HIT-V with a hexagon nut and a washer M6 to M16,
- a threaded rod HAS-U with a hexagon nut and a washer M6 to M16 or
- an internal threaded rod HIT-IC M8 to M12

and, if applicable, sieve sleeves HIT-SC.
Anchoring is achieved by bonding and/or form closure between the steel part, injection mortar and masonry. The injection system Hilti HIT-HY 270 may be used under static and quasi-static loadings.
With ETA-13/1036 [P1] and ETA-19/0160 [P2] valid European Technical Assessments are available for the Hilti HIT-HY 270 injection system.
In addition, with the general construction technique permit Z-21.3-2114 [P3], a national verification of applicability is available which describes the performance characteristics in case of fire. The characteristic tensile load bearing capacities in case of fire shown in this document correspond to the performance characteristics specified in [P3].
With regard to the geometric and material properties of the components of the injection system Hilti HIT-HY 270 and the permissible masonry brick types, please see [P1, P2, P3].
When installing the injection system Hilti HIT-HY 270, the manufacturer's instructions specified in [P1, P2, P3] must be observed.

II References

1 Utilized guidelines, rules and standards

The analyses are based on the following guidelines, rules and standards:

[N1] DIN EN 1363-1:2012-10: Fire resistance tests - Part 1: General Requirements; German version EN 1363-1:2012

[N2] ETAG 029: Guideline for european technical approval of metal injection anchors for use in masonry; 04/2013

[N3] EAD 330076-00-0604: European assessment document: Metal injection anchors for use in masonry; 07/2014

[N4] TR 020: Evaluation of Anchorages in Concrete concerning Resistance to Fire; 05/2004

2 Reference documents

The analyses are based on the following additional documents:

2.1 ETAs and verifications of applicability

[P1] ETA-13/1036: Injection system Hilti HIT-HY 270, Injektionssystem zur Verankerung im Mauerwerk – Deutsches Institut für Bautechnik, 12.12.2017

[P2] ETA-19/0160: Injection system Hilti HIT-HY 270 mit HAS-U, Metall-Injektionsdübel zur Verankerung im Mauerwerk – Deutsches Institut für Bautechnik, 29.04.2019

[P3] Allgemeine Bauartgenehmigung Nummer Z-21.3-2114: Hilti HIT-HY 270 Metall-Injektionsdübel zur Verankerung in Mauerwerk unter Brandbeanspruchung – Deutsches Institut für Bautechnik, 29.10.2020

2.2 Assessment and test reports

[G1] Gutachterliche Stellungnahme Nr. GS 6.1/19-035-4: Bewertung des Tragverhaltens des Injektionssystems Hilti HIT-HY 270 unter zentrischem Zug und einseitiger Brandbeanspruchung gemäß Einheitstemperaturzeitkurve bei Verankerung in Mauerwerk – MFPA Leipzig GmbH; 05.10.2020

[G2] Gutachterliche Stellungnahme Nr. GS 6.1/19-035-1-r1: Bewertung des Tragverhaltens des Injektionssystems Hilti HIT-HY 270 unter zentrischem Zug und einseitiger Brandbeanspruchung gemäß Einheitstemperaturzeitkurve bei Verankerung in Mauerwerk auf Basis von PB 3.2/14-179-1 – MFPA Leipzig GmbH; 24.04.2020

[G3] Gutachterliche Stellungnahme Nr. GS 6.1/19-035-2-r1: Bewertung des Tragverhaltens des Injektionssystems Hilti HIT-HY 270 unter zentrischem Zug und einseitiger Brandbeanspruchung gemäß Einheitstemperaturzeitkurve bei Verankerung in Mauerwerk auf Basis von PB 3.2/14-179-1 - Kurzfassung – MFPA Leipzig GmbH; 24.04.2020

III Assessment of the performance

1 Design concept

The European Technical Assessment ETA-13/1036 [P1] is based on ETAG 029 [N2]. EAD 330076-00-0604 [N3] is a further document for the assessment of the performance characteristics of injection systems for use in masonry, which forms the basis of European Technical Assessment ETA-19/0160 [P2]. While [N3] does not address the assessment of fire resistance (not a significant performance characteristic according to [N3], Table 1), [N2] points out that an assessment of performance in terms of fire resistance is only possible for a complete system (end use) consisting of masonry and injection system. With regard to the determination of fire resistance, reference is made to TR 020 [N4].
The investigation of the time-dependent load-bearing capacity in case of fire was carried out in the present case according to [N2] and following [N4] by means of fire tests. Additional failure modes specific to masonry and not anchored in [N4] as well as influences from excess strength were considered in the determination of the performance characteristics.

2 Load bearing capacity in case of fire

The characteristic tensile load bearing capacities summarized below are applicable to brick types according to [P1, P2, P3] resp. masonry structures with the boundary conditions summarized in Table 1.

Type	Compressive strength class	Bulk density	Wall thickness [cm]
Hollow clay brick	$\geq 12 / \geq 20$	$\geq 1{,}4$	$\geq 24{,}0$
Hollow calcium silicate brick	$\geq 12 / \geq 16$	$\geq 1{,}4$	$\geq 24{,}0$
Solid clay brick	$\geq 20 / \geq 28$	$\geq 2{,}0$	$\geq 17{,}5$
Solid calcium silicate brick	$\geq 12 / \geq 20$	$\geq 2{,}0$	$\geq 17{,}5$
Hollow lightweight concrete brick [1]	$\geq 2 / \geq 6$	$\geq 0{,}7$	$\geq 24{,}0$
Hollow clay brick, ceiling brick	$\geq$ R2	$\geq 1{,}0$	$\geq 18{,}0$

Table 1: Injection system Hilti HIT-HY 270: Permissable brick types and wall thickness ([1]: different from [P1, P2] version with 3 chambers)

In addition, the following requirements or restrictions apply:

- For hollow clay bricks and hollow lightweight concrete bricks, the fasteners must always be anchored in at least 2 chambers.
- A maximum of one fastener may be arranged per individual stone.
- The limit values for edge and fastener spacing according to [N4] must be observed.
- The characteristic tensile load-bearing capacities for plastered masonry structures are valid for plaster layers of lime gypsum plaster or alternative plasters with the same or better insulating effect with the plaster thickness $d_{plaster} \geq 15mm$.

2.1 Hollow clay brick, plastered, compressive strength class ≥ 12

	$h_{ef} = 80mm$				$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$							
	30	60	90	120	30	60	90	120
M8	0.338	0.207	0.075	-	0.920	0.658	0.396	0.265
M10	0.338	0.207	0.075	-	1.293	0.919	0.544	0.357
M12	0.338	0.207	0.075	-	1.722	1.218	0.713	0.461

Table 2: Injection system Hilti HIT-HY 270, hollow clay brick, plastered, compressive strength class ≥ 12: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR, HIT-IC with sieve sleeve

2.2 Hollow clay brick, unplastered, compressive strength class ≥ 12

	$h_{ef} = 80mm$				$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$							
	30	60	90	120	30	60	90	120
M8	0.338	0.207	-	-	0.920	0.658	0.396	-
M10	0.338	0.207	-	-	1.293	0.919	0.396	-
M12	0.338	0.207	-	-	1.722	1.218	0.396	-

Table 3: Injection system Hilti HIT-HY 270, hollow clay brick, unplastered, compressive strength class ≥ 12: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR, HIT-IC with sieve sleeve

2.3 Hollow clay brick, plastered, compressive strength class ≥ 20

	$h_{ef} = 80mm$				$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$							
	30	60	90	120	30	60	90	120
M8	0.464	0.284	0.103	-	0.916	0.683	0.450	0.333
M10	0.464	0.284	0.103	-	1.510	1.092	0.675	0.466
M12	0.464	0.284	0.103	-	2.250	1.597	0.945	0.618

Table 4: Injection system Hilti HIT-HY 270, hollow clay brick, plastered, compressive strength class ≥ 20: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR, HIT-IC with sieve sleeve

2.4 Hollow clay brick, unplastered, compressive strength class ≥ 20

	$h_{ef} = 80mm$				$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$							
	30	60	90	120	30	60	90	120
M8	0.464	0.284	-	-	0.916	0.683	0.450	-
M10	0.464	0.284	-	-	1.510	1.092	0.450	-
M12	0.464	0.284	-	-	2.250	1.597	0.450	-

Table 5: Injection system Hilti HIT-HY 270, hollow clay brick, unplastered, compressive strength class ≥ 20: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR, HIT-IC with sieve sleeve

2.5 Hollow calcium silicate brick, plastered, compressive strength class ≥ 12

	$h_{ef} = 80mm$				$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$							
	30	60	90	120	30	60	90	120
M8	0.107	0.061	-	-	0.107	0.061	-	-
M10	0.107	0.061	-	-	0.107	0.061	-	-
M12	0.107	0.061	-	-	0.107	0.061	-	-

Table 6: Injection system Hilti HIT-HY 270, hollow calcium silicate brick, plastered, compressive strength class ≥ 12: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR, HIT-IC with sieve sleeve

2.6 Hollow calcium silicate brick, unplastered, compressive strength class $\geq$ 12

	$h_{ef} = 80mm$				$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$							
	30	60	90	120	30	60	90	120
M8	0.107	-	-	-	0.107	0.061	-	-
M10	0.107	-	-	-	0.107	0.061	-	-
M12	0.107	0.061	-	-	0.107	0.061	-	-

Table 7: Injection system Hilti HIT-HY 270, hollow calcium silicate brick, unplastered, compressive strength class $\geq$ 12: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR, HIT-IC with sieve sleeve

2.7 Hollow calcium silicate brick, plastered, compressive strength class $\geq$ 16

	$h_{ef} = 80mm$				$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$							
	30	60	90	120	30	60	90	120
M8	0.154	0.088	-	-	0.154	0.088	-	-
M10	0.154	0.088	-	-	0.154	0.088	-	-
M12	0.154	0.088	-	-	0.154	0.088	-	-

Table 8: Injection system Hilti HIT-HY 270, hollow calcium silicate brick, plastered, compressive strength class $\geq$ 16: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR, HIT-IC with sieve sleeve

2.8 Hollow calcium silicate brick, unplastered, compressive strength class $\geq$ 16

	$h_{ef} = 80mm$				$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$							
	30	60	90	120	30	60	90	120
M8	0.154	-	-	-	0.154	0.088	-	-
M10	0.154	-	-	-	0.154	0.088	-	-
M12	0.154	0.088	-	-	0.154	0.088	-	-

Table 9: Injection system Hilti HIT-HY 270, hollow calcium silicate brick, unplastered, compressive strength class $\geq$ 16: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR, HIT-IC with sieve sleeve

2.9 Solid clay brick, plastered, compressive strength class $\geq$ 20

	$h_{ef} = 80mm$				$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$							
	30	60	90	120	30	60	90	120
M8	0.812	0.257	-	-	0.812	0.257	-	-
M10	0.812	0.257	-	-	0.812	0.257	-	-
M12	0.812	0.257	-	-	0.812	0.257	-	-

Table 10: Injection system Hilti HIT-HY 270, solid clay brick, plastered, compressive strength class $\geq$ 20: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR, HIT-IC with and without sieve sleeve

2.10 Solid clay brick, unplastered, compressive strength class ≥ 20

	$h_{ef} = 80mm$				$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$							
	30	60	90	120	30	60	90	120
M8	0.812	0.257	-	-	0.812	0.257	-	-
M10	0.812	0.257	-	-	0.812	0.257	-	-
M12	0.812	0.257	-	-	0.812	0.257	-	-

Table 11: Injection system Hilti HIT-HY 270, solid clay brick, unplastered, compressive strength class ≥ 20: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR, HIT-IC with and without sieve sleeve

2.11 Solid clay brick, plastered, compressive strength class ≥ 28

	$h_{ef} = 80mm$				$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$							
	30	60	90	120	30	60	90	120
M8	0.961	0.304	-	-	0.961	0.304	-	-
M10	0.961	0.304	-	-	0.961	0.304	-	-
M12	0.961	0.304	-	-	0.961	0.304	-	-

Table 12: Injection system Hilti HIT-HY 270, solid clay brick, plastered, compressive strength class ≥ 28: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR, HIT-IC with and without sieve sleeve

2.12 Solid clay brick, unplastered, compressive strength class ≥ 28

	$h_{ef} = 80mm$				$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$							
	30	60	90	120	30	60	90	120
M8	0.961	0.304	-	-	0.961	0.304	-	-
M10	0.961	0.304	-	-	0.961	0.304	-	-
M12	0.961	0.304	-	-	0.961	0.304	-	-

Table 13: Injection system Hilti HIT-HY 270, solid clay brick, unplastered, compressive strength class ≥ 28: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR, HIT-IC with and without sieve sleeve

2.13 Solid calcium silicate brick, plastered, compressive strength class ≥ 20

	$h_{ef} = 80mm$				$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$							
	30	60	90	120	30	60	90	120
M8	0.464	0.284	-	-	0.464	0.284	-	-
M10	0.464	0.284	-	-	0.464	0.284	-	-
M12	0.464	0.284	-	-	0.464	0.284	-	-

Table 14: Injection system Hilti HIT-HY 270, solid calcium silicate brick, plastered, compressive strength class ≥ 20: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR, HIT-IC with and without sieve sleeve

2.14 Solid calcium silicate brick, unplastered, compressive strength class ≥ 12

	$h_{ef} = 80mm$				$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$							
	30	60	90	120	30	60	90	120
M8	0.154	0.088	-	-	0.154	0.088	-	-
M10	0.154	0.088	-	-	0.154	0.088	-	-
M12	0.154	0.088	-	-	0.154	0.088	-	-

Table 15: Injection system Hilti HIT-HY 270, solid calcium silicate brick, unplastered, compressive strength class ≥ 12: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR, HIT-IC with and without sieve sleeve

2.15 Hollow lightweight concrete brick, plastered, compressive strength class ≥ 2

no performance characteristics determined in case of fire for $h_{ef} = 80mm$

	$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$			
	30	60	90	120
M8	0.467	0.376	-	-
M10	0.467	0.376	-	-
M12	0.467	0.376	-	-

Table 16: Injection system Hilti HIT-HY 270, hollow lightweight concrete brick, plastered, compressive strength class ≥ 2: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR and $h_{ef} = 130mm$ and $h_{ef} = 160mm$ with sieve sleeve

2.16 Hollow lightweight concrete brick, unplastered, compressive strength class ≥ 2

no performance characteristics determined in case of fire for $h_{ef} = 80mm$

	$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$			
	30	60	90	120
M8	0.467	0.376	-	-
M10	0.467	0.376	-	-
M12	0.467	0.376	-	-

Table 17: Injection system Hilti HIT-HY 270, hollow lightweight concrete brick, unplastered, compressive strength class ≥ 2: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR and $h_{ef} = 130mm$ and $h_{ef} = 160mm$ with sieve sleeve

2.17 Hollow lightweight concrete brick, plastered, compressive strength class ≥ 6

no performance characteristics determined in case of fire for $h_{ef} = 80mm$

	$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$			
	30	60	90	120
M8	0.916	0.683	-	-
M10	0.916	0.683	-	-
M12	0.916	0.683	-	-

Table 18: Injection system Hilti HIT-HY 270, hollow lightweight concrete brick, plastered, compressive strength class ≥ 6: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR and $h_{ef} = 130mm$ and $h_{ef} = 160mm$ with sieve sleeve

2.18 Hollow lightweight concrete brick, unplastered, compressive strength class ≥ 6

no performance characteristics determined in case of fire for $h_{ef} = 80mm$

	$h_{ef} = 130mm$, $h_{ef} = 160mm$			
	fire duration $[min]$			
	30	60	90	120
M8	0.916	0.683	-	-
M10	0.916	0.683	-	-
M12	0.916	0.683	-	-

Table 19: Injection system Hilti HIT-HY 270, hollow lightweight concrete brick, unplastered, compressive strength class ≥ 6: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR and $h_{ef} = 130mm$ and $h_{ef} = 160mm$ with sieve sleeve

2.19 Hollow clay brick, ceiling brick, plastered

	$h_{ef} = 80mm$			
	fire duration $[min]$			
	30	60	90	120
M6	0.106	-	-	-

Table 20: Injection system Hilti HIT-HY 270, hollow clay brick, ceiling brick, plastered: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR and $h_{ef} = 80mm$ with sieve sleeve

2.20 Hollow clay brick, ceiling brick, unplastered

	$h_{ef} = 80mm$			
	fire duration $[min]$			
	30	60	90	120
M6	0.106	-	-	-

Table 21: Injection system Hilti HIT-HY 270, hollow clay brick, ceiling brick, unplastered: Characteristic tensile load bearing capacities $N_{Rk,fi}(t)$ $[kN]$ for HIT-V-5.8, HIT-V-8.8, HIT-V-R, HIT-V-HCR, HAS-U-5.8, HAS-U-8.8, HAS-U A4, HAS-U HCR and $h_{ef} = 80mm$ with sieve sleeve

IV Special notes

The advisory opinion at hand applies to the injection system Hilti HIT-HY 270 for anchoring in masonry, which is installed in compliance with the installation regulations described by the manufacturer. The mechanical load must not exceed the load-bearing capacities specified by the manufacturer under ambient conditions.

The load bearing capacities specified in this document were determined for a one-sided fire load according to the standard-time-temperature-curve. According to [N4], the values may also be used for multi-sided fire exposure, provided that $c \geq 300mm$ and $c \geq 2 \cdot h_{ef}$ apply for the edge distance of the fasteners.

The load bearing capacities specified in this document have been determined for tension in the longitudinal direction of the fastener. According to [N4], lying on the safe side, transfer to transverse tensile loads perpendicular to the longitudinal axis without a lever arm is possible.

V Signatures

This document does not replace a certificate of conformity or suitability according to national and European building codes.

Leipzig, 30.10.2020

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