CONSTRUCTION LEADERS

LETTER OF TRANSMITTAL			
DATE:	**March 18, 2015**	PCL JOB NO:	**5515002**
ATTN:	**Chris Barker**	TRANSMITTAL NO:	**041**

To: **State of Vermont Agency of Transportation**
One National Life Drive

(802) 828-0053

Re: Hartford Lateral Slide
Project No.: IM 091-2(79)
Contract ID.: 12A132 County: Windsor PCL FILE NO: 5515002-27

WE ARE SENDING X Attached ____ Under separate cover via **Email & SP** the following:
____ Shop drawings ____ Prints ____ Plans ____ Samples X Specifications
____ Copy of Letter ____ Change Order X Other

COPIES	SPEC.	REVISION	DESCRIPTION
1	**507.06**		**Adhesive for #9 Dowels at Abutment 4 Subfooting**

TRANSMITTED for as checked below:

X For approval ____ Approved as submitted ____ Resubmit 1 Copies for approval
____ For your use ____ Approved as noted ____ Submit ____ Copies for distribution
____ As requested ____ Returned for corrections ____ Return ____ Corrected prints
____ For review and comment

Remarks:

The included adhesive is to be used for the #9 dowels at abutment 4 subfooting.

Please return an email of this approved submittal to Erich Heymann (ewheymann@pcl.com) and Jeremy Mackling (jmackling@pcl.com).

We request the review and return of this submittal within 7 days. Please advise if this request cannot be met so we can plan accordingly.

By: **Erich Heymann,** Project Engineer

COPY TO: Project Files

3810 Northdale Blvd., Suite 200; Tampa, FL • (813) 264-9500 • (813) 264-6689 (fax)

CONSTRUCTION LEADERS

SUBMITTAL NO. : 27
Adhesive for #9 Dowels at Abutment 4 Subfooting

Item No.	Specification	Description
1	507.06	Adhesive for #9 Dowels at Abutment 4 Subfooting

PROJECT:
HARTFORD LATERAL SLIDE
PROJECT NO.: IM 091-2(79)
CONTRACT ID.: 12A132

OWNER:
STATE OF VERMONT AGENCY OF TRANSPORTATION

ENGINEER OF RECORD:
STATE OF VERMONT AGENCY OF TRANSPORTATION

CONTRACTOR:
PCL CIVIL CONSTRUCTORS, INC.

MARCH 18, 2015

3810 Northdale Blvd., Suite 200; Tampa, FL • (813) 264-9500 • (813) 264-6689 (fax)

Attached are page(s) from the 2014 Hilti North American Product Tech Guide. For complete details on this product, including data development, product specifications, general suitability, installation, corrosion, and spacing and edge distance guidelines, please refer to the Technical Guide, or contact Hilti.

Hilti, Inc.
5400 South 122nd East Avenue
Tulsa, OK 74146

1-800-879-8000
www.hilti.com

3.2.3 HIT-HY 200 Adhesive Anchoring System

3.2.3.1 Product description

3.2.3.2 Material specifications

3.2.3.3 Technical data

3.2.3.4 Installation instructions

3.2.3.5 Ordering information

HIT-HY 200-A

HIT-HY 200-R

Listings/Approvals

ICC-ES (International code council)
ESR-3187

Independent code evaluation

IBC®/IRC® 2009
IBC®/IRC® 2006
IBC®/IRC® 2003

LEED® Credit 4.1-Low Emitting Materials

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.

3.2.3.1 Product description

Hilti HIT-HY 200 adhesive is an injectable, two-component, hybrid adhesive. The two components are separated 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.

Hilti HIT-HY 200 adhesive is available in two options, Hilti HIT-HY 200-A, and Hilti HIT-HY 200-R. Both options utilize the same technical data. Hilti HIT-HY 200-A will have shorter working times and curing times than Hilti HIT-HY 200-R. The packaging for each is different which helps the user distinguish between the two adhesives.

Hilti HIT-HY 200 adhesive comes with three hole cleaning options:

- The traditional hole cleaning method uses steel wire brushes and compressed air
- The self-cleaning method uses the Hilti TE-CD or TE-YD Hollow Drill Bits in conjunction with a Hilti vacuum to remove the dust as you drill. The hole is clean and ready for anchor installation.
- The no-cleaning method requires the use of Hilti HIT-Z and HIT-Z-R threaded anchor rods. If the base material temperature is less than 41° F (5° C) or if diamond core drilling is used, then the drilled hole must be cleaned.

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

Product features

- Two great products with equal performance data
- User can select product gel time suitability based on temperature of the base material and jobsite time requirements
- No hole cleaning requirement when installed SafeSet™ hollow drill bit technology
- No hole cleaning requirement when installing HIT-Z rods in dry conditions
- ICC-ES approved for cracked concrete and seismic service
- May be installed in diamond cored holes when addition cleaning steps are employed

Guide specifications

Injectable adhesive shall be used for installation of threaded rods (rebar) (inserts) into existing concrete. Adhesive shall be furnished in containers which keep component A and component B separate. Containers shall be designed to accept static mixing nozzle which thoroughly blends component A and component B and allows injection of the mixed adhesive directly into the drilled hole. Only injection tools and static mixing nozzles supplied by the manufacturer may be used. Injection adhesive shall be formulated to include the resin and hardener to provide optimal curing speed, high strength and stiffness. Injection adhesive anchor system shall be Hilti HIT-HY 200 installed using Hilti Safe Set™ Technology. HIT-HY 200 System shall be supplied by Hilti.

3.2.3.2 Material specifications

Material specifications for the HIT-Z and HIT-Z-R rods are listed in section 3.2.3.3.1.
Material specifications for HAS threaded rods are listed in section 3.2.3.3.3.
Materials specifications for HIS-N and HIS-RN internally threaded inserts are listed in section 3.2.3.3.4.

3.2.3.3 Technical data

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-3187 and the equations within ACI 318-11 Appendix D. For a detailed explanation of the Hilti Simplified Design Tables, refer to section 3.1.7. Data tables from ESR-3187 are not contained in this section, but can be found at www.icc-es.org or at www.us.hilti.com.

3.2.3.3.1 HIT-HY 200 adhesive with HIT-Z and HIT-Z-R threaded rods

Figure 1 - HIT-Z and HIT-Z-R installation conditions

Permissible concrete conditions			Permissible drilling method	
Uncracked concrete	Dry concrete		Hammer drilling with carbide tipped drill bit [1]	
Cracked concrete	Water-saturated concrete		Hilti TE-CD or TE-YD Hollow Drill Bit [2]	
	Water-filled drilled holes		Diamond core drill bit [3]	

1 Anchor may be installed in a hole drilled with a carbide-tipped bit without cleaning the drilling dust from the hole. Temperature must be 41° F or higher. Drilling dust must be removed from the hole if the temperature is below 41° F. See Manufacturer's Published Installation Instructions (MPII).
2 When temperatures are below 41° F, TE-CD or TE-YD Hollow Drill Bits used with a Hilti vacuum cleaner are viable methods for removing drilling dust from the hole.
3 Holes drilled by diamond coring require cleaning with a wire brush, a water hose and compressed air. See MPII.

Table 1 - HIT-Z and HIT-Z-R specifications

Setting information		Symbol	Units	Nominal anchor diameter			
				3/8	1/2	5/8	3/4
Nominal bit diameter		d_o	in.	7/16	9/16	3/4	7/8
Effective embedment	minimum	$h_{ef,min}$	in. (mm)	2-3/8 (60)	2-3/4 (70)	3-3/4 (95)	4 (102)
	maximum	$h_{ef,max}$	in. (mm)	4-1/2 (114)	6 (152)	7-1/2 (190)	8-1/2 (216)
Fixture hole diameter	through-set		in.	1/2	5/8	13/16[1]	15/16[1]
	preset		in.	7/16	9/16	11/16	13/16
Installation torque		T_{inst}	ft-lb (Nm)	15 (20)	30 (40)	60 (80)	110 (150)

1 Install using (2) washers. See Figure 3.

Figure 2 - HIT-TZ and HIT-TZ-R specfications

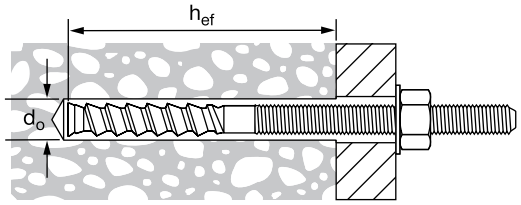


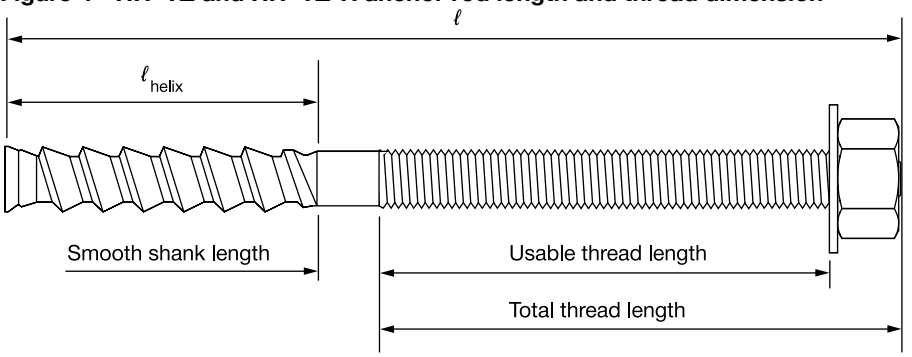
Figure 3 - Installation with (2) washers

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 2 - HIT-Z and HIT-Z-R anchor rod length and thread dimension

Size	ℓ Anchor length		ℓ_{helix} Helix length		Smooth shank length		Total thread length		Usable thread length	
	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
3/8 x 4-3/8	4-3/8	(111)	2-1/4	(57)	5/16	(8)	1-13/16	(46)	1-5/16	(33)
3/8 x 5-1/8	5-1/8	(130)	2-1/4	(57)	5/16	(8)	2-9/16	(65)	2-1/16	(52)
3/8 x 6-3/8	6-3/8	(162)	2-1/4	(57)	5/16	(8)	3-13/16	(97)	3-5/16	(84)
1/2 x 4-1/2	4-1/2	(114)	2-1/2	(63)	5/16	(8)	1-11/16	(43)	1	(26)
1/2 x 6-1/2	6-1/2	(165)	2-1/2	(63)	5/16	(8)	3-11/16	(94)	3-1/16	(77)
1/2 x 7-3/4	7-3/4	(197)	2-1/2	(63)	5/16	(8)	4-15/16	(126)	4-5/16	(109)
5/8 x 6	6	(152)	3-5/8	(92)	7/16	(11)	1-15/16	(49)	1-1/8	(28)
5/8 x 8	8	(203)	3-5/8	(92)	7/16	(11)	3-15/16	(100)	3-1/8	(79)
5/8 x 9-1/2	9-1/2	(241)	3-5/8	(92)	1-15/16	(49)	3-15/16	(100)	3-1/8	(79)
3/4 x 8-1/2	8-1/2	(216)	4	(102)	7/16	(12)	4	(102)	3-1/16	(77)
3/4 x 9-3/4	9-3/4	(248)	4	(102)	1-11/16	(44)	4	(102)	3-1/16	(77)

Figure 4 - HIT-TZ and HIT-TZ-R anchor rod length and thread dimension



HIT-Z carbon steel material specifications

3/8-, 1/2- and 5/8-in. HIT-Z rods are manufactured from AISI 1038 with a minimum tensile strength of 94.2 ksi (650 MPa) and a minimum yield strength of 75.3 ksi (520 MPa).

3/4-in. HIT-Z rods are manufactured from either AISI 1038 or 18MnV5 with a minimum tensile strength of 94.2 ksi (650 MPa) and a minimum yield strength of 75.3 ksi (520 MPa).

HIT-Z rods have a electroplate zinc coating with a minimum thickness of 5 µm.

Carbon steel nuts conform to ASTM A563 and ANSI B18.2.2.

Carbon steel washers conform to ASTM F844.

HIT-Z-R stainless steel material specifications

HIT-Z-R rods are manufactured from AISI Type 316 stainless steel minimum tensile strength of 94.2 ksi (650 MPa) and a minimum yield strength of 75.3 ksi (520 MPa).

Stainless steel nuts conform with ASTM F594 and ANSI B18.2.2.

Stainless steel washers are manufactured from AISI Type 316 stainless steel and conform to ASTM A240.

HIT-HY 200 Adhesive Anchoring System 3.2.3

Table 3 - HIT-HY 200 design strength with concrete/pullout failure for HIT-Z(-R) rods in uncracked concrete [1,2,3,4,5,6,7,8,10]

Nominal anchor diameter in.	Effective embed. in. (mm)	Tension — ΦN_n or N_r				Shear — ΦV_n or V_r			
		f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)	f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)
3/8	2-3/8 (60)	2,855 (12.7)	3,125 (13.9)	3,610 (16.1)	4,425 (19.7)	3,075 (13.7)	3,370 (15.0)	3,890 (17.3)	4,765 (21.2)
	3-3/8 (86)	4,835 (21.5)	5,300 (23.6)	5,560 (24.7)	5,560 (24.7)	10,415 (46.3)	11,410 (50.8)	13,175 (58.6)	16,135 (71.8)
	4-1/2 (114)	5,560 (24.7)	5,560 (24.7)	5,560 (24.7)	5,560 (24.7)	16,035 (71.3)	17,570 (78.2)	20,285 (90.2)	24,845 (110.5)
1/2	2-3/4 (70)	3,555 (15.8)	3,895 (17.3)	4,500 (20.0)	5,510 (24.5)	7,660 (34.1)	8,395 (37.3)	9,690 (43.1)	11,870 (52.8)
	4-1/2 (114)	7,445 (33.1)	8,155 (36.3)	8,190 (36.4)	8,190 (36.4)	16,035 (71.3)	17,570 (78.2)	20,285 (90.2)	24,845 (110.5)
	6 (152)	8,190 (36.4)	8,190 (36.4)	8,190 (36.4)	8,190 (36.4)	24,690 (109.8)	27,045 (120.3)	31,230 (138.9)	38,250 (170.1)
5/8	3-3/4 (95)	5,665 (25.2)	6,205 (27.6)	7,165 (31.9)	8,775 (39.0)	12,200 (54.3)	13,365 (59.5)	15,430 (68.6)	18,900 (84.1)
	5-5/8 (143)	10,405 (46.3)	11,400 (50.7)	13,165 (58.6)	14,950 (66.5)	22,415 (99.7)	24,550 (109.2)	28,350 (126.1)	34,720 (154.4)
	7-1/2 (191)	14,950 (66.5)	14,950 (66.5)	14,950 (66.5)	14,950 (66.5)	34,505 (153.5)	37,800 (168.1)	43,650 (194.2)	53,455 (237.8)
3/4	4 (102)	6,240 (27.8)	6,835 (30.4)	7,895 (35.1)	9,665 (43.0)	13,440 (59.8)	14,725 (65.5)	17,000 (75.6)	20,820 (92.6)
	6-3/4 (171)	13,680 (60.9)	14,985 (66.7)	17,305 (77.0)	19,890 (88.5)	29,460 (131.0)	32,275 (143.6)	37,265 (165.8)	45,645 (203.0)
	8-1/2 (216)	19,330 (86.0)	19,890 (88.5)	19,890 (88.5)	19,890 (88.5)	41,635 (185.2)	45,605 (202.9)	52,660 (234.2)	64,500 (286.9)

Table 4 - HIT-HY 200 design strength with concrete/pullout failure for HIT-Z(-R) rods in cracked concrete [1,2,3,4,5,6,7,8,9,10]

Nominal anchor diameter in.	Effective embed. in. (mm)	Tension — ΦN_n or N_r				Shear — ΦV_n or V_r			
		f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)	f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)
3/8	2-3/8 (60)	2,020 (9.0)	2,215 (9.9)	2,560 (11.4)	3,135 (13.9)	2,180 (9.7)	2,385 (10.6)	2,755 (12.3)	3,375 (15.0)
	3-3/8 (86)	3,425 (15.2)	3,755 (16.7)	4,335 (19.3)	5,305 (23.6)	7,380 (32.8)	8,085 (36.0)	9,335 (41.5)	11,430 (50.8)
	4-1/2 (114)	5,275 (23.5)	5,560 (24.7)	5,560 (24.7)	5,560 (24.7)	11,360 (50.5)	12,445 (55.4)	14,370 (63.9)	17,600 (78.3)
1/2	2-3/4 (70)	2,520 (11.2)	2,760 (12.3)	3,185 (14.2)	3,905 (17.4)	5,425 (24.1)	5,945 (26.4)	6,865 (30.5)	8,405 (37.4)
	4-1/2 (114)	5,275 (23.5)	5,780 (25.7)	6,670 (29.7)	7,640 (34.0)	11,360 (50.5)	12,445 (55.4)	14,370 (63.9)	17,600 (78.3)
	6 (152)	7,640 (34.0)	7,640 (34.0)	7,640 (34.0)	7,640 (34.0)	17,490 (77.8)	19,160 (85.2)	22,120 (98.4)	27,095 (120.5)
5/8	3-3/4 (95)	4,010 (17.8)	4,395 (19.5)	5,075 (22.6)	6,215 (27.6)	8,640 (38.4)	9,465 (42.1)	10,930 (48.6)	13,390 (59.6)
	5-5/8 (143)	7,370 (32.8)	8,075 (35.9)	9,325 (41.5)	11,420 (50.8)	15,875 (70.6)	17,390 (77.4)	20,080 (89.3)	24,595 (109.4)
	7-1/2 (191)	11,350 (50.5)	12,430 (55.3)	14,355 (63.9)	14,950 (66.5)	24,440 (108.7)	26,775 (119.1)	30,915 (137.5)	37,865 (168.4)
3/4	4 (102)	4,420 (19.7)	4,840 (21.5)	5,590 (24.9)	6,845 (30.4)	9,520 (42.3)	10,430 (46.4)	12,040 (53.6)	14,750 (65.6)
	6-3/4 (171)	9,690 (43.1)	10,615 (47.2)	12,255 (54.5)	15,010 (66.8)	20,870 (92.8)	22,860 (101.7)	26,395 (117.4)	32,330 (143.8)
	8-1/2 (216)	13,690 (60.9)	15,000 (66.7)	17,320 (77.0)	19,535 (86.9)	29,490 (131.2)	32,305 (143.7)	37,300 (165.9)	45,685 (203.2)

1 See section 3.1.7 for explanation on development of load values.
2 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Apply spacing, edge distance, and concrete thickness factors in tables 10 - 17 as necessary. Compare to the steel values in table 5. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 104° F (40° C), max. long term temperature = 75° F (24° C).
For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 122° F (50° C) multiply above value by 0.86.
For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above value by 0.70.
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 and water saturated concrete conditions.
7 Tabular values are for short-term loads only. For sustained loads, see section 3.1.7.5.
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 static loads only. For seismic loads, multiply cracked concrete tabular values by the following reduction factors:
3/8-in diameter - α_{seis} = 0.705
1/2-in to 3/4-in diameter - α_{seis} = 0.75
See Section 3.1.7.4 for additional information on seismic applications.
10 Diamond core drilling with Hilti HIT-Z(-R) rods is permitted with no reduction in published data above.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 5 - Steel design strength for Hilti HIT-Z and HIT-Z-R rods [1,2]

Nominal anchor diameter in.	ACI 318 Appendix D Based Design					
	HIT-Z carbon steel rod			HIT-Z-R stainless steel rod		
	Tensile[3] ϕN_{sa} lb (kN)	Shear[4] ϕV_{sa} lb (kN)	$\alpha_{seis,V}$ [5]	Tensile[3] ϕN_{sa} lb (kN)	Shear[4] ϕV_{sa} lb (kN)	$\alpha_{seis,V}$ [5]
3/8	4,750 (21.1)	1,930 (8.6)	1.0	4,750 (21.1)	2,630 (11.7)	1.0
1/2	8,695 (38.7)	3,530 (15.7)	0.65	8,695 (38.7)	4,815 (21.4)	0.75
5/8	13,850 (61.6)	5,625 (25.0)	0.65	13,850 (61.6)	7,670 (34.1)	0.65
3/4	20,455 (91.0)	8,310 (37.0)	0.65	20,455 (91.0)	11,330 (50.4)	0.65

1 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.
2 HIT-Z and HIT-Z-R rods are to be considered brittle steel elements.
3 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318 Appendix D.
4 Shear values determined by static shear tests with $\phi V_{sa} \leq \phi\ 0.60\ A_{se,V} f_{uta}$ as noted in ACI 318 Appendix D.
5 Reduction factor for seismic shear only. See section 3.1.7.4 for additional information on seismic applications.

Hilti HIT-Z(-R) rod permissible combinations of edge distance, snchor spacing, and concrete thickness

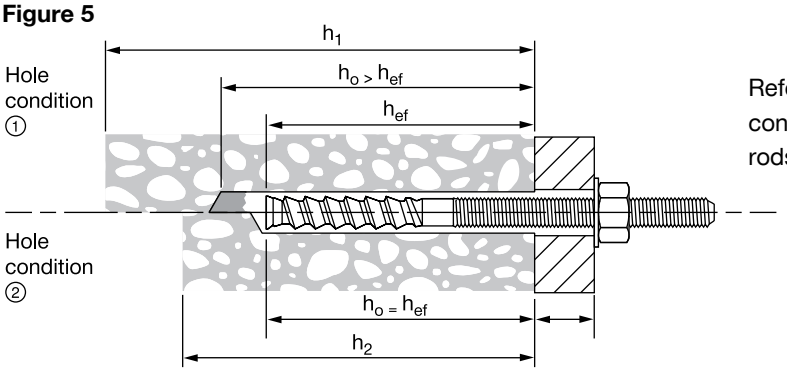
The Hilti HIT-Z and HIT-Z-R Rods produce higher expansion forces in the concrete slab when the installation torque is applied. This means that the anchor must be installed with larger edge distances and spacing when compared to standard threaded rod, to minimize the likelihood that the concrete slab will split during installation.

The permissible edge distance is based on the concrete condition (cracked or uncracked), the concrete thickness, and anchor spacing if designing for anchor groups. The permissible concrete thickness is dependent on whether or not the drill dust is removed during the anchor installation process.

Step 1: Check concrete thickness

When using Hilti HIT-Z and HIT-Z-R rods, drilling dust does not need to be removed for optimum capacity when base material temperatures are greater than 41° F (5° C) and a hammer drill with a carbide tipped drill bit is used. However, concrete thickness can be reduced if the drilling dust is removed. The figure below shows both drilled hole conditions. Drilled hole condition 1 illustrates the hole depth and concrete thickness when drilling dust is left in the hole. Drilled hole condition 2 illustrates the corresponding reduction when drill dust is removed by using compressed air, Hilti TE-CD or TE-YD Hollow Drill Bits with a Hilti vacuum.

Figure 5



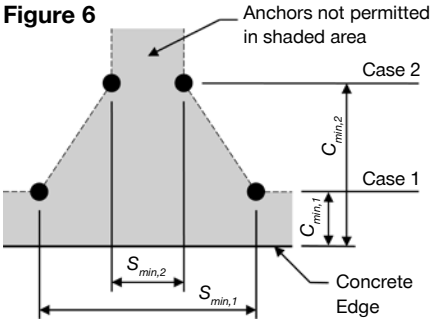
Refer to tables 6 to 9 in this section for the minimum concrete thicknesses associated with the Hilti HIT-Z(-R) rods based on diameter and drilled hole condition.

Step 2: Check edge distance and anchor spacing

Tables 6 to 9 in this section show the minimum edge distance and anchor spacing based on a specific concrete thickness and whether or not the design is for cracked or uncracked concrete. There are two cases of edge distance and anchor spacing combinations for each embedment and concrete condition (cracked or uncracked). **Case 1** is the minimum edge distance needed for one anchor or for two anchors with large anchor spacing. **Case 2** is the minimum anchor spacing that can be used, but the edge distance is increased to help prevent splitting. Linear interpolation can be used between **Case 1** and **Case 2** for any specific concrete thickness and concrete condition. See the following figure and calculation which can be used to determine specific edge distance and anchor spacing combinations.

HIT-HY 200 Adhesive Anchoring System 3.2.3

Figure 6



For a specific edge distance, the permitted spacing is calculated as follows:

$$s \geq s_{min,2} + \frac{(s_{min,1} - s_{min,2})}{(c_{min,1} - c_{min,2})}(c - c_{min,2})$$

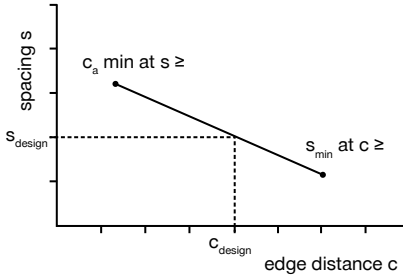


Table 6 - Minimum edge distance, spacing, and concrete thickness for 3/8-in. diameter Hilti HIT-Z and HIT-Z-R rods[1]

Nominal anchor diameter		d	in.	3/8								
Effective embedment		h_{ef}	in. (mm)	2-3/8 (60)			3-3/8 (86)			4-1/2 (114)		
Drilled hole condition		-	-	2 [2]	1 or 2		2 [2]	1 or 2		2 [2]	1 or 2	
Minimum concrete thickness		h	in. (mm)	4 (102)	4-5/8 (117)	5-3/4 (146)	4-5/8 (117)	5-5/8 (143)	6-3/8 (162)	5-3/4 (146)	6-3/4 (171)	7-3/8 (187)
Uncracked concrete	Minimum edge and spacing **Case 1**	$c_{min,1}$	in. (mm)	3-1/8 (79)	2-3/4 (70)	2-1/4 (57)	2-3/4 (70)	2-1/4 (57)	2 (51)	2-1/4 (57)	1-7/8 (48)	1-7/8 (48)
		$s_{min,1}$	in. (mm)	9-1/8 (232)	7-3/4 (197)	6-1/8 (156)	7-3/4 (197)	6-1/2 (165)	5-5/8 (143)	6-1/8 (156)	5-3/8 (137)	4-1/2 (114)
	Minimum edge and spacing **Case 2**	$c_{min,2}$	in. (mm)	5-5/8 (143)	4-3/4 (121)	3-3/4 (95)	4-3/4 (121)	3-7/8 (98)	3-1/4 (83)	3-3/4 (95)	3-1/8 (79)	2-3/4 (70)
		$s_{min,2}$	in. (mm)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)
Cracked concrete	Minimum edge and spacing **Case 1**	$c_{min,1}$	in. (mm)	2-1/8 (54)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)
		$s_{min,1}$	in. (mm)	6-3/8 (162)	5-1/2 (140)	4-1/4 (108)	5-1/2 (140)	3-1/2 (89)	2-5/8 (67)	3-1/4 (83)	2 (51)	1-7/8 (48)
	Minimum edge and spacing **Case 2**	$c_{min,2}$	in. (mm)	3-5/8 (92)	3-1/8 (79)	2-3/8 (60)	3-1/8 (79)	2-1/2 (64)	2-1/8 (54)	2-3/8 (60)	2 (51)	1-7/8 (48)
		$s_{min,2}$	in. (mm)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)	1-7/8 (48)

Table 7 - Minimum edge distance, spacing, and concrete thickness for 1/2-in. diameter Hilti HIT-Z and HIT-Z-R rods[1]

Nominal anchor diameter		d	in.	1/2								
Effective embedment		h_{ef}	in. (mm)	2-3/4 (70)			4-1/2 (114)			6 (152)		
Drilled hole condition		-	-	2 [2]	1 or 2		2 [2]	1 or 2		2 [2]	1 or 2	
Minimum concrete thickness		h	in. (mm)	4 (102)	5 (127)	7-1/8 (181)	5-3/4 (146)	6-3/4 (171)	8-1/4 (210)	7-1/4 (184)	8-1/4 (210)	9-3/4 (248)
Uncracked Concrete	Minimum edge and spacing **Case 1**	$c_{min,1}$	in. (mm)	5-1/8 (130)	4-1/8 (105)	2-7/8 (73)	3-5/8 (92)	3 (76)	2-1/2 (64)	2-7/8 (73)	2-1/2 (64)	2-1/2 (64)
		$s_{min,1}$	in. (mm)	14-7/8 (378)	11-7/8 (302)	8-5/8 (219)	10-1/4 (260)	9 (229)	7-1/4 (184)	8-1/8 (206)	7-1/4 (184)	5 (127)
	Minimum edge and spacing **Case 2**	$c_{min,2}$	in. (mm)	9-1/4 (235)	7-1/4 (184)	4-7/8 (124)	6-1/4 (159)	5-1/4 (133)	4-1/8 (105)	4-3/4 (121)	4-1/8 (105)	3-3/8 (86)
		$s_{min,2}$	in. (mm)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)
Cracked Concrete	Minimum edge and spacing **Case 1**	$c_{min,1}$	in. (mm)	3-5/8 (92)	3 (76)	2-1/2 (64)	2-5/8 (67)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)
		$s_{min,1}$	in. (mm)	10-7/8 (276)	8-1/2 (216)	6 (152)	7-3/8 (187)	5-1/2 (140)	3-1/8 (79)	4-1/2 (114)	3-1/8 (79)	2-1/2 (64)
	Minimum edge and spacing **Case 2**	$c_{min,2}$	in. (mm)	6-1/2 (165)	5 (127)	3-1/4 (83)	4-1/4 (108)	3-1/2 (89)	2-3/4 (70)	3-1/4 (83)	2-3/4 (70)	2-1/2 (64)
		$s_{min,2}$	in. (mm)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)	2-1/2 (64)

1 Linear interpolation is permitted to establish an edge distance and spacing combination between Case 1 and Case 2
Linear interpoloation for a specific edge distance c, where $c_{min,1} < c < c_{min,2}$, will determine the permissible spacing s as follows:

$$s \geq s_{min,2} + \frac{(s_{min,1} - s_{min,2})}{(c_{min,1} - c_{min,2})}(c - c_{min,2})$$

2 For shaded cells, drilling dust must be removed from drilled hole to justify minimum concrete thickness.

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Table 8 - Minimum edge distance, spacing, and concrete thickness for 5/8-in. diameter Hilti HIT-Z and HIT-Z-R rods[1]

Nominal anchor diameter		d	in.	5/8								
Effective embedment		h_{ef}	in. (mm)	3-3/4 (95)			5-5/8 (143)			7-1/2 (191)		
Drilled hole condition		-	-	2 [2]	1 or 2		2 [2]	1 or 2		2 [2]	1 or 2	
Minimum concrete thickness		h	in. (mm)	5-1/2 (140)	7-3/4 (197)	9-3/8 (238)	7-3/8 (187)	9-5/8 (244)	10-1/2 (267)	9-1/4 (235)	11-1/2 (292)	12-1/4 (311)
Uncracked concrete	Minimum edge and spacing **Case 1**	$c_{min,1}$	in. (mm)	6-1/4 (159)	4-1/2 (114)	3-3/4 (95)	4-5/8 (117)	3-5/8 (92)	3-1/4 (83)	3-3/4 (95)	3-1/8 (79)	3-1/8 (79)
		$s_{min,1}$	in. (mm)	18-3/8 (467)	12-7/8 (327)	10-5/8 (270)	13-7/8 (352)	10-3/8 (264)	9-3/4 (248)	10-7/8 (276)	8-3/8 (213)	7-3/8 (187)
	Minimum edge and spacing **Case 2**	$c_{min,2}$	in. (mm)	11-3/8 (289)	7-3/4 (197)	6-1/4 (159)	8-1/4 (210)	6-1/8 (156)	5-1/2 (140)	6-3/8 (162)	4-7/8 (124)	4-5/8 (117)
		$s_{min,2}$	in. (mm)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)
Cracked concrete	Minimum edge and spacing **Case 1**	$c_{min,1}$	in. (mm)	4-5/8 (117)	3-3/8 (86)	3-1/8 (79)	3-1/2 (89)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)
		$s_{min,1}$	in. (mm)	13-7/8 (352)	9-1/2 (241)	8-3/4 (222)	10-1/8 (257)	6-1/2 (165)	5-3/8 (137)	7-1/8 (181)	3-7/8 (98)	3-1/8 (79)
	Minimum edge and spacing **Case 2**	$c_{min,2}$	in. (mm)	8-1/4 (210)	5-1/2 (140)	4-3/8 (111)	5-7/8 (149)	4-1/4 (108)	3-7/8 (98)	4-1/2 (114)	3-3/8 (86)	3-1/8 (79)
		$s_{min,2}$	in. (mm)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)

Table 9 - Minimum edge distance, spacing, and concrete thickness for 3/4-in. diameter Hilti HIT-Z and HIT-Z-R rods[1]

Nominal anchor diameter		d	in.	3/4								
Effective embedment		h_{ef}	in. (mm)	4 (102)			6-3/4 (171)			8-1/2 (216)		
Drilled hole condition		-	-	2 [2]	1 or 2		2 [2]	1 or 2		2 [2]	1 or 2	
Minimum concrete thickness		h	in. (mm)	5-3/4 (146)	8 (203)	11-1/2 (292)	8-1/2 (216)	10-3/4 (273)	13-1/8 (333)	10-1/4 (260)	12-1/2 (318)	14-1/2 (368)
Uncracked concrete	Minimum edge and spacing **Case 1**	$c_{min,1}$	in. (mm)	9-3/4 (248)	7 (178)	5 (127)	6-5/8 (168)	5-1/4 (133)	4-1/4 (108)	5-1/2 (140)	4-1/2 (114)	4 (102)
		$s_{min,1}$	in. (mm)	28-3/4 (730)	20-5/8 (524)	14 (356)	19-3/8 (492)	15-1/4 (387)	12-5/8 (321)	16 (406)	13-1/4 (337)	11 (279)
	Minimum edge and spacing **Case 2**	$c_{min,2}$	in. (mm)	18-1/8 (460)	12-5/8 (321)	8-1/2 (216)	11-7/8 (302)	9-1/8 (232)	7-1/4 (184)	9-5/8 (244)	7-3/4 (197)	6-1/2 (165)
		$s_{min,2}$	in. (mm)	3-3/4 (95)	3-3/4 (95)	3-3/4 (95)	3-3/4 (95)	3-3/4 (95)	3-3/4 (95)	3-3/4 (95)	3-3/4 (95)	3-3/4 (95)
Cracked concrete	Minimum edge and spacing **Case 1**	$c_{min,1}$	in. (mm)	7-1/4 (184)	5-1/4 (133)	4-1/8 (105)	5 (127)	4 (102)	3-3/4 (95)	4-1/8 (105)	3-3/4 (95)	3-3/4 (95)
		$s_{min,1}$	in. (mm)	21-3/4 (552)	15-1/2 (394)	12-1/4 (311)	14-1/2 (368)	11-3/8 (289)	9 (229)	12-1/8 (308)	8-3/4 (222)	6-1/2 (165)
	Minimum edge and spacing **Case 2**	$c_{min,2}$	in. (mm)	13-1/4 (337)	9-1/4 (235)	6 (152)	8-5/8 (219)	6-5/8 (168)	5-1/8 (130)	7 (178)	5-1/2 (140)	4-1/2 (114)
		$s_{min,2}$	in. (mm)	3-3/4 (95)	3-3/4 (95)	3-3/4 (95)	3-3/4 (95)	3-3/4 (95)	3-3/4 (95)	3-3/4 (95)	3-3/4 (95)	3-3/4 (95)

1 Linear interpolation is permitted to establish an edge distance and spacing combination between Case 1 and Case 2
Linear interpoloation for a specific edge distance c, where $c_{min,1} < c < c_{min,2}$, will determine the permissible spacing s as follows:

$$s \geq s_{min,2} + \frac{(s_{min,1} - s_{min,2})}{(c_{min,1} - c_{min,2})}(c - c_{min,2})$$

2 For shaded cells, drilling dust must be removed from drilled hole to justify minimum concrete thickness.

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Table 10 - Load adjustment factors for 3/8-in. diameter HIT-Z and HIT-Z-R rods in uncracked concrete [1,2]

3/8-in. HIT-Z(-R) uncracked concrete	Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Embedment h_{ef} in. (mm)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																		
1-7/8 (48)	0.63	0.59	0.57	n/a	n/a	0.21	0.57	0.53	0.52	n/a	n/a	0.05	n/a	n/a	0.10	n/a	n/a	n/a
2 (51)	0.64	0.60	0.57	n/a	0.25	0.21	0.57	0.53	0.52	n/a	0.09	0.06	n/a	0.17	0.11	n/a	n/a	n/a
2-1/4 (57)	0.66	0.61	0.58	0.38	0.26	0.22	0.58	0.54	0.53	0.33	0.10	0.07	0.38	0.21	0.13	n/a	n/a	n/a
3 (76)	0.71	0.65	0.61	0.46	0.30	0.25	0.61	0.55	0.54	0.51	0.16	0.10	0.51	0.32	0.21	n/a	n/a	n/a
4 (102)	0.78	0.70	0.65	0.59	0.36	0.29	0.64	0.57	0.55	0.79	0.24	0.16	0.79	0.44	0.29	0.76	n/a	n/a
4-5/8 (117)	0.82	0.73	0.67	0.69	0.40	0.31	0.66	0.58	0.56	0.98	0.30	0.20	0.98	0.49	0.31	0.81	0.55	n/a
5 (127)	0.85	0.75	0.69	0.74	0.43	0.33	0.68	0.58	0.56	1.00	0.34	0.22	1.00	0.52	0.33	0.84	0.57	n/a
5-3/4 (146)	0.90	0.78	0.71	0.86	0.49	0.36	0.70	0.59	0.57	1.00	0.42	0.27	1.00	0.59	0.36	0.91	0.61	0.53
6 (152)	0.92	0.80	0.72	0.89	0.51	0.38	0.71	0.60	0.57	1.00	0.45	0.29	1.00	0.62	0.38	0.92	0.63	0.54
7 (178)	0.99	0.85	0.76	1.00	0.60	0.43	0.75	0.61	0.59		0.57	0.37		0.72	0.43	1.00	0.68	0.58
8 (203)	1.00	0.90	0.80		0.69	0.49	0.79	0.63	0.60		0.69	0.45		0.83	0.49	1.00	0.72	0.63
9 (229)	1.00	0.94	0.83		0.77	0.55	0.82	0.65	0.61		0.83	0.54		0.93	0.55		0.77	0.66
10 (254)	1.00	0.99	0.87		0.86	0.61	0.86	0.66	0.62		0.97	0.63		1.00	0.63		0.81	0.70
11 (279)		1.00	0.91		0.94	0.67	0.89	0.68	0.63		1.00	0.72			0.72		0.85	0.73
12 (305)			0.94		1.00	0.73	0.93	0.70	0.65			0.83			0.83		0.88	0.77
14 (356)			1.00			0.85	1.00	0.73	0.67			1.00			1.00		0.96	0.83
16 (406)						0.98		0.76	0.70								1.00	0.88
18 (457)						1.00		0.79	0.72									0.94
24 (610)								0.89	0.79									1.00
30 (762)								0.99	0.87									
36 (914)								1.00	0.94									
> 48 (1219)									1.00									

Table 11 - Load adjustment factors for 3/8-in. diameter HIT-Z and HIT-Z-R rods in cracked concrete [1,2]

3/8-in. HIT-Z(-R) cracked concrete	Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Embedment h_{ef} in. (mm)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																		
1-7/8 (48)	0.63	0.59	0.57	n/a	0.56	0.50	0.57	0.53	0.52	n/a	0.08	0.05	n/a	0.16	0.10	n/a	n/a	n/a
2 (51)	0.64	0.60	0.57	n/a	0.57	0.51	0.57	0.53	0.52	n/a	0.09	0.06	n/a	0.17	0.11	n/a	n/a	n/a
2-1/4 (57)	0.66	0.61	0.58	0.73	0.60	0.53	0.58	0.54	0.53	0.34	0.10	0.07	0.67	0.21	0.14	n/a	n/a	n/a
3 (76)	0.71	0.65	0.61	0.88	0.70	0.60	0.61	0.55	0.54	0.52	0.16	0.10	0.88	0.32	0.21	n/a	n/a	n/a
4 (102)	0.78	0.70	0.65	1.00	0.84	0.70	0.64	0.57	0.55	0.80	0.25	0.16	1.00	0.49	0.32	0.76	n/a	n/a
4-5/8 (117)	0.82	0.73	0.67		0.93	0.76	0.67	0.58	0.56	0.99	0.31	0.20		0.61	0.40	0.81	0.55	n/a
5 (127)	0.85	0.75	0.69		0.99	0.80	0.68	0.58	0.56	1.00	0.34	0.22		0.69	0.45	0.85	0.57	n/a
5-3/4 (146)	0.90	0.78	0.71		1.00	0.88	0.71	0.59	0.57		0.42	0.28		0.85	0.55	0.91	0.61	0.53
6 (152)	0.92	0.80	0.72			0.91	0.71	0.60	0.57		0.45	0.29		0.91	0.59	0.93	0.63	0.54
7 (178)	0.99	0.85	0.76			1.00	0.75	0.61	0.59		0.57	0.37		1.00	0.74	1.00	0.68	0.59
8 (203)	1.00	0.90	0.80				0.79	0.63	0.60		0.70	0.45			0.91		0.72	0.63
9 (229)		0.94	0.83				0.82	0.65	0.61		0.83	0.54			1.00		0.77	0.67
10 (254)		0.99	0.87				0.86	0.66	0.62		0.97	0.63					0.81	0.70
11 (279)		1.00	0.91				0.89	0.68	0.64		1.00	0.73					0.85	0.74
12 (305)			0.94				0.93	0.70	0.65			0.83					0.89	0.77
14 (356)			1.00				1.00	0.73	0.67			1.00					0.96	0.83
16 (406)								0.76	0.70								1.00	0.89
18 (457)								0.79	0.72									0.94
24 (610)								0.89	0.79									1.00
30 (762)								0.99	0.87									
36 (914)								1.00	0.94									
> 48 (1219)									1.00									

1 Linear interpolation not permitted.
2 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
3 Spacing reduction factor in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{hV} = 1.0.

If a reduction factor value is in a shaded area, this indicates that this specific edge distance may not be permitted with a certain spacing (or vice versa). Check with figure 6 and table 6 of this section to calculate permissible edge distance, spacing and concrete thickness combinations.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 12 - Load adjustment factors for 1/2-in. diameter HIT-Z and HIT-Z-R rods in uncracked concrete [1,2]

1/2-in. HIT-Z(-R) uncracked concrete	Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear ⊥ Toward edge f_{RV}			Edge distance in shear ‖ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Embedment h_{ef} in. (mm)	2-3/4 (70)	4-1/2 (114)	6 (152)	2-3/4 (70)	4-1/2 (114)	6 (152)	2-3/4 (70)	4-1/2 (114)	6 (152)	2-3/4 (70)	4-1/2 (114)	6 (152)	2-3/4 (70)	4-1/2 (114)	6 (152)	2-3/4 (70)	4-1/2 (114)	6 (152)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																		
2-1/2 (64)	0.65	0.59	0.57	n/a	0.23	0.20	0.55	0.53	0.53	n/a	0.09	0.06	n/a	0.18	0.12	n/a	n/a	n/a
2-7/8 (73)	0.67	0.61	0.58	0.35	0.24	0.21	0.56	0.54	0.53	0.22	0.11	0.07	0.35	0.22	0.15	n/a	n/a	n/a
3 (76)	0.68	0.61	0.58	0.36	0.25	0.21	0.56	0.54	0.53	0.23	0.12	0.08	0.36	0.24	0.15	n/a	n/a	n/a
3-1/2 (89)	0.71	0.63	0.60	0.40	0.27	0.22	0.57	0.55	0.54	0.29	0.15	0.10	0.40	0.30	0.19	n/a	n/a	n/a
4 (102)	0.74	0.65	0.61	0.44	0.29	0.24	0.58	0.55	0.54	0.36	0.18	0.12	0.44	0.33	0.24	0.58	n/a	n/a
4-1/2 (114)	0.77	0.67	0.63	0.50	0.31	0.25	0.59	0.56	0.55	0.42	0.22	0.14	0.50	0.35	0.25	0.61	n/a	n/a
5 (127)	0.80	0.69	0.64	0.55	0.33	0.27	0.60	0.57	0.55	0.50	0.26	0.17	0.55	0.38	0.27	0.65	n/a	n/a
5-1/2 (140)	0.83	0.70	0.65	0.61	0.35	0.28	0.62	0.57	0.56	0.57	0.30	0.19	0.61	0.40	0.28	0.68	n/a	n/a
6 (152)	0.86	0.72	0.67	0.66	0.38	0.30	0.63	0.58	0.56	0.65	0.34	0.22	0.66	0.43	0.30	0.71	0.57	n/a
7 (178)	0.92	0.76	0.69	0.77	0.43	0.33	0.65	0.59	0.57	0.82	0.42	0.28	0.82	0.49	0.33	0.77	0.61	n/a
7-1/4 (184)	0.94	0.77	0.70	0.80	0.44	0.34	0.65	0.60	0.57	0.87	0.45	0.29	0.87	0.50	0.34	0.78	0.62	0.54
8 (203)	0.98	0.80	0.72	0.88	0.49	0.36	0.67	0.61	0.58	1.00	0.52	0.34	1.00	0.56	0.36	0.82	0.66	0.57
9 (229)	1.00	0.83	0.75	0.99	0.55	0.40	0.69	0.62	0.59	1.00	0.62	0.40	1.00	0.63	0.40	0.87	0.70	0.60
10 (254)	1.00	0.87	0.78	1.00	0.61	0.44	0.71	0.63	0.60	1.00	0.72	0.47	1.00	0.72	0.47	0.92	0.73	0.64
11 (279)	1.00	0.91	0.81		0.67	0.48	0.73	0.65	0.61		0.84	0.54		0.84	0.54	0.96	0.77	0.67
12 (305)	1.00	0.94	0.83		0.73	0.53	0.75	0.66	0.62		0.95	0.62		0.95	0.62	1.00	0.80	0.70
14 (356)	1.00	1.00	0.89		0.85	0.62	0.79	0.69	0.64		1.00	0.78		1.00	0.78		0.87	0.75
16 (406)	1.00		0.94		0.98	0.70	0.83	0.72	0.66			0.95			0.95		0.93	0.80
18 (457)			1.00		1.00	0.79	0.88	0.74	0.68			1.00			1.00		0.98	0.85
24 (610)						1.00	1.00	0.82	0.74								1.00	0.98
30 (762)								0.90	0.80									1.00
36 (914)								0.98	0.86									
> 48 (1219)								1.00	0.98									

Table 13 - Load adjustment factors for 1/2-in. diameter HIT-Z and HIT-Z-R rods in Cracked Concrete [1,2]

1/2-in. HIT-Z(-R) cracked concrete	Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear ⊥ Toward edge f_{RV}			Edge distance in shear ‖ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Embedment h_{ef} in. (mm)	2-3/4 (70)	4-1/2 (114)	6 (152)	2-3/4 (70)	4-1/2 (114)	6 (152)	2-3/4 (70)	4-1/2 (114)	6 (152)	2-3/4 (70)	4-1/2 (114)	6 (152)	2-3/4 (70)	4-1/2 (114)	6 (152)	2-3/4 (70)	4-1/2 (114)	6 (152)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																		
2-1/2 (64)	0.65	0.59	0.57	0.71	0.56	0.50	0.55	0.53	0.53	0.18	0.09	0.06	0.35	0.18	0.12	n/a	n/a	n/a
2-7/8 (73)	0.67	0.61	0.58	0.77	0.59	0.53	0.56	0.54	0.53	0.22	0.11	0.07	0.44	0.23	0.15	n/a	n/a	n/a
3 (76)	0.68	0.61	0.58	0.79	0.60	0.53	0.56	0.54	0.53	0.23	0.12	0.08	0.47	0.24	0.16	n/a	n/a	n/a
3-1/2 (89)	0.71	0.63	0.60	0.88	0.65	0.57	0.57	0.55	0.54	0.29	0.15	0.10	0.59	0.30	0.20	n/a	n/a	n/a
4 (102)	0.74	0.65	0.61	0.98	0.70	0.60	0.58	0.55	0.54	0.36	0.18	0.12	0.72	0.37	0.24	0.58	n/a	n/a
4-1/2 (114)	0.77	0.67	0.63	1.00	0.75	0.64	0.59	0.56	0.55	0.43	0.22	0.14	0.86	0.44	0.29	0.62	n/a	n/a
5 (127)	0.80	0.69	0.64	1.00	0.80	0.67	0.61	0.57	0.55	0.50	0.26	0.17	1.00	0.52	0.34	0.65	n/a	n/a
5-1/2 (140)	0.83	0.70	0.65	1.00	0.86	0.71	0.62	0.57	0.56	0.58	0.30	0.19	1.00	0.60	0.39	0.68	n/a	n/a
6 (152)	0.86	0.72	0.67	1.00	0.91	0.75	0.63	0.58	0.56	0.66	0.34	0.22	1.00	0.68	0.44	0.71	0.57	n/a
7 (178)	0.92	0.76	0.69	1.00	1.00	0.83	0.65	0.59	0.57	0.83	0.43	0.28	1.00	0.86	0.56	0.77	0.62	n/a
7-1/4 (184)	0.94	0.77	0.70			0.85	0.65	0.60	0.57	0.88	0.45	0.29		0.90	0.59	0.78	0.63	0.54
8 (203)	0.98	0.80	0.72			0.91	0.67	0.61	0.58	1.00	0.52	0.34		1.00	0.68	0.82	0.66	0.57
9 (229)	1.00	0.83	0.75			1.00	0.69	0.62	0.59		0.62	0.41			0.81	0.87	0.70	0.60
10 (254)	1.00	0.87	0.78				0.71	0.64	0.60		0.73	0.47			0.95	0.92	0.74	0.64
11 (279)	1.00	0.91	0.81				0.73	0.65	0.61		0.84	0.55			1.00	0.96	0.77	0.67
12 (305)		0.94	0.83				0.75	0.66	0.62		0.96	0.62				1.00	0.81	0.70
14 (356)		1.00	0.89				0.79	0.69	0.64		1.00	0.79					0.87	0.75
16 (406)			0.94				0.84	0.72	0.66			0.96					0.93	0.81
18 (457)			1.00				0.88	0.74	0.68			1.00					0.99	0.85
24 (610)							1.00	0.82	0.74								1.00	0.99
30 (762)								0.91	0.80									1.00
36 (914)								0.99	0.87									
> 48 (1219)								1.00	0.99									

1 Linear interpolation not permitted.
2 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
3 Spacing reduction factor in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{hV} = 1.0.

If a reduction factor value is in a shaded area, this indicates that this specific edge distance may not be permitted with a certain spacing (or vice versa). Check with figure 6 and table 7 of this section to calculate permissible edge distance, spacing and concrete thickness combinations.

HIT-HY 200 Adhesive Anchoring System 3.2.3

Table 14 - Load adjustment factors for 5/8-in. diameter HIT-Z and HIT-Z-R rods in uncracked concrete [1,2]

5/8-in. HIT-Z(-R) uncracked concrete	Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	3-3/4 (95)	5-5/8 (143)	7-1/2 (191)	3-3/4 (95)	5-5/8 (143)	7-1/2 (191)	3-3/4 (95)	5-5/8 (143)	7-1/2 (191)	3-3/4 (95)	5-5/8 (143)	7-1/2 (191)	3-3/4 (95)	5-5/8 (143)	7-1/2 (191)	3-3/4 (95)	5-5/8 (143)	7-1/2 (191)
3-1/8 (79)	0.64	0.59	0.57	n/a	n/a	0.20	0.55	0.54	0.53	n/a	n/a	0.07	n/a	n/a	0.13	n/a	n/a	n/a
3-1/4 (83)	0.64	0.60	0.57	n/a	0.24	0.20	0.55	0.54	0.53	n/a	0.11	0.07	n/a	0.21	0.14	n/a	n/a	n/a
3-3/4 (95)	0.67	0.61	0.58	0.34	0.25	0.21	0.56	0.54	0.53	0.23	0.13	0.09	0.34	0.27	0.17	n/a	n/a	n/a
4 (102)	0.68	0.62	0.59	0.36	0.26	0.22	0.57	0.55	0.53	0.25	0.15	0.10	0.36	0.29	0.19	n/a	n/a	n/a
5 (127)	0.72	0.65	0.61	0.42	0.29	0.24	0.58	0.56	0.54	0.36	0.21	0.13	0.42	0.38	0.24	n/a	n/a	n/a
5-1/2 (140)	0.74	0.66	0.62	0.45	0.31	0.25	0.59	0.56	0.55	0.41	0.24	0.15	0.45	0.40	0.25	0.61	n/a	n/a
6 (152)	0.77	0.68	0.63	0.49	0.33	0.26	0.60	0.57	0.55	0.47	0.27	0.18	0.49	0.42	0.26	0.63	n/a	n/a
7 (178)	0.81	0.71	0.66	0.57	0.36	0.29	0.62	0.58	0.56	0.59	0.34	0.22	0.59	0.47	0.29	0.68	n/a	n/a
7-3/8 (187)	0.83	0.72	0.66	0.60	0.38	0.30	0.62	0.59	0.56	0.64	0.37	0.24	0.64	0.49	0.30	0.70	0.58	n/a
8 (203)	0.86	0.74	0.68	0.65	0.40	0.31	0.63	0.59	0.57	0.72	0.41	0.27	0.72	0.52	0.31	0.73	0.61	n/a
9 (229)	0.90	0.77	0.70	0.73	0.45	0.34	0.65	0.60	0.58	0.86	0.50	0.32	0.86	0.58	0.34	0.78	0.65	n/a
9-1/4 (235)	0.91	0.77	0.71	0.76	0.46	0.35	0.65	0.61	0.58	0.89	0.52	0.34	0.89	0.59	0.35	0.79	0.65	0.57
10 (254)	0.94	0.80	0.72	0.82	0.50	0.37	0.67	0.62	0.59	1.00	0.58	0.38	1.00	0.64	0.38	0.82	0.68	0.59
11 (279)	0.99	0.83	0.74	0.90	0.55	0.39	0.68	0.63	0.60	1.00	0.67	0.43	1.00	0.70	0.43	0.86	0.71	0.62
12 (305)	1.00	0.86	0.77	0.98	0.60	0.43	0.70	0.64	0.60	1.00	0.76	0.50	1.00	0.77	0.50	0.90	0.75	0.65
14 (356)	1.00	0.91	0.81	1.00	0.70	0.50	0.73	0.66	0.62		0.96	0.62		0.96	0.62	0.97	0.81	0.70
16 (406)	1.00	0.97	0.86		0.80	0.57	0.77	0.69	0.64		1.00	0.76		1.00	0.76	1.00	0.86	0.75
18 (457)	1.00	1.00	0.90		0.89	0.64	0.80	0.71	0.66			0.91			0.91		0.91	0.79
24 (610)	1.00		1.00		1.00	0.86	0.90	0.78	0.71			1.00			1.00		1.00	0.91
30 (762)						1.00	1.00	0.85	0.76									1.00
36 (914)								0.92	0.81									
> 48 (1219)								1.00	0.92									

Table 15 - Load adjustment factors for 5/8-in. diameter HIT-Z and HIT-Z-R rods in cracked concrete [1,2]

5/8-in. HIT-Z(-R) cracked concrete	Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Embedment h_{ef} in. (mm) / Spacing (s) / Edge Distance (c_a) / Concrete thickness (h), - in. (mm)	3-3/4 (95)	5-5/8 (143)	7-1/2 (191)	3-3/4 (95)	5-5/8 (143)	7-1/2 (191)	3-3/4 (95)	5-5/8 (143)	7-1/2 (191)	3-3/4 (95)	5-5/8 (143)	7-1/2 (191)	3-3/4 (95)	5-5/8 (143)	7-1/2 (191)	3-3/4 (95)	5-5/8 (143)	7-1/2 (191)
3-1/8 (79)	0.64	0.59	0.57	0.67	0.56	0.50	0.55	0.54	0.53	0.18	0.10	0.07	0.35	0.20	0.13	n/a	n/a	n/a
3-1/4 (83)	0.64	0.60	0.57	0.69	0.56	0.51	0.55	0.54	0.53	0.19	0.11	0.07	0.38	0.22	0.14	n/a	n/a	n/a
3-3/4 (95)	0.67	0.61	0.58	0.75	0.60	0.53	0.56	0.54	0.53	0.23	0.13	0.09	0.47	0.27	0.17	n/a	n/a	n/a
4 (102)	0.68	0.62	0.59	0.78	0.62	0.55	0.57	0.55	0.53	0.26	0.15	0.10	0.51	0.30	0.19	n/a	n/a	n/a
5 (127)	0.72	0.65	0.61	0.91	0.70	0.60	0.58	0.56	0.54	0.36	0.21	0.13	0.72	0.41	0.27	n/a	n/a	n/a
5-1/2 (140)	0.74	0.66	0.62	0.98	0.74	0.63	0.59	0.56	0.55	0.41	0.24	0.15	0.83	0.48	0.31	0.61	n/a	n/a
6 (152)	0.77	0.68	0.63	1.00	0.78	0.66	0.60	0.57	0.55	0.47	0.27	0.18	0.94	0.54	0.35	0.64	n/a	n/a
7 (178)	0.81	0.71	0.66	1.00	0.87	0.72	0.62	0.58	0.56	0.59	0.34	0.22	1.00	0.68	0.44	0.69	n/a	n/a
7-3/8 (187)	0.83	0.72	0.66	1.00	0.90	0.74	0.62	0.59	0.56	0.64	0.37	0.24	1.00	0.74	0.48	0.70	0.59	n/a
8 (203)	0.86	0.74	0.68	1.00	0.96	0.78	0.63	0.59	0.57	0.73	0.42	0.27	1.00	0.84	0.54	0.73	0.61	n/a
9 (229)	0.90	0.77	0.70	1.00	1.00	0.85	0.65	0.60	0.58	0.87	0.50	0.32	1.00	1.00	0.65	0.78	0.65	n/a
9-1/4 (235)	0.91	0.77	0.71			0.86	0.66	0.61	0.58	0.90	0.52	0.34			0.68	0.79	0.66	0.57
10 (254)	0.94	0.80	0.72			0.91	0.67	0.62	0.59	1.00	0.58	0.38			0.76	0.82	0.68	0.59
11 (279)	0.99	0.83	0.74			0.98	0.69	0.63	0.60		0.67	0.44			0.88	0.86	0.72	0.62
12 (305)	1.00	0.86	0.77			1.00	0.70	0.64	0.60		0.77	0.50			1.00	0.90	0.75	0.65
14 (356)	1.00	0.91	0.81				0.74	0.66	0.62		0.97	0.63			1.00	0.97	0.81	0.70
16 (406)		0.97	0.86				0.77	0.69	0.64		1.00	0.77				1.00	0.86	0.75
18 (457)		1.00	0.90				0.80	0.71	0.66			0.92					0.92	0.79
24 (610)			1.00				0.90	0.78	0.71			1.00					1.00	0.92
30 (762)							1.00	0.85	0.76									1.00
36 (914)								0.92	0.81									
> 48 (1219)								1.00	0.92									

1 Linear interpolation not permitted.
2 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
3 Spacing reduction factor in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{hV} = 1.0.

If a reduction factor value is in a shaded area, this indicates that this specific edge distance may not be permitted with a certain spacing (or vice versa). Check with figure 6 and table 8 of this section to calculate permissible edge distance, spacing and concrete thickness combinations.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 16 - Load adjustment factors for 3/4-in. diameter HIT-Z and HIT-Z-R rods in uncracked concrete [1,2]

3/4-in. HIT-Z(-R) uncracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Embedment h_{ef}	in. (mm)	4 (102)	6-3/4 (171)	8-1/2 (216)	4 (102)	6-3/4 (171)	8-1/2 (216)	4 (102)	6-3/4 (171)	8-1/2 (216)	4 (102)	6-3/4 (171)	8-1/2 (216)	4 (102)	6-3/4 (171)	8-1/2 (216)	4 (102)	6-3/4 (171)	8-1/2 (216)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																			
3-3/4	(95)	0.66	0.59	0.57	n/a	n/a	n/a	0.56	0.54	0.53	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4	(102)	0.67	0.60	0.58	n/a	n/a	0.21	0.57	0.54	0.53	n/a	n/a	0.08	n/a	n/a	0.17	n/a	n/a	n/a
4-1/8	(105)	0.67	0.60	0.58	n/a	n/a	0.21	0.57	0.54	0.53	n/a	n/a	0.09	n/a	n/a	0.18	n/a	n/a	n/a
4-1/4	(108)	0.68	0.60	0.58	n/a	0.24	0.21	0.57	0.54	0.53	n/a	0.13	0.09	n/a	0.26	0.19	n/a	n/a	n/a
5	(127)	0.71	0.62	0.60	0.39	0.26	0.23	0.58	0.55	0.54	0.35	0.17	0.12	0.39	0.32	0.23	n/a	n/a	n/a
5-3/4	(146)	0.74	0.64	0.61	0.44	0.28	0.24	0.59	0.56	0.55	0.43	0.21	0.15	0.44	0.34	0.24	0.61	n/a	n/a
6	(152)	0.75	0.65	0.62	0.45	0.28	0.24	0.60	0.56	0.55	0.45	0.22	0.16	0.45	0.35	0.24	0.63	n/a	n/a
7	(178)	0.79	0.67	0.64	0.53	0.31	0.27	0.61	0.57	0.56	0.57	0.28	0.20	0.57	0.38	0.27	0.68	n/a	n/a
8	(203)	0.83	0.70	0.66	0.60	0.34	0.29	0.63	0.58	0.56	0.70	0.34	0.24	0.70	0.42	0.29	0.72	n/a	n/a
8-1/2	(216)	0.85	0.71	0.67	0.64	0.36	0.30	0.64	0.59	0.57	0.77	0.37	0.26	0.77	0.44	0.30	0.75	0.59	n/a
9	(229)	0.88	0.72	0.68	0.68	0.37	0.31	0.65	0.59	0.57	0.83	0.40	0.29	0.83	0.45	0.31	0.77	0.60	n/a
10	(254)	0.92	0.75	0.70	0.75	0.40	0.33	0.66	0.60	0.58	0.98	0.47	0.33	0.98	0.49	0.33	0.81	0.64	n/a
10-1/4	(260)	0.93	0.75	0.70	0.77	0.41	0.34	0.67	0.60	0.58	1.00	0.49	0.35	1.00	0.50	0.35	0.82	0.64	0.57
11	(279)	0.96	0.77	0.72	0.83	0.44	0.35	0.68	0.61	0.59	1.00	0.55	0.39	1.00	0.55	0.39	0.85	0.67	0.59
12	(305)	1.00	0.80	0.74	0.90	0.48	0.38	0.70	0.62	0.60	1.00	0.62	0.44	1.00	0.62	0.44	0.89	0.70	0.62
14	(356)	1.00	0.85	0.77	1.00	0.56	0.43	0.73	0.64	0.61	1.00	0.78	0.55	1.00	0.78	0.55	0.96	0.75	0.67
16	(406)	1.00	0.90	0.81	1.00	0.64	0.50	0.76	0.66	0.63	1.00	0.96	0.68	1.00	0.96	0.68	1.00	0.80	0.72
18	(457)	1.00	0.94	0.85	1.00	0.72	0.56	0.80	0.68	0.64	1.00	1.00	0.81	1.00	1.00	0.81		0.85	0.76
24	(610)	1.00	1.00	0.97	1.00	0.97	0.75	0.89	0.74	0.69	1.00		1.00	1.00		1.00		0.99	0.88
30	(762)	1.00		1.00		1.00	0.93	0.99	0.80	0.74								1.00	0.98
36	(914)						1.00	1.00	0.86	0.79									1.00
> 48	(1219)								0.99	0.89									

Table 17 - Load adjustment factors for 3/4-in. diameter HIT-Z and HIT-Z-R rods in cracked concrete [1,2]

3/4-in. HIT-Z(-R) cracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Embedment h_{ef}	in. (mm)	4 (102)	6-3/4 (171)	8-1/2 (216)	4 (102)	6-3/4 (171)	8-1/2 (216)	4 (102)	6-3/4 (171)	8-1/2 (216)	4 (102)	6-3/4 (171)	8-1/2 (216)	4 (102)	6-3/4 (171)	8-1/2 (216)	4 (102)	6-3/4 (171)	8-1/2 (216)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																			
3-3/4	(95)	0.66	0.59	0.57	n/a	0.56	0.51	0.56	0.54	0.53	n/a	0.11	0.08	n/a	0.22	0.16	n/a	n/a	n/a
4	(102)	0.67	0.60	0.58	n/a	0.57	0.52	0.57	0.54	0.53	n/a	0.12	0.09	n/a	0.24	0.17	n/a	n/a	n/a
4-1/8	(105)	0.67	0.60	0.58	0.76	0.58	0.53	0.57	0.54	0.53	0.26	0.13	0.09	0.52	0.25	0.18	n/a	n/a	n/a
4-1/4	(108)	0.68	0.60	0.58	0.78	0.59	0.53	0.57	0.54	0.53	0.27	0.13	0.09	0.55	0.26	0.19	n/a	n/a	n/a
5	(127)	0.71	0.62	0.60	0.87	0.63	0.57	0.58	0.55	0.54	0.35	0.17	0.12	0.70	0.34	0.24	n/a	n/a	n/a
5-3/4	(146)	0.74	0.64	0.61	0.97	0.68	0.61	0.59	0.56	0.55	0.43	0.21	0.15	0.86	0.42	0.29	0.62	n/a	n/a
6	(152)	0.75	0.65	0.62	1.00	0.70	0.62	0.60	0.56	0.55	0.46	0.22	0.16	0.92	0.44	0.31	0.63	n/a	n/a
7	(178)	0.79	0.67	0.64	1.00	0.77	0.67	0.62	0.57	0.56	0.58	0.28	0.20	1.00	0.56	0.40	0.68	n/a	n/a
8	(203)	0.83	0.70	0.66	1.00	0.84	0.72	0.63	0.58	0.56	0.70	0.34	0.24	1.00	0.68	0.48	0.73	n/a	n/a
8-1/2	(216)	0.85	0.71	0.67	1.00	0.88	0.75	0.64	0.59	0.57	0.77	0.37	0.26	1.00	0.75	0.53	0.75	0.59	n/a
9	(229)	0.88	0.72	0.68	1.00	0.91	0.78	0.65	0.59	0.57	0.84	0.41	0.29	1.00	0.82	0.58	0.77	0.61	n/a
10	(254)	0.92	0.75	0.70	1.00	0.99	0.83	0.67	0.60	0.58	0.99	0.48	0.34	1.00	0.95	0.68	0.81	0.64	n/a
10-1/4	(260)	0.93	0.75	0.70	1.00	1.00	0.85	0.67	0.60	0.58	1.00	0.50	0.35	1.00	0.99	0.70	0.82	0.65	0.58
11	(279)	0.96	0.77	0.72	1.00		0.89	0.68	0.61	0.59	1.00	0.55	0.39	1.00	1.00	0.78	0.85	0.67	0.60
12	(305)	1.00	0.80	0.74	1.00		0.95	0.70	0.62	0.60	1.00	0.63	0.44	1.00		0.89	0.89	0.70	0.62
14	(356)	1.00	0.85	0.77	1.00		1.00	0.73	0.64	0.61	1.00	0.79	0.56	1.00		1.00	0.96	0.76	0.67
16	(406)	1.00	0.90	0.81				0.76	0.66	0.63		0.97	0.68				1.00	0.81	0.72
18	(457)	1.00	0.94	0.85				0.80	0.68	0.65		1.00	0.82					0.86	0.76
24	(610)	1.00	1.00	0.97				0.90	0.74	0.69			1.00					0.99	0.88
30	(762)			1.00				1.00	0.81	0.74								1.00	0.98
36	(914)							1.00	0.87	0.79									1.00
>48	(1219)								0.99	0.89									

1 Linear interpolation not permitted.
2 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
3 Spacing reduction factor in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{hV} = 1.0.

If a reduction factor value is in a shaded area, this indicates that this specific edge distance may not be permitted with a certain spacing (or vice versa). Check with figure 6 and table 9 of this section to calculate permissible edge distance, spacing and concrete thickness combinations.

3.2.3.3.2 Hilti HIT-HY 200 Adhesive with deformed reinforcing bars (rebar)

Figure 7 - Rebar installation conditions

Permissible concrete conditions	Uncracked concrete	Dry concrete	Permissible drilling method	Hammer drilling with carbide tipped drill bit
	Cracked concrete	Water-saturated concrete		Hilti TE-CD or TE-YD Hollow Drill Bit

Figure 8 - Rebar installed with HIT-HY 200 adhesive

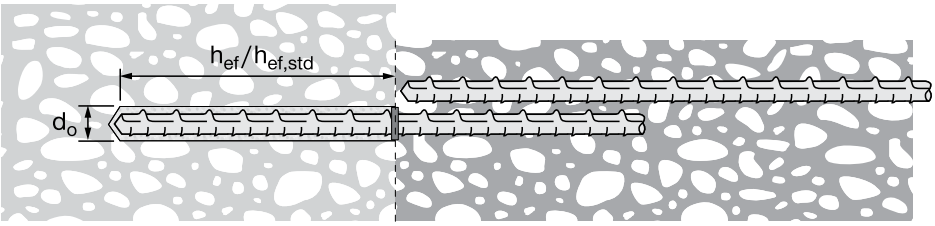

Table 18 - Rebar installed with HIT-HY 200 adhesive

Setting information		Symbol	Units	Rebar size							
				3	4	5	6	7	8	9	10
Nominal bit diameter		d_o	in.	1/2	5/8	3/4	7/8	1	1-1/8	1-3/8	1-1/2
Standard effective embedment		$h_{ef,std}$	in.	3-3/8	4-1/2	5-5/8	6-3/4	7-7/8	9	10-1/8	11-1/4
			(mm)	(86)	(114)	(143)	(171)	(200)	(229)	(257)	(286)
Effective embedment	minimum	$h_{ef,min}$	in.	2-3/8	2-3/4	3-1/8	3-1/2	3-1/2	4	4-1/2	5
			(mm)	(60)	(70)	(79)	(89)	(89)	(102)	(114)	(127)
	maximum	$h_{ef,max}$	in.	7-1/2	10	12-1/2	15	17-1/2	20	22-1/2	25
			(mm)	(191)	(254)	(318)	(381)	(445)	(508)	(572)	(635)
Minimum concrete member thickness		h_{min}	in.	h_{ef} + 1-1/4		h_{ef} + $2d_o$					
			(mm)	h_{ef} + 30							

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 19 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for rebar in uncracked concrete [1,2,3,4,5,6,7,8]

Rebar size	Effective embedment in. (mm)	Tension — ϕN_n or N_r				Shear — ϕV_n or V_r			
		f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)	f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)
#3	3-3/8 (86)	4,295 (19.1)	4,295 (19.1)	4,295 (19.1)	4,550 (20.2)	9,245 (41.1)	9,245 (41.1)	9,245 (41.1)	9,800 (43.6)
	4-1/2 (114)	5,725 (25.5)	5,725 (25.5)	5,725 (25.5)	6,065 (27.0)	12,330 (54.8)	12,330 (54.8)	12,330 (54.8)	13,070 (58.1)
	7-1/2 (191)	9,540 (42.4)	9,540 (42.4)	9,540 (42.4)	10,110 (45.0)	20,545 (91.4)	20,545 (91.4)	20,545 (91.4)	21,780 (96.9)
#4	4-1/2 (114)	7,445 (33.1)	7,630 (33.9)	7,630 (33.9)	8,090 (36.0)	16,035 (71.3)	16,435 (73.1)	16,435 (73.1)	17,425 (77.5)
	6 (152)	10,175 (45.3)	10,175 (45.3)	10,175 (45.3)	10,785 (48.0)	21,915 (97.5)	21,915 (97.5)	21,915 (97.5)	23,230 (103.3)
	10 (254)	16,960 (75.4)	16,960 (75.4)	16,960 (75.4)	17,975 (80.0)	36,525 (162.5)	36,525 (162.5)	36,525 (162.5)	38,720 (172.2)
#5	5-5/8 (143)	10,405 (46.3)	11,400 (50.7)	11,925 (53.0)	12,640 (56.2)	22,415 (99.7)	24,550 (109.2)	25,685 (114.3)	27,225 (121.1)
	7-1/2 (191)	15,900 (70.7)	15,900 (70.7)	15,900 (70.7)	16,855 (75.0)	34,245 (152.3)	34,245 (152.3)	34,245 (152.3)	36,300 (161.5)
	12-1/2 (318)	26,500 (117.9)	26,500 (117.9)	26,500 (117.9)	28,090 (124.9)	57,075 (253.9)	57,075 (253.9)	57,075 (253.9)	60,500 (269.1)
#6	6-3/4 (171)	13,680 (60.9)	14,985 (66.7)	17,170 (76.4)	18,200 (81.0)	29,460 (131.0)	32,275 (143.6)	36,985 (164.5)	39,205 (174.4)
	9 (229)	21,060 (93.7)	22,895 (101.8)	22,895 (101.8)	24,270 (108.0)	45,360 (201.8)	49,310 (219.3)	49,310 (219.3)	52,270 (232.5)
	15 (381)	38,160 (169.7)	38,160 (169.7)	38,160 (169.7)	40,445 (179.9)	82,185 (365.6)	82,185 (365.6)	82,185 (365.6)	87,120 (387.5)
#7	7-7/8 (200)	17,235 (76.7)	18,885 (84.0)	21,805 (97.0)	24,775 (110.2)	37,125 (165.1)	40,670 (180.9)	46,960 (208.9)	53,360 (237.4)
	10-1/2 (267)	26,540 (118.1)	29,070 (129.3)	31,160 (138.6)	33,030 (146.9)	57,160 (254.3)	62,615 (278.5)	67,120 (298.6)	71,145 (316.5)
	17-1/2 (445)	51,935 (231.0)	51,935 (231.0)	51,935 (231.0)	55,055 (244.9)	111,865 (497.6)	111,865 (497.6)	111,865 (497.6)	118,575 (527.4)
#8	9 (229)	21,060 (93.7)	23,070 (102.6)	26,640 (118.5)	32,360 (143.9)	45,360 (201.8)	49,690 (221.0)	57,375 (255.2)	69,695 (310.0)
	12 (305)	32,425 (144.2)	35,520 (158.0)	40,700 (181.0)	43,145 (191.9)	69,835 (310.6)	76,500 (340.3)	87,665 (390.0)	92,925 (413.3)
	20 (508)	67,835 (301.7)	67,835 (301.7)	67,835 (301.7)	71,905 (319.8)	146,110 (649.9)	146,110 (649.9)	146,110 (649.9)	154,875 (688.9)
#9	10-1/8 (257)	25,130 (111.8)	27,530 (122.5)	31,785 (141.4)	38,930 (173.2)	54,125 (240.8)	59,290 (263.7)	68,465 (304.5)	83,850 (373.0)
	13-1/2 (343)	38,690 (172.1)	42,380 (188.5)	48,940 (217.7)	54,605 (242.9)	83,330 (370.7)	91,285 (406.1)	105,405 (468.9)	117,610 (523.2)
	22-1/2 (572)	83,245 (370.3)	85,855 (381.9)	85,855 (381.9)	91,005 (404.8)	179,300 (797.6)	184,920 (822.6)	184,920 (822.6)	196,015 (871.9)
#10	11-1/4 (286)	29,430 (130.9)	32,240 (143.4)	37,230 (165.6)	45,595 (202.8)	63,395 (282.0)	69,445 (308.9)	80,185 (356.7)	98,205 (436.8)
	15 (381)	45,315 (201.6)	49,640 (220.8)	57,320 (255.0)	67,410 (299.9)	97,600 (434.1)	106,915 (475.6)	123,455 (549.2)	145,195 (645.9)
	25 (635)	97,500 (433.7)	105,995 (471.5)	105,995 (471.5)	112,355 (499.8)	210,000 (934.1)	228,295 (1015.5)	228,295 (1015.5)	241,995 (1076.4)

1 See section 3.1.7 for explanation on development of load values.
2 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Apply spacing, edge distance, and concrete thickness factors in tables 22 - 37 as necessary. Compare to the steel values in table 21. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 104° F (40° C), max. long term temperature = 75° F (24° C).
For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 122° F (50° C) multiply above value by 0.80.
For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above value by 0.70.
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 saturated concrete multiply design strength (factored resistance) by 0.85.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.7.5.
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.

HIT-HY 200 Adhesive Anchoring System 3.2.3

Table 20 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for rebar in cracked concrete[1,2,3,4,5,6,7,8,9]

Rebar size	Effective embedment in. (mm)	Tension — ϕN_n or N_r				Shear — ϕV_n or V_r			
		f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)	f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)
#3	3-3/8 (86)	2,700 (12.0)	2,700 (12.0)	2,700 (12.0)	2,860 (12.7)	5,810 (25.8)	5,810 (25.8)	5,810 (25.8)	6,160 (27.4)
	4-1/2 (114)	3,600 (16.0)	3,600 (16.0)	3,600 (16.0)	3,815 (17.0)	7,750 (34.5)	7,750 (34.5)	7,750 (34.5)	8,215 (36.5)
	7-1/2 (191)	5,995 (26.7)	5,995 (26.7)	5,995 (26.7)	6,355 (28.3)	12,915 (57.4)	12,915 (57.4)	12,915 (57.4)	13,690 (60.9)
#4	4-1/2 (114)	4,830 (21.5)	4,830 (21.5)	4,830 (21.5)	5,120 (22.8)	10,400 (46.3)	10,400 (46.3)	10,400 (46.3)	11,025 (49.0)
	6 (152)	6,440 (28.6)	6,440 (28.6)	6,440 (28.6)	6,825 (30.4)	13,870 (61.7)	13,870 (61.7)	13,870 (61.7)	14,700 (65.4)
	10 (254)	10,730 (47.7)	10,730 (47.7)	10,730 (47.7)	11,375 (50.6)	23,115 (102.8)	23,115 (102.8)	23,115 (102.8)	24,500 (109.0)
#5	5-5/8 (143)	7,370 (32.8)	7,590 (33.8)	7,590 (33.8)	8,045 (35.8)	15,875 (70.6)	16,345 (72.7)	16,345 (72.7)	17,325 (77.1)
	7-1/2 (191)	10,120 (45.0)	10,120 (45.0)	10,120 (45.0)	10,725 (47.7)	21,790 (96.9)	21,790 (96.9)	21,790 (96.9)	23,100 (102.8)
	12-1/2 (318)	16,865 (75.0)	16,865 (75.0)	16,865 (75.0)	17,875 (79.5)	36,320 (161.6)	36,320 (161.6)	36,320 (161.6)	38,500 (171.3)
#6	6-3/4 (171)	9,690 (43.1)	10,615 (47.2)	10,980 (48.8)	11,635 (51.8)	20,870 (92.8)	22,860 (101.7)	23,645 (105.2)	25,065 (111.5)
	9 (229)	14,640 (65.1)	14,640 (65.1)	14,640 (65.1)	15,515 (69.0)	31,530 (140.3)	31,530 (140.3)	31,530 (140.3)	33,420 (148.7)
	15 (381)	24,395 (108.5)	24,395 (108.5)	24,395 (108.5)	25,860 (115.0)	52,550 (233.8)	52,550 (233.8)	52,550 (233.8)	55,700 (247.8)
#7	7-7/8 (200)	12,210 (54.3)	12,665 (56.3)	12,665 (56.3)	13,425 (59.7)	26,300 (117.0)	27,275 (121.3)	27,275 (121.3)	28,910 (128.6)
	10-1/2 (267)	16,885 (75.1)	16,885 (75.1)	16,885 (75.1)	17,900 (79.6)	36,370 (161.8)	36,370 (161.8)	36,370 (161.8)	38,550 (171.5)
	17-1/2 (445)	28,140 (125.2)	28,140 (125.2)	28,140 (125.2)	29,830 (132.7)	60,615 (269.6)	60,615 (269.6)	60,615 (269.6)	64,250 (285.8)
#8	9 (229)	14,920 (66.4)	16,340 (72.7)	16,615 (73.9)	17,610 (78.3)	32,130 (142.9)	35,195 (156.6)	35,785 (159.2)	37,930 (168.7)
	12 (305)	22,150 (98.5)	22,150 (98.5)	22,150 (98.5)	23,480 (104.4)	47,710 (212.2)	47,710 (212.2)	47,710 (212.2)	50,575 (225.0)
	20 (508)	36,920 (164.2)	36,920 (164.2)	36,920 (164.2)	39,135 (174.1)	79,520 (353.7)	79,520 (353.7)	79,520 (353.7)	84,290 (374.9)
#9	10-1/8 (257)	17,800 (79.2)	19,500 (86.7)	21,120 (93.9)	22,385 (99.6)	38,340 (170.5)	42,000 (186.8)	45,490 (202.3)	48,220 (214.5)
	13-1/2 (343)	27,405 (121.9)	28,160 (125.3)	28,160 (125.3)	29,850 (132.8)	59,025 (262.6)	60,655 (269.8)	60,655 (269.8)	64,290 (286.0)
	22-1/2 (572)	46,935 (208.8)	46,935 (208.8)	46,935 (208.8)	49,750 (221.3)	101,090 (449.7)	101,090 (449.7)	101,090 (449.7)	107,155 (476.6)
#10	11-1/4 (286)	20,850 (92.7)	22,840 (101.6)	26,130 (116.2)	27,700 (123.2)	44,905 (199.7)	49,190 (218.8)	56,285 (250.4)	59,660 (265.4)
	15 (381)	32,095 (142.8)	34,840 (155.0)	34,840 (155.0)	36,935 (164.3)	69,135 (307.5)	75,045 (333.8)	75,045 (333.8)	79,545 (353.8)
	25 (635)	58,070 (258.3)	58,070 (258.3)	58,070 (258.3)	61,555 (273.8)	125,075 (556.4)	125,075 (556.4)	125,075 (556.4)	132,580 (589.7)

1 See section 3.1.7 for explanation on development of load values.
2 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Apply spacing, edge distance, and concrete thickness factors in tables 22 - 37 as necessary. Compare to the steel values in table 21. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 104° F (40° C), max. long term temperature = 75° F (24° C).
For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 122° F (50° C) multiply above value by 0.80.
For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above value by 0.70.
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 saturated concrete multiply design strength (factored resistance) by 0.85.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.7.5
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 static loads only. For seismic loads, multiply tabular values by α_{seis} = 0.60. See section 3.1.7.4 for additional information on seismic applications.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 21 - Steel design strength for rebar[1,2]

Rebar size	ASTM A615 Grade 40 [5]			ASTM A615 Grade 60 [5]			ASTM A706 Grade 60 [5]		
	Tensile[1] ϕN_{sa} lb (kN)	Shear[2] ϕV_{sa} lb (kN)	$\alpha_{seis,V}$[7]	Tensile[1] ϕN_{sa} lb (kN)	Shear[2] ϕV_{sa} lb (kN)	$\alpha_{seis,V}$[7]	Tensile[1] ϕN_{sa} lb (kN)	Shear[2] ϕV_{sa} lb (kN)	$\alpha_{seis,V}$[7]
#3	4,290 (19.1)	2,375 (10.6)	0.7	6,435 (28.6)	3,565 (15.9)	0.7	6,600 (29.4)	3,430 (15.3)	0.7
#4	7,800 (34.7)	4,320 (19.2)	0.7	11,700 (52.0)	6,480 (28.8)	0.7	12,000 (53.4)	6,240 (27.8)	0.7
#5	12,090 (53.8)	6,695 (29.8)	0.7	18,135 (80.7)	10,045 (44.7)	0.7	18,600 (82.7)	9,670 (43.0)	0.7
#6	17,160 (76.3)	9,505 (42.3)	0.7	25,740 (114.5)	14,255 (63.4)	0.7	26,400 (117.4)	13,730 (61.1)	0.7
#7	23,400 (104.1)	12,960 (57.6)	0.7	35,100 (156.1)	19,440 (86.5)	0.7	36,000 (160.1)	18,720 (83.3)	0.7
#8	30,810 (137.0)	17,065 (75.9)	0.7	46,215 (205.6)	25,595 (113.9)	0.7	47,400 (210.8)	24,650 (109.6)	0.7
#9	39,000 (173.5)	21,600 (96.1)	0.7	58,500 (260.2)	32,400 (144.1)	0.7	60,000 (266.9)	31,200 (138.8)	0.7
#10	49,530 (220.3)	27,430 (122.0)	0.7	74,295 (330.5)	41,150 (183.0)	0.7	76,200 (339.0)	39,625 (176.3)	0.7

1 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318 Appendix D
2 Shear = ϕ 0.60 $A_{se,N} f_{uta}$ as noted in ACI 318 Appendix D
3 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.
4 Reduction factor for seismic shear only. See section 3.1.7.4 for additional information on seismic applications.
5 ASTM A706 Grade 60 rebar are considered ductile steel elements. ASTM A615 Grade 40 and 60 rebar are considered brittle steel elements.

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Table 22 - Load adjustment factors for #3 rebar in uncracked concrete[1,2,3]

#3 Uncracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[4] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[5] f_{HV}		
Embedment h_{ef}	in. (mm)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																			
1-3/4	(44)	n/a	n/a	n/a	0.31	0.22	0.13	n/a	n/a	n/a	0.08	0.06	0.04	0.16	0.12	0.07	n/a	n/a	n/a
1-7/8	(48)	0.59	0.57	0.54	0.32	0.23	0.13	0.53	0.53	0.52	0.09	0.07	0.04	0.18	0.13	0.08	n/a	n/a	n/a
2	(51)	0.60	0.57	0.54	0.32	0.24	0.14	0.54	0.53	0.52	0.10	0.07	0.04	0.19	0.15	0.09	n/a	n/a	n/a
3	(76)	0.65	0.61	0.57	0.40	0.29	0.17	0.55	0.54	0.53	0.18	0.13	0.08	0.36	0.27	0.16	n/a	n/a	n/a
3-5/8	(92)	0.68	0.63	0.58	0.45	0.33	0.19	0.56	0.55	0.54	0.24	0.18	0.11	0.46	0.36	0.21	n/a	n/a	n/a
4	(102)	0.70	0.65	0.59	0.48	0.35	0.20	0.57	0.56	0.54	0.28	0.21	0.12	0.49	0.40	0.25	n/a	n/a	n/a
4-5/8	(117)	0.73	0.67	0.60	0.54	0.39	0.23	0.58	0.57	0.55	0.34	0.26	0.15	0.54	0.43	0.31	0.57	n/a	n/a
5	(127)	0.75	0.69	0.61	0.58	0.42	0.24	0.59	0.57	0.55	0.38	0.29	0.17	0.58	0.46	0.33	0.59	n/a	n/a
5-3/4	(146)	0.78	0.71	0.63	0.66	0.48	0.28	0.60	0.58	0.56	0.47	0.36	0.21	0.66	0.50	0.35	0.64	0.58	n/a
6	(152)	0.80	0.72	0.63	0.69	0.50	0.29	0.61	0.59	0.56	0.51	0.38	0.23	0.69	0.52	0.36	0.65	0.59	n/a
7	(178)	0.85	0.76	0.66	0.81	0.59	0.34	0.62	0.60	0.57	0.64	0.48	0.29	0.81	0.59	0.39	0.70	0.64	n/a
8	(203)	0.90	0.80	0.68	0.92	0.67	0.39	0.64	0.62	0.58	0.78	0.58	0.35	0.92	0.67	0.43	0.75	0.68	n/a
8-3/4	(222)	0.93	0.82	0.69	1.00	0.74	0.43	0.65	0.63	0.59	0.89	0.67	0.40	1.00	0.74	0.45	0.79	0.71	0.60
9	(229)	0.94	0.83	0.70		0.76	0.44	0.66	0.63	0.59	0.93	0.70	0.42		0.76	0.46	0.80	0.72	0.61
10	(254)	0.99	0.87	0.72		0.84	0.49	0.68	0.65	0.60	1.00	0.82	0.49		0.84	0.50	0.84	0.76	0.64
11	(279)	1.00	0.91	0.74		0.92	0.54	0.69	0.66	0.61		0.94	0.57		0.92	0.54	0.88	0.80	0.68
12	(305)		0.94	0.77		1.00	0.58	0.71	0.67	0.62		1.00	0.64		1.00	0.58	0.92	0.84	0.71
14	(356)		1.00	0.81			0.68	0.75	0.70	0.65			0.81			0.68	0.99	0.90	0.76
16	(406)			0.86			0.78	0.78	0.73	0.67			0.99			0.78	1.00	0.97	0.81
18	(457)			0.90			0.88	0.82	0.76	0.69			1.00			0.88		1.00	0.86
24	(610)			1.00			1.00	0.92	0.85	0.75						1.00			1.00
30	(762)							1.00	0.94	0.81									
36	(914)								1.00	0.87									
>48	(1219)									1.00									

Table 23 - Load adjustment factors for #3 rebar in cracked concrete[1,2,3]

#3 Cracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[4] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[5] f_{HV}		
Embedment h_{ef}	in. (mm)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																			
1-3/4	(44)	n/a	n/a	n/a	0.54	0.49	0.43	n/a	n/a	n/a	0.09	0.07	0.04	0.18	0.14	0.08	n/a	n/a	n/a
1-7/8	(48)	0.59	0.57	0.54	0.56	0.50	0.44	0.54	0.53	0.52	0.10	0.08	0.05	0.20	0.15	0.09	n/a	n/a	n/a
2	(51)	0.60	0.57	0.54	0.57	0.51	0.44	0.54	0.53	0.52	0.11	0.08	0.05	0.22	0.17	0.10	n/a	n/a	n/a
3	(76)	0.65	0.61	0.57	0.70	0.60	0.49	0.56	0.55	0.53	0.20	0.15	0.09	0.41	0.30	0.18	n/a	n/a	n/a
3-5/8	(92)	0.68	0.63	0.58	0.78	0.66	0.53	0.57	0.56	0.54	0.27	0.20	0.12	0.54	0.41	0.24	n/a	n/a	n/a
4	(102)	0.70	0.65	0.59	0.84	0.70	0.55	0.58	0.56	0.55	0.31	0.23	0.14	0.63	0.47	0.28	n/a	n/a	n/a
4-5/8	(117)	0.73	0.67	0.60	0.93	0.76	0.58	0.59	0.57	0.55	0.39	0.29	0.18	0.78	0.58	0.35	0.60	n/a	n/a
5	(127)	0.75	0.69	0.61	0.99	0.80	0.60	0.60	0.58	0.56	0.44	0.33	0.20	0.87	0.66	0.39	0.62	n/a	n/a
5-3/4	(146)	0.78	0.71	0.63	1.00	0.88	0.64	0.61	0.59	0.56	0.54	0.40	0.24	1.00	0.81	0.49	0.66	0.60	n/a
6	(152)	0.80	0.72	0.63		0.91	0.66	0.62	0.60	0.57	0.58	0.43	0.26		0.86	0.52	0.68	0.62	n/a
7	(178)	0.85	0.76	0.66		1.00	0.72	0.63	0.61	0.58	0.72	0.54	0.33		1.00	0.65	0.73	0.67	n/a
8	(203)	0.90	0.80	0.68			0.78	0.65	0.63	0.59	0.89	0.66	0.40			0.78	0.78	0.71	n/a
8-3/4	(222)	0.93	0.82	0.69			0.83	0.67	0.64	0.60	1.00	0.76	0.46			0.83	0.82	0.74	0.63
9	(229)	0.94	0.83	0.70			0.85	0.67	0.64	0.60		0.79	0.48			0.85	0.83	0.76	0.64
10	(254)	0.99	0.87	0.72			0.91	0.69	0.66	0.61		0.93	0.56			0.91	0.88	0.80	0.67
11	(279)	1.00	0.91	0.74			0.98	0.71	0.67	0.62		1.00	0.64			0.98	0.92	0.84	0.70
12	(305)		0.94	0.77			1.00	0.73	0.69	0.64			0.73			1.00	0.96	0.87	0.74
14	(356)		1.00	0.81				0.77	0.72	0.66			0.92				1.00	0.94	0.79
16	(406)			0.86				0.81	0.75	0.68			1.00					1.00	0.85
18	(457)			0.90				0.85	0.79	0.70									0.90
24	(610)			1.00				0.96	0.88	0.77									1.00
30	(762)							1.00	0.98	0.84									
36	(914)								1.00	0.91									
>48	(1219)									1.00									

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

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Table 24 - Load adjustment factors for #4 rebar in uncracked concrete[1,2,3]

#4 Uncracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[4] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[5] f_{HV}		
Embedment h_{ef}	in. (mm)	4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																			
1-3/4	(44)	n/a	n/a	n/a	0.27	0.20	0.12	n/a	n/a	n/a	0.05	0.04	0.02	0.11	0.08	0.05	n/a	n/a	n/a
2-1/2	(64)	0.59	0.57	0.54	0.31	0.23	0.13	0.53	0.53	0.52	0.09	0.07	0.04	0.18	0.13	0.08	n/a	n/a	n/a
3	(76)	0.61	0.58	0.55	0.33	0.24	0.14	0.54	0.53	0.52	0.12	0.09	0.05	0.24	0.17	0.10	n/a	n/a	n/a
4	(102)	0.65	0.61	0.57	0.39	0.29	0.17	0.55	0.54	0.53	0.18	0.13	0.08	0.37	0.27	0.16	n/a	n/a	n/a
5	(127)	0.69	0.64	0.58	0.45	0.33	0.19	0.57	0.55	0.54	0.26	0.19	0.11	0.46	0.37	0.23	n/a	n/a	n/a
5-3/4	(146)	0.71	0.66	0.60	0.50	0.36	0.21	0.58	0.56	0.54	0.32	0.23	0.14	0.50	0.41	0.28	0.56	n/a	n/a
6	(152)	0.72	0.67	0.60	0.51	0.38	0.22	0.58	0.57	0.55	0.34	0.25	0.15	0.52	0.42	0.30	0.57	n/a	n/a
7	(178)	0.76	0.69	0.62	0.59	0.43	0.25	0.59	0.58	0.55	0.42	0.31	0.19	0.59	0.46	0.33	0.61	n/a	n/a
7-1/4	(184)	0.77	0.70	0.62	0.61	0.45	0.26	0.60	0.58	0.56	0.45	0.33	0.20	0.61	0.47	0.34	0.62	0.56	n/a
8	(203)	0.80	0.72	0.63	0.67	0.49	0.29	0.61	0.59	0.56	0.52	0.38	0.23	0.67	0.51	0.36	0.66	0.59	n/a
9	(229)	0.83	0.75	0.65	0.76	0.55	0.32	0.62	0.60	0.57	0.62	0.45	0.27	0.76	0.55	0.38	0.70	0.63	n/a
10	(254)	0.87	0.78	0.67	0.84	0.62	0.36	0.63	0.61	0.58	0.72	0.53	0.32	0.84	0.62	0.41	0.73	0.66	n/a
11-1/4	(286)	0.92	0.81	0.69	0.95	0.69	0.41	0.65	0.62	0.59	0.86	0.63	0.38	0.95	0.69	0.44	0.78	0.70	0.59
12	(305)	0.94	0.83	0.70	1.00	0.74	0.43	0.66	0.63	0.59	0.95	0.70	0.42	1.00	0.74	0.46	0.80	0.72	0.61
14	(356)	1.00	0.89	0.73		0.86	0.50	0.69	0.65	0.61	1.00	0.88	0.53		0.86	0.51	0.87	0.78	0.66
16	(406)		0.94	0.77		0.99	0.58	0.72	0.67	0.62		1.00	0.64		0.99	0.58	0.93	0.84	0.71
18	(457)		1.00	0.80		1.00	0.65	0.74	0.70	0.64			0.77		1.00	0.65	0.98	0.89	0.75
20	(508)			0.83			0.72	0.77	0.72	0.66			0.90			0.72	1.00	0.93	0.79
22	(559)			0.87			0.79	0.80	0.74	0.67			1.00			0.79		0.98	0.83
24	(610)			0.90			0.87	0.82	0.76	0.69						0.87		1.00	0.86
30	(762)			1.00			1.00	0.90	0.83	0.73						1.00			0.97
36	(914)							0.98	0.89	0.78									1.00
>48	(1219)							1.00	1.00	0.87									

Table 25 - Load adjustment factors for #4 rebar in cracked concrete[1,2,3]

#4 Cracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[4] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[5] f_{HV}		
Embedment h_{ef}	in. (mm)	4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																			
1-3/4	(44)	n/a	n/a	n/a	0.49	0.45	0.41	n/a	n/a	n/a	0.06	0.04	0.03	0.12	0.09	0.05	n/a	n/a	n/a
2-1/2	(64)	0.59	0.57	0.54	0.56	0.50	0.44	0.54	0.53	0.52	0.10	0.07	0.04	0.20	0.15	0.09	n/a	n/a	n/a
3	(76)	0.61	0.58	0.55	0.60	0.53	0.46	0.54	0.54	0.53	0.13	0.10	0.06	0.26	0.20	0.12	n/a	n/a	n/a
4	(102)	0.65	0.61	0.57	0.70	0.60	0.49	0.56	0.55	0.53	0.20	0.15	0.09	0.40	0.30	0.18	n/a	n/a	n/a
5	(127)	0.69	0.64	0.58	0.80	0.67	0.53	0.57	0.56	0.54	0.28	0.21	0.13	0.56	0.42	0.25	n/a	n/a	n/a
5-3/4	(146)	0.71	0.66	0.60	0.88	0.73	0.56	0.58	0.57	0.55	0.35	0.26	0.16	0.70	0.52	0.31	0.57	n/a	n/a
6	(152)	0.72	0.67	0.60	0.91	0.75	0.57	0.59	0.57	0.55	0.37	0.28	0.17	0.74	0.56	0.33	0.59	n/a	n/a
7	(178)	0.76	0.69	0.62	1.00	0.83	0.62	0.60	0.58	0.56	0.47	0.35	0.21	0.94	0.70	0.42	0.63	n/a	n/a
7-1/4	(184)	0.77	0.70	0.62		0.85	0.63	0.60	0.59	0.56	0.49	0.37	0.22	0.99	0.74	0.44	0.64	0.59	n/a
8	(203)	0.80	0.72	0.63		0.91	0.66	0.61	0.59	0.57	0.57	0.43	0.26	1.00	0.86	0.51	0.68	0.62	n/a
9	(229)	0.83	0.75	0.65		1.00	0.70	0.63	0.61	0.58	0.68	0.51	0.31		1.00	0.61	0.72	0.65	n/a
10	(254)	0.87	0.78	0.67			0.75	0.64	0.62	0.58	0.80	0.60	0.36			0.72	0.76	0.69	n/a
11-1/4	(286)	0.92	0.81	0.69			0.81	0.66	0.63	0.59	0.95	0.71	0.43			0.81	0.80	0.73	0.62
12	(305)	0.94	0.83	0.70			0.85	0.67	0.64	0.60	1.00	0.79	0.47			0.85	0.83	0.75	0.64
14	(356)	1.00	0.89	0.73			0.95	0.70	0.67	0.62		0.99	0.60			0.95	0.90	0.81	0.69
16	(406)		0.94	0.77			1.00	0.73	0.69	0.63		1.00	0.73			1.00	0.96	0.87	0.73
18	(457)		1.00	0.80				0.76	0.71	0.65			0.87				1.00	0.92	0.78
20	(508)			0.83				0.79	0.74	0.67			1.00					0.97	0.82
22	(559)			0.87				0.82	0.76	0.69								1.00	0.86
24	(610)			0.90				0.84	0.78	0.70									0.90
30	(762)			1.00				0.93	0.86	0.75									1.00
36	(914)							1.00	0.93	0.80									
>48	(1219)								1.00	0.90									

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

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Table 26 - Load adjustment factors for #5 rebar in uncracked concrete[1,2,3]

#5 Uncracked Concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[4] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[5] f_{HV}		
Embedment h_{ef}	in. (mm)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	1-3/4 (44)	n/a	n/a	n/a	0.25	0.18	0.11	n/a	n/a	n/a	0.04	0.03	0.02	0.08	0.06	0.03	n/a	n/a	n/a
	3-1/8 (79)	0.59	0.57	0.54	0.31	0.22	0.13	0.54	0.53	0.52	0.10	0.07	0.04	0.20	0.13	0.08	n/a	n/a	n/a
	4 (102)	0.62	0.59	0.55	0.34	0.25	0.15	0.55	0.53	0.52	0.15	0.10	0.06	0.29	0.19	0.12	n/a	n/a	n/a
	4-5/8 (117)	0.64	0.60	0.56	0.37	0.27	0.16	0.55	0.54	0.53	0.18	0.12	0.07	0.36	0.24	0.14	n/a	n/a	n/a
	5 (127)	0.65	0.61	0.57	0.39	0.28	0.17	0.56	0.54	0.53	0.21	0.13	0.08	0.39	0.27	0.16	n/a	n/a	n/a
	6 (152)	0.68	0.63	0.58	0.43	0.32	0.19	0.57	0.55	0.54	0.27	0.18	0.11	0.44	0.35	0.21	n/a	n/a	n/a
	7 (178)	0.71	0.66	0.59	0.48	0.36	0.21	0.58	0.56	0.54	0.34	0.22	0.13	0.49	0.40	0.27	n/a	n/a	n/a
	7-1/8 (181)	0.71	0.66	0.60	0.49	0.36	0.21	0.58	0.56	0.54	0.35	0.23	0.14	0.50	0.40	0.27	0.57	n/a	n/a
	8 (203)	0.74	0.68	0.61	0.54	0.39	0.23	0.59	0.57	0.55	0.41	0.27	0.16	0.54	0.43	0.32	0.61	n/a	n/a
	9 (229)	0.77	0.70	0.62	0.60	0.44	0.26	0.60	0.58	0.56	0.50	0.32	0.19	0.60	0.47	0.34	0.65	0.56	n/a
	10 (254)	0.80	0.72	0.63	0.67	0.49	0.29	0.62	0.59	0.56	0.58	0.38	0.23	0.67	0.51	0.36	0.68	0.59	n/a
	11 (279)	0.83	0.74	0.65	0.74	0.54	0.32	0.63	0.60	0.57	0.67	0.44	0.26	0.74	0.54	0.38	0.71	0.62	n/a
	12 (305)	0.86	0.77	0.66	0.80	0.59	0.35	0.64	0.60	0.57	0.76	0.50	0.30	0.80	0.59	0.40	0.75	0.65	n/a
	14 (356)	0.91	0.81	0.69	0.94	0.69	0.40	0.66	0.62	0.59	0.96	0.63	0.38	0.94	0.69	0.44	0.81	0.70	0.59
	16 (406)	0.97	0.86	0.71	1.00	0.79	0.46	0.69	0.64	0.60	1.00	0.77	0.46	1.00	0.79	0.48	0.86	0.75	0.63
	18 (457)	1.00	0.90	0.74		0.89	0.52	0.71	0.66	0.61		0.92	0.55		0.89	0.52	0.91	0.79	0.67
	20 (508)		0.94	0.77		0.98	0.58	0.73	0.67	0.62		1.00	0.64		0.98	0.58	0.96	0.84	0.71
	22 (559)		0.99	0.79		1.00	0.63	0.75	0.69	0.64			0.74		1.00	0.63	1.00	0.88	0.74
	24 (610)		1.00	0.82			0.69	0.78	0.71	0.65			0.85			0.69		0.92	0.77
	26 (660)			0.85			0.75	0.80	0.73	0.66			0.95			0.75		0.95	0.80
	28 (711)			0.87			0.81	0.82	0.74	0.67			1.00			0.81		0.99	0.83
	30 (762)			0.90			0.86	0.85	0.76	0.69						0.86		1.00	0.86
	36 (914)			0.98			1.00	0.92	0.81	0.72						1.00			0.95
	>48 (1219)			1.00				1.00	0.92	0.80									1.00

Table 27 - Load adjustment factors for #5 rebar in cracked concrete[1,2,3]

#5 Cracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[4] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[5] f_{HV}		
Embedment h_{ef}	in. (mm)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	1-3/4 (44)	n/a	n/a	n/a	0.46	0.43	0.40	n/a	n/a	n/a	0.04	0.03	0.02	0.09	0.06	0.04	n/a	n/a	n/a
	3-1/8 (79)	0.59	0.57	0.54	0.56	0.50	0.44	0.54	0.53	0.52	0.10	0.07	0.04	0.20	0.15	0.09	n/a	n/a	n/a
	4 (102)	0.62	0.59	0.55	0.62	0.55	0.46	0.55	0.54	0.53	0.15	0.11	0.06	0.30	0.22	0.13	n/a	n/a	n/a
	4-5/8 (117)	0.64	0.60	0.56	0.67	0.58	0.48	0.55	0.54	0.53	0.18	0.13	0.08	0.37	0.27	0.16	n/a	n/a	n/a
	5 (127)	0.65	0.61	0.57	0.70	0.60	0.49	0.56	0.55	0.53	0.21	0.15	0.09	0.41	0.30	0.18	n/a	n/a	n/a
	6 (152)	0.68	0.63	0.58	0.78	0.66	0.53	0.57	0.56	0.54	0.27	0.20	0.12	0.54	0.40	0.24	n/a	n/a	n/a
	7 (178)	0.71	0.66	0.59	0.87	0.72	0.56	0.58	0.57	0.55	0.34	0.25	0.15	0.68	0.50	0.30	n/a	n/a	n/a
	7-1/8 (181)	0.71	0.66	0.60	0.88	0.73	0.56	0.58	0.57	0.55	0.35	0.26	0.15	0.70	0.51	0.31	0.58	n/a	n/a
	8 (203)	0.74	0.68	0.61	0.96	0.78	0.59	0.59	0.58	0.55	0.42	0.30	0.18	0.84	0.61	0.37	0.61	n/a	n/a
	9 (229)	0.77	0.70	0.62	1.00	0.85	0.62	0.60	0.58	0.56	0.50	0.36	0.22	1.00	0.73	0.44	0.65	0.58	n/a
	10 (254)	0.80	0.72	0.63		0.91	0.66	0.62	0.59	0.57	0.58	0.43	0.26		0.85	0.51	0.68	0.61	n/a
	11 (279)	0.83	0.74	0.65		0.98	0.69	0.63	0.60	0.57	0.67	0.49	0.29		0.98	0.59	0.72	0.64	n/a
	12 (305)	0.86	0.77	0.66		1.00	0.73	0.64	0.61	0.58	0.77	0.56	0.34		1.00	0.67	0.75	0.67	n/a
	14 (356)	0.91	0.81	0.69			0.81	0.66	0.63	0.59	0.97	0.71	0.42			0.81	0.81	0.73	0.61
	16 (406)	0.97	0.86	0.71			0.89	0.69	0.65	0.61	1.00	0.86	0.52			0.89	0.86	0.78	0.66
	18 (457)	1.00	0.90	0.74			0.97	0.71	0.67	0.62		1.00	0.62			0.97	0.92	0.82	0.70
	20 (508)		0.94	0.77			1.00	0.73	0.69	0.63			0.72			1.00	0.97	0.87	0.73
	22 (559)		0.99	0.79				0.76	0.71	0.65			0.83				1.00	0.91	0.77
	24 (610)		1.00	0.82				0.78	0.73	0.66			0.95					0.95	0.80
	26 (660)			0.85				0.80	0.75	0.67			1.00					0.99	0.84
	28 (711)			0.87				0.83	0.76	0.69								1.00	0.87
	30 (762)			0.90				0.85	0.78	0.70									0.90
	36 (914)			0.98				0.92	0.84	0.74									0.98
	>48 (1219)			1.00				1.00	0.95	0.82									1.00

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

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Table 28 - Load adjustment factors for #6 rebar in uncracked concrete[1,2,3]

#6 Uncracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[4] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[5] f_{HV}		
Embedment h_{ef}	in.	6-3/4	9	15	6-3/4	9	15	6-3/4	9	15	6-3/4	9	15	6-3/4	9	15	6-3/4	9	15
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	(mm)	(171)	(229)	(381)	(171)	(229)	(381)	(171)	(229)	(381)	(171)	(229)	(381)	(171)	(229)	(381)	(171)	(229)	(381)
1-3/4	(44)	n/a	n/a	n/a	0.24	0.18	0.10	n/a	n/a	n/a	0.03	0.02	0.01	0.07	0.05	0.02	n/a	n/a	n/a
3-3/4	(95)	0.59	0.57	0.54	0.30	0.22	0.13	0.54	0.53	0.52	0.11	0.07	0.04	0.22	0.14	0.08	n/a	n/a	n/a
4	(102)	0.60	0.57	0.54	0.31	0.23	0.14	0.54	0.53	0.52	0.12	0.08	0.04	0.24	0.16	0.09	n/a	n/a	n/a
5	(127)	0.62	0.59	0.56	0.35	0.26	0.15	0.55	0.54	0.53	0.17	0.11	0.06	0.33	0.22	0.12	n/a	n/a	n/a
5-1/4	(133)	0.63	0.60	0.56	0.36	0.26	0.15	0.55	0.54	0.53	0.18	0.12	0.06	0.36	0.23	0.13	n/a	n/a	n/a
6	(152)	0.65	0.61	0.57	0.39	0.28	0.17	0.56	0.55	0.53	0.22	0.14	0.08	0.39	0.29	0.16	n/a	n/a	n/a
7	(178)	0.67	0.63	0.58	0.43	0.31	0.18	0.57	0.55	0.54	0.28	0.18	0.10	0.43	0.36	0.20	n/a	n/a	n/a
8	(203)	0.70	0.65	0.59	0.47	0.34	0.20	0.58	0.56	0.54	0.34	0.22	0.12	0.47	0.39	0.24	n/a	n/a	n/a
8-1/2	(216)	0.71	0.66	0.59	0.49	0.36	0.21	0.59	0.56	0.54	0.37	0.24	0.13	0.49	0.40	0.27	0.59	n/a	n/a
9	(229)	0.72	0.67	0.60	0.51	0.37	0.22	0.59	0.57	0.55	0.40	0.26	0.14	0.51	0.41	0.29	0.60	n/a	n/a
10	(254)	0.75	0.69	0.61	0.56	0.41	0.24	0.60	0.58	0.55	0.47	0.31	0.17	0.56	0.44	0.32	0.64	n/a	n/a
10-3/4	(273)	0.77	0.70	0.62	0.60	0.44	0.26	0.61	0.58	0.55	0.53	0.34	0.19	0.60	0.47	0.34	0.66	0.57	n/a
12	(305)	0.80	0.72	0.63	0.67	0.49	0.29	0.62	0.59	0.56	0.62	0.40	0.22	0.67	0.50	0.36	0.70	0.60	n/a
14	(356)	0.85	0.76	0.66	0.78	0.57	0.34	0.64	0.61	0.57	0.78	0.51	0.28	0.78	0.57	0.39	0.75	0.65	n/a
16	(406)	0.90	0.80	0.68	0.89	0.65	0.38	0.66	0.62	0.58	0.96	0.62	0.34	0.89	0.65	0.42	0.80	0.70	n/a
16-3/4	(425)	0.91	0.81	0.69	0.93	0.69	0.40	0.67	0.63	0.59	1.00	0.67	0.37	0.93	0.69	0.43	0.82	0.71	0.59
18	(457)	0.94	0.83	0.70	1.00	0.74	0.43	0.68	0.64	0.59		0.74	0.41	1.00	0.74	0.46	0.85	0.74	0.61
20	(508)	0.99	0.87	0.72		0.82	0.48	0.70	0.65	0.60		0.87	0.48		0.82	0.49	0.90	0.78	0.64
22	(559)	1.00	0.91	0.74		0.90	0.53	0.72	0.67	0.61		1.00	0.55		0.90	0.53	0.94	0.82	0.67
24	(610)		0.94	0.77		0.98	0.58	0.74	0.68	0.62			0.63		0.98	0.58	0.99	0.85	0.70
26	(660)		0.98	0.79		1.00	0.62	0.76	0.70	0.63			0.71		1.00	0.62	1.00	0.89	0.73
28	(711)		1.00	0.81			0.67	0.78	0.71	0.64			0.80			0.67		0.92	0.76
30	(762)			0.83			0.72	0.80	0.73	0.65			0.88			0.72		0.95	0.78
36	(914)			0.90			0.86	0.86	0.77	0.68			1.00			0.86		1.00	0.86
>48	(1219)			1.00			1.00	0.99	0.86	0.75						1.00			0.99

Table 29 - Load adjustment factors for #6 rebar in cracked concrete[1,2,3]

#6 Cracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[4] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[5] f_{HV}		
Embedment h_{ef}	in.	6-3/4	9	15	6-3/4	9	15	6-3/4	9	15	6-3/4	9	15	6-3/4	9	15	6-3/4	9	15
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	(mm)	(171)	(229)	(381)	(171)	(229)	(381)	(171)	(229)	(381)	(171)	(229)	(381)	(171)	(229)	(381)	(171)	(229)	(381)
1-3/4	(44)	n/a	n/a	n/a	0.44	0.42	0.39	n/a	n/a	n/a	0.03	0.02	0.01	0.07	0.05	0.03	n/a	n/a	n/a
3-3/4	(95)	0.59	0.57	0.54	0.56	0.50	0.44	0.54	0.53	0.52	0.11	0.07	0.04	0.22	0.15	0.09	n/a	n/a	n/a
4	(102)	0.60	0.57	0.54	0.57	0.51	0.44	0.54	0.53	0.52	0.12	0.08	0.05	0.24	0.16	0.10	n/a	n/a	n/a
5	(127)	0.62	0.59	0.56	0.63	0.56	0.47	0.55	0.54	0.53	0.17	0.11	0.07	0.34	0.22	0.13	n/a	n/a	n/a
5-1/4	(133)	0.63	0.60	0.56	0.65	0.57	0.47	0.55	0.54	0.53	0.18	0.12	0.07	0.36	0.24	0.14	n/a	n/a	n/a
6	(152)	0.65	0.61	0.57	0.70	0.60	0.49	0.56	0.55	0.53	0.22	0.15	0.09	0.44	0.29	0.18	n/a	n/a	n/a
7	(178)	0.67	0.63	0.58	0.77	0.65	0.52	0.57	0.55	0.54	0.28	0.19	0.11	0.56	0.37	0.22	n/a	n/a	n/a
8	(203)	0.70	0.65	0.59	0.84	0.70	0.55	0.58	0.56	0.54	0.34	0.23	0.14	0.68	0.45	0.27	n/a	n/a	n/a
8-1/2	(216)	0.71	0.66	0.59	0.88	0.72	0.56	0.59	0.57	0.55	0.37	0.25	0.15	0.75	0.50	0.30	0.59	n/a	n/a
9	(229)	0.72	0.67	0.60	0.91	0.75	0.57	0.59	0.57	0.55	0.41	0.27	0.16	0.82	0.54	0.32	0.61	n/a	n/a
10	(254)	0.75	0.69	0.61	0.99	0.80	0.60	0.60	0.58	0.55	0.48	0.32	0.19	0.95	0.63	0.38	0.64	n/a	n/a
10-3/4	(273)	0.77	0.70	0.62	1.00	0.84	0.62	0.61	0.58	0.56	0.53	0.35	0.21	1.00	0.70	0.42	0.66	0.58	n/a
12	(305)	0.80	0.72	0.63		0.91	0.66	0.62	0.59	0.57	0.63	0.42	0.25		0.83	0.50	0.70	0.61	n/a
14	(356)	0.85	0.76	0.66		1.00	0.72	0.64	0.61	0.58	0.79	0.52	0.31		1.00	0.63	0.76	0.66	n/a
16	(406)	0.90	0.80	0.68			0.78	0.66	0.62	0.59	0.97	0.64	0.38			0.77	0.81	0.70	n/a
16-3/4	(425)	0.91	0.81	0.69			0.81	0.67	0.63	0.59	1.00	0.68	0.41			0.81	0.83	0.72	0.61
18	(457)	0.94	0.83	0.70			0.85	0.68	0.64	0.60		0.76	0.46			0.85	0.86	0.75	0.63
20	(508)	0.99	0.87	0.72			0.91	0.70	0.65	0.61		0.89	0.54			0.91	0.90	0.79	0.66
22	(559)	1.00	0.91	0.74			0.98	0.72	0.67	0.62		1.00	0.62			0.98	0.95	0.82	0.70
24	(610)		0.94	0.77			1.00	0.74	0.69	0.63			0.70			1.00	0.99	0.86	0.73
26	(660)		0.98	0.79				0.76	0.70	0.64			0.79				1.00	0.90	0.76
28	(711)		1.00	0.81				0.79	0.72	0.65			0.89					0.93	0.78
30	(762)			0.83				0.81	0.73	0.66			0.99					0.96	0.81
36	(914)			0.90				0.87	0.78	0.70			1.00					1.00	0.89
>48	(1219)			1.00				0.99	0.87	0.76									1.00

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

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Table 30 - Load adjustment factors for #7 rebar in uncracked concrete[1,2,3]

#7 Uncracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[4] f_{AV}			Edge distance in shear ⊥ Toward edge f_{RV}			Edge distance in shear ‖ To edge f_{RV}			Concrete thickness factor in shear[5] f_{HV}		
Embedment h_{ef}	in. (mm)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																			
1-3/4	(44)	n/a	n/a	n/a	0.23	0.17	0.10	n/a	n/a	n/a	0.03	0.02	0.01	0.05	0.04	0.02	n/a	n/a	n/a
4-3/8	(111)	0.59	0.57	0.54	0.30	0.22	0.13	0.54	0.53	0.52	0.11	0.07	0.04	0.22	0.14	0.07	n/a	n/a	n/a
5	(127)	0.61	0.58	0.55	0.32	0.24	0.14	0.54	0.53	0.52	0.13	0.09	0.04	0.27	0.17	0.09	n/a	n/a	n/a
5-1/2	(140)	0.62	0.59	0.55	0.34	0.25	0.15	0.55	0.54	0.52	0.15	0.10	0.05	0.31	0.20	0.10	n/a	n/a	n/a
6	(152)	0.63	0.60	0.56	0.35	0.26	0.15	0.55	0.54	0.52	0.17	0.11	0.06	0.35	0.23	0.12	n/a	n/a	n/a
7	(178)	0.65	0.61	0.57	0.39	0.28	0.17	0.56	0.55	0.53	0.22	0.14	0.07	0.39	0.29	0.15	n/a	n/a	n/a
8	(203)	0.67	0.63	0.58	0.42	0.31	0.18	0.57	0.55	0.53	0.27	0.17	0.09	0.43	0.35	0.18	n/a	n/a	n/a
9	(229)	0.69	0.64	0.59	0.45	0.33	0.20	0.58	0.56	0.54	0.32	0.21	0.11	0.46	0.38	0.21	n/a	n/a	n/a
9-7/8	(251)	0.71	0.66	0.59	0.49	0.36	0.21	0.59	0.56	0.54	0.37	0.24	0.12	0.49	0.40	0.24	0.59	n/a	n/a
10	(254)	0.71	0.66	0.60	0.49	0.36	0.21	0.59	0.57	0.54	0.38	0.24	0.12	0.50	0.40	0.25	0.59	n/a	n/a
11	(279)	0.73	0.67	0.60	0.53	0.39	0.23	0.60	0.57	0.55	0.43	0.28	0.14	0.53	0.43	0.29	0.62	n/a	n/a
12	(305)	0.75	0.69	0.61	0.57	0.42	0.25	0.60	0.58	0.55	0.49	0.32	0.16	0.57	0.45	0.33	0.65	n/a	n/a
12-1/2	(318)	0.76	0.70	0.62	0.60	0.44	0.26	0.61	0.58	0.55	0.52	0.34	0.17	0.60	0.46	0.34	0.66	0.57	n/a
14	(356)	0.80	0.72	0.63	0.67	0.49	0.29	0.62	0.59	0.56	0.62	0.40	0.21	0.67	0.50	0.36	0.70	0.60	n/a
16	(406)	0.84	0.75	0.65	0.76	0.56	0.33	0.64	0.60	0.57	0.76	0.49	0.25	0.76	0.56	0.38	0.75	0.65	n/a
18	(457)	0.88	0.79	0.67	0.86	0.63	0.37	0.66	0.62	0.57	0.91	0.59	0.30	0.86	0.63	0.41	0.79	0.68	n/a
19-1/2	(495)	0.91	0.81	0.69	0.93	0.68	0.40	0.67	0.63	0.58	1.00	0.66	0.34	0.93	0.68	0.43	0.82	0.71	0.57
20	(508)	0.92	0.82	0.69	0.95	0.70	0.41	0.67	0.63	0.58		0.69	0.35	0.95	0.70	0.44	0.83	0.72	0.58
22	(559)	0.97	0.85	0.71	1.00	0.77	0.45	0.69	0.64	0.59		0.80	0.41	1.00	0.77	0.47	0.87	0.76	0.60
24	(610)	1.00	0.88	0.73		0.84	0.49	0.71	0.66	0.60		0.91	0.46		0.84	0.50	0.91	0.79	0.63
26	(660)		0.91	0.75		0.91	0.53	0.73	0.67	0.61		1.00	0.52		0.91	0.54	0.95	0.82	0.66
28	(711)		0.94	0.77		0.98	0.58	0.74	0.68	0.62			0.58		0.98	0.58	0.99	0.85	0.68
30	(762)		0.98	0.79		1.00	0.62	0.76	0.70	0.62			0.65		1.00	0.62	1.00	0.88	0.71
36	(914)		1.00	0.84			0.74	0.81	0.73	0.65			0.85			0.74		0.97	0.77
>48	(1219)			0.96			0.99	0.92	0.81	0.70			1.00			0.99		1.00	0.89

Table 31 - Load adjustment factors for #7 rebar in cracked concrete[1,2,3]

#7 Cracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[4] f_{AV}			Edge distance in shear ⊥ Toward edge f_{RV}			Edge distance in shear ‖ To edge f_{RV}			Concrete thickness factor in shear[5] f_{HV}		
Embedment h_{ef}	in. (mm)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																			
1-3/4	(44)	n/a	n/a	n/a	0.43	0.41	0.38	n/a	n/a	n/a	0.03	0.02	0.01	0.06	0.04	0.02	n/a	n/a	n/a
4-3/8	(111)	0.59	0.57	0.54	0.56	0.50	0.44	0.54	0.53	0.52	0.11	0.08	0.05	0.22	0.16	0.10	n/a	n/a	n/a
5	(127)	0.61	0.58	0.55	0.59	0.52	0.45	0.54	0.54	0.53	0.13	0.10	0.06	0.27	0.19	0.12	n/a	n/a	n/a
5-1/2	(140)	0.62	0.59	0.55	0.62	0.54	0.46	0.55	0.54	0.53	0.15	0.11	0.07	0.31	0.22	0.13	n/a	n/a	n/a
6	(152)	0.63	0.60	0.56	0.64	0.56	0.47	0.55	0.54	0.53	0.18	0.13	0.08	0.35	0.25	0.15	n/a	n/a	n/a
7	(178)	0.65	0.61	0.57	0.70	0.60	0.49	0.56	0.55	0.54	0.22	0.16	0.10	0.44	0.32	0.19	n/a	n/a	n/a
8	(203)	0.67	0.63	0.58	0.76	0.64	0.52	0.57	0.56	0.54	0.27	0.20	0.12	0.54	0.39	0.24	n/a	n/a	n/a
9	(229)	0.69	0.64	0.59	0.82	0.68	0.54	0.58	0.56	0.55	0.32	0.23	0.14	0.65	0.47	0.28	n/a	n/a	n/a
9-7/8	(251)	0.71	0.66	0.59	0.87	0.72	0.56	0.59	0.57	0.55	0.37	0.27	0.16	0.74	0.54	0.32	0.59	n/a	n/a
10	(254)	0.71	0.66	0.60	0.88	0.73	0.56	0.59	0.57	0.55	0.38	0.27	0.16	0.76	0.55	0.33	0.59	n/a	n/a
11	(279)	0.73	0.67	0.60	0.95	0.77	0.59	0.60	0.58	0.56	0.44	0.32	0.19	0.87	0.63	0.38	0.62	n/a	n/a
12	(305)	0.75	0.69	0.61	1.00	0.82	0.61	0.60	0.58	0.56	0.50	0.36	0.22	1.00	0.72	0.43	0.65	n/a	n/a
12-1/2	(318)	0.76	0.70	0.62		0.84	0.62	0.61	0.59	0.56	0.53	0.38	0.23	1.00	0.77	0.46	0.66	0.59	n/a
14	(356)	0.80	0.72	0.63		0.91	0.66	0.62	0.60	0.57	0.63	0.45	0.27		0.91	0.54	0.70	0.63	n/a
16	(406)	0.84	0.75	0.65		1.00	0.71	0.64	0.61	0.58	0.77	0.55	0.33		1.00	0.67	0.75	0.67	n/a
18	(457)	0.88	0.79	0.67			0.76	0.66	0.63	0.59	0.91	0.66	0.40			0.76	0.79	0.71	n/a
19-1/2	(495)	0.91	0.81	0.69			0.80	0.67	0.64	0.60	1.00	0.75	0.45			0.80	0.82	0.74	0.62
20	(508)	0.92	0.82	0.69			0.82	0.67	0.64	0.60		0.77	0.46			0.82	0.84	0.75	0.63
22	(559)	0.97	0.85	0.71			0.87	0.69	0.65	0.61		0.89	0.54			0.87	0.88	0.79	0.66
24	(610)	1.00	0.88	0.73			0.93	0.71	0.67	0.62		1.00	0.61			0.93	0.92	0.82	0.69
26	(660)		0.91	0.75			0.99	0.73	0.68	0.63			0.69			0.99	0.95	0.86	0.72
28	(711)		0.94	0.77			1.00	0.74	0.70	0.64			0.77			1.00	0.99	0.89	0.75
30	(762)		0.98	0.79				0.76	0.71	0.65			0.85				1.00	0.92	0.77
36	(914)		1.00	0.84				0.81	0.75	0.68			1.00					1.00	0.85
>48	(1219)			0.96				0.92	0.84	0.74									0.98

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 32 - Load adjustment factors for #8 rebar in uncracked concrete[1,2,3]

#8 Uncracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[4] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[5] f_{HV}		
Embedment h_{ef}	in. (mm)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																			
1-3/4	(44)	n/a	n/a	n/a	0.23	0.17	0.10	n/a	n/a	n/a	0.02	0.01	0.01	0.05	0.03	0.01	n/a	n/a	n/a
5	(127)	0.59	0.57	0.54	0.30	0.22	0.13	0.54	0.53	0.52	0.11	0.07	0.03	0.22	0.14	0.07	n/a	n/a	n/a
6	(152)	0.61	0.58	0.55	0.33	0.24	0.14	0.55	0.53	0.52	0.14	0.09	0.04	0.29	0.19	0.09	n/a	n/a	n/a
6-1/4	(159)	0.62	0.59	0.55	0.34	0.25	0.15	0.55	0.54	0.52	0.15	0.10	0.05	0.30	0.20	0.09	n/a	n/a	n/a
7	(178)	0.63	0.60	0.56	0.36	0.26	0.15	0.55	0.54	0.52	0.18	0.12	0.06	0.36	0.23	0.11	n/a	n/a	n/a
8	(203)	0.65	0.61	0.57	0.39	0.28	0.17	0.56	0.55	0.53	0.22	0.14	0.07	0.39	0.29	0.14	n/a	n/a	n/a
9	(229)	0.67	0.63	0.58	0.41	0.30	0.18	0.57	0.55	0.53	0.26	0.17	0.08	0.42	0.34	0.16	n/a	n/a	n/a
10	(254)	0.69	0.64	0.58	0.44	0.33	0.19	0.58	0.56	0.53	0.31	0.20	0.10	0.45	0.37	0.19	n/a	n/a	n/a
11	(279)	0.70	0.65	0.59	0.48	0.35	0.21	0.58	0.56	0.54	0.35	0.23	0.11	0.48	0.39	0.22	n/a	n/a	n/a
11-1/4	(286)	0.71	0.66	0.59	0.48	0.36	0.21	0.59	0.56	0.54	0.37	0.24	0.11	0.49	0.40	0.23	0.58	n/a	n/a
12	(305)	0.72	0.67	0.60	0.51	0.37	0.22	0.59	0.57	0.54	0.40	0.26	0.13	0.51	0.41	0.25	0.60	n/a	n/a
13	(330)	0.74	0.68	0.61	0.54	0.40	0.23	0.60	0.57	0.55	0.46	0.30	0.14	0.55	0.44	0.28	0.63	n/a	n/a
14	(356)	0.76	0.69	0.62	0.58	0.43	0.25	0.61	0.58	0.55	0.51	0.33	0.16	0.58	0.46	0.32	0.65	n/a	n/a
14-1/4	(362)	0.76	0.70	0.62	0.59	0.44	0.26	0.61	0.58	0.55	0.52	0.34	0.16	0.59	0.46	0.32	0.66	0.57	n/a
16	(406)	0.80	0.72	0.63	0.67	0.49	0.29	0.62	0.59	0.56	0.62	0.40	0.19	0.67	0.50	0.36	0.70	0.60	n/a
18	(457)	0.83	0.75	0.65	0.75	0.55	0.32	0.64	0.60	0.56	0.74	0.48	0.23	0.75	0.55	0.38	0.74	0.64	n/a
20	(508)	0.87	0.78	0.67	0.83	0.61	0.36	0.65	0.61	0.57	0.87	0.56	0.27	0.83	0.61	0.40	0.78	0.67	n/a
22	(559)	0.91	0.81	0.68	0.92	0.67	0.40	0.67	0.63	0.58	1.00	0.65	0.31	0.92	0.67	0.43	0.82	0.71	n/a
22-1/4	(565)	0.91	0.81	0.69	0.93	0.68	0.40	0.67	0.63	0.58		0.66	0.32	0.93	0.68	0.43	0.82	0.71	0.56
24	(610)	0.94	0.83	0.70	1.00	0.74	0.43	0.68	0.64	0.58		0.74	0.35	1.00	0.74	0.46	0.85	0.74	0.58
26	(660)	0.98	0.86	0.72	1.00	0.80	0.47	0.70	0.65	0.59		0.84	0.40	1.00	0.80	0.48	0.89	0.77	0.60
28	(711)	1.00	0.89	0.73		0.86	0.50	0.71	0.66	0.60		0.94	0.45		0.86	0.51	0.92	0.80	0.62
30	(762)		0.92	0.75		0.92	0.54	0.73	0.67	0.60		1.00	0.50		0.92	0.54	0.95	0.83	0.65
36	(914)		1.00	0.80		1.00	0.65	0.77	0.70	0.63			0.65		1.00	0.65	1.00	0.91	0.71
>48	(1219)			0.90			0.86	0.86	0.77	0.67			1.00			0.86		1.00	0.82

Table 33 - Load adjustment factors for #8 rebar in cracked concrete[1,2,3]

#8 Cracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[4] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[5] f_{HV}		
Embedment h_{ef}	in. (mm)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																			
1-3/4	(44)	n/a	n/a	n/a	0.42	0.40	0.38	n/a	n/a	n/a	0.02	0.02	0.01	0.05	0.03	0.02	n/a	n/a	n/a
5	(127)	0.59	0.57	0.54	0.56	0.50	0.44	0.54	0.53	0.52	0.11	0.07	0.04	0.22	0.15	0.09	n/a	n/a	n/a
6	(152)	0.61	0.58	0.55	0.60	0.53	0.46	0.55	0.54	0.53	0.14	0.10	0.06	0.29	0.19	0.12	n/a	n/a	n/a
6-1/4	(159)	0.62	0.59	0.55	0.61	0.54	0.46	0.55	0.54	0.53	0.15	0.10	0.06	0.31	0.21	0.12	n/a	n/a	n/a
7	(178)	0.63	0.60	0.56	0.65	0.57	0.47	0.55	0.54	0.53	0.18	0.12	0.07	0.36	0.24	0.15	n/a	n/a	n/a
8	(203)	0.65	0.61	0.57	0.70	0.60	0.49	0.56	0.55	0.53	0.22	0.15	0.09	0.44	0.30	0.18	n/a	n/a	n/a
9	(229)	0.67	0.63	0.58	0.75	0.64	0.51	0.57	0.55	0.54	0.26	0.18	0.11	0.53	0.36	0.21	n/a	n/a	n/a
10	(254)	0.69	0.64	0.58	0.80	0.67	0.53	0.58	0.56	0.54	0.31	0.21	0.13	0.62	0.42	0.25	n/a	n/a	n/a
11	(279)	0.70	0.65	0.59	0.86	0.71	0.55	0.58	0.56	0.55	0.36	0.24	0.14	0.72	0.48	0.29	n/a	n/a	n/a
11-1/4	(286)	0.71	0.66	0.59	0.87	0.72	0.56	0.59	0.57	0.55	0.37	0.25	0.15	0.74	0.50	0.30	0.59	n/a	n/a
12	(305)	0.72	0.67	0.60	0.91	0.75	0.57	0.59	0.57	0.55	0.41	0.27	0.16	0.82	0.55	0.33	0.61	n/a	n/a
13	(330)	0.74	0.68	0.61	0.97	0.79	0.59	0.60	0.58	0.55	0.46	0.31	0.19	0.92	0.62	0.37	0.63	n/a	n/a
14	(356)	0.76	0.69	0.62	1.00	0.83	0.62	0.61	0.58	0.56	0.51	0.35	0.21	1.00	0.69	0.42	0.65	n/a	n/a
14-1/4	(362)	0.76	0.70	0.62		0.84	0.62	0.61	0.58	0.56	0.53	0.36	0.21		0.71	0.43	0.66	0.58	n/a
16	(406)	0.80	0.72	0.63		0.91	0.66	0.62	0.59	0.57	0.63	0.42	0.25		0.85	0.51	0.70	0.61	n/a
18	(457)	0.83	0.75	0.65		1.00	0.70	0.64	0.61	0.58	0.75	0.50	0.30		1.00	0.61	0.74	0.65	n/a
20	(508)	0.87	0.78	0.67			0.75	0.65	0.62	0.58	0.88	0.59	0.35			0.71	0.78	0.69	n/a
22	(559)	0.91	0.81	0.68			0.80	0.67	0.63	0.59	1.00	0.68	0.41			0.80	0.82	0.72	n/a
22-1/4	(565)	0.91	0.81	0.69			0.80	0.67	0.63	0.59		0.69	0.42			0.80	0.82	0.72	0.61
24	(610)	0.94	0.83	0.70			0.85	0.68	0.64	0.60		0.78	0.47			0.85	0.86	0.75	0.63
26	(660)	0.98	0.86	0.72			0.90	0.70	0.65	0.61		0.88	0.53			0.90	0.89	0.78	0.66
28	(711)	1.00	0.89	0.73			0.95	0.71	0.66	0.62		0.98	0.59			0.95	0.92	0.81	0.68
30	(762)		0.92	0.75			1.00	0.73	0.68	0.63		1.00	0.65			1.00	0.96	0.84	0.71
36	(914)		1.00	0.80				0.77	0.71	0.65			0.86				1.00	0.92	0.78
>48	(1219)			0.90				0.87	0.78	0.70			1.00					1.00	0.90

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

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Table 34 - Load adjustment factors for #9 rebar in uncracked concrete[1,2]

#9 Uncracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Embedment h_{ef}	in. (mm)	10-1/8 (257)	13-1/2 (343)	22-1/2 (572)	10-1/8 (257)	13-1/2 (343)	22-1/2 (572)	10-1/8 (257)	13-1/2 (343)	22-1/2 (572)	10-1/8 (257)	13-1/2 (343)	22-1/2 (572)	10-1/8 (257)	13-1/2 (343)	22-1/2 (572)	10-1/8 (257)	13-1/2 (343)	22-1/2 (572)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																			
1-3/4	(44)	n/a	n/a	n/a	0.22	0.16	0.10	n/a	n/a	n/a	0.02	0.01	0.01	0.04	0.02	0.01	n/a	n/a	n/a
5-5/8	(143)	0.59	0.57	0.54	0.31	0.22	0.13	0.54	0.53	0.52	0.11	0.07	0.03	0.22	0.14	0.07	n/a	n/a	n/a
6	(152)	0.60	0.57	0.54	0.31	0.23	0.14	0.54	0.53	0.52	0.12	0.08	0.04	0.24	0.16	0.07	n/a	n/a	n/a
7	(178)	0.62	0.59	0.55	0.34	0.25	0.15	0.55	0.54	0.52	0.15	0.10	0.05	0.30	0.20	0.09	n/a	n/a	n/a
7-1/4	(184)	0.62	0.59	0.55	0.34	0.25	0.15	0.55	0.54	0.52	0.16	0.10	0.05	0.32	0.21	0.10	n/a	n/a	n/a
8	(203)	0.63	0.60	0.56	0.36	0.27	0.16	0.55	0.54	0.52	0.18	0.12	0.06	0.37	0.24	0.11	n/a	n/a	n/a
9	(229)	0.65	0.61	0.57	0.39	0.28	0.17	0.56	0.55	0.53	0.22	0.14	0.07	0.40	0.29	0.13	n/a	n/a	n/a
10	(254)	0.66	0.62	0.57	0.41	0.30	0.18	0.57	0.55	0.53	0.26	0.17	0.08	0.42	0.33	0.16	n/a	n/a	n/a
11	(279)	0.68	0.64	0.58	0.44	0.32	0.19	0.57	0.56	0.53	0.30	0.19	0.09	0.45	0.37	0.18	n/a	n/a	n/a
12	(305)	0.70	0.65	0.59	0.47	0.34	0.20	0.58	0.56	0.54	0.34	0.22	0.10	0.47	0.39	0.20	n/a	n/a	n/a
12-7/8	(327)	0.71	0.66	0.60	0.49	0.36	0.21	0.59	0.57	0.54	0.38	0.24	0.11	0.50	0.40	0.23	0.59	n/a	n/a
13	(330)	0.71	0.66	0.60	0.50	0.36	0.21	0.59	0.57	0.54	0.38	0.25	0.12	0.50	0.41	0.23	0.59	n/a	n/a
14	(356)	0.73	0.67	0.60	0.53	0.39	0.23	0.59	0.57	0.54	0.43	0.28	0.13	0.53	0.43	0.26	0.61	n/a	n/a
16	(406)	0.76	0.70	0.62	0.60	0.44	0.26	0.61	0.58	0.55	0.52	0.34	0.16	0.60	0.46	0.31	0.66	n/a	n/a
16-1/4	(413)	0.77	0.70	0.62	0.61	0.44	0.26	0.61	0.58	0.55	0.53	0.35	0.16	0.61	0.47	0.32	0.66	0.57	n/a
18	(457)	0.80	0.72	0.63	0.67	0.49	0.29	0.62	0.59	0.55	0.62	0.40	0.19	0.67	0.51	0.36	0.70	0.60	n/a
20	(508)	0.83	0.75	0.65	0.75	0.55	0.32	0.63	0.60	0.56	0.73	0.47	0.22	0.75	0.55	0.38	0.73	0.64	n/a
22	(559)	0.86	0.77	0.66	0.82	0.60	0.35	0.65	0.61	0.57	0.84	0.55	0.25	0.82	0.60	0.40	0.77	0.67	n/a
24	(610)	0.90	0.80	0.68	0.89	0.66	0.38	0.66	0.62	0.57	0.96	0.62	0.29	0.89	0.66	0.42	0.80	0.70	n/a
25-1/4	(641)	0.92	0.81	0.69	0.94	0.69	0.40	0.67	0.63	0.58	1.00	0.67	0.31	0.94	0.69	0.44	0.83	0.71	0.55
26	(660)	0.93	0.82	0.69	0.97	0.71	0.42	0.68	0.63	0.58		0.70	0.33	0.97	0.71	0.45	0.84	0.73	0.56
28	(711)	0.96	0.85	0.71	1.00	0.77	0.45	0.69	0.64	0.59		0.78	0.36	1.00	0.77	0.47	0.87	0.75	0.58
30	(762)	0.99	0.87	0.72		0.82	0.48	0.70	0.65	0.59		0.87	0.40		0.82	0.49	0.90	0.78	0.60
36	(914)	1.00	0.94	0.77		0.99	0.58	0.74	0.68	0.61		1.00	0.53		0.99	0.58	0.99	0.85	0.66
>48	(1219)		1.00	0.86		1.00	0.77	0.82	0.74	0.65			0.82		1.00	0.77	1.00	0.99	0.76

Table 35 - Load adjustment factors for #9 rebar in cracked concrete[1,2]

#9 Cracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Embedment h_{ef}	in. (mm)	10-1/8 (257)	13-1/2 (343)	22-1/2 (572)	10-1/8 (257)	13-1/2 (343)	22-1/2 (572)	10-1/8 (257)	13-1/2 (343)	22-1/2 (572)	10-1/8 (257)	13-1/2 (343)	22-1/2 (572)	10-1/8 (257)	13-1/2 (343)	22-1/2 (572)	10-1/8 (257)	13-1/2 (343)	22-1/2 (572)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																			
1-3/4	(44)	n/a	n/a	n/a	0.41	0.39	0.38	n/a	n/a	n/a	0.02	0.01	0.01	0.04	0.02	0.01	n/a	n/a	n/a
5-5/8	(143)	0.59	0.57	0.54	0.56	0.50	0.44	0.54	0.53	0.52	0.11	0.07	0.04	0.22	0.14	0.08	n/a	n/a	n/a
6	(152)	0.60	0.57	0.54	0.57	0.51	0.44	0.54	0.53	0.52	0.12	0.08	0.05	0.24	0.16	0.09	n/a	n/a	n/a
7	(178)	0.62	0.59	0.55	0.61	0.54	0.46	0.55	0.54	0.52	0.15	0.10	0.06	0.30	0.20	0.12	n/a	n/a	n/a
7-1/4	(184)	0.62	0.59	0.55	0.62	0.55	0.46	0.55	0.54	0.53	0.16	0.10	0.06	0.32	0.21	0.12	n/a	n/a	n/a
8	(203)	0.63	0.60	0.56	0.65	0.57	0.48	0.55	0.54	0.53	0.19	0.12	0.07	0.37	0.24	0.14	n/a	n/a	n/a
9	(229)	0.65	0.61	0.57	0.70	0.60	0.49	0.56	0.55	0.53	0.22	0.14	0.08	0.44	0.29	0.17	n/a	n/a	n/a
10	(254)	0.66	0.62	0.57	0.74	0.63	0.51	0.57	0.55	0.54	0.26	0.17	0.10	0.52	0.34	0.20	n/a	n/a	n/a
11	(279)	0.68	0.64	0.58	0.79	0.67	0.53	0.57	0.56	0.54	0.30	0.19	0.11	0.60	0.39	0.23	n/a	n/a	n/a
12	(305)	0.70	0.65	0.59	0.84	0.70	0.55	0.58	0.56	0.54	0.34	0.22	0.13	0.68	0.44	0.26	n/a	n/a	n/a
12-7/8	(327)	0.71	0.66	0.60	0.88	0.73	0.56	0.59	0.57	0.55	0.38	0.25	0.14	0.76	0.49	0.29	0.59	n/a	n/a
13	(330)	0.71	0.66	0.60	0.89	0.73	0.56	0.59	0.57	0.55	0.39	0.25	0.15	0.77	0.50	0.29	0.59	n/a	n/a
14	(356)	0.73	0.67	0.60	0.94	0.77	0.58	0.60	0.57	0.55	0.43	0.28	0.16	0.86	0.56	0.33	0.62	n/a	n/a
16	(406)	0.76	0.70	0.62	1.00	0.84	0.62	0.61	0.58	0.56	0.53	0.34	0.20	1.00	0.68	0.40	0.66	n/a	n/a
16-1/4	(413)	0.77	0.70	0.62		0.85	0.63	0.61	0.58	0.56	0.54	0.35	0.20		0.70	0.41	0.66	0.58	n/a
18	(457)	0.80	0.72	0.63		0.91	0.66	0.62	0.59	0.56	0.63	0.41	0.24		0.82	0.48	0.70	0.61	n/a
20	(508)	0.83	0.75	0.65		0.99	0.70	0.64	0.60	0.57	0.73	0.48	0.28		0.95	0.56	0.74	0.64	n/a
22	(559)	0.86	0.77	0.66		1.00	0.74	0.65	0.61	0.58	0.85	0.55	0.32		1.00	0.64	0.77	0.67	n/a
24	(610)	0.90	0.80	0.68			0.78	0.66	0.62	0.59	0.97	0.63	0.37			0.73	0.81	0.70	n/a
25-1/4	(641)	0.92	0.81	0.69			0.81	0.67	0.63	0.59	1.00	0.68	0.40			0.79	0.83	0.72	0.60
26	(660)	0.93	0.82	0.69			0.82	0.68	0.63	0.59		0.71	0.41			0.82	0.84	0.73	0.61
28	(711)	0.96	0.85	0.71			0.87	0.69	0.64	0.60		0.79	0.46			0.87	0.87	0.76	0.63
30	(762)	0.99	0.87	0.72			0.91	0.70	0.65	0.61		0.88	0.51			0.91	0.90	0.78	0.65
36	(914)	1.00	0.94	0.77			1.00	0.74	0.68	0.63		1.00	0.67			1.00	0.99	0.86	0.72
>48	(1219)		1.00	0.86				0.83	0.74	0.67			1.00				1.00	0.99	0.83

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

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Table 36 - Load adjustment factors for #10 rebar in uncracked concrete [1,2]

#10 Uncracked concrete	Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Embedment h_{ef} in. (mm)	11-1/4 (286)	15 (381)	25 (635)	11-1/4 (286)	15 (381)	25 (635)	11-1/4 (286)	15 (381)	25 (635)	11-1/4 (286)	15 (381)	25 (635)	11-1/4 (286)	15 (381)	25 (635)	11-1/4 (286)	15 (381)	25 (635)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																		
1-3/4 (44)	n/a	n/a	n/a	0.22	0.16	0.09	n/a	n/a	n/a	0.02	0.01	0.00	0.03	0.02	0.01	n/a	n/a	n/a
6-1/4 (159)	0.59	0.57	0.54	0.31	0.22	0.13	0.54	0.53	0.52	0.11	0.07	0.03	0.22	0.14	0.07	n/a	n/a	n/a
7 (178)	0.60	0.58	0.55	0.32	0.24	0.14	0.54	0.53	0.52	0.13	0.08	0.04	0.26	0.17	0.08	n/a	n/a	n/a
8 (203)	0.62	0.59	0.55	0.34	0.25	0.15	0.55	0.54	0.52	0.16	0.10	0.05	0.31	0.20	0.10	n/a	n/a	n/a
9 (229)	0.63	0.60	0.56	0.36	0.27	0.16	0.55	0.54	0.52	0.19	0.12	0.06	0.37	0.24	0.11	n/a	n/a	n/a
10 (254)	0.65	0.61	0.57	0.39	0.28	0.17	0.56	0.55	0.53	0.22	0.14	0.07	0.39	0.29	0.13	n/a	n/a	n/a
11 (279)	0.66	0.62	0.57	0.41	0.30	0.18	0.57	0.55	0.53	0.25	0.16	0.08	0.42	0.33	0.15	n/a	n/a	n/a
12 (305)	0.68	0.63	0.58	0.43	0.32	0.19	0.57	0.55	0.53	0.29	0.19	0.09	0.44	0.36	0.17	n/a	n/a	n/a
13 (330)	0.69	0.64	0.59	0.46	0.34	0.20	0.58	0.56	0.54	0.33	0.21	0.10	0.47	0.38	0.20	n/a	n/a	n/a
14 (356)	0.71	0.66	0.59	0.48	0.36	0.21	0.59	0.56	0.54	0.36	0.24	0.11	0.49	0.40	0.22	n/a	n/a	n/a
14-1/4 (362)	0.71	0.66	0.60	0.49	0.36	0.21	0.59	0.56	0.54	0.37	0.24	0.11	0.50	0.40	0.23	0.59	n/a	n/a
15 (381)	0.72	0.67	0.60	0.51	0.37	0.22	0.59	0.57	0.54	0.40	0.26	0.12	0.52	0.42	0.24	0.60	n/a	n/a
16 (406)	0.74	0.68	0.61	0.54	0.39	0.23	0.60	0.57	0.54	0.45	0.29	0.13	0.54	0.43	0.27	0.62	n/a	n/a
17 (432)	0.75	0.69	0.61	0.57	0.42	0.24	0.60	0.58	0.55	0.49	0.32	0.15	0.57	0.45	0.29	0.64	n/a	n/a
18 (457)	0.77	0.70	0.62	0.60	0.44	0.26	0.61	0.58	0.55	0.53	0.35	0.16	0.60	0.47	0.32	0.66	0.57	n/a
20 (508)	0.80	0.72	0.63	0.67	0.49	0.29	0.62	0.59	0.55	0.62	0.40	0.19	0.67	0.51	0.36	0.70	0.60	n/a
22 (559)	0.83	0.74	0.65	0.74	0.54	0.32	0.63	0.60	0.56	0.72	0.47	0.22	0.74	0.54	0.38	0.73	0.63	n/a
24 (610)	0.86	0.77	0.66	0.80	0.59	0.35	0.65	0.61	0.57	0.82	0.53	0.25	0.80	0.59	0.40	0.76	0.66	n/a
26 (660)	0.89	0.79	0.67	0.87	0.64	0.37	0.66	0.62	0.57	0.92	0.60	0.28	0.87	0.64	0.42	0.79	0.69	n/a
28 (711)	0.91	0.81	0.69	0.94	0.69	0.40	0.67	0.63	0.58	1.00	0.67	0.31	0.94	0.69	0.44	0.82	0.71	0.55
30 (762)	0.94	0.83	0.70	1.00	0.74	0.43	0.68	0.64	0.58		0.74	0.35	1.00	0.74	0.46	0.85	0.74	0.57
36 (914)	1.00	0.90	0.74		0.89	0.52	0.72	0.66	0.60		0.98	0.45		0.89	0.52	0.94	0.81	0.63
>48 (1219)		1.00	0.82		1.00	0.69	0.79	0.72	0.63		1.00	0.70		1.00	0.69	1.00	0.94	0.72

Table 37 - Load adjustment factors for #10 rebar in cracked concrete [1,2]

#10 Cracked concrete	Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Embedment h_{ef} in. (mm)	11-1/4 (286)	15 (381)	25 (635)	11-1/4 (286)	15 (381)	25 (635)	11-1/4 (286)	15 (381)	25 (635)	11-1/4 (286)	15 (381)	25 (635)	11-1/4 (286)	15 (381)	25 (635)	11-1/4 (286)	15 (381)	25 (635)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																		
1-3/4 (44)	n/a	n/a	n/a	0.40	0.39	0.37	n/a	n/a	n/a	0.02	0.01	0.01	0.03	0.02	0.01	n/a	n/a	n/a
6-1/4 (159)	0.59	0.57	0.54	0.56	0.50	0.44	0.54	0.53	0.52	0.11	0.07	0.04	0.22	0.14	0.08	n/a	n/a	n/a
7 (178)	0.60	0.58	0.55	0.58	0.52	0.45	0.54	0.53	0.52	0.13	0.08	0.05	0.26	0.17	0.09	n/a	n/a	n/a
8 (203)	0.62	0.59	0.55	0.62	0.55	0.46	0.55	0.54	0.52	0.16	0.10	0.06	0.32	0.21	0.11	n/a	n/a	n/a
9 (229)	0.63	0.60	0.56	0.66	0.57	0.48	0.55	0.54	0.53	0.19	0.12	0.07	0.38	0.25	0.14	n/a	n/a	n/a
10 (254)	0.65	0.61	0.57	0.70	0.60	0.49	0.56	0.55	0.53	0.22	0.14	0.08	0.44	0.29	0.16	n/a	n/a	n/a
11 (279)	0.66	0.62	0.57	0.74	0.63	0.51	0.57	0.55	0.53	0.26	0.17	0.09	0.51	0.33	0.18	n/a	n/a	n/a
12 (305)	0.68	0.63	0.58	0.78	0.66	0.53	0.57	0.55	0.54	0.29	0.19	0.10	0.58	0.38	0.21	n/a	n/a	n/a
13 (330)	0.69	0.64	0.59	0.82	0.69	0.54	0.58	0.56	0.54	0.33	0.21	0.12	0.66	0.43	0.24	n/a	n/a	n/a
14 (356)	0.71	0.66	0.59	0.87	0.72	0.56	0.59	0.56	0.54	0.37	0.24	0.13	0.73	0.48	0.26	n/a	n/a	n/a
14-1/4 (362)	0.71	0.66	0.60	0.88	0.73	0.56	0.59	0.57	0.54	0.38	0.25	0.14	0.75	0.49	0.27	0.59	n/a	n/a
15 (381)	0.72	0.67	0.60	0.91	0.75	0.57	0.59	0.57	0.55	0.41	0.26	0.15	0.82	0.53	0.29	0.61	n/a	n/a
16 (406)	0.74	0.68	0.61	0.96	0.78	0.59	0.60	0.57	0.55	0.45	0.29	0.16	0.90	0.58	0.32	0.63	n/a	n/a
17 (432)	0.75	0.69	0.61	1.00	0.81	0.61	0.60	0.58	0.55	0.49	0.32	0.18	0.98	0.64	0.35	0.64	n/a	n/a
18 (457)	0.77	0.70	0.62		0.85	0.62	0.61	0.58	0.56	0.54	0.35	0.19	1.00	0.70	0.38	0.66	0.57	n/a
20 (508)	0.80	0.72	0.63		0.91	0.66	0.62	0.59	0.56	0.63	0.41	0.23		0.82	0.45	0.70	0.61	n/a
22 (559)	0.83	0.74	0.65		0.98	0.69	0.63	0.60	0.57	0.72	0.47	0.26		0.94	0.52	0.73	0.63	n/a
24 (610)	0.86	0.77	0.66		1.00	0.73	0.65	0.61	0.57	0.82	0.54	0.30		1.00	0.59	0.77	0.66	n/a
26 (660)	0.89	0.79	0.67			0.77	0.66	0.62	0.58	0.93	0.60	0.33			0.67	0.80	0.69	n/a
28 (711)	0.91	0.81	0.69			0.81	0.67	0.63	0.59	1.00	0.68	0.37			0.75	0.83	0.72	0.59
30 (762)	0.94	0.83	0.70			0.85	0.68	0.64	0.59		0.75	0.41			0.83	0.86	0.74	0.61
36 (914)	1.00	0.90	0.74			0.97	0.72	0.66	0.61		0.98	0.54			0.97	0.94	0.81	0.67
>48 (1219)		1.00	0.82			1.00	0.79	0.72	0.65		1.00	0.84			1.00	1.00	0.94	0.77

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

3.2.3.3 Hilti HIT-HY 200-AR Adhesive with Hilti HAS threaded rod

Figure 9 -HAS threaded rod installation conditions

Permissible concrete conditions	Uncracked concrete	Dry concrete	Permissible drilling method	Hammer drilling with carbide tipped drill bit
	Cracked concrete	Water saturated concrete		Hilti TE-CD or TE-YD Hollow Drill Bit

Table 38 - HAS threaded rod specifications

Setting information		Symbol	Units	Nominal rod diameter						
				3/8	1/2	5/8	3/4	7/8	1	1-1/4
Nominal bit diameter		d_o	in.	7/16	9/16	3/4	7/8	1	1-1/8	1-3/8
Standard effective embedment		$h_{ef,std}$	in.	3-3/8	4-1/2	5-5/8	6-3/4	7-7/8	9	11-1/4
			(mm)	(86)	(114)	(143)	(171)	(200)	(229)	(286)
Effective embedment	minimum	$h_{ef,min}$	in.	2-3/8	2-3/4	3-1/8	3-1/2	3-1/2	4	5
			(mm)	(60)	(70)	(79)	(89)	(89)	(102)	(127)
	maximum	$h_{ef,max}$	in.	7-1/2	10	12-1/2	15	17-1/2	20	25
			(mm)	(191)	(254)	(318)	(381)	(445)	(508)	(635)
Fixture hole diameter	through-set		in.	1/2	5/8	13/16[1]	15/16[1]	1-1/8[1]	1-1/4[1]	1-1/2[1]
Fixture hole diameter	preset		in.	7/16	9/16	11/16	13/16	15/16	1-1/8	1-3/8
Installation torque		T_{inst}	ft-lb	15	30	60	100	125	150	200
			(Nm)	(20)	(40)	(80)	(136)	(169)	(203)	(271)

1 Install using (2) washers. See Figure 11.

Figure 10 - HAS threaded rods

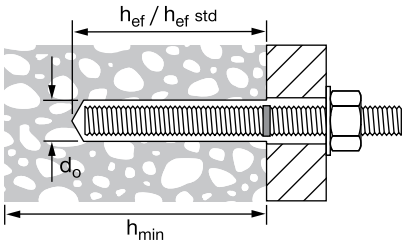

Figure 11 - Installation with (2) washers

HAS-E carbon steel threaded rod specifications

Carbon steel rods conform to ISO 898 class 5.8 with a minimum tensile strength of 72.5 ksi (500 MPa) and a minimum yield strength of 58 ksi (400 MPa).

HAS-E nuts conform to SAE J995 Grade 5.

HAS-E washers conform to ASTM F884, HV, and ANSI B18.22.1 Type A Plain.

HAS-E rod, nut and washer has an electroplated zinc coating conforming to ASTM B633, SC 1.

HAS Super high strength threaded rod specifications

Carbon steel rods manufactured from ASTM A193, Grade B7, with a minimum tensile strength of 125 ksi (862 MPa) and a minimum yield strength of 105 ksi (724 MPa).

HAS Super nuts conform to SAE J995 Grade 5.

HAS Super washers conform to ASTM F884, HV, and ANSI B18.22.1 Type A Plain.

HAS Super rods, nuts and washers, except the 7/8-in. diameter, have an electroplated zinc coating conforming to ASTM B633, SC1.

7/8-in. HAS Super rods, nuts and washers are hot-dip galvanized in accordance with ASTM A153.

HAS-R 304 stainless steel

3/8-, 1/2- and 5/8-in. rods manufactured from AISI Type 304 stainless steel with a minimum tensile strength of 100 ksi (689 MPa) and a minimum yield strength of 65 ksi (448 MPa).

3/4-, 1- and 1 1/4-in. rods are manufactured from AISI Type 304 stainless steel conforming to ASTM F593 Condition CW or cold worked.

AISI Type 304 stainless steel nuts conform to ASTM F594.

AISI Type 304 stainless steel washers conform to ASTM A240 and ANSI B18.22.1 Type A Plain.

HAS-R 316 stainless steel

3/8-, 1/2- and 5/8-in. rods manufactured from AISI Type 316 stainless steel with a minimum tensile strength of 100 ksi (689 MPa) and a minimum yield strength of 65 ksi (448 MPa).

3/4-, 1- and 1 1/4-in. rods are manufactured from AISI Type 316 stainless steel conforming to ASTM F593 Condition CW.

AISI Type 316 stainless steel nuts conform to ASTM F594.

AISI Type 316 stainless steel washers conform to ASTM A240 and ANSI B18.22.1 Type A Plain.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 39 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for threaded rod in uncracked concrete [1,2,3,4,5,6,7,8]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension — ΦN_n or N_r				Shear — ΦV_n or V_r			
		f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)	f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)
3/8	2-3/8 (60)	2,855 (12.7)	3,125 (13.9)	3,415 (15.2)	3,620 (16.1)	3,075 (13.7)	3,370 (15.0)	3,680 (16.4)	3,900 (17.3)
	3-3/8 (86)	4,835 (21.5)	4,855 (21.6)	4,855 (21.6)	5,150 (22.9)	10,415 (46.3)	10,460 (46.5)	10,460 (46.5)	11,085 (49.3)
	4-1/2 (114)	6,475 (28.8)	6,475 (28.8)	6,475 (28.8)	6,865 (30.5)	13,945 (62.0)	13,945 (62.0)	13,945 (62.0)	14,785 (65.8)
	7-1/2 (191)	10,790 (48.0)	10,790 (48.0)	10,790 (48.0)	11,440 (50.9)	23,245 (103.4)	23,245 (103.4)	23,245 (103.4)	24,640 (109.6)
1/2	2-3/4 (70)	3,555 (15.8)	3,895 (17.3)	4,500 (20.0)	5,510 (24.5)	7,660 (34.1)	8,395 (37.3)	9,690 (43.1)	11,870 (52.8)
	4-1/2 (114)	7,445 (33.1)	8,155 (36.3)	8,635 (38.4)	9,150 (40.7)	16,035 (71.3)	17,570 (78.2)	18,595 (82.7)	19,710 (87.7)
	6 (152)	11,465 (51.0)	11,510 (51.2)	11,510 (51.2)	12,200 (54.3)	24,690 (109.8)	24,795 (110.3)	24,795 (110.3)	26,280 (116.9)
	10 (254)	19,185 (85.3)	19,185 (85.3)	19,185 (85.3)	20,335 (90.5)	41,320 (183.8)	41,320 (183.8)	41,320 (183.8)	43,800 (194.8)
5/8	3-1/8 (79)	4,310 (19.2)	4,720 (21.0)	5,450 (24.2)	6,675 (29.7)	9,280 (41.3)	10,165 (45.2)	11,740 (52.2)	14,380 (64.0)
	5-5/8 (143)	10,405 (46.3)	11,400 (50.7)	13,165 (58.6)	14,300 (63.6)	22,415 (99.7)	24,550 (109.2)	28,350 (126.1)	30,795 (137.0)
	7-1/2 (191)	16,020 (71.3)	17,550 (78.1)	17,985 (80.0)	19,065 (84.8)	34,505 (153.5)	37,800 (168.1)	38,740 (172.3)	41,065 (182.7)
	12-1/2 (318)	29,975 (133.3)	29,975 (133.3)	29,975 (133.3)	31,775 (141.3)	64,565 (287.2)	64,565 (287.2)	64,565 (287.2)	68,440 (304.4)
3/4	3-1/2 (89)	5,105 (22.7)	5,595 (24.9)	6,460 (28.7)	7,910 (35.2)	11,000 (48.9)	12,050 (53.6)	13,915 (61.9)	17,040 (75.8)
	6-3/4 (171)	13,680 (60.9)	14,985 (66.7)	17,305 (77.0)	20,590 (91.6)	29,460 (131.0)	32,275 (143.6)	37,265 (165.8)	44,350 (197.3)
	9 (229)	21,060 (93.7)	23,070 (102.6)	25,900 (115.2)	27,455 (122.1)	45,360 (201.8)	49,690 (221.0)	55,785 (248.1)	59,130 (263.0)
	15 (381)	43,165 (192.0)	43,165 (192.0)	43,165 (192.0)	45,755 (203.5)	92,975 (413.6)	92,975 (413.6)	92,975 (413.6)	98,550 (438.4)
7/8	3-1/2 (89)	5,105 (22.7)	5,595 (24.9)	6,460 (28.7)	7,910 (35.2)	11,000 (48.9)	12,050 (53.6)	13,915 (61.9)	17,040 (75.8)
	7-7/8 (200)	17,235 (76.7)	18,885 (84.0)	21,805 (97.0)	26,705 (118.8)	37,125 (165.1)	40,670 (180.9)	46,960 (208.9)	57,515 (255.8)
	10-1/2 (267)	26,540 (118.1)	29,070 (129.3)	33,570 (149.3)	37,365 (166.2)	57,160 (254.3)	62,615 (278.5)	72,300 (321.6)	80,485 (358.0)
	17-1/2 (445)	57,100 (254.0)	58,755 (261.4)	58,755 (261.4)	62,280 (277.0)	122,990 (547.1)	126,545 (562.9)	126,545 (562.9)	134,140 (596.7)
1	4 (102)	6,240 (27.8)	6,835 (30.4)	7,895 (35.1)	9,665 (43.0)	13,440 (59.8)	14,725 (65.5)	17,000 (75.6)	20,820 (92.6)
	9 (229)	21,060 (93.7)	23,070 (102.6)	26,640 (118.5)	32,625 (145.1)	45,360 (201.8)	49,690 (221.0)	57,375 (255.2)	70,270 (312.6)
	12 (305)	32,425 (144.2)	35,520 (158.0)	41,015 (182.4)	48,805 (217.1)	69,835 (310.6)	76,500 (340.3)	88,335 (392.9)	105,120 (467.6)
	20 (508)	69,765 (310.3)	76,425 (340.0)	76,740 (341.4)	81,345 (361.8)	150,265 (668.4)	164,605 (732.2)	165,285 (735.2)	175,205 (779.3)
1-1/4	5 (127)	8,720 (38.8)	9,555 (42.5)	11,030 (49.1)	13,510 (60.1)	18,785 (83.6)	20,575 (91.5)	23,760 (105.7)	29,100 (129.4)
	11-1/4 (286)	29,430 (130.9)	32,240 (143.4)	37,230 (165.6)	45,595 (202.8)	63,395 (282.0)	69,445 (308.9)	80,185 (356.7)	98,205 (436.8)
	15 (381)	45,315 (201.6)	49,640 (220.8)	57,320 (255.0)	70,200 (312.3)	97,600 (434.1)	106,915 (475.6)	123,455 (549.2)	151,200 (672.6)
	25 (635)	97,500 (433.7)	106,805 (475.1)	119,905 (533.4)	127,100 (565.4)	210,000 (934.1)	230,045 (1023.3)	258,260 (1148.8)	273,755 (1217.7)

1 See section 3.1.7 for explanation on development of load values.
2 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Apply spacing, edge distance, and concrete thickness factors in tables 42 - 55 as necessary. Compare to the steel values in table 41. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 104° F (40° C), max. long term temperature = 75° F (24° C).
For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 122° F (50° C) multiply above value by 0.80.
For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above value by 0.70.
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 saturated concrete multiply design strength (factored resistance) by 0.85.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.7.5.
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.

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Table 40 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for threaded rod in cracked concrete [1,2,3,4,5,6,7,8,9]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension — ΦN_n or N_r				Shear — ΦV_n or V_r			
		f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)	f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)
3/8	2-3/8 (60)	1,900 (8.5)	1,900 (8.5)	1,900 (8.5)	2,015 (9.0)	2,045 (9.1)	2,045 (9.1)	2,045 (9.1)	2,165 (9.6)
	3-3/8 (86)	2,700 (12.0)	2,700 (12.0)	2,700 (12.0)	2,860 (12.7)	5,810 (25.8)	5,810 (25.8)	5,810 (25.8)	6,160 (27.4)
	4-1/2 (114)	3,600 (16.0)	3,600 (16.0)	3,600 (16.0)	3,815 (17.0)	7,750 (34.5)	7,750 (34.5)	7,750 (34.5)	8,215 (36.5)
	7-1/2 (191)	5,995 (26.7)	5,995 (26.7)	5,995 (26.7)	6,355 (28.3)	12,915 (57.4)	12,915 (57.4)	12,915 (57.4)	13,690 (60.9)
1/2	2-3/4 (70)	2,520 (11.2)	2,760 (12.3)	2,950 (13.1)	3,130 (13.9)	5,425 (24.1)	5,945 (26.4)	6,355 (28.3)	6,735 (30.0)
	4-1/2 (114)	4,830 (21.5)	4,830 (21.5)	4,830 (21.5)	5,120 (22.8)	10,400 (46.3)	10,400 (46.3)	10,400 (46.3)	11,025 (49.0)
	6 (152)	6,440 (28.6)	6,440 (28.6)	6,440 (28.6)	6,825 (30.4)	13,870 (61.7)	13,870 (61.7)	13,870 (61.7)	14,700 (65.4)
	10 (254)	10,730 (47.7)	10,730 (47.7)	10,730 (47.7)	11,375 (50.6)	23,115 (102.8)	23,115 (102.8)	23,115 (102.8)	24,500 (109.0)
5/8	3-1/8 (79)	3,050 (13.6)	3,345 (14.9)	3,860 (17.2)	4,470 (19.9)	6,575 (29.2)	7,200 (32.0)	8,315 (37.0)	9,625 (42.8)
	5-5/8 (143)	7,370 (32.8)	7,590 (33.8)	7,590 (33.8)	8,045 (35.8)	15,875 (70.6)	16,345 (72.7)	16,345 (72.7)	17,325 (77.1)
	7-1/2 (191)	10,120 (45.0)	10,120 (45.0)	10,120 (45.0)	10,725 (47.7)	21,790 (96.9)	21,790 (96.9)	21,790 (96.9)	23,100 (102.8)
	12-1/2 (318)	16,865 (75.0)	16,865 (75.0)	16,865 (75.0)	17,875 (79.5)	36,320 (161.6)	36,320 (161.6)	36,320 (161.6)	38,500 (171.3)
3/4	3-1/2 (89)	3,620 (16.1)	3,965 (17.6)	4,575 (20.4)	5,605 (24.9)	7,790 (34.7)	8,535 (38.0)	9,855 (43.8)	12,070 (53.7)
	6-3/4 (171)	9,690 (43.1)	10,615 (47.2)	10,980 (48.8)	11,635 (51.8)	20,870 (92.8)	22,860 (101.7)	23,645 (105.2)	25,065 (111.5)
	9 (229)	14,640 (65.1)	14,640 (65.1)	14,640 (65.1)	15,515 (69.0)	31,530 (140.3)	31,530 (140.3)	31,530 (140.3)	33,420 (148.7)
	15 (381)	24,395 (108.5)	24,395 (108.5)	24,395 (108.5)	25,860 (115.0)	52,550 (233.8)	52,550 (233.8)	52,550 (233.8)	55,700 (247.8)
7/8	3-1/2 (89)	3,620 (16.1)	3,965 (17.6)	4,575 (20.4)	5,605 (24.9)	7,790 (34.7)	8,535 (38.0)	9,855 (43.8)	12,070 (53.7)
	7-7/8 (200)	12,210 (54.3)	12,665 (56.3)	12,665 (56.3)	13,425 (59.7)	26,300 (117.0)	27,275 (121.3)	27,275 (121.3)	28,910 (128.6)
	10-1/2 (267)	16,885 (75.1)	16,885 (75.1)	16,885 (75.1)	17,900 (79.6)	36,370 (161.8)	36,370 (161.8)	36,370 (161.8)	38,550 (171.5)
	17-1/2 (445)	28,140 (125.2)	28,140 (125.2)	28,140 (125.2)	29,830 (132.7)	60,615 (269.6)	60,615 (269.6)	60,615 (269.6)	64,250 (285.8)
1	4 (102)	4,420 (19.7)	4,840 (21.5)	5,590 (24.9)	6,845 (30.4)	9,520 (42.3)	10,430 (46.4)	12,040 (53.6)	14,750 (65.6)
	9 (229)	14,920 (66.4)	16,340 (72.7)	16,615 (73.9)	17,610 (78.3)	32,130 (142.9)	35,195 (156.6)	35,785 (159.2)	37,930 (168.7)
	12 (305)	22,150 (98.5)	22,150 (98.5)	22,150 (98.5)	23,480 (104.4)	47,710 (212.2)	47,710 (212.2)	47,710 (212.2)	50,575 (225.0)
	20 (508)	36,920 (164.2)	36,920 (164.2)	36,920 (164.2)	39,135 (174.1)	79,520 (353.7)	79,520 (353.7)	79,520 (353.7)	84,290 (374.9)
1-1/4	5 (127)	6,175 (27.5)	6,765 (30.1)	7,815 (34.8)	9,570 (42.6)	13,305 (59.2)	14,575 (64.8)	16,830 (74.9)	20,610 (91.7)
	11-1/4 (286)	20,850 (92.7)	22,840 (101.6)	26,130 (116.2)	27,700 (123.2)	44,905 (199.7)	49,190 (218.8)	56,285 (250.4)	59,660 (265.4)
	15 (381)	32,095 (142.8)	34,840 (155.0)	34,840 (155.0)	36,935 (164.3)	69,135 (307.5)	75,045 (333.8)	75,045 (333.8)	79,545 (353.8)
	25 (635)	58,070 (258.3)	58,070 (258.3)	58,070 (258.3)	61,555 (273.8)	125,075 (556.4)	125,075 (556.4)	125,075 (556.4)	132,580 (589.7)

1 See section 3.1.7 for explanation on development of load values.
2 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Apply spacing, edge distance, and concrete thickness factors in tables 42 - 55 as necessary. Compare to the steel values in table 41. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 104° F (40° C), max. long term temperature = 75° F (24° C).
For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 122° F (50° C) multiply above value by 0.80.
For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above value by 0.70.
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 saturated concrete multiply design strength (factored resistance) by 0.85.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.7.5.
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 static loads only. For seismic loads, multiply cracked concrete tabular values by the following reduction factors:
3/8-in to 3/4-in diameter - α_{seis} = 0.60
7/8-in to 1-1/4-in diameter - α_{seis} = 0.75
See section 3.1.7.4 for additional information on seismic applications.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 41 - Steel design strength for Hilti HAS threaded rods [3]

Nominal anchor diameter in.	HAS-E [5]			HAS Super ASTM A193 B7 [5]			HAS SS AISI 304/316 SS [5]		
	Tensile[1] ϕN_{sa} lb (kN)	Shear[2] ϕV_{sa} lb (kN)	$\alpha_{seis,V}$ [4]	Tensile[1] ϕN_{sa} lb (kN)	Shear[2] ϕV_{sa} lb (kN)	$\alpha_{seis,V}$ [4]	Tensile[1] ϕN_{sa} lb (kN)	Shear[2] ϕV_{sa} lb (kN)	$\alpha_{seis,V}$ [4]
3/8	3,655 (16.3)	1,685 (7.5)	0.7	7,265 (32.3)	3,150 (14.0)	0.7	5,040 (22.4)	2,325 (10.3)	0.7
1/2	6,690 (29.8)	3,705 (16.5)	0.7	13,300 (59.2)	6,915 (30.8)	0.7	9,225 (41.0)	5,110 (22.7)	0.7
5/8	10,650 (47.4)	5,900 (26.2)	0.7	21,190 (94.3)	11,020 (49.0)	0.7	14,690 (65.3)	8,135 (36.2)	0.7
3/4	15,765 (70.1)	8,730 (38.8)	0.7	31,360 (139.5)	16,305 (72.5)	0.7	18,480 (82.2)	10,235 (45.5)	0.7
7/8	21,755 (96.8)	12,050 (53.6)	0.7	43,285 (192.5)	22,505 (100.1)	0.7	25,510 (113.5)	14,125 (62.8)	0.7
1	28,540 (127.0)	15,805 (70.3)	0.7	56,785 (252.6)	29,525 (131.3)	0.7	33,465 (148.9)	18,535 (82.4)	0.7
1-1/4	45,670 (203.1)	25,295 (112.5)	0.7	90,850 (404.1)	47,240 (210.1)	0.7	53,540 (238.2)	29,655 (131.9)	0.7

1 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318 Appendix D
2 Shear = ϕ 0.60 $A_{se,N} f_{uta}$ as noted in ACI 318 Appendix D
3 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.
4 Reduction factor for seismic shear only. See section 3.1.7.4 for additional information on seismic applications.
5 HAS Super rods are considered ductile steel elements. HAS standard-E and HAS SS rods are considered brittle steel elements.

HIT-HY 200 Adhesive Anchoring System 3.2.3

Table 42 - Load adjustment factors for 3/8-in. diameter threaded rods in uncracked concrete[1,2,3]

3/8-in. uncracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.37	0.30	0.22	0.13	n/a	n/a	n/a	n/a	0.23	0.07	0.05	0.03	0.44	0.14	0.11	0.06	n/a	n/a	n/a	n/a
1-7/8 (48)	0.59	0.59	0.57	0.54	0.38	0.31	0.23	0.13	0.57	0.53	0.53	0.52	0.25	0.08	0.06	0.04	0.38	0.16	0.12	0.07	n/a	n/a	n/a	n/a
2 (51)	0.60	0.60	0.57	0.54	0.40	0.32	0.23	0.14	0.57	0.53	0.53	0.52	0.28	0.09	0.06	0.04	0.40	0.17	0.13	0.08	n/a	n/a	n/a	n/a
3 (76)	0.65	0.65	0.61	0.57	0.51	0.39	0.28	0.17	0.61	0.55	0.54	0.53	0.51	0.16	0.12	0.07	0.51	0.32	0.24	0.14	n/a	n/a	n/a	n/a
3-5/8 (92)	0.68	0.68	0.63	0.58	0.60	0.44	0.32	0.19	0.63	0.56	0.55	0.53	0.68	0.21	0.16	0.09	0.60	0.42	0.32	0.19	0.72	n/a	n/a	n/a
4 (102)	0.69	0.69	0.65	0.59	0.66	0.47	0.34	0.20	0.64	0.57	0.55	0.54	0.79	0.24	0.18	0.11	0.66	0.47	0.37	0.22	0.75	n/a	n/a	n/a
4-5/8 (117)	0.72	0.72	0.67	0.60	0.76	0.52	0.38	0.22	0.66	0.58	0.56	0.54	0.98	0.30	0.23	0.14	0.76	0.52	0.41	0.27	0.81	0.55	n/a	n/a
5 (127)	0.74	0.74	0.69	0.61	0.82	0.55	0.40	0.23	0.68	0.58	0.57	0.55	1.00	0.34	0.26	0.15	0.82	0.55	0.43	0.31	0.84	0.57	n/a	n/a
5-3/4 (146)	0.78	0.78	0.71	0.63	0.95	0.63	0.46	0.27	0.70	0.59	0.58	0.55		0.42	0.31	0.19	0.95	0.63	0.48	0.34	0.91	0.61	0.56	n/a
6 (152)	0.79	0.79	0.72	0.63	0.99	0.66	0.48	0.28	0.71	0.60	0.58	0.56		0.45	0.34	0.20	0.99	0.66	0.49	0.34	0.92	0.63	0.57	n/a
7 (178)	0.84	0.84	0.76	0.66	1.00	0.77	0.56	0.32	0.75	0.61	0.59	0.57		0.57	0.42	0.25	1.00	0.77	0.56	0.37	1.00	0.68	0.61	n/a
8 (203)	0.89	0.89	0.80	0.68		0.88	0.64	0.37	0.79	0.63	0.61	0.58		0.69	0.52	0.31		0.88	0.64	0.41	1.00	0.72	0.66	n/a
8-3/4 (222)	0.93	0.93	0.82	0.69		0.96	0.70	0.41	0.81	0.64	0.62	0.58		0.79	0.59	0.35		0.96	0.70	0.43		0.76	0.69	0.58
9 (229)	0.94	0.94	0.83	0.70		0.99	0.72	0.42	0.82	0.65	0.62	0.59		0.83	0.62	0.37		0.99	0.72	0.44		0.77	0.69	0.59
10 (254)	0.99	0.99	0.87	0.72		1.00	0.80	0.46	0.86	0.66	0.63	0.60		0.97	0.72	0.43		1.00	0.80	0.48		0.81	0.73	0.62
11 (279)	1.00	1.00	0.91	0.74			0.88	0.51	0.89	0.68	0.65	0.60		1.00	0.83	0.50			0.88	0.51		0.85	0.77	0.65
12 (305)			0.94	0.77			0.96	0.56	0.93	0.70	0.66	0.61			0.95	0.57			0.96	0.56		0.88	0.80	0.68
14 (356)			1.00	0.81			1.00	0.65	1.00	0.73	0.69	0.63			1.00	0.72			1.00	0.65		0.96	0.87	0.73
16 (406)				0.86				0.74	1.00	0.76	0.71	0.65				0.88				0.74		1.00	0.93	0.78
18 (457)				0.90				0.83		0.79	0.74	0.67				1.00				0.83			0.98	0.83
24 (610)				1.00				1.00		0.89	0.82	0.73								1.00			1.00	0.96
30 (762)										0.99	0.90	0.79												1.00
36 (914)										1.00	0.98	0.84												
>48 (1219)											1.00	0.96												

Table 43 - Load adjustment factors for 3/8-in. diameter threaded rods in cracked concrete[1,2,3]

3/8-in. cracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.54	0.54	0.49	0.43	n/a	n/a	n/a	n/a	0.25	0.09	0.07	0.04	0.49	0.18	0.14	0.08	n/a	n/a	n/a	n/a
1-7/8 (48)	0.59	0.59	0.57	0.54	0.55	0.55	0.50	0.44	0.57	0.54	0.53	0.52	0.27	0.10	0.08	0.05	0.55	0.20	0.15	0.09	n/a	n/a	n/a	n/a
2 (51)	0.60	0.60	0.57	0.54	0.57	0.57	0.51	0.44	0.57	0.54	0.53	0.52	0.30	0.11	0.08	0.05	0.60	0.22	0.17	0.10	n/a	n/a	n/a	n/a
3 (76)	0.65	0.65	0.61	0.57	0.69	0.69	0.60	0.49	0.61	0.56	0.55	0.53	0.55	0.20	0.15	0.09	0.88	0.41	0.30	0.18	n/a	n/a	n/a	n/a
3-5/8 (92)	0.68	0.68	0.63	0.58	0.78	0.78	0.66	0.53	0.64	0.57	0.56	0.54	0.73	0.27	0.20	0.12	1.00	0.54	0.41	0.24	0.74	n/a	n/a	n/a
4 (102)	0.69	0.69	0.65	0.59	0.83	0.83	0.70	0.55	0.65	0.58	0.56	0.55	0.85	0.31	0.23	0.14		0.63	0.47	0.28	0.77	n/a	n/a	n/a
4-5/8 (117)	0.72	0.72	0.67	0.60	0.92	0.92	0.76	0.58	0.67	0.59	0.57	0.55	1.00	0.39	0.29	0.18		0.78	0.58	0.35	0.83	0.60	n/a	n/a
5 (127)	0.74	0.74	0.69	0.61	0.98	0.98	0.80	0.60	0.69	0.60	0.58	0.56		0.44	0.33	0.20		0.87	0.66	0.39	0.86	0.62	n/a	n/a
5-3/4 (146)	0.78	0.78	0.71	0.63	1.00	1.00	0.88	0.64	0.71	0.61	0.59	0.56		0.54	0.40	0.24		1.00	0.81	0.49	0.93	0.66	0.60	n/a
6 (152)	0.79	0.79	0.72	0.63			0.91	0.66	0.72	0.62	0.60	0.57		0.58	0.43	0.26			0.86	0.52	0.95	0.68	0.62	n/a
7 (178)	0.84	0.84	0.76	0.66			1.00	0.72	0.76	0.63	0.61	0.58		0.72	0.54	0.33			1.00	0.65	1.00	0.73	0.67	n/a
8 (203)	0.89	0.89	0.80	0.68				0.78	0.80	0.65	0.63	0.59		0.89	0.66	0.40				0.78		0.78	0.71	n/a
8-3/4 (222)	0.93	0.93	0.82	0.69				0.83	0.83	0.67	0.64	0.60		1.00	0.76	0.46				0.83		0.82	0.74	0.63
9 (229)	0.94	0.94	0.83	0.70				0.85	0.84	0.67	0.64	0.60			0.79	0.48				0.85		0.83	0.76	0.64
10 (254)	0.99	0.99	0.87	0.72				0.91	0.87	0.69	0.66	0.61			0.93	0.56				0.91		0.88	0.80	0.67
11 (279)	1.00	1.00	0.91	0.74				0.98	0.91	0.71	0.67	0.62			1.00	0.64				0.98		0.92	0.84	0.70
12 (305)			0.94	0.77				1.00	0.95	0.73	0.69	0.64				0.73				1.00		0.96	0.87	0.74
14 (356)			1.00	0.81					1.00	0.77	0.72	0.66				0.92						1.00	0.94	0.79
16 (406)				0.86						0.81	0.75	0.68				1.00							1.00	0.85
18 (457)				0.90						0.85	0.79	0.70												0.90
24 (610)				1.00						0.96	0.88	0.77												1.00
30 (762)										1.00	0.98	0.84												
36 (914)											1.00	0.91												
>48 (1219)												1.00												

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d ≤ s ≤ 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 44 - Load adjustment factors for 1/2-in. diameter threaded rods in uncracked concrete[1,2,3]

1/2-in. uncracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	2-3/4 (70)	4-1/2 (114)	6 (152)	10 (254)	2-3/4 (70)	4-1/2 (114)	6 (152)	10 (254)	2-3/4 (70)	4-1/2 (114)	6 (152)	10 (254)	2-3/4 (70)	4-1/2 (114)	6 (152)	10 (254)	2-3/4 (70)	4-1/2 (114)	6 (152)	10 (254)	2-3/4 (70)	4-1/2 (114)	6 (152)	10 (254)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.34	0.26	0.20	0.11	n/a	n/a	n/a	n/a	0.10	0.05	0.03	0.02	0.21	0.11	0.07	0.04	n/a	n/a	n/a	n/a
2-1/2 (64)	0.59	0.59	0.57	0.54	0.40	0.30	0.22	0.13	0.55	0.53	0.53	0.52	0.18	0.09	0.06	0.04	0.35	0.18	0.12	0.07	n/a	n/a	n/a	n/a
3 (76)	0.61	0.61	0.58	0.55	0.45	0.32	0.24	0.14	0.56	0.54	0.53	0.52	0.23	0.12	0.08	0.05	0.45	0.24	0.15	0.09	n/a	n/a	n/a	n/a
4 (102)	0.65	0.65	0.61	0.57	0.56	0.38	0.28	0.16	0.58	0.55	0.54	0.53	0.36	0.18	0.12	0.07	0.56	0.37	0.24	0.14	0.58	n/a	n/a	n/a
5 (127)	0.68	0.68	0.64	0.58	0.69	0.43	0.32	0.19	0.60	0.57	0.55	0.54	0.50	0.26	0.17	0.10	0.69	0.43	0.33	0.20	0.65	n/a	n/a	n/a
5-3/4 (146)	0.71	0.71	0.66	0.60	0.80	0.48	0.35	0.21	0.62	0.58	0.56	0.54	0.61	0.32	0.21	0.12	0.80	0.48	0.39	0.25	0.69	0.56	n/a	n/a
6 (152)	0.72	0.72	0.67	0.60	0.83	0.49	0.36	0.21	0.63	0.58	0.56	0.54	0.65	0.34	0.22	0.13	0.83	0.49	0.40	0.26	0.71	0.57	n/a	n/a
7 (178)	0.76	0.76	0.69	0.62	0.97	0.56	0.41	0.24	0.65	0.59	0.57	0.55	0.82	0.42	0.28	0.16	0.97	0.56	0.44	0.32	0.77	0.61	n/a	n/a
7-1/4 (184)	0.76	0.76	0.70	0.62	1.00	0.58	0.43	0.25	0.65	0.60	0.57	0.55	0.87	0.45	0.29	0.17	1.00	0.58	0.45	0.32	0.78	0.62	0.54	n/a
8 (203)	0.79	0.79	0.72	0.63		0.64	0.47	0.27	0.67	0.61	0.58	0.56	1.00	0.52	0.34	0.20		0.64	0.48	0.34	0.82	0.66	0.57	n/a
9 (229)	0.83	0.83	0.75	0.65		0.72	0.53	0.31	0.69	0.62	0.59	0.56		0.62	0.40	0.24		0.72	0.53	0.36	0.87	0.70	0.60	n/a
10 (254)	0.86	0.86	0.78	0.67		0.80	0.59	0.34	0.71	0.63	0.60	0.57		0.72	0.47	0.28		0.80	0.59	0.39	0.92	0.73	0.64	n/a
11-1/4 (286)	0.91	0.91	0.81	0.69		0.90	0.66	0.39	0.74	0.65	0.61	0.58		0.86	0.56	0.34		0.90	0.66	0.42	0.97	0.78	0.67	0.57
12 (305)	0.94	0.94	0.83	0.70		0.96	0.70	0.41	0.75	0.66	0.62	0.59		0.95	0.62	0.37		0.96	0.70	0.44	1.00	0.80	0.70	0.59
14 (356)	1.00	1.00	0.89	0.73		1.00	0.82	0.48	0.79	0.69	0.64	0.60		1.00	0.78	0.47		1.00	0.82	0.49		0.87	0.75	0.63
16 (406)			0.94	0.77			0.94	0.55	0.83	0.72	0.66	0.61			0.95	0.57			0.94	0.55		0.93	0.80	0.68
18 (457)			1.00	0.80			1.00	0.62	0.88	0.74	0.68	0.63			1.00	0.68			1.00	0.62		0.98	0.85	0.72
20 (508)				0.83				0.69	0.92	0.77	0.70	0.64				0.80				0.69		1.00	0.90	0.76
22 (559)				0.87				0.76	0.96	0.80	0.72	0.66				0.92				0.76			0.94	0.79
24 (610)				0.90				0.82	1.00	0.82	0.74	0.67				1.00				0.82			0.98	0.83
30 (762)				1.00				1.00		0.90	0.80	0.71								1.00			1.00	0.93
36 (914)										0.98	0.86	0.76												1.00
>48 (1219)										1.00	0.98	0.84												

Table 45 - Load adjustment factors for 1/2-in. diameter threaded rods in cracked concrete[1,2,3]

1/2-in. cracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	2-3/4 (70)	4-1/2 (114)	6 (152)	10 (254)	2-3/4 (70)	4-1/2 (114)	6 (152)	10 (254)	2-3/4 (70)	4-1/2 (114)	6 (152)	10 (254)	2-3/4 (70)	4-1/2 (114)	6 (152)	10 (254)	2-3/4 (70)	4-1/2 (114)	6 (152)	10 (254)	2-3/4 (70)	4-1/2 (114)	6 (152)	10 (254)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.49	0.49	0.45	0.41	n/a	n/a	n/a	n/a	0.10	0.06	0.04	0.03	0.21	0.12	0.09	0.05	n/a	n/a	n/a	n/a
2-1/2 (64)	0.59	0.59	0.57	0.54	0.55	0.55	0.50	0.44	0.55	0.54	0.53	0.52	0.18	0.10	0.07	0.04	0.35	0.20	0.15	0.09	n/a	n/a	n/a	n/a
3 (76)	0.61	0.61	0.58	0.55	0.60	0.60	0.53	0.46	0.56	0.54	0.54	0.53	0.23	0.13	0.10	0.06	0.47	0.26	0.20	0.12	n/a	n/a	n/a	n/a
4 (102)	0.65	0.65	0.61	0.57	0.69	0.69	0.60	0.49	0.58	0.56	0.55	0.53	0.36	0.20	0.15	0.09	0.72	0.40	0.30	0.18	0.58	n/a	n/a	n/a
5 (127)	0.68	0.68	0.64	0.58	0.79	0.79	0.67	0.53	0.61	0.57	0.56	0.54	0.50	0.28	0.21	0.13	1.00	0.56	0.42	0.25	0.65	n/a	n/a	n/a
5-3/4 (146)	0.71	0.71	0.66	0.60	0.88	0.88	0.73	0.56	0.62	0.58	0.57	0.55	0.62	0.35	0.26	0.16		0.70	0.52	0.31	0.70	0.57	n/a	n/a
6 (152)	0.72	0.72	0.67	0.60	0.90	0.90	0.75	0.57	0.63	0.59	0.57	0.55	0.66	0.37	0.28	0.17		0.74	0.56	0.33	0.71	0.59	n/a	n/a
7 (178)	0.76	0.76	0.69	0.62	1.00	1.00	0.83	0.62	0.65	0.60	0.58	0.56	0.83	0.47	0.35	0.21		0.94	0.70	0.42	0.77	0.63	n/a	n/a
7-1/4 (184)	0.76	0.76	0.70	0.62			0.85	0.63	0.65	0.60	0.59	0.56	0.88	0.49	0.37	0.22		0.99	0.74	0.44	0.78	0.64	0.59	n/a
8 (203)	0.79	0.79	0.72	0.63			0.91	0.66	0.67	0.61	0.59	0.57	1.00	0.57	0.43	0.26		1.00	0.86	0.51	0.82	0.68	0.62	n/a
9 (229)	0.83	0.83	0.75	0.65			1.00	0.70	0.69	0.63	0.61	0.58		0.68	0.51	0.31			1.00	0.61	0.87	0.72	0.65	n/a
10 (254)	0.86	0.86	0.78	0.67				0.75	0.71	0.64	0.62	0.58		0.80	0.60	0.36				0.72	0.92	0.76	0.69	n/a
11-1/4 (286)	0.91	0.91	0.81	0.69				0.81	0.74	0.66	0.63	0.59		0.95	0.71	0.43				0.81	0.97	0.80	0.73	0.62
12 (305)	0.94	0.94	0.83	0.70				0.85	0.75	0.67	0.64	0.60		1.00	0.79	0.47				0.85	1.00	0.83	0.75	0.64
14 (356)	1.00	1.00	0.89	0.73				0.95	0.79	0.70	0.67	0.62			0.99	0.60				0.95		0.90	0.81	0.69
16 (406)			0.94	0.77				1.00	0.84	0.73	0.69	0.63			1.00	0.73				1.00		0.96	0.87	0.73
18 (457)			1.00	0.80					0.88	0.76	0.71	0.65				0.87						1.00	0.92	0.78
20 (508)				0.83					0.92	0.79	0.74	0.67				1.00							0.97	0.82
22 (559)				0.87					0.96	0.82	0.76	0.69											1.00	0.86
24 (610)				0.90					1.00	0.84	0.78	0.70												0.90
30 (762)				1.00						0.93	0.86	0.75												1.00
36 (914)										1.00	0.93	0.80												
>48 (1219)											1.00	0.90												

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d ≤ s ≤ 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

HIT-HY 200 Adhesive Anchoring System 3.2.3

Table 46 - Load adjustment factors for 5/8-in. diameter threaded rods in uncracked concrete[1,2,3]

5/8-in. uncracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	3-1/8 (79)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	3-1/8 (79)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	3-1/8 (79)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	3-1/8 (79)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	3-1/8 (79)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	3-1/8 (79)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.33	0.25	0.18	0.11	n/a	n/a	n/a	n/a	0.09	0.04	0.03	0.01	0.19	0.08	0.06	0.03	n/a	n/a	n/a	n/a
3-1/8 (79)	0.59	0.59	0.57	0.54	0.44	0.30	0.22	0.13	0.56	0.54	0.53	0.52	0.22	0.10	0.07	0.04	0.44	0.20	0.13	0.07	n/a	n/a	n/a	n/a
4 (102)	0.62	0.62	0.59	0.55	0.52	0.33	0.25	0.14	0.58	0.55	0.53	0.52	0.32	0.15	0.10	0.05	0.52	0.29	0.19	0.10	n/a	n/a	n/a	n/a
4-5/8 (117)	0.63	0.63	0.60	0.56	0.59	0.36	0.27	0.16	0.59	0.55	0.54	0.53	0.40	0.18	0.12	0.06	0.59	0.36	0.24	0.13	0.60	n/a	n/a	n/a
5 (127)	0.65	0.65	0.61	0.57	0.63	0.38	0.28	0.16	0.60	0.56	0.54	0.53	0.45	0.21	0.13	0.07	0.63	0.38	0.27	0.14	0.63	n/a	n/a	n/a
6 (152)	0.68	0.68	0.63	0.58	0.76	0.42	0.31	0.18	0.62	0.57	0.55	0.53	0.59	0.27	0.18	0.09	0.76	0.42	0.35	0.19	0.69	n/a	n/a	n/a
7 (178)	0.70	0.70	0.66	0.59	0.86	0.47	0.34	0.20	0.64	0.58	0.56	0.54	0.75	0.34	0.22	0.12	0.88	0.47	0.38	0.24	0.74	n/a	n/a	n/a
7-1/8 (181)	0.71	0.71	0.66	0.60	0.87	0.47	0.35	0.20	0.64	0.58	0.56	0.54	0.77	0.35	0.23	0.12	0.90	0.47	0.38	0.24	0.75	0.57	n/a	n/a
8 (203)	0.73	0.73	0.68	0.61	0.95	0.52	0.38	0.22	0.66	0.59	0.57	0.55	0.91	0.41	0.27	0.14	1.00	0.52	0.41	0.29	0.79	0.61	n/a	n/a
9 (229)	0.76	0.76	0.70	0.62	1.00	0.57	0.42	0.25	0.68	0.60	0.58	0.55	1.00	0.50	0.32	0.17		0.57	0.45	0.32	0.84	0.65	0.56	n/a
10 (254)	0.79	0.79	0.72	0.63		0.64	0.47	0.27	0.70	0.62	0.59	0.56		0.58	0.38	0.20		0.64	0.48	0.34	0.89	0.68	0.59	n/a
11 (279)	0.82	0.82	0.74	0.65		0.70	0.52	0.30	0.72	0.63	0.60	0.56		0.67	0.43	0.23		0.70	0.52	0.36	0.93	0.71	0.62	n/a
12 (305)	0.85	0.85	0.77	0.66		0.77	0.56	0.33	0.74	0.64	0.60	0.57		0.76	0.50	0.26		0.77	0.56	0.38	0.97	0.75	0.65	n/a
14 (356)	0.91	0.91	0.81	0.69		0.89	0.66	0.38	0.77	0.66	0.62	0.58		0.96	0.62	0.33		0.89	0.66	0.41	1.00	0.81	0.70	0.57
16 (406)	0.97	0.97	0.86	0.71		1.00	0.75	0.44	0.81	0.69	0.64	0.59		1.00	0.76	0.41		1.00	0.75	0.46		0.86	0.75	0.61
18 (457)	1.00	1.00	0.90	0.74			0.84	0.49	0.85	0.71	0.66	0.60			0.91	0.49			0.84	0.50		0.91	0.79	0.64
20 (508)			0.94	0.77			0.94	0.55	0.89	0.73	0.67	0.61			1.00	0.57			0.94	0.55		0.96	0.83	0.68
22 (559)			0.99	0.79			1.00	0.60	0.93	0.75	0.69	0.63				0.66			1.00	0.60		1.00	0.87	0.71
24 (610)			1.00	0.82				0.66	0.97	0.78	0.71	0.64				0.75				0.66			0.91	0.74
26 (660)				0.85				0.71	1.00	0.80	0.73	0.65				0.84				0.71			0.95	0.77
28 (711)				0.87				0.77		0.82	0.74	0.66				0.94				0.77			0.99	0.80
30 (762)				0.90				0.82		0.85	0.76	0.67				1.00				0.82			1.00	0.83
36 (914)				0.98				0.99		0.92	0.81	0.71								0.99				0.91
>48 (1219)				1.00				1.00		1.00	0.92	0.77								1.00				1.00

Table 47 - Load adjustment factors for 5/8-in. diameter threaded rods in cracked concrete[1,2,3]

5/8-in. cracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	3-1/8 (79)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	3-1/8 (79)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	3-1/8 (79)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	3-1/8 (79)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	3-1/8 (79)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	3-1/8 (79)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.46	0.46	0.43	0.40	n/a	n/a	n/a	n/a	0.09	0.04	0.03	0.02	0.19	0.09	0.06	0.04	n/a	n/a	n/a	n/a
3-1/8 (79)	0.59	0.59	0.57	0.54	0.55	0.55	0.50	0.44	0.56	0.54	0.53	0.52	0.22	0.10	0.07	0.04	0.45	0.20	0.15	0.09	n/a	n/a	n/a	n/a
4 (102)	0.62	0.62	0.59	0.55	0.62	0.62	0.55	0.46	0.58	0.55	0.54	0.53	0.33	0.15	0.11	0.06	0.65	0.30	0.22	0.13	n/a	n/a	n/a	n/a
4-5/8 (117)	0.63	0.63	0.60	0.56	0.66	0.66	0.58	0.48	0.59	0.55	0.54	0.53	0.40	0.18	0.13	0.08	0.81	0.37	0.27	0.16	0.60	n/a	n/a	n/a
5 (127)	0.65	0.65	0.61	0.57	0.69	0.69	0.60	0.49	0.60	0.56	0.55	0.53	0.45	0.21	0.15	0.09	0.91	0.41	0.30	0.18	0.63	n/a	n/a	n/a
6 (152)	0.68	0.68	0.63	0.58	0.77	0.77	0.66	0.53	0.62	0.57	0.56	0.54	0.60	0.27	0.20	0.12	1.00	0.54	0.40	0.24	0.69	n/a	n/a	n/a
7 (178)	0.70	0.70	0.66	0.59	0.86	0.86	0.72	0.56	0.64	0.58	0.57	0.55	0.75	0.34	0.25	0.15		0.68	0.50	0.30	0.74	n/a	n/a	n/a
7-1/8 (181)	0.71	0.71	0.66	0.60	0.87	0.87	0.73	0.56	0.64	0.58	0.57	0.55	0.77	0.35	0.26	0.15		0.70	0.51	0.31	0.75	0.58	n/a	n/a
8 (203)	0.73	0.73	0.68	0.61	0.95	0.95	0.78	0.59	0.66	0.59	0.58	0.55	0.92	0.42	0.30	0.18		0.84	0.61	0.37	0.79	0.61	n/a	n/a
9 (229)	0.76	0.76	0.70	0.62	1.00	1.00	0.85	0.62	0.68	0.60	0.58	0.56	1.00	0.50	0.36	0.22		1.00	0.73	0.44	0.84	0.65	0.58	n/a
10 (254)	0.79	0.79	0.72	0.63			0.91	0.66	0.70	0.62	0.59	0.57		0.58	0.43	0.26		1.00	0.85	0.51	0.89	0.68	0.61	n/a
11 (279)	0.82	0.82	0.74	0.65			0.98	0.69	0.72	0.63	0.60	0.57		0.67	0.49	0.29			0.98	0.59	0.93	0.72	0.64	n/a
12 (305)	0.85	0.85	0.77	0.66			1.00	0.73	0.74	0.64	0.61	0.58		0.77	0.56	0.34			1.00	0.67	0.97	0.75	0.67	n/a
14 (356)	0.91	0.91	0.81	0.69				0.81	0.78	0.66	0.63	0.59		0.97	0.71	0.42				0.81	1.00	0.81	0.73	0.61
16 (406)	0.97	0.97	0.86	0.71				0.89	0.82	0.69	0.65	0.61		1.00	0.86	0.52				0.89		0.86	0.78	0.66
18 (457)	1.00	1.00	0.90	0.74				0.97	0.85	0.71	0.67	0.62			1.00	0.62				0.97		0.92	0.82	0.70
20 (508)			0.94	0.77				1.00	0.89	0.73	0.69	0.63				0.72				1.00		0.97	0.87	0.73
22 (559)			0.99	0.79					0.93	0.76	0.71	0.65				0.83						1.00	0.91	0.77
24 (610)			1.00	0.82					0.97	0.78	0.73	0.66				0.95							0.95	0.80
26 (660)				0.85					1.00	0.80	0.75	0.67				1.00							0.99	0.84
28 (711)				0.87						0.83	0.76	0.69											1.00	0.87
30 (762)				0.90						0.85	0.78	0.70												0.90
36 (914)				0.98						0.92	0.84	0.74												0.98
>48 (1219)				1.00						1.00	0.95	0.82												1.00

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d ≤ s ≤ 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 48 - Load adjustment factors for 3/4-in. diameter threaded rods in uncracked concrete[1,2,3]

3/4-in. uncracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.33	0.24	0.18	0.10	n/a	n/a	n/a	n/a	0.09	0.03	0.02	0.01	0.17	0.07	0.05	0.02	n/a	n/a	n/a	n/a
3-3/4 (95)	0.59	0.59	0.57	0.54	0.49	0.30	0.22	0.13	0.57	0.54	0.53	0.52	0.27	0.11	0.07	0.03	0.49	0.22	0.14	0.07	n/a	n/a	n/a	n/a
4 (102)	0.60	0.60	0.57	0.54	0.51	0.31	0.23	0.13	0.57	0.54	0.53	0.52	0.29	0.12	0.08	0.04	0.51	0.24	0.16	0.08	n/a	n/a	n/a	n/a
5 (127)	0.62	0.62	0.59	0.56	0.60	0.34	0.25	0.15	0.59	0.55	0.54	0.52	0.41	0.17	0.11	0.05	0.60	0.33	0.22	0.11	n/a	n/a	n/a	n/a
5-1/4 (133)	0.63	0.63	0.60	0.56	0.63	0.35	0.26	0.15	0.60	0.55	0.54	0.52	0.44	0.18	0.12	0.06	0.63	0.35	0.23	0.11	0.62	n/a	n/a	n/a
6 (152)	0.65	0.65	0.61	0.57	0.69	0.38	0.28	0.16	0.61	0.56	0.55	0.53	0.54	0.22	0.14	0.07	0.72	0.38	0.29	0.14	0.66	n/a	n/a	n/a
7 (178)	0.67	0.67	0.63	0.58	0.76	0.41	0.30	0.18	0.63	0.57	0.55	0.53	0.68	0.28	0.18	0.09	0.84	0.41	0.34	0.18	0.72	n/a	n/a	n/a
8 (203)	0.69	0.69	0.65	0.59	0.83	0.45	0.33	0.19	0.65	0.58	0.56	0.54	0.83	0.34	0.22	0.11	0.96	0.45	0.37	0.21	0.77	n/a	n/a	n/a
8-1/2 (216)	0.71	0.71	0.66	0.59	0.87	0.47	0.35	0.20	0.66	0.59	0.56	0.54	0.91	0.37	0.24	0.12	1.00	0.47	0.38	0.24	0.79	0.59	n/a	n/a
9 (229)	0.72	0.72	0.67	0.60	0.90	0.49	0.36	0.21	0.67	0.59	0.57	0.54	0.99	0.40	0.26	0.13		0.49	0.39	0.26	0.81	0.60	n/a	n/a
10 (254)	0.74	0.74	0.69	0.61	0.98	0.53	0.39	0.23	0.68	0.60	0.58	0.55	1.00	0.47	0.31	0.15		0.53	0.42	0.30	0.86	0.64	n/a	n/a
10-3/4 (273)	0.76	0.76	0.70	0.62	1.00	0.57	0.42	0.25	0.70	0.61	0.58	0.55		0.53	0.34	0.17		0.57	0.44	0.32	0.89	0.66	0.57	n/a
12 (305)	0.79	0.79	0.72	0.63		0.64	0.47	0.27	0.72	0.62	0.59	0.56		0.62	0.40	0.20		0.64	0.48	0.34	0.94	0.70	0.60	n/a
14 (356)	0.84	0.84	0.76	0.66		0.74	0.55	0.32	0.76	0.64	0.61	0.57		0.78	0.51	0.25		0.74	0.55	0.37	1.00	0.75	0.65	n/a
16 (406)	0.89	0.89	0.80	0.68		0.85	0.62	0.37	0.79	0.66	0.62	0.58		0.96	0.62	0.30		0.85	0.62	0.40		0.80	0.70	n/a
16-3/4 (425)	0.91	0.91	0.81	0.69		0.89	0.65	0.38	0.81	0.67	0.63	0.58		1.00	0.67	0.33		0.89	0.65	0.41		0.82	0.71	0.56
18 (457)	0.94	0.94	0.83	0.70		0.95	0.70	0.41	0.83	0.68	0.64	0.58			0.74	0.36		0.95	0.70	0.43		0.85	0.74	0.58
20 (508)	0.99	0.99	0.87	0.72		1.00	0.78	0.46	0.87	0.70	0.65	0.59			0.87	0.42		1.00	0.78	0.47		0.90	0.78	0.61
22 (559)	1.00	1.00	0.91	0.74			0.86	0.50	0.91	0.72	0.67	0.60			1.00	0.49			0.86	0.50		0.94	0.82	0.64
24 (610)			0.94	0.77			0.93	0.55	0.94	0.74	0.68	0.61				0.56			0.93	0.55		0.99	0.85	0.67
26 (660)			0.98	0.79			1.00	0.59	0.98	0.76	0.70	0.62				0.63			1.00	0.59		1.00	0.89	0.70
28 (711)			1.00	0.81				0.64	1.00	0.78	0.71	0.63				0.70				0.64			0.92	0.73
30 (762)				0.83				0.68		0.80	0.73	0.64				0.78				0.68			0.95	0.75
36 (914)				0.90				0.82		0.86	0.77	0.67				1.00				0.82			1.00	0.82
>48 (1219)				1.00				1.00		0.99	0.86	0.73								1.00				0.95

Table 49 - Load adjustment factors for 3/4-in. diameter threaded rods in cracked concrete[1,2,3]

3/4-in. cracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.44	0.44	0.42	0.39	n/a	n/a	n/a	n/a	0.09	0.03	0.02	0.01	0.17	0.07	0.05	0.03	n/a	n/a	n/a	n/a
3-3/4 (95)	0.59	0.59	0.57	0.54	0.55	0.55	0.50	0.44	0.57	0.54	0.53	0.52	0.27	0.11	0.07	0.04	0.54	0.22	0.15	0.09	n/a	n/a	n/a	n/a
4 (102)	0.60	0.60	0.57	0.54	0.57	0.57	0.51	0.44	0.57	0.54	0.53	0.52	0.30	0.12	0.08	0.05	0.59	0.24	0.16	0.10	n/a	n/a	n/a	n/a
5 (127)	0.62	0.62	0.59	0.56	0.63	0.63	0.56	0.47	0.59	0.55	0.54	0.53	0.41	0.17	0.11	0.07	0.83	0.34	0.22	0.13	n/a	n/a	n/a	n/a
5-1/4 (133)	0.63	0.63	0.60	0.56	0.64	0.64	0.57	0.47	0.60	0.55	0.54	0.53	0.45	0.18	0.12	0.07	0.89	0.36	0.24	0.14	0.62	n/a	n/a	n/a
6 (152)	0.65	0.65	0.61	0.57	0.69	0.69	0.60	0.49	0.61	0.56	0.55	0.53	0.54	0.22	0.15	0.09	1.00	0.44	0.29	0.18	0.67	n/a	n/a	n/a
7 (178)	0.67	0.67	0.63	0.58	0.76	0.76	0.65	0.52	0.63	0.57	0.55	0.54	0.69	0.28	0.19	0.11		0.56	0.37	0.22	0.72	n/a	n/a	n/a
8 (203)	0.69	0.69	0.65	0.59	0.83	0.83	0.70	0.55	0.65	0.58	0.56	0.54	0.84	0.34	0.23	0.14		0.68	0.45	0.27	0.77	n/a	n/a	n/a
8-1/2 (216)	0.71	0.71	0.66	0.59	0.87	0.87	0.72	0.56	0.66	0.59	0.57	0.55	0.92	0.37	0.25	0.15		0.75	0.50	0.30	0.79	0.59	n/a	n/a
9 (229)	0.72	0.72	0.67	0.60	0.90	0.90	0.75	0.57	0.67	0.59	0.57	0.55	1.00	0.41	0.27	0.16		0.82	0.54	0.32	0.82	0.61	n/a	n/a
10 (254)	0.74	0.74	0.69	0.61	0.98	0.98	0.80	0.60	0.69	0.60	0.58	0.55		0.48	0.32	0.19		0.95	0.63	0.38	0.86	0.64	n/a	n/a
10-3/4 (273)	0.76	0.76	0.70	0.62	1.00	1.00	0.84	0.62	0.70	0.61	0.58	0.56		0.53	0.35	0.21		1.00	0.70	0.42	0.89	0.66	0.58	n/a
12 (305)	0.79	0.79	0.72	0.63			0.91	0.66	0.72	0.62	0.59	0.57		0.63	0.42	0.25			0.83	0.50	0.94	0.70	0.61	n/a
14 (356)	0.84	0.84	0.76	0.66			1.00	0.72	0.76	0.64	0.61	0.58		0.79	0.52	0.31			1.00	0.63	1.00	0.76	0.66	n/a
16 (406)	0.89	0.89	0.80	0.68				0.78	0.80	0.66	0.62	0.59		0.97	0.64	0.38				0.77		0.81	0.70	n/a
16-3/4 (425)	0.91	0.91	0.81	0.69				0.81	0.81	0.67	0.63	0.59		1.00	0.68	0.41				0.81		0.83	0.72	0.61
18 (457)	0.94	0.94	0.83	0.70				0.85	0.83	0.68	0.64	0.60			0.76	0.46				0.85		0.86	0.75	0.63
20 (508)	0.99	0.99	0.87	0.72				0.91	0.87	0.70	0.65	0.61			0.89	0.54				0.91		0.90	0.79	0.66
22 (559)	1.00	1.00	0.91	0.74				0.98	0.91	0.72	0.67	0.62			1.00	0.62				0.98		0.95	0.82	0.70
24 (610)			0.94	0.77				1.00	0.94	0.74	0.69	0.63				0.70				1.00		0.99	0.86	0.73
26 (660)			0.98	0.79					0.98	0.76	0.70	0.64				0.79						1.00	0.90	0.76
28 (711)			1.00	0.81					1.00	0.79	0.72	0.65				0.89							0.93	0.78
30 (762)				0.83						0.81	0.73	0.66				0.99							0.96	0.81
36 (914)				0.90						0.87	0.78	0.70				1.00							1.00	0.89
>48 (1219)				1.00						0.99	0.87	0.76												1.00

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d ≤ s ≤ 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

HIT-HY 200 Adhesive Anchoring System 3.2.3

Table 50 - Load adjustment factors for 7/8-in. diameter threaded rods in uncracked concrete[1,2,3]

7/8-in. uncracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	3-1/2 (89)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	3-1/2 (89)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	3-1/2 (89)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	3-1/2 (89)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	3-1/2 (89)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	3-1/2 (89)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.36	0.23	0.17	0.10	n/a	n/a	n/a	n/a	0.09	0.03	0.02	0.01	0.18	0.05	0.04	0.02	n/a	n/a	n/a	n/a
4-3/8 (111)	0.59	0.59	0.57	0.54	0.55	0.30	0.22	0.13	0.58	0.54	0.53	0.52	0.35	0.11	0.07	0.03	0.60	0.22	0.14	0.07	n/a	n/a	n/a	n/a
5 (127)	0.60	0.60	0.58	0.55	0.58	0.32	0.23	0.14	0.59	0.54	0.53	0.52	0.43	0.13	0.09	0.04	0.66	0.27	0.17	0.08	n/a	n/a	n/a	n/a
5-1/2 (140)	0.61	0.61	0.59	0.55	0.61	0.33	0.24	0.14	0.60	0.55	0.54	0.52	0.50	0.15	0.10	0.05	0.72	0.31	0.20	0.09	0.65	n/a	n/a	n/a
6 (152)	0.63	0.63	0.60	0.56	0.64	0.34	0.26	0.15	0.61	0.55	0.54	0.52	0.57	0.17	0.11	0.05	0.78	0.34	0.23	0.11	0.68	n/a	n/a	n/a
7 (178)	0.65	0.65	0.61	0.57	0.69	0.37	0.28	0.16	0.63	0.56	0.55	0.53	0.71	0.22	0.14	0.07	0.91	0.37	0.29	0.13	0.73	n/a	n/a	n/a
8 (203)	0.67	0.67	0.63	0.58	0.75	0.41	0.30	0.18	0.65	0.57	0.55	0.53	0.87	0.27	0.17	0.08	1.00	0.41	0.34	0.16	0.78	n/a	n/a	n/a
9 (229)	0.69	0.69	0.64	0.59	0.81	0.44	0.32	0.19	0.67	0.58	0.56	0.54	1.00	0.32	0.21	0.10		0.44	0.36	0.19	0.83	n/a	n/a	n/a
9-7/8 (251)	0.71	0.71	0.66	0.59	0.86	0.47	0.35	0.20	0.69	0.59	0.56	0.54		0.37	0.24	0.11		0.47	0.38	0.22	0.87	0.59	n/a	n/a
10 (254)	0.71	0.71	0.66	0.60	0.87	0.47	0.35	0.20	0.69	0.59	0.57	0.54		0.38	0.24	0.11		0.47	0.38	0.23	0.87	0.59	n/a	n/a
11 (279)	0.73	0.73	0.67	0.60	0.93	0.51	0.37	0.22	0.71	0.60	0.57	0.54		0.43	0.28	0.13		0.51	0.41	0.26	0.91	0.62	n/a	n/a
12 (305)	0.75	0.75	0.69	0.61	1.00	0.54	0.40	0.23	0.73	0.60	0.58	0.55		0.49	0.32	0.15		0.54	0.43	0.30	0.95	0.65	n/a	n/a
12-1/2 (318)	0.76	0.76	0.70	0.62		0.57	0.42	0.24	0.74	0.61	0.58	0.55		0.52	0.34	0.16		0.57	0.44	0.32	0.97	0.66	0.57	n/a
14 (356)	0.79	0.79	0.72	0.63		0.63	0.47	0.27	0.77	0.62	0.59	0.55		0.62	0.40	0.19		0.63	0.48	0.34	1.00	0.70	0.60	n/a
16 (406)	0.83	0.83	0.75	0.65		0.73	0.53	0.31	0.80	0.64	0.60	0.56		0.76	0.49	0.23		0.73	0.53	0.36		0.75	0.65	n/a
18 (457)	0.88	0.88	0.79	0.67		0.82	0.60	0.35	0.84	0.66	0.62	0.57		0.91	0.59	0.27		0.82	0.60	0.39		0.79	0.68	n/a
19-1/2 (495)	0.91	0.91	0.81	0.69		0.88	0.65	0.38	0.87	0.67	0.63	0.58		1.00	0.66	0.31		0.88	0.65	0.41		0.82	0.71	0.55
20 (508)	0.92	0.92	0.82	0.69		0.91	0.67	0.39	0.88	0.67	0.63	0.58			0.69	0.32		0.91	0.67	0.42		0.83	0.72	0.56
22 (559)	0.96	0.96	0.85	0.71		1.00	0.73	0.43	0.92	0.69	0.64	0.59			0.80	0.37		1.00	0.73	0.45		0.87	0.76	0.59
24 (610)	1.00	1.00	0.88	0.73		1.00	0.80	0.47	0.96	0.71	0.66	0.59			0.91	0.42			0.80	0.48		0.91	0.79	0.61
26 (660)			0.91	0.75			0.87	0.51	0.99	0.73	0.67	0.60			1.00	0.48			0.87	0.51		0.95	0.82	0.64
28 (711)			0.94	0.77			0.93	0.55	1.00	0.74	0.68	0.61				0.53			0.93	0.55		0.99	0.85	0.66
30 (762)			0.98	0.79			1.00	0.59		0.76	0.70	0.62				0.59			1.00	0.59		1.00	0.88	0.68
36 (914)			1.00	0.84				0.70		0.81	0.73	0.64				0.77				0.70			0.97	0.75
>48 (1219)				0.96				0.94		0.92	0.81	0.69				1.00				0.94			1.00	0.87

Table 51 - Load adjustment factors for 7/8-in. diameter threaded rods in cracked concrete[1,2,3]

7/8-in. cracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	3-1/2 (89)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	3-1/2 (89)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	3-1/2 (89)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	3-1/2 (89)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	3-1/2 (89)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)	3-1/2 (89)	7-7/8 (200)	10-1/2 (267)	17-1/2 (445)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.43	0.43	0.41	0.38	n/a	n/a	n/a	n/a	0.09	0.03	0.02	0.01	0.18	0.06	0.04	0.02	n/a	n/a	n/a	n/a
4-3/8 (111)	0.59	0.59	0.57	0.54	0.55	0.55	0.50	0.44	0.58	0.54	0.53	0.52	0.36	0.11	0.08	0.05	0.71	0.22	0.16	0.10	n/a	n/a	n/a	n/a
5 (127)	0.60	0.60	0.58	0.55	0.58	0.58	0.52	0.45	0.60	0.54	0.54	0.53	0.43	0.13	0.10	0.06	0.87	0.27	0.19	0.12	n/a	n/a	n/a	n/a
5-1/2 (140)	0.61	0.61	0.59	0.55	0.61	0.61	0.54	0.46	0.61	0.55	0.54	0.53	0.50	0.15	0.11	0.07	1.00	0.31	0.22	0.13	0.65	n/a	n/a	n/a
6 (152)	0.63	0.63	0.60	0.56	0.64	0.64	0.56	0.47	0.61	0.55	0.54	0.53	0.57	0.18	0.13	0.08		0.35	0.25	0.15	0.68	n/a	n/a	n/a
7 (178)	0.65	0.65	0.61	0.57	0.69	0.69	0.60	0.49	0.63	0.56	0.55	0.54	0.72	0.22	0.16	0.10		0.44	0.32	0.19	0.73	n/a	n/a	n/a
8 (203)	0.67	0.67	0.63	0.58	0.75	0.75	0.64	0.52	0.65	0.57	0.56	0.54	0.88	0.27	0.20	0.12		0.54	0.39	0.24	0.78	n/a	n/a	n/a
9 (229)	0.69	0.69	0.64	0.59	0.81	0.81	0.68	0.54	0.67	0.58	0.56	0.55	1.00	0.32	0.23	0.14		0.65	0.47	0.28	0.83	n/a	n/a	n/a
9-7/8 (251)	0.71	0.71	0.66	0.59	0.86	0.86	0.72	0.56	0.69	0.59	0.57	0.55		0.37	0.27	0.16		0.74	0.54	0.32	0.87	0.59	n/a	n/a
10 (254)	0.71	0.71	0.66	0.60	0.87	0.87	0.73	0.56	0.69	0.59	0.57	0.55		0.38	0.27	0.16		0.76	0.55	0.33	0.87	0.59	n/a	n/a
11 (279)	0.73	0.73	0.67	0.60	0.93	0.93	0.77	0.59	0.71	0.60	0.58	0.56		0.44	0.32	0.19		0.87	0.63	0.38	0.92	0.62	n/a	n/a
12 (305)	0.75	0.75	0.69	0.61	1.00	1.00	0.82	0.61	0.73	0.60	0.58	0.56		0.50	0.36	0.22		1.00	0.72	0.43	0.96	0.65	n/a	n/a
12-1/2 (318)	0.76	0.76	0.70	0.62			0.84	0.62	0.74	0.61	0.59	0.56		0.53	0.38	0.23		1.00	0.77	0.46	0.98	0.66	0.59	n/a
14 (356)	0.79	0.79	0.72	0.63			0.91	0.66	0.77	0.62	0.60	0.57		0.63	0.45	0.27			0.91	0.54	1.00	0.70	0.63	n/a
16 (406)	0.83	0.83	0.75	0.65			1.00	0.71	0.81	0.64	0.61	0.58		0.77	0.55	0.33			1.00	0.67		0.75	0.67	n/a
18 (457)	0.88	0.88	0.79	0.67				0.76	0.84	0.66	0.63	0.59		0.91	0.66	0.40				0.76		0.79	0.71	n/a
19-1/2 (495)	0.91	0.91	0.81	0.69				0.80	0.87	0.67	0.64	0.60		1.00	0.75	0.45				0.80		0.82	0.74	0.62
20 (508)	0.92	0.92	0.82	0.69				0.82	0.88	0.67	0.64	0.60			0.77	0.46				0.82		0.84	0.75	0.63
22 (559)	0.96	0.96	0.85	0.71				0.87	0.92	0.69	0.65	0.61			0.89	0.54				0.87		0.88	0.79	0.66
24 (610)	1.00	1.00	0.88	0.73				0.93	0.96	0.71	0.67	0.62			1.00	0.61				0.93		0.92	0.82	0.69
26 (660)			0.91	0.75				0.99	1.00	0.73	0.68	0.63				0.69				0.99		0.95	0.86	0.72
28 (711)			0.94	0.77				1.00	1.00	0.74	0.70	0.64				0.77				1.00		0.99	0.89	0.75
30 (762)			0.98	0.79						0.76	0.71	0.65				0.85						1.00	0.92	0.77
36 (914)			1.00	0.84						0.81	0.75	0.68				1.00							1.00	0.85
>48 (1219)				0.96						0.92	0.84	0.74												0.98

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d ≤ s ≤ 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 52 - Load adjustment factors for 1-in. diameter threaded rods in uncracked concrete[1,2,3]

1-in. uncracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																								
1-3/4 (44)	n/a	n/a	n/a	n/a	0.36	0.22	0.17	0.10	n/a	n/a	n/a	n/a	0.08	0.02	0.01	0.01	0.15	0.05	0.03	0.01	n/a	n/a	n/a	n/a
5 (127)	0.59	0.59	0.57	0.54	0.55	0.30	0.22	0.13	0.59	0.54	0.53	0.52	0.37	0.11	0.07	0.03	0.61	0.22	0.14	0.07	n/a	n/a	n/a	n/a
6 (152)	0.61	0.61	0.58	0.55	0.60	0.32	0.24	0.14	0.60	0.55	0.53	0.52	0.48	0.14	0.09	0.04	0.70	0.29	0.19	0.09	n/a	n/a	n/a	n/a
6-1/4 (159)	0.61	0.61	0.59	0.55	0.61	0.33	0.24	0.14	0.61	0.55	0.54	0.52	0.51	0.15	0.10	0.05	0.73	0.30	0.20	0.09	0.65	n/a	n/a	n/a
7 (178)	0.63	0.63	0.60	0.56	0.64	0.35	0.26	0.15	0.62	0.55	0.54	0.52	0.61	0.18	0.12	0.05	0.82	0.35	0.23	0.11	0.69	n/a	n/a	n/a
8 (203)	0.65	0.65	0.61	0.57	0.69	0.38	0.28	0.16	0.64	0.56	0.55	0.53	0.74	0.22	0.14	0.07	0.93	0.38	0.29	0.13	0.74	n/a	n/a	n/a
9 (229)	0.66	0.66	0.63	0.58	0.74	0.40	0.30	0.17	0.65	0.57	0.55	0.53	0.89	0.26	0.17	0.08	1.00	0.40	0.33	0.16	0.78	n/a	n/a	n/a
10 (254)	0.68	0.68	0.64	0.58	0.79	0.43	0.32	0.19	0.67	0.58	0.56	0.53	1.00	0.31	0.20	0.09		0.43	0.35	0.19	0.83	n/a	n/a	n/a
11 (279)	0.70	0.70	0.65	0.59	0.85	0.46	0.34	0.20	0.69	0.58	0.56	0.54		0.35	0.23	0.11		0.46	0.37	0.21	0.87	n/a	n/a	n/a
11-1/4 (286)	0.71	0.71	0.66	0.59	0.86	0.47	0.34	0.20	0.69	0.59	0.56	0.54		0.37	0.24	0.11		0.47	0.38	0.22	0.88	0.58	n/a	n/a
12 (305)	0.72	0.72	0.67	0.60	0.90	0.49	0.36	0.21	0.70	0.59	0.57	0.54		0.40	0.26	0.12		0.49	0.39	0.24	0.91	0.60	n/a	n/a
13 (330)	0.74	0.74	0.68	0.61	0.96	0.52	0.38	0.22	0.72	0.60	0.57	0.54		0.46	0.30	0.14		0.52	0.41	0.28	0.94	0.63	n/a	n/a
14 (356)	0.76	0.76	0.69	0.62	1.00	0.56	0.41	0.24	0.74	0.61	0.58	0.55		0.51	0.33	0.15		0.56	0.44	0.31	0.98	0.65	n/a	n/a
14-1/4 (362)	0.76	0.76	0.70	0.62		0.57	0.42	0.24	0.74	0.61	0.58	0.55		0.52	0.34	0.16		0.57	0.44	0.32	0.99	0.66	0.57	n/a
16 (406)	0.79	0.79	0.72	0.63		0.64	0.47	0.27	0.77	0.62	0.59	0.55		0.62	0.40	0.19		0.64	0.48	0.34	1.00	0.70	0.60	n/a
18 (457)	0.83	0.83	0.75	0.65		0.72	0.52	0.31	0.81	0.64	0.60	0.56		0.74	0.48	0.22		0.72	0.52	0.36		0.74	0.64	n/a
20 (508)	0.86	0.86	0.78	0.67		0.80	0.58	0.34	0.84	0.65	0.61	0.57		0.87	0.56	0.26		0.80	0.58	0.38		0.78	0.67	n/a
22 (559)	0.90	0.90	0.81	0.68		0.87	0.64	0.38	0.88	0.67	0.63	0.58		1.00	0.65	0.30		0.87	0.64	0.41		0.82	0.71	n/a
22-1/4 (565)	0.91	0.91	0.81	0.69		0.88	0.65	0.38	0.88	0.67	0.63	0.58			0.66	0.31		0.88	0.65	0.41		0.82	0.71	0.55
24 (610)	0.94	0.94	0.83	0.70		0.95	0.70	0.41	0.91	0.68	0.64	0.58			0.74	0.35		0.95	0.70	0.43		0.85	0.74	0.57
26 (660)	0.97	0.97	0.86	0.72		1.00	0.76	0.44	0.94	0.70	0.65	0.59			0.84	0.39		1.00	0.76	0.46		0.89	0.77	0.60
28 (711)	1.00	1.00	0.89	0.73			0.82	0.48	0.98	0.71	0.66	0.60			0.94	0.43			0.82	0.49		0.92	0.80	0.62
30 (762)			0.92	0.75			0.87	0.51	1.00	0.73	0.67	0.60			1.00	0.48			0.87	0.51		0.95	0.83	0.64
36 (914)			1.00	0.80			1.00	0.62		0.77	0.70	0.62				0.63			1.00	0.62		1.00	0.91	0.70
>48 (1219)				0.90				0.82		0.86	0.77	0.66				0.98				0.82			1.00	0.81

Table 53 - Load adjustment factors for 1-in. diameter threaded rods in cracked concrete[1,2,3]

1-in. cracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																								
1-3/4 (44)	n/a	n/a	n/a	n/a	0.42	0.42	0.40	0.38	n/a	n/a	n/a	n/a	0.08	0.02	0.02	0.01	0.15	0.05	0.03	0.02	n/a	n/a	n/a	n/a
5 (127)	0.59	0.59	0.57	0.54	0.55	0.55	0.50	0.44	0.59	0.54	0.53	0.52	0.37	0.11	0.07	0.04	0.74	0.22	0.15	0.09	n/a	n/a	n/a	n/a
6 (152)	0.61	0.61	0.58	0.55	0.60	0.60	0.53	0.46	0.60	0.55	0.54	0.53	0.49	0.14	0.10	0.06	0.97	0.29	0.19	0.12	n/a	n/a	n/a	n/a
6-1/4 (159)	0.61	0.61	0.59	0.55	0.61	0.61	0.54	0.46	0.61	0.55	0.54	0.53	0.52	0.15	0.10	0.06	1.00	0.31	0.21	0.12	0.66	n/a	n/a	n/a
7 (178)	0.63	0.63	0.60	0.56	0.64	0.64	0.57	0.47	0.62	0.55	0.54	0.53	0.61	0.18	0.12	0.07		0.36	0.24	0.15	0.69	n/a	n/a	n/a
8 (203)	0.65	0.65	0.61	0.57	0.69	0.69	0.60	0.49	0.64	0.56	0.55	0.53	0.75	0.22	0.15	0.09		0.44	0.30	0.18	0.74	n/a	n/a	n/a
9 (229)	0.66	0.66	0.63	0.58	0.74	0.74	0.64	0.51	0.65	0.57	0.55	0.54	0.89	0.26	0.18	0.11		0.53	0.36	0.21	0.79	n/a	n/a	n/a
10 (254)	0.68	0.68	0.64	0.58	0.79	0.79	0.67	0.53	0.67	0.58	0.56	0.54	1.00	0.31	0.21	0.13		0.62	0.42	0.25	0.83	n/a	n/a	n/a
11 (279)	0.70	0.70	0.65	0.59	0.85	0.85	0.71	0.55	0.69	0.58	0.56	0.55		0.36	0.24	0.14		0.72	0.48	0.29	0.87	n/a	n/a	n/a
11-1/4 (286)	0.71	0.71	0.66	0.59	0.86	0.86	0.72	0.56	0.69	0.59	0.57	0.55		0.37	0.25	0.15		0.74	0.50	0.30	0.88	0.59	n/a	n/a
12 (305)	0.72	0.72	0.67	0.60	0.90	0.90	0.75	0.57	0.71	0.59	0.57	0.55		0.41	0.27	0.16		0.82	0.55	0.33	0.91	0.61	n/a	n/a
13 (330)	0.74	0.74	0.68	0.61	0.96	0.96	0.79	0.59	0.72	0.60	0.58	0.55		0.46	0.31	0.19		0.92	0.62	0.37	0.95	0.63	n/a	n/a
14 (356)	0.76	0.76	0.69	0.62	1.00	1.00	0.83	0.62	0.74	0.61	0.58	0.56		0.51	0.35	0.21		1.00	0.69	0.42	0.98	0.65	n/a	n/a
14-1/4 (362)	0.76	0.76	0.70	0.62			0.84	0.62	0.74	0.61	0.58	0.56		0.53	0.36	0.21			0.71	0.43	0.99	0.66	0.58	n/a
16 (406)	0.79	0.79	0.72	0.63			0.91	0.66	0.77	0.62	0.59	0.57		0.63	0.42	0.25			0.85	0.51	1.00	0.70	0.61	n/a
18 (457)	0.83	0.83	0.75	0.65			1.00	0.70	0.81	0.64	0.61	0.58		0.75	0.50	0.30			1.00	0.61		0.74	0.65	n/a
20 (508)	0.86	0.86	0.78	0.67				0.75	0.84	0.65	0.62	0.58		0.88	0.59	0.35				0.71		0.78	0.69	n/a
22 (559)	0.90	0.90	0.81	0.68				0.80	0.88	0.67	0.63	0.59		1.00	0.68	0.41				0.80		0.82	0.72	n/a
22-1/4 (565)	0.91	0.91	0.81	0.69				0.80	0.88	0.67	0.63	0.59			0.69	0.42				0.80		0.82	0.72	0.61
24 (610)	0.94	0.94	0.83	0.70				0.85	0.91	0.68	0.64	0.60			0.78	0.47				0.85		0.86	0.75	0.63
26 (660)	0.97	0.97	0.86	0.72				0.90	0.95	0.70	0.65	0.61			0.88	0.53				0.90		0.89	0.78	0.66
28 (711)	1.00	1.00	0.89	0.73				0.95	0.98	0.71	0.66	0.62			0.98	0.59				0.95		0.92	0.81	0.68
30 (762)			0.92	0.75				1.00	1.00	0.73	0.68	0.63			1.00	0.65				1.00		0.96	0.84	0.71
36 (914)			1.00	0.80						0.77	0.71	0.65				0.86						1.00	0.92	0.78
>48 (1219)				0.90						0.87	0.78	0.70				1.00							1.00	0.90

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d ≤ s ≤ 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0

HIT-HY 200 Adhesive Anchoring System 3.2.3

Table 54 - Load adjustment factors for 1-1/4-in. diameter threaded rods in uncracked concrete[1,2,3]

1-1/4-in. uncracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	5 (127)	11-1/4 (286)	15 (381)	25 (635)	5 (127)	11-1/4 (286)	15 (381)	25 (635)	5 (127)	11-1/4 (286)	15 (381)	25 (635)	5 (127)	11-1/4 (286)	15 (381)	25 (635)	5 (127)	11-1/4 (286)	15 (381)	25 (635)	5 (127)	11-1/4 (286)	11-1/4 (286)	25 (635)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.35	0.23	0.16	0.09	n/a	n/a	n/a	n/a	0.05	0.02	0.01	0.01	0.11	0.03	0.02	0.02	n/a	n/a	n/a	n/a
6-1/4 (159)	0.59	0.59	0.57	0.54	0.55	0.31	0.22	0.13	0.59	0.54	0.53	0.52	0.37	0.11	0.07	0.03	0.63	0.22	0.14	0.07	n/a	n/a	n/a	n/a
7 (178)	0.60	0.60	0.58	0.55	0.58	0.33	0.23	0.14	0.60	0.54	0.53	0.52	0.43	0.13	0.08	0.04	0.69	0.26	0.17	0.08	n/a	n/a	n/a	n/a
8 (203)	0.62	0.62	0.59	0.55	0.62	0.35	0.25	0.14	0.61	0.55	0.54	0.52	0.53	0.16	0.10	0.05	0.78	0.31	0.20	0.10	0.66	n/a	n/a	n/a
9 (229)	0.63	0.63	0.60	0.56	0.65	0.37	0.26	0.15	0.62	0.55	0.54	0.52	0.63	0.19	0.12	0.06	0.87	0.37	0.24	0.11	0.70	n/a	n/a	n/a
10 (254)	0.65	0.65	0.61	0.57	0.69	0.39	0.28	0.16	0.64	0.56	0.55	0.53	0.74	0.22	0.14	0.07	0.97	0.39	0.29	0.13	0.74	n/a	n/a	n/a
11 (279)	0.66	0.66	0.62	0.57	0.73	0.41	0.29	0.17	0.65	0.57	0.55	0.53	0.86	0.25	0.16	0.08	1.00	0.41	0.33	0.15	0.78	n/a	n/a	n/a
12 (305)	0.68	0.68	0.63	0.58	0.77	0.44	0.31	0.18	0.66	0.57	0.55	0.53	0.98	0.29	0.19	0.09		0.44	0.35	0.17	0.81	n/a	n/a	n/a
13 (330)	0.69	0.69	0.64	0.59	0.82	0.46	0.33	0.19	0.68	0.58	0.56	0.54	1.00	0.33	0.21	0.10		0.46	0.36	0.20	0.84	n/a	n/a	n/a
14 (356)	0.70	0.70	0.66	0.59	0.86	0.49	0.34	0.20	0.69	0.59	0.56	0.54		0.36	0.24	0.11		0.49	0.38	0.22	0.87	0.58	n/a	n/a
14-1/4 (362)	0.71	0.71	0.66	0.60	0.87	0.49	0.35	0.20	0.69	0.59	0.56	0.54		0.37	0.24	0.11		0.49	0.38	0.23	0.88	0.59	n/a	n/a
15 (381)	0.72	0.72	0.67	0.60	0.90	0.51	0.36	0.21	0.70	0.59	0.57	0.54		0.40	0.26	0.12		0.51	0.39	0.24	0.91	0.60	n/a	n/a
16 (406)	0.73	0.73	0.68	0.61	0.95	0.54	0.38	0.22	0.72	0.60	0.57	0.54		0.45	0.29	0.13		0.54	0.41	0.27	0.94	0.62	n/a	n/a
17 (432)	0.75	0.75	0.69	0.61	0.99	0.56	0.40	0.23	0.73	0.60	0.58	0.55		0.49	0.32	0.15		0.56	0.43	0.29	0.96	0.64	n/a	n/a
18 (457)	0.76	0.76	0.70	0.62	1.00	0.60	0.42	0.25	0.75	0.61	0.58	0.55		0.53	0.35	0.16		0.60	0.44	0.32	0.99	0.66	0.57	n/a
20 (508)	0.79	0.79	0.72	0.63		0.66	0.47	0.27	0.77	0.62	0.59	0.55		0.62	0.40	0.19		0.66	0.48	0.34	1.00	0.70	0.60	n/a
22 (559)	0.82	0.82	0.74	0.65		0.73	0.51	0.30	0.80	0.63	0.60	0.56		0.72	0.47	0.22		0.73	0.51	0.36		0.73	0.63	n/a
24 (610)	0.85	0.85	0.77	0.66		0.80	0.56	0.33	0.83	0.65	0.61	0.57		0.82	0.53	0.25		0.80	0.56	0.37		0.76	0.66	n/a
26 (660)	0.88	0.88	0.79	0.67		0.86	0.61	0.36	0.86	0.66	0.62	0.57		0.92	0.60	0.28		0.86	0.61	0.39		0.79	0.69	n/a
28 (711)	0.91	0.91	0.81	0.69		0.93	0.65	0.38	0.88	0.67	0.63	0.58		1.00	0.67	0.31		0.93	0.65	0.41		0.82	0.71	0.55
30 (762)	0.94	0.94	0.83	0.70		1.00	0.70	0.41	0.91	0.68	0.64	0.58			0.74	0.35		1.00	0.70	0.43		0.85	0.74	0.57
36 (914)	1.00	1.00	0.90	0.74		1.00	0.84	0.49	0.99	0.72	0.66	0.60			0.98	0.45		1.00	0.84	0.50		0.94	0.81	0.63
>48 (1219)			1.00	0.82			1.00	0.66	1.00	0.79	0.72	0.63			1.00	0.70			1.00	0.66		1.00	0.94	0.72

Table 55 - Load adjustment factors for 1-1/4-in. diameter threaded rods in cracked concrete[1,2,3]

1-1/4-in. cracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	5 (127)	11-1/4 (286)	15 (381)	25 (635)	5 (127)	11-1/4 (286)	15 (381)	25 (635)	5 (127)	11-1/4 (286)	15 (381)	25 (635)	5 (127)	11-1/4 (286)	15 (381)	25 (635)	5 (127)	11-1/4 (286)	15 (381)	25 (635)	5 (127)	11-1/4 (286)	11-1/4 (286)	25 (635)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.40	0.40	0.39	0.37	n/a	n/a	n/a	n/a	0.05	0.02	0.01	0.01	0.11	0.03	0.02	0.01	n/a	n/a	n/a	n/a
6-1/4 (159)	0.59	0.59	0.57	0.54	0.55	0.55	0.50	0.44	0.59	0.54	0.53	0.52	0.37	0.11	0.07	0.04	0.74	0.22	0.14	0.08	n/a	n/a	n/a	n/a
7 (178)	0.60	0.60	0.58	0.55	0.58	0.58	0.52	0.45	0.60	0.54	0.53	0.52	0.44	0.13	0.08	0.05	0.88	0.26	0.17	0.09	n/a	n/a	n/a	n/a
8 (203)	0.62	0.62	0.59	0.55	0.62	0.62	0.55	0.46	0.61	0.55	0.54	0.52	0.54	0.16	0.10	0.06	1.00	0.32	0.21	0.11	0.66	n/a	n/a	n/a
9 (229)	0.63	0.63	0.60	0.56	0.65	0.65	0.57	0.48	0.62	0.55	0.54	0.53	0.64	0.19	0.12	0.07		0.38	0.25	0.14	0.70	n/a	n/a	n/a
10 (254)	0.65	0.65	0.61	0.57	0.69	0.69	0.60	0.49	0.64	0.56	0.55	0.53	0.75	0.22	0.14	0.08		0.44	0.29	0.16	0.74	n/a	n/a	n/a
11 (279)	0.66	0.66	0.62	0.57	0.73	0.73	0.63	0.51	0.65	0.57	0.55	0.53	0.86	0.26	0.17	0.09		0.51	0.33	0.18	0.78	n/a	n/a	n/a
12 (305)	0.68	0.68	0.63	0.58	0.77	0.77	0.66	0.53	0.66	0.57	0.55	0.54	0.98	0.29	0.19	0.10		0.58	0.38	0.21	0.81	n/a	n/a	n/a
13 (330)	0.69	0.69	0.64	0.59	0.82	0.82	0.69	0.54	0.68	0.58	0.56	0.54	1.00	0.33	0.21	0.12		0.66	0.43	0.24	0.85	n/a	n/a	n/a
14 (356)	0.70	0.70	0.66	0.59	0.86	0.86	0.72	0.56	0.69	0.59	0.56	0.54		0.37	0.24	0.13		0.73	0.48	0.26	0.88	0.58	n/a	n/a
14-1/4 (362)	0.71	0.71	0.66	0.60	0.87	0.87	0.73	0.56	0.70	0.59	0.57	0.54		0.38	0.25	0.14		0.75	0.49	0.27	0.89	0.59	n/a	n/a
15 (381)	0.72	0.72	0.67	0.60	0.90	0.90	0.75	0.57	0.71	0.59	0.57	0.55		0.41	0.26	0.15		0.82	0.53	0.29	0.91	0.61	n/a	n/a
16 (406)	0.73	0.73	0.68	0.61	0.95	0.95	0.78	0.59	0.72	0.60	0.57	0.55		0.45	0.29	0.16		0.90	0.58	0.32	0.94	0.63	n/a	n/a
17 (432)	0.75	0.75	0.69	0.61	0.99	0.99	0.81	0.61	0.73	0.60	0.58	0.55		0.49	0.32	0.18		0.98	0.64	0.35	0.97	0.64	n/a	n/a
18 (457)	0.76	0.76	0.70	0.62	1.00	1.00	0.85	0.62	0.75	0.61	0.58	0.56		0.54	0.35	0.19		1.00	0.70	0.38	0.99	0.66	0.57	n/a
20 (508)	0.79	0.79	0.72	0.63			0.91	0.66	0.77	0.62	0.59	0.56		0.63	0.41	0.23			0.82	0.45	1.00	0.70	0.61	n/a
22 (559)	0.82	0.82	0.74	0.65			0.98	0.69	0.80	0.63	0.60	0.57		0.72	0.47	0.26			0.94	0.52		0.73	0.63	n/a
24 (610)	0.85	0.85	0.77	0.66			1.00	0.73	0.83	0.65	0.61	0.57		0.82	0.54	0.30			1.00	0.59		0.77	0.66	n/a
26 (660)	0.88	0.88	0.79	0.67				0.77	0.86	0.66	0.62	0.58		0.93	0.60	0.33				0.67		0.80	0.69	n/a
28 (711)	0.91	0.91	0.81	0.69				0.81	0.88	0.67	0.63	0.59		1.00	0.68	0.37				0.75		0.83	0.72	0.59
30 (762)	0.94	0.94	0.83	0.70				0.85	0.91	0.68	0.64	0.59			0.75	0.41				0.83		0.86	0.74	0.61
36 (914)	1.00	1.00	0.90	0.74				0.97	0.99	0.72	0.66	0.61			0.98	0.54				0.97		0.94	0.81	0.67
>48 (1219)			1.00	0.82				1.00	1.00	0.79	0.72	0.65			1.00	0.84				1.00		1.00	0.94	0.77

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d ≤ s ≤ 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0

3.2.3 HIT-HY 200 Adhesive Anchoring System

3.2.3.3.4 HIT-HY 200 with HIS-N Inserts

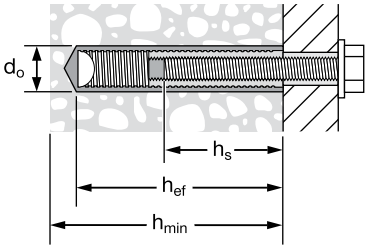
Figure 12 - HIS-N and HIS-RN internally threaded insert installation conditions

Permissible concrete conditions			Permissible Drilling Method	
	Uncracked concrete	Dry concrete		Hammer drilling with carbide tipped drill bit
	Cracked concrete	Water saturated concrete		Hilti TE-CD or TE-YD Hollow Drill Bit

Table 56 - HIS-N and HIS-RN specifications

Setting information		Symbol	Units	Thread size			
				3/8-16 UNC	1/2-13 UNC	5/8-11 UNC	3/4-10 UNC
Outside diameter of insert			in.	0.65	0.81	1.00	1.09
Nominal bit diameter		d_o	in.	11/16	7/8	1-1/8	1-1/4
Effective embedment		h_{ef}	in. (mm)	4-3/8 (110)	5 (125)	6-3/4 (170)	8-1/8 (205)
Thread engagement	minimum maximum	h_s	in. in.	3/8 15/16	1/2 1-3/16	5/8 1-1/2	3/4 1-7/8
Installation torque		T_{inst}	ft-lb (Nm)	15 (20)	30 (40)	60 (81)	100 (136)
Concrete thickness		h_{min}	in. (mm)	5.9 (150)	6.7 (170)	9.1 (230)	10.6 (270)

Figure 13 - HIS-N and HIS-RN specifications



HIS-N internally threaded insert specifications

3/8-in. HIS-N is manufactured from 11MnPb30+C carbon steel conforming to DIN 10277-3 with a minimum tensile strength of 71.1 ksi (490 MPa) and a minimum yield strength of 59.5 ksi (410 MPa).

1/2-, 5/8- and 3/4-in. HIS-N is manufactured from 11MnPb30+C carbon steel conforming to DIN 10277-3 with a minimum tensile strength of 66.7 ksi (460 MPa) and a minimum yield strength of 54.4 ksi (375 MPa).

HIS-RN is manufactured from X5CrNiMo 17122 K700 stainless steel conforming to DIN EN 10088-3 with a minimum tensile strength of 101.5 ksi (700 MPa) and a minimum yield strength of 50.8 ksi (350 MPa).

HIT-HY 200 Adhesive Anchoring System 3.2.3

Table 57 - Hilti HIT-HY 200 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]

Thread size	Effective embedment in. (mm)	Tension — ΦN_n or N_r				Shear — ΦV_n or V_r			
		f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)	f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)
3/8-16 UNC	4-3/8 (111)	7,140 (31.8)	7,820 (34.8)	9,030 (40.2)	11,060 (49.2)	15,375 (68.4)	16,840 (74.9)	19,445 (86.5)	23,815 (105.9)
1/2-13 UNC	5 (127)	8,720 (38.8)	9,555 (42.5)	11,030 (49.1)	13,510 (60.1)	18,785 (83.6)	20,575 (91.5)	23,760 (105.7)	29,100 (129.4)
5/8-11 UNC	6-3/4 (171)	13,680 (60.9)	14,985 (66.7)	17,305 (77.0)	21,190 (94.3)	29,460 (131.0)	32,275 (143.6)	37,265 (165.8)	45,645 (203.0)
3/4-10 UNC	8-1/8 (206)	18,065 (80.4)	19,790 (88.0)	22,850 (101.6)	27,985 (124.5)	38,910 (173.1)	42,620 (189.6)	49,215 (218.9)	60,275 (268.1)

Table 58 - Hilti HIT-HY 200 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]

Thread size	Effective embedment in. (mm)	Tension — ΦN_n or N_r				Shear — ΦV_n or V_r			
		f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)	f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)
3/8-16 UNC	4-3/8 (111)	5,055 (22.5)	5,540 (24.6)	6,145 (27.3)	6,510 (29.0)	10,890 (48.4)	11,930 (53.1)	13,235 (58.9)	14,025 (62.4)
1/2-13 UNC	5 (127)	6,175 (27.5)	6,765 (30.1)	7,815 (34.8)	9,335 (41.5)	13,305 (59.2)	14,575 (64.8)	16,830 (74.9)	20,110 (89.5)
5/8-11 UNC	6-3/4 (171)	9,690 (43.1)	10,615 (47.2)	12,255 (54.5)	13,210 (58.8)	20,870 (92.8)	22,860 (101.7)	26,395 (117.4)	28,450 (126.6)
3/4-10 UNC	8-1/8 (206)	12,795 (56.9)	14,015 (62.3)	16,185 (72.0)	17,385 (77.3)	27,560 (122.6)	30,190 (134.3)	34,860 (155.1)	37,450 (166.6)

1 See section 3.1.7 for explanation on development of load values.
2 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Apply spacing, edge distance, and concrete thickness factors in tables 60 - 61 as necessary. Compare to the steel values in table 59. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 104° F (40° C), max. long term temperature = 75° F (24° C).
For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 122° F (50° C) multiply above value by 0.80.
For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above value by 0.70.
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 saturated concrete multiply design strength (factored resistance) by 0.85.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.7.5.
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 static loads only. For seismic loads, multiply cracked concrete tabular values by α_{seis} = 0.60.
See section 3.1.7.4 for additional information on seismic applications.

Table 59 - Steel design strength for steel bolt and cap screw for Hilti HIS-N and HIS-RN internally threaded inserts [1,2]

Thread size	ACI 318 Appendix D Based Design					
	ASTM A193 B7			ASTM A193 Grade B8M stainless steel		
	Tensile[3] ϕN_{sa} lb (kN)	Shear[4] ϕV_{sa} lb (kN)	$\alpha_{seis,V}$[5]	Tensile[3] ϕN_{sa} lb (kN)	Shear[4] ϕV_{sa} lb (kN)	$\alpha_{seis,V}$[5]
3/8-16 UNC	6,300 (28.0)	3,490 (15.5)	0.7	5,540 (24.6)	3,070 (13.7)	0.7
1/2-13 UNC	11,530 (51.3)	6,385 (28.4)	0.7	10,145 (45.1)	5,620 (25.0)	0.7
5/8-11 UNC	18,365 (81.7)	10,170 (45.2)	0.7	16,160 (71.9)	8,950 (39.8)	0.7
3/4-10 UNC	27,180 (120.9)	15,055 (67.0)	0.7	23,915 (106.4)	13,245 (58.9)	0.7

1 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.
2 HIT-Z and HIT-Z-R rods are to be considered brittle steel elements.
3 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318 Appendix D.
4 Shear values determined by static shear tests with $\phi V_{sa} \leq \phi\ 0.60\ A_{se,V} f_{uta}$ as noted in ACI 318 Appendix D.
5 Reduction factor for seismic shear only. See section 3.1.7.4 for additional information on seismic applications.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 60 - Load adjustment factors for Hilti HIS-N and HIS-RN internally threaded inserts in uncracked concrete[1,2,3]

HIS-N and HIS-RN all diameters uncracked concrete		Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Thread Size	in.	3/8	1/2	5/8	3/4	3/8	1/2	5/8	3/4	3/8	1/2	5/8	3/4	3/8	1/2	5/8	3/4	3/8	1/2	5/8	3/4	3/8	1/2	5/8	3/4
Embedment h_{ef}	in.	4-3/8	5	6-3/4	8-1/8	4-3/8	5	6-3/4	8-1/8	4-3/8	5	6-3/4	8-1/8	4-3/8	5	6-3/4	8-1/8	4-3/8	5	6-3/4	8-1/8	4-3/8	5	6-3/4	8-1/8
	(mm)	(111)	(127)	(171)	(206)	(111)	(127)	(171)	(206)	(111)	(127)	(171)	(206)	(111)	(127)	(171)	(206)	(111)	(127)	(171)	(206)	(111)	(127)	(171)	(206)
Spacing (s) / Edge distanc (c_a) / Concrete thickness (h), - in. (mm)																									
3-1/4	(83)	0.59	n/a	n/a	n/a	0.35	n/a	n/a	n/a	0.55	n/a	n/a	n/a	0.15	n/a	n/a	n/a	0.31	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4	(102)	0.61	0.59	n/a	n/a	0.39	0.38	n/a	n/a	0.56	0.55	n/a	n/a	0.21	0.19	n/a	n/a	0.39	0.38	n/a	n/a	n/a	n/a	n/a	n/a
5	(127)	0.64	0.61	0.59	n/a	0.45	0.43	0.37	n/a	0.57	0.57	0.55	n/a	0.29	0.26	0.17	n/a	0.45	0.43	0.33	n/a	n/a	n/a	n/a	n/a
5-1/2	(140)	0.65	0.62	0.60	0.59	0.48	0.46	0.39	0.35	0.58	0.58	0.56	0.55	0.34	0.30	0.19	0.15	0.48	0.46	0.39	0.29	n/a	n/a	n/a	n/a
6	(152)	0.67	0.64	0.61	0.60	0.51	0.48	0.41	0.37	0.59	0.58	0.56	0.55	0.39	0.35	0.22	0.17	0.51	0.48	0.41	0.33	0.60	n/a	n/a	n/a
7	(178)	0.70	0.66	0.63	0.62	0.59	0.54	0.45	0.40	0.60	0.60	0.57	0.56	0.49	0.43	0.28	0.21	0.59	0.54	0.45	0.40	0.64	0.62	n/a	n/a
8	(203)	0.72	0.68	0.65	0.63	0.67	0.61	0.49	0.43	0.62	0.61	0.58	0.57	0.60	0.53	0.34	0.26	0.67	0.61	0.49	0.43	0.69	0.66	n/a	n/a
9	(229)	0.75	0.70	0.66	0.65	0.76	0.69	0.54	0.46	0.63	0.62	0.59	0.58	0.71	0.63	0.40	0.31	0.76	0.69	0.54	0.46	0.73	0.70	n/a	n/a
10	(254)	0.78	0.73	0.68	0.67	0.84	0.76	0.58	0.50	0.65	0.64	0.60	0.58	0.83	0.74	0.47	0.36	0.84	0.76	0.58	0.50	0.77	0.74	0.64	n/a
11	(279)	0.81	0.75	0.70	0.68	0.93	0.84	0.64	0.53	0.66	0.65	0.61	0.59	0.96	0.86	0.55	0.41	0.93	0.84	0.64	0.53	0.81	0.78	0.67	0.61
12	(305)	0.84	0.77	0.72	0.70	1.00	0.91	0.70	0.57	0.68	0.66	0.62	0.60	1.00	0.98	0.62	0.47	1.00	0.91	0.70	0.57	0.84	0.81	0.70	0.64
14	(356)	0.89	0.82	0.76	0.73		1.00	0.81	0.66	0.71	0.69	0.64	0.62		1.00	0.78	0.59		1.00	0.81	0.66	0.91	0.87	0.75	0.69
16	(406)	0.95	0.86	0.79	0.77			0.93	0.76	0.74	0.72	0.66	0.63			0.96	0.73			0.93	0.76	0.97	0.94	0.80	0.73
18	(457)	1.00	0.91	0.83	0.80			1.00	0.85	0.77	0.75	0.68	0.65			1.00	0.87			1.00	0.85	1.00	0.99	0.85	0.78
24	(610)		1.00	0.94	0.90				1.00	0.85	0.83	0.74	0.70				1.00				1.00		1.00	0.99	0.90
30	(762)			1.00	1.00					0.94	0.91	0.80	0.75											1.00	1.00
36	(914)									1.00	0.99	0.86	0.80												
>48	(1219)										1.00	0.99	0.90												

Table 61 - Load adjustment factors for Hilti HIS-N and HIS-RN internally threaded inserts in cracked concrete[1,2,3]

HIS-N and HIS-RN all diameters cracked concrete		Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Thread Size	in.	3/8	1/2	5/8	3/4	3/8	1/2	5/8	3/4	3/8	1/2	5/8	3/4	3/8	1/2	5/8	3/4	3/8	1/2	5/8	3/4	3/8	1/2	5/8	3/4
Embedment h_{ef}	in.	4-3/8	5	6-3/4	8-1/8	4-3/8	5	6-3/4	8-1/8	4-3/8	5	6-3/4	8-1/8	4-3/8	5	6-3/4	8-1/8	4-3/8	5	6-3/4	8-1/8	4-3/8	5	6-3/4	8-1/8
	(mm)	(111)	(127)	(171)	(206)	(111)	(127)	(171)	(206)	(111)	(127)	(171)	(206)	(111)	(127)	(171)	(206)	(111)	(127)	(171)	(206)	(111)	(127)	(171)	(206)
Spacing (s) / Edge distanc (c_a) / Concrete thickness (h), - in. (mm)																									
3-1/4	(83)	0.59	n/a	n/a	n/a	0.55	n/a	n/a	n/a	0.55	n/a	n/a	n/a	0.16	n/a	n/a	n/a	0.31	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4	(102)	0.61	0.59	n/a	n/a	0.60	0.55	n/a	n/a	0.56	0.55	n/a	n/a	0.21	0.19	n/a	n/a	0.42	0.38	n/a	n/a	n/a	n/a	n/a	n/a
5	(127)	0.64	0.61	0.59	n/a	0.68	0.61	0.55	n/a	0.57	0.57	0.55	n/a	0.30	0.26	0.17	n/a	0.59	0.53	0.34	n/a	n/a	n/a	n/a	n/a
5-1/2	(140)	0.65	0.62	0.60	0.59	0.72	0.63	0.57	0.55	0.58	0.58	0.56	0.55	0.34	0.31	0.19	0.15	0.69	0.61	0.39	0.29	n/a	n/a	n/a	n/a
6	(152)	0.67	0.64	0.61	0.60	0.75	0.66	0.60	0.57	0.59	0.58	0.56	0.55	0.39	0.35	0.22	0.17	0.78	0.70	0.44	0.34	0.60	n/a	n/a	n/a
7	(178)	0.70	0.66	0.63	0.62	0.84	0.72	0.64	0.62	0.60	0.60	0.57	0.56	0.49	0.44	0.28	0.21	0.98	0.88	0.56	0.42	0.64	0.62	n/a	n/a
8	(203)	0.72	0.68	0.65	0.63	0.92	0.79	0.69	0.66	0.62	0.61	0.58	0.57	0.60	0.54	0.34	0.26	1.00	1.00	0.68	0.52	0.69	0.66	n/a	n/a
9	(229)	0.75	0.70	0.66	0.65	1.00	0.85	0.74	0.71	0.63	0.62	0.59	0.58	0.72	0.64	0.41	0.31	1.00	1.00	0.82	0.62	0.73	0.70	n/a	n/a
10	(254)	0.78	0.73	0.68	0.67		0.92	0.79	0.75	0.65	0.64	0.60	0.58	0.84	0.75	0.48	0.36			0.95	0.72	0.77	0.74	0.64	n/a
11	(279)	0.81	0.75	0.70	0.68		0.99	0.85	0.80	0.66	0.65	0.61	0.59	0.97	0.86	0.55	0.42			1.00	0.83	0.81	0.78	0.67	0.61
12	(305)	0.84	0.77	0.72	0.70		1.00	0.90	0.85	0.68	0.66	0.62	0.60	1.00	0.98	0.63	0.48				0.95	0.84	0.81	0.70	0.64
14	(356)	0.89	0.82	0.76	0.73			1.00	0.95	0.71	0.69	0.64	0.62		1.00	0.79	0.60				1.00	0.91	0.88	0.76	0.69
16	(406)	0.95	0.86	0.79	0.77				1.00	0.74	0.72	0.66	0.64			0.97	0.73					0.97	0.94	0.81	0.74
18	(457)	1.00	0.91	0.83	0.80					0.77	0.75	0.68	0.65			1.00	0.87					1.00	0.99	0.86	0.78
24	(610)		1.00	0.94	0.90					0.86	0.83	0.74	0.70				1.00						1.00	0.99	0.90
30	(762)			1.00	1.00					0.95	0.91	0.81	0.75											1.00	1.00
36	(914)									1.00	0.99	0.87	0.80												
>48	(1219)										1.00	0.99	0.91												

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

3.2.3.4 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) and www.hilti.ca (Canada). 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 14 - HIT-HY 200 adhesive cure time and working time

HIT-HY 200-A					
		HAS / HIS-N / Rebar		HIT-Z	
[°C]	[°F]	t_{work}	t_{cure}	t_{work}	t_{cure}
-10...-5	14...23	1.5 h	7 h	–	–
-4...0	24...32	50 min	4 h	–	–
1...5	33...41	25 min	2 h	–	–
6...10	42...50	15 min	1.25 h	15 min	1.25 h
11...20	51...68	7 min	45 min	7 min	45 min
21...30	69...86	4 min	30 min	4 min	30 min
31...40	87...104	3 min	30 min	3 min	30 min

HIT-HY 200-R					
		HAS / HIS-N / Rebar		HIT-Z	
[°C]	[°F]	t_{work}	t_{cure}	t_{work}	t_{cure}
-10...-5	14...23	3 h	20 h	–	–
-4...0	24...32	2 h	8 h	–	–
1...5	33...41	1 h	4 h	–	–
6...10	42...50	40 min	2.5 h	40 min	2.5 h
11...20	51...68	15 min	1.5 h	15 min	1.5 h
21...30	69...86	9 min	1 h	9 min	1 h
31...40	87...104	6 min	1 h	6 min	1 h

Resistance of cured Hilti HIT-HY 200 to chemicals

Chemical		Behavior
Acetic acid	10%	+
Acetone		•
Ammonia	5%	+
Benzyl alcohol		–
Chloric acid	10%	•
Chlorinated lime	10%	+
Citric acid	10%	+
Concrete plasticizer		+
De-icing salt (Calcium chloride)		+
Demineralized water		+
Diesel fuel		+
Drilling dust suspension pH 13.2		+
Ethanol	96%	
Ethylacetate		–
Formic acid	10%	+
Formwork oil		+
Gasoline		+
Glycole		•
Hydrogen peroxide	10%	•
Lactic acid	10%	+
Maschinery oil		+
Methylethylketon		•
Nitric acid	10%	•
Phosphoric acid	10%	+
Potassium Hydroxide pH 13.2		+
Sea water		+
Sewage sludge		+
Sodium carbonate 10%	10%	+
Sodium hypochlorite 2%	2%	+
Sulphuric acid	10%	+
	30%	+
Toluene		•
Xylene		•

Key: – non-resistant
+ resistant
• limited resistance

Samples of the HIT-HY 200 adhesive were immersed in the various chemical compounds for up to one year. At the end of the test period, the samples were analyzed. Any samples showing no visible damage and having less than a 25% reduction in bending (flexural) strength were classified as “Resistant.” Samples that had slight damage, such as small cracks, chips, etc. or reduction in bending strength of 25% or more were classified as “Limited Resistance” (i.e. exposed for 48 hours or less until chemical is cleaned up). Samples that were heavily damaged or destroyed were classified as “Non-Resistant.”

Note: In actual use, the majority of the adhesive is encased in the base material, leaving very little surface area exposed.

3.2.3 HIT-HY 200 Adhesive Anchoring System

3.2.3.5 Ordering information

Hilti HIT-Z anchor rod

Description	Bit dia. (in.)	Min. embed. (in.)	Qty
HIT-Z 3/8 x 4 3/8	7/16	2-3/8	40
HIT-Z 3/8 x 5 1/8	7/16	2-3/8	40
HIT-Z 3/8 x 6 3/8	7/16	2-3/8	40
HIT-Z 1/2 x 4 1/2	9/16	2-3/4	20
HIT-Z 1/2 x 6 ½	9/16	2-3/4	20
HIT-Z 1/2 x 8	9/16	2-3/4	20
HIT-Z 5/8 x 6	3/4	3-3/4	12
HIT-Z 5/8 x 8	3/4	3-3/4	12
HIT-Z 5/8 x 9 1/2	3/4	3-3/4	12
HIT-Z 3/4 x 8 1/2	7/8	4	6
HIT-Z 3/4 x 9 ¾	7/8	4	6

HIT-HY 200-A

HIT-HY 200-R

HIT-HY 200-A (accelerated working time)

Description	Package contents	Qty
HIT-HY 200-A (11.1 fl oz/330 ml)	Includes (1) foil pack with (1) mixer and 3/8 filler tube per pack	1
HIT-HY 200-A Master Carton (11.1 fl oz/330 ml)	Includes (1) master carton containing (25) foil packs with (1) mixer and 3/8 filler tube per pack	25
HIT-HY 200-A Combo (11.1 fl oz/330 ml)	Includes (1) master carton containing (25) foil packs with (1) mixer and 3/8 filler tube per pack and (1) HDM 500 Manual Dispenser	25
HIT-HY 200-A Master Carton (16.9 fl oz/500 ml)	Includes (1) master carton containing (20) foil packs with (1) mixer and 3/8 filler tube per pack	20
HIT-HY 200-A Combo (16.9 fl oz/500 ml)	Includes (2) master cartons containing (20) foil packs each with (1) mixer and 3/8 filler tube per pack and (1) HDM 500 Manual Dispenser	40
HIT-RE-M Static Mixer	For use with HIT-HY 200-A cartridges	1

HIT-HY 200-R (regular working time)

Description	Package contents	Qty
HIT-HY 200-R (11.1 fl oz/330 ml)	Includes (1) foil pack with (1) mixer and 3/8 filler tube per pack	1
HIT-HY 200-R Master Carton (11.1 fl oz/330 ml)	Includes (1) master carton containing (25) foil packs with (1) mixer and 3/8 filler tube per pack	25
HIT-HY 200-R Combo (11.1 fl oz/330 ml)	Includes (1) master carton containing (25) foil packs with (1) mixer and 3/8 filler tube per pack and (1) HDM 500 manual dispenser	25
HIT-HY 200-R Master Carton (16.9 fl oz/500 ml)	Includes (1) master carton containing (20) foil packs with (1) mixer and 3/8 filler tube per pack	20
HIT-HY 200-R Combo (16.9 fl oz/500 ml)	Includes (2) master cartons containing (20) foil packs each with (1) mixer and 3/8 filler tube per pack and (1) HDM 500 manual dispenser	40
HIT-RE-M Static Mixer	For use with HIT-HY 200-R cartridges	1

TE-CD Hollow Drill Bits

Order Description	Working length (in.)
Hollow Drill Bit TE-CD 1/2-13	8
Hollow Drill Bit TE-CD 9/16-14	9-1/2
Hollow Drill Bit TE-CD 5/8-14	9-1/2
Hollow Drill Bit TE-CD 3/4-14	9-1/2
Hollow Drill Bit TE-CD 16-A (Replacement collar)	

TE-YD Hollow Drill Bits

Order Description	Working Length (in.)
Hollow Drill Bit TE-YD 3/4-24	15-1/2
Hollow Drill Bit TE-YD 7/8-24	15-1/2
Hollow Drill Bit TE-YD 1-24	15-1/2
Hollow Drill Bit TE-YD 1 1/8-24	15-1/2
Hollow Drill Bit TE-YD 25-A (Replacement collar)	

HIT-HY 200 Adhesive Anchoring System 3.2.3

Threaded anchors for Hilti chemical anchor systems[1]

HAS-E Rods 5.8 steel			HAS Super A193, B7 high strength steel		HAS-R 304 stainless steel		HAS-R 316 stainless steel	
Description	Qty	Qty	Description	Qty	Description	Qty	Description	Qty
3/8 x 4-3/8	10	240	-	-	-	-	-	-
3/8x 5-1/8	20	200	**3/8 x 5-1/8**	20	**3/8 x 5-1/8**	20	**3/8 x 5-1/8**	20
3/8 x 8	10	160	-	-	**3/8 x 8**	10	-	-
3/8 x 12	10	90	-	-	-	-	**3/8 x 8**	10
1/2 x 3-1/8	10	240	-	-	-	-	-	-
1/2 x 4-1/2	10	160	-	-	-	-	-	-
1/2 x 6-1/2	20	160	**1/2 x 6-1/2**	20	**1/2 x 6-1/2**	20	**1/2 x 6-1/2**	20
1/2x 8	10	120	-	-	**1/2 x 8**	10	**1/2 x 8**	10
1/2 x 10	10	120	-	-	**1/2 x 10**	10	**1/2 x 11**	10
1/2 x 12	10	80	-	-	-	-	**1/2 x 12**	10
5/8 x 8	20	80	**5/8 x 7-5/8**	20	**5/8 x 7-5/8**	20	**5/8 x 7-5/8**	20
5/8 x 9	10	60	-	-	**5/8 x 10**	10	**5/8 x 9**	10
5/8 x 12	10	60	-	-	-	-	**5/8 x 12**	10
5/8 x 17	10	40	-	-	-	-	-	-
3/4 x 10	10	40	**3/4 x 9-5/8**	10	**3/4 x 9-5/8**	10	**3/4 x 9-5/8**	10
3/4 x 11	10	30	-	-	-	-	**3/4 x 10**	10
3/4 x 12	10	30	-	-	**3/4 x 12**	10	-	-
3/4 x 14	10	30	**3/4 x 14**	10	**3/4 x 14**	10	**3/4 x 16**	10
3/4 x 17	10	20	-	-	**3/4 x 16**	10		
3/4 x 19	10	20	-	-	-	-	-	-
3/4 x 21	10	20	-	-	-	-	-	-
3/4 x 25	10	20	-	-	-	-		
7/8 x 10	10	20	**7/8 x 10 HDG**	5	**7/8 x 10**	10	**7/8 x 10**	10
-	-	-	**7/8 x 12 HDG**	5	-	-	-	-
7/8 x 13	10	20	**7/8 x 16 HDG**	5	-	-	**7/8 x 16**	10
1 x 12	4	16	**1 x 12**	4	**1 x 12**	4	**1 x 12**	4
1 x 14	2	16	**1 x 14**	2	-	-	-	-
1 x 16	2	12	**1 x 16**	2	-	-	**1 x 16**	2
1 x 20	2	12	**1 x 21**	2	-	-	**1 x 20**	2
1-1/4 x 16	4	8	**1-1/4 x 16**	4	-	-	-	-
1-1/4 x 22	4	8	**1-1/4 x 23**	4	-	-	-	-

Hilti Rods are now stamped on the end to show grade of steel and overall anchor length!

E = ISO 898 Class 5.8 Steel

B = ASTM A 193, Grade B7 Steel

R1 = AISI 304 Stainless Steel

R2 = AISI 316 Stainless Steel

HIS-N carbon steel and HIS-RN 316 stainless steel internally threaded inserts[1]

Description	Useable thread length (in)	Qty
3/8 x 4-1/4	1	10
1/2 x 5	1-3/16	5
5/8 x 6-5/8	1-1/2	5
3/4 x 8-1/4	2	5

1 All dimensions in inches.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Accessories — Dispensers

Battery Powered

Description
HDE 500-A18 Compact Battery Dispenser Kit[1] Includes dispenser, (2) compact B 18 1.6-Ah Li-Ion batteries, C 4/36 battery charger, black and red cartridge holders in a soft bag.
HDE 500-A18 Industrial Battery Dispenser Kit[1] Includes dispenser, (2) industrial B 18 3.3-Ah Li-Ion batteries, C 4/36 battery charger, black and red cartridge holders in a soft bag.
HDE 500-A18 Battery Dispenser Tool Body[1] Includes black and red cartridge holders
Battery Charger C 4/36 Li-Ion 115V Use with all B 14.4, B 18 batteries or B 36 batteries
Battery Compact 18 1.6-Ah Li-Ion
Battery Industrial B 18 3.3-Ah Li-Ion
HDE 500-A18 Hard Case

Manual

Description
MD 1000 Manual Dispenser[1] For HIT ICE
HDM 500 Manual Dispenser with black foil pack holder For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil packs of HIT-HY 150 MAX, HIT-HY 150 MAX-SD, HIT-RE 500, RE 500-SD, HIT-HY 10 PLUS, HIT-HY 70
HDM 500 Manual Dispenser with red foil pack holder For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil pack adhesives HY 200-A and HY 200-R
HDM 500 Manual Dispenser with black and red foil pack holder For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil pack adhesives HIT-HY 200-A, HIT-HY 200-R, HIT-HY 150 MAX, HIT-HY 150 MAX-SD, HIT-RE 500, HIT-RE 500-SD, HIT-HY 10 PLUS and HIT-HY 70
HIT-CB 500 black cartridge (foil pack) holder replacement For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil packs or HIT-HY 150 MAX, HIT-HY 150 MAX-SD, HIT-RE 500, HIT-RE 500-SD, HIT-HY 10 PLUS and HIT-HY 70
HIT-CR 500 red cartridge (foil pack) holder replacement For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil pack adhesives HIT-HY 200-A and HIT-HY 200-R
HDM 500 Hard Case Only, no tool

Pneumatic with 1/4 female compressed air coupling

Description
P 3500 Pneumatic Dispenser[1] For use with HIT 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil pack
HIT-P 8000D Pneumatic Dispenser[1] For use with HIT 47.3 fl oz/1400 ml jumbo foil pack
P 3500 Cartridge (black foil pack) holder replacement For use with the P 3500 Pneumatic Dispenser and HIT-HY 150 MAX-SD, HIT-HY 150 MAX, HIT-RE 500-SD, HIT-RE 500, HIT-HY 70 and HIT-HY 10 PLUS

1 Dispensers not compatible with HIT-HY 200 Adhesive Anchor System.

Color coded cartridge holders with the same quality dispenser

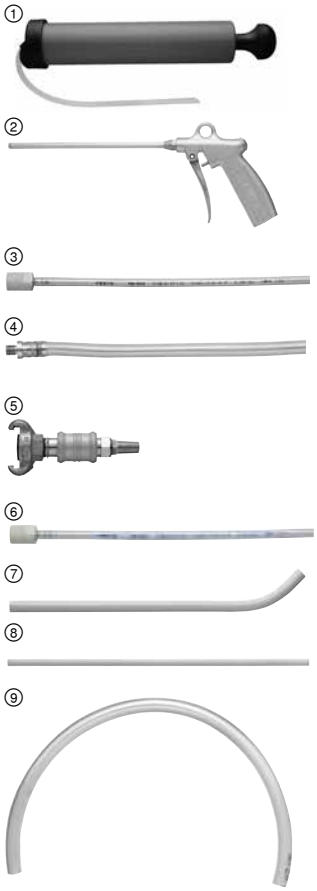
With the introduction of HIT-HY 200 and Safe Set™ Technology, Hilti has introduced a new chemistry with a 5:1 ratio. **All other Hilti adhesive anchor system have a 3:1 mix ratio.** The new technology allows for better performance and both the HDM 500 Manual Dispensers and HDE 500-A18 Battery Dispenser can accept both cartridge ratios. Simply change out the cartridge holder and you can use the dispenser on any jobsite with any Hilti foil pack adhesive.

Red	Black

HIT-HY 200 Adhesive Anchoring System 3.2.3

Hilti HIT Profi Accessories for blowing out drilled holes

Description		Diameter in.	Length ft	Qty
Blow-Out Pump For use in holes up to 10 in. deep	①			1
Blow-Out Tool G 1/4 NPT Inlet For use in holes up to 11 in. deep. For holes deeper than 11 in., use Blow-Out Tool plus the following extensions	②			1
Extension hose for blow-out tool HIT-DL 10/0.8	③	0.39	2.6	1
Extension hose for blow-out tool HIT-DL 16/0.8	④	0.71	2.6	1
3/8 Claw-type Quick Connect HIT-DL A	⑤			1
Extension hose for HIT-DL A HIT-DL V10/1	⑥	0.39	3.3	1
Extension tube HIT-DL B (Rigid/bent)	⑦	0.63		5
Extension tube HIT-VL 16/0.7 (Rigid/straight)	⑧	0.63	2.3	10
Coupler for blowing extensions HIT-DL K Metal coupler for splicing 16 mm extension hose		0.63		10
Extension hose HIT-VL 16 (Flexible)	⑨	0.63	33	1
HIT-DRS Dust Removal System with one hole for vacuum attachment and another hole for the Blow-Out Tool. For use with compressed air				1



Air nozzles

Attach to extension end for proper hole cleaning[1]

Description	Qty
HIT-DL 1/2 Use with 10 mm diameter hose	1
HIT-DL 9/16 Use with 10 mm diameter hose	1
HIT-DL 11/16 Use with 10 mm diameter hose	1
HIT-DL 3/4 Use with 16 mm diameter hose/tube	1
HIT-DL 7/8 Use with 16 mm diameter hose/tube	1
HIT-DL 1 Use with 16 mm diameter hose/tube	1
HIT-DL 1-3/8 Use with 16 mm diameter hose/tube	1

1 HIT-DL size determined by the diameter of drilled hole; see Accessory Selection Table below for proper sizing

Also avaliable in metric!

Round brush[2]

Piston plug (10 pack)[3]

Air nozzle

Hole diameter[1]	Description	Description	Use with hose dia.	Description
7/16	**HIT-RB 7/16**	**-**		**-**
1/2	**HIT-RB 1/2**	**HIT-IP 1/2**	9 mm	**HIT-DL 1/2**
9/16	**HIT-RB 9/16**	**HIT-IP 9/16**	9 mm	**HIT-DL 9/16**
5/8	**HIT-RB 5/8**	**HIT-IP 5/8**	9 mm	**-**
11/16	**HIT-RB 11/16**	**HIT-IP 11/16**	9 mm	**HIT-DL 11/16**
3/4	**HIT-RB 3/4**	**HIT-IP 3/4**	16 mm	**HIT-DL 3/4**
7/8	**HIT-RB 7/8**	**HIT-IP 7/8**	16 mm	**HIT-DL 7/8**
1	**HIT-RB 1**	**HIT-IP 1**	16 mm	**HIT-DL 1**
1-1/8	**HIT-RB 1 1/8**	**HIT-IP 1 1/8**	16 mm	**-**
1-1/4	**HIT-RB 1 1/4**	**HIT-IP 1 1/4**	16 mm	**-**
1- 3/8	**HIT-RB 1 3/8**	**HIT-IP 1 3/8**	16 mm	**HIT-DL 1 3/8**
1-1/2	**HIT-RB 1 1/2**	**HIT-IP 1 1/2**	16 mm	**-**
1-3/4	**HIT-RB 1 3/4**	**HIT-IP 1 3/4**	16 mm	**-**

1 Refer to adhesive anchor system installation instructions to determine the proper hole diameter for the fastening element to be used.
2 Attach brush to HIT-RBH T-handle, HIT-RBS or HIT-RBV extensions.
3 Use piston plugs to help prevent air voids during injection.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Hilti HIT Profi Accessories for brushing drilled holes

Manual brush handle for round steel brush

Description		Qty
HIT-RBH (T-handle) Use to clean holes up to 11 in. deep	①	1

Manual brush extension for round steel brush

Description		Qty
HIT-RBV 11 in. extension for HIT-RBH (T-handle)	②	1

Holders for brush extension RBS

Connects RBS extension to your Hilti drill for use in cleaning holes

Description		Qty
TE-Y SDS Max connection	③	1
TE-C SDS + Connection	④	1

Extensions for round steel brushes

Description		Diameter in	Length ft	Qty
HIT-RBS 10/0.7	⑤	0.39	2.3	1
HIT-RBS-10/0.35	⑤	0.39	1.2	1

Hilti HIT Profi Accessories for adhesive injection

Extension hoses

For use in holes deeper than 10 in.

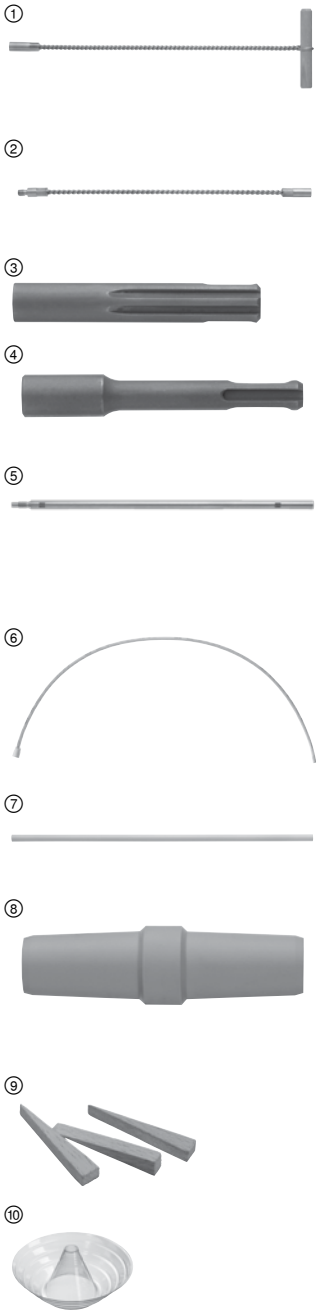
Description		Diameter in.	Length ft	Qty
HIT-VL 9/1.0 flexible hose	⑥	0.35	3.3	10
HIT-VL 16/0.7 rigid tube	⑦	0.63	2.3	10
HIT-VL 16 flexible hose		0.63	33	1

Coupler for injection extensions

Description		Diameter in.	Qty
HIT-VL K Plastic coupler for connecting 16 mm (0.63 in.) hoses and tubes	⑧	0.63	5

Overhead injection accessories

Description		Hole Diameter in.	Qty
HIT-OHW overhead wedge	⑨	7/16 to 1-1/4	100
HIT-OHC1 overhead drip guard	⑩	7/16 to 5/8	10
HIT-OHC2 overhead drip guard		11/16 to 1-1/4	10



Notes

Material Safety Data Sheet
acc. to ISO 11014

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* 1 Identification of the substance/mixture and of the company/undertaking

· **Product identifier**

· **Trade name:** **Hilti HIT-HY 200-A**
· **Container size:** 330 ml, 500 ml
· **Relevant identified uses of the substance or mixture and uses advised against**
· **Sector of Use** Building and construction work
· **Application of the substance / the preparation** Adhesive anchoring system for rebar and anchor fastenings in concrete.

· **Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Hilti, Inc.
5400 South 122nd East Ave.
US-Tulsa, OK 74146
Phone: (800) 879-8000
Fax: (800) 879-7000
Español: (800) 879-5000

· **Information department:**
anchor.hse@hilti.com
see section 16
· **Emergency telephone number:**
Chem-Trec
Tel.: 1 800 424 9300

* 2 Hazards identification

· **Classification of the substance or mixture**

GHS07

H319 Causes serious eye irritation.
Skin Sens. 1 H317 May cause an allergic skin reaction.

· **Classification according to Directive 67/548/EEC or Directive 1999/45/EC**

Xi; Sensitising

R43: May cause sensitization by skin contact.

O; Oxidizing

R7: May cause fire.
· **Information concerning particular hazards for human and environment:**
The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.
· **Classification system:**
The classification was made according to the latest editions of the EU-lists, and expanded upon from company and literature data.

· **Label elements**
· **GHS label elements** The product is classified and labelled according to the Globally Harmonized System (GHS).
· **Hazard pictograms**

GHS07

· **Signal word** Warning

· **Hazard-determining components of labelling:**
methacrylic acid, monoester with propane-1,2-diol
dibenzoyl peroxide
· **Hazard statements**
H319 Causes serious eye irritation.
H317 May cause an allergic skin reaction.
· **Precautionary statements**

P262	Do not get in eyes, on skin, or on clothing.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352	IF ON SKIN: Wash with plenty of soap and water.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P333+P313	If skin irritation or rash occurs: Get medical advice/attention.
P337+P313	If eye irritation persists: Get medical advice/attention.

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Trade name: Hilti HIT-HY 200-A

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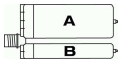
· **Classification system**
· **NFPA ratings (scale 0-4)**

Health = 2
Fire = 1
Reactivity = 1

· **Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

· **Additional information:**



Hilti HIT

· **Information pertaining to particular dangers for man and environment: A**
H317 May cause an allergic skin reaction.
.
· **Information pertaining to particular dangers for man and environment: B**
H319 Causes serious eye irritation.
H317 May cause an allergic skin reaction.

*

3 Composition/information on ingredients

· **Chemical characterization: Mixtures**
· **Description:**
2-Component-Foilpack, contains:
Component A: Urethane methacrylate resin, inorganic filler
Component B: Dibenzoylperoxide, phlegmatized

Mixture of the substances listed below with nonhazardous additions.

· **Dangerous components:**		
27813-02-1	methacrylic acid, monoester with propane-1,2-diol Xi R36; Xi R43 H319; Skin Sens. 1, H317	5-10%
94-36-0	dibenzoyl peroxide Xi R36; Xi R43; E R3; O R7 Org. Perox. B, H241; Eye Irrit. 2, H319; Skin Sens. 1, H317	10-15%

.

· **Dangerous components A:**		
27813-02-1	methacrylic acid, monoester with propane-1,2-diol	Xi R36; Xi R43 H319; Skin Sens. 1, H317

· **Dangerous components B:**		
94-36-0	dibenzoyl peroxide	Xi R36; Xi R43; E R3; O R7 Org. Perox. B, H241; Eye Irrit. 2, H319; Skin Sens. 1, H317

.

· **Non Dangerous components:**		
14808-60-7	Quartz (SiO2)	25-50%
1344-28-1	aluminium oxide	2.5-10%
7631-86-9	silicon dioxide, chemically prepared	<2.5%

· **SVHC** None
· **Additional information** For the wording of the listed risk phrases refer to section 16.

4 First aid measures

· **Description of first aid measures**
· **General information** Immediately remove any clothing soiled by the product.
· **After inhalation** Take affected persons into fresh air and keep quiet.
· **After skin contact** Immediately wash with water and soap and rinse thoroughly.
· **After eye contact**
Rinse opened eye for several minutes under running water. Then consult a doctor.
Protect unharmed eye.
· **After swallowing**
Rinse out mouth and then drink plenty of water.
Seek immediate medical advice.

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· **Information for doctor**
· **Most important symptoms and effects, both acute and delayed** Allergic reactions
· **Indication of any immediate medical attention and special treatment needed** No further relevant information available.

5 Firefighting measures

· **Extinguishing media**
· **Suitable extinguishing agents** CO2, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
· **For safety reasons unsuitable extinguishing agents** Water with full jet.
· **Special hazards arising from the substance or mixture**
In case of fire, the following can be released:
Nitrogen oxides (NOx)
Carbon monoxide (CO)
Carbondioxide (CO2)
In certain fire conditions, traces of other toxic gases cannot be excluded.
· **Advice for firefighters**
· **Protective equipment:** Wear self-contained respiatory protective device.

6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures**
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
· **Environmental precautions:** Do not allow to penetrate the ground/soil.
· **Methods and material for containment and cleaning up:**
Pick up mechanically.
Clean the affected area carefully; suitable cleaners are:
organic solvent
Ensure adequate ventilation.
Dispose contaminated material as waste according to item 13.
· **Reference to other sections**
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

· **Handling**
· **Precautions for safe handling**
Check the expiry date: see imprint on manifold (month/year). Do not use expired mortar!
The usual precautionary measures for handling chemicals should be followed.
· **Information about protection against explosions and fires:**
Keep ignition sources away - Do not smoke.
Protect from heat.

· **Conditions for safe storage, including any incompatibilities**
· **Storage**
· **Requirements to be met by storerooms and receptacles:** Keep in a cool, dry and dark place; 41 °F / 5 °C to 77 °F / 25 °C.
· **Information about storage in one common storage facility:** Store away from foodstuffs.
· **Further information about storage conditions:** Protect from heat and direct sunlight.

· **Storage class**
As per VCI (1991) storage classification concept.
11
· **Specific end use(s)** Adhesive anchoring system for rebar and anchor fastenings in concrete.

*

8 Exposure controls/personal protection

· **Additional information about design of technical systems:** No further data; see item 7.

· **Control parameters**
· **Components with limit values that require monitoring at the workplace:**
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.
The product has a pasty consistency. Exposure limit values for respirable dusts ar not relevant for this product.
· **Additional information:** The lists that were valid during the creation were used as basis.

· **Exposure controls**
· **Personal protective equipment**
· **General protective and hygienic measures**
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Wash hands before breaks and at the end of work.
Avoid contact with the eyes and skin.
Do not eat, drink, smoke or sniff while working.

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· **Breathing equipment:** Not required.
· **Protection of hands:**
Protective gloves.
EN 374 / EN 388
Avoid direct contact with the chemical/ the product/ the preparation by organizational measures.
The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
· **Material of gloves** Nitrile rubber, NBR
· **Penetration time of glove material**
The exact break trough time has to be found out by the manufacturer of the protective gloves and has to be observed.
· **Not suitable are gloves made of the following materials:**
Natural rubber, NR
Leather gloves
Strong gloves
· **Eye protection:**
Tightly sealed goggles.
EN 166 / EN 170
· **Body protection:** Protective work clothing.

*

9 Physical and chemical properties

· **Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Pasty
Color:	Component A: grey Component B: white
· **Odor:**	Ester-like
· **Odour threshold:**	Not determined
· **pH-value:**	Componente A: not applicable Componente B: ~ 7
· **Change in condition**	
Melting point/Melting range:	Not determined.
Boiling point/Boiling range:	undetermined
· **Flash point:**	Component A: > 109 °C (DIN 53213) Component B: not applicable
· **Flammability (solid, gaseous)**	Not determined
· **Ignition temperature:**	355°C (671 °F)
· **Decomposition temperature:**	Component A: not relevant Component B: SADT 65°C UN test H4
· **Auto igniting:**	Product is not selfigniting.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined
Upper:	Not determined
· **Vapor pressure at 20°C (68 °F):**	< 0.1 hPa (< 0 mm Hg) (HPMA)
· **Density at 20°C (68 °F):**	1.8 g/cm³ (15.021 lbs/gal) (DIN 51757)
· **Relative density**	Not determined
· **Vapour density**	Not determined
· **Evaporation rate**	Not determined
· **Solubility in / Miscibility with**	
Water:	Not miscible or difficult to mix
· **Partition coefficient (n-octanol/water):**	Not determined
· **Viscosity:**	
dynamic at 20°C (68 °F):	50 Pa.s (DIN 53788)
kinematic at 20°C (68 °F):	> 20 s (DIN 53211/4)
· **Solvent content:**	
Water:	Component B: ~ 20%
· **Other information**	No further relevant information available.

10 Stability and reactivity

· **Reactivity**
· **Chemical stability**
· **Thermal decomposition / conditions to be avoided:**
To avoid thermal decomposition do not overheat.
No decomposition if used and stored according to specifications.

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Trade name: Hilti HIT-HY 200-A

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· **Possibility of hazardous reactions** No dangerous reactions known
· **Conditions to avoid** No further relevant information available.
· **Incompatible materials:** No further relevant information available.
· **Hazardous decomposition products:** No dangerous decomposition products known

*

11 Toxicological information

· **Information on toxicological effects**
· **Acute toxicity:**
· **Primary irritant effect:**
· **on the skin:** No irritant effect.
· **on the eye:** Irritating effect.
· **Sensitization:** Sensitization possible through skin contact.
· **Additional toxicological information:**
The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version:
Irritant

· **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer)**		
14808-60-7	Quartz (SiO2)	1
94-36-0	dibenzoyl peroxide	3
7631-86-9	silicon dioxide, chemically prepared	3

· **NTP (National Toxicology Program)**		
14808-60-7	Quartz (SiO2)	K

12 Ecological information

· **Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **Persistence and degradability** No further relevant information available.
· **Behavior in environmental systems:**
· **Bioaccumulative potential** No further relevant information available.
· **Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **According to the formulation contains the following heavy metals and compounds from the EU guideline NO. 2006/11/EC:** None
· **General notes:** The product does not contain organically bounded halogens (AOX-free).
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.
· **Other adverse effects** No further relevant information available.

13 Disposal considerations

· **Waste treatment methods**
· **Recommendation**
After curing, the product can be disposed of with household waste.
Full or only partially emptied cartridges must be disposed of as special waste in accordance with official regulations.

· **European waste catalogue:**	
08 00 00	WASTES FROM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS), ADHESIVES, SEALANTS AND PRINTING INKS
08 04 00	wastes from MFSU of adhesives and sealants (including waterproofing products)
08 04 09*	waste adhesives and sealants containing organic solvents or other dangerous substances
20 00 00	MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS
20 01 00	separately collected fractions (except 15 01)
20 01 27*	paint, inks, adhesives and resins containing dangerous substances

· **Uncleaned packagings:**
· **Recommendation:**
Disposal must be made according to official regulations.
Empty packs: May be disposed via the local Green Dot collecting system or EAK waste material code 150102 (plastic packaging materials)

*

14 Transport information

· **UN-Number**
· **DOT, ADR, ADN, IMDG, IATA** Void

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· **UN proper shipping name**	
· **DOT, ADN, IMDG, IATA**	Void
· **ADR**	Void
· **Transport hazard class(es)**	
· **DOT, ADR, ADN, IMDG, IATA**	
· **Class**	Void
· **Packing group**	
· **DOT, ADR, IMDG, IATA**	Void
· **Environmental hazards:**	
· **Marine pollutant:**	No
· **Special precautions for user**	Not applicable.
· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **Transport/Additional information:**	Not dangerous according to the above specifications. available oxygen content < 1 %
· **UN "Model Regulation":**	-
· **HS-Code:**	3214 10 10: Glaziers' putty, grafting putty, resin cements, caulking compounds and other mastics

15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **Sara**

· **Section 355 (Extremely hazardous substances):**

None of the ingredients is listed.

· **Section 313 (Specific toxic chemical listings):**

1344-28-1	aluminium oxide
94-36-0	dibenzoyl peroxide

· **TSCA (Toxic Substances Control Act):**

All ingredients are listed.

· **Proposition 65:**

· **Chemicals known to cause cancer:**

None of the ingredients are listed.

· **Cancerogenity categories**

· **EPA (Environmental Protection Agency)**

None of the ingredients is listed.

· **TLV (Threshold Limit Value established by ACGIH)**

14808-60-7	Quartz (SiO2)	A2
1344-28-1	aluminium oxide	A4
94-36-0	dibenzoyl peroxide	A4

· **MAK (German Maximum Workplace Concentration)**

14808-60-7	Quartz (SiO2)	1
1344-28-1	aluminium oxide	2

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

14808-60-7	Quartz (SiO2)

· **OSHA-Ca (Occupational Safety & Health Administration)**

None of the ingredients is listed.

· **National regulations** The product is subject to be labeled according with the prevailing version of the regulations on hazardous substances.

· **Information about limitation of use:** Employment restrictions concerning young persons must be observed.
· **Chemical safety assessment:** not required.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Relevant phrases**
H241 Heating may cause a fire or explosion.
H317 May cause an allergic skin reaction.
H319 Causes serious eye irritation.

R3 Extreme risk of explosion by shock, friction, fire or other sources of ignition.
R36 Irritating to eyes.

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R43 May cause sensitization by skin contact.
R7 May cause fire.

· **Department issuing MSDS:**
Hilti Entwicklungsgesellschaft mbH
Hiltistrasse 6
D-86916 Kaufering
Tel.: +49 8191 906310
Fax: +49 8191 90176310
e-mail: anchor.hse@hilti.com
· **Contact:** Mechthild Krauter
· **Abbreviations and acronyms:**
RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)
ICAO: International Civil Aviation Organization
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
· *** Data compared to the previous version altered.**