HIT-RE 500 V3 Epoxy Adhesive Anchoring System 3.2.4

3.2.4.1 Product description

The new Hilti HIT-RE 500 V3 Adhesive Anchoring System is an injectable two-component epoxy adhesive. The two components are kept separate by means of a dual-cylinder foil pack attached to a manifold.

The two components combine and react when dispensed through a static mixing nozzle attached to the manifold.

HIT-RE 500 V3 Adhesive Anchoring System may be used with continuously threaded rod, Hilti HIS-N and HIS-RN internally-threaded inserts or deformed reinforcing bar installed in cracked or uncracked concrete. The primary components of the Hilti Adhesive Anchoring System are:

- HIT-RE 500 V3 adhesive packaged in foil packs
- Adhesive mixing and dispensing equipment
- Equipment for hole cleaning and adhesive injection

Product Features

- Superior bond performance in both cracked and uncracked concrete
- Seismic qualified in accordance with ICC-ES Acceptance Criteria AC308 and ACI 355.4
- Use in diamond cored holes with roughening tool for cracked and uncracked concrete in all seismic zones
- Use underwater up to 50 m
- Meets requirements of ASTM C881-14, Type I, II, IV, and V, Grade 3, Class A, B, and C except linear shrinkage
- Meets requirements of AASHTO specification M235, Type I, II, IV, and V, Grade 3, Class A, B, and C except linear shrinkage
- Mixing tube provides proper mixing, eliminates measuring errors and minimizes waste
- Contains no styrene and virtually odorless
- Extended installation temperature range from -5°C to 40°C
- Excellent weathering resistance and resistant to elevated temperature.

Hilti HIT-RE 500 V3 Adhesive can be installed using two cleaning options:

1. Traditional cleaning methods comprised of steel wire brushes and air nozzles,
2. Self-cleaning methods using the Hilti TE-CD or TE-YD hollow carbide drill bits used in conjunction of a Hilti vacuum cleaner that will remove drilling dust, automatically cleaning the hole.

Elements that are suitable for use with this system are as follows: threaded steel rods, Hilti HIS-(R)N steel internally threaded inserts, and steel reinforcing bars.

Hilti HIT-RE 500 V3 is approved for use with the Hilti HIT TE-YRT Roughening Tool. The tool is used for hole preparation in conjunction with holes core drilled with a diamond core bit to allow diamond coring in cracked and uncracked concrete in all seismic zones.

3.2.4.1 Product description
3.2.4.2 Material specifications
3.2.4.3 Technical data
3.2.4.4 Installation instructions
3.2.4.5 Ordering information

Listings/Approvals

ICC-ES (International Code Council)
ESR-3814

NSF/ANSI Std 61
certification for use of HIT-RE 500 V3 in potable water

City of Los Angeles
Research Report No. 26028

Independent Code Evaluation

IBC®/IRC® 2015 (ICC-ES AC308/ACI 355.4)

IBC®/IRC® 2012 (ICC-ES AC308/ACI 355.4)

IBC®/IRC® 2009 (ICC-ES AC308)

IBC®/IRC® 2006 (ICC-ES AC308)

Abu Dhabi International Building Code (ADIBC) 2013

FBC 2014 w/ HVHZ

The Leadership in Energy and Environmental Design (LEED) Green Building Rating system™ is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings.

Department of Transportation

Contact Hilti to get a current list of State Departments of Transportation that have added HIT-RE 500 V3 to their qualified product listing.

3.2.4 HIT-RE 500 V3 Epoxy Adhesive Anchoring System

Guide Specifications

Master Format Section:

Previous	**2004 Format**	
03250	**03 16 00**	Concrete Anchors

Related Sections:

03200	**03 20 00**	Concrete Reinforcing
05050	**05 50 00**	Metal Fabrications
05120	**05 10 00**	Structural Metal Framing

Injectable adhesive shall be used for installation of all reinforcing steel dowels or threaded anchor rods and inserts into existing concrete. Adhesive shall be furnished in side-by-side refill packs which keep component A and component B separate. Side-by-side packs shall be designed to compress during use to minimize waste volume. Side-by-side packs shall also be designed to accept static mixing nozzle which thoroughly blends component A and component B and allows injection directly into drilled hole. Only injection tools and static mixing nozzles as recommended by manufacturer shall be used. Manufacturer's instructions shall be followed. Injection adhesive shall be formulated to include resin and hardener to provide optimal curing speed as well as high strength and stiffness. Typical curing time at 20°C shall be approximately 6.5 hours.

Injection adhesive shall be HIT-RE 500 V3, as furnished by Hilti.

Anchor rods shall be end stamped to show the grade of steel and overall rod length. Anchor rods shall be manufactured to meet the following requirements:

1. HIT-V-5.8 carbon steel
2. HIT-V-8.8 high strength carbon steel anchor
3. HIT-V-R Stainless steel meeting the requirements of ISO 3506-1
4. HIT-V-HCR manufacturerd from EN 10088 with a minimum tensile strength of 800 MPa and a mimumum yeild strength of 640 MPa

Special order HIT-V Rods may vary from standard product.

Nuts and washers of other grades and styles having specified proof load strength greater than the specified grade and style are also suitable. Nuts must have specified proof load strength equal to or greater than the minimum tensile strength of the specified threaded rod.

3.2.4.2 Material specifications

Table 1 - Material properties of fully cured HIT-RE 500 V3

Bond Strength ASTM C882M-13A[1] 2 day cure 14 day cure	 10.8 MPa 11.7 MPa
Compressive Strength ASTM D695-10[1]	82.7 MPa
Compressive Modulus ASTM D695-10[1]	2,600 MPa
Tensile Strength 7 day ASTM D638-14	49.3 MPa
Elongation at break ASTM D638-14	1.1%
Heat Deflection Temperature ASTM D648-07	50°C
Absorption ASTM D570-98	0.18%
Linear Coefficient of Shrinkage on Cure ASTM D2566-86	0.008

1 Minimum values obtained as the result of tests at 2°C, 10°C, 24°C and 43°C.

Material specifications for HIT-V threaded rods and HIS-N inserts are listed in section 3.2.8.

3.2.4.3 Technical data

The following document is a supplement to the Hilti North American Product Technical Guide, Volume 2: Anchor Fastening Technical Guide, Edition 16. Specific sections in this supplement will refer to the aforementioned document.

Please refer to the publication in its entirety for complete details on this product including data development, product specifications, general suitability, installation, corrosion and spacing and edge distance guidelines.

To consult directly with a team member regarding our anchor fastening products, contact Hilti's team of technical support specialists on the following mail address ae.technicalsupport@hilti.com.

3.2.4.3.1 ACI 318-14 Chapter 17 design

The load values contained in this section are Hilti Simplified Design Tables. The load tables in this section were developed using the strength design parameters and variables of ESR-3814 and the equations within ACI 318-14 Chapter 17. For a detailed explanation of the Hilti Simplified Design Tables, refer to Section 3.1.8. Data tables from ESR-3814 are not contained in this section, but can be found at www.icc-es.org or at www.hilti.ae.

3.2.4.3.1 HIT-RE 500 V3 adhesive with deformed reinforcing bars (Rebar)

Figure 1 - Rebar installed with HIT-RE 500 V3 adhesive

Cracked or uncracked concrete	Permissible drilling methods	Permissible concrete conditions
Cracked and uncracked concrete	Hammer drilling with carbide-tipped drill bit	Dry concrete Water-saturated concrete Water-filled holes Submerged (underwater)
	Hilti TE-CD or TE-YD hollow drill bit and VC 20/40 vacuum Diamond core drill bit with Hilti TE-YRT roughening tool	Dry concrete Water-saturated concrete
Uncracked concrete	Diamond core drill bit	Dry concrete Water-saturated concrete

Figure 2 - Rebar installed with HIT-RE 500 V3 adhesive

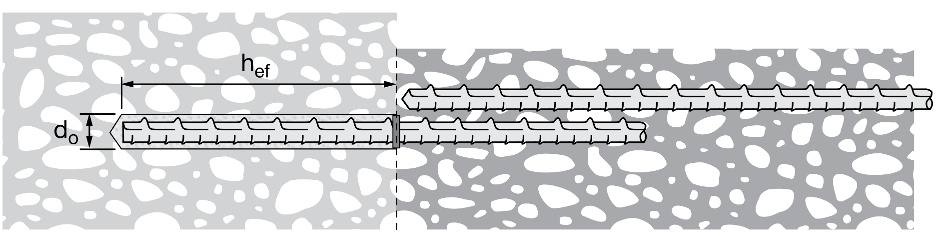


Table 2 - Specifications for rebar installed with HIT-RE 500 V3 adhesive

Setting information		Symbol	Units	Rebar size								
				10	12	14	16	20	25	28	30	32
Nominal bit diameter		d_o	mm	14	16	18	20	25	32	35	37	40
Effective embedment	minimum	$h_{ef,min}$	mm	60	70	80	80	90	100	112	120	128
	maximum	$h_{ef,max}$	mm	200	240	280	320	400	500	560	600	640
Minimum concrete member thickness		h_{min}	mm	h_{ef} + 30	$h_{ef} + 2d_o$							
Minimum edge distance[1]		c_{min}	mm	50	60	70	80	100	125	140	150	160
Minimum anchor spacing		s_{min}	mm	50	60	70	80	100	125	140	150	160

1 Edge distance of 44mm is permitted provided the rebar remains un-torqued.

Note: The installation specifications in table 2 above and the data in tables 3 through 7 pertain to the use of Hilti HIT-RE 500 V3 with rebar designed as a post-installed anchor using the provisions of ACI 318-14 Chapter 17. For the use of Hilti HIT-RE 500 V3 with rebar for typical development calculations according to ACI 318-14 Chapter 25 (formerly ACI 318-11 Chapter 12), refer to section 3.1.8.14 for the design method and table 20 in section 3.2.4.3.8.

3.2.4 HIT-RE 500 V3 Epoxy Adhesive Anchoring System

Table 3 - Hilti HIT-RE 500 V3 adhesive design strength with concrete / bond failure for metric rebar in uncracked concrete [1,2,3,4,5,6,7,8,9,11]

Nominal rebar diameter mm	Effective embedment mm	Tension — ϕN_n				Shear — ϕV_n			
		f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN	f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN
10	60	15.1	16.5	18.5	19.5	16.3	17.8	19.9	21.0
	90	24.6	25.8	27.7	29.3	53.0	55.5	59.6	63.1
	120	32.8	34.4	36.9	39.0	70.7	74.0	79.5	84.1
	200	54.7	57.3	61.5	65.1	117.8	123.3	132.5	140.1
12	70	19.0	20.9	24.1	26.9	41.0	44.9	51.9	58.0
	108	35.2	36.8	39.5	41.8	75.7	79.3	85.2	90.1
	144	46.9	49.1	52.7	55.8	101.0	105.7	113.6	120.1
	240	78.1	81.8	87.9	92.9	168.3	176.1	189.3	200.1
14	80	23.3	25.5	29.4	32.9	50.1	54.9	63.4	70.8
	126	46.0	49.7	53.4	56.4	99.0	107.0	115.0	121.6
	168	63.3	66.2	71.2	75.3	136.3	142.7	153.3	162.1
	280	105.5	110.4	118.6	125.4	227.2	237.8	255.5	270.2
16	80	23.3	25.5	29.4	32.9	50.1	54.9	63.4	70.8
	144	56.2	61.5	68.6	72.5	121.0	132.5	147.7	156.1
	192	81.3	85.1	91.4	96.7	175.1	183.2	196.9	208.2
	320	135.5	141.8	152.4	161.1	291.8	305.4	328.1	347.0
20	90	27.7	30.4	35.1	39.2	59.8	65.5	75.6	84.5
	180	78.5	86.0	99.3	111.0	169.0	185.2	213.8	239.1
	240	120.8	130.7	140.4	148.5	260.3	281.4	302.4	319.8
	400	208.1	217.8	234.0	247.4	448.2	469.1	504.0	532.9
25	100	32.5	35.6	41.1	46.0	70.0	76.7	88.5	99.0
	225	109.7	120.2	138.7	155.1	236.3	258.8	298.8	334.1
	300	168.9	185.0	213.6	228.0	363.7	398.4	460.1	491.0
	500	319.5	334.4	359.3	380.0	688.2	720.3	774.0	818.4
28[10]	112	38.5	42.2	48.7	54.5	83.0	90.9	105.0	117.3
	252	130.0	142.4	164.5	183.9	280.0	306.8	354.2	396.0
	336	200.2	219.3	253.2	281.0	431.1	472.3	545.3	605.1
	560	393.8	412.1	442.9	468.3	848.1	887.6	953.8	1,008.6
30	120	42.7	46.8	54.0	60.4	92.0	100.8	116.4	130.1
	270	144.2	158.0	182.4	203.9	310.6	340.2	392.8	439.2
	360	222.0	243.2	280.8	313.9	478.1	523.8	604.8	676.2
	600	448.0	468.9	503.8	532.7	964.9	1,009.9	1,085.2	1,147.5
32	128	47.1	51.6	59.5	66.6	101.4	111.0	128.2	143.4
	288	158.8	174.0	200.9	224.6	342.1	374.8	432.8	483.8
	384	244.6	267.9	309.3	345.9	526.7	577.0	666.3	744.9
	640	505.1	528.7	568.1	600.7	1,087.9	1,138.7	1,223.6	1,293.8

1 See Section 3.1.8 for explanation on development of load values.
2 See Section 3.1.8.6 to convert design strength value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Tabular values represent a single anchor without reductions for edge distance, anchor spacing, or concrete thickness. Shaded cells indicate that bond strength is the controlling failure mode. Compare to the steel values in Table 7. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 55°C, max. long term temperature = 43°C.
For temperature range B: Max. short term temperature = 80°C, max. long term temperature = 43°C multiply above values by 0.69.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry concrete and water-saturated concrete conditions.
For water-filled drilled holes multiply design strength by 0.51.
For submerged (under water) applications multiply design strength by 0.45.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λa as follows:
For sand-lightweight, λa = 0.51. For all-lightweight, λa = 0.45.
9 Tabular values are for holes drilled in concrete with carbide tipped hammer drill bit. For diamond core drilling, except as indicated in note 10, multiply above values by 0.55. Diamond core drilling is not permitted for the water-filled or under-water (submerged) applications.
10 Diamond core drilling with the Hilti TE-YRT Roughening Tool is permitted for 28 mm rebar in dry and water-saturated concrete. See Table 5
11 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

Table 4 - Hilti HIT-RE 500 V3 adhesive design strength with concrete / bond failure for metric rebar in cracked concrete[1,2,3,4,5,6,7,8,9,11]

Nominal rebar diameter mm	Effective embedment mm	Tension — ϕN_n				Shear — ϕV_n			
		f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN	f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN
10	60	10.7	11.7	12.9	13.4	11.5	12.7	13.9	14.4
	90	18.1	18.6	19.4	20.1	38.9	40.0	41.8	43.2
	120	24.1	24.8	25.9	26.7	51.9	53.4	55.7	57.6
	200	40.2	41.3	43.1	44.6	86.5	88.9	92.8	96.0
12	70	13.5	14.8	17.1	18.9	29.1	31.9	36.8	40.8
	108	25.9	27.0	28.2	29.2	55.8	58.2	60.8	62.9
	144	35.1	36.1	37.6	38.9	75.6	77.7	81.1	83.8
	240	58.5	60.1	62.7	64.9	125.9	129.4	135.1	139.7
14	80	16.5	18.1	20.9	23.4	35.6	39.0	45.0	50.3
	126	32.6	35.8	38.8	40.2	70.3	77.0	83.7	86.5
	168	48.3	49.6	51.8	53.5	103.9	106.8	111.5	115.3
	280	80.4	82.7	86.3	89.2	173.2	178.0	185.9	192.2
16	80	16.5	18.1	20.9	23.4	35.6	39.0	45.0	50.3
	144	39.9	43.7	50.4	53.0	85.9	94.1	108.6	114.2
	192	61.4	65.5	68.3	70.7	132.2	141.0	147.2	152.2
	320	106.2	109.1	113.9	117.8	228.7	235.0	245.4	253.7
20	90	19.7	21.6	24.9	27.9	42.4	46.5	53.7	60.0
	180	55.7	61.0	70.5	78.8	120.0	131.5	151.8	169.7
	240	85.8	94.0	107.9	111.6	184.8	202.4	232.4	240.3
	400	167.6	172.3	179.8	186.0	361.0	371.0	387.4	400.5
25	100	23.1	25.3	29.2	32.6	49.7	54.4	62.9	70.3
	225	77.9	85.3	98.5	110.1	167.7	183.7	212.2	237.2
	300	119.9	131.3	151.7	169.6	258.2	282.9	326.7	365.2
	500	258.0	271.9	283.9	293.6	555.7	585.7	611.5	632.3
28[10]	112	27.4	30.0	34.6	38.7	58.9	64.5	74.5	83.3
	252	92.3	101.1	116.8	130.5	198.8	217.8	251.5	281.2
	336	142.1	155.7	179.8	201.0	306.1	335.3	387.2	432.9
	560	305.8	335.0	352.5	364.5	658.6	721.5	759.2	785.1
30	120	30.3	33.2	38.4	42.9	65.3	71.6	82.6	92.4
	270	102.4	112.1	129.5	144.8	220.5	241.5	278.9	311.8
	360	157.6	172.7	199.4	222.9	339.5	371.9	429.4	480.1
	600	339.1	371.5	396.3	409.8	730.4	800.2	853.6	882.7
32	128	33.4	36.6	42.3	47.3	72.0	78.8	91.0	101.8
	288	112.8	123.5	142.7	159.5	242.9	266.1	307.3	343.5
	384	173.6	190.2	219.6	245.6	374.0	409.7	473.1	528.9
	640	373.6	409.3	441.4	456.4	804.7	881.5	950.8	983.1

1 See Section 3.1.8 for explanation on development of load values.
2 See Section 3.1.8.6 to convert design strength value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Tabular values represent a single anchor without reductions for edge distance, anchor spacing, or concrete thickness. Shaded cells indicate that bond strength is the controlling failure mode. Compare to the steel values in table 7. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 55°C, max. long term temperature = 43°C.
For temperature range B: Max. short term temperature = 80°C, max. long term temperature = 43°C multiply above values by 0.69.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry concrete and water-saturated concrete conditions.
For water-filled drilled holes multiply design strength by 0.51.
For submerged (under water) applications multiply design strength by 0.45.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λa as follows:
For sand-lightweight, λa = 0.51. For all-lightweight, λa = 0.45.
9 Tabular values are for holes drilled in concrete with carbide tipped hammer drill bit. Diamond core drilling is not permitted in cracked concrete except as indicated in note 10.
10 Diamond core drilling with the Hilti TE-YRT Roughening Tool is permitted for 28 mm rebar in dry and water-saturated concrete. See Table 6
11 Tabular values are for static loads only. For seismic loads, multiply cracked concrete tabular values in tension and shear by α_{seis} = 0.68. See section 3.1.8.7 for additional information on seismic applications.

3.2.4 HIT-RE 500 V3 Epoxy Adhesive Anchoring System

Table 5 - Hilti HIT-RE 500 V3 adhesive design strength for core drilled holes with Hilti TE-YRT roughening tool with concrete / bond failure for metric rebar in uncracked concrete[1,2,3,4,5,6,7,8,9]

Nominal rebar diameter mm	Effective embedment mm	Tension — ϕN_n				Shear — ϕV_n			
		f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN	f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN
28	112	38.5	42.2	48.7	54.5	83.0	90.9	105.0	117.3
	252	130.0	142.4	161.4	161.4	280.0	306.8	347.6	347.6
	336	200.2	215.2	215.2	215.2	431.1	463.4	463.4	463.4
	560	358.6	358.6	358.6	358.6	772.4	772.4	772.4	772.4

Table 6 - Hilti HIT-RE 500 V3 adhesive design strength for core drilled holes with Hilti TE-YRT roughening tool with concrete / bond failure for metric rebar in cracked concrete[1,2,3,4,5,6,7,8,9]

Nominal rebar diameter mm	Effective embedment mm	Tension — ϕN_n				Shear — ϕV_n			
		f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN	f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN
28	112	27.4	30.0	34.6	38.7	58.9	64.5	74.5	83.3
	252	92.3	98.0	98.0	98.0	198.8	211.0	211.0	211.0
	336	130.6	130.6	130.6	130.6	281.4	281.4	281.4	281.4
	560	217.7	217.7	217.7	217.7	469.0	469.0	469.0	469.0

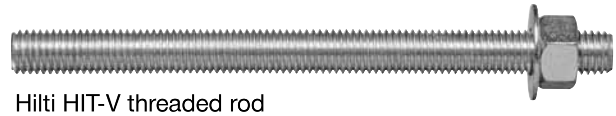
1 See Section 3.1.8 for explanation on development of load values.
2 See Section 3.1.8.6 to convert design strength value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Tabular values represent a single anchor without reductions for edge distance, anchor spacing, or concrete thickness. Shaded cells indicate that bond strength is the controlling failure mode. Compare to the steel values in Table 7. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 55°C, max. long term temperature = 43°C.
For temperature range B: Max. short term temperature = 80°C, max. long term temperature = 43°C multiply above values by 0.69.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry concrete and water-saturated concrete conditions.
Water-filled and submerged (under water) applications are not permitted for this hole preparation method.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete. For seismic loads, multiply cracked concrete tabular values in tension by α_{seis} = 0.68. See section 3.1.8.7 for additional information on seismic applications.

Table 7 - Steel design strength for rebar[1]

Nominal rebar diameter mm	BS 4449 Grade B 500B		
	Tensile[3] ϕN_{sa} kN	Shear[4] ϕV_{sa} kN	Seismic shear[5] $\phi V_{sa,eq}$ kN
10	28.0	15.6	10.9
12	40.3	22.5	15.8
14	54.9	30.6	21.4
16	71.8	39.9	27.9
20	112.5	61.8	43.3
25	175.5	97.2	68.0
28	220.0	121.8	85.3
32	287.6	159.3	111.5

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 BS 4449 Grade 500B rebar is considered brittle steel elements.
3 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318-14 Chapter 17
4 Shear = $\phi\ 0.60 A_{se,N} f_{uta}$ as noted in ACI 318-14 Chapter 17
5 Seismic Shear = $\alpha_{V,seis} \phi V_{sa}$: Reduction for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.

3.2.4.3.4 Hilti HIT-RE 500 V3 adhesive with Hilti HIT-V threaded rod



Hilti HIT-V threaded rod

Figure 4 - HIT-V threaded rod installation conditions

Cracked or uncracked concrete	Permissible drilling methods	Permissible concrete conditions
Cracked and uncracked concrete	Hammer drilling with carbide-tipped drill bit	Dry concrete Water-saturated concrete Water-filled holes Submerged (underwater)
	Hilti TE-CD or TE-YD hollow drill bit and VC 20/40 Vacuum	Dry concrete
	Diamond core drill bit with Hilti TE-YRT roughening tool	Water-saturated concrete
Uncracked concrete	Diamond core drill bit	Dry concrete Water-saturated concrete

Table 8 - Hilti HIT-V threaded rod installation specifications

Setting information		Symbol	Units	Nominal rod diameter, d							
				8	10	12	16	20	24	27	30
Nominal bit diameter		d_o	mm	10	12	14	18	22	28	30	35
Effective embedment	minimum	$h_{ef,min}$	mm	60	60	70	80	90	100	110	120
	maximum	$h_{ef,max}$	mm	160	200	240	320	400	480	540	600
Diameter of fixture hole	through-set		mm	11	14	16	20[1]	24[1]	30[1]	32[1]	37[1]
	preset		mm	9	12	14	18	22	26	30	33
Installation torque		T_{inst}	Nm	10	20	40	80	150	200	270	300
Minimum concrete thickness		h_{min}	mm	$h_{ef}+30$		$h_{ef}+2d_o$					
Minimum edge distance[2]		c_{min}	mm	40	50	60	80	100	120	135	150
Minimum anchor spacing		s_{min}	mm	40	50	60	80	100	120	135	150

1 Install using (2) washers. See Figure 5.

2 Edge distance of 44mm is permitted provided the installation torque is reduced to 0.30 T_{inst} for 5d < s < 406 mm and to 0.5T_{inst} for s > 406 mm

Figure 4 - HIT-V threaded rods

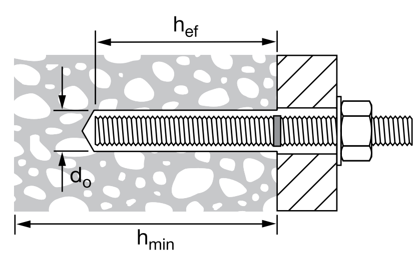
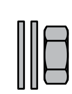


Figure 5 - Installation with (2) washers



3.2.4 HIT-RE 500 V3 Epoxy Adhesive Anchoring System

Table 9 - Hilti HIT-RE 500 V3 adhesive design strength with concrete / bond failure for threaded rod in uncracked concrete[1,2,3,4,5,6,7,8,9,11]

Nominal anchor diameter mm	Effective embedment mm	Tension — ϕN_n				Shear — ϕV_n			
		f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN	f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN
8	60	15.1	16.5	19.1	21.4	16.3	17.8	20.6	23.0
	72	19.9	21.8	24.3	25.6	42.8	46.8	52.2	55.2
	96	28.8	30.1	32.3	34.2	61.9	64.8	69.7	73.7
	160	47.9	50.2	53.9	57.0	103.2	108.0	116.1	122.8
10	60	15.1	16.5	19.1	21.4	16.3	17.8	20.6	23.0
	90	27.7	30.4	35.1	39.1	59.8	65.5	75.6	84.2
	120	42.7	45.9	49.3	52.2	92.0	98.9	106.2	112.3
	200	73.1	76.5	82.2	86.9	157.4	164.8	177.1	187.2
12	70	19.0	20.9	24.1	26.9	41.0	44.9	51.9	58.0
	108	36.5	40.0	46.1	51.6	78.6	86.1	99.4	111.1
	144	56.2	61.5	69.7	73.7	121.0	132.5	150.2	158.8
	240	103.3	108.1	116.2	122.9	222.5	232.9	250.3	264.6
16	80	23.3	25.5	29.4	32.9	50.1	54.9	63.4	70.8
	144	56.2	61.5	71.0	79.4	121.0	132.5	153.0	171.1
	192	86.5	94.7	109.4	122.3	186.2	204.0	235.6	263.4
	320	174.5	182.6	196.2	207.5	375.8	393.4	422.7	446.9
20[10]	90	27.7	30.4	35.1	39.2	59.8	65.5	75.6	84.5
	180	78.5	86.0	99.3	111.0	169.0	185.2	213.8	239.1
	240	120.8	132.4	152.8	170.9	260.3	285.1	329.2	368.1
	400	260.0	272.2	292.5	309.3	560.0	586.3	630.0	666.2
24	100	32.5	35.6	41.1	46.0	70.0	76.7	88.5	99.0
	216	103.2	113.0	130.5	145.9	222.2	243.4	281.1	314.3
	288	158.8	174.0	200.9	224.6	342.1	374.8	432.8	483.8
	480	341.8	373.1	400.9	423.9	736.1	803.5	863.5	913.0
27	110	37.5	41.1	47.4	53.0	80.8	88.5	102.2	114.2
	243	123.1	134.9	155.7	174.1	265.2	290.5	335.4	375.0
	324	189.5	207.6	239.8	268.1	408.2	447.2	516.4	577.3
	540	407.8	446.8	485.3	513.2	878.4	962.2	1,045.3	1,105.3
30[10]	120	42.7	46.8	54.0	60.4	92.0	100.8	116.4	130.1
	270	144.2	158.0	182.4	203.9	310.6	340.2	392.8	439.2
	360	222.0	243.2	280.8	313.9	478.1	523.8	604.8	676.2
	600	477.7	523.2	576.5	609.5	1,028.8	1,127.0	1,241.6	1,312.8

1 See Section 3.1.8 for explanation on development of load values.
2 See Section 3.1.8.6 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Tabular values represent a single anchor without reductions for edge distance, anchor spacing, or concrete thickness. Shaded cells indicate that bond strength is the controlling failure mode. Compare to the steel values in Table 13. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 55°C, max. long term temperature = 43°C.
For temperature range B: Max. short term temperature = 80°C, max. long term temperature = 43°C multiply above values by 0.69.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry concrete conditions.
For water-filled drilled holes multiply design strength by 0.51.
For submerged (under water) applications multiply design strength by 0.45.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength (factored resistance) by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for holes drilled in concrete with carbide tipped hammer drill bit. For diamond core drilling, except as indicated in note 10, multiply above values by 0.55. Diamond core drilling is not permitted for water-filled or underwater (submerged) applications.
10 Diamond core drilling with Hilti TE-YRT Roughening Tool is permitted for 20 mm and 30 mm diameter anchors for dry and water-saturated concrete conditions. See Table 11.
11 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

HIT-RE 500 V3 Epoxy Adhesive Anchoring System 3.2.4

Table 10 - Hilti HIT-RE 500 V3 adhesive design strength with concrete / bond failure for threaded rod in cracked concrete[1,2,3,4,5,6,7,8,9,11]

Nominal anchor diameter mm	Effective embedment mm	Tension — ϕN_n				Shear — ϕV_n			
		f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN	f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN
8	60	9.1	9.4	9.8	10.1	9.8	10.1	10.5	10.9
	72	10.9	11.3	11.7	12.1	23.6	24.2	25.3	26.2
	96	14.6	15.0	15.7	16.2	31.4	32.3	33.7	34.9
	160	24.3	25.0	26.1	27.0	52.4	53.9	56.2	58.1
10	60	10.7	11.7	12.2	12.7	11.5	12.6	13.2	13.6
	90	17.1	17.6	18.4	19.0	36.8	37.9	39.5	40.9
	120	22.8	23.4	24.5	25.3	49.1	50.5	52.7	54.5
	200	38.0	39.1	40.8	42.2	81.9	84.1	87.9	90.8
12	70	13.5	14.8	17.1	17.7	29.1	31.9	36.8	38.2
	108	24.6	25.3	26.4	27.3	53.1	54.5	56.9	58.9
	144	32.8	33.8	35.2	36.4	70.7	72.7	75.9	78.5
	240	54.7	56.3	58.7	60.7	117.9	121.2	126.5	130.8
16	80	16.5	18.1	20.9	23.4	35.6	39.0	45.0	50.3
	144	39.9	43.7	46.5	48.0	85.9	94.1	100.1	103.5
	192	57.7	59.3	61.9	64.1	124.3	127.8	133.4	138.0
	320	96.2	98.9	103.2	106.8	207.2	213.0	222.4	229.9
20[10]	90	19.7	21.6	24.9	27.9	42.4	46.5	53.7	60.0
	180	55.7	61.0	70.5	74.2	120.0	131.5	151.8	159.8
	240	85.8	91.6	95.7	98.9	184.8	197.4	206.1	213.1
	400	148.6	152.7	159.5	164.9	320.1	328.9	343.4	355.1
24	100	23.1	25.3	29.2	32.6	49.7	54.4	62.9	70.3
	216	73.3	80.2	92.7	103.6	157.8	172.8	199.6	223.1
	288	112.8	123.5	136.2	140.8	242.9	266.1	293.3	303.3
	480	211.5	217.4	226.9	234.7	455.5	468.2	488.8	505.4
27	110	26.6	29.2	33.7	37.6	57.3	62.8	72.5	81.1
	243	87.4	95.8	110.6	123.6	188.3	206.2	238.1	266.2
	324	134.6	147.4	170.2	178.2	289.9	317.5	366.6	383.8
	540	267.7	275.1	287.2	297.0	576.5	592.5	618.6	639.7
30[10]	120	30.3	33.2	38.4	42.9	65.3	71.6	82.6	92.4
	270	102.4	112.1	129.5	144.8	220.5	241.5	278.9	311.8
	360	157.6	172.7	199.4	217.4	339.5	371.9	429.4	468.3
	600	326.6	335.6	350.4	362.4	703.4	722.9	754.8	780.5

1 See Section 3.1.8 for explanation on development of load values.
2 See Section 3.1.8.6 to convert design strength value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Tabular values represent a single anchor without reductions for edge distance, anchor spacing, or concrete thickness. Shaded cells indicate that bond strength is the controlling failure mode. Compare to the steel values in Table 13. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 55°C, max. long term temperature = 43°C.
For temperature range B: Max. short term temperature = 80°C, max. long term temperature = 43°C multiply above values by 0.69.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry or water saturated concrete conditions.
For water-filled drilled holes multiply design strength by 0.51.
For submerged (under water) applications multiply design strength by 0.44.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for holes drilled in concrete with carbide tipped hammer drill bit. Diamond core drilling is not permitted in cracked concrete conditions except as indicated in note 10.
10 Diamond core drilling with Hilti TE-YRT Roughening Tool is permitted for 20 mm and 30 mm diameter anchors for dry and water-saturated concrete conditions. See Table 11.
11 Tabular values are for static loads only. For seismic loads, multiply cracked concrete tabular values in tension and shear by α_{seis} indicated below.
See section 3.1.8.7 for additional information on seismic applications.
8 mm diameter - α_{seis} = 0.75
10 mm diameter - α_{seis} = 0.69
12 diameter - α_{seis} = 0.70
16 mm diameter - α_{seis} = 0.71
20 mm and larger - α_{seis} = 0.75

3.2.4 HIT-RE 500 V3 Epoxy Adhesive Anchoring System

Table 11 - Hilti HIT-RE 500 V3 adhesive design strength for core drilled holes with Hilti TE-YRT roughening tool with concrete / bond failure for threaded rod in uncracked concrete[1,2,3,4,5,6,7,8,9]

Nominal anchor diameter mm	Effective embedment mm	Tension — ϕN_n				Shear — ϕV_n			
		f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN	f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN
20	90	27.7	30.4	35.1	39.2	59.8	65.5	75.6	84.5
	180	78.5	86.0	99.3	106.6	169.0	185.2	213.8	229.6
	240	120.8	132.4	142.1	142.1	260.3	285.1	306.1	306.1
	400	236.9	236.9	236.9	236.9	510.2	510.2	510.2	510.2
30	120	42.7	46.8	54.0	60.4	92.0	100.8	116.4	130.1
	270	144.2	158.0	182.4	203.9	310.6	340.2	392.8	439.2
	360	222.0	243.2	280.1	280.1	478.1	523.8	603.3	603.3
	600	466.8	466.8	466.8	466.8	1,005.4	1,005.4	1,005.4	1,005.4

Table 12 - Hilti HIT-RE 500 V3 adhesive design strength for core drilled holes with Hilti TE-YRT roughening tool with concrete / bond failure for threaded rod in cracked concrete[1,2,3,4,5,6,7,8,9]

Nominal anchor diameter mm	Effective embedment mm	Tension — ϕN_n				Shear — ϕV_n			
		f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN	f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN
20	90	19.7	21.6	22.1	22.1	42.4	46.5	47.5	47.5
	180	44.1	44.1	44.1	44.1	95.0	95.0	95.0	95.0
	240	58.8	58.8	58.8	58.8	126.7	126.7	126.7	126.7
	400	98.0	98.0	98.0	98.0	211.1	211.1	211.1	211.1
30	120	30.3	33.2	38.4	42.9	65.3	71.6	82.6	92.4
	270	97.6	97.6	97.6	97.6	210.2	210.2	210.2	210.2
	360	130.1	130.1	130.1	130.1	280.3	280.3	280.3	280.3
	600	216.9	216.9	216.9	216.9	467.1	467.1	467.1	467.1

1 See Section 3.1.8 for explanation on development of load values.
2 See Section 3.1.8.6 to convert design strength value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Tabular values represent a single anchor without reductions for edge distance, anchor spacing, or concrete thickness. Shaded cells indicate that bond strength is the controlling failure mode. Compare to the steel values in Table 13. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 55°C, max. long term temperature = 43°C.
For temperature range B: Max. short term temperature = 80°C, max. long term temperature = 43°C multiply above values by 0.69.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry or water saturated concrete conditions. Water-filled and submerged (under water) applications are not permitted for this hole preparation method.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete. For seismic loads, multiply cracked concrete tabular values in tension and shear by α_{seis}=0.75. See section 3.1.8.7 for additional information on seismic applications.

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Table 13 - Steel design strength for Hilti HIT-V threaded rods[1]

Nominal anchor diameter mm	HIT-V ISO 898-1 Class 5.8[5]			HIT-V ISO 898-1 Class 8.8[5]			HIT-V-R ISO 3506-1 Class A4 stainless[5]			HIT-V-HCR High corrosion resistant steel[5]		
	Tensile[2] ϕN_{sa} kN	Shear[3] ϕV_{sa} kN	Seismic Shear[4] $\phi V_{sa,eq}$ kN	Tensile[2] ϕN_{sa} kN	Shear[3] ϕV_{sa} kN	Seismic Shear[4] $\phi V_{sa,eq}$ kN	Tensile[2] ϕN_{sa} kN	Shear[3] ϕV_{sa} kN	Seismic Shear[4] $\phi V_{sa,eq}$ kN	Tensile[2] ϕN_{sa} kN	Shear[3] ϕV_{sa} kN	Seismic Shear[4] $\phi V_{sa,eq}$ kN
8	11.9	6.6	4.6	19.0	10.6	7.4	16.6	9.2	6.5	19.0	8.8	6.1
10	18.9	8.7	6.1	30.2	13.8	9.7	26.4	12.2	8.5	30.2	13.9	9.7
12	27.3	15.3	10.7	43.9	24.3	17.0	38.4	21.2	14.9	43.8	24.3	17.0
16	51.0	28.2	19.7	81.6	45.3	31.7	71.4	39.5	27.7	81.6	45.2	31.7
20	79.6	44.1	30.9	127.4	70.5	49.4	111.5	61.7	43.2	127.4	70.6	49.4
24	114.7	63.6	44.5	183.6	101.7	71.2	160.6	89.0	62.3	160.6	89.0	62.3
27	149.2	82.5	57.8	238.6	132.3	92.6	119.0	65.9	46.2	208.8	115.7	81.0
30	182.3	101.1	70.8	291.9	161.7	113.2	145.5	80.6	56.4	255.3	141.4	99.0

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318 Chapter 17.
3 Shear = ϕ 0.60 $A_{se,V} f_{uta}$ as noted in ACI 318 Chapter 17.
4 Seismic Shear = $\alpha_{V,seis} \phi V_{Vsa}$: Reduction for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.
5 HIT-V Threaded rods are considered brittle steel elements.

3.2.4 HIT-RE 500 V3 Epoxy Adhesive Anchoring System

3.2.4.3.6 Hilti HIT-RE 500 V3 adhesive with Hilti HIS-N and HIS-RN internally threaded insert

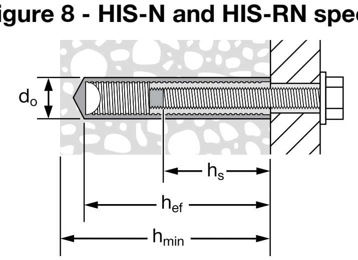
Figure 7 - Hilti HIS-N and HIS-RN internally threaded insert installation conditions

Cracked or uncracked concrete	Permissible drilling methods	Permissible concrete conditions
Cracked and uncracked concrete	Hammer drilling with carbide-tipped drill bit	Dry concrete Water-saturated concrete Water-filled holes Submerged (underwater)
	Hilti TE-CD or TE-YD hollow drill bit Diamond core drill bit with Hilti TE-YRT roughening tool	Dry concrete Water-saturated concrete
Uncracked concrete	Diamond core drill bit	Dry concrete Water-saturated concrete

Table 14 - HIS-N and HIS-RN specifications

Setting information		Symbol	Units	Nominal bolt/cap screw diameter				
				8	10	12	16	20
Outside diameter of insert			mm	12.5	16.5	20.5	25.4	27.6
Nominal bit diameter		d_o	mm	14	18	22	28	32
Effective embedment		h_{ef}	mm	90	110	125	170	205
Thread engagement	minimum	h_s	mm	8	10	12	16	20
	maximum		mm	20	25	30	40	50
Installation torque		T_{inst}	Nm	10	20	40	80	150
Minimum concrete member thickness		h_{min}	mm	120	150	170	230	270
Minimum edge distance		c_{min}	mm	63	83	102	127	140
Minimum anchor spacing		s_{min}	mm	63	83	102	127	140

Figure 8 - HIS-N and HIS-RN specifications



HIT-RE 500 V3 Epoxy Adhesive Anchoring System 3.2.4

Table 15 - Hilti HIT-RE 500 V3 adhesive design strength with concrete / bond failure for Hilti HIS-N and HIS-RN internally threaded inserts in uncracked concrete[1,2,3,4,5,6,7,8,9,11]

Internal thread diameter mm	Effective embed depth mm	Tension - ϕN_n or N_r				Shear - ϕV_n or V_r			
		f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN	f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN
8	90	27.7	30.4	34.9	36.9	59.8	65.5	75.2	79.5
10	110	37.5	41.1	47.4	53.0	80.8	88.5	102.2	114.2
12[10]	125	45.4	49.8	57.5	64.2	97.8	107.2	123.7	138.3
16	170	72.0	78.9	91.1	101.9	155.2	170.0	196.3	219.4
20	205	95.4	104.5	120.7	134.9	205.5	225.1	259.9	290.6

Table 16 - Hilti HIT-RE 500 V3 adhesive design strength with concrete / bond failure for Hilti HIS-N and HIS-RN internally threaded inserts in cracked concrete[1,2,3,4,5,6,7,8,9,11]

Internal thread diameter mm	Effective embed. depth mm	Tension - ϕN_n or N_r				Shear - ϕV_n or V_r			
		f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN	f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN
8	90	18.0	18.5	19.3	20.0	38.7	39.8	41.6	43.0
10	110	26.6	29.2	31.1	32.2	57.3	62.8	67.0	69.3
12[10]	125	32.2	35.3	40.8	45.4	69.5	76.1	87.9	97.9
16	170	51.1	56.0	64.7	72.3	110.2	120.7	139.3	155.8
20	205	67.7	74.2	85.7	95.8	145.9	159.8	184.5	206.3

1 See Section 3.1.8 for explanation on development of load values.
2 See Section 3.1.8.6 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Tabular values represent a single anchor without reductions for edge distance, anchor spacing, or concrete thickness. Shaded cells indicate that bond strength is the controlling failure mode. Compare to the steel values in Table 19. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 55° C, max. long term temperature = 43° C.
For temperature range B: Max. short term temperature = 80° C, max. long term temperature = 43° C multiply above values by 0.69
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry concrete and water saturated concrete conditions.
For water-filled drilled holes multiply design strength by 0.52.
For submerged (under water) applications multiply design strength by 0.46.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for holes drilled in concrete with carbide tipped hammer drill bit. Diamond core drilling is not permitted in cracked concrete except as indicated in note 10. For diamond core drilling in uncracked concrete, except as indicated in note 10, multiply the above values by 0.57. Diamond core drilling is not permitted for water-filled or under-water (submerged) applications in uncracked concrete.
10 Diamond core drilling is only permitted in cracked concrete with use of the Hilti TE-YRT roughening tool for 12 mm anchors in dry and water-saturated concrete. See Tables 47 and 48.
11 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete. For seismic loads, multiply cracked concrete tabular values in tension and shear by α_{seis} = 0.75. See section 3.1.8.7 for additional information on seismic applications.

3.2.4 HIT-RE 500 V3 Epoxy Adhesive Anchoring System

Table 17 - Hilti HIT-RE 500 V3 adhesive design strength in core drilled holes roughened with Hilti TE-YRT roughening tool with concrete / bond failure for Hilti HIS-N and HIS-RN internally threaded inserts in uncracked concrete[1,2,3,4,5,6,7,8,9]

Internal thread diameter mm	Effective embed depth mm	Tension - ϕN_n or N_r				Shear - ϕV_n or V_r			
		f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN	f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN
12	125	45.4	49.8	57.5	64.2	97.8	107.2	123.7	138.3

Table 18 - Hilti HIT-RE 500 V3 adhesive design strength in core drilled holes roughened with Hilti TE-YRT roughening tool with concrete / bond failure for Hilti HIS-N and HIS-RN internally threaded inserts in cracked concrete[1,2,3,4,5,6,7,8,9]

Internal thread diameter mm	Effective embed depth mm	Tension - ϕN_n or N_r				Shear - ϕV_n or V_r			
		f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN	f'_c = 25 MPa kN	f'_c = 30 MPa kN	f'_c = 40 MPa kN	f'_c = 50 MPa kN
12	125	27.2	27.2	27.2	27.2	58.6	58.6	58.6	58.6

1 See Section 3.1.8 for explanation on development of load values.
2 See Section 3.1.8.6 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Tabular values represent a single anchor without reductions for edge distance, anchor spacing, or concrete thickness. Shaded cells indicate that bond strength is the controlling failure mode. Compare to the steel values in Table 19. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 55° C, max. long term temperature = 43° C.
For temperature range B: Max. short term temperature = 80° C, max. long term temperature = 43° C multiply above values by 0.69
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry concrete and water saturated concrete conditions.
For water-filled drilled holes multiply design strength by 0.52.
For submerged (under water) applications multiply design strength by 0.46.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete. For seismic loads, multiply cracked concrete tabular values in tension and shear by α_{seis} = 0.75. See section 3.1.8.7 for additional information on seismic applications.

Table 19 - Steel design strength for steel bolt / cap screw for Hilti HIS-N and HIS-RN internally threaded inserts[1,2,3]

Internal thread diameter mm	ISO 898-1 Class 8.8			ISO 3056-1 Class A4-70 Stainless Steel		
	Tensile[1] ϕN_{sa} kN	Shear[2] ϕV_{sa} kN	Seismic Shear[4] $\phi V_{sa,eq}$ kN	Tensile[1] ϕN_{sa} kN	Shear[2] ϕV_{sa} kN	Seismic Shear[4] $\phi V_{sa,eq}$ kN
8	19.2	10.5	7.4	16.6	9.3	6.5
10	30.2	16.8	11.8	26.3	14.7	10.3
12	43.9	24.3	17.0	38.4	21.3	14.9
16	81.6	45.3	31.7	71.5	39.6	17.7
20	125.5	70.5	49.4	111.5	61.8	43.3

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 Hilti HIS-N and HIS-RN inserts with steel bolts are considered brittle steel elements.
3 Table values are the lesser of steel failure in the HIS-N insert or inserted steel bolt.
4 Tensile = $\phi\, A_{se,N}\, f_{uta}$ as noted in ACI 318 Chapter 17.
5 Shear = ϕ 0.60 $A_{se,V}\, f_{uta}$ as noted in ACI 318 Chapter 17.
6 Seismic Shear = $\alpha_{V,seis}\ \phi\ V_{sa}$: Reduction for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.

3.2.4.3.8 Development and splicing of post-installed reinforcement

Calculations for post-installed rebar for typical development lengths may be done according to ACI 318-14 Chapter 25 (formerly ACI 318-11 Chapter 12) and for adhesive anchors tested and approved in accordance with AC 308. This section contains tables for the data provided in ICC Evaluation Services ESR-3814. Refer to section 3.1.14 and the Hilti North America Post-Installed Reinforcing Bar Guide for the design method.

Table 20 - Calculated tension development and Class B splice lengths for BS 4449 Grade B 500B bars in walls, slabs, columns, and footings per ACI 318-14 Chapter 25 for Hilti HIT-RE 500 V3

Rebar size	$\frac{c_b + K_{tr}}{d_b}$	Minimum edge dist. mm[1]	Minimum spacing mm[2]	f'_c = 25 Mpa		f'_c = 30 Mpa		f'_c = 40 Mpa		f'_c = 50 Mpa	
				ℓ_d mm	Class B splice mm	ℓ_d mm	Class B splice mm	ℓ_d mm	Class B splice mm	ℓ_d mm	Class B splice mm
8		50	40	310	310	310	310	310	310	310	310
10		60	50	310	380	310	350	310	310	310	310
12		60	60	350	460	320	420	310	360	310	310
16	2.5	70	80	470	610	430	550	370	480	330	430
20		90	100	730	940	660	860	580	750	520	670
25		110	125	910	1180	830	1080	720	930	640	840
32		130	160	1160	1510	1060	1380	920	1190	820	1070

1 Edge distances are determined using the minimum cover specified by ESR-3814 with an additional 6% of the development length per suggestions for drilling without an aid per Hilti Post-Installed Reinforcing Bar Guide Section 3.3. Smaller edge distances may be possible, for which development and splice lengths may need to be recalculated. For further information on required cover see ACI 318-14, Sec. 20.6.1.3.1; see Sec. 2.2 for determination of cb.

2 Spacing values represent those producing c_b =5 d_b rounded up to the nearest 10 mm. Smaller spacing values may be possible, for which development and splice lengths may need to be recalculated. For further information on required spacing see ACI 318-14 Sec. 25.2; see Sec. 2.2 for determination of c_b.

3 ψ_t = 1.0 See ACI 318-14, Sec. 25.4.2.4.

4 ψ_e = 1.0 for non-epoxy coated bars. See ACI 318-14, Sec. 25.4.2.4.

5 ψ_s = 0.8 for 16 mm bars and smaller bars, 1.0 for 20 mm and larger bars. See ACI 318-14, Sec. 25.4.2.4.

6 Values are for normal weight concrete. For sand-lightweight concrete, multiply development and splice lengths by 1.18, for all-lightweight concrete multiply development and splice lengths by 1.33. See ACI 318-14 Sec. 19.2.4.

7 Development and splice length values are for static design. Seismic design development and splice lengths can be found in ACI 318-14 18.8.5 for special moment frames and ACI 318-14 18.10.2.3 for special structural walls. For further information about reinforcement in seismic design, see ACI 318-14 Ch. 18.

8 Refer to the Hilti North America Post-Installed Reinforcing Bar Guide for further explanation, background information, and design examples.

3.2.4 HIT-RE 500 V3 Epoxy Adhesive Anchoring System

3.2.4.4 Installation instructions

Installation Instructions For Use (IFU) are included with each product package. They can also be viewed or downloaded online at www.us.hilti.com (US). Because of the possibility of changes, always verify that downloaded IFU are current when used. Proper installation is critical to achieve full performance. Training is available on request. Contact Hilti Technical Services for applications and conditions not addressed in the IFU.

Figure 9 - HIT-RE 500 V3 adhesive cure and working time (approx.)

[°F]	[°C]	t_{work}	$t_{cure, ini}$	$t_{cure, full}$
23	-5	2 h	48 h	168 h
32	0	2 h	24 h	36 h
40	4	2 h	16 h	24 h
50	10	1.5 h	12 h	16 h
60	16	1 h	8 h	16 h
72	22	25 min	4 h	6.5 h
85	29	15 min	2.5 h	5 h
95	35	12 min	2 h	4.5 h
105	41	10 min	2 h	4 h

≥ +5 °C / 41 °F

= 2x t_{cure}

Table 93 - Resistance of HIT-RE 500 V3 to chemicals

Chemicals tested	Content (%)	Resistance
toluene	47.5	+
iso-octane	30.4	
heptane	17.1	
methanol	3	
butanol	2	
toluene	60	+
xylene	30	
methylnaphthalene	10	
diesel	100	+
petrol	100	+
methanol	100	–
dichloromethane	100	–
mono-chlorobenzene	100	●
ethylacetat	50	+
methylisobutylketone	50	
salicylic acid-methylester	50	+
mcetophenon	50	
acetic acid	50	–
propionic acid	50	
sulfuric acid	100	–
nitric acid	100	–
hyrdocholoric acid	36	–
potassium hydroxide	100	–
sodium hydroxide 20%	100	–
triethanolamine	50	–
butylamine	50	
benzyl alcohol	100	–
ethanol	100	
ethyl acetate	100	
methyl ethly ketone (MEK)	100	
trichlorethylene	100	
lutensit TC KLC 50	3	+
marlophen NP 9,5	2	
water	95	
tetrahydrofurane	100	–
demineralized water	100	+
salt water	saturated	+
salt spray testing	–	+
SO_2	–	+
environment/weather	–	+
oil for formwork (forming oil)	100	+
concrete plasticizer	–	+
concrete drilling mud	–	+
concrete potash solution	–	+
saturated suspension of bore-hole cuttings	–	+

- \+ Resistant
- ● Partially resistant
- – Not resistant

3.2.4.5 Ordering information

HIT-RE 500 V3 adhesive

Description	Package contents	Qty	Item number
Hit-RE 500 V3 (500 ml)	Includes (1) foil pack with (1) mixer and (1) mixer extension	1	2123406

TE-YRT roughening tool

Order description	Description	Length
TE-Y-RT 16/40	Roughening tool for use with 16 diameter threaded rod in core drilled holes	40
TE-Y-RT 18/40	Roughening tool for use with 18 diameter threaded rod in core drilled holes	40
TE-Y-RT 22/40	Roughening tool for use with 22 diameter threaded rod in core drilled holes	40
TE-Y-RT 28/55	Roughening tool for use with 28 diameter threaded rod in core drilled holes	55
TE-Y-RT 32/55	Roughening tool for use with 32 diameter threaded rod in core drilled holes	55

TE-CD hollow drill bits

Order description	Working length	Item number
Hollow drill bit TE-CD 12/33	200 mm	2018940
Hollow drill bit TE-CD 14/37	240 mm	2018945
Hollow drill bit TE-CD 16/37	240 mm	2018946

TE-YD hollow drill bits

Order description	Working length	Item number
Hollow drill bit TE-YD 16/59	400 mm	2018956
Hollow drill bit TE-YD 18/59	400 mm	2018957
Hollow drill bit TE-YD 20/59	400 mm	2018959
Hollow drill bit TE-YD 22/59	400 mm	2018960
Hollow drill bit TE-YD 25/59	400 mm	2018962
Hollow drill bit TE-YD 28/59	400 mm	2018964
Hollow drill bit TE-YD 32/59	400 mm	2018966